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

23–27 March 2015

Öregrund, Sweden

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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Executive summary

The ICES Baltic International Fish Survey Working Group (WGBIFS) met in the Institute of Coastal Research in Öregrund (SLU), Sweden, from 23–27 March 2015, to compile the research surveys (BITS, BASS, BIAS) results from 2014 and the first half of 2015 moreover, to coordinate and plan the schedule for surveys in the second half of 2015 and the first half of 2016. The common survey manuals were slightly updated, according to decisions made during the meeting and suggestions prepared by reviewers. The extended verification of text of the manuals will be realized by some WGBIFS members, until the next WG meeting, taking into account the SISP standards. All Baltic fish stocks assessment relevant surveys were internationally coordinated. A total of 24 participants, representing all countries around the Baltic Sea, attended in the meeting (see Annex 1). Wlodzimierz Grygiel, Poland chaired the group.

The routine surveys standard data compilation can be found under the relevant sections. Each survey nationally organized in the second half of 2014 and the first half of 2015 is described in separate reports and was orally presented during the meeting (Annexes 6, 7, 8, 10). Time-series of the acoustic tuning fleets are presented in the Annex ToR a. One from presentations was focused on some facts from the history of WGBIFS activities. During the meeting were discussed and clarified non-routine aspects of BITS surveys, e.g. cod stomachs sampling, reporting the marine litter occurred in bottom control-catches, and discrepancy between national fish maturity keys and ICES conversion table.

The evaluation of the recently realized standard surveys showed that sampling plans and their accomplishment is similar however, from three years is noticed the lack of Russian data from a part of the ICES SDs 26 and 32, which created problems with accuracy of international data. Fish stocks indices were evaluated based on the standard surveys and reflect possible precision of the current fish stocks size and distribution.

Discussion of obtaining the survey results and new plans showed that the national cruise leaders have to inform the international coordinators of surveys as soon as possible if planned control-stations cannot be realized or planned areas cannot be covered for some reasons. Coordinators should have the opportunity to offer alternative solutions. In respect of activations in 2016, a new Danish research vessel “Havfisken II”, intercalibration with the old vessel is needed.

WGBIFS discussed different methodical aspects of the acoustic surveys. However, statistical analyses were commonly based on a subset of the data. There is a proposal to establish a new international acoustic database, which is linked the AtlantOS project and WGBIFS Access-database. Initial information regarding an attempt to standardize the pelagic fishing gear used in acoustic surveys was presented. WGBIFS members accept the initiative and an international steering group needs to be organized for evaluating the possibility of implementation the standard trawl.

The ICES Data Centre expert – V. Soni informed the group about the current developments and plans of DATRAS-database, e.g. about additional fields in CA and HH records.

Based on inquiries from other ICES expert groups, a part of the working time was committed to discussions of additional terms of reference, e.g. on comparison of Baltic fish ageing methods used in the national laboratories, species validity codes condition in DATRAS, the status of acoustic data (2010–2013) delivering to special study, and verification discrepancy between herring stocks size in the ICES SD 30 and the Central

Baltic, estimated with various methods. All these requests are replied in the current report.

1 Administrative details

Working Group name –

Baltic International Fish Survey Working Group (WGBIFS)

Year of Appointment – 2015

Reporting year within current cycle (1, 2 or 3) – 1

Chair – Wlodzimierz Grygiel, Poland

Meeting venue – Institute of Coastal Research in Öregrund (SLU), Sweden

Meeting dates – 23–27 March 2015

2 Terms of references

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

ToR b) Update the BIAS and BASS acoustic databases;

ToR c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2015 and spring 2016;

ToR d) Discuss the results from BITS surveys performed in autumn 2014 and spring 2015 and evaluate the characteristics of TVL and TVS standard gears used in BITS;

ToR e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2015 and spring 2016, and update and correct the Tow Database;

ToR f) Review and update the Baltic International Trawl Survey (BITS) Manual according to SISP standards;

ToR g) Review and update the International Baltic Acoustic Surveys (IBAS) Manual according to SISP standards;

ToR h) Discuss the indices of acoustic surveys based on different methods of evaluation;

ToR i) Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey (BITS);

ToR j) Discuss the possibilities to make further consistency of IBAS for WGBIFS. Initial information about how to standardize the pelagic fishing gear used in BIAS and BASS surveys.

ToR k) Review the progress of the ICES acoustic database.

The revised full list of WGBIFS Multi-annual ToRs is accessible in the Annex 2A. The Agenda of WGBIFS-2015 meeting is presented in the Annex 3 and the full list of responsibilities allocated by particular WG members is accessible only on the ICES SharePoint – WGBIFS 2015.

3 Summary of the Work Plan for Year 1

Seven first ToRs of WGBIFS/2015 are simultaneously ongoing work because these matters change over the time. Moreover, they are related the way of the realization with themselves and the materials obtained from research surveys are the input data independent from commercial fishery preferences and can be used for tuning in the main Baltic fish stocks size assessment, realized annually by WGBFAS. Terms of references Nos. a) - e), i) and j) from the list above have been completed successfully for 2015. Results of investigations obtained in the framework of BITS-4q/2014, BITS-1q/2015, BASS/2014 and BIAS/2014 surveys have been analysed and are reporting to WGBFAS. Moreover, during the meeting have been made coordination and planning the time-spatial schedule for research standard surveys in the second half of 2015 and the first half of 2016 however, some extension and deficiencies in surveys was underlined. Cod stomachs sampling programme in the BITS surveys was discussed and suitable guide was elaborated, based on the international study project MARE/2012/02 and WGSAM advices. The initial approach to select and design the standard pelagic fishing gear which potentially be used in BIAS and BASS surveys was deliberated and in the next phase, an international steering group composed from gear-technologist and invited other experts should be establish for preparation the EU tender and to construct the model of standard pelagic trawl and the trawling set. Terms of references Nos. f) and g) needs additional works, which will be made within the running year by small group of WGBIFS members. Terms of references Nos. h) and k) because of not sufficient time- and spatial-range of data, delivered to leaded WGBIFS experts and some gaps in transfer of information, should be supplemented within the running year and the new analyses will be made at the next year meeting. Inquiries from other ICES expert groups, addresses to WGBIFS, were considered and replied in the current report, e.g.: comparison of Baltic fish ageing methods used in the national laboratories, species validity codes condition in DATRAS, the status of acoustic data (2010–2013) delivering to special study, and verification discrepancy between herring stocks size in ICES SD 30 and Central Baltic, estimated with various methods.

4 List of outcomes and achievements of the WG in this delivery period

1) Maps of BASS and BIAS-2014 area coverage, agreed plans (time-spatial coverage) for the next standard fish-acoustic surveys, per country, ICES SDs and ICES rectangles.

2) Geographical distribution of sprat, herring and cod abundance in the Baltic Sea, per the ICES-rectangles (Sep.-Oct. 2014; BIAS surveys).

3) BIAS – sprat from the ICES SD 22–29, herring from the ICES SD 25–29 and separately from the ICES SD 30 - tuning fleet index, i.e. abundance per age groups from 0 to 8+ for years 1991–2014.

4) BIAS – sprat and herring (age-group 0) recruitment index for years 1991–2014.

5) BASS – geographical distribution of sprat in the ICES SD 24–28 abundance per the ICES-rectangles, age groups from 1 to 8+ for years 2001–2014 (May-June 2014).

6) Updated the BIAS and BASS acoustic databases, accordingly to the BASS_DB.mdb the BIAS_DB.mdb Access-database.

7) Set of BITS surveys (BITS-4q/2014, BITS-1q/2015) standard reports (Annex 6) reflect the comparison between planned and realized fishing-stations by the ICES Subdivisions and depth layers and country.

8) Agreed plan and decide on demersal trawl fish control-catches to be conducted in autumn 2015 and spring 2016, during BITS surveys, per depth zones, country, ICES SDs.

9) Updated and corrected the Tow-Database and the Database of Trawl Surveys (DATRAS), which allow calculating cod and flatfish abundance index per age groups, ICES SDs, depth stratums and planning the spatial distribution of catch-stations in the areas, where the seabed is suitable for safety trawling.

10) The BITS- and IBAS-Manuals were updated with the description on procedures connected with collecting and reporting the marine litter and cod stomachs from BITS surveys, moreover with explanation of calibration, and intercalibration needs of acoustic system on surveying vessels, during BIAS surveys. Was revised and updated the Baltic main fish maturity scales used in national laboratories and converted into the ICES scale - used in DATRAS (the Annex 7 in Addendum 1).

11) The main results of standard fish- and acoustic surveys were for the first time orally presented during meeting by everyone from national delegates (the Annex 10) and partly described in the extended survey reports and working papers (the Annexes 7, 8, 9).

12) Recommendations (the Annex 4) to WGBFAS and others ICES WGs with respect among others, to the main Baltic fish species abundance index to be applied as tuning parameter in the stocks size assessment, moreover the Action list (the Annex 5) for WGBIFS was prepared.

13) Inquiries from others Expert Groups (WGBIOP, WGBEAM, WGSAM, and WGBFAS) as well as other issues emerged before and during the meeting were deliberated and adequate answers were prepared (Ch. 7 Other business and the Annex ToR 7).

14) The initial information about how to standardize the pelagic fishing gear (incl. full set of rigging) used in BIAS and BASS surveys was presented and discussed and this topic will be considered within the next two years.

5 Progress report on ToRs and workplan

5.1 ToR a) Combine and analyse the results of spring (BASS) and autumn (BIAS) 2014 acoustic surveys and experiments and report to WGBFAS

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

In 2014, five research vessels participated in the accomplishment of seven autumn acoustic surveys (BIAS type), conducted in September – October in the ICES Subdivisions 21–32 however, only in parts in some areas. Stock indices of herring, sprat and cod by age groups of the different cruises are stored in the BIAS-database of WGBIFS. The extended reports from German-Danish, Latvian-Polish, Estonian-Polish, Finnish, Polish, Swedish and Lithuanian BIAS 2014 cruises are presented in the Annex 8. The whole time-series of data linked with tuning indices of sprat and herring and originated from the standard acoustic surveys, accomplished in the period of 1991–2014 are accessible in the Annex ToR a).

5.1.1.1 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. Totally, seven statistical ICES-rectangles were inspected by more than one country (Figure 5.1.1.1.1 in the Annex ToR a). The Figure 5.1.1.1.1 illustrates that the planned coverage of the Baltic Sea during the BIAS survey in September-October 2014, was not fully realized as required by the WGBIFS 2014 meeting (the Annex ToR a). It should be mentioned that, Russia (AtlantNIRO) has not realized (and not even planned) any BIAS surveys in the southeastern part of the ICES SD 26 in recent three years. The extended summary of the BIAS national surveys from 2014 are presented in the Annex 8.

5.1.1.2 Total results

The fish abundance estimates, which are based on the BIAS surveys in September-October 2014, are presented per the ICES-rectangles and age groups and are specified in Tables 5.1.1.2.1, 5.1.1.2.2 and 5.1.1.2.3 (the Annex ToR a) for herring, sprat and cod, respectively. In addition, the abundance estimates for herring and sprat aggregated per the ICES Subdivisions and fish age groups are presented in Tables 5.1.1.2.4 and 5.1.1.2.5 (the Annex ToR a). Geographical distribution of herring, sprat and cod abundance in the Baltic Sea, accordingly to the ICES rectangles inspected in September-October 2014 is illustrated in Figures 5.1.1.2.1 – 5.1.1.2.3 (the Annex ToR a). The highest herring stock abundance (all age groups) was concentrated in the Gotland Basin, the Gulf of Finland and the Bothnian Sea and considerably lower was detected in the whole southern part of the Baltic Sea, incl. the Arkona Basin (Figure 5.1.1.2.1). The highest sprat stock abundance was detected in the somewhat different areas as in the case of herring, i.e. in the southern part of Gotland Basin, the northern part of Gdańsk Basin, the Gulf of Finland and the western part of Aland Sea and was considerably lower in the Bothnian Sea and the Polish part of the southern Baltic (Figure 5.1.1.2.2). The highest cod stock abundance was recognized in the area southeast from the Gotland and somewhat lesser abundance was evaluated in the areas northwards from the Bornholm and in part of the Arkona Basin; in others inspected areas of the Baltic the cod abundance was at very low level (Figure 5.1.1.2.3). Taking into consideration the recent BIAS surveys results should be underlined the fact that in the case of CBH (the ICES SDs 25–27, 28.2, 29) BIAS acoustic tuning fleet index (age groups 1–8+) the systematic increase can be observed after 2007 but, in the case of sprat stock (the ICES SDs 22–29) this parameter is continuously declining (Grygiel 2015). Moreover, the latest BIAS results indicate that in 2014 was born very abundant sprat and herring year-class in the central-eastern and northern parts of the Baltic. The abundance of herring and sprat (age 0) from year-class 2014 was respectively, 11- and 7-times higher than year-class 2013 (Grygiel, 2015).

5.1.1.3 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 IBAS manual (Table 2.2 in Addendum 2) and the area of ICES-rectangles, which was covered during the survey. Some disagreements appeared about the appropriate area of the ICES Subdivision 28. It was agreed that the Gulf of Riga (ICES Subdivision 28.1) must be excluded from the total area. All other the ICES Subdivisions kept their areas from the manual (Section 3.3). The area corrected abundance estimates for herring and sprat per the ICES Subdivisions and age groups are summarized in Tables 5.1.1.3.1 and 5.1.1.3.2, respectively. Biomass for herring and sprat per the ICES Subdivisions and age groups are summarized in Tables 5.1.1.3.3 and 5.1.1.3.4, respectively.

5.1.1.4 Tuning fleets for WGBFAS

5.1.1.4.1 Herring in the ICES Subdivisions 25–29

Following tuning fleets' index was derived from the 1991–2014 BIAS (September-October) surveys for the herring assessment of the Central Baltic stock (Figure 5.1.1.4.1.1) and are presented in the Annex ToR a):

- the area corrected numbers per age groups from 1 to 8+ of the ICES Subdivisions 25–27, 28.2 and 29 (including and excluding the existing data of the ICES SD 29 North; the Annex ToR a) - Tables 1 and 6),
- the area corrected recruitment index for age 0 of the ICES Subdivisions 25–27, 28.2 and 29 (including and excluding the existing data of the ICES SD 29 North; the Annex ToR a) - Tables 2 and 7).

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. Nevertheless, high density of herring has been recorded there very frequently.

The tuning fleet for assessment of the Central Baltic herring stock (the ICES Subdivisions 25–29) was calculated with inclusion of the data from the ICES SD 29N, collected during the September/October 1991–2014 BIAS surveys (the Annex ToR a) - Table 1). The recruitment index for herring (age 0) in the ICES Subdivisions 25–29 is presented in Annex ToR a) - Table 2.

5.1.1.4.2 Sprat in the ICES Subdivisions 22–29

The tuning fleet for assessment of sprat from the ICES Subdivisions 22–29 is presented from the September/October 1991–2014 BIAS surveys (Figure 5.1.1.4.2.1) and the area corrected combined results of the above-mentioned the ICES Subdivisions are presented in the Annex ToR a) - Table 3. The recruitment index for sprat (age 0) in the ICES Subdivisions 22–29 is presented in the Annex ToR a) - 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.

5.1.1.4.3 Herring in the ICES Subdivision 30

Tuning fleet data from the October 1991, 2000, 2007–2014 BIAS surveys are presented for the herring assessment of the Bothnian Sea (the ICES Sub-div. 30) stock, the area corrected combined results are presented in Table 5.1.1.4.3.1 and Figure 5.1.1.4.3.1 (the Annex ToR a). The abundance indices for herring from the ICES SD 30 in age-groups 0 and 1 have high variability (Figure 5.1.1.4.3.1) in BIAS surveys. The abundant and poor year-classes are not well traceable in the time-series for younger age groups. This has been caused by the differences in temporal horizontal distribution of young specimens and not fully recruited herring. WGBIFS recommends WGBFAS to handle the abundance indices of herring in the ICES SD 30 for age-groups 0 and 1 with caution.

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

In 2014, three vessels participated in the accomplishment of three spring acoustic surveys (BASS type), conducted in May-June (the Annex ToR a - table in Ch. 5.1.2). Stock indices of sprat by age groups of the different BASS cruises are stored in the in the BASS-database of WGBIFS. The standard reports from BASS/2014 cruises are presented in the Annex 8.

5.1.2.1 Area under investigation and overlapping areas

The BASS/2014 surveys were realized by Germany, Lithuania and Latvia-Estonia in the ICES Subdivisions 24, 25, 26, 27, 28 and SE part of the ICES SD 29 and one rectangle of ICES Subdivision 32 (Figure 5.1.2.1.1). The area coverage of the Baltic Sea with the BASS/2014 survey principally was the same as required by the WGBIFS 2014.

5.1.2.2 Combined results and area corrected data

The Baltic sprat stock abundance estimates per the ICES-rectangles and ICES Subdivisions acc. to age groups are presented in Tables 5.1.2.2.1 and 5.1.2.2.2. The geographical distribution of the sprat abundance is demonstrated in Figure 5.1.2.2.1. The correction factors, calculated by the ICES Subdivisions for 2014 are included in Tables 5.1.2.2.3 and 5.1.2.2.4. The area corrected abundance estimates for sprat per ICES Subdivision are summarized in Table 5.1.2.2.3. The corresponding biomass estimates of sprat are given in the Table 5.1.2.2.4.

5.1.2.2.1 Sprat in the ICES Subdivisions 24 – 28

Tuning Fleets for WGBFAS

The complete time-series (2001 to 2014) of the area-corrected sprat abundance in the ICES Subdivisions 24, 25, 26, 27 and 28 (without the Gulf of Riga) is given in the Annex ToR a) - Table 5 (Whole time-series of tuning indices) and Figure 5.1.2.2.1.1.

5.2 ToR b) Update the BIAS and BASS acoustic databases

The updated data of the Baltic Acoustic Spring Survey (BASS) are stored in the *BASS_DB.mdb* Access-database. The updated data of the Baltic International Acoustic

Survey (BIAS) are stored in the *BIAS_DB.mdb* Access-database. These *Access-databases* also include queries with the used algorithms for creation of the report tables and the calculation of the different tuning fleets. The data from the year 2014, after validation, were added to both databases (Annex ToR b). The current versions of the databases are located in the folder "Data" of the WGBIFS-SharePoint.

5.3 ToR c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2015 and spring 2016

5.3.1 Planned acoustic survey activities

All the Baltic Sea countries intend to take part in the standard acoustic surveys and experiments in 2015 and 2016 (Figures 5.3.1.1, 5.3.1.2 and 5.3.1.3; see tables' a-c, Ch. 5.3.1 in the Annex ToR c). There is also an intention to conduct the Latvian-Estonian acoustic survey in the Gulf of Riga on July 2015 and 2016.

Extension and deficiencies of BIAS and BASS surveys in 2015

Expected extension: after some years absence Russia (Kaliningrad) intend to perform BASS survey in SE-part of the Gdańsk Basin, and Russia (St. Petersburg) again likes to perform BIAS survey in E-part of the Gulf of Finland.

Deficiencies: no plans for BASS survey in part of the Swedish and Finnish EEZs, and in middle- and eastern parts of the Gulf of Finland, moreover, no plans for BIAS survey in the Russian part of the Gdańsk Basin.

5.3.2 Delivering of the acoustic data from BIAS and BASS surveys

It was agreed during the WGBIFS/2015 meeting, that the file BIAS_Haul-sA_example_2013_DB_v.1.2 should be used and that all countries should send as many years as possible between 2010–2014 to niklas.larson@slu.se, starting with the year 2014 and working back through those years. The file can be found on the WGBIFS SharePoint under the folder Data. These data can in future be the base for a database and it was agreed that these data can be used for the interests of the WGBIFS, but it was agreed that the data deliverers should be contacted before any further work is made on these data other than the survey sampling variance calculations and the work presented in the chapter 5.8 - ToR h). The WGBIFS members discussed also the "List of missing data for the period 2009–2012" and some problems in data were recognized (the Annex ToR c, Ch. 5.3.2).

5.4 ToR d) Discuss the results from BITS surveys performed in autumn 2014 and spring 2015

5.4.1. BITS 4th quarter 2014

During the BITS surveys in the quarter 4th - 2014, the level of realized valid hauls represented 100% (on average) of the planned catch-stations, and principally the coverage with catch-stations was on the same level as in the previous years (Table 5.4.1.1 in the Annex ToR d). This level of valid hauls was considered by WGBIFS as appropriate to tuning series and is recommended for the assessment of Baltic cod and flatfish stocks.

5.4.1 BITS 1st quarter 2015

In general, the BITS-1q/2015 survey coverage (number of catch-stations) was near to planned effort (Table 5.4.2.1 in the Annex ToR d, Ch. 5.4.2). The BITS standard reports giving overviews of the range of accomplished works and some results of the 4th quarter 2014 and the 1st quarter 2015 surveys, from each country, can be found in the Annex 6. Detailed descriptions of the individual BITS surveys can be found in the Annex 7.

Deficiencies in BITS 2014-Q4 and 2015-Q1:

In the ICES Subdivision 27, the coverage with control-hauls in both surveys was considerably lower than was planned, because of restrictions made by the Swedish military, which not allowed the chartered research vessel to enter with investigations (acoustic, fishing) into planned Swedish areas. Comparable problem was experienced in the ICES Subdivision 28. Similarly, like in two previous years, Russia did not carry out the BITS-1st and -4th quarter surveys in the ICES Subdivision. 26.

5.4.2 Standard fishing-gear checking

The WGBIFS decided on implementation as a standard procedure to perform at least once a year a full and thorough measurements of technical parameters (the geometry, mesh sizes, rope lengths of the trawl, etc.) of exploited demersal trawls type TV-3L and TV-3S to be conducted by each country involved in the BITS surveys realization. All the measurements should follow the Manual of the construction and use of the International Standard Trawl for the Baltic Demersal Surveys. In autumn 2014 and spring 2015, only three countries realized their bottom fishing gear technical check-in and two laboratories delivered results from this works. One example from the standard bottom fishing gear checking is given in the Annex ToR d - Table 5.4.3.1.

5.5 ToR e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2015 and spring 2016, and update, and correct the Tow-Database and DATRAS

5.5.1 Plan and decide on demersal trawl surveys and experiments

The procedure used for allocating ground trawl catch-stations to the ICES Subdivisions and depth layers is described in the Annex ToR e; see also the Annex 3 “Method used for planning the Baltic International Trawl Survey” of the WGBIFS Report in 2004). The method for allocating catch-stations to ICES SDs was slightly adapted according to the new definition of the stock structure of cod in the Baltic Sea during WKBALTCOD in March 2015 (for details see the Annex ToR e). The most of the participating institutes plan the same numbers of control-hauls during BITS surveys in autumn 2015 and spring 2016 (Tables 5.5.1.1 – 5.5.1.7 in the Annex ToR e - Ch. 5.5.1) as in the year before. Additional stations were planned for RV “Havfisken” and RV “Solea” to improve the coverage of the ICES SD 22. The total number of available control-stations (Table 5.5.1.1) was used in the combination with the results of relative distribution of stations by the ICES Subdivision and depth layer (Tables 5.5.1.2 and 5.5.1.3) to allocate the number of total planned stations by the ICES Subdivision and depth layer for the different surveys. Allocated ground trawl hauls by the ICES Subdivision and the depth layer for autumn survey in 2015 are presented in Tables 5.5.1.4 and 5.5.1.5. Furthermore, the number of fish control-hauls to be carried out by countries in the different ICES Subdivisions is given. Tables 5.5.1.6 and 5.5.1.7 show the data corresponding effort for the survey in spring 2016. WGBIFS reiterates its strong recommendation from 2013 that Russia should reconsider its decision and perform its indispensable part of BITS survey in the Russian EEZ, at least partially. The planned fishing-stations by country and the ICES Subdivision can be considered as not fixed. Probably on the beginning of 2016, the Danish research vessel Havfisken (old) will be replaced in duty by the new vessel, what needs also a number of calibration hauls between vessels (the Annex ToR e).

5.5.2 Update and correct the Tow-Database and DATRAS

5.5.2.1 Reworking of the Tow-Database

Feedbacks of the recent BITS surveys (Nov. 2014, Feb.-March 2015) were used to update the Tow Database and have demonstrated that the structure of the TD is suitable for the routine use. Changes of the TD structure were not proposed. The structure of required feedback is demonstrated in Table 8.1.1 from the WGBIFS-2014 Report (see also the WGBIFS-2005 Report and the BITS Manual). Some catch-stations were deleted (appearance of 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 control-hauls were provided by the most countries in the Baltic 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. Final version of the Tow-Database was not available during the meeting because the feedback of the BITS in spring 2015 was not available before the WGBIFS meeting started. The missing feedback will be used immediately after submission by the countries. Then the version TD_2015V1.XLS will be made available for all countries.

5.5.2.2 Feedback of the BITS

Structure of feedback of the BITS surveys was agreed in 2013. This structure should be used for reporting the information from the realized ground trawl 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 Annex ToR e – Ch. 5.5.2.2). The feedback of realized BITS surveys should be submitted to Rainer Oeberst (rainer.oeberst@ti.bund.de), Germany using the proposed standard format not later than 20 December (autumn survey) and immediately after spring survey.

5.5.2.3 Reworking of the Database of Trawl Surveys (DATRAS)

WGBIFS members have been informed by V. Soni (ICES Secretariat, Data-Center) about suggested improvements to DATRAS and possibilities to adopt new fields in the database structure (the Annex 10, the Annex ToR e – Ch. 5.5.2.3). During the WG meeting was also discussed the issue – "Fish species code in DATRAS" and the group agreed that in BITS/DATRAS only SpecCodeVal 0, 1, and 4 are accepted according to the Manual and SpecCodeVal of BITS (the Annex ToR e – Ch. 5.5.2.3). WGBIFS accepted the new version of screening procedure for BITS to unify the data check. DATRAS download web page shows invalid species code (the WoRMS Aphia codes) upon download process.

5.6 ToR f) Review and update the Baltic International Trawl Survey (BITS) Manual according to SISP standards

The Manual for the Baltic International Trawl Surveys (BITS) from the WGBIFS-2015 meeting was partly reviewed and some technical aspects regarding the format, new standard data submission and necessary changes to improve this one, according to SSGESST working group and the SISP suggestions were discussed. A small group of WGBIFS members intends to perform detailed verification of the BITS SISP Manual as well as the IBAS SISP Manual within the period until to the next WG meeting. The new standard data, which should be regularly collecting and reporting, starting from autumn 2015 the BITS survey, are mentioned below, and are described in the Ch. 5 - Addendum 1 (see also the Annex ToR f). Moreover, fish species code in DATRAS was also discussed and revised information as well as the proposals how to improve structure of this database are presented in Ch. 5.5.2.3 and the Annexes ToR e and 10.

5.6.1 Stomach (cod) sampling Manual

Baltic cod stomachs sampling for food spectrum and feeding intensity analyses, accordingly to the format agreed during the WGBIFS-2015 meeting and described in the BITS Manual-2015 (Addendum 1 - Ch. 5.1; see also the Annex ToR f, and Ch. 5.9 ToR i) should be implemented as the routine procedure during BITS surveys. The state of cod gall bladder should be also recorded using the scale described in the BITS Manual-2015. WGBIFS recommends the exchange format directly linked with fish stomachs sampling. Detailed methodological description of Baltic cod stomach sampling and reporting can be finding in Addendum 1 – BITS Manual, Ch. 5, and in Ch. 5.9 ToR i).

5.6.2 The marine litter collecting and reporting from BITS surveys

Regularly collecting and reporting the findings of marine litter (anthropogenic origin), occurred in the bottom-trawl type TV-3 is also recommended by WGBIFS as the standard procedure during BITS. The report from findings should be prepared in a standard database, similarly like in the IBTS surveys (see Ch. 5.2 in the BITS Manual – 2015, Addendum 1). Data submitters will transfer data using the DATRAS Trawl litter format, described in the suitable manual accessible at the web page http://www.ices.dk/marine-data/data-portals/Pages/DATRAS-Docs.aspx. The information about marine litters is suggested to be noticed by the cruise leader during BITS surveys.

5.6.3 The interpretation of Baltic fish gonads maturity

The WGBIFS discussed once more the problem of interpretation of Baltic fish gonads maturity based on the ICES (DATRAS), the BITS Manual and the national scales of fish maturation conversion tables. Currently verified the tables for maturity keys per species are uploaded to the Annex 7 in Addendum 1 (see also Ch. 7.1.1).

5.7 ToR g) Review and update the International Baltic Acoustic Surveys (IBAS) Manual according to SISP standards

The IBAS Manual covers both, Baltic Acoustic Spring Survey (SPRASS/BASS) and Baltic International Acoustic Survey (BIAS) those are carried out yearly in Baltic Sea. Very many of SSGESST suggestions concerning corrections in the Manual were made as recommended during the WGBIFS-2014 meeting. The currently made verification of the Manual was connected with the suggestion from reviewers - to indicate in the manual how the statistical subareas during the acoustic surveys are allocated of among the participating countries (the Annex ToR g). Therefore, a general assignment scheme of the ICES statistical rectangles to the countries in the Baltic Sea has been added to the IBAS Manual (Figure 2.1.2 in Addendum 2). Also the chapter 2.1 (Area of observation) was updated accordingly. The new text suggests that this allocation scheme should be used for the planning of BIAS. Additionally, text in the chapters 3.4 (Calibration) and 3.5 (Intercalibration) was updated (for details see Addendum 2 and the Annex ToR g). Moreover, the list of references was updated accordingly.

5.8 ToR h) Discuss the indices of acoustic surveys based on different methods of evaluation

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

To be able to present survey sampling variance it was decided that the bootstrap method should be used and presented at the ICES Subdivision level. The resampling technique will be done on the control-haul and the NASC data. Because not all requested data has been delivered, an initial bootstrap has been made on the ICES SD 27 (Figures 5.8.1.1–5.8.1.3 – see the Annex ToR h).

5.8.2 Evaluate the proportion of WBSSH and CBH in the ICES SDs 22–26 during BIAS surveys

Age–length data of herring sampled during BIAS surveys (2009–2012) was used to classify individuals to one of the both Baltic herring stocks - Western Baltic Spring Spawning Herring (WBSSH) and Central Baltic Herring (CBH) by means of the separation function presented in Gröhsler *et al*. (2013) and to estimate the proportion of WBSSH by age groups, the ICES Subdivisions and year (the Annex ToR h). Analyses of the age–length data sampled during the German BIAS and BASS in 2014 did not indicate change of the growth of WBSSH and CBH (Oeberst 2015; all citations are listed there – see the Annex 9). Herring fished in the ICES SDs 22 and 23 were mainly classified to WBSSH. In contrast to this, proportion of WBSSH decreased with increasing age in the ICES SD 24 (Table 5.8.2.1; the Annex ToR h). More than 50% of age-groups 1 and 2 (2011 and 2012), which were captured in the ICES SD 25 were classified as WBSSH (Table 5.8.2.2). In the ICES Sub-div. 26, more than 50% of age-group 1 herring were classified as WBSSH (Table 5.8.2.3). The study, based on the BIAS data from 2009–2012 (R. Oeberst – in the Annexes 9 and 10), leaded among-others to following conclusions:

a) abundance indices of cod based on the acoustic surveys can provide a vulnerable time-series of cod in the Baltic pelagic waters,

b) separation of the herring abundance indices into WBSSH and CBH can improve the understanding of the dynamics of both stocks.

5.9 ToR i) Coordinate cod stomach sampling programme in the Baltic International Trawl Survey

Baltic cod stomachs sampling for food spectrum and feeding intensity analyses from many years were not internationally realized during the BITS surveys. The results of sampling and analysing will be handling also by WGSAM. The WGBIFS decided that Baltic cod stomachs sampling procedure (the Annex ToR i), widely described within the MARE project manual, would be adopted for realization during the BITS-1q and BITS-4q surveys. The cod stomach samples collected in Q4–2014 and Q1–2015 BITS surveys by some national laboratories are listed in the Table 5.9.1 (the Annex ToR i). For detailed description of the sampling procedure and the list of information to be collected during the BITS surveys - see the Addendum 1 and the Annex ToR i. Processing of cod stomach samples should be carried out within the National Fisheries Data Sampling Programme (DC MAP), either by national labs if they have sufficient expertise, or by other institute experienced in fish stomachs analyses processing.

5.10 ToR j) Discuss the possibilities to make further consistency of IBAS for WGBIFS. Initial information about how to standardize the pelagic fishing gear used in BIAS and BASS surveys.

The WGBIFS was provided with overview of the proposal to standardize the pelagic gear for BIAS and BASS – see K. Stanuch presentation "An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys" (Annex 10). The goals of the proposal are:

a) to minimize the differences in efficiency and species composition in pelagic monitoring trips between different vessels by eliminating diversity in gear construction and its elements used during production;

b) to make research catches more comparable, e.g. as was made in the case of TV-3 demersal trawl (achieved after standardization process), applied from 2000 in the BITS surveys.

The WGBIFS was introduced with overview of the existing constructions of both commercial and research trawls used in the Baltic Sea and with expected steps for the standardization (the Annex ToR j). The WGBIFS welcomed such an initiative, agreeing on the need for standardization of survey trawl for acoustic surveys. The group also admitted that with this initiative only the first step has been done and the practical ways of should be further discussed.

5.11 ToR k) Review the progress of the ICES acoustic database

WGBIFS members (N. Larson and U. Böttcher) delegated to cooperation with the international AtlantOS project cannot to participate in the ad hoc meeting in January 2015 however, further attendance in the meetings (e.g. WKIACTDB) is respected. The supplementary information concerns widely implementation of the modern common acoustic database can be ready for the 2016 WGBIFS meeting.

6 References

Oeberst, R., Gröhsler, T., Schaber, Matthias. 2015. Applicability of the Separation Function (SF) for Western Baltic Spring Spawning and Central Baltic herring stocks on 2014 GERAS survey results. Working document of WG International Pelagic Surveys (WGIPS), 19–23 January 2015; 8 pp.

Radtke, K., and W. Grygiel 2013. Sexual maturation of cod (*Gadus morhua* L.) in the southern Baltic (1990–2006). J. Appl. Ichthyol. (2013), 1–8; Blackwell Verlag GmbH, ISSN 0175–8659, doi: 10.1111/jai.12135.

Grygiel, W. 2015. WGBIFS/2015 outcomes relevant for WGBFAS. Presentation at the WGBFAS meeting, Copenhagen; 14–21.04.2015; 18 pp.

Note: other references, mentioned in this Report are cited under particular working papers or cruises extended reports.

7 Other business

7.1 Inquiries from other Expert Groups

7.1.1 The interpretation of Baltic cod gonads maturity based on the ICES conversion table (WGBIOP request)

The WGBIFS discussed the problem of interpretation of Baltic fish gonads maturity based on the ICES (DATRAS), the BITS Manual and the national scales of fish maturation conversion tables. The clarification of this matter was requested by WGBIOP. Currently verified the conversion tables for maturity keys per species are uploaded to the Annex 7 in Addendum 1. The discrepancy was occurred in the interpretation of fish gonads (Baltic cod) development on stage II. Currently such overlapping in interpretation of fish gonads in the stage II (virgin or resting after spawning?) not exists (the Annex ToR 7). Stage II is the resting stage of fish gonads. Before the WGBIFS-2015 meeting the problem was resulted from the fact that, the conversion tables on the DATRAS homepage wasn't updated with the latest version WGBIFS.

7.1.2 Species validity codes in the Database of Trawl Surveys – DATRAS (WGBEAM request)

In the consequence of WGBEAM proposal to revise species validity codes in DATRAS, the ICES Secretariat Data-Center requested WGBIFS to evaluate the implementation of an option related to SpecCodeVal. In BITS only SpecCodeVal 0, 1, and 4 are accepted according to the Manual. DATRAS download (Sep. 2014) page shows invalid fish species code (the WoRMS Aphia codes) upon download process.

7.1.3 Verification discrepancy between herring stocks size in the ICES SD 30 and the Central Baltic, estimated with various methods (WGBFAS request)

WGBFAS requested (May 2014) WGBIFS about an explanation of discrepancy between herring the ICES SD 30 and the Central Baltic herring (CBH) stocks size, estimated with various methods. From some graphs prepared by WGBFAS was visible that for nearly all analysed age groups the estimates for the CBH was the highest than in the Bothnian Sea. However, from acoustic survey results was possible to obtain opposite conclusions. In the meantime, was also proposal to conduct a new calculation of herring stock size, based on the BIAS survey data. As one of the answers on this question - O.

Kaljuste, in the presentation (Annex 10) was concentrated mainly on the technical aspects of acoustic measurements as a source of potential errors in fish resources evaluation. The problem of discrepancy between herring stocks size in the above-mentioned regions, estimated with various methods (BIAS surveys data and XSA WGBFAS data) needs to be once more discussed on the next WGBIFS meeting.

7.2 Other issues emerged before and during the meeting

7.2.1 Comparison of Baltic fish ageing methods used in national laboratories

In order to clarify the consistency of age reading of cod, herring, sprat and flounder - commercially important and stock assessed fish species in the Baltic, information about reading methods applied by the national laboratories were collected and compared by H. Degel (the Annex ToR 7). Such action was proposed by WGBIFS-2014. Detailed description of Baltic fish ageing methods used in some national laboratories is presented in the Annex 9. It should be noted that ICES fish age reading forum (http://community.ices.dk/ExternalSites/arf/_layouts/15/start.aspx#/Age%20Readers%20Forum%20documents) holds detailed information about national procedures for age readings and historical information about otoliths workshops, otoliths reference collections, circulated otoliths etc.

7.2.2 Marine litter – sampling and reporting during the BITS surveys

Based on EC's Marine Strategy Framework Directive (MSFD) WKMAL requested WGBIFS to discuss the suggested collection and storage of information about the marine litter in the BITS surveys. The WGBIFS agreed on systematically monitoring of marine litter during the BITS surveys, and using the standard protocols for reporting.

8 Revisions to the work plan and justification

(As deemed necessary based on progress report (Section 5), highlight changes in summary table. (new ToRs, if applicable. Typically 1 page).

Any significant changes to the final version of ToRs were not made. The collated data for ToR d) in the part – "Discuss the results BITS surveys…" before the WGBIFS meeting was not a final set of data because some BITS-1q/2015 surveys were not ended yet. These data were principally supplemented shortly after meeting and revised final DATRAS data, including the very recent BITS survey results will be accessible within incoming weeks. The second part of ToR d) was discussed however, only from the logistic and methodological points of view, because only very limited numbers of TVL and TVS standard ground trawls was technically checked (measured) and reported before WGBIFS meeting. The WG suggested performing the above-mentioned work every year, as obligatory for each vessel involved in the BITS surveys realization. In the headline of Ch. 5.5 ToR e) was added … and update, and correct the Tow Database and DATRAS. It is proposed to have the same headline for 2016 and 2017 WGBIFS meetings. The ToR k) "Review the progress of the ICES acoustic database" has been discussed only initially, because of misunderstanding in correspondence transfer between the international AtlantOS project managers and delegated two WGBIFS members; the delegates were not able to participate in the ad hoc meeting in January 2015. Future meetings are planned and supplementary information concerns widely implementation of the common acoustic database are respected be ready for the 2016 WGBIFS meeting.

9 Next meeting (Interim reports only)

There was one proposal for the venue of the next WGBIFS meeting, i.e. Rostock, Germany. The all WG members supported the idea to organize the next meeting at TI-OF Rostock in the period of 30 March – 3 April 2016. The list of ToRs for the next meeting is shown in the Annex 2B.

Annex: ToR a) Combine and analyse the results of spring (BASS) and autumn (BIAS) 2014 acoustic surveys and experiments and report to WGBFAS

5.1.1. Combined results of the Baltic International Acoustic Survey (BIAS)

In 2014, the following acoustic surveys (BIAS type) were conducted in September - October:

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

5.1.1.1. Area under investigation and overlapping areas

Totally, seven the statistical ICES-rectangles were inspected by more than one country (Figure 5.1.1.1.1), precisely the following rectangles:

- 38G4 by GER and POL,
- 39G5 and 40G7 by SWE and POL,
- 43G9 by SWE and LAT,
- 45H0 and 45H1 by EST and LAT,
- 47H0 by SWE and FIN,
- 48H4 by EST and FIN.

The following small areas of the Baltic were omitted from acoustic monitoring:

- the northern part of the ICES SD 21 (German/Danish survey),
- the Russian part of the ICES SD 26,
- eastern part of the ICES SD 32 (Russian – GosNIORH survey),
- the northern part of the ICES SD 32 (Finnish survey).

It should be added that, the Estonian-Latvian acoustic survey in the Gulf of Riga was accomplished in July-August 2014, as was planned during WGBIFS 2014 meeting. The survey results from the 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 (ICES SD 32), i.e. the Estonian and Finnish EEZs only. The recent BIAS surveys (Oct. 2014) in the above-mentioned areas were performed on the Finnish RV "Aranda" and the Polish RV "Baltica". Since 2012, Russia (GosNIORH) has annually planned to conduct the BIAS surveys in the eastern part of the ICES SD 32, but has failed so far to perform any of them.

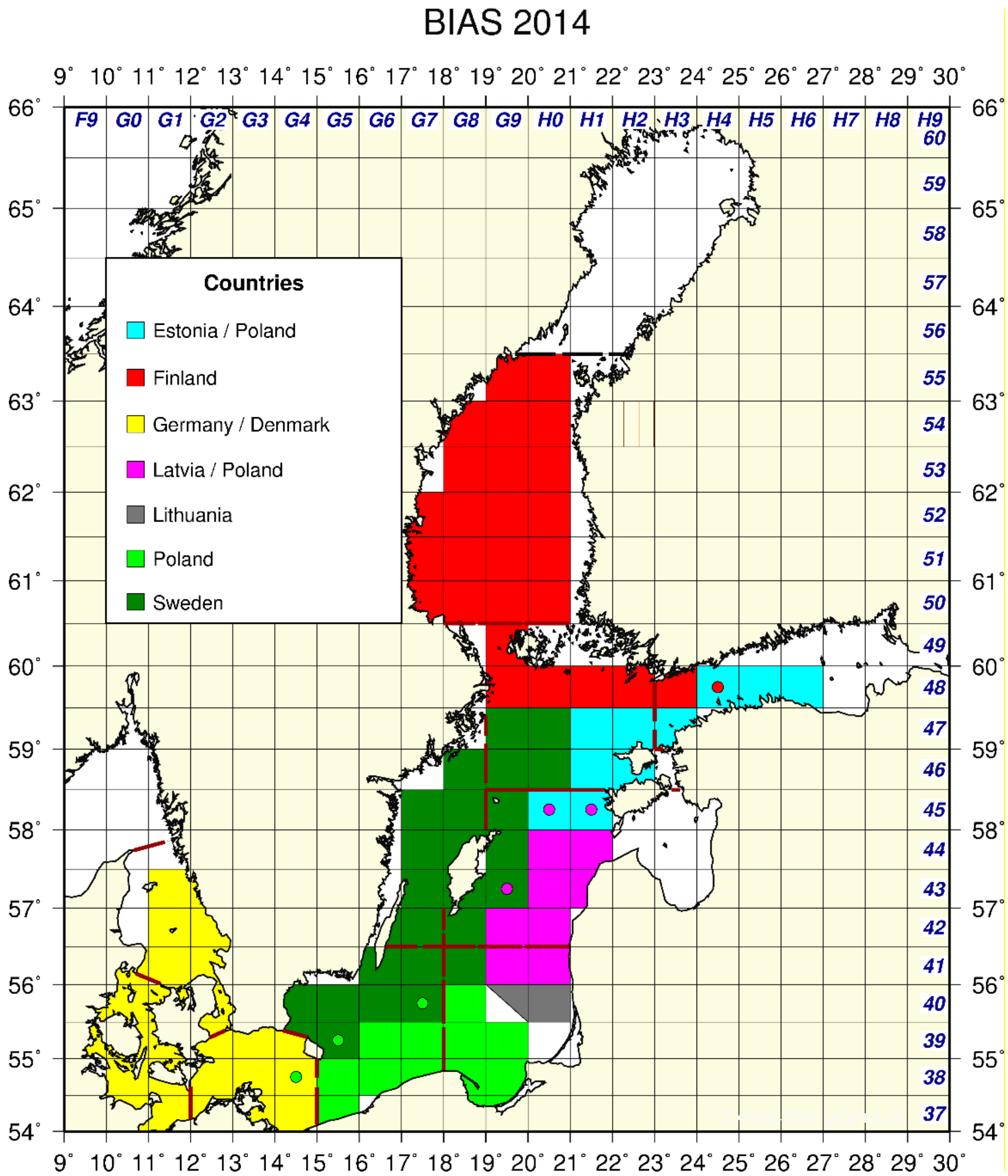


Figure 5.1.1.1.1. Map of the BIAS survey conducted in September-October 2014. Various colours indicate the countries, which covered specific ICES-rectangles and delivered data to BIAS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BIAS-database partly or totally covered by other countries.

5.1.1.2. Total results

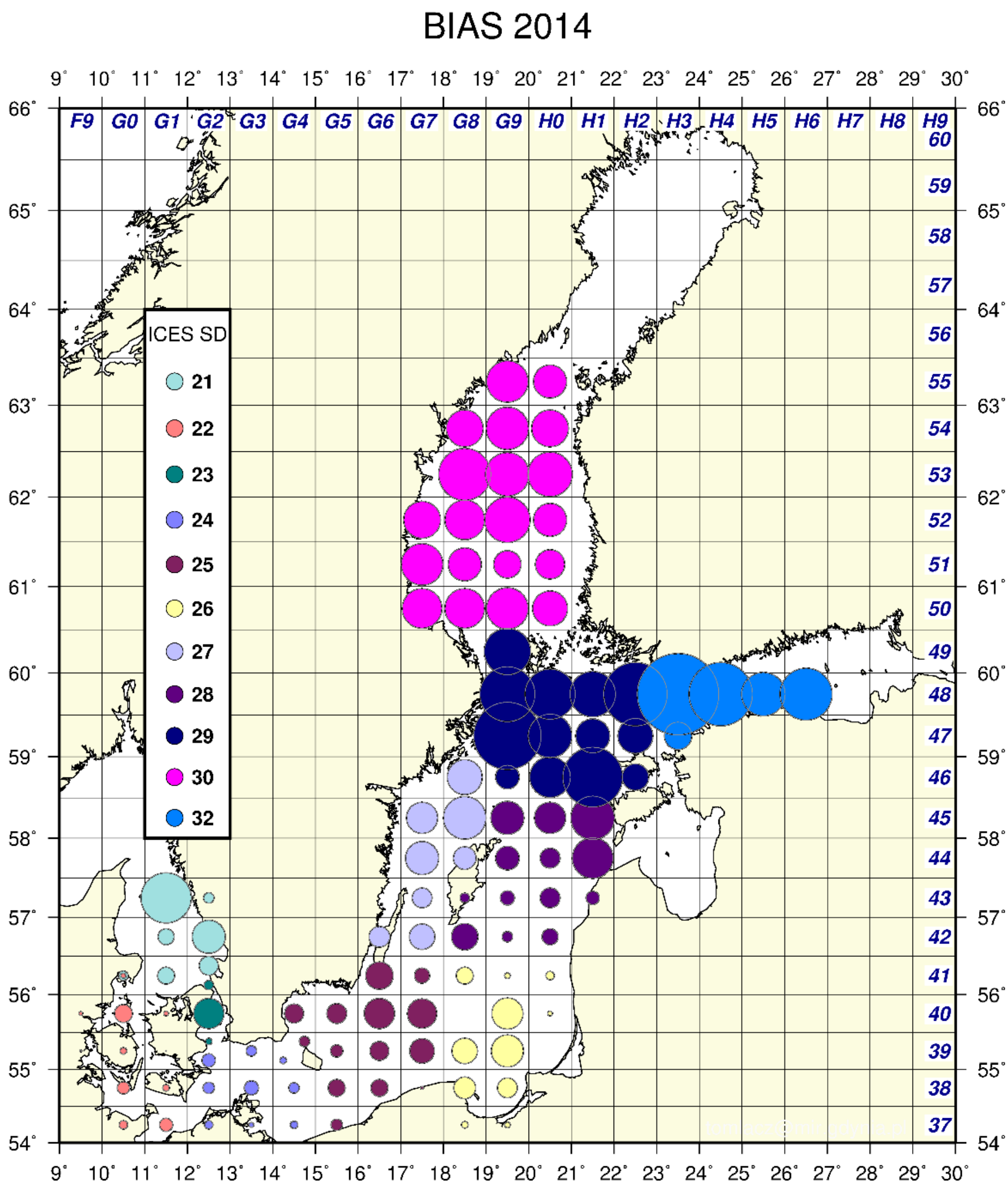


Figure 5.1.1.2.1. The abundance of herring per the ICES-rectangles monitored in September-October 2014 (the area of circles indicates estimated numbers of specimens x10^6 in given rectangle; the colour indicates ICES Subdivision).

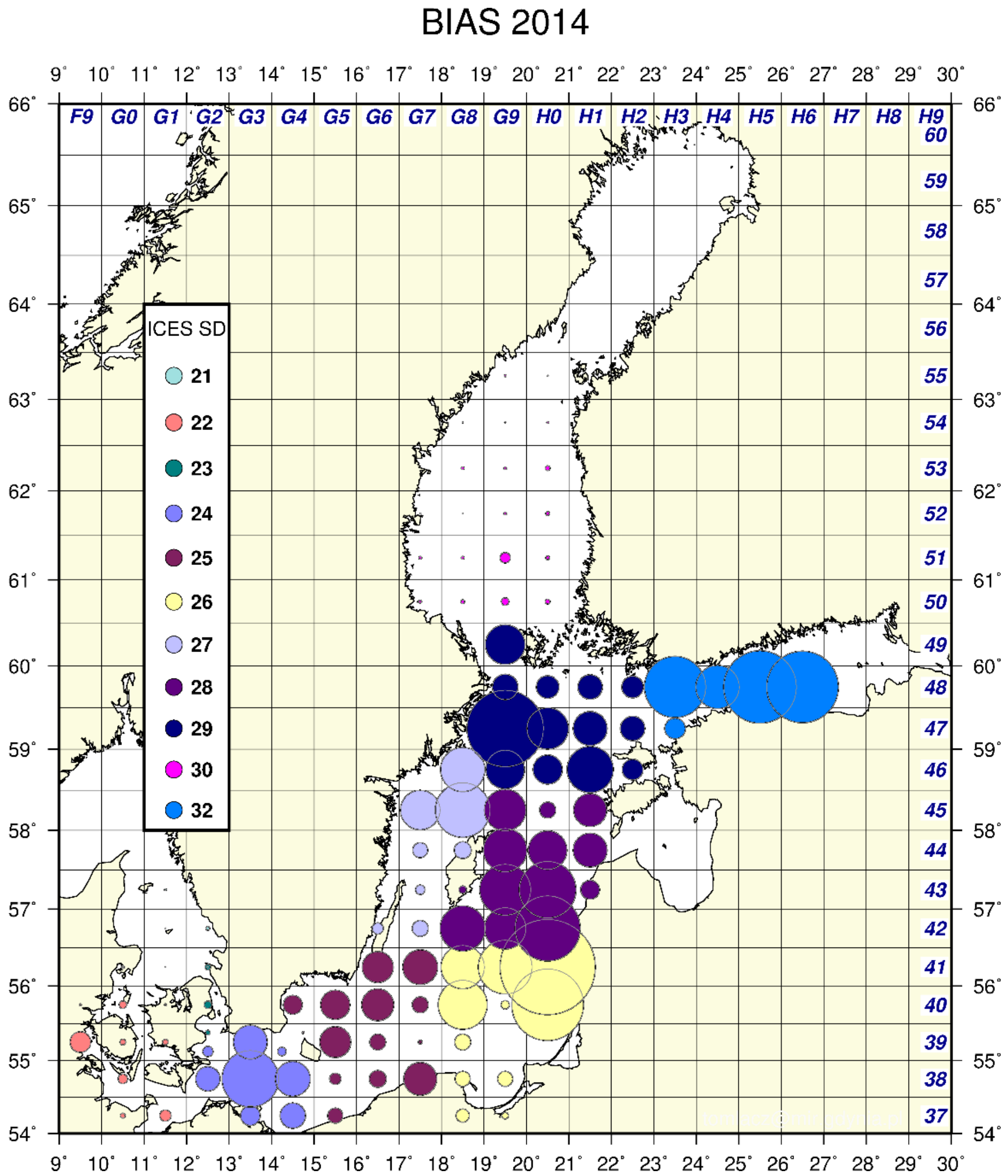


Figure 5.1.1.2.2. The abundance of sprat per the ICES-rectangles monitored in September-October 2014 (the area of circles indicates estimated numbers of specimens x10^6 in given rectangle; the colour indicates ICES Subdivision).

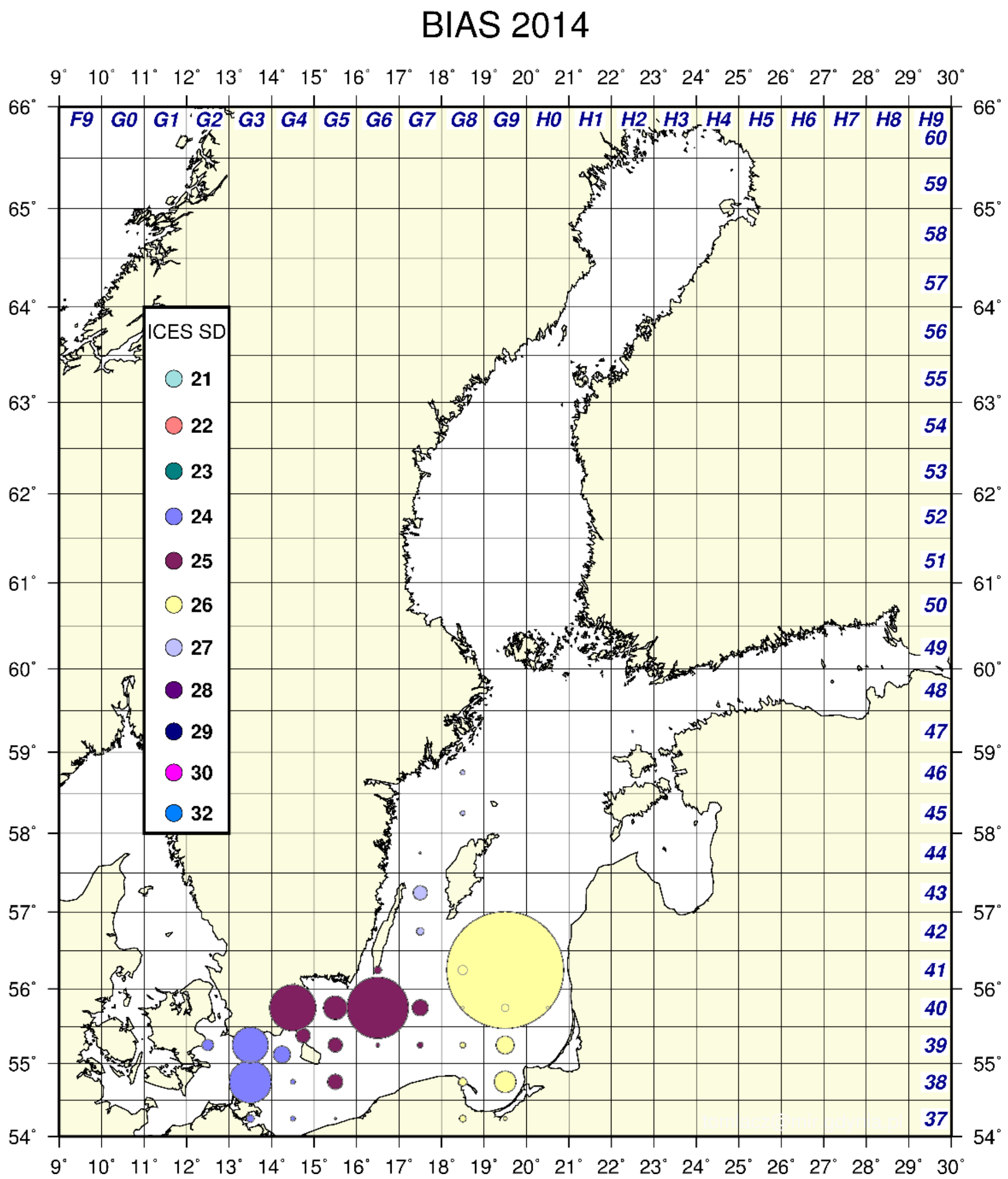


Figure 5.1.1.2.3. The abundance of cod per the ICES-rectangles monitored in September-October 2014 (the area of circles indicates estimated numbers of specimens x10^6 in given rectangle; the colour indicates ICES Subdivision).

Table 5.1.1.2.1. Estimated numbers (millions) of herring in September-October 2014, 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+
2014	21	41G0	132.92	106.92	25.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	41G1	476.91	466.21	10.15	0.55	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	41G2	556.64	547.61	8.96	0.07	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	42G1	428.25	381.81	45.26	1.18	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	42G2	1 831.15	1830.50	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	43G1	4 154.67	4138.94	15.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	21	43G2	172.06	172.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	37G0	129.26	104.63	23.34	0.85	0.37	0.07	0.00	0.00	0.00	0.00
2014	22	37G1	286.83	228.96	48.75	5.07	2.93	0.94	0.18	0.00	0.00	0.00
2014	22	38G0	259.22	176.65	82.17	0.40	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	38G1	81.68	70.60	10.64	0.26	0.15	0.03	0.00	0.00	0.00	0.00
2014	22	39F9	3.38	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	39G0	66.29	37.42	28.72	0.15	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	39G1	2.91	1.63	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	40F9	20.14	11.20	8.00	0.31	0.29	0.17	0.17	0.00	0.00	0.00
2014	22	40G0	503.11	279.79	199.81	7.86	7.27	4.19	4.19	0.00	0.00	0.00
2014	22	40G1	35.20	12.85	15.61	2.05	4.06	0.63	0.00	0.00	0.00	0.00
2014	22	41G0	39.32	17.99	19.31	0.42	1.13	0.34	0.13	0.00	0.00	0.00
2014	23	39G2	63.68	54.52	6.23	1.36	0.71	0.25	0.26	0.09	0.20	0.06
2014	23	40G2	1 459.82	3.38	124.35	159.92	213.33	301.61	307.84	211.38	82.73	55.28
2014	23	41G2	138.60	135.91	0.90	0.25	0.36	0.51	0.40	0.22	0.04	0.01
2014	24	37G2	111.67	98.86	11.65	0.31	0.61	0.00	0.24	0.00	0.00	0.00
2014	24	37G3	34.29	31.05	1.26	0.64	0.61	0.34	0.04	0.06	0.23	0.06
2014	24	37G4	88.91	64.74	6.99	5.98	5.41	2.75	0.63	0.84	1.02	0.55
2014	24	38G2	194.74	182.16	12.07	0.37	0.04	0.00	0.10	0.00	0.00	0.00
2014	24	38G3	339.62	294.45	19.40	10.58	7.82	2.09	0.67	1.79	1.94	0.88
2014	24	38G4	164.60	119.86	12.94	11.06	10.01	5.09	1.16	1.55	1.90	1.03
2014	24	39G2	279.85	239.59	27.39	5.99	3.12	1.08	1.15	0.41	0.87	0.25
2014	24	39G3	164.19	80.16	23.59	17.45	18.32	11.62	3.93	2.67	4.29	2.16
2014	24	39G4	68.32	5.17	7.57	19.41	18.02	8.06	2.58	2.77	3.05	1.69
2014	25	37G5	213.77	139.15	14.08	6.29	19.30	9.11	4.59	9.55	5.71	5.99
2014	25	38G5	497.83	24.37	26.83	32.05	106.29	78.48	27.78	89.65	50.88	61.50
2014	25	38G6	480.13	300.38	29.23	16.33	49.76	20.19	12.55	25.39	14.69	11.60
2014	25	38G7	9.70	9.51	0.05	0.01	0.07	0.01	0.03	0.01	0.01	0.00
2014	25	39G4	186.19	6.40	21.32	18.19	87.70	22.17	15.49	9.66	4.55	0.71
2014	25	39G5	259.42	13.33	28.69	5.55	62.56	25.25	26.11	51.00	25.36	21.57
2014	25	39G6	608.30	38.50	113.90	56.35	157.11	56.46	40.96	73.34	43.34	28.34
2014	25	39G7	1 014.62	10.00	129.53	101.00	274.82	104.49	75.44	160.36	90.64	68.35
2014	25	40G4	567.42	120.19	99.59	120.58	98.47	44.89	31.65	14.94	19.97	17.15
2014	25	40G5	621.24	46.09	113.28	102.20	197.10	88.62	21.91	17.43	33.10	1.50
2014	25	40G6	1 475.89	24.63	228.33	133.70	374.45	73.47	323.62	171.63	144.60	1.45
2014	25	40G7	1 424.06	0.00	13.22	36.75	301.60	205.93	334.34	252.55	214.69	64.98
2014	25	41G6	1 201.39	31.40	133.51	176.56	335.67	155.22	152.04	135.21	74.26	7.52
2014	25	41G7	364.76	3.60	4.83	35.70	181.80	51.75	32.57	44.07	8.72	1.72
2014	26	37G8	78.20	33.67	28.58	1.69	3.20	1.57	3.42	3.30	1.74	1.02
2014	26	37G9	44.96	6.93	8.81	1.29	2.75	1.58	2.51	5.45	6.57	9.07
2014	26	38G8	764.49	38.89	36.95	20.77	65.43	35.87	61.48	139.02	164.58	201.50
2014	26	38G9	656.40	5.33	7.55	5.48	19.66	22.15	23.34	81.05	152.51	339.33
2014	26	39G8	1 103.64	11.82	45.99	33.84	113.34	55.50	101.65	226.02	240.04	275.43
2014	26	39G9	1 654.66	6.19	27.95	42.13	157.62	69.02	147.97	329.35	378.89	495.55
2014	26	40G8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	26	40G9	1 619.80	0.00	5.73	40.88	234.69	146.12	362.12	424.20	210.97	195.09
2014	26	40H0	38.58	3.16	4.06	1.84	7.64	3.62	6.61	7.01	2.37	2.26
2014	26	41G8	500.67	14.82	0.00	55.99	39.79	43.39	98.24	132.75	46.92	68.77
2014	26	41G9	48.16	3.19	0.00	2.30	5.43	3.91	6.16	10.96	11.12	5.08
2014	26	41H0	119.09	85.31	3.71	4.74	6.77	4.95	3.16	6.06	1.35	3.05
2014	27	42G6	705.56	0.00	0.00	19.67	264.59	89.55	124.15	135.01	44.10	28.49
2014	27	42G7	1 096.52	0.73	0.00	145.51	466.04	70.85	180.94	213.13	14.28	5.05
2014	27	43G7	623.21	26.10	2.62	94.30	256.64	71.23	95.85	27.24	41.37	7.86
2014	27	44G7	1 812.17	66.76	98.23	510.91	474.76	205.90	192.89	154.11	93.65	14.94
2014	27	44G8	847.74	112.20	19.45	283.25	198.47	106.72	88.27	24.43	11.97	2.99
2014	27	45G7	1 610.59	1523.69	4.16	16.83	44.79	8.31	6.37	4.16	1.25	1.04
2014	27	45G8	2 910.19	1719.33	19.91	225.90	490.81	139.66	123.43	173.03	18.12	0.00
2014	27	46G8	2 005.71	1223.83	42.68	249.40	235.20	156.56	48.12	39.99	9.91	0.00
2014	28_2	42G8	1 177.47	19.26	3.96	158.36	184.88	109.74	338.08	222.02	137.72	3.46
2014	28_2	42G9	183.92	16.38	0.00	15.39	24.09	12.33	30.05	31.69	29.28	24.71
2014	28_2	42H0	404.04	165.77	22.61	43.80	64.95	22.59	13.34	23.87	26.76	20.34
2014	28_2	43G8	148.49	0.79	0.96	9.21	32.03	31.84	26.09	23.98	22.63	0.96
2014	28_2	43G9	315.32	112.75	0.00	1.50	41.41	29.11	76.83	41.71	8.40	3.60
2014	28_2	43H0	671.54	38.46	8.61	144.25	199.36	39.96	79.08	53.36	71.00	37.46
2014	28_2	43H1	283.77	21.08	2.19	57.15	74.71	20.22	34.92	27.56	34.70	11.26
2014	28_2	44G9	937.19	214.24	0.00	72.23	207.13	205.46	98.15	56.22	64.32	19.44
2014	28_2	44H0	667.12	97.21	29.67	148.33	162.34	65.71	42.88	65.31	39.60	16.07
2014	28_2	44H1	2 666.88	77.30	134.82	674.01	737.65	298.59	194.83	296.77	179.92	73.01
2014	28_2	45G9	1 809.67	1796.49	0.00	2.58	4.83	1.36	3.29	0.47	0.65	0.00
2014	28_2	45H0	1 599.50	1208.12	49.88	160.48	99.06	31.52	14.71	20.17	9.92	5.66
2014	28_2	45H1	3 071.65	507.48	202.11	842.69	710.32	227.34	143.52	217.11	137.29	83.77
2014	29	46G9	950.97	558.93	0.00	29.40	202.56	81.68	41.17	33.98	0.00	3.27
2014	29	46H0	2 683.38	1396.96	8.72	72.56	439.13	441.84	134.75	182.91	6.51	0.00
2014	29	46H1	5 845.09	1439.24	46.58	394.01	937.71	798.06	631.16	199.31	694.82	704.19
2014	29	46H2	1 182.59	291.19	9.42	79.72	189.72	161.47	127.70	40.33	140.58	142.47
2014	29	47G9	7 281.43	6051.56	9.17	291.67	426.28	292.07	197.00	13.68	0.00	0.00
2014	29	47H0	3 061.52	2950.00	14.67	27.07	39.23	24.42	5.35	0.79	0.00	0.00
2014	29	47H1	1 900.56	716.97	75.87	207.04	407.21	165.73	129.13	37.17	101.93	59.51
2014	29	47H2	2 018.68	582.58	81.27	259.51	502.80	200.72	154.41	52.25	114.40	70.75
2014	29	48G9	4 922.68	2156.15	608.95	654.51	691.91	24.18	329.88	284.43	133.03	39.64
2014	29	48H0	4 050.81	1774.27	501.10	538.59	569.37	19.90	271.46	234.06	109.47	32.62
2014	29	48H1	3 370.36	1610.00	400.24	416.44	432.91	16.69	214.79	171.87	81.75	25.67
2014	29	48H2	6 608.69	539.08	1 046.40	1 520.21	1 632.74	35.94	775.16	672.50	313.46	73.21
2014	29	49G9	3 519.24	2973.15	296.23	77.99	66.85	15.17	33.86	26.68	13.13	16.18
2014	30	50G7	2 552.49	2275.97	252.56	8.89	2.33	1.39	2.63	2.63	2.08	4.02
2014	30	50G8	2 536.04	1137.41	529.75	257.61	191.70	88.74	86.02	66.47	59.36	118.97
2014	30	50G9	2 843.21	1000.32	700.67	491.58	262.83	103.81	76.77	60.17	47.74	99.30
2014	30	50H0	2 018.84	265.47	602.32	512.61	256.84	101.24	73.68	58.22	46.68	101.77
2014	30	51G7	2 870.00	1617.54	435.60	197.90	169.45	84.21	91.74	71.01	64.40	138.15
2014	30	51G8	1 803.71	395.15	479.44	274.83	206.08	95.28	91.89	70.79	63.31	126.95
2014	30	51G9	1 219.54	969.29	116.87	51.96	33.25	13.19	10.14	7.79	6.03	11.03
2014	30	51H0	1 386.49	102.46	378.03	343.12	198.10	85.34	72.65	55.87	48.18	102.72
2014	30	52G7	2 277.95	634.01	569.08	319.46	204.73	96.91	97.24	80.12	73.09	203.33
2014	30	52G8	2 587.30	783.75	229.06	193.63	280.07	154.37	191.38	158.22	161.12	435.70
2014	30	52G9	3 435.64	1261.27	310.22	427.99	414.35	192.11	191.58	156.81	143.18	338.12
2014	30	52H0	1 782.67	252.63	349.63	320.82	239.03	109.91	105.77	89.60	85.40	229.88
2014	30	53G8	4 446.45	3044.04	281.39	161.35	199.60	104.92	133.74	115.74	111.32	294.35
2014	30	53G9	3 031.05	734.60	254.02	574.06	460.76	210.50	197.40	149.39	144.46	305.87
2014	30	53H0	3 264.15	1171.71	750.00	453.46	287.86	126.68	113.12	87.55	81.55	192.23
2014	30	54G8	2 265.02	1215.17	75.91	177.77	195.84	98.04	111.01	90.99	86.25	214.03
2014	30	54G9	3 022.87	1991.74	214.07	182.77	168.26	81.64	86.10	66.54	64.80	166.95
2014	30	54H0	2 188.30	754.04	424.26	331.68	227.30	99.85	85.83	66.82	60.00	138.51
2014	30	55G9	2 808.95	944.43	638.76	466.63	301.86	126.91	94.65	70.14	57.66	107.91
2014	30	55H0	1 841.70	167.67	742.26	437.88	238.19	92.73	54.39	40.25	28.22	40.12
2014	32	47H3	1 247.25	383.89	29.33	280.36	329.82	151.55	43.59	19.86	4.67	4.18
2014	32	48H3	10 853.37	6114.06	862.24	1 680.76	755.21	741.65	90.44	265.30	162.80	180.89
2014	32	48H4	6 661.49	1755.62	299.97	1 954.19	1 763.80	636.98	158.63	47.06	27.81	17.44
2014	32	48H5	3 029.85	1289.80	151.63	699.41	565.08	216.83	70.95	25.27	3.08	7.81
2014	32	48H6	4361.42	2249.9	498.84	1103.18	326.84	139.15	35.48	6.48	0.46	1.11

Table 5.1.1.2.2. Estimated numbers (millions) of sprat in September-October 2014, by the ICES rectangles, accordingly to age groups.

SD	RECT	total	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
21	41G0	0.94	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	41G1	1.56	1.17	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	41G2	7.57	7.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	42G1	3.53	1.11	0.65	0.00	0.98	0.59	0.20	0.00	0.00	0.00
21	42G2	38.28	37.53	0.57	0.00	0.12	0.06	0.00	0.00	0.00	0.00
21	43G1	10.08	5.04	1.68	0.00	0.56	0.56	0.56	1.68	0.00	0.00
21	43G2	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	37G0	47.74	8.08	14.90	8.45	7.75	8.27	0.29	0.00	0.00	0.00
22	37G1	309.22	87.53	131.48	28.21	25.97	33.50	2.53	0.00	0.00	0.00
22	38G0	207.16	105.00	24.96	22.25	24.62	28.83	1.50	0.00	0.00	0.00
22	38G1	0.39	0.26	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00
22	39F9	950.91	947.91	1.87	0.91	0.11	0.11	0.00	0.00	0.00	0.00
22	39G0	82.79	53.22	17.42	6.47	2.82	2.62	0.24	0.00	0.00	0.00
22	39G1	74.78	74.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	40F9	4.68	0.98	0.52	0.54	1.03	1.60	0.01	0.00	0.00	0.00
22	40G0	116.84	24.50	12.89	13.50	25.74	39.98	0.23	0.00	0.00	0.00
22	40G1	9.93	0.90	1.70	1.18	2.79	3.36	0.00	0.00	0.00	0.00
22	41G0	16.63	0.00	11.86	2.25	1.27	1.21	0.04	0.00	0.00	0.00
23	39G2	52.59	42.94	6.24	1.05	1.33	0.33	0.45	0.23	0.02	0.00
23	40G2	123.52	15.72	17.72	4.91	24.31	30.13	20.92	5.46	2.36	1.99
23	41G2	72.79	62.74	8.58	1.47	0.00	0.00	0.00	0.00	0.00	0.00
24	37G2	3.66	3.29	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	37G3	875.07	585.83	261.87	18.63	4.78	0.87	2.72	0.37	0.00	0.00
24	37G4	1 464.42	1 313.79	123.52	9.21	9.03	3.43	3.98	1.35	0.11	0.00
24	38G2	1 356.12	668.34	527.90	45.20	63.86	17.70	25.73	6.86	0.53	0.00
24	38G3	7 240.07	6 328.66	782.79	50.44	41.63	14.48	17.49	3.88	0.70	0.00
24	38G4	2 711.17	2 432.30	228.68	17.04	16.72	6.36	7.37	2.50	0.20	0.00
24	39G2	231.08	188.72	27.42	4.61	5.84	1.43	1.96	1.02	0.08	0.00
24	39G3	2 614.23	974.55	1 189.67	134.61	186.61	37.33	68.27	22.31	0.88	0.00
24	39G4	172.32	11.87	109.14	14.31	23.59	4.48	6.86	1.87	0.20	0.00
25	37G5	522.83	214.59	88.67	98.62	61.73	23.51	18.34	12.41	2.34	2.63
25	38G5	270.49	9.08	33.41	68.11	77.31	31.09	26.03	18.41	4.27	2.79
25	38G6	626.17	364.72	88.93	96.73	44.42	12.67	10.02	6.16	0.45	2.07
25	38G7	2 429.12	2 270.23	99.00	54.69	3.80	1.40	0.00	0.00	0.00	0.00
25	39G4	9.09	1.85	4.75	0.81	0.34	0.84	0.17	0.34	0.00	0.00
25	39G5	2 210.18	305.93	307.54	289.01	462.46	157.59	294.62	370.18	0.00	22.86
25	39G6	574.30	0.00	60.78	135.26	172.02	77.29	65.63	45.22	10.98	7.11
25	39G7	34.30	0.26	4.05	7.99	9.91	4.62	3.82	2.61	0.65	0.39
25	40G4	800.94	131.28	205.47	93.23	179.87	96.99	62.44	8.71	22.95	0.00
25	40G5	1 958.91	562.82	303.17	158.54	385.48	277.17	88.89	144.18	6.02	32.64
25	40G6	2 274.75	219.95	382.87	525.00	493.68	257.84	107.59	274.23	0.00	13.59
25	40G7	574.25	185.75	10.14	35.82	136.94	126.14	42.09	23.41	13.95	0.00
25	41G6	2 174.48	1 023.60	379.21	162.15	276.44	161.47	46.49	63.36	22.26	39.50
25	41G7	2 798.73	588.12	106.88	284.14	778.52	221.72	210.40	404.75	187.50	16.68
26	37G8	366.13	0.00	120.75	107.38	70.95	40.27	16.22	6.96	0.63	2.96
26	37G9	88.47	0.00	34.56	26.34	15.72	7.83	2.48	1.16	0.05	0.32
26	38G8	505.51	0.00	159.62	167.65	99.19	51.33	16.62	7.97	0.57	2.56
26	38G9	538.93	417.74	62.14	30.78	17.05	6.00	3.35	0.90	0.16	0.81
26	39G8	545.34	0.00	180.46	185.19	104.94	45.38	15.55	9.33	1.20	3.29
26	39G9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	40G8	5 451.31	5 439.41	2.38	5.95	3.57	0.00	0.00	0.00	0.00	0.00
26	40G9	175.34	0.73	13.83	21.33	63.24	40.73	20.79	13.84	0.84	0.00
26	40H0	11 389.84	8 626.04	901.99	764.68	646.86	294.28	91.72	19.05	14.20	31.01
26	41G8	4 153.44	3 400.76	5.49	71.73	324.06	80.05	68.52	125.76	24.43	52.65
26	41G9	6 388.46	6 388.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	41H0	20 464.42	19 788.07	514.51	20.23	60.69	60.69	0.00	20.23	0.00	0.00
27	42G6	301.94	11.47	26.75	94.02	39.37	88.67	5.73	35.93	0.00	0.00
27	42G7	578.24	543.97	11.80	14.75	4.76	0.00	0.00	2.95	0.00	0.00
27	43G7	197.67	195.55	0.06	0.00	0.67	0.67	0.06	0.66	0.00	0.00
27	44G7	480.70	470.60	1.99	0.00	0.00	1.38	1.68	1.38	0.00	3.67
27	44G8	624.46	594.53	0.00	17.46	2.49	4.99	2.49	2.49	0.00	0.00
27	45G7	3 464.68	3 462.60	1.04	0.00	0.00	0.00	1.04	0.00	0.00	0.00
27	45G8	6 594.33	6 577.34	0.00	6.79	10.19	0.00	0.00	0.00	0.00	0.00
27	46G8	4 435.11	4 435.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28_2	42G8	4 570.19	4 200.85	30.27	57.58	103.22	85.48	31.53	40.23	21.04	0.00
28_2	42G9	3 773.82	3 745.13	0.00	0.00	7.17	0.00	0.00	14.34	0.00	7.17
28_2	42H0	9 589.31	5 414.92	846.13	817.43	1 142.47	346.53	155.55	535.98	162.98	167.31
28_2	43G8	114.50	106.99	0.00	1.74	0.95	2.29	1.74	0.79	0.00	0.00
28_2	43G9	5 780.40	5 626.55	15.43	17.69	61.87	21.79	26.48	10.59	0.00	0.00
28_2	43H0	7 086.35	991.32	695.53	1 697.78	1 611.80	915.63	87.46	851.53	97.30	138.00
28_2	43H1	835.68	336.15	80.33	85.61	155.87	77.16	33.14	45.49	8.93	13.00
28_2	44G9	4 186.63	3 597.83	51.51	187.46	88.84	68.17	105.70	87.13	0.00	0.00
28_2	44H0	3 306.85	2 868.35	23.58	87.70	151.83	47.15	58.94	64.13	0.00	5.19
28_2	44H1	2 521.98	2 404.13	0.00	23.57	47.14	0.00	0.00	23.57	0.00	23.57
28_2	45G9	3 795.16	3 793.34	0.00	0.68	0.46	0.00	0.23	0.46	0.00	0.00
28_2	45H0	586.30	496.41	9.55	12.35	30.28	9.50	3.09	12.00	3.19	9.93
28_2	45H1	2 503.03	1 925.67	134.45	117.97	165.68	51.89	10.79	43.84	12.11	40.63
29	46G9	3 322.55	3 308.83	0.00	2.09	0.00	2.09	5.36	2.09	0.00	2.09
29	46H0	1 971.33	1 971.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	46H1	4 763.05	3 740.85	155.51	493.70	220.75	64.16	6.52	58.72	3.26	19.57
29	46H2	963.67	756.85	31.46	99.89	44.66	12.98	1.32	11.88	0.66	3.96
29	47G9	12 959.43	12 946.43	0.00	0.00	12.99	0.00	0.00	0.00	0.00	0.00
29	47H0	3 920.02	3 912.06	0.00	0.00	3.98	0.00	1.67	2.31	0.00	0.00
29	47H1	2 616.05	1 625.14	126.75	337.17	264.43	73.62	27.22	100.26	17.51	43.95
29	47H2	1 304.81	384.12	82.26	322.44	267.36	73.53	26.34	96.33	17.01	35.40
29	48G9	1 419.03	1 330.01	41.89	0.00	0.00	47.13	0.00	0.00	0.00	0.00
29	48H0	1 167.70	1 094.45	34.47	0.00	0.00	38.78	0.00	0.00	0.00	0.00
29	48H1	1 333.32	1 188.93	67.59	0.00	0.00	76.80	0.00	0.00	0.00	0.00
29	48H2	1 083.58	936.66	73.46	0.00	0.00	73.46	0.00	0.00	0.00	0.00
29	49G9	3 468.45	3 445.78	0.00	0.00	0.00	22.67	0.00	0.00	0.00	0.00
30	50G7	22.93	17.83	0.00	0.74	0.66	0.63	0.58	0.33	0.59	1.57
30	50G8	26.98	13.19	0.00	1.04	1.70	1.60	1.89	0.94	1.85	4.77
30	50G9	125.34	114.73	0.00	0.82	1.60	1.50	1.42	0.60	1.15	3.52
30	50H0	50.81	39.20	0.00	0.78	1.51	1.55	1.56	0.55	0.97	4.69
30	51G7	19.28	11.63	0.00	0.65	0.87	0.84	1.02	0.54	1.07	2.66
30	51G8	20.45	6.97	0.00	0.86	1.64	1.55	1.90	0.93	1.85	4.75
30	51G9	241.17	228.16	0.00	1.02	2.05	1.93	1.92	0.75	1.64	3.70
30	51H0	33.61	7.55	0.19	2.10	3.18	2.75	3.37	1.74	3.40	9.33
30	52G7	0.89	0.00	0.00	0.45	0.11	0.11	0.00	0.11	0.00	0.11
30	52G8	2.98	1.49	0.00	0.00	0.00	0.05	0.20	0.15	0.10	0.99
30	52G9	13.35	10.27	0.00	0.68	0.41	0.38	0.22	0.29	0.12	0.98
30	52H0	38.57	5.67	0.00	1.29	2.91	2.69	4.19	2.30	4.37	15.15
30	53G8	16.59	5.93	0.00	0.25	0.78	0.76	1.61	0.88	1.85	4.53
30	53G9	19.74	8.47	0.00	1.06	2.17	2.22	2.04	0.35	1.36	2.07
30	53H0	57.64	6.94	0.17	3.82	5.86	5.53	7.05	3.66	6.74	17.87
30	54G8	2.79	0.93	0.00	0.04	0.12	0.12	0.28	0.16	0.30	0.84
30	54G9	3.85	1.28	0.00	0.00	0.00	0.04	0.36	0.26	0.28	1.63
30	54H0	11.46	0.00	0.12	0.75	1.14	0.99	1.45	0.89	1.28	4.84
30	55G9	4.97	0.00	0.00	0.03	0.11	0.17	0.69	0.49	0.63	2.85
30	55H0	2.21	0.00	0.00	0.03	0.10	0.11	0.30	0.21	0.32	1.14
32	47H3	939.60	20.85	90.18	322.45	203.77	89.02	62.67	110.02	16.80	23.84
32	48H3	8 383.34	5 616.84	586.83	905.40	243.12	783.84	79.64	41.92	83.83	41.92
32	48H4	4 278.01	78.57	464.73	1 585.26	870.26	398.68	289.01	410.60	77.55	103.34
32	48H5	11 933.55	469.35	1 430.78	4 564.42	2 295.85	1 054.02	709.65	1 010.59	176.52	222.37
32	48H6	11599.46	649.96	1390.16	4345.56	2203.23	1019.04	663.13	965.58	162.35	200.45

Table 5.1.1.2.3. Estimated numbers (millions) of cod in September-October 2005–2014, by the ICES rectangles.

Sub_Div	RECT	Area	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
24	37G2	192.40	2.17	0.00	1.82	0.00	0.00	0.00	0.00	0.00	6.01	0.00
24	37G3	167.70	0.00	4.14	0.87	1.18	0.72	4.26	0.00	1.99	1.09	0.91
24	37G4	875.10	9.50	0.13	4.27	5.16	1.41	2.60	0.02	0.00	19.73	0.31
24	38G2	832.90	10.86	0.00	1.95	0.00	0.00	1.93	1.07	5.97	0.46	0.00
24	38G3	865.70	0.28	0.00	1.61	1.07	1.97	3.57	0.40	4.39	0.94	25.85
24	38G4	1034.80	3.10	0.27	4.86	6.85	0.48	2.18	0.20	1.03	0.83	0.29
24	39G2	406.10	1.49	3.89	1.76	0.41	1.26	3.77	0.05	0.87	0.04	1.69
24	39G3	765.00	17.92	3.78	13.93	2.76	0.55	3.80	0.35	2.08	5.09	18.75
24	39G4	524.80	2.70	1.82	2.44	1.19	1.58	7.09	0.21	0.38	1.18	4.19
25	37G5	642.20	17.83	0.25	1.31	0.00	0.38	0.21	0.00	0.00	0.00	0.03
25	38G5	1035.70	57.28	2.06	5.20	0.74	2.92	4.54	18.40	19.88	4.98	3.37
25	38G6	940.20	9.54	3.00	17.12	2.52	0.27	0.23	0.00	15.48	0.00	0.00
25	38G7	471.70	0.00	0.13	0.04	0.92	0.37	0.85	0.00	0.21	0.00	0.00
25	39G4	287.30	2.67	28.46	0.22	4.36	0.35	0.29	0.22	0.57	0.49	2.90
25	39G5	979.00	0.75	1.80	0.90	1.57	1.25	3.10	35.67	4.46	2.04	2.88
25	39G6	1026.00	0.86	6.50	0.69	4.05	0.48	16.71	3.48	0.04	0.00	0.16
25	39G7	1026.00	47.40	0.52	0.44	5.78	0.26	0.18	2.18	0.00	0.00	0.51
25	40G4	677.20	1.38	5.54	15.86	0.22	19.19	0.33	25.27	15.24	2.06	31.02
25	40G5	1012.90	2.40	7.60	4.89	25.09	1.81	0.81	14.00	5.45	1.24	7.96
25	40G6	1013.00	1.13	6.53	0.24	5.94	6.54	7.03	30.84	5.66	0.22	53.62
25	40G7	1013.00	2.85	2.89	0.00	3.13	1.75	0.25	9.31	21.37	0.15	3.90
25	41G6	764.40	2.69	14.80	0.00	2.53	0.63	0.36	0.00	1.03	0.00	0.84
25	41G7	1000.00	0.08	1.90	8.71	0.25	4.40	1.12	61.89	29.81	35.29	0.00
26	37G8	86.00	0.46	3.25	0.00	0.23	0.00	0.03	0.00	0.08	0.00	0.54
26	37G9	151.60	37.64	0.89	1.59	0.99	0.32	0.21	0.51	0.59	0.00	0.16
26	38G8	624.60	37.05	4.97	1.68	3.39	2.01	1.43	1.29	7.19	0.00	1.05
26	38G9	918.20	0.00	0.00	0.00	0.00	0.26	0.00	1.31	4.53	49.20	6.52
26	39G8	1026.00	32.28	22.10	1.63	0.83	4.33	4.71	19.88	5.18	0.00	0.50
26	39G9	1026.00	0.00	0.00	0.00	0.00	0.35	0.00	0.92	0.00	3.12	4.66
26	39H0	881.60					0.00	0.00	0.02			
26	40G8	1013.00	17.82	4.57	0.54	0.21	0.55	6.77	3.96	3.18	0.00	0.10
26	40G9	1013.00	0.00		0.00	0.00	1.51	0.00	0.21	5.86	9.07	0.79
26	40H0	1012.10	5.10		0.00	0.71	34.59	51.72	1.12	0.23	0.13	0.14
26	41G8	1000.00	0.00	2.62		0.04	1.16	1.59	21.93	19.24	0.92	1.30
26	41G9	1000.00	10.00	0.07	3.21	0.18	0.00	1.05	0.00	0.00	0.27	195.80
26	41H0	953.30	54.47	0.24	3.39	1.92	0.00	0.09	0.00	0.00	0.30	0.00
27	42G6	266.00		2.23	0.04	0.00	1.14	0.02	0.00	0.26	0.01	0.00
27	42G7	986.90	1.02	1.14	0.49	0.02	0.88	0.00	1.57	0.61	0.69	0.92
27	43G6	269.80				0.00						
27	43G7	913.80	0.00	22.02	0.00	0.08	0.00	0.50	0.09	0.00	1.87	2.70
27	44G7	960.50	0.00	1.19	1.25	0.42	0.00	0.23	0.00	0.00	0.00	0.07
27	44G8	456.60	0.00	0.00	0.00	0.03	0.51	0.23	0.09	0.00	0.19	0.00
27	45G7	908.70	0.00	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00	0.00
27	45G8	947.20	0.00	2.22	0.23	0.00	0.00	0.00	0.00	0.00	1.14	0.32
27	46G8	884.80	0.00	0.21	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.37
29	46G9	933.80	0.03	0.00	0.48	0.18	0.00	0.00	0.00	0.00	0.00	0.00
29	46H0	933.80	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
29	46H1	921.50	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.70	0.09	0.00
29	46H2	258.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	47G9	876.20	2.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
29	47H0	920.30	0.00	0.00	0.63	0.29	0.00	0.00	0.00	0.00	0.00	0.00
29	47H1	920.30	0.00	0.00	0.00	0.00	0.00	0.00	8.77	0.00	0.00	0.00
29	47H2	793.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.05
29	48G9	772.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	48H0	730.30			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	48H1	544.00			0.00		0.00	0.00	0.00	0.00	0.00	0.00
29	48H2	597.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	49G9	564.20			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.1.1.2.4. Estimated numbers (millions) of herring by the ICES Subdivisions, accordingly to age groups; September-October 2014.

Year	Sub_Div	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8
2014	21	7 643.99	106.73	1.88	0.00	0.00	0.00	0.00	0.00	0.00
2014	22	945.10	437.63	17.37	16.20	6.37	4.67	0.00	0.00	0.00
2014	23	193.81	131.48	161.53	214.40	302.37	308.50	211.69	82.97	55.35
2014	24	1 116.04	122.86	71.79	63.96	31.03	10.50	10.09	13.30	6.62
2014	25	767.55	956.38	841.26	2 246.71	936.05	1 099.07	1 054.80	730.52	292.39
2014	26	209.32	169.32	210.95	656.32	387.67	816.66	1 365.16	1 217.07	1 596.17
2014	27	4 672.64	187.04	1 545.78	2 431.30	848.79	860.02	771.10	234.65	60.37
2014	28_2	4 275.34	454.80	2 329.96	2 542.78	1 095.78	1 095.75	1 080.25	762.19	299.73
2014	29	23 040.06	3 098.61	4 568.71	6 538.41	2 277.85	3 045.82	1 949.95	1 709.09	1 167.50
2014	30	20 718.66	8 333.90	6 185.98	4 538.44	2 067.76	1 967.74	1 565.13	1 434.85	3 369.90
2014	32	11 793.27	1 842.00	5 717.91	3 740.75	1 886.15	399.09	363.97	198.82	211.42

Table 5.1.1.2.5. Estimated numbers (millions) of sprat by the ICES Subdivisions, accordingly to age groups; September-October 2014.

Sub_Div	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8+
21	52.58	4.23	0.00	1.66	1.21	0.76	1.68	0.00	0.00
22	1 303.16	217.71	83.78	92.10	119.48	4.84	0.00	0.00	0.00
23	121.40	32.54	7.43	25.64	30.46	21.37	5.69	2.38	1.99
24	12 507.35	3 251.36	294.05	352.06	86.08	134.38	40.16	2.70	0.00
25	5 878.19	2 074.87	2 010.10	3 082.91	1 450.33	976.53	1 373.97	271.38	140.25
26	44 061.21	1 995.75	1 401.25	1 406.27	626.56	235.26	205.20	42.07	93.60
27	16 291.17	41.64	133.03	57.49	95.71	11.01	43.41	0.00	3.67
28_2	35 507.64	1 886.77	3 107.57	3 567.57	1 625.58	514.65	1 730.08	305.55	404.80
29	36 641.43	613.39	1 255.29	814.18	485.23	68.43	271.60	38.45	104.98
30	480.24	0.48	16.41	26.92	25.52	32.05	16.13	29.87	87.99
32	6 835.57	3 962.67	11 723.09	5 816.24	3 344.60	1 804.10	2 538.71	517.06	591.91

5.1.1.3. Area corrected data

The area corrected abundance estimates for herring and sprat per the ICES Subdivisions and age groups are summarized in Tables 5.1.1.3.1 and 5.1.1.3.2, respectively. Biomass for herring and sprat per the ICES Subdivisions and age groups are summarized in Tables 5.1.1.3.3 and 5.1.1.3.4, respectively.

Table 5.1.1.3.1. Area corrected numbers (millions) of herring by the ICES Subdivisions and age groups (September-October 2014).

Sub_Div	AREA_CORR_FACTOR	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8+
21	1.22	9 301.18	129.87	2.29	0.00	0.00	0.00	0.00	0.00	0.00
22	1.02	964.59	446.65	17.73	16.53	6.50	4.77	0.00	0.00	0.00
23	1.00	193.81	131.48	161.53	214.40	302.37	308.50	211.69	82.97	55.35
24	1.00	1 116.04	122.86	71.79	63.96	31.03	10.50	10.09	13.30	6.62
25	1.03	792.10	986.98	868.17	2 318.58	966.00	1 134.23	1 088.54	753.89	301.74
26	1.10	230.73	186.64	232.54	723.47	427.34	900.22	1 504.83	1 341.59	1 759.48
27	1.23	5 750.79	230.20	1 902.46	2 992.29	1 044.64	1 058.46	949.02	288.79	74.30
28_2	1.01	4 331.37	460.76	2 360.50	2 576.11	1 110.14	1 110.11	1 094.41	772.18	303.66
29	1.04	23 955.66	3 221.75	4 750.27	6 798.25	2 368.37	3 166.86	2 027.44	1 777.00	1 213.89
30	1.08	22 393.65	9 007.65	6 686.09	4 905.35	2 234.93	2 126.82	1 691.66	1 550.85	3 642.34
32	2.12	25 045.04	3 911.80	12 142.96	7 944.13	4 005.55	847.54	772.96	422.23	448.99

Table 5.1.1.3.2. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (September-October 2014).

Sub_Div	AREA_CORR_FACTOR	AGE0	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8+
21	1.22	63.98	5.15	0.00	2.02	1.47	0.92	2.04	0.00	0.00
22	1.02	1 330.03	222.20	85.51	94.00	121.94	4.94	0.00	0.00	0.00
23	1.00	121.40	32.54	7.43	25.64	30.46	21.37	5.69	2.38	1.99
24	1.00	12 507.35	3 251.36	294.05	352.06	86.08	134.38	40.16	2.70	0.00
25	1.03	6 066.22	2 141.24	2 074.40	3 181.53	1 496.73	1 007.77	1 417.92	280.06	144.73
26	1.10	48 569.23	2 199.94	1 544.62	1 550.15	690.67	259.33	226.20	46.38	103.18
27	1.23	20 050.16	51.25	163.72	70.76	117.80	13.55	53.43	0.00	4.52
28_2	1.01	35 973.04	1 911.50	3 148.31	3 614.33	1 646.89	521.39	1 752.76	309.55	410.10
29	1.04	38 097.55	637.76	1 305.18	846.53	504.51	71.15	282.40	39.97	109.15
30	1.08	519.06	0.52	17.74	29.10	27.58	34.64	17.43	32.28	95.10
32	2.12	14 516.51	8 415.41	24 896.00	12 351.79	7 102.83	3 831.32	5 391.40	1 098.07	1 257.02

Table 5.1.1.3.3. Estimated biomass (in tons) of herring in September-October 2014, per the ICES Subdivisions and age groups.

Sub_Div	AREA_CORR_FACTOR	0	1	2	3	4	5	6	7	8+
21	1.22	98 722.20	5 213.56	138.08						
22	1.02	14 554.96	15 783.73	1 131.74	1502.95	854.46	792.09			
23	1.00	1 778.13	7 078.48	16 246.09	27 240.13	55 866.57	62 487.97	45 709.88	18 418.68	13 355.61
24	1.00	16 840.51	8 392.73	5 779.59	6 896.84	3 052.86	1 275.20	808.50	1 241.69	548.73
25	1.03	9 848.62	33 376.04	43 697.89	135 722.12	65 565.69	69 136.96	73 405.88	51 761.04	26 697.83
26	1.10	1 983.78	5 103.89	9 124.61	34 234.07	21 336.19	44 540.73	81 760.21	82 593.21	122 364.75
27	1.23	22 397.97	4 554.86	49 633.88	99 964.23	38 987.38	47 062.52	42 478.44	13 978.99	4 324.24
28_2	1.01	21 863.10	12 978.34	80 375.37	101 530.38	43 898.14	48 314.35	54 080.96	41 257.82	18 666.34
29	1.04	75 726.37	54 339.26	102 161.46	157 336.89	68 604.21	84 002.23	52 081.39	56 107.28	43 625.96
30	1.08	106 823.00	142 516.48	153 685.98	133 748.00	65 101.27	70 226.21	58 393.85	55 963.66	152 241.98
32	2.12	86 426.42	98 992.50	327 682.84	229 948.11	160 216.50	27 771.51	41 105.94	25 203.75	25 962.86

Table 5.1.1.3.4. Estimated biomass (in tons) of sprat in September-October 2014, per the ICES Subdivisions and age groups.

Sub_Div	AREA_CORR_FACTOR	0	1	2	3	4	5	6	7	8+
21	1.22	228.32	81.38		45.84	34.17	22.50	55.19		
22	1.02	2 807.15	3 526.54	1 603.27	1 960.69	2 641.65	108.60			
23	1.00	388.88	478.73	118.29	543.94	684.23	495.78	133.86	67.96	60.97
24	1.00	50 608.38	39 506.27	4 592.24	6 700.52	2 441.83	2 152.00	912.13	83.27	86.27
25	1.03	24 198.19	25 599.97	28 820.92	52 067.30	26 607.05	17 743.12	24 185.26	4 449.77	2 626.43
26	1.10	134 606.71	20 873.18	17 474.02	19 400.61	9 542.62	3 783.33	3 526.80	728.83	1 681.92
27	1.23	50 388.07	606.51	2 122.47	922.76	1 870.02	213.76	807.04		72.29
28_2	1.01	127 659.14	19 870.57	39 275.82	47 820.27	22 233.92	7 514.36	25 894.24	4 635.52	6 618.90
29	1.04	85 131.18	5 859.07	13 317.00	9 489.22	5 557.72	890.81	3 342.11	501.14	1 255.48
30	1.08	1 621.50	5.12	224.08	388.05	372.40	502.98	258.28	473.98	1 470.87
32	2.12	42 856.39	81 486.46	260 378.28	136 577.69	85 050.33	41 509.49	60 193.54	13 294.20	15 532.08

5.1.1.4. Tuning fleets for WGBFAS

5.1.1.4.1. Herring in the ICES Subdivisions 25-29

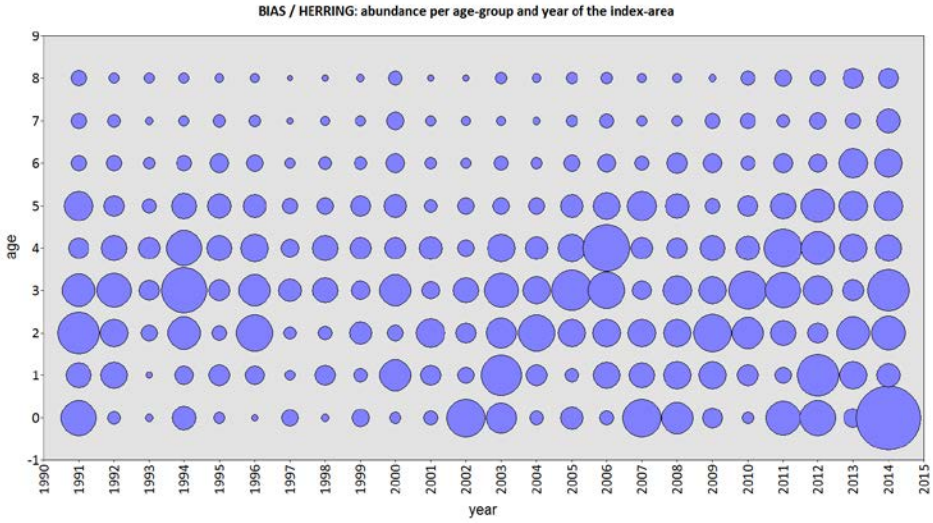


Figure 5.1.1.4.1.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1991–2014) for herring in the ICES Subdivisions 25–29.

5.1.1.4.2. Sprat in the ICES Subdivisions 22-29

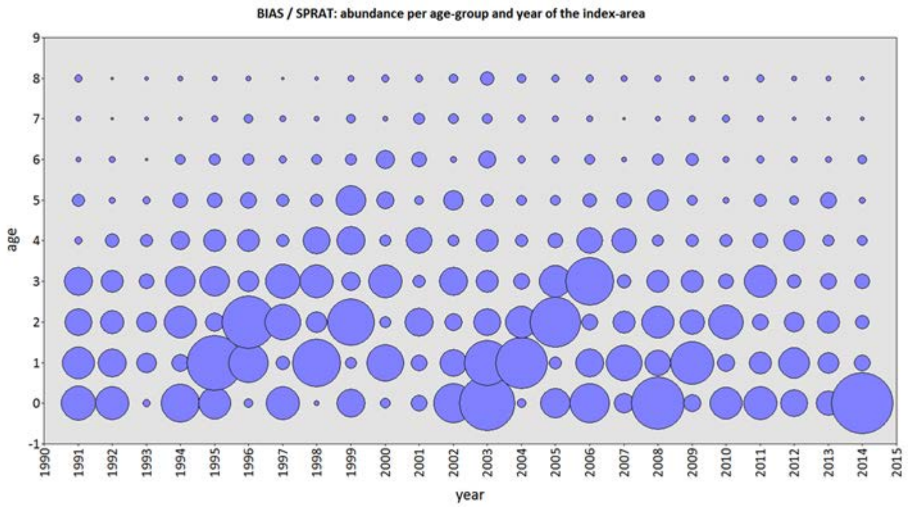


Figure 5.1.1.4.2.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1991–2014) for sprat in the ICES Subdivisions 22–29.

5.1.1.4.3. Herring in the ICES Subdivision 30

Tuning fleet data from the October 1991, 2000, 2007–2014 BIAS surveys are presented for the herring assessment of the Bothnian Sea (the ICES Sub-div. 30) stock, the area corrected combined results are presented in Table 5.1.1.4.3.1 and Figure 5.1.1.4.3.1. The results from 2012 survey are not consistent with the results from other years due to lower area coverage than normally. In 2012, Sweden could not support the funding for the BIAS survey in the Bothnian Sea therefore the coverage of the ICES SD 30 was based on Finnish data only, which resulted in half of the normal effort. In 2013, Finland installed fishing equipment and Simrad EK-60 echosounder into the RV "Aranda" and used the vessel in order to cover all required rectangles in the Bothnian Sea. In 2014, the distance of the acoustic transects and the numbers of realized fish control-hauls were done almost as planned. Not all of the 2014 herring age samples were available at the deadline-time of data delivery for the 2015 WGBIFS meeting and therefore there could be higher uncertainty in the 2014 age composition of the fish hauls. According to the procedure, delayed data cannot be taken into account for evaluation of the tuning data in the current year.

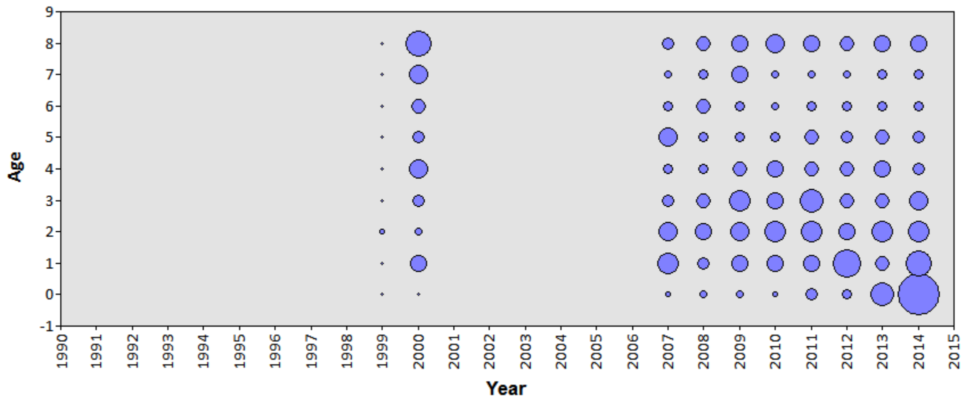


Figure 5.1.1.4.3.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1999–2000 and 2007–2014) for herring in the ICES Subdivision 30.

Table 5.1.1.4.3.1. Correction factor and area corrected numbers (millions) of herring per age groups in the ICES Subdivision 30 (1999, 2000, 2007–2014).

YEAR	AREA_CORR_FACTOR	HER_AGE0	HER_AGE1	HER_AGE2	HER_AGE3	HER_AGE4	HER_AGE5	HER_AGE6	HER_AGE7	HER_AGE8+	HER_TOTAL_age1_8
1999	1.28	100.45	187.68	561.32	252.25	228.34	252.55	140.65	156.24	188.65	1 967.69
2000	1.06	104.19	3 846.00	928.57	1 794.16	4 429.95	2 048.50	2 704.11	4 361.30	8 552.91	28 665.50
2007	1.06	442.53	5 670.78	4 916.19	1 845.69	1 507.59	5 254.43	1 441.11	826.08	2 347.95	23 809.82
2008	1.20	859.15	2 669.79	4 846.31	3 386.30	1 649.49	1 825.30	3 344.39	1 265.96	3 049.00	22 036.55
2009	1.06	679.46	3 573.39	5 089.63	5 558.51	2 438.03	1 282.91	1 518.46	3 615.98	3 757.41	26 834.34
2010	1.06	452.73	3 989.84	6 534.82	3 500.95	3 535.59	1 576.84	982.35	891.26	4 479.00	25 490.64
2011	1.06	2 041.68	3 699.81	6 100.51	7 384.00	3 086.23	3 133.75	1 442.21	641.73	3 870.69	29 358.92
2012	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	28 374.82
2013	1.11	8 358.81	3 306.48	6 645.52	2 843.18	3 486.22	3 386.11	1 434.66	1 771.46	3 946.95	26 820.57
2014	1.08	22393.65	9007.65	6686.09	4905.35	2234.93	2126.82	1691.66	1550.85	3642.34	31845.69

5.1.2. Combined results of the Baltic Acoustic Spring Survey (BASS)

In 2014, the following acoustic surveys were conducted in May–June.

Vessel	Country	ICES Subdivisions
Walther Herwig III	Germany	24, 25, parts of 26, 28 and 29
Commercial vessel “Ulrika”	Latvia-Estonia	parts of 26, 28, 29, 32
Darius	Lithuania	part of 26

5.1.2.1. Area under investigation and overlapping areas

The BASS/2014 surveys were realized by Germany, Lithuania and Latvia-Estonia in the ICES Subdivisions 24, 25, 26, 27, 28 and SE part of SD 29 and one rectangle of ICES Subdivision 32 (Figure 5.1.2.1.1).

Two statistical the ICES rectangles (42G9 and 43G9) were inspected by Germany and Latvia-Estonia (Figure 5.1.2.1.1). 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.

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.

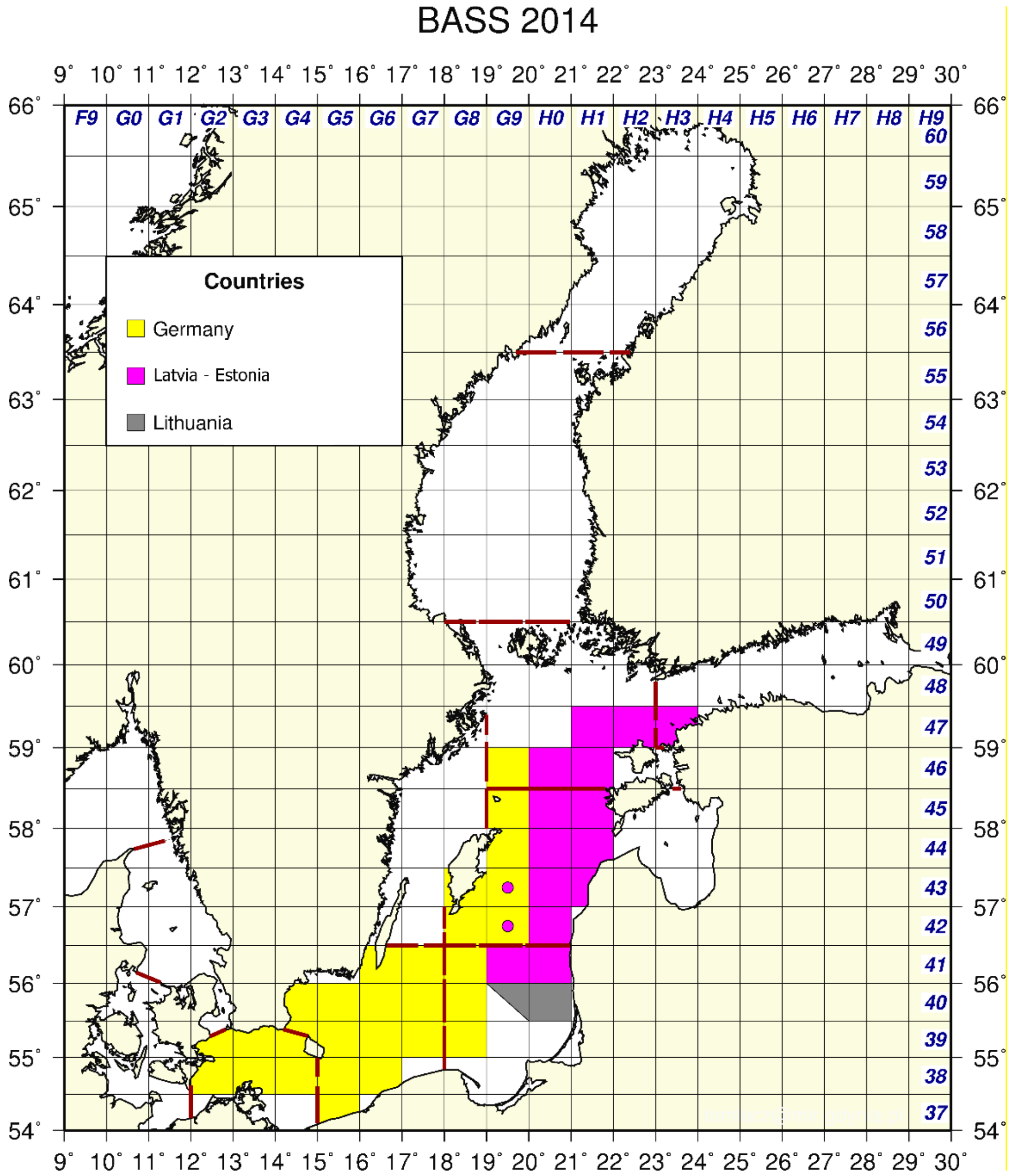


Figure 5.1.2.1.1. Map of the BASS survey conducted in May-June 2014. Various colours indicate the countries, which covered specific ICES-rectangles and delivered data to BASS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BASS-database partly or totally covered by other countries.

5.1.2.2. Combined results and area corrected data

The Baltic sprat stock abundance estimates per the ICES-rectangles and the ICES Subdivisions acc. to age groups are presented in Tables 5.1.2.2.1 and 5.1.2.2.2. The geographical distribution of the sprat abundance is demonstrated in Figure 5.1.2.2.1. 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 IBAS manual) and the area of rectangles covered during the survey. The correction factors, calculated by ICES Subdivisions for 2014 are included in Tables 5.1.2.2.3 and 5.1.2.2.4. The area corrected abundance estimates for sprat per ICES Subdivision are summarized in Table 5.1.2.2.3. The corresponding biomass estimates of sprat are given in the Table 5.1.2.2.4.

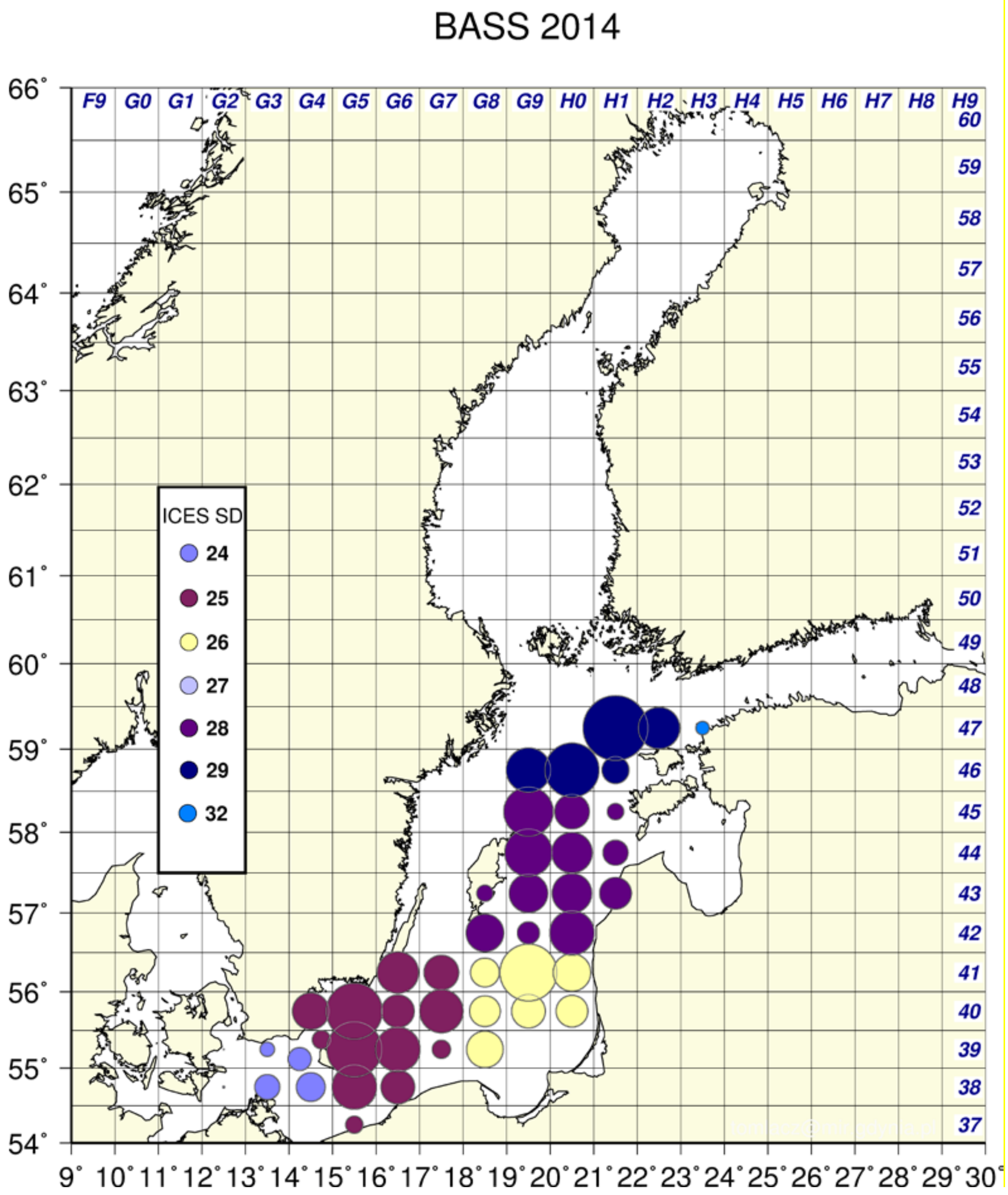


Figure 5.1.2.2.1. The abundance of sprat per the ICES-rectangles monitored in May-June 2014 (the area of circles indicates estimated numbers of specimens x10^6 in given rectangle; the colour indicates ICES Subdivision).

Table 5.1.2.2.1. Estimated abundance (millions) of sprat in May-June 2014, per age groups and the ICES-rectangles in given the ICES Subdivisions.

SD	rect	total	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
24	38G2	7.76	0.12	1.20	1.98	1.73	1.15	0.96	0.61	0.01
24	38G3	851.73	205.55	164.43	178.72	118.59	101.40	58.20	24.31	0.53
24	38G4	1 136.16	282.02	237.51	233.52	153.28	124.75	72.89	31.74	0.45
24	39G2	2.37		0.23	0.44	0.75	0.29	0.39	0.23	0.04
24	39G3	289.60	0.91	42.36	61.99	76.85	43.29	42.13	18.09	3.98
24	39G4	761.58	25.19	195.12	207.50	132.17	117.16	61.38	22.70	0.36
25	37G5	423.44	16.97	111.77	113.62	63.23	78.36	23.28	10.06	6.15
25	38G5	2 721.63	104.59	689.90	720.56	410.25	523.59	160.56	69.23	42.95
25	38G6	1 572.16	90.06	524.94	410.91	210.77	228.43	63.17	25.60	18.28
25	39G4	462.98	23.94	112.53	106.82	68.79	89.12	37.99	13.59	10.20
25	39G5	4 175.99	404.01	1 592.79	1 049.94	449.05	485.05	111.28	56.32	27.55
25	39G6	2 665.96	78.95	1 108.85	751.36	303.47	306.75	66.38	33.39	16.81
25	39G7	444.94	22.79	205.19	117.41	44.96	40.69	7.21	4.75	1.94
25	40G4	1 842.03	104.84	773.90	476.59	196.05	203.67	48.26	25.46	13.26
25	40G5	4 251.41	76.85	1 696.26	1 212.76	518.65	549.37	111.40	56.27	29.85
25	40G6	1 451.21	77.36	644.97	391.35	145.30	143.62	24.62	17.54	6.45
25	40G7	2 596.73	441.67	1 043.96	596.67	227.00	217.34	37.47	21.66	10.96
25	41G6	2 388.62	337.21	1 254.09	500.96	172.00	94.72	15.88	10.52	3.24
25	41G7	1 615.57	228.07	848.21	338.83	116.34	64.07	10.74	7.12	2.19
26	39G8	1 818.23	31.35	720.85	432.79	286.35	176.05	107.86	46.65	16.33
26	40G8	1 345.94	11.80	579.55	310.18	197.45	125.78	80.19	28.41	12.58
26	40G9	1 566.48	72.37	264.45	282.20	346.88	178.20	223.74	119.41	79.25
26	40H0	1 347.66	918.94	161.95	139.77	42.19	27.98	38.30	9.24	9.29
26	41G8	1 157.94	86.79	587.71	213.40	121.22	71.08	45.42	25.18	7.14
26	41G9	4 377.74	296.46	1 650.50	1 391.30	351.18	151.79	373.60	29.91	133.01
26	41H0	1 949.17	148.06	670.60	766.64	108.63	53.95	134.80	15.32	51.17
28_2	42G8	1 893.51	135.87	814.63	586.56	114.31	163.15	35.97	25.31	17.71
28_2	42G9	699.44	355.45	127.91	129.49	28.20	39.09	8.98	6.24	4.08
28_2	42H0	2 729.03	908.43	547.46	700.09	216.21	37.81	249.24	39.06	30.73
28_2	43G8	359.89	29.34	139.09	121.23	24.79	30.16	6.74	4.90	3.64
28_2	43G9	2 078.59	259.45	780.55	649.20	133.79	169.28	38.35	26.99	20.98
28_2	43H0	2 167.25	319.83	684.81	604.01	147.79	29.57	251.49	52.16	77.60
28_2	43H1	1 384.29	778.68	128.65	253.31	102.68	10.18	78.74	22.88	9.17
28_2	44G9	3 111.05	42.11	1 328.93	1 118.38	206.37	287.47	60.77	38.15	28.87
28_2	44H0	2 283.87	760.22	665.77	429.81	133.58	21.54	199.79	12.77	60.39
28_2	44H1	876.30	574.99	119.42	91.82	44.49	4.37	28.54	6.90	5.77
28_2	45G9	3 260.55	76.96	1 486.21	1 062.80	197.17	297.08	66.90	42.85	30.58
28_2	45H0	1 631.09	517.33	492.94	337.31	65.83	29.61	115.86	8.39	63.82
28_2	45H1	347.15	92.01	120.80	66.21	17.75	6.28	30.64	1.35	12.11
29	46G9	2 661.34	71.54	1 371.38	699.76	107.08	268.40	56.25	5.10	81.83
29	46H0	4 045.91	1028.88	1 116.03	968.00	291.84	199.89	272.66	69.49	99.12
29	46H1	998.98	174.06	322.21	193.14	107.48	40.08	75.45	37.51	49.05
29	47H1	5 773.13	1809.80	1 685.13	811.59	266.88	477.90	309.75	107.30	304.77
29	47H2	2 400.52	112.38	667.42	611.71	220.32	271.66	270.67	52.68	193.69
32	47H3	239.01	21.36	55.74	62.25	21.71	37.44	20.13	4.23	16.14

Table 5.1.2.2.2. Estimated numbers of sprat (millions) by the ICES Subdivisions, according to age groups (May-June 2014).

Sub_Div	AREA_CORR_FACTOR	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8+
24	1.28	657.07	819.56	874.94	618.17	496.25	301.75	124.92	6.87
25	1.07	2 157.11	11 398.95	7 294.33	3 144.21	3 250.51	771.84	377.74	204.00
26	1.54	2 416.21	7 153.45	5 457.01	2 243.59	1 211.10	1 549.17	423.00	476.47
28_2	1.01	4 914.26	7 534.66	6 230.82	1 451.74	1 140.34	1 187.37	291.72	370.23
29	2.25	7 207.93	11 639.87	7 405.34	2 240.39	2 836.44	2 220.51	613.50	1 642.55
32	13.98	298.72	779.30	870.40	303.57	523.50	281.52	59.15	225.65

Table 5.1.2.2.3. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (May-June 2014).

Sub_Div	AREA_CORR_FACTOR	AGE1	AGE2	AGE3	AGE4	AGE5	AGE6	AGE7	AGE8+
24	1.28	657.07	819.56	874.94	618.17	496.25	301.75	124.92	6.87
25	1.07	2 157.11	11 398.95	7 294.33	3 144.21	3 250.51	771.84	377.74	204.00
26	1.54	2 416.21	7 153.45	5 457.01	2 243.59	1 211.10	1 549.17	423.00	476.47
28_2	1.01	4 914.26	7 534.66	6 230.82	1 451.74	1 140.34	1 187.37	291.72	370.23
29	2.25	7 207.93	11 639.87	7 405.34	2 240.39	2 836.44	2 220.51	613.50	1 642.55
32	13.98	298.72	779.30	870.40	303.57	523.50	281.52	59.15	225.65

Table 3.2.2.4. Corrected sprat biomass (in tonnes), according to the ICES Subdivisions and age groups (May-June 2014).

Sub_Div	AREA_CORR_FACTOR	1	2	3	4	5	6	7	8+
24	1.28	5 126.36	12 481.72	14 862.18	11 595.92	8 823.19	6 210.11	2 648.97	168.67
25	1.07	14 164.03	118 636.50	88 984.56	42 646.15	48 038.52	13 067.40	5 834.26	3 442.23
26	1.54	12 493.85	68 450.68	58 974.20	26 240.41	14 991.67	19 503.13	5 080.35	6 021.95
28_2	1.01	36 910.52	93 880.34	85 237.34	24 678.71	15 762.53	22 998.84	4 464.38	6 938.35
29	2.25	31 059.76	92 084.39	67 877.89	22 298.03	29 141.42	23 667.46	6 409.51	17 905.57
32	13.98	1 148.92	6 155.05	8 117.19	2 991.14	5 284.23	3 020.88	628.02	2 455.61

5.1.2.2.1. Sprat in the ICES Subdivisions 24 – 28

Tuning Fleets for WGBFAS

The complete time-series (2001 to 2014) of the area-corrected sprat abundance in the ICES Subdivisions 24, 25, 26, 27 and 28 (without the Gulf of Riga) is given in the Table 5 (Whole time-series of tuning indices) and Figure 5.1.2.2.1.1.

Figure 5.1.2.2.1.1. Spring (BASS) tuning fleet index (abundance per age groups and years 2001–2014) for sprat in the ICES Subdivisions 24–28.

Whole time-series of tuning indices

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

YEAR	HER_TOTAL_age1_8	HER_AGE1	HER_AGE2	HER_AGE3	HER_AGE4	HER_AGE5	HER_AGE6	HER_AGE7	HER_AGE8+
1991	59944.22	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	45994.83	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	28396.39	709.95	4 539.70	6 809.39	7 830.70	3 619.01	2 054.43	1 089.66	1 743.56
1994	57157.97	3 924.41	11 881.25	20 303.84	11 526.53	5 653.24	2 098.90	940.75	829.04
1995	28048.83	4 663.87	2 235.90	4 464.12	5 908.26	5 286.76	3 156.91	1 503.95	829.06
1996	43944.57	3 985.13	13 761.96	9 989.35	7 360.96	4 532.76	2 358.59	1 178.87	776.94
1997	15438.37	1 447.81	1 544.65	5 182.71	3 237.17	2 156.86	1 091.15	466.71	311.32
1998	24922.96	4 285.08	2 170.72	6 617.17	6 520.67	2 584.07	1 523.58	791.27	430.41
1999	20511.86	1 754.15	4 741.92	3 193.65	4 251.46	3 679.73	1 427.81	833.20	629.96
2000	40924.36	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	24300.57	4 028.51	8 194.34	3 286.15	4 660.79	1 567.36	1 238.05	861.26	464.12
2002	20672.28	2 686.92	4 242.02	6 508.41	2 842.26	2 326.29	869.78	741.28	455.30
2003	49161.77	16 704.18	9 115.70	10 643.33	6 689.95	2 319.57	1 777.96	755.07	1 156.00
2004	34519.87	4 913.56	13 229.49	6 788.89	4 672.24	2 500.08	1 132.10	603.52	679.98
2005	41760.33	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	62514.29	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	29634.05	5 400.70	6 587.26	2 974.88	4 191.03	7 092.91	1 696.87	882.93	807.46
2008	35039.19	6 841.54	6 822.40	7 588.80	3 612.67	4 926.52	3 563.14	877.07	807.05
2009	38653.24	6 408.78	12 141.39	6 820.28	5 551.44	2 058.64	2 969.48	2 089.22	614.00
2010	37891.76	3 829.47	8 278.75	12 047.60	5 006.24	3 542.80	1 684.71	1 901.90	1 600.30
2011	44189.58	2 342.05	5 669.33	10 999.96	12 684.72	5 532.63	3 263.35	1 451.90	2 245.62
2012	51695.69	14 947.97	3 630.05	7 544.67	9 345.39	9 199.52	2 684.65	2 261.89	2 081.55
2013	46887.63	6 895.68	9 160.08	3 855.08	6 934.01	7 127.08	7 272.45	2 154.28	3 488.96
2014	59146.09	5 086.33	10 113.93	15 408.71	5 916.49	7 369.87	6 664.24	4 933.46	3 653.07

Note: The coverage of the ICES Subdivision 29N has been very inconsistent until 2007. In the years, 1993, 1995 and 1997 the total 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 the Central Baltic herring (ICES Subdivisions 25–27, 28.2 and 29, including the existing data of the ICES SD 29 North).

YEAR	HER_AGE0
1991	13 732.73
1992	1 607.67
1993	1 297.73
1994	6 122.03
1995	1 356.71
1996	336.39
1997	4 050.41
1998	507.52
1999	2 591.05
2000	1 318.96
2001	2 122.76
2002	16 046.38
2003	9 066.54
2004	1 586.72
2005	5 567.63
2006	1 990.13
2007	12 197.22
2008	8 673.16
2009	3 365.99
2010	1 177.97
2011	10 100.49
2012	11 140.63
2013	3 068.44
2014	35060.67

Note: The coverage of the ICES Subdivision 29N has been very inconsistent until 2007. In the years, 1993, 1995 and 1997 the total 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 22–29).

YEAR	SPR_TOTAL	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	213 176.57	99 128.90	32 269.59	24 035.40	23 198.49	8 015.62	13 163.37	4 830.62	8 534.58
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	88 295.36	12 048.42	51 771.79	10 275.01	6 594.51	1 880.19	1 951.11	2 591.36	1 182.97
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
2013	71 926.85	19 407.84	20 363.57	11 448.00	5 683.54	11 219.11	1 771.30	759.48	1 274.02
2014	40 768.24	10 447.80	8 623.21	9 735.00	4 695.08	2 033.89	3 778.55	681.04	773.67

Note: 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 (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	41 158.22
2011	45 186.05
2012	33 653.39
2013	24 694.37
2014	162 714.99

Note: 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 (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
2013	111 418.65	24 876.63	35 333.30	18 392.57	11 357.94	14 959.37	3 385.50	2 163.71	949.62
2014	76 549.35	10 144.65	26 906.62	19 857.10	7 457.71	6 098.20	3 810.12	1 217.38	1 057.57

Table 6. An alternative autumn acoustic (BIAS) tuning fleet index (numbers in millions) for the Central Baltic herring (the ICES Subdivisions 25–27, 28.2 and 29, the numbers for ICES SD 29 were calculated on base of the data from the ICES SD 29 South in all years. Existing data of ICES SD 29 North were not used because of the inconsistent area coverage).

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	32 982.39	5 939.88	6 593.06	7 030.74	3 637.02	4 710.72	3 434.87	852.74	783.35
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	33 822.24	2 423.36	7 159.99	11 175.51	4 849.12	3 406.92	1 633.51	1 784.94	1 388.88
2011	41 761.90	1 638.86	4 457.56	10 787.81	12 474.52	5 663.26	3 173.22	1 414.59	2 152.08
2012	44 294.08	8 625.38	3 046.09	7 175.80	9 557.44	9 202.03	2 707.97	2 109.11	1 870.26
2013	43 203.32	4 123.33	8 670.52	3 556.42	6 406.25	7 485.99	7 364.78	2 140.82	3 455.20
2014	50756.97	2245.02	7471.01	13479.66	6901.96	6402.79	5504.55	4795.06	3956.91

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

Table 7. An alternative autumn acoustic (BIAS) recruitment index (age 0; numbers in millions) for the Central Baltic herring (the ICES Subdivisions 25–27, 28.2 and 29, the numbers for ICES SD 29 were calculated on base of the data from the ICES SD 29 south in all years. Existing data of ICES SD 29 North were not used because of the inconsistent area coverage).

YEAR	HER_AGE0
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	3885.17
2009	1521.30
2010	868.82
2011	8385.04
2012	5460.90
2013	1923.00
2014	32763.35

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

Annex: ToR b) Update the BIAS and BASS acoustic databases

5.2. ToR b) Update the BIAS and BASS acoustic databases

The updated data of the Baltic Acoustic Spring Survey (BASS) are stored in the *BASS_DB.mdb* Access-database. The updated data of the Baltic International Acoustic Survey (BIAS) are stored in the *BIAS_DB.mdb* Access-database. These *Access-databases* also include queries with the used algorithms for creation of the report tables and the calculation of the different tuning fleets. The data from the year 2014, after validation, were added to both databases. The current versions of the databases are located in the folder “Data” of the WGBIFS-SharePoint.

The main results of both types of international acoustic surveys (BIAS, BASS), carried out in 2015, should be summarized in table format according the IBAS Manual and uploaded latest one month before the WGBIFS meeting of the next year to the current data folder of the ICES-SharePoint of WGBIFS 2016.

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.

Annex: ToR c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2015 and spring 2016

5.3.1. Planned acoustic survey activities

All the Baltic Sea countries intend to take part in the standard acoustic surveys and experiments in 2015 and 2016 (Figures 5.3.1.1, 5.3.1.2, 5.3.1.3). There is also an intention to conduct the Latvian-Estonian acoustic survey in the Gulf of Riga on July 2015 and 2016. The list of participating research vessels and initially planned periods of particular surveys are given in the following tables:

a) BASS surveys in 2015

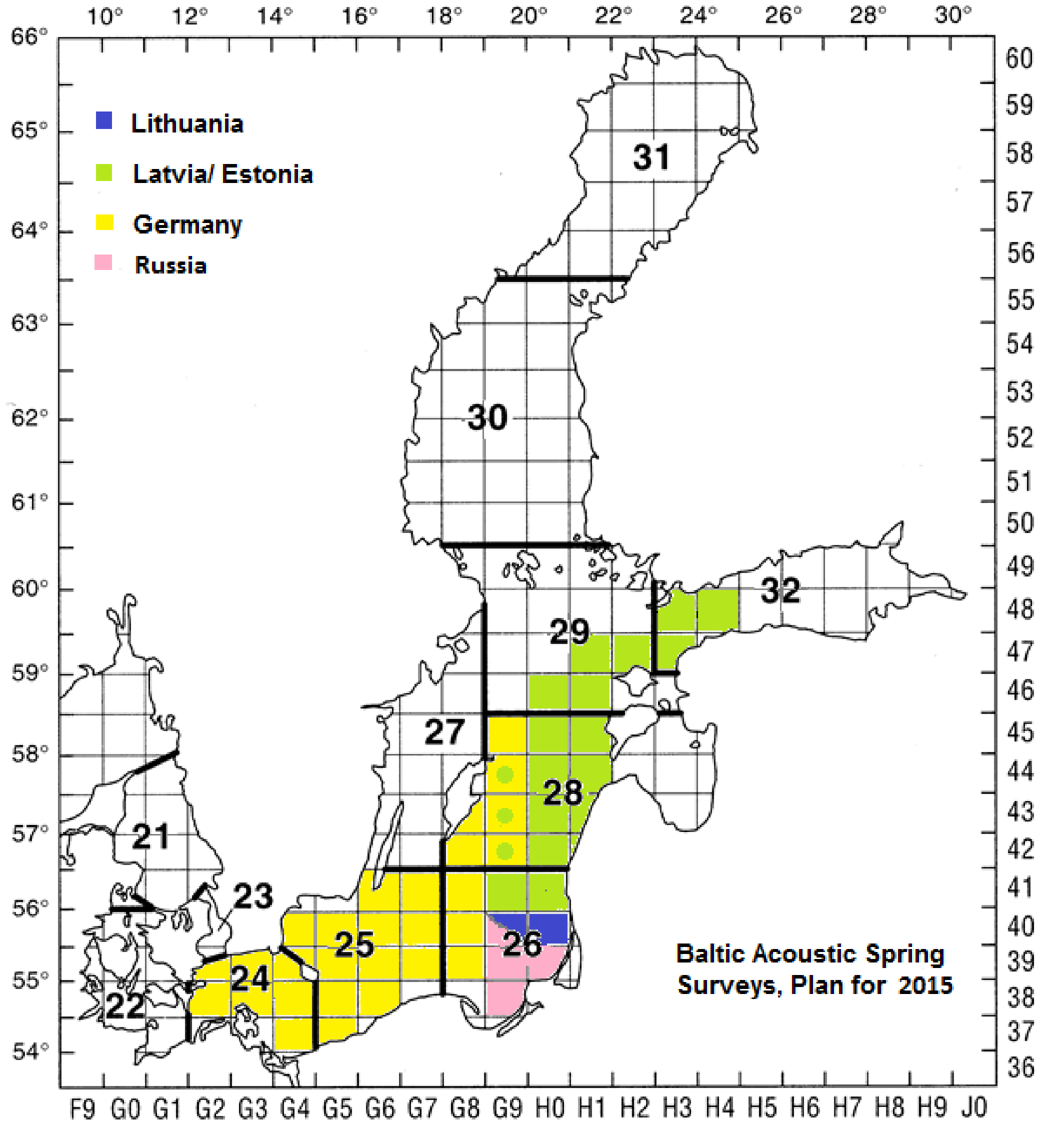
Vessel	Country	Area of Investigation (ICES Subdivisions)	(Preliminary)Period of Investigations	Duration (Days)
Walther Hervig III	Germany	24, 25, 26 (part), 28 (part)	14.5.-04.06.2015	22
Commercial, Ulrika	Latvia/Estonia	26, 28, 29, 32	11.-22.5. 2015	12
Darius	Lithuania	26 (the Lithuanian EEZ)	May 2015	2
Atlantniro, Atlantida	Russia	26 (the Russian EEZ)	9.5.-26.5.2015	18

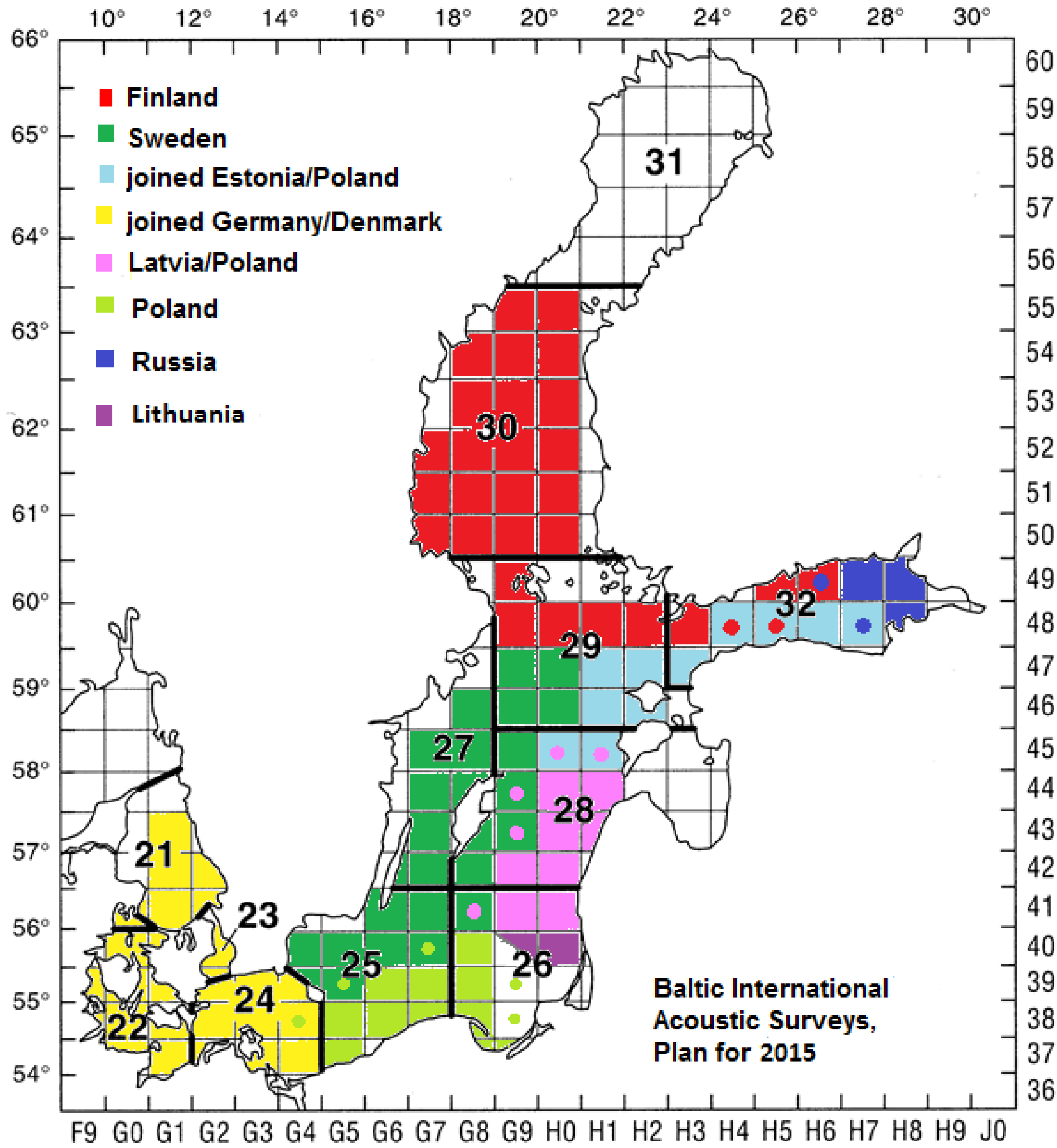
b) BIAS surveys in 2015

Vessel	Country	Area of Investigation (ICES Subdivisions)	(Preliminary)Period of Investigations	Duration (Days)
Solea	Germany	21, 22, 23, 24	01.10.- 21.10. 2015	20
Darius	Lithuania	26	October, 2015	2
Baltica	Latvia	26, 28	8-17.10. 2015	10
Baltica	Poland	24(part), 25,26	17.9-4.10.2015	18
Dana	Sweden	27,25,26,28,29	1.10-14.10.2015	14
Baltica	Estonia	28, 29, 32	18.10.-28.10.2015	11
Aranda	Finland	29N, 32N, 30	24.-30.09 & 30.09.-7.10 2015	14
Victor Klimov	Russia	32E	September-October	7-10

c) BASS surveys in 2016

Vessel	Country	Area of Investigation (ICES Subdivisions)	(Preliminary)Period of Investigations	Duration (Days)
Walther Hervig III	Germany	24, 25, 26 (part), 28 (part)	May 2016	21
Commercial, Ulrika	Latvia	26, 28	11.-19.5. 2016	9
Darius	Lithuania	26 (the Lithuanian EEZ)	May 2016	2


Lithuania
Latvia/ Estonia
Germany
Russia
Baltic Acoustic Spring Surveys, Plan for 2015
10° 12° 14° 16° 18° 20° 22° 24° 26° 28° 30°
66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54°
60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36
F9 G0 G1 G2 G3 G4 G5 G6 G7 G8 G9 H0 H1 H2 H3 H4 H5 H6 H7 H8 H9 J0
21 22 23 24 25 26 27 28 29 30 31 32


Finland
Sweden
joined Estonia/Poland
joined Germany/Denmark
Latvia/Poland
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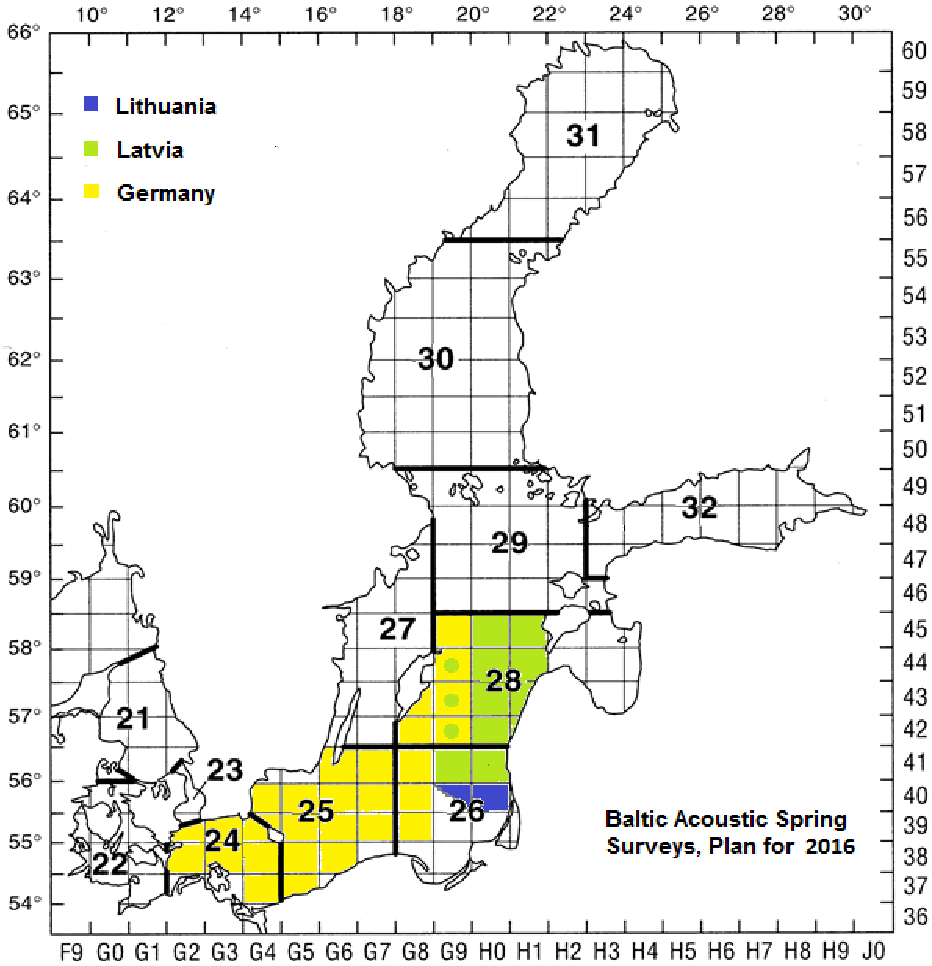
Baltic International
Acoustic Surveys,
Plan for 2015
10° 12° 14° 16° 18° 20° 22° 24° 26° 28° 30°
66° 65° 64° 63° 62° 61° 60° 59° 58° 57° 56° 55° 54°
60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36
F9 G0 G1 G2 G3 G4 G5 G6 G7 G8 G9 H0 H1 H2 H3 H4 H5 H6 H7 H8 H9 J0



Figures 5.3.1.1–5.3.1.3. The planned coverage of the Baltic Sea and the assignment of the national/joint acoustic surveys to the ICES-rectangles during the May 2015, September-October 2015 and May 2016 surveys (from top to bottom). Base colours of the ICES-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 the ICES-rectangle are covered).

5.3.2. Delivering of the acoustic data from BIAS and BASS surveys

It was agreed during the WGBIFS/2015 meeting, that the file BIAS_Haul-sA_example_2013_DB_v.1.2 should be used and that all countries should send as many years as possible between 2010–2014 to niklas.larson@slu.se, starting with the year 2014 and working back through those years. The file can be found on the WGBIFS SharePoint under the folder Data. These data can in future be the base for a database and it was agreed that these data can be used for the interests of the WGBIFS, but it was agreed that the data deliverers should be contacted before any further work is made on these data other than the survey sampling variance calculations and the work presented in the chapter 5.8 ToR h). At the WGBIFS meeting 2013, some work on Large Fish Indices (LFI) was presented and this newly delivered data could be used to extend and improve the LFI (see helcom.fi). The WGBIFS members have discussed also the "List of missing data for the period 2009–2012" and following problems in data were recognized:

Length data

Length of herring and sprat are measured in 0.5-cm classes below in most cases, but the length is reported as 5.5 cm or as 5.75 cm (addition of halve length interval). The second length value is required. In addition, length was measured in mm in some cases, but it is not identified in the submitted data. Please submit the data in the required format or give clear explanation what is different in relation to the standard structure.

S_A(k) values of fishing stations should be given based on the average of 0.1 nm values sampled during the fishing station. If this procedure is not possible estimates of S_A(k) based on 1 nm should be provided. The applied method should be reported as short comment.

Mean S_A value of analysed ICES Subdivision is required for the analyses based on the new method. These values must be estimated based on the number of realized acoustic measurements and the mean S_A values of countries, which covered the ICES Sub-div. Therefore, the data are requested in the sheet "Info". Data of BIAS were not provided by Poland for the 2009 and 2010, Lithuania in 2009 and by Russia in 2010 and 2011.

It was agreed that the missing data of fishing stations and acoustic values could be submitted in the format provided for data submission of the period 2009 to 2012 or in the new defined format for exchange of data of acoustic surveys.

WGBIFS agreed that the data of BIAS and BASS between 2001 and 2008 and 2014 would be submitted to Rainer Oeberst until 1 July 2015. Data of acoustic measurements and of fishing-stations will be submitted in the agreed new exchange format of acoustic data (BIAS_HA.sA example_2013_DB_v.1.2.xlsx).

Annex: ToR d) Discuss the results from BITS surveys performed in autumn 2014 and spring 2015

5.4.1 BITS 4th quarter 2014

During the BITS surveys in the quarter 4th - 2014, the level of realized valid hauls represented 100% (on average) of the planned catch-stations (Table 5.4.1.1). This level of valid hauls was considered by WGBIFS as appropriate to tuning series and is recommended for the assessment of Baltic cod and flatfish stocks.

In the ICES Subdivision 27, the coverage with control-hauls was significantly lower than was planned due to denying of the Swedish military of the chartered research vessel into to certain Swedish military areas. Similar problems were experienced in the ICES Subdivision 28. Few replacements hauls were possible in the given strata.

The coverage by depth stratum (depth stratum, coverage) was as follow: (1, 96), (2, 97), (3, 87), (4, 102), (5, 71), (6, 138). The low coverage at the depth stratum 5 and high coverage at the depth stratum 6 was impacted by incorrect depth information in the Tow-Database. This has now been corrected. The general coverage with catch-stations was on the same level as in the previous years. Russia did not participate in the survey.

Table 5.4.1.1 Comparison of the planned and realized fishing-stations by the ICES Subdivisions and depth layers during BITS 4th quarter 2014.

ICES Subdivisions	Gear (TVL,TVS)	Depth strata (1–6)	Number of hauls planed	Number of valid hauls realized using the 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 (not including invalid hauls)
21	TVS	All	24	24	0	0	0	0	100
21	TVS	1	8	8	0	0	0	0	100
21	TVS	2	10	10	0	0	0	0	100
21	TVS	3	4	4	0	0	0	0	100
21	TVS	4	2	2	0	0	0	0	100
22	TVS	All	26	25	0	0	0	0	96
22	TVS	1	11	11	0	0	0	0	100
22	TVS	2	14	13	0	0	0	0	93
22	TVS	3	1	1	0	0	0	0	100
23	TVS	All	3	3	0	0	0	0	100
23	TVS	1	2	2	0	0	0	0	100
23	TVS	2	1	1	0	0	0	0	100
24	TVS	All	51	49	0	0	0	0	96
24	TVS	1	24	22	0	0	0	0	92
24	TVS	2	27	27	0	0	0	0	100
25	TVL	All	73	68	0	0	7	2	93
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	13	12	0	0	2	0	92
25	TVL	3	23	20	0	0	2	1	87
25	TVL	4	25	26	0	0	2	0	104
25	TVL	5	10	7	0	0	0	0	70
25	TVL	6	0	1	0	0	1	1	
26	TV3S/TV3L	All	38	28	2	6	3	1	95
26	TV3S/TV3L	1	1	1	0	0	0	0	100
26	TV3S/TV3L	2	5	6	0	0	1	0	120
26	TV3S/TV3L	3	9	7	0	1	1	0	89

ICES Subdivisions	Gear (TVL,TVS)	Depth strata (1–6)	Number of hauls planed	Number of valid hauls realized using the 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 (not including invalid hauls)
26	TVL	4	8	5	2	0	1	1	88
26	TVL	5	10	4	0	3	0	0	70
26	TVL	6	6	5	0	2	0	0	120
27	TVL	All	10	3	0	4	2	0	70
27	TVL	3	2	0	0	0	0	0	0
27	TVL	4	4	3	0	1	2	0	100
27	TVL	5	1	0	0	1	0	0	100
27	TVL	6	3	0	0	2	0	0	67
28	TV3S/TV3L	All	28	8	14	4	2	2	93
28	TVL	2	3	0	2	0	0	0	67
28	TV3S/TV3L	3	9	4	4	0	1	0	89
28	TV3S/TV3L	4	9	4	5	1	1	1	111
28	TV3S/TV3L	5	7	0	2	3	0	1	71
28	TVL	6	0	0	1	0	0	0	
29	TVS	All	5	5	0	0	0	0	100
29	TVS	2	1	1	0	0	0	0	100
29	TVS	3	3	3	0	0	0	0	100
29	TVS	4	1	1	0	0	0	0	100
All SD		**All**	**258**	**213**	**16**	**14**	**14**	**5**	**94**

5.4.2 BITS 1st quarter 2015

In general, the BITS-1q/2015 survey coverage (number of catch-stations) was near to the planned effort (Table 5.4.2.1). Only in the ICES Subdivision 27, the number of control-hauls carried out was significant lower than the number of hauls planned, because of the same reason as explained above under 4th quarter 2014 survey. The coverage with catch-stations by depth stratum (depth stratum, coverage) was as follow: (1,100), (2, 98), (3,93), (4,96), (5, 113), (6, 90). The deeper strata (5 and 6) have significant higher and lower coverage, respectively and are coursed by the Swedish fishing access in the Swedish military areas and incorrect depth information in the Tow-Database. This new depth information is reported in the feedback.

Table 5.4.2.1. Comparison of the planned and realized fishing stations by the ICES Subdivisions and depth layers during BITS 1st quarter 2015.

ICES Subdivisions	Gear (TVL,TVS)	Depth strata (1–6)	Number of hauls planed	Number of valid hauls realized using the 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 (not including invalid hauls)
21	TVS	All	24	24	0	0	0	0	100,0
21	TVS	1	7	7	0	0	0	0	100,0
21	TVS	2	10	10	0	0	0	0	100,0
21	TVS	3	7	7	0	0	0	0	100,0
22	TVS	All	29	28	0	0	0	0	96,6
22	TVS	1	17	17	0	0	0	0	100,0
22	TVS	2	12	11	0	0	0	0	91,7
23	TVS	All	3	3	0	0	0	0	100,0
23	TVS	1	1	1	0	0	0	0	100,0
23	TVS	2	2	2	0	0	0	0	100,0
24	TVS	All	50	50	0	0	0	0	100,0
24	TVS	1	22	22	0	0	0	0	100,0
24	TVS	2	28	28	0	0	0	0	100,0
25	TVL	All	93	92	0	1	8	2	100,0
25	TVL	1	2	2	0	0	0	0	100,0
25	TVL	2	16	16	0	0	0	0	100,0
25	TVL	3	31	32	0	0	4	0	103,2
25	TVL	4	34	27	0	1	3	2	82,4
25	TVL	5	10	14	0	0	1	0	140,0
25	TVL	6	0	1	0	0	0	0	
26	TV3S/TV3L	All	48	38	13	2	0	0	110,4
26	TVS	1	2	2	0	0	0	0	100,0
26	TV3S/TV3L	2	8	8	0	0	0	0	100,0
26	TV3S/TV3L	3	9	7	0	0	0	0	77,8
26	TVL	4	12	7	11	1	0	0	158,3
26	TVL	5	10	9	1	0	0	0	100,0
26	TVL	6	7	5	1	1	0	0	100,0
27	TVL	All	10	2	0	4	2	0	60,0
27	TVL	3	2	0	0	0	0	0	0,0
27	TVL	4	4	2	0	2	1	0	100,0
27	TVL	5	1	0	0	1	0	0	100,0
27	TVL	6	3	0	0	1	1	0	33,3
28	TVL	All	29	8	16	5	4	0	100,0
28	TVL	2	4	0	3	0	1	0	75,0
28	TVL	3	8	4	3	0	1	0	87,5
28	TVL	4	9	4	7	0	1	0	122,2
28	TVL	5	8	0	3	5	1	0	100,0
All SD		**All**	**286**	**245**	**29**	**12**	**14**	**2**	**100,0**

5.4.3 Standard fishing-gear checking

The WGBIFS decided on implementation as a standard procedure to perform at least once a year a full and thorough measurements of technical parameters (the geometry, mesh sizes, rope lengths of the trawl, etc.) of exploited demersal trawls type TV-3L and TV-3S to be conducted by each country involved in the BITS surveys realization. In addition, prior to each BITS survey, a short measurement of the trawl should also be made. All the measurements should follow the Manual of the construction and use of the International Standard Trawl for the Baltic Demersal Surveys. It is recommended to perform the TV-3L and TV-3S trawl technical parameters measurement by professional experts in fishing gear technology or experienced crewmembers. Each country measurement results should be made available to the WGBIFS using the standard protocols. One example from the standard bottom fishing gear-checking form is given below.

Table 5.4.3.1. Results of the Polish (RV "Baltica") bottom, standard fishing gear-checking exercise.

Type of fishing gear	TV-3#930
Nation	Poland
Date of measurements	16.03.2015
Name of operators	R. Zaporowski, I. Wybierała, K. Radtke
Number of realized hauls	over 400, permanently used
Comments concerning the use	

Manual TV-3#930 page 11 Parameter	Measured distance [m]	Mesh size [mm]
Section 1 - 1B1	21,80	213*
Section 1 - 1A1	22,00	210*
Section 1 - 1A2	22,00	208*
Section 1 - 1B2	21,80	210*
Section 1 – 1C1	22,60	106
Section 1 – 1C2	22,60	106
Section 2 – 2B1	2,98**	143
Section 2 - 2A	3,00	145
Section 2 – 2B2	2,96**	142
Section 2 – 2C1	2,88	112
Section 2 – 2C2	2,86	110
Section 3 – 3B1	2,65**	112
Section 3 – 3A	2,90	108
Section 3 – 3B2	2,95**	109
Section 3 – 3C	2,88	110
Section 4 – 4B1	7,86**	74
Section 4 – 4A	7,90	74
Section 4 – 4B2	7,95**	75
Section 4 – 4C	8,05	78
Section 5 – 5B1	5,75**	54
Section 5 – 5A	5,70	53
Section 5 – 5B2	5,80**	56

Manual TV-3#930 page 11 Parameter	Measured distance [m]	Mesh size [mm]
Section 5 – 5C	5,85	55
Section 6 – 6B1	12,00	38
Section 6 – 6A	12,20	39
Section 6 – 6B2	12,10	38
Section 6 – 6C	12,05	37
Section 7		
Section 8		

Notes: * - mesh opening measured with a ruler, others measured with use of the ICES gauge, ** - measured along selvedges.

Manual TV-3#930 page 13 Parameter	Measured distance [m]
Head line extension Port.	4,10
Head line wing section Port.	28,90
Head line bossom section	2,25
Head line wing section Stbd.	28,70
Head line extension Stbd.	3,50
Fishing line extension Port.	0,90
Fishing line wing section Port.	31,00
Fishing line bossom section	1,20
Fishing line wing section Stbd.	30,90
Fishing line extension Stbd.	0,90
Lower wing line Port.	2,30
Lower wing line Stbd.	2,45
Upper wing line Port.	2,70
Upper wing line Stbd.	2,65

Manual TV3#930 page 8/12 Parameter	Port - Gdynia	Stbd
Backstrop		
Sweep		
Chain sweep		
Lower bridle		
Lower extension		
Chain for adjustment of upper bridle		
Upper bridle		
Headline extension		
Floats		
Chain for adjustment of footrope		

The cod bottom (ground) trawl type TV-3#930:

- **bridles with the top and centre combirope diameter of 18 mm, and the bottom wire with the length of 27,5 m and diameter of 16 mm and with the 50 mm diameter rubber discs,**
- **sweeps combirope with the length of 75 m and diameter of 40 mm,**
- **trawl lines with the maximum length of 520 m and the diameter of 18 mm.**

Annex: ToR e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2015 and spring 2016, and update and correct the Tow-Database and DATRAS

5.5.1. Plan and decide on demersal trawl surveys and experiments

The procedure used for allocating catch-stations to the ICES Subdivisions and depth layers is described in the Annex 3 "Method used for planning the Baltic International Trawl Survey" of the WGBIFS Report in 2004. The DATRAS Database (version from March 2015) 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 2010–2014 was used based on the current applied version of conversion factors, which are stored in the DATRAS system.

The method for allocating catch-stations to ICES SDs was slightly adapted according to the new definition of the stock structure of cod in the Baltic Sea during WKBALTCOD in March 2015. Analyses based on otolith shape, genetics and the distance between the center of the otolith and the outer edge of the first hyaline zone clearly indicated that large part (between 30 and 60%) of cod captured in the ICES SD 24 are eastern Baltic cod. New stock structure was defined based on the analyses as preliminary approach. Cod captured in the ICES SDs 22 and 23, and westwards of the meridian 13°E were assigned to western Baltic cod. WKBALTCOD also proposed increased survey coverage in the southern part of the Small Belt area and in the southern part of Øresund (the Belt) to improve the quality of the new stock index based on BITS.

This new cod stock structure does not correspond to the method used for allocating planned fishing stations of BITS to the ICES SDs 22 and 24. Area of the ICES SD 24 is ~ 1.5 times larger than the area of the ICES SD 22. In addition, the 5 years running mean cpue values of the ICES SD 24 is about 3-times higher than the corresponding value of the ICES SD 22. Consequently, increase of the number of planned catch-stations for the ICES SDs 22 – 24 have only small effect concerning the increase of planned stations for the ICES SD 22 if the standard approach for allocating catch-stations is used.

It was agreed that a constant number of fishing stations is planned for the ICES SD 24 with 50 hauls. All additionally planned stations by RV "Solea" and RV "Havfisken" will be realized in the ICES SD 22 to improve the coverage of this subdivision. The agreed new rule for allocating catch-stations to the ICES SDs 22 and 24 were applied for quarter 4th in 2015 at the first time.

Two additional hauls will be carried out in the southern part of the Sound (Øresund) in order to improve the survey coverage in the subdivision.

The most of the participating institutes plan the same numbers of control-hauls during BITS surveys in autumn 2015 and spring 2016 as in the year before. Additional stations were planned for RV "Havfisken" and RV "Solea" to improve the coverage of the ICES SD 22.

Small variations did not lead to a significantly changed of the total number of stations by BITS surveys. The stable total number of catch-stations of the quarters 1st and 4th surveys gives the opportunity that most countries can realize the planned fishing stations within the own EEZ. However, it must be pointed out that all countries should be able to work also in EEZs of other countries to fulfil the requirements of the international coordinated surveys.

The total number of available control-stations (Table 5.5.1.1) was used in the combination with the results of relative distribution of stations by the ICES Subdivision and depth layer (Tables 5.5.1.2 and 5.5.1.3) to allocate the number of total planned stations by the ICES Subdivision and depth layer for the different surveys. Allocated ground trawl hauls by the ICES Subdivision and the depth layer for autumn survey in 2015 are presented in Tables 5.5.1.4 and 5.5.1.5. Furthermore, the number of fish control-hauls to be carried out by countries in the different ICES Subdivisions is given. Tables 5.5.1.6 and 5.5.1.7 show the data corresponding for the survey in spring 2016.

Table 5.5.1.1. Total numbers of catch-stations planned by particular countries during BITS in autumn 2015 and spring 2016.

		Number of planned stations in autumn	Number of planned stations in spring
Country	Vessel	2015	2016
Germany	Solea	60	60
Denmark	Havfisken	27	27
	Total 22 + 24	**87**	**87**
Denmark	Dana	50	50
Estonia	Commercial vessel	5	0
Finland	Aranda	0	0
Latvia	Chartered vessel	25	25
Lithuania	Darius	6	6
Poland	Baltica	33	49
Russia	Atlantniro/Atlantida	0	0
Sweden	Dana	30	50
	Total 25 - 28	**149**	**180**

The planned fishing-stations by country and the ICES Subdivision can be considered as not fixed. It is possible that the number of control-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 for inspection.

Estonia is participating at the 4th quarter BITS survey, performing five control-hauls in the Estonian EEZ of the ICES SD 28–2 and additionally five hauls in the ICES SD 29 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 exclusively in the Estonian EEZ of the ICES SD 28–2.

WGBIFS notes that Russia did not to participate in the BITS survey in last years. Since other ICES Member Countries will not be able to get permission to work in the EEZ of Russia, the negative effect on the quality of the survey results based on BITS survey would be eminent.

According to the recommendations of WGBIFS-2011, all countries should upload to DATRAS information related to all fished species.

New research vessels will be introduced in BITS

The Danish research vessel Havfisken has been in service for approximately 50 years and is about to be succeeded by a new build vessel on the beginning of 2016. The new vessel will be equipped in order to comply fully with the requirements specified in the BITS Manual. In order to maintain the BITS cpue time-series, a number of calibration hauls will be carried out between Havfisken (old) and Havfisken (new). The exercise will carried out in due time to establish the conversion factors before the Havfisken (old) is taken out of service.

Table 5.5.1.2. Basic data for allocating control-hauls for BITS 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+ (2010-2014)	Proportion of the index values (weight=0.4)	Proportion of the stations country	Special decisions (additional stations)
	[NM²]	**[%]**		**[%]**	**[%]**	
22	3673	39	188.7	25.0	33.6	
23	0	0	0	0	0	3
24	5724	61	552.1	75.0	66.4	
Total	**9397**	**100**	704.3	**100**	**100**	
25	13762	43	1428.3.6	64.4	51.4	
26	9879	31	753.2	33.9	32.0	
27	0	0	0	0	0	10
28	8516	26	27.1	1.7	16.6	
Total	**32157**	**100**	**2219**	**100**	**100**	

Table 5.5.1.3. Basic data for allocating hauls according to the 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+ (2010-2014)	Proportion of the depth layer (weight=0.4)	Proportion of the depth layer
	[m]	[nm²]	[%]		[%]	[%]
24	10 - 39	4174	73	83.0	4.2	45.2
	40 – 59	1550	27	343.9	17.4.6	23.1
	60 – 79	29	1	1548.8	78.4	31.6
	Total	**5753**	**100**	**1972.7**	**100**	**100**
25	10 - 39	4532	37	201.8	3.6	23.6
	40 - 59	3254	26	2115.1	37.4	30.9
	60 - 79	3037	25	2223.3	39.3	30.6
	80 – 99	1461	12	1112.4	19.7	15.0
	Total	**12284**	**100**	**5652.2**	**100**	**100**
26	10 - 39	2379	23	81.8	2.4	15.0
	40 - 59	1519	15	641.7	18.6	16.4

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+ (2010-2014)	Proportion of the depth layer (weight=0.4)	Proportion of the depth layer
	60 - 79	1911	19	1328.5	38.5	26.6
	80 - 100	2872	28	1174.1	34.0	30.5
	100 - 120	1504	15	228.7	6.6	11.5
	Total	**10185**	**100**	**3454.8**	**100**	**100**
27	10 - 39	1642	31	0	0	18.5
	40 - 59	1101	21	14.6	4.9	14.3
	60 - 79	996	19	182.3	61.0	35.6
	80 - 99	1596	30	102.0	34.1	31.6
	Total	**5335**	**100**	**298.9**	**100**	**100**
28	10 - 39	2589	38.8	2.2	1.3	23.8
	40 - 59	1598	23.9	29.0	17.2	21
	60 - 79	1101	16.5	74.7	44.2	2
	80 - 100	1389	20.8	63.1	37.3	27.4
	Total	**6677**	**100**	**169**	**100**	**100**

Table 5.5.1.4. Allocation of planned catch-stations by country and the ICES Subdivision in autumn 2015.

Country	Total	22	23	24	25	26	27	28
Denmark	77	24	3		39	11		
Estonia	5							5
Finland	0							
Germany	60	10		50				
Latvia	25					11		14
Lithuania	6					6		
Poland	33				21	12		
Russia	0							
Sweden	30				10	6	10	4
Total	**236**	**34**	**3**	**50**	**70**	**46**	**10**	**23**

Table 5.5.1.5. Allocation of planned fishing stations by ICES Subdivision and depth layer in autumn 2015.

ICES Subdivision	22	23	24	25	26	27	28
Depth layer [m]							
10 – 39	34	3	23	17	7	3	5
40 – 59			12	21	7	2	5
60 – 79			15	21	12	2	7
80 – 100				11	15	3	6
100 – 120					5		
Total	**34**	**3**	**50**	**70**	**46**	**10**	**23**

Table 5.5.1.6. Allocation of planned fishing stations by country and ICES Subdivision in spring 2016.

ICES Subdivision								
Country	Total	22	23	24	25	26	27	28
Denmark	77	24	3		39	11		
Estonia	0							
Finland	0							
Germany	60	10		50				
Latvia	25					11		14
Lithuania	6					6		
Poland	49				31	18		
Russia	0				0	0		
Sweden	50				17	9	10	14
Total	**267**	**34**	**3**	**50**	**87**	**55**	**10**	**28**

Table 5.5.1.7. Allocation of planned catch-stations by ICES Subdivision and depth layer in spring 2016.

ICES Subdivision	22	23	24	25	26	27	28
Depth layer [m]							
10 – 39	34	3	23	21	8	3	7
40 – 59			12	26	9	2	6
60 – 79			15	27	15	2	7
80 – 100				13	17	3	8
100 – 120					6		
Total	**34**	**3**	**50**	**87**	**55**	**10**	**28**

5.5.2. Update and correct the Tow-Database

5.5.2.1. Reworking of the Tow-Database

Feedbacks of the recent BITS surveys (Nov. 2014, Feb.-March 2015) were used to update the Tow Database and have demonstrated that the structure of the TD is suitable for the routine use. Changes of the TD structure were not proposed. The current used structure of the TD was described in the WGBIFS 2005 Report and in the BITS Manual. Some catch-stations were deleted (appearance of 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 control-hauls were provided by the most countries in the Baltic 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 2015 was not available before the WGBIFS meeting started. The missing feedback will be used immediately after submission by the countries. Then the version TD_2015V1.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 structure of required feedback is demonstrated in Table 8.1.1 from the WGBIFS-2014 Report.

5.5.2.2 Feedback of the BITS

The following information of all realized catch-stations of BITS should be submitted to Germany:

- New version of haul number for the Tow-Database
- ICES Subdivision
- Start position (latitude, longitude) of fishing operation
- Mean seabed depth
- Bottom depth range
- Code of the haul
- Reason for deleting the planned 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 appearance, …. Data of the Tow-Database must not be changed in these cases.
b	1	The position is suitable, and trawling 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 right, and position must be corrected (reason). This code must be used when the fishing position must be permanent changed because of reasons which will not be changed in future.
b	3	The required depth is not stable, new fishing position is proposed with flat bottom.
c		The fishing position is not suitable and it should be deleted (reason) from TD
d		New haul proposed for the Tow-Database

It was agreed that:

- The feedback of realized BITS surveys should be submitted to Rainer Oeberst (rainer.oeberst@ti.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 hauls position should be submitted to Rainer Oeberst (rainer.oeberst@ti.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 BITS surveys to allocate new haul positions in the "white areas".

5.5.2.3 Reworking of the Database of Trawl Surveys (DATRAS)

During the WG meeting was also discussed the issue – "Fish species code in DATRAS" and the group agreed that in BITS/DATRAS only SpecCodeVal 0, 1 and 4 are accepted according to the Manual and SpecCodeVal of BITS is defined by:

0 = Invalid information,

1 = Valid information,

4 = No length measurements, only total number per hour in the control-catch.

The changes of the screening of SpecCodeVal will probably not relevant and the check will not produce additional error messages. Therefore, WGBIFS accepted the new version of screening procedure for BITS to unify the data check.

The WoRMS Aphia codes are used for the data submission however, recently 47 species Aphia codes that are in DATRAS database is changed. DATRAS download page shows invalid species code upon download process.

V. Soni (ICES Secretariat, Data-Center) in the presentation "DATRAS status and overview" (the Annex 10) had informed members about the following suggested improvements to DATRAS:

- establishment of a data submitters contact list (1 person per country and per survey),
- easier data submission process and improved documentation,
- publication of fixed parameters involved in products' calculation,
- ongoing documentation of changes and updates,
- improved visualization of DATRAS data on ICES GeoPortal,
- links on DATRAS webpage to tutorials and packages using DATRAS data,
- development of products for BITS surveys,
- publication of intermediate calculations for existing products,
- development of new products for single-stock and ecosystem assessment.

Moreover, the DATRAS users have been informed about possibilities to adopt new fields in the database structure, e.g.:

HH: CodendMesh

HL: LenMeasType (IBTSWG wish from 2010)

CA: FishID

CA: genetic sampling flag

CA: stomach sampling flag

CA: parasite sampling flag

CA: AgeSource

CA: AgePrepMet

CA: OtGrading.

Annex: ToR f) Review and update the Baltic International Trawl Survey (BITS) Manual according to SISP standards

The Manual for the Baltic International Trawl Surveys (BITS) from the WGBIFS-2015 meeting was partly reviewed and some technical aspects regarding the format, new standard data submission and necessary changes to improve this one, according to SSGESST (SCICOM Steering Group on Ecosystem Surveys, Science and Technology) working group and the Series of ICES Survey Protocols (SISP) suggestions were discussed. The new standard data, which should be regularly collecting and reporting, starting from autumn 2015 the BITS survey, are mentioned below. Moreover, fish species code in DATRAS was also discussed and revised information as well as the proposals how to improve structure of this database are presented in Ch. 5.5.2.3 and in the Annex ToR e) and the Annex 10. The WGBIFS members supported the main objectives of the BITS survey, i.e. the spatial distribution and abundance of cod, flounder, sprat and herring recruiting year-classes, and other less numerous fish species. Detailed description was inserted to the previous year WGBIFS Report and BITS Manual.

5.6.1 Stomach (cod) sampling Manual

The WGBIFS recommends to all countries participating in the BITS surveys collecting Baltic cod stomachs for food spectrum and feeding intensity analyses, accordingly to the format agreed during the WGBIFS-2015 meeting and described in the BITS Manual-2015 (Addendum 1; see also Ch. 5.9 ToR i). The fish sampled for stomachs analyses must be selected with care to obtain reliable data. The material collected at sea should originate from feeding fish showing no evidence of regurgitation and from non-feeding fish. A wide geographical coverage of samples should be obtained whenever possible. The state of cod gall bladder should be also recorded using the scale described in the BITS Manual-2015 (Addendum 1 - Table 2 in Ch. 5.1). WGBIFS recommends the exchange format directly linked with fish stomachs sampling and presented in Table 3 (the BITS Manual-2015; Addendum 1 - Ch. 5.1). Stomachs should be selected randomly within each length group. To assure random selection within size classes, and as additional single-fish data are needed anyways, it is recommended to use fish selected for single-fish data, otoliths and maturity sampling whenever possible. Detailed methodological description of cod stomach sampling and reporting can be finding in Addendum 1 – BITS Manual, Ch. 5.

5.6.2 The marine litter collecting and reporting from BITS surveys

The report from findings of marine litter should be prepared in a standard database, used also in the IBTS surveys (see Ch. 5.2 in BITS Manual – 2015 (Addendum 1). Data submitters will transfer data using the DATRAS Trawl litter format, described in the suitable manual, downloaded at: http://www.ices.dk/marine-data/data-portals/Pages/DATRAS-Docs.aspx. The information about marine litters (as one of the environment descriptors – see the Report MEDPOL/Black Sea/JRC/ICES Workshop on Marine Litters; WKMAL/2011), in relation to the Marine Strategy Framework Directive, is suggested to be noticed by the cruise leader during BITS surveys.

5.6.3 The interpretation of Baltic fish gonads maturity

Currently verified the tables for basic fish maturity keys per species are uploaded to the Annex 7 in Addendum 1. Previously the discrepancy was occurred in the interpretation of fish gonads development on stage II – resting. Currently such overlapping in interpretation of fish gonads in stage II as virgin or resting after spawning not exists (see also Ch. 7.1.1).

Annex: ToR g) Review and update the International Baltic Acoustic Surveys (IBAS) Manual according to SISP standards

The ICES SCICOM Steering Group on Ecosystem Surveys, Science and Technology (SSGESST) carefully reviewed the IBAS manual before the meeting of WGBIFS 2014. The review of the SSGESST contained a lot of very useful suggestions and corrections, and almost all of those were corrected as recommended during the WGBIFS 2014 meeting. However, there were some few suggestions that were not implemented during the last update of the manual. One of these was the suggestion to indicate in the manual how the statistical subareas during the surveys are allocated of among the participating countries. Therefore, a general assignment scheme of the ICES statistical rectangles to the countries in the Baltic Sea has been added to the IBAS Manual (Figure 2.1.2 in Addendum 2). Also the chapter 2.1 (Area of observation) was updated accordingly. The new text suggests that this allocation scheme should be used for the planning of the BIAS surveys. As there are only few countries participating in Baltic Acoustic Spring Surveys, partition of the ICES-rectangles within the planned survey area among the participating countries is agreed during the preceding WGBIFS meeting. Additionally, text in the chapter 3.4 (Calibration) was updated. It suggests that if calibration is performed in the site with different hydrological conditions as prevailing in the survey area, the transducer gain needs to be recalculated and edited in EK-60 transducer settings as described in Bodholt (2002). Moreover, if calibration is impossible near the survey area, the gain needs to be recalculated and edited in the EK-60 Simrad scientific echosounder. The list of references was updated accordingly. Finally, a short text was added to the chapter 3.5 (Intercalibration). It recommends intercalibration procedure even then, when more than one ship is engaged in the same area in following years. The name of the manual was renewed in WGBIFS-2014 meeting due to new denomination of ICES survey manuals. Thus, the new name of the manual is “SISP Manual of International Baltic Acoustic Surveys”. The manual covers both Baltic Acoustic Spring Survey (SPRASS/BASS) and Baltic International Acoustic Survey (BIAS) those are carried out yearly in Baltic Sea. As was already mentioned within the period until to the next WG meeting, a small group of WGBIFS members intends to perform detailed verification of the SISP Manual of IBAS (version from 2015). During the reported WGBIFS meeting - O. Kaljuste presented the list of necessary changes in text of manual, accordingly to suggestions made by reviewers (see presentation entitled “Reviewed the text for SISP protocols - Manuals of research surveys” in the Annex 10).

Annex: ToR h) Discuss the indices of acoustic surveys based on different methods of evaluation

5.8.1. Evaluate the new information how to estimate the acoustic survey sampling variance

To be able to present survey sampling variance it was decided that the bootstrap method should be used and presented at the ICES Subdivision level. The resampling technique will be done on the control-haul and the NASC data. Because not all requested data has been delivered, an initial bootstrap has been made on the ICES SD 27 (Figures 5.8.1.1–5.8.1.3).

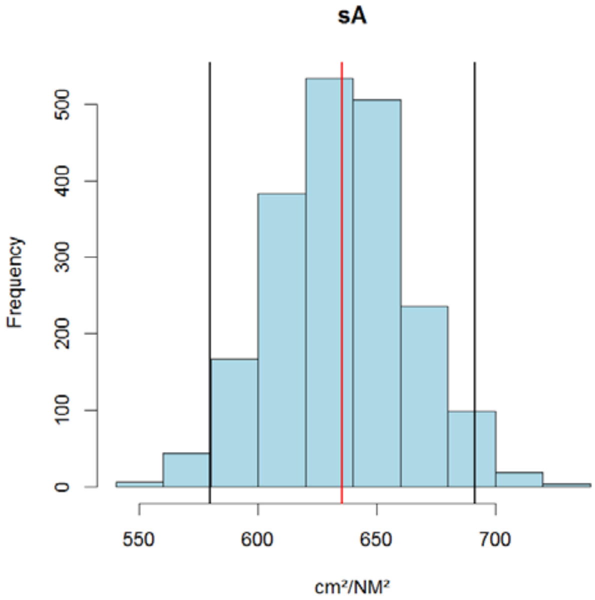


Figure 5.8.1.1. Bootstrap of average S_A for the ICES SD 27.

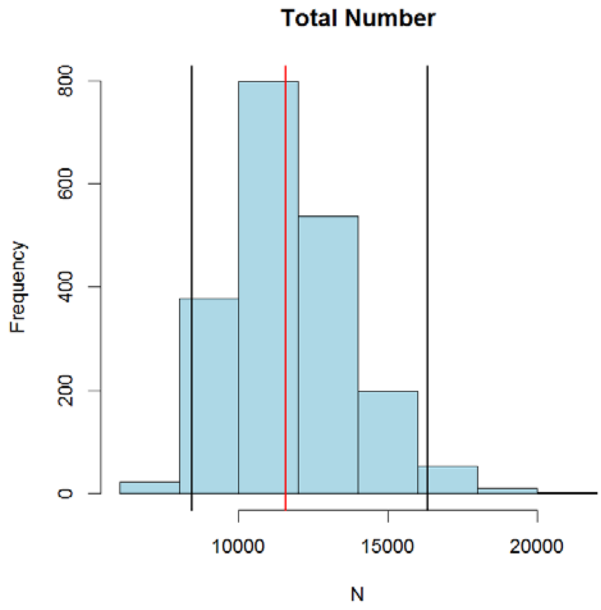


Figure. 5.8.1.2. Bootstrap of fish total numbers for the ICES SD 27.

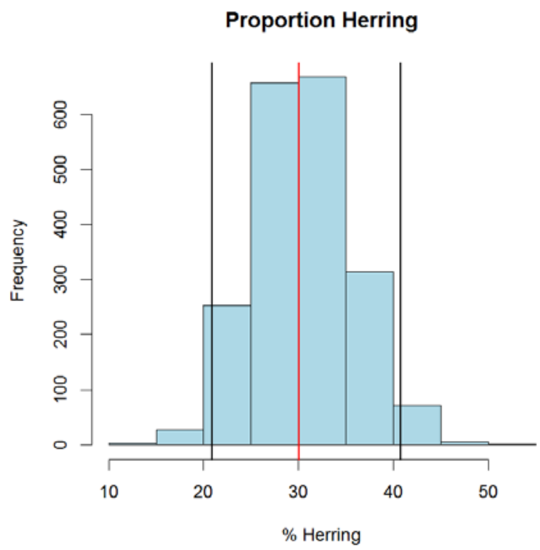


Figure 5.8.1.3. Bootstrap of percentage of herring for the ICES SD 27.

5.8.2. Evaluate the proportion of WBSSH and CBH in the ICES SDs 22–26 during BIAS surveys

Age–length data of herring sampled during BIAS surveys (2009–2012) was used to classify individuals to one of the both Baltic herring stocks - Western Baltic Spring Spawning Herring (WBSSH) and Central Baltic Herring (CBH) by means of the separation function presented in Gröhsler *et al*. (2013) and to estimate the proportion of WBSSH by age groups, ICES SDs and year. Analyses of the age–length data sampled during the German BIAS and BASS in 2014, did not indicate change of the growth of WBSSH and CBH (Oeberst 2015; all citations are listed there – see the Annex 9). Herring fished in the ICES SDs 22 and 23 were mainly classified to WBSSH (Oeberst 2015). In contrast to this proportion of WBSSH decreased with increasing age in the ICES SD 24 (Table 5.8.2.1). The low density of older herring in the ICES SD 24 can explain this effect, because WBSSH mainly inhabit the ICES SDs 21 and 23 during BIAS. More than 50% of age groups 1 and 2 (2011 and 2012), which were captured in the ICES SD 25 were classified as WBSSH (Table 5.8.2.2). The proportions of WBSSH decreased with increasing age and were zero for age-group 6. More than 50% of age-group 1 herring were also classified as WBSSH in the ICES SD 26 (Table 5.8.2.3). The proportion of WBSSH of older age groups showed similar trends as observed in the ICES SD 25 – increasing proportion of WBSSH from 2010 to 2012. Analyses of the data of the ICES SDs 27–32 suggested that individuals of age-group 1 of WBSSH are likely in the ICES SDs 27 and 28, but older age groups of WBSSH were not found in the ICES SDs 27–32. The analyses clearly showed intensive mixing of WBSSH and CBH at least in the ICES SDs 24, 25 and 26 with variable proportion of WBSSH from year-to-year. Therefore, the incorporation of the WBSSH in the ICES SDs 25 and 26 into the stock indices of WBSSH will improve the description of the dynamics of the WBSSH. On the other hand, CBH in the ICES SD 24 should be taken into account during the estimation of stock indices of CBH.

Table 5.8.2.1. Proportion of Western Baltic Spring Spawning Herring (WBSSH) in the ICES SD 24 during BIAS (2009–2012).

	Age group						
Year	0	1	2	3	4	5	6
2009	100	100	67	40	25	33	0
2010	100	100	80	30	14	33	0
2011	100	100	90	52	26	21	46
2012	100	99	99	96	67	37	53

Table 5.8.2.2. Proportion of Western Baltic Spring Spawning Herring (WBSSH) in the ICES SD 25 during BIAS (2009–2012).

	Age group						
Year	0	1	2	3	4	5	6
2009	0	67	24	17	11	13	0
2010	0	73	29	9	7	0	0
2011	0	100	60	15	4	0	0
2012	0	88	83	33	7	6	0

Table 5.8.2.3. Proportion of Western Baltic Spring Spawning Herring (WBSSH) in the ICES SD 26 during BIAS (2009–2012).

	Age group						
Year	0	1	2	3	4	5	6
2009	0	50	6	0	0	0	0
2010	0	67	0	0	0	0	0
2011	0	86	25	0	0	0	0
2012	0	100	67	33	0	0	0

The study, based on the BIAS data from 2009–2012 (R. Oeberst – in the Annexes 9 and 10), leaded among-others to following conclusions:

a) the new approach described more appropriate relations between the species compositions,

b) abundance indices of cod based on the acoustic surveys can provide a vulnerable time-series of cod in the Baltic pelagic waters,

c) intensive mixing of youngest age groups of WBSSH and CBH is occurring in the ICES SDs 25 and 26,

d) separation of the herring abundance indices into WBSSH and CBH can improve the understanding of the dynamics of both stocks.

Annex: ToR i) Coordinate cod stomach sampling programme in the Baltic International Trawl Survey

The Working Group on Multispecies Assessment Methods (WGSAM) in 2010 proposed the realization of stomach sampling of the main predator fish in the North Sea and the Baltic Sea to improve the basic knowledge concerning the species interactions in relation to the multispecies approach. On this basis, the EU project MARE/2012/02 “Study on stomach contents of fish to support the assessment of good environmental status of marine foodwebs and the prediction of MSY after stock restoration” was funded and realized from 1 December 2012 and lasted for 24 months. Following multi-annual management of SCICOM Expert Groups, one of the WGBIFS-2015 TOR’s was to coordinate Baltic cod stomachs sampling programme for WGSAM. In order to be in line with accomplished the MARE project, the WGBIFS decided that cod stomachs sampling procedure in the Baltic would be adopted for realization during the demersal, standard trawl surveys available in February-March and November-December. According to the MARE project manual for cod stomach sampling in the Baltic Sea, 10 stomachs per 1-cm length class of cod from each the ICES Subdivisions (22–26, 28) in the 1st and the 4th quarter should be collected in the BITS surveys. The set of 10 stomachs may include also empty stomachs; however stomachs that are obviously regurgitated are discarded. Within each ICES SD, a wide geographical coverage of samples should be obtained whenever possible. In those, ICES SDs with many catch-stations and where large catches can be expected (the ICES SDs 22–26 for cod) in this cases the sampling frequency can be achieved by limiting to:

- no more than 2 stomachs per 1-cm group per haul,
- no more than 2 stomachs per 1-cm group per surveying day.

However, in those the ICES SDs with fewer stations and/or where fish catches may be relatively small (the ICES SD 28), a higher sampling frequency per haul/day may need to be chosen in order to obtain sufficient numbers of samples per length class.

The cod stomach samples collected in Q4–2014 and Q1–2015 BITS surveys are listed in the Table 5.9.1. For detailed description of the sampling procedure and the list of information to be collected during the BITS surveys – see the Addendum 1.

Table 5.9.1. Cod stomach samples collected in Q4–2014 and Q1–2015 BITS surveys.

		ICES SD 25	ICES SD 26	ICES SD 28	Total
Q4 2014	Denmark	App. 323	App. 300	-	623
	Latvia	-	45	42	87
Q4 2014 Total		323	345	42	710
Q 1 2015	Denmark	260	-	-	260
	Poland	336	213	-	549
	Latvia	-	81	42	123
Q1 2015 Total		596	294	42	932

Processing of Baltic cod stomach samples should be carried out within the National Fisheries Data Sampling Programme (DC MAP) either by national labs if they have sufficient expertise, or by other institute experienced in stomachs analyses processing. All countries participating in the BITS survey should collect Baltic cod stomachs for food spectrum and feeding intensity analyses, accordingly to the format agreed during the WGBIFS-2015 meeting and described in the BITS Manual 2015 (Addendum 1). Standard form is also included in the BITS manual.

Annex: ToR j) Discuss the possibilities to make further consistency of IBAS for WGBIFS. Initial information about how to standardize the pelagic fishing gear used in BIAS and BASS surveys

The main topics of K. Stanuch presentation "An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys" (Annex 10) were:

- targets for standardizing the research pelagic fishing gear;
- differences in existing pelagic sets;
- finding ways to standardize research pelagic fishing gears;
- expected steps in the standardization.

The goals of the proposal are:

a) to minimize the differences in efficiency and species composition in pelagic monitoring trips between different vessels by eliminating diversity in gear construction and its elements used during production;

b) to make research catches more comparable, e.g. as was made in the case of TV-3 demersal trawl (achieved after standardization process), applied from 2000 in the BITS surveys.

The WGBIFS was introduced with overview of the existing constructions of both commercial and research trawls used in the Baltic Sea and with expected steps for the standardization. These were:

- developing the initial design of the gear or selection of existing one, taking into account the level of difficulties of construction, its assembling and catching operations;
- developing the detailed gear design and its elements; it should take into consideration the towing ability of the research vessels;
- developing the assembling and maintenance manual with all possible details;

- conducting model scale research, results of which could be useful to adjust the construction details and fishing operation (horizontal and vertical trawl opening, otter boards distance related to trawling speed, etc.).

In order to achieve the standardization of pelagic survey gear should follow the 3 steps:

- unification of trawl belly;
- unification of trawl rigging;
- unification of otter boards.

Applying these steps would ensure the standardization of the acoustic survey gears, their inlet areas, hydromechanical characteristics and provide similar fish reaction on towing gear:

- threshold response and initial time of it;
- power of the response;
- direction and response specifications.

Standardization of the pelagic gear used in the BIAS and BASS surveys will allow comparability of data and surveys results, as is already in the case with standardized demersal trawls TV-3#930 and TV-3#520.

Annex: ToR k) Review the progress of the ICES acoustic database

WGBIFS was contacted by the international AtlantOS project for choosing members to participate in the development of a modern international acoustic database. Niklas Larson and Uwe Böttcher were delegated from WGBIFS members to cooperation with the AtlantOS project. Because of misunderstanding in correspondence transfer, the above-mentioned delegates were not able to participate in the *ad hoc* meeting in January 2015. Future meetings are planned and supplementary information concerns widely implementation of the common acoustic database should be ready for the 2016 WGBIFS meeting. In the period of 01–02.10.2015 is planned in Copenhagen the Workshop on the review of the ICES acoustic-trawl survey database design (WKIACTDB), chaired by N. Holdsworth and N.-O. Handegard with the main ToR: Review the proposed design for the ICES acoustic trawl survey database.

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Annex 2A: Revised WGBIFS Multi-annual ToRs

2014/MA2/SSGIEOM02 The **Baltic International Fish Survey Working Group** (WGBIFS), chaired Wlodzimierz Grygiel*, Poland, will meet in Öregrund, Sweden, 23–27 March 2015, to work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2015	23–27 March 2015	Öregrund, Sweden	Interim report by 15 May 2015 to SSGIEOM, SCICOM and ACOM	
Year 20XX			Interim report by “DATE” to “SGXX”, “SCICOM”…	
Year 20XX			Final report by “DATE” to “SGXX”, “SCICOM”…	

ToR descriptors

TOR	Description	Background	Science plan topics addressed	duration	Expected deliverables
a	Combine and analyse the results of spring and autumn acoustic surveys and experiments	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks		Year 1, 2 and 3	Updated acoustic tuning index for WGBFAS
b	Update the BIAS and BASS hydroacoustic databases	The aim of BIAS and BASS databases is to store the aggregated data from acoustic surveys		Year 1, 2 and 3	Updated databases with aggregated acoustic data for WGBIFS
c	Plan and decide on acoustic surveys and experiments to be conducted	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks		Year 1, 2 and 3	Finalized planning for the surveys for WGBIFS
d	Discuss the results BITS surveys and evaluate the characteristics of TVL and TVS standard gears used in BITS	Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks		Year 1, 2 and 3	Updated BITS data in DATRAS database for ICES Data Centre and WGBFAS
e	Plan and decide on demersal trawl surveys and experiments to be conducted, and update and correct the Tow Database	Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks		Year 1, 2 and 3	Finalized planning for the surveys for WGBIFS

f	Review and update the Baltic International Trawl Survey (BITS) manual according to SISP standards	Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks	Year 3	Updated BITS manual for WGBIFS
g	Review and update the International Baltic Acoustic Surveys (IBAS) manual according to SISP standards	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks	Year 3	Updated IBAS manual for WGBIFS
h	Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks	Year 3	Improved quality of acoustic indices with estimates of the uncertainty for WGBFAS
i	Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey (BITS)	Baltic cod stomachs collected during the demersal trawl surveys improve the basic knowledge concerning the species interactions in relation to the multi-species approach	Year 1, 2 and 3	Coordinated cod stomachs sampling programme for BITS surveys for WGSAM
j	Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys.	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks	Year 3	Agreements for further standardizations of IBAS for WGBIFS and through the improved data quality for WGBFAS. The 1st approach to designing the standard pelagic fishing gear used in BIAS and BASS surveys, including an update of the IBAS manual to ensure consistent use.
k	Review the progress of the ICES acoustic database		Year 1	ICES is developing an acoustic database and it is important that the plans are reviewed to ensure adoption of the system.

Summary of the Work Plan

Year 1	Compilation the survey results from 2014 and first half of 2015 and reporting to WGBFAS. Coordination and planning the schedule for surveys in second half of 2015 and first half of 2016. Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey. The 1st approach to designing the standard pelagic fishing gear used in BIAS and BASS surveys.
Year 2	Compilation the survey results from 2015 and first half of 2016 and reporting to WGBFAS. Coordination and planning the schedule for surveys in second half of 2016 and first half of 2017. Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey. An attempt to construct the standard pelagic fishing gear, which will be applied to BIAS and BASS surveys.
Year 3	Compilation the survey results from 2016 and first half of 2017 and reporting to WGBFAS. Coordination and planning the schedule for surveys in second half of 2017 and first half of 2018. Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey. Reviewing and updating the common survey manuals according to SISP standards. Proposals for improvement of quality of acoustic indices and for further standardization of International Baltic Acoustic Surveys. The implementation of the standard pelagic fishing gear to control-catches in BIAS and BASS surveys and fishing gears intercalibration.

“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.
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 ACOM and groups under ACOM	The survey data are prime inputs to the assessments of Baltic herring, sprat, cod and flatfish stocks carried out by WGBFAS. Linked to ACOM through the quality of stock assessments and management advice.
Linkages to other committees or groups	There is a very close working relationship with WGBFAS. It is also relevant to the SSGESST and WGFAST.
Linkages to other organizations	No direct linkage to other organizations.

