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

30 March–3 April 2016

Rostock, Germany

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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Contents

Attendees of the WGBIFS-2016 Meeting

Executive summary

The ICES Working Group on Baltic International Fish Survey (WGBIFS) met in the Institute of Baltic Sea Fisheries (TI-OF), Rostock, Germany, from 30 March to 3 April 2016. Overall, 25 participants representing all countries around the Baltic Sea, and the ICES Secretariat (Data-Centre) attended the meeting (Annex 1). Włodzimierz Grygiel, Poland chaired the group for the second time. One of the main tasks of the meeting was to compile results obtained during the research surveys types BITS, BASS, and BIAS, realized from May 2015 until March 2016 (Annex 2A). The other task of the meeting was to coordinate and plan the time-schedule and an effort per area for given research vessels/country for fish surveys in the period from May 2016 to March 2017. All Baltic fish stocks assessment relevant surveys were internationally coordinated. New persons from WGBIFS members were chosen to coordinate and plan the BITS, BIAS, and BASS surveys as well as to compile and store the acoustic database. During the meeting the common surveys manuals were considerably up-dated, and revised according to decisions made prior and during the meeting and suggestions elaborated by reviewers.

The routine fish surveys standard data compilation can be found under the relevant sections. Each survey, nationally organized in the period from May 2015 until March 2016, is described in separate reports and was orally presented during the meeting (Annexes 6–9). One from additional presentations was focused on the results of calibration catches between the Danish old and new RV "Havfisken". Time-series of the acoustic tuning fleets are presented in Annex ToR a.

The evaluation of the recently realized standard fish surveys showed that sampling plans and their accomplishment are nearly similar. Fish stocks indices were evaluated based on the standard surveys and reflect possible precision of the current fish stocks size and distribution. For the last three years, WGBIFS lacks Russian data from BIAS and BITS surveys in the ICES Subdivisions 26 and 32 that induced problems with accuracy of international data. In May 2015, the Russian vessel (from Kaliningrad) realized for the first time for a long-period the BASS survey.

During the meeting other aspects of BITS surveys were discussed and clarified, e.g. the redistribution of fish control-catches location and the hauls number per country, starting from November 2016 and onwards (ToR e), graphical demonstration of cod and flatfish geographical distribution (recommendation from WGBFAS; Annex 11) and some uncertainty in the DATRAS database (Annex 10). Synchronization of Baltic cod stomachs sampling programme in the BITS surveys (the ToR i) was realized by the WGBIFS in 2015–2016 however, due to a lack of interest from other ICES WGs concerning the issue of cod feeding, the WGBIFS agreed to stop international coordination of the above-mentioned work. Coordination of monitoring of the marine litter collecting and registering during the BITS surveys (part of ToR i) will be continued by the WGBIFS. It was agreed that the works focused on an additional, not clearly formulated ToR (l) – "Define methods for processing and implementation the Large Fish Indicator (LFI) and Mean Maximum Length (MML) indicator in BITS" will be not realized during the very limited time of the WGBIFS meeting. The ToR l) and part of the ToR i) should be adequately, removed and reformulated on the list of ToRs dedicated on the next year WGBIFS meeting.

At the meeting was considered proposal of the ICES Data Centre to establish a new international acoustic database, which will be linked to the AtlantOS project and WGBIFS Access-database (ToR k). The ICES delegates presented the aims of AtlantOS

project, structure (format) of acoustic-trawl data model, and description of the upcoming Acoustic Trawl data portal. It was agreed that the ICES Data Centre will complete the Acoustic Trawl data format by the end of September 2016 for WGBIFS to try out and use in practice during autumn (BIAS survey). We will then try to arrange a dedicated workshop at the beginning of December 2016 to work with the actual data. In addition, the ICES Data Centre will produce output from the database as requested.

Discussion during the meeting showed that it would not be possible to get data on the fishing stations, NASC values during catching, and data of NASC during the regular BIAS surveys between 2000 and 2008 for the total area covered by the acoustic surveys. Reason for this is as follow: in many countries, data of earlier years are not stored or are currently not accessible in national database, and therefore such additional study (ToR h) will be stopped. It was agreed for all countries to send BIAS and BASS data from 2014 and 2015 to other special study aimed on calculation the survey sampling variance. Because of the lack of interest from the fishing gears specialists (excl. Poland), the constructive and critical discussion concerns implementation of a new standard pelagic trawl with suitable rigging, for control-catches during BIAS and BASS surveys was not possible to conduct (ToR j). This type of work will be prolonged in cooperation with the ICES-FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB). All the standard ToRs and requirements from other ICES expert groups are addressed in the current report.

1 Administrative details

Working Group name - Working Group on Baltic International Fish Survey (WGBIFS)

Year of Appointment - 2014

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

Chair - Włodzimierz Grygiel, Poland

Meetings venue and dates:

Institute of Baltic Sea Fisheries (TI-OF), Rostock, Germany, 30 March – 3 April 2016 (25 participants)

Institute of Coastal Research in Öregrund (SLU), Sweden, 23–27 March 2015 (24 participants)

2 WGBIFS Terms of references

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

ToR b) Update the BIAS and BASS hydroacoustic databases;

ToR c) Plan and decide on acoustic surveys and experiments to be conducted;

ToR d) Discuss the results BITS surveys 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, 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) Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty;

ToR i) Coordinate cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey (BITS);

ToR j) Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys;

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

ToR l) Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators;

The full list of WGBIFS Multi-annual ToRs is accessible in Annex 2A. The Agenda of WGBIFS 2016 meeting with links to ToRs is presented in Annex 3.

3 Summary of the Work Plan for Year 2

The seven first ToRs of WGBIFS 2016 are simultaneously ongoing works because these issues change over time. Moreover, they are related to 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 the Baltic Fisheries Assessment Working Group (WGBFAS). Terms of references a) to e) and i) from the list above have been completed successfully in 2016. Results of investigations obtained in the framework of BITS-4q/2015, BITS-1q/2016, BASS/2015, and BIAS/2015 surveys have been analysed and were reported to WGBFAS. Moreover, during the meeting coordination and planning of the time-spatial schedule and numbers of catch-stations have been made for standard surveys in the second half of 2016 and the first half of 2017. However, some extension and deficiencies in surveys were underlined. Cod stomachs and marine litter methodological aspects of sampling in the BITS surveys were discussed and suitable guide for data registering was elaborated. The initial review of schemes of various types of national pelagic trawls applied by four countries for BIAS and BASS surveys (ToR j) indicate a need of additional advice from the ICES/FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB). WGFTFB will be asked to advise, which type of pelagic trawl, incl. rigging (e.g. type of trawl doors), would be best for BIAS and BASS surveys in the Baltic Sea conditions. Terms of references f) and g) need only a minor works, which a small group of WGBIFS members will make within the running year. ToR h) because of insufficient time- and spatial-range of data from 2000–2014 BIAS surveys, after consideration is suggested to be stopped. It was agreed by all countries to send BIAS and BASS data from 2014 and 2015 (by 01.07.2016) to other special investigation aimed on calculation the survey sampling variance. Because of the marginal interest or a lack of the fishing gears specialists in some institutes around the Baltic countries, the proposal of implementation of a full set of new standard pelagic trawl (incl. rigging) for the BIAS and BASS surveys (ToR j) will be based on cooperation with WGFTFB. The ICES Data Centre proposal to establish a new international acoustic database, which will be linked to the AtlantOS project and WGBIFS Access-database (BASS and BIAS surveys; ToR k) was developed at the meeting. However, some technical-conceptual work is respected to be realized prior to the next WGBIFS meeting. ToR l) and part of the ToR i) should be adequately, removed and reformulated on the list of ToRs dedicated to the next year WGBIFS meeting. Other requirements e.g. from WGBFAS to WGBIFS were considered and addressed in the current report.

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

1) Maps of BIAS and BASS 2015 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 (incl. 0 age group) and cod abundance in the Baltic Sea, per the ICES-rectangles (Sep.-Oct. 2015; 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 1991–2015.

4) BIAS – sprat and herring-CBH (0 age group) recruitment index for the period 1991–2015.

5) BASS – geographical distribution of sprat in the ICES SD 24-29 (32-W) abundance per the ICES-rectangles, age groups from 1 to 8+ for the period 2001–2014 (May-June 2015).

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

7) Set of BITS surveys (BITS-4q/2015, BITS-1q/2016) standard reports reflect the comparison between planned and realized fishing-stations by the ICES Subdivisions, depth layers, and country.

8) Agreed plan and decide on demersal trawl fish control-catches to be conducted in autumn 2016 and spring 2017, 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 once more revised and considerably updated e.g. with the description on procedures connected with collecting and reporting the marine litter from BITS surveys.

11) The main results of standard research surveys were orally presented during meeting by national delegates (Annex 9) and described in the standard and extended survey reports (Annexes 6, 7, 8).

12) The technical schemes of pelagic trawls used by Poland, Germany, Russia, and Finland (list of technical data only) during the BIAS and BASS surveys.

13) The protocols from the standard measurements of the technical parameters of the TV-3 bottom trawl used by some research vessels (Annex 6.1).

14) The set of maps showing geographical distribution (cpue in numbers/h) of brill, cod, dab, flounder, turbot, and plaice during the BITS-Q1/2015 and BITS-Q4/2015 (Annex 11).

15) Recommendations (Annex 4) to ICES WGs, Action list (Annex 5) addressed to WGBIFS and the ICES Secretariat, and the list of ToRs for the WGBIFS 2017 meeting were prepared.

5 Progress report on ToRs and workplan

5.1 ToR a) Combine and analyse the results of spring (BASS) and autumn (BIAS) 2015 acoustic surveys and experiments and report to WGBFAS

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

In September-October 2015, four research vessels participated in the accomplishment of six autumn acoustic surveys (BIAS type), conducted in the ICES Subdivisions 21-32 (excl. ICES SD 31) however, only in partially in some subdivisions. Stock indices of herring, sprat, and cod by age groups of the different cruises are stored in the BIAS-database of WGBIFS. The reports from German-Danish, Latvian-Polish, Estonian-Polish, Finnish, Polish, and Swedish BIAS 2015 cruises are presented in Annex 7. The summary of all type of standard research surveys, conducted in the period from May 2015 until March 2016, were orally presented during the meeting and this set of information is accessible in Annex 9. The whole time-series of acoustic surveys data from the period 1991–2015 linked to tuning indices of sprat and herring, are accessible in Annex ToR a).

5.1.1.1 Area under investigation and overlapping areas

In September-October 2015, four statistical ICES-rectangles were inspected by more than one country (Figure 5.1.1.1.1 in 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 2015, was not fully realized as required by the WGBIFS 2015 meeting (Annex ToR a). It should be mentioned that, Russia has not realized in recent years any BIAS surveys in the southeastern part of the ICES SD 26 and in the eastern part of the Gulf of Finland. It should be added that, the Estonian-Latvian acoustic survey in the Gulf of Riga was accomplished in July-August 2015, as planned during WGBIFS 2015 meeting. The survey results from the recent years are accessible at the national level, however, were not uploaded to the WGBIFS database.

5.1.1.2 Total results

The fish abundance estimates, which are based on the BIAS surveys in September-October 2015, 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 (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 (Annex ToR a). Geographical distribution of herring, sprat, and cod abundance in the Baltic Sea, according to the ICES rectangles inspected in September-October 2015 is illustrated in Figures 5.1.1.2.1 - 5.1.1.2.3 (Annex ToR a). The highest herring stock abundance (age groups 1+) was concentrated in the ICES Subdivision 29 (Åland Islands), the Bothnian Sea, the Gulf of Finland, and between Öland and Gotland and somewhat lower concentrations were detected in the western part of the Gotland Basin (Figure 5.1.1.2.2). Herring from 0 age group (year class 2015) occurred mostly on the border between the ICES Subdivisions 29 and 30 (Figure 5.1.1.2.1). The high sprat stock abundance was detected in relatively large area of the central-eastern Baltic, with the maximum in the whole ICES Subdivision 29 and western-central part of the Gulf of Finland (Figure 5.1.1.2.3). Somewhat lesser abundance of sprat stock was recognized in the whole ICES Subdivision 28 and on the borders with the ICES Subdivisions 27 and 26. Considerably lesser abundance of sprat stock was noticed in the Bothnian Sea and the Polish part of the southern Baltic (Figure 5.1.1.2.3). The relatively high cod stock abundance was recognized in a small area, i.e. northward from Bornholm (Figure 5.1.1.2.4). Cod stock abundance in the central-eastern Baltic was practically close to zero.

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 SISP 8 IBAS Manual (Table 2.2) and the area of the ICES rectangles, which was covered during the survey. Some disagreements appeared about the appropriate area of ICES Subdivision 28. It was agreed that the Gulf of Riga (ICES Subdivision 28.1) must be excluded from the total area. All other the ICES subdivisions kept their areas from the manual (see 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 1991-2015 BIAS (September-October) surveys for the herring assessment of the Central Baltic stock (Figure 5.1.1.4.1.1) and are presented in Annex ToR a:

- the area corrected numbers per age groups from 1 to 8+ of the ICES SDs 25–27, 28.2 and 29 (incl. the existing data of the ICES SD 29-North; Table 5.1.1.4.1.2);
- the area corrected recruitment index for age 0 of the ICES SDs 25–27, 28.2 and 29 (including the existing data of the ICES SD 29-North; Table 5.1.1.4.1.2.

In 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.

Taking into consideration the recent BIAS surveys, results should be underlined the fact that in the case of the Central Baltic herring the systematic increase of the acoustic tuning fleet index (age groups 1–8+) can be observed after 2007 (Table 5.1.1.4.1.1, Annex ToR a). In the case of sprat stock (the ICES SDs 22–29) this parameter was continuously declining, with the exception of year 2015, when the very abundant year class 2014 was recruited (Table 5.1.1.4.2.1 in Annex ToR a). It should be underlined that, in 2014 in the central-eastern and northern parts of the Baltic was born also very abundant herring year class. The abundance of herring and sprat (age 0) from year class 2014 was respectively, 11- and 7-times higher than the year class 2013 (Tables 5.1.1.4.1.2 and 5.1.1.4.2.2 in Annex ToR a).

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 1991–2015 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 Table 5.1.1.4.2.1 (Annex ToR a). The recruitment index for sprat (age 0) in the ICES Subdivisions 22–29 is presented in the Table 5.1.1.4.2.2 (Annex ToR a) Data older than 1991 do not exist in the current BIAS database. In 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, 2007–2015 BIAS surveys are presented for assessment the stock size of herring in the Bothnian Sea (the ICES Subdivision 30), and the area corrected combined results are presented in Table 5.1.1.4.3.1 and Figure 5.1.1.4.3.1 (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 May-June 2015, four vessels participated in the four spring acoustic surveys (BASS type; Annex ToR a text-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 reports from German, Latvian-Estonian, Russian, and Lithuanian BASS-2015 cruises are presented in Annex 7.

5.1.2.1 Area under investigation and overlapping areas

The BASS 2015 surveys were realized by the above-mentioned countries in the ICES Subdivisions 24, 25, 26, 28, NE parts of SD 27, SE parts of SD 29 and in one ICES rectangle of the ICES Subdivisions 32 (Figure 5.1.2.1.1). The area coverage of the Baltic Sea with the BASS 2015 survey principally was the same as required by the WGBIFS-2015. Two statistical ICES rectangles (42G9 and 43G9) were inspected by both - Germany and Latvia. One statistical ICES rectangle (40G9) was monitored by Russia and Lithuania. Differences in the results of these overlapped areas have not significant effect on the calculation of the tuning fleet indices.

5.1.2.2 Combined results and area corrected data

The Baltic sprat stock abundance estimates per the ICES-rectangles and ICES Subdivisions according 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 2015 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 (2001–2015) of the area-corrected sprat abundance in the ICES Subdivisions 24, 25, 26, and 28.2 (without the Gulf of Riga) is given in the Table 5.1.2.2.1.1 (Annex ToR a) and Figure 5.1.2.2.1.1.

5.2 ToR b) Update the BIAS and BASS acoustic databases

After validation, the data from BIAS and BASS surveys carried out in 2015 were added to the BIAS_DB.mdb and the BASS_DB.mdb Access-databases (Annex ToR b). The updated versions of the databases are located in the folder "Data" of the ICES WGBIFS-2016 SharePoint. A data transmission error was found and corrected when checking the database (BIAS 2011, ICES rectangles 37G8 and 40G7, missing herring datasets in the Tables 5.2.1 and 5.2.2). The correction caused changes < 0.25% of the herring tuning fleets in 2011. N. Larson and O. Kaljuste (Sweden) were assigned as data coordinators responsible to control that the acoustic surveys results are uploaded in the right format on the ICES WGBIFS SharePoint site. T. Łączkowski (Poland) was assigned to be the new manager of BIAS and BASS databases for aggregated data.

5.3 ToR c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2016 and spring 2017

5.3.1 Planned acoustic survey activities

All the Baltic Sea countries (with the exception of Russia – Kaliningrad) intend to take part in the acoustic surveys and experiments in 2016 and 2017. Cooperation between Germany and Denmark in the BIAS survey realization is planned. There is also an intention to conduct the Latvian/Estonian acoustic survey in the Gulf of Riga in July 2016 and 2017. In May 2016 are planned the Latvian-Polish and Estonian-Polish BASS surveys. Moreover, Poland intends to realize the BASS-2017 survey in the Polish EEZ, for the first time in 30 years. The list of participating research vessels and initially planned periods of particular surveys are given in tables presented in Annex ToR c. The Figures 5.3.1.1–5.3.1.3 reflect areas, which will be covered with investigations during planned BASS and BIAS surveys (2016–2017).

5.4 ToR d) Discuss the results from BITS surveys performed in autumn 2015 and spring 2016

5.4.1 BITS 4th quarter 2015

During the BITS-Q4/2015 surveys the level of realized valid hauls represented 89% of the total planned stations (Table 5.4.1.1, Annex ToR d), due to bad weather condition during the survey period. Only in the ICES Subdivisions 21, 22, and 29 the sampling level was close to the number planned (Figure 5.4.1.1, Annex ToR d). Because the missing catch-stations in each ICES Subdivision are rather uniformly distributed in the survey area, the number of valid hauls was considered by WGBIFS as appropriate to tuning series and it is recommended that the data will be used for the assessment of Baltic and Kattegat cod and flatfish stocks. The coverage with control-hauls by depth stratum is as follow (depth stratum, coverage in %): 1, 89; 2, 80; 3, 90; 4, 88; 5, 59; 6, 86. In autumn 2015, and spring 2016 the Russian EEZ, similarly like in the recent years, was not covered with the BITS-Q4 and BITS-Q1 surveys. Sweden was able to substitute most of the allocated catch-stations, which the Swedish military prohibited to inspect.

5.4.2 BITS 1st quarter 2016

In the 1st quarter 2016 the areas coverage with catch-stations was on the sufficient level (Figure 5.4.2.1, Table 5.4.2.1; Annex ToR d). In the ICES Subdivision 22, the number of hauls carried out exceed the number of hauls planned because the extra catch-stations were added in the Small Belt on request of the cod benchmark WK (WKBALTCOD). In the ICES Subdivision 27, the same problem exists as previously for the Swedish research vessel to enter certain areas, where the Swedish military does not permit to carry out any fishing activities. In most cases, substitutions were made. The coverage with control-hauls by the depth stratum is as follow (depth stratum, coverage in %): 1, 94; 2, 106; 3, 86; 4, 92; 5, 106; 6, 150. The depth stratum 6 has significantly higher coverage because of incorrect depth information in the Trawl-Database. This new depth information linked with the depth stratum 6 was reported in the feedback to the Trawl Database. Standard reports giving overviews of the BITS-Q4/2015 and BITS-Q1/2016 results from country involved in surveys realization can be found in Annexes 6, 8, and 9.

5.4.3 Technical checking of the standard bottom trawl TV-3

In 2015–2016 the technical parameters of the bottom trawls type TV-3L and TV-3S, used in BITS surveys were measured and registered by Germany, Poland, Lithuania, and Sweden. As Latvia charters the Polish vessel “Baltica” for BITS surveys, therefore Poland checked parameters of two trawls. Protocols from the recent measurements of the TV-3 trawl are presented in the standard tables form (Tables 6.1.1–6.1.6 in Annex 6.1). The results of measured parameters did not significantly deviate from the standard values of the parameters given in the BITS manual. The relative errors most often were at a level of few percents. These results suggest that cpue values presented in the BITS database are not influenced by observed differences between measured and standard technical parameters of the trawls. WGBIFS recommended that the all Baltic countries involved in the BITS surveys realization should check their trawls according to the parameters listed in the tables (see SISP 7 BITS Manual) once a year and be presented to the next WGBIFS meeting.

5.4.4 Inter-calibration exercise between the Danish old and new RV “Havfisken”

In the period of 13–19 March 2016, inter-calibration exercise was carried out in the Skagerrak and the northwestern Kattegat in order to be able to continue the BITS time-series. The setup was simple pair trawling following normal BITS haul procedure and using the small BITS standard trawl. In total, 30 successful pair of hauls were made (Annex 6.2). The estimates of confidence intervals for cod are at a level, which means that the conversion factors is significant different from 1 and might be suitable for converting BITS cpue estimates obtained with the new RV Havfisken to the BITS cpue estimates obtained with the old RV Havfisken. This means that new BITS surveys results acquired with the new RV Havfisken can be included in the existing time-series for cod if the species-specific conversion factors are applied. For plaice and flounder it can be discussed if anything is gained by applying the conversion factors as the factors for most length classes are not significant different from 1. More observations will probably reveal a factor significant different from 1. The confidence intervals for dab are very big and indicate that the conversion factors estimates are very uncertain and not very well estimated. This has to do with the limited number of individuals caught of this species. The estimated conversion factors are not different from 1 and nothing is gained by applying the factors.

5.5 ToR e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2016 and spring 2017, 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 was described in Annex ToR e of the WGBIFS 2015 Report (see also the Annex 3 "Method used for planning the BITS" of the WGBIFS-2004 Report). The method for allocating catch-stations to the ICES SDs was slightly adapted in 2015, according to the new definition of the stock structure of cod in the Baltic Sea, created during WKBALTCOD in March 2015. Most of the institutes that intend to participate in the BITS-Q4/2016 and BITS-Q1/2017 surveys have nearly the same plans regarding the numbers of control-hauls, but location of the catch-stations per country is significantly revised (Tables 5.5.1.1 – 5.5.1.7; Annex ToR e). The planning of catch-stations in the framework of the BITS-Q4/2016 and the BITS-Q1/2017 was influenced by the new rule of the Polish government concerning the investigations of the foreign flag research vessels in the Polish marine waters. An administrative (government-owned) observer must be on board of the research vessels if they want to work in the Polish EEZ from February 2016 onwards. Denmark and Germany informed that they would not realize fishing stations in the Polish zone during the next BITS surveys. Poland increases the number of catch-stations to compensate the missing coverage of the Polish EEZ by the Danish and German research vessels.

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 (Annex ToR e). Allocated ground trawl hauls by the ICES Subdivision and the depth layer for autumn survey in 2016 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 2017. The planned fishing-stations by country and the ICES Subdivision can be considered as not ultimately fixed. It should be emphasized that, according to the recommendations of WGBIFS-2011, all countries participated in the BITS surveys have to upload to DATRAS information related to all fished species.

5.5.2 Update and correct the Tow-Database

Feedbacks of the recent BITS surveys (November 2015) were used to update the Tow-Database and have demonstrated that the structure of the database is suitable for the routine use (Annex ToR e; Ch. 5.5.2). Changes of the Tow-Database structure were not proposed. Some catch-stations were deleted or were corrected dependent on the information of the different countries. New control-hauls locations were provided by most countries in the Baltic areas, where the density of available catch-stations was low. More than 90% of the catch-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 WGBIFS meeting because feedbacks of the BITS in spring 2016 were not available from some countries. The version of TD_2016V1.XLS will be made available after submission the data by all countries. To speed up the process it is necessary that all countries submit feedbacks immediately after the survey, according to the description mentioned in Annex ToR e; Ch. 5.5.2.2.

5.5.2.1 Feedback of the BITS

The feedback of realized catch-stations (BITS surveys) should be submitted to Henrik Degel (Denmark; hd@aqua.dtu.dk), using the proposed standard format (Annex ToR e, Ch. 5.5.2.2) not later than 20 December (autumn survey) and immediately after spring survey. The above-mentioned Danish delegate will be also responsible for planning the fish control-hauls distribution for the next BITS surveys and managing the Tow-Database. The current version of hauls number for the Tow-Database should contain information about:

- ICES Subdivision;
- start and end position (latitude, longitude) of trawling;
- ship course during fishing;
- mean seabed depth;
- bottom depth range;
- codes of the running hauls;
- reason for deleting the haul.

Set of codes for characterizing the different type of realization of hauls was defined and is presented in Annex ToR e, Ch. 5.5.2.2.

5.5.3 Reworking of the Database of Trawl Surveys (DATRAS)

The WGBIFS agreed that in BITS/DATRAS only SpecCodeVal 0, 1, and 4 are accepted according to the Manual and SpecCodeVal of BITS. WGBIFS accepted the new version of screening procedure for BITS to unify the data check. At the WGBIFS-2016 meeting, any significant changes concern DATRAS was not suggested. V. Soni (ICES Secretariat Data-Centre) informed members that submission of the marine litter data from BITS into DATRAS is in a good progress; there are many new facilities provided from DATRAS to improve and speed up the submission process (Annex ToR i). During the WGBIFS-2016 was agreed that, in the LT sub-database of DATRAS, dedicated to storage the records concerns marine litter findings during the BITS surveys, when zero catches occurs, then data on marine litter will not be uploaded. Submitters of the marine litter data should transfer data using the DATRAS Trawl litter format, described in the suitable manual accessible on the web page:

http://www.ices.dk/marine-data/data-portals/Pages/DATRAS-Docs.aspx.

In autumn 2015, some errors in DATRAS have been found, mostly regarding misreporting of fish CatCatchWeight data (record type HL.CatCatchWgt). Most of the errors have originated from BITS in the 1st half of 1990s. The incorrect BITS surveys data were indicated in DATRAS by particular countries and adequate explanations were provided to the ICES Secretariat Data-Centre (text table in Annex 10). Various weight units of fish were used in early 1990s and after 1996. Particular submitters will make amendments. More details regarding background and effect of various fish weight units used in the early 1990s and after 1996 are presented in Annex 10.

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

A small group of WGBIFS members corrected the Manual for the Baltic International Trawl Surveys (BITS) after the WGBIFS-2015 meeting however, some corrections and supplementing data were expected to be done at the WGBIFS 2016 meeting. This work was accomplished at the recent meeting of WGBIFS, e.g. was made a verification in the scheme of technical parameters of the TV-3S and TV-3L, and the condition of the text of SISP 7 BITS Manual was also significantly reworked. The marine litter reference list was changed from C-TS to C-TS-REV (http://vocab.ices.dk/?ref=1381). The Addendum 1 – SISP 7 BITS Manual contains the new detailed information and hints how formatting and reporting the marine litter data to the DATRAS. During the next WGBIFS meeting, the minor supplementary information e.g. formulas, which should be inserted to the manual, needs further explanations moreover, the ICES new recommendation regarding the marine litter data registration, sent after WGBIFS-2016 meeting should be added.

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 (BASS) and Baltic International Acoustic Survey (BIAS). Those are carried out yearly in Baltic Sea. A small group of WGBIFS members corrected the SISP 8 IBAS Manual after the WGBIFS-2015 meeting however, some corrections and supplementing data were expected to be done at the WGBIFS-2016 meeting. This work was accomplished at the recent meeting of WGBIFS, e.g. the condition of the text of SISP 8 IBAS Manual was significantly reworked, the list of references was updated accordingly, the area of investigations was precised, and an example of the technical scheme of pelagic trawl and the fish length-measuring scheme were added (Addendum 2). During the next WGBIFS meeting, the example of herring or sprat stock abundance and biomass estimation in the ICES rectangle should be added.

5.8 ToR h) Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty

5.8.1 The new acoustic methods

During the WGBIFS meeting in 2015 it was agreed that the available time-series of the BIAS surveys data of fishing stations, NASC values during trawling and data of NASC during the regular surveys in 2009–2014 will be extended to the period from 2000 to 2008. The accessibility of defined data was limited to Estonia, Finland, and Germany, years and selected the Baltic areas. Indices based on the available data present biased estimates, which cannot be used for the fish stock assessment. Therefore, new analyses were not realized. Based on the status of data submission, it was concluded that further such analyses would be stopped. At the WGBIFS 2016 meeting it was also agreed, that the acoustic experts from all Baltic countries would send by the end of June 2016, the BIAS and BASS data from 2014 and 2015 to Niklas Larson (niklas.larson@slu.se). The data will be used to calculate the IBAS surveys sampling variance. The format of numbers should be in the total estimated numbers per each species and length-class in the whole control-catch in given the ICES rectangle.

5.8.2 Evaluate the proportion of WBSSH and CBH in the acoustic surveys

The topic – what kind of method is more applicable for an evaluation the proportion of Western Baltic Spring-spawning herring (WBSSH) and Central Baltic herring (CBH), based on the acoustic surveys results was discussed at the WGBIFS meetings e.g. in 2013, 2015, and 2016. Age-length data of herring sampled during acoustic surveys were used to classify individuals to one of the both Baltic herring stocks - WBSSH and 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 (Annex ToR h in WGBIFS-2015 report). The current paper, prepared by Oeberst *et al.* (2016; Annex 8) was based on the length – age data of herring sampled during the German Autumn Acoustic Survey (GERAS) in the ICES SDs 21 and 23 and the German BASS survey in the ICES SDs 27-28 in 2015. The above-mentioned input data were used to estimate the parameters of v. Bertalanffy growth functions (BGF) for WBSSH and CBH in 2015. Authors concluded that, the recent results sustain the applicability of the separation function $SF_{2005\text{-}2010}$ in 2015 (Annex ToR h, Ch. 5.8.2). On 15.04.2016, the WGBIFS members have been informed that the Polish experts have a negative opinion about the common implementation of a separation function for Baltic herring stocks diversification, based on the German method.

5.9 ToR i) Coordinate cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey

Baltic cod stomachs sampling

Baltic cod stomachs sampling was implemented as the routine procedure by all countries during BITS surveys, starting from autumn 2015, however in some national laboratories this type of sampling was initiated earlier. The above-mentioned additional task of BITS surveys was suggested by WGSAM. Therefore, the WGBIFS prepared a manual on cod stomachs sampling during BITS surveys, in a line with the accomplished MARE project. The cod stomach samples were collected in November 2015 and February-March 2016 by most of the Baltic countries national laboratories, however were examined for contents only by Poland, Latvia, and Estonia (Table 5.9.1, Annex ToR i). The WGBIFS has not received any formal request to coordinate programme devoted Baltic cod stomachs sampling and analysing and continue the sampling as well as has not obtained any plan for how future stomach samples should be worked up or intend to be used. Therefore, the WGBIFS members at the meeting in 2016 agreed to stop further international coordination of Baltic cod stomach sampling and to transfer such responsibility to individual countries/laboratories level. The national laboratories can continue the Baltic cod stomachs sampling and analyses, based on their experiences, staff, and financial possibilities. The above-mentioned decision was taken due to very limited number of Baltic cod feeding experts, relatively high costs of stomachs sampling and analysing, lack of interest from WGSAM and not fully developed ICES database for such issue.

Marine litter sampling and recording

Submission of the marine litter data from the current BITS surveys into DATRAS is in a good progress; there are many new facilities provided from DATRAS to improve and speed up the submission process (Annex ToR i). The status of submission of marine litter data from BITS-Q1 and BITS-Q4 per country and years is listed in Annex ToR i.

5.10 ToR j) Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys

During the WGBIFS 2016 meeting, the technical-schemes of national pelagic trawls used during the BIAS and BASS surveys were presented by Poland, Germany (two type of trawls), Russia, and Finland (only some technical parameters; Annex ToR j and WGBIFS-2016 SharePoint; folder Background documents - Pelagic gear in BIAS_BASS surveys). The construction, shape (symmetrical, asymmetrical) and size, inlet area as well as the rigging of those trawls are different, and however for some trawls there was not information about rigging. Even the trawl doors were very different and some of them in use were actually designed for demersal hauls. Because of the fish unique behaviour, the reaction on these gears can be different. Differences were recognized in the inlet area and other parameters of trawls, e.g. in netting size of the front part of these trawls and different meshes, what leads to different catchability properties of the fishing gears and determined various cpue of fish. Considering all available technical information about pelagic trawls, applied for fish catches during BIAS and BASS surveys, there is a need to develop works devoted standardization of research trawls, taking into consideration, those two models of pelagic trawl – one for a large vessels and one for small vessels. Because of lack of interest by the fishing gears specialists from the other countries (excl. Poland), the constructive and critical discussion at the WGBIFS meeting was not possible to conduct. The Swedish and Finnish members informed the WGBIFS that, they have already ordered and use relatively new pelagic fishing gears and do not intend to implement for BIAS surveys new standard gear. However, the Swedish delegate suggested performing an experiment focused on observations how the fish behave in the front part of trawl and about the trawl catchability. For this experiment, the underwater cameras will be mounted to the headrope and footrope of trawl. Because WGBIFS has not enough competence for proposing particular type of pelagic trawl, the WK would like to ask the ICES - FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB) for advice, which type of pelagic trawl, incl. rigging (e.g. type of trawl doors), would be the best for BIAS and BASS surveys in the Baltic Sea conditions.

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. The next one similar action was taken under the WKIACTDB workshop in Copenhagen, 1–2 October 2015 with O. Kaljuste as WGBIFS representative in the workshop (Annex ToR k, and Annex 9). Two post-processing software systems (StoX and EchoR/Echobase) were presented during the workshop and the data requirements for these packages were taken into account when reviewing the requirements to the data storage at the ICES Data-Centre. During the WGBIFS 2016 meeting, the ICES Data Centre experts presented the idea behind and the component of the upcoming Acoustic Trawl data portal (Figure 5.11.1) as well as the general structure of the Acoustic Trawl data model (Figure 5.11.2 in Annex ToR k). The acoustic trawl data model and its content fields were discussed in the acoustic subgroup of WGBIFS-2016 in order to ensure that the current development is sufficient for the acoustic surveys carried out in the Baltic. It was agreed that the ICES Data Centre would complete the Acoustic Trawl data format by September 2016 for WGBIFS, to try out and use in practice during autumn BIAS survey. At the beginning of December 2016, the ICES Data Centre will try to arrange a dedicated workshop for working with the actual BIAS data. In addition, the ICES Data Centre will produce output from the database as requested.

5.12 ToR l) Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators

Members at the WGBIFS-2016 meeting discussed the background and real possibility to realize during the meeting an additional ToR (l), focused on define methods for processing and implementation the Large Fish Indicator (LFI) and Mean Maximum Length (MML) indicator in BITS. Time consuming different steps is necessary between the definitions of the aim and derived the LFI, and to prove that the defined LFI deliver unbiased assessment of the development of the species community. WGBIFS agreed that during limited period of the meeting, the group could not realize such time consuming work, which requires a lot of special knowledge of the targeted species community and knowledge of the literature. Description of ToR l) is accessible under Annex ToR l) and in Annex 9 – presentation made by R. Oeberst. The ToR l) should be removed from the list of ToRs dedicated on the next year WGBIFS meeting.

6 References

References, mentioned in this Report and Annexes are cited under particular ToRs, working papers or cruises extended reports and presentations.

7 Other issues emerged before and during the meeting

7.1 Other issues – corrections needed in DATRAS

At the end of 2015, the WGBIFS has been requested to verify the set of data concerning among other things the mean weight of fish (HL.CatCatchWgt records) originated from the BITS surveys and uploaded in the period of 1991–2015 into DATRAS with various (incorrect) weight units (Annex 10). The topic is described also in the Chapter 5.5.3. Reworking of the Database of Trawl Surveys (DATRAS).

7.2 Inquires from WGBFAS

The WGBFAS at the 2015 meeting requested WGBIFS to prepare a set of maps (Annex 11) showing geographical distribution (cpue in numbers/h) of brill, cod, dab, flounder, turbot, and plaice during the BITS-Q1/2015 and BITS-Q4/2015. It should be mentioned that, for relatively rare species in the Baltic, like brill and dab, the attached maps shows distribution of this species in very limited areas of the western Baltic only.

8 Revisions to the work plan and justification

Any significant changes in the final version of ToRs dedicated to WGBIFS-2016 meeting have not been done however, before beginning of the meeting, more one ToR was added by ICES, i.e. "Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators" (ToR l; Annex 2A). WGBIFS agreed that the time consuming work, which requires a lot of special knowledge of the targeted species community and information of the literature could not be realized within limited period of the meeting. Coordination of Baltic cod stomachs sampling programme in the BITS surveys (the ToR i) was realized by the WGBIFS in 2015-2016 however, because of lack of interest from other ICES WGs concerns the issue of cod feeding, the WGBIFS agreed to stop international coordination of the above-mentioned work. Coordination of monitoring of the marine litter collecting and registering during the BITS surveys will be continued by the WGBIFS. The ToR l) and part of the ToR i) should be adequately, removed and reformulated on the list of ToRs dedicated on the next year WGBIFS meeting. Prior to the WGBIFS meeting a final set of data was not provided by every country for ToR d) "Discuss the results BITS surveys…" because some BITS-1q/2016 surveys were ended shortly before the meeting start and some extended reports from surveys were submitted shortly after WGBIFS meeting. Revised final DATRAS database with included recent BITS survey results (HH, HL, CA, marine litter records) was principally supplemented after the meeting. The preliminary data concerns fish catches calibration, curried out in the period of 13-19.03.2016 on the Danish RV Havfisken New and RV Havfisken Old were presented on the meeting, however description of the above-mentioned experiment was supplemented after meeting. Status of the protocols from the measurements of technical parameters of the bottom trawls type TV-3L and TV-3S (Annex 6.1) was discussed however, not every country prepared such protocols and reported to the WGBIFS meeting. The WGBIFS suggested performing the above-mentioned work every year, as obligatory for each vessel involved in the BITS surveys realization. The realization of ToR h) "Analyses related to the improvement of quality of acoustic indices…" was once more revised by the WGBIFS, because the indispensable for analysis data from the period 2000-2014, were provided by three countries only from a part of the Baltic. Indices based on the available data present biased estimates, which cannot be used for the fish stock assessment. Discussion during the meeting showed that it would not be possible to get data of the period between 2000 and 2008 for the total area covered by the acoustic surveys, because in many countries data of earlier years are not stored in national database. It was concluded that further analyses would be stopped. Because of lack of interest by the fishing gears specialists from the Baltic countries (excl. Poland), the constructive and critical discussion concerns implementation of a new standard pelagic trawl with suitable rigging, for fish control-catches during BIAS and BASS surveys was not possible to conduct. Any new ToR(s) aren't respected to consider during the WGBIFS-2017 meeting, however some exercises connected with monitoring of catchability of the applied pelagic trawls are planned.

9 Next meeting

There was one proposal for the venue of the next WGBIFS meeting, i.e. Riga, Latvia. The WGBIFS members supported the idea to organize the next meeting at the BIOR Institute/Fish Resources Research Department, in the period of 27–31 March 2017. The list of ToRs for the next meeting is demonstrated in Annex 2B.

Annex ToR a) Combine and analyse the results of spring (BASS) and autumn (BIAS) 2015 acoustic surveys and experiments and report to WGBFAS

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

In September - October 2015, the following acoustic surveys were conducted:

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
Solea	Germany/Denmark	21, 22, 23, 24

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

- 43G9 by SWE and LAT,
- 47H0 by SWE and FIN,
- 48H4 by EST and FIN,
- 48H5 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 Lithuanian part of the ICES SD 26,
- the Russian part of the ICES SD 26,
- the eastern part of the ICES SD 32 (Russian – GosNIORH survey)
- the northern part of the ICES SD 30 (Finnish survey).

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. 2015) 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.

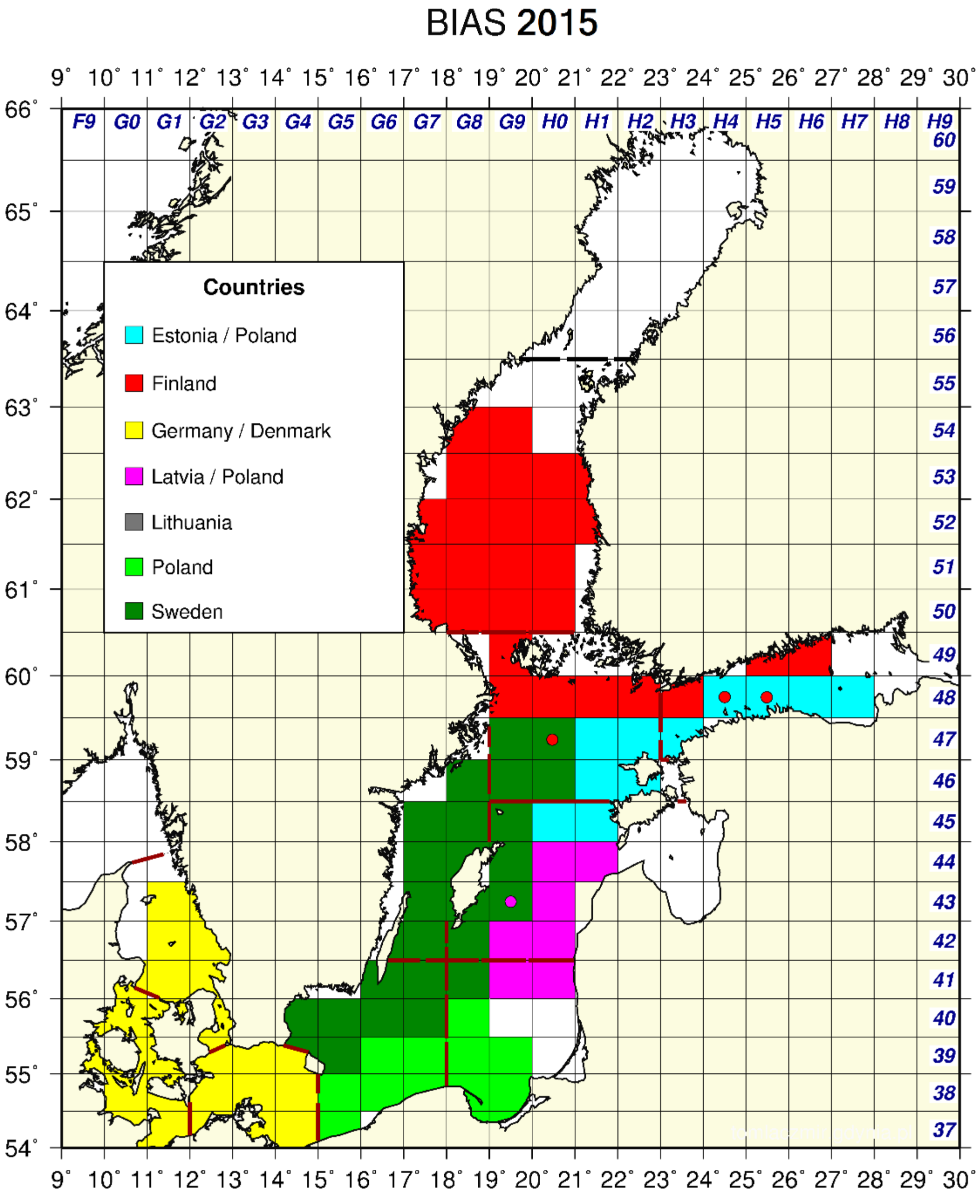


Figure 5.1.1.1.1. Map of the BIAS survey conducted in September-October 2015. Various colours indicate the countries, which covered specific ICES-rectangles and delivered data to BIAS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BIAS-database partly or totally covered by other countries.

5.1.1.2. Total results

Geographical distribution of herring, sprat and cod abundance in the Baltic Sea, accordingly to the ICES rectangles inspected in September-October 2015 is illustrated in Figures 5.1.1.2.1 - 5.1.1.2.4.

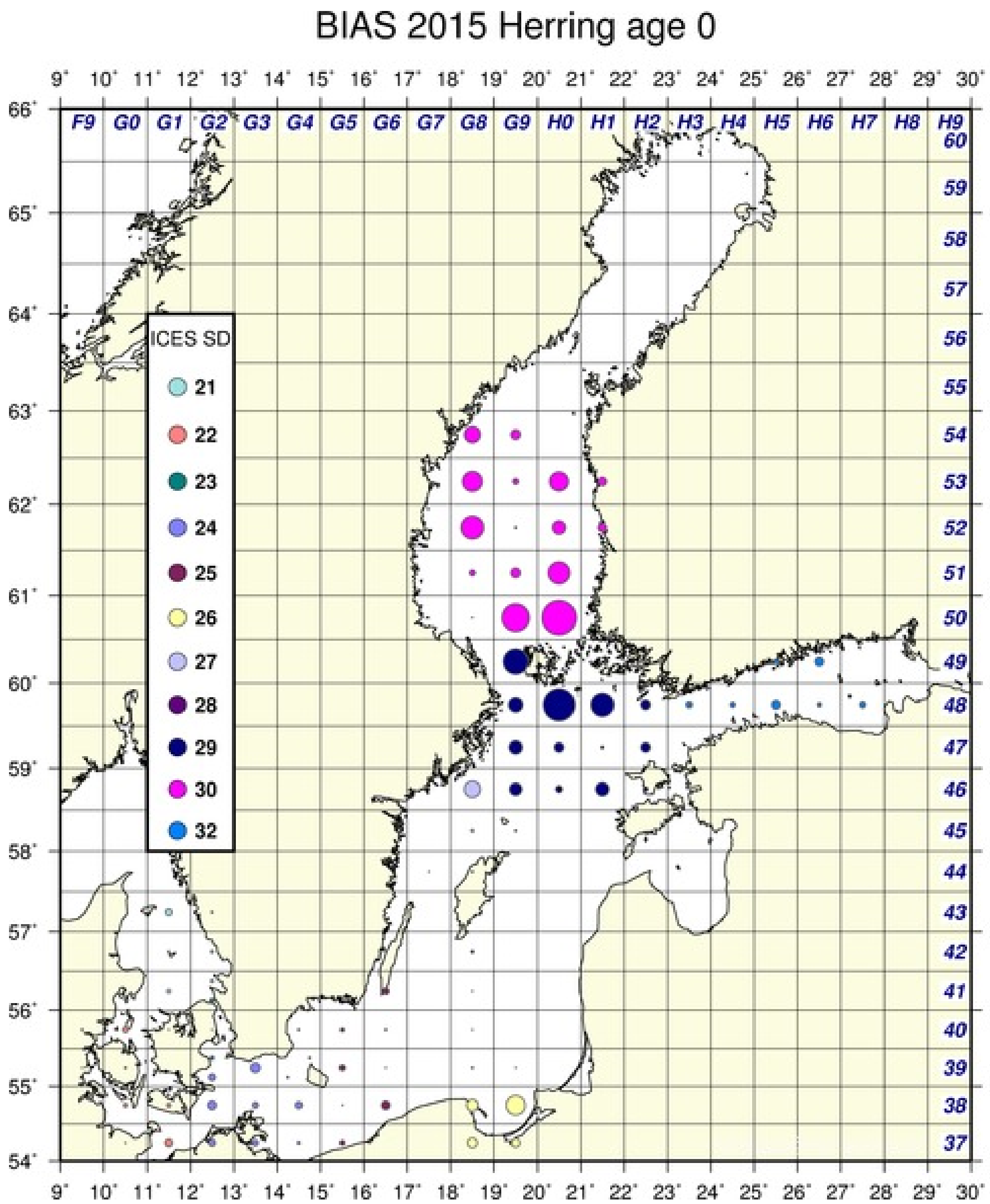


Figure 5.1.1.2.1. The abundance of herring (age 0) per the ICES-rectangles monitored in September-October 2015 (the area of circles indicates estimated numbers of specimens x10[6] in given rectangle; the colour indicates ICES subdivision).

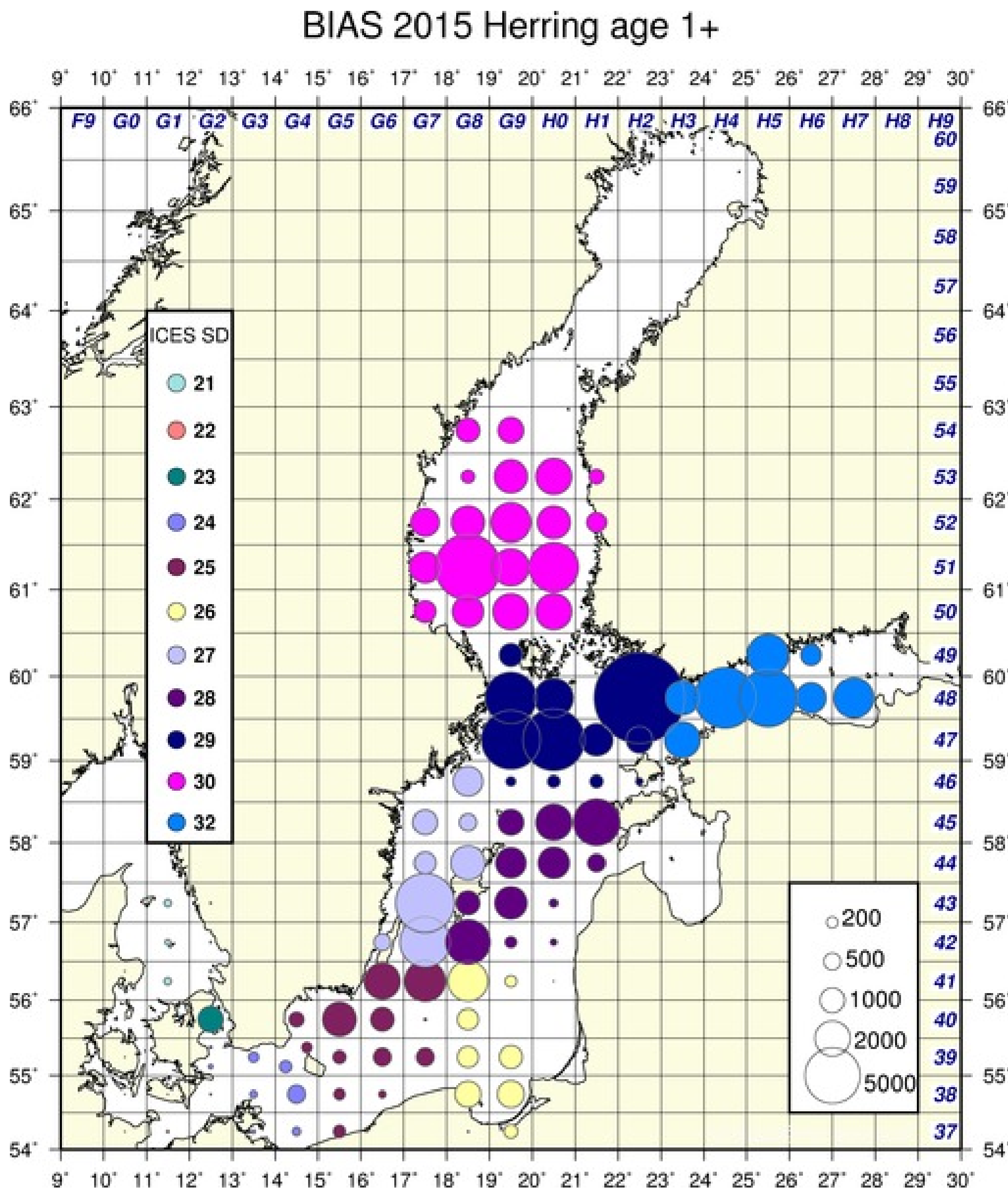


Figure 5.1.1.2.2. The abundance of herring (age 1+) per the ICES-rectangles monitored in September-October 2015 (the area of circles indicates estimated numbers of specimens x10[6] in given rectangle; the colour indicates ICES subdivision).

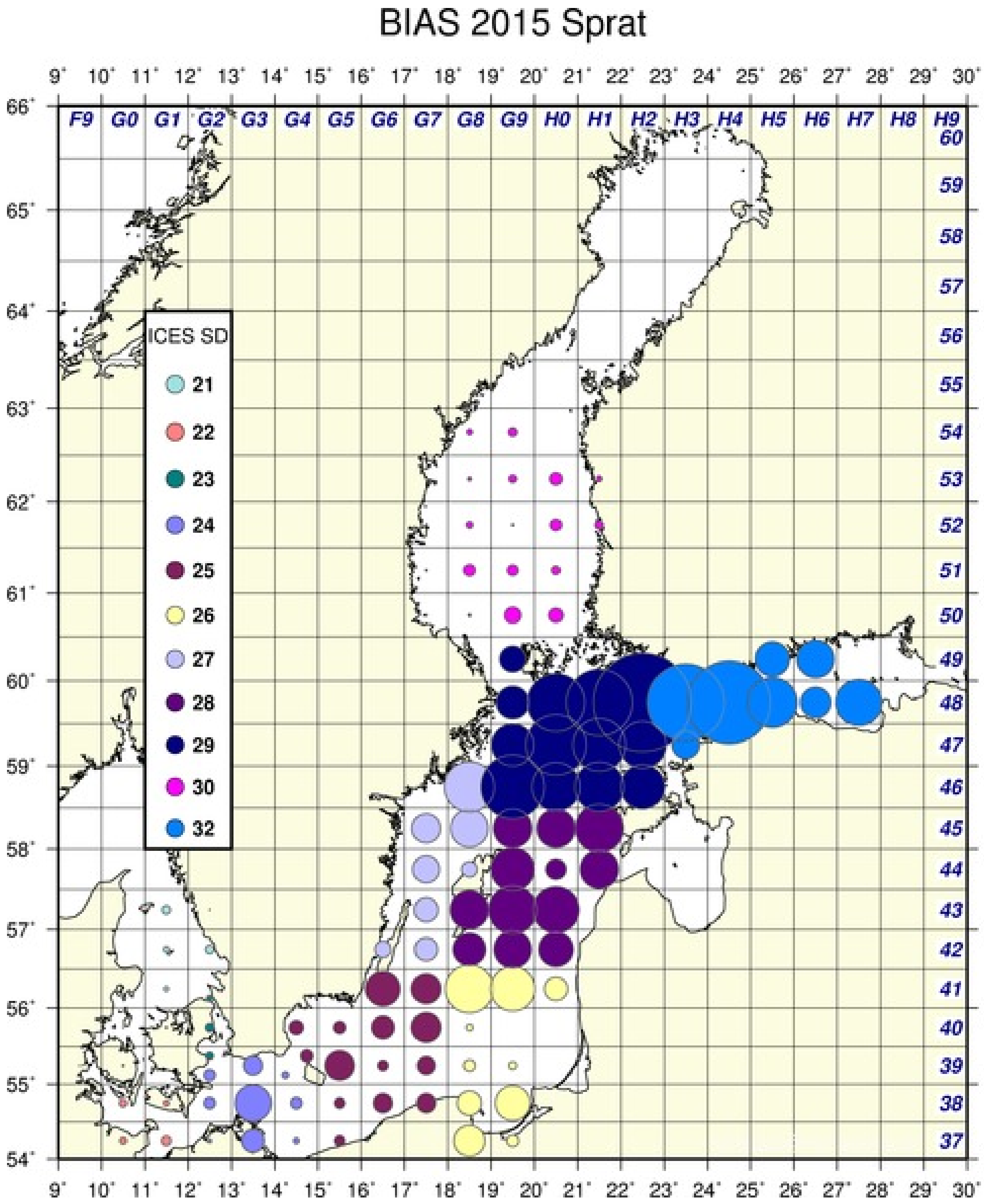


Figure 5.1.1.2.3. The abundance of sprat per the ICES-rectangles monitored in September-October 2015 (the area of circles indicates estimated numbers of specimens x10⁶ in given rectangle; the colour indicates ICES subdivision).

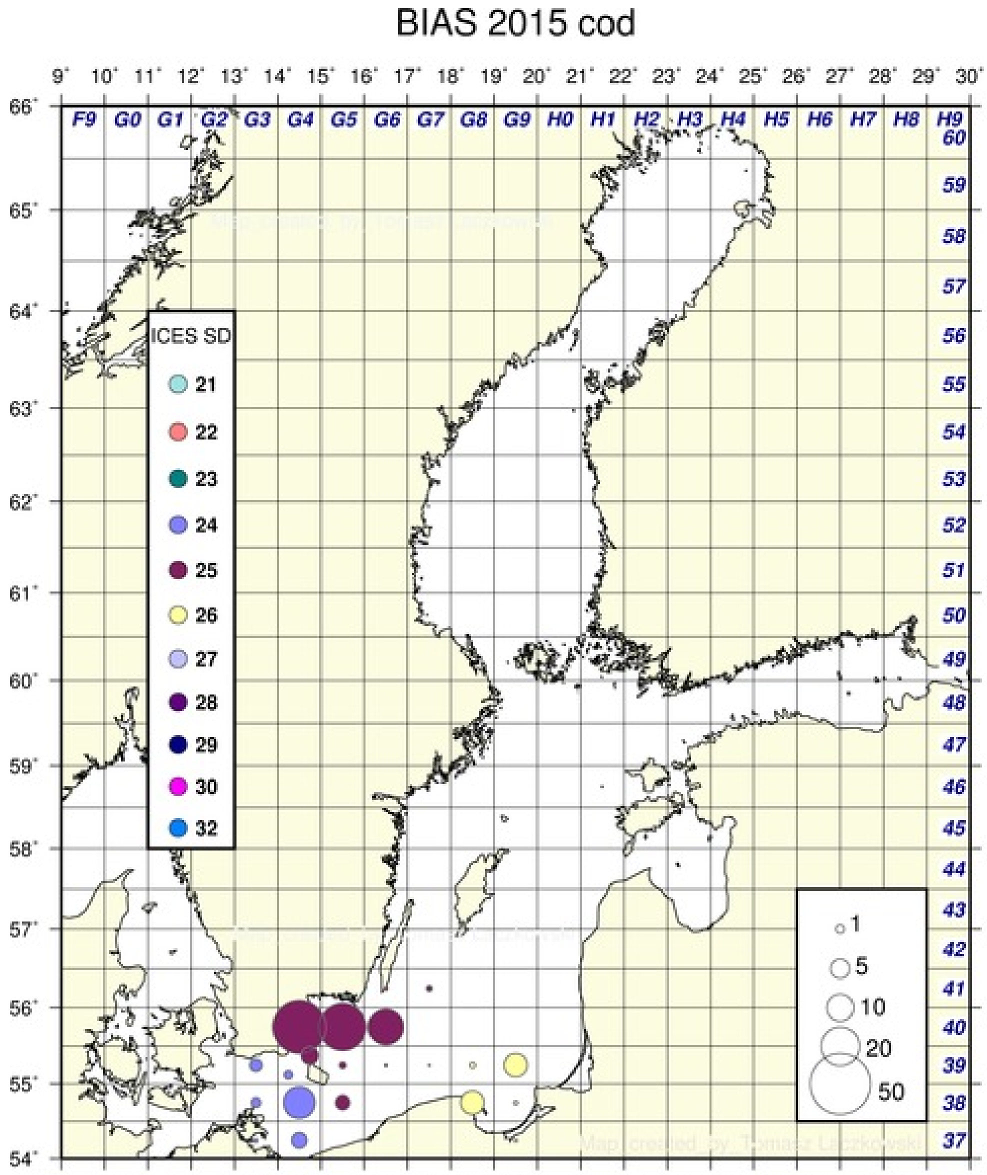


Figure 5.1.1.2.4. The abundance of cod per the ICES-rectangles monitored in September-October 2015 (the area of circles indicates estimated numbers of specimens x10[6] in given rectangle; the colour indicates ICES subdivision).

The fish abundance estimates, which are based on the BIAS surveys in September-October 2015, 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 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.

Table 5.1.1.2.1. Estimated numbers (millions) of herring in September-October 2015, by the ICES rectangles, accordingly to age groups.

YEAR	Sub_Div	RECT	total	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	41G0	1.54	0.97	0.39	0.14	0.04	0.00	0.00	0.00	0.00	0.00
2015	21	41G1	121.71	26.59	77.15	16.09	1.20	0.45	0.00	0.00	0.00	0.23
2015	21	41G2	22.79	12.64	9.18	0.83	0.12	0.02	0.00	0.00	0.00	0.00
2015	21	42G1	64.28	9.10	52.82	2.21	0.07	0.07	0.00	0.00	0.00	0.01
2015	21	42G2	18.69	9.76	8.48	0.40	0.02	0.01	0.00	0.00	0.00	0.02
2015	21	43G1	178.32	74.88	91.01	11.42	0.40	0.26	0.14	0.00	0.00	0.21
2015	21	43G2	9.62	3.40	5.96	0.25	0.01	0.00	0.00	0.00	0.00	0.00
2015	22	37G0	3.63	1.58	1.31	0.23	0.22	0.19	0.05	0.01	0.03	0.01
2015	22	37G1	100.93	88.98	4.79	2.05	0.83	2.01	0.42	1.26	0.48	0.11
2015	22	38G0	30.60	29.12	0.97	0.23	0.06	0.12	0.05	0.00	0.00	0.05
2015	22	38G1	26.46	25.29	0.88	0.05	0.04	0.20	0.00	0.00	0.00	0.00
2015	22	39F9	2.33	2.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	39G0	10.72	8.12	2.10	0.11	0.14	0.25	0.00	0.00	0.00	0.00
2015	22	39G1	0.35	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	40F9	5.42	5.16	0.00	0.17	0.00	0.09	0.00	0.00	0.00	0.00
2015	22	40G0	51.11	48.68	0.00	1.62	0.00	0.81	0.00	0.00	0.00	0.00
2015	22	40G1	0.99	0.66	0.13	0.08	0.04	0.08	0.00	0.00	0.00	0.00
2015	22	41G0	1.27	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	23	39G2	44.80	29.29	6.94	2.11	2.49	1.46	0.64	0.81	0.80	0.26
2015	23	40G2	1 103.23	1.07	59.79	400.02	261.05	115.76	88.25	101.70	43.69	31.90
2015	23	41G2	54.82	42.74	10.22	0.00	0.93	0.93	0.00	0.00	0.00	0.00
2015	24	37G2	77.99	75.18	1.48	0.33	0.45	0.33	0.04	0.09	0.09	0.00
2015	24	37G3	70.31	46.32	5.92	6.06	3.11	2.75	1.38	1.65	2.08	1.04
2015	24	37G4	139.47	15.08	23.15	34.70	16.08	13.91	8.80	10.62	10.86	6.27
2015	24	38G2	130.13	126.01	2.77	0.43	0.57	0.13	0.04	0.11	0.07	0.00
2015	24	38G3	139.45	44.36	25.00	21.85	13.27	11.36	5.70	6.61	7.68	3.62
2015	24	38G4	591.44	63.95	98.16	147.18	68.18	59.01	37.32	45.02	46.05	26.57
2015	24	39G2	117.39	76.78	18.18	5.53	6.53	3.82	1.67	2.11	2.10	0.67
2015	24	39G3	325.30	154.72	48.42	41.20	22.95	17.05	9.95	11.34	12.93	6.74
2015	24	39G4	262.03	7.23	30.25	54.06	39.19	42.38	24.74	25.57	22.56	16.05
2015	25	37G5	293.28	41.31	76.19	12.59	63.52	48.09	12.37	15.76	9.49	13.96
2015	25	38G5	217.13	2.37	15.17	9.79	31.41	41.03	11.18	17.36	20.04	68.78
2015	25	38G6	206.21	113.97	66.23	1.25	7.24	6.43	1.53	1.91	1.73	5.92
2015	25	38G7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	25	39G4	195.82	6.15	4.75	38.60	65.89	50.17	11.39	13.91	3.47	1.49
2015	25	39G5	322.16	53.97	12.28	24.15	43.39	85.75	27.41	46.04	13.79	15.38
2015	25	39G6	545.76	1.06	44.10	35.84	109.67	117.05	42.14	53.50	49.08	93.32
2015	25	39G7	522.95	0.00	24.60	34.77	71.54	106.74	36.50	52.94	59.03	136.83
2015	25	40G4	374.52	8.26	5.93	30.35	116.45	53.83	34.40	35.96	58.79	30.55
2015	25	40G5	1 938.19	20.86	54.04	405.83	575.94	299.76	160.44	264.65	151.48	5.19
2015	25	40G6	921.14	5.53	82.15	16.96	216.44	251.83	55.12	180.48	75.48	37.15
2015	25	40G7	16.97	0.23	1.70	4.18	4.48	3.47	1.01	0.82	0.85	0.23
2015	25	41G6	2 135.57	69.95	293.01	308.11	582.59	665.53	52.37	74.19	71.38	18.44
2015	25	41G7	2 761.08	0.00	68.33	344.45	942.09	715.42	330.02	143.67	166.06	51.04
2015	26	37G8	162.54	155.68	3.72	0.12	0.51	0.57	0.09	0.16	0.27	1.42
2015	26	37G9	390.99	113.76	30.93	17.99	48.06	55.20	17.57	24.17	25.34	57.97
2015	26	38G8	1 258.53	196.70	70.15	57.00	122.08	197.34	61.43	95.43	112.15	346.25
2015	26	38G9	1 734.75	600.51	40.90	42.70	103.16	191.97	47.36	90.67	132.24	485.24
2015	26	39G8	730.53	4.72	50.29	49.48	122.60	150.95	49.43	70.40	71.43	161.23
2015	26	39G9	855.27	3.18	16.12	39.09	76.31	154.35	44.53	74.47	97.29	349.93
2015	26	40G8	680.94	0.43	48.14	51.00	112.38	140.74	53.69	69.54	68.37	136.65
2015	26	41G8	2 550.34	1.26	142.31	142.21	522.69	626.59	253.92	311.66	495.73	53.97
2015	26	41G9	213.31	0.00	22.28	21.58	31.69	38.69	17.60	33.80	25.85	21.82
2015	26	41H0	1.29	0.00	0.61	0.20	0.00	0.00	0.00	0.07	0.07	0.34
2015	27	42G6	479.42	0.00	29.06	26.47	92.98	174.66	77.80	31.96	43.26	3.23
2015	27	42G7	4 066.11	0.00	294.43	828.24	1 195.22	797.66	318.55	356.78	216.62	58.61
2015	27	43G7	5 570.53	0.00	636.95	418.99	887.73	2 158.43	541.59	680.30	171.72	74.82
2015	27	44G7	771.12	2.02	199.59	196.01	158.70	114.71	58.40	23.77	14.11	3.81
2015	27	44G8	1 920.96	5.11	353.54	705.03	197.20	392.37	217.64	39.85	10.22	0.00
2015	27	45G7	994.39	0.34	225.77	221.11	224.49	173.91	81.56	46.00	12.16	9.05
2015	27	45G8	500.68	9.82	79.01	80.06	92.26	117.30	61.94	31.30	25.70	3.29
2015	27	46G8	1 825.81	414.99	291.73	234.40	174.33	324.68	224.02	101.45	47.32	12.89
2015	28_2	42G8	3 295.69	10.85	224.69	164.68	1 269.31	1 023.56	476.94	37.13	84.16	4.37
2015	28_2	42G9	227.28	0.00	26.81	20.23	44.03	53.05	11.16	29.86	27.49	14.65
2015	28_2	42H0	77.84	0.00	30.78	12.62	17.12	6.02	2.40	2.69	2.30	3.91
2015	28_2	43G8	910.28	0.00	67.04	16.94	184.17	434.67	89.62	82.56	35.28	0.00
2015	28_2	43G9	1 644.98	0.00	739.42	44.23	340.80	313.18	102.57	43.90	45.09	15.79
2015	28_2	43H0	114.30	0.00	52.94	3.87	12.27	16.80	8.40	7.75	6.46	5.81
2015	28_2	44G9	1 492.87	0.00	609.55	177.70	155.99	320.17	127.09	73.84	24.05	4.48
2015	28_2	44H0	1 600.35	0.00	777.70	122.45	255.93	244.47	23.12	79.89	54.11	42.68
2015	28_2	44H1	502.61	0.00	226.47	109.18	105.20	33.91	16.09	7.13	3.19	1.44
2015	28_2	45G9	1 071.64	3.45	294.87	151.18	174.07	313.76	95.75	30.69	1.46	6.41
2015	28_2	45H0	2 063.00	0.00	613.89	176.63	375.42	385.33	71.81	116.80	81.78	241.34
2015	28_2	45H1	3 502.27	0.00	985.42	319.53	706.10	580.93	121.06	194.54	147.69	447.00
2015	29	46G9	416.81	264.76	102.08	21.18	9.68	14.87	1.04	1.08	1.58	0.54
2015	29	46H0	328.04	82.01	188.81	6.94	7.23	30.38	7.75	4.36	0.00	0.56
2015	29	46H1	556.08	283.88	136.82	28.19	52.82	33.74	2.64	5.01	4.00	8.98
2015	29	46H2	112.87	29.74	41.66	12.56	14.94	7.65	1.49	0.96	1.94	1.93
2015	29	47G9	5 968.38	269.88	2 685.56	491.01	1 242.69	606.25	494.38	75.82	49.28	53.51
2015	29	47H0	6 382.06	137.75	5 187.77	418.85	292.13	246.75	20.89	46.66	15.34	15.92
2015	29	47H1	1 739.35	14.46	1 210.71	159.85	181.66	110.34	8.00	14.54	8.03	31.76
2015	29	47H2	1 296.13	143.72	926.51	68.15	85.67	49.01	4.55	5.59	1.04	11.89
2015	29	48G9	4 544.07	318.47	2 985.12	392.59	276.54	141.74	47.77	94.53	72.59	214.72
2015	29	48H0	4 058.12	1 595.91	2 297.20	69.34	46.19	16.55	8.06	8.99	3.86	12.02
2015	29	48H1	810.66	810.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	29	48H2	13 267.33	157.47	9 817.00	1 346.29	857.88	369.48	142.80	231.14	135.29	209.98
2015	29	49G9	1 801.23	975.46	700.09	58.15	25.75	14.35	6.02	7.09	6.23	8.09
2015	30	50G7	784.05	3.14	741.50	35.04	2.94	0.81	0.11	0.02	0.49	0.00
2015	30	50G8	1 583.13	0.52	936.39	314.70	129.60	74.57	29.64	26.15	21.75	49.81
2015	30	50G9	3 291.35	1 205.83	1 514.15	326.11	107.61	57.14	19.79	16.82	16.45	27.45
2015	30	50H0	4 053.75	1 931.38	1 449.92	365.37	137.95	71.45	25.35	22.79	16.08	33.46
2015	30	51G7	1 570.68	0.00	153.22	313.55	235.07	209.10	124.67	116.31	94.36	324.40
2015	30	51G8	6 961.52	44.52	914.78	1 044.18	1 025.81	953.92	577.81	528.72	402.68	1 469.10
2015	30	51G9	2 305.09	135.36	1 694.10	329.32	76.11	31.78	9.17	5.87	9.52	13.86
2015	30	51H0	4 811.26	798.20	1 876.63	943.02	453.34	268.60	106.66	92.51	74.23	198.07
2015	30	52G7	1 310.35	0.00	127.82	261.58	196.11	174.44	104.01	97.03	78.72	270.64
2015	30	52G8	2 595.40	820.66	300.81	273.38	246.92	229.98	138.87	128.42	98.43	357.93
2015	30	52G9	2 583.79	3.48	892.32	817.67	386.74	205.09	65.00	56.86	47.80	108.83
2015	30	52H0	2 070.92	304.21	981.67	347.79	159.66	97.02	40.83	36.45	28.09	75.20
2015	30	52H1	771.02	113.26	365.48	129.49	59.44	36.12	15.20	13.57	10.46	28.00
2015	30	53G8	966.03	673.54	93.54	48.69	29.87	28.07	16.65	16.35	12.97	46.35
2015	30	53G9	1 804.02	60.39	689.87	376.54	188.26	140.95	73.30	65.32	52.85	156.54
2015	30	53H0	2 650.93	582.29	1 070.94	294.25	159.29	132.44	75.57	72.76	59.42	203.97
2015	30	53H1	493.36	108.37	199.31	54.76	29.65	24.65	14.06	13.54	11.06	37.96
2015	30	54G8	1 334.57	435.21	342.32	185.40	96.06	75.40	40.46	36.98	29.76	92.98
2015	30	54G9	1 257.36	158.96	494.37	201.09	103.42	80.55	43.48	40.03	32.52	102.94
2015	32	47H3	2 099.09	8.86	1 222.53	160.79	316.04	312.36	38.89	38.89	0.00	0.73
2015	32	48H3	1 914.48	50.28	1 631.58	95.73	39.28	21.07	17.10	25.08	15.38	18.98
2015	32	48H4	5 962.58	30.30	4 615.60	309.15	407.03	461.54	61.59	66.15	5.94	5.28
2015	32	48H5	5 531.95	115.69	3 902.36	414.89	438.78	443.51	84.09	88.75	21.62	22.26
2015	32	48H6	1 559.89	21.20	1 141.00	132.21	115.93	109.37	17.82	19.18	1.62	1.56
2015	32	48H7	2 607.28	51.73	2 276.72	139.68	85.15	36.41	4.27	11.73	0.00	1.59
2015	32	49H5	2 882.95	38.21	2 388.98	203.38	75.20	40.85	30.12	50.87	21.18	34.16
2015	32	49H6	815.40	127.59	527.11	52.59	23.66	16.61	12.19	24.93	13.70	17.02

Table 5.1.1.2.2. Estimated numbers (millions) of sprat in September-October 2015, by the ICES rectangles, accordingly to age groups.

YEAR	Sub_Div	RECT	total	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	41G0	2.65	0.00	2.15	0.24	0.26	0.00	0.00	0.00	0.00	0.00
2015	21	41G1	56.97	0.00	36.46	11.14	8.77	0.57	0.03	0.00	0.00	0.00
2015	21	41G2	98.88	0.00	84.26	8.10	5.73	0.68	0.11	0.00	0.00	0.00
2015	21	42G1	69.29	0.00	41.80	10.58	4.97	6.06	5.09	0.79	0.00	0.00
2015	21	42G2	145.65	0.00	131.52	6.64	5.65	1.38	0.45	0.01	0.00	0.00
2015	21	43G1	153.31	0.00	119.36	10.95	9.38	8.01	5.02	0.59	0.00	0.00
2015	21	43G2	0.90	0.00	0.22	0.21	0.20	0.18	0.08	0.01	0.00	0.00
2015	22	37G0	102.03	0.00	93.56	3.34	1.35	3.46	0.32	0.00	0.00	0.00
2015	22	37G1	203.45	64.60	125.82	7.24	2.17	3.12	0.50	0.00	0.00	0.00
2015	22	38G0	133.55	0.03	117.21	6.72	1.09	7.59	0.91	0.00	0.00	0.00
2015	22	38G1	83.45	3.70	78.96	0.58	0.16	0.05	0.00	0.00	0.00	0.00
2015	22	39F9	1.22	0.31	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	39G0	10.79	4.53	6.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	39G1	0.18	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	40F9	0.28	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	40G0	2.64	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	22	40G1	6.20	0.00	6.09	0.07	0.03	0.01	0.00	0.00	0.00	0.00
2015	22	41G0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	23	39G2	114.07	0.42	68.33	26.02	12.14	5.31	0.81	0.79	0.03	0.22
2015	23	40G2	166.95	0.00	52.23	19.39	23.05	42.46	17.43	7.65	3.37	1.37
2015	23	41G2	72.48	0.00	69.52	1.09	0.86	0.75	0.12	0.05	0.09	0.00
2015	24	37G2	25.67	17.48	6.68	0.84	0.27	0.29	0.06	0.03	0.02	0.00
2015	24	37G3	1 164.40	1 147.61	14.75	1.62	0.21	0.21	0.00	0.00	0.00	0.00
2015	24	37G4	63.10	0.36	21.42	18.33	12.36	6.84	1.69	1.45	0.28	0.37
2015	24	38G2	288.97	94.21	152.75	27.38	8.82	5.19	0.24	0.24	0.00	0.14
2015	24	38G3	2 910.71	738.30	1 686.12	336.60	88.30	52.71	3.88	3.95	0.16	0.69
2015	24	38G4	267.59	1.53	90.82	77.72	52.43	29.03	7.15	6.15	1.20	1.56
2015	24	39G2	298.99	1.09	179.11	68.19	31.83	13.92	2.13	2.08	0.08	0.56
2015	24	39G3	813.77	0.82	343.46	247.76	132.13	58.66	13.76	13.41	0.57	3.20
2015	24	39G4	101.47	0.27	18.17	31.83	29.02	15.79	2.65	2.37	0.31	1.06
2015	25	37G5	236.77	0.00	16.20	46.82	91.17	37.43	20.07	18.49	4.79	1.80
2015	25	38G5	245.54	0.00	28.22	48.98	87.42	37.06	18.82	18.19	4.94	1.91
2015	25	38G6	802.86	0.00	92.05	157.27	289.52	122.42	61.11	57.29	16.14	7.06
2015	25	38G7	763.33	0.00	106.38	165.56	297.23	91.66	53.78	26.75	12.72	9.25
2015	25	39G4	349.19	0.00	94.08	44.76	112.15	70.20	20.08	2.13	0.00	5.79
2015	25	39G5	1 856.73	0.00	244.31	136.65	624.46	448.92	64.97	271.82	34.13	31.47
2015	25	39G6	245.51	0.00	52.58	53.14	79.70	27.72	15.88	10.76	3.62	2.11
2015	25	39G7	731.44	0.00	192.14	155.95	224.21	74.25	42.62	25.93	9.89	6.45
2015	25	40G4	432.52	0.00	58.66	82.59	103.26	99.43	10.30	60.59	0.00	17.69
2015	25	40G5	362.84	0.00	101.97	29.52	93.67	49.29	25.35	16.59	27.82	18.63
2015	25	40G6	1 116.24	0.00	218.07	230.31	379.24	156.23	68.44	47.26	16.69	0.00
2015	25	40G7	1 971.54	0.00	1 066.59	219.39	426.57	203.42	0.00	3.99	47.47	4.11
2015	25	41G6	2 523.80	0.00	530.82	232.45	360.74	715.55	429.33	190.24	44.03	20.64
2015	25	41G7	1 880.21	25.76	601.67	93.07	454.76	390.95	6.20	216.62	76.45	14.73
2015	26	37G8	2 043.10	0.00	1 504.93	375.65	119.34	32.04	5.57	4.18	1.39	0.00
2015	26	37G9	299.76	7.49	234.23	40.65	13.03	3.34	0.51	0.41	0.10	0.00
2015	26	38G8	1 200.68	11.16	657.94	281.05	162.75	60.98	15.63	8.49	2.68	0.00
2015	26	38G9	2 626.68	0.00	1 454.25	667.00	327.45	134.49	21.74	18.99	2.76	0.00
2015	26	39G8	288.46	0.00	65.99	88.97	81.12	36.01	8.64	5.84	1.89	0.00
2015	26	39G9	130.12	0.00	90.01	24.17	10.49	4.09	0.68	0.56	0.12	0.00
2015	26	40G8	106.95	0.00	29.12	29.57	28.65	13.05	3.66	2.26	0.64	0.00
2015	26	41G8	5 005.54	0.00	3 487.54	534.82	215.06	382.38	81.73	172.21	95.80	36.00
2015	26	41G9	4 226.75	86.96	3 224.65	392.96	280.93	126.98	50.69	1.93	40.87	20.78
2015	26	41H0	1 103.08	16.50	573.97	245.30	136.11	61.55	36.15	6.00	22.52	4.98
2015	27	42G6	561.85	28.61	226.30	85.32	110.29	24.97	13.01	62.95	10.40	0.00
2015	27	42G7	1 138.30	7.25	349.30	56.68	306.30	171.85	32.26	88.13	82.45	44.08
2015	27	43G7	1 292.47	11.00	439.57	107.33	286.86	48.24	26.68	132.81	239.98	0.00
2015	27	44G7	1 536.35	24.25	553.03	332.29	384.04	146.20	0.00	26.55	69.99	0.00
2015	27	44G8	517.71	11.59	187.77	103.16	93.88	76.50	0.00	6.95	37.86	0.00
2015	27	45G7	1 757.94	31.12	1 225.20	71.74	108.17	143.42	60.32	52.46	20.34	45.17
2015	27	45G8	3 103.14	118.19	2 077.49	282.65	326.83	111.92	11.13	39.42	109.78	25.73
2015	27	46G8	5 473.26	3 454.07	1 849.27	31.61	79.24	54.21	0.00	0.00	4.86	0.00
2015	28_2	42G8	2 357.02	161.55	1 155.90	308.49	421.78	98.84	0.00	188.82	10.82	10.82
2015	28_2	42G9	2 964.98	6.10	1 632.96	593.95	365.12	201.28	101.28	0.00	38.52	25.77
2015	28_2	42H0	2 637.97	12.79	1 226.24	676.46	434.18	199.90	40.16	0.00	20.53	27.71
2015	28_2	43G8	3 233.78	176.64	2 146.80	323.38	402.18	130.44	27.17	27.17	0.00	0.00
2015	28_2	43G9	4 882.73	219.17	2 775.20	374.48	825.88	435.69	33.58	43.71	114.98	60.04
2015	28_2	43H0	4 622.60	10.22	2 361.81	896.94	653.78	513.73	35.14	33.42	116.99	0.57
2015	28_2	44G9	4 104.23	537.75	1 570.65	539.36	800.85	108.14	24.80	126.97	204.79	190.92
2015	28_2	44H0	914.38	19.87	344.88	176.08	144.89	142.94	33.45	8.50	19.43	24.34
2015	28_2	44H1	3 185.58	15.39	1 635.37	463.73	403.20	362.16	104.65	0.00	123.11	77.97
2015	28_2	45G9	3 189.37	1 073.99	1 453.10	172.57	310.65	52.49	6.02	95.60	0.00	24.95
2015	28_2	45H0	3 166.53	63.26	1 186.69	619.07	471.34	376.02	319.05	44.14	36.11	50.85
2015	28_2	45H1	4 991.59	3 916.65	340.52	192.59	178.49	147.23	138.26	27.86	22.28	27.71
2015	29	46G9	8 752.26	435.78	7 188.48	114.24	453.73	421.35	0.00	120.07	18.61	0.00
2015	29	46H0	5 016.45	186.33	3 852.19	246.81	328.33	169.97	76.82	123.41	32.59	0.00
2015	29	46H1	5 259.96	20.71	4 323.28	499.37	154.58	113.00	45.22	71.25	15.42	17.13
2015	29	46H2	4 251.44	1 961.08	1 126.61	320.29	264.65	211.94	144.19	121.18	70.81	30.69
2015	29	47G9	3 897.88	1 228.10	2 531.00	9.35	93.62	0.00	13.23	0.00	0.00	22.58
2015	29	47H0	7 830.19	1 818.88	4 649.39	344.33	582.49	178.37	57.49	33.70	42.76	122.79
2015	29	47H1	5 970.91	1 107.07	2 901.57	616.98	485.02	326.96	212.52	187.03	94.53	39.23
2015	29	47H2	4 833.78	0.00	3 521.58	582.66	289.80	180.62	101.78	97.33	39.52	20.49
2015	29	48G9	2 266.85	269.19	1 723.81	51.10	103.55	61.30	15.90	19.91	10.21	11.88
2015	29	48H0	7 069.20	4 033.09	2 592.59	93.39	163.21	93.47	30.61	29.89	15.15	17.80
2015	29	48H1	9 391.95	7 594.59	1 727.88	23.76	33.02	7.62	5.08	0.00	0.00	0.00
2015	29	48H2	20 690.31	3 076.27	11 500.30	947.27	2 678.23	1 225.06	361.45	225.33	393.93	282.47
2015	29	49G9	1 451.88	917.32	415.79	27.19	41.27	21.72	6.00	7.94	6.57	8.08
2015	30	50G7	5.98	0.00	4.52	0.16	0.33	0.40	0.08	0.07	0.17	0.25
2015	30	50G8	23.49	0.00	14.05	0.88	1.87	2.17	0.33	0.48	1.05	2.66
2015	30	50G9	574.00	6.60	368.35	17.63	45.31	58.40	9.92	10.21	20.01	37.57
2015	30	50H0	438.98	0.00	340.68	14.26	22.74	24.56	4.29	4.70	9.41	18.34
2015	30	51G7	6.18	0.00	2.49	0.28	0.82	1.00	0.19	0.20	0.43	0.77
2015	30	51G8	272.31	0.00	151.09	8.40	26.53	34.33	6.37	6.50	13.80	25.29
2015	30	51G9	228.10	4.37	98.29	5.90	23.95	34.14	6.38	7.14	15.72	32.21
2015	30	51H0	172.99	0.00	42.34	5.91	25.05	34.72	6.24	7.48	15.39	35.86
2015	30	52G7	5.16	0.00	2.08	0.23	0.69	0.83	0.16	0.17	0.36	0.64
2015	30	52G8	101.62	0.00	57.47	3.26	9.51	12.11	2.24	2.41	4.96	9.66
2015	30	52G9	10.45	0.00	2.04	0.30	1.55	2.35	0.44	0.50	1.01	2.26
2015	30	52H0	265.12	0.00	87.91	11.67	40.73	54.21	9.10	9.10	18.52	33.88
2015	30	52H1	146.84	0.00	48.69	6.47	22.56	30.02	5.04	5.04	10.26	18.76
2015	30	53G8	38.10	0.00	23.44	1.44	2.90	3.32	0.59	0.87	1.53	4.01
2015	30	53G9	117.32	0.00	42.52	4.72	17.97	24.26	4.00	3.75	7.55	12.55
2015	30	53H0	351.21	0.00	110.83	13.90	48.91	67.60	11.50	13.19	26.38	58.90
2015	30	53H1	65.37	0.00	20.63	2.59	9.10	12.58	2.14	2.46	4.91	10.96
2015	30	54G8	79.73	0.00	30.38	3.19	11.76	15.79	2.61	2.49	4.99	8.52
2015	30	54G9	144.02	0.00	47.75	5.73	20.74	28.43	4.78	5.13	10.29	21.17
2015	32	47H3	1 654.39	0.00	206.66	197.61	258.69	475.09	243.95	77.94	66.83	127.62
2015	32	48H3	12 763.24	264.60	11 003.30	305.93	683.19	173.83	65.79	85.50	61.64	119.46
2015	32	48H4	14 790.12	519.74	13 073.30	245.22	360.90	277.31	125.33	62.55	37.90	87.85
2015	32	48H5	5 304.92	46.29	4 914.06	67.08	139.90	56.99	19.34	13.45	10.94	36.86
2015	32	48H6	2 039.15	1.64	1 852.98	35.77	27.86	59.85	30.43	9.61	8.04	12.97
2015	32	48H7	4 519.17	1.44	4 312.97	84.59	28.82	47.27	23.63	5.76	5.76	8.93
2015	32	49H5	2 635.98	10.02	2 323.44	67.80	144.45	44.19	7.82	10.82	6.96	20.48
2015	32	49H6	3 082.37	55.21	2 988.99	6.62	19.39	4.75	0.98	1.59	1.03	3.81

Table 5.1.1.2.3. Estimated numbers (millions) of cod in September-October 2005–2015, by the ICES rectangles.

Sub_Div	RECT	Area	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
24	37G2	192.40	2.17	0.00	1.82	0.00	0.00	0.00	0.00	0.00	6.01	0.00	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	0.25
24	37G4	875.10	9.50	0.13	4.27	5.16	1.41	2.60	0.02	0.00	19.73	0.31	3.32
24	38G2	832.90	10.86	0.00	1.95	0.00	0.00	1.93	1.07	5.97	0.46	0.00	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	1.22
24	38G4	1034.80	3.10	0.27	4.86	6.85	0.48	2.18	0.20	1.03	0.83	0.29	14.08
24	39G2	406.10	1.49	3.89	1.76	0.41	1.26	3.77	0.05	0.87	0.04	1.69	0.13
24	39G3	765.00	17.92	3.78	13.93	2.76	0.55	3.80	0.35	2.08	5.09	18.75	2.19
24	39G4	524.80	2.70	1.82	2.44	1.19	1.58	7.09	0.21	0.38	1.18	4.19	1.07
25	37G5	642.20	17.83	0.25	1.31	0.00	0.38	0.21	0.00	0.00	0.00	0.03	0.00
25	38G5	1035.70	57.28	2.06	5.20	0.74	2.92	4.54	18.40	19.88	4.98	3.37	2.95
25	38G6	940.20	9.54	3.00	17.12	2.52	0.27	0.23	0.00	15.48	0.00	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	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	4.21
25	39G5	979.00	0.75	1.80	0.90	1.57	1.25	3.10	35.67	4.46	2.04	2.88	0.71
25	39G6	1026.00	0.86	6.50	0.69	4.05	0.48	16.71	3.48	0.04	0.00	0.16	0.12
25	39G7	1026.00	47.40	0.52	0.44	5.78	0.26	0.18	2.18	0.00	0.00	0.51	0.06
25	40G4	677.20	1.38	5.54	15.86	0.22	19.19	0.33	25.27	15.24	2.06	31.02	38.33
25	40G5	1012.90	2.40	7.60	4.89	25.09	1.81	0.81	14.00	5.45	1.24	7.96	31.00
25	40G6	1013.00	1.13	6.53	0.24	5.94	6.54	7.03	30.84	5.66	0.22	53.62	17.00
25	40G7	1013.00	2.85	2.89	0.00	3.13	1.75	0.25	9.31	21.37	0.15	3.90	0.00
25	41G6	764.40	2.69	14.80	0.00	2.53	0.63	0.36	0.00	1.03	0.00	0.84	0.23
25	41G7	1000.00	0.08	1.90	8.71	0.25	4.40	1.12	61.89	29.81	35.29	0.00	0.53
26	37G8	86.00	0.46	3.25	0.00	0.23	0.00	0.03	0.00	0.08	0.00	0.54	0.00
26	37G9	151.60	37.64	0.89	1.59	0.99	0.32	0.21	0.51	0.59	0.00	0.16	0.15
26	38G8	624.60	37.05	4.97	1.68	3.39	2.01	1.43	1.29	7.19	0.00	1.05	7.11
26	38G9	918.20	0.00	0.00	0.00	0.00	0.26	0.00	1.31	4.53	49.20	6.52	0.25
26	39G8	1026.00	32.28	22.10	1.63	0.83	4.33	4.71	19.88	5.18	0.00	0.50	0.42
26	39G9	1026.00	0.00	0.00	0.00	0.00	0.35	0.00	0.92	0.00	3.12	4.66	7.30
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	2.75
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	0.00
26	41G9	1000.00	10.00	0.07	3.21	0.18	0.00	1.05	0.00	0.00	0.27	195.80	1.59
26	41H0	953.30	54.47	0.24	3.39	1.92	0.00	0.09	0.00	0.00	0.30	0.00	0.01
27	42G6	266.00		2.23	0.04	0.00	1.14	0.02	0.00	0.26	0.01	0.00	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	0.00
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	0.00
27	44G7	960.50	0.00	1.19	1.25	0.42	0.00	0.23	0.00	0.00	0.00	0.07	0.00
27	44G8	456.60	0.00	0.00	0.00	0.03	0.51	0.23	0.09	0.00	0.19	0.00	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	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	0.00
27	46G8	884.80	0.00	0.21	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.37	0.00
29	46G9	933.80	0.03	0.00	0.48	0.18	0.00	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	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	0.03
29	46H2	258.00	0.00	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	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	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	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	0.00
29	48G9	772.80	0.00	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	0.00
29	48H1	544.00			0.00		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	0.00
29	49G9	564.20			0.00	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 2015.

YEAR	Sub_Div	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	137.34	244.99	31.34	1.86	0.81	0.14	0.00	0.00	0.47
2015	22	211.54	10.18	4.54	1.33	3.75	0.52	1.27	0.51	0.17
2015	23	73.10	76.95	402.13	264.47	118.15	88.89	102.51	44.49	32.16
2015	24	609.63	253.33	311.34	170.33	150.74	89.64	103.12	104.42	60.96
2015	25	323.66	748.48	1 266.87	2 830.65	2 445.10	775.88	901.19	680.67	478.28
2015	26	1 076.24	425.45	421.37	1 139.48	1 556.40	545.62	770.37	1 028.74	1 614.82
2015	27	432.28	2 110.08	2 710.31	3 022.91	4 253.72	1 581.50	1 311.41	541.11	165.70
2015	28_2	14.30	4 649.58	1 319.24	3 640.41	3 725.85	1 146.01	706.78	513.06	787.88
2015	29	5 084.17	26 279.34	3 073.10	3 093.18	1 641.12	745.39	495.77	299.17	569.90
2015	30	7 379.32	14 839.14	6 661.93	3 823.85	2 892.08	1 520.63	1 386.50	1 097.64	3 597.49
2015	32	443.86	17 705.88	1 508.42	1 501.06	1 441.72	266.07	325.58	79.45	101.57

Table 5.1.1.2.5. Estimated numbers (millions) of sprat by the ICES Subdivisions, accordingly to age groups, September-October 2015.

YEAR	Sub_Div	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	0.00	415.77	47.86	34.96	16.88	10.78	1.40	0.00	0.00
2015	22	73.35	431.73	17.95	4.80	14.23	1.73	0.00	0.00	0.00
2015	23	0.42	190.08	46.50	36.05	48.52	18.36	8.49	3.49	1.59
2015	24	2 001.67	2 513.28	810.27	355.37	182.64	31.56	29.68	2.62	7.58
2015	25	25.76	3 403.74	1 696.46	3 624.10	2 524.53	836.95	966.65	298.69	141.64
2015	26	122.11	11 322.63	2 680.14	1 374.93	854.91	225.00	220.87	168.77	61.76
2015	27	3 686.08	6 907.93	1 070.78	1 695.61	777.31	143.40	409.27	575.66	114.98
2015	28_2	6 213.38	17 830.12	5 337.10	5 412.34	2 768.86	863.56	596.19	707.56	521.65
2015	29	22 648.40	48 054.47	3 876.73	5 671.49	3 011.38	1 070.29	1 037.04	740.10	573.14
2015	30	10.97	1 495.55	106.92	333.02	441.22	76.40	81.89	166.74	334.26
2015	32	898.95	40 675.69	1 010.62	1 663.20	1 139.29	517.26	267.23	199.11	417.99

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 2015).

YEAR	Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	1.22	167.11	298.10	38.13	2.26	0.99	0.17	0.00	0.00	0.57
2015	22	1.02	215.90	10.39	4.63	1.36	3.83	0.53	1.30	0.52	0.17
2015	23	1.00	73.10	76.95	402.13	264.47	118.15	88.89	102.51	44.49	32.16
2015	24	1.00	609.63	253.33	311.34	170.33	150.74	89.64	103.12	104.42	60.96
2015	25	1.03	334.01	772.42	1 307.40	2 921.20	2 523.32	800.70	930.02	702.44	493.58
2015	26	1.39	1 494.42	590.76	585.09	1 582.23	2 161.14	757.62	1 069.70	1 428.46	2 242.26
2015	27	1.23	532.02	2 596.95	3 335.68	3 720.41	5 235.21	1 946.41	1 614.00	665.96	203.93
2015	28_2	1.05	15.06	4 895.58	1 389.04	3 833.02	3 922.98	1 206.64	744.17	540.21	829.57
2015	29	1.04	5 286.21	27 323.66	3 195.22	3 216.10	1 706.33	775.01	515.47	311.06	592.55
2015	30	1.21	8 949.47	17 996.57	8 079.44	4 637.48	3 507.45	1 844.19	1 681.52	1 331.19	4 362.95
2015	32	1.42	630.83	25 164.35	2 143.82	2 133.38	2 049.03	378.14	462.74	112.92	144.36

Table 5.1.1.3.2. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (September-October 2015).

YEAR	Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	1.22	0.00	505.91	58.24	42.54	20.54	13.12	1.70	0.00	0.00
2015	22	1.02	74.86	440.63	18.32	4.90	14.52	1.77	0.00	0.00	0.00
2015	23	1.00	0.42	190.08	46.50	36.05	48.52	18.36	8.49	3.49	1.59
2015	24	1.00	2 001.67	2 513.28	810.27	355.37	182.64	31.56	29.68	2.62	7.58
2015	25	1.03	26.58	3 512.62	1 750.73	3 740.03	2 605.29	863.72	997.57	308.24	146.17
2015	26	1.39	169.56	15 722.06	3 721.51	1 909.16	1 187.09	312.42	306.69	234.35	85.76
2015	27	1.23	4 536.60	8 501.85	1 317.85	2 086.85	956.66	176.49	503.70	708.49	141.51
2015	28_2	1.05	6 542.12	18 773.49	5 619.48	5 698.70	2 915.36	909.25	627.73	745.00	549.25
2015	29	1.04	23 548.44	49 964.13	4 030.79	5 896.88	3 131.05	1 112.82	1 078.25	769.51	595.92
2015	30	1.21	13.30	1 813.77	129.67	403.88	535.10	92.66	99.31	202.22	405.38
2015	32	1.42	1 277.63	57 810.05	1 436.34	2 363.82	1 619.20	735.16	379.79	282.98	594.07

Table 5.1.1.3.3. Estimated biomass (in tons) of herring in September-October 2015, per the ICES Subdivisions and age groups.

YEAR	Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	1.22	2 395.16	9 233.43	1 982.01	143.30	39.72	39.52			35.64
2015	22	1.02	1 939.93	298.92	223.85	44.89	165.96	21.26	57.13	21.63	7.11
2015	23	1.00	812.09	5 252.12	42 525.32	34 049.93	17 511.25	15 050.21	19 030.17	8 062.99	6 516.89
2015	24	1.00	5 372.24	8 075.70	18 005.28	10 095.39	10 711.22	6 604.67	7 483.22	6 534.31	4 703.34
2015	25	1.03	3 518.04	14 923.96	46 739.28	103 686.27	110 132.19	37 467.43	45 681.92	34 288.45	26 426.04
2015	26	1.39	9 768.85	11 645.39	20 037.97	49 988.10	81 148.19	28 073.78	45 891.93	62 369.04	126 744.34
2015	27	1.23	1 174.04	29 506.05	60 625.54	89 011.11	160 352.36	58 354.45	59 185.96	27 017.32	9 029.11
2015	28_2	1.05	136.56	55 083.45	23 308.68	90 645.97	106 552.44	41 283.53	23 066.86	18 436.98	24 019.83
2015	29	1.04	12 880.48	316 746.06	59 280.94	72 693.31	46 831.37	22 040.91	13 201.17	7 821.23	17 390.03
2015	30	1.21	31 903.20	269 690.50	164 384.42	115 083.96	101 413.77	61 596.75	57 564.68	46 572.06	182 026.63
2015	32	1.42	3 456.60	299 607.38	43 610.32	55 927.28	64 186.47	12 491.18	14 936.39	3 226.36	4 961.95

Table 5.1.1.3.4. Estimated biomass (in tons) of sprat in September-October 2015, per the ICES Subdivisions and age groups.

YEAR	Sub_Div	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	21	1.22		5 200.67	929.03	678.84	444.25	308.60	42.59		
2015	22	1.02	305.75	4 751.89	279.98	75.45	240.21	30.42			
2015	23	1.00	0.61	2 259.34	744.91	670.97	1 059.30	419.52	193.11	79.41	37.89
2015	24	1.00	6 573.46	30 422.71	11 405.22	5 625.47	2 970.65	560.19	522.33	56.75	130.45
2015	25	1.03	53.17	32 493.23	22 269.71	50 487.36	37 254.52	13 741.81	15 537.25	4 862.89	2 257.05
2015	26	1.39	534.24	118 815.13	37 214.72	21 830.38	14 726.73	3 655.77	4 020.70	3 220.48	1 060.88
2015	27	1.23	9 986.76	52 085.29	13 082.22	22 934.43	11 193.72	2 373.72	6 818.32	9 097.87	1 824.67
2015	28_2	1.05	14 448.84	131 399.34	52 267.07	61 115.10	32 820.30	10 218.72	7 724.34	8 720.26	5 905.27
2015	29	1.04	54 371.45	322 735.91	37 064.50	63 843.28	34 238.73	12 239.74	11 898.25	8 673.83	7 406.01
2015	30	1.21	40.44	17 049.73	1 426.29	5 166.66	7 112.19	1 249.64	1 384.21	2 859.48	5 982.30
2015	32	1.42	4 511.54	429 817.55	15 452.35	27 474.01	19 490.86	8 797.15	4 683.93	3 516.80	7 227.18

5.1.1.4. Tuning fleets for WGBFAS

5.1.1.4.1. Herring in the ICES Subdivisions 25-29

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 1991–2015 BIAS surveys (Table 5.1.1.4.1.1 and Figure 5.1.1.4.1.1). The recruitment index for herring (age 0) in the ICES Subdivisions 25-29 is presented in the Table 5.1.1.4.1.2.

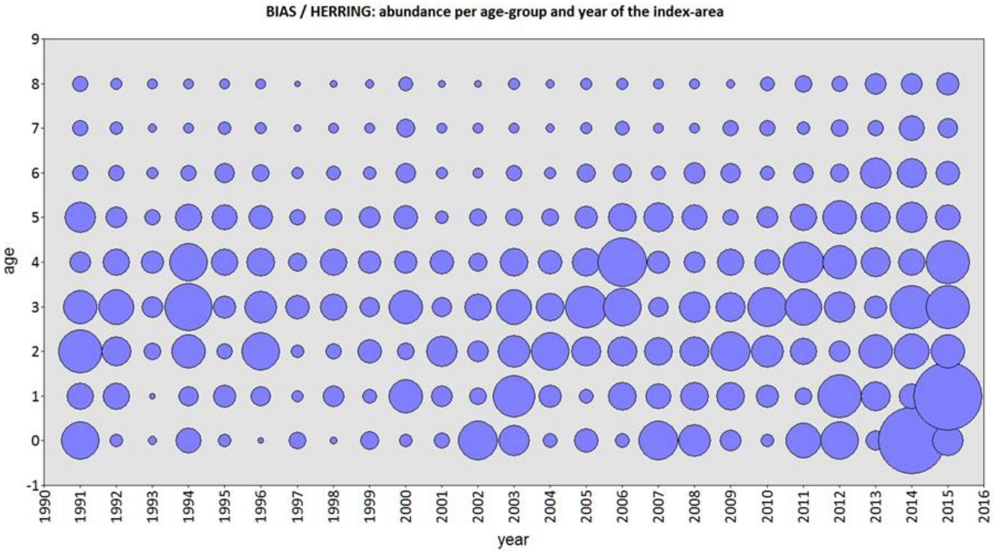


Figure 5.1.1.4.1.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1991–2015) for herring in the ICES Subdivisions 25-29.

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 1991-2015 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 Table 5.1.1.4.2.1 and Figure 5.1.1.4.2.1. The recruitment index for sprat (age 0) in the ICES Subdivisions 22-29 is presented in the Table 5.1.1.4.2.2.

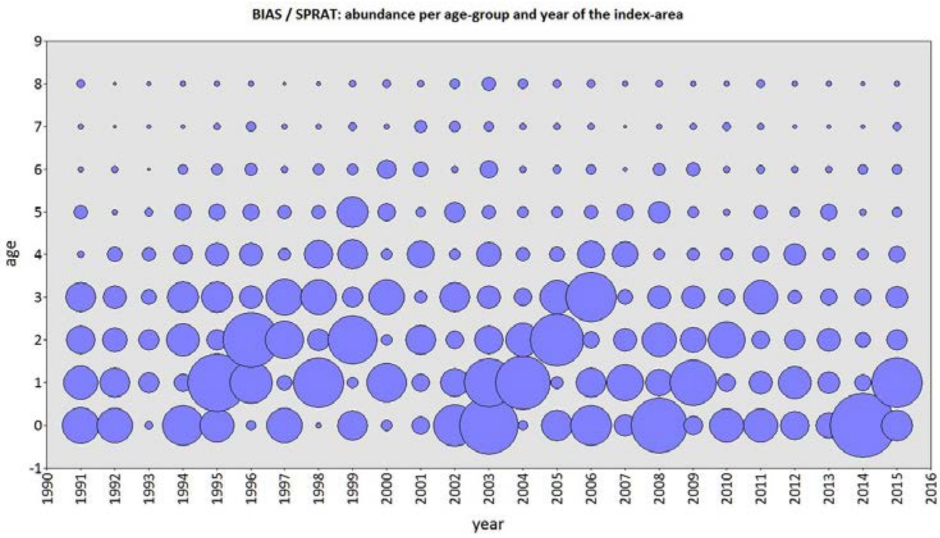


Figure 5.1.1.4.2.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1991-2015) for sprat in the ICES Subdivisions 22-29.

5.1.1.4.3. Herring in the ICES Subdivision 30

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 and therefore the coverage of the ICES SD 30 was based on the Finnish data only, which resulted in half of the normal effort. In 2013, Finland installed fishing equipment and the Simrad EK-60 echosounder into the

RV "Aranda" and used the vessel in order to cover all required ICES 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. All of the 2014 herring age samples were not available at the deadline 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. Tuning fleet data from the October 1991, 2000, 2007–2015 BIAS surveys are presented for the herring assessment of the Bothnian Sea (the ICES Subdivision 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.

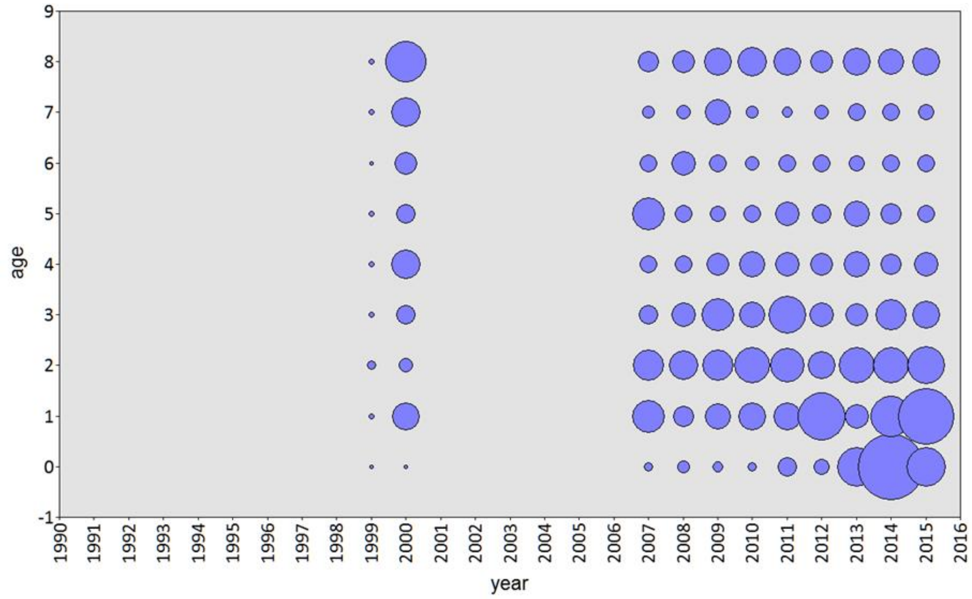


Figure 5.1.1.4.3.1. Autumn (BIAS) tuning fleet index (abundance per age groups and years 1999–2000 and 2007–2015) for herring in the ICES Subdivision 30.

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, 2007–2015).

YEAR	AREA_CORR_FACTOR	age 0	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
1999	1.28	100.45	187.68	561.32	252.25	228.34	252.55	140.65	156.24	188.65
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
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
2008	1.2	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
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
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
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
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
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
2014	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
2015	1.21	8 949.47	17 996.57	8 079.44	4 637.48	3 507.45	1 844.19	1 681.52	1 331.19	4 362.95

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

In May–June 2015, the following acoustic surveys were conducted:

Vessel	Country	ICES Subdivisions
Walther Herwig III	Germany	24, 25, parts of 26, 28 and 29
Commercial cutter "Ulrika"	Latvia/Estonia	Parts of 26, 28, 29, 32
Atlantniro	Russia	Part of 26
Darius	Lithuania	Part of 26

5.1.2.1. Area under investigation and overlapping areas

The BASS/2015 surveys were realized by Germany, Lithuania, Latvia-Estonia and Russia in seven the ICES Subdivisions however, in some regions only partly, what is illustrated in Figure 5.1.2.1.1. The area coverage of the Baltic Sea with the BASS/2015 survey principally was the same as required by the WGBIFS 2015. Two statistical ICES rectangles (42G9 and 43G9) were inspected by Germany and Latvia. 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. One statistical ICES rectangle (40G9) was inspected by Russia and Lithuania, as they both covered different parts of that rectangle, the data from both countries was used in the calculation of the indices. During late spring, sprat is usually concentrated in the deeper Baltic basins for spawning. Herring stays at this time primarily in the shallow water areas, close to the 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.

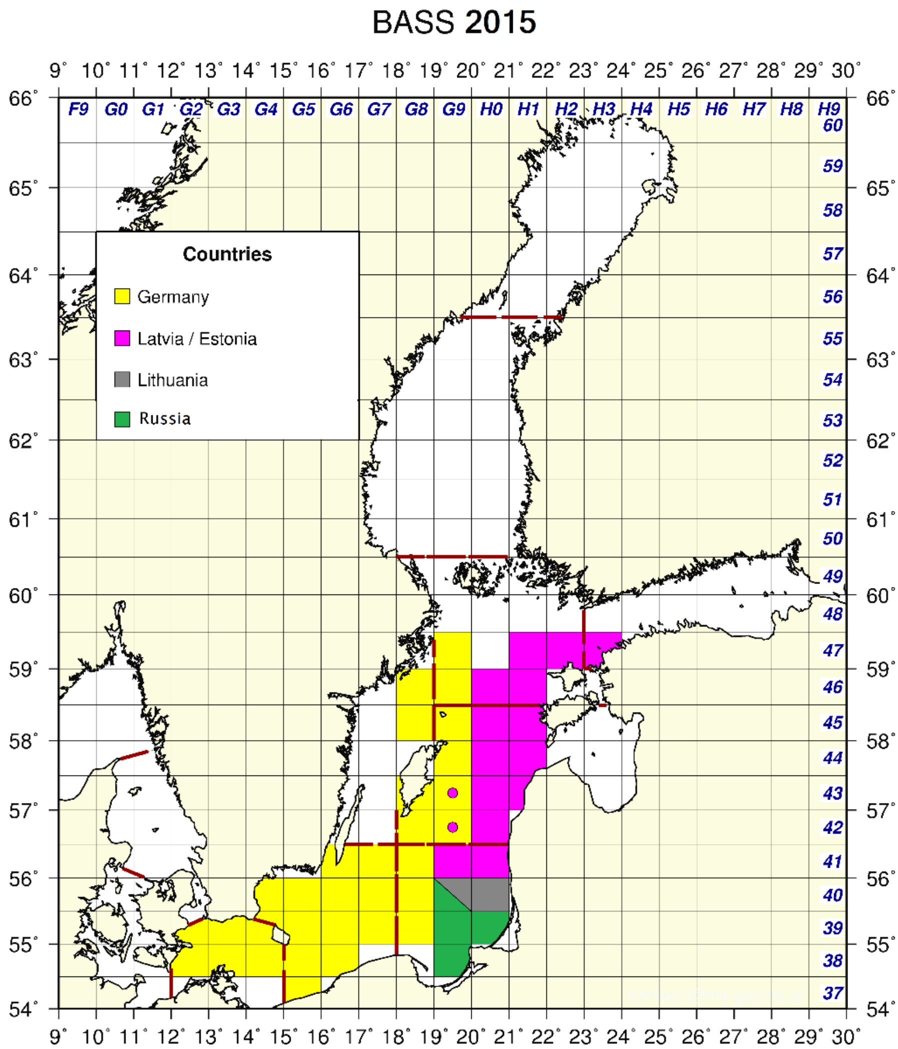


Figure 5.1.2.1.1. Map of the BASS survey conducted in May-June 2015. Various colours indicate the countries, which covered specific ICES-rectangles and delivered data to BASS-database, thus was responsible for this rectangle. Dot with different colour within a rectangle explain additional data in BASS-database 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 was discussed, and a correction factor for each ICES Subdivision and year was introduced because of the coverage of the investigated areas 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 2015 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.

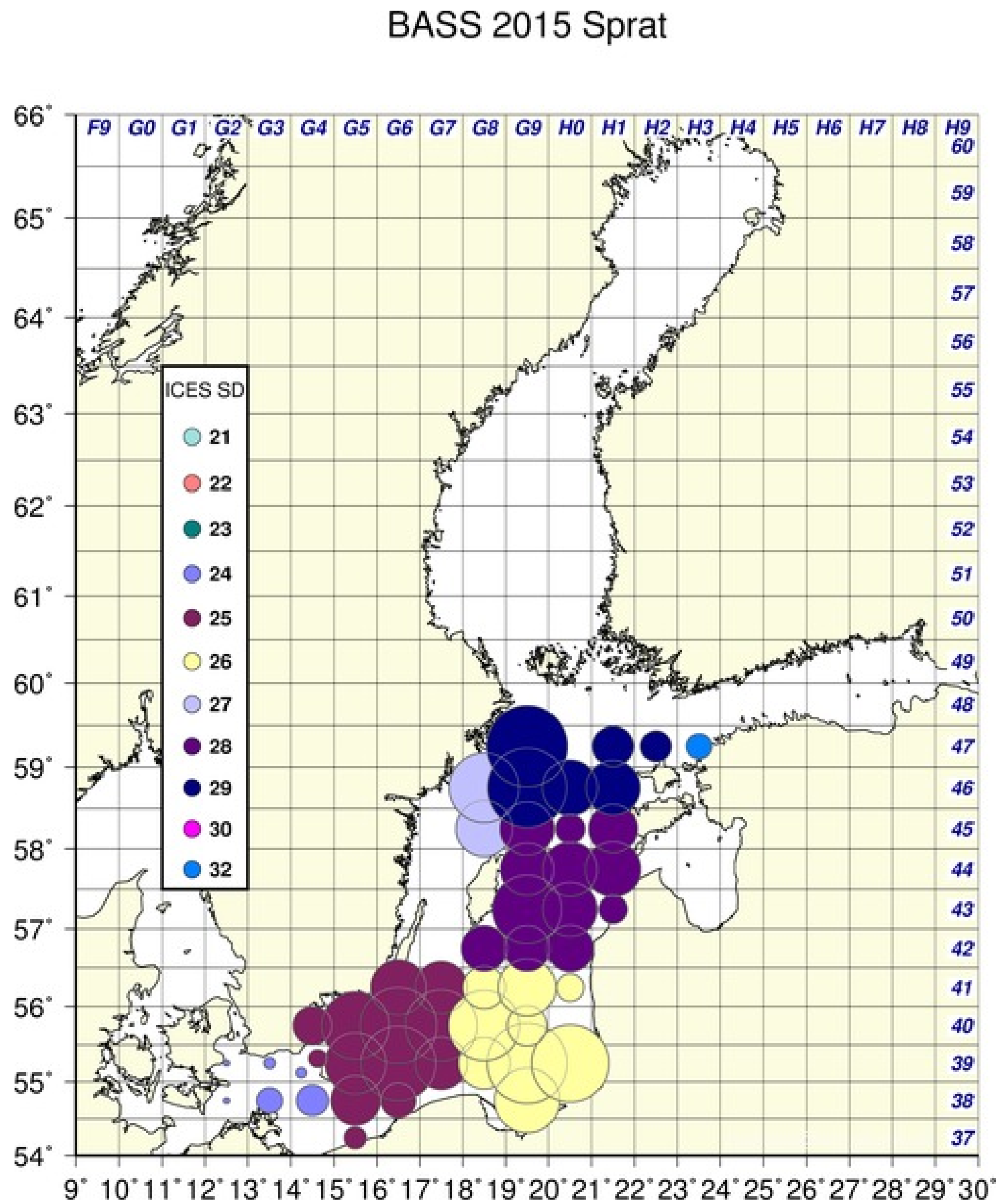


Figure 5.1.2.2.1. The abundance of sprat per the ICES-rectangles monitored in May-June 2015 (the area of circles indicates estimated numbers of specimens x10^6 in given rectangle; the colour indicates ICES Subdivision).

Table 5.1.2.2.1. Estimated abundance (millions) of sprat in May-June 2015, per age groups and the ICES-rectangles in given the ICES Subdivisions.

YEAR	Sub_Div	RECT	total	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	24	38G2	48.62	3.21	6.90	7.50	12.16	5.99	6.68	4.53	1.65
2015	24	38G3	961.54	291.68	236.44	113.39	139.16	60.00	62.98	43.57	14.32
2015	24	38G4	1 381.92	169.45	587.13	211.64	229.45	86.74	59.75	31.74	6.02
2015	24	39G2	43.74	2.89	6.20	6.75	10.94	5.39	6.01	4.08	1.48
2015	24	39G3	188.88	2.70	49.73	37.03	49.53	19.38	13.78	10.51	6.22
2015	24	39G4	165.19	25.00	60.69	25.03	28.17	10.65	9.48	5.41	0.76
2015	25	37G5	648.09	45.59	49.78	188.89	121.35	128.58	59.93	35.65	18.32
2015	25	38G5	3 456.65	243.18	265.52	1 007.46	647.24	685.78	319.63	190.13	97.71
2015	25	38G6	1 748.50	33.54	219.43	597.68	339.51	304.27	134.35	79.11	40.61
2015	25	39G4	442.48	67.55	32.28	110.05	78.75	78.96	38.62	24.59	11.68
2015	25	39G5	5 266.15	516.90	784.10	1 945.06	962.41	587.66	280.16	110.04	79.82
2015	25	39G6	7 802.95	344.30	1 246.65	3 018.12	1 493.39	993.84	402.89	171.49	132.27
2015	25	39G7	3 833.80	449.13	712.48	1 452.86	646.60	327.58	154.52	45.31	45.32
2015	25	40G4	2 040.90	347.85	241.55	629.80	339.36	271.17	110.91	62.33	37.93
2015	25	40G5	6 497.47	3 536.47	500.98	1 236.17	595.96	356.37	173.08	51.71	46.73
2015	25	40G6	8 137.67	3 740.44	767.19	1 767.90	868.82	556.89	258.97	103.55	73.91
2015	25	40G7	7 085.16	3 804.04	800.36	1 398.47	595.55	271.90	134.92	41.87	38.05
2015	25	41G6	4 312.40	4 134.74	34.99	74.03	34.99	20.19	8.08	2.69	2.69
2015	25	41G7	3 921.62	1 991.26	454.20	841.97	355.34	166.04	71.84	14.69	26.28
2015	26	38G9	5 923.78	2 595.02	2 020.51	747.93	424.56	56.64	14.13	57.07	7.92
2015	26	39G8	3 740.13	255.08	1 559.82	956.43	634.52	135.79	127.23	36.86	34.40
2015	26	39G9	8 995.66	4 111.54	1 771.67	1 731.99	825.53	236.05	64.88	237.01	16.99
2015	26	39H0	8 438.17	7 326.02	551.82	400.88	159.45				
2015	26	40G8	6 976.56	2 114.54	2 376.73	1 336.18	791.72	149.80	137.88	36.22	33.49
2015	26	40G9	2 196.80	135.68	512.91	882.53	364.98	162.93	47.08	74.96	15.72
2015	26	41G8	2 533.12	617.61	888.26	541.18	333.04	63.95	64.94	12.52	11.62
2015	26	41G9	4 584.30	1 663.90	940.70	770.90	742.60	117.90	23.20	270.90	54.20
2015	26	41H0	1 103.90	446.80	201.40	194.30	173.20	14.80	5.40	58.60	9.40
2015	27	45G8	4 397.53	3 509.03	229.49	316.20	156.73	29.99	111.28		44.81
2015	27	46G8	6 882.25	4 882.34	603.56	746.93	317.50	54.59	205.87		71.46
2015	28_2	42G8	2 922.78	298.91	385.51	649.82	922.86	314.23	235.17	11.33	104.95
2015	28_2	42G9	2 923.09	547.16	465.38	659.23	782.16	231.02	144.09		94.05
2015	28_2	42H0	3 113.50	1 996.40	259.70	336.90	283.90	82.80	20.90	106.80	26.10
2015	28_2	43G9	6 552.57	2 109.44	966.77	1 244.54	1 394.03	419.82	247.32		170.65
2015	28_2	43H0	4 077.20	3 326.80	184.70	141.80	173.60	61.90	12.10	114.00	62.30
2015	28_2	43H1	1 163.40	740.90	125.00	90.30	86.80	35.90	11.60	46.30	26.60
2015	28_2	44G9	3 844.21	2 700.27	218.16	299.59	364.71	124.40	78.77	7.98	50.33
2015	28_2	44H0	4 178.00	3 461.00	177.10	214.80	157.50	47.00	15.60	59.60	45.40
2015	28_2	44H1	4 218.70	3 624.80	199.90	188.70	145.40			40.60	19.30
2015	28_2	45G9	3 957.55	2 239.80	358.81	438.53	534.71	161.84	147.05		76.81
2015	28_2	45H0	1 188.00	714.30	52.30	90.30	159.40	39.70	12.80	78.50	40.70
2015	28_2	45H1	3 259.20	3 018.30	73.80	86.40	56.30	4.90	4.90	4.90	9.70
2015	29	46G9	8 679.51	8 199.23	86.03	212.41	95.81	27.73	58.30		
2015	29	46H0	4 227.80	3 665.90	33.60	129.50	133.70	48.10		137.70	79.30
2015	29	46H1	4 186.60	3 650.60	128.40	108.90	162.60	48.10	13.30	34.20	40.50
2015	29	47G9	9 301.87	8 787.15	92.20	227.64	102.68	29.72	62.48		
2015	29	47H1	2 353.40	1 775.90	81.90	163.60	112.50	53.30	17.50	88.70	60.00
2015	29	47H2	1 361.50	893.40	33.00	116.30	109.60	19.50	14.60	109.00	66.10
2015	32	47H3	901.80	539.90	20.20	104.60	108.30	5.00	4.70	70.80	48.30

Table 5.1.2.2.2. Estimated numbers of sprat (millions) by the ICES Subdivisions, according to age groups (May-June 2015).

YEAR	Sub_Div	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	24	494.93	947.09	401.34	469.41	188.15	158.68	99.84	30.45
2015	25	19 254.99	6 109.51	14 268.46	7 079.27	4 749.23	2 147.90	933.16	651.32
2015	26	19 266.20	10 823.82	7 562.33	4 449.60	937.86	484.74	784.14	183.74
2015	27	8 391.37	833.05	1 063.13	474.23	84.58	317.15		116.27
2015	28_2	24 778.08	3 467.13	4 440.91	5 061.37	1 523.51	930.30	470.01	726.89
2015	29	26 972.18	455.13	958.35	716.89	226.45	166.18	369.60	245.90
2015	32	539.90	20.20	104.60	108.30	5.00	4.70	70.80	48.30

Table 5.1.2.2.3. Area corrected numbers (millions) of sprat by the ICES Subdivisions and age groups (May-June 2015).

YEAR	Sub_Div	AREA_CORR_FACTOR	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	24	1.28	632.95	1 211.21	513.26	600.31	240.62	202.93	127.68	38.94
2015	25	1.07	20 691.92	6 565.44	15 333.26	7 607.57	5 103.65	2 308.19	1 002.80	699.93
2015	26	1.23	23 624.66	13 272.43	9 273.10	5 456.20	1 150.03	594.40	961.54	225.30
2015	27	4.25	35 653.25	3 539.46	4 517.03	2 014.91	359.36	1 347.51		494.01
2015	28_2	1.04	25 802.90	3 610.53	4 624.59	5 270.71	1 586.52	968.78	489.45	756.95
2015	29	1.89	50 911.97	859.09	1 808.96	1 353.18	427.44	313.68	697.65	464.15
2015	32	13.98	7 548.93	282.44	1 462.53	1 514.26	69.91	65.72	989.93	675.34

Table 5.1.2.2.4. Corrected sprat biomass (in tonnes), according to the ICES Subdivisions and age groups (May-June 2015).

YEAR	Sub_Div	AREA_CORR_FACTOR	age 1	age 2	age 3	age 4	age 5	age 6	age 7	age 8+
2015	24	1.28	4 736.72	16 806.55	8 356.34	10 407.32	4 259.43	3 925.43	2 561.74	837.64
2015	25	1.07	93 760.26	67 887.21	180 220.30	95 458.45	72 711.14	32 932.09	16 136.67	9 998.14
2015	26	1.23	127 476.09	137 494.70	118 610.92	72 162.15	18 817.70	9 183.70	14 382.77	3 184.22
2015	27	4.25	117 804.80	32 159.28	45 731.98	22 518.64	4 638.21	16 231.31		6 238.24
2015	28_2	1.04	104 766.25	39 114.02	53 804.02	61 936.86	18 579.19	12 097.45	7 789.55	9 183.01
2015	29	1.89	157 596.84	7 915.76	17 355.97	13 605.84	4 779.60	3 406.46	7 808.81	5 022.89
2015	32	13.98	17 362.55	2 287.75	13 162.74	14 839.76	622.20	676.87	11 087.24	6 955.95

5.1.2.2.1. Sprat in the ICES Subdivisions 24 – 26, 28

Tuning Fleets for WGBFAS

The complete time-series (2001 to 2015) of the area-corrected sprat abundance in the ICES Subdivisions 24, 25, 26, and 28 (without the Gulf of Riga) is given in the Table 5.1.2.2.1.1 and Figure 5.1.2.2.1.1.

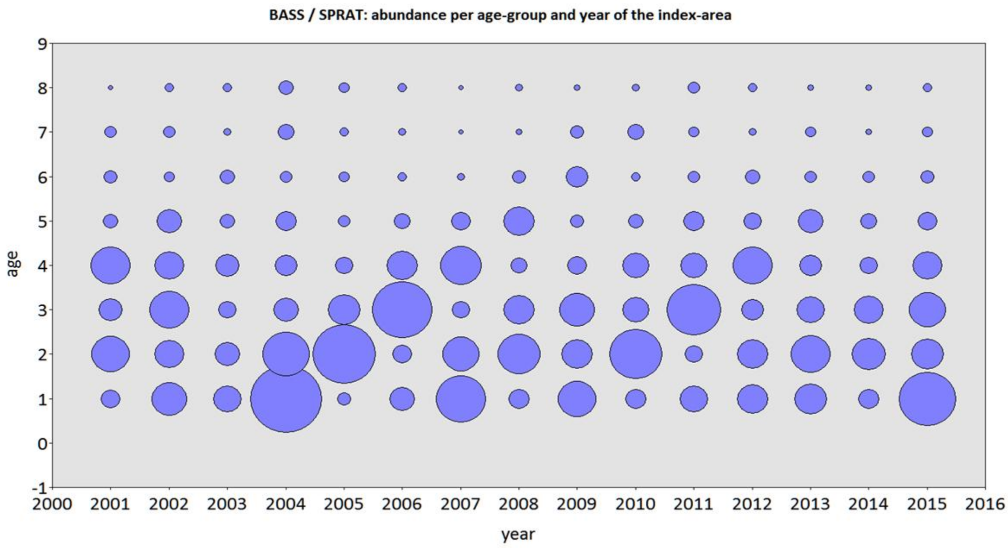


Figure 5.1.2.2.1.1. Spring (BASS) tuning fleet index (abundance per age groups and years 2001–2015) for sprat in the ICES Subdivisions 24-26, 28.

Whole time-series of tuning indices

Table 5.1.1.4.1.1. 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_AGE	HER_AGE8+
1991	59 944,22	6 942,71	20 002,43	11 963,95	4 148,43	9 642,76	2 511,21	2280,03	2452,71
1992	45 994,83	7 416,92	9 155,99	13 177,55	7 156,18	4 107,91	2 273,74	1539,52	1167,03
1993	28 396,39	709,95	4 539,70	6 809,39	7 830,70	3 619,01	2 054,43	1089,66	1743,56
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	1503,95	829,06
1996	43 944,57	3 985,13	13 761,96	9 989,35	7 360,96	4 532,76	2 358,59	1178,87	776,94
1997	15 438,37	1 447,81	1 544,65	5 182,71	3 237,17	2 156,86	1 091,15	466,71	311,32
1998	24 922,96	4 285,08	2 170,72	6 617,17	6 520,67	2 584,07	1 523,58	791,27	430,41
1999	20 511,86	1 754,15	4 741,92	3 193,65	4 251,46	3 679,73	1 427,81	833,2	629,96
2000	40 924,36	10 151,18	2 560,04	9 873,66	4 837,59	5 200,35	3 234,04	3006,83	2060,67
2001	24 300,57	4 028,51	8 194,34	3 286,15	4 660,79	1 567,36	1 238,05	861,26	464,12
2002	20 672,28	2 686,92	4 242,02	6 508,41	2 842,26	2 326,29	869,78	741,28	455,3
2003	49 161,77	16 704,18	9 115,70	10 643,33	6 689,95	2 319,57	1 777,96	755,07	1156
2004	34 519,87	4 913,56	13 229,49	6 788,89	4 672,24	2 500,08	1 132,10	603,52	679,98
2005	41 760,33	1 920,24	8 250,78	15 344,88	7 123,19	4 355,80	2 540,70	1095,95	1128,8
2006	62 514,29	7 316,60	8 059,84	12 700,27	21 120,77	7 336,31	3 068,12	1700,65	1211,72
2007	29 634,05	5 400,70	6 587,26	2 974,88	4 191,03	7 092,91	1 696,87	882,93	807,46
2008	35 039,19	6 841,54	6 822,40	7 588,80	3 612,67	4 926,52	3 563,14	877,07	807,05
2009	38 653,24	6 408,78	12 141,39	6 820,28	5 551,44	2 058,64	2 969,48	2089,22	614
2010	37 891,76	3 829,47	8 278,75	12 047,60	5 006,24	3 542,80	1 684,71	1901,9	1600,3
2011	44 141,66	2 338,71	5 667,81	10 992,95	12 668,94	5 525,30	3 257,40	1448,43	2242,12
2012	51 695,69	14 947,97	3 630,05	7 544,67	9 345,39	9 199,52	2 684,65	2261,89	2081,55
2013	46 887,63	6 895,68	9 160,08	3 855,08	6 934,01	7 127,08	7 272,45	2154,28	3488,96
2014	59 146,09	5 086,33	10 113,93	15 408,71	5 916,49	7 369,87	6 664,24	4933,46	3653,07
2015	95 183,53	36 179,38	9 812,43	15 272,96	15 548,98	5 486,39	4 873,36	3648,14	4361,89

Note: The coverage of the ICES Subdivision 29N was 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 5.1.1.4.1.2. 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	10 098,28
2012	11 140,63
2013	3 068,44
2014	35 060,67
2015	7 661,72

<u>Note:</u> 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 5.1.1.4.2.1. Autumn acoustic (BIAS) tuning fleet index (numbers in millions) for Baltic sprat (the ICES Subdivisions 22–29).

YEAR	SPR_TOTAL_age 1_8	SPR_AGE1	SPR_AGE2	SPR_AGE3	SPR_AGE4	SPR_AGE5	SPR_AGE6	SPR_AGE7	SPR_AGE8
1991	149 058,78	46 487,55	40 298,51	43 681,07	2 743,40	8 923,78	1 850,70	1 956,55	3117,22
1992	102 482,10	36 519,48	26 991,22	24 050,54	9 289,37	1 920,67	2 436,59	714,03	560,2
1993	98 533,51	30 598,67	30 890,12	16 143,51	12 681,94	4 602,94	989,26	1 451,80	1175,27
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	1559,41
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	1400,83
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	1310,87
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	416,8
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	1010,56
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	1738,19
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	2678,2
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	2406,58
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	4344,84
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	8534,58
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	3551,91
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	3325,36
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	2947,37
2007	120 744,73	51 888,04	21 665,20	8 174,54	26 102,00	9 800,35	1 066,69	470,39	1577,52
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	1917,21
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	1375,72
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	1182,97
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	2807,94
2012	90 590,08	40 515,77	16 525,13	7 935,32	18 412,56	3 494,33	1 732,67	606,20	1368,12
2013	71 926,85	19 407,84	20 363,57	11 448,00	5 683,54	11 219,11	1 771,30	759,48	1274,02
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
2015	158 980,65	99 618,14	17 315,45	19 727,94	11 041,13	3 426,39	3 552,12	2 771,69	1527,78

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

Table 5.1.1.4.2.2. 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
2015	36 900.25

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

Table 5.1.2.2.1.1. Spring acoustic (BASS) tuning fleet index (numbers in millions) for Baltic sprat (the ICES Subdivisions 24-26 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
2015	160 548,72	70 752,42	24 659,60	29 744,21	18 934,79	8 080,81	4 074,30	2 581,47	1 721,12

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*. The updated data of the Baltic International Acoustic Survey (BIAS) are stored in the *BIAS_DB.mdb*. 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 2015 were added to both databases. The updated versions of the databases are located in the folder "Data" of the ICES WGBIFS-2016 SharePoint. The results of the next international acoustic surveys (BIAS, BASS) should be summarized in table format according the IBAS Manual and latest one month before the next year meeting uploaded to the ICES WGBIFS-SharePoint. N. Larson and O. Kaljuste (Sweden) were assigned as data coordinators responsible to control that the acoustic survey results are uploaded in the right format. T. Łączkowski (Poland) was assigned to be the new manager of BIAS and BASS databases for aggregated data. Before the next meeting of WGBIFS, the acoustic data from both surveys must be integrated into the database by the database manager. The integrated data will be checked for errors and preliminary analysis 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. During summer 2016, the previous manager of BIAS and BASS databases (U. Böttcher, Germany) will provide a well-documented description of standard data handling procedures. U. Böttcher to handle over the responsibilities of the BIAS and BASS database manager. At the beginning of September 2016 will be organized a meeting at the TI-OF Institute in Rostock between the new and retiring acoustic data coordinators.

Annex ToR c) Plan and decide on acoustic surveys and experiments to be conducted in autumn 2016 and spring 2017

5.3.1. Planned acoustic survey activities

All the Baltic Sea countries (with the exception of Russia – Kaliningrad) intend to take part in acoustic surveys and experiments in 2016 and 2017 (Figures 5.3.1.1- 5.3.1.3). The list of participating research vessels and initially planned periods of particular surveys are given in the following tables:

BASS – 2016 surveys

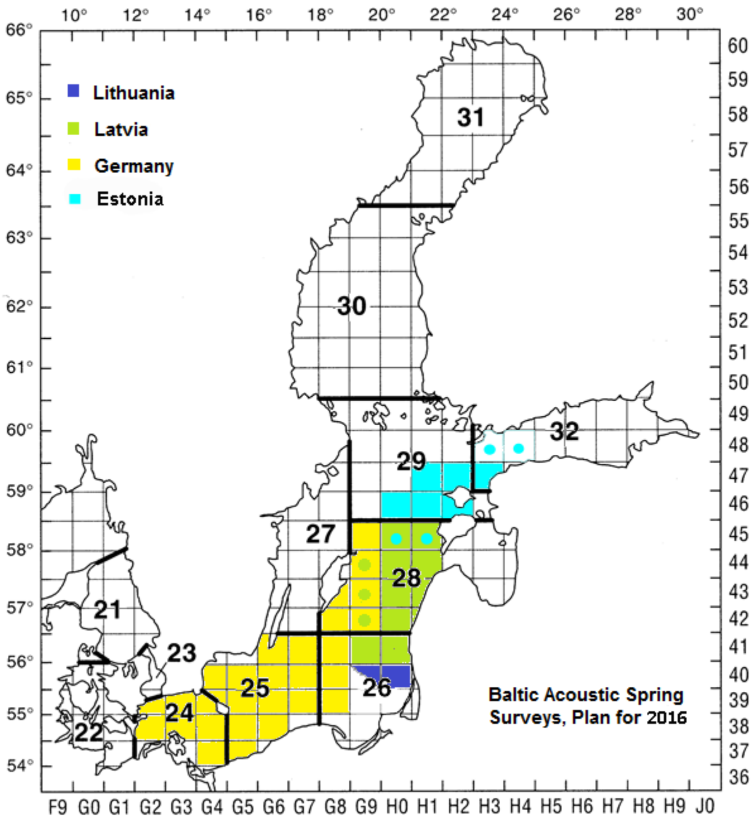
Vessel	Country	Area of investigation (ICES Subdivisions)	Period of investigations (preliminary)	Duration (days)
Walther Herwig III	Germany	24, 25, 26 (part), 28 (part)	03-23.05.2016	**21**
Baltica	Latvia-Poland	26, 28	12-21.05.2016	**10**
Baltica	Estonia-Poland	28(part), 29E, 32	22-26.05.2016	**5**
Darius	**Lithuania**	**26 (the Lithuanian EEZ)**	**May 2016**	**2**

BIAS – 2016 surveys

Vessel	Country	Area of investigation (ICES Subdivisions)	Period of investigations (preliminary)	Duration (days)
Solea	Germany	21, 22, 23, 24	30.09.-23.10.2016	**21**
Darius	Lithuania	26	Oct. 2016	**2**
Baltica	Latvia-Poland	26, 28	11-20.10.2016	**10**
Baltica	Poland	24 (part), 25, 26 (the Polish EEZ)	13-30.09.2016	**18**
Dana	Sweden	27, 25, 26, 28, 29	28.09.-13.10.2016	**16**
Baltica	Estonia-Poland	28, 29, 32	21-31.10.2016	**11**
Aranda	Finland	29N, 32N, 30	22.09.-05.10.2016	**14**
Victor Klimov	**Russia (St. Petersburg)**	**32E**	**Sep.-Oct. 2016**	**7-10**

BASS – 2017 surveys

Vessel	Country	Area of Investigation (ICES Subdivisions)	Period of investigations (preliminary)	Duration (Days)
Walther Herwig III	Germany	24, 25N, 26SW, 28W, 29(part)	May 2017	**20**
Baltica	Poland	24 (part), 25, 26 (the Polish EEZ)	May 2017	**10**
Baltica	Estonia-Poland	28 (part), 29 (part), 32 (part)	May 2017	**5**
Baltica	Latvia-Poland	26 (part), 28 (part)	May 2017	**8**
Darius	**Lithuania**	**26 (the Lithuanian EEZ)**	**May 2017**	**2**


Lithuania
Latvia
Germany
Estonia
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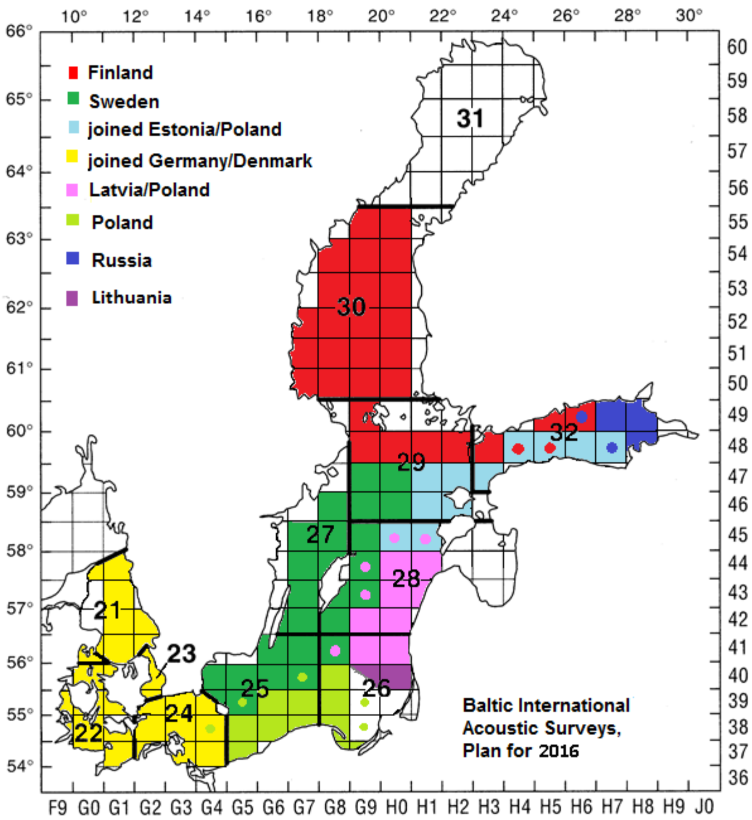
Baltic Acoustic Spring
Surveys, Plan for 2016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Sweden
joined Estonia/Poland
joined Germany/Denmark
Latvia/Poland
Poland
Russia
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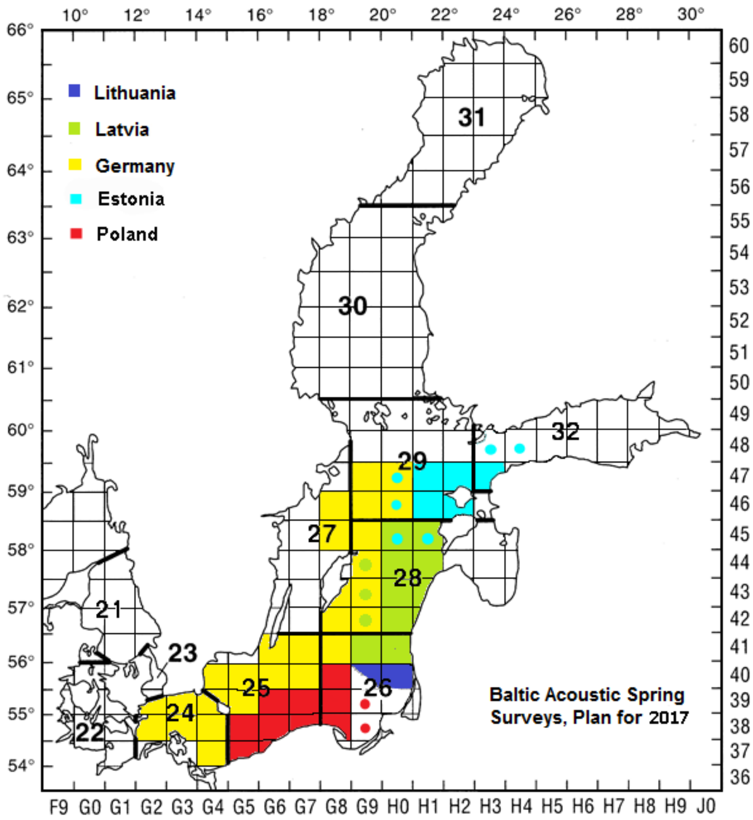
Baltic International
Acoustic Surveys,
Plan for 2016



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 May 2016, September/October 2016 and May 2017 (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 rectangle are covered).

Annex ToR d) Discuss the results from BITS surveys performed in autumn 2015 and spring 2016

5.4.1. BITS 4th quarter 2015

The Figure 5.4.1.1 shows the difference in the number of planned and index-valid fishing stations for each ICES Subdivision.

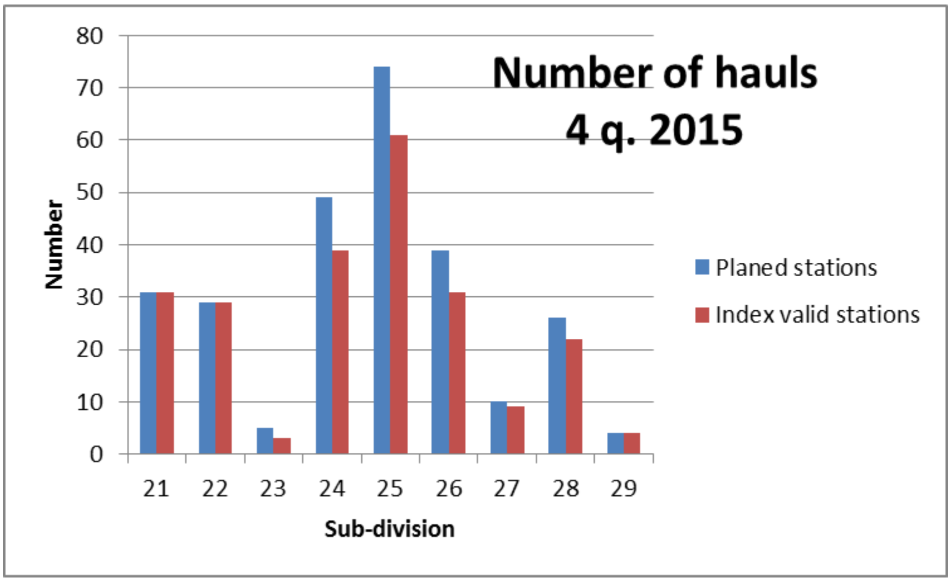


Figure 5.4.1.1. Comparison of the planned and the index-valid fishing stations by the ICES Sub-divisions and depth layers during the BITS 4th quarter 2015.

Table 5.4.1.1. Comparison of the planned and realized fishing stations by the ICES Subdivisions and depth layers during the BITS 4th quarter 2015.

ICES Subdivisions	Gear (TVL,TVS)	Depth strata (1-6)	Number of hauls planned	Number of valid hauls realized using the standard rigging 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
21	TVS	All	31	31	0	0	0	0	100
21	TVS	1-4	31	31	0	0	0	0	100
22	TVS	All	29	29	0	0	0	0	100
22	TVS	1	10	10	0	0	0	0	100
22	TVS	1-3	19	19	0	0	0	0	100
23	TVS	All	5	3	0	0	0	0	60
23	TVS	1-2	5	3	0	0	0	0	60
24	TVS	All	49	39	0	0	0	0	80
24	TVS	1	23	19	0	0	0	0	83
24	TVS	2	26	20	0	0	0	0	77
25	TVL	All	74	61	0	0	3	0	86
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	13	12	0	0	0	0	92
25	TVL	3	27	24	0	0	3	0	100
25	TVL	4	22	20	0	0	0	0	91
25	TVL	5	10	3	0	0	0	0	30
26	TV3S/TV3L	All	39	25	6	0	2	0	85
26	TV3S/TV3L	2	6	5	0	0	0	0	83
26	TV3S/TV3L	3	5	4	0	0	0	0	80
26	TV3S/TV3L	4	15	10	2	0	1	0	87
26	TVL	5	9	6	1	0	1	0	89
26	TVL	6	4	0	3	0	0	0	75
27	TVL	All	10	2	0	7	2	0	110
27	TVL	3	2	1	0	0	0	0	50
27	TVL	4	4	1	0	3	1	0	125
27	TVL	5	1	0	0	1	0	0	100
27	TVL	6	3	0	0	3	1	0	133
28	TV3S/TV3L	All	26	11	8	3	2	0	92
28	TVL	2	5	1	1	0	0	0	40
28	TV3S/TV3L	3	6	3	4	0	0	0	117
28	TV3S/TV3L	4	8	5	3	0	1	0	113
28	TV3S/TV3L	5	7	2	0	3	1	0	86
29	TVS	All	4	4	0	0	0	0	100
29	TVS	2	1	2	0	0	0	0	200
29	TVS	3	2	2	0	0	0	0	100
29	TVS	4	1	0	0	0	0	0	0
All SD		All	267	205	14	10	9	0	89.1

5.4.2. BITS 1st quarter 2016

The Figure 5.4.2.1 shows the difference in the number of planned and index-valid fishing stations for each ICES Subdivision.

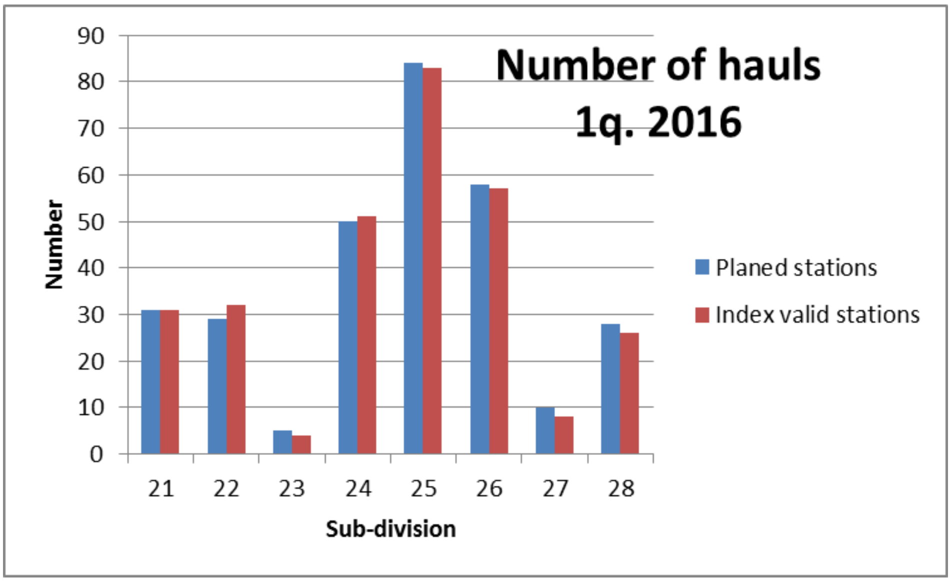


Figure 5.4.2.1. Comparison of the planned and the index-valid fishing stations by the ICES Sub-divisions and depth layers during the BITS 1st quarter 2016.

Table 5.4.2.1. Comparison of the planned and realized fishing stations by the ICES Subdivisions and depth layers during the BITS 1st quarter 2016.

ICES Subdivisions	Gear (TVL,TVS)	Depth strata (1-6)	Number of hauls planned	Number of valid hauls realized using the standard rigging 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
21	TVS	All	31	31	0	0	0	0	100
21	TVS	1-4	31	31	0	0	0	0	100
22	TVS	All	29	32	0	0	0	0	110
22	TVS	1	10	10	0	0	0	0	100
22	TVS	1-3	19	22	0	0	0	0	116
23	TVS	All	5	4	0	0	0	0	80
23	TVS	1-2	5	4	0	0	0	0	80
24	TVS	All	50	51	0	0	3	1	108
24	TVS	1	23	21	0	0	1	1	96
24	TVS	2	27	30	0	0	2	0	119
25	TVL	All	84	83	0	0	6	3	106
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	12	12	0	0	0	0	100
25	TVL	3	30	28	0	0	5	1	110
25	TVL	4	30	25	0	0	1	0	87
25	TVL	5	10	12	0	0	0	1	120
25	TVL	6	0	4	0	0	0	1	
26	TV3S/TV3L	All	58	45	6	6	2	3	102
26	TV3S/TV3L	2	9	9	0	0	0	0	100
26	TV3S/TV3L	3	10	9	1	0	0	0	100
26	TVL	4	17	13	2	1	1	3	100
26	TVL	5	17	14	1	2	1	0	106
26	TVL	6	5	0	2	3	0	0	100
27	TVL	All	10	3	0	5	2	0	100
27	TVL	3	2	0	0	0	0	0	0
27	TVL	4	4	3	0	1	1	0	125
27	TVL	5	1	0	0	1	0	0	100
27	TVL	6	3	0	0	3	1	0	133
28	TVL	All	28	5	16	5	2	1	100
28	TVL	2	6	1	5	0	0	0	100
28	TVL	3	7	2	2	0	0	1	57
28	TVL	4	8	2	6	1	1	0	125
28	TVL	5	7	0	3	4	1	0	114
All SD		All	295	254	22	16	15	8	104

5.4.3. Technical checking of the standard bottom trawl TV-3

The WGBIFS decided on implementation as a standard procedure to perform at least once a year a full and thorough measurements of the technical parameters (geometry, mesh sizes, rope lengths of the trawl, etc.) of applied demersal trawls type TV-3L and TV-3S. Such task should be realized by each country involved in the BITS surveys. In addition, prior to each BITS survey, a short measurement of the trawl should also be made. All the measurements should follow some hints presented in the BITS Manual. 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. The measurements results from each country should be made available to the WGBIFS using the standard protocols. In 2015–2016, the TV-3 trawls measurements (lengths of trawl sections and mesh sizes) were performed by Germany and Lithuania, while Sweden and Poland measured the TV-3 trawl sections lengths only (Tables 6.1.1 – 6.1.6 in Annex 6.1). Denmark sends all standard trawls to the gear maker in order to check-up the conformity with the agreed standards.

5.4.4. Inter-calibration exercise between the Danish old and new RV "Havfisken"

In the period of 13–19 March 2016, inter-calibration exercise was carried out in order to be able to continue the BITS time-series. The setup was simple pair trawling following normal BITS haul procedure (in daylight, ½ hour) and using the small BITS standard trawl (TV-3S, #520). The Skagerrak and the north-western Kattegat were selected for the above-mentioned investigation, based on the following criteria:

- reasonable abundance of cod and flatfish;
- the length range of each fish species should be as wide as possible;
- the sea-depth range at monitored location should be comparable to the depth range in Kattegat and western Baltic.

In total, 30 successful pair of hauls were made (Annex 6.2).

Annex ToR e) Plan and decide on demersal trawl surveys and experiments to be conducted in autumn 2016 and spring 2017, and update and correct the Tow-Database and DATRAS

5.5.1. Plan and decide on demersal trawl surveys and experiments

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 the 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. During the WGBIFS-2015 meeting was agreed that a constant number of fishing stations is planned for the ICES SD 24 with 50 hauls. All additionally planned stations by the RV "Solea" and the 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 the 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 ICES Subdivision.

Denmark and Germany realized planned fishing stations within the Polish EEZ in the past, regularly. Germany carried out ~ 10 fishing stations in the Polish EEZ in the ICES SD 24 and Denmark realized ~ 20 fishing stations in the Polish EEZ of the ICES SD 25. In addition, Latvia carried out two fishing stations in the Polish zone during last BITS. Following specifications were agreed during the WGBIFS meeting in 2016. Denmark intends to realize the planned number of 50 fishing stations in the ICES SD 25–27, outside the Polish EEZ. Germany plans 45 hauls in the ICES SD 24 outside the Polish EEZ and 15 hauls in the ICES SD 22. Poland plans 10 additional hauls in the Polish EEZ of the ICES SD 24 and 22 additional fishing hauls in Polish EEZ of the ICES SD 25 to compensate the missing coverage of the area by Danish and German research vessels.

The DATRAS Database (version from March 2016) 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 2011–2015 was used based on the current applied version of conversion factors, which are stored in the DATRAS system. 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 2016 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 2017. The planned fishing-stations by country and the ICES Subdivision can be considered as not fixed.

It should be underlined that, according to the recommendations of WGBIFS-2011, all countries participated in the BITS surveys are obliging to upload to DATRAS information related to all fished species. WGBIFS notes that Russia did not to participate in the BITS survey in a few 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 visible.

Table 5.5.1.1. Total numbers of catch-stations planned by particular country during BITS in autumn 2016 and spring 2017.

COUNTRY	VESSEL	NUMBER OF PLANNED STATIONS IN AUTUMN	NUMBER OF PLANNED STATIONS IN SPRING
		2016	2017
Germany	Solea	60	60
Denmark	Havfisken	27	27
Poland	Baltica	10	10
	Total 22 + 24	97	97
Denmark	Dana	50	50
Estonia	Commercial vessel	5	0
Finland	Aranda	0	0
Latvia	Baltica	25	25
Lithuania	Darius	6	6
Poland	Baltica	55	71
Russia	Atlantniro/Atlantida	0	0
Sweden	Dana	30	50
	Total 25–28	171	202

Table 5.5.1.2. Basic data for allocating control-hauls for survey by ICES Subdivision.

ICES SUB.-DIV.	Total area of the depth layer 10-120 m	Proportion of the SUBDIVs (weight = 0.6)	Running mean of the cpue value of age groups 1+ (2011-2015)	Proportion of the index values (weight=0.4)	Proportion of the stations COUNTRY	Special decisions (additional stations)
SD	**[NM²]**	**[%]**		**[%]**	**[%]**	
22	3 673	39	188.7	25.0	33.6	
23	0	0	0	0	0	3
24	5724	61	552.1	75.0	66.4	
Total	9 397	100	704.3	100	100	
25	13 762	43	1 428.3.6	64.4	51.4	
26	9 879	31	753.2	33.9	32.0	
27	0	0	0	0	0	10
28	8 516	26	27.1	1.7	16.6	
Total	32 157	100	2 219	100	100	

Table 5.5.1.3. Basic data for allocating hauls according to depth layer for survey by ICES Subdivision.

ICES Subdiv.	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+ (2011–2015)	Proportion of the depth layer (weight = 0.4)	Proportion of the depth layer
	[M]	[NM²]	[%]		[%]	[%]
24	10–39	4 174	73	83.0	4.2	45.2
	40–59	1 550	27	343.9	17.4.6	23.1
	60–79	29	1	1 548.8	78.4	31.6
	Total	**5 753**	**100**	**1 972.7**	**100**	**100**
25	10–39	4 532	37	201.8	3.6	23.6
	40–59	3 254	26	2 115.1	37.4	30.9
	60–79	3 037	25	2 223.3	39.3	30.6
	80–99	1 461	12	1 112.4	19.7	15.0
	Total	**12 284**	**100**	**5 652.2**	**100**	**100**
26	10–39	2 379	23	81.8	2.4	15.0
	40–59	1 519	15	641.7	18.6	16.4
	60–79	1 911	19	1 328.5	38.5	26.6
	80–100	2 872	28	1 174.1	34.0	30.5
	100–120	1 504	15	228.7	6.6	11.5
	Total	**10 185**	**100**	**3 454.8**	**100**	**100**
27	10–39	1 642	31	0	0	18.5
	40–59	1 101	21	14.6	4.9	14.3
	60–79	996	19	182.3	61.0	35.6
	80–99	1 596	30	102.0	34.1	31.6
	Total	**5 335**	**100**	**298.9**	**100**	**100**
28	10–39	2 589	38.8	2.2	1.3	23.8
	40–59	1 598	23.9	29.0	17.2	21
	60–79	1 101	16.5	74.7	44.2	2
	80–100	1 389	20.8	63.1	37.3	27.4
	Total	**6 677**	**100**	**169**	**100**	**100**

Table 5.5.1.4. Allocation of planned catch-stations by country and ICES Subdivision in autumn 2016.

Country	Total	22	23	24	25	26	27	28
Denmark	77	22	5		29	21		
Estonia	5							5
Finland	0							
Germany	60	15		45				
Latvia	25					11		14
Lithuania	6					6		
Poland	65			10	47	8		
Russia	0							
Sweden	30				9	3	10	8
Total	268	37	5	55	85	49	10	27

Table 5.5.1.5. Allocation of planned fishing stations by ICES Subdivision and depth layer in autumn 2016.

ICES Subdiv.	22	23	24	25	26	27	28
Depth layer [m]							
10–39	37	5	25	20	8	3	7
40–59			22	26	9	2	7
60–79			8	26	13	2	8
80–100				13	14	3	5
100–120					5		
Total	37	5	55	85	49	10	27

Table 5.5.1.6. Allocation of planned fishing stations by country and the ICES Subdivision in spring 2017.

		ICES Subdivision						
Country	Total	22	23	24	25	26	27	28
Denmark	77	22	5		29	21		
Estonia	0							
Finland	0							
Germany	60	15		45				
Latvia	25					11		14
Lithuania	6					6		
Poland	81			10	63	8		
Russia	0				0	0		
Sweden	50				10	12	10	18
Total	267	37	5	55	102	58	10	32

Table 5.5.1.7. Allocation of planned catch-stations by ICES Subdivision and depth layer in spring 2017.

Subdivision	22	23	24	25	26	27	28
Depth layer [m]							
10–39	37	5	25	24	9	3	8
40–59			22	32	11	2	8
60–79			8	31	16	2	10
80–100				15	16	3	6
100–120					6		
Total	37	5	55	102	58	10	32

5.5.2. Update and correct the Tow-Database

The current used structure of the T-D was described in the WGBIFS-2005 Report and in the BITS Manual. Based on feedback from the BITS-Q4/2015 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 locations were provided by the most countries in the Baltic areas, where the density of available catch-stations was low. More than 90% of the catch-stations, which are stored in the Tow-Database, were already successfully used at least one time. The bottom hauls location were net was damaged, however previously were successfully used at least one time, were further use in the Tow-Database, but the datasets are marked. The catch-stations are deleted if similar problems were found during the next surveys. The missing feedback will be used immediately after submission by the countries. Then the version of TD_2016V1.XLS will be made available for all countries. To speed up the process it is necessary that all countries submit the feedback immediately after the survey, according to the description mentioned below. The structure of required feedback is demonstrated in Table 8.1.1 from the WGBIFS-2014 Report.

5.5.2.1. 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 feedback of realized catch-stations during the next BITS surveys should be submitted to Henrik Degel (Denmark) (e-mail: hd@aqua.dtu.dk), using the below proposed standard format, not later than 20 December (autumn survey) and immediately after spring survey. It should be added that, the above-mentioned Danish delegate would be also responsible for planning the fish control-hauls distribution for the next BITS surveys and managing the Tow-Database.

The current version of haul number for the Tow-Database

- ICES Subdivision
- Start position (latitude, longitude)
- Mean depth
- Depth range
- Code of the haul
- Reason for deleting the haul

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

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

It was agreed that:

- the feedback of realized BITS surveys should be submitted to Henrik Degel (Denmark), 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 catch-station was successfully carried out during earlier surveys with this gear (see the columns TV-3 and groundrope in the T-D),
- new control-haul positions should be submitted to Henrik Degel (Denmark) (e-mail: hd@aqua.dtu.dk) as soon as possible; especially, hauls in the "white areas" are necessary to cover the total distribution area of the target species,
- the time should be used during surveys to allocate new haul positions in the "white areas".

5.5.3. Reworking of the Database of Trawl Surveys (DATRAS)

During the WG meeting was 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 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.

The BITS surveys data for fish weight misreporting (record type HL.CatCatchWgt), mostly from 1990s, were indicated in DATRAS and adequate amendments will be made by particular submitters. The list of such errors and respected action was summarized by the ICES Secretariat Data-Center (see WGBIFS-2016 Meeting SharePoint, folder - Background documents, Corrections needed in DATRAS). More details regarding background and effect of various weight units of fish used in the early 1990s and after 1996 are presented in Annex 10. Moreover, the status of check-up the BITS data and amendments of errors is listed also in Annex 10.

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

At the WGBIFS-2016 meeting the SISP 7 BITS Manual for the Baltic International Trawl Surveys was considerably revised, corrected and supplemented with needed the parts of information (Addendum 1). The suggestions prepared by reviewers, accordingly to the Series of ICES Survey Protocols (SISP), were once more discussed. Review of the BITS Manual showed discrepancies concerning the description of the trawl doors used for TVS, which is used by the small research vessels Havfisken, Solea, Darius and Estonian commercial cutter. In the figure "Rigging details (1)…" of the gear specifications in the Manual an area of 1.96 m² and weight of 235 kg was given. Discussion within German institute showed that doors of the TVS were not changed between 2001 and 2015. Comments from the Danish firm Thyborön, which produced the doors, showed that the correct specification of the doors are Thyborön Type 2 with 1.78 m², 63 " and 205 kg. The new, correct one replaced the previous figure in the Manual. Moreover, the correct scheme of "Check list for rigging of trawl TV3-520x80" was attached. The needed scheme of the Danish a "stone escape device" used by the RV "Dana" during the BITS surveys in 2014–2015 when catching with TV-3L was attached to the BITS Manual (Annex 4.1, Figure 4.1.1). The purpose of installation such additional part of trawl was to let big rocks getting away through an opening in the lower panel of the belly of the trawl. Under the normal seabed conditions, the opening was covered with net of the same dimensions as the surrounding net in the lower part, let no fish out, and therefore does not change the geometry or the selectivity of the trawl. However, was taken decision by the Danish specialists to stop using the above-mentioned stone-panel from the BITS-Q4/2016 and onwards.

The Addendum 1 – SISP 7 BITS Manual contains the new detailed information and hints how formatting and reporting the marine litter data to the DATRAS. The marine litter reference list was changed from C-TS to C-TS-REV (http://vocab.ices.dk/?ref=1381). The information about marine litter is suggested to be noticed by the cruise leader during BITS surveys. Submitters of the marine litter data should 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.

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 SISP 7 BITS Manual (Addendum 1; see also the WGBIFS-2015 Report), can be implemented as the routine procedure during national BITS surveys. The state of cod gall bladder should be also recorded using the scale described in the BITS Manual. The materials collected at sea should originate from feeding fish showing no evidence of regurgitation and from non-feeding fish. Stomachs should be selected randomly within each length group. A wide geographical coverage of samples should be obtained whenever possible.

During the next WGBIFS meeting, the minor supplementary information e.g. about some formulas inserted to the Manual needs further explanations (Addendum 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) reviewed carefully 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 there are only few countries participating in the 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.

Annex ToR h) Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty

5.8.1. The new acoustic methods

The new method for combining the results of fishing stations during acoustic surveys was described by Oeberst (1985, 1986, 2005, and 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 the ICES Subdivision 25 in May 2003 and 2004. Oeberst and Böttcher (2012) applied the new method to estimate the indices of herring and sprat in the ICES SDs 24–28 during the German BASS surveys in 2008–2010. 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 and previously were presented in the WGBIFS 2014 and 2015 reports.

During the WGBIFS meeting in 2015 it was agreed that the available time-series of the data of fishing station, NASC values during the fishing stations and data of NASC during the regular acoustic surveys in 2009–2014 will be expand by the period from 2000 to 2008. The defined data were made available by Estonia, Finland, and Germany and covered only parts of the area under investigations. Indices based on the available data present biased estimates, which cannot be used for the stock assessment. Therefore, new analyses were not realized. Discussions during the meeting of WGBIFS in 2016 showed that it would not be possible to get data of the period 2000–2008 for the total area covered by the acoustic surveys because data of earlier years are not stored or are currently not accessible in national database in many countries. Based on the status of data submission it was concluded that further such analyses would be stopped.

At the WGBIFS-2016 meeting was also agreed, that the acoustic experts from all Baltic countries would send until the end of June 2016, the BIAS and BASS data from 2014 and 2015 to Niklas Larson (niklas.larson@slu.se). The data will be used to calculate the IBAS surveys sampling variance. The data-format (length, age and NASC) can be found on the SharePoint (BIAS-BASS_Haul-sA_DB_example_2014_simple version_v.1.3). The format of numbers should be in total estimated numbers per species and length-class in the whole control-catch. Information about the ICES rectangles is needed and all fish species should be included in the length of file. Additionally data from earlier years are requested too, going back to 2009.

References:

Oeberst, R. 1985. Zu einigen Aspekten der Planung von hydroakustischen Bestandsbestimmungen Fischerei – Forschung, Rostock, 23 (4); 77 – 88.

Oeberst, R. 2005. Estimation of species composition during acoustic analyses of scattered layers based on control hauls. Working document of the BIFS, Rostock, 4 – 8 April 2005, 15 pp.

Oeberst, R. 2011. Species composition in scattered layers during acoustic surveys estimated by means of trawling stations. Working doc WGBIFS, Kaliningrad, Russia, 21-25.03.2011, Report of the WGBIFS, ICES CM 2011 /SSGESST:05, 386 – 395.

Oeberst, R., Götze, E. 2006. Combination of trawl results during acoustic surveys – CASE STUDY. ICES CM/I:33 (Poster).

Oeberst, R., Gröhsler, T. 2012. Indices of sprat and herring based on German acoustic survey in October (BIAS) – estimated with different methods for combining the results of fishing stations. Report of the WGBIFS, ICES CM 2012 /SSGESST:02, 413 – 425.

Oeberst, R., Gröhsler, T. 2013. Comparison of stock indices based on GERAS estimated with the standard procedure and by the new proposed method. Working document of WGBIFS 2013; 386 – 394 (Annex 9).

Oeberst, R., Böttcher, U. 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).

5.8.2. Evaluate the proportion of WBSSH and CBH in the acoustic surveys

The papers prepared by Gröhsler *et al.* (2013), Oeberst (2015) and Oeberst *et al.* (2016; Annex 8) were a platform for consideration the topic – what kind of method is more applicable for an evaluation the proportion of Western Baltic Spring Spawning herring (WBSSH) and Central Baltic herring (CBH), based on the acoustic surveys results. The issue was discussed at the WGBIFS meetings e.g. in 2013, 2015, and 2016. The current paper was based on the length – age data of herring sampled during the German Autumn Acoustic Survey (GERAS) in the ICES SDs 21 and 23 and the German BASS survey in the ICES SDs 27-28 in 2015. The above-mentioned input data were used to estimate the parameters of v. Bertalanffy growth functions (BGF) for WBSSH and CBH in 2015. Authors concluded that, the recent results support the applicability of the separation function $SF_{2005-2010}$ in 2015. In Oeberst (2015) was concluded that herring fished in the ICES SDs 22 and 23 was mainly classified to WBSSH. In contrast to this, proportion of WBSSH decreased with increasing age in the ICES SD 24. More than 50% of age groups 1 and 2 (y.c. 2011 and 2012), which were captured in the ICES SD 25 were classified as WBSSH. In the ICES Subdiv. 26, more than 50% of age group 1 herring were classified as WBSSH. Cited author concluded also that - separation of the herring abundance indices into WBSSH and CBH could improve the understanding of the dynamics of both stocks. Due to the fact, that not every Baltic herring specialists support the mentioned conclusions, among-others the Polish delegates have been asked for the decision, whether the institute in Gdynia likes to join the procedure of Baltic herring stocks separation using the method proposed by the German specialists. The Polish experts have a negative opinion about the common implementation of a separation function for Baltic herring stocks dividing, based on the German method.

References:

Gröhsler, T., Oeberst, R., Schaber, M., Larson, N., and Kornilovs, G. 2013. Discrimination of western Baltic spring-spawning and central Baltic herring (*Clupea harengus* L.) based on growth vs. natural tag information. – ICES Journal of Marine Science, 70: 1108–1117.

Oeberst, R. 2015. Stock indices based on acoustic surveys in the Baltic Sea – Alternative application of results of fishing stations. Annex 9, WGBIFS-2015 report.

Oeberst, R., T. Gröhsler, M. Schaber 2016. Applicability of the Separation Function (SF) for Western Baltic Spring Spawning and Central Baltic herring stocks on 2015 GERAS survey results. Annex 8, WGBIFS/2016 Meeting; 4 pp.

Annex ToR i) Coordinate cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey

Baltic cod stomachs sampling

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 December 1, 2012 and lasted 24 months. The WGBIFS at the meeting in 2014 decided that Baltic cod stomachs sampling procedure (Annex ToR i), widely described within the EU project MARE/2012/02 manual, would be adopted for realization during the BITS-1q and BITS-4q surveys. According to the Manual 10 cod stomachs per 1-cm length class 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. More detailed description of cod stomachs sampling procedures was inserted to the WGBIFS-2015 Report and Annexes.

The cod stomach samples collected in November 2015 and February-March 2016 by most of the Baltic countries national laboratories, however examined for contents only by Poland, Latvia and Estonia, are listed in the Table 5.9.1

Table 5.9.1. The numbers of cod stomach samples collected in the BITS-Q4/2015 and the BITS-Q1/2016 surveys.

Survey	Country	ICES Subdivisions						Food content examination
		22	24	25	26	27	28	
Q4/2015	Denmark			640				
	Lithuania				120			
	Germany	40	163					
	Sweden			179	121	12	69	
	Poland			213	201			yes
	Estonia						61	yes
	Latvia			222	184			yes
Q4/2015 Total		40	163	1 254	626	12	130	
Q1/2016	Denmark			250	254			
	Lithuania				51			
	Germany	36	371					
	Sweden			231	188	76	48	
	Poland			213	234			yes
	Latvia				312		72	yes
Q1/2016 Total		36	371	694	1 039	76	120	

Marine litter sampling and recording

Based on EC's Marine Strategy Framework Directive (MSFD) the 2010 Joint MED-POL/Black Sea/JRC/ICES Workshop on Marine Litter (WKMAL) requested WGBIFS to discuss at the meeting in 2012, the suggested collection and storage of information about the marine litter in the BITS surveys. The WGBIFS at the meeting in 2014 agreed on systematically monitoring and reporting the findings of marine litter (anthropogenic origin), occurred in the bottom trawl during the BITS surveys. The report from findings should be prepared in a standard database format. Submission of the marine litter data from the current BITS surveys into DATRAS is in a good progress; there are many new facilities provided from DATRAS to improve and faster submission process, i.e.:

- improved data screening procedures and defined new checks base on position, and new references,
- cross check against submitted Trawl HH record,
- exchange data available on promptly soon after upload,
- HH and LT records are in the same file.

The status of submission of marine litter data from BITS-Q1 and BITS-Q4 per country and years is as below:

Year/Q1	DEN	SWE	GFR	LAT	RUS	POL	EST	LTU
2012		x						
2013		x						
2014		x						
2015		x						
2016		x		x		x		
Year/Q4								
2011								
2012		x						
2013		x						
2014		x						
2015	**x**	**x**		**x**		**x**	**x**	

Annex ToR j) Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys

During the WGBIFS/2016 meeting, the technical-schemes of national pelagic trawls used during the BIAS and BASS surveys were presented by:

- Poland, the symmetrical trawl type WP53/64x4 with the total length of 88 m, the total length of codend – 12 m with 6 mm mesh bar length, and vertical net opening of 15-19 m,
- Germany, used by the RV "Solea" – the asymmetrical trawl type PN388 (42/45 + 27/26),
- Germany, used by the RV "Walther Herwig" – the asymmetrical trawl type PS205 (50/56 + 48/46),
- Russia, used by the RV "Atlantniro" – the asymmetrical trawl type RTA 70-300 (70/44+70/120),
- Finland, used by the RV "Aranda" – some technical parameters of trawl were presented only.

The construction, shape and size, inlet area as well as the rigging of those trawls are different however, for some trawls wasn't information about rigging. Even the trawl doors were very different and some of them in use were actually designed for demersal hauls. Because of the fish unique behaviour, the reaction on these gears can be different. The unlike inlet area and other parameters of trawls, e.g. differences in netting size of the front part of these trawls, different meshes, leads to different catchability properties of the fishing gears and determined various cpue of fish. The trawls from Poland, one from Germany and trawl from Finland have similar size; this is only concerns the circumference, which gives only information about inlet area. If we assume the same mesh-opening factor (0.3) the theoretical inlet area of smallest trawl is app. 150 m^2 and biggest one is 2000 m^2. The Swedish and Finnish delegates informed the WGBIFS that, they have already ordered und use relatively new pelagic fishing gears and do not like to implement for BIAS surveys more one new standard gear however, suggested to perform an experiment focused on observations how the fish behaves in the front part of trawl and about the trawl catchability. For this experiment, the underwater cameras will be mounted to the headrope and footrope of trawl. It should be underlined that in 2016, similarly like at the previous meeting, only the Polish expert on fishing gear constructions was attended in a part time the WGBIFS/2016 meeting. Because of lack of interest by the fishing gears specialists from the other countries, the constructive and critical discussion was not possible to conduct. WGBIFS like to ask the WGFTFB for advice, which type of pelagic trawl, incl. rigging (e.g. type of trawl doors), would be the best for BIAS and BASS surveys in the Baltic Sea conditions.

In order to achieve the standardization of pelagic survey gear 3-steps procedure should be followed:

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

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. N. Larson and U. Böttcher were delegated from WGBIFS members to cooperation with the AtlantOS project. However, both cannot to participate in the *ad hoc* meeting in January 2015. The next one similar action was the WKIACTDB workshop in Copenhagen, 1-2 October 2015 with O. Kaljuste as WGBIFS representative in the workshop (Annex ToR k, and Annex 9). WKIACTDB was a part of the Horizon 2020 (H2020) project AtlantOS task 2.4, and the objective was to review and consolidate a model for storing and extracting acoustics data at the ICES Data Centre, to support storage and processing of acoustic survey data from the ICES coordinated acoustic surveys. Two post-processing software systems (StoX and EchoR/Echobase) were presented during the workshop and the data requirements for these packages were taken into account when reviewing the requirements to the data storage at the ICES Data-Centre. The ICES Data Centre presented a first version of the data model, both for acoustic data by category and the DAtabase of TRAwl Surveys (DATRAS) extension for pelagic hauls, and the details for each model was discussed in detail.

After the workshop, the ICES Data Centre compiled the information and set up a first specification. This specification is the AtlantOS internal milestone 2.4.1 that includes the data model and specifications of the API’s. During the WGBIFS 2016 meeting, the ICES Data Centre experts presented the idea behind and the component of the upcoming Acoustic Trawl data portal (Figure 5.11.1) as well as the general structure of the Acoustic Trawl data model (Figure 5.11.2).

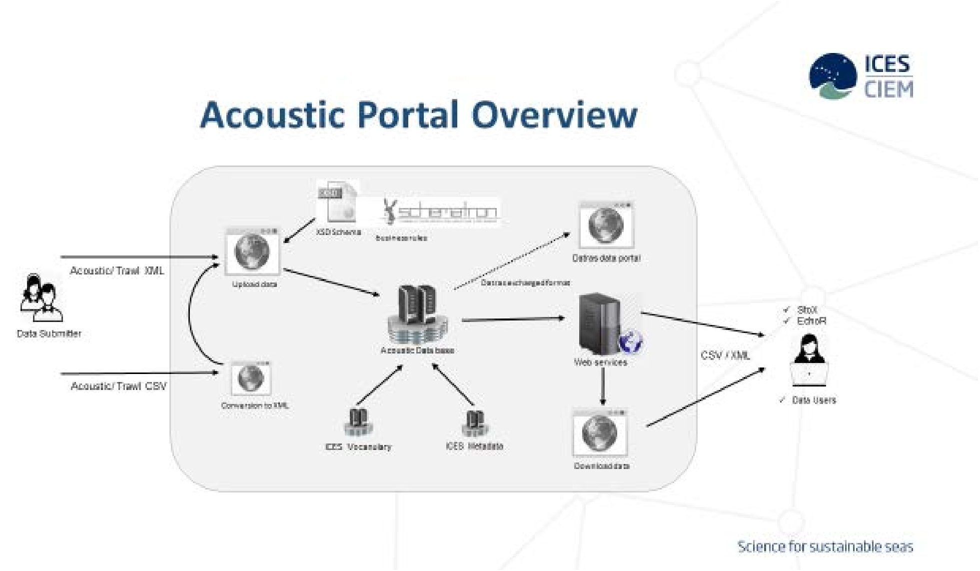


Figure 5.11.1

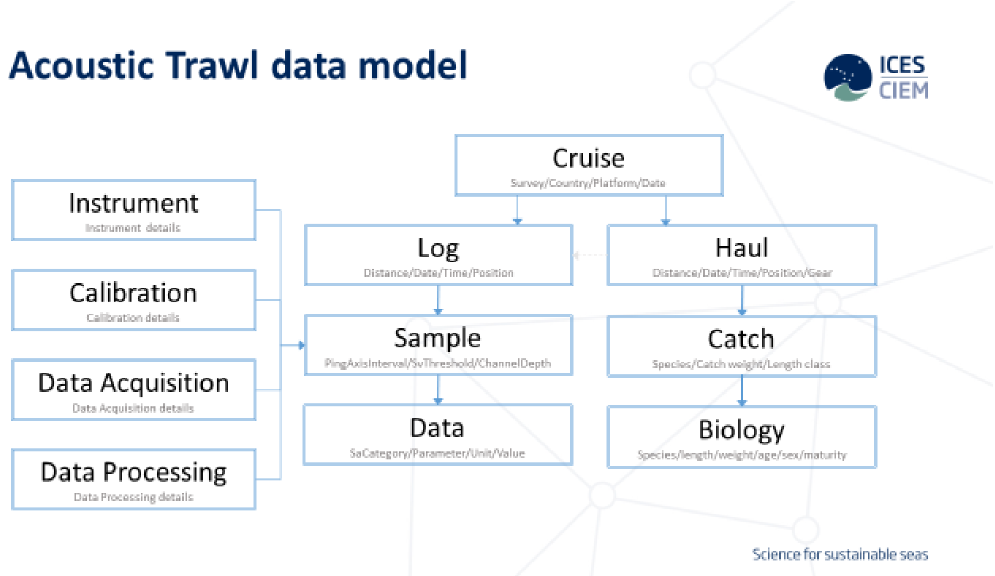


Figure 5.11.2

The following questions were asked and answered in a subgroup discussion during the WGBIFS 2016 meeting:

- Are you able to supply the mandatory fields?
- Are the content fields (mandatory as optional) sufficient for your needs?
- Is the data model appropriate?

The acoustic trawl data model and its content fields were discussed in the acoustic subgroup of WGBIFS-2016 in order to ensure that the current development is sufficient for the acoustic surveys carried out in the Baltic. It was agreed that the ICES Data Centre will complete the Acoustic Trawl data format by September 2016 for WGBIFS, to try out and use in practice during autumn and at the beginning of December 2016, the ICES Data Centre will try to arrange a dedicated workshop for working with the actual BIAS data. In addition, the ICES Data Centre will produce output from the database as requested.

ICES Acoustic Trawl data model specification is available at:

http://www.ices.dk/marine-data/documents/specification%20of%20the%20acoustic%20database.pdf

ICES Report of the Workshop on the review of the Acoustic Trawl survey database is available at:

http://ices.dk/sites/pub/Publication Reports/Expert Group Report/SSGIEOM/2015/WKIACTDB 2015 Report.pdf

Annex ToR l) Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators

The Large Fish Indicator (LFI) initially was developed by Greenstreet *et al*. (2011) and is defined as the proportion by biomass of large fish in demersal trawl surveys, where fish are considered as large if they exceed a length threshold, for example, 40 cm (see also Annex 9 – presentation made by R. Oeberst). The indicators LFI and Mean Maximum Length (MML) are intended to reflect the status of the fish community. Analyses related to LFI were carried out by many scientists. Houle *et al.* (2012) stated that the LFI is sensitive and specific to fishing pressure that truncates the upper end of the fish size spectrum (Sheldon *et al.*, 1972). LFI quantifies a characteristic of marine foodwebs that are slow to recover and often under intense pressure (WKGMSFDD4_II, 2015) and depends on community of species taken into account, defined length limit. Area, which is taken into account (different spatial distribution pattern of species taken into account), the variability of the abundance of new year classes and human activities (change in the fishing activity can results in changing LFI). MML is calculated as the average maximum potential length of individuals making up a community and takes no account of length of individuals at the time of sampling although it is a community indicator it does reflect a shift in species composition (WKGMSFDD3 Final Report). The method needs unbiased estimates of L_∞ for all species taken into account, which requires unbiased and validated age-length data. Validated age data are not available for species sampled during BITS.

LFI defined for the North Sea was adapted to the Baltic Sea by Oesterwind *et al.* (2013), due to mainly lower diversity of marine fish species and lower mean length of marine commercial fish species in the Baltic Sea. Furthermore, strong environmental gradients from west to east, e.g. salinity, and of the fish communities occur in the Baltic Sea. The authors used the data of BITS between 2001 and 2011. They combined the data of cod, dab, flounder, whiting, plaice, turbot, brill and sole in a species community, which represented more than 98% of the total biomass. It must be pointed out, that the spatial distribution of incorporated species is quite different. Brill and dab are concentrated in the ICES SD 22. Cod is dominating species and makes up 71% (± 5%) of the biomass of individuals larger 20 cm, 86% (± 3%) of biomass larger 30 cm and 96% (± 1%) of biomass larger 40 cm (Figure 1, after Oesterwind *et al.,* 2016). Other data sampled during the international coordinated surveys in the Baltic Sea were used to define LFI (HELCOM 2015. HELCOM core indicator report. Online).

The analyses showed that BITS data were already used for defining LFI. However, the analyses also showed that different time consuming steps are necessary between the definition of the aim of the LFI, the definition of the derived LFI and the prove that the defined LFI provide unbiased assessment of the development of the species community.

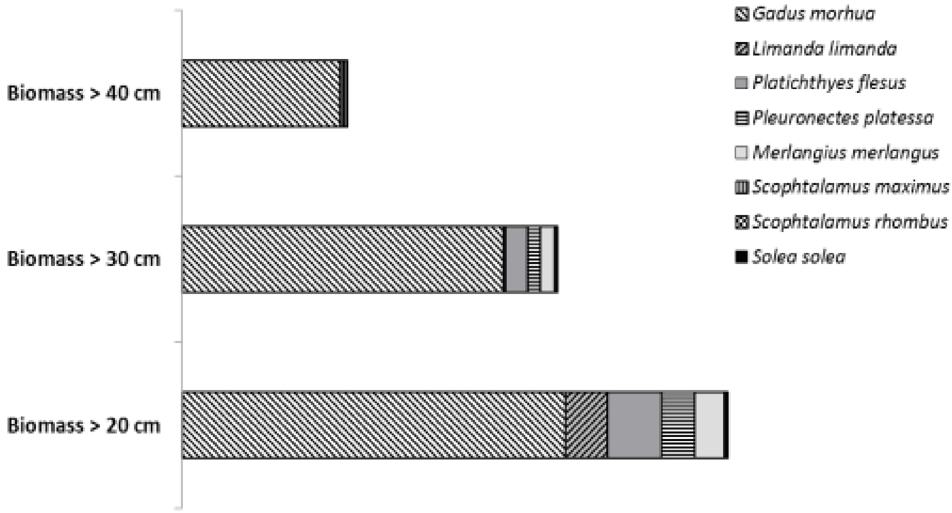


Figure 1. Species biomass in percentage of the eight selected demersal fish species, concerning the different length classes caught during the BITS-Q1 in 2001-2011 in the ICES SD 22-24 (Oesterwind *et al.*, 2016, in prep.).

Annex 1. The list of WGBIFS (2016 Meeting) participants

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Annex 2A. Terms of references dedicated to the WGBIFS – 2016 meeting

2014/MA2/SSGIEOM02 The **Baltic International Fish Survey Working Group** (WGBIFS), chaired by Włodzimierz Grygiel, Poland, met in Rostock, Germany, 30 March – 3 April 2016, 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 2016	30 March – 3 April 2016	Rostock, Germany	Interim report by 16 May 2016 to SSGIEOM, SCICOM and ACOM	
Year 2017			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 and marine litter sampling programmes 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 multispecies approach. Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data on present ecological status of marine seabed in investigated areas of the Baltic.	Year 1, 2 and 3	Coordinated cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey (BITS).

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.
l	Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators	The 2nd holistic assessment of the Baltic Sea by HELCOM will draw on ICES competence to provide D3 indicators; through the BalticBoost project the ICES Data Centre is given resources to implement the indicators based on an appropriate methodology to be defined by WGBIFS as the survey experts.	Year 2	Processing method for BITS survey data including any caveats to its use and applicability to the indicators.

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 the second half of 2016 and the first half of 2017. Coordinate cod stomachs and marine litter sampling programmes 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 about 25 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 dedicated to the WGBIFS – 2017 meeting

2014/MA2/SSGIEOM02 The **Baltic International Fish Survey Working Group** (WGBIFS), chaired by Włodzimierz Grygiel, Poland, will meet in Riga, Latvia on 27-31 March 2017, 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	
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ToR descriptors

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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
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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
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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 the marine litter sampling programme in the Baltic International Trawl Survey (BITS) and registering the data in the ICES database. The status of Baltic cod stomachs sampling in BITS surveys.	Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data on present ecological status of marine seabed in investigated areas of the Baltic. Baltic cod stomachs collected during the demersal trawl surveys improve the basic knowledge concerning the species interactions in relation to the multispecies approach.	Year 1, 2 and 3	Coordinated the marine litter sampling programme in the Baltic International Trawl Survey (BITS). The status of Baltic cod stomachs sampling.

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.

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 the second half of 2016 and the first half of 2017. Coordinate cod stomachs and marine litter sampling programmes 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 the marine litter sampling programme in the Baltic International Trawl Survey. Final reviewing and updating the common survey manuals according to SISP standards. Proposals for improvement of quality of acoustic indices and for further standardization of BIAS. An attempt to implement 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 about 25 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 3. Agenda of the WGBIFS – 2016 Meeting

Date

30.03. – 03.04.2016;

working time: 09:00(10:00) – 17:00(17:30)

coffee breaks: 10:30–10:50; 15:00–15:20,

lunch break: 12:30–13:30,

Note: working hours at the Institute TI-OF/Rostock are limited to 18:00

Venue

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Chair

Włodzimierz Grygiel, National Marine Fisheries Research Institute in Gdynia, Poland

Local representative of organizer – host of the meeting

Rainer Oeberst [rainer.oeberst@ti.bund.de] Thünen-Institut für Ostseefischerei, Rostock

ICES ASC 2014 Resolution No. 2014/MA2/SSGIEOM02

30.03.2016; 10:00 – 17:30

1. Opening of the meeting, welcome and introduction:
Info about logistic aspects of the WGBIFS/2016 meeting, a few facts from the history of Rostock city (the presentation made by chair).
Household remarks (info from local organizer and host of the meeting).
2. Arrangement and implementation of the proposed agenda; time schedule and organization of the meeting:
• Presentation of participants and adoption of agenda of the WGBIFS-2016 meeting.
• Allocation of tasks between participants. Election of the WGBIFS reporter, which will be active during the running WGBIFS meeting (the presentation made by chair).
• What was done between consecutive WGBIFS meetings? The current ToRs dedicated on the WGBIFS meeting in Rostock (the presentation made by chair).
• "The BITS-4q/2015, BITS-1q/2016, BASS and BIAS – 2015 surveys status of realization in the Baltic waters and obtained the main results" – one by one the oral presentations made by delegates from the national research institutes (max. 10-15 minutes per presenter). The presentation should include information about the status of curried out obligatory measurements of technical parameters of the standard bottom trawls type TV-3L and TV-3S.
3. Acoustic surveys data compilation and calculations (the subgroup leader - Olavi Kaljuste will coordinate works, during a part of the day), particularly with following ToRs:

• Combine and analyse the results of spring and autumn 2015 acoustic surveys and experiments and report to WGBFAS. Updated the acoustic tuning index for WGBFAS (ToR a). Task supported by the WGBFAS.
• Status of reports from the BIAS and BASS (2015) surveys.
• Update the BIAS and BASS acoustic databases. (ToR b)
• Plan and decide on acoustic surveys and experiments to be conducted in autumn 2016 and spring 2017. (ToR c)
• Status of review and update the International Baltic Acoustic Surveys (IBAS) manual, according to the Series of ICES Survey Protocols (SISP) standards. (ToR g)
• Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty. (ToR h).
• Discuss the possibilities to make further standardizations of IBAS. An attempt to standardize the pelagic fishing gear used in BIAS and BASS surveys. (ToR j).
• Review the progress of the ICES acoustic database, elaborated under the AtlantOS project (Optimizing and Enhancing the Integrated Atlantic Ocean Observing System) - the development and widely implementation of the acoustic database. (ToR k).
4. <u>Bottom-trawl standard surveys</u> data compilation and evaluation (the subgroup leaders - Henrik Degel and Rainer Oeberst will coordinate works, particularly with following ToRs:
• Discuss the results from BITS surveys performed in autumn 2015 and spring 2016 and evaluate the characteristics of TV-3L and TV-3S standard gears used in BITS. (ToR d). Task supported by the WGBFAS.
• Status of BITS surveys standard- and extended reports.
• Status of WGBIFS standard protocols from measurements of technical parameters of the bottom trawls type TV-3L and TV-3S.
• Status of the recent BITS surveys basic data in the DATRAS database; moreover, an evaluation of progress in the submission of marine litter data, collected by particular institutes during the BITS surveys, to sub-database in DATRAS.
• 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 2016 and spring 2017. (ToR e)
• Status of review and update the BITS manual according to SISP standards. (ToR f)
• Coordinate cod stomach sampling programme in the BITS (task supported by WGSAM) – ToR i. Questionnaire on fish stomach sampling program - the fishPi project. Some WGBIFS members have been asked for fill in submitted tables and transfer the needed meta-data to coordinator of the project.
• Coordinate marine litter sampling in the BITS. Review the range of both types of additionally collected and stored data per various strata (ToR i). Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data on present ecological status of marine seabed in investigated areas of the Baltic.
• Marine litter and cod stomachs food spectrum databases – who is responsible for data managing and analysing and where the data should be stored.
• "Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators", (ToR "l") for WGBIFS, suggested by ICES - SSGIEOM.
• The discrepancy between the „old" strange unit (100-grams) of CatCatchWgt (HL records) from BITS surveys, uploaded to the DATRAS, and currently applied the unit (1-g) of CatCatchWgt should be detected for all members and adjusted.
<u>5. Other topics</u>

• Requests from WGBFAS (2015) addressed to WGBIFS (2016): "To produce maps showing the distribution of abundance and biomass of Baltic cod, flounder and plaice (all size groups) in the previous two seasons (BITS surveys data)" and "To produce maps showing the distribution of cod, flounder, plaice, turbot, dab and brill stocks abundance (age group 1) index from BITS surveys".

• The Latvian experimental research connected with the acoustic surveys and performed in the frame of the INSPIRE Project (Integrating spatial processes into ecosystem models for sustainable utilization of fish resources) - presentation made by Guntars Strods.

• Status of reviewed the text for SISP protocols - Manuals (BITS, IBAS) of research surveys - presentation made by chair.

NOTE: for more details see also: WGBIFS 2016 time schedule.xls and Allocation of the WGBIFS-2016 tasks.xls (WGBIFS-2016 Meeting SharePoint on the ICES site).

31.03.2016; 09:00 – 17:00

Others presentations and discussions, e.g.:

• Review the progress of the ICES acoustic-trawl survey database design, elaborated under the AtlantOS project - the development and widely implementation of the acoustic database. (ToR k). Presentation and comment on this issue based on the WKIACTDB - Olavi Kaljuste.

• Currently agreed status (structure) of the ICES Acoustic Portal (the new acoustic-trawl database). The acoustic metadata standard developed by WGFAST. How to transfer the BIAS, BASS hitherto existing data from current format(s) into the new proposed format? (ToR k). Presentation and comments on this issue - Hjalte Parner, Mehdi Abbasi and other invited experts.

• Review the progress of the ICES acoustic database. How to facilitate converting the WGBIFS data into the StoX format in order for the WGBIFS to test out using StoX (software) for fish stocks size assessment? Presentation and comments - Espen Johnsen and/or Atle Totland, Hjalte Parner, Mehdi Abbasi.

• "Analyses related to the improvement of quality of acoustic indices and estimation of the uncertainty". Presentation the status of additional study on acoustic data from BIAS surveys - Niklas Larson and Rainer Oeberst (ToR h)

• The review of submitted the technical-schemes of national pelagic trawls used during the BIAS and BASS surveys for fish control-catches (ToR j) - Olavi Kaljuste and Krzysztof Stanuch.

• How to improve some incorrect data (CatCatchWgt in HL records from BITS surveys), uploaded to the DATRAS database, and proposals concern logistic aspects of transfer Baltic cod stomachs and marine litter data to ICES Data Center. Presentation and comment - Vaishav Soni.

• "Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators" (ToR l) - presentation made by Rainer and Andrea. Supplementary presentation and comments on the same topic, made by Niklas Larsson and Vaishav Soni will be valuable. This action is based on experiences from Michele Casini and Niklas Larsson previous cooperation with HELCOM and CORESET project and study of the LFI and MML indicators from the Swedish BIAS surveys. The previous presentation entitled "Proportion of large fish (LFI) in the pelagic community. Mean maximum length (MML) of fish in the pelagic community" made by Michele, can by also used by Niklas. The scientific effort from other WGBIFS members is needed.

• Some uncorrected information in the BITS Manual regarding the trawl doors of TV-3#520(S) and supplemented data concerns the Danish stone panel for TVL - presentation made by Henrik Degel and Rainer Oeberst.

• Revise the data on Baltic sprat stock abundance per age groups/area corrected from the BIAS surveys in 2010 and 2011, particularly in the ICES SD 28.1, which should be the same in the WGBIFS Report and hydroacoustic surveys database; some, short comment in WGBIFS-2016 Report is needed from Uwe.

Working in the subgroups during the main part of the day.

01.04. – 03.04.2016; 09:00 – 17:00

Working in the subgroups during the main part of the days.

Ad hoc inquires from the others ICES Working Groups.

Systematically works and finalize the WGBIFS obligatory tasks and the draft text of Report from 2016 meeting. Prepare the “Action list” and recommendations.

Other business.

Agreeing on ToRs for the next year WGBIFS meeting.

Selection of the venue and period for the next WGBIFS meeting.

Election of a new coordinator of the BIAS and BASS database.

Final discussion and closing of the meeting (03.04.2016; app. at 13:00-13:30).

Annex 4. Recommendations

RECOMMENDATIONS CONCERNING THE BITS SURVEYS	RESPONSIBLE	DEAD LINE
WGBIFS regard the spatial coverage of both the 4th quarter 2015 and the 1st quarter 2016 with valid control-catches as to be of sufficiently quality and recommend that the data be used for calculating of the 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 Centre	In due time before WGBFAS 2016 meeting.
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 however are valid for other ICES Subdivisions.	WGBIFS - all countries participating in the BITS surveys.	In due time before the 4th quarter 2016 survey and onwards.
The WGBIFS recommends performing 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.	WGBIFS - all countries participating in the BITS surveys.	2016 BITS-4q and 2017 BITS-1q
WGBIFS recommends that the latest version of the marine litter sheet should be accessible on the DATRAS webpage.	ICES Data Center	As soon as possible.
WGBIFS recommend that all countries will collect and upload the marine litter appeared in the ground trawl fish control-catches (BITS surveys) to the marine litter database and that they follow the agreed DATRAS Litter reporting format.	WGBIFS - all countries participating in the BITS surveys.	In due time before the following WGBIFS meeting.
Baltic cod stomachs sampling and analysing the food components will be no longer internationally coordinated by the WGBIFS. The national laboratories can continue the Baltic cod stomachs sampling and analysing, based on their experiences, personal and financial possibilities.	WGBIFS - all countries participating in the BITS surveys.	In due time before the following WGBIFS meeting.
The ToR l) – "Define methods for processing and implementation the Large Fish Indicator (LFI) and Mean Maximum Length (MML) indicator in BITS" and a part of the ToR i) – "Coordinate cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey (BITS)", dedicated to the WGBIFS-2016 meeting, should be adequately, removed and reformulated on the list of ToRs devoted on the next year WGBIFS meeting.	ICES Secretariat	In due time before ICES ASC 2016 meeting and before WGBIFS 2017 meeting.
The WGBIFS recommends that Russia resume carrying out the BIAS, BASS, BITS the 1st and the 4th quarter survey in order to complete the spatial coverage of the survey with needed investigation results.	AtlantNIRO – Kaliningrad, GostNIORH – St. Petersburg	In due time before the following WGBIFS meeting.

RECOMMENDATIONS CONCERNING THE BIAS AND BASS SURVEYS	RESPONSIBLE	DEAD LINE
WGBIFS recommends that, the BIAS-dataset, including the valid data from 2015, 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	2016
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	WGBFAS	2016

abundance indices for age groups 0 and 1 should be handled with caution.		
WGBIFS recommends that, the BASS-dataset with the valid data of 2015 can be used in the assessment of the sprat stock in the Baltic Sea.	WGBFAS	2016
WGBIFS recommends that, starting from 2017, Poland should start participating in the BASS survey covering Polish EEZ.	Poland	2017
Because WGBIFS has not enough competence for proposing particular type of pelagic trawl, like to ask the ICES - FAO Working Group on Fishing Technology and Fish Behaviour (WGFTFB) for advice, which type of pelagic trawl, incl. rigging (e.g. type of trawl doors), would be the best for BIAS and BASS surveys in the Baltic Sea conditions.	WGFTFB	2016
The acoustic experts from all Baltic countries would send until the end of June 2016, the BIAS and BASS data from 2014 and 2015 to Niklas Larson. The data will be used to calculate the IBAS surveys sampling variance.	WGBIFS - all countries participating in the IBAS surveys.	2016

Annex 5. Actions list

1) The feedback of catch-stations realized in the framework of BITS surveys should be submitted to Henrik Degel (Denmark; e-mail: hd@aqua.dtu.dk), using the proposed standard format (Annex ToR e, Ch. 5.5.2.2) not later than 20 December (autumn survey) and immediately after winter-spring survey. The above-mentioned Danish delegate is a new coordinator of the Tow-Database and will be responsible for planning the fish control-hauls distribution for the next BITS surveys. The new control-haul positions should be submitted to H. Degel as soon as possible; especially, info about the hauls location in the "white areas" are necessary to cover the total distribution area of the target species. The mentioned tasks will be realized in temporary cooperation with R. Oeberst. The version of TD_2016V1.XLS will be made available after submission the full set of data from the current BITS surveys by all countries. The feedback from BITS-Q4/2015 and BITS-Q1/2016 catch-stations should be transferred soon as possible to R. Oeberst and H. Degel.

2) N. Larson and O. Kaljuste (Sweden) were assigned as data coordinators responsible to control that the acoustic surveys results are uploaded in the right format to the ICES WGBIFS-SharePoint. T. Łączkowski (Poland) was assigned to be the new coordinator of BIAS and BASS databases for aggregated data, responsible also for all kind of input data preparation, before and during the next WGBIFS meeting. During summer 2016, the previous manager of BIAS and BASS databases (U. Böttcher, Germany) will provide a well-documented description of standard data handling procedures. U. Böttcher to handle over the responsibilities of the BIAS and BASS database manager. At the beginning of September 2016 will be organized a meeting at the TI-OF Institute in Rostock between the new and retiring acoustic data coordinators.

3) Before the next WGBIFS Meeting, the following examples should be prepared for completing the SISP 8 IBAS Manual (Addendum 2):

   a. the example of herring or sprat stock abundance estimation in the ICES rectangle,
   b. the example of herring or sprat stock biomass estimation in the ICES rectangle.

   The above-mentioned works will be realized by O. Kaljuste (Sweden) – co-coordinator of BIAS and BASS surveys.

4) Until the next WGBIFS Meeting, the minor supplementary information about some formulas inserted to the SISP 7 BITS Manual needs further explanations (Addendum 1).

The above-mentioned work will be realized by R. Oeberst (Germany).

5) Submitters of the marine litter data from BITS surveys should 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 above-mentioned type of data should by transfer to the ICES Data-Centre shortly after each BITS survey finalization.

6) It is suggested to perform an experiment during the BASS and BIAS surveys focused on observations how the fish behaves in the front part of pelagic trawl and about the trawl catchability. For this experiment, the underwater cameras will be mounted to the headrope and footrope of trawl.

7) WGBIFS representatives from all Baltic countries will send until 01.07.2016 to N. Larson (Sweden) the BIAS and BASS data from 2014 and 2015 and if possible, backwards to special investigation aimed on calculation the survey sampling variance. The data-format (length, age and NASC) can be found on the SharePoint (BIAS-BASS_Haul-sA_DB_example_2014_simple version_v.1.3). The format of numbers should be in total estimated numbers per species and length-class in the whole control-catch. Information about the ICES rectangles is needed and all fish species should be included in the length of file.

8) The ICES Data Centre will complete the Acoustic Trawl data format by September 2016 for WGBIFS, to try out and use in practice during autumn BIAS survey. Beginning of December 2016, the ICES Data Centre will try to arrange a dedicated workshop for working with the actual BIAS data. In addition, the ICES Data Centre will produce output from the database as requested.

9) The incorrect BITS surveys data, mostly concerns the record type HL.CatCatchWgt (the mean weight of fish), indicated in DATRAS (see the text table in Annex 10 and the Chapter 5.5.3 in WGBIFS Report) should be verified by particular countries and adequate corrections need to uploaded soon as possible to a.m. database, with separate message send to the ICES Secretariat Data Centre (V. Soni).

10) 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.

Annex 6: Standard reports from BITS surveys in the 4th quarter 2015 and the 1st quarter 2016

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

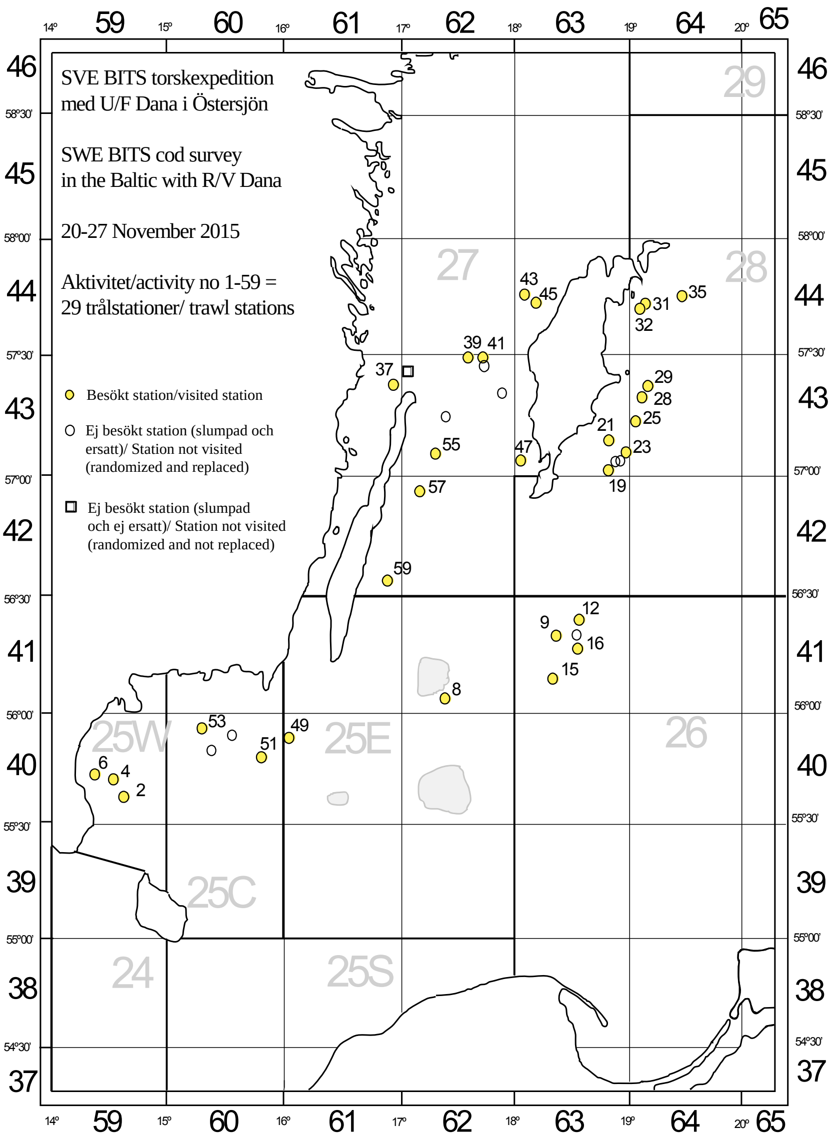
NATION:	**SWEDEN**	**VESSEL:**	**RV “DANA”**
Survey:	BITS Q4 2015	Dates:	19-28 November 2015

Cruise	
Gear details:	The large (930#) standard TV3 trawl was used. No tows are done with the rock hopper ground gear 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.):	29 stations out of the 30 allocated were trawled. In SD 25, 27 and 28, seven hauls were cancelled because the Swedish Armed Forces did not grant us permission. A total of ten allocated hauls in SD 26, 27 and 28 had oxygen deficiency.
Additional comments:	1 haul was replaced due to a permanent power cable on the bottom

ICES Sub-Divi-sions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planned	Number of valid hauls realized using “Standard” ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	Stations fished %	Remarks
25	TVL	21-40 m	1	1	-	0	0	0	100	-
25	TVL	41-60 m	6	6	-	0	3	0	100	
26	TVL	41-60 m	1	1	-	0	0	0	100	
26	TVL	61-80 m	2	2	-	0	1	0	100	
26	TVL	81-100 m	1	1	-	0	0	0	100	
27	TVL	41-60 m	2	1	-	0	0	0	50	
27	TVL	61-80 m	4	4	-	3	1	0	100	
27	TVL	81-100 m	1	1	-	1	0	0	100	
27	TVL	>100 m	3	3	-	3	1	0	100	
28	TVL	21-40 m	1	1	-	0	0	0	100	
28	TVL	41-60 m	2	2	-	0	0	0	100	
28	TVL	61-80 m	2	2	-	0	1	0	100	
28	TVL	81-100 m	3	3	-	3	1	0	100	

Remark. 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
Clupea harengus	477504	
Cyclopterus lumpus	4	
Enchelyopus cimbrius	7	
Gadus morhua	7191	654
Gasterosteus aculeatus	718	
Hyperoplus lanceolatus	8	
Limanda limanda	4	
Merlangius merlangus	43	
Myoxocephalus quadricornis	2111	
Myoxocephalus scorpius	470	
Osmerus eperlanus	1	
Platichthys flesus	3312	869
Pleuronectes platessa	357	
Pomatoschistus	55	
Pungitius pungitius	2	
Scomber scombrus	1	
Scophthalmus maximus	20	
Sprattus sprattus	246437	
Zoarces viviparus	12	



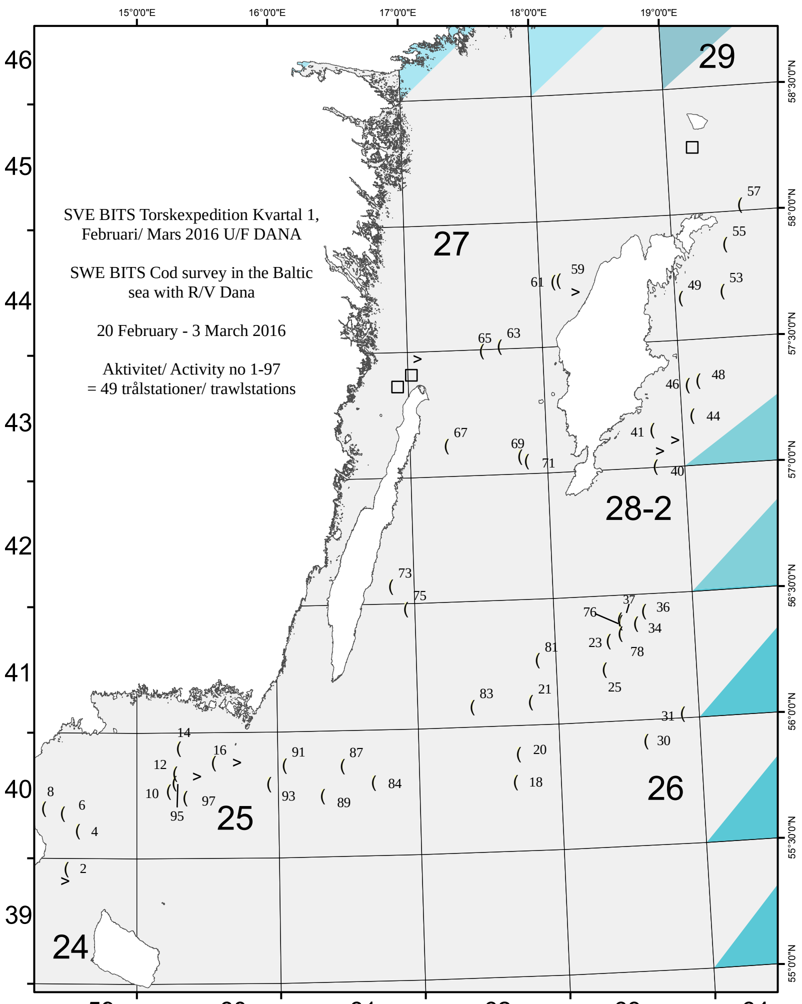
NATION:	**SWEDEN**	**VESSEL:**	**RV “DANA”**
Survey:	BITS Q1 2016	Dates:	20 February - 03 Mars 2016

Cruise	
Gear details:	The large (930#) standard TV3 trawl was used. No tows are done with the rock hopper ground gear 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, 47 of these were trawled. Two hauls were cancelled in SD 27 and one in SD 28 because the Swedish Armed Forces (SAF) did not grant us permission. No invalid hauls this time. A total of ten 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” GROUND GEAR**	**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	21-40 m	1	1	-		0		100	
25	TVL	41-60 m	13	13	-		5		100	
25	TVL	61-80 m	7	7	-		1		100	
26	TVL	21-40 m	2	2	-		0		100	
26	TVL	41-60 m	2	2	-		0		100	
26	TVL	61-80 m	3	3	-	1	0		100	
26	TVL	>100 m	2	2	-	2	0		100	
27	TVL	41-60 m	2	0	-		0		0	2
27	TVL	61-80 m	4	4	-	1	1		100	
27	TVL	81-100 m	1	1	-	1	0		100	
27	TVL	>100 m	3	3	-	3	1		100	
28	TVL	21-40 m	1	1	-		0		100	
28	TVL	41-60 m	3	2	-		0		66.6	2
28	TVL	61-80 m	3	3	-	1	1		100	
28	TVL	81-100 m	3	3	-	3	1		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	Lenght	Age
Clupea harengus	523 679	
Cyclopterus lumpus	11	
Enchelyopus cimbrius	51	
Engraulis encrasicolus	1	
Gadus morhua	37 420	894
Gasterosteus aculeatus	3 400	
Hyperoplus lanceolatus	5	
Limanda limanda	20	
Lumpenus lampretaeformis	8	
Merlangius merlangus	388	
Myoxocephalus quadricornis	1 765	
Myoxocephalus scorpius	2 440	
Platichthys flesus	7 931	1115
Pleuronectes platessa	1 849	
Pomatoschistus	14	
Pungitius pungitius	1	
Scophthalmus maximus	35	
Sprattus sprattus	1 184 525	
Zoarces viviparus	26	



(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

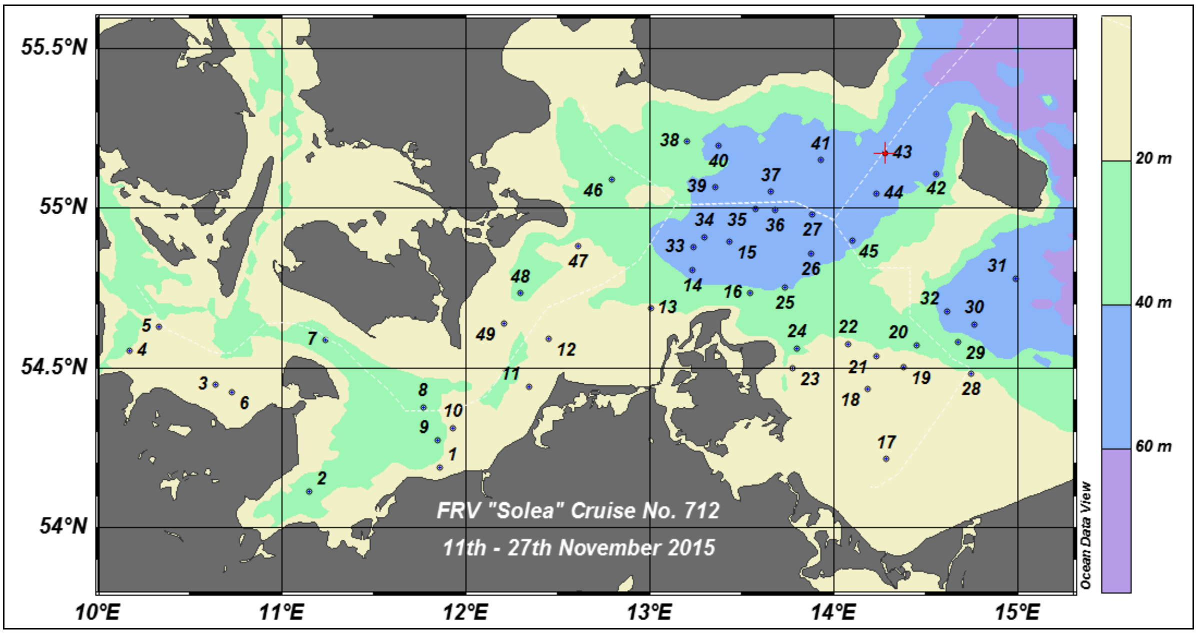
Nation:	**Germany**	**Vessel:**	**FRV "Solea"**
Survey:	BITS 2015, quarter 4	Dates:	11th – 27th November 2015

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.):	Severe weather conditions caused some interruptions and therefore only 49 from total 59 planned fishing hauls and hydrographical stations were performed. 1 Station in Swedish territorial waters was not allowed to carry out.
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (2–6)	Number of hauls planed	Number of valid hauls realized using "standard" ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
22	TVS	1	10	10			-	-	100
24	TVS	1	23	19			-	-	83
24	TVS	2	26	20			-	-	77

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	7091	1096
Platichthys flesus	8959	904
Pleuronectes platessa	5961	1038
Limanda limanda	5402	761
Psetta maxima	253	253
Scophthalmus rhombus	3	3
Clupea harengus	3977	-
Sprattus sprattus	3164	-

Other species may need to be added for your survey

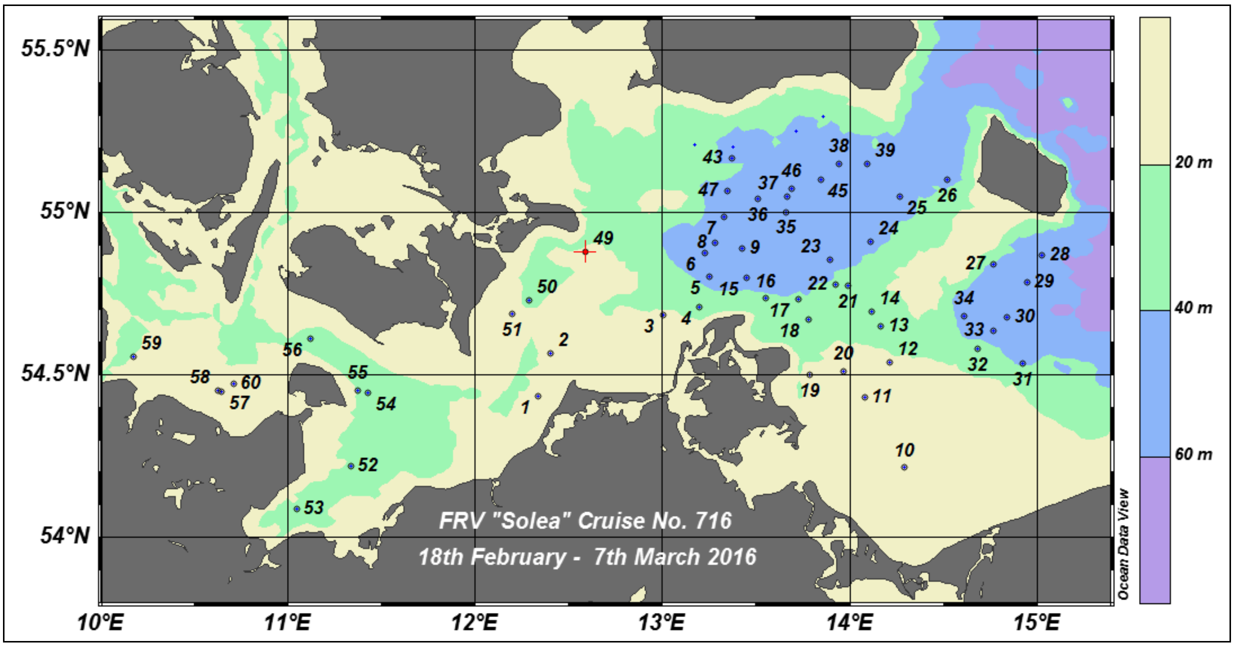


Nation:	**Germany**	**Vessel:**	**FRV “Solea”**
Survey:	BITS 2016, quarter 1	Dates:	18 th February to 7th March 2016

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. 1 Station in Swedish territorial waters was not allowed to carry out.
Notes from survey (e.g. problems, additional work etc.):	Total 60 fishing hauls and 60 hydrographical stations were performed.
Additional comments:	

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (1–5)	Number of hauls planed	Number of valid hauls realized using “standard” ground gear	Number of valid hauls realized using rock hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	% stations fished
22	TVS	1	10	10			-	0	100
24	TVS	1	23	21			1	1	91
24	TVS	2	27	30			2	-	111

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	8577	996
Platichthys flesus	7657	863
Limanda limanda	3567	900
Pleuronectes platessa	4978	1127
Psetta maxima	157	157
Scophthalmus rhombus	2	2
Clupea harengus	3197	-
Sprattus sprattus	5630	-

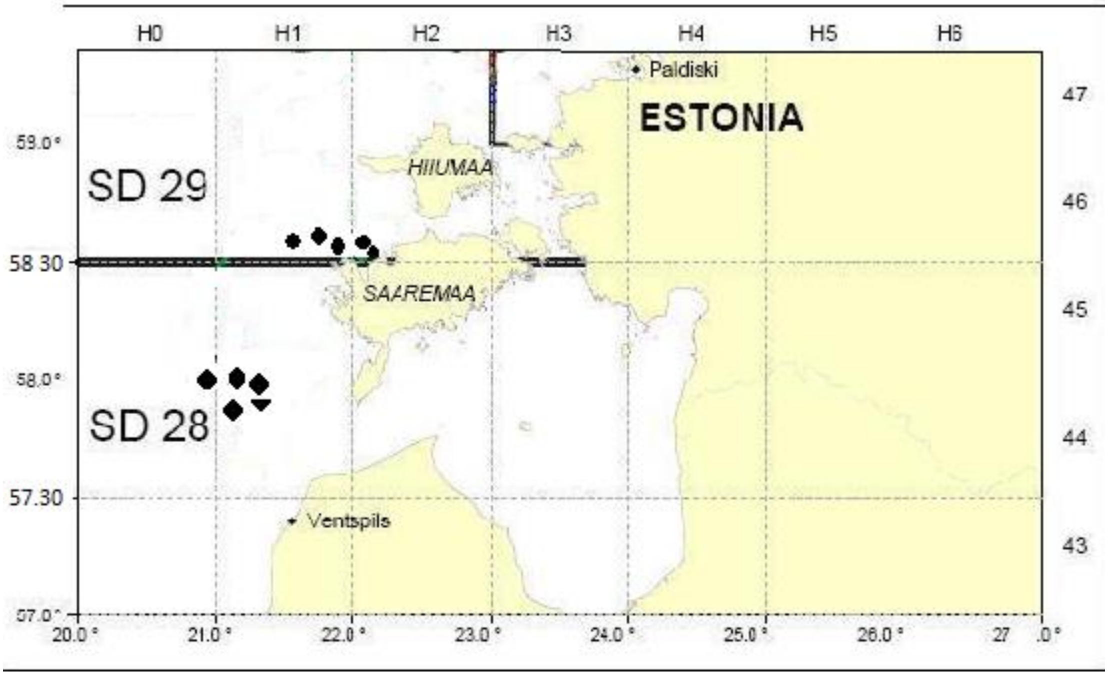


NATION:	ESTONIA	VESSEL:	CEV
Survey:	BITS15IVQRT	Dates:	23-24 November 2015

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.):	The survey was carried out as planned. Survey started from the Port of Dirhamn in the western Gulf of Finland late evening on 22th of November 2015, steaming to the Sub-division 28-2. The weather conditions were extremely poor; however it was possible to carry out all 5 trawl hauls on November, 23th, as planned. After accomplishing the planned work in Sub-division 28-2, the vessel steamed to Port of Veere on Saaremaa Island. Next day the weather conditions further worsened. However the vessel started working in the Sub-division 29 where 4 hauls of 5 planned were performed. One haul was not performed due to extremely bad weather (wind speed > 20 m/s. Another planned haul was shifted to the stratum 20-39 m due to heavy waves. The survey was finished in late hours of 24 November 2015 in the Port of Veere. No technical problems were observed during the survey this year. All catches were analysed at the field station of the Estonian Marine Institute on Saaremaa Island.

ICES Sub-Divisions	Gear (TVL,TVS)	Depth strata (1–6)	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
28	TVS	40-59	1	1	0	0	0	0	100
28	TVS	60-79m	3	3	0	0	0	0	100
28	TVS	80-99m	1	1	0	0	0	0	100
29	TVS	20-39m	1	2	0	0	0	0	200
29	TVS	40-59m	2	2	0	0	0	0	100
29	TVS	60-79m	1	0	0	0	0	0	0

Number of biological samples (maturity and age material, *maturity only):		
Species	Age	Length
Gadus morhua	61	61
Sprattus sprattus	200	1397
Clupea harengus	203	1770
Platichthys flesus	416	1205



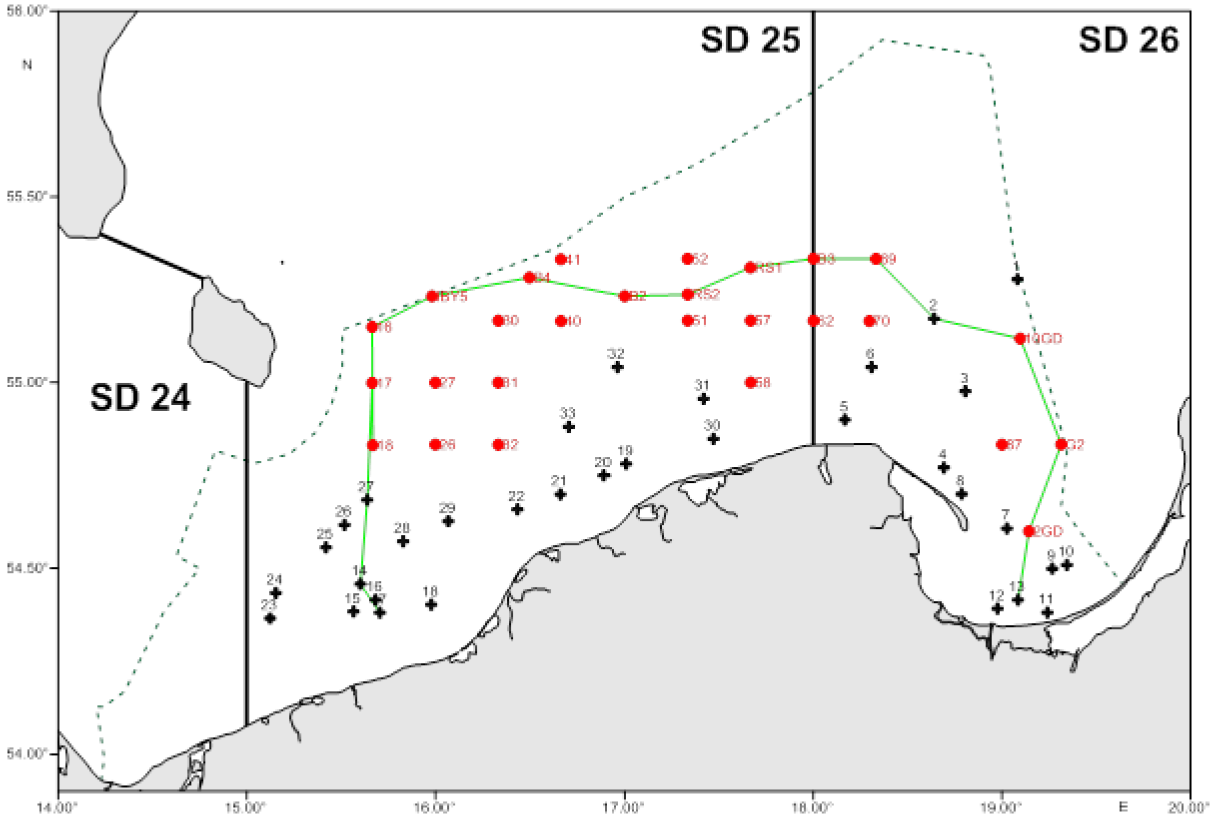
Approximate positions of realised hauls during Estonian BITS survey in 4 QRT 2015

NATION:	**POLAND**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q4/2015	Dates:	15-27/11/2015

Cruise	No. 18/2015/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 realisation. 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 2015) recommendations, the vessel "Baltica" was designated to cover parts of the ICES Sub-divisions 25 and 26 with totally 33 randomly selected fish control-hauls. The catch-stations were located at the bottom depth range of 19 - 95 m. Totally, 32 fish catch-stations (out of 33) can be accepted as representative. Haul 25025 is considered as invalid as the footrope was broken. The catch-station No. 25025 should be deleted from the TD list. 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. 26045, 26219 and 25017 fishing was shortened to 15 minutes. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 33 fish catch-stations starting positions and 27 standard hydrographic stations were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES SUB-DIVISIONS	**GEAR (TVL, TVS)**	**DEPTH STRATA (2–6)**	**NUMBER OF HAULS PLANED**	**NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR**	**NUMBER OF VALID HAULS REALIZED USING ROCK HOPPERS**	**NUMBER OF ASSUMED ZERO-CATCH HAULS**	**NUMBER OF REPLACE-MENT HAULS**	**NUMBER OF INVALID HAULS**	**% STATIONS FISHED**
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	11	10	0	0	0	1	91
25	TVL	3	5	5	0	0	0	0	100
25	TVL	4	2	2	0	0	0	0	100
26	TVL	2	4	4	0	0	0	0	100
26	TVL	3	2	2	0	0	0	0	100
26	TVL	4	4	4	0	0	0	0	100
26	TVL	5	3	3	0	0	0	0	100

NUMBER OF BIOLOGICAL SAMPLES (MATURITY AND AGE MATERIAL, *MATURITY ONLY):		
SPECIES (LATIN NAME)	**Length**	**Age and maturity**
Gadus morhua	6527	417
Platichthys flesus	2514	748
Clupea harengus	4352	662
Sprattus sprattus	3509	439
Pleuronectes platessa	333	278
Psetta maxima	17	17
Cyclopterus lumpus	6	6
Enchelyopus cimbrius	20	20
Hyperoplus lanceolatus	40	40
Osmerus eperlanus	11	11
Merlangius merlangus	21	21
Myoxocephalus scorpius	67	67
Pomatoschistus minutus	1	1
Zoarces viviparus	2	2
Alosa fallax	1	1
Engraulis encrasicolus	2	2
Neogobius melanostomus	5	5
Sander lucioperca	1	1
Perca fluviatilis	1	1



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

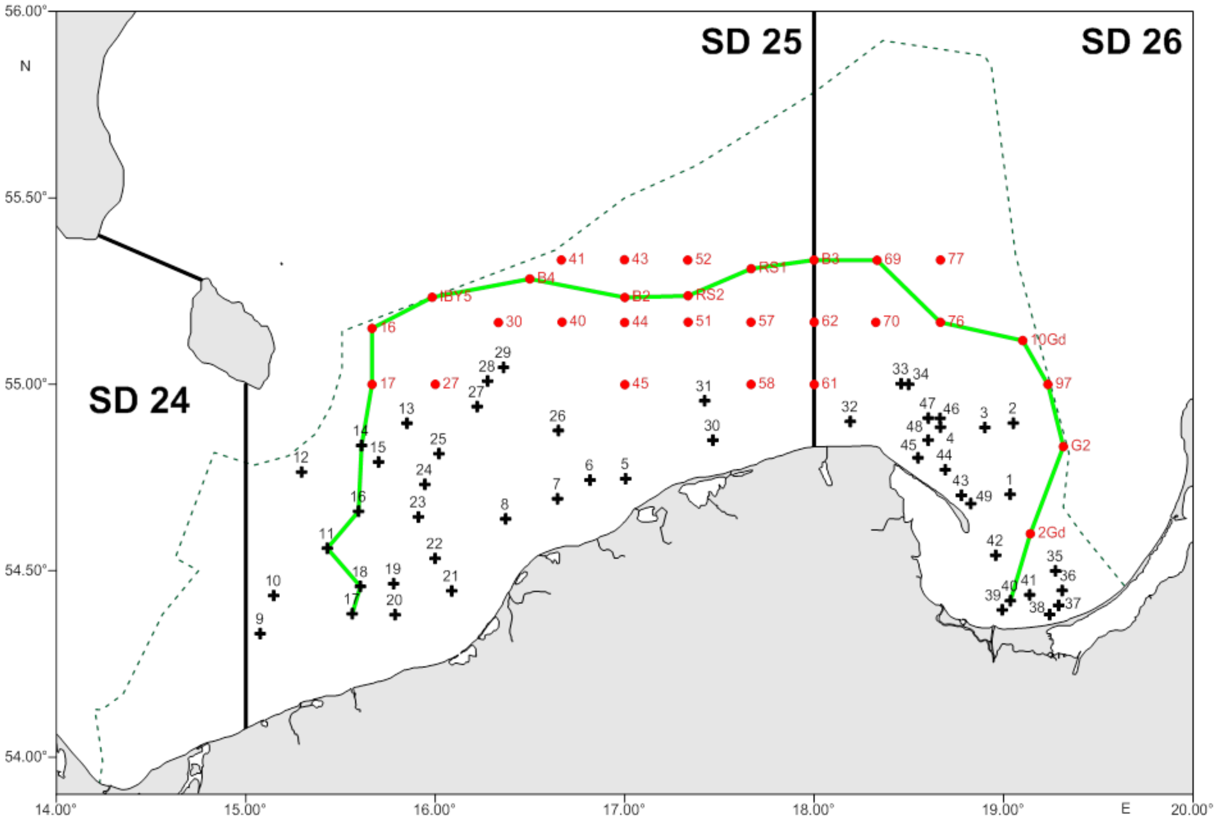
NATION:	POLAND	VESSEL:	RV "BALTICA"
Survey:	BITS-Q1/2016	Dates:	11-26/02/2016

Cruise	No. 1/2016/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 realisation. 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 2015) recommendations, the vessel "Baltica" was designated to cover parts of the ICES Sub-divisions 25 and 26 with totally 49 randomly selected fish control-hauls. The catch-stations were located at the bottom depth range of 19 - 102 m. Totally, 47 fish catch-stations can be accepted as representative. Two planned fish hauls No. 26257, 26087 were omitted, as the oxygen content was below 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. 25195 and 26266fishing was shortened to 15 minutes. Every control-haul was preceded by the seawater temperature, salinity and oxygen content measurements, made continuously from the sea-surface to a bottom. Overall, 49 fish catch-stations starting positions and 29 standard hydrographic stations were controlled by the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
25	TVL	1	2	2	0	0	0	0	100
25	TVL	2	10	10	0	0	0	0	100
25	TVL	3	10	10	0	0	0	0	100
25	TVL	4	5	5	0	0	0	0	100
26	TVL	2	6	6	0	0	0	0	100
26	TVL	3	6	6	0	0	0	0	100
26	TVL	4	7	7	0	0	0	0	100
26	TVL	5	2	1	0	1	0	0	100
26	TVL	6	1	0	0	1	0	0	100

NUMBER OF BIOLOGICAL SAMPLES (MATURITY AND AGE MATERIAL, *MATURITY ONLY):		
SPECIES (LATIN NAME)	Length	Age and maturity
Gadus morhua	10943	449
Platichthys flesus	5702	823
Clupea harengus	6092	680
Sprattus sprattus	4313	501
Pleuronectes platessa	810	471
Psetta maxima	12	12
Cyclopterus lumpus	10	10
Enchelyopus cimbrius	43	43
Hyperoplus lanceolatus	15	15
Osmerus eperlanus	91	50
Merlangius merlangus	22	22
Myoxocephalus scorpius	108	108
Limanda limanda	1	1
Pomatoschistus minutus	6	6
Zoarces viviparus	4	4
Alosa fallax	1	1
Scomber scombrus	4	4
Engraulis encrasicholus	14	14
Gasterosteus aculeatus	2	2

Neogobius melanostomus	12	12
Trisopterus minutus	1	1
Ammodytes tobianus	1	1
Agonus cataphractus	4	4
Anguilla anguilla	1	0



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

Nation:	**Lithuania**	**Vessel:**	**RV «Darius»**
Survey:	BITS-Q4/2015	Dates:	02-03 and 16/12/2015

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.):	Total 4 trawls were made. During survey we have problems with trawling gear , so the survey was skipped into two parts. 3 hauls were performed on December 02-03. Next possibility to go to sea was on December 16. A weather condition was very bad so only one haul was done in in that day.
Additional comments:	

ICES Sub-Divisions	Gear (TVS)	Depth strata	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	% stations fished
26	TVS	20-39	1	1	0	0	0	0	100
26	TVS	40-59m	1	1	0	0	0	0	100
26	TVS	60-79m	4	1	0	0	0	1	50
26	TVS	80-99m	0	0	0	0	0	0	0

Number of biological samples (maturity and age material, *maturity only):			
Species	**Age**	**Length**	**Maturity**
Gadus morhua	254	636	
Platichthys flesus	284	967	
Pleuronectes platessa	2	2	
Psetta maxima	1	1	
Clupea harengus		767	
Sprattus sprattus		5	
Osmerus eperlanus		275	
Myoxocephalus scorpius		12	
Alosa falax		1	
Neogobius melanostomus		2	
Pomatoschistus minutus		5	

Nation:	**Lithuania**	**Vessel:**	**RV «Darius»**
Survey:	BITS-Q1/2016	Dates:	15-16 03/2016

Cruise	
Gear details:	The small (530) standard TV3 trawl was used. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	Total 6 trawls were planned. 5 trawls were made. One trawl was not made during bad sea ground.
Additional comments:	

ICES Sub-Divisions	Gear (TVS)	Depth strata	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replace-ment hauls	Number of invalid hauls	% stations fished
26	TVS	20-39	1	1	0	0	0	0	100
26	TVS	40-59m	1	1	0	0	0	0	100
26	TVS	60-79m	3	3	0	0	0	1	100
26	TVS	80-99m	1	0	0	0	0	0	0

Number of biological samples (maturity and age material, *maturity only):			
Species	**Age**	**Length**	**Maturity**
Gadus morhua	150	198	
Platichthys flesus	240	546	
Pleuronectes platessa	2	2	
Psetta maxima	0	2	
Clupea harengus		1083	
Sprattus sprattus		711	
Osmerus eperlanus		623	
Myoxocephalus scorpius		94	
Neogobius melanostomus		3	
Pomatoschistus minutus		16	

NATION:	**LATVIA**	**VESSEL:**	**RV "BALTICA"**
Survey:	BITS-Q4/2015	Dates:	02-11/12/2015

Cruise	No. 2/2015
Gear details:	The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The 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 during the survey. Sixteen hauls in the Latvian EEZ, 7 hauls in the Swedish EEZ and 2 hauls in the Polish EEZ (12 trawls in SD 28, 11 trawls in SD 26 and 2 hauls in SD 25). Five additional hauls, in case if main control-hauls are made were planned in the Lithuanian EEZ (SD 26). The r.v."Baltica" realized 14 bottom trawl control-hauls from the 25 planned, incl. the Latvian territorial waters (Fig. 1). One track in SD 26, in Polish EEZ (26120) was not realized due to the very hard bottom. This track was replaced with 26138, which belongs to the deeper depth layer. It was not possible to find alternative track to substitute track 26120 during the survey in this ICES rectangle due to the heavy bottom ground problems. All trawl catches were performed in the daylight. The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. Two tracks in the Polish EEZ were realized with large standard TV3 trawl. The standard trawling duration was planned 30 minutes. The mean speed of vessel while trawling was 3.0 knots. However, in the case of 13 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder or bad weather. The length measurements in the 1.0-cm classes was realised for 615 cod and 889 flounder. Length measurements in the 0.5-cm classes was realised for 1458 herring and 1474 sprat. In total, 486 cod and 315 flounder individuals were taken for biological analysis. Stomachs from the 406 cod were taken for investigation of cod feeding. Acoustic data, i.e. the echo-integration records (SA = NASCs; Nautical Area Scattering (Strength) Coefficient) were collected with the EK-60 scientific echosounder during fishing operations and on the distances between consecutive hauls. Echo-sounding data collected during the BITS survey were delivered to the Latvian researchers for further analysis. Directly before every haul, the seawater temperature, salinity and oxygen content were measured continuously from the sea surface to a bottom. The seawater samples were taken also at the standard HELCOM stations. Totally, 19 hydrological stations were inspected with the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method. Meteorological observations of wind velocity and directions and the sea state were realized at the actual geographic position of each control-haul.
Additional comments:	**Due to the very bad weather conditions 5 working days during the survey were lost.**

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
25	TVL	3	2						0
26	TVL	2	1						0
26	TVL	3	1						0
26	TVL	4	2		2				100
26	TVL	5	3		1				33
26	TVL	6	4		3				75
28	TVL	2	4		1				25
28	TVL	3	3		4				133
28	TVL	4	3		3				100
28	TVL	5	2						0

NUMBER OF BIOLOGICAL SAMPLES (MATURITY AND AGE MATERIAL, *MATURITY ONLY):		
SPECIES	**LENGTH**	**AGE**
Gadus morhua	1101	486
Platichthys flesus	1204	315
Clupea harengus	1458	
Sprattus sprattus	1474	
Scophthalmus maximus	3	
Zoarces viviparus	1	
Cyclopterus lumpus	2	
Pomatoschistus minutus	107	
Myoxocephalus scorpius	23	
Osmerus eperlanus	246	
Gasterosteus aculeatus	19	
Enchelyopus cimbrius	3	
Neogobius melanostomus	1	

Realised BITS 2015 Q4

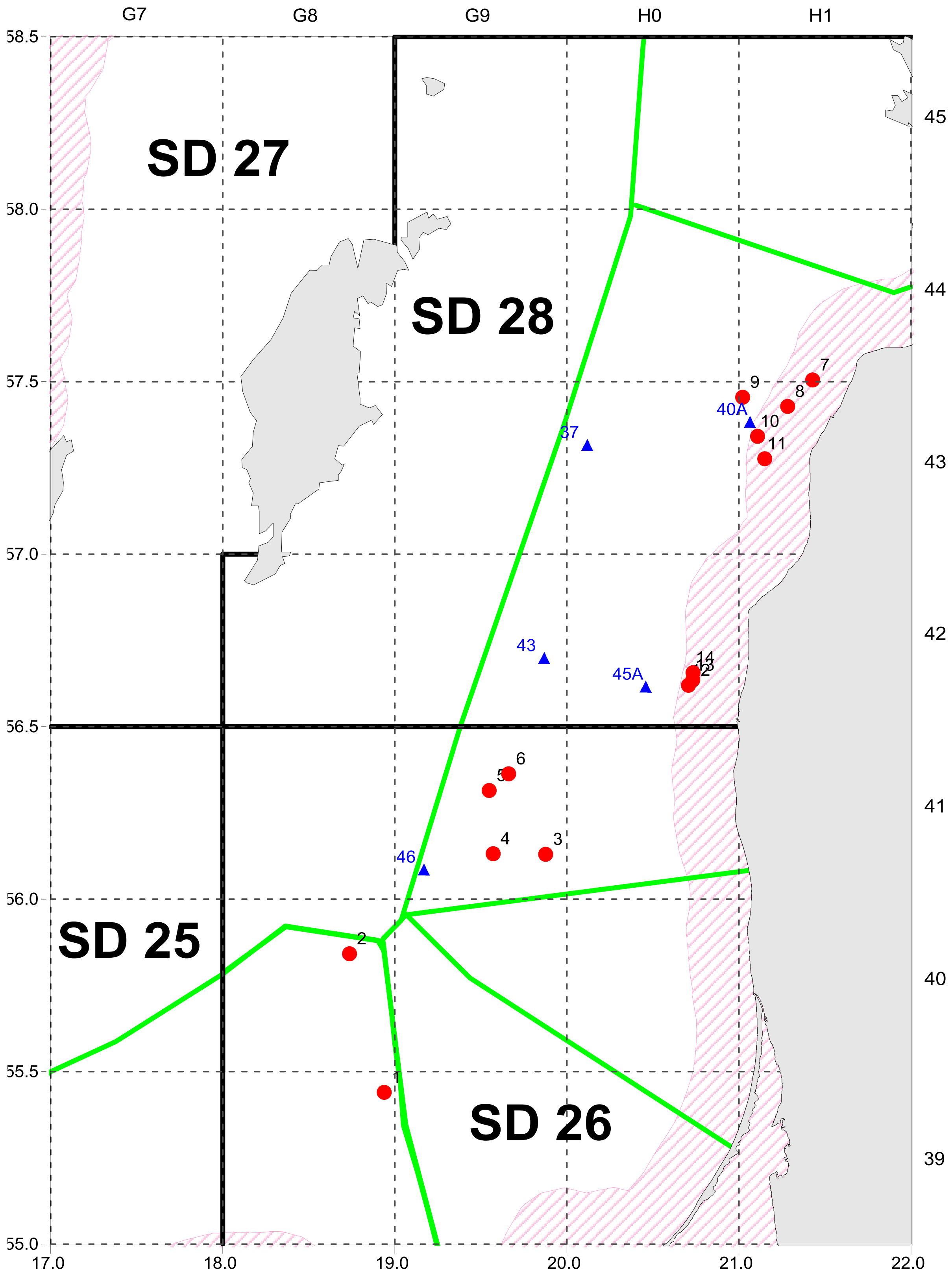


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with blue triangles), green lines - national fishing zone borders.

NATION:	LATVIA	VESSEL:	RV "BALTICA"
Survey:	BITS-Q1/2016	Dates:	03-11/03/2016

Cruise	No. 1/2016
Gear details:	The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The construction of the trawl follows the specifications in the manual.
Notes from survey (e.g. problems, additional work etc.):	The original surveys plan provided that 23 control-hauls will be realized in the Latvian EEZ (16 trawls in SD 28 and 7 trawls in SD 26) and 2 control-hauls in the Estonian EEZ (SD 28). Five additional trawls were planned in the Lithuanian EEZ (SD 26). The r.v."Baltica" realized 25 bottom trawl control-hauls from the 25 planned, incl. the Latvian territorial waters (Fig.1). Two catch-stations were only initiated by hydrological parameters measurement and due to very low oxygen concentration (below 1.0 ml/l) near bottom, fishing was omitted. Trawling in one position (track 28015) was unfortunate; trawl was destroyed and replaced with new during the survey. Five additional trawls were realized in the Lithuanian EEZ (SD 26). All trawl catches were performed in the daylight. The hard bottom ground-rope (rockhopper) trawl, type TV-3#930 (with 10-mm mesh bar length in the codend) was applied for fish catches. The standard trawling duration was 30 minutes. The mean speed of vessel while trawling was 3.0 knots. However, in the case of 22 hauls, their duration was shortened to 15 minutes, due to dense clupeids concentrations observed on the echosounder or bad fishing ground. The length measurements in the 1.0-cm classes were realised for 1163 cod and 2219 flounder. Length measurements in the 0.5-cm classes were realized for 2746 herring and 2754 sprat. In total, 474 cod and 512 flounder individuals were taken for biological analysis. Stomachs from the 384 cod were taken for investigation of cod feeding. Acoustic data, i.e. the echo-integration records (SA = NASCs; Nautical Area Scattering (Strength) Coefficient) were collected with the EK-60 scientific echosounder during fishing operations and on the distances between consecutive hauls. Echo-sounding data collected during the BITS survey were delivered to the Latvian researchers for further analysis. Directly before every haul, the seawater temperature, salinity and oxygen content were measured continuously from the sea surface to a bottom. The seawater samples were taken also at the standard HELCOM stations. Totally, 35 hydrological stations were inspected with the Neil-Brown CTD-probe combined with the rosette sampler (the bathometer rosette). Oxygen content was determined by the standard Winkler's method. Meteorological observations of wind velocity and directions and the sea state were realized at the actual geographic position of each control-haul.
Additional comments:	

ICES SUB-DIVISIONS	GEAR (TVL, TVS)	DEPTH STRATA (2–6)	NUMBER OF HAULS PLANED	NUMBER OF VALID HAULS REALIZED USING "STANDARD" GROUND GEAR	NUMBER OF VALID HAULS REALIZED USING ROCK HOPPERS	NUMBER OF ASSUMED ZERO-CATCH HAULS	NUMBER OF REPLACE-MENT HAULS	NUMBER OF INVALID HAULS	% STATIONS FISHED
26	TVL	3	1		1				100
26	TVL	4	2		2				100
26	TVL	5	2		1		1		100
26	TVL	6	2		2				100
28	TVL	2	5		5				100
28	TVL	3	4		2			1	75
28	TVL	4	5		6				120
28	TVL	5	4		3		1		100

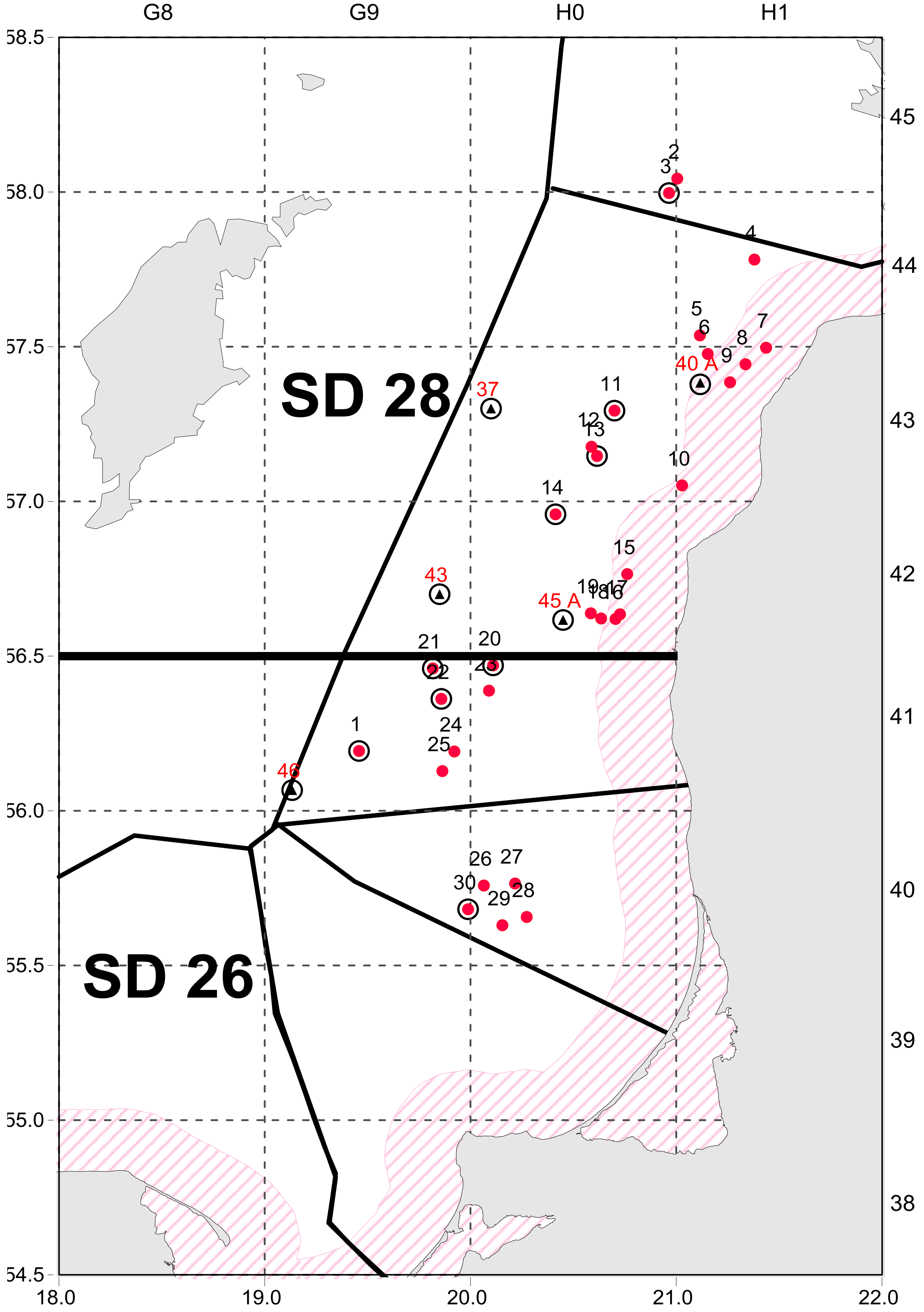


Figure 1. Location of the realized fish control-hauls (marked with red dots) and the HELCOM standard hydrological stations (marked with black triangles), ichthyoplankton stations (marked with black cicles, black lines - national fishing zone borders.

Number of biological samples (maturity and age material, *maturity only):		
Species	**Length**	**Age**
Gadus morhua	1637	474
Platichthys flesus	2731	512
Clupea harengus	2746	
Sprattus sprattus	2754	
Zoarces viviparus	11	
Triglopsis quadricornis	1	
Cyclopterus lumpus	2	
Pomatoschistus minutus	1	
Myoxocephalus scorpius	68	
Osmerus eperlanus	143	
Gasterosteus aculeatus	66	
Enchelyopus cimbrius	1	
Hyperoplus lanceolatus	8	
Neogobius melanostomus	1	

Nation:	Denmark	Vessel:	Dana
Survey:	BITS	Dates:	3-19/11 - 2015

Cruise	
Gear details:	The big (#920) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual. No rock hopper was used
Notes from survey (e.g. problems, additional work etc.):	Stomack sampling from cod, plankton fishing during night.

ICES Sub-Divisions and Depth stratum	Gear (TVL,TVS)	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25								
2	TVL	1	1	0	0	0	0	100.0
3	TVL	14	13	0	0	0	2	107.1
4	TVL	20	18	0	0	0	0	90.0
5	TVL	10	3	0	0	0	1	30.0
26								
4	TVL	3	3	0	0	0	0	100.0
5	TVL	2	2	0	0	1	0	100.0

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Clupea harengus			
Gadus morhua			
Sprattus sprattus			

Nation:	Denmark	Vessel:	Dana
Survey:	BITS	Dates:	4-22/3 - 2016

Cruise	
Gear details:	The big (#920) standard TV3 trawl is used. The construction of the trawl follows the specifications in the manual. No rock hopper was used
Notes from survey (e.g. problems, additional work etc.):	Stomack sampling from cod, plankton fishing during night.

ICES Sub-Divisions and Depth stratum	Gear (TVL,TVS)	Number of hauls planed	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock-hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Number of invalid hauls	% stations fished
25	TVL							
2	TVL	1	1	0	0	0	0	100.0
3	TVL	7	5	0	0	0	1	85.7
4	TVL	18	13	0	0	0	0	72.2
5	TVL	10	12	0	0	0	1	120.0
6	TVL	0	4	0	0	0	1	
26	TVL							
4	TVL	2	1	0	0	1	2	50.0
5	TVL	12	13	0	0	1	0	108.3

Number of biological samples (maturity and age material, *maturity only):			
Species	Age	Species	Age
Clupea harengus			
Gadus morhua			
Sprattus sprattus			

Annex 6.1. Protocols from the standard measurements of the technical parameters of the TV-3 bottom trawl

Contributions accessible at the WGBIFS 2016 meeting in Rostock, Germany, 30.03.-03.04.2016.

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

Table 6.1.1. Results of the German fishing gear check-up.

Germany (09.11.2015) - Check list for trawl and for frame ropes of trawl Tag no. TV3-520 # - 03

Check list for trawl TV3-520#											
Section	Manual TV3-520 # page 42	Standard			Tag no. TV3-520 # - 03				Relative error [%]		Remarks
		Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Mesh size [mm]	Number of meshes	
1	1B1	**8,22**	**120**	**69**	8,05	61	122	66,0	1,7	-3,7	
	1A1	**8,10**	**200**	**41**	8,05	96	192	41,9	-4,0	3,5	
	1A2	**8,10**	**200**	**41**	7,95	107	214	37,1	7,0	-8,3	
	1B2	**8,22**	**120**	**69**	8,18	58	116	70,5	-3,3	2,9	
	1C1	**8,28**	**120**	**69**	8,00	60	120	66,7	0,0	-3,4	
	1C2	**8,28**	**120**	**69**	8,10	62	124	65,3	3,3	-5,3	
2	2B1	**2,04**	**80**	**26**	2,07	44	88	23,5	10,0	-7,8	
	2A	**2,04**	**120**	**17**	1,85	59	118	15,7	-1,7	-7,8	
	2B2	**2,04**	**80**	**26**	2,05	42,5	85	24,1	6,3	-5,4	
	2C1	**2,12**	**80**	**27**	1,94	41	82	23,7	2,5	-10,7	
	2C2	**2,12**	**80**	**27**	1,96	41	82	23,9	2,5	-9,8	
3	3B1	**1,96**	**80**	**25**	2,10	44	88	23,9	10,0	-2,6	
	3A	**1,96**	**80**	**25**	1,96	41	82	23,9	2,5	-2,4	
	3B2	**1,96**	**80**	**25**	2,12	40	80	26,5	0,0	8,2	
	3C	**2,12**	**80**	**27**	2,05	41	82	25,0	2,5	-5,7	
4 (2 subsections)	4B1	**7,92**	**80**	**99**	7,77	40	80	97,1	0,0	-1,9	
	4A	**7,92**	**80**	**99**	7,68	39,5	79	97,2	-1,3	-1,8	
	4B2	**7,92**	**80**	**99**	7,90	39	78	101,3	-2,5	2,3	
	4C	**8,00**	**80**	**100**	7,82	40	80	97,8	0,0	-2,3	
5 and 6 together	5B1+6B1	**7,88**	**80**	**99**	8,53	41,5	83	102,8	3,8	4,3	
	5A+6A	**7,88**	**80**	**99**	9,05	41,5	83	109,0	3,8	10,7	
	5B2+6B2	**7,88**	**80**	**99**	8,53	41,3	82,6	103,3	3,2	4,8	
	5C+6C	**7,96**	**80**	**100**	9,10	41,5	83	109,6	3,8	10,2	
Codend			**40**			42					
			20			24					
Mean mesh opening in codend (OMEGA mesh gauge): 37 mm (37, 37, 37, 38, 37, 37, 36, 38, 38, 37)											

Check list for frame ropes of trawl TV3-520 #				
Manual TV3-520 #	page 43	Measured distance [m]		Remarks
		Standard	TV3-520 # -01	
Head line extension Port.		**3,00**	3,10	
Head line wing section Port.		**12,68**	12,50	
Head line bosom section		**2,80**	2,97	
Head line wing section Stbd.		**12,68**	12,50	
Head line extension Stbd.		**3,00**	3,16	
Fishing line extension Port.		**0,80**	0,82	
Fishing line wing section Port.		**14,41**	14,26	
Fishing line bosom section		**2,80**	2,87	
Fishing line wing section Stbd.		**14,41**	14,20	
Fishing line extension Stbd.		**0,80**	0,83	
Lower wing line Port.		**3,73**	3,50	
Lower wing line Stbd.		**3,73**	3,50	
Upper wing line Port.		**3,83**	3,50	
Upper wing line Stbd.		**3,80**	3,50	

Type of fishing gear:	TV3-520 # - 03
Nation:	Germany
Date of measurements:	2015-11-09
Name of operators:	Mieske, Santos, Velasco
Number of realized hauls:	
Comments concerning the use:	

Table 6.1.2. Results of the Swedish fishing gear check-up (Trawl No. 1).

Type of fishing gear:	TV3-930 #
Nation:	Sweden
Date of measurements:	2015-05-05
Name of operators:	Olof Lövgren
Number of realized hauls:	
Comments concerning the use:	

Check list for trawl TV3-930#										
		STANDARD (Manual data)			Tag no. TV3-930 # -				Relative error [%]	
Section	Manual TV3-930 # page 57	Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Distance [m]	Number of meshes
1	1B1	**22.10**	**200**	**111**	**22.06**				-0.2	
	1A1	**22.10**	**200**	**111**	**21.99**				-0.5	
	1A2	**22.10**	**200**	**111**	**21.88**				-1.0	
	1B2	**22.10**	**200**	**111**	**21.96**				-0.6	
	1C1	**22.10**	**120**	**184**	**22.90**				3.6	
	1C2	**22.10**	**120**	**184**	**22.88**				3.5	
2	2B1	**2.96**	**160**	**19**	**2.75**				-7.1	
	2A	**2.96**	**160**	**19**	**2.79**				-5.7	
	2B2	**2.96**	**160**	**19**	**2.77**				-6.4	
	2C1	**3.00**	**120**	**25**	**3.00**				0.0	
	2C2	**3.00**	**120**	**25**	**2.93**				-2.3	
3	3B1	**2.94**	**120**	**25**	**2.81**				-4.4	
	3A	**2.94**	**120**	**25**	**2.80**				-4.8	
	3B2	**2.94**	**120**	**25**	**2.80**				-4.8	
	3C	**3.00**	**120**	**25**	**2.91**				-3.0	
4	4B1	**7.92**	**80**	**99**	**7.78**				-1.8	
	4A	**7.92**	**80**	**99**	**7.72**				-2.5	
	4B2	**7.92**	**80**	**99**	**7.80**				-1.5	
	4C	**8.00**	**80**	**100**	**7.89**				-1.4	
5	5B1	**5.94**	**60**	**99**	**5.87**				-1.2	
	5A	**5.94**	**60**	**99**	**5.82**				-2.0	
	5B2	**5.94**	**60**	**99**	**5.81**				-2.2	
	5C	**6.00**	**60**	**100**	**5.90**				-1.7	
6	6B1	**11.92**	**40**	**298**	**11.69**				-1.9	
	6A	**11.92**	**40**	**298**	**11.71**				-1.8	
	6B2	**11.92**	**40**	**298**	**11.71**				-1.8	
	6C	**12.00**	**40**	**300**	**11.91**				-0.7	
Codend			**20**							
			20							
Mean mesh opening in codend (OMEGA mesh gauge): mm (n, n, n, n, n, n, n, n, n, n)										

Check list for frame ropes of trawl TV3-930 #			
Manual TV3-930 # page 59	Measured distance [m]		Remarks
	Standard	TV3-930 #	
Head line extension Port.	**4.00**	3.94	
Head line wing section Port.	**28.50**	28.46	
Head line bosom section	**2.50**	2.6	
Head line wing section Stbd.	**28.50**	28.36	
Head line extension Stbd.	**4.00**	3.9	
Fishing line extension Port.	**0.95**		
Fishing line wing section Port.	**29.94**	30.25	
Fishing line bosom section	**1.68**	1.7	
Fishing line wing section Stbd.	**29.94**	30.37	
Fishing line extension Stbd.	**0.95**		
Upper wing line Port.	**2.70**	2.7	
Upper wing line Stbd.	**2.70**	2.7	
Upper wing side Port.	**2.15**	2.52	
Upper wing side Stbd.	**2.15**	2.53	
Lower wing line Port.	**2.75**	2.70	
Lower wing line Stbd.	**2.75**	2.66	
Lower wing side Port.	**2.20**	2.55	
Lower wing side Stbd.	**2.20**	2.52	

Table 6.1.3. Results of the Swedish fishing gear check-up (Trawl No. 2).

Type of fishing gear:	TV3-930 #
Nation:	Sweden
Date of measurements:	2015-05-05
Name of operators:	Anders Svenson
Number of realized hauls:	
Comments concerning the use:	

Check list for trawl TV3-930#										
Section	Manual TV3-930 # page 57	STANDARD (Manual data)			Tag no. TV3-930 # -				Relative error [%]	
		Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Distance [m]	Number of meshes
1	1B1	22.10	200	111	22.19				0.4	
	1A1	22.10	200	111	22.14				0.2	
	1A2	22.10	200	111	22.55				2.0	
	1B2	22.10	200	111	22.52				1.9	
	1C1	22.10	120	184	22.89				3.6	
	1C2	22.10	120	184	23.02				4.2	
2	2B1	2.96	160	19	2.89				-2.4	
	2A	2.96	160	19	2.83				-4.4	
	2B2	2.96	160	19	2.88				-2.7	
	2C1	3.00	120	25	3.09				3.0	
	2C2	3.00	120	25	3.05				1.7	
3	3B1	2.94	120	25	2.85				-3.1	
	3A	2.94	120	25	2.80				-4.8	
	3B2	2.94	120	25	2.80				-4.8	
	3C	3.00	120	25	2.88				-4.0	
4	4B1	7.92	80	99	7.79				-1.6	
	4A	7.92	80	99	7.77				-1.9	
	4B2	7.92	80	99	7.81				-1.4	
	4C	8.00	80	100	7.92				-1.0	
5	5B1	5.94	60	99	5.90				-0.7	
	5A	5.94	60	99	5.83				-1.9	
	5B2	5.94	60	99	5.85				-1.5	
	5C	6.00	60	100	5.94				-1.0	
6	6B1	11.92	40	298	11.77				-1.3	
	6A	11.92	40	298	11.70				-1.8	
	6B2	11.92	40	298	11.77				-1.3	
	6C	12.00	40	300	11.78				-1.8	
Codend			20							
			20							
Mean mesh opening in codend (OMEGA mesh gauge): mm (n, n, n, n, n, n, n, n, n, n)										

Check list for frame ropes of trawl TV3-930 #			
Manual TV3-930 # page 59	Measured distance [m]		Remarks
	Standard	TV3-930 #	
Head line extension Port.	4.00	3.97	
Head line wing section Port.	28.50	28.44	
Head line bosom section	2.50	2.6	
Head line wing section Stbd.	28.50	28.45	
Head line extension Stbd.	4.00	4	
Fishing line extension Port.	0.95		
Fishing line wing section Port.	29.94	30.23	
Fishing line bosom section	1.68	1.65	
Fishing line wing section Stbd.	29.94	30.32	
Fishing line extension Stbd.	0.95		
Upper wing line Port.	2.70	2.67	
Upper wing line Stbd.	2.70	2.67	
Upper wing side Port.	2.15	2.57	
Upper wing side Stbd.	2.15	2.56	
Lower wing line Port.	2.75	2.70	
Lower wing line Stbd.	2.75	2.91	
Lower wing side Port.	2.20	2.52	
Lower wing side Stbd.	2.20	2.51	

Table 6.1.4. Results of the Polish fishing gear check-up (Trawl No. 1).

POLAND - Check of the TV-3#930 STANDARD GEAR used during the BITS since 2000

Table of the fishing gear data

Type of fishing gear	TV–3#930 No.1
Nation	Poland
Date of measurements	01.09.2015
Name of operators	BalicNet & K. Radtke,
Number of realized hauls	over 400, permanently used
Comments concerning the use	

Check list for trawl TV3-930#										
		STANDARD (Manual data)			Tag no. TV3-930 # -				Relative error [%]	
Section	Manual TV3-930 # page 57	Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Distance [m]	Number of meshes
1	1B1	22.10	200	111	22.08				-0.1	
	1A1	22.10	200	111	22.08				-0.1	
	1A2	22.10	200	111	22.10				0.0	
	1B2	22.10	200	111	22.13				0.1	
	1C1	22.10	120	184	22.13				0.1	
	1C2	22.10	120	184	22.10				0.0	
2	2B1	2.96	160	19	2.95				-0.3	
	2A	2.96	160	19	2.95				-0.3	
	2B2	2.96	160	19	2.92				-1.4	
	2C1	3.00	120	25	2.95				-1.7	
	2C2	3.00	120	25	2.92				-2.7	
3	3B1	2.94	120	25	2.86				-2.7	
	3A	2.94	120	25	2.86				-2.7	
	3B2	2.94	120	25	2.86				-2.7	
	3C	3.00	120	25	2.86				-4.7	
4	4B1	7.92	80	99	7.72				-2.5	
	4A	7.92	80	99	7.82				-1.3	
	4B2	7.92	80	99	7.79				-1.6	
	4C	8.00	80	100	7.74				-3.3	
5	5B1	5.94	60	99	5.90				-0.7	
	5A	5.94	60	99	5.75				-3.2	
	5B2	5.94	60	99	5.78				-2.7	
	5C	6.00	60	100	5.75				-4.2	
6	6B1	11.92	40	298	11.18				-6.2	
	6A	11.92	40	298	11.26				-5.5	
	6B2	11.92	40	298	11.19				-6.1	
	6C	12.00	40	300	11.28				-6.0	
Codend			20							
			20							
Mean mesh opening in codend (OMEGA mesh gauge): mm (n, n, n, n, n, n, n, n, n, n)										

Notes:

*** - mesh opening measured with a ruler, others measured with use of the ICES gauge,**

**** - measured along selvedges.**

Check list for frame ropes of trawl TV3-930 #			
Manual TV3-930 # page 59	**Measured distance [m]**		**Remarks**
	Standard	**TV3-930 #**	
Head line extension Port.	**4.00**	3.96	
Head line wing section Port.	**28.50**	28.40	
Head line bosom section	**2.50**	2.60	
Head line wing section Stbd.	**28.50**	28.40	
Head line extension Stbd.	**4.00**	4.00	
Fishing line extension Port.	**0.95**	1.30	
Fishing line wing section Port.	**29.94**	29.90	
Fishing line bosom section	**1.68**	1.68	
Fishing line wing section Stbd.	**29.94**	29.93	
Fishing line extension Stbd.	**0.95**	1.30	
Upper wing line Port.	**2.70**	2.20	
Upper wing line Stbd.	**2.70**	2.10	
Upper wing side Port.	**2.15**	2.20	
Upper wing side Stbd.	**2.15**	2.10	
Lower wing line Port.	**2.75**	2.70	
Lower wing line Stbd.	**2.75**	2.70	
Lower wing side Port.	**2.20**	2.08	
Lower wing side Stbd.	**2.20**	2.05	

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.

Table 6.1.5. Results of the Polish fishing gear check-up (Trawl No. 2).

POLAND - Check of the TV-3#930 STANDARD GEAR used during the BITS since 2000

Table of gear data

Type of fishing gear	TV3#930 No.2
Nation	Poland
Date of measurements	01.09.2015
Name of operators	BalicNet & K. Radtke,
Number of realized hauls	over 400, permanently used
Comments concerning the use	

Check list for trawl TV3-930#										
		STANDARD (Manual data)			Tag no. TV3-930 # -				Relative error [%]	
Section	Manual TV3-930 # page 57	Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Distance [m]	Number of meshes
1	1B1	**22.10**	**200**	**111**	**21.76**				-1.5	
	1A1	**22.10**	**200**	**111**	**21.76**				-1.5	
	1A2	**22.10**	**200**	**111**	**21.83**				-1.2	
	1B2	**22.10**	**200**	**111**	**21.90**				-0.9	
	1C1	**22.10**	**120**	**184**	**21.90**				-0.9	
	1C2	**22.10**	**120**	**184**	**21.90**				-0.9	
2	2B1	**2.96**	**160**	**19**	**2.85**				-3.7	
	2A	**2.96**	**160**	**19**	**2.85**				-3.7	
	2B2	**2.96**	**160**	**19**	**2.88**				-2.7	
	2C1	**3.00**	**120**	**25**	**2.88**				-4.0	
	2C2	**3.00**	**120**	**25**	**2.86**				-4.7	
3	3B1	**2.94**	**120**	**25**	**2.85**				-3.1	
	3A	**2.94**	**120**	**25**	**2.85**				-3.1	
	3B2	**2.94**	**120**	**25**	**2.85**				-3.1	
	3C	**3.00**	**120**	**25**	**2.85**				-5.0	
4	4B1	**7.92**	**80**	**99**	**7.82**				-1.3	
	4A	**7.92**	**80**	**99**	**7.83**				-1.1	
	4B2	**7.92**	**80**	**99**	**7.81**				-1.4	
	4C	**8.00**	**80**	**100**	**7.82**				-2.3	
5	5B1	**5.94**	**60**	**99**	**5.85**				-1.5	
	5A	**5.94**	**60**	**99**	**5.82**				-2.0	
	5B2	**5.94**	**60**	**99**	**5.82**				-2.0	
	5C	**6.00**	**60**	**100**	**5.80**				-3.3	
6	6B1	**11.92**	**40**	**298**	**11.71**				-1.8	
	6A	**11.92**	**40**	**298**	**11.66**				-2.2	
	6B2	**11.92**	**40**	**298**	**11.64**				-2.3	
	6C	**12.00**	**40**	**300**	**11.71**				-2.4	
Codend			**20**							
			20							
Mean mesh opening in codend (OMEGA mesh gauge): mm (n, n, n, n, n, n, n, n, n, n)										

Notes:

*** - mesh opening measured with a ruler, others measured with use of the ICES gauge,**

**** - measured along selvedges.**

Check list for frame ropes of trawl TV3-930 #			
Manual TV3-930 # page 59	Measured distance [m]		Remarks
	Standard	TV3-930 #	
Head line extension Port.	**4.00**	4.00	
Head line wing section Port.	**28.50**	28.44	
Head line bosom section	**2.50**	2.55	
Head line wing section Stbd.	**28.50**	28.44	
Head line extension Stbd.	**4.00**	4.00	
Fishing line extension Port.	**0.95**	0.95	
Fishing line wing section Port.	**29.94**	29.85	
Fishing line bosom section	**1.68**	1.68	
Fishing line wing section Stbd.	**29.94**	29.80	
Fishing line extension Stbd.	**0.95**	0.95	
Upper wing line Port.	**2.70**	2.70	
Upper wing line Stbd.	**2.70**	2.70	
Upper wing side Port.	**2.15**	2.20	
Upper wing side Stbd.	**2.15**	2.10	
Lower wing line Port.	**2.75**	2.76	
Lower wing line Stbd.	**2.75**	2.76	
Lower wing side Port.	**2.20**	2.20	
Lower wing side Stbd.	**2.20**	2.20	

Table 6.1.6. Results of the Lithuanian fishing gear check-up (Trawl No. 3).

Lithuania (24.03.2016) - Check list for trawl TV3-520#											
Section	Manual TV3-520 # page 42	Standard			Tag no. TV3-520 # - 03				Relative error [%]		Remarks
		Measured distance [m]	Mesh size [mm]	Number of meshes	Measured distance [m]	Mesh size [mm]	Mesh size mean	Number of meshes	Mesh size [mm]	Number of meshes	
1	1B1	**8,22**	**120**	**69**	8,20	120	120,6	68,0	0,5	0,8	
	1A1	**8,10**	**200**	**41**	8,00	200	200,0	40,0	0,0	0,5	
	1A2	**8,10**	**200**	**41**	8,00	200	200,0	40,0	0,0	0,5	
	1B2	**8,22**	**120**	**69**	8,20	120	120,6	68,0	0,5	0,8	
	1C1	**8,28**	**120**	**69**	8,20	120	120,6	68,0	0,5	0,8	
	1C2	**8,28**	**120**	**69**	8,20	120	120,6	68,0	0,5	0,8	
2	2B1	**2,04**	**80**	**26**	2,05	80	78,8	26,0	-1,4	1,2	
	2A	**2,04**	**120**	**17**	2,00	120	125,0	16,0	4,2	0,9	
	2B2	**2,04**	**80**	**26**	2,05	80	78,8	26,0	-1,4	1,2	
	2C1	**2,12**	**80**	**27**	2,10	80	80,8	26,0	1,0	1,3	
	2C2	**2,12**	**80**	**27**	2,10	80	80,8	26,0	1,0	1,3	
3	3B1	**1,96**	**80**	**25**	2,00	80	83,3	24,0	4,2	1,3	
	3A	**1,96**	**80**	**25**	1,95	80	81,3	24,0	1,6	1,3	
	3B2	**1,96**	**80**	**25**	2,00	80	83,3	24,0	4,2	1,3	
	3C	**2,12**	**80**	**27**	2,10	80	80,8	26,0	1,0	1,3	
4	4B1	**7,92**	**80**	**99**	7,80	80	79,6	98,0	-0,5	1,2	
	4A	**7,92**	**80**	**99**	7,80	80	79,6	98,0	-0,5	1,2	
	4B2	**7,92**	**80**	**99**	7,80	80	79,6	98,0	-0,5	1,2	
	4C	**8,00**	**80**	**100**	8,00	80	80,0	100,0	0,0	1,3	
5	5B1	**3,96**	**80**	**50**	3,95	80	79,0	50,0	-1,3	1,2	
	5A	**3,96**	**80**	**50**	3,95	80	79,0	50,0	-1,3	1,2	
	5B2	**3,96**	**80**	**50**	3,95	80	79,0	50,0	-1,3	1,2	
	5C	**4,00**	**80**	**50**	3,95	80	79,0	50,0	-1,3	1,2	
6	6B1	**3,92**	**80**	**50**	3,90	80	78,0	50,0	-2,5	1,2	
	6A	**3,92**	**80**	**50**	3,90	80	78,0	50,0	-2,5	1,2	
	6B2	**3,92**	**80**	**50**	3,90	80	78,0	50,0	-2,5	1,2	
	6C	**3,96**	**80**	**50**	4,00	80	80,0	50,0	0,0	1,3	
Codend			**40**			40					

Annex 6.2. Results of inter-calibration between the Danish old and new RV "Havfisken"

(prepared by H. Degel – DTU AQUA, Charlottenlund)

Introduction

The Danish research vessel "Havfisken" has for more than 50 years been used for research for Denmark. It was built in wood in 1962 as a side trawler weighting 20 BRT and can now be considered as outdated. Therefore, it has been replaced with the newly built "Havfisken". In order to be able to continue already established fish survey time-series (BITS in Kattegat and western Baltic (KASU)) it was decided to realize a calibration exercise between the old RV Havfisken and the new RV Havfisken.

Trawling procedure and material

The exercise was carried out in the period from 13-19 March 2016 in the area of Skagerrak and north-western Kattegat. The method used was parallel hauling between the two vessels. Figure 1 shows the set parallel of hauls.

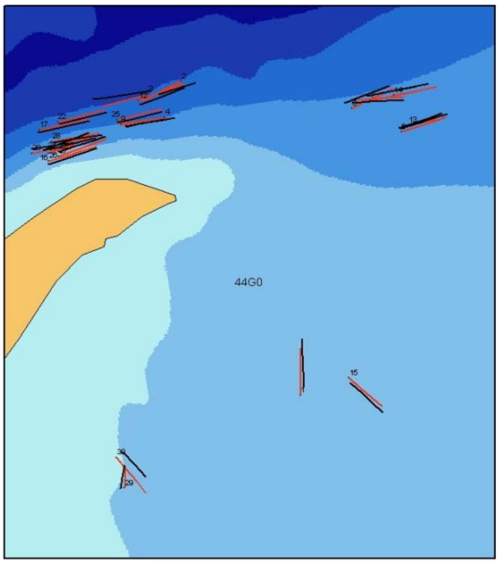


Figure 1. Map showing the parallel hauls with indication of pair haul number

The criteria for selecting this area were that it could be expected to exhibit reasonable abundance of cod and flatfish and that each species could be expected to exist in length span comparable to the length span observed during BITS and finally that trawling could be carried out on depth comparable to the depth observed during the BITS. In addition, the area was in a convenient distance from the home port of the vessels, Strandby, on the east coast of Jutland. The trawl used was the small standard BITS trawl (TV3S, TV3 #520). Because the old Havfisken is a side trawler, it has not been possible to use the normal standard trawl doors. Instead a set of "Munkebo" trawl doors have been used for the whole time-series and during this calibration exercise. The new Havfisken uses "Thyborøn" trawl doors (1.78 m^2 (63 inch), Weight 205 kg), which is the BITS standard trawl doors for aft-trawlers.

The trawling procedure follows the standard BITS trawling procedure, which dictates 30 minutes of haul duration, trawling speed of 3 knots and trawling only during daytime. Parallel trawling was used where the two vessels conduct to parallel tracks few hundred meters from each other at the same time. The engine power of the old Havfisken is not always sufficient to keep up this speed if the current is strong against the trawling direction. This has the consequence that the trawling distance in these cases differs between the two vessels. Overall, 30 haul pairs were conducted, but only 28 hauls can be included in the analysis because two hauls of the old Havfisken were invalid due to significant catches of peat, which completely blocked the codend. The trawl and haul parameters of the 30 haul pairs are shown in the Table 1, together with the catches of the most frequent flatfish species and cod.

Table 1.

Haul pair	Validity	Vessel	Fishing duration	Mean depth	Otter–board distance	Wire Length	Distance (Bottom)	Dab	Turbot	Plaice	Flounder	Cod
			minutes	meters	meters	meters	nautical miles	kg	kg	kg	kg	kg
1	V	New	30	22	65.3	136	1.5	37.7	0.72	49	0.7	3.37
	V	Old	30				1.45	33.6	0.7	37.1	1.0	0.2
2	V	New	30	78	74.3	250	1.5	0.89	0.0	6.88	0.0	69.2
	V	Old	30				1.25	1.7	0.0	5.4	0.3	21.1
3	V	New	30	77	69	225	1.5	0.0	0.0	19.4	0.0	118.5
	V	Old	30	80.3		232	1.15	0.5	0.0	12.5	0.0	27
4	V	New	30	54		188	1.5	6.07	1.53	31.3	1.2	94.4
	V	Old	30	53.2		186	1.2	10.9	0.0	54.5	0.9	32.8
5	V	New	30	52	69.3		1.5	33.8	0.0	24.9	0.0	222
	V	Old	30	51.1		186	1.5	10.4	0.0	16	0.0	41.6
6	V	New	30	42	73.3	168	1.5	4.25	0.36	16.8	1.1	28.1
	V	Old	30	44.5	43.7	186	1.5	6.6	0.0	9.3	0.6	5.9
7	V	New	30	51	72.6	188	1.5	0.12	0.0	27.6	2.0	133
	V	Old	30	52.9	39	186	1.5	3.6	0.0	16	0.6	43.4
8	V	New	30	50	71.6	188	1.5	8.42	0.0	20.4	0.0	19.45
	V	Old	30	53.6	36	232	1.5	12.4	0.0	10.6	0.0	144.5
9	V	New	30	75.8	78	232	1.5	0.0	0.0	0.0	0.0	0.0
	I	Old	30	52		232	1.5	0.0	0.0	0.0	0.0	0.0
10	V	New	30	55	70.4	182	1.5	10.2	0.49	36.5	0.9	2.51
	V	Old	30	27		186	1.45	9.2	0.0	24.2	0.4	0.1
11	V	New	30	32	66.6	136	1.5	75.7	0.0	164	2.4	112
	V	Old	30	50		232	1.5	73.3	0.0	379	0.7	3.1
12	V	New	30	54.8	72.8	182	1.5	2.8	0.0	31.6	0.5	83
	V	Old	30	71		277	1.5	7.5	0.0	21.4	0.3	40.8
13	V	New	30	44.9	74.5	182	1.5	2.79	0.0	14.6	2.1	40.4
	V	Old	30	44		232	1.5	2.12	0.0	7.4	1.0	36.9
14	V	New	30	69	75.3	235	1.5	4.97	0.0	16.4	1.4	130.6

Haul pair	Validity	Vessel	Fishing duration	Mean depth	Otter–board distance	Wire Length	Distance (Bottom)	Dab	Turbot	Plaice	Flounder	Cod
			minutes	meters	meters	meters	nautical miles	kg	kg	kg	kg	kg
	V	Old	30	53		277	1.5	13.5	0.0	11.5	0.2	74.4
15	V	New	30	50.8	73.1	182	1.5	3.24	0.0	72.3	1.0	8.9296
	V	Old	30	25		186	1.4	20.4	0.0	43.1	0.4	1.6
16	V	New	30	23	68	136	1.5	48.8	2.2	50.9	1.2	105.9
	V	Old	30	57		232	1.5	0.0	0.0	27.6	0.0	40.8
17	V	New	30	53	72.3	200	1.5	1.68	0.0	42.8	0.0	136.5
	V	Old	30	74		277	1.5	10.1	0.0	29.6	0.0	71.7
18	V	New	30	75	76	240	1.5	1.49	0.0	39.5	0.3	260.01
	V	Old	30	78		277	1.5	1.7	0.0	22.7	0.2	93.1
19	V	New	30	80	75.5	250	1.5	4.79	0.0	52.6	0.4	16.24
	V	Old	30	67		277	1.45	1.95	0.0	24.8	1.0	2
20	V	New	30	56	74.3	235	1.5	43.5	1.7	67.4	0.7	63.3
	V	Old	30	58.5	28	277	1.4	22.4	0.0	47.8	0.7	22.6
21	V	New	30	56	73.6	216	1.5	5.18	1.53	15.2	0.7	42.1
	V	Old	30	52.5	31	236	1.5	7.5	0.0	10.2	0.3	11.9
22	V	New	30	77	73.3	240	1.5	5.35	0.0	61.5	0.7	32.2
	V	Old	30	75	23.5	277	1.5	15.4	0.0	51	0.0	7.3
23	V	New	30	93	74.6	312	1.5	0.0	0.0	0.0	0.0	3.9
	V	Old	30	95	25	315	1.35	0.1	0.0	0.6	0.0	0.2
24	V	New	30	98	77	312	1.5	0.43	0.0	0.41	0.0	7.2
	V	Old	30	100.5	34	315	1.45	0.2	0.0	0.0	0.0	
25	V	New	30	62	71	215	1.5	26.5	0.0	76.4	0.4	47.7
	V	Old	30	59.9	37	236	1.35	10.7	0.7	71.7	0.0	16.2
26	V	New	30	36	64.6	150	1.5	33.6	1.63	146	0.6	14.3
	V	Old	30	31.2	37	136	1.5	46.1	0.4	195	1.5	2.3
27	V	New	30	46	72.7	200	1.5	45	1.31	98.2	2.1	4.1
	V	Old	30	48.4	35	186	1.5	14.5	0.5	59.7	0.0	6.5
28	V	New	30	60	69.7	215	1.5	0.0	0.0	0.0	0.6	0.0
	I	Old	30	56.9		186	1.5	0.0	0.0	0.0	0.3	0.0

Haul pair	Validity	Vessel	Fishing duration	Mean depth	Otter-board distance	Wire Length	Distance (Bottom)	Dab	Turbot	Plaice	Flounder	Cod
			minutes	meters	meters	meters	nautical miles	kg	kg	kg	kg	kg
29	V	New	15	17	62.5	136	0.75	23.9	0.0	74.6	0.0	8.5
	V	Old	15	17.6	37	136	0.75	19	0.0	42.8	0.0	4.8
30	V	New	30	17	63.3	136	1.5	39.4	0.0	86.3	1.8	18.5
	V	Old	30	17.8	43	136	1.4	27.3	0.0	43	0.4	13.5

Analysing method

The compare of the species-specific catches of the new Havfisken vs. the old Havfisken were done based on a statistical method for intercalibration of surveys, i.e. determining the relative selectivity of two gear types or two vessels. The relative selectivity is estimated for each size class. The method relies on data from paired trawl hauls performed with the two gear types. The method models the size spectrum of the underlying population at each station, size-structured clustering of fish at small temporal and spatial scales, as well as the relative selectivity of the two gear types in each length class. The method is described in the draft paper "Intercalibration of survey trawl gear…" prepared by Thygesen et al. 2015.

Trawling results

The amount of the catches by haul are given in Table 1 for the most frequent flatfish caught (dab, turbot, plaice, flounder) and cod. The length distributions of the 4 most frequent species are shown in Figure 2. The catch of other species are too small to allow the establishment of conversion factors.

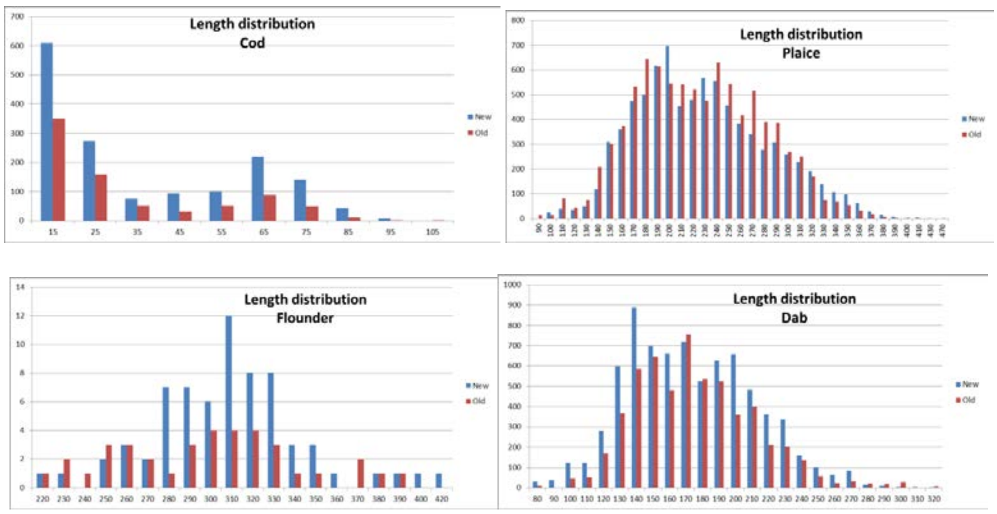


Figure 2. Compare of length distribution for the two vessels for the four most frequent species caught.

Results of calibration factors modelling

Figure 3 shows the relative selectivity for the new Havfisken compared with the old Havfisken for each of the most frequent caught species. The circles indicate the individual observations and the solid line indicate the estimated conversion factor. The grey area indicates the 95% significant intervals. The conversion factor expresses the factor, which the catches of the new Havfisken must be multiplied with in order to be comparable to the time-series of the old Havfisken. The calibration factors are given in Table 2.

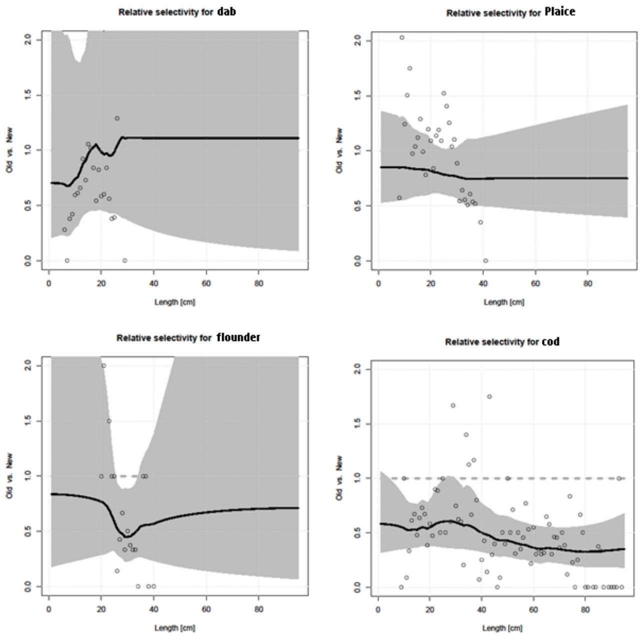


Figure 3. The estimated calibration factors (solid line) for dab plaice, flounder and cod by cm length group for converting cpue values from new Havfisken to old Havfisken time-series. Grey area indicates significant intervals for the estimate.

Discussion

Because the vessels use different rigging due to different trawl doors, the distance between the doors is more than double as large for the new Havfisken that for the old Havfisken (mean distance for new and old Havfisken is 71.5 meters and 34.6 meters respectively). Looking at the compare of length distribution (figure 1) there seems to be a difference in the selection of all length groups between the flatfish and the cod. The difference in the number of cod in all length groups is significant larger than for the flatfish species. This might be explained by the difference in response to herding effect by the doors where cod is likely to respond by aggregating close to the median line of the trawl and then after a while to fall back into the belly of the trawl while flatfish is less likely to seek towards the median of the trawl and will be able to escape under the bridles. As a consequence the catch of cod represents individuals from the water mass defined by the opening of the net and the distance between the doors while the catch of flatfish represent the water mass defined by the opening and the distance between the wings.

The difference in trawling distance might have little influence on the catch as well. In 12 cases out of the 30 hauls the old Havfisken was not capable of keeping up the 3 knots and consequently has a shorter trawl distance than the new Havfisken. The difference was in average for the 12 hauls 0.14 knots and 0.06 knots including all hauls.

The difference in hauling procedure of the trawls might influence the catch of round fish as large individuals might escape when the wire are coiled up and the net is floating in the surface before it is pulled onboard the side trawler. The hauling process onboard the aft trawler is a more continuous movement, which does not allow the fish to escape.

Conclusions

The estimates of confidence intervals for cod are at a level, which means that the conversion factors is significant different from 1 and might be suitable for converting BITS cpue estimates obtained with the new Havfisken to the BITS cpue estimates obtained with the old Havfisken. This means that new BITS surveys results acquired with the new Havfisken can be included in the existing time-series for cod if the species-specific conversion factors are applied.

For plaice and flounder it can be discussed if anything is gained by applying the conversion factors as the factors for most length classes are not significant different from 1. Never the less, more observations will probably reveal a factor significant different from 1.

The confidence intervals for dab are very big and indicate that the conversion factors estimates are very uncertain and not very well estimated. This has to do with the limited number of individuals caught of this species. The estimated conversion factors are not different from 1 and nothing is gained by applying the factors.

Reference

Thygesen et al. 2015. Intercalibration of survey trawl gear using paired hauls. Draft prepared by Uffe Høgsbro Thygesen, Kasper Kristensen, Teunis Jansen, Jan E. Beyer. Additional authors to be included. DTU-Aqua, Danish Technical University. Compiled September 1, 2015.

Table 2. The estimated conversion factors by 1-cm length group for cod, plaice and dab.

Cod	
Length Cm	gr. Conversion factor
<13	0.54
14	0.53
15	0.52
16	0.53
17	0.53
18	0.53
19	0.54
20	0.55
21	0.55
22	0.54
23	0.55
24	0.56
25	0.58
26	0.59
27	0.60
28	0.60
29	0.61
30	0.61
31	0.61
32	0.60
33	0.60
34	0.59
35	0.58
36	0.57
37	0.57
38	0.57
39	0.56
40	0.55
41	0.53
42	0.51
43	0.50
44	0.49
45	0.48
46	0.48
47	0.46
48	0.45
49	0.44
50	0.43
51	0.43
52	0.43
53	0.43

Cod	
Length Cm	gr. Conversion factor
54	0.42
55	0.42
56	0.41
57	0.40
58	0.40
59	0.39
60	0.39
61	0.38
62	0.37
63	0.37
64	0.36
65	0.36
66	0.35
67	0.36
68	0.36
69	0.36
70	0.36
71	0.36
72	0.35
73	0.35
74	0.35
75	0.34
76	0.34
77	0.34
78	0.33
79	0.33
80	0.33
81	0.33
82	0.33
83	0.33
84	0.33
85	0.33
86	0.33
87	0.33
88	0.33
89	0.33
90	0.33
91	0.34
92	0.34
>93	0.34

Plaice	
Length Cm	gr. Conversion factor
<13	0.85
14	0.85
15	0.84
16	0.84
17	0.84
18	0.83
19	0.83
20	0.83
21	0.83
22	0.83
23	0.82
24	0.81
25	0.81
26	0.80
27	0.79
28	0.78
29	0.78
30	0.78
31	0.78
32	0.77
33	0.77
34	0.76
35	0.75
36	0.75
37	0.75
38	0.75
39	0.75
40	0.75
41	0.75
42	0.75
>43	0.75

Dab	
Length Cm	gr. Conversion factor
<=11	0.68
12	0.71
13	0.74
14	0.76
15	0.81
16	0.88
17	0.90
18	0.97
19	1.00
20	1.03
21	1.05
22	1.02
23	0.99
24	0.96
25	0.98
26	0.95
27	0.95
>=28	0.99

Annex 7. Cruise reports from the acoustic surveys (BASS, BIAS) in 2015

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

Working paper on the WGBIFS meeting in Rostock 30.03.-04.04.2016

RESEARCH REPORT FROM

THE GERMAN BALTIC ACOUSTIC SPRING SURVEY (GerBASS)

ON BOARD OF THE F.R.V. "Walther Herwig III"

(Cruise no. 384, 01.05. – 21.05.2015)

Uwe Böttcher
Thünen-Institute of Baltic Sea Fisheries, Rostock

1. Introduction

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). The German Fisheries Data Collection Program financially and logistically supported the GerBASS survey.

Following the recommendation of WGBIFS, the German survey covered the ICES-Subdivisions 24, 25 and the Polish and Swedish parts of Subdivisions 26 and 28. Other areas in the Baltic Sea were covered by Lithuania and Latvia and Russia. In recent years there were indications that the main distribution area of the Baltic sprat stock moved to more northern areas. Therefore the standard survey area was extended by covering Subdivision 27 and 29 (Figure 1).

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.

2. Survey description & methods

2.1. 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	M. Drenckow	Acoustics / Thünen-Institute of SeaSea Fisheries, Hamburg
8	L. Priebe	Volunteer, Universität Oldenburg
9	J. Friedl	Volunteer

* only 01-03 May 2015

2.2. Narrative

FRV "W. Herwig" was equipped with all hydroacoustic equipment and biological sampling gear on 30th April in Bremerhaven and left the port on afternoon of the 1st May headed for the western Baltic. After crossing the Kiel Canal the hydroacoustic equipment was calibrated on the next day at calm weather conditions in the area off Kühlungsborn.
On 3st Mai FRV "W. Herwig" entered the port of Warnemünde for embarkation of the rest of the scientific crew. The ship left the port on the same day and the hydroacoustic survey operations commenced 4st May at 06:00 AM in SD 24.
Overall seventeen days were necessary for the investigations of the intended survey area (calibration of the transducer, acoustic tracks, fishing hauls and hydrographical measurements). Additional four days were used to cross between the home port Bremerhaven and the area of investigation.
On 19st May at 05:00 PM the scientific program was finished north of the Hoburg bank (Gotland Sea) and the FRV "W. Herwig" left the area to steam back to Warnemünde port (disembarking of the scientific crew) and onward to Bremerhaven port, where the ship arrived on 21st May, 03:00 PM.

2.3. Survey design

The investigation of FRV “W. Herwig” covered the whole Subdivisions 24 and 25 as well the Polish and Swedish waters of Subdivisions 26 and 28. It was possible to cover also ICES rectangles 46G9 and 47G9 of Subdivision 29 and 45G8 and 46G8 of Subdivision 27 additionally (Figure 1).
The sampling stratification is 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 85 - 100 nautical miles. The acoustic measurements were predominantly conducted on parallel transects with a distance of 15 - 18 nautical miles.
The acoustic investigations and the fishing hauls were carried out at daylight from 4:00 - 18:00 UTC (6:00 and 20:00 local time). During the survey, hydroacoustic data were recorded at a standard ship speed of 10 knots.
In general, each ICES-rectangle was covered by two transects, corresponding to acoustic measurements of approx. 60 nautical miles per statistical rectangle
For some parts of applied transects including planned CTD-stations in Swedish waters no license was granted by the Swedish authorities (Figure 1). Due to these restrictions the area coverage remained below recommended requirements in ICES rectangles 42G8, 42G9, 45G9, 46G9 and 46G9 of ICES Subdivision 28 and 29.

2.4. 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).

2.5. 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.

2.6. Biological data – fishing stations

Trawling was done with the pelagic gear “PSN205” in the midwater as well as near the bottom to identify the echo signals. The intention was to conduct at least two hauls per ICES statistical rectangle. The trawling time lasted usually 30 minutes by using a trawling speed of about 4 knots. According to the IBAS-manual the following cod end inlets with stretched mesh sizes were used:

- 20 mm 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. Generally a net opening of about 11 to 13 m was achieved. The trawl depth (headrope below the surface) was chosen in accordance to ‘characteristic indications’ of the echogram and ranged from 10 to 73 m. The bottom depth at the trawling positions varied from 30 to 215 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 biological analyses were made according to the standard procedure (i.e. sex, maturity, otolith dissection).

2.7. Hydrography

A Seabird-CTD-probe with a carousel water sampler and oxygen sensor was used for hydrographical measurements. Vertical profiles were taken 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 during all hydrographical investigations

2.8. 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 echo integrals 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 $m^2/n.mi.^2$) 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:
    - haul25; 39G4/SD25
- Usage of neighbouring trawl information for rectangles, which contain only acoustic investigations:
    - haul 1; 38G2/SD24 for 39G2/SD24
    - haul 2; 39G2/SD24 for 38G2/SD24
    - haul 19; 38G5/SD25 for 37G5/SD25
    - haul 18; 38G5/SD25 for 37G5/SD25
    - haul 19; 38G5/SD25 for 38G6/SD25
    - haul 25; 39G6/SD25 for 39G4/SD25
    - haul 25; 39G4/SD25 for 38G6/SD25
    - haul 12; 39G4/SD24 for 39G4/SD25
    - haul 34; 41G7/SD25 for 40G7/SD25
    - haul 49; 45G8/SD27 for 46G8/SD27
    - haul 35; 41G7/SD25 for 42G8/SD28
    - haul 58; 42G9/SD28 for 42G8/SD28
    - haul 54; 46G9/SD29 for 47G9/SD29
    - haul 53; 47G9/SD29 for 46G9/SD29

2.9. Realized samplings during the survey:

Length of hydroacoustic transects	1.314 nm
Number of pelagic trawl hauls valid/invalid	57/1
Number of CTD vertical profiles	120
Number of water bottle samples for oxygen measurements (Winkler titration)	71

Totally 58 hauls were carried out on the cruise. One haul was excluded from the further analyses because of low catch. The catch compositions are presented in Table 1.

3. Results

3.1. Biological data

The CPUE ranged from 2 to 2224 kg/0.5h. The mean catch reached with 398 kg/0.5h, which represents medium catch level related to the preceding years of the time series. As in the previous years, the CPUE were significantly higher in SD 25 compared to the other areas (Figure 3). Overall 11 fish species were recorded in 58 pelagic trawl hauls.

Presence of species in trawl hauls and corresponding number of investigated individuals

Species	No. of trawl hauls with the species	No. of length measurements	No. of individual measurements
CLUPEA HARENGUS	57	12.549	1.149
CYCLOPTERUS LUMPUS	9	13	
ENGRAULIS ENCRASICOLUS	7	45	
GADUS MORHUA	40	688	500
GASTEROSTEUS ACULEATUS	31	1.630	
HYPEROPLUS LANCEOLATUS	4	4	
MERLANGIUS MERLANGUS	9	442	
PLATICHTHYS FLESUS	11	21	
PUNGITIUS PUNGITIUS	1	1	
SCOMBER SCOMBRUS	4	21	
SPRATTUS SPRATTUS	58	14.511	654

The catch composition was dominated by sprat. Herring was also caught regularly in the trawl catches. Cod was present in 69 % of the hauls. Overall the numbers and biomass of species other than herring, sprat and cod was negligible.

Most cod was caught in SD 25 and SD 26 but a few cod were even recorded in the most northern part of the investigated area. Whiting in SD 24 occurred in noticeable numbers.

The length distributions of herring and sprat per Subdivision compared to previous year are presented in Figure 4.

3.2. Acoustic data

The basic results are given in Table 2 (survey area, mean s_A, mean scattering cross section σ, estimated total number of fish and percentage of herring and sprat per rectangle).

The valid measured cruise track totally reached a distance of 1314 nautical miles. On an ICES subdivision scale the mean NASC values in SD 25 und 28 significantly exceeding previous years and the long-time average (Figure 5). In SD 26 the average NASC range at about the long-term average

The echo distribution along the hydroacoustic track is shown in Figure 6. Very high fish concentrations were found especially in the eastern Bornholm basin, and in the investigated parts of SD 27 and 29. Lower but constant fish concentration occurred in the basin of Subdivision 28.As in other years the NASC were slightly lower in SD 24 than in the other Subdivisions.

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 in the surface layer ranged there at about 7 ºC. The intermediate water layer about the halocline (old winter water) was characterized by exceptionally high temperatures (4-5 ºC). Normally the temperature of this layer varies between 2 and 4 °C.
Relating to previous year's the oxygen content in the deep water of the Bornholm basin and eastern Gotland basin has increased significantly resulting from major inflows events in 2014. Aerobic conditions were recorded in the bottom layer in the whole area of the Bornholm basin and Stolpe Channel as well as in the eastern Gotland basin at water depth of about 120 m (Figure 7, 8 and 9).

4. Discussion

The contribution of the new incoming year-class of sprat (<10 cm) is very high especially in SD 27, 28 and 29 indicating a strong sprat year class 2014. The results of the length distributions of herring in Subdivisions 25 and 28 also indicate a strong incoming year class 2014 for this specie.

At spring survey time sprat in the Baltic basins are usually concentrated below the halocline. This distribution pattern could again be recorded in the Bornholm basin in 2015. By contrast in the southern Gotland basin fish schools were distributed in the whole water column between 10 and 80 m water dept.
Water layers with temperature < 3.5 ° C can prevent the migration of sprat in upper water layer. The weak form of the intermediate winter water layer in 2014 and 2015 could explain abnormal vertical distribution pattern of sprat in some parts of the investigated area (Figure 7).

5. References

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.

6. Figures and Tables

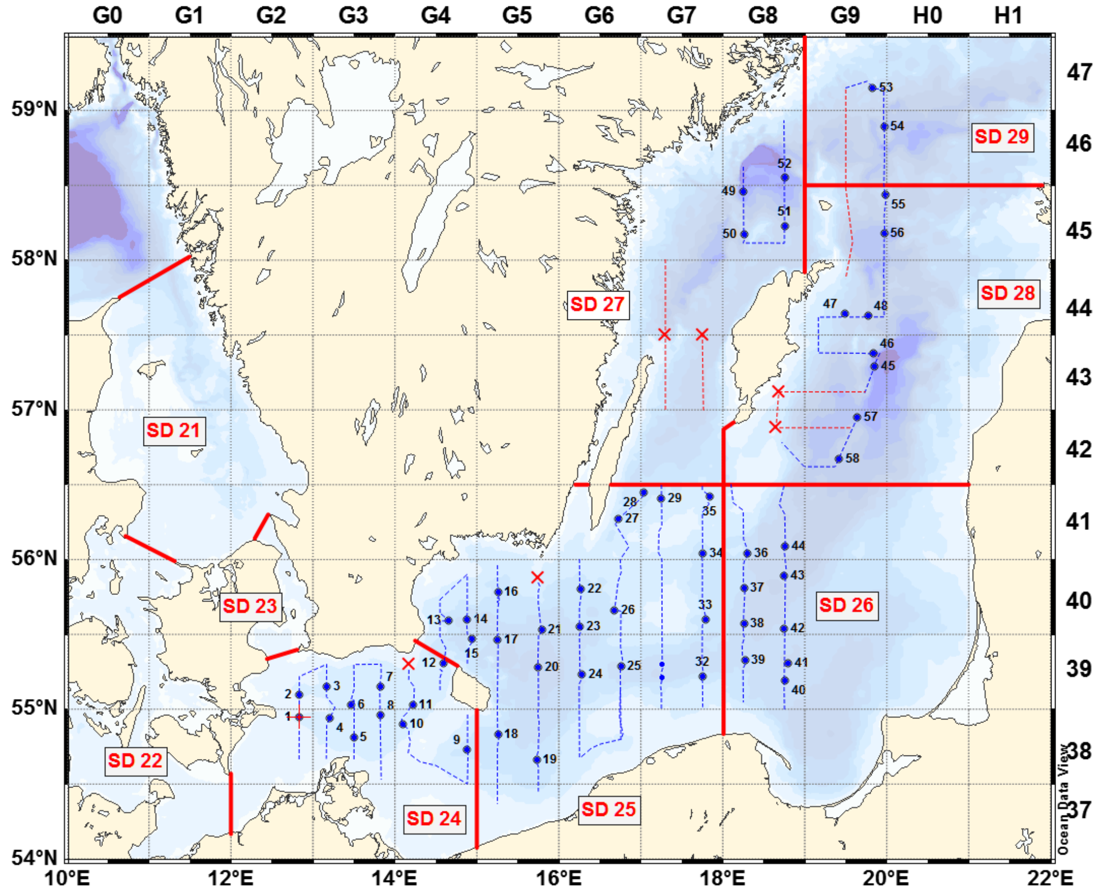


Figure 1: FRV "W. Herwig" cruise 384/2015. Hydroacoustic tracks and trawl stations (by Swedish authorities not approved tracks and stations are red marked).

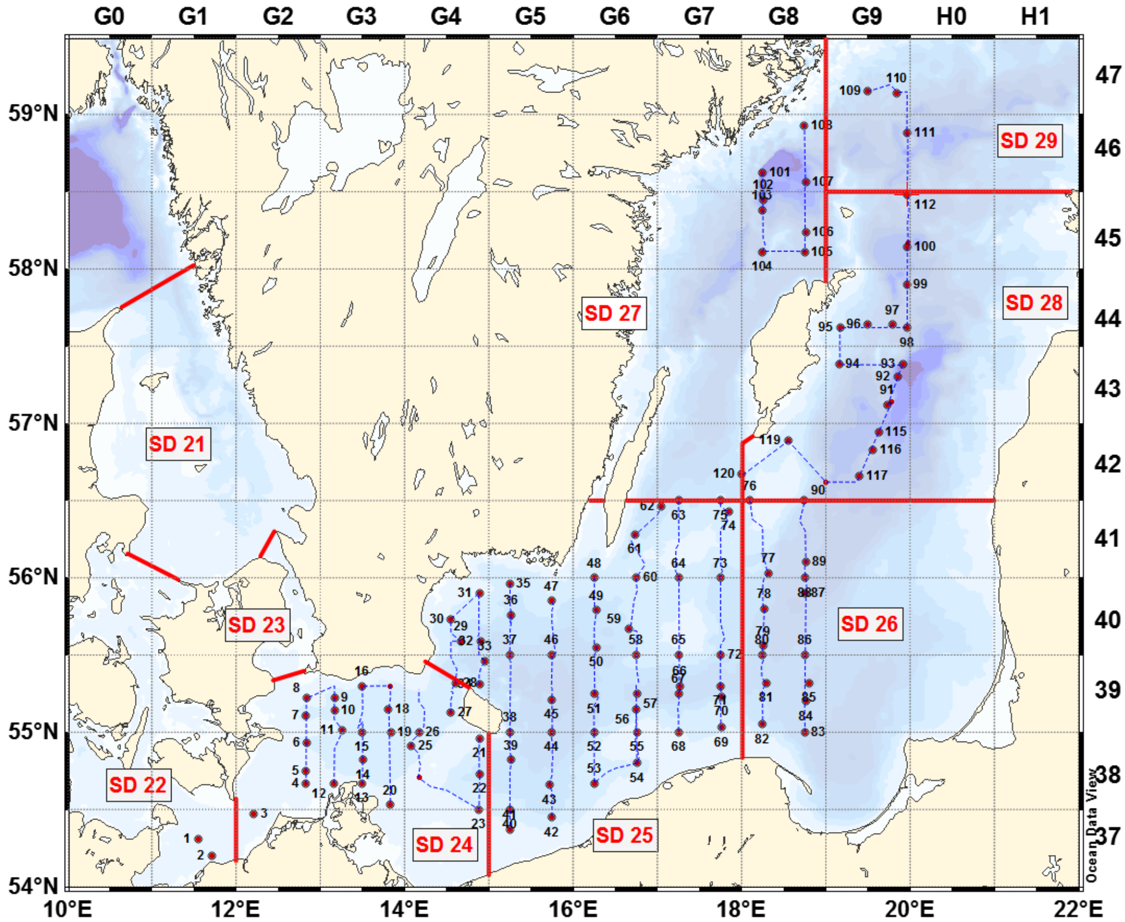


Figure 2: FRV "W. Herwig" cruise 384/2015. CTD- and bottle-stations on the hydroacoustic transects.

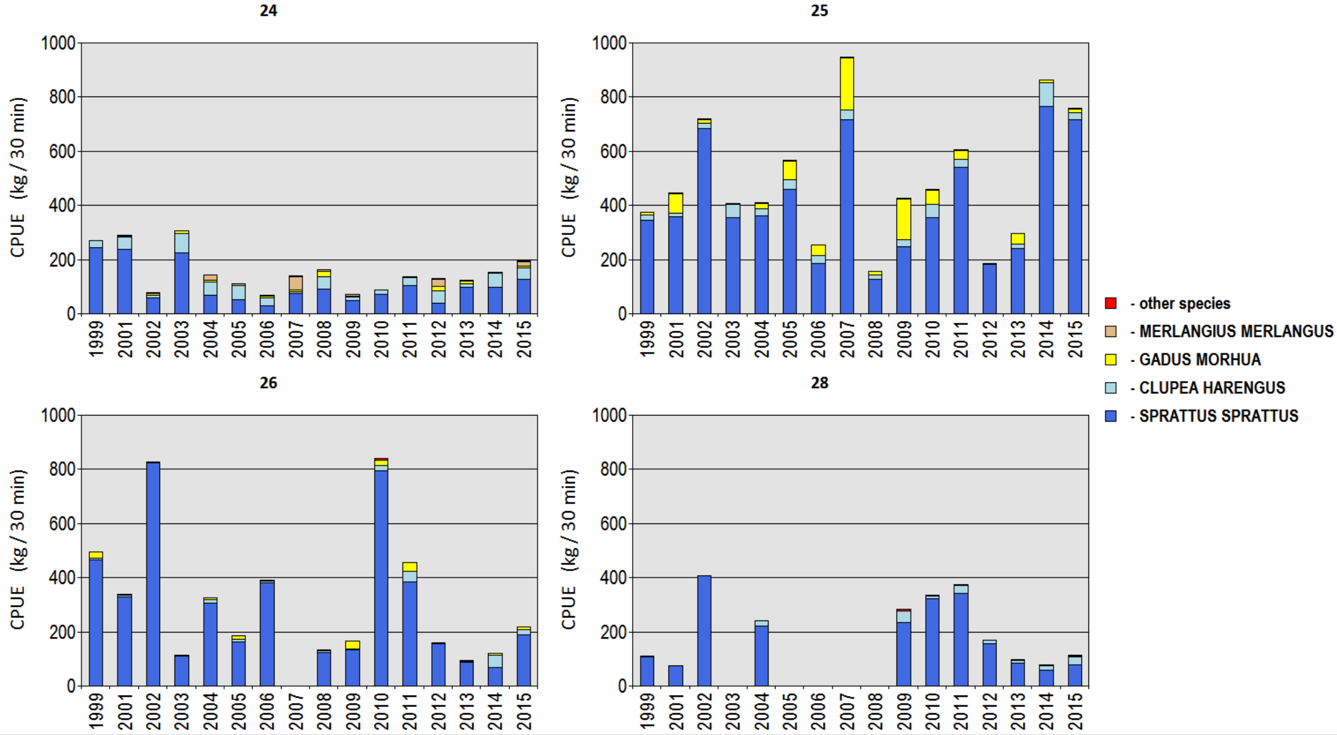


Figure 3: FRV “W. Herwig” cruise 384/2015. CPUE (kg/0,5 hour) compared to previous years (1999-2014).

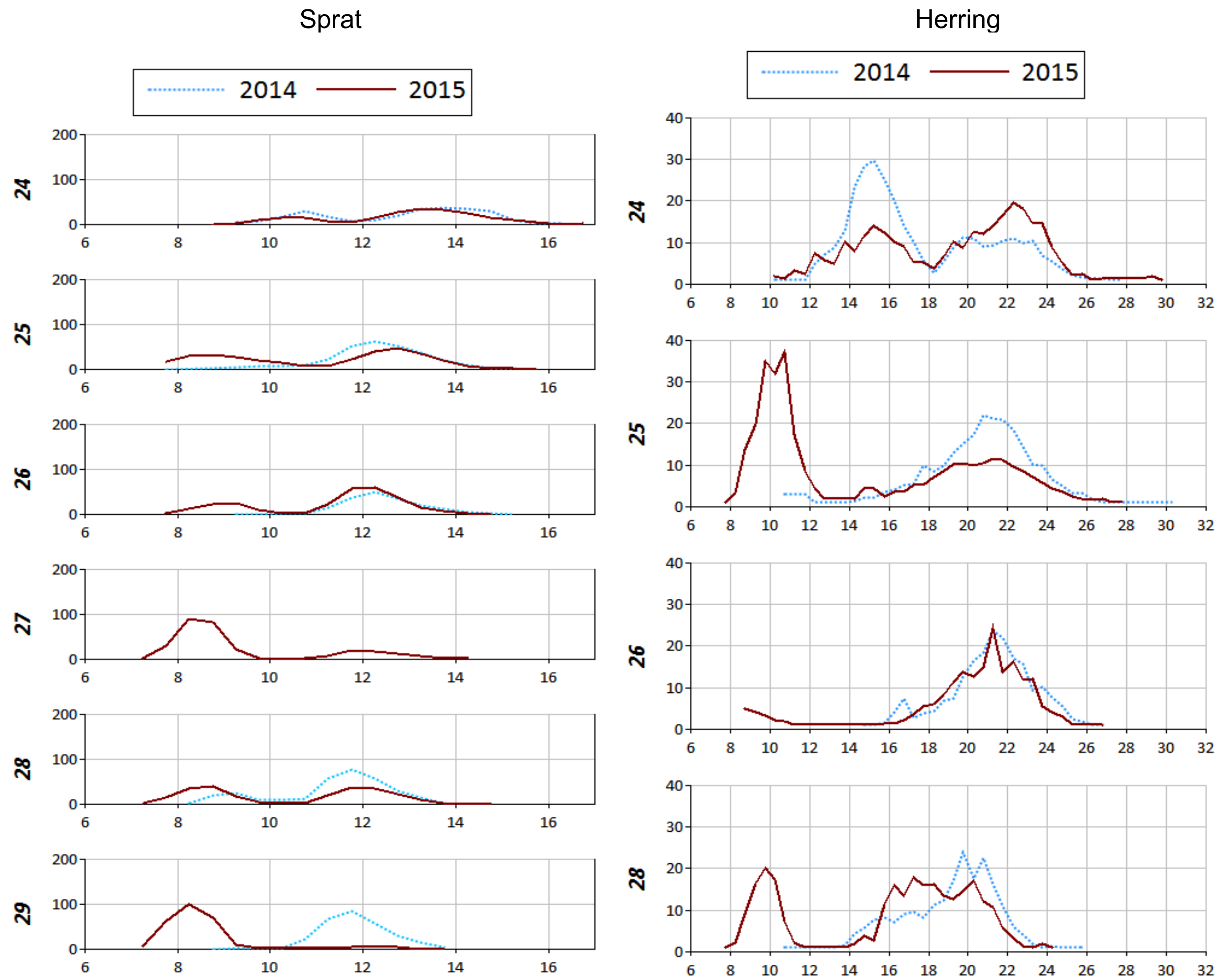


Figure 4: Length distribution in numbers of sprat (left) and herring (right) per Subdivisions in May 2014 and 2015.

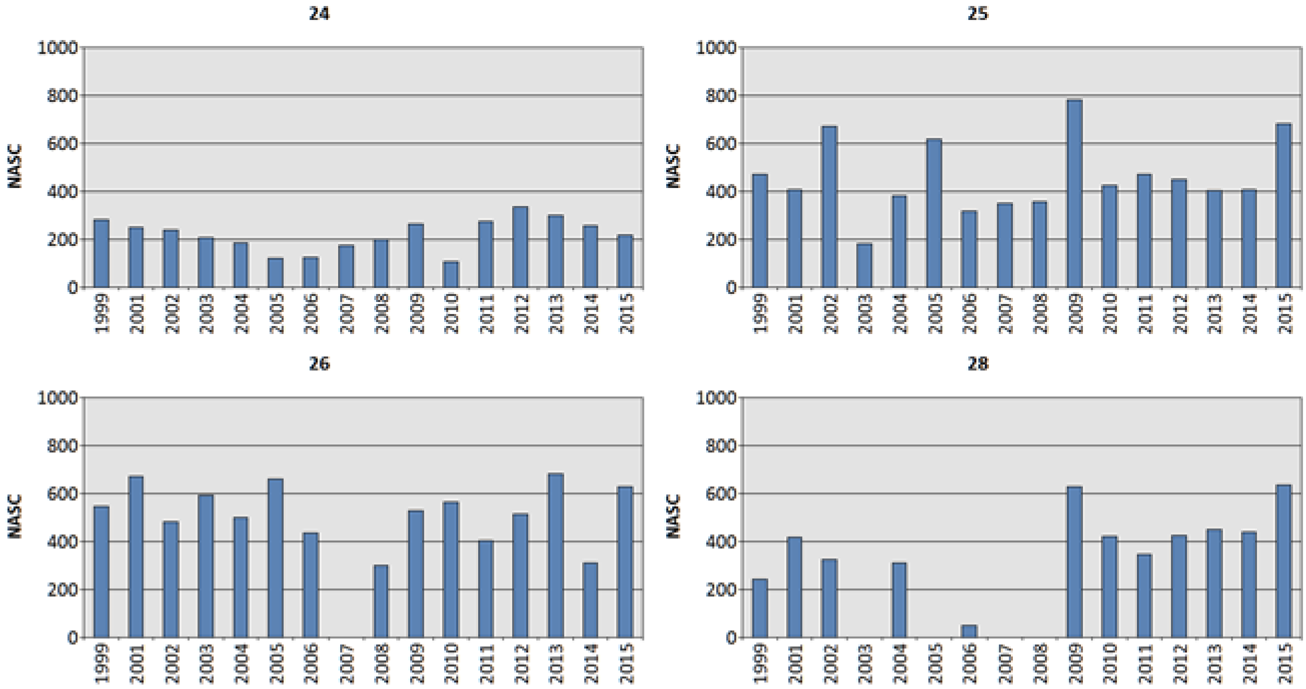


Figure 5: FRV “W. Herwig” cruise 384/2015. NASC per Sub-division compared to previous years (1999-2015).

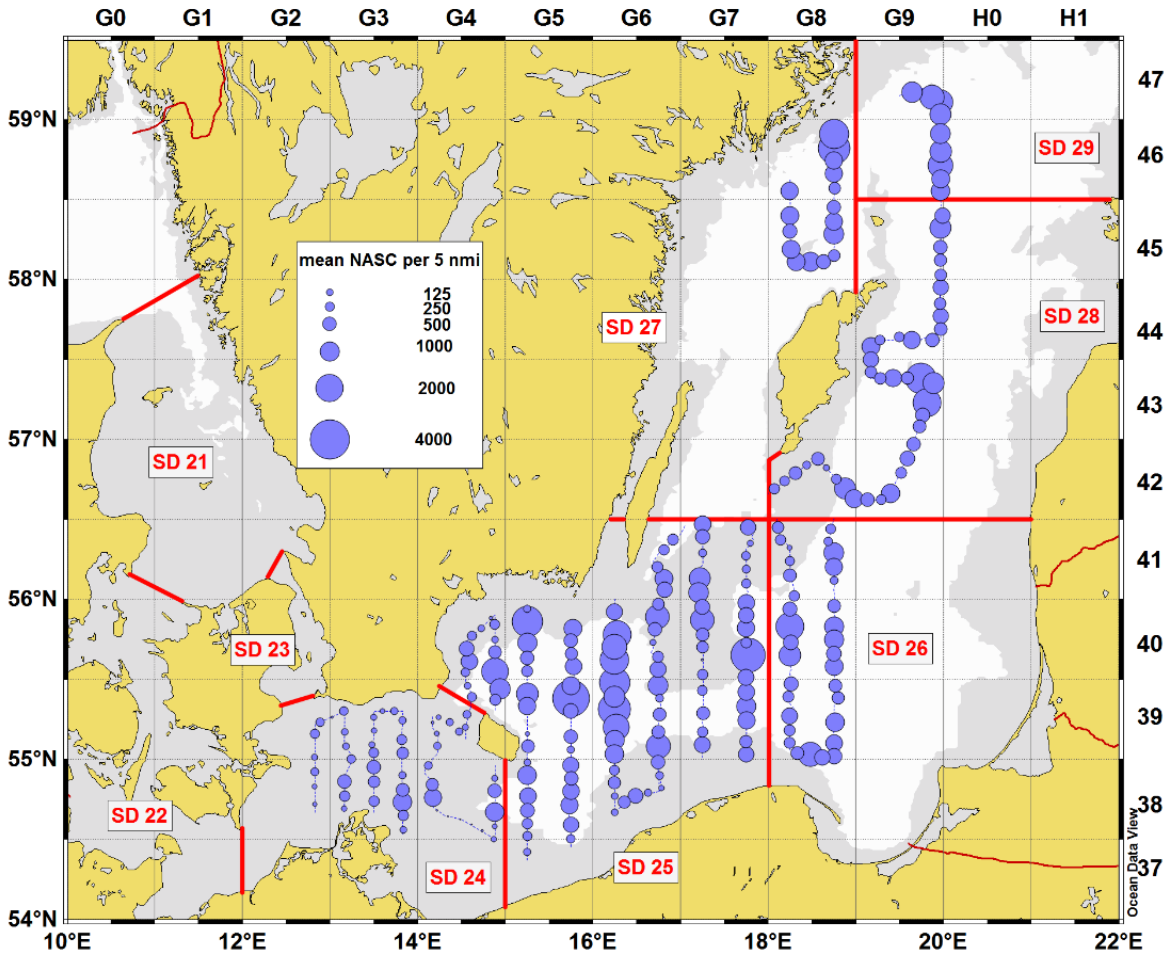


Figure 6: FRV “W. Herwig” cruise 384/2015. Echo distribution along the hydroacoustic transects. Shown is the mean nautical area backscattering coefficient NASC per 5 n.mi. interval.

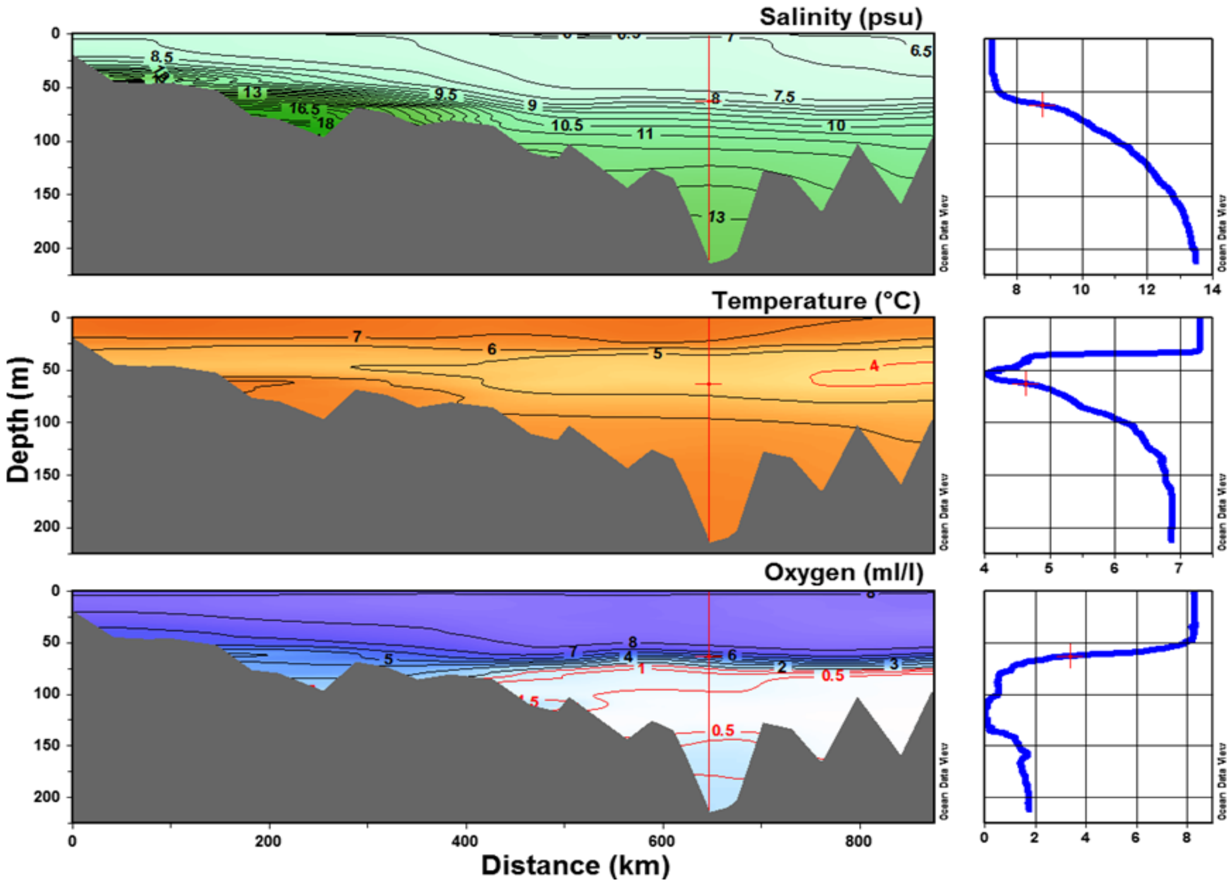


Figure 7: FRV "W. Herwig" cruise 384/2015. Vertical distribution of salinity, temperature and oxygen on a transect from west to east through the investigated area.

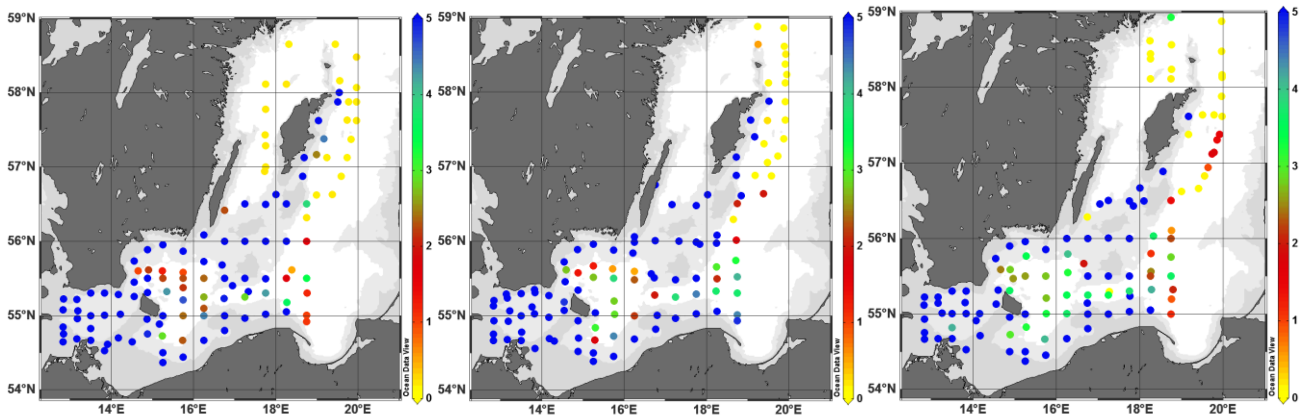


Figure 8: FRV "W. Herwig" cruise 384/2015. Oxygen content in the bottom-near water on the CTD-stations (right) compared to previous two years (left: SB672/2013; middle: 374/2014).

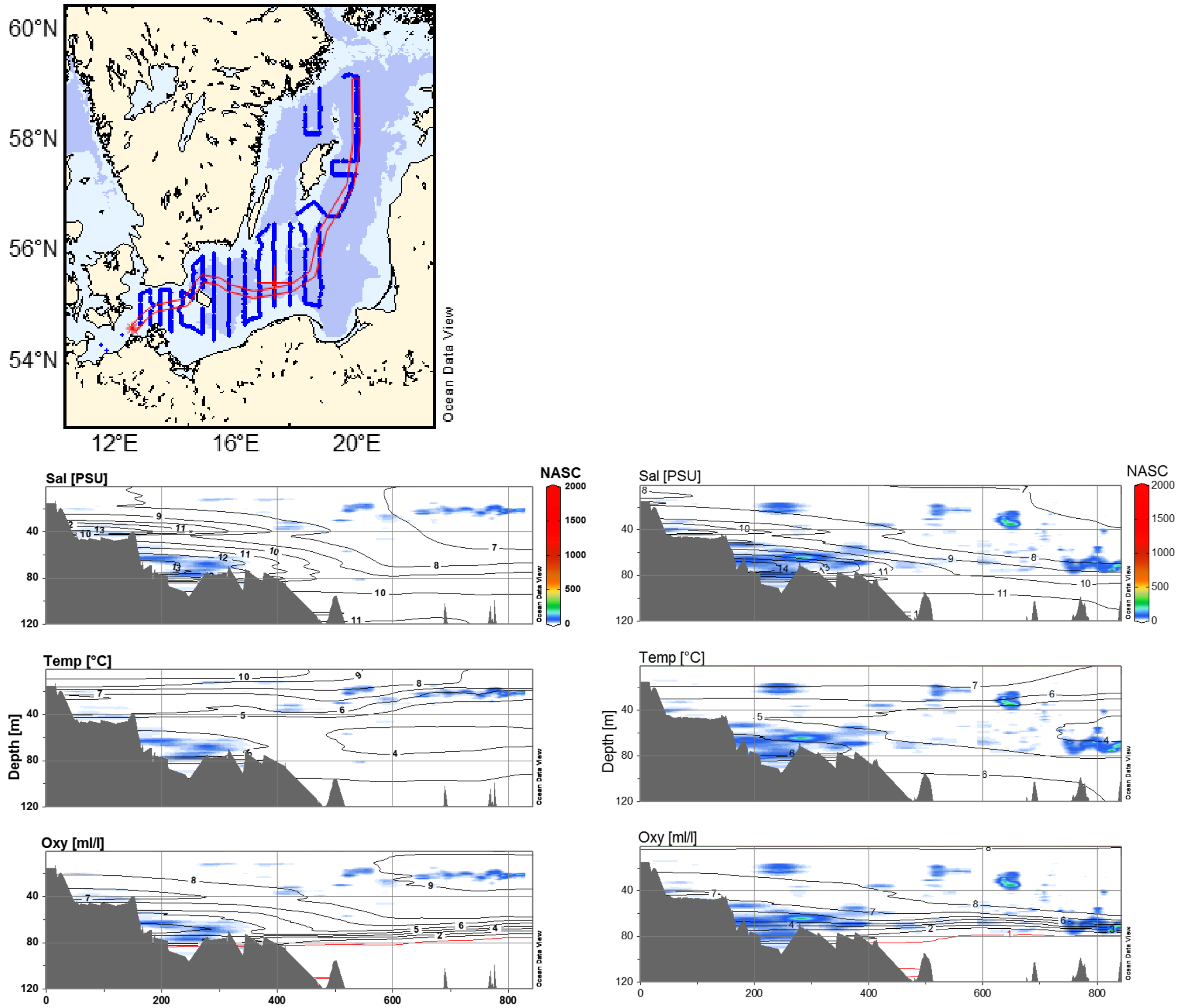


Figure 9: The echoes of fish (blue clouds) related to vertical distribution of salinity, temperature and oxygen on a transect through the investigated area in 2014 (left) and 2015 (right). *05_Sect_Scatter_Overlay_SaSTO.xview*

Table 1: Catch composition (kg/0.5 h) per fishing haul (Cruise No. 384 of FRV "WALTHER HERWIG III", May 2015)

station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
ICES-subdivision	24	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	25
rectangle	38G2	39G2	39G3	38G3	38G3	39G3	39G3	38G3	38G4	38G4	39G4	39G4	40G4	40G4	39G4	40G5	39G5	38G5	38G5	39G5	40G5	40G6	40G6	39G6	39G6	40G6	41G6	41G7	41G7
trawl-typ	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205
# cod-end	10	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	6
trawl-time	30	30	31	30	30	46	40	30	30	40	30	30	30	30	30	30	20	30	30	20	30	30	20	15	30	30	30	30	30
bottom-depth	30	31	37	46.5	44	45	44.5	47	57	40	47	53.5	69	77.5	74.5	54.5	85.5	68.5	61	95	81.5	58	74	72.5	74.5	56	58	62	50
mean-headlineDepth	10	9.5	14	25	22.5	24.5	22	28.5	43	20	26	35.5	48.5	62.5	53	38.5	68	51.5	44	73	61.5	41	55	54.5	49.5	38	31	43.5	32
trawl-distance	1.87	1.90	1.91	1.84	1.77	2.56	2.25	1.70	1.90	2.51	1.69	1.95	1.82	1.68	1.81	1.81	1.19	1.80	1.83	1.14	1.57	1.67	1.23	0.91	1.72	1.72	1.83	1.72	1.85
CLUPEA HARENGUS	18.77	7.28	2.11	45.42	10.76	11.20	23.19	24.70	68.50	12.78	89.50	203.55	42.88	19.75	20.68	66.48	27.38	56.79	25.51	10.02	13.91	50.89	13.31	9.45	23.01	58.70	5.25	17.89	35.70
CYCLOPTERUS LUMPUS		0.22		0.35		0.55	0.26	0.27			0.58	1.39							0.27					0.99					
ENGRAULIS ENCRASICOLUS													0.27				0.05	0.71			0.29		0.44	1.08		0.10			
GADUS MORHUA				6.42		0.50	2.06	19.79	9.77	0.18	3.40	1.94	0.69	1.38	1.27	6.06		18.75	35.49	2.13			0.68	0.78	11.40	0.46			
GASTEROSTEUS ACULEATUS													1.11	0.35		0.26						0.56					7.25	2.47	2.30
HYPEROPLUS LANCEOLATUS					0.04			0.02																			0.04		
MERLANGIUS MERLANGUS				40.84	0.29	1.64	53.14	24.90	1.21		0.29							3.35	1.19										
PLATICHTHYS FLESUS								0.13				0.48																	
PUNGITIUS PUNGITIUS																											0.00		
SCOMBER SCOMBRUS																		7.50	4.96				0.49	2.33					
SPRATTUS SPRATTUS	2.93	0.48	0.02	11.30	218.81	30.34	17.30	183.32	808.15	92.89	108.35	55.62	563.31	387.18	1 538.53	708.55	1 149.57	620.64	507.75	1 452.75	765.69	374.46	2 208.63	2 215.86	441.59	697.93	102.12	257.05	282.11
total	21.70	7.98	2.13	104.33	229.89	44.23	95.95	253.13	887.63	105.85	202.11	262.98	608.24	408.65	1 560.47	781.36	1 177.00	707.75	575.17	1 464.90	779.89	425.91	2 223.54	2 230.49	476.00	757.18	114.66	277.41	320.11

station	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	49	50	51	52	45	46	47	48	55	56	57	58	53	54
ICES-subdivision	25	25	25	25	25	25	26	26	26	26	26	26	26	26	26	27	27	27	27	28	28	28	28	28	28	28	28	29	29
rectangle	39G7	39G7	39G7	40G7	41G7	41G7	41G8	40G8	40G8	39G8	39G8	39G8	40G8	40G8	41G8	45G8	45G8	45G8	46G8	43G9	43G9	44G9	44G9	45G9	45G9	42G9	42G9	47G9	46G9
trawl-typ	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	PSN205	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	6	6	6
trawl-time	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
bottom-depth	75	88.5	57.5	60	61.5	52	70.5	79	87.5	80.5	92.5	91	85.5	112.5	111.5	169.5	105.5	106	197	215.5	200	91.5	117	100.5	171.5	170	128	82	154
mean-headlineDepth	51	68	33	37	38	33.5	49.5	40.5	62	49	65.5	48.5	61.5	61.5	68	54.5	57.5	60	58.5	64.5	22.5	57.5	15.5	67	62.5	63	64.5	49	62.5
trawl-distance	1.65	1.68	1.78	1.91	1.77	1.95	1.81	1.87	1.81	1.86	1.77	1.79	1.76	1.75	1.69	1.75	1.78	0.70	1.74	1.67	1.90	1.71	1.90	1.79	1.81	1.83	1.83	1.83	1.80
CLUPEA HARENGUS	10.97	34.65	25.14	1.85	18.89	14.97	69.66	0.53	11.80	29.95	1.36		11.50	4.30	29.06	17.01	113.57	76.13	46.21	33.84	2.02	55.60	0.06	72.06	22.52	43.28	7.45	59.57	58.48
CYCLOPTERUS LUMPUS																													
ENGRAULIS ENCRASICOLUS																													
GADUS MORHUA	48.07	10.53				0.80	0.23		1.18	0.54	36.30	1.65	19.12	6.60	2.38		0.34	1.12	0.47	9.54		1.69		0.20	0.20	4.04	3.72	0.01	
GASTEROSTEUS ACULEATUS	0.02		0.01		0.11	0.05	0.06	0.08		0.01			0.01	0.19	0.16	0.83	0.24	0.50	0.42	0.37	1.10	0.85	10.70	1.26	0.31	0.36	0.07	0.93	0.59
HYPEROPLUS LANCEOLATUS																							0.01						
MERLANGIUS MERLANGUS																													
PLATICHTHYS FLESUS											0.27	0.27			0.33			0.30		0.39		0.11		0.31		0.27	0.43		
PUNGITIUS PUNGITIUS																													
SCOMBER SCOMBRUS																													
SPRATTUS SPRATTUS	170.10	226.52	496.56	943.86	247.53	155.60	118.43	279.61	60.66	185.40	25.36	398.42	117.18	292.32	235.01	23.61	147.08	34.78	31.61	77.14	185.60	35.48	9.82	108.97	27.44	25.61	157.39	53.97	71.63
total	229.16	271.70	521.70	945.71	266.54	171.43	188.39	280.21	73.64	215.90	63.29	400.33	147.80	303.41	266.94	41.46	261.22	112.83	78.71	121.28	188.71	93.73	20.59	182.80	50.46	73.55	169.05	114.48	130.70

Table 2: Survey statistics of the Cruise No. 384 of RV "W. Herwig III" in May 2015

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	96.2	3.201	250.23	80.53	19.47	0	201.52	48.71	0
24	38G3	865.7	373.2	2.581	1251.89	20.42	76.79	0.26	255.59	961.28	3.21
24	38G4	1034.8	237.1	1.724	1422.91	2.85	97.12	0.03	40.55	1381.92	0.38
24	39G2	406.1	177.4	3.201	225.01	80.53	19.47	0	181.21	43.8	0
24	39G3	765	168.3	3.577	359.85	44.23	52.52	0.09	159.18	188.99	0.34
24	39G4	524.8	119.3	2.521	248.29	33.36	66.57	0.06	82.82	165.3	0.16
25	38G5	1035.7	583.4	1.718	3516.92	1.41	98.4	0.17	49.55	3460.68	6.03
25	38G6	940.2	316.1	1.678	1771.36	1.13	98.71	0.15	20.01	1748.53	2.73
25	39G4	287.3	443.6	2.166	588.35	24.75	75.22	0.03	145.62	442.55	0.18
25	39G5	979	812.4	1.505	5284.65	0.35	99.65	0	18.31	5266.22	0.12
25	39G6	1026	1184.2	1.546	7858.59	0.65	99.32	0.03	51.02	7804.83	2.74
25	39G7	1026	594.2	1.557	3915.34	1.77	97.92	0.29	69.29	3833.78	11.36
25	40G4	677.2	473.8	1.516	2116.43	2.71	96.45	0.01	57.32	2041.3	0.19
25	40G5	1012.9	779.6	1.197	6596.97	1.45	98.51	0.01	95.41	6498.63	0.55
25	40G6	1013	1046.4	1.274	8320.2	2.02	97.82	0	167.89	8138.49	0.05
25	40G7	1013	817.2	1.12	7391.1	1.24	98.71	0	91.95	7295.96	0
25	41G6	764.4	489.8	0.658	5690.37	2.29	79.76	0	130.48	4538.52	0
25	41G7	1000	476.8	1.103	4322.39	3.98	94.35	0	171.95	4078.31	0.07
26	39G8	1026	642	1.72	3829.72	1.25	97.66	1.08	47.87	3740.12	41.34
26	40G8	1013	892.7	1.276	7086.79	1.37	98.44	0.11	97.24	6976.56	7.54
26	41G8	1000	385.7	1.428	2701.05	5.99	93.78	0.03	161.69	2533.11	0.78
27	45G8	947.2	734.2	1.012	6872.25	33.24	63.99	0.01	2284.61	4397.52	0.88
27	46G8	884.8	1317.4	1.117	10435.57	29.43	65.95	0.02	3071.01	6882.24	2.01
28	42G8	945.4	457.2	1.418	3048.42	3.92	95.88	0.05	119.35	2922.78	1.37
28	42G9	986.9	531.9	1.519	3455.64	13.1	84.59	0.16	452.56	2923.09	5.67
28	43G9	973.7	925.8	1.269	7103.33	5.42	92.25	0.2	384.83	6552.57	14.29
28	44G9	876.6	548.5	1.02	4713.87	15.75	81.55	0.02	742.59	3844.21	0.85
28	45G9	924.5	648.7	1.201	4993.69	17.66	79.25	0.01	881.83	3957.55	0.51
29	46G9	933.8	1147	0.833	12857.63	31.05	67.5	0	3992.05	8679.51	0.24
29	47G9	876.2	1310	0.833	13779.59	31.05	67.5	0	4278.3	9301.87	0.26

Table 3: Estimated numbers (millions) of sprat on Cruise No. 384 of RV “W. Herwig III” in May 2015

	Age-group								
Subdivision/rectangle	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8+**	**Total**
24/38G2	3.21	6.90	7.50	12.16	5.99	6.68	4.53	1.65	48.62
24/38G3	291.68	236.44	113.39	139.16	60.00	62.98	43.57	14.32	961.54
24/38G4	169.45	587.13	211.64	229.45	86.74	59.75	31.74	6.02	1381.92
24/39G2	2.89	6.20	6.75	10.94	5.39	6.01	4.08	1.48	43.74
24/39G3	2.70	49.73	37.03	49.53	19.38	13.78	10.51	6.22	188.88
24/39G4	25.00	60.69	25.03	28.17	10.65	9.48	5.41	0.76	165.19
25/38G5	243.18	265.52	1007.46	647.24	685.78	319.63	190.13	97.71	3456.65
25/38G6	33.54	219.43	597.68	339.51	304.27	134.35	79.11	40.61	1748.50
25/39G4	67.55	32.28	110.05	78.75	78.96	38.62	24.59	11.68	442.48
25/39G5	516.90	784.10	1945.06	962.41	587.66	280.16	110.04	79.82	5266.15
25/39G6	344.30	1246.65	3018.12	1493.39	993.84	402.89	171.49	132.27	7802.95
25/39G7	449.13	712.48	1452.86	646.60	327.58	154.52	45.31	45.32	3833.80
25/40G4	347.85	241.55	629.80	339.36	271.17	110.91	62.33	37.93	2040.90
25/40G5	3536.47	500.98	1236.17	595.96	356.37	173.08	51.71	46.73	6497.47
25/40G6	3740.44	767.19	1767.90	868.82	556.89	258.97	103.55	73.91	8137.67
25/40G7	3804.04	800.36	1398.47	595.55	271.90	134.92	41.87	38.05	7085.16
25/41G6	4134.74	34.99	74.03	34.99	20.19	8.08	2.69	2.69	4312.40
25/41G7	1991.26	454.20	841.97	355.34	166.04	71.84	14.69	26.28	3921.62
26/39G8	255.08	1559.82	956.43	634.52	135.79	127.23	36.86	34.40	3740.13
26/40G8	2114.54	2376.73	1336.18	791.72	149.80	137.88	36.22	33.49	6976.56
26/41G8	617.61	888.26	541.18	333.04	63.95	64.94	12.52	11.62	2533.12
27/45G8	3509.03	229.49	316.20	156.73	29.99	111.28	0.00	44.81	4397.53
27/46G8	4882.34	603.56	746.93	317.50	54.59	205.87	0.00	71.46	6882.25
28/42G8	298.91	385.51	649.82	922.86	314.23	235.17	11.33	104.95	2922.78
28/42G9	547.16	465.38	659.23	782.16	231.02	144.09	0.00	94.05	2923.09
28/43G9	2109.44	966.77	1244.54	1394.03	419.82	247.32	0.00	170.65	6552.57
28/44G9	2700.27	218.16	299.59	364.71	124.40	78.77	7.98	50.33	3844.21
28/45G9	2239.80	358.81	438.53	534.71	161.84	147.05	0.00	76.81	3957.55
29/46G9	8199.23	86.03	212.41	95.81	27.73	58.30	0.00	0.00	8679.51
29/47G9	8787.15	92.20	227.64	102.68	29.72	62.48	0.00	0.00	9301.87

Table 4: Sprat mean weight (g) per age group on Cruise No. 384 of RV “W. Herwig III” in May 2015

	Age-group								
Subdivision/rectangle	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8+**	**Total**
24/38G2	8.23	14.88	18.15	19.32	20.48	20.46	21.10	21.99	18.33
24/38G3	7.17	13.60	16.60	18.10	18.99	20.20	20.79	22.41	13.88
24/38G4	8.00	13.92	15.75	16.46	16.32	18.24	18.98	20.40	14.38
24/39G2	8.23	14.88	18.15	19.32	20.48	20.46	21.10	21.99	18.33
24/39G3	8.40	14.08	17.70	18.62	18.78	19.52	19.98	20.41	17.31
24/39G4	7.36	14.14	16.16	16.82	16.77	18.86	19.08	20.38	14.51
25/38G5	6.38	10.48	12.66	13.82	14.85	15.81	16.43	14.62	13.26
25/38G6	6.54	10.34	12.12	13.20	14.67	15.36	16.21	14.44	12.93
25/39G4	6.39	10.12	12.73	14.31	15.00	16.04	16.42	15.00	12.81
25/39G5	5.78	10.57	11.77	12.51	14.14	13.98	16.10	14.39	11.65
25/39G6	6.31	10.39	11.77	12.46	14.04	13.51	15.63	14.05	11.94
25/39G7	5.10	10.35	11.44	11.98	13.89	13.58	16.00	14.06	10.97
25/40G4	5.82	10.46	12.02	12.99	14.45	14.52	16.02	14.39	11.56
25/40G5	4.97	10.39	11.77	12.29	13.91	13.62	16.02	14.06	8.23
25/40G6	5.22	10.23	11.75	12.48	14.14	13.95	16.06	14.28	8.99
25/40G7	4.20	10.08	11.18	11.82	14.00	13.87	16.28	14.23	7.57
25/41G6	3.53	10.27	11.51	11.97	13.84	13.21	15.36	13.72	3.87
25/41G7	3.82	10.24	11.28	11.74	13.68	13.15	15.69	13.89	7.58
26/39G8	4.59	9.38	10.71	11.69	12.98	13.41	13.37	13.15	10.13
26/40G8	4.03	9.36	10.50	11.44	12.87	13.16	13.40	13.15	8.39
26/41G8	4.20	9.50	10.60	11.40	12.76	13.23	13.39	13.15	8.91
27/45G8	3.31	8.97	10.30	11.33	13.01	12.37	0.00	12.72	4.79
27/46G8	3.30	9.13	10.05	11.10	12.85	11.87	0.00	12.57	5.33
28/42G8	4.10	8.95	10.12	10.86	11.59	12.13	14.00	10.93	9.95
28/42G9	3.66	8.96	9.91	10.63	11.44	11.76	0.00	10.21	9.00
28/43G9	3.88	8.86	9.84	10.60	11.48	11.80	0.00	10.14	8.12
28/44G9	3.48	8.81	9.94	10.73	11.61	12.11	14.00	11.44	5.54
28/45G9	3.35	8.81	9.78	10.73	11.64	12.22	0.00	10.78	6.37
29/46G9	3.14	10.20	9.59	10.15	13.00	11.25	0.00	0.00	3.53
29/47G9	3.14	10.20	9.59	10.15	13.00	11.25	0.00	0.00	3.53

Table 5: Sprat total biomass (t) per age group on Cruise No. 384 of RV "W. Herwig III" in May 2015

	Age-group								
Subdivision/rectangle	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8+**	**Total**
24/38G2	26.42	102.67	136.13	234.93	122.68	136.67	95.58	36.28	891.36
24/38G3	2091.35	3215.58	1882.27	2518.80	1139.40	1272.20	905.82	320.91	13346.33
24/38G4	1355.60	8172.85	3333.33	3776.75	1415.60	1089.84	602.43	122.81	19869.21
24/39G2	23.78	92.26	122.51	211.36	110.39	122.96	86.09	32.55	801.90
24/39G3	22.68	700.20	655.43	922.25	363.96	268.99	209.99	126.95	3270.45
24/39G4	184.00	858.16	404.48	473.82	178.60	178.79	103.22	15.49	2396.56
25/38G5	1551.49	2782.65	12754.44	8944.86	10183.83	5053.35	3123.84	1428.52	45822.98
25/38G6	219.35	2268.91	7243.88	4481.53	4463.64	2063.62	1282.37	586.41	22609.71
25/39G4	431.64	326.67	1400.94	1126.91	1184.40	619.46	403.77	175.20	5668.99
25/39G5	2987.68	8287.94	22893.36	12039.75	8309.51	3916.64	1771.64	1148.61	61355.13
25/39G6	2172.53	12952.69	35523.27	18607.64	13953.51	5443.04	2680.39	1858.39	93191.46
25/39G7	2290.56	7374.17	16620.72	7746.27	4550.09	2098.38	724.96	637.20	42042.35
25/40G4	2024.49	2526.61	7570.20	4408.29	3918.41	1610.41	998.53	545.81	23602.75
25/40G5	17576.26	5205.18	14549.72	7324.35	4957.11	2357.35	828.39	657.02	53455.38
25/40G6	19525.10	7848.35	20772.83	10842.87	7874.42	3612.63	1663.01	1055.43	73194.64
25/40G7	15976.97	8067.63	15634.89	7039.40	3806.60	1871.34	681.64	541.45	53619.92
25/41G6	14595.63	359.35	852.09	418.83	279.43	106.74	41.32	36.91	16690.30
25/41G7	7606.61	4651.01	9497.42	4171.69	2271.43	944.70	230.49	365.03	29738.38
26/39G8	1170.82	14631.11	10243.37	7417.54	1762.55	1706.15	492.82	452.36	37876.72
26/40G8	8521.60	22246.19	14029.89	9057.28	1927.93	1814.50	485.35	440.39	58523.13
26/41G8	2593.96	8438.47	5736.51	3796.66	816.00	859.16	167.64	152.80	22561.20
27/45G8	11614.89	2058.53	3256.86	1775.75	390.17	1376.53	0.00	569.98	21042.71
27/46G8	16111.72	5510.50	7506.65	3524.25	701.48	2443.68	0.00	898.25	36696.53
28/42G8	1225.53	3450.31	6576.18	10022.26	3641.93	2852.61	158.62	1147.10	29074.54
28/42G9	2002.61	4169.80	6532.97	8314.36	2642.87	1694.50	0.00	960.25	26317.36
28/43G9	8184.63	8565.58	12246.27	14776.72	4819.53	2918.38	0.00	1730.39	53241.50
28/44G9	9396.94	1921.99	2977.92	3913.34	1444.28	953.90	111.72	575.78	21295.87
28/45G9	7503.33	3161.12	4288.82	5737.44	1883.82	1796.95	0.00	828.01	25199.49
29/46G9	25745.58	877.51	2037.01	972.47	360.49	655.88	0.00	0.00	30648.94
29/47G9	27591.65	940.44	2183.07	1042.20	386.36	702.90	0.00	0.00	32846.62

Survey report for FRV "Solea"

German Acoustic Autumn Survey (GERAS)
01 – 19 October 2015

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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 28th 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 (01.-03.10.2015)

Matthias Schaber	Scientist in charge	TI-SF
Verena Kalter	Acoustics	TI-SF
Ben Stefanowitsch	Acoustics	TI-SF

Acoustic survey (03.-19.10.2015)

Matthias Schaber	Scientist in charge (03.-12.10.2015)	TI-SF
Tomas Gröhsler	Scientist in charge (12.-19.10.2015)	TI-OF
Ina Hennings	Biology (12.-19.10.2015)	TI-OF
Steffen Hagemann	Biology (03.-12.10.2015)	TI-OF
Verena Kalter	Biology	TI-SF
Mario Koth	Biology	TI-OF
Thomas Møller	Biology	DTU Aqua/Denmark
Ben Stefanowitsch	Acoustics	TI-SF

2.2 Narrative

The 710th cruise of FRV "SOLEA" represents the 28th subsequent GERAS survey. FRV "SOLEA" left the port of Rostock/Marienehe on 01 October 2015. The acoustic survey covered the whole area of Subdivisions (SD) 21, 22, 23 and 24. Due to varying weather conditions in the survey area the following survey schedule was accomplished:

- Arkona Sea	(SD 24)	03. - 06.10.
- Belt Sea	(SD 22)	06. - 07.10
- Sound	(SD 23)	07. - 08.10.
- Arkona Sea	(SD 24)	08. - 10.10.
- Belt Sea	(SD 22)	10. - 14.10.
- Kattegat	(SD 21)	14. - 18.10.