Annex 2B: Terms of references for the next meeting

The **Baltic International Fish Survey Working Group** (WGBIFS), chaired by Wlodzimierz Grygiel, Poland, will meet in Rostock, Germany 30 March – 3 April 2016 to:

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2015	23–27 March 2015	Öregrund, Sweden	Interim report by 15 May 2015 to SSGIEOM, SCICOM and ACOM	
Year 2016	30 March – 3 April	Rostock, Germany	Interim report by 15 May 2016 to SSGIEOM, SCICOM and ACOM	
Year 20XX			Final report by “DATE” to “SGXX”, “SCICOM”…	

ToR descriptors

TOR	Description	Background	Science plan topics addressed	duration	Expected deliverables
a	Combine and analyse the results of spring and autumn 2015 acoustic surveys and experiments	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks		Year 1, 2 and 3	Updated acoustic tuning index for WGBFAS
b	Update the BIAS and BASS hydroacoustic databases	The aim of BIAS and BASS databases is to store the aggregated data from acoustic surveys		Year 1, 2 and 3	Updated databases with aggregated acoustic data for WGBIFS
c	Plan and decide on acoustic surveys and experiments to be conducted in 2017	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks		Year 1, 2 and 3	Finalized planning for the surveys for WGBIFS
d	Discuss the results BITS surveys curried out in the 4^{th} quarter 2015 and the 1^{st} quarter 2016 and evaluate the characteristics of TVL and TVS standard gears used in BITS	Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks		Year 1, 2 and 3	Updated BITS data in DATRAS database for ICES Data Centre and WGBFAS
e	Plan and decide on demersal trawl surveys and experiments to be conducted in the 4^{th} quarter 2016 and the 1^{st} quarter 2017, and update and correct the Tow-Database and DATRAS	Demersal trawl surveys provide important fishery-independent stock estimates for Baltic cod and flatfish stocks		Year 1, 2 and 3	Finalized planning for the surveys for WGBIFS
f	Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey (BITS)	Baltic cod stomachs collected during the demersal trawl surveys improve the basic knowledge concerning the species interactions in relation to the multi-species approach		Year 1, 2 and 3	Coordinated cod stomachs sampling programme for BITS surveys for WGSAM

g	Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys.	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks	Year 2, 3	Agreements for further standardizations of IBAS for WGBIFS and through the improved data quality for WGBFAS. The 1st approach to designing the standard pelagic fishing gear used in BIAS and BASS surveys, including an update of the IBAS manual to ensure consistent use.
h	Review the progress of the ICES acoustic database		Year 2	ICES is developing an acoustic database and it is important that the plans are reviewed to ensure adoption of the system.

Summary of the Work Plan

Year 2	Compilation the survey results from 2015 and first half of 2016 and reporting to WGBFAS. Coordination and planning the schedule for surveys in second half of 2016 and first half of 2017. Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey. An attempt to construct the standard pelagic fishing gear, which will be applied to BIAS and BASS surveys.

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 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 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 develop a database for disaggregated hydroacoustic 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 ca. 20 members and chair-invited specialists.
Secretariat facilities	None.

Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The survey data are prime inputs to the assessments of Baltic herring, sprat, cod and flatfish stocks carried out by WGBFAS. Linked to ACOM through the quality of stock assessments and management advice.
Linkages to other commi tees or groups	There is a very close working relationship with WGBFAS. It is also relevant to the SSGESST and WGFAST.
Linkages to other organizations	No direct linkage to other organizations.

Annex 3: Agenda of WGBIFS-2015

AGENDA OF WGBIFS MEETING IN 2015			
Date	**Venue**	**Chair**	**Local organizer – host of the meeting**
23–27.03.2015; working time: 09:00 – 17:00 coffee breaks: 10:30–11:00; 15:00–15:30, lunch break: 12:30–13:30,	Institute of Coastal Research (Kustlaboratoriet), Swedish University of Agricultural Sciences, Skolgatan 6, SE-74242 Öregrund, Sweden	Włodzimierz Grygiel, National Marine Fisheries Research Institute in Gdynia, Poland	Olavi Kaljuste, Institute of Coastal Research in Öregrund

ICES ASC 2014 Resolution No. 2014/MA2/SSGIEOM02

23.03.2015; 10:00 – 17:00

1. Opening of the meeting, welcome and introduction

Info about logistic aspects of the WGBIFS/2015 meeting (presentation made by chair)

Household remarks (info from local organizer of the meeting)

2. Arrangement and implementation of the proposed agenda and time schedule and organization of the meeting

Allocation of tasks between participants. Election of the WGBIFS reporter, which will be active during the running WGBIFS meeting.

"From history of WGBIFS" - presentation made by chair.

"Peculiarities of BITS-4q/2014, BITS-1q/2015, BASS and BIAS surveys in the national marine waters of the Baltic" – one by one presentations made by delegates from the consecutive national research institutes.

"An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys" – presentations made by chair's invited experts + discussion. An initial work.

3. Acoustic surveys and data (working in subgroup during a part of the day) – the initial phase only

Combine and analyse the results of spring and autumn 2014 acoustic surveys and experiments and report to WGBFAS. Updated acoustic tuning index for WGBFAS. (ToR a)

Status of BIAS and BASS surveys standard reports.

Update the BIAS and BASS acoustic databases. (ToR b)

Plan and decide on acoustic surveys and experiments to be conducted in autumn 2015 and spring 2016. (ToR c)

Status of review and update the International Baltic Acoustic Surveys (IBAS) manual according to the Series of ICES Survey Protocols (SISP) standards - an initial work. (ToR g)

Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty. Presentation and discuss the indices of acoustic surveys based on different methods - an initial work. (ToR h)

Discuss the possibilities to make further standardizations of IBAS - an initial work. Task supported by WGBFAS. (ToR j)

An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys - an initial information + discussion. (see above; sub-task of ToR j)

Review the progress of the ICES acoustic database. Results from the first meeting (14.01.2015) of the AtlantOS project - the development and widely implementation of the acoustic database. (ToR k)

4. Bottom-trawl surveys and data (working in subgroup during a part of the day) – the initial phase only

Discuss the results from BITS surveys performed in autumn 2014 and spring 2015 and evaluate the characteristics of TV-3L and TV-3S standard gears used in BITS. (ToR d)

- *Status of BITS surveys standard reports.*
- *Status of WGBIFS standard protocols from measurements of technical parameters of the standard bottom-trawls type TV-3L and TV-3S.*
- *Status of recent BITS surveys data in the DATRAS database.*
- *Status of completions and amendments the Tow Database. (part of ToR e)*

Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2015 and spring 2016. (ToR e)

Status of review and update the Baltic International Trawl Survey (BITS) manual according to SISP standards - an initial work. (ToR f)

Coordinate cod stomach sampling programme in the Baltic International Trawl Survey (BITS). Standardization of the range of cod stomachs sampling per various strata. Task supported by WGSAM. (ToR i)

24–27.03.2015; 09:00 – 17:00

Working in the subgroups during the main part of the days. Others presentations. Inquiries from WGs concerns joint acoustic and bottom-trawl surveys issues.

Systematically works and finalize the WGBIFS/2015 obligatory tasks.

Presentations and discussions on:

Fish ageing methods used in the Baltic countries national laboratories (see the WGBIFS/2014 Report, "Annex 10. Action list").

Species validity codes in DATRAS. To revise species validity conditions in DATRAS (from WGBEAM and the ICES Secretariat - Data Center).

The important update in DATRAS database regarding fish species code - DATRAS download page shows invalid species code upon download process (the ICES Secretariat - Data Center).

How to explain discrepancy between herring ICES SD 30 and central herring stocks size, estimated with various methods (from WGBFAS).

The main conclusions and recommendations from the Workshop on Integrated DATRAS Products (WKIDP).

Other questions, e.g. Research surveys vs. a new fishing rule implemented into Baltic fishery, i.e. landings obligation (discards ban)

Final issues:

Selection of the venue for the next meeting

Agreeing on ToRs for next year WGBIFS meeting

Going through recommendations

Reviewing text

Final discussion

Closing of the meeting (27.03.2015; app. at 16:30–17:00).

Annex 4: Recommendations

Recommendations concerning the BITS type of surveys	Recipent	Deadline
The level of spatial coverage with valid control-hauls achieved in Q4–2014 and Q1–2015 was considered by WGBIFS as fully appropriate to calculating of BITS cpue indices without restrictions. Obtained results (DATRAS) can be considered as sufficient for tuning series, and are recommended for the assessment of Baltic cod and flatfish.	ICES Data Center	In due time before WGBFAS 2015.
In order to improve the coverage of the BITS survey area, a number of new haul positions covering the "white spot" areas where no tracks are available (despite the fact that significant commercial fishing activity is registered) should be included in the Tow Database. This is particularly essential to the ICES SDs 22 and 23.	All countries participating in the BITS surveys (WGBIFS).	In due time before the 4th quarter 2015 survey.
It is essential to the consistency of the time-series maintained by the BITS survey, that properly calibration exercise is carried out when RV "Havfisken" (old) is succeeded by RV "Havfisken" (new) in 2016. This generally counts for any new vessel introduced in the BITS.	DTU-Aqua	In due time before the survey is taken over by the new vessel.
The WGBIFS recommends that Russia resumes carrying out the BITS surveys in order to complete the spatial coverage of the fish investigations in the bottom zone of the Baltic.	AtlantNIRO (Kaliningrad) – Russian Delegate	
The WGBIFS recommends collecting Baltic cod stomachs for food spectrum and feeding intensity analyses, accordingly to the format agreed during the WGBIFS-2015 meeting and described in the BITS Manual 2015. This action is recommended also by WGSAM.	All countries participating in the BITS surveys (WGBIFS).	2015 BITS-4q and 2016 BITS-1q
The WGBIFS recommends to perform the TV-3L and TV-3S trawl technical parameters measurement by professional experts in fishing gear technology or experienced crew members. Each country measurement results should be made available to the WGBIFS using the standard protocols.	All countries participating in the BITS surveys (WGBIFS).	2015 BITS-4q and 2016 BITS-1q
The WGBIFS recommends collecting and reporting the marine litter appeared in the ground trawl fish control-catches according to the proposed format, described in the BITS Manual 2015 (Addendum 1).	All countries participating in the BITS surveys (WGBIFS).	2015 BITS-4q and 2016 BITS-1q

Recommendations concerning the BIAS and BASS type of surveys	Recipient	Deadline
WGBIFS recommends that, the BIAS-dataset, including the valid data from 2014 (the Annex ToR a), 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	2015
The alternative tuning indices, presented in the Annex ToR a, can be evaluated during the next benchmark assessment of the Central Baltic herring with the restriction, that the years 1993, 1995 and 1997 are excluded from the index series.	WGBFAS	Next benchmark
WGBIFS recommends that the current 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. The abundance indices for age-groups 0 and 1 should be handled with caution.	WGBFAS	2015
WGBIFS recommends that, the BASS-dataset with the valid data of 2014 can be used in the assessment of the sprat stock in the Baltic Sea.	WGBFAS	2015
When more than one ship is engaged in the same area at the same time or in following years, the performance of the equipment should be compared by means of an intercalibration as described in the IBAS manual.	All countries participating in the acoustic surveys (WGBIFS).	

Annex 5: Action list

WGBIFS agreed that the assessment results based on the new methods of calculation provided valuable data of stock indices of Baltic herring, sprat and cod. The group agreed and recommended that data, which were not provided for the period from 2009 to 2012, **will be made available until 1 July 2015** based on the list of additional requested data provided by Rainer Oeberst until beginning of April 2015.

WGBIFS also agreed to expand the time-series from BIAS surveys to the period from 2001 to 2008 and 2014. The required **data should be submitted to Rainer Oeberst until 1 July 2015, according to the defined standard format, which was used for the period 2009 to 2013.**

It was agreed that the file BIAS_Haul-sA_example_2013_DB_v.1.2 should be used and that all countries should send as many years as possible between 2010–2014 to niklas.larson@slu.se, starting with the year 2014 and working back through those years. The file can be found on the WGBIFS-2015 SharePoint under the folder Data.

Supplementary information concerns widely implementation of the common and modern acoustic database should be ready for the 2016 WGBIFS meeting. The above-mentioned acoustic database will be created based on close cooperation with the international AtlantOS project, and two the WGBIFS members – Niklas Larson and Uwe Böttcher were delegated to cooperation with the project.

All countries participating in the BITS survey should to collect Baltic cod stomachs for food spectrum and feeding intensity analyses, accordingly to the format agreed during the WGBIFS-2015 meeting and described in the BITS Manual 2015. Standard form is also included in the BITS manual. This action is recommended also by WGSAM.

All countries participating in the BITS surveys should start to collect the marine litter according to the proposed format, described in the BITS Manual 2015. Standard form is accessible from the WGBIFS-2015 SharePoint.

WGBIFS suggested performing the technical checking (standard measurements) of TVL and TVS standard ground trawls in every year, as obligatory action for each vessel involved in the BITS surveys realization. The measurements results should be reported to WGBIFS meeting using the agreed format of protocols.

- The feedback of realized BITS surveys should be submitted to Rainer Oeberst (rainer.oeberst@ti.bund.de), Germany using the proposed standard format not later than 20 December (autumn survey) and immediately after spring survey.

Annex 6: Standard Reports of BITS surveys in the 4th quarter 2014 and the 1st quarter 2015

Extended cruise reports of BITS surveys from some vessels, with more detailed descriptions are summarized in the Annex 7.

Notes:

a) the text of cruises standard report should be prepared in Word format as *.doc, using template as below mentioned,

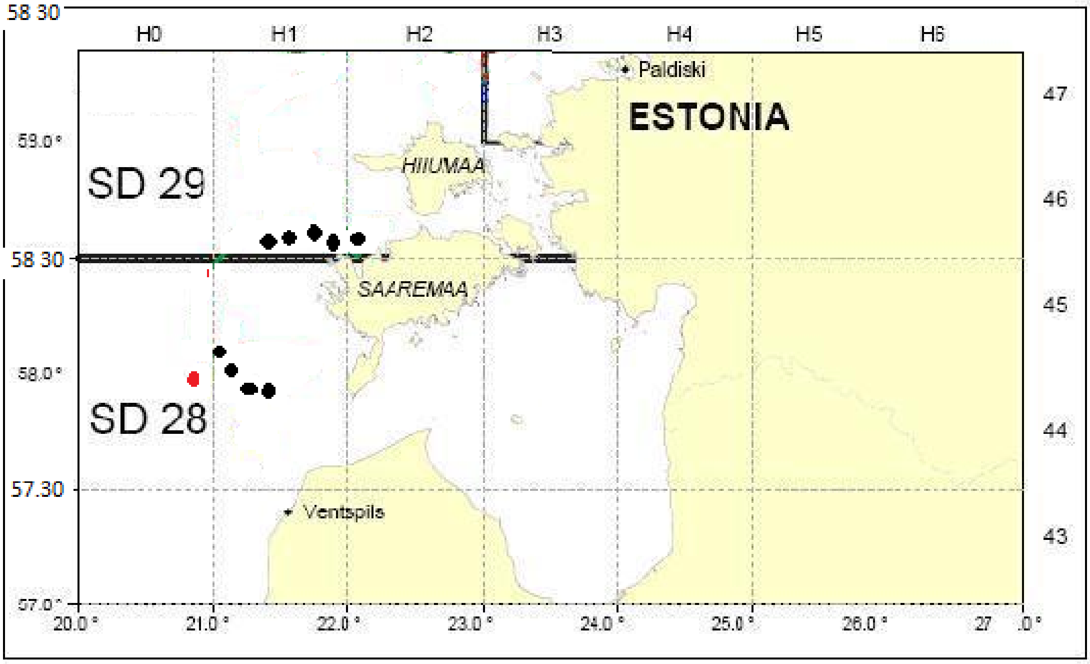
b) Authors are fully responsible for quality of the prepared text and all kind of presented data.

Nation:	**Estonia**	**Vessel:**	**CEV**
Survey:	BITS14IVQRT	**Dates:**	17–20 November 2014

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 the Port of Haapsalu late evening on 17 November 2014 steaming to the ICES Subdivision 29. The weather conditions were extremely poor; however it was possible to carry out 5 trawl hauls in the Subdivision 29 on November, 18, as planned. Next day the weather improved and we moved to the Subdivision 28.2, to realize the listed for Estonia hauls. Here however we encountered difficulties to perform the hauls on the listed positions. First, we broke the trawl performing the ID28190. Additionally, after repairing the trawl at sea, the skipper decided that it would not be possible to perform the 2 hauls, listed as ID 58059 and ID 28061 on their exact positions, since rocky seabed. Therefore, it was decided to perform these hauls at slightly modified positions in order to avoid more damage to the trawlnet. The survey was finished at early hours of 20 November in the Port of Kuivastu.

ICES Subdivis-ions	Gear (TVL, TVS)	Depth strata (1–6)	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
28	TVS	3	1	1	0	0	0	0	100
28	TVS	4	3	3	0	0	0	0	100
28	TVS	5	1	0	0	0	0	1	0
29	TVS	2	1	1	0	0	0	0	100
29	TVS	3	3	3	0	0	0	0	100
29	TVS	4	1	1	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):		
Species	**Age**	**Length**
Gadus morhua	134	134
Sprattus sprattus	200	1166
Clupea harengus	201	1791
Platichthys flesus	258	784



Approximate positions of realized hauls during Estonian BITS survey in 4 QRT 2014.

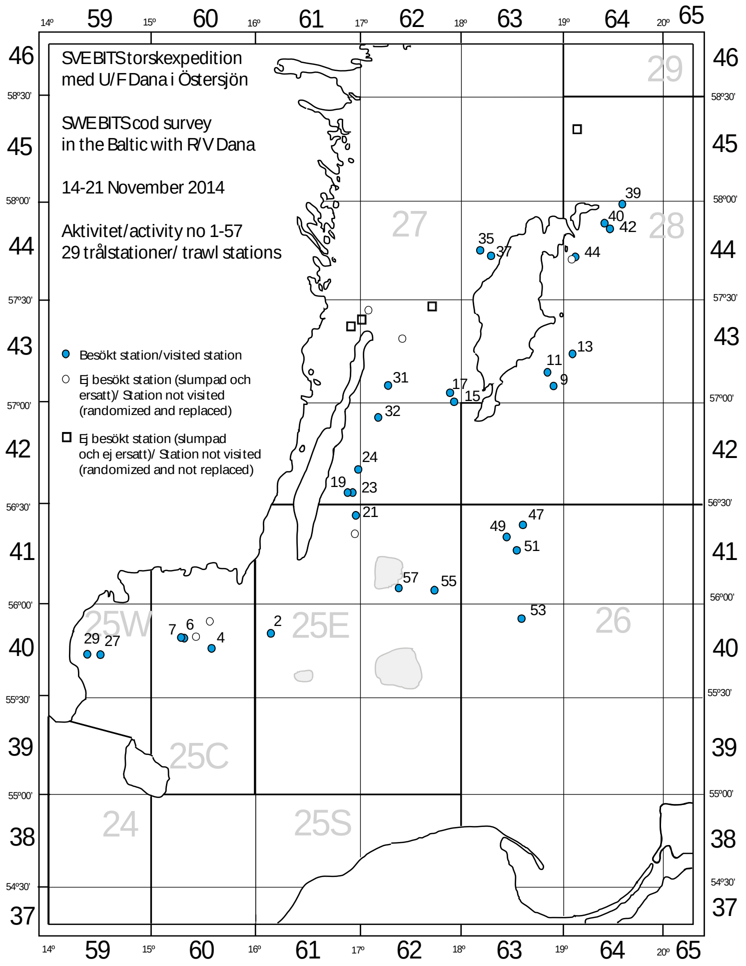
Nation:	**SWEDEN**	**Vessel:**	**RV “DANA”**
Survey:	BITS Q4 2014	**Dates:**	14–21 November 2014

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.):	26 stations out of the 30 allocated were trawled. In SD 25, 27 and 28, eight hauls were cancelled because the Swedish Armed Forces did not grant us permission. A total of eight allocated hauls in the ICES SDs 26, 27 and 28 had oxygen deficiency.
Additional comments:	

ICES Sub-divi-sions	Gear (TVL, TVS)	Depth strata (2–6)	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 replace-ment hauls	Number of invalid hauls	ations shed	Remarks
25	TVL	2	1	1	0	0	0	-	100	
25	TVL	3	6	5	0	0	1	-	83	1
25	TVL	4	2	3	0	0	2	-	150	1
26	TVL	3	1	1	0	0	0	-	100	
26	TVL	4	1	1	0	0	0	-	100	
26	TVL	5	1	0	0	1	0	-	100	
26	TVL	6	1	0	0	1	0	-	100	
27	TVL	3	2	0	0	0	0	-	0	2
27	TVL	4	4	3	0	1	2	-	100	
27	TVL	5	1	0	0	1	0	-	100	
27	TVL	6	3	0	0	2	0	-	67	2
28	TVL	3	3	3	0	0	1	-	100	
28	TVL	4	2	1	0	0	1	1	50	2
28	TVL	5	2	0	0	2	0	0	100	

Remark 1. The % number deviates from 100 because the depths of some of the stations are close to the depth strata limit.
Remark 2. The % number deviates from 100 because we were prohibited by Swedish Armed Forces to visit some of the stations.

Number of biological samples (maturity and age material, *maturity only):		
Species	Length	Age
Aphia minuta	1	
Clupea harengus	4657	
Cyclopterus lumpus	10	
Enchelyopus cimbrius	7	
Engraulis encrasicolus	1	
Gadus morhua	3974	641
Gasterosteus aculeatus	574	
Gobiusculus flavescens	1	
Limanda limanda	3	
Lumpenus lampretaeformis	10	
Melanogrammus aeglefinus	1	
Merlangius merlangus	2	
Myoxocephalus quadricornis	593	
Myoxocephalus scorpius	502	
Osmerus eperlanus	1	
Pholis gunnellus	1	
Platichthys flesus	1815	777
Pleuronectes platessa	116	
Pollachius virens	2	
Pomatoschistus	35	
Pomatoschistus minutus	1	
Pungitius pungitius	5	
Scophthalmus maximus	22	
Sprattus sprattus	2365	
Zoarces viviparus	7	


SVEBITS torskexpedition
med U/F Dana i Östersjön
SWEBITS cod survey
in the Baltic with R/V Dana
14-21 November 2014
Aktivitet/activity no 1-57
29 trålstationer/ trawl stations
Besökt station/visited station
Ej besökt station (slumpad och ersatt)/ Station not visited (randomized and replaced)
Ej besökt station (slumpad och ej ersatt)/ Station not visited (randomized and not replaced)
24
25W
25C
25E
25S
26
27
28
29

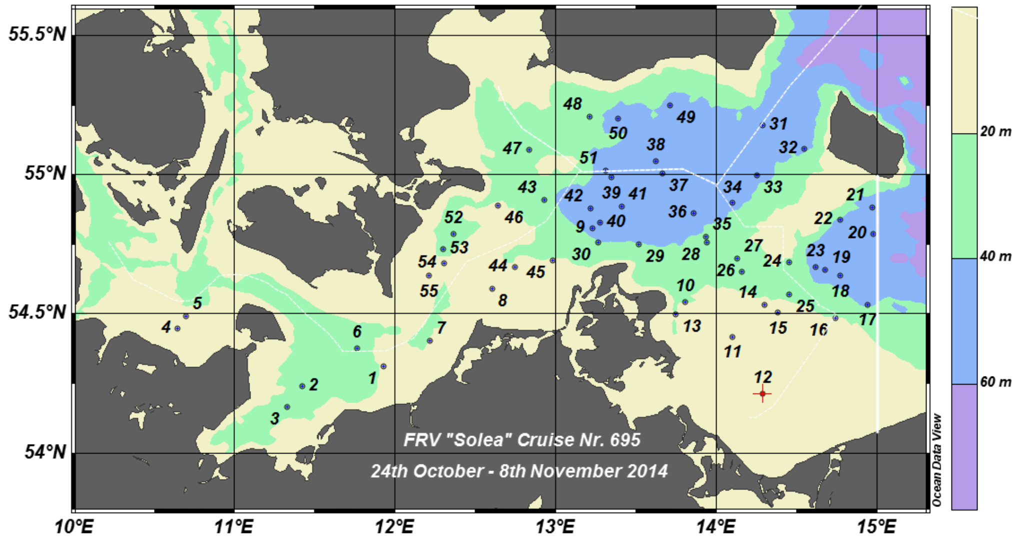
Nation:	**Germany**	**Vessel:**	**FRV "Solea"**
Survey:	BITS 2014, quarter 4	**Dates:**	24 October – 8 November 2014

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 55 fishing hauls and 55 hydrographical stations were performed. Two approved catch-stations in the Swedish territorial waters, east from 13° E 50' N were in the short term not allowed to carry out.
Additional comments:	

ICES Sub-divis-ions	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 assume d zero-catch hauls	Number of replace-ment hauls	Numb er of invali d hauls	% station s fished
22	TVS	1	6	6			-	-	100
24	TVS	1	24	22			-	-	92
24	TVS	2	27	27			-	-	100

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	8566	942
Platichthys flesus	9491	763
Limanda limanda	3733	784
Pleuronectes platessa	6764	773
Psetta maxima	140	140
Scophthalmus rhombus	8	8
Clupea harengus	3767	-
Sprattus sprattus	4693	-

Other species may need to be added for your survey

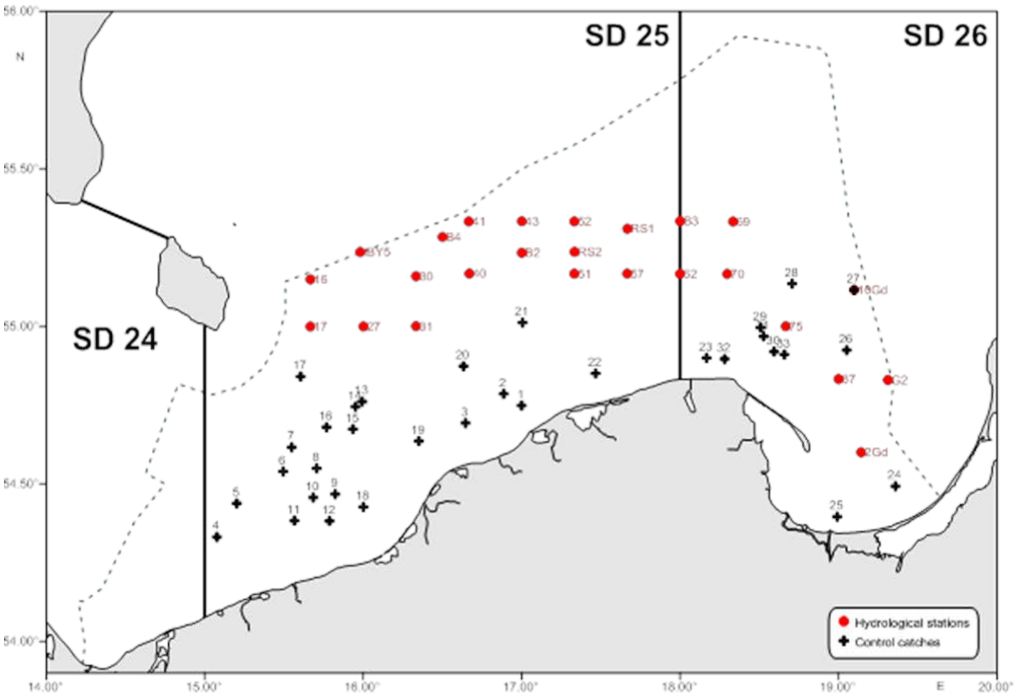

FRV "Solea" Cruise Nr. 695
24th October - 8th November 2014
55.5°N
55°N
54.5°N
54°N
10°E
11°E
12°E
13°E
14°E
15°E
20 m
40 m
60 m
Ocean Data View

Nation:	**Poland**	**Vessel:**	**RV "Baltica"**
Survey:	BITS-Q4/2014	**Dates:**	16–28/11/2014
Cruise	No. 15/2014/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.):	The vessel "Baltica" was recommended by WGBIFS to cover parts of the ICES Subdivisions 25 and 26 with totally 33 randomly selected control-hauls. The catch-stations were located at the bottom depth range of 19 - 102 m. Totally, 33 fish catch-stations can be accepted as representative. There were no planned fish hauls omitted, as the oxygen content was always above critical minimum (i.e. 1.5 ml/l) in the bottom-waters. Zero catches were not achieved. Hauls No. 25002 and 25025 were shortened to 15 minutes due to appearance of obstacles on the seabed. Hauls No. 25046 and 25048 were shortened to 15 minutes due to high densities of fish. Haul No. 25061, the primary selected towing position was not accessible due to prolonged navy military training. The depth on new position was 49 m as compared to primary selected – 27 m. Haul No. 25011 position slightly shifted due to GNS appearance. Haul No. 26183 was shortened to 15 minutes due to appearance of obstacles on the seabed, also the primary selected position was not accessible due to prolonged navy military training. The depth on new position was 46 m as compared to primary selected – 30 m. Haul No. 26133, the primary selected position was not accessible due to prolonged navy military training. The depth on new position was 56 m as compared to primary selected – 50 m. Haul No. 26169 was shortened to 15 minutes due to appearance of obstacles on the seabed, also the primary selected position was not accessible due to prolonged navy military training. The depth on new position was 22 m as compared to primary selected – 32 m. Haul No. 26038, the primary selected position was not accessible due to prolonged navy military training, the depth was the same. 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 25 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 replacement hauls	Number of invalid hauls	% stations fished
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	10	11	0	0	1	0	110
25	TVL	3	6	5	0	0	1	0	83
25	TVL	4	3	3	0	0	0	0	100
25	TVL	5	1	1	0	0	0	0	100
26	TVL	2	4	5	0	0	1	0	125
26	TVL	3	1	2	0	0	1	0	200
26	TVL	4	3	3	0	0	0	0	100
26	TVL	5	2	2	0	0	0	0	100
26	TVL	6	1	1	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):		
Species (Latin name)	**Length**	**Age**
Gadus morhua	6130	388
Platichthys flesus	1115	502
Clupea harengus	3551	549
Sprattus sprattus	2490	272
Pleuronectes platessa	297	196
Psetta maxima	5	5
Cyclopterus lumpus	10	8
Enchelyopus cimbrius	40	36
Melanogrammus aeglefinus	35	35
Ammodytes lanceolatus	387	37
Engraulis encrasicolus	11	11
Osmerus eperlanus	26	10
Merlangius merlangus	4	4
Myoxocephalus scorpius	129	78
Zoarces viviparus	1	1
Pomatoschistus minutus	12	
Neogobius melanostomus	1	
Agonus cataphractus	1	1


SD 24
SD 25
SD 26
Hydrological stations
Control catches

Nation:	**Lithuania**	**Vessel:**	**RV "Darius"**
Survey:	BITS-Q4/2014	**Dates:**	21–22/11/2014

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.):	A total of 6 stations were planned for the Lithuania part of the survey, which realize complete accordance with the agreements of WGBIFS. All 6 fishing stations were successfully realized. One trawling station was empty. The last trawl was made two miles to south because was construction of HDVC cable in planned station.
Additional comments:	

ICES Sub-Divis-ions	Gear (TVL, TVS)	Depth strata (1–6)	Numb er of hauls planed	Number of valid hauls realized using "Standard" groundgea r	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacemen t hauls	Numbe r of invalid hauls	% stations fished
26	TVS	1	1	1	0	0	0	0	100
26	TVS	2	1	1	0	0	0	0	100
26	TVS	3	4	4	0	1	0	0	100

Number of biological samples (Age, maturity and Length material):

Species	**Length**	**Age**	**Maturity**
Gadus morhua	871	250	242
Platichthys flesus	493	341	341
Clupea harengus	325		
Sprattus sprattus	106		
Psetta maxima	1		1
Pleuronectes platessa	4	4	4
Osmerus eperlanus	36		
Myoxocephalus scorpius	16		16

Nation:	**Latvia**	**Vessel:**	**RV "Baltica"**
Survey:	BITS-Q4/2014	**Dates:**	03–11/12/2014

Cruise	No. 2/2014
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 original surveys plan provided that 25 control-hauls will be realized in the Latvian EEZ (16 trawls in SD 28 and 9 trawls in SD 26) and 5 additional hauls in the Lithuanian EEZ (SD 26). Unfortunately, the bad weather affected the planned performance. Due to the very bad weather conditions (the storm "Billie" and it has Latvia braced for the impact of what could become one of the top eight to twelve storms in its recorded history) survey ended sooner than expected. On 11.12.2014 RV "Baltica" returned back to the homeport. The RV "Baltica" realized 21 bottom-trawl control-hauls from the 25 planned, incl. the Latvian territorial waters (Figure 1). Five catch-stations were only initiated by hydrological parameters measurement and due to very low oxygen concentration (in 2 stations below 1.0 ml/l, in 3 stations below 1.5 ml/l) near bottom, fishing was omitted. One track in SD 26 (26284) was not realized. Track is not suitable for the work due to the heavy bottom ground in this place. Overall, 21 hauls were conducted in Latvian EEZ (incl. the Latvian territorial waters; Figure 1). 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. The mean speed of vessel while trawling was 3.0 knots. However, in the case of 14 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder or bad weather. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 21 fish catch-stations starting positions and 5 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-Divis-ions	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	3	1						0
26	TVL	4	3		2				66
26	TVL	5	3			2			66
26	TVL	6	2			1			50
28	TVL	2	3		2				66
28	TVL	3	5		4				100
28	TVL	4	4		5	1			150
28	TVL	5	4		2	1			66
28	TVL	6	0		1				-

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	1067	398
Platichthys flesus	425	301
Clupea harengus	1486	
Sprattus sprattus	1429	
Scophthalmus maximus	2	
Pleuronectes platessa	1	
Zoarces viviparus	2	
Cyclopterus lumpus	2	
Myoxocephalus scorpius	18	
Osmerus eperlanus	26	
Gasterosteus aculeatus	94	
Hyperoplus lanceolatus	7	
Engraulis encrasicholus	22	

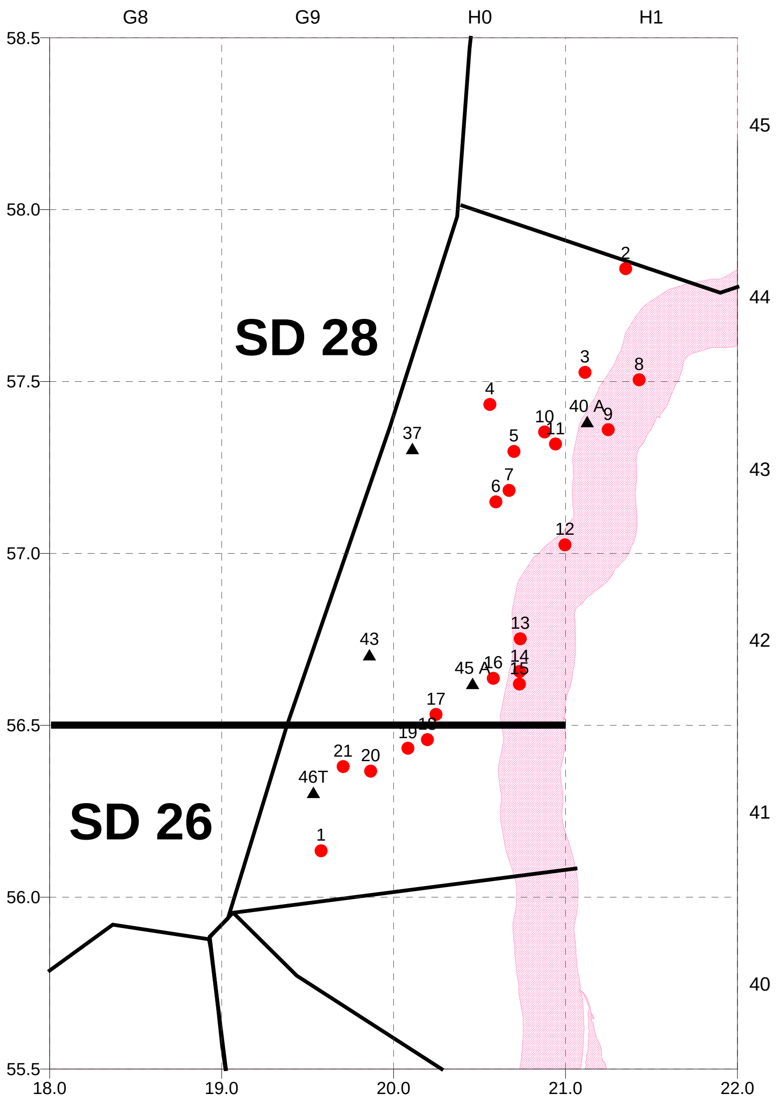


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with black triangles), black lines - national fishing zone borders.

Nation:	**Denmark**	**Vessel:**	**RV "Havfisken"**
Survey:	KASU 2	**Dates:**	30/10–25/11 2014

Cruise	KASU 2 Part of BITS
Gear details:	The small (#520) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	3 stations were moved due to problems with time, stones or other problems at the stations. 1 station was cancel in the ICES Subdivision 22.

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**
22	TVS	1	5	5					100
22	TVS	2	14	13					93
22	TVS	3	1	1					100
21	TVS	1	8	8					100
21	TVS	2	10	10					100
21	TVS	3	4	4					100
21	TVS	4	2	2					100
23	TVS	1	2	2					100
23	TVS	2	1	1					100

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

Species	**Number of otoliths**	**Species**	**Number of otoliths**
sole	467	Dab	110
Cod	414	Turbot*	37
Plaice	656	Brill*	120
witch	23		
hake	25		
whiting	124		

Nation:	**SWEDEN**	**Vessel:**	**RV "DANA"**
Survey:	BITS Q1 2015	**Dates:**	26 February - 08 March 2015

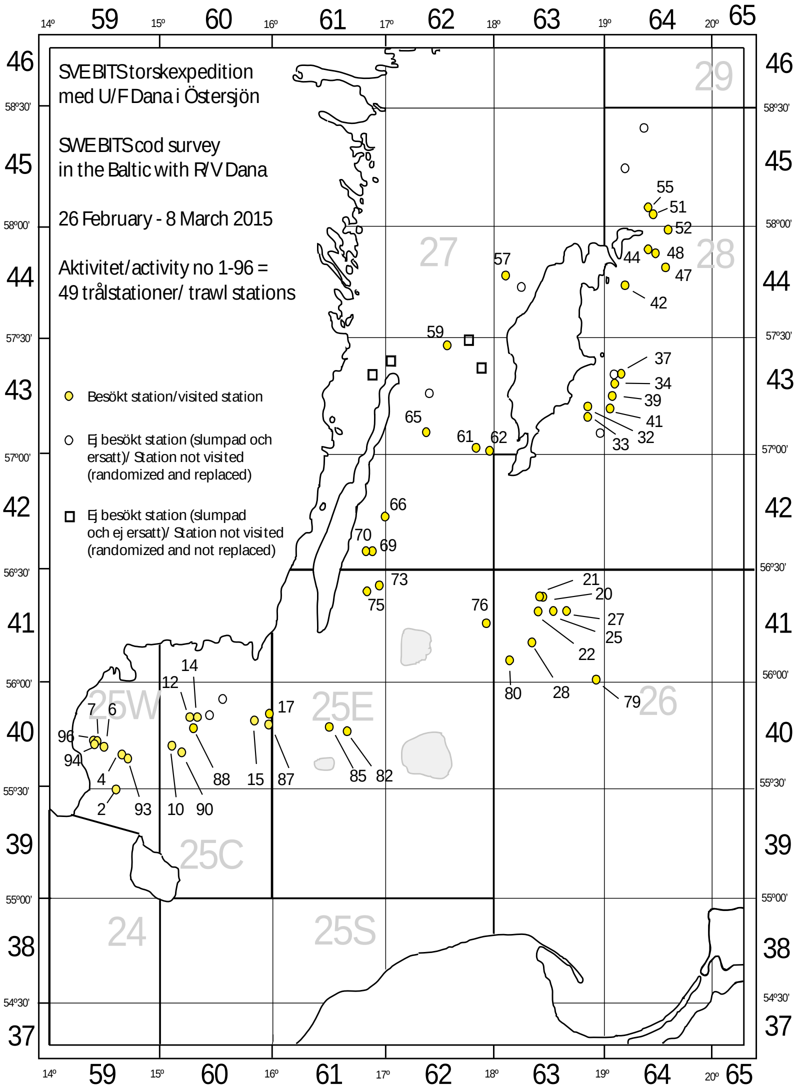
Cruise	
Gear details:	The large (930#) standard TV3 trawl was used. No tows are done with the rock-hopper groundgear on harder ground stations. The trawl construction is according to the specification in the BITS manual.
Notes from survey (e.g. problems, additional work etc.):	50 stations were allocated, 46 of these were trawled. In SD 27 four hauls were cancelled (because the Swedish Armed Forces (SAF) did not grant us permission. No invalid hauls this time. Three additional stations, not used for index calculations, where made, one in SD 25 and two in SD 27. A total of eleven hauls in SD 25, 26, 27 and 28 had oxygen deficiency.
Aditional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2–6)	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 replace-ment hauls	Number of invalid hauls	Stations fished %	Remarks
25	TVL	2	3	3	0	0	0	0	100	-
25	TVL	3	11	12	0	0	3	0	109	1
25	TVL	4	5	3	0	1	1	0	80	1
26	TVL	2	2	2	0	0	0	0	100	-
26	TVL	3	2	2	0	0	0	0	100	-
26	TVL	4	2	2	0	0	0	0	100	-
26	TVL	6	2	1	0	1	0	0	100	-
27	TVL	3	2	0	0	0	0	0	0	2
27	TVL	4	4	2	0	2	1	0	100	2

Remark 1. The % number deviates from 100 because the depths of some of the stations are close to the depth strata limit.

Remark 2. The % number deviates from 100 because we were prohibited by Swedish Armed Forces to visit some of the stations.

Number of biological samples (maturity and age material, *maturity only):		
Species	Lenght	Age
Enchelyopus cimbrius	10	
Pollachius virens	1	
Myoxocephalus quadricornis	635	
Aphia minuta	43	
Merluccius merluccius	1	
Scomber scombrus	12	
Osmerus eperlanus	3	
Scophthalmus maximus	21	
Pomatoschistus	9	
Pleuronectes platessa	937	
Myoxocephalus scorpius	1120	
Limanda limanda	17	
Clupea harengus	7845	
Cyclopterus lumpus	26	
Sprattus sprattus	3292	
Platichthys flesus	4596	1111
Pungitius pungitius	2	
Lumpenus lampretaeformis	12	
Alosa fallax	2	
Gasterosteus aculeatus	259	
Trachurus trachurus	22	
Hyperoplus lanceolatus	15	
Gadus morhua	8326	869
Merlangius merlangus	423	
Zoarces viviparus	21	

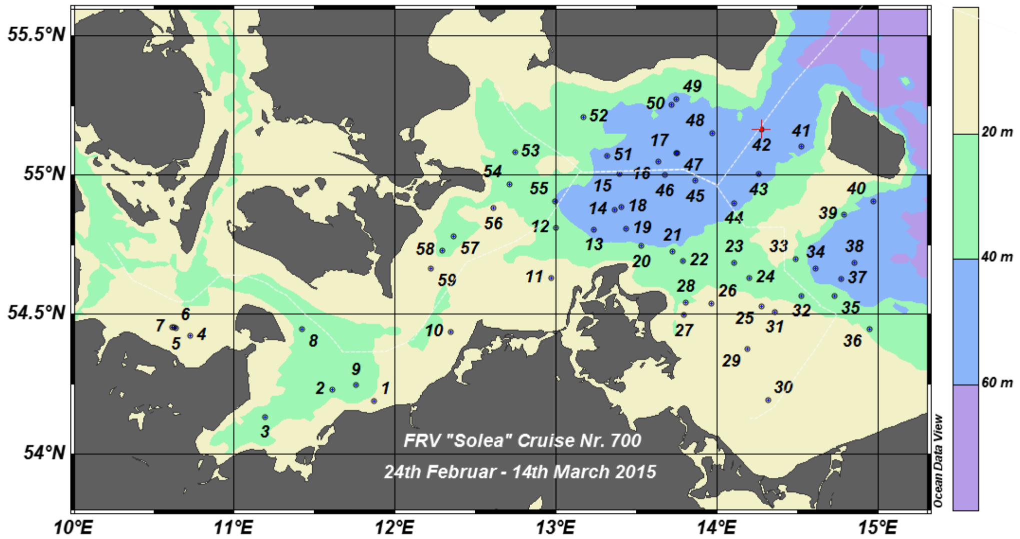

SVEBITS torskexpedition
med U/F Dana i Östersjön
SWEBITS cod survey
in the Baltic with R/V Dana
26 February - 8 March 2015
Aktivitet/activity no 1-96 =
49 trålstationer/ trawl stations
Besökt station/visited station
Ej besökt station (slumpad och ersatt)/ Station not visited (randomized and replaced)
Ej besökt station (slumpad och ej ersatt)/ Station not visited (randomized and not replaced)
24
25W
25C
25E
25S
26
27
28
29

Nation:	**Germany**	**Vessel:**	**FRV "Solea"**
Survey:	BITS 2015, quarter 1	**Dates:**	24 February to 14 March 2015

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 59 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" 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	9	9			-	-	100
24	TVS	1	22	22			-	-	100
24	TVS	2	28	28			-	-	100

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	13082	1414
Platichthys flesus	6044	719
Limanda limanda	2948	773
Pleuronectes platessa	4461	847
Psetta maxima	171	171
Scophthalmus rhombus	2	2
Clupea harengus	3793	-
Sprattus sprattus	6261	-


FRV "Solea" Cruise Nr. 700
24th Februar - 14th March 2015
55.5°N
55°N
54.5°N
54°N
10°E
11°E
12°E
13°E
14°E
15°E
20 m
40 m
60 m
Ocean Data View

Nation:	**Lithuania**	**Vessel:**	**RV "Darius"**
Survey:	BITS-Q1/2015	**Dates:**	24–25/03/2015

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.):	A total of 6 stations were planned for the Lithuania part of the survey, which realize complete accordance with the agreements of WGBIFS. All 6 fishing stations were successfully realized..
Additional comments:	

ICES Sub divisions	Gear (TVL,TVS)	Depth strata (1–6)	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
26	TVS	1	2	2	0	0	0	0	100
26	TVS	2	1	1	0	0	0	0	100
26	TVS	3	3	3	0	0	0	0	100

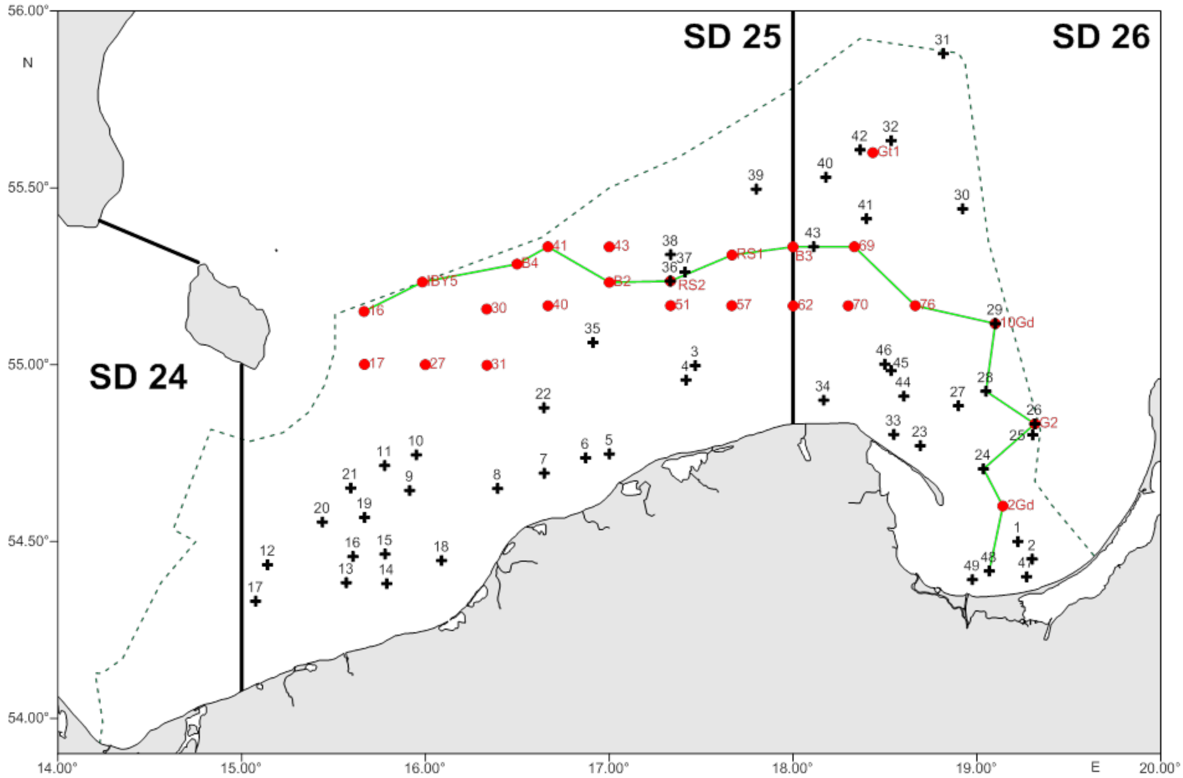
Number of biological samples (Age, Maturity and Length material:			
Species	**Length**	**Age**	**Maturity**
Gadus morhua	1119	256	257
Platichthys flesus	1469	323	323
Clupea harengus	1997		
Sprattus sprattus	342		
Alosa fallax	2		
Pleuronectes platessa	3	3	3
Osmerus eperlanus	23		
Myoxocephalus scorpius	28		
Gasterosteus aculeatus	1		
Cyclopterus lumpus	1		

Nation:	Poland	Vessel:	RV "Baltica"
Survey:	BITS-Q1/2015	Dates:	12/02–27/02/2015

Cruise	No. 2/2015/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 2014) 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 - 110 m. Totally, 49 fish catch-stations can be accepted as representative. There were no planned fish hauls omitted, as the oxygen content was always above critical minimum (i.e. 1.5 ml/l) in the bottom-waters. Zero catches were not achieved. Due to a rocky bottom appearance at part of trawling transects connected with hauls No. 25022, 25002, 25051, 25039, 26106, 26266, 26177, 26172 fishing was shortened to 15 minutes. In the cases of haul No. 26130, the primary selected towing position is located in the Russian zone and the new geographical coordinates (54°45.9'N; 19°16.4'E) for catch-station No. 26130 should be assigned if will be still realized by the Polish vessel (depth is the same). Also in case of haul No. 26276, the primary selected towing position is in the Russian zone and the new geographical coordinates (54°50.1'N; 19°14.4'E) for catch-station No. 26276 should be assigned if will be still realized by Polish vessel (depth the same). The position of haul No. 26286 is suitable, but the depth is completely different (57 m assigned, 97 m in fact). Haul No. 26046 was shortened to 15 minutes due to appearance of very danger obstacles on the seabed. The catch-station No. 26046 should be deleted from the TD list; Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 45 fish catch-stations starting positions and 25 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" 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
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	11	11	0	0	0	0	100
25	TVL	3	5	5	0	0	0	0	100
25	TVL	4	5	5	0	0	0	0	100
25	TVL	5	2	2	0	0	0	0	100
26	TVL	2	5	5	0	0	0	0	100
26	TVL	3	3	2	0	0	0	0	67
26	TVL	4	4	4	0	0	0	0	100
26	TVL	5	8	9	0	0	0	0	113
26	TVL	6	4	4	0	0	0	0	100

Number of biological samples (maturity and age material, *maturity only):		
Species (Latin name)	Length	Age and maturity
Gadus morhua	10712	526
Platichthys flesus	4482	863
Clupea harengus	3895	480
Sprattus sprattus	4800	531
Pleuronectes platessa	215	201
Psetta maxima	6	6
Cyclopterus lumpus	2	2
Enchelyopus cimbrius	275	73
Hyperoplus lanceolatus	12	10
Osmerus eperlanus	87	34
Merlangius merlangus	37	37
Myoxocephalus scorpius	26	23
Limanda limanda	1	1
Pomatoschistus minutus	1	1
Zoarces viviparus	2	
Alosa fallax	5	5
Trachurus trachurus	1	
Scomber scombrus	2	
Engraulis encrasicolus	421	
Gasterosteus aculeatus	83	
Neogobius melanostomus	1	
Melanogrammus aeglefinus	1	1
Trisopterus minutus	1	
Caranx rhonchus	126	



Crosses – fish control stations, red dots – hydrological stations, green line – hydrological profile.

Nation:	**Latvia**	**Vessel:**	**RV “Baltica”**
Survey:	BITS-Q1/2015	**Dates:**	06–14/03/2015

Cruise	No. 1/2015
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 original surveys plan provided that 25 control-hauls will be realized in the Latvian EEZ (16 trawls in SD 28 and 9 trawls in SD 26) and 5 additional control-hauls in the Lithuanian EEZ (SD 26). The RV“Baltica” realized 30 bottom-trawl control-hauls from the 30 planned, incl. the Latvian territorial waters (Figure 1, Table 1). One additional catch-stations in the Lithuanian EEZ were only initiated by hydrological parameters measurement and due to very low oxygen concentration (below 1.0 ml/l) near bottom, fishing was omitted. Overall, 5 hauls were conducted in Lithuanian EEZ and 25 hauls within the Latvian EEZ (incl. the Latvian territorial waters; Figure 1). 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. The mean speed of vessel while trawling was 3.0 knots. However, in the case of 15 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder or bad weather. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 30 fish catch-stations starting positions and 5 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-divis-ions	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	3	1						0
26	TVL	4	5		11	1			240
26	TVL	5	2		1				50
26	TVL	6	1		1				100
28	TVL	2	3		3				100
28	TVL	3	4		3				75
28	TVL	4	6		7				117
28	TVL	5	3		3				100

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

Species	Length	Age
Gadus morhua	1318	617
Platichthys flesus	2515	612
Clupea harengus	2694	
Sprattus sprattus	2153	
Scophthalmus maximus	3	
Pleuronectes platessa	2	
Zoarces viviparus	25	
Cyclopterus lumpus	4	
Myoxocephalus scorpius	83	
Osmerus eperlanus	19	
Gasterosteus aculeatus	121	
Enchelyopus cimbrius	1	
Hyperoplus lanceolatus	1	

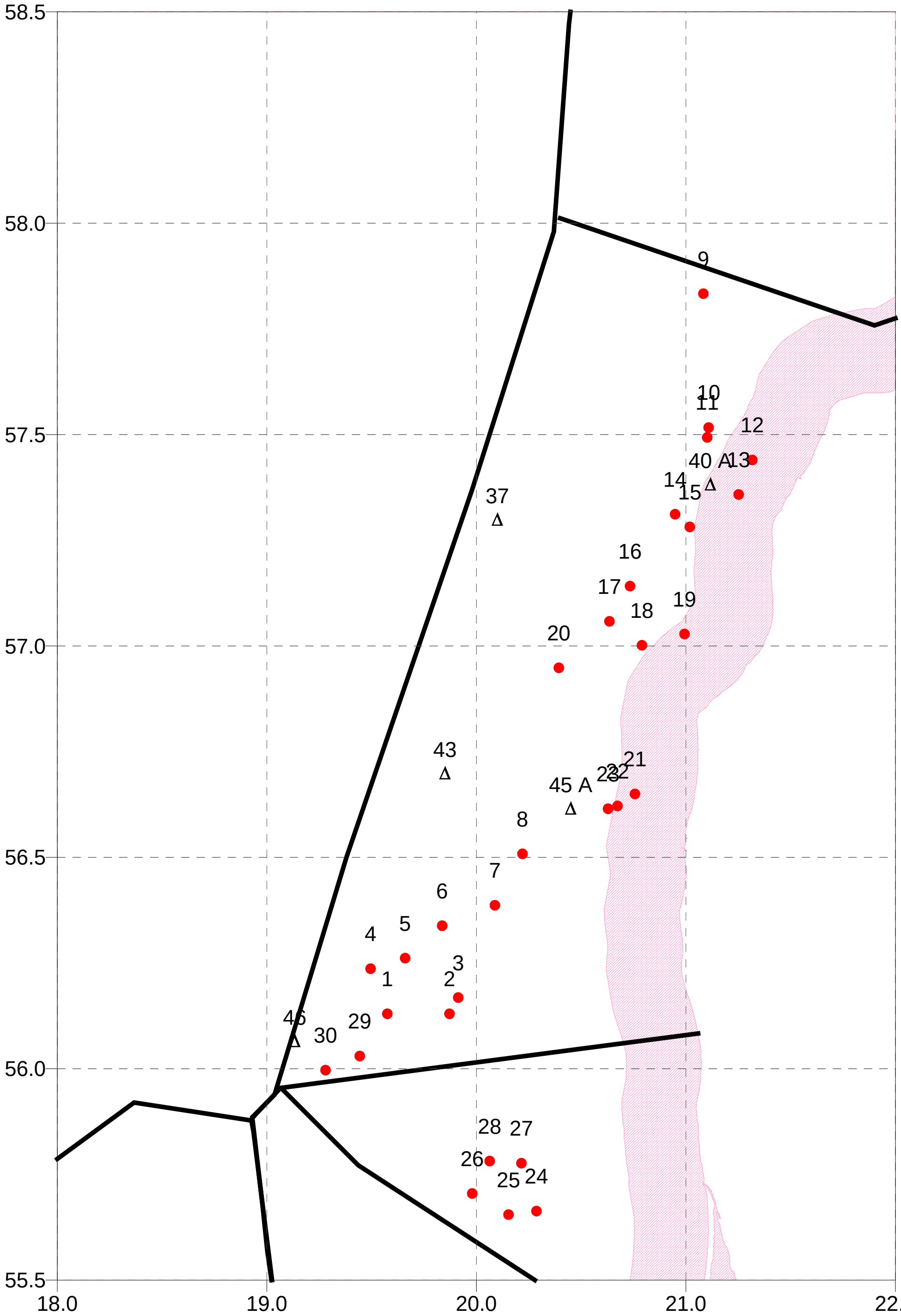


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with black triangles), black lines - national fishing zone borders.

Nation:	Denmark	Vessel:	RV "Havfisken"
Survey:	KASU	Dates:	24/2–13/3 2015

Cruise	
Gear details:	The small (#520) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	3 stations in the ICES Subdivision 22 were moved due to problems with stones or other problems at the stations.

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
22	TVS	1	8	8					100
22	TVS	2	12	12					92
21	TVS	1	7	7					100
21	TVS	2	10	10					100
21	TVS	3	7	7					100
20	TVS	2	1	1					100
20	TVS	3	1	1					100
23	TVS	1	1	1					100
23	TVS	2	2	2					100

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

Species	Number of otoliths	Species	Number of otoliths
sole	57	saithe	
cod	343	dab	59
whiting	50	haddock	
witch	9	turbot	
hake	18	brill	
plaice	339		

Annex 7: Extended cruise reports of BITS in the 4th quarter 2014 and the 1st quarter 2015

Annex 7: Extended cruise reports of BITS in the 4th quarter 2014 and the 1st quarter 2015

Notes:

a) the text should be prepared in Word format as *.doc,
b) Authors are fully responsible for quality of the prepared text and all kind of presented data.

Sweden. Baltic International Trawl Survey (BITS) R/V Dana, 14 – 21 November 2014

Expedition leader : Ann-Christin Rudolphi and Olof Lövgren
Scientific leader : Michele Casini

Summary

The survey was conducted using the TV3L demersal trawl according to the Baltic International Trawl Survey (BITS) manual (Anon., 2014a). Sweden was assigned 30 randomly selected hauls of which R/V Dana realized 26 valid stations. Four stations were not visited because of prohibition from the Swedish Armed Forces.

Overall, Dana made 29 hauls with TV3L demersal trawl (including eight 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 25 fish species were caught. The total catch, in terms of weight, was dominated by herring, cod, sprat, flounder and fourhorn sculpin.

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., 2014a) and the recommendations from WGBIFS 2014 (ICES 2014b). Sweden is one of the eight countries performing the BITS survey during this period of the year.

The expedition started in Ystad on Thursday 13 November and ended in Copenhagen on Saturday 24 November. The weather during the expedition was varied, with gale in average wind November 15-16, then weaker winds.

Sweden was allocated 30 random stations: 9 in SD 25, 4 in SD 26, 10 in SD 27 and 7 in SD 28 (Fig. 1, Table 1). Trawling could only be performed in 19 stations of the 30 allocated included 8 fictitious hauls (see table 1). Several reasons contributed to the other 11 random stations could not be trawled. This was due to bottoms judged not suitable for trawling with TV3-trawl (3 stations). These latter stations were replaced. Eight stations could not be visited cause of the Swedish armed forces (SAF) prohibition (Table 3). Four of these stations could be replaced with stations in the same depth interval and SD while 4 stations could not be trawled or replaced. SAF has a number of selected areas within 12nm from Swedish coast where foreign research vessels (as Dana) are prohibited to enter. Overall, Dana performed 26 valid trawl hauls (including the 8 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, 25 different species were caught (Table 2). Totally, 20,3 tons of fish were caught, of which 3,7 tons of cod (16484 individuals), 12,7 tons of herring and 2,7 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, 641 cods were age-estimated.

For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 777 flounder otoliths were sampled.

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

Ad-hoc studies and sampling were performed:

- Collection of herring in all stations to Michele Casini for genetic analysis

Other

The results of Swedish BITS expeditions are presented yearly in a report by SLU-Department of Aquatic Resources.
All Swedish BITS data are uploaded into FISKDATA 2 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

Olof Lövgren	SLU, Havsfiskelaboratoriet
Johnny Bengtsson	SLU, Havsfiskelaboratoriet
Alessandro Orio	SLU, Havsfiskelaboratoriet
Marie Leiditz	SLU, Havsfiskelaboratoriet
Fredrik Nilsson	SLU, Havsfiskelaboratoriet
Anne-Marie Palmén Bratt	SLU, Havsfiskelaboratoriet
Mikael Pettersson	SLU, Kustlaboratoriet
Ann-Christin Rudolphi, exp. leader	SLU, Havsfiskelaboratoriet

References

Anon., 2014a. Manual for the Baltic International Trawl Surveys. Manual for the Baltic International Trawl Surveys (BITS). ICES CM 2014/SSGESST:13
Anon., 2014b. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2014/SSGESST:13

Figure 1. Map of the trawl stations performed during the Swedish BITS Quarter 4 2014. Trawled stations including 6 fictitious hauls.

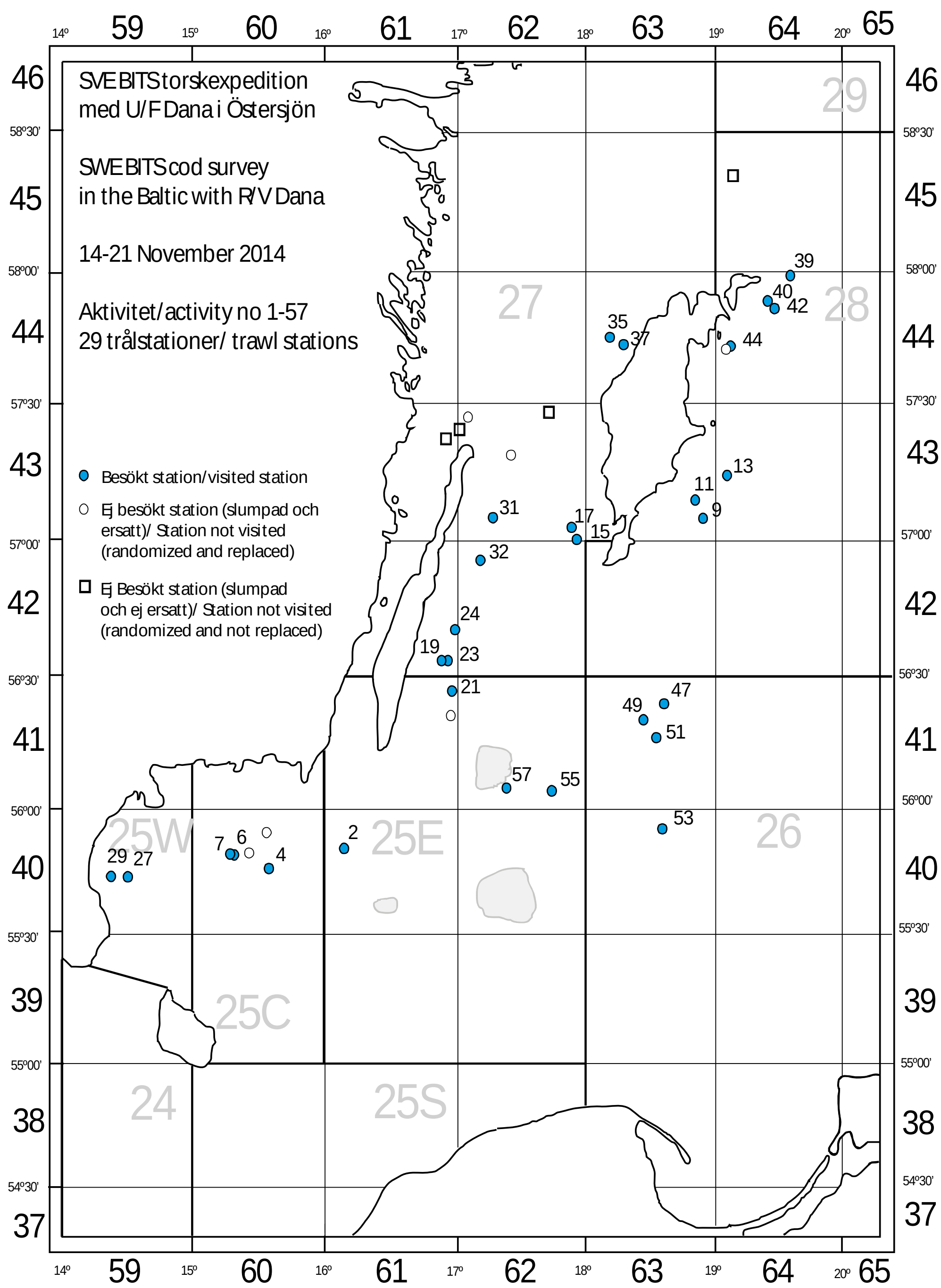


Figure 2. Oxygen concentration (red numbers) 1 m from the bottom at the trawl stations. Numbers in brackets (black) indicate bottom depth. Swedish BITS, Quarter 4 2014.

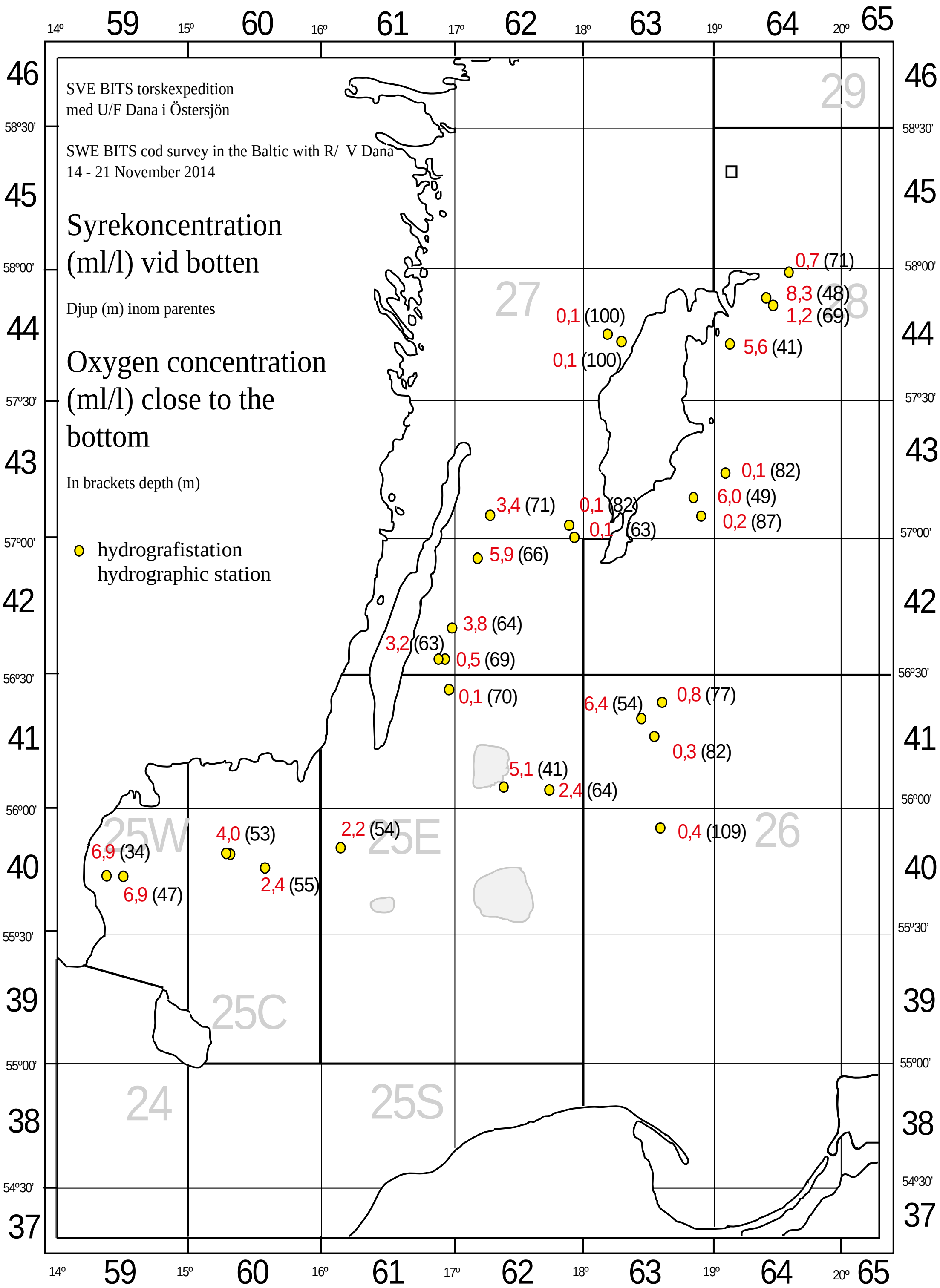


Table 1. Summary of all stations. Swedish BITS quarter 4 2014.

Trålstationer gjorda/stations realized : total	29	Beståndsuppskattningsdrag/Valid hauls for assessment:			
slumpade giltiga/randomized valid	11	Tilldelade drag/	SD28	7	
fiktiva (syrebrist)/oxygen deficiency	8	Allocated hauls	SD27	10	
giltiga ersättningsdrag/valid replacement hauls	7		SD26	4	
kompletteringsdrag/additional hauls	2		SD25	9	TV3 trawl station
ogiltiga drag/invalid hauls	1	Utförda giltiga drag/	SD28	6	Fiktiva drag/oxygen deficiency
		Realized hauls	SD27	7	Ogiltigt drag/invalid haul
Slumpade stationer ej trålade/	10		SD26	4	Hydrographic station (SEA)
randomized stations, not trawled			SD25	9	Kompletteringsdrag/ additional haul

Datum Date	Akti-vitet nr Act. no	Om-råde Area SD	Ruta Rect.	Posi-tion N Lati-tude	Posi-tion E Longi-tude	Stat. nr New haul no	Station-namn Station name	Red-skap Gear	Trål-tid Dura-tion min	Trål-djup Trawl-depth m	Hydro Djup Depth m	Hydro O2 Oxy-gen ml/l	Anmärk-ningar	Remarks
2014-11-14	1	25E	4061	5550861	1610152	25145	18 SE UTKLIPPAN	SEA			54	2,2		
2014-11-14	2	25E	4061	5550234	1611215	25145	18 SE UTKLIPPAN	TV3	30	58				
2014-11-14	3	25C	4060	5546427	1537470	25397	8 NW TÅNGEN	SEA			55	2,4		
2014-11-14	4	25C	4060	5546464	1535555	25397	8 NW TÅNGEN	TV3	30	61			Ersatte 25142.	Replaced 25142.
2014-11-14	5	25C	4060	5548294	1517079	25123	3 N VÄSTRA NABBEN	SEA			53	4,0		
2014-11-14	6	25C	4060	5548424	1517315	25123	3 N VÄSTRA NABBEN	TV3	30	55				
2014-11-14	7	25C	4060	5550259	1517186	25426	3NW VÄSTRA NABBEN	TV3	30	51			Ersatte 25404.	Replaced 25404.
2014-11-15	8	28	4363	5702952	1853194	28107	12 SE NÄR	SEA			91	0,3		
2014-11-15	9	28	4363	5702897	1853222	28107	12 SE NÄR	TV3	30	87		0,2	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-15	10	28	4363	5711037	1853899	28096	5 SE NÄR	SEA			54	4,9		
2014-11-15	11	28	4363	5710498	1851815	28096	5 SE NÄR	TV3	30	49		6,0		
2014-11-15	12	28	4364	5715413	1906159	28072	13 E LJUGARN	SEA			85	0,1		
2014-11-15	13	28	4364	5715386	1905926	28072	13 E LJUGARN	TV3	30	82		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-15	14	27	4362	5701416	1757570	27024	8 NW HOBURG	SEA			67	0,1		
2014-11-15	15	27	4362	5701341	1755619	27024	8 NW HOBURG	TV3	30	63		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-15	16	27	4362	5702469	1752336	27013	11,5 NW HOBURG	SEA			83	0,1		
2014-11-15	17	27	4362	5702399	1751963	27013	11,5 NW HOBURG	TV3	30	82		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-16	18	27	4261	5634717	1653667	27021	6 SE BLÄSINGE	SEA			66	2,6		
2014-11-16	19	27	4261	5634192	1651120	27021	6 SE BLÄSINGE	TV3	30	63		3,2	Ersatte 27025.	Replaced 27025.
2014-11-16	20	25E	4261	5630276	1655271	25315	15 NE SEGERSTAD	SEA			70	0,1		
2014-11-16	21	25E	4161	5628965	1657493	25315	15 NE SEGERSTAD	TV3	30	72			Ersatte 25314.	Replaced 25314.
2014-11-16	22	27	4261	5632473	1655009	27004	8 SE BLÄSINGE	SEA			69	0,5		
2014-11-16	23	27	4261	5632578	1655036	27004	8 SE BLÄSINGE	TV3	30	75				
2014-11-16	24	27	4261	5640325	1659281	24028	10 SSE KAPELL-UDDEN	TV3	30	67			Komplet-terings-drag.	Additional haul.

Table1 continued

Datum Date	Akti-vitet nr Act. no	Om-råde Area SD	Ruta Rect.	Posi-tion N Lati-tude	Posi-tion E Longi-tude	Stat. nr New haul no	Station-namn Station name	Red-skap Gear	Trål-tid Dura-tion min	Trål-djup Trawl-depth m	Hydro Djup Depth m	Hydro O2 Oxy-gen ml/l	Anmärk-ningar	Remarks
2014-11-16	25	27	4261	5641852	1658976	24028	10 SSE KAPELL-UDDEN	SEA			64	3,8		
2014-11-17	26	25W	4059	5539649	1429084	25353	RACKAPUTT NORD	SEA			50	6,9		
2014-11-17	27	25W	4059	5541109	1430268	25353	RACKAPUTT NORD	TV3	30	47		6,9		
2014-11-17	28	25W	4059	5540955	1423205	25419	3,5 NE STENSHUVUD	SEA			40	6,9		
2014-11-17	29	25W	4059	5541910	1421813	25419	3,5 NE STENSHUVUD	TV3	30	34		6,9		
2014-11-18	30	27	4362	5705424	1718204	27010	7 ESE HÖGBY FYR	SEA			71	3,4		
2014-11-18	31	27	4362	5706056	1717090	27010	7 ESE HÖGBY FYR	TV3	30	71		3,4	Ersatte 27029.	Replaced 27029.
2014-11-18	32	27	4262	5656227	1710466	27005	10 E KÅREHAMN	TV3	30	73			Komplet-terings-drag.	Additional haul.
2014-11-18	33	27	4262	5658203	1710675	27005	10 E KÅREHAMN	SEA			66	5,9		
2014-11-18	34	27	4463	5745939	1809836	27018	6 NW VISBY	SEA			100	0,1		
2014-11-18	35	27	4463	5745779	1819239	27018	6 NW VISBY	TV3	30	104			Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-18	36	27	4463	5745816	1819675	27019	6 N VISBY	SEA			100	0,1		
2014-11-18	37	27	4463	5745803	1819544	27019	6 N VISBY	TV3	30	104			Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-19	38	28	4564	5801587	1932586	28105	6,5 ENE FÅRÖ	SEA			96	0,1		
2014-11-19	39	28	4564	5800119	1932724	28105	6,5 ENE FÅRÖ	TV3	30	71		0,7	Ogiltigt. Trålen riven.	Invalid. Trawl damaged.
2014-11-19	40	28	4464	5754047	1925955	28027	5 SE FÅRÖ	TV3	30	48		8,3		
2014-11-19	41	28	4464	5753564	1932429	28104	6,5 SE FÅRÖ	SEA			63	1,8	För grund.	Too shallow.
2014-11-19	42	28	4464	5752705	1930390	28104	6,5 SE FÅRÖ	TV3	30	69		1,2	Ersatte 28105.	Replaced 28105.
2014-11-19	43	28	4464	5751980	1930599	28104	6,5 SE FÅRÖ	SEA			69	1,2		
2014-11-19	44	28	4464	5742957	1910167	28186	3,8 SE GRAUTEN NORD	TV3	25	41		5,6	Ersatte 28185.	Replaced 28185.
2014-11-19	45	28	4464	5742359	1909963	28186	3,8 SE GRAUTEN NORD	SEA			42	5,6		
2014-11-20	46	26	4163	5625731	1841046	26074	10,5 S HOBURG BANK	SEA			83	0,5		
2014-11-20	47	26	4163	5624820	1837390	26074	10,5 S HOBURG BANK	TV3	30	77		0,8		
2014-11-20	48	26	4163	5622018	1833080	26032	14 S HOBURG BANK	SEA			62	4,2		
2014-11-20	49	26	4163	5620847	1829186	26032	14 S HOBURG BANK	TV3	30	54		6,4		
2014-11-20	50	26	4163	5618301	1834801	26124	16 S HOBURG BANK	SEA			90	0,6		
2014-11-20	51	26	4163	5618273	1834667	26124	16 S HOBURG BANK	TV3	30	82		0,3	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-20	52	26	4063	5555641	1837354	26221	11 SSW BANANBANK	SEA			109	0,4		
2014-11-20	53	26	4063	5556045	1833796	26221	11 SSW BANANBANK	TV3	30	113			Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2014-11-21	54	25E	4162	5606768	1746661	25311	SE NORRA MIDSJÖBANKEN	SEA			66	2,2		
2014-11-21	55	25E	4162	5604438	1745915	25311	SE NORRA MIDSJÖBANKEN	TV3	30	64		2,4		
2014-11-21	56	25E	4162	5604009	1729646	25461	4 SE NORRA MIDSJÖBANKEN	SEA			44	4,9		
2014-11-21	57	25E	4162	5605157	1724974	25461	4 SE NORRA MIDSJÖBANKEN	TV3	30	41		5,1		

Table 2. Summary of the species in the catches. Swedish BITS, quarter 4 2014.

Namn Local name	Latinskt namn Species	SD 25W Antal No.	 Vikt (kg) Weight (kg)	SD 25C Antal No.	 Vikt (kg) Weight (kg)	SD 25E Antal No.	 Vikt (kg) Weight (kg)	SD 26 Antal No.	 Vikt (kg) Weight (kg)	SD 27 Antal No.	 Vikt (kg) Weight (kg)	SD 28 Antal No.	 Vikt (kg) Weight (kg)	Totalt Antal No.	 Vikt (kg) Weight (kg)
TORSK	*Gadus morhua*	3 818	879,0	8 380	1 855,3	4 079	909,1	49	12,8	122	27,8	37	9,0	16 484	3 693,1
SILL	*Clupea harengus*	659	39,4	10 224	586,0	32 870	1 816,5	34 599	1 507,8	142 205	6 349,9	73 931	2 445,1	294 489	12 744,8
SKARPSILL	*Sprattus sprattus*	216	2,9	16 166	250,1	60 868	592,7	124 591	554,1	86 086	1 160,8	22 197	164,1	310 125	2 724,7
ANSJOVIS	*Engraulis encrasicolus*					1	0,01							1	0,01
FYRTÖMMAD SKÄRLÅNGA	*Enchelyopus cimbrius*			7	0,5									7	0,5
GRÅSEJ	*Pollachius virens*					1	0,9			1	1,0			2	1,9
HORNSIMPA	*Myoxocephalus quadricornis*											2 577	374,7	2 577	374,7
KLARBULT	*Aphia minuta*	6	0,01											6	0,01
KOLJA	*Melanogrammus aeglefinus*	1	0,7											1	0,7
NORS	*Osmerus eperlanus*	1	0,01											1	0,01
PIGGVAR	*Scophthalmus maximus*	19	9,7			1	0,5					2	1,2	22	11,4
STUBBAR (släkte)	*Pomatoschistus*	259	0,1	3	0,003							23	0,03	285	0,1
RÖDSPÄTTA	*Pleuronectes platessa*	53	13,6	30	6,0	26	5,1			5	0,9	2	0,4	116	26,1
RÖTSIMPA	*Myoxocephalus scorpius*	4	0,5	13	1,9	7	1,4	74	15,0	23	3,7	381	63,4	502	85,9
SANDSKÄDDA	*Limanda limanda*	3	0,5											3	0,5
SANDSTUBB	*Pomatoschistus minutus*											1	0,003	1	0,003
SJURYGG	*Cyclopterus lumpus*							3	0,7			7	2,1	10	2,8
SJUSTRÅLIG SMÖRBULT	*Gobiusculus flavescens*	1	0,001											1	0,001
SKRUBBSKÄDDA	*Platichthys flesus*	1 044	269,8	437	90,7	87	19,2	24	4,3	146	28,6	1 729	174,5	3 467	587,0
SMÅSPIGG	*Pungitius pungitius*									2	0,002	3	0,003	5	0,01
SPETSSTJÄRTAT LÅNGEBARN	*Lumpenus lampretaeformis*											10	0,1	10	0,1
STORSPIGG	*Gasterosteus aculeatus*	2	0,002			500	0,6	66	0,2	3 665	5,6	412	0,7	4 645	7,0
TEJSTEFISK	*Pholis gunnellus*	1	0,001											1	0,001
VITLING	*Merlangius merlangus*	1	0,2	1	0,1									2	0,3
ÅLKUSA	*Zoarces viviparus*											7	0,3	7	0,3
SUMMA	TOTAL	6 089	1 288	35 260	2 792	98 441	3 351	159 406	2 096	232 255	7 580	101 319	3 236	632 770	20 343

Table 3. List over stations not trawled and prohibited by Swedish Armed Forces Q4 2014.

Nr_Haul	Square	SD	Lat1	Lon1	Plats/Location	Depth	Ersatt med	Replaced with
25314	4161	25E	5621	1658	Namnlös/no name	70	Ersätts med 25315 denna finns ej!	Replaced with25315 Station does not exist
28097/2	4464	28	5752,5	1925,6	5 SE FÅRÖ	49	28027 2 stationsnr men en station	28027 two stationnr but only one station
28185	4464	28	5742,12	1906,41	3 SE GRAUTEN	36	3 SE Grauten.Rivit en gång. Ersätts med 28186	Rough bottom replaced with 28186
25404	4060	25C	5549,52	1525,99	YTTERTORPET	51	FÖRBJUDEN MILITÄREN. Ersatt med 25426	SAF prohibition replaced with 25426
25142	4060	25C	5553,3	1534,27	5 SSW UTKLIPPAN	50	FÖRBJUDEN MILITÄREN. Ersatt med 25397	SAF prohibition replaced with 25397
27025	4362	27	5728,28	1704,79	3 SW ÖLANDS NORRA GRUND	63	FÖRBJUDEN MILITÄREN. Ersatt med 27021	SAF prohibition replaced with 27021
27029	4362	27	5718,13	1724,98	11 ESE Ölands norra udde	74	FÖRBJUDEN MILITÄREN. Ersatt med 27010	SAF prohibition replaced with 27010
27020	4361	27	5721,79	1655,24	4 NW BYXELKROK	45	FÖRBJUDEN MILITÄREN. ERSÄTTS EJ.	SAF prohibition No replace station possible.
27003	4362	27	5724,56	1701,56	5 N BYXELKROK	57	FÖRBJUDEN MILITÄREN. ERSÄTTS EJ.	SAF prohibition No replace station possible.
27026	4362	27	5729,03	1743,64	10 SE KNOLLS GRUND	108	FÖRBJUDEN MILITÄREN. ERSÄTTS EJ.	SAF prohibition No replace station possible.
28189	4564	28	5820,42	1906,6	4 W GOTSKA SANDÖN	69	FÖRBJUDEN MILITÄREN. ERSÄTTS EJ.	SAF prohibition No replace station possible.

Sweden. Baltic International Trawl Survey (BITS)
R/V Dana, 26 February – 08 March 2015

Expedition leader : Ann-Christin Rudolphi and Olof Lövgren
Scientific leader : Michele Casini

Summary

The survey was conducted using the TV3L demersal trawl according to the BITS manual (Anon., 2014a). Sweden was assigned 50 randomly selected hauls of which Dana realized 46 valid stations. Four stations could not be trawled because the access prohibition to some areas from the Swedish armed forces (Table 3).

Overall, Dana made 49 hauls with TV3L demersal trawl (including 11 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 26 fish species were caught. The total catch, in terms of weight, was dominated by herring, sprat, cod, flounder, shorthorn and fourhorn sculpin.

The hydrographical conditions were 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., 2014a) and the recommendations from WGBIFS 2014 (ICES 2014b). Sweden is one of the seven countries performing the BITS survey during this period of the year.

The expedition started in Copenhagen on Wednesday February 25 and ended up in Ystad Monday 09 of March. The weather during the expedition was calm except Sunday March first with winds up to gale.

Sweden was allocated 50 random stations: 19 in SD 25, 8 in SD 26, 10 in SD 27 and 13 in SD 28 (Fig. 1, Table 1). Trawling could only be performed in 38 stations of the 50 allocated (see table 1) This was due to oxygen concentration < 1.5 ml/l (11 stations, so called fictitious stations) or bottoms evaluated not suitable for trawling with TV3-trawl (three stations). These latter three stations were replaced by three other stations in the same depth interval and SD. 11 stations could not be visited cause of the Swedish armed forces (SAF) prohibition (Table 3). Seven of these stations could be replaced with stations in the same depth interval and SD while four stations could not be trawled or replaced. SAF has a number of selected areas within 12nm from Swedish coastline where foreign research vessels (as Dana) are prohibited to enter. Overall, Dana performed 46 valid trawl hauls (including the 11 fictitious stations) that can be used in stock assessment. Three additional stations were trawled in SD 27 (not used in stock assessment). The fictitious stations are used in stock assessment as 0-catch stations.

Hydrography

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

Fish catches

Overall, 26 different fish species were caught (Table 2). Totally, 39 tons of fish were caught, of which 4.63 tons of cod (18 565 individuals), 23.1 tonnes of herring and 8.5 tonnes 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, 869 cods were age-estimated.
For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 1 111 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 tissue samples (50 specimen by SD25,26 and 27) to Henrik Svedäng, Institute of Marine Research, for genetic analysis.
- Maturity calibration of herring. 2*5kg from each ICES subdivision 25, 26, 27 and 28 to Institute of Marine Research.
- Sampling of Baltic herring and sprat for the analysis of dioxins and PCBs from ICES subdivisions 25 and 27 for Swedish National food agency.

Other

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

All Swedish BITS data are uploaded into FISKDATA 2 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

Fredrik Landfors	SLU, Kustlaboratoriet
Rebecca Eliasson	SLU, Havsfiskelaboratoriet
Marie Leiditz	SLU, Havsfiskelaboratoriet
Fredrik Nilsson	SLU, Havsfiskelaboratoriet
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Ann-Marie Palmén Bratt	SLU, Havsfiskelaboratoriet

References

Anon., 2014a. Manual for the Baltic International Trawl Surveys. Manual for the Baltic International Trawl Surveys (BITS). ICES CM 2014/SSGESST:13

Anon., 2014b. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2014/SSGESST:13

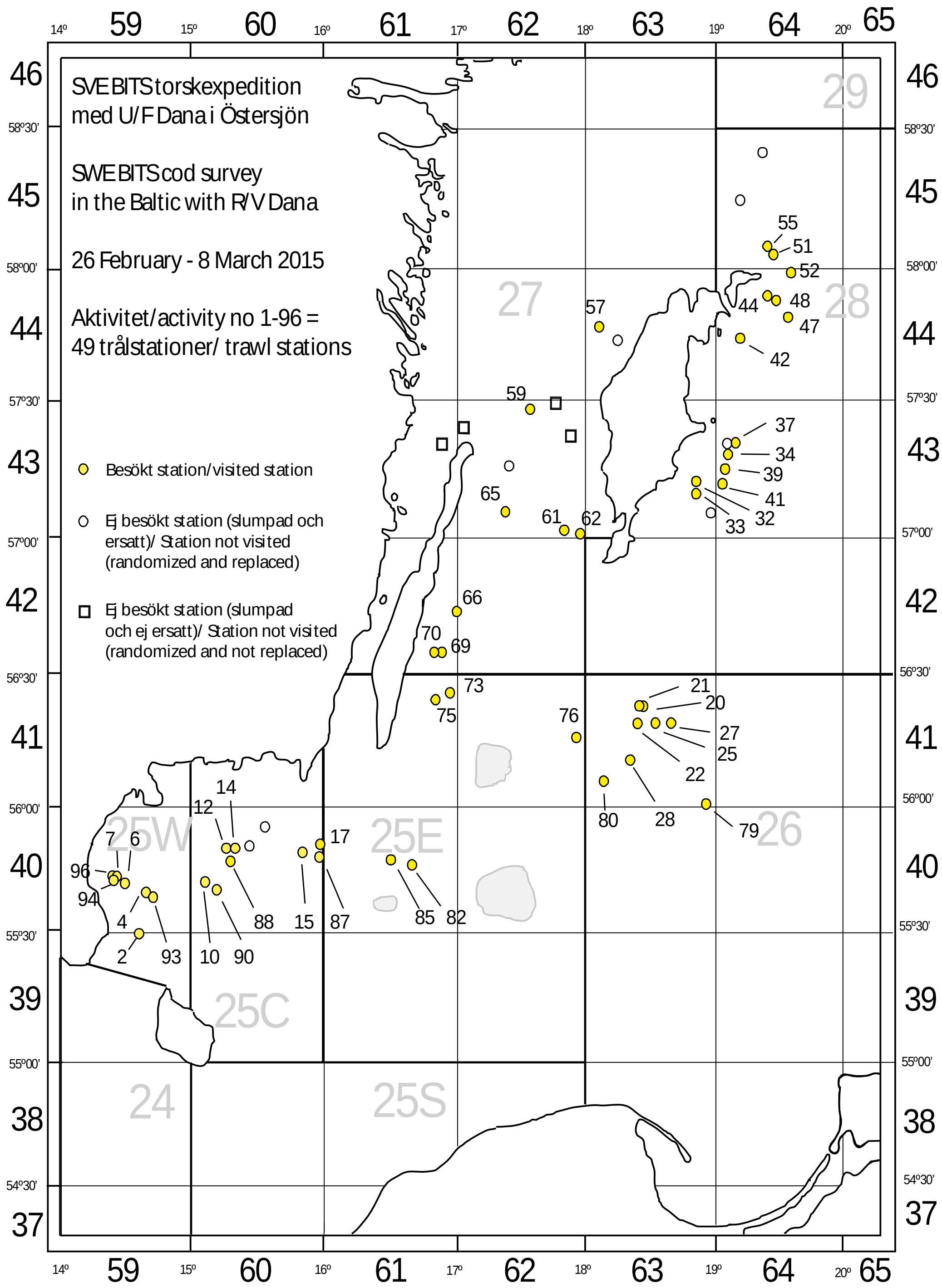

Figure 1. Map of the trawl stations performed during the Swedish BITS, Quarter-1, 2015. (Trawled stations include 11 fictitious hauls).

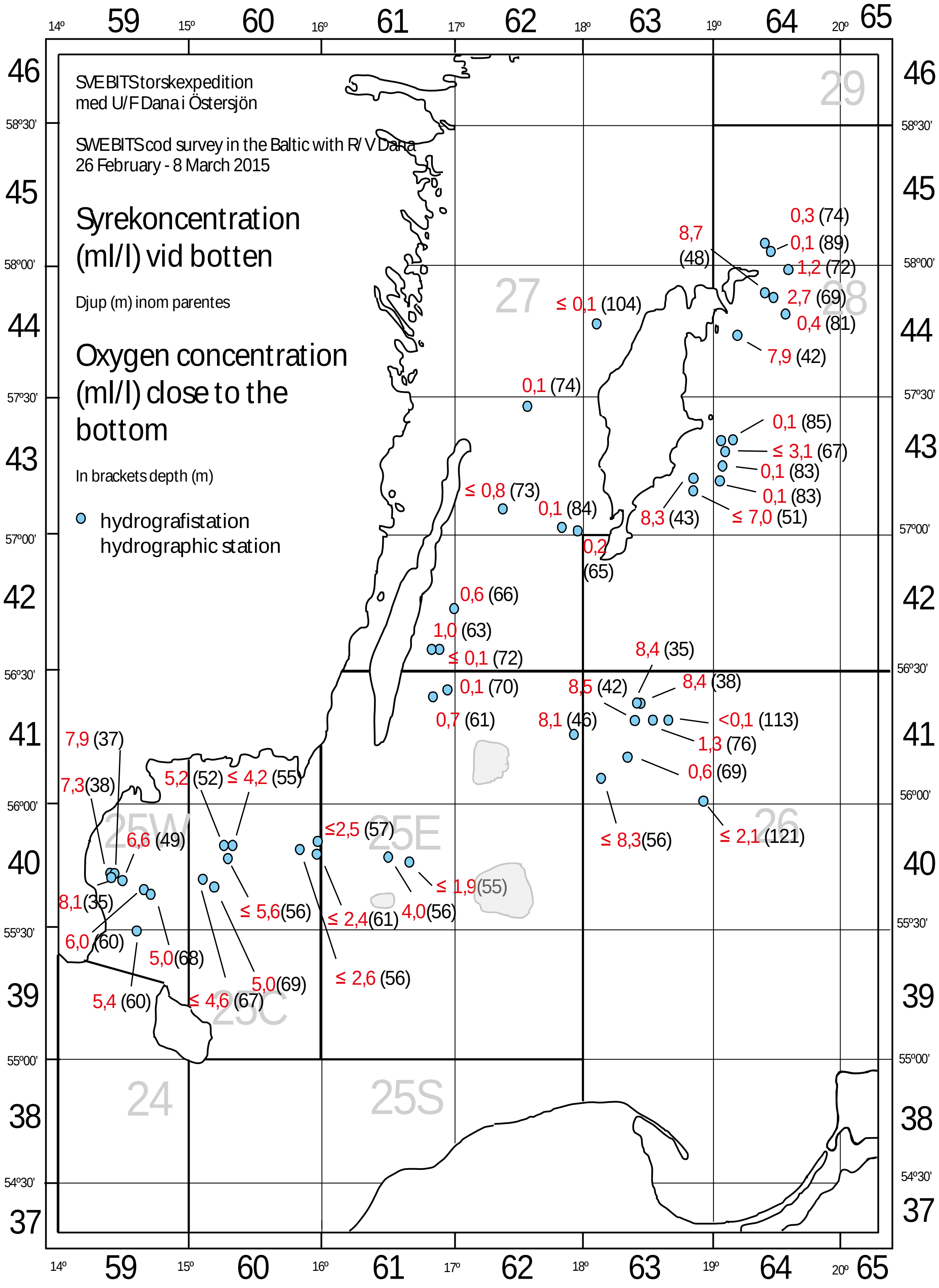

Figure 2. Oxygen concentration (red numbers) 1 m from the bottom at the trawl stations. Numbers in brackets (black) indicate bottom depth. Swedish BITS, Quarter-1, 2015.

Table 1. Summary of all stations. Swedish BITS, quarter 1 2015

Trålstationer gjorda/stations realized :	total 49	Beståndsuppskattningsdrag/Valid hauls for assessment:			
slumpade giltiga/randomized valid	27	Tilldelade drag/	SD28	13	
fiktiva (syrebrist)/oxygen deficiency	11	Allocated hauls	SD27	10	
giltiga ersättningsdrag/valid replacement haul	8		SD26	8	
kompletteringsdrag/additional hauls	3		SD25	19	TV3 trawl station
ogiltiga drag/invalid hauls	0	Utförda giltiga drag/	SD28	13	Fiktiva drag/oxygen deficiency
		Realized hauls	SD27	6	Ogiltigt drag/invalid haul
Slumpade stationer ej trålade/	14		SD26	8	Hydrographic station (SEA)
randomized stations, not trawled			SD25	19	Kompletteringsdrag/ additional haul

Datum Date	Akti-vitet nr Act. no	Om-råde Area SD	Ruta Rect.	Posi-tion N Lati-tude	Posi-tion E Longi-tude	Stat. nr New haul no	Station-namn Station name	Red-skap Gear	Trål-tid Dura-tion min	Trål-djup Trawl-depth m	Hydro Djup Depth m	Hydro O2 Oxy-gen ml/l	Anmärk-ningar	Remarks
2015-02-26	1	25W	3959	5527,952	1436,963	25435	SLAGGE-NABBEN	SEA			63	5,4		
2015-02-26	2	25W	3959	5528,905	1436,289	25435	SLAGGE-NABBEN	TV3	30	60		5,4		
2015-02-26	3	25W	4059	5536,621	1435,784	25093	11 E STENS HUVUD	SEA			62	5,1		
2015-02-26	4	25W	4059	5538,35	1437,371	25093	11 E STENS HUVUD	TV3	30	60		6	Ersatte 25391.	Replaced 25391.
2015-02-26	5	25W	4059	5539,46	1432,056	25421	RACKAPUTT C	SEA			51	6,4		
2015-02-26	6	25W	4059	5540,318	1429,766	25421	RACKAPUTT C	TV3	30	49		6,6		
2015-02-26	7	25W	4059	5542,449	1422,785	25418	RACKAPUTT 38 M	TV3	30	37		7,9		
2015-02-26	8	25W	4059	5542,738	1426,291	25418	RACKAPUTT 38 M	SEA			38	7,9		
2015-02-27	9	25C	4060	5541,022	1503,492	25119	E VÄNERS-BORGS-VRAKET	SEA			62	4,6		
2015-02-27	10	25C	4060	5541,342	1504,687	25119	E VÄNERS-BORGS-VRAKET	TV3	30	67		≤4,6		
2015-02-27	11	25C	4060	5541,548	1507,339	25119	E VÄNERS-BORGS-VRAKET	SEA			63	4,8		
2015-02-27	12	25C	4060	5548,935	1515,311	25426	3 NW VÄSTRA NABBEN	TV3	30	52		5,2		
2015-02-27	13	25C	4060	5547,288	1514,115	25426	3 NW VÄSTRA NABBEN	SEA			53	4,2		
2015-02-27	14	25C	4060	5548,422	1517,497	25123	3 N VÄSTRA NABBEN	TV3	30	55		≤4,2		
2015-02-27	15	25C	4060	5548,147	1548,112	25427	5 N TÅNGEN	TV3	30	56		≤2,6		
2015-02-27	16	25C	4060	5548,456	1552,024	25427	5 N TÅNGEN	SEA	-	-	55	2,6		
2015-02-27	17	25C	4060	5550,075	1556,51	25413	11 SE UTKLIPPAN	TV3	30	57		≤2,5	Ersatte 25142.	Replaced 25142.
2015-02-27	18	25C	4060	5550,815	1559,363	25413	11 SE UTKLIPPAN	SEA	-	-	54	2,5		
2015-02-28	19	26	4163	5624,715	1833,082	26013	11 S HOBURG BANK	SEA	-	-	42	8,4		
2015-02-28	20	26	4163	5623,644	1829,385	26013	11 S HOBURG BANK	TV3	30	38		8,4		
2015-02-28	21	26	4163	5624,187	1829,181	26224	12 SSW HOBURG BANK	TV3	30	35		8,4		
2015-02-28	22	26	4163	5621,037	1826,75	26225	16 SSW HOBURG BANK	TV3	30	42		8,5		
2015-02-28	23	26	4163	5619,496	1825,75	26225	16 SSW HOBURG BANK	SEA	-	-	44	8,5		
2015-02-28	24	26	4163	5619,338	1834,461	26070	15 S HOBURG BANK	SEA	-	-	83	0,3		
2015-02-28	25	26	4163	5619,323	1833,256	26070	15 S HOBURG BANK	TV3	30	76		1,3		
2015-02-28	26	26	4163	5620,096	1843,247	26141	6 NW BANAN-BANKEN	SEA	-	-	113	<0,1		
2015-02-28	27	26	4163	5620,251	1843,219	26141	6 NW BANAN-BANKEN	TV3	30	113		<0,1	Fiktivt drag p g a syrebrist. Ersatte 25142.	Oxygen deficiency haul. Replaced 25142.
2015-02-28	28	26	4163	5612,361	1821,722	26010	14 W BANAN-BANKEN	TV3	30	69		0,6		
2015-02-28	29	26	4163	5609,584	1823,429	26010	14 W BANAN-BANKEN	SEA	-	-	70	0,6		
2015-02-28	30	26	4163	5602,712	1856,205	26140	5 SE BANAN-BANKEN	SEA	-	-	118	2,4	Endast hydrografi	Only hydrography.
2015-03-01	31	28	4363	5710,698	1851,188	28179	5 ESE NÄR	SEA	-	-	47	7,0		

Datum Date	Aktivitet nr Act. no	Område Area SD	Ruta Rect.	Position N Latitude	Position E Longitude	Stat. nr New haul no	Stationnamn Station name	Redskap Gear	Tråltid Duration min	Tråldjup Trawl-depth m	Hydro Djup Depth m	Hydro O2 Oxygen ml/l	Anmärkningar	Remarks
2015-03-01	32	28	4363	5711,873	1849,91	28179	5 ESE NÄR	TV3	29	43		8,3		
2015-03-01	33	28	4363	5710,565	1852,322	28096	5 SE NÄR	TV3	25	51		≤7,0		
2015-03-01	34	28	4364	5719,711	1905,00	28103	12 E LJUGARN	TV3	30	67		≤3,1	Ersatte 28181.	Replaced 28181.
2015-03-01	35	28	4364	5719,615	1906,037	28103	12 E LJUGARN	SEA	-	-	64	3,1		
2015-03-01	36	28	4364	5721,069	1911,044	28098	8 SE ÖSTERGARN NORD	SEA	-	-	87	0,1		
2015-03-01	37	28	4364	5721,346	1910,608	28098	8 SE ÖSTERGARN NORD	TV3	30	85		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-01	38	28	4364	5716,865	1907,446	28072	13 E LJUGARN	SEA	-	-	85	0,1		
2015-03-01	39	28	4364	5717,126	1907,21	28072	13 E LJUGARN	TV3	30	83		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-01	40	28	4364	5713,372	1905,653	28071	12 E NÄR	SEA	-	-	88	0,2		
2015-03-01	41	28	4364	5713,485	1905,446	28071	12 E NÄR	TV3	30	83		0,1	Fiktivt drag p g a syrebrist. Ersatte 28067	Oxygen deficiency haul. Replaced 28067.
2015-03-02	42	28	4464	5743,211	1910,635	28186	3,8 SE GRAUTEN NORD	TV3	30	42		7,9	Ersatte 28185.	Replaced 28185.
2015-03-02	43	28	4464	5742,205	1910,003	28186	3,8 SE GRAUTEN NORD	SEA	-	-	42	7,9		
2015-03-02	44	28	4464	5752,412	1925,176	28027	5 SE FÅRÖ	TV3	30	48		8,7	Samma stn som 28097.	Same stn as 28097.
2015-03-02	45	28	4464	5753,575	1927,03	28027	5 SE FÅRÖ	SEA	-	-	54	6,6		
2015-03-02	46	28	4464	5747,609	1932,508	28099	8 SE FÅRÖ	SEA	-	-	84	0,1		
2015-03-02	47	28	4464	5747,736	1932,404	28099	8 SE FÅRÖ	TV3	30	81		0,4	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-02	48	28	4464	5751,488	1928,521	28104	6,5 SE FÅRÖ	TV3	30	69		2,7	Ersatte 28100.	Replaced 28100.
2015-03-02	49	28	4464	5752,388	1932,507	28104	6,5 SE FÅRÖ	SEA	-	-	72	1,5		
2015-03-02	50	28	4564	5802,85	1928,1	28078	E SALVO REV	SEA	-	-	99	0,1		
2015-03-02	51	28	4564	5802,328	1930,59	28078	E SALVO REV	TV3	30	89		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-03	52	28	4464	5758,783	1933,455	28105	6,5 ENE FÅRÖ	TV3	30	72		1,2		
2015-03-03	53	28	4464	5800,466	1932,909	28105	6,5 ENE FÅRÖ	SEA	-	-	79	0,3		
2015-03-03	54	28	4564	5802,745	1927,535	28106	2 E SALVOREV	SEA	-	-	81	0,1		
2015-03-03	55	28	4564	5803,295	1926,718	28106	2 E SALVOREV	TV3	30	74		0,3	Ersatte 28060.	Replaced 28060.
2015-03-03	56	27	4463	5746,116	1807,389	27015	10 NW VISBY	SEA	-	-	102	<0,1		
2015-03-03	57	27	4463	5746,165	1807,698	27015	10 NW VISBY	TV3	30	104		<0,1	Fiktivt drag p g a syrebrist. Ersatte 27019.	Oxygen deficiency haul. Replaced 27019.
2015-03-03	58	27	4362	5728,794	1736,532	27011	5 SSE KNOLLS GRUND	SEA	-	-	81	0,1		
2015-03-03	59	27	4362	5728,83	1736,442	27011	5 SSE KNOLLS GRUND	TV3	30	74		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-04	60	27	4362	5702,558	1750,271	27013	11,5 NW HOBURG	SEA	-	-	86	0,1		
2015-03-04	61	27	4362	5702,539	1750,606	27013	11,5 NW HOBURG	TV3	30	84		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-04	62	27	4362	5701,347	1757,314	27024	8 NW HOBURG	TV3	30	65		0,2	Komplet-terings-drag.	Additional haul.
2015-03-04	63	27	4362	5700,414	1755,818	27024	8 NW HOBURG	SEA	-	-	68	0,1		
2015-03-04	64	27	4362	5705,641	1719,747	27010	7 ESE HÖGBY FYR	SEA	-	-	72	0,8		
2015-03-04	65	27	4362	5705,868	1717,046	27010	7 ESE HÖGBY FYR	TV3	30	73		≤0,8	Ersatte 27029.	Replaced 27029.
2015-03-04	66	27	4261	5643,547	1659,615	27022	9 SE KAPELL-UDDEN	TV3	30	66		0,6		
2015-03-04	67	27	4261	5641,186	1701,534	27022	9 SE KAPELL-UDDEN	SEA	-	-	67	0,5		
2015-03-04	68	27	4261	5631,563	1655,207	27004	8 SE BLÄSINGE	SEA	-	-	70	0,1		

Datum Date	Aktivitet nr Act. no	Område Area SD	Ruta Rect.	Position N Latitude	Position E Longitude	Stat. nr New haul no	Stationnamn Station name	Redskap Gear	Tråltid Duration min	Tråldjup Trawl depth m	Hydro Djup Depth m	Hydro O2 Oxygen ml/l	Anmärkningar	Remarks
2015-03-05	69	27	4261	5631,523	1655,345	27004	8 SE BLÄSINGE	TV3	30	72		≤0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-05	70	27	4261	5634,3	1651,188	27021	6 SE BLÄSINGE	TV3	30	63		1,0	Kompletterings-drag.	Additional haul.
2015-03-05	71	27	4261	5632,747	1651,462	27021	6 SE BLÄSINGE	SEA	-	-	63	0,7		
2015-03-05	72	25E	4161	5630,884	1657,143	25314/ 25315	15 NE SEGERSTAD	SEA	-	-	70	0,1		
2015-03-05	73	25E	4161	5630,903	1657,109	25315	15 NE SEGERSTAD	TV3	30	70		0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-03-05	74	25E	4161	5627,867	1648,768	25169	6,5 NE SEGERSTAD	SEA	-	-	61	0,7		
2015-03-05	75	25E	4161	5627,114	1646,68	25169	6,5 NE SEGERSTAD	TV3	30	61		0,7	Kompletterings-drag.	Additional haul.
2015-03-05	76	25E	4162	5615,402	1753,175	25167	18 ENE NORRA MIDSJÖ-BANKEN	TV3	30	46		8,1		
2015-03-05	77	25E	4162	5613,71	1750,666	25167	18 ENE NORRA MIDSJÖ-BANKEN	SEA	-	-	53	7,7		
2015-03-06	78	26	4163	5602,804	1856,265	26140	5 SSE BANAN-BANKEN	SEA	-	-	118	2,1		
2015-03-06	79	26	4163	5602,353	1856,285	26140	5 SSE BANAN-BANKEN	TV3	30	121		≤2,1		
2015-03-06	80	26	4163	5606,417	1807,469	26275	26 E NORRA MIDSJÖ-BANKEN	TV3	30	56		≤8,3		
2015-03-06	81	26	4163	5605,278	1802,604	26275	26 E NORRA MIDSJÖ-BANKEN	SEA	-	-	52	8,3		
2015-03-06	82	25E	4061	5546,02	1639,656	25462	7 NNE HOLGERS STEN	TV3	30	55		≤1,9		
2015-03-06	83	25E	4061	5545,763	1639,849	25462	7 NNE HOLGERS STEN	SEA	-	-	54	1,9		
2015-03-07	84	25E	4061	5546,049	1627,5	25359	3 W TENERIFFA	SEA	-	-	58	3,4		
2015-03-07	85	25E	4061	5548,363	1631,412	25359	3 W TENERIFFA	TV3	30	56		4,0		
2015-03-07	86	25C	4060	5547,683	1559,343	25299	INRE U10	SEA	-	-	59	2,4		
2015-03-07	87	25C	4060	5547,865	1557,806	25299	INRE U10	TV3	30	61		≤2,4		
2015-03-07	88	25C	4060	5546,202	1518,091	25124	1 WNW VÄSTRA NABBEN	TV3	30	56		≤5,6	Ersatte 25404.	Replaced 25404.
2015-03-07	89	25C	4060	5546,334	1514,233	25124	1 WNW VÄSTRA NABBEN	SEA	-	-	53	5,6		
2015-03-07	90	25C	4060	5539,847	1516,534	25272	6 ESE VÄNERS-BORGS-VRAKET	TV3	30	69		5,0		
2015-03-07	91	25C	4060	5539,85	1513,768	25272	6 ESE VÄNERS-BORGS-VRAKET	SEA	-	-	75	5,0		
2015-03-08	92	25W	4059	5536,967	1448,56	25438	12,5 ENE SIMRISHAMN	SEA	-	-	75	5,1		
2015-03-08	93	25W	4059	5537,556	1445,228	25438	12,5 ENE SIMRISHAMN	TV3	30	68		5,0		
2015-03-08	94	25W	4059	5541,978	1422,277	25416	3,8 NE STENS HUVUD	TV3	30	35		8,1		
2015-03-08	95	25W	4059	5541,091	1422,976	25416	3,8 NE STENS HUVUD	SEA			40	7,0		
2015-03-08	96	25W	4059	5542,17	1422,38	25401	5 NE STENS HUVUD	TV3	30	38		7,3		

Table 2. Summary of the species in the catches. Swedish BITS, quarter 1 2015

Namn Local name	Latinskt namn Species	SD 25W Antal No.	Vikt (kg) Weight (kg)	SD 25C Antal No.	Vikt (kg) Weight (kg)	SD 25E Antal No.	Vikt (kg) Weight (kg)	SD 26 Antal No.	Vikt (kg) Weight (kg)	SD 27 Antal No.	Vikt (kg) Weight (kg)	SD 28 Antal No.	Vikt (kg) Weight (kg)	Totalt Antal No.	Vikt (kg) Weight (kg)
TORSK	*Gadus morhua*	7 768	2 216,5	6 997	1 605,5	3 153	607,1	305	114,2	88	33,9	255	53,6	18 565	4 630,8
SILL	*Clupea harengus*	31 985	1 565,9	91 080	4 630,4	77 496	3 814,1	29 309	742,9	72 630	3 196,3	207 169	9 137,8	509 669	23 087,4
SKARPSILL	*Sprattus sprattus*	317 036	2 192,6	257 801	3 244,4	49 329	621,0	55 707	257,4	190 768	2 115,4	5 808	42,7	876 448	8 473,5
ANSJOVIS	*Engraulis encrasicolus*			2	0,02	1	0,01							3	0,04
FYRTÖMMAD SKÄRLÅNGA	*Enchelyopus cimbrius*							10	1,0					10	1,0
GRÅSEJ	*Pollachius virens*	1	1,0											1	1,0
HORNSIMPA	*Myoxocephalus quadricornis*					1	0,2	1	0,2			3 210	414,5	3 212	414,9
KLARBULT	*Aphia minuta*	77	0,04	55	0,03	1	0,001							133	0,1
KUMMEL	*Merluccius merluccius*			1	0,2									1	0,2
MAKRILL	*Scomber scombrus*			12	1,7									12	1,71
NORS	*Osmerus eperlanus*			2	0,03			1	0,1					3	0,1
PIGGVAR	*Scophthalmus maximus*	13	5,5	3	2,6	1	1,1	4	2,1					21	11,2
POMATOSCHISTUS (SLÄKTE)	*Pomatoschistus*	5	0,003					3	0,002			1	0,001	9	0,01
RÖDSPÄTTA	*Pleuronectes platessa*	469	82,0	548	86,2	18	2,2	4	0,6			5	0,4	1 044	171,4
RÖTSIMPA	*Myoxocephalus scorpius*	1	0,2	3	0,5	132	22,7	2 234	374,7	1	0,1	243	38,5	2 614	436,6
SANDSKÄDDA	*Limanda limanda*	13	2,7	4	0,6									17	3,3
SJURYGG	*Cyclopterus lumpus*	1	0,4	1	0,3	2	0,5	13	3,2			9	1,9	26	6,2
SKRUBBSKÄDDA	*Platichthys flesus*	2 667	655,8	2 221	519,7	260	46,0	944	175,1	295	48,6	1 524	233,3	7 910	1 678,4
SMÅSPIGG	*Pungitius pungitius*					1	0,001					1	0,001	2	0,002
SPETSSTJÄRTAT LÅNGEBARN	*Lumpenus lampretaeformis*											12	0,2	12	0,2
STAKSILL	*Alosa fallax*			2	0,4									2	0,4
STORSPIGG	*Gasterosteus aculeatus*					530	0,8	5	0,01	125	0,2	63	0,1	723	1,0
TAGGMAKRILL	*Trachurus trachurus*	8	0,2	13	0,3	1	0,03							22	0,5
TOBISKUNG	*Hyperoplus lanceolatus*	6	0,1					9	0,1					15	0,2
VITLING	*Merlangius merlangus*	219	28,2	193	34,8	11	2,1							423	65,1
ÅLKUSA	*Zoarces viviparus*					1	0,02	4	0,8	1	0,03	15	0,9	21	1,7
SUMMA	TOTAL	360 272	6 761	358 944	10 128	130 936	5 118	88 554	1 675	263 913	5 395	218 315	9 925	1 420 934	39 002

Table 3. List over stations not trawled and prohibited by SAF Q1 2015.

Nr_Haul	Square	SD	Plats	Lat1	Lon1	Depth	Ersatt med	Replaced with
25391	4059	25W	No name	5540,10	1443,46	46	Dålig botten ersätts med 25093	Rough bottom replaced with 25093
25404	4060	25C	YTTERTORPET	5549,52	1525,99	51	Förbjuden. Ers med 25124 (Station 25404= 25125)	SAF prohibition replaced with 25124
25142	4060	25C	5 SSW UTKLIPPAN	5553,30	1534,27	50	Förbjuden. Ers m 25413	SAF prohibition replaced with 25413
27029	4362	27	11 ESE Ölands norra udde	5718,13	1724,98	71	Förbjuden. Ers med 27010	SAF prohibition replaced with 27010
27020	4361	27	4 NW Byxelkrok (Specialen)	5721,79	1655,24	44	Förbjuden. Kan ej ersättas	SAF prohibition No replace station possible.
27016	4362	27	4 NW St Karlsö	5721,80	1754,5	107	Förbjuden. Kan ej ersättas	SAF prohibition No replace station possible.
27003	4362	27	5 N Byxelkrok (SW-draget)	5724,56	1701,56	57	Förbjuden. Kan ej ersättas	SAF prohibition No replace station possible.
27026	4362	27	10 SE Knolls grund	5729,03	1743,64	108	Förbjuden. Kan ej ersättas	SAF prohibition No replace station possible.
27019	4463	27	6 N Visby	5742,80	1816,2	103	Förbjuden. Ers med 27015	SAF prohibition replaced with 27015
28067	4363	28	11 ESE NÄR	5706,19	1856,78	88	Förbjuden. Ers m 28071	SAF prohibition replaced with 28071
28185	4464	28	3 SE GRAUTEN	5742,12	1906,41	36	Rev 1211 Ersätts med 28186	Rough bottom replaced with 28186
28100	4564	28	4 SW GOTSKA SANDÖN	5817,38	1910,55	59	Förbjuden. Ersätts med 28104	SAF prohibition replaced with 28104
28060	4564	28	4 E GOTSKA SANDÖN	5827,53	1923,97	71	Förbjuden. Ersätts med 28106	SAF prohibition replaced with 28106
28181	4364	28	6 SE ÖSTERGARN	5722,00	1905	63	Dålig botten. Ersätts med 28183	Rough bottom replaced with 28183

Survey Report of RV "Darius" 2014.11.21 – 22

Marijus Špėgys

1. INTRODUCTION

The cruise of the RV "Darius was part of the Baltic International Trawl Survey (BITS) program. This program is coordinated by ICES WGBIFS. The main objective of the survey is the estimation of fishery independent stock indices of both Baltic cod stocks, of flounder and other flat fish. The following further objectives were covered during the survey:

a) collecting data for assessing stock indices, the structure and recruitment of the stocks especially for cod and flatfish,
b) monitoring the composition of fish species in the Easter Baltic Sea,
c) collecting length samples for all species,
d) collecting samples of cod and flounder for biological investigations (i.e., maturity, fecundity, age)

2. METHODS

2.1 Personnel

Marijus Špegys, FS FRSS, Klaipeda - cruise leader;
Žilvinas Kregždys, FS FRSS, Klaipeda –fish sampling;
Deividas Norkus, FS FRSS, Klaipeda –fish sampling.

2.2 Description

The cruise took place three days (21-22 November 2014). RV "Darius" has covered the Sub-division 26 in Lithuanian EEZ.

2.3 Survey design and realization

The international coordinate trawl survey is planned as Stratified Random Survey where ICES subdivisions and depth layers are used as strata. A total of 6 stations were planned for the Lithuania part of the survey, which realize complete accordance with the agreements of WGBIFS during the meeting in 2013. The hauls' positions were selected from the TOW Database by the coordinator of the BITS surveys (ICES 2007, WGBIFS report as reference). All 6 fishing stations were successfully realized. The fishing hauls were realized in the daylight, between 8:15 and 17:30 local time.

Trawling was done with the standard trawl "TV3/520#". The stretched mesh size in the codend was 10 mm. The duration of the hauls was 30 minutes and the velocity was 3 knots. The total catch of each haul was analysed to determine the species' composition in weight and number as well as the distribution of length among all species. Sub-samples of cod, flounder were investigated concerning sex, maturity and age. Surface temperature and salinity were immediately sampled after every fishing hauls. Positions of the trawling are shown on Figure 1.

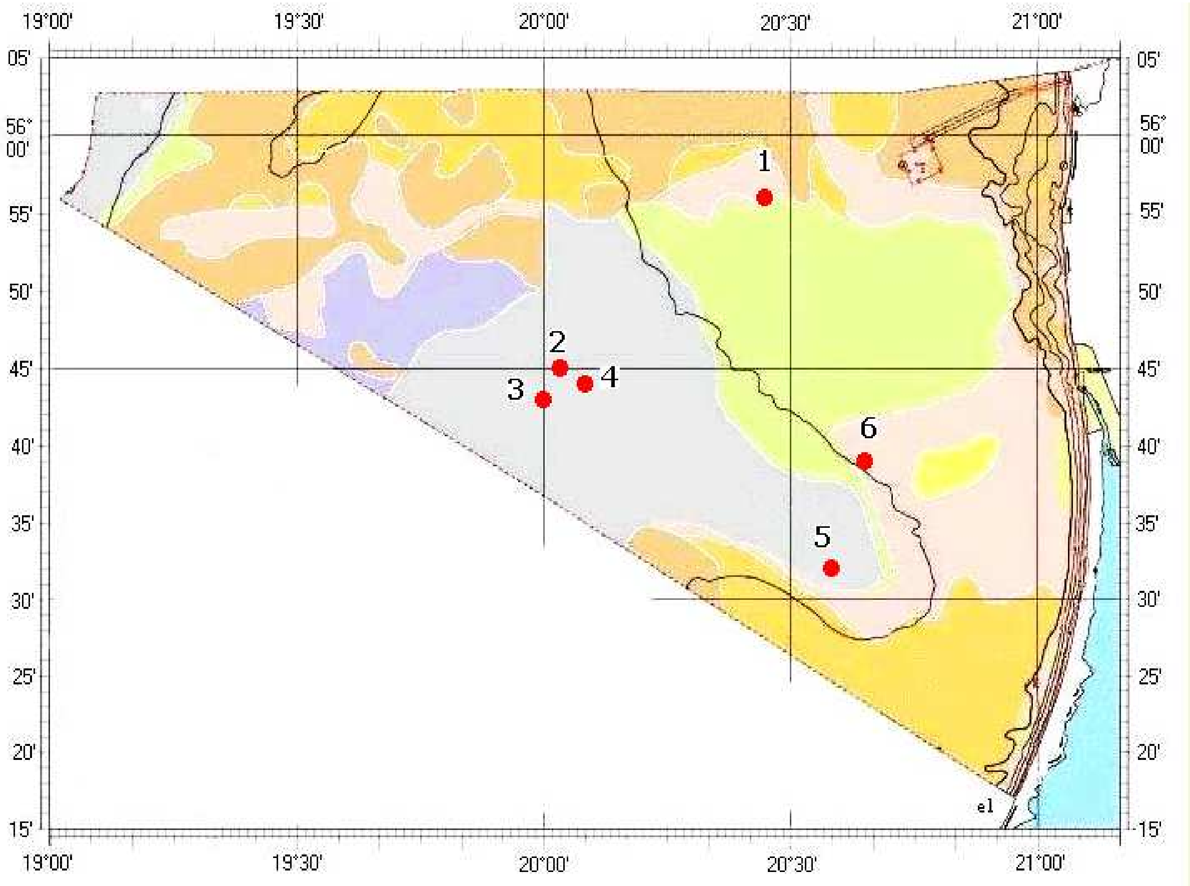

Figure 1. Trawling positions in BITS 4Q survey

The length measurements in the 1.0 cm classes was realised for cod, flounder and turbot, some of them were taken for biological analysis to laboratory. The length measurements in the 0.5 cm classes was realised of herring and sprat. All information about haul and catches are shown in table 1 and table 2.

Table 1. Haul information from the Lithuania BITS 1q survey with the TV3/520# bottom trawl

Haul number according to TD data	The ICES rectangle and subdivision	Trawling depth (m)	Geographical position of catch station				Surface temperature	Surface salinity	Bot. tempe-rature	Bot. salinity
			00.00 N	00.00 E	00.00 N	00.00 N				
26134	40H0 (26)	38	55,9	20,4	55,9	20,4	7,68	6,44	7,25	7,25
26196	40H0 (26)	70	55,8	20,0	55,8	20,0	6,55	6,67	7,25	7,26
26197	40G9 (26)	60	55,7	20,0	55,7	20,0	6,51	6,11	7,28	7,26
26214	40H0 (26)	75	55,7	20,1	55,7	20,1	7,01	6,78	7,32	7,3
26052	40H0 (26)	63	55,5	20,6	55,5	20,6	7,82	7,58	7,33	7,32
26028	40H0 (26)	50	55,7	20,6	55,7	20,6	8,05	7,22	7,33	7,33

Table 2 Fish catches results from the Lithuania BITS 1Q survey with the TV3/520# bottom trawl

Haul number according to TD data	Catch date	The ICES rectangle and subdivision	Trawling depth (m)	Total CPUE (kg/h)	CPUE per species (kg/h)				
					Cod	Flounder	Herring	Turbot	Others
26134	21.11.2014	40H0 (26)	38	891.6	210.6	671.6	0.2	1.2	8.0
26196	21.11.2014	40H0 (26)	70	0.0	0.0	0.0	0.0	0.0	0.0
26197	22.11.2014	40G9 (26)	60	16.3	7.4	2.2	5.1	0.0	1.6
26214	22.11.2014	40H0 (26)	75	16.2	14.0	1.1	0.9	0.0	0.2
26052	22.11.2014	40H0 (26)	63	138.1	10.9	26.2	100.8	0.0	0.1
26028	22.11.2014	40H0 (26)	50	591.5	562.1	20.1	8.7	0.0	0.5
Mean					**161.0**	**144.3**	**23.1**	**1.2**	**2.1**

3. RESULTS

In total 871 cods, 493 flounders, 4 places, 325 herrings and 106 sprats were collected for measuring and from that measurement sample 250 cods and 341 flounders and 4 places were collected for weight, sex, maturity and age. Numbers of biological samples by haul given in Table 3.

Cod from the length classes range of 26-39 dominated in samples. The fish with this length range constituted about 83.0% of all measured cod (Fig. 1). Moreover, 85.3% of all measured cods were undersized individuals (less than 38 cm).

The total length of flounder ranged from 15 to 35 cm, with dominating length classes of 20-32 cm. The fish with this length range constituted about 89.9% of all measured flounder.

The total length of herring ranged from 15 to 26.0 cm. Herring from the length classes of 17.5-22.5 was dominated in samples and constituted about 88.3% of all measured herring (Fig. 3).

The length distributions of cod, flounder, herring and sprat, according to the ICES Sub-divisions 26 are shown in Figures 2-4.

Table 3. Biological samples of all hauls from the Lithuania BITS 2015 m. 1Q survey

Haul number	Catch date	The ICES rectangle and subdivision	Trawling depth (m)	Numbers of biological samples						
				Length					Age, sex, maturity	
				Cod	Flounder	Turbot	Herring	Sprat	Cod	Flounder
1	21.11.2014	40H0 (26)	38	440	426	1	2		176	315
2	21.11.2014	40H0 (26)	70							
3	22.11.2014	40G9 (26)	60	6	6		48	87	1	
4	22.11.2014	40H0 (26)	75	13	3		8	9	7	
5	22.11.2014	40H0 (26)	63	16	13		198	5	4	12
6	22.11.2014	40H0 (26)	50	397	45		69	5	62	14
Sum				**872**	**493**	**1**	**325**	**106**	**250**	**341**

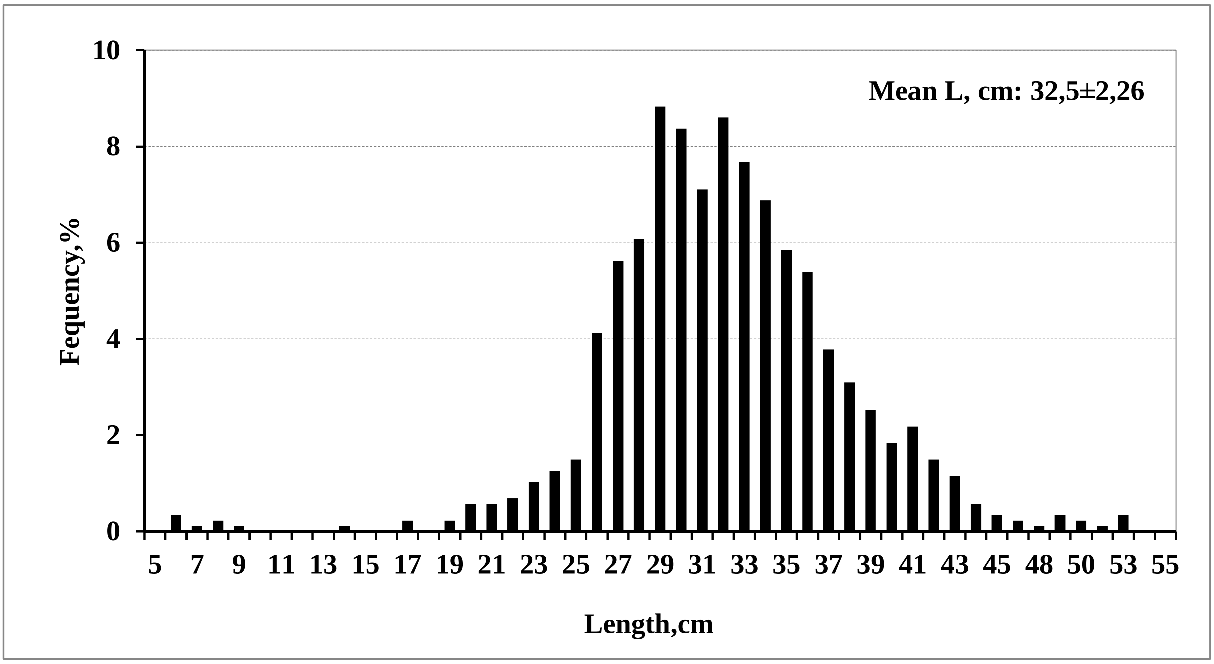

Figure 2. Cod length distribution in samples from the ICES Sub-divisions r/v "Darius" BITS 2014 m. 4Q survey

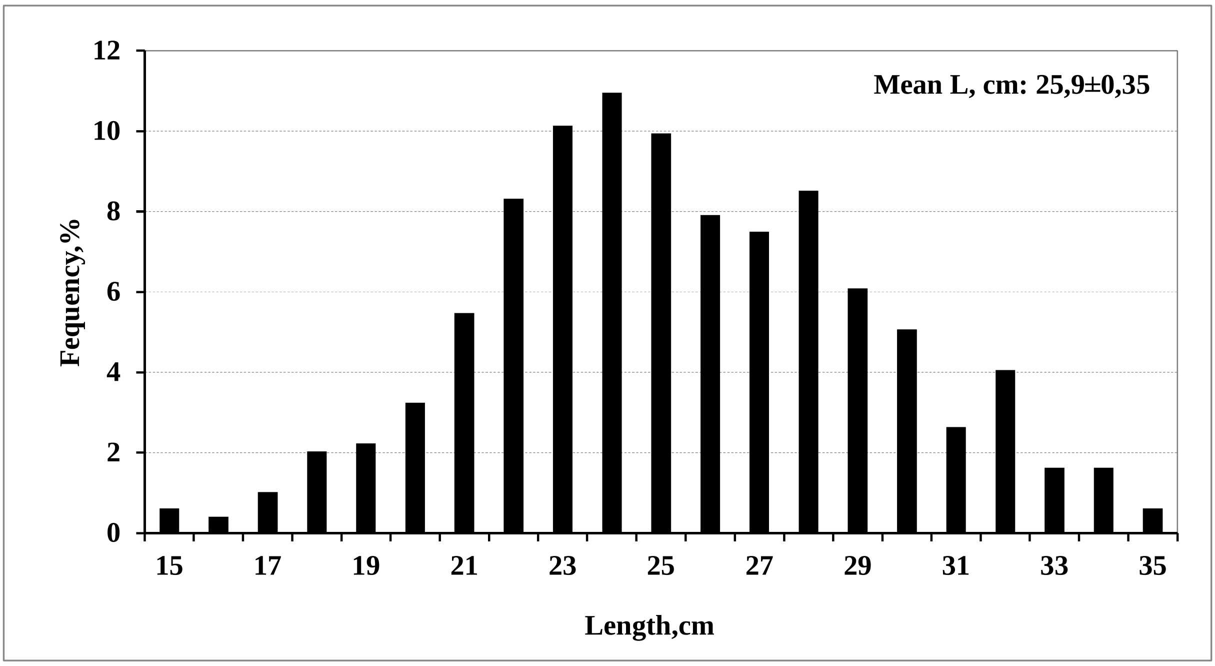

Figure 3. Flounder length distribution in samples from the ICES Sub-divisions 26, r.v. "Darius" BITS 2014 m. 4Q survey

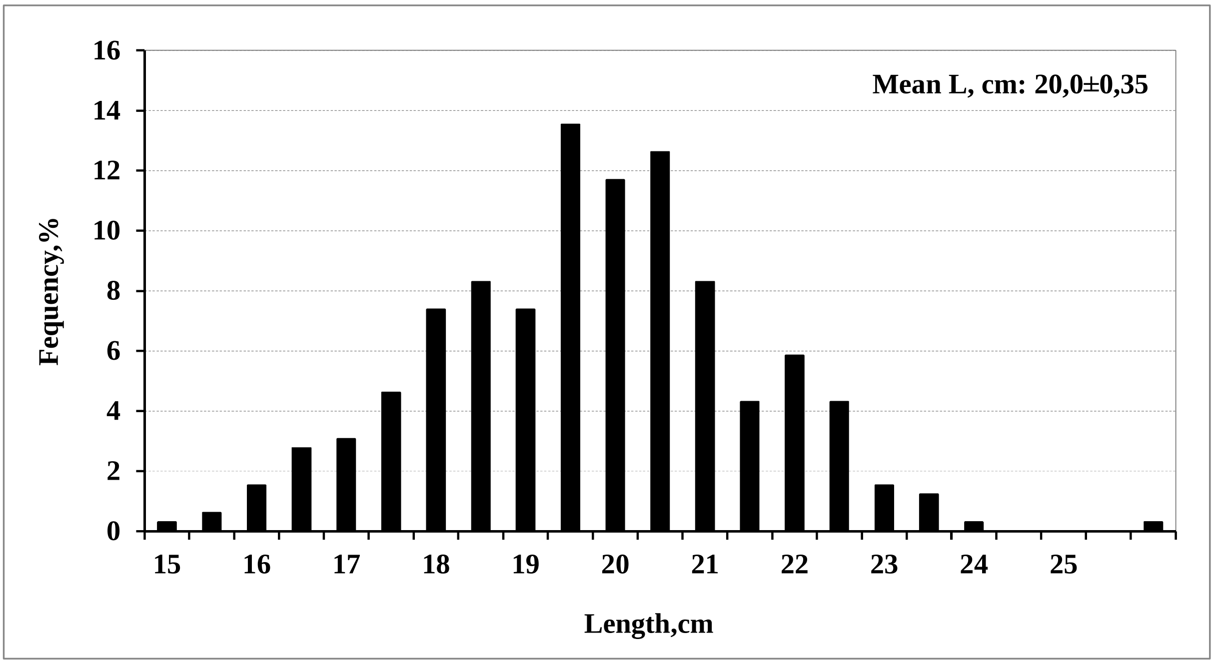

Figure 4. Herring length distribution in samples from the ICES Sub-division 26, r.v. "Darius" BITS 2014 -4Q survey.

Survey Report of RV “Darius” 2015.02.24 – 25

Marijus Špėgys

1. INTRODUCTION

The cruise of the RV “Darius was part of the Baltic International Trawl Survey (BITS) which is coordinated by ICES WGBIFS. The main objective of the survey is the estimation of fishery independent stock indices of both Baltic cod stocks, of flounder and other flat fish.

The following further 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 South-Eastern Baltic Sea

Collecting length samples for all species.

Collecting samples of cod and flounder for biological investigations (i.e., sex, maturity, age)

2 METHODS

2.1 Personnel

Marijus Špegys, FS FRSS, Klaipeda - cruise leader;
Žilvinas Kregždys, FS FRSS, Klaipeda –fish sampling;
Deividas Norkus, FS FRSS, Klaipeda –fish sampling.

2.2 Description

The cruise took place two days (24-25 February 2015). RV “Darius” has covered the Sub-division 26 in Lithuanian EEZ.

2.3 Survey design and realization

The international coordinate trawl survey is planned as Stratified Random Survey where ICES subdivisions and depth layers are used as strata. A total of 6 stations were planned for the Lithuania part of the survey, which realize complete accordance with the agreements of WGBIFS during the meeting in 2007. The hauls' positions were selected from the TOW Database by the coordinator of the BITS surveys (ICES 2007, WGBIFS report as reference). All 6 fishing stations were successfully realized. The fishing hauls were realized in the daylight, between 8:15 and 17:30 local time.

Trawling was done with the standard trawl “TV3/520#“. The stretched mesh size in the codend was 10 mm. The duration of the hauls was 30 minutes and the velocity was 3 knots. The total catch of each haul was analysed to determine the species' composition in weight and number as well as the distribution of length among all species. Sub-samples of cod, flounder were investigated concerning sex, maturity and age. Surface temperature and salinity were immediately sampled after every fishing hauls.

Annex 8: Cruise reports of acoustic surveys BASS and BIAS in 2014

Annex 8: Cruise reports of the acoustic surveys type BASS and BIAS in 2014

Notes:

a) the text should be prepared in Word format as *.doc,
b) Authors are fully responsible for quality of the prepared text and all kind of presented data.

BALTIC ACOUSTIC SPRING SURVEY – BASS 2014

INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT – BIOR, RIGA (LATVIA)

ESTONIAN MARINE INSTITUTE, UNIVERSITY OF TARTU – EMI, TALLINN (ESTONIA)

THE CRUISE REPORT

FROM THE LATVIAN-ESTONIAN JOINT BALTIC ACOUSTIC SPRING SURVEY – BASS 2014 ON THE F/V "ULRIKA" IN THE ICES SUBDIVISIONS 26N, 28, 29 AND 32W OF THE BALTIC SEA

(14 – 26 MAY 2014)

Working paper on the WGBIFS meeting in Öregrund, Sweden, 23-27.03.2015

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Riga, February 2015

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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 (GDR) 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, but before – in 2003-2004 with AtlantNIRO in Kaliningrad, Russia. In 2009 due to collapse of Latvian economy the survey was not performed. In 2010 we resumed our international cooperation in the fisheries research, but this time on the Lithuanian r/v "Darius" board. The collaboration lasted for three years till the 2012. In May 2013 The Latvian Baltic Acoustic Spring Survey (BASS) in the ICES Sub-divisions 26N and 28 was conducted on Latvian commercial fishing vessel "Ulrika" with which crew and the owners cooperation in research for pelagic fish distribution and feeding conditions in the recent decade has developed a very close and productive.

The first Latvian-Estonian joint Baltic Acoustic Spring Survey (BASS) in the ICES Sub-divisions 26N, 28 29 and 32W in May 2014 was conducted on Latvian commercial fishing vessel "Ulrika". The reported cruise was organized on the basis of the agreement between the Institute of Food Safety, Animal Health and Environment (BIOR) from Riga, Estonian Marine Institute from Tallinn and the fishing company "Vergi" Ltd from Jurmala. The vessel was operated within the Latvian, Estonian and Swedish EEZs (ICES Sub-divisions 26N, 28 29 and 32W). The "Latvian National Fisheries Data Collection Programme, 2014-2016" in accordance with the EU Council Regulation No. 199/2008 and EU Commission Regulation No.605/2008, EU Commission Decisions 2008/605/EC, 2009/10121/EC, C (2013) 5568 and BONUS project INSPIRE was partly subsidized this cruise. It was coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS) [ICES 2014] and BONUS project INSPIRE.

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 institute's database as well as in the BAD1 and FishFrame Acoustic like (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 mentioned fish 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 five persons:

Dr. F. Svecovs, BIOR, Latvia – scientific staff and cruise leader, acoustic team;

G. Strods, BIOR, Latvia – fish sampling team and acoustics;

A. Makarcuks, BIOR, Latvia – fish sampling team, hydrology and plankton;

E. Sepp, EMI, Estonia – fish sampling team and acoustics;

T. Arula, EMI, Estonia – fish sampling team, hydrology and plankton.

Survey description

The reported BASS survey of the f/v "Ulrika" took place during the period of 14 – 26 May 2014. The vessel left the port of Ventspils on 14.05.2014 at 15:00 o'clock GMT+02:00. The sea researches were conducted in the period of 15.-25. 05.2013 within Latvian, Estonian and Swedish EEZs (ICES Sub-divisions 26N, 28, 29 and 32W). The research activity had been stopped at 10:00 o'clock GMT+02:00 on 26th of May and the vessel returned back to the port of Ventspils for the scientific team disembarkation there. The almost full eleven 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 and prolonged in Estonian EEZ of ICES SD 29 and 32W. Overall 925 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 May 2014 was 13933.9 nm^2, in the northern part of the ICES Sub-division 26 – 1953.3 nm^2, in SD 28 – 7874.9 nm^2, in SD 29 – 3569.5 $nm^2$and in the western part of the SD 32 – 536.2 nm^2 (Fig. 1).

Calibration of the BIOR portable acoustic system composed of BioSonics D-TX echo-sounder with 38 kHz was performed in Riga yacht port aquatory before cruise according to BIAS manual [ICES 2003, 2014].

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 vertical distribution of clupeids actual density pattern along the 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 31 control haul in the pelagic offshore zone were conducted with the pelagic trawl with max. 83 m horizontal opening, max. 22 m vertical opening and 10 mm mesh bar length in the codend. The trawling depth and the net opening were controlled by the sonar type IGEK. The trawl headrope positions in particular hauls were localized on the depth range from 10 to 70 m from the sea surface (Tab. 1). Mean headrope depth location in all investigated areas was 55 m. The trawl mouth vertical opening ranged from 15 to 22 m (mean – 20 m) and horizontal opening ranged from 76 to 83 m (mean – 78 m). The mean bottom depth at trawling positions varied from 49 to 178 m (mean for all investigated area – 107 m). Totally, 4 hauls were localized in the ICES Sub-division 26, 18 hauls in the ICES Sub-division 28, 7 hauls in the ICES Sub-division 29 and 2 hauls in the ICES Sub-division 32. On the whole, 13 catch samples were taken in the Latvian EEZ, 11 samples in the Estonian EEZ and 7 samples in the Sweden EEZ. All hauls were conducted outside the territorial waters of these countries. The catches were made at the daylight between 06:58 a.m. and 19:28 p.m. GMT+02:00. The mean speed of the vessel during trawling was 3.0 knots. The trawling time of the single valid haul lasted for 30 minutes. All hauls can be accepted as representative (valid from technical point of view).

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 6295 sprat, 5133 herring, 269 cod, 211 flounder, 18 three-spined stickleback, 10 lumpfish, 1 smelt and 1 shorthorn sculpin individuals. 2798 and 2614 individuals of sprat and herring were aged respectively. Detailed ichthyologic 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 [ICES 1983, 2014]:

- for clupeids: TS = 20logL-71.2;
- for gadoids: TS = 20logL-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.

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, 45 hydrological stations were inspected in May 2014 by f/v “Ulrika”. The hydrological and hydrobiological research profiles location is presented in Fig. 2. The Seabird SBE 19plus was used for above-mentioned measurements. The row data were aggregated to the 10 m depth stratums.

Ichthyoplankton and zooplankton samples were collected at the positions of the hydrological stations or after trawling. Totally 19 zooplankton, 45 ichthyoplankton and 45 ichthyoplankton with circulation stations were realized and 19 zooplankton and 90 ichthyoplankton samples were taken. 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. 2-6.

Totally, eight fish species were recorded in the 31 pelagic control hauls taking place in the central-eastern Baltic (ICES Sub-divisions: 26N and 28). Sprat dominated very distinctly – over 90.00 % in 10 catches of fishes (Tab. 6) and 73.10 % on average in mass of all catches, but herring, cod, flounder, three-spined stickleback, lumpfish, smelt and shorthorn sculpin were the following frequently occurred species: 26.33 %, 0.32 %, 0.15 %, 0.08 %, 0.01 %, <0.01% and <0.01% in the total mass respectively. Herring dominated in three hauls – 77.08 %, 63.49 % and 55.74 % and as considerable proportion (more than 20.00 %) was found in 14 hauls. The average share in the catches of herring, cod and flounder in May 2014 was higher, but sprat, stickleback and lumpfish had decreasing tendency of average share comparing to average share in May of period 2005-2008 and 2010-2013 [Grygiel et al. 2006a, 2006b, 2007, 2009, Svecovs et al. 2010, 2011, 2012, 2013, Wyszynski et al. 2007]. Overall the by-catch of other fish specimens in northern part of ICES SD 26 was rather symbolic – 1.87 %. In ICES SD 28 and 29 the by-catch of herring increased significantly to 25.03 % and 24.61 % on average respectively, but in SD 32 herring was dominant species (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. In 2013 and 2014 the relatively high CPUEs for sprat and herring was determined by different type of trawl – it was larger than WP53 and analog of Lithuanian. 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. In 2014 herring CPUEs increased to 342.8 kg/h. Higher average CPUEs for sprat were noted in ICES SD 29, for herring in SD 32, for cod higher average CPUEs were noted in Sub-division 26 in comparison to other Sub-divisions. The distribution of CPUE scopes for sprat, herring, cod and flounder per single haul is shown in Fig. 3-4.

The mean length and mean weight distributions of dominant fish species (sprat and herring) by the ICES Sub-divisions 26, 28, 29 and 32 are shown in Tab. 9, the same data for cod in Tab. 10. The total length of these fish species ranged as follows:

- sprat – 8.0÷14.5 cm (average TL = 11.3 cm), 2.6÷20.0 g (average W = 8.4 g);
- herring – 9.0÷25.0 cm (average TL = 17.7 cm), 4.4÷125.0 (average W = 32.2 g);
- cod – 11.3÷58.5 cm (average TL = 28.6 cm), 10.0÷2320.0 (average W = 227.6 g).

Sprat mean length is more less equal to 2012 and 2013, mean weight had increased in comparison to 2013, but mean length and mean weight of herring had slightly decreased. Mean length and mean weight of cod is more less equal to 2013.

Acoustical and biological estimates

The basic acoustic and biological data (surveyed area statistics, mean NASC, the mean scattering cross-section, calculated target strength, the total number of fish, percentages of herring and sprat) per ICES rectangles, collected in May 2014, are given in Tab. 11. The estimated abundance and biomass of sprat and herring per above mentioned rectangles are listed in Tab. 12. The basic acoustic data related to cod and estimated abundance and biomass of cod per rectangles are represented in Tab. 13. The age structured data of sprat and herring are aggregated in Tab. 14-25. The geographical distribution of NASC, sprat and herring stock densities in the central-eastern Baltic in May 2013 is shown in Fig. 5-7.

The pelagic fish stock was represented practically by sprat – 93.4 % on average. Herring was represented as 6.6 % in average with the highest numbers in SD 32 were herring was 42.5 % of pelagic fish numbers. The highest sprat stock density (7.25 n×10^6/nm^2) were recorded in ICES SD 29 rectangle 47H1. The highest average parameters of the sprat stock densities were recorded in ICES rectangles 42G9 and 47H1. The distribution of the high density sprat concentrations in May 2014 was totally different from May 2005-2008 and 2011-2012, but was more-less equal to May 2010 and 2013, when sprat density increased from northeast to southwest in SD 28. This year shows that largest sprat concentrations were observed in central part of SD 29.

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 northern part of the investigated area (in Sub-division 29, rectangle 47H1).

Comparison of the acoustic results from May of 2003-2008 and 2010-2014 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 period of 1983-1987, 2010 and 2013 and differs from the other recent years when stock had pattern the same as in years with high population abundance since 1992 [Shvetsov et al. 1988, 1989, 1992, 2002].

Ichthyoplankton estimates

Sprat eggs and larvae prevailed in the ichthyoplankton in May 2014. The average numbers of sprat eggs and larvae in the investigated region were approximately at the same level as the average value for the previous years. The number of eggs increased with the depth (Tab. 26). The maximum number of them were registered in two places: in the southwestern corner of Latvian zone, and over the eastern slope of the Gotland Basin between 57°00’N and 57°25’N. A horizontal distribution of sprat larvae generally followed that of sprat eggs: the larvae were found mainly over the big depths at the latitudes between 56°00’N and 57°25’N. 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 (Fig. 8).

Biodiversity in the ichthyoplankton was on low level – only one flounder egg was found in May, apart from those of sprat. There were more larvae of flounder than in recent years, they were found mostly in the southern part of the Gotland Basin. Also two sand-ell larvae were found.

Zooplankton estimates

In May 2014 in the Baltic Sea the estimated zooplankton biomass was generally equal to 2013. Total zooplankton biomass in 2014 was 1.7 times less than in 2012. The most part of the biomass (56.96 %) was made from small rotatorians and copepods (20.55 %), the residual part was made from cladocerans (5.94 %) and other planktonic organisms (16.56 %). The dominance of rotatorians in the spring season in the Baltic Sea is not unusual, but the pelagic fish prefers different copepod species. Amount of them in 2014 on average was 1.4 times lower than in 2012 and 1.5 times under the long-term average. Overall, biomass of *Pseudocalanus* sp., taking the top rank among copepods, without reaching the long-term average. Higher biomass of *Pseudocalanus* sp. was detected in the deep stations of the investigated aquatory. In 2014 decreased *Acartia* spp. and average biomass of *Temora longicornis*. These copepods is under long-term average also, unlike the May 2012, when *Acartia* spp. and *T. longicornis* resided at more shallow waters. In 2014 had increased the role of above mentioned copepods in the deep zone. In deep stations estimated quantity of Acartia spp was 2 times less than the stated in 2012. In the upper layer (0-50 m) of water column after rotatorians the next dominant object of zooplankton was cladoceran *Evadne nordmanni*. Biomass of *E. nordmanni* was at lower level than in 2013 and almost equal to the level of long-term average. Overall, the favorable feeding conditions in May 2014 formed in the deepest part of the investigated area.

Meteorological and hydrological data

The mean hydrological parameters in the central-eastern Baltic in May 2014 are presented in Tab. 28 and 29.

Temperatures in the surface layer at 0-10 m of the sea water changed during the survey from 7.73°C on average of whole layer at the southern part of Gotland Deep to about 10.97°C at northern part of investigated area, the water temperature in this layer was higher than the multi-annual average value. The highest surface water salinity was in the southern part of Gotland Basin – up to 7.28 PSU, but the lowest in northern area of basin – 5.72 PSU. In comparison to long-term values salinity was higher. The oxygen content at the sea surface ranged from 11.53 at the southern part of Gotland basin to 12.70 and 12.68 ml/l at the central and northern part of investigated area. The mean oxygen content was significantly higher than in 2013.

The homogenous layer in respect to salinity of the surface water occurred mostly to the depth of 50-70 m. The main thermocline was formed under the winter water approximately at the depth a little higher as halocline. The temperature minimum of the homogenous layer was about 2.85°C in the northern part of investigated area and increased to 3.90°C in the central part of Gotland Deep. The average water temperature of this layer was about 3.58°C. Water salinity of this layer was fluctuating from 6.75 to 8.00 PSU and was somewhat higher than in 2013. Oxygen content varied from 9.07 ml/l in the northern part of investigated area to 11.70 ml/l in the southern part of investigated area.

The fish control hauls were conducted under the winter-cold waters, however the net headrope sometimes reached them, but footrope reached the halocline and oxycline level. Into the depth layer of 70-90 m – most frequently occupied by pelagic trawl – the average oxygen content varied from 5.97 ml/l to 13.36 ml/l, salinity changed from 6.74 PSU to 9.37 PSU and temperature from 2.85°C to 6.06°C.

The deep-water or bottom layer was determined under 90 m of the sea depth. In this layer the water temperature varied from 5.05°C in southern part of observed area to 5.81°C in central part of area. Salinity was from 10.00 PSU in the northern part of the investigated area to 11.41 PSU in the central part of the Gotland basin. Oxygen content varied from 0.47 ml/l in the northern part of the investigated area to 2.28 ml/l in the southern part. As depths over 225 m was not surveyed due to sufficient cable length of probe, the layer of anoxic conditions was not observed, but judging from the observed changes in oxygen concentration in the surveyed water column and based on researches of other scientists (Hansson et al. 2012) the layer of anoxia was increased in volume till 2012, but in 2013 and 2014 could be reduced.

DISCUSSION

The data collected in May 2014, during the r/v “Ulrika” 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 2014 had more-less similar pattern as in years with low level of population number. The main sprat stock was settled among the cold winter and saline waters in quite narrow layer where oxygen content was 8.99 ml/l on average (in 2013 here was 4.43 ml/l) and salinity was not more than 9.00 PSU. In 2014 the pattern of pelagic stock concentrations was determined by hydrological and feeding conditions when in southern part of investigated area waters below 70 m was more oxygenated and feeding objects was in higher concentrations in northern part.

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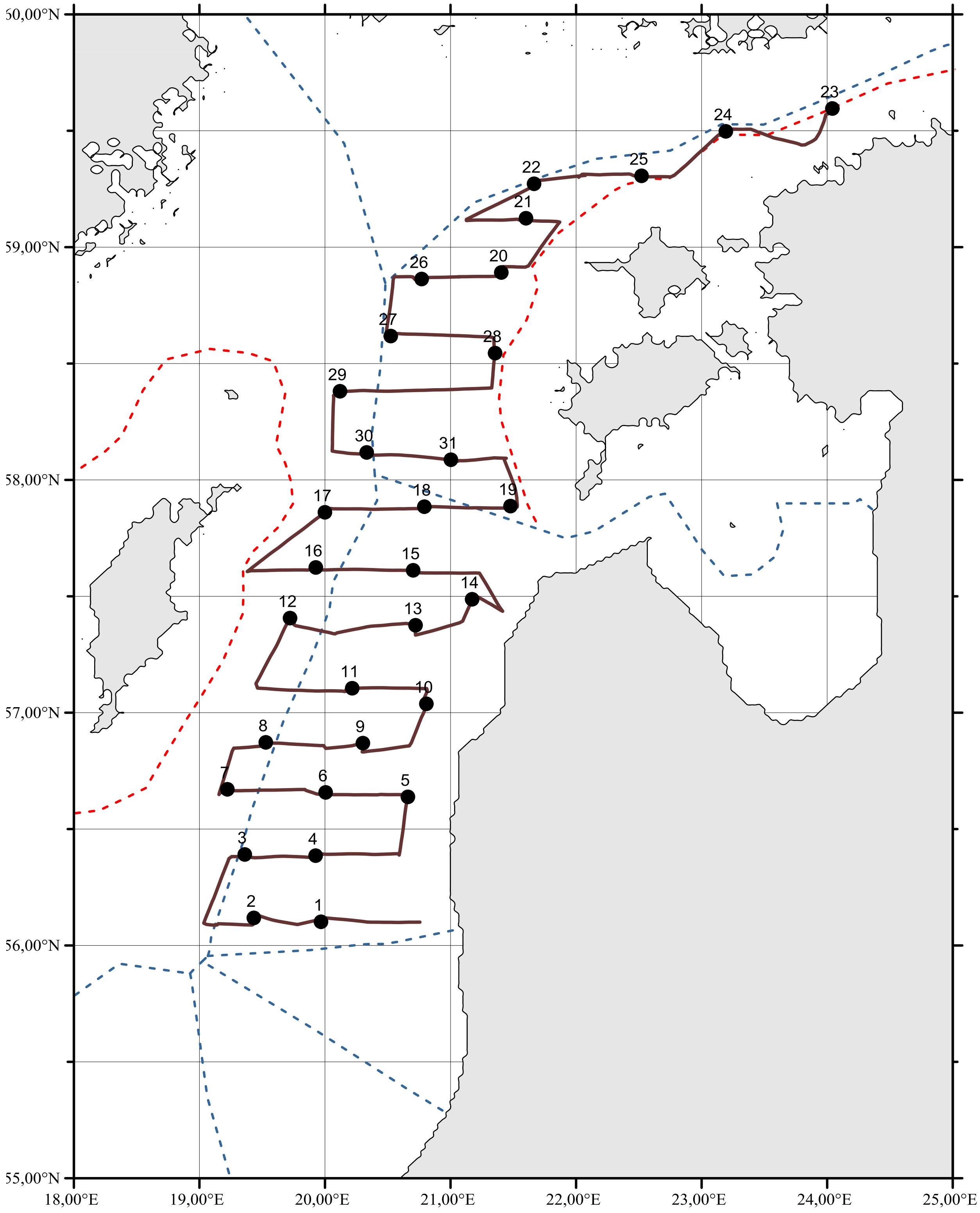


Figure 1. Cruise track design and hauls of the Latvian-Estonian joint Baltic Acoustic Spring Survey on the f/v "Ulrika", 14-26.05.2014.

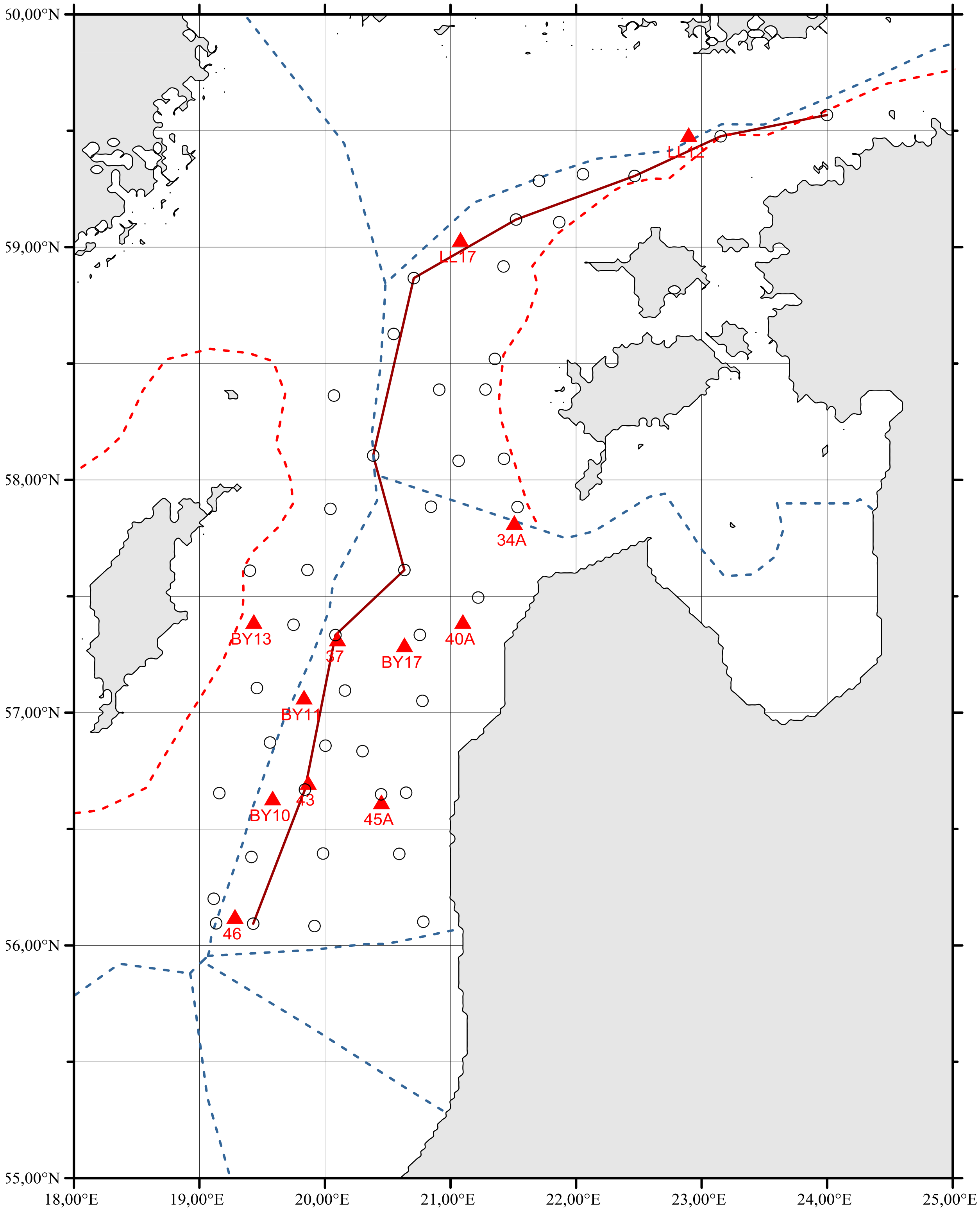


Figure 2. Locations of the hydrological and hydrobiological stations performed during the Latvian-Estonian joint Baltic Acoustic Spring Survey on the f/v "Ulrika", 14-26.05.2014

(▲ - HELCOM stations; ○ - hydrological and hydrobiological stations; — - hydrological profile).

Table 1. Fish control-catch results in the Baltic Sea ICES SD 26N, 28, 29 and 32W
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	Date	ICES rect.	ICES SD	Mean bot-tom depth [m]	Head-rope depth [m]	Hor. open. [m]	Ver. open. [m]	Trawl. speed [knt]	Trawl. direct. [°]	Geographical position				Time Start	Haul dur. [min]	Total cactch [kg]
										Start		End				
										Latitude 00°00.0'N	Longitude 00°00.0'E	Latitude 00°00.0'N	Longitude 00°00.0'E			
1	2014.05.15	41G9	26	60	40	78	20	3.0	240	56°06'06''	19°58'06''	56°05'07''	19°56'02''	11:50	30	200.000
2	2014.05.15	41G9	26	92	68	78	20	3.0	190	56°07'06''	19°26'00''	56°06'07''	19°25'99''	15:53	30	501.991
3	2014.05.16	41G9	26	135	60	78	20	3.2	90	56°22'87''	19°21'40''	56°22'89''	19°24'22''	08:48	30	726.400
4	2014.05.16	41G9	26	79	58	77	21	3.0	65	56°23'09''	19°55'32''	56°22'67''	19°57'66''	12:47	30	100.198
5	2014.05.16	42H0	28	49	25	76	22	3.0	0	56°37'78''	20°39'38''	56°39'21''	20°34'18''	19:28	30	121.060
6	2014.05.17	42H0	28	145	65	76	22	3.1	270	56°38'87''	20°00'19''	56°38'94''	19°57'64''	08:14	30	155.591
7	2014.05.17	42G9	28	152	65	76	22	3.0	270	56°39'75''	19°12'81''	56°39'51''	19°10'27''	13:12	30	1403.531
8	2014.05.17	42G9	28	146	70	78	20	3.1	60	56°52'21''	19°31'43''	56°52'68''	19°33'69''	17:54	30	807.443
9	2014.05.18	42H0	28	107	60	78	20	3.2	150	56°52'09''	20°17'67''	56°50'63''	20°18'62''	08:25	30	405.504
10	2014.05.18	43H0	28	70	58	76	22	2.9	350	57°01'77''	20°47'87''	57°03'10''	20°47'29''	13:13	30	400.854
11	2014.05.18	43H0	28	173	70	78	20	2.8	260	57°06'18''	20°12'61''	57°05'93''	20°10'11''	17:45	30	1506.039
12	2014.05.19	43G9	28	156	65	78	20	2.8	110	57°23'83''	19°43'18''	57°23'27''	19°45'47''	08:54	30	405.084
13	2014.05.19	43H0	28	73	53	78	20	3.2	170	57°21'92''	20°42'77''	57°20'47''	20°43'23''	15:28	30	508.139
14	2014.05.19	43H1	28	70	50	78	20	3.0	45	57°28'74''	21°10'19''	57°29'59''	21°12'56''	19:15	30	300.225
15	2014.05.20	44H0	28	105	60	78	20	3.0	280	57°36'42''	20°41'68''	57°36'70''	20°38'89''	14:45	30	806.497
16	2014.05.20	44G9	28	131	65	78	20	3.0	270	57°36'86''	19°54'97''	57°36'89''	19°52'40''	19:23	30	402.754
17	2014.05.21	44G9	28	131	65	78	20	3.0	270	57°51'39''	19°59'58''	57°52'29''	20°01'87''	09:35	30	1104.015
18	2014.05.21	44H0	28	101	66	78	20	3.0	85	57°52'66''	20°47'29''	57°52'82''	20°50'00''	14:12	30	905.089
19	2014.05.21	44H1	28	63	48	83	15	3.0	80	57°52'75''	21°28'40''	57°52'95''	21°31'23''	18:17	30	140.269
20	2014.05.22	46H1	29	78	55	78	20	3.0	30	58°53'28''	21°23'76''	58°54'61''	21°25'20''	07:51	30	802.193
21	2014.05.22	47H1	29	140	61	77	21	2.8	270	59°06'87''	21°36'03''	59°06'91''	21°33'25''	13:31	30	501.940
22	2014.05.22	47H1	29	106	10	76	22	3.2	60	59°15'80''	21°39'55''	59°16'72''	21°41'99''	19:20	30	199.999
23	2014.05.23	48H4	32	66	45	78	20	3.2	219	59°35'44''	24°01'89''	59°35'44''	24°00'24''	06:58	30	1000.000
24	2014.05.23	47H3	32	93	60	78	20	2.8	220	59°29'51''	23°10'94''	59°28'58''	23°09'10''	12:28	30	700.829
25	2014.05.23	47H2	29	121	55	78	20	3.0	270	59°18'23''	22°30'77''	59°18'35''	22°27'98''	17:10	30	2000.120
26	2014.05.24	46H0	29	178	65	76	22	3.0	210	58°51'47''	20°45'72''	58°51'51''	20°43'20''	07:46	30	170.996
27	2014.05.24	46H0	29	142	60	78	20	3.0	80	58°36'65''	20°30'86''	58°37'37''	20°32'91''	12:20	30	600.860
28	2014.05.24	46H1	29	98	60	78	20	2.8	180	58°32'41''	21°21'17''	58°31'24''	21°21'19''	17:59	30	302.119
29	2014.05.25	45H0	28	104	70	78	20	2.9	245	58°22'51''	20°07'11''	58°21'79''	20°04'64''	09:37	30	701.340
30	2014.05.25	45H0	28	102	10	78	20	3.2	90	58°06'65''	20°19'56''	58°06'27''	20°22'50''	14:05	30	700.000
31	2014.05.25	45H1	28	64	44	78	20	3.0	100	58°05'12''	21°00'11''	58°04'88''	21°03'11''	18:02	30	300.342
SD26				92	57	78	20	3.1	146							1528.589
SD28				108	56	78	20	3.0	173							11073.336
SD26+28				105	56	78	20	3.0	168							12601.925
SD29				123	52	77	21	3.0	157							4578.227
SD32				80	53	78	20	3.0	220							1700.829
SD29+32				114	52	77	21	3.0	171							6279.056
Total				107	55	78	20	3.0	169							18880.981

Table 2. Fish control-catch results by species in the Baltic Sea ICES SD 26N, 28, 29 and 32W
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	***Total catch [kg]***	***Catch per species [kg]***							
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Smelt***	***Lumpfish***	***Shorthorn sculpin***
		161789	***161722***	***164712***	***172894***	***166365***	***162039***	***167612***	***167318***
1	200.000	200.000							
2	501.991	500.000	0.104	1.512	0.375				
3	726.400	700.000	8.533	15.694	2.173				
4	100.198	100.000			0.175		0.023		
5	121.060	94.739	25.474	0.780	0.280				
6	155.591	147.618	2.382	3.932	1.659				
7	1403.531	1367.357	32.643	2.887	0.644				
8	807.443	766.312	34.128	3.966	3.037				
9	405.504	142.559	257.441	2.198	3.306				
10	400.854	362.505	37.495		0.384			0.470	
11	1506.039	941.665	558.335	4.791	1.248				
12	405.084	349.626	50.374	4.402	0.682				
13	508.139	216.760	283.240	0.247	7.752				0.140
14	300.225	235.554	64.446		0.225				
15	806.497	403.768	396.232	3.606	2.891				
16	402.754	286.352	113.648	2.103	0.651				
17	1104.015	1012.716	87.284	3.077	0.938				
18	905.089	530.429	369.571	3.668	1.090			0.331	
19	140.269	96.593	43.407					0.269	
20	802.193	425.362	373.859	1.695	0.498	0.779			
21	501.940	302.998	197.002	1.057	0.743			0.140	
22	199.999	132.891	66.753			0.355			
23	1000.000	229.151	770.849						
24	700.829	407.390	292.610	0.571				0.258	
25	2000.120	1705.865	284.551		0.120	9.584			
26	170.996	140.734	29.266	0.842				0.154	
27	600.860	569.176	30.824	0.860					
28	302.119	155.465	144.535	1.989	0.130				
29	701.340	536.113	163.180	1.340		0.707			
30	700.000	574.878	121.411			3.711			
31	300.342	168.441	131.378			0.181		0.342	
SD26	1528.589	1500.000	8.637	17.206	2.723		0.023		
SD28	11073.336	8233.985	2771.416	36.997	24.787	4.599	0.000	1.412	0.140
SD26+28	12601.925	9733.985	2780.053	54.203	27.510	4.599	0.023	1.412	0.140
SD29	4578.227	3432.491	1126.790	6.443	1.491	10.718		0.294	
SD32	1700.829	636.541	1063.459	0.571				0.258	
SD29+32	6279.056	4069.032	2190.249	7.014	1.491	10.718		0.552	
Total	18880.981	13803.017	4970.302	61.217	29.001	15.317	0.023	1.964	0.140

Table 3. Catch per unit effort results by species in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	***Total CPUE [kg/h]***	***CPUE per species [kg/h]***							
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Smelt***	***Lumpfish***	***Shorthorn sculpin***
		161789	***161722***	***164712***	***172894***	***166365***	***162039***	***167612***	***167318***
1	400.000	400.000							
2	1003.982	1000.000	0.208	3.024	0.750				
3	1452.800	1400.000	17.066	31.388	4.346				
4	200.396	200.000			0.350		0.046		
5	242.546	189.478	50.948	1.560	0.560				
6	311.182	295.236	4.764	7.864	3.318				
7	2807.062	2734.714	65.286	5.774	1.288				
8	1614.886	1532.624	68.256	7.932	6.074				
9	811.008	285.118	514.882	4.396	6.612				
10	801.708	725.010	74.990		0.768			0.940	
11	3012.078	1883.330	1116.670	9.582	2.496				
12	810.168	699.252	100.748	8.804	1.364				
13	1016.278	433.520	566.480	0.494	15.504				0.280
14	600.450	471.108	128.892		0.450				
15	1612.994	807.536	792.464	7.212	5.782				
16	805.508	572.704	227.296	4.206	1.302				
17	2208.030	2025.432	174.568	6.154	1.876				
18	1810.178	1060.858	739.142	7.336	2.180			0.662	
19	280.538	193.186	86.814					0.538	
20	1604.386	850.724	747.718	3.390	0.996	1.558			
21	1003.880	605.996	394.004	2.114	1.486			0.280	
22	399.998	265.782	133.506			0.710			
23	2000.000	458.302	1541.698						
24	1401.658	814.780	585.220	1.142				0.516	
25	4000.240	3411.730	569.102		0.240	19.168			
26	341.992	281.468	58.532	1.684				0.308	
27	1201.720	1138.352	61.648	1.720					
28	604.238	310.930	289.070	3.978	0.260				
29	1402.680	1072.226	326.360	2.680		1.414			
30	1400.000	1149.756	242.822			7.422			
31	600.684	336.882	262.756			0.362		0.684	
SD26	764.295	750.000	8.637	17.206	1.815		0.046		
SD28	1256.052	903.872	344.348	5.487	3.254	1.558		0.605	0.280
SD26+28	1162.384	874.563	309.010	6.952	3.026	1.558	0.046	0.605	0.280
SD29	1308.065	980.712	321.940	2.577	0.746	7.145		0.294	
SD32	1700.829	636.541	1063.459	1.142				0.516	
SD29+32	1395.346	904.229	486.722	2.338	0.746	7.145		0.368	
Total	1218.170	890.517	342.824	5.830	2.762	5.106	0.046	0.561	0.280

Table 4. Catch per unit effort results by species in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

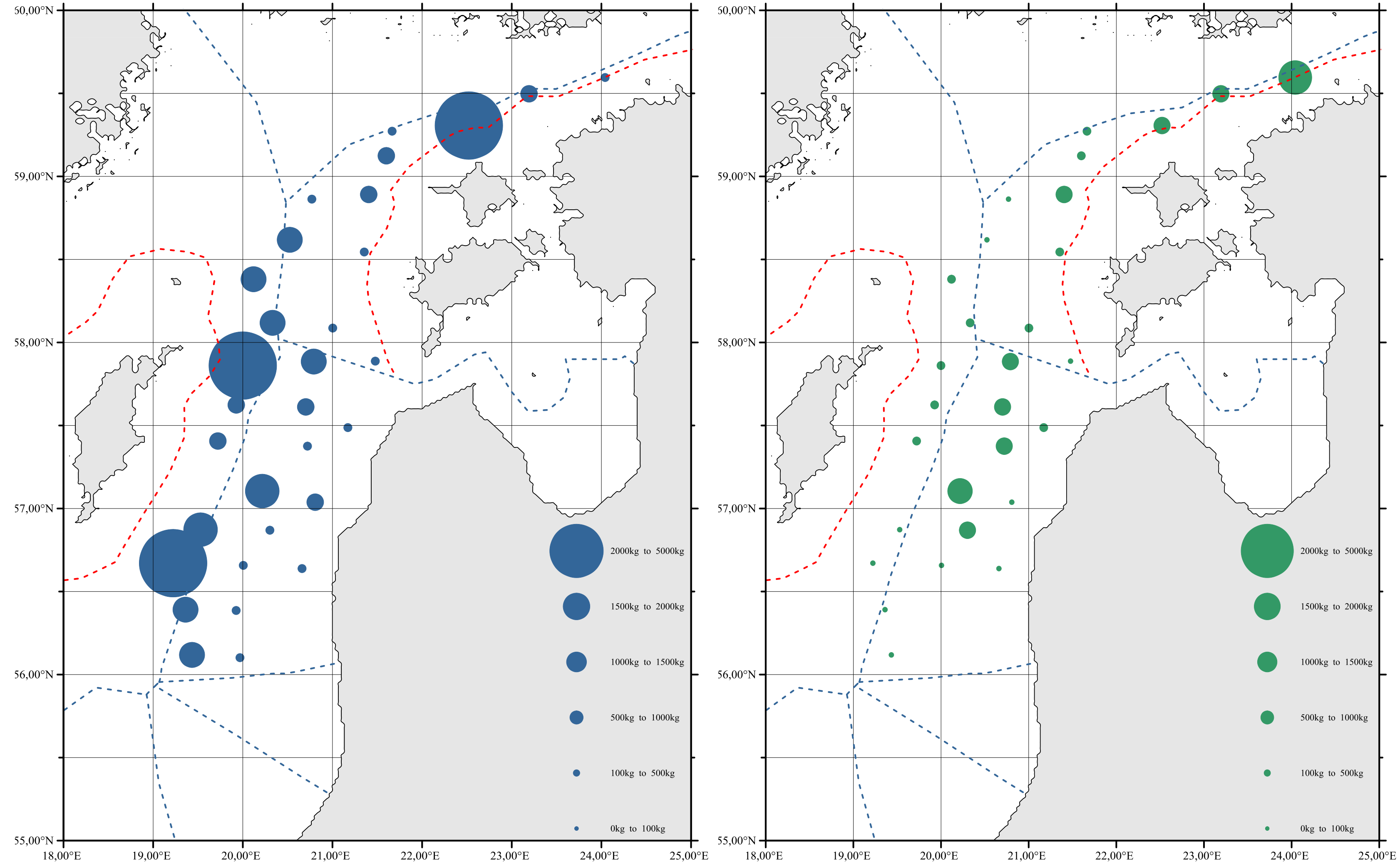
Haul number	Total CPUE [n/h]	CPUE per species [n/h]							
		Sprat	Herring	Cod	Flounder	Three-spined stickleback	Smelt	Lumpfish	Shorthorn sculpin
		161789	161722	164712	172894	166365	162039	167612	167318
1	36098	36098							
2	99520	99504	4	10	2				
3	149822	149340	362	88	32				
4	19628	19624			2		2		
5	22570	20902	1660	2	6				
6	30856	30692	122	20	22				
7	314136	312682	1414	30	10				
8	182882	181338	1472	34	38				
9	53568	40766	12740	14	48				
10	85850	83914	1924		6			6	
11	223854	198204	25574	58	18				
12	85084	82850	2186	40	8				
13	63232	47480	15622	4	124				2
14	82432	78308	4122		2				
15	114784	94266	20430	42	46				
16	76784	71480	5264	28	12				
17	305480	301084	4342	40	14				
18	141240	120330	20850	48	10			2	
19	25738	23040	2694					4	
20	120552	96798	22994	8	10	742			
21	101976	89392	12560	14	8			2	
22	33710	27720	5712			278			
23	136786	55194	81592						
24	111540	87566	23968	4				2	
25	410066	380214	20424		2	9426			
26	35766	33778	1974	10				4	
27	155416	153350	2058	8					
28	52244	42828	9396	18	2				
29	148568	138950	9094	18		506			
30	170284	157622	10042			2620			
31	46270	37920	8164			182		4	
SD26	305068	304566	366	98	36		2		
SD28	2173612	2021828	147716	378	364	3308		16	2
SD26+28	2478680	2326394	148082	476	400	3308	2	16	2
SD29	909730	824080	75118	58	22	10446		6	
SD32	248326	142760	105560	4				2	
SD29+32	1158056	966840	180678	62	22	10446		8	
Total	3636736	3293234	328760	538	422	13754	2	24	2

Table 5. Number of sprat individuals measured in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	***Length class [cm]***														***Total***	***<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***		
1			1	1	2		9	40	66	46	29	7	3		204	12.4
2			1	2	1	2	32	67	57	27	10	5	3	2	209	12.1
3		2	5	7	6	13	44	45	46	24	14	3			209	11.7
4			4	3	3	6	23	51	63	29	14	3	1		200	12.0
5			7	19	8	11	34	53	40	19	10				201	11.5
6		3	1	3	4	12	32	62	46	22	13	1			199	11.8
7		2	10	21	9	12	26	45	43	20	9	2		1	200	11.5
8	1	4	24	17	15	8	30	42	30	15	11	2			199	11.2
9	13	25	31	28	13	2	13	19	31	18	5	2			200	10.6
10	1	8	20	28	13	5	18	30	29	31	16	3	1		203	11.3
11		1	2	9	2	5	46	50	49	27	13	1	1		206	11.8
12			13	16	6	17	52	52	27	14	3				200	11.3
13	1	1	5	9	5	9	46	55	41	21	10				203	11.7
14	1	9	56	60	27	3	10	17	7	5	2	2			199	10.1
15		10	16	16	3	13	32	38	36	24	14	1			203	11.4
16	1	3	18	21	3	14	45	41	34	9	8	2			199	11.3
17	2	6	46	33	14	11	33	41	17	5	2				210	10.6
18		3	8	10	2	11	51	48	42	23	5				203	11.6
19		4	13	24	10	10	40	44	39	11	8	2			205	11.3
20		1	9	5	3	17	56	50	42	14	6	1			204	11.6
21	1	11	42	24	6	25	30	30	22	6	3	1			201	10.7
22		1		4	1	13	48	46	44	32	10	1	1		201	11.9
23	1	16	18	4	1	17	40	46	36	19	4				202	11.3
24		2	2	1	3	14	43	50	42	42	9				208	11.9
25		8	3		1	18	44	57	43	25	4	2			205	11.7
26			4	6	2	41	74	46	21	8	2				204	11.4
27	2	4	31	19	12	20	46	39	21	9	3	1			207	10.9
28		17	33	27	4	14	35	36	22	12	3				203	10.8
29		6	19	19	7	36	38	48	19	9	2	1			204	11.0
30		2	32	42	6	18	27	24	26	13	6	1			197	10.9
31		1	4	9	10	12	52	54	44	12	8	1			207	11.6
SD26		2	11	13	12	21	108	203	232	126	67	18	7	2	822	12.1
SD28	20	88	325	384	157	209	625	763	600	298	145	21	2	1	3638	11.3
SD26+28	20	90	336	397	169	230	733	966	832	424	212	39	9	3	4460	11.4
SD29	3	42	122	85	29	148	333	304	215	106	31	6	1		1425	11.3
SD32	1	18	20	5	4	31	83	96	78	61	13				410	11.6
SD29+32	4	60	142	90	33	179	416	400	293	167	44	6	1		1835	11.3
Total	24	150	478	487	202	409	1149	1366	1125	591	256	45	10	3	6295	11.4

Table 6. Mean weight [g] of sprat in catch in the Baltic Sea ICES SD 26N, 28, 29 and 32W
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	*Length class [cm]*														*Average*
	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			4.2	4.6	5.9		8.0	9.5	10.8	11.7	13.3	15.0	16.7		11.1
2			4.5	4.5	5.2	6.4	8.0	9.1	10.3	11.5	14.0	16.0	16.3	20.0	10.0
3		3.6	4.0	6.3	7.5	7.5	8.1	9.2	10.1	12.1	12.9	13.3			9.4
4			3.8	4.5	5.3	7.1	8.1	9.4	10.7	12.2	13.9	13.9	18.6		10.2
5			4.9	5.4	6.1	6.7	8.3	9.4	10.6	12.2	12.8				9.1
6		3.6	4.5	4.6	5.8	7.5	8.2	9.2	10.4	12.0	13.5	20.2			9.6
7		3.7	4.3	4.8	5.7	6.9	8.2	9.2	10.3	11.7	12.6	14.0		17.8	8.7
8	3.0	3.7	4.4	5.1	6.0	7.3	8.3	9.1	10.7	13.0	13.6	14.0			8.5
9	3.2	3.7	4.2	5.1	5.8	6.2	8.1	8.9	10.3	11.8	13.6	14.7			7.0
10	2.9	4.0	4.4	5.0	6.2	7.0	8.3	9.5	10.6	11.8	13.1	13.5	16.7		8.6
11		3.6	3.8	5.0	5.5	6.8	8.2	9.1	10.4	11.5	13.6	14.3	15.0		9.5
12			4.6	5.1	6.7	7.0	8.0	9.3	10.2	12.1	14.0				8.4
13	2.9	4.2	4.5	5.2	6.1	7.0	8.3	9.2	10.7	11.2	12.0				9.1
14	3.2	4.0	4.6	5.1	5.7	6.9	8.6	9.3	10.3	11.0	11.6	14.1			6.0
15		3.7	4.3	5.0	6.0	7.1	7.8	8.9	10.6	11.8	12.9	14.0			8.6
16	2.6	3.4	4.4	4.8	5.7	6.6	7.8	8.9	10.0	11.7	13.0	13.8			8.0
17	3.0	3.6	4.1	4.7	5.4	6.4	7.9	9.1	10.6	11.5	12.4				6.7
18		3.7	4.4	4.8	5.9	6.5	8.2	9.1	10.2	11.5	13.0				8.8
19		3.7	4.5	4.8	5.7	6.7	8.3	9.3	10.4	11.5	12.8	14.1			8.4
20		3.5	4.3	4.8	5.7	7.1	8.0	9.0	10.2	11.8	13.0	16.4			8.8
21	2.6	3.5	4.0	4.7	5.8	6.8	7.8	8.9	9.8	11.3	12.0	13.0			6.8
22		3.6		4.8	6.4	7.2	8.0	9.3	10.5	11.6	13.0	13.7	14.3		9.6
23	3.0	3.5	4.1	4.6	6.6	7.1	8.3	9.2	10.5	11.6	11.9				8.3
24		3.2	3.9	5.0	5.1	7.0	8.1	9.1	10.1	11.2	12.0				9.3
25		3.4	3.9		5.9	6.9	8.0	9.1	10.3	11.2	12.8	14.0			9.0
26			4.4	4.9	6.2	6.8	8.1	9.3	10.0	11.9	12.7				8.3
27	3.2	3.6	4.2	4.9	5.2	7.0	7.8	9.0	10.7	11.1	13.3	15.0			7.4
28		3.9	4.2	5.0	5.7	6.9	8.0	9.1	10.2	11.7	13.0				7.3
29		3.8	4.5	4.8	6.0	7.1	7.7	9.3	10.0	11.6	14.5	17.2			7.7
30		3.7	4.2	4.8	5.7	6.6	8.0	8.8	10.5	11.6	13.0	16.7			7.3
31		3.7	4.6	5.1	5.8	6.8	8.0	9.0	10.6	11.9	12.5	15.0			8.9
SD26		3.6	4.0	5.5	6.5	7.3	8.0	9.3	10.5	11.9	13.4	14.8	16.8	20.0	10.2
SD28	3.3	3.8	4.3	4.4	5.3	6.1	7.7	8.6	10.0	11.2	12.4	13.7	15.9	17.8	7.8
SD26+28	3.3	3.8	4.3	4.5	5.4	6.2	7.8	8.7	10.1	11.4	12.7	14.2	16.6	19.3	8.2
SD29	3.0	3.7	4.2	4.9	5.6	6.9	8.0	9.1	10.3	11.5	12.9	14.4	14.3		8.2
SD32	3.0	3.5	4.0	4.6	5.5	7.0	8.2	9.1	10.3	11.3	12.0				8.8
SD29+32	3.0	3.6	4.1	4.9	5.6	6.9	8.0	9.1	10.3	11.4	12.6	14.4	14.3		8.3
Total	3.1	3.7	4.3	4.9	5.8	6.9	8.1	9.2	10.4	11.7	13.1	14.7	16.4	19.3	8.5



Sprat **Herrin**

Figure 3. CPUE [kg/h] ranges distribution of sprat and herring cod in the catch hauls in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

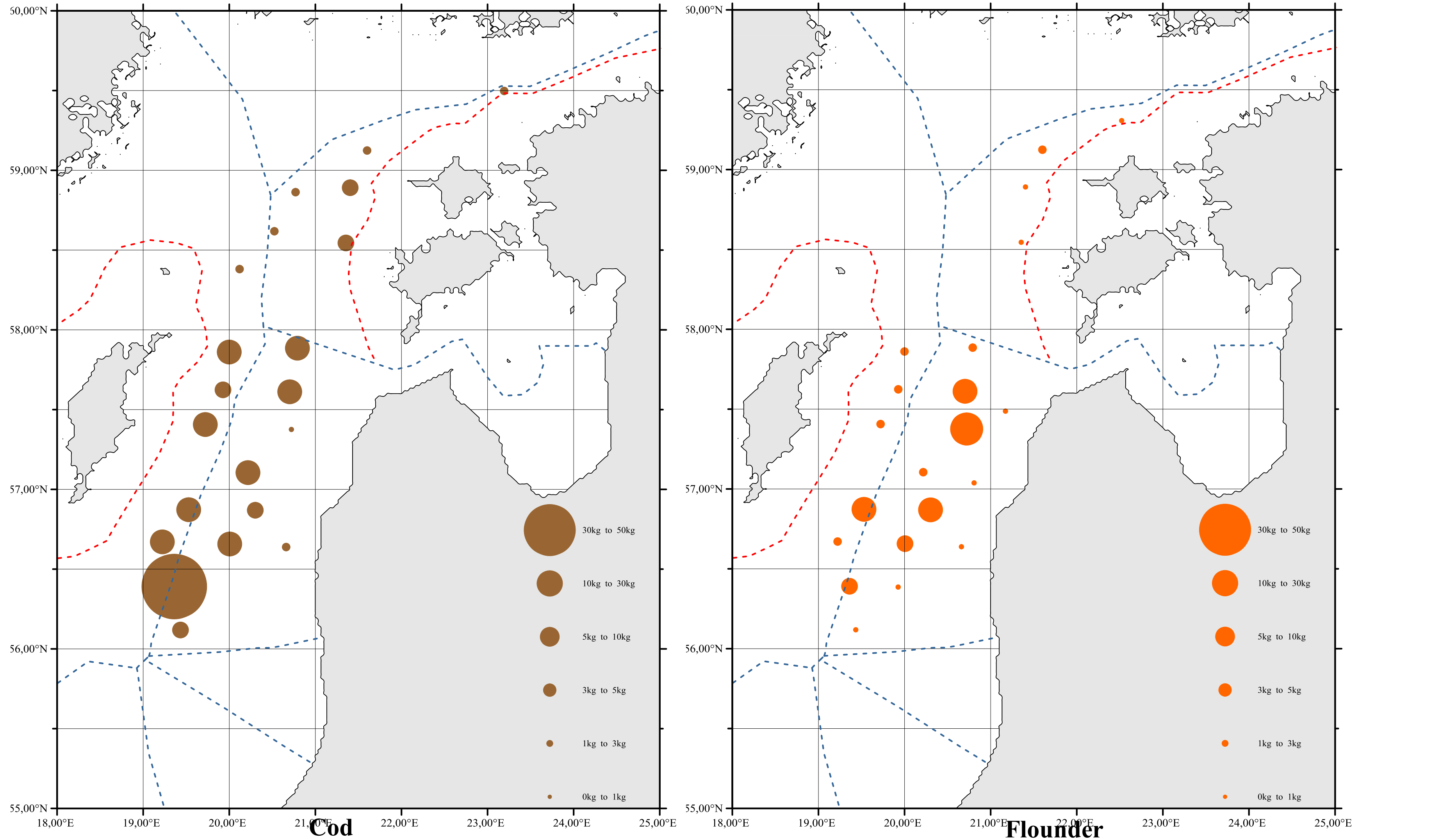


Figure 4. CPUE [kg/h] ranges distribution of cod and flounder in the catch hauls in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Table 7. Share of fish species in mass of the control catches in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	***Total***	***Catch share [%]***							
		Sprat	***Herring***	***Cod***	***Flounder***	***Three-spined stickleback***	***Smelt***	***Lumpfish***	***Shorthorn sculpin***
		161789	***161722***	***164712***	***172894***	***166365***	***162039***	***167612***	***167318***
1	100.00	100.00							
2	100.00	99.60	0.02	0.30	0.07				
3	100.00	96.37	1.17	2.16	0.30				
4	100.00	99.80			0.17		0.02		
5	100.00	78.12	21.01	0.64	0.23				
6	100.00	94.88	1.53	2.53	1.07				
7	100.00	97.42	2.33	0.21	0.05				
8	100.00	94.91	4.23	0.49	0.38				
9	100.00	35.16	63.49	0.54	0.82				
10	100.00	90.43	9.35		0.10			0.12	
11	100.00	62.53	37.07	0.32	0.08				
12	100.00	86.31	12.44	1.09	0.17				
13	100.00	42.66	55.74	0.05	1.53				0.03
14	100.00	78.46	21.47		0.07				
15	100.00	50.06	49.13	0.45	0.36				
16	100.00	71.10	28.22	0.52	0.16				
17	100.00	91.73	7.91	0.28	0.08				
18	100.00	58.61	40.83	0.41	0.12			0.04	
19	100.00	68.86	30.95					0.19	
20	100.00	53.02	46.60	0.21	0.06	0.10			
21	100.00	60.37	39.25	0.21	0.15			0.03	
22	100.00	66.45	33.38			0.18			
23	100.00	22.92	77.08						
24	100.00	58.13	41.75	0.08				0.04	
25	100.00	85.29	14.23		0.01	0.48			
26	100.00	82.30	17.12	0.49				0.09	
27	100.00	94.73	5.13	0.14					
28	100.00	51.46	47.84	0.66	0.04				
29	100.00	76.44	23.27	0.19		0.10			
30	100.00	82.13	17.34			0.53			
31	100.00	56.08	43.74			0.06		0.11	
SD26	100.00	98.13	0.57	1.13	0.18		<0.01		
SD28	100.00	74.35	25.03	0.33	0.22	0.04		0.01	<0.01
SD26+28	100.00	77.24	22.06	0.43	0.22	0.04	<0.01	0.01	<0.01
SD29	100.00	74.97	24.61	0.14	0.03	0.23		0.01	
SD32	100.00	37.43	62.53	0.03				0.02	
SD29+32	100.00	64.80	34.88	0.11	0.02	0.17		0.01	
Total	100.00	73.10	26.33	0.32	0.15	0.08	<0.01	0.01	<0.01

Table 8. Share of fish species in numbers of the control catches in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	Total	Catch share [%]							
		Sprat	Herring	Cod	Flounder	Three-spined stickleback	Smelt	Lumpfish	Shorthorn sculpin
		161789	161722	164712	172894	166365	162039	167612	167318
1	100.00	100.00							
2	100.00	99.98	<0.01	0.01	<0.01				
3	100.00	99.68	0.24	0.06	0.02				
4	100.00	99.98			0.01		0.01		
5	100.00	92.61	7.35	0.01	0.03				
6	100.00	99.47	0.40	0.06	0.07				
7	100.00	99.54	0.45	0.01	<0.01				
8	100.00	99.16	0.80	0.02	0.02				
9	100.00	76.10	23.78	0.03	0.09				
10	100.00	97.74	2.24		0.01			0.01	
11	100.00	88.54	11.42	0.03	0.01				
12	100.00	97.37	2.57	0.05	0.01				
13	100.00	75.09	24.71	0.01	0.20				<0.01
14	100.00	95.00	5.00		<0.01				
15	100.00	82.12	17.80	0.04	0.04				
16	100.00	93.09	6.86	0.04	0.02				
17	100.00	98.56	1.42	0.01	0.00				
18	100.00	85.20	14.76	0.03	0.01			<0.01	
19	100.00	89.52	10.47					0.02	
20	100.00	80.30	19.07	0.01	0.01	0.62			
21	100.00	87.66	12.32	0.01	0.01			<0.01	
22	100.00	82.23	16.94			0.82			
23	100.00	40.35	59.65						
24	100.00	78.51	21.49	<0.01				<0.01	
25	100.00	92.72	4.98		<0.01	2.30			
26	100.00	94.44	5.52	0.03				0.01	
27	100.00	98.67	1.32	0.01					
28	100.00	81.98	17.98	0.03	<0.01				
29	100.00	93.53	6.12	0.01		0.34			
30	100.00	92.56	5.90			1.54			
31	100.00	81.95	17.64			0.39		0.01	
SD26	100.00	99.84	0.12	0.03	0.01		<0.01		
SD28	100.00	93.02	6.80	0.02	0.02	0.15		<0.01	<0.01
SD26+28	100.00	93.86	5.97	0.02	0.02	0.13	<0.01	<0.01	<0.01
SD29	100.00	90.59	8.26	0.01	<0.01	1.15		<0.01	
SD32	100.00	57.49	42.51	<0.01				<0.01	
SD29+32	100.00	83.49	15.60	0.01	<0.01	0.90		<0.01	
Total	100.00	90.55	9.04	0.01	0.01	0.38	<0.01	<0.01	<0.01

Table 9. The biological data of pelagic fish species collected in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Haul No	Herring		Sprat	
			L [cm]	W [g]	L [cm]	W [g]
32	47H3	23,24	15.2	20.1	11.6	8.9
29	47H2	22,25,24	16.6	25.7	11.7	9.1
	47H1	21,22	17.2	28.9	11.0	7.4
	46H1	20,28	17.8	32.0	11.3	8.3
	46H0	26,27	17.5	29.8	11.0	7.6
28	45H1	19,28,31	17.7	31.5	11.2	8.1
	45H0	29,30,31	17.5	30.5	11.02	7.65
	44H1	14,19	17.6	31.6	10.4	6.6
	44H0	15,16,17,18	18.9	38.0	11.0	7.6
	43H1	10,14	18.0	33.7	10.7	7.4
	43H0	10,11,13	19.1	40.8	11.7	9.2
	43G9	12,8,16	19.8	44.3	11.3	8.4
	42H0	5,6,9,10	18.8	39.2	11.3	8.5
	42G9	6,7,8	19.9	45.7	11.4	8.7
26	41H0	1,4,5	17.0	30.1	12.1	10.3
	41G9	1,2,3,4	19.7	46.8	11.9	9.9
SD32		23,24	15.2	20.1	11.6	8.9
SD29		20-22,24-28	17.2	28.9	11.1	7.8
SD29+32		20-28	17.0	28.0	11.1	7.9
SD28		5-18,28-31	18.7	38.1	11.2	8.3
SD26		1-5	17.3	31.9	12.0	10.0
SD26+28		1-18,28-34	18.7	37.8	11.4	8.7
Total		1-31	17.7	32.2	11.3	8.4

Table 10. The biological data of cod collected in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Haul No	Cod	
			L [cm]	W [g]
32	47H3	23,24	31.6	285.5
29	47H2	22,25,24	31.6	285.5
	47H1	21,22	26.0	151.0
	46H1	20,28	30.6	283.4
	46H0	26,27	26.9	189.1
28	45H1	19,28,31	28.6	221.0
	45H0	29,30,31	25.8	148.9
	44H1	14,19		
	44H0	15,16,17,18	26.4	158.9
	43H1	10,14		
	43H0	10,11,13	26.0	162.5
	43G9	12,8,16	28.0	205.3
	42H0	5,6,9,10	33.0	383.9
	42G9	6,7,8	29.8	256.8
26	41H0	1,4,5	46.5	780.0
	41G9	1,2,3,4	33.6	350.8
SD32		23,24	31.6	285.5
SD29		20-22,24-28	28.6	208.9
SD29+32		20-28	28.6	208.9
SD28		5-18,28-31	27.5	196.9
SD26		1-5	33.5	359.7
SD26+28		1-18,28-34	28.6	227.5
Total		1-31	28.6	227.6

Table 11. Hydroacoustic survey statistics of pelagic fish species in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Area [nm^2]	NASC [m^2/nm^2]	σ×10^4 [m^2]	Total abundance [n×10^6]	Species composition [%]		TS calc. [dB]
						Herring	Sprat	
32	47H3	536.2	131.605	1.69737	415.732	42.5	57.5	-48.7
29	47H2	793.9	479.142	1.43907	2643.263	9.2	90.8	-49.4
	47H1	920.3	1007.586	1.38947	6673.779	13.5	86.5	-49.6
	46H1	921.5	210.107	1.57318	1230.721	18.8	81.2	-49.0
	46H0	933.8	532.959	1.20411	4133.082	2.1	97.9	-50.2
28	45H1	827.1	75.353	1.50215	414.901	16.3	83.7	-49.2
	45H0	947.2	242.910	1.26383	1820.538	5.4	94.6	-50.0
	44H1	824.6	132.154	1.16521	935.227	6.3	93.7	-50.3
	44H0	960.5	349.274	1.35176	2481.792	8.0	92.0	-49.7
	43H1	412.7	413.937	1.18974	1435.875	3.6	96.4	-50.2
	43H0	973.7	394.118	1.56583	2450.791	11.6	88.4	-49.0
	43G9	973.7	659.390	1.28635	4991.247	2.6	97.4	-49.9
	42H0	968.5	435.549	1.41367	2983.926	8.5	91.5	-49.5
	42G9	986.9	664.837	1.27201	5158.184	0.6	99.4	-49.9
26	41H0	953.3	297.865	1.42557	1991.868	2.1	97.9	-49.5
	41G9	1000.0	600.571	1.37029	4382.803	0.1	99.9	-49.6
SD32		536.2	131.605	1.69737	415.732	42.5	57.5	-48.7
SD29		3569.5	557.448	1.40145	14680.845	10.0	90.0	-49.5
SD29+32		4105.7	472.280	1.46064	15096.577	10.9	89.1	-49.4
SD28		7874.9	374.169	1.33451	22672.480	5.3	94.7	-49.8
SD26		1953.3	449.218	1.39793	6374.671	0.7	99.3	-49.5
SD26+28		9828.2	387.814	1.34604	29047.151	4.3	95.7	-49.7
Total		13933.9	414.210	1.38185	44143.727	6.6	93.4	-49.6

Table 12. Estimated abundance and biomass of pelagic fish species in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Area [nm^2]	ρ [n×10^6/nm^2]	Quantity [n×10^6]			Biomass [kg×10^3]		
				Total	Herring	Sprat	Total	Herring	Sprat
32	47H3	536.2	0.77535	415.732	176.726	239.006	5692.220	3560.849	2131.372
29	47H2	793.9	3.32953	2643.263	242.739	2400.524	28002.654	6239.075	21763.579
	47H1	920.3	7.25159	6673.779	900.651	5773.128	68979.088	26004.053	42975.036
	46H1	921.5	1.33556	1230.721	231.741	998.980	15729.331	7417.972	8311.359
	46H0	933.8	4.42617	4133.082	87.169	4045.912	33296.317	2598.410	30697.907
28	45H1	827.1	0.50163	414.901	67.748	347.153	4949.186	2136.163	2813.023
	45H0	947.2	1.92202	1764.218	133.132	1631.086	16534.663	4056.803	12477.860
	44H1	824.6	1.13416	935.227	58.931	876.296	7608.841	1865.083	5743.758
	44H0	960.5	2.58385	2481.792	197.927	2283.865	24893.948	7520.578	17373.369
	43H1	412.7	3.47922	1435.875	51.584	1384.291	11946.615	1739.785	10206.829
	43H0	973.7	2.51699	2450.791	283.538	2167.253	31562.024	11560.512	20001.512
	43G9	973.7	5.12606	4991.247	129.208	4862.039	46350.947	5727.529	40623.419
	42H0	968.5	3.08098	2983.926	254.892	2729.034	33130.949	9988.176	23142.773
	42G9	986.9	5.22665	5158.184	29.401	5128.783	45940.138	1343.270	44596.867
26	41H0	953.3	2.08944	1991.868	42.693	1949.175	21367.974	1285.182	20082.792
	41G9	1000.0	4.38280	4382.803	5.060	4377.744	43357.760	236.534	43121.225
SD32		536.2	0.77535	415.732	176.726	239.006	5692.220	3560.849	2131.372
SD29		3569.5	4.08571	14680.845	1462.300	13218.545	146007.390	42259.510	103747.881
SD29+32		4105.7	3.42364	15096.577	1639.027	13457.550	151699.611	45820.359	105879.252
SD28		7874.9	2.84129	22616.159	1206.360	21409.799	222917.311	45937.899	176979.412
SD26		1953.3	3.23612	6374.671	47.752	6326.919	64725.733	1521.716	63204.017
SD26+28		9828.2	2.91307	28990.830	1254.112	27736.718	287643.045	47459.615	240183.429
Total		13933.9	3.07263	44087.407	2893.139	41194.268	439342.655	93279.974	346062.681

Table 13*. Hydroacoustic survey statistics of cod in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Area [nm^2]	NASC [m^2/nm^2]	$\sigma \times 10^4$ [m^2]	ρ [n/nm^2]	Abundance [$n \times 10^3$]	Biomass [$kg \times 10^3$]	TS calc. [dB]
32	47H3	536.2						
29	47H2	793.9						
	47H1	920.3						
	46H1	921.5						
	46H0	933.8						
28	45H1	827.1	0.138	18.94054	0.060	13.306	0.00007	-38.2
	45H0	947.2	0.149	15.19129	0.093	13.797	0.00010	-39.2
	44H1	824.6						
	44H0	960.5	0.765	16.00872	0.459	72.947	0.00048	-38.9
	43H1	412.7						
	43H0	973.7	0.649	15.50398	0.408	66.254	0.00042	-39.1
	43G9	973.7	2.793	18.40597	1.477	303.338	0.00152	-38.3
	42H0	968.5	1.501	26.08894	0.557	213.958	0.00058	-36.8
	42G9	986.9	1.738	20.88575	0.821	210.836	0.00083	-37.8
26	41H0	953.3	0.258	48.31876	0.051	39.683	0.00005	-34.2
	41G9	1000.0	3.755	26.46098	1.419	497.771	0.00142	-36.8
SD32		536.2						
SD29		3569.5						
SD29+32		4105.7						
SD28		7874.9	1.105	18.71788	3.875	894.436	0.00057	-38.3
SD26		1953.3	2.006	37.38987	1.470	537.455	0.00074	-35.5
SD26+28		9828.2	1.305	22.86721	5.345	1431.890	0.00061	-37.7
Total		13933.9	1.305	22.86721	5.345	1431.890	0.00061	-37.7

* - cod in ICES SD 29 and 32W was caught in small numbers.

Sprat in ICES SD 26N and 28

Table 14. Sprat age composition [%] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
32	47H3	8.9	23.3	26.0	9.1	15.7	8.4	1.8	6.8	100.0
29	47H2	4.7	27.8	25.5	9.2	11.3	11.3	2.2	8.1	100.0
	47H1	31.3	29.2	14.1	4.6	8.3	5.4	1.9	5.3	100.0
	46H1	17.4	32.3	19.3	10.8	4.0	7.6	3.8	4.9	100.0
	46H0	25.4	27.6	23.9	7.2	4.9	6.7	1.7	2.4	100.0
28	45H1	26.5	34.8	19.1	5.1	1.8	8.8	0.4	3.5	100.0
	45H0	31.7	30.2	20.7	4.0	1.8	7.1	0.5	3.9	100.0
	44H1	65.6	13.6	10.5	5.1	0.5	3.3	0.8	0.7	100.0
	44H0	33.3	29.2	18.8	5.8	0.9	8.7	0.6	2.6	100.0
	43H1	56.3	9.3	18.3	7.4	0.7	5.7	1.7	0.7	100.0
	43H0	14.8	31.6	27.9	6.8	1.4	11.6	2.4	3.6	100.0
	43G9	26.2	35.7	18.3	6.8	1.4	7.7	1.4	2.4	100.0
	42H0	33.3	20.1	25.7	7.9	1.4	9.1	1.4	1.1	100.0
	42G9	25.6	29.1	23.9	9.6	1.8	8.0	0.2	1.7	100.0
26	41H0	7.6	34.4	39.3	5.6	2.8	6.9	0.8	2.6	100.0
	41G9	6.8	37.7	31.8	8.0	3.5	8.5	0.7	3.0	100.0
SD32		8.9	23.3	26.0	9.1	15.7	8.4	1.8	6.8	100.0
SD29		23.6	28.7	19.6	6.7	7.5	7.0	2.0	4.9	100.0
SD29+32		23.4	28.6	19.7	6.7	7.6	7.0	2.0	4.9	100.0
SD28		30.5	28.0	21.5	7.2	1.4	8.1	1.0	2.2	100.0
SD26		7.0	36.7	34.1	7.3	3.3	8.0	0.7	2.9	100.0
SD26+28		25.2	30.0	24.4	7.2	1.8	8.1	1.0	2.4	100.0
Total		24.6	29.5	22.8	7.1	3.7	7.8	1.3	3.2	100.0

Table 15. Sprat age composition [n×10^6] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
32	47H3	21.4	55.7	62.3	21.7	37.4	20.1	4.2	16.1	239.0
29	47H2	112.4	667.4	611.7	220.3	271.7	270.7	52.7	193.7	2400.5
	47H1	1809.8	1685.1	811.6	266.9	477.9	309.8	107.3	304.8	5773.1
	46H1	174.1	322.2	193.1	107.5	40.1	75.4	37.5	49.0	999.0
	46H0	1028.9	1116.0	968.0	291.8	199.9	272.7	69.5	99.1	4045.9
28	45H1	92.0	120.8	66.2	17.8	6.3	30.6	1.4	12.1	347.2
	45H0	517.3	492.9	337.3	65.8	29.6	115.9	8.4	63.8	1631.1
	44H1	575.0	119.4	91.8	44.5	4.4	28.5	6.9	5.8	876.3
	44H0	760.2	665.8	429.8	133.6	21.5	199.8	12.8	60.4	2283.9
	43H1	778.7	128.7	253.3	102.7	10.2	78.7	22.9	9.2	1384.3
	43H0	319.8	684.8	604.0	147.8	29.6	251.5	52.2	77.6	2167.3
	43G9	1275.7	1737.9	890.0	329.8	67.7	375.4	66.7	118.9	4862.0
	42H0	908.4	547.5	700.1	216.2	37.8	249.2	39.1	30.7	2729.0
	42G9	1313.0	1491.9	1227.2	492.1	94.3	410.7	9.8	89.7	5128.8
26	41H0	148.1	670.6	766.6	108.6	54.0	134.8	15.3	51.2	1949.2
	41G9	296.5	1650.5	1391.3	351.2	151.8	373.6	29.9	133.0	4377.7
SD32		21.4	55.7	62.3	21.7	37.4	20.1	4.2	16.1	239.0
SD29		3125.1	3790.8	2584.4	886.5	989.5	928.5	267.0	646.6	13218.5
SD29+32		3146.5	3846.5	2646.7	908.2	1027.0	948.7	271.2	662.8	13457.6
SD28		6540.2	5989.6	4599.8	1550.2	301.4	1740.4	220.1	468.1	21409.8
SD26		444.5	2321.1	2157.9	459.8	205.7	508.4	45.2	184.2	6326.9
SD26+28		6984.7	8310.7	6757.8	2010.0	507.1	2248.8	265.3	652.3	27736.7
Total		10131.2	12157.2	9404.4	2918.3	1534.1	3197.4	536.5	1315.1	41194.3

Table 16. Sprat mean weight [g] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age								Average
		1	2	3	4	5	6	7	8+	
32	47H3	3.8	7.9	9.3	9.9	10.1	10.7	10.6	10.9	8.9
29	47H2	3.6	8.0	9.3	10.2	10.3	10.5	10.7	10.1	9.1
	47H1	4.2	7.6	9.2	9.6	10.2	10.5	10.3	10.7	7.4
	46H1	4.6	7.9	9.1	10.0	11.2	10.6	9.6	10.9	8.3
	46H0	4.5	7.5	8.6	9.6	9.5	10.5	10.7	11.5	7.6
28	45H1	4.7	8.4	9.7	10.2	11.6	10.6	11.1	11.1	8.1
	45H0	4.7	7.9	9.2	9.8	11.6	10.8	11.6	11.4	7.7
	44H1	4.9	8.8	9.5	10.1	11.6	12.0	10.7	10.4	6.6
	44H0	4.5	8.2	9.3	10.0	11.9	10.6	12.7	10.6	7.6
	43H1	5.0	8.9	10.4	10.6	10.9	12.0	12.6	13.3	7.4
	43H0	5.0	8.6	10.2	10.9	11.4	11.4	12.2	11.6	9.2
	43G9	4.9	8.5	10.0	10.5	12.7	11.3	10.3	11.7	8.4
	42H0	4.8	9.0	10.4	10.8	11.2	11.7	12.9	13.0	8.5
	42G9	5.0	8.9	10.1	10.5	11.2	11.7	13.6	13.1	8.7
26	41H0	5.5	9.6	10.8	12.1	12.6	12.7	13.1	12.2	10.3
	41G9	5.9	8.9	10.5	10.8	11.5	12.4	11.9	11.7	9.9
SD32		3.8	7.9	9.3	9.9	10.1	10.7	10.6	10.9	8.9
SD29		4.3	7.6	9.0	9.8	10.1	10.5	10.4	10.7	7.8
SD29+32		4.3	7.7	9.0	9.8	10.1	10.5	10.4	10.7	7.9
SD28		4.9	8.6	10.0	10.5	11.6	11.4	11.8	11.9	8.3
SD26		5.8	9.1	10.6	11.1	11.8	12.5	12.3	11.9	10.0
SD26+28		4.9	8.7	10.2	10.6	11.7	11.7	11.9	11.9	8.7
Total		4.7	8.4	9.8	10.4	10.6	11.3	11.1	11.3	8.4

Table 17. Sprat biomass [tonnes] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
32	47H3	82.2	440.2	580.5	213.9	377.9	216.1	44.9	175.6	2131.4
29	47H2	401.0	5311.5	5670.0	2237.2	2793.8	2838.3	562.2	1949.6	21763.6
	47H1	7655.1	12808.5	7449.3	2571.6	4863.1	3257.2	1102.2	3268.1	42975.0
	46H1	792.2	2542.7	1757.9	1073.7	449.0	801.6	359.0	535.3	8311.4
	46H0	4583.0	8327.2	8333.4	2804.0	1889.8	2872.4	746.6	1141.4	30697.9
28	45H1	435.0	1009.6	641.0	180.6	72.9	324.4	15.0	134.6	2813.0
	45H0	2433.9	3891.3	3087.2	642.5	342.8	1253.1	97.3	729.8	12477.9
	44H1	2841.5	1055.7	867.9	450.3	50.7	343.7	73.8	60.2	5743.8
	44H0	3392.1	5462.4	4002.9	1332.2	256.5	2123.8	162.4	641.1	17373.4
	43H1	3876.1	1149.7	2630.0	1083.4	111.4	946.9	287.6	121.7	10206.8
	43H0	1589.6	5877.6	6174.3	1609.7	335.8	2877.0	634.0	903.4	20001.5
	43G9	6304.3	14818.3	8873.1	3456.7	858.6	4235.3	689.9	1387.1	40623.4
	42H0	4385.5	4919.3	7259.6	2328.3	423.0	2923.0	504.5	399.6	23142.8
	42G9	6604.3	13251.7	12369.5	5184.5	1052.8	4823.3	133.6	1177.2	44596.9
26	41H0	819.5	6416.1	8317.3	1310.2	679.9	1716.1	201.2	622.5	20082.8
	41G9	1742.2	14729.6	14559.0	3795.5	1741.0	4638.3	354.4	1561.3	43121.2
SD32		82.2	440.2	580.5	213.9	377.9	216.1	44.9	175.6	2131.4
SD29		13431.3	28989.9	23210.6	8686.5	9995.7	9769.6	2769.9	6894.4	103747.9
SD29+32		13513.5	29430.1	23791.2	8900.4	10373.7	9985.6	2814.8	7070.0	105879.3
SD28		31862.2	51435.6	45905.6	16268.1	3504.5	19850.6	2598.0	5554.6	176979.4
SD26		2561.7	21145.7	22876.3	5105.7	2420.9	6354.4	555.6	2183.8	63204.0
SD26+28		34423.9	72581.3	68781.8	21373.9	5925.4	26205.0	3153.6	7738.4	240183.4
Total		47937.4	102011.4	92573.0	30274.3	16299.1	36190.6	5968.4	14808.4	346062.7

Table 18. Sprat proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age								Total
		1	2	3	4	5	6	7	8+	
32	47H3	3.9	20.7	27.2	10.0	17.7	10.1	2.1	8.2	100.0
29	47H2	1.8	24.4	26.1	10.3	12.8	13.0	2.6	9.0	100.0
	47H1	17.8	29.8	17.3	6.0	11.3	7.6	2.6	7.6	100.0
	46H1	9.5	30.6	21.2	12.9	5.4	9.6	4.3	6.4	100.0
	46H0	14.9	27.1	27.1	9.1	6.2	9.4	2.4	3.7	100.0
28	45H1	15.5	35.9	22.8	6.4	2.6	11.5	0.5	4.8	100.0
	45H0	19.5	31.2	24.7	5.1	2.7	10.0	0.8	5.8	100.0
	44H1	49.5	18.4	15.1	7.8	0.9	6.0	1.3	1.0	100.0
	44H0	19.5	31.4	23.0	7.7	1.5	12.2	0.9	3.7	100.0
	43H1	38.0	11.3	25.8	10.6	1.1	9.3	2.8	1.2	100.0
	43H0	7.9	29.4	30.9	8.0	1.7	14.4	3.2	4.5	100.0
	43G9	15.5	36.5	21.8	8.5	2.1	10.4	1.7	3.4	100.0
	42H0	18.9	21.3	31.4	10.1	1.8	12.6	2.2	1.7	100.0
	42G9	14.8	29.7	27.7	11.6	2.4	10.8	0.3	2.6	100.0
26	41H0	4.1	31.9	41.4	6.5	3.4	8.5	1.0	3.1	100.0
	41G9	4.0	34.2	33.8	8.8	4.0	10.8	0.8	3.6	100.0
SD32		3.9	20.7	27.2	10.0	17.7	10.1	2.1	8.2	100.0
SD29		12.9	27.9	22.4	8.4	9.6	9.4	2.7	6.6	100.0
SD29+32		12.8	27.8	22.5	8.4	9.8	9.4	2.7	6.7	100.0
SD28		18.0	29.1	25.9	9.2	2.0	11.2	1.5	3.1	100.0
SD26		4.1	33.5	36.2	8.1	3.8	10.1	0.9	3.5	100.0
SD26+28		14.3	30.2	28.6	8.9	2.5	10.9	1.3	3.2	100.0
Total		13.9	29.5	26.8	8.7	4.7	10.5	1.7	4.3	100.0

Table 19. Sprat mean length [cm] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	*ICES rectangle*	*Age*								*Average*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8+*	
32	47H3	9.1	11.2	11.8	12.1	12.2	12.5	12.4	12.6	11.6
29	47H2	8.9	11.2	11.8	12.2	12.3	12.4	12.4	12.2	11.7
	47H1	9.4	11.1	11.8	12.0	12.2	12.3	12.2	12.6	11.0
	46H1	9.4	11.2	11.7	12.1	12.6	12.4	12.0	12.4	11.3
	46H0	9.4	11.0	11.5	11.9	11.9	12.3	12.5	12.7	11.0
28	45H1	9.5	11.4	11.9	12.2	12.7	12.3	12.5	12.5	11.2
	45H0	9.6	11.2	11.7	12.0	12.7	12.4	12.8	12.6	11.0
	44H1	9.6	11.5	11.8	12.2	13.1	13.0	12.4	12.3	10.5
	44H0	9.5	11.4	11.8	12.1	12.9	12.4	13.3	12.4	11.0
	43H1	9.6	11.5	12.2	12.3	12.6	12.9	13.0	13.4	10.7
	43H0	9.6	11.5	12.1	12.4	12.7	12.6	12.8	12.7	11.7
	43G9	9.6	11.5	12.0	12.2	12.9	12.5	12.1	12.7	11.3
	42H0	9.5	11.6	12.2	12.3	12.5	12.7	13.2	13.3	11.3
	42G9	9.7	11.6	12.1	12.2	12.4	12.7	13.3	13.2	11.4
26	41H0	9.9	11.8	12.3	12.8	13.0	13.0	13.1	12.8	12.1
	41G9	9.8	11.6	12.2	12.4	12.7	12.9	12.8	12.8	11.9
SD32		9.1	11.2	11.8	12.1	12.2	12.5	12.4	12.6	11.6
SD29		9.4	11.1	11.7	12.0	12.2	12.3	12.3	12.5	11.1
SD29+32		9.4	11.1	11.7	12.0	12.2	12.3	12.3	12.5	11.1
SD28		9.6	11.5	12.0	12.2	12.6	12.6	12.7	12.8	11.2
SD26		9.9	11.7	12.3	12.5	12.8	12.9	12.9	12.8	12.0
SD26+28		9.6	11.5	12.1	12.3	12.7	12.7	12.8	12.8	11.4
Total		9.5	11.4	12.0	12.2	12.4	12.6	12.5	12.6	11.3

Herring in ICES SD 26N and 28

Table 20. Herring age composition [%] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	*ICES rectangle*	*Age*									*Total*
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9+*	
32	47H3	6.8	19.7	25.2	9.5	10.6	3.6	14.5	1.4	8.6	100.0
29	47H2	0.3	10.6	19.4	8.0	14.9	5.6	28.2	1.3	11.8	100.0
	47H1	0.2	5.8	9.7	12.0	20.8	10.0	24.1	3.3	14.1	100.0
	46H1		1.1	10.5	3.5	25.0	26.2	23.1	1.8	8.8	100.0
	46H0		2.2	6.6	8.3	18.7	16.1	30.0	3.0	15.1	100.0
28	45H1		7.0	18.9	12.5	16.4	20.7	15.1	3.2	6.2	100.0
	45H0		14.0	17.7	6.9	12.9	21.2	16.5	4.0	6.9	100.0
	44H1		2.8	34.4	8.1	15.9	14.6	13.8	4.7	5.7	100.0
	44H0		0.7	7.1	6.5	16.0	27.1	27.5	4.7	10.4	100.0
	43H1		3.7	31.5	6.2	16.3	15.9	14.0	6.4	6.1	100.0
	43H0		2.6	13.5	4.6	6.1	19.5	27.5	9.9	16.3	100.0
	43G9		0.2	6.4	3.6	10.4	18.3	35.0	8.6	17.5	100.0
	42H0	1.0	4.8	13.9	2.4	6.5	18.4	26.0	13.0	14.0	100.0
	42G9		2.3	11.2	2.1	7.3	20.1	36.7	5.4	15.0	100.0
26	41H0	9.4	17.8	23.1	4.9	9.4	9.5	10.7	2.4	12.8	100.0
	41G9		2.8	5.8	9.2	8.8	16.3	29.0	7.2	21.0	100.0
SD32		6.8	19.7	25.2	9.5	10.6	3.6	14.5	1.4	8.6	100.0
SD29		0.2	5.7	11.2	9.8	20.4	12.2	25.0	2.7	13.0	100.0
SD29+32		0.9	7.2	12.7	9.7	19.3	11.3	23.8	2.6	12.5	100.0
SD28		0.2	4.0	14.3	5.2	10.5	20.3	25.1	8.0	12.4	100.0
SD26		8.4	16.2	21.3	5.3	9.3	10.2	12.7	2.9	13.7	100.0
SD26+28		0.5	4.5	14.6	5.2	10.5	19.9	24.6	7.8	12.4	100.0
Total		0.7	6.0	13.5	7.8	15.5	15.0	24.2	4.9	12.5	100.0

Table 21. Herring age composition [n×10^6] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age									Total
		1	2	3	4	5	6	7	8	9+	
32	47H3	12.0	34.8	44.6	16.9	18.7	6.4	25.6	2.5	15.2	176.7
29	47H2	0.8	25.8	47.0	19.4	36.1	13.5	68.4	3.1	28.7	242.7
	47H1	1.9	52.6	87.0	107.7	187.3	90.3	217.1	29.6	127.1	900.7
	46H1		2.5	24.3	8.2	58.0	60.6	53.5	4.2	20.5	231.7
	46H0		1.9	5.7	7.2	16.3	14.0	26.1	2.7	13.2	87.2
28	45H1		4.7	12.8	8.5	11.1	14.1	10.2	2.2	4.2	67.7
	45H0		18.6	23.5	9.2	17.1	28.2	21.9	5.4	9.2	133.1
	44H1		1.7	20.3	4.8	9.3	8.6	8.1	2.8	3.4	58.9
	44H0		1.4	14.0	12.9	31.6	53.6	54.4	9.4	20.6	197.9
	43H1		1.9	16.2	3.2	8.4	8.2	7.2	3.3	3.2	51.6
	43H0		7.4	38.4	12.9	17.2	55.3	78.0	28.2	46.1	283.5
	43G9		0.2	8.3	4.6	13.4	23.7	45.2	11.1	22.6	129.2
	42H0	2.4	12.3	35.5	6.2	16.5	46.8	66.2	33.2	35.8	254.9
	42G9		0.7	3.3	0.6	2.1	5.9	10.8	1.6	4.4	29.4
26	41H0	4.0	7.6	9.9	2.1	4.0	4.0	4.6	1.0	5.5	42.7
	41G9		0.1	0.3	0.5	0.4	0.8	1.5	0.4	1.1	5.1
SD32		12.0	34.8	44.6	16.9	18.7	6.4	25.6	2.5	15.2	176.7
SD29		2.7	82.9	164.0	142.6	297.7	178.4	365.1	39.5	189.4	1462.3
SD29+32		14.8	117.8	208.6	159.5	316.4	184.8	390.7	41.9	204.6	1639.0
SD28		2.4	48.8	172.3	62.8	126.9	244.4	302.2	97.1	149.4	1206.4
SD26		4.0	7.7	10.2	2.6	4.5	4.9	6.0	1.4	6.5	47.8
SD26+28		6.5	56.5	182.5	65.4	131.3	249.3	308.2	98.4	156.0	1254.1
Total		21.2	174.3	391.1	224.8	447.7	434.1	698.9	140.4	360.5	2893.1

Table 22. Herring mean weight [g] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age									Average
		1	2	3	4	5	6	7	8	9+	
32	47H3	6.4	14.1	17.8	21.7	23.5	25.6	25.4	31.9	33.0	20.1
29	47H2	8.4	15.7	19.4	22.0	25.7	26.7	30.9	38.6	33.8	25.7
	47H1	16.5	17.0	19.4	23.3	25.8	30.6	33.6	37.4	38.5	28.9
	46H1		17.4	20.9	23.1	29.6	34.0	37.5	32.4	37.1	32.0
	46H0		18.7	20.5	23.3	27.6	30.1	32.7	36.5	34.2	29.8
28	45H1		18.6	23.4	29.6	31.1	35.1	38.3	44.1	40.8	31.5
	45H0		17.7	22.8	28.2	31.2	35.3	37.3	42.0	39.0	30.5
	44H1		18.5	24.5	28.6	32.5	36.7	40.8	41.9	39.7	31.6
	44H0		20.7	24.8	29.5	33.7	39.0	40.8	43.0	47.6	38.0
	43H1		21.8	25.7	28.7	33.5	37.5	43.8	45.1	42.8	33.7
	43H0		21.5	29.9	43.5	33.4	41.3	41.7	46.0	49.4	40.8
	43G9		29.0	33.0	37.4	37.2	45.9	44.8	47.3	50.2	44.3
	42H0	15.1	21.0	26.7	32.1	36.5	38.8	43.6	40.5	53.1	39.2
	42G9		24.5	37.1	38.1	41.9	47.9	45.4	53.4	53.2	45.7
26	41H0	15.1	20.7	23.0	29.5	33.2	38.0	41.5	45.8	46.5	30.1
	41G9		28.7	40.5	45.3	45.8	45.7	47.0	50.5	51.2	46.8
SD32		6.4	14.1	17.8	21.7	23.5	25.6	25.4	31.9	33.0	20.1
SD29		14.2	16.6	19.6	23.1	26.6	31.4	33.6	36.9	37.3	28.9
SD29+32		7.8	15.9	19.3	23.0	26.4	31.2	33.1	36.6	37.0	28.0
SD28		15.1	19.6	26.6	33.0	33.9	39.6	42.1	43.7	49.0	38.1
SD26		15.1	20.9	23.5	32.4	34.4	39.3	42.9	47.1	47.3	31.9
SD26+28		15.1	19.8	26.4	33.0	33.9	39.6	42.1	43.8	49.0	37.8
Total		10.0	17.1	22.6	25.9	28.6	36.0	37.1	41.6	42.2	32.2

Table 23. Herring biomass [tonnes] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age									Total
		1	2	3	4	5	6	7	8	9+	
32	47H3	242.8	702.1	898.9	339.8	377.4	128.7	515.6	49.5	306.0	3560.8
29	47H2	19.9	664.2	1207.7	499.1	927.3	346.9	1757.7	79.1	737.1	6239.1
	47H1	55.8	1519.9	2512.2	3110.7	5409.1	2607.0	6267.0	853.5	3668.8	26004.1
	46H1		79.3	777.4	263.2	1856.1	1940.5	1713.3	133.3	654.9	7418.0
	46H0		58.0	171.1	215.4	484.7	418.2	779.1	79.2	392.7	2598.4
28	45H1		88.0	299.5	250.5	345.5	493.2	391.5	95.5	172.4	2136
	45H0		329.5	536.9	257.9	533.1	997.6	818.7	225.9	357.2	4057
	44H1		30.7	496.1	136.5	303.9	315.7	332.5	116.2	133.6	1865
	44H0		29.0	348.3	379.7	1066.6	2094.1	2221.4	402.0	979.4	7521
	43H1		41.4	417.7	91.2	281.8	306.6	316.1	149.6	135.4	1740
	43H0		158.3	1147.4	561.7	574.2	2287.8	3253.1	1296.9	2281.0	11561
	43G9		6.7	272.4	173.3	498.9	1087.3	2025.0	526.3	1137.6	5728
	42H0	37.0	257.8	946.5	198.9	604.0	1815.8	2884.8	1345.3	1898.0	9988
	42G9		16.4	122.5	23.9	89.5	282.6	489.6	84.7	234.1	1343
26	41H0	60.7	157.3	227.4	61.4	132.8	153.6	190.1	46.7	255.1	1285
	41G9		4.1	11.9	21.1	20.4	37.5	68.9	18.3	54.3	237
SD32		242.8	702.1	898.9	339.8	377.4	128.7	515.6	49.5	306.0	3560.8
SD29		75.7	2321.4	4668.4	4088.6	8677.1	5312.6	10517.0	1145.1	5453.6	42259.5
SD29+32		318.5	3023.6	5567.3	4428.3	9054.6	5441.2	11032.7	1194.6	5759.6	45820.4
SD28		37.0	957.9	4587.2	2073.7	4297.5	9680.7	12732.8	4242.3	7328.8	45937.9
SD26		60.7	161.4	239.3	82.5	153.2	191.2	259.0	65.0	309.4	1521.7
SD26+28		97.7	1119.3	4826.5	2156.2	4450.7	9871.9	12991.8	4307.3	7638.2	47459.6
Total		416.2	4142.9	10393.8	6584.6	13505.3	15313.1	24024.4	5501.9	13397.8	93280.0

Table 24. Herring proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	ICES rectangle	Age									Total
		1	2	3	4	5	6	7	8	9+	
32	47H3	6.8	19.7	25.2	9.5	10.6	3.6	14.5	1.4	8.6	100.0
29	47H2	0.3	10.6	19.4	8.0	14.9	5.6	28.2	1.3	11.8	100.0
	47H1	0.2	5.8	9.7	12.0	20.8	10.0	24.1	3.3	14.1	100.0
	46H1		1.1	10.5	3.5	25.0	26.2	23.1	1.8	8.8	100.0
	46H0		2.2	6.6	8.3	18.7	16.1	30.0	3.0	15.1	100.0
28	45H1		4.1	14.0	11.7	16.2	23.1	18.3	4.5	8.1	100.0
	45H0		8.1	13.2	6.4	13.1	24.6	20.2	5.6	8.8	100.0
	44H1		1.6	26.6	7.3	16.3	16.9	17.8	6.2	7.2	100.0
	44H0		0.4	4.6	5.0	14.2	27.8	29.5	5.3	13.0	100.0
	43H1		2.4	24.0	5.2	16.2	17.6	18.2	8.6	7.8	100.0
	43H0		1.4	9.9	4.9	5.0	19.8	28.1	11.2	19.7	100.0
	43G9		0.1	4.8	3.0	8.7	19.0	35.4	9.2	19.9	100.0
	42H0	0.4	2.6	9.5	2.0	6.0	18.2	28.9	13.5	19.0	100.0
	42G9		1.2	9.1	1.8	6.7	21.0	36.5	6.3	17.4	100.0
26	41H0	4.7	12.2	17.7	4.8	10.3	12.0	14.8	3.6	19.8	100.0
	41G9		1.7	5.0	8.9	8.6	15.9	29.1	7.7	22.9	100.0
SD32		6.8	19.7	25.2	9.5	10.6	3.6	14.5	1.4	8.6	100.0
SD29		0.2	5.5	11.0	9.7	20.5	12.6	24.9	2.7	12.9	100.0
SD29+32		0.7	6.6	12.2	9.7	19.8	11.9	24.1	2.6	12.6	100.0
SD28		0.1	2.1	10.0	4.5	9.4	21.1	27.7	9.2	16.0	100.0
SD26		4.0	10.6	15.7	5.4	10.1	12.6	17.0	4.3	20.3	100.0
SD26+28		0.2	2.4	10.2	4.5	9.4	20.8	27.4	9.1	16.1	100.0
Total		0.4	4.4	11.1	7.1	14.5	16.4	25.8	5.9	14.4	100.0

Table 25. Herring mean length [cm] in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	***ICES rectangle***	***Age***									***Average***
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9+***	
32	47H3	10.8	13.6	14.8	15.8	16.3	16.7	16.6	17.6	18.2	15.2
29	47H2	11.1	14.1	15.2	15.9	16.8	17.0	17.8	18.8	18.4	16.6
	47H1	13.8	14.1	15.1	16.2	16.7	17.7	18.2	19.2	19.1	17.2
	46H1		14.2	15.4	15.9	17.4	18.2	18.8	18.1	18.9	17.8
	46H0		14.8	15.2	16.1	17.1	17.6	18.3	19.2	18.6	17.5
28	45H1		14.7	16.0	17.4	17.7	18.5	19.2	20.0	19.5	17.7
	45H0		14.5	15.9	17.2	17.8	18.5	18.9	19.7	19.4	17.5
	44H1		14.6	16.1	17.0	17.9	18.6	19.4	19.4	19.1	17.6
	44H0		15.1	16.3	17.3	18.2	19.1	19.5	19.9	20.6	18.9
	43H1		15.5	16.4	17.2	18.2	18.8	19.8	19.7	19.4	18.0
	43H0		15.5	17.2	19.1	17.9	19.4	19.4	20.1	20.3	19.1
	43G9		16.8	17.6	18.5	18.6	19.9	20.0	20.5	20.7	19.8
	42H0	13.1	15.5	16.7	17.5	18.5	18.9	19.7	19.2	20.8	18.8
	42G9		15.6	18.3	18.7	19.4	20.2	19.9	21.1	21.0	19.9
26	41H0	13.1	15.1	15.8	17.2	17.8	18.7	19.2	20.4	20.3	17.0
	41G9		16.8	18.8	19.5	19.7	19.6	19.7	20.3	20.4	19.7
SD32		10.8	13.6	14.8	15.8	16.3	16.7	16.6	17.6	18.2	15.2
SD29		13.0	14.1	15.2	16.1	16.9	17.8	18.2	19.1	18.9	17.2
SD29+32		11.2	14.0	15.1	16.1	16.8	17.8	18.1	19.0	18.9	17.0
SD28		13.1	15.0	16.6	17.8	18.1	19.1	19.6	19.8	20.4	18.7
SD26		13.1	15.1	15.8	17.6	17.9	18.8	19.3	20.4	20.3	17.3
SD26+28		13.1	15.0	16.6	17.8	18.1	19.1	19.6	19.8	20.4	18.7
Total		11.8	14.3	15.8	16.6	17.2	18.5	18.8	19.5	19.5	17.7

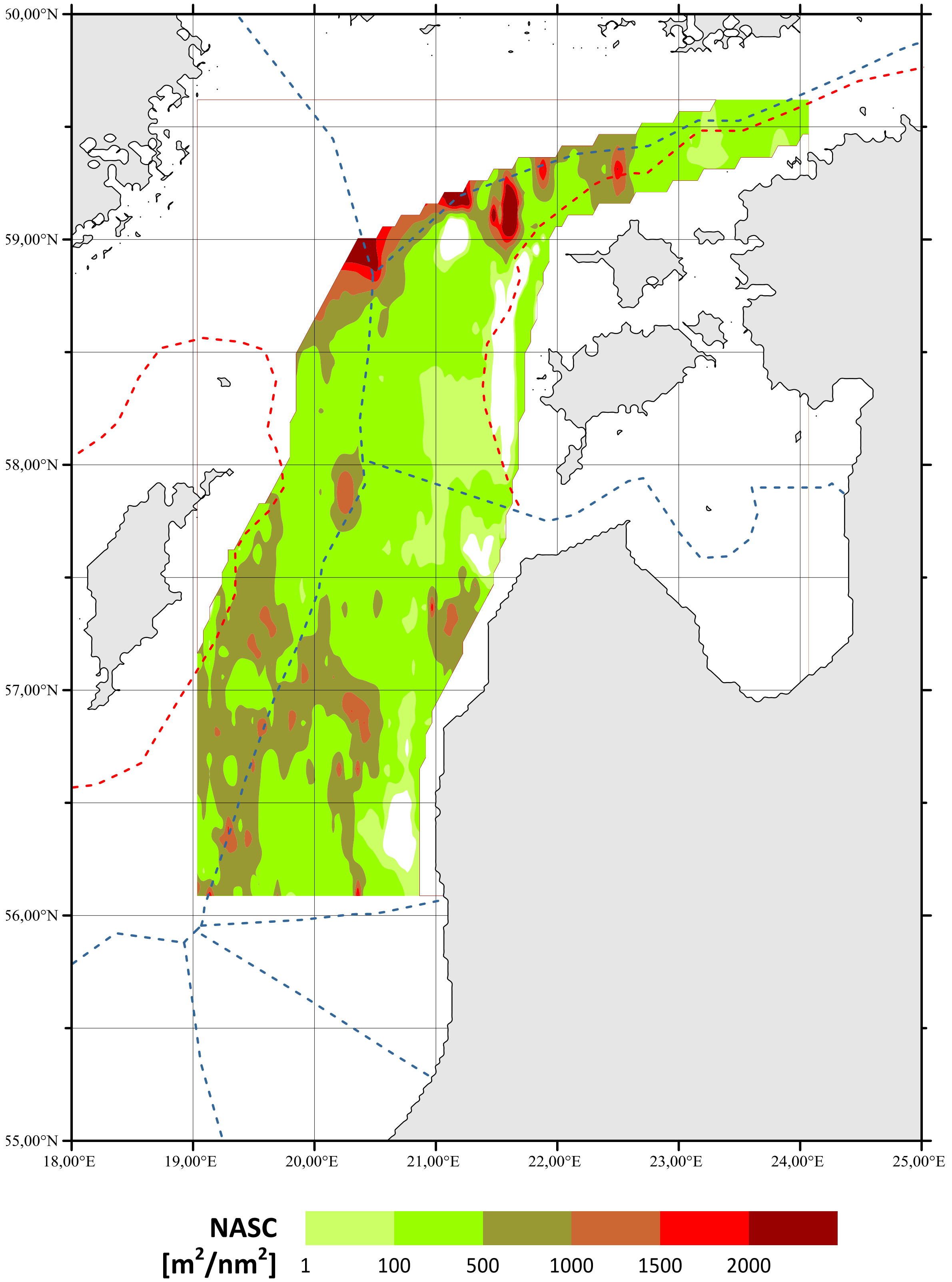


Figure 5. Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

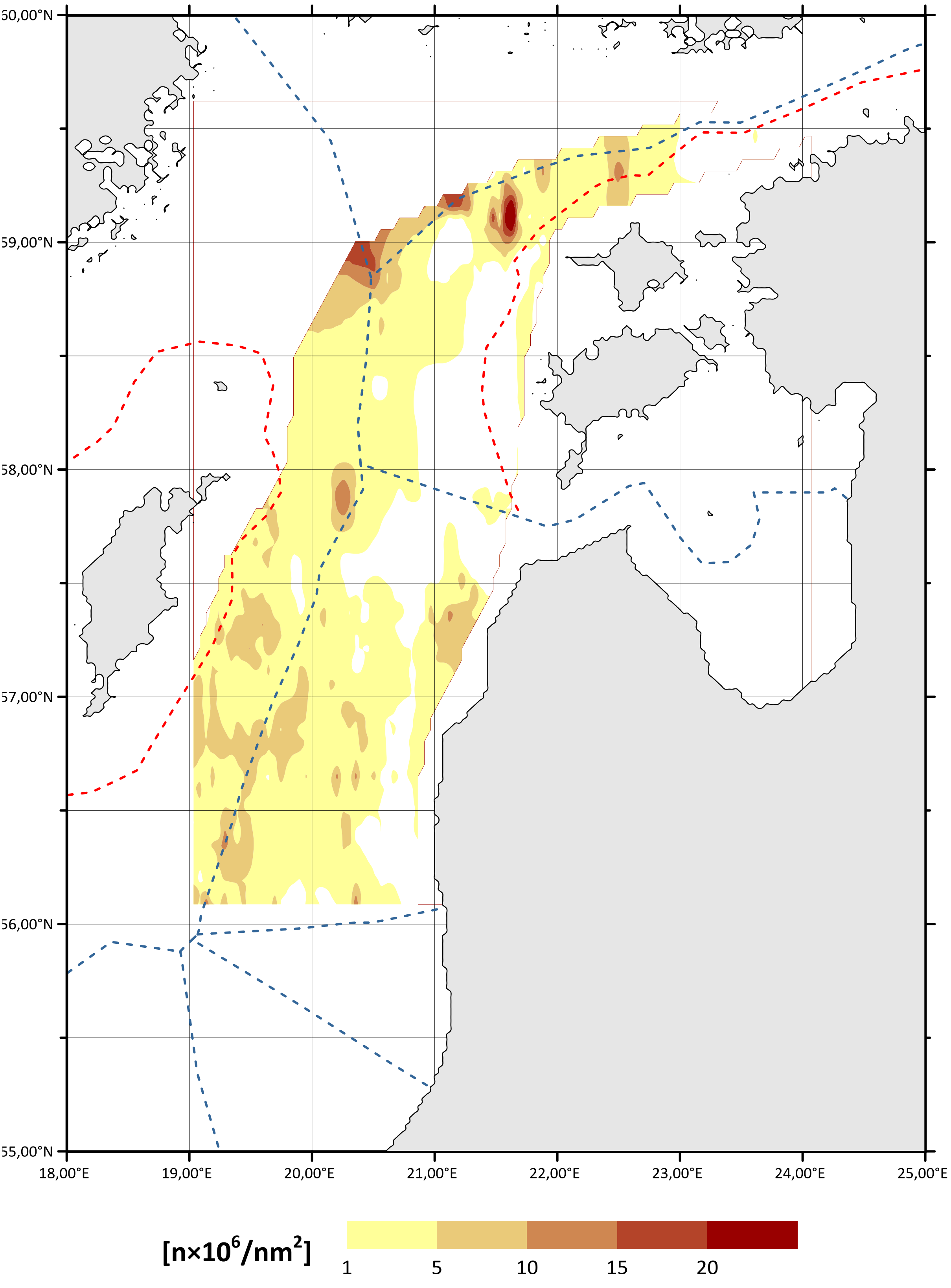


Figure 6. Sprat distribution (n×10[6]) in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

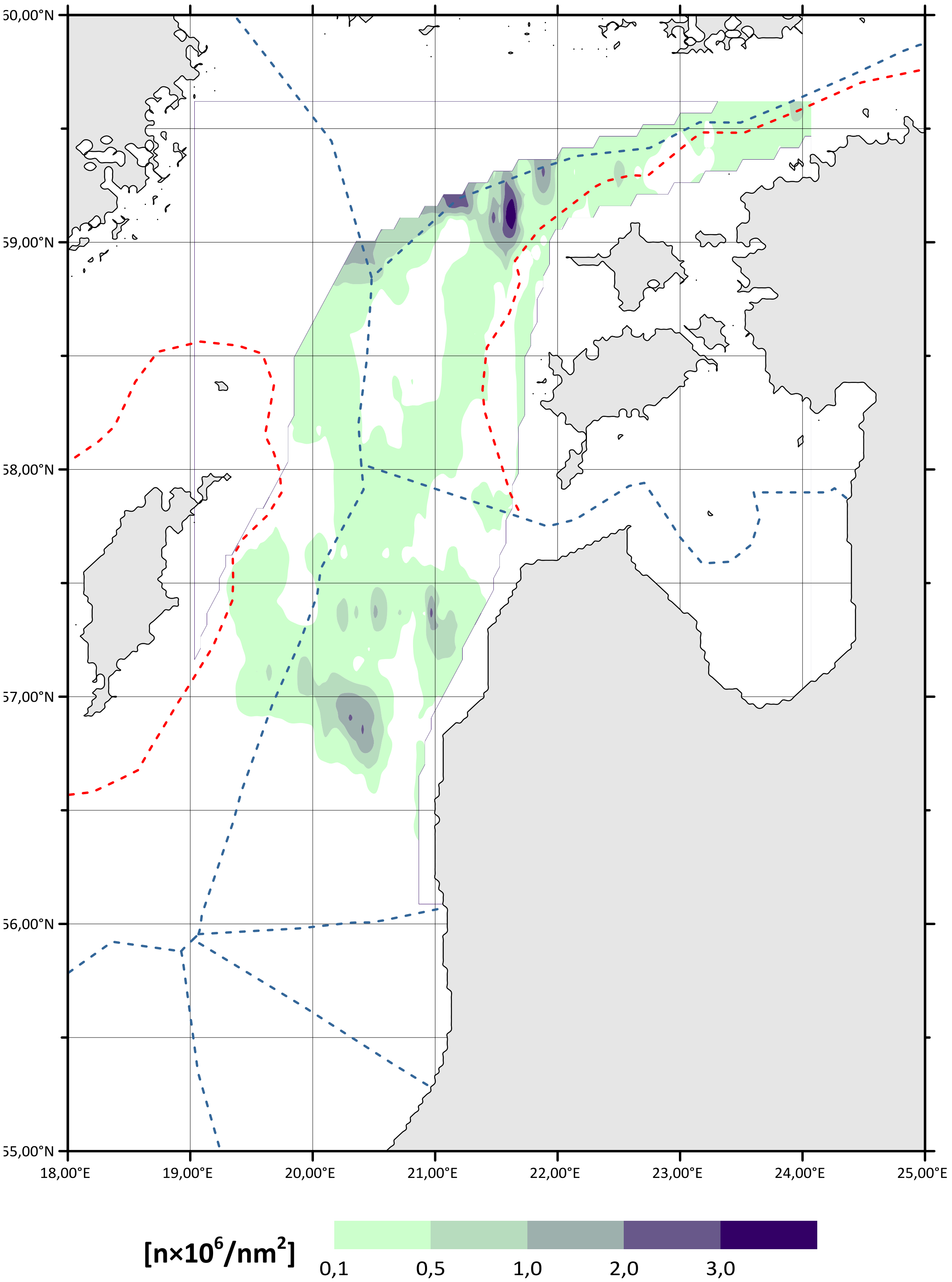


Figure 7. Herring distribution (n×10^6) in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

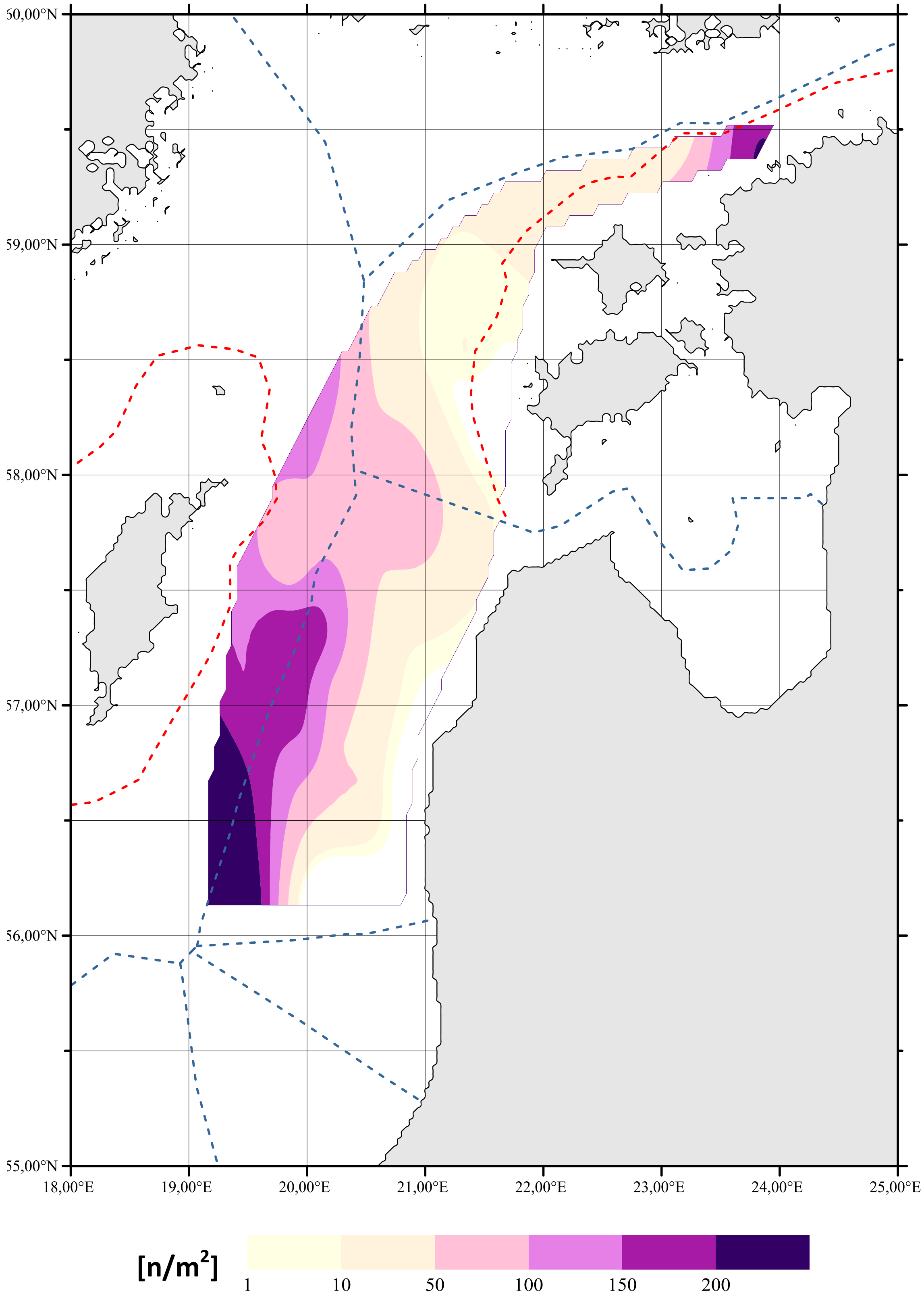


Figure 8. Distribution of sprat eggs on development stage 1 in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Table 26. Number of sprat eggs and larvae per 1 m^2 or per 10 minutes of sampling on water surface in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

ICES SD	32W		29		28N		28S		26N	
Depth strata	>70m	<70m	>70m	<70m	>70m	<70m	>70m	<70m	>70m	<70m
Eggs (per 1m^2)	22.90	5.70	20.60		85.10	15.20	163.00	15.70	301.00	16.20
Larvae (per 1m^2)					1.60		15.50	2.80	22.30	
Eggs (per 10 min. of haul on the water surface)			0.32		0.32	2.90	5.00	2.80	40.00	7.60
Larvae (per 10 min. of haul on the water surface)							0.25	2.80	2.40	1.30

Table 27. The average number and average biomass of zooplankton organisms in 0-100m water column per volume unit in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Species or group	Whole aquatory		Stations with depth more than 100m		Stations with depth less than 100m	
	n\m^3	mg\m^3	n\m^3	mg\m^3	n\m^3	mg\m^3
Acartia spp.	460	4.67	424	4.38	567	5.52
Eurytemora affinis	7	0.20	2	0.04	22	0.68
Temora longicornis	1086	7.79	1010	6.79	1308	10.73
Centropages hamatus	137	1.04	97	0.80	255	1.77
Pseudocalanus sp.	1962	19.19	1767	17.92	2539	22.93
Bosmina	4	0.02	4	0.01	7	0.03
Evadne	331	9.36	264	7.44	530	15.02
Podon	11	0.13	6	0.07	24	0.30
Synchaeta baltica	15192	91.15	13848	83.09	19154	114.92
Synchaeta monopus	1	0.01	2	0.01		
Polychaeta	146	4.38	67	2.01	379	11.38
Bivalvia larvae	20	0.02	7	0.01	59	0.06
Fritillaria borealis	2210	22.10	2135	21.35	2432	24.32
Mnemiopsis leidyi	11		12		9	
Copepoda	3652	32.89	3300	29.92	4692	41.63
Cladocera	346	9.50	274	7.52	560	15.35
Rotatoria	15193	91.16	13850	83.10	19154	114.92
Varia	2388	26.50	2221	23.37	2879	35.75
Total	21579	160.05	19645	143.91	27285	207.66

Table 28. The values of hydrological parameters registered at the catching depth in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Haul number	Date of catch	ICES rectangle	ICES SD	Mean trawling depth [m]	Hydrological parameters		
					Temperature [°C]	Salinity [PSU]	Oxygen [mg/l]
1	2014.05.15	41G9	26	50	3.93	7.60	10.93
2	2014.05.15	41G9	26	78	4.00	8.53	9.13
3	2014.05.16	41G9	26	70	4.03	8.60	8.23
4	2014.05.16	41G9	26	69	3.60	8.00	10.50
5	2014.05.16	42H0	28	36	5.00	7.17	12.73
6	2014.05.17	42H0	28	76	4.08	8.70	8.18
7	2014.05.17	42G9	28	76	4.20	8.93	7.08
8	2014.05.17	42G9	28	80	4.43	9.37	5.00
9	2014.05.18	42H0	28	70	4.00	8.60	9.00
10	2014.05.18	43H0	28	69	3.70	8.15	9.15
11	2014.05.18	43H0	28	80	4.23	8.93	7.93
12	2014.05.19	43G9	28	75	4.13	8.80	8.55
13	2014.05.19	43H0	28	63	3.70	7.90	10.40
14	2014.05.19	43H1	28	60	3.40	7.70	9.80
15	2014.05.20	44H0	28	70	3.97	8.63	7.73
16	2014.05.20	44G9	28	75	4.03	8.50	8.20
17	2014.05.21	44G9	28	75	4.33	8.90	7.33
18	2014.05.21	44H0	28	76	4.35	9.00	6.20
19	2014.05.21	44H1	28	56	3.20	7.30	10.80
20	2014.05.22	46H1	29	65	4.20	8.65	9.00
21	2014.05.22	47H1	29	72	4.20	8.63	7.97
22	2014.05.22	47H1	29	21	5.60	6.74	12.14
23	2014.05.23	48H4	32	55	2.85	6.75	11.15
24	2014.05.23	47H3	32	70	4.27	8.80	6.70
25	2014.05.23	47H2	29	65	4.18	8.60	7.55
26	2014.05.24	46H0	29	76	4.38	8.78	8.65
27	2014.05.24	46H0	29	70	4.37	8.93	5.97
28	2014.05.24	46H1	29	70	4.30	8.90	7.20
29	2014.05.25	45H0	28	80	4.33	8.73	8.37
30	2014.05.25	45H0	28	20	6.06	6.84	13.36
31	2014.05.25	45H1	28	54	4.73	6.98	13.63
SD26				67	3.89	8.18	9.70
SD28				66	4.22	8.29	9.08
SD26+28				66	4.16	8.27	9.19
SD29				63	4.46	8.46	8.35
SD32				65	4.15	8.25	8.99
SD29+32				63	4.26	8.31	8.48
Total				65	4.19	8.28	8.99

Table 29. Mean values of the sea water temperature (**T**), salinity (**S**) and oxygen content (**O_2**) recorded along hydrological profile in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 14.-26.05.2014.

Station No.	***Sinking depth [m]***	***0-10m***			***50-70m***			***>90m***		
		T [°C]	***S [PSU]***	***O_2 [mg/l]***	***T [°C]***	***S [PSU]***	***O_2 [mg/l]***	***T [°C]***	***S [PSU]***	***O_2 [mg/l]***
3	80	8.15	7.28	11.53	3.73	8.00	10.63			
11	150	7.73	7.22	12.07	3.60	7.63	11.70	5.48	11.08	2.28
20	225	7.88	7.00	11.72	3.50	7.60	11.27	5.81	11.41	0.94
23	125	8.65	6.92	12.70	3.47	7.80	10.60	5.20	10.57	0.73
44	80	10.97	6.82	12.22	3.73	7.27	11.67			
39	150	10.13	6.66	12.12	3.80	7.43	11.67	5.05	10.23	1.60
33	125	8.42	6.70	12.18	3.63	7.67	10.57	5.13	10.13	0.60
37	125	9.35	6.12	12.60	3.90	8.20	9.07	5.10	10.07	0.47
36	90	9.22	6.08	12.68	3.57	7.80	9.73	5.10	10.00	0.60
35	60	7.95	5.72	12.33	2.85	6.75	11.15			
Average	121	8.84	6.65	12.22	3.58	7.62	10.81	5.27	10.50	1.03

Fisheries Service under the Ministry of Agriculture of Republic of Lithuania,

Fishery Research and Science State

RESEARCH REPORT FROM THE BALTIC INTERNATIONAL ACOUSTIC SURVEY (BASS) IN THE ICES SUBDIVISION 26

(LITHUANIAN ESPECIAL ECONOMIC ZONE) OF THE BALTIC SEA

(R/V “DARIUS”;19.05. - 20.05.2014)

Klaipeda, May, 2014

Lithuania

1 INTRODUCTION

The main objective is to assess clupeids resources in the Baltic Sea. The Lithuanian survey is coordinated within the frame of the **Baltic International Sprat Survey (BISS).** 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 Ministry of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda – cruise leader and acoustics;
E. 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 1st cruise of RV "Darius" took place from 19-th to 20-th of May 2014. 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 20 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 were calibrated in 20th of May 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 20.05.2014	Place : near Klaipeda port
Type of transducer	Split – beam for 38 kHz
Gain (38 kHz)	21.94 dB
Athw. Angle Sens	12.5
Along. Angle Sens	12.5
Athw. Beam Angle	12.06
Along. Beam Angle	11.96
Athw. Offset Angle	0.07
Along. Offset Angle	-0.06
SA Correction (38 kHz)	-0.82 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 S_v, 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 **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 numbers were separated into herring and sprat according to the mean catch composition.

3 RESULTS

3.1 Biological data

In total 6 trawl hauls were carried out: 567 herrings and 1981 sprats were measured and 461 herrings and 749 sprats were aged. The acoustic sounder didn't detect fish school in the north part of ICES rectangle 40H0, so there was no trawling in this area (Fig.1).

The results of the catch composition are presented in Table 1. In the catch composition was dominated by sprat (except first trawling, where 61.3% of the catch was herring).

The length distributions of herring and sprat of the May 2014 presented in Fig. 2 and 3. The biggest part of catching herring was 16.0-20.0 length classes (73.4%) in the rectangle 40H0. Very small proportion (0.3%) of fish was 10.5 cm length class. In 40G9 ICES rectangle were only adult herrings, most of its (more than 80%) have 15.5-20.0 cm length classes. Sprat dominated 8.0 – 11.5 cm length classes (91.2%) in 40H0 ICES rectangle and 11 -13.0 cm length classes (88.9%) 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 2-14.

3.3 Abundance estimates

R/V "Darius" survey statistics (aggregated data for herring and sprat), included the total abundance of herrings and sprats are presented in Tables 2-4. The estimated age composition of sprat and herring are given in Tables 5, 10. The estimated number sprat and herring by age group and rectangle are given in Table 6, 11. The

estimates of sprat and herring biomass by age group and rectangle are summarised in Table 7, 12. The corresponding mean weights and mean length by age group and rectangle for each species are shown in Table 8-9 and 13-14.
The herring stock was estimated to be $53.3 \cdot 10^6$ fish or about 2086 tonnes.
The estimated sprat stock was $2941.2 \cdot 10^6$ fish or 24493 tonnes.
The abundance estimates of sprat were dominated by 1age fish in rectangle 40H0 and by 1-3 and 2-6 ages fish in rectangle 40G9 (Fig. 3 and Table 5).

3.4. Hydrographic data

The survey hydrographic data by hauls in trawling depth presented in the Table 15. The seawater temperature was from 8º C to 12º C in the surface layer, but in the sixth haul the temperature was 17º C in surface layer. Temperature near bottom was 9.5 ºC in 90 m dept. Water temperature in others hauls was from 12º to 17º C there were the depths less when 90 m. There was no thermocline in 2014 of May. Salinity was about 7.5 ‰ in all hauls and depts. The oxygen-condition was excellent in all hauls and depts.

4 REFERENCES

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Figure1 The survey grid ant trawl hauls position of R/V “Darius” 19-20 May 2014

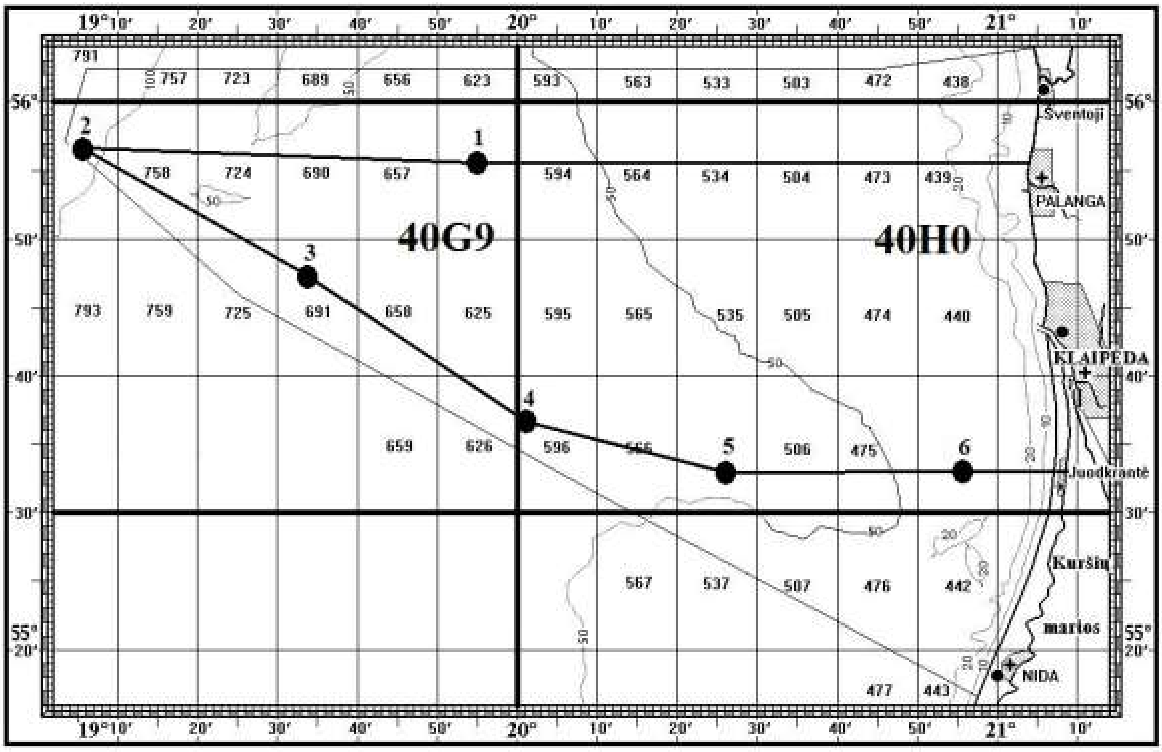

Table 1 Catch composition (kg/1hour) per haul (R/V "Darius", 19-20.05.2014)

ICES subdivision 26						
Haul No	1	2	3	4	5	6
Date	2014.05.19	2014.05.19	2014.05.20	2014.05.20	2014.05.2 0	2014.05.20
Validity	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	40G9	40G9	40G9	40H0	40H0	40H0
Clupea hrengus	73.762		2.384	7.136	19.062	2.648
Sprattus sprattus	46.476	180.0	444.376	261.828	780.938	18.310
Gadus morhua			1.582	1.036		0.984
Platichtys flesus			1.658			
Total	120.0	180.0	450.	270.0	800.0	21.942

Figure 2 Length composition of herring (%) (R/V "Darius", 19-20.05.2014)

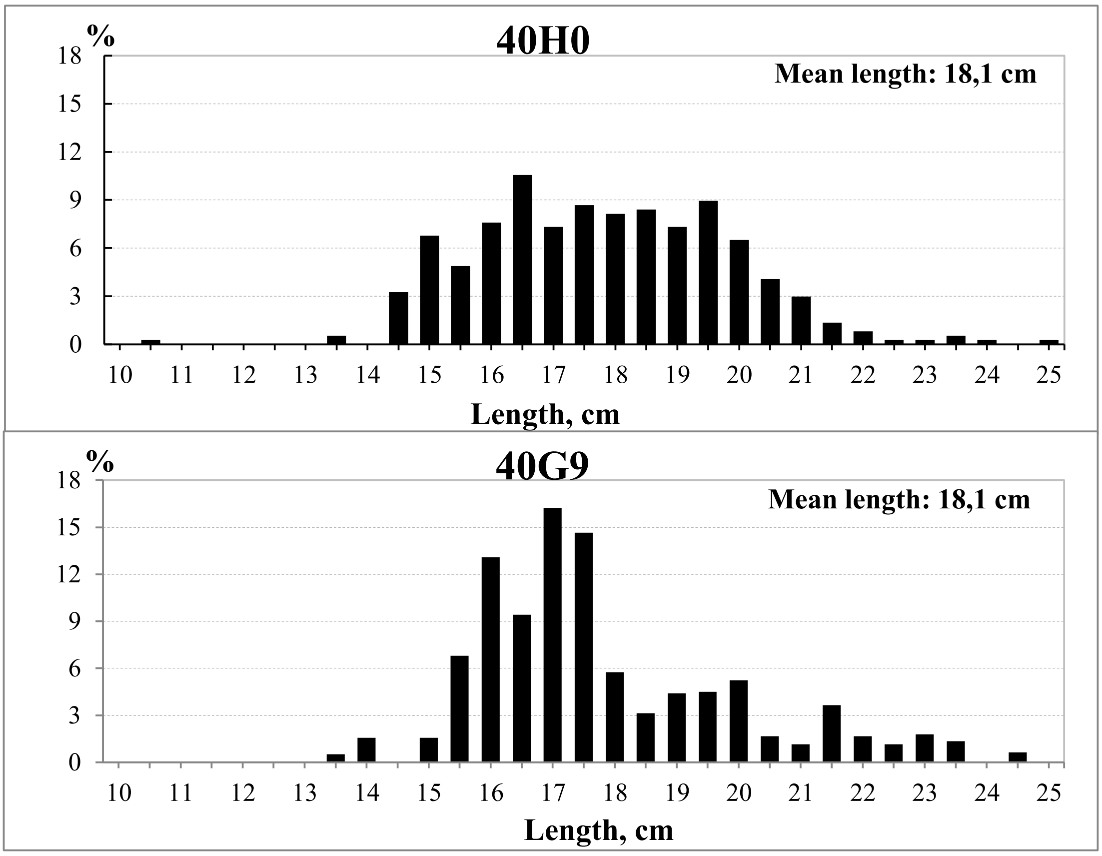

Figure 3 Length distribution of sprat (%) (R/V "Darius", 19-20.05.2014)

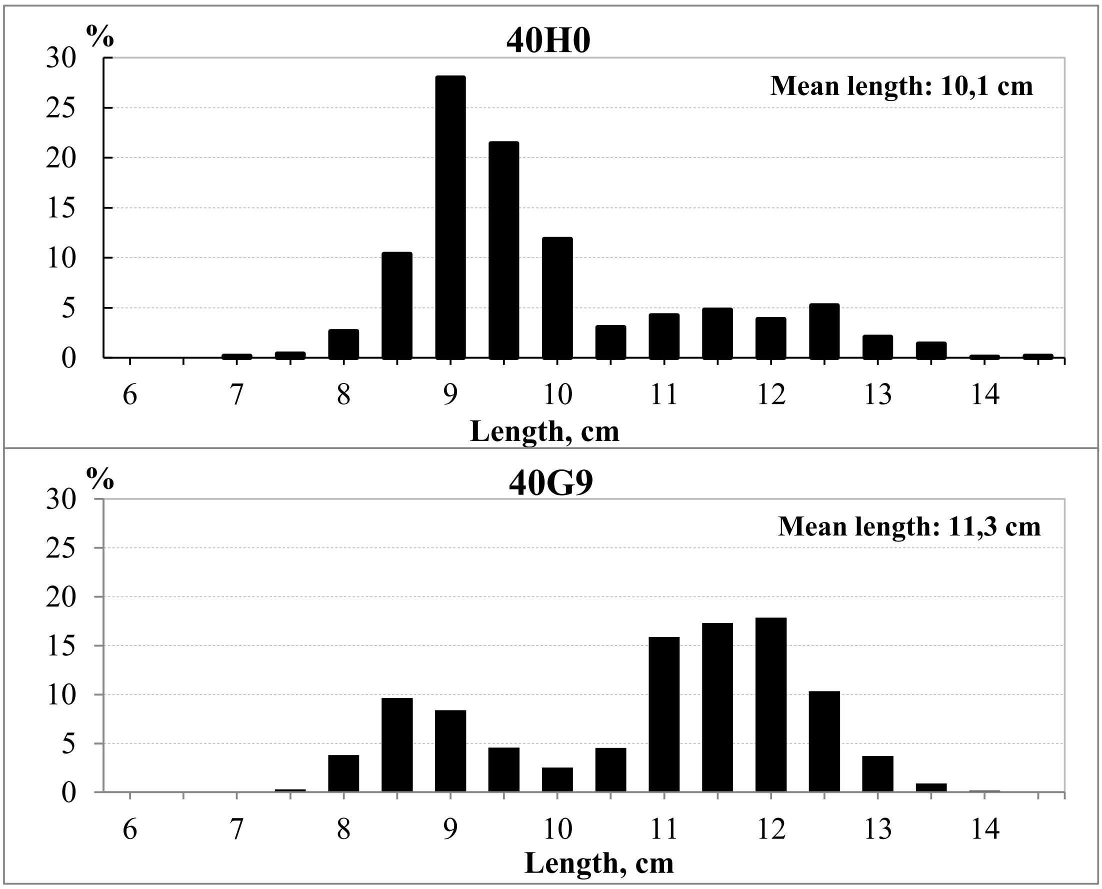

Table 2 R/V "DARIUS" survey statistics (abundance of herring and sprat),), 19-20.05.2014

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	1,34	1353,3	5,6	1347,7	8206	219	7988
	40G9	1013.0	1,59	1614,2	47,7	1566,5	18373	1867	16505

Table 3 R/V "DARIUS" survey statistics (aggregated data of herring and sprat),), 19-20.05.2014

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	4,5	4,5,6	18,08	39,04	0,41	9,85	5,93	99,59	126,8
	40G9	1,2,3	1,2,3	18,07	39,17	2,95	11,97	10,54	97,05	227,1

Table 4 R/V "DARIUS" survey statistics (herring and sprat), 19-20.05.2014

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	126,8	0,94832	1353,3	0,41	99,59
	40G9	1013	227,1	1,42542	1614,2	2,95	97,05

Table 5 R/V "Darius" estimated age composition (%) of sprat, 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0	0,0	68,2	12,0	10,4	3,1	2,1	2,8	0,7	0,7
	40G9	100,0	0,0	4,6	16,9	18,0	22,1	11,4	14,3	7,6	5,1

Table 6 R/V "Darius" estimated number (millions) of sprat, 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	1347,7	0,0	918,9	162,0	139,8	42,2	28,0	38,3	9,2	9,3
	40G9	1566,5	0,0	72,4	264,5	282,2	346,9	178,2	223,7	119,4	79,2

Table 7 R/V "Darius" estimated biomass (in tons) of sprat,), 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	7988	0	4238	1161	1079	447	340	472	115	136
	40G9	16505	0	324	2295	2818	3705	2062	2728	1499	1074

Table 8 R/V "Darius" estimated mean weights (g) of sprat, -19-20.05.2014

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	5,93	0,0	4,6	7,2	7,7	10,6	12,2	12,3	12,4	14,6
	40G9	10,54	0,00	4,48	8,68	9,99	10,68	11,57	12,19	12,55	13,55

Table 9 R/V "Darius" estimated mean length (cm) of sprat,), 19-20.05.2014

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	9,8		8,9	10,4	11,0	11,7	12,2	12,5	12,3	13,1
	40G9	12,0		9,1	11,1	11,5	11,8	12,1	12,3	12,5	12,7

Table 10 R/V "Darius" estimated age composition (%) of herring, 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0	0,0	1,4	17,7	29,1	8,1	11,9	14,9	8,2	8,8
	40G9	100,0	0,0	0,5	25,7	34,7	6,8	8,2	8,0	6,2	9,9

Table 11 R/V "Darius" estimated number (millions) of herring,), 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	5,6	0,0	0,1	1,0	1,6	0,5	0,7	0,8	0,5	0,5
	40G9	47,7	0,0	0,2	12,3	16,6	3,2	3,9	3,8	3,0	4,7

Table 12 R/V "Darius" estimated biomass (in tons) of herring,), 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	219	0	1,5	27,2	50,9	19,4	29,8	36,8	22,6	30,3
	40G9	1867	0	4,1	371,9	574,3	142,3	149,2	178,5	160,6	286,6

Table 13 R/V "Darius" estimated mean weights (g) of herring,), 19-20.05.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	39,0		19,1	27,5	31,3	42,7	44,9	44,1	49,2	61,5
	40G9	39,2		16,6	30,4	34,7	44,2	38,1	47,0	54,0	60,8

Table 14 R/V "Darius" estimated mean length (cm) of herring,), 07-08.05.2013

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	18,1	0	14,0	16,0	16,8	17,9	18,7	19,0	19,8	20,4
	40G9	18,1	0	13,5	16,4	17,1	18,6	17,7	19,0	20,4	21,2

Table 15. The values of hydrological parameters registered at the catching depth in the Baltic Sea ICES SD from the Lithuanian BISS survey conducted by r/v "Darius" in the period of 19.05-20.05.2014.

Haul number	**Date of catch**	**Mean trawling depth, m**	**Hydrological parameters**		
			Temperature, °C	**Salinity, ‰**	**Oxygen, ml/l**
1	2014.05.19	44	12,46	7,47	7,11
2	2014.05.19	52	11,23	7,47	7,31
3	2014.05.20	48	10,48	7,49	7,44
4	2014.05.20	54	13,01	7,5	7,03
5	2014.05.20	49	15,36	7,51	6,68
6	2014.05.20	18	18,32	7,51	6,28
Average		44,2			

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

(Cruise no. 374, 14.05. – 04.06.2014)

Uwe Böttcher

Thünen-Institute of Baltic Sea Fisheries, Rostock

Background: The GerBASS is part of the Baltic International Acoustic Spring Survey (BASS), which is co-ordinated within the scope of ICES. Timing, surveying area and the principal methods of investigations were internationally co-ordinated by the WGBIFS (ICES Baltic International Fish Survey Working Group). Germany covered the ICES Subdivisions 24, 25 and the western parts of Subdivisions 26 and 28 (Figure 1).

The German Fisheries Data Collection Program for 2014 in accordance with the EU Commission Regulations Nos. 1639/2001, 1581/2005, 665/2008, 199/2008) financially and logistically supported the GerBASS survey.

Objectives: This acoustic survey is conducted every year 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). The acoustic survey was accompanied by extensive hydrographical investigations.& methods

PERSONAL

	name	institution
1	Dr. U. Böttcher	Scientist in charge / Thünen-Institute of Baltic Sea Fisheries, Rostock
2	Dr. E Bethke*	Acoustics / Thünen-Institute of SeaSea Fisheries, Hamburg
3	D. Stephan	Biology / Thünen-Institute of Baltic Sea Fisheries Rostock
4	M. Koth	Biology / Thünen-Institute of Baltic Sea Fisheries, Rostock
5	B. Stepputtis	Biology / Thünen-Institute of Baltic Sea Fisheries, Rostock
6	T. Kirchner	Acoustics /Thünen-Institute of SeaSea Fisheries, Hamburg
7	D. Schuschkow	Volunteer
8	P. Hilber	Volunteer
9	R. Wildermuth	Volunteer
10	A. Schütze	Volunteer
11	L. Weirup	Biology / Thünen-Institute of Fisheries Ecology
12	J. Friedl	Volunteer

* only 15-16 May 2014

NARRATIVE

The cruise started on 14 May and ended on 4th June in Bremerhaven. The scientific team embarked in Warnemünde on 15 May half a day behind schedule because of technical problems with the ship engine and disembarked on 2th June in the same harbour. The ship entered the port of Warnemünde at the 16th May for a half day again to solve problems with the ship's computer network. Seventeen days were utilized for fulfilling the survey purposes (calibration of the transducer, acoustic tracks, fishing hauls and hydrographical measurements). Additional 4 days were necessary for crossings between the home port Bremerhaven and the area of investigation.

SURVEY DESIGN

The investigation of FRV "Solea" covered the whole Subdivisions 24 and 25 as well the Polish and Swedish areas of Subdivision 26 and 28 Rectangle and 46G9 of ICES Subdivision 29 (Fig. 1).

The acoustic and ichthyological sampling stratification was based on ICES statistical rectangles. The size of these rectangles is 0.5 degrees 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

CALIBRATION

The hull mounted 38 kHz transducer was calibrated on 15 May in the coastal area of the Mecklenburg Bay. The calibration procedure was carried out as described in the 'Manual for International Baltic Acoustic Surveys (IBAS)' (ICES 2014).

ACOUSTIC DATA COLLECTION

The main pelagic species of interest were herring and sprat. The acoustic equipment used was a Simrad scientific echosounder EK60 operated at 38 kHz. Specific settings of the hydroacoustic equipment were used as described in the "Manual for the Baltic International Acoustic Survey (BIAS)" (ICES, 2014). Echo-integration, i.e. the integration and allocation of NASC values to species abundance and biomass was accomplished using Myriax Echoview 6.0 post-processing software. Mean volume back scattering values (sv) were integrated over 1 nm intervals from ca. 8 m below the surface (depending on surface turbulence) to ca. 0.5 m over the seafloor. Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram.

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 but was shortened when echograms and netsounder indicated large catches. According to the IBAS-manual codend-inlets with stretched mesh sizes of 20 mm were used in Subdivision 24 and 12 mm in Subdivision 25 to 28.

The trawling depth and the net opening were controlled by a Scanmar net probe. The trawl depth (headrope below the surface) was chosen in accordance to 'characteristic indications' of the echogram and ranged from 18 to 78 m. Normally a net opening of about 11 to 13 m was achieved. The bottom depth on the trawling positions varied from 32 to 213 m.

Samples were taken from each haul in order to determine the length and weight distribution of fish. Sub-samples of cod, 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. Detailed ichthyological analyses were made according to the standard procedure (i.e. sex, maturity, otolith dissection).

HYDROGRAPHY

A "Seabird-SBE19 plus" 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.

DATA ANALYSIS

The pelagic target species sprat and herring are usually distributed 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 separated into herring, sprat and cod 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 1
  - haul 24
- Exclusion of trawl hauls in SD26 in a bottom near fish layer with a inconsiderable share of the NASC:
  - haul 48
  - haul 49
  - haul 51
  - haul 54

- Usage of neighbouring trawl information for rectangles, which contain only acoustic investigations:
    - haul 2; 39G2; SD24 in 38G2 SD24
    - haul 4; 38G3; SD24 in 38G2 SD24
    - haul 3; 39G3; SD24 in 39G2 SD24
    - haul 11; 38G4; SD24 in 39G4 SD24
    - haul 22; 41G7; SD25 in 41G6 SD25
    - haul 23; 41G6; SD25 in 41G7 SD25
    - haul 26; 39G6; SD25 in 38G6 SD25
    - haul 34; 38G5; SD25 in 38G6 SD25
    - haul 13; 40G4; SD25 in 39G4 SD25
    - haul 12; 39G4; SD24 in 39G4 SD25
    - haul 45; 42G9; SD28 in 42G8 SD28
    - haul 45; 42G9; SD28 in 43G8 SD28
    - haul 42; 43G9; SD28 in 43G8 SD28
    - haul 40; 46G9; SD29 in 45G9 SD28
    - haul 19; 38G5; SD25 in 37G5 SD25
    - haul 34; 38G5; SD25 in 37G5 SD26
    - haul 47; 42G8; SD28 in 41G8 SD26

3.1. BIOLOGICAL DATA

Totally 55 hauls were carried out on the cruise (Figure 1). Results of catch compositions are presented in Table 1. The CPUE ranged from 6 to 3288 kg/0.5h. The mean CPUE amounted 436 kg/0.5h. Overall 12 fish species were recorded in the 53 valid pelagic hauls.

Two hauls were excluded from the further analyses because of low catches. Four hauls were excluded because they were done in a bottom near layer which only very few contributed to the NASC of the corresponding rectangles.

The following table list the number of investigated individuals per specie.

species	total of hauls with the species	total of length-measured individuals	total of detailed ichthyological analyses
CLUPEA HARENGUS	51	9734	967
CYCLOPTERUS LUMPUS	12	24	
GADUS MORHUA	25	467	386
GASTEROSTEUS ACULEATUS	11	577	
HYPEROPLUS LANCEOLATUS	4	162	
MERLANGIUS MERLANGUS	6	10	
MERLUCIUS MERLUCIUS	1	1	
MYXOCEPHALUS SCORPIUS	1	1	
PLATICHTHYS FLESUS	11	31	
SALMO SALAR	1	3	
SCOMBER SCOMBRUS	2	2	
SPRATTUS SPRATTUS	53	13144	600

The catch composition of the valid hauls was dominated by sprat. Herring also occurred regularly in the trawl catches. Cod was present in 25 hauls. The biomass of species other than herring, sprat and cod was negligible. Figure 3 present the CPUE (kg/0,5 hour) on the May acoustic survey in 1999 to 2014.The length distributions of sprat and herring per subdivision of the years 2013 and 2014 are presented in Figure 4.

3.2. ACOUSTIC DATA

The valid measured cruise track totally reached a distance of 1300 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).

On an ICES subdivision scale, in SD 26 the average NASC measured was distinctly lower than in 2013 and also lower than the long-time mean. In the other subdivisions the NASC range about the long-term average (Figure 5).

The echo distribution along the hydroacoustic track is shown in Figure 6. High fish concentrations were found especially in the southern and north-western part of SD 25, on the northern Middle Bank as well as on the northern Hoburgs Bank. Lower but constant fish concentration occurred in the basin of Subdivision 28. Remarkably long distances with very low values occurred in SD 26 and the eastern parts of SD 25.

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 9 ºC to 11 ºC in the surface layer of the survey area (Figure 8) and therewith distinctly increased related to the surveys in previous years. Reasons therefore are the late time of the survey (2^{nd} half of may) and the previous warm winter. The warm winter as well caused the high temperature of the intermediate water layer above the halocline. The temperature in this layer was with 4 - 6 °C 2 - 3 degrees warmer than after a “normal cold” winters season.

The oxygen content shows in the last three years a slightly increasing trend in the bottom near water of the Bornholm basin and south-western Gotland basin. Aerobic conditions were found in the bottom near water layer in the whole area of the Bornholm basin and Stolpe Channel as well as in the south-western part of the Gotland basin (Figure 8 and 9).

In spring sprat of the Baltic basins usually is concentrated below the halocline. This year sprats were distributed in the most parts of the investigated area in loose schools far above the halocline between 10 and 40 m water depth. The remaining little fish targets under the halocline contained significantly higher proportions of herring then in other years. Another remarkable finding was the increasing number small cod in the south-western Gotland Sea. The first indications of this trend could be seen already in the previous year.

Caused by a very mild winter the seawater temperature in the surface layer ranged with 7 ºC to 11 ºC about the usual temperature for this season (Figure 7). Also the intermediate water layer about the halocline (old winter water) was characterized by exceptionally high temperature (4-5 ºC). In “normal” years the temperature of this layer varied between 2 and 4 °C. It is known that water layers with a temperature < 3.5 ° C delayed the migration of sprat in the upper water layer. The absence of this layer is probably the cause for the conspicuous vertical distribution of sprat in SD 26 and 28 in this year. Figure 9 show very clear the changed vertical distribution of fish (obviously sprat) in the eastern parts of the investigated area related to the previous year.

The presented length distribution show that the contribution of the new incoming year-class (<10 cm) is very low especially in SD 25 and 26 and there are no indication for a new strong year class of sprat.

ICES 1983: Report of the Planning Group on ICES co-ordinated herring and sprat acoustic surveys. ICES CM 1983/H:12.

ICES 2014. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES Document CM 2014/SSGESST:13, Addendum 2: SISP Manual of International Baltic Acoustic Surveys (IBAS),Version 1.02: 24

Foote, K.G., Aglen, A. and Nakken, O. 1986. Measurement of fish target strength with a split-beam echosounder. Journal of the Acoustical Society of America, 80(2): 612-621.

FIGURES AND TABLES

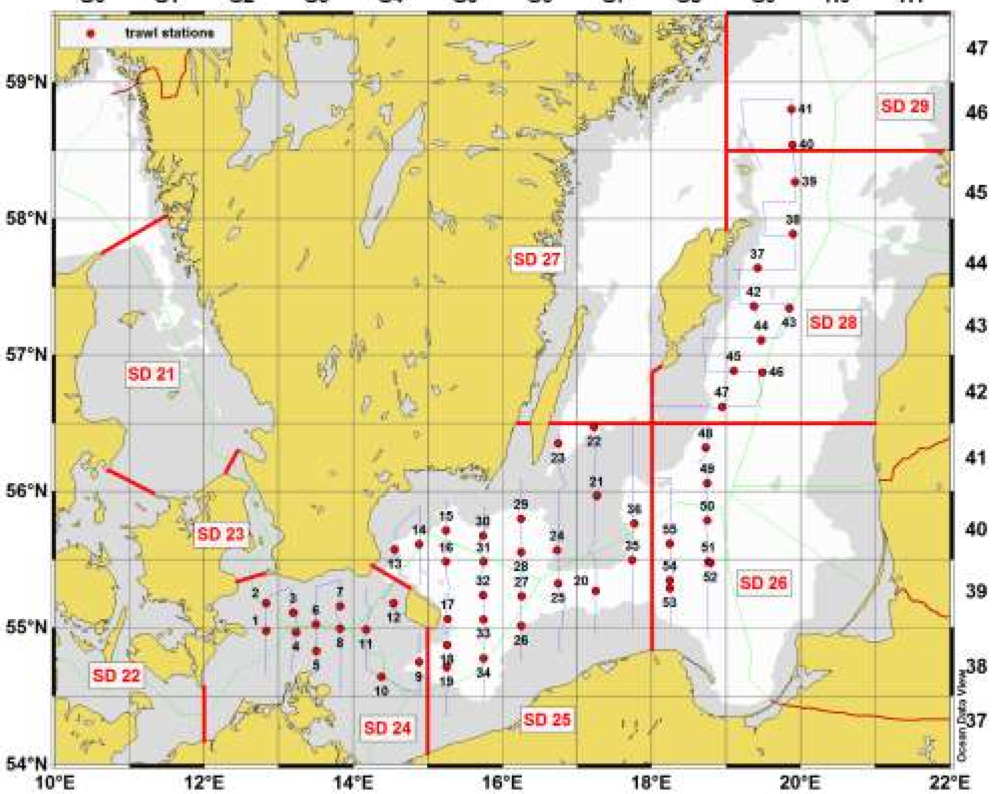

FIGURE 1: HYDROACOUSTIC TRACKS AND TRAWL STATIONS (CRUISE NO. 374 OF FRV "WALTHER HERWIG III", MAY 2014).

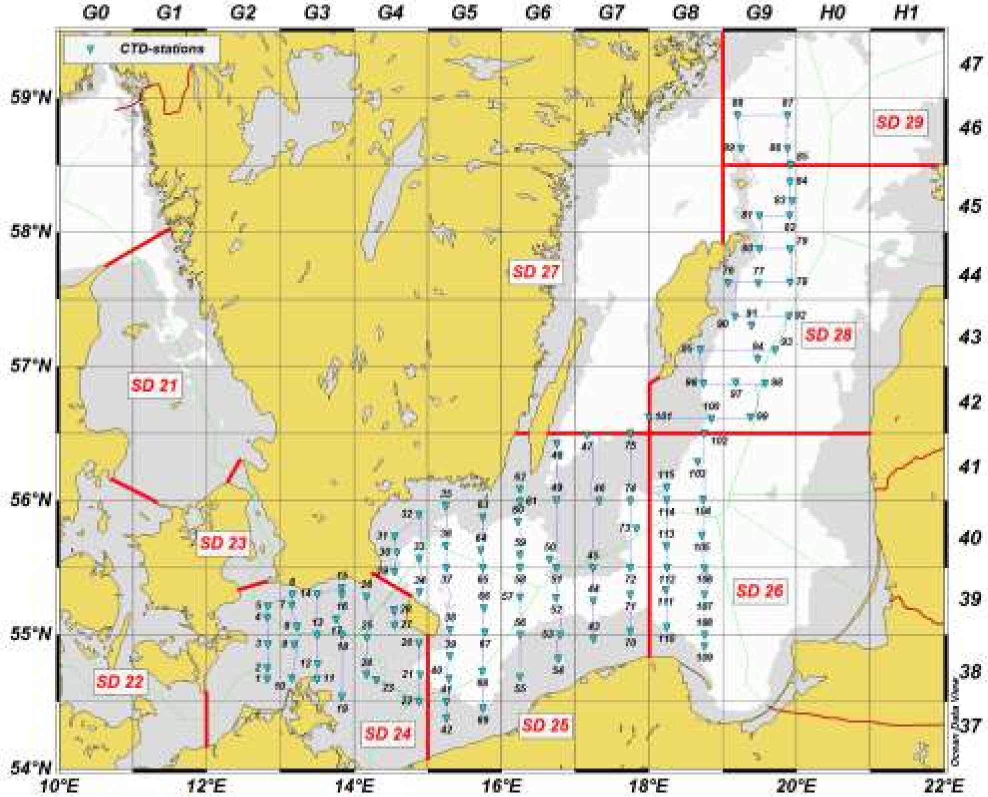

FIGURE 2: DISTRIBUTION OF CTD- AND BOTTLE-STATIONS ON THE HYDROACOUSTIC TRANSECTS (CRUISE NO. 374 OF FRV "WALTHER HERWIG III", MAY 2014)

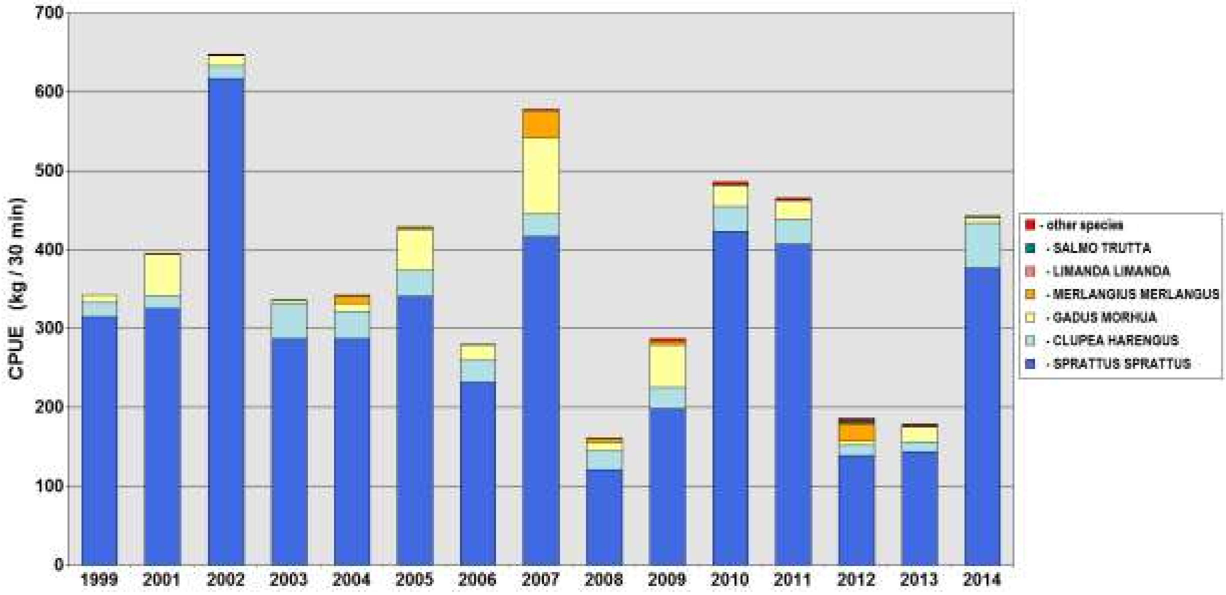

FIGURE 3: CPUE (KG/0,5 HOUR) ON THE MAY ACOUSTIC SURVEY IN 1999 TO 2014.

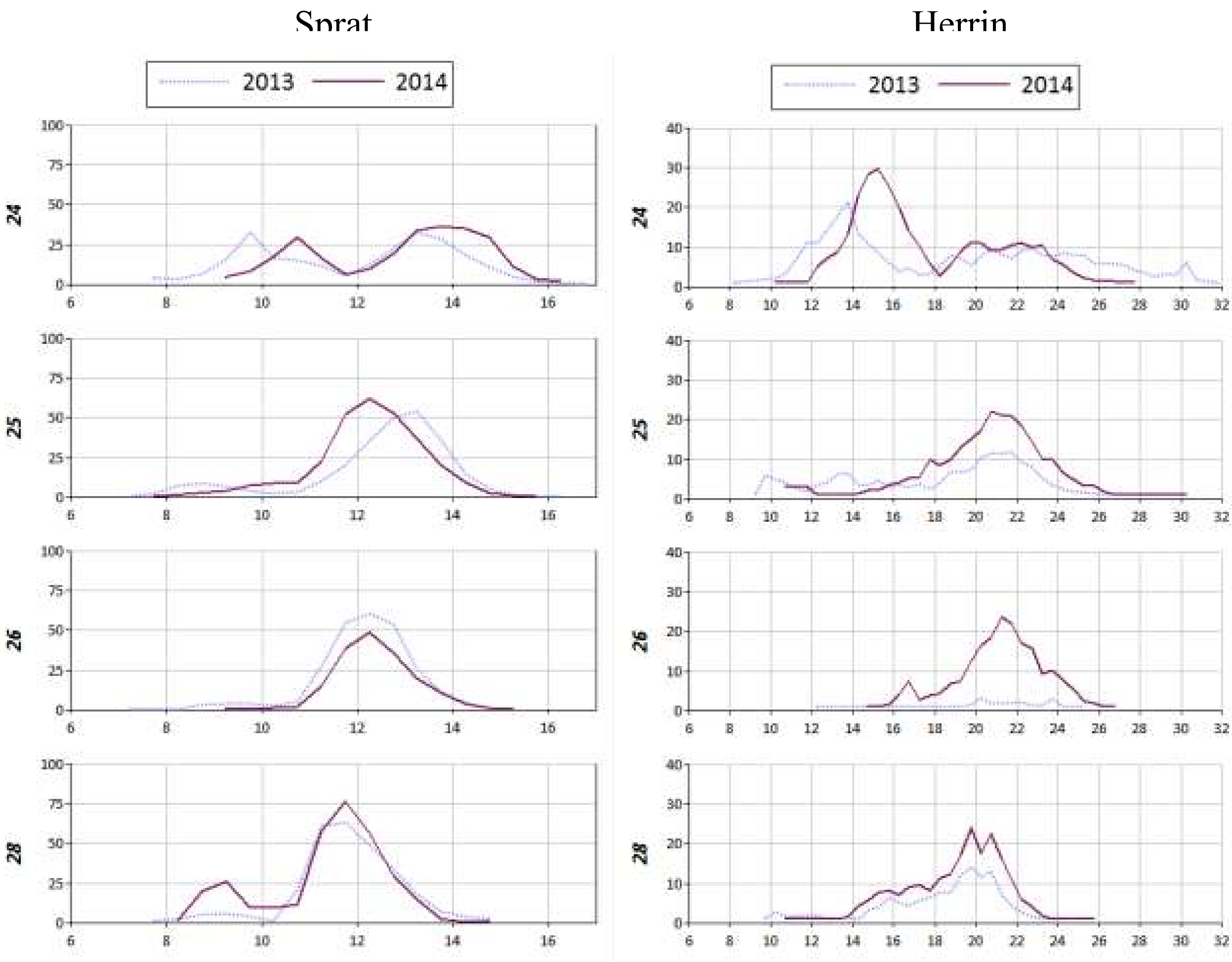

FIGURE 4: LENGTH DISTRIBUTION IN NUMBERS OF SPRAT (LEFT) AND HERRING (RIGHT) PER SUBDIVISIONS IN MAY 2013 AND 2014.

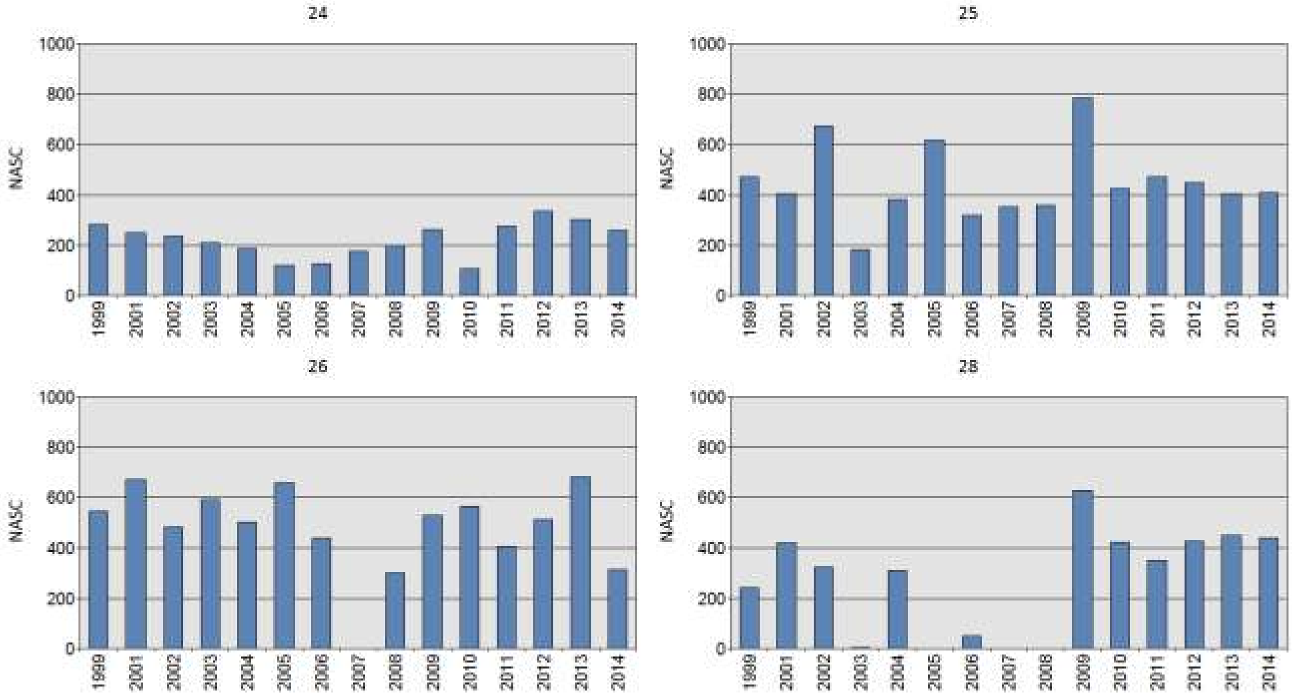

FIGURE 5: NASC PER SUB-DIVISION ON THE MAY ACOUSTIC SURVEY IN 1999 TO 2013.

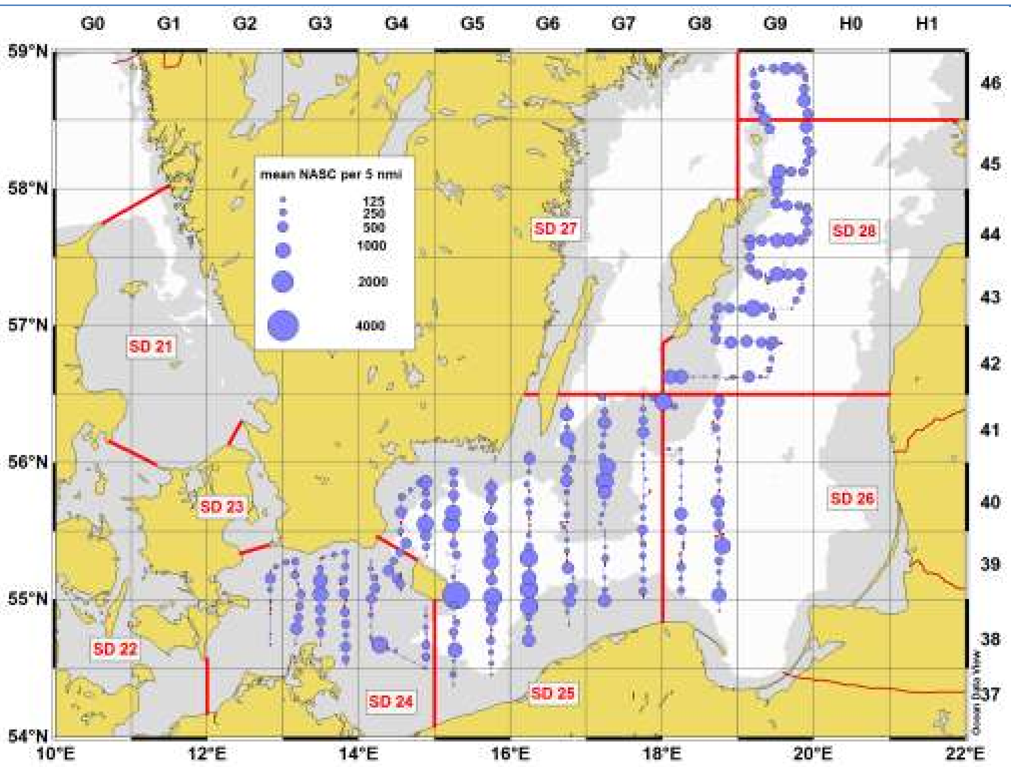

FIGURE 6: ECHO DISTRIBUTION ALONG THE HYDROACOUSTIC TRACK (CRUISE NO. 374 OF OF FRV "WALTHER HERWIG III", MAY 2014). SHOWN IS THE MEAN NAUTICAL AREA BACKSCATTERING COEFFICIENT NASC PER 5 N.MI. INTERVAL.

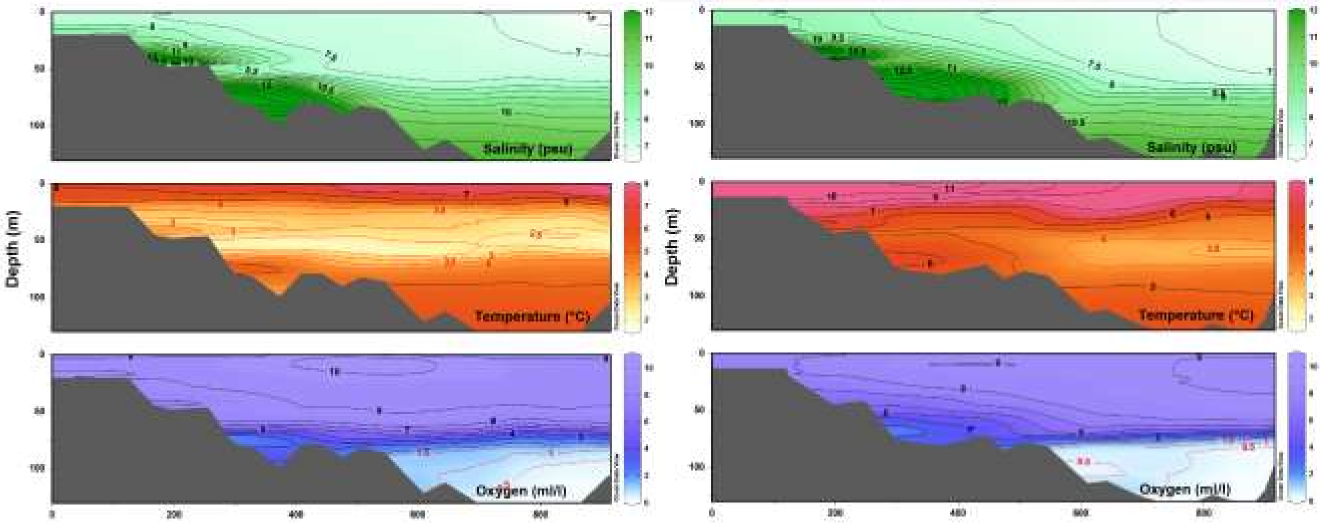

FIGURE 7: VERTICAL DISTRIBUTION OF SALINITY, TEMPERATURE AND OXYGEN ON A TRANSECT FROM WEST TO EAST THROUGH THE INVESTIGATED AREA IN 2013 (LEFT) AND 2014 (RIGHT)

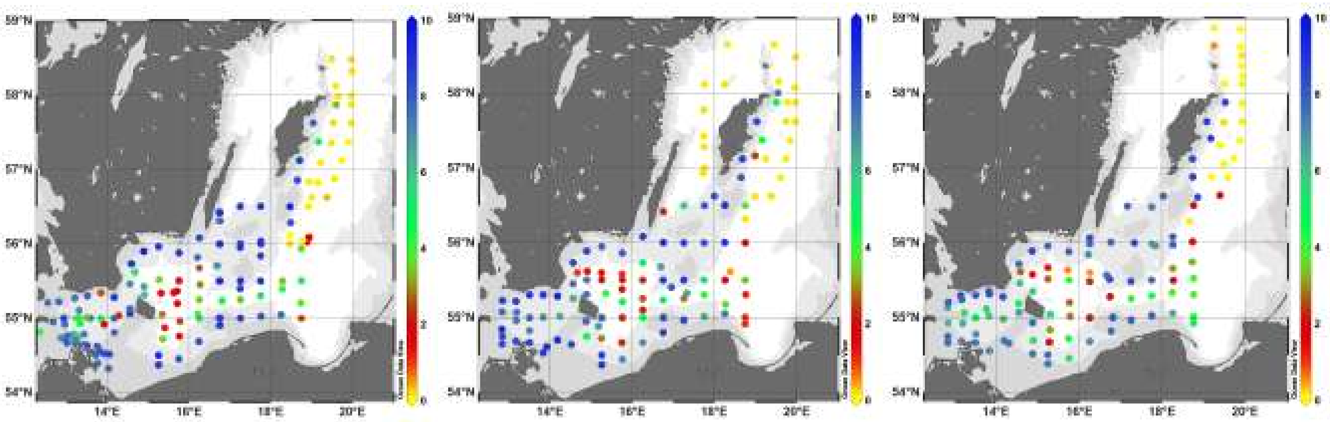

FIGURE 8: OXYGEN CONTENT IN THE BOTTOM-NEAR WATER ON THE CTD-STATIONS IN 2012 (LEFT) 2013 (MID) AND 2014 (RIGHT

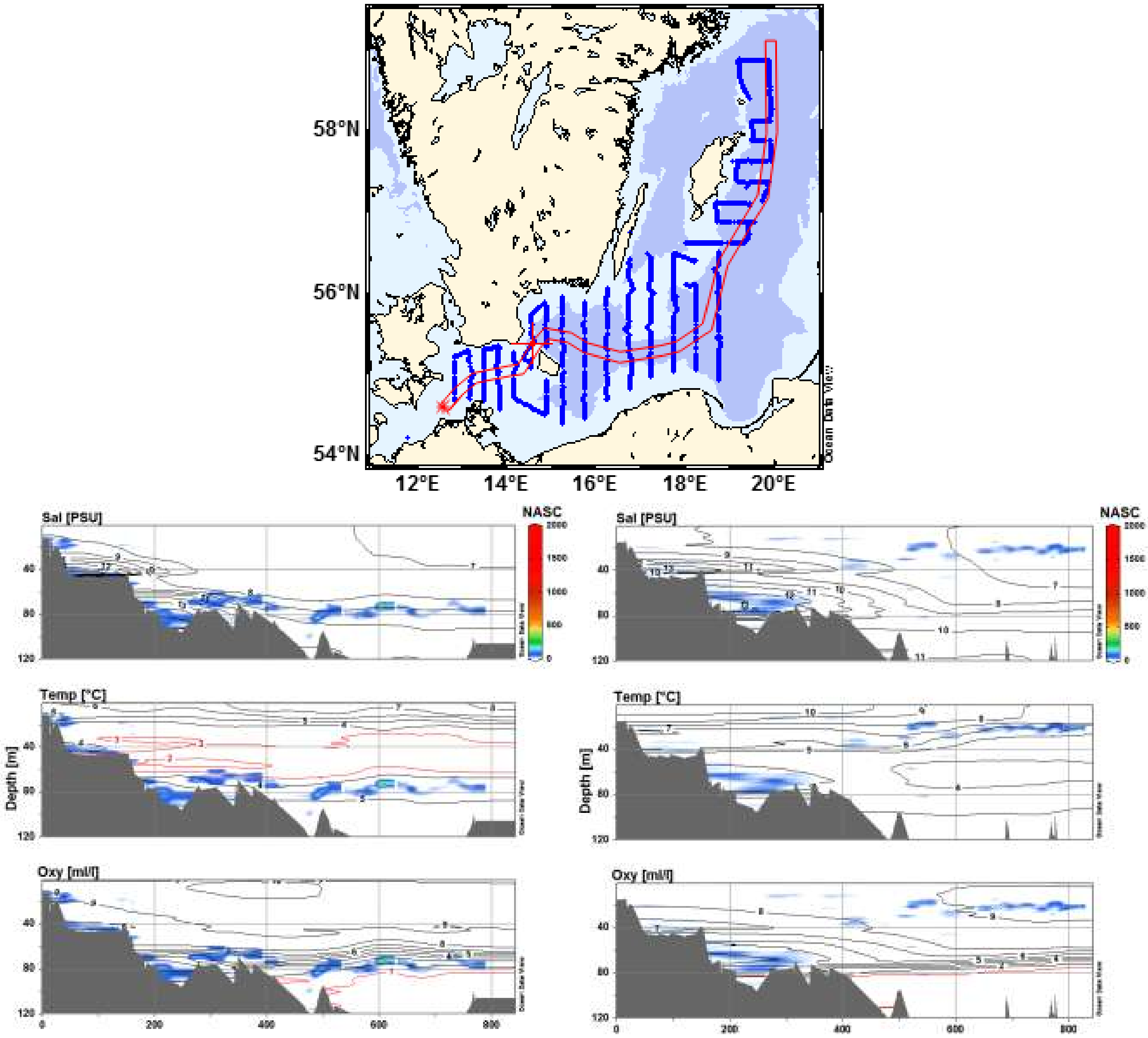

FIGURE 9: VERTICAL DISTRIBUTION OF SALINITY, TEMPERATURE AND OXYGEN RELATED TO THE ECHOES OF FISH (BLUE CLOUDS) ON A TRANSECT FROM THROUGH INVESTIGATED AREA IN 2013 (LEFT) AND 2014 (RIGHT).

TABLE 1: CATCH COMPOSITION (KG/0.5 H) PER FISHING HAUL (CRUISE NO. 374 OF FRV "WALTHER HERWIG III", MAY 2014)

station	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	28	29
ICES-subdivision	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
rectangle	39G2	39G3	38G3	38G3	39G3	39G3	38G3	38G4	38G4	38G4	39G4	40G4	40G4	40G5	39G5	39G5	38G5	38G5	39G7	40G7	41G7	41G6	39G6	39G6	39G6	40G6	40G6
trawl-typ																											
# cod-end	10	10	10	10	10	10	10	10	10	10	10	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
haul	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	25	26	27	28	29
trawl-time	30	30	30	30	30	30	30	30	30	31	31	30	30	30	20	20	30	30	20	30	30	30	30	30	30	30	30
bottom-depth	32.5	41	46.5	45	45.5	45.5	48	57.5	32.5	44	45.5	61.5	78	64	86	70.5	70.5	64.5	82	44.5	51	62	72.5	68	75	74.5	58
mean-headlineDepth	18	20	30	30	30	30	30	41	15	30	34	50	60	50	71	50	50.5	51	61	25	10.5	45	53	56	56	59	43
trawl-distance	2.31	2.35	2.30	2.28	2.14	2.30	2.05	2.03	2.21	2.16	2.22	2.08	2.07	2.06	1.30	1.26	1.93	2.03	1.29	2.15	2.11	2.05	2.04	1.98	2.11	1.96	2.01
CLUPEA HARENGUS	52.00	6.26	205.61	26.80	49.30	30.20	132.38	0.90	35.35	13.00	18.08	33.24	160.45	33.55	3.66	3.00	12.59	68.32			0.05	1.36	32.38	940.45	83.24	128.03	84.97
CYCLOPTERUS LUMPUS	0.28			0.90	1.07		0.98				0.52				0.55									0.80			0.22
GADUS MORHUA							0.32				0.33	0.96	28.84	0.78			0.42	2.62	3.99				0.92	1.62		8.38	
GASTEROSTEUS ACULEATUS																						0.03					
HYPEROPLUS LANCEOLATUS	3.38									0.08																	
MERLANGIUS MERLANGUS			0.07	0.28	1.54					0.87													0.13				
MERLUCCIUS MERLUCCIUS																											
MYOXOCEPHALUS SCORPIUS																											
PLATICHTHYS FLESUS																											
SALMO SALAR									3.99																		
SCOMBER SCOMBRUS				1.11						0.59																	
SPRATTUS SPRATTUS	0.15	0.04	65.64	43.02	20.20	14.10	223.52	167.20	409.54	79.55	51.81	91.56	2 794.12	464.95	2 597.99	1634.37	277.22	267.32	700.19	341.35	41.20	1317.16	363.15	345.87	410.25	1061.65	392.36
total	55.81	6.30	271.32	72.10	72.11	44.30	357.20	168.10	448.88	94.08	70.75	125.76	2 983.41	499.28	2 602.20	1637.37	290.23	338.26	704.17	341.35	41.25	1318.54	396.58	1288.74	493.49	1198.06	477.55

station	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
ICES-subdivision	25	25	25	25	25	25	25	28	28	28	29	29	28	28	28	28	28	28	26	26	26	26	26	26	26	26
rectangle	40G5	39G5	39G5	39G5	38G5	39G7	40G7	44G9	44G9	45G9	46G9	46G9	43G9	43G9	43G9	42G9	42G9	42G8	41G8	41G8	40G8	39G8	39G8	39G8	39G8	40G8
trawl-typ													PSN205													
# cod-end	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
haul	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
trawl-time	30	20	30	30	30	30	30	30	30	40	40	30	30	30	30	30	40	30	30	30	30	30	30	30	30	30
bottom-depth	67	85	95.5	86.5	69.5	70	58.5	89.5	136.5	156	140	149	135	213	180.5	161	149	107.5	119.5	115.5	105	87.5	86	74	83.5	87
mean-headlineDepth	52	42	82	70	55	53	42	20	26	20	20	17.5	70	70	20	75	20	70	75	78	78	68	55	30	63	30
trawl-distance	2.07	1.34	1.86	1.97	2.12	2.04	2.01	1.60	1.40	1.75	1.56	1.29	1.89	2.03	2.00	1.90	2.65	1.97	1.97	1.94	1.73	1.85	2.02	1.95	1.98	2.03
CLUPEA HARENGUS	6.59	3.05	83.74	66.37	71.26	12.45	0.31	4.35	0.91	4.23	2.71	33.68	84.98	5.25	0.48	9.08	26.16	11.23	18.36	6.18	12.78	28.82	0.87	0.67	299.80	0.05
CYCLOPTERUS LUMPUS								1.09		0.10			0.20	0.12												
GADUS MORHUA			32.74	10.75		0.31							1.44	1.33		5.06	8.56	5.60	4.81	20.59	4.10	11.47	4.77		1.29	
GASTEROSTEUS ACULEATUS								0.18	0.15	0.43	0.62	1.17	0.00	0.01	0.02				0.01	0.00						
HYPEROPLUS LANCEOLATUS								0.03														0.46				
MERLANGIUS MERLANGUS				0.10																						
MERLUCCIUS MERLUCCIUS			0.45																							
MYOXOCEPHALUS SCORPIUS											0.17															
PLATICHTHYS FLESUS			0.30							0.21			0.48	0.68			0.18	0.10	0.98	0.89		0.11		0.27	0.12	
SALMO SALAR																										
SCOMBER SCOMBRUS																										
SPRATTUS SPRATTUS	146.31	3 254.60	248.80	777.94	92.15	1.67	19.76	145.28	20.20	34.76	45.90	128.66	21.72	17.50	225.86	16.80	0.86	45.14	0.09	0.01	4.90	4.11	27.60	342.58	25.22	138.40
total	152.90	3 257.65	366.02	855.16	163.41	14.42	20.07	150.92	21.26	39.73	49.40	163.51	108.82	24.88	226.36	30.93	35.76	62.06	24.25	27.66	21.79	44.97	33.24	343.52	326.43	138.45

TABLE 2: SURVEY STATISTICS OF THE CRUISE NO. 374 OF RV "W. HERWIG III" IN MAY 2014

subdivision	rectangle	area	sa	sigma	ntot_mill	Clupea harengus (%)	Sprattus sprattus (%)	Gadus morhua (%)	Clupea harengus (million)	Sprattus sprattus (million)	Gadus morhua (million)
24	38G2	832.9	13.1	2.696	40.47	80.86	19.14	0	32.72	7.74	0
24	38G3	865.7	310.4	2.047	1312.68	35.1	64.89	0	460.76	851.74	0.02
24	38G4	1034.8	194	1.683	1192.63	4.71	95.27	0	56.23	1136.17	0
24	39G2	406.1	193.5	3.123	251.57	99.06	0.94	0	249.2	2.37	0
24	39G3	765	331.6	2.994	847.15	65.76	34.19	0	557.12	289.61	0
24	39G4	524.8	309.7	1.943	836.47	8.91	91.05	0.01	74.52	761.59	0.11
25	37G5	642.2	136.7	1.88	466.86	9.29	90.7	0.01	43.36	423.44	0.06
25	38G5	1035.7	506	1.8	2911.35	6.51	93.48	0.01	189.44	2721.62	0.29
25	38G6	940.2	507	2.27	2099.71	25.12	74.87	0	527.46	1572.15	0.09
25	39G4	287.3	326.7	1.834	511.75	9.49	90.47	0.04	48.57	462.99	0.19
25	39G5	979	656.6	1.516	4240.12	1.44	98.49	0.07	61.08	4175.98	3.05
25	39G6	1026	569.6	1.875	3116.96	14.46	85.53	0.01	450.78	2665.96	0.19
25	39G7	1026	144.2	2.28	648.72	31.28	68.59	0.13	202.92	444.94	0.85

25	40G4	677.2	460.9	1.604	1945.98	5.3	94.66	0.04	103.16	1842.02	0.8
25	40G5	1012.9	659.2	1.547	4316.05	1.49	98.5	0.01	64.38	4251.4	0.27
25	40G6	1013	233	1.558	1514.69	4.17	95.81	0.02	63.16	1451.21	0.32
25	40G7	1013	354.1	1.379	2600.89	0.16	99.84	0	4.15	2596.74	0
25	41G6	764.4	413.4	1.322	2390.22	0.06	99.93	0	1.52	2388.62	0
25	41G7	1000	213.7	1.322	1616.64	0.06	99.93	0	1.03	1615.56	0
26	39G8	1026	275.3	1.546	1827.22	0.31	99.51	0.18	5.69	1818.23	3.3
26	40G8	1013	308.4	1.944	1606.94	15.63	83.76	0.61	251.15	1345.95	9.84
26	41G8	1000	297.4	2.084	1427.02	18.07	81.14	0.79	257.85	1157.93	11.24
28	42G8	945.4	368.9	1.679	2077.06	8.13	91.16	0.71	168.79	1893.51	14.76
28	42G9	986.9	347.8	2.72	1261.85	42.21	55.43	2.36	532.59	699.45	29.81
28	43G8	296.2	372.5	2.161	510.52	28.91	70.49	0.58	147.61	359.89	2.96
28	43G9	973.7	440.6	1.683	2548.98	18.21	81.55	0.16	464.1	2078.59	4.05
28	44G9	876.6	503.3	1.374	3210.82	1.35	96.89	0	43.29	3111.05	0
28	45G9	924.5	512.7	1.353	3503.53	2.63	93.06	0	92.16	3260.55	0
29	46G9	933.8	428.8	1.368	2926.93	5.59	90.93	0	163.76	2661.34	0

TABLE 3: ESTIMATED NUMBERS (MILLIONS) OF SPRAT ON CRUISE NO. 374 OF RV "W. HERWIG III" IN MAY 2014

	Age-group							
Subdivision/rectangle	1	2	3	4	5	6	7	8+
24/38G2	0.12	1.2	1.98	1.73	1.15	0.96	0.61	0.01
24/38G3	205.55	164.43	178.72	118.59	101.4	58.2	24.31	0.53
24/38G4	282.02	237.51	233.52	153.28	124.75	72.89	31.74	0.45
24/39G2	0	0.23	0.44	0.75	0.29	0.39	0.23	0.04
24/39G3	0.91	42.36	61.99	76.85	43.29	42.13	18.09	3.98
24/39G4	25.19	195.12	207.5	132.17	117.16	61.38	22.7	0.36
25/37G5	16.97	111.77	113.62	63.23	78.36	23.28	10.06	6.15
25/38G5	104.59	689.9	720.56	410.25	523.59	160.56	69.23	42.95
25/38G6	90.06	524.94	410.91	210.77	228.43	63.17	25.6	18.28
25/39G4	23.94	112.53	106.82	68.79	89.12	37.99	13.59	10.2
25/39G5	404.01	1592.79	1049.94	449.05	485.05	111.28	56.32	27.55
25/39G6	78.95	1108.85	751.36	303.47	306.75	66.38	33.39	16.81
25/39G7	22.79	205.19	117.41	44.96	40.69	7.21	4.75	1.94
25/40G4	104.84	773.9	476.59	196.05	203.67	48.26	25.46	13.26
25/40G5	76.85	1696.26	1212.76	518.65	549.37	111.4	56.27	29.85

25/40G6	77.36	644.97	391.35	145.3	143.62	24.62	17.54	6.45
25/40G7	441.67	1043.96	596.67	227	217.34	37.47	21.66	10.96
25/41G6	337.21	1254.09	500.96	172	94.72	15.88	10.52	3.24
25/41G7	228.07	848.21	338.83	116.34	64.07	10.74	7.12	2.19
26/39G8	31.35	720.85	432.79	286.35	176.05	107.86	46.65	16.33
26/40G8	11.8	579.55	310.18	197.45	125.78	80.19	28.41	12.58
26/41G8	86.79	587.71	213.4	121.22	71.08	45.42	25.18	7.14
28/42G8	135.87	814.63	586.56	114.31	163.15	35.97	25.31	17.71
28/42G9	355.45	127.91	129.49	28.2	39.09	8.98	6.24	4.08
28/43G8	29.34	139.09	121.23	24.79	30.16	6.74	4.9	3.64
28/43G9	259.45	780.55	649.2	133.79	169.28	38.35	26.99	20.98
28/44G9	42.11	1328.93	1118.38	206.37	287.47	60.77	38.15	28.87
28/45G9	76.96	1486.21	1062.8	197.17	297.08	66.9	42.85	30.58
29/46G9	71.54	1371.38	699.76	107.08	268.4	56.25	5.1	81.83

TABLE 4: SPRAT MEAN WEIGHT (G) PER AGE GROUP ON CRUISE NO. 374 OF RV "W. HERWIG III" IN MAY 2014

	Age-group								
Subdivision/rectangle	0	1	2	3	4	5	6	7	8+
24/38G2	0	7.88	17.02	18.18	19.81	18.45	20.62	21.82	24.56
24/38G3	0	7.87	15.14	17.02	18.58	17.65	20.42	21.11	24.56
24/38G4	0	7.67	14.89	16.72	18.3	17.47	20.51	21.38	24.56
24/39G2	0	0	18.53	18.69	21.38	21.28	21.51	21.84	24.56
24/39G3	0	7.01	16.86	18.1	20.86	20.07	21.41	21.72	24.56
24/39G4	0	8.75	15.35	16.91	18.2	17.36	20.24	20.63	24.56
25/37G5	0	6.97	10.93	13.1	14.61	15.13	16.98	15.8	17.09
25/38G5	0	7.01	10.92	13.2	14.73	15.21	17.03	15.85	17.15
25/38G6	0	6.61	10.77	12.67	14.1	14.98	17	15.95	17.24
25/39G4	0	6.64	10.85	13.44	15.26	16.04	17.76	17.09	17.89
25/39G5	0	6.67	10.43	12.29	13.64	14.67	16.8	15.16	16.44
25/39G6	0	6.58	10.69	12.21	13.48	14.57	17.18	15.46	16.83
25/39G7	0	6.57	10.4	11.94	13.04	14.49	16.86	15.29	17.21
25/40G4	0	6.7	10.43	12.18	13.6	14.84	16.97	15.54	17.17
25/40G5	0	7.08	10.75	12.35	13.59	14.62	16.72	15.09	16.5

25/40G6	0	6.81	10.38	12	13.15	14.48	16.73	15.03	16.85
25/40G7	0	6	10.28	11.86	12.97	14.36	16.19	14.44	15.97
25/41G6	0	6.7	9.72	10.87	11.53	14.31	16.91	15.22	16.71
25/41G7	0	6.7	9.72	10.87	11.53	14.31	16.91	15.22	16.71
26/39G8	0	7.34	10.74	12.36	13.15	13.37	13.35	12.05	14.12
26/40G8	0	8.48	10.64	11.82	12.64	12.99	13.16	10.64	14.12
26/41G8	0	7.4	9.95	11.38	12.25	12.72	12.97	10.26	14.12
28/42G8	0	6	8.74	10.41	11.53	12.08	12.94	12.53	12.1
28/42G9	0	4.36	9.06	10.67	11.53	12.21	12.98	12.59	12.07
28/43G8	0	5.56	8.88	10.5	11.46	12	12.9	12.43	12.05
28/43G9	0	5.27	8.79	10.48	11.48	12.2	12.98	12.41	12.13
28/44G9	0	5.51	8.94	10.43	11.42	12.22	13.2	12.54	12.36
28/45G9	0	5.76	8.73	10.35	11.52	12.34	13.18	12.57	12.27
29/46G9	0	4.8	8.64	9.85	11.23	10.91	12.92	14.25	12.79

TABLE 5: SPRAT TOTAL BIOMASS (T) PER AGE GROUP ON CRUISE NO. 374 OF RV "W. HERWIG III" IN MAY 2014

	Age-group								
Subdivision/rectangle	0	1	2	3	4	5	6	7	8+
24/38G2	0	0.95	20.42	36	34.27	21.22	19.8	13.31	0.25
24/38G3	0	1617.68	2489.47	3041.81	2203.4	1789.71	1188.44	513.18	13.02
24/38G4	0	2163.09	3536.52	3904.45	2805.02	2179.38	1494.97	678.6	11.05
24/39G2	0	0	4.26	8.22	16.04	6.17	8.39	5.02	0.98
24/39G3	0	6.38	714.19	1122.02	1603.09	868.83	902	392.91	97.75
24/39G4	0	220.41	2995.09	3508.83	2405.49	2033.9	1242.33	468.3	8.84
25/37G5	0	118.28	1221.65	1488.42	923.79	1185.59	395.29	158.95	105.1
25/38G5	0	733.18	7533.71	9511.39	6042.98	7963.8	2734.34	1097.3	736.59
25/38G6	0	595.3	5653.6	5206.23	2971.86	3421.88	1073.89	408.32	315.15
25/39G4	0	158.96	1220.95	1435.66	1049.74	1429.48	674.7	232.25	182.48
25/39G5	0	2694.75	16612.8	12903.76	6125.04	7115.68	1869.5	853.81	452.92
25/39G6	0	519.49	11853.61	9174.11	4090.78	4469.35	1140.41	516.21	282.91
25/39G7	0	149.73	2133.98	1401.88	586.28	589.6	121.56	72.63	33.39
25/40G4	0	702.43	8071.78	5804.87	2666.28	3022.46	818.97	395.65	227.67
25/40G5	0	544.1	18234.79	14977.59	7048.45	8031.79	1862.61	849.11	492.53

25/40G6	0	526.82	6694.79	4696.2	1910.7	2079.62	411.89	263.63	108.68
25/40G7	0	2650.02	10731.91	7076.51	2944.19	3121	606.64	312.77	175.03
25/41G6	0	2259.31	12189.75	5445.44	1983.16	1355.44	268.53	160.11	54.14
25/41G7	0	1528.07	8244.6	3683.08	1341.4	916.84	181.61	108.37	36.59
26/39G8	0	230.11	7741.93	5349.28	3765.5	2353.79	1439.93	562.13	230.58
26/40G8	0	100.06	6166.41	3666.33	2495.77	1633.88	1055.3	302.28	177.63
26/41G8	0	642.25	5847.71	2428.49	1484.95	904.14	589.1	258.35	100.82
28/42G8	0	815.22	7119.87	6106.09	1317.99	1970.85	465.45	317.13	214.29
28/42G9	0	1549.76	1158.86	1381.66	325.15	477.29	116.56	78.56	49.25
28/43G8	0	163.13	1235.12	1272.92	284.09	361.92	86.95	60.91	43.86
28/43G9	0	1367.3	6861.03	6803.62	1535.91	2065.22	497.78	334.95	254.49
28/44G9	0	232.03	11880.63	11664.7	2356.75	3512.88	802.16	478.4	356.83
28/45G9	0	443.29	12974.61	10999.98	2271.4	3665.97	881.74	538.62	375.22
29/46G9	0	343.39	11848.72	6892.64	1202.51	2928.24	726.75	72.68	1046.61

BALTIC INTERNATIONAL ACOUSTIC SURVEY – BIAS 2014

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

National Marine Fisheries Research Institute – NMFRI, Gdynia (Poland)

THE CRUISE REPORT

FROM THE JOINT LATVIAN-POLISH BALTIC INTERNATIONAL ACOUSTIC SURVEY – BIAS 2014 ON THE R/V "BALTICA" IN THE ICES SUBDIVISIONS 26N AND 28.2 OF THE BALTIC SEA

(09-18 October 2014)

Working paper on the WGBIFS meeting in Öregrund, Sweden, 23-27.03.2015

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Riga – Gdynia, March 2015

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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]. The permanent participation of the Polish r/v "Baltica" in the autumn Baltic International Acoustic Surveys (BIAS) within the Polish EEZ has taken place since 1994 in the framework of long-term ICES Baltic International Acoustic Surveys programme, coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS). 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 10 BIAS on pelagic fish stocks and 17 BITS on demersal fish stocks.

This was the 10th joint Latvian-Polish Baltic International Acoustic Survey (BIAS) in the ICES Sub-divisions 26N and 28.2 conducted by the r/v "Baltica" in October 2014. 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 28.2). The "Latvian National Fisheries Data Collection Programme, 2014-2016" in accordance with the EU Council Regulation No. 199/2008 and EU Commission Regulation No.605/2008, EU Commission Decisions 2008/605/EC, 2009/10121/EC, C (2013) 5568 was partly subsidized this cruise. It was coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS) [ICES 2014].

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;
M. Wyszynski (NMFRI, Gdynia – Poland) – cruise leader, fish sampling team;
B. Witalis (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;
J. Aizups (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 09-18 October 2014. The vessel left the port of Gdynia on 08.10.2014 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 09.10.2014 in the noon. The sea researches were conducted in the period of 09-17.10.2014 within Latvian, Estonian and Sweden EEZs (ICES Sub-divisions 26N and 28.2) and were ended on 18.10.2014 morning. Then the r/v "Baltica" was navigated to the port Ventspils (Latvia), reaching it on 18.10.2014 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 625 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 2014 was 1953.3 nm^2 in the northern part of the ICES Sub-division 26 and 7874.9 nm^2 in Sub-division 28.2, totally 9828.2 nm^2 (Fig. 1).

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 22 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 80 m from the sea surface (Tab. 1). Mean headrope depth location in all investigated areas was 36 m. The trawl mouth opening ranged from 16 to 20 m (mean – 19 m). The mean bottom depth at trawling positions varied from 45 to 222 m (mean for all investigated area – 94 m). Totally, 5 hauls were localized in the ICES Sub-division 26 and 17 hauls in the ICES Sub-division 28.2. On the whole, 13 catch samples were taken in the Latvian EEZ, 5 samples in the Sweden EEZ and 4 samples in the Estonian EEZ. All hauls were conducted outside the territorial waters of these countries. The catches were made at the daylight between 07:25 am and 18:15 pm (GMT+01:00). The speed of the vessel during trawling was 2.8-3.3 knots (mean – 3.1 knt). The trawling time of the single haul lasted 30 minutes (20 stations) and 60 minutes (2 stations) – 30 minutes in each of two fish concentration layers. 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 2827 (int. al. 1895 individuals of 0 year class) sprat, 2227 herring, 582 three-spined sticklebacks, 20 cods, 19 lumpfish, 5 flounders and for one greater sandeel and river lamprey. 977 (int. al. 436 individuals of 0 year class) and 960 individuals of sprat and herring were aged respectively. The number of measured and analyzed (aged) fish specimens during survey are aggregated in Tab. 2. Detailed ichthyologic 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, 2014]:

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 12 zooplankton stations were realized (Fig. 2) and 16 samples were taken. 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 09-17 October 2014, totally at 28 stations, int. al. at 22 fish catch-station and 7 HELCOM stations located in the central-eastern part of the Baltic Sea (Fig. 3). Positions of the 8th haul station and HELCOM station J40/45 overlapped. 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. The oxygen probes ware taken on every 10 meters. The salinity parameter was presented in Practical Salinity Unit (PSU).

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 8 fish species were recorded in the 22 pelagic control hauls taking place in ICES Sub-divisions 26N and 28.2 of the central-eastern Baltic Sea. In all hauls was dominated clupeids (totally 8443.8 kg or 97.5 % on average in mass of all catches). In October 2014 amount of three-spined sticklebacks in hauls was decreased more than two times, forming 2.5 % of all catches. By-catch of other species was negligible – 10.5 kg or 0.1 % of fish mass (Tab. 4 and 5). Herring dominated in 8 hauls from ICES SD 28.2 and made 31.5 % on average in mass of all catches from this SD (Tab. 6 and 7). In catches from ICES SD 26N proportion of herring evidently decreased to 3.6 % and the average share of herring per sub-divisions was 26.8 % - practically the same as in 2013 (25.8 %). The herring average share in the catches in October 2010 was 28.5 % – for about the same as it was in October 2012 (only +0.2 %), but 1.7 % less than it was in October 2011 and 9.2 % less than it was in October 2009 and 2.6 % more comparing to average share in October of period 2005-2009 [Grygiel et al. 2006, 2007, 2008, 2009, 2010, Svecovs et al. 2011, 2012, 2013].

Mean CPUE for all species in the investigated area in 2014 amounted 751.2 kg/h and was higher comparing to the previous year (504.5 kg/h in 2013). The mean CPUEs of sprat were: 540 kg/h in ICES SD 26N, and 528 kg/h in SD 28.2. The mean CPUEs of herring were as follow: in SD 26N – 20.2 kg/h and 254.3 kg/h in SD 28.2 (Tab. 8 and 9). 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 2005-2014 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), but in 2012-2013 dropped to level of 2005-2008. In 2013 the average CPUE of sprat had decreasing tendency and was more than two times less than in 2006-2010. Significantly higher average CPUEs for sprat in 2013 were noted in Sub-division 28.2 in comparison to Sub-division 26N. In the period of years 2005-2010 was the same pattern. CPUEs for herring were higher in SD 28.2 as well as sprat. In 2014 CPUEs of sprat and herring had increased.

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 2014, are given in Tab. 10 and 11, for third dominant species – three-spined stickleback in Tab. 30. The geographical distributions of NASC and pelagic fish stock densities in the central-eastern Baltic Sea in October 2013 are shown in Fig. 7, 8 and 9.

The pelagic fish stock was represented mostly by sprat – 86.8 %, in comparison – 71.5% in 2013. Herring was represented as 13.2 %, 28.5 % in 2013. The highest sprat stock density (21.59 n×10^6/nm^2) were recorded in ICES rectangle 41H0 of the ICES Sub-division 26N. The highest average abundance per nm^2 of the sprat stock were recorded in the southern part of investigated area in ICES rectangle 41H0, the highest biomass in rectangle 43H0. The distribution of the high density sprat concentrations in October 2014 totally differed comparing with that from October of the years previous 2013, when high density sprat concentrations had found mostly in the central and northern parts of the investigated area. In 2013 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. In 2014 sprat had scattered distribution of concentrations mostly made from specimens of new generation.

The herring stock density was significantly lower in comparison to sprat stock density. The highest density values was over 20.0 n×10^6/nm^2 and noted in two ICES rectangles in central and northern part of the investigated area in Sub-division 28.2 – rectangles 43H0 and 45H0 in comparison to 2013 were highest density values was not over 8.8 n×10^6/nm^2 and only in one rectangle 44H0.

Comparison of the acoustic results from October of 2005-2014 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, 2013].

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 stickleback are shown in Tab. 30. The total length and mean weight in control hauls of sprat, herring and stickleback ranged as follows:

- sprat – 6.0÷14.5 cm (average TL = 9.4 cm), 1.6÷19.3 g (average W = 5.9 g)
- herring – 6.5÷25.0 cm (average TL = 14.9 cm), 1.8÷145.2 g (average W = 26.6 g)
- stickleback – 4.5÷8.0 cm (average TL = 6.4 cm), 0.7÷4.8 g (average W = 2.0 g)

The sprat length distribution curves have a bimodal character in case of Sub-division 28.2 and one mode character in SD 26N. First length frequency pick takes place on

7.5 cm length class in both Sub-divisions and represents fish generation born in 2014. The length distribution curves show a high abundance of this sprat generation, which represents till 97.6% share of species total number in SD 26N and 59.1% in SD 28.2. Second smaller pick (representing adult part of the stock) in SD 28.2 is situated on 12 cm length class.

The herring length distribution curves have a bimodal character in both Sub-divisions 26N and 28.2. The fish representing 6.5-10 cm length range belong to the generation born in 2014. The frequency share of this herring generation was significantly higher in SD 26N constituting 49.5% of total catch number and comparing to SD 28.2 – 23.8%. The frequency picks representing adult fish fall to the length classes 17 and 18.5 cm in SDs 28.2 and 26N respectively.

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 dominantly of year class 0 specimens – 97.5 % in SD 26N, 66.8 % in SD 28.2 and 79.8 % overall. Herring stock was composed mainly of year class 0, 2 and 3 specimens (24.3 %, 19.3 % and 20.8 % respectively). The year-class 0 of sprat was represented by length-classes 6.0÷9.5 cm (7.6 cm on average) with mean weights 1.6÷5.0 g (2.7 g on average).

2.1.3. Zooplankton estimates

Zooplankton estimates show evident decrease of organisms in several groups Tab. 31 and this might cause sprat population decrease. All of important diet organisms for sprat – *Acartia* spp., *Pseudocalanus* sp. and *Temora longicornis* had 2-3 times decreased.

2.2. Meteorological and hydrological data

2.2.1. Weather conditions

During trawling, following meteorological conditions were noticed (Fig. 14): most frequently wind during survey time was from ENE direction. The wind speed varied from 0.3 m/s to 15.1 m/s and average speed was 7.0 m/s. The air temperature ranged from 4.9 °C to 15.2 °C, and average temperature was 11.4 °C.

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 for October 2014 is shown in Fig. 15, the hydrological situation in bottom layer of all investigated area are shown in Fig. 16. In recent nine years we could observe more-less stable water conditions in the Gotland basin with low dissolved oxygen content and salinity in deeper parts and northwardly this trend becomes stronger.

During survey in October 2014 the seawater temperature in the surface layer varied from 11.80 to 13.95 °C. The lowest values were observed at the haul 22 in the northern part of the investigated area, while the warmest surface water was measured at the haul 9. The average value equalled 13.02 °C. The average surface salinity was 6.55 PSU. The minimum value of this parameter was 5.35 PSU (haul 6) and maximum 7.08 PSU (haul 1 and independent hydrological station 1). The highest oxygen content in surface layer was 7.76 ml/l (hydrological station 43/J37)) while the lowest one 6.44 ml/l (haul 7). Mean value of dissolved oxygen equalled 7.25 ml/l.

Near-bottom layer conditions are presented in the (Fig. 6). Water temperature varied from 3.95 °C (haul 2) to 6.82 °C (hydrological station 46/J52). The mean value calculated for the whole area covered during the survey was 5.25 °C. The average salinity in the close to the bottom layer was 10.25 PSU. The highest values were measured in the Gotland Deep (12.54 PSU). The lowest one was 7.29 PSU (haul 15, shallow waters north of Ventspils). The dissolved oxygen varied from 0 (hydrological station 2 and hydrological station 37/J1) to 6.84 ml/l (haul 15). The mean value of this parameter was 2.29 ml/l.

3. DISCUSSION

The data of the Latvian-Polish BIAS in the 4th quarter of 2014 were considered by the ICES BIFS Working Group (Gdynia, Poland meeting, 24-28.03.2014) 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 28.2 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 2014 had similar pattern as in years with low sprat abundance and establishes the fact observed during BASS and BIAS in 2010-2014.

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Table 1. Fish control-catch statistics in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

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	2014-10-09	41G9	26	124	10/80	22/17	3.2	10	56°07.2'	19°03.6'	56°08.4'	19°04.5'	17:05	18:05	60	170.888
2	2014-10-10	41G9	26	52	14	17	3.2	85	56°06.2'	19°37.4'	56°06.3'	19°40.5'	09:30	10:00	30	264.597
3	2014-10-10	41H0	26	51	25	20	3.3	0	56°07.4'	20°07.4'	56°09.1'	20°07.8'	12:35	13:05	30	253.126
4	2014-10-10	41H0	26	45	20	18	3.3	350	56°23.5'	20°21.6'	56°25.2'	20°21.3'	16:50	17:20	30	751.110
5	2014-10-11	41G9	26	85	31	19	3.1	90	56°22.7'	19°50.6'	56°22.7'	19°53.3'	08:00	08:30	30	52.090
6	2014-10-11	42G9	28	129	67	19	3.0	90	56°37.0'	19°19.9'	56°37.0'	19°22.5'	15:30	16:00	30	86.372
7	2014-10-12	42H0	28	91	30	19	3.1	275	56°37.1'	20°21.3'	56°37.3'	20°18.4'	09:00	09:30	30	393.036
8	2014-10-12	42H0	28	62	30	20	3.1	270	56°37.2'	20°35.4'	56°37.2'	20°32.4'	12:05	12:35	30	1032.127
9	2014-10-12	42G9	28	58	35	18	3.3	280	56°53.6'	20°29.9'	56°54.0'	20°27.1'	17:00	17:30	30	1005.610
10	2014-10-13	42G9	28	120	30	19	3.1	90	56°52.9'	19°38.7'	56°53.0'	19°41.4'	08:40	09:10	30	99.706
11	2014-10-13	43G9	28	222	60	20	2.8	90	57°06.9'	19°47.7'	57°06.9'	19°50.0'	17:15	17:45	30	65.294
12	2014-10-14	43H0	28	199	57	19	3.1	270	57°07.1'	20°10.3'	57°07.2'	20°07.5'	07:25	07:55	30	1449.138
13	2014-10-14	43H0	28	65	40	20	3.0	187	57°09.2'	20°44.4'	57°07.7'	20°44.2'	12:35	13:05	30	37.742
14	2014-10-14	43H0	28	58	26	20	3.0	247	57°21.5'	20°56.2'	57°20.8'	20°53.7'	17:15	17:45	30	606.289
15	2014-10-15	44H0	28	58	25	16	3.1	204	57°36.2'	20°50.9'	57°34.6'	20°49.6'	16:15	16:45	30	346.066
16	2014-10-16	44H1	28	78	57/25	18/20	3.2	280	57°52.2'	21°08.8'	57°52.5'	21°02.8'	08:40	09:40	60	628.663
17	2014-10-16	44H0	28	98	28	19	3.2	267	57°52.5'	20°36.6'	57°52.4'	20°33.3'	12:10	12:40	30	36.723
18	2014-10-16	45H0	28	120	32	20	2.9	240	58°05.7'	20°09.1'	58°05.0'	20°06.8'	17:45	18:15	30	216.027
19	2014-10-17	45H0	28	54	32	20	3.2	267	58°06.8'	20°55.1'	58°06.7'	20°52.2'	08:30	09:00	30	467.358
20	2014-10-17	45H1	28	97	50	18	3.3	220	58°20.9'	21°06.5'	58°19.7'	21°04.6'	12:00	12:30	30	505.088
21	2014-10-17	45H0	28	102	50	19	3.0	275	58°23.0'	20°44.3'	58°23.2'	20°41.3'	15:20	15:50	30	112.159
22	2014-10-17	45H0	28	90	24	20	3.1	174	58°27.0'	20°41.0'	58°25.6'	20°41.3'	17:10	17:40	30	83.332

Table 2. Number of measured and aged fish individuals in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Fish species	Number of measured individuals			Number of aged individuals		
	SD 26	SD 28	Total	SD 26	SD 28	Total
Sprat (all)	582	2245	2827	296	855	977
Sprat (yearclass 0)	568	1327	1895	122	314	436
Herring (all)	313	1914	2227	138	822	960
Herring (GoR population)	21	312	333	10	159	169
Cod		20	20			
Flounder	1	4	5			
Lumpfish	4	15	19			
Stickleback, three-spined	59	523	582			
River lamprey	1		1			
Greater sandeel		1	1			
Total	1549	6361	7910	566	2150	2542

Table 3. The values of meteorological and hydrological parameters registered at the trawling depth in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	Date of catch	Mean trawling depth [m]	Hydrological parameters			Meteorological parameters				
			Temperature [°C]	Salinity [PSU]	Oxygen [ml/l]	Wind direction	Wind force Beaufort	Sea state WMO	Air temperature [°C]	Atmospheric pressure [hPa]
1	2014-10-09	21/89	13,26/13,26	7,07/11,42	7,61/2,57	SSW	4	2	13	1012
2	2014-10-10	23	12.92	7.04	7.22	SE	4	2	12	1015
3	2014-10-10	35	5.66	7.42	6.44	S	3	2	14	1017
4	2014-10-10	29	13.66	7.04	6.84	SW	4	2	14	1020
5	2014-10-11	41	5.12	7.17	6.93	SW	4	2	11	1021
6	2014-10-11	77	4.56	9.36	2.20	changeable	1	1	13	1023
7	2014-10-12	40	5.87	7.08	6.20	ESE	6	3	9	1014
8	2014-10-12	40	7.54	7.06	6.68	SE	4	2	10	1014
9	2014-10-12	44				E	4	2	10	1014
10	2014-10-13	40	6.48	6.83	7.26	W	4	2	9	1017
11	2014-10-13	70	4.00	8.02	4.49	changeable	2	1	11	1019
12	2014-10-14	67	3.79	7.41	6.00	E	5	3	8	1010
13	2014-10-14	50	4.66	7.23	6.21	ENE	5	3	9	1010
14	2014-10-14	36	9.86	6.80	6.70	NE	5	3	10	1010
15	2014-10-15	33	13.11	6.57	6.41	NE	6	4	8	1013
16	2014-10-16	66/35	6,32/4,30	6,73/8,37	7,21/3,50	NE	6	3	5	1012
17	2014-10-16	38	5.62	6.75	7.26	ENE	5	3	6	1013
18	2014-10-16	42	5.12	6.96	7.02	ENE	5	3	7	1013
19	2014-10-17	42	9.54	6.62	7.08	NE	4	2	4	1017
20	2014-10-17	59	4.41	8.66	2.04	ENE	3	2	4	1013
21	2014-10-17	60	4.22	7.89	3.54	ENE	4	2	4	1013
22	2014-10-17	34	3.28	6.88	6.50	ENE	4	2	4	1013

Table 4. Fish control-catch results by species in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	Total catch [kg]	Catch per species [kg]							
		Sprat	Herring	Cod	Flounder	Lumpfish	River lamprey	Three-spined stickleback	Greater sandeel
		161789	161722	164712	172894	167612	159719	166365	171682
1	170.888	116.280	44.000			0.388		10.220	
2	264.597	264.350			0.196		0.051		
3	253.126	227.574	25.286			0.266			
4	751.110	748.105	3.005						
5	52.090	51.830	0.260						
6	86.372	22.936	57.760	2.662				3.014	
7	393.036	373.037	19.225		0.204	0.492		0.078	
8	1032.127	1006.998	24.762			0.367			
9	1005.610	732.084	273.526						
10	99.706	96.379	0.398			0.346		2.583	
11	65.294	5.045	58.560	1.434				0.255	
12	1449.138	1355.838	92.717	0.438				0.145	
13	37.742	34.652	2.648	0.337	0.103			0.002	
14	606.289	221.708	384.052	0.117		0.355			0.057
15	346.066	337.038	5.832		0.118	0.268		2.810	
16	628.663	50.862	577.058		0.110	0.633			
17	36.723	20.966	2.345	0.066		0.169		13.177	
18	216.027	34.122	37.577			0.067		144.261	
19	467.358	124.715	341.450			0.258		0.935	
20	505.088	80.717	423.259	0.608				0.504	
21	112.159	6.940	104.328	0.219				0.672	
22	83.332	9.148	44.407			0.172		29.605	
SD 26	1491.811	1408.139	72.551		0.196	0.654	0.051	10.220	
SD 28	7170.730	4513.185	2449.904	5.881	0.535	3.127		198.041	0.057
SD 26+28	8662.541	5921.324	2522.455	5.881	0.731	3.781	0.051	208.261	0.057

Table 5. Share of fish species in mass by hauls in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	Total catch [%]	Catch per species [%]							
		Sprat	Herring	Cod	Flounder	Lumpfish	River lamprey	Three-spined stickleback	Greater sandeel
		161789	161722	164712	172894	167612	159719	166365	171682
1	100.00	68.04	25.75			0.23		5.98	
2	100.00	99.91			0.07	0.00	0.02		
3	100.00	89.91	9.99			0.11			
4	100.00	99.60	0.40						
5	100.00	99.50	0.50						
6	100.00	26.55	66.87	3.08				3.49	
7	100.00	94.91	4.89		0.05	0.13		0.02	
8	100.00	97.57	2.40			0.04			
9	100.00	72.80	27.20						
10	100.00	96.66	0.40			0.35		2.59	
11	100.00	7.73	89.69	2.20				0.39	
12	100.00	93.56	6.40	0.03				0.01	
13	100.00	91.81	7.02	0.89	0.27			0.01	
14	100.00	36.57	63.34	0.02		0.06			0.01
15	100.00	97.39	1.69		0.03	0.08		0.81	
16	100.00	8.09	91.79		0.02	0.10			
17	100.00	57.09	6.39	0.18		0.46		35.88	
18	100.00	15.80	17.39			0.03		66.78	
19	100.00	26.69	73.06			0.06		0.20	
20	100.00	15.98	83.80	0.12				0.10	
21	100.00	6.19	93.02	0.20				0.60	
22	100.00	10.98	53.29			0.21		35.53	
SD 26	100.00	95.99	3.59		0.01	0.03	0.004	0.36	
SD 28	100.00	65.45	31.52	0.086	0.007	0.04		2.888	0.001
SD 26+28	100.00	70.65	26.77	0.071	0.008	0.04	0.001	2.459	0.0007

Table 6. Share of dominant fish species in mass of the control catches in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	Catch share					
	Total [kg]	Sprat [kg]	Herring [kg]	Total [%]	Sprat [%]	Herring [%]
1	160.280	116.280	44.000	100.00	72.55	27.45
2	264.350	264.350		100.00	100.00	
3	252.860	227.574	25.286	100.00	90.00	10.00
4	751.110	748.105	3.005	100.00	99.60	0.40
5	52.090	51.830	0.260	100.00	99.50	0.50
6	80.696	22.936	57.760	100.00	28.42	71.58
7	392.262	373.037	19.225	100.00	95.10	4.90
8	1031.760	1006.998	24.762	100.00	97.60	2.40
9	1005.610	732.084	273.526	100.00	72.80	27.20
10	96.777	96.379	0.398	100.00	99.59	0.41
11	63.605	5.045	58.560	100.00	7.93	92.07
12	1448.555	1355.838	92.717	100.00	93.60	6.40
13	37.300	34.652	2.648	100.00	92.90	7.10
14	605.760	221.708	384.052	100.00	36.60	63.40
15	342.870	337.038	5.832	100.00	98.30	1.70
16	627.920	50.862	577.058	100.00	8.10	91.90
17	23.311	20.966	2.345	100.00	89.94	10.06
18	71.699	34.122	37.577	100.00	47.59	52.41
19	466.165	124.715	341.450	100.00	26.75	73.25
20	503.976	80.717	423.259	100.00	16.02	83.98
21	111.268	6.940	104.328	100.00	6.24	93.76
22	53.555	9.148	44.407	100.00	17.08	82.92
SD 26	1480.690	1408.139	72.551	100.00	95.10	4.90
SD 28	6963.089	4513.185	2449.904	100.00	64.82	35.18
SD 26+28	8443.779	5921.324	2522.455	100.00	70.13	29.87

Table 7. Share of dominant fish species in mass by rectangles in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES rectangle	Haul No	Catch share					
			Total [kg]	Sprat [kg]	Herring	Total [%]	Sprat [%]	Herring [%]
26	41G9	1,2,5	271.807	249.547	22.260	100.00	91.81	8.19
	41H0	3,4	1003.970	975.679	28.291	100.00	97.18	2.82
28	42G9	6,9,10	788.722	567.599	221.123	100.00	71.96	28.04
	42H0	7,8	1424.022	1380.035	43.987	100.00	96.91	3.09
	43G9	11	127.210	10.090	117.120	100.00	7.93	92.07
	43H0	12,13,14	1394.410	1074.799	319.611	100.00	77.08	22.92
	44H0	15,17	366.181	358.004	8.177	100.00	97.77	2.23
	44H1	16	627.920	50.862	577.058	100.00	8.10	91.90
	45H0	18,19,21,22	351.344	87.463	263.881	100.00	24.89	75.11
	45H1	20	1007.952	161.434	846.518	100.00	16.02	83.98
SD 26		1-5	565.275	540.000	25.276	100.00	95.53	4.47
SD 28		6-22	782.250	527.971	254.279	100.00	67.49	32.51
SD 26+28		1-22	741.364	530.705	210.660	100.00	71.58	28.42

Table 8. Catch per unit effort results by species in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES rectangle	Haul number	Total CPUE [kg/h]	CPUE per species [kg/h]							
				sprat	herring	cod	flounder	lumpfish	lamprey	three-spined stickleback	Greater sandeel
26	41G9	1,2,5	268.087	249.547	22.260		0.392	0.388	0.102	10.220	
	41H0	3,4	1004.236	975.679	28.291			0.532			
28	42G9	6,9,10	794.459	567.599	221.123	5.324		0.692		5.597	
	42H0	7,8	1425.163	1380.035	43.987		0.408	0.859		0.156	
	43G9	11	130.588	10.090	117.120	2.868				0.510	
	43H0	12,13,14	1395.446	1074.799	319.611	0.595	0.206	0.710		0.147	0.114
	44H0	15,17	382.789	358.004	8.177	0.132	0.236	0.437		15.987	
	44H1	16	628.663	50.862	577.058		0.110	0.633			
	45H0	18,19,21,22	439.438	87.463	263.881	0.438		0.331		87.737	
	45H1	20	1010.176	161.434	846.518	1.216				1.008	
26		1-5	562.547	540.000	25.276		0.392	0.460	0.102	10.220	
28		6-22	806.635	527.971	254.279	1.470	0.240	0.562		30.468	0.114
26+28		1-22	751.161	530.705	210.660	1.470	0.270	0.545	0.102	29.022	0.114

Table 9. Share of fish species in mass by rectangles in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES rectangle	Haul number	Total CPUE [%]	CPUE per species [%]							
				sprat	herring	cod	flounder	lumpfish	lamprey	three-spined stickleback	Greater sandeel
26	41G9	1,2,5	100.00	93.08	8.30	0.00	0.15	0.14	0.04	3.81	
	41H0	3,4	100.00	97.16	2.82	0.00	0.00	0.05			
28	42G9	6,9,10	100.00	71.44	27.83	0.67	0.00	0.09		0.70	
	42H0	7,8	100.00	96.83	3.09		0.03	0.06		0.01	
	43G9	11	100.00	7.73	89.69	2.20				0.39	
	43H0	12,13,14	100.00	77.02	22.90	0.04	0.01	0.05		0.01	0.01
	44H0	15,17	100.00	93.53	2.14	0.03	0.06	0.11		4.18	
	44H1	16	100.00	8.09	91.79		0.02	0.10			
	45H0	18,19,21,22	100.00	19.90	60.05	0.10		0.08		19.97	
	45H1	20	100.00	15.98	83.80	0.12				0.10	
26		1-5	100.00	95.99	4.49	0.00	0.07	0.08	0.02	1.82	
28		6-22	100.00	65.45	31.52	0.18	0.03	0.07		3.78	0.01
26+28		1-22	100.00	70.65	28.04	0.20	0.04	0.07	0.01	3.86	0.01

Table 10. Hydroacoustic survey statistics from the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES Rect.	Area nm^2	NASC m^2/nm^2	$\sigma \times 10^4$ m^2	Total abundance, mln	Species composition (%)	
						herring	sprat
28	45H1	827.1	926.5	1.4448	5304.1	44.4	55.6
	45H0	947.2	305.4	0.8922	3241.9	59.8	40.2
	44H1	824.6	1046.6	1.6632	5188.9	51.4	48.6
	44H0	960.5	407.5	0.9849	3974.0	16.8	83.2
	43H1	412.7	426.2	1.5713	1119.5	25.3	74.7
	43H0	973.7	1226.7	1.5396	7757.9	8.7	91.3
	43G9	973.7	447.7	0.8027	5430.9	5.1	94.9
	42H0	968.5	1080.3	1.0469	9993.3	4.0	96.0
	42G9	986.9	309.7	0.7723	3957.7	4.6	95.4
26	41H0	953.3	1366.9	0.6331	20583.5	0.6	99.4
	41G9	1000.0	401.1	0.6232	6436.6	0.7	99.3

Table 11. Estimated abundance and biomass of prevalent fish species in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES Rect.	Area nm^2	ρ mln/nm^2	Quantity, mln			Biomass, tons		
				N sum	N her	N spr	W sum	W her	W spr
28	45H1	827.1	6.41	5304.1	2354.6	2949.4	72951.1	61251.3	11699.8
	45H0	947.2	3.42	3241.9	1940.3	1301.7	20557.0	15439.6	5117.4
	44H1	824.6	6.29	5188.9	2666.9	2522.0	88371.9	81213.7	7158.2
	44H0	960.5	4.14	3974.0	667.1	3306.8	30790.3	18126.5	12663.8
	43H1	412.7	2.71	1119.5	283.8	835.7	17013.2	10230.8	6782.4
	43H0	973.7	7.97	7757.9	671.5	7086.4	100969.3	23143.1	77826.3
	43G9	973.7	5.58	5430.9	275.3	5155.6	28733.7	10569.0	18181.2
	42H0	968.5	10.32	9993.3	404.0	9589.3	76561.1	10005.3	66555.8
	42G9	986.9	4.01	3957.7	183.9	3773.8	19329.6	6334.3	12995.3
26	41H0	953.3	21.59	20583.5	119.1	20464.4	64882.4	1828.3	63054.1
	41G9	1000.0	6.44	6436.6	48.2	6388.5	20371.6	1891.4	18480.3

Table 12. Number of sprat individuals measured in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	L, cm																		Total n in	Mean L,
	6.0	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		
1			12	30	39	22	4	1											36677	8.2
2		1	20	41	32	11													92832	7.9
3			11	80	81	17	4				1	2		2	5		1		63858	8.3
4			14	49	35	7					1	2							252801	8.0
5			16	25	13	3													19989	7.8
6		3	15	37	30	12	2						1	1	1		1		6783	8.1
7		2	10	27	19	4	1												135689	7.9
8			12	32	21	7				1	22	19	37	32	23	15	5	2	110894	11.1
9				2	1	1					7	15	43	49	52	24	10		57729	12.7
10				8	28	18	4												27866	8.4
11		1	7	35	29	7	1						3	6	7	8	2	1	894	9.3
12			3	3	7	1					10	16	41	53	41	21	8	2	115210	12.5
13		1	6	26	16	6													12706	7.9
14				4	1					2	11	26	59	40	44	14	4		18881	12.5
15		7	45	83	37	3						2	6	9	13	5			79921	8.6
16		9	33	33	25	2							1		2	1	1		17920	7.9
17	6	21	23	14	1														8925	7.1
18			18	29	16	4													12371	7.8
19		10	52	62	30	2					1	6	9	14	9	5	5	2	26066	8.9
20		26	68	63	14	1					9	18	17	3					20624	8.4
21		4	15	24	9	1													2749	7.6
22			16	45	25	1								1					3307	7.9
SD 26		1	73	225	200	60	8	1			2	4		2	5		1		466157	8.1
SD 28	6	84	323	527	309	70	8			3	60	102	217	208	192	93	36	7	658535	9.8
26+28	6	85	396	752	509	130	16	1		3	62	106	217	210	197	93	37	7	1124692	9.4

Table 13. Mean weight [g] of sprat in catch in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul	L, cm																		Total	Mean
number	6.0	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	catch	W,
1			2.3	2.7	3.3	3.8	4.4	4.8											116.280	3.2
2		2.0	2.3	2.7	3.1	3.7													264.350	2.8
3			2.3	2.7	3.2	3.7	4.5				9.4	10.1		13.8	14.1		17.5		227.574	3.6
4			2.3	2.6	3.1	3.5					8.4	9.3							748.105	3.0
5			2.2	2.6	3.0	3.4													51.830	2.6
6		1.7	2.3	2.7	3.3	3.9	5.0						11.4	11.6	15.0		16.2		22.936	3.4
7		1.7	2.1	2.6	3.1	3.6	4.0												373.037	2.7
8			2.2	2.7	3.2	3.7				8.0	8.9	9.9	11.3	12.5	13.4	15.4	15.9	18.3	1006.998	9.1
9				2.7	3.2	3.7					9.0	9.9	11.6	12.6	13.8	15.3	15.9		732.084	12.7
10				2.8	3.3	3.8	4.3												96.379	3.5
11		1.8	2.3	2.7	3.2	3.9	4.2						11.2	12.5	13.6	14.3	16.3	16.5	5.045	5.6
12			2.1	2.6	3.0	3.8					9.0	10.1	11.3	12.3	13.2	14.9	15.8	19.3	1355.838	11.8
13		1.2	2.1	2.5	3.1	3.6													34.652	2.7
14				2.5	2.7					7.8	8.9	9.9	11.3	12.2	13.7	14.3	16.4		221.708	11.7
15		1.7	2.1	2.6	3.0	3.7						9.2	11.4	12.2	13.2	14.1			337.038	4.2
16		1.6	2.0	2.5	2.8	3.4							10.1		13.9	13.9	14.2		50.862	2.8
17	1.6	2.0	2.6	2.9	2.9														20.966	2.3
18			2.1	2.7	3.2	3.8													34.122	2.8
19		1.7	2.0	2.5	3.0	4.0					9.5	9.7	10.9	11.5	12.5	13.8	15.2	15.3	124.715	4.8
20		1.7	2.0	2.5	3.0	3.6					8.9	9.6	10.9	12.7					80.717	3.9
21		1.8	2.2	2.6	3.1	3.6													6.940	2.5
22			2.2	2.6	3.0	4.0								12.2					9.148	2.8
SD 26		2.0	2.2	2.7	3.2	3.7	4.5	4.8			8.9	9.7		13.8	14.1		17.5		1408.139	3.2
SD 28	1.6	1.7	2.1	2.6	3.1	3.8	4.4			7.8	8.9	9.8	11.3	12.3	13.5	14.8	15.8	17.5	4513.185	6.6
26+28	1.6	1.7	2.2	2.6	3.1	3.7	4.4	4.8		7.8	8.9	9.8	11.3	12.4	13.5	14.8	15.9	17.5	5921.324	5.9

Table 14. Number of herring individuals measured in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	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														1					1	2
2																				
3			4	35	53	21	11	1		2		1							1	5
4													1							
5			1	9	12	4	3	1												
6				1	5	2										1		4	8	11
7			6	15	17	9	2													
8				1	2	2										1	1	1	3	1
9															1	1	3	9	10	14
10			2	3	5	5	2	1												
11																1		2	2	12
12																1	6	9	21	13
13	2	2	7	20	13	6														
14																	2	9	14	16
15		1	10	23	12	4														
16			3	1	1	1										1	7	15	27	40
17	8	8	21	14	3															
18		2	13	17	14	3	1													
19	1	3	2	6	3	2								3	16	29	36	23	23	23
20		3	10	25	9	2									1	3	7	10	21	30
21		1	7	15	24	3														
22		2	5	22	19	2														
SD 26			5	44	65	25	14	2		2		1	1	1					2	7
SD 28	11	22	86	163	127	41	5	1						3	18	38	62	82	129	160
26+28	11	22	91	207	192	66	19	3		2		1	1	4	18	38	62	82	131	167

Table 14. Continued

Haul number	L, cm																		Total n in	Mean L,
	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	23.0	23.5	24.0	24.5	25.0		
1	7	17	10	19	20	12	13	4	4	2			1						1062	18.5
2																				
3	4	5	5	2	3	1	1	4	2	2		1					1	1	1739	11.1
4	1			1			1												104	16.9
5																			65	8.8
6	19	37	23	28	28	16	11	8	2	2	1	1							1600	17.6
7																			5048	8.6
8	2	2	1		2	1		1	1										934	15.3
9	22	26	31	20	26	12	6	6	7	5									6840	17.8
10																			89	8.9
11	16	27	19	27	34	25	13	14	4	2		2							1447	18.3
12	17	13	10	4	1	2	1	1		1									3185	16.6
13																			797	8.3
14	26	30	21	21	15	16	10	8	6	6									9929	17.8
15																			1717	8.3
16	31	21	27	11	12	3	5	1											18949	16.6
17																			872	7.7
18																			10508	8.3
19	20	7	6	4	1														15056	14.8
20	18	19	15	13	7	3		2		1									17575	14.7
21																			28258	8.5
22																			12502	8.4
SD 26	12	22	15	22	23	13	15	8	6	4		1	1				1	1	2970	13.6
SD 28	171	182	153	128	126	78	46	41	20	17	1	3							135306	15.1
26+28	183	204	168	150	149	91	61	49	26	21	1	4	1				1	1	138276	14.9

Table 15. Mean weight [g] of herring in catch in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul	L, cm																			
number	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														13.8					27.2	26.2
2																				
3			3.3	3.5	4.2	4.6	5.6	7.0		10.0		12.4							28.6	29.7
4													11.4							
5			3.4	3.3	3.9	4.4	5.1	6.2												
6				3.8	4.1	4.3										20.0		24.0	26.5	27.5
7			2.9	3.4	3.9	4.5	5.3													
8				3.0	3.8	4.1										16.6	21.6	20.2	24.6	26.0
9															18.2	18.6	22.2	23.2	25.4	29.1
10			3.1	3.7	4.2	4.7	5.9	6.6												
11																21.4		24.9	25.5	27.4
12																19.0	20.6	22.7	24.7	26.3
13	2.3	2.2	2.6	3.3	3.8	4.2														
14																	19.6	24.3	26.4	29.2
15		2.6	2.9	3.3	3.8	4.4														
16			3.1	3.6	3.6	4.4										16.8	19.7	22.7	25.3	27.5
17	1.8	2.2	2.7	3.2	3.6															
18		2.6	3.1	3.5	3.7	4.9	6.2													
19	2.0	2.3	2.7	3.4	4.1	4.7								13.7	17.3	18.6	21.0	22.7	26.0	27.5
20		2.9	2.9	3.4	3.9	4.7									17.0	18.9	21.6	22.4	25.3	27.2
21		2.6	3.0	3.4	4.0	4.3														
22		2.5	3.0	3.4	3.9	4.0														
SD 26			3.3	3.5	4.1	4.6	5.5	6.6		10.0		12.4	11.4	13.8					27.9	28.7
SD 28	1.9	2.4	2.9	3.4	3.9	4.5	5.7	6.6						13.7	17.3	18.7	20.9	23.0	25.5	27.6
26+28	1.9	2.4	2.9	3.4	4.0	4.5	5.5	6.6		10.0		12.4	11.4	13.8	17.3	18.7	20.9	23.0	25.5	27.7

Table 15. Continued

Haul number	L, cm																		Total catch	Mean W,
	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	23.0	23.5	24.0	24.5	25.0		
1	32.0	33.3	36.9	39.4	42.4	45.6	49.3	52.7	59.5	62.5			72.2						44.000	41.4
2																				
3	31.8	35.7	39.7	44.7	46.5	48.6	53.8	56.1	63.7	71.8		81.2					124.0	145.2	25.286	14.5
4	27.4			35.6			41.6												3.005	29.0
5																			0.260	4.0
6	30.0	33.0	34.4	38.3	41.4	43.2	49.0	51.9	56.9	64.9	70.0	72.4							57.760	36.1
7																			19.225	3.8
8	26.3	30.7	38.6		42.9	48.0		55.2	64.8										24.762	26.5
9	31.6	35.1	38.5	42.2	47.7	50.3	53.3	61.3	64.1	71.5									273.526	40.0
10																			0.398	4.5
11	30.1	34.0	36.2	39.6	42.7	45.9	50.3	54.4	54.4	60.1		67.6							58.560	40.5
12	30.5	32.8	33.6	35.7	40.8	46.3	46.0	49.8		50.8									92.717	29.1
13																			2.648	3.3
14	30.6	35.2	38.2	39.8	44.0	48.3	53.3	57.0	61.3	60.5									384.052	38.7
15																			5.832	3.4
16	30.4	33.6	36.0	40.6	43.4	44.1	46.5	52.2											577.058	30.5
17																			2.345	2.7
18																			37.577	3.6
19	30.6	33.6	36.7	44.2	51.2														341.450	22.7
20	29.9	33.8	36.1	38.1	42.1	49.8		56.3		57.4									423.259	24.1
21																			104.328	3.7
22																			44.407	3.6
SD 26	31.5	33.8	37.8	39.8	42.9	45.8	49.1	54.4	60.9	67.2		81.2	72.2				124.0	145.2	72.551	23.4
SD 28	30.5	34.0	36.5	39.7	43.7	46.6	50.5	55.4	60.7	63.5	70.0	69.2							2449.904	27.1
26+28	30.5	33.9	36.6	39.7	43.6	46.5	50.2	55.2	60.7	64.2	70.0	72.2	72.2				124.0	145.2	2522.455	26.6

Table 16. The basic biological data collected during the Latvian-Polish BIAS survey by hauls in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 09.-18.10.2014

Haul number	Sprat		Herring	
	L [cm]	W [g]	L [cm]	W [g]
1	8.2	3.2	18.5	41.4
2	7.9	2.8		
3	8.3	3.6	11.1	14.5
4	8.0	3.0	16.9	29.0
5	7.8	2.6	8.8	4.0
6	8.1	3.4	17.6	36.1
7	7.9	2.7	8.6	3.8
8	11.1	9.1	15.3	26.5
9	12.7	12.7	17.8	40.0
10	8.4	3.5	8.9	4.5
11	9.3	5.6	18.3	40.5
12	12.5	11.8	16.6	29.1
13	7.9	2.7	8.3	3.3
14	12.5	11.7	17.8	38.7
15	8.6	4.2	8.3	3.4
16	7.9	2.8	16.6	30.5
17	7.1	2.3	7.7	2.7
18	7.8	2.8	8.3	3.6
19	8.9	4.8	14.8	22.7
20	8.4	3.9	14.7	24.1
21	7.6	2.5	8.5	3.7
22	7.9	2.8	8.4	3.6
SD 26	8.1	3.2	13.6	23.4
SD 28	9.8	6.6	15.1	27.1
SD 26+28	9.4	5.9	14.9	26.6

Table 17. The basic biological data collected during the Latvian-Polish BIAS survey by rectangles in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES Rect.	No trawl	Herring			Sprat			NASC	TS calc.
			L, cm	w, g	N, %	L, cm	w, g	N, %	m^2/nm^2	dB
28	45H1	16,19,20	15.4	26.0	44.4	8.5	4.0	55.6	926.5	-49.4
	45H0	18,19,21,22	9.9	8.0	59.8	8.5	3.9	40.2	305.4	-51.5
	44H1	16	16.6	30.5	51.4	7.9	2.8	48.6	1046.6	-48.8
	44H0	15,16,17	15.6	27.2	16.8	8.3	3.8	83.2	407.5	-51.1
	43H1	13,14	17.1	36.1	25.3	10.6	8.1	74.7	426.2	-49.0
	43H0	12,13,14	17.0	34.5	8.7	12.1	11.0	91.3	1226.7	-49.1
	43G9	10,11	17.8	38.4	5.1	8.4	3.5	94.9	447.7	-51.9
	42H0	7,8,9	14.0	24.8	4.0	10.0	6.9	96.0	1080.3	-50.8
	42G9	6,10	17.2	34.4	4.6	8.4	3.4	95.4	309.7	-52.1
26	41H0	3,4	11.4	15.4	0.6	8.1	3.1	99.4	1366.9	-53.0
	41G9	1,2,5	17.9	39.3	0.7	7.9	2.9	99.3	401.1	-53.0

Sprat in ICES SD 26N and 28.2

Table 18. Sprat age composition [%] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE 0	1	2	3	4	5	6	7	8+	Total
28	45H1	81.9	3.8	3.8	5.0	1.6	0.4	1.6	0.4	1.4	100.0
	45H0	85.5	1.4	1.4	5.2	1.7	0.6	2.0	0.6	1.7	100.0
	44H1	95.3	0.0	0.9	1.9	0.0	0.0	0.9	0.0	0.9	100.0
	44H0	86.7	0.7	2.7	4.6	1.4	1.8	1.9	0.0	0.2	100.0
	43H1	40.2	9.6	10.2	18.7	9.2	4.0	5.4	1.1	1.6	100.0
	43H0	14.0	9.8	24.0	22.7	12.9	1.2	12.0	1.4	1.9	100.0
	43G9	99.2	0.0	0.1	0.3	0.1	0.1	0.1	0.0	0.1	100.0
	42H0	56.5	8.8	8.5	11.9	3.6	1.6	5.6	1.7	1.7	100.0
	42G9	99.2	0.0	0.0	0.2	0.0	0.0	0.4	0.0	0.2	100.0
26	41H0	96.7	2.5	0.1	0.3	0.3	0.0	0.1	0.0	0.0	100.0
	41G9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Table 19. Sprat age composition [$n\times10^6$] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE 0	1	2	3	4	5	6	7	8+	Total
28	45H1	2416.0	112.7	111.2	148.9	47.6	11.5	47.9	11.5	42.1	2949.4
	45H0	1112.7	18.4	18.4	67.4	22.1	7.4	25.8	7.4	22.1	1301.7
	44H1	2404.1	0.0	23.6	47.1	0.0	0.0	23.6	0.0	23.6	2522.0
	44H0	2868.3	23.6	87.7	151.8	47.2	58.9	64.1	0.0	5.2	3306.8
	43H1	336.2	80.3	85.6	155.9	77.2	33.1	45.5	8.9	13.0	835.7
	43H0	991.3	695.5	1697.8	1611.8	915.6	87.5	851.5	97.3	138.0	7086.4
	43G9	5115.2	1.5	3.0	15.0	7.5	3.0	7.5	0.0	3.0	5155.6
	42H0	5414.9	846.1	817.4	1142.5	346.5	155.6	536.0	163.0	167.3	9589.3
	42G9	3745.1	0.0	0.0	7.2	0.0	0.0	14.3	0.0	7.2	3773.8
26	41H0	19788.1	514.5	20.2	60.7	60.7	0.0	20.2	0.0	0.0	20464.4
	41G9	6388.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6388.5

Table 20. Sprat biomass [tonnes] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE 0	1	2	3	4	5	6	7	8+	Total
28	45H1	9583.7	447.1	441.3	590.5	189.0	45.6	189.9	45.6	167.1	11699.8
	45H0	4374.4	72.4	72.4	265.0	86.9	29.0	101.4	29.0	86.9	5117.4
	44H1	6823.7	0.0	66.9	133.8	0.0	0.0	66.9	0.0	66.9	7158.2
	44H0	10984.6	90.3	335.9	581.4	180.6	225.7	245.6	0.0	19.9	12663.8
	43H1	2728.2	652.0	694.8	1265.0	626.3	269.0	369.2	72.5	105.5	6782.4
	43H0	10887.2	7638.7	18646.0	17701.6	10056.0	960.6	9352.0	1068.6	1515.6	77826.3
	43G9	18038.5	5.3	10.6	52.8	26.4	10.6	26.4	0.0	10.6	18181.2
	42H0	37583.0	5872.7	5673.5	7929.4	2405.1	1079.6	3720.1	1131.2	1161.2	66555.8
	42G9	12896.5	0.0	0.0	24.7	0.0	0.0	49.4	0.0	24.7	12995.3
26	41H0	60970.2	1585.3	62.3	187.0	187.0	0.0	62.3	0.0	0.0	63054.1
	41G9	18480.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18480.3

Table 21. Sprat proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	81.9	3.8	3.8	5.0	1.6	0.4	1.6	0.4	1.4	100.0
	45H0	85.5	1.4	1.4	5.2	1.7	0.6	2.0	0.6	1.7	100.0
	44H1	95.3	0.0	0.9	1.9	0.0	0.0	0.9	0.0	0.9	100.0
	44H0	86.7	0.7	2.7	4.6	1.4	1.8	1.9	0.0	0.2	100.0
	43H1	40.2	9.6	10.2	18.7	9.2	4.0	5.4	1.1	1.6	100.0
	43H0	14.0	9.8	24.0	22.7	12.9	1.2	12.0	1.4	1.9	100.0
	43G9	99.2	0.0	0.1	0.3	0.1	0.1	0.1	0.0	0.1	100.0
	42H0	56.5	8.8	8.5	11.9	3.6	1.6	5.6	1.7	1.7	100.0
	42G9	99.2	0.0	0.0	0.2	0.0	0.0	0.4	0.0	0.2	100.0
26	41H0	96.7	2.5	0.1	0.3	0.3	0.0	0.1	0.0	0.0	100.0
	41G9	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0

Table 22. Sprat mean weight [g] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	2.3	9.8	10.3	11.7	11.6	13.8	13.3	13.4	13.6	4.0
	45H0	2.6	10.1	10.6	11.8	11.8	13.8	13.2	13.4	13.6	3.9
	44H1	2.3	0.0	10.1	13.9	0.0	0.0	14.2	0.0	13.9	2.8
	44H0	2.5	10.7	11.6	12.9	12.7	13.0	13.1	0.0	13.9	3.8
	43H1	2.7	8.8	11.3	12.2	13.0	13.3	12.8	13.4	12.2	8.1
	43H0	2.7	9.6	11.9	12.3	12.7	14.1	14.3	14.6	13.5	11.0
	43G9	3.4	12.5	11.8	13.3	13.5	13.4	14.4	0.0	15.4	3.5
	42H0	2.8	9.7	12.4	12.6	13.3	13.3	13.9	14.0	14.3	6.9
	42G9	3.4	0.0	0.0	11.4	0.0	0.0	13.3	0.0	16.2	3.4
26	41H0	2.8	9.2	14.1	12.6	15.3	0.0	14.1	0.0	0.0	3.1
	41G9	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9

Table 23. Sprat mean length [cm] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	7.6	11.8	12.0	12.7	12.7	13.8	13.6	13.5	13.7	8.5
	45H0	7.7	11.9	12.3	12.8	12.8	13.8	13.5	13.5	13.7	8.5
	44H1	7.6	0.0	12.3	13.3	0.0	0.0	14.3	0.0	13.8	7.9
	44H0	7.6	12.3	12.5	13.1	13.0	13.2	13.2	0.0	13.8	8.3
	43H1	7.9	11.1	12.3	12.7	13.0	13.1	12.9	13.2	12.8	10.6
	43H0	7.9	11.5	12.6	12.7	12.9	13.5	13.5	13.7	13.3	12.1
	43G9	8.4	12.8	12.5	13.2	13.3	13.3	13.7	0.0	14.3	8.4
	42H0	7.9	11.6	12.7	12.8	13.0	13.0	13.3	13.4	13.4	10.0
	42G9	8.3	0.0	0.0	12.3	0.0	0.0	13.0	0.0	14.3	8.4
26	41H0	7.9	11.6	13.3	12.6	13.6	0.0	13.3	0.0	0.0	8.1
	41G9	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9

Herring in ICES SD 26N and 28.2

Table 24. Herring age composition [%] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	11.8	4.9	25.9	24.2	8.5	6.0	8.9	5.8	4.0	100.0
	45H0	79.2	2.3	7.7	6.7	1.5	0.5	1.1	0.4	0.6	100.0
	44H1	2.9	5.1	25.3	27.7	11.2	7.3	11.1	6.7	2.7	100.0
	44H0	14.6	4.4	22.2	24.3	9.9	6.4	9.8	5.9	2.4	100.0
	43H1	7.4	0.8	20.1	26.3	7.1	12.3	9.7	12.2	4.0	100.0
	43H0	5.7	1.3	21.5	29.7	6.0	11.8	7.9	10.6	5.6	100.0
	43G9	5.8	1.4	1.8	9.9	3.7	19.6	25.8	18.7	13.4	100.0
	42H0	41.0	5.6	10.8	16.1	5.6	3.3	5.9	6.6	5.0	100.0
	42G9	8.9	0.0	8.4	13.1	6.7	16.3	17.2	15.9	13.4	100.0
26	41H0	71.6	3.1	4.0	5.7	4.2	2.7	5.1	1.1	2.6	100.0
	41G9	6.6	0.0	4.8	11.3	8.1	12.8	22.8	23.1	10.6	100.0

Table 25. Herring age composition [$n \times 10^6$] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	278.8	114.7	609.8	569.0	199.8	141.7	209.5	136.9	94.6	2354.6
	45H0	1535.8	45.5	149.2	130.8	29.4	8.8	21.8	8.0	11.1	1940.3
	44H1	77.3	134.8	674.0	737.7	298.6	194.8	296.8	179.9	73.0	2666.9
	44H0	97.2	29.7	148.3	162.3	65.7	42.9	65.3	39.6	16.1	667.1
	43H1	21.1	2.2	57.1	74.7	20.2	34.9	27.6	34.7	11.3	283.8
	43H0	38.5	8.6	144.2	199.4	40.0	79.1	53.4	71.0	37.5	671.5
	43G9	15.9	3.9	4.8	27.1	10.2	53.9	71.0	51.6	36.8	275.3
	42H0	165.8	22.6	43.8	65.0	22.6	13.3	23.9	26.8	20.3	404.0
	42G9	16.4	0.0	15.4	24.1	12.3	30.0	31.7	29.3	24.7	183.9
26	41H0	85.3	3.7	4.7	6.8	4.9	3.2	6.1	1.4	3.0	119.1
	41G9	3.2	0.0	2.3	5.4	3.9	6.2	11.0	11.1	5.1	48.2

Table 26. Herring biomass [tonnes] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	7252.5	2982.7	15862.9	14801.0	5197.4	3685.2	5449.3	3560.4	2460.0	61251.3
	45H0	12221.2	361.7	1187.0	1040.7	233.8	70.4	173.5	63.3	88.0	15439.6
	44H1	2354.0	4105.5	20525.3	22463.5	9092.8	5933.0	9037.3	5479.0	2223.2	81213.7
	44H0	2641.4	806.2	4030.4	4411.0	1785.5	1165.0	1774.6	1075.9	436.6	18126.5
	43H1	759.9	78.9	2060.2	2693.5	728.8	1258.8	993.7	1251.0	406.0	10230.8
	43H0	1325.3	296.6	4971.1	6870.5	1377.2	2725.4	1839.1	2446.8	1291.1	23143.1
	43G9	611.7	149.4	185.6	1041.3	390.7	2070.9	2726.0	1981.1	1412.1	10568.8
	42H0	4105.0	559.8	1084.7	1608.5	559.5	330.4	591.1	662.7	503.7	10005.3
	42G9	564.2	0.0	529.9	829.7	424.7	1034.9	1091.4	1008.5	851.1	6334.3
26	41H0	1309.7	56.9	72.8	103.9	75.9	48.5	93.0	20.8	46.8	1828.3
	41G9	125.4	0.0	90.3	213.2	153.6	242.1	430.3	436.8	199.6	1891.4

Table 27. Herring proportion of biomass [%] per age group in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	11.8	4.9	25.9	24.2	8.5	6.0	8.9	5.8	4.0	100.0
	45H0	79.2	2.3	7.7	6.7	1.5	0.5	1.1	0.4	0.6	100.0
	44H1	2.9	5.1	25.3	27.7	11.2	7.3	11.1	6.7	2.7	100.0
	44H0	14.6	4.4	22.2	24.3	9.9	6.4	9.8	5.9	2.4	100.0
	43H1	7.4	0.8	20.1	26.3	7.1	12.3	9.7	12.2	4.0	100.0
	43H0	5.7	1.3	21.5	29.7	6.0	11.8	7.9	10.6	5.6	100.0
	43G9	5.8	1.4	1.8	9.9	3.7	19.6	25.8	18.7	13.4	100.0
	42H0	41.0	5.6	10.8	16.1	5.6	3.3	5.9	6.6	5.0	100.0
	42G9	8.9	0.0	8.4	13.1	6.7	16.3	17.2	15.9	13.4	100.0
26	41H0	71.6	3.1	4.0	5.7	4.2	2.7	5.1	1.1	2.6	100.0
	41G9	6.6	0.0	4.8	11.3	8.1	12.8	22.8	23.1	10.6	100.0

Table 28. Herring mean weight [g] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	3.4	19.7	24.5	29.3	30.1	31.7	33.7	37.0	40.1	26.0
	45H0	3.6	17.8	21.8	26.7	24.4	28.2	33.9	29.9	34.1	8.0
	44H1	3.5	22.8	26.9	31.8	31.7	35.4	33.5	37.5	45.0	30.5
	44H0	3.2	22.8	26.9	31.8	31.7	35.4	33.5	37.5	45.0	27.2
	43H1	3.3	44.0	31.2	34.4	35.0	38.4	50.0	52.0	42.5	36.1
	43H0	3.3	33.7	30.0	32.4	34.6	37.3	49.1	49.7	39.2	34.5
	43G9	4.5	23.7	30.5	38.9	34.2	36.0	42.1	44.5	44.4	38.4
	42H0	3.8	28.1	32.8	35.3	38.9	40.3	51.3	50.8	49.6	24.8
	42G9	4.3	0.0	26.9	31.3	33.5	36.9	40.7	43.6	40.7	34.4
26	41H0	4.2	14.2	34.3	39.3	35.0	49.2	52.4	68.7	80.6	15.4
	41G9	5.2	0.0	32.2	39.4	43.5	40.6	41.4	43.2	45.6	39.3

Table 29. Herring mean length [cm] in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014

SD	Rect.	AGE									Total
		0	1	2	3	4	5	6	7	8+	
28	45H1	8.2	14.5	15.5	16.5	16.6	16.9	17.2	17.8	18.3	15.4
	45H0	8.4	14.0	14.9	15.9	15.5	16.3	17.0	16.6	17.3	9.9
	44H1	8.3	15.3	16.1	17.0	16.9	17.5	17.3	17.9	19.3	16.6
	44H0	8.1	15.3	16.1	17.0	16.9	17.5	17.3	17.9	19.3	15.6
	43H1	8.3	18.8	16.6	17.2	17.3	17.7	19.4	19.8	18.4	17.1
	43H0	8.3	17.1	16.5	16.9	17.3	17.6	19.3	19.5	18.1	17.0
	43G9	8.9	14.9	16.7	18.1	17.4	17.6	18.6	18.9	18.9	17.8
	42H0	8.6	16.1	16.9	17.2	17.8	17.8	19.2	19.2	19.0	14.0
	42G9	8.9	0.0	16.0	16.9	17.4	18.0	18.6	19.0	18.5	17.2
26	41H0	8.8	12.8	17.0	17.7	17.3	18.9	19.8	21.3	21.7	11.4
	41G9	9.3	0.0	16.8	18.2	18.7	18.4	18.5	18.8	19.1	17.9

Stickleback in ICES SD 26N and 28.2

Table 30. Hydroacoustic survey statistics related to stickleback, abundance and biological data of cod from the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 09.-18.10.2014

ICES SD	ICES Rect.	Area nm^2	No trawl	NASC m^2/nm^2	TS calc. dB	σ *10^4 m^2	ρ mln/nm^2	Total abundance, mln	Biomas tons	Stickleback L, cm	Stickleback w, g
28	45H1	827.1	16,19,20	3.6	-51.5	0.8881	0.04	33.1	65.7	6.3	2.0
	45H0	947.2	18,19,21,22	216.6	-51.3	0.9332	2.32	2198.5	4267.3	6.4	1.9
	44H1	824.6	16	0.0	0.0	0.0000	0.00	0.0	0.0	0.0	0.0
	44H0	960.5	15,16,17	24.8	-51.0	0.9976	0.25	238.7	495.2	6.7	2.1
	43H1	412.7	13,14	0.0	0.0	0.0000	0.00	0.0	0.0	0.0	0.0
	43H0	973.7	12,13,14	0.3	-51.4	0.9092	0.00	3.6	7.0	6.4	2.0
	43G9	973.7	10,11	22.8	-51.2	0.9594	0.24	231.6	508.7	6.5	2.2
	42H0	968.5	7,8,9	0.1	-51.7	0.8523	0.00	1.2	2.5	6.2	2.0
	42G9	986.9	6,10	26.7	-51.5	0.8979	0.30	293.8	609.6	6.3	2.1
26	41H0	953.3	3,4	0.0	0.0	0.0000	0.00	0.0	0.0	0.0	0.0
	41G9	1000.0	1,2,5	17.4	-51.5	0.8898	0.20	195.8	436.7	6.3	2.2

Table 31. Average biomass (mg/m^3) of zooplankton species in the Baltic Sea ICES SD 26N and 28.2 during October observations

Year	*Acartia spp.*	*Pseudocalanus sp.*	*Temora longicornis*	*Centropages hamatus*	*Eurytemora affinis*	*Cycopls spp.*	*Bosmina spp.*	*Evadne nordmanni*	*Podon spp.*	*Synchaeta spp.*	*Keratella spp.*	*Fritillaria*
1980	35.00	32.00	55.90	17.40			0.45	20.40	1.00	4.50		
1981	37.20	38.50	22.80	1.10			4.34	20.24	0.76	9.60		
1982	31.20	92.50	59.50	2.70			0.58	14.12	1.59	4.20		
1983	20.00	6.40	21.40	2.80			0.05	12.01	0.00	12.60		
1984	36.00	64.60	24.30	3.80			0.41	9.30	0.50	5.30		
1985	8.00	18.70	10.30	11.60			0.30	4.40	0.00	66.90		
1986	7.40	5.30	5.60	0.80			0.22	4.30	1.11	20.80		
1987	47.70	31.50	45.00	7.90			3.86	14.16	1.09	3.40		
1988	12.20	20.40	28.00	2.70			0.00	3.29	0.59	7.00		
1989	36.30	14.80	25.00	1.30			0.00	10.66	1.28	2.60		
1990	7.30	5.90	11.30	6.70			0.11	19.60	0.65	3.90		
1993	13.30	22.90	11.30	0.00			0.00	0.67	0.00	1.60		
1994	26.80	20.30	12.70	0.90			0.00	0.00	0.00	5.20		
1995	25.40	13.50	44.50	3.50			0.26	0.70	2.61	1.70		
1996	17.50	21.00	16.40	3.60			1.02	0.00	0.37	0.00		
1997	38.10	19.10	26.00	1.80			0.17	0.66	0.55	4.30		
1998	35.20	28.40	16.10	9.30			1.90	4.20	2.10	0.30		
1999	32.60	19.50	31.10	6.00			1.10	2.60	4.40	2.50		
2000	44.60	16.40	25.20	18.20			3.60	9.60	1.40	3.00		
2001	35.60	25.60	54.60	5.40			2.60	27.90	3.90	0.90		
2002	57.80	26.50	13.70	2.30			0.60	2.20	3.70	9.50		
2003	43.00	25.10	13.30	3.10			0.30	2.20	2.80	4.30		
2004	54.40	8.40	27.40	15.00			3.20	4.00	2.10	4.80		
2005	39.00	20.10	30.90	7.85	3.85		2.55	3.15	3.27	3.90		
2006	37.80	20.10	51.90	6.95	12.35		3.85	3.20	4.40	9.20		
2007	6.10	14.20	1.70	1.25		0.02	0.00	0.02	0.00	0.15		
2008	19.80	33.50	52.30	34.00			1.10	0.40	5.30	7.00		
2009	40.40	24.50	48.90	29.50			36.50	15.40	5.30	0.07		
2010	25.83	32.08	34.13	8.03	1.36		4.80	10.89	3.62	43.09	0.01	
2011	24.98	27.63	44.95	10.92	3.42		4.42	14.96	1.48	40.20		
2012	9.70	45.80	28.30	9.20	0.20	0.00	5.60	7.90	1.30	5.90	0.01	0.90
2013	8.90	19.40	20.00	2.30	2.20	0.00	1.10	3.60	1.10	4.00	0.00	1.60
2014	8.03	15.76	8.06	6.52	0.99	0.00	0.12	0.51	0.38	3.87	0.00	1.51
LTA	24.88	32.69	26.96	6.68	3.48	0.01	2.16	6.81	1.68	9.18	0.00	1.34

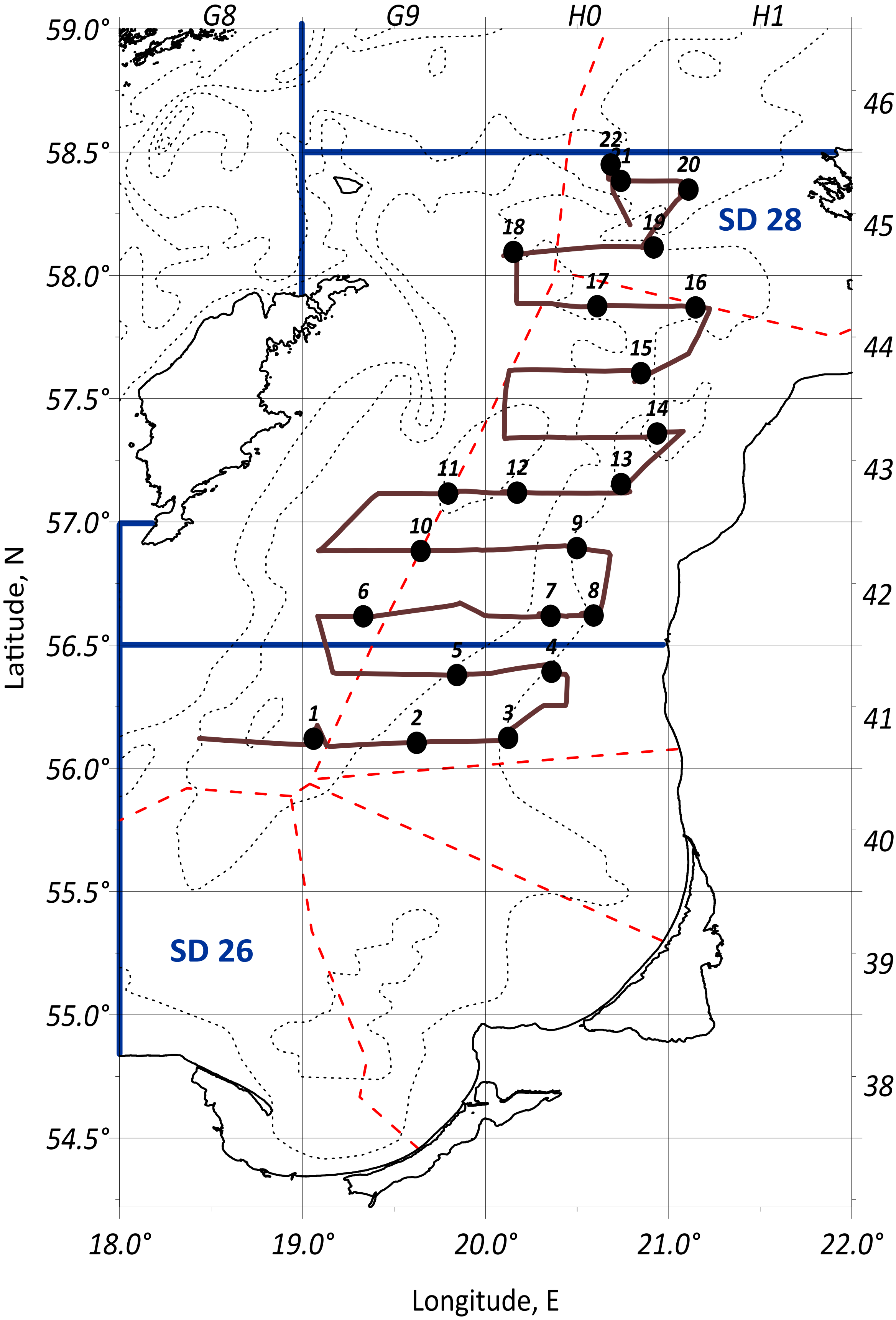
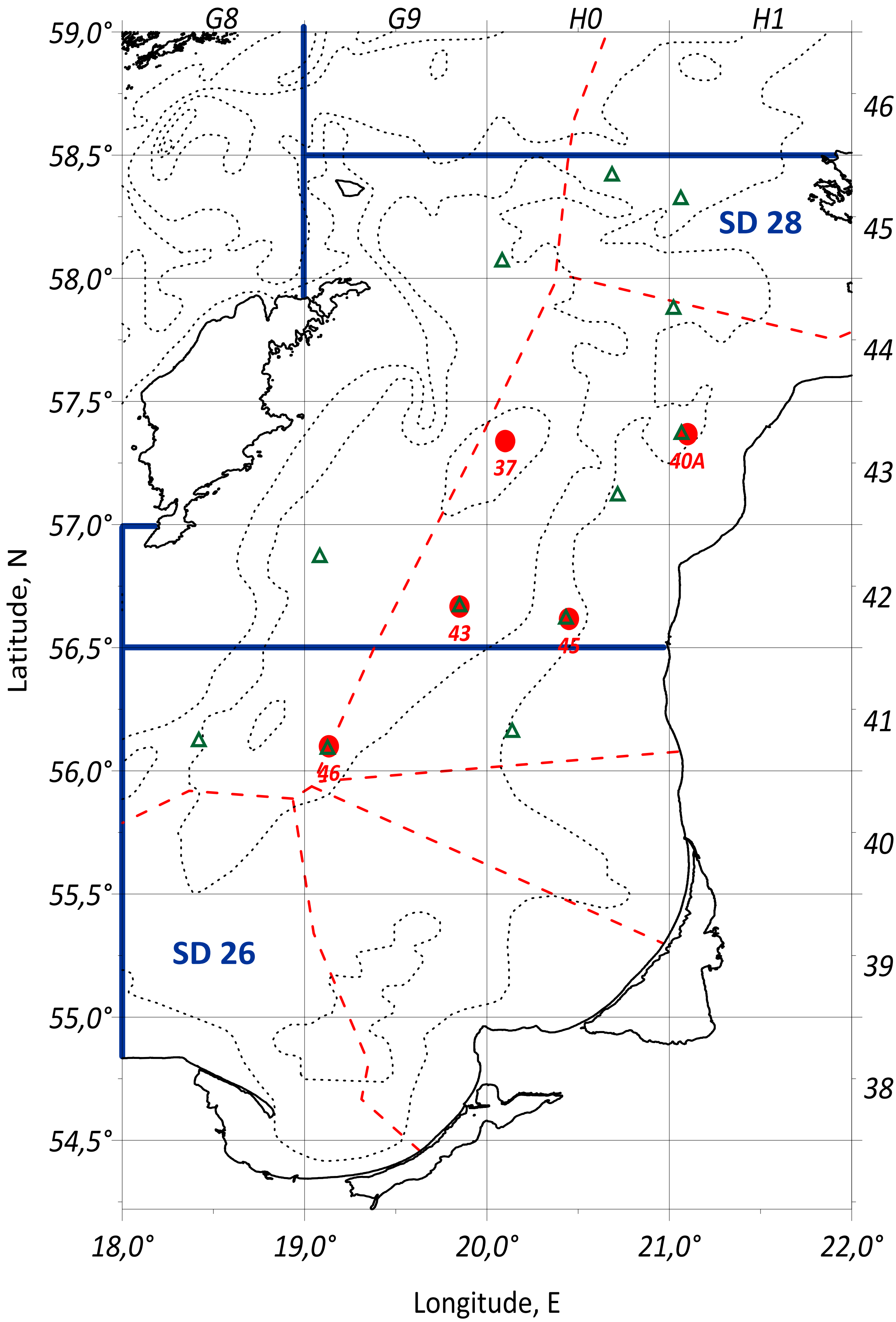


Figure 1: Cruise track design and trawling positions of the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 09.-18.10.2014.