The survey ended on 19 October 2015 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 1 230 nm covering a survey area of 13 206 nm^2 (Figure 1).

2.4 Calibration

Calibration of both 38 and 120 kHz transducer took place off Kühlungsborn at good overall weather conditions. The 38 kHz transducer was calibrated three times at two different pulse lengths, the 120 kHz transducer twice at two different pulse lengths. Calibration results were considered very good based on the calculated RMS values.
The calibration procedure was carried out as described in the "Manual for the Baltic International Acoustic Surveys (BIAS)" (ICES, 2014). 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 to account for the more pelagic distribution of clupeids during that time. The main pelagic species of interest were herring and sprat. The acoustic equipment used was a Simrad scientific echosounder EK60 operated at 38 kHz (120 kHz). Specific settings of the hydroacoustic equipment were used as described in the "Manual for the Baltic International Acoustic Survey (BIAS)" (ICES, 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 7-9 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
Engraulis encrasicolus
Gadus morhua
Gasterosteus aculeatus
Melanogrammus aeglefinus
Merlangius merlangus
Sprattus sprattus
Trachinus draco
Trisopterus esmarkii

Exclusion of trawl hauls with very low catch level:

Haul No.	Rectangle	Subdivision (SD)
29, 31	38G0	22
44, 45	41G1	21
47, 49	42G2	21
54	43G1	21

Despite low catch levels of both herring and sprat the following hauls 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:

Haul No.	Rectangle	Subdivision (SD)
12	39G1	22
13, 34	39G0	22
25	37G1	22
32, 33	38G0	22
35	39F9	22
36, 37, 40	40G0	22
38	41G0	22
39	40G1	22
43	41G0	21

Usage of neighbouring trawl information for rectangles which contain only acoustic investigations:

Rectangle/SD to be filled	with Haul No.	of Rectangle/SD
40F9/22	36, 37, 40	40G0/22
39G2/23	17, 24	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 2015.
In almost all rectangles surveyed, mean NASC values per nautical mile were distinctly below the observations recorded in 2014 and also below the long-time survey average. On ICES subdivision scale, mean NASC values were lower than in the previous year in SD 21, 22 and 24 while in SD 23 mean NASC values were higher than in 2014.
In SD 21, mean NASC per 1 nm EDSU was lower in than both the previous year and the long-time survey average in all rectangles surveyed. As in the previous year, increased aggregations of clupeids were measured in the northern part of the Kattegat (rectangle 43G1), but mean and overall NASC values also in this area were significantly lower than in 2014.
Also in SD 22, mean NASC values recorded were lower than the previous year and the survey average in all rectangle surveyed. Notable but small aggregations of clupeids were only recorded in the western part of Kiel Bight (38G0) and north/east of Fehmarn Island (38G1, 37G1) while the distribution was irregular along the rest of the survey transect in the remaining parts of the subdivision.
The large aggregations of big herring that can be observed annually in SD 23 in the Öre Sound were again present in autumn 2015. NASC values in rectangle 40G2 covering the aggregation hotspot in this area were slightly lower than the high levels measured in 2014 but still significantly higher than the long-time survey average. Like in 2014 the herring aggregations expanded north towards the narrow Helsingör/Helsingborg strait into rectangle 41G2 with corresponding NASC values similar to the previous year.
As in 2014, highest fish densities in SD 24 were recorded north and east of Rügen Island and also in the central parts of the Arkona Sea (37G3, 38G3 and southern 39G3). In most of the rectangles surveyed however, mean NASC values were lower than in the previous year. In rectangles 38G4

(southeastern Arkona Sea) and 39G2 (northwestern Arkona Sea, near Öre Sound mouth), NASC values were above the 2014 results (but below average).

3.2 Biological data

In total 59 trawl hauls were conducted:

Subdivision	No. of Hauls
21	19
22	18
23	3
24	19

Altogether, 1 745 individual herring, 904 sprat and 272 European anchovies were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 2-5. Altogether, 39 different species were recorded. Herring were caught in 58, sprat in 54 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 year where sardines (*Sardina pilchardus*) were caught in SD 21, this species did not appear in 2015 catches. As in last year anchovy (*Engraulis encrasicolus*) was present in most catches. Anchovies were caught throughout the survey area (exception SD 23) in 43 out of 59 hauls, including the majority of hauls in SD 21. 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 subdivisions 21, 22, 23 and 24 for the years 2014 and 2015. Compared to results from the previous survey in 2014, the following conclusions for herring can be drawn (Fig. 2):

- Catches in SD 21 show a bimodal distribution characterized by the presence of the incoming year class (<=15 cm) and older herring (>15 cm) in 2015. This is in contrast to 2014, where the fraction of older herring was mostly absent.
- SD 22 shows the incoming year class with only one mode at 10.75 cm while in 2014 two modes were observed at 12.75 cm and 15.25 cm. Older fishes show another mode at 16.75 cm (17.75 cm in 2014). In contrast to previous year this year's results show fewer larger herring.
- In SD 23, larger herring (> 20 cm) dominate catches. The contribution of larger herring is more pronounced compared to the previous year when herring of the incoming year class were present with two modes at ca. 7.25 cm and at 11.75 cm.
- In SD 24, the herring length-frequency distribution is characterized by the incoming year class (<=15.00 cm) and older herring (>15 cm), whereas in 2014 it was dominated by the incoming year class (mode at 11.25 cm) with only few older fishes.
- Altogether, the present contribution of the incoming year class (ca. <15 cm) seemed to be less pronounced than in the previous year.

Relative length-frequency distributions of **sprat** in the years 2014 and 2015 (Fig. 3) can be characterized as follows:

- In SD 21, 22 and 23 catch numbers of the incoming year class (<= 10 cm) are virtually absent in 2015. The catches are now mostly dominated by the contribution of larger sprat (ca. >10 cm). The highest contribution of very large sprat is found in SD 23 (mode at 15.75 cm).
- In SD 24, the sprat length-frequency distribution is similar compared to 2014 with a bimodal distribution of both incoming year class (< 10 cm) and older sprat.
- Altogether, the present contribution of the incoming year class (ca. <10 cm) is very low.

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 from recent years indicated 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 derived from 2005 to 2010 has been developed to quantify the proportion of CBH and WBSSH in the area (Gröhsler et al., 2013; Gröhsler et al., 2016). The estimates of the growth parameters based on baseline samples of WBSSH and CBH in 2011-2014 and in 2015 support the applicability of SF (Oeberst et al., 2013, WD Oeberst et al., 2014; WD Oeberst et al., 2015; WD Oeberst et al., 2016). Beside in SD 24, the SF was finally also applied to ICES rectangle 39G2 (SD 23 area) since biological samples of 39G2 (SD 24 area) were used to raise the corresponding recorded Sa values.
The age-length distribution of herring in SD 22 in 2015 for the first time indicated a higher contribution of older fish of CBH origin. Thus, the SF was also applied in SD 22.
The present results in SD 23 further show an unusual, very high contribution of mature herring (percentage of maturity stages ≥6 in 2015: 31 %; mean 1994-2014: 3 %), which cannot be considered of WBSSH origin. Accordingly, the fraction of 'mature' herring has not been taken into account in the final analysis.

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 2005-2015 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.

3.3.1 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 3.7 x 10^9 fish (Table 7) or 240.5 x 10^3 tonnes (Table 9). For the included area of Subdivisions 22-24 the number of herring was calculated to be 3.35 x 10^9 fish or 229.1 x 10^3 tonnes. In contrast to former years, where the overall abundance estimate was dominated by young herring (age 0-1), the results in 2015 show a higher contribution of age 2 (Figure 2 and Table 7).
The estimated **sprat** stock in Subdivisions 21-24 was 7.4 x 10^9 fish (Table 10) or 75.6 x 10^3 tonnes (Table 12). For the included area of Subdivisions 22-24 the number of sprat was calculated to be 6.8 x 10^9 fish or 69.3 x 10^3 tonnes. The overall abundance estimate was dominated by the incoming year class (Figure 3 and Table 10).

3.3.2 Estimates excl. Central Baltic herring in SDs 22&24 and mature herring in SD 23

Estimated numbers of **herring excluding CBH** in SDs 22-24 or mature herring (stages ≥6) in SD 23 by age group and SD/rectangle for 2015 are given in Table 13. 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 in SDs 22 and 24 from herring GERAS index in 2015 resulted in biomass reductions of 10.1 % with corresponding reductions in numbers of 13.9 % (0.8 and 0.7 %, respectively in 2014; Fig. 5). Further removal of all mature herring in SD 23 from herring GERAS index in 2015 gave an overall biomass reduction of 35.7 % with corresponding reductions in numbers of 25.6 % (Fig. 5).

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 84 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 6.
Like in 2014, surface temperatures were comparatively high especially in the Arkona Sea. Overall surface temperatures ranged from ca. 11.5 °C in SD 21 to 15.5 °C in the southeastern SD 24. Bottom

temperatures in the southern Kattegat were higher than surface temperatures with values around 14.5 °C, while in the northern Kattegat in deeper water temperatures at the seafloor were around 8.5 °C. In the remaining survey area, especially in SD 22 and SD 24, seafloor temperatures were similar to surface temperatures. Surface salinities ranged from ca. 22 psu in the Kattegat to ca. 8 psu in the eastern Arkona Sea. Bottom salinities showed a similar gradient but were generally higher in the range of 35 psu (northern part of survey area in SD 21) to ca. 9.5 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 and southern Mecklenburg Bight as well as the southern part of the little Belt and the eastern Kiel Bight had proceeded to almost anoxic conditions near the seafloor.

4 DISCUSSION

Compared to 2014, the present estimates of **herring (incl. CBH)** show a significant decrease in stock biomass or abundance:

Herring	Difference compared to 2014	
Area	Numbers (%)	Biomass (%)
Subdivisions 22-24	-28	-27
Subdivisions 21-24	-70	-40

The significant decrease in 2015 was mainly driven by lower numbers or biomass estimates of age groups 0-1 and 4-6, which were somehow compensated by higher values of age groups 2-3 and 7-8+. The strength of the new incoming year class in 2015 was the lowest observed in the time series since 1994.

As in the years before 2014, some 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 these 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 2015, such migration of big herring was already partially detected during the survey period, indicating that according hydrographic conditions were met driving herring out of the Sound (see also bottom oxygen concentrations measured in the area, Figure 6). The higher contribution of older herring (ages 3-8+) diminished when excluding CBH by applying the SF but remained clearly detectable. Elimination of CHB in SD 24 lead – regarding the GERAS index covering the standard survey area - to differences of -9.9 % in numbers or -13.6 % in biomass.

The overall decrease in numbers and biomass was also evident in SD 22, showing far lower estimates of age groups 0 and 1 than in 2014. Before 2014 this area was characterised by almost exclusively small, young herring. Since 2014 the amount of older, small sized herring (TL < 20 cm and ages 3-8) - most likely of CBH origin – steadily increased and now showed the highest contribution in 2015. Therefore it was decided for the first time in 2015 to apply the SF also in SD 22 when compiling the final GERAS index. However, excluding CBH by applying the SF also in SD 22 further lead to only very small differences of <-1 % in numbers or biomass (overall -10.1 % in numbers or -13.9 % in biomass).

As in former years, SD 23, which is seen as an important transition and aggregation area for the WBSSH stock during its spawning migration – showed a high contribution of large herring. However, in contrast to former years, which only gave a small fraction of mature herring (maturity stages >=6: mean contribution 1994 – 2014: 3 %), this year's estimates increased to 31 %. The presence of distinct numbers of mature herring in SD 23 most likely could be related to North Sea autumn spawning herring, which could have migrated into this area, probably driven by prolonged inflow events bringing high salinity water masses into this area. This would not be in contrast to other herring already migrating southward out of the Sound driven by hydrographic conditions as immigration by

NSAS and emigration by WBSSH could be driven by temporally decoupled hydrographic factors discussed above. It has been suggested that variations in temperature and salinity, indicating changes in water masses, could affect distribution patterns of herring in the North Sea (Maravelias and Reid, 1995; Röckmann et al., 2011).

Since the present high fraction of mature herring at the survey time of GERAS cannot be assigned to WBSSH, it was decided to remove all mature herring from the final index results. This further reduction lead to overall final differences of --25.6 % in numbers or -35.7 % in biomass.

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6 FIGURES AND TABLES

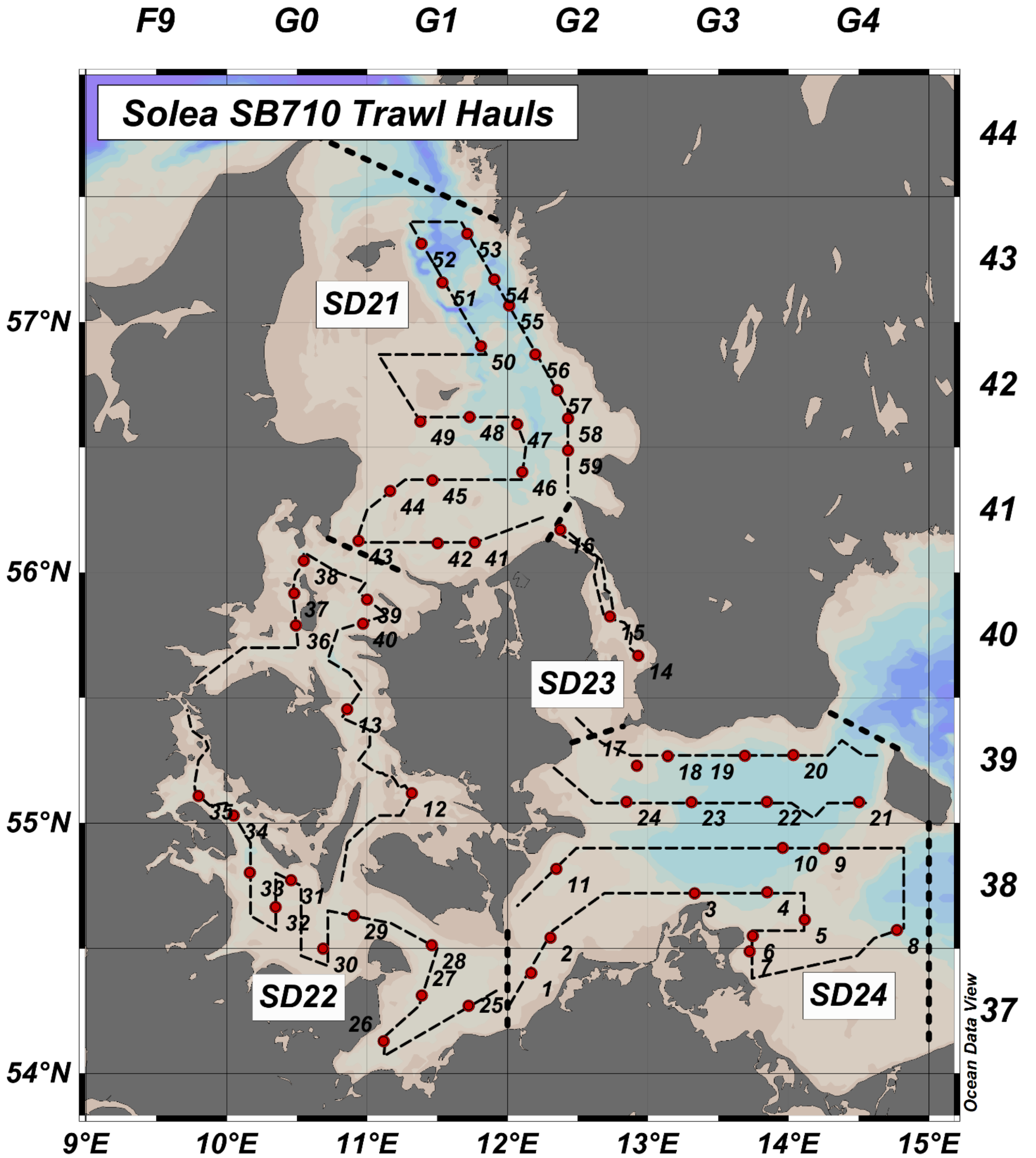

Figure 1: FRV "Solea", cruise 710/2015. Cruise track (lines) and fishery hauls (dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

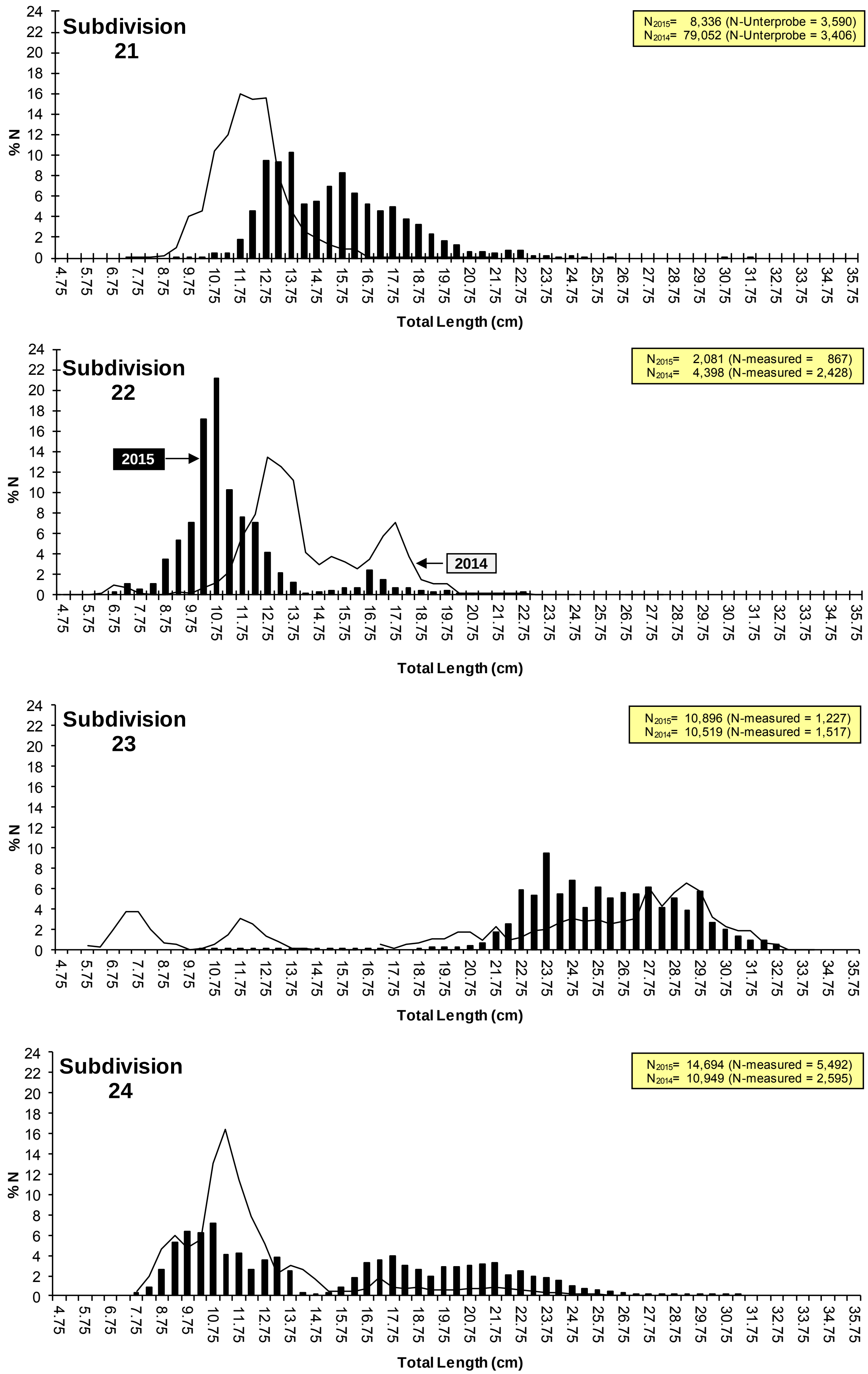

Figure 2: FRV "Solea," cruise 710/2015: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 694/2014).

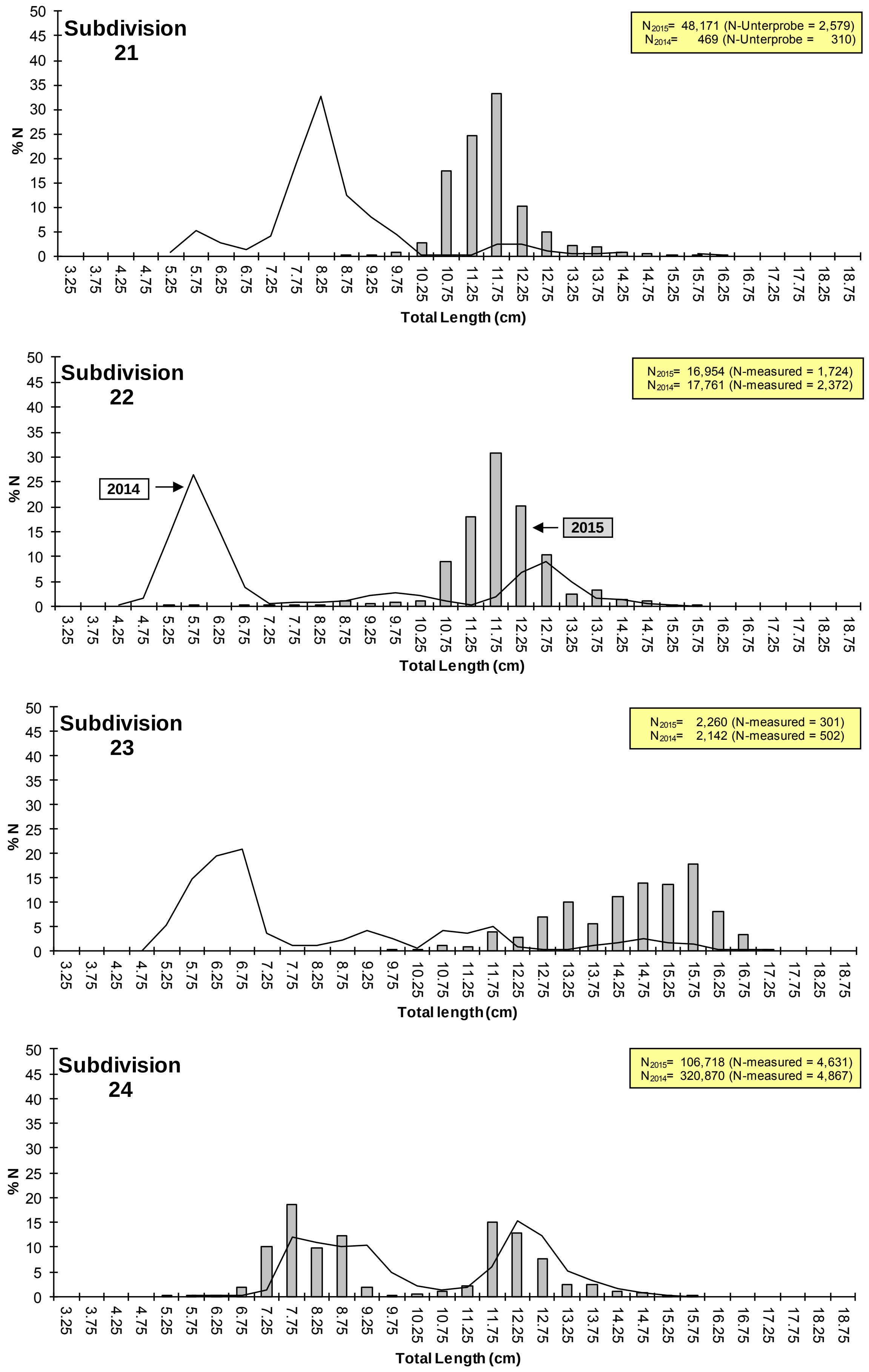

Figure 3: FRV "Solea", cruise 710/2015: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 694/2014).

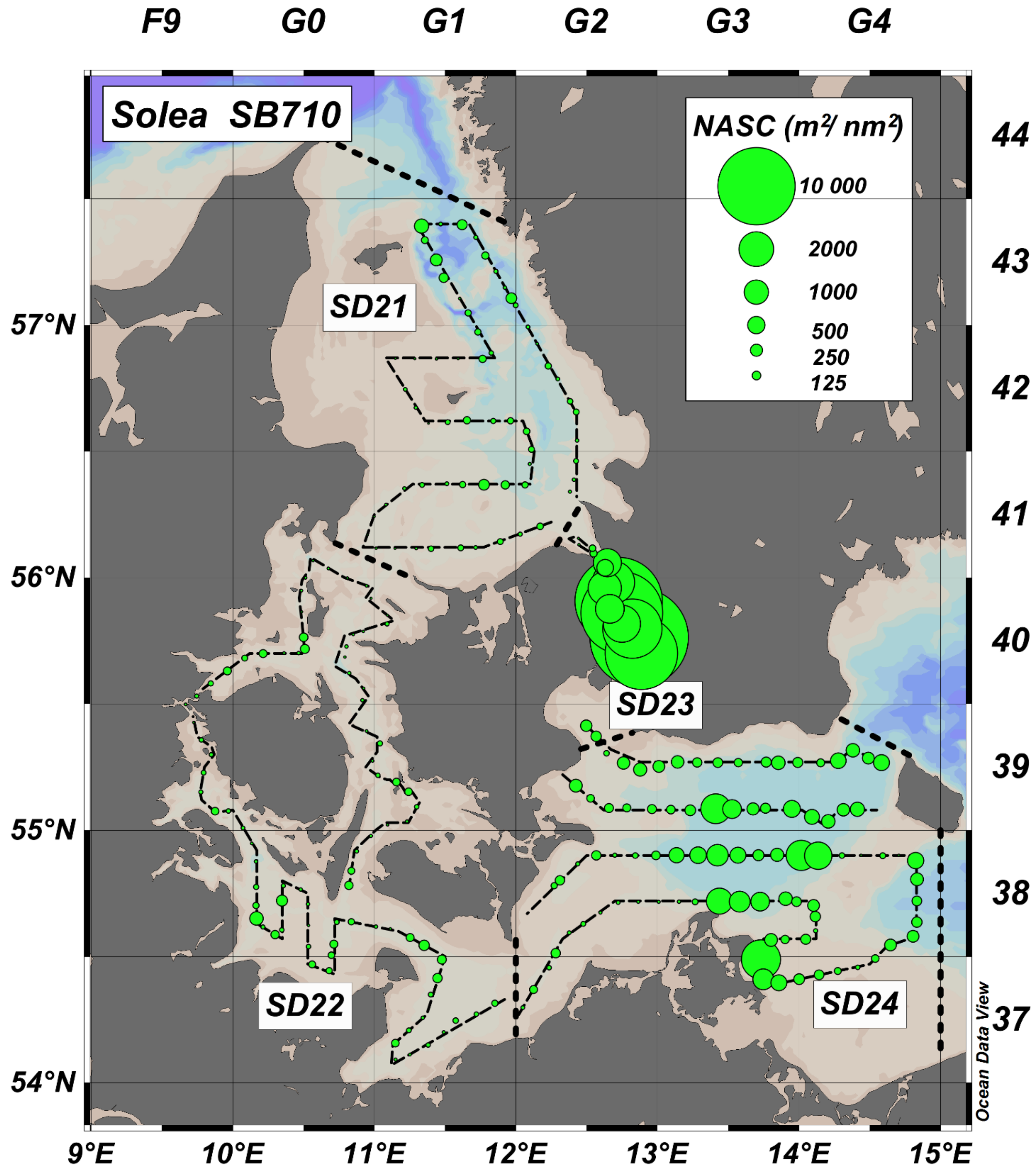

Figure 4: FRV "Solea", cruise 710/2015. Cruisetrack (lines) and mean NASC (5 nm intervals). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

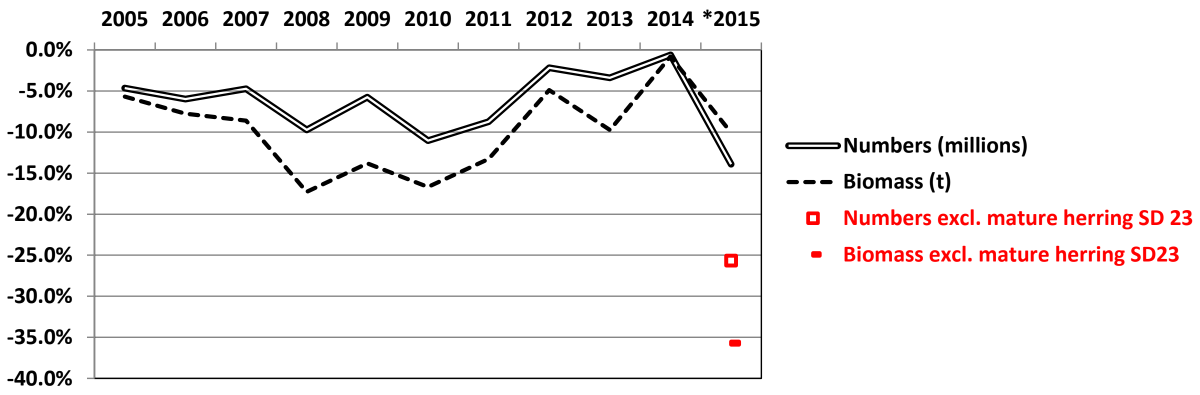

Figure 5 **Relative changes in abundance and biomass of Western Baltic Spring Spawning herring in ICES Subdivisions 21-24 (2005-2015) after application of the stock separation function (SF, Gröhsler et al., 2013) to the abundance and biomass index generated from German acoustic survey data (GERAS).**
***2015 = excl. CBH also in SD 22.**

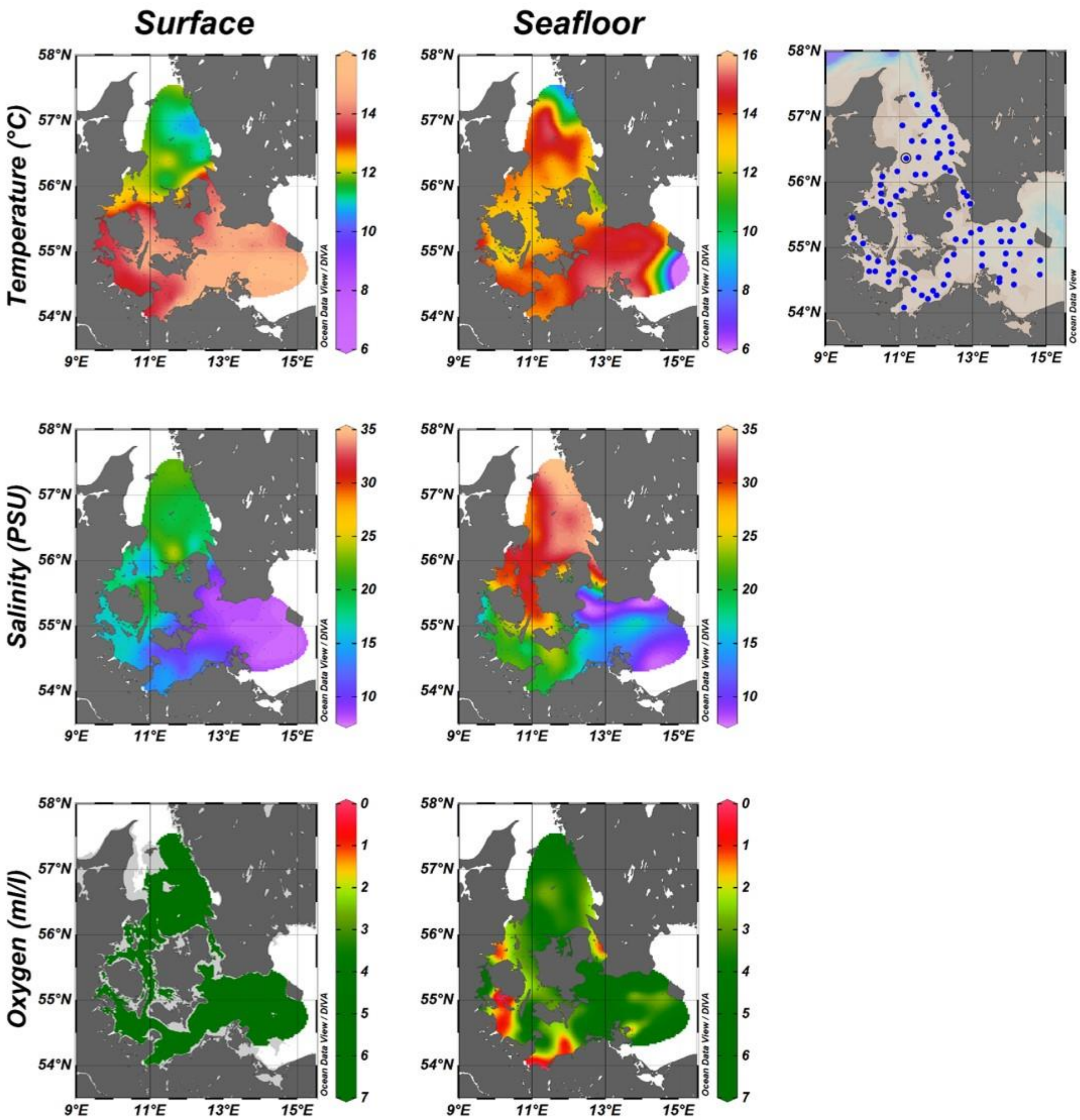

Figure 6: FRV "Solea" cruise 710/2015: Hydrography. CTD stations are depicted as blue dots in the area map (far right). Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right). Surface oxygen concentration levels are displayed at 5 m depth.

Table 1: FRV "Solea", cruise 710/2015. Simrad EK60 calibration report.

```
#  Calibration  Version   2.1.0.12
#
#  Date:  01.10.2015
#
#  Comments: Querab Kühlungsborn, 54°11.5 N, 11°47.8 E, treibend
#
#
#  Reference Target:
#    TS                   -42.37 dB          Min. Distance     16.00 m
#    TS Deviation               2.0 dB       Max. Distance     18.00 m
#
#  Transducer:  ES38B  Serial No.   30545
#    Frequency            38000 Hz       Beamtype                Split
#    Gain                 26.16 dB       Two Way Beam Angle   -20.6 dB
#    Athw. Angle Sens.       21.70       Along. Angle Sens.      21.70
#    Athw. Beam Angle     7.06 deg       Along. Beam Angle    7.03 deg
#    Athw. Offset Angle  -0.03 deg       Along. Offset Angle -0.03 deg
#    SaCorrection         -0.58 dB       Depth                  4.20  m
#
#  Transceiver:  GPT  38 kHz 009072056b06 2-1 ES38B
#    Pulse Duration       1.024 ms       Sample Interval     0.190   m
#    Power                 2000  W       Receiver Bandwidth   2.43 kHz
#
#  Sounder Type:
#    EK60 Version  2.2.0
#
#  TS Detection:
#    Min. Value           -50.0 dB       Min. Spacing            100 %
#    Max. Beam Comp.        6.0 dB       Min. Echolength          80 %
#    Max. Phase Dev.           8.0       Max. Echolength         180 %
#
#  Environment:
#    Absorption Coeff.   4.3 dB/km       Sound Velocity     1487.0 m/s
#
#  Beam Model results:
#    Transducer Gain    = 26.25 dB       SaCorrection       = -0.50 dB
#    Athw. Beam Angle   = 7.16 deg       Along. Beam Angle  = 7.15 deg
#    Athw. Offset Angle =-0.04 deg       Along. Offset Angle=-0.01 deg
#
#  Data deviation from beam model:
#    RMS =    0.21 dB
#    Max =    0.63 dB  No. =   152  Athw. = -2.9 deg  Along =  4.0 deg
#    Min =   -1.26 dB  No. =   133  Athw. =  3.3 deg  Along =  3.2 deg
#
#  Data deviation from polynomial model:
#    RMS =    0.17 dB
#    Max =    0.55 dB  No. =   152  Athw. = -2.9 deg  Along =  4.0 deg
#    Min =   -1.12 dB  No. =   133  Athw. =  3.3 deg  Along =  3.2 deg
```

Table 2: **FRV "Solea", cruise 710/2015. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 21.**

Haul No.	41	42	43	44	45	46	47	48	49	50	51
Species/ICES Rectangle	41G1	41G1	41G0	41G1	41G1	41G2	42G2	42G1	42G1	42G1	43G1
CLUPEA HARENGUS	2.59	55.21	1.55	1.52	1.31	8.87	1.41	8.9	0.18	6.86	5.71
CRANGON CRANGON											
CRYSTALLOGOBIUS LINEARIS											+
CTENOLABRUS RUPESTRIS	0.01										
CYCLOPTERUS LUMPUS	0.19										
ENGRAULIS ENCRASICOLUS	0.01		0.02	0.16	0.02	0.16	0.02	0.82		0.08	0.070
EUTRIGLA GURNARDUS			0.02		0.11			0.22			
GADUS MORHUA				2.30	2.48		0.75				
GASTEROSTEUS ACULEATUS	0.01	0.01									
HIPPOGLOSSOIDES PLATESSOIDES											
LIMANDA LIMANDA	0.06		0.44					4.98	0.11		
LOLIGO FORBESI	0.01	+	0.01	+			+	+		0.05	0.08
MERLANGIUS MERLANGUS	0.01	0.02	0.00	0.01	+	+	0.41	2.71	0.12	0.05	0.07
MERLUCCIUS MERLUCCIUS											
MYSIDACEA											
NEPHROPS NORVEGICUS											
PLEURONECTES PLATESSA								0.09			
POMATOSCHISTUS MINUTUS											0
SCOMBER SCOMBRUS				8.77	16.92	5.66	1.1		7.57	0.64	17.54
SCOPHTHALMUS RHOMBUS											
SEPIOLA											0.01
SPRATTUS SPRATTUS	2.07	1.91	1.31	0.05	0.09	109.16	0.09	216.67		0.07	1.98
SQUALUS ACANTHIAS											6.51
SYNGNATHUS TYPHLE	+										
TRACHINUS DRACO	1.09	0.21	0.07	0.17	0.12	0.2	0.28	7.64	0.43	0.26	2.62
TRACHURUS TRACHURUS	0.03	0.01	+	+	+	0.01	+	+		0.01	0.13
TRISOPTERUS ESMARKI											+
Total	**6.08**	**57.37**	**3.42**	**12.98**	**21.05**	**124.06**	**4.06**	**242.03**	**8.41**	**8.02**	**34.72**
Medusae	4.55	0.78	1.83	3.05	0.00	0.27	0.36	1.34	3.67	0.54	0.03

Haul No.	52	53	54	55	56	57	58	59	Total
Species/ICES Rectangle	43G1	43G1	43G1	43G2	42G2	42G2	42G2	41G2	
CLUPEA HARENGUS	3.58	36.20		5.64	16.64	16.32	5.92	26.72	**205.13**
CRANGON CRANGON		0.07						+	**0.07**
CRYSTALLOGOBIUS LINEARIS			+	+	+		+		**+**
CTENOLABRUS RUPESTRIS									**0.01**
CYCLOPTERUS LUMPUS									**0.19**
ENGRAULIS ENCRASICOLUS	0.02	0.03	0.31	+	0.08	0.05	0.08	0.01	**1.94**
EUTRIGLA GURNARDUS	0.18				0.10	0.04	0.22	0.29	**1.18**
GADUS MORHUA				0.65	3.92	16.00	8.90	9.04	**44.04**
GASTEROSTEUS ACULEATUS									**0.02**
HIPPOGLOSSOIDES PLATESSOIDES	0.02	0.17							**0.19**
LIMANDA LIMANDA	0.13	0.03			0.34	0.37	0.36	0.03	**6.85**
LOLIGO FORBESI	0.04	0.01	0.10	0.01	0.01	0.02	0.05	0.03	**0.42**
MERLANGIUS MERLANGUS	0.61	5.32	0.21	0.59	0.81	0.30	1.25	0.44	**12.93**
MERLUCCIUS MERLUCCIUS		0.14	0.00	0.02		0.23	0.37	0.09	**0.85**
MYSIDACEA	+	0.02	+						**0.02**
NEPHROPS NORVEGICUS				0.05					**0.05**
PLEURONECTES PLATESSA						0.66	1.26		**2.01**
POMATOSCHISTUS MINUTUS		+	+				+		**+**
SCOMBER SCOMBRUS	1.28				0.15	0.16			**59.79**
SCOPHTHALMUS RHOMBUS						0.56			**0.56**
SEPIOLA	0.02	0.01	+	+	0.11		0.03	0.01	**0.19**
SPRATTUS SPRATTUS	9.28	0.46		0.44	61.88	79.34	29.18	26.34	**540.32**
SQUALUS ACANTHIAS		1.35			2.25				**10.11**
SYNGNATHUS TYPHLE									**+**
TRACHINUS DRACO	0.31		0.07	0.9	1.06	1.04	1.05	0.59	**18.11**
TRACHURUS TRACHURUS	0.01	+	+			0.02	0.02		**0.24**
TRISOPTERUS ESMARKI	0.14	0.84		0.01					**0.99**
Total	**15.62**	**44.65**	**0.69**	**8.31**	**87.35**	**115.11**	**48.69**	**63.59**	**906.21**
Medusae	0.12	0.00	0.43	0.10	0.00	0.00	0.00	0.33	**17.40**

+ = < 0.01 kg

Table 3: **FRV "Solea", cruise 710/2015. Catch composition (kg 0.5h[-1]) by trawl haul in SD 22.**

Haul No.	12	13	25	26	27	28	29	30	31	32	33
Species/ICES Rectangle	**39G1**	**39G0**	**37G1**	**37G1**	**37G1**	**38G1**	**38G0**	**37G0**	**38G0**	**38G0**	**38G0**
AGONUS CATAPHRACTUS											
CARCINUS						0.07	0.05				
CLUPEA HARENGUS	0.01	0.11	0.46	1.54	2.49	11.40	0.52	2.62	0.09	0.50	0.51
CRANGON CRANGON									+		+
CRYSTALLOGOBIUS LINEARIS	+						+	+			
CTENOLABRUS RUPESTRIS	0.05										
CYCLOPTERUS LUMPUS							0.32				
ENGRAULIS ENCRASICOLUS	0.09	0.03	0.11	0.03	0.20	3.02	0.72	0.03	0.28	0.72	2.89
GADUS MORHUA					3.27	0.16		5.90			
GASTEROSTEUS ACULEATUS	2.48		0.08		0.03	0.17				0.04	+
GOBIUS NIGER	0.03					0.06					
HIPPOGLOSSOIDES PLATESSOIDES					0.17						
LIMANDA LIMANDA	0.56		0.05		2.58	4.19	0.13	19.26	1.94	3.57	
LOLIGO FORBESI										0.00	
MELANOGRAMMUS AEGLEFINUS				0.66							
MERLANGIUS MERLANGUS			0.11		0.55	0.18		0.39	+	+	0.01
MYOXOCEPHALUS SCORPIUS	0.21										
PLATICHTHYS FLESUS					0.23			6.22	0.42	0.80	
PLEURONECTES PLATESSA								11.35			
POMATOSCHISTUS MINUTUS	0.01				+	+		0.01	+	+	
PSETTA MAXIMA								2.18			
SCOPHTHALMUS RHOMBUS											
SOLEA VULGARIS						0.06		0.36			
SPRATTUS SPRATTUS	+	0.06	7.61	0.06	94.09	41.47	0.05	38.42	0.09	4.59	0.10
SYMPHODUS MELOPS	0.02										
SYNGNATHUS TYPHLE	+					+			+	+	+
TRACHINUS DRACO								0.08		0.02	
TRACHURUS TRACHURUS			0							0	
Total	**3.46**	**0.20**	**8.42**	**2.29**	**103.61**	**60.78**	**1.79**	**86.82**	**2.82**	**10.24**	**3.51**
Medusae	0.01	0.63	2.78	0.33	0.16	0.60	0.49	7.86	4.47	1.22	1.47

Haul No.	34	35	36	37	38	39	40	Total
Species/ICES Rectangle	**39G0**	**39F9**	**40G0**	**40G0**	**41G0**	**40G1**	**40G0**	
AGONUS CATAPHRACTUS						0.02		**0.02**
CARCINUS								**0.12**
CLUPEA HARENGUS	0.05	0.46	0.10	0.12	0.03	0.21	0.03	**21.25**
CRANGON CRANGON								**+**
CRYSTALLOGOBIUS LINEARIS			+					**+**
CTENOLABRUS RUPESTRIS					0.01	+	0.02	**0.08**
CYCLOPTERUS LUMPUS								**0.32**
ENGRAULIS ENCRASICOLUS		0.24	0.02	0.03	0.09	0.01	0.09	**8.60**
GADUS MORHUA					0.09			**9.42**
GASTEROSTEUS ACULEATUS	0.77	4.51		0.01	0.01	+	0.02	**8.12**
GOBIUS NIGER					+			**0.09**
HIPPOGLOSSOIDES PLATESSOIDES								**0.17**
LIMANDA LIMANDA	0.02	0.72		0.06	0.56	0.31	0.08	**34.03**
LOLIGO FORBESI					0.02	0.01	+	**0.03**
MELANOGRAMMUS AEGLEFINUS								**0.66**
MERLANGIUS MERLANGUS		+	0.01	+		+	0.01	**1.26**
MYOXOCEPHALUS SCORPIUS					0.14			**0.35**
PLATICHTHYS FLESUS					0.12			**7.79**
PLEURONECTES PLATESSA								**11.35**
POMATOSCHISTUS MINUTUS						0.00		**0.02**
PSETTA MAXIMA								**2.18**
SCOPHTHALMUS RHOMBUS				0.16				**0.16**
SOLEA VULGARIS								**0.42**
SPRATTUS SPRATTUS	0.14	0.14		0.01		0.72		**187.55**
SYMPHODUS MELOPS							0.10	**0.12**
SYNGNATHUS TYPHLE								**+**
TRACHINUS DRACO				0.04	0.05	1.14	0.09	**1.42**
TRACHURUS TRACHURUS				0.01	+	+		**0.01**
Total	**0.98**	**6.07**	**0.13**	**0.44**	**1.12**	**2.42**	**0.44**	**295.54**
Medusae	0.49	3.23	15.90	6.00	5.15	2.50	0.18	**53.47**

+ = < 0.01 kg

Table 4: FRV "Solea", cruise 710/2015. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 23.

Haul No. Species/ICES Rectangle	14 40G2	15 40G2	16 41G2	Total
CARCINUS	0.07			**0.07**
CLUPEA HARENGUS	644.34	778.58	0.72	**1423.64**
CTENOLABRUS RUPESTRIS			0.02	**0.02**
EUTRIGLA GURNARDUS			0.06	**0.06**
GADUS MORHUA	289.41	114.47		**403.88**
LIMANDA LIMANDA	0.24		6.73	**6.97**
LOLIGO FORBESI			0.01	**0.01**
MELANOGRAMMUS AEGLEFINUS		2.29		**2.29**
MERLANGIUS MERLANGUS		1.27	0.15	**1.42**
PLATICHTHYS FLESUS		0.56		**0.56**
SPRATTUS SPRATTUS	0.85	41.90	0.64	**43.39**
SYNGNATHUS TYPHLE		+		**+**
TRACHINUS DRACO			0.39	**0.39**
TRACHURUS TRACHURUS			+	**+**
Total	**934.91**	**939.07**	**8.72**	**1882.70**
Medusae	0.00	0.00	0.24	**0.24**

+ = < 0.01 kg

Table 5: FRV "Solea", cruise 710/2015. Catch composition (kg $0.5h^{-1}$) by trawl haul in SD 24.

Haul No. Species/ICES Rectangle	1 37G2	2 38G2	3 38G3	4 38G3	5 38G4	6 38G3	7 37G3	8 38G4	9 38G4	10 38G3	11 38G2
AGONUS CATAPHRACTUS											
CLUPEA HARENGUS	1.85	7.05	4.61	10.10	58.99	13.25	52.54	68.34	7.95	12.02	7.74
CRANGON CRANGON											
CRYSTALLOGOBIUS LINEARIS				+							
CYCLOPTERUS LUMPUS		0.32									
ENGRAULIS ENCRASICOLUS	0.05	0.01	0.06		0.04	0.04	0.05				
EUTRIGLA GURNARDUS											
GADUS MORHUA			0.77		20.86	8.06	4.41	2.63	4.48	0.49	
GASTEROSTEUS ACULEATUS		+	+	+							0.19
GOBIUS NIGER											0.03
LEANDER											
LIMANDA LIMANDA			0.46			0.07					0.65
MERLANGIUS MERLANGUS	0.01	0.01	0.20	3.85	0.42	0.19			0.56	2.72	
MYOXOCEPHALUS SCORPIUS								0.18			
OSMERUS EPERLANUS				0.04	0.01	0.06					
PLATICHTHYS FLESUS			0.45	0.84	0.13	1.58	1.06	0.13	0.26	0.16	1.14
PLEURONECTES PLATESSA		0.18	1.64								0.21
POMATOSCHISTUS MINUTUS		+	0.01	+				+	+	+	+
PSETTA MAXIMA											0.68
RUTILUS RUTILUS							3.42				
SCOMBER SCOMBRUS				0.97							
SPRATTUS SPRATTUS	0.47	20.5	108.06	233.89	2.64	51.59	131.01	1.64	6.35	27.26	18.76
SYNGNATHUS TYPHLE											
TRACHINUS DRACO											0.04
TRACHURUS TRACHURUS			0.01								
Total	**2.38**	**28.07**	**116.27**	**249.69**	**83.09**	**74.84**	**192.49**	**72.92**	**19.60**	**42.65**	**29.44**
Medusae	0.99	0.07	0.52	0.67	0.08	1.90	0.02	1.39	7.85	1.10	0.31

Haul No. Species/ICES Rectangle	17 39G2	18 39G3	19 39G3	20 39G4	21 39G4	22 39G3	23 39G3	24 39G2	Total
AGONUS CATAPHRACTUS								+	**+**
CLUPEA HARENGUS	13.46	11.27	12.83	36.08	77.74	34.78	12.63	20.33	**463.56**
CRANGON CRANGON	+	+		+			+	+	**+**
CRYSTALLOGOBIUS LINEARIS									**+**
CYCLOPTERUS LUMPUS									**0.32**
ENGRAULIS ENCRASICOLUS				0.01			0.01	0.02	**0.29**
EUTRIGLA GURNARDUS	0.06								**0.06**
GADUS MORHUA	1.02	3.17	7.58	1.70	0.47	1.35			**56.99**
GASTEROSTEUS ACULEATUS								+	**0.19**
GOBIUS NIGER								+	**0.03**
LEANDER	0.01								**0.01**
LIMANDA LIMANDA				0.14			0.09		**1.41**
MERLANGIUS MERLANGUS			0.33		6.43	19.91	+	0.03	**34.66**
MYOXOCEPHALUS SCORPIUS									**0.18**
OSMERUS EPERLANUS									**0.11**
PLATICHTHYS FLESUS	0.26	0.64		0.22		1.36	0.85		**9.08**
PLEURONECTES PLATESSA			0.33	0.09					**2.45**
POMATOSCHISTUS MINUTUS	0.00	0.01	0.01	0.02			0.22	0.01	**0.28**
PSETTA MAXIMA				0.48					**1.16**
RUTILUS RUTILUS									**3.42**
SCOMBER SCOMBRUS			0.24						**1.21**
SPRATTUS SPRATTUS	22.25	21.83	48.8	10.61	0.34	16.86	10.61	49.67	**783.14**
SYNGNATHUS TYPHLE								+	**+**
TRACHINUS DRACO									**0.04**
TRACHURUS TRACHURUS									**0.01**
Total	**37.06**	**36.92**	**70.12**	**49.35**	**84.98**	**74.26**	**24.41**	**70.06**	**1358.60**
Medusae	4.52	2.26	0.40	3.64	0.30	1.02	2.36	0.96	**30.34**

+ = < 0.01 kg

Table 6: FRV "Solea", cruise 710/2015. Survey statistics by area.

Sub-division	ICES Rectangle	Area (nm²)	Sa (m²/NM²)	Sigma (cm²)	N total (million)	Herring (%)	Sprat (%)	NHerring (million)	NSprat (million)
21	41G0	108.1	7.3	1.732	4.56	34.08	58.1	1.55	2.65
21	41G1	946.8	56.0	2.621	202.29	60.17	28.16	121.71	56.97
21	41G2	432.3	43.0	1.518	122.46	18.61	80.75	22.79	98.89
21	42G1	884.2	34.4	2.162	140.69	45.69	49.26	64.28	69.3
21	42G2	606.8	41.2	1.498	166.89	11.2	87.28	18.69	145.66
21	43G1	699.0	123.1	2.281	377.23	47.27	40.64	178.33	153.32
21	43G2	107.0	30.0	2.786	11.52	83.4	7.78	9.61	0.9
21	Total	3,784.2			1,025.64			416.96	527.69
22	37G0	209.9	74.4	1.472	106.09	3.43	96.16	3.64	102.02
22	37G1	723.3	57.4	1.315	315.72	31.96	64.43	100.91	203.43
22	38G0	735.3	55.4	0.913	446.17	6.86	29.93	30.6	133.55
22	38G1	173.2	84.8	1.189	123.53	21.42	67.55	26.46	83.44
22	39F9	159.3	36.7	0.327	178.79	1.3	0.68	2.33	1.22
22	39G0	201.7	20.9	0.829	50.85	21.09	21.23	10.72	10.79
22	39G1	250.0	43.7	0.262	416.98	0.08	0.04	0.35	0.18
22	40F9	51.3	43.6	0.985	22.71	23.86	1.23	5.42	0.28
22	40G0	538.1	39.2	0.985	214.15	23.86	1.23	51.11	2.64
22	40G1	174.5	19.1	2.846	11.71	8.49	52.83	0.99	6.19
22	41G0	173.1	13.1	0.923	24.57	5.17	0	1.27	0
22	Total	3,389.7			1,911.27			233.80	543.74
23	39G2	130.9	205.6	1.691	159.15	28.14	71.68	44.79	114.07
23	40G2	164.0	6018.4	7.534	1310.08	84.21	12.74	1103.23	166.95
23	41G2	72.3	426.0	1.997	154.23	35.54	46.99	54.82	72.47
23	Total	367.2			1,623.46			1,202.84	353.49
24	37G2	192.4	57.7	1.039	106.85	73	24.04	78	25.68
24	37G3	167.7	506.1	0.687	1235.41	5.69	94.25	70.3	1164.40
24	37G4	875.1	86.1	3.655	206.15	67.65	30.61	139.46	63.10
24	38G2	832.9	57.9	1.125	428.67	30.36	67.41	130.13	288.97
24	38G3	865.7	472.1	1.336	3059.11	4.56	95.15	139.45	2910.70
24	38G4	1034.8	308.8	3.655	874.27	67.65	30.61	591.45	267.58
24	39G2	406.1	173.7	1.691	417.15	28.14	71.68	117.40	298.99
24	39G3	765.0	322.0	2.137	1152.69	28.22	70.60	325.29	813.79
24	39G4	524.8	299.4	4.263	368.58	71.09	27.53	262.02	101.47
24	Total	5,664.5			7,848.88			1,853.50	5,934.68
22-24	Total	9,421.4			11,383.61			3,290.14	6,831.91
21-24	Total	13,205.6			12,409.25			3,707.10	7,359.60

Table 7: FRV "Solea", cruise 710/2015. 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	0.97	0.39	0.14	0.04						1.54
21	41G1	26.59	77.15	16.09	1.20	0.45				0.23	121.71
21	41G2	12.64	9.18	0.83	0.12	0.02					22.79
21	42G1	9.10	52.82	2.21	0.07	0.07				0.01	64.28
21	42G2	9.76	8.48	0.40	0.02	0.01				0.02	18.69
21	43G1	74.88	91.01	11.42	0.40	0.26	0.14			0.21	178.32
21	43G2	3.40	5.96	0.25	0.01						9.62
21	Total	137.34	244.99	31.34	1.86	0.81	0.14	0.00	0.00	0.47	416.95
22	37G0	1.58	1.31	0.23	0.22	0.19	0.05	0.01	0.03	0.01	3.63
22	37G1	88.98	4.79	2.05	0.83	2.01	0.42	1.26	0.48	0.11	100.93
22	38G0	29.12	0.97	0.23	0.06	0.12	0.05			0.05	30.60
22	38G1	25.29	0.88	0.05	0.04	0.20					26.46
22	39F9	2.33									2.33
22	39G0	8.12	2.10	0.11	0.14	0.25					10.72
22	39G1	0.35									0.35
22	40F9	5.16		0.17		0.09					5.42
22	40G0	48.68		1.62		0.81					51.11
22	40G1	0.66	0.13	0.08	0.04	0.08					0.99
22	41G0	1.27									1.27
22	Total	211.54	10.18	4.54	1.33	3.75	0.52	1.27	0.51	0.17	233.81
23	39G2	29.29	6.94	2.11	2.49	1.46	0.64	0.81	0.80	0.26	44.80
23	40G2	1.07	59.79	400.02	261.05	115.76	88.25	101.7	43.69	31.9	1,103.23
23	41G2	42.74	10.22		0.93	0.93					54.82
23	Total	73.10	76.95	402.13	264.47	118.15	88.89	102.51	44.49	32.16	1,202.85
24	37G2	75.18	1.48	0.33	0.45	0.33	0.04	0.09	0.09		77.99
24	37G3	46.32	5.92	6.06	3.11	2.75	1.38	1.65	2.08	1.04	70.31
24	37G4	15.08	23.15	34.70	16.08	13.91	8.80	10.62	10.86	6.27	139.47
24	38G2	126.01	2.77	0.43	0.57	0.13	0.04	0.11	0.07		130.13
24	38G3	44.36	25.00	21.85	13.27	11.36	5.70	6.61	7.68	3.62	139.45
24	38G4	63.95	98.16	147.18	68.18	59.01	37.32	45.02	46.05	26.57	591.44
24	39G2	76.78	18.18	5.53	6.53	3.82	1.67	2.11	2.10	0.67	117.39
24	39G3	154.72	48.42	41.20	22.95	17.05	9.95	11.34	12.93	6.74	325.30
24	39G4	7.23	30.25	54.06	39.19	42.38	24.74	25.57	22.56	16.05	262.03
24	Total	609.63	253.33	311.34	170.33	150.74	89.64	103.12	104.42	60.96	1,853.51
22-24	Total	894.27	340.46	718.01	436.13	272.64	179.05	206.90	149.42	93.29	3,290.17
21-24	Total	1,031.61	585.45	749.35	437.99	273.45	179.19	206.90	149.42	93.76	3,707.12

Table 8: FRV "Solea", cruise 710/2015. 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	12.35	37.59	64.35	84.14	40.30					25.33
21	41G1	14.23	35.30	56.23	63.91	40.30				56.40	33.80
21	41G2	12.99	27.77	57.49	93.53	40.30				56.40	21.01
21	42G1	15.32	27.54	31.95	40.30	40.30				56.40	25.99
21	42G2	14.00	25.04	46.63	65.78	40.30				195.37	19.97
21	43G1	14.48	30.58	49.90	54.40	40.30	232.00			56.40	25.31
21	43G2	15.75	24.37	33.16	58.67	40.30					21.59
21	Total	14.33	30.97	51.97	63.31	40.30	232.00			62.31	27.33
22	37G0	9.82	27.77	40.06	35.39	34.07	39.01	43.67	37.79	41.00	21.85
22	37G1	8.82	30.30	39.96	34.44	37.17	40.06	44.08	41.78	41.00	12.01
22	38G0	8.47	26.49	39.16	25.21	34.47	41.00			41.00	9.51
22	38G1	7.40	27.21	29.00	28.64	54.42					8.49
22	39F9	10.72									10.72
22	39G0	9.30	27.40	29.56	25.67	30.30					13.76
22	39G1	7.60									7.60
22	40F9	10.07		61.33		61.33					12.53
22	40G0	10.07		61.33		61.33					12.51
22	40G1	12.09	32.17	58.87	33.93	45.39					22.08
22	41G0	10.49									10.49
22	Total	8.99	28.77	48.31	33.07	43.36	40.05	44.08	41.55	41.00	11.65
23	39G2	9.85	29.09	45.12	34.35	44.17	51.10	47.79	46.42	63.95	19.21
23	40G2	14.00	81.21	106.07	130.00	150.49	170.17	186.74	183.70	203.77	133.42
23	41G2	11.90	19.05		30.00	28.00					13.81
23	Total	11.11	68.25	105.75	128.75	148.21	169.31	185.64	181.23	202.64	123.72
24	37G2	6.97	28.11	37.30	29.97	35.84	48.31	38.18	38.18		7.85
24	37G3	6.96	31.09	54.20	45.30	47.56	55.16	57.29	52.18	64.29	20.66
24	37G4	7.77	33.25	57.92	53.33	62.08	68.19	68.92	59.86	75.59	50.72
24	38G2	7.09	25.09	26.52	28.72	34.37	33.13	33.89	34.31		7.70
24	38G3	6.57	32.49	54.87	45.96	51.47	62.82	59.99	54.29	67.77	35.24
24	38G4	7.77	33.25	57.92	53.33	62.08	68.19	68.92	59.86	75.59	50.72
24	39G2	9.85	29.09	45.12	34.35	44.17	51.10	47.79	46.42	63.95	19.20
24	39G3	12.17	29.24	54.66	47.74	56.89	61.77	61.87	56.75	68.29	31.13
24	39G4	12.13	32.73	63.23	89.34	101.79	93.87	91.82	78.24	87.58	76.91
24	Total	8.81	31.88	57.83	59.27	71.06	73.68	72.57	62.58	77.15	41.86
22-24	Total	9.04	40.01	84.61	101.32	104.11	121.06	128.42	97.83	120.35	69.64
21-24	Total	9.75	36.23	83.24	101.16	103.92	121.15	128.42	97.83	120.06	64.88

Table 9: FRV "Solea", cruise 710/2015. 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	12.0	14.7	9.0	3.4						39.0
21	41G1	378.4	2,723.4	904.7	76.7	18.1				13.0	4,114.3
21	41G2	164.2	254.9	47.7	11.2	0.8					478.9
21	42G1	139.4	1,454.7	70.6	2.8	2.8				0.6	1,670.9
21	42G2	136.6	212.3	18.7	1.3	0.4				3.9	373.3
21	43G1	1,084.3	2,783.1	569.9	21.8	10.5	32.5			11.8	4,513.8
21	43G2	53.6	145.3	8.3	0.6						207.7
21	Total	1,968.4	7,588.3	1,628.9	117.8	32.6	32.5	0.0	0.0	29.3	11,397.8
22	37G0	15.5	36.4	9.2	7.8	6.5	2.0	0.4	1.1	0.4	79.3
22	37G1	784.8	145.1	81.9	28.6	74.7	16.8	55.5	20.1	4.5	1,212.1
22	38G0	246.7	25.7	9.0	1.5	4.1	2.1			2.1	291.1
22	38G1	187.2	23.9	1.5	1.2	10.9					224.6
22	39F9	25.0									25.0
22	39G0	75.5	57.5	3.3	3.6	7.6					147.5
22	39G1	2.7									2.7
22	40F9	52.0		10.4		5.5					67.9
22	40G0	490.2		99.4		49.7					639.2
22	40G1	8.0	4.2	4.7	1.4	3.6					21.9
22	41G0	13.3									13.3
22	Total	1,900.8	292.9	219.3	43.99	162.6	20.8	55.98	21.18	7.0	2,724.5
23	39G2	288.5	201.9	95.2	85.53	64.5	32.7	38.71	37.14	16.6	860.8
23	40G2	15.0	4,855.6	42,430.1	33,936.5	17,420.7	15,017.5	18,991.5	8,025.9	6,500.3	147,192.9
23	41G2	508.6	194.7		27.9	26.0					757.2
23	Total	812.1	5,252.1	42,525.3	34,049.9	17,511.3	15,050.2	19,030.2	8,063.0	6,516.9	148,811.0
24	37G2	524.0	41.6	12.3	13.5	11.8	1.9	3.4	3.4		612.0
24	37G3	322.4	184.1	328.5	140.9	130.8	76.1	94.5	108.5	66.9	1,452.6
24	37G4	117.2	769.7	2,009.8	857.6	863.5	600.1	731.9	650.1	474.0	7,073.8
24	38G2	893.4	69.5	11.4	16.4	4.5	1.3	3.7	2.4		1,002.6
24	38G3	291.5	812.3	1,198.9	609.9	584.7	358.1	396.5	417.0	245.3	4,914.1
24	38G4	496.9	3,263.8	8,524.7	3,636.0	3,663.3	2,544.9	3,102.8	2,756.6	2,008.4	29,997.4
24	39G2	756.3	528.9	249.5	224.3	168.7	85.3	100.8	97.5	42.9	2,254.2
24	39G3	1,882.9	1,415.8	2,252.0	1,095.6	970.0	614.6	701.6	733.8	460.3	10,126.6
24	39G4	87.7	990.1	3,418.2	3,501.2	4,313.9	2,322.3	2,347.8	1,765.1	1,405.7	20,152.0
24	Total	5,372.2	8,075.7	18,005.3	10,095.4	10,711.2	6,604.7	7,483.2	6,534.3	4,703.4	77,585.4
22-24	Total	8,085.1	13,620.7	60,749.9	44,189.3	28,385.1	21,675.7	26,569.4	14,618.5	11,227.2	229,120.8
21-24	Total	10,053.5	21,209.0	62,378.8	44,307.1	28,417.7	21,708.2	26,569.4	14,618.5	11,256.5	240,518.6

Table 10: FRV "Solea", cruise 710/2015. 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		2.15	0.24	0.26						2.65
21	41G1		36.46	11.14	8.77	0.57	0.03				56.97
21	41G2		84.26	8.10	5.73	0.68	0.11				98.88
21	42G1		41.80	10.58	4.97	6.06	5.09	0.79			69.29
21	42G2		131.52	6.64	5.65	1.38	0.45	0.01			145.65
21	43G1		119.36	10.95	9.38	8.01	5.02	0.59			153.31
21	43G2		0.22	0.21	0.20	0.18	0.08	0.01			0.90
21	Total	0.00	415.77	47.86	34.96	16.88	10.78	1.40	0.00	0.00	527.65
22	37G0		93.56	3.34	1.35	3.46	0.32				102.03
22	37G1	64.60	125.82	7.24	2.17	3.12	0.50				203.45
22	38G0	0.03	117.21	6.72	1.09	7.59	0.91				133.55
22	38G1	3.70	78.96	0.58	0.16	0.05					83.45
22	39F9	0.31	0.91								1.22
22	39G0	4.53	6.26								10.79
22	39G1	0.18									0.18
22	40F9		0.28								0.28
22	40G0		2.64								2.64
22	40G1		6.09	0.07	0.03	0.01					6.20
22	41G0										0.00
22	Total	73.35	431.73	17.95	4.80	14.23	1.73	0.00	0.00	0.00	543.79
23	39G2	0.42	68.33	26.02	12.14	5.31	0.81	0.79	0.03	0.22	114.07
23	40G2		52.23	19.39	23.05	42.46	17.43	7.65	3.37	1.37	166.95
23	41G2		69.52	1.09	0.86	0.75	0.12	0.05	0.09		72.48
23	Total	0.42	190.08	46.50	36.05	48.52	18.36	8.49	3.49	1.59	353.50
24	37G2	17.48	6.68	0.84	0.27	0.29	0.06	0.03	0.02		25.67
24	37G3	1,147.61	14.75	1.62	0.21	0.21					1,164.40
24	37G4	0.36	21.42	18.33	12.36	6.84	1.69	1.45	0.28	0.37	63.10
24	38G2	94.21	152.75	27.38	8.82	5.19	0.24	0.24		0.14	288.97
24	38G3	738.30	1,686.12	336.60	88.30	52.71	3.88	3.95	0.16	0.69	2,910.71
24	38G4	1.53	90.82	77.72	52.43	29.03	7.15	6.15	1.20	1.56	267.59
24	39G2	1.09	179.11	68.19	31.83	13.92	2.13	2.08	0.08	0.56	298.99
24	39G3	0.82	343.46	247.76	132.13	58.66	13.76	13.41	0.57	3.20	813.77
24	39G4	0.27	18.17	31.83	29.02	15.79	2.65	2.37	0.31	1.06	101.47
24	Total	2,001.67	2,513.28	810.27	355.37	182.64	31.56	29.68	2.62	7.58	5,934.67
22-24	Total	2,075.44	3,135.09	874.72	396.22	245.39	51.65	38.17	6.11	9.17	6,831.96
21-24	Total	2,075.44	3,550.86	922.58	431.18	262.27	62.43	39.57	6.11	9.17	7,359.61

Table 11: **FRV "Solea", cruise 710/2015. 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		11.88	13.89	13.84						12.25
21	41G1		12.38	15.02	14.54	17.76	19.55				13.29
21	41G2		10.63	15.33	14.86	18.25	19.55				11.32
21	42G1		10.95	16.89	16.78	22.55	24.02	25.33			14.41
21	42G2		10.72	15.30	15.35	19.93	20.96	23.80			11.23
21	43G1		8.64	16.87	17.88	21.79	23.38	24.60			11.02
21	43G2		11.80	17.43	18.95	21.49	22.76	24.28			17.75
21	Total		10.28	15.95	15.96	21.63	23.53	25.00			11.84
22	37G0		11.00	15.54	15.99	16.99	17.85				11.44
22	37G1	4.11	11.43	14.46	14.77	16.75	18.64				9.35
22	38G0	5.75	10.28	16.18	16.19	16.26	16.23				11.00
22	38G1	4.26	10.35	13.90	13.96	15.00					10.11
22	39F9	1.87	7.75								6.26
22	39G0	3.74	10.23								7.51
22	39G1	3.38									3.38
22	40F9		8.46								8.46
22	40G0		8.46								8.46
22	40G1		11.60	13.43	13.57	15.00					11.64
22	41G0										
22	Total	4.08	10.78	15.28	15.40	16.54	17.23				10.24
23	39G2	1.46	12.95	14.53	15.46	15.76	17.24	17.17	20.65	17.21	13.74
23	40G2		14.11	17.98	20.33	22.63	23.14	23.33	22.81	24.89	19.21
23	41G2		9.17	16.7	17.07	19.66	18.57	21.34	21.34		9.52
23	Total	1.46	11.89	16.02	18.61	21.83	22.85	22.75	22.75	23.83	15.46
24	37G2	3.19	11.41	12.22	14.42	15.88	20.65	20.65	20.65		5.96
24	37G3	3.09	9.57	10.50	12.25	12.25					3.19
24	37G4	5.10	13.06	15.59	16.89	18.17	18.56	18.26	22.09	17.21	15.38
24	38G2	3.57	11.66	12.76	14.29	13.53	16.72	16.72		17.21	9.25
24	38G3	3.55	11.77	12.61	14.26	13.98	17.44	17.55	20.65	17.21	9.91
24	38G4	5.10	13.06	15.59	16.89	18.17	18.56	18.26	22.09	17.21	15.39
24	39G2	1.46	12.95	14.53	15.46	15.76	17.24	17.17	20.65	17.21	13.74
24	39G3	2.39	13.21	15.26	16.25	17.00	17.28	17.22	20.65	17.21	14.75
24	39G4	4.09	14.10	16.18	17.24	18.24	18.38	18.13	22.32	17.21	16.53
24	Total	3.28	12.10	14.08	15.83	16.27	17.75	17.60	21.66	17.21	9.82
22-24	Total	3.31	11.91	14.20	16.08	17.38	19.55	18.74	22.28	18.36	10.14
21-24	Total	3.31	11.72	14.29	16.07	17.66	20.23	18.96	22.28	18.36	10.27

Table 12: **FRV "Solea", cruise 710/2015. 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		25.5	3.3	3.6						32.5
21	41G1		451.4	167.3	127.5	10.1	0.6				756.9
21	41G2		895.7	124.2	85.2	12.4	2.2				1,119.6
21	42G1		457.7	178.7	83.4	136.7	122.3	20.0			998.7
21	42G2		1,409.9	101.6	86.7	27.5	9.4	0.2			1,635.4
21	43G1		1,031.3	184.7	167.7	174.5	117.4	14.5			1,690.1
21	43G2		2.6	3.7	3.8	3.9	1.8	0.2			16.0
21	Total	0.0	4,274.1	763.5	557.9	365.1	253.6	35.0	0.0	0.0	6,249.2
22	37G0		1,029.2	51.9	21.6	58.8	5.7				1,167.2
22	37G1	265.5	1,438.1	104.7	32.1	52.3	9.3				1,902.0
22	38G0	0.2	1,204.9	108.7	17.7	123.4	14.8				1,469.7
22	38G1	15.8	817.2	8.1	2.2	0.8					844.0
22	39F9	0.6	7.1								7.6
22	39G0	16.9	64.0								81.0
22	39G1	0.6									0.6
22	40F9		2.4								2.4
22	40G0		22.3								22.3
22	40G1		70.6	0.9	0.4	0.2					72.1
22	41G0										0.0
22	Total	299.6	4,655.9	274.3	73.9	235.4	29.8	0.0	0.0	0.0	5,568.9
23	39G2	0.6	884.9	378.1	187.7	83.7	14.0	13.6	0.6	3.8	1,566.9
23	40G2		737.0	348.6	468.6	960.9	403.3	178.5	76.9	34.1	3,207.9
23	41G2		637.5	18.2	14.7	14.8	2.2	1.1	1.9		690.4
23	Total	0.6	2,259.3	744.9	671.0	1,059.3	419.5	193.1	79.4	37.9	5,465.1
24	37G2	55.8	76.2	10.3	3.9	4.6	1.2	0.6	0.4		153.0
24	37G3	3,546.1	141.2	17.0	2.6	2.6					3,709.4
24	37G4	1.8	279.8	285.8	208.8	124.3	31.4	26.5	6.2	6.4	970.8
24	38G2	336.3	1,781.1	349.4	126.0	70.2	4.0	4.0		2.4	2,673.5
24	38G3	2,621.0	19,845.6	4,244.5	1,259.2	736.9	67.7	69.3	3.3	11.9	28,859.3
24	38G4	7.8	1,186.1	1,211.7	885.5	527.5	132.7	112.3	26.5	26.9	4,116.9
24	39G2	1.6	2,319.5	990.8	492.1	219.4	36.7	35.7	1.7	9.6	4,107.1
24	39G3	2.0	4,537.1	3,780.8	2,147.1	997.2	237.8	230.9	11.8	55.1	11,999.8
24	39G4	1.1	256.2	515.0	500.3	288.0	48.7	43.0	6.9	18.2	1,677.5
24	Total	6,573.5	30,422.7	11,405.2	5,625.5	2,970.7	560.2	522.3	56.8	130.5	58,267.2
22-24	Total	6,873.6	37,337.9	12,424.4	6,370.4	4,265.3	1,009.5	715.4	136.2	168.3	69,301.1
21-24	Total	6,873.6	41,612.0	13,187.9	6,928.3	4,630.4	1,263.1	750.4	136.2	168.3	75,550.3

Table 13: **FRV "Solea", cruise 710/2015. Numbers (m) of herring excl. CBH and mature herring (maturity stages ≥6) in SD 23 by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total
21	41G0	0.97	0.39	0.14	0.04						1.54
21	41G1	26.59	77.15	16.09	1.20	0.45				0.23	121.71
21	41G2	12.64	9.18	0.83	0.12	0.02					22.79
21	42G1	9.10	52.82	2.21	0.07	0.07				0.01	64.28
21	42G2	9.76	8.48	0.40	0.02	0.01				0.02	18.69
21	43G1	74.88	91.01	11.42	0.40	0.26	0.14			0.21	178.32
21	43G2	3.40	5.96	0.25	0.01						9.62
21	Total	137.34	244.99	31.34	1.86	0.81	0.14	0.00	0.00	0.47	416.95
22	37G0	1.58	1.23	0.09							2.90
22	37G1	88.68	4.39	1.12							94.19
22	38G0	29.37	0.68								30.05
22	38G1	25.29	0.75			0.13					26.17
22	39F9	2.33									2.33
22	39G0	8.04	2.16								10.20
22	39G1	0.35									0.35
22	40F9	5.15		0.18							5.33
22	40G0	48.55		1.70							50.26
22	40G1	0.66	0.13	0.07							0.87
22	41G0	1.27									1.27
22	Total	211.28	9.35	3.16	0.00	0.13	0.00	0.00	0.00	0.00	223.92
23	39G2	29.29	6.33	1.21	0.14	0.15	0.07	0.05	0.01	0.02	37.27
23	40G2	1.10	57.20	243.02	148.00	66.59	67.14	64.06	39.24	29.21	715.55
23	41G2	42.75	10.21	0.00	0.93	0.93	0.00	0.00	0.00	0.00	54.82
23	Total	73.14	73.75	244.23	149.07	67.66	67.21	64.11	39.25	29.23	807.64
24	37G2	75.18	1.28	0.14							76.60
24	37G3	46.32	5.02	5.30	0.86	0.38	0.19	0.26	0.03	0.03	58.39
24	37G4	15.08	22.65	31.76	7.17	5.40	2.51	2.05	0.49	0.73	87.84
24	38G2	126.01	1.81								127.82
24	38G3	44.36	24.36	18.65	3.80	2.34	1.19	0.88	0.23	0.26	96.07
24	38G4	63.95	96.08	134.71	30.39	22.91	10.63	8.70	2.08	3.09	372.54
24	39G2	76.78	16.60	3.18	0.36	0.40	0.19	0.14	0.02	0.05	97.72
24	39G3	154.72	40.71	35.53	7.31	4.54	1.97	1.62	0.57	0.62	247.59
24	39G4	7.23	28.85	50.75	29.02	31.29	14.42	10.73	4.96	4.39	181.64
24	Total	609.63	237.36	280.02	78.91	67.26	31.10	24.38	8.38	9.17	1,346.21
22-24	Total	894.05	320.46	527.41	227.98	135.05	98.31	88.49	47.63	38.40	2,377.76
21-24	Total	1,031.39	565.45	558.75	229.84	135.86	98.45	88.49	47.63	38.87	2,794.71

Table 14: **FRV "Solea", cruise 710/2015. Mean weight (g) of herring excl. CBH and mature herring (maturity stages ≥6) in SD 23 by age/W-rings and area.**

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	12.35	37.59	64.35	84.14	40.30					25.33	
21	41G1	14.23	35.30	56.23	63.91	40.30				56.40	33.80	
21	41G2	12.99	27.77	57.49	93.53	40.30				56.40	21.01	
21	42G1	15.32	27.54	31.95	40.30	40.30				56.40	25.99	
21	42G2	14.00	25.04	46.63	65.78	40.30				195.37	19.97	
21	43G1	14.48	30.58	49.90	54.40	40.30	232.00			56.40	25.31	
21	43G2	15.75	24.37	33.16	58.67	40.30					21.59	
21	Total	14.33	30.97	51.97	63.31	40.30	232.00			62.31	27.33	
22	37G0	9.57	28.08	47.38							18.55	
22	37G1	8.51	31.08	42.64							9.96	
22	38G0	7.56	27.70								8.01	
22	38G1	7.14	28.06			66.00					8.03	
22	39F9	10.34									10.34	
22	39G0	9.38	27.11								13.14	excl. CBH
22	39G1	7.29									7.29	
22	40F9	9.92		63.00							11.71	
22	40G0	9.92		63.00							11.71	
22	40G1	11.88	32.15	63.00							19.32	
22	41G0	11.88									11.88	
22	Total	8.66	29.30	55.38		66.00					10.21	
23	39G2	9.51	30.74	56.96	81.46	99.25	90.09	91.82	91.31	105.04	15.62	
23	40G2	13.75	78.63	90.44	111.33	130.88	174.72	185.95	192.68	208.84	124.36	excl.
23	41G2	11.64	18.61		29.00	26.00					13.48	maturity >=6
23	Total	10.82	66.21	90.27	110.79	129.37	174.63	185.88	192.65	208.77	111.81	
24	37G2	6.63	29.52	51.36							7.09	
24	37G3	6.56	34.18	59.58	71.97	80.88	87.50	89.04	100.17	100.17	15.92	
24	37G4	7.37	34.32	62.54	76.49	89.99	89.28	100.16	99.11	123.39	50.97	
24	38G2	6.75	27.96								7.05	
24	38G3	6.18	33.50	60.96	76.41	91.75	95.47	93.44	99.29	96.15	30.98	excl. CBH
24	38G4	7.37	34.32	62.54	76.49	89.99	89.28	100.16	99.11	123.39	50.97	
24	39G2	9.51	30.74	56.96	81.46	99.25	90.09	91.82	91.31	105.04	15.63	
24	39G3	11.82	32.19	60.76	77.96	95.45	94.53	96.25	102.80	108.99	27.34	
24	39G4	11.85	34.19	67.15	104.16	117.15	109.79	118.40	117.96	116.61	83.24	
24	Total	8.45	33.53	62.92	86.77	103.06	99.35	107.52	110.51	118.22	38.80	
22-24	Total	8.70	40.92	75.54	102.48	116.20	150.81	164.29	178.20	187.14	60.91	
21-24	Total	9.45	36.61	74.22	102.16	115.75	150.93	164.29	178.20	185.63	55.90	

Table 15: FRV "Solea", cruise 710/2015. Total biomass (t) of herring excl. CBH and mature herring (maturity stages ≥6) in SD 23 by age/W-rings and area.

Sub-division	Rectangle/ W-rings	0	1	2	3	4	5	6	7	8+	Total	
21	41G0	12.0	14.7	9.0	3.4						39.0	
21	41G1	378.4	2723.4	904.7	76.7	18.1				13.0	4114.3	
21	41G2	164.2	254.9	47.7	11.2	0.8					478.9	
21	42G1	139.4	1454.7	70.6	2.8	2.8				0.6	1670.9	
21	42G2	136.6	212.3	18.7	1.3	0.4				3.9	373.3	
21	43G1	1084.3	2783.1	569.9	21.8	10.5	32.5			11.8	4513.8	
21	43G2	53.6	145.3	8.3	0.6						207.7	
21	Total	1968.4	7588.3	1628.9	117.8	32.6	32.5	0.0	0.0	29.3	11397.8	
22	37G0	15.2	34.6	4.1							53.8	
22	37G1	754.4	136.5	47.6							938.5	
22	38G0	221.9	18.9								240.8	
22	38G1	180.6	21.0			8.6					210.2	
22	39F9	24.1									24.1	
22	39G0	75.4	58.6								134.0	excl. CBH
22	39G1	2.6									2.6	
22	40F9	51.1		11.4							62.4	
22	40G0	481.4		107.3							588.8	
22	40G1	7.8	4.3	4.6							16.7	
22	41G0	15.1									15.1	
22	Total	1829.5	273.9	175.0	0.0	8.6	0.0	0.0	0.0	0.0	2287.0	
23	39G2	278.6	194.6	68.9	11.4	14.9	6.3	4.6	0.9	2.1	582.3	
23	40G2	15.2	4498.0	21978.3	16477.2	8714.4	11729.7	11911.3	7560.5	6099.6	88984.1	excl.
23	41G2	497.7	190.1		27.0	24.1					738.8	maturity >=6
23	Total	791.4	4882.7	22047.2	16515.5	8753.4	11736.0	11915.8	7561.4	6101.7	90305.1	
24	37G2	498.4	37.8	7.2	0.0	0.0	0.0	0.0	0.0	0.0	543.4	
24	37G3	303.9	171.6	315.8	61.9	30.7	16.6	23.2	3.0	3.0	929.6	
24	37G4	111.1	777.4	1986.3	548.4	486.0	224.1	205.3	48.6	90.1	4477.2	
24	38G2	850.6	50.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	901.2	
24	38G3	274.1	816.1	1136.9	290.4	214.7	113.6	82.2	22.8	25.0	2975.8	excl. CBH
24	38G4	471.3	3297.5	8424.8	2324.5	2061.7	949.1	871.4	206.2	381.3	18987.6	
24	39G2	730.2	510.3	181.1	29.3	39.7	17.1	12.9	1.8	5.3	1527.7	
24	39G3	1828.8	1310.5	2158.8	569.9	433.3	186.2	155.9	58.6	67.6	6769.6	
24	39G4	85.7	986.4	3407.9	3022.7	3665.6	1583.2	1270.4	585.1	511.9	15118.9	
24	Total	5154.1	7958.0	17618.7	6847.2	6931.7	3089.9	2621.3	926.1	1084.1	52231.0	
22-24	Total	7775.0	13114.6	39840.9	23362.7	15693.6	14825.9	14537.2	8487.5	7185.8	144823.1	
21-24	Total	9743.4	20702.9	41469.8	23480.4	15726.3	14858.4	14537.2	8487.5	7215.1	156220.9	

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 2015 ON THE R/V "BALTICA" IN THE ICES SUBDIVISIONS 26N AND 28.2 OF THE BALTIC SEA
(08-18 October 2015)

Working paper on the WGBIFS meeting in Rostock, Germany, 30.03-03.04.2016

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Riga – Gdynia, March 2016

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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 11th 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 2015. 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 were stored in 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;
T. Wodzinowski (NMFRI, Gdynia – Poland) – hydrologist, hydrology team;
J. Slembarski (NMFRI, Gdynia – Poland) – acoustician, acoustic team;
W. Gawel (NMFRI, Gdynia – Poland) – ichthyologist, acoustic team;
G. Strods (BIOR, Riga – Latvia) – ichthyologist, acoustic and fish sampling team, hydrobiology;
V. Cervoncevs (BIOR, Riga – Latvia) – ichthyologist, fish sampling team;
N. Kondratjeva (BIOR, Riga – Latvia) – ichthyologist, fish sampling team;
O. Ozernaja (BIOR, Riga – Latvia) – data analyst, fish sampling team.

1.2. Survey description

The reported BIAS survey of the r/v “Baltica” took place during the period of 08-17 October 2015. The vessel left the port of Gdynia on 07.10.2015 at 22:48 (GMT+01:00) and was navigated in the north-eastern direction to the geographical position 56°06’N 019°00’E. The direct at sea researches began on 08.10.2015 in the noon. The sea researches were conducted in the period of 08-17.10.2015 within Latvian, Estonian and Sweden EEZs (ICES Sub-divisions 26N and 28.2) and were ended on 18.10.2015 morning. Then the r/v “Baltica” was navigated to the port Ventspils (Latvia), reaching it on 17.10.2015 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 511 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.

The r/v “Baltica” realized 20 fish control-catches (Tab. 1). All catches were performed in the daylight between 07:00 am and 17:10 pm (GMT+01:00) 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, three hauls duration were shortened to 15 minutes (due to very dense fish concentrations observed). The mean speed of vessel while trawling was 3.1 knots. Overall, 5 hauls were conducted in SD 26N and 15 hauls in SD 28.2. Totally 16 hauls were performed in the Latvian EEZ and 4 hauls in Swedish EEZ (see text-table below). The investigations did not cover early planed southern part of Estonian EEZ.

1.3.2. Biological sampling

The length measurements (in 0.5 cm length classes) were realized for 1943 herring and 4040 sprat individuals. In total, 900 herring and 2012 sprat individuals were taken for biological analysis. Moreover, all 774 individuals of other species (threespine stickleback, ninespine stickleback, cod, lumpfish, flounder, great sandeel, smelt, shorthorn sculpin and salmon) were measured (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 = 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.

Zooplankton samples were collected at the positions of the hydrological stations or after trawling. Totally 15 zooplankton stations were realized (Fig. 2) and 25 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 08-18 October 2015, totally at 26 stations, int. al. at 20 fish catch-station and 5 HELCOM stations located in the central-eastern part of the Baltic Sea (Fig. 3). Positions of the 6^{th} haul station and HELCOM station 43 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 Table 3.

2. RESULTS

2.1. Biological data

2.1.1. Catch statistics

Total number of realized hauls and total catches [in kg] of fish in Latvian and Swedish EEZs during reported BIAS 4Q 2015 are presented in the Table 4. Overall, 11 fish species were recognized in hauls performed in the Central-eastern Baltic Sea. Sprat was dominating species by mass in the both ICES Sub-divisions 26N and 28.2 (89.8 and 83.5% respectively). The rest 9 species represented 1.0 % (in this 0.8% belonging to threespine stickleback) of the total mass in average for all investigated area.

Mean CPUE for all species in the investigated area in 2015 amounted 832.6 kg/h and was higher comparing to the previous years (504.5 kg/h in 2013 and 751.2 kg/h in 2014). The mean CPUEs of sprat were: 678.3 kg/h in ICES SD 26N, and 716.7 kg/h in SD 28.2. The mean CPUEs of herring were as follow: in SD 26N – 76.2 kg/h and 131.0 kg/h in SD 28.2. Taking into advice all investigated area, an increase of mean CPUE value for sprat and its decrease for herring was noted in 2015, comparing to previous year. The CPUE values and distributions by particular haul for herring, sprat and others are presented at the Fig. 4 and 5. Higher CPUE values for herring were noted in the Northern part of SD 28, but good CPUEs for sprat were distributed more equally in all investigated area.

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 2015, are given in Table. 5, for third dominant species – cod in Table 6. The characteristics of the pelagic fish stock are aggregated in Table 7 for sprat and Table 8 for herring. The geographical distributions of NASC and pelagic fish stock densities in the central-eastern Baltic Sea in October 2013 are shown in Fig. 6, 7 and 8.

The pelagic fish stock was represented mostly by sprat – 88.2 %, in comparison – 71.5% in 2013 and 86.8 % in 2014. Herring was represented as 11.8 %, 28.5 % in 2013 and 13.2 % in 2014. The highest sprat stock density (72.6 n×10^6/nm^2) were recorded in ICES rectangle 42H0 of the ICES Sub-division 28.2. The highest average abundance per nm^2 and biomass of the sprat stock were recorded in the central part of investigated area in ICES rectangle 43H0. The distribution of the high density sprat concentrations in October 2015 totally differed comparing with that from October of the years previous 2010-2014, 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. In 2015 distribution was scattered too, but with relatively high rate of concentrations in separate points.

The herring stock density was significantly lower in comparison to sprat stock density. The highest density value was 10.2 n×10^6/nm^2 and noted in ICES rectangle 44H0 in central part of the investigated area in Sub-division 28.2 in comparison to 2013 were highest density values was not over 8.8 n×10^6/nm^2 in rectangle 44H0, but in 2014 values over 10.0 n×10^6/nm^2 were recorded in two rectangles 43H0 and 45H0.

Comparison of the acoustic results from October of 2005-2015 indicated that investigated sprat stock abundance and biomass has decreasing tendency, but herring stock has a slight increase. The geographical distribution of main sprat stock shows different pattern as in years 2010-2014 and is very scattered with several concentration points of high abundance [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 Figures 9 and 10 respectively. The total length and mean weight in control hauls of sprat, herring and stickleback ranged as follows:

- sprat – 6.5÷15.0 cm (average TL = 11.2 cm), 1.4÷16.6 g (average W = 8.1 g)
- herring – 9.5÷22.5 cm (average TL = 15.6 cm), 6.0÷70.6 g (average W = 23.3 g)

The sprat length distribution curves have a bimodal character for both Sub-divisions 26 and 28.2. First length frequency pick takes place at 10.5 cm length class and the second lower one at length classes 12-12.5 cm represent adult sprat. The frequency of fish generation born in 2015 (ranged from 6.5 to 8.5 cm total length) was scarcely notice comparing to high frequency of sprat generation born in 2014.

The herring length distribution curves have a similar character in both Sub-divisions 26N and 28.2. The two frequency picks representing adult fish correspond to 12-12.5 and 15.5-17 cm length classes. The fish representing 6.5-10 cm length range belonging to the generation born in 2015 have a very low frequency.

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. Sprat stock was composed dominantly of year class 1 specimens – 71.27 % in SD 26N, 53.54 % in SD 28.2 and 57.95 % overall. Herring stock was composed mainly of year class 1 specimens (40.18 %). The year-class 0 of sprat was represented by length-classes 6.5÷9.0 cm (8.2 cm on average) with mean weights 1.4÷5.0 g (3.2 g on average).

2.1.3. Zooplankton estimates

Not yet processed.

2.2. Meteorological and hydrological data

2.2.1. Weather conditions

The most frequently wind (Fig. 11) was from E direction. The wind force varied from 2°B to 6°B and average force was 4.7°B. The air temperature ranged from 10°C to 4°C, and average temperature was 7°C. Air pressure varied from 1021 to 1038 hPa, and the average was 1030 hPa.

2.2.2. Hydrology of the Gotland Deep

The seawater temperature in the surface layers varied from 12.96 to 14.66°C (the mean was 13.75°C).The lowest surface temperatures were recorded at the haul station 20. The highest ones were noticed at the haul 3. The minimum value of salinity in Practical Salinity Unit (PSU) was 6.78 at the haul station 20 in the surface layer. The maximum was 7.18 PSU at the hydrological station 46. The mean value of salinity was 6.99 PSU. The oxygen content in the surface layers of investigated the research area varied in the range of 6.70 ml/l (haul 3) – 7.20 ml/l (haul 13). The mean value of surface water oxygen content was 6.95 ml/l. The Figure 12 shows comparison of the values of three main hydrological parameters vertical distributions at the station No 37 situated at the middle part of Eastern Gotland Deep slope investigated in October 2014 and 2015. The increase of water temperature below thermocline and salinity (PSU values) in whole water column were noticed, as well as increase of oxygen content in the water layer below 140 m depth. A little colder with lower oxygenation waters have been lifted to the depth range 80-140 m.

The temperature at the hauls layer was changing in the range of 14.64 (haul 4) – 4.72 °C (haul 16), the mean was 7.68 °C. Salinity in the haul waters varied from 6.93 (haul 13) to 9.69 PSU (haul 1), and the mean was 7.74 PSU. Oxygen content varied from 0.94 ml/l (haul 17) to 7.38 ml/l (haul 20), the mean was 5.57 ml/l.

The temperature of near bottom (Fig. 13) layer was changing in the range of 13.24 (station C) - 4.94°C (haul 2), the mean was 6.16°C. Salinity in the bottom waters varied from 6.97 to 13.29 PSU (the mean was 10.41 PSU). The low values of salinity were at the station C. The highest values of salinity were noticed at the hydrological station 37. Oxygen content varied from 0.44 ml/l to 6.98 ml/l (the mean was 2.68 ml/l). The lowest values of this parameter were noticed at the station B.

3. DISCUSSION

The data of the Latvian-Polish BIAS in the 4th quarter of 2015 were considered by the ICES BIFS Working Group (Öregrund, Sweden, 23-27.03.2015) 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 overall decreasing tendency of abundance with slight increasing in 2015 due to very abundant sprat generation of 2014. The mean length and weight of adult sprat had the opposite tendency to abundance. The geographical distribution of sprat densities in the October 2015 had different pattern as in 2010-2014 due to low adult fish abundance and relatively high recruitment.

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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 08.-18.10.2015

Haul number	Date	ICES rectangle	ICES SD	Mean bottom depth [m]	Headrope depth [m]	Vertical opening [m]	Trawling speed [knt]	Trawling direction [°]	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	Haul duration [min]	Total cactch [kg]
1	2015-10-08	41G9	26	123	60	18	3.1	275	56°06.2'	19°03.0'	56°06.2'	19°00.9'	14:20	30	196.140
2	2015-10-09	41G9	26	53	30	20	3.0	90	56°06.2'	19°45.0'	56°06.2'	19°47.7'	07:25	30	116.408
3	2015-10-09	41H0	26	50	27	20	3.0	270	56°06.7'	20°05.8'	56°06.7'	20°03.4'	09:55	30	450.780
4	2015-10-09	41H0	26	49	25	20	3.3	275	56°22.9'	20°18.5'	56°22.9'	20°15.5'	15:35	30	158.740
5	2015-10-10	41G9	26	83	16/57	22/20	3.1	270	55°22.9'	19°55.4'	55°22.8'	19°52.4'	07:00	30	966.085
6	2015-10-10	42G9	28	157	20	22	3.0	100	56°39.1'	19°51.6'	56°38.6'	19°54.2'	16:20	30	206.358
7	2015-10-11	42H0	28	75	50	19	3.0	275	56°37.0'	20°25.5'	56°37.1'	20°23.9'	07:40	15	1090.674
8	2015-10-11	42H0	28	39	18	20	3.1	280	56°37.0'	20°40.5'	56°37.1'	20°37.9'	09:50	30	54.498
9	2015-10-11	42H0	28	46	20	22	3.3	225	56°50.6'	20°48.4'	56°49.3'	20°46.7'	13:40	30	25.909
10	2015-10-11	42H0	28	60	35	20	3.1	270	56°53.1'	20°26.9'	56°53.1'	20°25.3'	16:50	15	503.707
11	2015-10-15	42/43G9	28	170	60	18	3.0	275	56°59.7'	19°15.1'	57°00.1'	19°12.5'	07:40	30	317.412
12	2015-10-15	43/G9	28	329	60	18	2.8	310	57°07.7'	19°58.1'	57°08.5'	19°56.4'	12:55	30	651.478
13	2015-10-15	43H0	28	91	20	20	3.1	266	57°07.2'	20°36.7'	57°07.1'	20°34.1'	17:10	30	611.941
14	2015-10-16	43H0	28	52	26	20	3.0	280	57°23.1'	20°55.3'	57°23.2'	20°54.2'	07:20	15	876.513
15	2015-10-16	43H0	28	59	38	20	3.1	275	57°23.4'	20°41.0'	57°23.2'	20°37.9'	09:05	30	79.799
16	2015-10-16	43G9	28	231	60	17	3.0	303	57°20.4'	19°59.3'	57°21.3'	19°56.9'	13:15	30	1284.892
17	2015-10-16	44G9	28	142	62	20	3.0	323	57°30.5'	19°48.9'	57°31.7'	19°47.3'	16:00	30	243.705
18	2015-10-17	44H0	28	110	40	18	3.1	11	57°37.5'	20°43.5'	57°38.9'	20°43.6'	07:40	30	170.328
19	2015-10-17	44H1	28	70	45	20	3.2	304	57°50.2'	21°12.6'	57°51.0'	21°10.2'	12:40	30	1160.258
20	2015-10-17	44H0	28	88	35	18	3.0	270	57°53.0'	20°51.3'	57°53.0'	20°48.7'	15:10	30	53.470
SD26				72	36	20	3.1	236							1888.153
SD28				115	39	189	3.1	251							7330.942
SD26+28				104	38	20	3.1	247							9219.095

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 08.-18.10.2015

Fish species	Number of measured individuals			Number of aged individuals		
	SD 26	SD 28	SD 26+28	SD 26	SD 28	SD 26+28
Sprat (all)	1004	3036	4040	511	1501	2012
Sprat (yearclass 0)	36	73	109	21	56	77
Herring (all)	413	1530	1943	200	700	900
Herring (GoR population)	59	314	373	29	144	173
Cod	2	9	11			
Flounder	2	2	4			
Lumpfish	2	11	13			
Salmon		1	1			
Stickleback, threespine	12	722	734			
Stickleback, ninespine		2	2			
Smelt		1	1			
Shorthorn sculpin	1	3	4			
Greate sandeel		4	4			
Total	1436	5321	6757	711	2201	2912

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 08.-18.10.2015

Haul number	Date of catch	Meteorological parameters					Hydrological parameters		
		wind direction	wind force [°B]	sea state	air temper. [°C]	atmospheric pressure [hP]	temperature [°C]	salinity [PSU]	oxygen [ml/l]
1	08-10-2015	E	5	3	6	1031	5.33	9.69	2.41
2	09-10-2015	E	3	2	6	1030	5.76	7.34	6.72
3	09-10-2015	E	3	2	6	1030	14.59	7.15	6.43
4	09-10-2015	E	2	1	7	1033	14.64	7.07	6.81
5	10-10-2015	E	4	2	5	1032	14.53/4.88	7.07/8.70	6.81/2.78
6	10-10-2015	NE	4	2	9	1031	9.25	6.99	7.21
7	11-10-2015	NE	4	3	5	1031	4.84	8.61	3.60
8	11-10-2015	E	4	2/3	6	1031	14.20	7.07	6.87
9	11-10-2015	E	4	2	8	1033	6.09	7.19	6.70
10	11-10-2015	E	3	2	6	1033	5.77	7.42	6.65
11	15-10-2015	E	5	4	7	1034	4.74	8.37	4.18
12	15-10-2015	SE	5	4	8	1038	4.77	8.89	3.28
13	15-10-2015	SE	5	4	8	1036	13.54	6.93	7.02
14	16-10-2015	SE	4	2	4	1030	9.72	7.15	6.40
15	16-10-2015	SE	4	2	6	1030	6.17/5.68	7.27/7.37	6.78/6.97
16	16-10-2015	SE	4	2	8	1030	4.72	8.64	3.47
17	16-10-2015	SE	4	3	8	1029	4.90	9.23	0.94
18	17-10-2015	E	3	2	7	1025	4.86	7.36	7.38
19	17-10-2015	E	3	2	9	1026	5.09	7.56	5.86
20	17-10-2015	E	3	2	9	1026	4.85	7.23	7.38

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 08.-18.10.2015

Haul number	Date	ICES rectangle	ICES SD	Total catch [kg]	Catch per species [kg]										
					sprat	herring	cod	flounder	shorthorn sculpin	lumpfish	great sandeel	threespine stickleback	ninespine stickleback	smelt	salmon
					161789	161722	164712	172894	167318	167612	171682	166365	166387	162039	161996
1	2015-10-08	41G9	26	196.140	91.009	104.935						0.196			
2	2015-10-09	41G9	26	116.408	101.149	14.981		0.167		0.111					
3	2015-10-09	41H0	26	450.780	448.075	2.705									
4	2015-10-09	41H0	26	158.740	156.162	2.378	0.022	0.090	0.088						
5	2015-10-10	41G9	26	966.085	899.277	65.613	0.872			0.323					
6	2015-10-10	42G9	28	206.358	161.740	13.495				0.068		26.185			4.870
7	2015-10-11	42H0	28	1090.674	1066.157	22.893	0.534					1.090			
8	2015-10-11	42H0	28	54.498	54.049	0.109				0.068	0.272				
9	2015-10-11	42H0	28	25.909	25.388	0.224		0.190		0.099		0.008			
10	2015-10-11	42H0	28	503.707	401.785	101.075	0.387	0.193		0.267					
11	2015-10-15	42/43G9	28	317.412	234.219	80.503	0.224			0.248		2.218			
12	2015-10-15	43/G9	28	651.478	492.580	153.565	0.778					4.555			
13	2015-10-15	43H0	28	611.941	607.090	3.668				0.571		0.612			
14	2015-10-16	43H0	28	876.513	845.716	30.674				0.123					
15	2015-10-16	43H0	28	79.799	77.924	0.362			0.111	0.818		0.582	0.002		
16	2015-10-16	43G9	28	1284.892	1128.689	154.986	0.827					0.390			
17	2015-10-16	44G9	28	243.705	158.875	83.452	0.405					0.973			
18	2015-10-17	44H0	28	170.328	15.320	151.496			0.108			3.404			
19	2015-10-17	44H1	28	1160.258	870.824	289.114			0.087			0.232		0.001	
20	2015-10-17	44H0	28	53.470	23.259	0.054						30.157			
SD26				1888.153	1695.672	190.612	0.894	0.257	0.088	0.434		0.196			
SD28				7330.942	6163.615	1085.670	3.155	0.383	0.306	2.262	0.272	70.406	0.002	0.001	4.870
SD26+28				9219.095	7859.287	1276.282	4.049	0.640	0.394	2.696	0.272	70.602	0.002	0.001	4.870

Table 5. Hydroacoustic survey statistics of pelagic fish species 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 08.-18.10.2015

Table 5A

ICES	ICES	Trawl	Herring			Sprat			NASC	TS calc.
SD	Rect.	No	L, cm	w, g	n, %	L, cm	w, g	n, %	m^2/nm^2	dB
28	44H1	19	13.82	16.37	13.63	11.16	7.78	86.37	576.25488	-49.89
	44H0	18,20	14.59	18.77	63.64	11.41	8.37	36.36	464.37105	-48.50
	43H0	13,14,15,16	14.80	19.70	2.41	11.17	7.89	97.59	594.86192	-50.12
	43G9	11,12,16,17	16.46	25.80	6.80	11.17	8.03	93.20	244.46343	-49.87
	42H0	7,8,9,10	14.86	23.77	2.87	11.43	8.53	97.13	359.38589	-49.91
	42G9	6,11	16.70	26.86	7.12	11.41	8.67	92.88	437.35953	-49.68
26	41H0	3,4	15.75	27.56	0.12	11.19	8.20	99.88	139.70271	-50.18
	41G9	1,2,5	16.90	28.03	4.80	11.24	8.32	95.20	571.62058	-49.89

Table 5B

ICES	ICES	Area	NASC	$\sigma \times 10^4$	Abundance	n, %	
SD	Rect.	nm^2	m^2/nm^2	m^2	$n \times 10^6$	herring	sprat
28	44H1	824.6	576.25488	1.28838	3688.203	13.63	86.37
	44H0	960.5	464.37105	1.77367	2514.724	63.64	36.36
	43H0	973.7	594.86192	1.22277	4736.925	2.41	97.59
	43G9	973.7	244.46343	1.29489	1838.253	6.80	93.20
	42H0	968.5	359.38589	1.28163	2715.797	2.87	97.13
	42G9	986.9	437.35953	1.35212	3192.243	7.12	92.88
26	41H0	953.3	139.70271	1.20593	1104.365	0.12	99.88
	41G9	1000.0	571.62058	1.28742	4440.042	4.80	95.20

Table 5C

ICES	ICES	Area	ρ	Abundance, $n \times 10^6$			Biomass, $kg \times 10^3$		
SD	Rect.	nm^2	$n \times 10^6/nm^2$	ΣN	$N_{HERRING}$	N_{SPRAT}	ΣW	$W_{HERRING}$	W_{SPRAT}
28	44H1	824.6	4.47272	3688.203	502.613	3185.590	33006.824	8226.935	24779.888
	44H0	960.5	2.61814	2514.724	1600.346	914.378	37690.913	30040.892	7650.021
	43H0	973.7	4.86487	4736.925	114.310	4622.615	38732.739	2251.586	36481.153
	43G9	973.7	1.88791	1838.253	125.024	1713.230	16978.211	3225.866	13752.344
	42H0	968.5	2.80413	2715.797	77.832	2637.964	24354.628	1850.418	22504.210
	42G9	986.9	3.23462	3192.243	227.268	2964.975	31813.939	6103.488	25710.451
26	41H0	953.3	1.15847	1104.365	1.292	1103.073	9083.383	35.608	9047.775
	41G9	1000.0	4.44004	4440.042	213.294	4226.748	41145.761	5978.032	35167.729

Table 6. Hydroacoustic survey statistics 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 08.-18.10.2015

ICES	ICES	Trawl	Cod		NASC	TS calc.	$\sigma \times 10^4$	ρ	Abundance	Biomass
SD	Rect.	No	L, cm	No	L, cm	dB	m^2	$n \times 10^6/nm^2$	$n \times 10^6$	$kg \times 10^3$
28	44H1	19								
	44H0	18,20	26.43	158.93	19.49948	-38.95	16.00872	0.01218	11.699	1859.412
	43H0	13,14,15,16	25.95	162.52	0.51374	-39.09	15.50398	0.00033	0.323	52.435
	43G9	11,12,16,17	27.97	205.31	0.65818	-38.34	18.40597	0.00036	0.348	71.487
	42H0	7,8,9,10	33.00	383.89	0.36188	-36.83	26.08894	0.00014	0.134	51.571
	42G9	6,11								
26	41H0	3,4	46.50	780.00	0.07590	-34.15	48.31876	0.00002	0.015	11.680
	41G9	1,2,5	33.56	350.78	4.20880	-36.77	26.46098	0.00159	1.591	557.946

Table 7. Sprat stock characteristics 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 08.-18.10.2015

Table 7A CANUM						Age group					Σ
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	
28	44H1	541	57471	16297	14169	12727	3678		4327	2740	111949
	44H0	100	1739	888	731	721	169	43	98	123	4611
	43H0	982	198152	61601	40172	32614	2622	1606	6555	55	344359
	43G9	90	156665	36437	28824	21297	2750	90	4025	765	250944
	42H0	1714	86052	45665	29418	13640	2751		1444	1914	182599
	42G9	94	25149	9147	5623	3100	1560		593	397	45663
26	41H0	1102	38331	16382	9090	4110	2414	401	1504	332	73666
	41G9	2699	100077	12195	8719	3941	1573	60	1268	645	131178
28		3520	525228	170035	118938	84100	13529	1738	17042	5994	940124
26		3801	138409	28577	17809	8051	3987	460	2773	977	204844
26+28		7321	663637	198613	136746	92151	17516	2199	19814	6971	1144969

Table 7B n × 10^6						Age group					Σ
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	
28	44H1	15.39	1635.37	463.73	403.20	362.16	104.65		123.11	77.97	3185.59
	44H0	19.87	344.88	176.08	144.89	142.94	33.45	8.50	19.43	24.34	914.38
	43H0	13.38	2700.48	839.52	547.47	444.48	35.74	21.88	89.33	0.75	4693.03
	43G9	0.61	1069.58	248.76	196.79	145.40	18.77	0.61	27.48	5.22	1713.23
	42H0	24.90	1249.74	663.20	427.24	198.10	39.95		20.98	27.80	2651.90
	42G9	6.10	1632.96	593.95	365.12	201.28	101.28		38.52	25.77	2964.97
26	41H0	16.50	573.97	245.30	136.11	61.55	36.15	6.00	22.52	4.98	1103.07
	41G9	86.96	3224.65	392.96	280.93	126.98	50.69	1.93	40.87	20.78	4226.75
28		80.24	8633.01	2985.25	2084.71	1494.36	333.84	31.00	318.85	161.85	16123.11
26		103.46	3798.62	638.26	417.04	188.53	86.84	7.93	63.39	25.76	5329.82
26+28		183.70	12431.63	3623.50	2501.76	1682.90	420.67	38.92	382.24	187.61	21452.93

Table 7C n, %						Age group					Σ
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	
28	44H1	0.48	51.34	14.56	12.66	11.37	3.29		3.86	2.45	100.00
	44H0	2.17	37.72	19.26	15.85	15.63	3.66	0.93	2.13	2.66	100.00
	43H0	0.29	57.54	17.89	11.67	9.47	0.76	0.47	1.90	0.02	100.00
	43G9	0.04	62.43	14.52	11.49	8.49	1.10	0.04	1.60	0.30	100.00
	42H0	0.94	47.13	25.01	16.11	7.47	1.51		0.79	1.05	100.00
	42G9	0.21	55.08	20.03	12.31	6.79	3.42		1.30	0.87	100.00
26	41H0	1.50	52.03	22.24	12.34	5.58	3.28	0.54	2.04	0.45	100.00
	41G9	2.06	76.29	9.30	6.65	3.00	1.20	0.05	0.97	0.49	100.00
28		0.50	53.54	18.52	12.93	9.27	2.07	0.19	1.98	1.00	100.00
26		1.94	71.27	11.98	7.82	3.54	1.63	0.15	1.19	0.48	100.00
26+28		0.86	57.95	16.89	11.66	7.84	1.96	0.18	1.78	0.87	100.00

Table 7D W, kg × 10^3						Age group					Σ
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	
28	44H1	43.09	10097.24	4008.78	3843.06	3657.02	1155.74		1189.08	785.88	24779.89
	44H0	47.68	2311.00	1475.42	1417.14	1437.19	374.77	111.76	224.76	250.30	7650.02
	43H0	42.06	17957.19	6979.17	5174.33	4493.60	407.95	213.48	965.13	10.50	36243.41
	43G9	1.47	7548.00	2154.12	1922.68	1539.68	216.36	8.29	306.69	55.05	13752.34
	42H0	72.90	9086.45	5598.77	4455.46	2191.14	494.11		227.92	346.03	22472.78
	42G9	15.85	12421.04	5332.81	3810.98	2282.81	1134.25		430.61	282.10	25710.45
26	41H0	49.97	4152.32	1999.25	1399.34	659.55	413.05	69.21	251.76	53.33	9047.78
	41G9	279.13	25409.97	3787.17	2976.66	1412.63	546.39	30.87	500.19	224.72	35167.73
28		223.06	59420.92	25549.07	20623.66	15601.43	3783.18	333.53	3344.20	1729.85	130608.90
26		329.10	29562.29	5786.42	4376.00	2072.18	959.44	100.07	751.95	278.05	44215.50
26+28		552.15	88983.21	31335.49	24999.66	17673.61	4742.62	433.61	4096.15	2007.90	174824.40

Table 7E W, %		Age group									
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	∑
28	44H1	0.17	40.75	16.18	15.51	14.76	4.66	0.00	4.80	3.17	100.00
	44H0	0.62	30.21	19.29	18.52	18.79	4.90	1.46	2.94	3.27	100.00
	43H0	0.12	49.55	19.26	14.28	12.40	1.13	0.59	2.66	0.03	100.00
	43G9	0.01	54.89	15.66	13.98	11.20	1.57	0.06	2.23	0.40	100.00
	42H0	0.32	40.43	24.91	19.83	9.75	2.20	0.00	1.01	1.54	100.00
	42G9	0.06	48.31	20.74	14.82	8.88	4.41	0.00	1.67	1.10	100.00
26	41H0	0.55	45.89	22.10	15.47	7.29	4.57	0.76	2.78	0.59	100.00
	41G9	0.79	72.25	10.77	8.46	4.02	1.55	0.09	1.42	0.64	100.00
28		0.17	45.50	19.56	15.79	11.95	2.90	0.26	2.56	1.32	100.00
26		0.74	66.86	13.09	9.90	4.69	2.17	0.23	1.70	0.63	100.00
26+28		0.32	50.90	17.92	14.30	10.11	2.71	0.25	2.34	1.15	100.00

Table 7F w, g		Age group									
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	Total
28	44H1	2.80	6.17	8.64	9.53	10.10	11.04		9.66	10.08	7.78
	44H0	2.40	6.70	8.38	9.78	10.05	11.20	13.15	11.57	10.28	8.37
	43H0	3.14	6.65	8.31	9.45	10.11	11.42	9.76	10.80	14.00	7.72
	43G9	2.40	7.06	8.66	9.77	10.59	11.52	13.53	11.16	10.54	8.03
	42H0	2.93	7.27	8.44	10.43	11.06	12.37		10.87	12.45	8.47
	42G9	2.60	7.61	8.98	10.44	11.34	11.20		11.18	10.95	8.67
26	41H0	3.03	7.23	8.15	10.28	10.72	11.43	11.54	11.18	10.72	8.20
	41G9	3.21	7.88	9.64	10.60	11.12	10.78	16.00	12.24	10.81	8.32
28		2.78	6.88	8.56	9.89	10.44	11.33	10.76	10.49	10.69	8.10
26		3.18	7.78	9.07	10.49	10.99	11.05	12.63	11.86	10.79	8.30
26+28		3.01	7.16	8.65	9.99	10.50	11.27	11.14	10.72	10.70	8.15

Table 7G L, cm		Age group									
ICES SD	ICES Rect.	0	1	2	3	4	5	6	7	8+	Total
28	44H1	7.75	10.24	11.65	12.17	12.49	13.04		12.25	12.50	11.16
	44H0	7.67	10.51	11.45	12.22	12.36	12.88	13.59	13.07	12.48	11.41
	43H0	7.97	10.45	11.42	12.07	12.42	13.02	12.25	12.74	13.75	11.06
	43G9	7.25	10.62	11.55	12.14	12.60	12.98	13.75	12.84	12.48	11.17
	42H0	8.07	10.76	11.41	12.48	12.74	13.33		12.66	13.61	11.40
	42G9	7.75	10.85	11.60	12.37	12.75	12.70		12.79	12.55	11.41
26	41H0	8.23	10.66	11.16	12.40	12.55	12.89	12.83	12.78	12.75	11.19
	41G9	8.18	11.01	11.96	12.50	12.81	12.56	14.25	13.27	12.72	11.24
28		7.86	10.55	11.50	12.24	12.53	12.95	12.65	12.58	12.70	11.23
26		8.19	10.96	11.65	12.47	12.73	12.69	13.18	13.10	12.73	11.23
26+28		8.05	10.68	11.53	12.28	12.56	12.90	12.75	12.67	12.71	11.23

Table 8. Herring stock characteristics 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 08.-18.10.2015

Table 8A CANUM		Age group									Σ
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	7959	3837	3697	1192	565	250	112	51		17663
	44H0	3922	618	1291	1233	117	403	273	215		8071
	43H0	3164	279	1024	1490	776	683	621	372	186	8595
	43G9	3261	637	3399	4087	1702	2111	1703	841	571	18313
	42H0	2062	846	1147	403	161	180	154	51	211	5214
	42G9	413	312	678	817	172	460	423	139	87	3500
26	41H0	41	14				5	5		23	86
	41G9	720	584	1041	1201	546	1049	802	404	274	6620
28		20781	6528	11236	9222	3493	4087	3286	1669	1055	61356
26		761	597	1041	1201	546	1054	807	404	296	6706
26+28		21542	7125	12276	10423	4039	5140	4093	2072	1351	68062

Table 8B n × 10^6		Age group									Σ
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	226.47	109.18	105.20	33.91	16.09	7.13	3.19	1.44		502.61
	44H0	777.70	122.45	255.93	244.47	23.12	79.89	54.11	42.68		1600.35
	43H0	43.12	3.81	13.96	20.30	10.57	9.31	8.46	5.08	2.54	117.14
	43G9	22.26	4.35	23.21	27.91	11.62	14.41	11.63	5.74	3.90	125.02
	42H0	29.95	12.28	16.66	5.86	2.34	2.61	2.24	0.73	3.07	75.73
	42G9	26.81	20.23	44.03	53.05	11.16	29.86	27.49	9.01	5.64	227.27
26	41H0	0.61	0.20				0.07	0.07		0.34	1.29
	41G9	23.20	18.81	33.53	38.69	17.60	33.80	25.85	13.00	8.82	213.29
28		1126.32	272.29	458.98	385.50	74.90	143.20	107.11	64.69	15.14	2648.12
26		23.81	19.01	33.53	38.69	17.60	33.87	25.91	13.00	9.16	214.59
26+28		1150.13	291.31	492.51	424.18	92.50	177.07	133.02	77.69	24.29	2862.71

Table 8C n, %		Age group									Σ
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	45.06	21.72	20.93	6.75	3.20	1.42	0.63	0.29		100.00
	44H0	48.60	7.65	15.99	15.28	1.44	4.99	3.38	2.67		100.00
	43H0	36.81	3.25	11.91	17.33	9.03	7.94	7.22	4.33	2.17	100.00
	43G9	17.81	3.48	18.56	22.32	9.30	11.53	9.30	4.59	3.12	100.00
	42H0	39.54	16.22	22.00	7.74	3.09	3.45	2.95	0.97	4.05	100.00
	42G9	11.80	8.90	19.37	23.34	4.91	13.14	12.09	3.97	2.48	100.00
26	41H0	47.37	15.79				5.26	5.26		26.32	100.00
	41G9	10.88	8.82	15.72	18.14	8.25	15.85	12.12	6.10	4.13	100.00
28		42.53	10.28	17.33	14.56	2.83	5.41	4.04	2.44	0.57	100.00
26		11.10	8.86	15.63	18.03	8.20	15.78	12.08	6.06	4.27	100.00
26+28		40.18	10.18	17.20	14.82	3.23	6.19	4.65	2.71	0.85	100.00

Table 8D W, kg × 10^3		Age group									Σ
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	2462.09	1895.92	2346.61	772.01	436.94	210.40	61.61	41.35		8226.94
	44H0	9947.06	2244.71	5684.19	6337.86	558.34	2204.11	1677.37	1387.23		30040.89
	43H0	484.19	71.77	345.47	521.46	294.20	278.37	269.29	168.97	96.50	2530.23
	43G9	282.79	92.63	580.80	785.36	346.04	435.65	380.03	180.64	141.93	3225.87
	42H0	472.28	282.83	467.01	177.89	63.66	77.92	105.88	25.06	127.89	1800.40
	42G9	359.03	462.23	1119.47	1657.15	340.41	846.58	870.53	255.44	192.65	6103.49
26	41H0	7.21	4.38				2.80	3.47	0.00	17.75	35.61
	41G9	294.27	366.04	831.14	1159.41	548.99	1122.97	836.94	438.81	379.47	5978.03
28		14007.43	5050.10	10543.56	10251.73	2039.60	4053.04	3364.70	2058.69	558.97	51927.82
26		301.48	370.41	831.14	1159.41	548.99	1125.77	840.41	438.81	397.22	6013.64
26+28		14308.91	5420.51	11374.69	11411.14	2588.59	5178.81	4205.11	2497.50	956.19	57941.46

Table 8E W, %		Age group									∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	29.93	23.05	28.52	9.38	5.31	2.56	0.75	0.50	0.00	100.00
	44H0	33.11	7.47	18.92	21.10	1.86	7.34	5.58	4.62	0.00	100.00
	43H0	19.14	2.84	13.65	20.61	11.63	11.00	10.64	6.68	3.81	100.00
	43G9	8.77	2.87	18.00	24.35	10.73	13.51	11.78	5.60	4.40	100.00
	42H0	26.23	15.71	25.94	9.88	3.54	4.33	5.88	1.39	7.10	100.00
	42G9	5.88	7.57	18.34	27.15	5.58	13.87	14.26	4.19	3.16	100.00
26	41H0	20.24	12.30	0.00	0.00	0.00	7.87	9.74	0.00	49.85	100.00
	41G9	4.92	6.12	13.90	19.39	9.18	18.78	14.00	7.34	6.35	100.00
28		26.97	9.73	20.30	19.74	3.93	7.81	6.48	3.96	1.08	100.00
26		5.01	6.16	13.82	19.28	9.13	18.72	13.98	7.30	6.61	100.00
26+28		24.70	9.36	19.63	19.69	4.47	8.94	7.26	4.31	1.65	100.00

Table 8F w, g		Age group									Total
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	10.87	17.37	22.31	22.76	27.16	29.53	19.31	28.65		16.37
	44H0	12.79	18.33	22.21	25.92	24.15	27.59	31.00	32.51		18.77
	43H0	11.23	18.86	24.75	25.68	27.82	29.92	31.83	33.29	38.02	21.60
	43G9	12.70	21.30	25.03	28.14	29.77	30.23	32.68	31.45	36.42	25.80
	42H0	15.77	23.03	28.04	30.37	27.24	29.82	47.34	34.13	41.70	23.77
	42G9	13.39	22.85	25.43	31.24	30.50	28.35	31.67	28.34	34.19	26.86
26	41H0	11.78	21.47				41.20	51.00		52.20	27.56
	41G9	12.69	19.46	24.79	29.97	31.19	33.22	32.38	33.75	43.04	28.03
28		12.44	18.55	22.97	26.59	27.23	28.30	31.41	31.83	36.93	19.61
26		12.66	19.48	24.79	29.97	31.19	33.24	32.43	33.75	43.38	28.02
26+28		12.44	18.61	23.10	26.90	27.98	29.25	31.61	32.15	39.36	20.24

Table 8G L, cm		Age group									Total
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	44H1	12.22	14.29	15.50	15.63	16.51	17.06	14.75	16.75		13.82
	44H0	12.89	14.65	15.69	16.56	16.25	17.04	17.67	18.09		14.59
	43H0	12.46	14.75	16.33	16.73	17.17	17.77	17.85	18.17	18.92	15.36
	43G9	12.89	15.46	16.44	17.18	17.54	17.62	18.04	17.80	18.75	16.46
	42H0	12.91	14.79	15.85	16.49	16.30	16.68	19.38	18.25	19.04	14.86
	42G9	13.02	15.77	16.47	17.71	17.65	17.16	17.96	17.17	18.59	16.70
26	41H0	12.47	14.92				18.25	20.25		20.75	15.75
	41G9	13.05	14.98	16.33	17.46	17.72	18.08	17.92	18.20	19.67	16.90
28		12.74	14.61	15.78	16.69	16.85	17.17	17.75	17.92	18.78	14.76
26		13.04	14.98	16.33	17.46	17.72	18.08	17.93	18.20	19.71	16.89
26+28		12.75	14.63	15.82	16.76	17.01	17.34	17.78	17.96	19.13	14.92

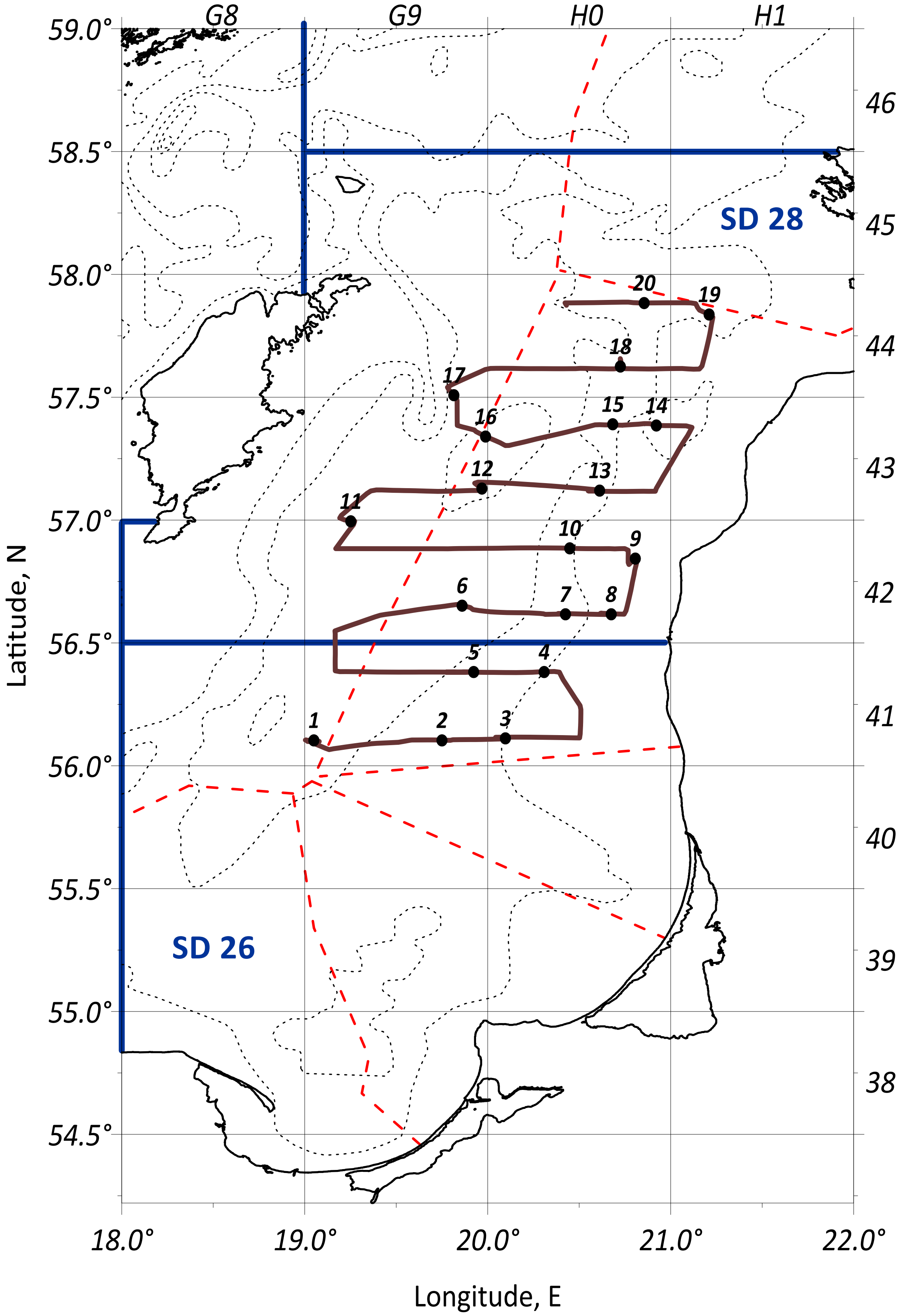

Figure 1: Cruise track design and trawling positions of the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 08.-18.10.2015.

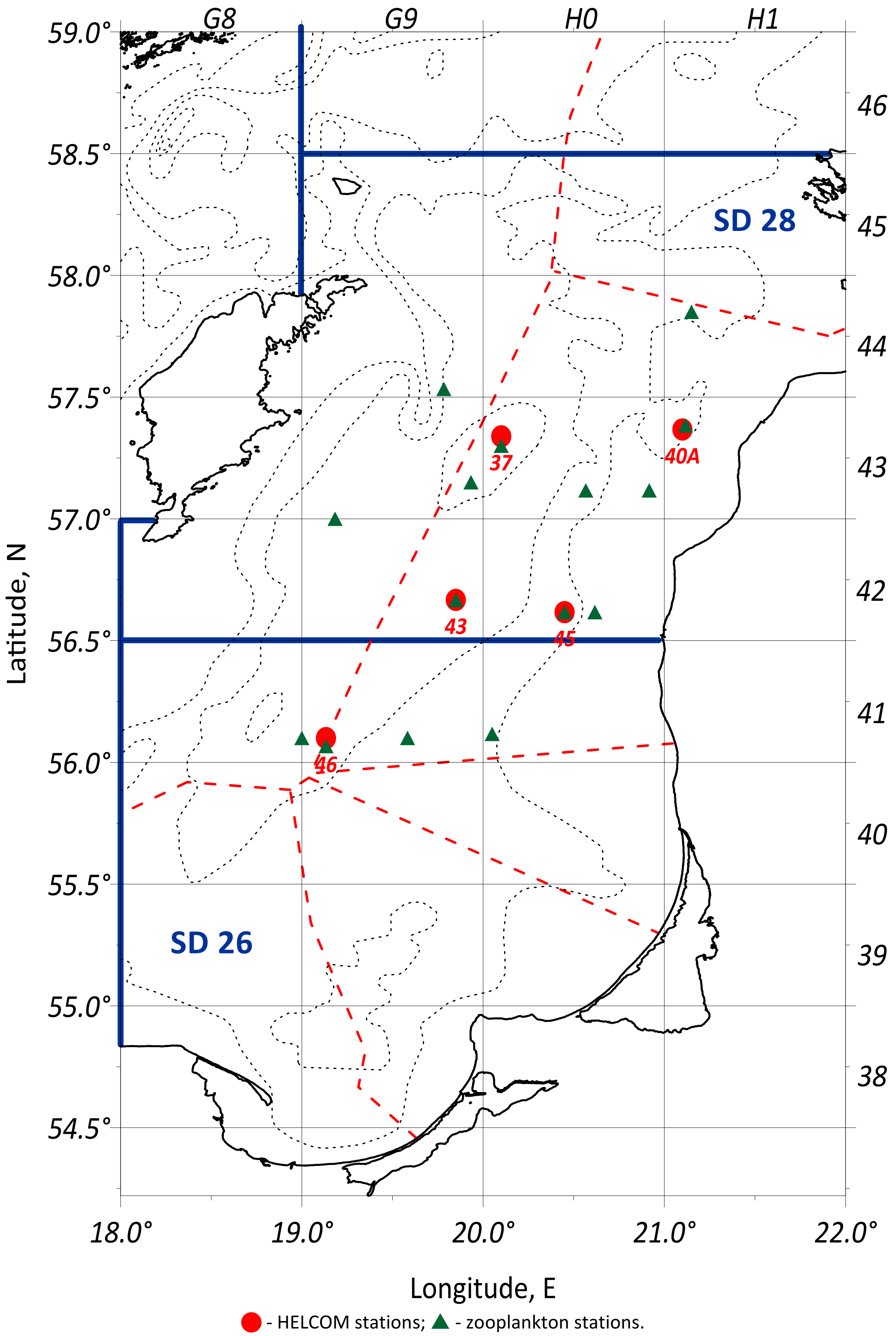

Figure 2: Locations of the zooplankton stations performed during the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 08.-18.10.2015.

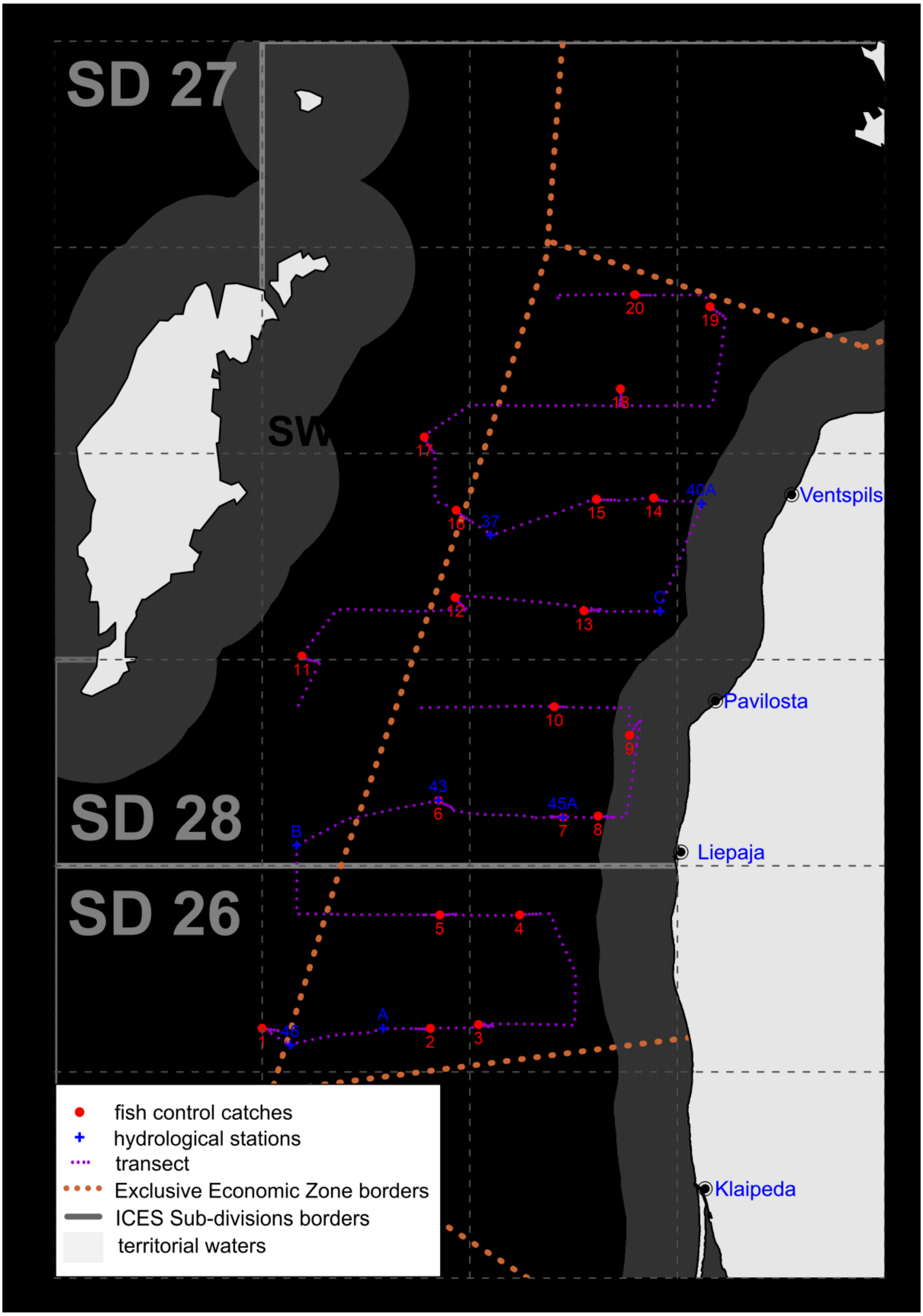

Figure 3: Locations of the hydrological stations performed during the Latvian-Polish hydroacoustic survey on the r/v "Baltica" in the period of 08.-18.10.2015.

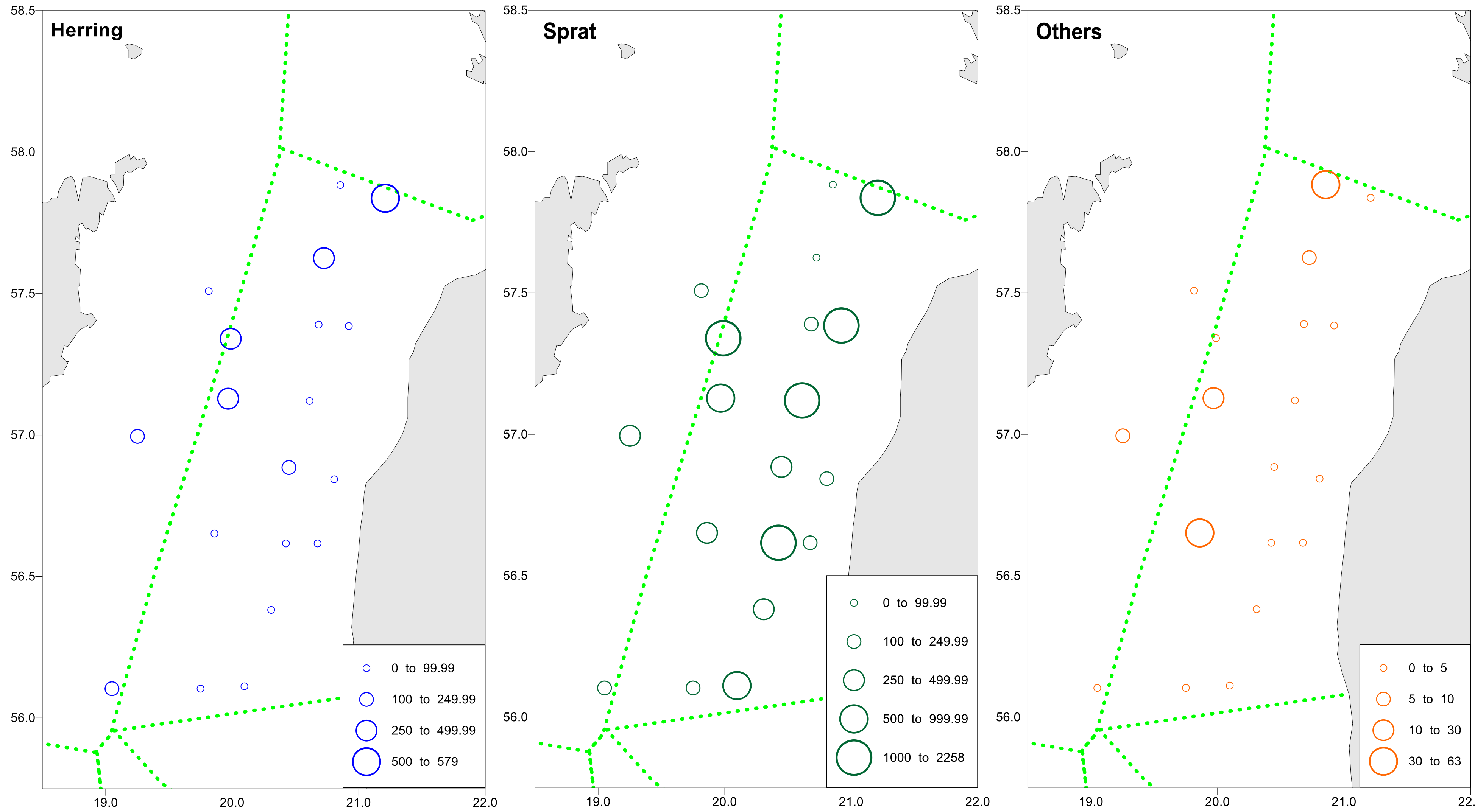

Figure 4: CPUE [kg/h] ranges distribution of fish in the catch hauls in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

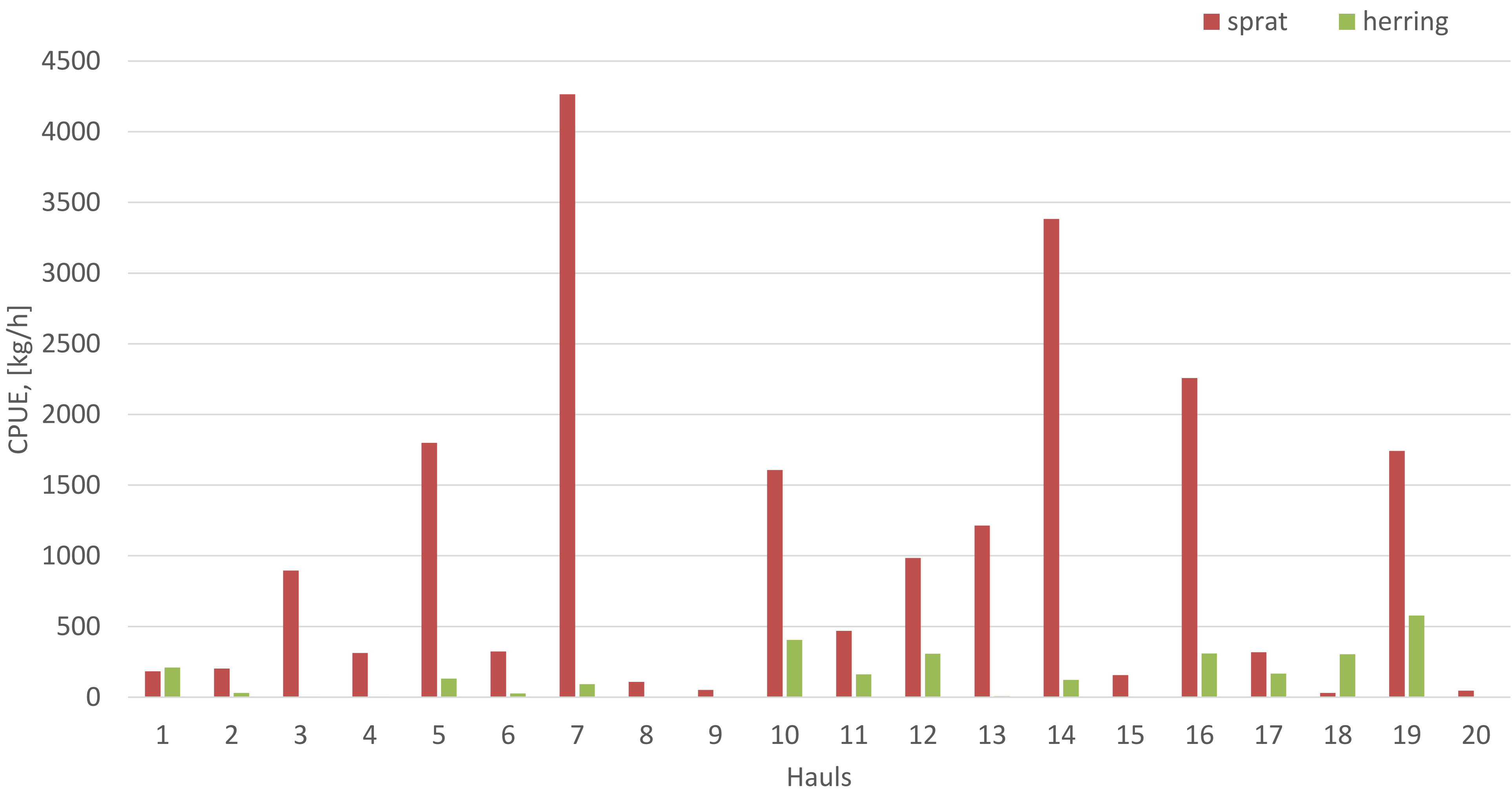

Figure 5: CPUE [kg/h] of dominant pelagic fish in the catch hauls in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

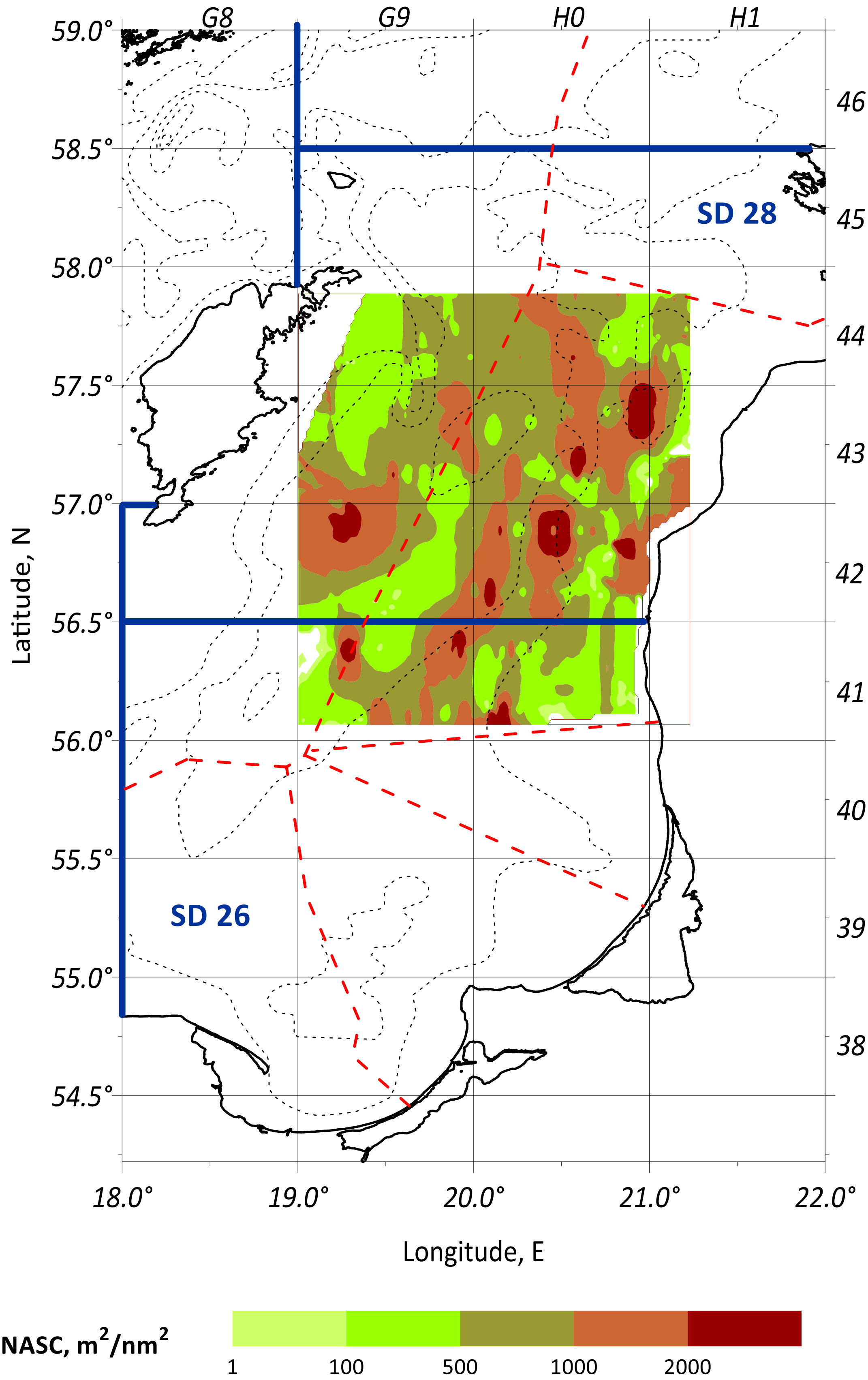

Figure 6: Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

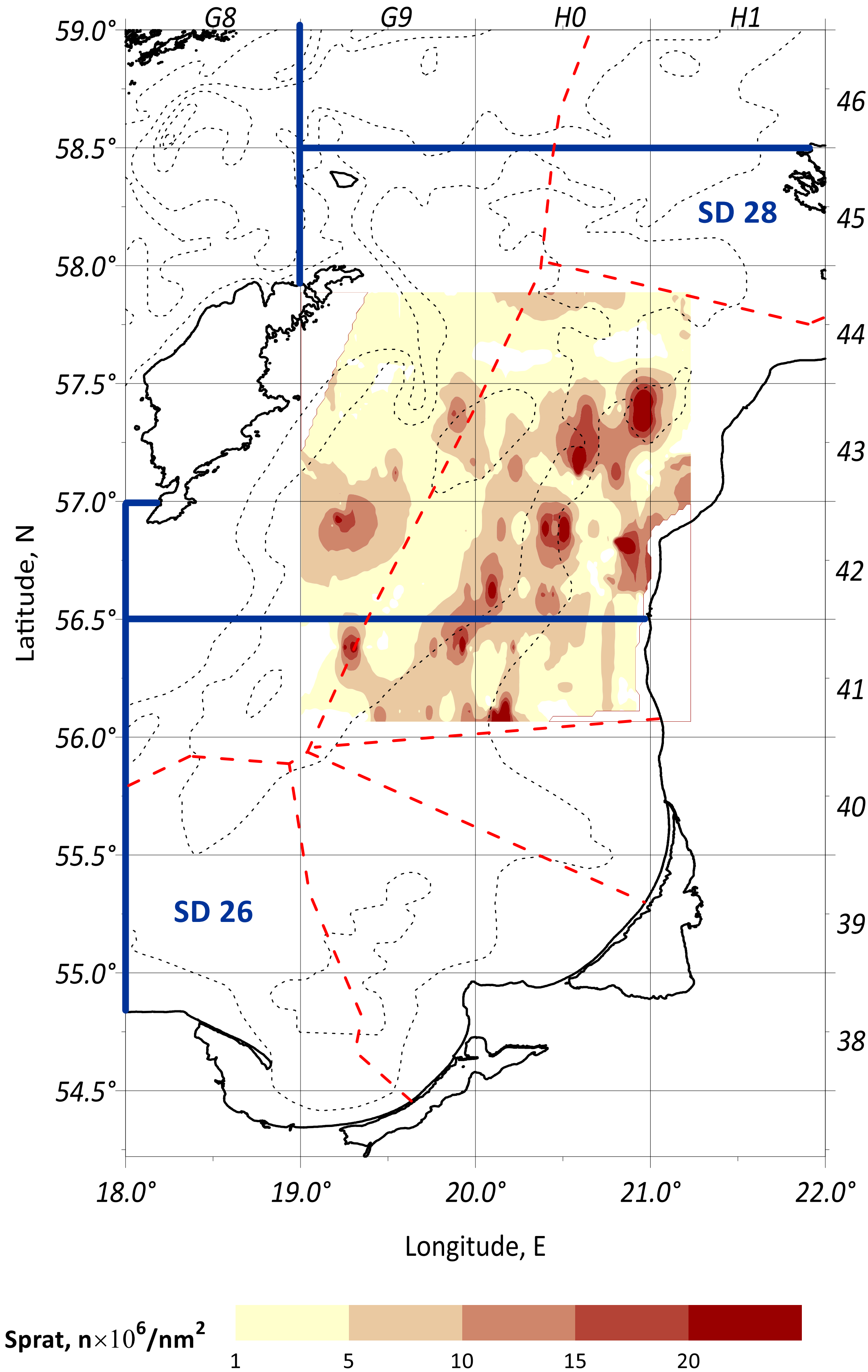

Figure 7: Sprat distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

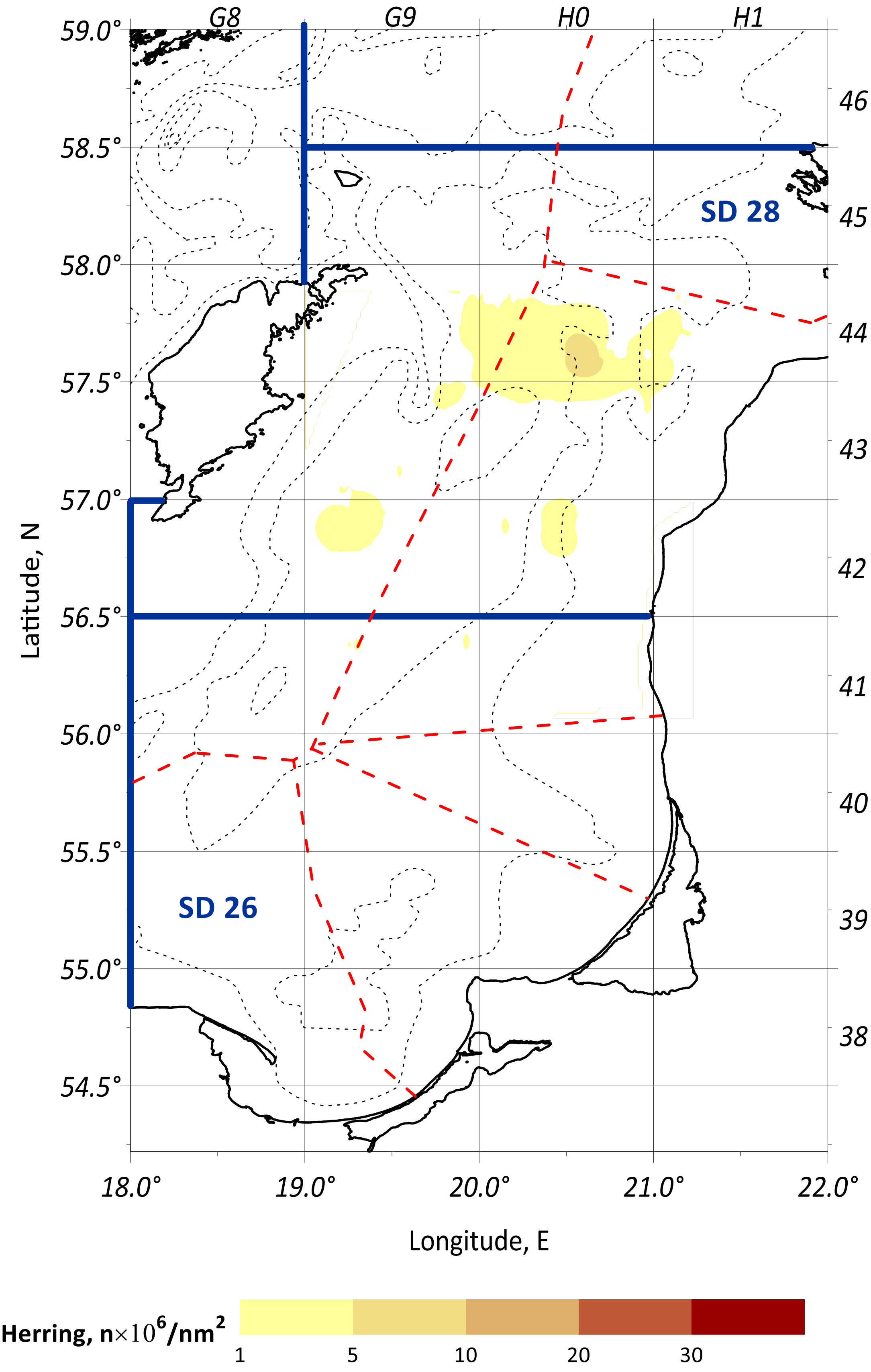

Figure 8: Herring distribution in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

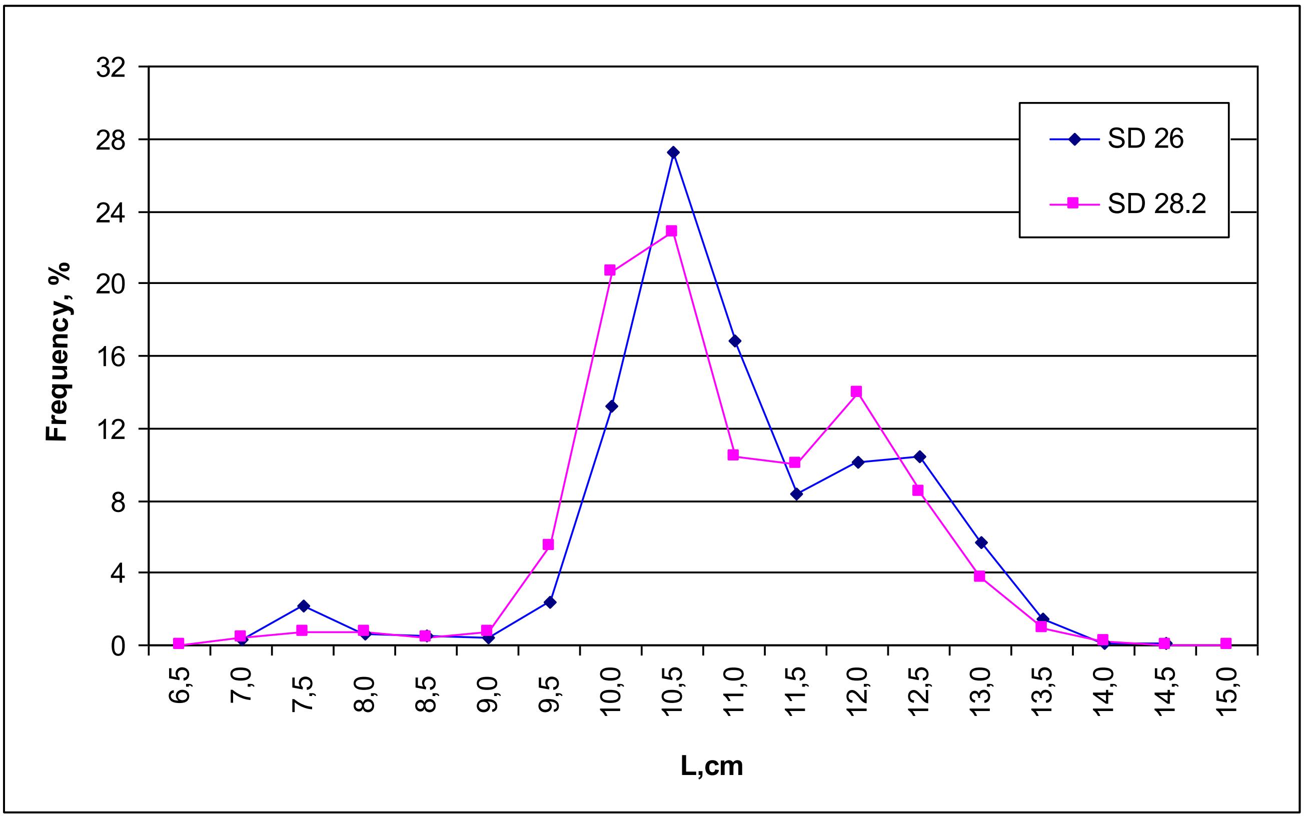

Figure 9: Sprat length distributions in control catches in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

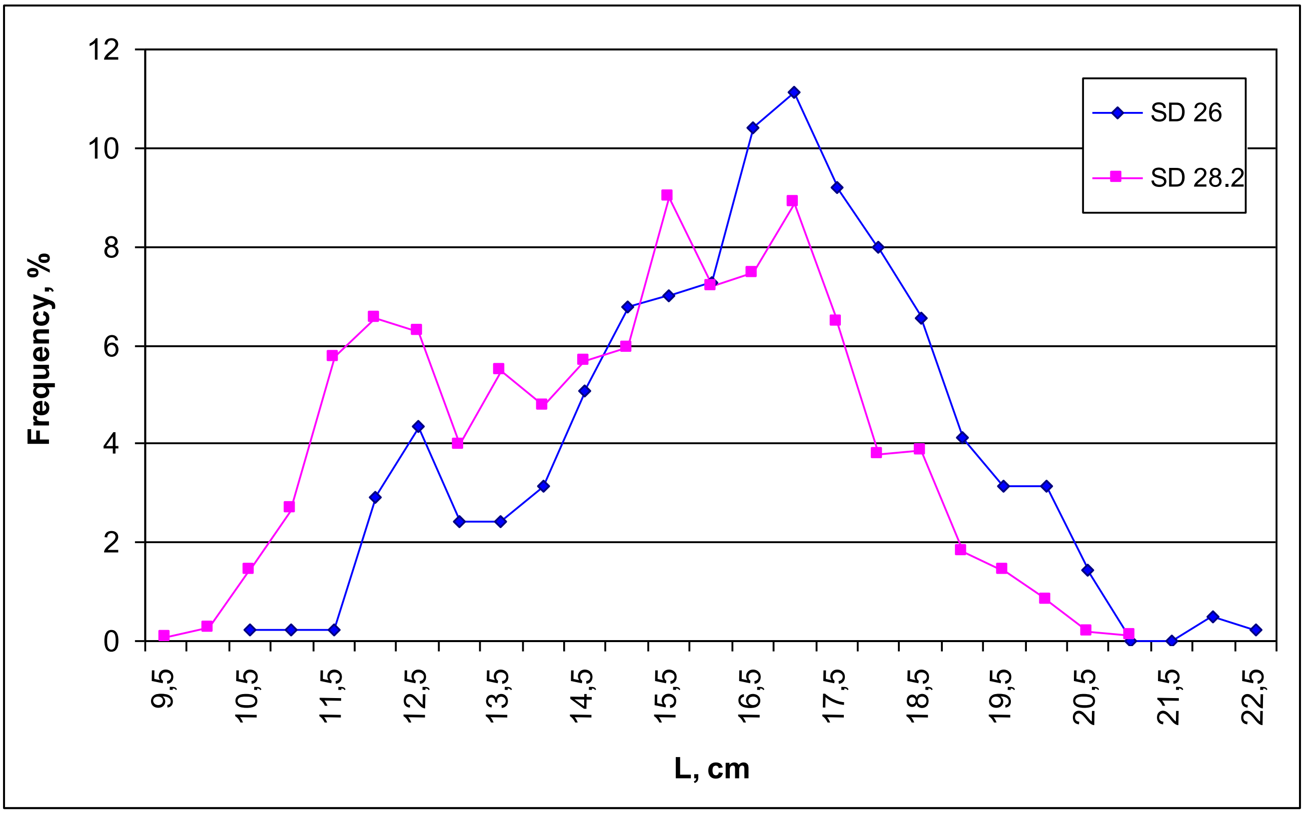

Figure 10: Herring length distributions in control catches in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

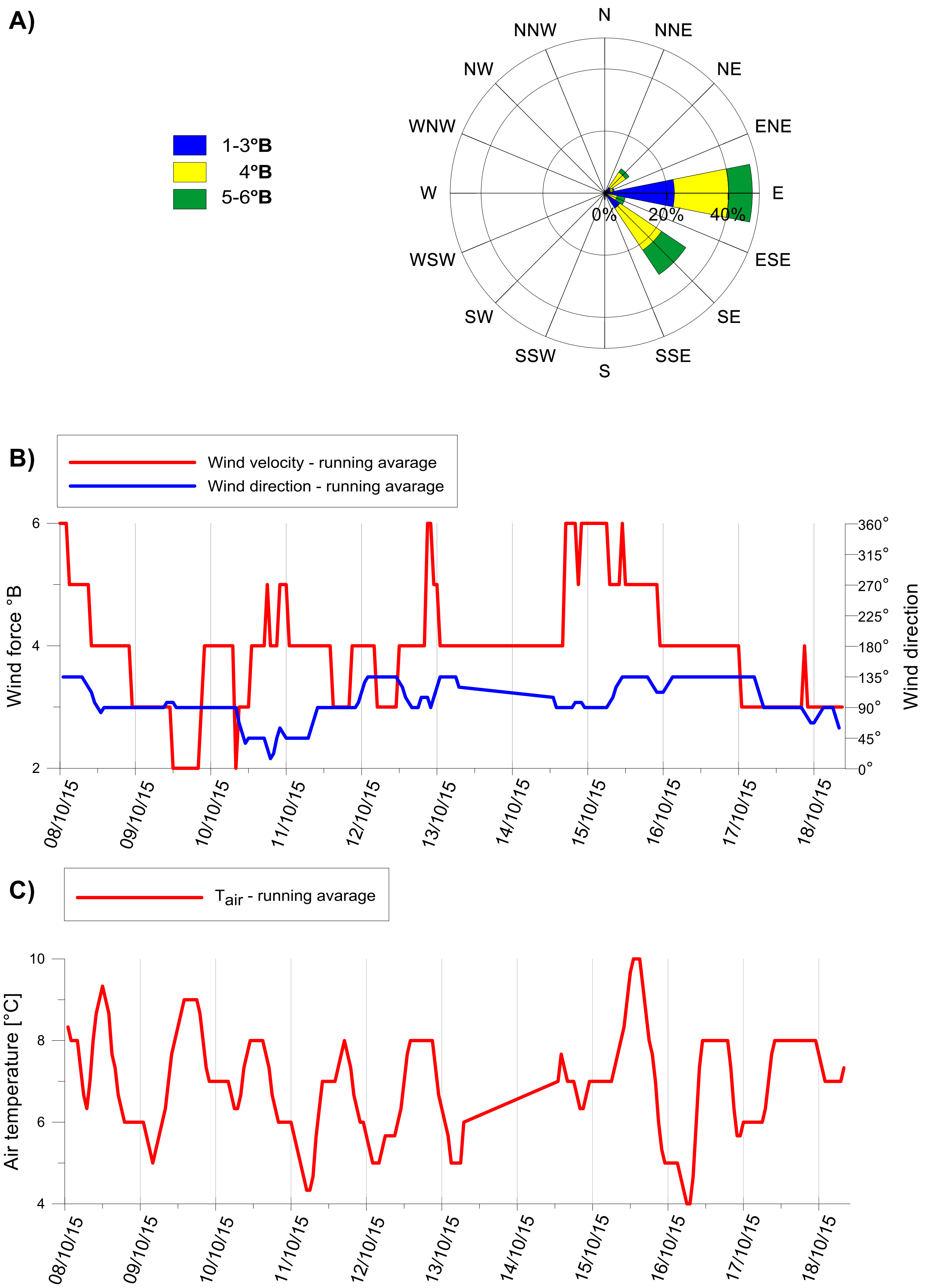

Figure 11: Changes of the main meteorological parameters (wind force, direction and the daily air temperature) during the Latvian-Polish BIAS survey in the Baltic Sea ICES SD 26N and 28.2 conducted by r/v "Baltica" in the period of 08.-18.10.2015

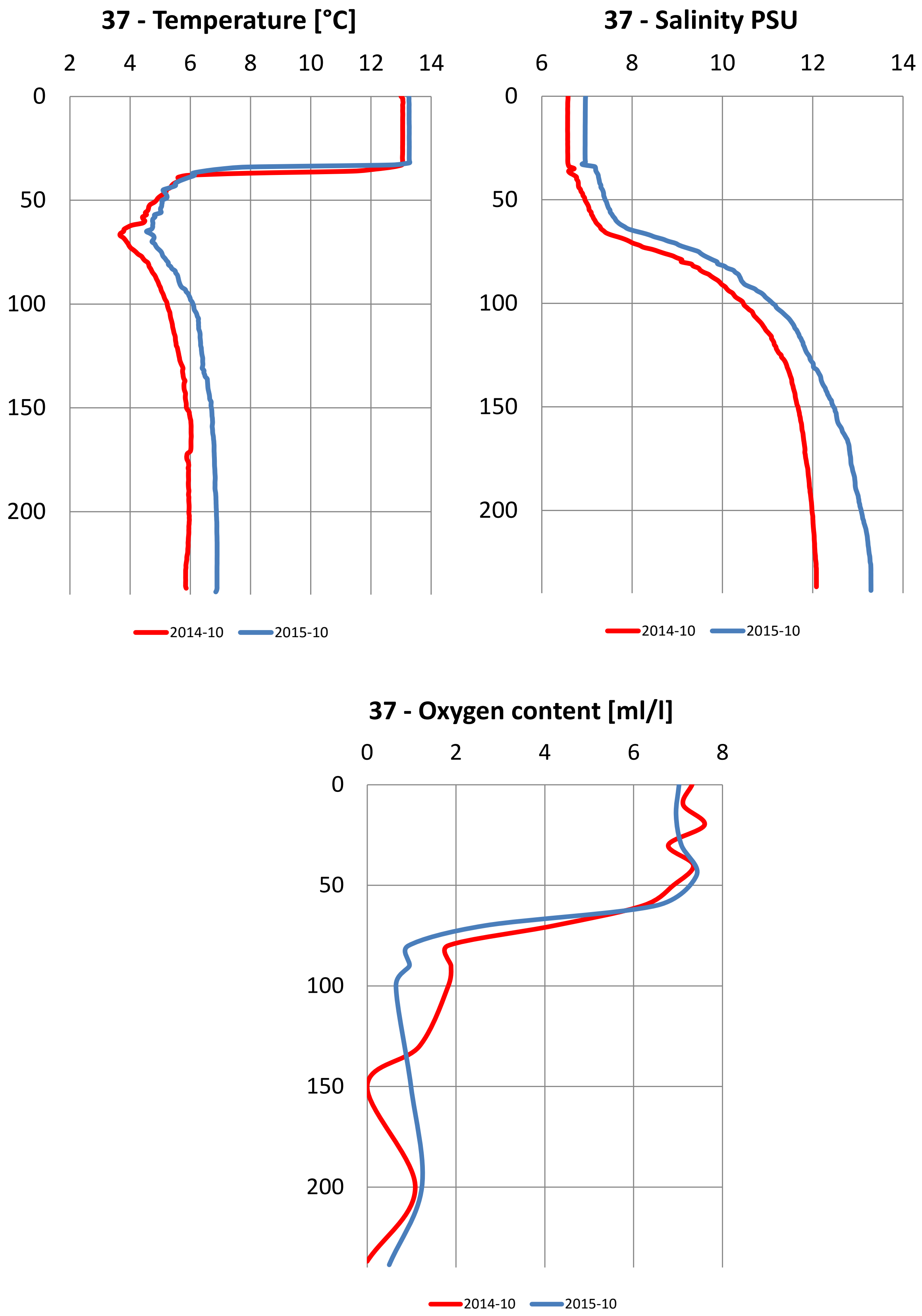

Figure 12: Vertical distribution of the seawater temperature, salinity and oxygen content at three different parts of the Gotland Basin in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in October in the period of 08.-18.10.2015.