● - 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 09.-18.10.2014.

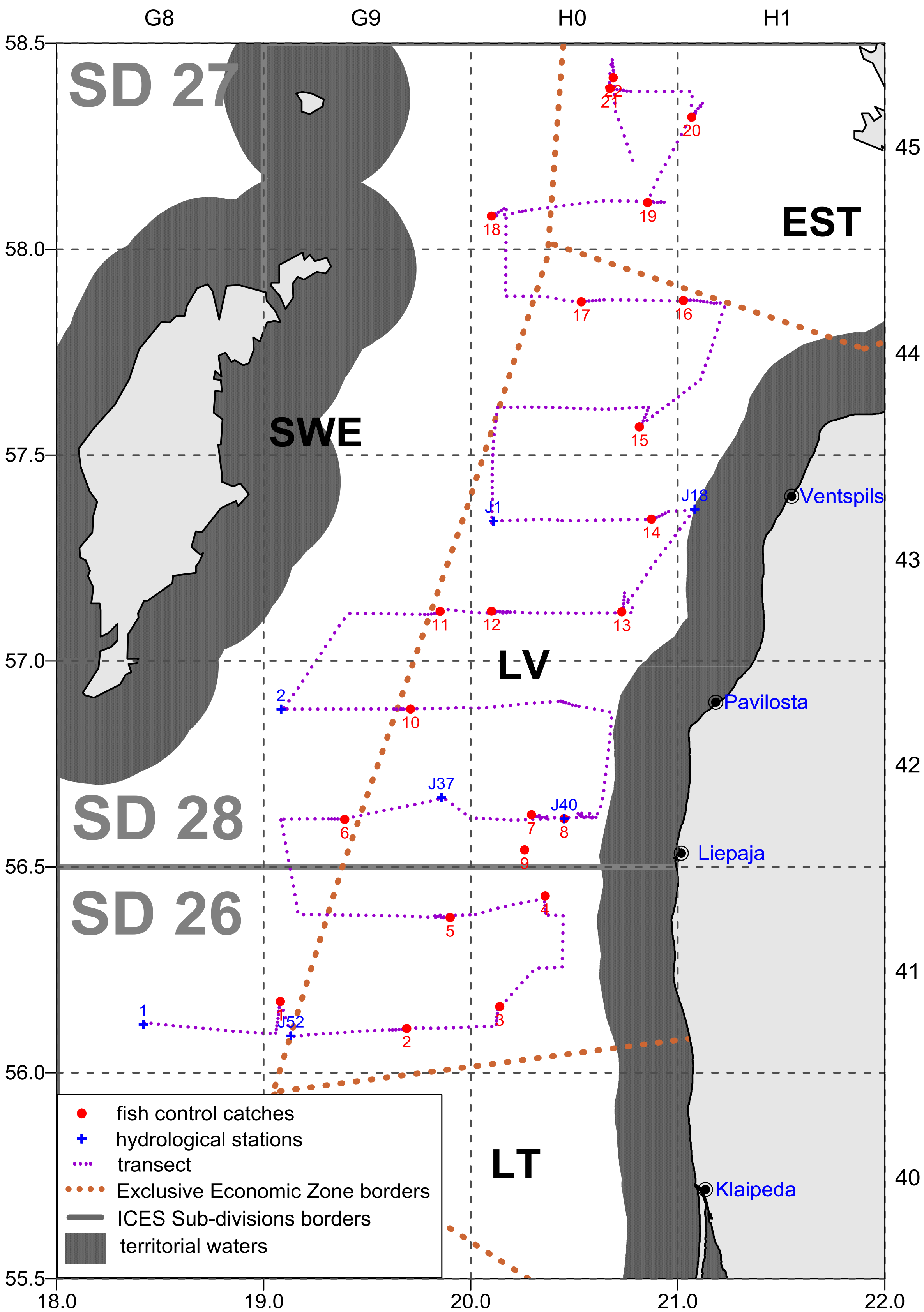


Figure 3: Locations of the hydrological stations performed during the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 09.-18.10.2014.

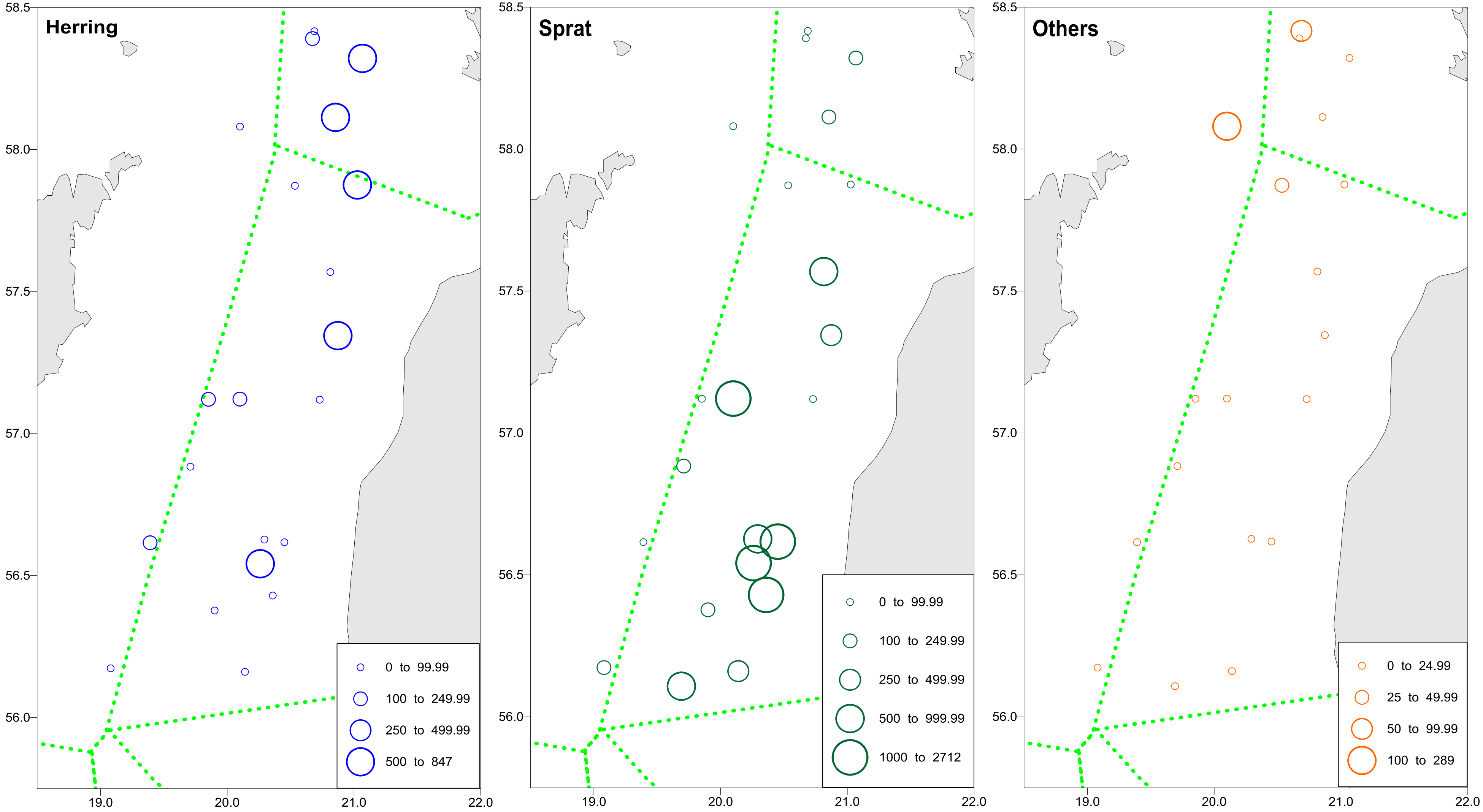


Figure 4: CPUE [kg/h] ranges distribution of fish in the catch hauls in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

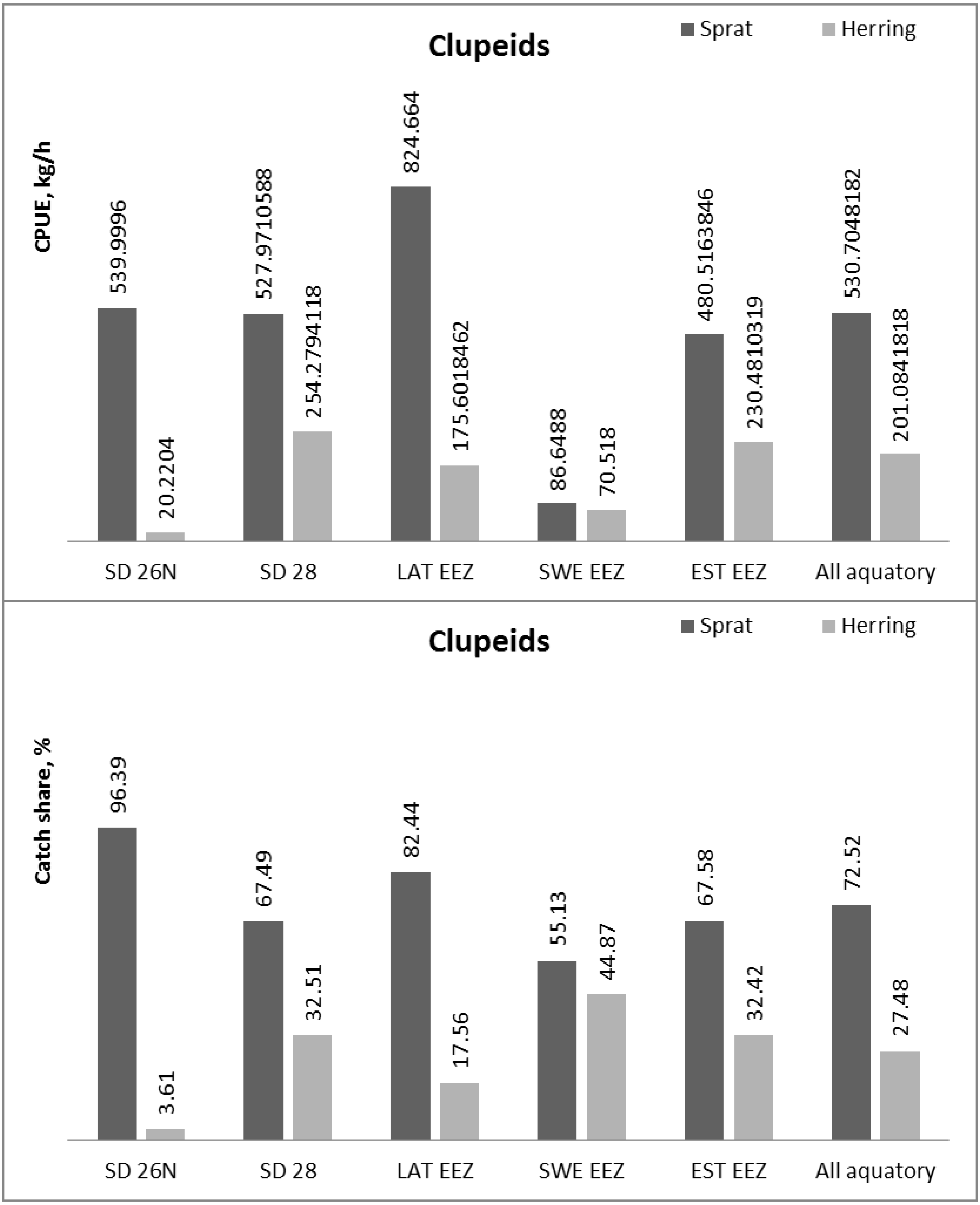


Figure 5: CPUE [kg/h] and share [%] distribution of dominant pelagic fish in the exclusive economic zones of countries in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

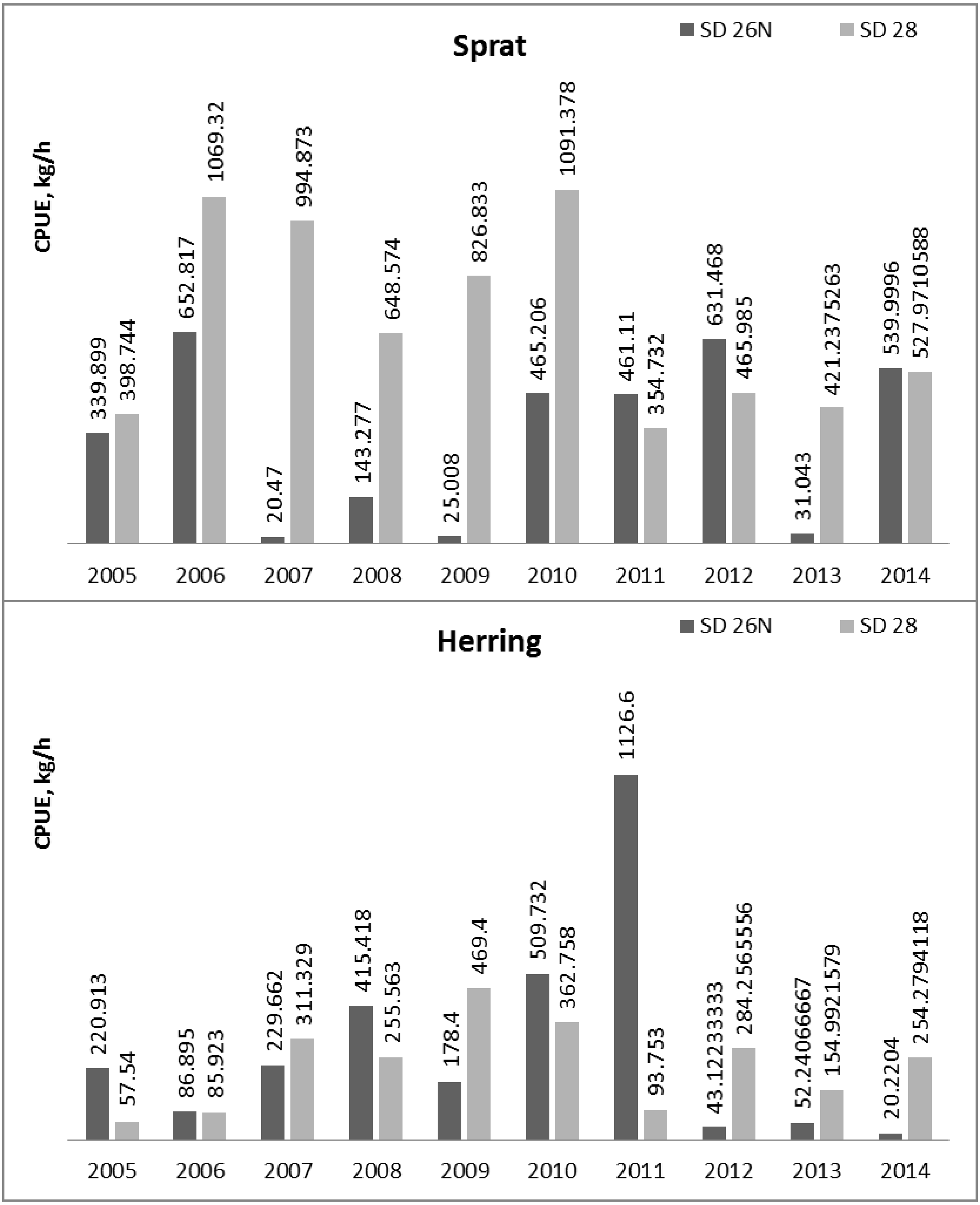


Figure 6: CPUE [kg/h] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2014.

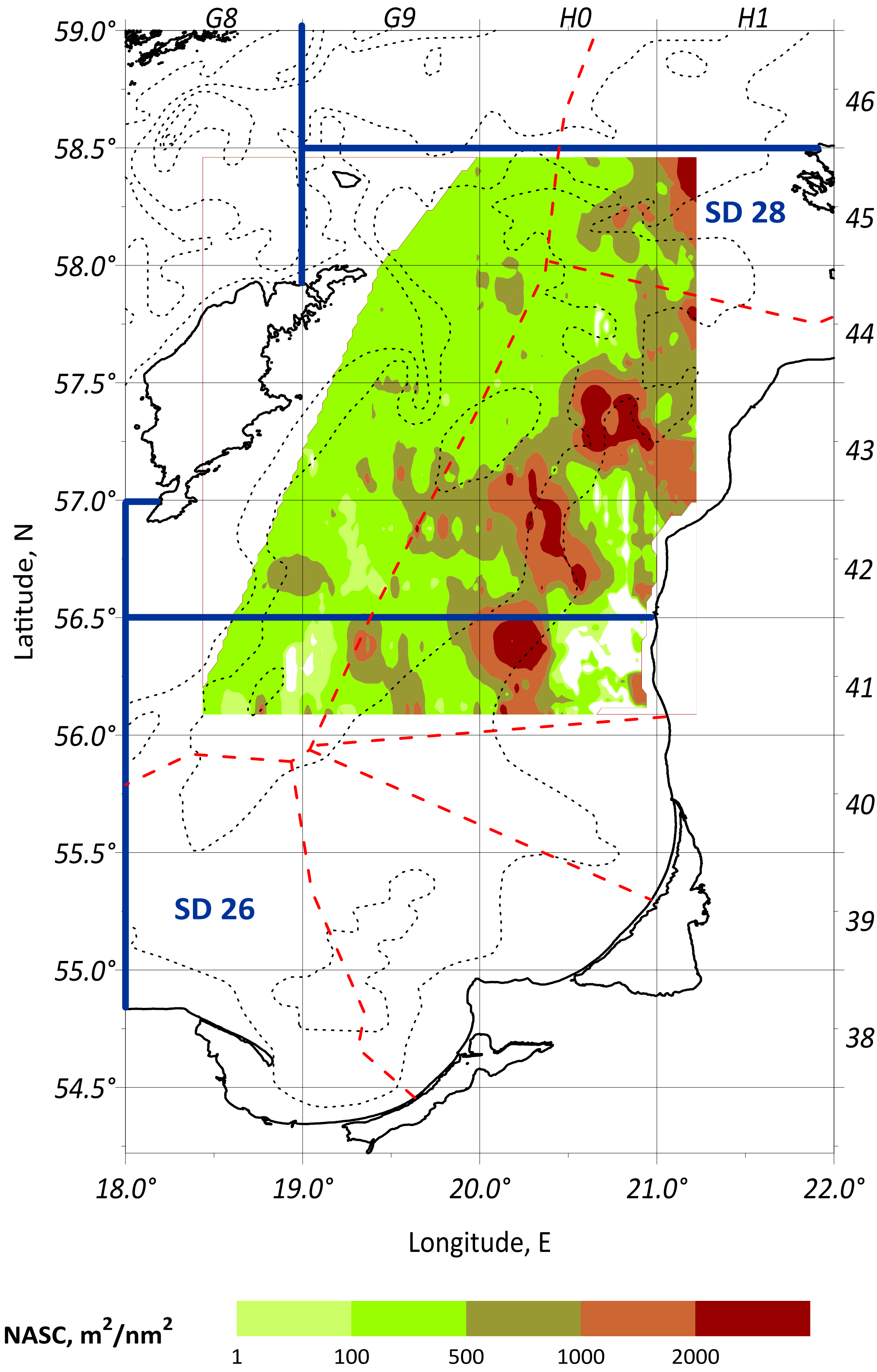


Figure 7: Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

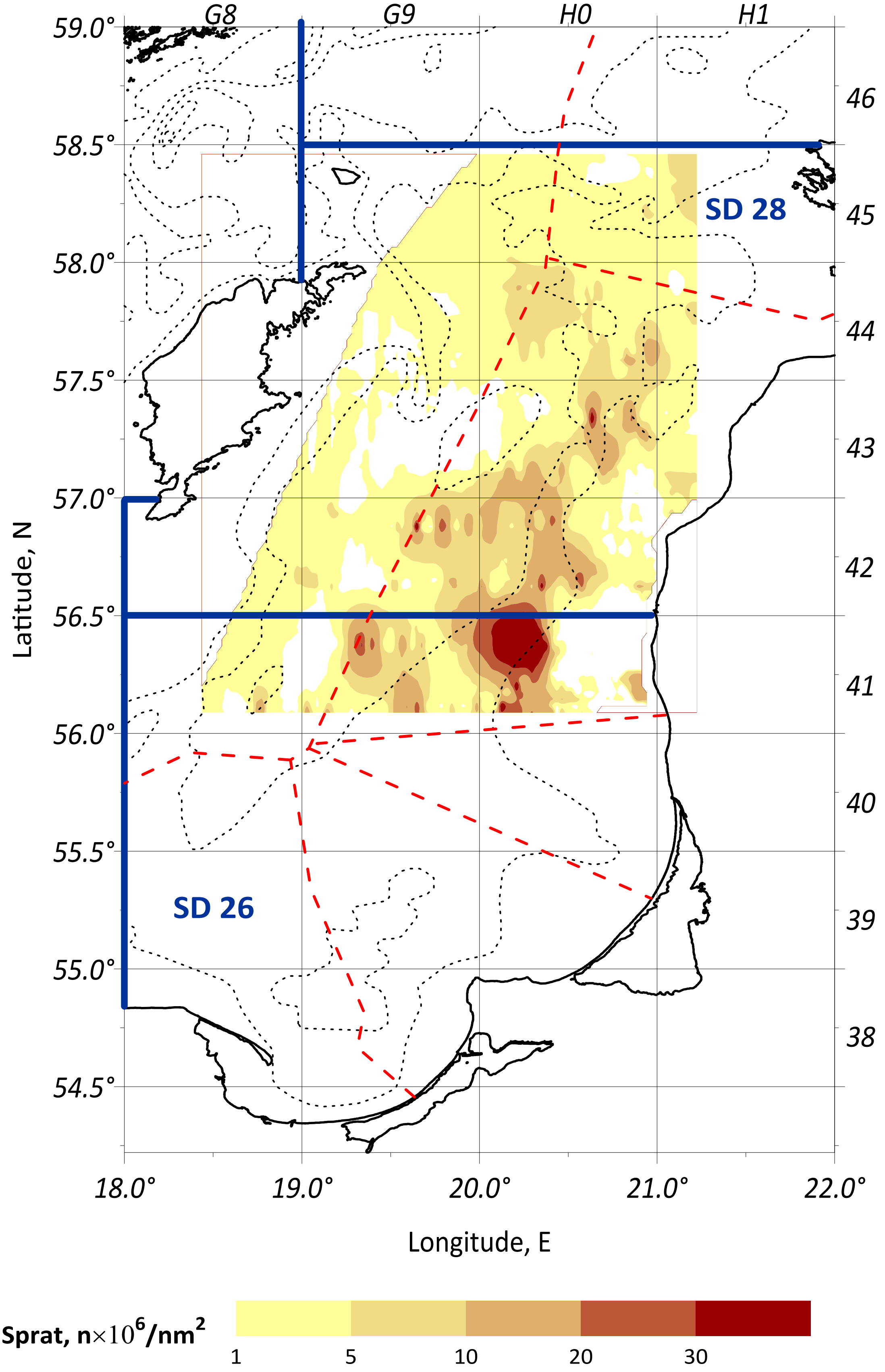


Figure 8: Sprat distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

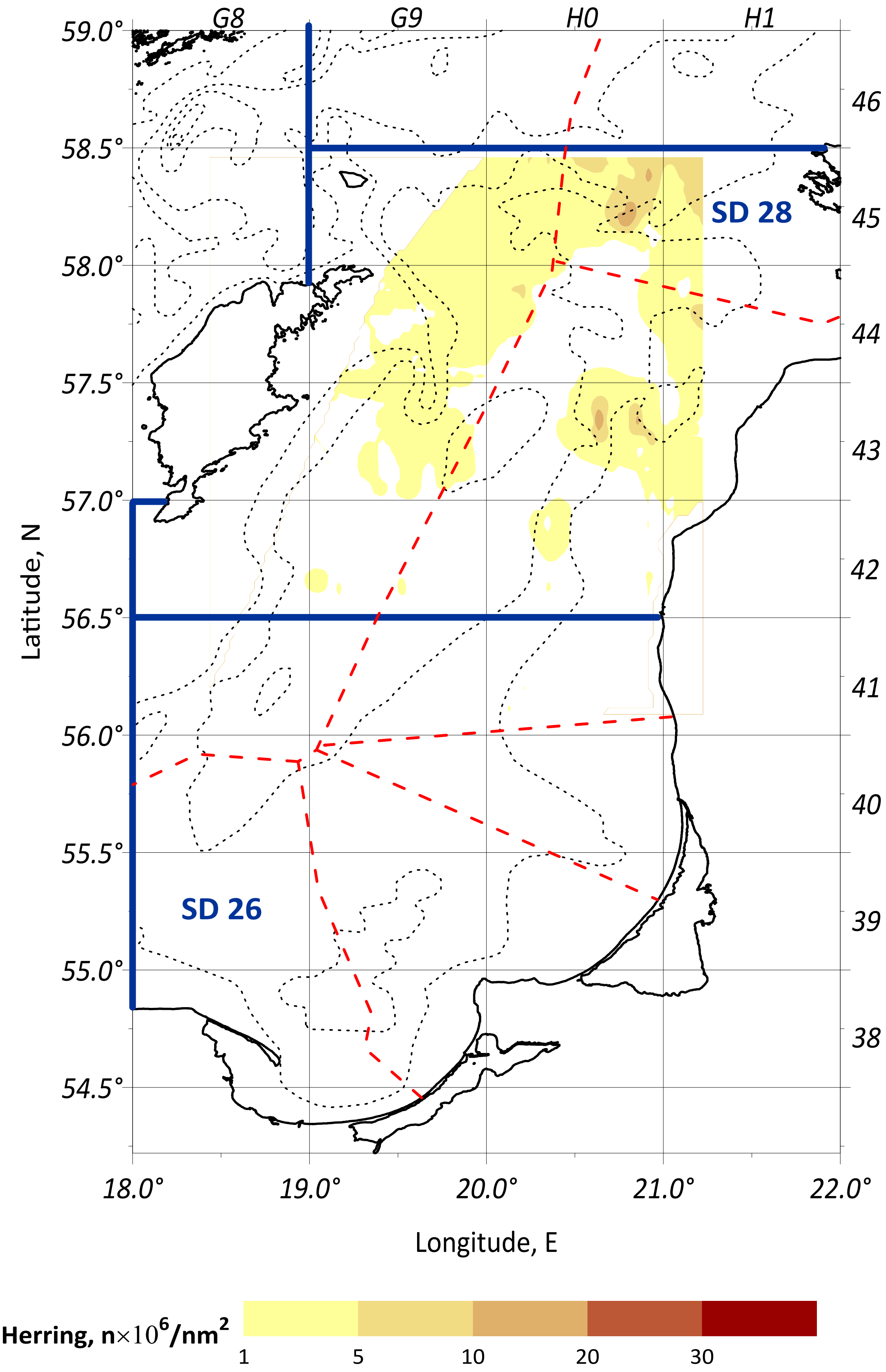


Figure 9: Herring distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

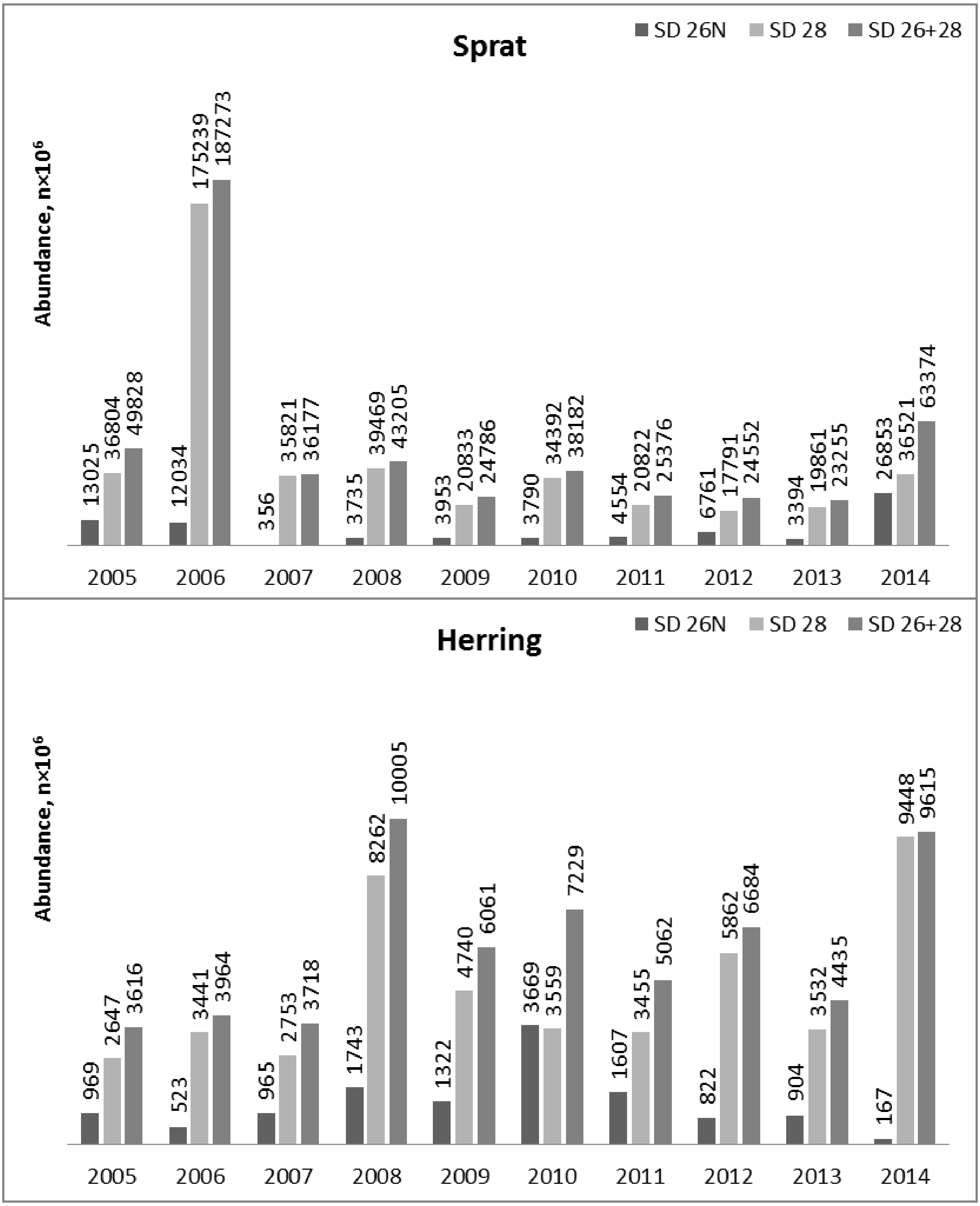


Figure 10: Abundance [n×10^6] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2014.

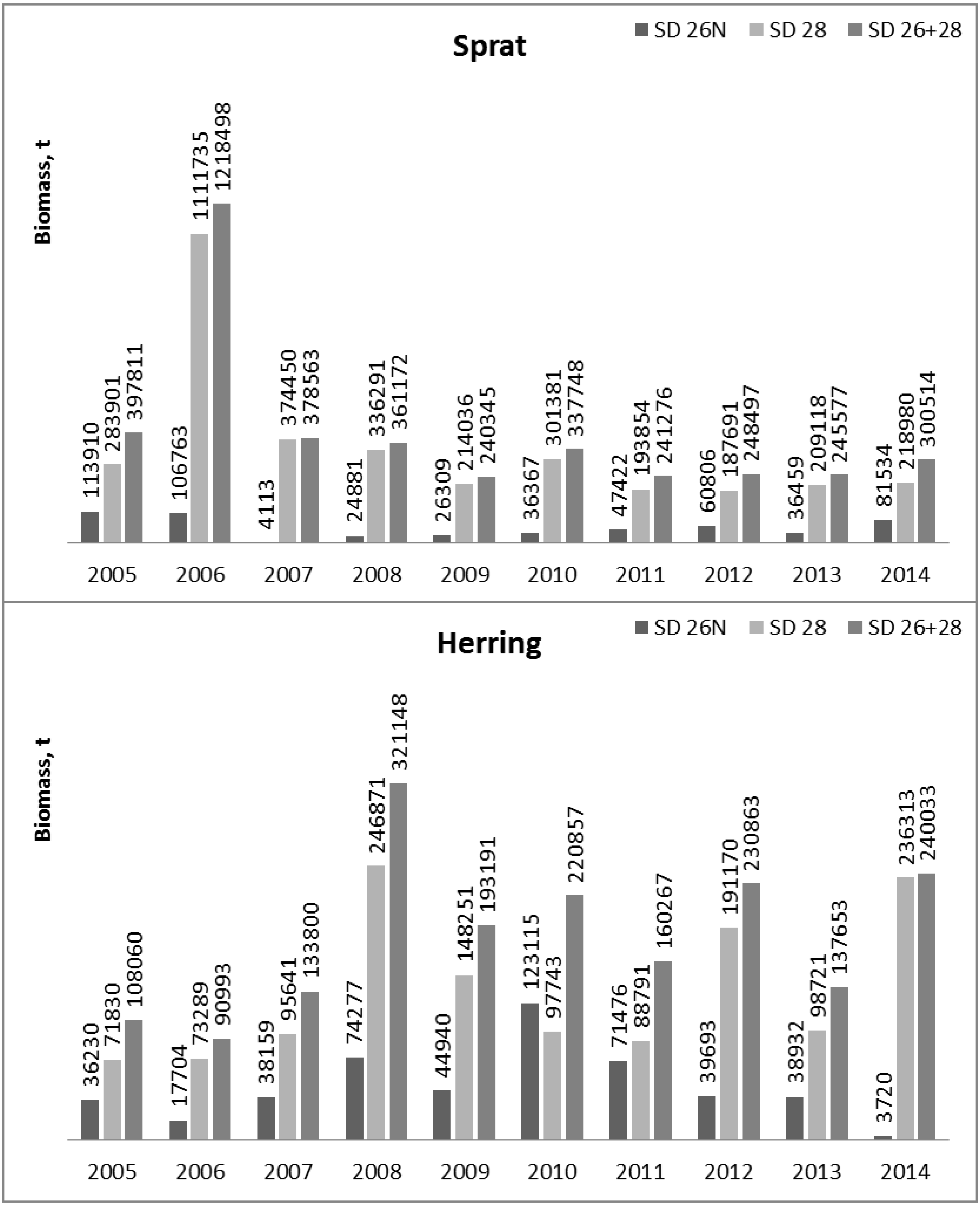


Figure 11: Biomass [t] comparison of dominant pelagic fish in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS surveys conducted by r/v "Baltica" in the period of October 2005-2014.

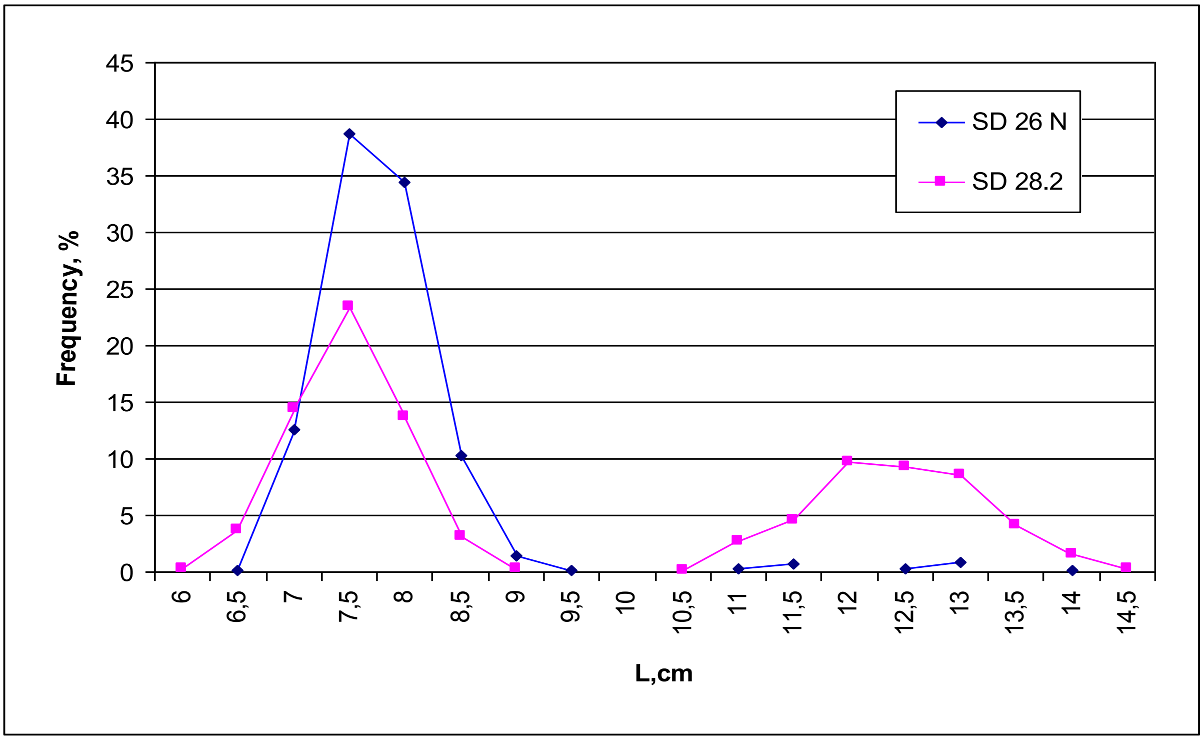


Figure 12: Sprat length distributions in control catches in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

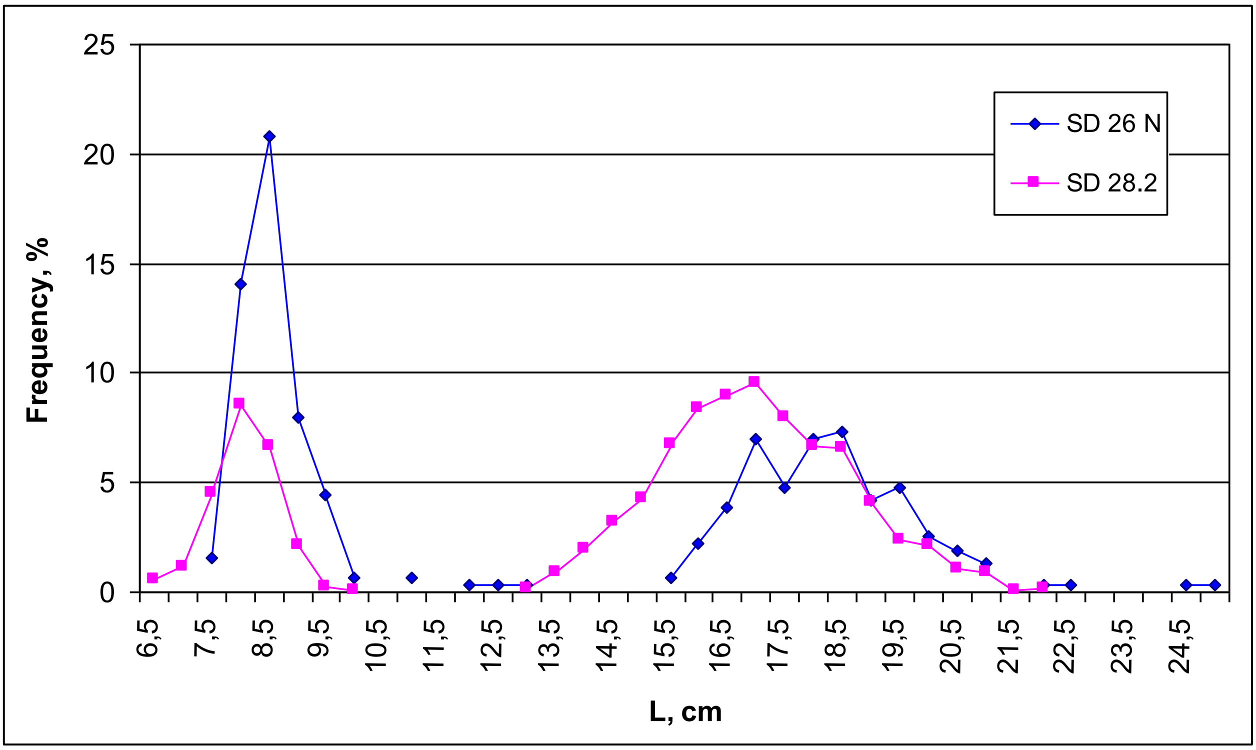


Figure 13: Herring length distributions in control catches in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

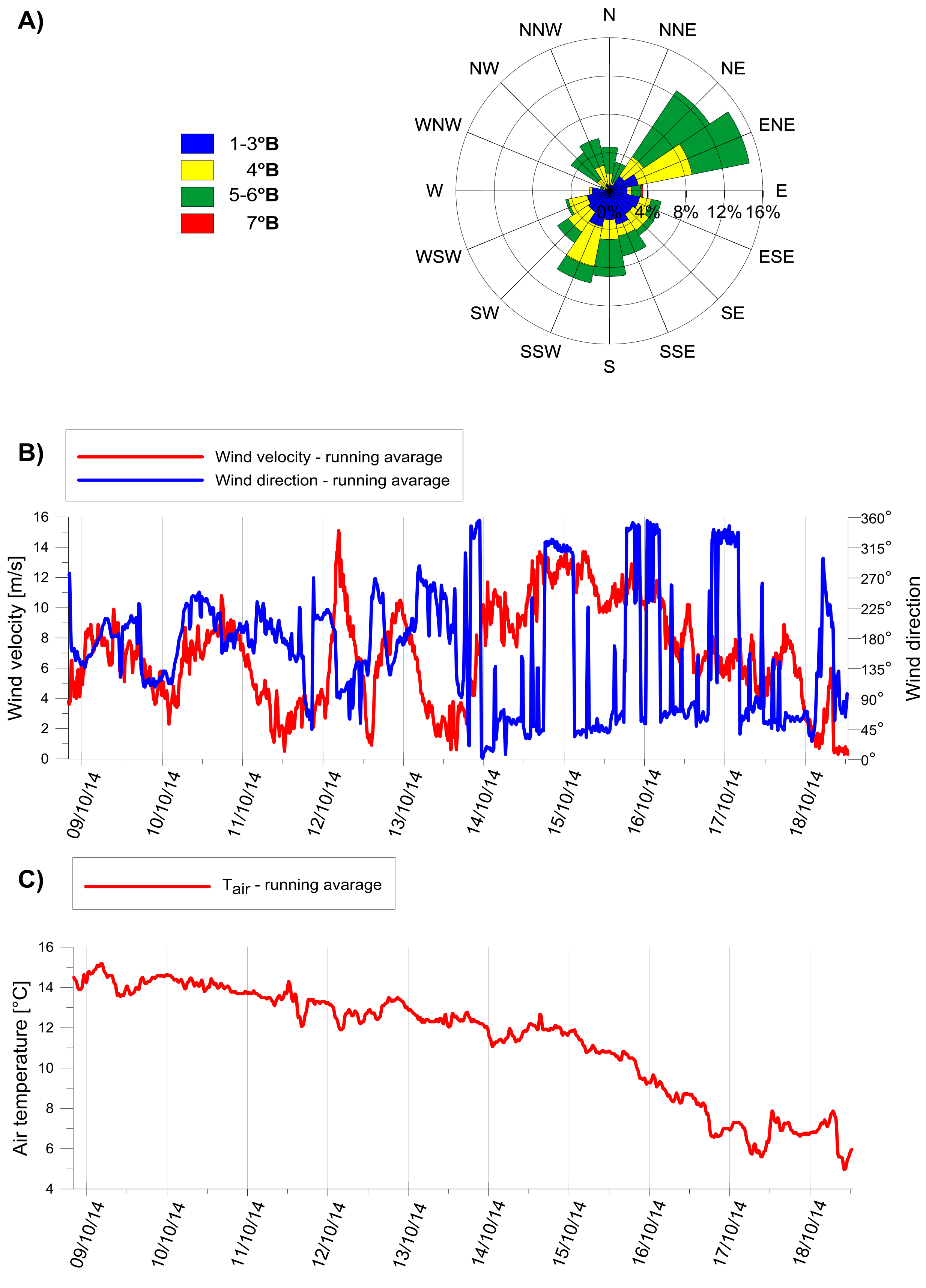


Figure 14: Changes of the main meteorological parameters (wind force, direction and the daily air temperature) during the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 09.-18.10.2014.

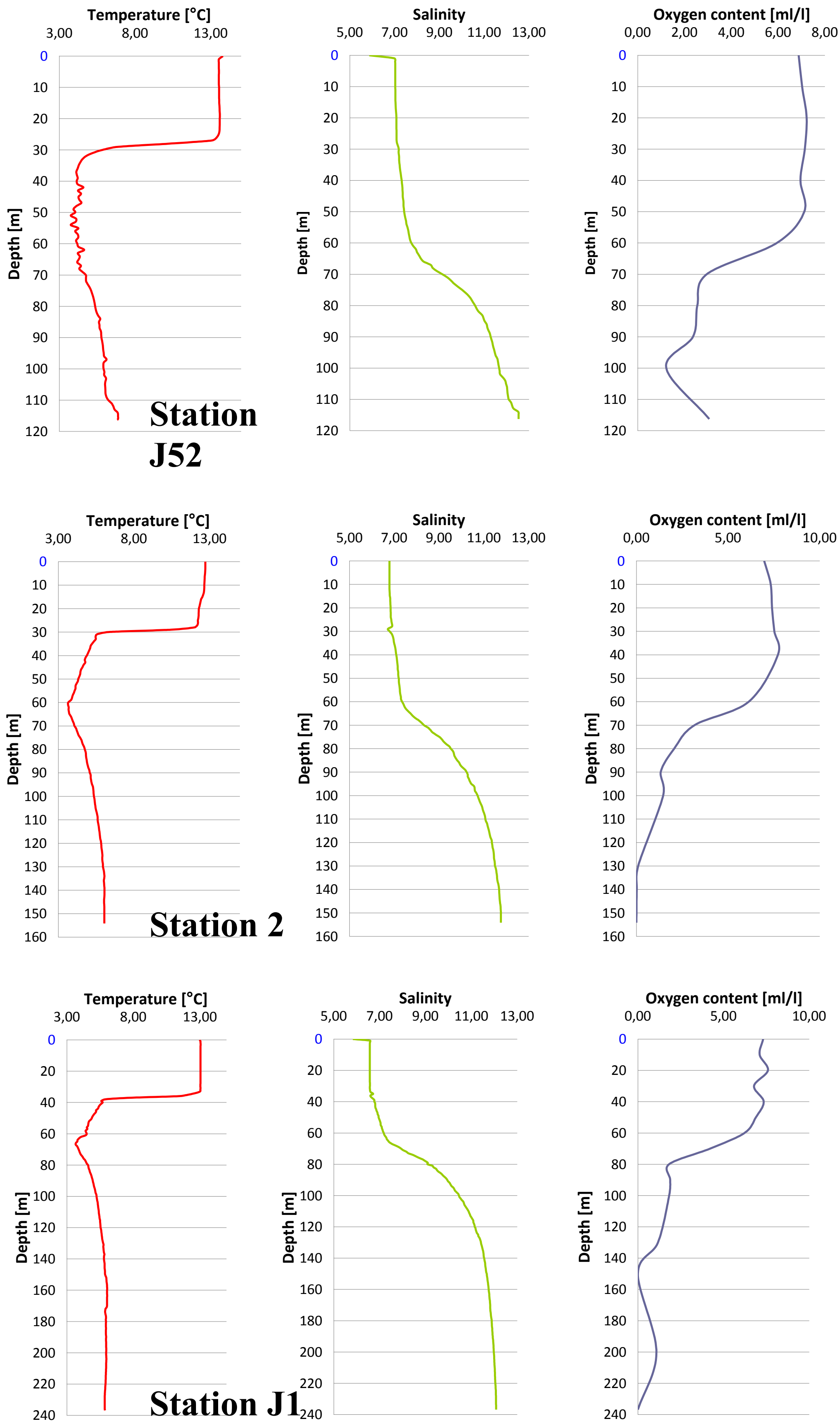


Figure 15: Vertical distribution of the seawater temperature, salinity and oxygen content at three different parts of the Gotland Basin in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in October in the period of 09.-18.10.2014.

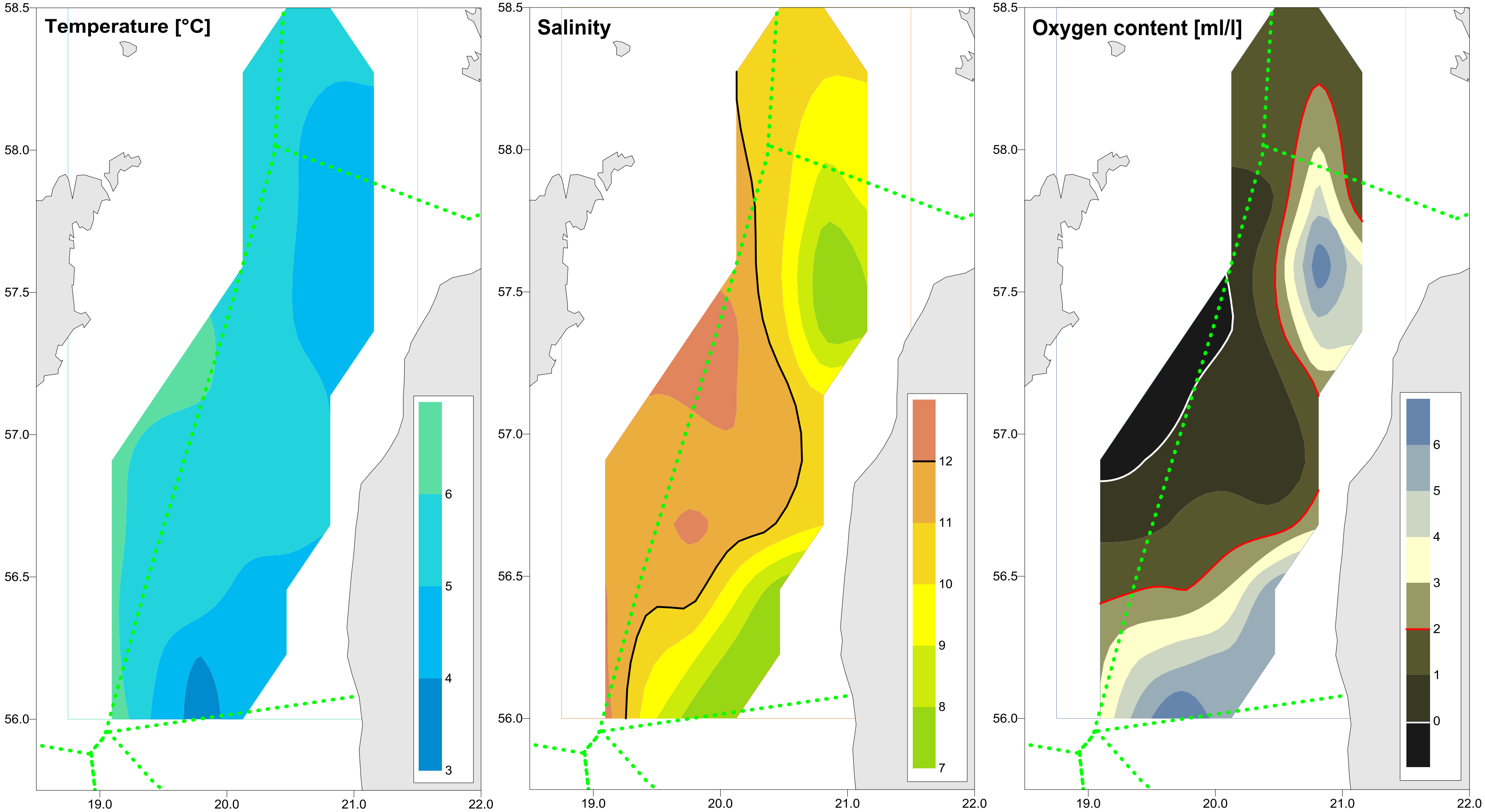


Figure 16: Horizontal distribution of the main hydrological parameters (temperature, salinity, oxygen content) measured in the bottom water layer of the Gotland Deep in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 09.-18.10.2014.

Survey Report for FRV "SOLEA"

German Acoustic Autumn Survey (GERAS)

30 September 2014 – 20 October 2014

Matthias Schaber [1] & Tomas Gröhsler [2]
Thünen Institute of
[1] Sea Fisheries (TI-SF), Hamburg
[2] Baltic Sea Fisheries (TI-OF), Rostock

1 INTRODUCTION

Background: The joint German/Danish GERAS survey is part of the Baltic International Acoustic Survey (BIAS), which is co-ordinated by the Baltic International Fish Survey Working Group (WGBIFS) and is conducted within the scope of the ICES Working Group for International Pelagic Surveys (WGIPS). Further WGBIFS contributors to the Baltic survey are national fisheries research institutes of Sweden, Poland, Finland, Latvia, Estonia, Lithuania and Russia. FRV "Solea" participated for the 27th time. The survey area covered the western Baltic Sea including Kattegat, Belt Sea, Sound and Arkona Sea (ICES Subdivisions 21, 22, 23 and 24). The survey effort was comparable to former years.

Objectives: The survey 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 SURVEY DESCRIPTION & METHODS

2.1 Personnel

Calibration of acoustic equipment (30.09.-02.10.2014)

Matthias Schaber	Scientist in charge	TI-SF
Svend-Erik Levinsky	Acoustics	DTU Aqua

Acoustic survey (02.10.-20.10.2014)

Tomas Gröhsler	Scientist in charge (02.10.-11.10.2014)	TI-OF
Matthias Schaber	Scientist in charge	TI-SF
France Collard	Biology	University Liege/Belgium

Tim Kirchner Acoustics (11.10.-20.10.2014) TI-SF
Mario Koth Biology TI-OF
Svend-Erik Levinsky Biology DTU Aqua/Denmark
Inken Rottgardt Biology (02.10.-11.10.2014) TI-SF
Dagmar Stephan Biology (11.10.-20.10.2014) TI-OF
Britta Stepputtis Biology (02.10.-11.10.2014) TI-OF

2.2 Narrative

The 694th cruise of FRV "SOLEA" represents the 27th subsequent GERAS survey. FRV "SOLEA" left the port of Rostock/Marienehe on 30 September 2014. The acoustic survey covered the whole area of Subdivisions (SD) 21, 22, 23 and 24. Both on the northernmost transect in SD 24 as well as on some sections of the transect in SD 23, the course had to be changed and measurements interrupted due to area closures of the Swedish armed forces. Several days were lost due to medical emergencies. Accordingly, survey operations had to be shifted to daytime in order to cover the northern survey area of SD 21 in the remaining survey time. The survey ended on 20 October 2014 in Rostock/Marienehe.

2.3 Survey design

ICES statistical rectangles were used as strata for all Subdivisions (ICES, 2014). 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 regular cruise track length was 1 217 nm covering a survey area of 13 206 nm^2 (Figure 1).

2.4 Calibration

The 38 kHz hull mounted transducer was calibrated twice, the 120 hull-mounted transducer once during daytime on 30 September and 1 October 2014 off Kühlungsborn (54°12.74 N, 011°43.373 E). The calibration site off Kühlungsborn was chosen according to prevailing weather conditions providing acceptable conditions for calibration. The calibration procedure was carried out as described in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES, 2014). Resulting calibration parameters were regarded as very good (38 kHz) and acceptable (120 kHz). Calibration results for the 38 kHz transducer are given in Table 1.

2.5 Acoustic data collection

All acoustic investigations were performed during night time, except for areas in SD 21 covered towards the end of survey. There, a shift to daytime recording had to be

accomplished due to overall loss of survey time in order to allow coverage of this survey area in the remaining survey 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, 2014). 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 Myriax Echoview 6.0 post-processing software. Mean volume back scattering values (s_v) were integrated over 1 nm intervals from ca. 8 m below the surface (depending on surface turbulence) to ca. 0.5 m over the seafloor. Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram.

2.6 Biological data – fishing trawls

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).

2.7 Hydrographic data

Hydrographic conditions were measured after each trawl haul and in regular distances on the survey transect. On each corresponding station, vertical profiles of temperature, salinity and oxygen concentration were measured using a "Seabird SBE 19 plus" CTD. Water samples for calibration purposes (salinity) were taken on every station, while water samples for Winkler titration and calibration of oxygen measurements were taken and processed at least once per day. Altogether, 80 CTD-profiles were measured (Fig. 5).

2.8 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, 2014) further calculations were performed as follows:

Fish species considered:

Clupea harengus
Crystallogobius linearis
Gadus morhua
Gasterosteus aculeatus
Merlangius merlangus
Pollachius virens
Pomatoschistus minutus
Sprattus sprattus
Trachurus trachurus

Exclusion of trawl hauls with low catch level:

Haul No.	Rectangle	Subdivision (SD)
24	40G0	22
25	40G0	22
28	38G0	22
29	38G0	22
48	41G1	21
52	42G1	21

Despite low catch levels of both herring and sprat, hauls 1 (37G2/SD 24) and 22 (40G1/SD 22) 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. One measured herring of 28.75 cm TL caught in Subdivision 24, which was not sampled for age determination, was assumed to be 5 years old (5 Wrs, mean of 15 herring of 28.75 cm TL aged in 2012).

Usage of neighbouring trawl information for rectangles which contain only acoustic investigations:

Rectangle/SD to be filled	with Haul No.	of Rectangle/SD
43G2/21	56 57	43G1/21 42G2/21
40F9/22	20, 21	40G0/22
39G2/23	16, 40	39G2/24
37G4/24	5, 8, 9	38G4/24

3 RESULTS

3.1 Acoustic data

Statistics on 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) along the transectes measured in 2014. In the majority of rectangles surveyed, mean NASC values per nautical mile were above the long-time survey average. However, on an ICES subdivision scale, differences compared to both previous years and long-time average were evident: While in SD 21 three out of five statistical rectangles, in SD 22 eight out of 11 and in SD 23 one out of two rectangles showed higher NASC values than both in 2013 and compared to the long-time mean resulting in overall higher NASC values in these rectangles, the situation was different in SD 24. There, the average NASC measured was distinctly lower than in 2013 and also lower than the long-time mean. This was reflected in only one (compared to 2013) and two (compared to the long-time average) rectangles showing higher NASC values as opposed to 8 (7) rectangles with partially significantly lower NASC values.

In SD 21, NASC values were slightly higher than in the previous year in the southern part of the Kattegat. In the northern part of rectangle 42G1 as well as in rectangle 43G1 NASC values were distinctly higher than in the other areas of that subdivision. In SD 22, NASC values were higher than in previous years especially in the Kiel Bight (38G0) but also north and south of the little Belt (e.g. 40G0, 39F9). In SD 23, the usual large aggregations of big herring in the Öre Sound near Ven Island were also present in autumn 2014, **with mean NASC values in this area significantly exceeding previous years and the long-time average**. From comparisons with distribution patterns in 2013 and additional daytime transects covered in 2014 it was evident that distribution patterns of this dense aggregations seem to shift rather fast according to prevailing currents. No southward expansion of these aggregations out of the Sound was detected in 2014. In SD 24, highest fish densities were recorded north and east of Rügen Island and to a lesser extent in the central to eastern parts of the Arkona Sea, however at partially much lower NASC values than in previous years. The differences were most pronounced in rectangles 37G3 and 38G3, i.e. around Rügen Island, where dense aggregations of herring had been observed in 2013. A similar decline was observed in rectangle 39G4 (Bornholmsgatt). This however could be an artefact as in that rectangle only a fraction of the planned cruisetrack could be covered due to area closures.

3.2 Biological data

In total 59 trawl hauls were conducted:

Subdivision	No. of Hauls
21	15
22	20
23	4
24	20

Altogether, 1 739 individual herring, 884 sprat, 513 European anchovies and 32 sardines were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 2-5. Altogether, 41 different species were recorded. Herring were caught in 58, sprat in 56 hauls. As in the previous year, mean catch rates per station (kg 0.5 h^{-1}) were lowest in SD 22 and highest in SD 23. In contrast to the last two years where no sardines (*Sardina pilchardus*) were caught, this species reappeared in SD 21 in 2014. A distinct increase in comparison to previous years was evident for anchovy (*Engraulis encrasicolus*) catches. Anchovies were present throughout the survey area (exception SD 23) in 43 out of 59 hauls, including the majority of hauls in SD 24. In some hauls in SD 22, anchovies contributed the bulk of clupeid catches.

Figures 2 and 3 show relative length-frequency distributions of herring and sprat in ICES SD 21, 22, 23 and 24 for the years 2013 and 2014. Compared to results from the previous survey in 2013, the following conclusions for **herring** can be drawn (Fig. 2):

- Catch numbers in SD 21 were dominated by the incoming year class (<15 cm). In contrast to 2013, when a bimodal distribution indicated presence of both incoming year class and older herring (ca. >17 cm), the latter were mostly absent in 2014.
- SD 22 shows the incoming year class with two modes at 12.75 cm and 15.25 cm in 2014 and at 11.75 cm and 14.25 cm in 2013. A further mode of older herring at 17.75 cm was absent in 2013. In contrast to previous years, which only contained herring smaller than ca. 20 cm, this year's results show few larger herring.

- In SD 23, very large herring (> 25 cm) dominated catches. The contribution of very large herring was less pronounced in 2013. Herring of the incoming year class show two modes at ca. 7.25 cm and at 11.75 cm, the latter only present in 2013.
- In SD24, the herring length-frequency distribution was similar compared to 2013. Both years were dominated by the incoming year class, which show a similar mode at 10.75 cm in 2014 and at 11.25 cm in 2013.
- Altogether, the present contribution of the incoming year class (ca. <15 cm) seemed to be similar to the one in the previous year.

Relative length-frequency distributions of **sprat** in the years 2013 and 2014 (Fig. 3) can be characterized as follows:

- In SD 21, 22 and 23 catch numbers were dominated by the incoming year class (≤ 10 cm). In contrast to 2013, the contribution of larger sprat (>10 cm) was less pronounced in 2014.
- In SD 24, the sprat length-frequency distribution was similar compared to 2013 with a bimodal distribution of both incoming year class (≤ 10 cm) and older sprat. The contribution of largest sprat (>12 cm) was less pronounced in 2014.
- Altogether, the present contribution of the incoming year class (≤10 cm) seemed to be far stronger than the one in the previous year.

3.3 Biomass and abundance estimates

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 (ICES, 2013). Accordingly, a stock separation function (SF) based on growth parameters in 2005 to 2010 has been developed to quantify the proportion of CBH and WBSSH in the area (Gröhsler et al., 2013). The estimates of the growth parameters based on baseline samples of WBSSH and CBH in 2011-2013 and in 2014 support the applicability of SF (Oeberst et al., 2013; Oeberst et al., 2014; WD for WGIPS Oeberst et al., 2015). Thus, SF was applied to correct the GERAS index for WBSS from 2005–2014.

3.3.1 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 12.3 x 10^9 fish (Table 7) or about 397.6 x 10^3 tonnes (Table 9). For the included area of Subdivisions 22-24 the number of herring was calculated to be 4.5 x 10^9 fish or about 312.1 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 18.8 x 10^9 fish (Table 10) or 118.9 x 10^3 tonnes (Table 12). For the included area of Subdivisions 22-24 the number of sprat was calculated to be 18.7 x 10^9 fish or 118.5 x 10^3 tonnes. The overall abundance estimate was dominated by the incoming year class (Figure 3 and Table 10).

3.3.2Estimates excl. Central Baltic herring

Estimated numbers of **herring excluding CBH** by age group and SD/rectangle for 2014 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 herring 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. Removal of the CBH fraction from herring GERAS survey indices in 2014 resulted in biomass reductions of ca. 0.8 % with corresponding reductions in numbers of 0.6 % (9.8 and 3.4 %, respectively in 2013; Fig. 5).

The ICES Herring Assessment Working Group for the area south of 62° N (HAWG)) is yearly supplied with an index for this survey (GERAS), which now excludes CBH in 2005-2014 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.

3.4 Hydrographic data

In addition to the trawl hauls, vertical profiles of temperature, salinity and oxygen concentration were measured on a station grid covering the whole survey area. Altogether, hydrography profiles were measured on 80 stations. CTD stations as well as horizontal gradients of temperature, salinity and oxygen concentration both at the surface and at the seafloor are displayed in Figure 5. In comparison with previous years it was evident that temperatures in the survey area were distinctly higher than in 2013 with surface temperatures ranging from 13 °C in the Kattegat to more than 16°C in the Arkona Sea. Bottom temperatures in the largest part of the survey area were only slightly lower or –in the Arkona Sea- partially in the same range as surface temperatures. Surface salinities ranged from ca. 21 psu in the central Kattegat to ca. 8 psu in the eastern Arkona Sea. Bottom salinities showed a similar gradient but were generally higher in the range of > 31 psu (SD 21) to ca. 8 psu (SD 24). Surface layers were well oxygenated throughout the survey area. Signs of oxygen depletion were as in previous years evident in bottom layers of some areas in SD 22. In SD 22, oxygen depletion in the inner Mecklenburg Bight and the southern part of the little Belt had proceeded to almost anoxic conditions near the seafloor.

4 DISCUSSION

Compared to previous results (incl. CBH), the present estimates of **herring (incl. CBH)** show a significant increase in biomass to record levels, while abundance decreased moderately to significantly in some subdivisions:

Herring	Difference compared to 2013	
Area	Numbers (%)	Biomass (%)
Subdivisions 22-24	-62	+22
Subdivisions 21-24	-6	+36

The high biomass estimates are mainly driven by unprecedentedly high NASC values measured in SD 23 (Sound) where WBSSH congregate in the autumn months for overwintering. According biomass and abundance estimates for the SD showed an increase of 317% and 38% respectively. From trawl catch data, a significant increase in large and older fishes (≥4 wr) was evident. The origin of these fishes however remains unclear as no correspondence with the abundance of younger fish in 2013 was detected. A further reason for the increase in SSB and the significant decrease in abundance was detected in SD 22 where unlike in previous years, when almost exclusively small herring were detected, also older and bigger herring (albeit in comparatively low numbers) were detected.

In previous years, older and bigger herring were detected in the northern and northwestern parts of SD 24. These were herring that already had started to migrate out of the Sound (SD 23). It is assumed that this migrations are triggered by hydrographic conditions in a way that barotropic inflow events in late summer and early autumn prevent deoxygenation in the Sound. This leads to prolonged aggregations of herring in the Sound (Miethe et al., 2014). In 2014, no such migration of big herring was detected during the survey period, indicating that these herring still remained in SD 23. Accordingly, this might explain the low numbers of bigger herring in SD 24.

Low numbers of CBH result in only minor decreases in both biomass and abundance when removed from the combined estimates. Possibly the low CBH estimates in SD

21-24 can be explained by comparatively high water temperatures resulting in a more easterly distribution.

The presence of distinct numbers of anchovies (*Engraulis encrasicolus*) in large parts of the survey area and also the catches of sardines (*Sardina pilchardus*) most likely can be related to warm summer temperatures both in North and Baltic Sea and the prevailing high temperatures in October with both surface and bottom temperatures in SD 24 around 16°C (e.g. Alheit *et al.*, 2012)

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6 FIGURES AND TABLES

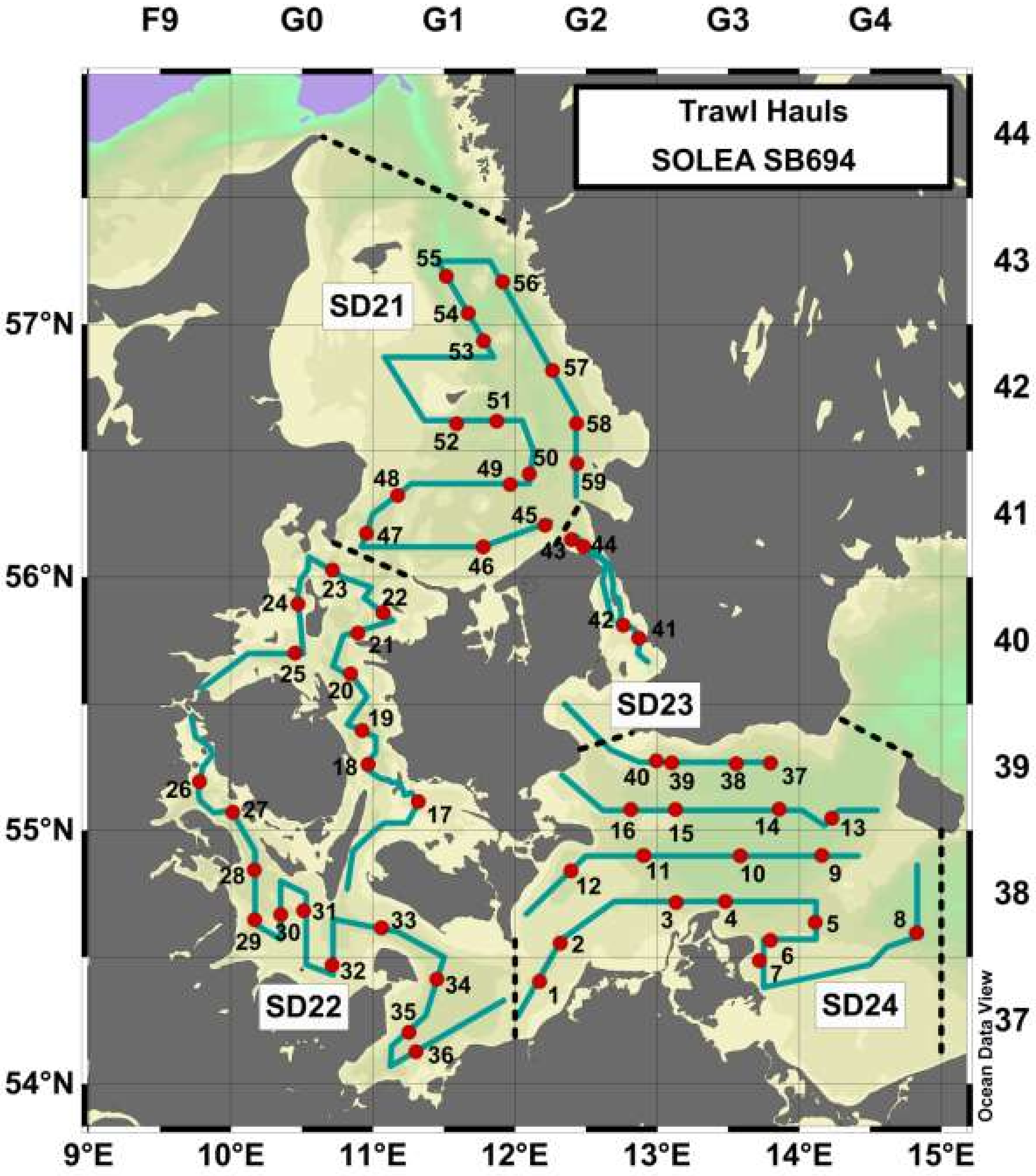

Figure 1: FRV "Solea", cruise 694/2014. Cruise track (lines) and fishery hauls (dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

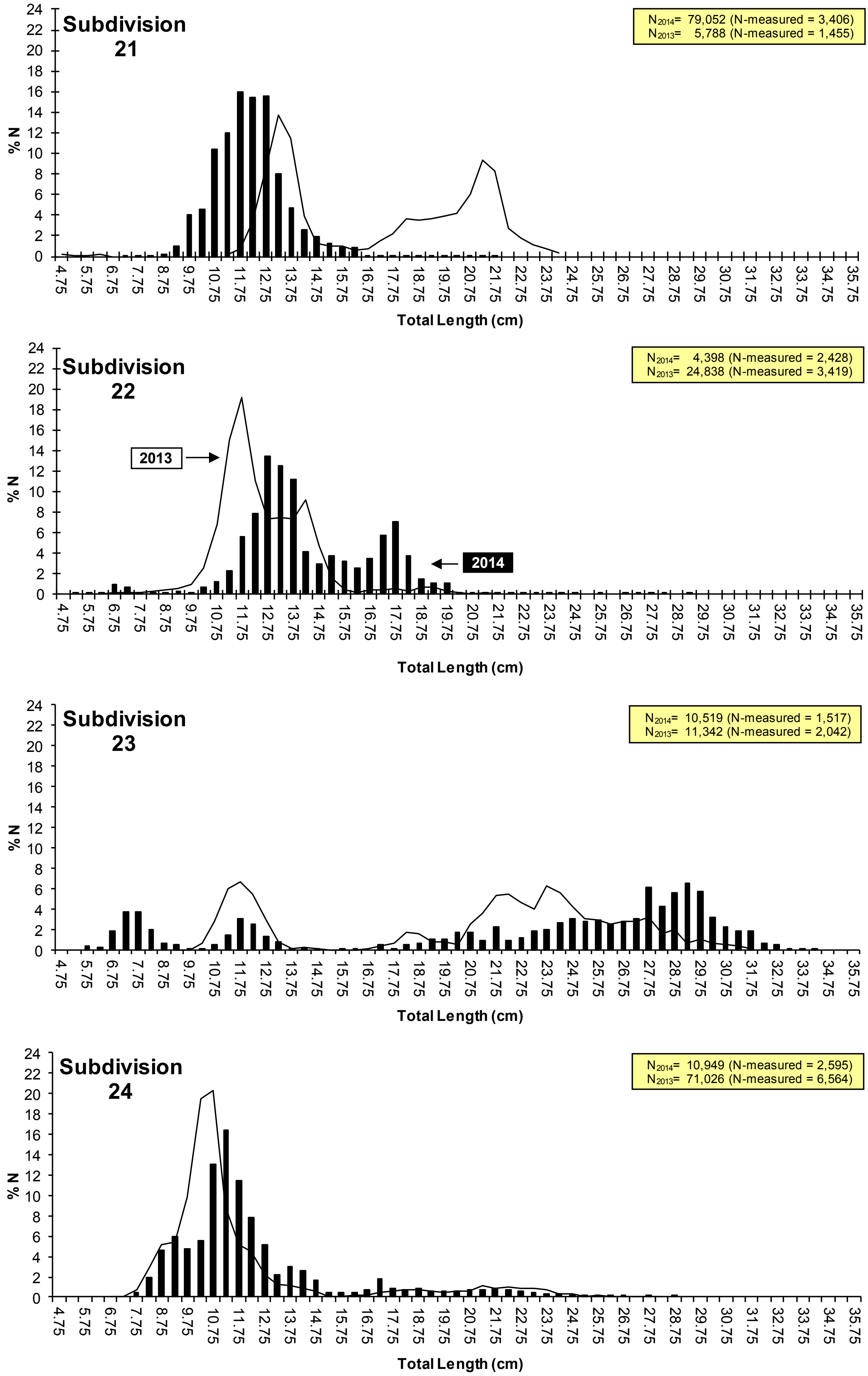

Figure 2: FRV "Solea," cruise 694/2014: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 679/2013).

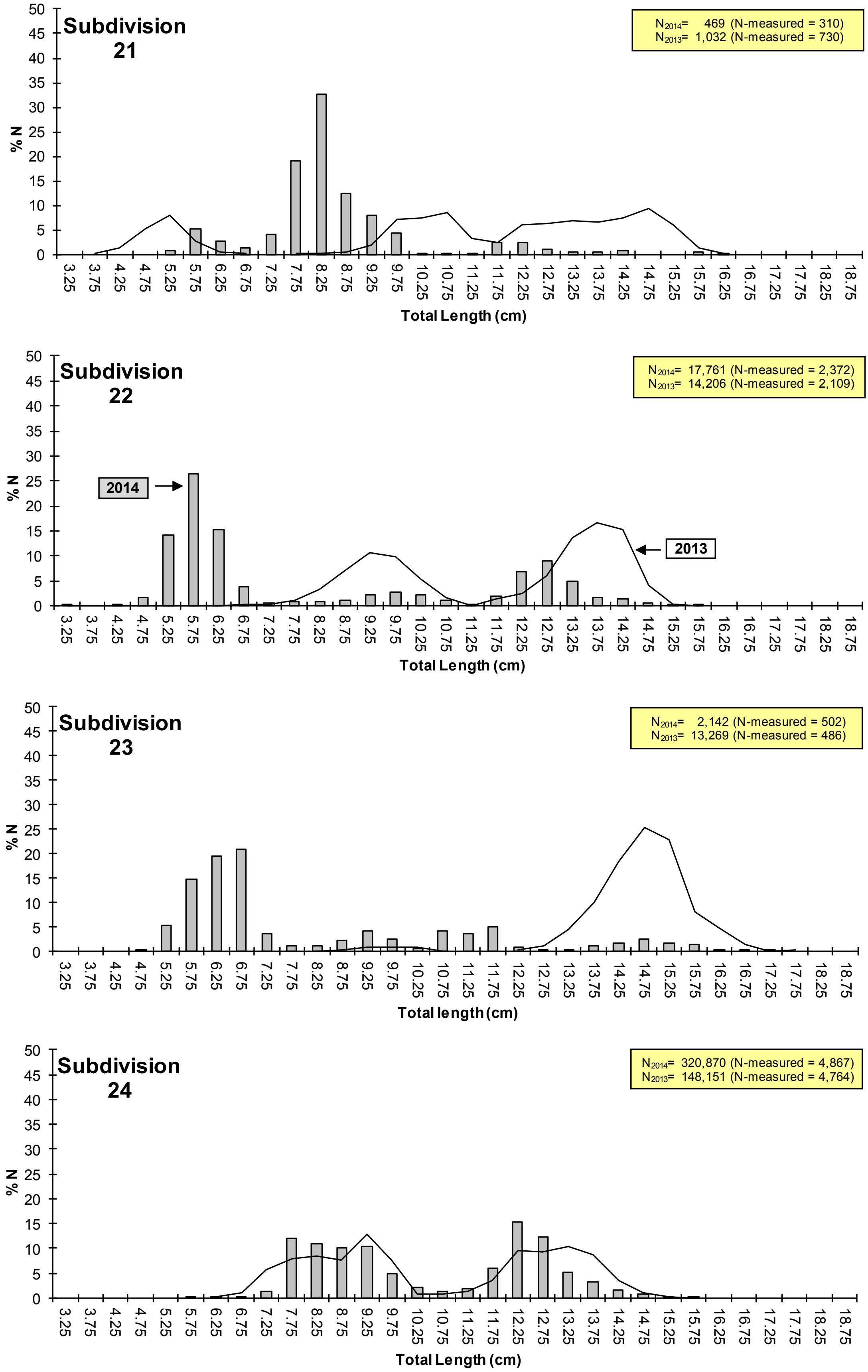

Figure 3: FRV "Solea", cruise 694/2014: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 679/2013).

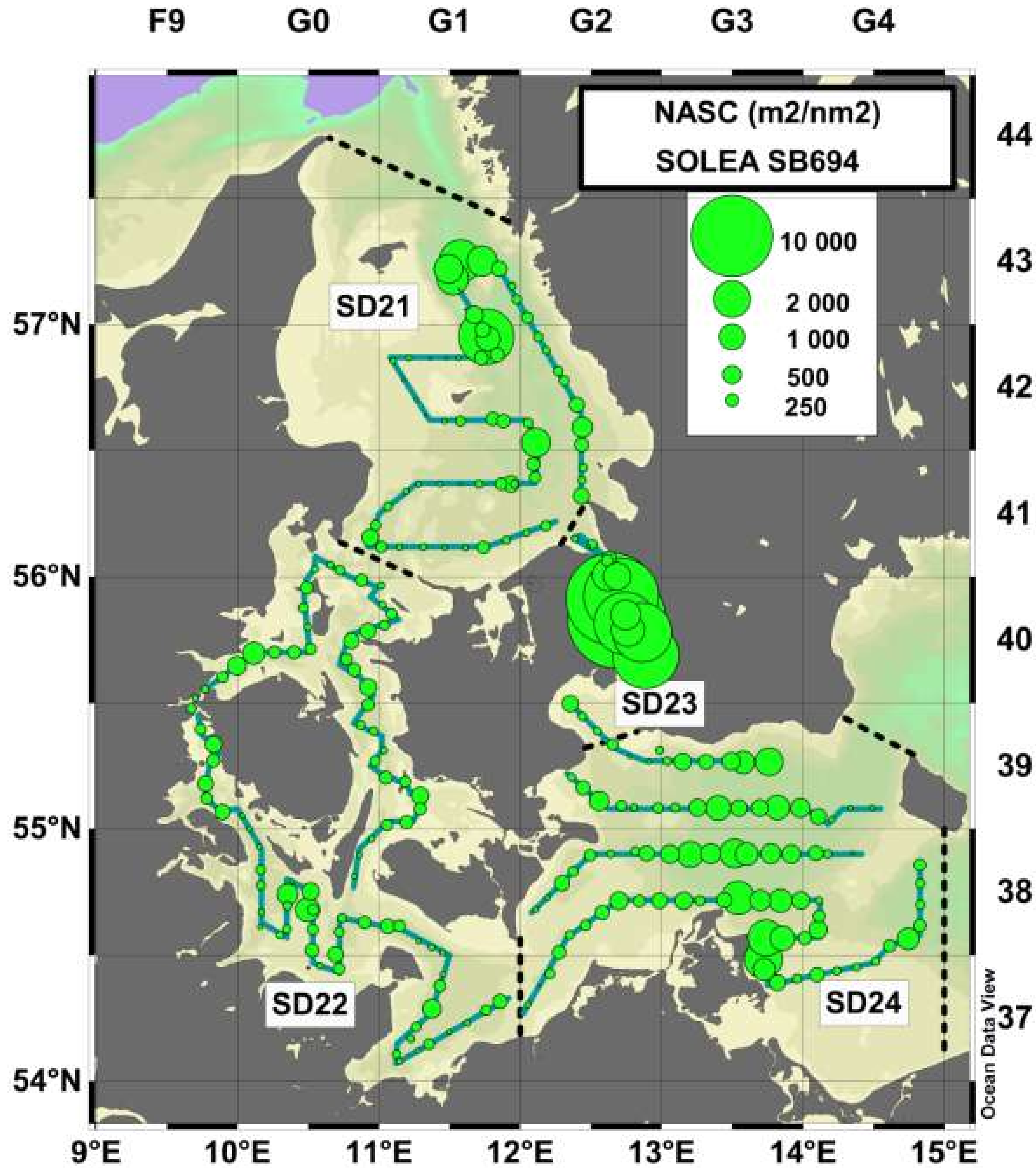

Figure 4: FRV "Solea", cruise 694/2014. Cruisetrack (lines) and mean NASC (5 nm intervals). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD). Deviations of cruisetrack in SE SD 24 due to temporal/navigational constraints.

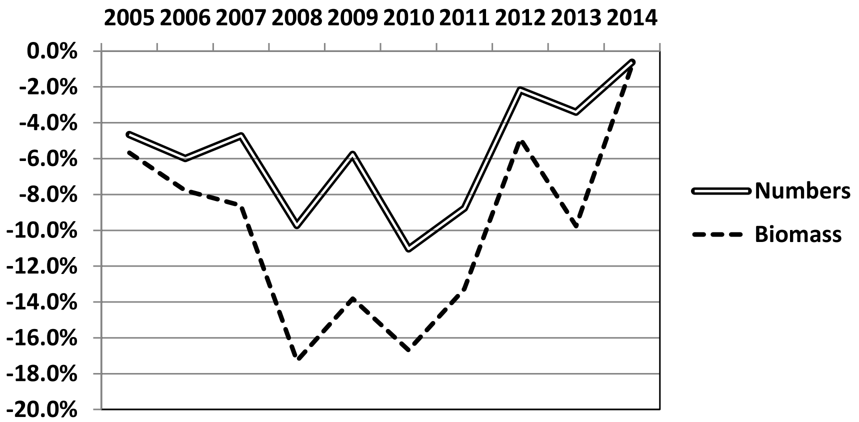

Figure 5 Relative changes in abundance and biomass of Western Baltic Spring Spawning herring in ICES Subdivisions 21-24 (2005-2014) after application of the stock separation function (SF, Gröhsler et al., 2013) to the abundance and biomass index generated from German acoustic survey data (GERAS).

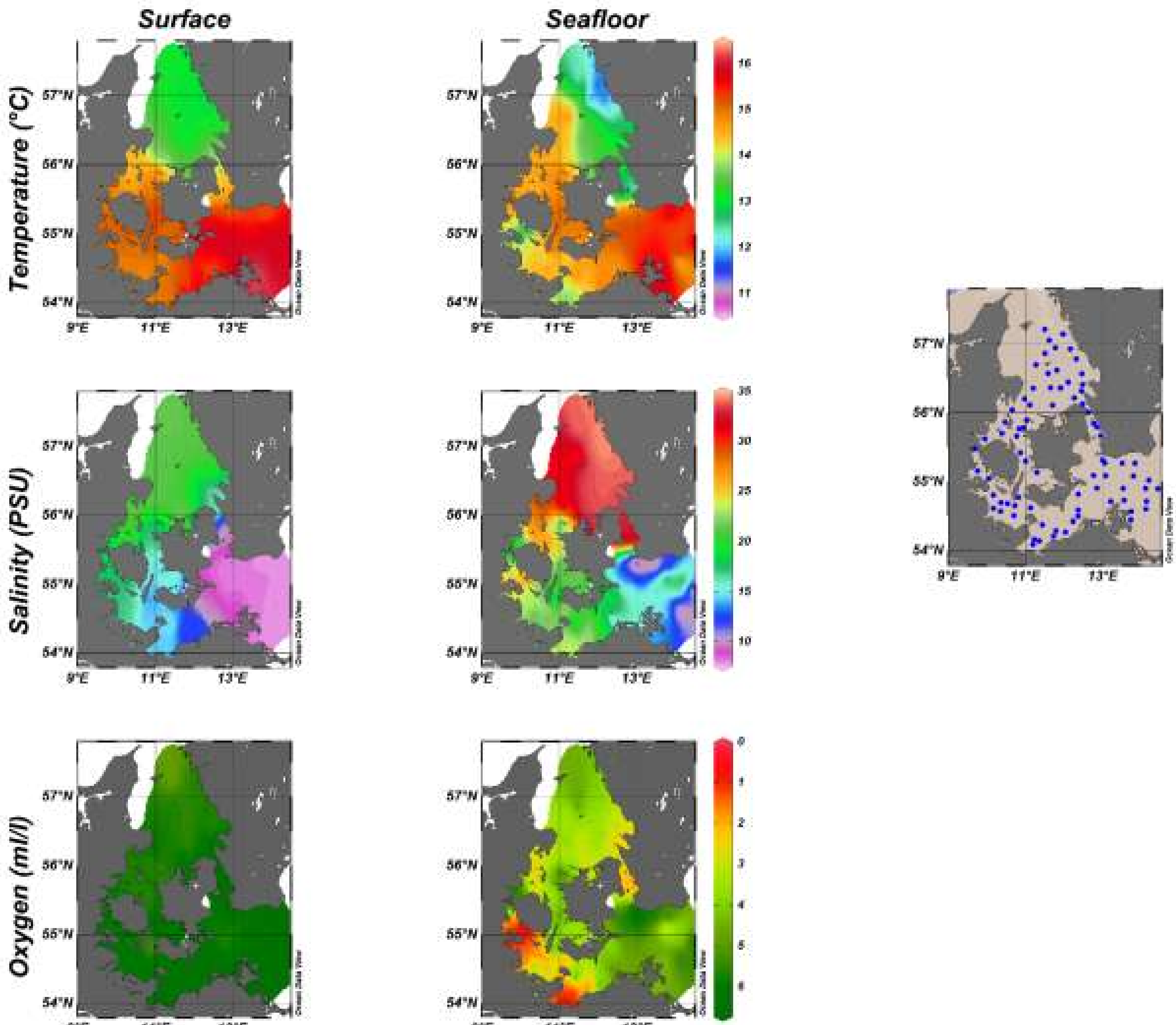

Figure 5: FRV "Solea" cruise 694/2014: Hydrography. CTD stations are depicted as blue dots in the area map (far right). Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right).

Table 1: FRV "Solea", cruise 694/2014. Simrad EK60 calibration report.

```
# Calibration  Version   2.1.0.12
#
# Date:  01.10.2014
#
# Comments: Kalibrierung querab Kühlungsborn. 54° 12.574 N,
#                  11° 43.373 E. Treibendes Schiff
#
# Reference Target:
#   TS                -42.40 dB      Min. Distance        15.00 m
#   TS Deviation          2.0 dB      Max. Distance        19.00 m
#
# Transducer:  ES38B  Serial No.   30545
#   Frequency          38000 Hz      Beamtype              Split
#   Gain               26.03 dB      Two Way Beam Angle   -20.6 dB
#   Athw. Angle Sens.      21.70      Along. Angle Sens.     21.70
#   Athw. Beam Angle     7.14 deg      Along. Beam Angle    7.14 deg
#   Athw. Offset Angle  -0.03 deg      Along. Offset Angle  0.01 deg
#   SaCorrection        -0.51 dB      Depth                4.20  m
#
# Transceiver:  GPT  38 kHz 009072056b06 2-1 ES38B
#   Pulse Duration      1.024 ms      Sample Interval      0.191   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.   3.7 dB/km      Sound Velocity     1488.8 m/s
#
# Beam Model results:
#   Transducer Gain    = 25.95 dB      SaCorrection       = -0.49 dB
#   Athw. Beam Angle   = 7.17 deg      Along. Beam Angle  = 7.27 deg
#   Athw. Offset Angle =-0.06 deg      Along. Offset Angle=-0.01 deg
#
# Data deviation from beam model:
#   RMS =    0.19 dB
#   Max =    0.57 dB  No. =    31  Athw. = -2.0 deg  Along =  4.4 deg
#   Min =   -0.76 dB  No. =   257  Athw. = -0.0 deg  Along = -1.8 deg
#
# Data deviation from polynomial model:
#   RMS =    0.15 dB
#   Max =    0.51 dB  No. =    31  Athw. = -2.0 deg  Along =  4.4 deg
#   Min =   -0.64 dB  No. =   257  Athw. = -0.0 deg  Along = -1.8 deg
```

Table 2: FRV "Solea", cruise 694/2014. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 21.

Haul No.	45	46	47	48	49	50	51	52	53	54	55
Species/ICES Rectangle	**41G2**	**41G1**	**41G0**	**41G1**	**41G1**	**41G2**	**42G1**	**42G1**	**42G1**	**43G1**	**43G1**
CLUPEA HARENGUS	17.94	8.86	2.97	0.25	9.30	2.09	7.08	0.06	20.25	6.75	689.44
CRYSTALLOGOBIUS LINEARIS	0.02	+	+	+						+	
CYCLOPTERUS LUMPUS	0.92			0.28			0.21	0.14	1.17		
ENGRAULIS ENCRASICOLUS	0.46	12.04	46.02	4.60	21.70	3.16	13.40		0.06	0.02	
EUTRIGLA GURNARDUS	0.01										
GADUS MORHUA	0.95			4.45					3.43		
GASTEROSTEUS ACULEATUS		+									
LIMANDA LIMANDA	0.06	0.03	0.04								
LOLIGO FORBESI	1.90	0.58	0.03	0.01	0.02	+	0.01		0.42	0.28	1.420
MAUROLICUS MUELLERI									0.05	+	
MERLANGIUS MERLANGUS	0.38	0.04	0.01						0.2		
MERLUCCIUS MERLUCCIUS	+										
MULLUS SURMULETUS		0.01	0.01								
MYSIDACEA									1.37	0.02	
POLLACHIUS VIRENS									5.78		
POMATOSCHISTUS MINUTUS	+										
SARDINA PILCHARDUS	0.03	0.01	0.02		0.02	0.01	0.01				
SCOMBER SCOMBRUS			0.05						0.06		
SEPIOLA	0.03										
SPRATTUS SPRATTUS	0.06	+	0.02	0.02	0.01		0.1	0.4	0.03	0.07	
SQUALUS ACANTHIAS									1.57		
TRACHINUS DRACO	0.32	0.06	0.04	0.04	0.19	0.12	0.13		0.18	0.62	0.33
TRACHURUS TRACHURUS	0.04	0.06	0.04	0.01					0.01		
TRISOPTERUS ESMARKI									0.04		
Total	**23.12**	**21.69**	**49.25**	**9.66**	**31.24**	**5.38**	**20.94**	**0.60**	**34.62**	**7.76**	**691.19**
Medusae	0.25	1.47	0.08	1.75	3.40	0.12	0.05	0.63	2.00	0.17	0.00

Haul No.	56	57	58	59	Total
Species/ICES Rectangle	**43G1**	**42G2**	**42G2**	**41G2**	
CLUPEA HARENGUS	8.87	6.37	74.65	7.66	**862.54**
CRYSTALLOGOBIUS LINEARIS					**0.02**
CYCLOPTERUS LUMPUS					**2.72**
ENGRAULIS ENCRASICOLUS	0.31	6.40	8.40	0.36	**116.93**
EUTRIGLA GURNARDUS					**0.01**
GADUS MORHUA			9.31		**18.14**
GASTEROSTEUS ACULEATUS					**+**
LIMANDA LIMANDA					**0.13**
LOLIGO FORBESI	0.44	0.03		0.01	**5.15**
MAUROLICUS MUELLERI					**0.05**
MERLANGIUS MERLANGUS		0.17			**0.80**
MERLUCCIUS MERLUCCIUS					**+**
MULLUS SURMULETUS					**0.02**
MYSIDACEA					**1.39**
POLLACHIUS VIRENS					**5.78**
POMATOSCHISTUS MINUTUS					**+**
SARDINA PILCHARDUS		0.04	0.12		**0.26**
SCOMBER SCOMBRUS				0.06	**0.17**
SEPIOLA					**0.03**
SPRATTUS SPRATTUS	+		1.59	0.02	**2.32**
SQUALUS ACANTHIAS					**1.57**
TRACHINUS DRACO					**2.03**
TRACHURUS TRACHURUS					**0.16**
TRISOPTERUS ESMARKI					**0.04**
Total	**9.62**	**13.01**	**94.07**	**8.11**	**1020.26**
Medusae	0.22	1.56	0.12	0.02	**11.84**

+ = < 0.01 kg

Table 3: FRV "Solea", cruise 694/2014. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 22.

Haul No.	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Species/ICES Rectangle	**39G1**	**39G0**	**39G0**	**40G0**	**40G0**	**40G1**	**41G0**	**40G0**	**40G0**	**39F9**	**39G0**
AGONUS CATAPHRACTUS						0.01		0.01	0.01		
BELONE BELONE										0.03	
CLUPEA HARENGUS	0.31	22.73	5.78	2.86	1.64	1.75	3.00	0.49	0.25	0.32	
CRANGON CRANGON				+							
CRYSTALLOGOBIUS LINEARIS	3.04	0.04	+	0.03	0.01	0.06	0.03	0.03	0.32	0.01	+
CTENOLABRUS RUPESTRIS	0.02		0.01					0.03			
CYCLOPTERUS LUMPUS	0.36							0.19			
ENGRAULIS ENCRASICOLUS		9.16	6.03	3.81	6.46	0.05	6.95	1.39	0.51	0.08	+
GADUS MORHUA	0.02	6.16	5.14					0.10	0.12		
GASTEROSTEUS ACULEATUS	1.38	0.03	+	0.03		0.01	+	0.24	7.20	5.82	0.09
GOBIUS NIGER										0.01	
LIMANDA LIMANDA	0.68	0.21	0.07	0.27			0.21	0.52	0.18		0.14
LOLIGO FORBESI			+	+		0.06	0.28	0.21	0.01		
MERLANGIUS MERLANGUS		0.01		0.08			0.25	0.02	0.03		0.01
MULLUS SURMULETUS		0.02		0.02		0.05	0.04				
MYOXOCEPHALUS SCORPIUS	0.32							0.11			
OSMERUS EPERLANUS											
PLATICHTHYS FLESUS								0.06	0.07		
PLEURONECTES PLATESSA						0.05					
POMATOSCHISTUS MINUTUS				+		+	+	+	+	0.01	+
PSETTA MAXIMA							0.30				
PUNGITIUS PUNGITIUS											
SCOMBER SCOMBRUS									0.04		
SPRATTUS SPRATTUS	1.76	14.80	0.48	0.11	0.40	0.19	0.65	0.21	0.11	11.38	4.23
SYMPHODUS MELOPS							0.06				
SYNGNATHUS ROSTELLATUS	0.01									0.01	
TRACHINUS DRACO		0.04		0.17		0.16	0.52	0.02			
TRACHURUS TRACHURUS	0.14	0.24	0.05	0.17	0.14	0.13	0.1	0.01	0.06		
Total	**8.04**	**53.44**	**17.56**	**7.55**	**8.65**	**2.52**	**12.39**	**3.64**	**8.91**	**17.67**	**4.47**
Medusae	32.0	3.8	8.5	2.2	9.9	12.8	4.9	5.4	7.8	0.0	4.5

Haul No.	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**Total**
Species/ICES Rectangle	**38G0**	**38G0**	**38G0**	**38G0**	**37G0**	**38G1**	**37G1**	**37G1**	**37G1**	
AGONUS CATAPHRACTUS										**0.03**
BELONE BELONE										**0.03**
CLUPEA HARENGUS	0.15	0.17	14.97	0.29	6.40	10.34	3.90	11.37	5.76	**92.48**
CRANGON CRANGON										**+**
CRYSTALLOGOBIUS LINEARIS	+			+	0.14	+	0.05	+		**3.76**
CTENOLABRUS RUPESTRIS										**0.06**
CYCLOPTERUS LUMPUS										**0.55**
ENGRAULIS ENCRASICOLUS	0.05	0.03			0.66	0.03	0.03	0.08	4.76	**40.08**
GADUS MORHUA		+		8.90	+	12.39		3.17		**36.00**
GASTEROSTEUS ACULEATUS	0.09	0.08		+		0.03			0.06	**15.06**
GOBIUS NIGER										**0.01**
LIMANDA LIMANDA	0.13	0.10	0.24	0.27		0.97	0.03			**4.02**
LOLIGO FORBESI	+									**0.56**
MERLANGIUS MERLANGUS	+	0.02	0.87	+	0.06		0.13	2.11		**3.59**
MULLUS SURMULETUS										**0.13**
MYOXOCEPHALUS SCORPIUS										**0.43**
OSMERUS EPERLANUS			+							**+**
PLATICHTHYS FLESUS						0.40		0.46		**0.99**
PLEURONECTES PLATESSA										**0.05**
POMATOSCHISTUS MINUTUS	+	+		0.01	+	+			+	**0.02**
PSETTA MAXIMA										**0.30**
PUNGITIUS PUNGITIUS						+				**+**
SCOMBER SCOMBRUS										**0.04**
SPRATTUS SPRATTUS	0.06	0.07	1.50	0.10	2.08	0.03	59.24	6.09	0.16	**103.65**
SYMPHODUS MELOPS										**0.06**
SYNGNATHUS ROSTELLATUS										**0.02**
TRACHINUS DRACO	0.02									**0.93**
TRACHURUS TRACHURUS		0.09	0.42	0.01	0.07	0.02	0.12	0.06	0.27	**2.10**
Total	**0.50**	**0.56**	**18.00**	**9.58**	**9.41**	**24.21**	**63.50**	**23.34**	**11.01**	**304.95**
Medusae	1.5	2.8	6.2	1.8	5.6	10.9	1.6	2.5	6.8	**131.4**

+ = < 0.01 kg

Table 4: FRV "Solea", cruise 694/2014. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 23.

Haul No.	41	42	43	44	Total
Species/ICES Rectangle	40G2	40G2	41G2	41G2	
ANGUILLA ANGUILLA		0.42			0.42
CLUPEA HARENGUS	220.33	1016.93	14.08	5.02	1256.36
CRYSTALLOGOBIUS LINEARIS			+	+	+
CTENOLABRUS RUPESTRIS	+				+
EUTRIGLA GURNARDUS			+		+
GADUS MORHUA	29.88	57.97			87.85
LIMANDA LIMANDA			0.55	0.36	0.91
LIPARIS LIPARIS					0.00
LOLIGO FORBESI	+	+	0.47	0.33	0.80
MERLANGIUS MERLANGUS	0.54	0.56	0.13	+	1.23
MERLUCCIUS MERLUCCIUS			0.08	0.03	0.11
MULLUS SURMULETUS			0.07	0.01	0.08
PLEURONECTES PLATESSA		0.17			0.17
SPRATTUS SPRATTUS	4.87	0.13	6.33	0.37	11.70
TRACHINUS DRACO			0.14		0.14
TRACHURUS TRACHURUS			0.21	0.04	0.25
Total	255.62	1076.18	22.06	6.16	1360.02
Medusae	0.1	0.1	0.5	0.1	0.7

+ = < 0.01 kg

Table 5: FRV "Solea", cruise 694/2014. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 24.

Haul No.	1	2	3	4	5	6	7	8	9	10	11
Species/ICES Rectangle	37G2	38G2	38G3	38G3	38G4	38G3	37G3	38G4	38G4	38G3	38G2
CLUPEA HARENGUS	0.85	23.15	4.05	11.26	0.97	8.48	9.70	8.97	0.56	1.79	1.68
CRANGON CRANGON		0.01	1.30	0.02				+			+
CRYSTALLOGOBIUS LINEARIS	+	0.01	+	+							
CTENOLABRUS RUPESTRIS			+								
CYCLOPTERUS LUMPUS								0.37	0.18		
ENGRAULIS ENCRASICOLUS	0.61		0.01	0.03	0.01	0.16			0.04	0.02	0.02
GADUS MORHUA		0.50	1.46	4.76		4.70	14.10	0.77		0.49	
GASTEROSTEUS ACULEATUS	+	0.28	0.28	0.02			0.01			0.07	0.93
LIMANDA LIMANDA		9.93	0.46								
LIPARIS LIPARIS			+								
LOLIGO FORBESI	+	0.01									
MERLANGIUS MERLANGUS		0.28	0.59	0.15		4.53	6.47		0.01	1.75	
MYOXOCEPHALUS SCORPIUS		0.14									
OSMERUS EPERLANUS	0.01		0.01	0.09		0.81	2.32	0.01			
PLATICHTHYS FLESUS		2.28	27.02	3.53		0.15	0.01	0.52			
PLEURONECTES PLATESSA		0.19	9.38								
POMATOSCHISTUS MINUTUS		0.05	0.71	0.09		0.04	0.02	+		0.03	0.03
PSETTA MAXIMA				0.49							
SALMO TRUTTA						1.09					
SCOMBER SCOMBRUS		0.05								0.03	
SPRATTUS SPRATTUS	0.01	1306.30	13.57	121.75	29.73	47.13	114.98	21.80	4.69	246.94	0.33
STIZOSTEDION LUCIOPERCA							1.97				
TRACHINUS DRACO		0.03									
TRACHURUS TRACHURUS	0.01	0.49	0.29	0.11		0.03	0.01		0.01	+	
Total	1.49	1343.70	59.13	142.30	30.71	67.12	149.59	32.44	5.49	251.12	2.99
Medusae	4.27	7.84	7.12	31.18	15.67	9.88	29.23	2.47	50.30	21.72	6.50

Haul No.	12	13	14	15	16	37	38	39	40	Total
Species/ICES Rectangle	38G2	39G4	39G3	39G3	39G2	39G3	39G3	39G3	39G2	
CLUPEA HARENGUS	25.04	3.94	8.90	1.43	16.50	21.87	6.21	1.57	4.94	161.86
CRANGON CRANGON		0.00		+	+					1.33
CRYSTALLOGOBIUS LINEARIS			+					+	0.01	0.02
CTENOLABRUS RUPESTRIS										+
CYCLOPTERUS LUMPUS										0.55
ENGRAULIS ENCRASICOLUS				0.05	0.22		0.01	0.03	0.01	1.22
GADUS MORHUA		3.14	1.25				4.94	2.81	1.57	40.49
GASTEROSTEUS ACULEATUS	0.17	+		0.01	0.16				+	1.93
LIMANDA LIMANDA										10.39
LIPARIS LIPARIS										+
LOLIGO FORBESI										0.01
MERLANGIUS MERLANGUS		2.85	0.14	0.02	0.02	0.23				17.04
MYOXOCEPHALUS SCORPIUS										0.14
OSMERUS EPERLANUS		0.02								3.27
PLATICHTHYS FLESUS				0.19			0.30			34.00
PLEURONECTES PLATESSA										9.57
POMATOSCHISTUS MINUTUS		0.16	0.01	0.04	0.04		+	0.04	+	1.26
PSETTA MAXIMA										0.49
SALMO TRUTTA										1.09
SCOMBER SCOMBRUS										0.08
SPRATTUS SPRATTUS	330.53	2.08	71.78	11.51	17.93	486.62	66.90	0.95	0.36	2895.89
STIZOSTEDION LUCIOPERCA										1.97
TRACHINUS DRACO										0.03
TRACHURUS TRACHURUS		0.01		0.02	0.02					1.00
Total	355.74	12.20	82.08	13.27	34.89	508.72	78.36	5.40	6.89	3183.63
Medusae	17.18	10.42	29.28	10.00	5.78	7.59	1.95	9.50	5.35	283.2

+ = < 0.01 kg

Table 6: FRV "Solea", cruise 694/2014. Survey statistics by area.

ICES Rectangle	Area (nm²)	Sa (m²/NM²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	NHerring (million)	NSprat (million)
41G0	108.1	269.5	2.021	144.15	92.21	0.65	132.92	0.94
41G1	946.8	88.3	1.714	487.76	97.77	0.32	476.91	1.56
41G2	432.3	207.1	1.541	580.98	95.81	1.3	556.64	7.57
42G1	884.2	99.8	2.026	435.55	98.32	0.81	428.25	3.52
42G2	606.8	370.0	1.2	1870.97	97.87	2.05	1831.15	38.27
43G1	699	825.7	1.385	4167.25	99.7	0.24	4154.67	10.07
43G2	107	194.4	1.207	172.33	99.84	0.09	172.06	0.16
Total	**3,784.2**			**7,858.99**			**7,752.60**	**62.09**
37G0	209.9	169.7	1.090	326.79	39.55	14.61	129.25	47.73
37G1	723.3	157.0	1.729	656.78	43.67	47.08	286.83	309.22
38G0	735.3	175.1	2.447	526.16	49.27	39.37	259.22	207.16
38G1	173.2	113.5	2.273	86.49	94.44	0.45	81.68	0.39
39F9	159.3	284.4	0.343	1320.84	0.26	71.99	3.38	950.91
39G0	201.7	134.5	1.736	156.27	42.42	52.97	66.29	82.78
39G1	250.0	219.6	0.17	3229.41	0.09	2.32	2.91	74.78
40F9	51.3	123.8	1.343	47.29	42.58	9.89	20.14	4.68
40G0	538.1	294.9	1.343	1181.58	42.58	9.89	503.11	116.84
40G1	174.5	101.5	0.619	286.13	12.3	3.47	35.2	9.93
41G0	173.1	92.2	1.42	112.39	34.98	14.8	39.31	16.63
Total	**3,389.7**			**7,930.13**			**1,427.32**	**1,821.05**
39G2	130.9	135.1	1.378	128.34	49.62	40.97	63.68	52.58
40G2	164	7283.2	7.44	1605.44	90.93	7.69	1459.81	123.52
41G2	72.3	290.4	0.982	213.81	64.82	34.05	138.59	72.8
Total	**367.2**			**1,947.59**			**1,662.08**	**248.90**
37G2	192.4	96.6	1.41	131.81	84.72	2.78	111.67	3.66
37G3	167.7	489.0	0.898	913.2	3.76	95.82	34.3	875.06
37G4	875.1	157.7	0.887	1555.84	5.71	94.12	88.91	1464.42
38G2	832.9	235.7	0.957	2051.35	9.49	66.11	194.74	1356.12
38G3	865.7	755.8	0.81	8077.73	4.2	89.63	339.62	7240.07
38G4	1034.8	246.9	0.887	2880.41	5.71	94.12	164.6	2711.16
39G2	406.1	191.4	1.378	564.06	49.62	40.97	279.87	231.08
39G3	765.0	566.0	1.478	2929.57	5.6	89.24	164.19	2614.22
39G4	524.8	191.9	2.332	431.86	15.82	39.9	68.3	172.32
Total	**5,664.5**			**19,535.83**			**1,446.20**	**16,668.11**
Total	**9,421.4**			**29,413.55**			**4,535.60**	**18,738.06**
Total	**13,205.6**			**37,272.54**			**12,288.20**	**18,800.15**

Table 7: FRV "Solea", cruise 694/2014. Numbers (millions) of herring incl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0	106.92	25.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	132.92
21	41G1	466.21	10.15	0.55	0.00	0.00	0.00	0.00	0.00	0.00	476.91
21	41G2	547.61	8.96	0.07	0.00	0.00	0.00	0.00	0.00	0.00	556.64
21	42G1	381.81	45.26	1.18	0.00	0.00	0.00	0.00	0.00	0.00	428.25
21	42G2	1,830.50	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,831.15
21	43G1	4,138.94	15.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,154.67
21	43G2	172.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	172.06
21	Total	7,643.99	106.73	1.88	0.00	0.00	0.00	0.00	0.00	0.00	7,752.60
22	37G0	104.63	23.34	0.85	0.37	0.07	0.00	0.00	0.00	0.00	129.26
22	37G1	228.96	48.75	5.07	2.93	0.94	0.18	0.00	0.00	0.00	286.83
22	38G0	176.65	82.17	0.40	0.00	0.00	0.00	0.00	0.00	0.00	259.22
22	38G1	70.60	10.64	0.26	0.15	0.03	0.00	0.00	0.00	0.00	81.68
22	39F9	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38
22	39G0	37.42	28.72	0.15	0.00	0.00	0.00	0.00	0.00	0.00	66.29
22	39G1	1.63	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.91
22	40F9	11.20	8.00	0.31	0.29	0.17	0.17	0.00	0.00	0.00	20.14
22	40G0	279.79	199.81	7.86	7.27	4.19	4.19	0.00	0.00	0.00	503.11
22	40G1	12.85	15.61	2.05	4.06	0.63	0.00	0.00	0.00	0.00	35.20
22	41G0	17.99	19.31	0.42	1.13	0.34	0.13	0.00	0.00	0.00	39.32
22	Total	945.10	437.63	17.37	16.20	6.37	4.67	0.00	0.00	0.00	1,427.34
23	39G2	54.52	6.23	1.36	0.71	0.25	0.26	0.09	0.20	0.06	63.68
23	40G2	3.38	124.35	159.92	213.33	301.61	307.84	211.38	82.73	55.28	1,459.82
23	41G2	135.91	0.90	0.25	0.36	0.51	0.4	0.22	0.04	0.01	138.60
23	Total	193.81	131.48	161.53	214.40	302.37	308.50	211.69	82.97	55.35	1,662.10
24	37G2	98.86	11.65	0.31	0.61	0.00	0.24	0.00	0.00	0.00	111.67
24	37G3	31.05	1.26	0.64	0.61	0.34	0.04	0.06	0.23	0.06	34.29
24	37G4	64.74	6.99	5.98	5.41	2.75	0.63	0.84	1.02	0.55	88.91
24	38G2	182.16	12.07	0.37	0.04	0.00	0.10	0.00	0.00	0.00	194.74
24	38G3	294.45	19.40	10.58	7.82	2.09	0.67	1.79	1.94	0.88	339.62
24	38G4	119.86	12.94	11.06	10.01	5.09	1.16	1.55	1.90	1.03	164.60
24	39G2	239.59	27.39	5.99	3.12	1.08	1.15	0.41	0.87	0.25	279.85
24	39G3	80.16	23.59	17.45	18.32	11.62	3.93	2.67	4.29	2.16	164.19
24	39G4	5.17	7.57	19.41	18.02	8.06	2.58	2.77	3.05	1.69	68.32
24	Total	1,116.04	122.86	71.79	63.96	31.03	10.50	10.09	13.30	6.62	1,446.19
22-24	Total	2,254.95	691.97	250.69	294.56	339.77	323.67	221.78	96.27	61.97	4,535.63
21-24	Total	9,898.94	798.70	252.57	294.56	339.77	323.67	221.78	96.27	61.97	12,288.23

Table 8: **FRV "Solea", cruise 694/2014. Mean weight (g) of herring incl. CBH by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0	16.77	38.18	50.00							20.97
21	41G1	14.37	38.09	62.43							14.93
21	41G2	12.35	39.95	50.00							12.80
21	42G1	14.68	45.07	60.71							18.02
21	42G2	8.33	26.59								8.34
21	43G1	10.53	31.26								10.61
21	43G2	8.38	26.59								8.39
21	Total	10.61	40.14	60.36							11.03
22	37G0	14.50	33.69	54.42	62.63	62.63					18.39
22	37G1	14.49	36.18	61.05	91.98	73.73	75.25				20.02
22	38G0	15.40	33.94	47.52							21.33
22	38G1	13.56	36.13	50.49	62.63	62.63					16.73
22	39F9	10.67									10.67
22	39G0	15.32	35.04	47.25							23.94
22	39G1	19.22	32.36								25.00
22	40F9	15.21	35.44	66.56	79.17	154.93	172.65				27.47
22	40G0	15.21	35.44	66.56	79.17	154.93	172.65				27.45
22	40G1	22.03	42.33	64.56	109.06	70.34					44.41
22	41G0	22.16	34.60	89.82	114.34	123.00	75.25				32.69
22	Total	15.09	35.34	63.84	90.90	131.43	166.18				23.77
23	39G2	11.95	35.72	57.60	68.36	87.05	46.29	58.82	78.77	84.85	16.66
23	40G2	12.04	54.85	100.96	127.24	184.87	202.71	216.03	222.36	241.47	168.32
23	41G2	7.99	39.28	88.93	131.91	168.96	184.21	182.56	177.17	206.19	10.10
23	Total	9.17	53.84	100.58	127.05	184.76	202.55	215.93	221.99	241.29	149.32
24	37G2	11.07	36.26	35.64	44.33		37.58				14.00
24	37G3	5.83	36.98	67.92	79.26	105.49	84.53	65.56	95.49	79.97	11.36
24	37G4	9.03	38.82	65.06	72.22	85.13	54.64	57.28	85.84	89.25	23.50
24	38G2	9.45	30.66	34.12	40.67		36.89				10.83
24	38G3	6.75	35.98	63.66	68.56	87.44	64.64	62.71	77.17	67.53	13.08
24	38G4	9.03	38.82	65.06	72.22	85.13	54.64	57.28	85.84	89.25	23.50
24	39G2	11.95	35.72	57.60	68.36	87.05	46.29	58.82	78.77	84.85	16.65
24	39G3	11.76	37.82	65.23	75.42	87.86	101.58	64.89	89.31	91.60	39.77
24	39G4	15.02	44.29	64.17	73.15	78.80	82.76	65.12	74.84	73.62	63.79
24	Total	9.44	36.76	63.77	72.54	84.95	78.40	62.52	82.88	82.89	20.75
22-24	Total	11.78	39.11	87.49	113.23	174.65	198.00	208.95	202.77	224.37	68.81
21-24	Total	10.88	39.24	87.29	113.23	174.65	198.00	208.95	202.77	224.37	32.36

Table 9: **FRV "Solea", cruise 694/2014. Total biomass (t) of herring incl. CBH by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0	1,793.1	989.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	2,786.7
21	41G1	6,699.4	386.6	34.3	0.0	0.0	0.0	0.0	0.0	0.0	7,120.4
21	41G2	6,763.0	358.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	7,124.4
21	42G1	5,605.0	2,039.9	71.6	0.0	0.0	0.0	0.0	0.0	0.0	7,716.5
21	42G2	15,248.1	17.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15,265.4
21	43G1	43,583.0	491.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44,074.8
21	43G2	1,441.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,443.0
21	Total	81,132.9	4,284.7	113.5	0.0	0.0	0.0	0.0	0.0	0.0	85,531.1
22	37G0	1,517.1	786.3	46.3	23.2	4.4	0.0	0.0	0.0	0.0	2,377.3
22	37G1	3,317.6	1,763.8	309.5	269.5	69.3	13.6	0.0	0.0	0.0	5,743.3
22	38G0	2,720.4	2,788.9	19.0	0.0	0.0	0.0	0.0	0.0	0.0	5,528.3
22	38G1	957.3	384.4	13.1	9.4	1.9	0.0	0.0	0.0	0.0	1,366.2
22	39F9	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.1
22	39G0	573.3	1,006.4	7.1	0.0	0.0	0.0	0.0	0.0	0.0	1,586.7
22	39G1	31.3	41.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.8
22	40F9	170.4	283.5	20.6	23.0	26.3	29.4	0.0	0.0	0.0	553.2
22	40G0	4,255.6	7,081.3	523.2	575.6	649.2	723.4	0.0	0.0	0.0	13,808.2
22	40G1	283.1	660.8	132.4	442.8	44.3	0.0	0.0	0.0	0.0	1,563.3
22	41G0	398.7	668.1	37.7	129.2	41.8	9.8	0.0	0.0	0.0	1,285.3
22	Total	14,260.9	15,464.8	1,108.9	1,472.57	837.2	776.1	0.00	0.00	0.0	33,920.4
23	39G2	651.5	222.5	78.3	48.54	21.8	12.0	5.29	15.75	5.1	1,060.9
23	40G2	40.7	6,820.6	16,145.5	27,144.1	55,758.6	62,402.3	45,664.4	18,395.8	13,348.5	245,720.5
23	41G2	1,085.9	35.4	22.2	47.5	86.2	73.7	40.2	7.1	2.1	1,400.2
23	Total	1,778.1	7,078.5	16,246.1	27,240.1	55,866.6	62,488.0	45,709.9	18,418.7	13,355.6	248,181.6
24	37G2	1,094.4	422.4	11.1	27.0	0.0	9.0	0.0	0.0	0.0	1,563.9
24	37G3	181.0	46.6	43.5	48.4	35.9	3.4	3.9	22.0	4.8	389.4
24	37G4	584.6	271.4	389.1	390.7	234.1	34.4	48.1	87.6	49.1	2,089.0
24	38G2	1,721.4	370.1	12.6	1.6	0.0	3.7	0.0	0.0	0.0	2,109.4
24	38G3	1,987.5	698.0	673.5	536.1	182.8	43.3	112.3	149.7	59.4	4,442.7
24	38G4	1,082.3	502.3	719.6	722.9	433.3	63.4	88.8	163.1	91.9	3,867.7
24	39G2	2,863.1	978.4	345.0	213.3	94.0	53.2	24.1	68.5	21.2	4,660.9
24	39G3	942.7	892.2	1,138.3	1,381.7	1,020.9	399.2	173.3	383.1	197.9	6,529.2
24	39G4	77.7	335.3	1,245.5	1,318.2	635.1	213.5	180.4	228.3	124.4	4,358.3
24	Total	10,534.7	4,516.6	4,578.1	4,639.9	2,636.1	823.2	630.8	1,102.3	548.7	30,010.5
22-24	Total	26,573.7	27,059.9	21,933.1	33,352.6	59,339.9	64,087.2	46,340.7	19,520.9	13,904.4	312,112.4
21-24	Total	107,706.7	31,344.6	22,046.5	33,352.6	59,339.9	64,087.2	46,340.7	19,520.9	13,904.4	397,643.5

Table 10: FRV "Solea", cruise 694/2014. Numbers (millions) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0	0.00	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94
21	41G1	1.17	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56
21	41G2	7.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.57
21	42G1	1.11	0.65	0.00	0.98	0.59	0.20	0.00	0.00	0.00	3.53
21	42G2	37.53	0.57	0.00	0.12	0.06	0.00	0.00	0.00	0.00	38.28
21	43G1	5.04	1.68	0.00	0.56	0.56	0.56	1.68	0.00	0.00	10.08
21	43G2	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16
21	Total	52.58	4.23	0.00	1.66	1.21	0.76	1.68	0.00	0.00	62.12
22	37G0	8.08	14.90	8.45	7.75	8.27	0.29	0.00	0.00	0.00	47.74
22	37G1	87.53	131.48	28.21	25.97	33.50	2.53	0.00	0.00	0.00	309.22
22	38G0	105.00	24.96	22.25	24.62	28.83	1.50	0.00	0.00	0.00	207.16
22	38G1	0.26	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.39
22	39F9	947.91	1.87	0.91	0.11	0.11	0.00	0.00	0.00	0.00	950.91
22	39G0	53.22	17.42	6.47	2.82	2.62	0.24	0.00	0.00	0.00	82.79
22	39G1	74.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.78
22	40F9	0.98	0.52	0.54	1.03	1.60	0.01	0.00	0.00	0.00	4.68
22	40G0	24.50	12.89	13.50	25.74	39.98	0.23	0.00	0.00	0.00	116.84
22	40G1	0.90	1.70	1.18	2.79	3.36	0.00	0.00	0.00	0.00	9.93
22	41G0	0.00	11.86	2.25	1.27	1.21	0.04	0.00	0.00	0.00	16.63
22	Total	1,303.16	217.71	83.78	92.10	119.48	4.84	0.00	0.00	0.00	1,821.07
23	39G2	42.94	6.24	1.05	1.33	0.33	0.45	0.23	0.02	0.00	52.59
23	40G2	15.72	17.72	4.91	24.31	30.13	20.92	5.46	2.36	1.99	123.52
23	41G2	62.74	8.58	1.47	0.00	0.00	0.00	0.00	0.00	0.00	72.79
23	Total	121.40	32.54	7.43	25.64	30.46	21.37	5.69	2.38	1.99	248.90
24	37G2	3.29	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.66
24	37G3	585.83	261.87	18.63	4.78	0.87	2.72	0.37	0.00	0.00	875.07
24	37G4	1,313.79	123.52	9.21	9.03	3.43	3.98	1.35	0.11	0.00	1,464.42
24	38G2	668.34	527.90	45.20	63.86	17.70	25.73	6.86	0.53	0.00	1,356.12
24	38G3	6,328.66	782.79	50.44	41.63	14.48	17.49	3.88	0.70	0.00	7,240.07
24	38G4	2,432.30	228.68	17.04	16.72	6.36	7.37	2.50	0.20	0.00	2,711.17
24	39G2	188.72	27.42	4.61	5.84	1.43	1.96	1.02	0.08	0.00	231.08
24	39G3	974.55	1,189.67	134.61	186.61	37.33	68.27	22.31	0.88	0.00	2,614.23
24	39G4	11.87	109.14	14.31	23.59	4.48	6.86	1.87	0.20	0.00	172.32
24	Total	12,507.35	3,251.36	294.05	352.06	86.08	134.38	40.16	2.70	0.00	16,668.14
22-24	Total	13,931.91	3,501.61	385.26	469.80	236.02	160.59	45.85	5.08	1.99	18,738.11
21-24	Total	13,984.49	3,505.84	385.26	471.46	237.23	161.35	47.53	5.08	1.99	18,800.23

Table 11: FRV "Solea", cruise 694/2014. Mean weight (g) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0		17.33								17.33
21	41G1	1.62	13.00								4.47
21	41G2	2.04									2.04
21	42G1	4.42	12.55		21.93	22.33	24.33				14.90
21	42G2	4.13	6.60		21.33	21.33					4.25
21	43G1	2.00	20.00		24.33	24.33	24.33	27.00			12.89
21	43G2	2.00									2.00
21	Total	3.57	15.81		22.70	23.21	24.33	27.00			6.19
22	37G0	4.96	16.43	18.75	20.24	20.78	18.65				16.28
22	37G1	6.91	15.48	18.34	21.04	21.87	23.25				14.54
22	38G0	1.30	17.10	19.02	20.89	21.49	21.65				10.39
22	38G1	7.35	16.16	16.16							10.29
22	39F9	1.35	17.70	17.70	17.70	17.70					1.40
22	39G0	3.94	16.47	18.12	19.95	20.20	18.65				8.79
22	39G1	5.57									5.57
22	40F9	2.31	16.35	19.49	20.96	21.95	18.65				16.71
22	40G0	2.31	16.35	19.49	20.96	21.95	18.65				16.71
22	40G1	2.63	15.35	20.15	21.03	21.49					18.44
22	41G0	0.00	15.28	18.13	20.09	20.22	18.65				16.40
22	Total	2.11	15.87	18.75	20.86	21.66	21.98				6.80
23	39G2	4.11	12.98	15.74	16.18	17.28	14.83	15.58	19.5		5.93
23	40G2	4.97	16.94	17.07	21.49	22.52	23.38	23.86	28.63	30.64	19.52
23	41G2	2.14	11.37	12.21							3.43
23	Total	3.20	14.71	15.92	21.21	22.46	23.20	23.53	28.55	30.64	11.94
24	37G2	5.61	7.10								5.76
24	37G3	3.58	9.82	10.49	14.49	14.49	13.67	15.85			5.70
24	37G4	4.56	11.57	13.49	15.60	18.10	14.06	16.78	19.50		5.35
24	38G2	4.87	12.61	15.27	15.70	16.96	14.39	16.32	19.50		9.14
24	38G3	3.56	11.27	12.15	15.97	18.25	14.22	16.99	19.50		4.59
24	38G4	4.56	11.57	13.49	15.60	18.10	14.06	16.78	19.50		5.35
24	39G2	4.11	12.98	15.74	16.18	17.28	14.83	15.58	19.50		5.93
24	39G3	4.58	12.72	15.26	15.89	16.28	14.71	16.42	19.50		10.18
24	39G4	4.54	12.22	14.94	16.68	17.77	15.45	16.36	19.50		12.85
24	Total	4.02	11.98	14.26	15.88	17.03	14.55	16.46	19.50		6.19
22-24	Total	3.83	12.25	15.27	17.15	20.08	15.92	17.34	23.74	30.64	6.32
21-24	Total	3.83	12.25	15.27	17.17	20.09	15.96	17.68	23.74	30.64	6.32

Table 12: FRV "Solea", cruise 694/2014. Total biomass (t) of sprat by age and area.

Sub-division	Rectangle/ Age group	0	1	2	3	4	5	6	7	8+	Total
21	41G0	0.0	16.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3
21	41G1	1.9	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
21	41G2	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4
21	42G1	4.9	8.2	0.0	21.5	13.2	4.9	0.0	0.0	0.0	52.6
21	42G2	155.0	3.8	0.0	2.6	1.3	0.0	0.0	0.0	0.0	162.6
21	43G1	10.1	33.6	0.0	13.6	13.6	13.6	45.4	0.0	0.0	129.9
21	43G2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
21	Total	187.7	66.9	0.0	37.7	28.1	18.5	45.4	0.0	0.0	384.1
22	37G0	40.1	244.8	158.4	156.9	171.9	5.4	0.0	0.0	0.0	777.5
22	37G1	604.8	2,035.3	517.4	546.4	732.7	58.8	0.0	0.0	0.0	4,495.4
22	38G0	136.5	426.8	423.2	514.3	619.6	32.5	0.0	0.0	0.0	2,152.9
22	38G1	1.9	1.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	4.0
22	39F9	1,279.7	33.1	16.1	2.0	2.0	0.0	0.0	0.0	0.0	1,332.8
22	39G0	209.7	286.9	117.2	56.3	52.9	4.5	0.0	0.0	0.0	727.5
22	39G1	416.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	416.5
22	40F9	2.3	8.5	10.5	21.6	35.1	0.2	0.0	0.0	0.0	78.2
22	40G0	56.6	210.8	263.1	539.5	877.6	4.3	0.0	0.0	0.0	1,951.8
22	40G1	2.4	26.1	23.8	58.7	72.2	0.0	0.0	0.0	0.0	183.1
22	41G0	0.0	181.2	40.8	25.5	24.5	0.8	0.0	0.0	0.0	272.7
22	Total	2,750.4	3,455.3	1,570.9	1,921.1	2,588.3	106.4	0.0	0.0	0.0	12,392.4
23	39G2	176.5	81.0	16.5	21.5	5.7	6.7	3.6	0.4	0.0	311.9
23	40G2	78.1	300.2	83.8	522.4	678.5	489.1	130.3	67.6	61.0	2,411.0
23	41G2	134.3	97.6	18.0	0.0	0.0	0.0	0.0	0.0	0.0	249.8
23	Total	388.9	478.7	118.3	543.9	684.2	495.8	133.9	68.0	61.0	2,972.6
24	37G2	18.5	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.1
24	37G3	2,097.3	2,571.6	195.4	69.3	12.6	37.2	5.9	0.0	0.0	4,989.2
24	37G4	5,990.9	1,429.1	124.2	140.9	62.1	56.0	22.7	2.2	0.0	7,828.0
24	38G2	3,254.8	6,656.8	690.2	1,002.6	300.2	370.3	112.0	10.3	0.0	12,397.2
24	38G3	22,530.0	8,822.0	612.9	664.8	264.3	248.7	65.9	13.7	0.0	33,222.3
24	38G4	11,091.3	2,645.8	229.9	260.8	115.1	103.6	42.0	3.9	0.0	14,492.4
24	39G2	775.6	355.9	72.6	94.5	24.7	29.1	15.9	1.6	0.0	1,369.8
24	39G3	4,463.4	15,132.6	2,054.2	2,965.2	607.7	1,004.3	366.3	17.2	0.0	26,610.9
24	39G4	53.9	1,333.7	213.8	393.5	79.6	106.0	30.6	3.9	0.0	2,214.9
24	Total	50,275.7	38,950.2	4,193.1	5,591.6	1,466.3	1,955.0	661.2	52.7	0.0	103,145.8
22-24	Total	53,415.0	42,884.2	5,882.3	8,056.6	4,738.8	2,557.2	795.0	120.6	61.0	118,510.8
21-24	Total	53,602.7	42,951.1	5,882.3	8,094.3	4,766.9	2,575.7	840.4	120.6	61.0	118,894.9

Table 13: FRV "Solea", cruise 694/2014. Numbers (m) of herring excl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	106.92	25.92	0.08	0.00	0.00	0.00	0.00	0.00	0.00	132.92	
21	41G1	466.21	10.15	0.55	0.00	0.00	0.00	0.00	0.00	0.00	476.91	
21	41G2	547.61	8.96	0.07	0.00	0.00	0.00	0.00	0.00	0.00	556.64	
21	42G1	381.81	45.26	1.18	0.00	0.00	0.00	0.00	0.00	0.00	428.25	
21	42G2	1,830.50	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,831.15	
21	43G1	4,138.94	15.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,154.67	
21	43G2	172.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	172.06	
21	Total	7,643.99	106.73	1.88	0.00	0.00	0.00	0.00	0.00	0.00	7,752.60	
22	37G0	104.63	23.34	0.85	0.37	0.07	0.00	0.00	0.00	0.00	129.26	
22	37G1	228.96	48.75	5.07	2.93	0.94	0.18	0.00	0.00	0.00	286.83	
22	38G0	176.65	82.17	0.40	0.00	0.00	0.00	0.00	0.00	0.00	259.22	
22	38G1	70.60	10.64	0.26	0.15	0.03	0.00	0.00	0.00	0.00	81.68	
22	39F9	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	
22	39G0	37.42	28.72	0.15	0.00	0.00	0.00	0.00	0.00	0.00	66.29	
22	39G1	1.63	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.91	
22	40F9	11.20	8.00	0.31	0.29	0.17	0.17	0.00	0.00	0.00	20.14	
22	40G0	279.79	199.81	7.86	7.27	4.19	4.19	0.00	0.00	0.00	503.11	
22	40G1	12.85	15.61	2.05	4.06	0.63	0.00	0.00	0.00	0.00	35.20	
22	41G0	17.99	19.31	0.42	1.13	0.34	0.13	0.00	0.00	0.00	39.32	
22	Total	945.10	437.63	17.37	16.20	6.37	4.67	0.00	0.00	0.00	1,427.34	
23	39G2	54.52	6.01	1.18	0.50	0.18	0.02	0.00	0.06	0.02	62.49	
23	40G2	3.38	124.35	159.92	213.33	301.61	307.84	211.38	82.73	55.28	1,459.82	
23	41G2	135.91	0.90	0.25	0.36	0.51	0.4	0.22	0.04	0.01	138.60	
23	Total	193.81	131.26	161.35	214.19	302.30	308.26	211.60	82.83	55.31	1,660.91	
24	37G2	98.86	11.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110.51	
24	37G3	31.05	1.26	0.57	0.57	0.32	0.03	0.00	0.10	0.00	33.90	
24	37G4	64.74	6.95	5.85	4.47	2.30	0.15	0.00	0.35	0.35	85.16	
24	38G2	182.16	11.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	193.86	excl. CBH
24	38G3	294.45	18.63	10.05	6.70	1.53	0.25	0.00	0.36	0.00	331.97	
24	38G4	119.86	12.87	10.84	8.27	4.26	0.28	0.00	0.64	0.64	157.66	
24	39G2	239.59	26.43	5.17	2.21	0.80	0.09	0.00	0.28	0.09	274.66	
24	39G3	80.16	22.96	16.79	15.39	10.53	2.29	0.00	1.52	0.55	150.19	
24	39G4	5.17	7.48	19.20	16.69	6.87	1.40	0.00	0.00	0.00	56.81	
24	Total	1,116.04	119.93	68.47	54.30	26.61	4.49	0.00	3.25	1.63	1,394.72	
22-24	Total	2,254.95	688.82	247.19	284.69	335.28	317.42	211.60	86.08	56.94	4,482.97	
21-24	Total	9,898.94	795.55	249.07	284.69	335.28	317.42	211.60	86.08	56.94	12,235.57	

Table 14: FRV "Solea", cruise 694/2014. Mean weight (g) of herring excl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	16.77	38.18	50.00							20.97	
21	41G1	14.37	38.09	62.43							14.93	
21	41G2	12.35	39.95	50.00							12.80	
21	42G1	14.68	45.07	60.71							18.02	
21	42G2	8.33	26.59								8.34	
21	43G1	10.53	31.26								10.61	
21	43G2	8.38	26.59								8.39	
21	Total	10.61	40.14	60.36							11.03	
22	37G0	14.50	33.69	54.42	62.63	62.63					18.39	
22	37G1	14.49	36.18	61.05	91.98	73.73	75.25				20.02	
22	38G0	15.40	33.94	47.52							21.33	
22	38G1	13.56	36.13	50.49	62.63	62.63					16.73	
22	39F9	10.67									10.67	
22	39G0	15.32	35.04	47.25							23.94	
22	39G1	19.22	32.36								25.00	
22	40F9	15.21	35.44	66.56	79.17	154.93	172.65				27.47	
22	40G0	15.21	35.44	66.56	79.17	154.93	172.65				27.45	
22	40G1	22.03	42.33	64.56	109.06	70.34					44.41	
22	41G0	22.16	34.60	89.82	114.34	123.00	75.25				32.69	
22	Total	15.09	35.34	63.84	90.90	131.43	166.18				23.77	
23	39G2	11.95	36.29	60.84	76.10	96.09	105.00		103.50	100.50	16.12	
23	40G2	12.04	54.85	100.96	127.24	184.87	202.71	216.03	222.36	241.47	168.32	
23	41G2	7.99	39.28	88.93	131.91	168.96	184.21	182.56	177.17	206.19	10.10	
23	Total	9.17	53.89	100.65	127.13	184.79	202.68	216.00	222.25	241.41	149.39	
24	37G2	11.07	36.26								13.73	
24	37G3	5.83	36.98	71.44	81.86	108.69	105.00		113.73		10.75	
24	37G4	9.03	38.92	65.64	75.96	89.76	84.89		100.50	100.50	21.94	
24	38G2	9.45	30.99								10.75	
24	38G3	6.75	36.58	65.19	71.44	95.87	95.29		111.17		12.09	excl. CBH
24	38G4	9.03	38.92	65.64	75.96	89.76	84.89		100.50	100.50	21.93	
24	39G2	11.95	36.29	60.84	76.10	96.09	105.00		103.50	100.50	16.13	
24	39G3	11.76	38.31	66.31	79.58	90.57	132.69		109.40	130.71	37.66	
24	39G4	15.02	44.58	64.43	74.66	81.51	99.97				63.27	
24	Total	9.44	37.16	65.08	76.10	88.72	115.09		106.51	110.69	19.35	
22-24	Total	11.78	39.19	88.21	115.33	176.15	200.90	216.00	217.88	237.67	68.93	
21-24	Total	10.88	39.32	88.00	115.33	176.15	200.90	216.00	217.88	237.67	32.25	

Table 15: FRV "Solea", cruise 694/2014. Total biomass (t) of herring excl. CBH by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	1,793.1	989.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	2,786.7	
21	41G1	6,699.4	386.6	34.3	0.0	0.0	0.0	0.0	0.0	0.0	7,120.4	
21	41G2	6,763.0	358.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	7,124.4	
21	42G1	5,605.0	2,039.9	71.6	0.0	0.0	0.0	0.0	0.0	0.0	7,716.5	
21	42G2	15,248.1	17.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15,265.4	
21	43G1	43,583.0	491.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44,074.8	
21	43G2	1,441.4	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,443.0	
21	Total	81,132.9	4,284.7	113.5	0.0	0.0	0.0	0.0	0.0	0.0	85,531.1	
22	37G0	1,517.1	786.3	46.3	23.2	4.4	0.0	0.0	0.0	0.0	2,377.3	
22	37G1	3,317.6	1,763.8	309.5	269.5	69.3	13.6	0.0	0.0	0.0	5,743.3	
22	38G0	2,720.4	2,788.9	19.0	0.0	0.0	0.0	0.0	0.0	0.0	5,528.3	
22	38G1	957.3	384.4	13.1	9.4	1.9	0.0	0.0	0.0	0.0	1,366.2	
22	39F9	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.1	
22	39G0	573.3	1,006.4	7.1	0.0	0.0	0.0	0.0	0.0	0.0	1,586.7	
22	39G1	31.3	41.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	72.8	
22	40F9	170.4	283.5	20.6	23.0	26.3	29.4	0.0	0.0	0.0	553.2	
22	40G0	4,255.6	7,081.3	523.2	575.6	649.2	723.4	0.0	0.0	0.0	13,808.2	
22	40G1	283.1	660.8	132.4	442.8	44.3	0.0	0.0	0.0	0.0	1,563.3	
22	41G0	398.7	668.1	37.7	129.2	41.8	9.8	0.0	0.0	0.0	1,285.3	
22	Total	14,260.9	15,464.8	1,108.9	1,472.57	837.2	776.1	0.00	0.00	0.0	33,920.4	
23	39G2	651.5	218.1	71.8	38.1	17.3	2.1	0.0	6.2	2.0	1,007.1	
23	40G2	40.7	6,820.6	16,145.5	27,144.1	55,758.6	62,402.3	45,664.4	18,395.8	13,348.5	245,720.5	
23	41G2	1,085.9	35.4	22.2	47.5	86.2	73.7	40.2	7.1	2.1	1,400.2	
23	Total	1,778.1	7,074.1	16,239.5	27,229.7	55,862.1	62,478.0	45,704.6	18,409.1	13,352.5	248,127.8	
24	37G2	1,094.4	422.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,516.8	
24	37G3	181.0	46.6	40.7	46.7	34.8	3.2	0.0	11.4	0.0	364.3	
24	37G4	584.6	270.5	384.0	339.5	206.5	12.7	0.0	35.2	35.2	1,868.1	
24	38G2	1,721.4	362.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,084.0	
24	38G3	1,987.5	681.5	655.2	478.7	146.7	23.8	0.0	40.0	0.0	4,013.4	excl. CBH
24	38G4	1,082.3	500.9	711.5	628.2	382.4	23.8	0.0	64.3	64.3	3,457.8	
24	39G2	2,863.1	959.1	314.5	168.2	76.9	9.5	0.0	29.0	9.1	4,429.3	
24	39G3	942.7	879.6	1,113.3	1,224.7	953.7	303.9	0.0	166.3	71.9	5,656.1	
24	39G4	77.7	333.5	1,237.1	1,246.1	560.0	140.0	0.0	0.0	0.0	3,594.2	
24	Total	10,534.7	4,456.7	4,456.4	4,132.0	2,360.8	516.7	0.0	346.2	180.4	26,983.9	
22-24	Total	26,573.7	26,995.6	21,804.8	32,834.3	59,060.1	63,770.9	45,704.6	18,755.3	13,533.0	309,032.1	
21-24	Total	107,706.7	31,280.2	21,918.2	32,834.3	59,060.1	63,770.9	45,704.6	18,755.3	13,533.0	394,563.2	

Fisheries Service under the Ministry of Agriculture of Republic of Lithuania,

Fishery Research and Science State

RESEARCH REPORT FROM THE BALTIC INTERNATIONAL ACOUSTIC SURVEY (BIAS) IN THE ICES SUBDIVISION 26

(LITHUANIAN ESPECIAL ECONOMIC ZONE) OF THE BALTIC SEA

(R/V "DARIUS"; 02.10. - 03.10.2014)

Klaipeda, October, 2014

Lithuania

1 INTRODUCTION

The main objective is to assess clupeid 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 (FS) with an index value for the stock size of herring, sprat and other species in the Subdivision 26 of the Baltic area.

The principal aims of the Lithuanian BIAS surveys organized and realized by the Fishery Research and Science State delegates on board of the R/V "Darius" were:

- annual verification of herring, sprat and cod stocks size and their spatial distribution in the pelagic zone of the Lithuanian Especial Economic Zone (LEEZ) waters with applied an acoustic method, along preselected transects on the distance of 112 nautical miles (NM),
- determination of herring, sprat and cod (usually dominants in catches) proportion by numbers and by mass in pelagic control-catches and an evaluation of their fishing efficiency, i.e. catch per unit effort (CPUE) in the investigated area,
- characteristics of dominants age-length-mass structure, sex, sexual maturation, feeding intensity,
- a preliminary evaluation of herring and sprat new recruiting year-class strength,
- analysis of the vertical and horizontal changes of the basic hydrological parameters (seawater temperature, salinity, oxygen content) in areas inspected by the R/V "Darius".

2 MATERIALS AND METHODS

2.1 Personnel

The main research tasks of the BIAS survey on board of the R/V "Darius" were realized by the Fishery Research and Science State (FS FRSS) two members of the scientific team. The group of researchers was composed of:

M. Spegys, FS FRSS, Klaipeda - cruise leader and acoustics;
E. Fedotova, FS FRSS, Klaipeda – scientific staff and fish sampling.

2.2 Narrative

The reported BIAS survey of the R/V "Darius" took place during the period of 2-3 October in 2014. The vessel left the port of Klaipeda on 02.10.2014 early morning.

On next day 03.10.2014 evening, the research activity had been stopped and the vessel returned back to the homeport. During research time was intended to cover parts of ICES subdivision (SD) 26, constituting the LEEZ.

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 1520 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 20th of May 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: 20.05.2014	Place : near Klaipeda port
Type of transducer	Split – beam for 38 kHz
Gain (38 kHz)	21.94 dB
Athw. Angle Sens	12.5
Along. Angle Sens	12.5
Athw. Beam Angle	12.06
Along. Beam Angle	11.96
Athw. Offset Angle	0.07
Along. Offset Angle	-0.06
SA Correction (38 kHz)	-0.82 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 of the single haul lasted for 30 minutes. On the whole, 7 catch samples were taken in the Lithuanian EEZ. 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 each rectangle was estimated as the product of the mean NASCs scrutinized acoustic data and a rectangle area, divided by corresponded the mean acoustic cross-section. Clupeids abundance was separated into herring and sprat according to the mean catch composition.

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

Caught fishes, before the length measurements, were separated by species and weighed, and the species composition, the mean share in mass (proportion) as well as the CPUE was determined for given species from each control-haul. The sample of fish dominants from each catch-station was taken for the length-mass structure analyses. Fish sampling the total length distribution and the mean mass at the 0.5-cm classes - in the case of clupeids and 1-cm classes in the case of cod were determined. Overall, in 7 trawl hauls was measured for 656 herring, 1499 sprat, 4 cod, 100 three-spined sticklebacks, 3 river lampreys, and 1 great sand eel. Totally, 409 individuals of sprat, 414 of herring and 4 of cod were biologically analyzed (age, sex, maturity, stomach fullness). The results of the catch composition are presented in Table 1. Ichthyological analyses were performed directly on board of surveying vessel, according to the ICES WGBIFS standard procedures. The numerical share of juvenile, undersized (below minimum landing/protective size) sprat, herring and cod in samples was determined based on fish length distribution results. For sprat the minimum commercial size (the separate length) is equal to 10.0 cm, for herring is equal to 16.0 cm and for cod is 38.0 cm.

The length distributions of herring and sprat of the October 2014 presented in Fig. 2 and 3. In the coastal rectangle (40H0) practically wasn't herring. Herring length dominated 16.0 – 20.5 cm length class in this area and there were about 8% of young (0+ age class) fish. In 40G9 rectangle fish stock was represented practically by herring. In this rectangle herring dominated 16.5 – 23.0 cm length class and there were not found young herring.

Sprat was dominated in all catches of 40H0 ICES rectangle. Sprat was represented by two size groups in the rectangle 40H0: 5.5 – 8.5 cm and 10.5-12.5 cm. In the western part of LEEZ (40G9 rectangle ICES) sprat was represented only adult fish 10.5-12.5 cm length classes.

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 2-12.

3.3 Abundance estimates

R/V "Darius" survey statistics (aggregated data for herring and sprat), included the total abundance of herrings and sprats are presented in Tables 2-4. The estimated age composition of sprat and herring are given in Tables 5, 10. The estimated number sprat and herring by age group and rectangle are given in Table 6, 11. The estimates of sprat and herring biomass by age group and rectangle are summarised in Table 7, 12. The corresponding mean weights and mean length by age group and rectangle for each species are shown in Table 8-9 and 13-14.

The herring stock was estimated to be $1658.4*10^6$ fish or about 91662 tones. The abundance estimates were dominated by age 2, and 5 - 6 ages herring in rectangle 40H0 and by 3, 5-8 ages herring in rectangle 40G9 (Fig. 2 and Table 8).

The sprat stock was estimated to be $11565.2*10^6$ fish or about 50575 tones. More than 75% of all aged sprats were young (0+ age class) fish in rectangle 40H0 and by ages 2-5 fish (>83%) in the rectangle 40G9 (Fig. 3 and Table 5).

Comparison of the acoustic results from last five years (2010-2014) indicated that investigated herring stock abundance have decreasing tendency in ICES rectangle 40H0. The highest average parameters of the herring stock densities were recorded this year in ICES rectangle 40G9 (Fig.4). At the same time investigated sprat stock have decreasing tendency in this rectangle in 2013-2014 The distribution of the high density sprat concentrations were indicated in the northern part of the ICES rectangle 40H0 (Fig.5).

3.4 Hydrologic data

The basic hydrological parameters (seawater temperature, salinity and oxygen contents) were measured from the surface to the bottom after every haul if weather conditions were favorable. Totally, 7 hydrological stations were inspected in October 2014 by r/v "Darius". The hydrological and hydro biological research profiles location is presented in Figure 5.

The seawater temperature varied from 10 ºC to 14 ºC in the surface layer in 40H0 ICES rectangle and 9 – 11 ºC in 40G9 ICES rectangle. The lowest temperature (8.5 ºC) was in 25 -30 m depth. Deeper temperate equable grow from 8.5 ºC until 11 - 12 ºC in 60 - 80 m depth. The salinity is 7.5 ‰ 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 trawl hauls position of R/V "DARIUS" (2-3 October 2014)

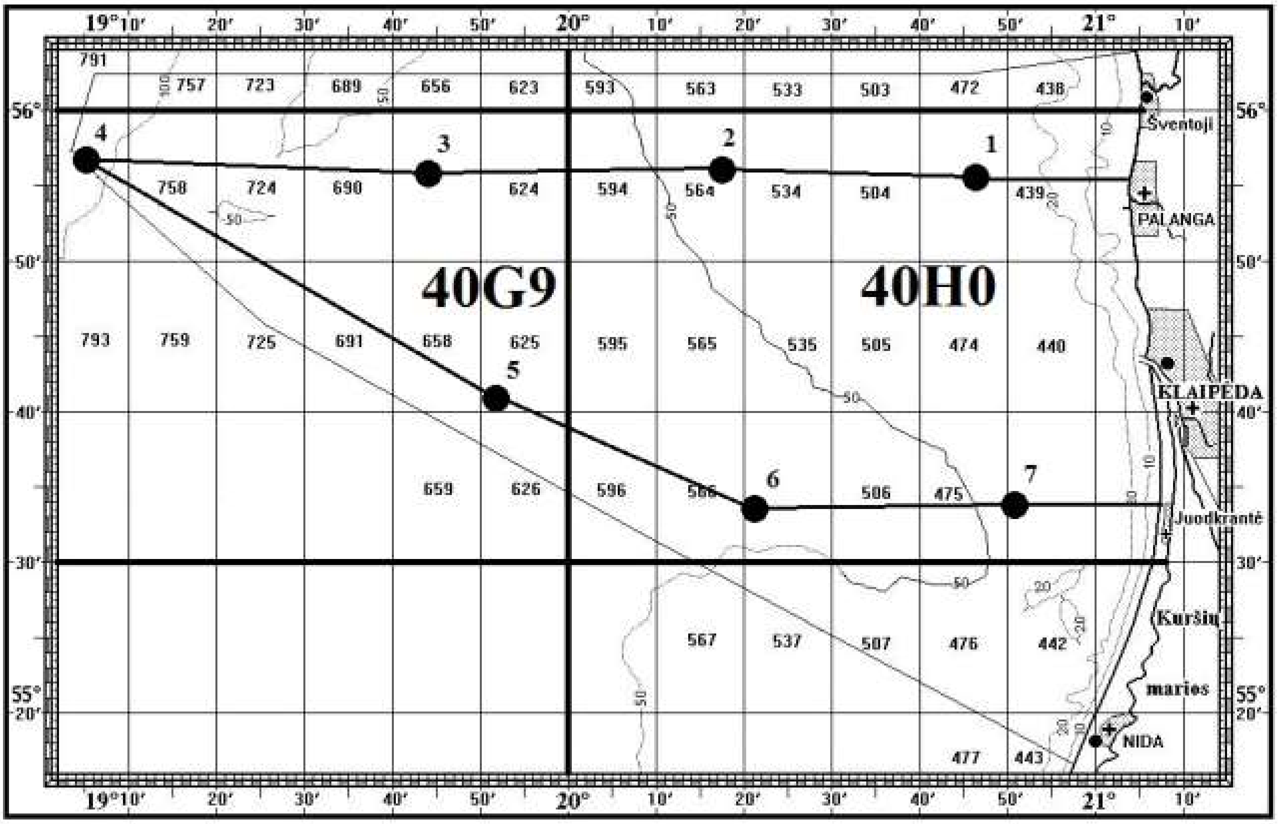


Table 1 Catch composition (kg/1hour) per haul (R/V "Darius", 2.10- 3.10.2014)

ICES subdivision 26							
Haul No	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Date	**02.10.2013**	**02.10.2013**	**02.10.2013**	**03.10.2013**	**03.10.2013**	**03.10.2013**	**03.10.2013**
Validity	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**
Species/ICES rectangle	**40H0**	**40H0**	**40G9**	**40G9**	**40G9**	**40H0**	**40H0**
CLUPEA HARENGUS		1.51		90.0	596.38	21.11	1.64
SPRATTUS SPRATTUS	200.0	298.49	18.06			3.72	200.0
GADUS MORHUA					3.62	1.32	
GASTEROSTEUS ACULEATUS				0.94			
HYPEROPLUS LANCEOLATUS	0.166						
LAMPETRA FLUVIATILUS	0.166						0.37
Total	200.332	300.0	18.06	90.94	600.0	26.15	202.01

Figure 2 Length composition of herring (%) (R/V "Darius", 2.10- 3.10.2014

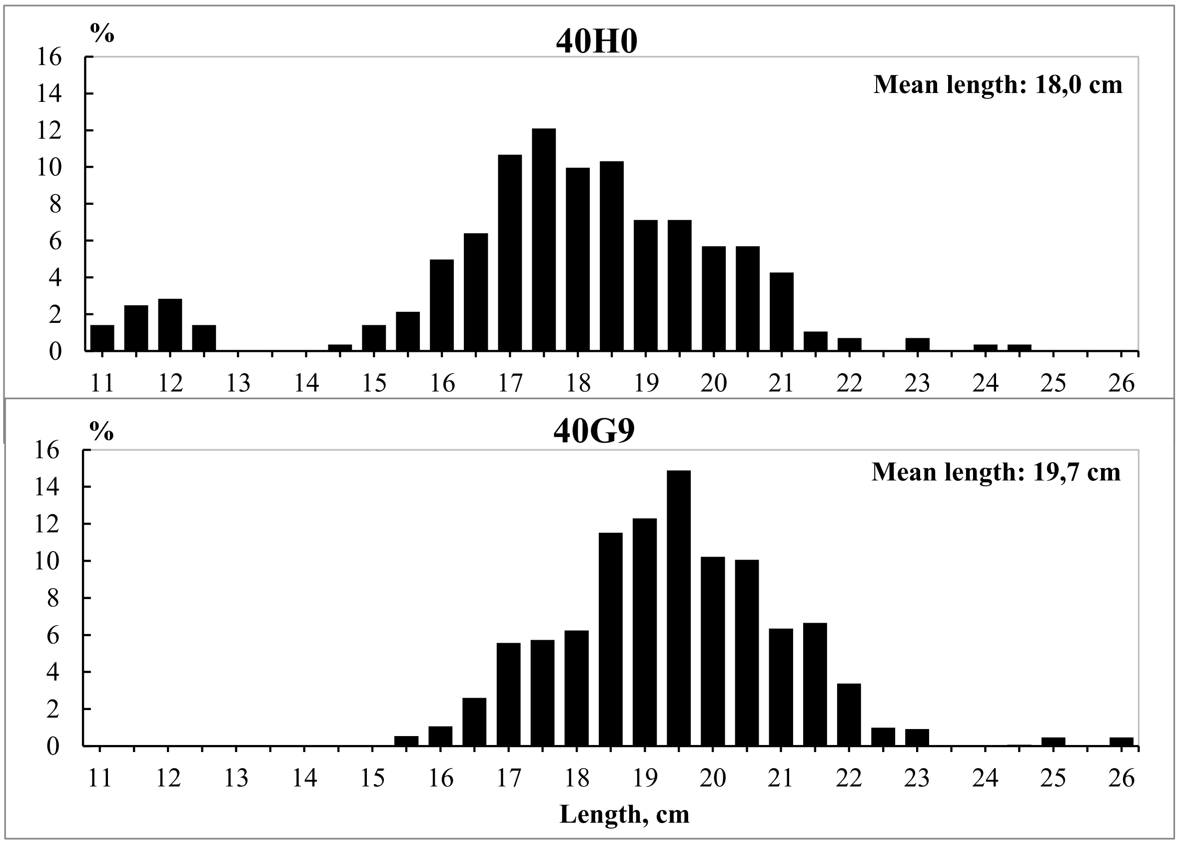


Figure 3 Length distribution of sprat (%) (R/V "Darius", 2.10- 3.10.2014)

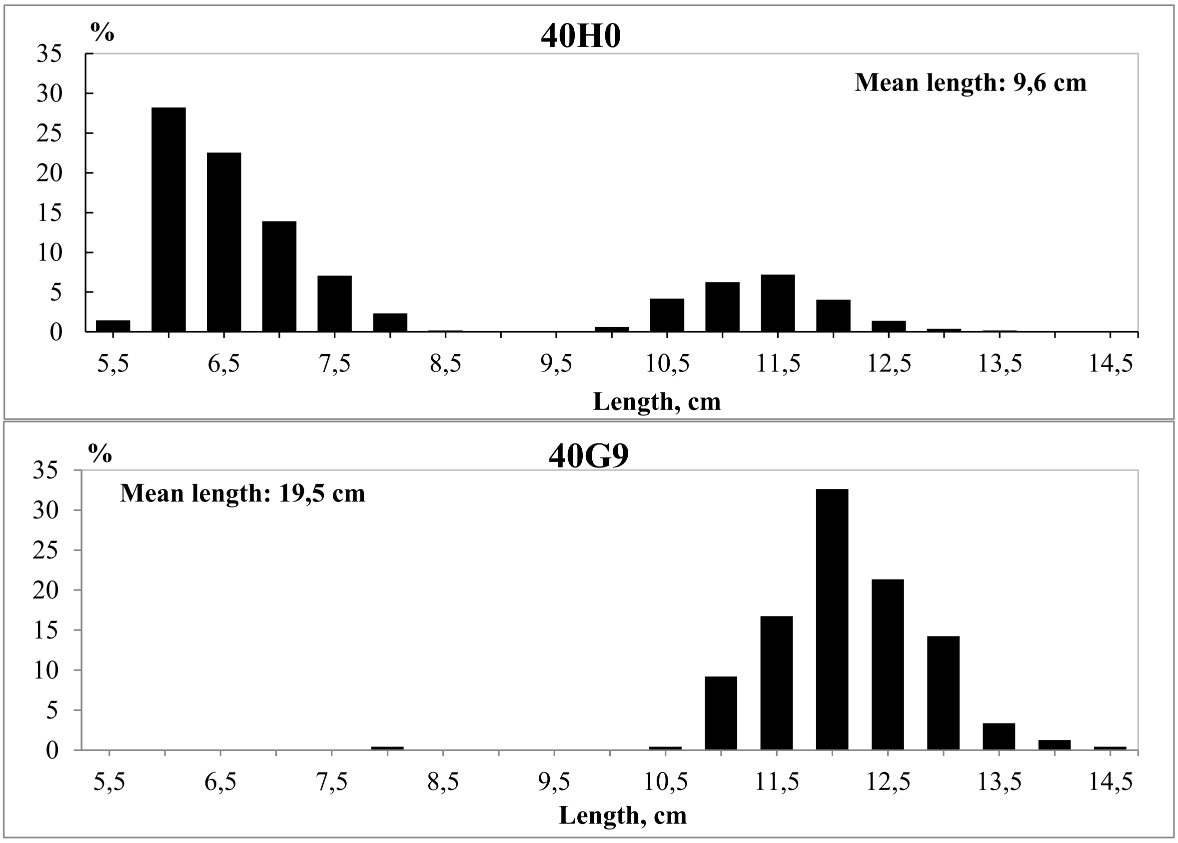


Table 2 R/V "DARIUS" survey statistics (abundance of herring and sprat), 02.10- 03.10.2014

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	11,29	11428,4	38,6	11389,8	49872	1665	48207
	40G9	1013,0	1,77	1795,1	1619,8	175,3	92365	89997	2368

Table 3 R/V "DARIUS" survey statistics (aggregated data of herring and sprat), 02.10- 03.10.2014

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	1,2,6,7	17,99	43,16	0,34	7,95	4,23	99,66	739,2	-52,8
	40G9	1,2,6,7	19,67	55,56	90,23	12,39	13,51	9,77	619,4	-45,6

Table 4 R/V "DARIUS" survey statistics (herring and sprat), 02.10- 03.10.2014

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	739,2	0,65463	11428,4	0,34	99,66
	40G9	1013	619,4	3,49529	1795,1	90,23	9,77

Table 5 R/V "Darius" estimated age composition (%) of sprat, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0	75,7	7,9	6,7	5,7	2,6	0,8	0,2	0,1	0,3
	40G9	100,0	0,4	7,9	12,2	36,1	23,2	11,9	7,9	0,5	0,0

Table 6 R/V "Darius" estimated number (millions) of sprat, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	11389,8	8626,0	902,0	764,7	646,9	294,3	91,7	19,1	14,2	31,0
	40G9	175,3	0,7	13,8	21,3	63,2	40,7	20,8	13,8	0,8	0,0

Table 7 R/V "Darius" estimated biomass (in tons) of sprat, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	48207	17997	8442	8327	7569	3752	1248	271	203	399
	40G9	2368	3	154	247	847	580	299	224	14	0

Table 8 R/V "Darius" estimated mean weights (g) of sprat, 02.10- 03.10.2014

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	4,23	2,1	9,4	10,9	11,7	12,7	13,6	14,2	14,3	12,9
	40G9	13,51	3,7	11,1	11,6	13,4	14,2	14,4	16,2	16,9	

Table 9 R/V "Darius" estimated mean length (cm) of sprat, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	7,9	6,5	10,7	11,3	11,6	12,1	12,5	12,8	12,9	12,1
	40G9	12,4	8,0	11,2	11,4	12,1	12,4	12,5	13,3	13,5	

Table 10 R/V "Darius" estimates age composition (%) of herring, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0	8,2	10,5	4,8	19,8	9,4	17,1	18,2	6,2	5,9
	40G9	100,0		0,4	2,5	14,5	9,0	22,4	26,2	13,0	12,0

Table 11 R/V "Darius" estimated number (millions) of herring, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	38,6	3,2	4,1	1,8	7,6	3,6	6,6	7,0	2,4	2,3
	40G9	1619,8		5,7	40,9	234,7	146,1	362,1	424,2	211,0	195,1

Table 12 R/V "Darius" estimated biomass (in tons) of herring, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	1665	36	122	77	304	154	315	361	144	152
	40G9	89997		213	1548	10979	6821	19289	24823	13573	12752

Table 13 R/V "Darius" estimated mean weights (g) of herring, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	43,2	11,6	30,1	41,8	39,7	42,4	47,6	51,5	60,7	67,2
	40G9	55,6		37,3	37,9	46,8	46,7	53,3	58,5	64,3	65,4

Table 14 R/V "Darius" estimated mean length (cm) of herring, 02.10- 03.10.2014

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	18,0	11,7	15,9	17,6	17,5	17,9	18,6	19,1	20,3	20,8
	40G9	19,7		17	17,0	18,3	18,2	19,2	19,9	20,4	20,7

Figure 4 Biomass and abundance of herring by acoustic survey results from October of 2010 – 2014 in ICES rectangles 40HO and 0G9

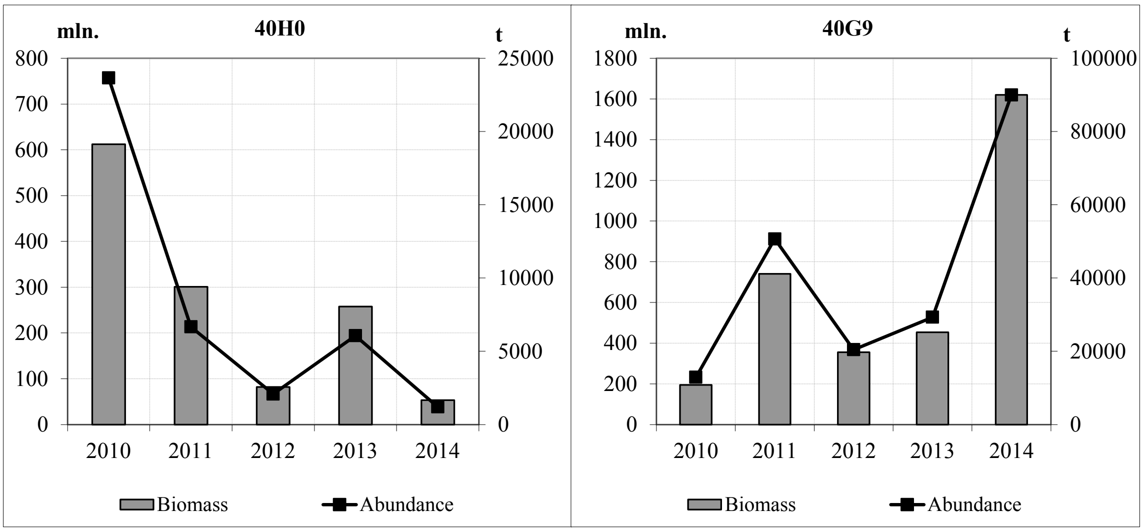


Figure 4 Biomass and abundance of sprat by acoustic survey results from October of 2010 – 2014 in ICES rectangles 40HO and 40G9

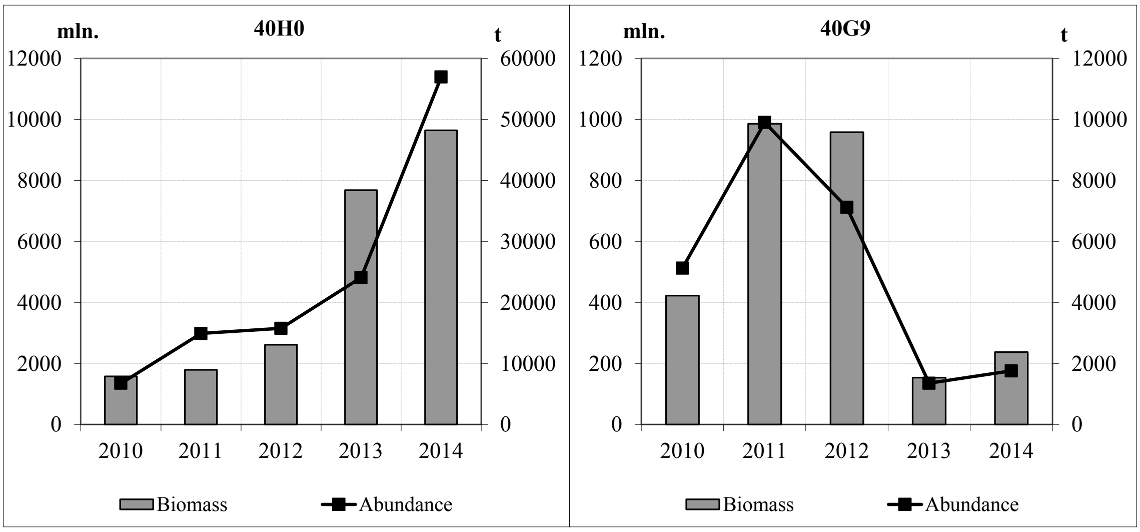
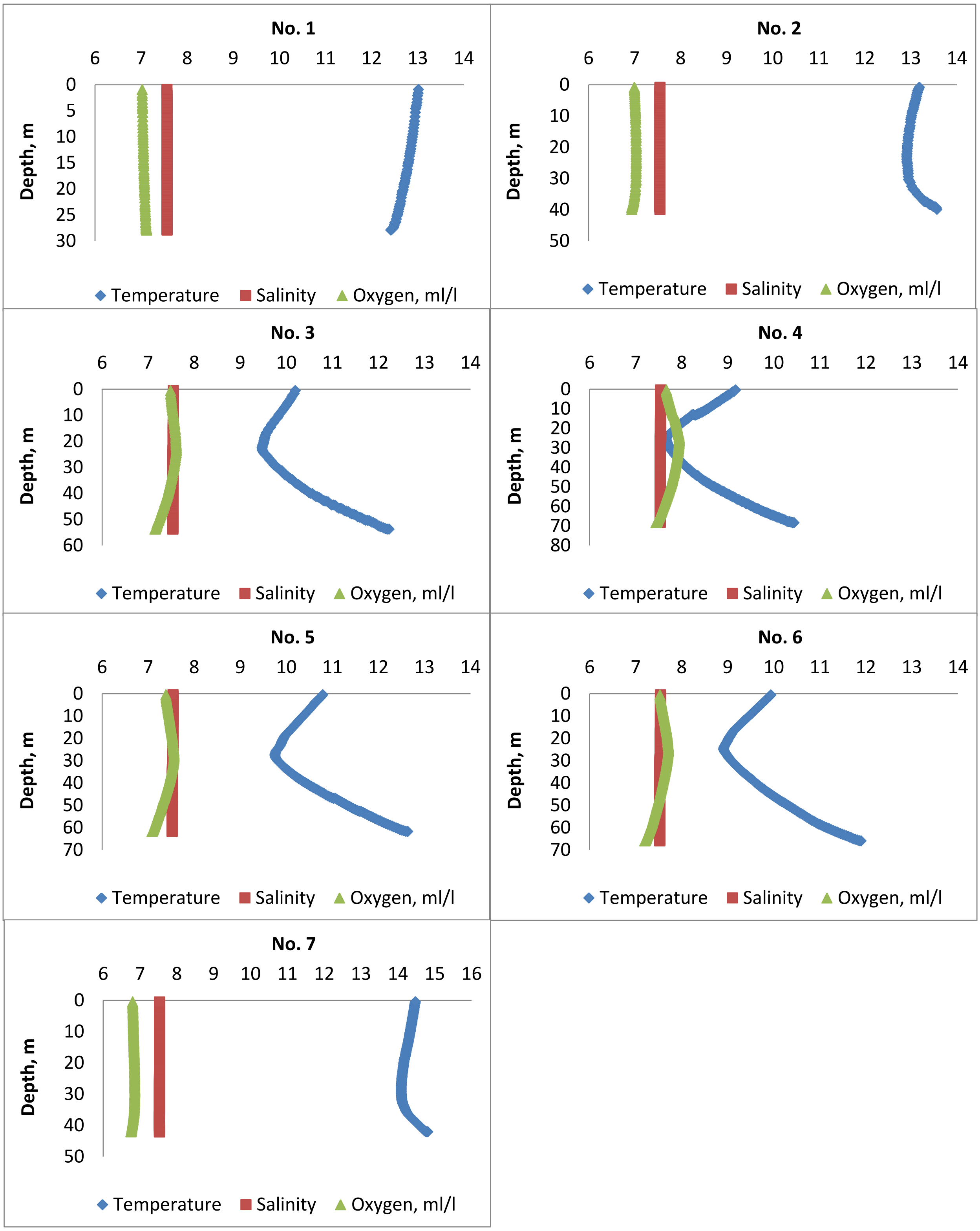


Table 15. The values of hydrological parameters registered at the catching depth in the Baltic Sea ICES SD from the Lithuanian BIASS survey conducted by r/v "Darius" in the period of 02.10-03.10.2014.

Haul number	Date of catch	Mean trawling depth, m	Hydrological parameters		
			Temperature, °C	Salinity, ‰	Oxygen, ml/l
1	2014.10.02	12	12,39	7,57	7,12
2	2014.10.02	24	13,25	7,55	6,99
3	2014.10.02	40	10,57	7,54	7,42
4	2014.10.02	23	10,9	7,54	7,4
5	2014.10.03	56	12,87	7,52	7,05
6	2014.10.03	42	12,14	7,53	7,18
7	2014.10.03	29	14,66	7,53	6,78
Average		32,3	12,4	7,54	7,13

Figure 5 Oxygen, salinity and temperature in each haul of BIAS 2014 survey.



BALTIC INTERNATIONAL ACOUSTIC SURVEY

REPORT FOR R/V ARANDA

R/V Aranda

Cruise 18/2014

ICES_BIAS2014

25th September – 7th October 2014

Juha Lilja, Jukka Pönni and Tero Saari

INTRODUCTION

International hydroacoustic surveys have been conducted in the Baltic Sea since 1978 (Håkansson et al. 1979). The initial Finnish-Estonian (FIN-EST) 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 FIN-EST BIAS surveys on the R/V Baltica were continued until 2012. Since 2007, Finland and Sweden joined together to additionally cover Bothnian Sea (ICES Subdivision 30). 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 (ICES 2013). In 2013, Finland installed fishing equipment and a Simrad EK60 echo sounder into the R/V Aranda and used the vessel in order to cover ICES SDs 29N, 30, and 32N during the autumn 2013.

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. 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). The aim of the cruise was to carry out Baltic International Acoustic Survey on herring and sprat covering SDs 29N, 30, and 32N during the autumn 2014, within the remit of the Finnish Game and Fisheries Research Institute (FGFRI). At the beginning of 2015, Natural Resources Institute Finland (Luke) comprises the state research institutes the Finnish Game and Fisheries Research Institute, MTT Agrifood Research Finland, the Finnish Forest Research Institute, and the statistical services of the Information Centre of the Ministry of Agriculture and Forestry.

MATERIALS AND METHODS

NARRATIVE

The cruise was completed in two legs, the first covering most of the Bothnian Sea (BS) and the second leg covering the Northern Baltic Sea and the Gulf of Finland (GoF). Altogether 36 stations were visited during both legs. The research area, cruise track and trawl stations are shown in Figure 1 and 2. At almost every station also a CTD cast was made. At one additional station the calibration of the echo sounder system was performed.

The R/V Aranda departed from HELSINKI on Thursday 25.09.2013 at 15:00 (UTC 12:00) and the direct at sea researches begun. Investigations were continued in the northern direction in to SD 30. All at sea researches were finalised on 7.10.2013 morning. The r/v Aranda arrived back to HELSINKI on Tuesday 07.10.2013 at 04:00. The harbour of Kaskinen was visited during the cruise at 01.10.2014 for change of scientific crew and the harbour of Rauma at 29.9. 06:00.- 30.9. 03:00 for fixing trawl-gear.

The Finnish BIAS 2014 survey had one interruption due to a technical fault and the fishing had to be stopped at 05.10.2014 in SD 29 due to a breakdown of the trawl-drum. Also, several fishing stations could not be realized due to a stormy weather.

SURVEY DESIGN AND HYDROGRAPHICAL DATA

During the cruise, echo-integration was performed along the survey track from ICES Sub-Divisions 29N, 30, and 32N. The conductivity, temperature, and depth (CTD) were measured using a "RBR XR-620" instrument. The CTD cast was done when whenever a trawl haul was conducted and also when calibrating the acoustic instrument.

CALIBRATION

The SIMRAD EK60 echo sounder with the transducer ES38B was calibrated on 5.10.2014 at the archipelago of Åland, according to the IBAS manual (ICES 2013, Addendum 2). Values from the calibration were within required accuracy.

ACOUSTIC DATA COLLECTION

The acoustic sampling was performed around the clock. SIMRAD EK60 echo sounder with the 38 kHz transducer (ES38B) mounted on a hull was used for the acoustic data collection. The settings of the hydroacoustic equipment were as described in the BIAS manual (ICES 2013, Addendum 2). The post processing of the stored raw data was done using the Echoview software (www.echoview.com). The mean volume back scattering values (Sv) were integrated over 1 nautical mile elementary distance sampling units (ESDUs) from 10 m below the surface to the bottom at 10 m intervals.

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 below.

Clupeoids:	TS = 20 log L (cm) - 71.2	(ICES 1983/H:12)
Gadoids:	TS = 20 log L (cm) - 67.5	(Foote et al. 1986)

Salmonids and 3-spined stickleback were assumed to have the same acoustic properties as herring.

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 δ (sigma). The total number was separated into different fish species according to the mean catch composition in the rectangle.

PERSONNEL

Cruise leader during the survey was Juha Lilja from Finnish Game and Fisheries Research Institute (FGFRI). The acoustic measurements and fishing trawls were performed by Finnish Game and Fisheries Research Institute (FGFRI) and fish sampling together by FGFRI and Swedish University of Agricultural Sciences (SLU). The participating scientist crew can be seen in the list below.

Juha Lilja	Cruise leader, Acoustics	FGFRI
Jukka Pönni	Fish sampling	FGFRI
Hannu Harjunpää	Fish sampling	FGFRI
Yvette Heimbrandt	Fish sampling	SLU
Peter Koskinen	Fishing	FGFRI
Mikko Leminen	Acoustics	FGFRI
Anne Odelström	Fish sampling	SLU
Tero Saari	Fish sampling	FGFRI
Kimmo Kirstua	Fishing	FGFRI
Arto Koskinen	Fish sampling	FGFRI
Otto Kiukkonen	Fishing	FGFRI
Sami Vesala	Fishing	FGFRI
Esa Lehtonen	Fishing , 1st period	FGFRI
Perttu Rantanen	Fish sampling, 1st period	FGFRI
Markku Gavrilov	Fishing , 1st period	FGFRI
Timo Myllylä	Fish sampling, 1st period	FGFRI
Jaakko Mattila	Acoustics , 1st period	FGFRI
Markku Vaajala	Fish sampling, 1st period	FGFRI

FGFRI: Riista- ja kalatalouden tutkimuslaitos / **Finnish Game and Fisheries Research Institute**
SLU: Sveriges lantbruksuniversitet / Swedish University of Agricultural Sciences

RESULTS

FISH CATCHES, BIOLOGICAL AND HYDRO-METEOROLOGICAL DATA

The number of planned trawling stations was 46. From these, 29 trawling stations were accomplished, and from those 25 were counted as "valid" (technically sound hauls and sufficient catch for a sample) (Table 1 & 4). The number of trawling stations in Bothnian Sea (ICES SD 30) was 25, in northern Baltic proper (SD 29) 3, and 1 in the northern Gulf of Finland (SD 32). The number of trawling stations was reduced mostly in SD 29 and 32 due to stormy weather and breakdown of the trawl gear.

The 3098 kg combined catches (Table 1) consisted of 15 fish species (2893 kg) and mostly unidentified organic matter categorized as "waist" (81 kg), but also including identified common jellyfish (*Aurelia aurita*), large number of mysids and small amounts of the isopod *Saduria entomon*. The unsorted "invalid" trawlcatches add up to 124 kg, and they are also included in the total catch. The most common and abundant species was herring (*Clupea harengus*) (2063 kg) followed by equally common species, three-spined stickleback (*Gasterosteus aculeatus*) (563 kg) and sprat (*Sprattus sprattus*) (263 kg). All observed species are presented in Table 2. From the sub-samples of the 25 fish catches a total of 11950 measurements for species-specific length distributions (0,5 cm interval for herring and sprat, and 1 cm interval for other species) were performed according to Table 3.

Ten individual samples per statistical rectangle for age determination and maturity definitions by length-class were collected from herring and sprat, 2980 and 605 samples respectively (Table 5). The mean weights for each length-class were also derived from these individual fish samples.

Additionally, from 10 statistical rectangles in SD 30 and 2 rectangles in SD 29 close to the Swedish coast, a 2 kg sample of herring from 17 cm to 20 cm of length was collected and frozen for dioxin analyses to be performed by Livsmedelsverket (SLV) of Sweden.

Also, in SD30, 17 dioxin samples of 25 herring individuals from the same size-category as in previous sampling were collected and frozen for Naturhistoriska Riksmuséet (NRM) of Sweden.

Three samples of threespined stickleback, herring and sprat were collected in three squares in SD30 for diet analyses for Laboratory of Marine Ecology, Nature Research Center in Vilnius Lithuania.

Hydrographical data: temperature (°C), salinity (psu), sound speed (m/s), special conductivity (µS/cm), conductivity (mS/cm) and sound speed (m/s) were measured and results are showed in Figures 5 - 12. Total of 29 CTD casts were done during the entire cruise. Here only a part of the CTD casts is presented.