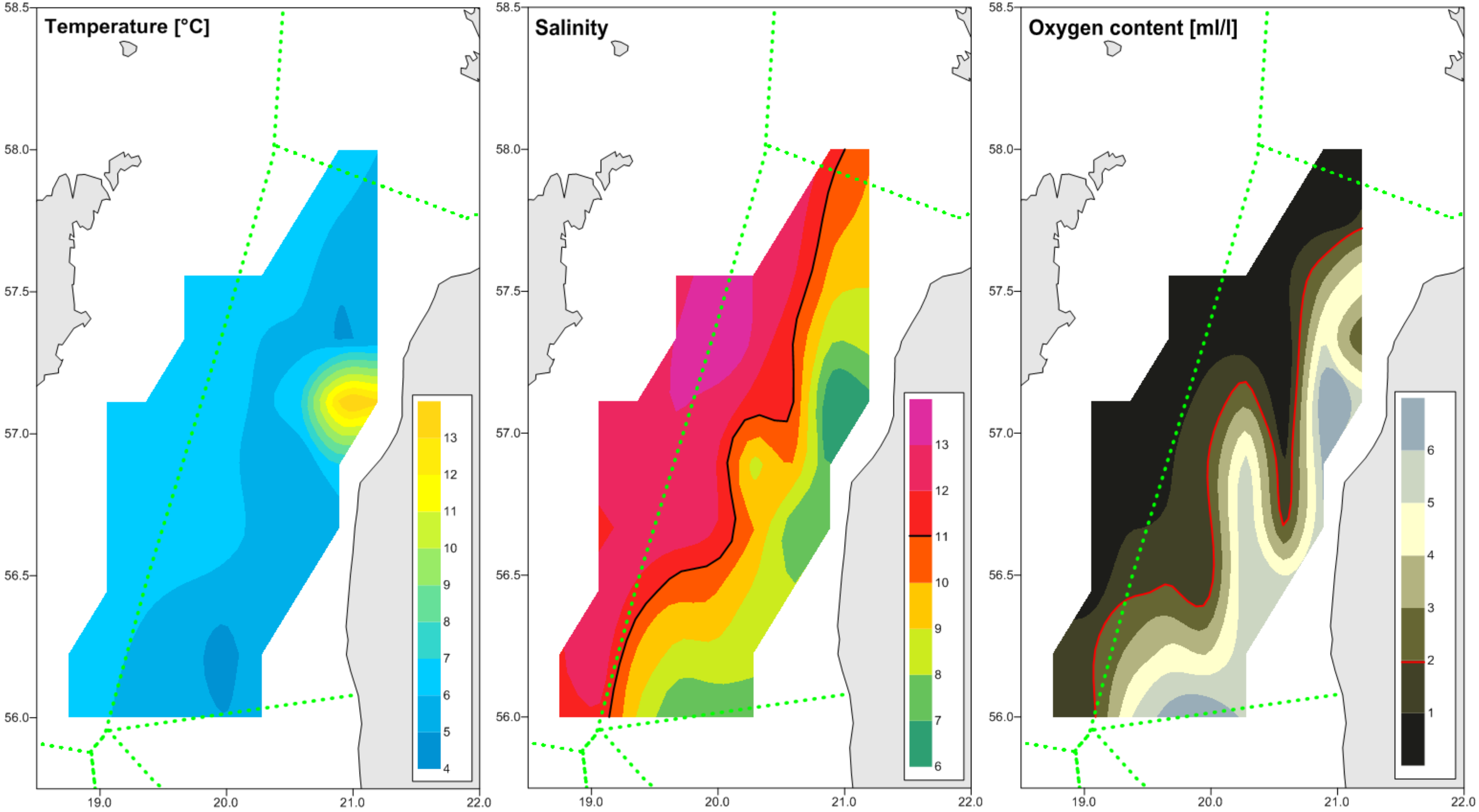

Figure 13: Horizontal distribution of the main hydrological parameters (temperature, salinity, oxygen content) measured in the bottom water layer of the Gotland Deep in the Baltic Sea ICES SD 26N and 28.2 from the Latvian-Polish BIAS survey conducted by r/v "Baltica" in the period of 08.-18.10.2015.

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THE CRUISE REPORT

FROM THE LATVIAN-ESTONIAN JOINT BALTIC ACOUSTIC SPRING SURVEY – BASS 2015 ON THE F/V "ULRIKA" IN THE ICES SUBDIVISIONS 26N, 28, 29 AND 32W OF THE BALTIC SEA

(12 – 24 MAY 2015)

Working paper on the WGBIFS meeting in Rostock, Germany, 30.03-03.04.2016

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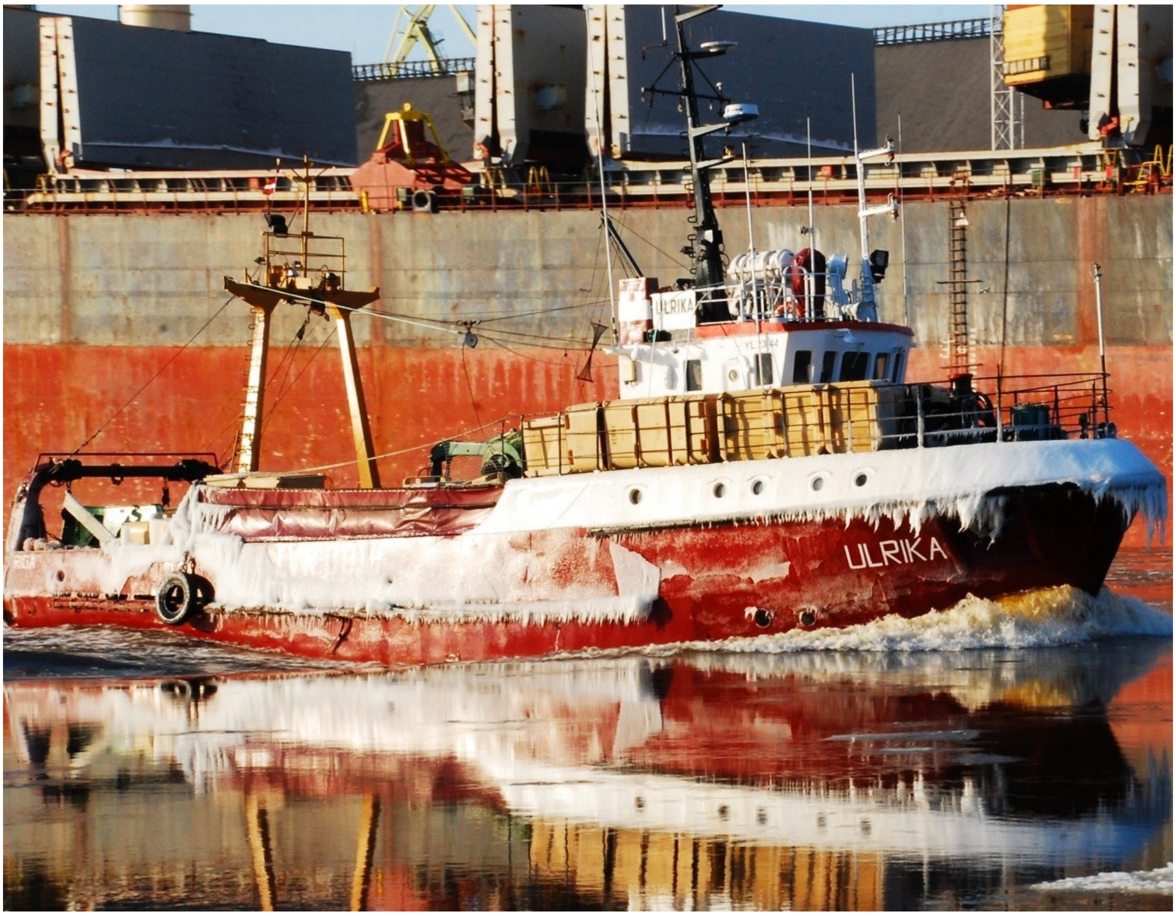

Riga, March 2016

THE CRUISE REPORT

FROM THE JOINT LATVIAN-ESTONIAN JOINT BALTIC ACOUSTIC SPRING SURVEY – BASS 2015
ON THE F/V "ULRIKA" IN THE ICES SUBDIVISIONS 26N, 28, 29 AND 32W OF THE BALTIC SEA
(12 – 24 MAY 2015)

Working paper on the WGBIFS meeting in Rostock, Germany, 30.03-03.04.2016

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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. Due to BONUS EEIG project INSPIRE (INSPIRE) funding historically the first Latvian-Estonian joint BASS in the ICES Sub-divisions 26N, 28 29 and 32W in May 2014 was conducted on the Latvian commercial fishing vessel "Ulrika" [Svecovs et al., 2015].

In May 2015 on the Latvian commercial fishing vessel "Ulrika" was performed the second Latvian-Estonian joint Baltic Acoustic Spring Survey (BASS). 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 INSPIRE was partly subsidized this cruise. It was coordinated by the ICES Baltic International Fish Survey Working Group (WGBIFS) [ICES 2014] and 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 four persons:

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

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

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

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 12 – 23 May 2015. The first two days due to unfavorable weather conditions the vessel stayed at port and crew and scientific team performed onboard upgrades for further catch processing. The vessel left the port of Ventspils on 14.05.2014 at 01:00 o’clock GMT+02:00. The sea researches were conducted in the period of 14.-23. 05.2014 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 23th 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 750 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 2015 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 24 control hauls 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 30 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 in all investigated areas was 20 m and horizontal opening was 78 m. The mean bottom depth at trawling positions varied from 52 to 224 m (mean for all investigated area – 109 m). Totally, 4 hauls were localized in the ICES Sub-division 26, 14 hauls in the ICES Sub-division 28, 4 hauls in the ICES Sub-division 29, one haul in the ICES Sub-division 32 and one haul was started in the ICES Sub-division 32 and ended in the ICES Sub-division 29. On the whole, 11 catch samples were taken in the Latvian EEZ, 8 samples in the Estonian EEZ and 5 samples in the Sweden EEZ. All hauls were conducted outside the territorial waters of these countries. The catches were made at the daylight between 07:00 a.m. and 20:14 p.m. GMT+02:00. The mean speed of the vessel during trawling was 2.9 knots. The trawling time of the single valid haul lasted for 30 minutes with an exception at first haul when trawling duration was 15 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 4714 sprat, 2323 herring, 105 cod, 24 flounder, 8 threespine stickleback, 7 lumpfish, 1 great sandeel individuals. 1819 and 602 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 nautical 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, 35 hydrological stations were inspected in May 2015 by f/v "Ulrika". The hydrological and hydrobiological research profiles location is presented in Figure 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 35 zooplankton, 35 ichthyoplankton and 35 ichthyoplankton with circulation stations were realized and 35 zooplankton and 70 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

Totally, seven fish species were recorded in the 24 pelagic control hauls taking place in the central-eastern Baltic (ICES Sub-divisions: 26N, 28.2, 29 and 32W). Sprat dominated very distinctly – over 90.00 % in 5 catches of fishes (Tab. 6) and 77.65 % on average in mass of all catches, but herring, cod, flounder, threespine stickleback, lumpfish and great sandeel were the following frequently occurred species: 22.04 %, 0.26 %, 0.02 %, 0.02 %, 0.01 % and <0.01% in the total mass respectively. Herring dominated in three hauls – 64.77 %, 64.69 % and 61.51 % and as considerable proportion (more than 20.00 %) was found in 13 hauls. The average share in the catches of herring and other by-catch species in May 2015 was lower, but sprat was higher average share comparing to average share in May 2014, but still remains decreasing tendency comparing to average share of period 2005-2008 and 2010-2013 [Grygiel et al. 2006a, 2006b, 2007, 2009, Svecovs et al. 2010, 2012, 2013, 2014, 2015, Wyszynski et al. 2007]. Overall the by-catch of other fish specimens in northern part of ICES SD 26 was in small amount – 5.32 %. In ICES SD 28 and 29 the by-catch of herring increased significantly to 29.96 % and 22.29 % on average respectively, but in SD 32 herring was 25.23 % (Tab. 2).

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 2013-2015 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 and in 2015 still in high level – 278.7 kg/h. Higher average CPUEs for sprat were noted in

ICES SD 26N, for herring in SD 28, for cod higher average CPUEs were noted in Sub-division 26N in comparison to other Sub-divisions. The distribution of CPUE scopes for sprat, herring, cod and flounder per single haul is shown in Figures 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 Table 3A. The total length of these fish species ranged as follows:

- sprat – 6.5÷14.5 cm (average TL = 9.7 cm), 1.3÷19.3 g (average W = 5.2 g);
- herring – 7.0÷23.5 cm (average TL = 13.0 cm), 1.6÷78.9 (average W = 16.8 g);

Sprat and herring mean length and weight had decreased in comparison to period 2012-2014.

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 2015, are given in Tab. 3. The age structured data of sprat and herring are aggregated in Tab. 4-6. The geographical distribution of NASC, sprat and herring stock densities in the central-eastern Baltic in May 2015 is shown in Figures 5-7.

The pelagic fish stock was represented mostly by sprat – 83.65 % on average. Herring was represented as 16.35 % in average with the highest numbers in SD 28 were herring was 19.8 % of pelagic fish numbers. The highest sprat stock density (40.22 n×10^6/nm^2) were recorded in ICES SD 26 rectangle 41G9. The highest average parameters of the sprat stock densities were recorded in ICES rectangle 44H1. The distribution of the high density sprat concentrations in May 2015 was totally different from May of other years. This year shows that largest sprat concentrations were observed in western part of SD 28.

The herring stock density was significantly lower in comparison to sprat stock density. The highest density values (over 10.0 n×10^6/nm^2) was noted in central part of the ICES Sub-division 28, rectangle 43H0).

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 2015. 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. 7). Sprat eggs were abundant only in the southern and central parts of the Gotland Basin, but their numbers were low in the Saaremaa Sea and in the Gulf of Finland. In the Gotland Basin amount of eggs as usual increased towards the greater depths near the center of the basin. In the Estonian EEZ eggs of sprat were scarce and mostly on the first stage of development. Only few larvae have been found here. All this must be the evidence that the spawning of sprat in the Estonian EEZ in May just started. At the same time there were many running females and males of sprat in the trawls. Sprat larvae also were more numerous over the bigger depths and in the southern part of the Gotland Basin. There amount gradually decreased towards the northern areas.

Larvae of flounder were sampled in all the regions of investigation, but they were much more abundant in the southern part of the Gotland Basin. In general, the amount of flounder larvae considerably increased in 2015 compared to 2014. Most of them were collected with vertically towed net.

There was a major inflow from the North Sea in 2015. We observed some improvement in the hydrological conditions in the Gotland Basin in May that year, though it was not very notable in the water layer where cod and rockling eggs are floating, i.e., at a depth where salinity accedes 11 ‰ or 10 ‰ respectively. Only one cod egg was sampled in May.

Biodiversity in the ichthyoplankton was on low level – only two larvae of sand-eel were found in May, apart from those of sprat and flounder.

Zooplankton estimates

Not yet processed.

Meteorological and hydrological data

The mean hydrological parameters in the central-eastern Baltic in May 2015 are presented in Tab. 8 and 9.

Temperatures in the surface layer at 0-10 m of the sea water changed during the survey from 6.49°C on average of whole layer at the central part of ICES Sub-division 29 to about 8.55°C at northern part of Gotland Deep, 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 7.24 PSU, but the lowest in northern area of basin – 5.74 PSU. In comparison to long-term values salinity was higher. The oxygen content at the sea surface ranged from 12.27 at the central part of ICES Sub-division 29 to 16.67 ml/l at the southern part of investigated area. The mean oxygen content was significantly higher than in 2013 and more than 2014.

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 3.35°C in the northern part of investigated area and increased to 4.64°C in the southern part of Gotland Deep. The average water temperature of this layer was about 4.07°C. Water salinity of this layer was fluctuating from 7.10 to 8.35 PSU and was somewhat higher than in 2013-2014. Oxygen content varied from 9.57 ml/l in the northern part of investigated area to 16.12 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 60-80 m – most frequently occupied by pelagic trawl – the average oxygen content varied from 6.88 ml/l to 15.90 ml/l, salinity changed from 6.76 PSU to 9.39 PSU and temperature from 3.15°C to 6.62°C.

The deep-water or bottom layer was determined under 90 m of the sea depth. In this layer the water temperature varied from 5.27°C in northern part of observed area to 6.38°C in central part of area. Salinity was from 10.46 PSU in the northern part of the investigated area to 11.83 PSU in the central part of the Gotland basin. Oxygen content varied from 1.63 ml/l in the northern part of the investigated area to 5.01 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 period of 2013-2015 could be reduced.

DISCUSSION

The data collected in May 2015, 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 slight increasing tendency of abundance. The geographical distribution of sprat densities in the May 2015 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 layer where oxygen content was 10.48 ml/l on average (in 2014 here was 8.99 ml/l and in 2013 4.43 ml/l) and salinity was not more than 9.39 PSU. In 2015 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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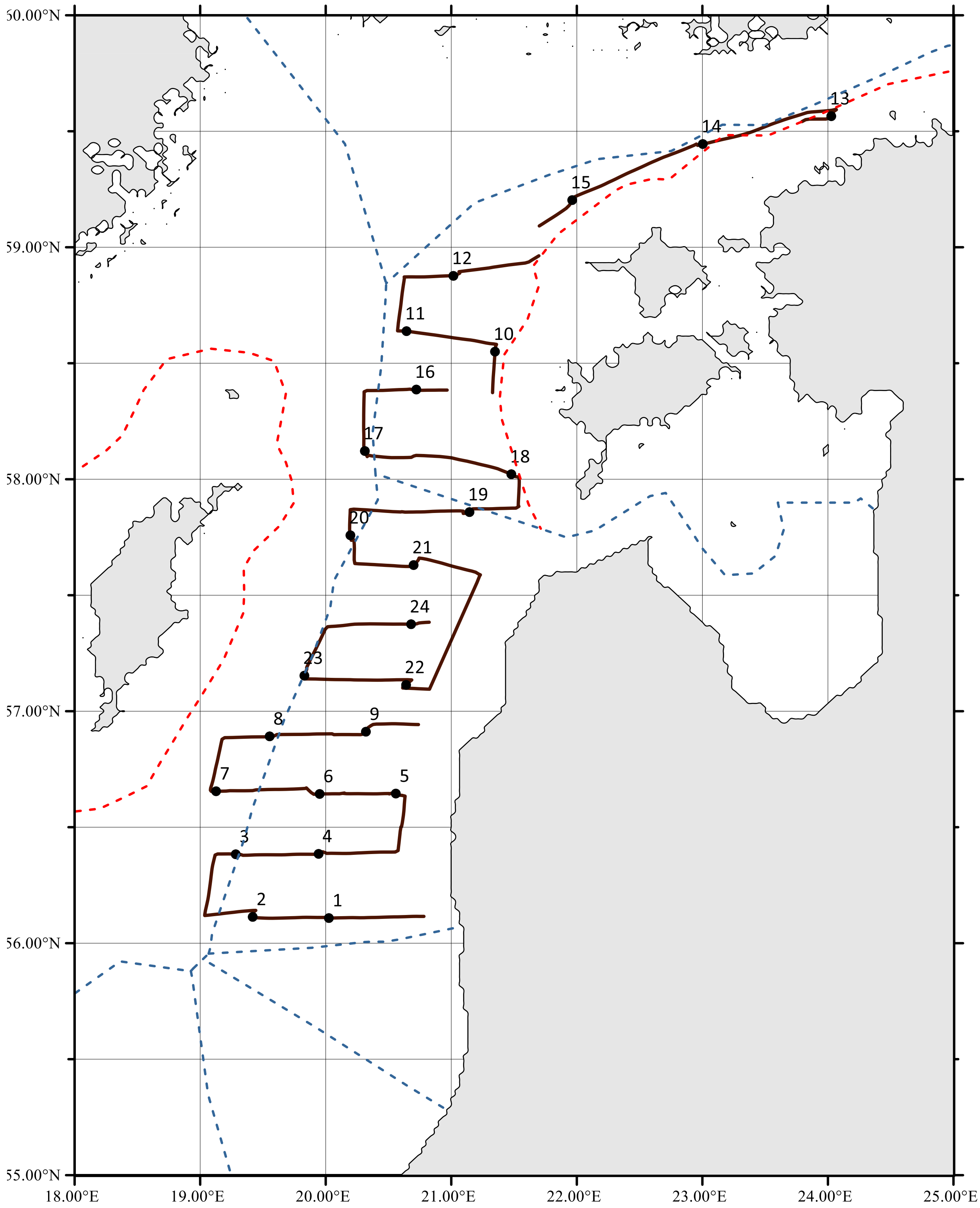

Figure 1. Cruise track design and hauls of the Latvian-Estonian joint Baltic Acoustic Spring Survey on the f/v "Ulrika", 12-24.05.2015.

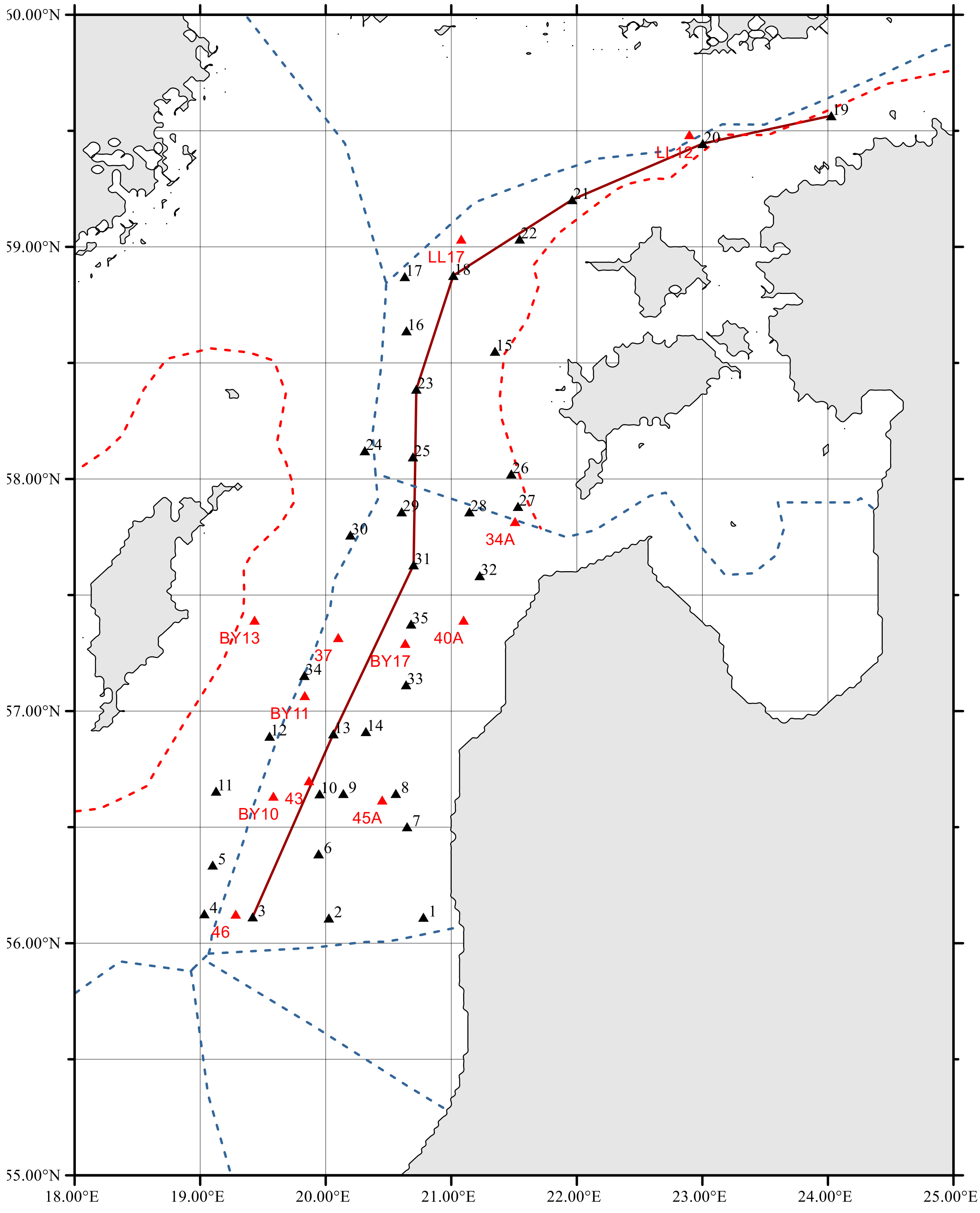

Figure 2. Locations of the hydrological and hydrobiological stations performed during the Latvian-Estonian joint Baltic Acoustic Spring Survey on the f/v "Ulrika", 12-24.05.2015 (▲ - HELCOM stations; ▲ - hydrological and hydrobiological stations; — - hydrological profile).

Table 1. 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 12.-24.05.2015.

Haul number	Date	ICES rectangle	ICES SD	Mean bottom depth [m]	Headrope depth [m]	Horizontal opening [m]	Vertical opening [m]	Trawling speed [knt]	Trawling direction [°]	Geographical position: 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	Haul duration [min]	Total cactch [kg]
1	2015-05-14	41H0	26	59	38	78	20	3	270	56°06'30''	20°01'30''	56°06'30''	20°00'12''	12:10	15	300.037
2	2015-05-14	41G9	26	86	60	78	20	3	270	56°06'48''	19°25'06''	56°08'00''	19°25'30''	16:10	30	1501.115
3	2015-05-15	41G9	26	135	66	78	20	2.8	90	56°23'00''	19°17'00''	56°22'54''	19°19'24''	08:00	30	410.955
4	2015-05-15	41G9	26	79	55	78	20	2.9	60	56°23'06''	19°56'36''	56°23'42''	19°58'54''	11:36	30	1300.315
5	2015-05-15	42H0	28	70	45	78	20	3	270	56°38'42''	20°33'30''	56°38'48''	20°30'48''	18:33	30	200.620
6	2015-05-16	42G9	28	147	65	78	20	2.8	270	56°38'36''	19°57'06''	56°38'36''	19°54'42''	07:50	30	153.055
7	2015-05-16	42G9	28	155	60	78	20	2.8	270	56°39'18''	19°07'36''	56°32'18''	19°05'06''	13:05	30	303.963
8	2015-05-16	42G9	28	147	60	78	20	2.7	92	56°53'30''	19°33'12''	56°53'36''	19°35'48''	18:20	30	1204.127
9	2015-05-17	42H0	28	92	63	78	20	3.1	20	56°54'42''	20°19'12''	56°56'06''	20°20'36''	08:10	30	252.235
10	2015-05-19	46H1	29	98	50	78	20	3	1	58°33'00''	21°20'54''	58°34'30''	21°21'12''	07:25	30	350.975
11	2015-05-19	46H0	29	113	70	78	20	2.8	275	58°38'18''	20°38'36''	58°38'24''	20°36'00''	12:07	30	1501.520
12	2015-05-19	46H1	29	136	60	78	20	3	80	58°52'36''	21°01'00''	58°53'06''	21°03'54''	17:45	30	250.260
13	2015-05-20	48H4	32	68	35	78	20	3	35	59°33'54''	24°01'36''	59°35'12''	24°02'48''	08:20	30	350.158
14	2015-05-20	47H3/H2	32/29	96	55	78	20	3	255	59°26'42''	23°00'12''	59°26'24''	22°57'48''	14:10	30	300.190
15	2015-05-20	47H1	29	125	50	78	20	3	210	59°12'12''	21°57'48''	59°11'00''	21°56'42''	20:14	30	300.115
16	2015-05-21	45H0	28	103	50	78	20	2.8	275	58°23'12''	20°43'18''	58°23'12''	20°40'48''	07:35	30	250.000
17	2015-05-21	45H0	28	121	65	78	20	3	170	58°07'18''	20°18'42''	58°05'54''	20°19'36''	12:45	30	401.817
18	2015-05-21	45H1	28	52	30	78	20	3.1	120	58°01'18''	21°28'42''	58°00'30''	21°31'06''	19:39	30	800.000
19	2015-05-22	44H1	28	79	57	78	20	3	245	57°51'30''	21°08'42''	57°51'00''	21°06'00''	07:00	30	1100.000
20	2015-05-22	44H0	28	135	60	78	20	3	180	57°45'30''	20°11'48''	57°44'06''	20°12'12''	13:53	30	1600.270
21	2015-05-22	44H0	28	128	60	78	20	2.8	50	57°37'48''	20°42'00''	57°38'42''	20°43'42''	18:25	30	202.756
22	2015-05-23	43H0	28	90	60	78	20	2.9	50	57°06'48''	20°38'24''	57°07'48''	20°40'24''	09:07	30	501.648
23	2015-05-23	43G9	28	224	60	78	20	2.8	20	57°09'12''	19°49'48''	57°10'30''	19°50'42''	14:11	30	124.329
24	2015-05-23	43H0	28	66	45	78	20	2.8	90	57°22'30''	20°40'48''	57°22'42''	20°43'30''	20:12	30	250.000
SD26				90	55	78	20	2.9	173							3512.422
SD28				115	56	78	20	2.9	152							7344.820
SD26+28				109	56	78	20	2.9	156							10857.242
SD29				114	57	78	20	3	164							2703.060
SD32				68	35	78	20	3	35							350.158
SD29+32				106	53	78	20	3	143							3053.218
Total				109	55	78	20	2.9	153							13910.460

Table 2. Catch per 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 12.-24.05.2015.

				Catch by species [kg]							
Haul number	Date	ICES rectangle	ICES SD	Sprat	Herring	Cod	Flounder	Stickleback	Grater sandeel	Lumpfish	Total cactch [kg]
				161789	161722	164712	172894	166365	171682	167612	
1	2015-05-14	41H0	26	300.000					0.037		300.037
2	2015-05-14	41G9	26	1441.428	58.572	1.115					1501.115
3	2015-05-15	41G9	26	304.569	95.431	10.779	0.172	0.004			410.955
4	2015-05-15	41G9	26	1279.619	20.381	0.315					1300.315
5	2015-05-15	42H0	28	200.000		0.620					200.620
6	2015-05-16	42G9	28	146.476	3.524	2.186	0.395			0.474	153.055
7	2015-05-16	42G9	28	253.441	46.559	3.963					303.963
8	2015-05-16	42G9	28	984.201	214.779	4.127		1.020			1204.127
9	2015-05-17	42H0	28	192.018	57.982	0.952	1.003			0.280	252.235
10	2015-05-19	46H1	29	257.750	91.511	0.665	0.080	0.738		0.230	350.975
11	2015-05-19	46H0	29	1314.453	185.547	1.360	0.160				1501.520
12	2015-05-19	46H1	29	173.081	76.730		0.260	0.188			250.260
13	2015-05-20	48H4	32	261.657	88.343		0.158				350.158
14	2015-05-20	47H3/H2	32/29	169.054	130.946		0.190				300.190
15	2015-05-20	47H1	29	182.310	117.690		0.115				300.115
16	2015-05-21	45H0	28	88.267	161.733						250.000
17	2015-05-21	45H0	28	139.755	260.245	1.213	0.412			0.192	401.817
18	2015-05-21	45H1	28	558.430	241.570						800.000
19	2015-05-22	44H1	28	777.261	322.739						1100.000
20	2015-05-22	44H0	28	1166.166	433.834	0.270					1600.270
21	2015-05-22	44H0	28	138.551	61.292	2.371	0.175	0.157		0.210	202.756
22	2015-05-23	43H0	28	294.300	205.125	1.420	0.098	0.575		0.130	501.648
23	2015-05-23	43G9	28	82.862	37.138	4.329					124.329
24	2015-05-23	43H0	28	96.230	153.770						250.000
SD26				3325.616	174.384	12.209	0.172	0.004	0.037		3512.422
SD28				5117.957	2200.291	21.451	2.083	1.752		1.286	7344.820
SD26+28				8443.573	2374.675	33.660	2.255	1.756	0.037	1.286	10857.242
SD29				2096.649	602.424	2.025	0.805	0.927		0.230	2703.060
SD32				261.657	88.343		0.158				350.158
SD29+32				2358.306	690.768	2.025	0.963	0.927		0.230	3053.218
Total				10801.878	3065.443	35.685	3.218	2.683	0.037	1.516	13910.460

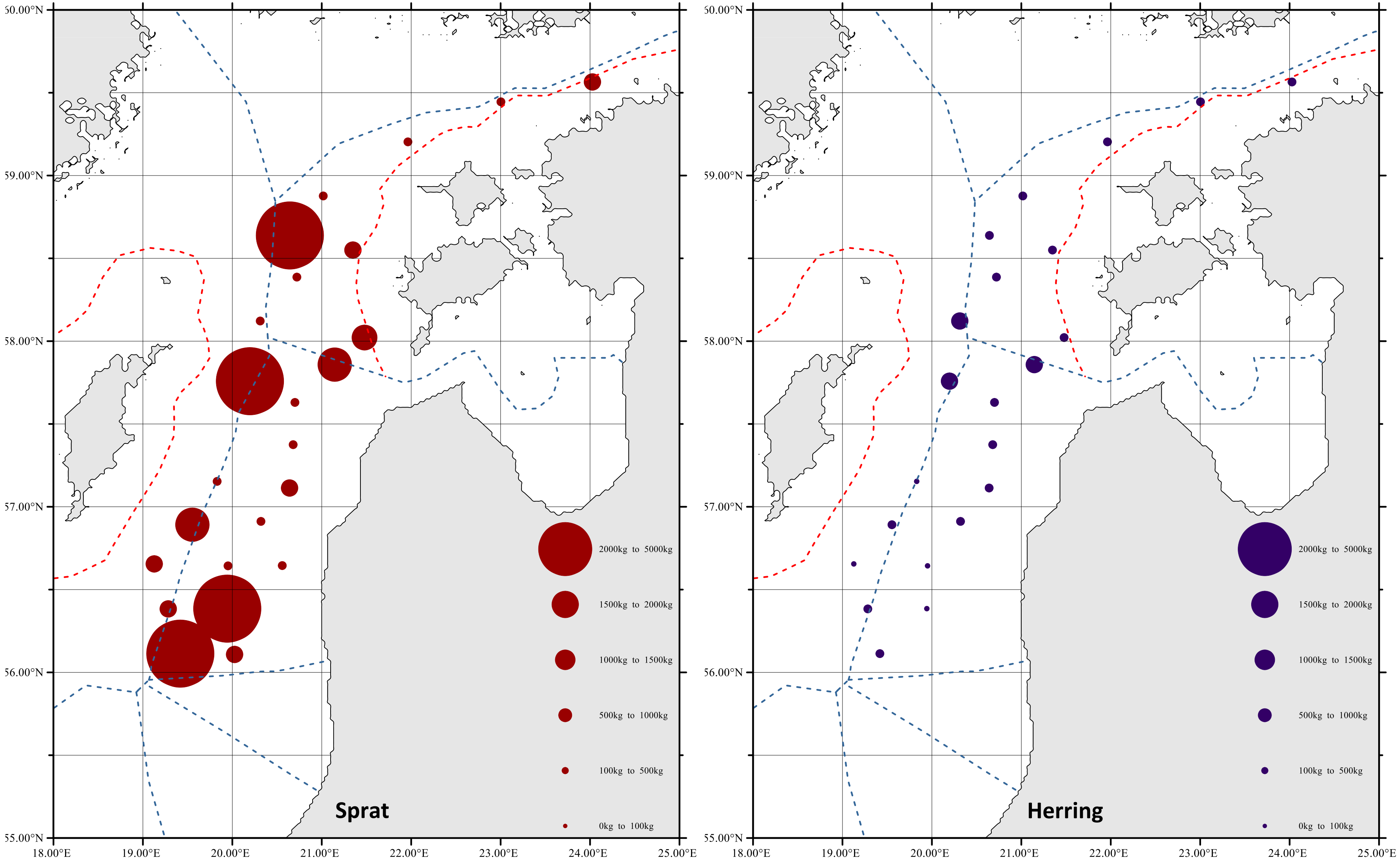

Figure 3. CPUE [kg/h] ranges distribution of sprat and herring cod in the catch hauls in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

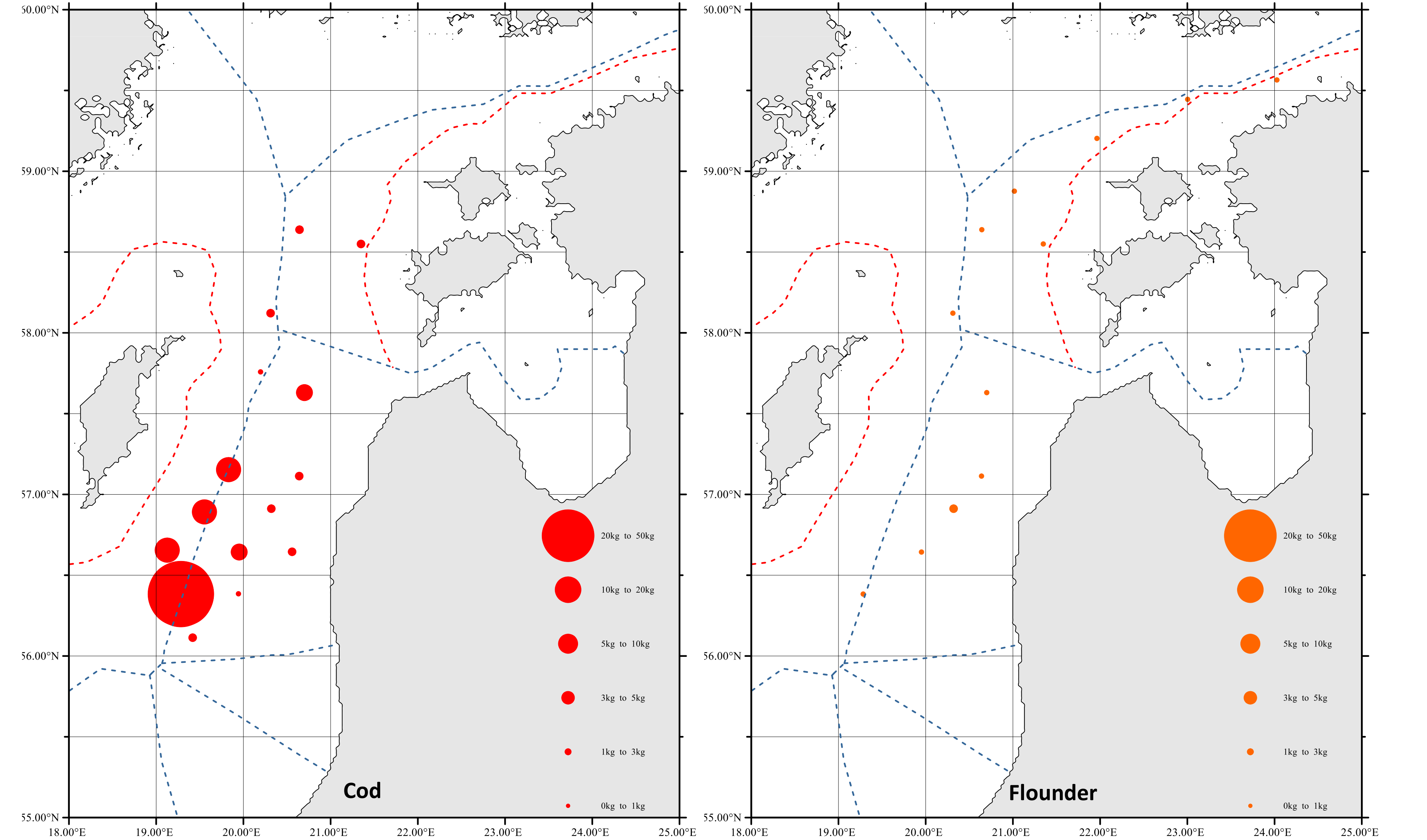

Figure 4. CPUE [kg/h] ranges distribution of cod and flounder in the catch hauls in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

Table 3. 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 12.-24.05.2015.

Table 3A

ICES	ICES	Trawl	Herring			Sprat			NASC	TS calc.
SD	Rect.	No	L, cm	w, g	n, %	L, cm	w, g	n, %	m^2/nm^2	dB
28	45H1	10,18	9.74	5.56	20.40	8.77	3.49	79.60	387.39	-52.06
	45H0	16,17	14.82	19.08	36.28	10.13	5.87	63.72	284.68	-49.39
	44H1	18,19	10.21	6.29	22.31	9.25	4.28	77.69	576.25	-51.57
	44H0	19,20,21	11.19	8.84	16.81	9.35	4.54	83.19	482.97	-51.34
	43H1	24	11.79	11.74	47.08	10.24	6.54	52.92	642.69	-50.18
	43H0	22,23,24	11.25	9.47	30.03	9.48	4.86	69.97	593.31	-51.03
	43G9	8,23	17.35	34.41	4.13	9.47	4.92	95.87	243.94	-50.60
	42H0	5,6,9	16.02	28.26	2.55	10.33	6.48	97.45	357.93	-50.64
	42G9	6,7,8	15.40	27.08	4.17	10.13	6.16	95.83	435.83	-50.72
26	41H0	1,4,5	19.76	44.78	0.20	11.11	7.76	99.80	139.75	-50.18
	41G9	1,2,3,4	19.19	43.25	0.64	11.25	8.04	99.36	574.38	-50.04
29	47H3	13,14	10.68	7.93	25.47	9.75	5.32	74.53	227.72	-50.95
	47H2	14,15	12.46	12.66	21.74	9.56	4.97	78.26	232.64	-50.73
	47H1	12,15	13.26	14.90	14.72	9.35	4.70	85.28	299.09	-51.00
	46H1	10,12	9.96	6.56	18.95	8.92	3.93	81.05	459.77	-51.85
	46H0	11,12	13.40	16.26	3.91	9.09	4.07	96.09	398.07	-51.72
28			11.56	10.66	19.78	9.59	5.05	80.22	459.86	-50.84
26			19.23	43.36	0.56	11.22	7.98	99.44	368.20	-50.11
26+28			11.59	10.81	17.00	9.87	5.56	83.00	438.74	-50.70
29			11.89	11.66	14.69	9.18	4.32	85.31	348.23	-51.25
∑			13.02	16.77	16.35	9.68	5.21	83.65	422.21	-50.88

Table 3B

ICES	ICES	Area	NASC	$\sigma \times 10^4$	Abundance	n, %	
SD	Rect.	nm^2	m^2/nm^2	m^2	$n \times 10^6$	herring	sprat
28	45H1	827.10	387.39	0.78256	4094.38	20.40	79.60
	45H0	947.20	284.68	1.44622	1864.49	36.28	63.72
	44H1	824.60	576.25	0.87509	5430.07	22.31	77.69
	44H0	960.50	482.97	0.92374	5021.91	16.81	83.19
	43H1	412.70	642.69	1.20654	2198.32	47.08	52.92
	43H0	973.70	593.31	0.99133	5827.56	30.03	69.97
	43G9	973.70	243.94	1.09455	2170.07	4.13	95.87
	42H0	968.50	357.93	1.08500	3194.99	2.55	97.45
	42G9	986.90	435.83	1.06549	4036.83	4.17	95.83
26	41H0	953.30	139.75	1.20453	1106.09	0.20	99.80
	41G9	1000.00	574.38	1.24489	4613.97	0.64	99.36
29	47H3	536.19	227.72	1.00926	1209.83	25.47	74.53
	47H2	793.88	232.64	1.06150	1739.88	21.74	78.26
	47H1	920.32	299.09	0.99739	2759.78	14.72	85.28
	46H1	921.50	459.77	0.82026	5165.18	18.95	81.05
	46H0	933.78	398.07	0.84486	4399.65	3.91	96.09
28		7874.90	459.86	1.05228	33838.62	19.78	80.22
26		1953.30	368.20	1.22471	5720.06	0.56	99.44
26+28		9828.20	438.74	1.08363	39558.68	17.00	83.00
29		4105.68	348.23	0.94665	15274.31	14.69	85.31
∑		13933.88	422.21	1.04083	54832.99	16.35	83.65

Table 3C

ICES SD	ICES Rect.	Area nm^2	ρ $n \times 10^6/nm^2$	Abundance, $n \times 10^6$ ΣN	$N_{HERRING}$	N_{SPRAT}	Biomass, $kg \times 10^3$ ΣW	$W_{HERRING}$	W_{SPRAT}
28	45H1	827.10	4.95	4094.38	835.34	3259.04	16026.43	4644.81	11381.61
	45H0	947.20	1.97	1864.49	676.36	1188.13	19873.54	12901.84	6971.69
	44H1	824.60	6.59	5430.07	1211.42	4218.65	25672.84	7624.96	18047.89
	44H0	960.50	5.23	5021.91	844.00	4177.91	26445.98	7458.76	18987.22
	43H1	412.70	5.33	2198.32	1034.90	1163.42	19757.60	12152.54	7605.06
	43H0	973.70	5.98	5827.56	1750.29	4077.27	36379.08	16571.11	19807.97
	43G9	973.70	2.23	2170.07	89.70	2080.37	13329.56	3086.13	10243.44
	42H0	968.50	3.30	3194.99	81.50	3113.49	22470.64	2303.47	20167.18
	42G9	986.90	4.09	4036.83	168.36	3868.47	28383.30	4558.99	23824.32
26	41H0	953.30	1.16	1106.09	2.19	1103.90	8665.44	98.11	8567.33
	41G9	1000.00	4.61	4613.97	29.67	4584.30	38134.44	1284.43	36850.01
29	47H3	536.19	2.26	1209.83	308.08	901.75	7242.11	2443.25	4798.85
	47H2	793.88	2.19	1739.88	378.27	1361.61	11557.39	4789.29	6768.10
	47H1	920.32	3.00	2759.78	406.35	2353.42	17127.39	6056.45	11070.94
	46H1	921.50	5.61	5165.18	978.59	4186.59	22856.03	6418.81	16437.22
	46H0	933.78	4.71	4399.65	171.94	4227.70	20002.12	2795.36	17206.75
28		7874.90	4.30	33838.62	6691.88	27146.74	208338.98	71302.61	137036.37
26		1953.30	2.93	5720.06	31.86	5688.20	46799.88	1382.54	45417.34
26+28		9828.20	4.03	39558.68	6723.74	32834.94	255138.86	72685.15	182453.72
29		4105.68	3.72	15274.31	2243.24	13031.07	78785.03	22503.17	56281.86
∑		13933.88	3.94	54832.99	8966.98	45866.01	333923.90	95188.32	238735.58

Table 4. Sprat stock characteristics in the Baltic Sea ICES SD 26N and 28
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

Table 4A. CANUM		Age group								∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	216440	5292	6199	4037	348	348	348	696	233707
	45H0	23364	1711	2953	5214	1300	419	2567	1332	38860
	44H1	268268	14792	13962	10758			3004	1430	312215
	44H0	379507	19417	23552	17268	5150	1707	6533	4980	458114
	43H1	9375	1582	1143	1099	454	146	586	337	14721
	43H0	79506	4414	3389	4149	1479	290	2726	1490	97443
	43G9	79506	4414	3389	4149	1479	290	2726	1490	97443
	42H0	53308	6934	8996	7581	2211	558	2851	696	83135
	42G9	141371	24490	27653	19755	1339	1604	5955	2579	224746
26	41H0	92814	41841	40358	35980	3079	1118	12165	1948	229304
	41G9	150165	84898	69574	67015	10641	2093	24444	4891	413721
28		1250646	83045	91235	74011	13759	5362	27295	15030	1560383
26		242980	126739	109932	102995	13720	3211	36609	6840	643025
26+28		1493625	209784	201168	177005	27478	8573	63904	21869	2203407

Table 4B. n × 10^6		Age group								∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	3018.25	73.79	86.44	56.30	4.85	4.85	4.85	9.70	3259.04
	45H0	714.34	52.31	90.30	159.43	39.74	12.80	78.49	40.73	1188.13
	44H1	3624.85	199.87	188.66	145.36			40.59	19.33	4218.65
	44H0	3461.03	177.08	214.79	157.48	46.96	15.57	59.58	45.42	4177.91
	43H1	740.88	125.02	90.30	86.82	35.89	11.58	46.31	26.63	1163.42
	43H0	3326.75	184.69	141.79	173.62	61.89	12.14	114.05	62.34	4077.27
	43G9	1697.43	94.23	72.35	88.59	31.58	6.20	58.19	31.81	2080.37
	42H0	1996.45	259.69	336.91	283.92	82.79	20.89	106.77	26.06	3113.49
	42G9	2433.37	421.54	475.98	340.04	23.04	27.61	102.50	44.38	3868.47
26	41H0	446.82	201.43	194.29	173.21	14.82	5.38	58.57	9.38	1103.90
	41G9	1663.93	940.72	770.93	742.57	117.91	23.19	270.85	54.20	4584.30
28		21013.35	1588.22	1697.51	1491.55	326.74	111.64	611.33	306.40	27146.74
26		2110.75	1142.15	965.22	915.78	132.73	28.57	329.42	63.58	5688.20
26+28		23124.10	2730.38	2662.73	2407.33	459.47	140.21	940.74	369.97	32834.94

Table 4C. n, %		Age group								∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	92.61	2.26	2.65	1.73	0.15	0.15	0.15	0.30	100.00
	45H0	60.12	4.40	7.60	13.42	3.34	1.08	6.61	3.43	100.00
	44H1	85.92	4.74	4.47	3.45			0.96	0.46	100.00
	44H0	82.84	4.24	5.14	3.77	1.12	0.37	1.43	1.09	100.00
	43H1	63.68	10.75	7.76	7.46	3.08	1.00	3.98	2.29	100.00
	43H0	81.59	4.53	3.48	4.26	1.52	0.30	2.80	1.53	100.00
	43G9	81.59	4.53	3.48	4.26	1.52	0.30	2.80	1.53	100.00
	42H0	64.12	8.34	10.82	9.12	2.66	0.67	3.43	0.84	100.00
	42G9	62.90	10.90	12.30	8.79	0.60	0.71	2.65	1.15	100.00
26	41H0	40.48	18.25	17.60	15.69	1.34	0.49	5.31	0.85	100.00
	41G9	36.30	20.52	16.82	16.20	2.57	0.51	5.91	1.18	100.00
28		77.41	5.85	6.25	5.49	1.20	0.41	2.25	1.13	100.00
26		37.11	20.08	16.97	16.10	2.33	0.50	5.79	1.12	100.00
26+28		70.43	8.32	8.11	7.33	1.40	0.43	2.87	1.13	100.00

Table 4D. W, kg × 10^3		Age group								∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	9072.46	662.41	846.17	525.30	50.33	54.57	54.57	115.81	11381.61
	45H0	2296.99	453.45	847.92	1546.38	413.54	138.99	833.86	440.56	6971.69
	44H1	12147.64	1845.92	1838.87	1443.00			505.63	266.83	18047.89
	44H0	11703.30	1670.15	2092.41	1596.75	530.22	172.26	705.37	516.76	18987.22
	43H1	3012.01	1236.11	962.57	961.80	425.62	153.39	538.11	315.45	7605.06
	43H0	12111.71	1763.44	1402.00	1805.89	643.92	141.35	1224.13	715.52	19807.97
	43G9	6199.99	874.76	735.38	978.24	308.19	72.69	710.66	363.51	10243.44
	42H0	8173.83	2438.10	3526.34	3161.33	964.86	264.14	1308.80	329.77	20167.18
	42G9	9098.41	3882.40	4787.18	3711.70	251.38	318.88	1247.71	526.65	23824.32
26	41H0	1856.20	1844.00	1992.64	1845.78	170.24	70.49	683.40	104.59	8567.33
	41G9	6791.74	8647.93	8029.48	7846.73	1384.63	290.80	3206.48	652.23	36850.01
28		73816.36	14826.75	17038.84	15730.40	3588.07	1316.27	7128.83	3590.86	137036.37
26		8647.94	10491.93	10022.11	9692.51	1554.87	361.29	3889.88	756.82	45417.34
26+28		82464.30	25318.68	27060.95	25422.91	5142.94	1677.56	11018.70	4347.68	182453.72

Table 4E. W, %		Age group								∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	79.71	5.82	7.43	4.62	0.44	0.48	0.48	1.02	100.00
	45H0	32.95	6.50	12.16	22.18	5.93	1.99	11.96	6.32	100.00
	44H1	67.31	10.23	10.19	8.00			2.80	1.48	100.00
	44H0	61.64	8.80	11.02	8.41	2.79	0.91	3.71	2.72	100.00
	43H1	39.61	16.25	12.66	12.65	5.60	2.02	7.08	4.15	100.00
	43H0	61.15	8.90	7.08	9.12	3.25	0.71	6.18	3.61	100.00
	43G9	60.53	8.54	7.18	9.55	3.01	0.71	6.94	3.55	100.00
	42H0	40.53	12.09	17.49	15.68	4.78	1.31	6.49	1.64	100.00
	42G9	38.19	16.30	20.09	15.58	1.06	1.34	5.24	2.21	100.00
26	41H0	21.67	21.52	23.26	21.54	1.99	0.82	7.98	1.22	100.00
	41G9	18.43	23.47	21.79	21.29	3.76	0.79	8.70	1.77	100.00
28		53.87	10.82	12.43	11.48	2.62	0.96	5.20	2.62	100.00
26		19.04	23.10	22.07	21.34	3.42	0.80	8.56	1.67	100.00
26+28		45.20	13.88	14.83	13.93	2.82	0.92	6.04	2.38	100.00

Table 4F. w, g		Age group								Total
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	
28	45H1	3.01	8.98	9.79	9.33	10.38	11.25	11.25	11.94	3.49
	45H0	3.22	8.67	9.39	9.70	10.41	10.86	10.62	10.82	5.87
	44H1	3.35	9.24	9.75	9.93			12.46	13.80	4.28
	44H0	3.38	9.43	9.74	10.14	11.29	11.07	11.84	11.38	4.54
	43H1	4.07	9.89	10.66	11.08	11.86	13.25	11.62	11.85	6.54
	43H0	3.64	9.55	9.89	10.40	10.40	11.64	10.73	11.48	4.86
	43G9	3.65	9.28	10.16	11.04	9.76	11.73	12.21	11.43	4.92
	42H0	4.09	9.39	10.47	11.13	11.65	12.64	12.26	12.66	6.48
	42G9	3.74	9.21	10.06	10.92	10.91	11.55	12.17	11.87	6.16
26	41H0	4.15	9.15	10.26	10.66	11.49	13.10	11.67	11.15	7.76
	41G9	4.08	9.19	10.42	10.57	11.74	12.54	11.84	12.03	8.04
28		3.51	9.34	10.04	10.55	10.98	11.79	11.66	11.72	5.05
26		4.10	9.19	10.38	10.58	11.71	12.64	11.81	11.90	7.98
26+28		3.57	9.27	10.16	10.56	11.19	11.96	11.71	11.75	5.56

Table 4G. L, cm		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Total
28	45H1	8.51	11.72	12.06	12.01	12.25	12.75	12.75	12.75	8.77
	45H0	8.63	11.82	12.23	12.34	12.72	13.02	12.66	12.71	10.13
	44H1	8.77	11.88	12.14	12.28			12.96	13.25	9.25
	44H0	8.74	11.97	12.18	12.28	12.84	12.81	12.95	12.71	9.35
	43H1	9.05	11.90	12.21	12.34	12.81	13.50	12.54	12.90	10.24
	43H0	8.86	11.93	12.08	12.25	12.34	12.88	12.46	12.68	9.48
	43G9	8.84	11.80	12.16	12.44	12.13	12.68	12.82	12.59	9.47
	42H0	9.15	11.90	12.34	12.58	12.84	13.05	13.10	13.52	10.33
	42G9	8.92	11.78	12.13	12.42	12.50	12.68	12.80	12.84	10.13
26	41H0	9.37	11.82	12.34	12.51	12.88	13.33	12.85	12.83	11.11
	41G9	9.32	11.87	12.41	12.50	12.98	13.25	12.95	13.08	11.25
28		8.81	11.86	12.18	12.37	12.63	12.92	12.78	12.83	9.59
26		9.33	11.86	12.39	12.50	12.97	13.26	12.93	13.05	11.22
26+28		8.85	11.86	12.26	12.42	12.73	12.99	12.83	12.87	9.87

Table 5. Sprat stock characteristics in the Baltic Sea ICES SD 29
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

Table 5A. CANUM		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Σ
29	47H3	48460	1811	9385	9718	445	422	6355	4338	80934
	47H2	46380	1715	6040	5690	1015	757	5658	3434	70688
	47H1	57009	2628	5252	3611	1711	563	2848	1926	75548
	46H1	95685	3366	2853	4262	1261	348	896	1061	109733
	46H0	316921	2901	11194	11559	4158		11902	6853	365488
29		564454	12421	34724	34840	8591	2091	27659	17612	702391

Table 5B. n × 10^6		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Σ
29	47H3	539.92	20.18	104.57	108.27	4.96	4.71	70.81	48.33	901.75
	47H2	893.38	33.03	116.34	109.60	19.55	14.59	108.98	66.14	1361.61
	47H1	1775.91	81.88	163.59	112.48	53.31	17.54	88.71	60.00	2353.42
	46H1	3650.62	128.43	108.86	162.61	48.13	13.27	34.19	40.48	4186.59
	46H0	3665.92	33.56	129.48	133.71	48.09		137.67	79.28	4227.70
29		10525.74	297.07	622.84	626.67	174.04	50.11	440.36	294.23	13031.07

Table 5C. n, %		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Σ
29	47H3	59.88	2.24	11.60	12.01	0.55	0.52	7.85	5.36	100.00
	47H2	65.61	2.43	8.54	8.05	1.44	1.07	8.00	4.86	100.00
	47H1	75.46	3.48	6.95	4.78	2.27	0.75	3.77	2.55	100.00
	46H1	87.20	3.07	2.60	3.88	1.15	0.32	0.82	0.97	100.00
	46H0	86.71	0.79	3.06	3.16	1.14		3.26	1.88	100.00
29		80.77	2.28	4.78	4.81	1.34	0.38	3.38	2.26	100.00

Table 5D. W, kg × 10^3		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	∑
29	47H3	1245.98	162.57	942.72	1065.06	44.10	48.56	792.11	497.76	4798.85
	47H2	2177.32	254.77	1070.31	1069.48	208.99	132.20	1175.92	679.12	6768.10
	47H1	5251.26	683.42	1573.69	1188.83	580.75	163.98	996.61	632.40	11070.94
	46H1	10904.70	1144.79	1081.77	1731.44	524.36	149.30	424.67	476.19	16437.22
	46H0	11568.07	299.44	1254.19	1199.48	472.30	0.00	1543.17	870.09	17206.75
29		31147.34	2544.99	5922.68	6254.28	1830.50	494.03	4932.48	3155.56	56281.86

Table 5E. W, %		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	∑
29	47H3	25.96	3.39	19.64	22.19	0.92	1.01	16.51	10.37	100.00
	47H2	32.17	3.76	15.81	15.80	3.09	1.95	17.37	10.03	100.00
	47H1	47.43	6.17	14.21	10.74	5.25	1.48	9.00	5.71	100.00
	46H1	66.34	6.96	6.58	10.53	3.19	0.91	2.58	2.90	100.00
	46H0	67.23	1.74	7.29	6.97	2.74	0.00	8.97	5.06	100.00
29		55.34	4.52	10.52	11.11	3.25	0.88	8.76	5.61	100.00

Table 5F. w, g		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Total
29	47H3	2.31	8.06	9.02	9.84	8.89	10.32	11.19	10.30	5.32
	47H2	2.44	7.71	9.20	9.76	10.69	9.06	10.79	10.27	4.97
	47H1	2.96	8.35	9.62	10.57	10.89	9.35	11.23	10.54	4.70
	46H1	2.99	8.91	9.94	10.65	10.89	11.25	12.42	11.76	3.93
	46H0	3.16	8.92	9.69	8.97	9.82		11.21	10.98	4.07
29		2.96	8.57	9.51	9.98	10.52	9.86	11.20	10.72	4.32

Table 5G. L, cm		Age group								
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8+	Total
29	47H3	8.03	11.64	11.99	12.33	11.98	12.56	12.83	12.49	9.75
	47H2	8.13	11.34	12.04	12.32	12.67	12.01	12.68	12.46	9.56
	47H1	8.41	11.48	12.09	12.39	12.55	12.09	12.79	12.45	9.35
	46H1	8.44	11.67	12.06	12.34	12.39	12.75	13.16	12.66	8.92
	46H0	8.60	11.72	12.09	11.81	12.10		12.92	12.86	9.09
29		8.44	11.59	12.06	12.23	12.38	12.29	12.84	12.60	9.18

Table 6. Herring stock characteristics in the Baltic Sea ICES SD 26N and 28
from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

Table 6A. CANUM		Age group									∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	56693	1187	278	768	419	139	69	349		59903
	45H0	5625	951	4837	5471	1904	1427	556	952	397	22122
	44H1	81909	3168	1060	1052	349	1060	353	703		89655
	44H0	72795	3711	4456	4358	1139	2278	884	2317	609	92546
	43H1	9006	699	1335	1185	342	238	83	155	52	13095
	43H0	31990	4448	1570	2142	420	355	200	614	91	41830
	43G9	1204	200	647	970	326	760	1305	1142	769	7322
	42H0	604	90	223	346	180	123	165	272	175	2176
	42G9	3943	238	568	851	247	721	1187	1141	885	9781
26	41H0			57	85	22	42	60	77	113	455
	41G9			454	590	48	240	383	354	609	2678
28		263769	14691	14975	17145	5325	7102	4802	7644	2977	338430
26				511	675	69	282	442	431	722	3133
26+28		263769	14691	15486	17819	5394	7384	5244	8075	3699	341563

Table 6B. n × 10^6		Age group									∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	790.58	16.55	3.88	10.71	5.84	1.94	0.97	4.87		835.34
	45H0	171.98	29.09	147.90	167.29	58.22	43.64	16.99	29.11	12.14	676.36
	44H1	1106.76	42.81	14.32	14.22	4.72	14.32	4.77	9.50		1211.42
	44H0	663.88	33.84	40.64	39.75	10.39	20.77	8.06	21.13	5.55	844.00
	43H1	711.75	55.22	105.54	93.67	27.00	18.82	6.54	12.27	4.09	1034.90
	43H0	1338.56	186.12	65.68	89.64	17.56	14.87	8.37	25.70	3.80	1750.29
	43G9	14.76	2.45	7.92	11.88	3.99	9.32	15.98	13.99	9.42	89.70
	42H0	22.61	3.37	8.36	12.94	6.73	4.60	6.17	10.17	6.55	81.50
	42G9	67.87	4.09	9.77	14.66	4.26	12.41	20.44	19.64	15.24	168.36
26	41H0			0.28	0.41	0.10	0.20	0.29	0.37	0.54	2.19
	41G9			5.03	6.55	0.53	2.66	4.24	3.93	6.76	29.70
28		4888.74	373.54	404.02	454.75	138.70	140.68	88.30	146.37	56.79	6691.88
26				5.31	6.95	0.63	2.87	4.53	4.30	7.30	31.89
26+28		4888.74	373.54	409.33	461.70	139.33	143.55	92.83	150.67	64.09	6723.77

Table 6C. n, %		Age group									∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	94.64	1.98	0.46	1.28	0.70	0.23	0.12	0.58		100.00
	45H0	25.43	4.30	21.87	24.73	8.61	6.45	2.51	4.30	1.80	100.00
	44H1	91.36	3.53	1.18	1.17	0.39	1.18	0.39	0.78		100.00
	44H0	78.66	4.01	4.82	4.71	1.23	2.46	0.95	2.50	0.66	100.00
	43H1	68.77	5.34	10.20	9.05	2.61	1.82	0.63	1.19	0.40	100.00
	43H0	76.48	10.63	3.75	5.12	1.00	0.85	0.48	1.47	0.22	100.00
	43G9	16.45	2.73	8.83	13.25	4.45	10.39	17.82	15.59	10.50	100.00
	42H0	27.74	4.13	10.26	15.88	8.26	5.65	7.57	12.48	8.03	100.00
	42G9	40.31	2.43	5.80	8.70	2.53	7.37	12.14	11.66	9.05	100.00
26	41H0			12.57	18.60	4.78	9.28	13.11	16.89	24.77	100.00
	41G9			16.95	22.04	1.77	8.96	14.29	13.22	22.75	100.00
28		73.05	5.58	6.04	6.80	2.07	2.10	1.32	2.19	0.85	100.00
26				16.65	21.81	1.98	8.99	14.21	13.48	22.89	100.00
26+28		72.71	5.56	6.09	6.87	2.07	2.13	1.38	2.24	0.95	100.00

Table 6D. W, kg × 10^3						Age group					∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	3468.22	302.82	67.69	335.06	190.81	46.02	24.71	209.48		4644.81
	45H0	806.57	407.51	3092.28	3793.07	1619.51	1139.77	513.88	1064.71	464.53	12901.84
	44H1	5287.54	583.69	345.70	418.23	158.13	351.75	128.92	350.99		7624.96
	44H0	3231.47	366.54	897.16	975.62	293.75	565.16	221.61	691.85	215.58	7458.76
	43H1	4077.71	837.63	2424.29	2427.89	916.11	571.04	188.16	498.63	211.07	12152.54
	43H0	8251.39	1772.08	1483.64	2339.85	572.35	485.08	299.69	1176.83	190.21	16571.11
	43G9	81.11	24.61	210.16	378.28	146.92	387.45	707.78	666.38	483.43	3086.13
	42H0	147.12	71.67	234.09	400.58	234.16	194.09	266.12	464.48	291.14	2303.47
	42G9	364.76	39.49	303.20	507.00	170.52	520.00	912.16	957.22	784.64	4558.99
26	41H0			8.42	15.71	3.72	9.43	13.97	18.32	28.55	98.11
	41G9			159.41	243.80	21.96	116.08	210.48	196.07	336.63	1284.43
28		25715.90	4406.05	9058.21	11575.59	4302.28	4260.36	3263.04	6080.57	2640.60	71302.61
26				167.83	259.51	25.68	125.51	224.45	214.39	365.17	1382.54
26+28		25715.90	4406.05	9226.04	11835.10	4327.95	4385.87	3487.49	6294.96	3005.78	72685.15

Table 6E. W, %						Age group					∑
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	74.67	6.52	1.46	7.21	4.11	0.99	0.53	4.51		100.00
	45H0	6.25	3.16	23.97	29.40	12.55	8.83	3.98	8.25	3.60	100.00
	44H1	69.35	7.66	4.53	5.49	2.07	4.61	1.69	4.60		100.00
	44H0	43.32	4.91	12.03	13.08	3.94	7.58	2.97	9.28	2.89	100.00
	43H1	33.55	6.89	19.95	19.98	7.54	4.70	1.55	4.10	1.74	100.00
	43H0	49.79	10.69	8.95	14.12	3.45	2.93	1.81	7.10	1.15	100.00
	43G9	2.63	0.80	6.81	12.26	4.76	12.55	22.93	21.59	15.66	100.00
	42H0	6.39	3.11	10.16	17.39	10.17	8.43	11.55	20.16	12.64	100.00
	42G9	8.00	0.87	6.65	11.12	3.74	11.41	20.01	21.00	17.21	100.00
26	41H0			8.58	16.01	3.79	9.61	14.24	18.67	29.10	100.00
	41G9			12.41	18.98	1.71	9.04	16.39	15.26	26.21	100.00
28		36.07	6.18	12.70	16.23	6.03	5.98	4.58	8.53	3.70	100.00
26				12.14	18.77	1.86	9.08	16.23	15.51	26.41	100.00
26+28		35.38	6.06	12.69	16.28	5.95	6.03	4.80	8.66	4.14	100.00

Table 6F. w, g						Age group					Total
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	4.39	18.29	17.47	31.28	32.67	23.75	25.50	43.00		5.56
	45H0	4.69	14.01	20.91	22.67	27.82	26.12	30.25	36.57	38.26	19.08
	44H1	4.78	13.63	24.13	29.42	33.50	24.56	27.00	36.97		6.29
	44H0	4.87	10.83	22.07	24.54	28.28	27.21	27.50	32.75	38.83	8.84
	43H1	5.73	15.17	22.97	25.92	33.93	30.35	28.75	40.63	51.60	11.74
	43H0	6.16	9.52	22.59	26.10	32.59	32.63	35.81	45.79	50.05	9.47
	43G9	5.50	10.06	26.53	31.83	36.84	41.59	44.28	47.64	51.32	34.41
	42H0	6.51	21.30	28.00	30.95	34.79	42.16	43.13	45.68	44.46	28.26
	42G9	5.37	9.65	31.03	34.59	40.04	41.91	44.63	48.75	51.50	27.08
26	41H0			30.57	38.54	35.51	46.35	48.63	49.49	52.60	44.78
	41G9			31.66	37.25	41.67	43.60	49.61	49.93	49.82	43.25
28		5.26	11.80	22.42	25.45	31.02	30.28	36.96	41.54	46.50	10.66
26				31.61	37.32	40.65	43.80	49.54	49.89	50.03	43.36
26+28		5.26	11.80	22.54	25.63	31.06	30.55	37.57	41.78	46.90	10.81

Table 6G. L, cm		Age group									Total
ICES SD	ICES Rect.	1	2	3	4	5	6	7	8	9+	
28	45H1	9.35	14.99	15.13	17.34	17.75	16.75	17.25	20.75		9.74
	45H0	9.48	13.71	15.89	16.38	17.75	17.25	18.47	19.33	19.95	14.82
	44H1	9.69	13.47	16.42	17.08	17.75	16.58	17.25	19.24		10.21
	44H0	9.82	12.58	16.09	16.78	17.52	17.16	17.34	18.44	19.75	11.19
	43H1	9.91	13.59	15.61	16.25	17.86	17.25	17.25	18.58	20.75	11.79
	43H0	10.19	12.00	15.64	16.46	17.70	17.85	18.71	19.48	20.75	11.25
	43G9	9.96	12.17	16.58	17.55	18.44	19.24	19.61	20.02	20.56	17.35
	42H0	10.14	15.35	16.70	17.29	17.97	19.30	19.56	19.82	19.78	16.02
	42G9	10.05	11.94	17.21	17.84	18.89	19.22	19.59	20.24	20.76	15.40
26	41H0			17.58	18.93	18.45	20.12	20.34	20.45	20.81	19.76
	41G9			17.32	18.22	19.16	19.32	20.20	20.26	20.23	19.19
28		9.82	12.75	15.87	16.55	17.81	17.60	18.76	19.43	20.34	11.56
26				17.33	18.26	19.04	19.37	20.21	20.28	20.27	19.23
26+28		9.82	12.75	15.89	16.58	17.82	17.63	18.83	19.45	20.33	11.59

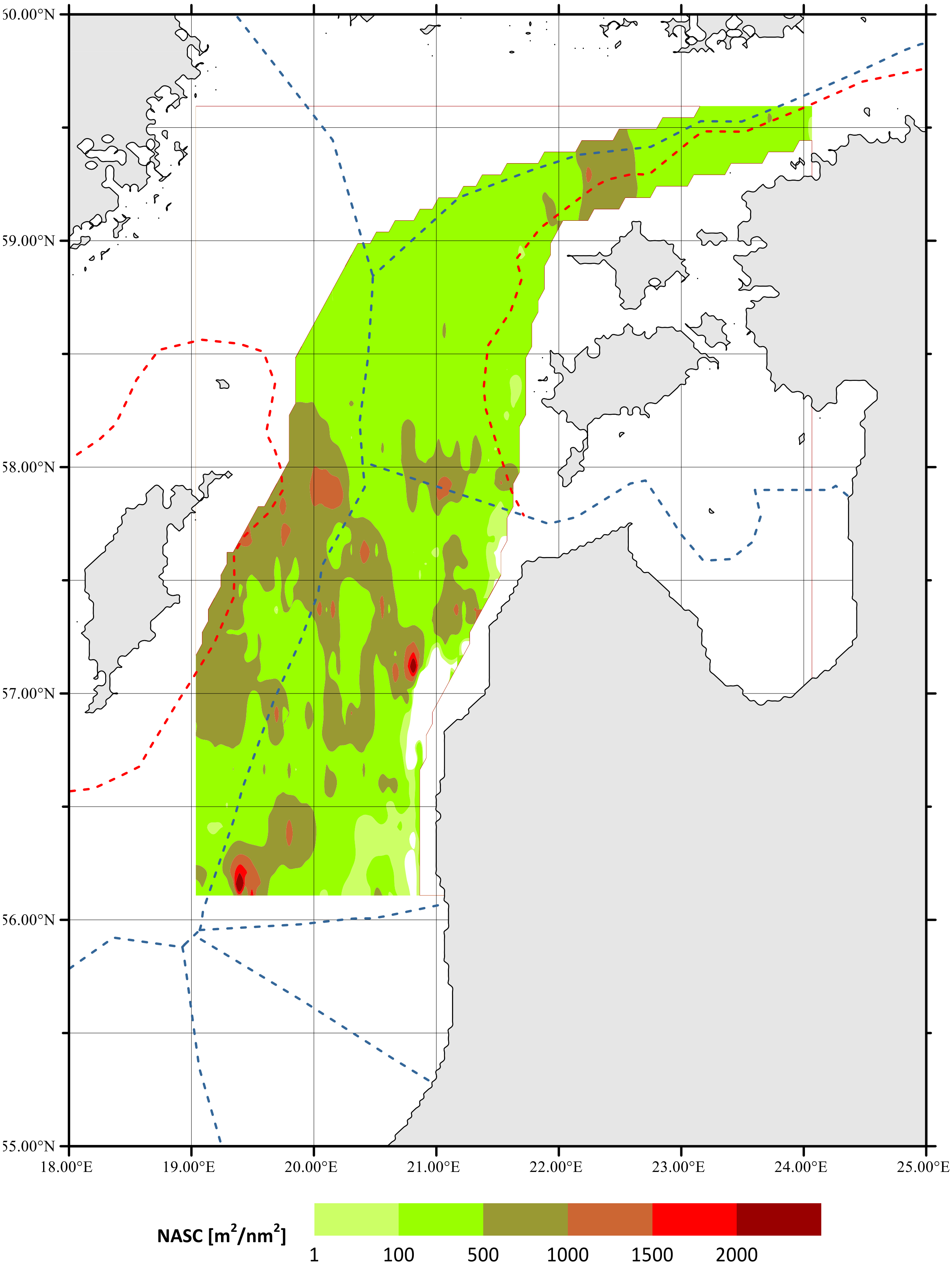

Figure 5. Acoustic parameter NASC distribution in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

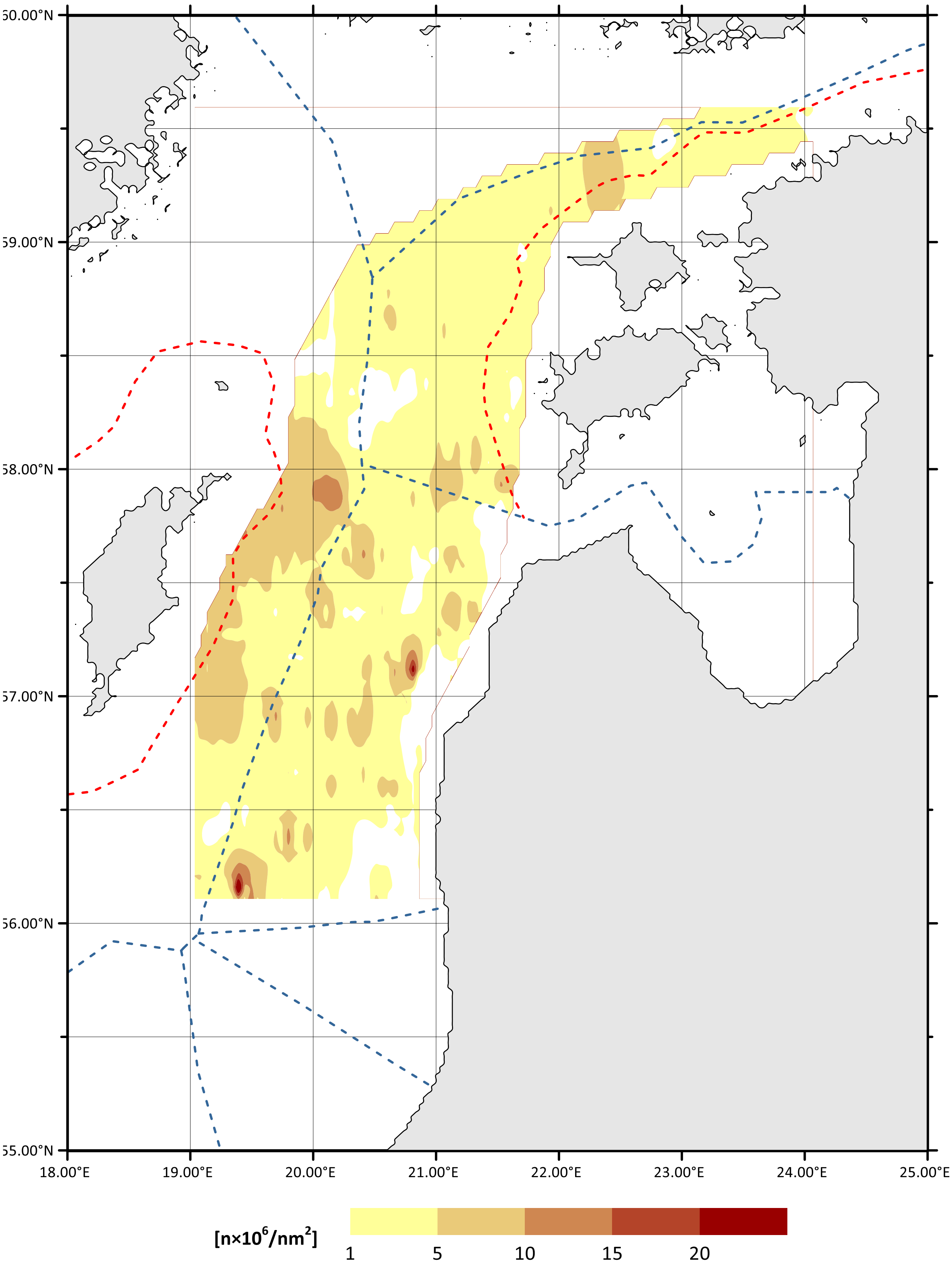

Figure 6. Sprat distribution ($n \times 10^6$) in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

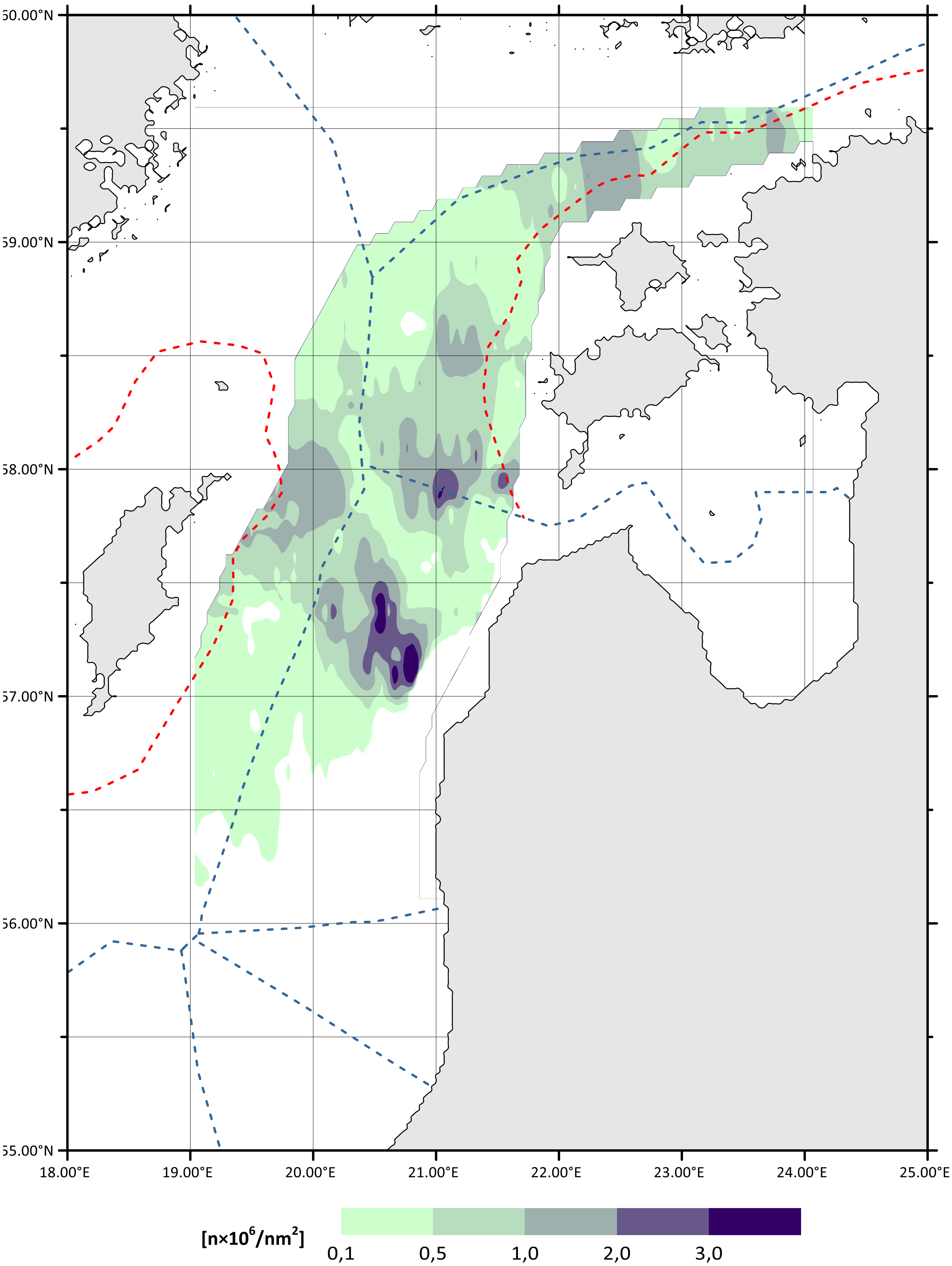

Figure 7. Herring distribution ($n \times 10^6$) in the Baltic Sea ICES SD 26N, 28, 29 and 32W from the Latvian-Estonian joint BASS survey conducted by f/v "Ulrika" in the period of 12.-24.05.2015.

Table 7. 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 12.-24.05.2015.

ICES SD	29		28N		28S		26N	
Depth strata	>70m	<70m	>70m	<70m	>70m	<70m	>70m	<70m
Eggs (per 1m^2)	26.30	2.86	30.20	2.86	139	17.1	225	5.71
Larvae (per 1m^2)			1.63	0.95	10.2		22.1	1.43
Eggs (per 10 min. of haul on the water surface)	2.86				4.71	7.14	2.14	7.14
Larvae (per 10 min. of haul on the water surface)	0.14				0.33		0.75	

Table 8. 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 12.-24.05.2015.

Haul number	Hydro-logical station number	Date of catch	ICES rectangle	ICES SD	Mean bottom depth [m]	Mean trawling depth [m]	Hydrological parameters		
							Salinity	Temperature	Oxygen
							[PSU]	[°C]	[mg/l]
1	2	14.05.2015	41H0	26	59	48	7.47	5.39	15.90
2	3	14.05.2015	41G9	26	86	70	9.32	5.07	12.41
3	5	15.05.2015	41G9	26	135	76	9.18	5.03	12.68
4	6	15.05.2015	41G9	26	79	65	7.95	4.65	14.36
5	8	15.05.2015	42H0	28	70	55	7.54	4.71	15.87
6	10	16.05.2015	42G9	28	147	75	9.39	5.10	11.65
7	11	16.05.2015	42G9	28	155	70	9.05	4.79	7.29
8	12	16.05.2015	42G9	28	147	70	9.12	4.80	6.88
9	14	17.05.2015	42H0	28	92	73	8.56	4.66	8.71
10	15	19.05.2015	46H1	29	98	60	7.30	4.01	11.58
11	16	19.05.2015	46H0	29	113	80	9.32	4.83	7.97
12	18	19.05.2015	46H1	29	136	70	8.31	4.29	9.82
13	19	20.05.2015	48H4	32	68	45	6.76	3.15	11.45
14	20	20.05.2015	47H3/H2	32/29	96	65	8.43	4.19	8.36
15	21	20.05.2015	47H1	29	125	60	7.22	3.63	10.96
16	23	21.05.2015	45H0	28	103	60	7.65	3.92	11.27
17	24	21.05.2015	45H0	28	121	75	9.02	4.90	7.34
18	26	21.05.2015	45H1	28	52	40	7.19	6.62	11.38
19	28	22.05.2015	44H1	28	79	67	7.70	4.38	10.45
20	30	22.05.2015	44H0	28	135	70	8.94	4.72	7.66
21	31	22.05.2015	44H0	28	128	70	8.42	4.67	9.95
22	33	23.05.2015	43H0	28	90	70	8.59	4.82	9.8
23	34	23.05.2015	43G9	28	224	70	9.30	5.00	7.67
24	35	23.05.2015	43H0	28	66	55	7.49	4.52	10.08
SD26					90	65	8.48	5.04	13.84
SD28					115	66	8.43	4.83	9.71
SD26+28					109	66	8.44	4.87	10.63
SD29					114	67	8.12	4.19	9.74
SD32					68	55	7.59	3.67	9.91
SD29+32					106	63	7.89	4.01	10.02
Total					109	65	8.30	4.66	10.48

Table 9. 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 12.-24.05.2015.

Station No.	Sinking depth [m]	0-10m			50-70m			>90m		
		S [PSU]	T [°C]	O_2 [mg/l]	S [PSU]	T [°C]	O_2 [mg/l]	S [PSU]	T [°C]	O_2 [mg/l]
3	90	7.24	7.59	16.67	8.35	4.64	16.12	10.93	6.14	5.01
13	150	7.34	7.78	12.45	8.04	4.57	10.40	11.83	6.38	2.80
31	100	6.98	8.55	12.31	7.69	4.46	11.02	11.27	6.16	2.67
23	100	6.91	7.24	12.57	7.65	3.92	11.27	10.63	5.62	1.87
18	120	6.74	6.49	12.27	7.48	4.10	11.14	10.64	5.46	1.63
21	110	6.56	7.04	12.72	7.22	3.63	10.96	10.46	5.27	2.84
20	80	5.74	6.54	13.06	7.92	3.92	9.57			
19	60	5.74	6.66	12.83	7.10	3.35	11.06			
Average	101	6.65	7.24	13.11	7.68	4.07	11.44	10.96	5.84	2.80

Survey Report for RV "ATLANTNIRO" 31.05-10.06.2015

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

1 INTRODUCTION

The main objective is to assess clupeoid resources in the Baltic Sea. The international acoustic survey in May-June is traditionally coordinated within the frame of the **Baltic Acoustic Spring Survey (BASS).** The reported acoustic survey is conducted every year to supply the ICES: "Baltic Fisheries Assessment Working Group (WGBFAS)" with an index value for the stock size and recruitment of sprat in the Subdivision 26 of the Baltic area.

2 METHODS

2.1 Personnel

A. Zezera	AtlantNIRO, Kaliningrad, Russia - cruise leader
A. Karpushevskaja	AtlantNIRO, Kaliningrad, Russia - scientific leader
A. Malishko	AtlantNIRO, Kaliningrad, Russia - acoustic
M. Sokolov	AtlantNIRO, Kaliningrad, Russia - acoustic
S. Alekseev	AtlantNIRO, Kaliningrad, Russia - hydrologist
A. Gusev	AtlantNIRO, Kaliningrad, Russia - hydrologist
I. Truphanova	AtlantNIRO, Kaliningrad, Russia - engineer
V. Shopov	AtlantNIRO, Kaliningrad, Russia - engineer
R. Linnikov	AtlantNIRO, Kaliningrad, Russia - engineer
N. Kalinina	AtlantNIRO, Kaliningrad, Russia - engineer
E. Bezuglaja	AtlantNIRO, Kaliningrad, Russia - engineer

2.2 Narrative

The RV "ATLANTNIRO" cruise number 64, 2015, was started from port Kaliningrad, the 28 May and continued to 21 June of 2015. The cruise covered the ICES Subdivision 26 and included only Russia economic zone. Calibration of acoustic equipment was carried out in 31 May 2015. Acoustic investigations were carried out from 04 till 10 June.

2.3 Survey design

The area of international acoustic survey is limited by the 10 m depth line. The statistical rectangles of Subdivision 26 (zone of Russia), were used as strata (IBAS, ver. 0.82, ICES CM 2015/ SSGIEOM:07 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 7.9-8.2 knots. The average speed of the vessel with a trawl was 3.5 knots; the trawling duration was standard 30 minutes. The survey was conducted in the daytime from 7.00 up to 20.00 of local time. All investigated area of survey constitutes the 3838.8 nm^2. The full cruise track with positions of the trawling is shown on Figure 1.

2.4 Calibration

The Simrad EK60 echosounder with transducers ES38B and ES120–7 were calibrated in the Baltic Sea shore area, near the port Pionerskiy (Russia), the 31.05.2015, in 55°05.36'N; 20°21.55'E. The ship was fixed on the two anchors and one trawl door on the 36.0 meters of depth. The calibration procedure was carried out with a standard calibrated copper sphere, in accordance with the 'SISP Manual of International Baltic Acoustic Surveys (IBAS) (“Manual of International Baltic Acoustic Surveys (IBAS)”, Version 0.82, WGBIFS 2015 ICES CM 2015/ SSGIEOM:07).

THE RESULTS OF CALIBRATION PROCEDURE FOR EK60 SCIENTIFIC ECHOSOUNDER	
Date: 31.05.2015	Place : port Pionerskiy (Russia)
Type of transducer	Split – beam for 38 and 120 kHz
Gain (38 kHz)	26.42 dB
SA Correction (38 kHz)	-0.67 dB
Gain (120 kHz)	25.90 dB
Sa Correction (120 kHz)	-0.35 dB

2.5 Acoustic data collection

The acoustic investigations have been performed during daytime only. The acoustic equipment was an echosounder EK60 with the 38/120 kHz working frequencies. Both transducers are stationary installed in the bottom of the ship, in special blister, for air bubbles noise level decreasing. The specific settings of the hydroacoustic equipment were as described in the “Manual of International Baltic Acoustic Surveys (IBAS)”, (Version 0.82, WGBIFS 2015 ICES CM 2015/ SSGIEOM:07). The post-processing of the stored echodata was done with the SonarData Echoview ver. 3.50.59.4151, Surfer 8.0 and Excel software’s. The mean volume backscattering values Sv, were integrated over 1 nm intervals, from 5 m below the surface to the bottom. Contributions from air bubbles, trawlings and on oceanology stations maneuvers, bottom structures and scattering layers were removed from the echograms by using the SonarData Echoview software. The map of fish density distribution was built on base NASC values with Surfer 8.0 software.

2.6 Biological data – fishing stations

All trawlings were done with the pelagic gear “RT/TM 70/300” in the midwater as well as near the bottom. The mesh size in the codend was 6.5 mm. The intention was to carry out at least two hauls per ICES statistical rectangle. The trawling depth and the trawl opening were defined with a trawl sonar monitoring system SI-110. The trawling depth was chosen on base the echogram, in accordance to echorecords from the fish. Normally, the trawl had vertical opening of about 28 m. The trawling time lasted 30 minutes. Samples were taken from each haul in order to determine length and weight composition of fish. Sub-samples of herring, cod and sprat were taken for further investigations in the laboratory (i.e. sex, maturity, age). In addition, stomachs of sprat, cod and herring were sampled for further biological investigations. The positions of trawlings are shown on Figure 1. Fish control-catch results from the Russian RV‘Atlantniro’ BASS survey are shown on Table 1.

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 define the integrator readings for 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 nautical area scattering coefficient – NASC (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.

2.8 Hydrographic data

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.

Samples of water on different depth were selected with the complex “SBE19+V2/SBE32/33”. Concentration of the dissolved oxygen in samples was defined on method Winkler, by means of the stand for titration "Dosimat 715" (Hydrobios, Germany).

3. RESULTS

3.1 Biological data

In total 13 trawl hauls were carried out in subdivision 26 (Russia zone). During the survey the 2733 sprat, 3780 herring, and 729 cod were measured and 1161 herring, 1123 sprat and 464 cod were aged. The results of the catch composition by ICES Subdivision are presented in Table 2. The average catch amounted to 785.4 kg per half hour of trawling. The average biomass fraction was 69.9% for sprat, 26.3% for herring and 3.6% for cod. In ten trawling stations the fraction of a sprat exceeded 70%, in three from 20 to 45%.

The length compositions of sprat, herring and cod in subdivision 26 (Russia zone) of the year 2015, are presented in Figure 2.

3.2 Acoustic data

The survey statistics concerning the survey area, the mean NASC, the mean scattering cross section σ, the estimated total number of fish, the percentages of herring and sprat per Sub-division/rectangle are shown in Table 3. The maps of surface density distribution in NASC [m^2/nm^2] – values, are shown in Figure 3.

3.3 Abundance estimates

The total abundance of herring and sprat are presented in Table 4. The estimated summary acoustic survey of sprat and herring (mean length and weights) by Sub-division/rectangle are given in Table 5. The estimates of sprat and herring number, mean weights and biomass by Sub-division/rectangle are shown in Table 6-11.

4.0 DISCUSSION

A young sprat in length of 10.0 cm and less (the generation 2014), was met in all trawlings. Its share ranged from 1.0 to 91.5% and in 39HO ICES rectangle reached of 75.9-91.5%. On the average the share a young sprat on survey has reached to 47.9%.

A young herring in length of 15.0 cm and less (the generation 2014) was met above 41-58 meters. Its share has reached only 1.6%.

The data collected during the survey should be considered as representative for the abundance of the pelagic species during the BASS in 2015.

5.0 REFERENCES

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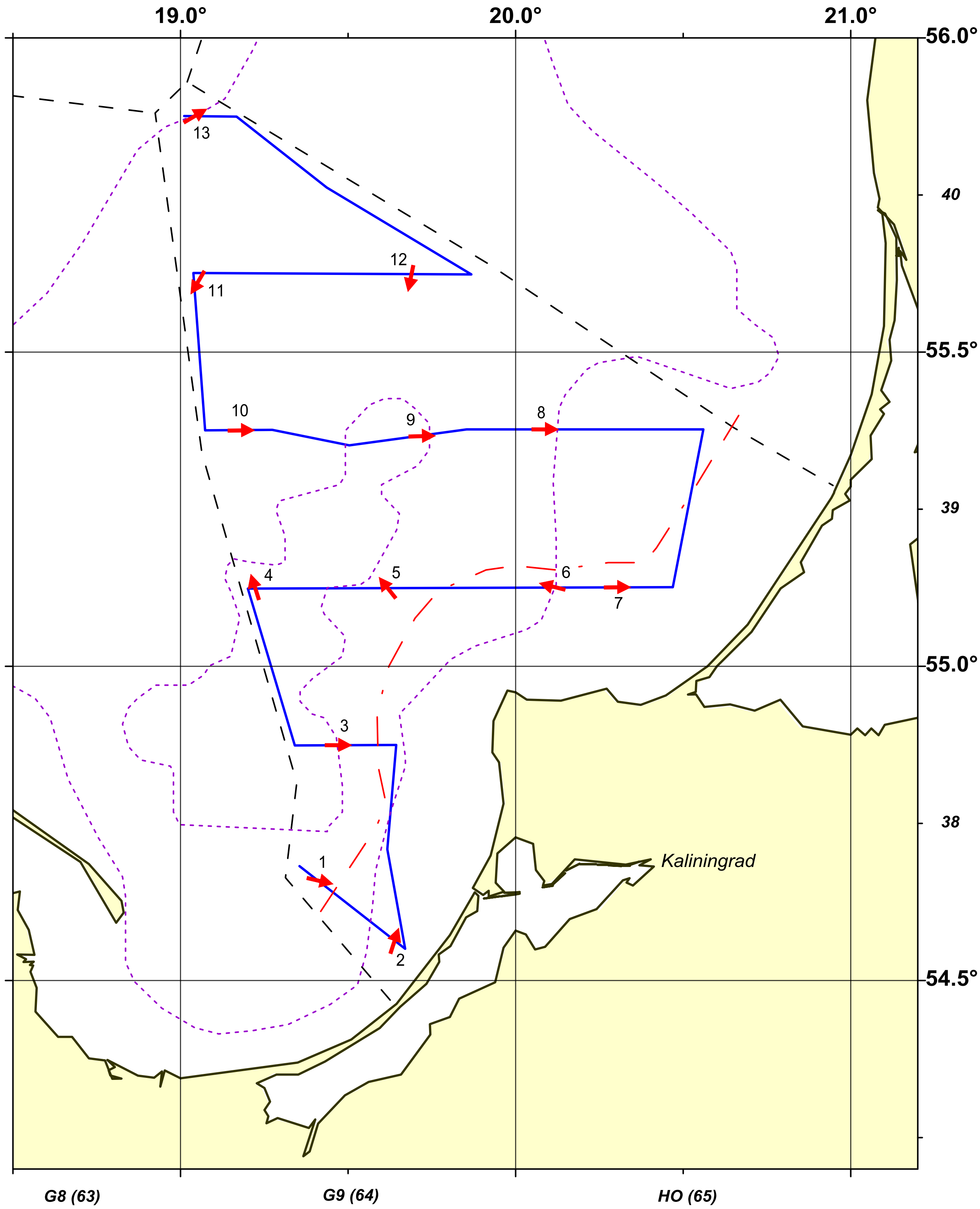


Figure 1. The scheme of cruise track and trawl stations for Russian part of survey (RV "ATLANTNIRO", 04-10.06. 2015)

Table 1. Fish control-catch results in the Baltic Sea ICES SD 26 from Russian BASS survey (RV “ATLANTNIRO”, 04–10.06.2015)

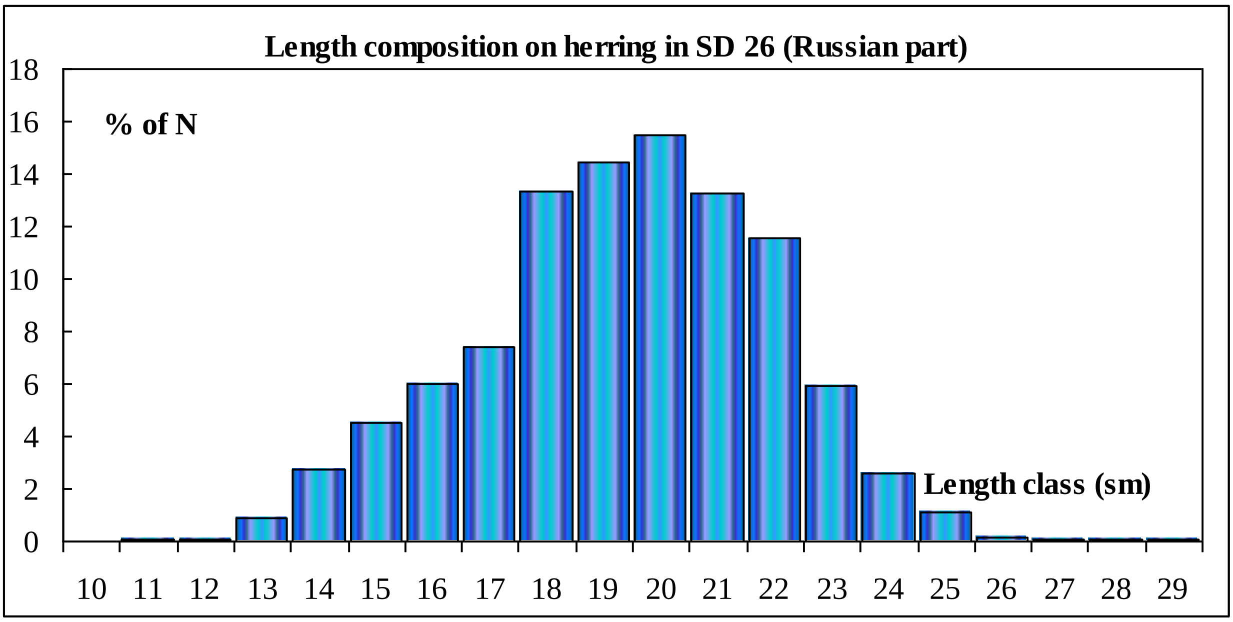
Haul number	Date	ICES rect.	ICES SD	Mean bottom depth [m]	Head-rope depth [m]	Hor. open [m]	Ver. open [m]	Trawl. speed [knt]	Trawl. direct [°]	Geographical position: Start Latitude 00° 00.0'N	Start Longitude 00° 00.0'E	End Latitude 00° 00.0'N	End Longitude 00° 00.0'E	Time Start	Haul dur. [min]	Total catch [kg]
1	04.06.2015	38G9	26	88	36	97	26	3.5	100	54 39.8	19 22.8	54 39.3	19 26.9	6:55	30	682.2
2	05.06.2015	38G9	26	46	17	92	26	3.5	24	54 32.7	19 37.5	54 34.5	19 38.9	7:22	30	610.0
3	05.06.2015	38G9	26	102	44	98	26	3.4	90	54 52.3	19 26.2	54 52.2	19 30.2	12:04	30	640.9
4	06.06.2015	39G9	26	99	42	98	28	3.4	341	55 06.3	19 14.0	55 08.5	19 12.8	6:36	30	806.7
5	06.06.2015	39G9	26	94	38	91	29	3.5	318	55 06.6	19 38.4	55 08.4	19 35.7	10:57	30	1121.1
6	06.06.2015	39HO	26	55	17	90	29	3.9	279	55 07.4	20 08.7	55 07.7	20 05.1	14:58	30	560.1
7	07.06.2015	39HO	26	43	10	89	31	3.8	90	55 07.5	20 16.3	55 07.5	20 19.9	6:25	30	473.7
8	07.06.2015	39HO	26	54	16	90	31	3.7	90	55 22.5	20 03.2	55 22.5	20 06.9	15:03	30	1182.6
9	08.06.2015	39G9	26	97	36	95	28	3.5	88	55 21.7	19 41.2	55 21.8	19 45.2	8:35	30	1033.7
10	08.06.2015	39G9	26	81	25	97	28	3.5	89	55 22.4	19 08.7	55 22.4	19 12.6	15:01	30	863.3
11	09.06.2015	40G9	26	90	36	96	30	3.4	210	55 37.6	19 04.1	55 35.7	19 02.0	7:04	30	689.2
12	09.06.2015	40G9	26	82	29	99	28	3.5	189	55 38.2	19 41.6	55 35.9	19 40.8	15:59	30	606.0
13	10.06.2015	40G9	26	103	35	97	29	3.3	62	55 52.1	19 00.9	55 53.2	19 04.5	9:49	30	940.0
SD26				80	29	95	28	3.5	152							10210

Table 2. Catch composition (kg/1hour) per haul by ICES Subdivision and ICES rectangles (RV “ATLANTNIRO”, 04–10.06.2015)

ICES_subdivision	**26**	**26**	**26**	**26**	**26**	**26**	**26**
Haul_No	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Date	04.06.2015	05.06.2015	05.06.2015	06.06.2015	06.06.2015	06.06.2015	07.06.2015
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	38G9(64)	38G9(64)	39G9(64)	39G9(64)	38G9(64)	39HO(65)	39HO(65)
CLUPEA HARENGUS	1056.0	17.2	134.6	160.8	281.0	184.2	16.8
SPRATTUS SPRATTUS	264.0	1191.2	1070.6	1341.8	1825.0	934.8	926.0
GADUS MORHUA	44.5	8.4	64.0	110.8	136.2	1.0	1.8
ANOTHER	-	3.2	12.6	-	-	0.4	2.9
Total	1364.5	1220.0	1281.8	1613.4	2242.2	1120.4	947.5
ICES_subdivision	**26**	**26**	**26**	**26**	**26**	**26**	**-**
Haul_No	***8***	***9***	***10***	***11***	***12***	***13***	-
Date	07.06.2015	08.06.2015	08.06.2015	09.06.2015	09.06.2015	10.06.2015	-
Validity	Valid	Valid	Valid	Valid	Valid	Valid	-
Species/ICES rectangle	39G9(64)	39G9(64)	39G9(64)	40G9(64)	40G9(64)	40G9(64)	-
CLUPEA HARENGUS	1327.8	516.2	161.6	174.2	896.0	453.2	-
SPRATTUS SPRATTUS	1034.8	1454.0	1489.6	1096.6	302.0	1344.8	-
GADUS MORHUA	2.6	97.2	72.8	107.4	14.0	81.8	-
ANOTHER	-	-	2.7	0.3	-	0.1	-
Total	2365.2	2067.4	1726.7	1378.5	1212.0	1879.9	-

Table 3. Survey statistics (RV “ATLANTNIRO”, 04–10.06.2015)

ICES SD	ICES Rect.	AREA NM^2	NASC M^2/NM^2	σ*10^4 M^2	N TOTAL MLN	SPECIES COMPOSITION (%): HERRING	SPRAT
26	40G9	1013.0	887.2	1.76	5094.0	13.75	86.25
26	39H0	881.6	1186.8	1.15	9085.4	7.12	92.88
26	39G9	1026.0	1151.4	1.27	9273.0	2.99	97.01
26	38G9	918.2	970.0	1.39	6388.3	7.27	92.73



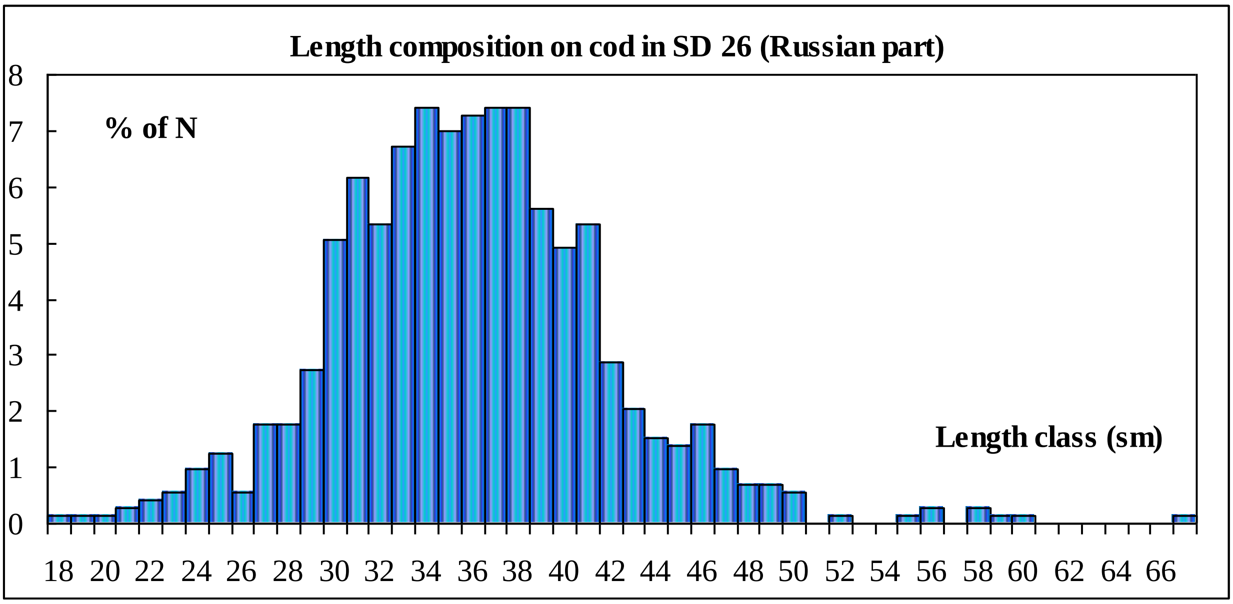


Figure 2. Length composition of sprat, herring and cod (%) (RV "ATLANTNIRO", 04–10.06.2015)

Table 4. Characteristics of the stock of sprat and herring acoustic survey data (RV "ATLANTNIRO", 04–10.06.2015)

ICES SD	ICES Rect.	Area nm^2	ρ mln/nm^2	Quantity, mln			Biomass, tonn		
				N sum	N her	N spr	W sum	W her	W spr
26	40G9	1013.0	5.03	5094.0	700.4	4393.6	83507.2	31820.7	51686.5
26	39H0	881.6	10.31	9085.4	647.2	8438.2	84620.1	29239.5	55380.6
26	39G9	1026.0	9.04	9273.0	277.3	8995.7	97594.2	15112.9	82481.3
26	38G9	918.2	6.96	6388.3	464.5	5923.8	79980.4	25872.8	54107.7
SD26		**3 838.8**		**29 841**	**2 089**	**27 751**	**345 702**	**102 046**	**243 656**

Table 5. Summary acoustic survey of sprat and herring (RV "ATLANTNIRO", 04–10.06.2015)

ICES SD	ICES Rect.	No trawl	HERRING			SPRAT			SA	TS CALC.
			L, cm	W, g	Numb.,%	L, cm	W, g	Numb.,%	M^2/NM^2	DB
26	40G9	11,12,13	19.34	45.43	13.75	12.39	11.76	86.25	887.2	-48.5
26	39H0	6,7,8	19.68	45.18	7.12	9.94	6.56	92.88	1186.8	-50.4
26	39G9	4,5,9,10	20.94	54.50	2.99	11.03	9.17	97.01	1151.4	-49.9
26	38G9	1,2,3	20.92	55.70	7.27	11.02	9.13	92.73	970.0	-49.5

Table 6. Estimated number (millions) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	NSTOT	1	2	3	4	5	6	7	8+
26	40G9	4393.58	271.37	1025.83	1765.07	729.95	325.86	94.16	149.93	31.43
26	39H0	8438.17	7326.02	551.82	400.88	159.45				
26	39G9	8995.66	4111.54	1771.67	1731.99	825.53	236.05	64.88	237.01	16.99
26	38G9	5923.78	2595.02	2020.51	747.93	424.56	56.64	14.13	57.07	7.92
	Sum	27751.19	14303.95	5369.82	4645.87	2139.49	618.55	173.16	444.01	56.33

Table 7. Estimated mean weights (g) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WSTOT	1	2	3	4	5	6	7	8+
26	40G9	11.76	5.99	10.35	11.97	13.52	13.89	15.14	14.24	11.57
26	39H0	6.56	5.75	10.45	12.70	15.12				
26	39G9	9.17	5.57	10.40	12.28	12.98	17.02	17.09	15.79	17.32
26	38G9	9.13	6.05	10.64	12.23	13.75	13.20	15.44	14.53	17.27

Table 8. Estimated biomass (in tonnes) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WSTOT	1	2	3	4	5	6	7	8+
26	40G9	51686.5	1626.7	10622.0	21123.5	9865.3	4525.0	1425.7	2134.6	363.7
26	39H0	55380.4	42108.5	5768.7	5093.0	2410.4				
26	39G9	82481.3	22915.0	18427.6	21261.9	10713.7	4017.8	1108.8	3742.0	294.4
26	38G9	54107.7	15690.8	21502.3	9144.4	5838.5	747.6	218.1	829.3	136.7
	Sum	243656	82341	56321	56623	28828	9290	2753	6706	795

Table 9. Estimated number (millions) of herring (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	NHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	700.39		2.86	8.30	121.84	171.22	57.12	77.49	97.79	79.49	40.37	43.92
26	39HO	647.22		59.25	116.62	69.68	121.06	44.34	49.28	53.92	56.87	22.76	53.44
26	39G9	277.31		2.13	23.28	27.51	60.73	20.24	24.45	28.01	37.76	23.03	30.17
26	38G9	464.48	0.21	9.47	36.54	31.91	96.54	35.93	48.47	72.54	65.12	41.17	26.59
	Sum	2089.40	0.21	73.70	184.73	250.94	449.55	157.63	199.70	252.26	239.23	127.32	154.12

Table 10. Estimated mean weights (g) of herring (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	45.43		22.69	29.19	33.94	38.58	44.74	45.29	54.35	55.13	53.87	64.59
26	39HO	45.18		23.95	37.40	38.38	44.69	47.26	53.39	49.12	57.59	57.65	63.85
26	39G9	54.50		17.46	38.93	41.31	50.19	51.17	57.78	56.58	60.46	60.28	75.59
26	38G9	55.70	24.36	20.14	38.86	41.76	49.49	57.73	58.96	62.55	60.38	65.25	77.42

Table 11. Estimated biomass (in tonnes) of herring (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	31820.7		64.8	242.2	4135.6	6605.1	2555.6	3509.6	5314.6	4382.1	2174.5	2836.6
26	39HO	29239.5		1419.2	4361.2	2674.0	5410.6	2095.2	2631.2	2648.8	3275.0	1312.1	3412.3
26	39G9	15112.9		37.1	906.2	1136.4	3048.2	1035.9	1412.9	1585.0	2282.6	1388.3	2280.2
26	38G9	25872.8	5.2	190.6	1419.9	1332.5	4777.3	2074.4	2858.0	4537.6	3932.1	2686.3	2059.0
	Sum	102046	5	1712	6930	9278	19841	7761	10412	14086	13872	7561	10588

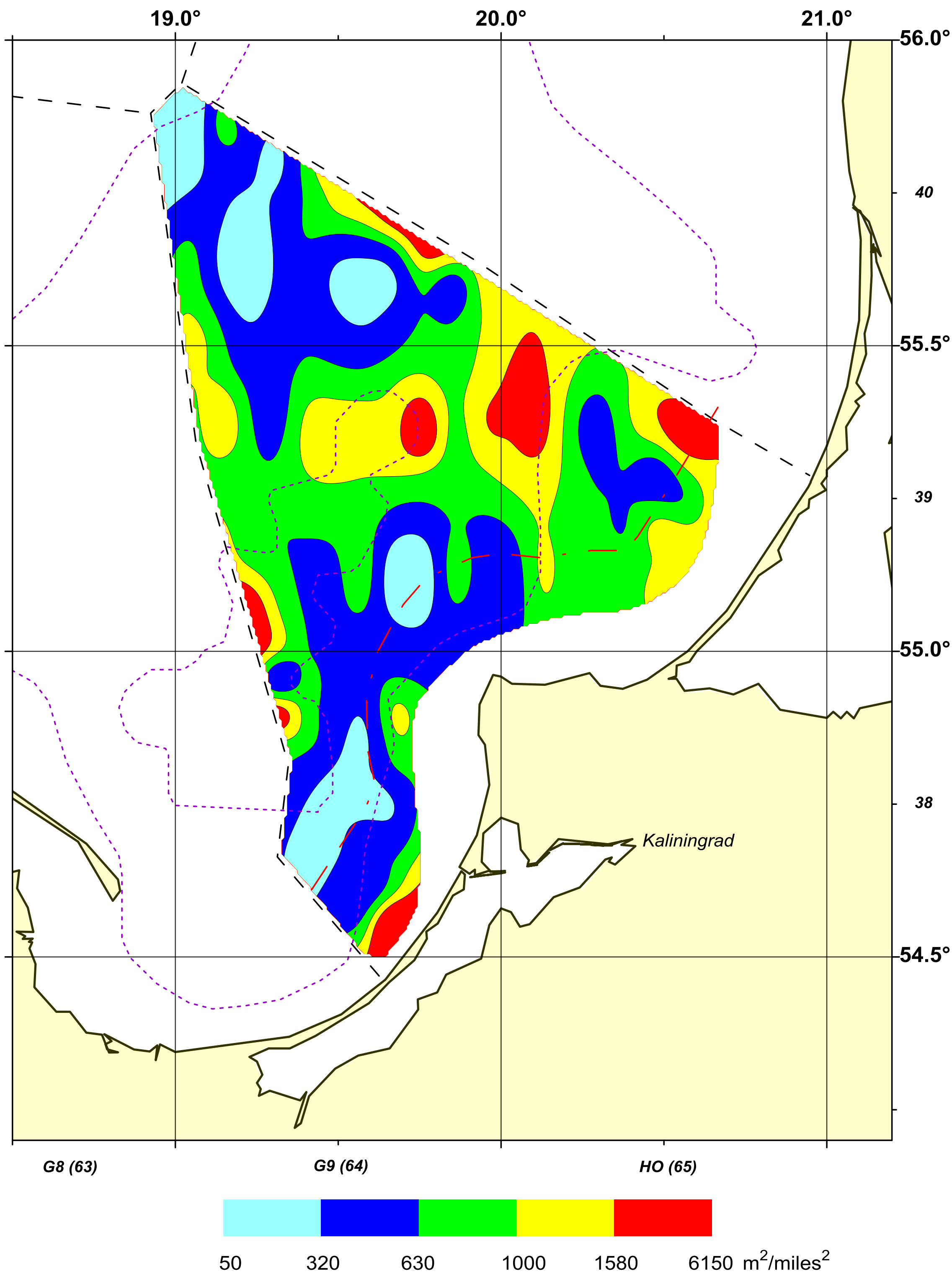


Figure 3. The map of NASC values distribution on the Russian area of international acoustic survey (RV "ATLANTNIRO", 04-10.06.2015)

PRELIMINARY REPORT

FROM THE JOINT ESTONIAN-POLISH BIAS 2015 CONDUCTED BY THE R.V. "BALTICA" IN THE NORTH-EASTERN BALTIC SEA (18-28 October 2015)

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 5/2015/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 2015 survey was conducted in the Estonian EEZ (the ICES Sub-divisions 28.2, 29 and 32).

The Estonian Data Collection Programme for 2015 and the European Union (the Commission regulations Nos. 1639/2001, 1581/2004, 665/2008, 1078/2008, 199/2008) financially supported the EST-POL BIAS 4Q 2015 survey. Timing, surveying area in the north-eastern Baltic and the principal methods of investigations concerns the above mentioned survey were designed and coordinated by the WGBIFS (Anon. 2015[1]).

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 EST-POL BIAS 4Q 2015 scientific staff was composed of nine persons:
Miroslaw Wyszynski (NMFRI, Gdynia – Poland) – survey leader
Jakub Slembarski (NMFRI, Gdynia – Poland) – acoustician
Bartosz Witalis (NMFRI, Gdynia – Poland) – hydrologist
Wladyslaw Gawel (NMFRI, Gdynia – Poland) – ichthyologist

[1]Anon. 2015. First Interim Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2015/SSGIEOM: 07.

Tiit Raid (TUEMI, Tallinn - Estonia) – Estonian scientific staff leader
Ain Lankov (TUEMI, Tallinn - Estonia) – ichthyologist
Andrus Hallang (TUEMI, Tallinn - Estonia) – ichthyologist
Timo Arula (TUEMI, Tallinn - Estonia) – biologist
Elor Sepp (TEMI, Tallinn - Estonia) – acoustician.

Narrative

The reported survey took place during the period of 18-29 October 2015. 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 18.10.2015 in the midday and was navigated in the north-eastern direction to the entering point of planed acoustic transect at the geographical position 58°05.0’N 021°48.0’E (Fig. 1). The at sea researches were ended on 26.10.2015 before the midday in the port of Ventspils (Latvia). Then the r.v. “Baltica” started its journey to the home-port in Gdynia (Poland), reaching it on 28.10.2015 after midday.

Survey design and realization

The r.v. “Baltica” realized 490 Nm echo-integration transect and 19 fish control-catches (Fig. 1). All the ICES rectangles were covered with acoustic transect and control catches. All catches were performed in the daylight (between 07:30 am. and 17:00 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 12 (from totally 19) hauls duration was shortened to 10-15 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 28.2, 6 hauls in SD 29 and 9 hauls in SD 32.

The length measurements (in 0.5 cm classes) were realized for 4043 sprat and 4156 herring individuals. Totally, 678 sprat and 1006 herring individuals were taken for biological analysis.

Calibration

The hydroacoustic equipment was calibrated before the survey according to the methodology described in the BIAS manual. (Anon. 2014[2])

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

Acoustic data collection

Acoustic data were collected during the light time with the Simrad EK60 echosounder equipped with “Echo-view V4.10” software for the data analysis. Data from two frequencies (38 and 120 kHz) were recorded simultaneously, but for the standard analyses only the information collected with 38 kHz was used. The specific settings of the equipment were used as described in the BIAS manual. (Anon. 2014[2]) The basic acoustic and biological data collected during recently carried out survey will be stored in the BIAS_DB.mdb managed by ICES.

Data analysis

The MYRIAX “EchoView v.4.10” software was used for the analysis of the acoustic data.

The total number of fish in each the ICES rectangle was estimated as a product of the mean NASCs from scrutinized acoustic data and a rectangle area, divided by corresponding mean acoustic cross-section (σ) which is based on the trawl catch results. The abundance of clupeids was separated into sprat and herring according to the mean catch composition.

Mean target strength (TS) – one of the principal acoustic parameter – of clupeids was calculated according to following formula:

TS = 20 log L – 71.2 (Anon. 1983[3]).

Due to fortunate weather conditions, all transects and planned trawls were conducted according to the plan and no data from colleagues from nearby countries were needed.

Catch results and fish measurements

Overall, 12 fish species were recognized in hauls performed at the North-eastern Baltic Sea in October 2015. Sprat was prevailing species by mass in the the total catch with the mean share amounted 60.1 % (especially in SD 29 – 72.4%). Only in SD 32 the catch mass share of sprat and herring was at the same level – 49.7 and 49.8% respectively. The rest 10 species (with the smelt predominance) represented only 0.3 % 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 2015 amounted 737.1 kg/h and was lower comparing to 1289.1 kg/h and 845.5 kg/h in the previous years (2014 and 2013 respectively). The mean CPUE decreasing for both two main investigated species (sprat and herring) was noted in 2015 comparing to 2014 – about 49% in case of herring and 38% for sprat. The most valueable CPUEs for sprat was noted in SD 28.2, but for herring – in SD 32. The mean CPUEs of sprat were: 552.4 kg/h in ICES SD 28.2, 455.5 kg/h in SD 29 and 386.3 kg/h in SD 32. The mean CPUEs in case of herring were as follow: 254.9, 173.0 and 387.0 kg/h in SDs 28.2, 29 and 32 respectively.

The length distributions of sprat and herring according to the ICES Sub-divisions 28.2, 29 and 32 are shown on Fig. 3 and 4 respectively.

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

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

The sprat length distribution curves represent similar character in three investigated SDs. First frequency peak represented sprat generation born in 2015 took place on 7 cm length class (but it is absent for SD 32), the second one is placed on 9.5-10 cm length classes and third – on 12 cm length class. The length distribution curves in case of herring show generally two frequency peaks – first one on 11-12 cm length classes and second one on 15-15 cm length classes. They represent the adult fish. Practically only in SD 29 a small frequency peak placed on 7.5 cm length class, representing 2015 herring generation is observed.

Acoustic results

The survey statistics concerning the survey area, the mean NASC, the mean sigma, the estimated total number of fish, the percentages of herring and sprat per ICES statistical rectangles are presented in Table 3. Fish concentrations were found to be higher in western part of Gulf of Finland.

Abundance and biomass estimates

The estimated abundances of herring and sprat by age group and Sub-division/ICES statistical rectangle are given in Table 4. The estimated biomass by age group and Sub-division/ICES statistical rectangle is shown in Table 5. Corresponding mean weights by age group and Sub-division/ICES statistical rectangle are summarized in Table 6.

The spatial distribution of sprat biomass and abundance differed considerably within the investigated area. The abundance and biomass of herring was highest in the eastern part of Gulf of Finland and lowest in the Baltic Proper. Corresponding results about sprat did not differ that much within the investigated area. The average weight of individuals from both species was lower than in the previous survey.

Meteorological and hydrological characteristics.

The 19 control catches (Fig.1) were inspected with the Neil-Brown CTD-probe combined with the rosette sampler. Oxygen content was determined by the standard Winkler’s method. The CTD row data aggregated to the 1-m depth stratum. The Oxygen probes were taken on every 10 meters, and the catch depth.

The most frequent wind was from south direction (Fig. 5). The wind speed varied from 16.5 m/s to 1.8 m/s and average speed was 8.8 m/s. The air temperature ranged from 11.9 °C to 6.3 °C, and average temperature was 9.6 °C.

The seawater temperature in the surface layers varied from 10,57 to 12.88°C (the mean was 11.69°C).The lowest surface temperatures were recorded at the haul 12. The highest ones were noticed at the haul 1. The minimum value of salinity in Practical Salinity Unit (PSU) was 4,14 at the haul 13 in the surface layer. The maximum was 6,81 PSU at the haul 1. The mean value of salinity was 5,79 PSU. The oxygen content in the surface layers of investigated the research area varied in the range of 6.85 ml/l (haul 4) - 7.33 ml/l (haul 11). The mean value of surface water oxygen content was 7.15 ml/l.

The temperature at the trawl towing layer was changing in the range of 4.26 (haul 11)- 12.92 °C (haul 1), the mean was 6.48 °C. Salinity at the haul depth varied from 4.26 (haul 12) to 9.48 PSU (haul 4), and the mean was 7.14 PSU. Oxygen content varied from 0.94 ml/l (haul 4) to 7.06 ml/l (haul 1), the mean was 5.01 ml/l.

The temperature of near bottom (Fig. 6) layer was changing in the range of 3.96 (haul - 6.07 °C (haul 3), the mean was 5.25°C . Salinity in the bottom waters varied from 5.52 to 11.25 PSU, and the mean was 9.40 PSU. The low value of salinity was at the haul 12. The highest values of salinity were noticed at the haul 8. Oxygen content varied from 0.00 ml/l to 4.96 ml/l (the mean was 1.46 ml/l). The zero values of this parameter near bottom waters were noticed at the haul locations: 5, 9, 15, 18 and 19.

The depth profiles of three basic hydrological parameters (Fig. 7) measured at the deepest sampling station show a thermocline and halocline starting from about 32 m depth and oxycline starting from about 60 m depth with the oxygen value 6 ml/l to below 0,5 ml/l below the depth of 80 m.

Discussion

The estimated total abundance of sprat in the survey regions was slightly higher compared to the previous year survey results. Herring abundance in same region was almost the same compared to the previous year. Mean weights of individuals from both species were slightly lower than in the previous year and much lower compared to 2013 results.

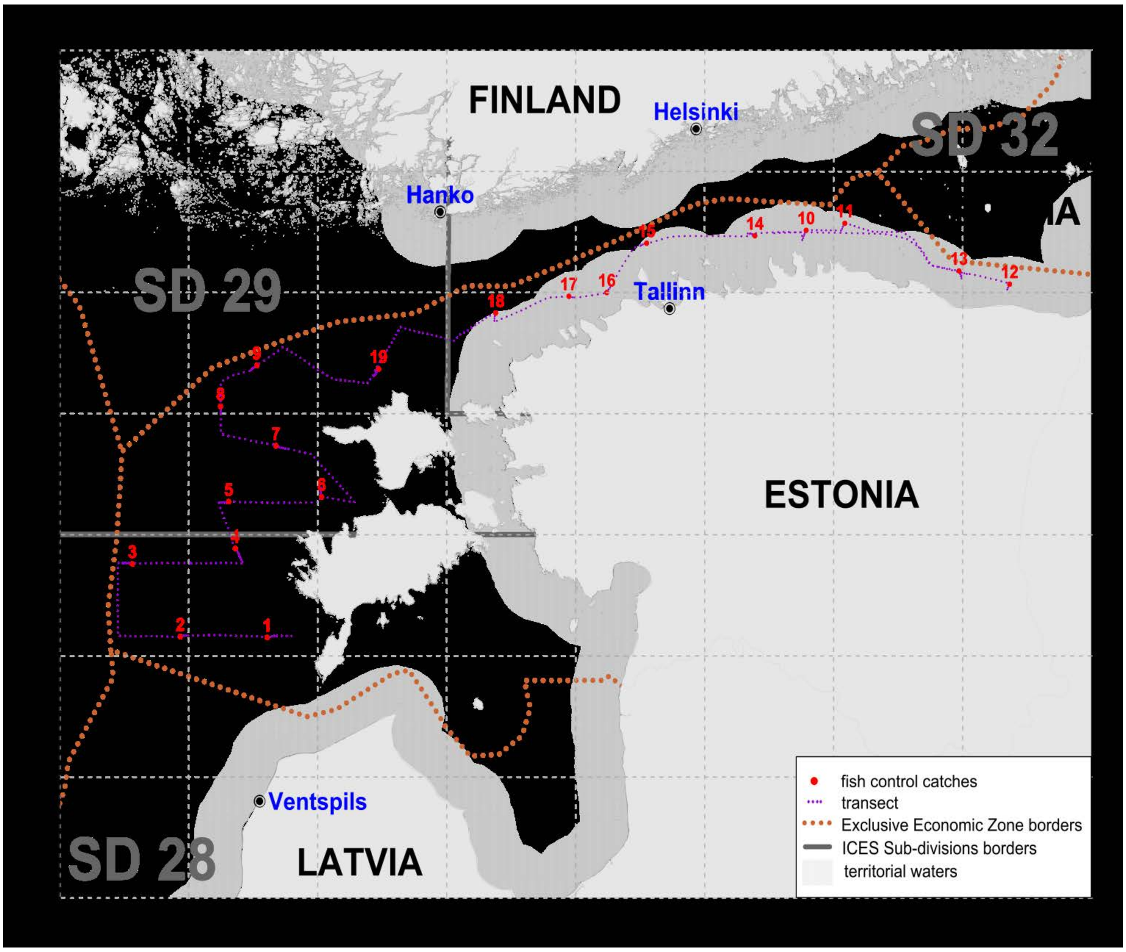

Fig. 1. Acoustic transects and pelagic fish control catches with connected hydrological stations realised during joint EST-POL BIAS (October 2015).

Table 1. Catch and CPUE results during joint Estonian-Polish BIAS conducted by r.v. "Baltica" in Estonian EEZ in October 2015.

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	fourbeard rockling	sand gobby	straight nose pipefish	nine-spined stickleback	three-spined stickleback	smelt	lumpfish	eelpoud
1	2015-10-19	45H1	28.2	58°04.9'	21°38.2'	58°04.6'	21°37.0'	07:30	08:00	30	18,344	18,020	0,194		0,090					0,040			
2	2015-10-19	45H0	28.2	58°05.0'	20°58.6'	58°04.9'	20°57.0'	11:10	11:25	15	720,100	532,626	187,190	0,140						0,144			
3	2015-10-19	45H0	28.2	58°23.0'	20°30.0'	58°22.9'	20°33.0'	16:30	17:00	30	70,200	12,763	56,726					0,0004	0,005	0,706			
4	2015-10-20	45H1	28.2	58°23.6'	21°24.4'	58°26.3'	21°22.3'	08:40	09:40	60	175,595	17,640	156,975	0,941		0,004			0,012	0,023			
5	2015-10-20	46H1	29	58°38.0'	21°15.1'	58°37.9'	21°17.6'	12:00	12:30	30	701,688	594,560	106,750	0,305					0,035	0,035			0,003
6	2015-10-20	46H2	29	58°41.3'	22°01.3'	58°39.8'	22°01.6'	16:25	16:55	30	58,000	54,613	3,115					0,0001	0,023	0,249			
7	2015-10-21	46H1	29	58°51.4'	21°44.4'	58°51.7'	21°41.3'	08:50	09:20	30	6,205	5,465	0,473						0,120	0,147			
8	2015-10-21	47H1	29	59°00.6'	21°15.0'	59°01.2'	21°14.9'	12:15	12:30	15	371,250	215,700	155,405							0,145			
9	2015-10-21	47H1	29	59°11.0'	21°29.5'	59°11.6'	21°30.7'	15:00	15:15	15	116,590	87,559	28,331							0,700			
10	2015-10-22	48H5	32	59°43.6'	25°45.8'	59°45.0'	25°46.7'	09:55	10:25	30	127,230	1,654	122,993						0,038	0,153	2,392		
11	2015-10-22	48H6	32	59°46.0'	26°04.0'	59°46.6'	26°04.6'	12:15	12:30	15	185,830	131,159	54,039						0,038	0,111	0,483		
12	2015-10-23	48H7	32	59°30.9'	27°20.8'	59°31.6'	27°21.3'	09:40	09:55	15	110,360	56,195	54,043						0,045	0,077			
13	2015-10-23	48H6	32	59°34.0'	26°59.2'	59°34.7'	26°58.7'	12:15	12:30	15	19,730	2,230	15,200				0,010	0,0001	0,362	0,198	1,710		0,020
14	2015-10-24	48H5	32	59°44.5'	25°20.9'	59°44.4'	25°22.3'	08:00	08:15	15	219,640	165,806	53,153						0,011	0,033	0,637		
15	2015-10-24	48H4	32	59°41.8'	24°30.9'	59°42.0'	24°31.9'	12:30	12:40	10	383,700	202,632	178,840							0,039	1,973	0,216	
16	2015-10-24	47H4	32	59°31.0'	24°15.5'	59°30.6'	24°15.1'	16:05	16:15	10	58,220	13,833	44,334						0,012	0,041			
17	2015-10-24	47H3	32	59°28.8'	23°58.3'	59°28.9'	23°57.4'	16:50	17:00	10	136,000	39,522	96,475						0,003				
18	2015-10-25	47H3	32	59°23.5'	23°22.2'	59°24.4'	23°22.3'	07:30	07:45	15	282,600	129,083	153,440						0,015	0,062			
19	2015-10-25	47H2	29	59°09.8'	22°27.0'	59°10.6'	22°27.5'	14:25	14:40	15	73,460	52,730	20,635						0,007	0,088			
									Total catch [kg]	SD 28.2	984,239	581,049	401,085	1,081	0,090	0,004		0,0004	0,017	0,913			
										SD 29	1327,193	1010,627	314,709	0,305				0,0001	0,185	1,364			0,003
										SD 32	1523,310	742,114	772,517				0,010	0,0001	0,524	0,714	7,195	0,216	0,020
										Sum	3834,742	2333,790	1488,311	1,386	0,090	0,004	0,010	0,001	0,726	2,991	7,195	0,216	0,023

Haul no	ICES rectangle	ICES Sub-division (SD)	Haul duration [min]	Total CPUE [kg/h]	CPUE per species [kg/h] sprat	herring	cod	flounder	fourbeard rockling	sand gobby	straight nose pipefish	nine-spined stickleback	three-spined stickleback	smelt	lumpfish	eelpoud
1	45H1	28.2	30	36,688	36,040	0,388		0,180					0,080			
2	45H0	28.2	15	2880,400	2130,504	748,760	0,560						0,576			
3	45H0	28.2	30	140,400	25,526	113,452					0,001	0,009	1,412			
4	45H1	28.2	60	175,595	17,640	156,975	0,941		0,004			0,012	0,023			
5	46H1	29	30	1403,376	1189,120	213,500	0,610					0,070	0,070			0,006
6	46H2	29	30	116,000	109,226	6,230					0,0002	0,046	0,498			
7	46H1	29	30	12,410	10,930	0,946						0,240	0,294			
8	47H1	29	15	1485,000	862,800	621,620							0,580			
9	47H1	29	15	466,360	350,236	113,324							2,800			
10	48H5	32	30	254,460	3,308	245,986						0,076	0,306	4,784		
11	48H6	32	15	743,320	524,636	216,156						0,152	0,444	1,932		
12	48H7	32	15	441,440	224,780	216,172						0,180	0,308			
13	48H6	32	15	78,920	8,920	60,800				0,040	0,0004	1,448	0,792	6,840		0,080
14	48H5	32	15	878,560	663,224	212,612						0,044	0,132	2,548		
15	48H4	32	10	2302,200	1215,792	1073,040							0,234	11,838	1,296	
16	47H4	32	10	349,320	82,998	266,004						0,072	0,246			
17	47H3	32	10	816,000	237,132	578,850						0,018				
18	47H3	32	15	1130,400	516,332	613,760						0,060	0,248			
19	47H2	29	15	293,840	210,920	82,540						0,028	0,352			
	Mean CPUE by SDs [kg/h]		28	808,271	552,428	254,894	0,375	0,045	0,001		0,0002	0,005	0,523			
			29	629,498	455,539	173,027	0,102				0,00003	0,064	0,766			0,001
			32	777,180	386,347	387,042				0,004	0,00004	0,228	0,301	3,105	0,144	0,009
			Total	737,089	443,161	291,638	0,111	0,009	0,0002	0,002	0,0001	0,129	0,494	1,471	0,068	0,005

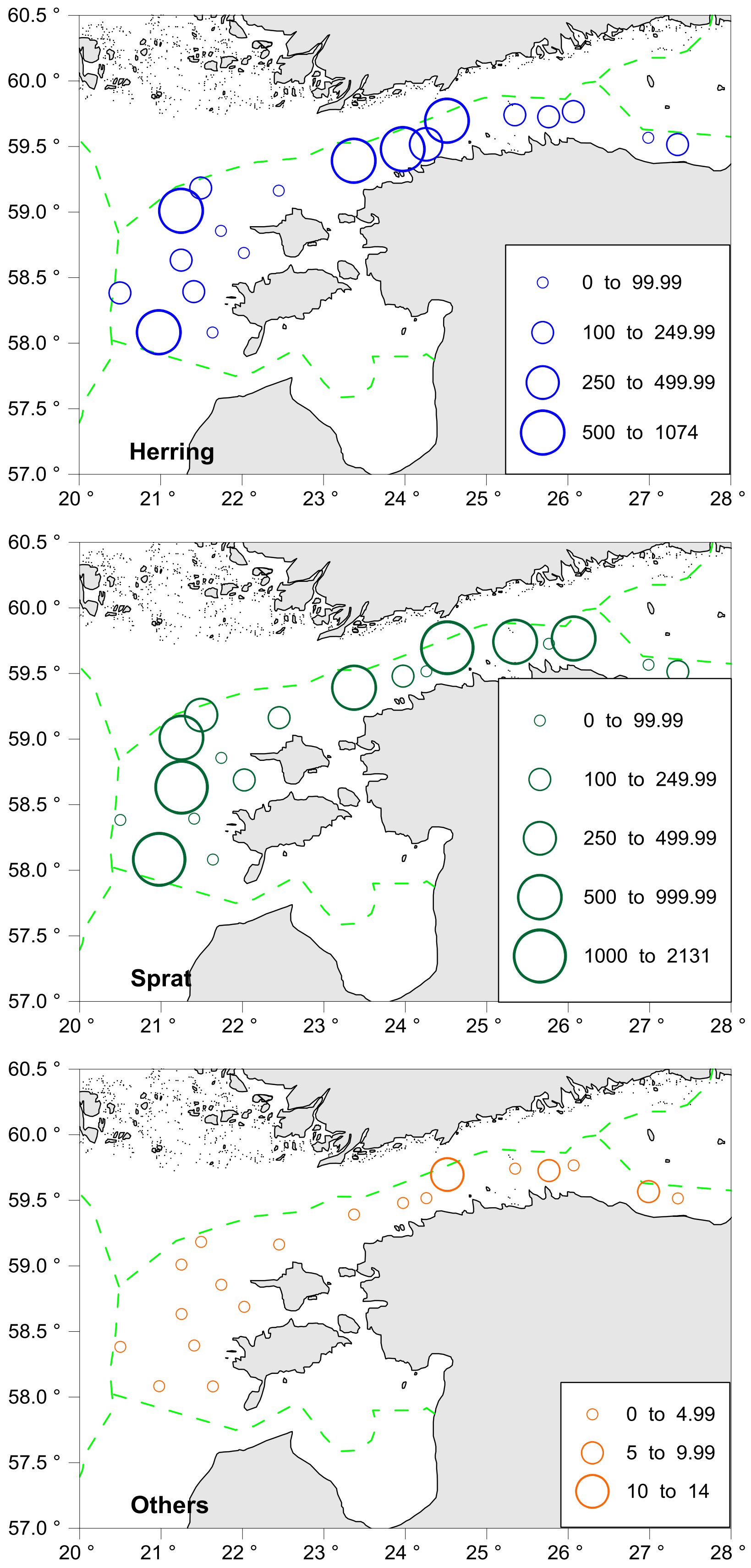

Fig. 2. Distribution of CPUE values (kg/h) for herring, sprat and other species in the pelagic fish control catches during joint EST-POL BIAS (October 2015).

Table. 2. Biological sampling in the r.v."Baltica" joint EST-POL BIAS in October 2015.

SD	Haul number	Fish number									
		SPRAT		Herring		3-SP.STICKEBACK		9-SP:STICKLEBACK		TOTAL	
		measured	analysed	measured	analysed	measured	analysed	measured	analysed	measured	analysed
28.2	4	906	248	827	315	60	0	5	0	1798	563
29	6	1397	225	1267	374	141	0	44	0	2849	599
32	9	1740	205	2062	317	103	0	54	0	3959	522
Total	19	4043	678	4156	1006	304	0	103	0	8606	1684

Pelagic fish species

Demersal fish species

SD	Haul number	Fish number									
		COD		FLOUNDER		LUMPFISH		SMELT		EELPOUD	
		measured	analysed	measured	analysed	measured	analysed	measured	analysed	measured	analysed
28.2	4	5	0	1	0	0	0	0	0	0	0
29	6	1	0	0	0	0	0	0	0	1	0
32	9	0	0	0	0	1	0	205	0	1	0
Total	19	6	0	1	0	1	0	205	0	2	0

SD	Haul number	Fish number							
		FOURB. ROCKLING		SAND GOBBY		STR. NOSE PIPEFISH		T O T A L	
		measured	analysed	measured	analysed	measured	analysed	measured	analysed
28.2	4	1	0	0	0	1	0	8	0
29	6	0	0	0	0	1	0	3	0
32	9	0	0	7	0	1	0	215	0
Total	19	1	0	7	0	3	0	226	0

Number of sampled plankton stations:
SD 28.2 - 4
SD 29 – 6
SD 32 – 9

Table 3. The BIAS survey basic biological and acoustic data concerning the clupeid stocks inhabiting the north- eastern Baltic Sea in October 2015.

ICES Sub-div.	ICES rectangle	Area [NM^2]	Share [%-indiv.] herring	Share [%-indiv.] sprat	Total abundance [x10^6]	Abundance density [10^6/NM^2]	NASC [m^2/NM^2]	σ [cm^2]
28	45H0	947.2	37,6	57,7	5486,0	5,792	882,8	1,524
28	45H1	827.1	41,1	58,6	8522,2	10,304	1328,3	1,289
29	46H1	921.5	8,6	81,7	6437,5	6,986	637,7	0,913
29	46H2	258.0	2,5	94,7	4491,2	17,408	1676,8	0,963
29	47H1	920.3	22,3	76,4	7814,8	8,492	954,6	1,124
29	47H2	793.9	21,0	78,1	6185,6	7,791	848,7	1,089
32	47H3	536.2	55,9	44	3757,3	7,007	1037,8	1,481
32	48H4	835.1	46,0	53,2	23004,9	27,547	3182,7	1,155
32	48H5	767.2	50,9	45,3	5230,1	6,817	1003,0	1,471
32	48H6	776.1	36,7	48	4247,6	5,473	555,7	1,015
32	48H7	851,4	36,3	62,9	7181,4	8,435	871,9	1,034
Average			**32,6**	**63,7**		**10,187**	**1180**	**1,187**
Total		**8434**			**82358**			

Table 4. Abundance (in 10^6 indiv.) of herring and sprat per age groups according to the ICES rectangles and Sub-divisions of the north-eastern Baltic in October 2015.

ICES	ICES rectangle	HERRING – age groups									
Sub-div.		0	1	2	3	4	5	6	7	8+	total
28	45H0		613,89	176,63	375,42	385,33	71,81	116,80	81,78	241,34	2063,01
28	45H1		985,42	319,53	706,10	580,93	121,06	194,54	147,69	447,00	3502,26
total			1599,31	496,16	1081,51	966,27	192,87	311,34	229,47	688,34	5565,26
29	46H1	283,88	136,82	28,19	52,82	33,74	2,64	5,01	4,00	8,98	556,08
29	46H2	29,74	41,66	12,56	14,94	7,65	1,49	0,96	1,94	1,93	112,87
29	47H1	14,46	1210,71	159,85	181,66	110,34	8,00	14,54	8,03	31,76	1739,34
29	47H2	143,72	926,51	68,15	85,67	49,01	4,55	5,59	1,04	11,89	1296,12
total		471,8	2315,7	268,75	335,1	200,74	16,67	26,09	15,01	54,55	3704,4
32	47H3	8,86	1222,53	160,79	316,04	312,36	38,89	38,89		0,73	2099,10
32	48H4	0,00	8087,91	547,03	783,44	910,53	113,79	121,17	8,40	6,14	10578,41
32	48H5	1,29	459,27	357,23	741,42	829,46	124,16	121,89	7,63	18,03	2660,39
32	48H6	21,20	1141,00	132,21	115,93	109,37	17,82	19,18	1,62	1,56	1559,89
32	48H7	51,73	2276,72	139,68	85,15	36,41	4,27	11,73		1,59	2607,28
total		83,09	13187,43	1336,94	2041,97	2198,13	298,94	312,86	17,65	28,05	19505,06
Grand total		554,89	17102,43	2101,84	3458,59	3365,14	508,48	650,29	262,13	770,94	28774,73

Table 4. Continued

ICES Sub-div.	ICES rectangle	SPRAT – age groups									
		0	1	2	3	4	5	6	7	8+	Total
28	45H0	63,26	1186,69	619,07	471,34	376,02	319,05	44,14	36,11	50,85	3166,53
28	45H1	3916,65	340,52	192,59	178,49	147,23	138,26	27,86	22,28	27,71	4991,60
total		3979,91	1527,22	811,66	649,83	523,25	457,31	72	58,39	78,56	8158,13
29	46H1	20,71	4323,28	499,37	154,58	113,00	45,22	71,25	15,42	17,13	5259,96
29	46H2	1961,08	1126,61	320,29	264,65	211,94	144,19	121,18	70,81	30,69	4251,45
29	47H1	1107,07	2901,57	616,98	485,02	326,96	212,52	187,03	94,53	39,23	5970,92
29	47H2		3521,58	582,66	289,80	180,62	101,78	97,33	39,52	20,49	4833,77
total		3088,86	11873,04	2019,3	1194,05	832,53	503,72	476,79	220,28	105,54	20316,11
32	47H3		206,66	197,61	258,69	475,09	243,95	77,94	66,83	127,62	1654,38
32	48H4	24,12	10831,43	238,24	239,62	432,14	219,19	75,35	62,64	113,96	12236,70
32	48H5	0,14	2181,30	34,72	27,18	61,28	29,51	10,70	8,45	15,34	2368,63
32	48H6	1,64	1852,98	35,77	27,86	59,85	30,43	9,61	8,04	12,97	2039,15
32	48H7	1,44	4312,97	84,59	28,82	47,27	23,63	5,76	5,76	8,93	4519,19
total		27,34	19385,35	590,93	582,18	1075,63	546,71	179,37	151,72	278,82	22818,05
Grand total		7096,12	32785,60	3421,89	2426,06	2431,41	1507,73	728,15	430,40	464,92	51292,29

Table 5. Biomass (in tons) of herring and sprat per age groups according to the ICES rectangles and Sub-divisions of the north-eastern Baltic in October 2015.

ICES	ICES rectangle	HERRING – age groups									
Sub-div.		0	1	2	3	4	5	6	7	8+	total
28	45H0		6419,74	2688,52	7141,79	8843,21	1765,86	2911,96	2127,03	6152,59	38050,70
28	45H1		9604,33	4800,11	13048,09	13176,26	2852,88	5319,24	4161,37	12907,03	65869,30
total			16024,07	7488,63	20189,88	22019,48	4618,73	8231,20	6288,40	19059,62	103920
29	46H1	683,27	1237,73	426,27	910,17	658,77	52,48	102,67	89,53	186,75	4347,63
29	46H2	66,06	373,98	183,44	259,96	144,09	46,14	19,34	70,57	38,56	1202,14
29	47H1	63,84	9592,42	2131,00	3212,29	2222,86	168,32	313,09	179,58	851,51	18734,92
29	47H2	371,85	8082,90	941,51	1488,99	915,55	88,89	109,61	20,73	232,58	12252,60
total		1185,02	19287,03	3682,21	5871,40	3941,28	355,83	544,71	360,41	1309,40	36537,29
32	47H3	17,73	9790,42	2163,87	5344,41	6169,89	904,38	896,70		20,09	25307,48
32	48H4		62811,13	7015,93	13190,83	17500,59	2600,29	2727,78	243,71	170,34	106260,60
32	48H5	3,10	3927,46	4831,74	12118,13	15897,87	2696,11	2672,79	215,85	825,50	43188,55
32	48H6	47,66	9491,91	1667,50	1882,74	2102,24	386,80	414,04	42,80	38,68	16074,36
32	48H7	101,39	19545,72	1865,03	1453,27	732,44	106,46	297,61		42,34	24101,92
total		169,89	105566,63	17544,08	33989,37	42403,03	6694,03	7008,92	502,36	1096,95	214932,92
Grand total		1355	140878	28715	60051	68364	11669	15785	7151	21466	355390

Table 5. Continued

ICES Sub-div.	ICES rectangle	SPRAT – age groups									
		0	1	2	3	4	5	6	7	8+	total
28	45H0	159,73	7352,93	5463,50	4637,66	3762,41	3359,82	509,27	432,84	588,25	26266,41
28	45H1	8428,90	1976,22	1671,07	1694,17	1466,72	1444,21	327,47	270,37	322,62	17601,74
total		8588,63	9329,15	7134,57	6331,83	5229,13	4804,03	836,73	703,21	910,87	43868,15
29	46H1	54,78	23789,11	3633,50	1401,44	1024,15	433,31	646,72	155,12	155,77	31293,89
29	46H2	3951,93	6150,67	2595,42	2582,63	2081,39	1489,46	1174,31	746,61	303,87	21076,29
29	47H1	2589,92	17184,72	5071,58	4752,51	3256,59	2272,30	1901,58	1002,66	407,00	38438,86
29	47H2		19920,02	4394,32	2663,28	1696,78	1073,52	954,68	412,74	194,55	31309,88
total		6596,63	67044,52	15694,82	11399,85	8058,90	5268,58	4677,29	2317,13	1061,19	122118,92
32	47H3	0,00	1207,64	1658,71	2329,22	4455,09	2304,54	777,01	671,74	1231,61	14635,56
32	48H4	71,01	53642,31	1806,80	2120,34	3998,83	2026,83	742,26	608,76	1090,12	66107,27
32	48H5	0,65	11105,86	270,78	245,74	568,58	272,50	106,23	82,65	150,95	12803,93
32	48H6	6,14	9606,68	277,44	243,86	542,54	277,61	95,68	78,78	125,23	11253,97
32	48H7	6,05	23422,90	583,48	259,10	427,46	213,73	55,72	55,72	81,53	25105,69
total		83,86	98985,39	4597,21	5198,26	9992,50	5095,21	1776,90	1497,65	2679,44	129906,41
Grand total		15269	175359	27427	22930	23281	15168	7291	4518	4651	295893

Table 6. Mean weight (in grams) of herring and sprat per age groups, according to the ICES rectangles of the north-eastern Baltic in October 2015.

ICES Sub-div.	ICES rectangle	HERRING – age groups									
		0	1	2	3	4	5	6	7	8+	avg.
28	45H0		10,46	15,22	19,02	22,95	24,59	24,93	26,01	25,49	18,44
28	45H1		9,75	15,02	18,48	22,68	23,57	27,34	28,18	28,87	18,81
29	46H1	2,41	9,05	15,12	17,23	19,53	19,90	20,49	22,39	20,80	7,82
29	46H2	2,22	8,98	14,61	17,40	18,82	30,97	20,24	36,43	20,01	10,65
29	47H1	4,42	7,92	13,33	17,68	20,15	21,04	21,54	22,37	26,81	10,77
29	47H2	2,59	8,72	13,81	17,38	18,68	19,55	19,61	19,88	19,57	9,45
32	47H3	2,00	8,01	13,46	16,91	19,75	23,26	23,06		27,70	12,06
32	48H4		7,77	12,83	16,84	19,22	22,85	22,51	29,00	27,74	10,05
32	48H5	2,40	8,55	13,53	16,34	19,17	21,71	21,93	28,30	45,79	16,23
32	48H6	2,25	8,32	12,61	16,24	19,22	21,70	21,58	26,40	24,82	10,30
32	48H7	1,96	8,59	13,35	17,07	20,11	24,92	25,37		26,60	9,24

Table 6. Continue

ICES Sub-div.	ICES rectangle	SPRAT – age groups									
		0	1	2	3	4	5	6	7	8+	avg.
28	45H0	2,53	6,20	8,83	9,84	10,01	10,53	11,54	11,99	11,57	8,30
28	45H1	2,15	5,80	8,68	9,49	9,96	10,45	11,75	12,13	11,64	3,53
29	46H1	2,65	5,50	7,28	9,07	9,06	9,58	9,08	10,06	9,09	5,95
29	46H2	2,02	5,46	8,10	9,76	9,82	10,33	9,69	10,54	9,90	4,96
29	47H1	2,34	5,92	8,22	9,80	9,96	10,69	10,17	10,61	10,38	6,44
29	47H2		5,66	7,54	9,19	9,39	10,55	9,81	10,45	9,49	6,48
32	47H3		5,84	8,39	9,00	9,38	9,45	9,97	10,05	9,65	8,85
32	48H4	2,94	4,95	7,58	8,85	9,25	9,25	9,85	9,72	9,57	5,40
32	48H5	4,60	5,09	7,80	9,04	9,28	9,23	9,92	9,78	9,84	5,41
32	48H6	3,74	5,18	7,76	8,75	9,06	9,12	9,96	9,80	9,66	5,52

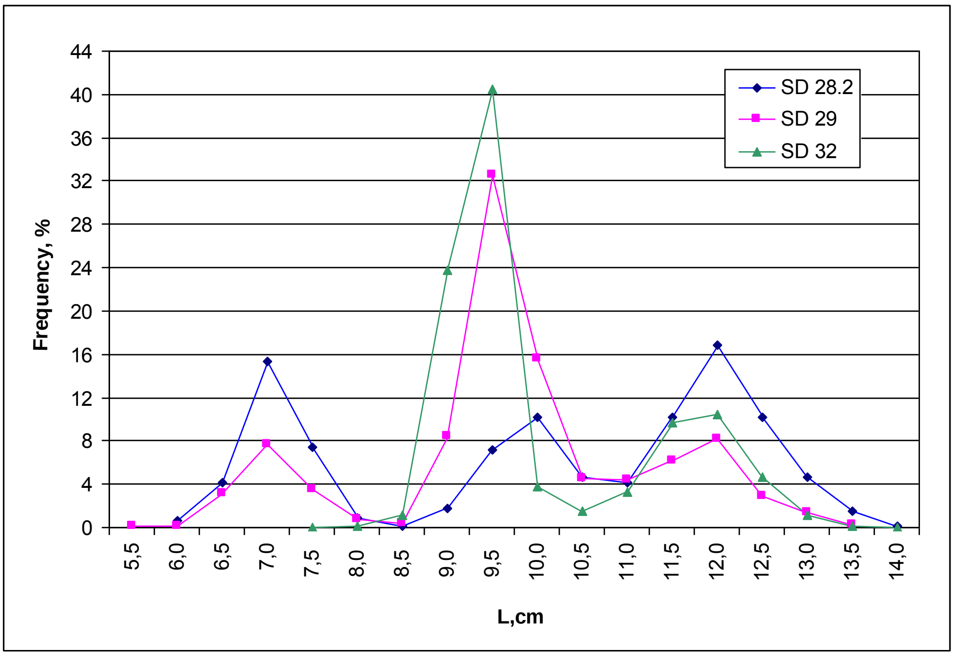

Fig. 3. Sprat length distributions from the control catches conducted by the rv. “Baltica” during joint EST-POL BIAS in the SDs 28.2, 29 and 32 (October 2015).

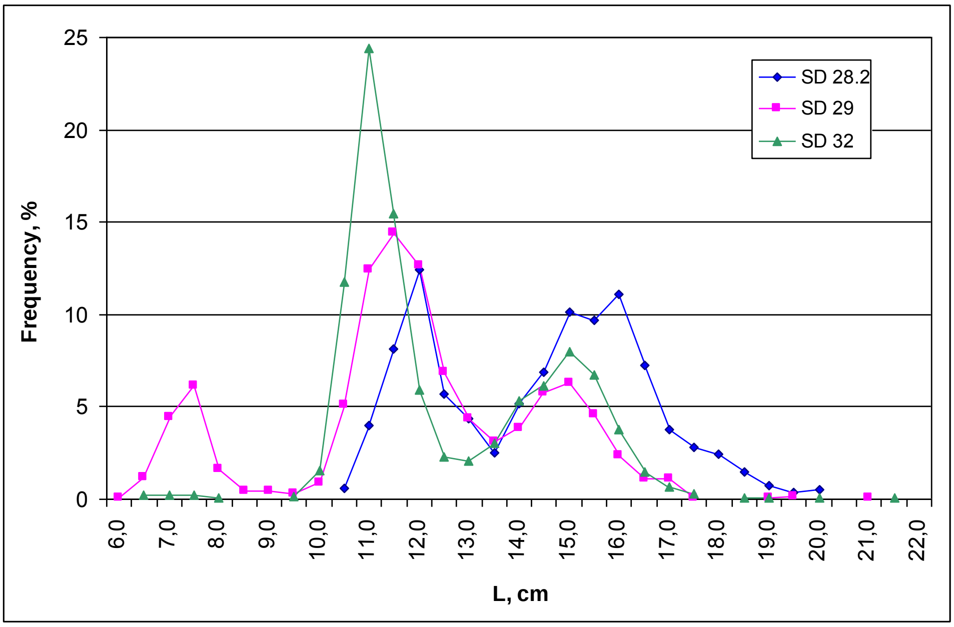

Fig. 4. Herring length distributions from the control catches conducted by the rv. “Baltica” during joint EST-POL BIAS in the SDs 28.2, 29 and 32 (October 2015).

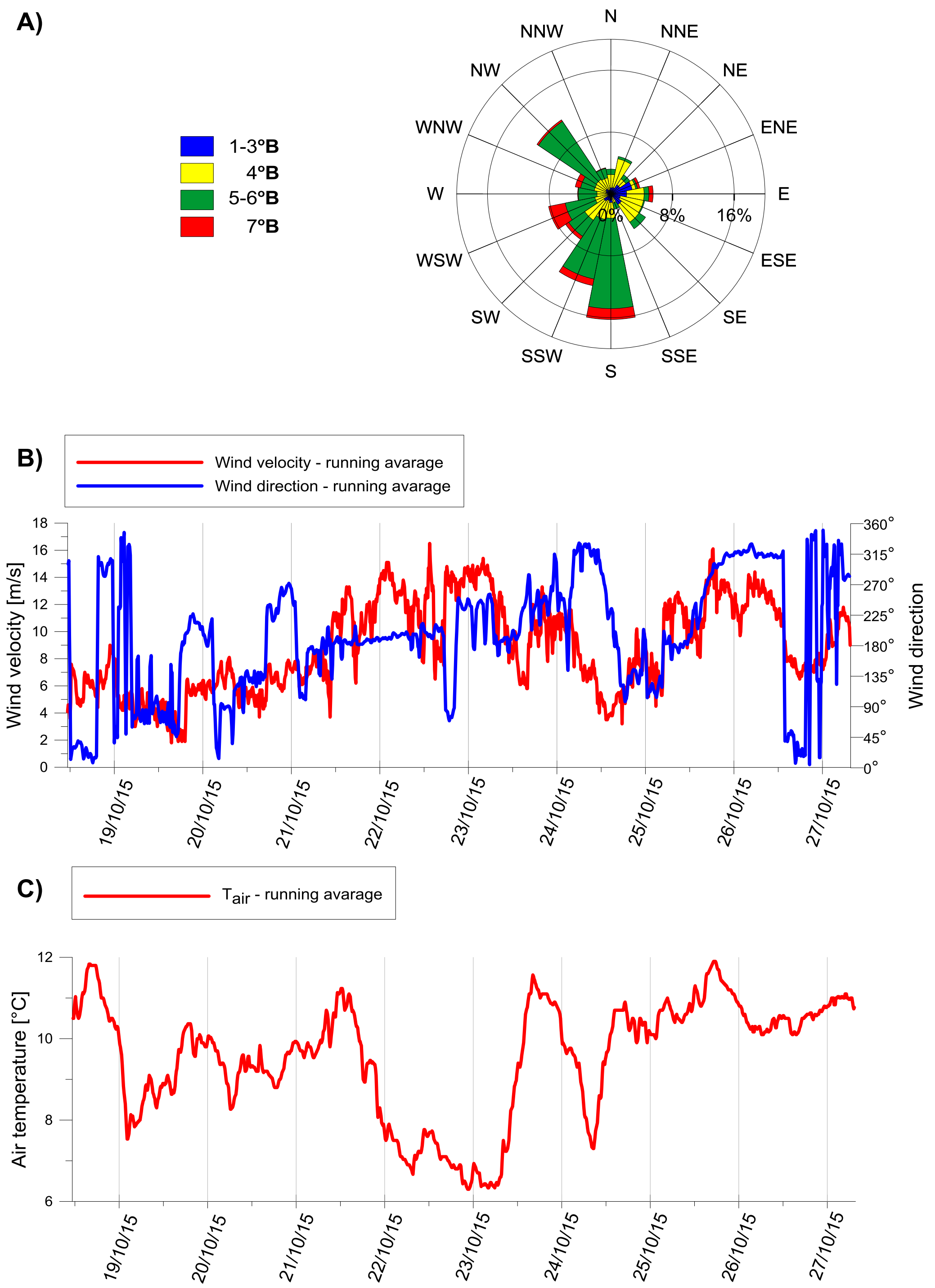

Fig. 5. Changes of the main meteorological parameters during joint EST-POL BIAS conducted in October 2015 (A and B – wind velocity and direction, C – air temperature).

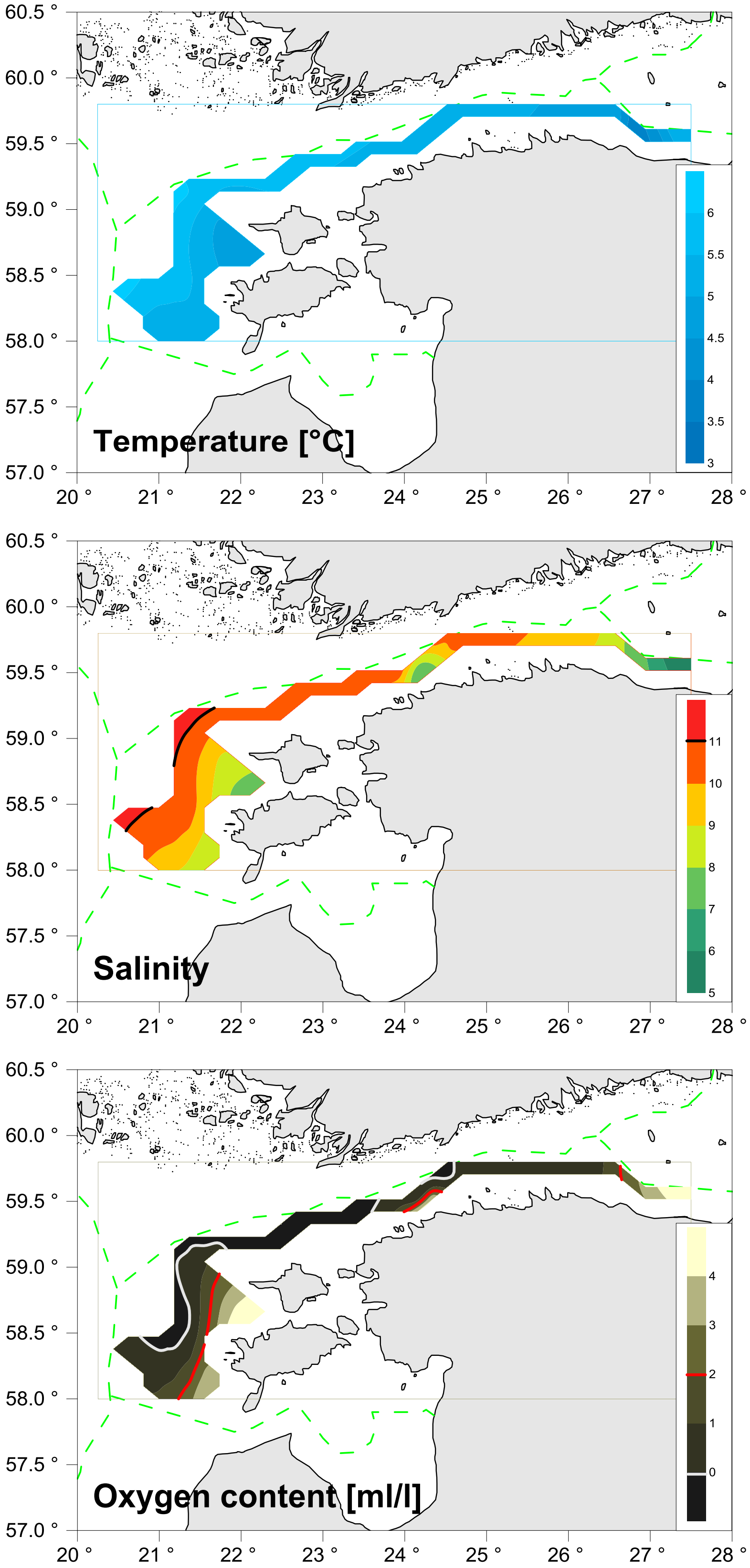

Fig. 6. Distribution of the seawater temperature, salinity and oxygen content in the near bottom waters during the joint EST-POL BIAS (October 2015).

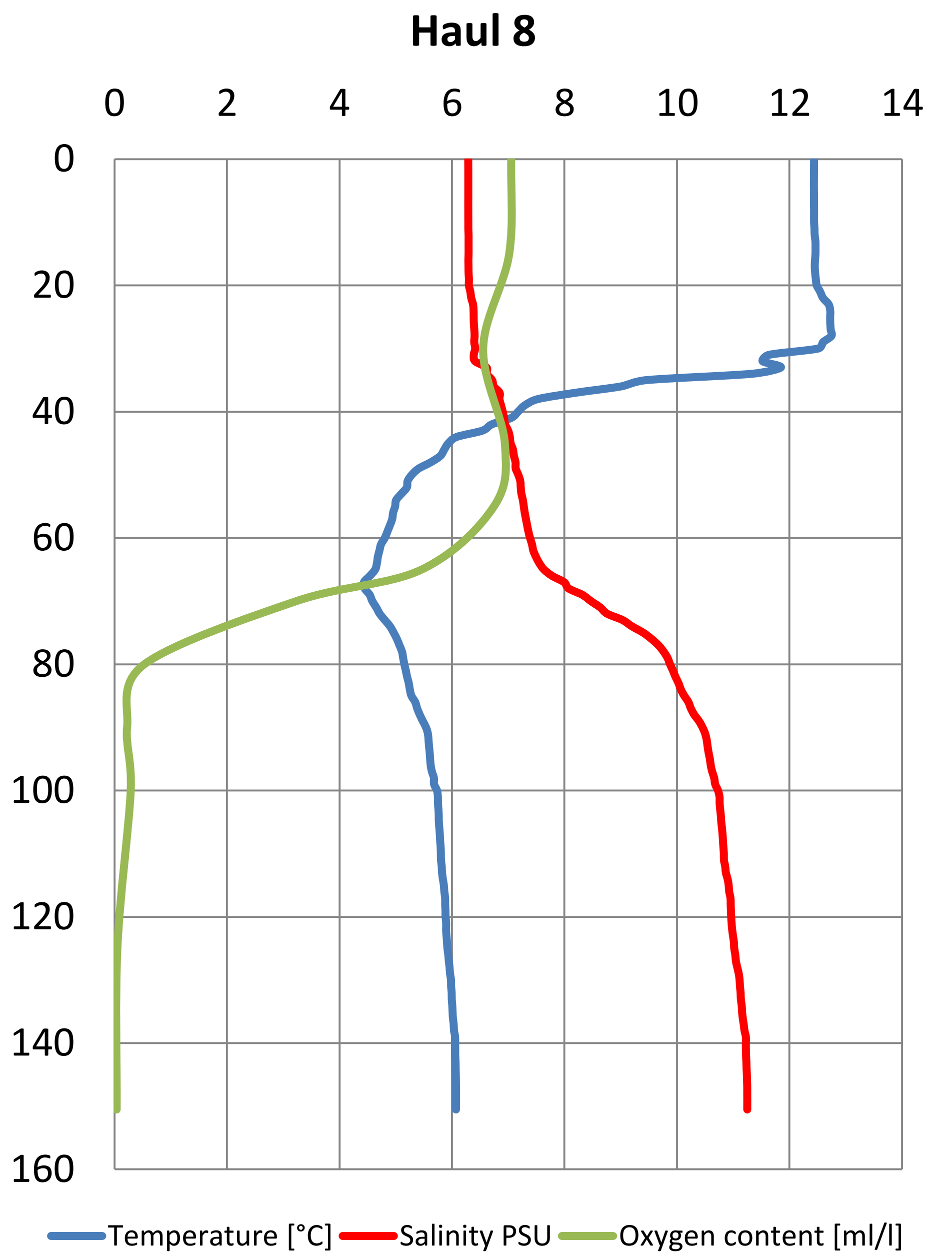

Fig.7. Temperature, salinity and oxygen depth [m] profiles at the deepest sampling station (haul No. 8) during the joint EST-POL BIAS, October 2015.

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"; 21.05 - 22.05.2015)

Klaipeda, May, 2015
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
D.Tarvydiene	Fisheries Service under the Ministry of Agriculture of The Republic of Lithuania; Division of Fishery Research and Science, Klaipeda - fish sampling

2.2 Narrative

The 1st cruise of RV "Darius" took place from 21-st to 22-d of May 2015. 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 was calibrated (20 of May 25) at the site of 20 m depth, located 3.5 nm northwest of Klaipeda harbour according to the BIAS manual (ICES 2011). S_v transducer gain after calibration was set to 21.94 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 7 m below the surface to the bottom. Contributions from air bubbles, bottom structures and noise scattering layers were removed from the echogram using Sonar4.

2.6 Biological data – fishing stations

All trawling was done with the pelagic gear „OTM“ in the midwater as well as near the bottom. The mesh size in the codend was 10 mm. The intention was to carry out at least two hauls per ICES statistical rectangle. The trawling depth was chosen by the echogram, in accordance to the characteristic of echo records from the fish. Normally, the trawl had vertical opening of about 12 m. The trawling time lasted 30 minutes. From each haul sub-samples were taken to determine length and weight composition of fish. Samples of herring and sprat were analyzed for further investigations on the board of vessel (i.e. sex, maturity, age).

2.7 Data analysis

The pelagic target species sprat and herring are usually distributed in mixed layers in combination with other species, so that it is impossible to allocate the integrator readings to a single species. Therefore the species composition was based on the trawl catch results. For each rectangle the species composition and length distribution were determined as the mean - weighted of all trawl results in this rectangle. From these distributions the mean acoustic cross section σ was calculated according to the following target strength-length (TS) relationships:

Clupeoids	TS = 20 log L (cm) - 71.2	(ICES 1983/H:12)
Gadoids	TS = 20 log L (cm) - 67.5	(Foote et al. 1986)

The total number of fish (total N) in one rectangle was estimated as the product of the mean area scattering cross section (Sa) and the rectangle area, divided by the corresponding mean cross section (σ). The total numbers were separated into herring and sprat according to the mean catch composition.

3 RESULTS

3.1 Biological data

In total 7 trawl hauls were carried out: 200 herrings and 2794 sprats were measured and 200 herrings and 787 sprats were aged. (Fig.1).

The results of the catch composition are presented in Table 1. In all catches composition was dominated by sprat.

The length distributions of herring and sprat of the May 2015 presented in Fig. 2 and 3. The biggest part of catching herring was 13.0-21.0 length classes (97.1%) in the rectangle 40H0. Very small proportion (0.6%) of fish was 10.0 cm length class. In 40G9 ICES rectangle were almost no herrings and most of its (more than 90%) have 8.5-10.5 cm length classes. In both rectangles sprat dominated in 8.0 – 9.5 cm length classes: 90.9% in 40H0 ICES rectangle and 81.1% 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 $16.0 \cdot 10^6$ fishes or about 323.5 tonnes.
The estimated sprat stock was $17655.6 \cdot 10^6$ fish or 86157 tonnes.
The abundance estimates of sprat were dominated by 1age fish in both rectangles (Fig. 3 and Table 5).

3.4. Hydrographic data

The survey hydrographic data by hauls presented in the Table. The seawater temperature was 9.8 ºC in the surface layer in the first haul. Temperature near bottom was 10.3 ºC in 30 m dept. Water temperature in others hauls was from 6 to 9 ºC. Differences between the first haul and others caused by wind direction. Wind direction was south-east in the first half day of cruise. Later wind direction changed to west. There was no thermocline in 2015 of May (Table.15). Salinity was about 7.5 ‰ in all hauls and depts. The oxygen-condition was excellent in all hauls and depts.

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Figure1 The survey grid ant trawl hauls position of R/V “Darius” 21-22 May 2015

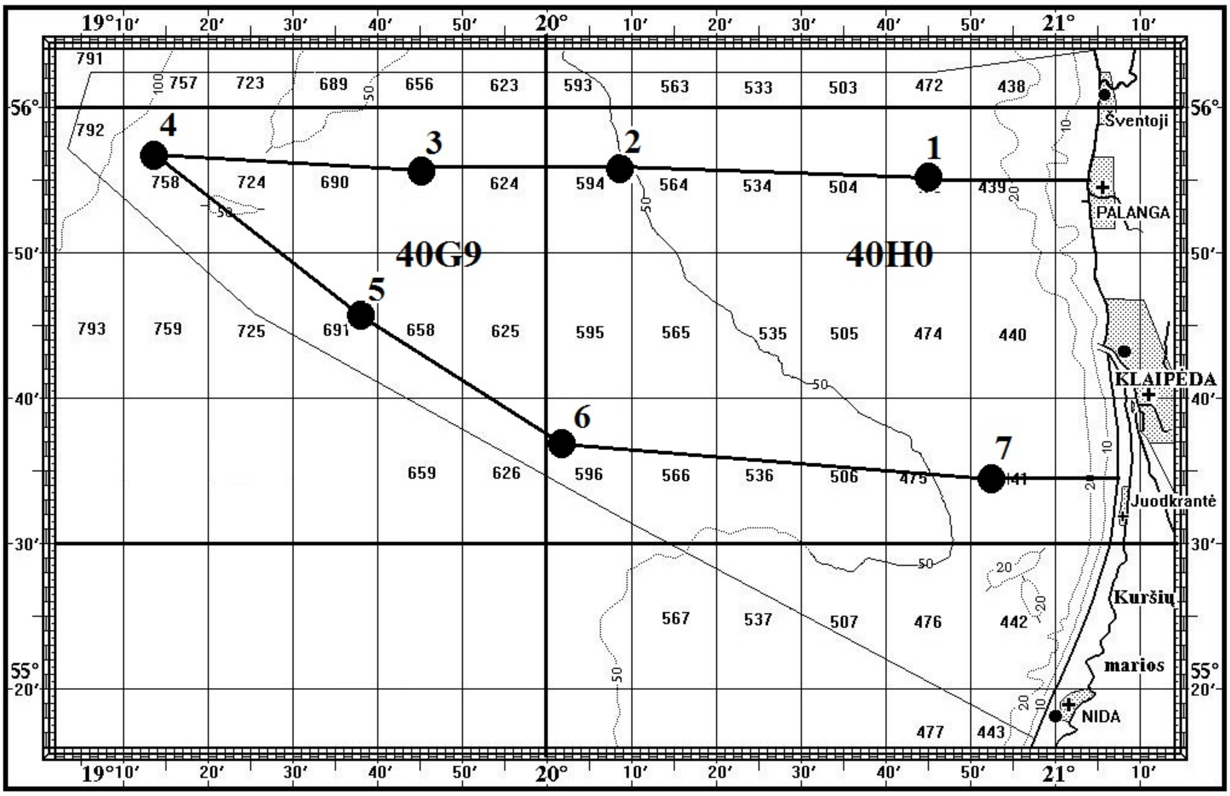

Table 1 Catch composition (kg/1hour) per haul (R/V "Darius", 21-22.05.2015)

ICES subdivision 26							
Haul No	1	2	3	4	5	6	7
Date	2015.05.21	2015.05.21	2015.05.21	2015.05.21	2015.05.22	2015.05.22	2015.05.22
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	40H0	40H0	40G9	40G9	40G9	40H0	40H0
Clupea hrengus	0.57	9.40		0.13	0.76	2.62	
Sprattus spratus	420.00	790.23	270.00	60.00	120.00	600.00	250.00
Gadus morhua				0.34			
Salmo trutta trutta	0.16						
Gasterosteus aculeatus					0.013		
Hyperoplus lanceolatus		0.37					
Total	420.73	800.00	270.00	60.47	120.78	602.62	250.00

Figure 2 Length composition of herring (%) (R/V "Darius", 21-22.05.2015)

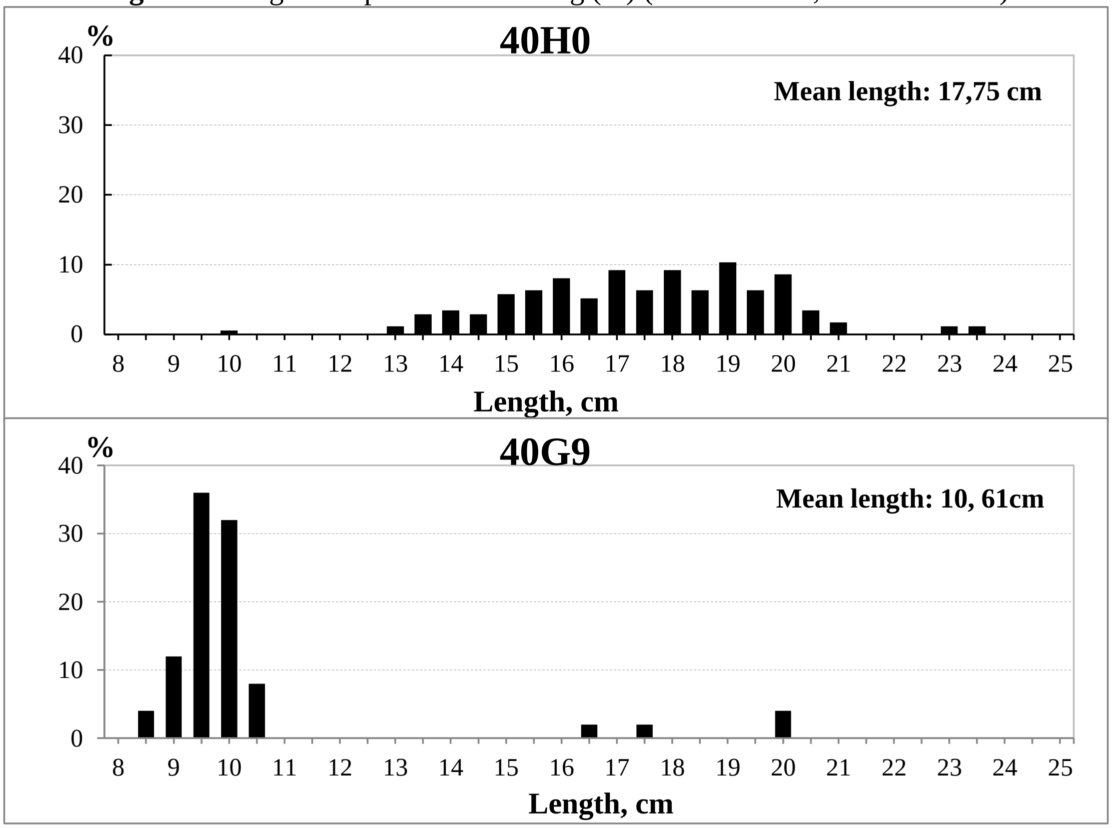

Figure 3 Length distribution of sprat (%) (R/V "Darius", 21-22.05.2015)

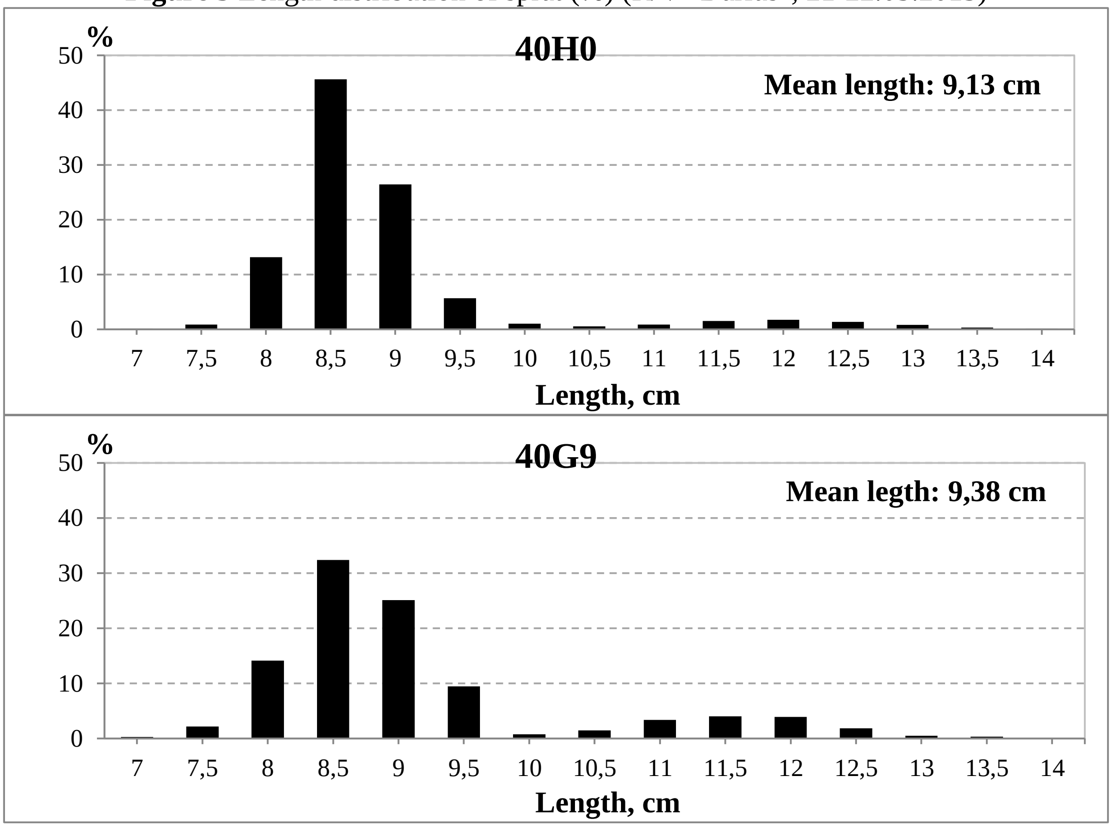

Table 2 R/V "DARIUS" survey statistics (abundance of herring and sprat),), 21-22.05.2015

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	9,29	9403,9	6,6	9397,3	44233	239	43994
	40G9	1013.0	8,16	8267,7	9,4	8258,3	42247	84	42163

Table 3 R/V "DARIUS" survey statistics (aggregated data of herring and sprat),), 21-22.05.2015

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	17,75	36,14	0,07	9,13	4,68	99,93	747,7	-51,9
	40G9	3,4,5	10,61	8,97	0,11	9,38	5,11	99,89	695,7	-51,7

Table 4 R/V "DARIUS" survey statistics (herring and sprat), 21-22.05.2015

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	747,7	0,80467	9403,9	0,07	99,93
	40G9	1013	695,7	0,85240	8267,7	0,11	99,89

Table 5 R/V "Darius" estimated age composition (%) of sprat, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0		92,4	1,6	1,6	1,0	1,2	0,7	0,8	0,6
	40G9	100,0		84,2	4,5	2,7	2,9	2,4	0,9	1,6	0,9

Table 6 R/V "Darius" estimated number (millions) of sprat, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	9397,3		8685,4	150,1	148,8	95,0	114,6	65,7	78,6	59,2
	40G9	8258,3		6951,0	372,0	221,0	239,7	195,3	73,0	135,0	71,4

Table 7 R/V "Darius" estimated biomass (in tons) of sprat, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	43994		36411	1190	1418	1044	1266	819	946	880
	40G9	42163		28938	3193	2093	2551	2123	832	1571	862

Table 8 R/V "Darius" estimated mean weights (g) of sprat, -21-22.05.2015

SD	Rect.	Age									
		Mean	0	1	2	3	4	5	6	7	8
26	40H0	4,68		4,2	7,9	9,5	11,0	11,0	12,5	12,0	14,9
	40G9	5,11		4,16	8,58	9,47	10,64	10,87	11,40	11,64	12,08

Table 9 R/V "Darius" estimated mean length (cm) of sprat, 21-22.05.2015

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

Table 10 R/V "Darius" estimated age composition (%) of herring, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	100,0		9,8	17,8	17,2	16,1	15,5	12,1	5,7	5,7
	40G9	100,0		92,0	4,0	0,0	0,0	0,0	0,0	4,0	0,0

Table 11 R/V "Darius" estimated number (millions) of herring, 21-22.05.2015

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

Table 12 R/V "Darius" estimated biomass (in tons) of herring, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	239,5		12,3	33,3	35,4	41,1	43,3	36,7	16,8	20,6
	40G9	84,0		53,7	12,4	0,0	0,0	0,0	0,0	18,0	0,0

Table 13 R/V "Darius" estimated mean weights (g) of herring, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	36,1		19,1	28,2	31,0	38,6	42,1	45,9	44,1	54,0
	40G9	9,0		6,2	33,0					47,9	

Table 14 R/V "Darius" estimated mean length (cm) of herring, 21-22.05.2015

SD	Rect.	Age									
		Total	0	1	2	3	4	5	6	7	8
26	40H0	17,7		14,1	16,2	16,7	18,1	18,6	19,1	19,0	20,4
	40G9	10,6		9,7	17,0					20,0	

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 21-22.05.2015.

Haul number	Date of catch	Mean trawling depth, m	Hydrological parameters		
			Temperature, °C	Salinity, ‰	Oxygen, ml/l
1	2015.05.21	15	9,95	7,51	10,76
2	2015.05.21	19	8,67	7,5	11,09
3	2015.05.21	40	7,39	7,5	8
4	2015.05.21	45	6,51	7,5	8,18
5	2015.05.22	45	6,32	7,52	8,22
6	2015.05.22	52	6,19	7,55	11
7	2015.05.22	22	8,25	7,55	7,84
Average		34,0			

Baltic International Acoustic Survey Report for R/V Dana

(calibration 2015-09-14 - 2015-09-15) survey 2015-09-30 - 2015-10-11

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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 2015.09.30 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 1379 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. Due to the distance between the calibration site and the survey area the gain was recalculated using the equation: G = G0 + 10*log10(c0*c0/c*c) (Bodholt 2002)

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
Öman, Cristin	IMR, Lysekil, Sweden	Fish sampling
Johansson, Marianne	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 49 trawl hauls were carried out, 16 in SD 25, 2 in SD 26, 15 in SD 27, 9 in SD 28 and 7 hauls in SD 29 . 2609 herrings and 1493 sprats were aged. Catch compositions by trawl haul is presented in Table 8 to 15. Length distributions for herring and sprat by ICES subdivision are shown in figures 2 to 13.

3.2 Acoustic data

The survey statistics concerning the survey area, the mean backscatter [s_A], the mean scattering cross section [σ], the estimated total number of fish, the percentages of herring, sprat and cod per Subdivision/rectangle are shown in Table 3.

3.3 Abundance estimates

The total abundances of herring and sprat by age group per rectangle are presented in Table 4 and 6. The corresponding mean weights by age group per rectangle are shown in Tables 5 and 7.

4 Discussion

The data collected during the survey should be considered as representative for the abundance of the pelagic species during the BIAS in 2012 for SD25 to 29. When using the results for SD30 in this years survey it should be noted that deviation has been made from the manual in the coverage of each square.

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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	534.4	2.788	550.76	35.55	63.40	0.764
25	39G5	979.0	422.4	1.897	2180.19	14.78	85.16	0.033
25	40G4	677.2	514.3	4.094	850.69	44.03	50.84	4.506
25	40G5	1012.9	931.3	4.036	2337.28	82.92	15.52	1.326
25	40G6	1013.0	565.8	2.748	2085.75	44.16	53.52	0.815
25	40G7	1013.0	278.1	1.417	1988.51	0.85	99.15	0.000
25	41G6	764.4	1328.2	2.138	4747.77	44.98	53.16	0.005
25	41G7	1000.0	1153.0	2.139	5391.20	51.21	34.88	0.010
26	41G8	1000.0	1570.5	1.165	13480.47	18.92	37.13	0.000
27	42G6	266.0	860.2	1.642	1393.48	34.40	40.32	0.000
27	42G7	986.9	1540.6	1.377	11042.91	36.82	10.31	0.000
27	43G7	913.8	2152.6	1.433	13722.74	40.59	9.42	0.000
27	44G7	960.5	498.2	0.904	5292.54	14.57	29.03	0.000
27	44G8	456.6	1145.3	1.480	3532.44	54.38	14.66	0.000
27	45G7	908.7	617.0	0.863	6496.65	15.31	27.06	0.000
27	45G8	947.2	828.7	0.603	13007.36	3.85	23.86	0.000
27	46G8	884.8	936.7	0.773	10727.39	17.02	51.02	0.000
28	42G8	945.4	1419.1	1.472	9113.50	36.16	25.86	0.000
28	43G8	296.2	2774.1	0.845	9720.46	9.36	33.27	0.000
28	43G9	973.7	1143.5	0.988	11267.13	14.60	43.34	0.000
28	44G9	876.6	1382.8	0.686	17665.62	8.45	23.23	0.000
28	45G9	924.5	850.5	0.657	11968.09	8.95	26.65	0.000
29	46G9	933.8	1159.1	0.810	13355.85	3.12	65.53	0.000
29	46H0	933.8	675.7	0.896	7043.15	4.66	71.22	0.000
29	47G9	876.2	1818.0	1.235	12898.74	46.27	30.22	0.000
29	47H0	920.3	2158.6	1.138	17459.83	34.99	55.60	0.000

Table 3: Survstat11

SD	RECT	NSprTOT	NSpr0	NSpr1	NSpr2	NSpr3	NSpr4	NSpr5	NSpr6	NSpr7	NSpr8
25	39G4	349.19	0.00	94.08	44.76	112.15	70.20	20.08	2.13	0.00	5.79
25	39G5	1856.73	0.00	244.31	136.65	624.46	448.92	64.97	271.82	34.13	31.47
25	40G4	432.53	0.00	58.66	82.59	103.26	99.43	10.30	60.59	0.00	17.69
25	40G5	362.83	0.00	101.97	29.52	93.67	49.29	25.35	16.59	27.82	18.63
25	40G6	1116.24	0.00	218.07	230.31	379.24	156.23	68.44	47.26	16.69	0.00
25	40G7	1971.53	0.00	1066.59	219.39	426.57	203.42	0.00	3.99	47.47	4.11
25	41G6	2523.78	0.00	530.82	232.45	360.74	715.55	429.33	190.24	44.03	20.64
25	41G7	1880.23	25.76	601.67	93.07	454.76	390.95	6.20	216.62	76.45	14.73
26	41G8	5005.53	0.00	3487.54	534.82	215.06	382.38	81.73	172.21	95.80	36.00
27	42G6	561.84	28.61	226.30	85.32	110.29	24.97	13.01	62.95	10.40	0.00
27	42G7	1138.30	7.25	349.30	56.68	306.30	171.85	32.26	88.13	82.45	44.08
28	42G8	2357.01	161.55	1155.90	308.49	421.78	98.84	0.00	188.82	10.82	10.82
27	43G7	1292.48	11.00	439.57	107.33	286.86	48.24	26.68	132.81	239.98	0.00
28	43G8	3233.78	176.64	2146.80	323.38	402.18	130.44	27.17	27.17	0.00	0.00
28	43G9	4882.72	219.17	2775.20	374.48	825.88	435.69	33.58	43.71	114.98	60.04
27	44G7	1536.35	24.25	553.03	332.29	384.04	146.20	0.00	26.55	69.99	0.00
27	44G8	517.71	11.59	187.77	103.16	93.88	76.50	0.00	6.95	37.86	0.00
28	44G9	4104.23	537.75	1570.65	539.36	800.85	108.14	24.80	126.97	204.79	190.92
27	45G7	1757.94	31.12	1225.20	71.74	108.17	143.42	60.32	52.46	20.34	45.17
27	45G8	3103.15	118.19	2077.49	282.65	326.83	111.92	11.13	39.42	109.78	25.73
28	45G9	3189.37	1073.99	1453.10	172.57	310.65	52.49	6.02	95.60	0.00	24.95
27	46G8	5473.26	3454.07	1849.27	31.61	79.24	54.21	0.00	0.00	4.86	0.00
29	46G9	8752.25	435.78	7188.48	114.24	453.73	421.35	0.00	120.07	18.61	0.00
29	46H0	5016.44	186.33	3852.19	246.81	328.33	169.97	76.82	123.41	32.59	0.00
29	47G9	3897.88	1228.10	2531.00	9.35	93.62	0.00	13.23	0.00	0.00	22.58
29	47H0	9707.56	2619.50	5290.36	503.35	832.08	154.09	51.36	0.00	51.36	205.45

Table 4: her3

SD	RECT	WSpr0	WSpr1	WSpr2	WSpr3	WSpr4	WSpr5	WSpr6	WSpr7	WSpr8
25	39G4		11.42	14.33	15.09	16.60	16.00	19.00		16.00
25	39G5		9.86	11.00	14.22	14.25	17.00	15.20	21.00	16.00
25	40G4		11.56	12.29	15.75	18.62	19.00	16.20		15.00
25	40G5		12.17	15.00	14.00	16.86	17.50	18.00	16.00	17.00
25	40G6		10.40	12.00	13.67	16.75	16.00	18.14	17.00	
25	40G7		9.16	13.00	13.60	13.60		17.00	15.67	13.00
25	41G6		7.44	11.60	11.00	13.20	16.12	14.60	17.50	18.00
25	41G7	2.00	7.65	10.00	11.12	13.11	16.00	15.30	13.00	15.00
26	41G8		6.96	11.00	11.50	12.62	11.00	13.00	15.00	13.50
27	42G6	2.14	7.86	10.33	11.44	12.50	14.50	14.38	11.00	
27	42G7	2.00	7.33	8.75	12.11	11.60	15.50	14.00	15.50	15.50
28	42G8	2.60	6.42	9.50	10.78	12.25		12.29	12.00	13.00
27	43G7	2.00	7.13	11.00	10.71	12.50	14.67	13.40	12.88	
28	43G8	2.30	6.27	9.43	11.09	12.00	10.00	13.00		
28	43G9	2.53	6.65	9.50	10.70	11.50	13.00	15.00	12.50	12.00
27	44G7	2.00	6.32	10.00	11.12	12.20		12.75	12.83	
27	44G8	2.00	6.74	9.67	11.57	11.17		14.00	11.20	
28	44G9	2.27	6.22	9.33	10.89	12.00	13.50	13.17	11.67	10.00
27	45G7	2.50	6.03	9.33	11.50	11.88	11.67	12.83	14.00	12.00
27	45G8	2.27	5.95	9.86	9.91	11.25	13.00	13.00	11.33	10.00
28	45G9	2.20	6.48	10.00	11.08	11.00	14.00	11.00		8.00
27	46G8	2.20	5.59	9.33	9.44	10.80			12.00	
29	46G9	2.08	6.46	10.00	10.20	10.33		12.33	13.00	
29	46H0	2.07	5.83	8.75	10.43	11.14	10.50	11.00	11.50	
29	47G9	2.14	6.00	10.00	10.11		11.00			10.00
29	47H0	2.05	5.94	8.80	9.70	11.50	13.00		11.00	9.50

Table 5: sprwe

SD	RECT	NHerTOT	NHer0	NHer1	NHer2	NHer3	NHer4	NHer5	NHer6	NHer7	NHer8
25	39G4	195.82	6.15	4.75	38.60	65.89	50.17	11.39	13.91	3.47	1.49
25	39G5	322.16	53.97	12.28	24.15	43.39	85.75	27.41	46.04	13.79	15.38
25	40G4	374.52	8.26	5.93	30.35	116.45	53.83	34.40	35.96	58.79	30.55
25	40G5	1938.18	20.86	54.04	405.83	575.94	299.76	160.44	264.65	151.48	5.19
25	40G6	921.15	5.53	82.15	16.96	216.44	251.83	55.12	180.48	75.48	37.15
25	40G7	16.98	0.23	1.70	4.18	4.48	3.47	1.01	0.82	0.85	0.23
25	41G6	2135.58	69.95	293.01	308.11	582.59	665.53	52.37	74.19	71.38	18.44
25	41G7	2761.09	0.00	68.33	344.45	942.09	715.42	330.02	143.67	166.06	51.04
26	41G8	2550.34	1.26	142.31	142.21	522.69	626.59	253.92	311.66	495.73	53.97
27	42G6	479.42	0.00	29.06	26.47	92.98	174.66	77.80	31.96	43.26	3.23
27	42G7	4066.12	0.00	294.43	828.24	1195.22	797.66	318.55	356.78	216.62	58.61
28	42G8	3295.69	10.85	224.69	164.68	1269.31	1023.56	476.94	37.13	84.16	4.37
27	43G7	5570.53	0.00	636.95	418.99	887.73	2158.43	541.59	680.30	171.72	74.82
28	43G8	910.28	0.00	67.04	16.94	184.17	434.67	89.62	82.56	35.28	0.00
28	43G9	1644.98	0.00	739.42	44.23	340.80	313.18	102.57	43.90	45.09	15.79
27	44G7	771.13	2.02	199.59	196.01	158.70	114.71	58.40	23.77	14.11	3.81
27	44G8	1920.96	5.11	353.54	705.03	197.20	392.37	217.64	39.85	10.22	0.00
28	44G9	1492.88	0.00	609.55	177.70	155.99	320.17	127.09	73.84	24.05	4.48
27	45G7	994.39	0.34	225.77	221.11	224.49	173.91	81.56	46.00	12.16	9.05
27	45G8	500.69	9.82	79.01	80.06	92.26	117.30	61.94	31.30	25.70	3.29
28	45G9	1071.64	3.45	294.87	151.18	174.07	313.76	95.75	30.69	1.46	6.41
27	46G8	1825.81	414.99	291.73	234.40	174.33	324.68	224.02	101.45	47.32	12.89
29	46G9	416.81	264.76	102.08	21.18	9.68	14.87	1.04	1.08	1.58	0.54
29	46H0	328.05	82.01	188.81	6.94	7.23	30.38	7.75	4.36	0.00	0.56
29	47G9	5968.38	269.88	2685.56	491.01	1242.69	606.25	494.38	75.82	49.28	53.51
29	47H0	6108.78	140.30	4292.40	654.08	461.94	449.68	20.44	69.50	20.44	0.00

Table 6: her3

SD	RECT	WHer0	WHer1	WHer2	WHer3	WHer4	WHer5	WHer6	WHer7	WHer8
25	39G4	11.43	25.00	43.80	57.40	77.03	92.77	104.00	69.00	29.00
25	39G5	10.27	19.67	27.78	31.88	37.50	47.50	48.62	53.20	47.40
25	40G4	10.50	30.67	35.00	51.25	59.85	75.22	53.50	53.69	58.14
25	40G5	13.00	29.00	49.22	48.89	68.71	60.22	52.08	53.20	93.00
25	40G6	12.00	26.73	18.89	45.08	49.30	51.00	48.43	45.20	71.25
25	40G7	12.00	21.17	26.86	28.07	33.54	36.75	39.50	34.00	91.00
25	41G6	11.50	15.58	35.00	30.40	37.60	42.75	51.83	48.71	53.00
25	41G7		12.87	20.29	25.87	36.71	38.67	47.00	49.33	52.40
26	41G8	3.00	12.46	20.00	22.12	26.46	31.00	42.45	40.32	48.50
27	42G6		12.67	17.33	24.87	31.57	33.80	43.62	43.33	52.00
27	42G7		12.37	20.06	26.16	30.67	35.17	43.92	48.78	41.50
28	42G8	11.00	11.23	16.33	28.04	30.59	40.29	34.00	46.75	58.00
27	43G7		12.36	17.30	21.64	32.50	30.67	35.25	30.00	47.67
28	43G8		11.79	20.50	21.93	29.67	30.43	40.67	43.25	
28	43G9		11.79	17.67	21.94	26.47	36.36	34.20	37.00	32.50
27	44G7	4.50	10.40	17.31	22.57	26.54	26.88	37.17	33.67	36.00
27	44G8	2.00	10.52	16.55	24.29	25.50	22.43	28.80	34.50	
28	44G9		11.17	18.44	24.67	25.94	28.89	32.71	30.00	42.00
27	45G7	3.67	10.52	19.00	25.71	28.69	30.70	30.29	52.75	32.00
27	45G8	2.50	10.86	16.17	19.80	24.88	28.75	30.33	28.50	45.50
28	45G9	3.00	11.30	16.50	25.47	26.18	34.10	37.00	46.00	37.75
27	46G8	2.19	10.50	18.69	20.44	28.35	27.83	26.33	45.60	46.00
29	46G9	2.52	10.67	18.62	19.67	23.67	18.00	41.00	30.00	32.00
29	46H0	2.43	11.03	14.67	19.25	20.37	24.12	25.60		30.00
29	47G9	2.41	9.91	16.73	22.68	31.44	30.85	38.25	30.00	42.67
29	47H0	2.27	10.03	15.69	22.89	21.50	19.00	20.50	23.00	

Table 7: herwe

	Species	2	4	6	8	10	12	14	16
1	Ammodytes	0.00							
2	Ammodytidae								
3	Clupea harengus	67.27	179.61	44.98	178.69	170.69	314.93	83.15	290.04
4	Cyclopterus lumpus	0.44		0.67	0.83	0.48			
5	Gadus morhua	12.18	112.84		20.66	6.06	0.56		
6	Gasterosteus aculeatus				0.00	0.00	0.07	0.51	13.36
7	Hyperoplus lanceolatus								
8	Limanda limanda		0.10						
9	Merlangius merlangus	0.31	9.56		0.37	0.14			
10	Myoxocephalus scorpius								0.06
11	Nerophis ophidion								
12	Platichthys flesus		0.58			0.09			
13	Pleuronectes platessa	0.26	0.52						
14	Pomatoschistus	0.00	0.00						
15	Pungitius pungitius								0.06
16	Salmo salar								
17	Sprattus sprattus	10.09	64.80	109.83	3.90	21.81	118.28	51.45	113.93
18	Syngnathus typhle								

Table 8: Linear regression model for cats data.

	Species	18	20	22	24	26	28	30	32
1	Ammodytes								
2	Ammodytidae								
3	Clupea harengus	0.07	688.41	101.19	397.90	10.46	0.19	477.73	471.87
4	Cyclopterus lumpus	0.40	0.31		0.01	0.37		0.32	0.04
5	Gadus morhua								
6	Gasterosteus aculeatus	40.90	8.77	14.65	14.50	17.45	30.60	50.93	24.01
7	Hyperoplus lanceolatus		0.29						
8	Limanda limanda								
9	Merlangius merlangus								
10	Myoxocephalus scorpius								
11	Nerophis ophidion					0.01	0.00	0.00	
12	Platichthys flesus								
13	Pleuronectes platessa								
14	Pomatoschistus								
15	Pungitius pungitius	0.00	0.03		0.02	0.07	0.03	0.03	0.02
16	Salmo salar								
17	Sprattus sprattus	21.70	46.11	30.77	42.00	252.21	5.80	70.92	62.67
18	Syngnathus typhle								

Table 9: Linear regression model for cats data.

	Species	34	36	38	40	42	44	46	48
1	Ammodytes								
2	Ammodytidae								
3	Clupea harengus	39.60	122.56	1.14	0.23	104.72	84.16	4.90	8.96
4	Cyclopterus lumpus	0.40		0.17	0.09	0.07			
5	Gadus morhua								
6	Gasterosteus aculeatus	29.34	7.76	45.28	75.08	20.23	9.42	48.63	15.06
7	Hyperoplus lanceolatus	0.08				0.17			
8	Limanda limanda								
9	Merlangius merlangus								
10	Myoxocephalus scorpius								
11	Nerophis ophidion			0.00				0.06	0.00
12	Platichthys flesus						0.17		
13	Pleuronectes platessa								
14	Pomatoschistus								
15	Pungitius pungitius	0.04	0.02	0.04	0.06	0.11	0.04	0.06	0.02
16	Salmo salar								0.33
17	Sprattus sprattus	38.96	66.15	23.16	136.47	49.99	99.75	768.39	88.60
18	Syngnathus typhle					0.00			

Table 10: Linear regression model for cats data.

	Species	50	52	54	56	58	60	62	64
1	Ammodytes								
2	Ammodytidae								
3	Clupea harengus	212.96	88.97	262.15	6.10	19.52	44.42	124.37	115.85
4	Cyclopterus lumpus	0.05		0.18	0.38		0.10	0.10	0.17
5	Gadus morhua								
6	Gasterosteus aculeatus	25.40	1.47	7.62	7.33	10.39	31.00	52.91	45.65
7	Hyperoplus lanceolatus								0.01
8	Limanda limanda								
9	Merlangius merlangus								
10	Myoxocephalus scorpius								
11	Nerophis ophidion			0.03		0.00			
12	Platichthys flesus								0.30
13	Pleuronectes platessa								
14	Pomatoschistus								
15	Pungitius pungitius		0.01	0.03	0.01	0.12	0.15	0.12	0.11
16	Salmo salar								
17	Sprattus sprattus	124.83	5.66	194.98	118.60	132.85	46.11	99.28	50.11
18	Syngnathus typhle								

Table 11: Linear regression model for cats data.

	Species	66	68	70	72	74	76	78	80
1	Ammodytes								
2	Ammodytidae								
3	Clupea harengus	41.13	99.79	234.00	319.30	873.00	130.19	49.83	255.32
4	Cyclopterus lumpus	0.19	0.22	0.17	0.75	0.40	0.36	2.12	1.61
5	Gadus morhua								
6	Gasterosteus aculeatus	64.10	30.18	47.27	111.67	28.59	32.42	22.26	25.43
7	Hyperoplus lanceolatus			0.01					
8	Limanda limanda								
9	Merlangius merlangus								
10	Myoxocephalus scorpius								
11	Nerophis ophidion								
12	Platichthys flesus								
13	Pleuronectes platessa								
14	Pomatoschistus								
15	Pungitius pungitius	0.01	0.04	0.04	0.26	0.17	0.10		
16	Salmo salar							0.26	3.72
17	Sprattus sprattus	174.03	233.24	180.27	315.81	50.27	142.00	116.04	57.16
18	Syngnathus typhle								

Table 12: Linear regression model for cats data.

	Species	82	84	86	88	90	92	94	96
1	Ammodytes								
2	Ammodytidae					0.01			
3	Clupea harengus	435.32	243.36	0.21	9.06	76.13	235.06	129.56	33.67
4	Cyclopterus lumpus						0.38	0.77	0.25
5	Gadus morhua	0.23				27.50	22.00	0.90	
6	Gasterosteus aculeatus	11.13	0.86			0.38	0.01		
7	Hyperoplus lanceolatus								
8	Limanda limanda								
9	Merlangius merlangus								
10	Myoxocephalus scorpius								
11	Nerophis ophidion								
12	Platichthys flesus					0.20			
13	Pleuronectes platessa								
14	Pomatoschistus		0.01						
15	Pungitius pungitius	0.01							
16	Salmo salar								
17	Sprattus sprattus	26.59	145.62	323.33	188.32	180.54	13.54	45.79	139.96
18	Syngnathus typhle								

Table 13: Linear regression model for cats data.

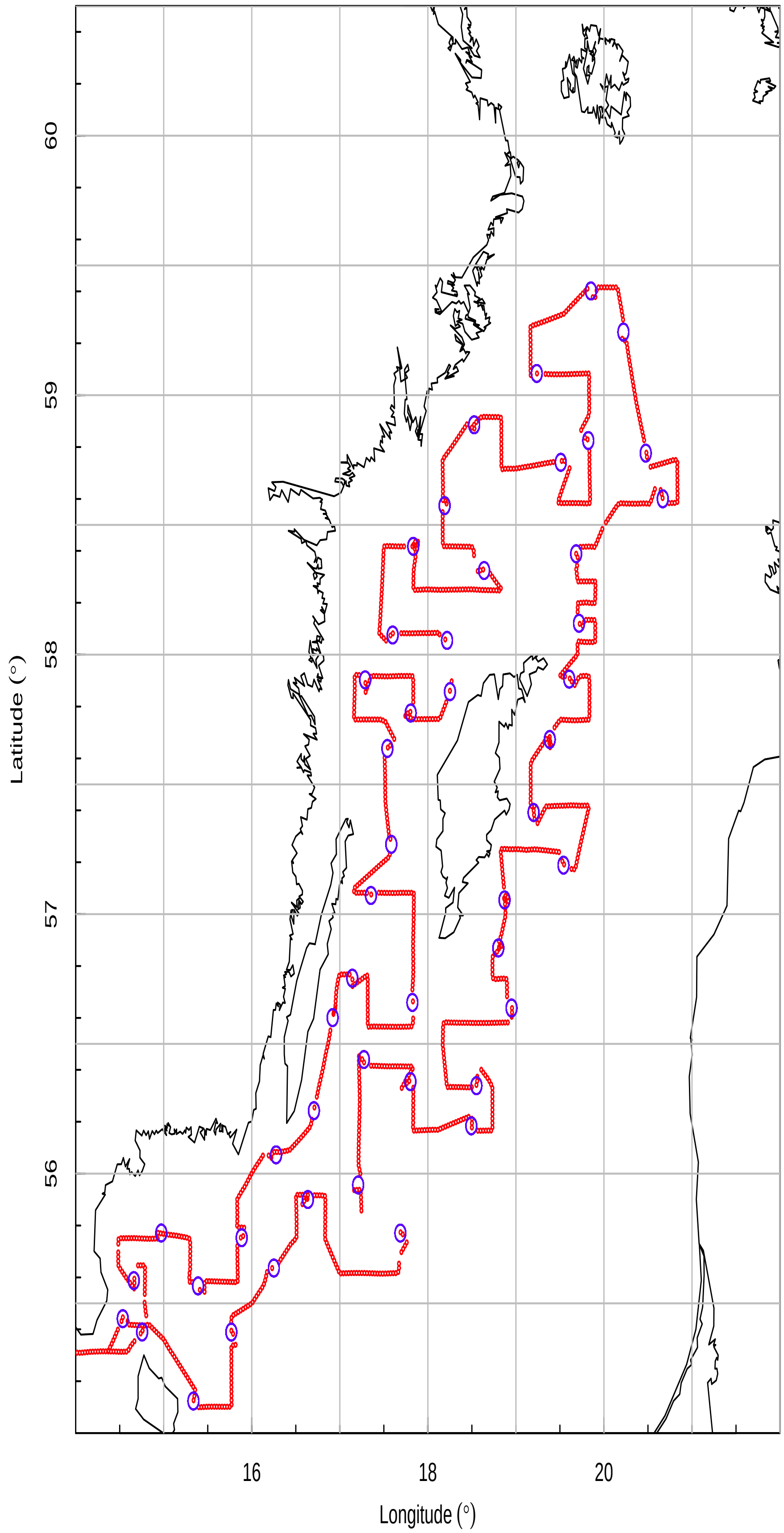

Figure 1: cruise track(red), positions of trawl hauls (blue) and survey grid (ICES squares)(grey)

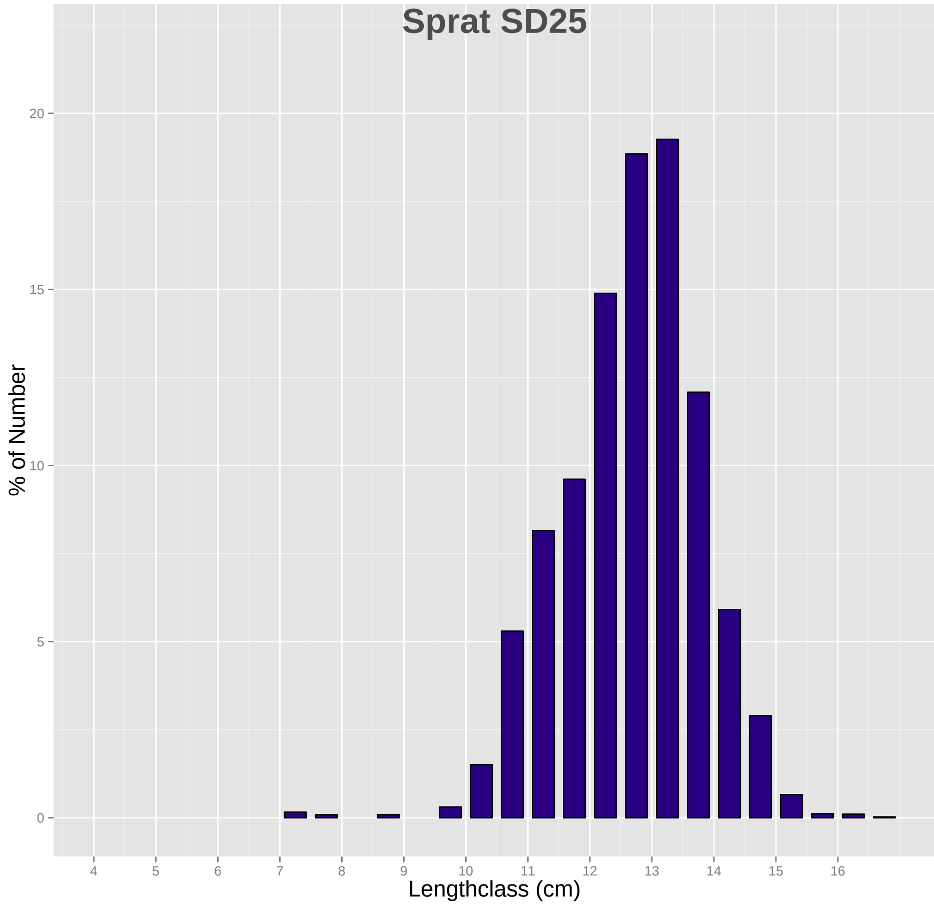

Figure 2: Length distribution of sprat

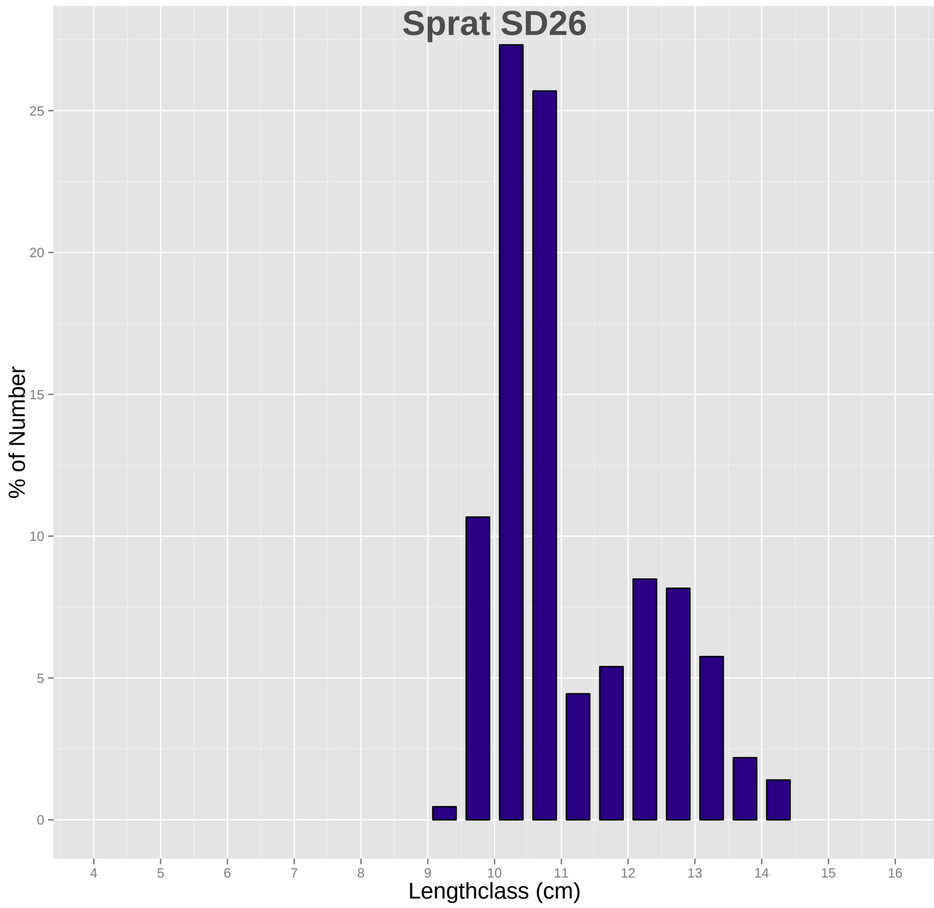

Figure 3: Length distribution of sprat

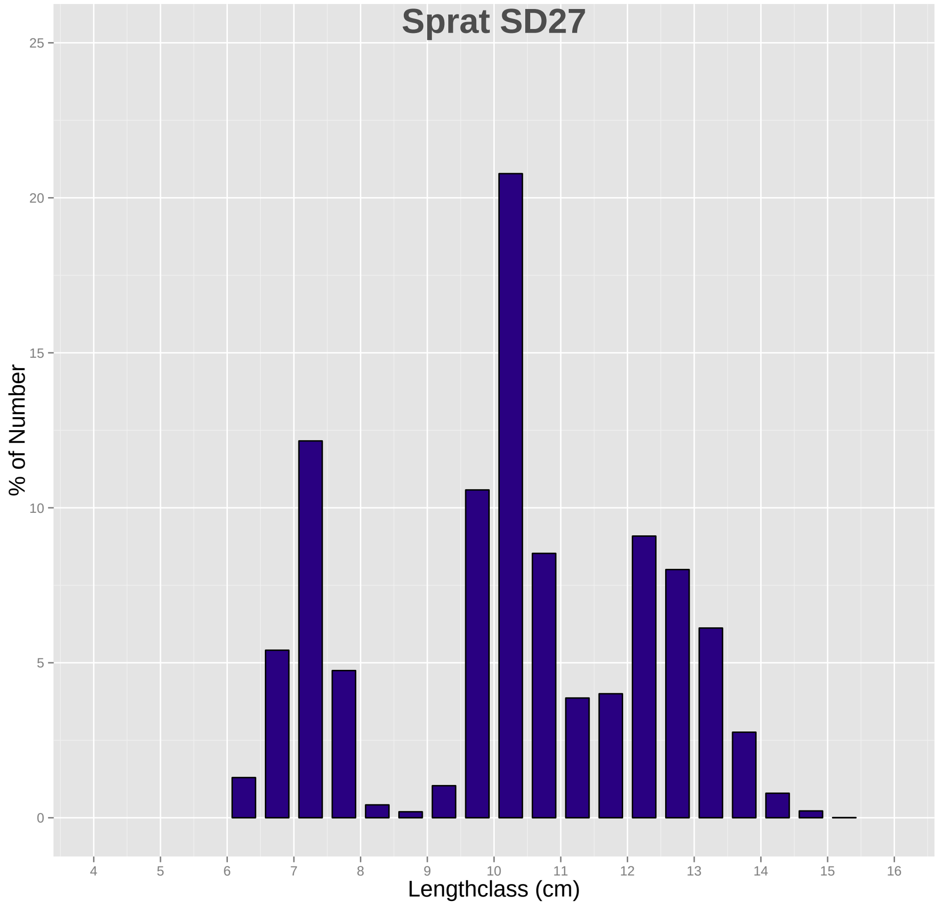

Figure 4: Length distribution of sprat

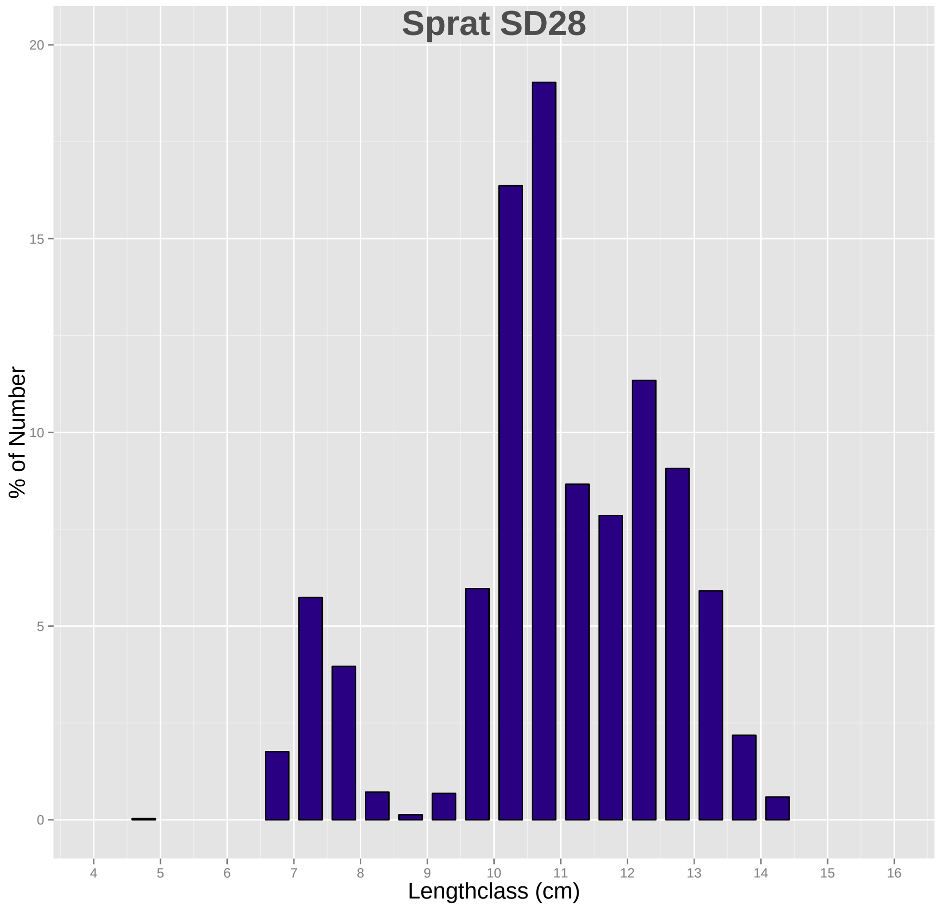

Figure 5: Length distribution of sprat

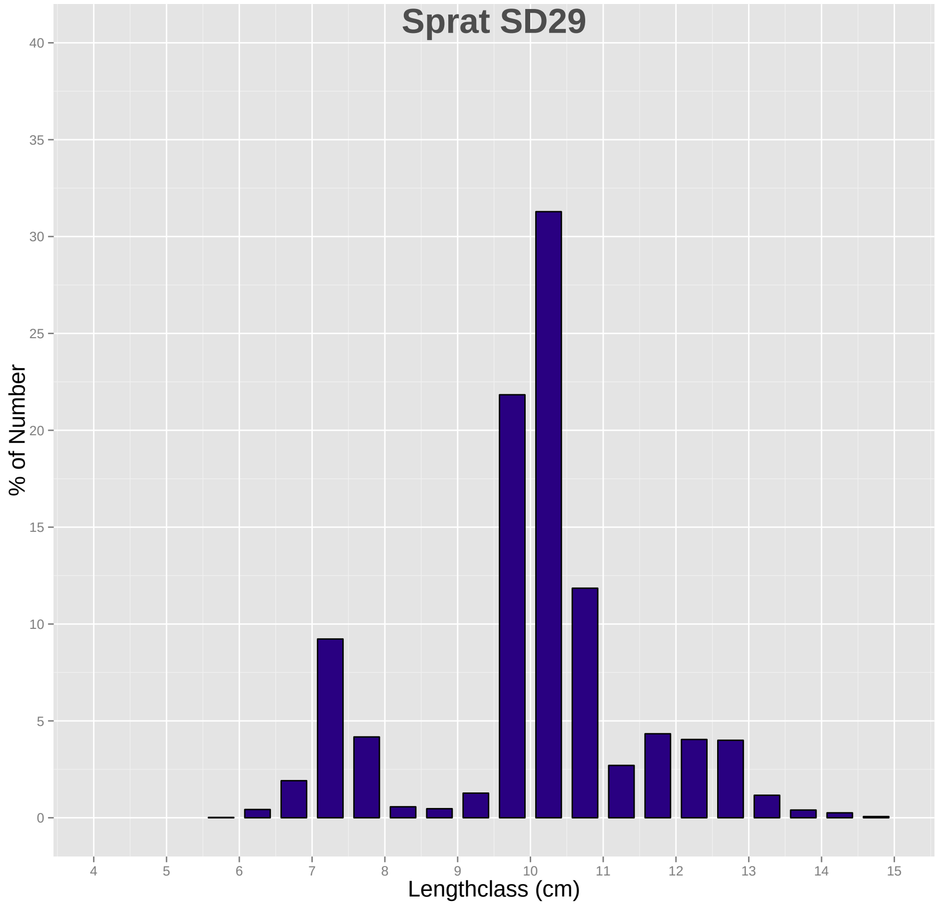

Figure 6: Length distribution of sprat

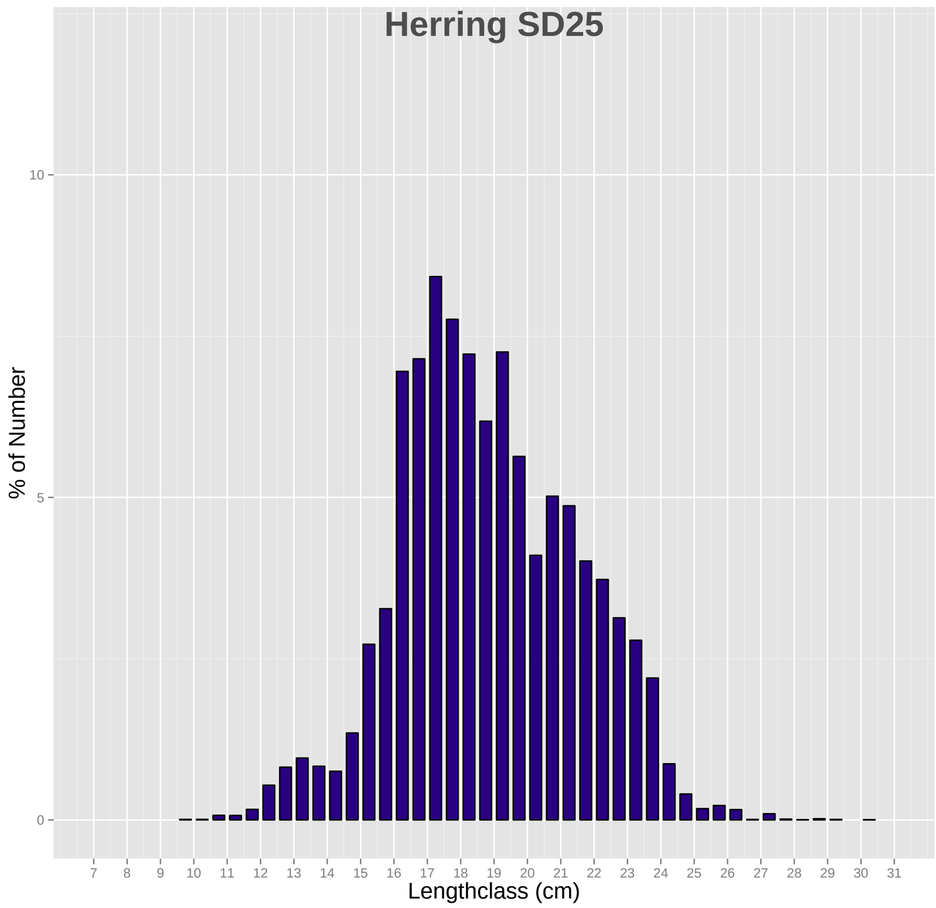

Figure 7: Length distribution of herring

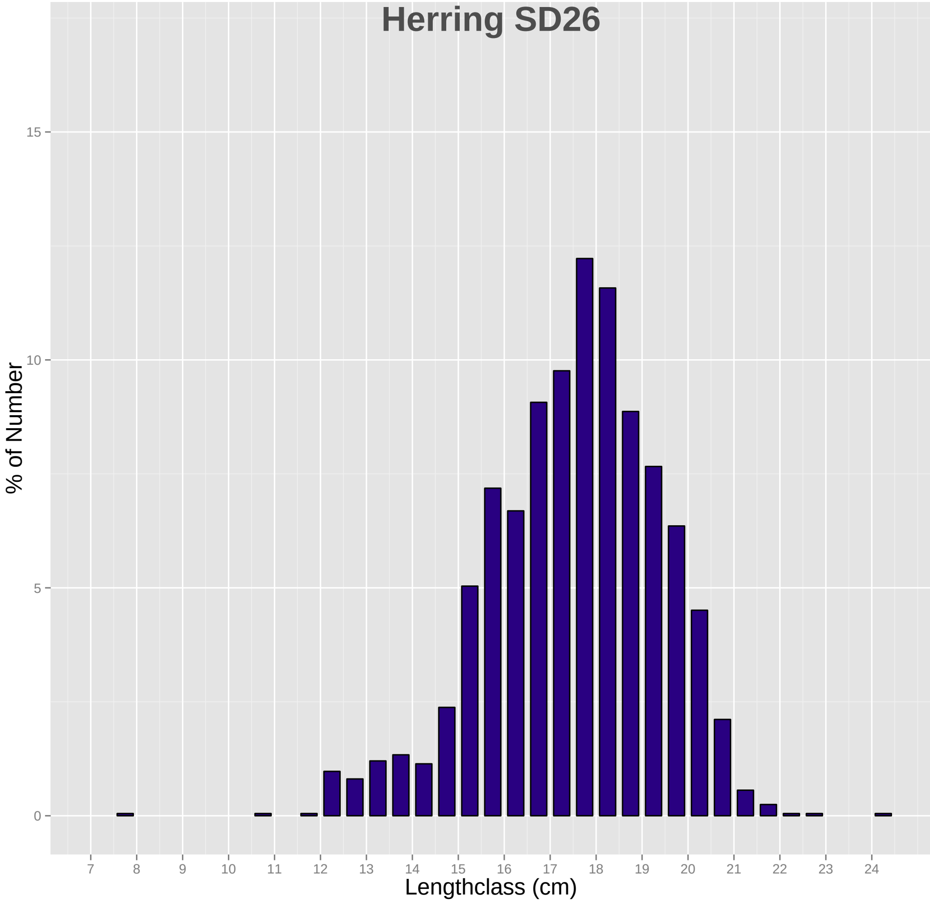

Figure 8: Length distribution of herring

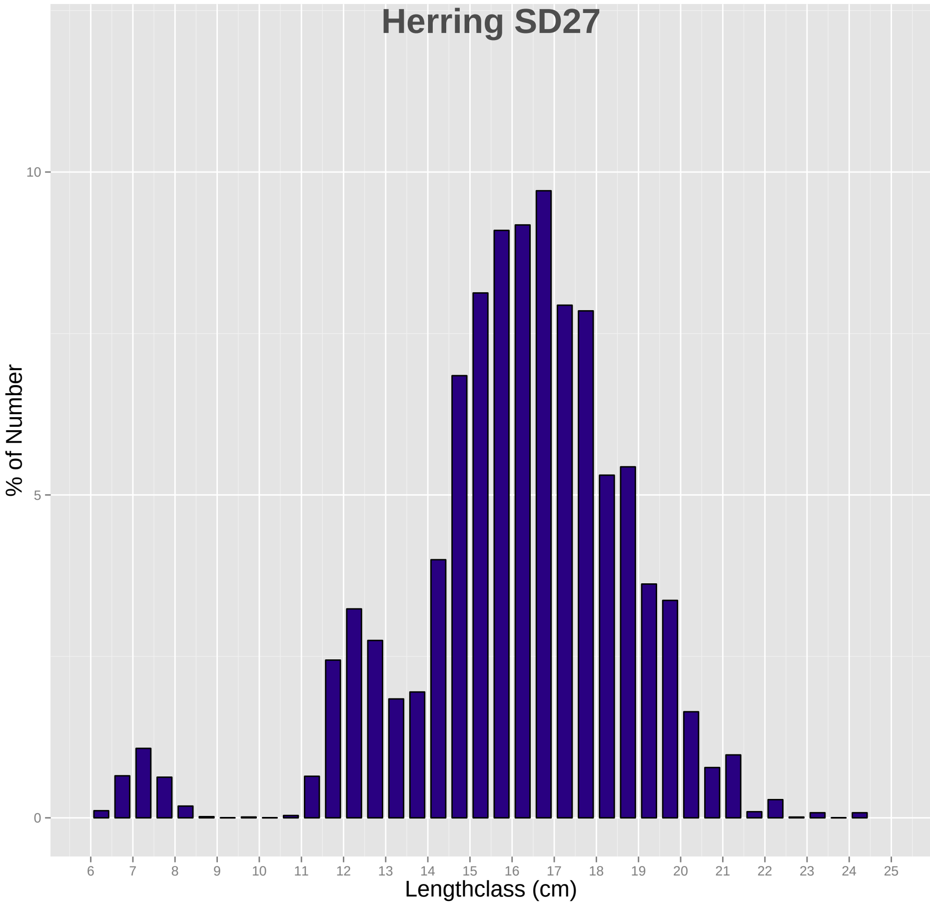

Figure 9: Length distribution of herring

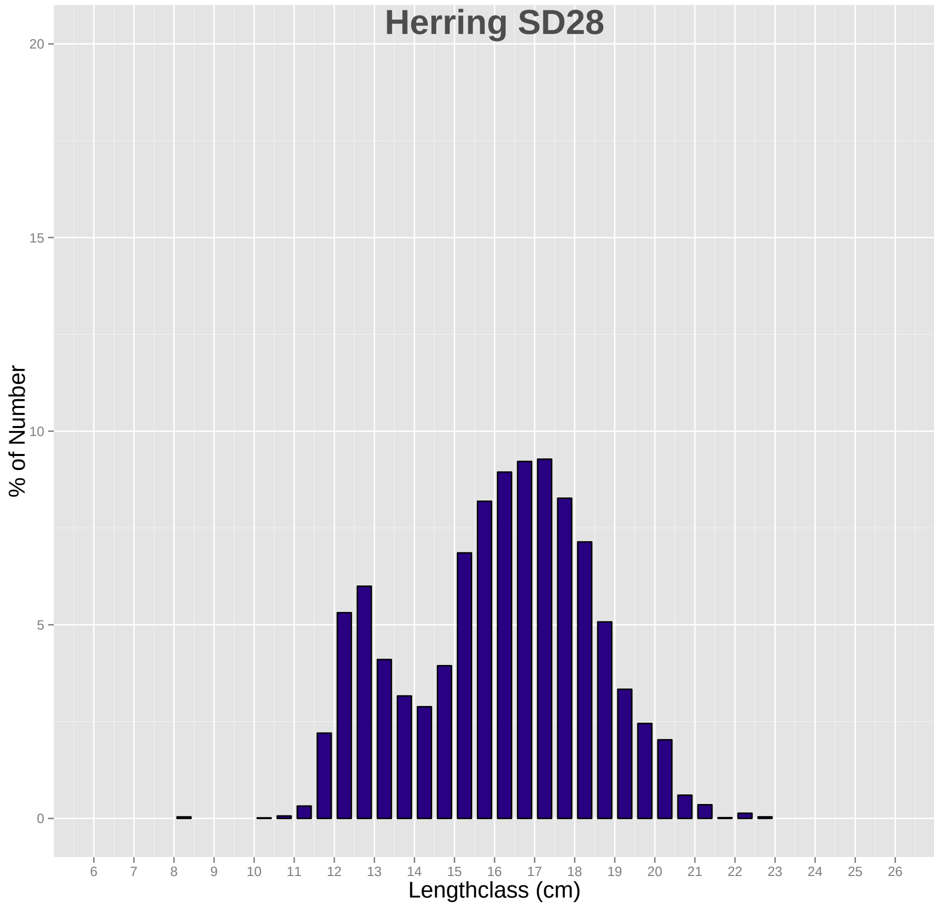

Figure 10: Length distribution of herring

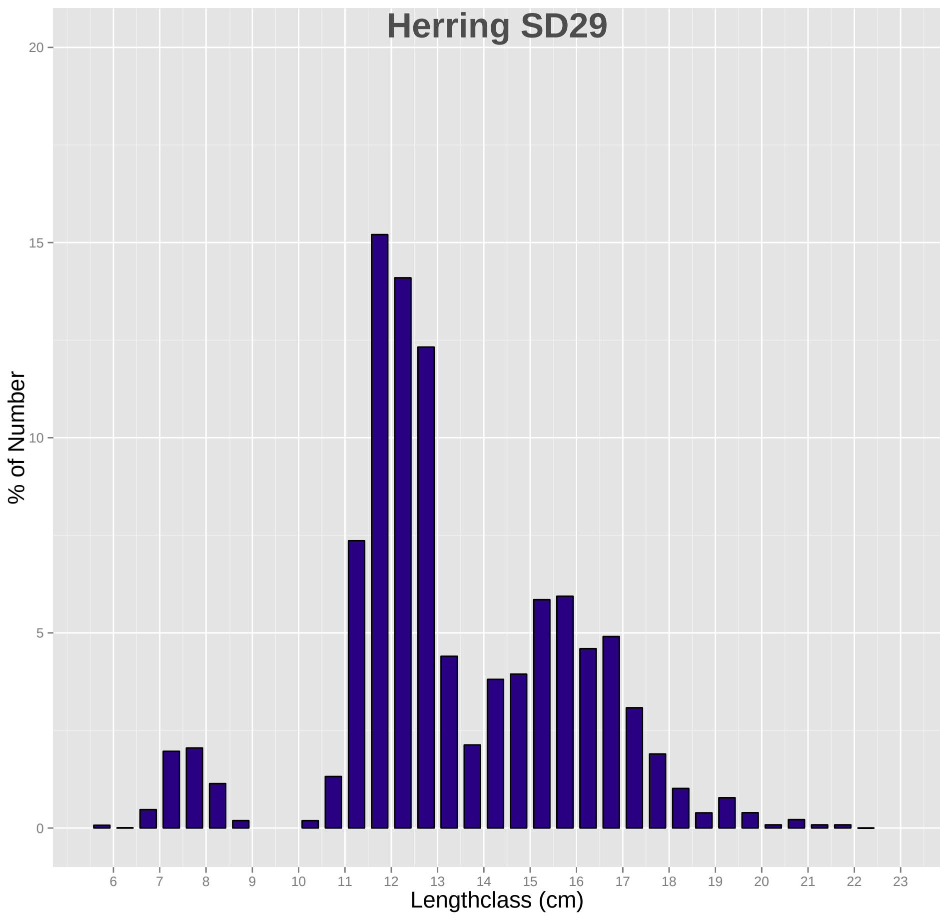

Figure 11: Length distribution of herring

Report on the Polish BIAS survey onboard r/v Baltica 17.09.–04.10.2015.

Tomasz Łączkowski*[1] and Bartosz Witalis[1]

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April 2, 2016

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Polish BIAS cruise was the part of the Baltic International Acoustic Survey program, coordinated by the ICES Baltic International Fish Survey Working Group.

Calibration was done on the first day of the survey on position 54°27.56' N, 019°09.46' E (Fig. 1). Water depth at calibration site was 66 m.. Standard copper spheres were used. New transducers gains for 38 and 120 kHz frequencies were respectively 23.85 dB and 26.50 dB. Plot of the uncompensated target strength of the copper sphere for 38 kHz frequency is illustrated on Fig. 2.

During the cruise total of 840 NM acoustic transects were covered using the SIMRAD EK60 scientific echosounder. In order to collect the biological samples of fish, 34 pelagic control hauls were performed. The gear used was the WP53/64x4 pelagic trawl with 6 mm mesh in codend. In addition water parameters was measured on 48 hydrological stations. Positions of all elements is presented on Fig. 1.

Four river lampreys were caught in the trawls 1, 2, 3 and 5. Their lengths were respectively 39, 38, 41 and 35 cm.

Scientific staff:

- Tomasz Łączkowski – scientist in charge, hydroacoustician
- Jakub Słembarski – hydroacoustician, electronics specialist
- Wojciech Deluga – ichtiologist, herring analyses
- Ireneusz Wybierała – ichtiologist, herring analyses
- Grzegorz Modrzejewski – ichtiologist, sprat analyses
- Zuzanna Celmer – ichtiologist, sprat analyses
- Marcin Nowakowski – ichtiologist, cod analyses and bycatch measurements
- Katarzyna Nadolna-Ałtyn – ichtiologist, cod analyses and bycatch measurements
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Table 1: Measured and analysed specimens during the Polish BIAS survey onboard r/v Baltica, 17.09.-04.10.2015.

	Measurement				**Analysis**			
	ICES SD			**Sum**	**ICES SD**			**Sum**
Species	24	25	26		24	25	26	
Herring	535	3294	4309	8138	99	522	599	1120
Sprat	384	2514	2560	5458	68	271	190	529
Cod	3	281	225	509	3	82	87	172
Flounder		1	1	2				
River lamprey			4	4				
Lumpfish	7	10	1	18				
Salmon			1	1				
Plaice		3		3				
Whiting	1	5		6	1	5		6
Garfish		2	1	3				
Fourbeard rockling	1			1				
Anchovy		1		1				

Table 2: Hydrometeorological conditions during the pelagic control hauls during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

Haul no.	Sea surface temperature [°C]	Water temperature at haul depth [°C]	Salinity at haul depth	Oxygene content at haul depth [ml/l]	Wind direction	Wind force [B]	Sea state
1	18.6	5.5	8.3	7.32	SE	3	2
2	16.8	5.2	8.5	6.19	SW	5	3
3	17.5	5.6	7.3	5.54	SW	3	3
4	14.0	6.4	4.5	5.68	SW	3	2
5	16.5	5.7	7.6	6.94	SW	3	2
6	17.2	6.2	11.4	2.19	SE	3	2
7	17.1	6.1	11.4	4.20	SES	3	1
8	16.2	5.8	10.6	2.60	S	4	1
9	16.1	4.8	7.3	6.31	NWN	1	1
10	16.1	5.1	9.5	1.39	SWS	1	0
11	16.3	6.6	7.3	5.74	NWW	3	2
12	16.9	5.5	9.2	4.95	NW	3	3
13	16.6	8.9	7.5	6.04	W	4	3
14	16.5	5.3	7.5	7.58	SWS	4	3
15	15.9	4.6	8.6	4.29	SWS	5	2
16	16.5	5.8	7.5	6.86	SE	6	3
17	15.7	15.4	7.4	6.80	SES	2	1
18	16.5	5.7	9.1	4.51	S	3	1
19	16.4	6.6	7.4	6.23	SES	2	1
20	16.3	5.5	7.5	4.54	SW	5	3
21	15.7	15.6	7.3	6.71	SWW	4	3
22	15.8	6.2	10.1	2.21	W	4	1
23	15.4	15.4	7.5	7.59	NWN	4	3
24	15.8	6.7	7.7	5.11	NWN	4	2
25	15.9	6.7	7.8	5.57	NW	4	2
26	15.6	7.1	17.8	2.03	N	4	3
27	15.6	13.1	7.7	6.27	NE	4	3
28	16.6	7.0	10.0	4.52	NE	4	2
29	15.6	7.5	13.2	2.92	NW	2	1
30	15.8	10.5	12.9	3.19	SW	3	1
31	15.5	6.0	9.0	6.07	W	5	3
32	15.6	15.6	7.6	5.70	SWW	5	3
33	15.5	6.6	8.2	6.15	W	5	4
34	15.6	8.2	8.0	6.34	W	5	3

Table 3: Technical details of the pelagic control hauls during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

Haul no.	SD	ICES rect.	Baltic rect.	Date	Time of shooting UTC	Time of pulling back UTC	Haul duration [min.]	Latitude of shooting	Longitude of shooting	Latitude of pulling	Longitude of pulling	Headrope depth [m]	Footrope depth [m]	Water depth max.	Water depth min.	Vertical opening [m]	Course [°]	Speed [kt]
1	26	37G9	T4	2015.09.17	12:20	12:50	30	54°26,94' N	019°09,92' E	54°27,62' N	019°07,42' E	42	60	66	63	18	295	3,1
2	26	38G9	T5	2015.09.18	11:10	11:40	30	54°34,26' N	019°13,29' E	54°35,55' N	019°14,94' E	53	73	80	78	20	35	3,2
3	26	37G9	T4	2015.09.18	14:05	14:35	30	54°29,94'N	019°19,08'E	54°29,81'N	019°16,48'E	50	68	70	70	18	265	3,1
4	26	37G8	S4	2015.09.19	5:35	6:05	30	54°27,16'N	018°55,59'E	54°28,15'N	018°53,81'E	23	43	54	47	20	305	3,1
5	26	38G8	S5	2015.09.19	7:40	8:10	30	54°32,96'N	018°54,53'E	54°33,01'N	018°57,14'E	43	61	67	65	18	90	3,1
6	26	38G8	S6	2015.09.19	10:45	11:15	30	54°43,21'N	018°59,52'E	54°41,67'N	018°59,51'E	66	85	91	88	19	185	3,0
7	26	38G9	T7	2015.09.19	14:00	14:30	30	54°55,09'N	019°01,42'E	54°54,99'N	019°03,98'E	71	90	102	101	19	94	3,0
8	26	39G9	T8	2015.09.20	5:20	5:50	30	55°09,91'N	019°03,58'E	55°09,89'N	019°01,16'E	62	82	89	87	20	275	3,0
9	26	40G8	S11	2015.09.20	9:35	10:05	30	55°32,01'N	018°59,38'E	55°33,48'N	018°58,99'E	30	48	87	86	18	353	3,3
10	26	40G8	S12	2015.09.20	14:40	15:10	30	55°48,81'N	018°40,11'E	55°47,24'N	018°40,18'E	70	89	105	101	19	180	3,1
11	26	39G8	S9	2015.09.21	5:20	5:50	30	55°19,35'N	018°40,08'E	55°17,64'N	018°40.00'E	40	60	81	81	20	180	3,0
12	26	38G8	S7	2015.09.21	9:10	9:40	30	54°55,65'N	018°40,35'E	54°54,31'N	018°41,92'E	60	78	85	85	18	145	3,0
13	26	39G8	P8	2015.09.21	14:40	15:10	30	55°01,26'N	018°19,94'E	55°02,73'N	018°19,97'E	40	60	65	43	20	355	3,0
14	26	39G8	P10	2015.09.22	5:35	6:05	30	55°21,44'N	018°19,92'E	55°23,09'N	018°20,07'E	53	73	85	81	20	0	3,1
15	26	40G8	R11	2015.09.22	8:45	9:15	30	55°36,90'N	018°26,46'E	55°38,26'N	018°26,03'E	63	81	95	95	18	340	3,1
16	26	39G8	P10	2015.09.22	15:50	16:20	30	55°28,07'N	018°01,52'E	55°29,65'N	018°01,43'E	40	59	71	70	19	0	3,2
17	25	38G7	N7	2015.09.23	9:50	10:05	15	54°59,88'N	017°37,92'E	54°59,84'N	017°36,70'E	10	28	36	35	18	265	3,0
18	25	39G7	O9	2015.09.23	13:35	14:05	30	55°19,08'N	017°40,27'E	55°20,44'N	017°40,31'E	50	68	78	77	18	355	3,0
19	25	40G7	O11	2015.09.23	15:45	16:15	30	55°30,56'N	017°40,35'E	55°31,79'N	017°41,47'E	30	50	60	58	20	30	3,1
20	25	39G7	N10	2015.09.24	8:10	8:40	30	55°20,49'N	017°21,08'E	55°21,81'N	017°22,88'E	46	66	71	68	20	35	3,0
21	25	38G7	N7	2015.09.24	13:25	13:55	30	54°59,34'N	017°21,11'E	54°59,80'N	017°23,90'E	6	28	30	28	22	75	3,3
22	25	39G6	L9	2015.09.25	9:45	10:15	30	55°13,62'N	016°56,30'E	55°13,57'N	016°58,86'E	56	74	88	86	18	90	2,9
23	25	38G6	J6	2015.09.27	4:45	8:15	30	54°44,65'N	016°19,67'E	54°43,11'N	016°19,27'E	12	30	39	36	18	190	3,2
24	25	38G6	J7	2015.09.27	11:05	11:35	30	54°59,63'N	016°19,01'E	54°58,67'N	016°16,69'E	27	44	50	49	17	235	3,1
25	25	39G6	K9	2015.09.27	14:40	15:10	30	55°16,90'N	016°21,13'E	55°16,48'N	016°23,97'E	37	57	62	59	20	100	3,1
26	25	39G5	H9	2015.09.28	7:25	7:55	30	55°13,18'N	015°57,85'E	55°11,99'N	015°56,10'E	65	83	90	89	18	220	3,0
27	25	37G5	H4	2015.09.29	5:10	5:40	30	54°28,91'N	015°58,23'E	54°28,18'N	015°55,39'E	16	36	41	41	20	250	3,3
28	25	38G5	G6	2015.09.29	11:20	11:50	30	54°41,70'N	015°38,35'E	54°40,56'N	015°36,69'E	45	65	67	67	20	230	3,0
29	25	38G5	H6	2015.09.30	6:55	7:25	30	54°47,26'N	015°40,19'E	54°48,81'N	015°40,22'E	52	72	75	73	20	0	3,0
30	25	39G5	G8	2015.09.30	11:25	11:55	30	55°06,15'N	015°37,32'E	55°04,64'N	015°35,93'E	50	70	79	75	20	210	3,2
31	25	38G5	F6	2015.10.01	6:25	6:55	30	54°41,98'N	015°14,40'E	54°41,83'N	015°19,09'E	40	60	65	65	20	95	3,0
32	25	37G5	F4	2015.10.01	10:10	10:40	30	54°28,70'N	015°16,52'E	54°28,47'N	015°19,39'E	13	33	42	38	20	90	3,2
33	24	38G4	E6	2015.10.02	10:15	10:45	30	54°44,63'N	014°51,51'E	54°44,24'N	014°54,48'E	33	51	57	57	18	105	3,2
34	24	38G4	E6	2015.10.02	12:30	13:00	30	54°40,87'N	014°49,65'E	54°40,84'N	014°52,47'E	30	50	53	53	20	95	3,1

Table 4: Total catch of species during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

Haul no.	**Herring**	**Sprat**	**Cod**	**Flounder**	**River lamprey**	**Lumpfish**	**Salmon**	**Plaice**	**Whiting**	**Garfish**	**Fourbeard rockling**	**Anchovy**
1	624.29	89.41	2.88		0.11							
2	152.51	95.32	0.41		0.14							
3	276.38	83.60	1.53		0.13							
4	10.76	154.59		0.05								
5	49.66	124.00			0.10		4.39					
6	385.05	20.71	33.32							0.26		
7	73.01	5.81	12.46								0.13	
8	128.83	3.29	7.65									
9	82.76	0.78	1.86									
10	275.83		12.46									
11	272.59	33.03	0.67			0.18						
12	202.98	23.18	2.37									
13	95.37	14.91	0.26									
14	164.30	14.07	1.68									
15	255.51	46.65	13.36									
16	196.98	7.38	0.69									
17						0.08						0.06
18	231.68	59.57	0.53									
19	73.30	7.62				0.69				0.55		
20	287.00	206.14		0.16		0.34						
21		4.74				0.33				0.45		
22	210.61	100.97	1.63									
23	4.91	22.99										
24	0.91	0.19										
25	368.38	4.65				0.88						
26	90.29	5.50	46.90						0.12			
27	84.80	30.87										
28	156.54	40.47	9.08						0.70			
29	193.55	43.32	26.12					0.08				
30	231.35	187.72	2.98						0.16			
31	120.74	96.32	1.25			0.08		0.33				
32	0.58	0.76										
33	52.47	52.07				0.41						
34	51.92	86.03	1.19			1.47			0.16			

Table 5: Daily catches of species during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

Date	**Herring**	**Sprat**	**Cod**	**Flounder**	**River lamprey**	**Lumpfish**	**Salmon**	**Plaice**	**Whiting**	**Garfish**	**Fourbeard rockling**	**Anchovy**
2015-09-17	624.29	89.41	2.88		0.11							
2015-09-18	428.89	178.92	1.94		0.26							
2015-09-19	518.49	305.10	45.78	0.05	0.10		4.39			0.26	0.13	
2015-09-20	487.42	4.07	21.97									
2015-09-21	570.94	71.12	3.30			0.18						
2015-09-22	616.79	68.10	15.73									
2015-09-23	304.98	67.19	0.53			0.77				0.55		0.06
2015-09-24	287.00	210.88		0.16		0.67				0.45		
2015-09-25	210.61	100.97	1.63									
2015-09-27	374.19	27.84				0.88						
2015-09-28	90.29	5.50	46.90						0.12			
2015-09-29	241.34	71.34	9.08						0.70			
2015-09-30	424.89	231.05	29.10					0.08	0.16			
2015-10-01	121.32	97.08	1.25			0.08		0.33				
2015-10-02	104.39	138.10	1.19			1.87			0.16			

Table 6: Cruise statistics of the Polish BIAS survey onboard r/v Baltica, 17.09.-04.10.2015.

							Species composition		Abundance (10^6)		
SD	**ICES rect.**	**Area [NM^2]**	**Mean S_A [m^2 / NM^2]**	**EDSU [NM]**	$\bar{\sigma}$ [m$^2 \times 10^{-4}$]	**Abundance** (10^6)	**Herring**	**Sprat**	**Herring**	**Sprat**	**Cod**
24	38G4	1034.8	96.9	35	2.10	476	26.2	73.8	125	352	0
Sum SD 24		1034.8	96.9	35	2.10	476			125	352	0
25	37G5	642.2	158.2	48	1.92	530	55.3	44.7	293	237	0
	38G5	1035.7	129.0	114	2.87	466	46.6	52.7	217	246	3
	38G6	940.2	175.8	89	1.64	1009	20.4	79.6	206	803	0
	38G7	471.7	255.7	36	1.58	763	0.0	100.0	0	763	0
	39G5	979.0	301.0	33	3.55	830	55.1	41.8	457	347	26
	39G6	1026.0	215.8	107	2.80	791	69.0	31.0	546	246	0
	39G7	1026.0	297.0	132	2.43	1254	41.7	58.3	523	731	0
	40G7	1013.0	279.1	31	2.98	947	74.8	25.2	708	239	0
Sum SD 25		7264.5	226.4	590	2.40	5644			2951	3611	29
26	37G8	86.0	2894.6	10	1.13	2206	7.4	92.6	163	2043	0
	37G9	151.6	914.1	37	2.01	691	56.6	43.4	391	300	0
	38G8	624.6	997.1	70	2.53	2466	51.0	48.7	1259	1201	7
	38G9	918.2	750.9	75	1.58	4362	39.8	60.2	1735	2627	0
	39G8	1026.0	285.0	128	2.87	1019	71.7	28.3	731	288	0
	39G9	1026.0	393.2	48	4.06	993	86.2	13.1	855	130	0
	40G8	1013.0	252.9	103	3.24	791	86.1	13.5	681	107	3
Sum SD 26		4845.4	926.8	471	2.49	12527			5814	6696	18
Sum 24+25+26		13144.7		1096		18648			8889	10658	47

Table 7: Herring abundance (10^6) estimated using acoustic method base on data collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	ICES rect.	Sum	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
24	38G4	124.69	8.51	32.05	12.76	19.58	16.26	12.18	10.78	4.66	7.92
	Suma	124.69	8.51	32.05	12.76	19.58	16.26	12.18	10.78	4.66	7.92
25	37G5	293	41.31	76.19	12.59	63.52	48.09	12.37	15.76	9.49	13.96
	38G5	217	2.37	15.17	9.79	31.41	41.03	11.18	17.36	20.04	68.78
	38G6	206	113.97	66.23	1.25	7.24	6.43	1.53	1.91	1.73	5.92
	38G7	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	39G5	457	1.85	31.96	23.72	73.62	89.72	27.32	41.37	42.67	125.13
	39G6	546	1.06	44.10	35.84	109.67	117.05	42.14	53.50	49.08	93.32
	39G7	523	0.00	24.60	34.77	71.54	106.74	36.50	52.94	59.03	136.83
	40G7	708	0.00	45.90	46.24	123.76	147.71	54.89	69.69	72.35	147.80
	Suma	2951	161	304	164	481	557	186	253	254	592
26	37G8	163	155.68	3.72	0.12	0.51	0.57	0.09	0.16	0.27	1.42
	37G9	391	113.76	30.93	17.99	48.06	55.20	17.57	24.17	25.34	57.97
	38G8	1259	196.70	70.15	57.00	122.08	197.34	61.43	95.43	112.15	346.25
	38G9	1735	600.51	40.90	42.70	103.16	191.97	47.36	90.67	132.24	485.24
	39G8	731	4.72	50.29	49.48	122.60	150.95	49.43	70.40	71.43	161.23
	39G9	855	3.18	16.12	39.09	76.31	154.35	44.53	74.47	97.29	349.93
	40G8	681	0.43	48.14	51.00	112.38	140.74	53.69	69.54	68.37	136.65
	Suma	5814	1075	260	257	585	891	274	425	507	1539

Table 8: Herring mean weight (g) in age groups. Samples collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	ICES rect.	Mean	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
24	38G4	35.3	12.93	29.56	49.46	29.92	36.94	40.63	35.58	44.08	56.10
25	37G5	24.1	10.34	18.50	28.77	26.83	28.28	30.38	30.71	35.08	43.58
	38G5	46.9	11.13	23.83	41.28	37.63	45.40	43.68	44.28	49.66	59.65
	38G6	15.0	9.53	12.87	30.32	29.95	40.18	40.85	47.49	53.92	66.99
	39G5	43.5	12.39	27.43	39.93	35.08	40.71	39.02	40.35	45.08	57.01
	39G6	36.6	12.56	29.83	38.68	31.19	35.33	35.60	36.56	39.65	46.27
	39G7	42.7	0.00	29.95	43.02	37.63	41.08	38.97	41.62	43.38	49.92
	40G7	39.5	0.00	30.24	40.64	33.49	38.20	36.94	38.49	41.78	48.50
26	37G8	7.5	6.40	12.44	34.25	33.67	46.26	38.08	42.43	61.18	67.62
	37G9	29.0	6.22	21.77	39.17	32.39	37.52	38.01	40.03	42.82	50.06
	38G8	40.9	7.32	21.16	44.18	41.15	46.39	43.55	45.16	47.25	56.50
	38G9	38.2	6.33	19.19	50.06	51.86	53.35	50.25	49.31	52.29	62.26
	39G8	39.8	9.82	28.65	39.61	34.10	38.74	38.13	39.17	42.40	49.34
	39G9	53.6	10.86	29.57	47.31	50.10	52.52	49.33	47.53	51.53	59.43
	40G8	38.2	13.03	29.51	39.08	32.79	37.33	37.06	38.00	39.94	46.11

Table 9: Herring biomass (10^3 t) estimated using acoustic method based on data collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	ICES rect.	Sum	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
24	38G4	4403.25	110.03	947.44	631.17	585.82	600.53	494.77	383.52	205.45	444.52
		4403.25	110.03	947.44	631.17	585.82	600.53	494.77	383.52	205.45	444.52
25	37G5	7064	427.17	1409.24	362.38	1704.37	1359.62	375.88	484.16	332.98	608.31
	38G5	10192	26.37	361.53	404.23	1181.95	1862.94	488.44	768.92	995.06	4103.00
	38G6	3095	1086.07	852.29	37.88	216.79	258.53	62.41	90.54	93.41	396.74
	39G5	19874	22.95	876.63	947.30	2582.40	3652.48	1066.17	1669.34	1923.55	7133.51
	39G6	19991	13.28	1315.38	1386.36	3420.95	4135.23	1500.24	1956.10	1946.10	4317.45
	39G7	22327	0.00	736.93	1495.86	2692.05	4384.54	1422.32	2203.47	2560.86	6830.52
	40G7	27955	0.00	1387.90	1879.06	4144.31	5642.90	2027.67	2682.56	3022.85	7168.23
	Suma	110499	1576	6940	6513	15943	21296	6943	9855	10875	30558
26	37G8	1213	996.54	46.24	4.00	17.20	26.19	3.41	6.98	16.78	95.79
	37G9	11335	707.49	673.43	704.59	1556.43	2071.11	667.84	967.52	1085.06	2901.84
	38G8	51467	1439.77	1484.64	2518.16	5023.21	9154.89	2674.98	4309.78	5299.54	19562.07
	38G9	66290	3799.17	784.78	2137.23	5349.41	10240.92	2379.67	4470.92	6915.22	30212.35
	39G8	29101	46.32	1441.12	1959.92	4180.25	5847.88	1884.68	2757.17	3028.63	7954.59
	39G9	45837	34.50	476.65	1849.20	3823.19	8106.58	2196.61	3539.88	5013.62	20796.71
	40G8	26022	5.58	1420.52	1993.11	3684.87	5254.05	1989.58	2642.07	2730.92	6301.45
	Suma	231265	7029	6327	11166	23635	40702	11797	18694	24090	87825

Table 10: Sprat abundance (10^6) estimated using acoustic method based on data collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	**ICES rect.**	**Sum**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8+**
24	38G4	352	0.00	54.92	91.54	88.06	71.13	31.40	13.55	0.92	0.00
	Suma	352	0.00	54.92	91.54	88.06	71.13	31.40	13.55	0.92	0.00
25	37G5	237	0.00	16.20	46.82	91.17	37.43	20.07	18.49	4.79	1.80
	38G5	246	0.00	28.22	48.98	87.42	37.06	18.82	18.19	4.94	1.91
	38G6	803	0.00	92.05	157.27	289.52	122.42	61.11	57.29	16.14	7.06
	38G7	763	0.00	106.38	165.56	297.23	91.66	53.78	26.75	12.72	9.25
	39G5	347	0.00	37.93	71.01	132.61	48.85	26.42	21.11	5.94	2.76
	39G6	246	0.00	52.58	53.14	79.70	27.72	15.88	10.76	3.62	2.11
	39G7	731	0.00	192.14	155.95	224.21	74.25	42.62	25.93	9.89	6.45
	40G7	239	0.00	89.76	44.87	58.73	22.59	10.89	7.80	2.65	1.49
	Suma	3611	0	615	744	1261	462	250	186	61	33
26	37G8	2043	0.00	1504.93	375.65	119.34	32.04	5.57	4.18	1.39	0.00
	37G9	300	7.49	234.23	40.65	13.03	3.34	0.51	0.41	0.10	0.00
	38G8	1201	11.16	657.94	281.05	162.75	60.98	15.63	8.49	2.68	0.00
	38G9	2627	0.00	1454.25	667.00	327.45	134.49	21.74	18.99	2.76	0.00
	39G8	288	0.00	65.99	88.97	81.12	36.01	8.64	5.84	1.89	0.00
	39G9	130	0.00	90.01	24.17	10.49	4.09	0.68	0.56	0.12	0.00
	40G8	107	0.00	29.12	29.57	28.65	13.05	3.66	2.26	0.64	0.00
	Suma	6696	19	4036	1507	743	284	56	41	10	0
Suma 24+25+26		10658	19	4707	2342	2091	817	337	241	71	33

Table 11: Sprat mean weight (g) in age groups. Samples collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	**ICES rect.**	**Mean**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8+**
24	38G4	15.8		13.86	15.47	15.94	16.90	16.31	17.09	21.5	
25	37G5	15.0		11.81	14.83	14.98	15.67	15.52	16.55	15.12	12.70
	38G5	14.7		11.44	14.37	14.84	15.78	15.43	16.96	15.33	12.70
	38G6	14.7		11.51	14.32	14.63	15.86	15.38	17.47	15.38	12.70
	38G7	13.8		11.83	13.89	14.12	14.27	14.05	15.17	13.57	12.70
	39G5	14.4		11.68	14.36	14.66	15.21	14.97	16.06	14.75	12.70
	39G6	13.6		11.19	13.45	14.28	14.82	14.60	15.71	14.22	12.70
	39G7	13.1		10.79	13.27	14.11	14.40	14.13	15.28	13.94	12.70
	40G7	12.4		10.03	13.18	14.14	14.05	14.33	15.47	14.22	12.70
26	37G8	8.4		7.63	9.77	11.45	12.86	13.23	13.57	13.60	
	37G9	7.9	2.85	7.46	9.66	11.32	12.74	13.10	13.50	13.60	
	38G8	9.4	3.07	8.01	10.10	12.08	13.14	14.57	13.61	13.60	
	38G9	9.4		8.04	10.08	11.88	12.95	13.02	13.50	13.60	
	39G8	11.3		8.69	10.72	12.52	13.32	13.97	14.06	13.60	
	39G9	8.9		8.06	9.66	11.81	12.93	13.05	13.48	13.60	
	40G8	11.2		8.35	10.78	12.63	13.37	14.59	14.57	13.60	

Table 12: Sprat biomass (10^3 t) estimated using acoustic method based on data collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	ICES rect.	Sum	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
	38G4	5546.5		761.3	1416.5	1403.4	1202.0	512.2	231.5	19.7	
	Suma	5546.5		761.3	1416.5	1403.4	1202.0	512.2	231.5	19.7	
25	37G5	3550.4		191.3	694.4	1365.3	586.6	311.5	305.9	72.5	22.9
	38G5	3608.2		322.9	703.7	1297.6	585.0	290.4	308.6	75.7	24.2
	38G6	11767.7		1059.4	2252.5	4235.8	1941.2	940.1	1000.8	248.2	89.6
	38G7	10513.5		1258.3	2300.0	4195.9	1307.7	755.7	405.8	172.7	117.5
	39G5	5007.1		443.1	1019.4	1944.5	743.0	395.4	339.1	87.7	35.0
	39G6	3331.0		588.2	714.7	1138.3	410.8	231.8	169.1	51.5	26.8
	39G7	9595.5		2073.9	2069.9	3164.2	1069.2	602.4	396.1	137.9	81.9
	40G7	2972.8		900.4	591.5	830.2	317.4	156.1	120.6	37.7	18.9
	Suma	50346	0	6838	10346	18172	6961	3683	3046	884	417
26	37G8	17077.8		11478.5	3671.6	1366.3	412.1	73.7	56.7	18.9	
	37G9	2363.9	21.3	1746.4	392.5	147.5	42.5	6.7	5.5	1.4	
	38G8	11293.0	34.2	5273.1	2839.5	1965.4	801.1	227.7	115.6	36.4	
	38G9	24624.4		11694.7	6722.4	3889.0	1741.3	283.2	256.3	37.5	
	39G8	3251.0		573.1	954.0	1015.7	479.7	120.6	82.2	25.7	
	39G9	1153.5		725.2	233.4	124.0	52.9	8.9	7.5	1.7	
	40G8	1193.2		243.2	318.8	361.8	174.6	53.3	32.9	8.7	
	Suma	60957	56	31734	15132	8870	3704	774	557	130	0
Suma 24+25+26		116850	56	39333	26895	28445	11867	4970	3834	1034	417

Table 13: Cod abundance (10^6) estimated using acoustic method based on the data from the Polish BIAS survey onboard r/v Baltica, 17.09-04.10.2015.

SD	ICES rect.	Sum	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8+
25	38G5	3	0.00	0.02	0.61	1.75	0.54	0.02	0.00	0.00	0.00
	39G5	26	0.00	0.00	4.83	14.49	6.19	0.70	0.00	0.00	0.00
	Suma	29	0.00	0.02	5.44	16.24	6.73	0.72	0.00	0.00	0.00
26	38G8	7	0.00	0.00	0.18	2.98	3.56	0.35	0.03	0.00	0.00
	40G8	3	0.00	0.04	0.25	1.35	1.03	0.06	0.02	0.00	0.00
	Suma	10	0.00	0.04	0.44	4.32	4.59	0.41	0.05	0.00	0.00

Table 14: Cod mean weight (g) in age groups. Samples collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

SD	ICES rect.	Mean	Age 0	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age +8
25	38G5	282.7		105.00	199.12	264.98	425.41	696.00			
	39G5	312.9			205.06	276.52	427.60	794.40			
26	38G8	446.1			212.50	333.89	494.57	1009.89	615.00		
	40G8	349.0		100.00	181.85	291.80	436.50	882.00	615.00		

Table 15: Cod biomass (10^3 t) estimated using acoustic method based on the data from the Polish BIAS survey onboard r/v Baltica, 17.09.-04.10.2015.

SD	**ICES rect.**	**Sum**	**Age 0**	**Age 1**	**Age 2**	**Age 3**	**Age 4**	**Age 5**	**Age 6**	**Age 7**	**Age 8+**
25	38G5	833.2		2.6	121.1	463.7	231.6	14.2			
	39G5	8197.5			990.2	4005.9	2645.4	556.0			
26	38G8	3170.2			39.2	993.7	1761.0	357.3	18.9		
	40G8	959.5		3.6	46.0	393.2	448.7	53.2	14.8		

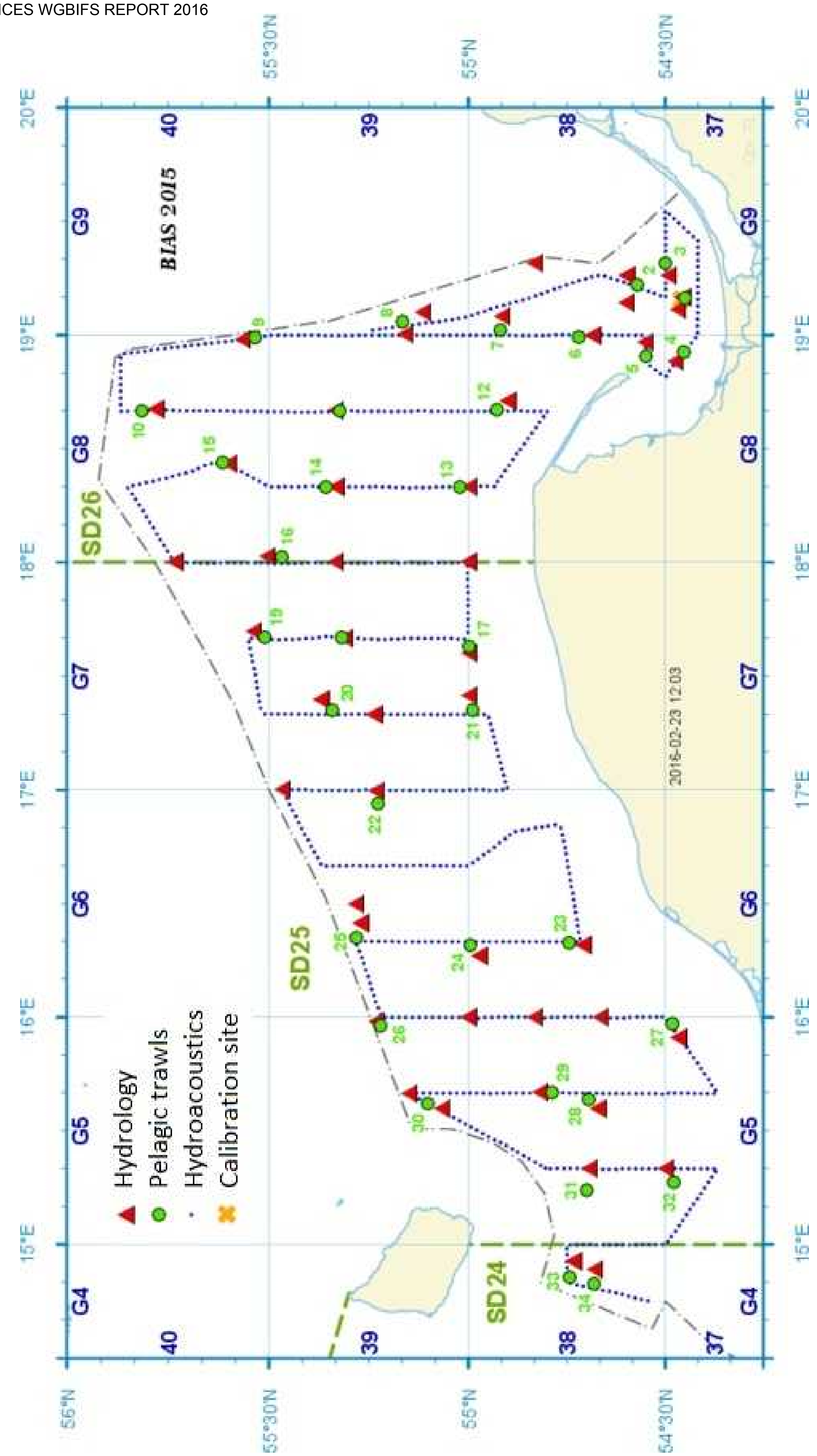

Figure 1: Tasks realized during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

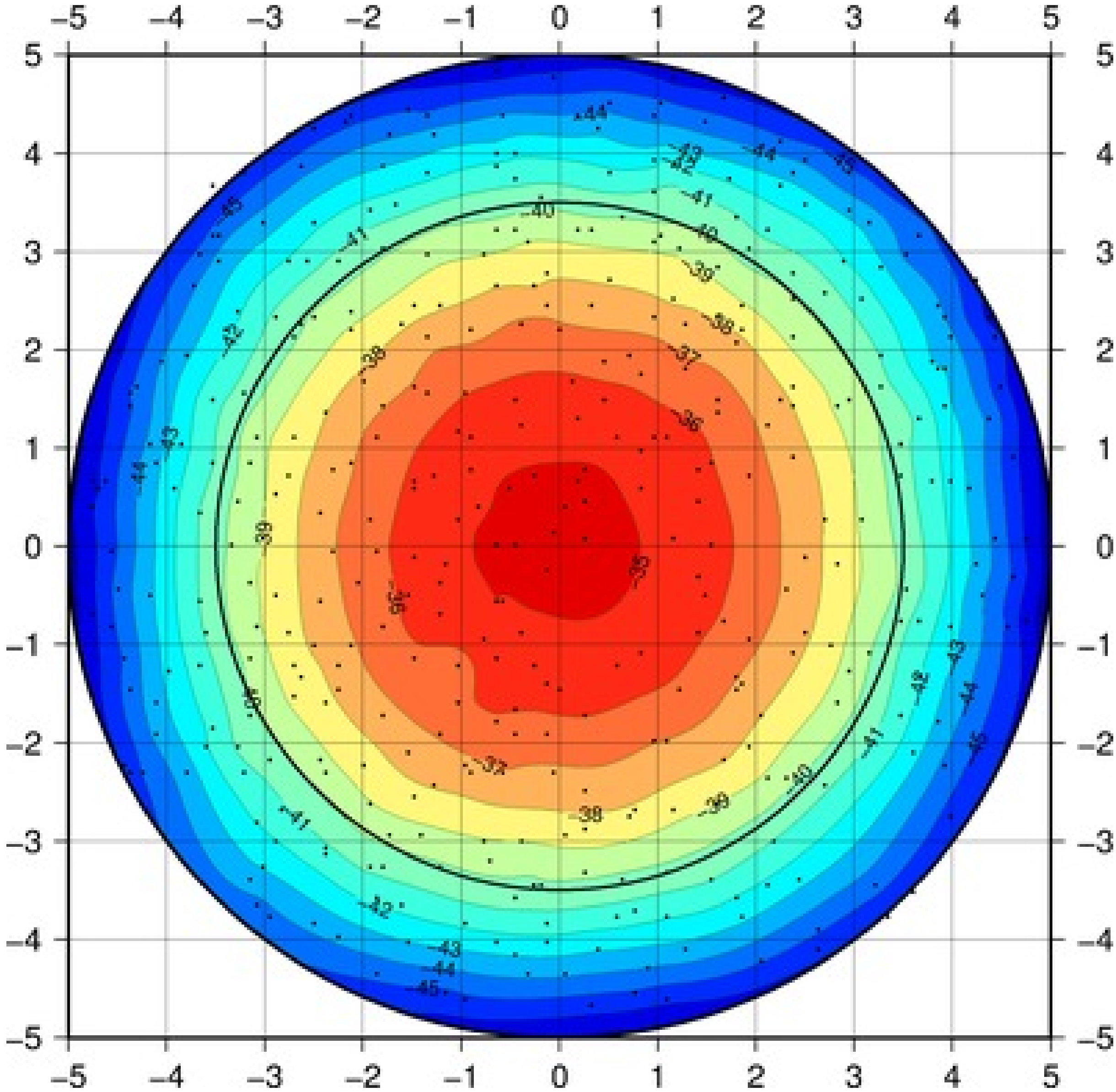

Figure 2: Uncompensated target strength of the standard copper sphere in the echosounder lobe on the frequency of 38 kHz. The calibration was carried during the Polish BIAS survey onboard r/v Baltica on September 17, 2015, on position 54°27, 56' N, 019°09, 46' E.

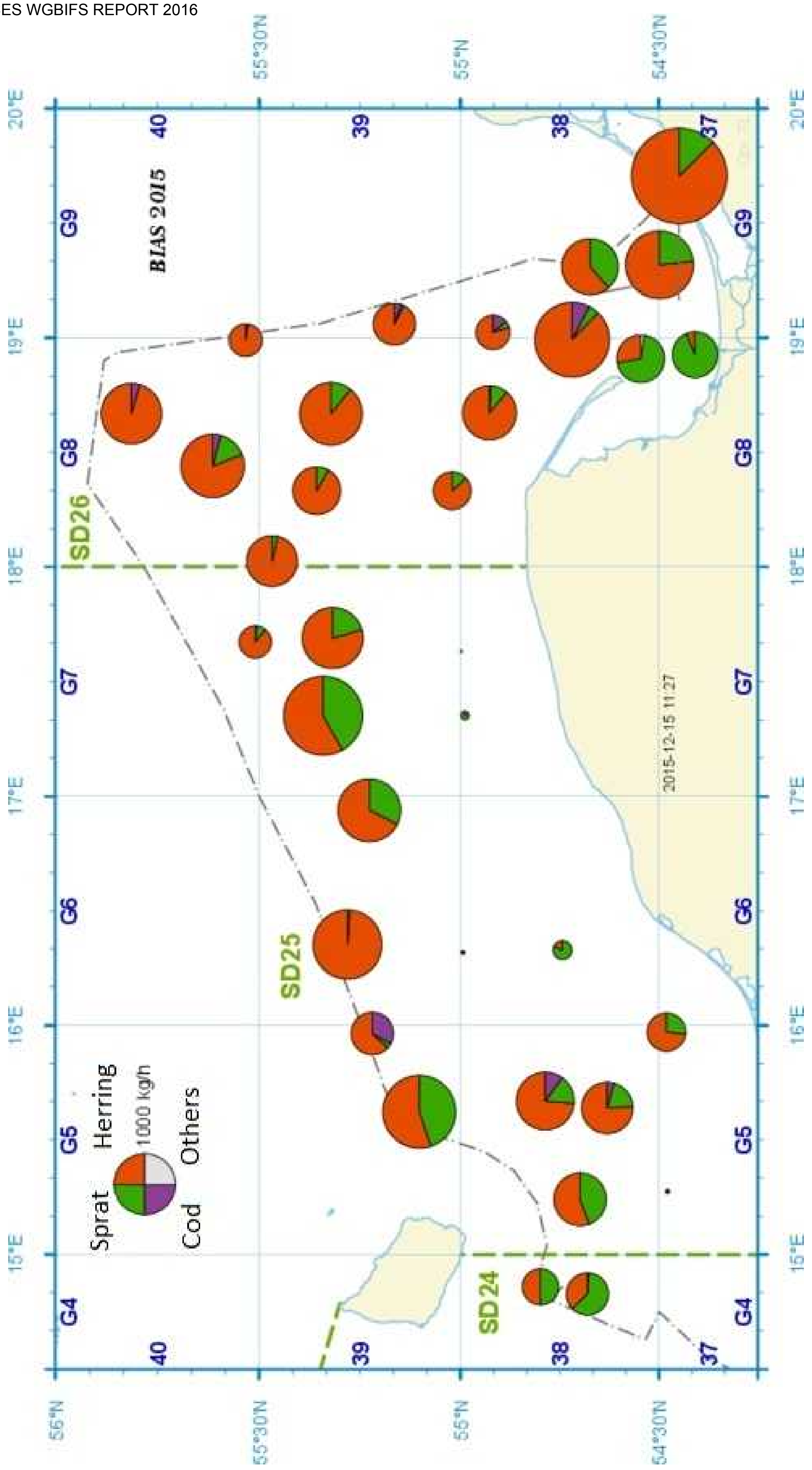

Figure 3: Catch per unit effort (1000 kg/h) of the main species during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

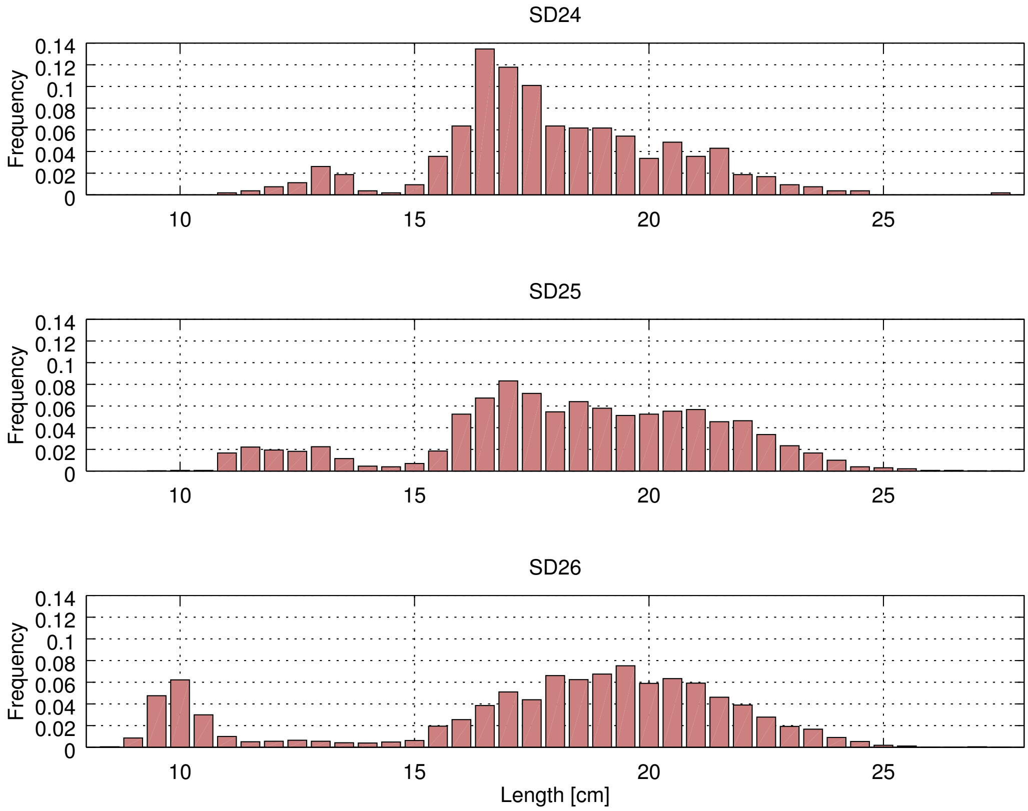

Figure 4: Herring length distribution in the ICES subdivisions. Samples collected during the Polish BIAS survey onboard r/v Baltica, 17.09.–04.10.2015.

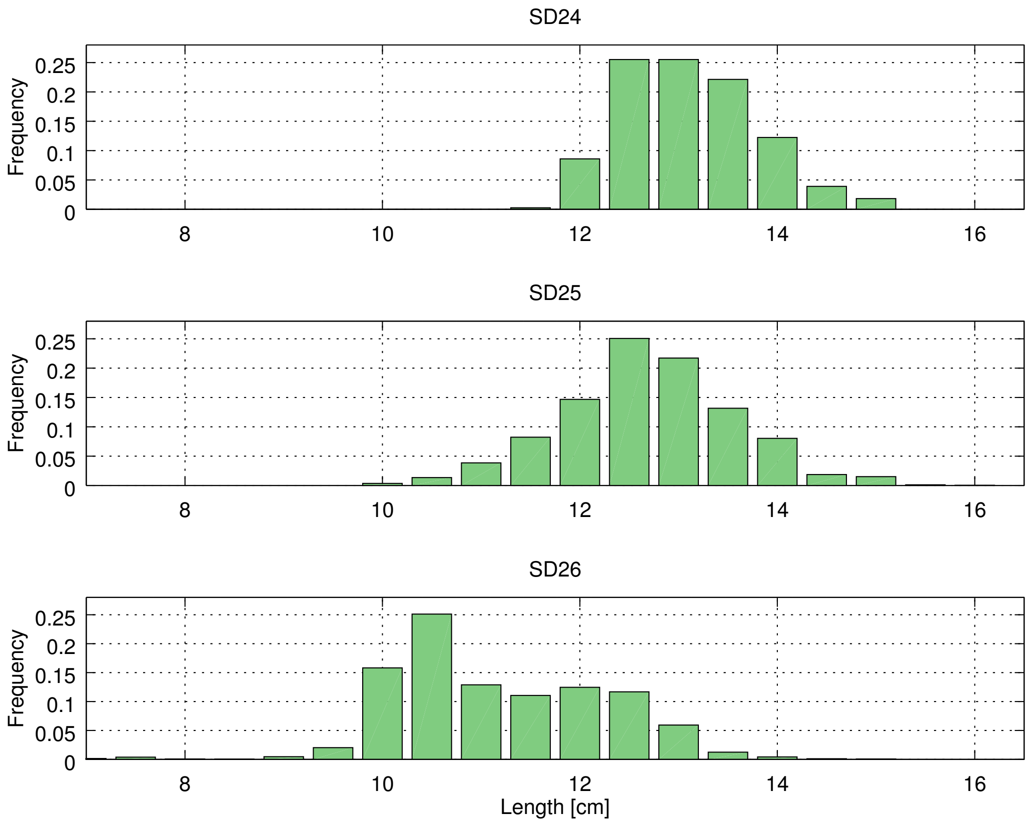

Figure 5: Sprat length distribution in the ICES subdivisions. Samples collected during the Polish BIAS survey onboard Baltica, 17.09.–04.10.2015.

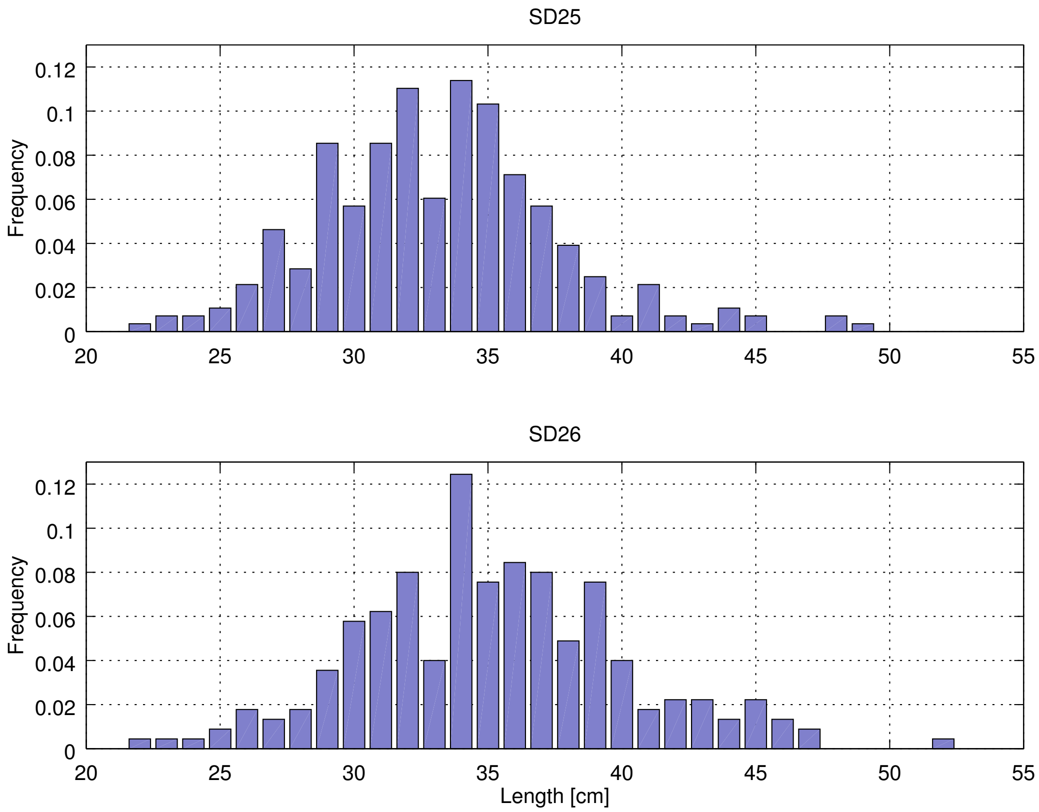

Figure 6: Cod length distribution in the ICES subdivisions. Samples collected during the Polish BIAS survey onboard Baltica, 17.09.–04.10.2015.

Luke
NATURAL RESOURCES
INSTITUTE FINLAND

Baltic International Acoustic Survey

Report for R/V Aranda

R/V Aranda

Cruise 14/2015

ICES_BIAS2015

25th September – 8th October 2015

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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.

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 2015, within the remit of the Natural Resources Institute Finland (Luke).

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 30 stations were visited during both legs. The research area, cruise track and trawl stations are shown in Figure 1 and 2. At 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 28.09.2015 at 23:00 (UTC 20:00) 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 8.10.2015 morning. The r/v Aranda arrived back to HELSINKI on Tuesday 08.10.2015 at 11:00. The harbour of Kaskinen was visited during the cruise at 01.10.2014 for change of scientific crew and repair the trawl. In addition, the harbour of Pori was visited at 03.10.2015 for fixing the vessel.

The Finnish BIAS 2015 survey had two interruptions due to technical faults and the fishing had to be stopped. The first fault was at 01.10.2015 in SD 39 when the trawl was damaged due to bottom contact. The second interruption was at between 2.-3.10.2015 due to a stormy weather, which damaged the vessel. Therefore, several fishing stations could not be realized and rectangles 55G9, 55H0, and 54H0 were not covered during the survey.

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 30.09.2015 at the sea, 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 Natural Resources Institute Finland (Luke). The acoustic measurements and fishing trawls were performed by Natural Resources Institute Finland (Luke) and fish sampling together by Luke and Swedish University of Agricultural Sciences (SLU). The participating scientist crew can be seen in the list below.

Juha Lilja	Luke	Cruise Leader, Acoustics
Ari Leskelä	Luke	Fishing
Jukka Pönni	Luke	Fish sampling
Tero Saari	Luke	Fish sampling
Hannu Harjunpää	SLU	Fish sampling
Mikko Jaukkuri	SLU	Fish sampling
Markku Vaajala	Luke	Fish sampling
Esa Lehtonen	Luke	Fish sampling
Arto Koskinen	Luke	Fish sampling
Jari Raitaniemi	Luke	Fish sampling
Erkki Jaala	Luke	Acoustics
Mikko Leminen	Luke	Acoustics
Jaakko Vedman	Luke	Acoustics
Perttu Rantanen	Luke	Database maintenance
Otto Kiukkonen		Fishing
Peter Koskinen		Fishing
Jari Johansson		Fishing
Markku Gavrilov	Luke	Fishing
Sami Vesala	Luke	Fishing
Yvette Heimbrand	SLU	Fish sampling
Anne Odelström	SLU	Fish sampling
Johanna Yliportimo	TY	Fish sampling
Anu Lastumäki	SYKE	Fish sampling

Luke: Luonnonvarakeskus / Natural Resources Institute Finland
SLU: Sveriges lantbruksuniversitet / Swedish University of Agricultural Sciences
TY: Turun yliopisto / University of Turku
SYKE: Suomen ympäristökeskus / Finnish Environment Institute

RESULTS

FISH CATCHES, BIOLOGICAL AND HYDRO-METEOROLOGICAL DATA

The number of planned trawling stations was 46. From these, 30 trawling stations were accomplished, and from those 29 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 18, in northern Baltic proper (SD 29) 6, and 6 in the northern Gulf of Finland (SD 32). The number of trawling stations was reduced mostly in SD 30 due to stormy weather and breakdown of the trawl gear.

The 6641 kg combined catches (Table 1) consisted of 17 fish species (6413 kg) and mostly unidentified organic matter categorized as "waist" (200 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 28 kg, and they are also included in the total catch. The most common and abundant species were sprat (*Sprattus sprattus*) (2868 kg) and herring (*Clupea harengus*) (2530 kg) followed by equally common species, three-spined stickleback (*Gasterosteus aculeatus*) (989 kg) and sprat (*Sprattus sprattus*) (263 kg). All observed species are presented in Table 2. From the sub-samples of the 29 fish catches a total of 16430 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, 2874 and 1333 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.

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 - 7. Total of 30 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 20770 square nautical miles (nmi^2) and after the scrutinizing, the distance used for acoustic estimates was 1504 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 2015.

SD	Day	Month	Haul Number	Atlantic salmon	Baltic herring	eelpout	greater sandeel	lumpsucker	nine-spined stickleback	sand goby	sea lamprey	small sandeel	smelt	snake blenny	sprat	straightnose pipefish	striped seasnail	three-spined stckleback	turbot	sarduria	waste	Total
32	29	9	1		117.0				0.1				0.0		1226.3			1.8		0.0	4.6	1350.0
30	30	9	2		129.7				0.0						1.9			0.6		0.0	20.8	153.0
30	30	9	3	0.8	136.4										1.0			0.6		0.0	1.2	140.0
30	30	9	4	INVALID																		28.0
30	30	9	5		118.5						2.8				12.7			392.3			1.6	528.0
30	30	9	6		58.2										2.3		0.0	62.8		0.0	7.6	131.0
30	1	10	7		66.1				0.0						0.3		0.0	4.6		0.0	1.4	72.3
30	2	10	8		164.6	0.0				0.0					21.7	0.0		19.6		0.0	9.1	215.0
30	2	10	9		62.7							0.0			4.1		0.2	9.6			1.4	78.0
30	2	10	10	0.3	16.3										0.6		0.0	143.3			13.5	174.0
30	4	10	11		121.3				0.0						23.0	0.0		28.6		0.0		173.0
30	4	10	12		77.3				0.8						2.3			10.1		0.0	1.6	92.0
30	4	10	13		43.3				0.0						0.2		0.2	2.0			1.9	47.6
30	4	10	14		49.5				0.1						1.6			21.8			2.0	75.0
30	4	10	15	3.0	108.9										4.0			84.2			3.0	203.0
30	4	10	16		89.9	0.0			0.1				10.0	0.0	9.7			17.9			1.9	129.5
30	5	10	17	0.2	70.1	0.0			0.0				0.2		18.1			23.9		0.0	1.4	114.0
30	5	10	18	0.2	39.3										2.1			25.8		0.0	2.6	70.0
30	5	10	19		72.6	0.2			0.0						0.9			22.1		0.0	4.1	100.0
29	5	10	20		99.4		0.0		0.1				0.0		79.8	0.0		16.5		0.1	8.9	205.0
29	6	10	21		54.2				0.0	0.0					27.0			0.8			1.9	84.0
29	6	10	22		70.6			0.3	0.2						63.1			25.9			14.9	175.0
29	6	10	23		6.3		0.0	0.1							71.3			44.6			39.6	162.0
29	6	10	24		191.4				0.1				0.1		99.2	0.0		4.3	0.1		4.8	300.0
29	6	10	25		124.5				0.2						375.2			14.0			19.1	533.0
32	7	10	26		47.9				0.1				0.4		207.1			2.8			9.8	268.0
32	7	10	27		10.5				0.0				0.0		135.7			2.1			4.5	153.0
32	7	10	28		40.0				0.1				1.9		148.9			1.5		0.0	12.6	205.0
32	8	10	29		211.4				0.1				1.3		207.3			2.6		0.0	2.3	425.0
32	8	10	30		132.3				0.1				0.2		120.6			2.5			2.2	258.0
				4.4	2530.4	0.2	0.0	0.4	2.1	0.0	2.8	0.0	14.2	0.0	2868.2	0.0	0.4	989.3	0.1	0.3	200.4	**6641.4**

Table 2. English, scientific, and Finnish names of observed species in Finnish BIAS-survey in 2015.

Fishnames		
English	**Scientific**	**Finnish**
snake blenny	Lumpenus lampretaeformis	Elaska
sand goby	Pomatoschistus minutus	Hietatokko
striped seasnail	Liparis liparis	Imukala
greater sandeel	Hyperoplus lanceolatus	Isotuulenkala
sarduria	Sarduria entomon	Kilkki
sprat	Sprattus sprattus	Kilohaili
eelpout	Zoarces viviparus	Kivinilkka
three-spined stckleback	Gasterosteus aculeatus	Kolmipiikki
jellyfish	Aurelia aurita	Korvameduusa
smelt	Osmerus eperlanus	Kuore
nine-spined stickleback	Pungitius pungitius	Kymmenpiikki
Atlantic salmon	Salmo salar	Lohi
sea lamprey	Petromyzon marinus	Meritaimen
turbot	Scophtalmus maximus	Piikkikampela
small sandeel	Ammodytes tobianus	Pikkutuulenkala
lumpsucker	Cyclopterus lumpus	Rasvakala
Baltic herring	Clupea harengus membras	Silakka
straightnose pipefish	Nerophis ophidion	Siloneula

Table 3. Number of length measurements /species and Sub-Division.

Species	ICES SD			Total
	29	30	32	
sand goby		1		1
striped seasnail		16		16
greater sandeel	2			2
sprat	1312	1622	1322	4256
eelpout		3		3
three-spined stckleback	533	1367	631	2531
smelt	3	94	43	140
nine-spined stickleback	66	88	71	225
Atlantic salmon		6		6
sea lamprey		1		1
turbot	1			1
small sandeel		1		1
lumpsucker	3			3
Baltic herring	1834	5455	1948	9237
straightnose pipefish	5	2		7
Total	3759	8656	4015	16430

Table 4. Numbers and locations of fishing stations (WGS-84) during Finnish BIAS-survey in 2015 (need to correct).

Statio	Trawl num.	Date	SD	Re(	Haul time (min)	Start lat.	Start lon.	Stop lat.	Stop lon.	Bottom depth (m)	Headrope depth (m)	Speed (knot	Trawl dist. (nmi	Door spread (m)	Total catch (kg)
1	48H3-1	29.09.2015	32	48H3	44			59.36	23.08	63	35	3	2.2	92	1350
2	50G8-1	30.09.2015	30	50G8	24			60.43	18.49	61	20	2.5	1	61	153
3	50G7-1	30.09.2015	30	50G7	46			60.46	18.02	57	13	2.8	2.15	62.5	140
4	51G8-1 (INVALID)	30.09.2015	30	51G8	45			61.06	18.29	35	10	2.2	1.65	62.5	28
5	51G9-1	30.09.2015	30	51G9	25			61.10	19.09	67	10	2.8	1.17	64.3	528
6	51G8-2	30.09.2015	30	51G8	30			61.21	18.55	72	15	2.8	1.4	62.8	131
7	51G7-1	01.10.2015	30	51G7	60			61.20	17.60	61	25	2.5	2.5	80	74
8	53H0-1	02.10.2015	30	53H0	56			62.14	20.35	72	20	2.8	2.61	68	215
9	53G9-1	02.10.2015	30	53G9	60			62.12	19.48	126	23	3.1	3.1	80.6	78
10	53G8-1	02.10.2015	30	53G8	60			62.08	18.49	90	16	3.3	3.3	78	174
11	52H0-1	04.10.2015	30	52H0	35			61.32	20.48	71	16	2.5	1.46	59.8	173
12	52H0-2	04.10.2015	30	52H0	35			61.50	20.23	94	23	2.8	1.63	72.5	92
13	52G9-1	04.10.2015	30	52G9	75			61.41	19.59	117	78	2.7	3.38	105	50
14	51H0-1	04.10.2015	30	51H0	135			61.26	20.16	127	77	3	6.75	94.9	75
15	51H0-2	04.10.2015	30	51H0	30			61.19	20.44	82	10	3	1.5	63	203
16	50H0-1	04.10.2015	30	50H0	28			60.56	20.35	63	17	2.8	1.31	62.5	130
17	50G9-1	05.10.2015	30	50G9	56			60.53	19.57	88	17	2.8	2.61	67.4	114
18	51G9-2	05.10.2015	30	51G9	45			61.04	19.56	107	15	3	2.25	70	70
19	50G9-2	05.10.2015	30	50G9	114			60.55	19.22	114	80	2.5	4.75	105.2	100
20	49G9-1	05.10.2015	29	49G9	45			60.05	19.03	153	17	3	2.25	68.2	205
21	48G9-1	06.10.2015	29	48G9	25			59.46	19.47	146	18	2.8	1.17	67.6	84
22	47H0-1	06.10.2015	29	47H0	60			59.16	20.39	84	32	3	3	78	175
23	48H1-1	06.10.2015	29	48H1	62			59.32	21.14	88	17	2.6	2.69	60.4	162
24	48H2-1	06.10.2015	29	48H2	22			59.32	22.12	72	22	2.6	0.95	64	300
25	48H2-2	06.10.2015	29	48H2	20			59.31	22.56	80	33	2.6	0.87	84	533
26	48H3-2	07.10.2015	32	48H3	11			59.32	23.25	94	28	3	0.55	78.3	268
27	48H4-1	07.10.2015	32	48H4	11			59.43	24.04	75	13	3.2	0.59	62.8	153
28	49H6-1	07.10.2015	32	49H6	20			60.04	26.20	68	19	2.7	0.9	71.4	205
29	48H5-1	08.10.2015	32	48H5	17			59.57	25.35	67	22	2.7	0.76	66.7	425
30	49H5-1	08.10.2015	32	49H5	11			60.01	25.20	57	16	2.8	0.51	63.8	258

Table 5. Individual samples of herring and sprat (for age-determination) per SD.

Length class	29		30		32		Sprat Total	Herring Total	Grand Total
	Sprat	Herring	Sprat	Herring	Sprat	Herring			
40		1		1				2	2
45				1				1	1
50		1		1		1		3	3
55		1		5		2		8	8
60	8	2	1	15	1	3	10	20	30
65	11	3	1	18	6	4	18	25	43
70	12	4	1	21	5	2	18	27	45
75	13	4	1	19	4	2	18	25	43
80	9	2	4	18	1	2	14	22	36
85	5	2		22	26	2	31	26	57
90	20	1	2	20	43	3	65	24	89
95	22	1	5	21	43	6	70	28	98
100	49	6	28	40	37	32	114	78	192
105	41	28	86	30	8	50	135	108	243
110	23	39	100	13	17	50	140	102	242
115	29	40	99	27	30	50	158	117	275
120	18	40	72	57	25	50	115	147	262
125	21	40	78	98	14	25	113	163	276
130	16	40	91	110	3	27	110	177	287
135	15	34	86	128		40	101	202	303
140		30	61	130		36	61	196	257
145		28	37	118		40	37	186	223
150		23	5	113		31	5	167	172
155		25		111		36		172	172
160		23		109		18		150	150
165		24		101		15		140	140
170		5		96		6		107	107
175		3		87		2		92	92
180		4		78				82	82
185		3		71		1		75	75
190				63				63	63
195		5		51				56	56
200		1		28		1		30	30
205				22				22	22
210				17				17	17
215				6				6	6
220		1		3				4	4
225				2				2	2
245				2				2	2
Total	312	464	758	1873	263	537	1333	2874	4207

Table 6. Survey statistics by area r/v Aranda 2015.

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	47H0	40	16.40449	920.3	1299	0.791852	15097	44.08	39.43	0	10.46	6.30
29	48G9	59	8.89974	772.8	1120	1.258747	6878	66.07	32.96	0	13.01	6.69
29	48H0	44	20.40612	730.3	1386	0.679265	14903	27.54	47.44	0	7.30	6.50
29	48H1	62	29.63491	544	1662	0.560717	16121	5.18	58.26	0	2.32	2.83
29	48H2	65	58.25315	597	1993	0.342126	34777	38.15	59.49	0	11.54	6.36
32	48H3	64	23.99524	615.7	2268	0.945054	14774	12.98	86.39	0	9.32	5.86
32	48H4	77	22.71351	835.1	1898	0.835735	18968	7.10	91.44	0	8.65	5.22
32	48H5	52	21.90068	767.2	2214	1.011008	16802	50.01	49.05	0	8.95	5.17
29	49G9	71	6.31966	564.2	445	0.703840	3566	50.68	40.72	0	7.02	4.65
32	49H5	17	18.21147	306.9	1811	0.994529	5589	51.74	47.16	0	12.42	5.68
32	49H6	45	6.79130	586.5	614	0.904124	3983	20.79	77.39	0	9.36	5.27
30	50G7	19	1.97897	403.1	331	1.671794	798	98.29	0.75	0	14.52	10.17
30	50G8	51	1.93603	833.4	387	1.999793	1613	98.12	1.45	0	18.91	11.44
30	50G9	66	5.64844	879.5	410	0.726698	4968	66.25	11.60	0	12.14	10.22
30	50H0	26	7.23652	795.1	560	0.773210	5754	70.45	7.63	0	10.67	10.26
30	51G7	29	2.74408	614.5	436	1.588334	1686	93.15	0.37	0	30.65	12.38
30	51G8	63	17.08100	863.7	914	0.535311	14753	47.19	1.85	0	29.94	12.16
30	51G9	67	10.69268	865.8	463	0.432825	9258	24.90	2.46	0	19.37	11.76
30	51H0	74	10.02432	865.7	492	0.490910	8678	55.44	1.99	0	17.38	12.27
30	52G7	16	2.91495	482.6	463	1.588334	1407	93.15	0.37	0	30.65	12.38
30	52G8	58	9.34716	852	430	0.459614	7964	32.59	1.28	0	21.18	11.87
30	52G9	90	3.19797	852	516	1.614095	2725	94.83	0.38	0	22.04	13.46
30	52H0	73	3.23436	852	347	1.073064	2756	75.38	9.62	0	17.50	10.92
30	52H1	25	4.17919	263.9	448	1.073064	1103	70.13	13.31	0	17.50	10.92
30	53G8	77	11.35098	838.1	449	0.395148	9513	10.15	0.40	0	10.40	10.55
30	53G9	35	2.62984	838.1	269	1.021395	2204	81.85	5.32	0	22.33	12.73
30	53H0	50	3.98123	838.1	423	1.062095	3337	79.93	10.53	0	18.34	10.34
30	53H1	9	4.90504	126.6	521	1.062095	621	79.93	10.53	0	18.34	10.34
30	54G8	23	6.23877	642.2	286	0.458064	4007	33.31	1.99	0	17.07	12.57
30	54G9	57	1.90261	824.2	200	1.051480	1568	80.42	9.19	0	20.33	11.15

Table 7. Numbers (millions) of herring by age and area (r/v Aranda 2015).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	47H0	135.2	6083.1	183.6	122.3	43.8	21.3	23.8	10.2	31.8	6655.3
29	48G9	318.5	2985.1	392.6	276.5	141.7	47.8	94.5	72.6	214.7	4544.1
29	48H0	1595.9	2297.2	69.3	46.2	16.6	8.1	9.0	3.9	12.0	4058.1
29	48H1	810.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	810.7
29	48H2	157.5	9817.0	1346.3	857.9	369.5	142.8	231.1	135.3	210.0	13267.3
32	48H3	50.3	1631.6	95.7	39.3	21.1	17.1	25.1	15.4	19.0	1914.5
32	48H4	60.6	1143.3	71.3	30.6	12.6	9.4	11.1	3.5	4.4	1346.7
32	48H5	230.1	7345.4	472.6	136.1	57.6	44.0	55.6	35.6	26.5	8403.5
29	49G9	975.5	700.1	58.1	25.8	14.3	6.0	7.1	6.2	8.1	1801.2
32	49H5	38.2	2389.0	203.4	75.2	40.8	30.1	50.9	21.2	34.2	2882.9
32	49H6	127.6	527.1	52.6	23.7	16.6	12.2	24.9	13.7	17.0	815.4
30	50G7	3.1	741.5	35.0	2.9	0.8	0.1	0.0	0.5	0.0	784.1
30	50G8	0.5	936.4	314.7	129.6	74.6	29.6	26.1	21.8	49.8	1583.1
30	50G9	1205.8	1514.2	326.1	107.6	57.1	19.8	16.8	16.5	27.5	3291.4
30	50H0	1931.4	1449.9	365.4	137.9	71.5	25.4	22.8	16.1	33.5	4053.7
30	51G7	0.0	153.2	313.6	235.1	209.1	124.7	116.3	94.4	324.4	1570.7
30	51G8	44.5	914.8	1044.2	1025.8	953.9	577.8	528.7	402.7	1469.1	6961.5
30	51G9	135.4	1694.1	329.3	76.1	31.8	9.2	5.9	9.5	13.9	2305.1
30	51H0	798.2	1876.6	943.0	453.3	268.6	106.7	92.5	74.2	198.1	4811.3
30	52G7	0.0	127.8	261.6	196.1	174.4	104.0	97.0	78.7	270.6	1310.4
30	52G8	820.7	300.8	273.4	246.9	230.0	138.9	128.4	98.4	357.9	2595.4
30	52G9	3.5	892.3	817.7	386.7	205.1	65.0	56.9	47.8	108.8	2583.8
30	52H0	304.2	981.7	347.8	159.7	97.0	40.8	36.4	28.1	75.2	2070.9
30	52H1	113.3	365.5	129.5	59.4	36.1	15.2	13.6	10.5	28.0	771.0
30	53G8	673.5	93.5	48.7	29.9	28.1	16.7	16.3	13.0	46.3	966.0
30	53G9	60.4	689.9	376.5	188.3	140.9	73.3	65.3	52.9	156.5	1804.0
30	53H0	582.3	1070.9	294.2	159.3	132.4	75.6	72.8	59.4	204.0	2650.9
30	53H1	108.4	199.3	54.8	29.6	24.6	14.1	13.5	11.1	38.0	493.4
30	54G8	435.2	342.3	185.4	96.1	75.4	40.5	37.0	29.8	93.0	1334.6
30	54G9	159.0	494.4	201.1	103.4	80.6	43.5	40.0	32.5	102.9	1257.4

Table 8. Mean weight (g) of herring by age and area (r/v Aranda 2015).

SD	Rect.	0	1	2	3	4	5	6	7	8+
29	47H0	4.1	9.8	16.0	17.8	18.3	22.3	21.4	21.5	35.9
29	48G9	2.8	10.0	17.5	20.1	20.3	22.5	20.7	23.1	33.0
29	48H0	2.0	9.8	16.0	17.8	18.3	22.3	21.4	21.5	35.9
29	48H1	1.9								
29	48H2	6.0	9.5	16.7	18.5	19.3	21.9	21.0	22.5	20.4
32	48H3	5.8	8.0	14.6	18.0	19.0	19.1	20.4	20.3	21.6
32	48H4	4.3	7.8	14.6	17.3	18.4	17.5	19.9	18.3	19.5
32	48H5	4.8	8.1	14.7	17.1	17.8	18.0	19.4	19.2	18.9
29	49G9	2.3	10.4	16.5	20.5	20.0	23.1	22.3	22.8	19.1
32	49H5	7.5	8.1	14.7	17.9	18.8	18.8	22.8	19.9	29.6
32	49H6	2.5	8.3	14.5	19.1	20.1	20.2	21.2	20.9	22.7
30	50G7	10.0	14.2	16.0	17.4	17.4	18.6	19.6	16.7	
30	50G8	10.9	15.2	19.7	23.6	26.2	30.7	32.2	31.5	42.3
30	50G9	3.9	14.8	19.1	22.9	25.6	29.5	30.4	28.2	35.0
30	50H0	4.3	13.8	19.9	22.9	25.6	29.4	30.6	29.0	36.6
30	51G7	0.0	16.2	21.6	25.7	30.1	34.2	34.8	37.1	41.8
30	51G8	3.2	16.2	21.5	26.2	30.3	34.4	35.0	36.0	42.4
30	51G9	3.9	15.2	18.3	21.0	23.4	27.7	29.8	25.4	39.8
30	51H0	4.1	14.9	20.2	23.9	26.7	30.7	31.9	31.5	41.6
30	52G7		16.2	21.6	25.7	30.1	34.2	34.8	37.1	41.8
30	52G8	2.5	16.1	21.2	26.1	30.3	34.3	34.9	36.1	42.4
30	52G9	10.0	15.7	20.5	23.6	25.8	29.9	31.0	30.3	38.1
30	52H0	3.9	14.5	20.1	23.8	27.0	31.5	33.4	32.7	41.2
30	52H1	3.9	14.5	20.1	23.8	27.0	31.5	33.4	32.7	41.2
30	53G8	2.5	16.0	20.1	25.4	30.3	33.6	34.7	36.5	41.9
30	53G9	3.7	15.8	20.0	24.4	28.9	33.3	34.1	34.3	39.3
30	53H0	3.0	14.5	19.9	25.0	29.7	33.9	34.8	36.2	42.4
30	53H1	3.0	14.5	19.9	25.0	29.7	33.9	34.8	36.2	42.4
30	54G8	2.6	15.9	20.0	24.6	29.2	33.4	34.3	34.9	40.1
30	54G9	3.1	15.1	20.0	24.6	29.2	33.6	34.4	35.1	40.7

Table 9. Total biomass (ton) of herring by age and area (r/v Aranda 2015).

SD	Rect.	SUM	0	1	2	3	4	5	6	7	8+
29	47H0	68282.2	552.3	59462.3	2940.0	2176.9	803.3	476.3	508.6	220.1	1142.3
29	48G9	57912.4	893.9	29920.3	6877.5	5552.6	2878.9	1073.1	1960.0	1677.6	7078.5
29	48H0	28720.6	3143.6	22454.9	1110.3	822.1	303.3	179.9	192.0	83.1	431.4
29	48H1	1540.2	1540.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	48H2	154764.5	943.0	92941.0	22534.5	15905.8	7133.6	3132.1	4850.8	3048.2	4275.6
32	48H3	17481.1	292.9	13122.0	1400.6	706.4	399.5	326.5	510.9	312.7	409.5
32	48H4	11551.4	259.3	8957.4	1037.6	530.4	230.8	164.6	221.4	63.9	86.0
32	48H5	73833.6	1097.9	59394.3	6933.0	2327.9	1026.6	790.1	1078.7	685.4	499.7
29	49G9	11921.8	2245.3	7311.6	958.4	527.0	286.4	139.2	157.8	141.8	154.4
32	49H5	27914.1	288.2	19363.3	2993.1	1347.7	766.7	564.9	1157.5	421.9	1010.7
32	49H6	7659.2	314.8	4350.1	760.1	452.8	334.0	245.8	528.9	286.0	386.6
30	50G7	11201.1	31.5	10531.8	562.0	51.2	14.1	2.0	0.4	8.1	0.0
30	50G8	30028.5	5.7	14254.6	6202.5	3065.0	1957.3	909.9	841.8	685.4	2106.3
30	50G9	39793.0	4673.0	22437.5	6238.2	2460.1	1464.1	583.4	510.7	463.9	962.0
30	50H0	43710.2	8255.7	20043.7	7281.6	3163.0	1830.9	745.6	697.2	466.7	1225.9
30	51G7	46956.4	0.0	2482.7	6774.2	6031.3	6284.3	4264.8	4047.6	3501.5	13569.9
30	51G8	208350.6	144.6	14828.0	22415.7	26862.2	28887.6	19867.0	18482.8	14513.0	62349.8
30	51G9	35932.7	526.8	25809.4	6027.9	1602.2	744.0	253.6	174.8	241.8	552.2
30	51H0	85041.0	3281.5	27886.1	19061.0	10825.3	7181.0	3274.9	2954.7	2337.2	8239.3
30	52G7	39173.6	0.0	2071.2	5651.4	5031.7	5242.7	3557.9	3376.7	2921.1	11320.8
30	52G8	54061.8	2066.5	4848.7	5788.0	6436.7	6964.0	4760.0	4483.8	3555.0	15159.1
30	52G9	54573.0	34.8	14035.8	16779.9	9129.4	5298.5	1944.6	1760.1	1446.5	4143.5
30	52H0	35391.5	1174.2	14274.6	7003.8	3805.0	2614.8	1287.2	1216.1	919.5	3096.1
30	52H1	13176.4	437.2	5314.5	2607.6	1416.6	973.5	479.2	452.8	342.3	1152.7
30	53G8	9311.6	1690.5	1493.7	978.3	757.8	849.8	560.0	567.1	473.6	1940.7
30	53G9	39970.6	221.6	10922.3	7527.9	4596.4	4068.0	2443.1	2230.1	1812.0	6149.2
30	53H0	46927.9	1741.0	15508.0	5865.0	3988.4	3933.7	2559.5	2534.7	2153.5	8644.1
30.0	53H1	8733.6	324.0	2886.1	1091.5	742.3	732.1	476.3	471.7	400.8	1608.7
30.0	54G8	22204.0	1121.3	5427.4	3709.5	2362.7	2200.2	1351.6	1267.8	1038.0	3725.4
30.0	54G9	25062.6	489.6	7484.2	4016.1	2548.6	2351.3	1458.8	1378.5	1142.3	4193.0

Table 10. Numbers (millions) of sprat by age and area (r/v Aranda 2015).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	47H0	1018.2	4008.4	185.3	332.9	202.6	63.6	67.4	34.2	40.1	5952.8
29	48G9	269.2	1723.8	51.1	103.5	61.3	15.9	19.9	10.2	11.9	2266.8
29	48H0	4033.1	2592.6	93.4	163.2	93.5	30.6	29.9	15.1	17.8	7069.2
29	48H1	7594.6	1727.9	23.8	33.0	7.6	5.1	0.0	0.0	0.0	9391.9
29	48H2	3076.3	11500.3	947.3	2678.2	1225.1	361.4	225.3	393.9	282.5	20690.3
32	48H3	264.6	11003.3	305.9	683.2	173.8	65.8	85.5	61.6	119.5	12763.2
32	48H4	1015.4	15315.2	252.2	482.2	122.5	31.5	49.8	13.2	61.7	17343.5
32	48H5	92.4	7646.8	99.4	252.6	52.7	9.2	16.2	13.4	58.4	8241.2
29	49G9	917.3	415.8	27.2	41.3	21.7	6.0	7.9	6.6	8.1	1451.9
32	49H5	10.0	2323.4	67.8	144.5	44.2	7.8	10.8	7.0	20.5	2636.0
32	49H6	55.2	2989.0	6.6	19.4	4.7	1.0	1.6	1.0	3.8	3082.4
30	50G7	0.0	4.5	0.2	0.3	0.4	0.1	0.1	0.2	0.2	6.0
30	50G8	0.0	14.0	0.9	1.9	2.2	0.3	0.5	1.1	2.7	23.5
30	50G9	6.6	368.3	17.6	45.3	58.4	9.9	10.2	20.0	37.6	574.0
30	50H0	0.0	340.7	14.3	22.7	24.6	4.3	4.7	9.4	18.3	439.0
30	51G7	0.0	2.5	0.3	0.8	1.0	0.2	0.2	0.4	0.8	6.2
30	51G8	0.0	151.1	8.4	26.5	34.3	6.4	6.5	13.8	25.3	272.3
30	51G9	4.4	98.3	5.9	23.9	34.1	6.4	7.1	15.7	32.2	228.1
30	51H0	0.0	42.3	5.9	25.1	34.7	6.2	7.5	15.4	35.9	173.0
30	52G7	0.0	2.1	0.2	0.7	0.8	0.2	0.2	0.4	0.6	5.2
30	52G8	0.0	57.5	3.3	9.5	12.1	2.2	2.4	5.0	9.7	101.6
30	52G9	0.0	2.0	0.3	1.5	2.3	0.4	0.5	1.0	2.3	10.4
30	52H0	0.0	87.9	11.7	40.7	54.2	9.1	9.1	18.5	33.9	265.1
30	52H1	0.0	48.7	6.5	22.6	30.0	5.0	5.0	10.3	18.8	146.8
30	53G8	0.0	23.4	1.4	2.9	3.3	0.6	0.9	1.5	4.0	38.1
30	53G9	0.0	42.5	4.7	18.0	24.3	4.0	3.7	7.6	12.5	117.3
30	53H0	0.0	110.8	13.9	48.9	67.6	11.5	13.2	26.4	58.9	351.2
30	53H1	0.0	20.6	2.6	9.1	12.6	2.1	2.5	4.9	11.0	65.4
30	54G8	0.0	30.4	3.2	11.8	15.8	2.6	2.5	5.0	8.5	79.7
30	54G9	0.0	47.8	5.7	20.7	28.4	4.8	5.1	10.3	21.2	144.0

Table 11. Mean weight (g) of sprat by age and area (r/v Adanda 2015).

SD	Rect.	0	1	2	3	4	5	6	7	8+
29	47H0	2.24	6.27	8.74	9.51	10.67	10.24	11.28	11.36	11.24
29	48G9	2.50	6.41	8.60	9.77	10.66	10.48	10.92	10.91	10.54
29	48H0	2.15	6.07	8.76	9.46	10.60	10.14	11.28	11.36	11.24
29	48H1	2.14	5.64	8.89	8.95	8.95	8.95	0.00	0.00	0.00
29	48H2	2.12	5.54	9.30	9.89	10.38	10.11	11.24	10.36	10.66
32	48H3	2.03	5.19	8.56	8.99	9.38	9.82	9.55	10.31	9.20
32	48H4	2.18	5.16	8.63	8.72	9.24	9.05	8.90	9.62	8.57
32	48H5	2.08	5.16	8.40	9.07	9.53	8.87	8.77	10.16	9.54
29	49G9	2.38	6.76	8.56	9.49	10.57	10.40	10.95	11.14	10.86
32	49H5	2.32	4.99	8.57	9.10	9.36	9.25	9.08	9.82	8.99
32	49H6	2.00	5.11	8.81	9.09	9.55	9.01	8.87	10.03	9.48
30	50G7	0.00	9.32	10.19	12.94	13.61	13.83	14.03	14.01	14.15
30	50G8	0.00	9.34	10.82	12.37	13.10	13.18	14.21	14.93	15.58
30	50G9	2.97	9.20	10.74	12.74	13.22	13.43	13.77	13.89	14.41
30	50H0	0.00	9.42	10.38	12.44	13.31	13.54	13.89	14.10	14.61
30	51G7	0.00	9.96	11.04	12.75	13.33	13.64	13.97	14.38	14.83
30	51G8	0.00	9.51	10.69	12.97	13.54	13.73	14.07	14.04	14.45
30	51G9	3.05	9.21	11.00	13.12	13.49	13.71	14.22	14.48	15.10
30	51H0	0.00	9.92	11.20	13.00	13.56	13.74	14.25	14.36	15.05
30	52G7	0.00	9.96	11.04	12.75	13.33	13.64	13.97	14.38	14.83
30	52G8	0.00	9.43	10.69	12.90	13.55	13.75	14.09	14.09	14.53
30	52G9	0.00	10.52	11.19	13.17	13.71	13.85	14.38	14.25	14.77
30	52H0	0.00	9.59	11.36	12.74	13.08	13.31	13.69	14.03	14.70
30	52H1	0.00	9.59	11.36	12.74	13.08	13.31	13.69	14.03	14.70
30	53G8	0.00	9.11	10.71	12.51	13.65	13.88	14.22	14.36	14.86
30	53G9	0.00	9.26	11.38	12.80	13.06	13.26	13.55	13.76	14.26
30	53H0	0.00	9.68	11.30	12.80	13.26	13.47	14.02	14.29	15.04
30	53H1	0.00	9.68	11.30	12.80	13.26	13.47	14.02	14.29	15.04
30	54G8	0.00	9.24	11.34	12.78	13.08	13.28	13.58	13.79	14.31
30	54G9	0.00	9.53	11.33	12.80	13.19	13.39	13.87	14.13	14.85

Table 12. Total biomass (ton) of sprat by age and area (r/v Aranda 2015).

SD	Rect.	0	1	2	3	4	5	6	7	8+	Total
29	47H0	2282.7	25119.7	1619.2	3165.6	2161.9	651.8	760.1	388.1	451.0	36600.2
29	48G9	672.3	11044.8	439.4	1011.3	653.4	166.6	217.5	111.4	125.1	14441.7
29	48H0	8677.7	15733.4	817.8	1543.4	991.0	310.5	337.1	172.1	200.0	28783.0
29	48H1	16254.3	9739.0	211.3	295.6	68.2	45.5	0.0	0.0	0.0	26613.8
29	48H2	6509.4	63761.2	8811.4	26496.2	12717.9	3654.4	2532.1	4081.4	3012.3	131576.3
32	48H3	536.2	57110.6	2619.5	6139.2	1631.4	646.3	816.7	635.5	1098.7	71233.9
32	48H4	2217.9	78997.8	2175.5	4204.1	1131.5	284.9	443.0	126.8	529.0	90110.6
32	48H5	192.4	39481.7	835.5	2290.7	502.3	81.2	142.1	136.5	557.3	44219.7
29	49G9	2186.0	2810.7	232.9	391.6	229.6	62.4	87.0	73.1	87.8	6161.2
32	49H5	23.3	11586.9	581.4	1314.5	413.8	72.3	98.3	68.3	184.0	14342.7
32	49H6	110.4	15282.7	58.3	176.2	45.3	8.8	14.1	10.3	36.1	15742.3
30	50G7	0.0	42.1	1.6	4.3	5.4	1.1	1.0	2.3	3.5	61.4
30	50G8	0.0	131.1	9.5	23.1	28.4	4.3	6.8	15.7	41.4	260.4
30	50G9	19.6	3390.4	189.3	577.2	772.3	133.3	140.6	277.8	541.3	6041.8
30	50H0	0.0	3209.6	148.1	282.9	326.8	58.1	65.3	132.7	268.0	4491.5
30	51G7	0.0	24.8	3.1	10.5	13.3	2.6	2.8	6.2	11.4	74.6
30	51G8	0.0	1436.9	89.8	344.1	464.9	87.5	91.5	193.8	365.4	3073.8
30	51G9	13.3	905.2	64.9	314.1	460.5	87.5	101.5	227.6	486.2	2660.9
30	51H0	0.0	419.9	66.2	325.7	470.9	85.7	106.5	221.0	539.8	2235.7
30	52G7	0.0	20.7	2.6	8.7	11.1	2.1	2.3	5.2	9.5	62.3
30	52G8	0.0	542.1	34.8	122.8	164.2	30.8	34.0	69.9	140.4	1138.9
30	52G9	0.0	21.5	3.4	20.4	32.2	6.0	7.2	14.4	33.3	138.3
30	52H0	0.0	843.2	132.6	519.0	709.2	121.2	124.6	259.8	498.0	3207.6
30	52H1	0.0	467.0	73.4	287.4	392.8	67.1	69.0	143.9	275.8	1776.5
30	53G8	0.0	213.5	15.4	36.2	45.4	8.2	12.4	22.0	59.6	412.7
30	53G9	0.0	393.8	53.7	230.0	316.9	53.1	50.8	103.9	179.0	1381.1
30	53H0	0.0	1073.1	157.1	626.0	896.5	154.9	184.9	376.9	886.0	4355.4
30	53H1	0.0	199.7	29.2	116.5	166.8	28.8	34.4	70.1	164.9	810.6
30	54G8	0.0	280.8	36.2	150.4	206.6	34.7	33.9	68.8	121.9	933.2
30	54G9	0.0	454.9	64.9	265.4	375.0	64.1	71.2	145.4	314.4	1755.4

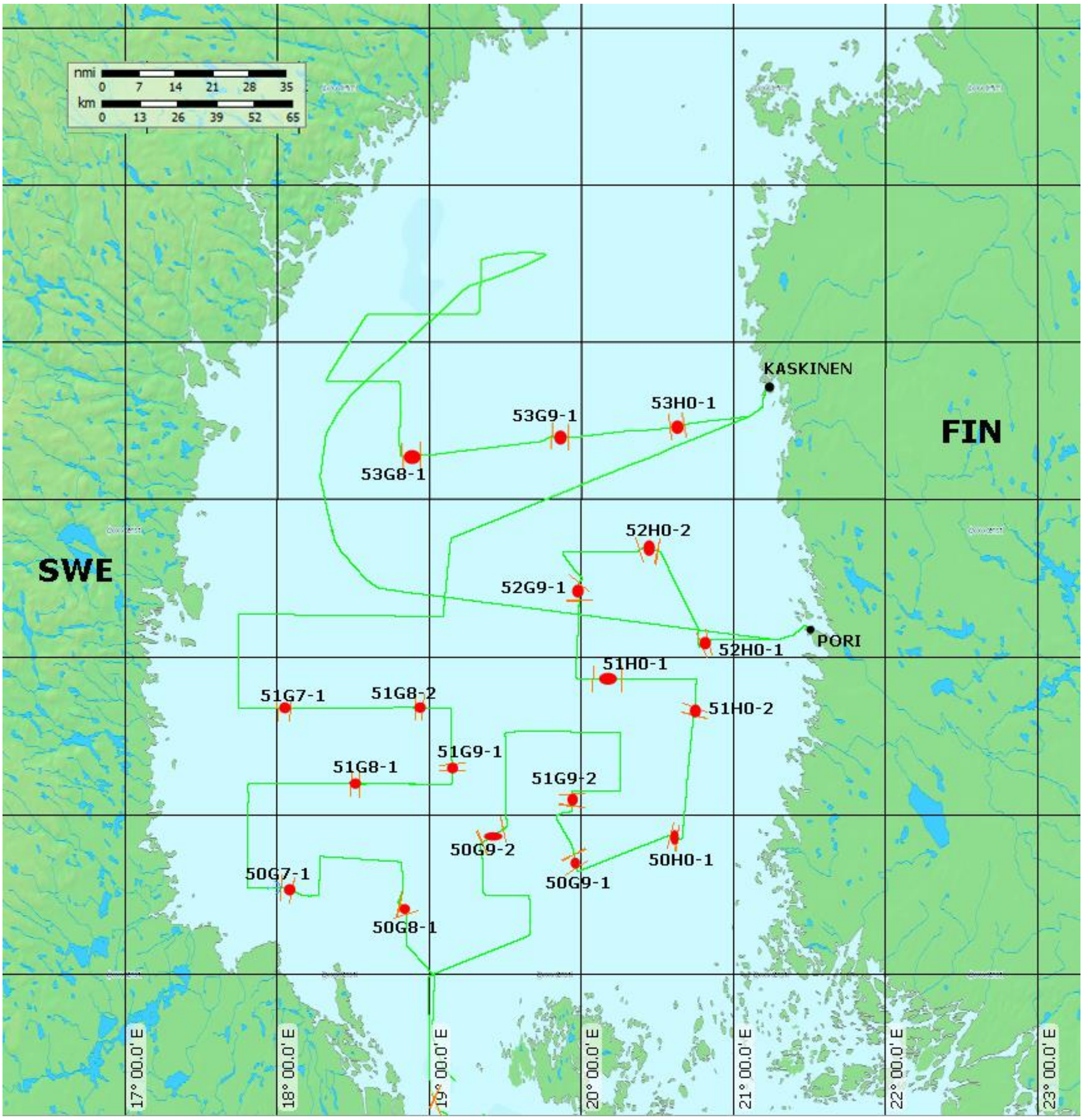

Figure 1. Cruise track of r/v Aranda in SD 30 during the BIAS-survey in 2015.

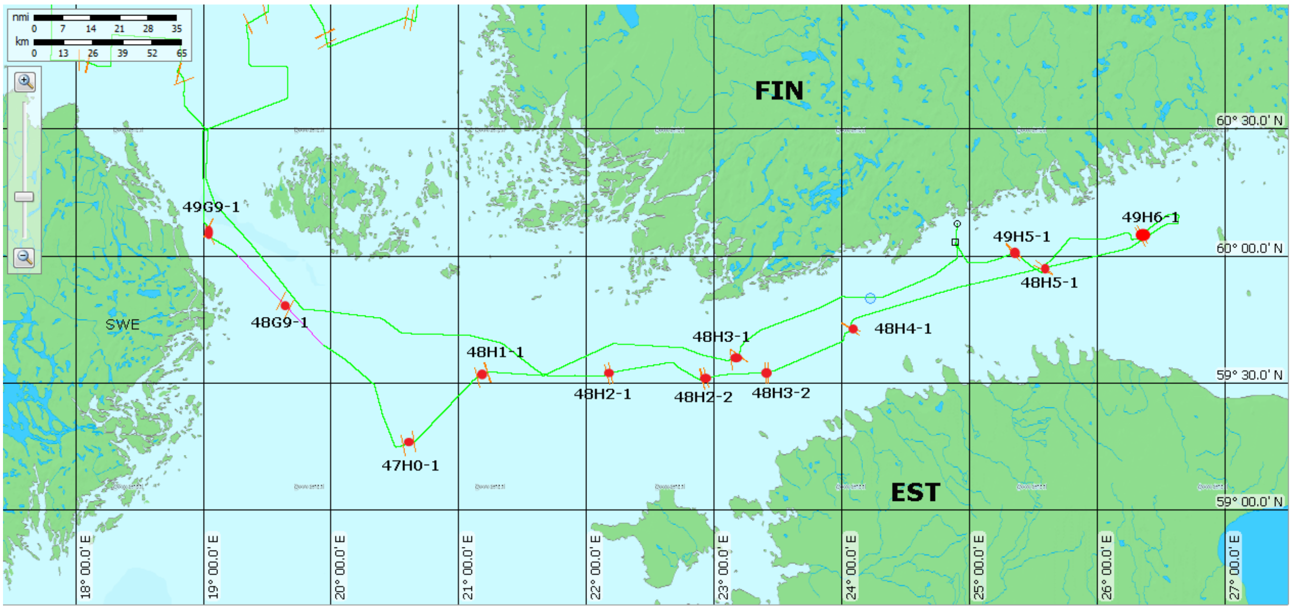

Figure 2. Cruise track of r/v Aranda in SD 29N and SD 32 during the BIAS-survey in 2015.

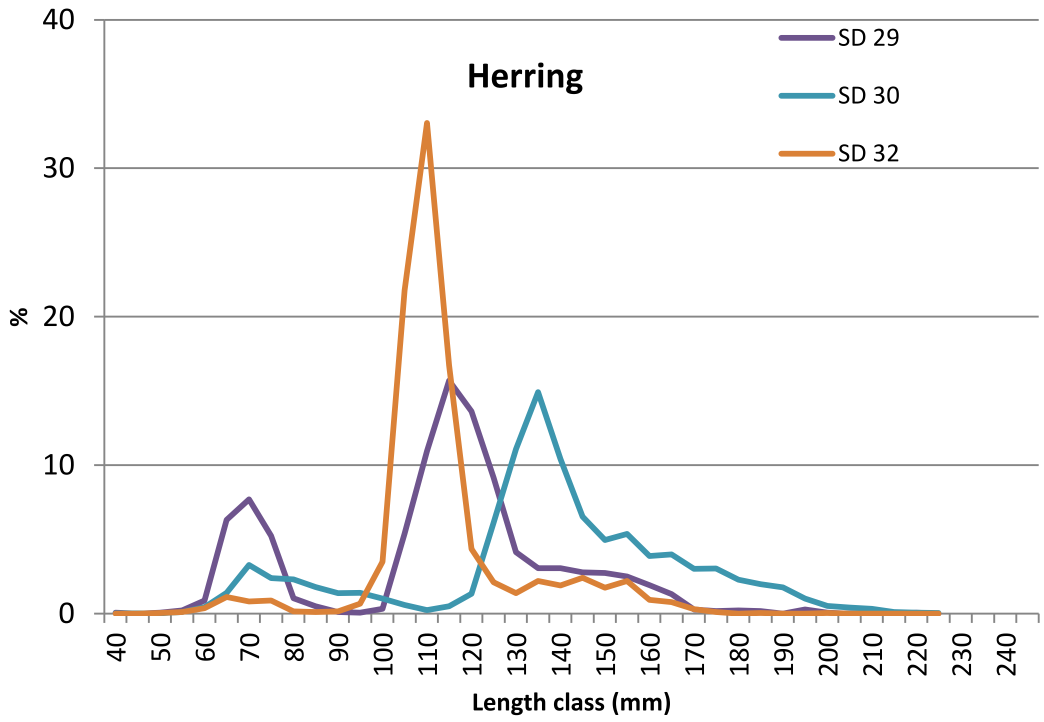

Figure 3. Length distributions of measured herring in three different Sub-Division.

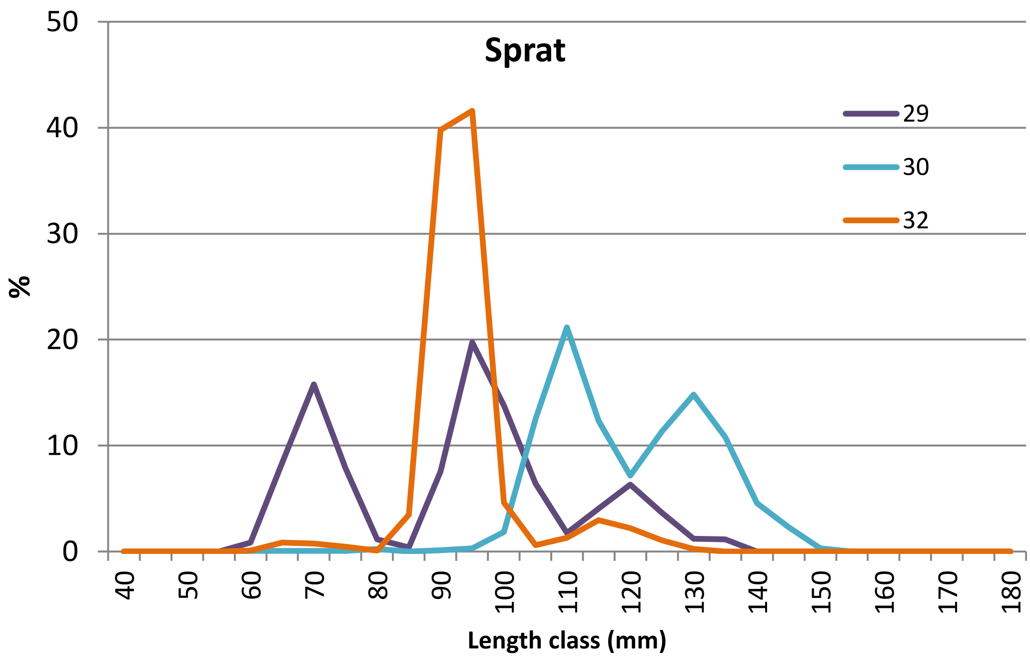

Figure 4. Length distributions of measured sprat in three different Sub-Division.

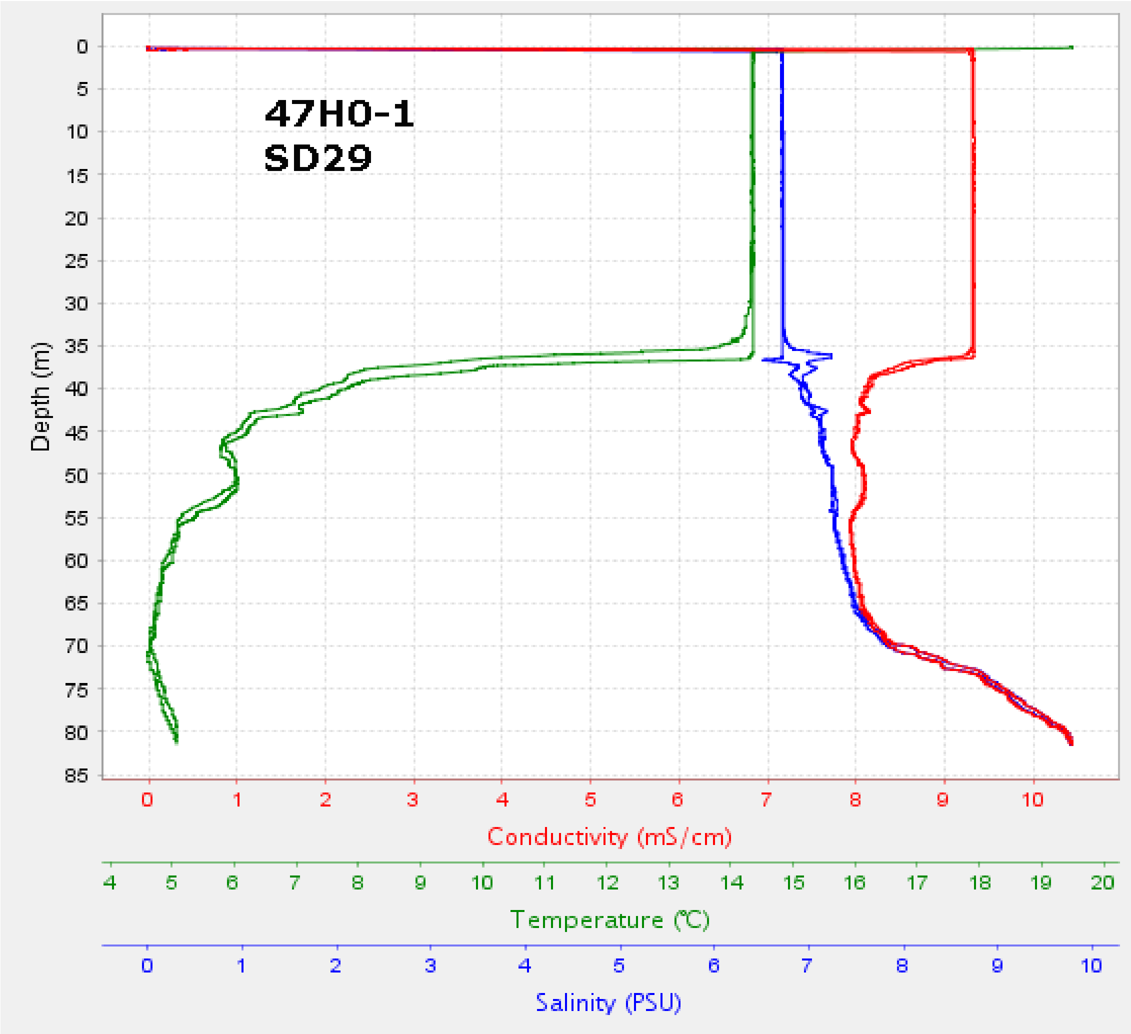

Figure 5. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 47H0-1 in SD 29.

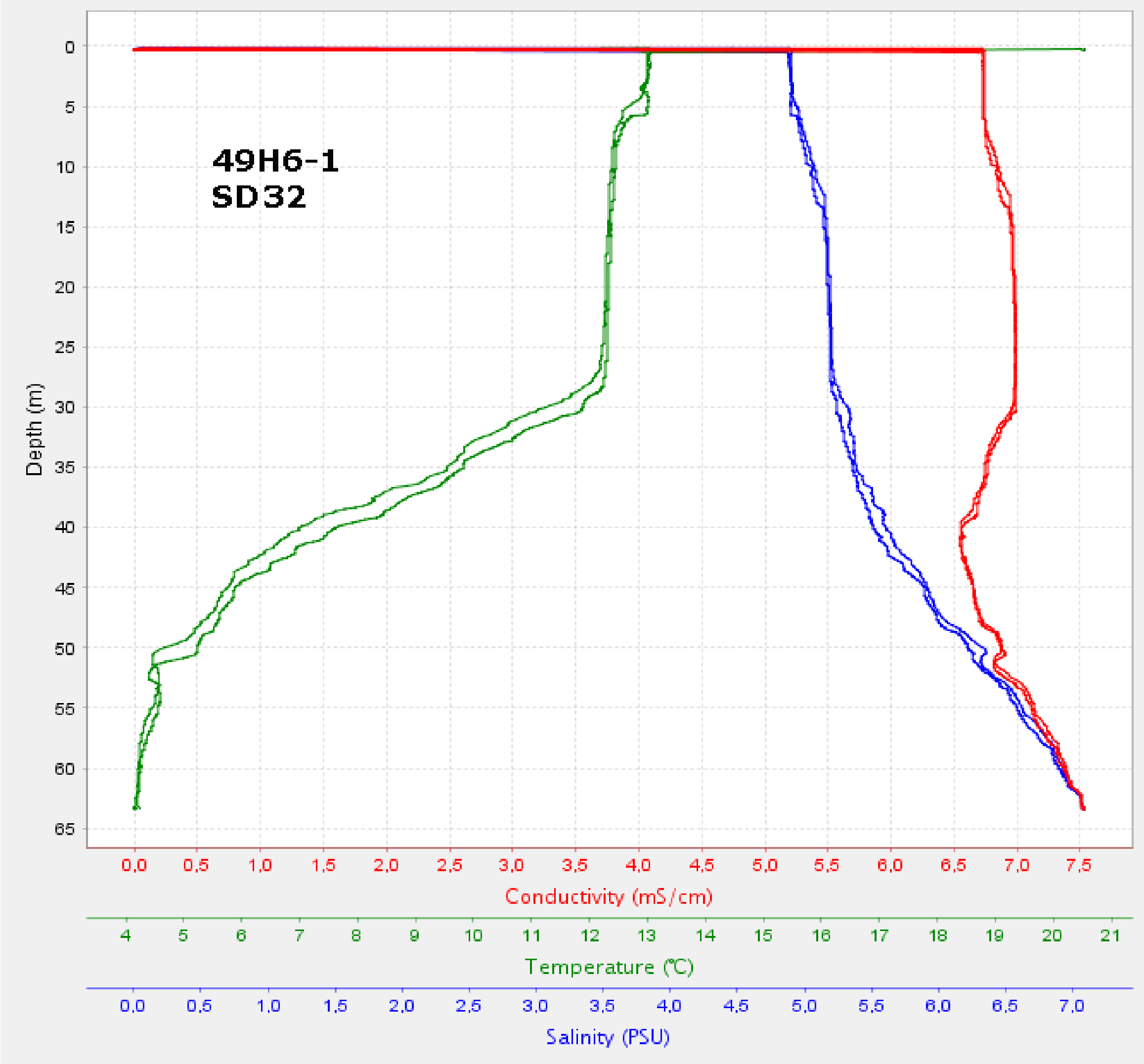

Figure 6. Vertical distribution of the connectivity, water temperature, and salinity at the trawling station 49H6-1 in SD 32.