ABUNDANCE ESTIMATES

The total area covered by the Finnish BIAS survey was 19841 square nautical miles (nmi^2) and after the scrutinizing, the distance used for acoustic estimates was 1633 nautical miles (nmi). The cruise track and positions of trawl hauls are shown in Figure 1 and 2. Length distributions for herring and sprat by ICES subdivision are shown in fgures 3 and 4, respectively. The total abundance of herring and sprat is presented in Table 6. Estimated numbers of herring and sprat by age group and Subdivision/rectangle are given in Table 7 and Table 10, respectively. Corresponding mean weights by age group and Subdivision/rectangle are shown in Table 8 and Table 11, respectively. Estimates of herring and sprat biomass by age group and Subdivision/rectangle are summarized in Table 9 and Table 12, respectively.

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TABLES, MAP, AND FIGURES

Table 1. Trawl catches (kg) by species/category during the Finnish BIAS-survey in 2014.

SD	Day	Month	Haul N:o	Snakeblenny	Seasnail	Greater Sandeel	Saduria isopod	Sprat	Eelpout	Three-spined Stickleback	Common Jellyfish	Smelt	Nine-spined Stickleback	Salmon	River Lamprey	Lesser Sandeel	Lumpfish	Herring	Straight-nosed Pipefish	Waste	Fish total	Catches total
32	25	9	1					99.4		4.4		0.1	1.2				0.3	128.7	0.0	0.5	234.2	234.7
29	26	9	2			0.0	0.0	59.0		2.6	0.2	0.0	0.5				0.2	286.9		16.3	349.2	365.8
29	26	9	3									**INVALID**										20.0
29	27	9	4			0.1		79.4		28.6			0.0					80.6		1.2	188.7	189.9
30	27	9	5									**INVALID**										36.0
30	27	9	6					0.7		1.3		0.1			0.1	0.0		71.3	0.0	2.9	73.5	76.4
30	27	9	7		0.0			0.3		0.3		0.0						63.3	0.0		64.0	64.0
30	27	9	8					1.5		0.9			0.0					83.0		1.4	85.5	86.9
30	28	9	9				0.0	5.0		14.9			0.0	0.2				26.8	0.0	3.7	46.9	50.7
30	30	9	10			0.0	0.0	4.2		98.4								20.6		5.4	123.1	128.6
30	30	9	11	0.0				0.2		23.2						0.0		53.0	0.0	0.5	76.4	76.9
30	30	9	12		0.1	0.0	0.0	1.1		64.6			0.0					164.2	0.0	1.2	230.0	231.2
30	1	10	13		0.0			0.5		13.0								68.4	0.0	0.6	82.0	82.5
30	1	10	14			0.0	0.0	1.7		14.3			0.0					38.0	0.0	0.4	54.0	54.4
30	1	10	15									**INVALID**										32.0
30	1	10	16		0.1		0.0	0.7		22.2								81.6		0.5	104.6	105.1
30	2	10	17		0.0		0.0	0.1		29.6								44.2		0.5	74.0	74.5
30	2	10	18					0.2		17.4			0.0					149.3		8.5	166.9	175.4
30	2	10	19									**INVALID**										36.0
30	3	10	20		0.1	0.0	0.0	0.0		12.7								88.6	0.0	0.2	101.4	101.6
30	3	10	21					0.5		104.1						0.0		27.3		11.5	131.9	143.4
30	3	10	22	0.0				0.0		6.9								99.6		1.5	106.5	108.1
30	3	10	23	0.0	0.0			0.0		13.7			0.0					64.8	0.0	5.6	78.5	84.0
30	4	10	24		0.0	0.0	0.0	0.1		5.3								90.3		2.2	95.7	97.9
30	4	10	25		0.4		0.0	0.5		6.1		0.0	0.0			0.0		62.8	0.0	14.1	69.9	84.0
30	4	10	26		0.0		0.0	2.3		10.1								65.1	0.0	0.1	77.5	77.6
30	4	10	27		0.0	0.0		3.2		34.4								94.4		0.9	132.0	132.9
30	5	10	28			0.0		0.5	0.0	1.4								48.5		0.5	50.4	50.9
30	5	10	29		0.0		0.0	1.5		33.1						0.0		61.5		0.9	96.1	97.0
			Total	0.0	0.8	0.2	0.1	262.8	0.0	563.4	0.2	0.3	1.7	0.2	0.1	0.1	0.5	2063.0	0.0	80.9	2893.1	3098.2

Table 2. English, scientific, and Finnish names of observed species in Finnish BIAS-survey in 2014.

Fishnames		
English	**Scientific**	**Finnish**
Common Jellyfish	Aurelia aurita	Korvameduusa
Eelpout	Zoarces viviparus	Kivinilkka
Greater Sandeel	Hyperoplus lanceolatus	Isotuulenkala
Herring	Clupea harengus	Silakka
Lesser Sandeel	Ammodytes tobianus	Pikkutuulenkala
Lumpfish	Cyclopterus lumpus	Rasvakala
Nine-spined Stickleback	Pungitius pungitius	Kymmenpiikki
River Lamprey	Lampetra fluviatilis	Nahkiainen
Saduria isopod	Saduria entomon	Kilkki
Salmon	Salmo salar	Lohi
Seasnail	Liparis liparis	Imukala
Smelt	Osmerus eperlanus	Kuore
Snakeblenny	Lumpenus lampretaeformis	Elaska
Sprat	Sprattus sprattus	Kilohaili
Straight-nosed Pipefish	Nerophis ophidion	Siloneula
Three-spined Stickleback	Gasterosteus aculeatus	Kolmipiikki

Table 3. Number of length measurements /species and Sub-Division.

Species	ICES sub-division			Total
	29	30	32	
Snakeblenny		2		2
Seasnail		91		91
Greater Sandeel	2	14		16
Sprat	301	813	200	1314
Eelpout		18		18
Three-spined Stickleback	224	2034	119	2377
Smelt	1	4	4	9
Nine-spined Stickleback	74	10	119	203
Salmon		1		1
River Lamprey		1		1
Lesser Sandeel		18		18
Lumpfish	1		2	3
Herring	621	6951	300	7872
Straight-nosed Pipefish		24	1	25
Total	**1224**	**9981**	**745**	**11950**

Table 4. Numbers and locations of fishing stations (WGS-84) during Finnish BIAS-survey in 2014.

Case num.	index CTD	Trawl num.	Date	ICES rectangle	ICES (SD)	Start latitude	Start longitude	Stop latitude	Stop longitude	Time (UTC) start	Time (UTC) end
1	668	48H3-1	25.9.2014	48H3	32	59°39.06'N	23°14.16'E	59°37.20'N	23°14.48'E	20:53	21:10
2	669	48H2-1	26.9.2014	48H2	32	59°35.45'N	22°53.25'E	59°34.72'N	22°52.80'E	0:48	1:07
3		48H0-1	26.9.2014	48H0	29	59°46.34'N	20°16.78'E	59°45.42'N	20°10.35'E	13:10	14:35
4	670	49G9-1	26.9.2014	49G9	29	60°05.20'N	19°26.68'E	60°05.86'N	19°23.83'E	22:05	22:36
5	671	50G8-1	27.9.2014	50G8	30	60°44.62'N	18°07.08'E	60°44.29'N	18°02.60'E	8:59	9:50
6	672	50G7-1	27.9.2014	50G7	30	60°46.47'N	17°58.81'E	60°45.76'N	17°54.21'E	12:10	13:10
7	673	51G8-1	27.9.2014	51G8	30	61°05.82'N	18°06.77'E	61°05.00'N	18°03.85'E	18:16	18:56
8	-	51G8-2	27.9.2014	51G8	30	61°05.71'N	18°55.95'E	61°04.31'N	18°50.61'E	23:29	0:29
9	-	51G9-1	28.9.2014	51G9	30	61°05.89'N	19°07.30'E	61°04.07'N	19°00.10'E	2:57	4:29
10	674	51G9-2	30.9.2014	51G9	30	61°21.30'N	19°46.31'E	61°23.08'N	19°44.97'E	7:20	8:05
11	675	52G9-1	30.9.2014	52G9	30	62°00.73'N	19°59.61'E	61°57.70'N	19°58.95'E	15:24	16:29
12	676	53G9-1	30.9.2014	53G9	30	62°07.14'N	19°53.99'E	62°10.01'N	20°01.48'E	20:00	21:53
13	677	53H0-1	1.10.2014	53H0	30	62°15.02'N	20°19.27'E	60°17.55'N	20°19.61'E	0:45	1:48
14	678	53H0-2	1.10.2014	53H0	30	62°21.10'N	20°14.97'E	62°25.24'N	20°15.01'E	4:09	5:40
15		54H0-1	1.10.2014	54H0	30	62°32.17'N	20°20.19'E	62°30.83'N	20°19.03'E	17:53	18:21
16	679	54H0-1	1.10.2014	54H0	30	62°30.00'N	20°14.15'E	62°27.48'N	20°12.91'E	20:39	21:27
17	680	54G9-1	2.10.2014	54G9	30	62°33.55'N	19°45.24'E	62°35.00'N	19°45.88'E	1:00	1:30
18	681	52G8-1	2.10.2014	52G8	30	61°38.81'N	18°01.25'E	61°41.06'N	18°05.92'E	17:39	18:47
19	682	52G8-2	2.10.2014	52G8	30	61°48.92'N	18°32.12'E	61°50.90'N	18°31.97'E	22:20	23:01
20	683	52G7-1	3.10.2014	52G7	30	61°53.66'N	17°50.30'E	61°56.83'N	17°55.11'E	2:25	3:48
21	684	53G8-1	3.10.2014	53G8	30	62°18.38'N	18°48.40'E	62°21.31'N	18°47.53'E	9:16	10:27
22	685	53G8-2	3.10.2014	53G8	30	62°29.93'N	18°53.37'E	52°33.85'N	18°52.76'E	15:17	16:22
23	686	54G9-2	3.10.2014	54G9	30	62°47.58'N	19°04.62'E	62°45.71'N	19°05.26'E	19:53	20:43
24	687	55H0-1	4.10.2014	55H0	30	63°09.88'N	20°10.09'E	63°06.37'N	20°12.00'E	2:45	3:58
25	688	52H0-1	4.10.2014	52H0	30	61°56.19'N	20°13.13'E	61°53.97'N	20°12.58'E	12:42	13:35
26	689	52H0-2	4.10.2014	52H0	30	61°43.01'N	20°30.12'E	61°41.75'N	20°25.29'E	18:11	19:05
27	690	51H0-1	4.10.2014	51H0	30	61°28.27'N	20°12.35'E	61°23.50'N	20°12.19'E	22:32	0:09
28	691	51H0-2	5.10.2014	51H0	30	61°11.85'N	20°11.86'E	61°08.73'N	20°11.21'E	2:50	3:55
	692	calibration				60°45.29'N	20°12.20'E	60°45.29'N	20°12.20'E		
29	693	50H0-1	5.10.2014	50H0	30	60°54.28'N	20°11.55'E	60°55.48'N	20°07.47'E	18:17	19:05

Table 5. Individual samples of herring and sprat (for age-determination) per SD.

Length-class mm	ICES sub-division						Herring Total	Sprat Total	Grand Total
	29		30		32				
	Herring	Sprat	Herring	Sprat	Herring	Sprat			
45			1				**1**		**1**
50	1						**1**		**1**
55	1					1	**1**	**1**	**2**
60	4	20	6		1	8	**11**	**28**	**39**
65	11	20	12	10	10	10	**33**	**40**	**73**
70	19	20	39	22	10	10	**68**	**52**	**120**
75	16	18	71	46	10	10	**97**	**74**	**171**
80	14	2	109	61	9		**132**	**63**	**195**
85	11		125	34	5		**141**	**34**	**175**
90	11		134	2			**145**	**2**	**147**
95	4		127				**131**		**131**
100			71				**71**		**71**
105		5	40			2	**40**	**7**	**47**
110		3	38	1	2	10	**40**	**14**	**54**
115		9	45	4		10	**45**	**23**	**68**
120	2	9	51	9		10	**53**	**28**	**81**
125	3	10	70	49		10	**73**	**69**	**142**
130	13	4	97	51	4	2	**114**	**57**	**171**
135	20		125	52	10	1	**155**	**53**	**208**
140	20		115	41	10		**145**	**41**	**186**
145	12		113	30	10		**135**	**30**	**165**
150	17		109	8	10		**136**	**8**	**144**
155	12		122	1	10		**144**	**1**	**145**
160	13		130		10		**153**		**153**
165	9		130		6		**145**		**145**
170	1		127		1		**129**		**129**
175	2		120				**122**		**122**
180	1		117				**118**		**118**
185	1		103				**104**		**104**
190			98				**98**		**98**
195			81				**81**		**81**
200			40				**40**		**40**
205			38				**38**		**38**
210			20				**20**		**20**
215			6				**6**		**6**
220			9				**9**		**9**
225			4				**4**		**4**
255			1				**1**		**1**
Grand Total	**218**	**120**	**2644**	**421**	**118**	**84**	**2980**	**625**	**3605**

Table 6. Survey statistics by area r/v Aranda 2014.

ICES SD	ICES Rect.	NM	N (million/nm²)	Area (nm²)	Sa (m²/nm²)	σ (cm²)	N total (million)	Herring (%)	Sprat (%)	Cod (%)	Herring W (g)	Sprat W (g)
29	48G9	53	8.80614	772.8	748	0.849719	6805	70.50	27.84	0.00	16.01	6.61
29	48H0	64	7.66817	730.3	652	0.849719	5600	54.96	42.45	0.00	10.85	7.70
29	48H1	66	9.39682	544.0	803	0.854943	5112	82.15	16.89	0.00	20.69	5.14
29	48H2	70	13.47468	597.0	1813	1.345179	8044	66.08	30.11	0.00	12.81	5.27
32	48H3	68	32.07407	615.7	2777	0.865796	19748	72.34	23.16	0.00	13.75	3.65
32	48H4	83	17.55092	835.1	1905	1.085582	14657	72.34	23.16	0.00	13.75	3.65
29	49G9	73	14.61062	564.2	744	0.509042	8243	42.69	42.08	0.00	5.83	2.22
30	50G7	19	6.52878	403.1	608	0.931048	2632	96.99	0.89	0.00	6.21	5.63
30	50G8	56	3.11214	833.4	432	1.386992	2594	97.78	1.05	0.00	15.95	8.83
30	50G9	135	3.79298	879.5	241	0.634915	3336	85.23	3.76	0.00	16.87	4.12
30	50H0	79	3.96917	795.1	252	0.635326	3156	63.97	1.61	0.00	21.19	6.29
30	51G7	27	4.76013	614.5	596	1.251511	2925	98.12	0.67	0.00	14.23	7.68
30	51G8	78	2.12883	863.7	422	1.983795	1839	98.10	1.11	0.00	21.00	10.50
30	51G9	72	6.11373	865.8	255	0.416429	5293	23.04	4.56	0.00	7.90	3.75
30	51H0	107	2.00494	865.7	168	0.835613	1736	79.88	1.94	0.00	24.57	12.42
30	52G7	30	5.40120	482.6	549	1.016227	2607	87.39	0.03	0.00	20.90	13.00
30	52G8	42	3.39469	852.0	368	1.084729	2892	89.46	0.10	0.00	25.43	8.00
30	52G9	65	5.81601	852.0	381	0.655380	4955	69.33	0.27	0.00	20.33	5.92
30	52H0	58	2.41076	852.0	233	0.966126	2054	86.79	1.88	0.00	25.40	14.00
30	53G8	72	9.71756	838.1	505	0.520005	8144	54.60	0.20	0.00	12.61	3.82
30	53G9	45	5.06593	838.1	347	0.685646	4246	71.39	0.47	0.00	23.32	8.86
30	53H0	108	4.90826	838.1	353	0.719015	4114	79.35	1.43	0.00	17.92	13.21
30	54G8	18	4.81729	642.2	241	0.499419	3094	73.21	0.09	0.00	17.18	1.95
30	54G9	54	5.31569	824.2	246	0.462056	4381	69.00	0.09	0.00	14.12	13.00
30	54H0	55	4.87304	727.9	388	0.796777	3547	61.69	0.32	0.00	19.81	14.42
30	55G9	21	6.20942	625.6	300	0.483219	3885	72.31	0.13	0.00	19.55	18.00
30	55H0	15	2.83544	688.6	395	1.394003	1952	94.33	0.11	0.00	23.94	17.50

Table 7. Numbers (millions) of herring by age and area (r/v Aranda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	48G9	2156.1	608.9	654.5	691.9	24.2	329.9	284.4	133.0	39.6	4922.7
29	48H0	1774.3	501.1	538.6	569.4	19.9	271.5	234.1	109.5	32.6	4050.8
29	48H1	1610.0	400.2	416.4	432.9	16.7	214.8	171.9	81.8	25.7	3370.4
29	48H2	539.1	1046.4	1520.2	1632.7	35.9	775.2	672.5	313.5	73.2	6608.7
32	48H3	6114.1	862.2	1680.8	755.2	741.6	90.4	265.3	162.8	180.9	10853.4
32	48H4	3193.3	1012.6	2300.4	1225.3	1410.4	122.1	402.6	296.8	238.8	10202.3
29	49G9	2973.1	296.2	78.0	66.8	15.2	33.9	26.7	13.1	16.2	3519.2
30	50G7	2276.0	252.6	8.9	2.3	1.4	2.6	2.6	2.1	4.0	2552.5
30	50G8	1137.4	529.8	257.6	191.7	88.7	86.0	66.5	59.4	119.0	2536.0
30	50G9	1000.3	700.7	491.6	262.8	103.8	76.8	60.2	47.7	99.3	2843.2
30	50H0	265.5	602.3	512.6	256.8	101.2	73.7	58.2	46.7	101.8	2018.8
30	51G7	1617.5	435.6	197.9	169.5	84.2	91.7	71.0	64.4	138.2	2870.0
30	51G8	395.1	479.4	274.8	206.1	95.3	91.9	70.8	63.3	126.9	1803.7
30	51G9	969.3	116.9	52.0	33.2	13.2	10.1	7.8	6.0	11.0	1219.5
30	51H0	102.5	378.0	343.1	198.1	85.3	72.6	55.9	48.2	102.7	1386.5
30	52G7	634.0	569.1	319.5	204.7	96.9	97.2	80.1	73.1	203.3	2278.0
30	52G8	783.8	229.1	193.6	280.1	154.4	191.4	158.2	161.1	435.7	2587.3
30	52G9	1261.3	310.2	428.0	414.4	192.1	191.6	156.8	143.2	338.1	3435.6
30	52H0	252.6	349.6	320.8	239.0	109.9	105.8	89.6	85.4	229.9	1782.7
30	53G8	3044.0	281.4	161.4	199.6	104.9	133.7	115.7	111.3	294.4	4446.5
30	53G9	734.6	254.0	574.1	460.8	210.5	197.4	149.4	144.5	305.9	3031.1
30	53H0	1171.7	750.0	453.5	287.9	126.7	113.1	87.5	81.5	192.2	3264.1
30	54G8	1215.2	75.9	177.8	195.8	98.0	111.0	91.0	86.3	214.0	2265.0
30	54G9	1991.7	214.1	182.8	168.3	81.6	86.1	66.5	64.8	166.9	3022.9
30	54H0	754.0	424.3	331.7	227.3	99.8	85.8	66.8	60.0	138.5	2188.3
30	55G9	944.4	638.8	466.6	301.9	126.9	94.7	70.1	57.7	107.9	2808.9
30	55H0	167.7	742.3	437.9	238.2	92.7	54.4	40.2	28.2	40.1	1841.7

Table 8. Mean weight (g) of herring by age and area (r/v Aranda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+
29	48G9	**3.1**	16.9	21.4	21.9	17.0	23.8	22.8	25.4	32.1
29	48H0	3.1	16.9	21.4	21.9	17.0	23.8	22.8	25.4	32.1
29	48H1	2.9	17.0	21.4	21.9	17.0	23.9	22.8	25.3	31.1
29	48H2	2.6	17.1	21.6	22.0	17.1	23.8	22.7	25.4	30.0
32	48H3	2.2	16.9	20.0	21.3	22.5	26.0	25.0	23.0	27.3
32	48H4	2.2	17.2	20.3	21.6	22.5	25.8	24.6	22.9	26.7
29	49G9	3.1	16.6	19.7	21.0	16.9	24.9	23.0	25.6	37.9
30	50G7	5.1	13.9	15.6	31.6	35.8	35.8	35.8	35.8	35.8
30	50G8	5.4	15.4	22.7	27.5	29.4	32.8	33.7	34.9	38.7
30	50G9	4.4	16.8	22.2	25.5	26.9	30.8	31.8	34.0	38.8
30	50H0	4.8	17.1	22.0	25.2	26.6	30.8	32.2	34.6	39.6
30	51G7	5.4	14.9	23.0	28.3	30.4	33.7	34.6	35.4	39.5
30	51G8	6.1	15.7	22.8	27.5	29.4	32.7	33.7	34.8	38.7
30	51G9	3.9	16.2	22.6	26.4	27.6	30.7	30.9	32.7	36.3
30	51H0	4.5	16.9	22.3	26.1	27.9	31.9	33.2	34.7	40.2
30	52G7	4.8	15.7	22.3	27.1	29.3	33.5	36.2	37.2	47.3
30	52G8	5.0	15.6	24.6	29.9	31.9	34.9	37.4	38.1	44.7
30	52G9	4.4	16.9	24.0	28.1	29.9	33.4	34.8	36.0	41.5
30	52H0	5.0	15.9	23.3	27.3	29.3	33.7	35.9	37.7	44.2
30	53G8	4.7	15.0	24.1	29.4	31.9	35.5	36.9	37.8	42.3
30	53G9	4.3	17.1	23.4	27.4	29.1	32.7	33.7	35.8	40.2
30	53H0	4.5	15.6	22.5	26.6	28.4	32.4	33.8	36.2	42.7
30	54G8	4.3	16.1	24.5	28.8	30.8	34.4	35.8	36.9	41.6
30	54G9	4.5	14.9	24.1	28.1	29.9	33.9	35.3	37.1	42.4
30	54H0	4.7	15.6	23.0	26.8	28.3	32.2	33.7	35.5	41.7
30	55G9	4.8	15.4	23.2	26.4	27.5	30.6	31.4	33.1	37.5
30	55H0	8.0	15.4	22.7	25.4	26.1	28.2	28.6	30.2	32.0

Table 9. Total biomass (ton) of herring by age and area (r/v Aranda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	48G9	6630.5	10314.4	14009.4	15168.5	411.4	7864.2	6473.7	3378.5	1272.8	65523.4
29	48H0	5456.1	8487.6	11528.2	12482.0	338.5	6471.4	5327.1	2780.1	1047.4	53918.4
29	48H1	4610.7	6808.6	8901.6	9496.5	283.9	5126.8	3919.4	2067.0	798.1	42012.5
29	48H2	1407.9	17906.4	32764.0	35890.7	614.9	18422.8	15295.8	7957.2	2197.4	132457.1
32	48H3	13725.9	14577.9	33574.7	16072.2	16687.1	2349.8	6624.2	3749.8	4941.9	112303.4
32	48H4	7138.3	17387.3	46672.8	26521.7	31668.8	3149.7	9908.8	6790.2	6369.9	155607.5
29	49G9	9294.7	4906.5	1532.7	1406.6	256.1	841.7	613.6	335.7	612.9	19800.5
30	50G7	11562.4	3506.6	138.4	73.4	49.6	94.3	94.3	74.4	143.9	15737.4
30	50G8	6135.9	8161.7	5859.6	5277.1	2609.9	2818.7	2238.9	2069.0	4603.4	39774.2
30	50G9	4391.6	11745.7	10899.8	6708.0	2791.5	2364.4	1912.6	1625.3	3852.0	46291.0
30	50H0	1270.1	10318.4	11295.8	6468.4	2694.0	2271.1	1872.6	1614.3	4034.7	41839.3
30	51G7	8739.9	6495.5	4552.3	4802.8	2558.6	3090.0	2458.1	2281.6	5463.8	40442.5
30	51G8	2393.4	7527.2	6274.4	5669.5	2799.1	3008.1	2382.2	2206.1	4916.5	37176.5
30	51G9	3765.4	1888.3	1173.8	876.3	363.8	311.6	240.7	197.1	400.0	9217.0
30	51H0	464.6	6406.7	7653.9	5180.0	2382.7	2320.6	1856.9	1672.7	4128.1	32066.2
30	52G7	3046.9	8936.8	7136.0	5547.7	2837.3	3258.4	2903.9	2722.7	9613.3	46003.0
30	52G8	3884.2	3583.7	4770.2	8361.4	4919.4	6680.8	5910.8	6131.7	19479.2	63721.4
30	52G9	5518.3	5253.9	10290.9	11636.6	5737.5	6394.2	5454.8	5150.0	14041.8	69478.0
30	52H0	1273.6	5570.4	7464.0	6521.4	3221.4	3562.9	3217.7	3221.9	10152.9	44206.1
30	53G8	14294.3	4219.1	3883.9	5876.7	3351.4	4742.2	4268.6	4209.8	12451.7	57297.8
30	53G9	3140.6	4332.3	13440.5	12619.7	6129.6	6460.5	5040.1	5176.0	12287.2	68626.5
30	53H0	5284.7	11672.3	10194.5	7663.3	3598.3	3662.0	2961.9	2949.3	8201.2	56187.4
30	54G8	5250.8	1221.4	4363.0	5632.3	3017.8	3818.9	3256.3	3180.4	8899.5	38640.3
30	54G9	8958.3	3189.6	4413.8	4722.8	2439.5	2917.9	2350.4	2402.9	7077.6	38472.9
30	54H0	3562.6	6601.4	7638.9	6093.2	2829.6	2766.4	2250.8	2129.9	5773.1	39646.0
30	55G9	4553.0	9823.4	10804.6	7961.5	3484.8	2898.6	2201.8	1910.6	4049.5	47687.7
30	55H0	1342.2	11402.2	9942.2	6052.0	2415.9	1531.8	1152.9	852.0	1285.3	35976.6

Table 10. Numbers (millions) of sprat by age and area (r/v Aranda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	48G9	1330.0	41.9	0.0	0.0	47.1	0.0	0.0	0.0	0.0	1419.0
29	48H0	1094.4	34.5	0.0	0.0	38.8	0.0	0.0	0.0	0.0	1167.7
29	48H1	1188.9	67.6	0.0	0.0	76.8	0.0	0.0	0.0	0.0	1333.3
29	48H2	936.7	73.5	0.0	0.0	73.5	0.0	0.0	0.0	0.0	1083.6
32	48H3	5616.8	586.8	905.4	243.1	783.8	79.6	41.9	83.8	41.9	8383.3
32	48H4	2755.9	258.0	411.6	143.1	385.8	32.8	11.7	35.2	35.2	4069.3
29	49G9	3445.8	0.0	0.0	0.0	22.7	0.0	0.0	0.0	0.0	3468.5
30	50G7	17.8	0.0	0.7	0.7	0.6	0.6	0.3	0.6	1.6	22.9
30	50G8	13.2	0.0	1.0	1.7	1.6	1.9	0.9	1.9	4.8	27.0
30	50G9	114.7	0.0	0.8	1.6	1.5	1.4	0.6	1.1	3.5	125.3
30	50H0	39.2	0.0	0.8	1.5	1.6	1.6	0.6	1.0	4.7	50.8
30	51G7	11.6	0.0	0.7	0.9	0.8	1.0	0.5	1.1	2.7	19.3
30	51G8	7.0	0.0	0.9	1.6	1.5	1.9	0.9	1.9	4.8	20.4
30	51G9	228.2	0.0	1.0	2.0	1.9	1.9	0.8	1.6	3.7	241.2
30	51H0	7.6	0.2	2.1	3.2	2.8	3.4	1.7	3.4	9.3	33.6
30	52G7	0.0	0.0	0.5	0.1	0.1	0.0	0.1	0.0	0.1	0.9
30	52G8	1.5	0.0	0.0	0.0	0.0	0.2	0.1	0.1	1.0	3.0
30	52G9	10.3	0.0	0.7	0.4	0.4	0.2	0.3	0.1	1.0	13.3
30	52H0	5.7	0.0	1.3	2.9	2.7	4.2	2.3	4.4	15.1	38.6
30	53G8	5.9	0.0	0.2	0.8	0.8	1.6	0.9	1.9	4.5	16.6
30	53G9	8.5	0.0	1.1	2.2	2.2	2.0	0.4	1.4	2.1	19.8
30	53H0	6.9	0.2	3.8	5.9	5.5	7.0	3.7	6.7	17.9	57.6
30	54G8	0.9	0.0	0.0	0.1	0.1	0.3	0.2	0.3	0.8	2.8
30	54G9	1.3	0.0	0.0	0.0	0.0	0.4	0.3	0.3	1.6	3.8
30	54H0	0.0	0.1	0.7	1.1	1.0	1.4	0.9	1.3	4.8	11.5
30	55G9	0.0	0.0	0.0	0.1	0.2	0.7	0.5	0.6	2.9	5.0
30	55H0	0.0	0.0	0.0	0.1	0.1	0.3	0.2	0.3	1.1	2.2

Table 11. Mean weight (g) of sprat by age and area (r/v Adanda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+
29	48G9	2.00	8.95			11.00				
29	48H0	2.00	8.95			11.00				
29	48H1	2.02	9.32			11.00				
29	48H2	2.00	8.95			11.00				
32	48H3	2.05	9.07	11.27	11.99	11.58	10.70	13.50	11.70	12.00
32	48H4	2.06	8.91	11.35	12.03	11.68	10.70	13.50	11.70	12.00
29	49G9	2.01				11.00				
30	50G7	3.28		12.02	13.21	13.16	13.92	13.21	14.27	15.62
30	50G8	3.05		12.72	13.42	13.47	14.38	14.58	14.59	15.31
30	50G9	3.04		13.03	13.16	13.27	14.05	14.45	14.22	15.05
30	50H0	3.59		13.03	13.09	13.32	13.93	14.48	13.80	15.44
30	51G7	3.28		12.44	13.56	13.57	14.29	14.25	14.49	15.25
30	51G8	2.79		13.00	13.46	13.52	14.45	14.80	14.64	15.26
30	51G9	3.04		13.10	13.26	13.33	14.00	14.43	14.22	14.63
30	51H0	3.42	9.88	12.29	13.20	13.45	14.57	14.82	14.78	15.66
30	52G7			11.40	11.40	11.40		11.40		11.40
30	52G8	2.83				15.78	15.78	15.78	15.78	15.78
30	52G9	3.26		11.73	12.33	12.57	14.64	13.23	14.43	14.69
30	52H0	3.90		13.31	13.62	13.70	14.94	15.31	15.05	16.34
30	53G8	3.33		14.16	14.35	14.32	15.05	15.45	15.07	15.53
30	53G9	3.26		13.15	13.21	13.26	13.37	13.15	13.37	13.30
30	53H0	3.05	9.88	12.47	13.35	13.56	14.51	14.74	14.66	15.09
30	54G8	3.35		14.16	14.35	14.38	15.24	15.61	15.22	15.71
30	54G9	2.83				15.78	16.47	16.43	16.68	16.40
30	54H0		9.88	12.05	12.96	13.63	15.04	15.28	15.07	15.52
30	55G9			14.90	14.90	15.33	15.92	15.91	15.77	15.98
30	55H0			14.90	14.90	15.19	15.33	15.36	15.10	15.47

Table 12. Total biomass (ton) of sprat by age and area (r/v Aranda 2014).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	48G9	2665.9	374.9	0.0	0.0	518.4	0.0	0.0	0.0	0.0	3559.2
29	48H0	2193.7	308.5	0.0	0.0	426.6	0.0	0.0	0.0	0.0	2928.8
29	48H1	2396.1	629.8	0.0	0.0	844.8	0.0	0.0	0.0	0.0	3870.8
29	48H2	1875.0	657.5	0.0	0.0	808.1	0.0	0.0	0.0	0.0	3340.6
32	48H3	11527.1	5323.4	10203.4	2915.7	9078.7	852.2	565.9	980.9	503.0	41950.2
32	48H4	5676.0	2299.7	4673.5	1720.9	4506.5	351.3	158.3	411.6	422.2	20220.1
29	49G9	6912.7	0.0	0.0	0.0	249.4	0.0	0.0	0.0	0.0	7162.1
30	50G7	58.5	0.0	8.8	8.7	8.3	8.0	4.4	8.5	24.5	129.7
30	50G8	40.3	0.0	13.3	22.8	21.6	27.1	13.7	27.0	73.1	238.8
30	50G9	348.4	0.0	10.7	21.0	19.9	20.0	8.7	16.3	53.0	498.1
30	50H0	140.6	0.0	10.2	19.8	20.7	21.7	8.0	13.4	72.4	306.8
30	51G7	38.1	0.0	8.1	11.8	11.5	14.6	7.7	15.5	40.5	147.7
30	51G8	19.4	0.0	11.2	22.1	20.9	27.4	13.7	27.1	72.5	214.4
30	51G9	694.0	0.0	13.3	27.2	25.7	26.8	10.8	23.3	54.2	875.3
30	51H0	25.8	1.9	25.8	41.9	37.0	49.1	25.8	50.2	146.1	403.7
30	52G7	0.0	0.0	5.2	1.3	1.3	0.0	1.3	0.0	1.3	10.3
30	52G8	4.2	0.0	0.0	0.0	0.8	3.1	2.4	1.6	15.7	27.8
30	52G9	33.5	0.0	8.0	5.0	4.8	3.2	3.8	1.8	14.4	74.5
30	52H0	22.1	0.0	17.2	39.6	36.9	62.6	35.3	65.7	247.4	526.9
30	53G8	19.7	0.0	3.5	11.2	10.9	24.3	13.6	27.9	70.4	181.5
30	53G9	27.6	0.0	14.0	28.7	29.5	27.3	4.7	18.2	27.5	177.5
30	53H0	21.2	1.7	47.6	78.2	74.9	102.3	54.0	98.8	269.7	748.4
30	54G8	3.1	0.0	0.5	1.7	1.7	4.2	2.5	4.6	13.2	31.6
30	54G9	3.6	0.0	0.0	0.0	0.7	6.0	4.2	4.6	26.7	45.8
30	54H0	0.0	1.2	9.0	14.8	13.5	21.8	13.7	19.2	75.2	168.3
30	55G9	0.0	0.0	0.4	1.7	2.6	10.9	7.7	10.0	45.6	78.9
30	55H0	0.0	0.0	0.4	1.5	1.7	4.6	3.2	4.9	17.6	33.9

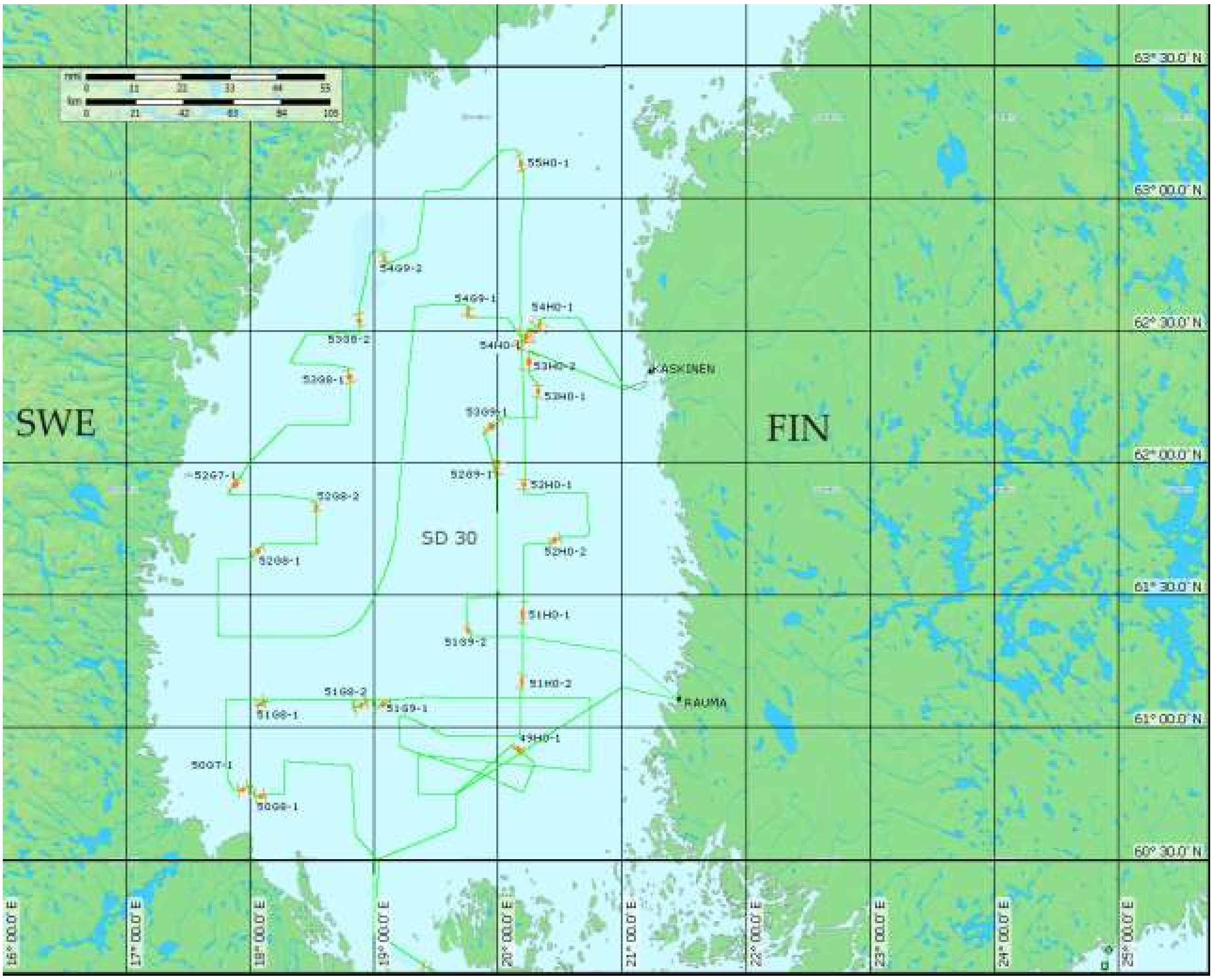

Figure 1. Cruise track of r/v Aranda in SD 30 during the BIAS-survey in 2014.

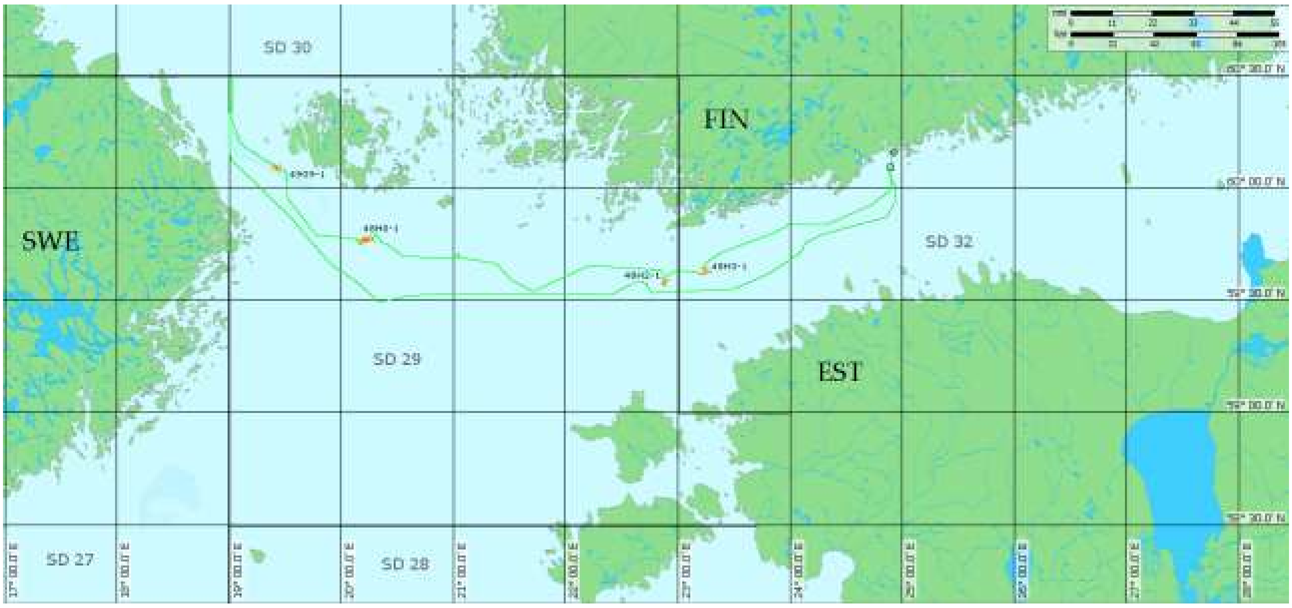

Figure 2. Cruise track of r/v Aranda in SD 29N and SD 32 during the BIAS-survey in 2014.

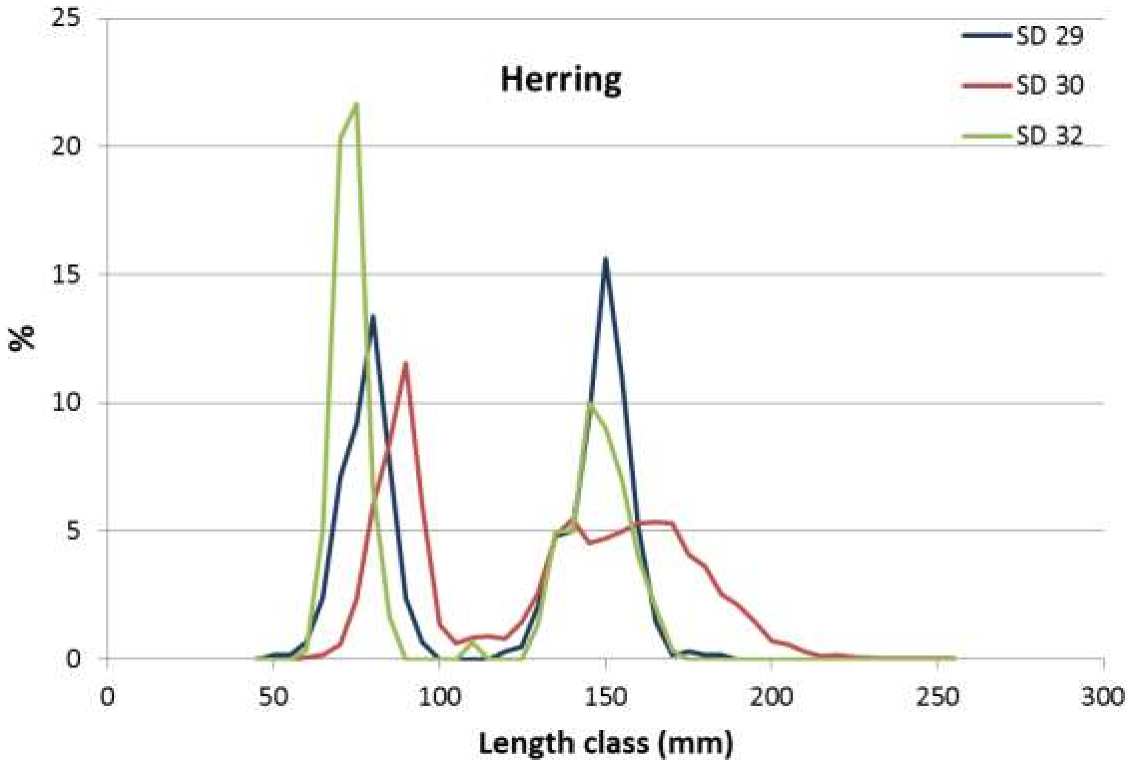

Figure 3. Length distributions of measured herring in three different Sub-Division.

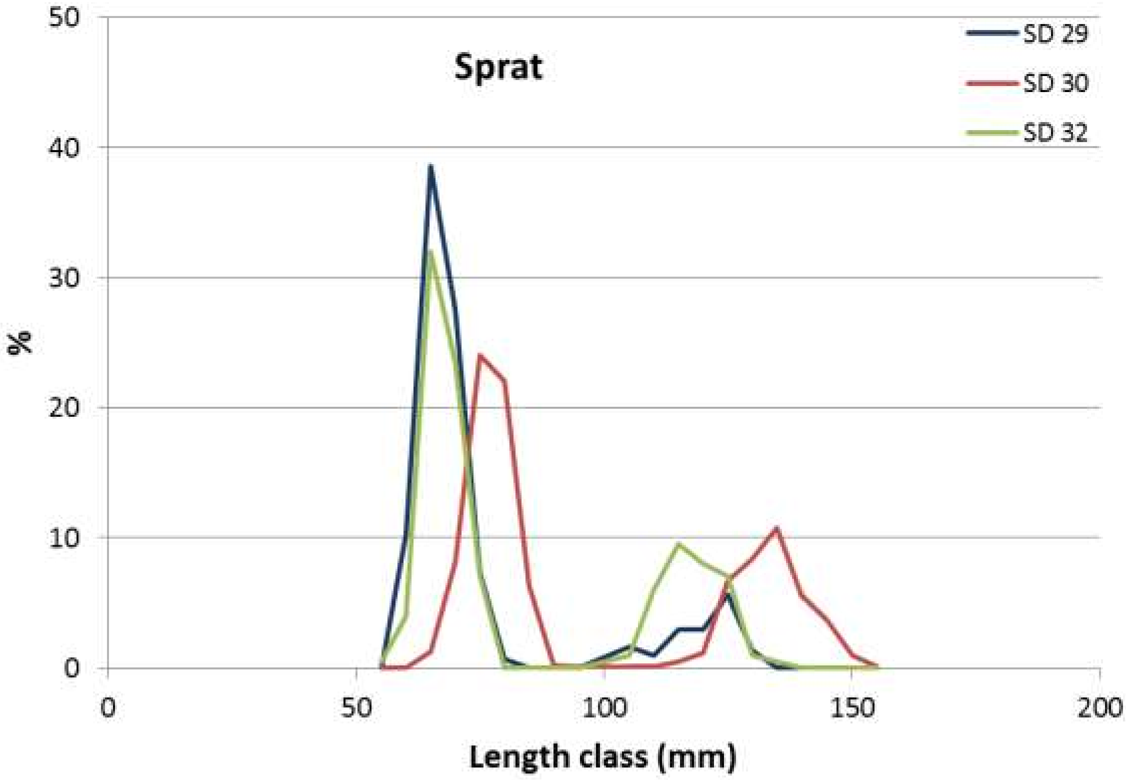

Figure 4. Length distributions of measured sprat in three different Sub-Division.

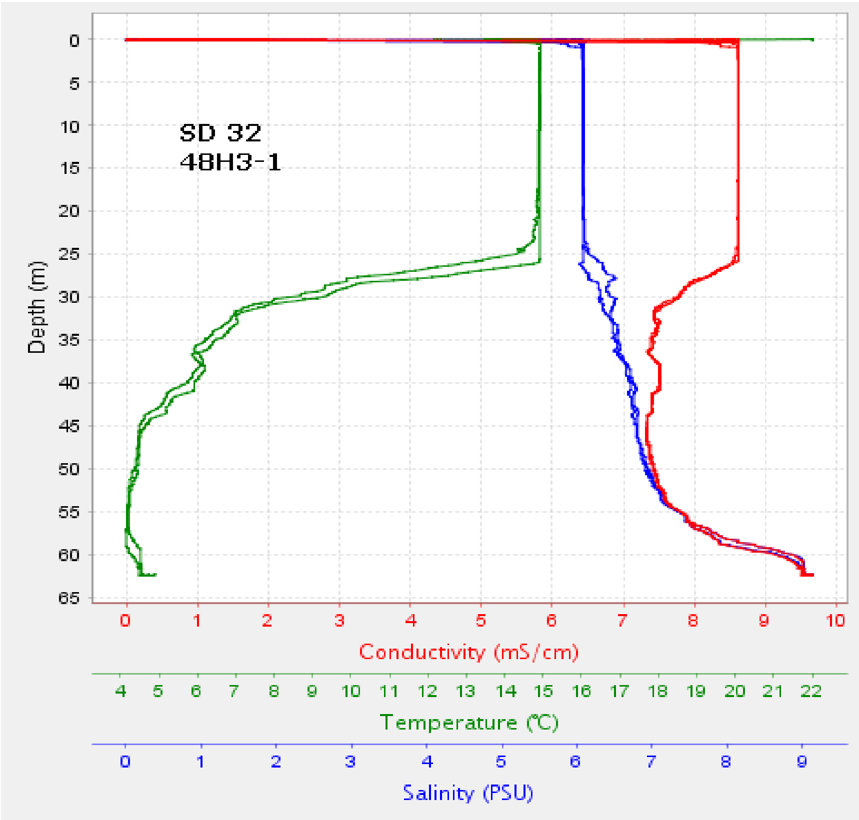

Figure 5. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 48H3-1 in SD 32.

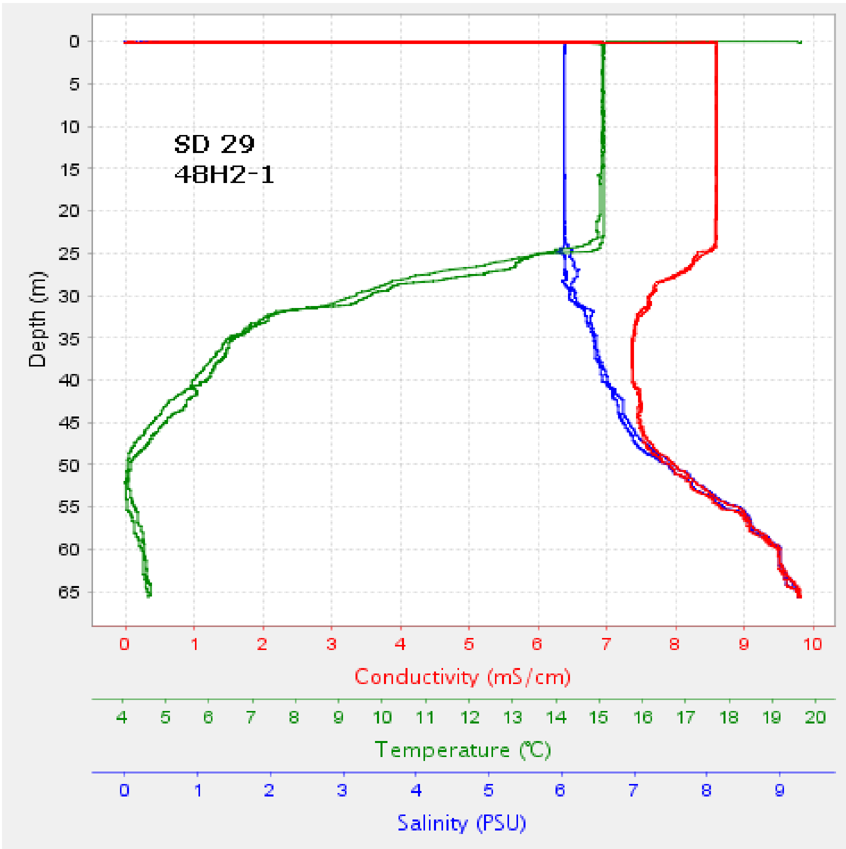

Figure 6. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 48H2-1 in SD 29.

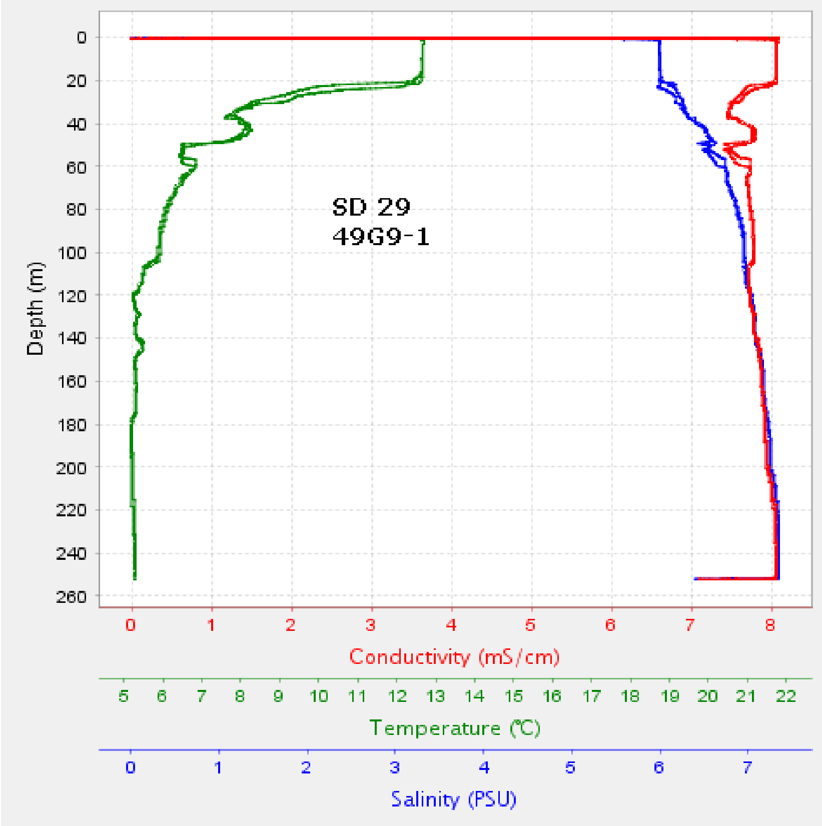

Figure 7. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 49G9-1 in SD 29.

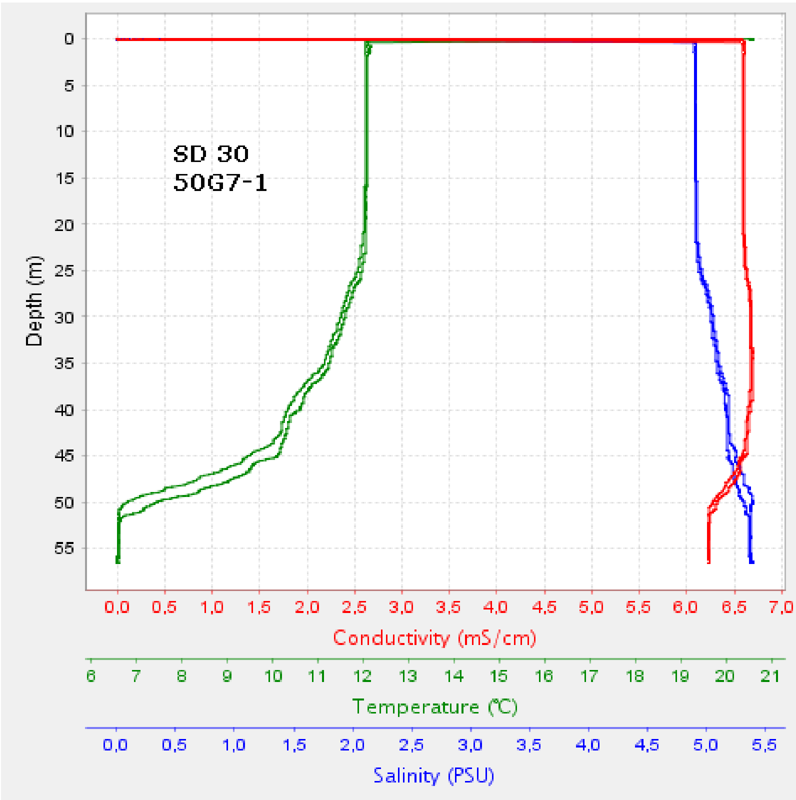

Figure 8. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 50G7-1 in SD 30.

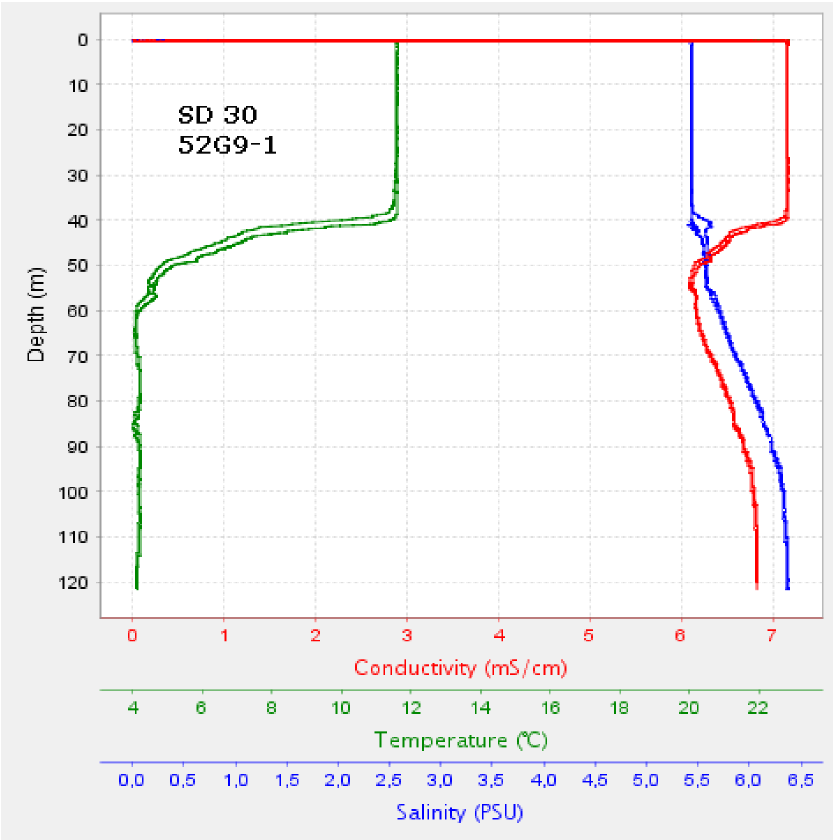

Figure 9. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 52G9-1 in SD 30.

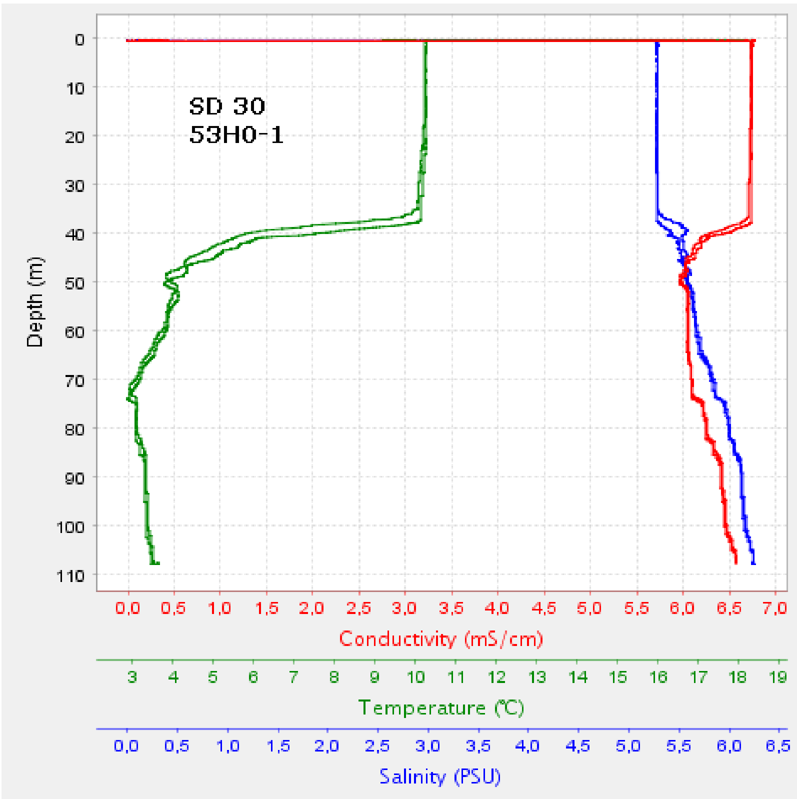

Figure 10. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 53H0-1 in SD 30.

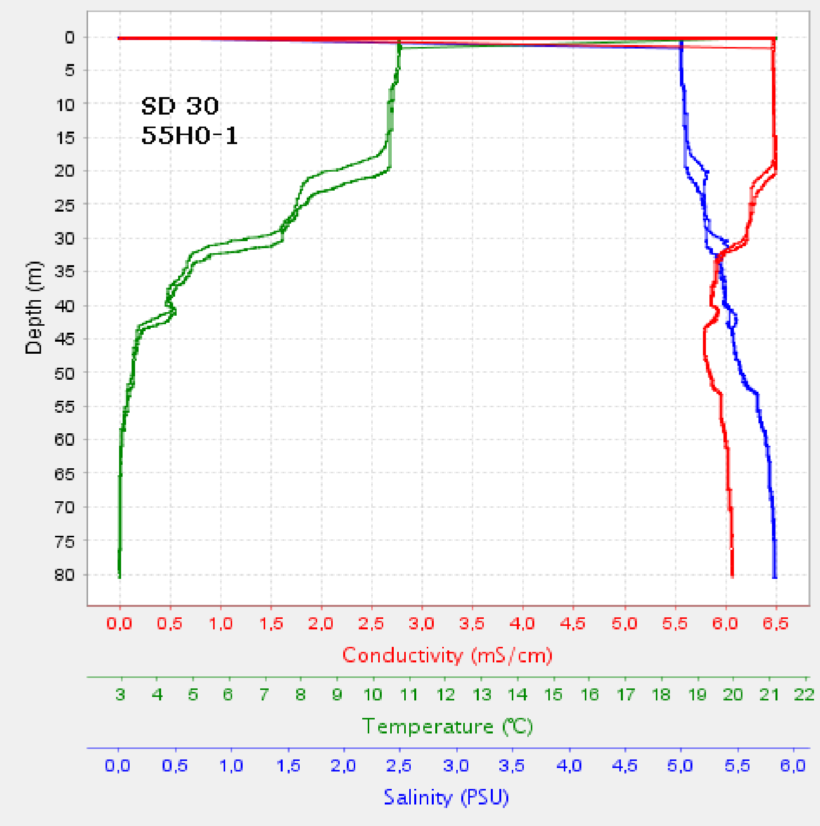

Figure 11. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 55H0-1 in SD 30.

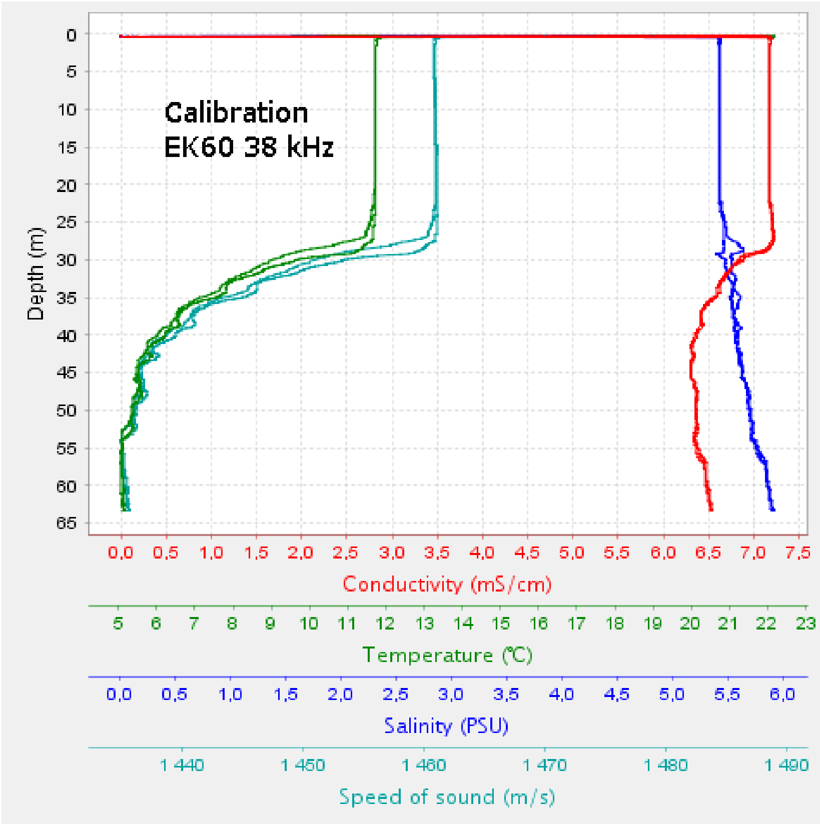

Figure 12. Vertical distribution of the connectivity, water temperature, salinity, and sound speed at the calibration station of echo sounder (EK60 38 kHz).

Report on Polish Baltic International Acoustic Survey onboard r/v Baltica September 17 – October 4, 2014

Tomasz Łączkowski*[1] and Tycjan Wodzinowski[1]

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March 23, 2015

1 Narrative

The ship left Gdynia harbour on September 16, 2014 at 22:00 local time and headed towards the first point of hydroacoustic survey. The measurements began on September 17 in the morning. The last control haul took place on October 2 in the western part of Polish EEZ (SD 24). The ship returned to Gdynia harbour on 4 October in the morning.

Scientific staff (all people from NMFRI, Gdynia, Poland):

– Tomasz Łączkowski – survey leader, acoustician,
– Jakub Słembarski – acoustician,
– Tycjan Wodzinowski – hydrologist, meteo station operator,
– Katarzyna Nadolna-Ałtyn – ichtiologist, herring analysis,
– Wojciech Deluga – ichtiologist, herring analysis,
– Grzegorz Modrzejewski – ichtiologist, sprat analysis,
– Paweł Rosa – ichtiologist, sprat analysis,
– Ireneusz Wybierała – ichtiologist, cod and other species analysis,
– Joanna Pawlak – ichtiologist, cod and other species analysis.

2 Calibration

The calibration was done using the standard copper spheres on September 18 at position 54°26.07' N, 019°07.48' E (Fig. 5). Water depth on site was 56 m. The new transducer gains for 38 and 120 kHz were 24.24 and 25.54 dB respectively with deviation from the beam model equal 0.16 and 0.15 dB. Uncompensated Target Strength of the 38 kHz copper sphere in the beam is ilustrated on Fig. 1.

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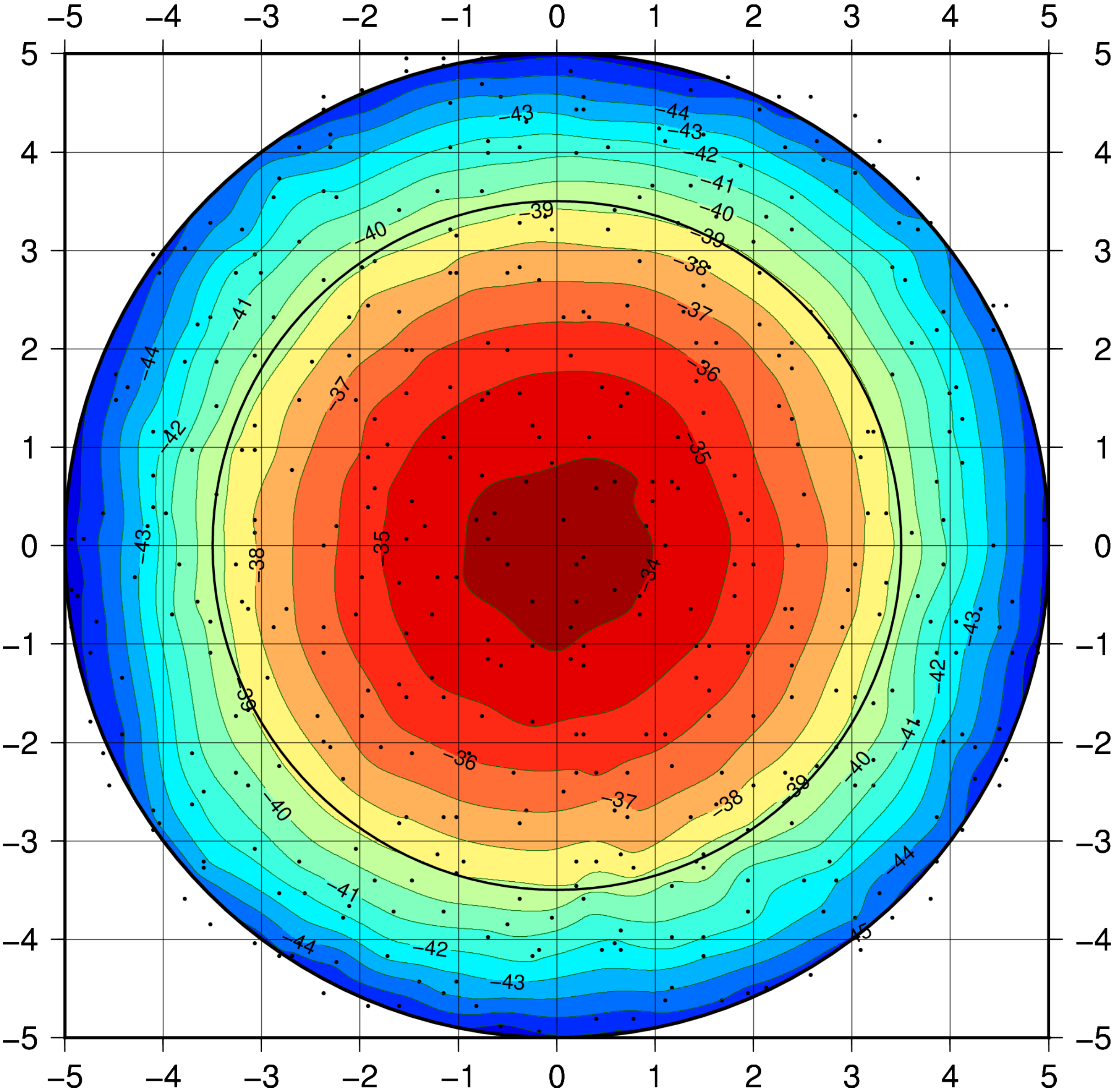

Figure 1: Uncompensated target strength of the standard copper sphere at the frequency of 38 kHz. Calibration made during the Polish BIAS survey onboard r/v Baltica on September 18, 2014, at position 54°26.07' N, 019°07.48' E.

3 Materials

Table 1: Measured and analysed specimens during the Polish BIAS survey onboard r/v Baltica carried on September 17 – October 4, 2014.

	Measurements				**Analysis**			
	ICES SD			**Sum**	**ICES SD**			**Sum**
Species	24	25	26		24	25	26	
Herring	267	2804	2163	5234	80	631	418	1129
Sprat	185	2180	1903	4268	91	320	171	582
Cod		137	137	274		130	78	208
Zander			1	1				
Flounder	2		6	8	2		6	8
River lamprey			4	4				
Lesser sand eel		2		2				
Turbot			1	1			1	1
Lumpfish	13	63		76				
Salmon			2	2				
Plaice		1		1		1		1
Whiting		2		2		2		2

Table 2: Technical details of the hauls conducted during Polish BIAS survey onboard r/v Baltica, September 17 – October 4, 2014.

Haul number	ICES SD	ICES rectangle	Baltic rectangle	Date	Shooting time UTC	Pulling back time UTC	Haul duration [min.]	Shooting latitude	Shooting longitude	Pulling latitude	Pulling longitude	Headrope depth [m]	Footrope depth [m]	Water depth max.	Water depth min.	Net height [m]	Course [°]	Speed [kt]
1	26	39G9	T8	09-17	08:25	08:55	30	55°07.93'	019°04.66'	55°09.01'	019°02.48'	62	82	92	92	20	320	3.1
2	26	38G9	T6	09-17	14:40	15:10	30	54°45.30'	019°13.36'	54°43.91'	019°13.89'	50	68	102	102	18	165	3.2
3	26	38G9	T5	09-17	16:25	16:55	30	54°39.48'	019°15.54'	54°37.86'	019°14.64'	58	75	88	88	18	200	3.1
4	26	37G9	T4	09-18	13:50	14:20	30	54°29.70'	019°19.25'	54°29.19'	019°16.20'	50	68	70	70	20	250	3.3
5	26	37G9	T4	09-19	05:15	05:45	30	54°25.27'	019°16.60'	54°25.36'	019°13.82'	25	44	52	49	19	270	3.5
6	26	37G8	S4	09-19	08:10	08:40	30	54°29.43'	018°54.51'	54°31.06'	018°54.66'	35	55	65	62	20	5	3.2
7	26	38G8	S5	09-19	11:00	11:30	30	54°33.06'	018°54.20'	54°33.05'	018°57.05'	40	58	68	65	18	100	3.1
8	26	38G8	S6	09-19	13:50	14:05	15	54°43.29'	018°58.60'	54°43.75'	018°57.29'	50	70	91	91	20	300	3.1
9	26	40G8	S11	09-20	09:30	10:00	30	55°36.47'	018°58.26'	55°34.83'	018°58.69'	10	29	87	86	19	175	3.3
10	26	40G8	S12	09-20	14:45	15:15	30	55°46.67'	018°40.09'	55°44.95'	018°39.98'	25	45	102	101	20	180	3.1
11	26	39G8	S9	09-21	06:40	07:10	30	55°12.90'	018°40.29'	55°14.49'	018°40.41'	67	85	87	80	18	0	3.1
12	26	38G8	S7	09-21	10:20	10:50	30	54°58.64'	018°40.32'	54°59.92'	018°41.52'	70	88	92	92	18	30	3.2
13	26	39G8	R8	09-21	16:00	16:15	15	55°00.32'	018°20.89'	55°00.73'	018°21.94'	12	30	42	33	18	57	3.2
14	26	39G8	P9	09-22	09:25	09:55	30	55°13.71'	018°16.84'	55°13.02'	018°17.07'	44	62	71	58	18	180	3.3
15	26	40G8	R11	09-24	08:00	08:30	30	55°38.65'	018°25.70'	55°40.20'	018°27.02'	15	35	96	94	20	15	3.2
16	25	39G7	N8	09-26	05:55	06:25	30	55°09.23'	017°19.70'	55°10.04'	017°21.97'	35	53	60	58	18	55	3.2
17	25	38G7	N7	09-26	09:15	09:45	30	54°58.44'	017°21.30'	54°59.91'	017°22.96'	4	23	30	27	19	30	3.4
18	25	38G7	N7	09-26	11:00	11:15	15	54°59.56'	017°34.07'	54°59.97'	017°35.34'	10	30	35	34	20	60	3.3
19	25	39G7	O9	09-26	13:40	14:10	30	55°15.04'	017°40.58'	55°16.37'	017°42.37'	50	68	84	66	18	30	3.4
20	25	40G7	O11	09-26	16:10	16:40	30	55°30.13'	017°46.02'	55°31.16'	017°48.48'	40	58	67	66	18	55	3.2
21	25	38G6	J6	09-28	08:00	08:30	30	54°42.96'	016°19.00'	54°43.32'	016°21.53'	17	37	39	34	20	75	3.2
22	25	38G6	J7	09-28	11:35	12:05	30	54°56.69'	016°14.89'	54°58.11'	016°16.75'	25	45	48	46	20	30	3.2
23	25	39G6	K8	09-28	14:10	14:40	30	55°03.57'	016°20.95'	55°04.53'	016°23.46'	27	45	62	59	18	50	3.2
24	25	39G6	J9	09-29	05:30	06:00	30	55°16.66'	016°18.27'	55°17.03'	016°20.90'	45	62	66	62	17	80	3.1
25	25	39G5	H8	09-29	10:10	10:50	40	55°08.06'	015°58.36'	55°08.04'	015°55.13'	66	84	87	87	18	270	2.8
26	25	37G5	G4	09-30	08:15	08:45	30	54°29.70'	015°38.62'	54°29.42'	015°35.67'	35	55	56	56	20	250	3.3
27	25	38G5	H6	09-30	11:05	11:35	30	54°40.17'	015°40.16'	54°41.79'	015°40.63'	45	63	67	65	18	0	3.0
28	25	38G5	G7	09-30	14:10	14:40	30	54°54.18'	015°38.72'	54°53.82'	015°35.72'	45	63	78	77	18	255	3.0
29	25	39G5	G8	10-01	06:10	06:40	30	55°03.70'	015°36.58'	55°03.76'	015°33.96'	50	68	74	72	18	270	3.0
30	25	38G5	G6	10-01	11:00	11:30	30	54°46.06'	015°22.60'	54°46.18'	015°19.84'	45	62	70	70	17	270	3.0
31	25	37G5	G4	10-01	14:55	15:25	30	54°28.92'	015°23.21'	54°29.92'	015°20.79'	20	40	46	45	20	305	3.3
32	24	38G4	E6	10-02	09:25	09:55	30	54°45.03'	014°58.52'	54°45.03'	014°55.50'	35	55	59	59	20	270	3.2
33	24	38G4	E5	10-02	12:20	12:50	30	54°37.31'	014°46.86'	54°38.96'	014°47.38'	25	45	50	47	20	10	3.1

Table 3: Hydrometeorological conditions during trawl stations.

Haul number	Sea surface temperature [°C]	Temperature at hauling depth [°C]	Salinity at hauling depth	Oxygen at hauling depth [ml/l]	Wind direction	Wind force [B]	Sea state
1	17.3	5.1	9.0	3.45	SE	3	2
2	17.9	4.7	8.6	4.88	ESE	3	2
3	17.6	5.2	9.8	3.56	ESE	3	2
4	17.8	4.7	8.6	4.72	E	3	2
5	17.0	3.9	7.4	6.84	SE	3	2
6	16.8	4.6	8.4	4.59	SSE	3	2
7	17.5	4.8	8.4	4.70	SE	3	2
8	17.6	4.7	8.8	4.20	E	3	2
9	17.4	17.0	7.1	6.40	SE	3	2
10	17.5	5.4	7.1	7.10	SE	2	2
11	17.6	5.1	9.3	4.29	SSE	3	2
12	17.6	5.6	11.7	2.29	SW	4	2
13	17.6	7.1	7.3	6.71	W	2	1
14	17.3	4.1	7.4	7.30	NNW	5	3
15	15.6	5.6	7.0	6.96	SW	6	3
16	15.6	6.5	7.7	6.31	NW	4	3
17	15.2	14.8	7.3	6.63	WSW	4	2
18	15.6	15.5	7.2	6.61	SW	4	2
19	15.3	7.9	9.8	5.17	SW	4	2
20	15.6	4.4	7.5	6.96	SW	6	3
21	15.4	14.3	7.6	6.67	W	5	3
22	14.7	11.3	7.7	6.20	SSW	5	3
23	15.3	7.3	8.0	5.72	WSW	6	3
24	14.8	8.4	11.0	4.22	WSW	4	2
25	15.3	9.0	15.4	2.12	WSW	3	2
26	15.5	8.1	10.8	4.06	NE	2	1
27	15.3	9.6	11.0	4.09	ENE	3	1
28	15.5	11.2	11.4	3.81	ENE	4	2
29	15.3	11.0	13.5	3.34	ESE	5	3
30	15.4	7.9	10.4	4.23	ESE	4	3
31	15.4	7.4	7.7	5.67	ESE	3	3
32	15.4	8.1	10.8	3.03	SW	3	2
33	15.4	9.5	9.3	4.70	ESE	3	2

Table 4: Total catch.

Haul number	Herring	Sprat	Cod	Zander	Flounder	River lamprey	Lesser sand eel	Turbot	Lumpfish	Salmon	Plaice	Whiting
1	263.23		5.20									
2	126.22	26.36	37.97	1.41								
3	231.98	2.80	1.53									
4	115.11	20.24	0.71									
5	55.60	10.68	1.70		0.46	0.11						
6	15.71	39.80	3.41			0.09						
7	7.27	376.66	1.93									
8	165.94	1.52	3.11									
9		91.69			0.20	0.09	0.02					
10												
11	351.71	0.45	2.60			0.13						
12	103.58	4.10	0.35		0.27							
13	11.48	231.00										
14	190.16		0.89		0.20							
15		90.52	0.64					0.50				
16	50.05	0.49							0.44			
17		22.99					0.01					
18	3.96	258.28								0.19		
19	52.70	0.55	0.86						1.14			
20	97.07											
21	6.99	48.33								2.36		
22	99.31	7.52							1.08			
23	258.07	16.55							7.50			
24	116.85	193.05	1.18						0.41			
25	116.59	3.08	20.50						0.17		0.12	
26	102.38	97.85	0.31						1.10			
27	243.35	19.55	4.52						1.72			
28	99.12	45.14	4.69									
29	56.36	273.06	2.29									0.22
30	304.73	16.01	12.10						0.79			0.18
31	37.27	33.95							2.81			
32	60.06	54.01			0.32				0.92			
33	1.52								2.42			

Table 5: Catch by day.

Date	Herring	Sprat	Cod	Zander	Flounder	River lamprey	Lesser sand eel	Turbot	Lumpfish	Salmon	Plaice	Whiting
2014-09-17	621.44	29.15	44.7	1.41								
2014-09-18	115.11	20.24	0.71									
2014-09-19	244.52	428.66	10.145		0.455	0.195						
2014-09-20		91.69			0.197	0.093	0.0216					
2014-09-21	466.78	235.54	2.945		0.272	0.1262						
2014-09-22	190.16		0.89		0.1984							
2014-09-24		90.52	0.64					0.5				
2014-09-26	203.78	282.31	0.86				0.0104		1.58	0.19		
2014-09-28	364.37	72.40							8.57	2.36		
2014-09-29	233.45	196.13	21.68						0.57		0.12	
2014-09-30	444.85	162.54	9.51						2.81			
2014-10-01	398.36	323.03	14.39						3.60			0.39
2014-10-02	61.58	54.01			0.32				3.35			

Table 6: Survey statistics.

ICES SD	ICES Rect-angle	Area [NM^2]	Mean S_A [m^2 / NM^2]	EDSU [NM]	$\bar{\sigma}$ [m$^2\times$ 10^{-4}]	Total abundance (10^6)	Species composition Herring	Species composition Sprat	Abundance (10^6) Herring	Abundance (10^6) Sprat	Abundance (10^6) Cod
24	38G4	1034.8	201.0	34	2.03	1027	73.1%	26.9%	751	276	0
Sum SD 24		1034.8	201.0	34		1027			751	276	0
25	37G5	642.2	185.4	43	1.62	737	29.0%	71.0%	214	523	0
	38G5	1035.7	260.5	107	3.50	772	64.5%	35.1%	498	270	3
	38G6	940.2	195.4	85	1.66	1106	43.4%	56.6%	480	626	0
	38G7	471.7	373.4	33	0.72	2439	0.4%	99.6%	10	2429	0
	39G5	979.0	181.1	32	3.13	565	47.1%	51.6%	266	292	7
	39G6	1026.0	311.5	104	2.70	1183	51.4%	48.6%	608	574	0
	39G7	1026.0	391.1	129	3.82	1049	96.7%	3.3%	1015	34	1
	40G7	1013.0	206.0	30	4.05	515	100.0%	0.0%	515	0	0
Sum SD 25		7264.5	263.1	563		7851			3605	4749	11
26	37G8	86.0	846.2	8	1.64	445	17.6%	82.3%	78	366	1
	37G9	151.6	186.4	36	2.12	134	33.7%	66.2%	45	88	0
	38G8	624.6	526.2	66	2.59	1271	60.1%	39.8%	764	506	1
	38G9	918.2	421.5	73	3.22	1202	54.6%	44.8%	656	539	7
	39G8	1026.0	485.9	122	3.02	1649	66.9%	33.1%	1104	545	1
	39G9	1026.0	670.6	45	4.15	1659	99.7%	0.0%	1655	0	5
	40G8	1013.0	316.4	101	0.59	5451	0.0%	100.0%	0	5451	0
Sum SD 26		4845.4	493.3	451		11812			4302	7496	14
Sum SD 24+25+26		13144.7	319.1	1048		20690			8658	12521	25

4 Results

4.1 Herring

4.2 Sprat

4.3 Cod

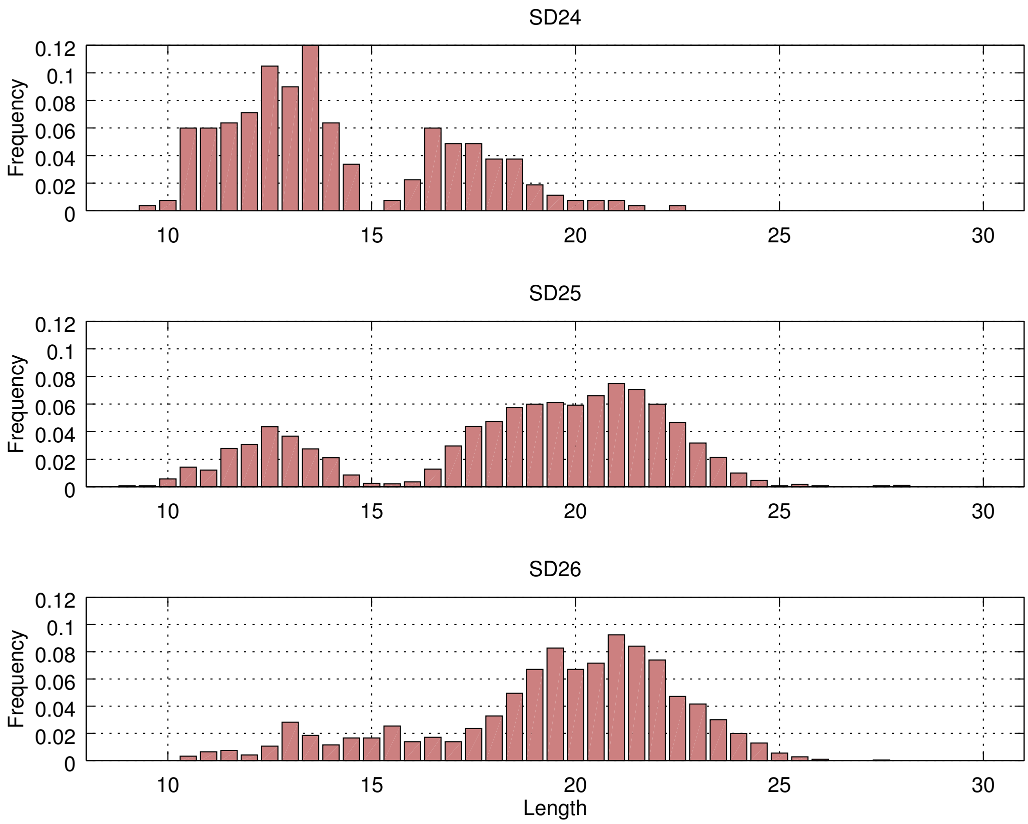

Figure 2: Herring length distribution.

Table 7: Estimated number (millions) of herring

ICES SD	ICES Rect-angle	Total	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4	751	515.84	120.88	35.14	54.11	10.54	8.43	2.81	2.81	
	Sum	751	515.84	120.88	35.14	54.11	10.54	8.43	2.81	2.81	
25	37G5	214	139.15	14.08	6.29	19.30	9.11	4.59	9.55	5.71	5.99
	38G5	498	24.37	26.83	32.05	106.29	78.48	27.78	89.65	50.88	61.50
	38G6	480	300.38	29.23	16.33	49.76	20.19	12.55	25.39	14.69	11.60
	38G7	10	9.51	0.05	0.01	0.07	0.01	0.03	0.01	0.01	
	39G5	266	14.24	20.40	20.24	69.73	31.80	18.70	44.13	24.62	22.54
	39G6	608	38.50	113.90	56.35	157.11	56.46	40.96	73.34	43.34	28.34
	39G7	1015	1	129.53	101.00	274.82	104.49	75.44	160.36	90.64	68.35
	40G7	515		43.24	44.52	141.35	61.84	42.51	87.45	52.23	41.59
	Sum	3605	536.15	377.25	276.78	818.44	362.38	222.55	489.88	282.12	239.91
26	37G8	78	33.67	28.58	1.69	3.20	1.57	3.42	3.30	1.74	1.02
	37G9	45	6.93	8.81	1.29	2.75	1.58	2.51	5.45	6.57	9.07
	38G8	764	38.89	36.95	20.77	65.43	35.87	61.48	139.02	164.58	201.50
	38G9	656	5.33	7.55	5.48	19.66	22.15	23.34	81.05	152.51	339.33
	39G8	1104	11.82	45.99	33.84	113.34	55.50	101.65	226.02	240.04	275.43
	39G9	1655	6.19	27.95	42.13	157.62	69.02	147.97	329.35	378.89	495.55
	40G8	0									
	Sum	4302	103	156	105	362	186	340	784	944	1322

Table 8: Herring average weight (g)

ICES SD	ICES Rect-angle	Mean	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4	19.8	12.22	32.07	34.19	41.71	39.53	53.60	63.20	49.60	
25	37G5	27.5	13.62	32.84	47.13	51.56	64.90	54.03	62.03	62.73	74.28
	38G5	61.4	15.23	36.57	55.03	60.56	72.78	61.73	63.00	66.81	73.56
	38G6	26.2	11.41	35.16	47.32	50.07	58.72	47.24	56.02	57.92	67.72
	38G7	9.0	8.41	41.20	42.50	41.36	39.20	40.95	34.60	43.80	
	39G5	53.9	14.41	38.42	52.89	53.74	63.06	51.80	57.81	59.94	69.16
	39G6	46.0	15.39	34.59	46.44	47.84	53.81	47.80	54.99	56.14	65.33
	39G7	51.9	16.67	36.08	49.89	51.50	58.34	49.45	56.14	56.97	67.39
	40G7	55.4		39.49	52.20	53.11	62.95	51.54	56.83	58.76	69.18
26	37G8	22.6	13.38	23.24	34.21	39.91	38.00	39.64	43.13	44.64	48.99
	37G9	45.2	12.79	24.40	38.12	46.63	56.08	46.99	53.96	63.12	70.21
	38G8	54.4	11.56	26.68	43.05	49.08	55.66	48.41	53.23	60.88	67.87
	38G9	74.6	14.40	22.56	49.67	56.18	75.40	65.31	65.85	72.47	81.87
	39G8	54.4	13.39	28.28	44.30	49.07	51.43	47.14	51.94	58.75	65.31
	39G9	58.0	14.94	32.43	44.96	49.27	56.04	48.83	52.84	59.76	69.11
	40G8										

Table 9: Estimated herring biomass (10^3 t)

ICES SD	ICES rect-angle	Sum	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4	14826.2	6305.8	3876.1	1201.5	2256.9	416.7	452.0	177.7	139.4	0.0
25	37G5	5883.3	1894.6	462.3	296.4	995.3	591.5	247.8	592.3	358.2	445.0
	38G5	30550.6	371.1	981.1	1763.6	6437.6	5711.8	1714.7	5647.7	3399.2	4523.7
	38G6	12555.9	3425.9	1027.5	772.9	2491.6	1185.7	593.1	1422.2	851.1	785.9
	38G7	87.7	80.0	1.9	0.5	2.9	0.5	1.1	0.2	0.6	0.0
	39G5	14366.1	205.3	783.8	1070.4	3747.4	2005.1	968.6	2551.1	1475.5	1558.9
	39G6	27978.6	592.4	3940.0	2616.6	7516.2	3037.8	1958.1	4033.4	2432.7	1851.4
	39G7	52631.1	166.7	4673.0	5038.6	14153.0	6096.5	3730.7	9003.2	5163.4	4606.2
	40G7	28538.2	0.0	1707.6	2323.9	7507.3	3892.6	2190.9	4969.9	3068.9	2877.0
	Sum	172591.5	6736.1	13577.1	13883.0	42851.2	22521.5	11404.9	28220.0	16749.6	16648.1
26	37G8	1766.6	450.6	664.1	57.8	127.8	59.6	135.8	142.2	77.5	50.2
	37G9	2033.1	88.7	214.9	49.2	128.1	88.5	117.8	293.9	414.8	637.1
	38G8	41609.5	449.4	985.7	894.2	3211.7	1996.4	2976.4	7400.7	10019.0	13676.2
	38G9	48987.7	76.7	170.3	272.3	1104.5	1670.1	1524.3	5337.1	11051.9	27780.5
	39G8	59998.4	158.4	1300.4	1499.2	5562.1	2854.4	4791.3	11740.1	14102.9	17989.7
	39G9	96045.3	92.5	906.3	1894.1	7766.5	3868.0	7224.9	17401.4	22643.5	34248.1
	40G8		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sum	250439.6	1316.2	4241.7	4666.8	17900.8	10537.1	16770.4	42315.5	58309.5	94381.7

Table 10: Estimated number (millions) of sprat

ICES SD	ICES Rect-angle	Total	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4	276	55.27	41.08	26.59	67.22	56.02	10.16	13.59	1.49	4.93
	Sum	276	55.27	41.08	26.59	67.22	56.02	10.16	13.59	1.49	4.93
25	37G5	523	214.59	88.67	98.62	61.73	23.51	18.34	12.41	2.34	2.63
	38G5	270	9.08	33.41	68.11	77.31	31.09	26.03	18.41	4.27	2.79
	38G6	626	364.72	88.93	96.73	44.42	12.67	10.02	6.16	0.45	2.07
	38G7	2429	2270.23	99.00	54.69	3.80	1.40				
	39G5	292		39.56	83.80	88.24	32.04	23.63	18.39	3.00	3.20
	39G6	574		60.78	135.26	172.02	77.29	65.63	45.22	10.98	7.11
	39G7	34	0.26	4.05	7.99	9.91	4.62	3.82	2.61	0.65	0.39
	40G7	0									
	Sum	4749	2858.88	414.40	545.20	457.43	182.62	147.47	103.20	21.69	18.18
26	37G8	366		120.75	107.38	70.95	40.27	16.22	6.96	0.63	2.96
	37G9	88		34.56	26.34	15.72	7.83	2.48	1.16	0.05	0.32
	38G8	506		159.62	167.65	99.19	51.33	16.62	7.97	0.57	2.56
	38G9	539	417.74	62.14	30.78	17.05	6.00	3.35	0.90	0.16	0.81
	39G8	545		180.46	185.19	104.94	45.38	15.55	9.33	1.20	3.29
	39G9	0									
	40G8	5451	5439.41	2.38	5.95	3.57					
	Sum	7496	5857.15	559.93	523.29	311.42	150.81	54.23	26.32	2.61	9.94

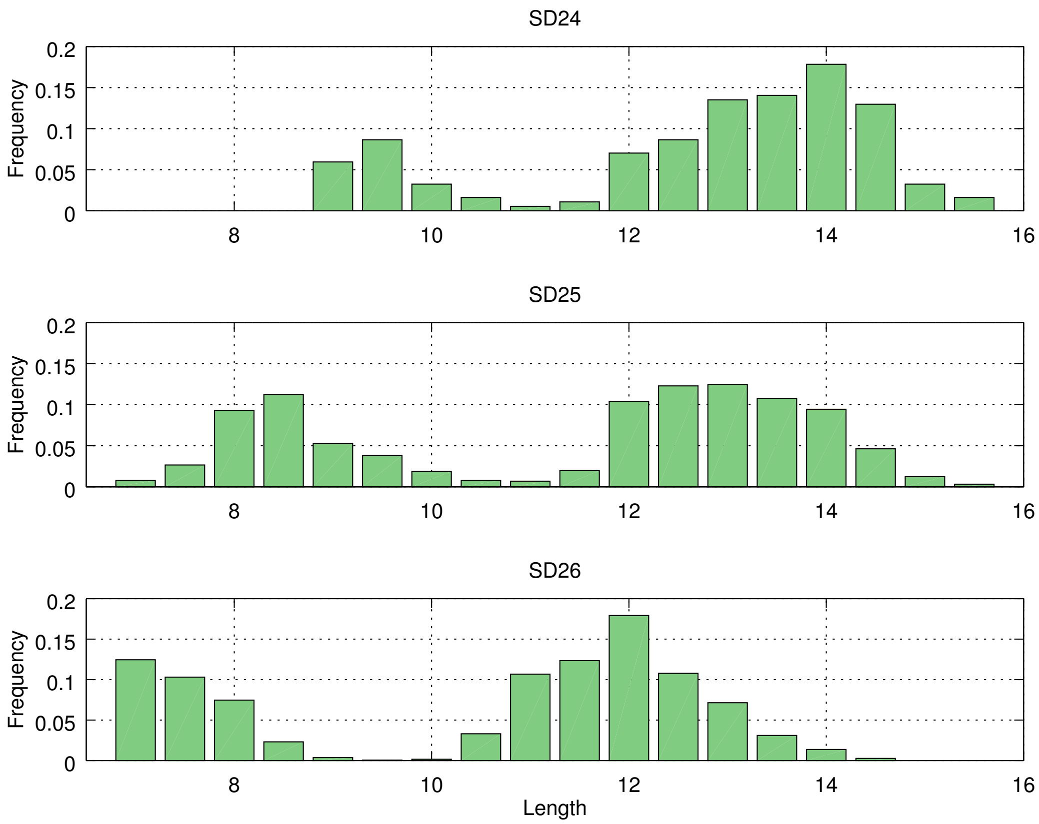

Figure 3: Sprat length distribution.

Table 11: Sprat average weight (g)

ICES SD	**ICES Rect-angle**	**Mean**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**
24	38G4	14.2	6.02	13.54	15.01	16.50	17.41	19.39	18.46	20.50	17.50
25	37G5	10.7	5.64	11.32	13.92	16.05	16.26	16.97	17.14	19.29	15.77
	38G5	15.8	5.98	13.35	14.92	16.72	17.15	18.12	17.64	19.60	16.50
	38G6	8.3	4.45	11.92	13.51	15.54	15.10	15.67	16.02	19.28	15.01
	38G7	4.5	4.05	9.87	11.46	11.04	12.30				
	39G5	15.7		13.67	14.81	16.38	16.76	17.19	16.99	18.84	15.64
	39G6	16.3		13.59	15.05	16.75	17.27	18.00	17.60	19.27	16.50
	39G7	16.2	9.68	13.17	14.94	16.79	17.37	17.97	17.57	19.04	16.82
	40G7										
26	37G8	11.8		9.73	11.84	12.79	13.98	14.51	15.30	15.60	15.23
	37G9	11.3		9.51	11.78	12.54	13.71	14.36	14.47	15.60	15.05
	38G8	11.8		1	11.87	12.61	13.72	14.45	14.32	15.60	15.27
	38G9	4.5	2.73	9.45	11.20	12.28	14.32	14.62	15.44	15.60	15.18
	39G8	11.7		10.04	11.78	12.44	13.79	14.73	14.64	15.60	15.82
	39G9										
	40G8	2.99	3.00	11.88	11.87	11.87					

Table 12: Estimated sprat biomass (10^3 t)

ICES SD	**ICES rect-angle**	**Sum**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**
24	38G4	3937.1	332.7	556.1	399.2	1108.9	975.5	197.0	251.0	30.6	86.3
25	37G5	5570.5	1210.8	1003.4	1372.9	990.5	382.4	311.3	212.7	45.1	41.4
	38G5	4268.3	54.3	445.8	1016.4	1292.7	533.2	471.5	324.7	83.6	46.0
	38G6	5166.8	1623.1	1060.1	1306.7	690.1	191.2	157.0	98.7	8.8	31.0
	38G7	10854.4	9191.3	977.2	626.8	41.9	17.2				
	39G5	4589.8		540.8	1241.2	1445.6	537.0	406.2	312.5	56.5	50.0
	39G6	9384.1		826.0	2035.5	2881.4	1334.9	1181.4	796.0	211.6	117.3
	39G7	555.3	2.5	53.3	119.4	166.3	80.2	68.7	45.8	12.4	6.6
	40G7	0.0									
	Sum	40389.2	12082.0	4906.6	7718.9	7508.6	3076.1	2596.1	1790.5	418.0	292.3
26	37G8	4313.7		1175.4	1271.4	907.2	562.9	235.4	106.5	9.8	45.1
	37G9	1001.6		328.7	310.2	197.2	107.4	35.7	16.7	0.8	4.8
	38G8	5943.4		1596.5	1989.4	1251.0	704.1	240.2	114.1	8.9	39.1
	38G9	2447.6	1142.4	587.6	344.7	209.4	85.9	49.0	13.9	2.5	12.2
	39G8	6360.8		1812.3	2181.3	1305.1	625.9	229.0	136.5	18.7	52.0
	39G9	0.0									
	40G8	16381.8	16240.5	28.3	70.6	42.4					
	Sum	36449.0	17382.9	5528.7	6167.7	3912.4	2086.1	789.4	387.9	40.7	153.3

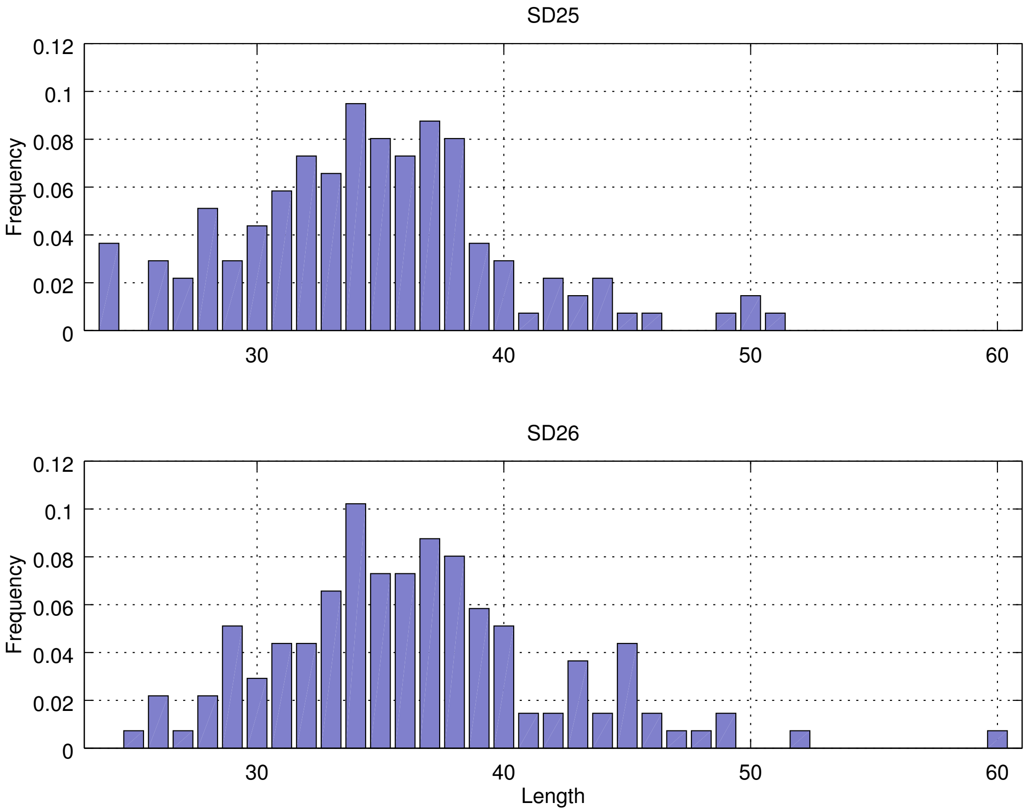

Figure 4: Cod length distribution.

Table 13: Estimated number (millions) of cod

ICES SD	ICES Rect-angle	Total	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4	0									
	Sum	0									
25	37G5	0									
	38G5	3			1.00	1.49	0.64	0.20	0.02	0.03	
	38G6	0									
	38G7	0									
	39G5	7			1.60	3.13	1.34	0.75	0.40		
	39G6	0									
	39G7	1					0.26			0.26	
	40G7	0									
	Sum	11			2.59	4.62	2.24	0.95	0.42	0.28	
26	37G8	1			0.02	0.21	0.21	0.10			
	37G9	0									
	38G8	1			0.06	0.53	0.30	0.16			
	38G9	7			1.19	3.99	0.92	0.35	0.07		
	39G8	1			0.03	0.17	0.17	0.03	0.10		
	39G9	5			0.24	3.50	0.81	0.12			
	40G8	0									
	40G9	0									
	Sum	14			1.54	8.40	2.41	0.77	0.17		

Table 14: Cod average weight (g)

ICES SD	ICES Rect-angle	Mean	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
24	38G4										
25	37G5										
25	38G5	323			226.1	302.1	398.8	645.0	330.0	855.0	
25	38G6										
25	38G7										
25	39G5	347			247.6	310.9	378.7	522.0	592.2		
25	39G6										
25	39G7	943					1030.0			855.0	
25	40G7										
26	37G8	661			580.0	547.1	779.0	675.0			
26	37G9										
26	38G8	541			458.1	441.2	677.3	639.1			
26	38G9	400			218.6	370.0	588.4	599.4	1815.0		
26	39G8	650			225.0	278.0	949.0	715.0	890.0		
26	39G9	403			385.0	373.0	519.3	525.0			
26	40G8										

Table 15: Estimated biomass of cod (10^3 t)

ICES SD	**ICES rect-angle**	**Sum**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8**
	38G4										
25	37G5										
	38G5	1088			225	449	255	130	7	23	
	38G6										
	38G7										
	39G5	2506			395	973	508	393	236		
	39G6										
	39G7	482					263			218	
	40G7										
	Sum	4076			620	1422	1027	522	241		
26	37G8	358			13	116	160	70			
	37G9										
	38G8	567			26	233	206	103			
	38G9	2609			259	1478	542	209	121		
	39G8	327			8	47	159	24	90		
	39G9	1878			92	1304	419	62			
	40G8										
	Sum	5739	0	0	397	3177	1487	468	210	0	0

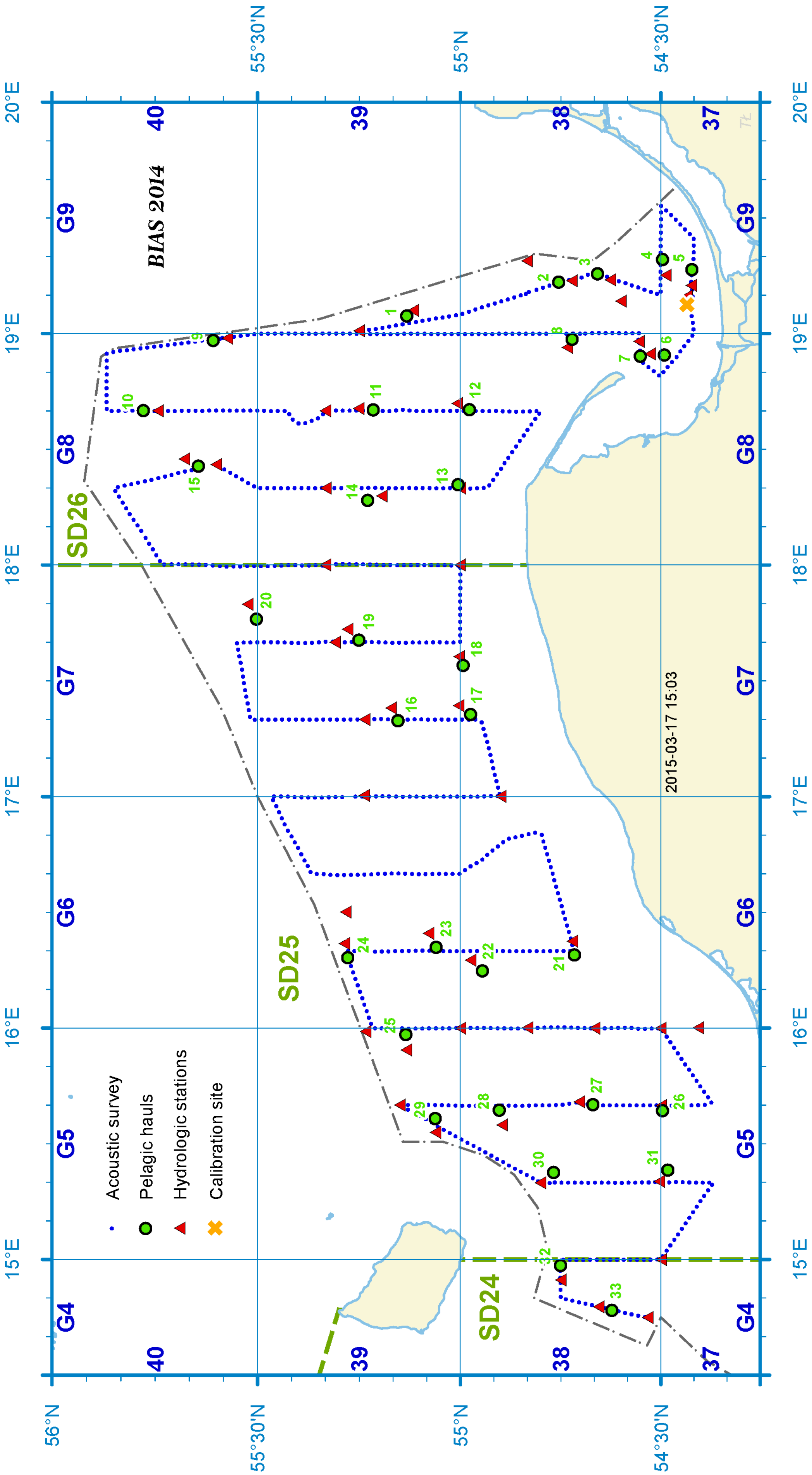

Figure 5: Activities

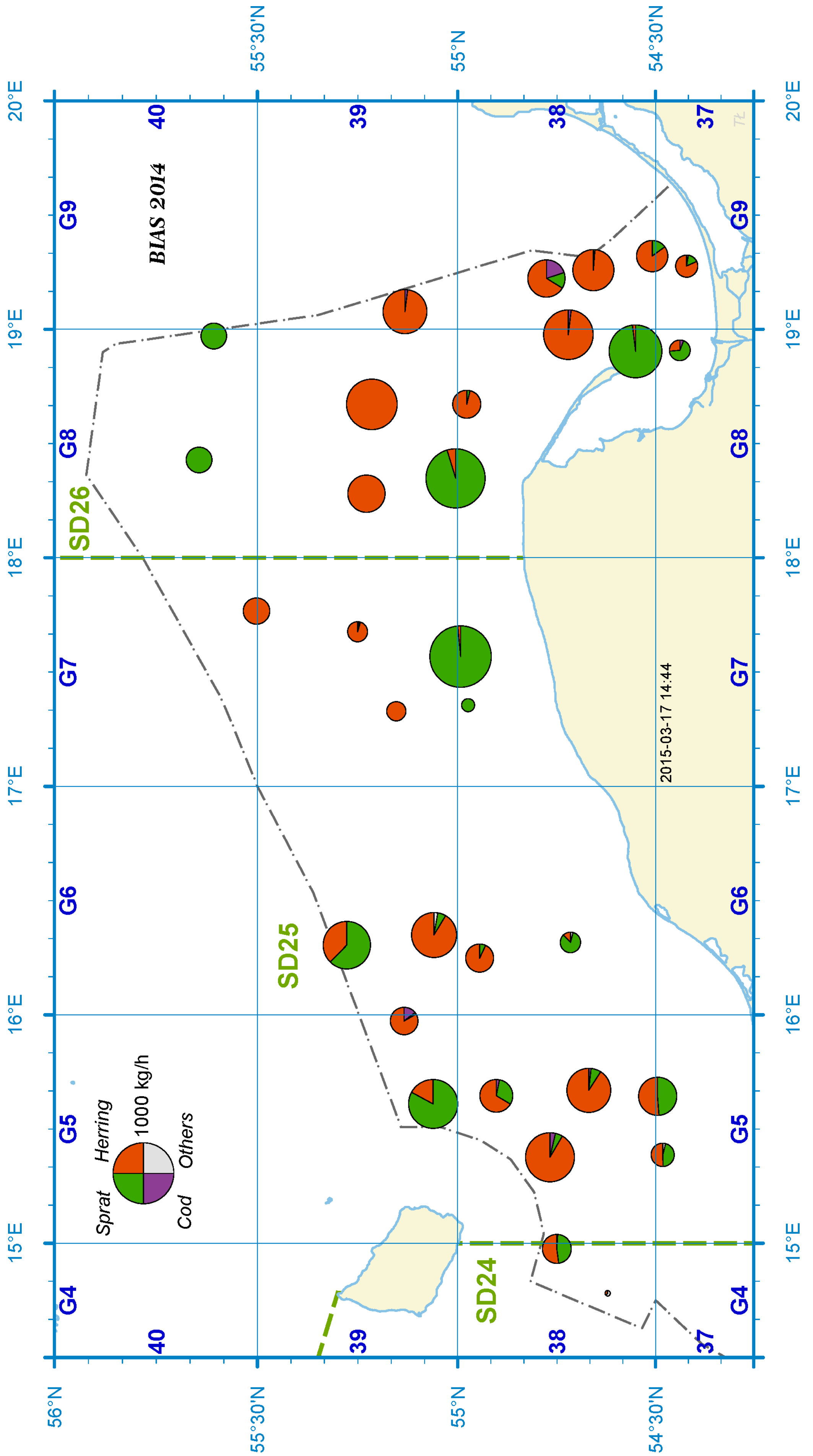

Figure 6: Catch Per Unit Effort (1000 kg/h) of the main pelagic species. Polish Baltic Acoustic Survey, September 17 – October 4, 2014.

Baltic International Acoustic Survey Report for R/V Dana

2014-09-30 - 2014-10-12

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).

Contents

2 Methods

2.1 Narrative

Due to that R/V Argos was taken out of order, Sweden has rented R/V Dana since 2011 for the BIAS survey. The scientific staff was Swedish and the ship crew was Danish. This year's calibration of the SIMRAD EK60 sounder was made at Gullmarsfjorden on the Swedish west coast, 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 2014.10.02 inbetween Sweden and Bornholm at the border between ICES subdivision (SD) 24 and SD 25, and ended a few nautical miles east from where it had started 2014-10-12. The total cruise covered SD 27 and parts of 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 normally 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. The total area covered was 21752 square nautical miles and the distance used for acoustic estimates was 1423 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 Bornö in Gullmarssfjorden 2014-09-30 according to the BIAS manual (ICES CM 2011/SSGESST:05, Addendum 2). Values from the calibration were within required accuracy. The change of calibration site was decided after correspondance with Simrad. Due to the distance between the calibration site and the survey area the gain was recalculated using the equation: $\mathrm{G} = \mathrm{G}_0 + 10 * log10(c_0^2/c^2)(Bodholt2002)$

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). 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 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 1.

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

Hilvarsson, Anneli	IMR, Lysekil, Sweden	Fish sampling
Jernberg, Carina	IMR, Lysekil, Sweden	Fish sampling
Larson, Niklas	IMR, Lysekil, Sweden	Scientific & Expedition leader, Acoustics
Lövgren, Olof	IMR, Lysekil, Sweden	Acoustics
Ovegård, Mikael	IMR, Lysekil, Sweden	Fish sampling
Palmen-Bratt, Anne-Marie	IMR, Lysekil, Sweden	Fish sampling
Sjöberg, Rajlie	IMR, Lysekil, Sweden	Fish sampling
Svenson, Anders	IMR, Lysekil, Sweden	Expedition leader, Acoustics
Tell, Anna-Kerstin	SMHI, Gothenburg	Oceanography

Table 2: Participating scientific crew

3 Results

3.1 Biological data

In total 48 trawl hauls were carried out, 15 in SD 25, 2 in SD 26, 14 in SD 27, 9 in SD 28 and 8 hauls in SD 29 . 2259 herrings and 1155 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 Sub-division/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	379.5	5.416	201.35	92.47	4.51	1.441
25	39G5	979.0	485.0	1.917	2476.47	10.48	89.25	0.233
25	40G4	677.2	543.5	2.190	1680.58	33.76	47.66	1.846
25	40G5	1012.9	536.0	2.050	2648.08	23.46	73.97	0.301
25	40G6	1013.0	916.9	2.438	3809.25	38.74	59.72	1.408
25	40G7	1013.0	627.1	3.150	2017.05	70.60	28.47	0.387
25	41G6	764.4	879.9	1.868	3601.18	33.36	60.38	0.023
25	41G7	1000.0	525.1	1.648	3185.52	11.45	87.86	0.000
26	41G8	1000.0	519.8	1.115	4660.50	10.74	89.12	0.028
27	42G6	266.0	1199.8	2.484	1284.67	54.92	23.50	0.000
27	42G7	986.9	440.9	1.574	2764.24	39.67	20.92	0.033
27	43G7	913.8	292.1	0.963	2773.60	22.47	7.13	0.097
27	44G7	960.5	613.5	1.527	3859.39	46.95	12.46	0.002
27	44G8	456.6	820.9	0.657	5703.46	14.86	10.95	0.000
27	45G7	908.7	431.1	0.558	7016.60	22.95	49.66	0.000
27	45G8	947.2	1004.6	0.730	13041.78	22.31	50.56	0.002
27	46G8	884.8	706.5	0.654	9553.25	20.99	46.43	0.004
28	42G8	945.4	860.3	0.968	8404.17	14.01	54.38	0.021
28	43G8	296.2	200.3	1.595	371.92	39.93	30.79	0.106
28	43G9	973.7	485.1	0.637	7420.49	4.25	77.90	0.000
28	44G9	876.6	881.2	0.689	11212.65	8.36	37.46	0.026
28	45G9	924.5	680.0	0.485	12952.28	13.97	29.30	0.000
29	46G9	933.8	482.9	0.573	7865.63	12.09	42.24	0.000
29	46H0	933.8	643.3	0.902	6658.82	40.30	29.60	0.000
29	47G9	876.2	1779.7	0.630	24732.94	29.44	52.40	0.000
29	47H0	920.3	518.9	0.579	8243.07	37.14	47.56	0.000

Table 3: Survey statistics

SD	RECT	NSprTOT	NSpr0	NSpr1	NSpr2	NSpr3	NSpr4	NSpr5	NSpr6	NSpr7	NSpr8
25	39G4	9.09	1.85	4.75	0.81	0.34	0.84	0.17	0.34	0.00	0.00
25	39G5	2210.18	305.93	307.54	289.01	462.46	157.59	294.62	370.18	0.00	22.86
25	40G4	800.94	131.28	205.47	93.23	179.87	96.99	62.44	8.71	22.95	0.00
25	40G5	1958.91	562.82	303.17	158.54	385.48	277.17	88.89	144.18	6.02	32.64
25	40G6	2274.75	219.95	382.87	525.00	493.68	257.84	107.59	274.23	0.00	13.59
25	40G7	574.25	185.75	10.14	35.82	136.94	126.14	42.09	23.41	13.95	0.00
25	41G6	2174.48	1023.60	379.21	162.15	276.44	161.47	46.49	63.36	22.26	39.50
25	41G7	2798.73	588.12	106.88	284.14	778.52	221.72	210.40	404.75	187.50	16.68
26	41G8	4153.44	3400.76	5.49	71.73	324.06	80.05	68.52	125.76	24.43	52.65
27	42G6	301.94	11.47	26.75	94.02	39.37	88.67	5.73	35.93	0.00	0.00
27	42G7	578.24	543.97	11.80	14.75	4.76	0.00	0.00	2.95	0.00	0.00
28	42G8	4570.19	4200.85	30.27	57.58	103.22	85.48	31.53	40.23	21.04	0.00
27	43G7	197.67	195.55	0.06	0.00	0.67	0.67	0.06	0.66	0.00	0.00
28	43G8	114.50	106.99	0.00	1.74	0.95	2.29	1.74	0.79	0.00	0.00
28	43G9	5780.40	5626.55	15.43	17.69	61.87	21.79	26.48	10.59	0.00	0.00
27	44G7	480.70	470.60	1.99	0.00	0.00	1.38	1.68	1.38	0.00	3.67
27	44G8	624.46	594.53	0.00	17.46	2.49	4.99	2.49	2.49	0.00	0.00
28	44G9	4186.63	3597.83	51.51	187.46	88.84	68.17	105.70	87.13	0.00	0.00
27	45G7	3464.68	3462.60	1.04	0.00	0.00	0.00	1.04	0.00	0.00	0.00
27	45G8	6594.33	6577.34	0.00	6.79	10.19	0.00	0.00	0.00	0.00	0.00
28	45G9	3795.16	3793.34	0.00	0.68	0.46	0.00	0.23	0.46	0.00	0.00
27	46G8	4435.11	4435.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	46G9	3322.55	3308.83	0.00	2.09	0.00	2.09	5.36	2.09	0.00	2.09
29	46H0	1971.33	1971.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	47G9	12959.43	12946.43	0.00	0.00	12.99	0.00	0.00	0.00	0.00	0.00
29	47H0	3920.02	3912.06	0.00	0.00	3.98	0.00	1.67	2.31	0.00	0.00

Table 4: Estimated number (millions) of sprat

SD	RECT	WSpr0	WSpr1	WSpr2	WSpr3	WSpr4	WSpr5	WSpr6	WSpr7	WSpr8
25	39G4	3.83	12.00	15.00	18.00	18.40	19.00	20.00		
25	39G5	4.38	10.82	12.80	16.00	19.00	16.75	16.71		19.00
25	40G4	4.41	11.21	16.50	17.67	19.14	19.00	21.33	17.00	
25	40G5	3.80	12.60	13.67	15.29	17.50	19.33	18.80	22.00	17.00
25	40G6	4.48	12.40	13.00	16.00	18.25	17.50	15.67		19.50
25	40G7	4.70	10.67	11.80	15.75	15.29	17.50	17.50	17.50	
25	41G6	3.33	11.50	12.50	16.00	15.60	18.00	16.00	17.50	17.00
25	41G7	3.46	11.50	12.80	15.62	17.67	16.00	17.00	14.67	20.00
26	41G8	3.59	10.00	11.50	13.90	16.40	16.00	16.14	16.50	18.50
27	42G6	3.00	12.20	13.43	13.33	16.22	16.00	15.75		
27	42G7	3.30	12.00	13.00	14.33			11.00		
28	42G8	3.31	10.17	13.33	13.43	15.00	15.00	16.00	14.00	
27	43G7	2.55	8.00		11.50	12.50	16.00	12.00		
28	43G8	2.80		13.00	14.50	14.80	16.00	16.50		
28	43G9	2.80	10.40	11.00	12.60	14.25	15.57	14.00		
27	44G7	2.58	7.00			11.00	16.00	16.00		16.00
27	44G8	2.17		11.00	12.00	11.50	15.00	11.00		
28	44G9	2.92	10.75	13.00	13.00	12.67	14.25	15.43		
27	45G7	2.77	10.00				16.00			
27	45G8	2.46		11.50	11.67					
28	45G9	2.56		11.33	10.50		14.00	13.50		
27	46G8	2.33								
29	46G9	2.19		12.00		11.00	12.50	12.00		11.00
29	46H0	2.20								
29	47G9	2.40			11.00					
29	47H0	2.24			13.50		14.00	12.00		

Table 5: Estimated mean weights (g) of sprat

SD	RECT	NHerTOT	NHer0	NHer1	NHer2	NHer3	NHer4	NHer5	NHer6	NHer7	NHer8
25	39G4	186.19	6.40	21.32	18.19	87.70	22.17	15.49	9.66	4.55	0.71
25	39G5	259.42	13.33	28.69	5.55	62.56	25.25	26.11	51.00	25.36	21.57
25	40G4	567.42	120.19	99.59	120.58	98.47	44.89	31.65	14.94	19.97	17.15
25	40G5	621.24	46.09	113.28	102.20	197.10	88.62	21.91	17.43	33.10	1.50
25	40G6	1475.89	24.63	228.33	133.70	374.45	73.47	323.62	171.63	144.60	1.45
25	40G7	1424.06	0.00	13.22	36.75	301.60	205.93	334.34	252.55	214.69	64.98
25	41G6	1201.39	31.40	133.51	176.56	335.67	155.22	152.04	135.21	74.26	7.52
25	41G7	364.76	3.60	4.83	35.70	181.80	51.75	32.57	44.07	8.72	1.72
26	41G8	500.67	14.82	0.00	55.99	39.79	43.39	98.24	132.75	46.92	68.77
27	42G6	705.56	0.00	0.00	19.67	264.59	89.55	124.15	135.01	44.10	28.49
27	42G7	1096.52	0.73	0.00	145.51	466.04	70.85	180.94	213.13	14.28	5.05
28	42G8	1177.47	19.26	3.96	158.36	184.88	109.74	338.08	222.02	137.72	3.46
27	43G7	623.21	26.10	2.62	94.30	256.64	71.23	95.85	27.24	41.37	7.86
28	43G8	148.49	0.79	0.96	9.21	32.03	31.84	26.09	23.98	22.63	0.96
28	43G9	315.32	112.75	0.00	1.50	41.41	29.11	76.83	41.71	8.40	3.60
27	44G7	1812.17	66.76	98.23	510.91	474.76	205.90	192.89	154.11	93.65	14.94
27	44G8	847.74	112.20	19.45	283.25	198.47	106.72	88.27	24.43	11.97	2.99
28	44G9	937.19	214.24	0.00	72.23	207.13	205.46	98.15	56.22	64.32	19.44
27	45G7	1610.59	1523.69	4.16	16.83	44.79	8.31	6.37	4.16	1.25	1.04
27	45G8	2910.19	1719.33	19.91	225.90	490.81	139.66	123.43	173.03	18.12	0.00
28	45G9	1809.67	1796.49	0.00	2.58	4.83	1.36	3.29	0.47	0.65	0.00
27	46G8	2005.71	1223.83	42.68	249.40	235.20	156.56	48.12	39.99	9.91	0.00
29	46G9	950.97	558.93	0.00	29.40	202.56	81.68	41.17	33.98	0.00	3.27
29	46H0	2683.38	1396.96	8.72	72.56	439.13	441.84	134.75	182.91	6.51	0.00
29	47G9	7281.43	6051.56	9.17	291.67	426.28	292.07	197.00	13.68	0.00	0.00
29	47H0	3061.52	2950.00	14.67	27.07	39.23	24.42	5.35	0.79	0.00	0.00

Table 6: Estimated number (millions) of herring

SD	RECT	WHer0	WHer1	WHer2	WHer3	WHer4	WHer5	WHer6	WHer7	WHer8
25	39G4	12.11	35.76	66.08	98.90	148.89	135.25	130.33	180.50	238.00
25	39G5	13.29	35.29	70.00	67.09	87.92	69.75	74.60	68.25	79.86
25	40G4	10.56	26.00	62.96	84.29	91.21	95.33	69.67	49.50	62.50
25	40G5	13.20	30.27	58.46	64.62	71.94	80.17	57.00	68.25	109.00
25	40G6	15.20	30.27	42.50	53.05	65.44	54.13	56.88	57.00	83.00
25	40G7		29.00	35.33	45.86	51.50	59.57	62.58	66.40	80.17
25	41G6	8.67	26.69	30.00	41.07	48.00	52.12	59.75	62.00	85.50
25	41G7	8.00	23.50	28.71	40.04	41.67	47.22	49.14	58.00	71.00
26	41G8	4.58		31.25	35.00	34.60	36.92	44.45	49.60	47.17
27	42G6			40.00	38.00	42.62	50.18	54.90	61.00	61.25
27	42G7	4.00		33.14	36.56	41.40	49.71	45.09	57.25	64.00
28	42G8	3.86	26.00	31.25	35.70	38.00	41.42	48.08	49.00	62.00
27	43G7	4.00	21.00	27.08	36.88	38.40	45.64	52.00	43.00	60.67
28	43G8	5.00	22.00	31.33	31.90	35.60	41.70	45.12	47.80	70.00
28	43G9	3.64		25.00	29.36	32.71	37.00	45.33	43.67	41.00
27	44G7	3.91	20.60	25.71	33.14	41.29	44.78	42.12	44.00	52.67
27	44G8	3.93	20.50	25.31	30.45	29.75	40.30	44.60	44.25	42.00
28	44G9	4.14		30.80	32.12	37.27	36.70	40.50	48.88	37.00
27	45G7	3.93	18.25	24.00	31.19	34.75	33.67	38.50	37.00	54.00
27	45G8	3.77	19.33	23.00	29.53	37.50	38.00	40.00	53.75	
28	45G9	3.38		27.62	33.24	39.00	38.42	45.33	63.00	
27	46G8	4.03	17.88	25.09	29.75	31.88	32.00	35.33	40.50	
29	46G9	3.51		23.25	26.57	33.10	27.80	31.00		37.00
29	46H0	3.50	13.00	19.25	24.17	29.64	29.86	34.86	40.00	
29	47G9	3.16	20.00	21.83	26.38	29.90	31.67	46.50		
29	47H0	3.31	19.50	23.42	26.38	28.22	28.67	35.50		

Table 7: Estimated mean weights (g) of herring

	Species	2	3	5	7	9	11	13	15
1	Ammodytes								
2	Aphia minuta								
3	Clupea harengus	941.58	223.30	35.00	629.70	318.90	80.43	356.26	179.18
4	Cyclopterus lumpus	0.15		0.43	0.32	0.49			
5	Gadus morhua	69.34	18.91	1.72	46.80	0.69		1.64	
6	Gasterosteus aculeatus			0.12			7.72	1.30	0.78
7	Hyperoplus lanceolatus								
8	Liparis liparis			0.00					
9	Lumpenus lampretaeformis								
10	Merlangius merlangus	4.73	7.80						
11	Myoxocephalus scorpius								
12	Nerophis ophidion								
13	Platichthys flesus	0.31	0.52						
14	Pleuronectes platessa		0.33						
15	Pollachius virens	12.00	0.32						
16	Pomatoschistus	0.06	0.16	0.01			0.07		
17	Pungitius pungitius							0.03	
18	Salmo salar	3.27							
19	Spinachia spinachia	0.01							
20	Sprattus sprattus	5.92	54.03	18.90	554.66	67.99	413.35	55.60	254.97

Table 8: Catch composition per haul.

	Species	17	19	21	23	25	27	29	31
1	Ammodytes								
2	Aphia minuta								
3	Clupea harengus	71.41	330.52	684.03	478.76	286.36	0.40	1495.27	96.12
4	Cyclopterus lumpus	0.23	0.22	0.93	0.13	0.32		0.24	0.53
5	Gadus morhua				0.01	0.02	0.64	0.52	
6	Gasterosteus aculeatus		41.72	12.24	14.47	15.46	84.11	27.69	10.16
7	Hyperoplus lanceolatus				0.19				
8	Liparis liparis								
9	Lumpenus lampretaeformis								
10	Merlangius merlangus								
11	Myoxocephalus scorpius						0.10		
12	Nerophis ophidion						0.02		0.01
13	Platichthys flesus								
14	Pleuronectes platessa								
15	Pollachius virens								
16	Pomatoschistus								
17	Pungitius pungitius		0.04	0.13	0.10	0.18	0.35		0.05
18	Salmo salar								
19	Spinachia spinachia								
20	Sprattus sprattus	829.94	81.49	90.95	0.81	3.78	10.29	55.29	0.60

Table 9: (continued): Catch composition per haul.

	Species	33	35	37	39	41	43	45	47
1	Ammodytes								
2	Aphia minuta								
3	Clupea harengus	110.53	83.31	32.35	73.68	61.71	80.97	58.39	7.05
4	Cyclopterus lumpus	0.20	0.24		0.71	0.50			0.32
5	Gadus morhua				0.13			0.09	
6	Gasterosteus aculeatus	31.61	29.66	12.33	8.00	11.66	44.41	6.24	29.85
7	Hyperoplus lanceolatus		0.07			0.03			
8	Liparis liparis								
9	Lumpenus lampretaeformis	0.01							
10	Merlangius merlangus								
11	Myoxocephalus scorpius	0.08		0.12					
12	Nerophis ophidion				0.01	0.02		0.00	0.02
13	Platichthys flesus				0.09				
14	Pleuronectes platessa								
15	Pollachius virens								
16	Pomatoschistus								
17	Pungitius pungitius	0.10	0.09		0.01	0.03		0.06	0.04
18	Salmo salar					0.42			0.98
19	Spinachia spinachia								
20	Sprattus sprattus	9.45	113.88	29.09	28.54	25.07	117.62	11.81	40.11

Table 10: (continued): Catch composition per haul.

	Species	49	51	53	55	57	59	61	63
1	Ammodytes								
2	Aphia minuta								
3	Clupea harengus	63.91	129.69	40.26	32.21	55.77	56.07	33.51	1.62
4	Cyclopterus lumpus	0.60	0.33	0.04	0.24		0.09	0.63	0.27
5	Gadus morhua								
6	Gasterosteus aculeatus	17.43	21.30	9.18	5.61	5.26	3.16	14.65	30.36
7	Hyperoplus lanceolatus								
8	Liparis liparis								
9	Lumpenus lampretaeformis								
10	Merlangius merlangus								
11	Myoxocephalus scorpius								
12	Nerophis ophidion	0.02		0.02	0.01		0.00	0.02	
13	Platichthys flesus								
14	Pleuronectes platessa								
15	Pollachius virens								
16	Pomatoschistus								
17	Pungitius pungitius	0.03	0.03	0.02			0.01	0.04	0.02
18	Salmo salar								
19	Spinachia spinachia								
20	Sprattus sprattus	19.08	70.69	36.26	18.41	39.65	0.62	52.66	30.95

Table 11: (continued): Catch composition per haul.

	Species	65	67	69	71	73	75	77	79
1	Ammodytes			0.02				0.01	
2	Aphia minuta								
3	Clupea harengus	46.31	98.01	58.24	43.12	1.68	58.06	63.00	360.59
4	Cyclopterus lumpus	0.92	0.97	1.40	0.18		0.22	0.32	0.83
5	Gadus morhua		0.03				0.00	0.01	
6	Gasterosteus aculeatus	50.84	52.68	24.16	13.94	18.32	2.53	18.91	20.91
7	Hyperoplus lanceolatus		0.02	0.01			0.05		
8	Liparis liparis								
9	Lumpenus lampretaeformis								
10	Merlangius merlangus								
11	Myoxocephalus scorpius								
12	Nerophis ophidion								
13	Platichthys flesus	0.09							
14	Pleuronectes platessa								
15	Pollachius virens								
16	Pomatoschistus								
17	Pungitius pungitius			0.03	0.02			0.04	
18	Salmo salar				0.61				
19	Spinachia spinachia								
20	Sprattus sprattus	17.18	61.87	46.89	40.80	469.91	4.31	47.90	90.59

Table 12: (continued): Catch composition per haul.

	Species	81	83	85	87	89	91	93	95
1	Ammodytes								
2	Aphia minuta								0.00
3	Clupea harengus	205.14	2.41	445.46	555.61	92.02	6.11	73.87	48.28
4	Cyclopterus lumpus		0.22			0.21			0.56
5	Gadus morhua	4.24		0.91	4.95	8.85	16.91	0.27	4.66
6	Gasterosteus aculeatus		0.26						
7	Hyperoplus lanceolatus								
8	Liparis liparis								
9	Lumpenus lampretaeformis								
10	Merlangius merlangus							1.19	4.46
11	Myoxocephalus scorpius								
12	Nerophis ophidion								
13	Platichthys flesus								0.24
14	Pleuronectes platessa								
15	Pollachius virens								
16	Pomatoschistus				0.04	0.01			0.74
17	Pungitius pungitius								
18	Salmo salar								
19	Spinachia spinachia								
20	Sprattus sprattus	69.83	304.50	121.90	0.83	112.39	193.49	65.19	38.62

Table 13: (continued): Catch composition per haul.

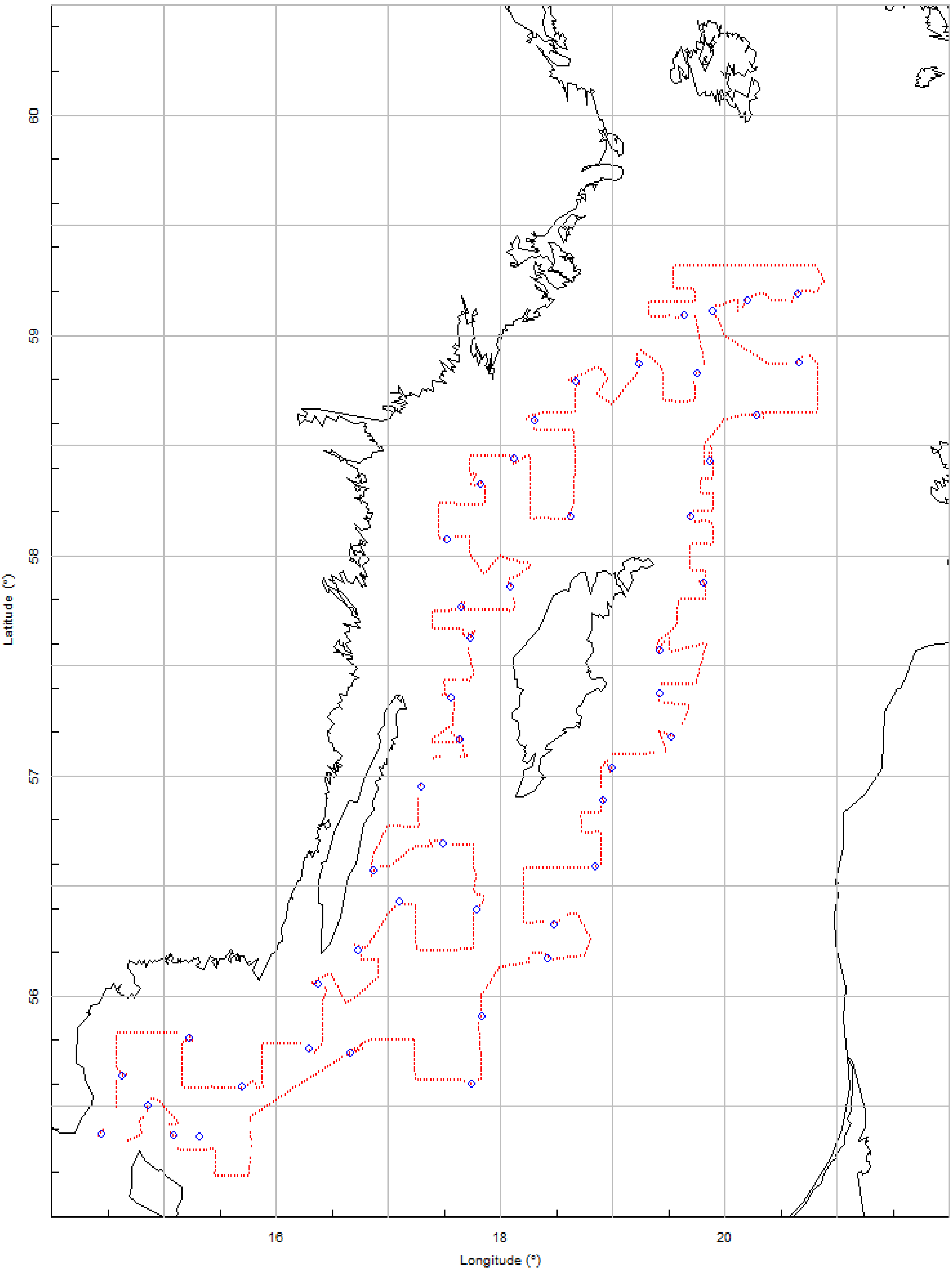

Figure 1: cruise track(red), positions of trawl hauls (blue) and survey grid (ICES squares)(grey)

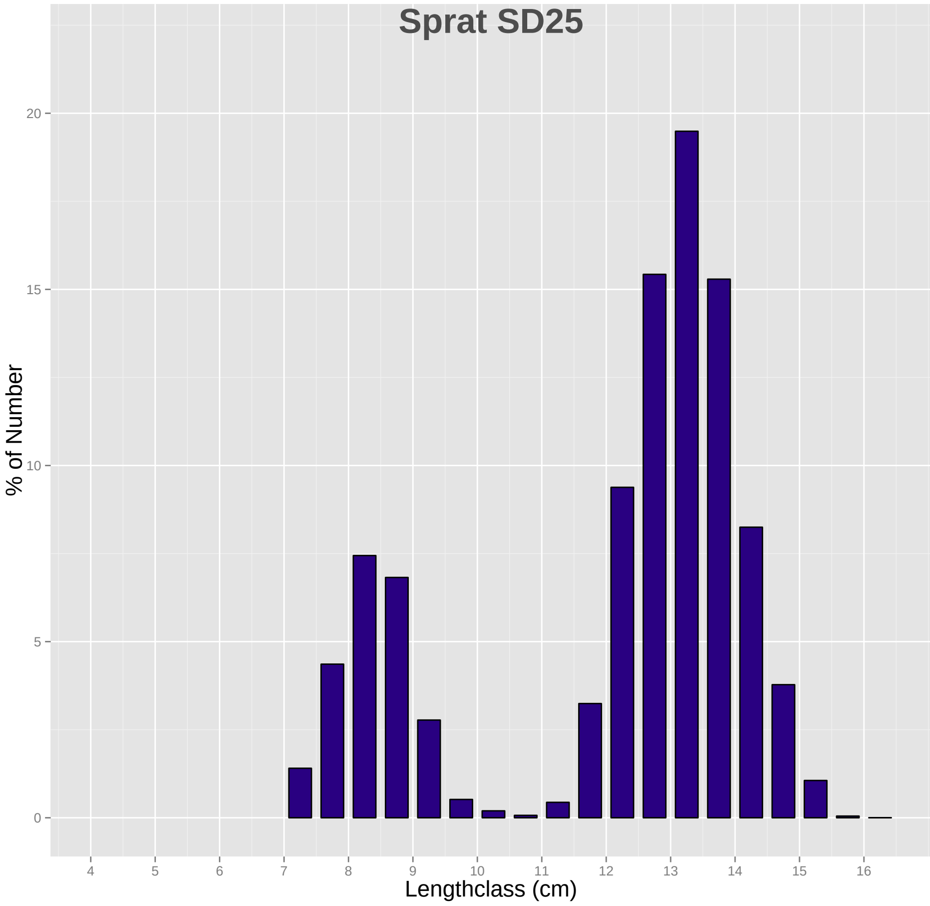

Figure 2: Length distribution of sprat

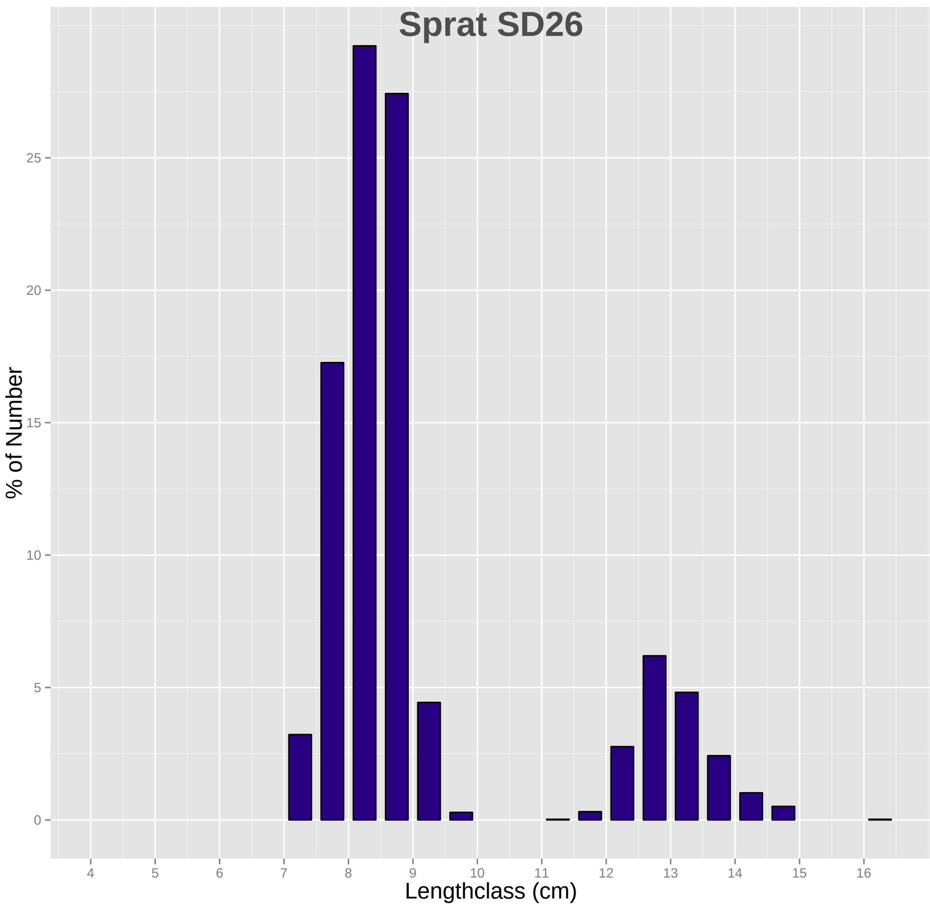

Figure 3: Length distribution of sprat

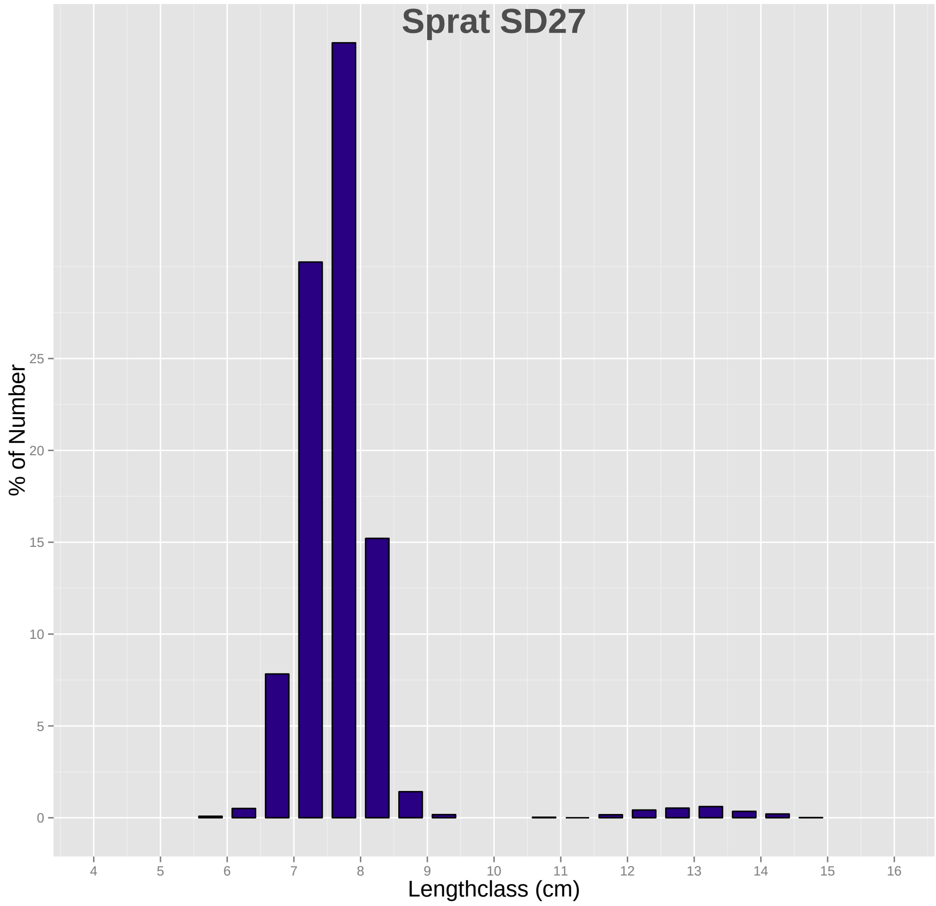

Figure 4: Length distribution of sprat

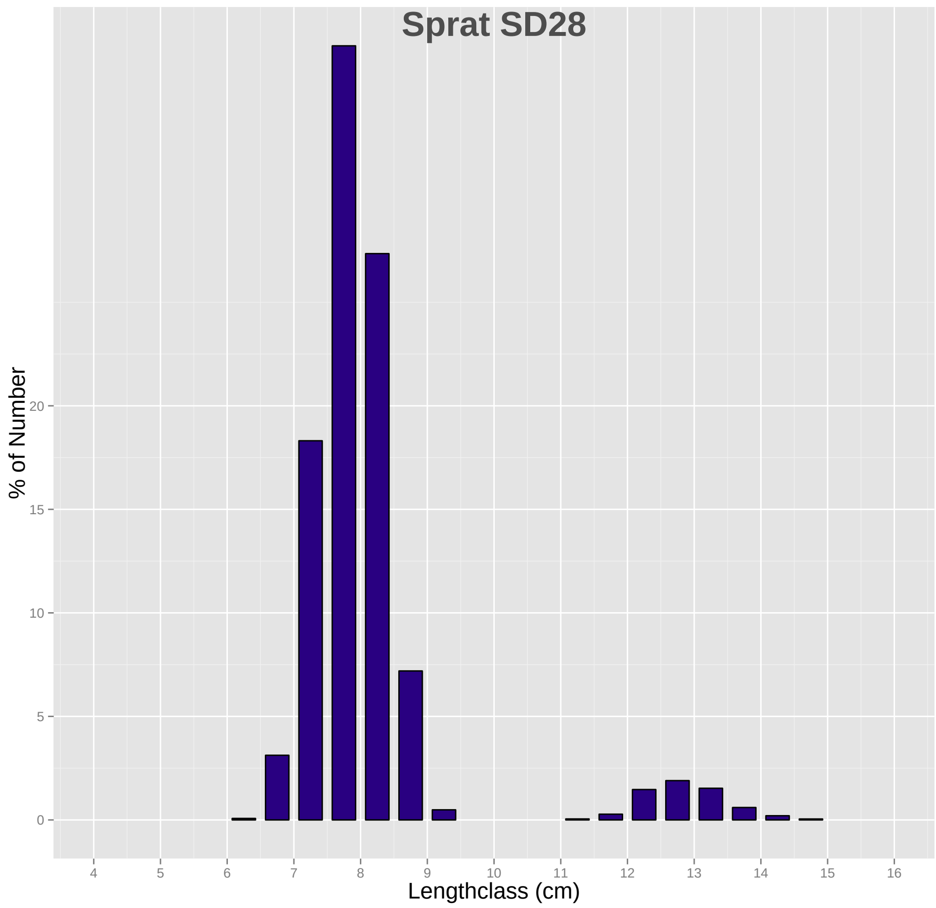

Figure 5: Length distribution of sprat

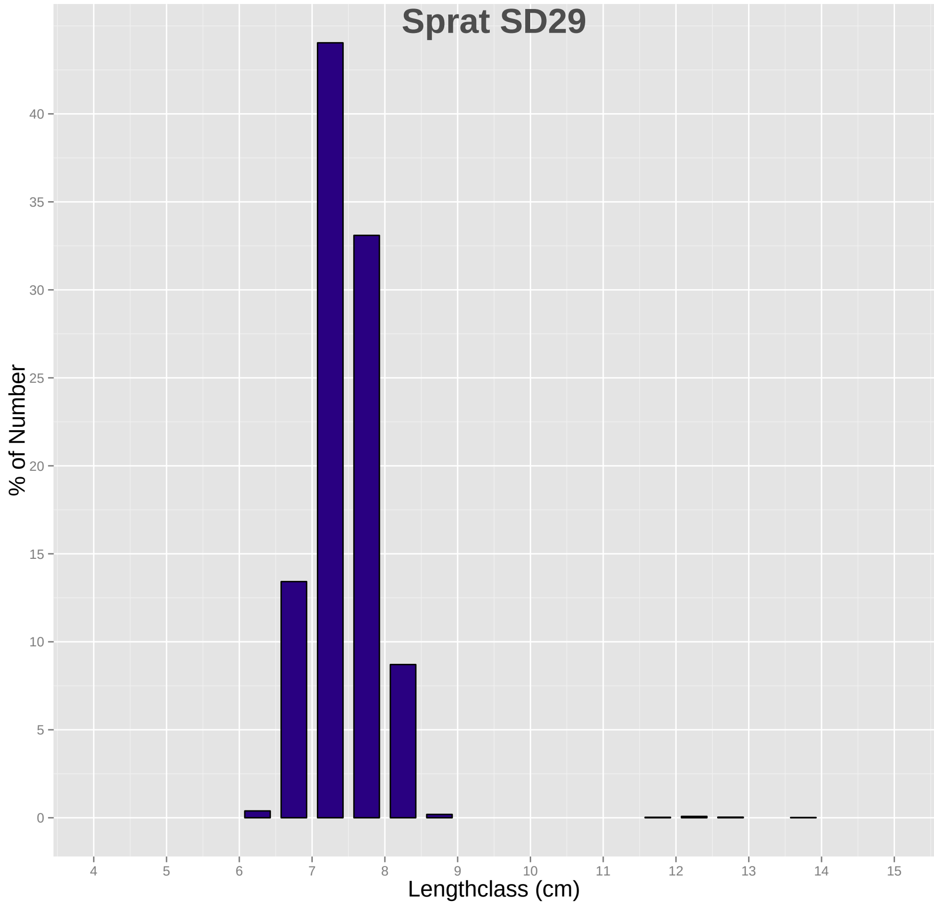

Figure 6: Length distribution of sprat

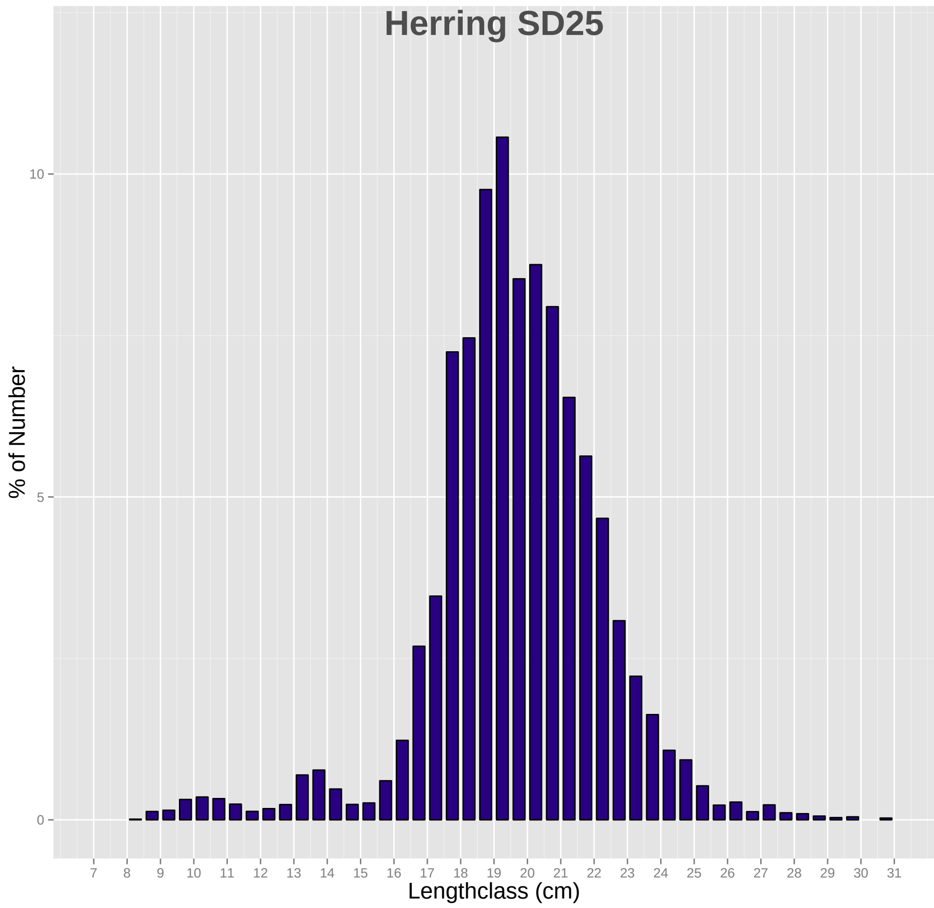

Figure 7: Length distribution of herring

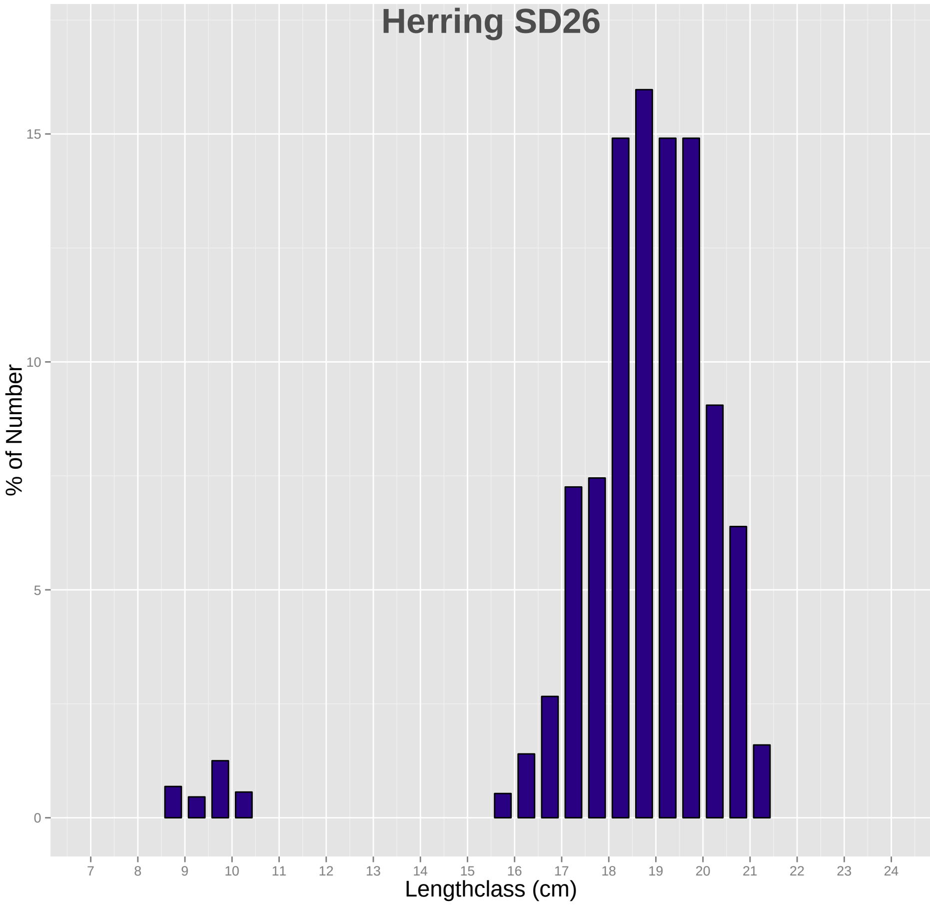

Figure 8: Length distribution of herring

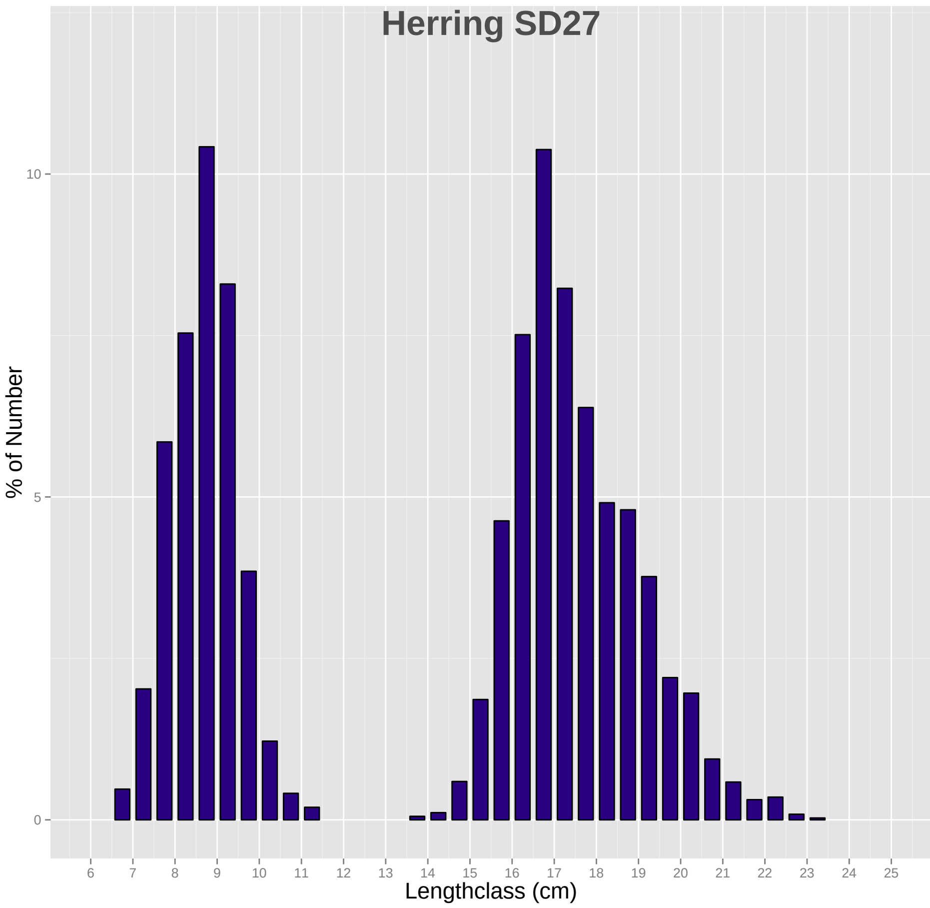

Figure 9: Length distribution of herring

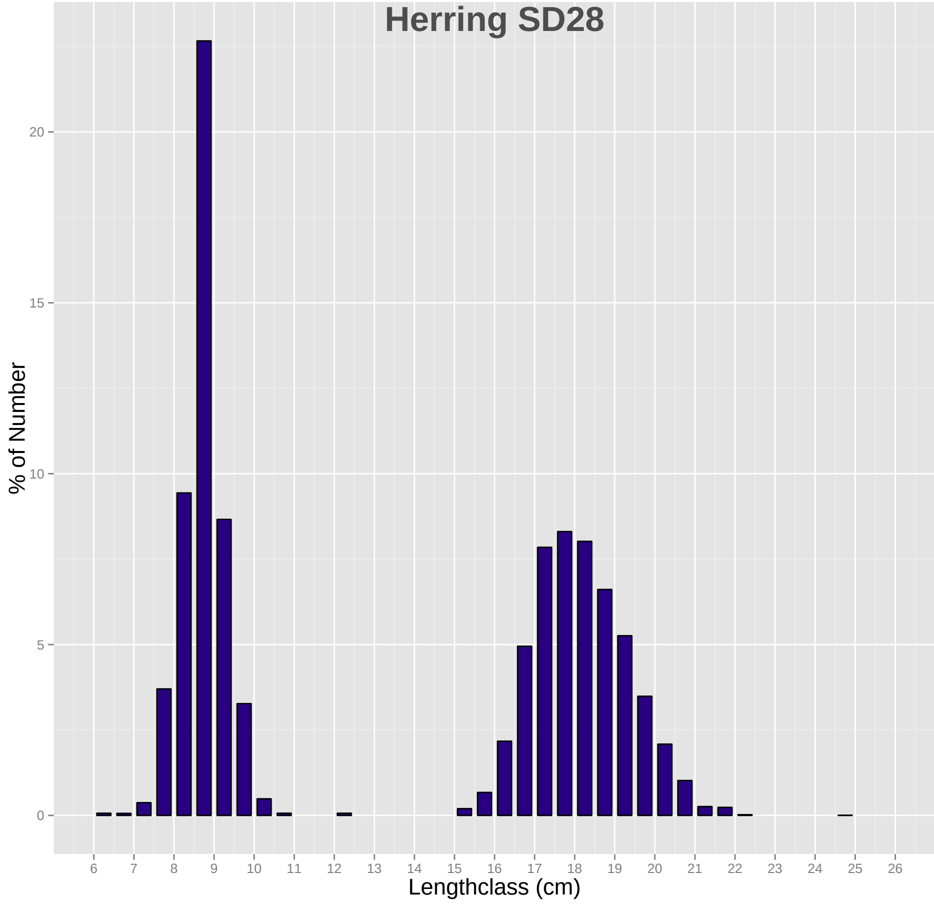

Figure 10: Length distribution of herring

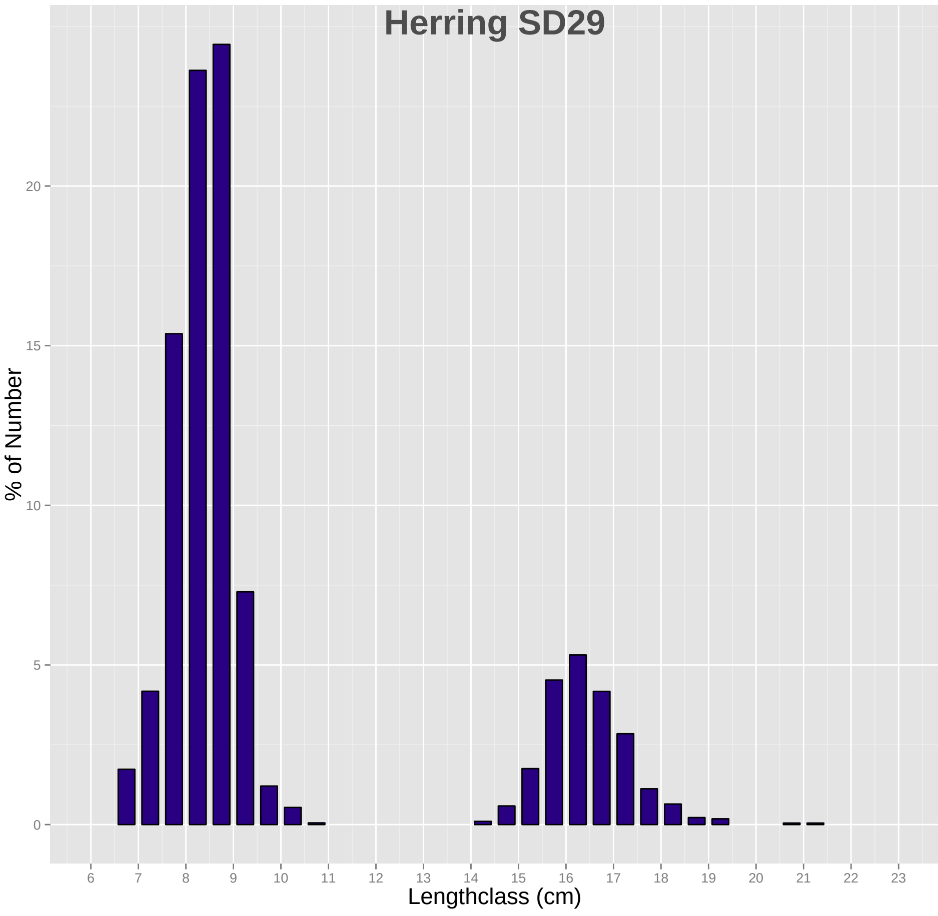

Figure 11: Length distribution of herring

PRELIMINARY REPOPRT

FROM THE JOINT ESTONIAN-POLISH BIAS SURVEY CONDUCTED BY THE R.V. "BALTICA" IN THE NORTH-EASTERN BALTIC SEA (19-29 October 2014)

by
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Introduction

The permanent participation of the Polish r.v. "Baltica" in the autumn Baltic International Acoustic Surveys (BIAS) within the Polish EEZ has taken place since 1994 in the framework of long-term ICES Baltic International Acoustic Surveys programme, coordinated by the ICES Baltic International Fish Survey Working Group [WGBIFS].

The first joint Estonian-Finnish-Polish BIAS survey was conducted on the r.v. "Baltica" in October 2006 in the ICES Sub-divisions 28.2, 29 and 32. The recent joint survey, marked with the number 13/2014/NMFRI/TUEMI was based on the procurement contract between the University of Tartu/Estonian Marine Institute in Tallinn and the National Marine Fisheries Research Institute in Gdynia. The joint Estonian-Polish BIAS 4Q 2014 survey was conducted in the Estonian EEZ (the ICES Sub-divisions 28.2, 29 and 32).

The Estonian Data Collection Programme for 2014 and the European Union (the Commission regulations Nos. 1639/2001, 1581/2004, 665/2008, 1078/2008, 199/2008) financially supported the BIAS-2014 survey. Timing, surveying area in the north-eastern Baltic and the principal methods of investigations concerns the BIAS 4Q 2014 survey were designed and coordinated by the WGBIFS (Anon. 2012[1], Anon. 2013[2]).

The main aims of the reported cruise were:

- to provide the echo-integration and to collect the acoustic data along the planned transects in the north-eastern Baltic Sea,
- to conduct the fish pelagic control-catches in the fish concentration locations,
- to collect ichthyological samples specially for herring and sprat,
- to collect plankton samples,
- to provide hydrological monitoring (temperature, salinity and oxygen content) at the catch locations.

Personnel

The BIAS 4Q 2014 scientific staff was composed of eight persons:
Miroslaw Wyszynski (NMFRI, Gdynia – Poland) – survey leader
Jakub Slembarski (NMFRI, Gdynia – Poland) – acoustician
Bartosz Witalis (NMFRI, Gdynia – Poland) - hydrologist
Tiit Raid (TUEMI, Tallinn - Estonia) – Estonian scientific staff leader
Viktor Kajalainen (TUEMI, Tallinn - Estonia) – ichthyologist

[1]Anon. 2012. Manual For International Balic Acoustic Surveys (IBAS). Version 1.01. Addendum 2: ICES WGBIFS BIAS Manual 2012.
[2]Anon. 2013. Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2013/SSGESST: 08.

Ain Lankov (TUEMI, Tallinn - Estonia) – ichthyologist
Andrus Hallang (TUEMI, Tallinn - Estonia) – ichthyologist
Elor Sepp (TEMI, Tallinn - Estonia) – acoustician.

Narrative

The reported survey took place during the period of 19-29 October 2014. The at sea researches (echo-integration, fish control catches, hydrological and plankton stations) were conducted within Estonian EEZ (the ICES Sub-divisions 28.2, 29 and 32), moreover inside the territorial waters of this country not shallower than 20 m.

The vessel left the Ventspils port (Latvia) on 18.10.2014 in the late evening and due to stormy weather was navigated in the north-eastern direction to the geographical position 59°34.9'N 026°59.7'E in eastern part of the Gulf of Finland (Fig. 1) where the vessel started investigations at the acoustic transect. The at sea researches were ended on 27.10.2014 before midday in the port Ventspils (Latvia). Then the r.v. "Baltica" started its journey to the home-port in Gdynia (Poland), reaching it on 29.10.2014 morning.

Survey design and realization

The r.v. "Baltica" realized 306 Nm echo-integration tracks and 13 fish control-catches (Fig. 1). Due to stormy weather it didn't success in covering with acoustic transect and control catches the following ISES rectangles: 45H0, 45H1 and partly 46H1. But these first two rectangles in SD 28.2 were covered with investigations during the going before Latvian-Polish BIAS in October 2014. All catches were performed in the daylight (between 07:10 am. and 15:45 pm.) using the pelagic trawl type WP 53/64x4 (with 6 mm mesh bar length in the codend). The standard trawling duration was 30 minutes, however four hauls duration was shortened to 15 minutes due to high fish density observed on the net-sounder monitor. The mean speed of vessel while trawling was 3.0 knots. Overall, 4 hauls were conducted in SD 29 and 9 hauls in SD 32. The stormy weather at the end of survey made impossible to perform more hauls in SD 29 and totally in SD 28.2.

The length measurements (in 0.5 cm classes) were realized for 2297 sprat and 2764 sprat. Totally, 306 sprat and 541 herring individuals were taken for biological analysis.

Acoustic data were collected with the EK-60 echo-sounder equipped with "Echo-view V4.10" software for the data analysis. The acoustic equipment was calibrated before the survey according to the methodology described in the BIAS manual (Anon. 2012). The basic acoustic and biological data collected during recently carried out survey will be stored in the BIAS_DB.mdb managed by ICES.

Catch results and fish measurements

Overall, 9 fish species were recognized in hauls performed in the north-eastern Baltic Sea in October 2014. Sprat was prevailing species by mass in the ICES Sub-divisions 32 with the mean share amounted 59.4 % of the total catch. Respectively herring dominated in the total catch mass in the Sub-division 29 with mean share 68 %. The rest 7 species (with the three-spined stickleback predominance) represented only 0.5 % of the total mass in average.

The detailed catch and CPUE results are presented in the Table 1 and Fig. 2. The biological sampling is shown in Table 2.

Mean CPUE for all species in the investigated area in 2014 amounted 1289.1 kg/h comparing to 845.5 kg/h in the previous year (2013) – about 52 % increase has been noted. The mean CPUE increasing for both two main investigated species (sprat and herring) has noted in 2014 comparing to 2013 – about 139% in case of herring and 20.5% for sprat. The mean CPUE value for all species in SD 32 was about three times higher comparing to SD 29 in the investigated year. The mean CPUEs of sprat were: 176.7 kg/h in ICES SD 29 and 955.1 kg/h in SD 32. The mean CPUEs in case of herring were as follow: 387.9 and 646.6 kg/h in SDs 29 and 32 respectively.

The length distributions of sprat and herring according to the ICES Sub-divisions 29 and 32 are shown on Fig. 3 and 4 respectively.

The both sprat and herring length distribution curves have a bimodal character in both SDs 29 and 32. First frequency picks take place on 7-7.5 cm length classes in case of sprat and 8-8.5 cm in case of herring. They represent the fish generation born in 2014. The length distribution curves show a high abundance share of this sprat and herring generation especially in SD 29. Second frequency picks are situated on 11.5-12 cm length classes according to particular SD in case of sprat and 15-15.5 cm in case of herring. They represent the adult fish.

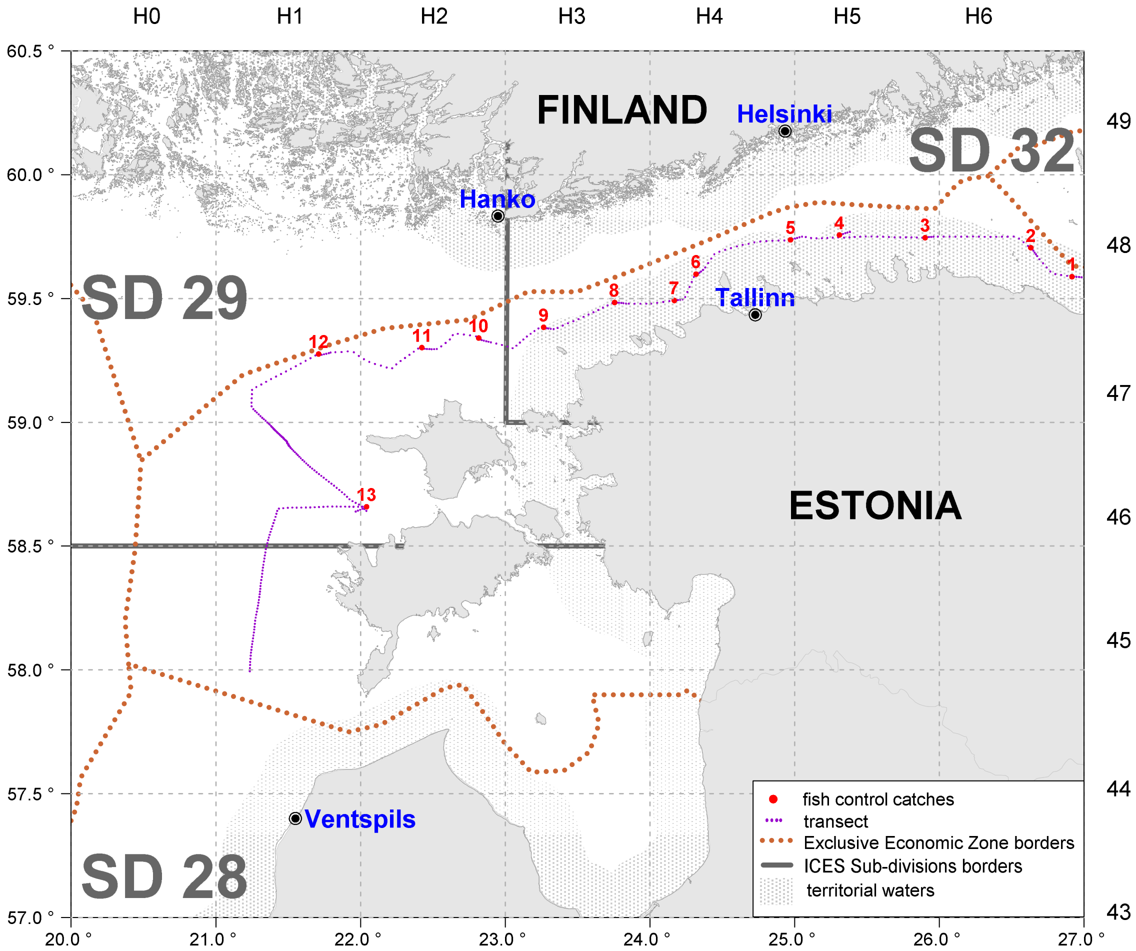

Fig. 1. Acoustic transects and pelagic fish control catches with connected hydrological stations realised during joint EST-POL BIAS (October 2014).

Table 1. Catch and CPUE results during joint Estonian-Polish BIAS conducted by r.v. “Baltica” in Estonian EEZ in October 2014.

Haul no	Date	ICES rectangle	ICES Sub-division (SD)	Geographical position start latitude 00°00.0'N	start longitude 00°00.0'E	end latitude 00°00.0'N	end longitude 00°00.0'E	Time start	Time end	Haul duration [min.]	Total catch [kg]	Catch per species [kg] sprat	herring	cod	flounder	smelt	lumpfish	lamprey	nine-spined stickleback	three-spined stickleback
1	2014-10-20	48H6	32	59°36.1'	26°59.4'	59°35.2'	26°56.2'	07:10	07:40	30	173,640	92,802	75,552			2,513			0,173	2,600
2	2014-10-20	48H6	32	59°40.6'	26°40.1'	59°41.9'	26°38.4'	09:40	10:10	30	403,976	268,761	129,532			1,952		0,105	0,402	3,224
3	2014-10-20	48H5	32	59°44.9'	25°56.2'	59°44.8'	25°55.1'	13:45	14:00	15	939,516	830,547	105,579			2,732			0,188	0,470
4	2014-10-21	48H5	32	59°46.0'	25°22.1'	59°45.5'	25°19.5'	07:20	07:50	30	537,320	366,452	167,106			2,149			0,538	1,075
5	2014-10-21	48H5/H4	32	59°44.8'	25°02.2'	59°44.3'	24°59.2'	09:45	10:15	30	1331,540	971,092	358,717			1,065			0,134	0,532
6	2014-10-21	48H4	32	59°36.6'	24°21.2'	59°36.0'	24°20.1'	13:45	14:00	15	746,793	216,724	528,724			0,298			0,002	1,045
7	2014-10-21	47H4	32	59°29.7'	24°12.8'	59°29.5'	24°11.2'	15:30	15:45	15	146,758	49,211	96,647		0,078	0,279			0,044	0,499
8	2014-10-22	47H3	32	59°28.8'	23°49.4'	59°28.9'	23°46.8'	07:50	08:20	30	343,250	91,045	251,189				0,330			0,686
9	2014-10-22	47H3	32	59°22.6'	23°18.9'	59°22.7'	23°17.3'	11:05	11:20	15	390,960	157,361	232,895			0,117			0,040	0,547
10	2014-10-23	47H2	29	59°19.5'	22°52.9'	59°19.0'	22°50.0'	07:50	08:20	30	391,448	91,232	296,650	0,877			0,191		0,312	2,186
11	2014-10-23	47H2	29	59°17.7'	22°30.0'	59°17.7'	22°26.7'	10:35	11:05	30	618,200	147,132	470,821							0,247
12	2014-10-23	47H1	29	59°16.8'	21°46.2'	59°16.3'	21°43.6'	14:50	15:20	30	31,940	24,325	7,442						0,007	0,166
13	2014-10-26	46H1/H2	29	58°38.5'	21°58.6'	58°39.2'	22°01.5'	07:10	07:40	30	99,757	90,813	0,959		0,387		0,510		0,544	6,544
									Total catch [kg]	32	5013,753	3043,995	1945,941		0,078	11,105	0,330	0,105	1,521	10,678
										29	1141,345	353,502	775,872	0,877	0,387		0,701		0,863	9,143
										28.2										
										Sum	6155,098	3397,497	2721,813	0,877	0,465	11,105	1,031	0,105	2,384	19,821

Haul no	Date	ICES rectangle	ICES Sub-division (SD)	Haul duration [min.]	Total CPUE [kg/h]	CPUE per species [kg/h] sprat	herring	cod	flounder	smelt	lumpfish	lamprey	nine-spined stickleback	three-spined stickleback
1	2014-10-20	48H6	32	30	347,280	185,604	151,104			5,026			0,346	5,200
2	2014-10-20	48H6	32	30	807,952	537,522	259,064			3,904		0,210	0,804	6,448
3	2014-10-20	48H5	32	15	3758,064	3322,188	422,316			10,928			0,752	1,880
4	2014-10-21	48H5	32	30	1074,640	732,904	334,212			4,298			1,076	2,150
5	2014-10-21	48H5/H4	32	30	2663,080	1942,184	717,434			2,130			0,268	1,064
6	2014-10-21	48H4	32	15	2987,172	866,896	2114,896			1,192			0,008	4,180
7	2014-10-21	47H4	32	15	587,032	196,844	386,588		0,312	1,116			0,176	1,996
8	2014-10-22	47H3	32	30	686,500	182,090	502,378				0,660			1,372
9	2014-10-22	47H3	32	15	1563,840	629,444	931,580			0,468			0,160	2,188
10	2014-10-23	47H2	29	30	782,896	182,464	593,300	1,754			0,382		0,624	4,372
11	2014-10-23	47H2	29	30	1236,400	294,264	941,642							0,494
12	2014-10-23	47H1	29	30	63,880	48,650	14,884						0,014	0,332
13	2014-10-26	46H1/H2	29	30	199,514	181,626	1,918		0,774		1,020		1,088	13,088
		Mean CPUE by SDs [kg/h]		32	1608,396	955,075	646,619		0,035	3,229	0,073	0,023	0,399	2,942
				29	570,673	176,751	387,936	0,439	0,194		0,351		0,432	4,572
				28.2										
				Total	1289,096	715,591	567,024	0,135	0,084	2,236	0,159	0,016	0,409	3,443

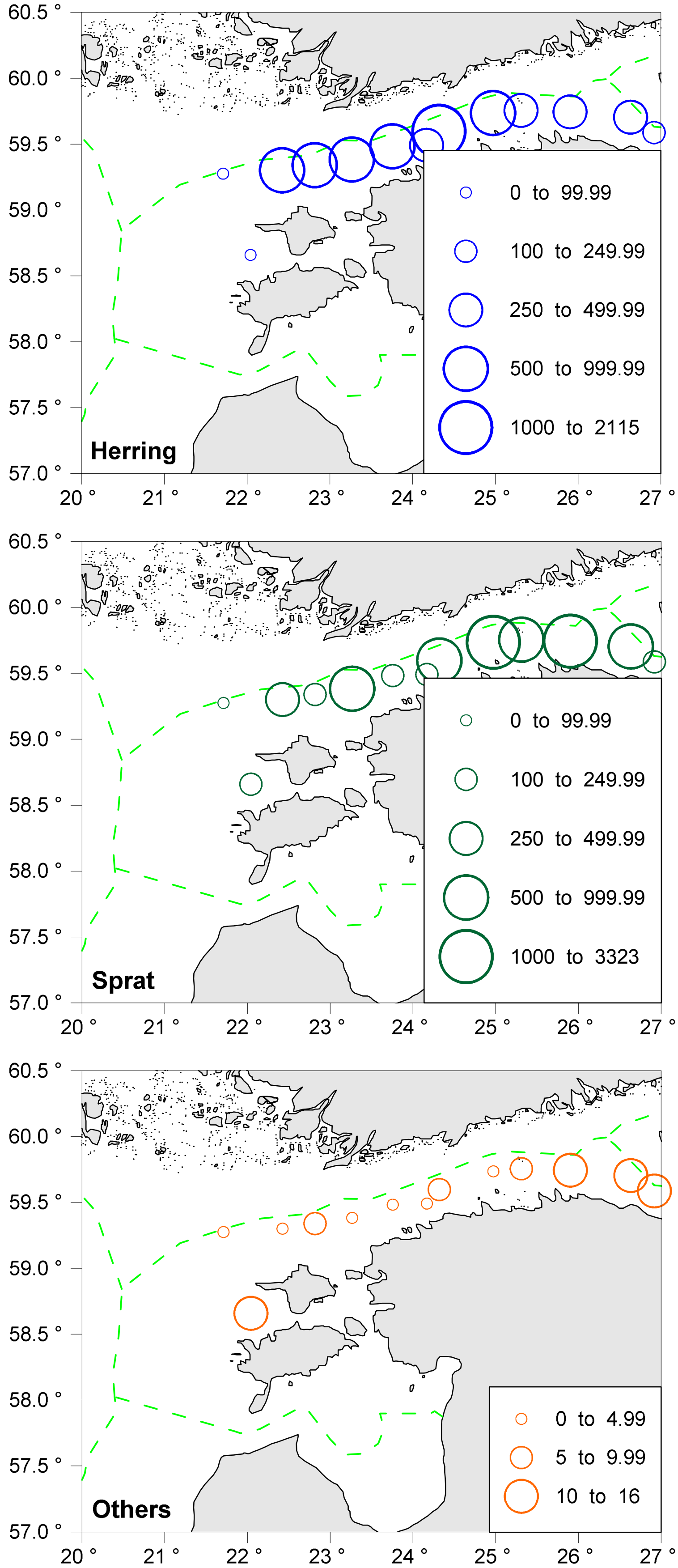

Fig. 2. Distribution of CPUE values (kg/h) for herring, sprat and other species in the pelagic fish control catches during EST-POL BIAS (October 2014).

Table. 2. Biological sampling in the r.v."Baltica" joint EST-POL BIAS in October 2014.

Pelagic fish species

SD	Haul number	Fish number									
		SPRAT		HERRING		3-SP. STICKLEBACK		9-SP. STICKLEBACK		TOTAL	
		measured	analysed	measured	analysed	measured	analysed	measured	analysed	measured	analysed
28.2	0										
29	4	827	141	803	219	100		47		1777	360
32	9	1877	165	1961	322	191		64		4093	487
Total	13	2704	306	2764	541	291	0	111	0	5870	847

Bottom fish species

SD	Haul number	Fish number									
		COD		FLOUNDER		LUMPFISH				TOTAL	
		measured	analysed	measured	analysed	measured	analysed	measured	analysed	measured	analysed
28.2	0										
29	4	1		2		8				11	0
32	9			1		2				3	0
Total	13	1	0	3	0	10	0	0	0	14	0

Number of sampled plankton stations:
SD 29 – 4
SD 32 – 9

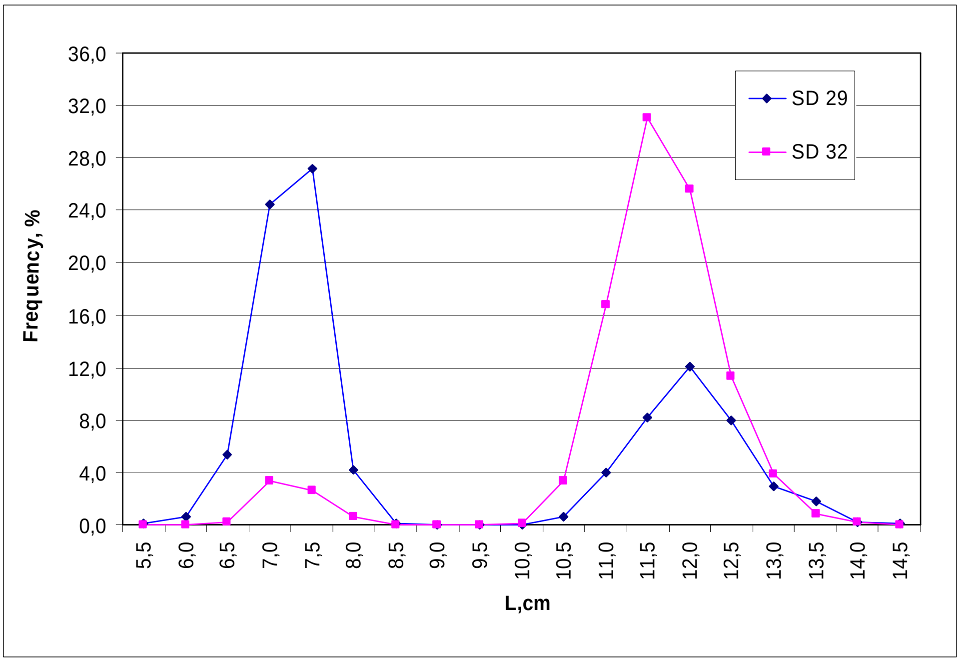

Fig. 3. Sprat length distributions from the control catches conducted by the rv. "Baltica" during joint EST-POL BIAS in the SDs 29 and 32 (October 2014).

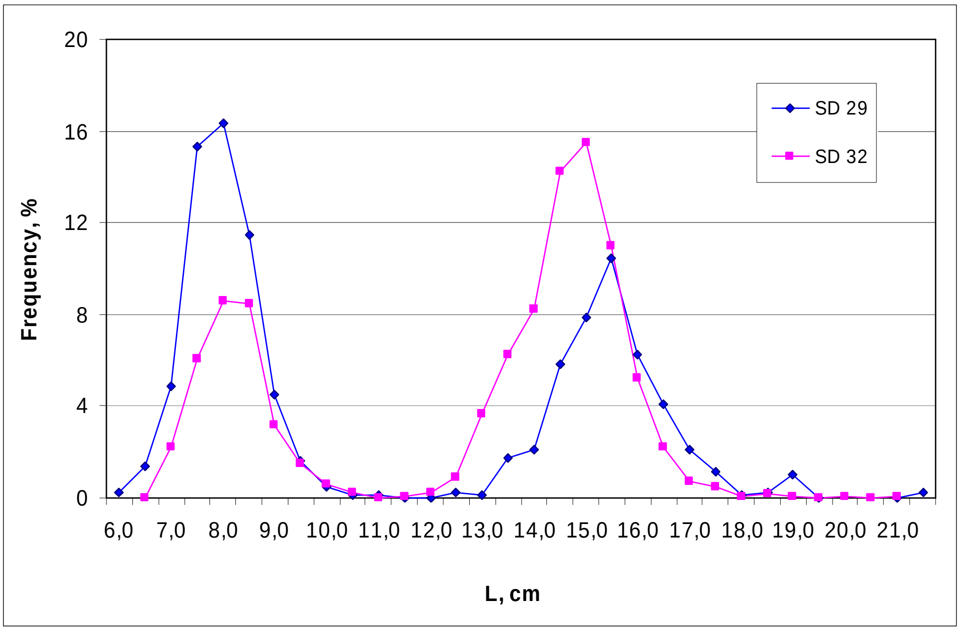

Fig. 4. Herring length distributions from the control catches conducted by the rv. “Baltica” during joint EST-POL BIAS in the SDs 29 and 32 (October 2014).

Meteorological and hydrological characteristics

The most frequently wind (Fig. 5.) was from ESE direction. The wind speed varied from 0,5 m/s to 16,8 m/s and average speed was 11,1 m/s. The air temperature ranged from 3,1 °C to 11.7 °C, and average temperature was 5.5 °C.

Hydrological parameters were measured on each fish control catch (haul) location (Fig.1). Measurements were conducted 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 1m depth stratum. The oxygen probes were taken on every 10 meters. The salinity parameter was presented in Practical Salinity Unit (PSU).

The seawater temperature in the surface layer of whole investigated area varied from 8.63 to 10.82 °C. The lowest values were observed at the haul 4 location, while the warmest surface water was measured at the haul 1. The average value equaled 9.96 °C. The average surface salinity was 5.68 PSU. The minimum value was 4.60 PSU (haul 2) and maximum 7.65 PSU (haul 13). The highest oxygen content in surface layer was 7.68 ml/l (haul 3) while the lowest one 6.69 ml/l (haul 1). Mean value of dissolved oxygen equaled 7.34 ml/l.

Near-bottom water temperature varied from 3.43 °C (haul 1) to 7.20 °C (haul 13). The mean value calculated for the whole area covered during the survey was 4.79 °C. The average salinity in the close to the bottom layers was 8.88 PSU. The highest values were measured at haul 13 location (10.27 PSU). The lowest one was 7.17 PSU (haul 1). The dissolved oxygen varied from 0.00 (haul 8) to 5.98 ml/l (haul 13). The mean value was 1.85 ml/l.

The graphic illustrations of the main hydrological parameters at the deepest station (connected with haul No. 11) are shown on the Fig. 6.