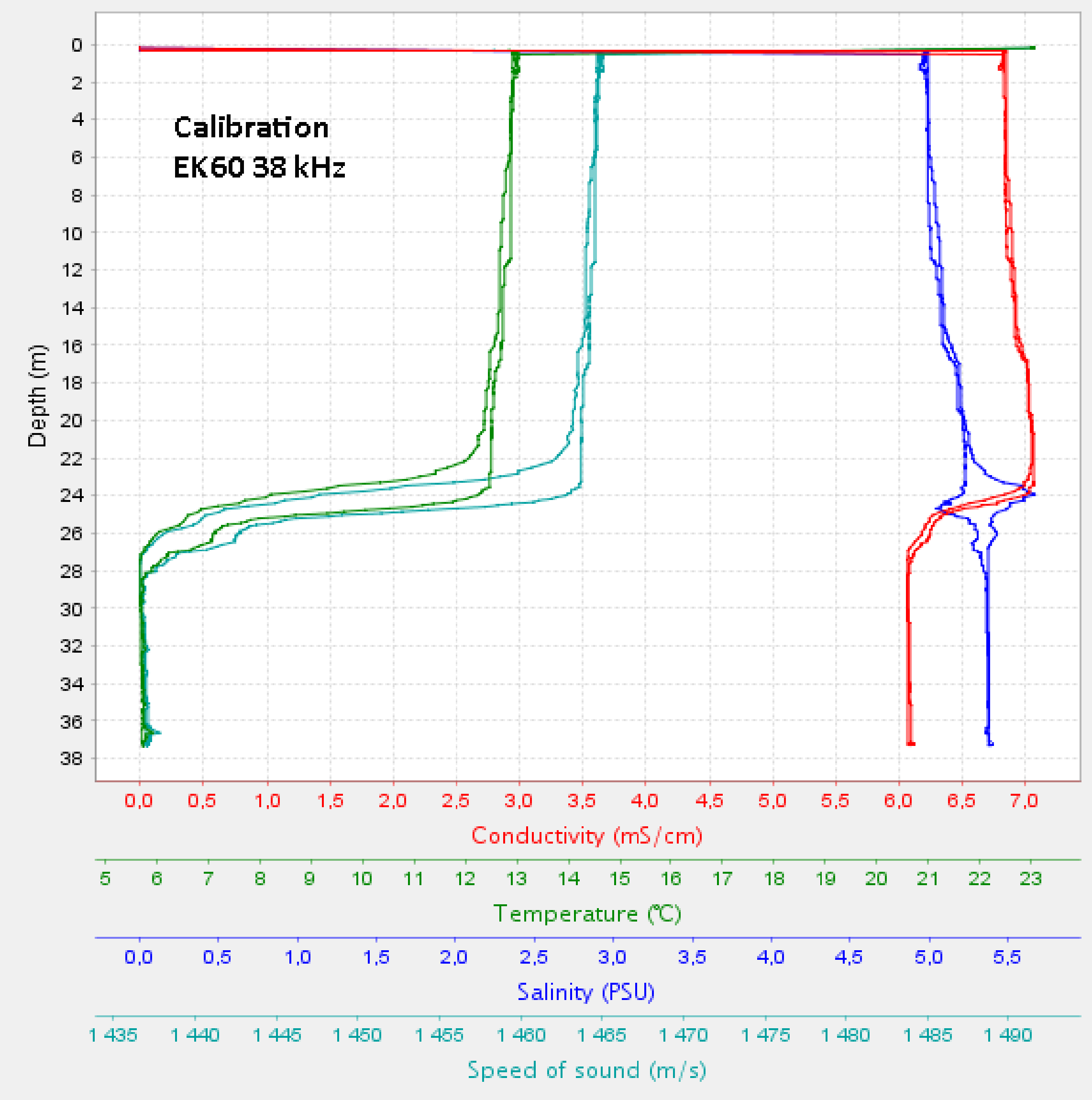

Figure 7. Vertical distribution of the connectivity, water temperature, salinity, and sound speed at the calibration station of echo sounder in SD 30 (EK60 38 kHz).

Annex 8. Working documents presented at the WGBIFS/2016 Meeting

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

Applicability of the Separation Function (SF) for Western Baltic Spring Spawning and Central Baltic herring stocks on 2015 GERAS survey results

by

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Abstract

Length – age data of herring sampled during the German Autumn Acoustic Survey (GERAS) in SD 21 and 23 as well as of German 'Baltic Acoustic Spring Survey (BASS)' in SD 27 and 28 were used to estimate the parameters of Bertalanffy growth functions (BGF) for Western Baltic Spring Spawning herring (WBSSH) and Central Baltic herring (CBH) in 2015. The present results in 2015 support the applicability of $SF_{2005\text{-}2010}$ in 2015.

Introduction

The aim of this WD is to estimate the parameters of Bertalanffy growth functions (BGF) parameters of Western Baltic Spring Spawning herring stock (WBSSH) and Central Baltic herring (CBH) based on new baseline samples from the German Autumn Acoustic Survey (GERAS) in SD 21 and 23 (WBSSH) and German BASS in SD 27 and 28 (CBH) in 2015. . The 2015 results were compared with the ones estimated for 2005 – 2010 to check the applicability of the $SF_{2005\text{-}2010}$ on newer survey samples (Gröhsler et al. (2013).

Material and Methods

Length and age data of herring captured during the German BASS in SD 27 and 28 in 2013 were used to estimate annually parameters of BGF of CBH. The parameters of BGF of WBSSH were estimates based on length and age data of German GERAS in SD 21 and SD 23.

Individual herring were allocated to a defined 0.5 cm length class by adding half of the length class to the measured total length TL (e.g. TL 20.5 cm = length class 20.75 cm). Age (winter rings, A_{WR}) was converted to age in months, A_M (with a "theoretical birthday" of January 1st), by the following equation

$$A_M = A_{WR} \times 12 + T \qquad (1)$$

with T representing survey / sampling month. The German acoustic surveys were conducted in May (BASS, T = 5) and October (GERAS, T = 10).
Individual age and length data from the baseline samples were used to derive growth patterns and parameters for both WBSS and CB herring using the von Bertalanffy growth equation

$$L_{S,A_M} = L_{\infty,S}(1 - e^{[+k_S(\frac{A_M}{12} - t_{0,S})]}) \qquad (2)$$

where L_{S,A_M} denotes length of an individual of the corresponding stock S at age A_M, $L_{\infty,S}$ symbolizes mean maximum length, k_S represents growth parameter and $t_{0,S}$ stands for theoretical age at length zero of the corresponding stock.

Statistical analyses were conducted with the statistical software program Statgraphics (Statgraphics Centurion, Version XV, StatPoint, Inc.).

Results

As in earlier years few individuals of the baseline sample of WBSSH were smaller than SF in 2015 (Fig. 1). The majority of WBSSH could be allocated to the corresponding stock using the SF established with BGF parameters from 2005-2010. The length range of age group 3 was noticeable. However, the L_∞ and k values of the BGF in 2015 within the range of earlier years (Fig. 3).
In CBH, the length of individuals from the baseline samples was in most cases smaller than the $SF_{2005-2010}$, also validating the applicability of the SF on this years´ samples (Fig. 2). The combination of L_∞ and k values was also within the range of earlier years (Fig. 3). The differences in length range of age groups 3 and 4 in 2013 compared to earlier years require additional analyses, e.g. a check of possible ageing errors and the incorporation of additional data of the Swedish acoustic survey (BASS data) to verify the BGF parameters for CBH.

Conclusions

The estimates of BGF based on base line samples of WBSSH and CBH in 2015 support the applicability of SF based on 2005 to 2010.

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FIGURES

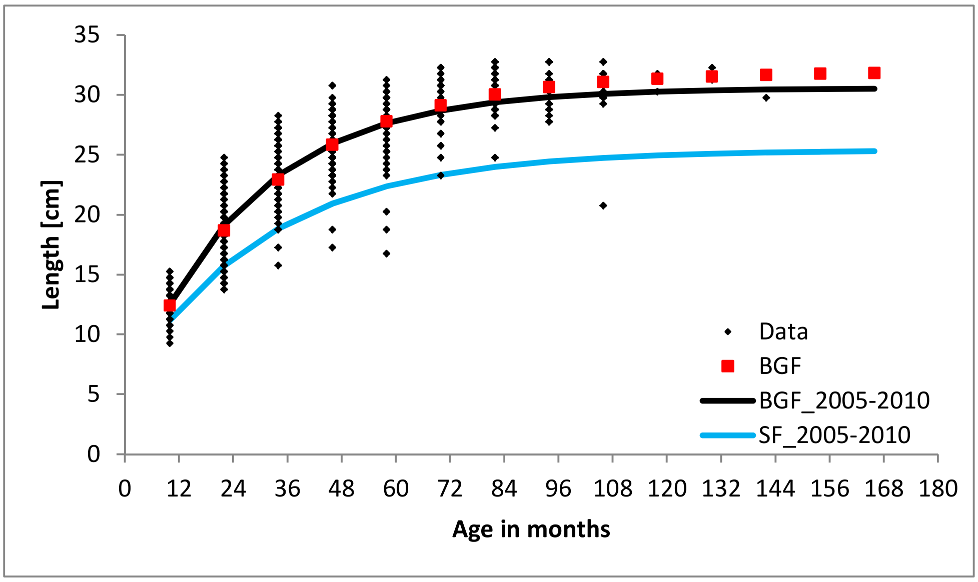

Figure 1: Length and age data of herring captured during German GERAS in SD 21 & 23 in 2015 (black dots), corresponding Bertalanffy growth function (BGF, black line), mean length at age estimated with the mean BGF of WBSSH 2005 – 2010 (red dots) and estimates of Separation Function (SF) 2005 – 2010 (blue line).

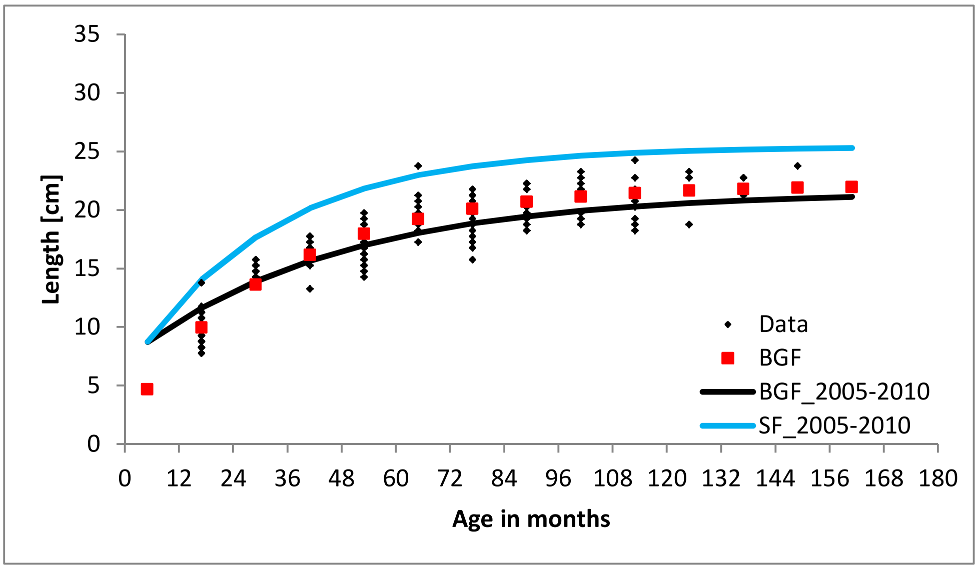

Figure 2: Length and age data of herring captured during German BASS in SD 27 and 28 in 2015 (black dots), corresponding Bertalanffy growth function (BGF), black line), mean length at age estimated with the mean BGF of CBH 2005 – 2010 (red dots) and estimates of Separation Function (SF) 2005 – 2010 (blue line).

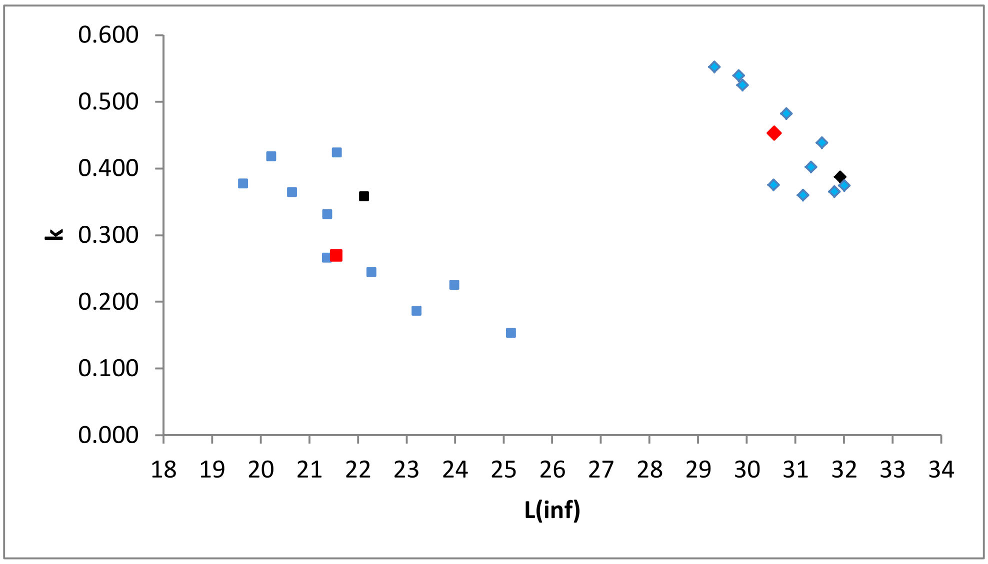

Figure 3: Relation of Bertalanffy growth parameters L(inf) and k for WBSSH (◆) and CBH (■). Estimates from 2005 to 2014 are marked with blue colour, estimates of 2015 are marked with black colour and estimates used for the separation function (2005 – 2010) are marked with red colour.

Working Document WGBIFS Meeting, 29 March – 03 April 2016

Baltic International Trawl Survey realized by Sweden in the period of 20-27.11.2015 on board of the R/V "Dana"

Expedition leader: 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 stations of which 29 were visited and valid for stock assessment including ten fictitious hauls which were not trawled because the oxygen concentration close to the bottom was <1.5 ml/l). They are included in stock assessment as zero catch. One station could not be visited because of the access prohibition from the Swedish Armed Forces.

Dana covered parts of SD 25, 26, 27 and 28 this year. During the whole survey, acoustic data were continuously recorded.

During this survey 19 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 seven countries performing the BITS survey during this period of the year.

The expedition started in Ystad on Thursday 19 November and ended in Copenhagen on Saturday 28 November. The weather during the expedition was varied, with 12 m/s as the strongest winds.

Sweden was allocated 30 random stations: 7 in SD 25, 4 in SD 26, 10 in SD 27 and 9 in SD 28 (Fig. 1, Table 1). Of these 30 allocated hauls 29 were realized including 7 fictitious hauls (see table 1). Several reasons contributed to the fact that 9 random hauls could not be ralized. At one station the bottom was not suitable for trawling with TV3L-trawl, another was directly over the north stream cable. These two stations was replaced with stations in the same depth interval and SD. Seven stations could not be visited because of the Swedish Armed Forces (SAF) prohibition (Table 3). Six of these stations could be replaced with stations in the same depth interval and SD while 1 station could not be trawled or replaced. Of all the replacement hauls three were fictitious. SAF has a number of selected areas within 12nm from the Swedish coast where foreign research vessels (as Dana) are prohibited to enter. Overall, Dana performed 29 valid trawl hauls (including the 10 fictive stations) that can be used in stock assessment. The fictive 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 approximately 1m from the bottom are presented in Fig. 2.

Fish catches

Overall, 19 species were caught (Table 2). We caught a total of 21 tons of fish, of which 1,8 tons of cod. (7 191 individuals), 15,9 tons of herring and 2,3 ton of sprat.

Sampling

Almost all cod were measured. Otoliths were collected for age determination with the aim to sample 5 individuals per 1 cm-class and SD. In SD 25 individuals were sampled in each of the areas 25W, 25C and 25E. Overall, 654 cods were age-estimated.

For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 869 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 specimens by SD25, 26 and 28) to Henrik Svedäng, Institute of Marine Research, for genetic analysis.
- Stomach sampling of cod and flounder for Michele Casini. Institute of marine research
- Length distributions and individual collection of *Saduria entomon.*

Other

The results of Swedish BITS expeditions are presented yearly in a report by SLU-Department of Aquatic Resources (SLU Aqua).
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 Exp. Leader	SLU, Havsfiskelaboratoriet
Johnny Bengtsson	SLU, Havsfiskelaboratoriet
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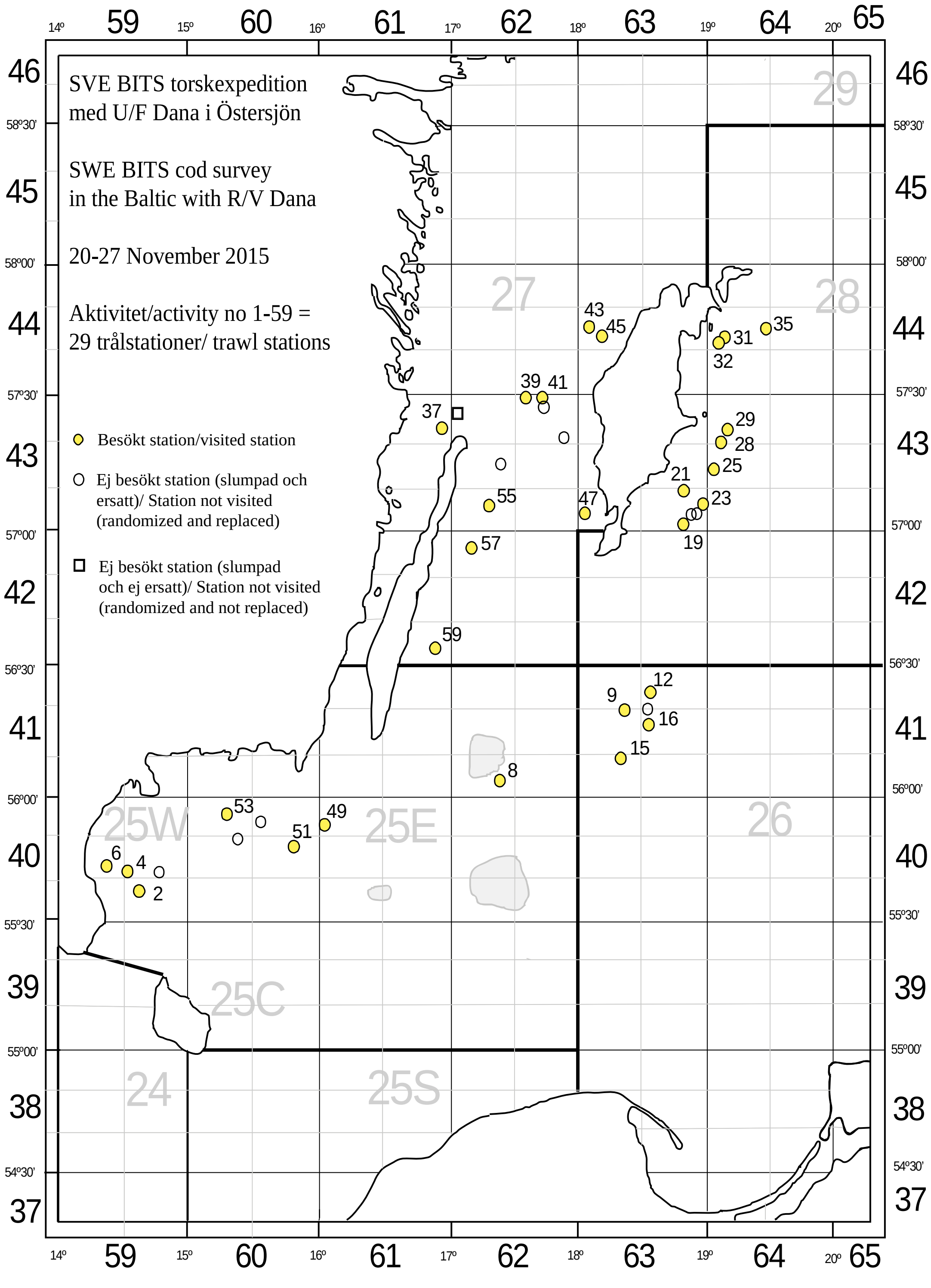

Figure 1. Map of the trawl stations performed during the Swedish BITS Quarter 4 2015. Trawled stations including 10 additional hauls.

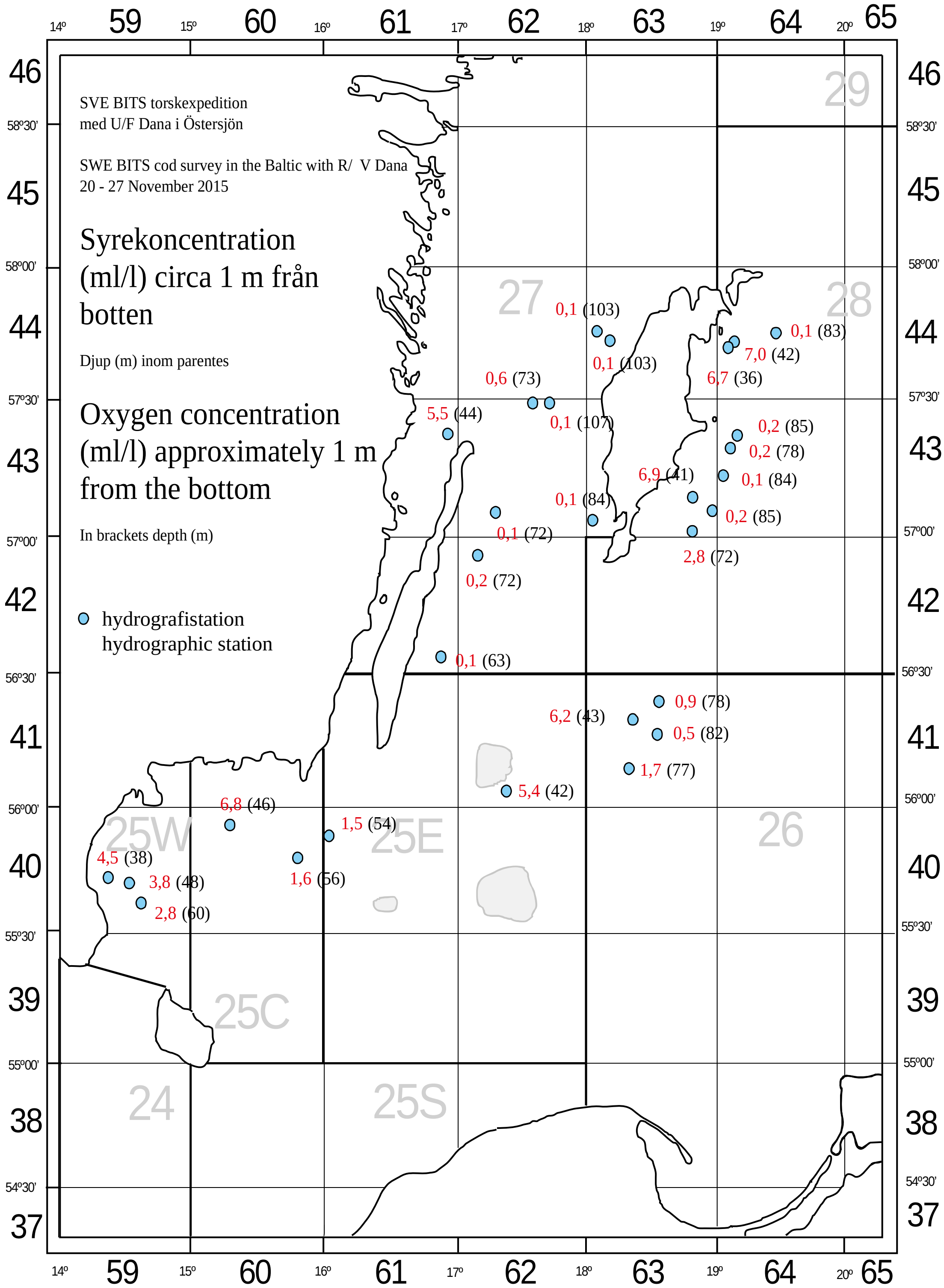

Figure 2. Oxygen concentration (red numbers) 1 m from the bottom at the trawl stations. Numbers in brackets (black) indicate bottom depth. Swedish BITS, Quarter 4 2015.

Table 1. Summary of all stations. Swedish BITS quarter 4 2015.

Tråldrag som används för beståndsuppskattning/ Valid hauls used for assessment	**29**
Slumpade trålade stationer/ Randomized trawled hauls	**14**
Ersättningsdrag, trålade (5) och fiktiva (3)/ Replacement hauls, trawled (5) and fictitious (3)	**8**
Slumpade fiktiva (syrebrist) drag/ Randomized fictitious (oxygen deficiency) hauls	**7**
Kompletteringsdrag/additional hauls	-
Ogiltiga drag/invalid hauls	-
Slumpade stationer, ej trålade/ random stations, not trawled	**9**

Tråldrag som används för beståndsuppskattning/ Valid hauls used for assessment		
Slumpade tilldelade drag/ Randomized allocated hauls	SD28	**9**
	SD27	**10**
	SD26	**4**
	SD25	**7**
Tråldrag som används för beståndsuppskattning/ Valid hauls used for assessment	SD28	**9**
	SD27	**9**
	SD26	**4**
	SD25	**7**

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

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
2015-11-20	1	25W	4059	55.37.571	014.35.907	25093	11 E STENS HUVUD	SEA	-	-	62	2.8		
2015-11-20	2	25W	4059	55.38.136	014.36.856	25093	11 E STENS HUVUD	TV3	30	60		2.8	Ersatte 25391.	Replaced 25391.
2015-11-20	3	25W	4059	55.40.483	014.30.668	25414	RACKAPUTT NORD	SEA	-	-	51	2.8		
2015-11-20	4	25W	4059	55.41.056	014.30.145	25414	RACKAPUTT NORD	TV3	30	48		3.8		
2015-11-20	5	25W	4059	55.41.576	014.23.295	25401	5 NE STENS HUVUD	SEA	-	-	39	4.2		
2015-11-20	6	25W	4059	55.42.130	014.22.100	25401	5 NE STENS HUVUD	TV3	30	38		4.5		
2015-11-21	7	25E	4162	56.03.497	017.19.756	25461	4 SE NORRA MIDSJÖBANKEN	SEA	-	-	40	5.4		
2015-11-21	8	25E	4162	56.04.179	017.22.160	25461	4 SE NORRA MIDSJÖBANKEN	TV3	30	42		5.4		
2015-11-21	9	26	4163	56.19.894	018.24.974	26225	16 SSW HOBURG BANK	TV3	30	43		6.2		
2015-11-21	10	26	4163	56.21.162	018.28.047	26225	16 SSW HOBURG BANK	SEA	-	-	45	5.9		
2015-11-21	11	26	4163	56.22.626	018.36.580	26074	10,5 S HOBURG BANK	SEA	-	-	80	0.7		
2015-11-21	12	26	4163	56.23.293	018.36.215	26074	10,5 S HOBURG BANK	TV3	30	78		0.9	Ersatte 26070.	Replaced 26070.
2015-11-21	13	26	4163	56.18.847	018.35.481	26124	16 S HOBURG BANK	SEA	-	-	80	0.7		
2015-11-22	14	26	4163	56.08.884	018.24.807	26170	15 W BANANBANKEN	SEA	-	-	79	1.5		
2015-11-22	15	26	4163	56.09.684	018.20.094	26170	15 W BANANBANKEN	TV3	30	77		1.7		
2015-11-22	16	26	4163	56.16.782	018.31.578	26124	16 S HOBURG BANK	TV3	30	82		0.5		
2015-11-22	17	26	4163	56.18.874	018.35.346	26124	16 S HOBURG BANK	SEA	-	-	91	0.4		
2015-11-23	18	28	4363	56.58.285	018.48.578	28037	13 E FALUDDEN	SEA	-	-	77	1.1		
2015-11-23	19	28	4364	57.00.266	018.48.366	28037	13 E FALUDDEN	TV3	30	72		2.8	Ersatte 28101.	Replaced 28101.
2015-11-23	20	28	4363	57.07.418	018.49.320	28177	4,5 SE NÄR	SEA	-	-	45	6.7		
2015-11-23	21	28	4363	57.08.154	018.47.515	28177	4,5 SE NÄR	TV3	30	41		6.9		
2015-11-23	22	28	4364	57.04.185	018.57.754	28067	11 ESE NÄR	SEA	-	-	101	0.1		
2015-11-23	23	28	4364	57.06.500	018.57.300	28067	11 ESE NÄR	TV3	30	85		0.2	Fiktivt drag p g a syrebrist. Ersatte 28107.	Oxygen deficiency haul. Replaced 28107.
2015-11-23	24	28	4364	57.11.870	019.03.642	28071	12 E NÄR	SEA	-	-	83	0.1		
2015-11-23	25	28	4364	57.12.033	019.03.018	28071	12 E NÄR	TV3	30	84		0.1		
2015-11-23	26	28	4364	57.19.634	019.10.989	28051/ 28098	8 SE ÖSTERGARN	SEA	-	-	94	0.1		
2015-11-24	27	28	4364	57.19.742	019.11.195	28051/ 28098	8 SE ÖSTERGARN	SEA	-	-	94	0.1		
2015-11-24	28	28	4364	57.19.409	019.06.855	28051	8 SE ÖSTERGARN SYD	TV3	30	78		0.2		
2015-11-24	29	28	4364	57.22.000	019.08.900	28098	8 SE ÖSTERGARN NORD	TV3	30	85		0.2	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-11-24	30	28	4464	57.42.884	019.11.994	28186	3,8 SE GRAUTEN NORD	SEA	-	-	44	6.2		
2015-11-24	31	28	4464	57.43.209	019.10.645	28186	3,8 SE GRAUTEN NORD	TV3	30	42		7.0		
2015-11-24	32	28	4464	57.41.447	019.05.302	28185	3 SE GRAUTEN	TV3	30	36		6.7		
2015-11-24	33	28	4464	57.42.010	019.07.582	28185	3 SE GRAUTEN	SEA	-	-	37	6.6		
2015-11-24	34	28	4464	57.42.708	019.29.205	28182	13 SSE FÅRÖ	SEA	-	-	84	0.1		
2015-11-24	35	28	4464	57.44.300	019.28.200	28182	13 SSE FÅRÖ	TV3	30	83		0.1	Fiktivt drag p g a syrebrist.	Oxygen deficiency 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
2015-11-25	36	28	4361	57.22.928	016.55.052	27020	4 NW BYXELKROK	SEA	-	-	43	5.2		
2015-11-25	37	28	4361	57.22.310	016.54.217	27020	4 NW BYXELKROK	TV3	30	44		5.5		
2015-11-25	38	28	4362	57.26.606	017.34.787	27011	5 SSE KNOLLS GRUND	SEA	-	-	83	0.1		
2015-11-25	39	28	4362	57.28.374	017.33.305	27011	5 SSE KNOLLS GRUND	TV3	30	73		0.6		
2015-11-25	40	28	4362	57.29.990	017.41.208	27026	10 SE KNOLLS GRUND	SEA	-	-	105	0.1		
2015-11-25	41	28	4462	57.27.600	017.44.250	27026	10 SE KNOLLS GRUND	TV3	30	107		0.1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-11-25	42	28	4463	57.45.580	018.07.081	27027	10 NW VISBY	SEA	-	-	101	0.1		
2015-11-25	43	28	4463	57.46.000	018.07.000	27027	10 NW VISBY	TV3	30	103		0.1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-11-25	44	28	4463	57.44.977	018.13.548	27019	6 N VISBY	SEA	-	-	105	0.1		
2015-11-25	45	28	4463	57.43.000	018.16.450	27019	6 N VISBY	TV3	30	103		0.1	Fiktivt drag p g a syrebrist. Ersatte 27016.	Oxygen deficiency haul. Replaced 27016.
2015-11-25	46	28	4363	57.06.695	017.50.306	27013	11,5 NW HOBURG	SEA	-	-	81	0.1		
2015-11-25	47	28	4363	57.02.500	017.52.450	27013	11,5 NW HOBURG	TV3	30	84		<=0,1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-11-26	48	25C	4061	55.50.572	016.01.338	25431	ARGOS TRACK	SEA	-	-	56	2.3		
2015-11-26	49	25C	4061	55.52.171	016.01.261	25431	ARGOS TRACK	TV3	30	54		1.5		
2015-11-26	50	25C	4060	55.48.215	015.52.316	25427	5 N TÅNGEN	SEA	-	-	54	1.6		
2015-11-26	51	25C	4060	55.48.506	015.50.733	25427	5 N TÅNGEN	TV3	30	56		1.6	Ersatte 25125.	Replaced 25125.
2015-11-26	52	25C	4060	55.55.851	015.16.594	602	INNERTORPET SYD	SEA	-	-	44	6.8		
2015-11-26	53	25C	4060	55.56.772	015.17.462	602	INNERTORPET SYD	TV3	30	46		6.8	Ersatte 25142.	Replaced 25142.
2015-11-27	54	27	4362	57.05.613	017.20.433	27010	7 ESE HÖGBY FYR	SEA	-	-	73	0.1		
2015-11-27	55	27	4362	57.06.000	017.17.100	27010	7 ESE HÖGBY FYR	TV3	30	72		0.1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.
2015-11-27	56	27	4262	56.56.739	017.13.450	27005	10 E KÅREHAMN	SEA	-	-	72	0.2		
2015-11-27	57	27	4262	56.56.500	017.10.500	27005	10 E KÅREHAMN	TV3	30	72		0.2	Fiktivt drag p g a syrebrist. Ersatte 27030.	Oxygen deficiency haul. Replaced 27030.
2015-11-27	58	27	4261	56.35.074	016.53.603	27021	6 SE BLÄSINGE	SEA	-	-	63	0.1		
2015-11-27	59	27	4261	56.34.000	016.51.000	27021	6 SE BLÄSINGE	TV3	30	63		0.1	Fiktivt drag p g a syrebrist.	Oxygen deficiency haul.

Table 2. Summary of the species in the catches. Swedish BITS, Q4 2015.

Namn	Latinskt namn	25W		25C		25E		26		27		28		Total	
		Antal	Vikt (kg)	Antal	Vikt (kg)	Antal	Vikt (kg)	Antal	Vikt (kg)	Antal	Vikt (kg)	Antal	Vikt (kg)	Antal	Vikt (kg)
Local name	Species	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)	No.	Weight (kg)
Torsk	*Gadus morhua*	2 761	613.4	290	56.80	3 449	1 038.78	582	64.6	12	3.4	97	15.3	7 191	1 792.31
Sill	*Clupea harengus*	50 407	2 120.6	5 466	283.4	5 264	236.7	195 542	6 785.5	53 024	1 083.1	177 994	5 395.1	487 698	15 904.3
Skarpsill	*Sprattus sprattus*	72 989	911.8	140	1.5	21 536	333.6	20 217	180.1	36 132	235.3	95 423	644.7	246 437	2 307.0
Fyrtömmad skärlånga	*Enchelyopus cimbrius*	1	0.2			5	0.3					1	0.0	7	0.5
Hornsimpa	*Myoxocephalus quadricornis*							1	0.2	1 299	108.5	811	106.5	2 111	215.23
Makrill	*Scomber scombrus*					1	0.7							1	0.7
Nors	*Osmerus eperlanus*											1	0.0	1	0.03
Piggvar	*Scophthalmus maximus*			1	0.6	13	6.6	1	0.6			5	1.2	20	9.1
Pomatoschistus (släkte)	*Pomatoschistus*	55	0.0											55	0.0
Rödspätta	*Pleuronectes platessa*	27	5.8	26	4.7	302	61.8	2	0.3					357	72.6
Rötsimpa	*Myoxocephalus scorpius*	18	3.05	9	1.19			247	43.9	3	0.6	193	26.7	470	75.4
Sandskädda	*Limanda limanda*					4	0.7							4	0.7
Sjurygg	*Cyclopterus lumpus*					1	0.4	2	0.7			1	0.3	4	1.33
Skrubbskädda	*Platichthys flesus*	221	45.0	165	29.40	1 323	342.8	129	24.1	283	45.2	1 190	162.6	3 312	649.1
Småspigg	*Pungitius pungitius*									2	0.0			2	0.00
Storspigg	*Gasterosteus aculeatus*							11	0.0	72	0.1	635	1.1	718	1.2
Tobiskung	*Hyperoplus lanceolatus*											8	0.3	8	0.3
Vitling	*Merlangius merlangus*					43	9.3							43	9.3
Ålkusa	*Zoarces viviparus*							2	0.2			10	0.6	12	0.8
Total		126 479	3 700	6 097	378	31 941	2 032	216 736	7 100	90 827	1 476	276 370	6 354	748 450	21 040

Table 3. List of the stations not visited and prohibited by Swedish Armed Forces Q4 2015.

Nr Haul	Square	SD	Lat1	Lon1	Plats/Location	Depth	Replaced with	Remarks
25142	4060	25C	5553.00	1534.00	5 SSW UTKLIPPAN	50	*602*	The Swedish Armed Forces prohibition
25125/ 25404	4060	25C	5549.52	1525.99	YTTERTORPET	51	25427	The Swedish Armed Forces prohibition
25391	4059	25W	5540.1	1443.46		46	25093	Rough bottom
26070	4163	26	5622.50	1833.30	15 S Hoburg Bank	74	26074	North Stream cable
27003	4362	27	5724.56	1701.56	5 N Byxelkrok	57	-	The Swedish Armed Forces prohibition. No replace station possible.
27030	4362	27	5713,66	1723,23	11 E Böda	77	27005	The Swedish Armed Forces prohibition
27016	4362	27	5722.00	1754.50	4 NW St Karlsö	108	27019	The Swedish Armed Forces prohibition
28101	4363	28	5704.88	1850.39	10 SE NÄR	67	28037	The Swedish Armed Forces prohibition
28107	4363	28	5702.84	1851.32	12 SE NÄR	84	28067	The Swedish Armed Forces prohibition

Working Document WGBIFS Meeting, 29 March – 03 April 2016

Baltic International Trawl Survey realized by Sweden in the period of 20.02. – 03.03.2016 on board of the R/V "Dana"

Cruise leader : 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 stations of which 47 were visited and valid for stock assessment (including 10 fictitious hauls which were not trawled because the oxygen concentration close to the bottom was <1.5 ml/l. They are included in stock assessment as zero catch). Three stations could not be visited because the access prohibition to some areas from the Swedish Armed Forces.

Dana covered parts of SD 25, 26, 27 and 28 this year. During the whole survey, acoustic data were continuously recorded.

During this survey 20 fish species were caught. The total catch, in terms of weight, was dominated by herring, sprat, cod, flounder, shorthorn sculpin and plaice.

The hydrographical conditions were measured at most of the stations. 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 several countries performing the BITS survey during this period of the year.

The expedition started in Copenhagen on Saturday February 20 and ended up in Ystad Thursday 03 of March. The weather during the expedition was calm with a couple of days with a strong breeze.

Sweden was allocated 50 random stations: 21 in Subdivision (SD) 25, 9 in SD 26, 10 in SD 27 and 10 in SD 28 (Fig. 1, Table 1). Of these 50 allocated hauls, 38 were realised including 7 fictitious hauls (see table 1). Several reasons contributed to the fact that 12 random hauls could not be realised (Table 3). In one station the bottom were evaluated not suitable for trawling with TV3L-trawl due to a power cable that was pulled straight over the haul path. This station was replaced by another station in the same depth interval and SD. Eight stations could not be visited cause of the Swedish Armed Forces (SAF) prohibition. Five of these stations could be replaced with stations in the same depth interval and SD while three stations could not be trawled or replaced. Three hauls were replaced for other reasons (duplicate and stations that do not exist in the database anymore). Of all the replacement hauls three were fictitious. 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 47 valid trawl hauls (including the 10 fictitious stations) that can be 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, 20 fish species were caught (Table 2). A total of 39 tons of fish were caught, of which 10.5 tons of cod (37 400 individuals), 15 tonnes of herring and 10.6 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 SD. In SD 25 individuals were sampled in each of the areas 25W, 25C and 25E. Overall, 894 cods were age-estimated.

For flounder, otoliths were collected with the aim to sample 20 individuals per 1 cm-class and SD. Totally, 1 115 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 specimens by SD25, 26 and 28) to Henrik Svedäng, Institute of Marine Research, for genetic analysis.
- Stomach sampling of cod and flounder for Michele Casini. Institute of marine research
- Length distributions and individual collection of *Saduria entomon*

Other

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

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

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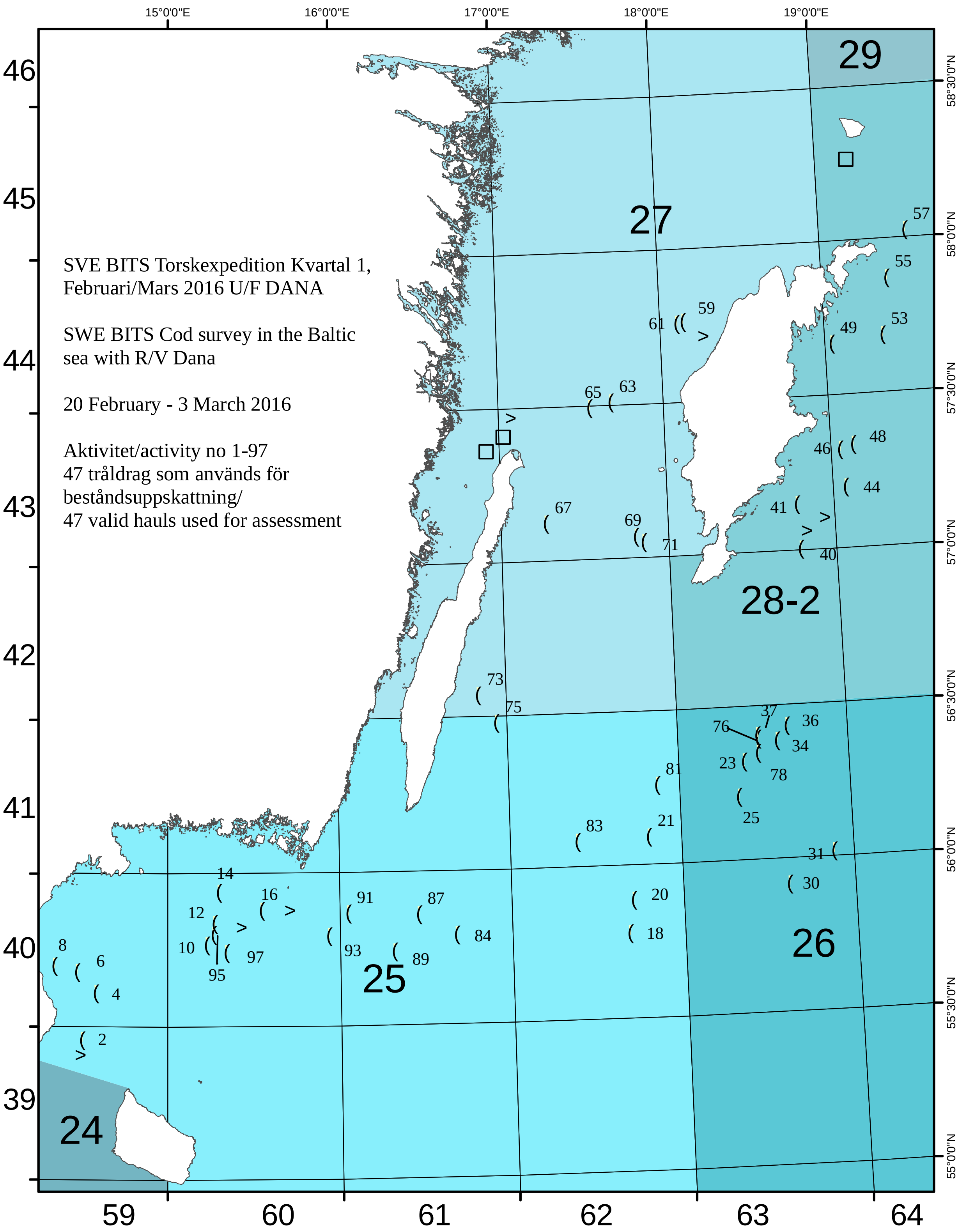
Anon., 2014a. Manual for the Baltic International Trawl Surveys. Manual for the Baltic International Trawl Surveys (BITS). ICES CM 2014/SSGESST:13

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



(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

Figure 1. Map of the trawl hauls performed during the Swedish BITS, Quarter 1 2016. (including10 fictitious hauls).

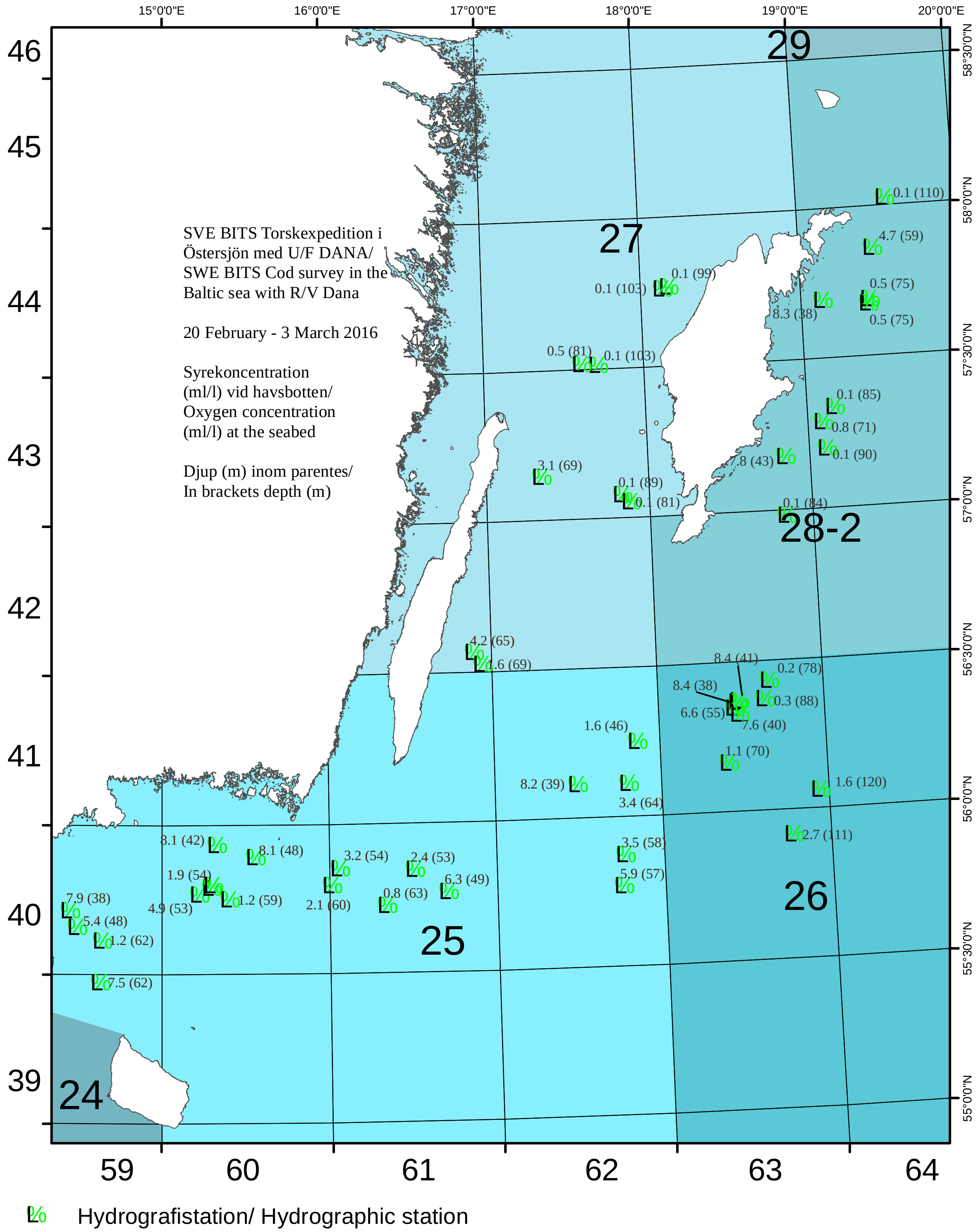


Figure 2. Oxygen concentration 1 m from the bottom at the trawl stations. Numbers in brackets indicate bottom depth. Swedish BITS, Quarter 1 2016.

Table 1. Summary of all stations. Swedish BITS, quarter 1 2016

Tråldrag som används för beståndsuppskattning/Valid hauls used for assessment	47	Tråldrag som används för beståndsuppskattning/ Valid hauls used for assessment		
Slumpade trålade stationer/Randomized trawled hauls	31	Slumpade tilldelade drag/ Randomized allocated hauls	SD28	10
Ersättningsdrag, trålade (6) och fiktiva (3)/Replacement hauls, trawled (6) and fictitious (3)	9		SD27	10
			SD26	9
Slumpade fiktiva (syrebrist) drag/Randomized fictitious (oxygen deficiency) hauls	7		SD25	21
Kompletteringsdrag/additional hauls	-	Tråldrag som används för beståndsuppskattning/ Valid hauls used for assessment	SD28	9
Ogiltiga drag/invalid hauls	-		SD27	8
Slumpade stationer, ej trålade/random stations, not trawled	12		SD26	9
			SD25	21

Legend
TV3 trawl station
Fictitious haul/oxygen deficien
Invalid haul
Hydrographic station (SEA)

Datum Date	Akt. nr Act. no	Område Area SD	Ruta Rect.	Position N Latitude	Position E Longitude	Stat. nr haul no	Stationsnamn Station name	Trålning Gear	Tråltid Dur min	Tråldjup Trawl depth	Hydro Djup Depth m	Hydro O2 Oxygen ml/l	Anmärkningar	Remarks
2016-02-21	1	25W	3959	55.28.324	14.37.614	25073	8 E SKILLINGE	SEA			62	7.5		
2016-02-21	2	25W	3959	55.27.644	14.31.673	25073	8 E SKILLINGE	TV3	30	58		7.5	Ersatte 25387	Replaced 25387
2016-02-21	3	25W	4059	55.36.775	14.38.235	25439	8 ENE SIMRISHAMN	SEA			62	1.2		
2016-02-21	4	25W	4059	55.36.782	14.36.318	25439	8 ENE SIMRISHAMN	TV3	30	66		1.2		
2016-02-21	5	25W	4059	55.39.449	14.29.228	25414	RACKAPUTT NORD	SEA			48	5.4		
2016-02-21	6	25W	4059	55.40.991	14.29.870	25414	RACKAPUTT NORD	TV3	30	48		5.8		
2016-02-21	7	25W	4059	55.42.798	14.26.664	25418	RACKAPUTT 38 M	SEA			38	7.9		
2016-02-21	8	25W	4059	55.42.121	14.22.025	25418	RACKAPUTT 38 M	TV3	30	38		7.9		
2016-02-22	9	25C	4060	55.46.009	15.12.719	25124	1WNW VÄSTRA NABBEN	SEA			56	1.6		
2016-02-22	10	25C	4060	55.46.215	15.14.860	25124	1WNW VÄSTRA NABBEN	TV3	30	56		1.6	Ersatte 25409	Replaced 25409
2016-02-22	11	25C	4060	55.47.313	15.17.069	25426	3 N VÄSTRA NABBEN	SEA			54	1.9		
2016-02-22	12	25C	4060	55.48.329	15.17.270	25426	3 N VÄSTRA NABBEN	TV3	30	55		1.9		
2016-02-22	13	25C	4060	55.55.916	15.19.028	602	INNERTORPET SYD	SEA			42	8.1		
2016-02-22	14	25C	4060	55.56.525	15.19.122	602	INNERTORPET SYD	TV3	30	46		8.1	Ersatte 25404	Replaced 25404
2016-02-22	15	25C	4060	55.53.459	15.32.865	25142	5 SSW UTKLIPPAN	SEA			48	8.1		
2016-02-22	16	25C	4060	55.52.958	15.33.997	25142	5 SSW UTKLIPPAN	TV3	30	51		8.1		
2016-02-23	17	25E	4062	55.46.008	17.44.219	25136	13 NE SÖDRA MIDSJÖBANKEN	SEA			57	5.9		
2016-02-23	18	25E	4062	55.46.831	17.41.938	25136	13 NE SÖDRA MIDSJÖBANKEN	TV3	30	57		6.6		
2016-02-23	19	25E	4062	55.52.287	17.45.266	25167	18 NE SÖDRA MIDSJÖBANKEN	SEA			58	3.5		
2016-02-23	20	25E	4062	55.53.417	17.43.665	25167	18 NE SÖDRA MIDSJÖBANKEN	TV3	30	62		3.5		
2016-02-23	21	25E	4162	56.05.624	17.49.733	1624	14 ESE NORRA MIDSJÖBANKEN	TV3	30	67		3.4	Ersatte 25313	Replaced 25313
2016-02-23	22	25E	4162	56.06.563	17.47.384	1624	14 ESE NORRA MIDSJÖBANKEN	SEA			64	3.4		
2016-02-23	23	26	4163	56.19.453	18.24.257	26225	16 SSW HOBURG BANK	TV3	30	42		8.4		
2016-02-23	24	26	4163	56.20.791	18.26.834	26225	16 SSW HOBURG BANK	SEA			41	8.4		
2016-02-23	25	26	4163	56.12.646	18.21.968	26010	14 W BANANBANKEN	TV3	30	69		2.4		
2016-02-23	26	26	4163	56.09.748	18.23.807	26010	14 W BANANBANKEN	SEA			70	1.1		
2016-02-23	27	26	4063	55.55.217	18.38.700	26221	11 SSW BANANBANK	SEA			111	2.7		
2016-02-23	28	26	4163	56.01.102	18.53.985	26140	5 SE BANANBANKEN	SEA			117	2.3		
2016-02-24	29	26	4063	55.54.815	18.45.844	26221	11 SSW BANANBANK	SEA			111	2.7		
2016-02-24	30	26	4063	55.55.134	18.38.139	26221	11 SSW BANANBANK	TV3	30	114		2.6		
2016-02-24	31	26	4163	56.01.136	18.54.284	26140	5 SE BANANBANKEN	TV3	30	122		1.6		

Datum Date	Akt. nr Act. no	Om-råde Area SD	Ruta Rect.	Position N Latitude	Position E Longitude	Stat. nr haul no	Stationsnamn Station name	Trål-ning Gear	Trål-tid Dur min	Trål-djup Trawl depth	Hydro Djup Depth m	Hydro O2 Oxygen ml/l	Anmärkningar	Remarks
2016-02-24	32	26	4163	56.03.492	18.56.238	26140	5 SE BANANBANKEN	SEA			120	1.6		
2016-02-24	33	26	4163	56.22.250	18.37.926	26074	10.5 S HOBURG BANK	SEA			88	0.3		
2016-02-24	34	26	4163	56.23.265	18.36.245	26074	10.5 S HOBURG BANK	TV3	30	78		0.7		
2016-02-24	35	26	4163	56.25.955	18.39.848	26076	8 S HOBURG BANK	SEA			78	0.2		
2016-02-24	36	26	4163	56.26.110	18.39.976	26076	8 S HOBURG BANK	AKU	30	75		0.4	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-24	37	26	4163	56.23.788	18.29.627	26013	11 S HOBURG BANK	TV3	30	38		8.5		
2016-02-24	38	26	4163	56.22.111	18.28.411	26013	11 S HOBURG BANK	SEA			38	8.4		
2016-02-25	39	28	4263	56.58.917	18.49.630	28037	13 E FALUDDEN	SEA			84	0.1		
2016-02-25	40	28	4363	57.00.462	18.48.488	28037	13 E FALUDDEN	AKU	30	73		0.8	Fiktivt drag p g a syrebrist. Ersatte 28101	Oxygen deficiency haul. Replaced 28101
2016-02-25	41	28	4363	57.09.144	18.47.921	28177	4,5 SE NÄR	TV3	30	41		8.1		
2016-02-25	42	28	4363	57.10.666	18.50.227	28177	4,5 SE NÄR	SEA			43	7.8		
2016-02-25	43	28	4364	57.11.912	19.05.802	28071	12 E NÄR	SEA			90	0.1		
2016-02-25	44	28	4364	57.12.100	19.05.875	28071	12 E NÄR	AKU	30	83		0.1	Fiktivt drag p g a syrebrist. Ersatte 28067	Oxygen deficiency haul. Replaced 28067
2016-02-25	45	28	4364	57.17.205	19.04.855	28103	12 E LJUGARN	SEA			71	0.8		
2016-02-25	46	28	4364	57.19.410	19.04.642	28103	12 E LJUGARN	TV3	30	68		1.4		
2016-02-25	47	28	4364	57.20.159	19.09.501	28098	8 SE ÖSTERGARN NORD	SEA			85	0.1		
2016-02-25	48	28	4364	57.20.348	19.09.421	28098	8 SE ÖSTERGARN NORD	AKU	30	85		0.1	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-25	49	28	4464	57.40.167	19.03.866	28185	3 SE GRAUTEN	TV3	30	36		8.4		
2016-02-25	50	28	4464	57.41.589	19.07.423	28185	3 SE GRAUTEN	SEA			38	8.3		
2016-02-25	51	28	4464	57.41.327	19.25.117	28183	11 SE BUNGEÖR	SEA			75	0.5		
2016-02-26	52	28	4464	57.40.455	19.24.462	28183	11 SE BUNGEÖR	SEA			75	0.5		
2016-02-26	53	28	4464	57.41.354	19.22.624	28183	11 SE BUNGEÖR	TV3	30	74		0.9		
2016-02-26	54	28	4464	57.51.570	19.27.290	28097	5 SE FÅRÖ	SEA			59	4.7		
2016-02-26	55	28	4464	57.52.428	19.25.192	28097	5 SE FÅRÖ	TV3	30	49		8.3		
2016-02-26	56	28	4564	58.01.442	19.33.009	28078	E SALVOREV	SEA			110	0.1		
2016-02-26	57	28	4564	58.01.608	19.33.058	28078	E SALVOREV	AKU	30	91		0.1	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-26	58	27	4463	57.45.919	18.09.987	27018	6 NW VISBY	SEA			99	0.1		
2016-02-26	59	27	4463	57.45.977	18.09.899	27018	6 NW VISBY	AKU	30	104		0.1	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-26	60	27	4463	57.45.533	18.07.530	27027	10 NW VISBY	SEA			103	0.1		
2016-02-26	61	27	4463	57.45.666	18.07.571	27027	10 NW VISBY	AKU	30	103		0.1	Fiktivt drag p g a syrebrist Ersatte 27019	Oxygen deficiency haul. Replaced 27019
2016-02-27	62	27	4362	57.30.727	17.42.329	27026	10 SE KNOLLS GRUND	SEA			103	0.1		
2016-02-27	63	27	4362	57.30.837	17.42.403	27026	10 SE KNOLLS GRUND	AKU	30	108		0.1	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-27	64	27	4462	57.31.060	17.36.134	27011	5 SSE KNOLLS GRUND	SEA			81	0.5		
2016-02-27	65	27	4362	57.29.876	17.34.425	27011	5 SSE KNOLLS GRUND	TV3	30	72		4.0		
2016-02-27	66	27	4362	57.08.660	17.19.855	27010	7 ESE HÖGBY FYR	SEA			69	3.1		
2016-02-27	67	27	4362	57.07.592	17.17.433	27010	7 ESE HÖGBY FYR	TV3	30	73		3.1		

Datum Date	Akt. nr Act. no	Om-råde Area SD	Ruta Rect.	Position N Latitude	Position E Longitude	Stat. nr haul no	Stationsnamn Station name	Trål-ning Gear	Trål-tid Dur min	Trål-djup Trawl depth	Hydro Djup Depth m	Hydro O2 Oxygen ml/l	Anmärk ningar	Remarks
2016-02-27	68	27	4362	57.04.559	17.49.437	27013	11.5 NW HOBURG	SEA			89	0.1		
2016-02-27	69	27	4362	57.04.379	17.49.522	27013	11.5 NW HOBURG	AKU	30	84		0.1	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-27	70	27	4362	57.03.133	17.52.476	27023	9 NW HOBURG	SEA			81	0.1		
2016-02-27	71	27	4362	57.03.222	17.52.272	27023	9 NW HOBURG	AKU	30	76		0.3	Fiktivt drag p g a syrebrist	Oxygen deficiency haul.
2016-02-28	72	27	4261	56.33.916	16.52.981	27021	6 SE BLÄSINGE	SEA			65	4.2		
2016-02-28	73	27	4261	56.34.422	16.51.328	27021	6 SE BLÄSINGE	TV3	30	62		5.3	Ersatte 27025	Replaced 27025
2016-02-28	74	25E	4261	56.31.528	16.56.135	25314	15 NE SEGERSTAD	SEA			69	1.6		
2016-02-28	75	25E	4161	56.28.940	16.57.498	25314	15 NE SEGERSTAD	TV3	30	71		1.6		
2016-02-28	76	26	4163	56.24.442	18.29.407	26224	12 SSW HOBURG BANK	TV3	30	34		8.5		
2016-02-28	77	26	4163	56.21.860	18.28.024	26224	12 SSW HOBURG BANK	SEA			40	7.6		
2016-02-28	78	26	4163	56.21.047	18.29.387	26032	14 S HOBURG BANK	TV3	30	54		7.2		
2016-02-28	79	26	4163	56.19.497	18.28.366	26032	14 S HOBURG BANK	SEA			55	6.6		
2016-02-29	80	25E	4162	56.14.902	17.51.039	25167	18 ENE NORRA MIDSJÖBANKEN	SEA			46	1.6		
2016-02-29	81	25E	4162	56.15.634	17.53.328	25167	18 ENE NORRA MIDSJÖBANKEN	TV3	30	45		3.9		
2016-02-29	82	25E	4162	56.06.741	17.28.968	25461	4 SE NORRA MIDSJÖBANKEN	SEA			39	8.2		
2016-02-29	83	25E	4162	56.05.080	17.24.709	25461	4 SE NORRA MIDSJÖBANKEN	TV3	30	41		8.2		
2016-02-29	84	25E	4061	55.47.731	16.41.797	25134	3 SE TENERIFFA	TV3	30	49		7.5		
2016-02-29	85	25E	4061	55.46.008	16.41.733	25134	3 SE TENERIFFA	SEA			49	6.3		
2016-03-01	86	25E	4061	55.50.701	16.29.808	25403	7 NW TENERIFFA	SEA			53	2.4		
2016-03-01	87	25E	4061	55.51.849	16.28.677	25403	7 NW TENERIFFA	TV3	30	53		5.7		
2016-03-01	88	25E	4061	55.43.557	16.19.734	25305	5 NW HOLGERS STEN	SEA			63	0.8		
2016-03-01	89	25E	4061	55.44.686	16.19.976	25305	5 NW HOLGERS STEN	TV3	30	65		0.8		
2016-03-01	90	25E	4061	55.51.033	16.03.087	25431	ARGOS TRACK	SEA			54	3.2		
2016-03-01	91	25E	4061	55.52.245	16.04.082	25431	ARGOS TRACK	TV3	30	54		3.9		
2016-03-01	92	25C	4061	55.47.647	16.00.118	25299	INRE U10	SEA			60	2.1		
2016-03-01	93	25C	4060	55.47.872	15.57.324	25299	INRE U10	TV3	30	61		2.1		
2016-03-02	94	25C	4060	55.47.851	15.17.714	25426	3 NW VÄSTRA NABBEN	SEA			53	4.9		
2016-03-02	95	25C	4060	55.50.458	15.17.506	25426	3 NW VÄSTRA NABBEN	TV3	30	51		7.4	Ersatte 25399	Replaced 25399
2016-03-02	96	25C	4060	55.45.032	15.23.565	25297	4 S YTTERTORPET	SEA			59	1.2		
2016-03-02	97	25C	4060	55.44.716	15.21.716	25297	4 S YTTERTORPET	TV3	30	60		1.6		

Table 2. Summary of the species in the catches. Swedish BITS, Q 1 2016

Namn	Latinskt namn	SD 25W		SD 25C		SD 25E		SD 26		SD 27		SD 28		Totalt	
		Antal	Vikt	Antal	Vikt	Antal	Vikt	Antal	Vikt	Antal	Vikt	Antal	Vikt	Antal	Vikt
Local name	Species	No.	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight	No.	Weight
Torsk	*Gadus morhua*	6 544	1 836.6	20 607	5 797.8	6 571	1 629.1	3 566	1 182.2	80	26.8	52	12.5	37 420	10 485.0
Sill	*Clupea harengus*	24 537	989.8	37 459	1 423.8	109 016	4 095.3	48 163	892.1	196 194	4 976.9	108 310	2 635.2	523 679	15 013.1
Skarpsill	*Sprattus sprattus*	15 020	215.4	104 226	1 212.8	696 140	6 209.5	19 240	142.0	182 572	1 539.9	167 327	1 298.5	1 184 525	10 618.0
Ansjovis	*Engraulis encrasicolus*			1	0.005									1	0.01
Fyrtömmad skärlånga	*Enchelyopus cimbrius*			2	0.1			49	3.9					51	4.0
Hornsimpa	*Myoxocephalus quadricornis*							3	0.7			1 762	243.4	1 765	244.1
Piggvar	*Scophthalmus maximus*	18	11.0	7	3.5	4	1.9	3	1.3			3	0.7	35	18.5
Pomatoschistus (släkte)	*Pomatoschistus*	3	0.001	1	0.001	1	0.001	2	0.002	1	0.001	6	0.01	14	0.01
Rödspätta	*Pleuronectes platessa*	583	118.1	1 141	171.6	112	16.5	8	1.2	3	0.6	2	0.5	1 849	308.4
Rötsimpa	*Myoxocephalus scorpius*	2	0.2	34	5.5	332	58.6	1 242	198.9	467	57.6	363	63.7	2 440	384.4
Sandskädda	*Limanda limanda*	12	2.1	8	1.6									20	3.7
Scyphozoa	*Scyphozoa*				0.3										0.3
Sjurygg	*Cyclopterus lumpus*	1	0.6			6	1.6	4	0.9					11	3.1
Skrubbskädda	*Platichthys flesus*	2 130	481.4	2 336	489.7	835	153.7	1 269	245.1	249	35.8	1 113	162.2	7 931	1 567.9
Småspigg	*Pungitius pungitius*					1	0.001							1	0.001
Spetsstjärtat långebarn	*Lumpenus lampretaeformis*					4	0.1					4	0.1	8	0.1
Storspigg	*Gasterosteus aculeatus*	1	0.001	32	0.03	3 098	4.7	6	0.01	258	0.4	5	0.01	3 400	5.2
Tobiskung	*Hyperoplus lanceolatus*					2	0.3	3	0.02					5	0.3
Vitling	*Merlangius merlangus*	247	49.6	133	30.3	8	1.6							388	81.5
Ålkusa	*Zoarces viviparus*					1	0.02	8	0.7	7	0.4	10	0.6	26	1.7
Summa	Total	49 098	3 705	165 988	9 137	816 130	12 173	73 565	2 669	379 831	6 638	278 956	4 417	1 763 568	38 739

Table 3. List of the stations not visited and prohibited by SAF Q1 2016.

Nr Haul	SD	Lat1	Lon1	Plats	Depth	KDL	Replaced with	Remarks
25387	25W	5524.54	1430.28		53	3	27073	Origin Sweden. Do not exist. Removed.
25404 25125	25C	5549.52	1525.99	YTTERTORPET	52	3	602	The Swedish Armed Forces prohibition.
25399	25C	5552.79	1542.88		51	3	25426	No Station. Removed.
25409 25299	25C	5547.9	1557.8	INRE U10	59	3	25124	Duplicate. Removed.
25313	25E	5606.8	1746.5	13 SE Norra Midsjöbanken	69	4	25313	Due to a electric cable
27020	27	5721.79	1655.24	4 NW Byxelkrok (Specialen)	44	3	-	The Swedish Armed Forces prohibition. No replace station possible.
27003	27	5724.56	1701.56	5 N Byxelkrok (SW-draget)	57	3	-	The Swedish Armed Forces prohibition. No replace station possible.
27025	27	5728.28	1704.79	3 SW Ölands norra grund	65	4	27021	The Swedish Armed Forces prohibition.
27019	27	5742.8	1816.2	6 N Visby	103	6	27027	The Swedish Armed Forces prohibition.
28100	28	5815.8	1911.8	4 SW GOTSKA SANDÖN	59	3	-	The Swedish Armed Forces prohibition. No replace station possible.
28067	28	5706.19	1856.78	11 ESE NÄR	83	5	28071	The Swedish Armed Forces prohibition.
28101	28	5703.84	1849.95	10 SE NÄR	69	4	28037	The Swedish Armed Forces prohibition.

Annex 9. Presentations at the WGBIFS/2016 Meeting

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

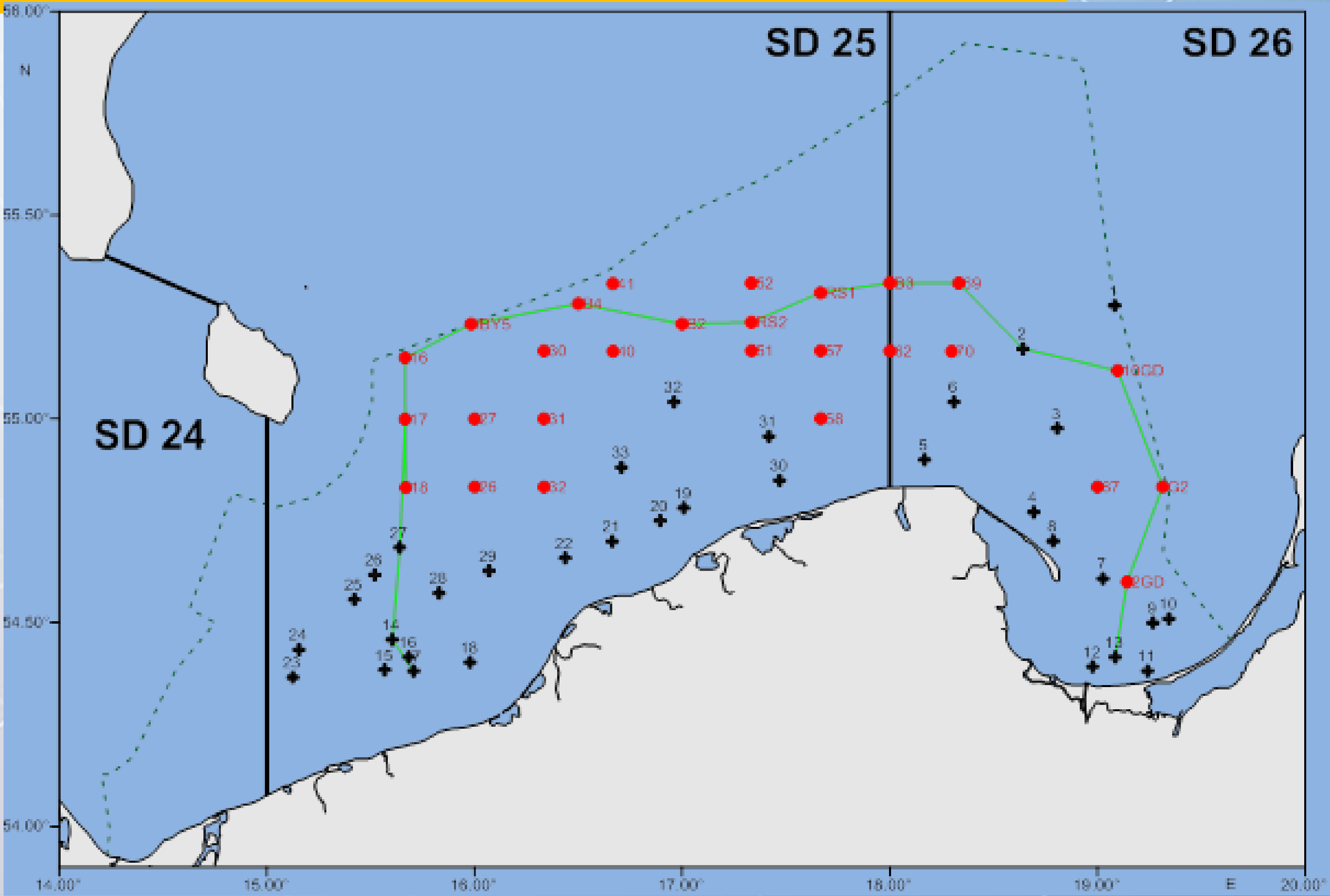
ICES WGBIFS meeting
Rostock, Germany
30.03-03.04. 2016

Polish BITS 4Q 2015 cruise results

Krzysztof Radtke
National Marine Fisheries Research Institute
Gdynia, Poland

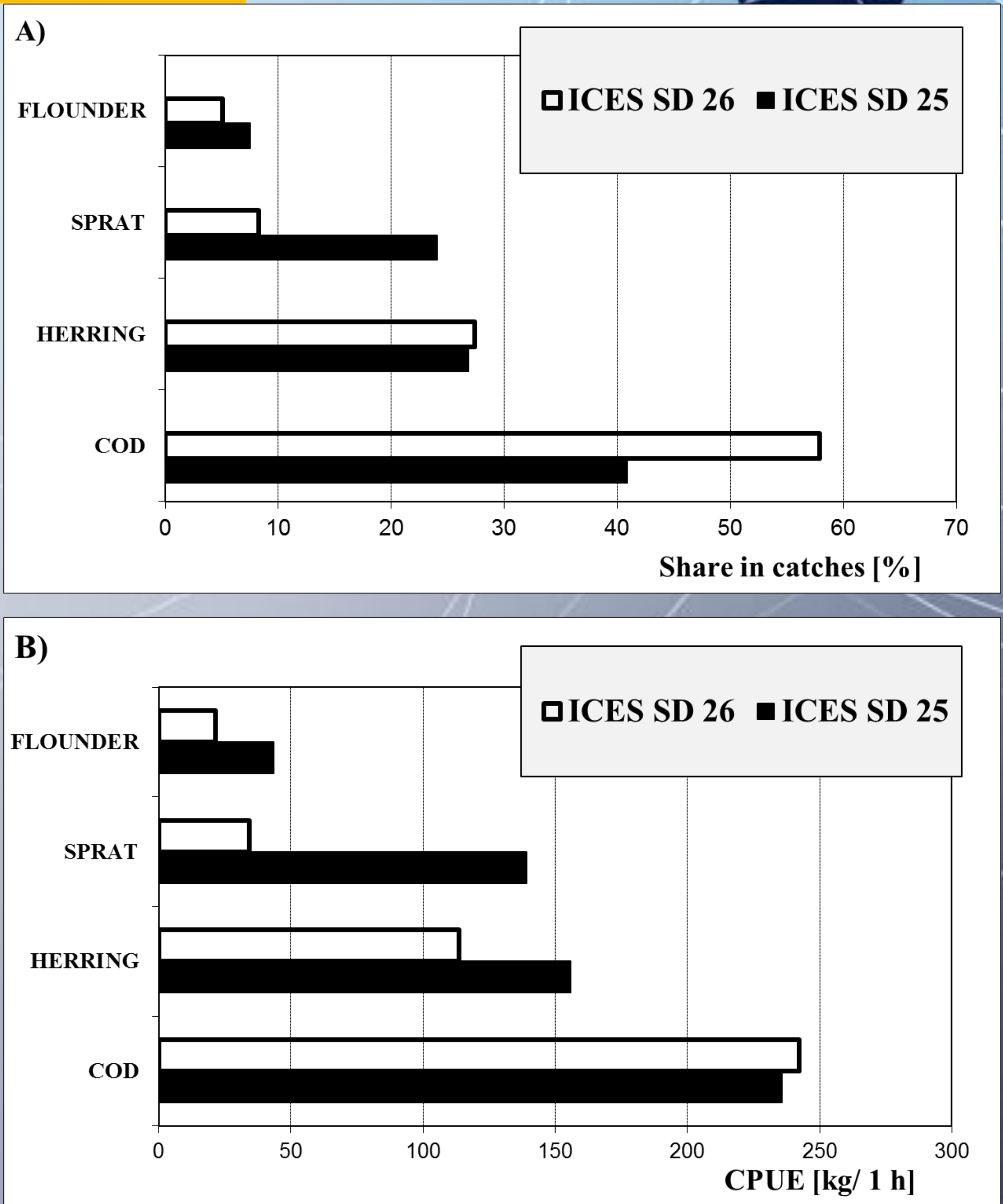
RESEARCH AREA

- ICES SDs 25 and 26, within Polish EEZ
- In total 33 control hauls planned, 32 successfully realized
- One haul – No 32 – invalid, broken footrope



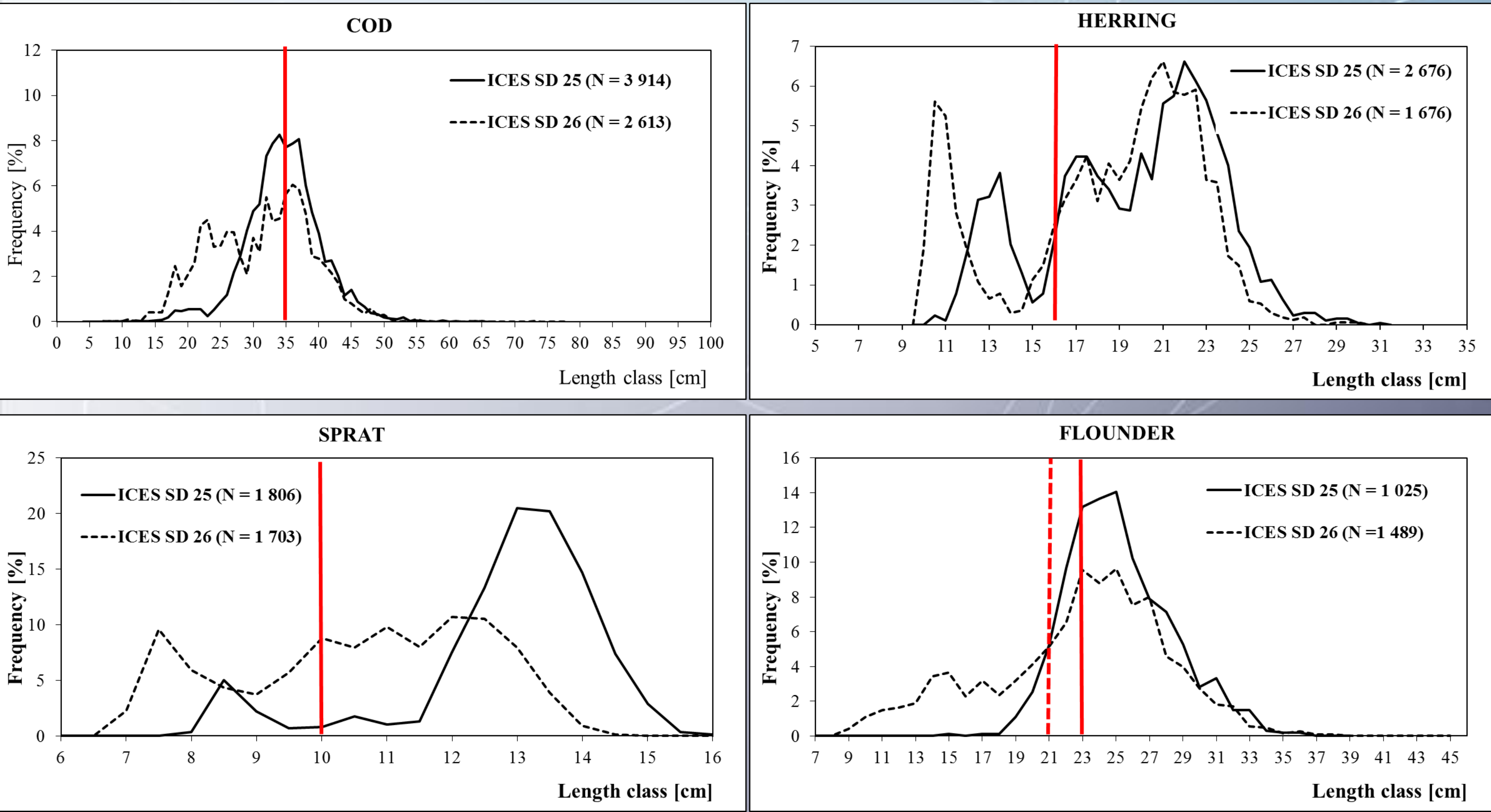
RESULTS

➢ **dominant species in the catches**



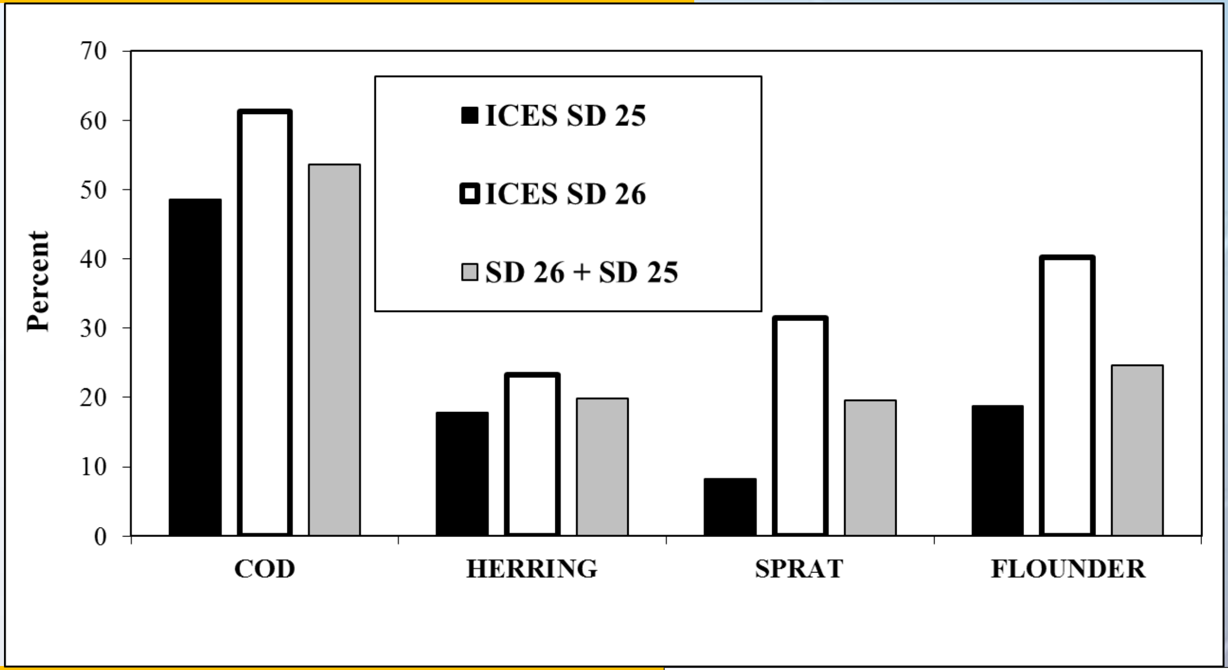
RESULTS

- length distributions of dominant species



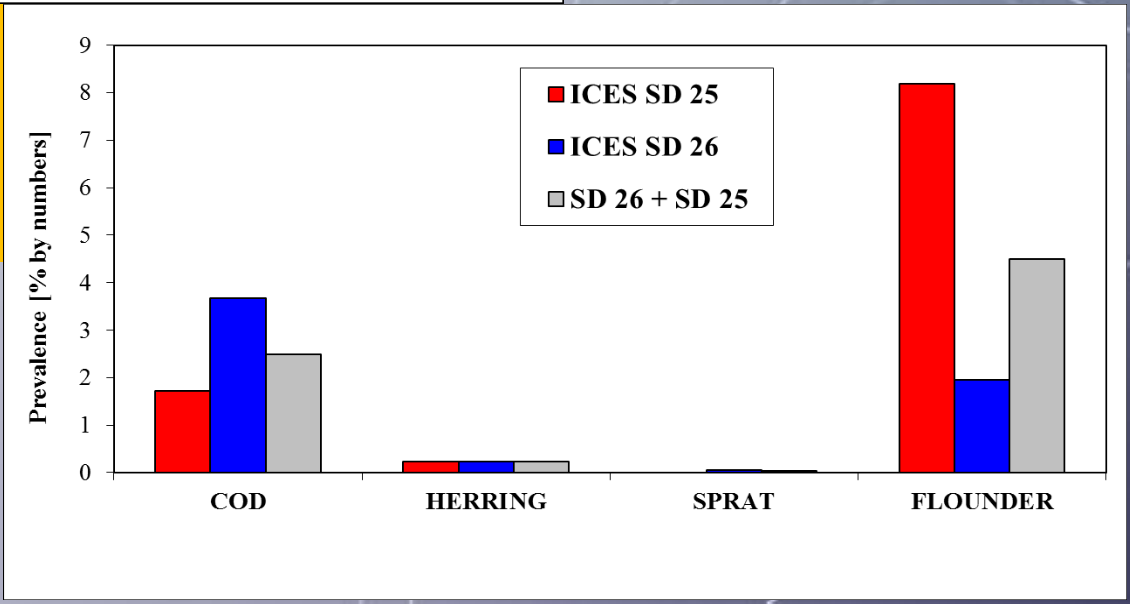
RESULTS

➢ fraction of undersized fish



RESULTS

➢ prevalence of externally visible diseases



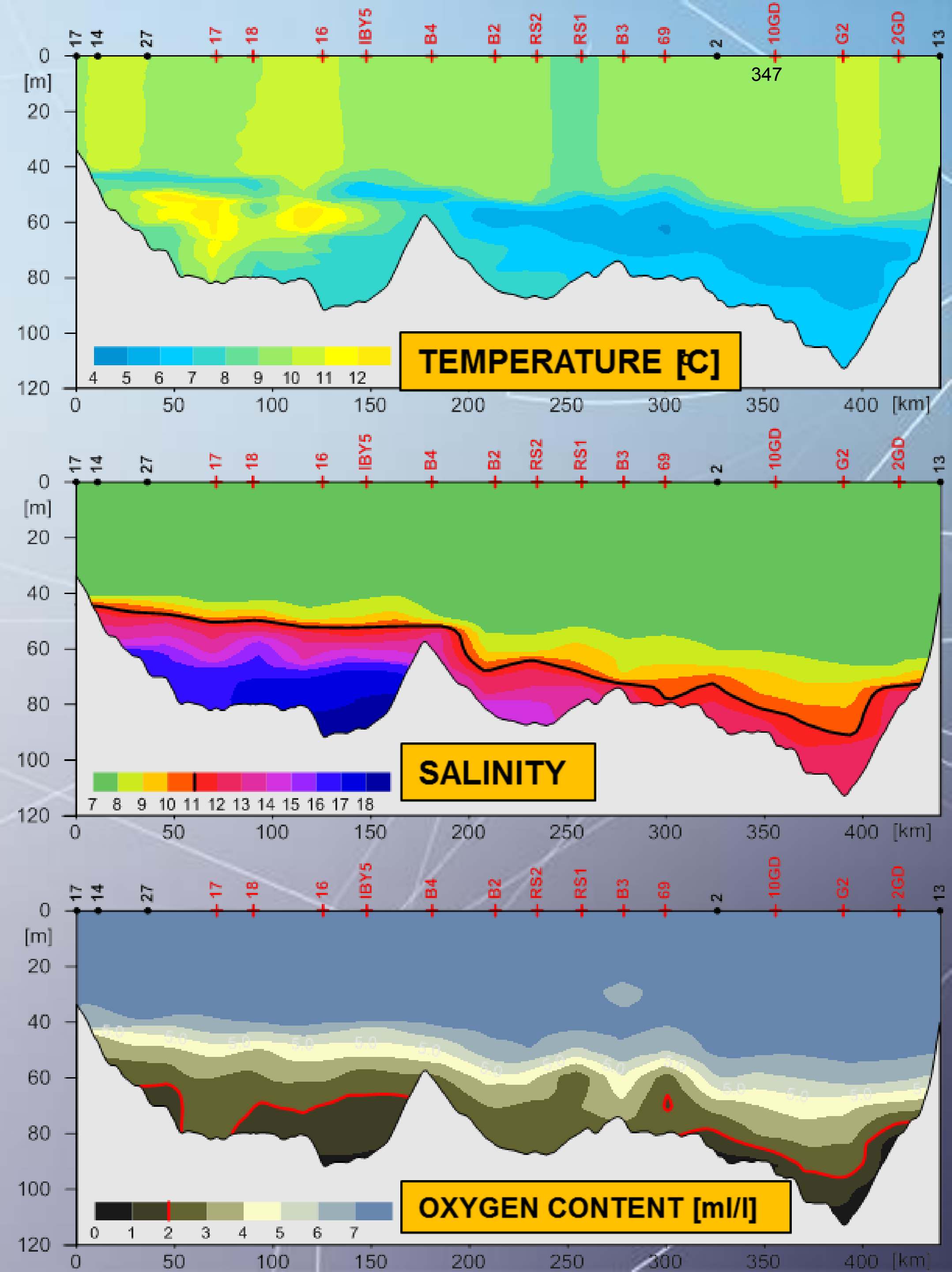
RESULTS

- list of species

Species (Latin name)	Length	Age
Gadus morhua	6527	417
Platichthys flesus	2514	748
Clupea harengus	4352	662
Sprattus sprattus	3509	439
Pleuronectes platessa	333	278
Psetta maxima	17	17
Cyclopterus lumpus	6	6
Enchelyopus cimbrius	20	20
Hyperoplus lanceolatus	40	40
Osmerus eperlanus	11	11
Merlangius merlangus	21	21
Myoxocephalus scorpius	67	67
Pomatoschistus minutus	1	1
Zoarces viviparus	2	2
Alosa fallax	1	1
Engraulis encrasicolus	2	2
Neogobius melanostomus	5	5
Sander lucioperca	1	1
Perca fluviatilis	1	1

RESULTS

➤ hydrological situation



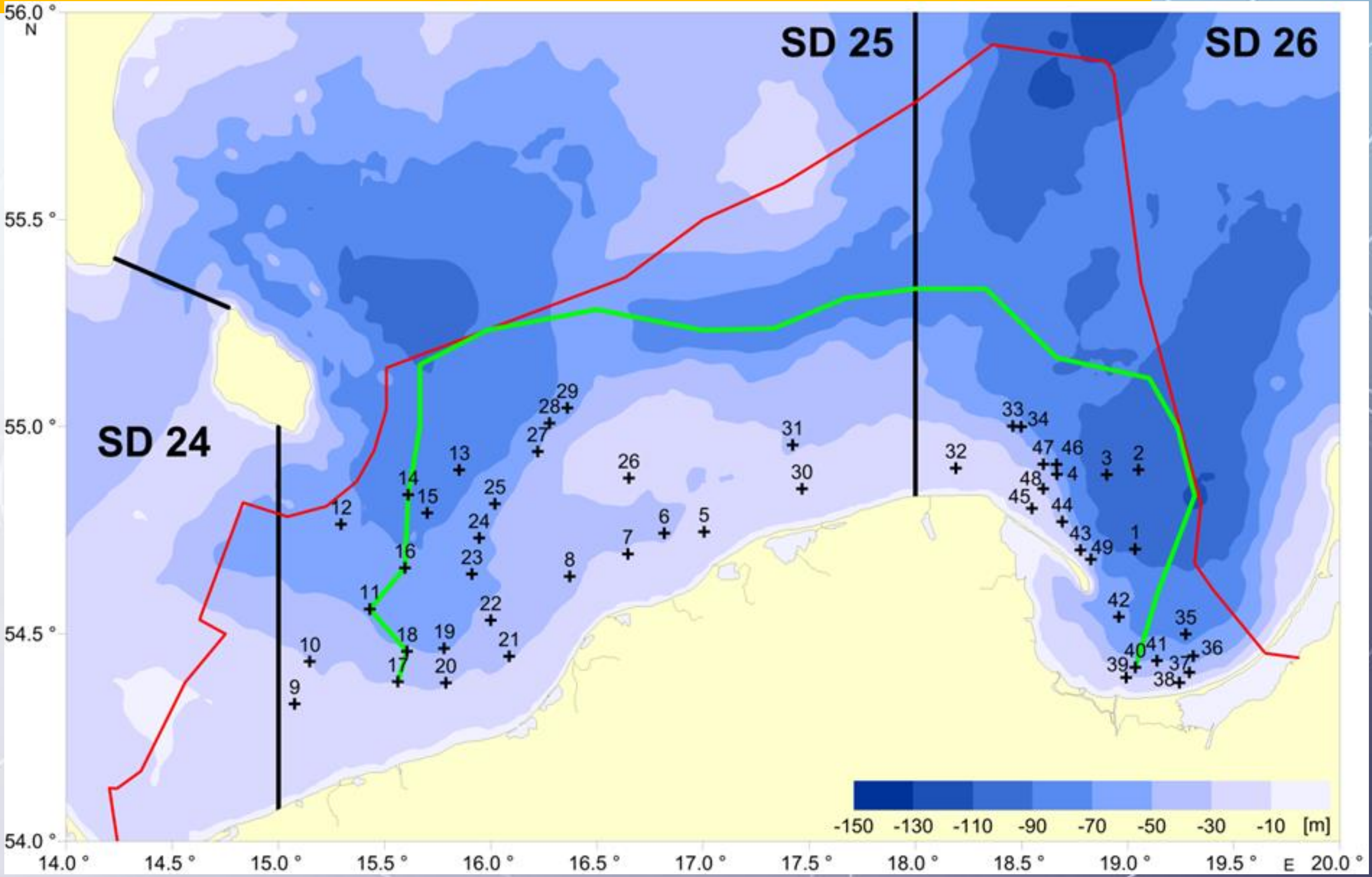
ICES WGBIFS meeting
Rostock, Germany
30.03-03.04. 2016

Polish BITS 1Q 2016 cruise results

Krzysztof Radtke
National Marine Fisheries Research Institute
Gdynia, Poland

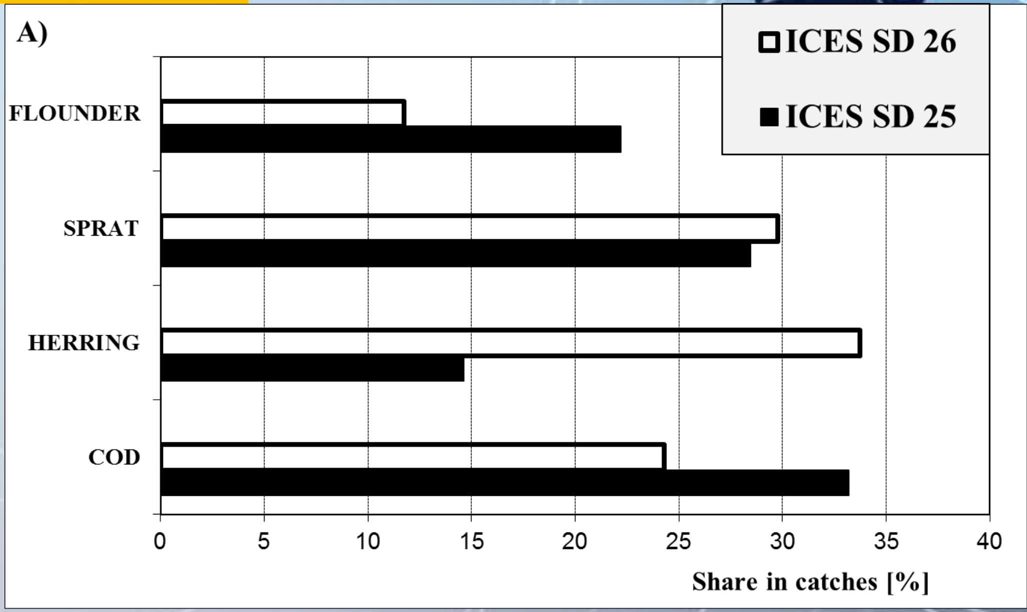
RESEARCH AREA

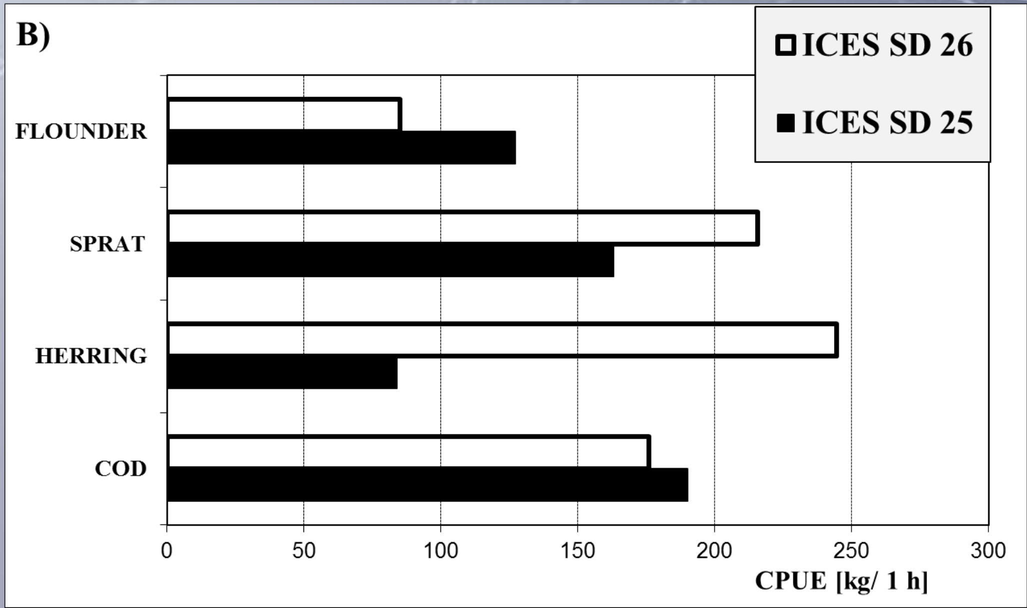
- ICES SDs 25 and 26, within Polish EEZ
- In total 49 control hauls planned, 47 successfully realized
- Hauls – No 2 and 3 not realized, due to too low oxygen (<1 ml/l)



RESULTS

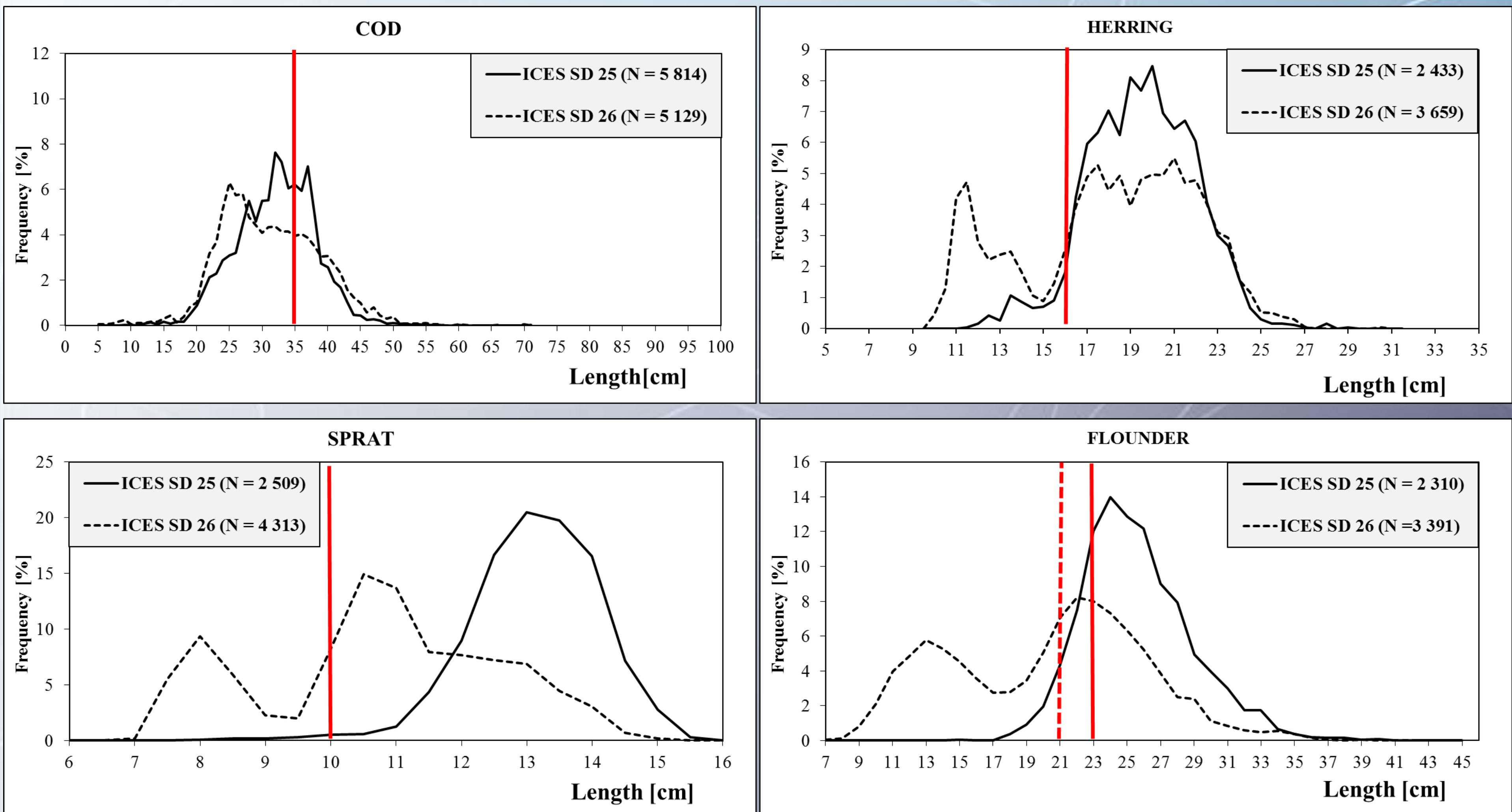
➢ dominant species in the catches





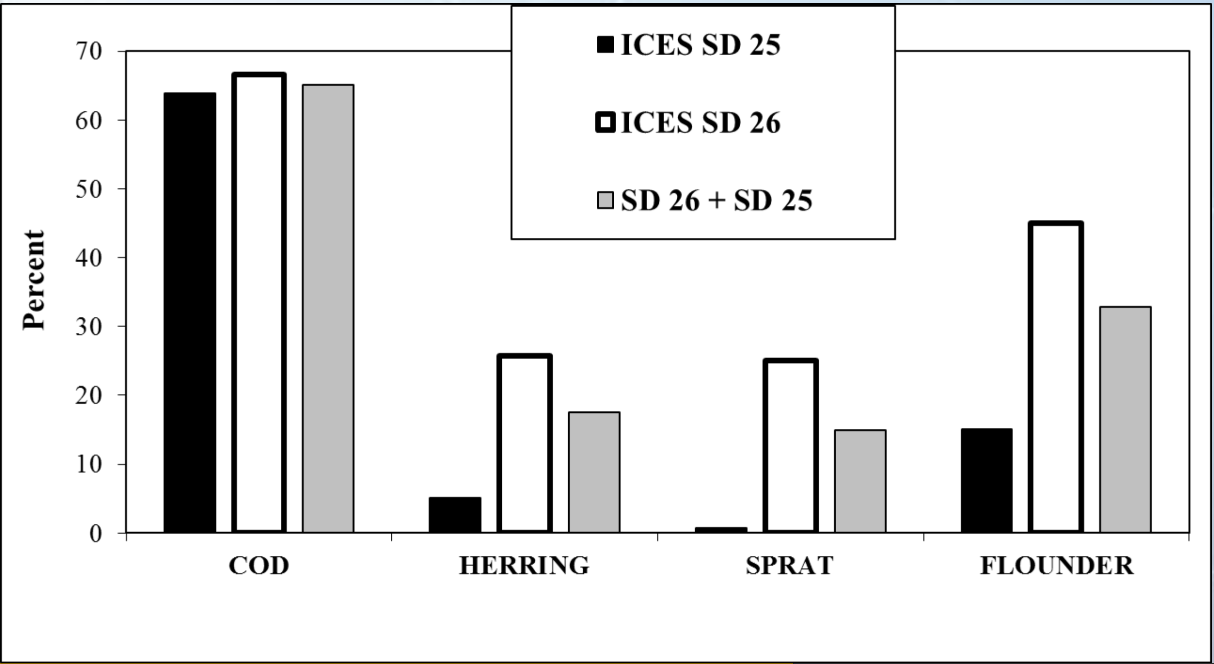
RESULTS

- length distributions of dominant species



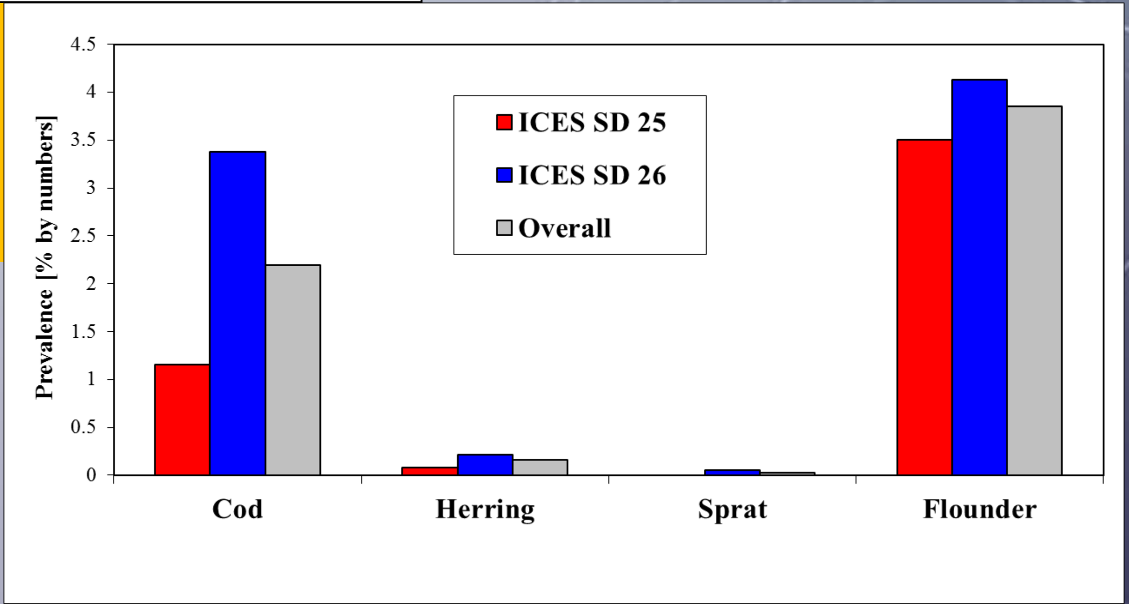
RESULTS

➢ fraction of undersized fish



RESULTS

➢ prevalence of externally visible diseases



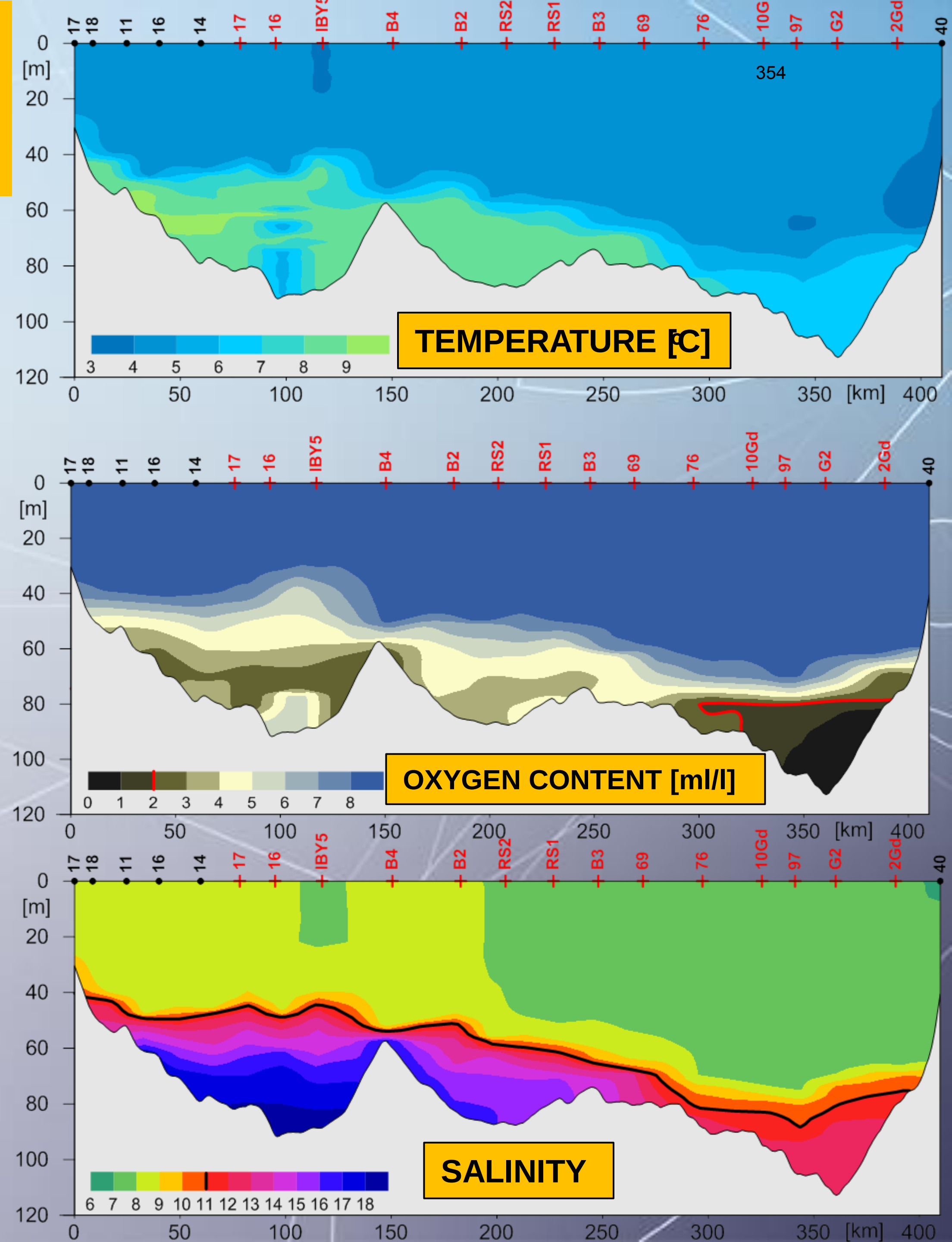
RESULTS

- list of species

Species (Latin name)	Length	Age
Gadus morhua	10943	449
Platichthys flesus	5702	823
Clupea harengus	6092	680
Sprattus sprattus	4313	501
Pleuronectes platessa	810	471
Psetta maxima	12	12
Cyclopterus lumpus	10	10
Enchelyopus cimbrius	43	43
Hyperoplus lanceolatus	15	15
Osmerus eperlanus	91	50
Merlangius merlangus	22	22
Myoxocephalus scorpius	108	108
Limanda limanda	1	1
Pomatoschistus minutus	6	6
Zoarces viviparus	4	4
Alosa fallax	1	1
Scomber scombrus	4	4
Engraulis encrasicolus	14	14
Gasterosteus aculeatus	2	2
Neogobius melanostomus	12	12
Trisopterus minutus	1	1
Ammodytes tobianus	1	1
Agonus cataphractus	4	4
Anguilla anguilla	1	

RESULTS

➢ hydrological situation



THÜNEN

German BITS in Q4 2015 & Q1 2016

Andrés Velasco & Martina Bleil
Thünen Institute of Baltic Sea Fisheries, Rostock

Rostock,
30.03.2016

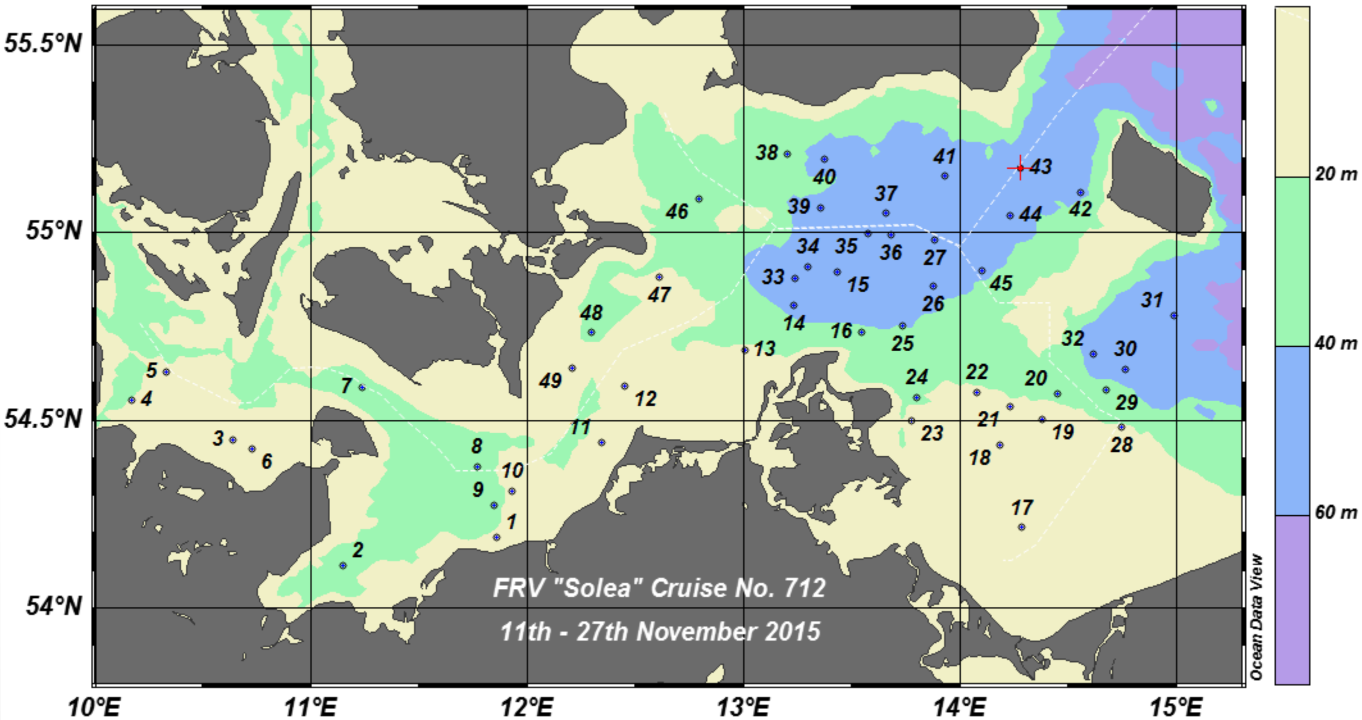
Introduction

- The autumn survey 2015 and the spring survey 2016 are the 34th autumn and the 35th spring German trawl surveys since 1981
- They took place from 11th - 27th November 2015 and from 18th February to 11th March 2016
- The German BITS covers Danish, Swedish, Polish and German territorial waters in the Belt Sea (Mecklenburg- and Kiel Bight and Belts) in ICES SD22 and the Baltic West from Bornholm in ICES SD24 (Arkona Sea)
- In total 110 fishery hauls and 110 hydrography stations (93 % of planned) in ICES SD22 and SD24 were carried out

Andrés Velasco & Martina Bleil
WGBIFS

German BITS Q4 2015

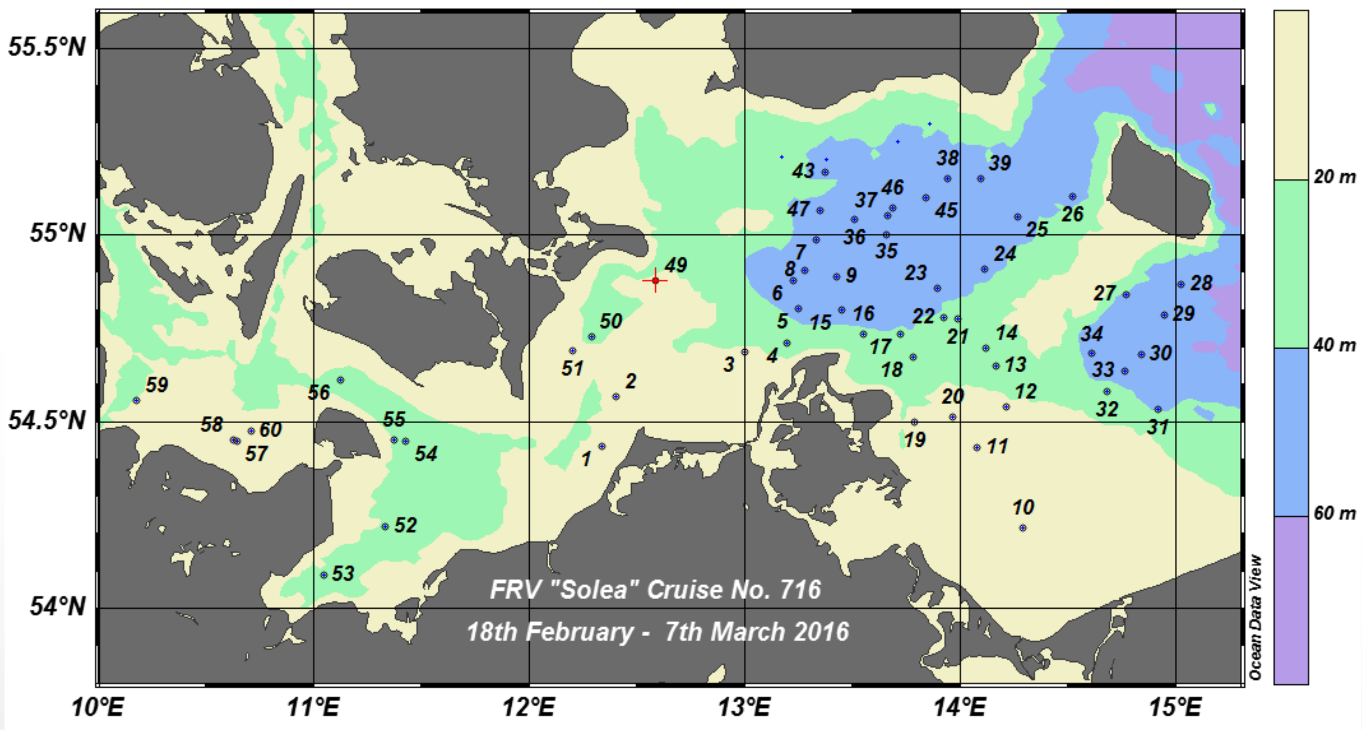
- 49 fishery hauls and 49 hydrography stations (83 % of planned due bad weather) were carried out in ICES SD22 and SD 24
- In total 1096 COD, 904 FLE, 1038 PLE, 761 DAB, 253 TUR & 3 BLL were collected for measuring length, weight, sex, maturity and age
- The mean catch per half hour (CPUE) was 52.9 kg of COD and 68.2 kg of FLE



Andrés Velasco & Martina Bleil
WFBIFS
THÜNEN

German BITS Q1 2016

- 61 fishery hauls and 61 hydrography stations (100 % of planned) were carried out in ICES SD 22 and SD24
- In total 996 COD, 863 FLE, 1127 PLE, 900 DAB, 157 TUR & 2 BLL were collected for measuring length, weight, sex, maturity and age
- The mean catch per half hour (CPUE) was 59.6 kg of COD and 21.9 kg of FLE



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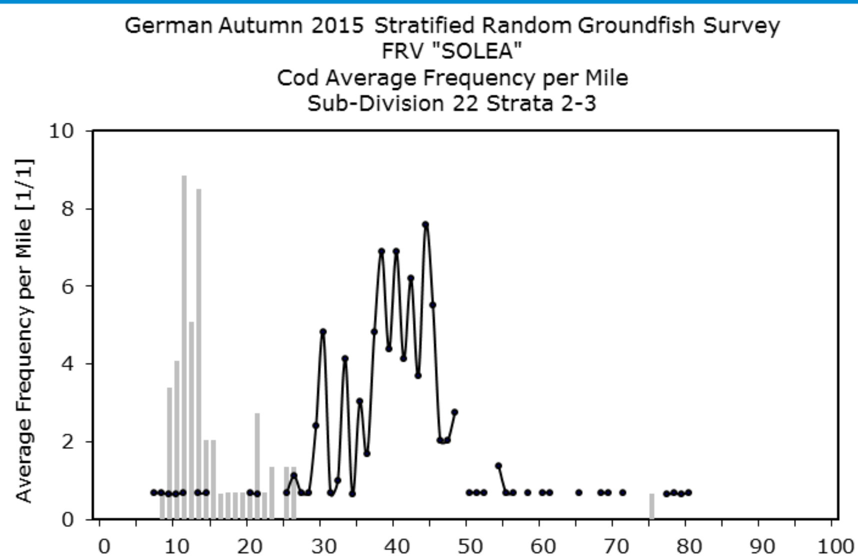
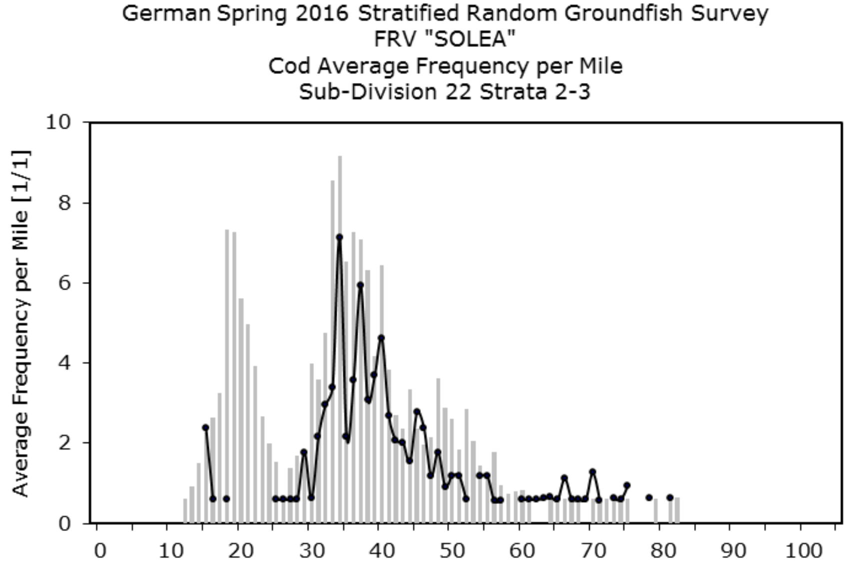
WGBIFS
THÜNEN

Length frequencies of Cod by depth strata (ICES SD 22, 10-29 m, Q4 2015 & Q1 2016)

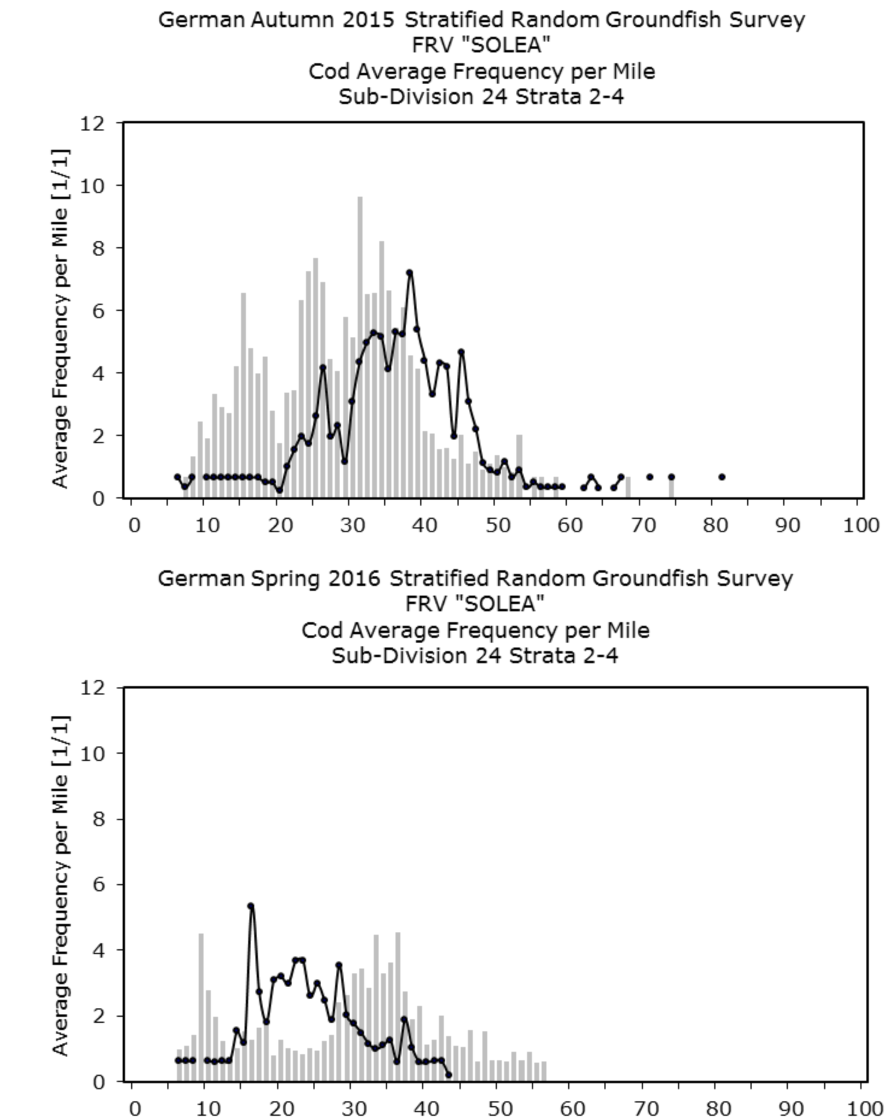




- the length range 10–25 cm of young cod in the depth layer 10-29 m in SD 22 in autumn 2015 and spring 2016 compared to the previous year is decreased

THÜNEN

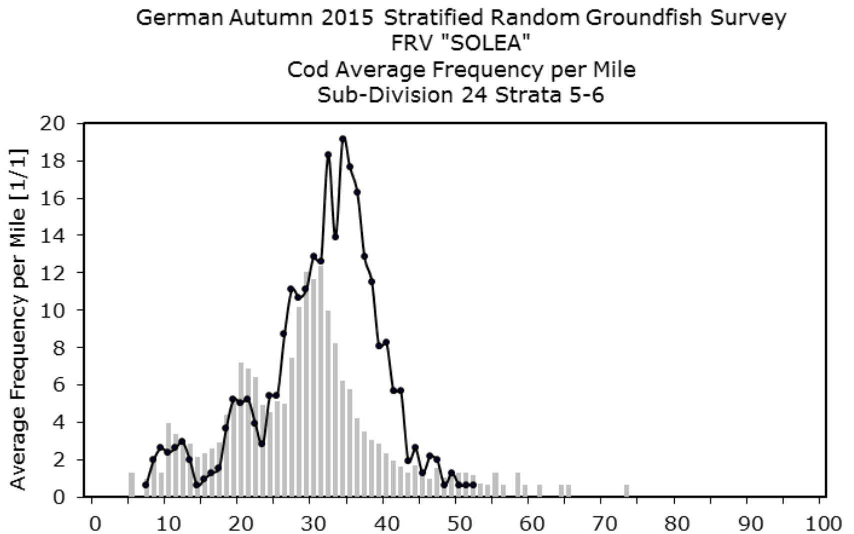
Length frequencies of Cod by depth strata (ICES SD 24, 10-39 m, Q4 2015 & Q1 2016)

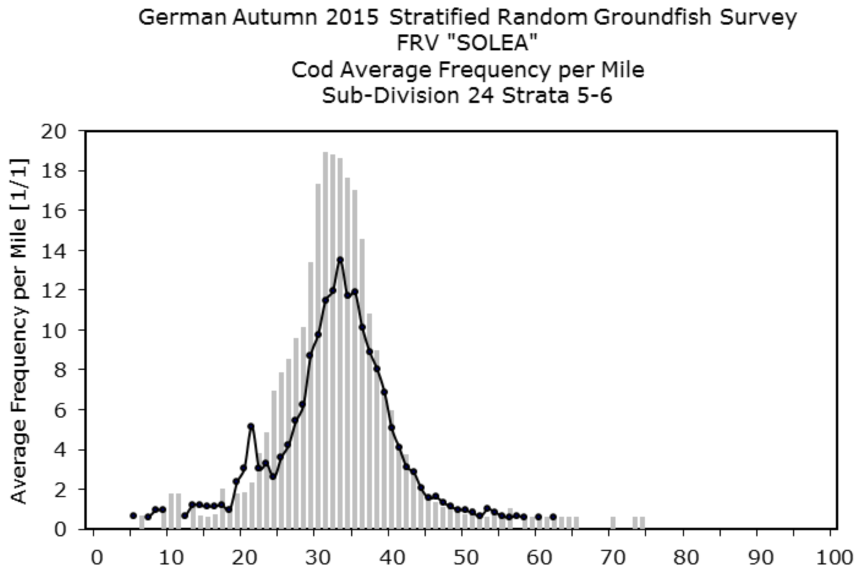


- the number per mile of length range 25–40 cm of young cod in the depth layer 10-39 m in SD 24 in autumn 2015 and spring 2016 compared to the previous year is in autumn increased and in spring decreased

THÜNEN

Length frequencies of Cod by depth strata (ICES SD 24, 40-59 m, Q4 2015 & Q1 2016)



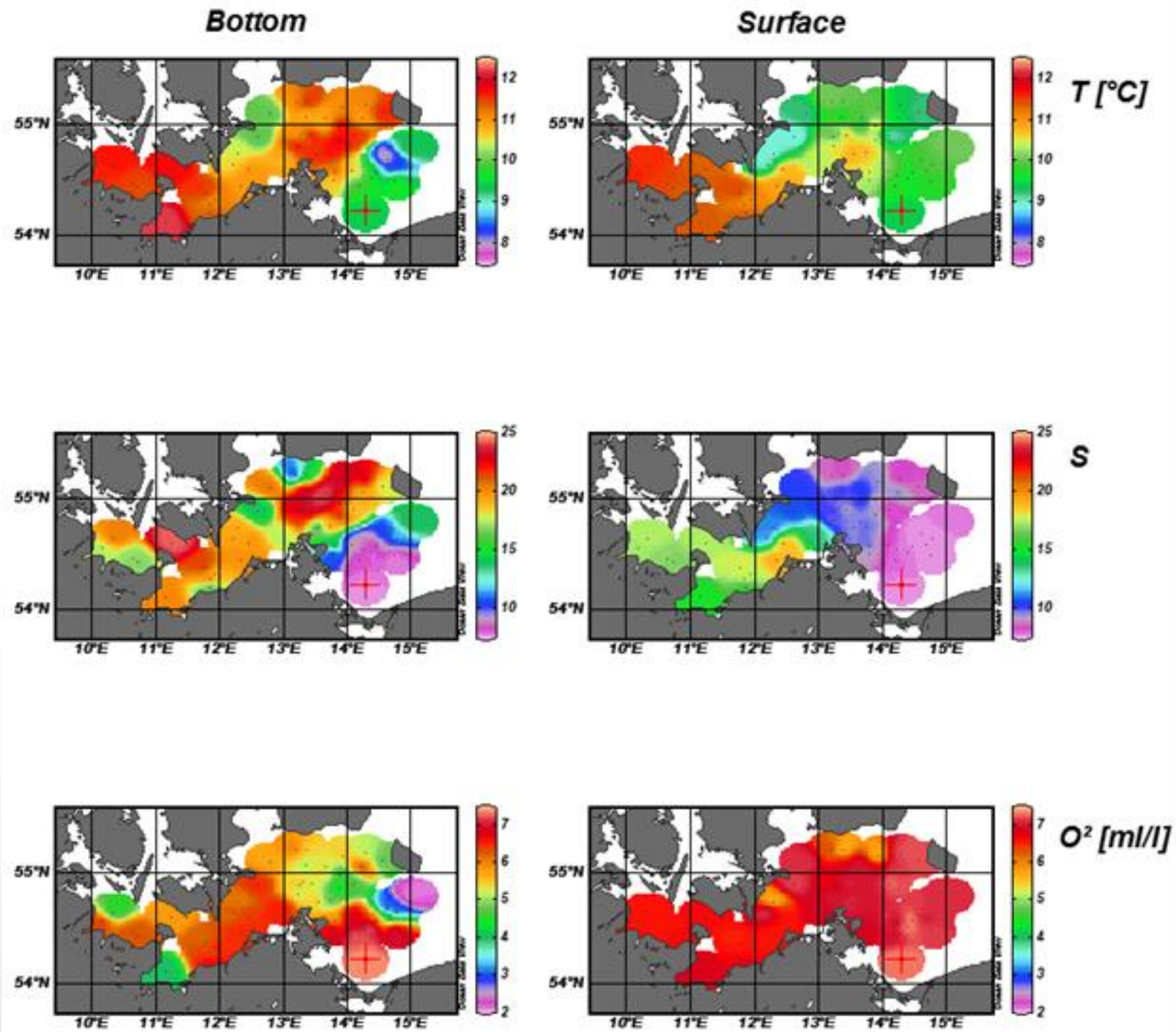


- the number per mile of length range 25–40 cm of young cod in the depth layer 40-59 m in SD 24 in autumn 2015 and spring 2016 compared to the previous year is in autumn increased and in spring decreased

THÜNEN

Hydrography in Q4 2015

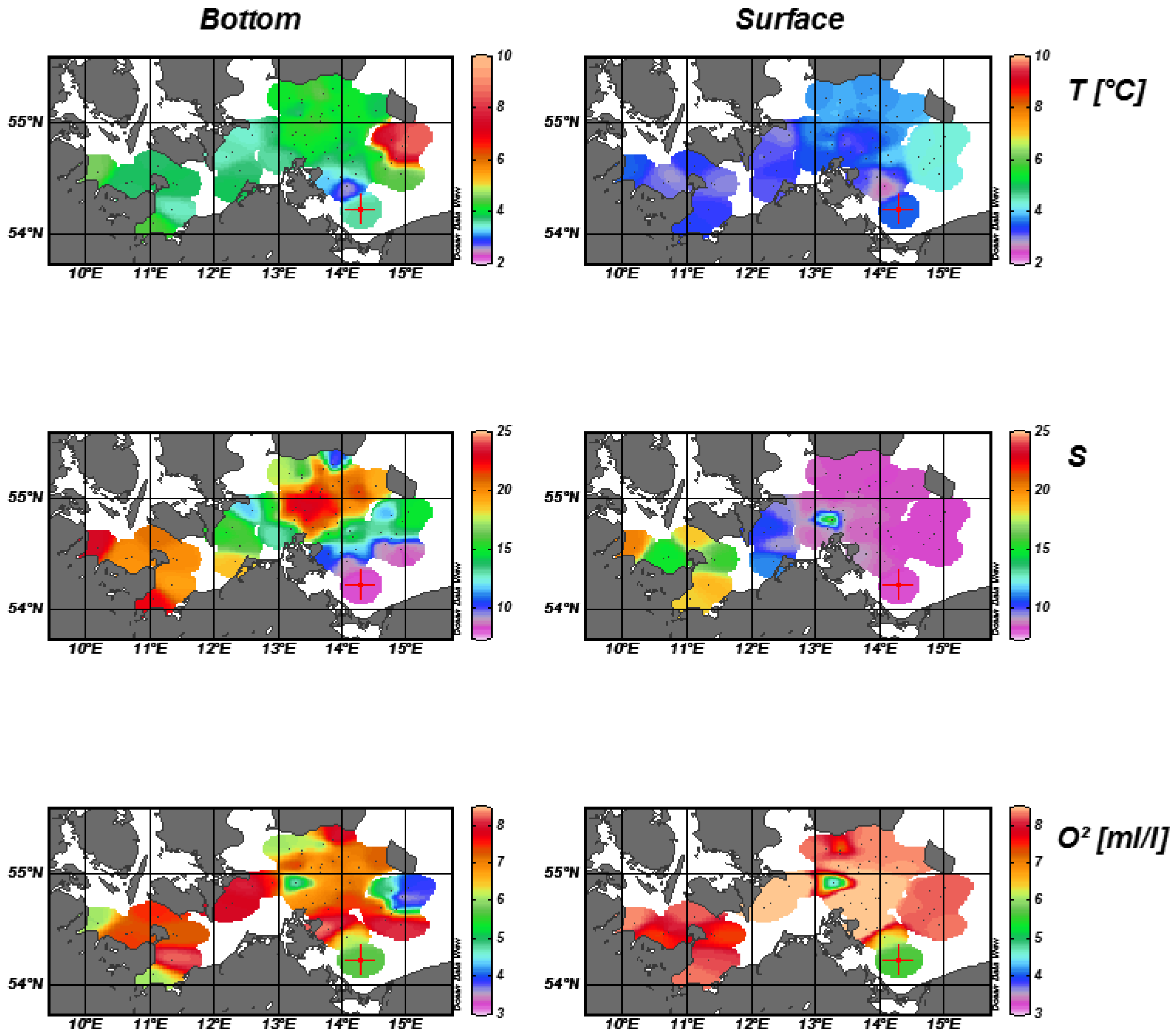
- typical autumn conditions with surface temperatures between 9 - 11.6 °C
- salinity of the surface water decreased from 17.9 - 7.7 from west to east
- lowest temperature value was found in the area south of Bornholm at 7.8 °C
- salinity above the permanent halocline at a water depth of 20 m south of Bornholm was 7.7
- salinity increased below the halocline at a depth of 44 m in the Arkona Sea up to 24.2 at 10.8 °C
- oxygen concentration close to the bottom was between 3.0-7.4 ml/l



Andrés Velasco & Martina Bleil
WGBIFS

Hydrography in Q1 2016

- typical spring conditions with surface temperatures between 2.5 - 4.3 °C
- salinity of the surface water decreased from 20.4 - 8.2 from west to east
- lowest temperature value was found in the area north of Oderbank at 2.5 °C
- salinity above the permanent halocline at a water depth of 15.9 m in the Arkona Basin was 8.4
- salinity increased below the halocline at a depth of 44 m in the Arkona Basin up to 23.3 at 4.3 °C
- oxygen concentration close to the bottom was between 3.2-8.4 ml/l



Andrés Velasco & Martina Bleil
WGBIFS
THÜNEN

Thank you!

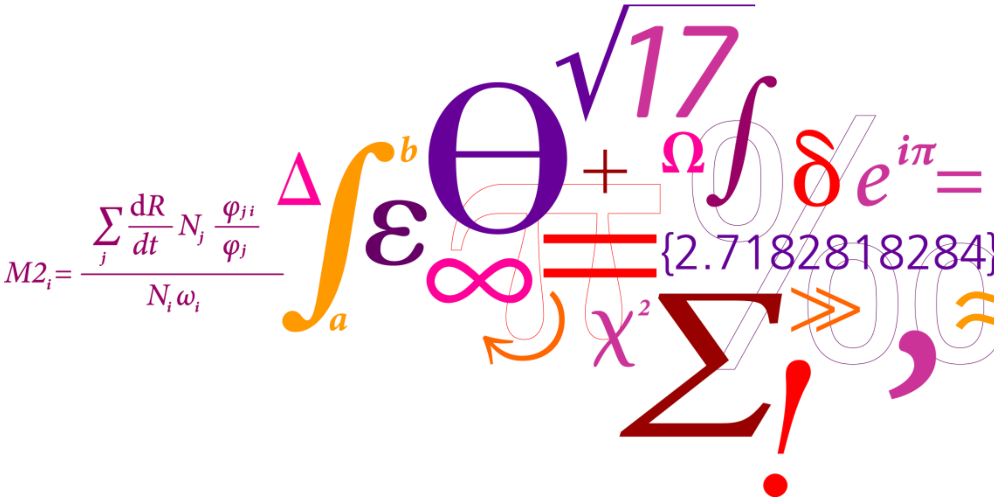
Andrés Velasco & Martina Bleil
WGBIFS

THÜNEN

Survey status and main results

Henrik Degel
DTU Aqua

BIFS meeting
30/3 – 4/4, 2016
Rostock



DTU Aqua
National Institute of Aquatic Resources

4th quarter 2015. Dana (SD 25, 26)

Cruise summary

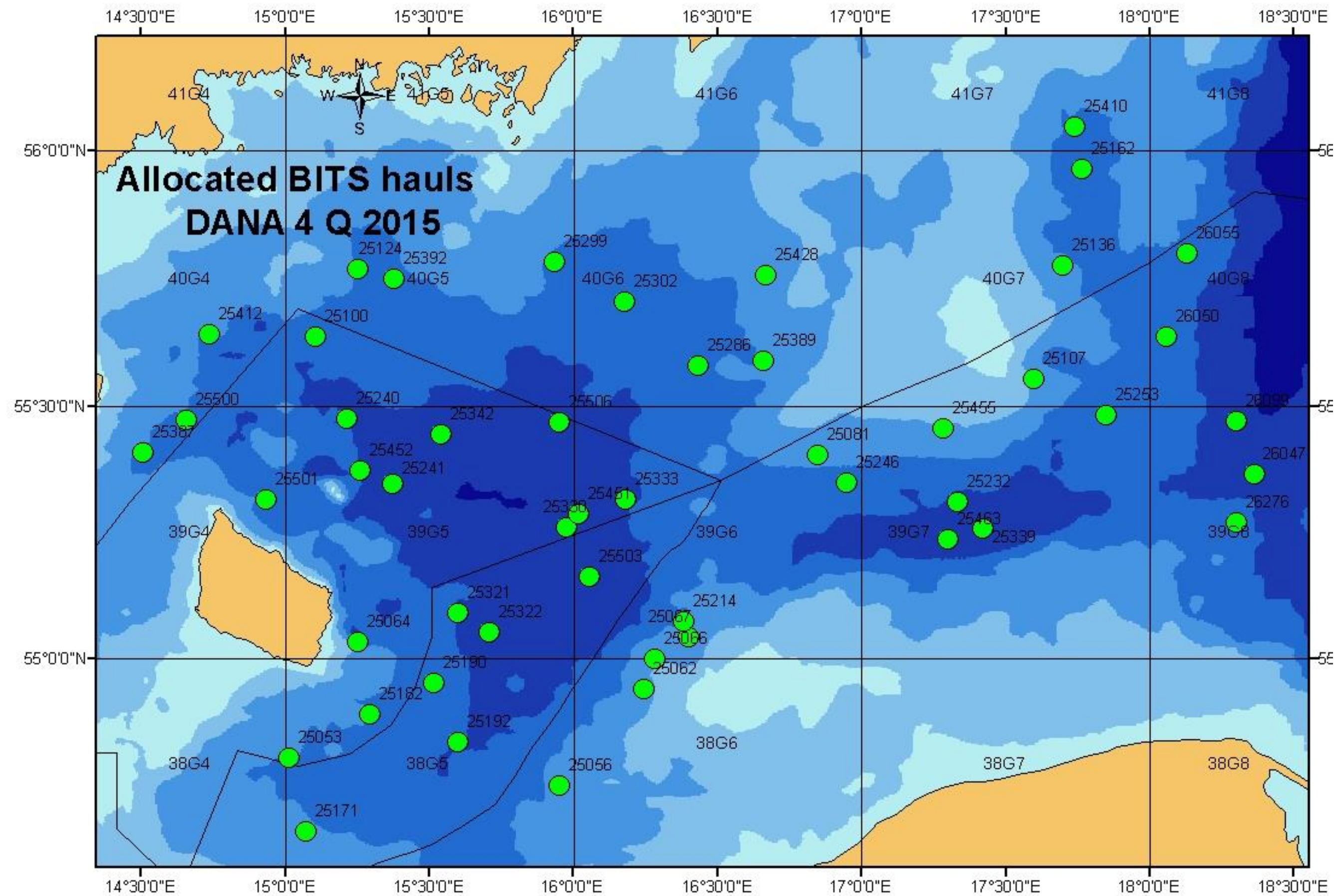
Cruise:	BITS
Cruise number	15
Quarter:	4
Year:	2015
Periode:	3-19/11
Country	Denmark

Number of hauls planed: 50

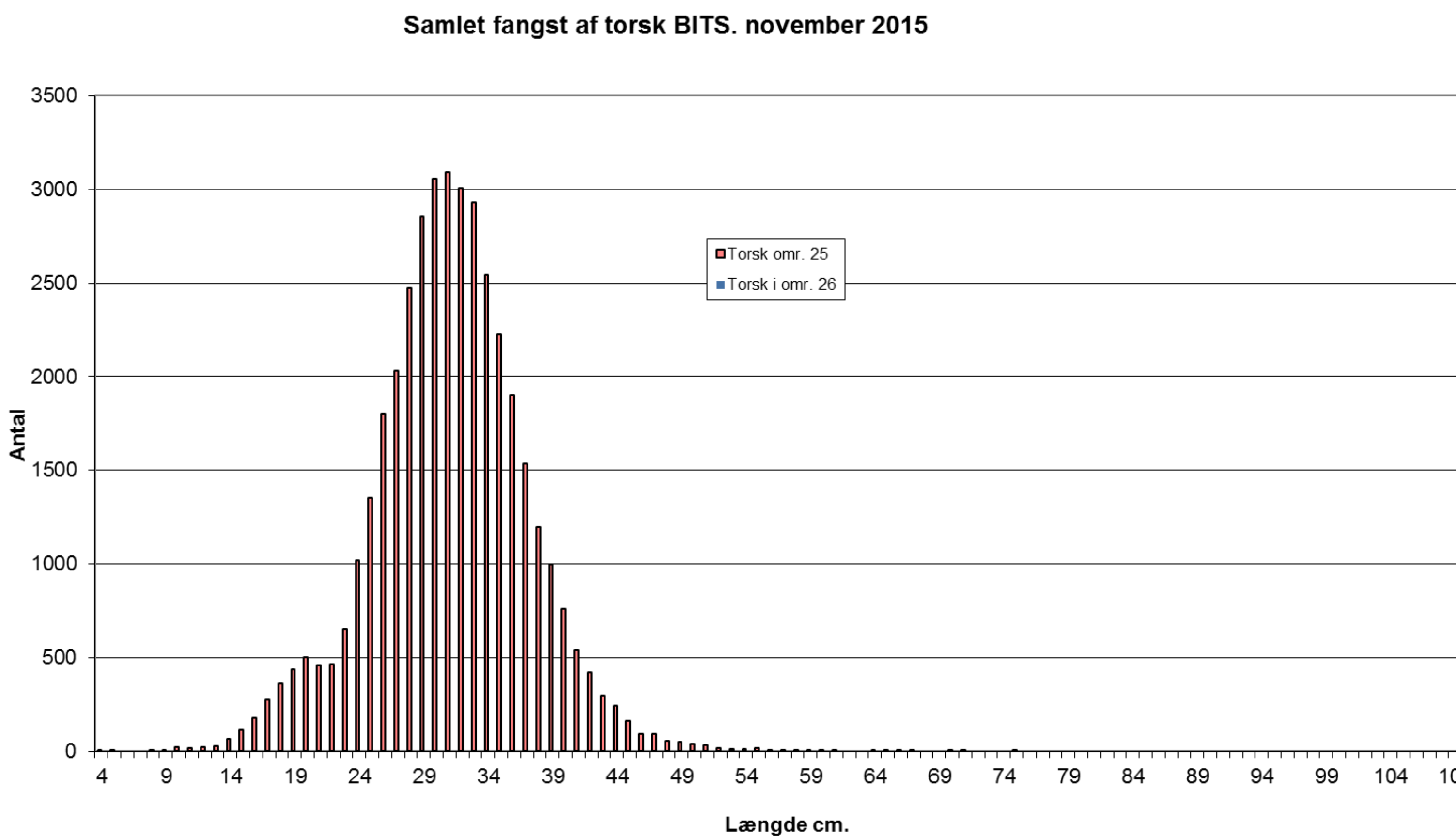
	Index qualified	Non-index qualified
Number of succesful trawl hauls carried out in total:	41	
Number of invalid trawl hauls carried out:		3
Number of "No oxygen trawl hauls" carried out (assumed zero-catch):	8	
SUM	49	3

Number of trawl related CTD stations performed:	49
Number of NON-trawl related CTD stations performed:	45
Number of succesful BONGO hauls carried out:	80
Number of succesful IKMT hauls carried out:	53
Number of succesful Appi hauls carried out:	0
Number of succesful WP2 hauls carried out:	2
Number of succesful BOM hauls carried out:	0
Number of succesful Multi-NET hauls carried out:	0

Total kgs of cod cached	11787.9
Total number of cod measured	41923
Total number of cod otoliths collected	728



Henrik Degel
BIFS meeting Rostock 30/3-4/4 -2016


Samlet fangst af torsk BITS. november 2015
3500
3000
2500
2000
1500
1000
500
0
Antal
Torsk omr. 25
Torsk i omr. 26
4
9
14
19
24
29
34
39
44
49
54
59
64
69
74
79
84
89
94
99
104
109
Længde cm.

1st quarter 2016. Dana (SD 25, 26)

Cruise summary

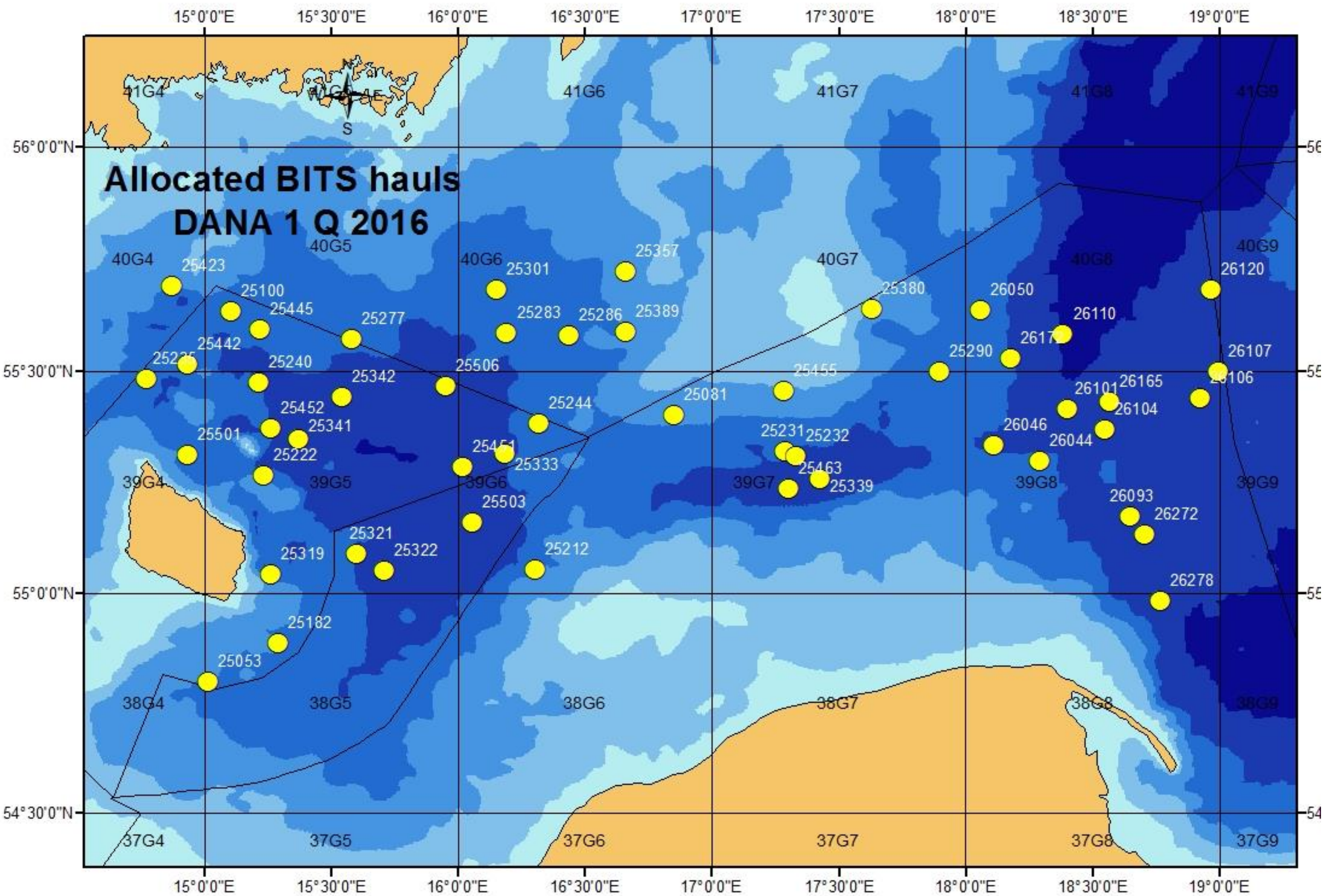
Cruise:	BITS
Cruise number	4
Quarter:	1
Year:	2016
Periode:	4-22/3
Country	Denmark

Number of hauls planed: 50

	Index qualified	Non-index qualified
Number of succesful trawl hauls carried out in total:	49	
Number of invalid trawl hauls carried out:		5
Number of "No oxygen trawl hauls" carried out (assumed zero-catch):	0	
SUM	49	5

Number of trawl related CTD stations performed:	4
Number of NON-trawl related CTD stations performed:	82
Number of succesful BONGO hauls carried out:	50
Number of succesful IKMT hauls carried out:	0
Number of succesful Appi hauls carried out:	0
Number of succesful WP2 hauls carried out:	8
Number of succesful BOM hauls carried out:	0
Number of succesful Multi-NET hauls carried out:	0

Total kgs of cod cached	6210
Total number of cod measured	18673
Total number of cod otoliths collected	0


Allocated BITS hauls
DANA 1 Q 2016
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°0'0"N
55°30'0"N
55°0'0"N
54°30'0"N
41G4
41G6
41G7
41G8
41G9
40G4
40G5
40G6
40G7
40G8
40G9
39G4
39G5
39G6
39G7
39G8
39G9
38G4
38G5
38G6
38G7
38G8
38G9
37G4
37G5
37G6
37G7
37G8
37G9
25423
25100
25445
25442
25277
25235
25240
25342
25506
25452
25341
25501
25222
25301
25357
25283
25286
25389
25244
25451
25333
25503
25321
25322
25319
25212
25182
25053
25081
25455
25380
25231
25232
25463
25339
25290
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26104
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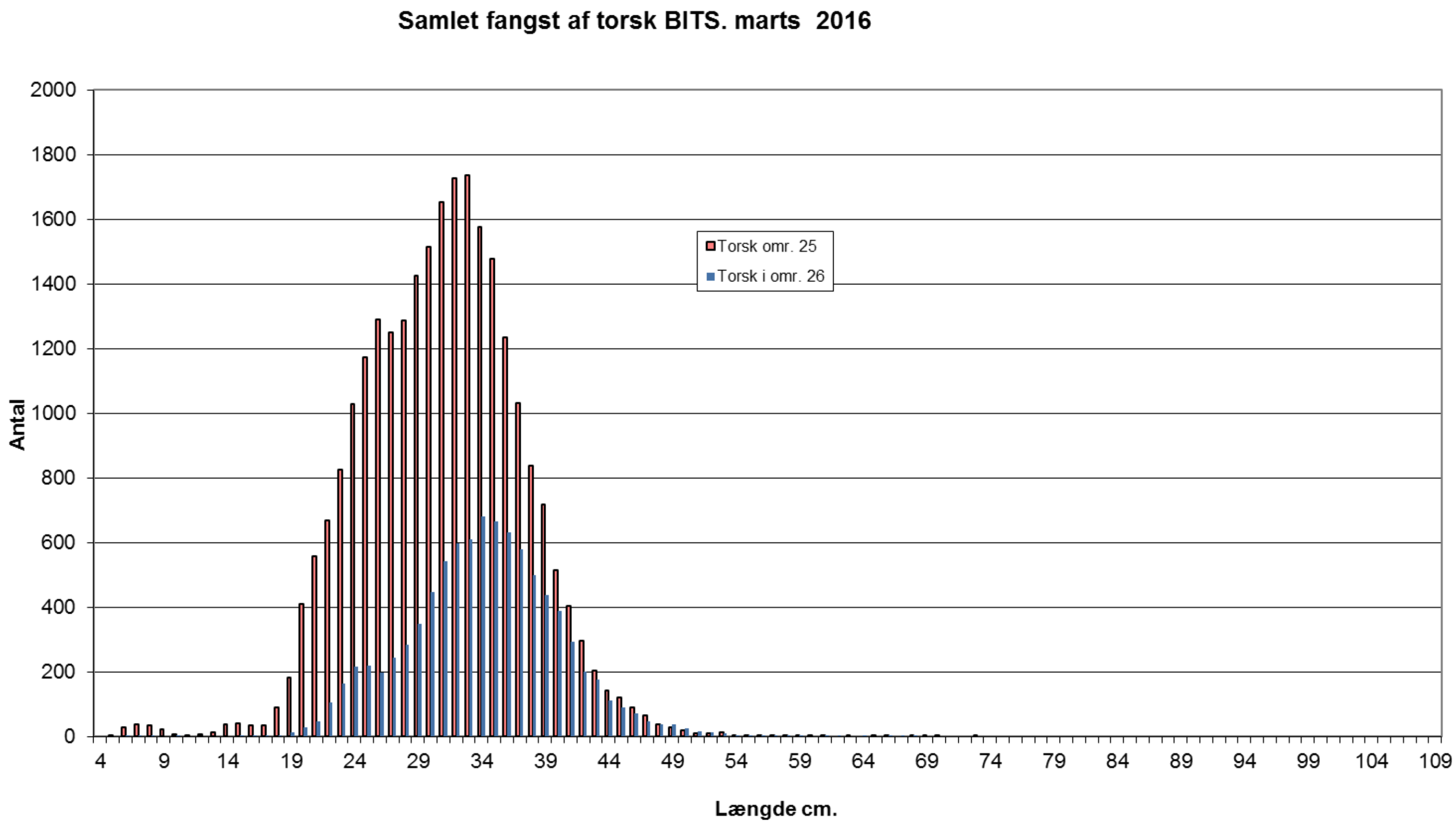
26044
26093
26272
26278



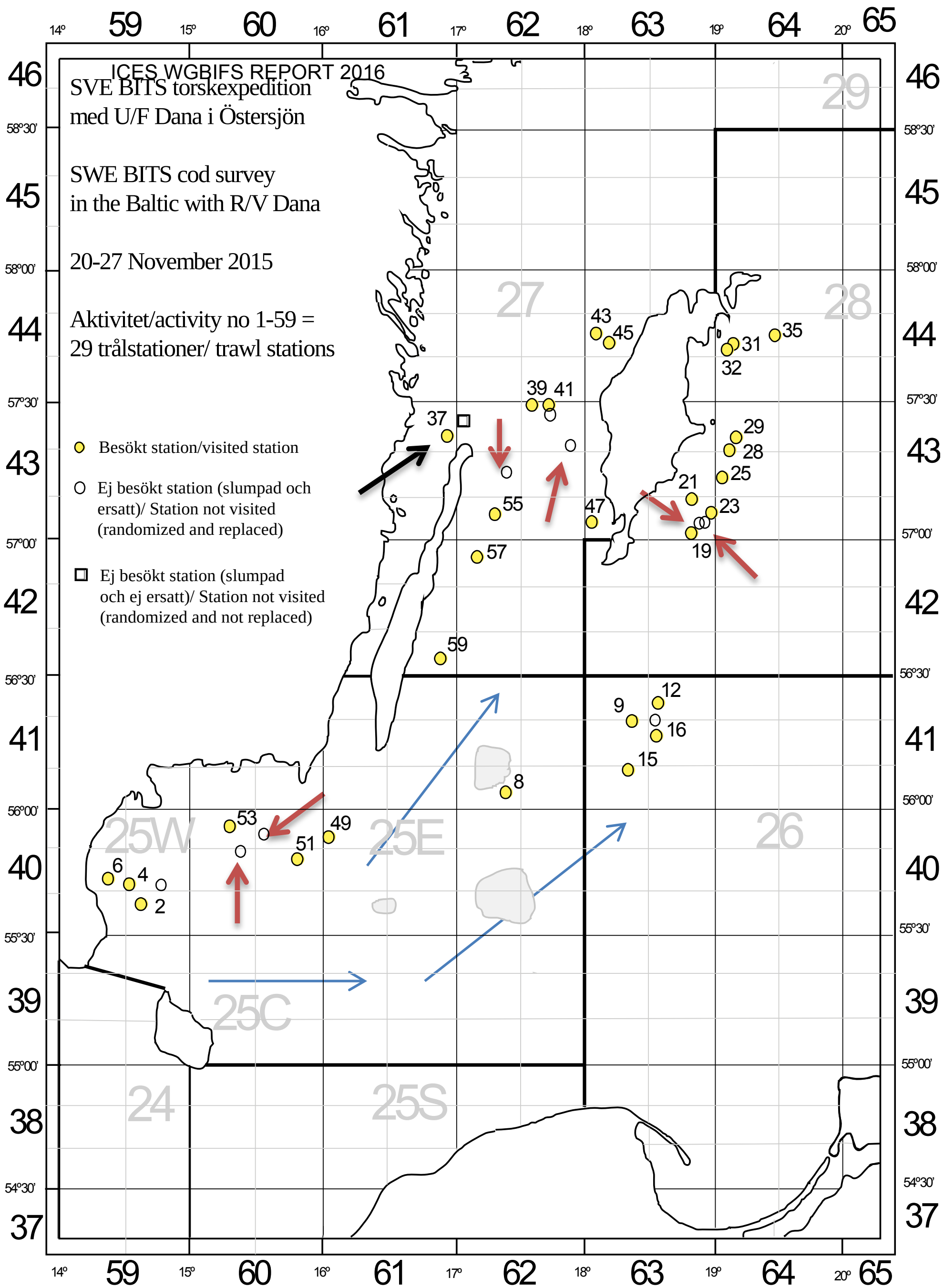
Henrik Degel
BIFS meeting Rostock 30/3-4/4 -2016

WGBIFS Rostock
30/3– 03/04-16

BITS 2015 Q4 and 2016 Q1

BITS 2015 Q4

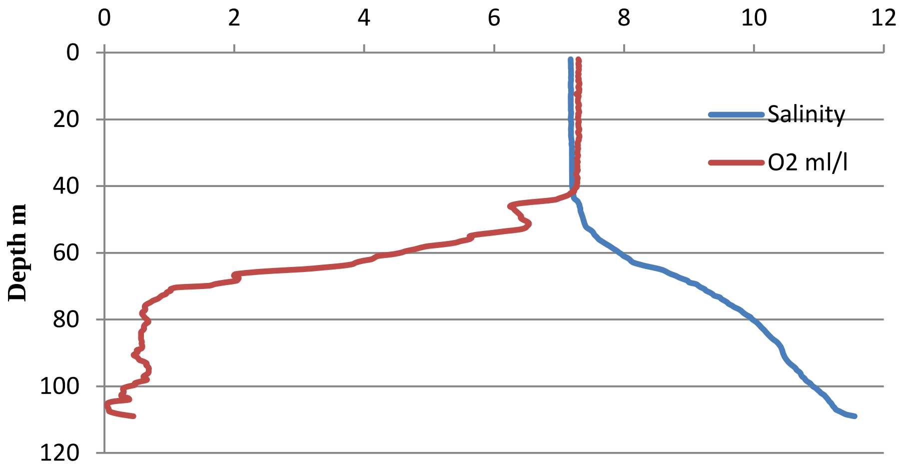
- Nov 20– nov 27
- Nine days survey (30 stations)
- Stomach sampling cod and flounder
- Additional sampling, Saduria entomon Lenght distribution
- Genetic sampling on cod



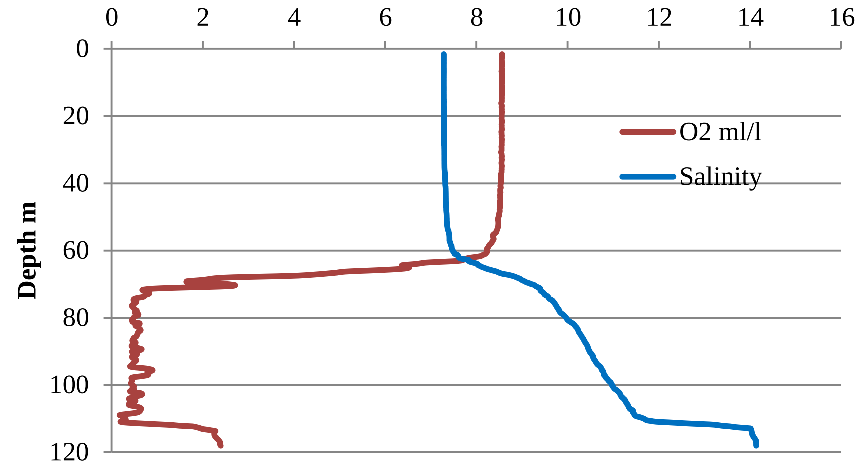
2015 Q4 Stations

- Squares. Forbidden stations
- Hollow circles. Replaced stations
- Yellow circles. Planned and executed stations
- On this survey some of the old prohibited stations were allowed. For example Nr 37
- Red arrows. Forbidden and replaced stations
- Continuesly high levels of salinity and oxygene, (ml/L) in some areas, particularly in Bornö basin and southern part of SD 26

201411 Station 26221



201502 Station 26140

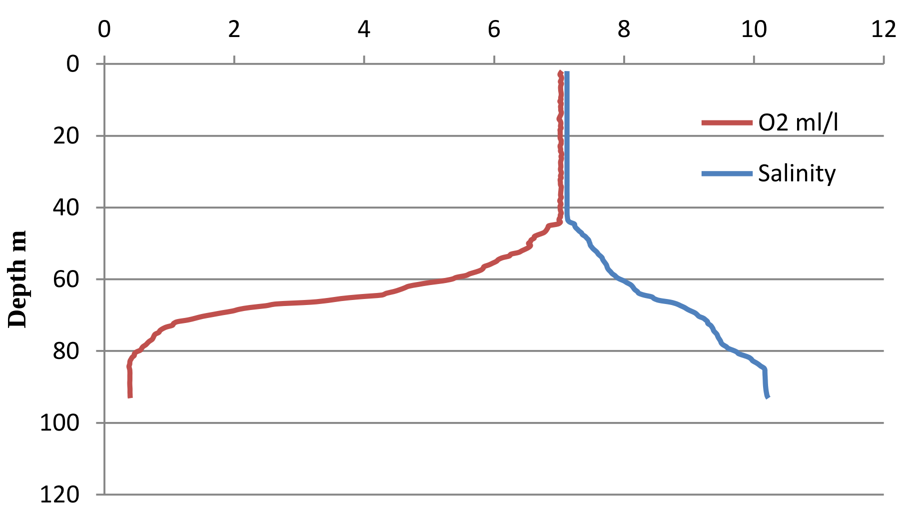


296 KG Cod

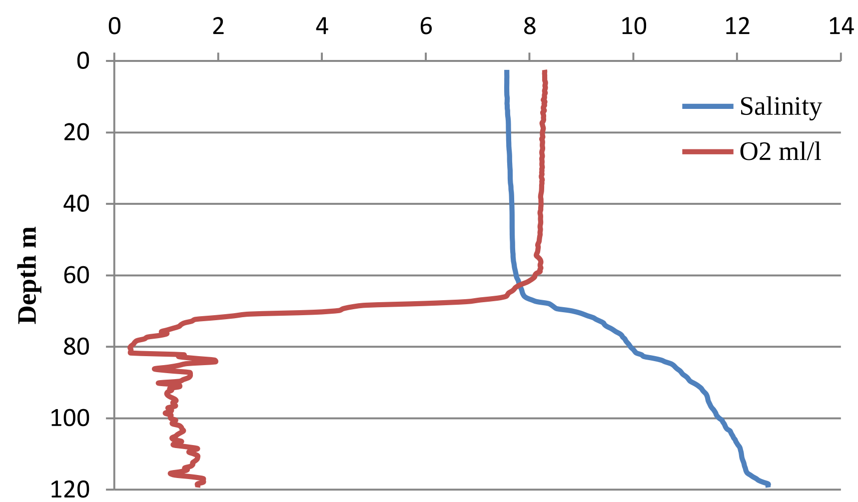
83 KG Cod

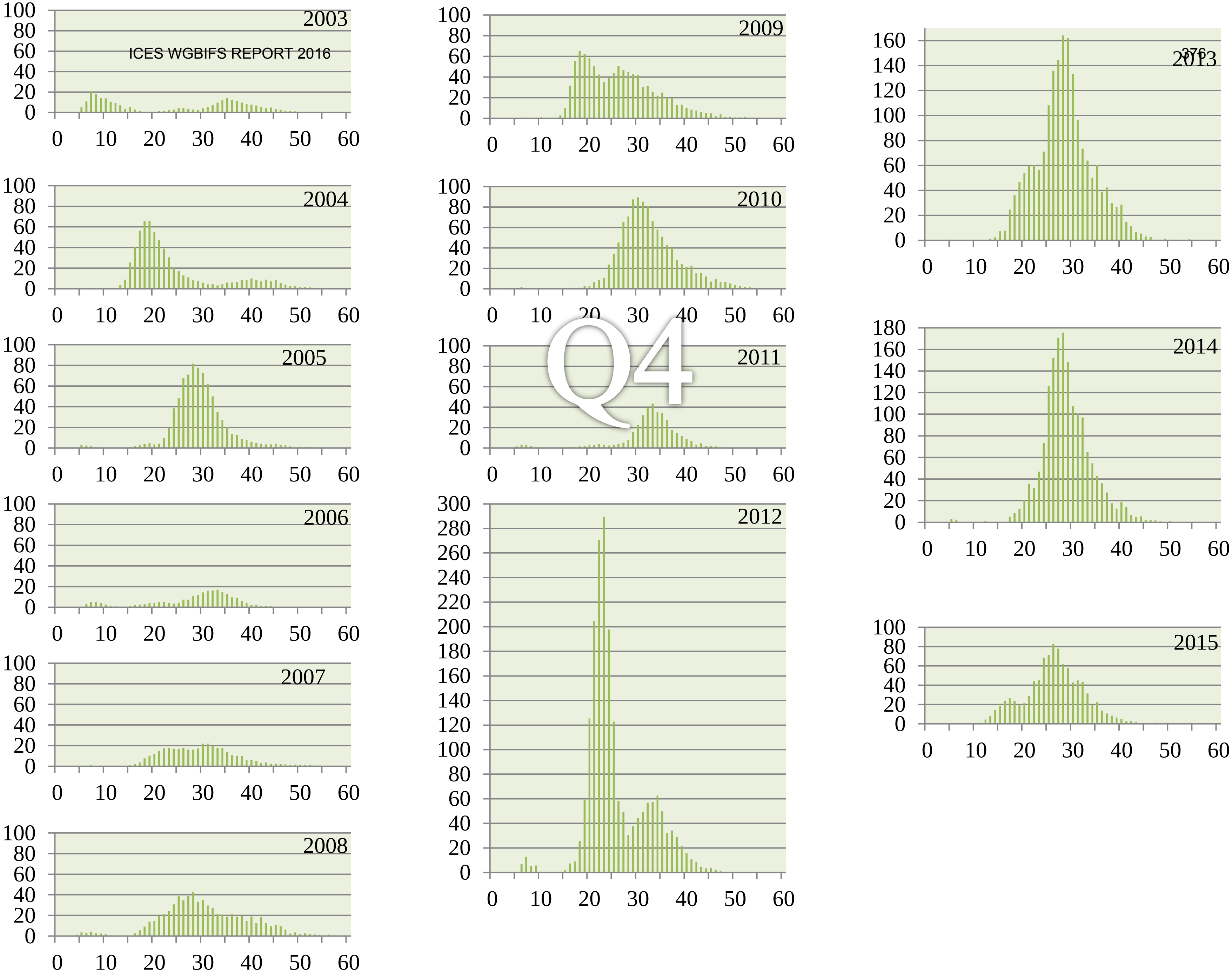
390 KG Cod

201511 Station 26124



201602 Station 26140





Q4
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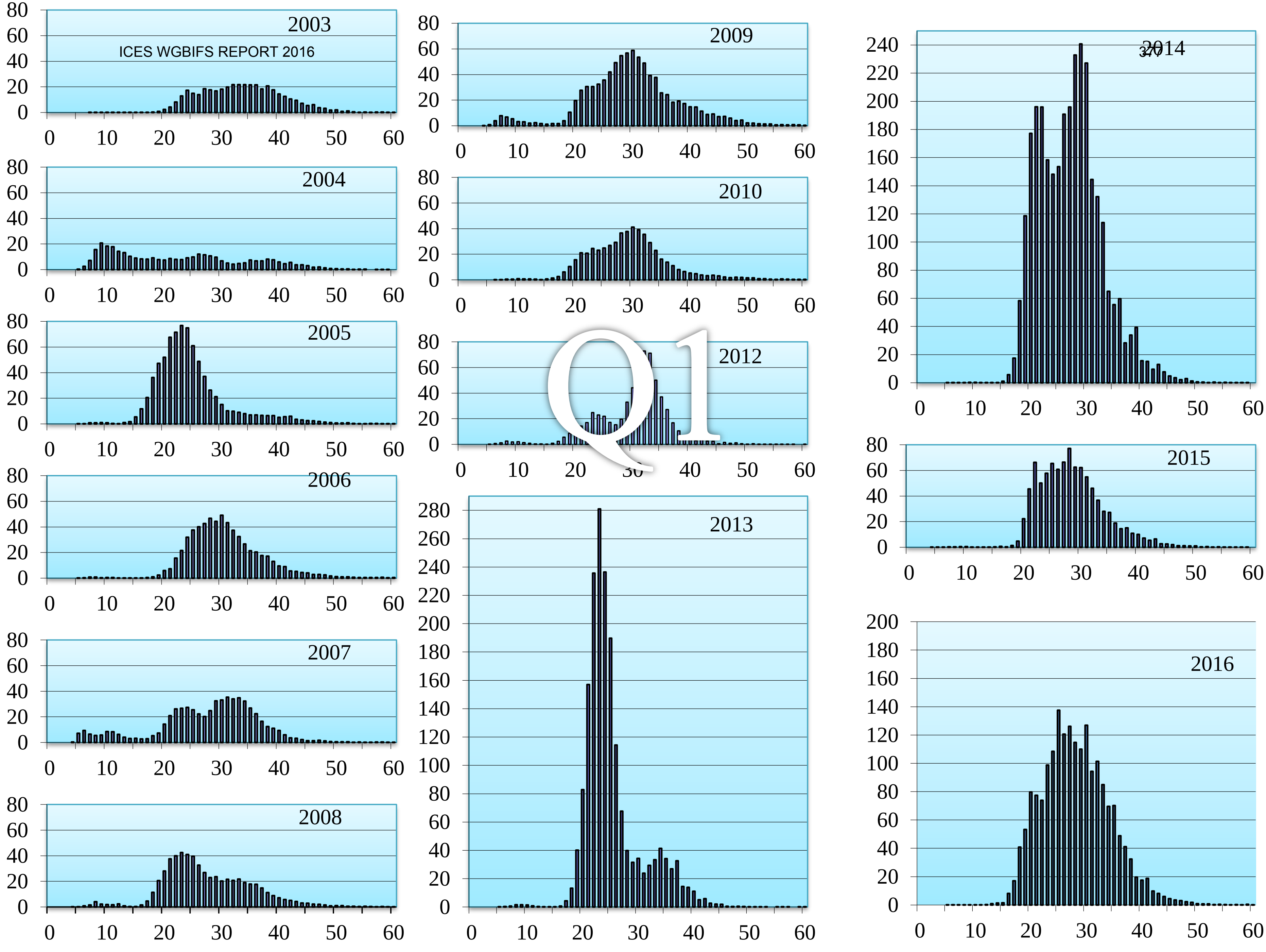
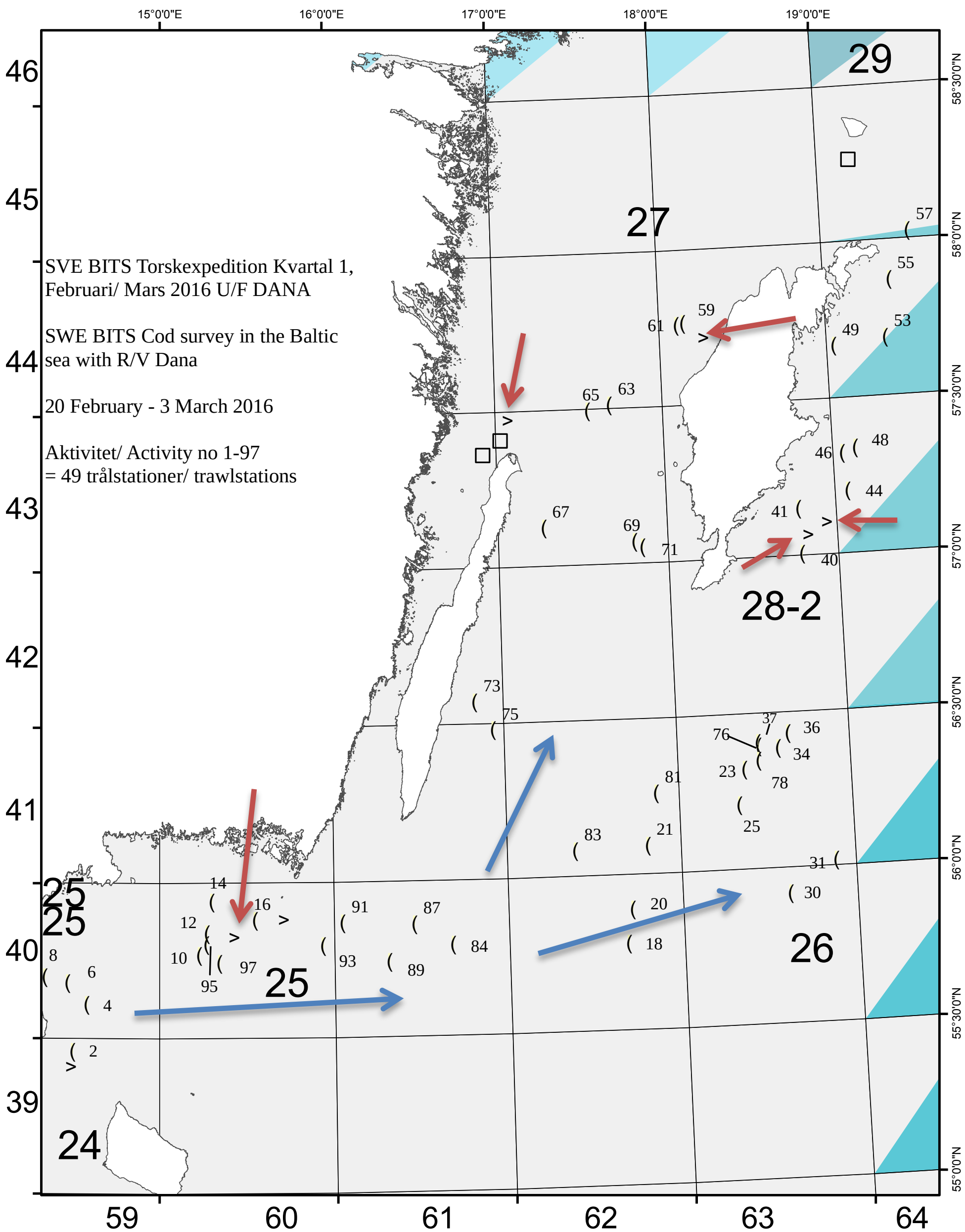

2003
2004
2005
2006
2007
2008
2009
2010
2012
Q1
2013
2014
2015
2016

BITS 2016 Q1

- February 20– March 03
- 13 days survey (50 stations)
- Stomach sampling cod and flounder
- Additional sampling, Saduria entomon Lenght distribution
- Genetic sampling on cod



Stations BITS 2016 Q1

- Squares. Forbidden stations
- Crosshair. Replaced stations
- Yellow circles. Planned and executed stations

- Red arrows, Forbidden and replaced stations

Oxygenated water mainly in areas bornö basin and SD 26

Stations forbidded by the swedish military

Stn nr	Ruta	SD	Namn	Lat1	Lon1	Depth	2013 Q4	2014 Q1	2014 Q4	2015 Q1	2015 Q4	2016 Q1
saknas?	4060	25C	INNERTORPET	5558.04	1523.64	46				x		
24288	3958	24	E YSTADKROKEN	5516.6	1357.699	37				x		
25429	4060	25C	1 S INNERTORPET	5557.59	1524.18	46				x		
saknas?	4060	25C	INNERTORPET (NORRA DELEN)	5558.01	1524.46	47				x		
saknas?	4060	25C	INNERTORPET SYD	5558.01	1524.46	47						
25404/25125	4060	25C	YTTERTORPET	5549.52	1525.99	51			x	x	x	x
25405/25142	4060	25C	5 SSW UTKLIPPAN	5554.7	1534.1	51		x	x	x	x	
25140	4060	25C	KLIPPEBANK	5551.06	1534.19	43				x		
25430	4060	25C	1 SW KYRKTORNET	5554.04	1534.599	52				x		
25124.01	4060	25C	8 NW TÅNGEN	5546.6	1536.5	59				x		
25127	4060	25C	2 N TÅNGEN	5546.31	1547.209	56		x				
27030	4362	27	11 E BÖDA	5713.66	1723.23	77	x	x		x	x	
27029	4362	27	11 ESE ÖLANDS NORRA UDDE	5718.13	1724.98	71	x	x	x	x		
27020	4361	27	4 NW BYXELKROK	5721.79	1655.24	44	x	x	x	x		x
27016	4362	27	4 NW ST KARLSÖ	5721.8	1754.5	108	x			x	x	
27003	4362	27	5 N BYXELKROK	5724.56	1701.56	57	x	x	x	x	x	x
27025	4362	27	3 SW ÖLANDS NORRA GRUND	5728.28	1704.79	63	x	x	x	x		x
27026	4362	27	10 SE KNOLLS GRUND	5729.03	1743.64	108		x	x	x	x	x
27019	4463	27	6 N VISBY	5742.8	1816.2	103	x			x		x
27027	4463	27	10 NW VISBY	5745.74	1807.21	104	x	x				
27018	4463	27	6 NW VISBY	5746.39	1810.17	101		x		x		
28060.01	4564	28	4 E GOTSKA SANDÖN	5827.53	1923.97	72	x	x		x		
28189	4564	28	4 W GOTSKA SANDÖN	5820.42	1906.6	69			x	x		
28100	4564	28	4 SW GOTSKA SANDÖN	5817.379	1910.55	59		x		x		x
28071.01	4364	28	12 E NÄR	5712.04	1902.04	81		x				
28177	4363	28	4,5 SE NÄR	5711.07	1848.65	40	x			x		
28096	4363	28	5 SE NÄR	5710.03	1849.54	46		x		x		
28016	4364	28	5 SE NÄR	5710	1851	47				x		
28067.01	4363	28	11 ESE NÄR	5706.5	1857.1	83	x	x		x		x
28102	4363	28	10 E NÄR-NORDÄNDAN	5705.919	1852.39	76				x		
28066	4363	28	12 SE NÄR-NORDÄNDAN	5705.19	1854.39	86				x		
28107	4363	28	12 SE NÄR	5704.14	1853.03	84				x	x	
28101	4363	28	10 SE NÄR	5703.84	1849.95	67				x	x	x
28037	4363	28	13 E FALUDDEN	5702.07	1849.55	74				x		

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

Swe BITS 2015 Q4

Total weight Kg	21000
Cod weight Kg	1 792
Number of Cod	7 191

Swe BITS 2016 Q1

Total weight Kg	38 754
Cod weight Kg	10 485
Number of Cod	37 420


30 31 32 33 34
38 39 40 41 42

The Sound
Öresund

Two Stations in the sound to be included in the west baltic stock

HÅLABBEN

Swe BITS 2015 Q4		Swe BITS 2016 Q1	
Total weight Kg	453	Total weight Kg	407
Cod weight Kg	38	Cod weight Kg	226
Number of cod	87	Number of Cod	316

Fisheries Service under the Ministry of Agriculture of Republic of Lithuania, Fishery Research and Science State

BALTIC INTERNATIONAL TRAWL SURVEY (BITS) IN THE LITHUANIAN ESPECIAL ECONOMIC ZONE OF THE BALTIC SEA

WGBIFS, 2016

BITS 2015 Q4

(R/V”DARIUS” 2015-12-02-03)

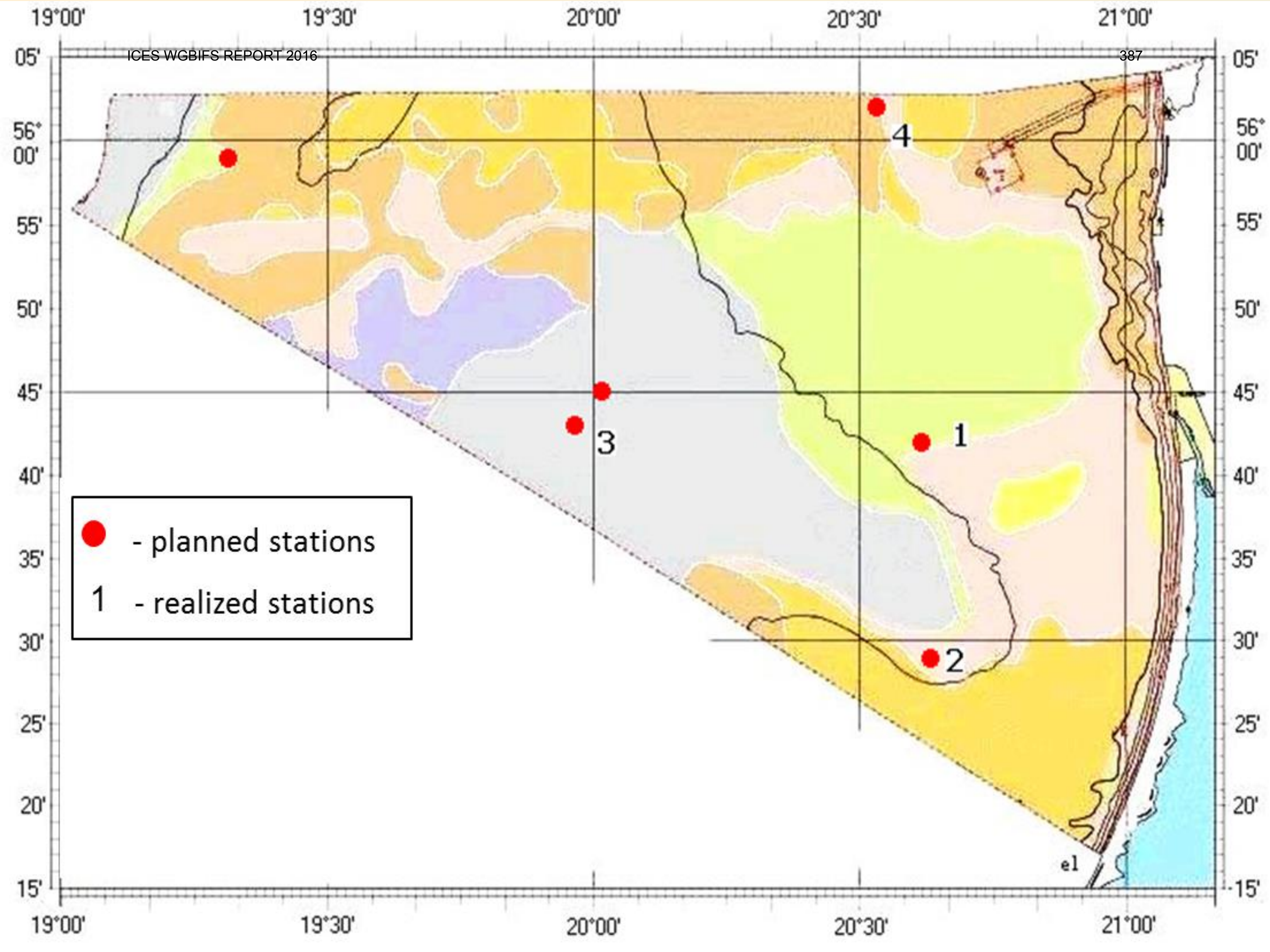
During survey was made 3 trawls and 3 hydrological station (planed 6 trawls).