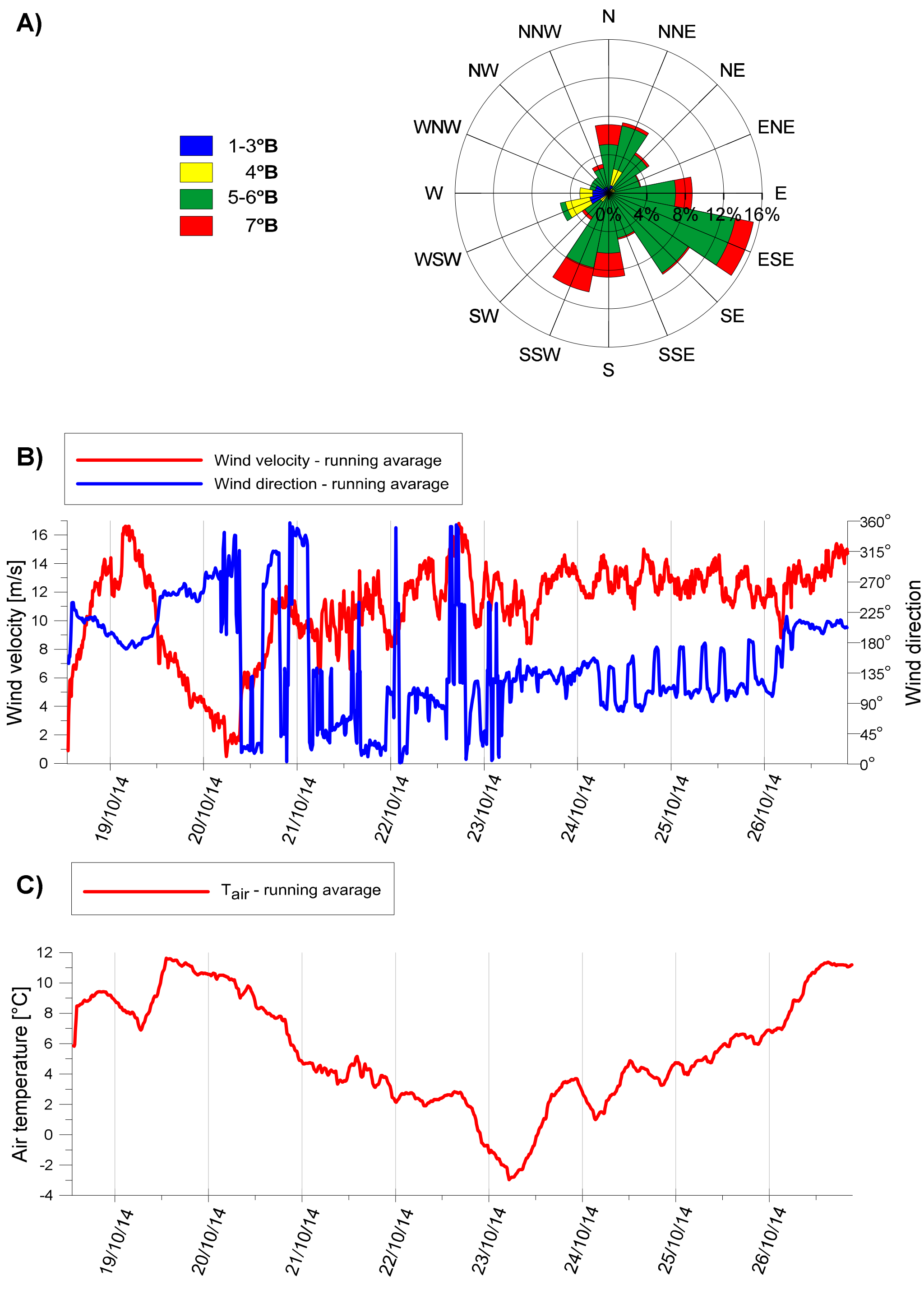

Fig. 5. Changes of the main meteorological parameters during EST-POL BIAS in October 2014.

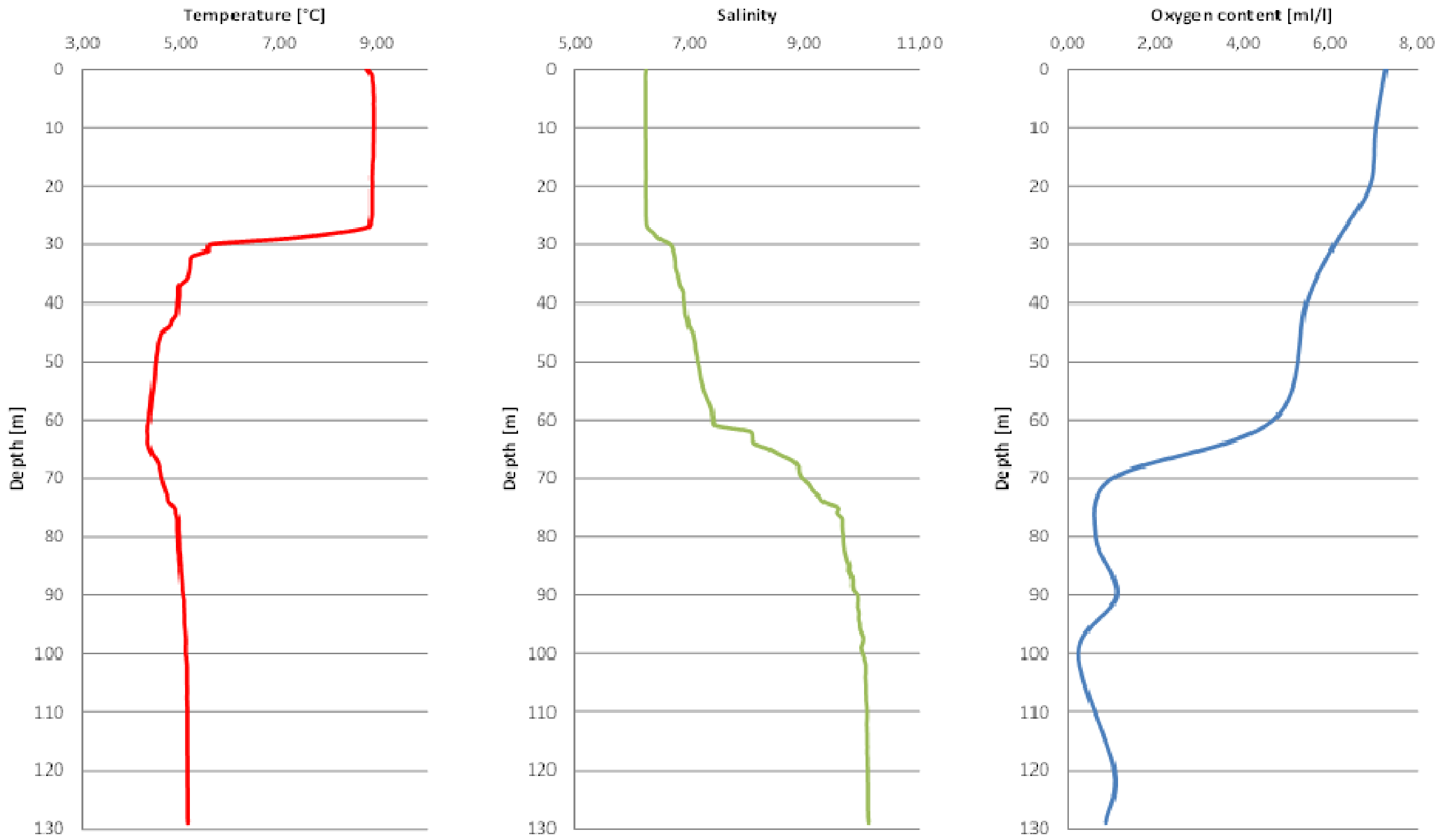

Fig.6. Temperature, salinity and oxygen profiles on the deepest sampling station (haul No. 11) during the EST-POL BIAS, October 2014.

Annex 9: Working papers presented at the WGBIFS 2015 meeting

Annex 9. Working papers on WGBIFS/2015

Notes:

a) the text should be prepared in Word format as *.doc,
b) Authors are fully responsible for quality of the prepared text and all kind of presented data.

PROTOCOLS FOR THE AGE DETERMINATION OF OTOLITHS BALTIC SPRAT (Lithuania)

Sampling and storing

Samples of otoliths of Baltic sprat are collected from both commercial catches and research (including BITS, BASS and BIAS) surveys. Min. 1 samples are taken every month in commercial catch 26 ICES sub-division. Min. 200 fishes are measured and grouped in 0.5 cm length classes. Each sample consists of pair otoliths taken from 10-15 specimens of sprat in each 0.5 cm fish length-class. The samples are random samples consisting of 100 fishes for which length, weight, sex, maturity stage is recorded. From every fish also pair of sagitta otoliths is taken and stored in folded paper booklets. After reading samples of otoliths are stored in plastic bags. On average 3000 sprats are aged annually.

Equipment and age determination

Age of sprat is determined using Motic microscope in transmitted light mainly with 100x magnification, but for older fishes even greater. It is considered that magnification less than 100x does not allow to determine correctly age of fishes which are older than 3 years. Age determination of sprat requires distinction and counting of annual growth zones which consist of broader and lighter opaque summer zone and narrower and darker hyaline winter zone. The opaque zone is formed in summer during good feeding conditions while the hyaline zone is formed in late autumn and winter when the feeding intensity of sprat is on a low level. During the formation of annual growth zone in summer inside the opaque zone often narrow hyaline rings are formed. It is especially characteristic for the second annual growth zone which probably is connected with some worsening of feeding conditions. These hyaline rings are regarded as false rings and are not included in counting the age of the fish. Unlike true winter rings they are usually discontinuous. To make certain the distinction between false and true ring it is often necessary to measure the width of the first and second growth zones.

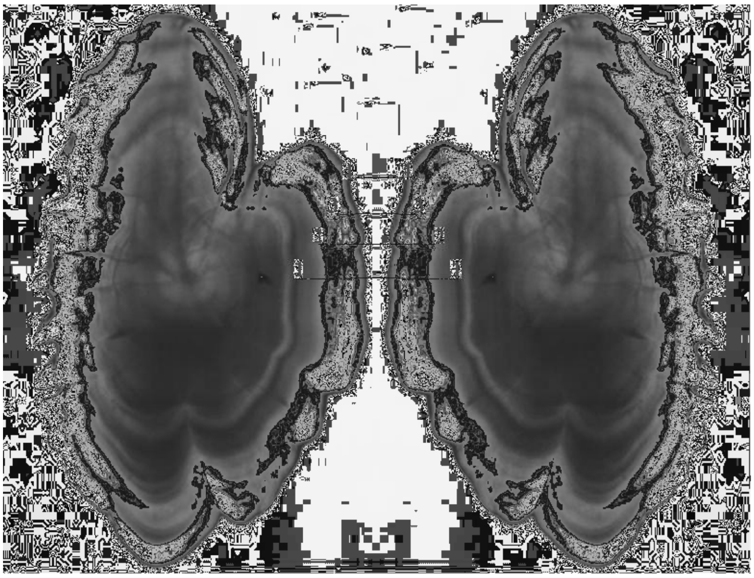

Fig. 1. Baltic sprat otolith

Last Workshop on Age Reading of Baltic Sprat (WKARBS) was 17–20 March 2008 in Klaipeda, Lithuania.

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BALTIC HERRING (Lithuania)

Sampling and storing

Samples of otoliths of herring are collected from both commercial catches and research (including BITS, BASS and BIAS) surveys. Min. 1 samples are taken every month in commercial catch26 ICES sub-division. Each sample consists of pair otoliths taken from 10 specimens of herring in each 0.5 cm fish length-class. This generally constitutes 150-200 pairs of otoliths in a sample. To each sample a protocol on the measurement of length frequency of herring is attached, along with a protocol on the standard biological analysis containing data relative to total length and weight of fish, their sex, gonad maturity stage, degree of fullness of the stomach, age of fish and the spawning group (population) that they belong to: coastal spring herring, open sea spring herring and autumn herring. 5-8 samples of herring are taken weekly during the spawning period (March, April, May).

After drying, otoliths are placed in the indentations of plates made of polypropylene tinted black plastic. In this manner they are prepared for age reading and storage. After reading samples of otoliths are stored in plastic bags.

Equipment and preparation of otoliths

Herring otoliths are examined under a stereo (binocular) microscope in reflected light against a black background (Fig.1). Magnifications of 8*4 or 8*2 are usually adequate for otoliths reading. One or both otoliths are placed on the object concaved glass. To obtain a clear image they should be immersed into ethanol. The outer concave surface of otolith is normally used for age reading because on this side of an otolith a nucleus and hyaline zones are most clearly seen. When required the otolith examined may be turned upside down by means of a scalpel or pincers, or its position may be changed in order to obtain the clearest image of the growth zones. This could be helpful for examining thick otoliths of older fishes, or for detection of the first winter zone which is not quite visible from the outer (concave) side of the otolith.

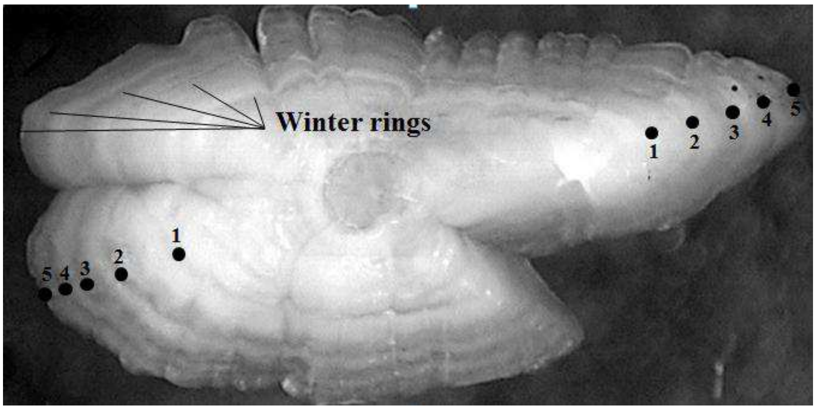

Fig. 1. Baltic herring otolith

Age reading criteria

The age determination differs in different seasons. In the first half of the year the age is determined as the number of opaque rings because the last hyaline ring becomes visible only in March-June. It would be the same if we would count the hyaline rings and add one year for the invisible hyaline ring on the edge of the otolith. The first winter zone has not often clearly distinctive contour and it could be detected by small differences in optical density of the neighbouring opaque zones.

In the second half of the year the age is determined as the number of hyaline rings. Usually it is the most difficult period of age reading. The formation of a new opaque summer zone for Baltic herring in Sd. 26 takes place in the second half of the year and depends on hydrometeorological and feeding conditions and age of the fish. At first the opaque zone appears for one year old herring (in May-June) and then subsequently for older herring. Especially for older herring it is possible to mistake the opaque zone of the previous year as a new opaque zone and vice versa. Therefore it is necessary to have more or less regular sampling of herring in the period from July till September. The reading of the number of growth zones is performed on the postrostrum and sometimes on the rostrum of the otolith. In the last decade the age determination for older herring in Sd. 26 is mainly possible on the rostrum because the growth rate of herring is very slow that has influenced also the size of otoliths and growth zones.

Last Workshop on Age Reading of Baltic Herring (WKARBH) was 9–13 June 2008 in Riga, Latvia.

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BALTIC FLOUNDER (Lithuania)

Sampling and storing

Samples of otoliths from the Baltic flounder are collected from commercial catches (landings and discards), research surveys and coastal surveys. Each sample consists of a pair of otoliths, taken from: 5 specimens of Baltic flounder from 15 cm or less in each 1,0 cm length-class, 10 specimens from 16 to 20 cm length-classes, 20 specimens from 21 to 34 cm length-class and 10 specimens from

35 cm or more. This is about 340 pairs of otoliths in a quarter of a year from commercial catches (landings and discards are counted separately) and research surveys. In addition, the same amount from coastal surveys. For each sample a protocol on the measurement of length frequency of the Baltic flounder is attached along with a protocol on the standard biological analysis containing data relative to total length and weight of the fish, their sex and gonad maturity stage. After taking the otoliths, they are dried and stored in a 96-well otolith tray. In this manner, they are prepared for age reading and storage. After reading samples of otoliths are stored in plastic bags.

Equipment and preparation of otoliths.

The age of the Baltic flounder in determined using a microscope in reflected light. Magnifications of 8x4 or 8x2 are usually adequate for otoliths reading. Before reading, one from the pair of otoliths is broken transversally across the nucleus into anterior and posterior parts and then both of the pieces are burnt using a spirit lamp for about 2-5 s (depending on the size of the otolith). The annual protein bands are thus burned producing a thin brownish-black line at the end of each translucent zone. To obtain a clear image of the rings, the otoliths should be immersed into ethanol. Then the broken surface is viewed for age estimation.

Last Workshop on Age Reading of Baltic flounder (WKARFLO) was in 26-29 May 2008 Rostock, Germany.

Working paper on the WGBIFS meeting in Öregrund (Sweden); 23-27.03.2015

THE METHODS APPLIED IN POLAND FOR OF BALTIC SPRAT, HERRING, COD AND FLOUNDER AGEING

by
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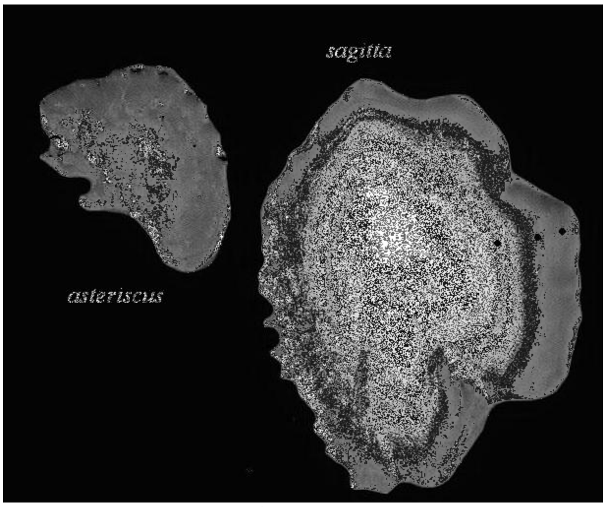
National Marine Fisheries Research Institute in Gdynia (Poland)

Introduction

Age determination is one of the most important analyse of fish and has many uses in fisheries research. Valid ageing of fish is essential in estimating the population parameters e.g. year-classes abundance, and mean length and mass at age groups. Discrepancies in fish age determination between particular national readers can create a serious problem with an accurate estimation of given species age composition and year-classes abundance in a macro scale. Methods of the Baltic sprat, herring, cod and flounder sampling and ageing based on analyses of otoliths morphological microstructure are somewhat widely described in the literature of subject. For example, in the case of sprat - in the ICES reports (Anon. 1988, 1991, 2002, 2006a, 2008a), the European Council Regulations No. 1543/2000 of 29 June 2000 (Anon. 2000a) and No. 1639/2001 of 25 July 2001 (Anon. 2001) and papers of Aps (1982, 1986), Anon. (1992a, 1999), Aps et al. (1992), Oeberst (1995), Müller (1996), Grygiel (2006a, 2006b). The paper contain brief description of current methods used by the National Marine Fisheries Research Institute in Gdynia (Poland) for age determination of the main Baltic fish species, which age data are uploaded to ICES DATRAS database. This work was done as the answer on the action recommended by WGBIFS/2014 (Annex 10. Action list).

The techniques and criteria of sprat age determination (W. Grygiel)

The Baltic sprat age determination was only very occasionally a subject of scientific discussion on an international forum. On the end of 1980s, an informal, ad hoc meeting of sprat age readers from GDR, Poland and Sweden took place in Västervik (Sweden), on board of r/v "Argos". On the very beginning of 1990s within the Six State Fisheries Agreement was established a research sub-group, composed from representatives from GDR, Poland and Soviet Union, for a preparation of "Guide for use Baltic sprat and herring otoliths in fisheries studies" (Aps et al. 1992). More wide, and for a first time fully international discussion of Baltic sprat age determination was undertaken during the ICES Workshop in Tallinn (Estonia), in the period 31.08-04.09.1992 (Anon. 1992). Later on, in the period 24-28.11.1997, take place "Ad hoc Workshop on Baltic Sprat Age Reading" and representatives of Estonia, Latvia, Lithuania, Poland and Russia met in Kaliningrad (Russia) for consultations of difficulties with the Baltic sprat age determination and the assessment of the Baltic coastal spring spawning herring population biomass (Grygiel, 1998). More one consultative meeting concerns Baltic sprat age interpretation, with participants from Poland and Lithuania, took place in Gdynia in the period 02-16.12.2004, within the POLMARF/WP-3 project. Methods of the Baltic sprat sampling and ageing using otoliths, accordingly to season and ICES Sub-div. stratums are described quite completely in the ICES reports (Anon. 1988, 1992), the European Council Regulations No. 1543/2000 of 29.06.2000 (Anon. 2000) and No. 1639/2001 of 25.07.2001 (Anon. 2001) and papers of Aps (1982, 1986), Anon. (1992, 1999), Aps et al. (1992), Oeberst (1995), Müller (1996), Grygiel et al. (2001). Ageing of sprat consists of recognition and counting of annual increments (fully developed hyaline zones) in otoliths - the inner ear bones. From three types of otoliths (*sagitta, asteriscus, lagena*) only *sagitta* is commonly applied in routine ageing (Fot. 1, Fig. 1).



Fot. 1. Two types of sprat otoliths (catch date - 13.10.2004, the Słupsk Furrow, 12.5 cm l.t., age group 3).

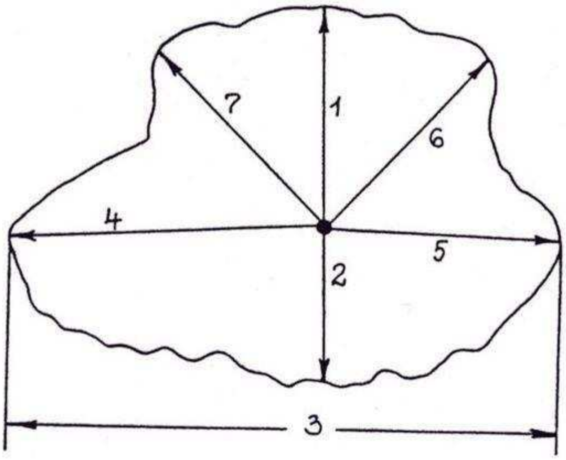
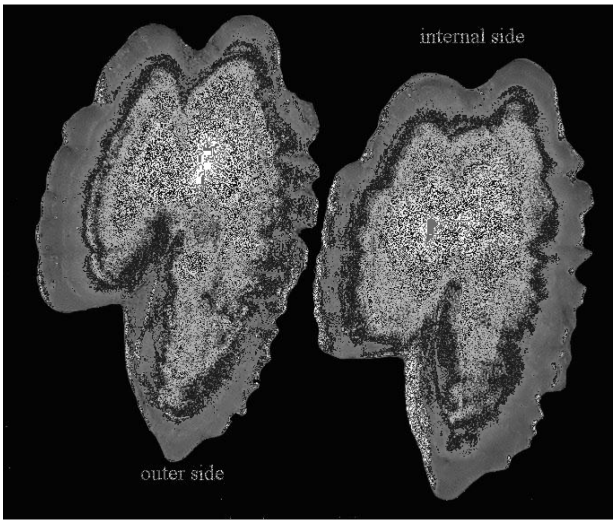


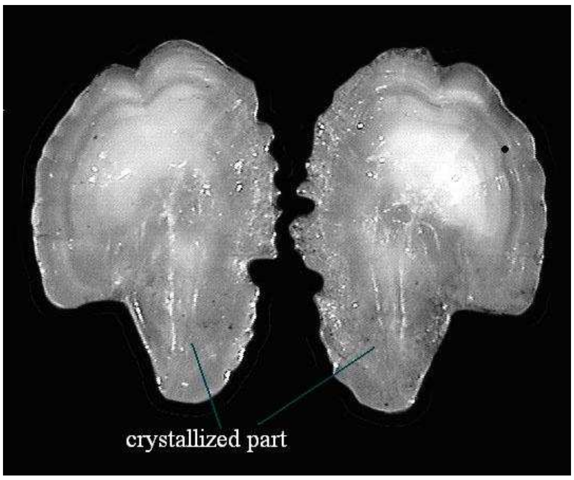
Fig. 1. The contour of the Baltic sprat otolith; 1 - dorsal and 2 - ventral distances, 3 - total length of otolith, 4 - rostral, 5 - postrostral, 6 - pararostral and 7 - anterostral distances (after Aps et al. 1992).

Age is determined from the outer (concave) side of otoliths (Fot. 2), on which the visibility of the nucleus and hyaline zones is highest. The internal side of the Baltic sprat otoliths is practically not used for standard ageing.



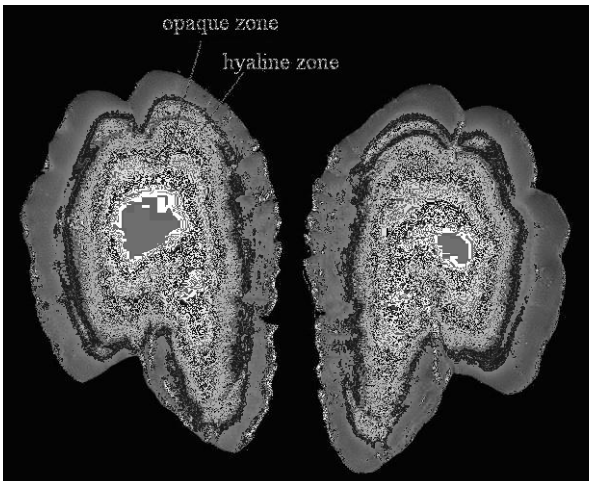
Fot. 2. The outer and internal sides of sprat otoliths (catch date - 28.09.2004, the Gulf of Gdańsk, 12.5 cm l.t., age group 3).

Age of sprat from group 1 and older is usually determined on the dorsal edge of the otoliths (not polished and not breached) where the growth seasonality can be somewhat clearly recognized (Fig. 1). The crystallized (translucent) otoliths of sprat older as 2-3 years are practically not readable, but if they are younger, age can be recognized (Fot. 3).



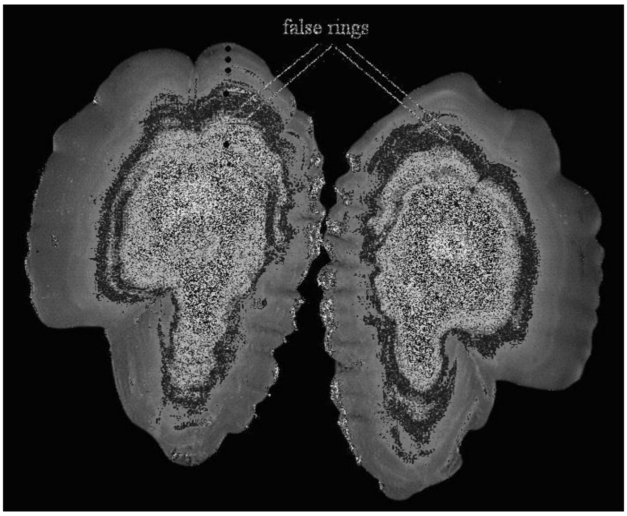
Fot. 3. The crystallized sprat otoliths (catch date - 28.09.2004, the Gulf of Gdańsk, 9.0 cm, age group 1).

One year's growth zone (annual increments) consists of a one wider-summer-opaque zone and one narrower-winter-hyaline (translucent) zone (Fot. 4). The 1st January, according to ICES recommendation, birthdates is used. The date of fish capture must be available.

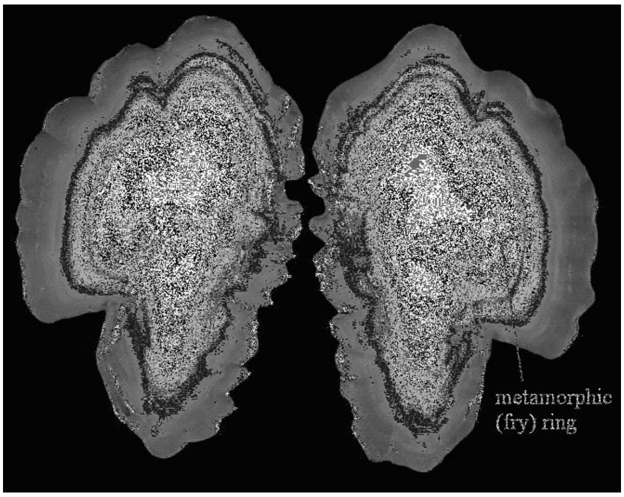


Fot. 4. One year's growth zone formed on sprat otolith (catch date - 28.09.2004, the Gulf of Gdańsk, 12.0 cm).

Summer zone, especially the second opaque zone, may include one or more narrow hyaline zones (false winter rings; Fot. 5) of intra-seasonal growth checks, which are not regarded in the case of ageing. These false winter rings possibly arise when the fish is in a stress condition, it may occur when it migrates from one area to another e.g. for spawning for the first time, during starvation or if the temperature increases to unusually high levels. The false rings are less translucent comparing with an annual hyaline ring, are blurred, irregular and only partly visible.



Fot. 5. The false winter rings marked on sprat otoliths (catch date - 28.09.2004, the Gulf of Gdansk, 13.0 cm, age group 5).



Fot. 6. The metamorphic ring marked on sprat otoliths (catch date - 28.09.2004, the Gulf of Gdansk, 12.5 cm, age group 3).

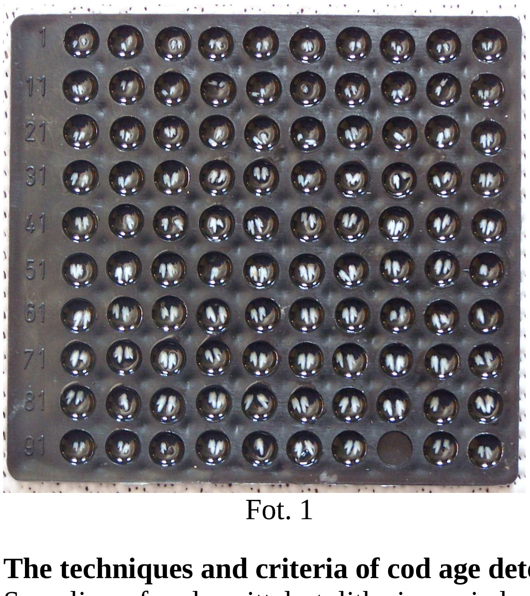
The metamorphic (fry) ring is located in the first growth zone of otolith, close to *nucleus* and does not have the shape of true winter ring, but it is rounded (Fot. 6). The winter, hyaline zone on the edge of sprat otolith from the southern Baltic is visible on the end of March or beginning of April, but in the northern part of the Baltic considerably later. In the first quarter of the year age is determined by counting the visible hyaline rings and the edge of the otolith despite the fact that the winter zone is not yet fully formed on it. In young sprat from age groups 1 and 2 the summer, opaque zone on the edges of otoliths appears e.g. in the southern Baltic - on the beginning of June or very rare on the end of May. The beginning of formation of the opaque zone on otoliths depends upon the hydrological and trophic conditions of the environment. In older fish (age group 3+), the opaque zone appears on otoliths in a very late summer. Moreover, in an old fish, which has stopped growing, the growth of the otolith will still occur, but it will slow down and the transparency will increase.

The timing of the new opaque zone formation in the current year should be taken into account in sprat ageing technique. In would be recommended collecting during summer one sprat sample per month for age reading. The knowledge about the sprat body condition factor changes will be very useful in opaque zone increment interpretation vs. year-class abundance. Year class abundance (strength), is reflected in more widely or relatively narrow opaque zone on otoliths, should be also considered during sprat ageing.

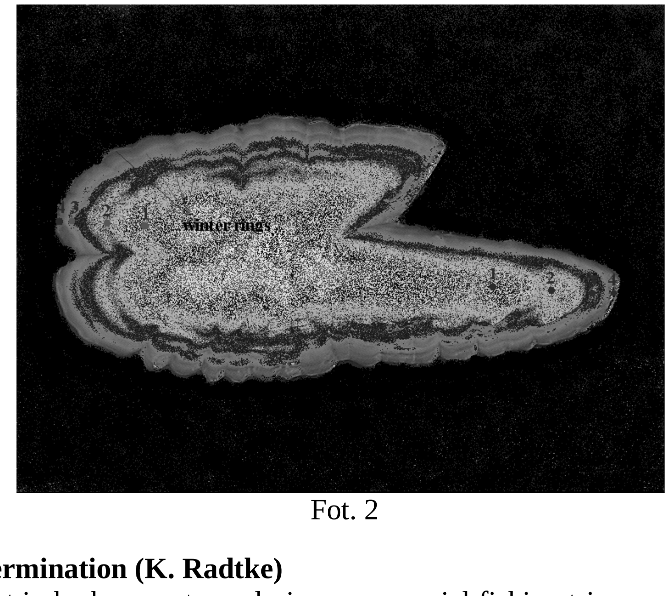
Sprat otoliths are stored and examined in Poland in one principal method. Otoliths are stored in the black plastic plates with numbered cavities (see Fot. 1 – herring) and embedded (immersed) into the Canadian balsam. Otoliths are examined in reflected light using a binocular microscope at the magnification of 50x. The applied Canadian balsam performs the task of increasing the sharpness of the otolith morphological structure and preventing otoliths from being damaged during storage or transportation. The use of plastic plates makes it easier to store and displace the research materials, and significantly increase the effectiveness of standard age reading as it eliminates additional manipulations with otoliths, necessary when envelopes are used.

The techniques and criteria of herring age determination (M. Wyszyński)

The otoliths are used for herring age determination from 1960s. Whole otoliths are taken for examination. They are placed into cavities of plastic plates made from tinted black polypropylene (Fot. 1). On plates, the pairs of otoliths are placed with the outer (concave) side up, on which the visibility of the nucleus and hyaline winter rings is the best one. Next, after drying they are immersed in eukitt or Canada balsam, what prove the sharpness of the otolith morphological structure and preventing otoliths from being damaged during storage. Herring otoliths are examined under stereomicroscope at a black background in a reflected light. During routine ageing, the magnification of 12x1 is used for otolith reading. Hyaline fully marked winter rings counting have been adopted as a criterion for age determination (Anon. 1992b, 1997, 2005, 2008b; Fot. 2). Additionally, the otoliths are used for herring biological groups (populations) separation (Popiel 1958, Ojaveer 1962, 1988, Rauck 1965, Kompowski 1969, Wyszyński, M., D. Kästner 1985).



Fot. 1



Fot. 2

The techniques and criteria of cod age determination (K. Radtke)

Sampling of cod sagittal otoliths is carried out in harbours, at sea during commercial fishing trips as well as during BITS and BIAS surveys. Poland sample Baltic cod otoliths from ICES Sub-divisions 24, 25 and 26. Broken, untreated (without polishing and burning) otoliths are used for ageing (Anon. 2000b, Anon. 2006b, 2006c). Right otolith is cut with a scalpel and broken by hand (Fig. 1), left otolith is used for weighting. Otolith is broken as close as possible to the nucleus. Otolith is mounted vertically in a small pot of black plasticine mixed with chimney soot and filled with water. During the counting of annual (winter) rings, the broken surface of the otolith is submerged in water. The age is determined under a binocular microscope using reflected light. It is preferred to place the microscope in the darkest place of the office of the reader to leave out unwanted sunlight or disturbing electrical room lighting. Usually, the binocular microscope magnification used varies from 6 to 12. If the otolith is difficult to read then the magnification is changed. If it is still not readable, the second otolith is cut. The ring patterns of the broken otolith surface may be further elucidated by simply shading the reflected light by a stick, pencil, etc. The axis of reading is dependent from the readability of the otolith and the preference of the reader. Quite often, the otolith is read several times along different axes (from the centre towards dorsal and the ventral edge or somewhere between *sulcus acoustics* and the dorsal edge) to make sure that the interpretation is as good as possible (Fig. 2). Age reading of cod has traditionally employed counting of annual zones (winter rings) in the otoliths (Fig. 2). After ageing the otoliths are stored in envelops (dry) with data on the biological standard parameters like species name, length, weight, maturity, sex and age.

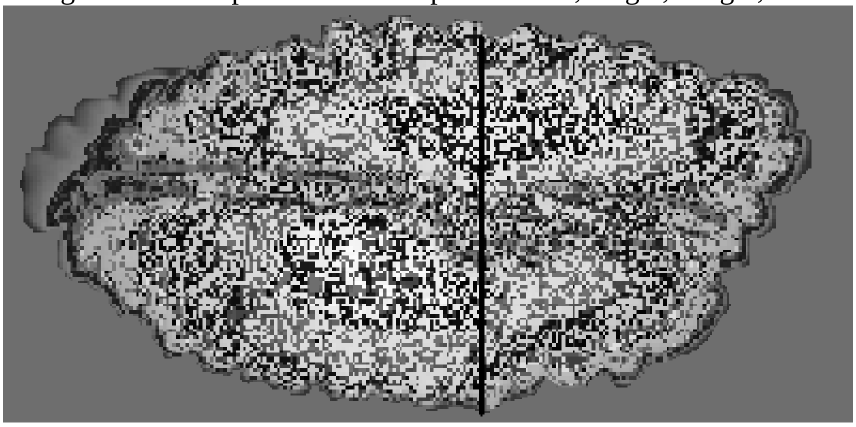


Fig. 1. Cod otolith with marked location (straight vertical line) of the cutting.

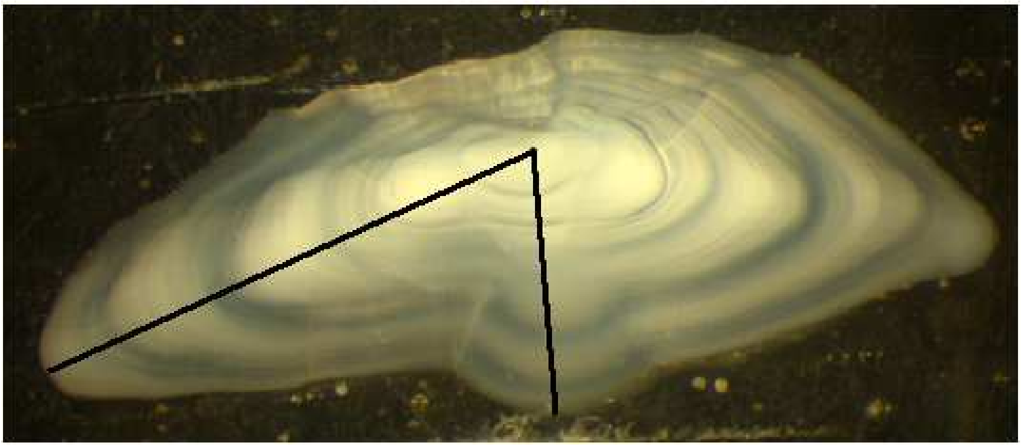


Fig. 2. Most often axes used to count the winter (annual) rings (straight black lines). Cod with age 5.

The techniques and criteria of flounder age determination (Z. Mirny)

Before 2011, age of flounder was determined in Poland using whole otoliths. Otoliths immersed in water were observed using a stereomicroscope (with magnification 20x) with reflected light. Workshop on Age Reading of Flounder (WKARFLO; Anon. 2007) recommended using sectioned and stained or broken and burnt otoliths instead of whole otoliths for flounder age determination, which has been stated to be uncertain. Age reading from sectioned and stained otoliths was proved more reliable as it gives higher agreement among readers. Since 2011, flounder age is read from sectioned and stained otoliths prepared according to the methodology described in the WKARFLO 2008 Report (Anon. 2008c).

A method for flounder otoliths preparation – sectioning and staining

Clean and dry otoliths with *nucleus* marked with a pencil are placed in rows in the mould (Struers Flexi Form, 90 x 50 x 35 mm) along the lines printed on the transparent foil, which is fixed to the bottom. Otoliths are placed concave side down, anterior end uppermost. Usually a symmetric otolith is chosen, but if it is not available or broken, an asymmetric one is used.

Each row contains seven otoliths. Otoliths placed in the mould are carefully covered with transparent epoxy resin (EpoFix resin mixed with EpoFix Hardener). After 12 hours, when the resin solidifies, the second layer of otoliths is put (as described above). One mould may contain up to three layers mentioned above, so a single slice contains 21 otoliths.

After hardening, the epoxy blocks are cut along the lines using variable-speed precision cutting machine (Struers Accutom 50) fitted with a metal-bonded diamond cut-off wheel. The slices of approx. 0.4 mm are etched in 1% hydrochloric acid for 1 minute. After rinsing in distilled water, they are immersed in a solution of neutral red (100 ml, 3.3 g/L) with 0.5 ml acetic acid (100%) and 1 g of sodium chloride for 10 minutes.

Stained slices are fixed to a microscope slide (76x52 mm) with an epoxy resin and observed under a stereomicroscope using reflected light with a magnification of 20-60x. The annual winter rings are counted in two directions: to ventral and dorsal edges.

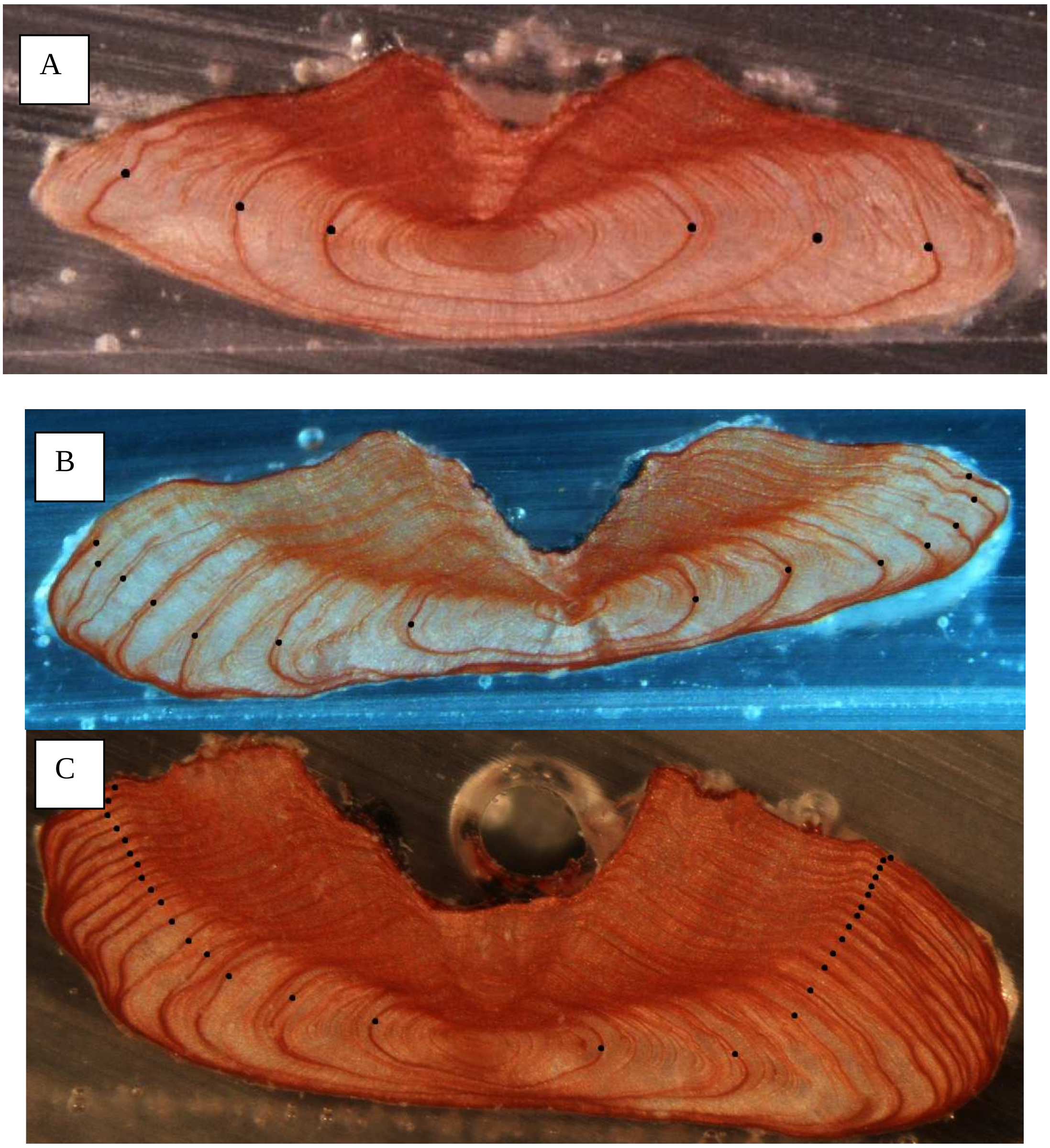


Fig.1. Stained flounder otolith sections with dots indicating winter rings; A – 3, B – 7, C – 16 age group.

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**Stock indices based on acoustic surveys in the Baltic Sea –
Alternative application of results of fishing stations**

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Introduction

Two international acoustic surveys are carried out in the Baltic Sea every year. Target species of the acoustic survey in May (BASS) is sprat. 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 acoustic survey in October (BIAS). In addition, cod, whiting, stickleback and other species occur in the pelagic waters and are observed by acoustic measurements and fishing stations. Fishing stations are used to estimate the relative species composition and the length frequencies by species to determine the acoustic characteristics. In addition, age-length data are sampled to estimate stock indices of herring and sprat by age group. It is assumed that the relative species composition within the layer observed by the fishing station is similar to relative species composition of the depth range observed by the acoustic measurements. Stock indices are estimated by rectangle of 30' N x 1 °E. It is required that 60 acoustic measurements (mean value per nautical mile) and two fishing stations are realized for each stratification unit. Results of fishing stations of a rectangle are combined by arithmetic mean of the relative species composition of each fishing stations (see manual of acoustic surveys). This method assumes that the relative species composition is independent of the density of fish observed by the acoustic equipment.
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. WGBIFS agreed during the meeting in 2013 that the new method should be applied for the total areas covered by BASS and BIAS between 2009 and 2013. Analyses of the acoustic surveys in 2013 were presented in the report of WGBIFS in 2014. This study presents estimates based on the new method between 2009 and 2012. The results are preliminary because some source data were not available and were approximated based on assumptions.

Materials and Methods

Catch composition in number and length frequencies of species of fishing stations conducted during acoustic surveys in quarter 2 (BASS) and in quarter 4 (BIAS) between 2009 and 2012 were provided in defined standard format by Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden. In addition, mean nautical area backscattering coefficients, s_A, during fishing stations were made available. In some cases number of acoustic values and mean s_A values by SD were submitted based on all acoustic data sampled in SD. The numbers of realized fishing stations of BIAS are given in Table 1 by year and country. In addition, all combination of year and country were green marked where countries realized acoustic surveys. Table 1 showed that not all sampled data were used in the analyses. Same data of BASS are given in Table 2. Overview of reported catch in numbers and length frequencies by year, country and species are given in Table 3 and 4 for BIAS and BASS, respectively. Data of target species of both acoustic surveys herring and sprat were always reported. In most cases data of cod and stickleback were also made available, but data of other species were only submitted in some cases.
The data were used to estimate stock indices by SD according to the method proposed in Oeberst (2011) which incorporates the relation between the total NASC, $s_A(k)$, and the NASC of species i,

s_A(k,i), during the fishing stations k. Mean s_A values in SD based on all realized acoustic measurement are also prerequisite for the proposed method. Unfortunately, mean s_A values and number of acoustic measurements by SD were not provided by all countries. Therefore, mean s_A value by SD were estimated by the arithmetic mean of s_A values of rectangle given in the BASS and BIAS database of aggregated data. The consequence of this approach is that estimated stock indices based on the new method presents only preliminary values. Estimates of both acoustic surveys in 2013 were presented in the report of WGBIFS in 2014.

Results

Relations between $s_A(k)$ an $s_A(k,i)$

Relations between s_A(k) an s_A(k,i) between 2009 and 2012 are presented in figures by SD for both surveys. Figures 1 to 11 shows the data of SD 22 to SD 32 of BITS and Figures 12 to 15 present data of BASS for SD 24 to SD 26 and SD 28.
s_A(k) values in SD 22 varied between ~ 60 in 2011 and ~420 in 2012. s_A(k,i) values of all species are close together in SD 22 (Fig. 1) if s_A(k) values are smaller than 150 and herring is dominant if s_A(k) was higher. Herring and sprat were the main species in SD 22 with strong variation of maximum s_A(k) values from year to year. The s_A(k,i) values of both species indicated spatially separated distribution of both species because s_A(k,i) values of herring were low if s_A(k,i) of sprat was high and vice versa.
Only low numbers of fishing stations were realized in SD 23 each year. Acoustic signals of herring and sprat increased with increasing s_A(k), but herring was more dominant in most years
Many species were captured in SD 24 every year, but, the acoustic signals during the fishing stations were small for species like whiting, mackerel, etc. s_A(k,i) of herring and sprat increased with increasing s_A(k) but the proportion of the acoustic signal of both species related to the total acoustic signal was highly variable. The s_A(k,i) values suggest that all species are close together if the total density is low (s_A(k) is small), but only one species is dominant in areas with high densities.
Similar relations between s_A(k,i) of herring and sprat were observed in SD 25 (Fig. 5). The maximum values of s_A(k) suggest significantly differences of total density from BIAS to BIAS. However, analyses of the distribution of all observed s_A values during the surveys are necessary to verify the hypothesis.
The relations between s_A(k) and s_A(k,i) in SD 26 did not show clear picture, partly due to the low number of fishing stations (2009 and 2010). Estimates of 2012 showed clear dominance of sprat in the area. The picture is not so clear in 2011 where herring was dominant for s_A(k) < 1000 and only one fishing station was realized in areas with higher s_A(k). More detailed analyses of observed s_A values during the acoustic tracks is necessary for the interpretation of the observed s_A(k,i).
Results of fishing stations in SD 27 indicated highly variable spatial distribution of herring, sprat, cod and stickleback. s_A(k,i) values of herring were highest in most cases however large values of s_A(k,i) for sprat and stickleback were also estimated. High variability of s_A(k,i) of herring and sprat were also observed in SD 28, but sprat were more dominant in SD 29 and SD 32.
In contrast to the highly variable proportion of herring and sprat in most areas during BIAS sprat was dominant during BASS because herring spawned in the shallow waters at the same time (Fig. 12 – 15).

Conclusion

- Assumptions of the currently used method are not fulfilled.
- The analyses clearly showed that the new model is more appropriate to describe the relations between s_A(k) and s_A(k,i)
- Correlations between s_A(k) and s_A(k,i) are zero for some species (cod, stickleback, herring during BASS, etc.)
- Correlations between s_A(k) and s_A(k,i) are high for other species (herring and sprat in BIAS and sprat in BASS)

Estimated stock indices

Abundance of herring, sprat and cod were estimated based on the new method. The indices are influenced by the estimation of the mean s_A value in SD during the acoustic tracks. The mean s_A values by SD used in the analyses are only raft estimates of the mean s_A values used in the standard procedure. Therefore, deviations of the absolute number based on both methods are possible.
Herring indices of BIAS based on both methods are presented in Figure 16 by SD for the years 2009 to 2012. Estimates based on both methods are similar for SD 22 – SD 27, but large deviations were found for SD 28, SD 29 and SD 32.
Same relations between indices based on both methods were found for sprat (Fig. 17). Large differences were estimated for SD 28, SD 29 and SD 32. The $s_A(k,i)$ values in these SD's are characterized by the dominance of one species.
Sprat was dominant in all SD's during BASS between 2009 and 2012. Therefore, the mixing of two species with highly variable spatial density did not influence the estimates. Nevertheless indices based on both methods differed in many cases (Fig. 18). Only small differences were found in 2010, but strong differences in 2012.

Conclusions:

- s_A values of acoustic tracks must be analysed to describe the frequency distribution of the values within the SD and to identify the reasons for the differences of the indices based on both methods
- Description of an exchange format is necessary for more easy exchange of the data of national databases for agreed analyses

Cod in the pelagic

Most fishing stations are realized in the pelagic waters without bottom contact. Therefore, estimated abundances of cod based on the acoustic surveys present only cod in the pelagic and are spatially separated from cod at the bottom, although cod close to the bottom can influence the acoustic signal. Slightly overlap of the vertical opening of the pelagic gear used during acoustic surveys and bottom trawl use during BITS is only likely in shallow areas like SD 22 and SD 24.
Indices of acoustic surveys are given in number by SD. The estimated indices were transferred in the unit of CPUE of TVL used in BITS by following steps:

- Calculation of the number of individuals per km² based the index
- Estimated of the covered area in km² by TVL within one hour (velocity of 3 kn, 1 hour haul duration, horizontal net opening of 25 m, see BITS manual)

CPUE per SD in units of TVL was downloaded from the DATRAS website of ICES. Numbers by age groups were sum up to get total number. Estimates of cod by year and SD for both methods of estimation are given in Table 5 for BIAS and BITS in quarter 4.
Increases of cod in the pelagic from 2009 to 2013 were observed in SD 22, SD 23 and SD 25. Cod estimated by acoustic methods were many times higher in SD 23 in 2011 and 2012. The relation between cod estimated in the pelagic and in the bottom layer varied significantly in all SD's from year to year. Abundance of cod in the pelagic water during BASS in relation to mean CPUE values of cod during BITS in quarter 1 significantly varied from SD to SD and from year to year (Table 6). Cod was more abundant in the pelagic waters compared to the estimates of BITS in SD 25 in 2009, but significantly lower in 2010 – 2012. Possible reasons for the variable relation between cod in the pelagic and close to the bottom in space and time must be evaluated in more details in the future. The estimated cod indices based on acoustic surveys can be a valuable extension of the time series of BITS based estimates.

Mixing of Western Baltic Spring Spawning Herring (WBSSH) and Central Baltic Herring (CBH)

Age-length data of herring was used to classify individuals to one of the both herring stocks WBSSH and CBH by means of the separation function given on Gröhsler et al. (2013) and to estimate the proportion of WBSSH by age groups, SD and year. Herring captured in SD 22 and 23 were mainly classified to WBSSH. In contrast to this proportion of WBSSH decreased with increasing age in SD 24 (Table 7). This effect can be explained by the low density of older herring in SD 24 because WBSSH mainly stay in SD 23 during BIAS. More than 50 % of age groups 1 and 2 (2011 & 2012) which were captured in SD 25 were classified as WBSSH (Table 8). The proportions of WBSSH decreased with increasing age and were zero for age group 6. More than 50 % of age group 1 herring were also classified as WBSSH in SD 26 (Table 9). The proportion of WBSSH of older age groups showed similar trends as observed in SD 25 – increasing proportion of WBSSH from 2010 to 2012. Analyses of the data of SD 27 to SD 32 suggested that individuals of age group 1 of WBSSH are likely in SD 27 and SD 28, but older age groups of WBSSH were not found in SD 27 to SD 32.

General conclusions

- New approach described more appropriate the relations between the species compositions
- Description of an exchange format of all relevant acoustic data (s_A values of acoustic tracks, $s_A(k)$ valued during the fishing stations and species compositions and length frequencies as well as data in individuals like length, age, weight, etc., application of fishing stations by area) is an important prerequisite to improve the estimates based on acoustic surveys and for more details analyses of available data.
- The analyses present only preliminary estimates of stock indices because some data were missing like s_A values of acoustic tracks, species composition of total catch, etc.

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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. 395 – 398. (Annex 9)

Tables

Table 1: Overview of realized surveys and used data of BIAS by year and country (green: realized surveys, number: number of fishing stations

	Estoni	Germa	Latvia	Lithuai	Polanc	Russia	Swede
2009	18	49	8				87
2010	24	57	19	6			84
2011	23	54	14	10	32		82
2012	22	56	19	8	37		47

Table 2: Overview of realized surveys and used data of BASS by year and country (green: realized surveys, number: number of fishing stations

	Germa	Latvia	Lithuai
2009	49		
2010	48	20	8
2011	52	21	6
2012	68	10	7

Table 3: Overview of reported species for BIAS

	Countr	Herring	Sprat	Cod	Sticklb	others
2009	Estoni	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x		
	Lithuania					
	Poland					
	Swede	x	x	x	x	
2010	Estoni	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x		
	Lithuai	x	x	x	x	
	Poland					
	Swede	x	x	x	x	
2011	Estoni	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x	x	
	Lithuai	x	x	x		
	Polanc	x	x	x		
	Swede	x	x	x	x	
2012	Estoni	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x	x	
	Polanc	x	x	x		
	Swede	x	x	x	x	

Table 4: Overview of reported species for BASS

	Countr	Herring	Sprat	Cod	Sticklb	others
2009	Germa	x	x	x	x	x
	Latvia					
	Lithuania					
2010	Germa	x	x	x	x	x
	Latvia	x	x			
	Lithuai	x	x	x	x	
2011	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x	x	x
2012	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x		

Table 5: Mean number cod per hour in unit of TVL estimated based on BIAS (left part) and based on BITS in quarter 4

	Estimates based on BIAS				Estimates based on BITS in quarter 4			
SD	2009	2010	2011	2012	2009	2010	2011	2012
22	31	61	147	347	42	121	111	306
23	188	471	1550	1284	220	102	42	89
24	147	250	27	105	557	969	510	532
25	300	275	337	1347	1376	1497	1216	1760
26	146	63	118	102	453	1121	482	771
27	26	12	7	22	125	17	2	2
28	11	18	78	19	476	146	373	235

Table 6: Mean number cod per hour in unit of TVL estimated based on BASS (left part) and based on BITS in quarter 1

	Estimates based on BASS				Estimates based on BITS in quarter 1			
SD	2009	2010	2011	2012	2009	2010	2011	2012
24	42	0	17	101	611	624	473	466
25	1851	184	113	31	1217	1305	1301	1217
26	403	73	257	1562	584	1081	427	1200
28	110	29	14	31	58	50	20	41

Table 7: Proportion of Western Baltic Spring Spawning Herring (WBSSH) in SD 24 during BIAS between 2009 and 2012

	Age group						
	0	1	2	3	4	5	6
2009	100	100	67	40	25	33	0
2010	100	100	80	30	14	33	0
2011	100	100	90	52	26	21	46
2012	100	99	99	96	67	37	53

Table 8: Proportion of Western Baltic Spring Spawning Herring (WBSSH) in SD 25 during BIAS between 2009 and 2012

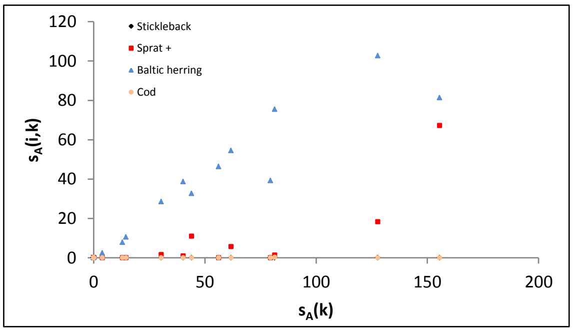
	Age group						
	0	1	2	3	4	5	6
2009	0	67	24	17	11	13	0
2010	0	73	29	9	7	0	0
2011	0	100	60	15	4	0	0
2012	0	88	83	33	7	6	0

Table 9: Proportion of Western Baltic Spring Spawning Herring (WBSSH) in SD 26 during BIAS between 2009 and 2012

	Age group						
	0	1	2	3	4	5	6
2009	0	50	6	0	0	0	0
2010	0	67	0	0	0	0	0
2011	0	86	25	0	0	0	0
2012	0	100	67	33	0	0	0

Figures

Relations between sA(k) by survey, year and SD



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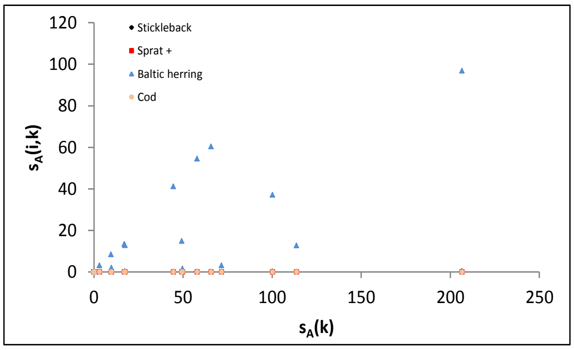

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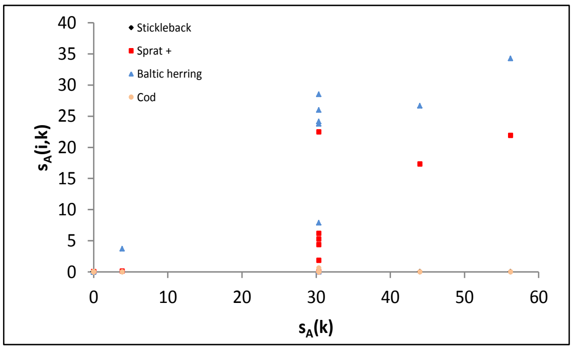

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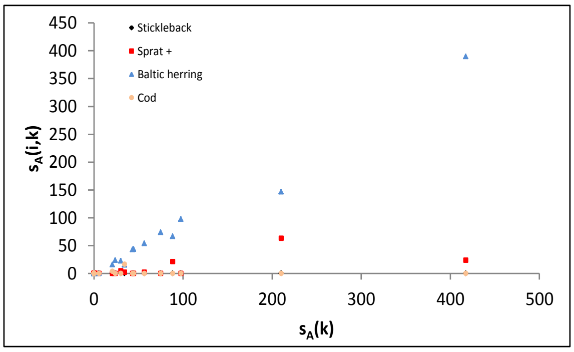

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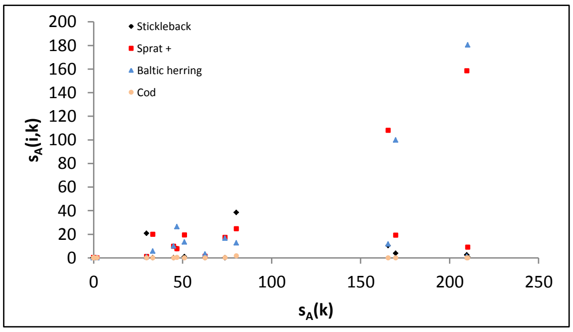
Figure 1: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 21 during fishing station of BIAS between 2009 and 2012



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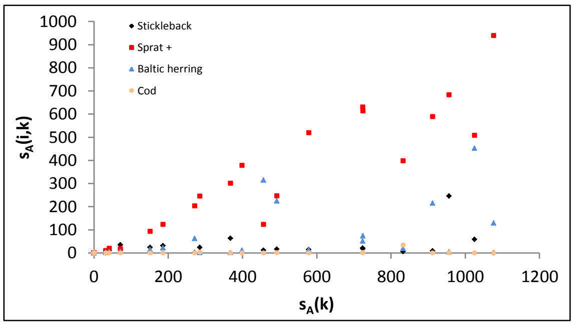

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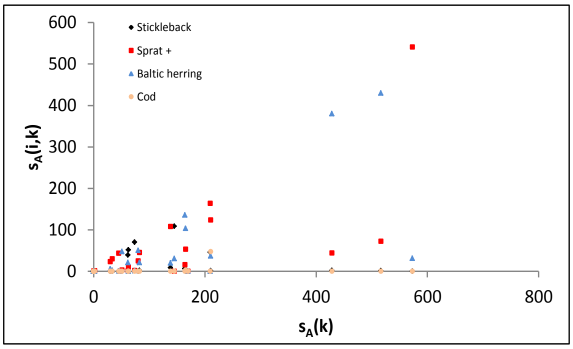

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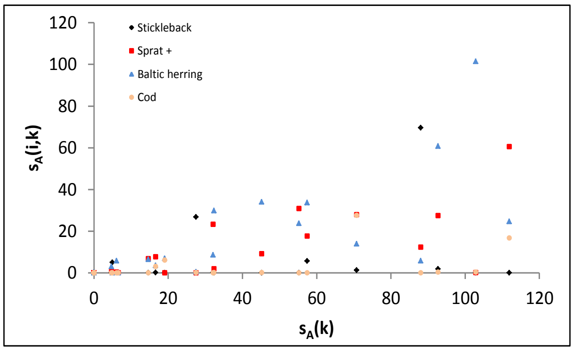
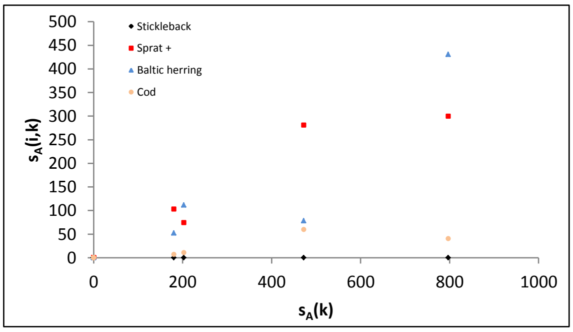


2012

Figure 2: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 22 during fishing station of BIAS between 2009 and 2012



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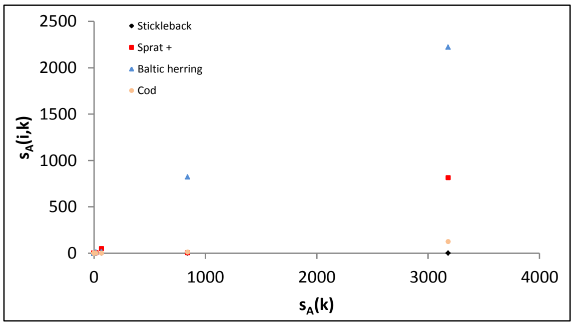

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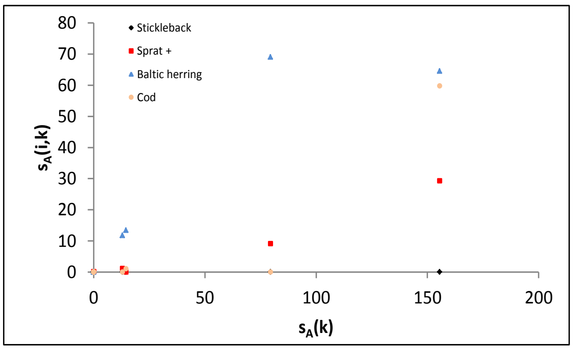

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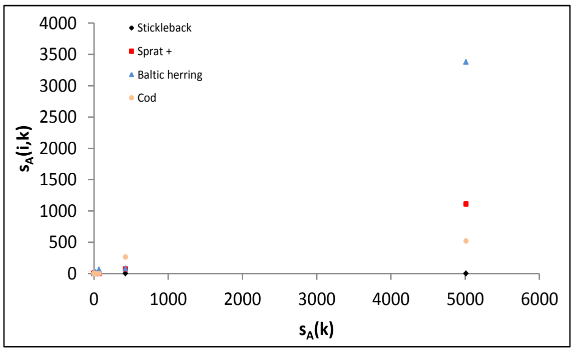

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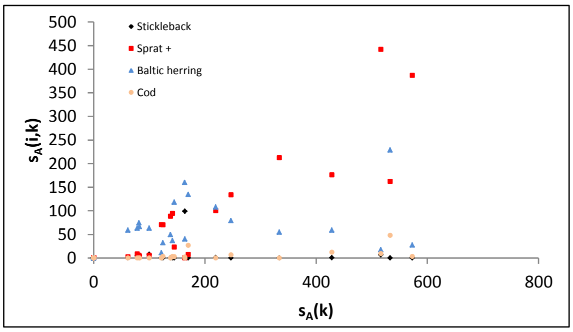
Figure 3: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 23 during fishing station of BIAS between 2009 and 2012



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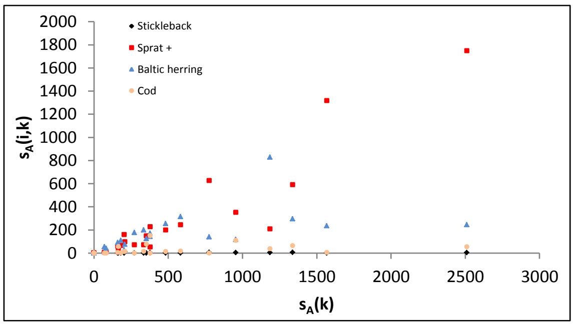

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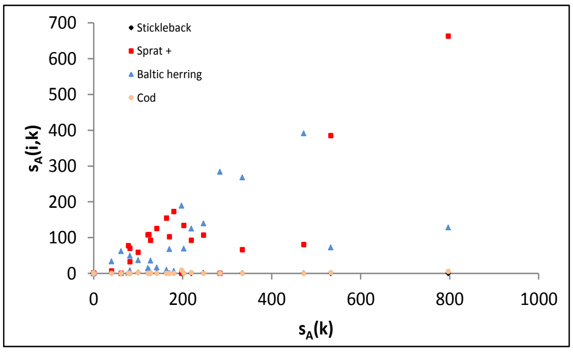

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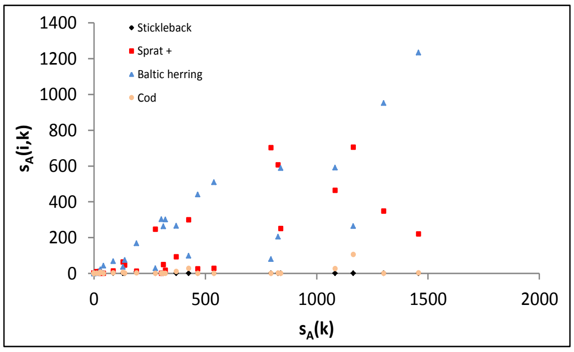

2012

Figure 4: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 24 during fishing station of BIAS between 2009 and 2012

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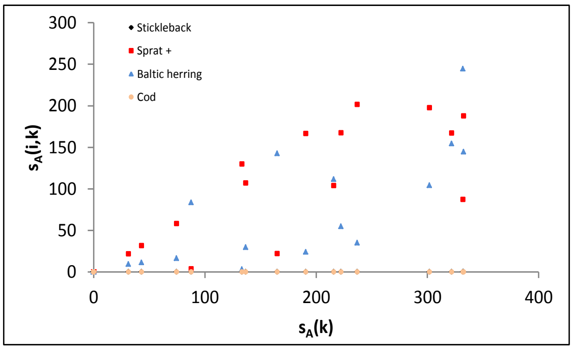

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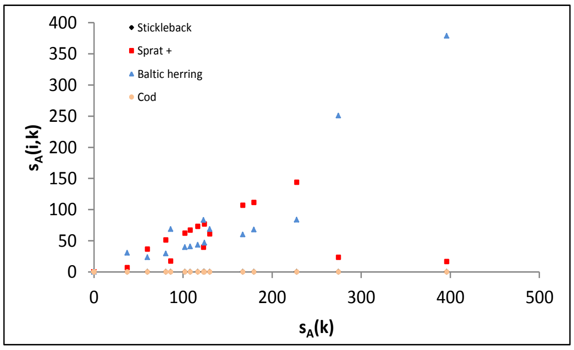

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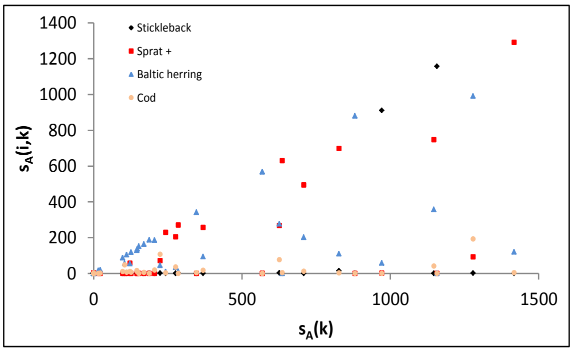

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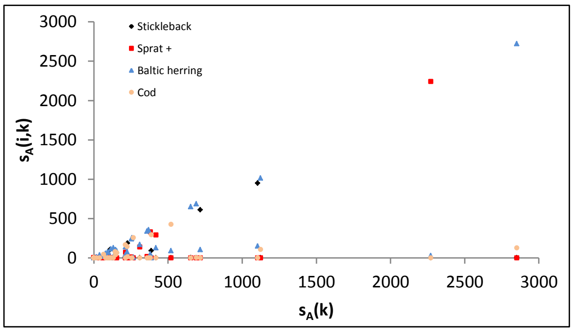
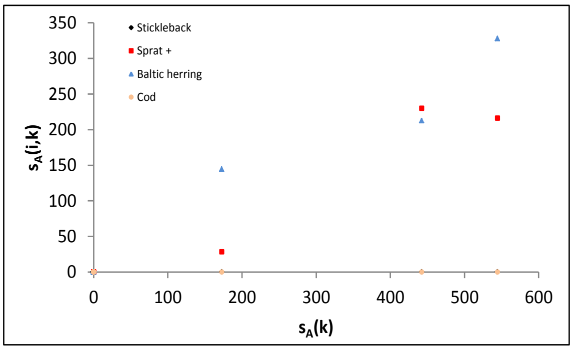


2012

Figure 5: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 25 during fishing station of BIAS between 2009 and 2012



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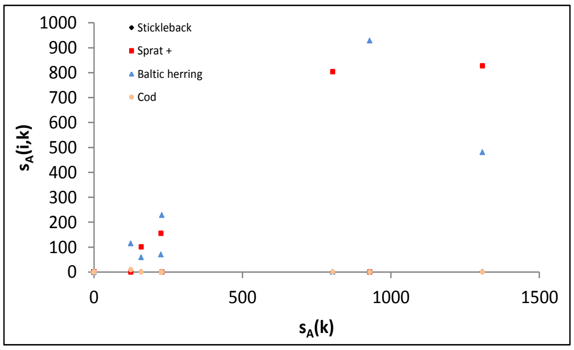

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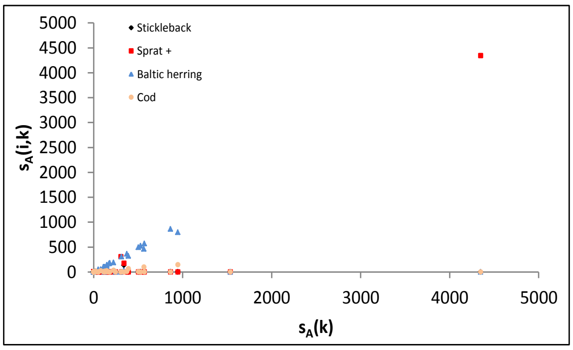

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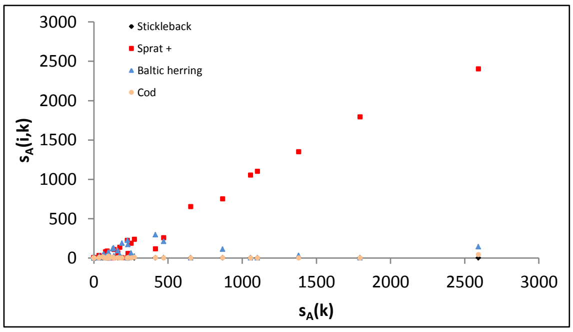

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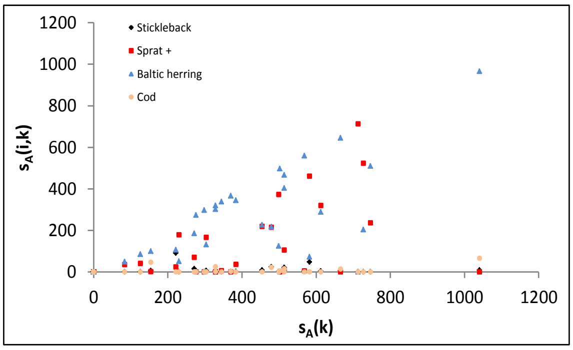
Figure 6: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 26 during fishing station of BIAS between 2009 and 2012



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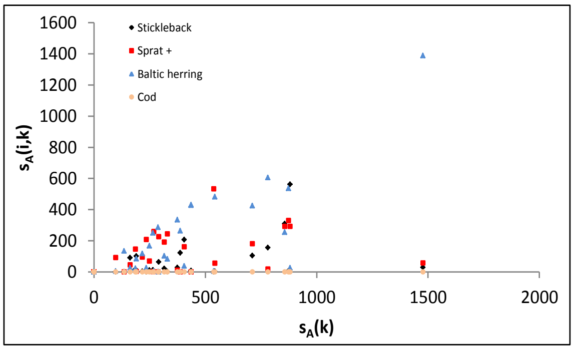

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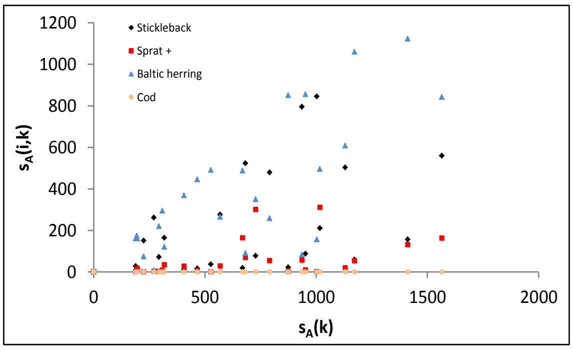

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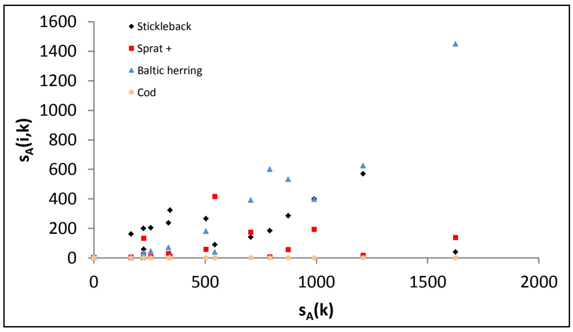
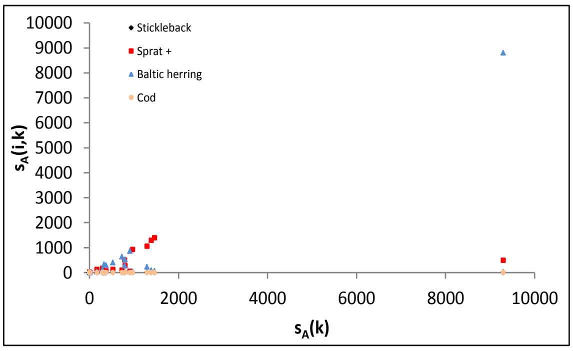


2012

Figure 7: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 27 during fishing station of BIAS between 2009 and 2012



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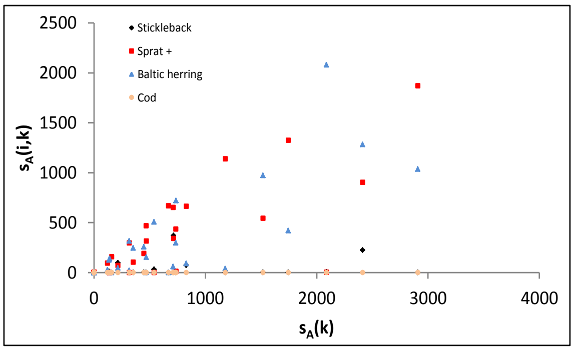

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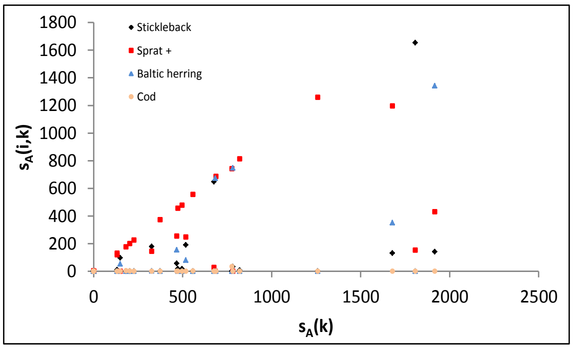

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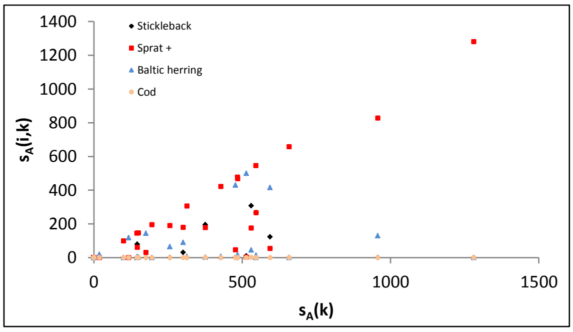

2012

Figure 8: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 28 during fishing station of BIAS between 2009 and 2012

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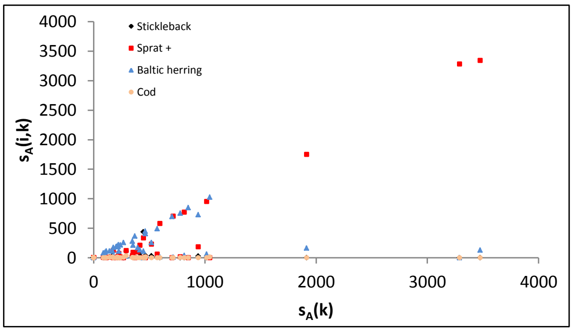

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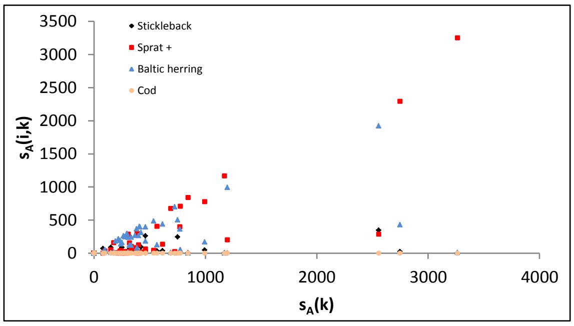

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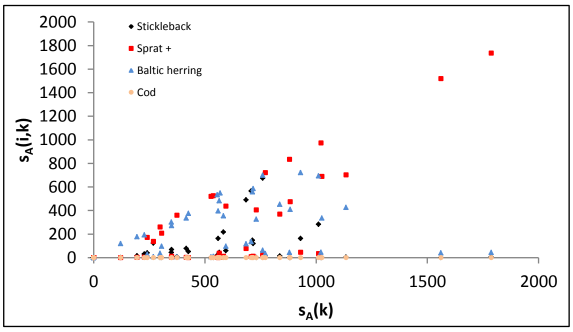

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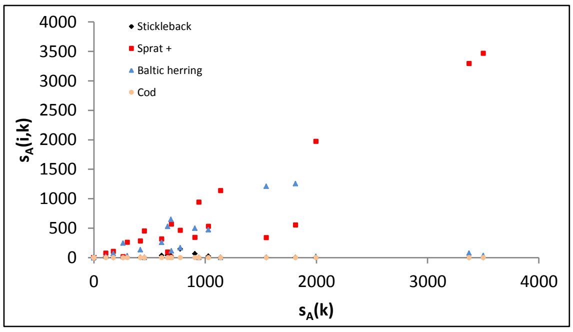
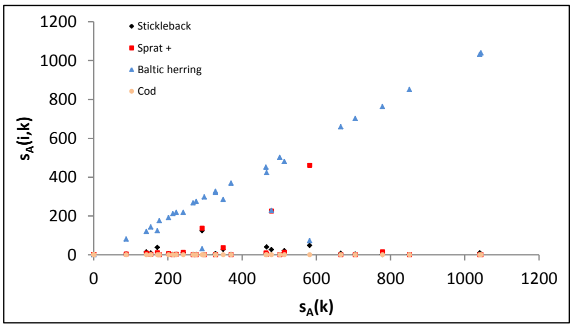


2012

Figure 9: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 29 during fishing station of BIAS between 2009 and 2012



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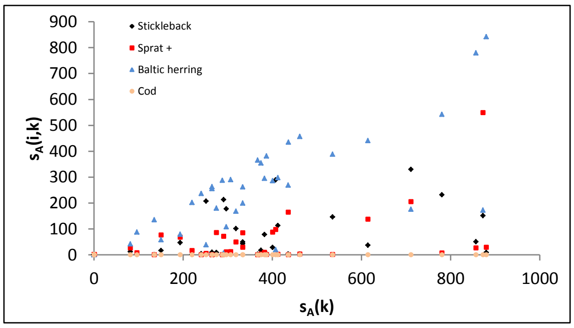

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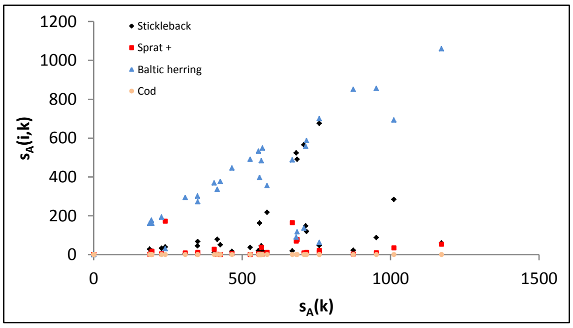
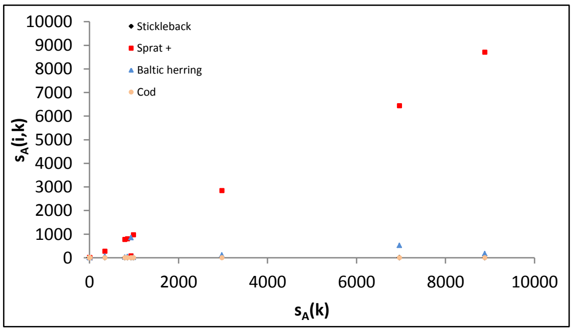


2011

Figure 10: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 30 during fishing station of BIAS between 2009 and 2012



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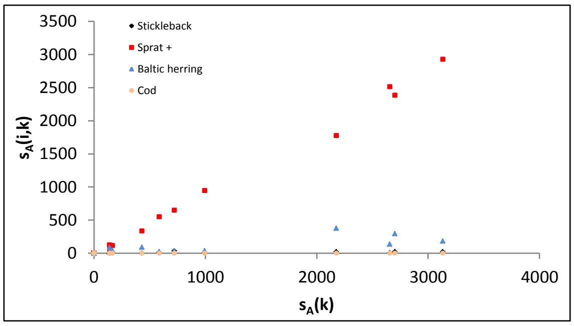
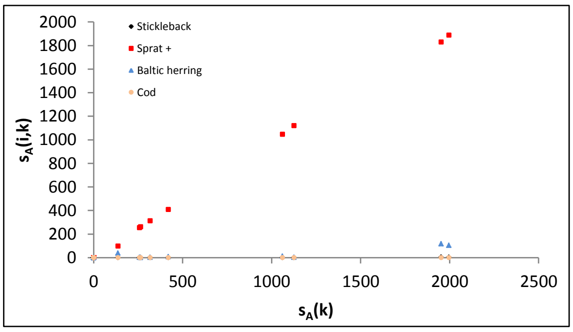
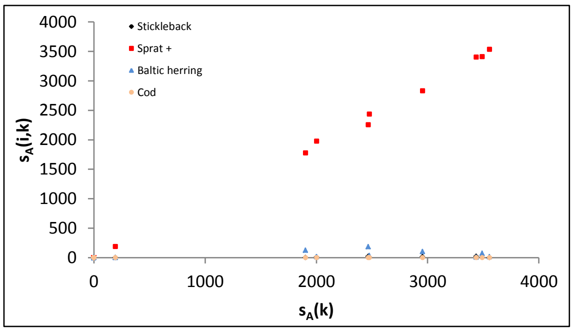


2010

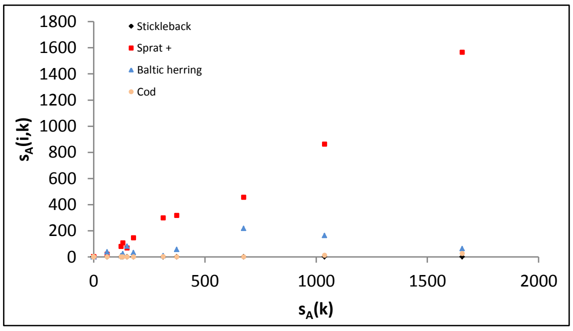


2011

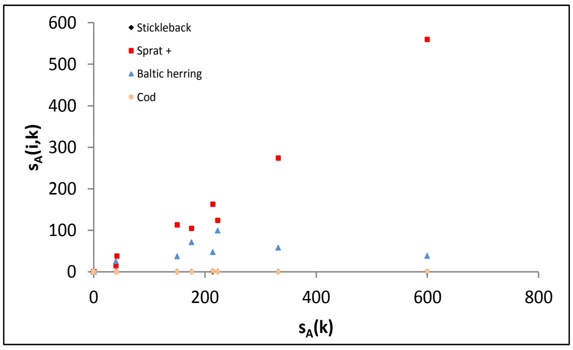


2012

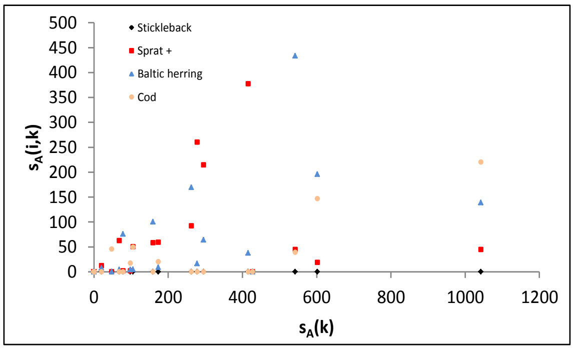
Figure 11: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 32 during fishing station of BIAS between 2009 and 2012



2009

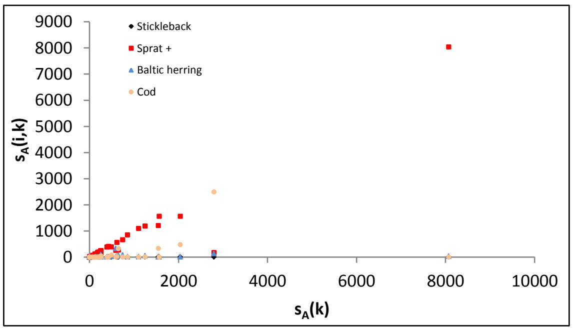


2011

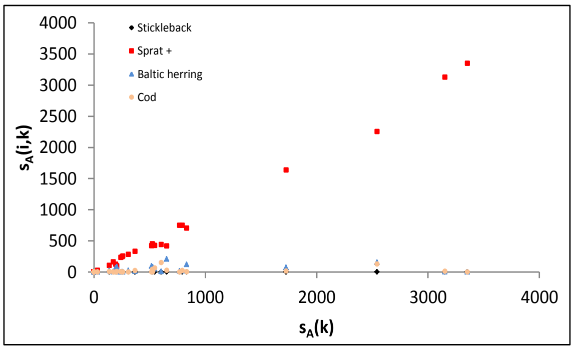


2012

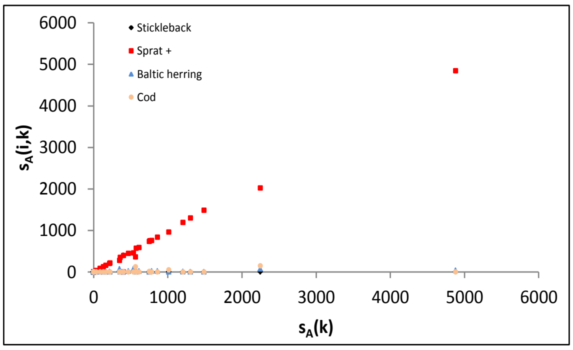
Figure 12: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 24 during fishing station of BASS between 2009 and 2012



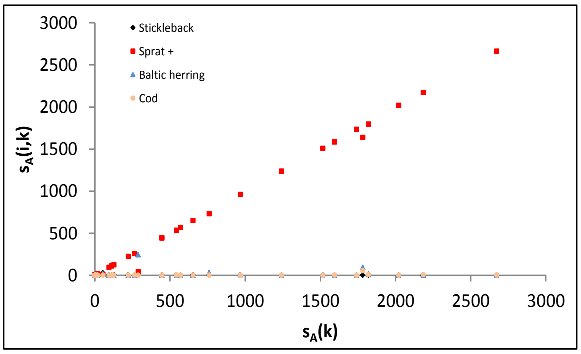
2009



2010



2011



2012

Figure 13: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 25 during fishing station of BASS between 2009 and 2012

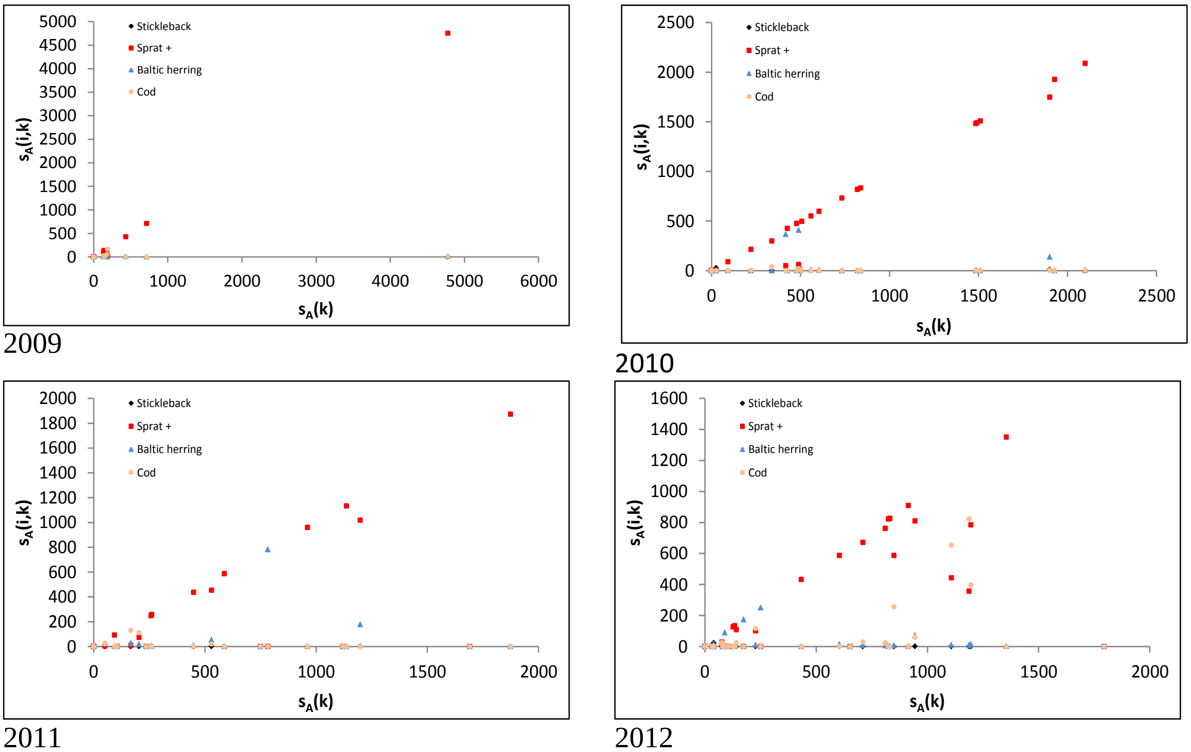


Figure 14: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 26 during fishing station of BASS between 2009 and 2012

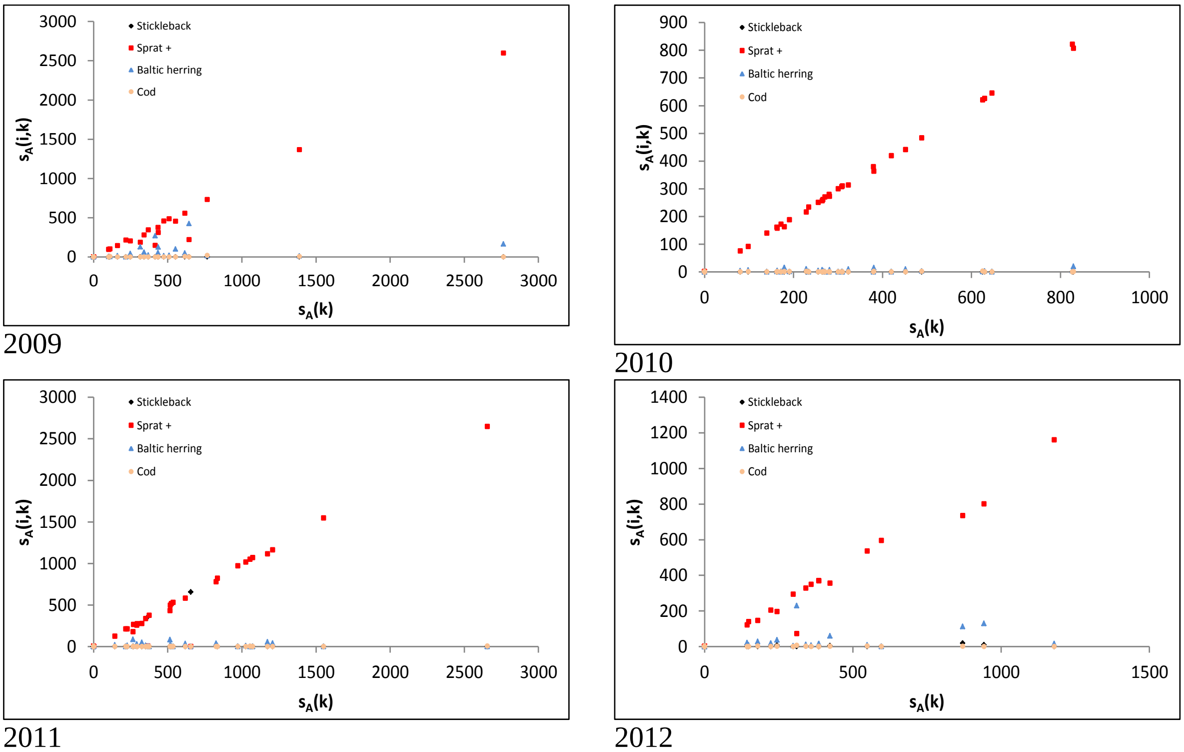


Figure 15: Relation between total $s_A(k)$ values and $s_A(k,i)$ values by species in SD 28 during fishing station of BASS between 2009 and 2012

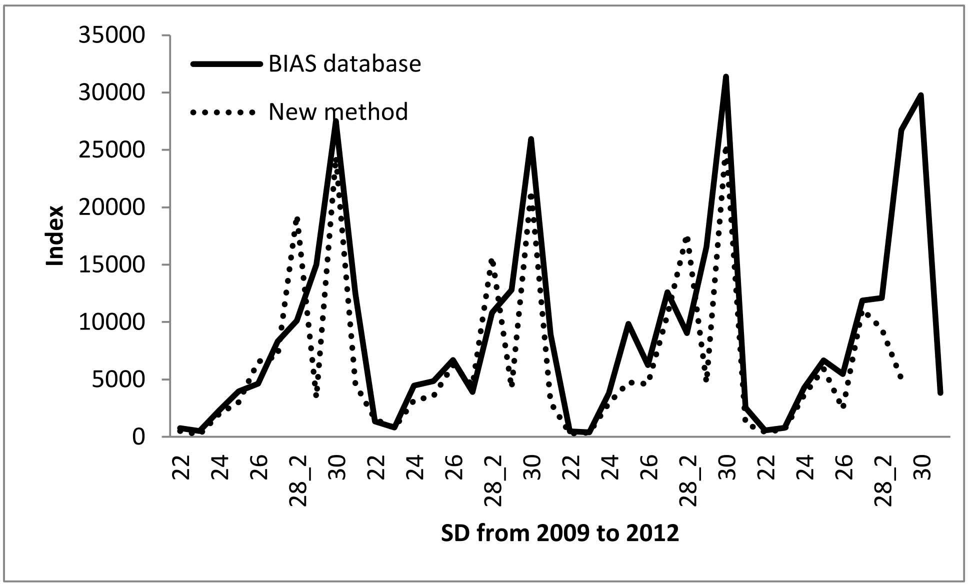


Figure 16: Indices of herring by SD from 2009 to 2012 based on standard and new method during BIAS

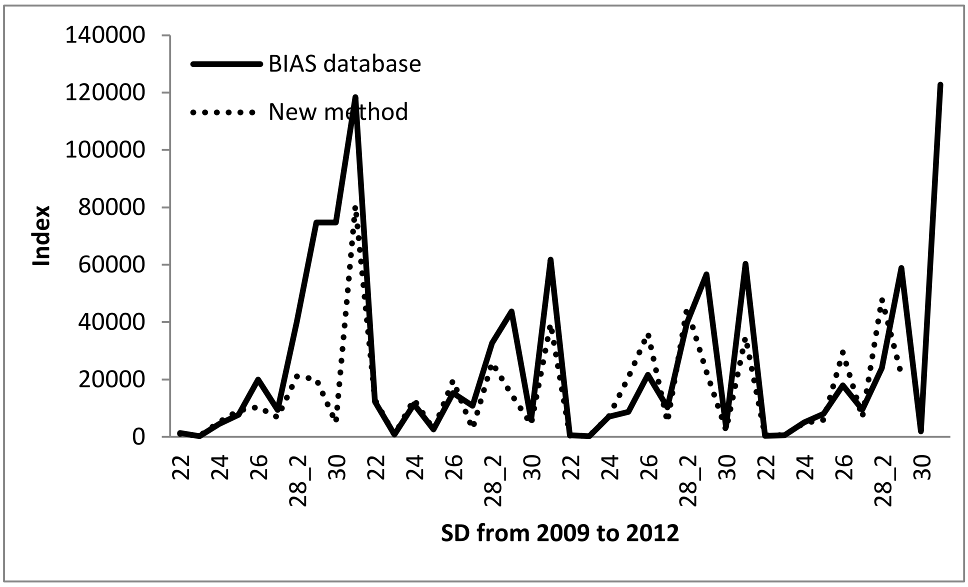


Figure 17: Indices of sprat by SD from 2009 to 2012 based on standard and new method during BASS

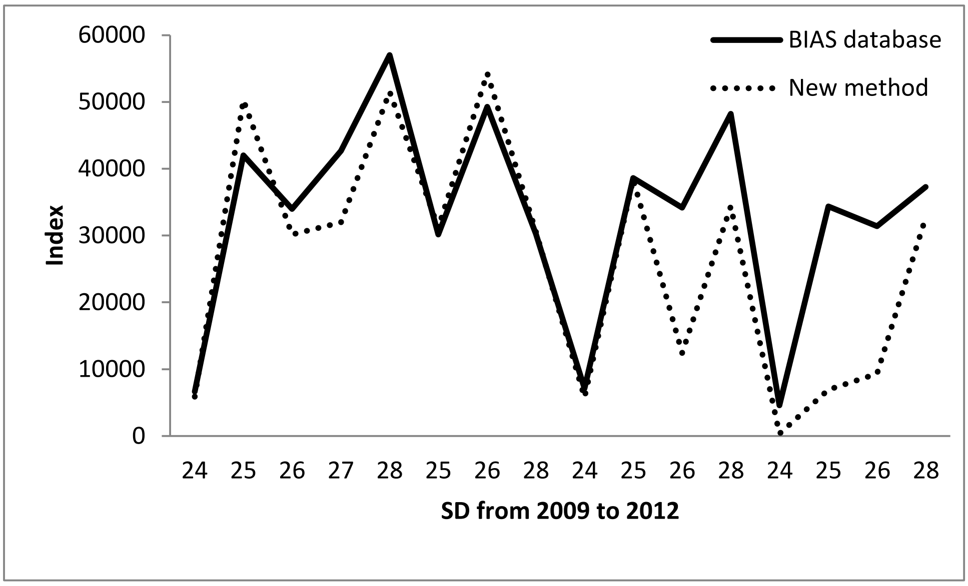


Figure 18: Indices of sprat by SD from 2009 to 2012 based on standard and new method during BASS

Annex 10: Presentations accessible at the WGBIFS 2015 meeting

ICES WGBIFS Report 2015
Presentations contributed to the WGBIFS/2015 meeting in Öregrund, Sweden, 23-27.03.2015

Notes:

a) **the version to the text of report should be prepared in *.pdf format,**
b) **Authors are fully responsible for quality of the prepared text and all kind of presented data.**

Annex 10: Presentations at the WGBIFS/2015 meeting

ICES - WGBIFS meeting in Öregrund/Sweden; 23-27.03.2015

Logistic aspects of the Baltic International Fish Survey Working Group [WGBIFS] meeting in Öregrund; 23-27.03.2015

Włodzimierz Grygiel (NMFRI, Gdynia - Poland)

Location of the meeting:

Välkommen till Öregrund

The local organizer and host of the meeting: **the Institute of Coastal Research in Öregrund** (Kustlaboratoriet) - Swedish University of Agricultural Sciences. The Institute provides scientific ecosystem-based advice for management of aquatic resources in Sweden.

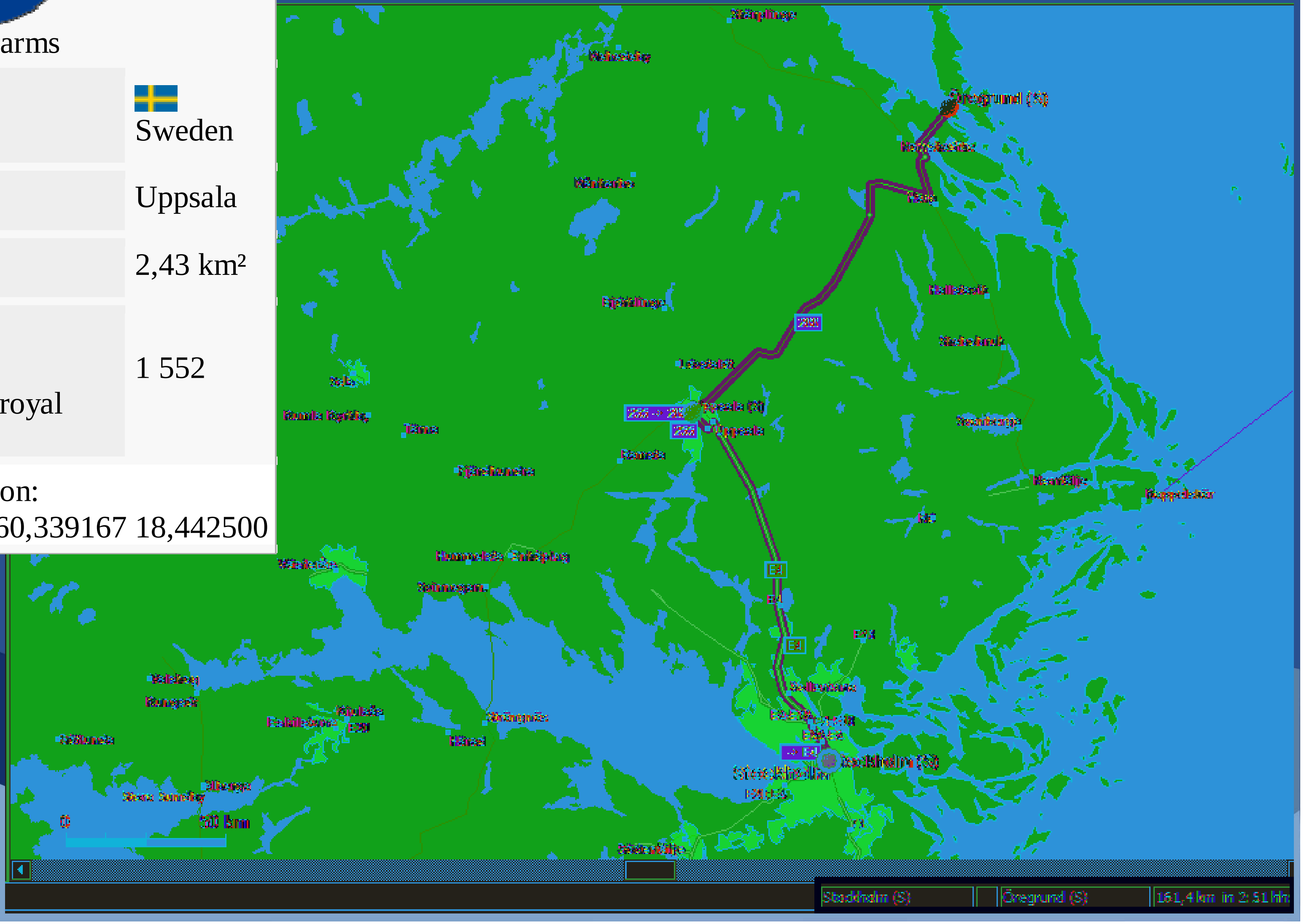
Öregrund

Coat of arms

Country	Sweden
Region	Uppsala
Surface area	2,43 km²
Population (28.04.2009) • No. of inhabitants The town was granted a royal charter in 1491.	1 552

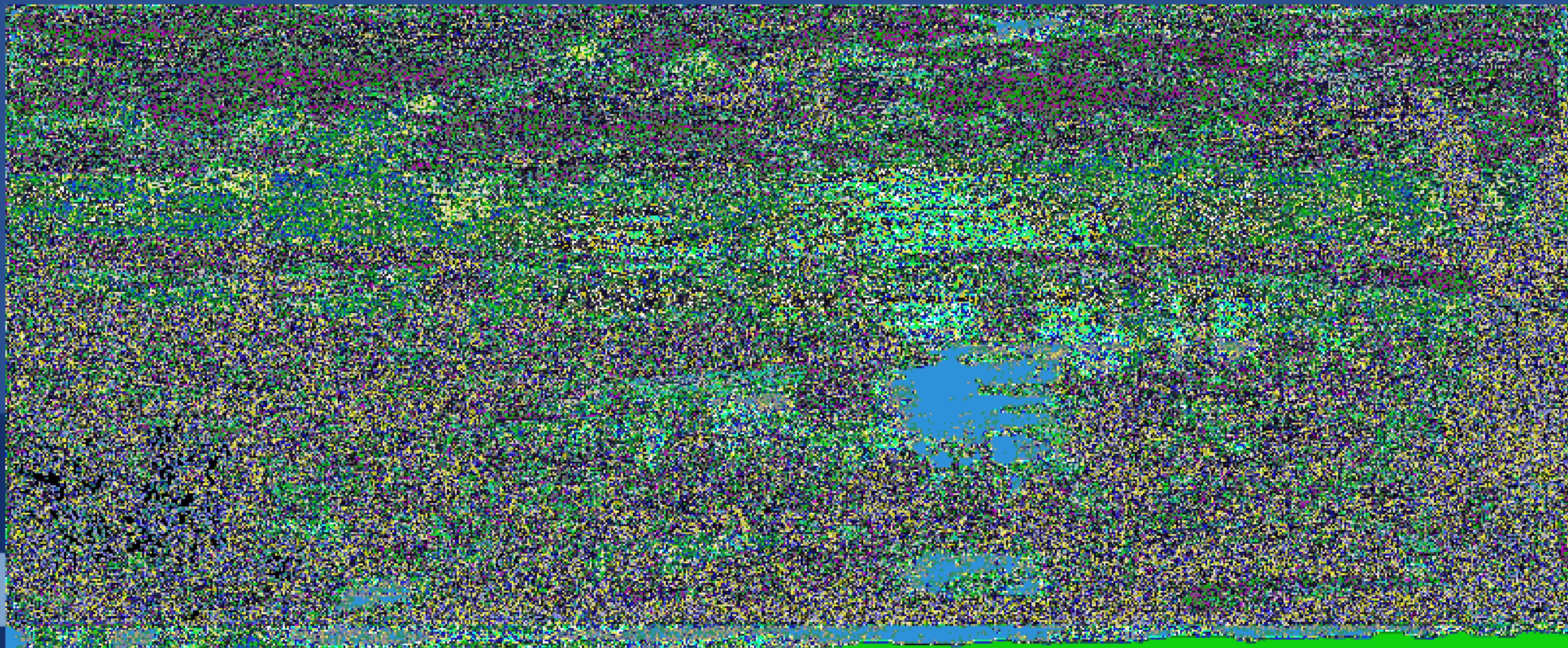
Location:
60°20′21″N 18°26′33″E60,339167 18,442500

The city Öregrund is situated in the northern part of Roslagen (famous recreational area in the central-eastern part of Sweden).



Some facts from history of the city Öregrund:

- the town was granted a royal charter in 1491, by request of Östhammar citizens (neighbouring city),
- during an industrial revolution in the 17th century, the Swedish iron was exported through Öregrund, and in England the best quality iron was known as Oregrounds iron,
- in the late 19th century a new business prospered in Öregrund - the spas; summer residence were build here by people from outside,
- in 1968 Öregrund was merged with the city of Östhammar, and since 1971 it is in Östhammar Municipality, Uppsala County,
- it is one of smallest historical city in Sweden (*Suecia*).



View of Öregrund from about y. 1700, acc. to *Suecia antiqua et hodierna* (after http://en.wikipedia.org/wiki/%C3%96regrund*).*

The time-schedule of the WGBIFS/2015 meeting:

- on 23.03.2015, from 10:00 to 17:00,
- on 24-27.03.2015, from 9:00 to 17:00,
- coffee breaks: the 1st at 10:30-11:00 and the 2nd at 15:00-15:30,
- lunch break at 12:30-13:30,
- meeting will be finalised on 27.03.2015 at about 16:30 -17:00,
- on 25.03.2015 (Wednesday, at about 18:00) - the reception (culinary event), offered by the Institute, and will take place at the Institute.

Summary of the BIFSWG Work Plan for Year 1st (2015)

Compilation the survey results from 2014 and first half of 2015 and reporting to WGBFAS.
Coordination and planning the schedule for surveys in second half of 2015 and first half of 2016.
Coordinate cod stomachs sampling programme in the Baltic International Trawl Survey.
WGBIFS will report (Interim report) on the activities of 2015 (the first year) by 15 May 2015 to SSGIEOM, SCICOM and ACOM.

Support from the ICES Secretariat

Mr. Adi Kellermann, Head of Science Programme - will assist the WGBIFS chair in his a new function,
Mrs. Claire Welling - will be the supporting secretary and contact point for all the practicalities connected to the Group's work, and will support the WGBIFS chair in his running works,
Mrs. Cristina Morgado - Head of ACOM Support,
Mrs. Maria Lifentseva - Science Programme Assisting Secretary.

MIR

Thank you for your attention!

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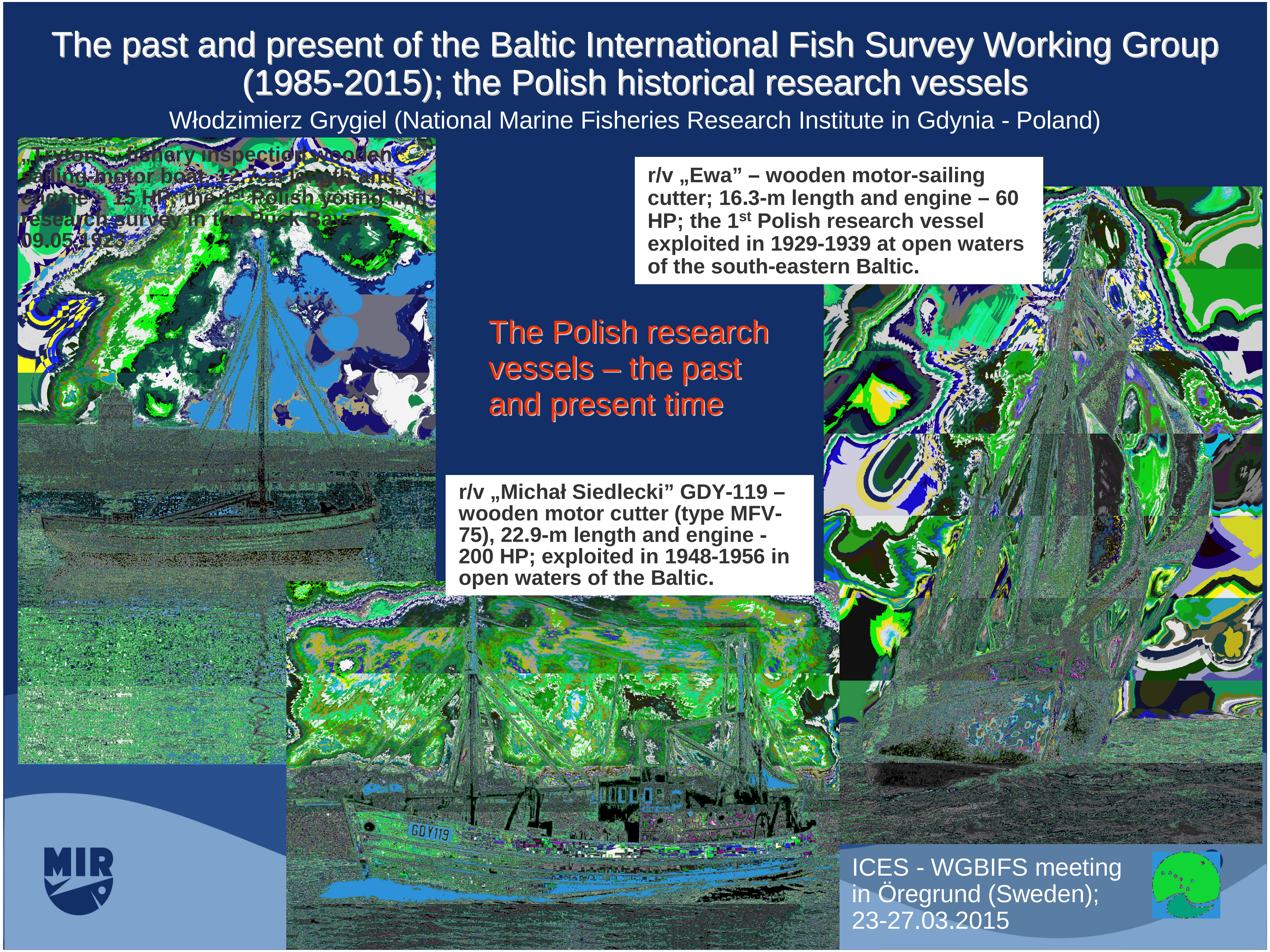
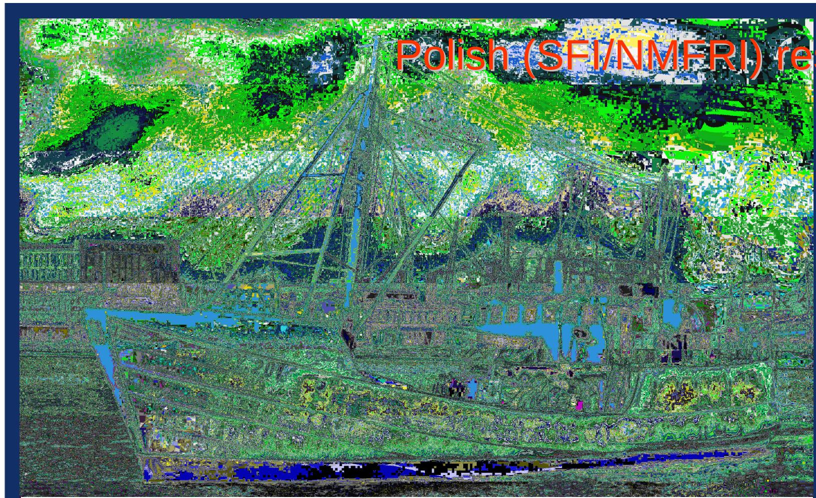
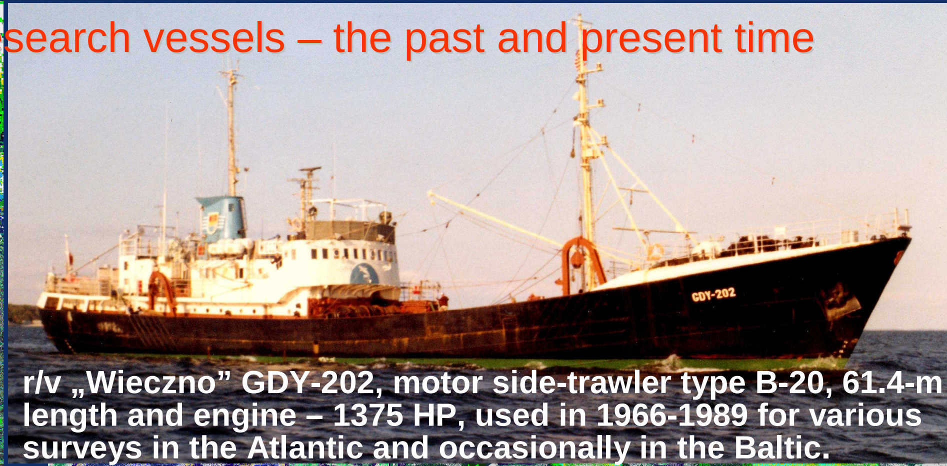

The past and present of the Baltic International Fish Survey Working Group (1985-2015); the Polish historical research vessels
Włodzimierz Grygiel (National Marine Fisheries Research Institute in Gdynia - Poland)
„Tryton" – fishery inspection wooden sailing-motor boat; 12.7-m length and engine – 15 HP; the 1st Polish young fish research survey in the Puck Bay on 09.05.1923
r/v „Ewa" – wooden motor-sailing cutter; 16.3-m length and engine – 60 HP; the 1st Polish research vessel exploited in 1929-1939 at open waters of the south-eastern Baltic.
The Polish research vessels – the past and present time
r/v „Michał Siedlecki" GDY-119 – wooden motor cutter (type MFV-75), 22.9-m length and engine - 200 HP; exploited in 1948-1956 in open waters of the Baltic.
GDY119
MIR
ICES - WGBIFS meeting in Öregrund (Sweden); 23-27.03.2015

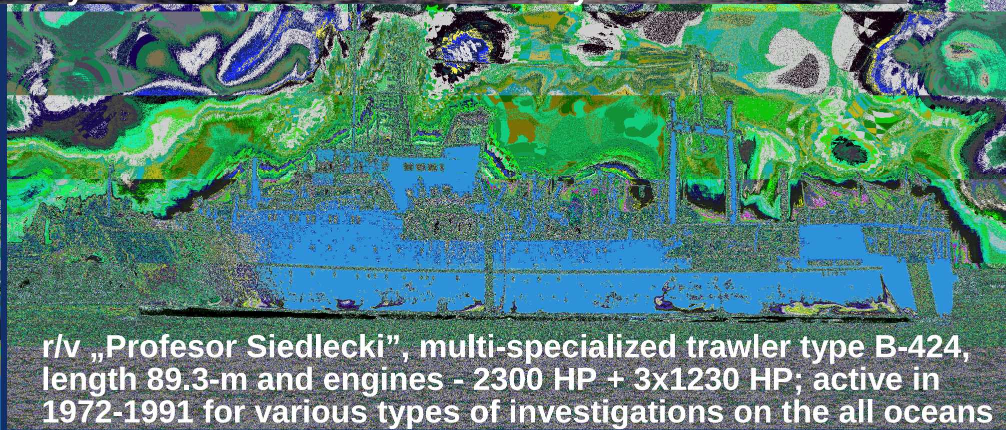
Polish (SFI/NMFRI) research vessels – the past and present time



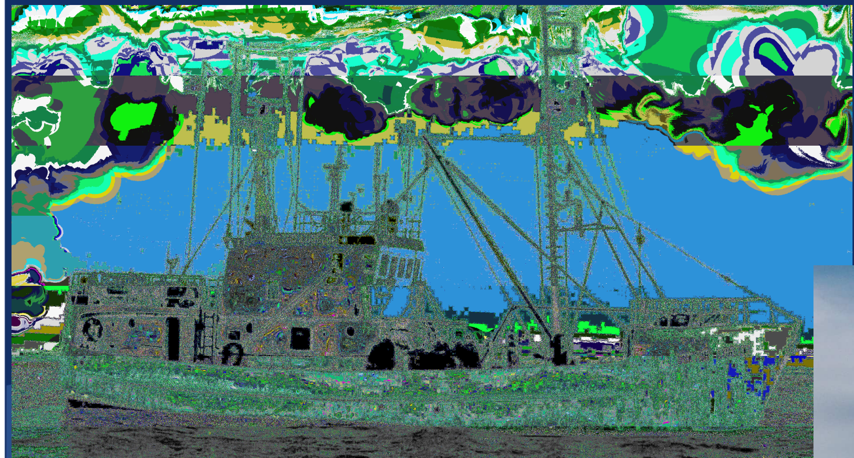
r/v „Birkut” GDY-201, motor side-lugger; 32.6-m length and engine - 300 HP; used in 1953-1982 for BITS surveys and other investigations in the North Sea, the Gulf of Biscay and NW Africa.



r/v „Wieczno” GDY-202, motor side-trawler type B-20, 61.4-m length and engine – 1375 HP, used in 1966-1989 for various surveys in the Atlantic and occasionally in the Baltic.



r/v „Profesor Siedlecki”, multi-specialized trawler type B-424, length 89.3-m and engines - 2300 HP + 3x1230 HP; active in 1972-1991 for various types of investigations on the all oceans and temporary for BIAS surveys.



r/v „Doktor Lubecki” motor side-cutter type B-25; 24.6-m length and engine - 225 HP; applied in 1968-1988 for BITS surveys and other investigations in the North Sea.

r/v „Baltica” multi-specialized trawler type BSB-40, length 41.1-m and engine - 1040 kW; used in 1993-2015 for BITS, BIAS, BASS and other types of surveys in the whole Baltic Sea.

Technical data concerns the Polish research vessels after W. Blady (2002).

WGBIFS developing in 1985-2014

This Report not to be quoted without prior reference to the Council*

International Council for The Exploration of the Sea

C.M. 1985/J:5

REPORT OF THE AD HOC WORKING GROUP ON YOUNG FISH TRAWL SURVEYS IN THE BALTIC

Rostock, 11- 15 March 1985

This document is a report of a Working Group of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council. Therefore, it should not be quoted without prior consultation with the General Secretary.

1985 - 9 participants, 1 task, Report – the text 20 pp.
1985 - the first attempt to coordinate national research surveys focused on the Baltic young fish investigation.

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*General Secretary,
ICES,
Palægade 2-4,
DK-1261 Copenhagen K,
DENMARK.

REPORT OF THE AD HOC WORKING GROUP ON YOUNG FISH TRAWL SURVEYS IN THE BALTIC

1. PARTICIPANTS

Mr. H J Bornsted	German Democratic Republic
Mr. R Hudd	Finland
Mr. D Kästner	German Democratic Republic
Mr. J Modin	Sweden
Dr. J Netzel	Poland
Dr. O Rechlin	German Democratic Republic
Mr. N Schulz	German Democratic Republic
Prof. F Thurow	Federal Republic of Germany
Mr. B Vaske (Chairman)	German Democratic Republic

2. TERMS OF REFERENCE

At the last Statutory Meeting it was decided (C. Res. 1984/2:12) that

"An ad hoc Working Group on Young Fish Trawl Surveys in the Baltic will meet in early 1985 to evaluate historical data on national surveys and to set up details for an international survey. Mr. B Vaske should chair this Group and make arrangements for a meeting of 4-5 days".

Following this resolution it was decided to hold this meeting in Rostock from 11-15 March 1985.

3. DESCRIPTION OF PAST SURVEYS

Information on Young Fish Surveys in the Baltic were available from Finland, the Federal Republic of Germany, the German Democratic Republic, Poland, and Sweden. The investigations of the Federal Republic of Germany, the German Democratic Republic, and Poland include cod, herring, and sprat as target species, whereas the Finnish surveys aimed primarily at the herring, sprat and smelt 0 groups. Swedish surveys are presently aiming at cod.

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This report not to be quoted without prior reference to the Council*

International Council for the Exploration of the Sea

C.M.1988/J:27
Baltic Fish Committee

REPORT OF THE STUDY GROUP ON YOUNG FISH SURVEYS IN THE BALTIC

Tallinn, USSR, 16-20 May 1988

This document is a report of a Study Group of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council. Therefore, it should not be quoted without consultation with the General Secretary.

*General Secretary
ICES
Palægade 2-4
DK-1261 Copenhagen K
DENMARK

1988 - 20 participants, 3 tasks, Report - 55 pp.

1 PARTICIPANTS

R. Aps	USSR
E. Aro	Finland
M. Fetter	USSR
B. Gortchakov	USSR
W. Grygiel	Poland
B. Jevtjukhova	USSR
M. Kangur	USSR
E. Kondratovich	USSR
G. Kornilovs	USSR
I. Lablaika	USSR
A. Lankov	USSR
K. Lisheva	USSR
J. Modin	Sweden
S. Munch-Petersen	Denmark
T. Raid	USSR
N. Schulz	GDR
H. Trauberga	USSR
L. Ustinova	USSR
M. Vitinsh	USSR
W. Weber (Chairman)	FRG

2 TERMS OF REFERENCE

At the 75th Statutory Meeting of ICES in 1987, it was decided (C.Res.1987/2:15) that the Study Group on Young Fish Surveys in the Baltic should meet for 5 days in May 1988. It was later decided that this meeting would be held in Tallinn from 17-20 May 1988 to:

a) reiterate the evaluation of the cod abundance indices from the existing survey data;

b) include, as far as possible, other species, i.e., herring and sprat, in the analyses;

c) evaluate new dats sets brought forward in accordance with the recommendations of the 1987 report of this Study Group.

Point c) of this resolution is directed especially to the following recommendations:

7.1 It is recommended that from young fish surveys in the Baltic the mean number of cod per tow and standard unit of time should be given per rectangle and month distributed according to age from 1982 onwards. Tables with all catch-per-tow data should also be made available.

7.2 It is recommended to increase the number of hauls in Sub-divisions 26, 27, 28, and 29S in order to cover the area in a way which reflects the distribution of the eastern cod stock properly.

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA
CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

C.M. 1991/J:2
Baltic Fish Committee

REPORT OF THE STUDY GROUP ON YOUNG FISH SURVEYS IN THE BALTIC

Tvärminne, Finland, 24-28 September 1990

Photo: Viking Nyström

This document is a report of a Study Group of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

Therefore,

it should not be quoted without consultation with:

General Secretary
ICES
Palaegade 2-4
DK-1261 Copenhagen K
DENMARK

1990 - 11 participants, 2 tasks, Report - 40 pp. + appendixes

1

1. INTRODUCTION

The Study Group on Young Fish Surveys in the Baltic met at Tvärminne Zoological Station, Finland, 24-28 September 1990.

1.1 Participants

Mr. R. Aps	USSR, Tallinn
Mr. E. Aro (Chairman)	Finland
Mr. J. Bay	Denmark
Mr. W. Grygiel	Poland
Ms. R. Hinrichs	Germany
Mr. P. Kotilainen	Finland
Mr. P.-O. Larsson	Sweden
Mr. J. Modin	Sweden
Mr. S. Munch-Petersen	Denmark
Mr. T. Raid	USSR, Tallinn
Mr. M. Vitinsh	USSR, Riga

1.2 Terms of reference

At the Statutory Meeting of ICES in 1989, it was decided (C.Res. 1989/2:19) that the Study Group on Young Fish Surveys in the Baltic should meet for five days in September 1990. It was later decided that the meeting would be held in Tvärminne, Finland, from 24-28 September 1990 in order to:

a) evaluate young fish survey data from the Baltic in detail and, in particular, the differences in distribution by area and depth;

b) evaluate by comparative age readings the criteria to be used for age determination especially when timing the hyaline and opaque zones formation

The request for the evaluation of the differences in distribution was considered in terms of area only for Baltic herring and sprat, although they also have vertical seasonal migration patterns, and in terms of area and depth for cod and flounder. The main aim of the Study Group during the meeting was to compile research survey data according to species, estimate changes in total abundance (year effect), map average (over years) spatial distributions (space effect) and evaluate absolute versus relative abundance according to species.

2. DATABASE

2.1 Research surveys according to species

The whole database so far available to the Study Group and the assessment Working Groups is presented in Table 2.1 The data base was compiled during the meeting as ASCII-files on floppy disks and these were distributed to all participants. Data files are also available at ICES.

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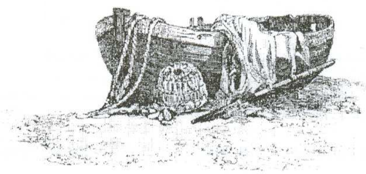
Baltic Fish Committee ICES CM 1996/J:1

1996 - 11 participants, 2 tasks (incl. the design of trawl surveys for cod stocks assessment and started the development of bottom-trawl manual), Report - 46 pp.

REPORT OF THE
BALTIC INTERNATIONAL FISHERIES SURVEY WORKING GROUP

Helsinki, Finland
6–10 May 1996



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International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK-1261 Copenhagen K Denmark

Baltic Committee **ICES CM 1998/H:4**

1998 - 11 participants, 2 tasks (incl. initial works on the standardization of bottom fishing gear applied in BITS surveys, and plans for the inter-calibration experiments between national and new standard gear and calculation the conversion factors for cod), Report - 70 pp.

REPORT OF THE

Baltic International Fish Survey Working Group

Karlskrona, Sweden
8–13 June 1998

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International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK-1261 Copenhagen K Denmark

www.nmfri.gdynia.pl

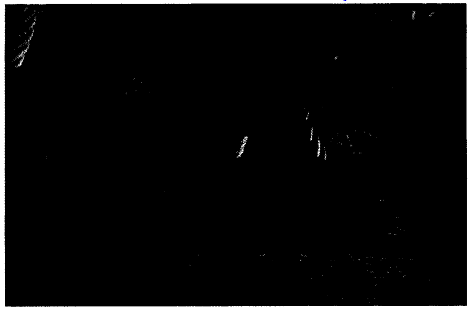
Baltic Committee

ICES CM 2001/H:02
Ref.: D

REPORT OF THE

Baltic International Fish Survey Working Group

Kalininigrad, Russia
5–9 February 2001



2001 - 26 participants, 9 tasks, Report - 249 pp.; prepared within 10 days after meeting

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK–1261 Copenhagen K Denmark

1 INTRODUCTION

1.1 Participation

Eero Aro - **Chair**	Finland
Fredrik Arrhenius	Sweden
Peter Ernst	Germany
Valeri Feldman	Russia
Pavel Gasjukov	Russia
Eberhard Götze	Germany
Tomas Gröhsler	Germany
Wlodzimierz Grygiel	Poland
Nils Håkansson	Sweden
Sergey Ivanov	Russia
Ahto Järvik	Estonia
Olavi Kaljuste	Estonia
Igor Karpoushevski	Russia
Lena Larsen	ICES
J. Rasmus Nielsen	Denmark
Rainer Oeberst	Germany
Wojciech Pelczarski	Poland
Maris Plikshs	Latvia
Tiit Raid	Estonia
Krzysztof Radtke	Poland
Vladimir Severin	Russia
Faust Shvetsov	Latvia
Ivo Sics	Latvia
Tatiana Vasilieva	Russia
Vorobyov Vladeen	Russia
Yvonne Walther	Sweden

1.2 Terms of Reference

According to Council Resolution (C.Res.2000/2H:01), the Baltic International Fish Survey Working Group [WGBIFS] (Chair: E. Aro, Finland) will meet at Kaliningrad, Russia from 5–9 February 2001 to:

a) combine and analyse the results of the 2000 acoustic surveys and report to the Baltic Fisheries Assessment Working Group;
b) correct errors in and update the hydroacoustic database BAD1 for the years 1991 to 2000;
c) plan and decide on acoustic surveys and experiments to be conducted in 2001 and 2002.
d) update, if necessary both Baltic International Trawl Survey (BITS) and Baltic International Acoustic Survey (BIAS) manuals;
e) continue the comparison and analysis of results from concurrent survey activities by the traditional and the new standard trawls;
f) consider and analyse conversion factors between new and old trawls, on national level and develop methods to estimate the proper conversion factors.
g) continue the evaluation of the survey design strategies for future BITS surveys.
h) continue to establish acoustic database BAD2;
i) take note of the report of the Study Group on Herring Assessment Units in the Baltic Sea.

WGBIFS will report by 18 February 2001 for the attention of the Baltic and Resource Management Committees.

Some of the above Terms of Reference are set up to provide the Baltic Fisheries Assessment Working Group with information required to respond to requests for advice from the International Baltic Sea Fishery Commission.

Linkage to advisory functions in ICES include the quality assurance of basic data for stock assessments and management of Baltic herring, sprat and cod stocks. Establishing a checking procedure on the data that are submitted into the BITS database and BAD1- and BAD2 databases are one important task for the Working Group in the future.

1

BIFSWG - current structure inside ICES

Baltic International Fish Survey Working Group (WGBIFS) – one of the ICES experts group, which meets annually and this group belongs to the Steering Group on Integrated Ecosystem Observation and Monitoring (SSGIEOM),
SSGIEOM – one from three Steering Groups within SCICOM/ACOM.

WGBIFS standard tasks and new challenges in 2015-2017

Summary of the Work Plan

Year 1	Compilation the survey results from 2014 and first half of 2015 and reporting tc WGBFAS. Coordination and planning the schedule for surveys in second half o 2015 and first half of 2016. Coordinate stomach sampling programme in the Baltic International Trawl Survey.
Year 2	Compilation the survey results from 2015 and first half of 2016 and reporting tc WGBFAS. Coordination and planning the schedule for surveys in second half o 2016 and first half of 2017. Coordinate stomach sampling programme in the Baltic International Trawl Survey.
Year 3	Compilation the survey results from 2016 and first half of 2017 and reporting tc WGBFAS. Coordination and planning the schedule for surveys in second half o 2017 and first half of 2018. Coordinate stomach sampling programme in the Baltic International Trawl Survey. Reviewing and updating the common survey manuals according to SISP standards. Proposals for improvement of quality of acoustic indices and for further standardization of International Baltic Acoustic Surveys.

Summary of WGBIFS history:

a) names of WG:

- Working Group on Young Fish Trawl Survey in the Baltic (1985),
- Study Group on Young Fish Surveys in the Baltic (1988),
- Baltic International Fisheries Survey Working Group (1996),
- Baltic International Fish Survey Working Group (from 1998 to present)

b) meeting time: February, March, May, June, September; end of March - in recent years,

c) number of basic tasks dedicated to meeting: 1 - 9

d) number of participants: from 9 (Rostock 1985) to 26 (Kaliningrad 2001); recently about 20 persons.

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The newest results of hydrological investigations in the Baltic Sea

The Leibniz Institute for Baltic Sea Research in Warnemünde (Germany) reported:

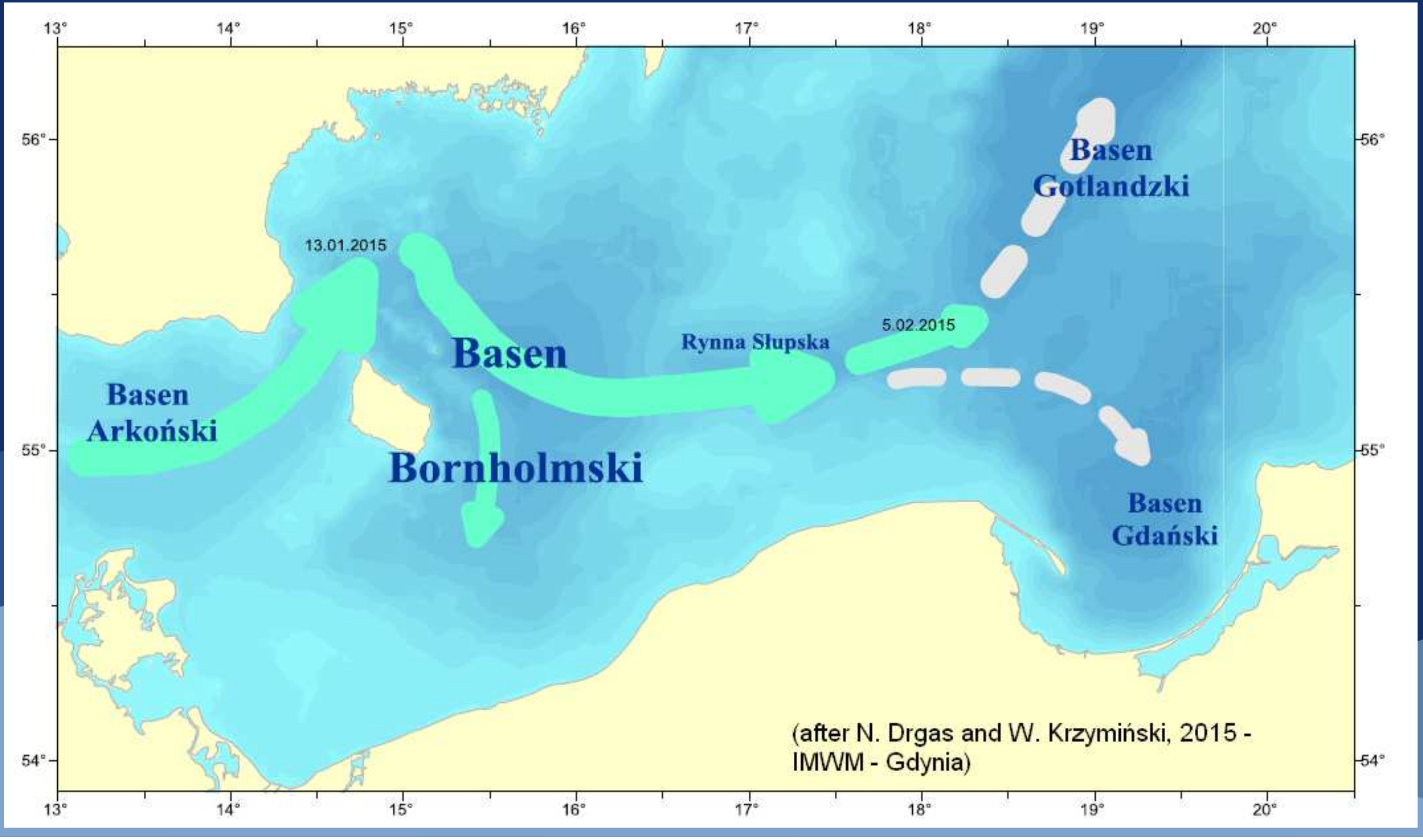
- on 12-26 December 2014 occurs a massive inflow of 198 km^3 marine waters (Major Baltic Inflow - MBI type) from the North Sea to the Baltic,
- it is the third largest inflow since 1880s,
- regarding a volume, the present inflow is comparable with this one from January 2003 (also MBI type).

The Swedish Meteorological and Hydrological Institute (SMHI, r/v „Aranda") reported:

- 13 Jan. 2015 – the inflow was detected in the Hanö Bay (the northern part of Bornholm), and oxygen content in the bottom layers increased from 2 ml/l – in December 2014 to 6.21 ml/l – in January 2015.

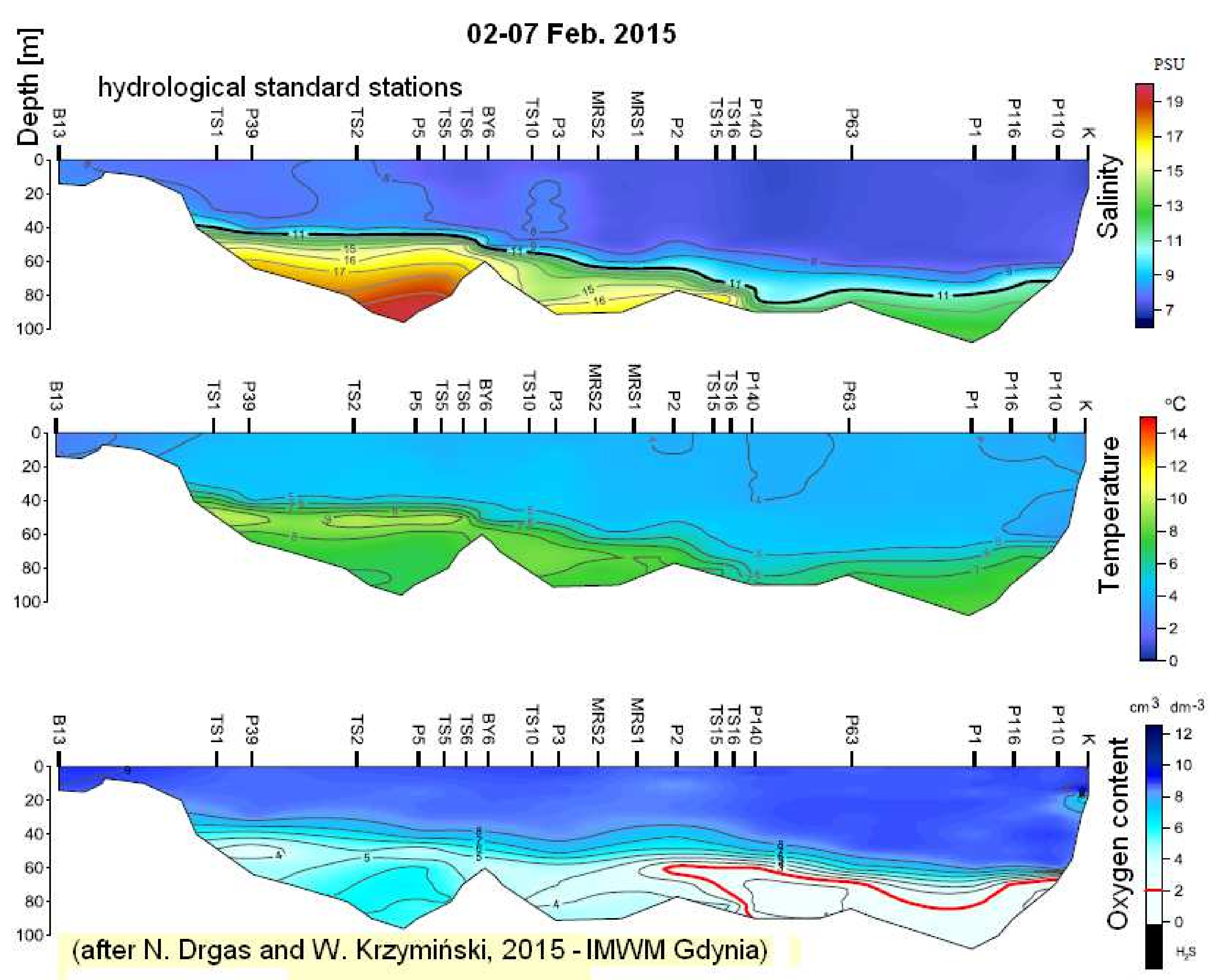
The Institute of Meteorology and Water Management, Branch in Gdynia (Poland) reported:

- 5 Feb. 2015 – the inflow was detected on a border of the Gdansk Deep (N) and the Gotland Deep (IMWM – Gdynia; N. Drgas and W. Krzymiński, 2015; r/v „Baltica").



The scheme of movement of marine waters inflow; white arrows – predicted directions of inflow in southern and central parts of the Baltic.

The Institute of Meteorology and Water Management, Branch in Gdynia (Poland) reported:

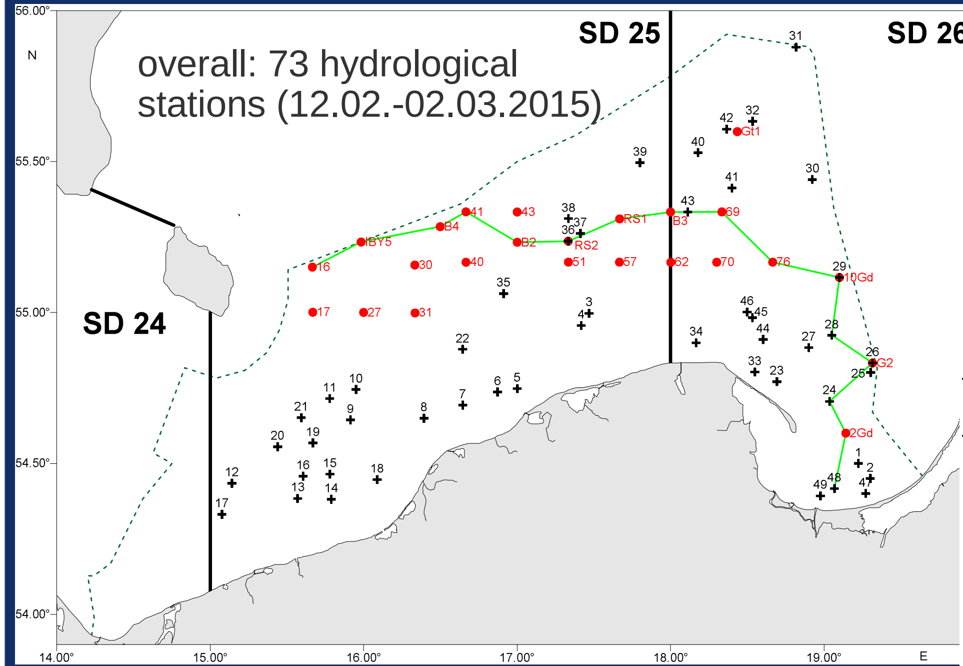


salinity 19.65 PSU - in the near bottom zone of the Bornholm Basin (the station P5; in Nov. 2014 - 16.16 PSU),

oxygen deficit disappeared in the bottom layers of the Bornholm Deep; the highest oxygen content - 6.06 ml/l (1.1 ml/l in Nov. 2014).

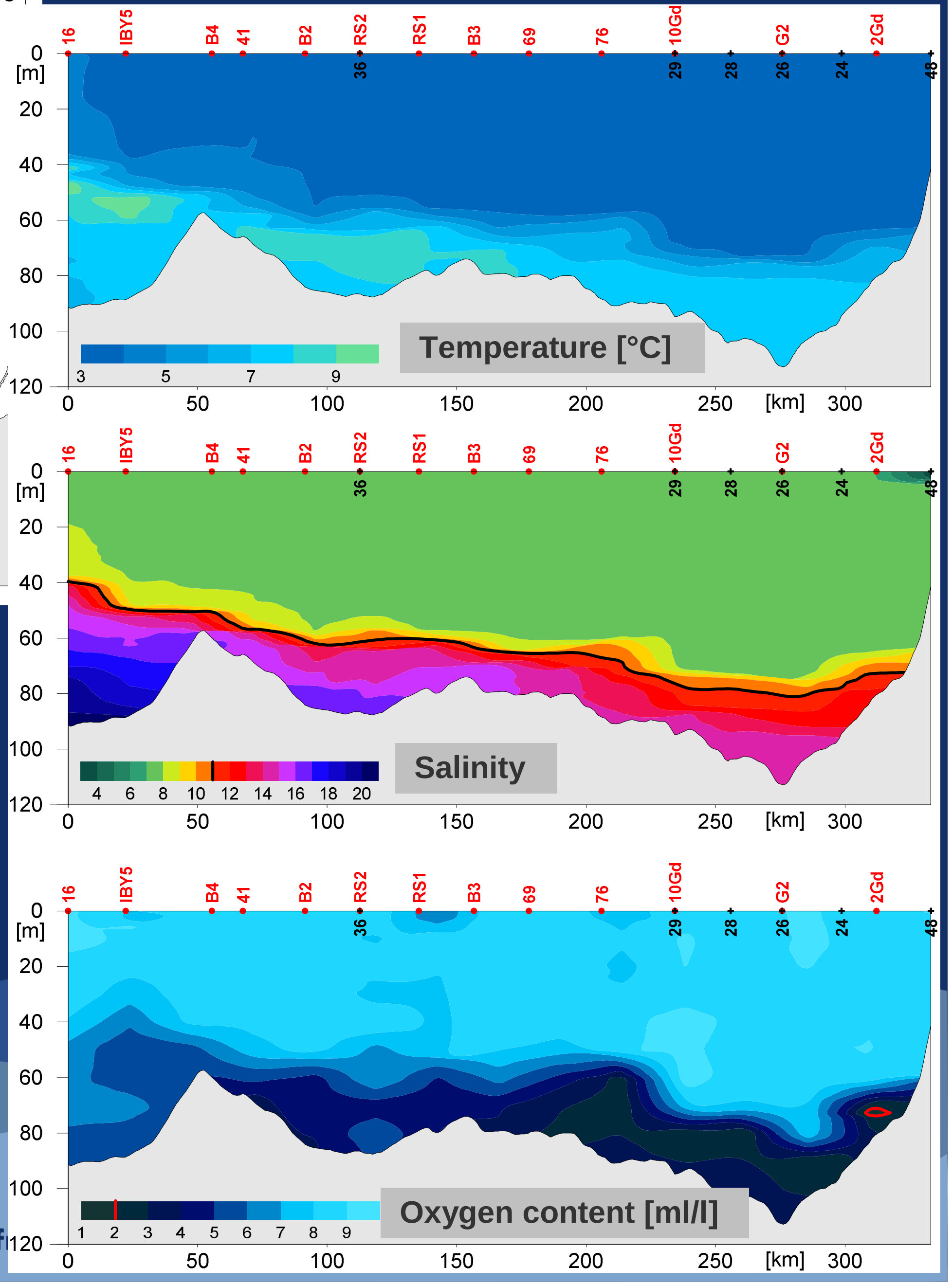
Vertical distribution of the seawater salinity (top part), temperature (middle part) and oxygen content (lower part) along the hydrological research profile of the southern Baltic, inspected on 02-07. Feb. 2015.

The NMFRI in Gdynia (Poland) – BITS-1q/2015 (r.v. „Baltica”) reported:

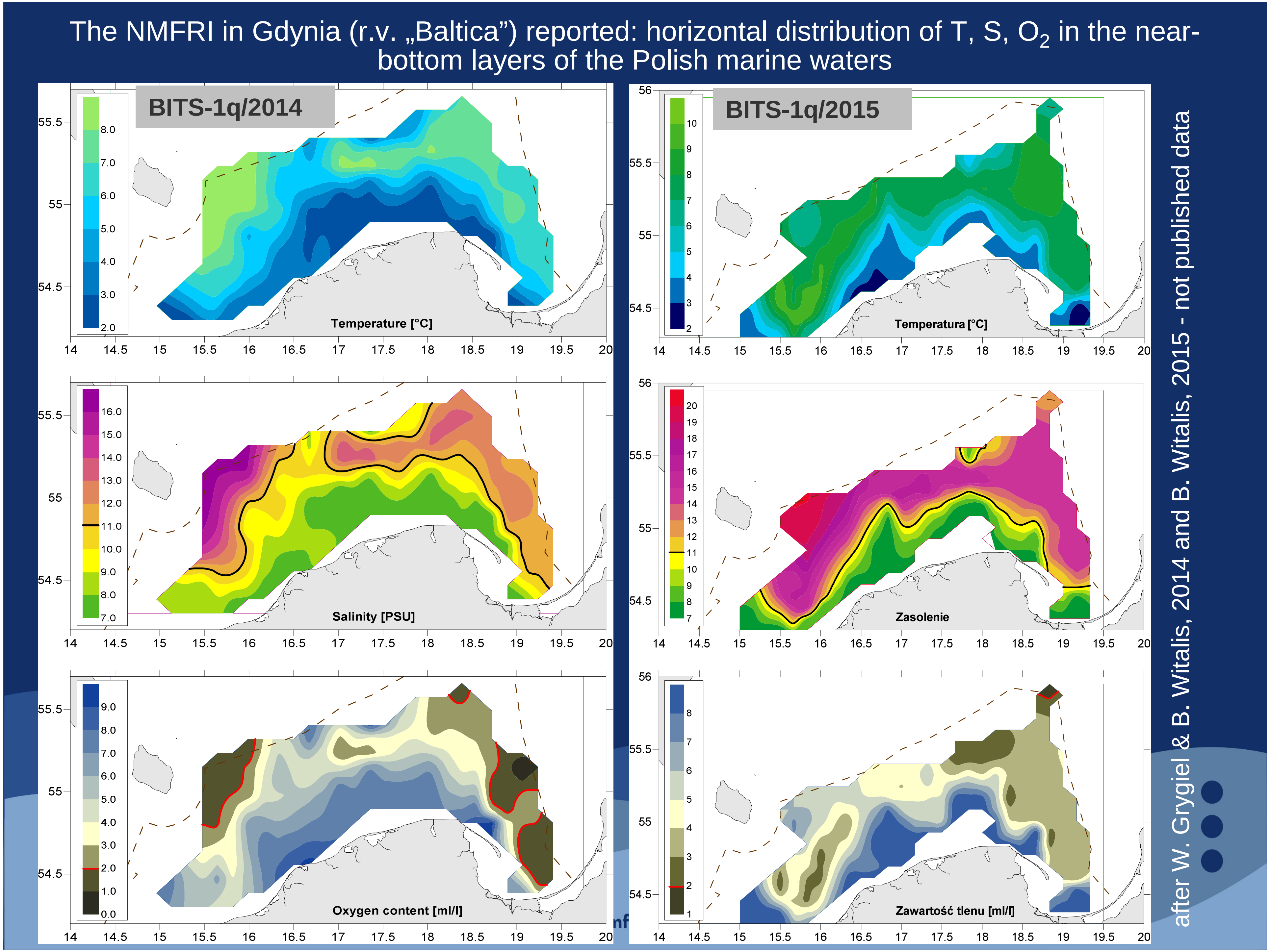


Location of the bottom trawl control-catches (black crosses, Nos. 1-49) and the hydrological standard stations (red bullets), inspected in the Polish marine waters.

The record high values of hydrological parameters in the bottom zone:
T – 9.94°C (haul No. 15),
S – 20.03 PSU (station No. 16),
O_2 – 9.35 ml/l (haul No. 1).



Vertical distribution of the seawater temperature, salinity and oxygen content along the hydrological research profile determined in the southern Baltic (12.02.-02.03.2015); on the axis X – distance, on the axis Y – depth from sea surface to seabed (after B. Witalis, 2015 – not published data).


The NMFRI in Gdynia (r.v. „Baltica") reported: horizontal distribution of T, S, O$_2$ in the near-bottom layers of the Polish marine waters
BITS-1q/2014
BITS-1q/2015
Temperature [°C]
Temperatura [°C]
Salinity [PSU]
Zasolenie
Oxygen content [ml/l]
Zawartość tlenu [ml/l]
after W. Grygiel & B. Witalis, 2014 and B. Witalis, 2015 - not published data

CONCLUSIONS concern impact of present MBI in the Polish EEZ:

A) Hydrological situation was considerably improved in the Bornholm Deep, the Slupsk Furrow and southern part of the Gdansk Basin.

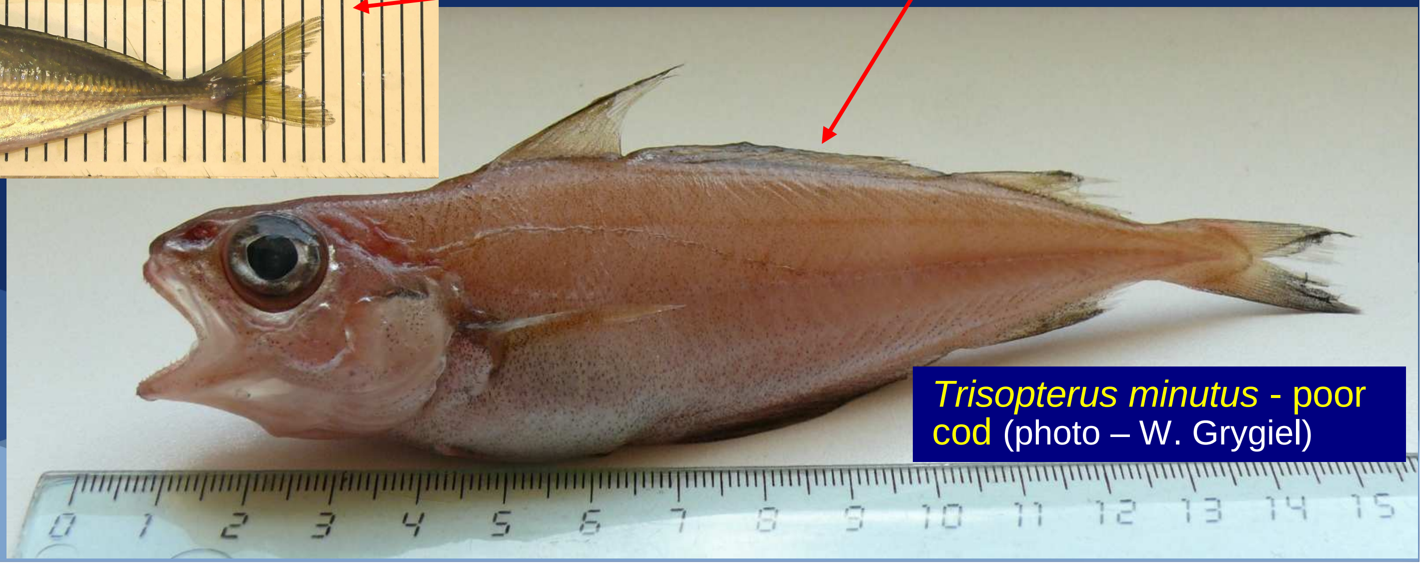
B) The recent hydrological investigations indicate on a significant improvement of Baltic cod and other fishes spawning environmental conditions and on a potential increase of cod new year-class abundance.

C) The Baltic ichthyofauna diversity significantly changed – the newcomers from other seas temporary visited the Polish part of the southern Baltic:

Trachurus trachurus - Atlantic horse mackerel
Scomber scombrus - Atlantic mackerel
Melanogrammus aeglefinus - Haddock
Merlangius merlangus - Whiting
Engraulis encrasicolus - European anchovy
Limanda limanda - Common dab

and some of them for the first time in the history of long-term investigations:

Caranx rhonchus - false scad; (photo after: K. Nadolna-Ałtyn, NMFRI Gdynia)



Trisopterus minutus - poor cod (photo – W. Grygiel)


Some changes in time of the WGBIFS members
Thank you for your attention!
WGBIFS MEETING IN HELSINKI 26-30 MARCH 2012
Juha Lilja
Wlodzimierz Grygiel
Ivo Sics
Igor Karpu-shevskiy
Tiit Raid
Tomasz Laczkowski
Marijus Spegys
Andres Velasco
Olavi Kaljuste
Elena Fedotova
Henrik Degel
Victoria Ivanovich
Jukka Pönni
Andrey Pedchenko
Rainer Oeberst
Ain Lankov
Uwe Böttcher
Niklas Larson
Ann-Christin Rudolphi
Fausts Svecovs
Vladimir Severin
Gdynia - mid of 1990s (left top), Pärnu - Aug. 1992 (left mid), Rostock – 07.04.2005 (left bottom), Kaliningrad - 25.03.2011 (right top), Helsinki – 26.03.2012 (right bottom)

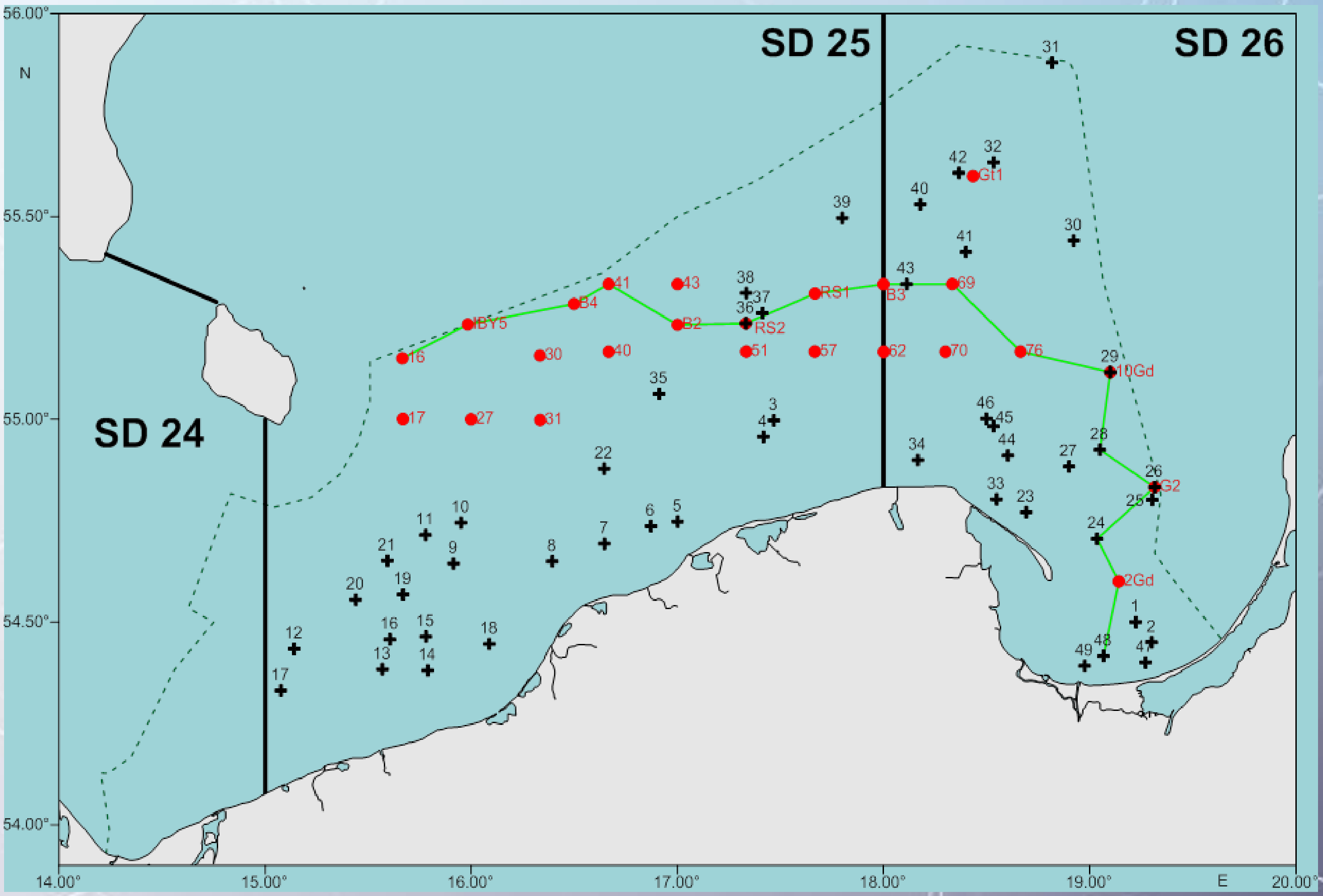
ICES WGBIFS meeting
Öregrund, Sweden
23-27.03. 2015

Polish BITS 1Q 2015 cruise results

Krzysztof Radtke
National Marine Fisheries Research Institute
Gdynia, Poland

➢ Research area

- ➢ - ICES SDs 25 and 26, within Polish EEZ
- ➢ In total 49 control hauls planned and 49 realized realized

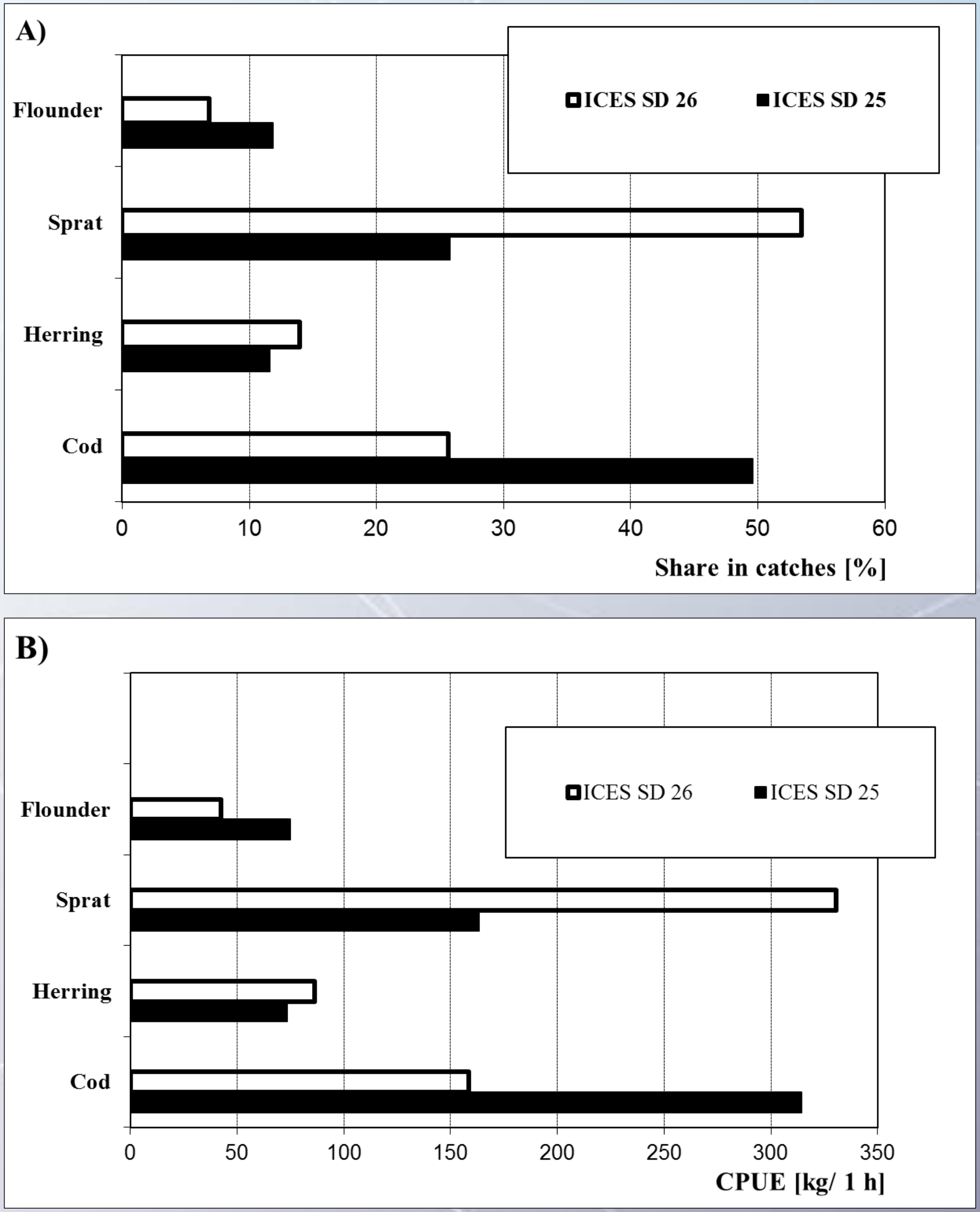


➢ **PROBLEMS:**

No significant problems occured

Results

➢ dominant species in catches



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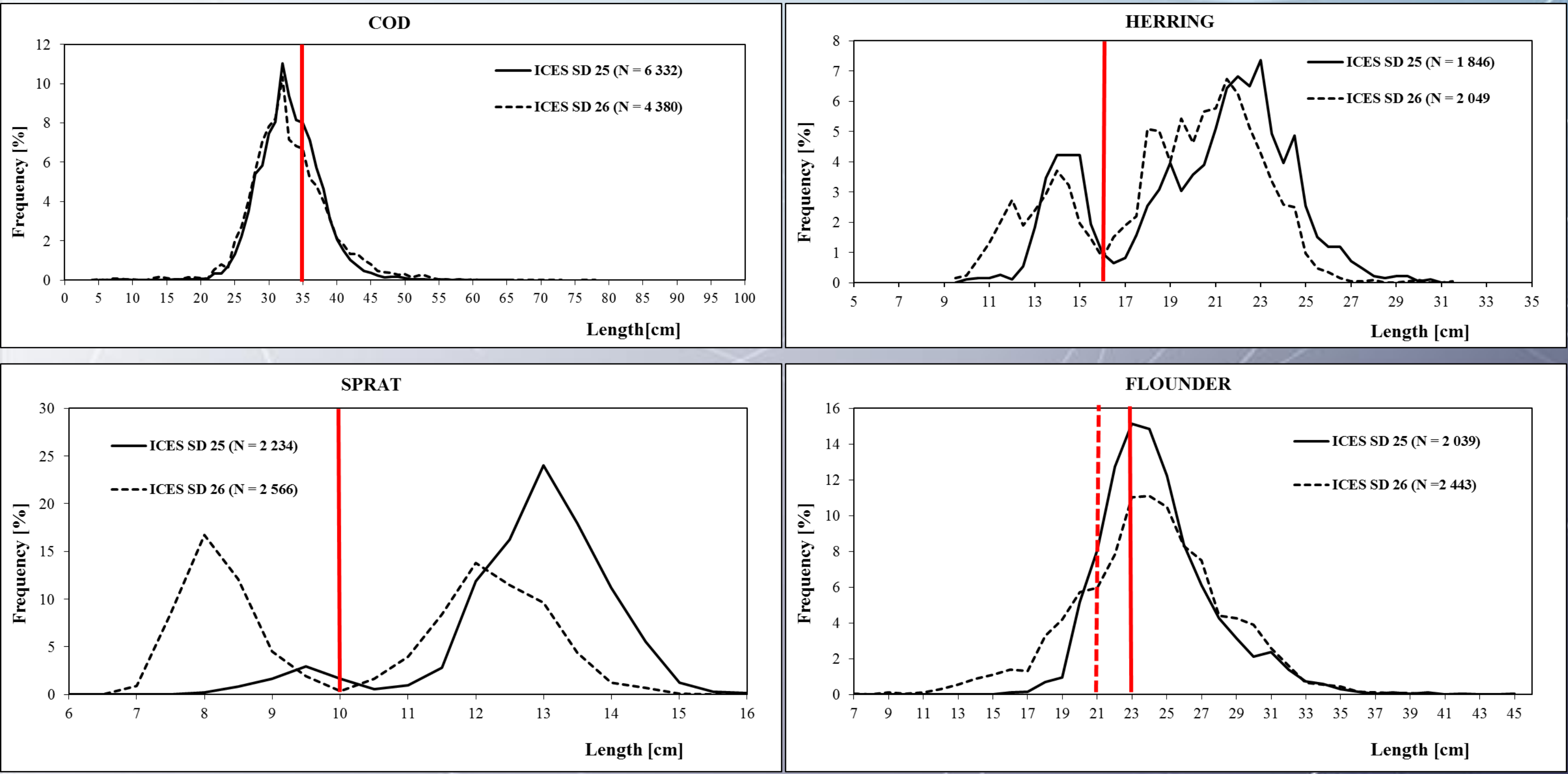
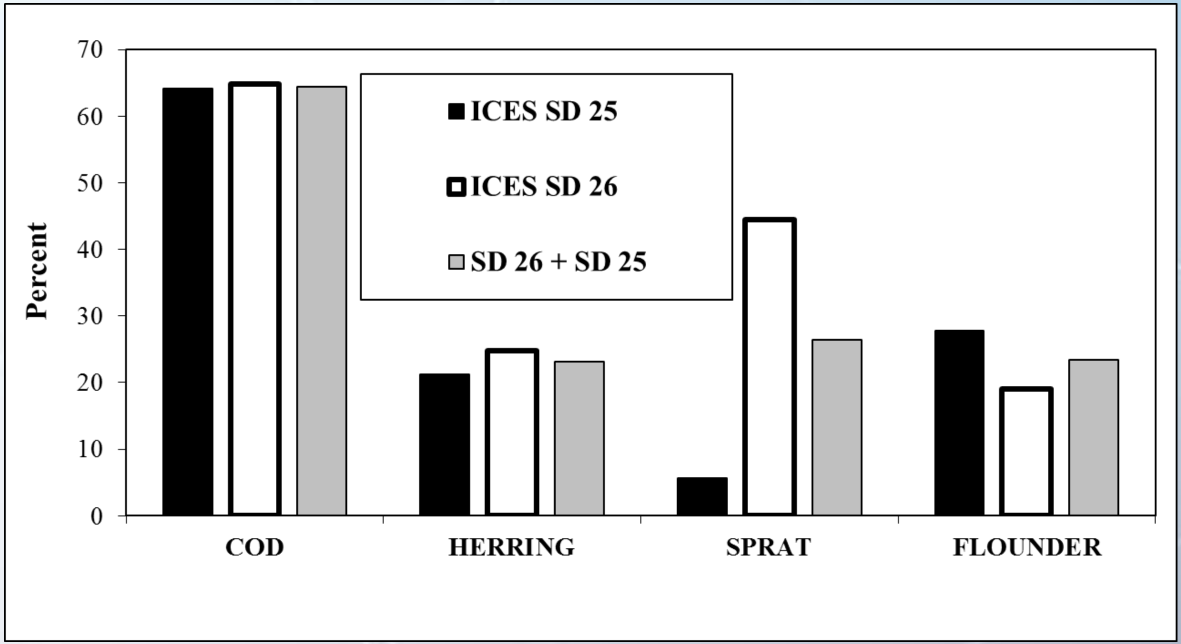
Results

- length distributions of dominant species

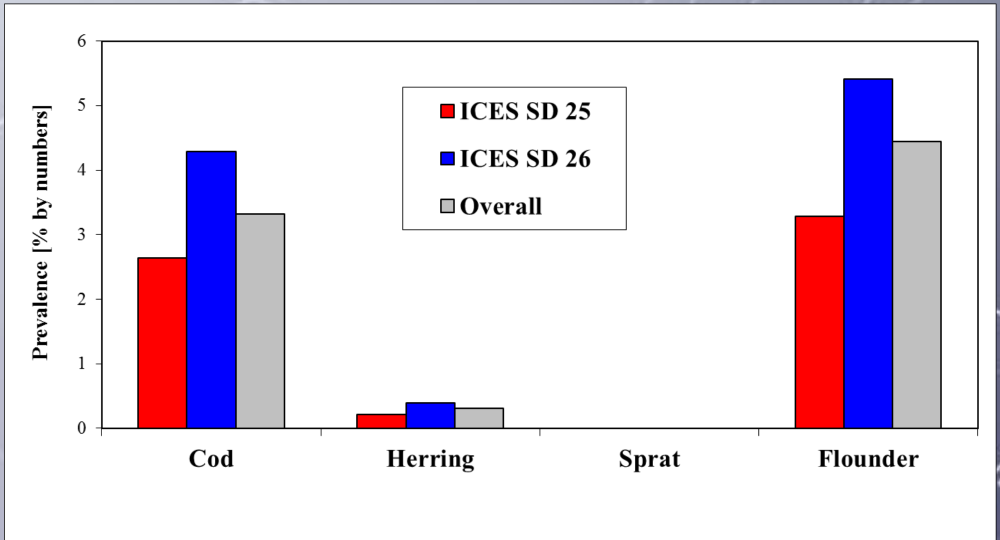


RESULTS

➢ Fraction of undersized fish



➢ Prevalence of externally visible diseases



.gdynia.pl

RESULTS

- **List of species**

Species (Latin name)	Length	Age
Gadus morhua	10712	526
Platichthys flesus	4482	863
Clupea harengus	3895	480
Sprattus sprattus	4800	531
Pleuronectes platessa	215	201
Psetta maxima	6	6
Cyclopterus lumpus	2	2
Enchelyopus cimbrius	275	73
Hyperoplus lanceolatus	12	10
Osmerus eperlanus	87	34
Merlangius merlangus	37	37
Myoxocephalus scorpius	26	23
Limanda limanda	1	1
Pomatoschistus minutus	1	1
Zoarces viviparus	2	
Alosa fallax	5	5
Trachurus trachurus	1	
Scomber scombrus	2	
Engraulis encrasicolus	421	
Gasterosteus aculeatus	83	
Neogobius melanostomus	1	
Melanogrammus aeglefinus	1	1
Trisopterus minutus	1	
Caranx rhonchus	126	

MIR

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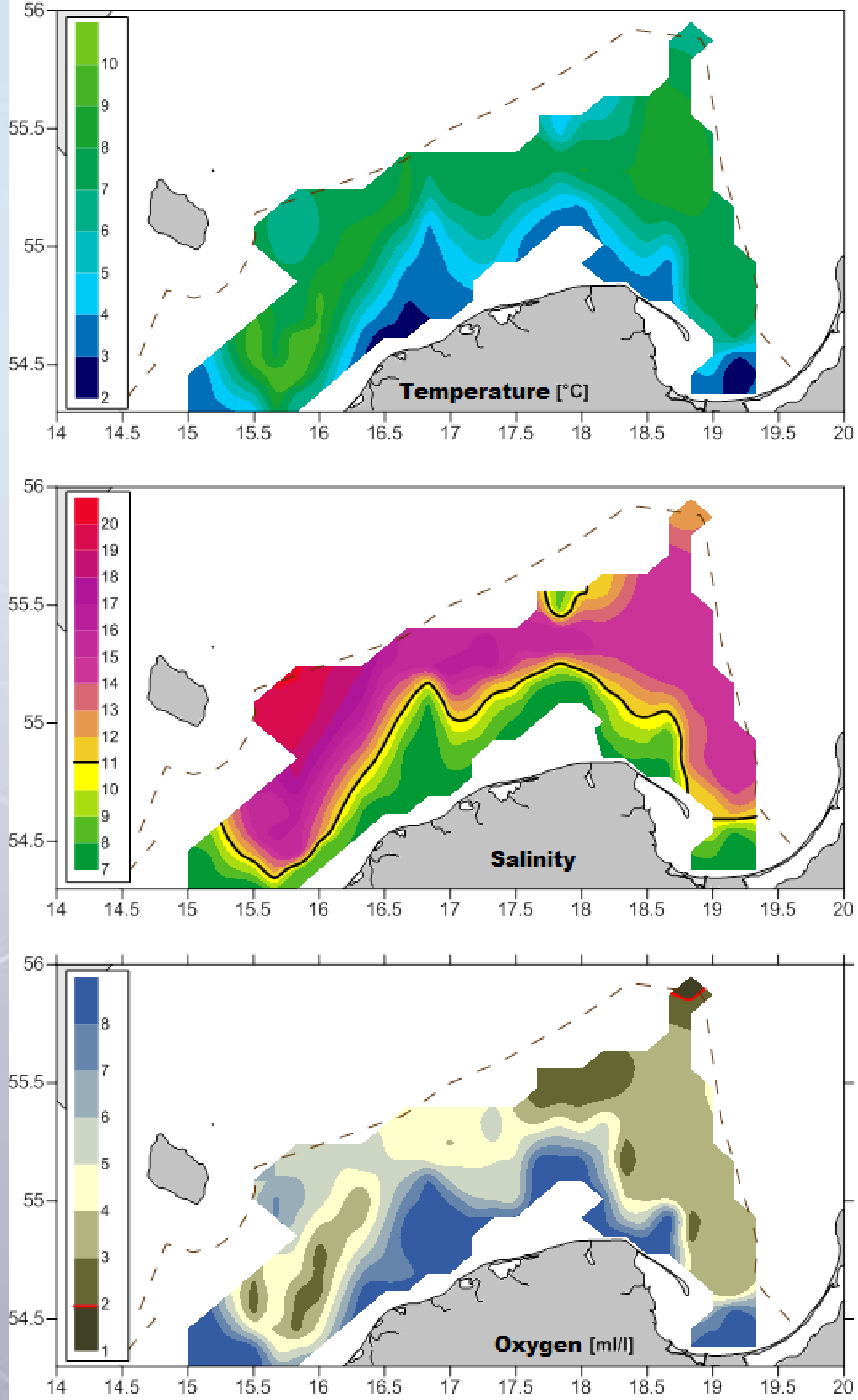
RESULTS

➢ Hydrology



Next 1Q BITS cruise

➢ **February 2016**

ICES WGBIFS meeting
Öregrund, Sweden
23-27.03. 2015

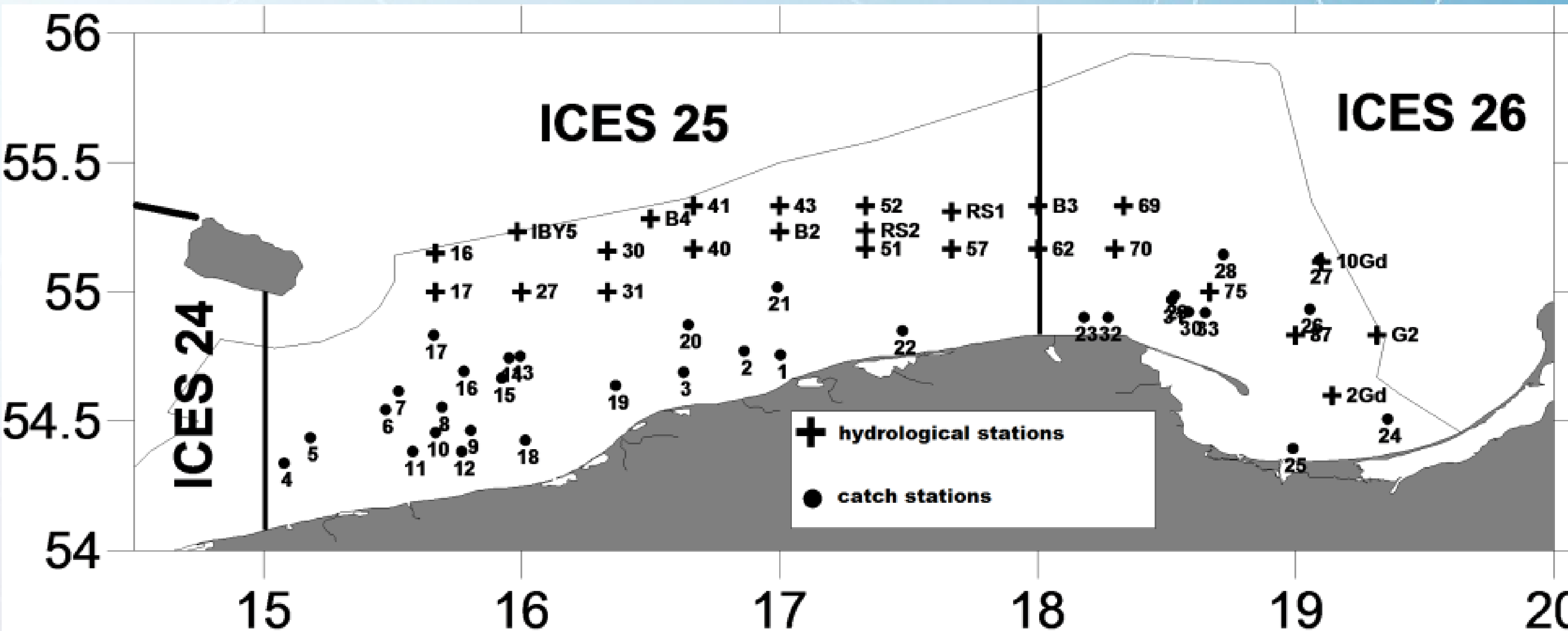
Polish BITS 4Q 2014 cruise results

Krzysztof Radtke
National Marine Fisheries Research Institute
Gdynia, Poland

➢ Research area

➢ - ICES SDs 25 and 26, within Polish EEZ

➢ In total 33 control hauls planned and 33 realized realized

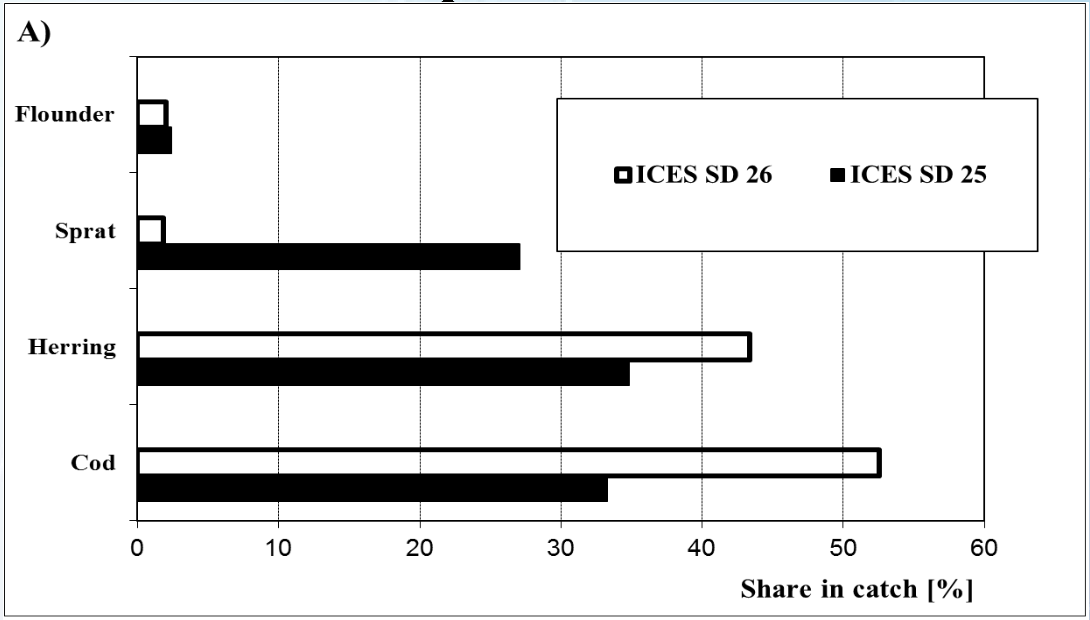


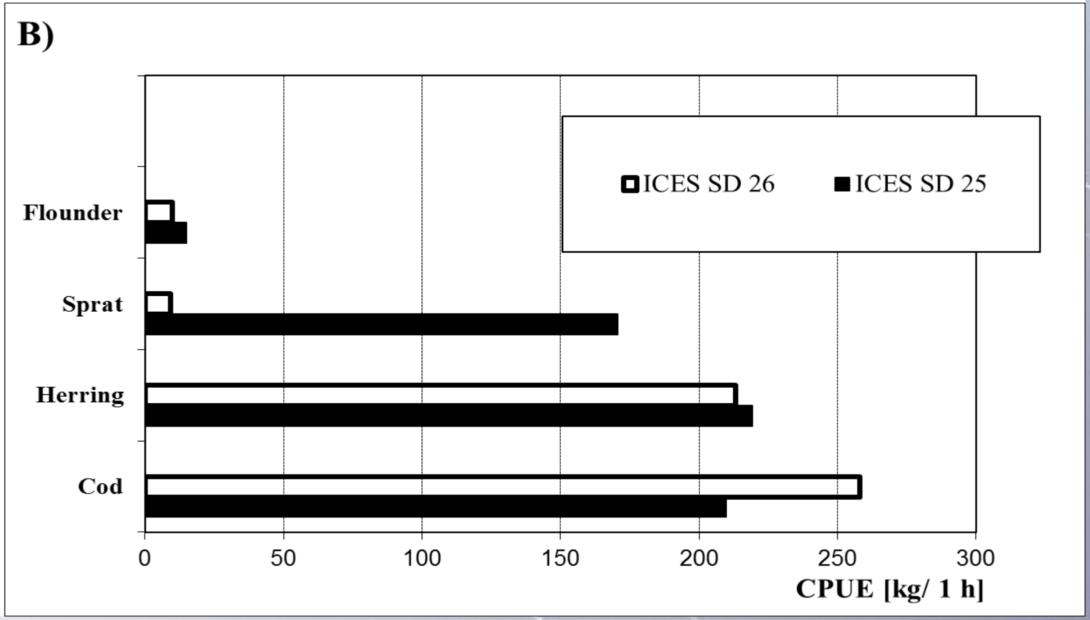
➢ **PROBLEMS:**

Navy exercises – four hauls shifted outside miltary closed zone

Results

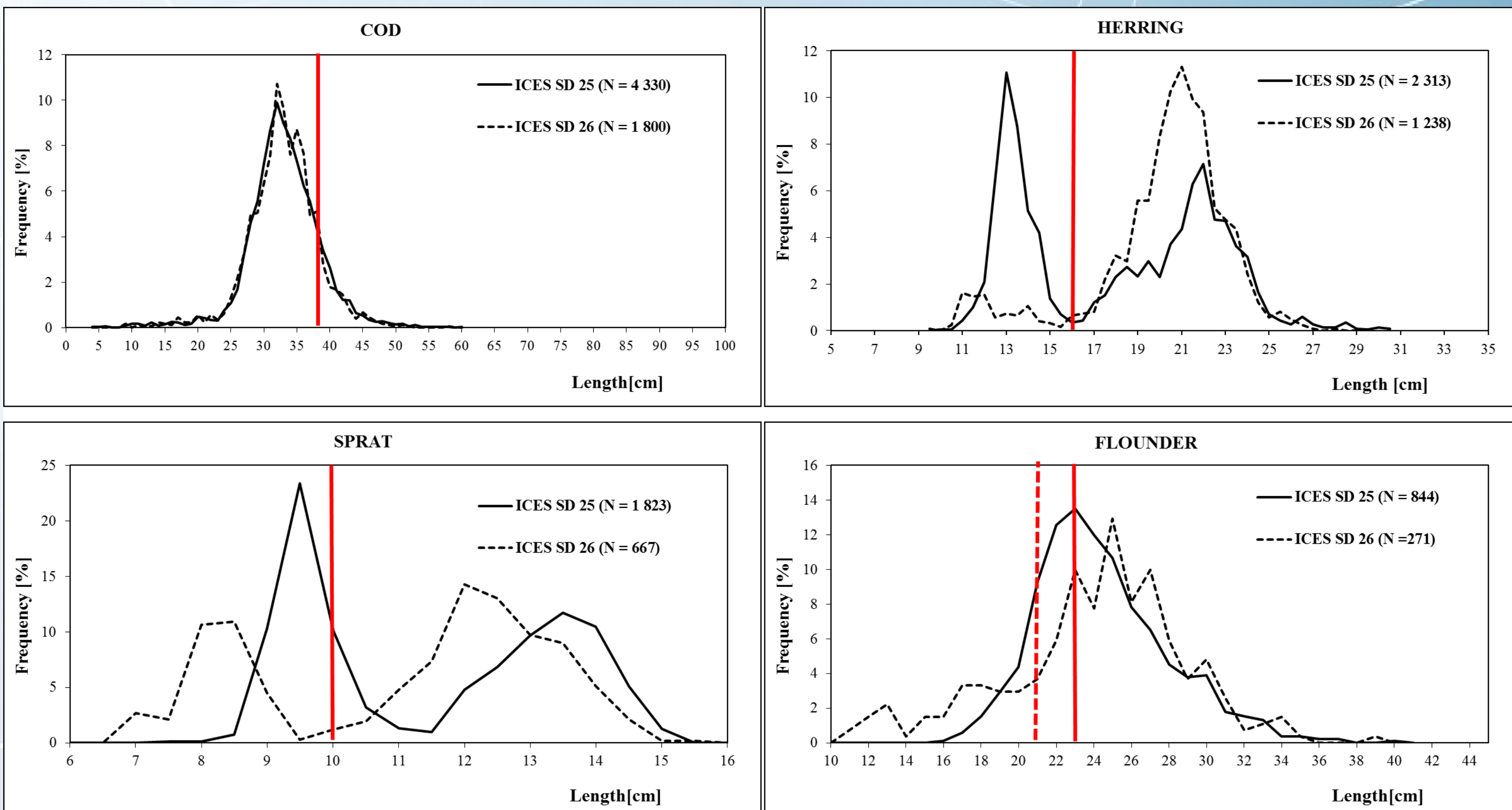
➢ dominant species in catches





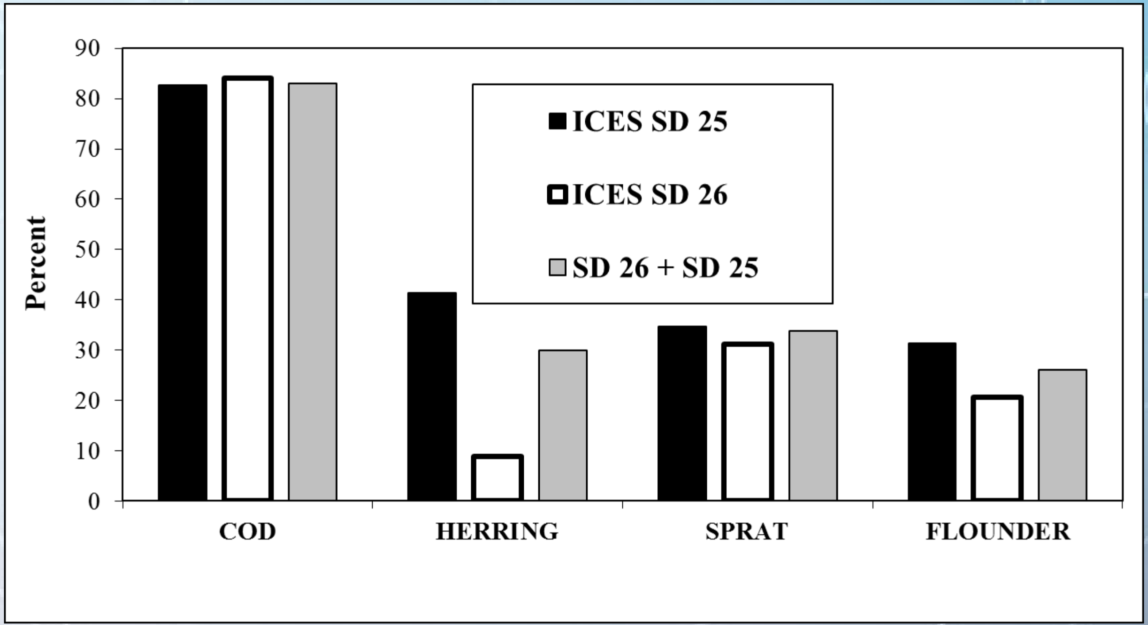
Results

➢ length distributions of dominant species

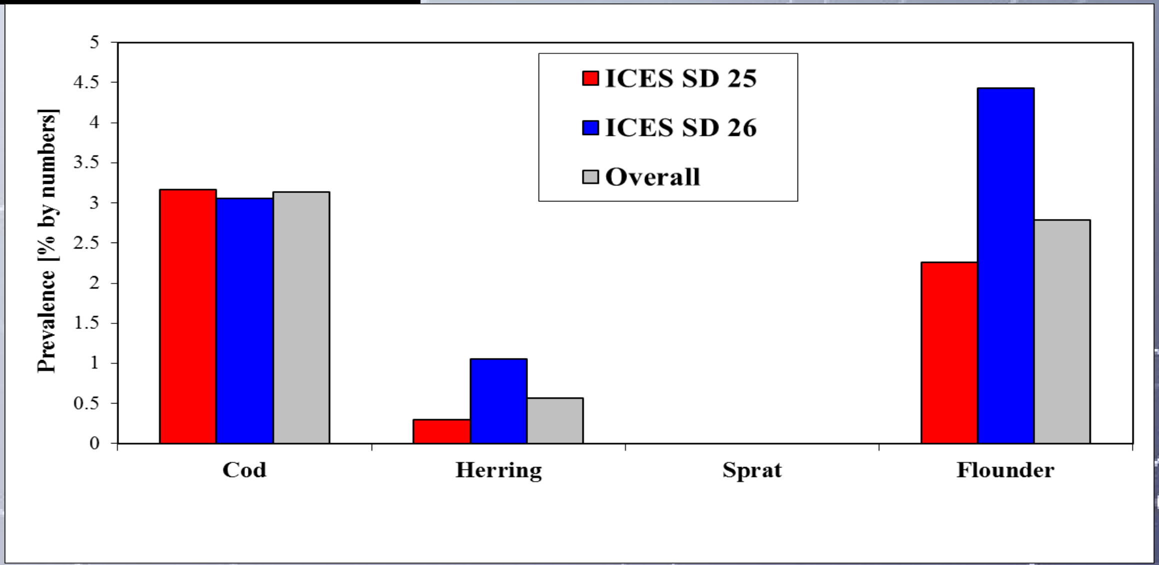


RESULTS

➢ Fraction of undersized fish



➢ Prevalence of externally visible diseases



dynia.pl

RESULTS

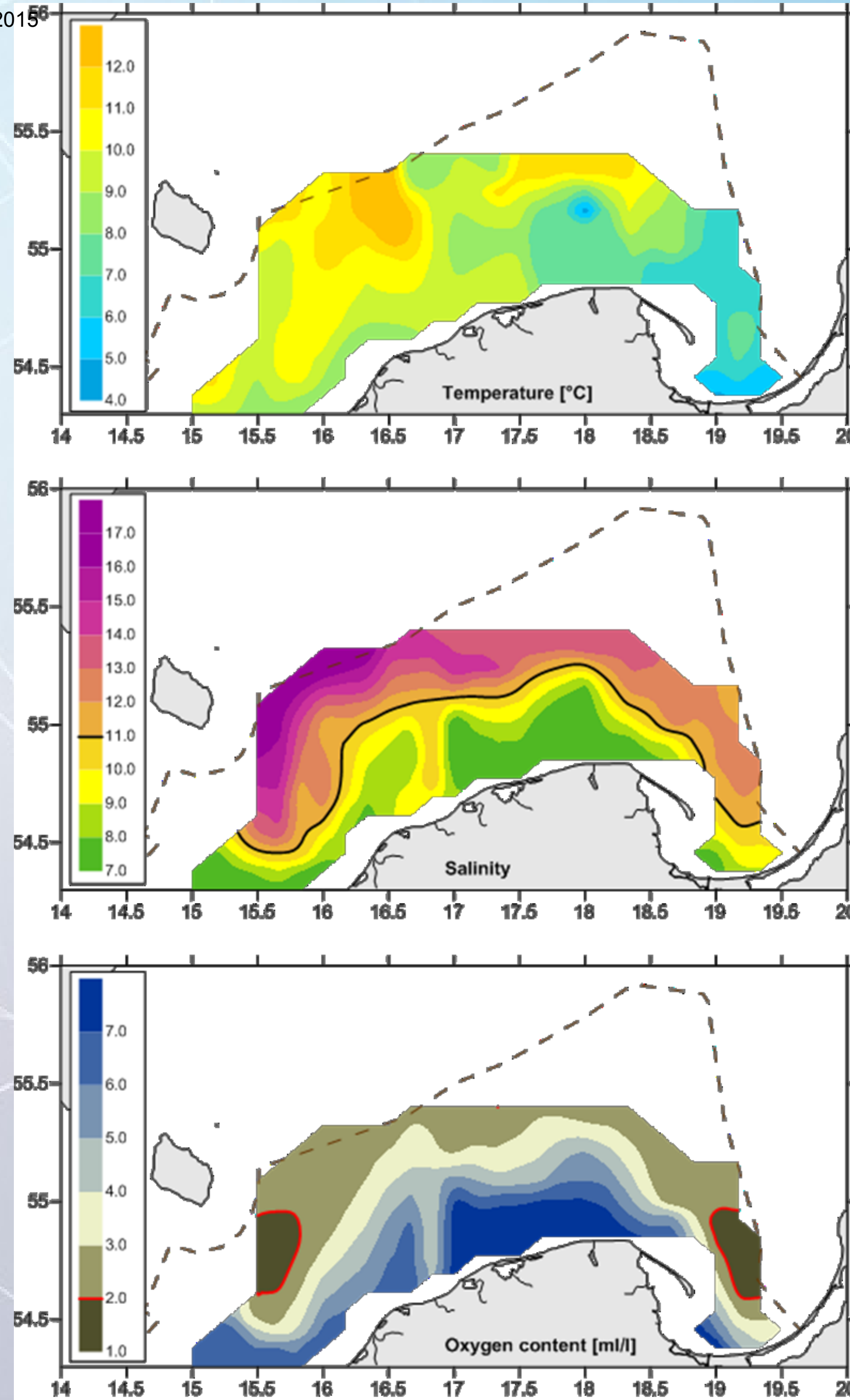
- **List of species**

Species (Latin name)	Length	Age
Gadus morhua	6130	388
Platichthys flesus	1115	502
Clupea harengus	3551	549
Sprattus sprattus	2490	272
Pleuronectes platessa	297	196
Psetta maxima	5	5
Cyclopterus lumpus	10	8
Enchelyopus cimbrius	40	36
Melanogrammus aeglefinus	35	35
Ammodytes lanceolatus	387	37
Engraulis encrasicolus	11	11
Osmerus eperlanus	26	10
Merlangius merlangus	4	4
Myoxocephalus scorpius	129	78
Zoarces viviparus	1	1
Pomatoschistus minutus	12	
Neogobius melanostomus	1	
Agonus cataphractus	1	1

i.gdynia.pl

RESULTS

➢ Hydrology



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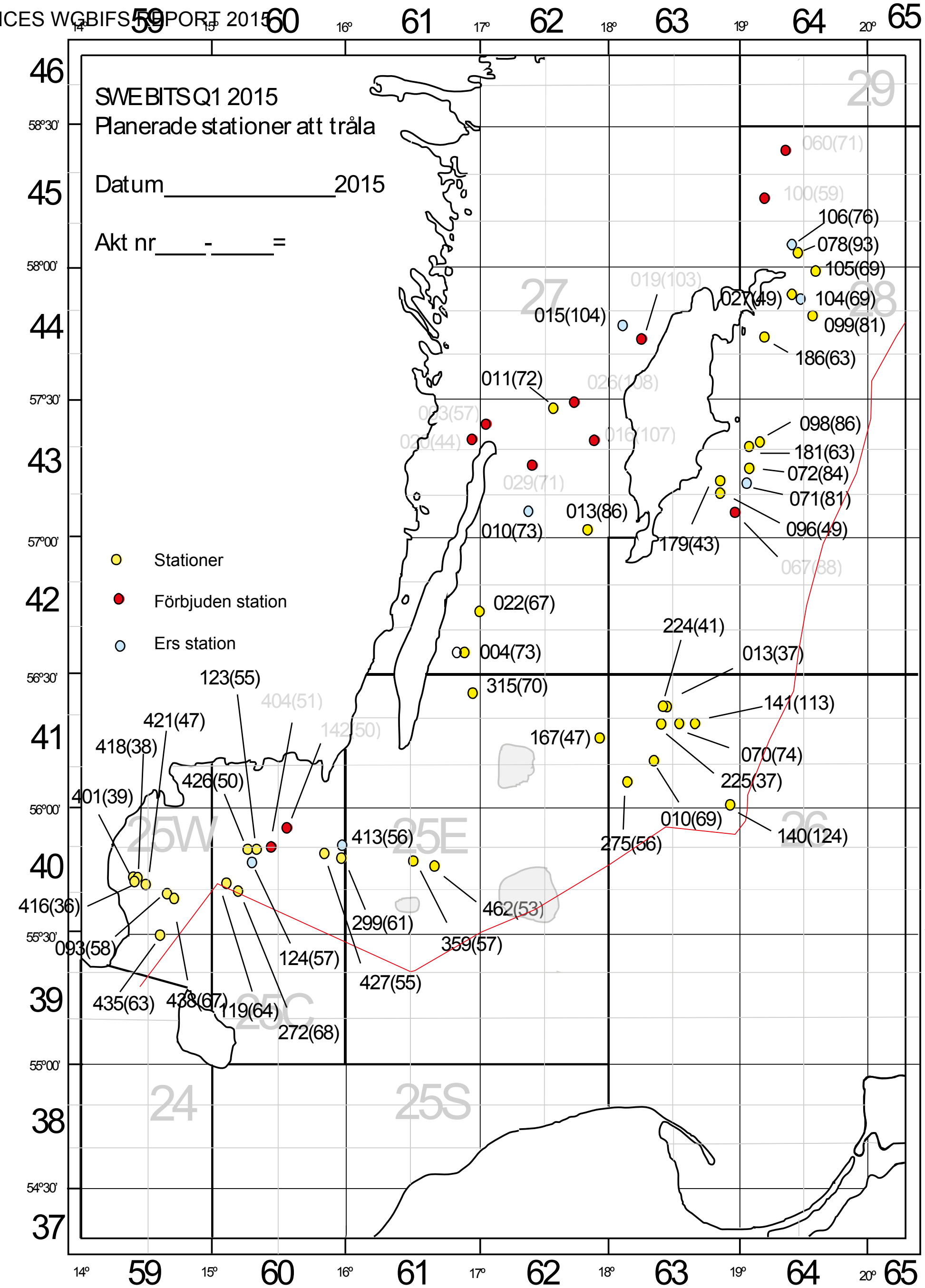
Next BITS 4Q cruise

- 16-27 November 2015

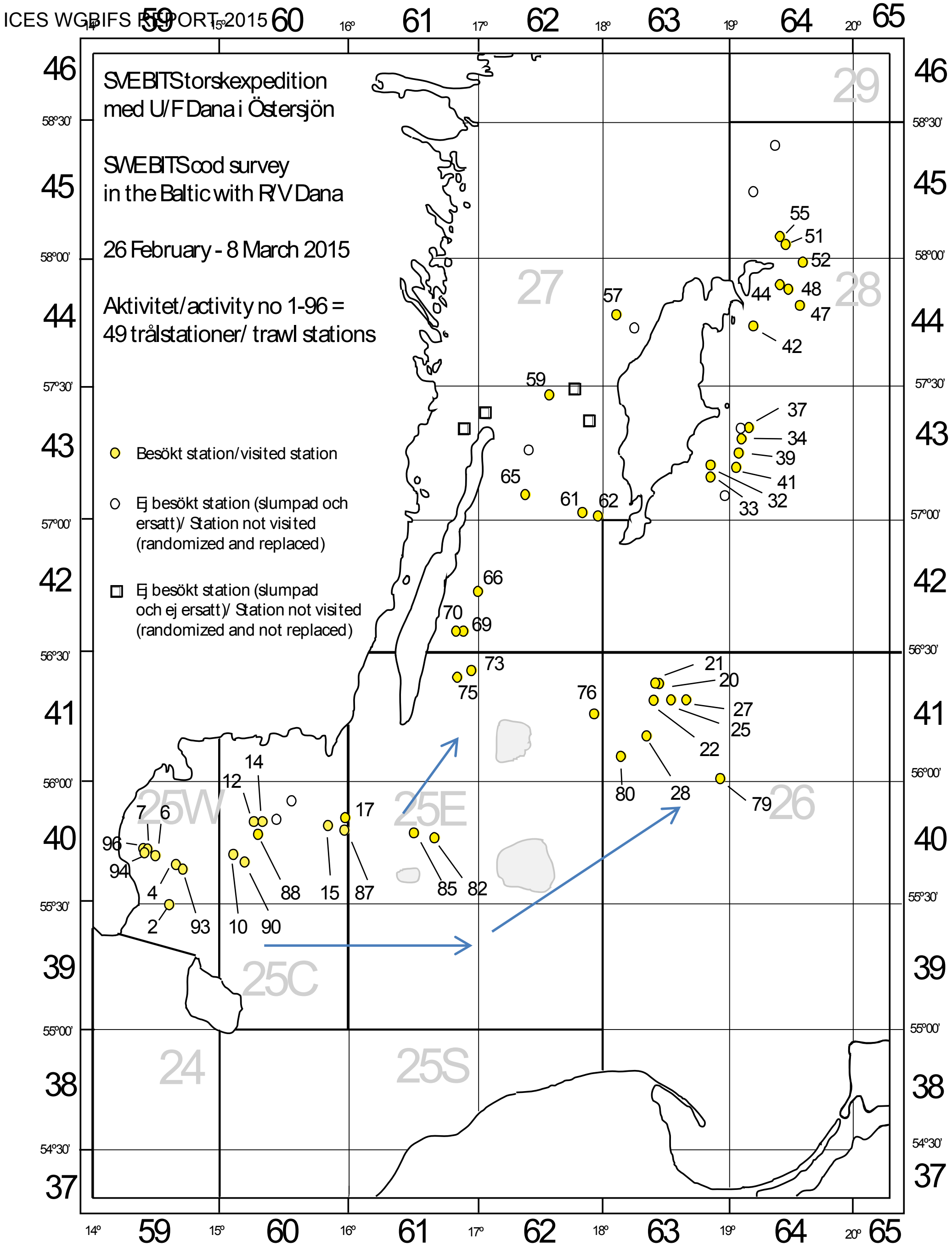
WGBIFS Öregrund
23 – 27/03 -15

BITS 2014 Q4 and 2015 Q1
R/V DANA



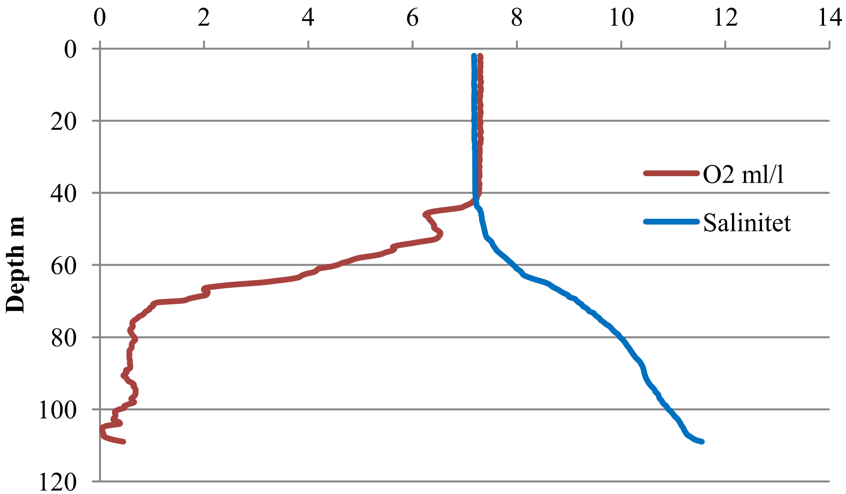
Stations prohibited by the swedish military!

- All stations inside swedish 12 nm borderline
- Stations in the vicinity of military secret areas in the baltic area

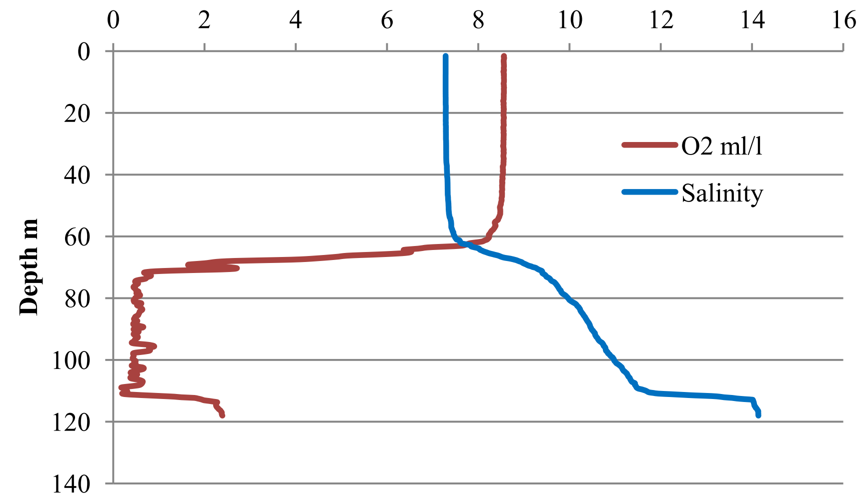


Stations BITS 2015

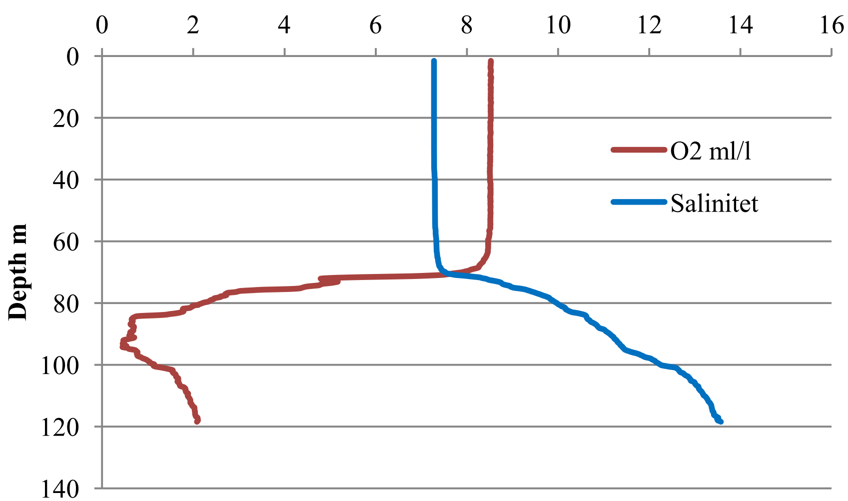
20141120 Station 26221



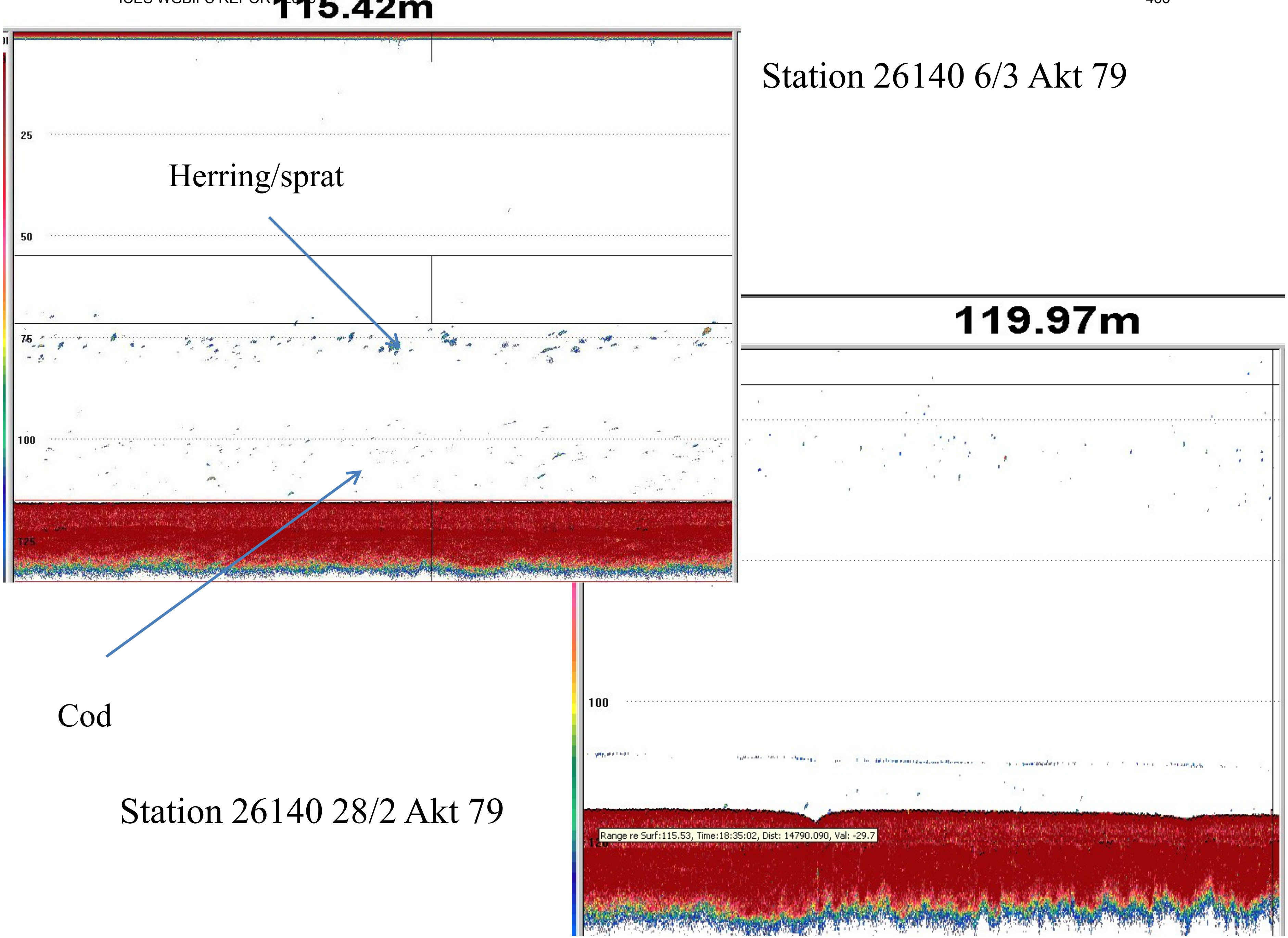
20150228 Station 26140

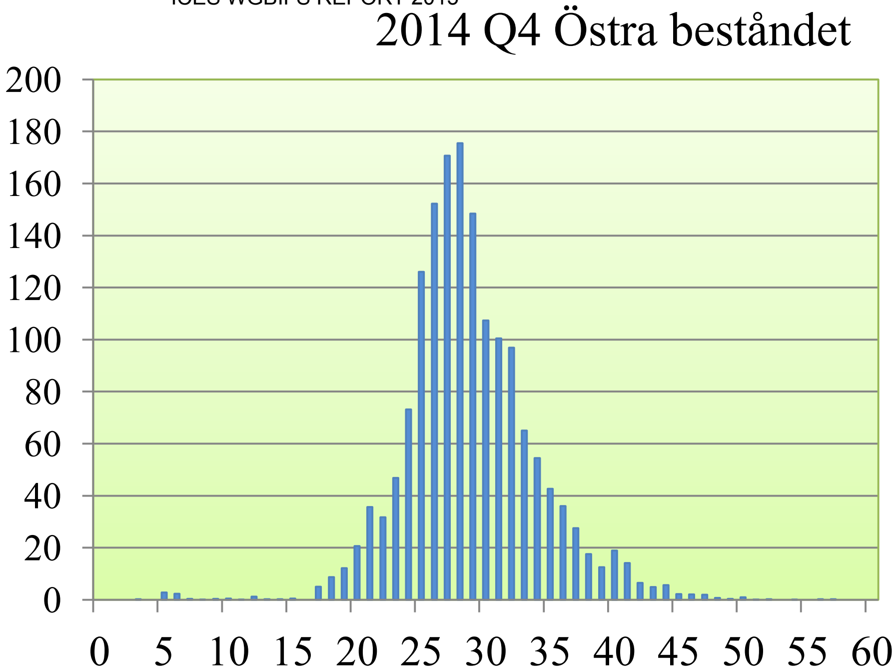


20150306 Station 26140

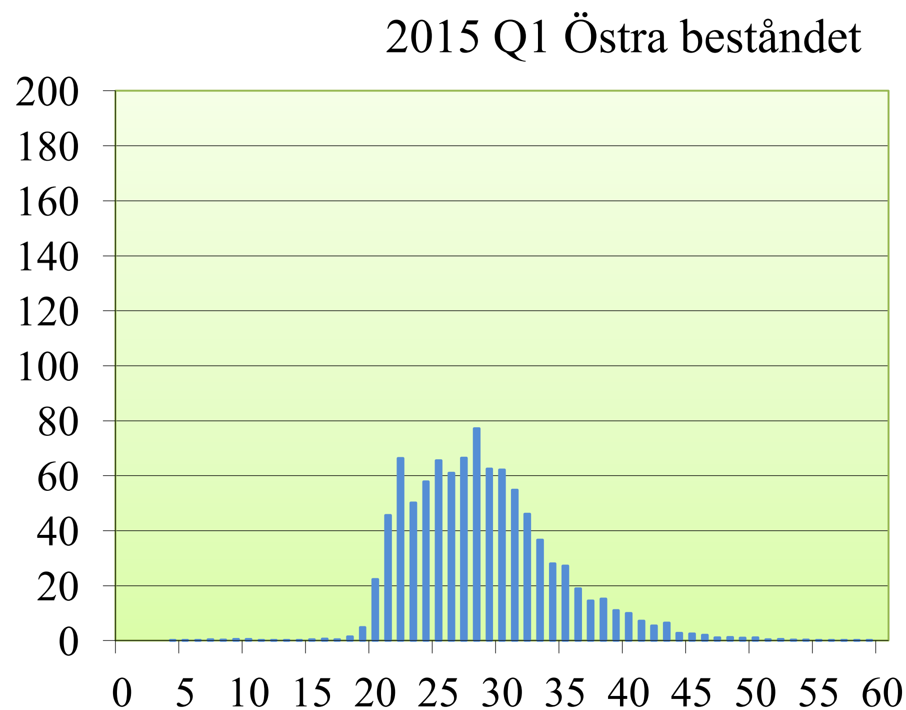


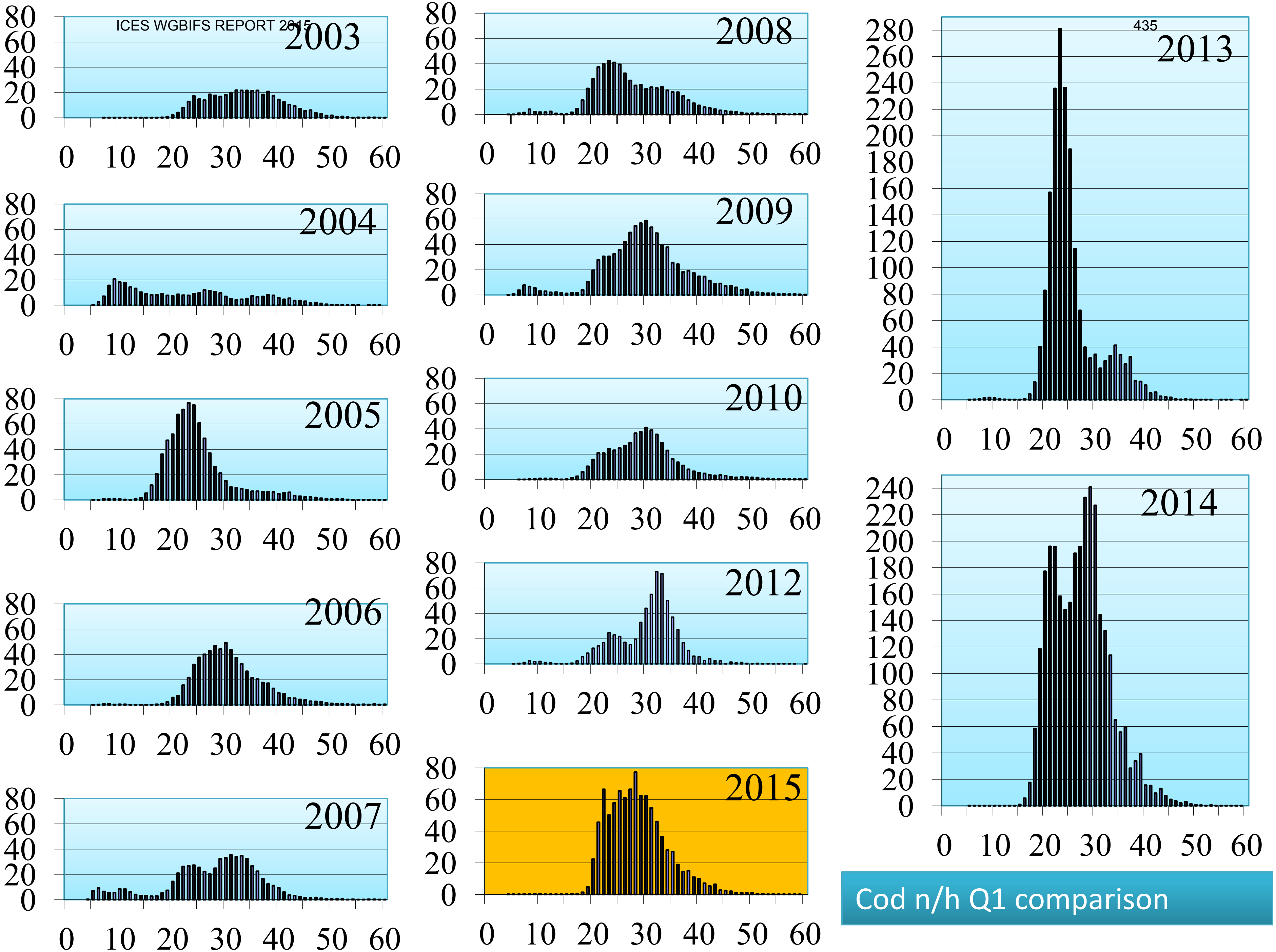
	Cod SD26 2015 Q1		Cod SD26 2014 Q4	
	kg	antal/ nos	kg	antal/ nos
	2	5	5	18
	0,2	1	8	31
	9	21	0	0
	3	9	0	0
	0	0		
	12	49		
	83	203		
	6	17		
Sum	114	305	13	49


115.42m
Station 26140 6/3 Akt 79
25
Herring/sprat
50
75
100
125
119.97m
Cod
100
Range re Surf:115.53, Time:18:35:02, Dist: 14790.090, Val: -29.7
Station 26140 28/2 Akt 79



Number of Cod per trawl hour





Cod n/h Q1 comparison

Swe BITS 2014 Q1

Total weight Kg	45 185
Cod weight Kg	11 155
Number of Cod	55 031

Swe BITS 2014 Q4

Total weight Kg	20 343
Cod weight Kg	3 693
Number of Cod	16 484

Swe BITS 2015 Q1

Total weight Kg	38 837
Cod weight Kg	4 631
Number of Cod	18 565

BITS 2015 Q4

- Nov 16 – nov 27
- Eleven days survey (30 stations)
- Additional sampling (herring and sprat for National food agency)

LATVIA
2014 BITS Q4 and 2015 BITS Q1 surveys

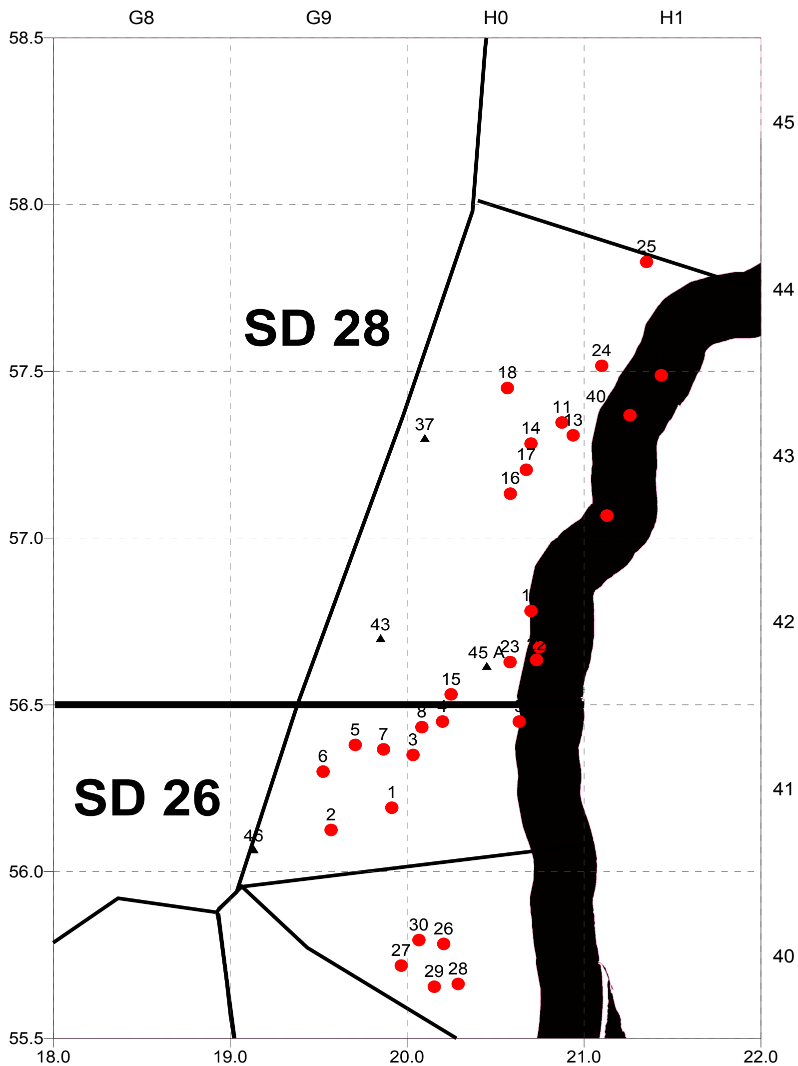
- Both surveys were performed in cooperation with Polish colleagues on the Polish r.v. “Baltica”

- During these surveys big TV3 with rochopper were used

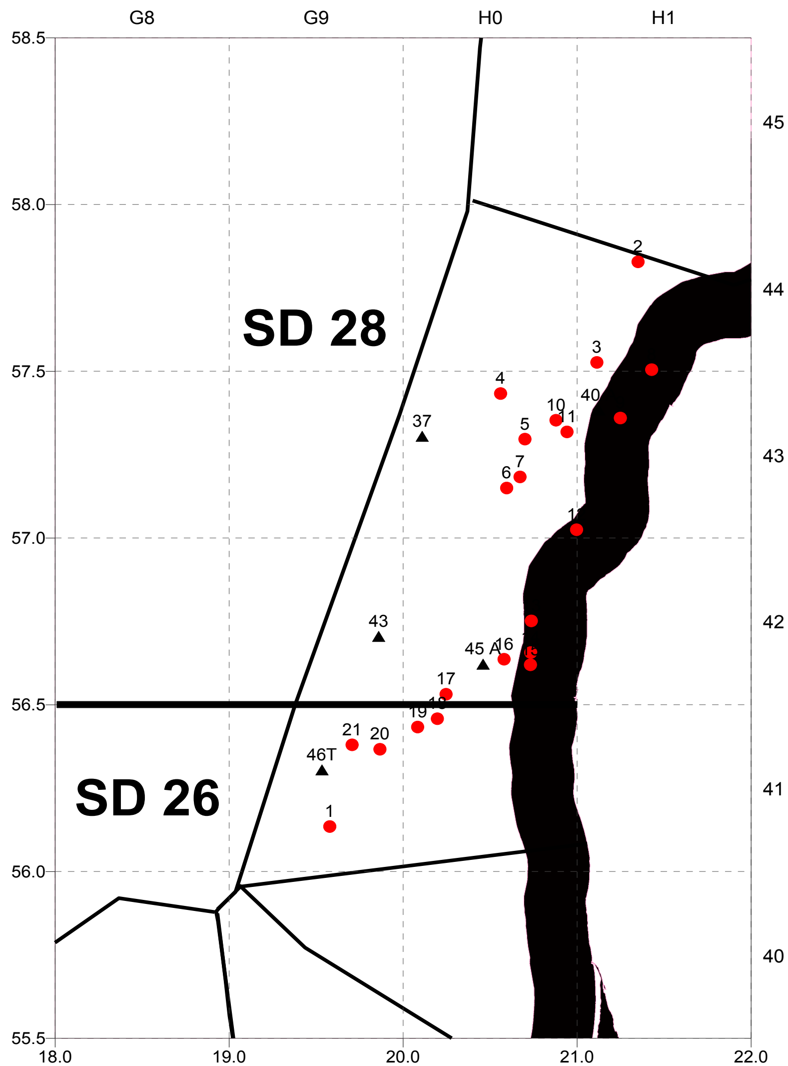
2014. BITS Q4 survey

- The joint Latvian-Polish BITS survey, conducted in the period of 03-11.12.2014 on the r.v. “Baltica” , in the Latvian EEZs (the ICES Sub-divisions 26 and 28).

Planed trawling stations



Realized trawling stations

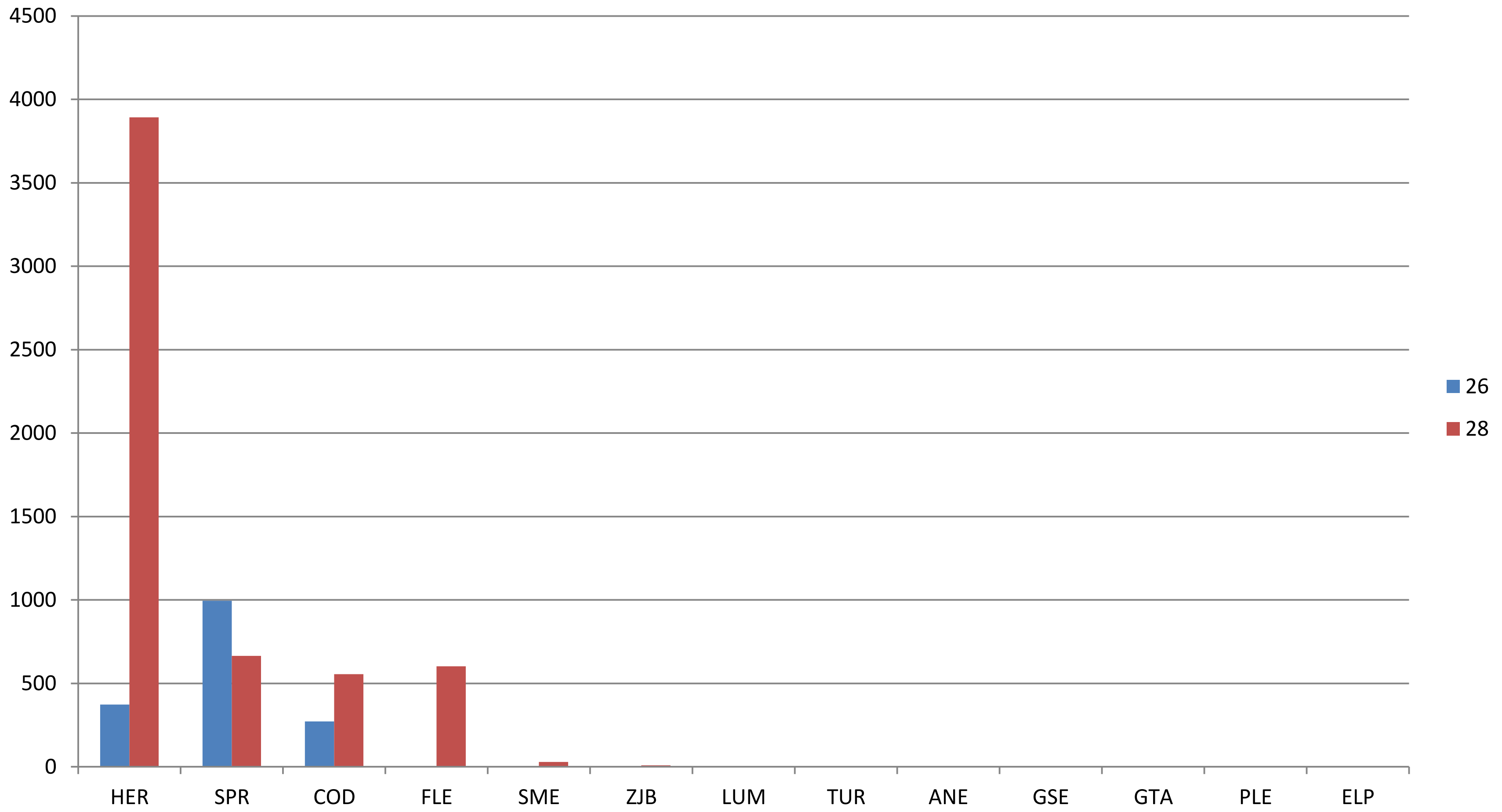


Numbers of fish biologically analysed during the BITS-4q survey (overall, 13 fish species)

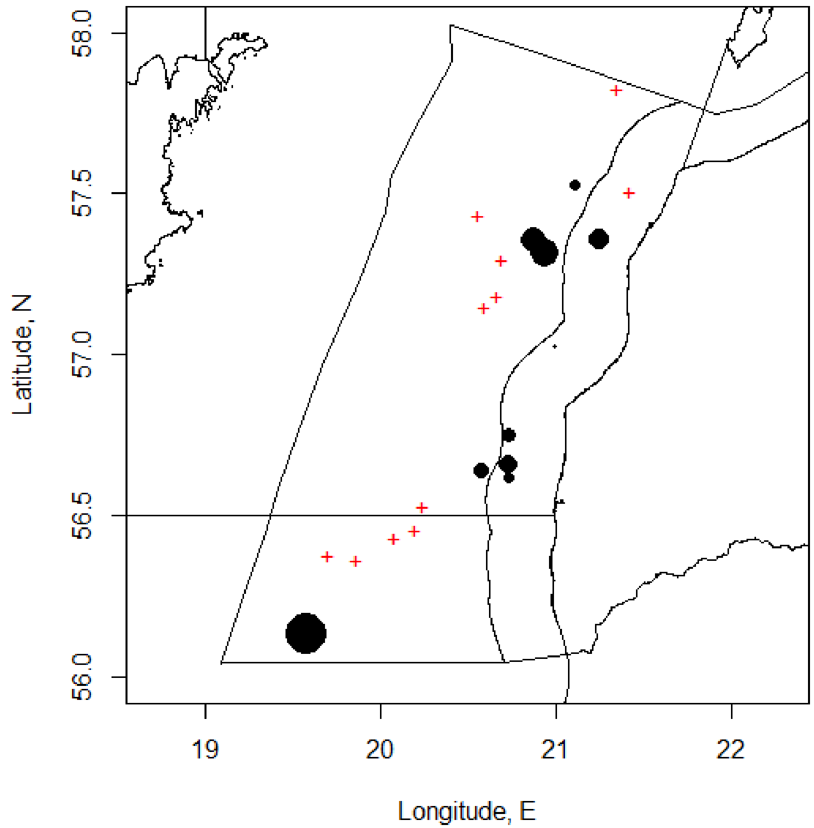
Species	ICES SD	Number of samples	Number of fish	
			measured	analyzed
Cod	26	1	638	98
	28	9	429	300
	Total	10	1067	398
Flounder	26	1	1	
	28	11	424	301
	Total	12	425	301
Turbot	26			
	28	1	2	
	Total	1	2	
Plaice	26	1	1	
	28			
	Total	1	1	
Herring	26	1	104	
	28	14	1382	
	Total	15	1486	
Sprat	26	2	231	
	28	14	1198	
	Total	16	1429	
All other species	26			
	28	14	171	
	Total	14	171	
Total	26	6	975	98
	28	63	3606	601
	Total	69	4581	797

Species	ICES SD	Number of samples	Number of stomachs collected
Cod stomach samples	26	1	45
	28	9	42
	Total	10	87

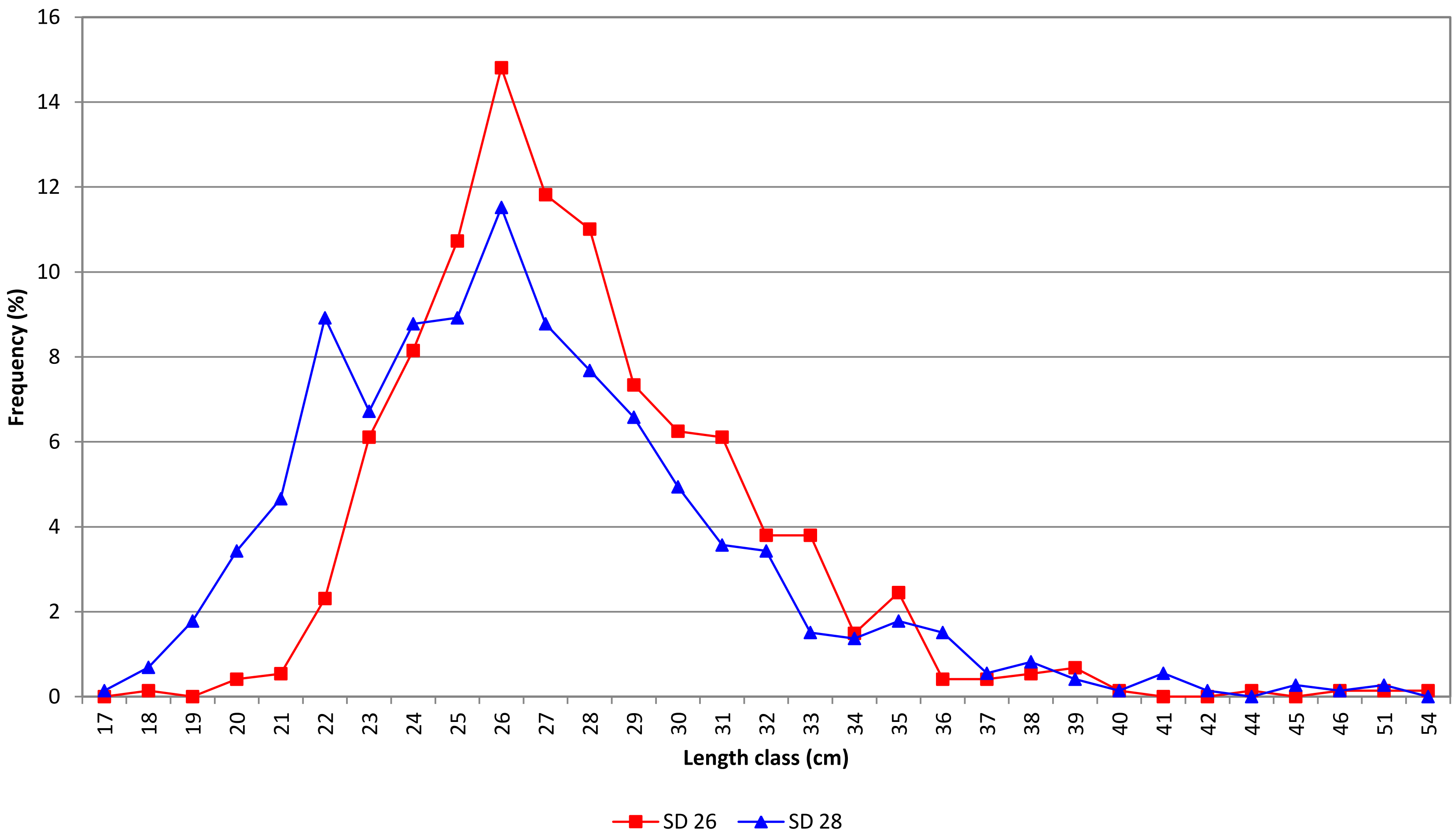
Fishes dominated by mass kg per 1 hour trawling in SD 26 and 28



Distribution of cod during the BITS 2014 Q4 survey



Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03-12 December 2014



Distribution of flounder during the BITS 2014 Q4 survey

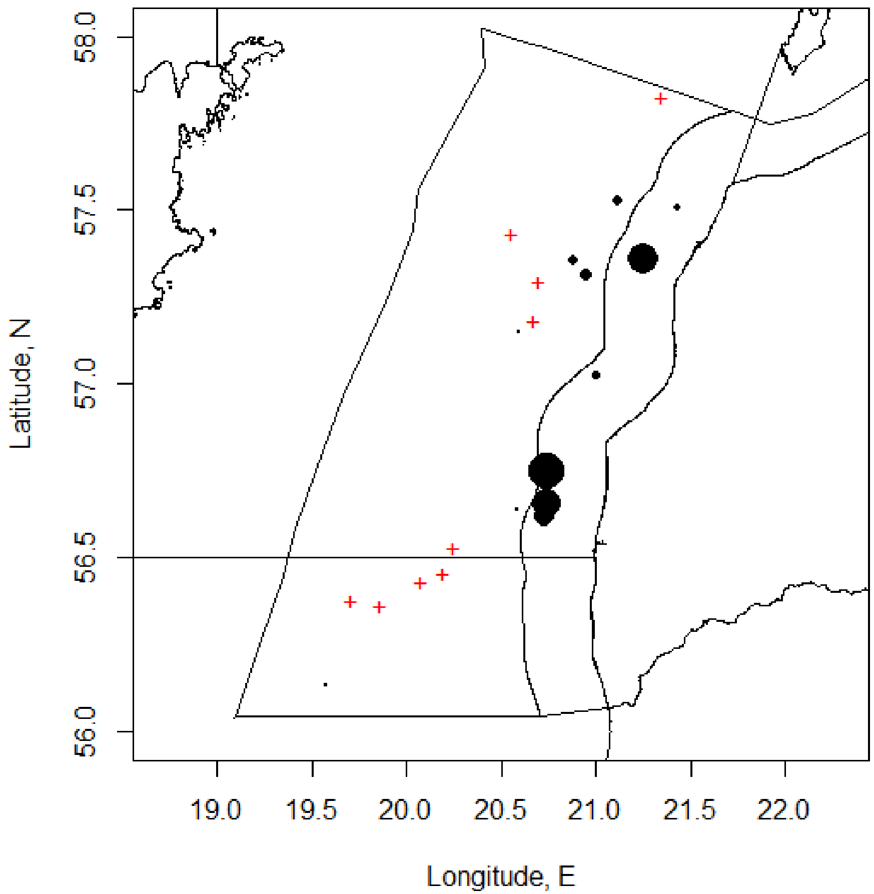
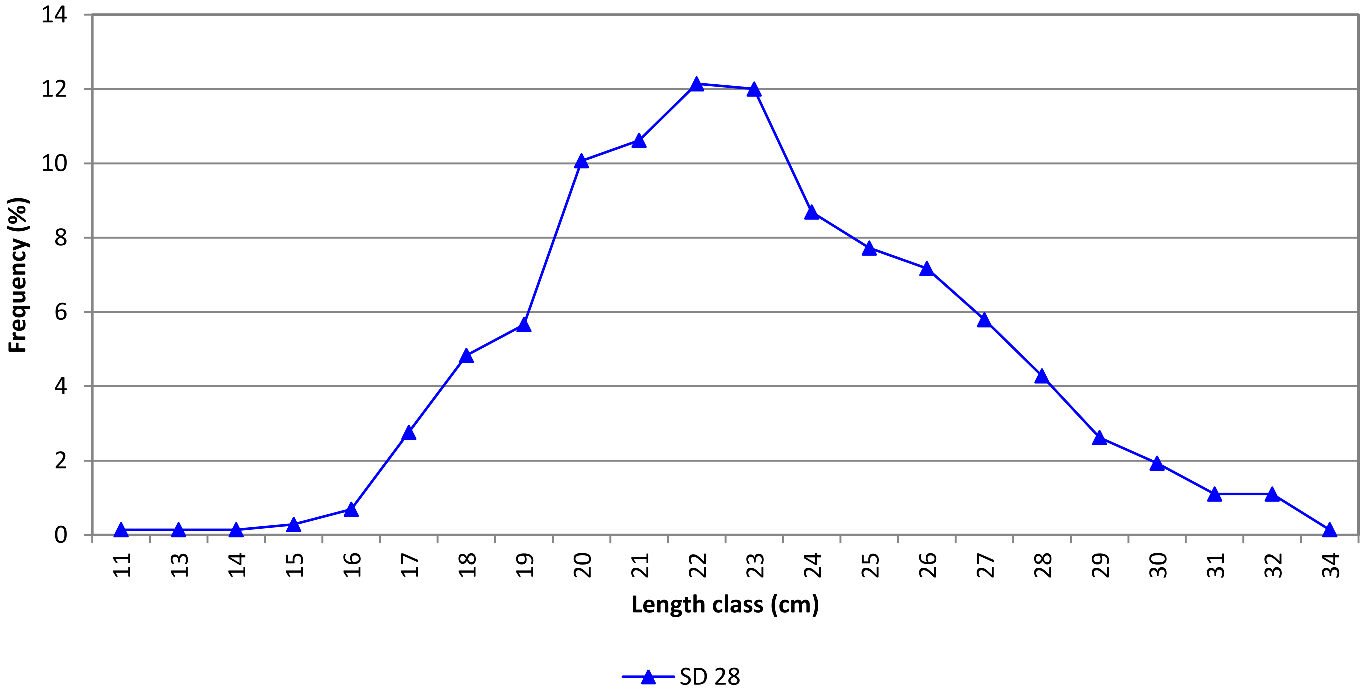


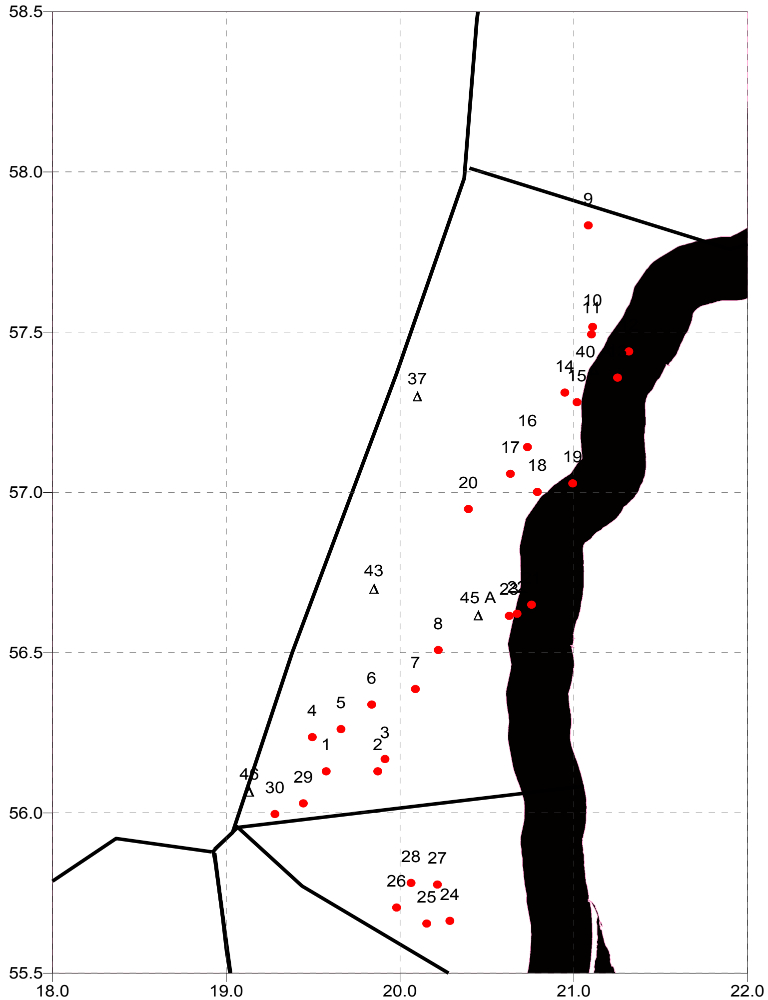
Fig. 4. Length frequency of flounder from Sub-Division 28 in the control catches during the r/v "Baltica" BITS survey, 03-12 December 2014



2015. BITS Q1 survey

- The joint Latvian-Polish BITS survey, conducted in the period of 06.-14.03.2015 on the r.v. “Baltica” , in the Latvian EEZs and Lithuanian EEZs (the ICES Sub-divisions 26 and 28).

Realized trawling stations

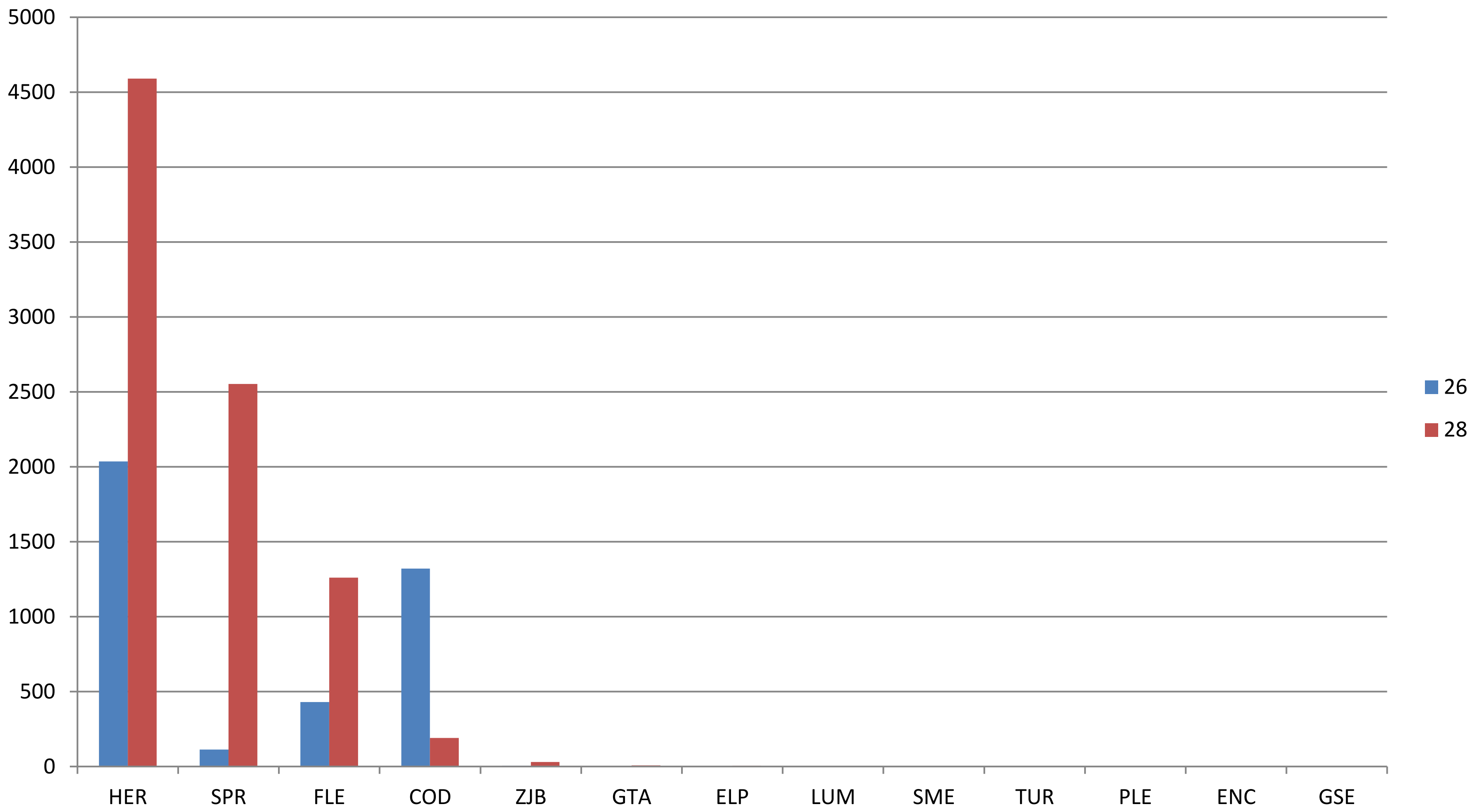


Numbers of fish biologically analysed during the BITS-1q survey (overall, 13 fish species)

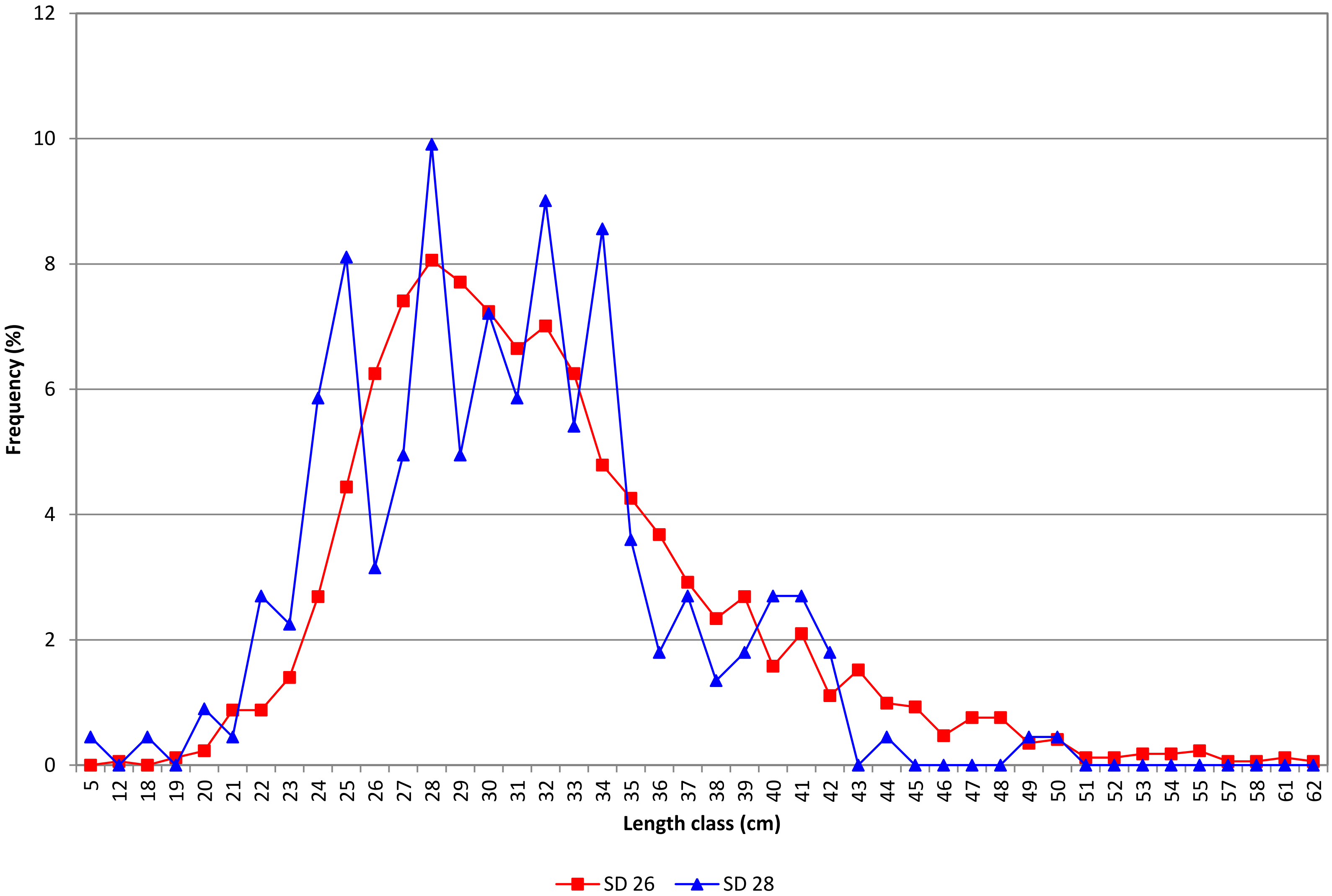
Species	ICES SD	Number of samples	Number of fish measured	Number of fish analyzed
Cod	26	12	1305	408
	28	15	13	209
	Total	27	1318	617
Flounder	26	12	508	284
	28	15	2007	328
	Total	27	2515	612
Turbot	26	1	1	
	28	1	2	
	Total	2	3	
Plaice	26	1	1	
	28	1	1	
	Total	2	2	
Herring	26	12	1325	
	28	16	1369	
	Total	28	2694	
Sprat	26	10	1013	
	28	14	1140	
	Total	24	2153	
All other species	26	5	15	
	28	16	244	
	Total	21	259	
Total	26	53	4168	692
	28	78	4776	537
	Total	131	8944	1637

Species	ICES SD	Number of samples	Number of stomachs collected
cod stomach samples	26	12	81
	28	15	42
	Total	27	123

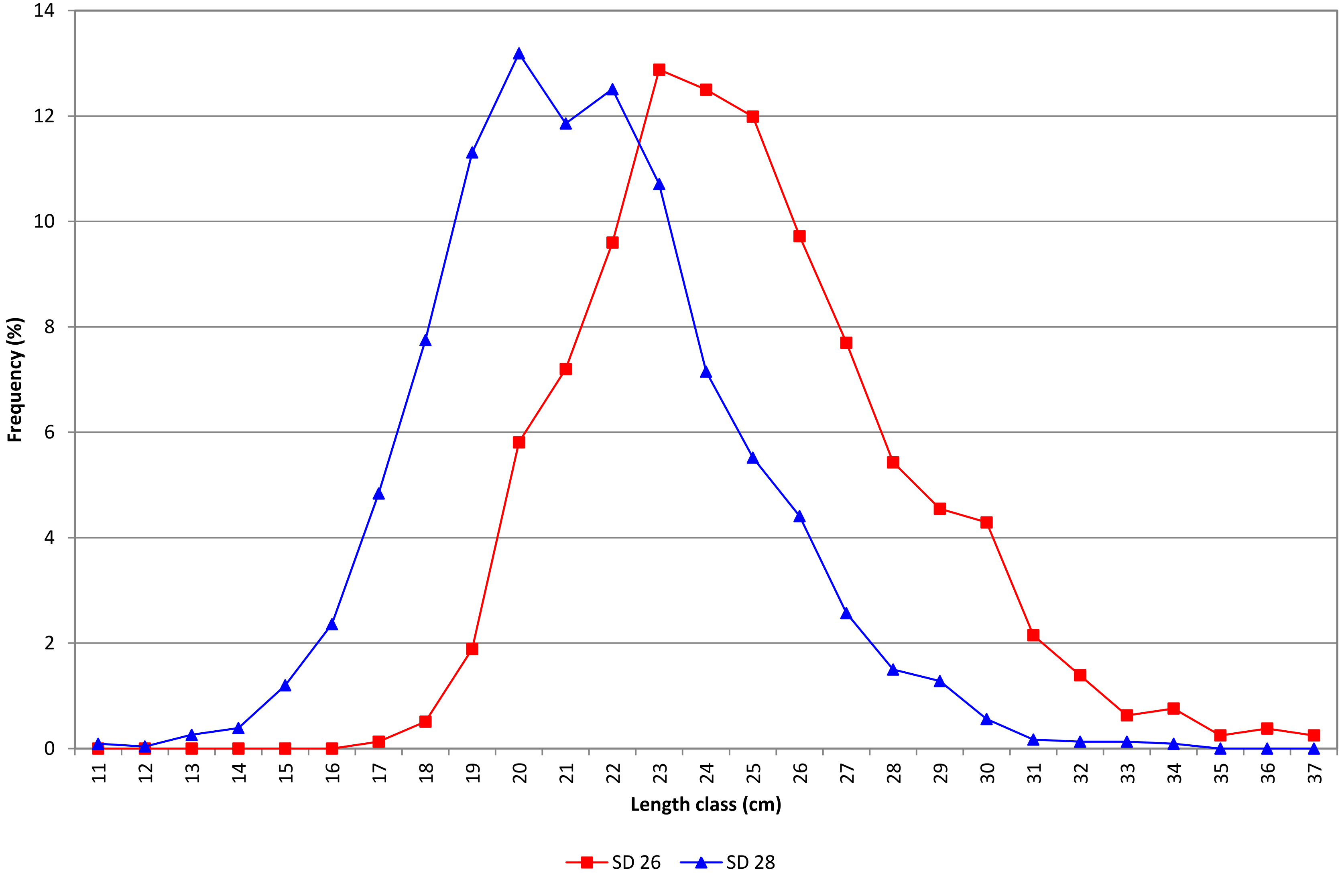
Fishes dominated by mass kg per 1 hour trawling in SD 26 and 28



Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 06-14 March 2015



Length frequency of flounder from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 06-14 March 2015



Fisheries Service under the Ministry of Agriculture of Republic of Lithuania, Fishery Research and Science State

BALTIC INTERNATIONAL ACOUSTIC SURVEYS (BASS, BIAS) IN THE LITHUANIAN ESPECIAL ECONOMIC ZONE OF THE BALTIC SEA

WGBIFS, 2015

BITS 2014 Q4

(R/V"DARIUS" 21-22. 11.2014)

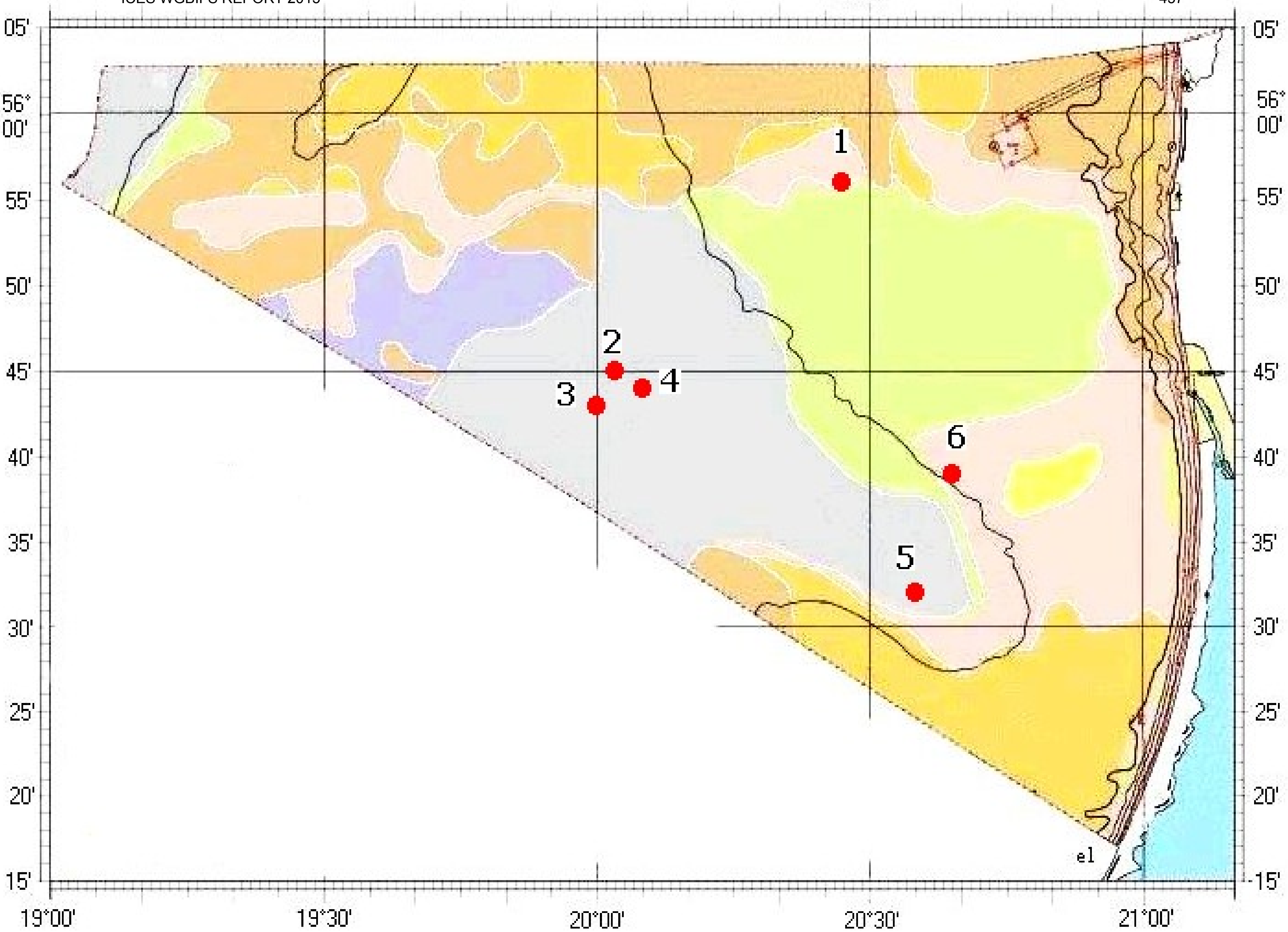
During survey was made six trawls and six hydrological station.

Trawling was done with the standard trawl TV3/520.

Seabird SBE 19plus v2 was used for hydrological data

The duration of the hauls was 30 minutes and the velocity was 3 knots. The total catch of each haul was analyzed to determine the species composition in weight and number as well as the distribution of length among all species.

Sub-samples of cod, flatfishes were investigated concerning sex, maturity and age.


19°00'
19°30'
20°00'
20°30'
21°00'
05'
56°
00'
55'
50'
45'
40'
35'
30'
25'
20'
15'
1
2
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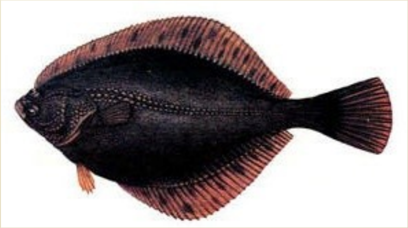
el

BITS (2014 Q4) RESULTS

Fish catches

Haul number	Catch date	The ICES rectangle and subdivision	Trawling depth (m)	Total CPUE (kg/h)	CPUE per species (kg/h)				
					Cod	Flounder	Herring	Turbot	Others
1	21.11.2014	40H0 (26)	38	891.6	210.6	671.6	0.2	1.2	8.0
2	21.11.2014	40H0 (26)	70	0.0	0.0	0.0	0.0	0.0	0.0
3	22.11.2014	40G9 (26)	60	16.3	7.4	2.2	5.1	0.0	1.6
4	22.11.2014	40H0 (26)	75	16.2	14.0	1.1	0.9	0.0	0.2
5	22.11.2014	40H0 (26)	63	138.1	10.9	26.2	100.8	0.0	0.1
6	22.11.2014	40H0 (26)	50	591.5	562.1	20.1	8.7	0.0	0.5
Mean					161.0	144.3	23.1	1.2	2.1

48,7%

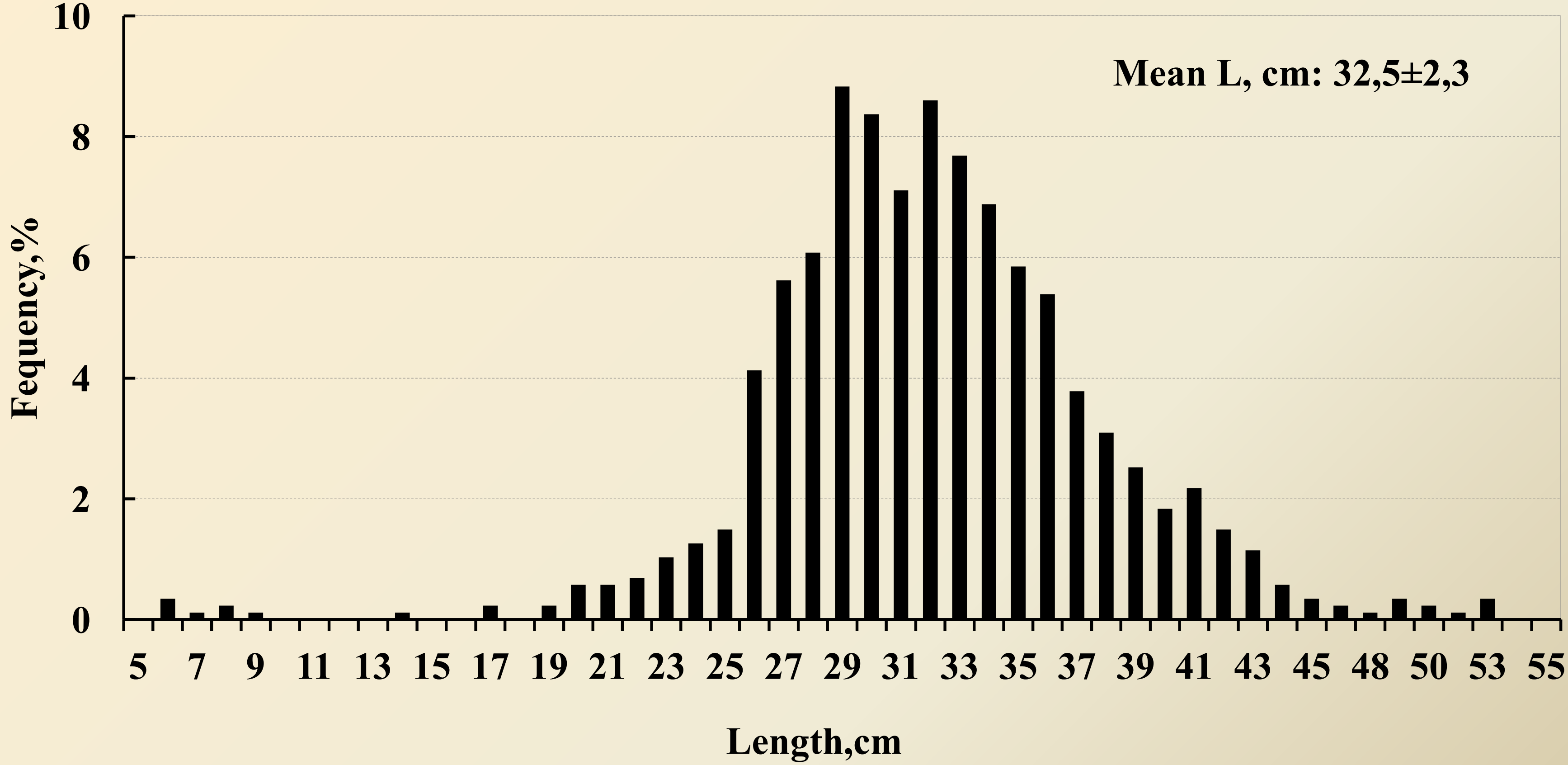


43,70%

BITS (2014 Q4) RESULTS

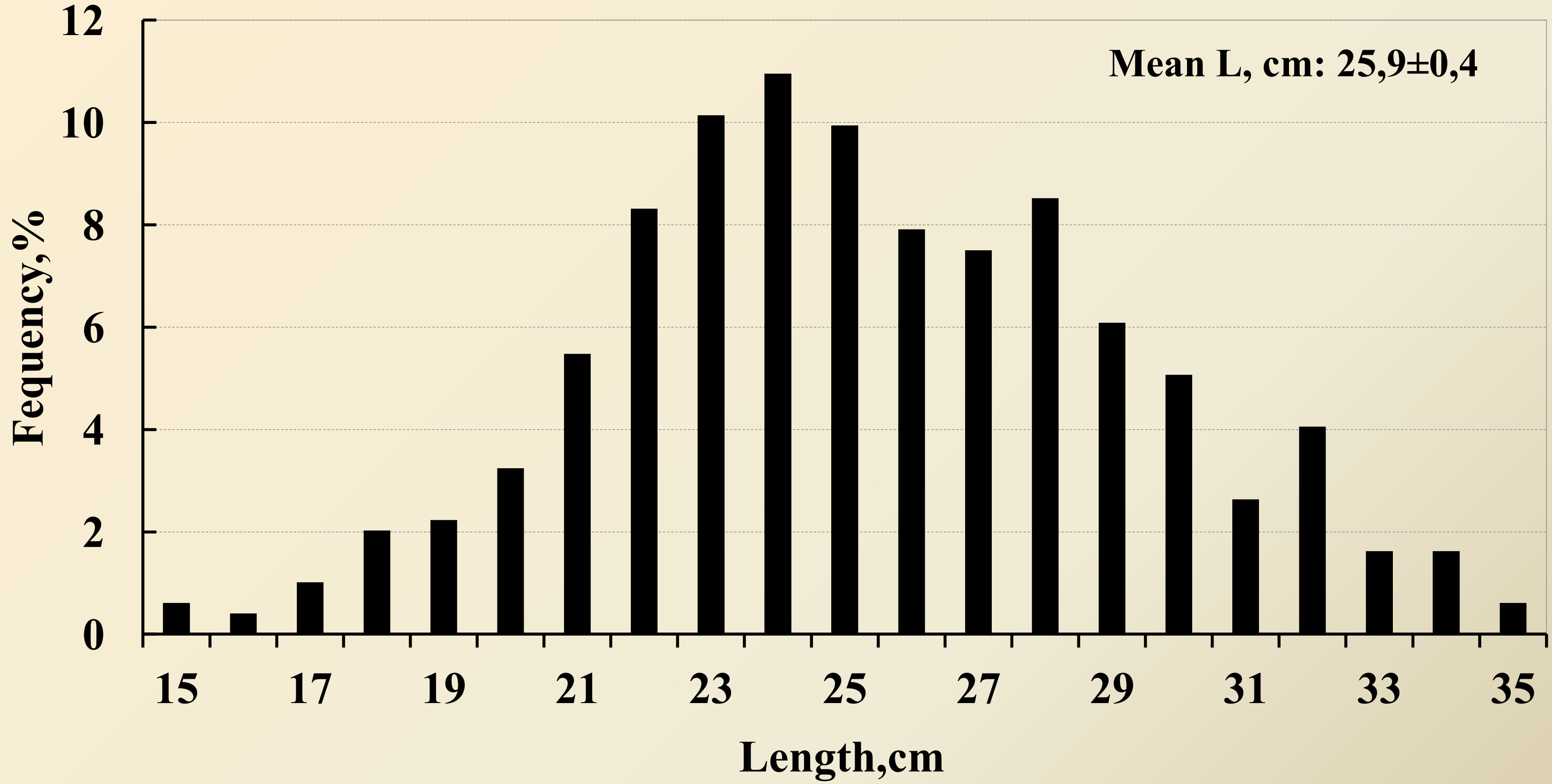
	Haul Nr.	Cod	Flounder	Sprat	Herring	Other
Length data	1	439	426	0	2	22
	2	0	0	0	0	0
	3	6	3	87	48	0
	4	13	3	9	8	0
	5	16	13	5	198	6
	6	397	45	5	69	29
Age data		250	341			5

Baltic cod length distribution in samples from the ICES Sub-division 26 (LEEZ)



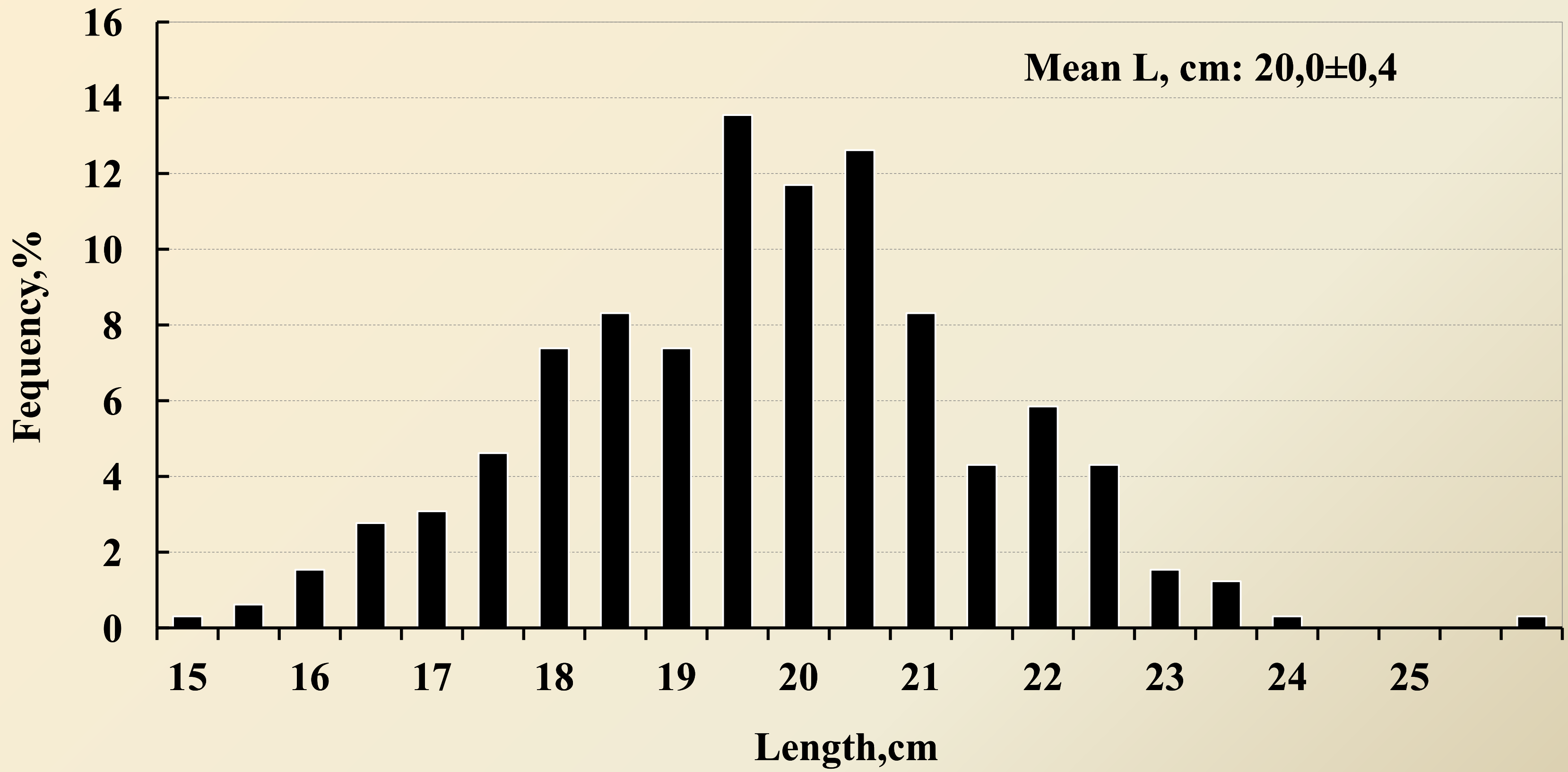
BITS , 21-22 November, 2014
R/V "DARIUS"

Flounder length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 21-22 November, 2014
R/V “DARIUS”

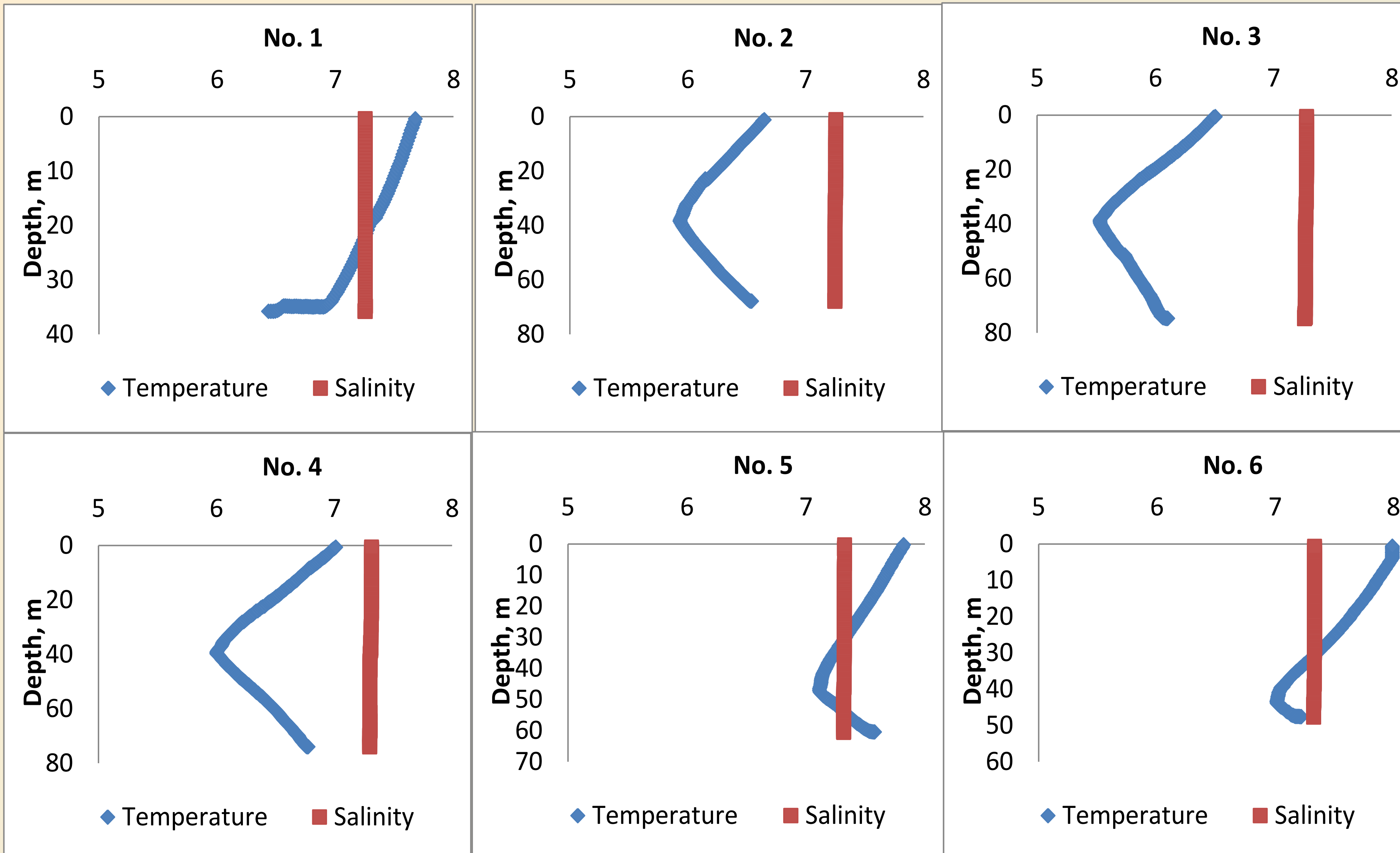
Herring length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 21-22 November, 2014
R/V "DARIUS"

Hydrological data

(R/V"DARIUS" 21-22. 11.2014)



BITS 2015 Q1

(R/V"DARIUS" 24-25. 03.2015)

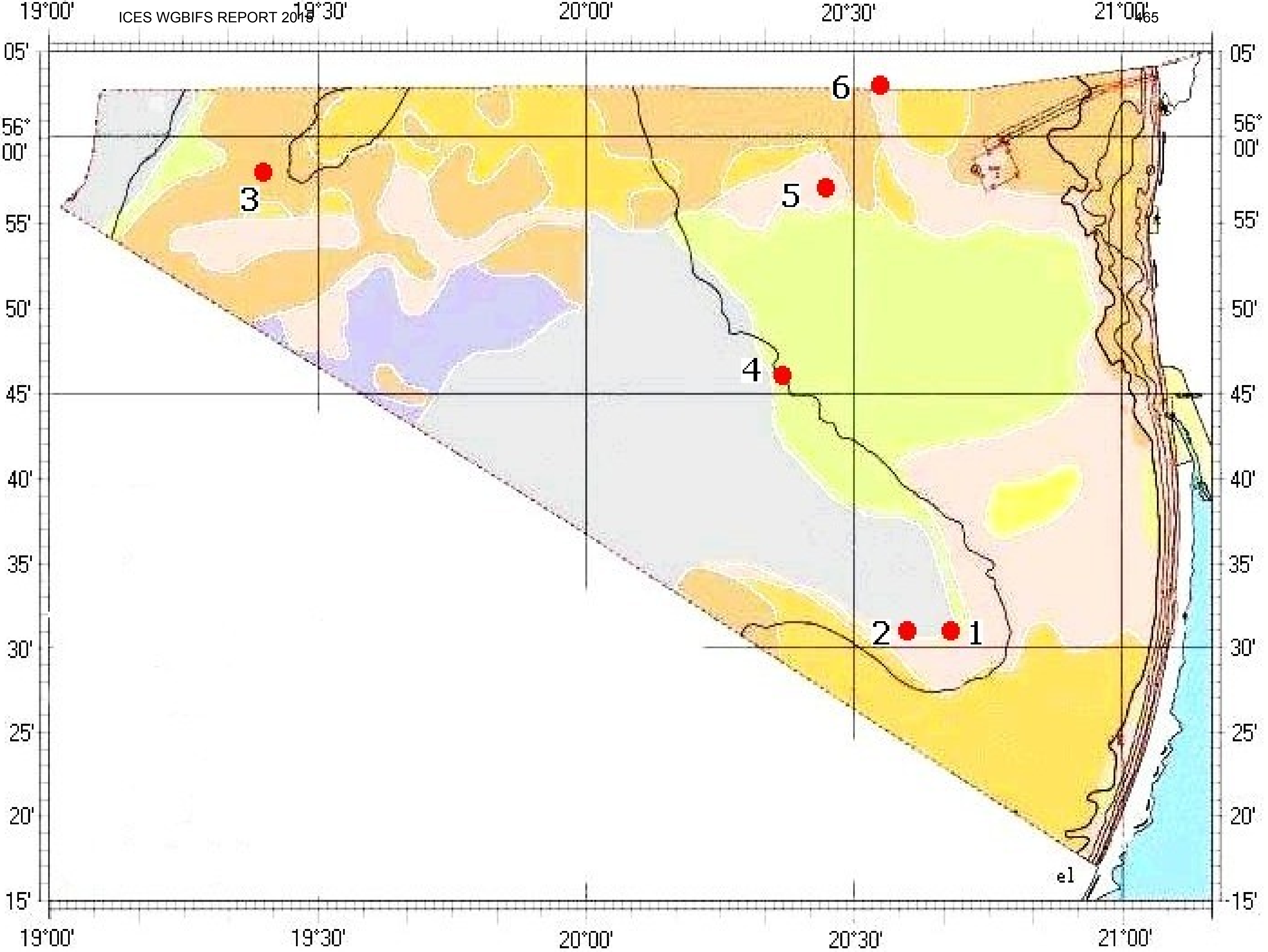
During survey was made six trawls and six hydrological station.

Trawling was done with the standard trawl TV3/520.

Seabird SBE 19plus v2 was used for hydrological data

The duration of the hauls was 30 minutes and the velocity was 3 knots. The total catch of each haul was analyzed to determine the species composition in weight and number as well as the distribution of length among all species.

Sub-samples of cod, flatfishes were investigated concerning sex, maturity and age.


19°00'
19°30'
20°00'
20°30'
21°00'
05'
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40'
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25'
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15'
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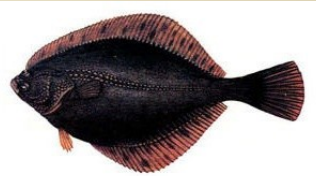
BITS (2015 Q1) RESULTS:

Fish catches and biological data

Haul number according to TD data	Catch date	The ICES rectangle and subdivision	Trawling depth (m)	Total CPUE (kg/h)	CPUE per species (kg/h)				
					Cod	Flounder	Herring	Turbot	Others
26153	24.02.2015	40H0(26)	64	266.68	105.2	111.9	46.4	0	3.3
26052	24.02.2015	40H0(26)	66	119.02	16.1	103.3	0.2	0	0.4
26060	24.02.2015	40G9(26)	76	42.06	9.2	18.6	14.3	0	0
26205	25.02.2015	40H0(26)	54	510.29	367.4	76.3	65.3	0.3	1.0
26134	25.02.2015	40H0(26)	36	439.82	87.6	108.5	238.7	0.2	8.8
26011	25.02.2015	41H0(26)	34	316.59	13.8	59	240	0.2	3.6
Mean					99.9	79.6	100.8	0.2	2.8

36,6%

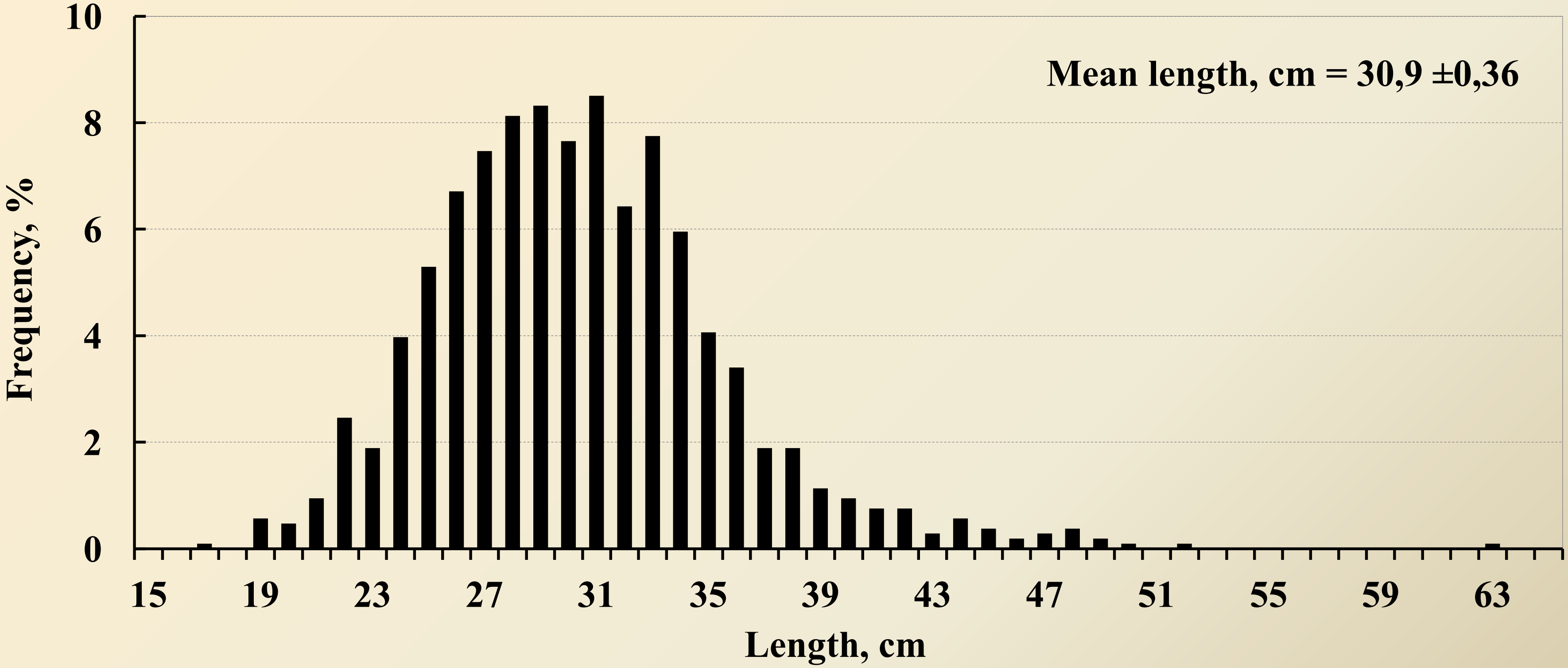
35,3%



28,1%

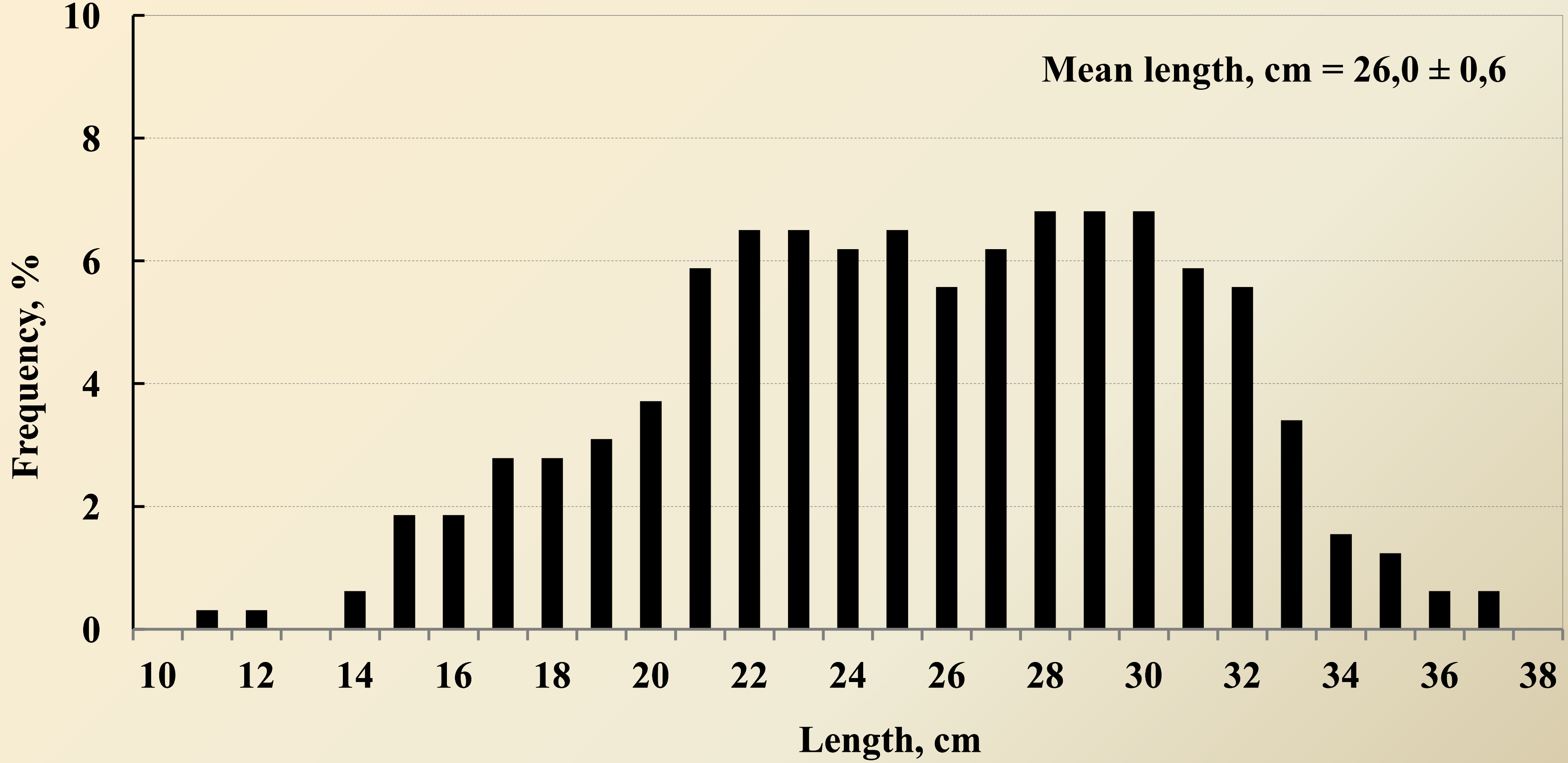
	Haul Nr.	Cod	Flounder	Sprat	Herring	Other
Length data	1	393	322	113	851	2
	2	30	290	5	6	2
	3	8	58	0	114	0
	4	480	214		256	7
	5	186	366	218	369	14
	6	22	233	6	401	21
Age data		256	323			3

Baltic cod length distribution in samples from the ICES Sub-division 26 (LEEZ)



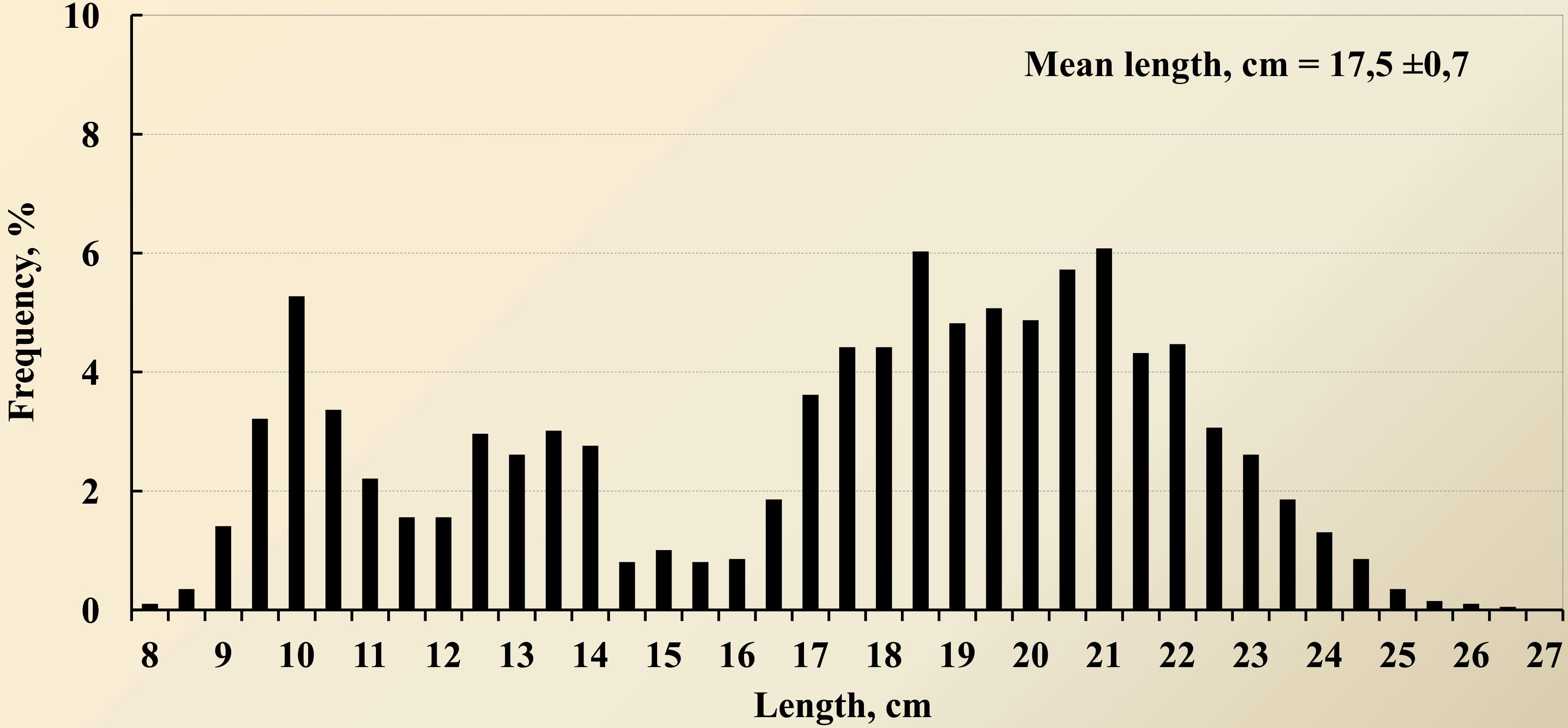
BITS , 24-25 March, 2015
R/V "DARIUS"

Flounder length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 24-25 March, 2015
R/V "DARIUS"

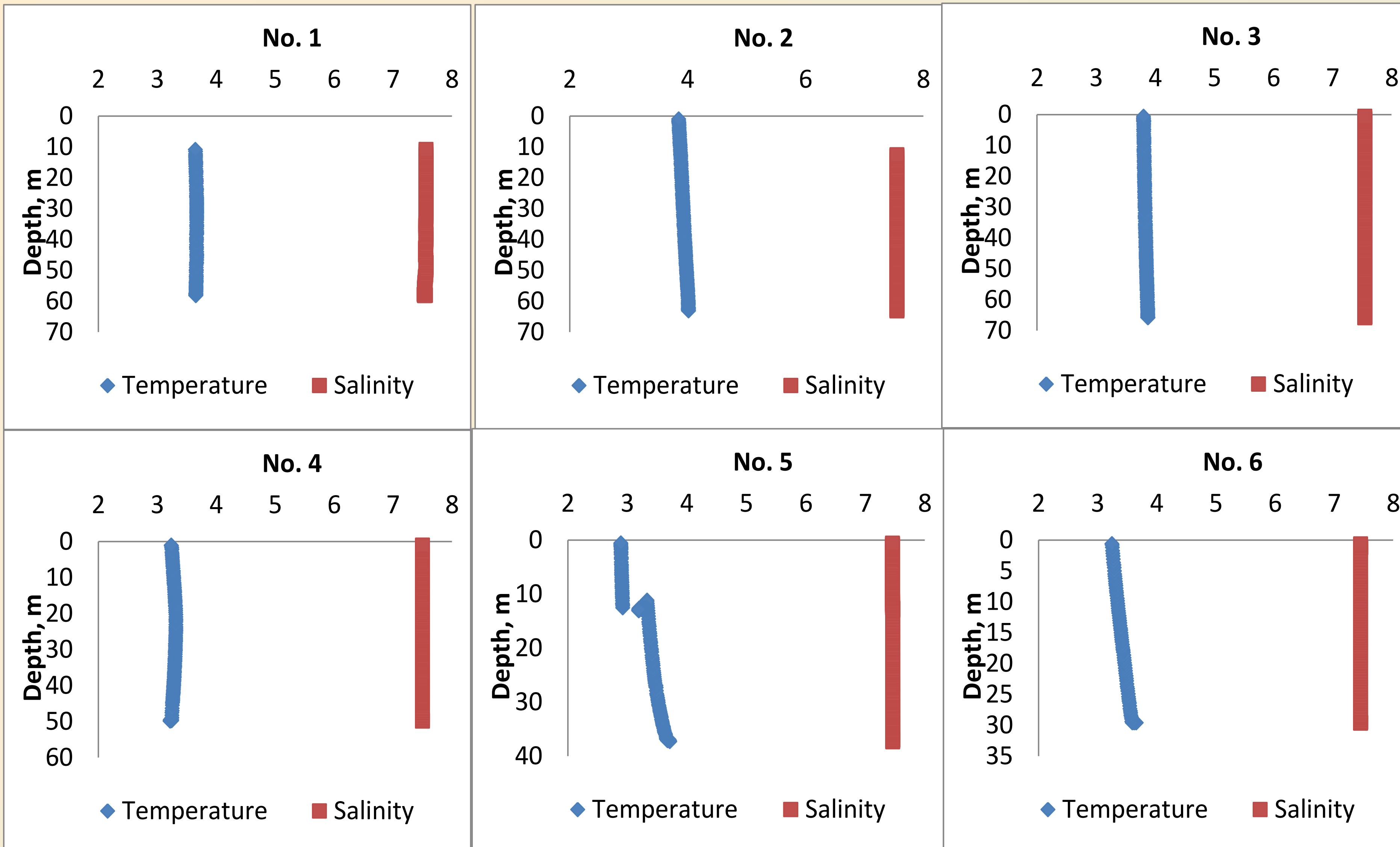
Herring length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 24-25 March, 2015
R/V "DARIUS"

Hydrological data

(R/V"DARIUS" 24-25. 03.2015)



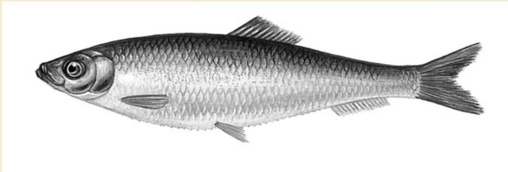

THANKS FOR ATTENTION!

**Fisheries Service under the Ministry of Agriculture of Republic of Lithuania,
Fishery Research and Science State**

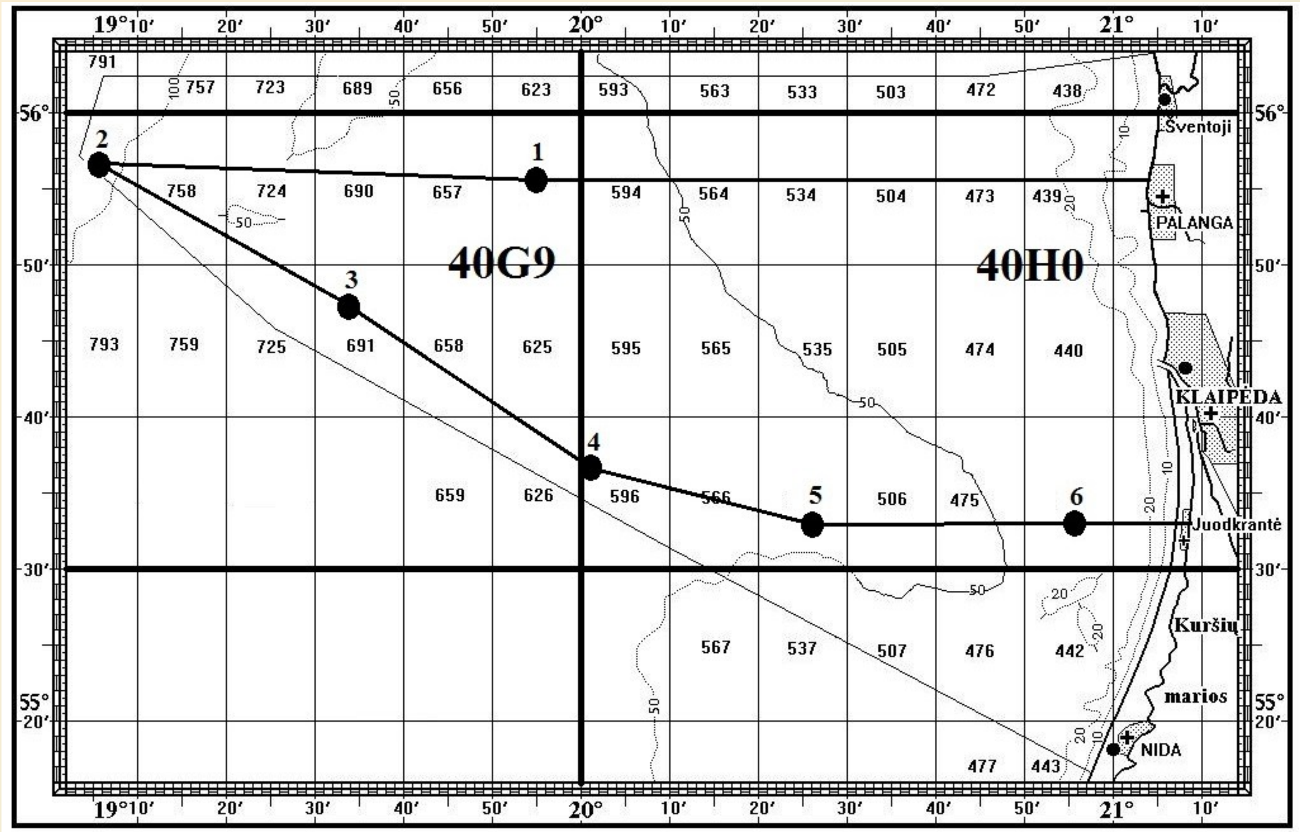
BALTIC INTERNATIONAL ACOUSTIC SURVEYS (BASS, BIAS) IN THE LITHUANIAN ESPECIAL ECONOMIC ZONE OF THE BALTIC SEA

WGBIFS, 2015

BASS
(R/V"DARIUS" 19-20. 05.2014)



Research vessel: "Darius"
Data: 19-20 May 2014



Survey area: ICES SD.26,
40H0 – 1012,1 nm^2
40G9 – 1013,0 nm^2

Hauls (CTD casts):
40H0 - 3 (3)
40G9 - 3 (3)
Total: 6 (6)

Personnel:
M. Špegys – cruise leader and acoustics;
E. Fedotova – scientific leader and fish sampling

BASS RESULTS:

Fish catches and biological data

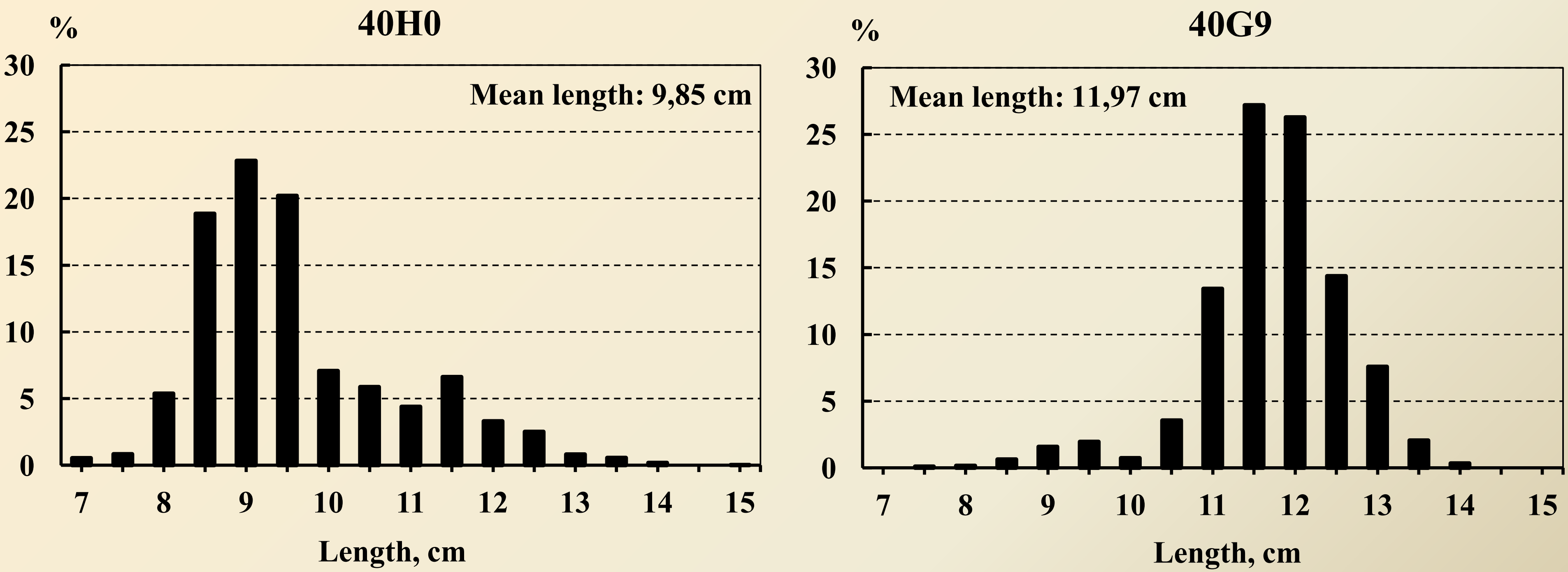
- **CPUE (kg/0,5 hour)**

ICES subdivision 26						
Haul No	**1**	**2**	**3**	**4**	**5**	**6**
Date	**2014.05.19**	**2014.05.19**	**2014.05.20**	**2014.05.20**	**2014.05.20**	**2014.05.20**
Validity	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**
Species/ICES rectangle	**40G9**	**40G9**	**40G9**	**40H0**	**40H0**	**40H0**
CLUPEA HARENGUS	**73,8**		**2,4**	**7,1**	**19,1**	**2,6**
SPRATTUS SPRATTUS	**46,5**	**180,0**	**444,4**	**261,8**	**780,9**	**18,3**
GADUS MORHUA			**1,6**	**1,0**		**1,0**
PLATICHTIS FLESUS			**1,7**			
Total	**120,0**	**180,0**	**450,0**	**270,0**	**800,0**	**21,9**

94,02%

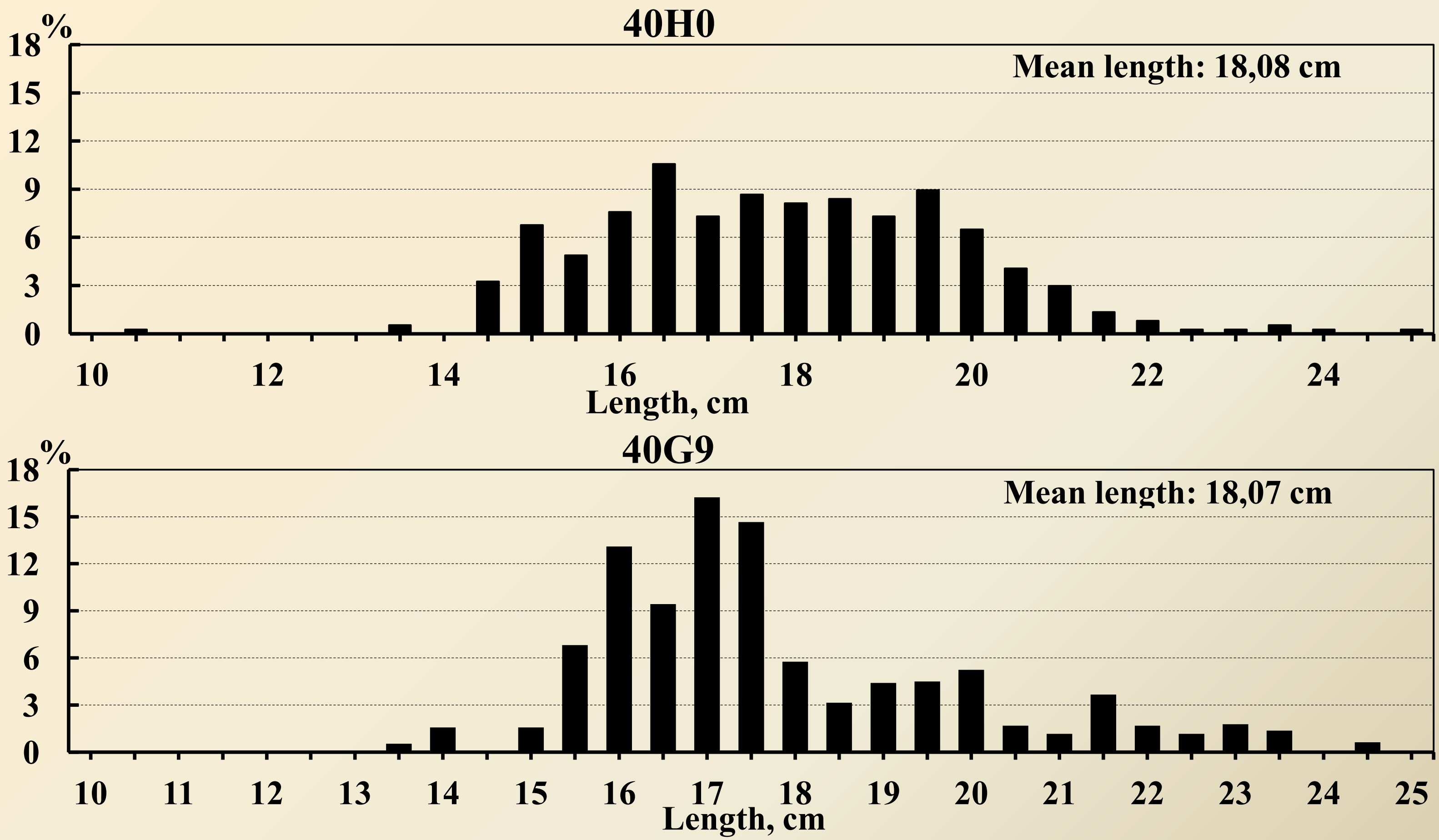
5,70%

Sprat length frequency distribution by BASS results in the ICES rectangles 40HO and 40G9



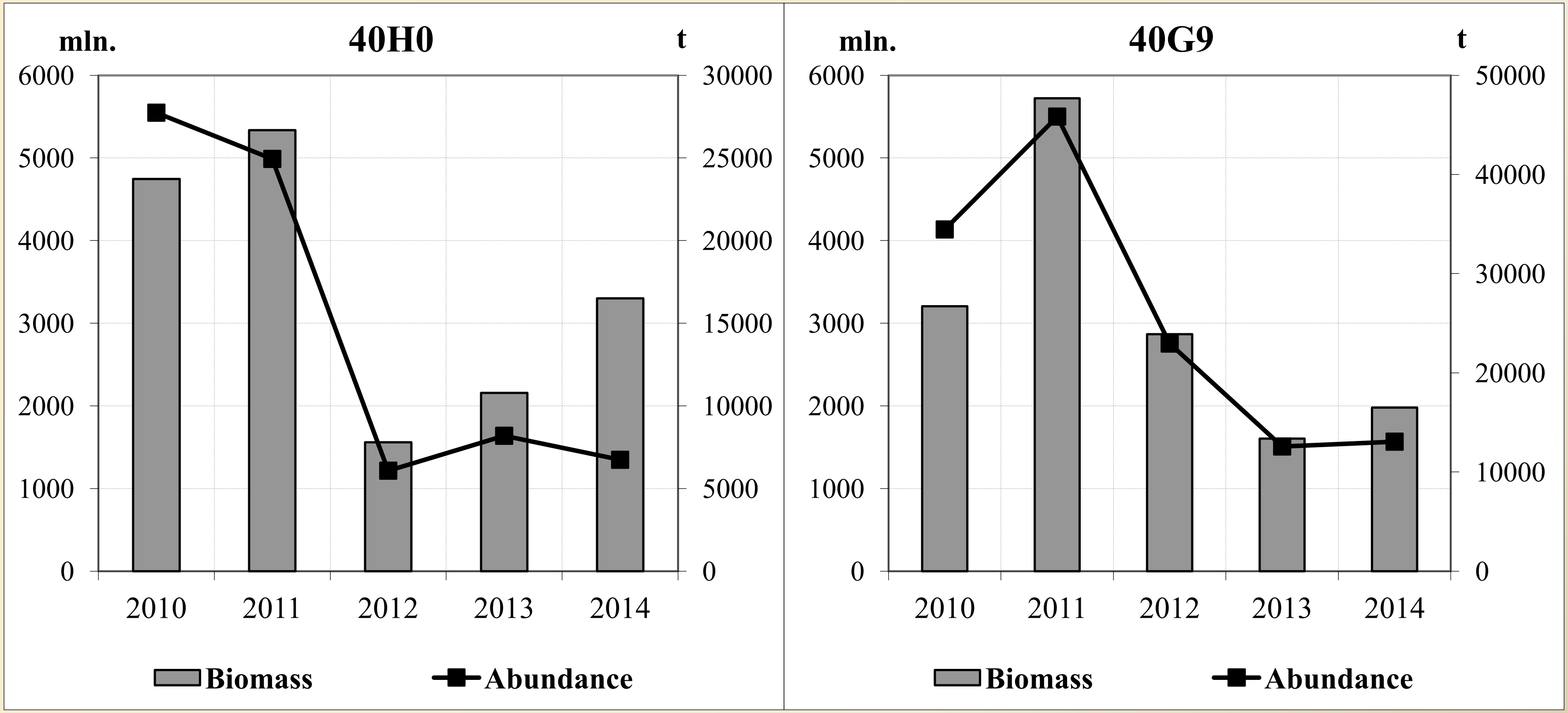
BASS , 19-20 May, 2014
R/V "DARIUS"

Herring length frequency distribution according to the 40HO and 40G9 rectangles



BASS , 19-20 May, 2014
R/V "DARIUS"

Sprat abundance and biomass by BASS results in rectangles 40H0 and 40G9 in 2010-2014



TOTAL	Abundance	Biomass
2011	10488,9	74367
2012	3969,6	31703
2013	3146,2	24140
2014	2914,2	33010

	Abundance	Biomass
2013-2014	-7,4	+36,7

BIAS

(R/V"DARIUS" 02-03. 10.2014)

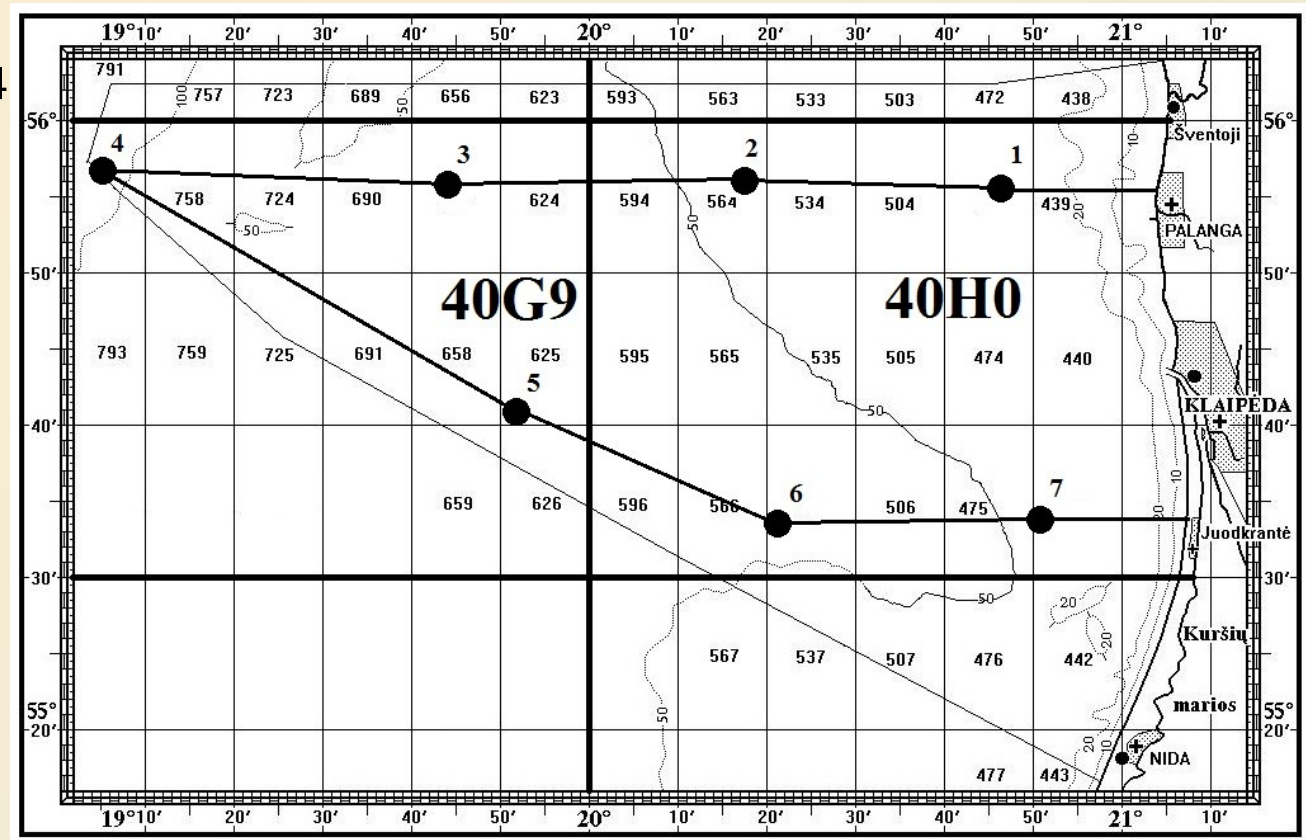
Research vessel: "Darius"

Data: 02-03 October 2014

Survey area: ICES SD.26,

40H0 – 1012,1 nm^2

40G9 – 1013,0 nm^2



Hauls (CTD casts):

40H0 - 4(4)

40G9 - 3(3)

Total: 7(7)

Personnel:

M.Špegys – cruise leader and acoustics;

E.Fedotova – scientific leader and fish sampling

BIAS RESULTS:

Fish catches and biological data

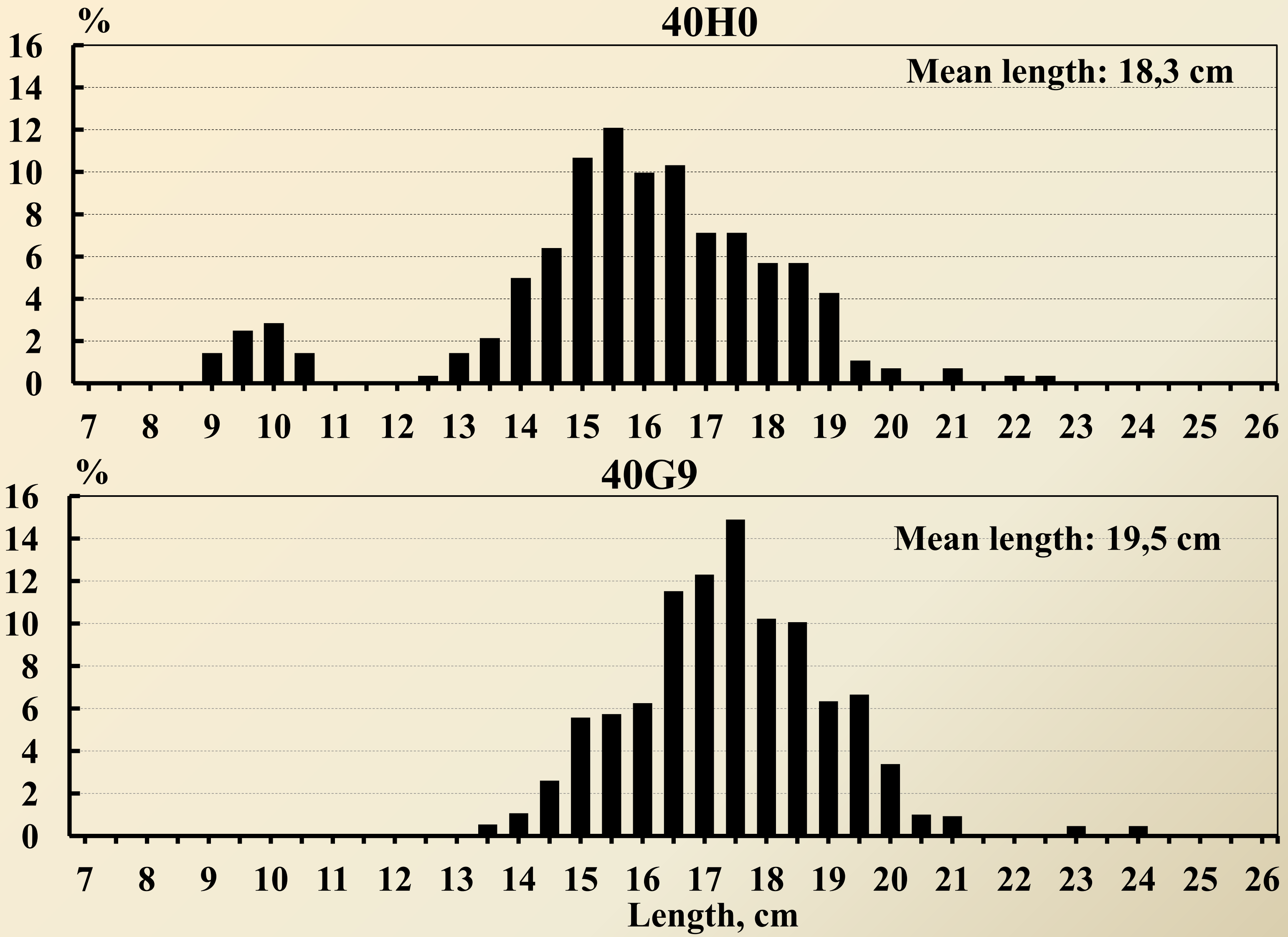
- **CPUE (kg/0,5 hour)**

ICES subdivision 26							
Haul No	1	2	3	4	5	6	7
Date	02.10.2013	02.10.2013	02.10.2013	03.10.2013	03.10.2013	03.10.2013	03.10.2013
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	40H0	40H0	40G9	40G9	40G9	40H0	40H0
CLUPEA HARENGUS		0,8		45,0	298,2	10,6	0,8
SPRATTUS SPRATTUS	100,0	149,2	9,0			1,9	100,0
GADUS MORHUA					1,8	0,7	
GASTEROSTEUS ACULEATUS				0,5			
HYPEROPLUS LANCEOLATUS	0,1						
LAMPETRA FLUVIATILUS	0,1						0,2
Total	100,2	150,0	9,0	45,5	300,0	13,1	101,0

50,11%

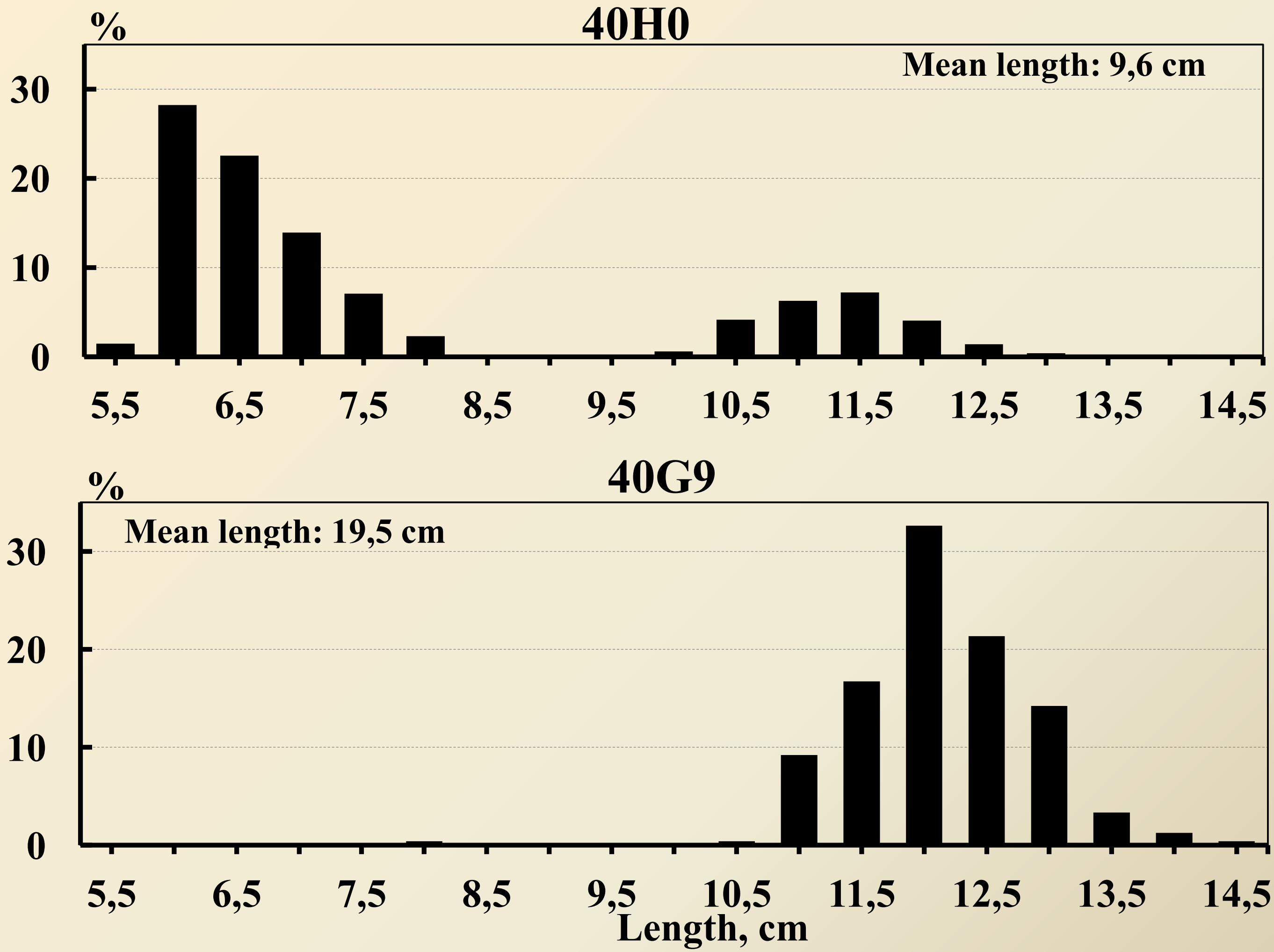
49,46%

Herring length frequency distribution according to the 40HO and 40G9 rectangles



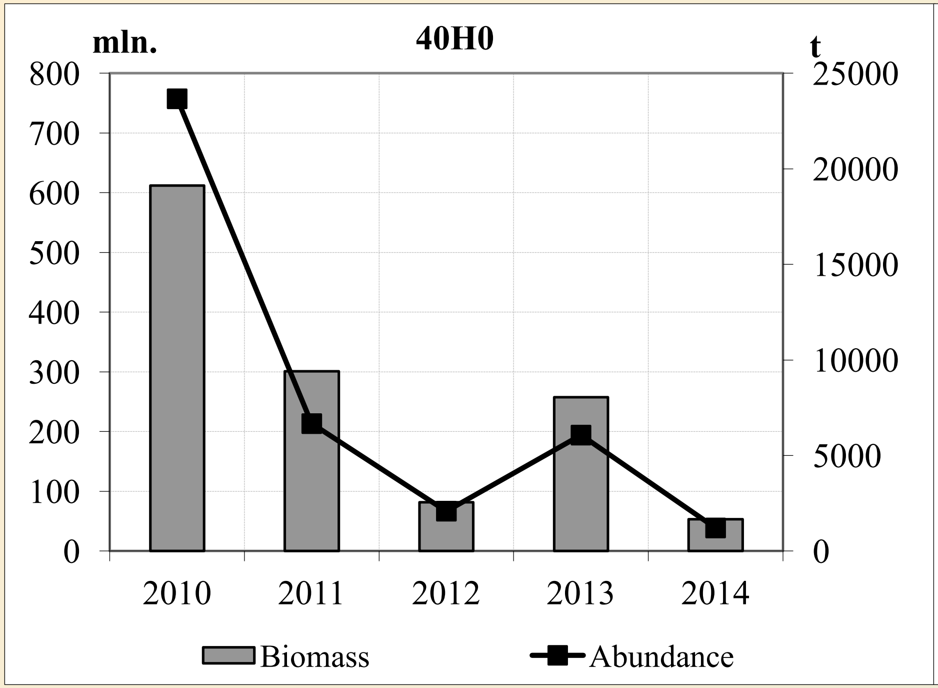
BIAS , 02-03 October, 2014

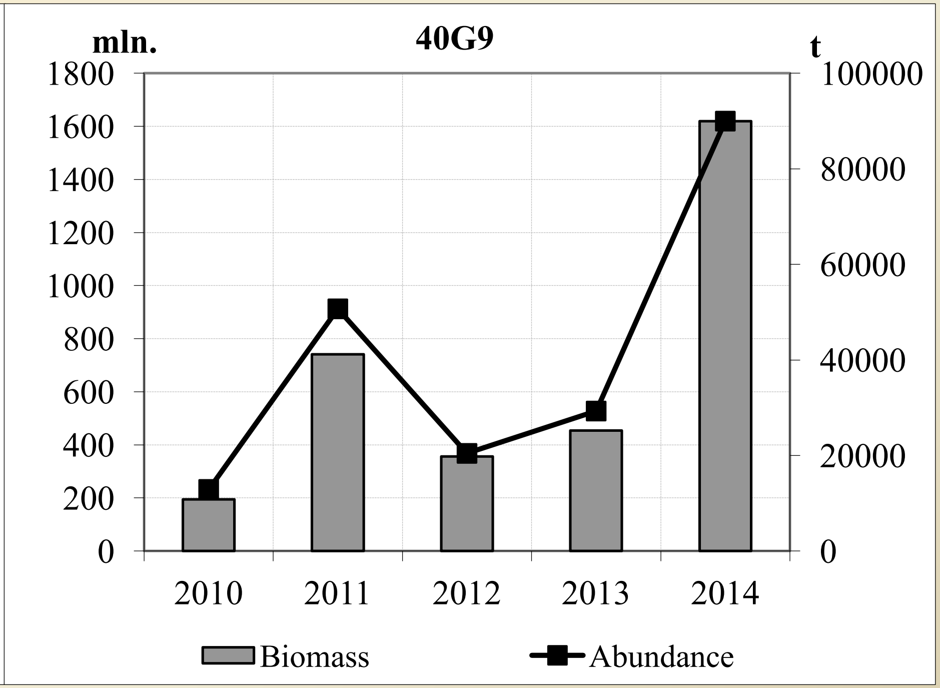
Sprat length frequency distribution by BIAS results in the ICES rectangles 40HO and 40G9



BIAS , 02-03 October, 2014

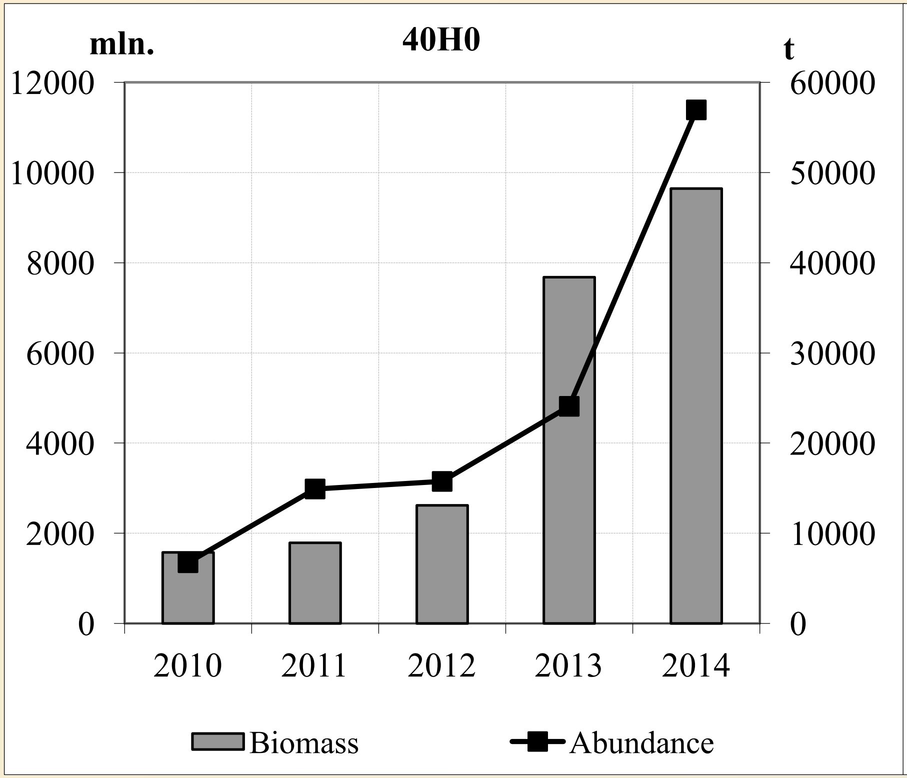
Herring biomass and abundance by BIAS results in ICES rectangles 40H0 and 40G9 (2010-2014)

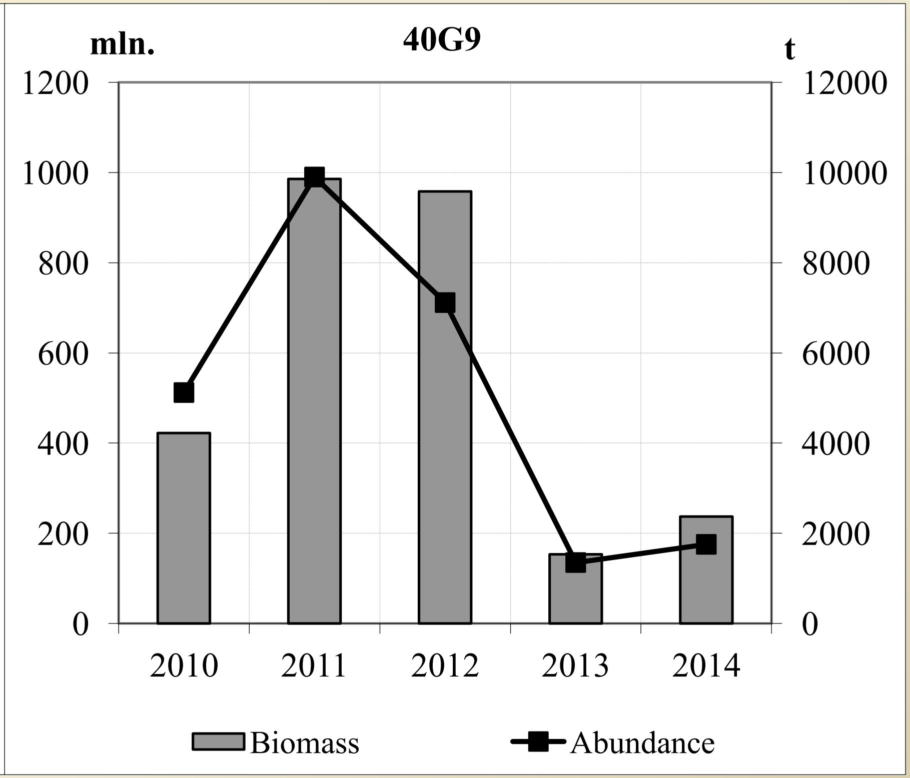




BIAS , 02-03 October, 2014

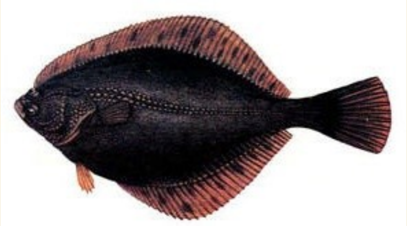
Sprat biomass and abundance by BIAS results in ICES rectangles 40H0 and 40G9 (2010-2014)





BIAS , 02-03 October, 2014

The ratio of species (%) in the catches during the acoustic surveys in 2014

BASS		BIAS
94,02%		50,11%
5,70%		49,46%
0,09%		
0,20%		0,34%
		0,04%
		0,07%
		0,01%


THANKS FOR ATTENTINON!

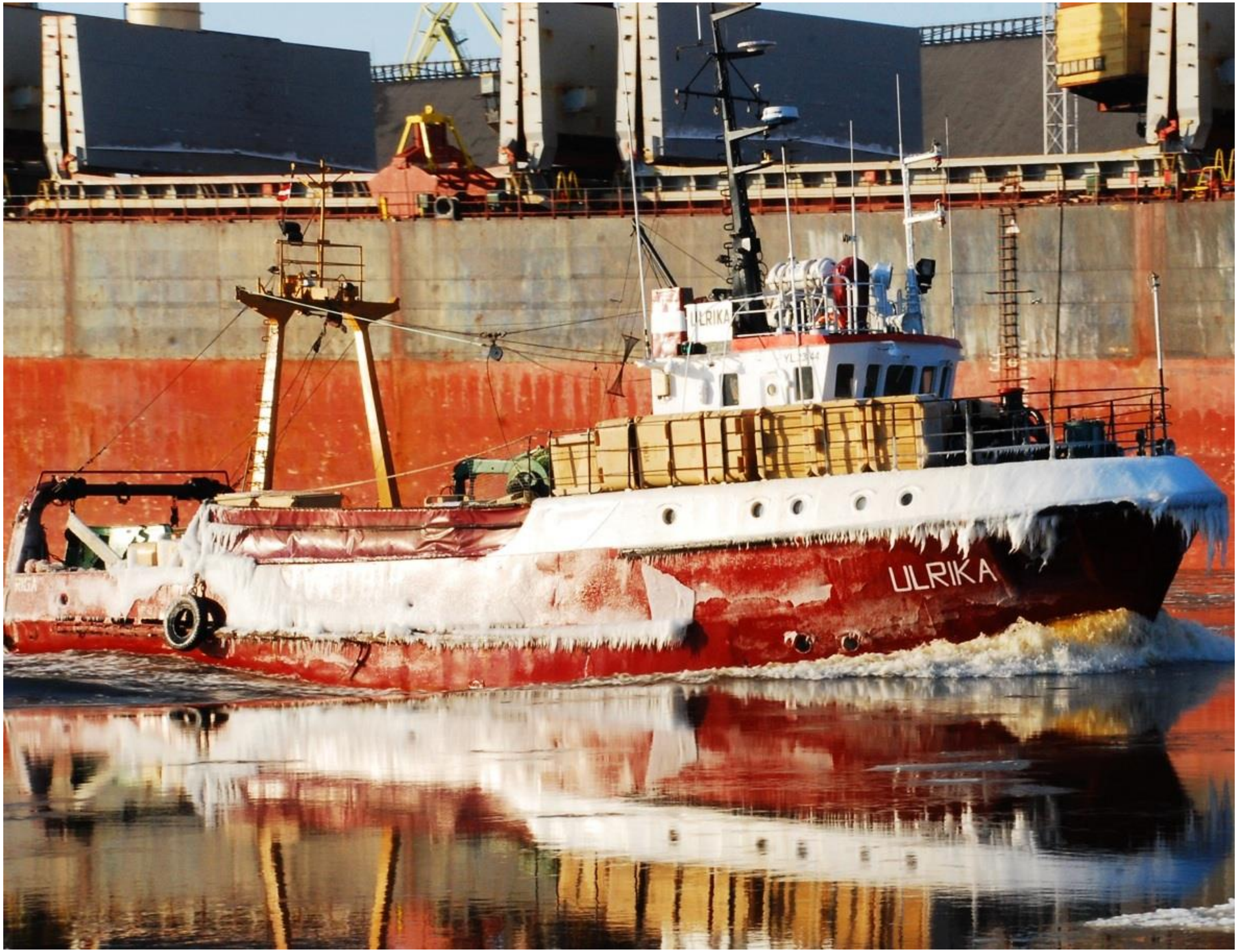
WGBIFS - Öregrund, Sweden, 23-27.03.2015

THE LATVIAN-ESTONIAN JOINT BALTIC ACOUSTIC SPRING SURVEY – BASS 2014 ON THE F/V "ULRIKA" IN THE ICES SUBDIVISIONS 26N, 28, 29 AND 32W OF THE BALTIC SEA (14 – 26 MAY 2014)

BIOR
INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

ESTONIAN MARINE INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015



WGBIFS - Öregrund, Sweden, 23-27.03.2015

Equipment:

BioSonics D-TX echo-sounder 38 kHz

Trawl:

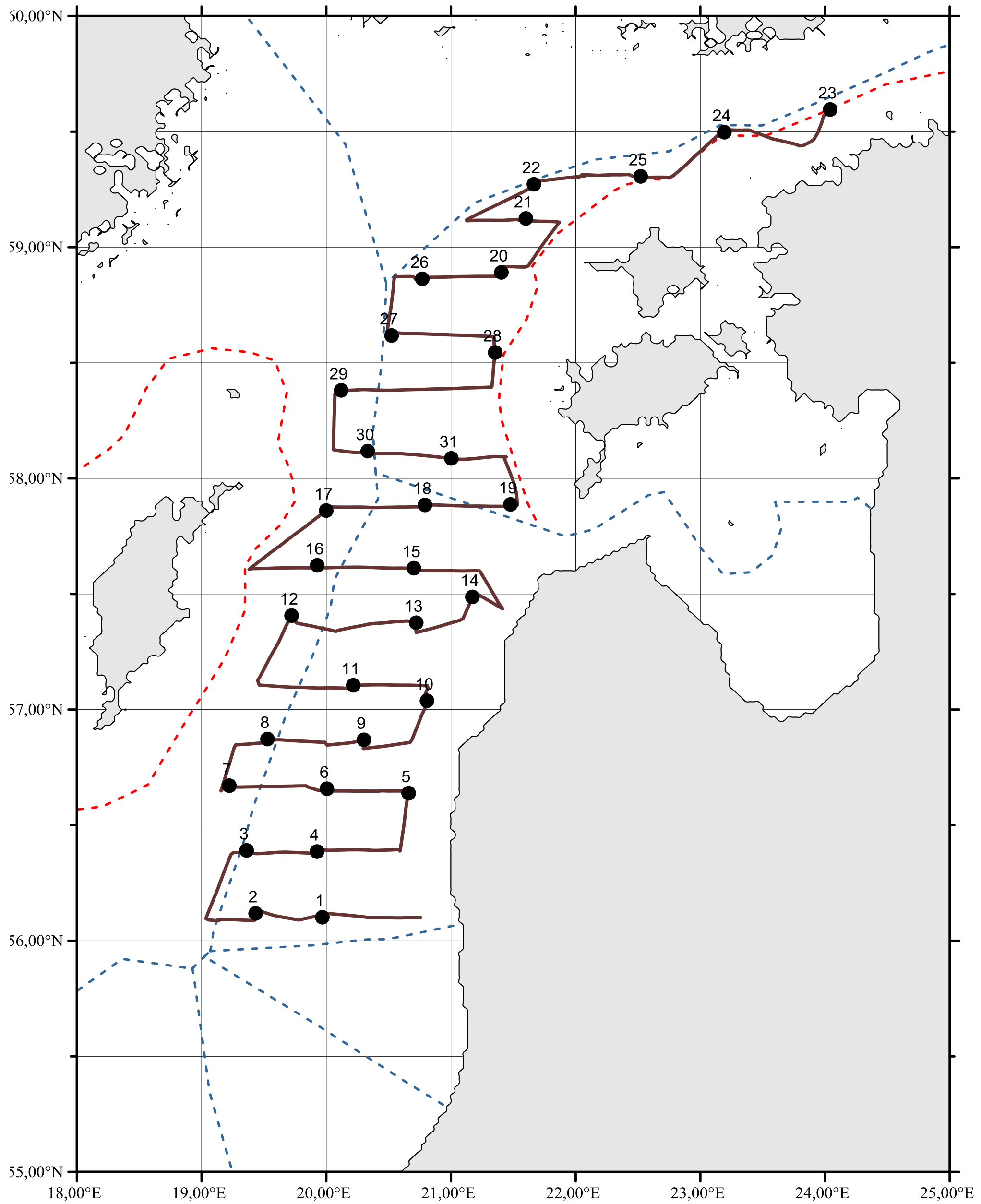
- Vertical opening – 22 m
- Horizontal opening – 83 m
- Mesh size at codend – 10 mm (bar)

Seabird SBE 19plus

Judday net 100 µm mesh

IKS-80 net 500 µm mesh

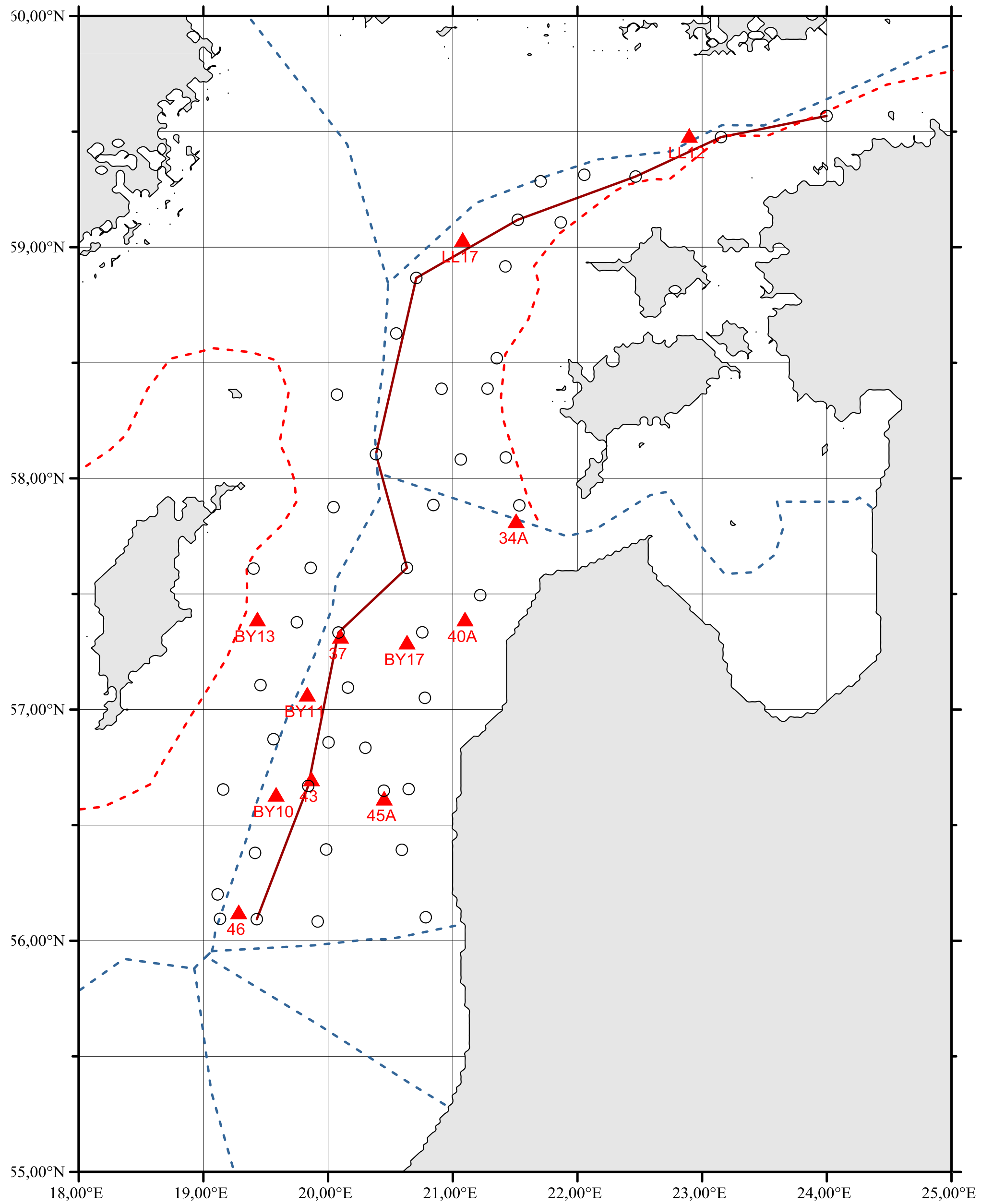
WGBIFS - Öregrund, Sweden, 23-27.03.2015



BIOR
INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

ESTONIAN MARINE INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015



WGBIFS - Öregrund, Sweden, 23-27.03.2015

- Days at sea – 12
- Survey tracks – 925 nm
- Control trawlings - 31
- Hydrological and hydrobiological stations - 45
- Ichthyoplankton samples – 90
- Zooplankton samples - 19

WGBIFS - Öregrund, Sweden, 23-27.03.2015

Totally 8 fish species:

Species	Catch, kg	Measured	Anlyzed
Sprat	13803	6295	2798
Herring	4970	5133	2614
Cod	61	269	
Flounder	29	211	
Stickleback	15	18	
Lumpfish	2	10	
Shorthorn sculpin	<1	1	
Smelt	<1	1	

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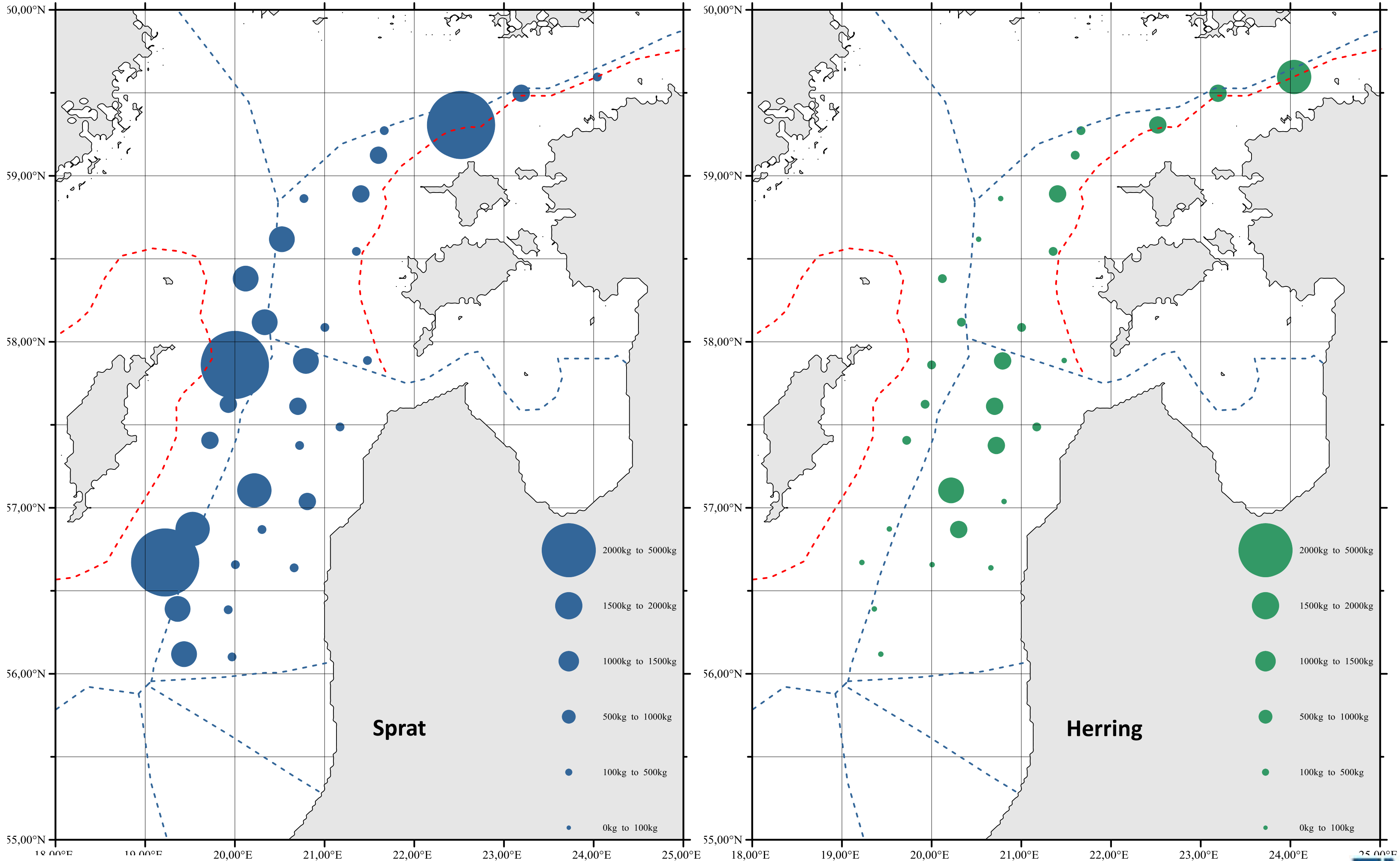
WGBIFS - Öregrund, Sweden, 23-27.03.2015

CPUE, kg/h



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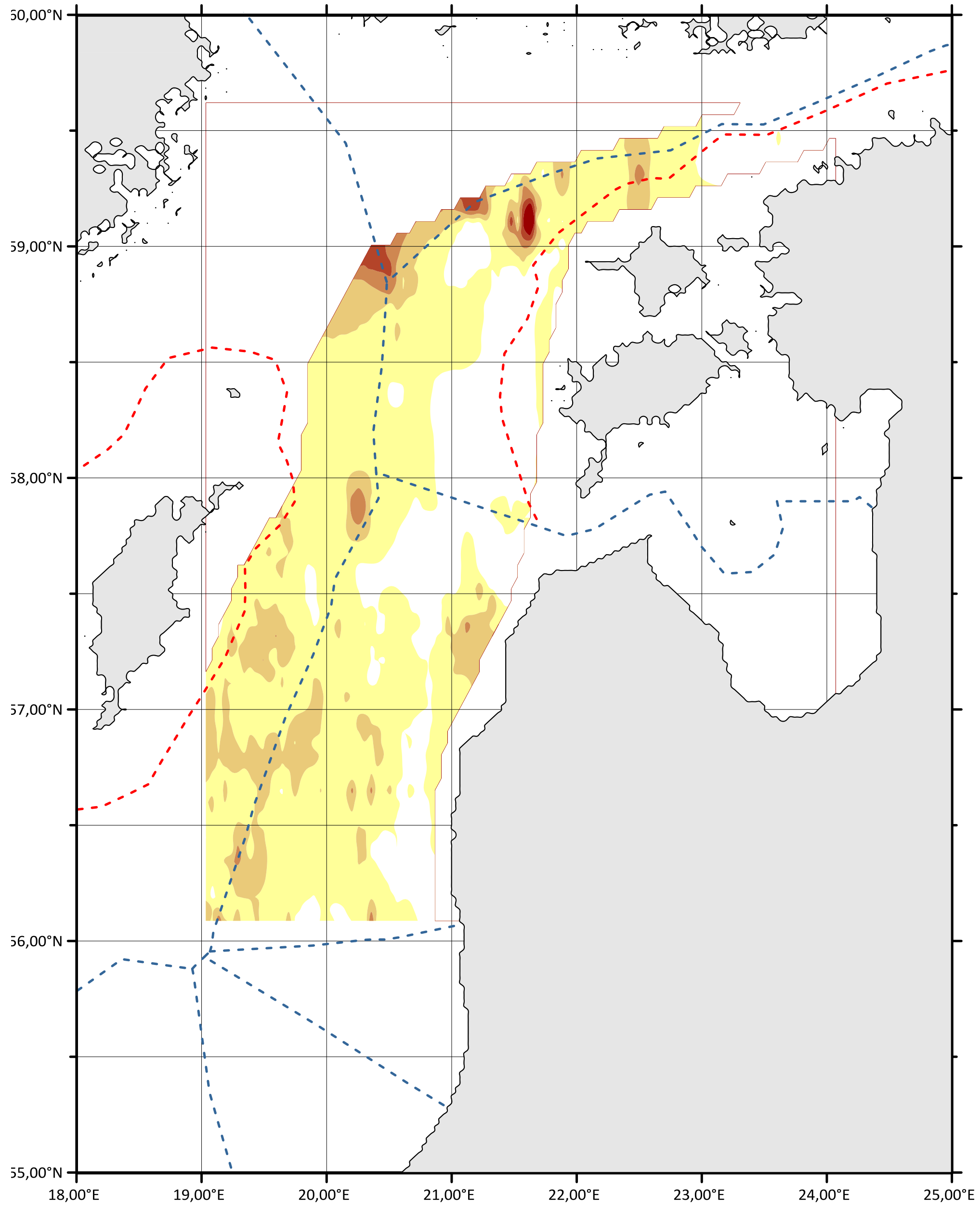
WGBIFS - Öregrund, Sweden, 23-27.03.2015

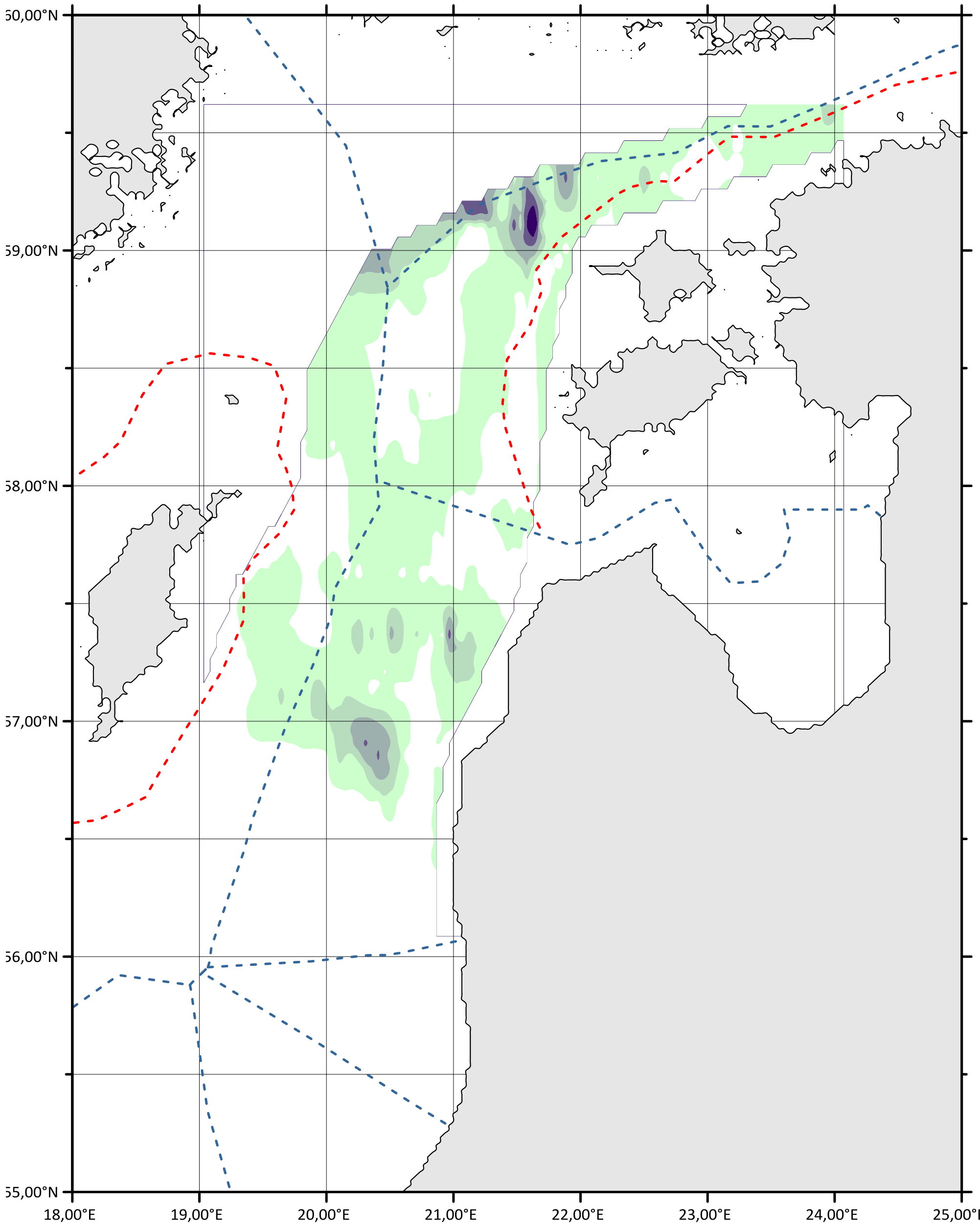
Sprat in May 2014

SD	Abundance	Biomass
26	6327	63204
28	21410	176980
29	13218	103748
32	239	2131
Σ	41194	346063



ICES CIEM

WGBIFS - Öregrund, Sweden, 23-27.03.2015



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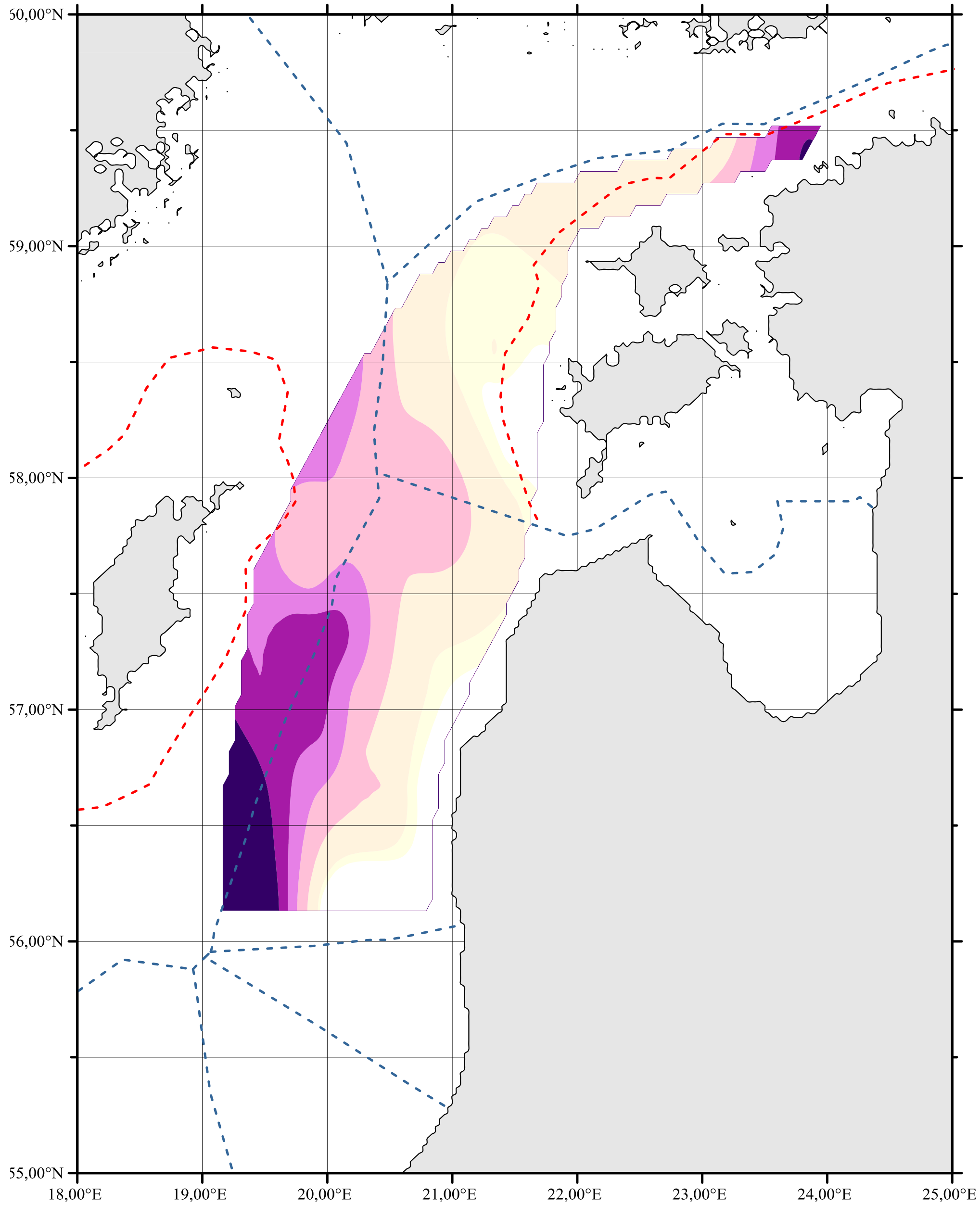
ESTONIAN MARINE INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015



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ESTONIAN MARINE INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015

THE JOINT LATVIAN-POLISH BALTIC INTERNATIONAL ACOUSTIC SURVEY – BIAS 2013 ON THE R/V “BALTICA” IN THE ICES SUBDIVISIONS 26N AND 28.2 OF THE BALTIC SEA (09-18 October 2014)

BIOR
INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015

WGBIFS - Öregrund, Sweden, 23-27.03.2015

Equipment:

SIMRAD EK-60 38 & 120 kHz

Trawl – WP53/64×4:

- Vertical opening – 20 m
- Horizontal opening – 70 m
- Mesh size at codend – 6 mm (bar)

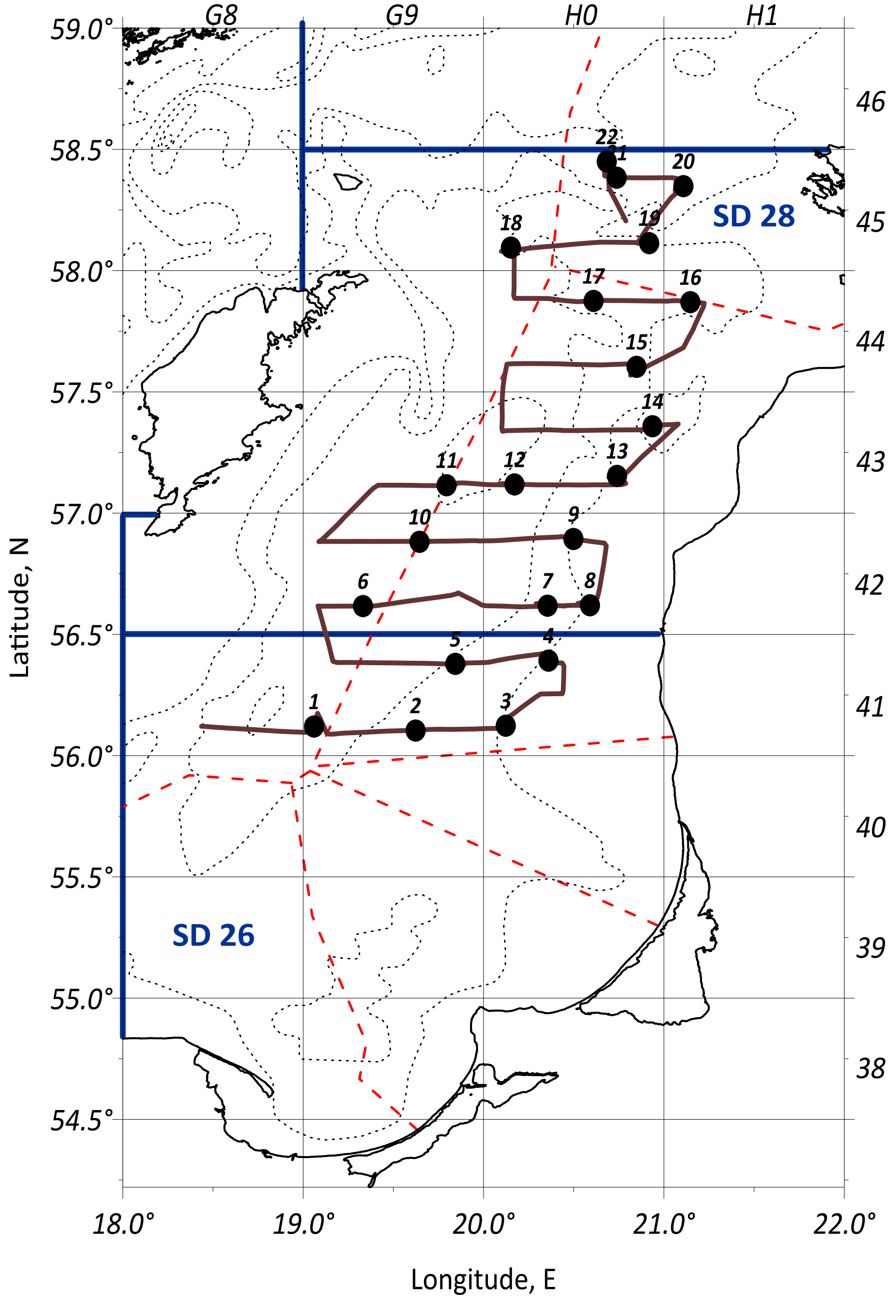
Neil-Brown CTD & bathometer rosette

Judday net 100 µm mesh

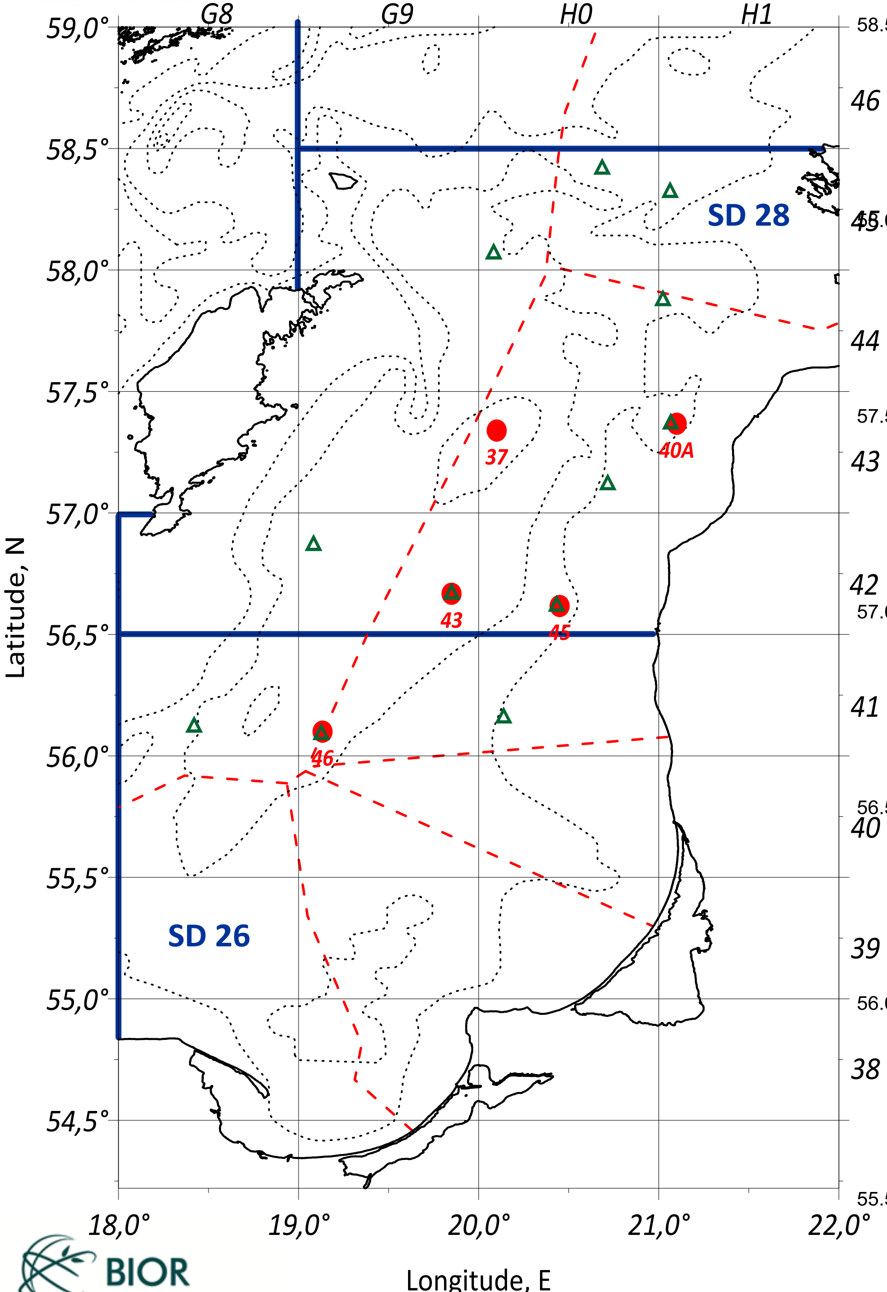
BIOR INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

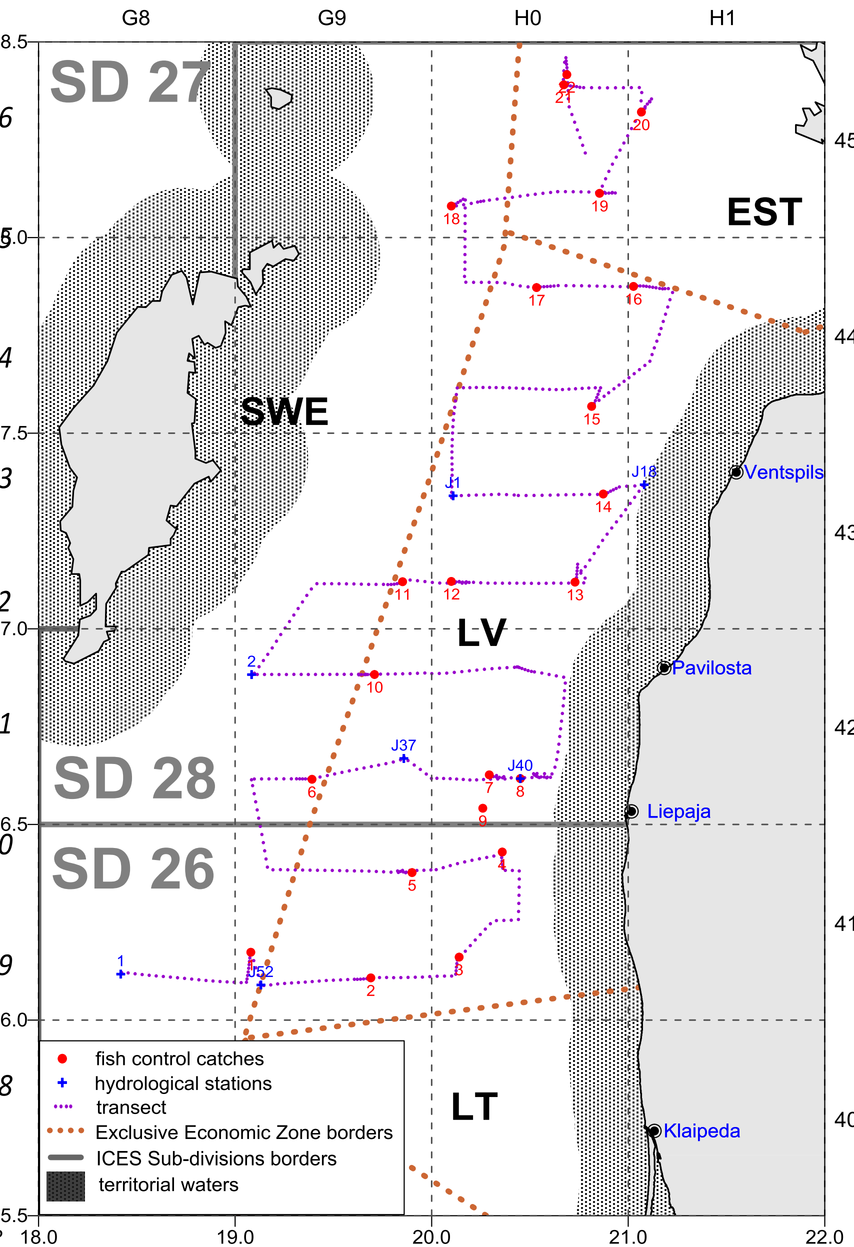
MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015



WGBIFS - Öregrund, Sweden, 23-27.03.2015





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MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

WGBIFS - Öregrund, Sweden, 23-27.03.2015

- Days at sea – 10
- Survey tracks – 625 nm
- Control trawlings - 22
- Hydrological and hydrobiological stations - 28
- Zooplankton samples - 12

WGBIFS - Öregrund, Sweden, 23-27.03.2015

Fish species	Number of measured individuals			Number of aged individuals		
	SD 26	SD 28	Total	SD 26	SD 28	Total
Sprat (all)	582	2245	2827	296	855	977
Sprat (yearclass 0)	568	1327	1895	122	314	436
Herring (all)	313	1914	2227	138	822	960
Herring (GoR pop.)	21	312	333	10	159	169
Cod		20	20			
Flounder	1	4	5			
Lumpfish	4	15	19			
Stickleback	59	523	582			
River lamprey	1		1			
Greater sandeel		1	1			
Total	1549	6361	7910	566	2150	2542