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'
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50'
45'
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35'
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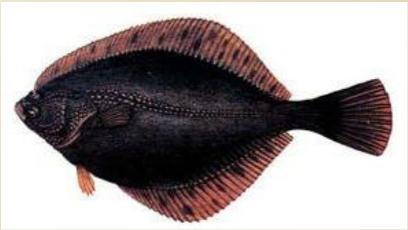
3
1
2
- planned stations
1 - realized stations
el

BITS (2015 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	Place	Turbot	Others
1	2015-12-02	40H0 (26)	52	728.2	440.1	224.6	0.1	0.5	62.2
2	2015-12-02	39H0 (26)	61	622.3	316.2	285.4	0.3	0.0	20.4
3	2015-12-03	41H0 (26)	74						
4	2015-12-16	41G9 (26)	31	247.5	0	221.7	0	0.0	25.8
Mean					252.1	243.9	0.1	0.2	36.1

47,4%

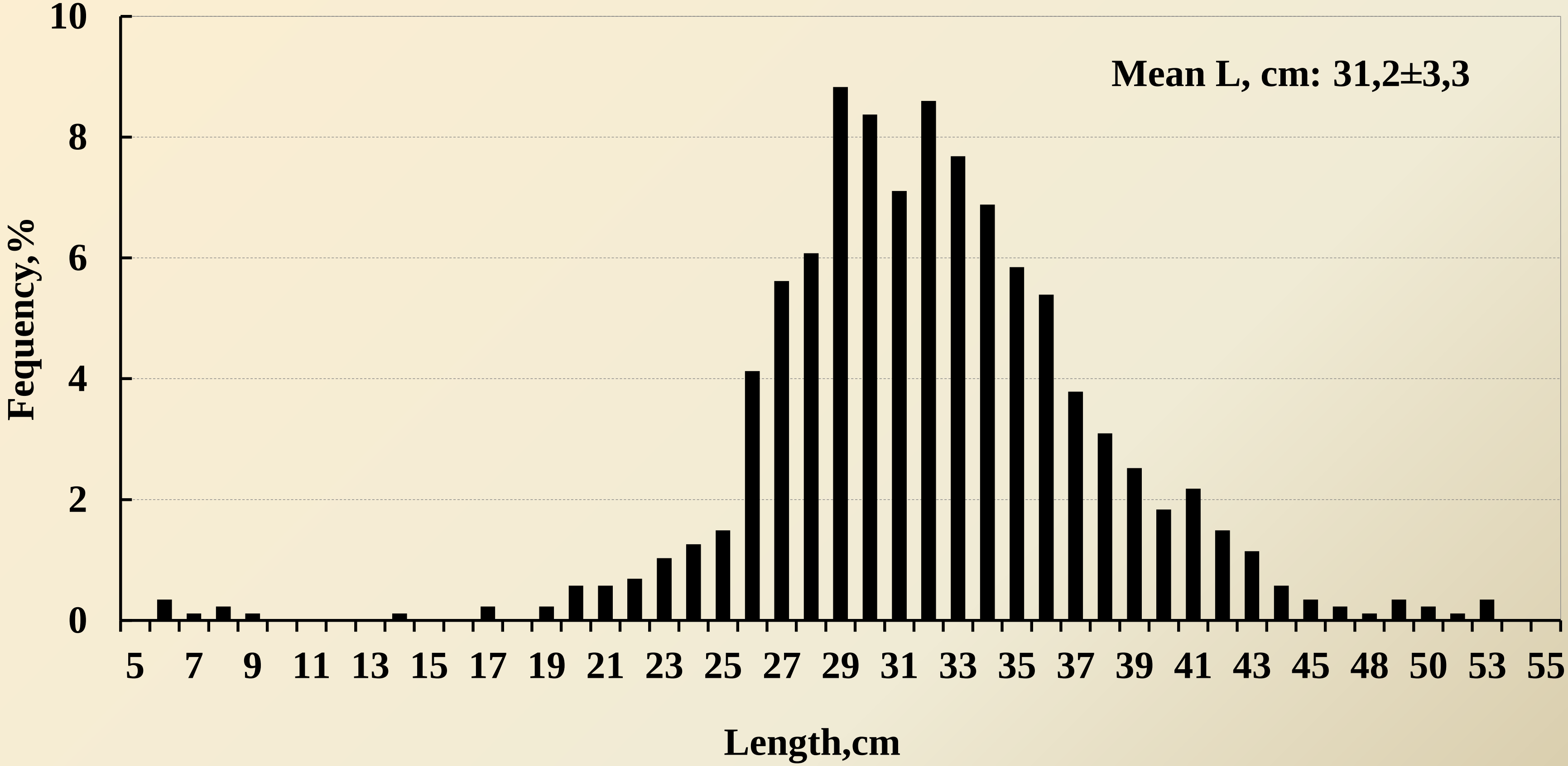


45,8%

BITS (2015 Q4) RESULTS

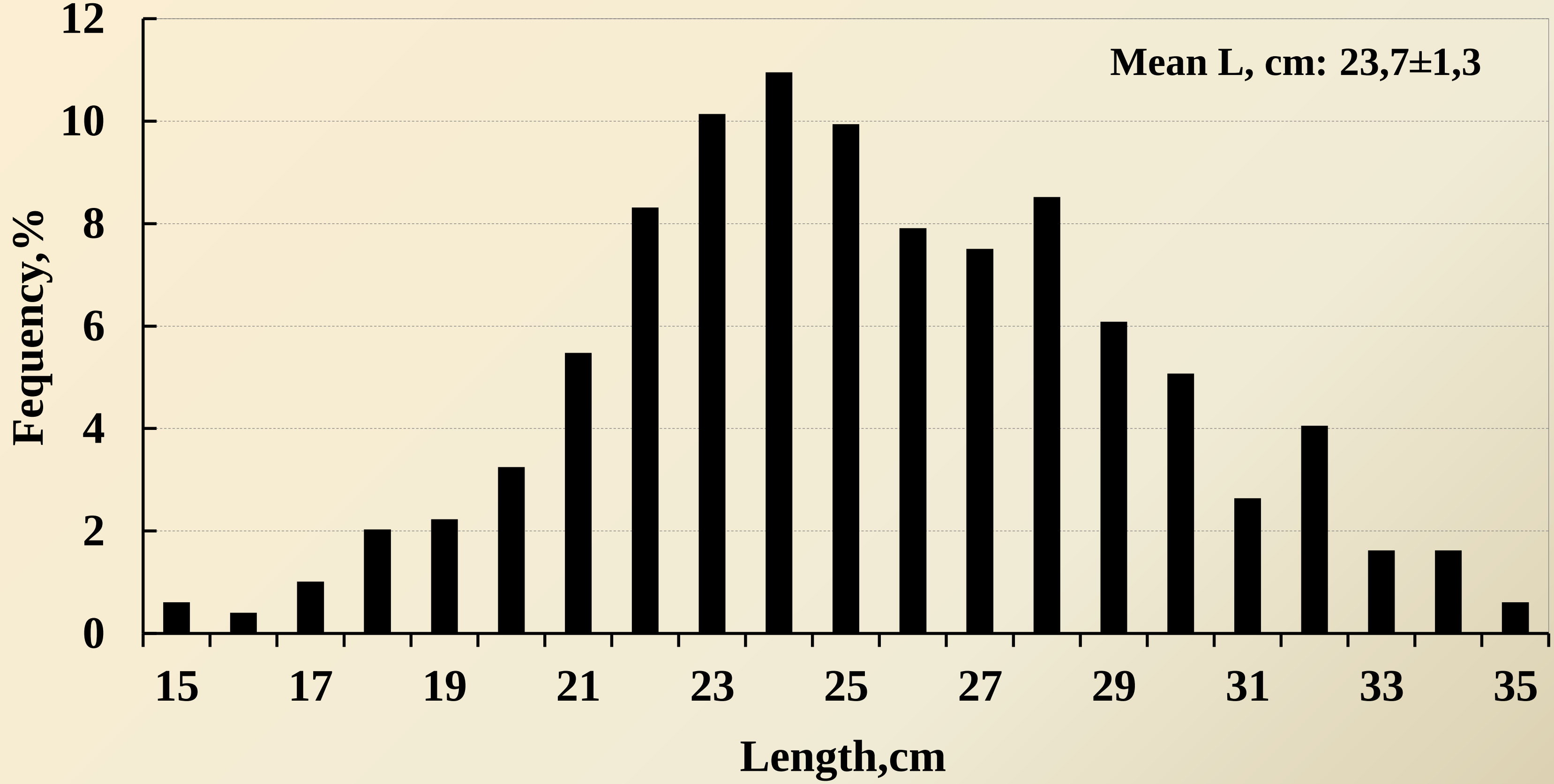
	Haul Nr.	Cod	Flounder	Place	Turbot	Other
Length data	1	277	390	1	1	360
	2	359	370	1	0	339
	3	0	207	0	0	368
	4	0	0	0	0	0
Age data		254	284	1	1	0
Stomach data		120				

Baltic cod length distribution in samples from the ICES Sub-division 26 (LEEZ)



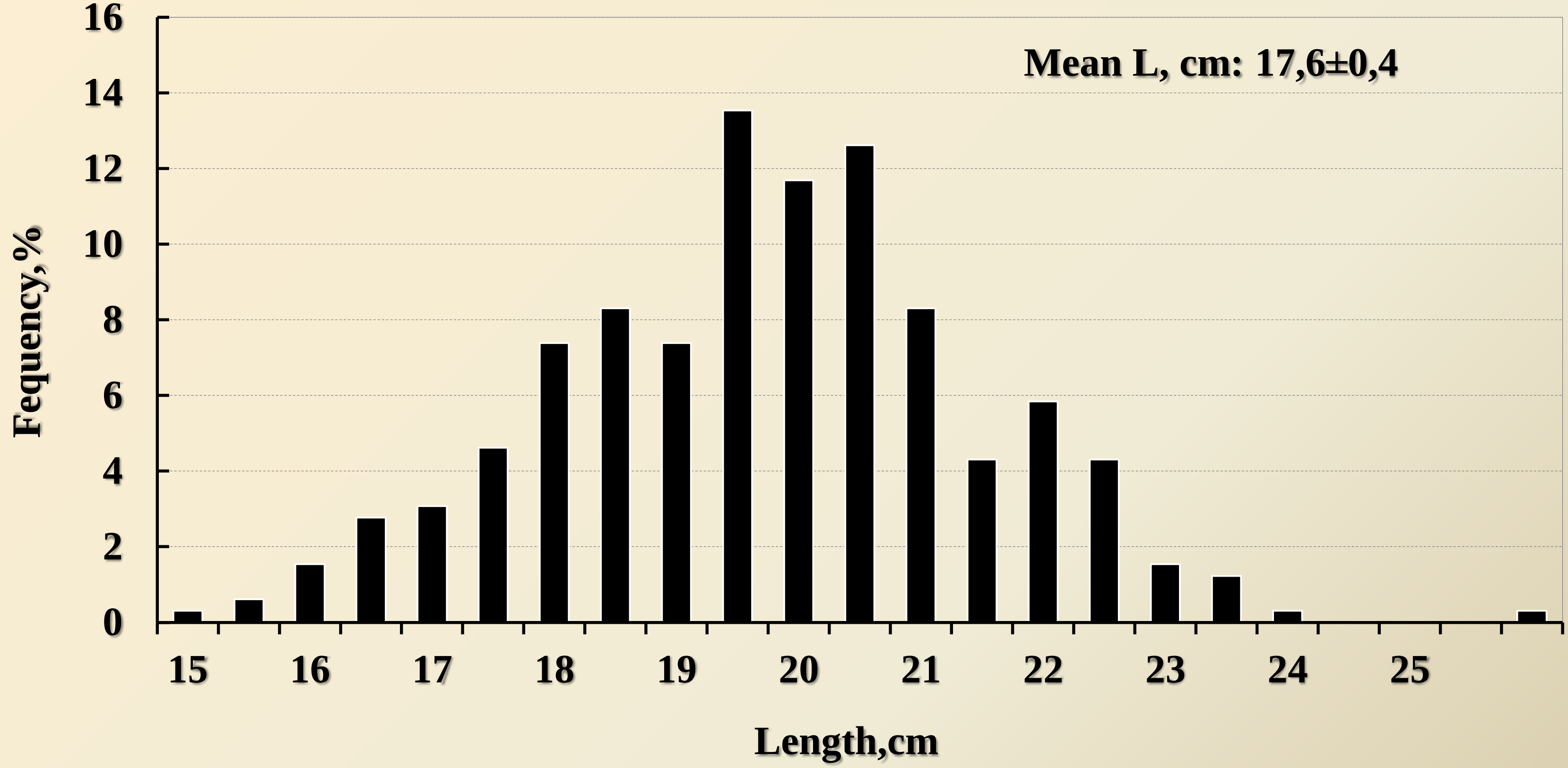
BITS , 02-03 December, 2015
R/V "DARIUS"

Flounder length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 02-03 December, 2015
R/V “DARIUS”

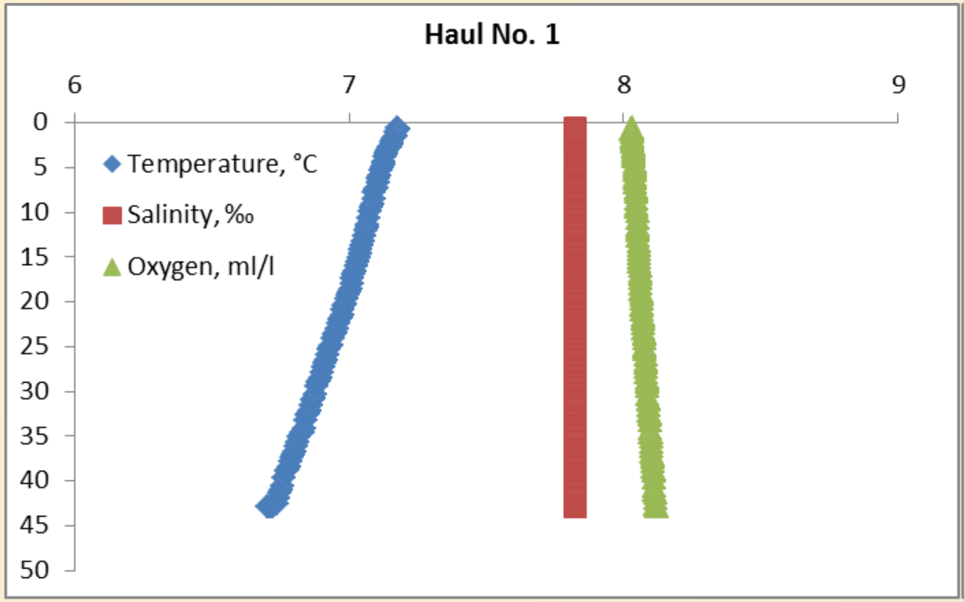
Herring length distribution in samples from the ICES Sub-division 26 (LEEZ)

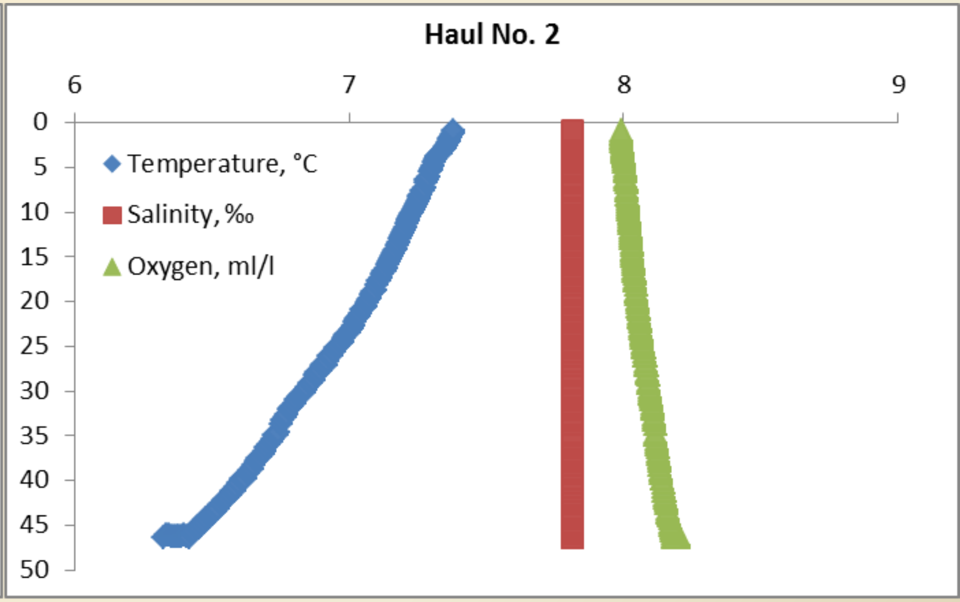


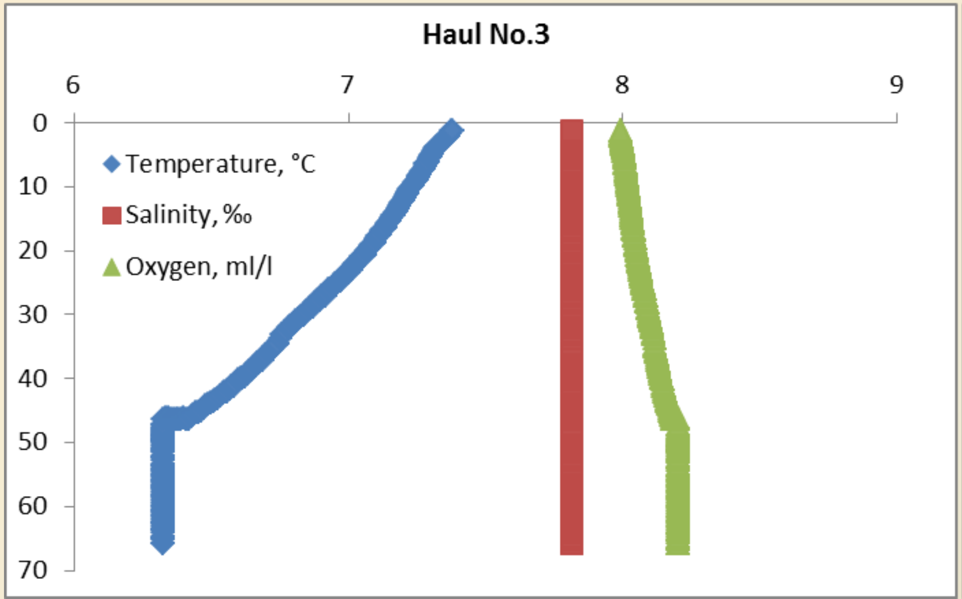
BITS , 02-03 December, 2015
R/V “DARIUS”

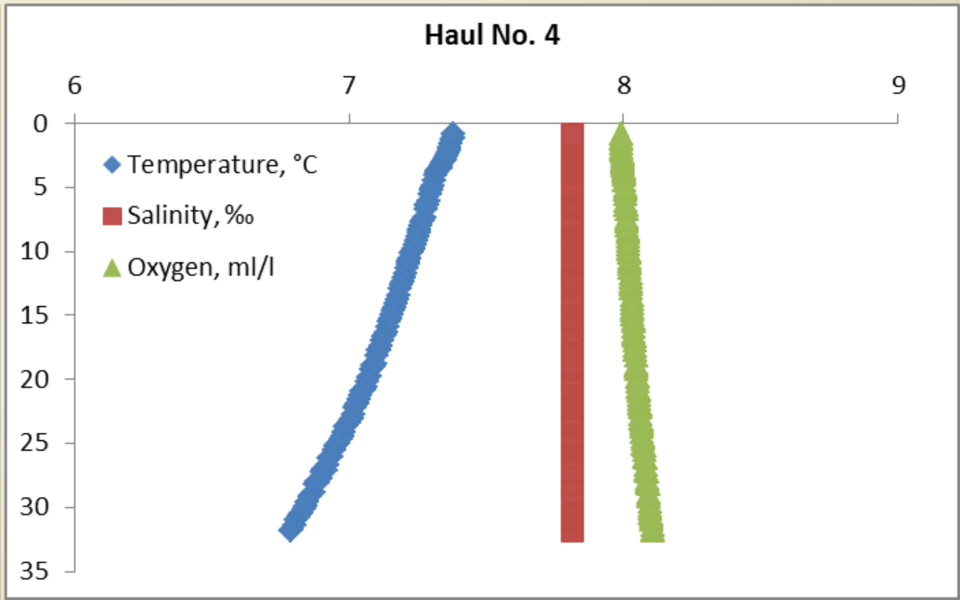
Hydrological data

(R/V"DARIUS" 01-02. 12.2015)









BITS 2016 Q1

(R/V"DARIUS" 15-16. 03.2016)

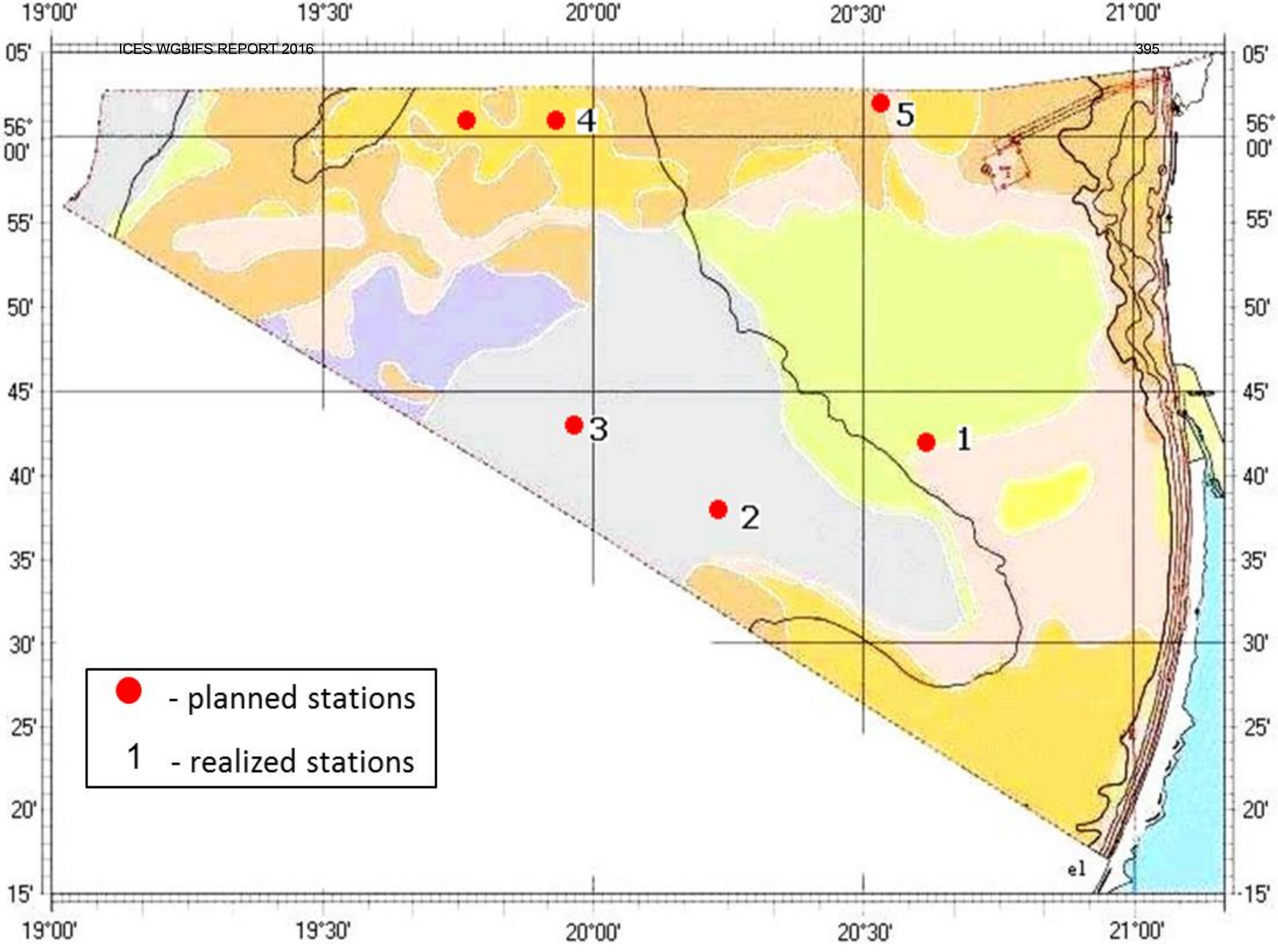
During survey was made six trawls and six hydrological station.

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.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- planned stations
1 - realized stations

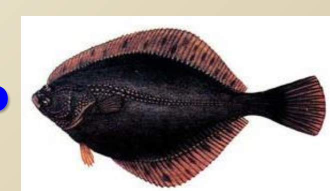
BITS (2016 Q1) RESULTS:

Fish catches and biological data

Haul number	Catch date	The ICES rectangle	Trawling depth (m)	Total CPUE (kg/h)	CPUE per species (kg/h)					
					Cod	Flounder	Place	Turbot	Herring	Others
1	2016-03-15	40H0	46	115.4	76.5	31.2	0.1	0	5.5	2.1
2	2016-03-15	40H0	72	2.3	0	1.6	0	0	0.5	0.2
3	2016-03-15	40G9	74	10.4	9.5	0.4	0	0	0.2	0.3
4	2016-03-16	41H0	62	376.2	66.0	141.7	0	0.3	138.9	29.3
5	2016-03-16	41G9	32	118.4	1.7	20.9	0.2	0.6	80.0	15.0
Mean					30.7	39.2	0.1	0.2	45.0	9.38

36.1%

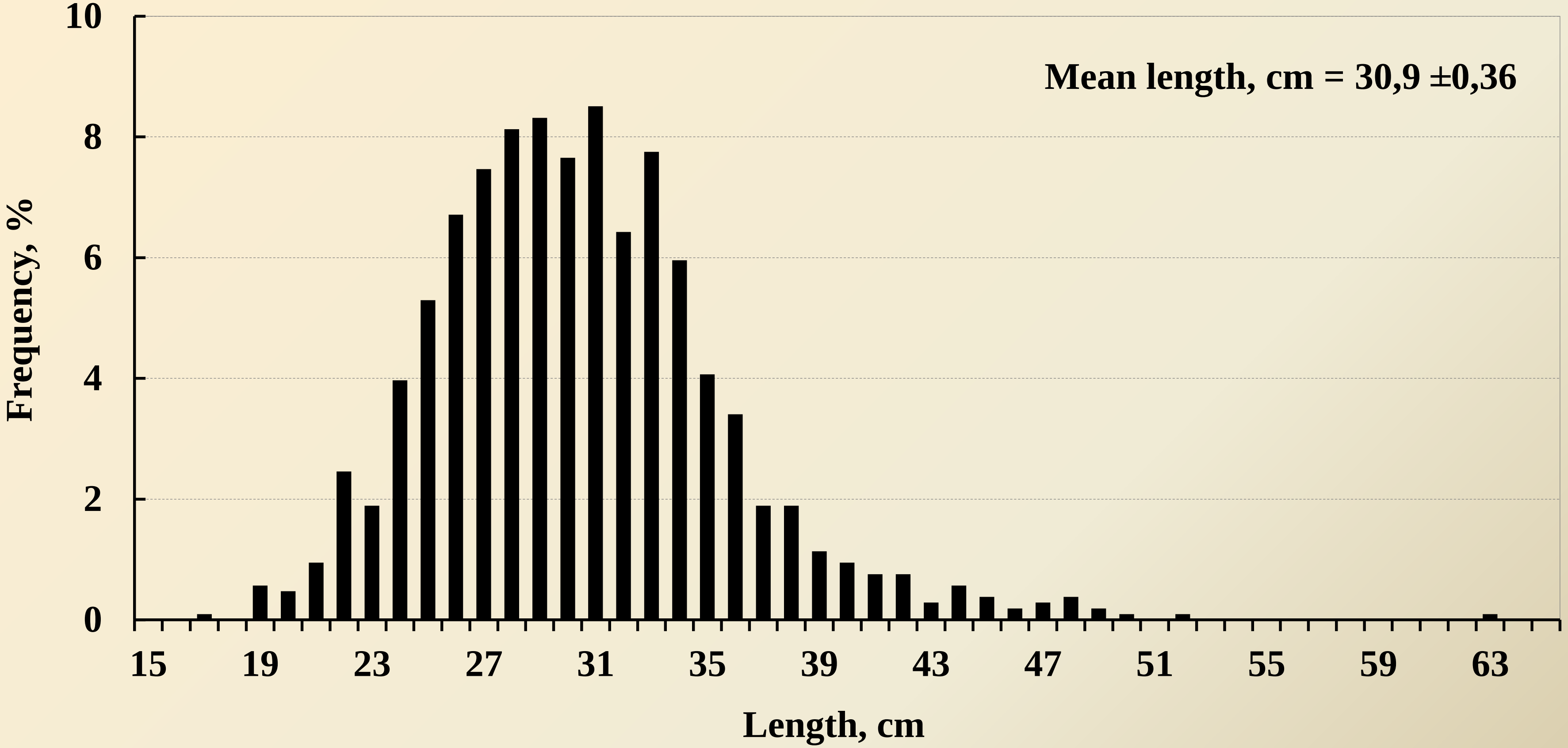
24.7%



31.4%

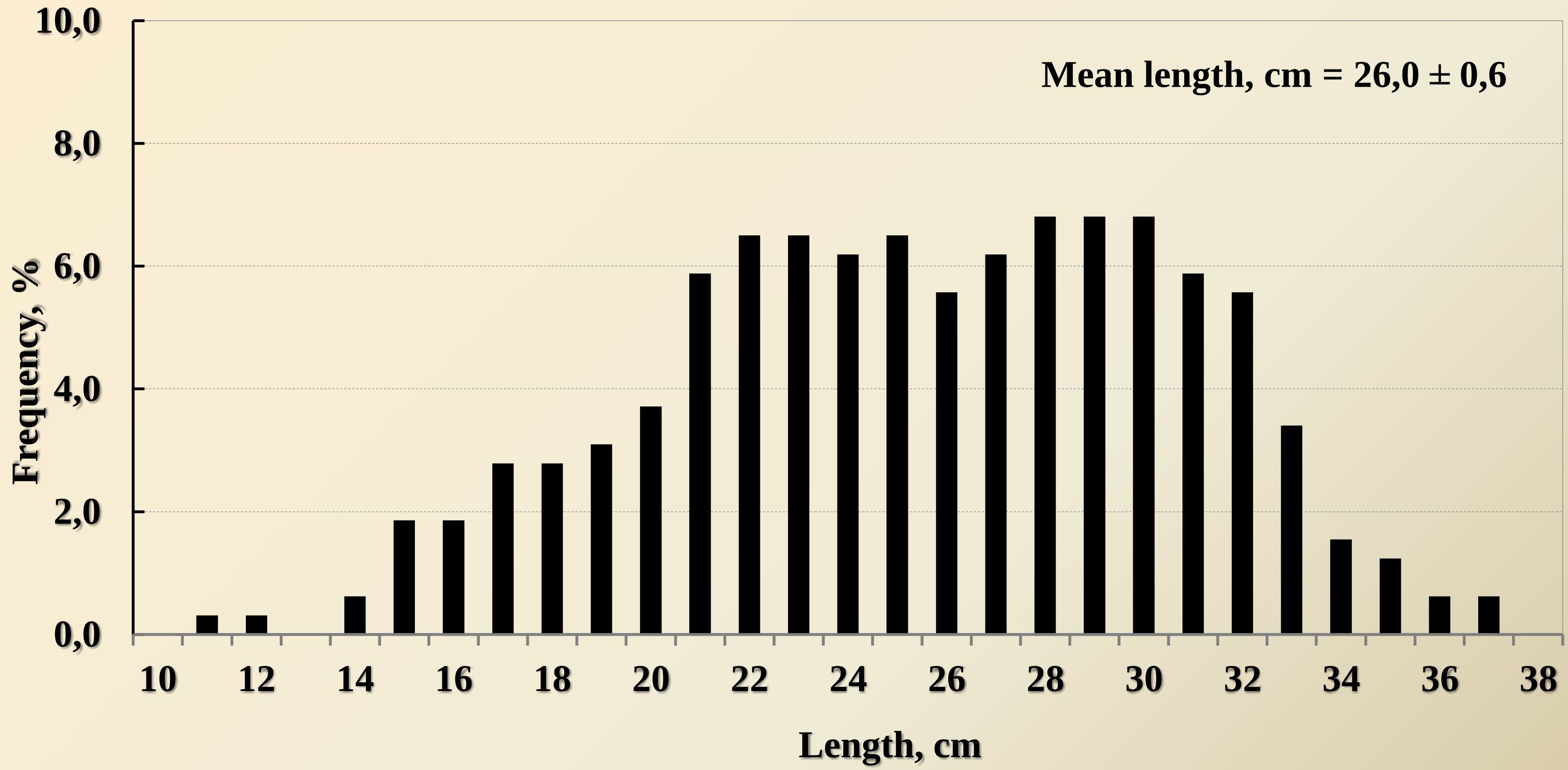
	Haul Nr.	Cod	Flounder	Place	Turbot	Other
Length data	1	113	94	1	0	79
	2	0	2	0	0	7
	3	10	4	0	0	17
	4	72	355	0	2	1354
	5	3	91	1	0	1075
Age data		150	240	2		
Stomach data		51				

Baltic cod length distribution in samples from the ICES Sub-division 26 (LEEZ)



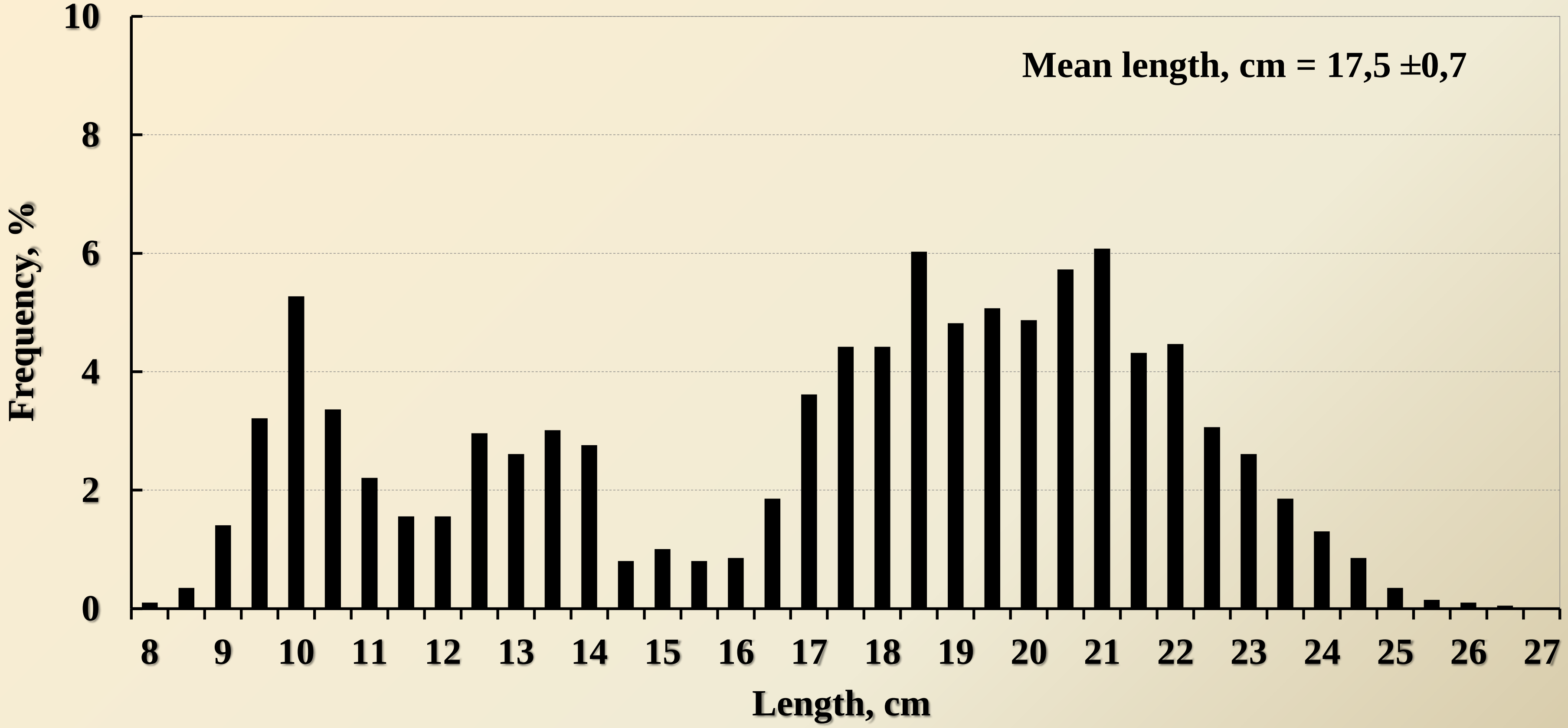
BITS , 15-16 March, 2016
R/V "DARIUS"

Flounder length distribution in samples from the ICES Sub-division 26 (LEEZ)

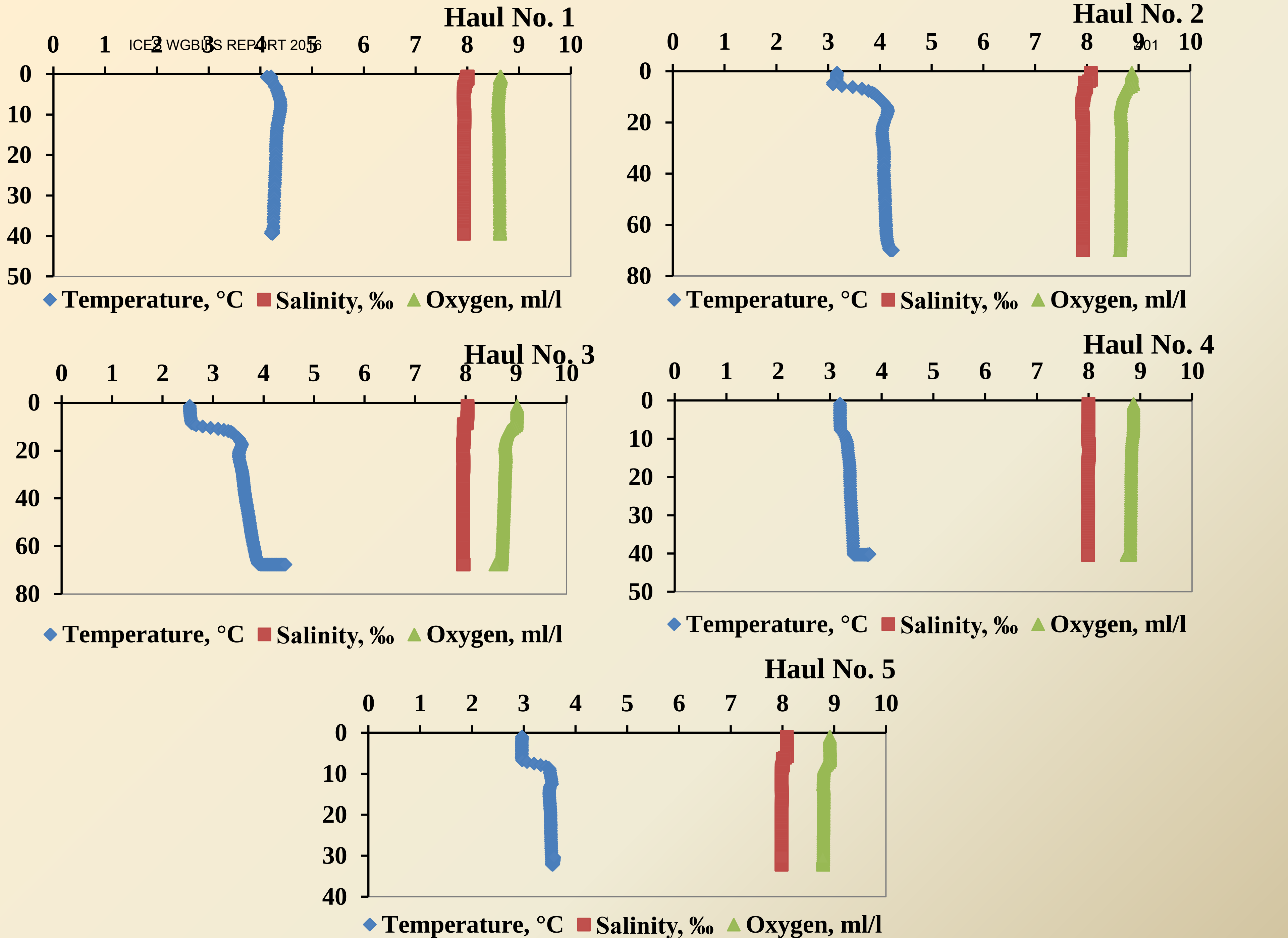


BITS , 15-16 March, 2016
R/V “DARIUS”

Herring length distribution in samples from the ICES Sub-division 26 (LEEZ)



BITS , 15-16 March, 2016
R/V “DARIUS”


Haul No. 1
Temperature, °C
Salinity, ‰
Oxygen, ml/l
Haul No. 2
Temperature, °C
Salinity, ‰
Oxygen, ml/l
Haul No. 3
Temperature, °C
Salinity, ‰
Oxygen, ml/l
Haul No. 4
Temperature, °C
Salinity, ‰
Oxygen, ml/l
Haul No. 5
Temperature, °C
Salinity, ‰
Oxygen, ml/l

LATVIA
2015 BITS Q4 and 2016 BITS Q1 surveys

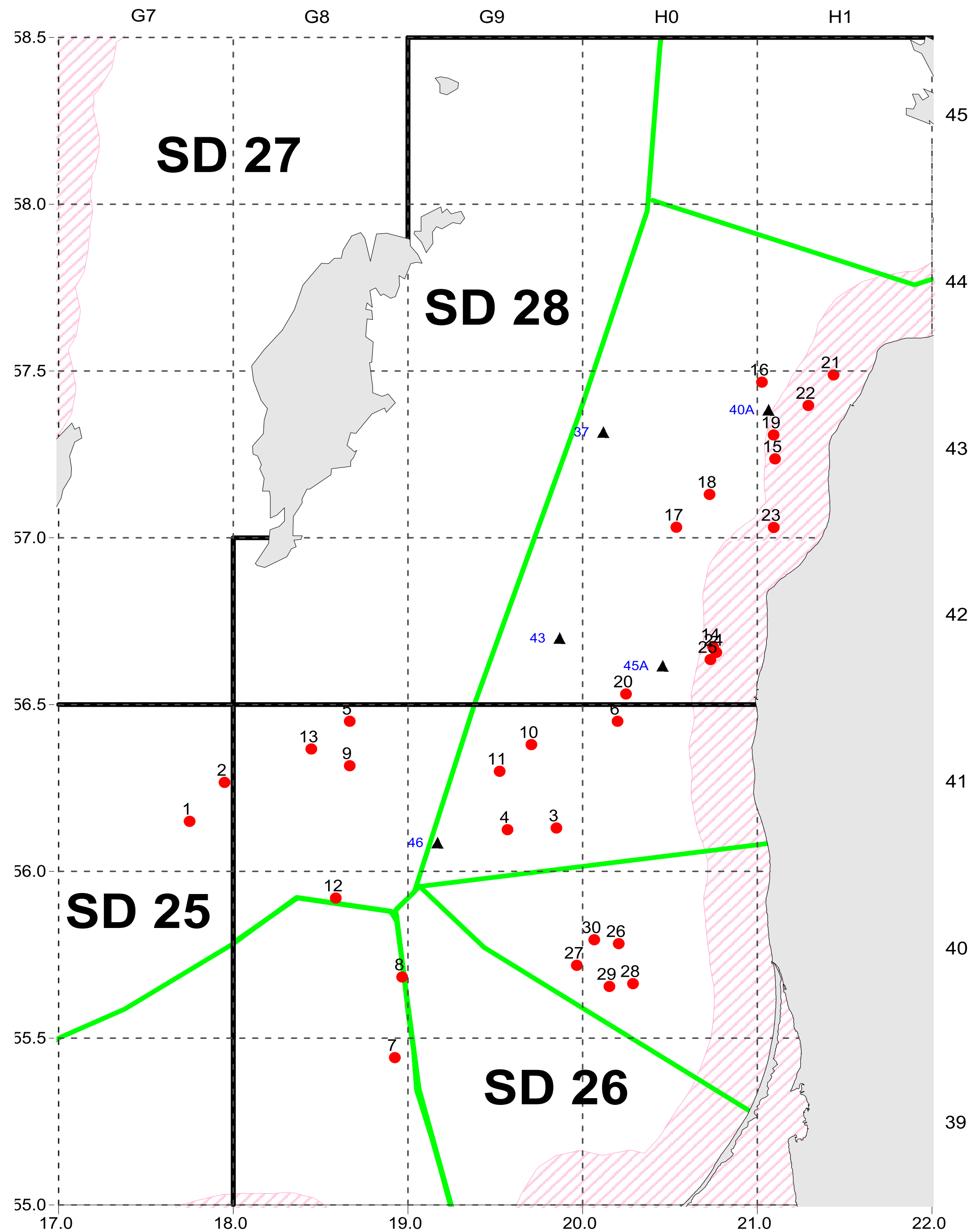
- Both surveys were performed in cooperation with Polish colleagues on the Polish r.v. “Baltica”

- During these surveys big TV3 with rochopper were used

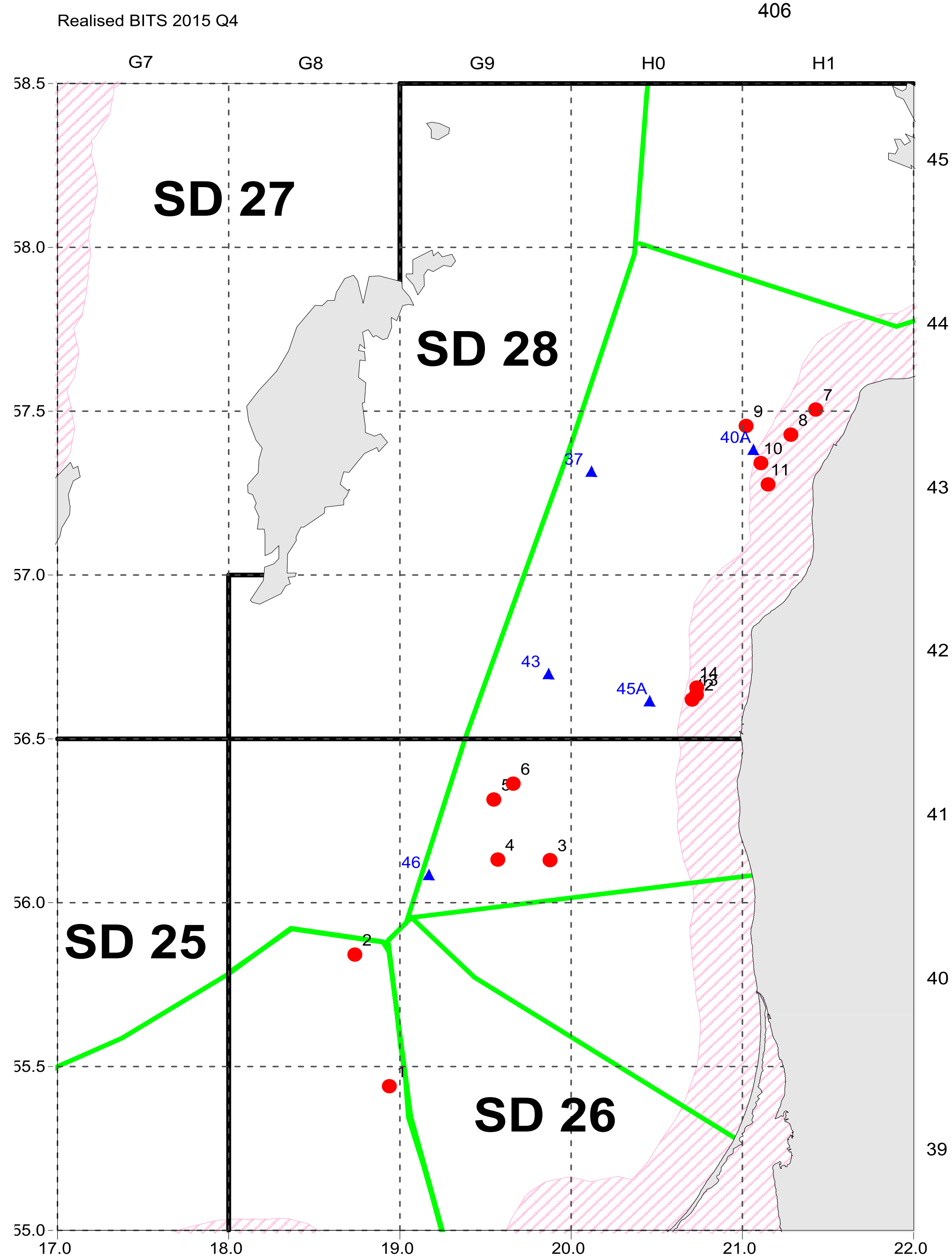
2015. BITS Q4 survey

- The joint Latvian-Polish BITS survey, conducted in the period of 02-11.12.2014 on the r.v. “Baltica” , in the Latvian and Poland EEZs (the ICES Sub-divisions 26 and 28).

Planned trawling stations



Realized trawling stations

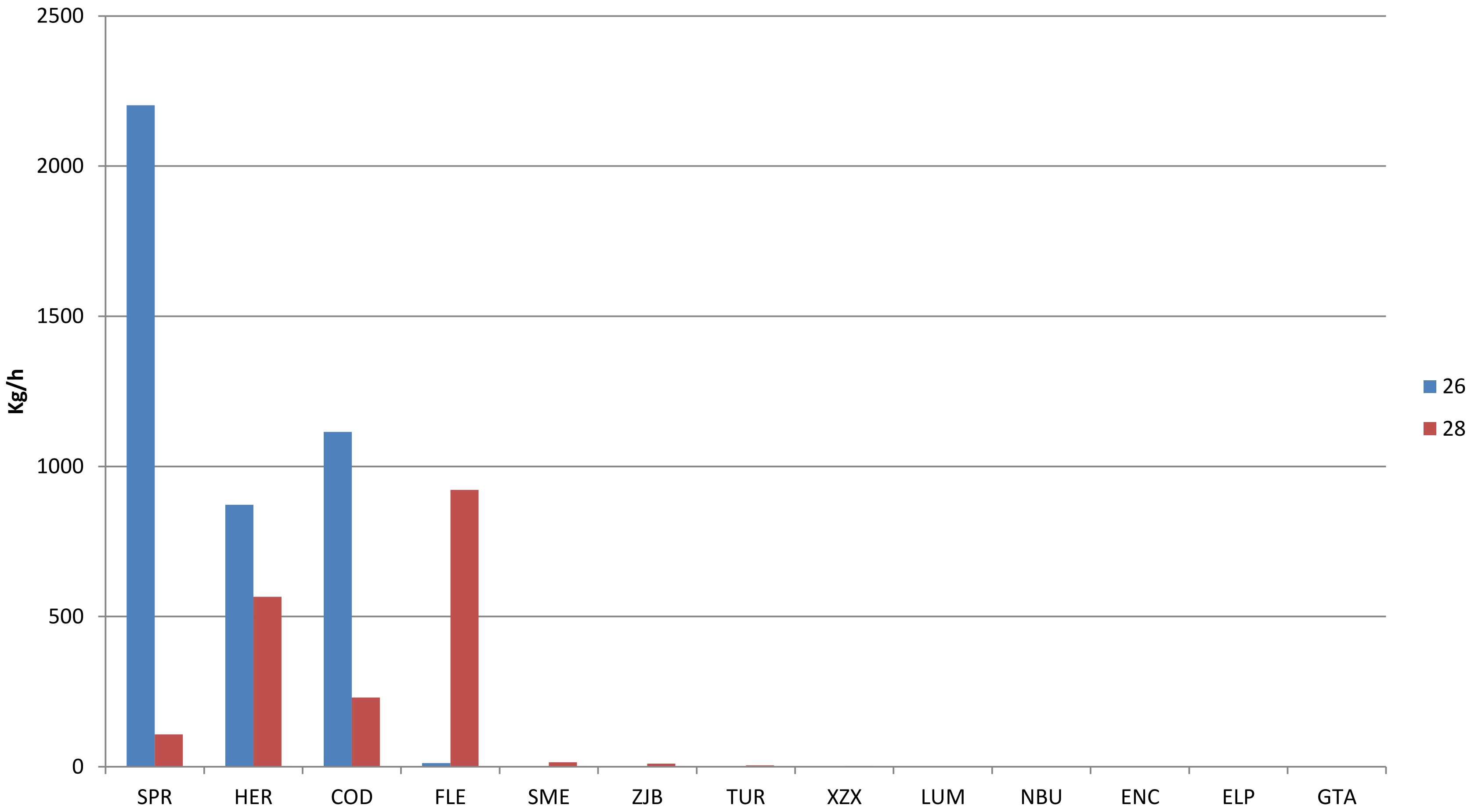


Numbers of fish biologically analysed during the BITS-4q survey (overall, 13 fish species)

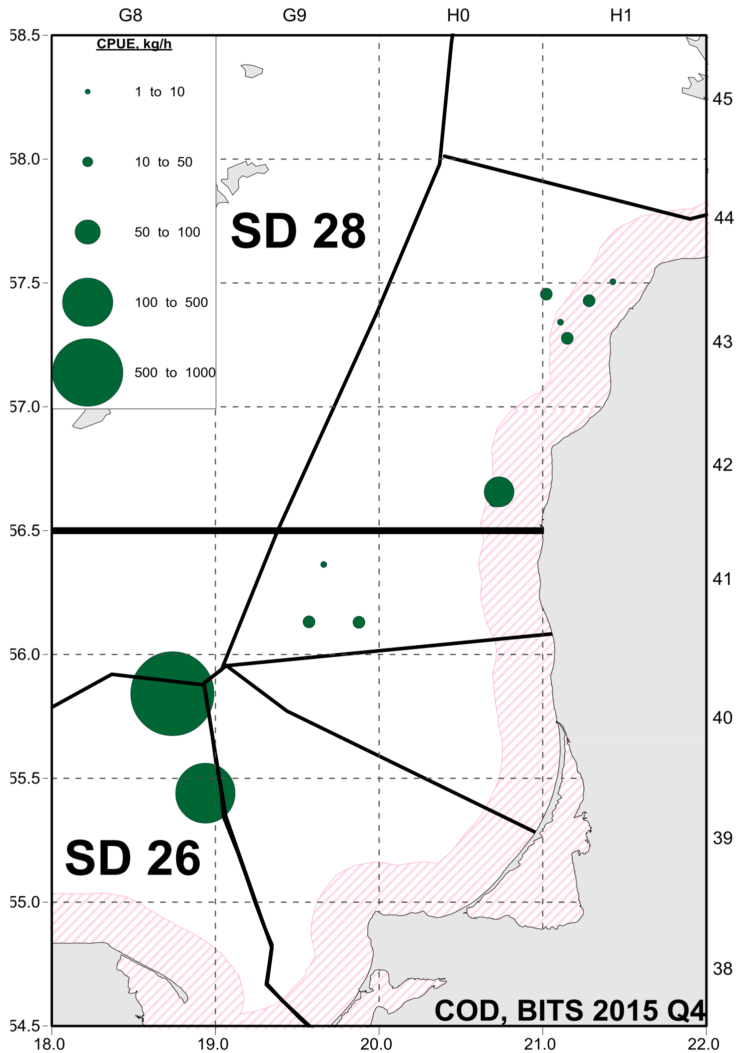
Species	ICES SD	Number of samples	Number of fish measured	Number of fish analyzed
Cod	26	5	581	301
	28	8	34	185
	Total	13	615	486
Flounder	26	2		13
	28	8	889	302
	Total	10	889	315
Turbot	26			
	28	3	3	
	Total	3	3	
Herring	26	6	566	
	28	8	892	
	Total	14	1458	
Sprat	26	6	629	
	28	8	845	
	Total	14	1474	
All other species	26	4	15	
	28	8	387	
	Total	12	402	
Total	26	23	1791	314
	28	43	3050	487
	Total	66	4841	801

Species	ICES SD	Number of samples	Number of stomachs collected
Cod stomach samples	26	5	222
	28	8	184
	Total	13	406

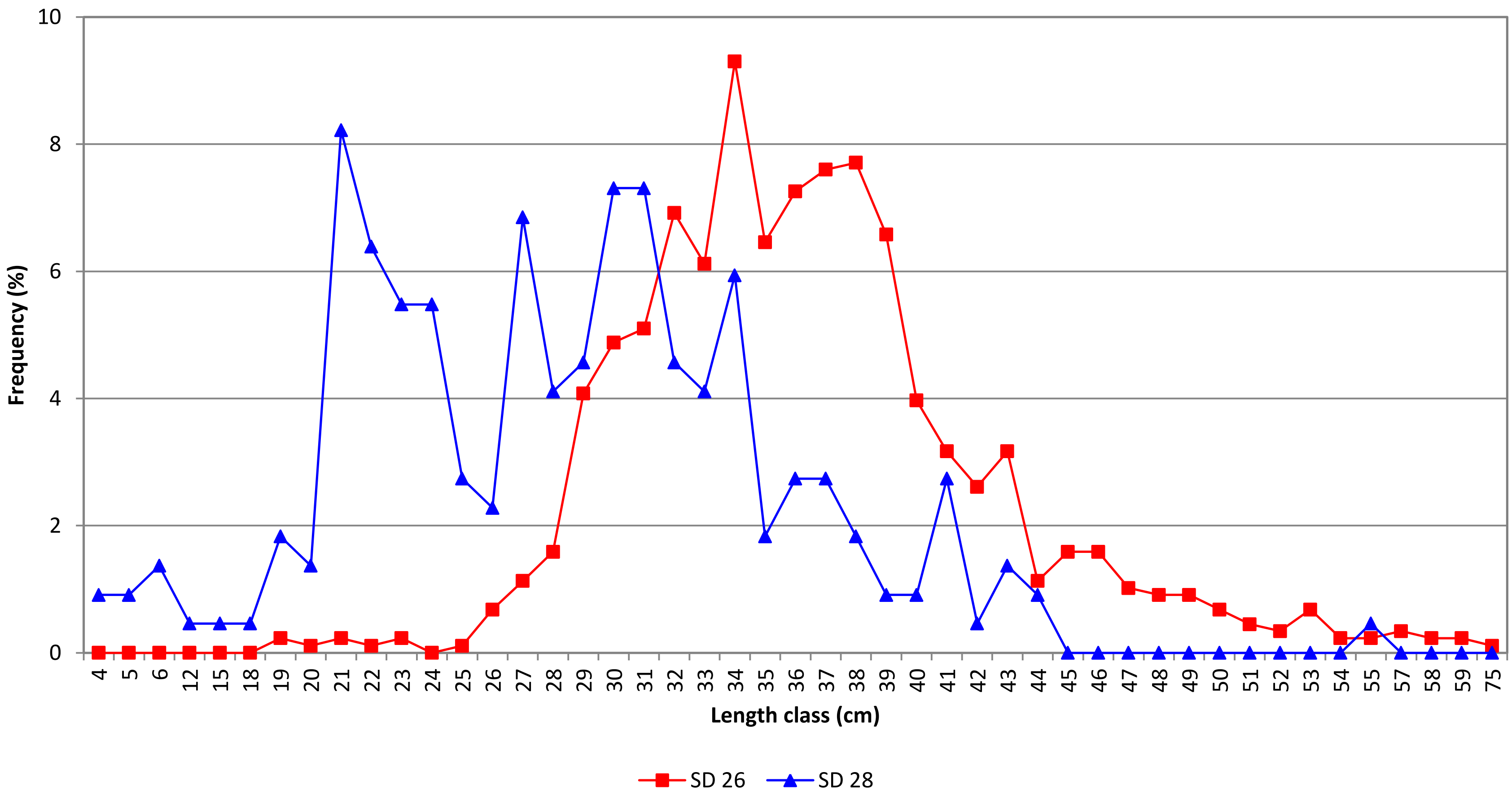
Fishes dominated by mass kg per 1 hour trawling in SD 26 and 28



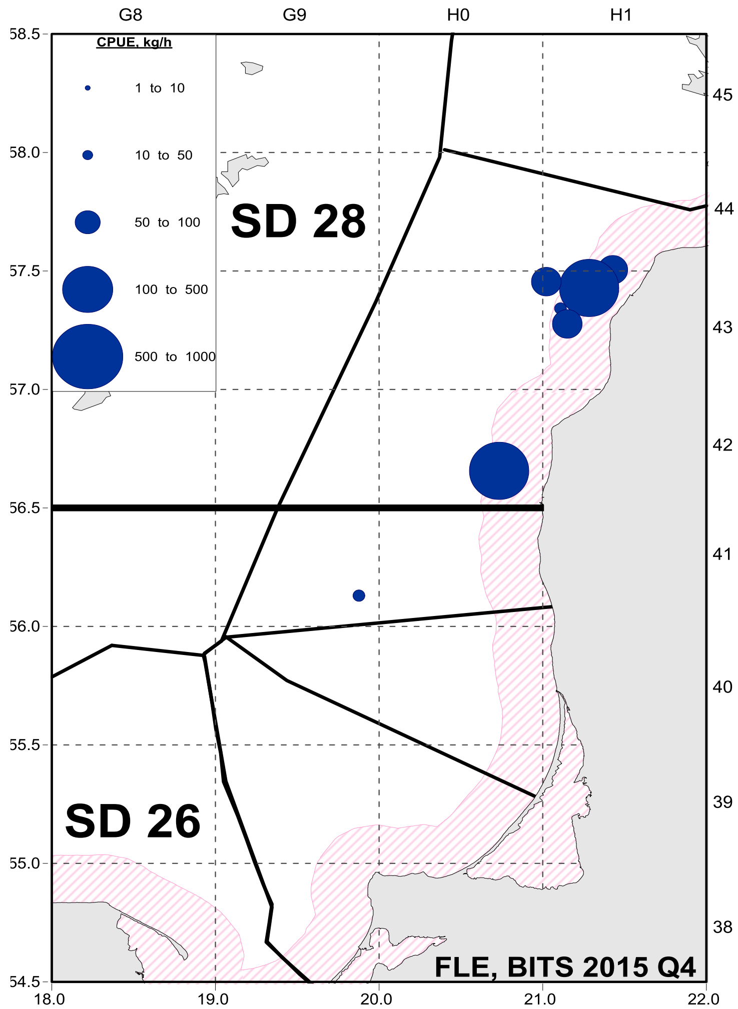
Distribution of cod during the BITS 2015 Q4 survey



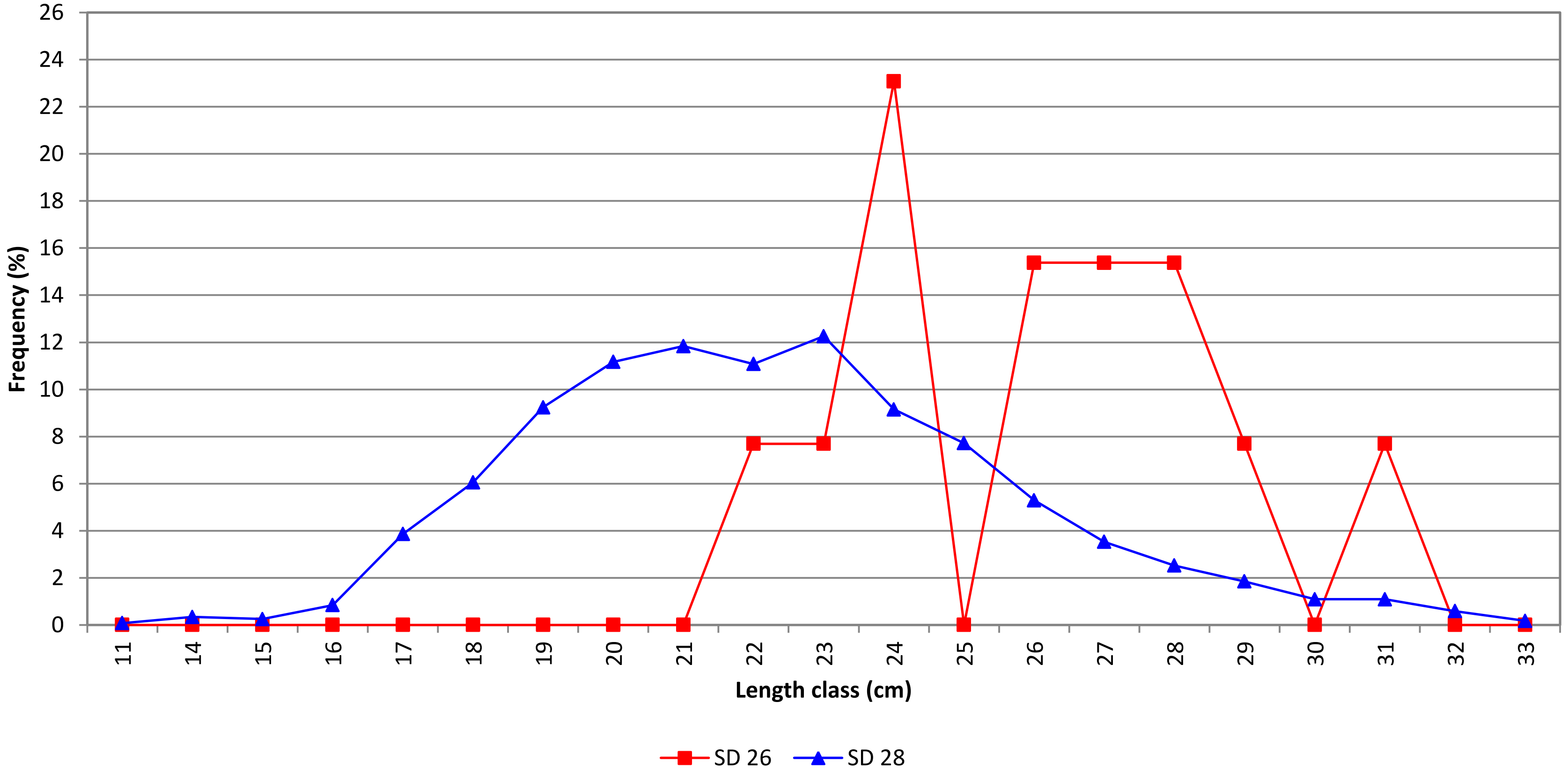
Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 02-11 December 2015



Distribution of flounder during the BITS 2015 Q4 survey



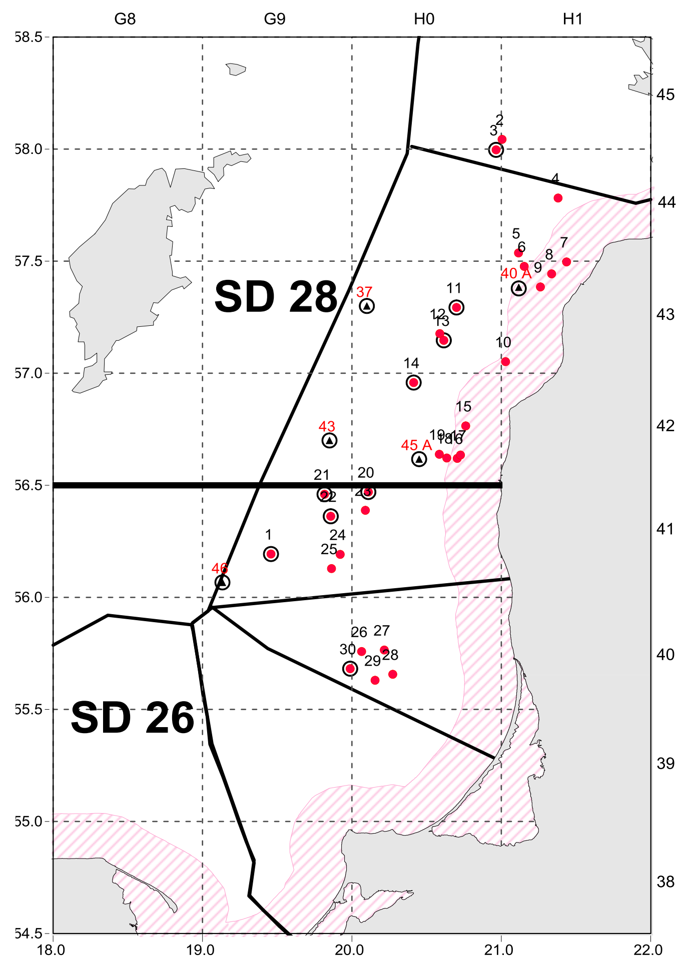
Length frequency of flounder from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 02-11 December 2015



2016. BITS Q1 survey

- The joint Latvian-Polish BITS survey, conducted in the period of 03.-11.03.2016 on the r.v. “Baltica” , in the Latvian, Estonian and Lithuanian EEZs (the ICES Sub-divisions 26 and 28).

Planned and realized trawling stations

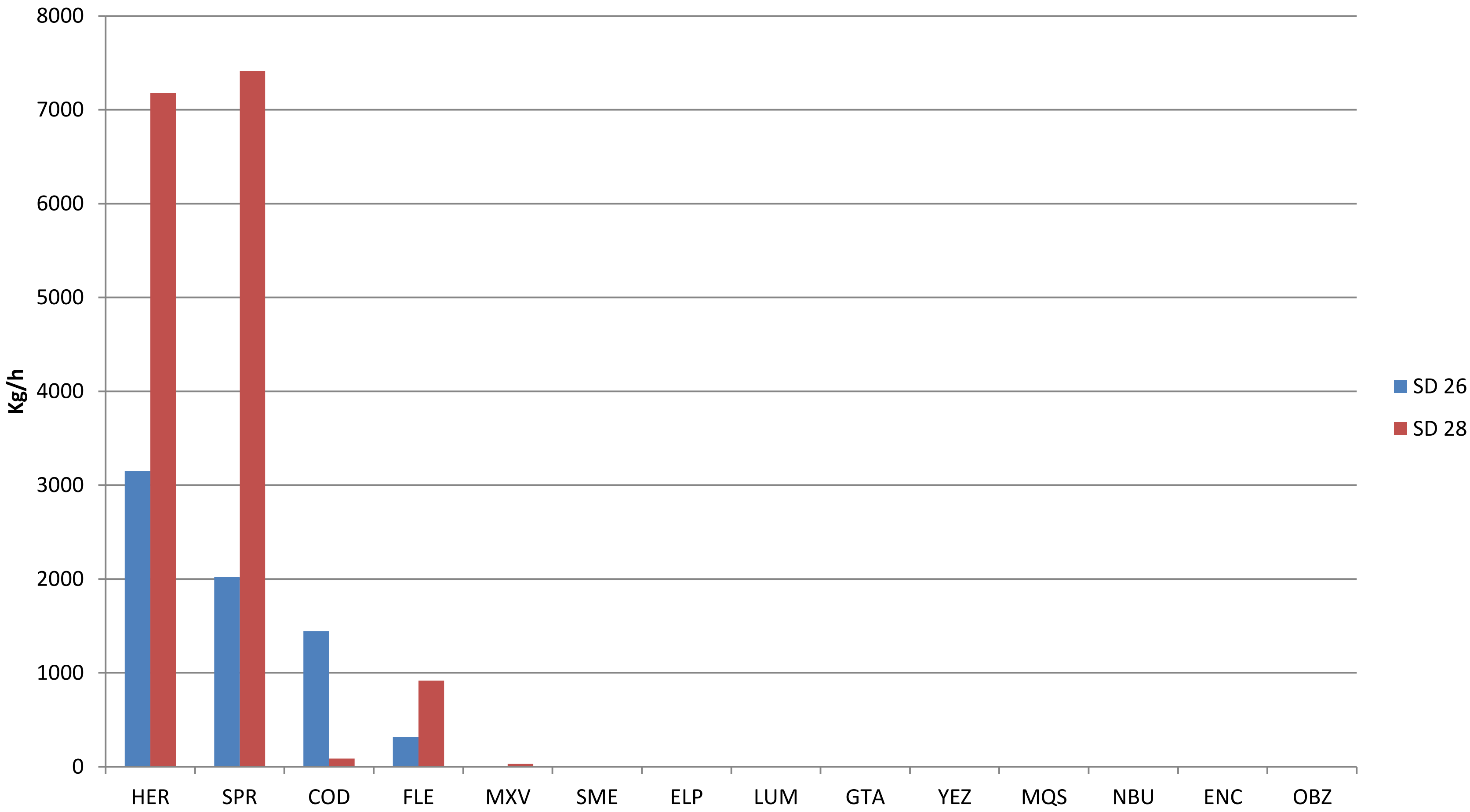


Numbers of fish biologically analysed during the BITS-1q survey (overall, 14 fish species)

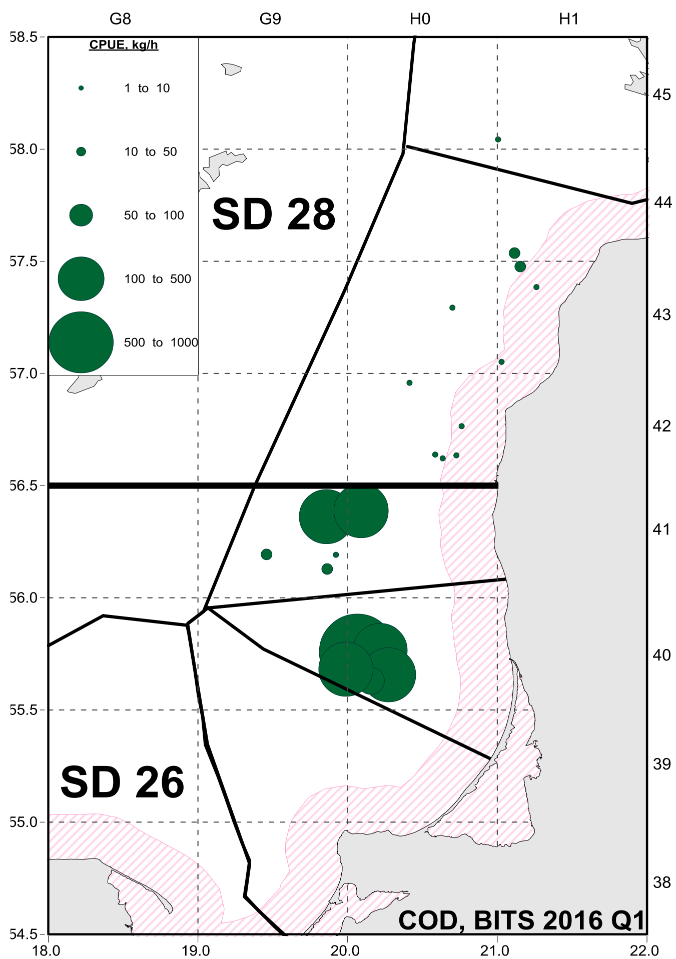
Species	ICES SD	Number of samples	Number of fish measured	Number of fish analyzed
Cod	26	11	1163	402
	28	11		72
	Total	22	1163	474
Flounder	26	11	335	208
	28	17	1884	304
	Total	28	2219	512
Herring	26	11	1059	
	28	17	1687	
	Total	28	2746	
Sprat	26	10	1059	
	28	17	1695	
	Total	27	2754	
All other species	26	3	4	
	28	16	298	
	Total	19	302	
Total	26	46	3620	610
	28	78	5564	376
	Total	124	9184	986

Species	ICES SD	Number of samples	Number of stomachs collected
Cod stomach samples	26	11	312
	28	11	72
	Total	22	384

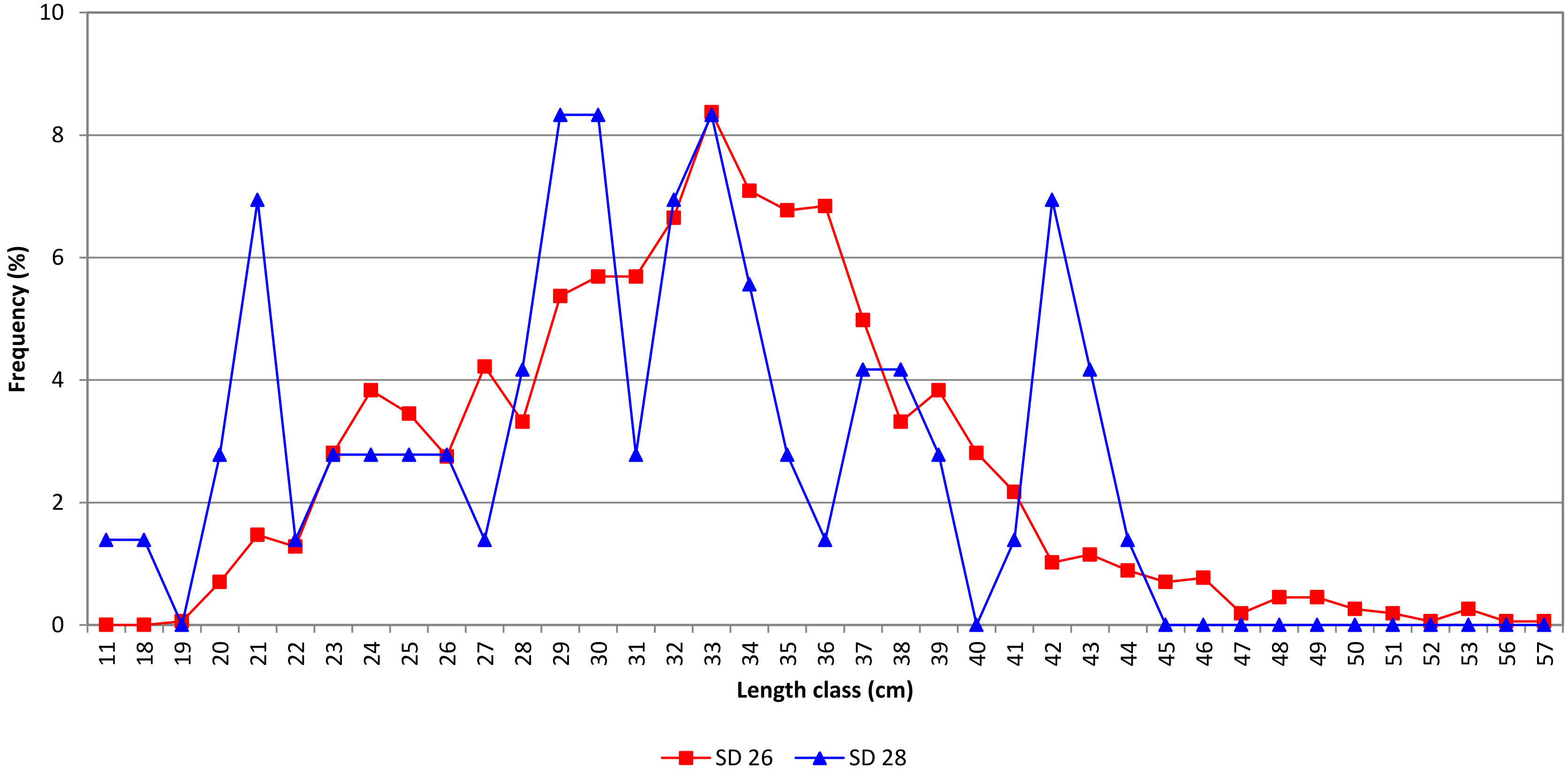
Fishes dominated by mass kg per 1 hour trawling in SD 26 and 28



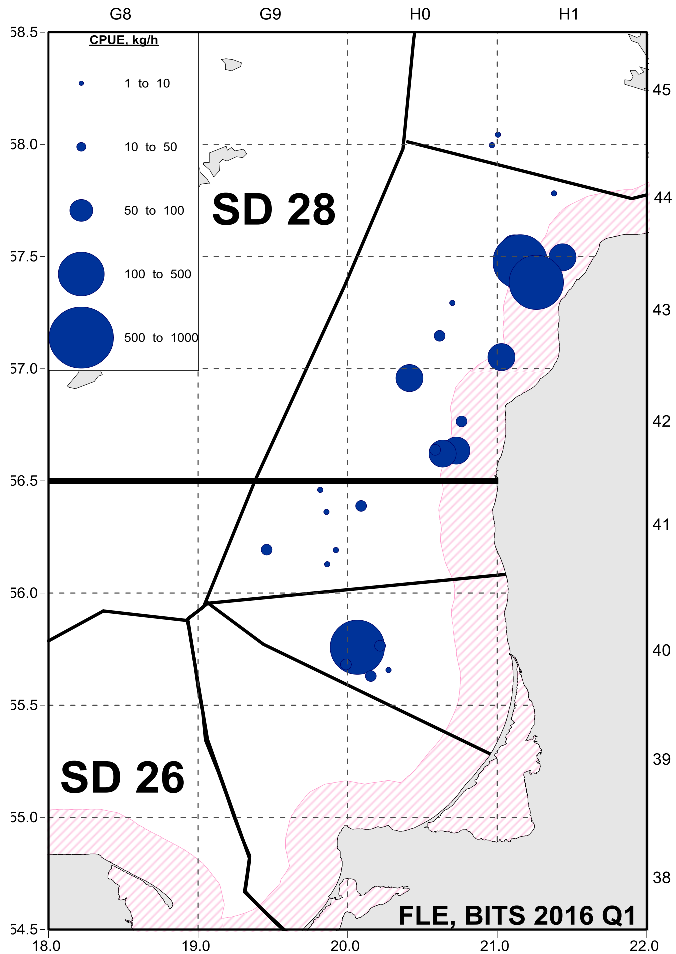
Distribution of cod during the BITS 2016 Q1 survey



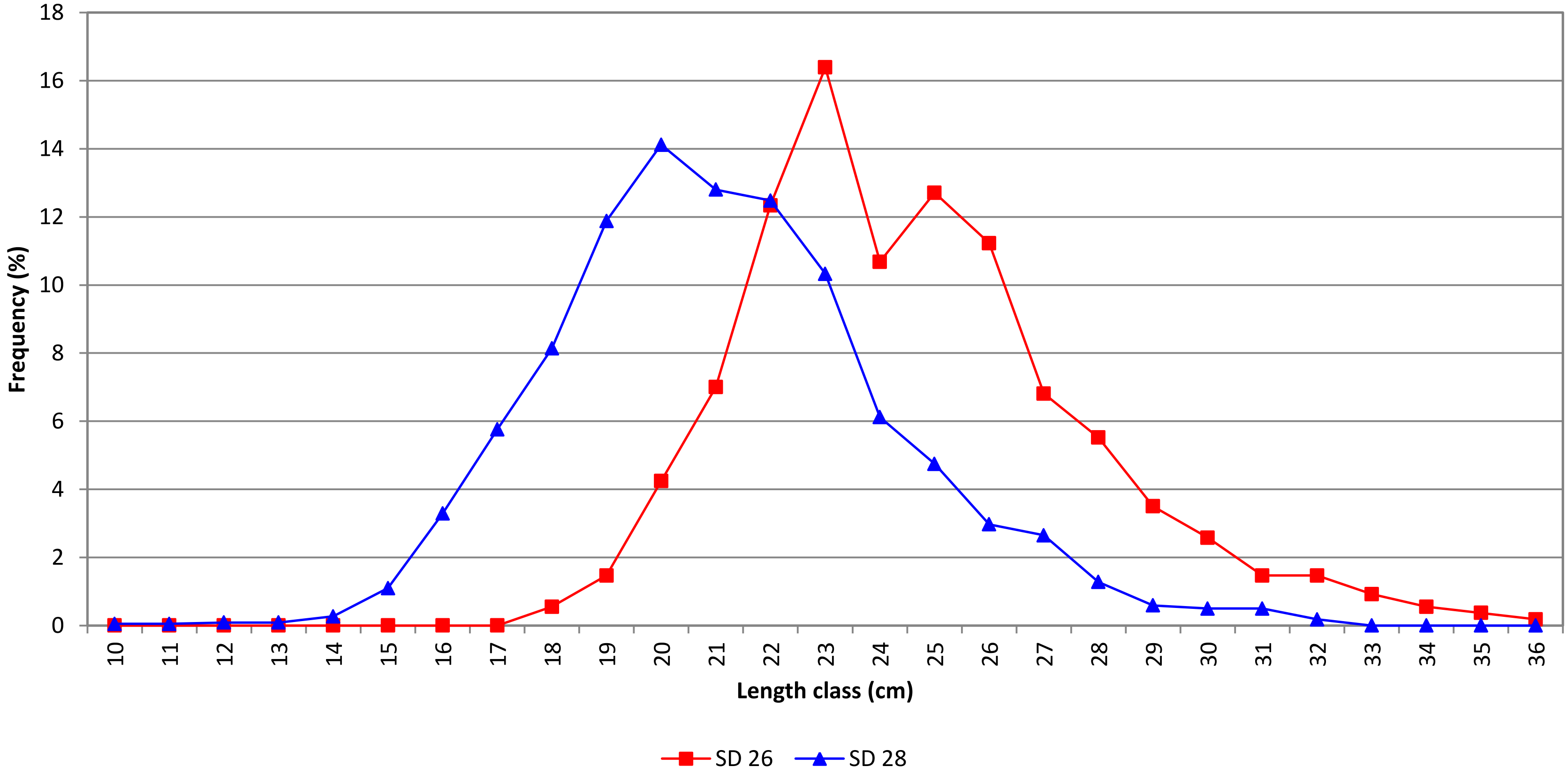
Length frequency of cod from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03-11 March 2016



Distribution of flounder during the BITS 2016 Q1 survey



Length frequency of flounder from Sub-Divisions 26 and 28 in the control catches during the r/v "Baltica" BITS survey, 03-11 March 2016



Estonian

BITS 2015 4qt.

Elor Sepp, Tiit Raid
Estonian Marine Institute

BITS 2015

BITS EST 2015 4 QRT

ESTONIAN CATCH INFORMATION- BITS 2015 4 QRT

EST BITS 2015 4. Qrt

Catch composition, kg per 30´ haul

		1	2	3	4	5	6	7	8	9
	Haul ID.	**28059**	**28077**	**28091**	**28112**	**28190**	**2904**	**2903**	**2905**	**2906**
	Sd	**28_2**	**28_2**	**28_2**	**28_2**	**28_2**	**29**	**29**	**29**	**29**
	Depth, m	62-65	70-77	42-46	68-72	87-90	41-42	46-49	33-33	31-26
	Date	23.11.2015	23.11.2015	23.11.2015	23.11.2015	23.11.2015	24.11.2015	24.11.2015	24.11.2015	24.11.2015
	Coordinates	5754_2128	5803_2101	5756_2139	5753_2119	5759_2058	5835_2157	5837_2153	5833_2207	5831_2205
	Catch information									
1	***Acerina cernua***	0	0	0	0	0	0	0	0	0.3925
2	***Clupea harengus***	8.7176	9.12	11.5605	1.9581	0	22.3271	39.3924	9.1673	17.1188
3	***Enchelyopus cimbrius***	0	0	0	0	0.0738	0	0	0	0
4	***Gadus morhua***	1.5277	5.7198	0	0	0.2653	0.074	0.64	0	0.601
5	***Gasterosteus aculeatus***	0	0.0039	0.0032	0	0	0.0023	0.001	0	0
6	***Gobius sp.***	0.016	0.0063	0	0	0	0.1149	0.0123	0.0064	0.0003
7	**Hyperoplus lanceolatus**	0	0	0	0	0	0	0	0	0.0421
8	***Myoxocephalus scorpius***	0.6569	2.12	0	0	0.3159	0.2512	1.7488	0	0
9	***Myxocephalys quadricornis***	0	0.1699	0	0	0	0.0185	0	0	0
10	***Neogobius melanostomus***	0.0473	0.0882	0.0094	0	0	0.0738	0.0114	0.0087	0.0026
11	***Osmerus eperlanus***	6.8612	3.6598	0.0663	0	0.0934	5.4275	8.7603	1.057	0.8498
12	***Platichthys flesus***	20.58	39.149	1.8815	0.2975	0.417	13.4696	14.992	30.1518	29.802
13	***Pungitius pungitius***	0	0	0	0	0	0	0.0009	0	0
14	***Scophthalmus maximus***	0.1985	0	0	0	0	0.351	0	0.047	0.187
15	***Sprattus sprattus***	1.04	2.42	0.03	1.35	4.38	0.23	1.83	14.24	13.55
16	***Zoarces viviparus***	0.2086	0.2035	0	0	0	0.3079	0.2625	0.5421	0.1864
	Total	**39.8538**	**62.6604**	**13.5509**	**3.6056**	**5.5454**	**42.6478**	**67.6516**	**55.2203**	**62.34**

Distribution of hauls by depth

ICES Sub-Divisions	Gear (TVL, TVS)	Depth strata (1–6)	Numb er of hauls plane d	Number of valid hauls realized using "Standard" ground gear	Number of valid hauls realized using Rock hoppers	Number of assumed zero-catch hauls	Number of replacement hauls	Numb er of invali d hauls	% station s fished
28	TVS	40-59	1	1	0	0	0	0	100
28	TVS	60-79m	3	3	0	0	0	0	100
28	TVS	80-99m	1	1	0	0	0	0	100
29	TVS	20-39m	1	2	0	0	0	0	200
29	TVS	40-59m	2	2	0	0	0	0	100
29	TVS	60-79m	1	0	0	0	0	0	0

EST_BITS 4 QRT 2015
Number of fish analysed

Number of biological samples (maturity and age material, *maturity only):		
Species	Age	Length
Gadus morhua	61	61
Sprattus sprattus	200	1397
Clupea harengus	203	1770
Platichthys flesus	416	1205

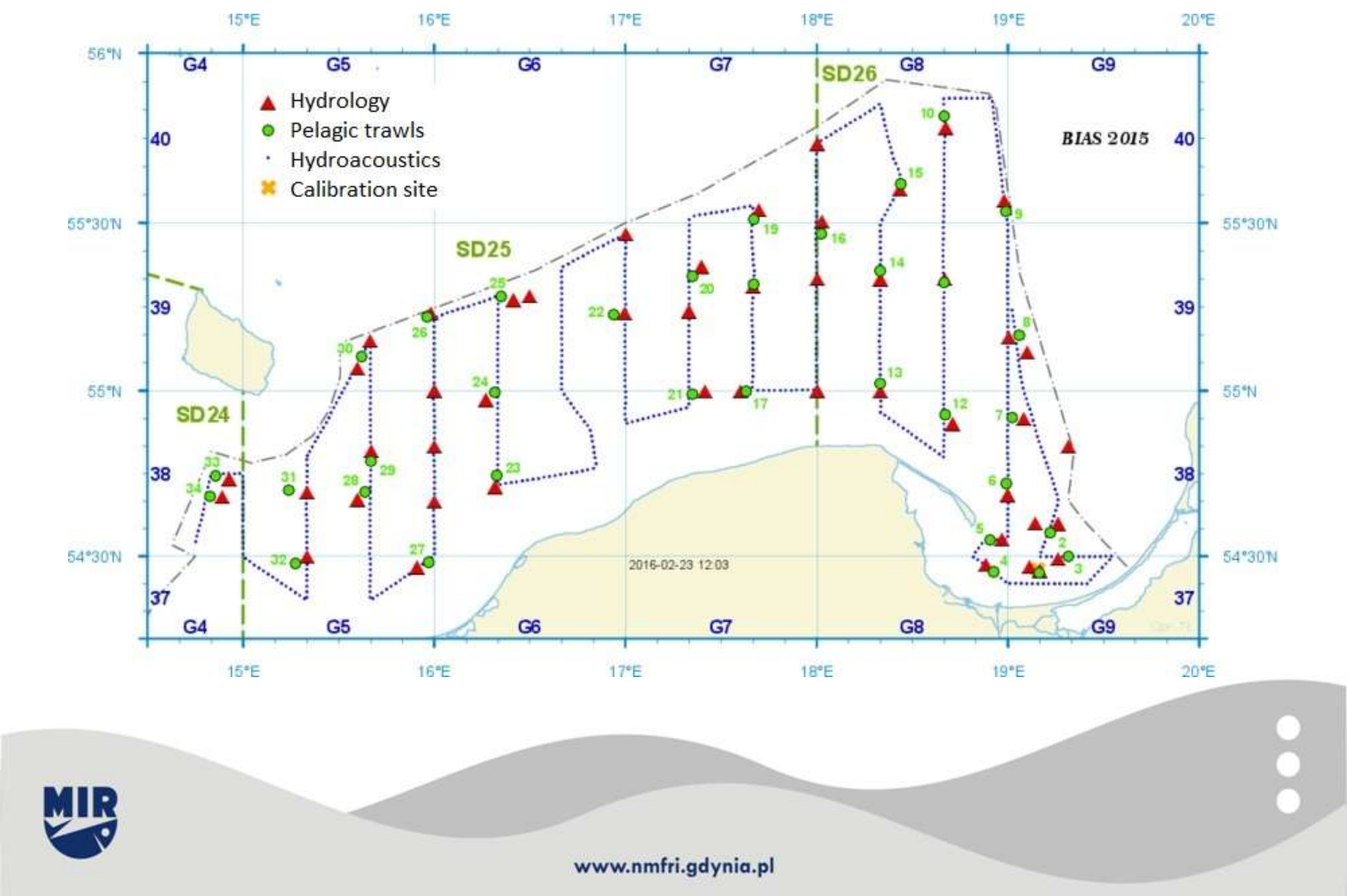
Polish part of the BIAS 2015 survey

Tomasz Łączkowski

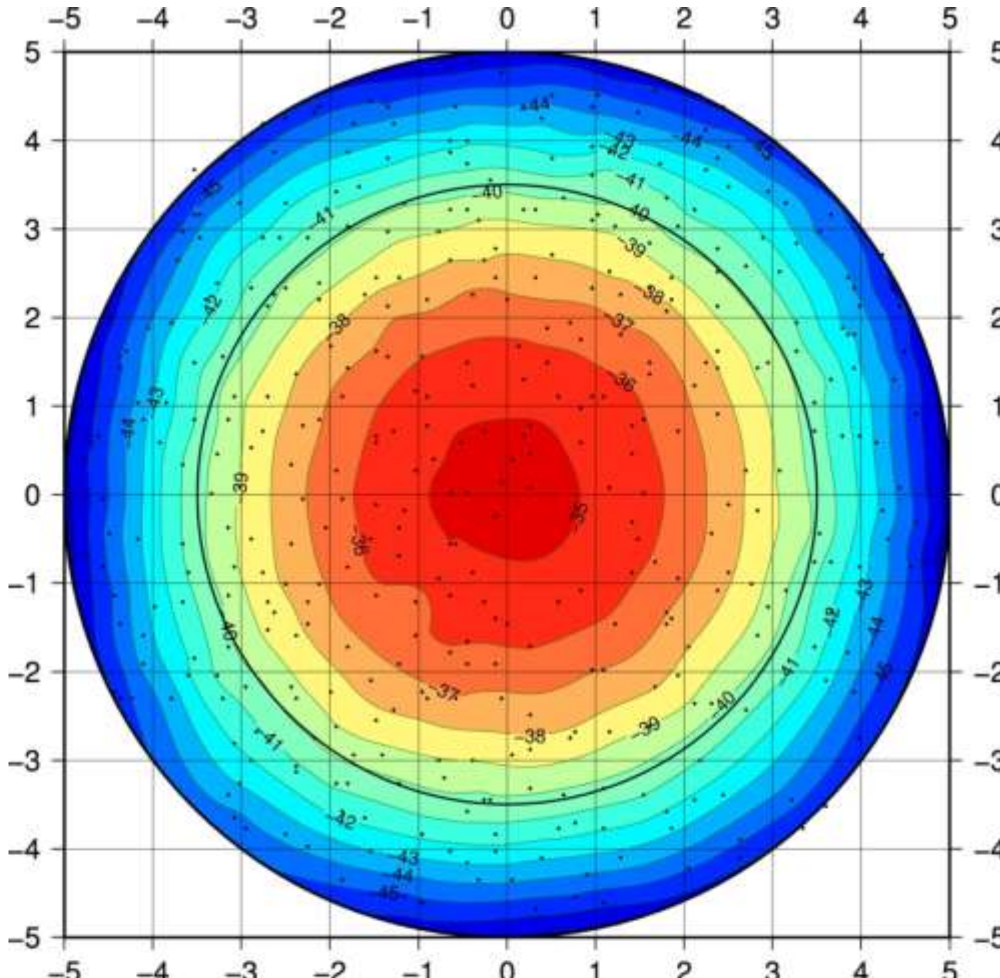
National Marine Fisheries Research Institute
tomlacz@mir.gdynia.pl

MIR

www.nmfri.gdynia.pl


Hydrology
Pelagic trawls
Hydroacoustics
Calibration site
BIAS 2015
SD24
SD25
SD26
G4
G5
G6
G7
G8
G9
37
38
39
40
15°E
16°E
17°E
18°E
19°E
20°E
54°30'N
55°N
55°30'N
56°N
2016-02-23 12:03
MIR
www.nmfri.gdynia.pl

Calibration 38 kHz



www.nmfri.gdynia.pl

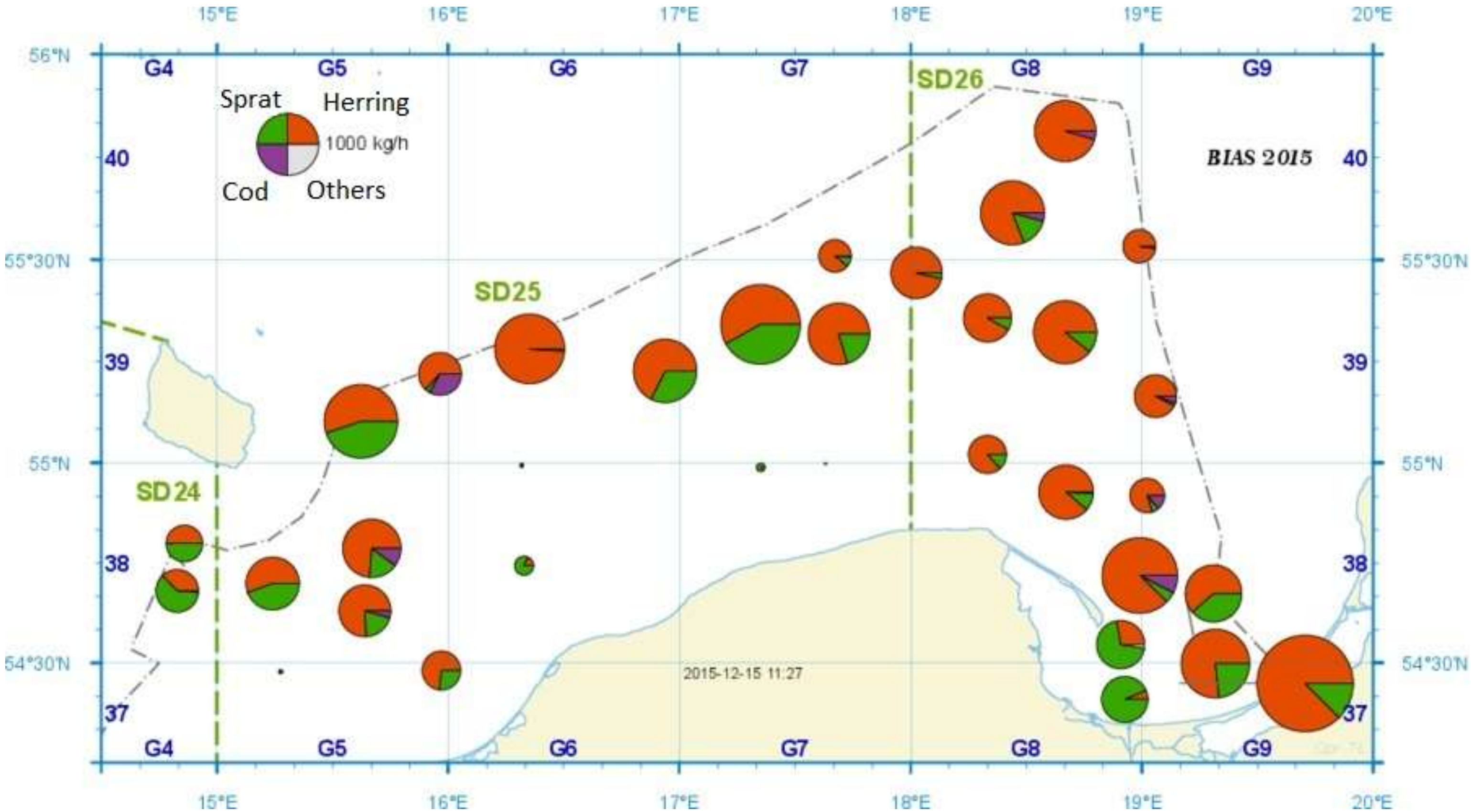
Materials

	Measurement				Analysis			
	ICES SD			Sum	ICES SD			Sum
Species	24	25	26		24	25	26	
Herring	535	3294	4309	8138	99	522	599	1120
Sprat	384	2514	2560	5458	68	271	190	529
Cod	3	281	225	509	3	82	87	172
Flounder		1	1	2				
River lamprey			4	4				
Lumpfish	7	10	1	18				
Salmon			1	1				
Plaice		3		3				
Whiting	1	5		6	1	5		6
Garfish		2	1	3				
Fourbeard rockling	1			1				
Anchovy		1		1				

MIR

www.nmfri.gdynia.pl

CPUE



15°E
16°E
17°E
18°E
19°E
20°E
56°N
55°30'N
55°N
54°30'N
G4
G5
G6
G7
G8
G9
SD26
SD25
SD 24
Sprat
Herring
1000 kg/h
Cod
Others
BIAS 2015
40
39
38
37
2015-12-15 11:27

Next Polish BIAS survey

September 17 – October 4 2016

German Acoustic surveys 2015

BASS FRV „W. Herwig“ cruise WH 384
BIAS FRV „Solea“ cruise SB 710

Matthias Schaber[1], Tomas Gröhsler[2] & Uwe Böttcher[2]
[1]Thünen-Institute of Sea Fisheries [2]Thünen-Institute of Baltic Sea Fisheries-

Rostock, March 2016

Survey stats

BASS

„W. Herwig“ WH374

01 May -21 May 2015

Survey area:

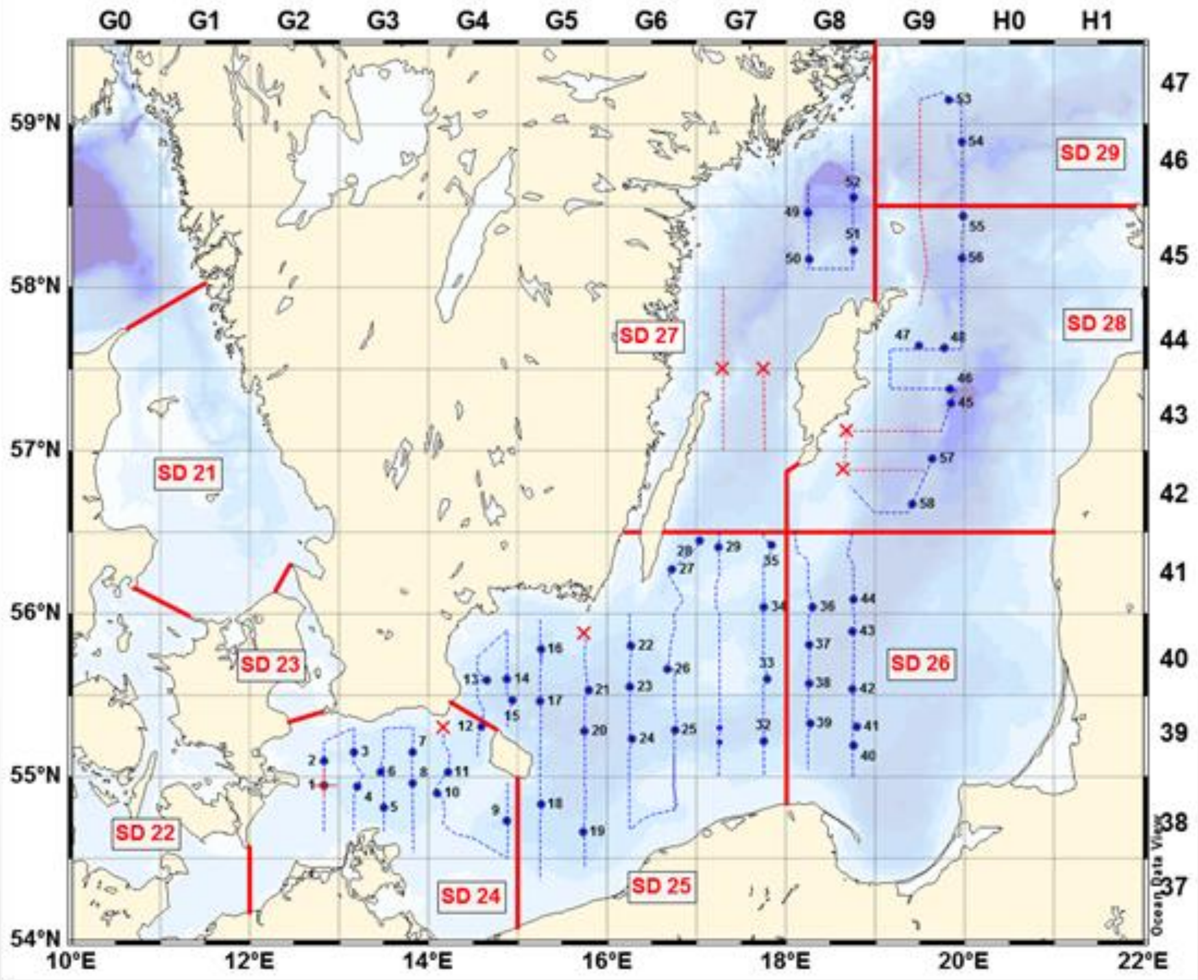
ICES SD 24, 25;
parts of SD 26 and 28
parts of SD 29 and 27 (add.)

Transect length: 1314 nm

Problems: not approved tracks and stations

Hauls (CTD casts):

SD24	12 (28)
SD25	23 (47)
SD26	9 (14)
SD28	8 (17)
SD29	2 (3)
SD27	4 (8)
TOTAL	58 (115)



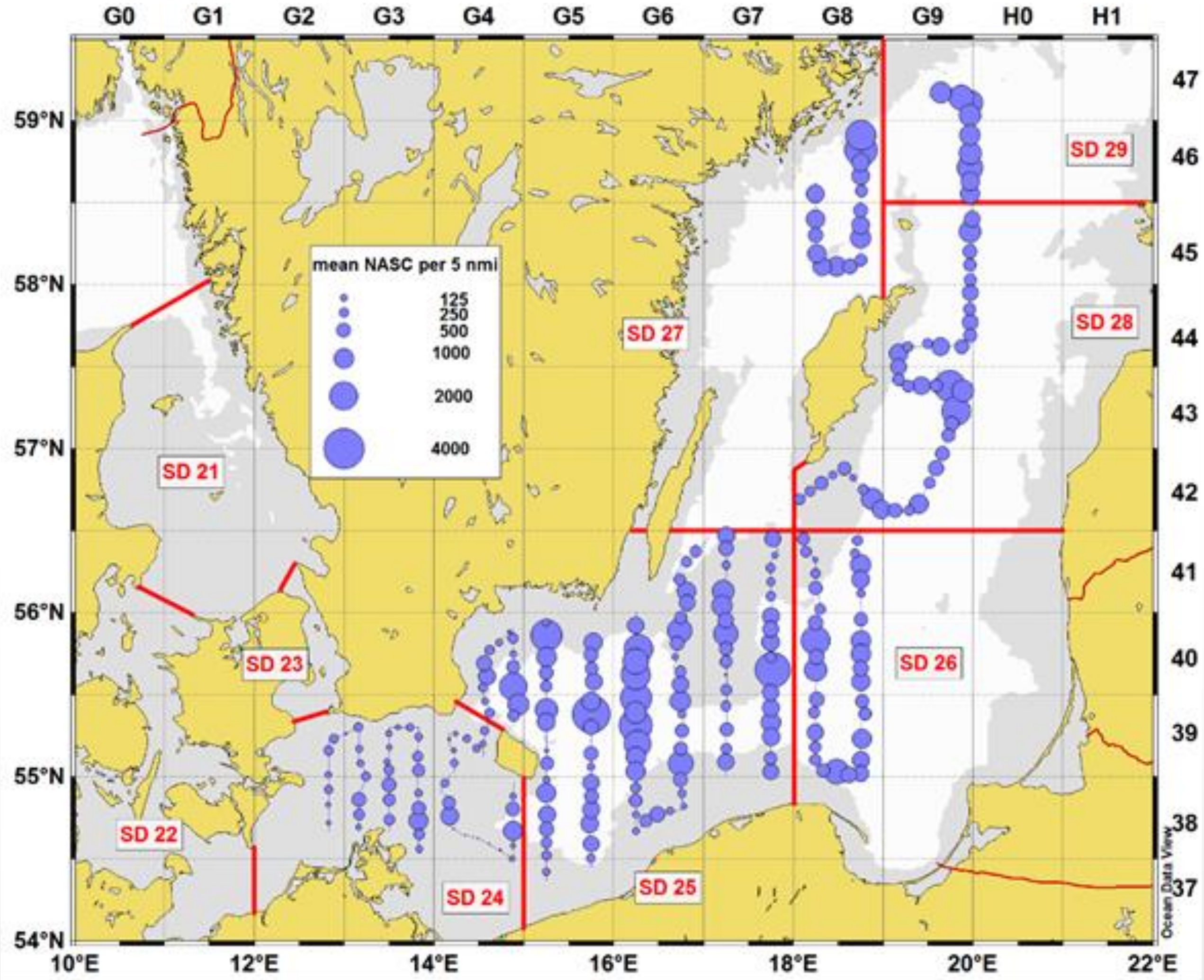
Uwe Böttcher, Matthias Schaber & Tomas Gröhsler
ICES WGBIFS

THÜNEN

Acoustics

BASS

Distribution of NASC values (5 nm intervals) along the track



THÜNEN

Acoustics

BASS

Mean NASC per ICES-SD

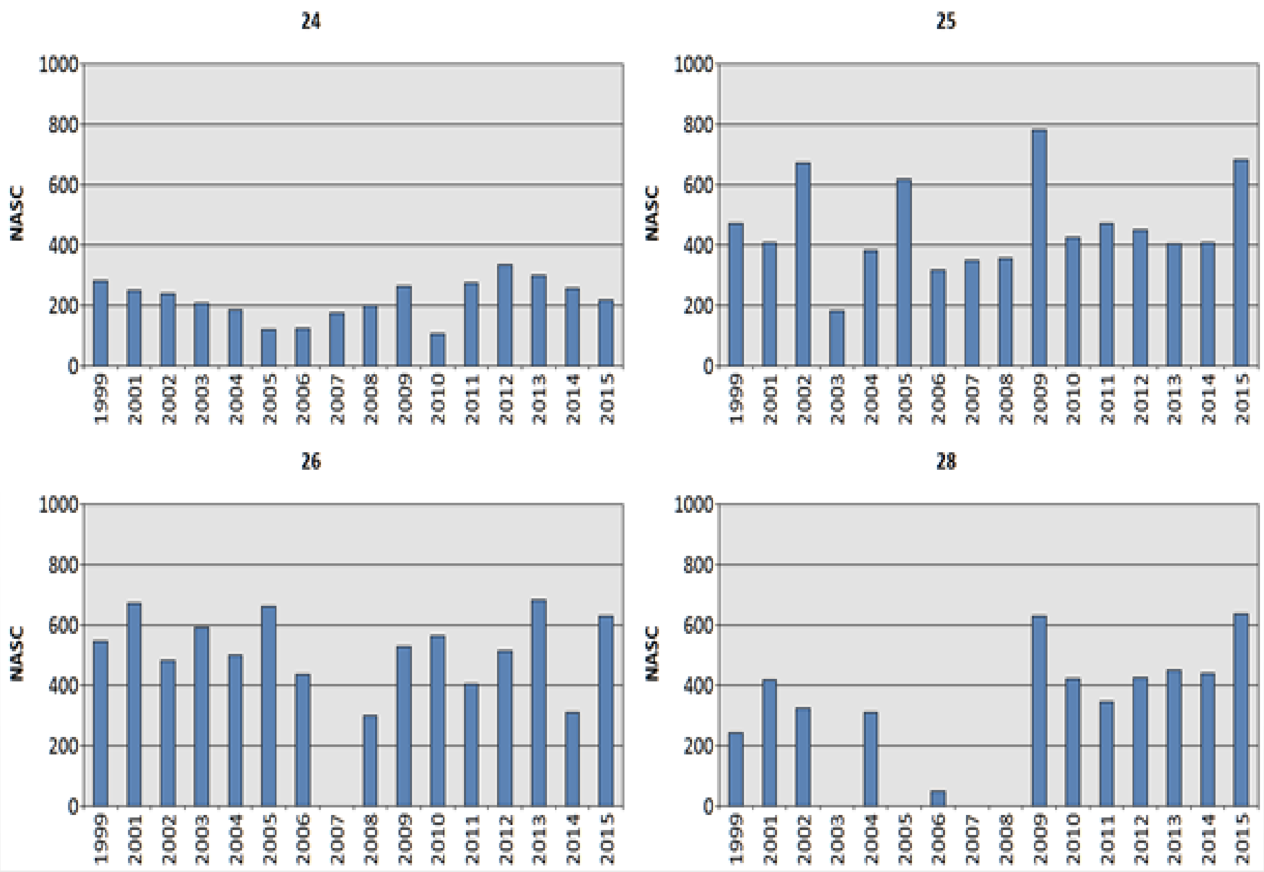
SD 24 ↔

SD 25 ↑↑

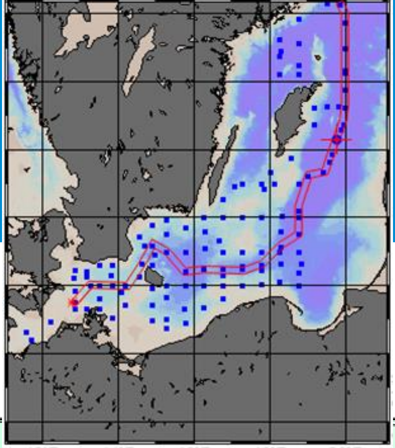
SD 26 ↔

SD 28 ↑↑

→ NASC in SD 25 and 28 significantly above the long term survey average



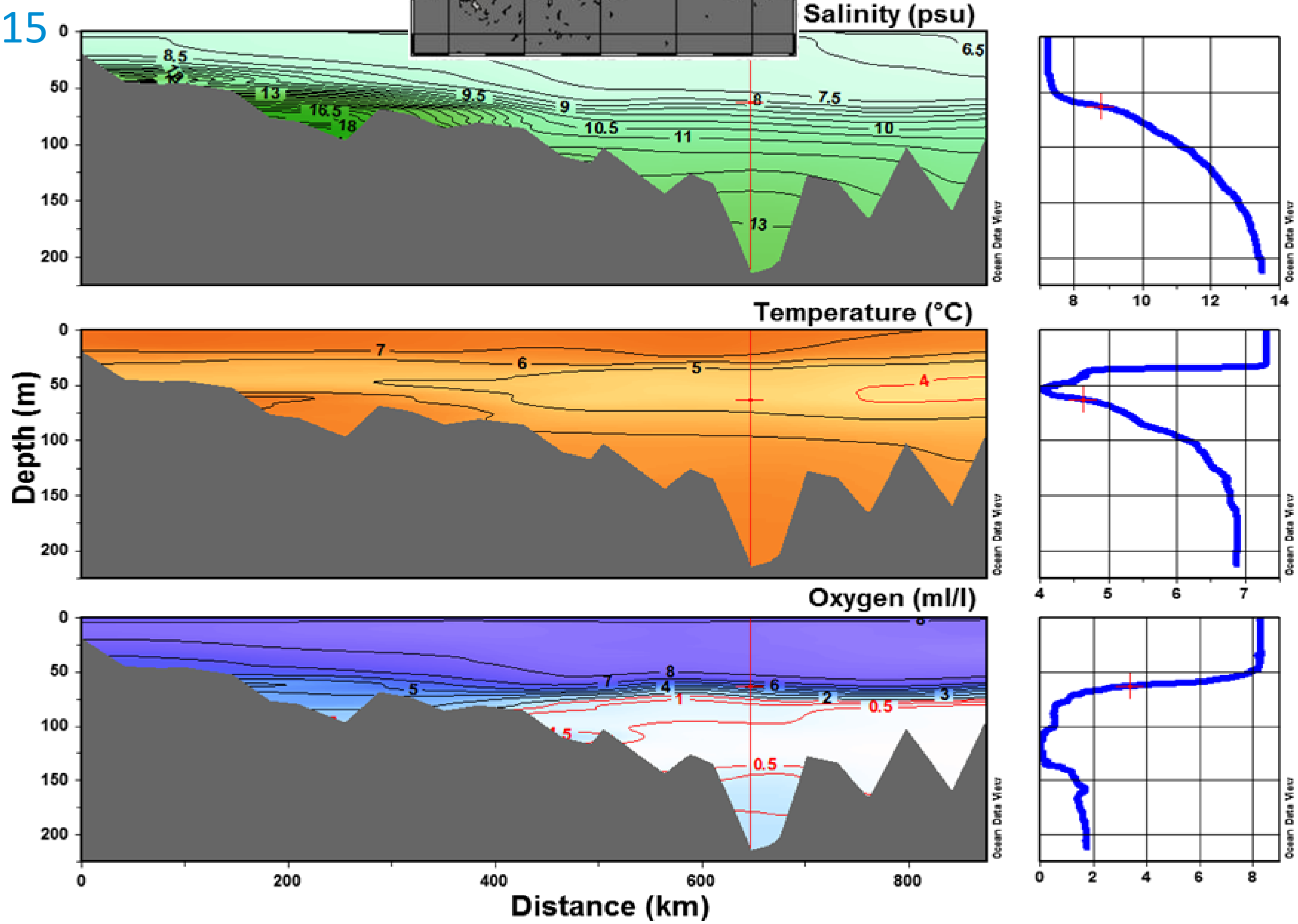
Hydrography



BASS

moderate inflow events in 2013
major inflows events in 2014
and weak winter 2014/2015

- **Salinity:**
  significantly increased in the deep water body of SD 25
- **Temperature:**
  significantly increased in the intermediate water layer related to the last 5 years
- **Oxygen:**
  Reduction of the oxygen depletion areas up to the south-western Gotland Sea



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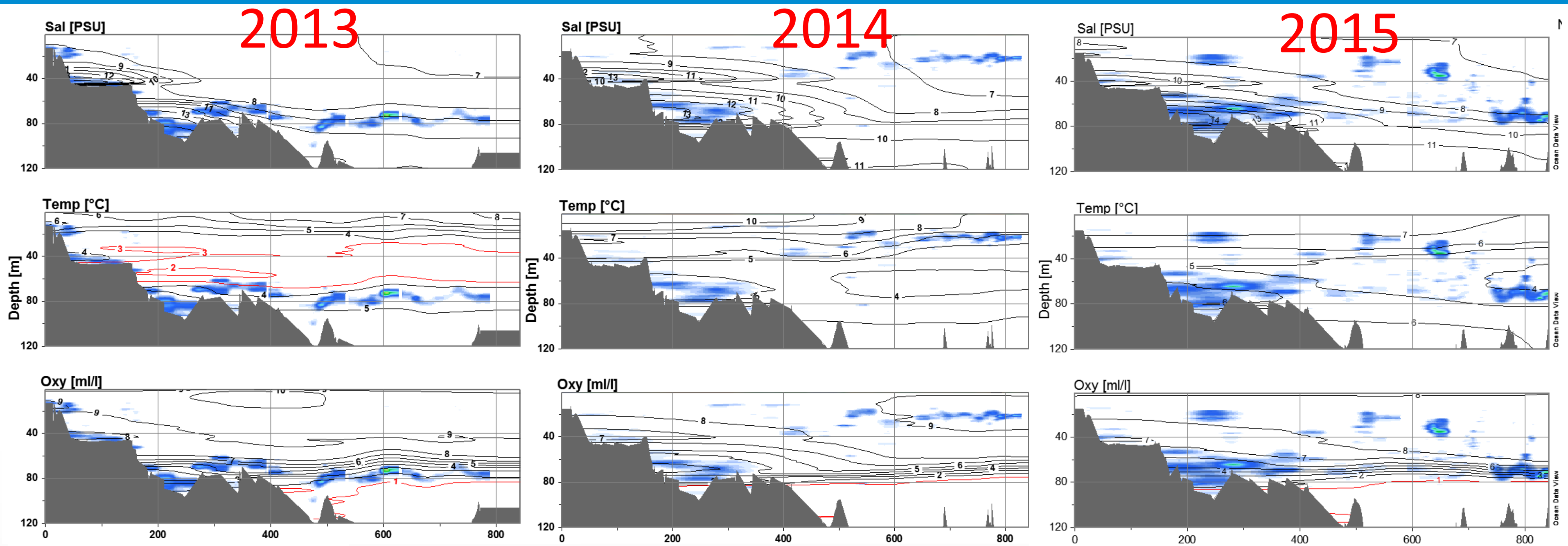
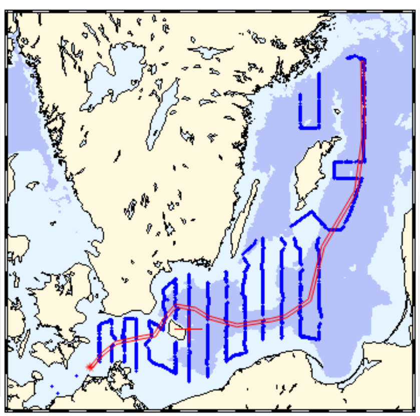
ICES WGBIFS

THÜNEN

Hydrography and vertical fish distribution BASS



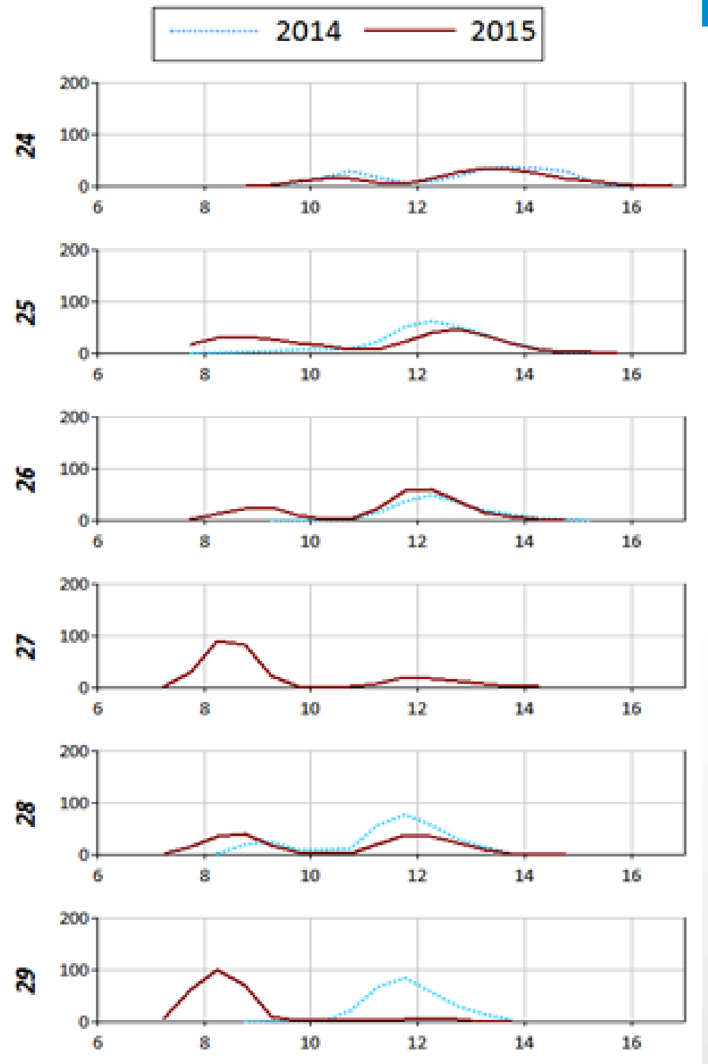


Vertical distribution of salinity, temperature and oxygen related to the echoes of fish (blue clouds) on a transect from through investigated area in 2013, 2014 and 2015.

Uwe Böttcher, Matthias Schaber & Tomas Gröhsler
ICES WGBIFS

Sprat length frequency distributions

BASS



SD 24, 25, 26, 28 and 29

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THÜNEN

Survey stats

BIAS

„Solea“ SB 710

30 Sep -19 Oct 2014

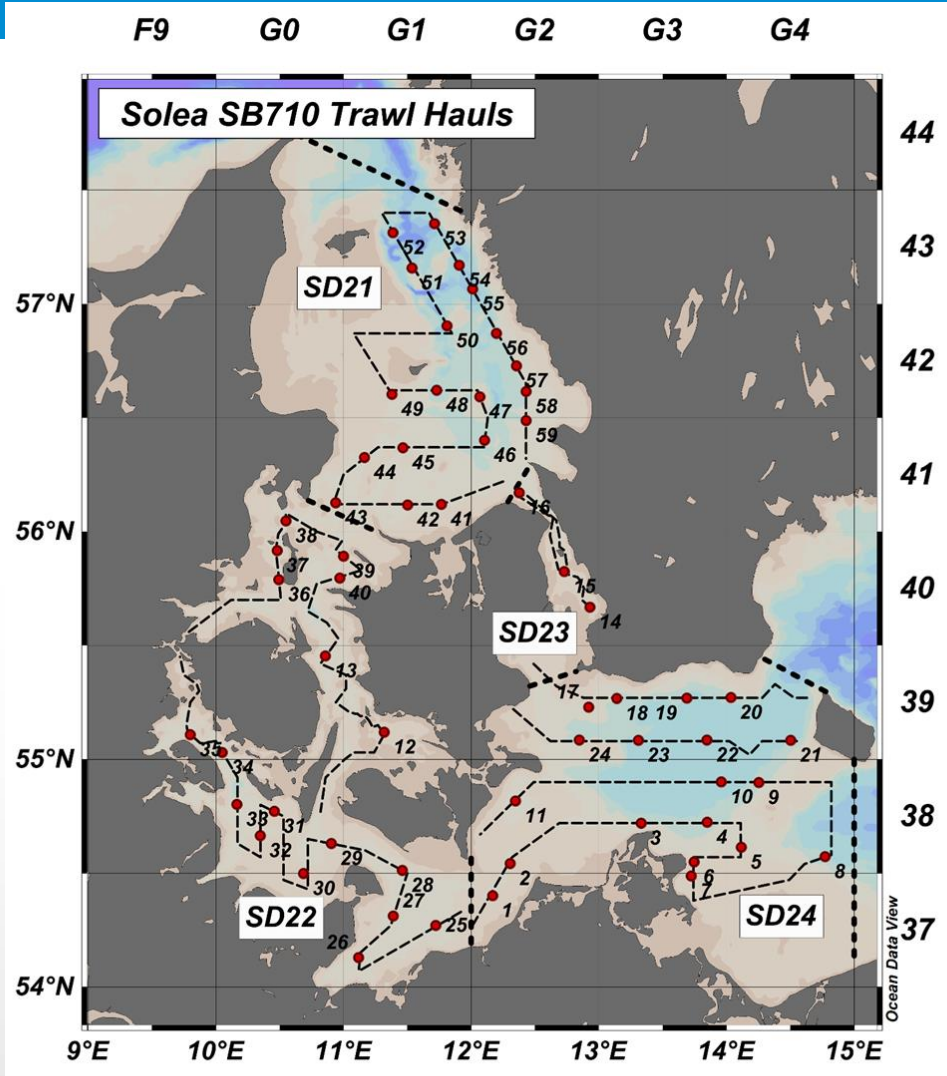
Cruise leader: M. Schaber, T. Gröhsler

Survey area: 13206 nm^2

Transect length: 1230 nm

Hauls (CTD casts):

SD21	19 (23)
SD22	18 (28)
SD23	3 (6)
SD24	19 (27)
TOTAL	**59 (84)**



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THÜNEN

Acoustics

BIAS

Distribution of NASC values (5 nm intervals)

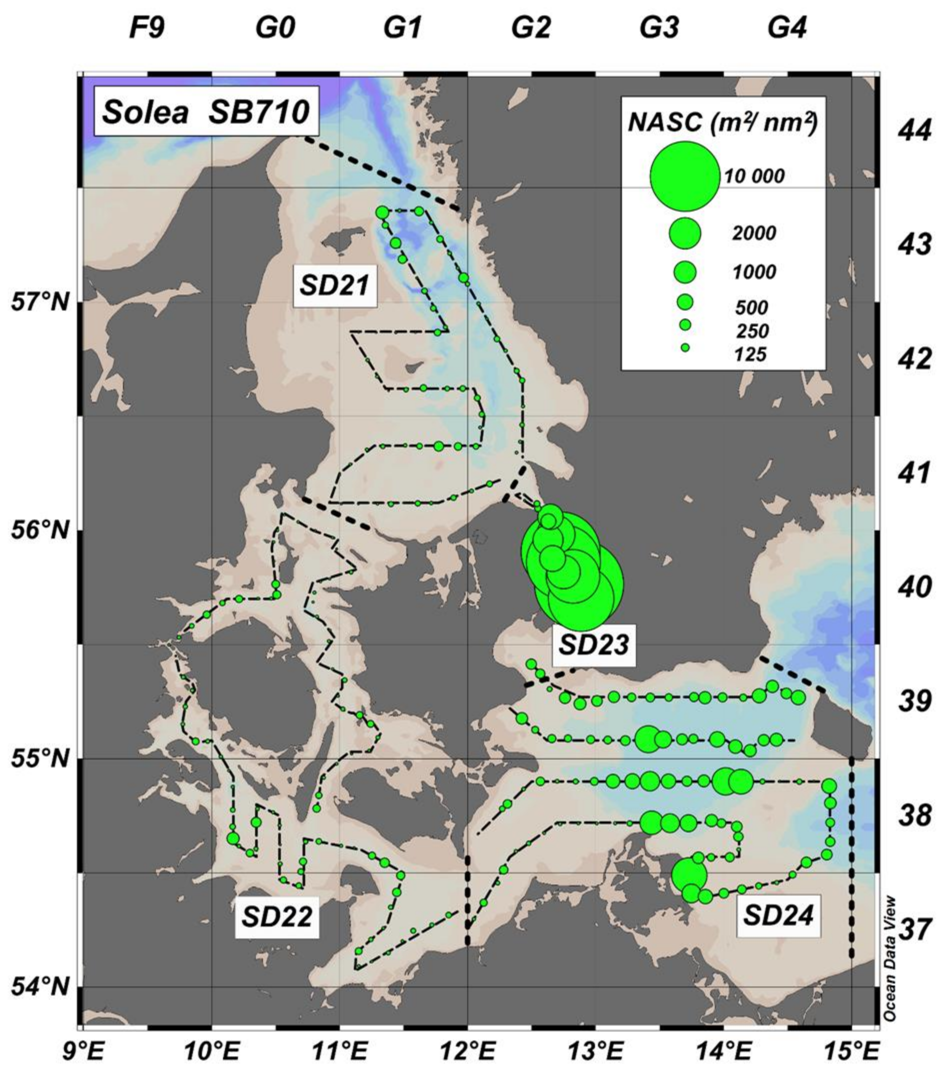
SD 21 ↓↓

SD 22 ↓

SD 23 ↑↑

SD 24 ↓

→ Overall NASC values mostly below long term survey average (1999-2014), except SD 23



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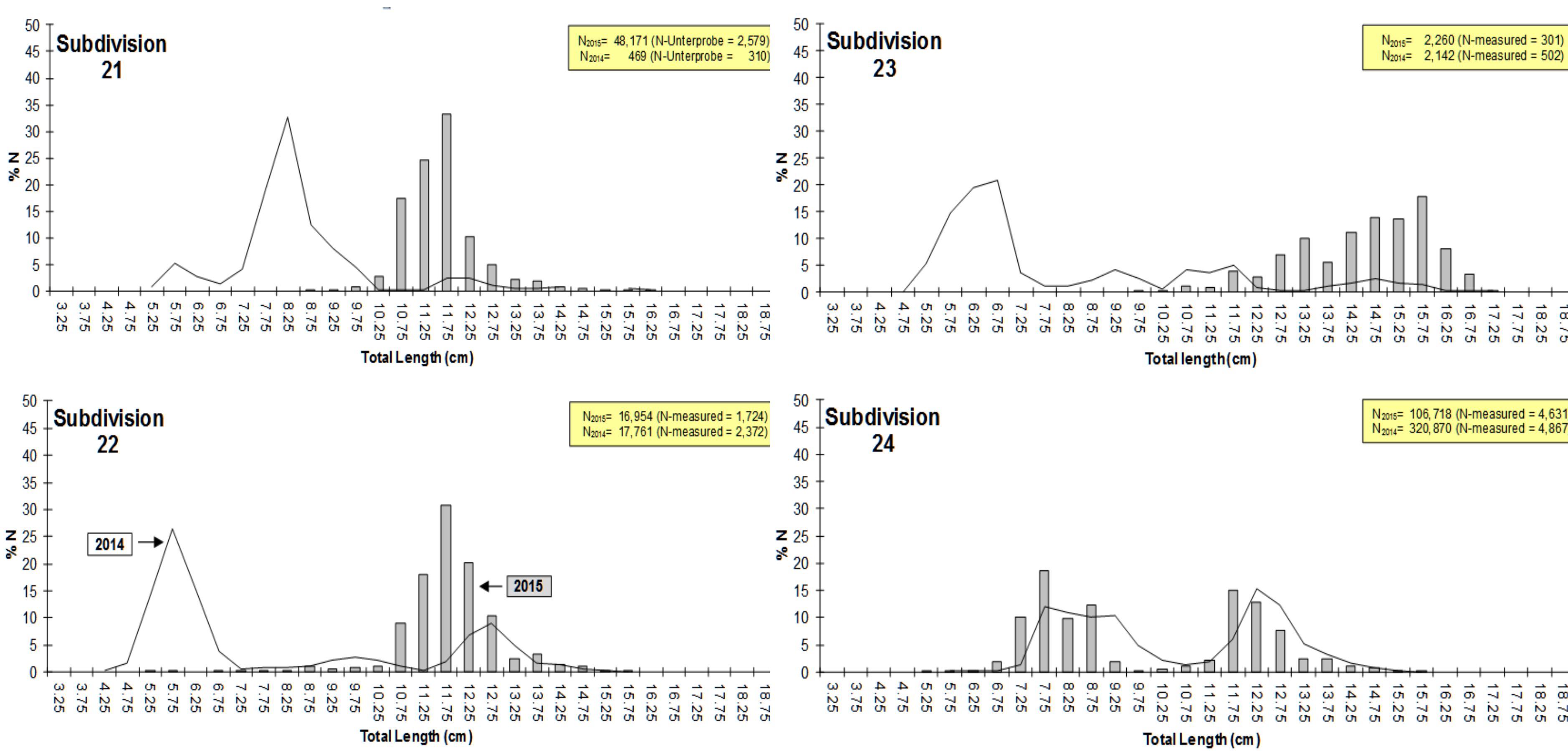
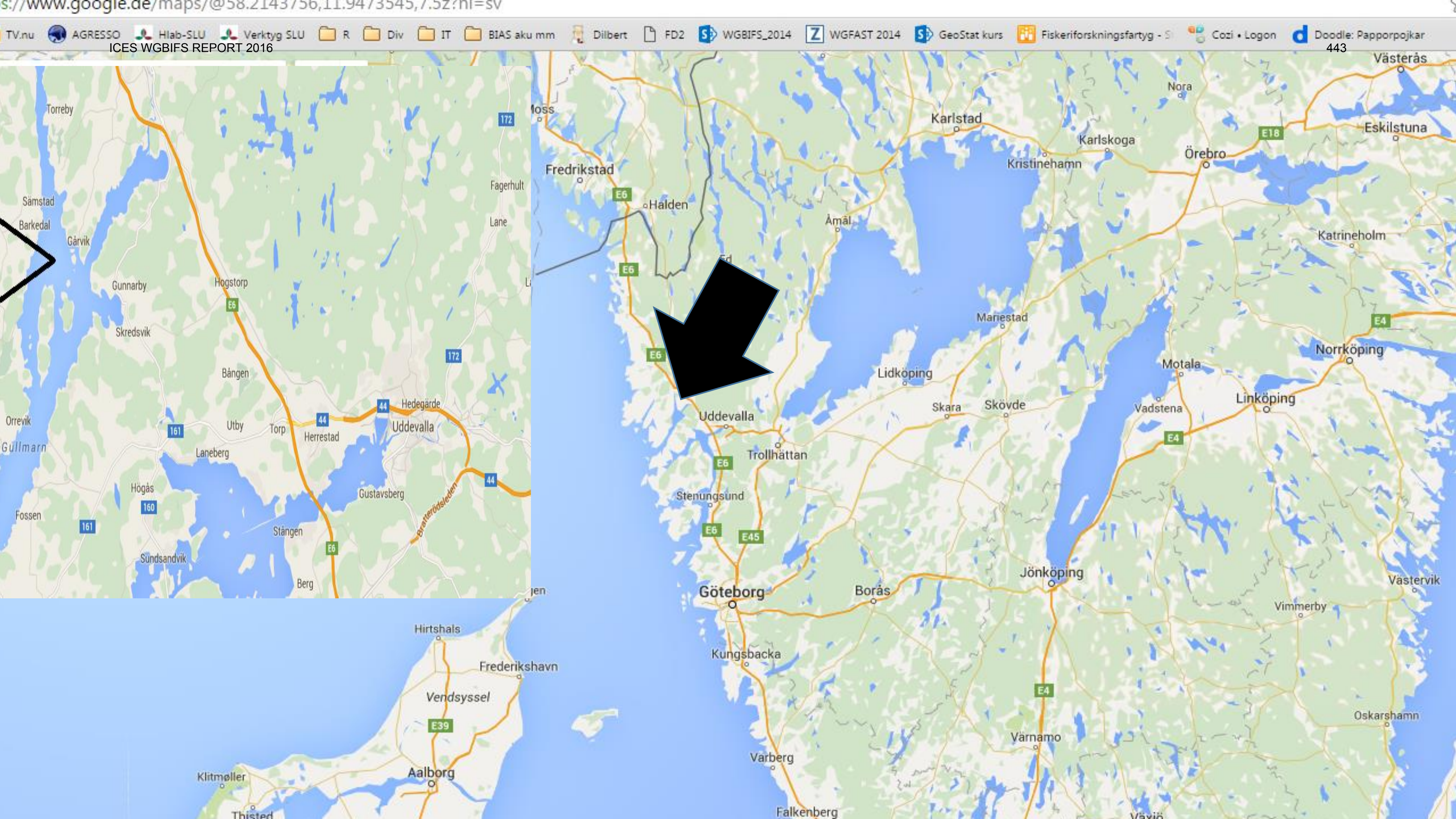
Sprat length frequency distributions

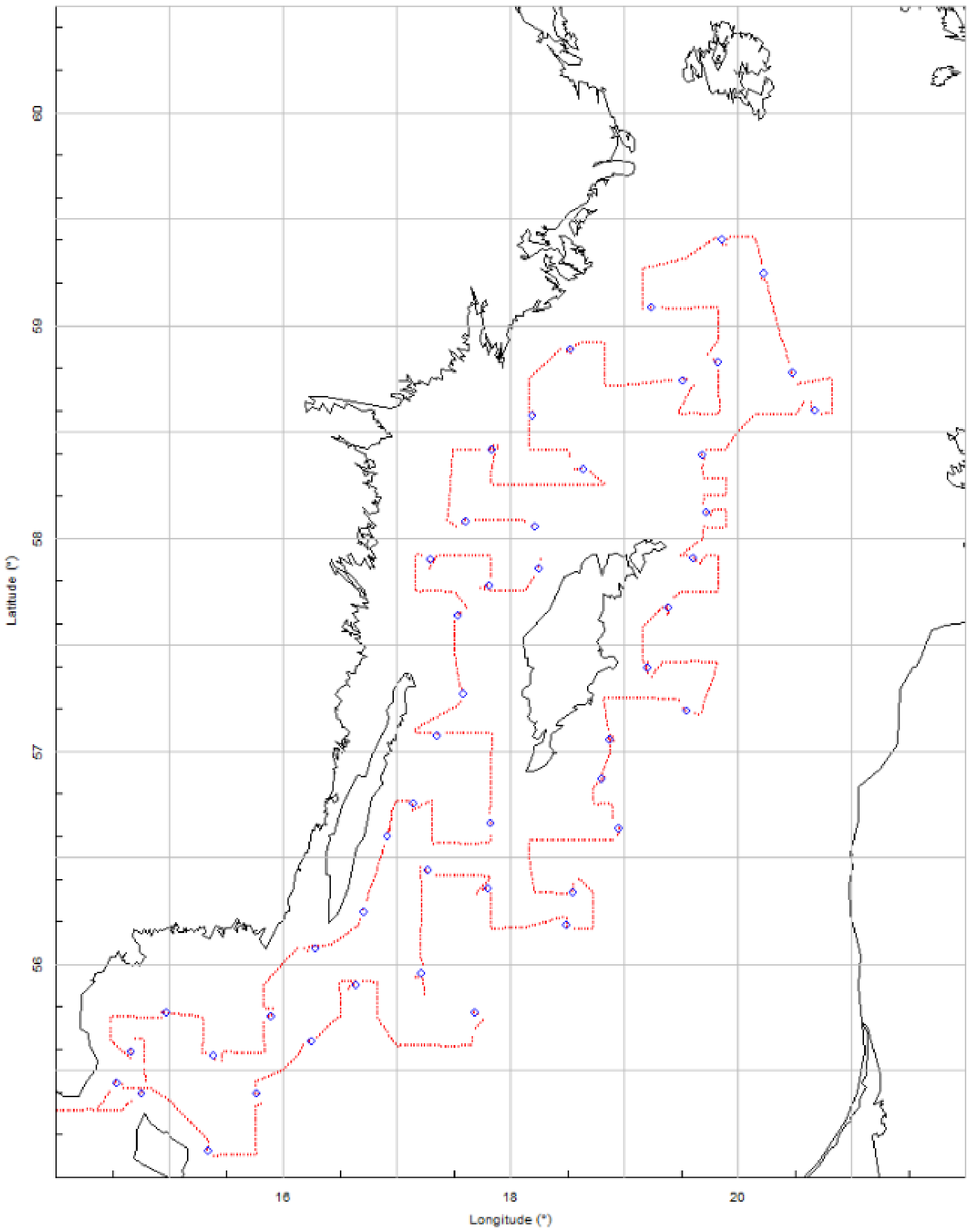
BIAS

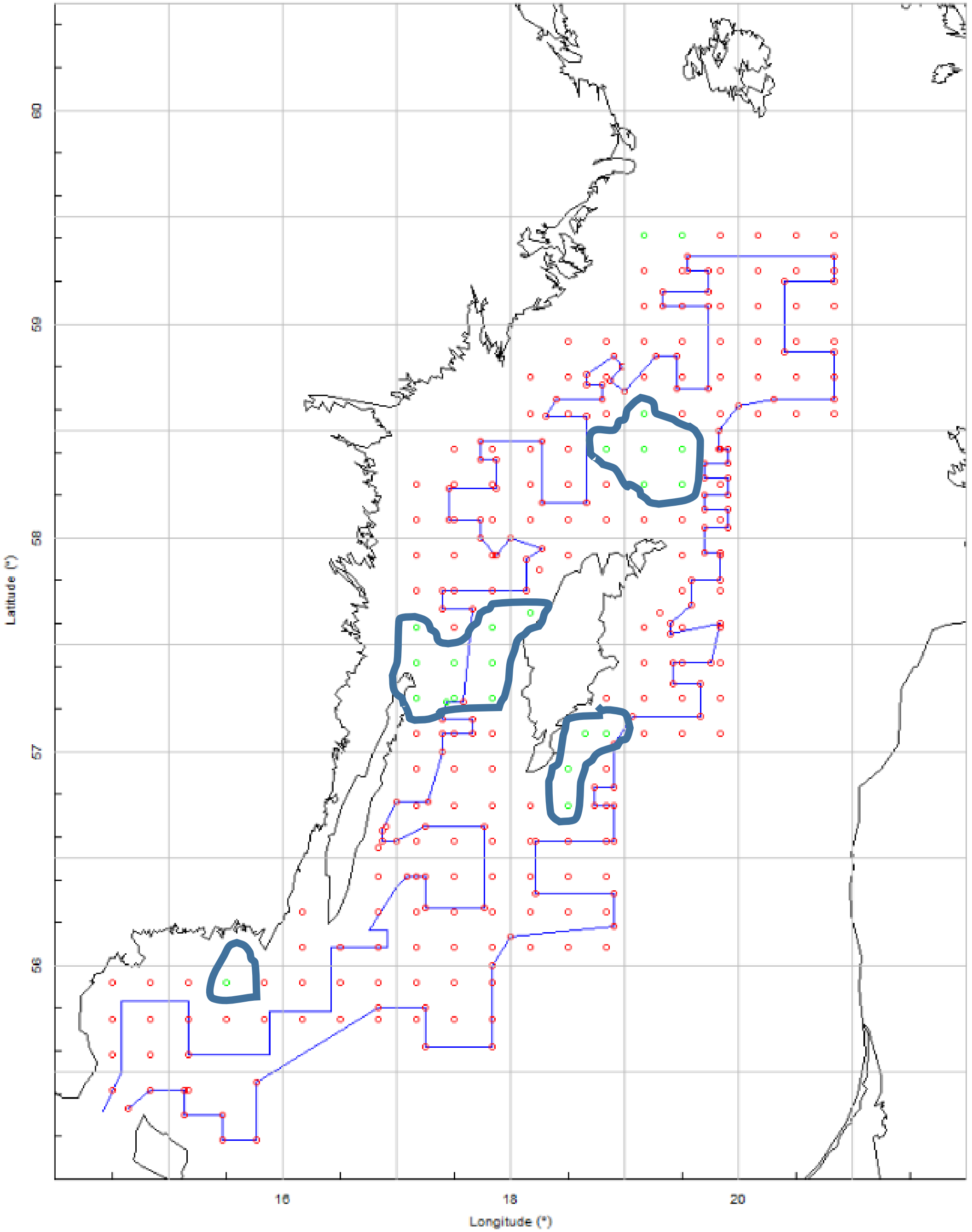


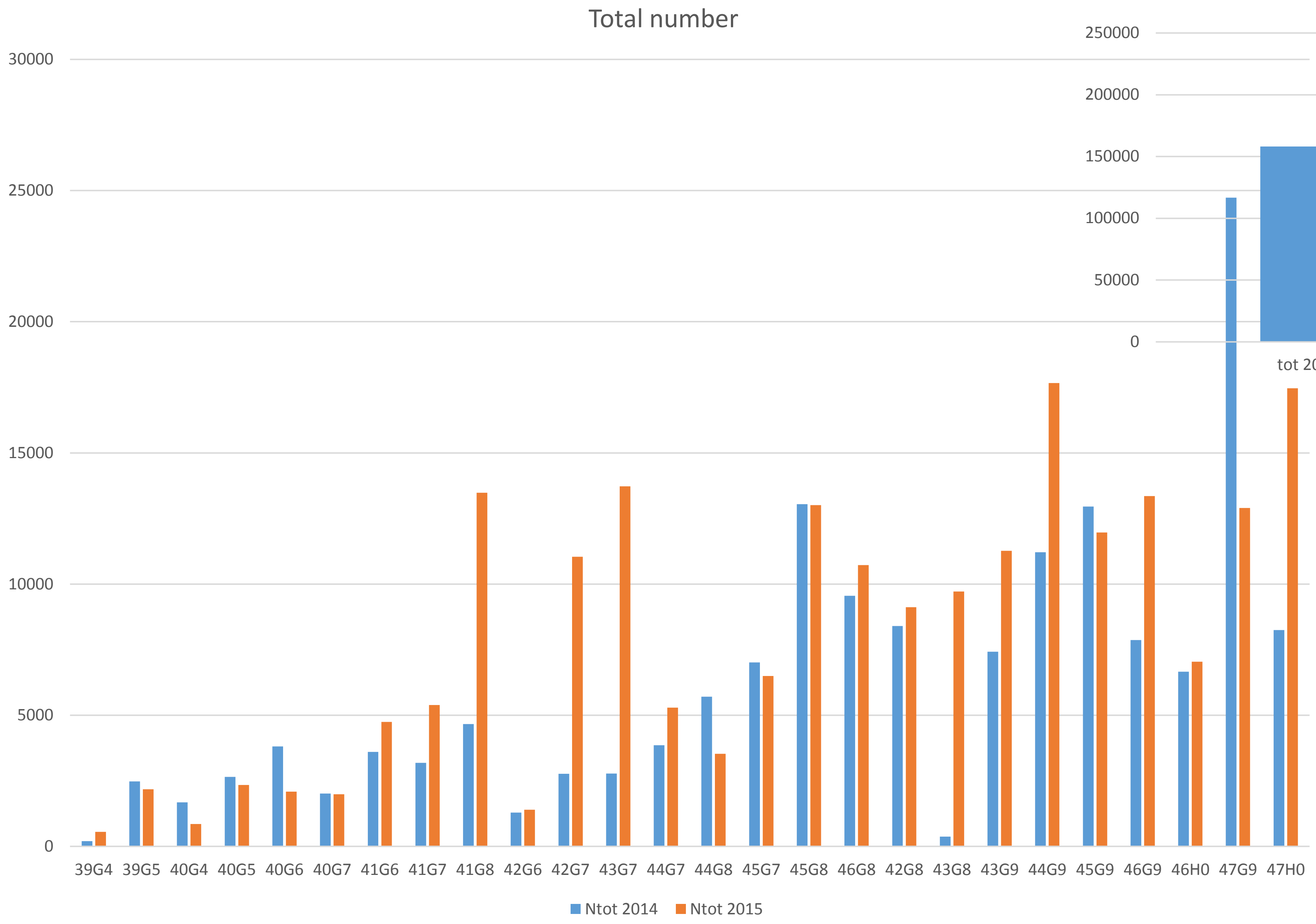
GERAS 2014: LFDs of sprat (*Sprattus sprattus*) in SD 21, 22, 23 and 24

Swedish BIAS 2015


s://www.google.de/maps/@58.2143756,11.9473545,7.5z?hl=sv
TV.nu
AGRESSO
Hlab-SLU
Verktyg SLU
R
Div
IT
BIAS aku mm
Dilbert
FD2
WGBIFS_2014
WGFAST 2014
GeoStat kurs
Fiskeriforskningsfartyg
Cozi • Logon
Doodle: Papporpojkar
Torreby
Sämstad
Barkedal
Gårvik
Gunnarby
Hogstorp
Skredsvik
Bången
Orrevik
Gullmarn
Utby
Torp
Herrestad
Laneberg
Hedegärde
Uddevalla
Högås
Fossen
Gustavsberg
Bratteröds leden
Stången
Sundsandvik
Berg
Fagerhult
Lane
172
161
160
44
E6
Moss
Fredrikstad
Halden
Ed
Åmål
Karlstad
Kristinehamn
Karlskoga
Nora
Örebro
Eskilstuna
Västerås
E18
Katrineholm
Mariestad
Lidköping
Skara
Skövde
Motala
Vadstena
Norrköping
Linköping
E4
Uddevalla
Trollhättan
Stenungsund
E45
Göteborg
Borås
Jönköping
Västervik
Vimmerby
Kungsbacka
Värnamo
Oskarshamn
Varberg
Falkenberg
Växjö
Hirtshals
Frederikshavn
Vendsyssel
E39
Aalborg
Klitmøller
Thisted


60
59
58
57
56
Latitude (°)
16
18
20
Longitude (°)


60
59
58
57
56
Latitude (°)
16
18
20
Longitude (°)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25000
20000
15000
10000
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39G4 39G5 40G4 40G5 40G6 40G7 41G6 41G7 41G8 42G6 42G7 43G7 44G7 44G8 45G7 45G8 46G8 42G8 43G8 43G9 44G9 45G9 46G9 46H0 47G9 47H0
Ntot 2014 Ntot 2015

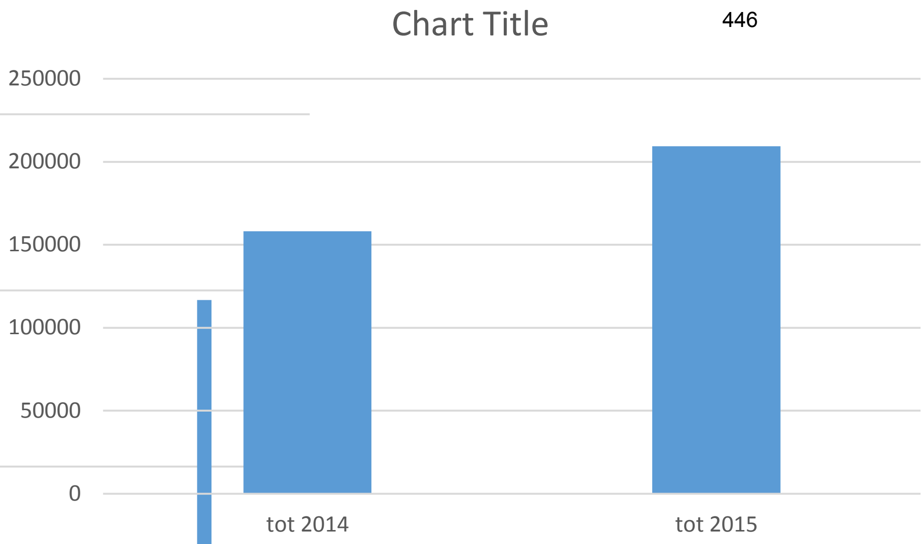
Chart Title
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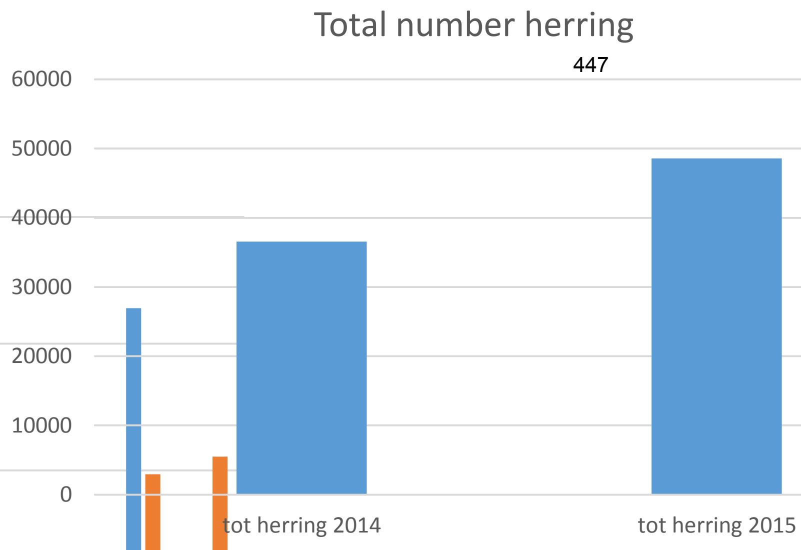
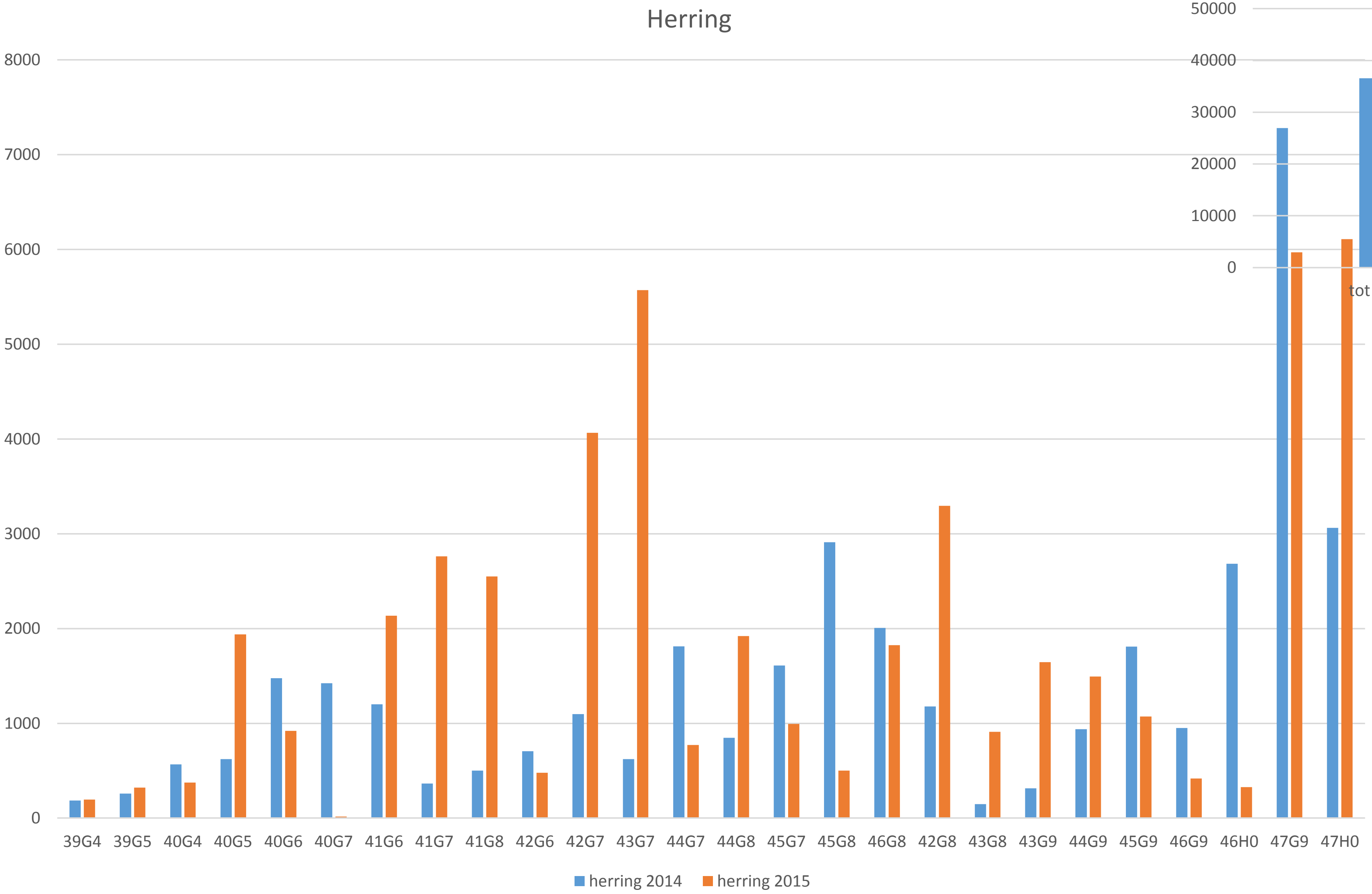
200000
150000
100000
50000
0
tot 2014
tot 2015


Total number herring
60000
50000
40000
30000
20000
10000
0
tot herring 2014
tot herring 2015