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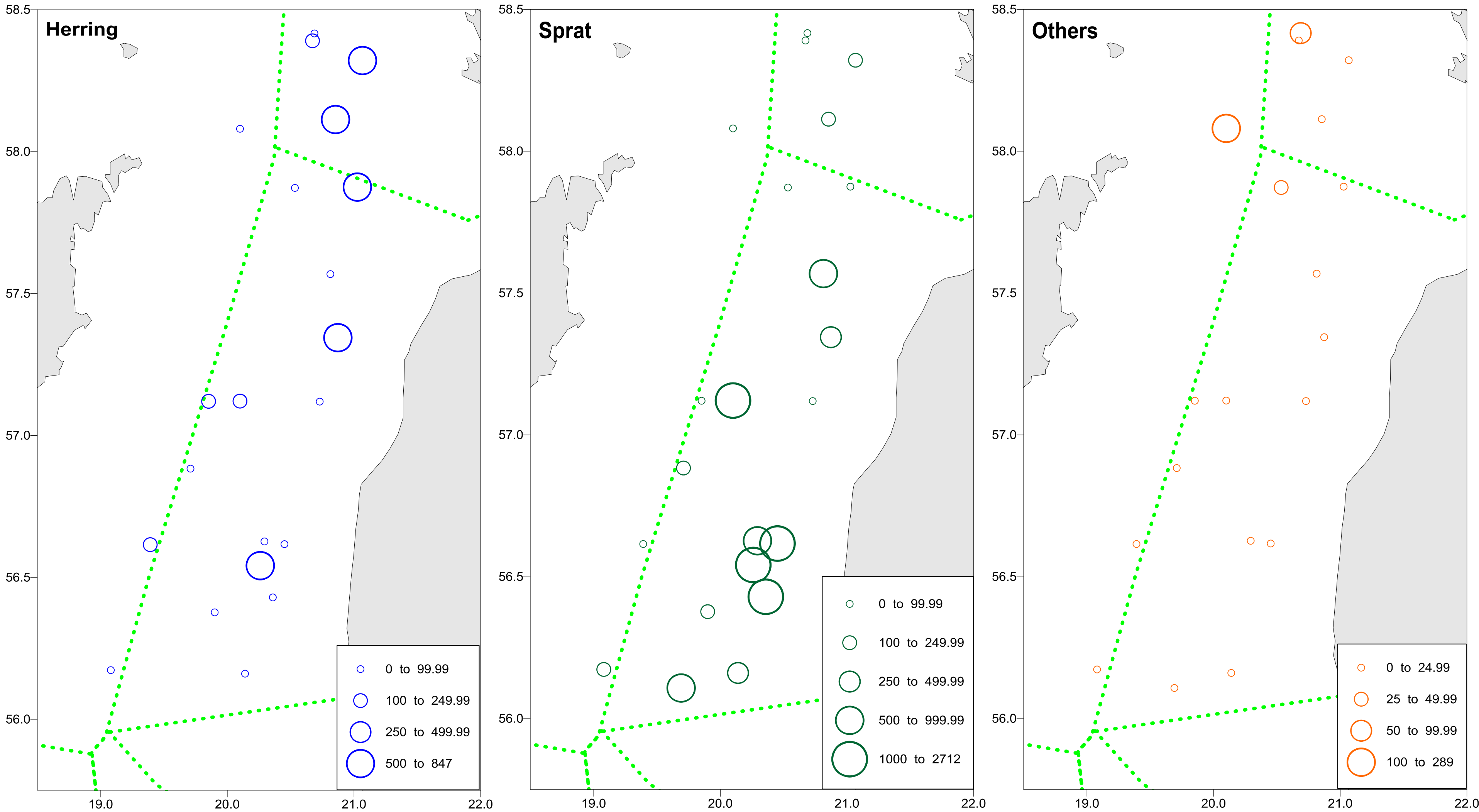
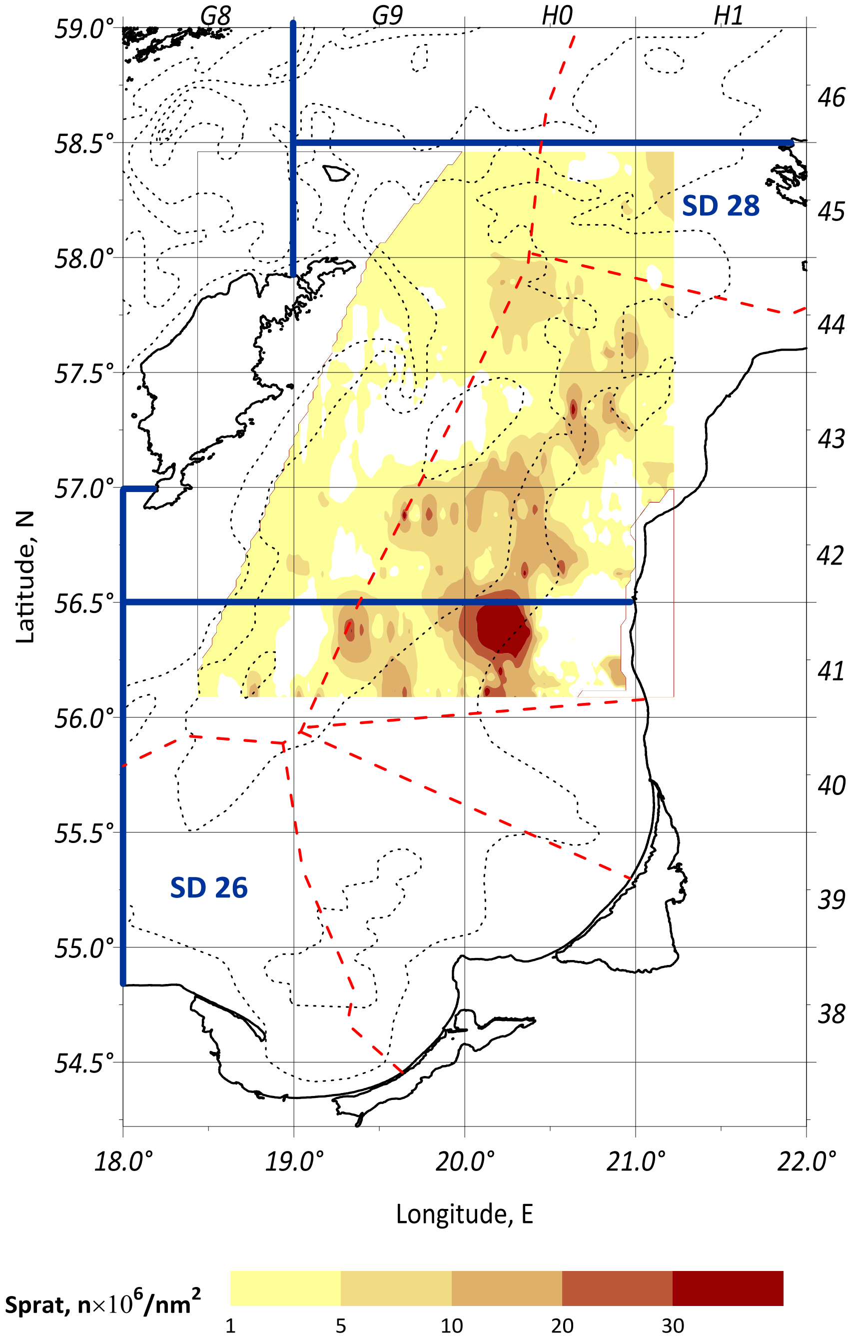
MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

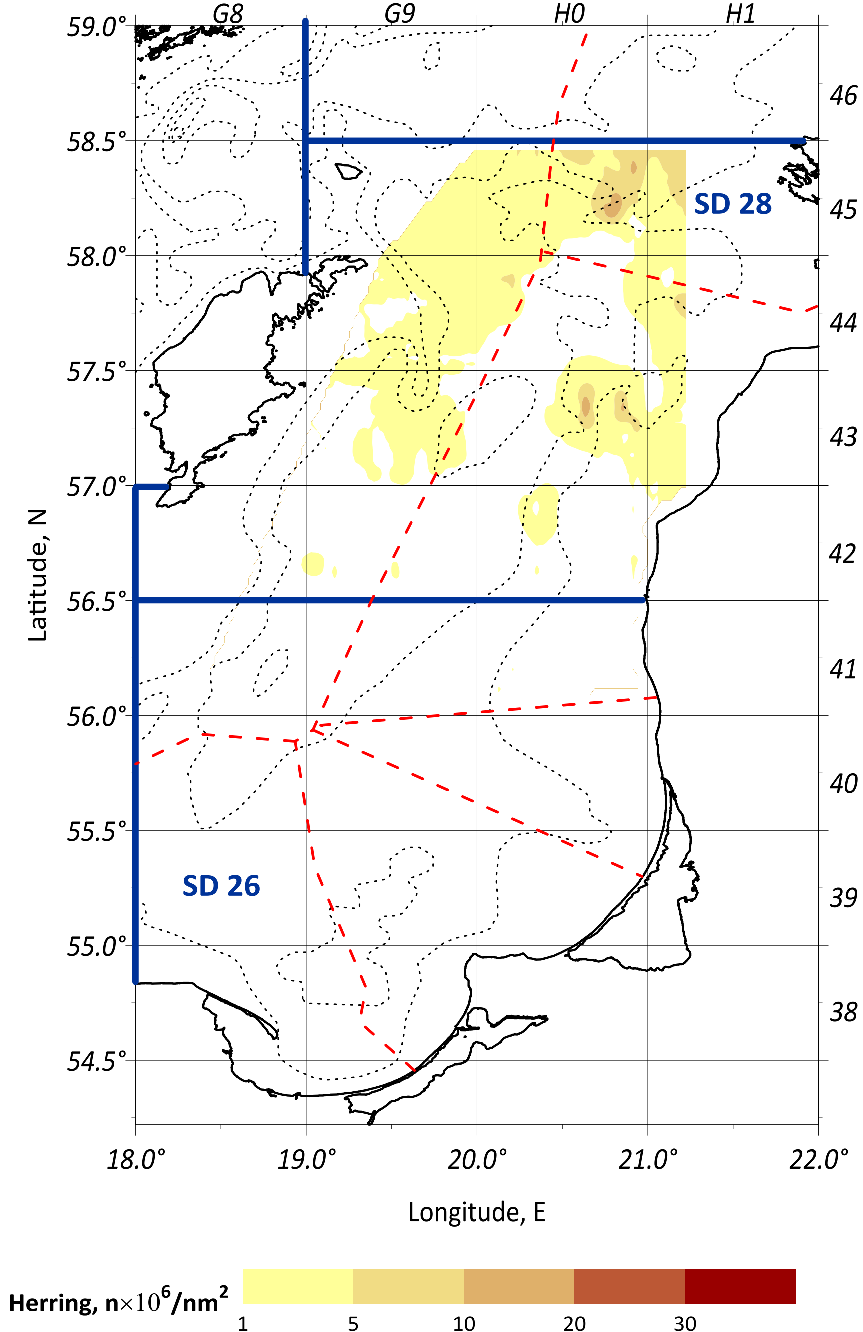
WGBIFS - Öregrund, Sweden, 23-27.03.2015



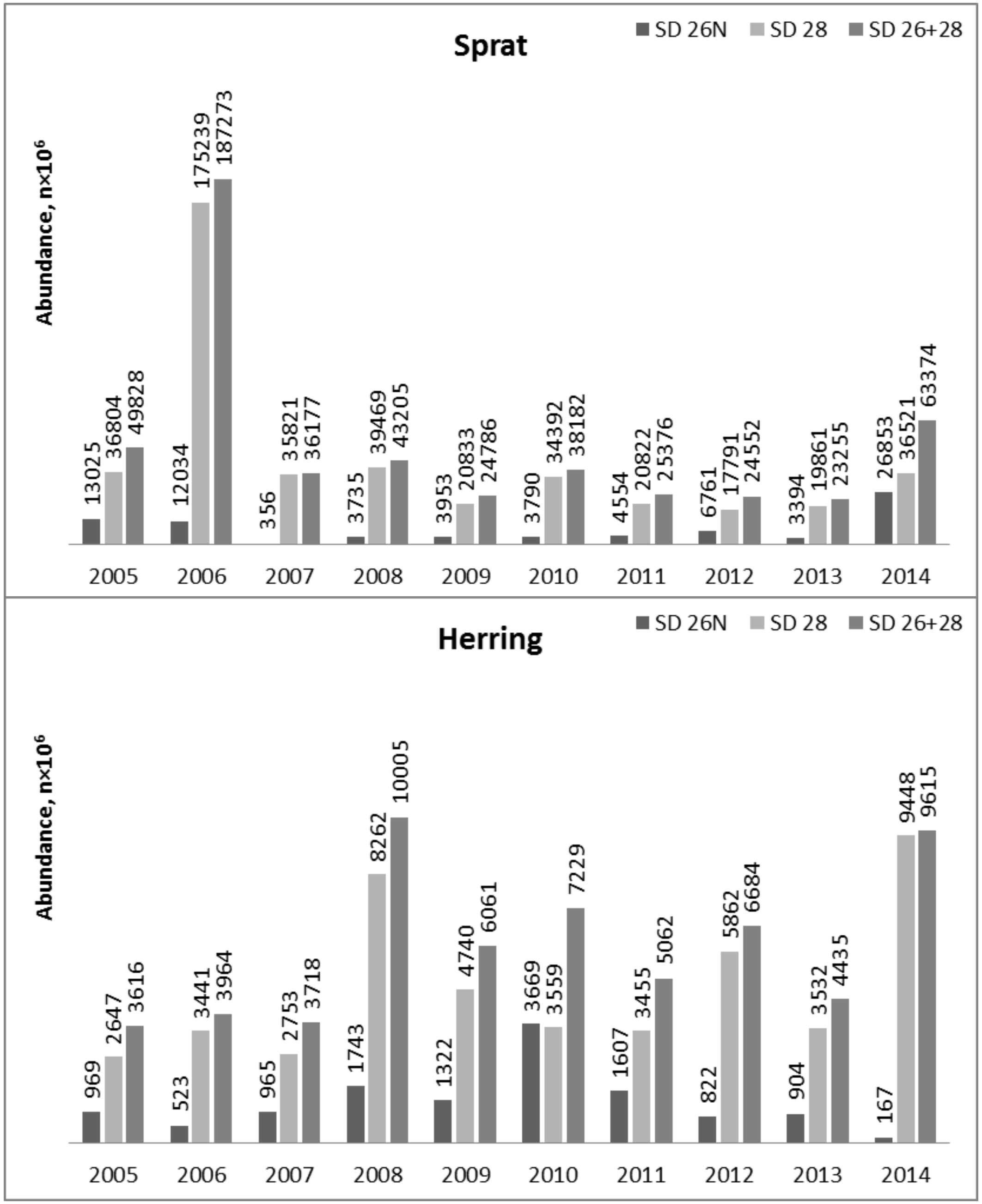
WGBIFS - Öregrund, Sweden, 23-27.03.2015



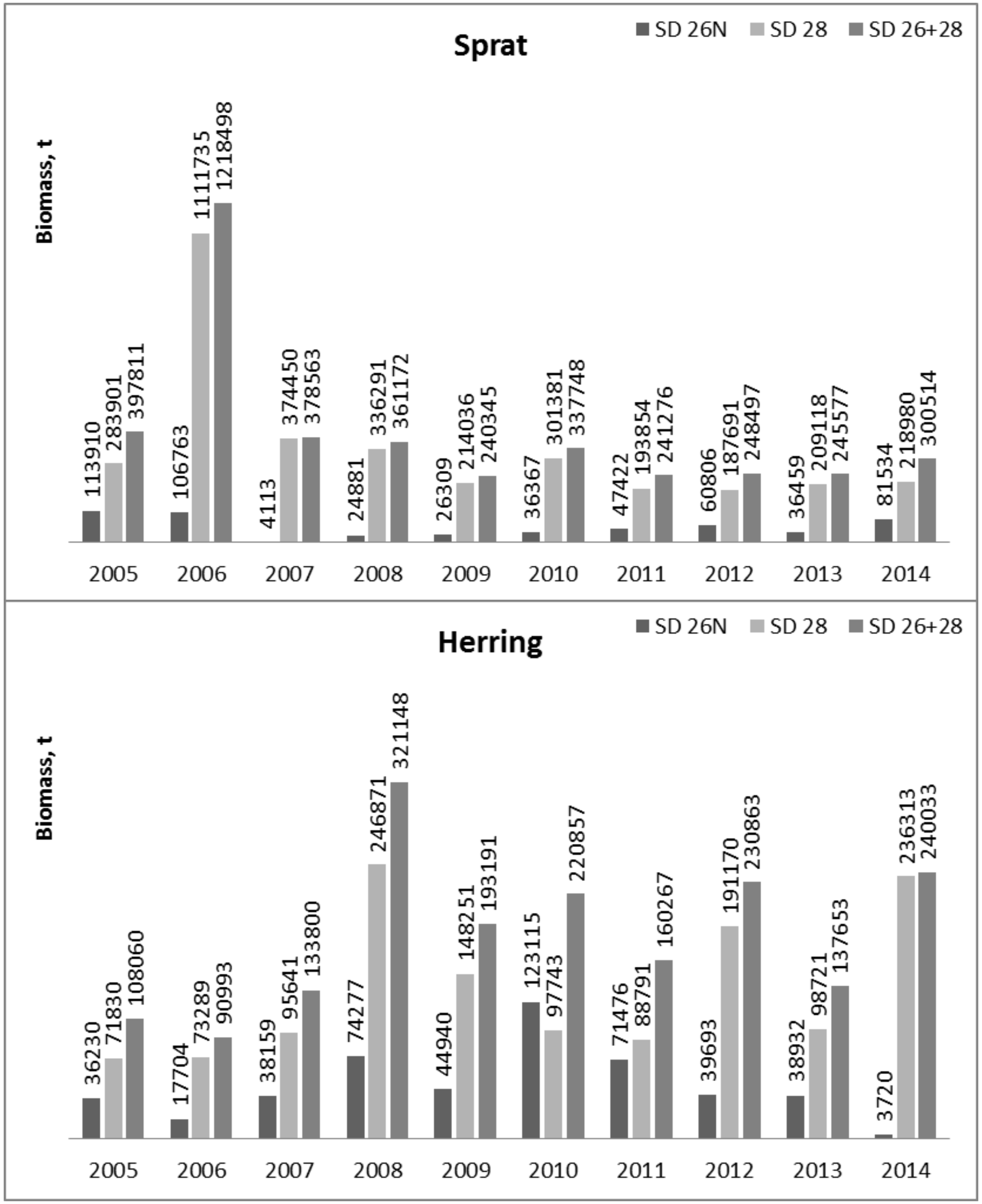
WGBIFS - Öregrund, Sweden, 23-27.03.2015



WGBIFS - Öregrund, Sweden, 23-27.03.2015



WGBIFS - Öregrund, Sweden, 23-27.03.2015




SNGH
IMO 9032745
GDY-100
BALTICA

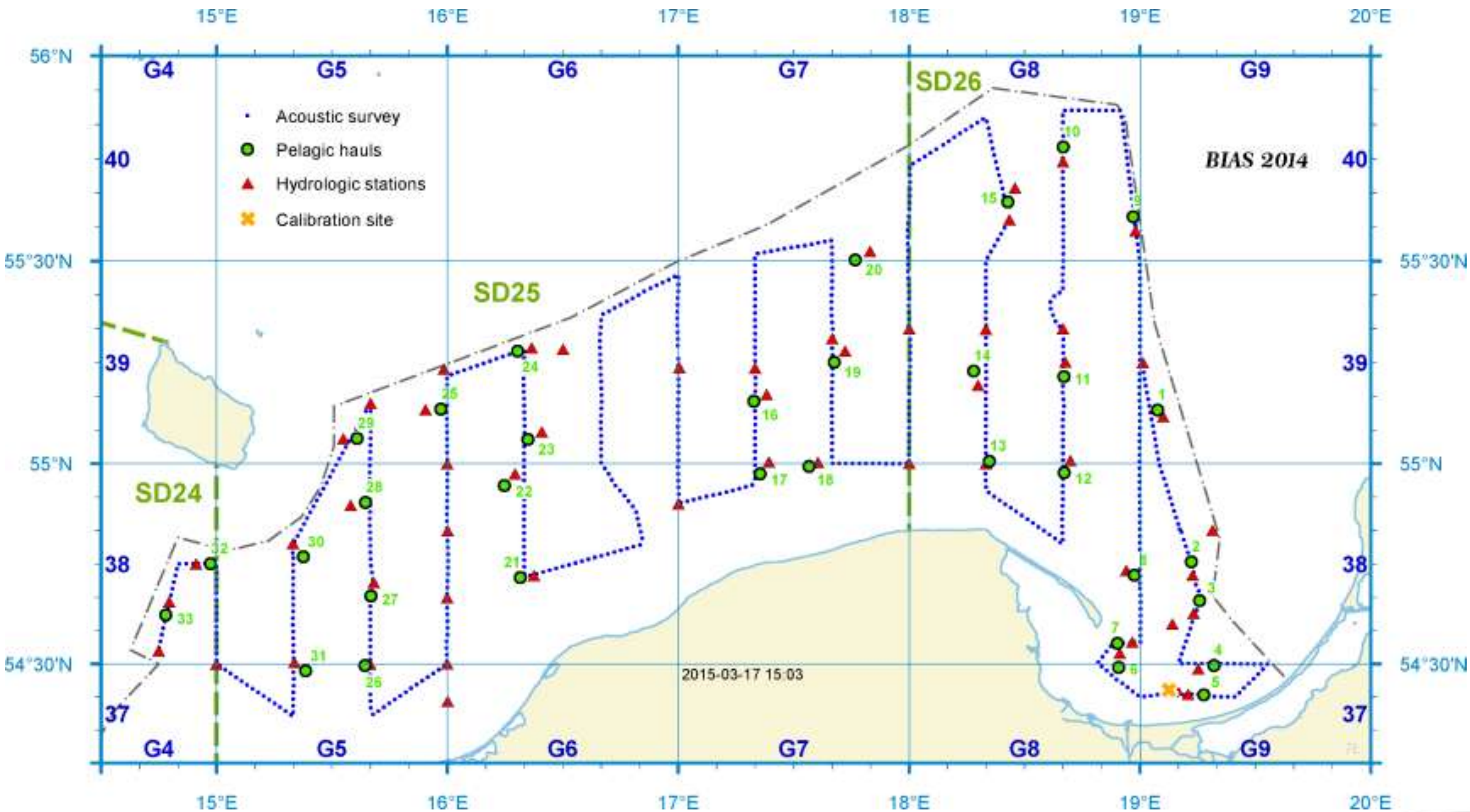
Polish part of the BIAS 2014 survey

Tomasz Łączkowski

National Marine Fisheries Research Institute
tomlacz@mir.gdynia.pl

MIR

www.nmfri.gdynia.pl



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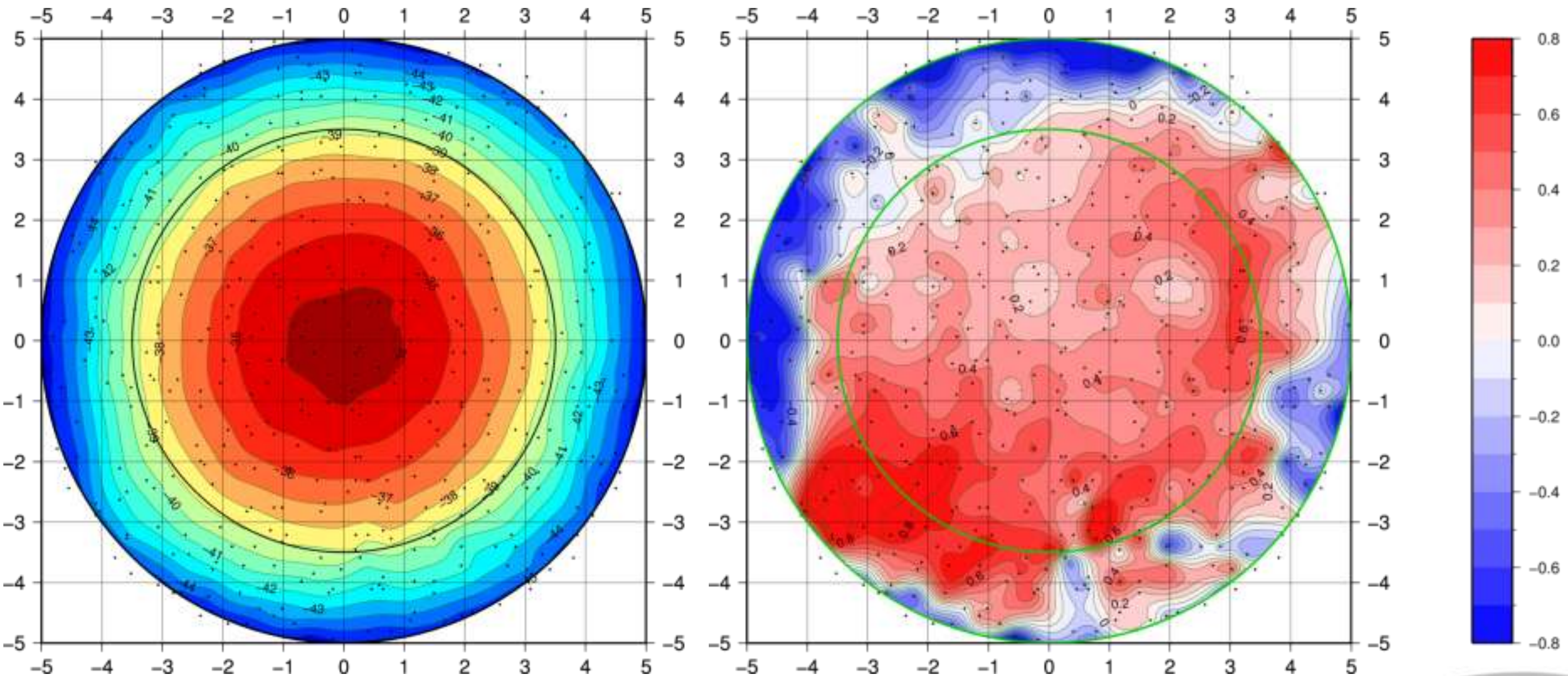
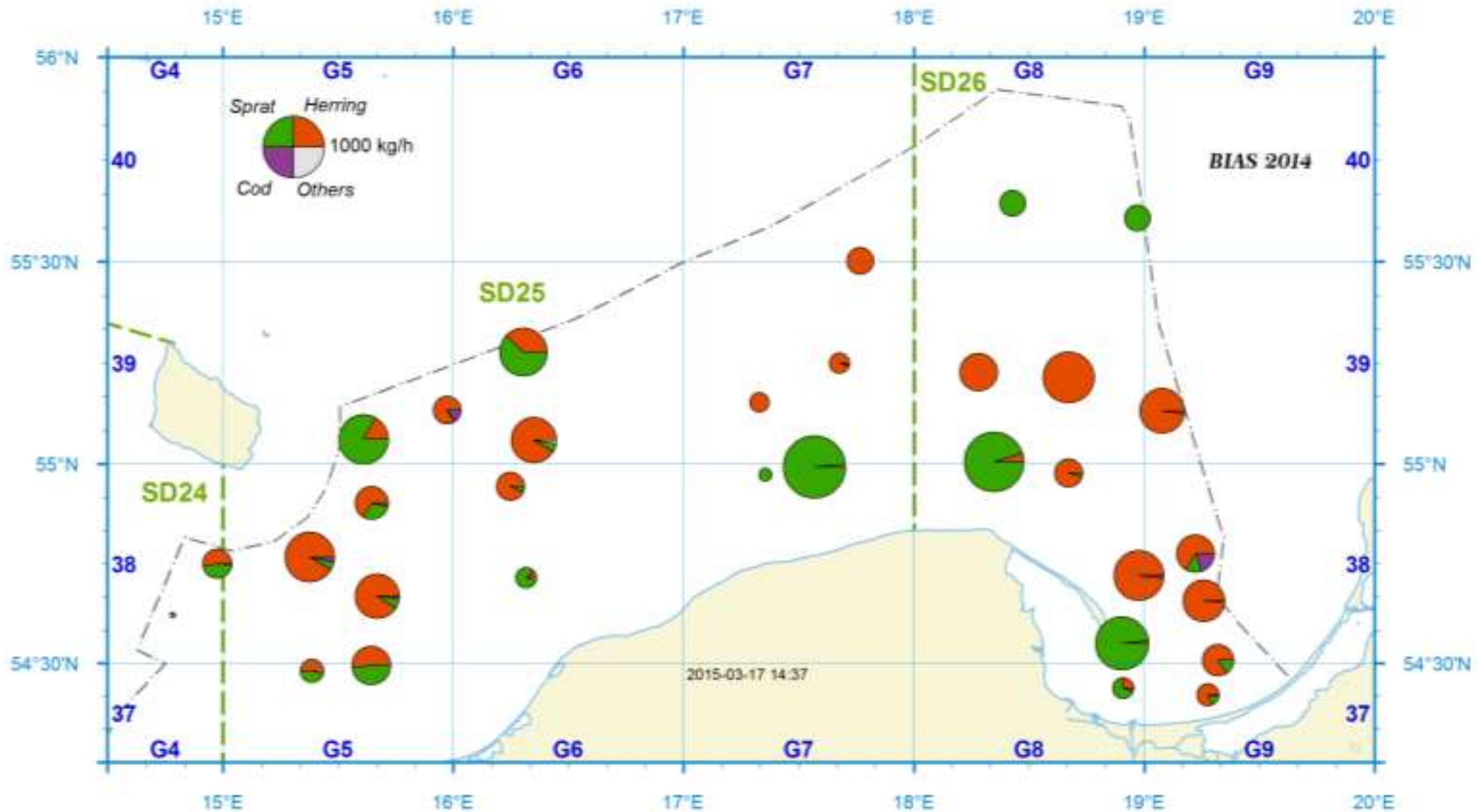
Calibration 38 kHz



Materials

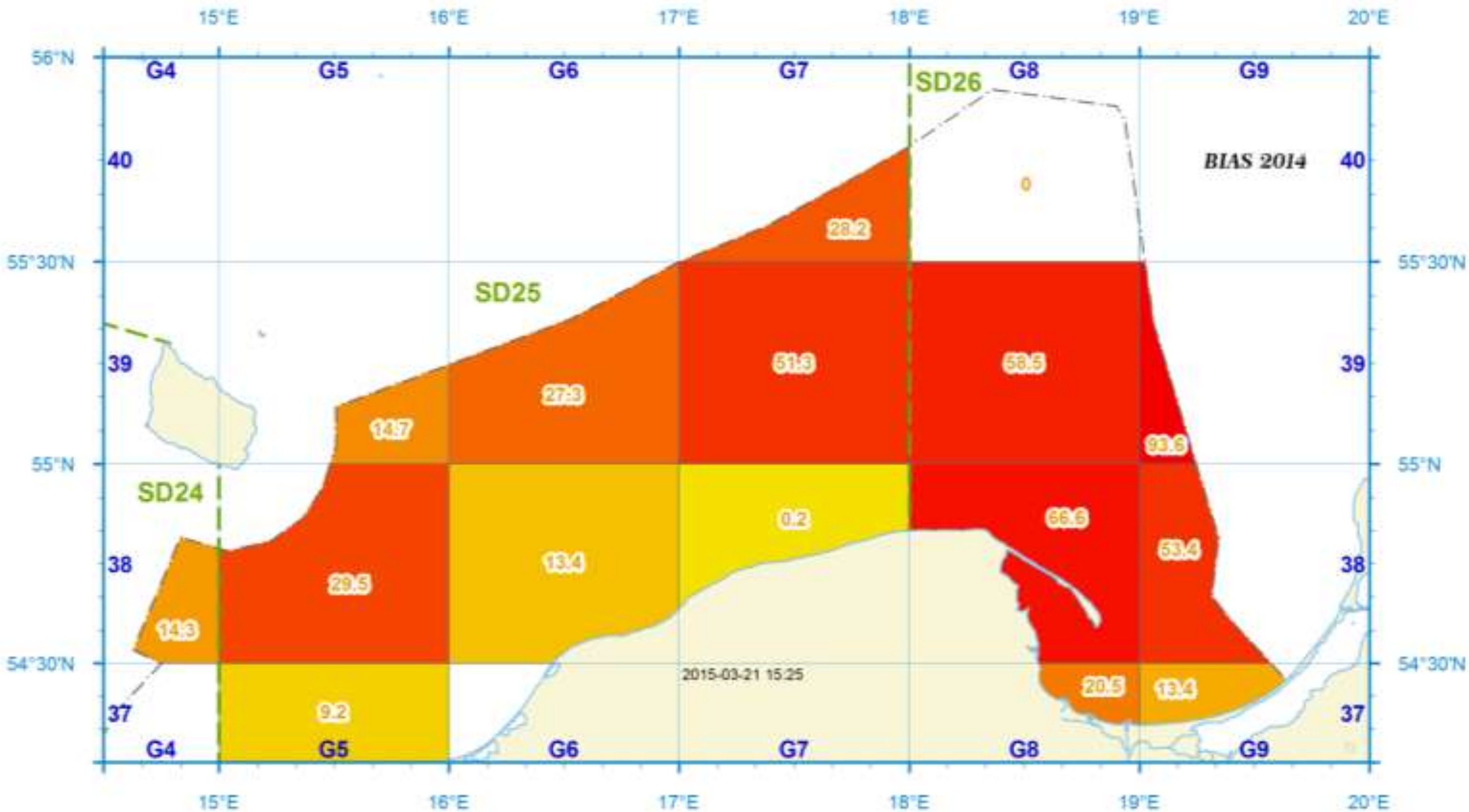
Species	Measurements ICES SD 24	Measurements ICES SD 25	Measurements ICES SD 26	Measurements Sum	Analysis ICES SD 24	Analysis ICES SD 25	Analysis ICES SD 26	Analysis Sum
Herring	267	2804	2163	5234	80	631	418	1129
Sprat	185	2180	1903	4268	91	320	171	582
Cod		137	137	274		130	78	208
Zander			1	1				
Flounder	2		6	8	2		6	8
River lamprey			4	4				
Lesser sand eel		2		2				
Turbot			1	1			1	1
Lumpfish	13	63		76				
Salmon			2	2				
Plaice		1		1		1		1
Whiting		2		2		2		2

CPUE

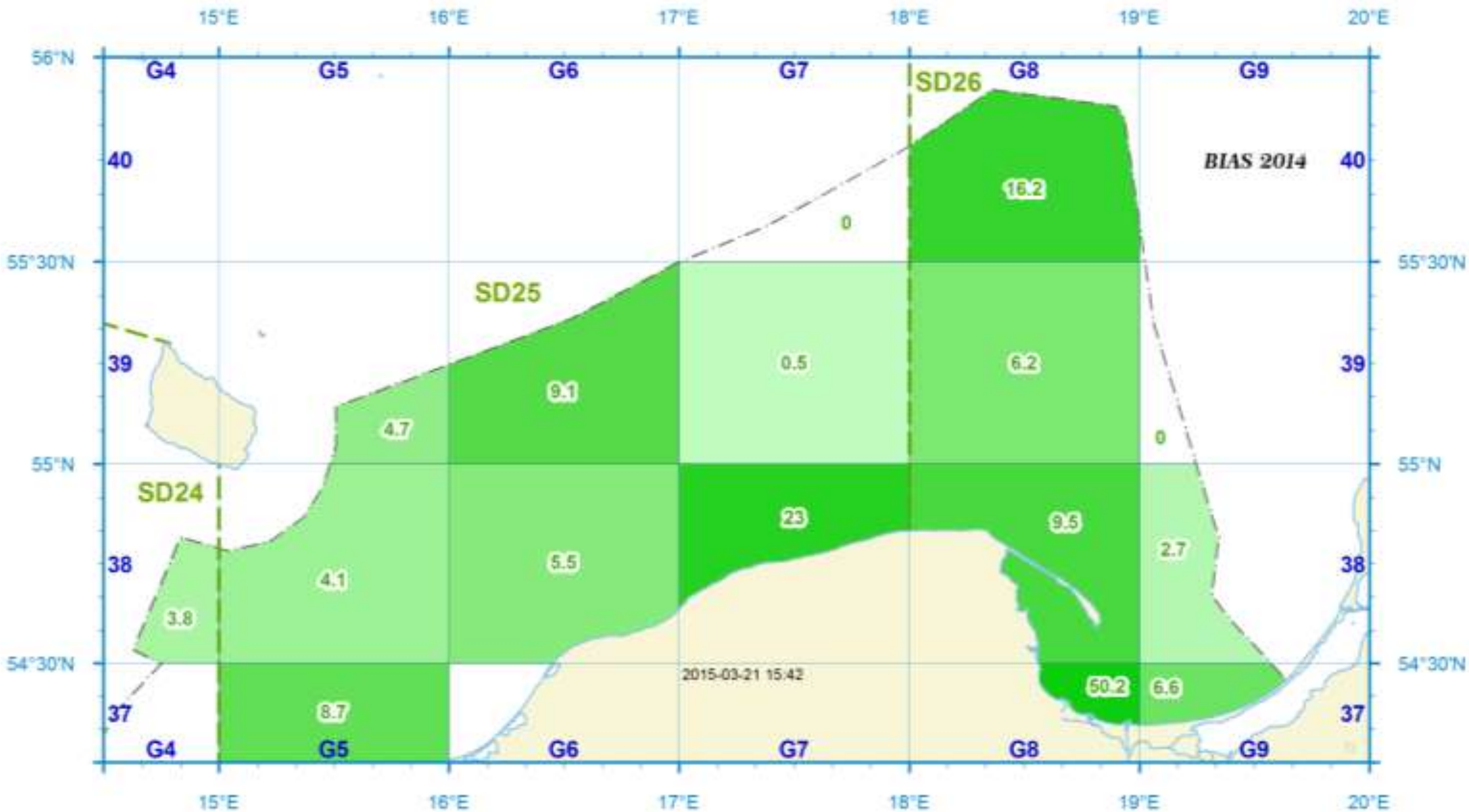


www.nmfri.gdynia.pl

Herring biomass density



Sprat biomass density



Next Polish BIAS survey

September 17 – October 4 2015

Finnish BIAS 2014

Cruise 18/2014

25th September – 7th October 2014

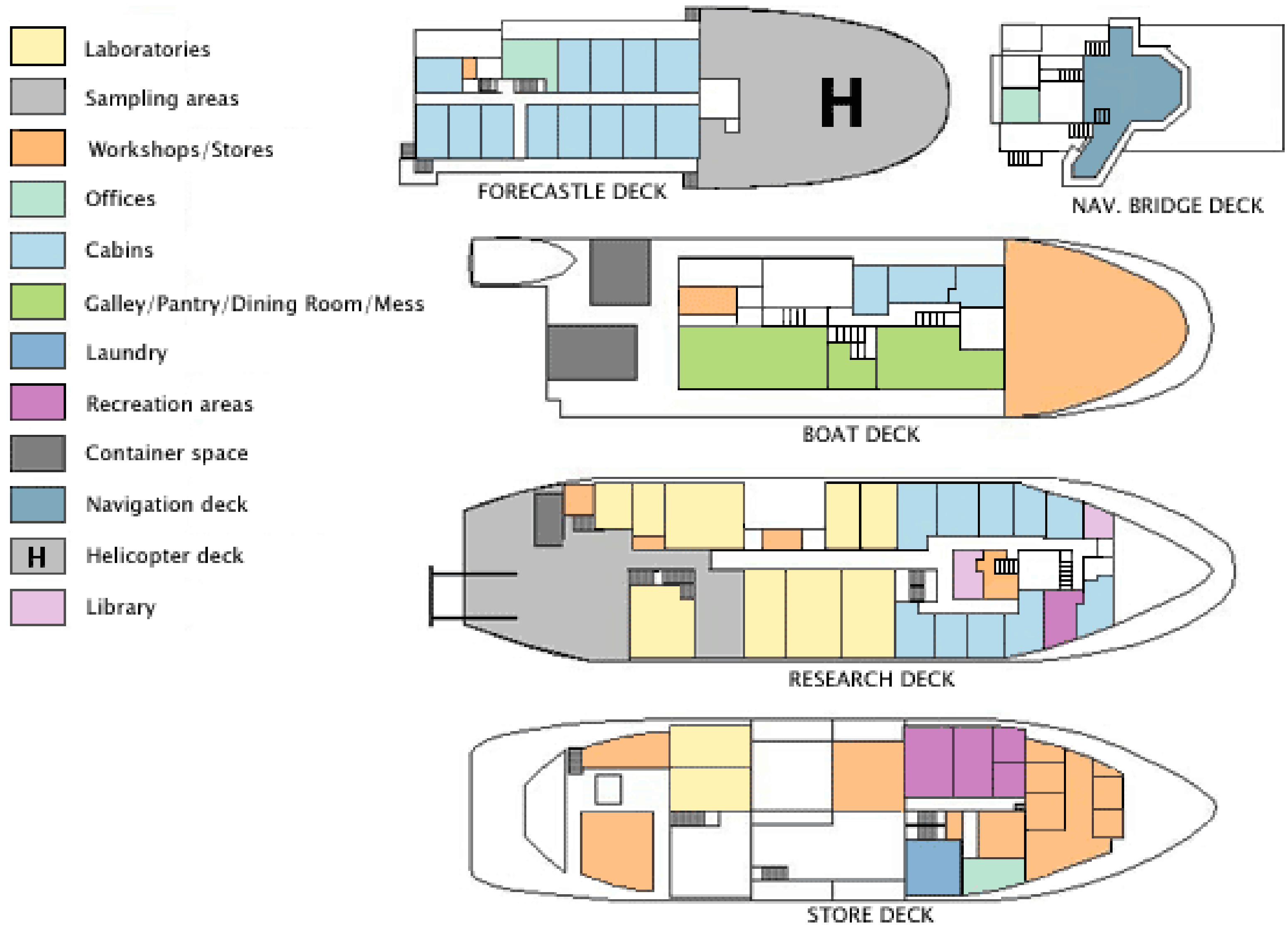
Juha Lilja

NATURAL RESOURCES INSTITUTE FINLAND

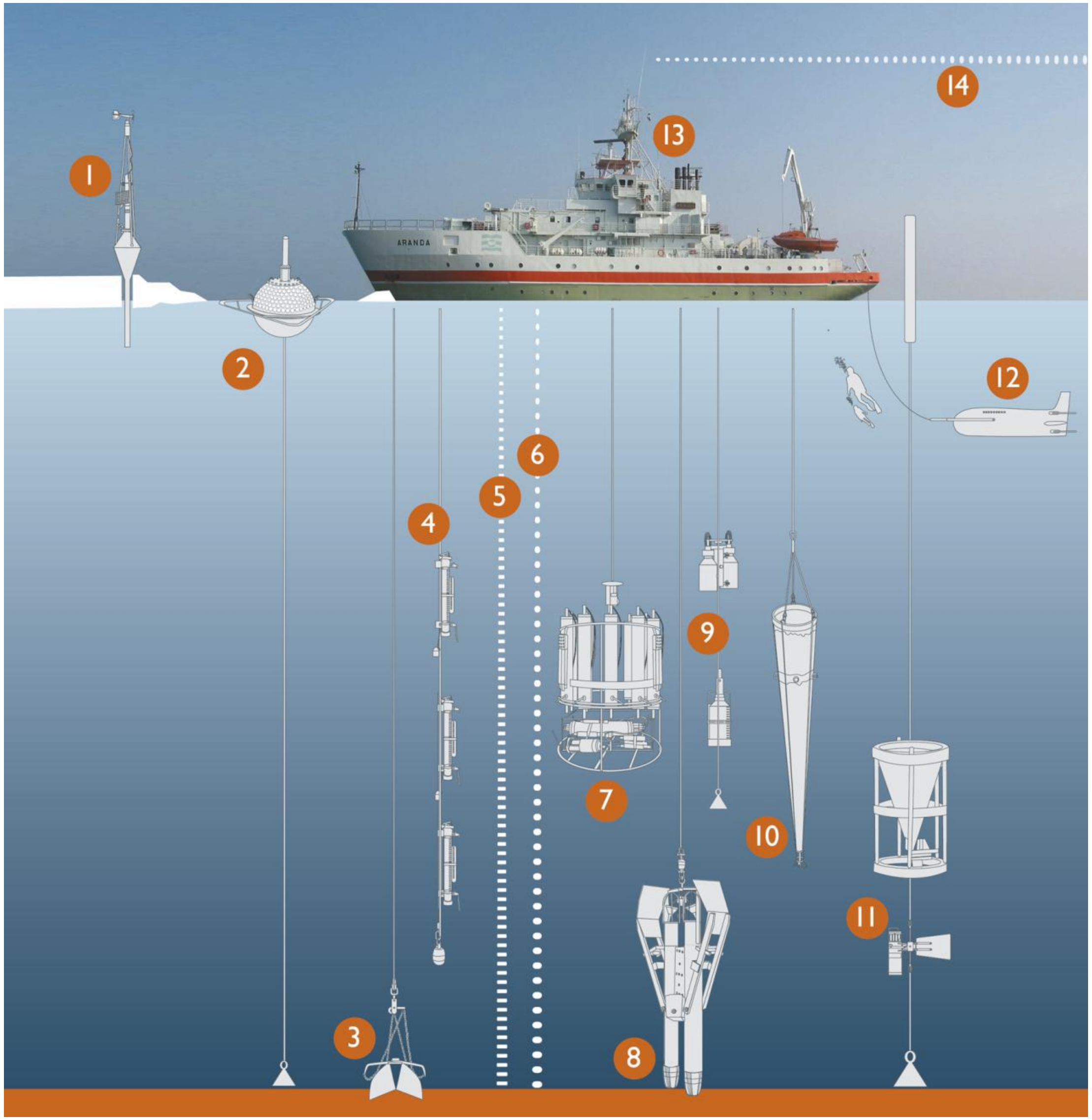
R/V Adanda

- OWNER: FINNISH ENVIRONMENT INSTITUTE
- COMMISSIONED 1989, HELSINKI, FINLAND
- HOME PORT HELSINKI, FINLAND
- LENGTH 59.20 m
- BEAM 13.80 m
- DRAFT 5.00 m
- GROSS TONNAGE 1734 GT
- POWER 3000 kW
- CRUISING SPEED 10.5 KNOTS
- MAXIMUM ENDURANCE 60 DAYS
- SCIENTISTS 27 PERSONS
- CREW 12 - 13 PERSONS

Luke NATURAL RESOURCES INSTITUTE FINLAND



Luke NATURAL RESOURCES INSTITUTE FINLAND



1. Satellite buoy
2. Wave buoy
3. Van Veen grab
4. Serial water sampler
5. Digital sonar equipment
6. Acoustic doppler current profiler
7. CTD probe and Rosette sampler
8. Sediment corer
9. Metal and Oil sampler
10. Plankton net 11. Sedimentation trap and Current profiler
12. Utow
13. Weather station
14. Data communication

Luke
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Luke
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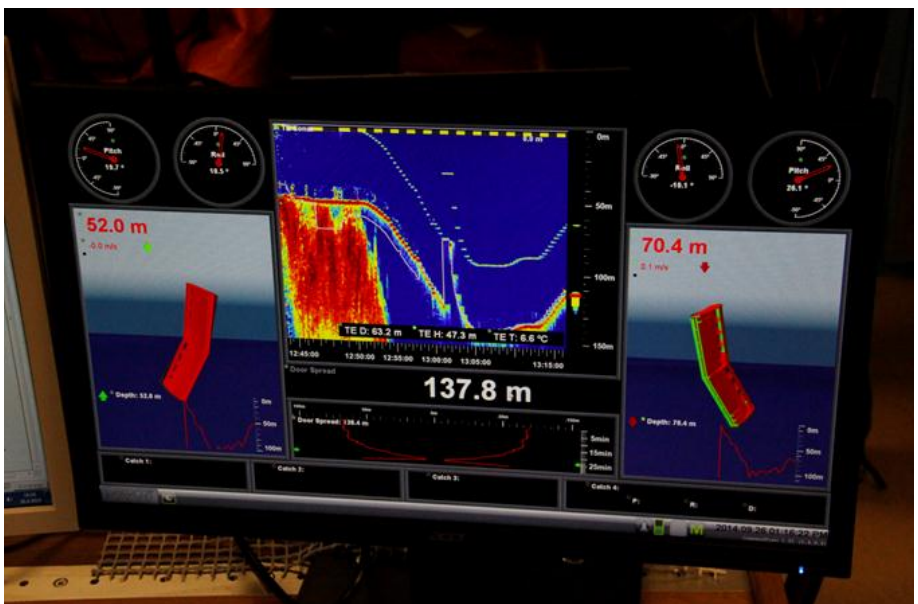
Trawl sensors:



- Marport Sounders presents a echogram, net opening, and fish target along with providing information:
- □ Depth
- □ Temperature

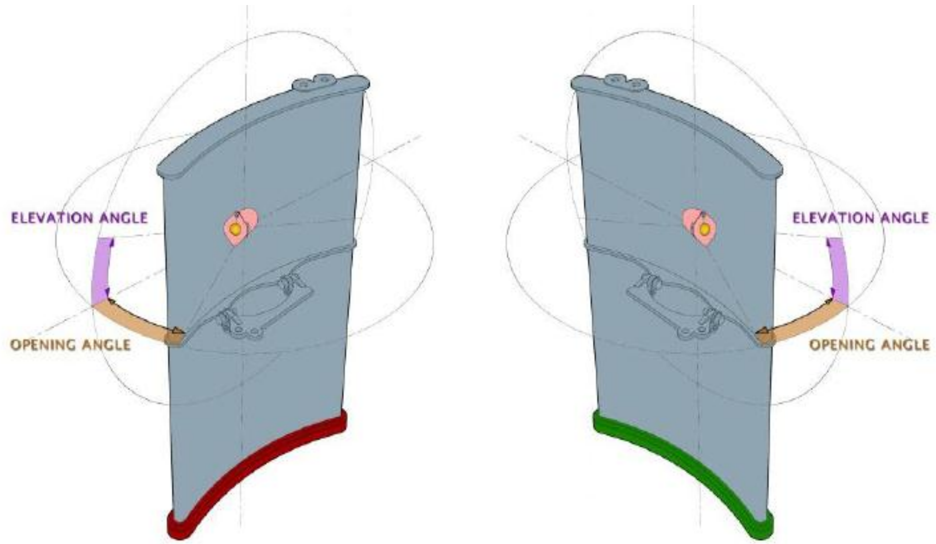


Figure 1: Measurements of doors

Figure 2: Door sensors in standars pockets

- Pitch/Roll
- Temperature
- Depth
- Distance (between doors)

Luke
NATURAL RESOURCES INSTITUTE FINLAND

Cruise 18/2014

25th September – 7th October 2014

Juha Lilja	Cruise leader, Acoustics	RKTL
Jukka Pönni	Fish sampling	RKTL
Hannu Harjunpää	Fish sampling	RKTL
Yvette Heimbrandt	Fish sampling	SLU
Peter Koskinen	Fishing	RKTL
Mikko Leminen	Acoustics	RKTL
Anne Odelström	Fish sampling	SLU
Tero Saari	Fish sampling	RKTL
Kimmo Kirstua	Fishing	RKTL
Arto Koskinen	Fish sampling	RKTL
Otto Kiukkonen	Fishing	RKTL
Sami Vesala	Fishing	RKTL
Esa Lehtonen	Fishing , 1st period	RKTL
Perttu Rantanen	Fish sampling, 1st period	RKTL
Markku Gavrilov	Fishing , 1st period	RKTL
Timo Myllylä	Fish sampling, 1st period	RKTL
Jaakko Mattila	Acoustics , 1st period	RKTL
Markku Vaajala	Fish sampling, 1st period	RKTL

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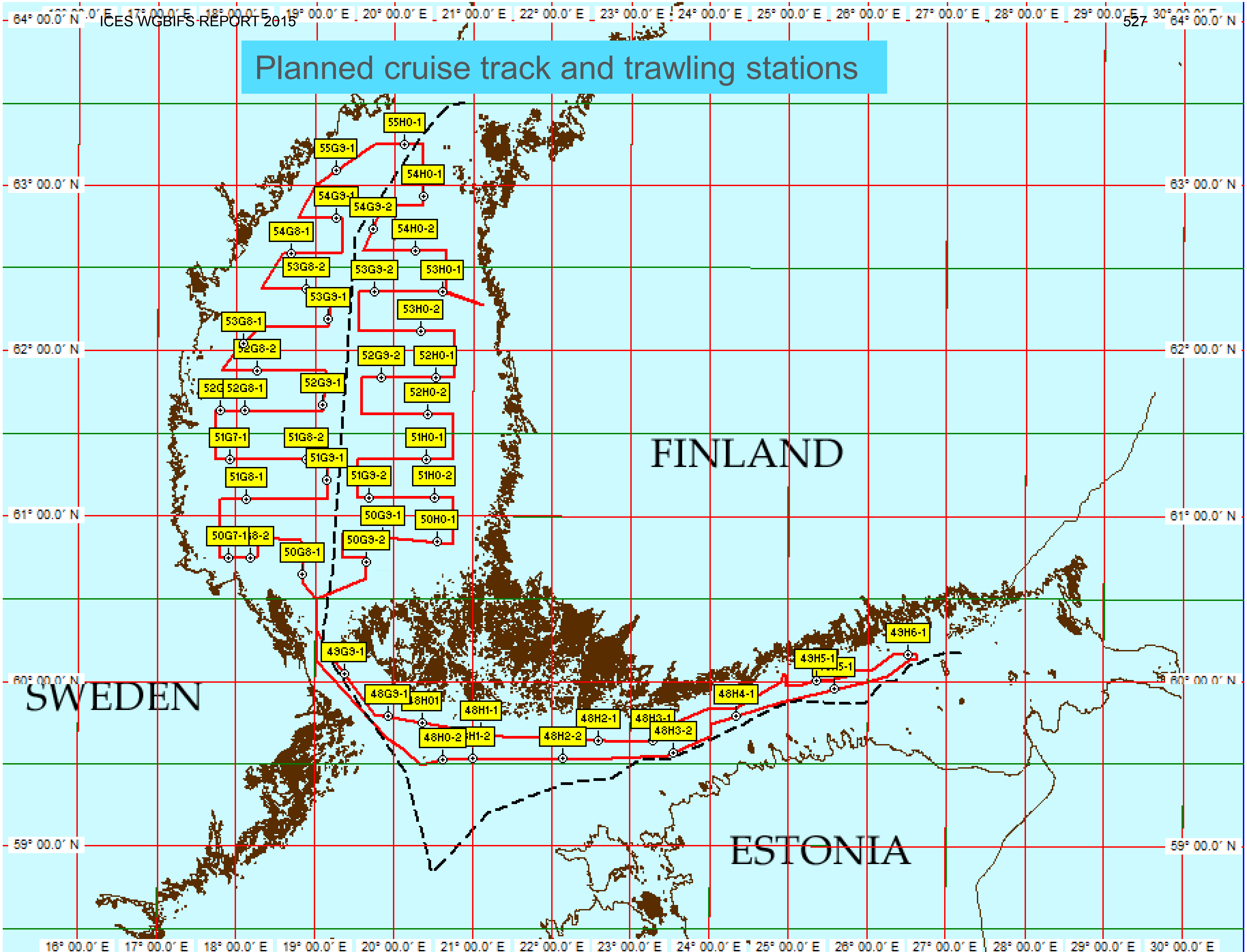
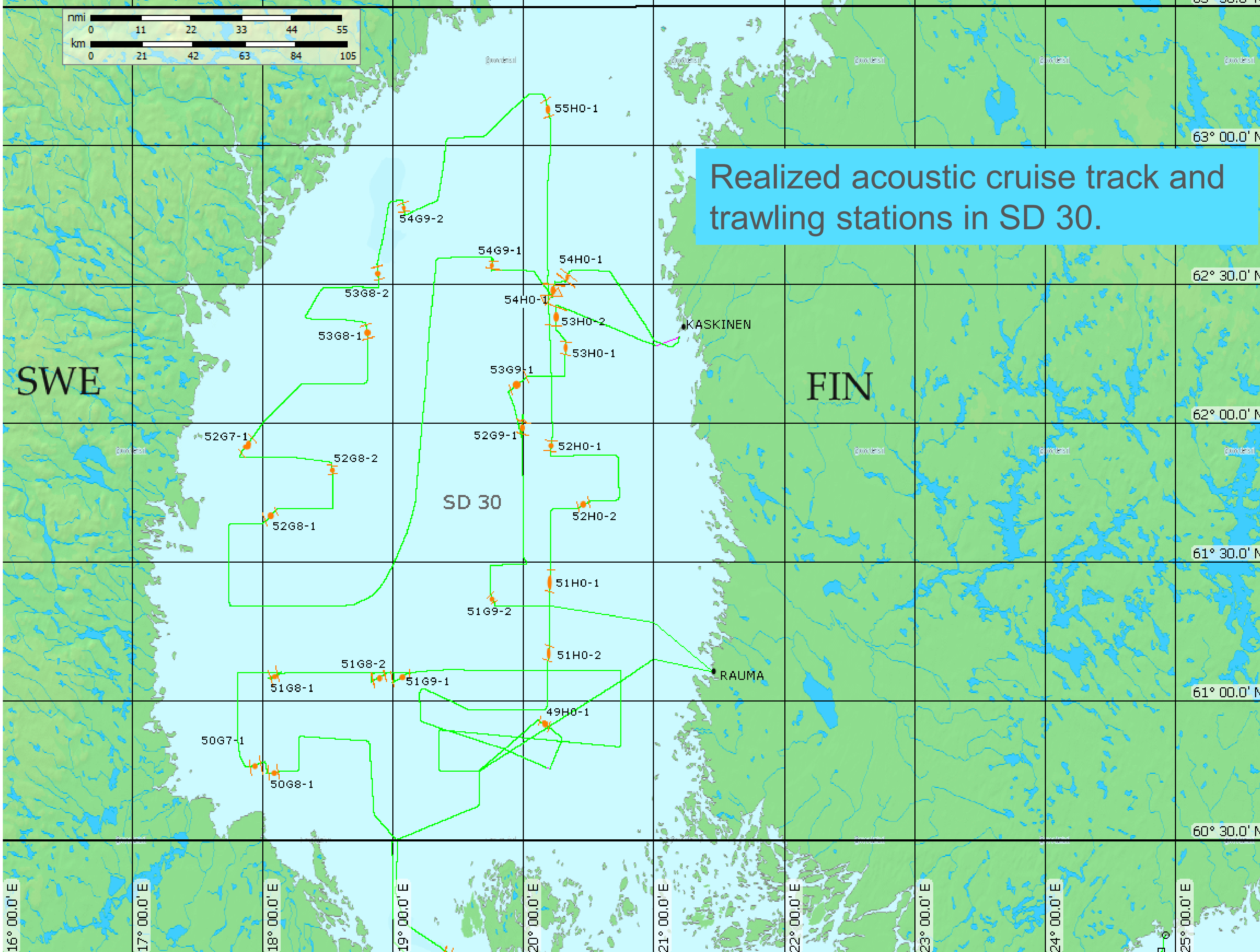
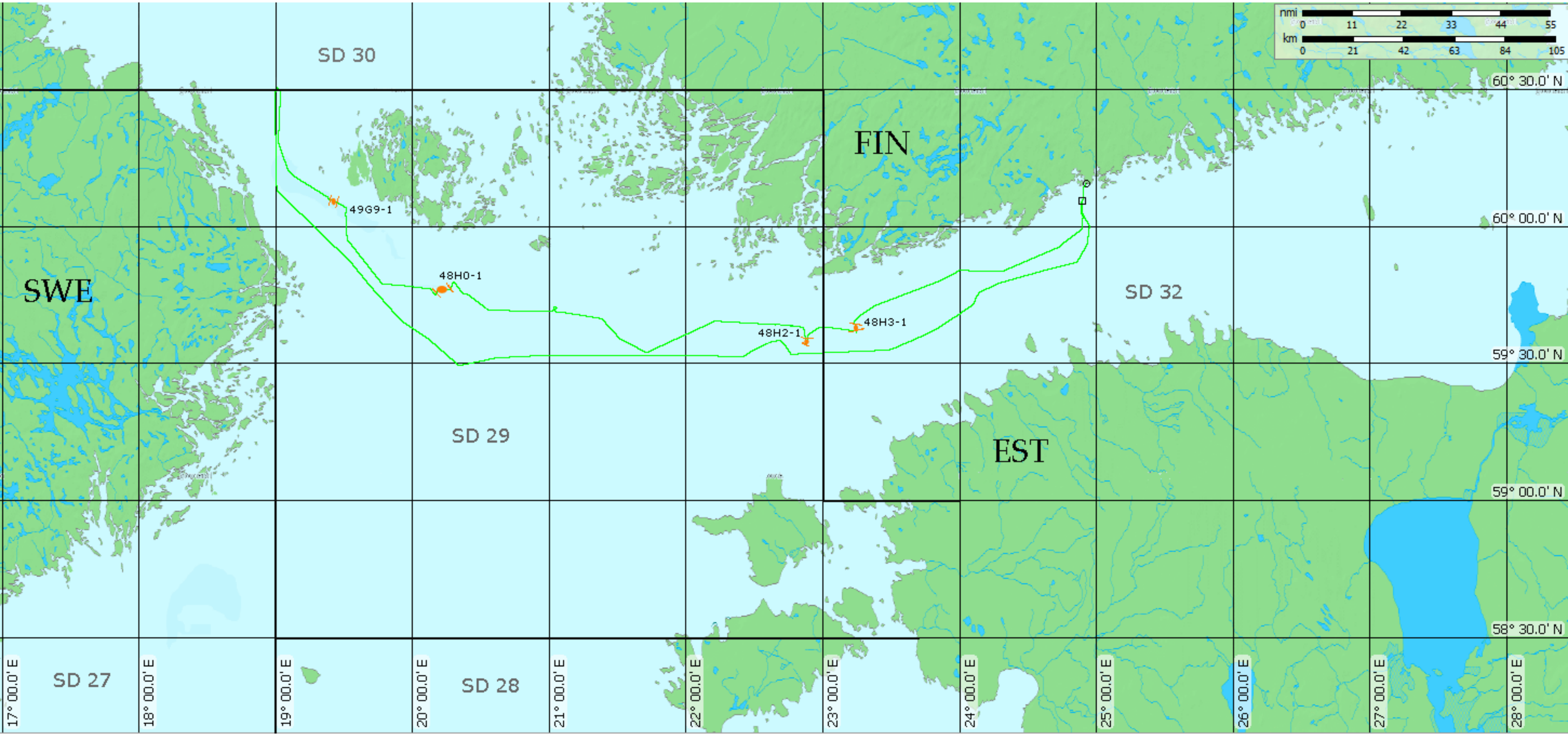

Planned cruise track and trawling stations
FINLAND
SWEDEN
ESTONIA
55H0-1
55G9-1
54H0-1
54G9-1
54G9-2
54G8-1
54H0-2
53G8-2
53G9-2
53H0-1
53G9-1
53H0-2
53G8-1
52G8-2
52G9-2
52H0-1
52G9-1
52G8-1
52H0-2
51G7-1
51G8-2
51H0-1
51G9-1
51G9-2
51H0-2
51G8-1
50G9-1
50H0-1
50G9-2
50G8-1
49G9-1
48G9-1
48H1-1
48H2-1
48H3-2
48H0-2
48H2-2
48H4-1
49H5-1
49H6-1
64° 00.0′ N
63° 00.0′ N
62° 00.0′ N
61° 00.0′ N
59° 00.0′ N
16° 00.0′ E
17° 00.0′ E
18° 00.0′ E
19° 00.0′ E
20° 00.0′ E
21° 00.0′ E
22° 00.0′ E
23° 00.0′ E
24° 00.0′ E
25° 00.0′ E
26° 00.0′ E
27° 00.0′ E
28° 00.0′ E
29° 00.0′ E
30° 00.0′ E


nmi
0
11
22
33
44
55
km
0
21
42
63
84
105
Realized acoustic cruise track and trawling stations in SD 30.
SWE
FIN
SD 30
KASKINEN
RAUMA
55H0-1
54G9-2
54G9-1
54H0-1
53G8-2
54H0-1
53H0-2
53G8-1
53H0-1
53G9-1
52G7-1
52G9-1
52H0-1
52G8-2
52H0-2
52G8-1
51H0-1
51G9-2
51H0-2
51G8-2
51G9-1
51G8-1
49H0-1
50G7-1
50G8-1
63° 30.0' N
63° 00.0' N
62° 30.0' N
62° 00.0' N
61° 30.0' N
61° 00.0' N
60° 30.0' N
16° 00.0' E
17° 00.0' E
18° 00.0' E
19° 00.0' E
20° 00.0' E
21° 00.0' E
22° 00.0' E
23° 00.0' E
24° 00.0' E
25° 00.0' E

Realized acoustic cruise track and trawling stations in SD 29N and 32NW.



Total length of the acoustic track was 1633 nmi

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Trawl stations:

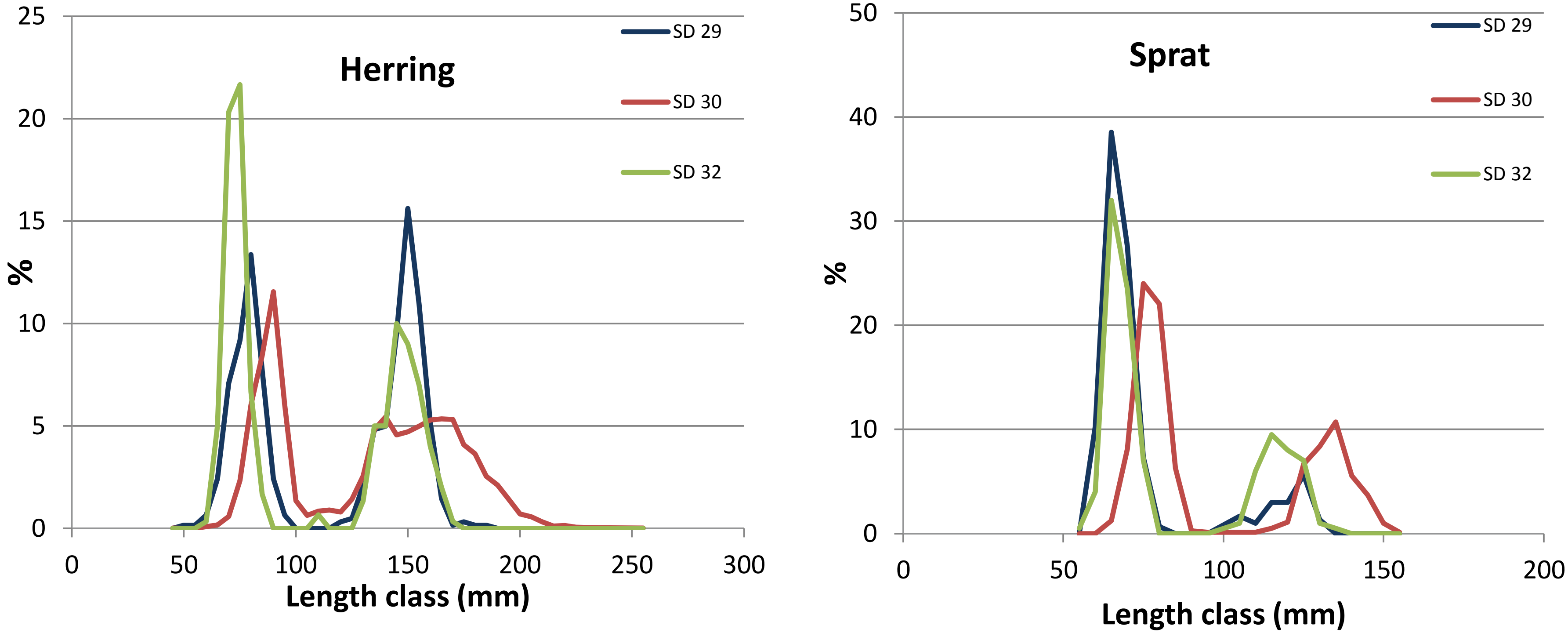
- Planned trawling stations was 46.
- 29 trawling stations were accomplished
- 25 were counted as “valid”
- Trawling stations was reduced mostly in SD 29 and 32 due to stormy weather and breakdown of the trawl gear

Luke LUONNONVARAKESKUS

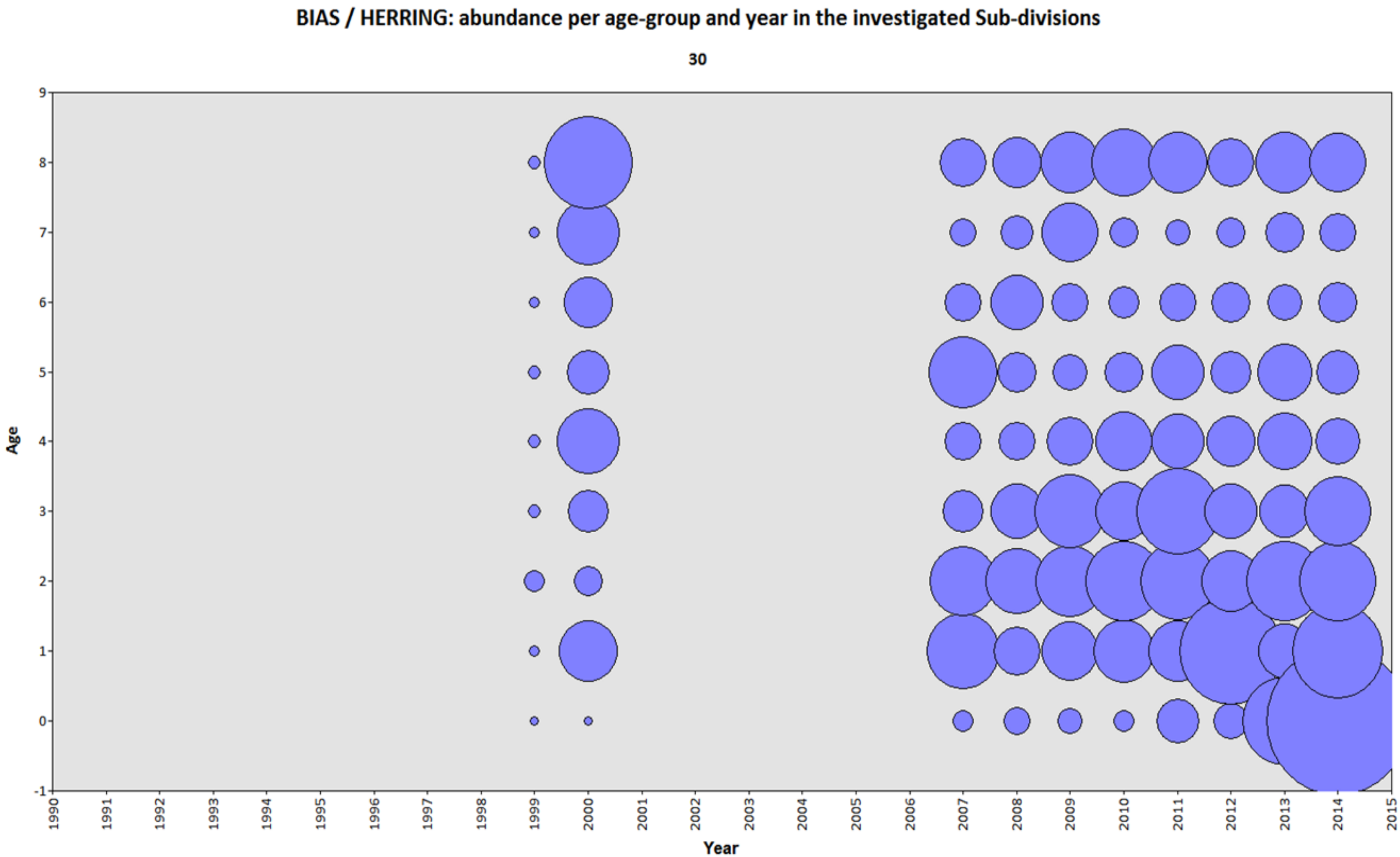
SD	Day	Month	Haul N:o	Snakeblenny	Seasnail	Greater Sandeel	Saduria isopod	Sprat	Eelpout	Three-spined Stickleback	Common Jellyfish	Smelt	Nine-spined Stickleback	Salmon	River Lamprey	Lesser Sandeel	Lumpfish	Herring	Straight-nosed Pipefish	Waste	Fish total	Catches total
32	25	9	1					99.4		4.4		0.1	1.2				0.3	128.7	0.0	0.5	234.2	234.7
29	26	9	2			0.0	0.0	59.0		2.6	0.2	0.0	0.5				0.2	286.9		16.3	349.2	365.8
29	26	9	3									INVALID										20.0
29	27	9	4			0.1		79.4		28.6			0.0					80.6		1.2	188.7	189.9
30	27	9	5									INVALID										36.0
30	27	9	6					0.7		1.3		0.1			0.1	0.0		71.3	0.0	2.9	73.5	76.4
30	27	9	7		0.0			0.3		0.3		0.0						63.3	0.0		64.0	64.0
30	27	9	8					1.5		0.9			0.0					83.0		1.4	85.5	86.9
30	28	9	9				0.0	5.0		14.9			0.0	0.2				26.8	0.0	3.7	46.9	50.7
30	30	9	10			0.0	0.0	4.2		98.4								20.6		5.4	123.1	128.6
30	30	9	11	0.0				0.2		23.2						0.0		53.0	0.0	0.5	76.4	76.9
30	30	9	12		0.1	0.0	0.0	1.1		64.6			0.0					164.2	0.0	1.2	230.0	231.2
30	1	10	13		0.0			0.5		13.0								68.4	0.0	0.6	82.0	82.5
30	1	10	14			0.0	0.0	1.7		14.3			0.0					38.0	0.0	0.4	54.0	54.4
30	1	10	15									INVALID										32.0
30	1	10	16		0.1		0.0	0.7		22.2								81.6		0.5	104.6	105.1
30	2	10	17		0.0		0.0	0.1		29.6								44.2		0.5	74.0	74.5
30	2	10	18					0.2		17.4			0.0					149.3		8.5	166.9	175.4
30	2	10	19									INVALID										36.0
30	3	10	20		0.1	0.0	0.0	0.0		12.7								88.6	0.0	0.2	101.4	101.6
30	3	10	21					0.5		104.1						0.0		27.3		11.5	131.9	143.4
30	3	10	22	0.0				0.0		6.9								99.6		1.5	106.5	108.1
30	3	10	23	0.0	0.0			0.0		13.7			0.0					64.8	0.0	5.6	78.5	84.0
30	4	10	24		0.0	0.0	0.0	0.1		5.3								90.3		2.2	95.7	97.9
30	4	10	25		0.4		0.0	0.5		6.1		0.0	0.0			0.0		62.8	0.0	14.1	69.9	84.0
30	4	10	26		0.0		0.0	2.3		10.1								65.1	0.0	0.1	77.5	77.6
30	4	10	27		0.0	0.0		3.2		34.4								94.4		0.9	132.0	132.9
30	5	10	28			0.0		0.5	0.0	1.4								48.5		0.5	50.4	50.9
30	5	10	29		0.0		0.0	1.5		33.1						0.0		61.5		0.9	96.1	97.0
			Total	0.0	0.8	0.2	0.1	262.8	0.0	563.4	0.2	0.3	1.7	0.2	0.1	0.1	0.5	2063.0	0.0	80.9	2893.1	3098.2

ICES SD	ICES Rect.	NM	N (million/nm²)	Area (nm²)	Sa (m²/nm²)	σ (cm²)	N total (million)	Herring (%)	Sprat (%)	Cod (%)
29	48G9	53	8.80614	772.8	748	0.849719	6805	70.50	27.84	0.00
29	48H0	64	7.66817	730.3	652	0.849719	5600	54.96	42.45	0.00
29	48H1	66	9.39682	544.0	803	0.854943	5112	82.15	16.89	0.00
29	48H2	70	13.47468	597.0	1813	1.345179	8044	66.08	30.11	0.00
32	48H3	68	32.07407	615.7	2777	0.865796	19748	72.34	23.16	0.00
32	48H4	83	17.55092	835.1	1905	1.085582	14657	72.34	23.16	0.00
29	49G9	73	14.61062	564.2	744	0.509042	8243	42.69	42.08	0.00
30	50G7	19	6.52878	403.1	608	0.931048	2632	96.99	0.89	0.00
30	50G8	56	3.11214	833.4	432	1.386992	2594	97.78	1.05	0.00
30	50G9	135	3.79298	879.5	241	0.634915	3336	85.23	3.76	0.00
30	50H0	79	3.96917	795.1	252	0.635326	3156	63.97	1.61	0.00
30	51G7	27	4.76013	614.5	596	1.251511	2925	98.12	0.67	0.00
30	51G8	78	2.12883	863.7	422	1.983795	1839	98.10	1.11	0.00
30	51G9	72	6.11373	865.8	255	0.416429	5293	23.04	4.56	0.00
30	51H0	107	2.00494	865.7	168	0.835613	1736	79.88	1.94	0.00
30	52G7	30	5.40120	482.6	549	1.016227	2607	87.39	0.03	0.00
30	52G8	42	3.39469	852.0	368	1.084729	2892	89.46	0.10	0.00
30	52G9	65	5.81601	852.0	381	0.655380	4955	69.33	0.27	0.00
30	52H0	58	2.41076	852.0	233	0.966126	2054	86.79	1.88	0.00
30	53G8	72	9.71756	838.1	505	0.520005	8144	54.60	0.20	0.00
30	53G9	45	5.06593	838.1	347	0.685646	4246	71.39	0.47	0.00
30	53H0	108	4.90826	838.1	353	0.719015	4114	79.35	1.43	0.00
30	54G8	18	4.81729	642.2	241	0.499419	3094	73.21	0.09	0.00
30	54G9	54	5.31569	824.2	246	0.462056	4381	69.00	0.09	0.00
30	54H0	55	4.87304	727.9	388	0.796777	3547	61.69	0.32	0.00
30	55G9	21	6.20942	625.6	300	0.483219	3885	72.31	0.13	0.00
30	55H0	15	2.83544	688.6	395	1.394003	1952	94.33	0.11	0.00

Length distributions for herring and sprat by ICES subdivision



LUONNONVARAKESKUS



LUONNONVARAKESKUS

Thank you!

NATURAL RESOURCES
INSTITUTE FINLAND

SLU
Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Request from WGBFAS: How to explain discrepancy between herring ICES SD 30 and Central Baltic Herring stocks size.

Factors affecting the accuracy of the research results

Sources of error (Acoustic index errors)	Random error	Systematic error (bias)
Physical calibration	±2%	±5%
Transducer motion*	–	0 – 30%
Bubble attenuation*	–	0 – 90%
Hydrografic conditions**	±2% - ±5%	–
Target strength (TS)	±5%	–
Species identification		0 – ±80%
Random sampling	±10% - ±40%	–
Fish migration		0 – ±40%
Diurnal behaviour***	0 – 25%	–
(Absolute abundance errors)		
Physical calibration	–	±3%
Hydrografic conditions**	–	0 – 5%
Target strength (TS)	–	0 – 50%
Avoidance reaction	–	Uncertain

*Worst in bad weather, ** Worst at long range, *** Only random if time of day is ignored

Fish target strength (TS) length relationship

Variation:
- Annual
- Seasonal
- Geographical (horizontal)
- Vertical

Seasonal variation

Seasonal variation

Herring > 16 cm

Sprat, herring =< 16 cm

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	TS=20*LOG10(L)-B			North Sea	BIAS/BASS	Ona et al., 2001	Ona et al., 2001	Baltic proper	Lassen & Staer, 1985	Didrikas and Hansson 2004	Didrikas, 2005	Kasatkina, 2009	Kasatkina, 2009	Bothnian Sea	Peltonen & Balk, 2005
2			B		71.2	68.9	63.6		70.8	67.8	66.3	67.6	73.3		63.9
3	L	16	TS		-47.1	-44.8	-39.5		-46.7	-43.7	-42.2	-43.5	-49.2		-39.8
4			Sigma		2.4E-04	4.1E-04	1.4E-03		2.7E-04	5.3E-04	7.5E-04	5.7E-04	1.5E-04		1.3E-03
5	NASC	1	Abundance		4098	2413	712		3737	1873	1326	1768	6692		763
6			Difference %			-41.1	-82.6		-8.8	-54.3	-67.6	-56.8	63.3		-81.4

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Reviewed the text for SISP protocols - Manuals of research surveys

SISP manual of International Baltic Acoustic Surveys

5) Table 2.1. Maybe this table should also provide the country which is responsible for that statistical sub-area?

SISP manual of International Baltic Acoustic Surveys

26) Section 5. It may be useful to add a section 5.9 for an example of taking acoustic and biological data for one or two rectangles and go through the procedure of estimating abundance, biomass, and ages.

Baltic International Trawl Survey (BITS) SISP manual

If English is to be used as the primary language for this manual, it would benefit from a more rigorous review from a native English speaker/writer to improve readability as there are numerous grammatical errors throughout the document.

We do not have any native English speaker in the group. Actually this should be job for ICES secretariat to edit linguistically all ICES publications.

Baltic International Trawl Survey (BITS) SISP manual

Section 2.4-Fishing Gears states that one country, Denmark, utilizes a stone panel to exclude large stones, however, there is no documentation of the stone panel in the manual or annexes. Such a modification has the potential to significantly alter fish capture and should be well detailed in gear documentation annex.

Baltic International Trawl Survey (BITS) SISP manual

This protocol document should better define the quality control methodology used during these surveys, specifically for the gear and vessel performance parameters. Section 2.5 includes a "quality control" section with a table defining trawl spread and height parameters. However, it is not clear whether or not these tolerance ranges are used at sea or post processed, or if these ranges are used to exclude tows or if there are adjustments made to the area swept. Are there any additional gear or vessel performance characteristics monitored each tow? if so, they should be listed and defined. It is suggested to give some additional thought to excluding tows based on a range of spread values as this method is likely to exclude only the shallowest and deepest tows due to the change in spread associated with depth.

Baltic International Trawl Survey (BITS) SISP manual

14. P34R17-18 and P34R25-26: I have given a very well explanation of this part in the MEDITS Manual as it is probably the most important part. I don’t think they have to simply explain the maintenance with a couple of two general sentences. I suggest to provide some pictures with trawl and technicians repairing the net. If you agree I can provide in attachment the Medits manual (or give the web link) for sharing information and ideas

Baltic International Trawl Survey (BITS) SISP manual

15. P37: the trawl design is well done, however some of the acronyms used are not explained. I suggest they provide a sort of table where readers can find the meaning.

Baltic International Trawl Survey (BITS) SISP manual

16. P44: this part is well done, however some pictures/photos (as in the Medits manual) can probably better explain the trawl check procedures.

ICES - WGBIFS meeting in Öregrund/Sweden; 23-27.03.2015

An attempt to standarize the pelagic fishing gear used in BIASS and BASS survey

Krzysztof Stanuch (baltic@balticnet.pl - Poland)

Main topics of presentation:

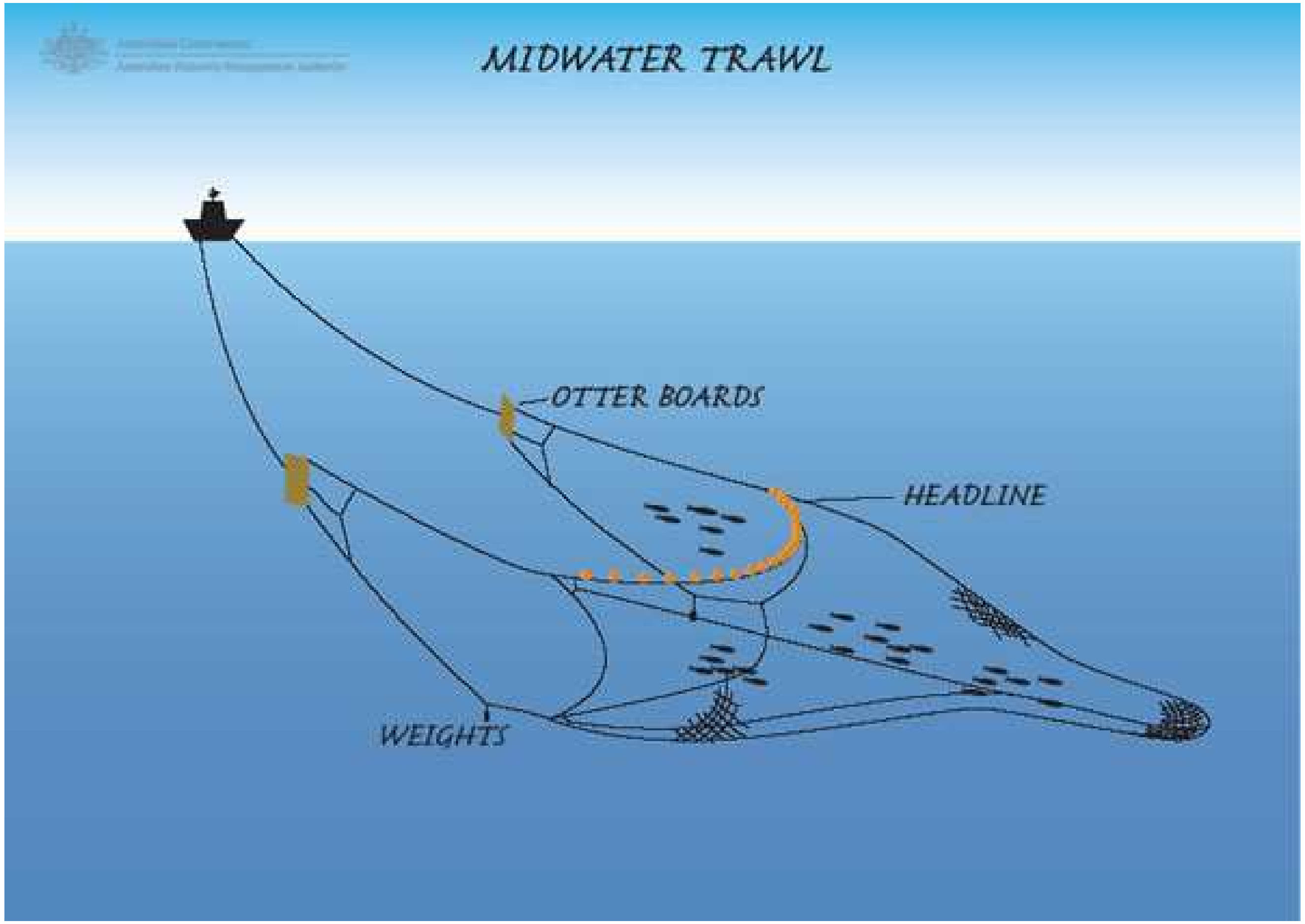
- targets for standardising the research pelagic fishing gear;
- differences in existing pelagic sets;
- finding ways to standardize research pelagic fishing gears;
- expected steps in the standarization;
- conclusions;
- proposal for pelagic fishing gear for research vessels.

Targets for standardizing the research pelagic fishing gear

- To minimize of differencies in efficiency and species composition in pelagic monitoring trips by eliminating diversity in gear construction and its elements used during production;

- To make research catches more comparable, e.g. as with the survey demersal trawl (achieved after its standarization in 2000).

Arrangement of pelagic fishing gear (*sketch*)



after AFMA www.afma.gov.au

Main elements of pelagic fishing gear

- Trawl (belly with codend);
- Headrope and footrope rigging;
- Bridles, other ropes and assembling accesories;
- Otter boards

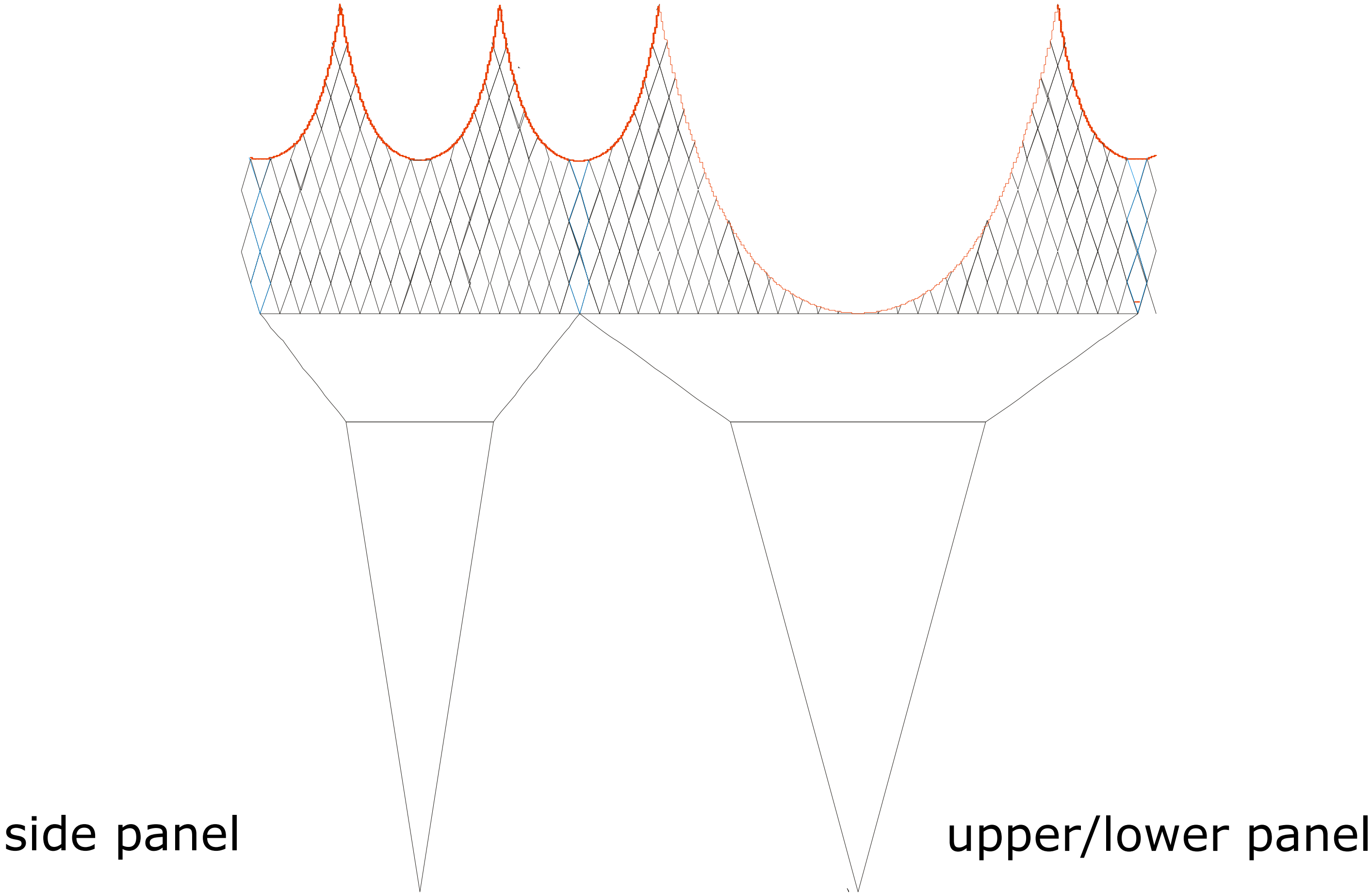
Possible differencies in trawl belly

- Shape and construction of trawl belly (inlet area, taper ratio);
- Netting (shape and size of meshes, type and thickness of twine);
- Frame ropes (type and length);
- Netting distribution on frame ropes (coefficient of mesh opening *Ux*)

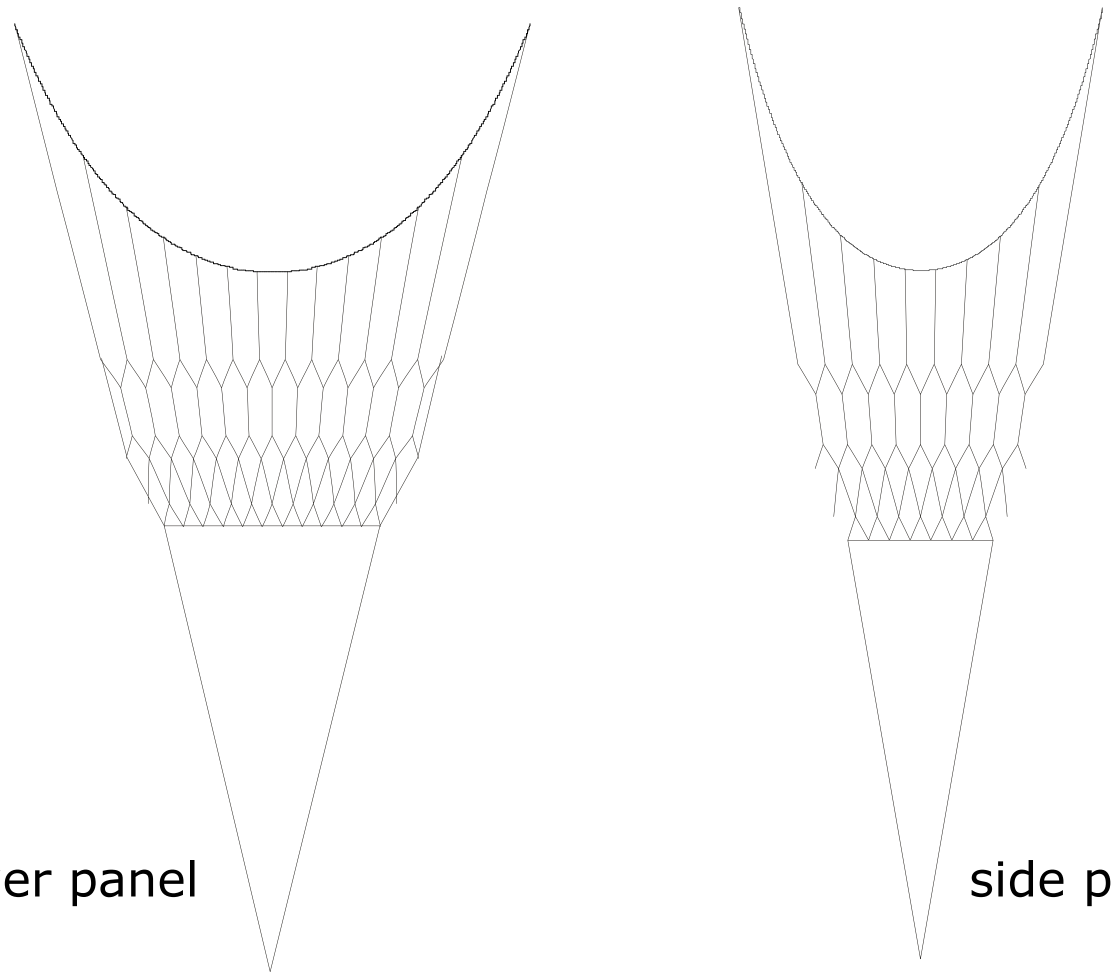
Possible differencies in trawl rigging

- Type of rigging (2-bridles, 3-bridles, 4-bridles, combined)
- Type and length of bridles;
- Other assembling ropes (sweeps, trawldoor straps etc.);
- Type and size of otter boards (door efficiency (C_L/C_D); underwater perfomance, turbulence);
- Footrope and headrope rigging

Full meshes type 4-bridle pelagic trawl *(example)*



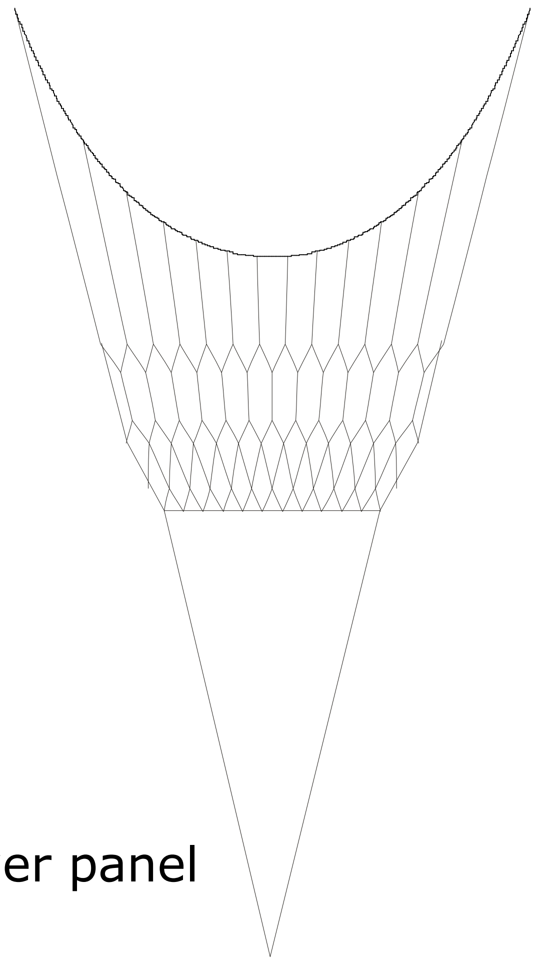
String type 2-bridle pelagic trawl with hexagonal meshes *(example)*



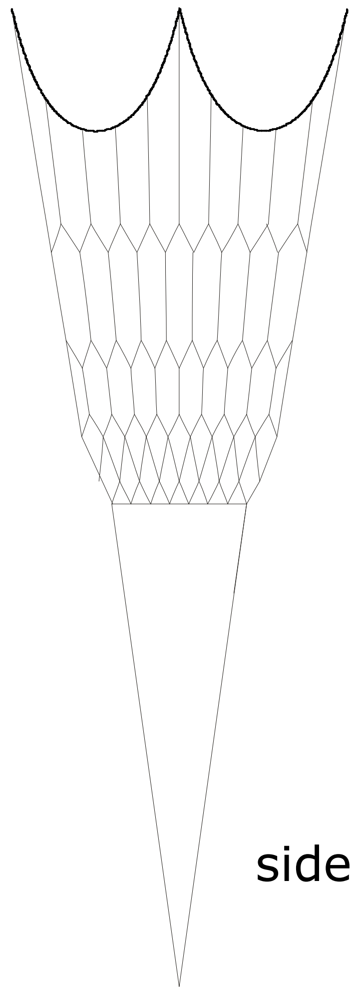
upper/lower panel

side panel

String type 3-bridle pelagic trawl with hexagonal meshes *(example)*

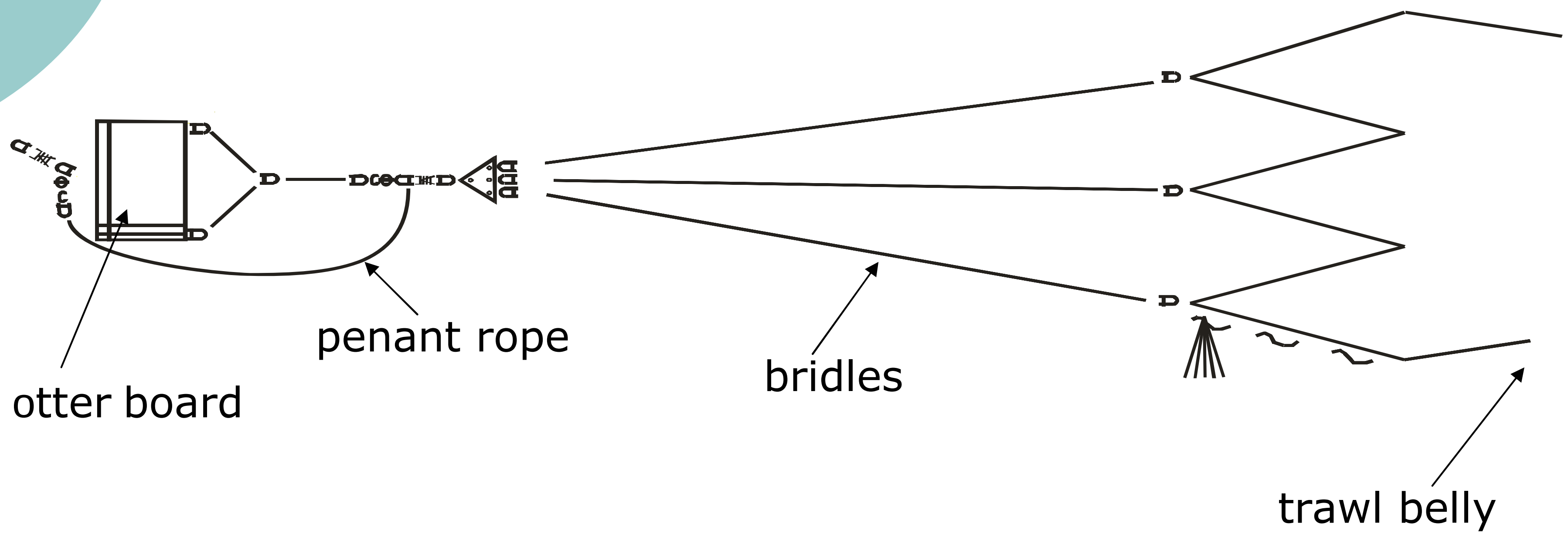


upper/lower panel

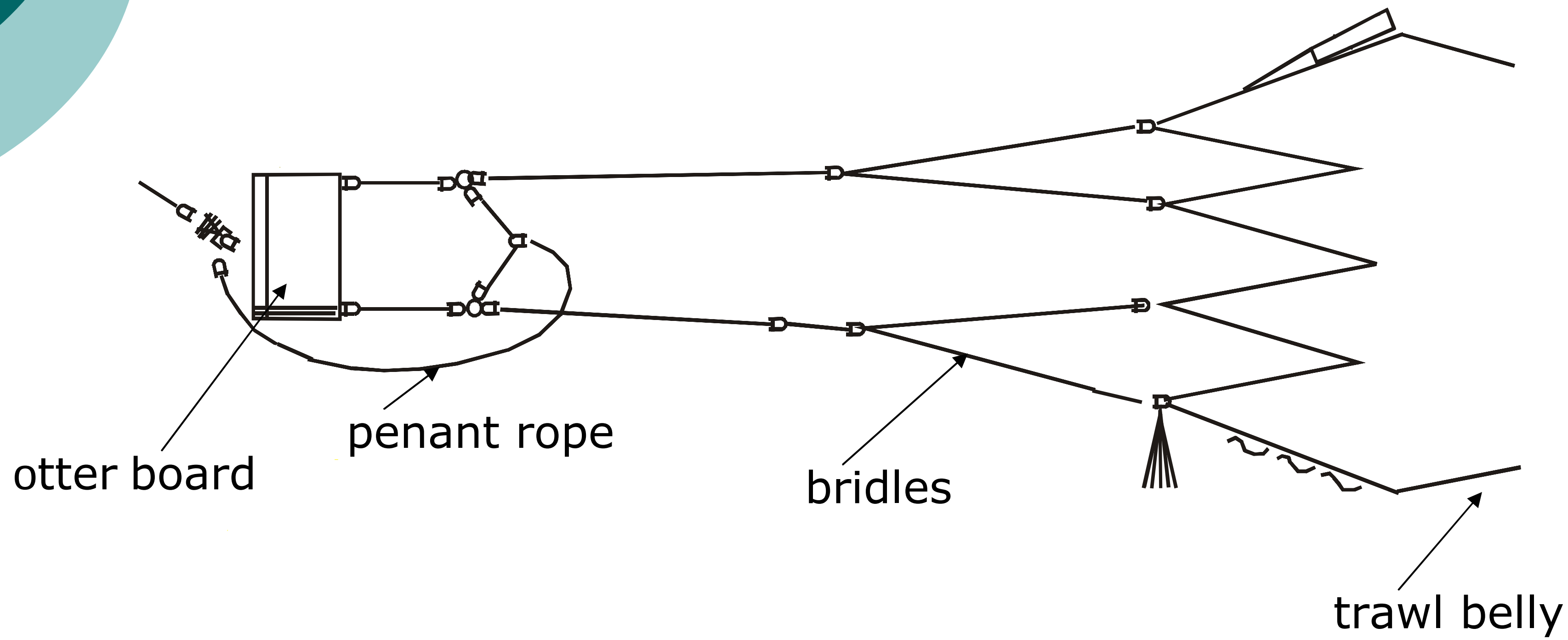


side panel

Rigging of 3-bridle pelagic trawl *(example)*



Rigging of 4-bridle pelagic trawl *(example)*



Examples of otter boards:

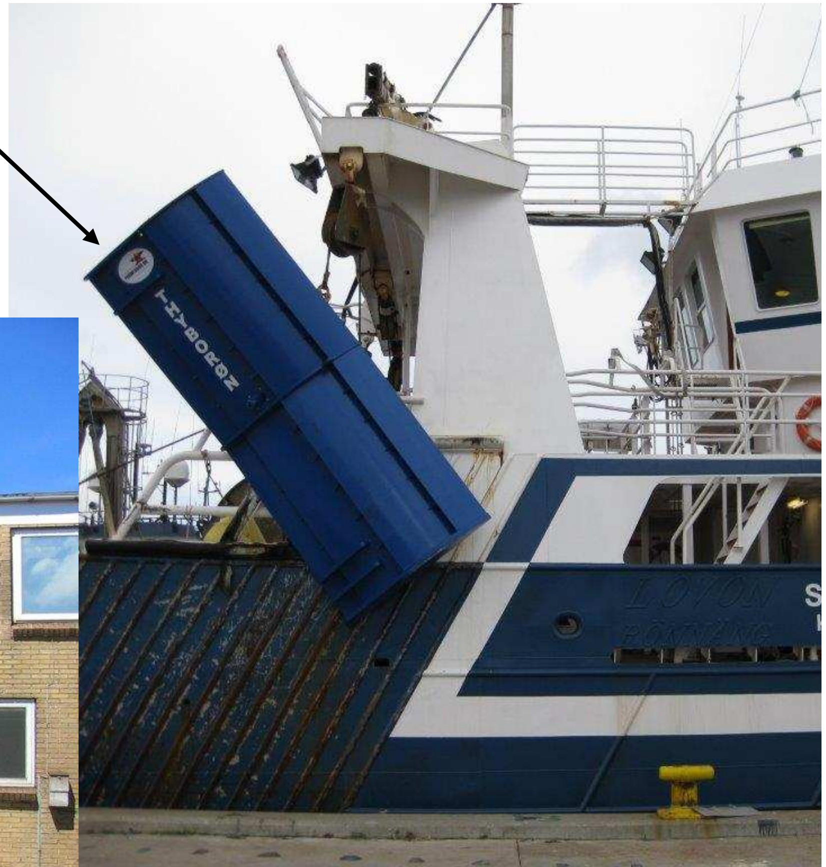
bottom-pelagic trawl doors type 2

Pelagic-bottom trawl doors type 14

Pelagic trawl doors type NTR

Pelagic trawl doors type Apollo Xtream

Pelagic trawl doors type 15



An attempt to standarize the research pelagic fishing gear for use in Baltic Sea

Keeping differences in trawl size depends on vessel size and main engine power as well as keeping differences in codend mesh size related to research area:
10 mm H/M- west from 15° longitude
and 6mm H/M – east from 15° longitude

by means of:

- unification of trawl belly;
- unification of trawl rigging;
- unification of otter boards

Trawl belly and its assembly

- The same trawl belly shape (width and depth of segments, tapering, assembling of segments, panels and seams);
- The same sort of netting;
- The same mesh size;
- The same twine thickness

Keeping the same parameters of netting ensures the same mesh opening coefficient and, consequently, gear selectivity.

Assembling and trawl rigging

- The same kind, thickness and length of ropes;
- The same netting mounting on frame ropes;
- Compatibility of rigging elements (floats, shackles, thimbles etc.);
- The same otter boards (type)

Keeping the same parameters ensures the same or similar shape of ropes (catenary), leading to the same mesh opening coefficient and inlet area.

Expected steps for standarization of the pelagic set

- Overview of the existing construction of both commercial and research trawls used in Baltic sea;
- Developing the initial design of the gear or selection of existing one, taking into account the level of difficulties of construction, its assembling and catching operations;
- Developing the detailed gear design and its elements. It should take into consideration the towing ability of the research vessels.

Expected steps for standarization of the pelagic set *(cont.)*

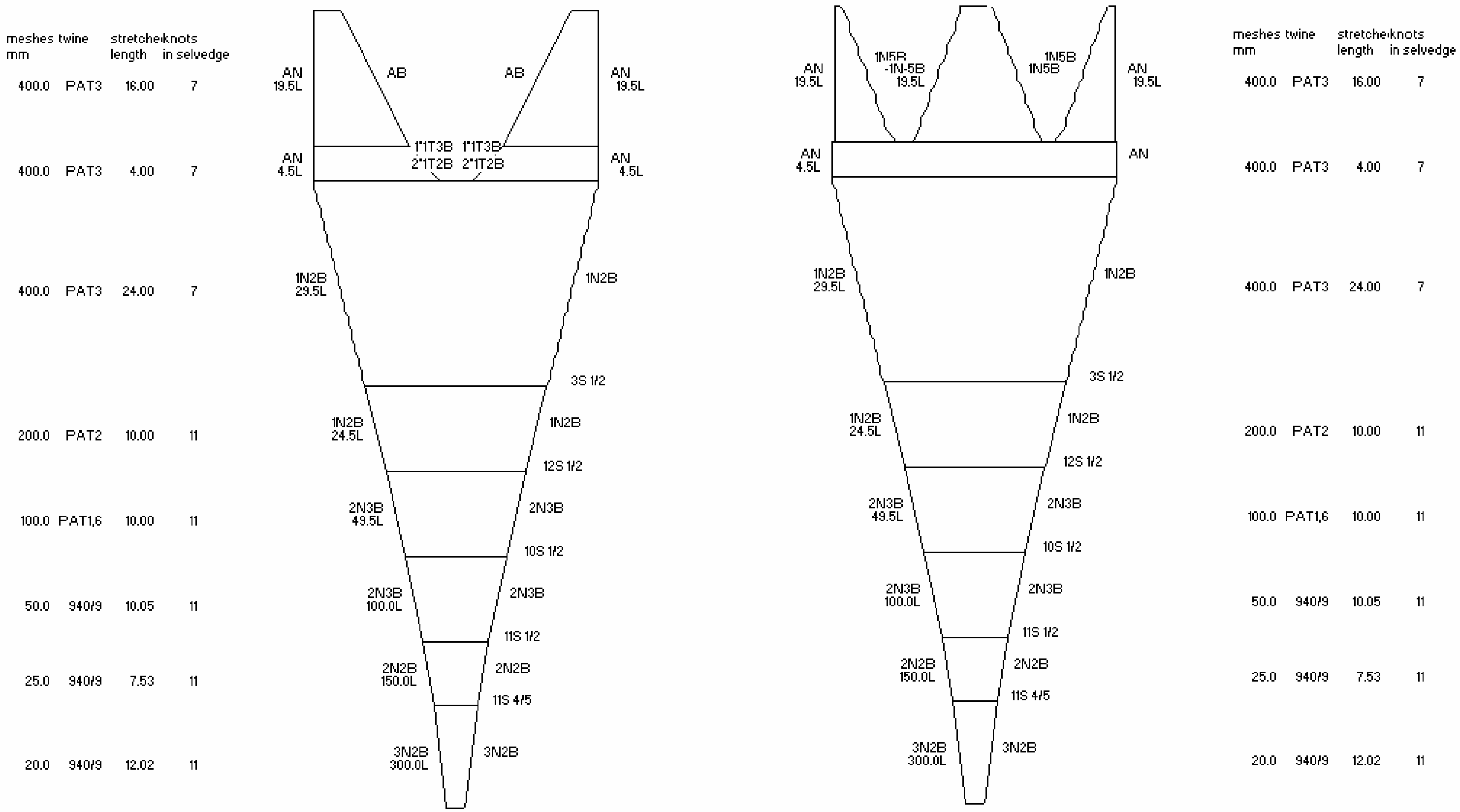
- Developing the assembling and maintenance manual with all possible details;
- Conducting model scale research, results of which could be useful to adjust the construction details and fishing operation (horizontal and vertical trawl opening, otter boards distance related to trawling speed etc.)

Conclusions

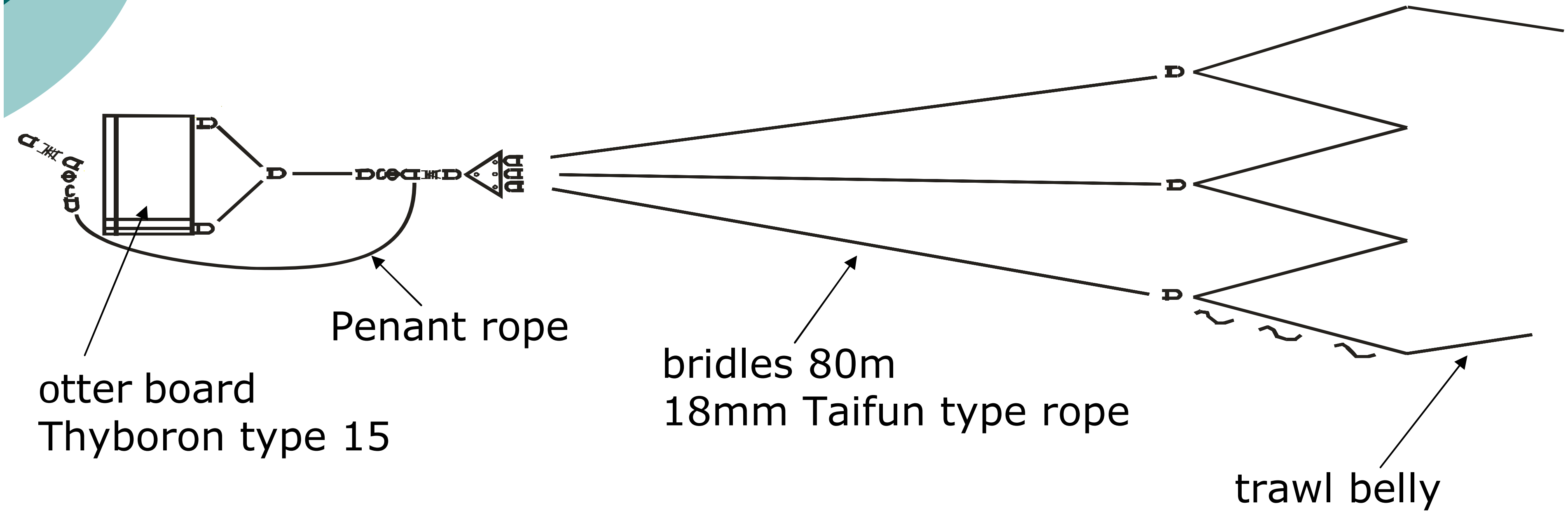
- Applying the rules mentioned above ensures the same or very similar survey gears, their inlet areas, hydromechanical characteristics and provides similar fish reaction on towing gear:
  - threshold response and initial time of it;
  - power of the response;
  - direction and response specifications

- Standarization of the pelagic gear used in surveys will enable comparability of data and surveys results, as is already the case with standarized survey demersal trawls TV-3#930 and TV-3#520.

Proposed pelagic trawl 268M (3350#)

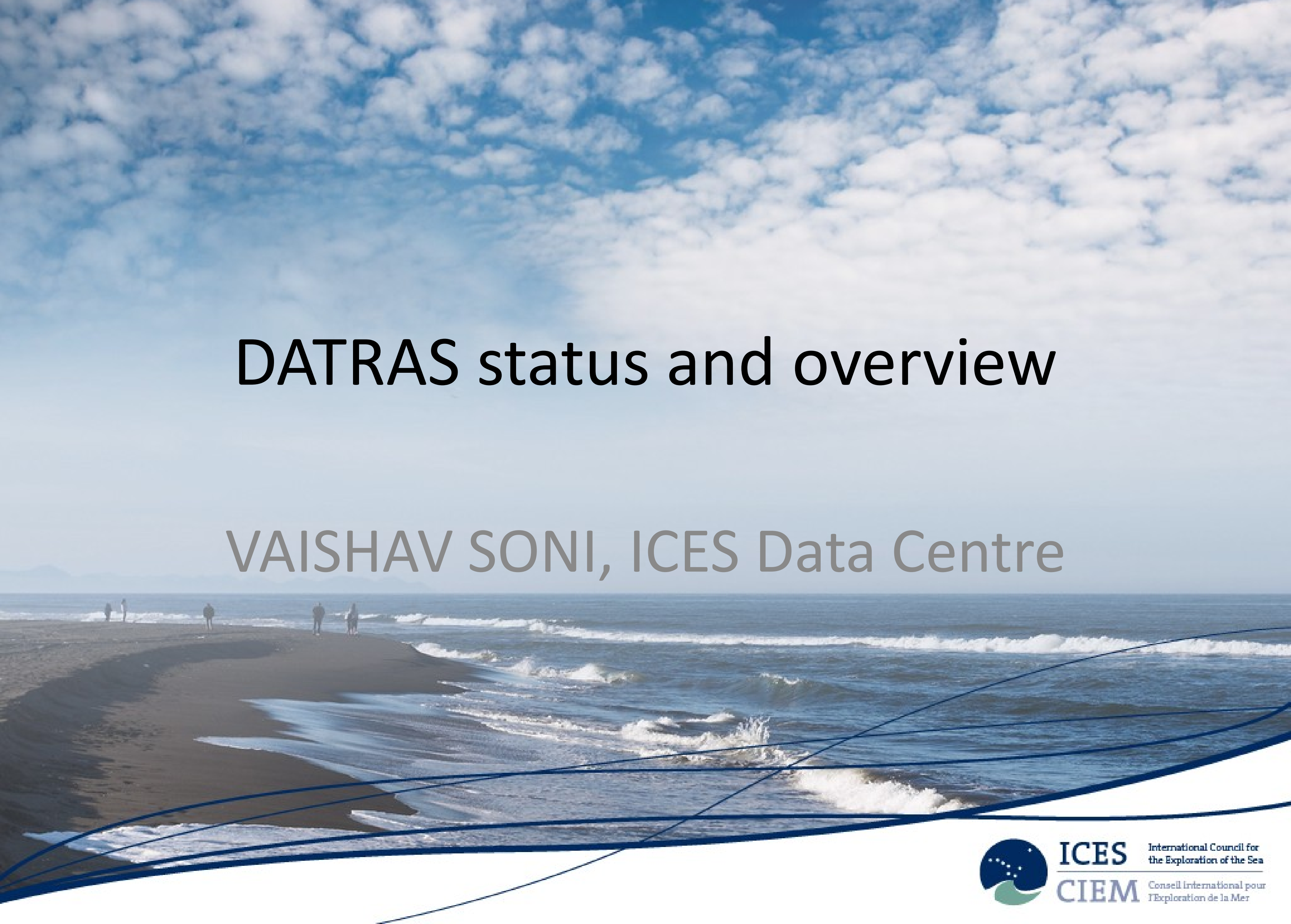


Proposed 3350# trawl rigging



Suggested otter boards Thyboron type 15

Thank you for your attention!


DATRAS status and overview
VAISHAV SONI, ICES Data Centre
ICES CIEM
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Workshop on Integrated DATRAS Products (WKIDP)

- **Current use of DATRAS**
- **Data mining, exploration and mapping of data**
- **Existing products to new outputs and estimation or calculation procedures of existing products**
- **new products**
- **Products needed for integrated ecosystem assessments and MSFD**

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

The suggested improvements to DATRAS

- Establishment of a data submitters contact list (1 person per country and per survey)
- Easier data submission process and improved documentation
- Publication of fixed parameters involved in products' calculation
- Ongoing documentation of changes and updates
- Improved visualisation of DATRAS data on ICES GeoPortal
- Links on DATRAS webpage to tutorials and packages using DATRAS data
- Development of products for BTS surveys
- Publication of intermediate calculations for existing products
- Development of new products for single-stock and ecosystem assessment

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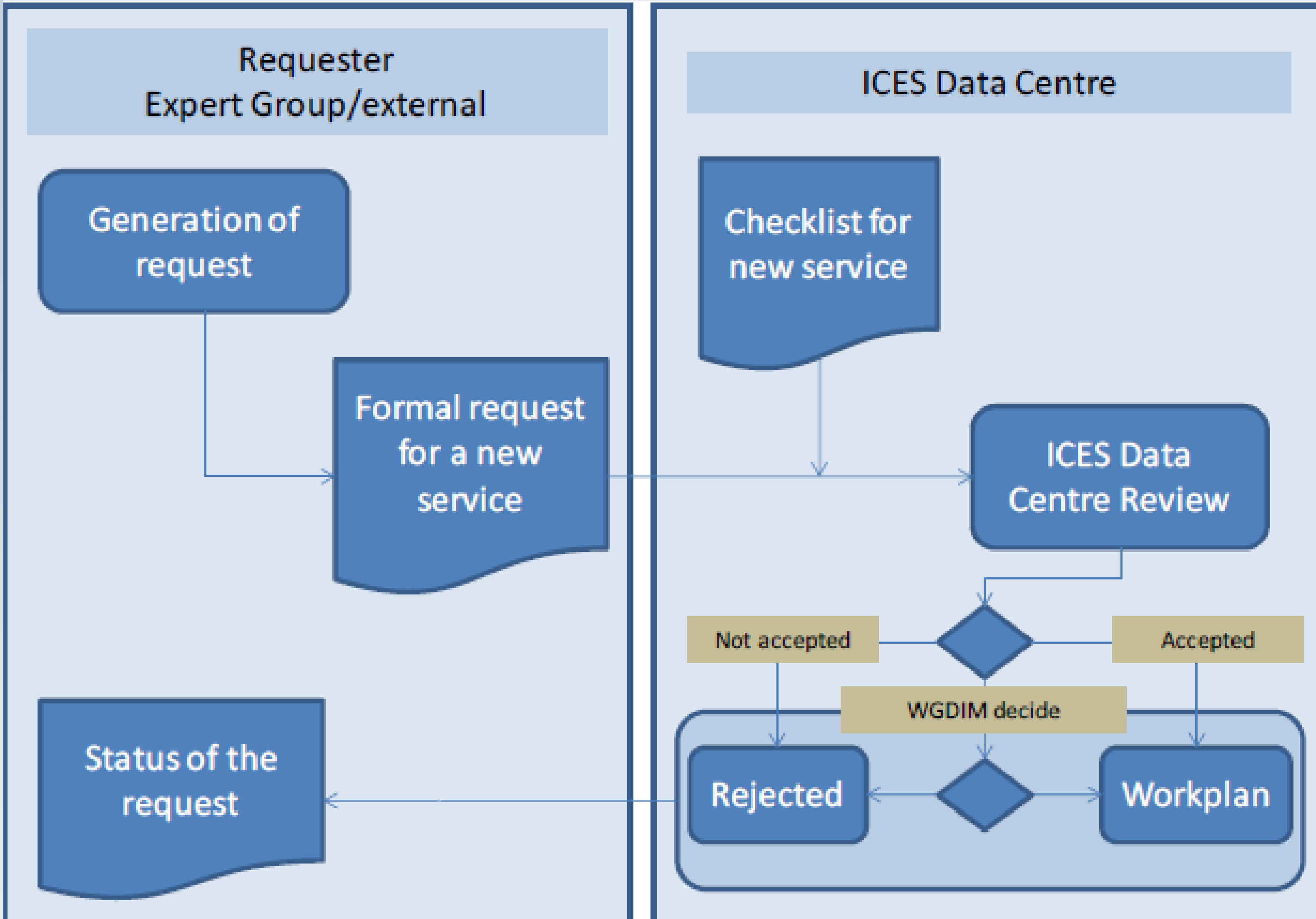
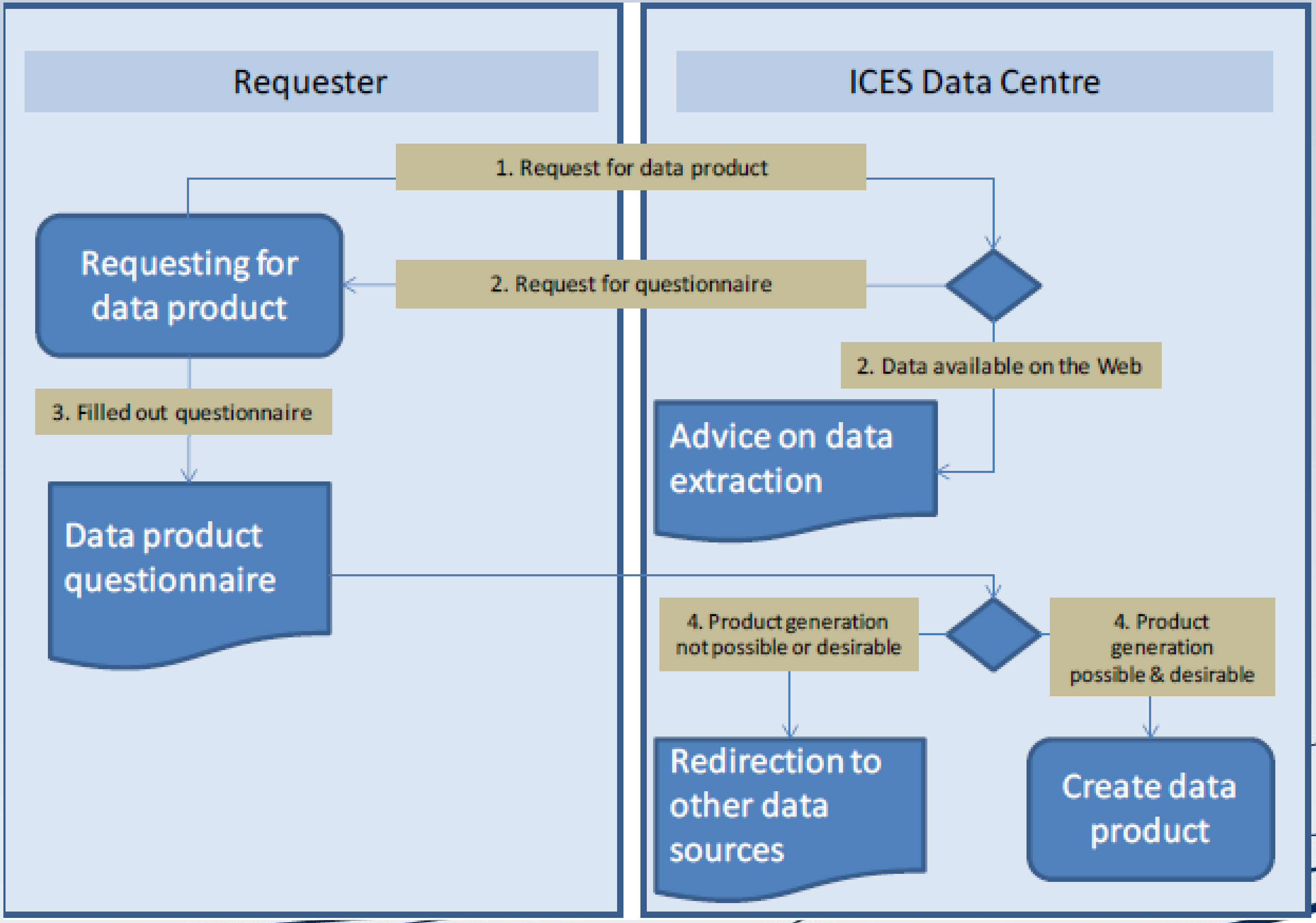
CIEM Conseil International pour l'Exploration de la Mer



Requester
Expert Group/external
ICES Data Centre
Generation of request
Checklist for new service
Formal request for a new service
ICES Data Centre Review
Not accepted
Accepted
WGDIM decide
Status of the request
Rejected
Workplan


Requester
ICES Data Centre
1. Request for data product
Requesting for data product
2. Request for questionnaire
2. Data available on the Web
3. Filled out questionnaire
Advice on data extraction
Data product questionnaire
4. Product generation not possible or desirable
4. Product generation possible & desirable
Redirection to other data sources
Create data product

- **Presently, some of the surveys are in progress of getting the extended data reporting formats (BTS, DYFS, Redfish).**

As we have some older requests by the IBTSWG to adopt new fields, we could offer new fields like f.ex.:
HH:CodendMesh
HL:LenMeasType (IBTSWG wish from 2010)
CA:FishID
CA: genetic sampling flag
CA: stomach sampling flag
CA: parasite sampling flag
CA:AgeSource
CA:AgePrepMet
CA:OtGrading

ICES CIEM International Council for the Exploration of the Sea Conseil International pour l'Exploration de la Mer

Thanks for your attention

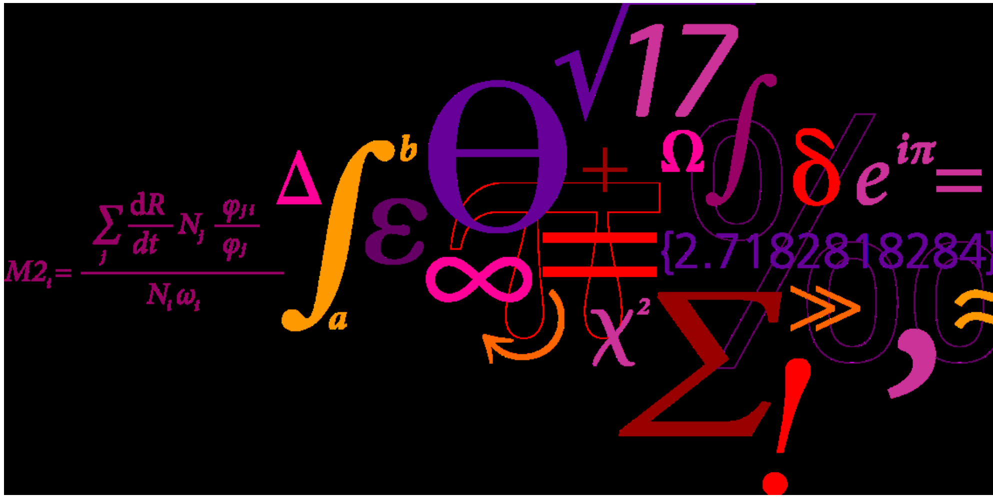
International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Summary of Danish BITS cruises

Autumn 2014 and spring 2015

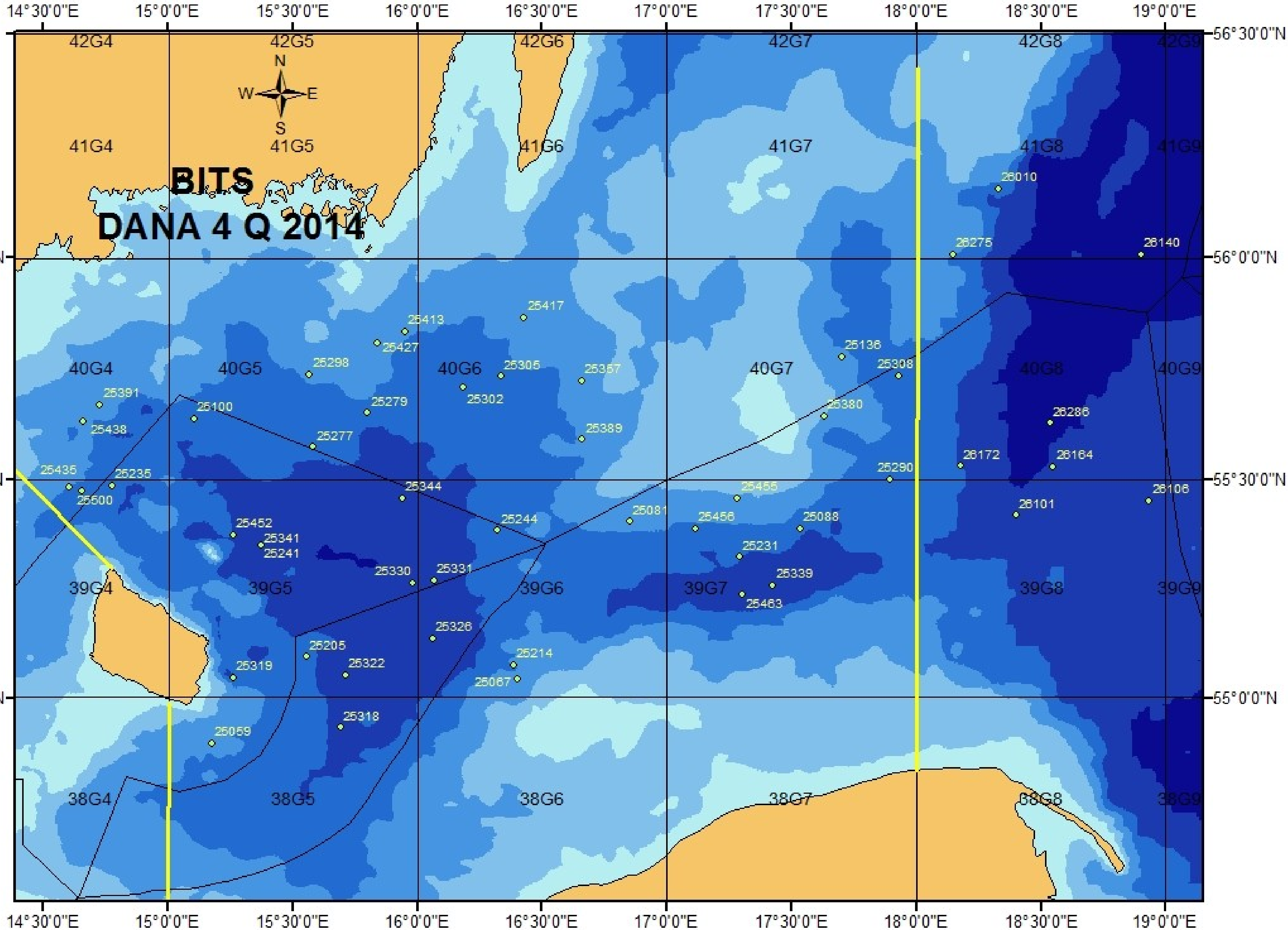
By Henrik Degel

WGBIFS, Öregrund, March 2015



DTU Aqua
National Institute of Aquatic Resources

BITS 4th quarter 2014
DANA


BITS
DANA 4 Q 2014
N
W
E
S
14°30'0"E
15°0'0"E
15°30'0"E
16°0'0"E
16°30'0"E
17°0'0"E
17°30'0"E
18°0'0"E
18°30'0"E
19°0'0"E
56°30'0"N
56°0'0"N
55°30'0"N
55°0'0"N
42G4
42G5
42G6
42G7
42G8
42G9
41G4
41G5
41G6
41G7
41G8
41G9
40G4
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39G4
39G5
39G6
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39G8
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38G4
38G5
38G6
38G7
38G8
38G9
26010
26275
26140
25417
25413
25427
25298
25305
25357
25136
25308
25391
25100
25279
25302
25380
26286
25438
25277
25389
26172
26164
25435
25235
25500
25344
25290
25455
26106
26101
25081
25456
25088
25244
25452
25341
25241
25231
25330
25331
25339
25463
25326
25205
25214
25319
25322
25067
25318
25059

Cruise summary

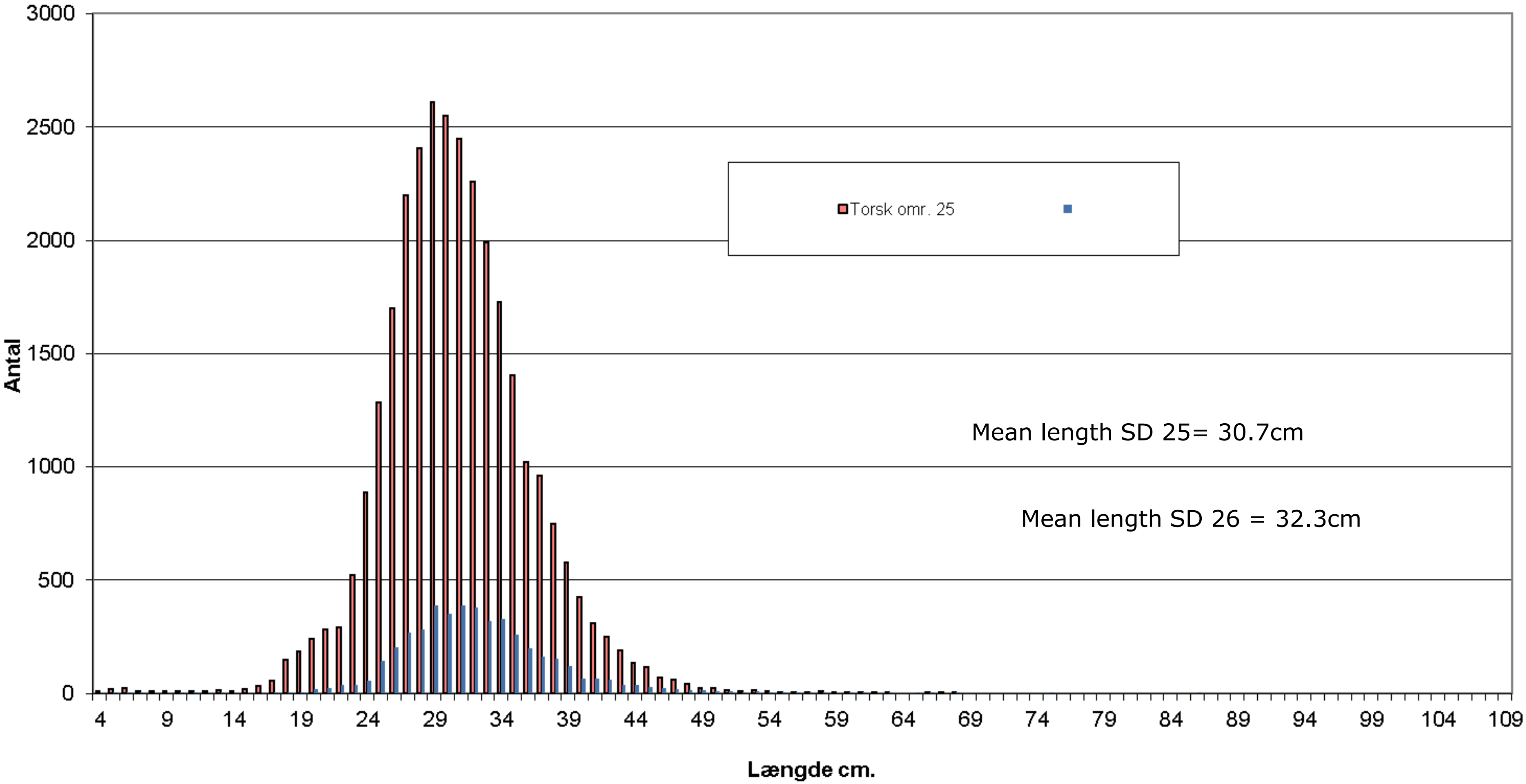
Cruise:	BITS
Cruise number	10
Quarter:	4
Year:	2014
Periode:	28/10-13/11
Country	Denmark

Number of hauls planed:	50	
	Index qualified	Non-index qualified
Number of succesful trawl hauls carried out in total:	44	
Number of invalid trawl hauls carried out:		2
Number of "No oxygen trawl hauls" carried out (assumed zerc	5	
SUM	49	2

Number of trawl related CTD stations performed:	50
Number of NON-trawl related CTD stations performed:	54
Number of succesful BONGO hauls carried out:	72
Number of succesful IKMT hauls carried out:	54
Number of succesful Appi hauls carried out:	4
Number of succesful WP2 hauls carried out:	5
Number of succesful BOM hauls carried out:	7
Number of succesful Multi-NET hauls carried out:	4
Total kgs of cod cached	10551.92
Total number of cod measured	34600
Total number of cod otoliths collected	883

DTU

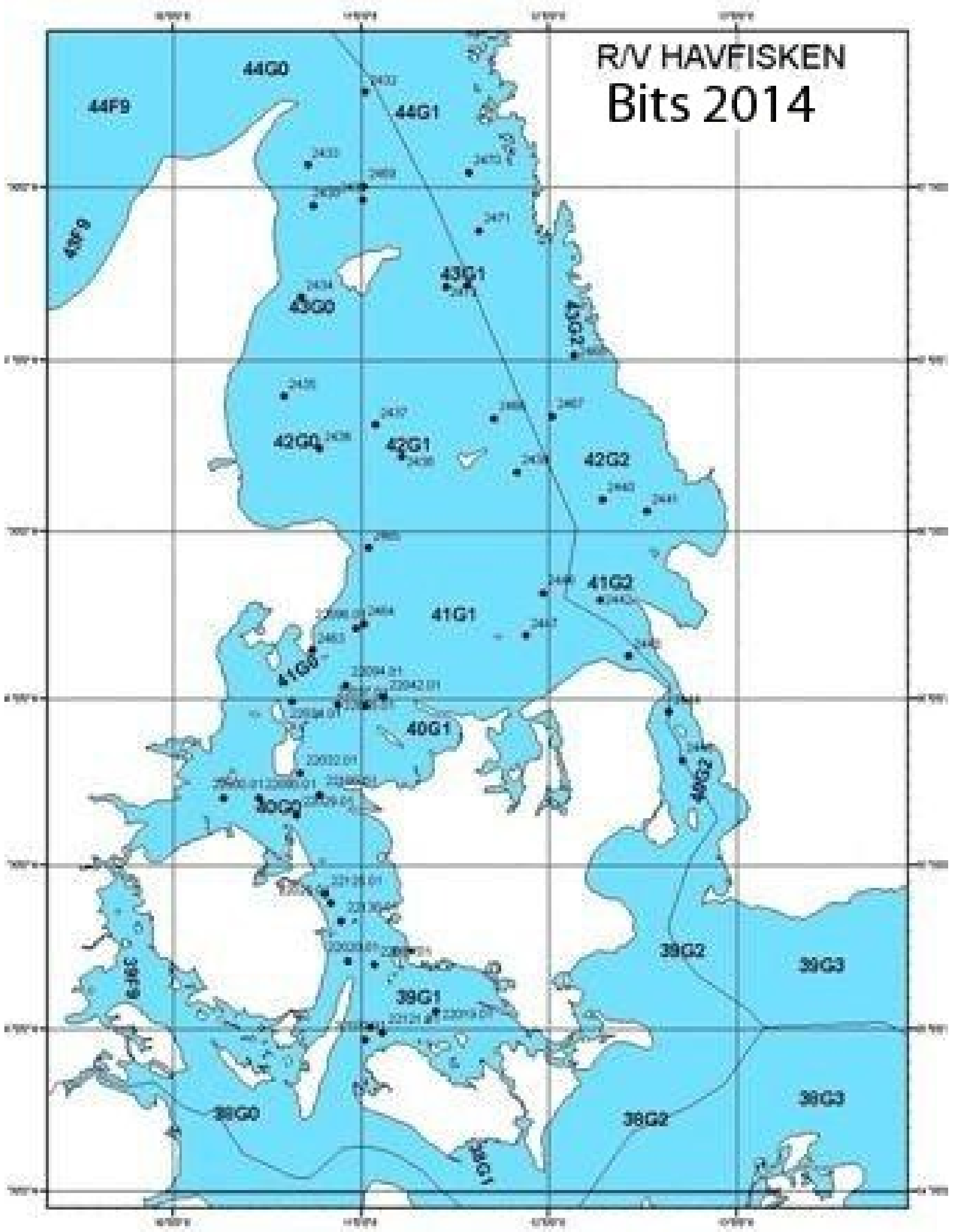
Samlet fangst af torsk BITS. november 2014



Mean length SD 25= 30.7cm

Mean length SD 26 = 32.3cm

BITS 4th quarter 2014
HAVFISKEN


R/V HAVFISKEN
Bits 2014
44G0
44F9
44G1
43F9
43G0
43G1
43G2
42G0
42G1
42G2
41G0
41G1
41G2
40G0
40G1
40G2
39F9
39G1
39G2
39G3
38G0
38G1
38G2
38G3

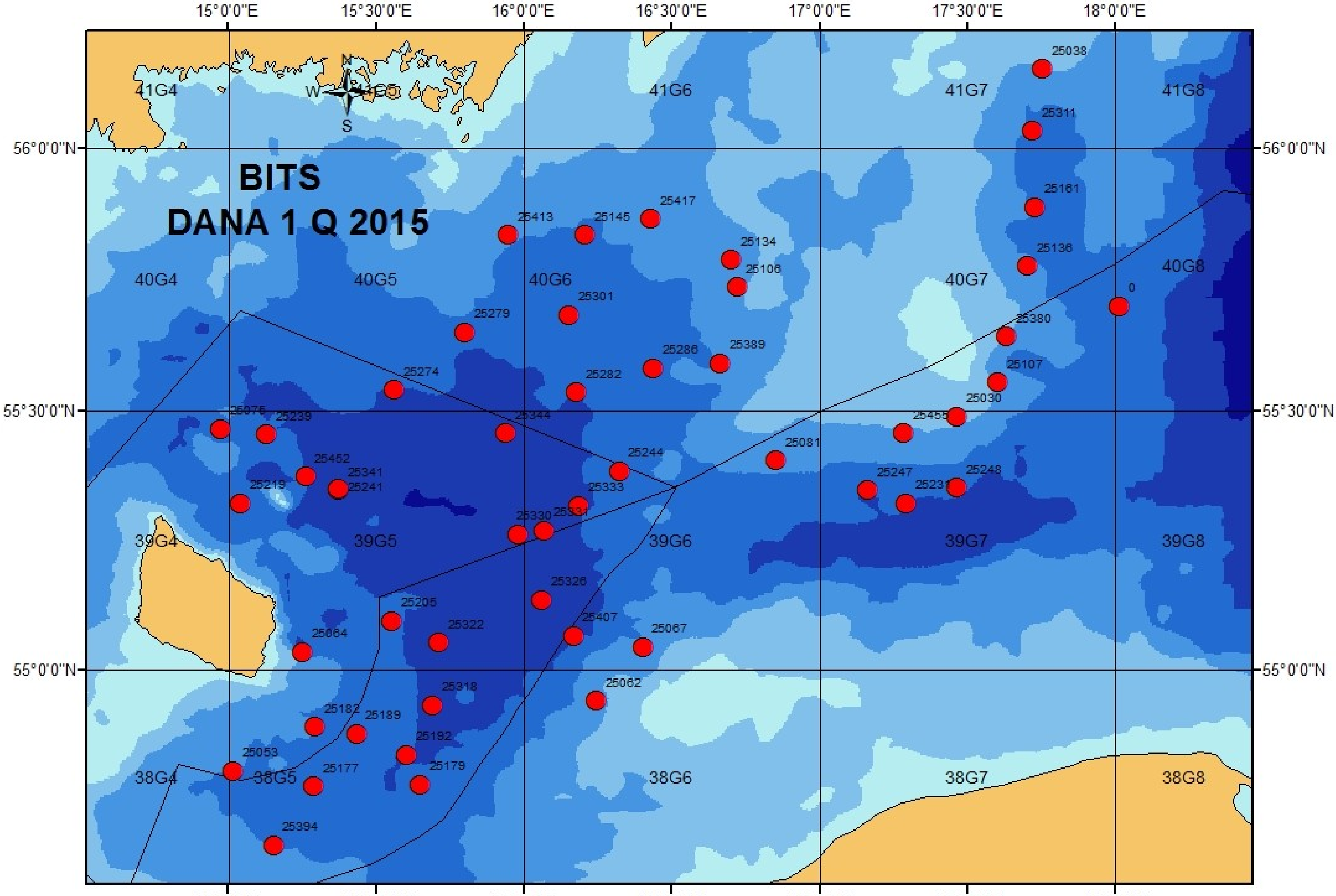
- Sub.division 21
  - 26 valid stations
  - Total catch: *4793kg.*
  - *Plaice: Number:3279 and 370kg.*
  - *Cod: Number 1396 and 693kg.*
  - *Sole: Number 155 and 23 kg.*
- Sub.division 22,
  - 19 valid stations
  - Total catch: 5514kg.
  - Plaice: Number: 5371 and 1089kg.
  - Cod: Number: 416 and 50 kg.
  - Sole: Numer: 329 and 46kg.
- Sub.division 23
  - 3 valid stations
  - Total catch:1678 kg.
  - Plaice Number: 215 and 69 kg.
  - Cod: Number: 217 and 141 kg.
  - Sole: Number: 6 and 2,4kg

Total for the cruise

- 48 valid stations
  - Total fangst 11986kg and 1529 kg
  - Plaice: Number: 8865 and 885kg.
  - Cod: Number: 2029 and 72kg.
  - Sole:Number:490 and 71.4 kg.

BITS 1st quarter 2015
DANA

Only 2/3 of the cruise is carried out at the time for presentation


BITS
DANA 1 Q 2015
15°0'0"E
15°30'0"E
16°0'0"E
16°30'0"E
17°0'0"E
17°30'0"E
18°0'0"E
56°0'0"N
55°30'0"N
55°0'0"N
41G4
41G5
41G6
41G7
41G8
40G4
40G5
40G6
40G7
40G8
39G4
39G5
39G6
39G7
39G8
38G4
38G5
38G6
38G7
38G8
N
W
S
25038
25311
25161
25136
0
25380
25107
25030
25455
25248
25231
25247
25081
25417
25145
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25075
25239
25452
25341
25241
25219
25326
25205
25322
25407
25067
25064
25062
25318
25182
25189
25192
25053
25177
25179
25394

Cruise summary

Only 2/3 of the cruise is carried out at the time for presentation

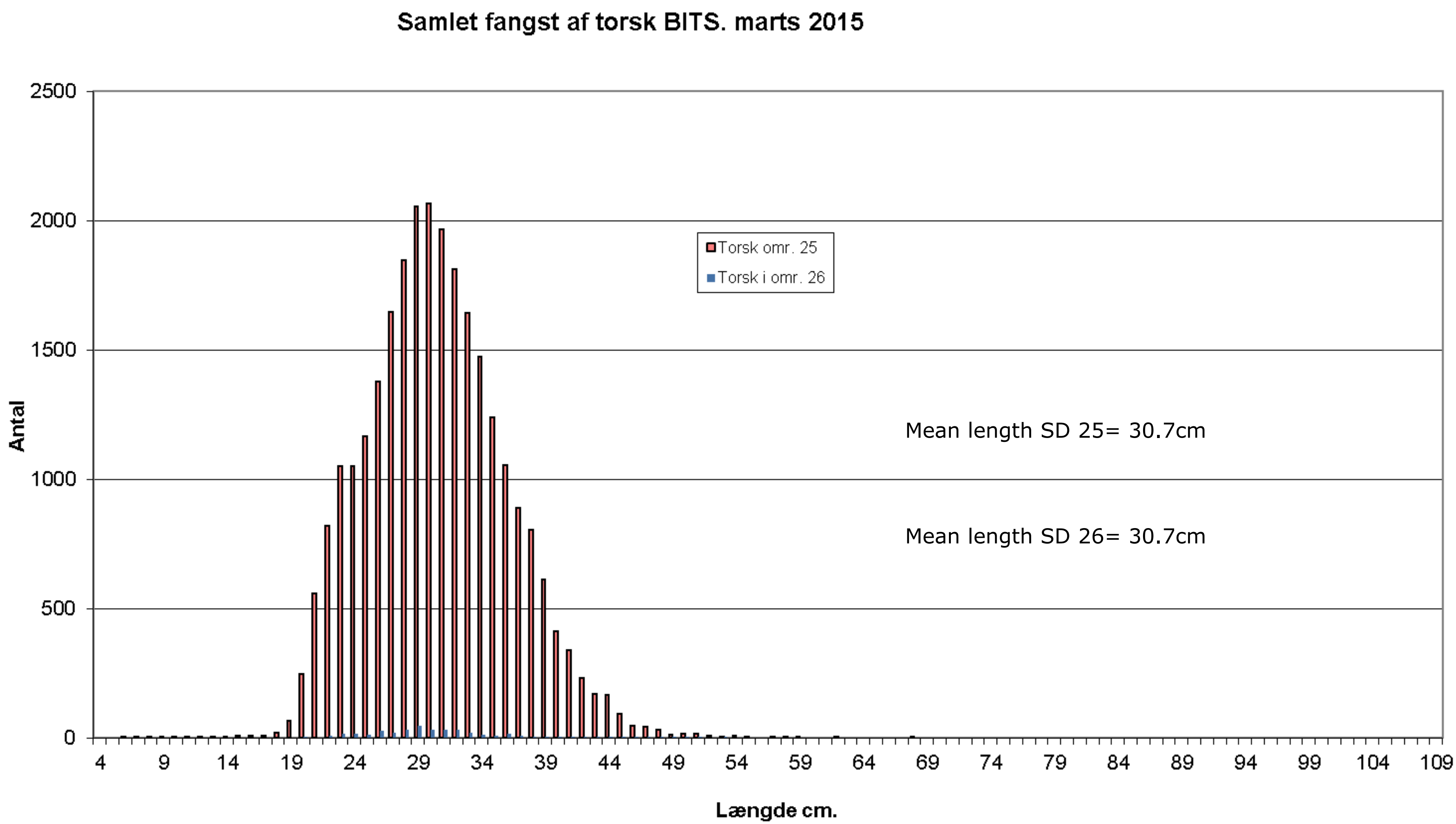
Cruise:	BITS
Cruise number	4
Quarter:	1
Year:	2015
Periode:	10/03-26/03
Country	Denmark

Number of hauls planed: 50

	Index qualified	Non-index qualified
Number of succesful trawl hauls carried out in total:	32	
Number of invalid trawl hauls carried out:		0
Number of "No oxygen trawl hauls" carried out (assumed zero-ca	0	
SUM	32	0

Number of trawl related CTD stations performed:	32
Number of NON-trawl related CTD stations performed:	0
Number of succesful BONGO hauls carried out:	0
Number of succesful IKMT hauls carried out:	0
Number of succesful Appi hauls carried out:	0
Number of succesful WP2 hauls carried out:	0
Number of succesful BOM hauls carried out:	0
Number of succesful Multi-NET hauls carried out:	0

Total kgs of cod cached	0
Total number of cod measured	0
Total number of cod otoliths collected	0


Samlet fangst af torsk BITS. marts 2015
Antal
Længde cm.
Torsk omr. 25
Torsk i omr. 26
Mean length SD 25= 30.7cm
Mean length SD 26= 30.7cm
0
500
1000
1500
2000
2500
4
9
14
19
24
29
34
39
44
49
54
59
64
69
74
79
84
89
94
99
104
109

Preliminary impressions from the cruise

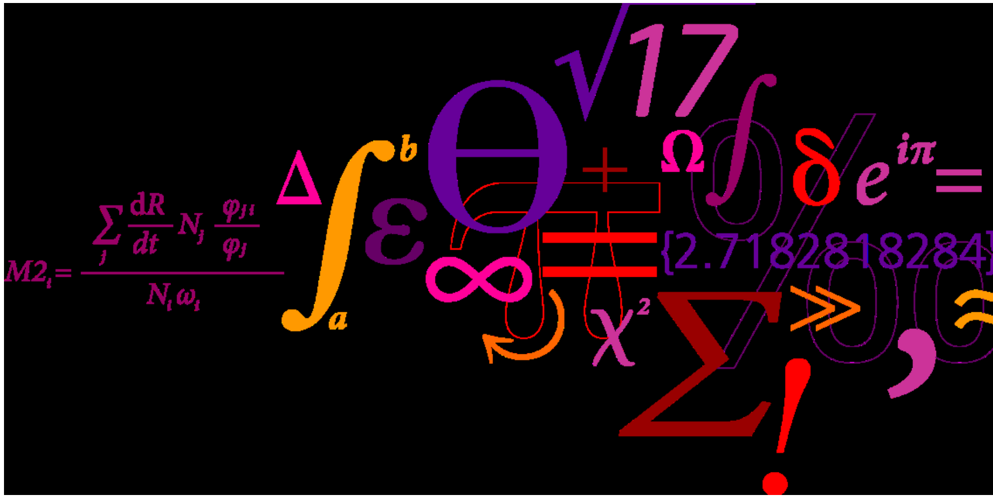
- Oxygen everywhere
- Very god condition factor
- Over average catches of cod

Age readings methods

Comparison of methods used for species in the Baltic Sea

By Henrik Degel

WGBIFS, Öregrund, March 2015



DTU Aqua
National Institute of Aquatic Resources

Country	Species						
	Sprat	Herring	Flounder	Plaice	Sole	Dab	Cod
Estonia							
Germany			3)	3)	3)	3)	2)
Denmark							
Poland							
Finland							
Russia							
Sweden		1)					
Lithuania							
Latvia							

Whole, Penetrating light, Alcohol

Stained, Sliced, Penetrating light

Sliced, Penetrating light, Alcohol?

Penetrating light

Reflecting light

Whole

Broken

Sliced

Whole, Reflecting light, Alcohol

Whole, Reflected light, Water

Broken, Reflecting light, Water

Broken, Reflecting light, Alcohol

Broken, Burned, Reflecting light

Stained, Sliced, Reflected light

Whole, Burned, Reflected light

1) Otoliths from Botnian Sea are treated as Finland
2) Broken otoliths were used until 2007
3) Whole otolith were used until middle of 2008

Stock indices based on acoustic surveys in the Baltic Sea – Alternative application of results of fishing stations

Rainer Oeberst
Thünen-Institut of Baltic Sea Fishery

Content:

Overview of available data
Relations between sA(k) and sA(k,i)
Estimated stock indices of herring and sprat
Cod in the pelagic
Mixing of WBSSH and CBH

THÜNEN

Thank you for providing the data which are required for the analyses

Definition of format for exchange data of acoustic survey is strongly required

Overview of data

Surveys: BIAS & BASS

Period: 2009 – 2012 (data of 2013 in report of last year)

Number of fishing stations during BIAS by year and country

	Estoni	Germa	Latvia	Lithuai	Poland	Russia	Swede
2009	18	49	8				87
2010	24	57	19	6			84
2011	23	54	14	10	32		82
2012	22	56	19	8	37		47

Number of fishing stations during BASS by year and country

	Germa	Latvia	Lithuai
2009	49		
2010	48	20	8
2011	52	21	6
2012	68	10	7

THÜNEN

Overview of data

Reported species composition of BIAS

	Countr	Herring	Sprat	Cod	Sticklb	others
2009	Estonia	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x		
	Lithuania					
	Poland					
	Swede	x	x	x	x	
2010	Estonia	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x		
	Lithuai	x	x	x	x	
	Poland					
	Swede	x	x	x	x	
2011	Estonia	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x	x	
	Lithuai	x	x	x		
	Poland	x	x	x		
	Swede	x	x	x	x	
2012	Estonia	x	x	x	x	
	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x	x	
	Poland	x	x	x		
	Swede	x	x	x	x	

Reported species composition of BASS

	Countr	Herring	Sprat	Cod	Sticklb	others
2009	Germa	x	x	x	x	x
	Latvia					
	Lithuania					
2010	Germa	x	x	x	x	x
	Latvia	x	x			
	Lithuai	x	x	x	x	
2011	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x	x	x
2012	Germa	x	x	x	x	x
	Latvia	x	x	x	x	x
	Lithuai	x	x	x		

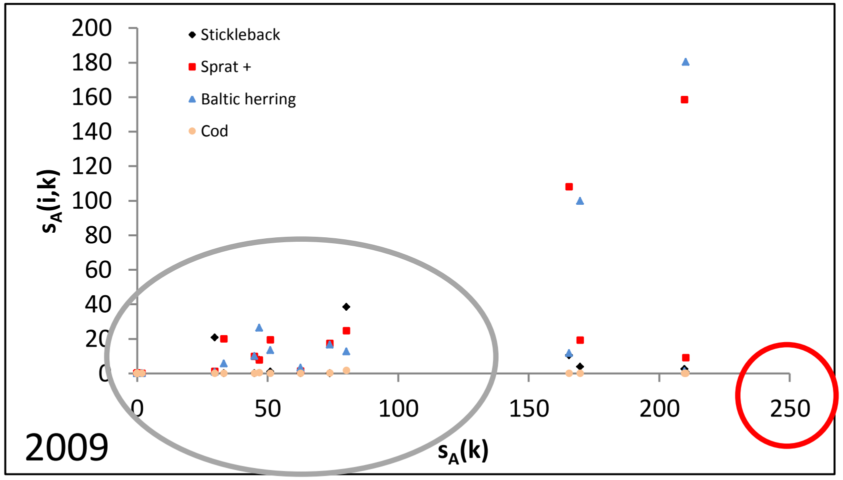
Did the species composition describe total catch?

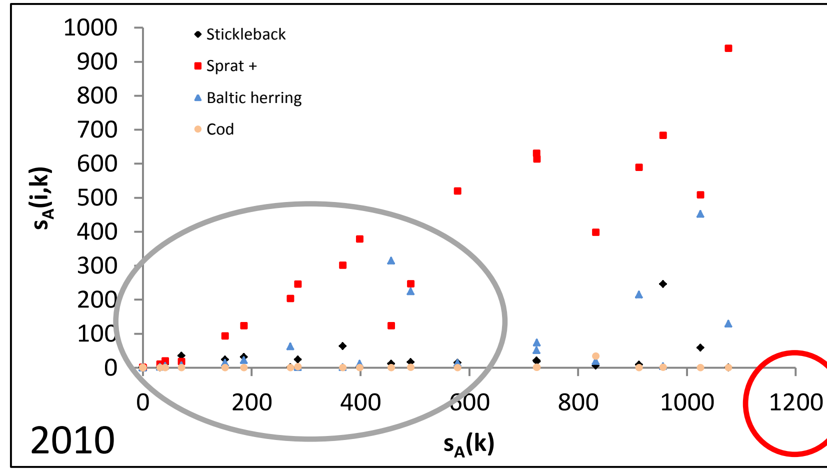
Species composition influences the estimated indices of target species

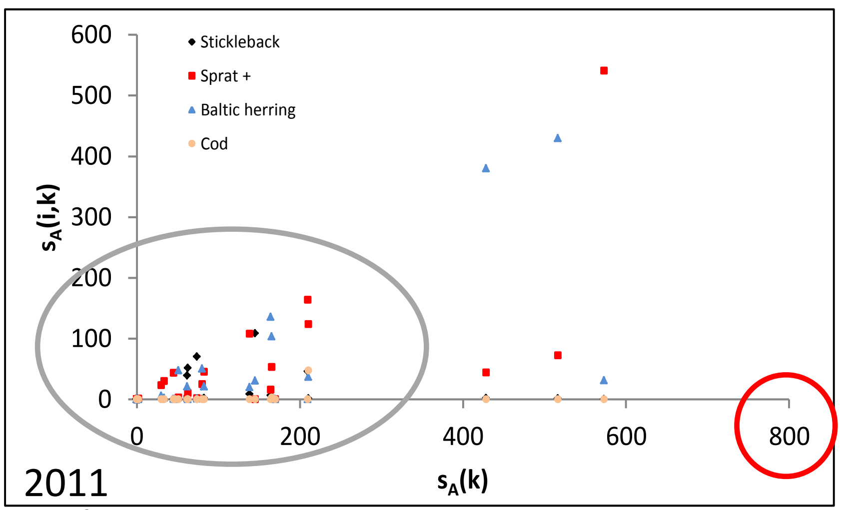
s_A values of acoustic tracks

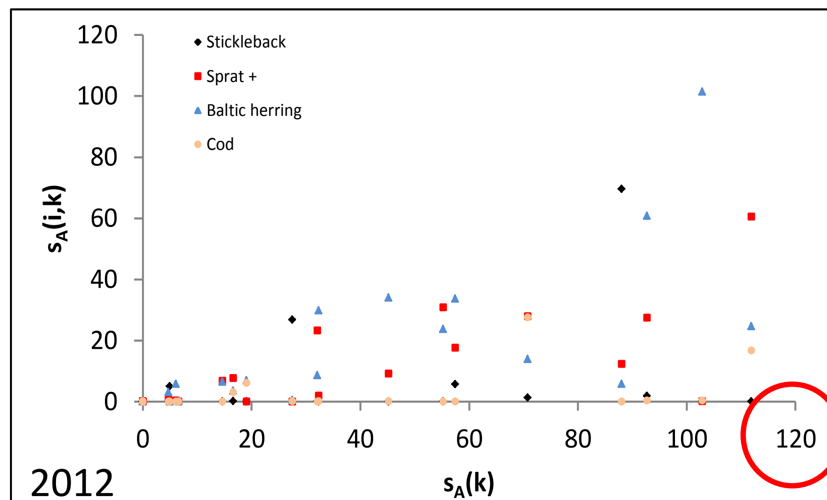
Relations between $s_A(k)$ an $s_A(k,i)$, BIAS

Figures summarize the data of all years for SD 22









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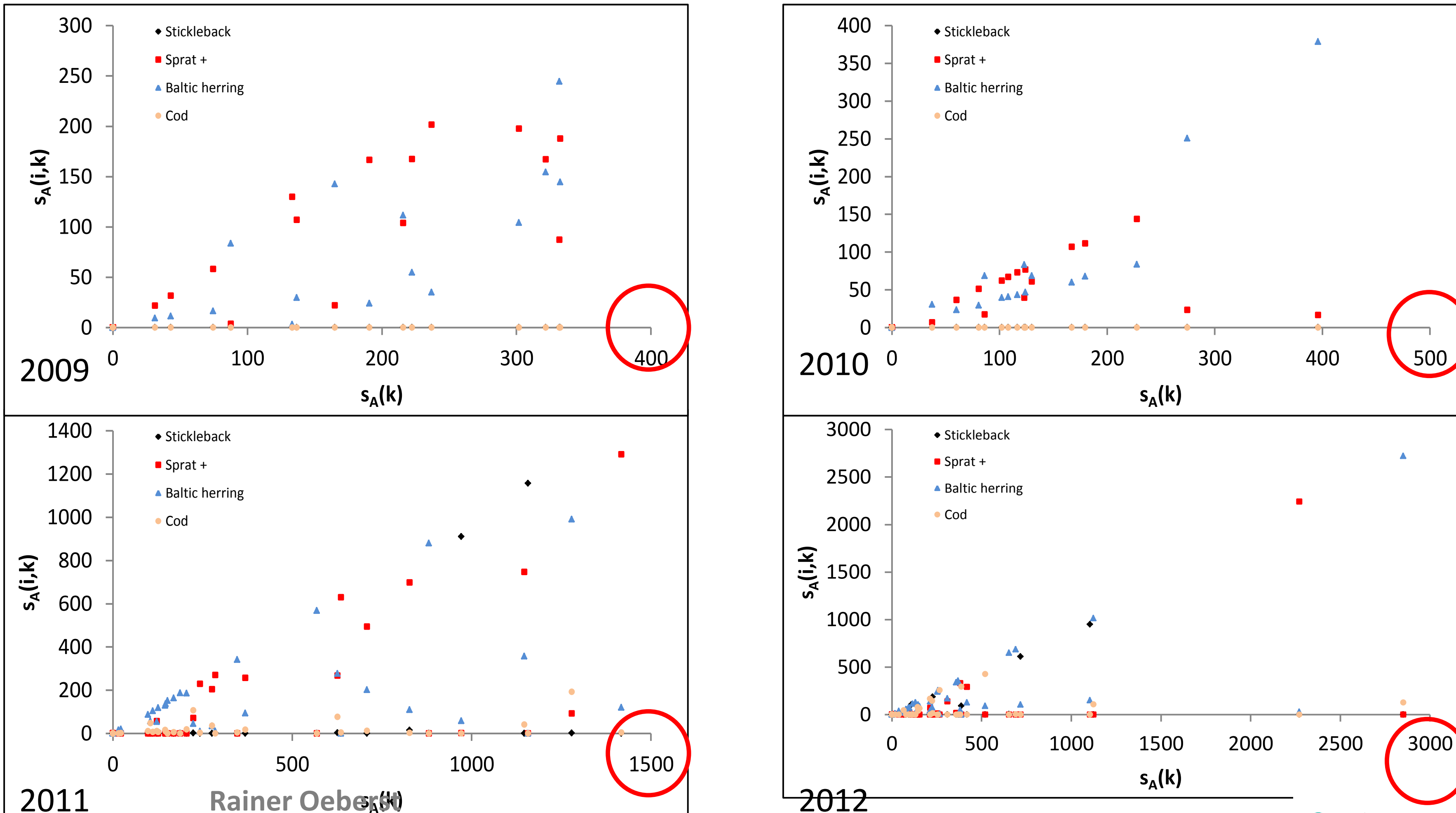
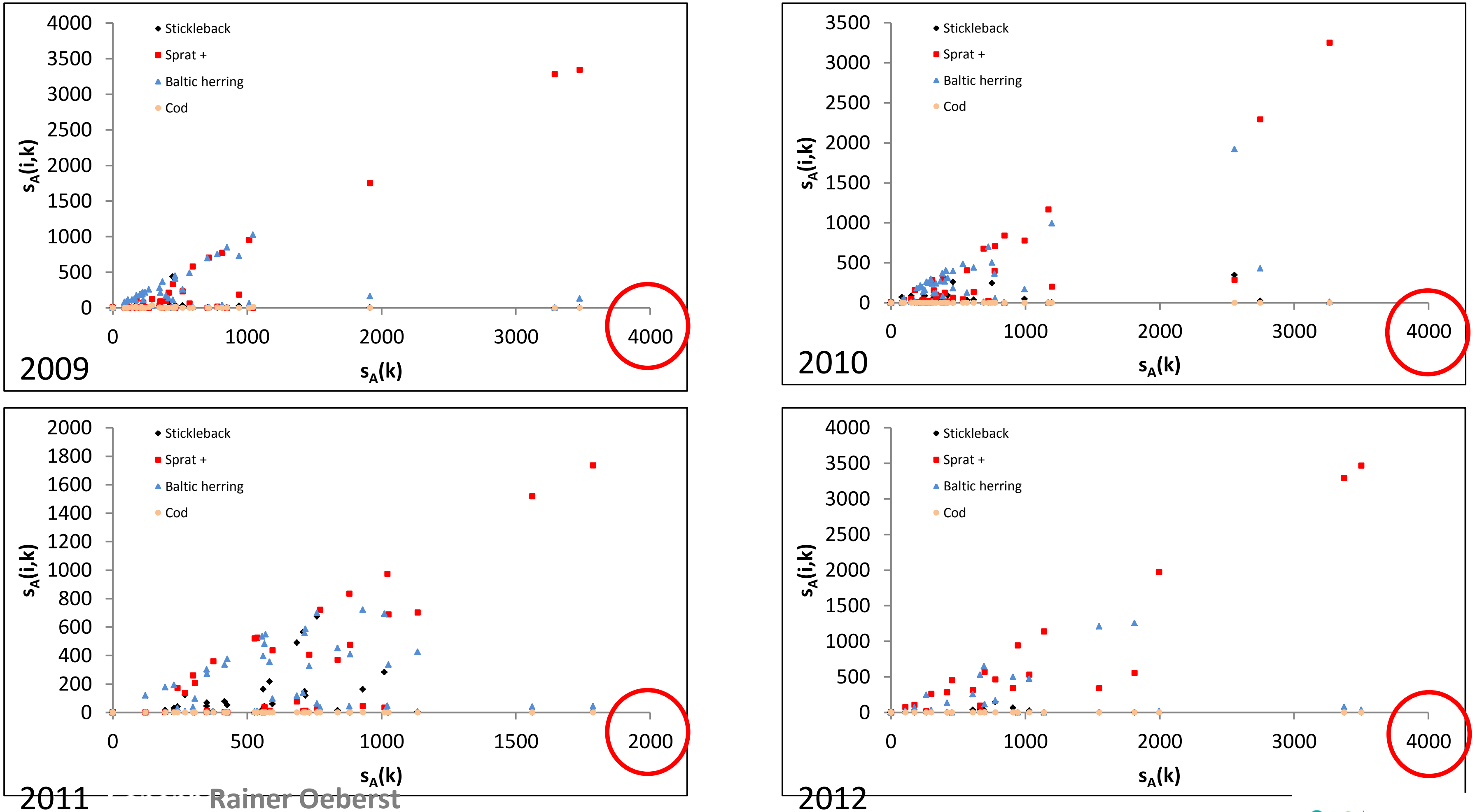
Relations between $s_A(k)$ an $s_A(k,i)$, BIAS

Figures summarize the data of all years for SD 25



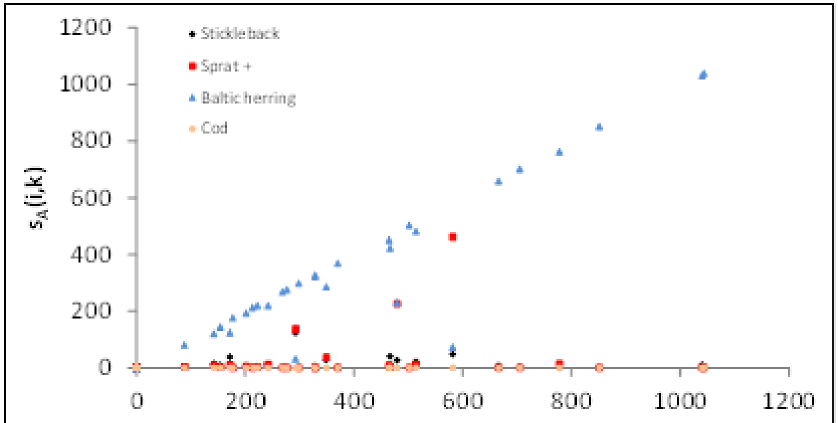
Relations between $s_A(k)$ an $s_A(k,i)$, BIAS

Figures summarize the data of all years for SD 32

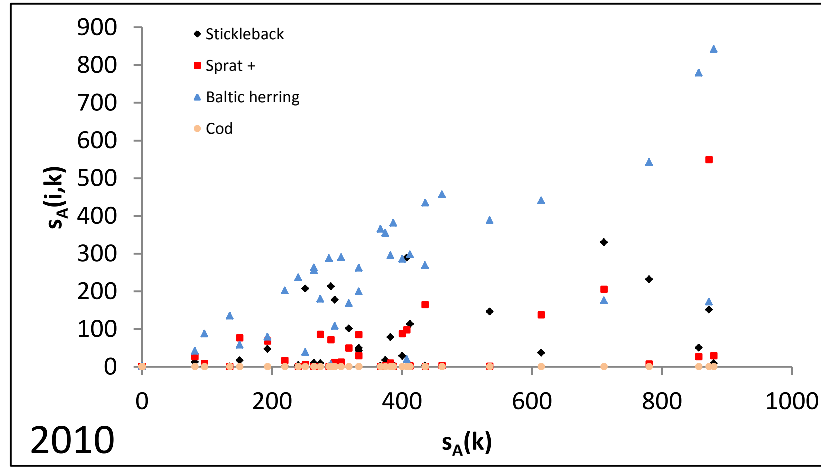


Relations between $s_A(k)$ an $s_A(k,i)$, BIAS

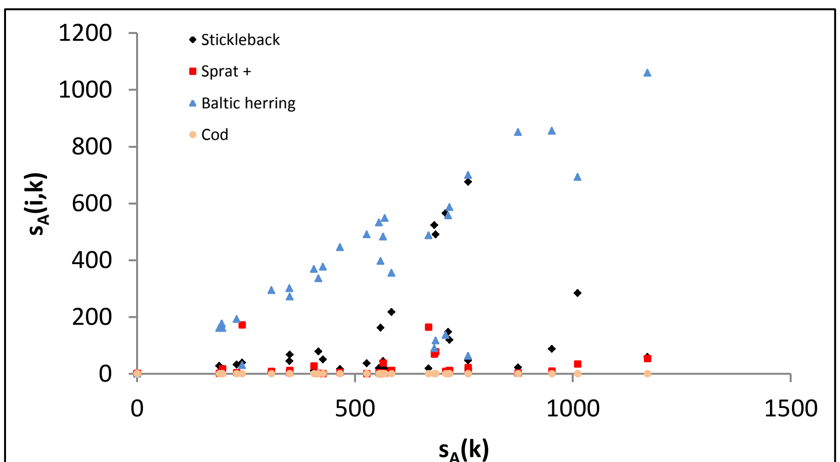
Figures summarize the data of all years for SD 30



2009



2010



2011

2012

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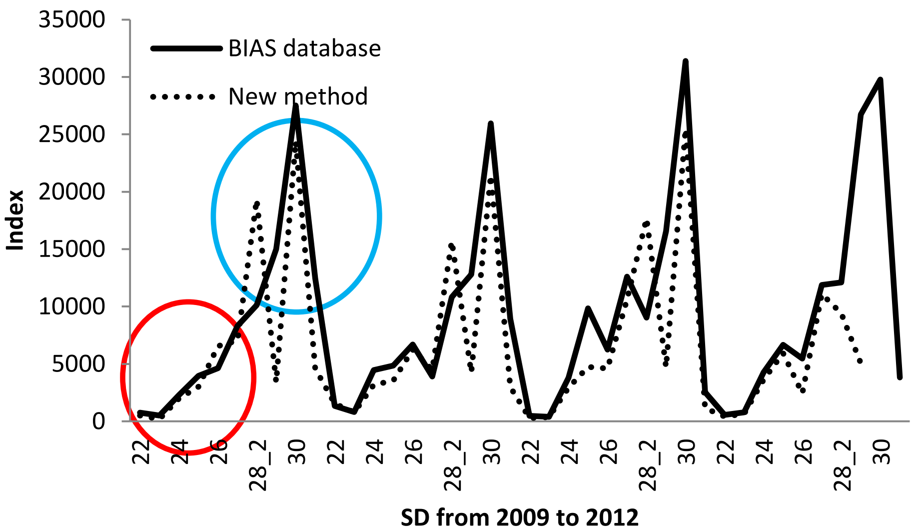
Indices based on both methods, BIAS

Indices of herring by SD based on BIAS from 2009 to 2012

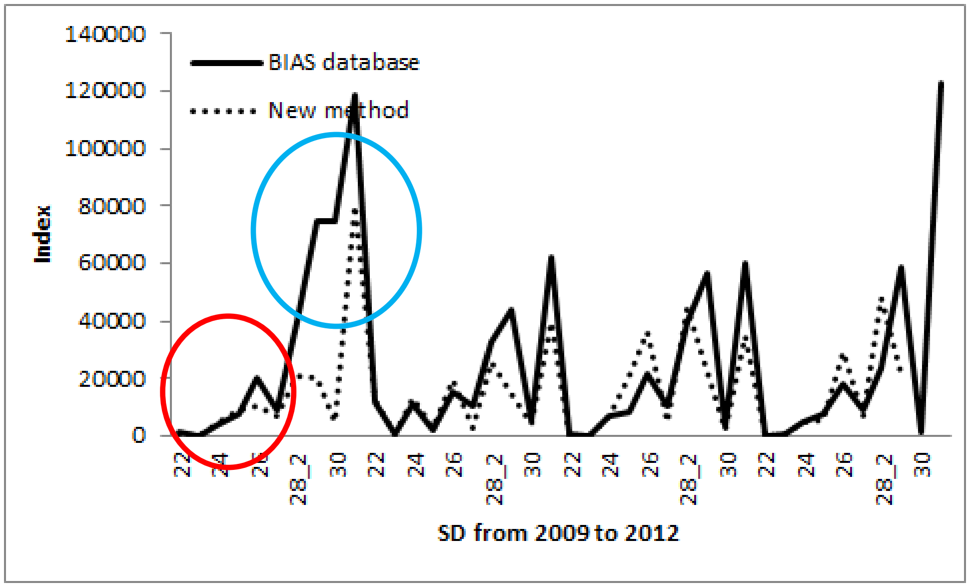


Similar herring indices in SD 22 - 27

Different herring indices in SD 28 - 32

Indices based on both methods, BIAS

Indices of sprat based on BIAS by SD from 2009 to 2012



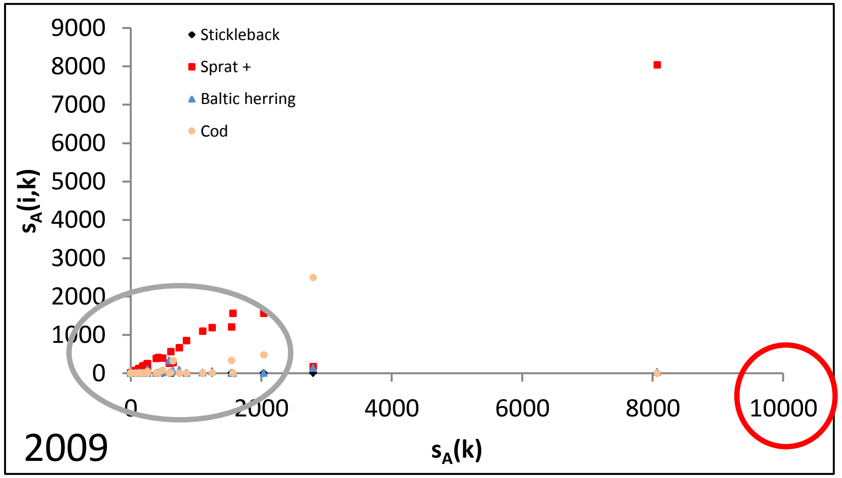
Similar sprat indices in SD 22 - 27

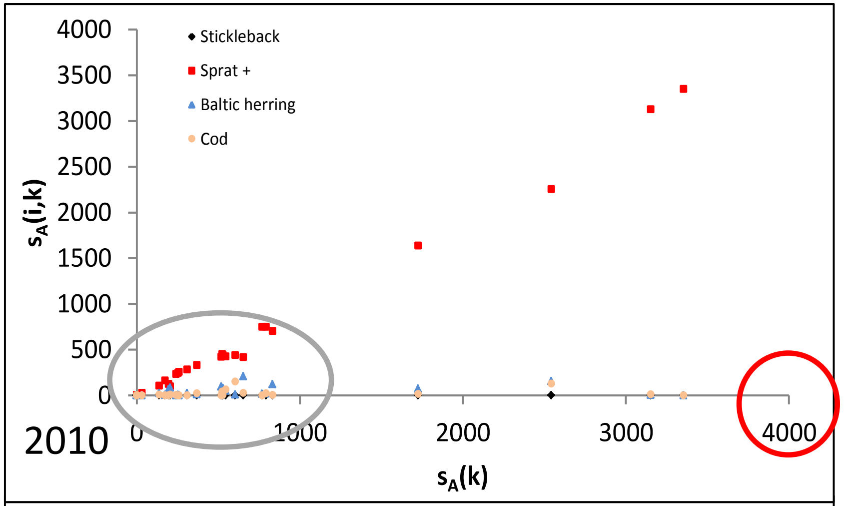
Different sprat indices in SD 28 - 32

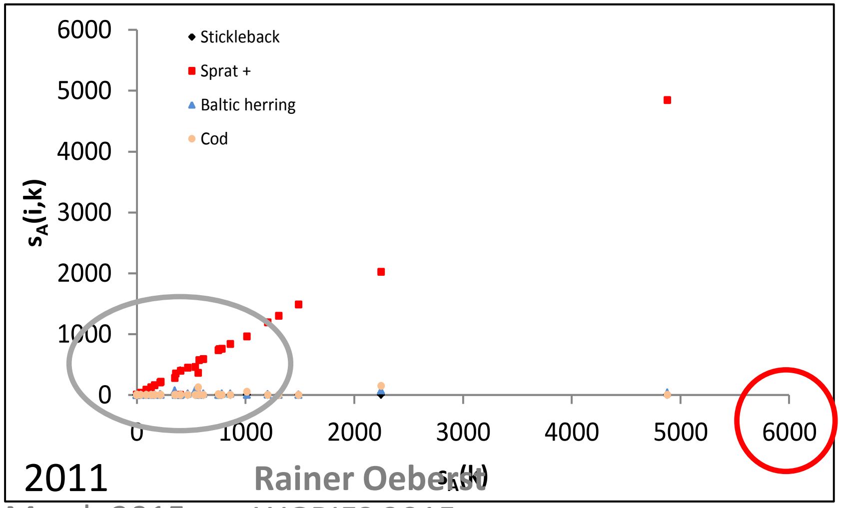
Results suggest that the effect of different methods for combining the results of fishing station is larger, if only one species is dominant

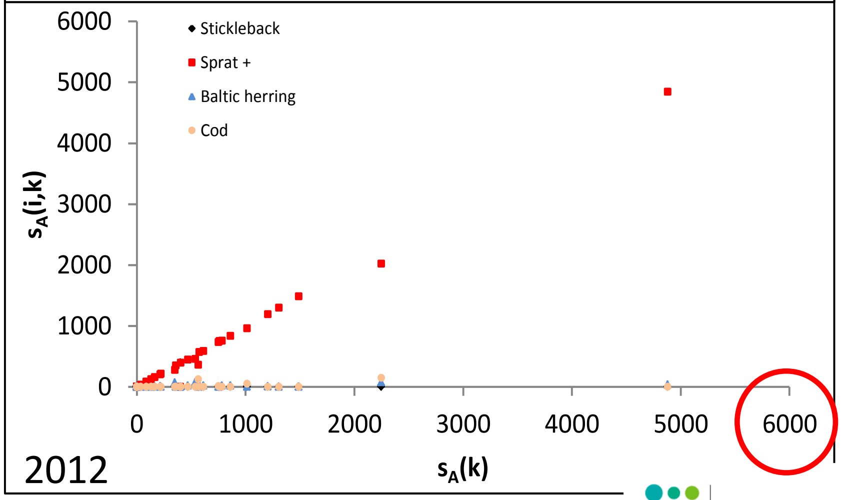
Relations between $s_A(k)$ an $s_A(k,i)$, BASS

Figures summarize the data of all years for SD 25 during BASS





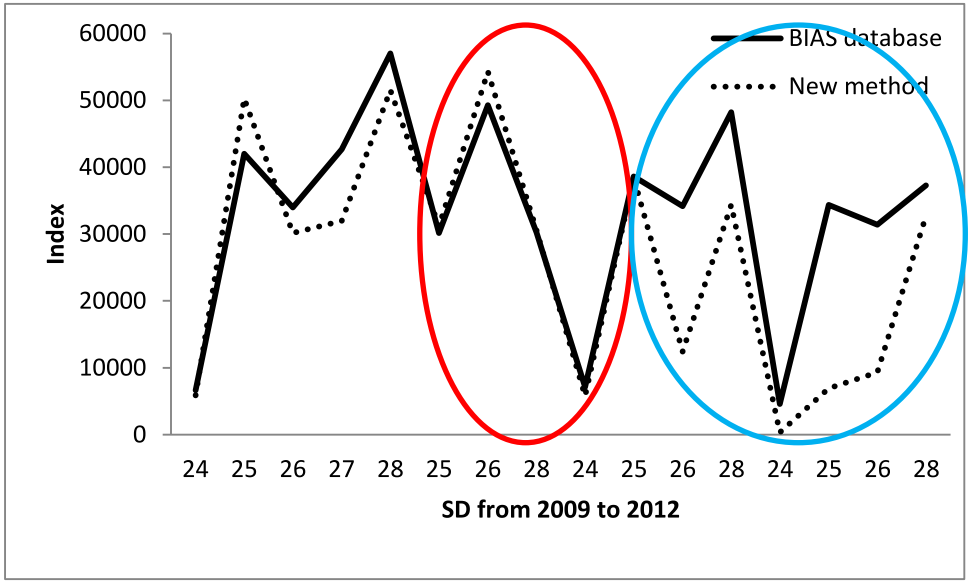




THÜNEN

Indices based on both methods, BASS

Indices of sprat by SD from 2009 to 2012



Similar sprat indices in all SD's in 2010

Strong differences in 2011 and 2012

Conclusions

- New approach described more appropriate the relations between the species compositions
- Description of an exchange format of all relevant acoustic data is an important prerequisite to improve the estimates based on acoustic surveys and for more details analyses of available data.
- The analyses present only preliminary estimates of stock indices because some data were missing like s_A values of acoustic tracks, species composition of total catch, etc.

Indices of pelagic cod

Fishing stations in the pelagic waters without bottom contact

Estimated abundances of cod present only cod in the pelagic and are spatially separated from cod at the bottom

Slightly overlap of the vertical opening of gears used during acoustic and BITS surveys is only likely in shallow areas

Indices of pelagic cod

Mean number cod per hour in unit of TVL estimated based on BIAS (left part) and based on BITS (right part) in quarter 4

	Estimates based on BIAS				Estimates based on BITS in (			
SD	2009	2010	2011	2012	2009	2010	2011	2012
22	31	61	147	347	42	121	111	306
23	188	471	1550	1284	220	102	42	89
24	147	250	27	105	557	969	510	532
25	300	275	337	1347	1376	1497	1216	1760
26	146	63	118	102	453	1121	482	771
27	26	12	7	22	125	17	2	2
28	11	18	78	19	476	146	373	235

Increases of cod in the pelagic from 2009 to 2013 (SD 22, SD 23 and SD 25)

Cod estimated by acoustic methods were many times higher in SD 23 in 2011 and 2012.

High variation of cod in the pelagic from year to year

Estimates based on acoustic methods can be valuable extension of BITS

Indices of pelagic cod

Mean number cod per hour in unit of TVL estimated based on BASS (left part) and based on BITS (right part) in quarter

	Estimates based on BASS				Estimates based on BITS in quarter 1			
SD	2009	2010	2011	2012	2009	2010	2011	2012
24	42	0	17	101	611	624	473	466
25	1851	184	113	31	1217	1305	1301	1217
26	403	73	257	1562	584	1081	427	1200
28	110	29	14	31	58	50	20	41

High abundance in SD 25 in 2009 in pelagic water compared to BITS

Significantly lower estimates in 2010 – 2012

High variation of cod in the pelagic from year to year

Mixing of WBSSH and CBH

Individuals were classified to one of the stock based on age-length data and defined separation function (Gröhsler et al. 2013)

Proportion of Western Baltic Spring Spawning Herring (WBSSH) in SD 24 during BIAS between 2009 and 2012

	Age group						
	0	1	2	3	4	5	6
2009	100	100	67	40	25	33	0
2010	100	100	80	30	14	33	0
2011	100	100	90	52	26	21	46
2012	100	99	99	96	67	37	53

Decreasing proportion of WBSSH for older age groups

Low number of older herring - WBSSH mainly stays in SD 21 and SD 23

Mixing of WBSSH and CBH

Proportion of Western Baltic Spring Spawning Herring (WBSSH) in SD 25 and SD 26 during BIAS between 2009 and 2012

	Age group						
	0	1	2	3	4	5	6
2009	0	67	24	17	11	13	0
2010	0	73	29	9	7	0	0
2011	0	100	60	15	4	0	0
2012	0	88	83	33	7	6	0

Increasing proportion of WBSSH in age groups 1 and 2 in 2011 and 2012

Low proportion of WBSSH in older age groups

	Age group						
	0	1	2	3	4	5	6
2009	0	50	6	0	0	0	0
2010	0	67	0	0	0	0	0
2011	0	86	25	0	0	0	0
2012	0	100	67	33	0	0	0

Similar development of the proportion of WBSSH of age group 1 and 2

WBSSH was not classified in age group 4+

Low proportion of WBSSH in older age groups

Conclusions

Indices of cod based on the acoustic surveys can provide a vulnerable time series of cod in the pelagic waters

Intensive mixing of youngest age groups of WBSSH and CBH is highly probably in SD 25 and SD 26. Separation of the herring indices into WBSSH and CBH can improve the understanding of the dynamics of both stocks.

Repeated estimation based on all sampled data and extension of the time series require the application of defined exchange format for the submission of required data.

Marine Litter

- Swedish BITS Marine litter.

A: Plastic	**B: Sanitary waste**	**C: Metals**	**Related size category**
A1. Bottle	B1. diapers	C1. Cans (food)	A: <5*5 cm= 25 cm^2
A2. Sheet	B2. cotton buds	C2. Cans (beverage)	B: <10*10 cm= 100 cm^2
A3. Bag	B3. cigarette butts	C3. Fishing related	C: <20*20 cm= 400 cm^2
A4. Caps/ lids	B4. condoms	C4. Drums	D: <50*50 cm= 2500 cm^2
A5. Fishing line (monofilament)	B5. syringes	C5. appliances	E: <100*100 cm= 10000 cm^2= 1 m^2
A6. Fishing line (entangled)	B6. sanitary towels/ tampon	C6. car parts	F: >100*100 cm = 10000 cm^2= 1 m^2
A7. Synthetic rope	B7. other	C7. cables	
A8. Fishing net		C8. other	
A9. Cable ties			
A10. Strapping band			
A11. crates and containers			
A12. other			

D: Rubber	**E: Glass/ Ceramics**	**F: Natural products**	**G: Miscellaneous**
D1. Boots	E1. Jar	F1. Wood (processed)	G1. Clothing/ rags
D2. Balloons	E2. Bottle	F2. Rope	G2. Shoes
D3. bobbins (fishing)	E3. piece	F3. Paper/ cardboard	G3. other
D4. tyre	E4. other	F4. pallets	
D5. glove		F5. other ***F5: Cinder stone (SWE)***	
D6. other			***F5: Hard coal (SWE)***

Country	SWE
Cruise	BITS2015Q1
Date	260215
Haul no	6
Litter Type (A1; B2; C…)	**A7**
Description (Label/ Brand)	synthetic rope
Size category (A; B; C..)	A
Weight (kg)	0,004
Number	1
Picture (no.)	
Attached organisms (yes/no) Taxonomy Info	no
Comments (Item description if other under litter type)	from a trawl