Herring
8000
7000
6000
5000
4000
3000
2000
1000
0
39G4
39G5
40G4
40G5
40G6
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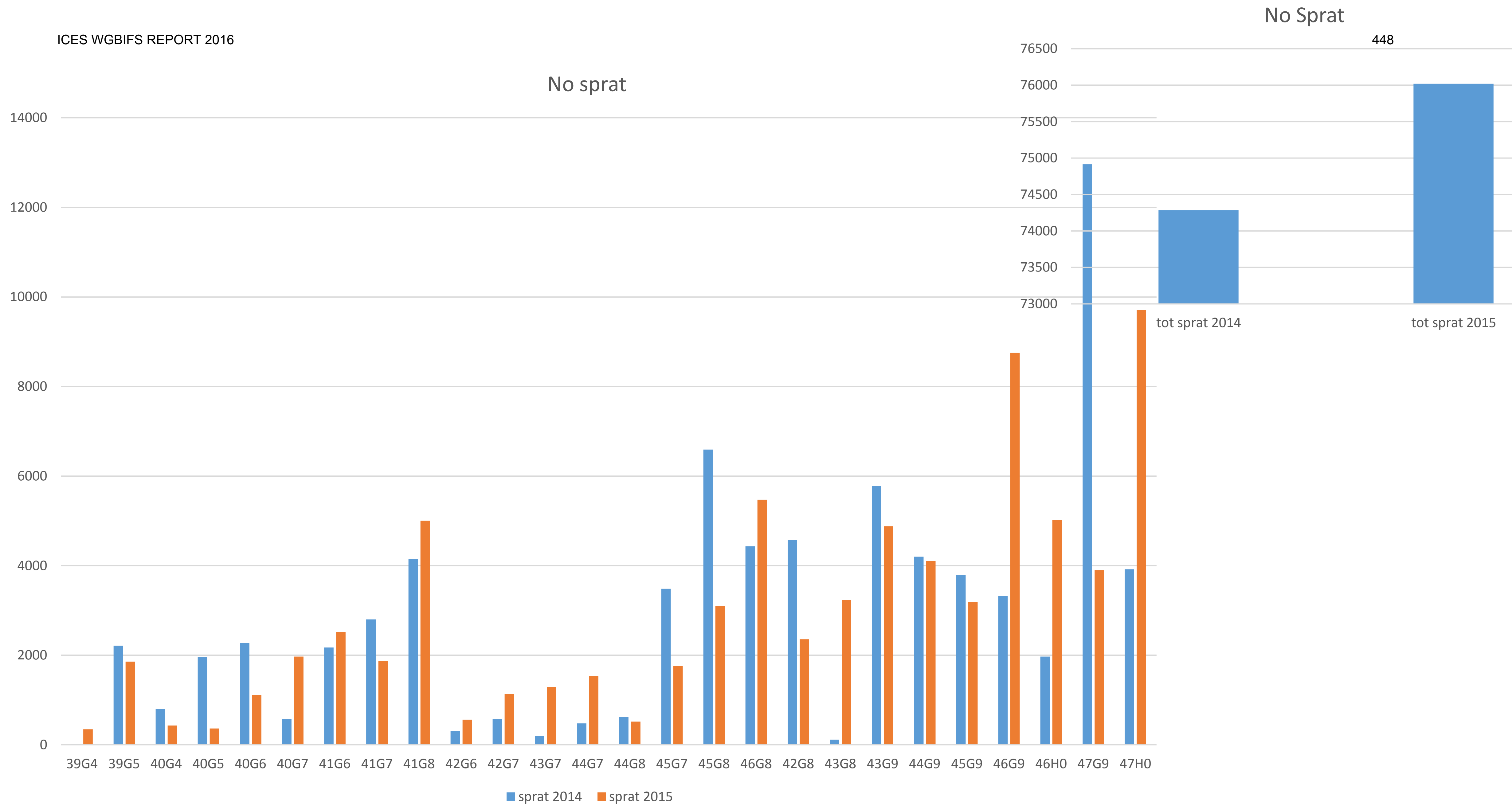
41G6
41G7
41G8
42G6
42G7
43G7
44G7
44G8
45G7
45G8
46G8
42G8
43G8
43G9
44G9
45G9
46G9
46H0
47G9
47H0
herring 2014
herring 2015


No sprat
14000
12000
10000
8000
6000
4000
2000
0
39G4
39G5
40G4
40G5
40G6
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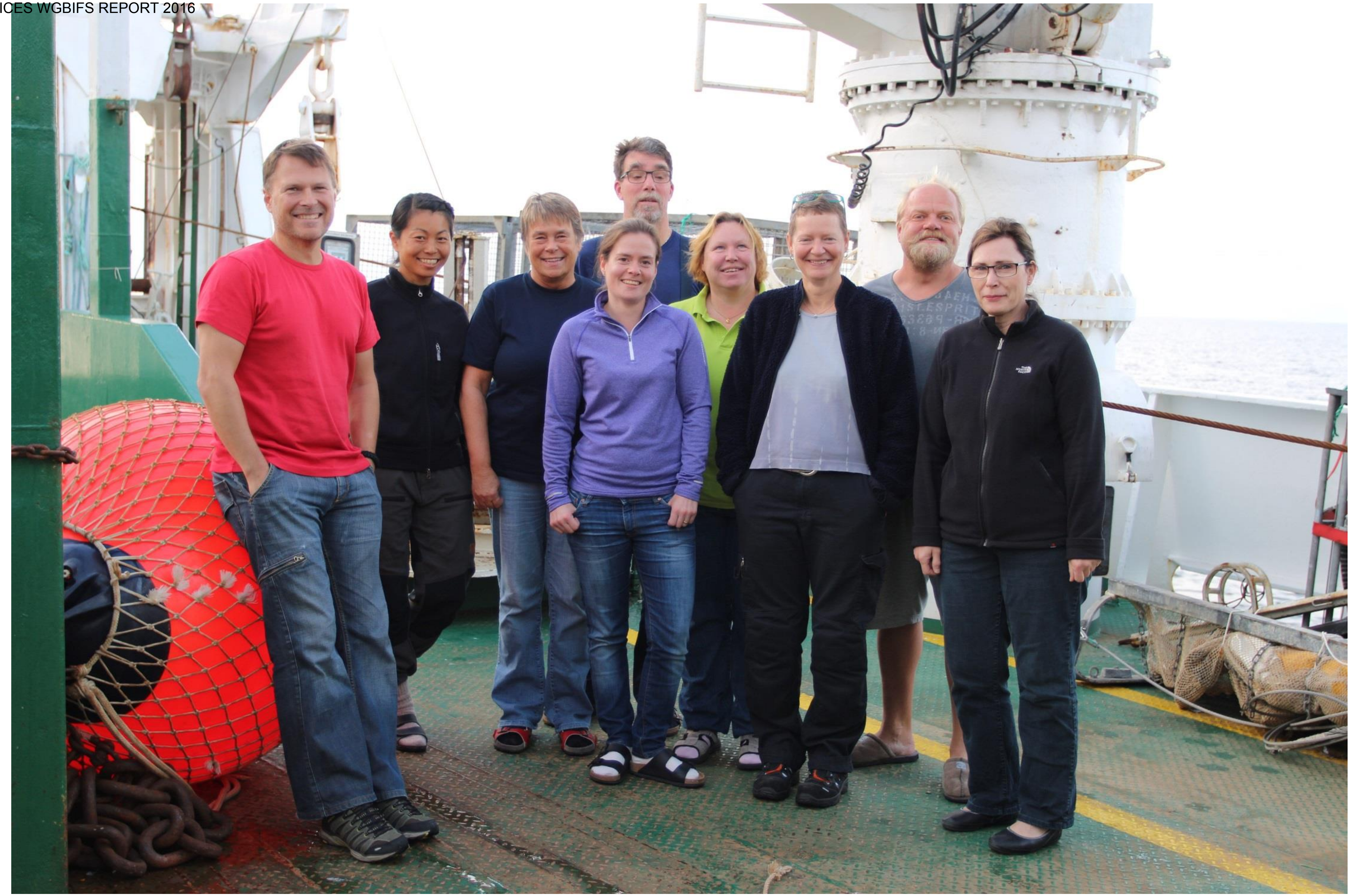
41G7
41G8
42G6
42G7
43G7
44G7
44G8
45G7
45G8
46G8
42G8
43G8
43G9
44G9
45G9
46G9
46H0
47G9
47H0
sprat 2014
sprat 2015
No Sprat
76500
76000
75500
75000
74500
74000
73500
73000
tot sprat 2014
tot sprat 2015



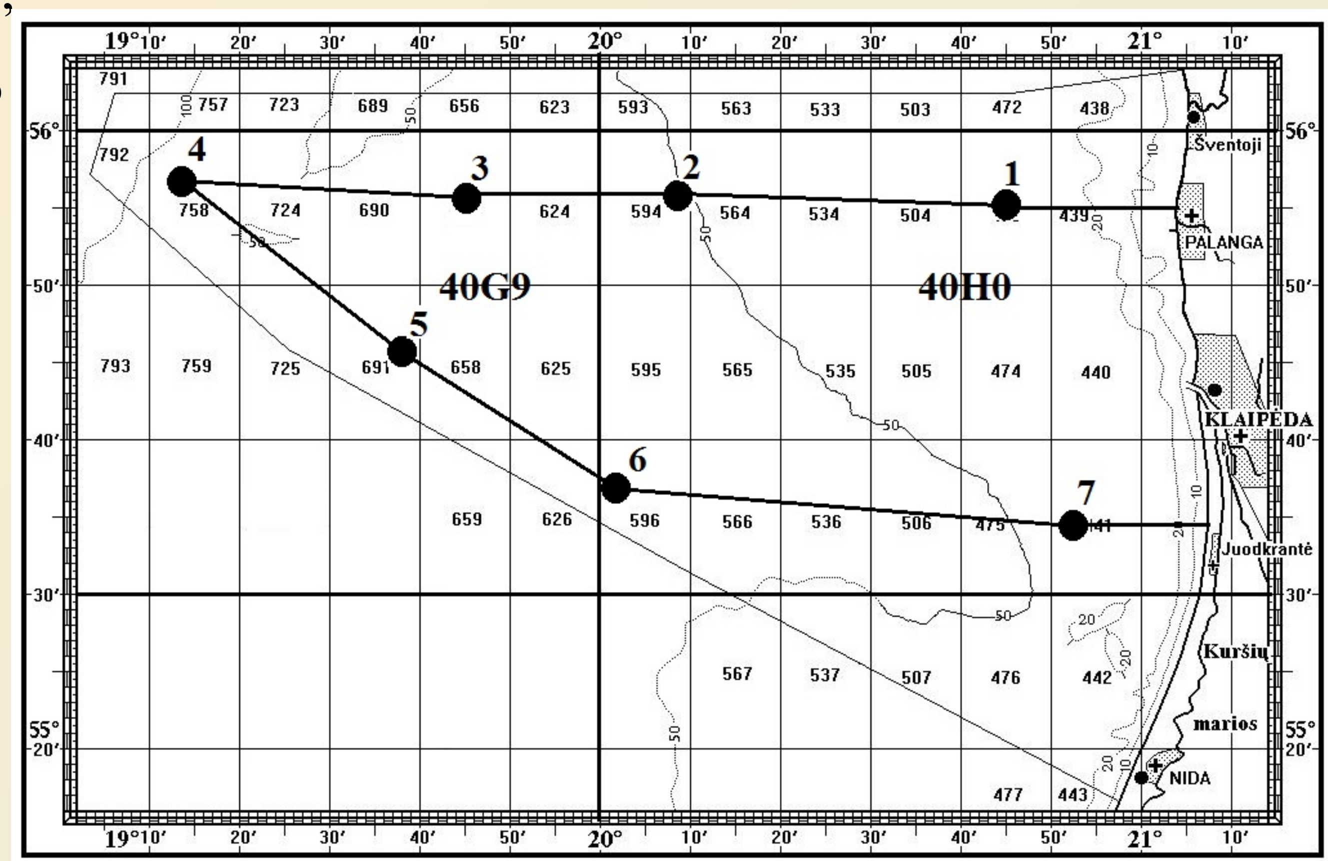
Fisheries Service under the Ministry of Agriculture of Republic of Lithuania, Fishery Research and Science State

BALTIC SPRING ACOUSTIC SURVEYS (BASS) IN THE LITHUANIAN ESPECIAL ECONOMIC ZONE OF THE BALTIC SEA

WGBIFS, 2016

BASS
(R/V"DARIUS" 21-22.05.2015)

Research vessel: "Darius"
Data: 21-22 May 2015



Survey area: ICES SD.26,

40H0 rect. – 1012,1 nm^2

40G9 rect. – 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
D.Tarvydiene- fish sampling

BASS RESULTS:

Fish catches and biological data

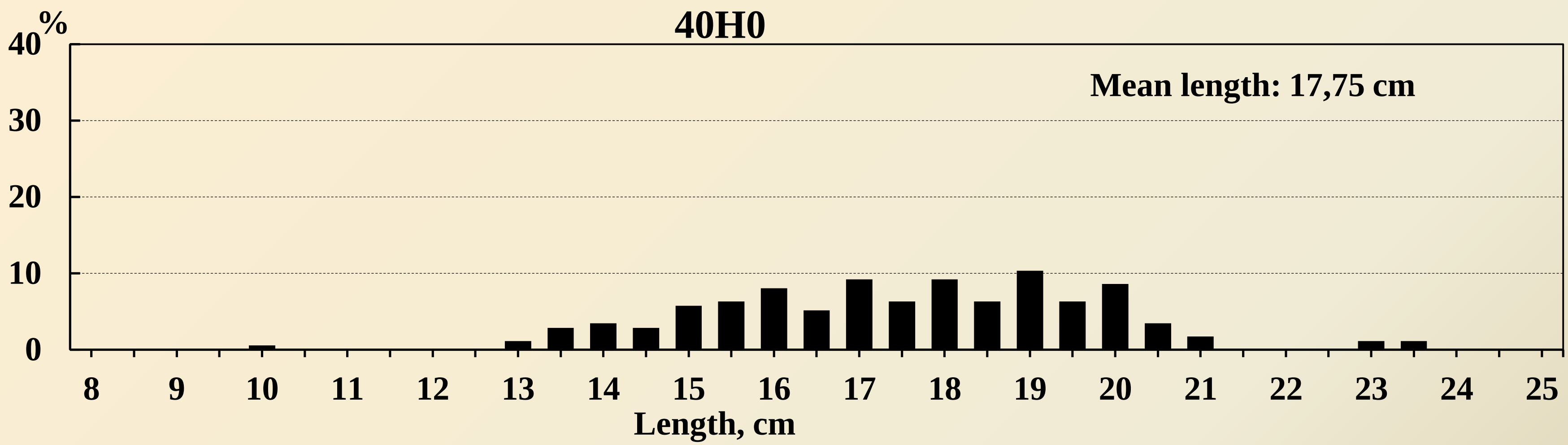
- CPUE (kg/1hour)

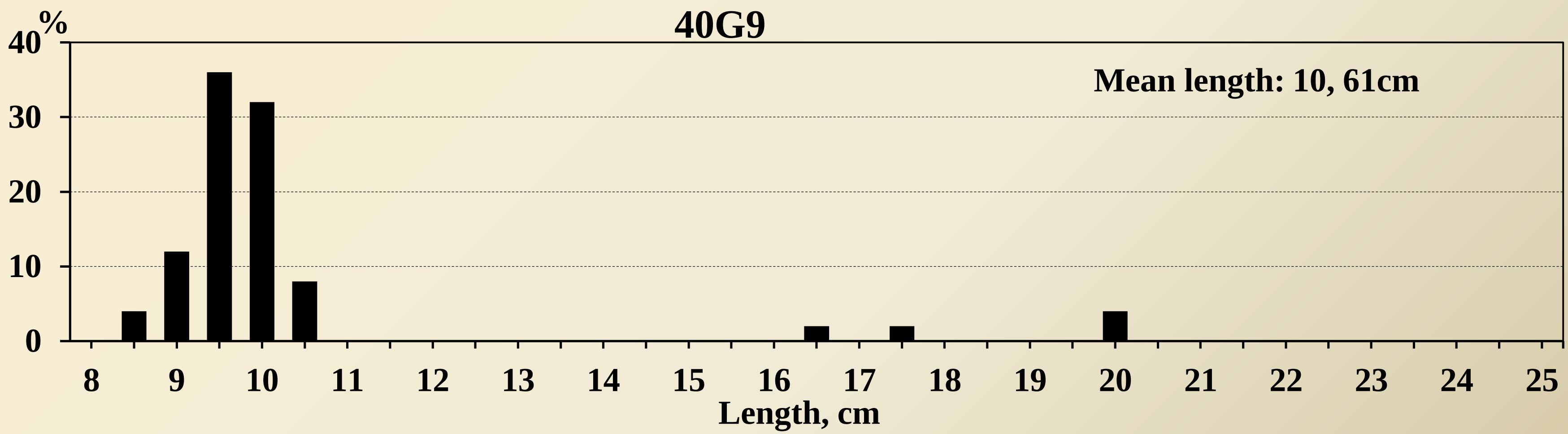
ICES subdivision 26							
Haul No	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Date	05.21	05.21	05.21	05.21	05.22	05.22	05.22
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	40H0	40H0	40G9	40G9	40G9	40H0	40H0
Clupea hrengus	0.57	9.40		0.13	0.76	2.62	
Sprattus spratus	420.00	790.23	270.00	60.00	120.00	600.00	250.00
Gadus morhua				0.34			
Sea trout	0.16						
Gasterosteus aculeatus					0.013		
Hyperoplus lanceolatus		0.37					
Total	420.73	800.00	270.00	60.47	120.78	602.62	250.00

96,55%

3,41%

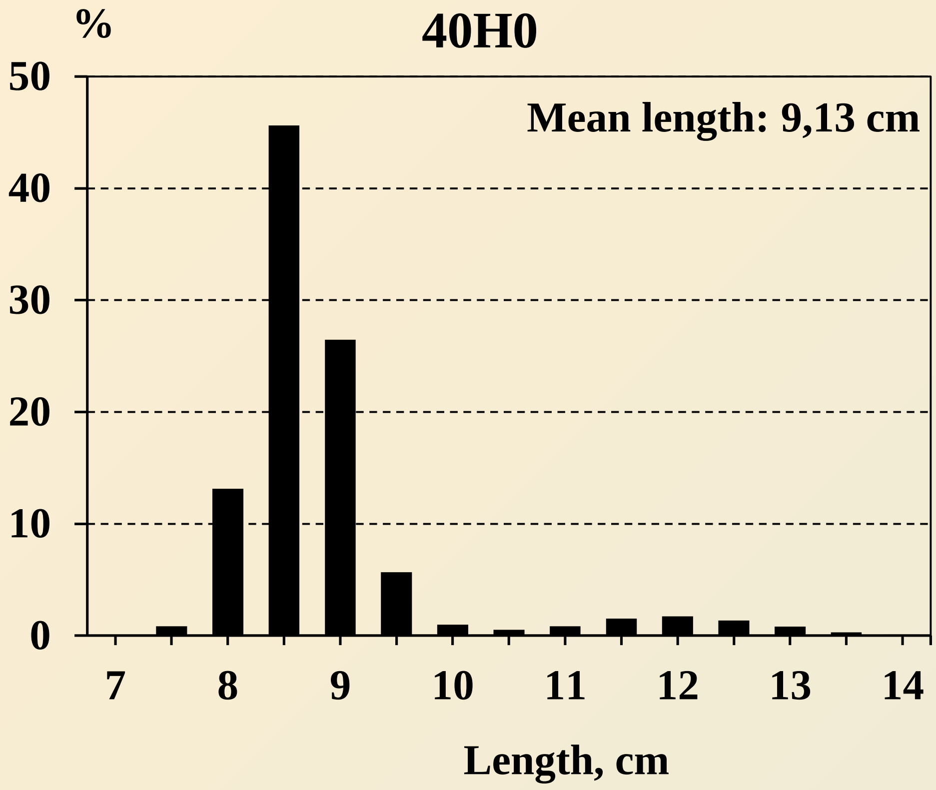
Herring length frequency distribution according to the 40HO and 40G9 rectangles

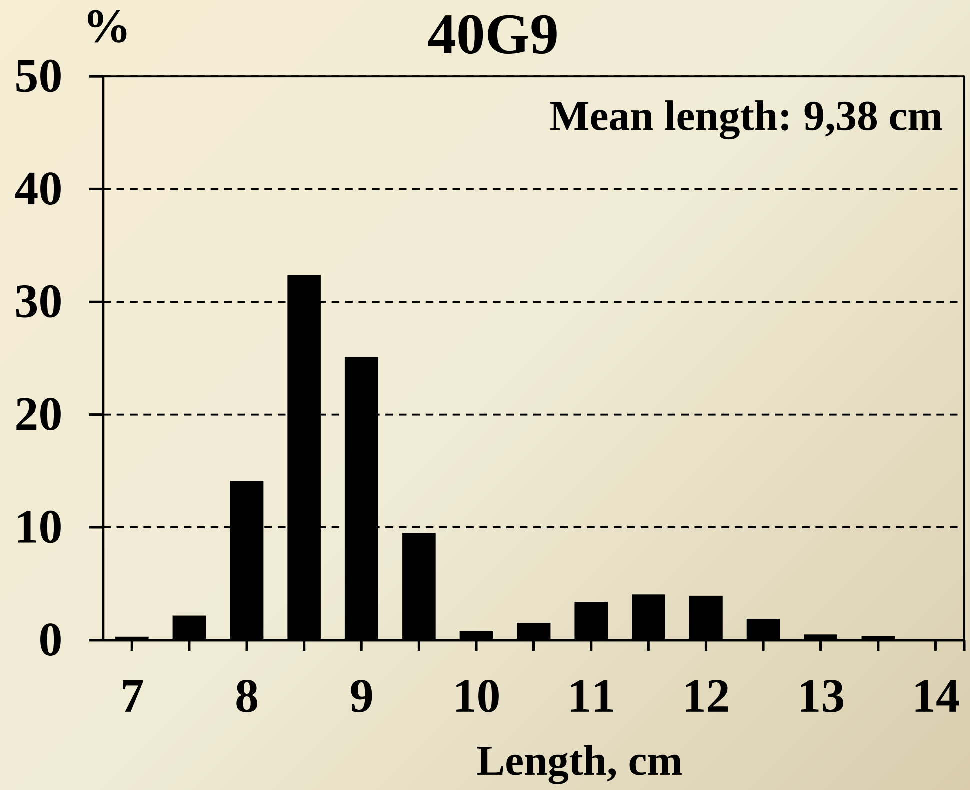




BASS , 21-22 May, 2015
R/V “DARIUS”

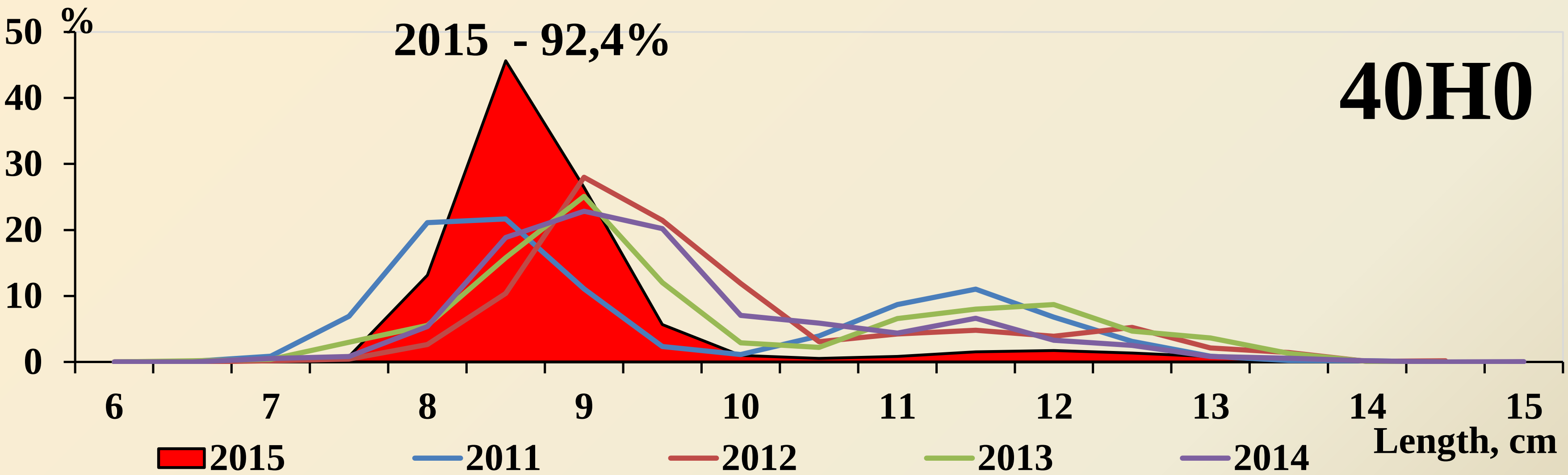
Sprat length frequency distribution by BASS results in the ICES rectangles 40HO and 40G9

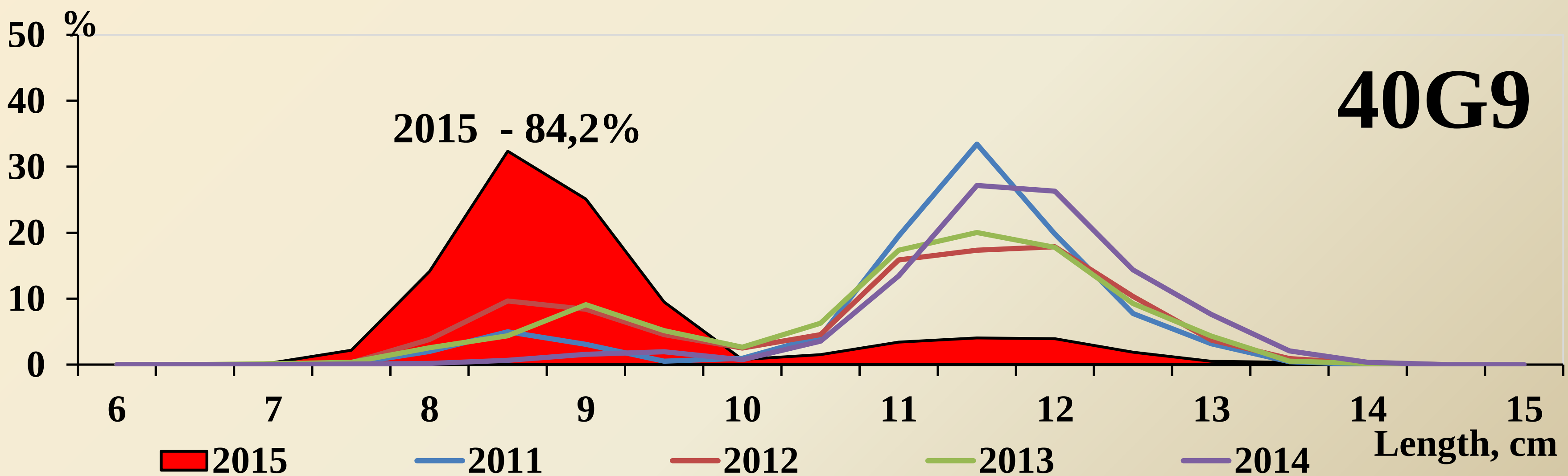




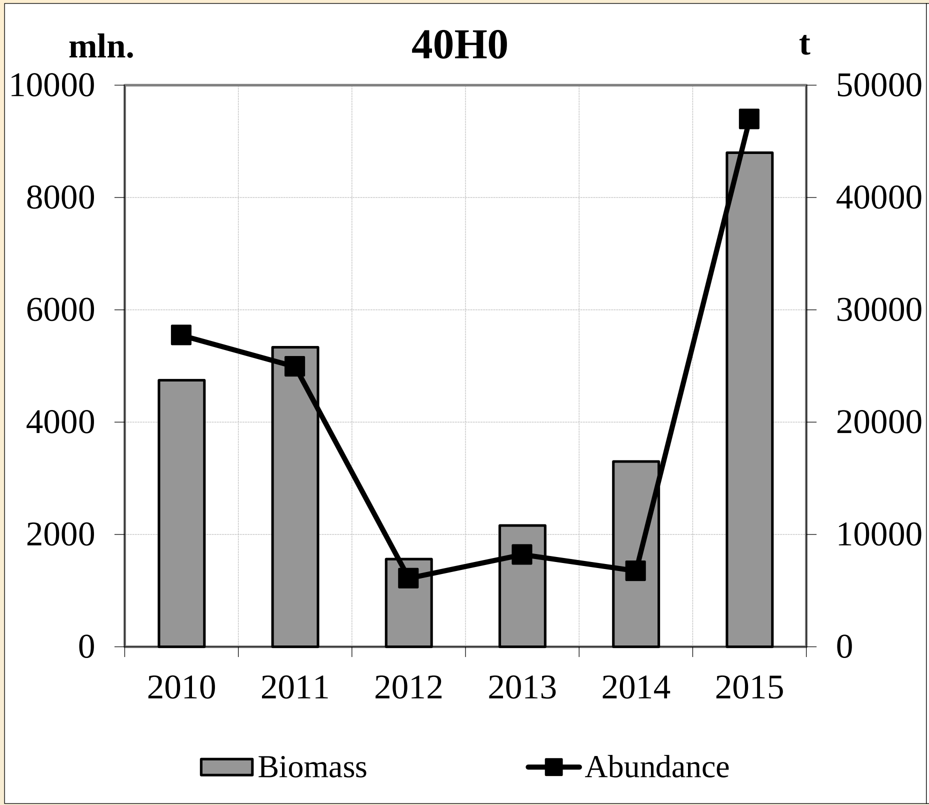
BASS , 21-22 May, 2015
R/V "DARIUS"

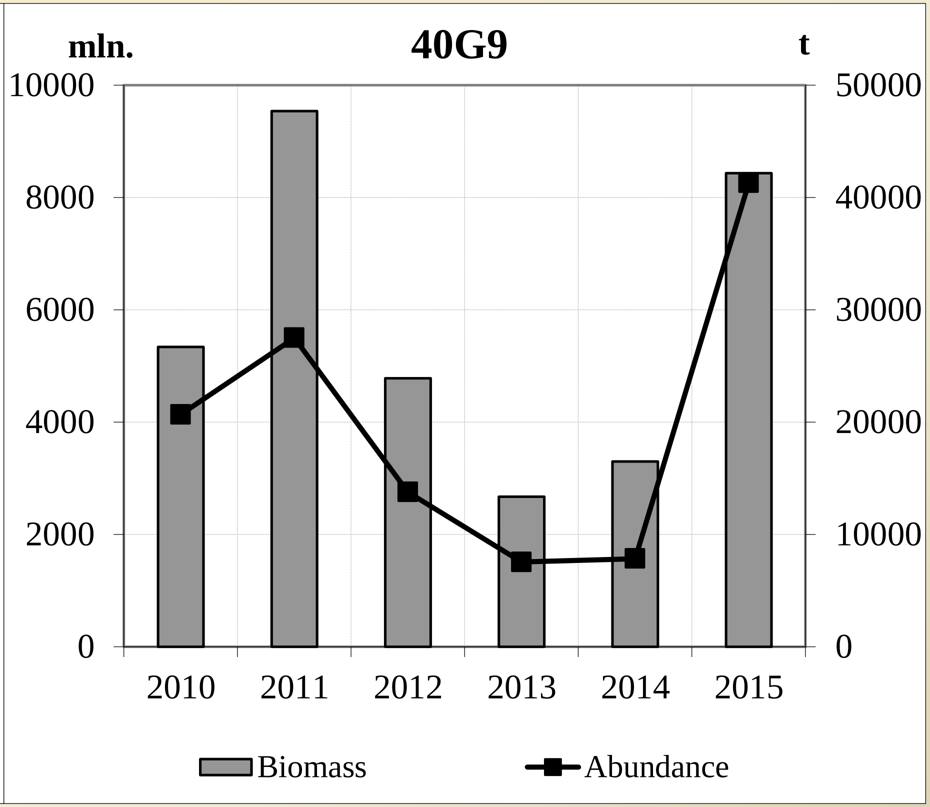
Sprat length frequency distribution in the ICES rectangles 40HO and 40G9 in 2011-2015





Sprat abundance and biomass by BASS results in rectangles 40H0 and 40G9 in 2011-2015





TOTAL	Abundance	Biomass
2010	9682,0	11978
2011	10488,9	74367
2012	3969,6	31703
2013	3146,2	24140
2014	2914,2	33010
2015	17655,6	86157

	Abundance	Biomass
2011-2015	+68,3	+15,9

Hydrology

Haul number	Date of catch	Mean trawling depth, m	Hydrological parameters		
			Temperature, °C	Salinity, ‰	Oxygen, ml/l
1	2015.05.21	15	9,95	7,51	10,76
2	2015.05.21	19	8,67	7,5	11,09
3	2015.05.21	40	7,39	7,5	8
4	2015.05.21	45	6,51	7,5	8,18
5	2015.05.22	45	6,32	7,52	8,22
6	2015.05.22	52	6,19	7,55	11
7	2015.05.22	22	8,25	7,55	7,84
Average		34,0			

BASS , 20-21 May, 2015
R/V "DARIUS"

WGBIFS - Rostock, Germany, 30.03-03.04.2016

THE LATVIAN-ESTONIAN JOINT BALTIC ACOUSTIC SPRING SURVEY – BASS 2015 ON THE F/V “ULRIKA” IN THE ICES SUBDIVISIONS 26N, 28.2, 29 AND 32W OF THE BALTIC SEA (12 – 24 MAY 2015)

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EMI ESTONIAN MARINE INSTITUTE

Equipment:

BioSonics D-TX echo-sounder 38 kHz

Trawl:

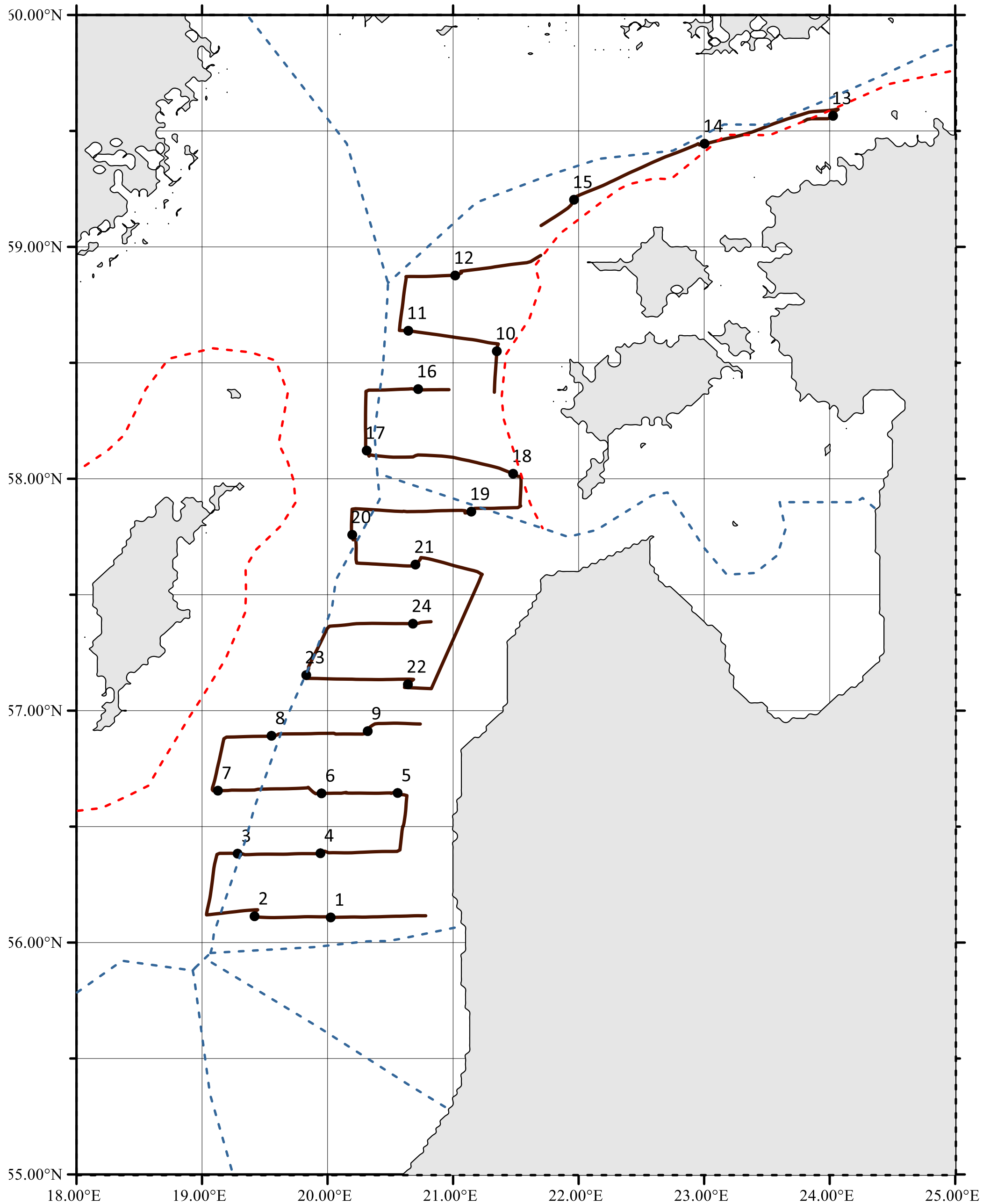
- Vertical opening – 22 m
- Horizontal opening – 83 m
- Mesh size at codend – 10 mm (bar)

Seabird SBE 19plus

Judday net 100 µm mesh

IKS-80 net 500 µm mesh

WGBIFS - Rostock, Germany, 30.03-03.04.2016



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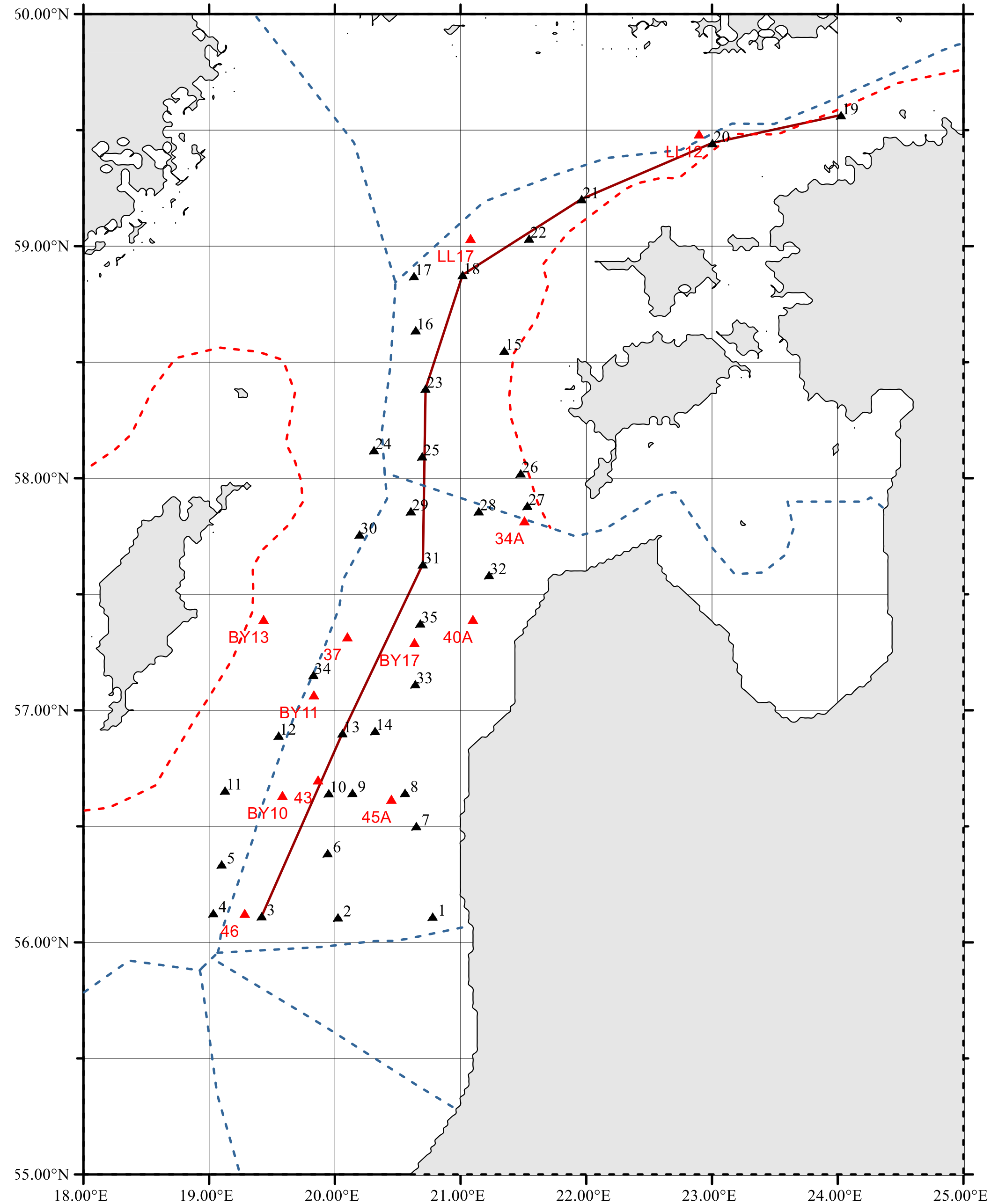
WGBIFS - Rostock, Germany, 30.03-03.04.2016



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- Days at sea – 11
- Survey tracks – 750 nm
- Control trawlings - 24
- Hydrological and hydrobiological stations - 35
- Ichthyoplankton samples – 70
- Zooplankton samples - 35

BIOR INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

ESTONIAN MARINE INSTITUTE

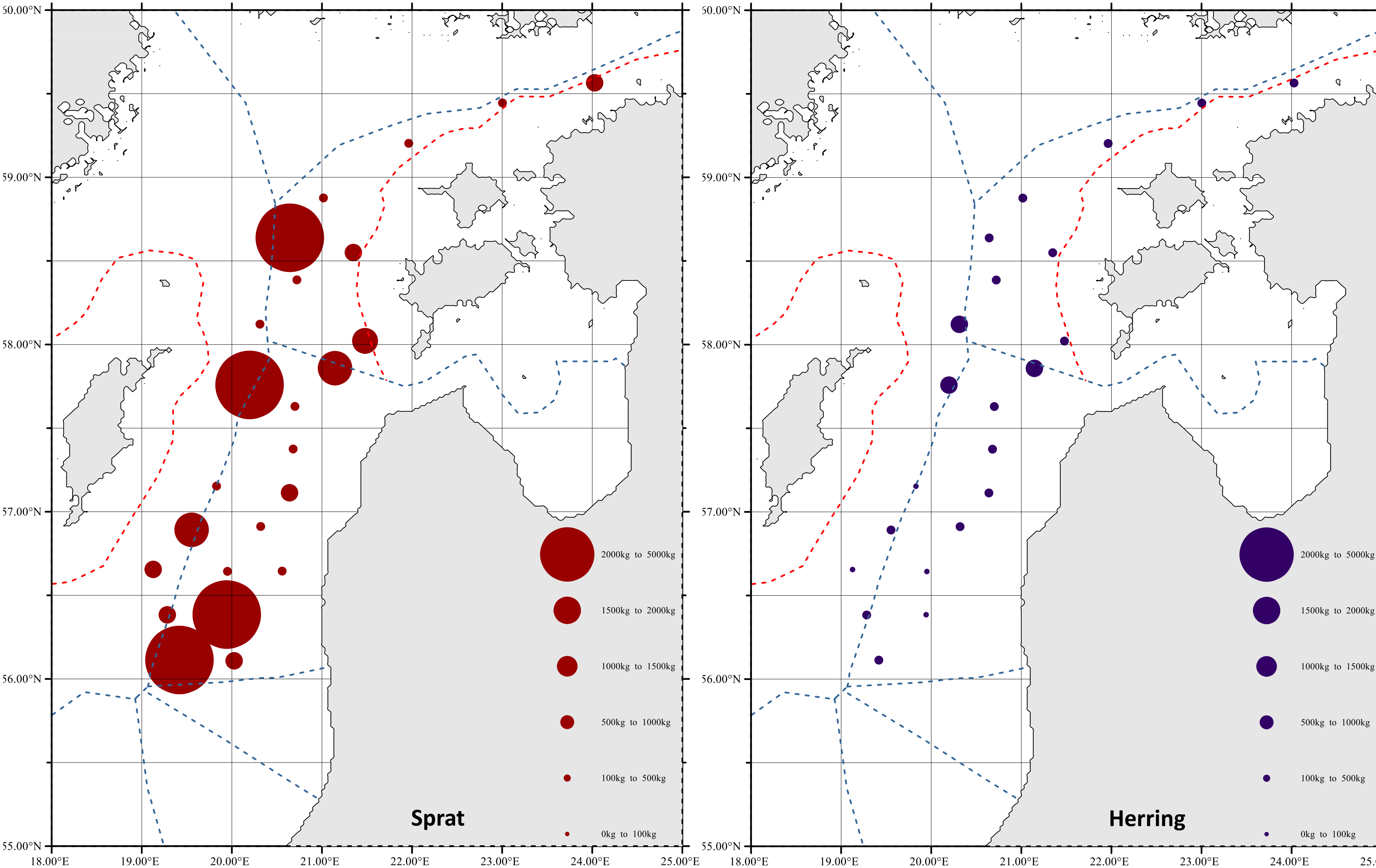
Totally 7 fish species:

Species	Catch, kg	Measured	Anlysed
Sprat	10802	4714	1819
Herring	3065	2323	602
Cod	36	105	
Flounder	3	24	
Stickleback	3	8	
Lumpfish	2	7	
Great sandeel	<1	1	
All fish	**13911**	**7183**	**2421**

ICES CIEM

WGBIFS - Rostock, Germany, 30.03-03.04.2016

CPUE, kg/h

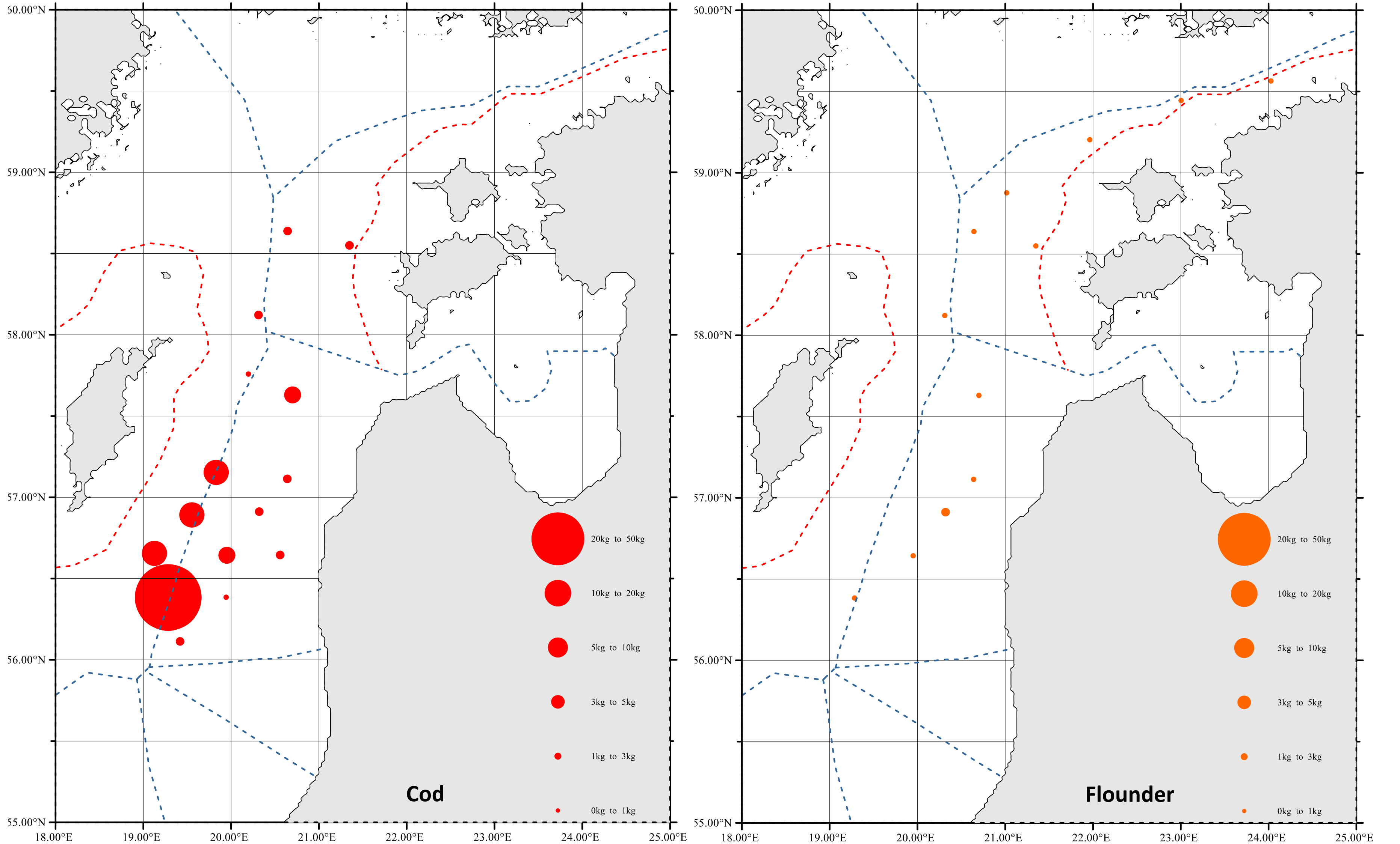


BIOR INSTITUTE OF FOOD SAFETY, ANIMAL HEALTH AND ENVIRONMENT

EMI ESTONIAN MARINE INSTITUTE

WGBIFS - Rostock, Germany, 30.03-03.04.2016

CPUE, kg/h



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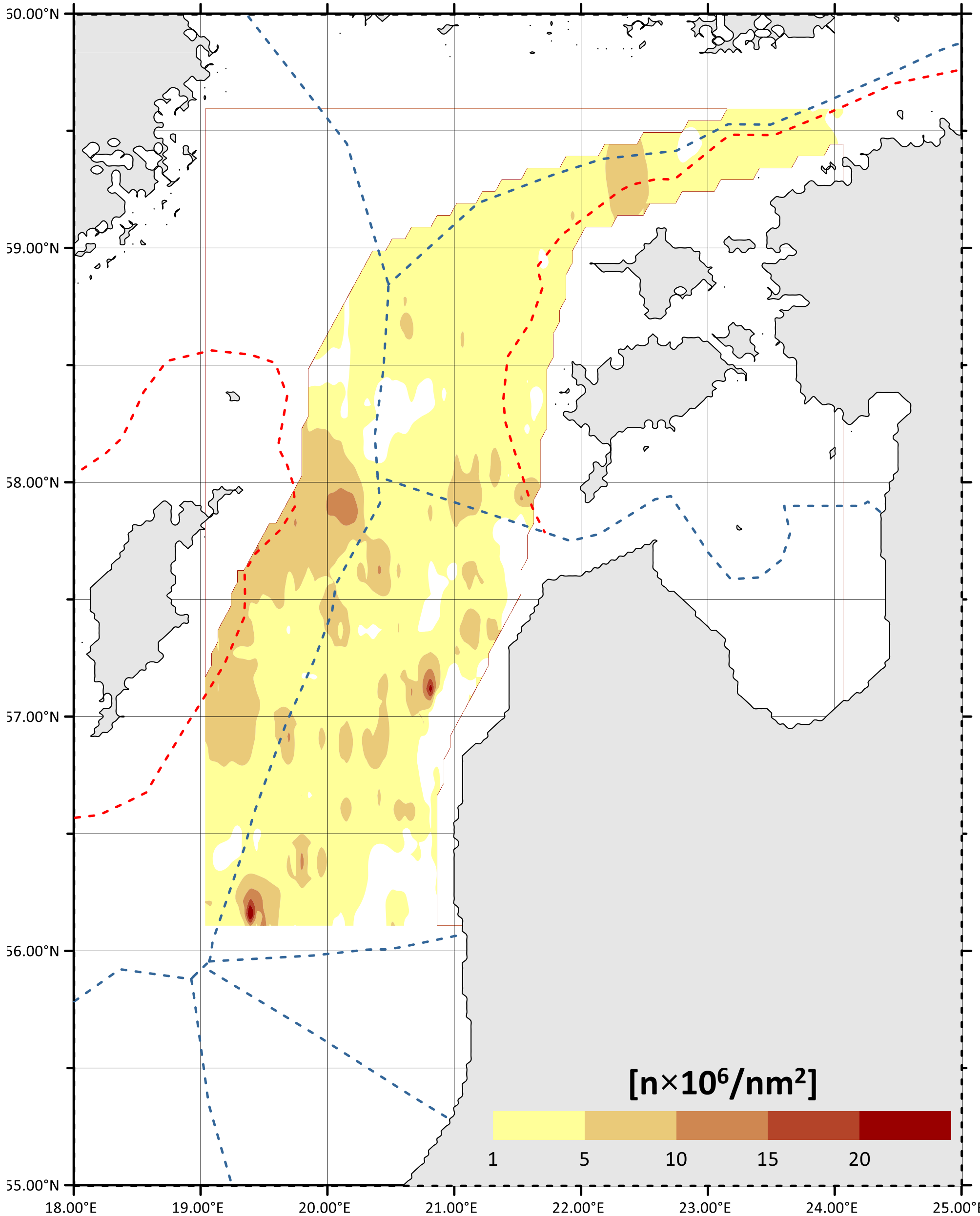
WGBIFS - Rostock, Germany, 30.03-03.04.2016

Sprat in May 2015

ICES SD	Abundance $[n \times 10^6]$	Biomass $[kg \times 10^3]$
26	27147	137036
28	5688	45417
26+28	32835	182454
29+32	13031	56282
∑	45866	238736



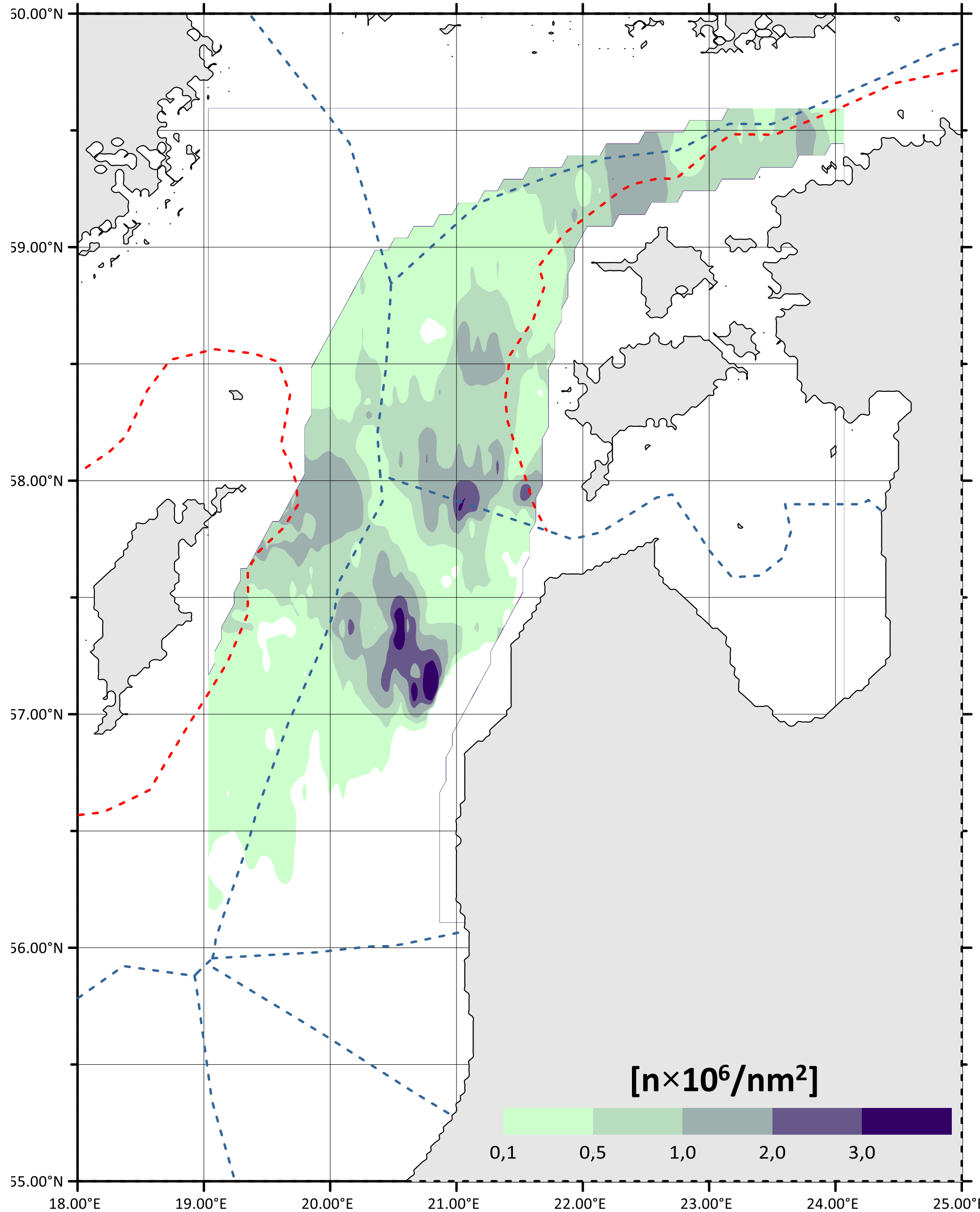
BIOR Institute of Food Safety, Animal Health and Environment

Estonian Marine Institute

WGBIFS - Rostock, Germany, 30.03-03.04.2016

Herring in May 2015

ICES SD	Abundance [n×10^6]	Biomass [kg×10^3]
26	6692	71303
28	32	1383
26+28	6724	72686
29+32	2243	22503
∑	8967	95189



WGBIFS - Rostock, Germany, 30.03-03.04.2016

THE JOINT LATVIAN-POLISH BALTIC INTERNATIONAL ACOUSTIC SURVEY – BIAS 2015 ON THE R/V "BALTICA" IN THE ICES SUBDIVISIONS 26N AND 28.2 OF THE BALTIC SEA

(08-18 October 2015)

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MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

WGBIFS - Rostock, Germany, 30.03-03.04.2016

WGBIFS - Rostock, Germany, 30.03-03.04.2016

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

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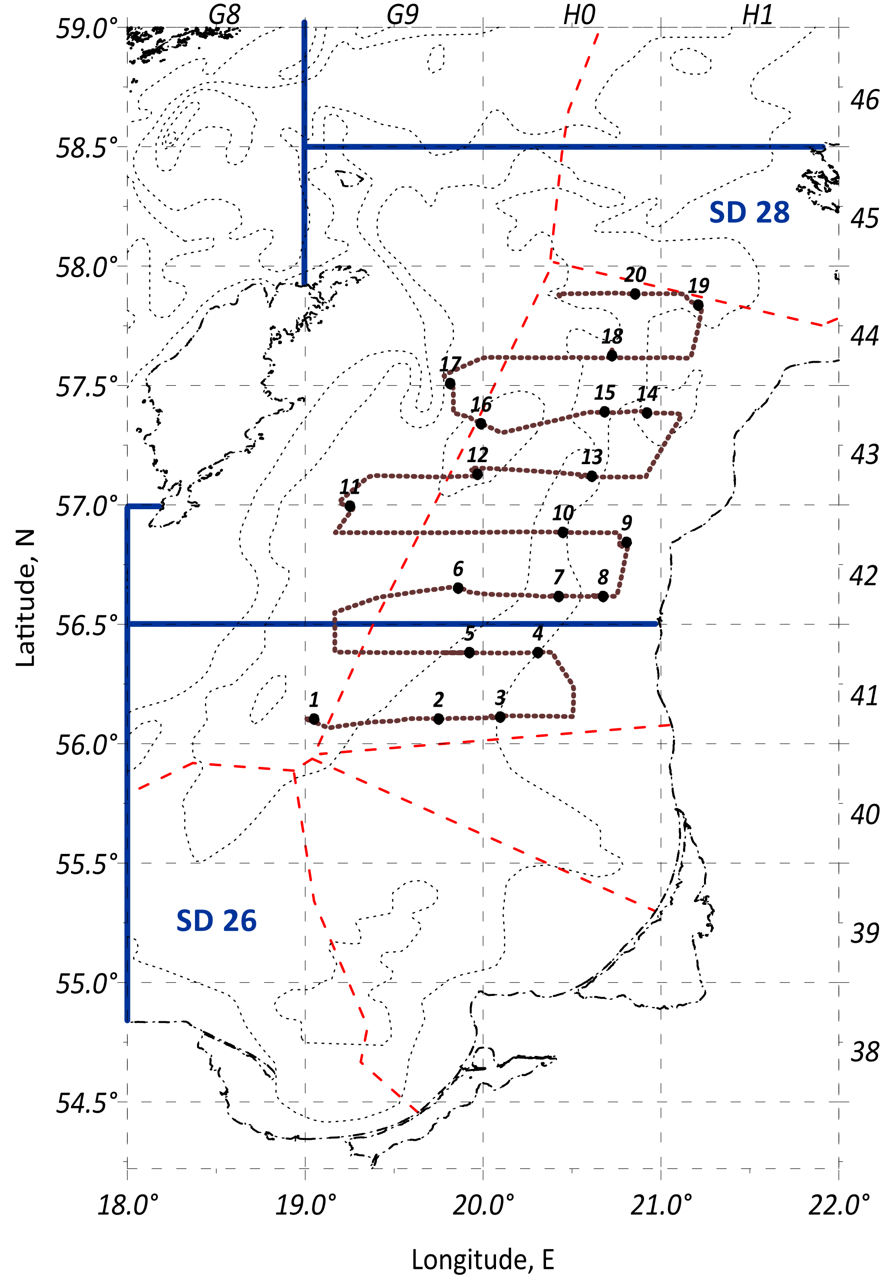

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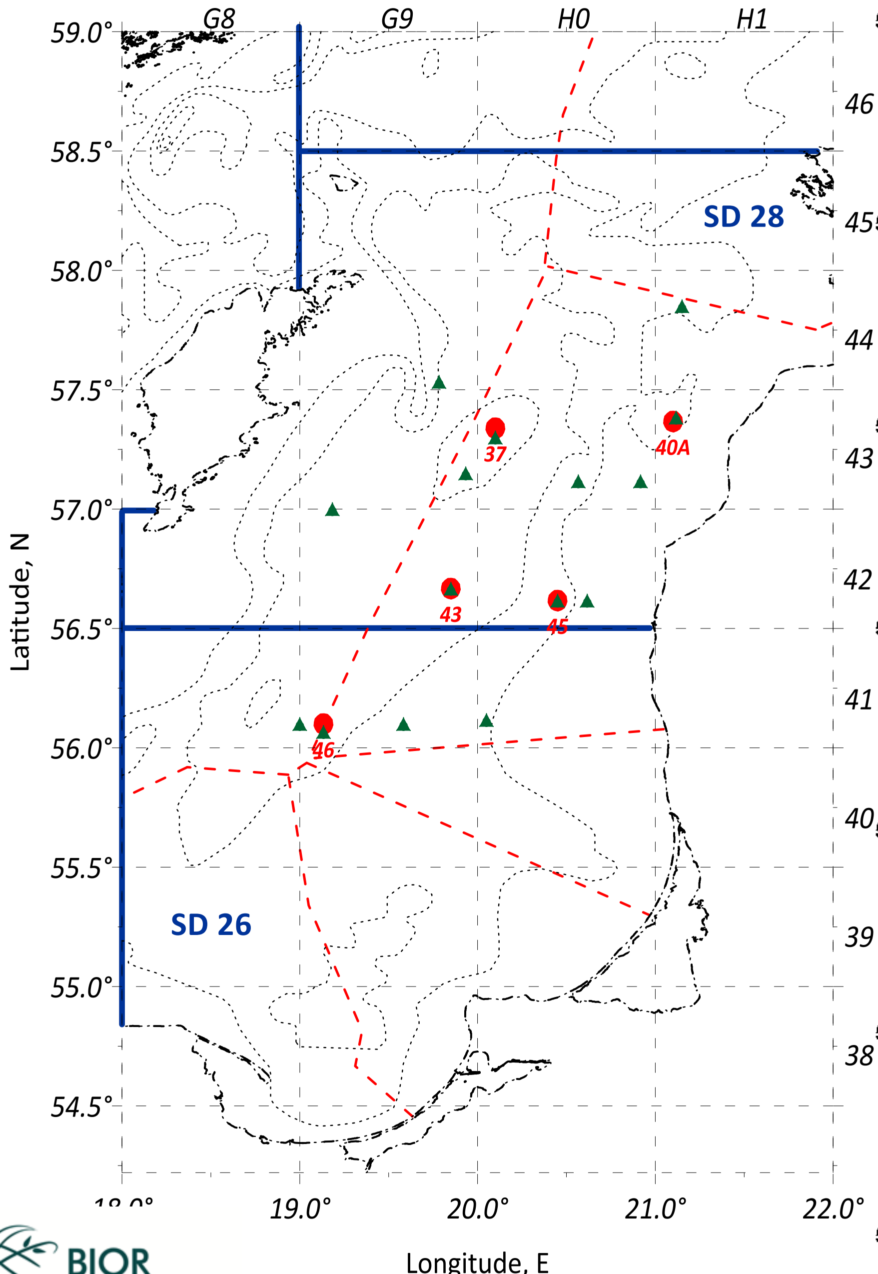
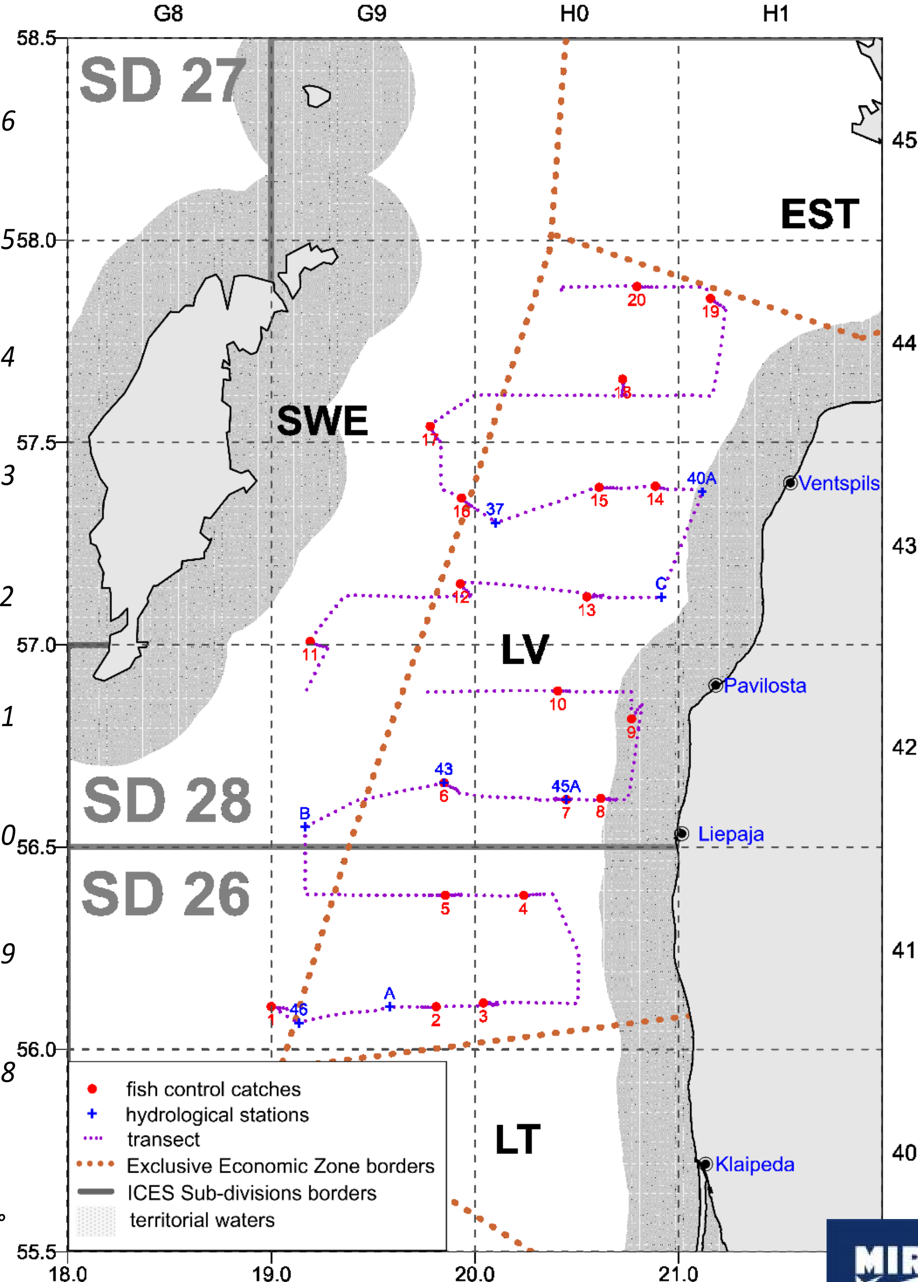
MIR NATIONAL MARINE FISHERIES RESEARCH INSTITUTE

WGBIFS - Rostock, Germany, 30.03-03.04.2016





ICES CIEM

WGBIFS - Rostock, Germany, 30.03-03.04.2016

- **Days at sea – 10**
- **Survey tracks – 511 nm**
- **Control trawlings - 20**
- **Hydrological stations – 26**
- **Zooplankton stations - 15**
- **Zooplankton samples - 25**

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Totally 11 fish species:

Fish species	Number of measured individuals			Number of aged individuals		
	SD 26	SD 28	Total	SD 26	SD 28	Total
Sprat (all)	1004	3036	4040	511	1501	2012
Sprat (yearclass 0)	36	73	109	21	56	77
Herring (all)	413	1530	1943	200	700	900
Herring (GoR population)	59	314	373	29	144	173
Cod	2	9	11			
Flounder	2	2	4			
Lumpfish	2	11	13			
Salmon		1	1			
Stickleback, threespine	12	722	734			
Stickleback, ninespine		2	2			
Smelt		1	1			
Shorthorn sculpin	1	3	4			
Greate sandeel		4	4			
All fish	**1436**	**5321**	**6757**	**711**	**2201**	**2912**

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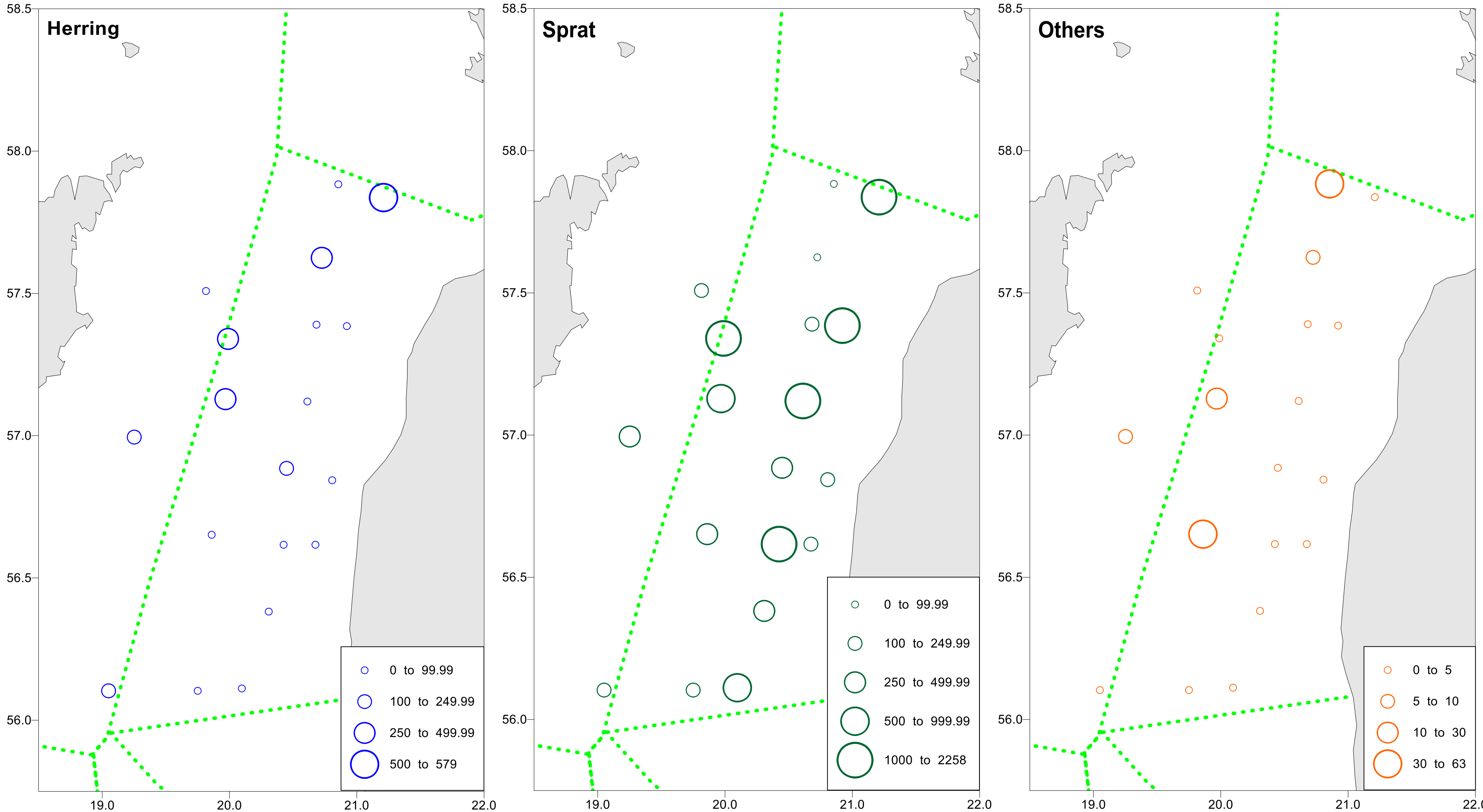
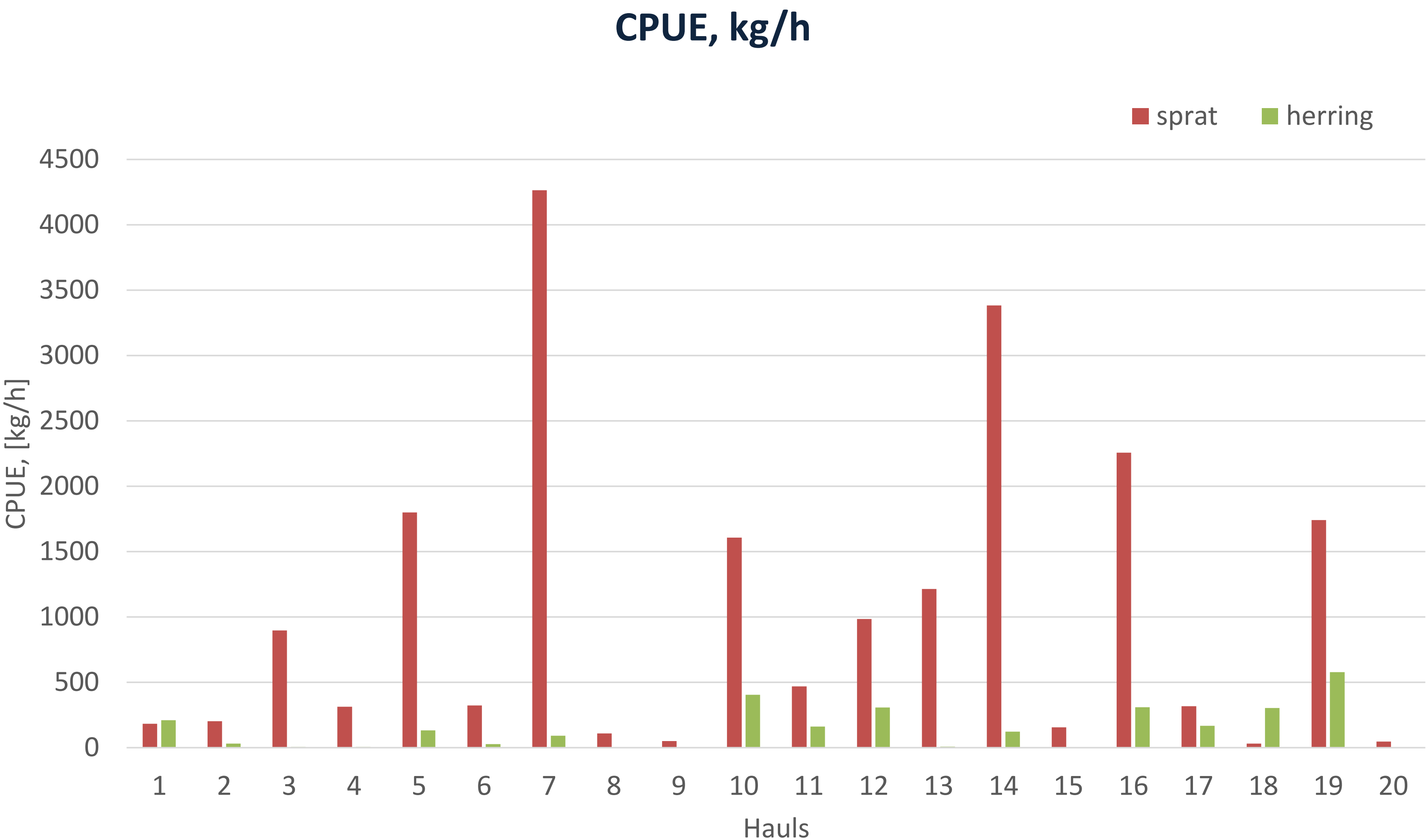
CPUE, kg/h



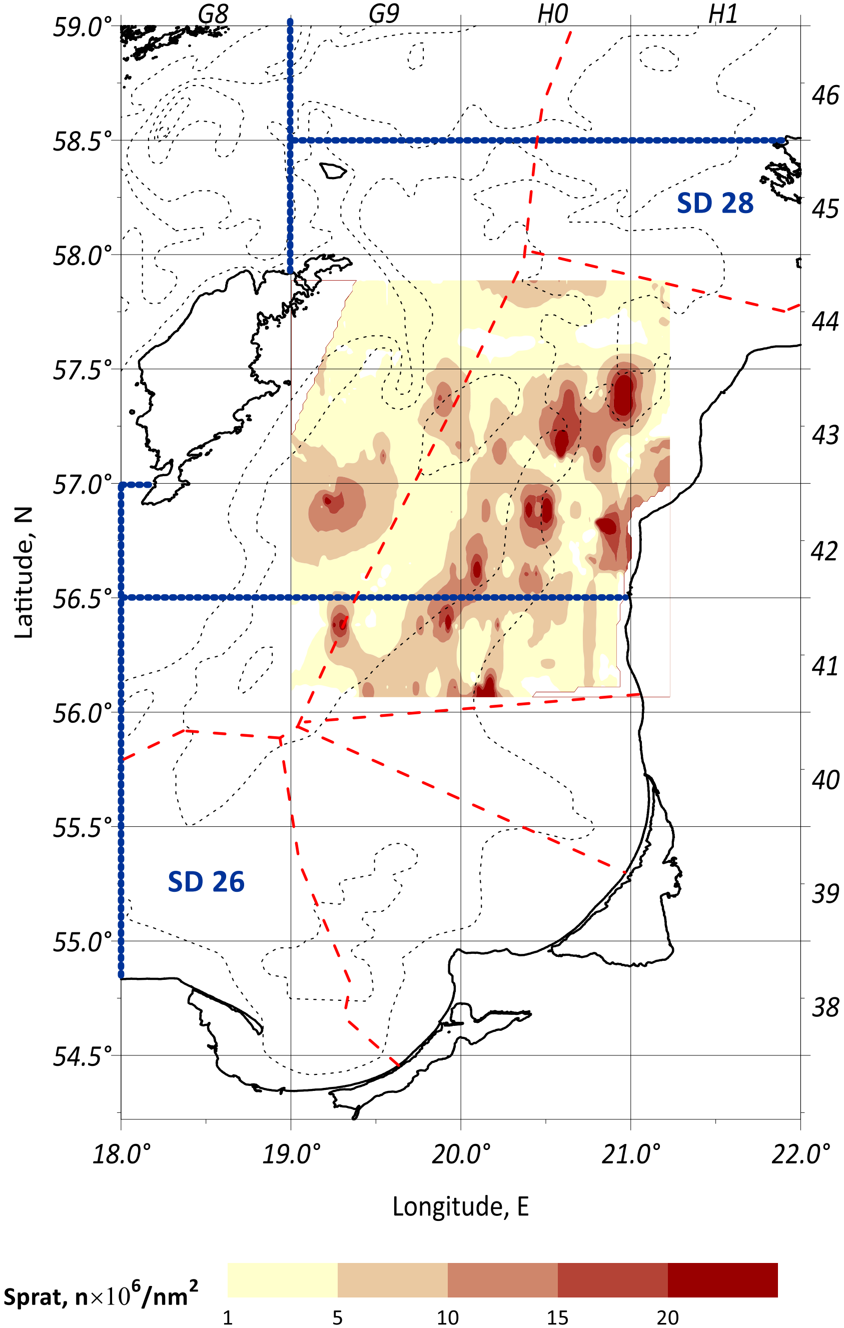
WGBIFS - Rostock, Germany, 30.03-03.04.2016



WGBIFS - Rostock, Germany, 30.03-03.04.2016

Sprat in October 2015

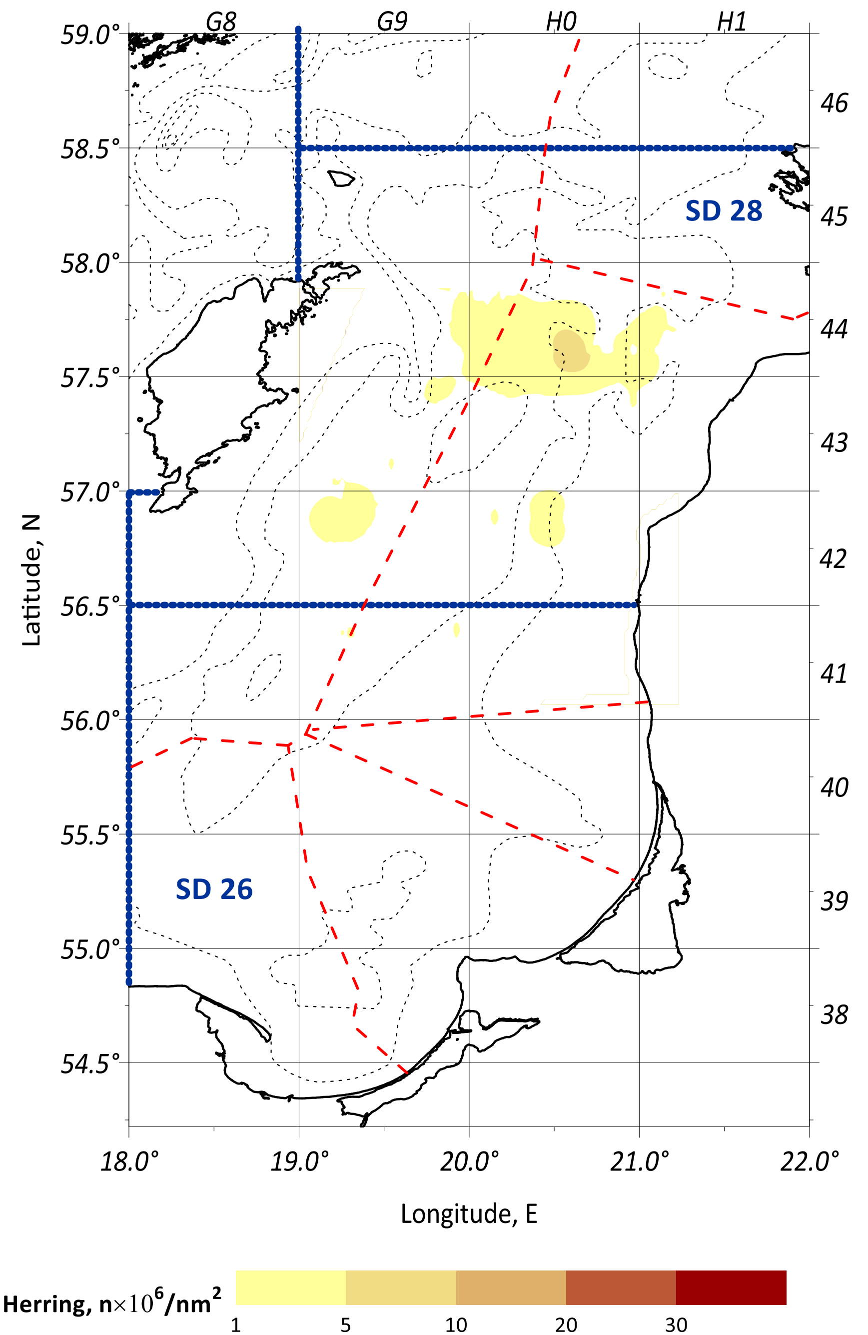
ICES SD	Abundance [n×10⁶]	Biomass [kg×10³]
28	16123	130609
26	5330	44216
∑	21453	174825



WGBIFS - Rostock, Germany, 30.03-03.04.2016

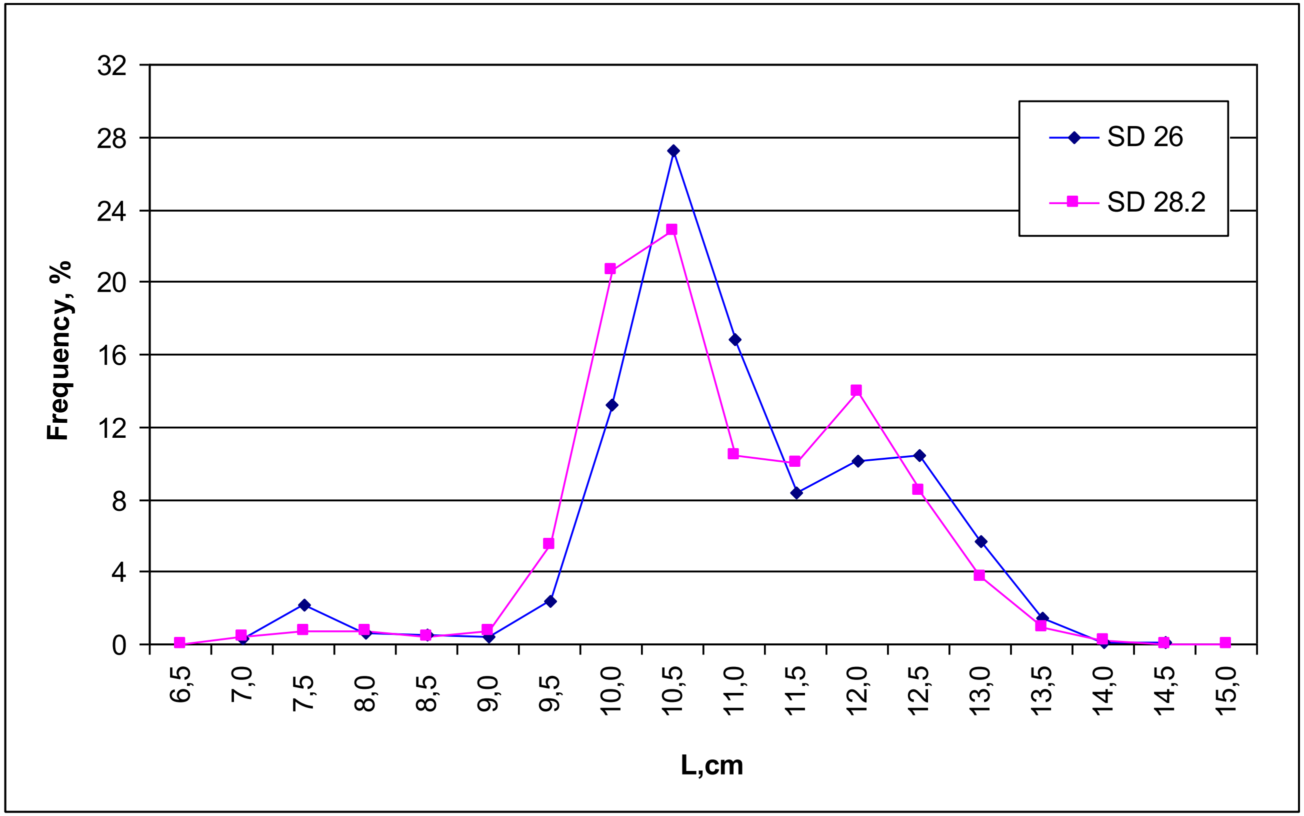
Herring in October 2015

ICES SD	Abundance [n×10⁶]	Biomass [kg×10³]
28	2648	51928
26	215	6014
∑	2863	57942



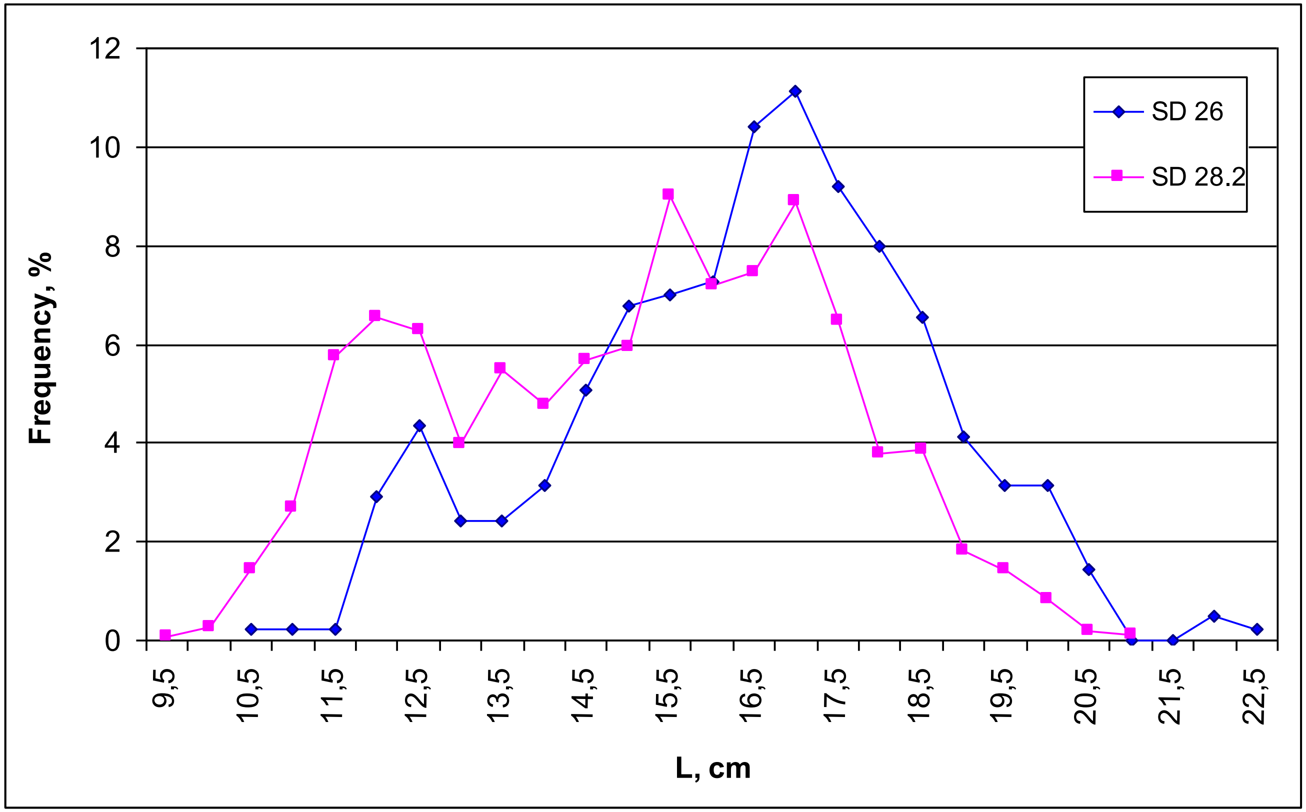
WGBIFS - Rostock, Germany, 30.03-03.04.2016

Sprat



WGBIFS - Rostock, Germany, 30.03-03.04.2016

Herring



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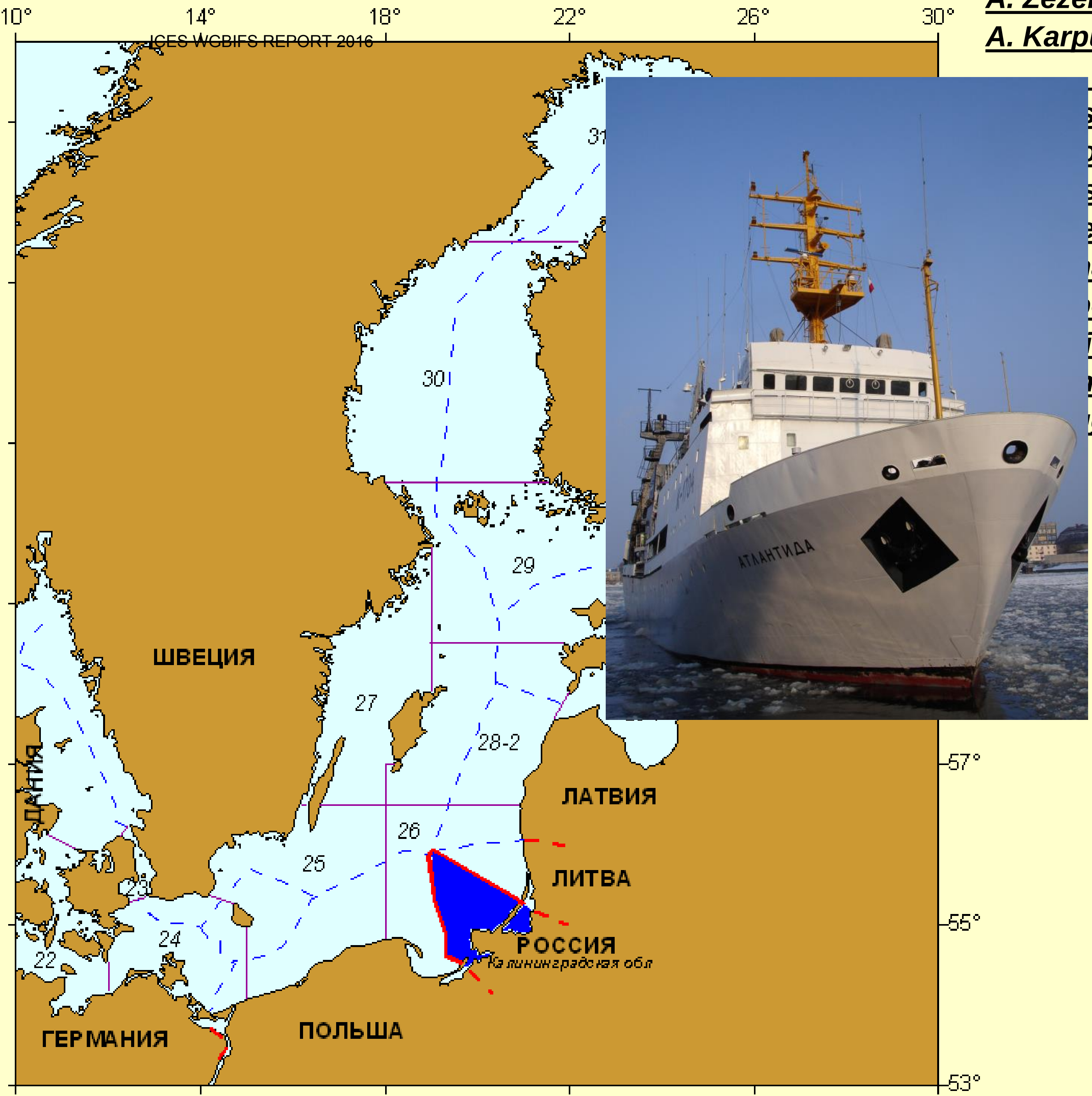
SNGH
GDY-100
BALTICA

Survey Report for RV "ATLANTNIRO" 31.05-10.06.2015

Atlantic Scientific Research Institute of Marine Fisheries and Oceanography

(AtlantNIRO), Kaliningrad, Russia



A. Zezera– cruise leader
A. Karpushevskaja– scientific leader
…shko– acoustic
…olov– acoustic
…seev– hydrologist
…ev– hydrologist
…anova– engineer
…ov– engineer
…ikov– engineer
…ina– engineer
…glaja– engineer

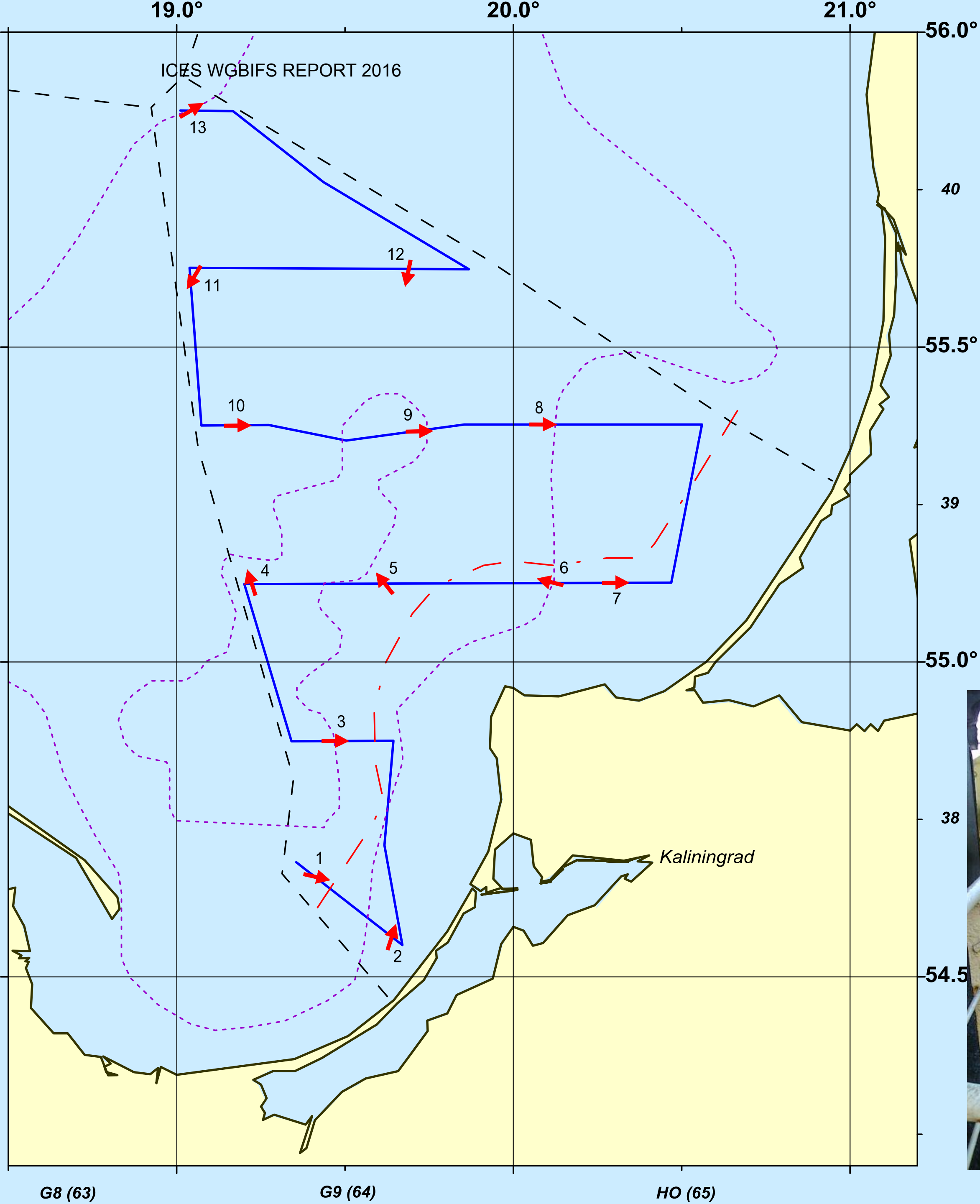


Figure 1. The scheme of cruise track and trawl stations for Russian part of survey (RV "ATLANTNIRO", 04-10.06. 2015)

Table 1. Fish control-catch results in the Baltic Sea ICES SD 26 from Russian BASS survey (RV "ATLANTNIRO", 04–10.06.2015)

Haul number	Date	ICES rect.	ICES SD	Mean bottom 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 catch [kg]
										Start		End				
										Latitude 00° 00.0'N	Longitude 00° 00.0'E	Latitude 00° 00.0'N	Longitude 00° 00.0'E			
1	04.06.2015	38G9	26	88	36	97	26	3.5	100	54 39.8	19 22.8	54 39.3	19 26.9	6:55	30	682.2
2	05.06.2015	38G9	26	46	17	92	26	3.5	24	54 32.7	19 37.5	54 34.5	19 38.9	7:22	30	610.0
3	05.06.2015	38G9	26	102	44	98	26	3.4	90	54 52.3	19 26.2	54 52.2	19 30.2	12:04	30	640.9
4	06.06.2015	39G9	26	99	42	98	28	3.4	341	55 06.3	19 14.0	55 08.5	19 12.8	6:36	30	806.7
5	06.06.2015	39G9	26	94	38	91	29	3.5	318	55 06.6	19 38.4	55 08.4	19 35.7	10:57	30	1121.1
6	06.06.2015	39HO	26	55	17	90	29	3.9	279	55 07.4	20 08.7	55 07.7	20 05.1	14:58	30	560.1
7	07.06.2015	39HO	26	43	10	89	31	3.8	90	55 07.5	20 16.3	55 07.5	20 19.9	6:25	30	473.7
8	07.06.2015	39HO	26	54	16	90	31	3.7	90	55 22.5	20 03.2	55 22.5	20 06.9	15:03	30	1182.6
9	08.06.2015	39G9	26	97	36	95	28	3.5	88	55 21.7	19 41.2	55 21.8	19 45.2	8:35	30	1033.7
10	08.06.2015	39G9	26	81	25	97	28	3.5	89	55 22.4	19 08.7	55 22.4	19 12.6	15:01	30	863.3
11	09.06.2015	40G9	26	90	36	96	30	3.4	210	55 37.6	19 04.1	55 35.7	19 02.0	7:04	30	689.2
12	09.06.2015	40G9	26	82	29	99	28	3.5	189	55 38.2	19 41.6	55 35.9	19 40.8	15:59	30	606.0
13	10.06.2015	40G9	26	103	35	97	29	3.3	62	55 52.1	19 00.9	55 53.2	19 04.5	9:49	30	940.0
SD26				80	29	95	28	3.5	152							10210

ICES_subdivision	**26**	**26**	**26**	**26**	**26**	**26**	**26**
Haul_No	***1***	***2***	***3***	***4***	***5***	***6***	***7***
Date	04.06.2015	05.06.2015	05.06.2015	06.06.2015	06.06.2015	06.06.2015	07.06.2015
Validity	Valid	Valid	Valid	Valid	Valid	Valid	Valid
Species/ICES rectangle	38G9(64)	38G9(64)	39G9(64)	39G9(64)	38G9(64)	39HO(65)	39HO(65)
CLUPEA HARENGUS 	1056.0	17.2	134.6	160.8	281.0	184.2	16.8
SPRATTUS SPRATTUS 	264.0	1191.2	1070.6	1341.8	1825.0	934.8	926.0
GADUS MORHUA 	44.5	8.4	64.0	110.8	136.2	1.0	1.8
ANOTHER	-	3.2	12.6	-	-	0.4	2.9
Total	1364.5	1220.0	1281.8	1613.4	2242.2	1120.4	947.5

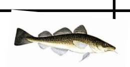
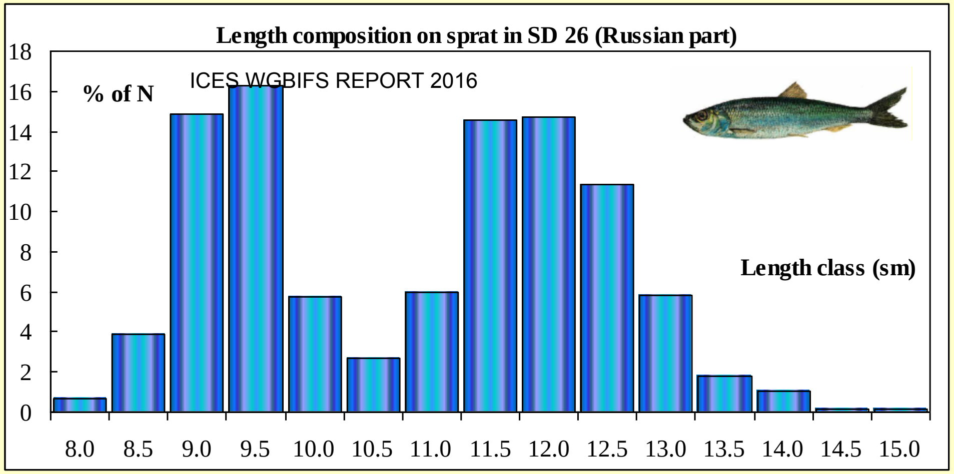
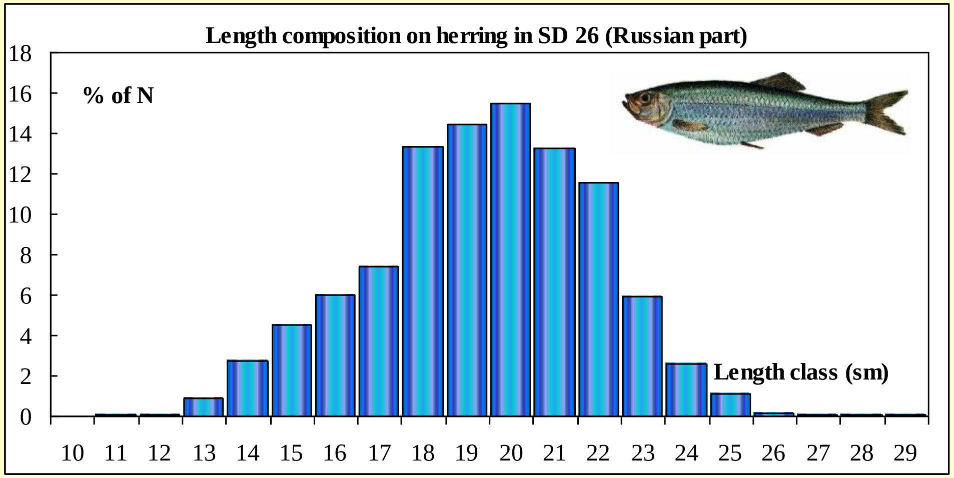
ICES_subdivision	**26**	**26**	**26**	**26**	**26**	**26**	**-**
Haul_No	***8***	***9***	***10***	***11***	***12***	***13***	-
Date	07.06.2015	08.06.2015	08.06.2015	09.06.2015	09.06.2015	10.06.2015	-
Validity	Valid	Valid	Valid	Valid	Valid	Valid	-
Species/ICES rectangle	39G9(64)	39G9(64)	39G9(64)	40G9(64)	40G9(64)	40G9(64)	-
CLUPEA HARENGUS 	1327.8	516.2	161.6	174.2	896.0	453.2	-
SPRATTUS SPRATTUS 	1034.8	1454.0	1489.6	1096.6	302.0	1344.8	-
GADUS MORHUA 	2.6	97.2	72.8	107.4	14.0	81.8	-
ANOTHER	-	-	2.7	0.3	-	0.1	-
Total	2365.2	2067.4	1726.7	1378.5	1212.0	1879.9	-

Table 2. Catch composition (kg/1hour) per haul by ICES Subdivision and ICES rectangles (RV "ATLANTNIRO", 04–10.06.2015)





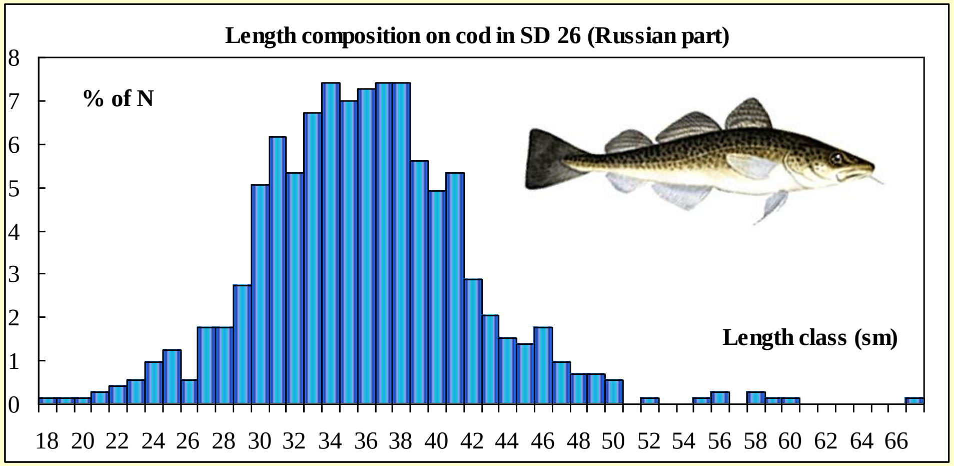


Figure 2. Length composition of sprat, herring and cod (%) (RV "ATLANTNIRO", 04–10.06.2015)

Figure 3. The map of NASC values distribution on the Russian area of international acoustic survey (RV "ATLANTNIRO", 04-10.06.2015)

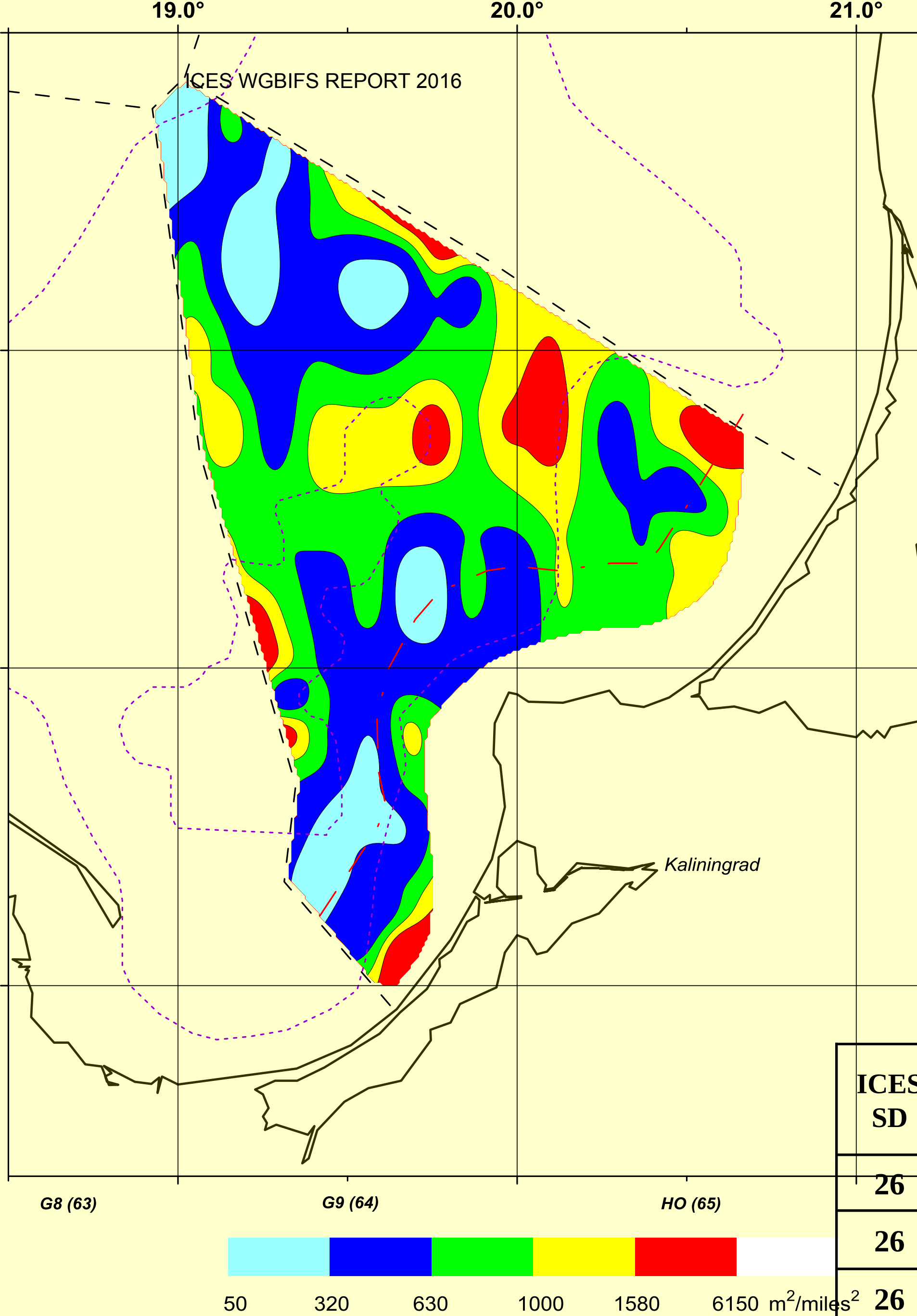


Table 3. Survey statistics (RV "ATLANTNIRO", 04–10.06.2015)

ICES SD	ICES Rect.	Area nm²	NASC m²/ nm²	σ*10⁴ m²	N total mln	Species comp. %)	
						her	sprat
26	40G9	1013.0	887.2	1.76	5094.0	13.75	86.25
26	39H0	881.6	1186.8	1.15	9085.4	7.12	92.88
26	39G9	1026.0	1151.4	1.27	9273.0	2.99	97.01
26	38G9	918.2	970.0	1.39	6388.3	7.27	92.73

Table 4. Characteristics of the stock of sprat and herring acoustic survey data (RV "ATLANTNIRO", 04–10.06.2015)

ICES SD	ICES Rect.	Area nm^2	ρ mln/nm^2	Quantity, mln			Biomass, tonn		
				N sum	N her	N spr	W sum	W her	W spr
26	40G9	1013.0	5.03	5094.0	700.4	4393.6	83507.2	31820.7	51686.5
26	39H0	881.6	10.31	9085.4	647.2	8438.2	84620.1	29239.5	55380.6
26	39G9	1026.0	9.04	9273.0	277.3	8995.7	97594.2	15112.9	82481.3
26	38G9	918.2	6.96	6388.3	464.5	5923.8	79980.4	25872.8	54107.7
SD26		3 838.8		29 841	2 089	27 751	345 702	102 046	243 656

Table 5. Summary acoustic survey of sprat and herring (RV "ATLANTNIRO", 04–10.06.2015)

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	40G9	11,12,13	19.34	45.43	13.75	12.39	11.76	86.25	887.2	-48.5
26	39H0	6,7,8	19.68	45.18	7.12	9.94	6.56	92.88	1186.8	-50.4
26	39G9	4,5,9,10	20.94	54.50	2.99	11.03	9.17	97.01	1151.4	-49.9
26	38G9	1,2,3	20.92	55.70	7.27	11.02	9.13	92.73	970.0	-49.5

Table 6. Estimated number (millions) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	NSTOT	1	2	3	4	5	6	7	8+
26	40G9	4393.58	271.37	1025.83	1765.07	729.95	325.86	94.16	149.93	31.43
26	39H0	8438.17	7326.02	551.82	400.88	159.45				
26	39G9	8995.66	4111.54	1771.67	1731.99	825.53	236.05	64.88	237.01	16.99
26	38G9	5923.78	2595.02	2020.51	747.93	424.56	56.64	14.13	57.07	7.92
	Sum	27751.19	14303.95	5369.82	4645.87	2139.49	618.55	173.16	444.01	56.33

Table 7. Estimated mean weights (g) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WSTOT	1	2	3	4	5	6	7	8+
26	40G9	11.76	5.99	10.35	11.97	13.52	13.89	15.14	14.24	11.57
26	39H0	6.56	5.75	10.45	12.70	15.12				
26	39G9	9.17	5.57	10.40	12.28	12.98	17.02	17.09	15.79	17.32
26	38G9	9.13	6.05	10.64	12.23	13.75	13.20	15.44	14.53	17.27

Table 8. Estimated biomass (in tonnes) of sprat (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WSTOT	1	2	3	4	5	6	7	8+
26	40G9	51686.5	1626.7	10622.0	21123.5	9865.3	4525.0	1425.7	2134.6	363.7
26	39H0	55380.4	42108.5	5768.7	5093.0	2410.4				
26	39G9	82481.3	22915.0	18427.6	21261.9	10713.7	4017.8	1108.8	3742.0	294.4
26	38G9	54107.7	15690.8	21502.3	9144.4	5838.5	747.6	218.1	829.3	136.7
	Sum	243656	82341	56321	56623	28828	9290	2753	6706	795

Table 9. Estimated number (millions) of herring (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	NHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	700.39		2.86	8.30	121.84	171.22	57.12	77.49	97.79	79.49	40.37	43.92
26	39HO	647.22		59.25	116.62	69.68	121.06	44.34	49.28	53.92	56.87	22.76	53.44
26	39G9	277.31		2.13	23.28	27.51	60.73	20.24	24.45	28.01	37.76	23.03	30.17
26	38G9	464.48	0.21	9.47	36.54	31.91	96.54	35.93	48.47	72.54	65.12	41.17	26.59
	Sum	2089.40	0.21	73.70	184.73	250.94	449.55	157.63	199.70	252.26	239.23	127.32	154.12

Table 10. Estimated mean weights (g) of herring (RV "ATLANTNIRO", 04–10.06.2015)

SD	RECT	WHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	45.43		22.69	29.19	33.94	38.58	44.74	45.29	54.35	55.13	53.87	64.59
26	39HO	45.18		23.95	37.40	38.38	44.69	47.26	53.39	49.12	57.59	57.65	63.85
26	39G9	54.50		17.46	38.93	41.31	50.19	51.17	57.78	56.58	60.46	60.28	75.59
26	38G9	55.70	24.36	20.14	38.86	41.76	49.49	57.73	58.96	62.55	60.38	65.25	77.42

Table 11. Estimated biomass (in tonnes) of herring (RV "ATLANTNIRO", 04–10.06.2015)

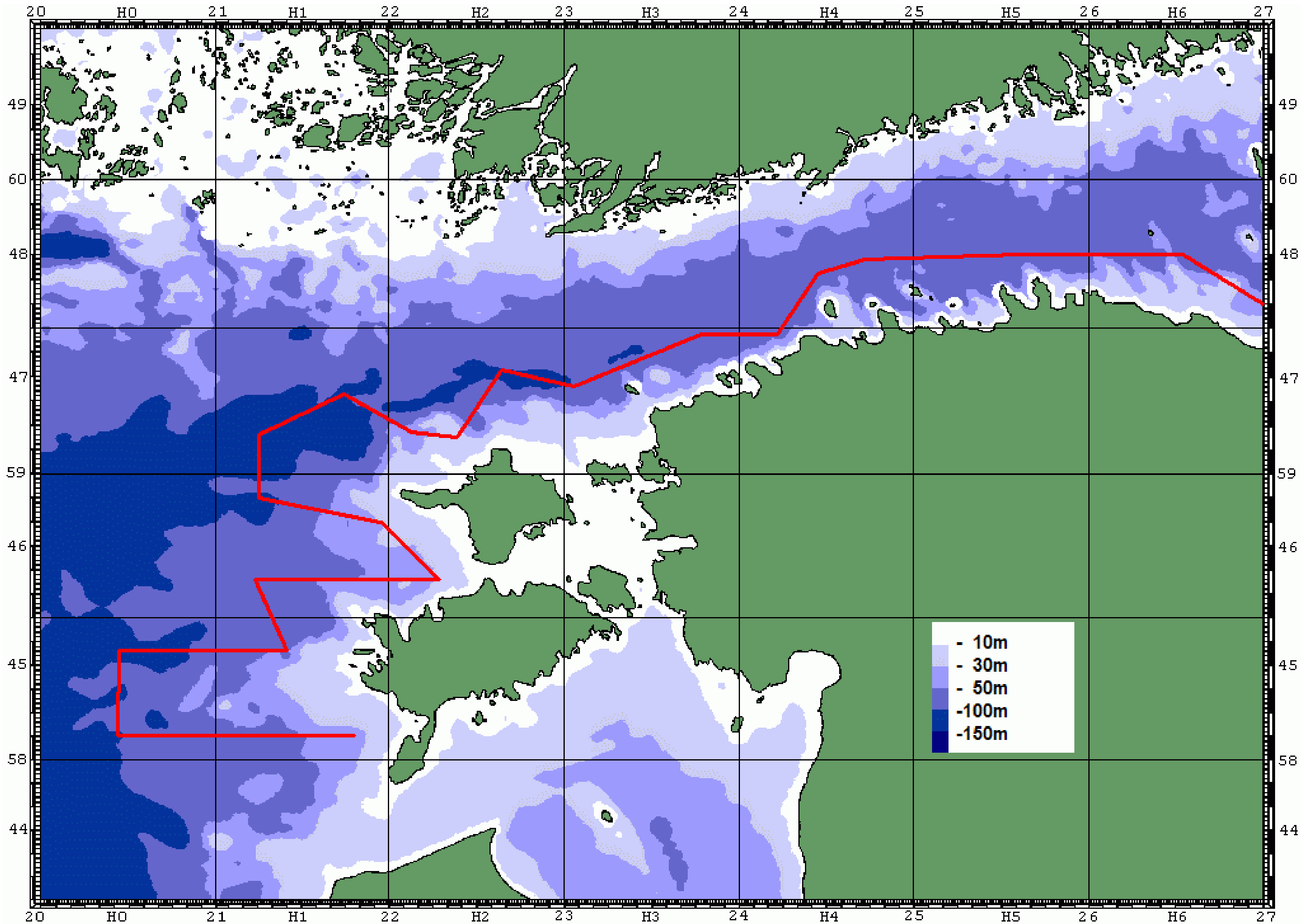
SD	RECT	WHTOT	0	1	2	3	4	5	6	7	8	9	10+
26	40G9	31820.7		64.8	242.2	4135.6	6605.1	2555.6	3509.6	5314.6	4382.1	2174.5	2836.6
26	39HO	29239.5		1419.2	4361.2	2674.0	5410.6	2095.2	2631.2	2648.8	3275.0	1312.1	3412.3
26	39G9	15112.9		37.1	906.2	1136.4	3048.2	1035.9	1412.9	1585.0	2282.6	1388.3	2280.2
26	38G9	25872.8	5.2	190.6	1419.9	1332.5	4777.3	2074.4	2858.0	4537.6	3932.1	2686.3	2059.0
	Sum	102046	5	1712	6930	9278	19841	7761	10412	14086	13872	7561	10588

Estonian
BIAS 2015

Elor Sepp, Tiit Raid
Estonian Marine Institute

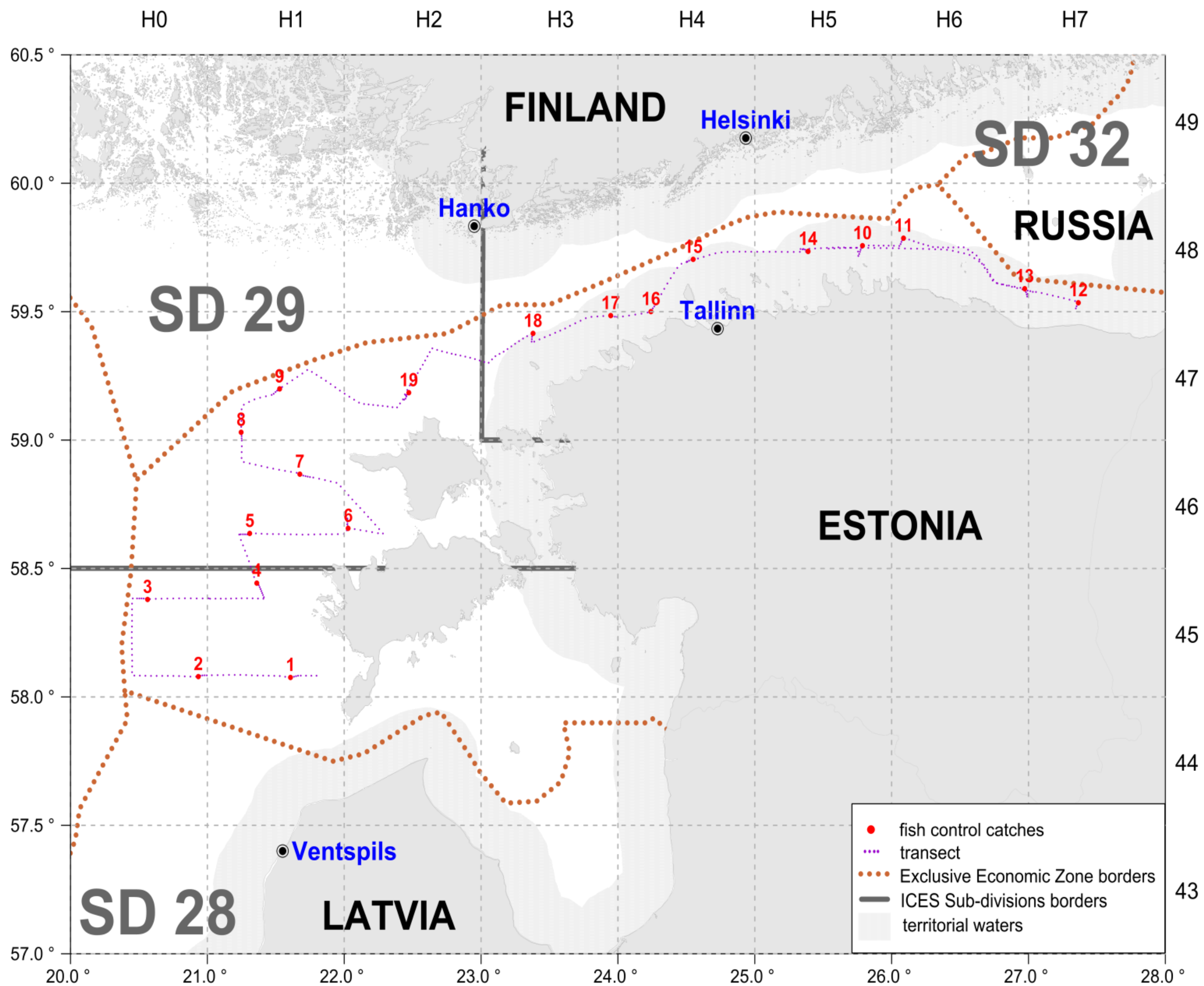
BIAS 2015

Design



20
H0
21
H1
22
H2
23
H3
24
H4
25
H5
26
H6
27
49
60
48
47
59
46
45
58
44
- 10m
- 30m
- 50m
-100m
-150m

Realization



BIAS Realization

- All survey was realized according to the plan.
- 490 nm of integration
- 19 trawl hauls

- Water was unusually warm and fish was not schooling as usual

Main results

- Herring estimates were approximately the same
- Sprat estimates were slightly higher
- Average weight of both species was lower

Plans for next survey

- 18.- 28. October?
- Same design

Finnish Baltic International Acoustic Survey in 2015
R/V Aranda

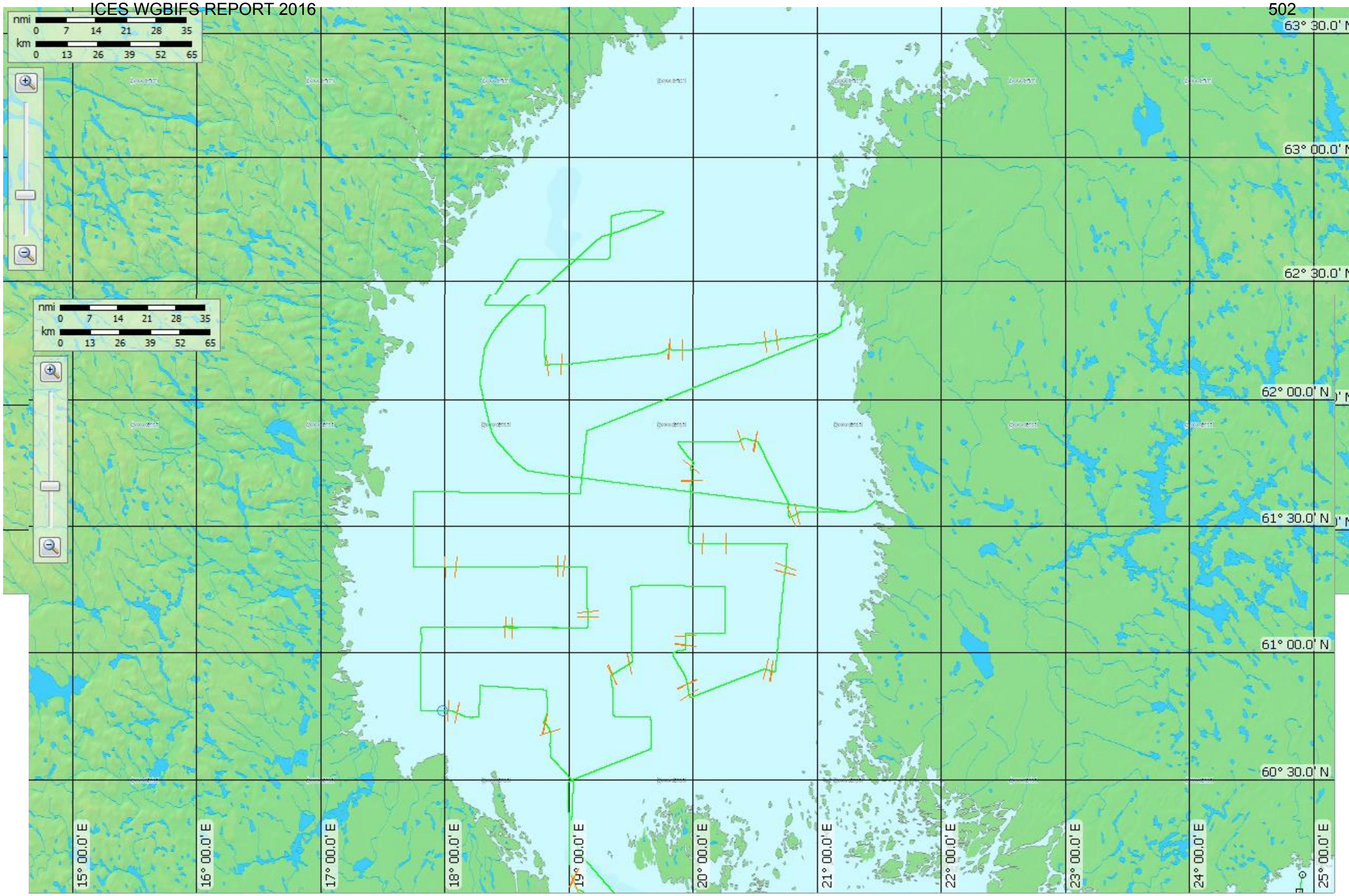
Cruise 14/2015

ICES_BIAS2015

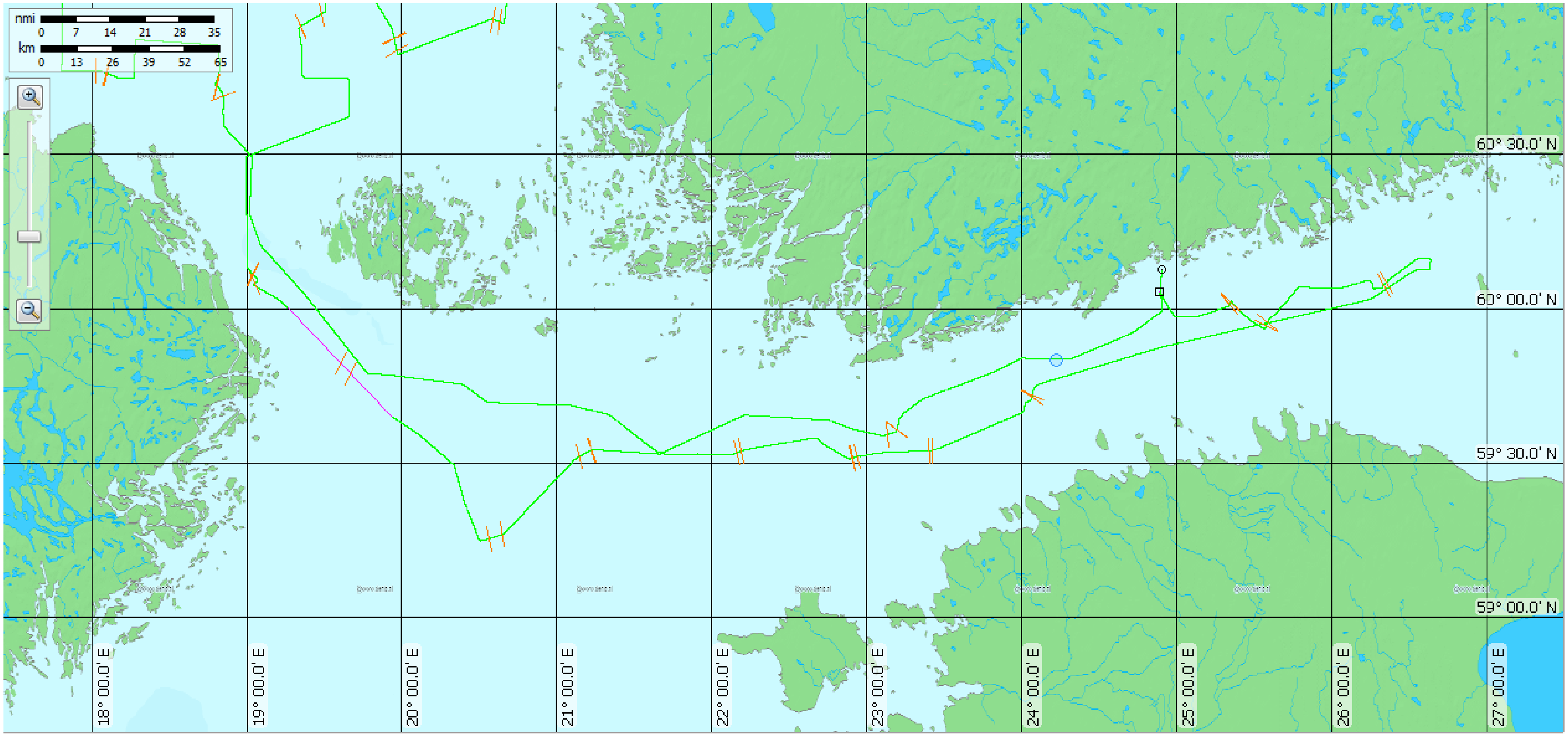
25th September – 8th October 2015

PERSONNEL

Juha Lilja	Luke	Cruise Leader, Acoustics
Ari Leskelä	Luke	Fishing
Jukka Pönni	Luke	Fish sampling
Tero Saari	Luke	Fish sampling
Hannu Harjunpää	SLU	Fish sampling
Mikko Jaukkuri	SLU	Fish sampling
Markku Vaajala	Luke	Fish sampling
Esa Lehtonen	Luke	Fish sampling
Arto Koskinen	Luke	Fish sampling
Jari Raitaniemi	Luke	Fish sampling
Erkki Jaala	Luke	Acoustics
Mikko Leminen	Luke	Acoustics
Jaakko Vedman	Luke	Acoustics
Perttu Rantanen	Luke	Database maintenance
Otto Kiukkonen		Fishing
Peter Koskinen		Fishing
Jari Johansson		Fishing
Markku Gavrilov	Luke	Fishing
Sami Vesala	Luke	Fishing
Yvette Heimbrand	SLU	Fish sampling
Anne Odelström	SLU	Fish sampling
Johanna Yliportimo	TY	Fish sampling
Anu Lastumäki	SYKE	Fish sampling



Cruise track and trawl stations in SD 30



Cruise track and trawl stations in SD 29 - SD 32

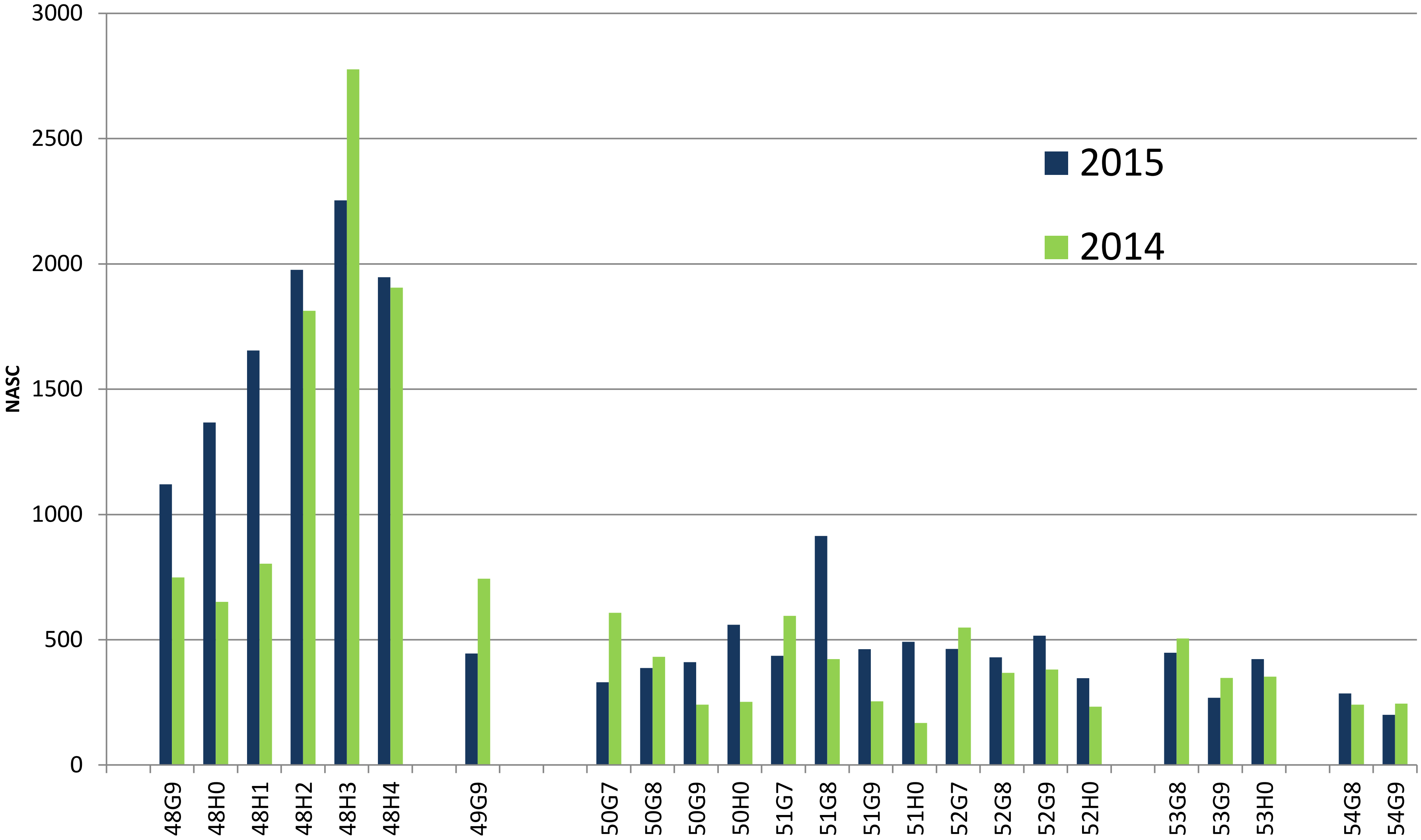
SD	Day	Month	Haul Number	Atlantic salmon	Baltic herring	eelpout	greater sandeel	lumpsucker	nine-spined stickleback	sand goby	sea lamprey	small sandeel	smelt	snake blenny	sprat	straightnose pipefish	striped seasnail	three-spined stckleback	turbot	sarduria	waste	Total
32	29	9	1		117.0				0.1				0.0		1226.3			1.8		0.0	4.6	1350.0
30	30	9	2		129.7				0.0						1.9			0.6		0.0	20.8	153.0
30	30	9	3	0.8	136.4										1.0			0.6		0.0	1.2	140.0
30	30	9	4									INVALID										28.0
30	30	9	5		118.5						2.8				12.7			392.3			1.6	528.0
30	30	9	6		58.2										2.3		0.0	62.8		0.0	7.6	131.0
30	1	10	7		66.1				0.0						0.3		0.0	4.6		0.0	1.4	72.3
30	2	10	8		164.6	0.0				0.0					21.7	0.0		19.6		0.0	9.1	215.0
30	2	10	9		62.7							0.0			4.1		0.2	9.6			1.4	78.0
30	2	10	10	0.3	16.3										0.6		0.0	143.3			13.5	174.0
30	4	10	11		121.3				0.0						23.0	0.0		28.6		0.0		173.0
30	4	10	12		77.3				0.8						2.3			10.1		0.0	1.6	92.0
30	4	10	13		43.3				0.0						0.2		0.2	2.0			1.9	47.6
30	4	10	14		49.5				0.1						1.6			21.8			2.0	75.0
30	4	10	15	3.0	108.9										4.0			84.2			3.0	203.0
30	4	10	16		89.9	0.0			0.1				10.0	0.0	9.7			17.9			1.9	129.5
30	5	10	17	0.2	70.1	0.0			0.0				0.2		18.1			23.9		0.0	1.4	114.0
30	5	10	18	0.2	39.3										2.1			25.8		0.0	2.6	70.0
30	5	10	19		72.6	0.2			0.0						0.9			22.1		0.0	4.1	100.0
29	5	10	20		99.4		0.0		0.1				0.0		79.8	0.0		16.5		0.1	8.9	205.0
29	6	10	21		54.2				0.0	0.0					27.0			0.8			1.9	84.0
29	6	10	22		70.6			0.3	0.2						63.1			25.9			14.9	175.0
29	6	10	23		6.3		0.0	0.1							71.3			44.6			39.6	162.0
29	6	10	24		191.4				0.1				0.1		99.2	0.0		4.3	0.1		4.8	300.0
29	6	10	25		124.5				0.2						375.2			14.0			19.1	533.0
32	7	10	26		47.9				0.1				0.4		207.1			2.8			9.8	268.0
32	7	10	27		10.5				0.0				0.0		135.7			2.1			4.5	153.0
32	7	10	28		40.0				0.1				1.9		148.9			1.5		0.0	12.6	205.0
32	8	10	29		211.4				0.1				1.3		207.3			2.6		0.0	2.3	425.0
32	8	10	30		132.3				0.1				0.2		120.6			2.5			2.2	258.0
				4.4	2530.4	0.2	0.0	0.4	2.1	0.0	2.8	0.0	14.2	0.0	2868.2	0.0	0.4	989.3	0.1	0.3	200.4	**6641.4**

English, scientific, and Finnish names of the observed species in Finnish BIAS-survey in 2015

Fishnames		
English	**Scientific**	**Finnish**
snake blenny	Lumpenus lampretaeformis	Elaska
sand goby	Pomatoschistus minutus	Hietatokko
striped seasnail	Liparis liparis	Imukala
greater sandeel	Hyperoplus lanceolatus	Isotuulenkala
sarduria	Sarduria entomon	Kilkki
sprat	Sprattus sprattus	Kilohaili
eelpout	Zoarces viviparus	Kivinilkka
three-spined stckleback	Gasterosteus aculeatus	Kolmipiikki
three-spined stckleback	Gasterosteus aculeatus	Korvameduusa
smelt	Osmerus eperlanus	Kuore
nine-spined stickleback	Pungitius pungitius	Kymmenpiikki
Atlantic salmon	Salmo salar	Lohi
sea lamprey	Petromyzon marinus	Meritaimen
turbot	Scophtalmus maximus	Piikkikampela
small sandeel	Ammodytes tobianus	Pikkutuulenkala
lumpsucker	Cyclopterus lumpus	Rasvakala
Baltic herring	Clupea harengus membras	Silakka
straightnose pipefish	Nerophis ophidion	Siloneula

Results

SD	RECT	AREA	SA	SIGMA	NTOT	HH	HS	HC
29	47H0	920.3	1298.99	0.79185	15097.05	44.08	39.43	0
29	48G9	772.8	1120.25	1.25875	6877.72	66.07	32.96	0
29	48H0	730.3	1386.12	0.67927	14902.59	27.54	47.44	0
29	48H1	544.0	1661.68	0.56072	16121.39	5.18	58.26	0
29	48H2	597.0	1992.99	0.34213	34777.13	38.15	59.49	0
32	48H3	615.7	2267.68	0.94505	14773.87	12.98	86.39	0
32	48H4	835.1	1898.25	0.83574	18968.05	7.10	91.44	0
32	48H5	767.2	2214.18	1.01101	16802.20	50.01	49.05	0
29	49G9	564.2	444.80	0.70384	3565.55	50.68	40.72	0
32	49H5	306.9	1811.18	0.99453	5589.10	51.74	47.16	0
32	49H6	586.5	614.02	0.90412	3983.10	20.79	77.39	0
30	50G7	403.1	330.84	1.67179	797.72	98.29	0.75	0
30	50G8	833.4	387.17	1.99979	1613.49	98.12	1.45	0
30	50G9	879.5	410.47	0.72670	4967.80	66.25	11.60	0
30	50H0	795.1	559.53	0.77321	5753.76	70.45	7.63	0
30	51G7	614.5	435.85	1.58833	1686.24	93.15	0.37	0
30	51G8	863.7	914.36	0.53531	14752.86	47.19	1.85	0
30	51G9	865.8	462.81	0.43282	9257.72	24.90	2.46	0
30	51H0	865.7	492.10	0.49091	8678.05	55.44	1.99	0
30	52G7	482.6	462.99	1.58833	1406.75	93.15	0.37	0
30	52G8	852	429.61	0.45961	7963.78	32.59	1.28	0
30	52G9	852	516.18	1.61410	2724.67	94.83	0.38	0
30	52H0	852	347.07	1.07306	2755.68	75.38	9.62	0
30	52H1	263.9	448.45	1.07306	1102.89	70.13	13.31	0
30	53G8	838.1	448.53	0.39515	9513.25	10.15	0.40	0
30	53G9	838.1	268.61	1.02140	2204.07	81.85	5.32	0
30	53H0	838.1	422.84	1.06209	3336.67	79.93	10.53	0
30	53H1	126.6	520.96	1.06209	620.978	79.92	10.52	0
30	54G8	642.2	285.77	0.45806	4006.54	33.30	1.99	0
30	54G9	824.2	200.05	1.05148	1568.13	80.42	9.18	0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2500
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1000
500
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NASC
2015
2014
48G9
48H0
48H1
48H2
48H3
48H4
49G9
50G7
50G8
50G9
50H0
51G7
51G8
51G9
51H0
52G7
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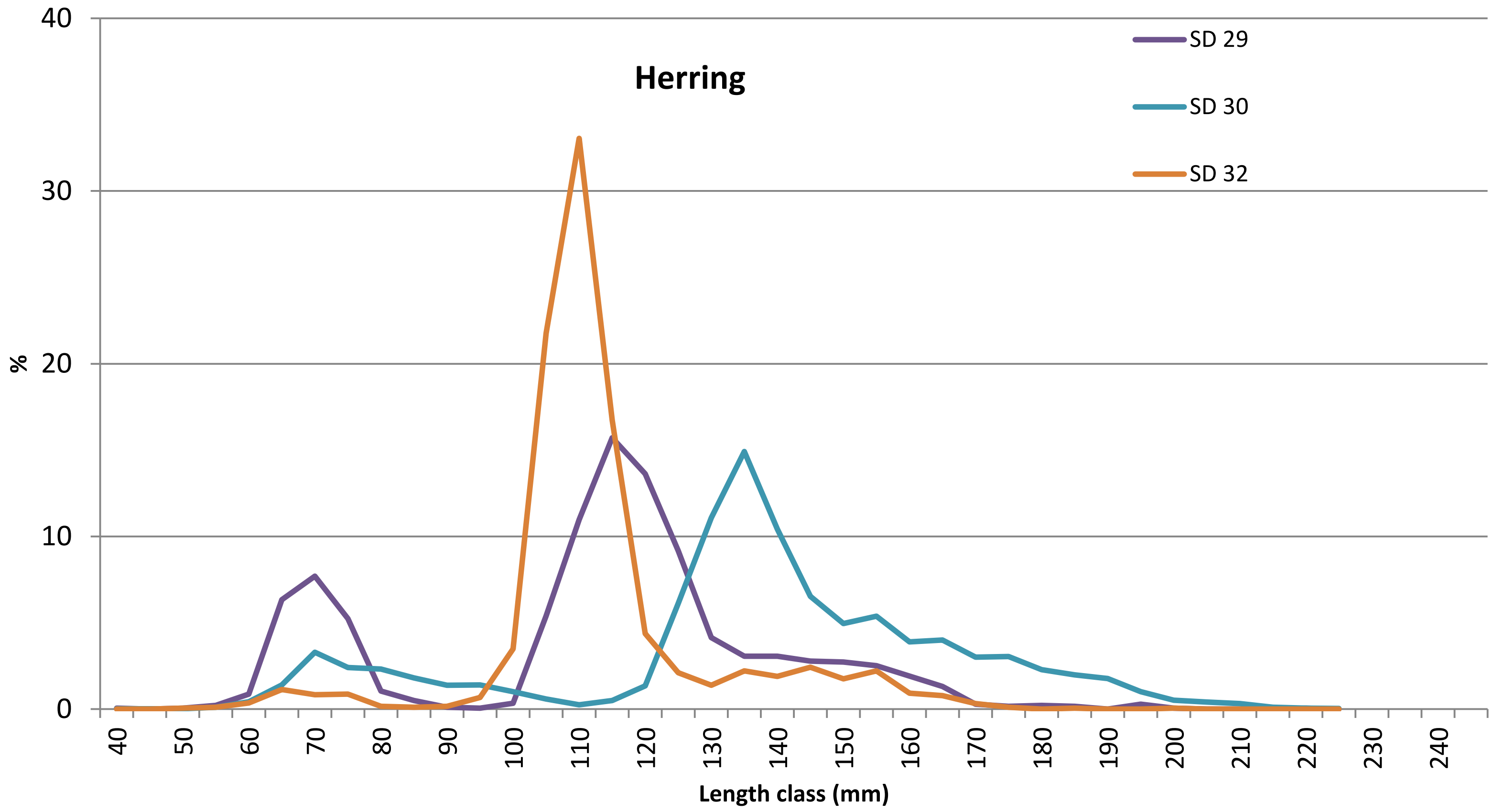
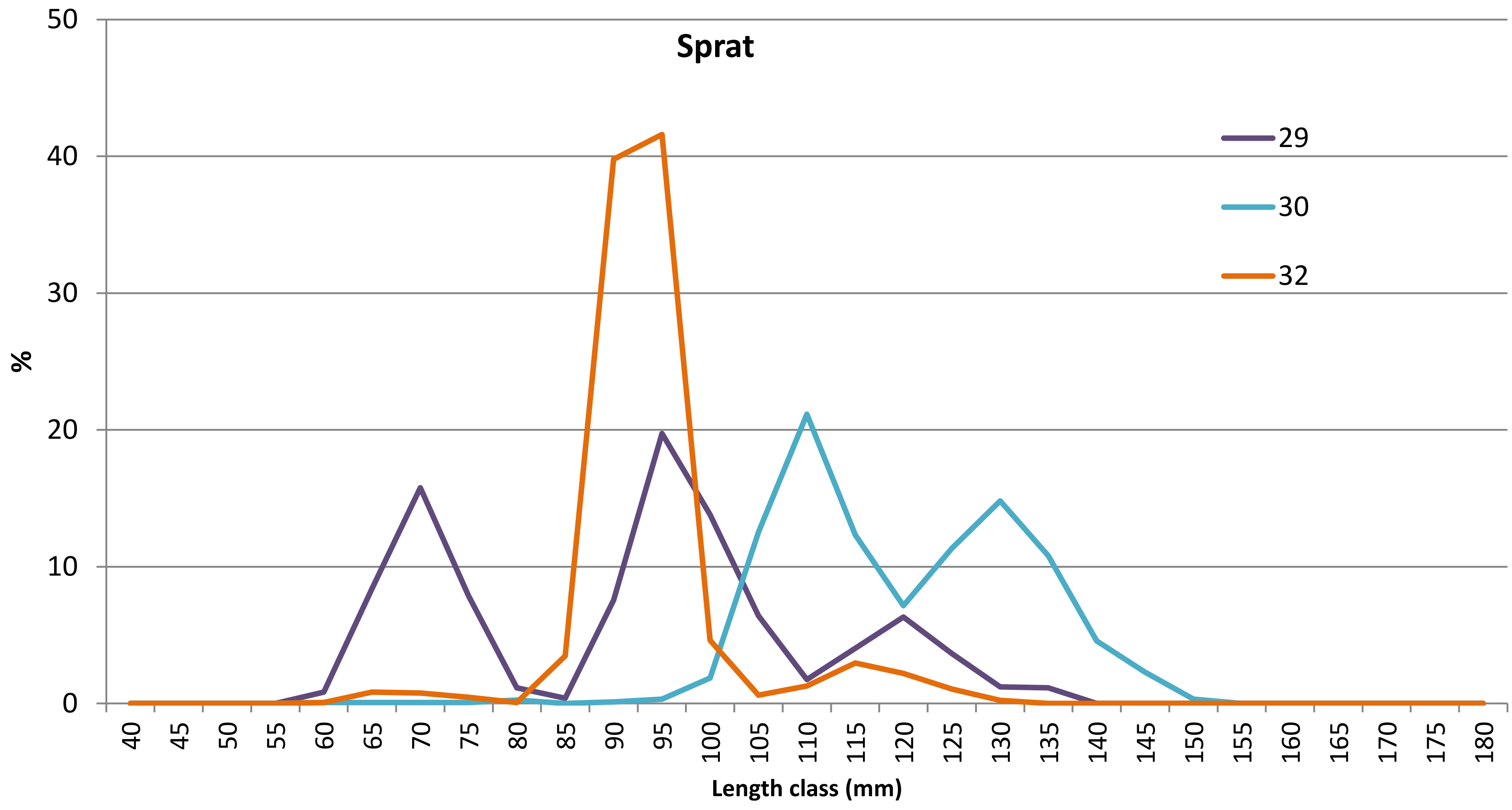
52G9
52H0
53G8
53G9
53H0
54G8
54G9

Length distributions of measured herring in three different Sub-Division.



Length distributions of measured sprat in three different Sub-Division

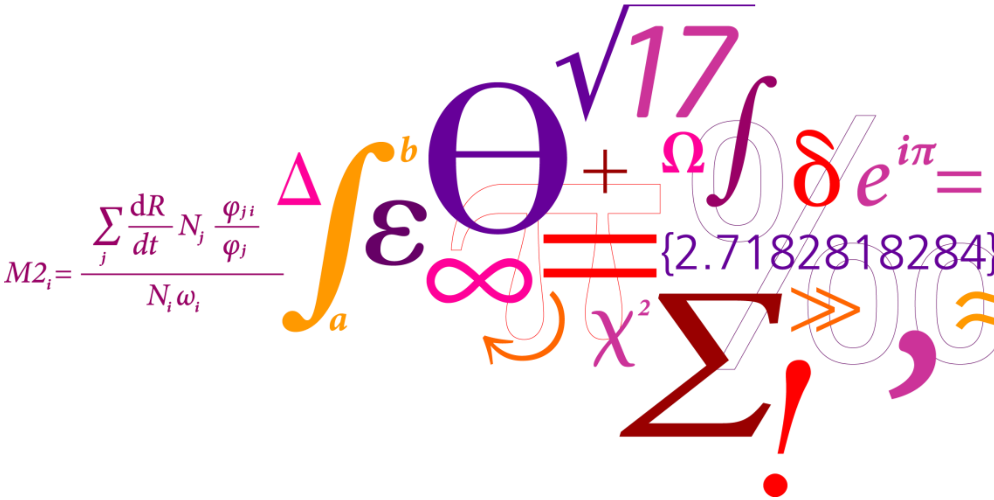


Fisheries Ecology and Assessment (25307), Spring 2016

Calibration exercise between Old and new R/V Havfisken

Henrik Degel
DTU Aqua

BIFS meeting
30/3 – 4/4, 2016
Rostock



DTU Aqua
National Institute of Aquatic Resources

Old and new Havfisken

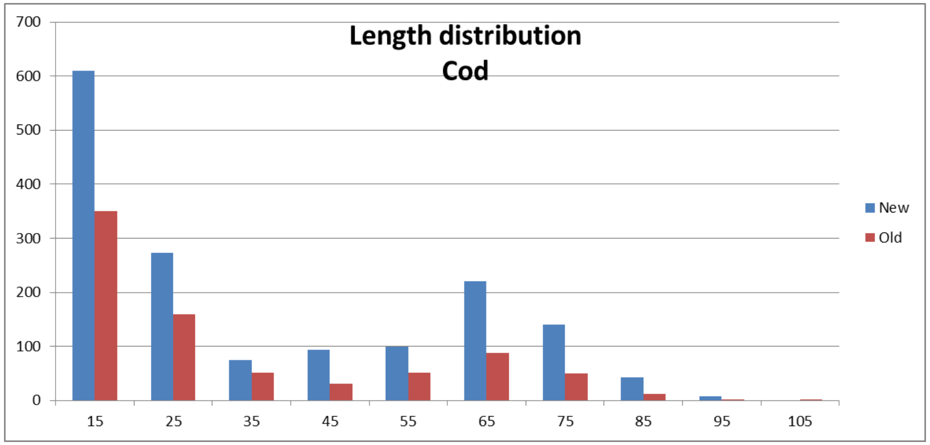
New Havfisken
Traditional stern trawler build in steel
Loa: 17 meter long
BRT: 105 tons

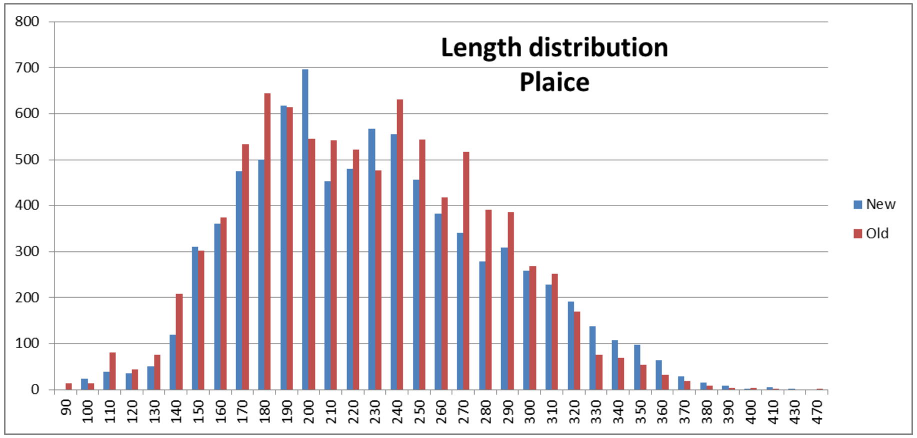
Old Havfisken
Traditional side trawler build in wood
Loa: 13 m long
BRT: 20 tons.

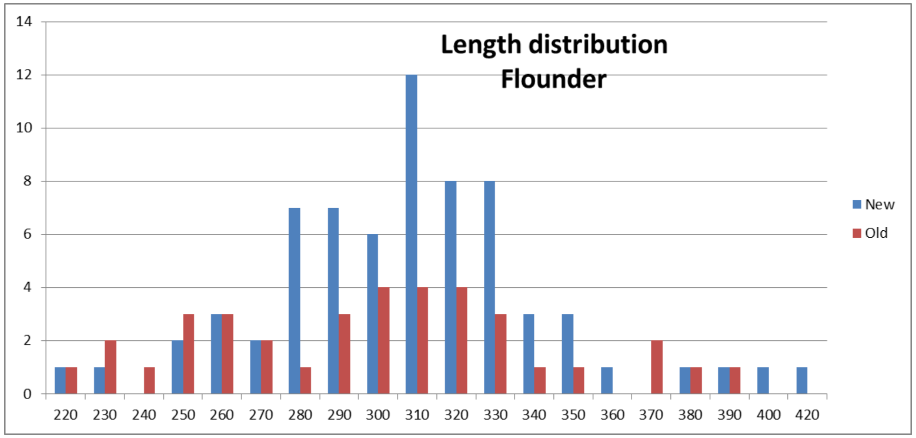
Calibration set-up

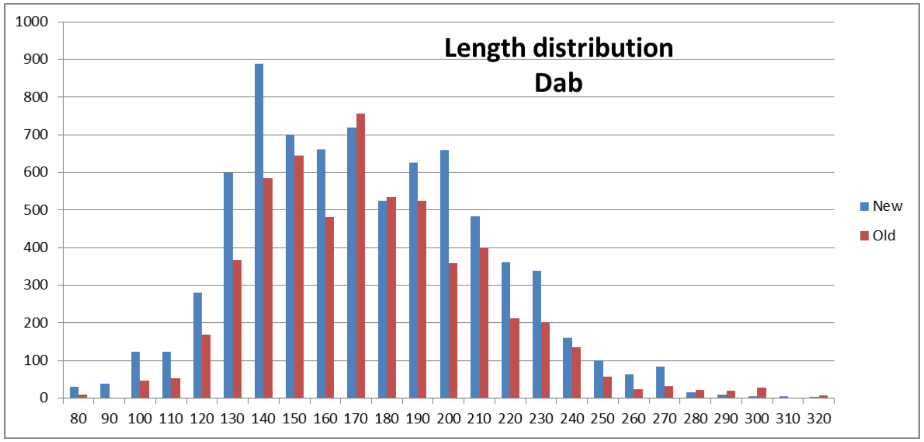
- Method: Parallel hauling following normal BITS haul procedure (in daylight, ½ hour)
- Period: 13-19/3 -2016
- Area: Skagerrak and North-western Kattegat
- Criteria
  - Reasonable abundance of cod and flatfish
  - The length rage of each species should be as wide as possible
  - The depth range should be comparable to the depth range in Kattegat and Western Baltic.
- Gear: Small TV3 (TV3S, #520)
- 30 successful pair of hauls were made.

Compare of length distributions (all pairs of hauls)

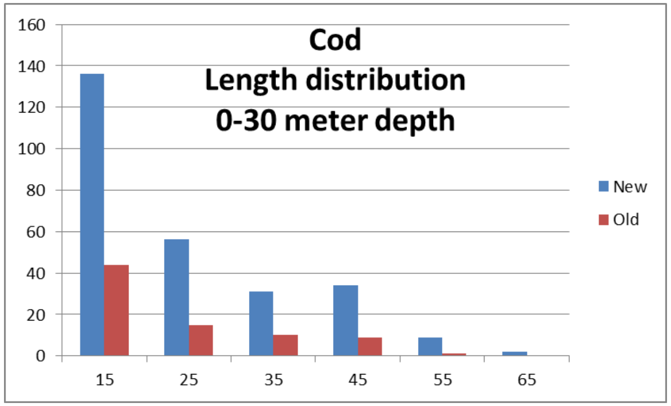


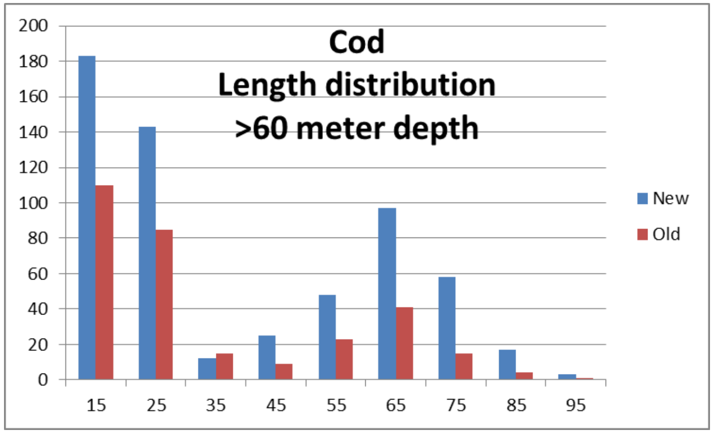


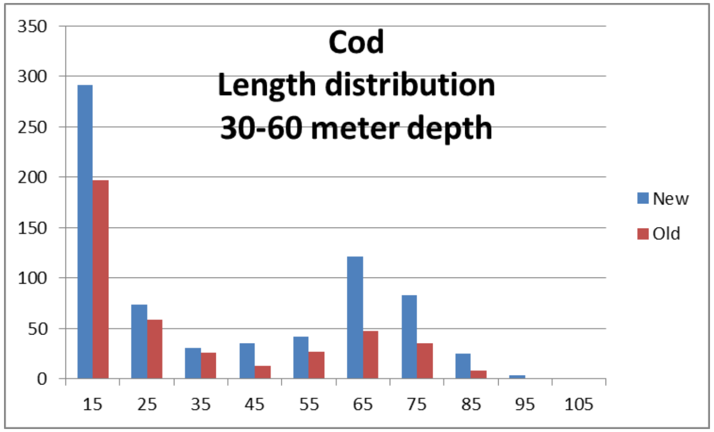




Henrik Degel
BIFS meeting Rostock 30/3-4/4 -2016







Henrik Degel
BIFS meeting Rostock 30/3-4/4 -2016

Species	Length group midpoint	Factor
Cod	15cm and smaller	0.58
	25cm	0.58
	35cm	0.69
	45cm	0.33
	55cm	0.52
	65cm	0.40
	75cm	0.35
	85cm	0.29
	95cm	0.29
	105cm and larger	0.29

Species	Length group midpoint	Factor
Flounder	25cm and smaller	0.70
	35cm	0.49
	45cm and larger	0.49

Species	Length group midpoint	Factor
Plaice	15cm and smaller	1.00
	25cm	1.00
	35cm	1.00
	45cm and larger	1.00

Species	Length group midpoint	Factor
Dab	15cm and smaller	0.12
	15cm	0.79
	25cm	0.64
	35cm and larger	2.91

Species	Length group midpoint	Factor
Brill	25cm and smaller	1.00
	35cm	1.00
	45cm and larger	1.00

AtlantOS WP 2.4

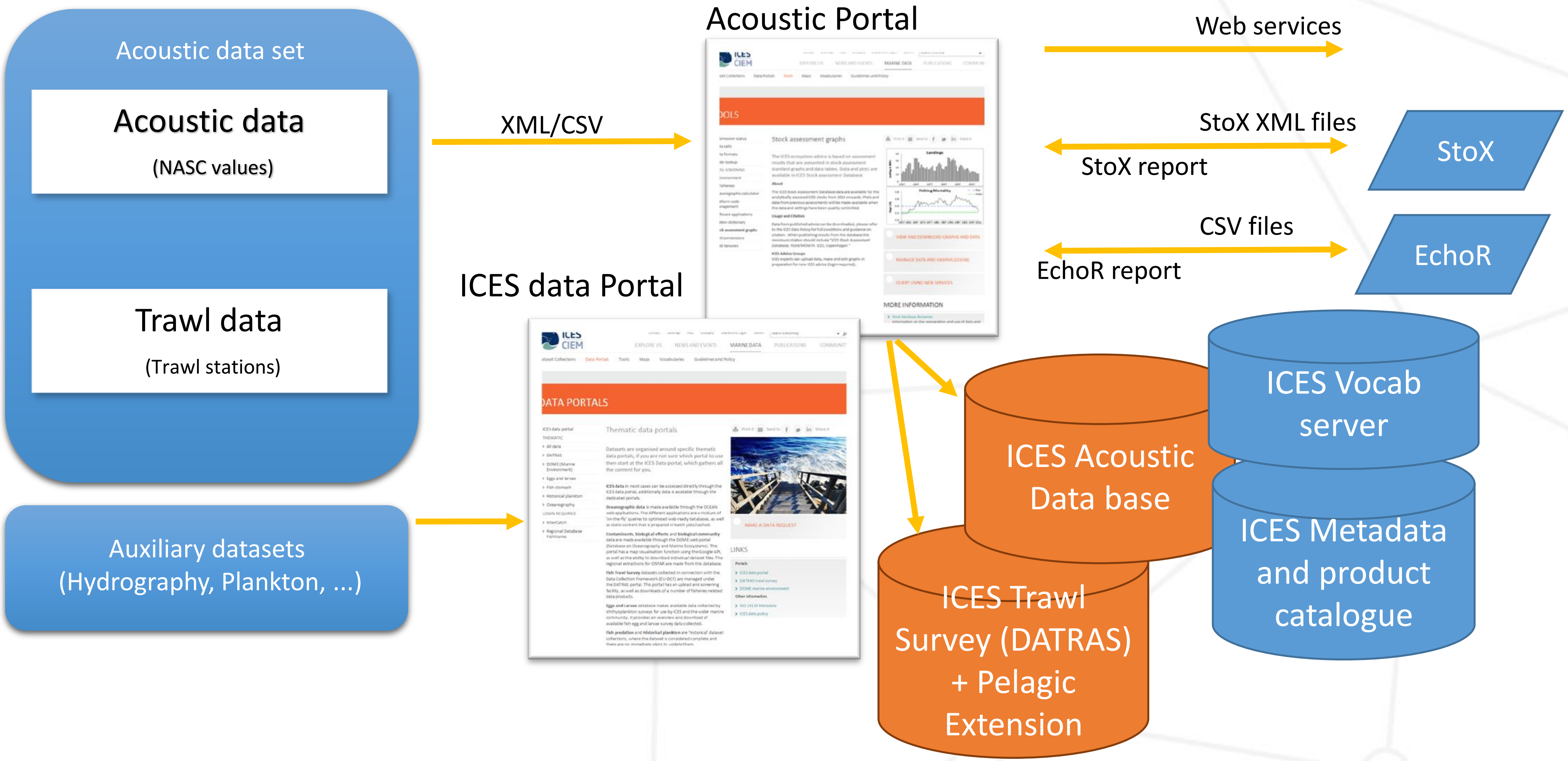
1) to improve the fish survey data availability through the ICES data center
2) to prepare the ICES data center to host these data in accordance with ICES and international data standards
3) to modify current processing and analysis software to fit into the new system.

1. WKEVAL
2. WKIACTDB
3. WGIPS, WGBIFS, WGACEGG and WGIDEEPS

WGBIFS March 2016

1) to present the component of the ICES Acoustic Trawl data portal
2) To present the currently agreed content fields in the Acoustic Trawl database – the acoustic part following the SISP 4 acoustic metadata standard developed by WGFAST and the trawl part following the DATRAS format
3) to give WGBIFS a chance to evaluate if above is sufficient for your needs.

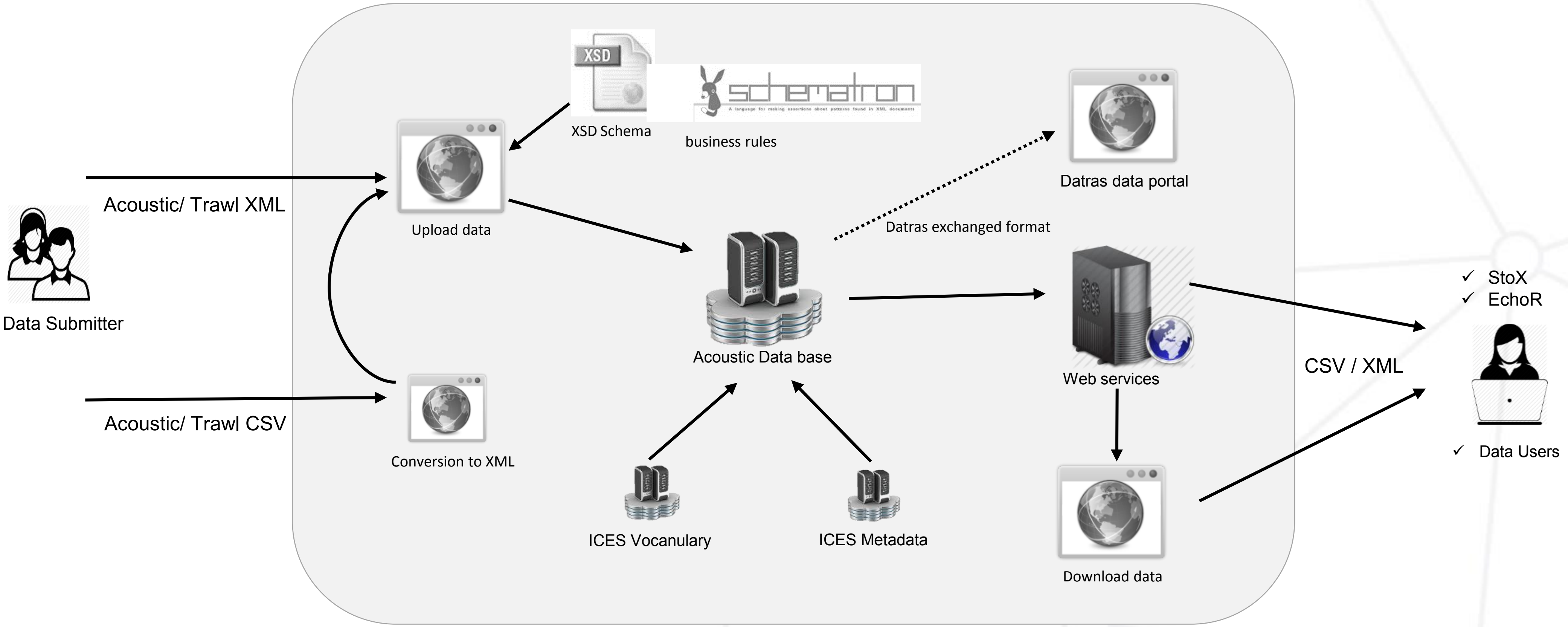
The Components



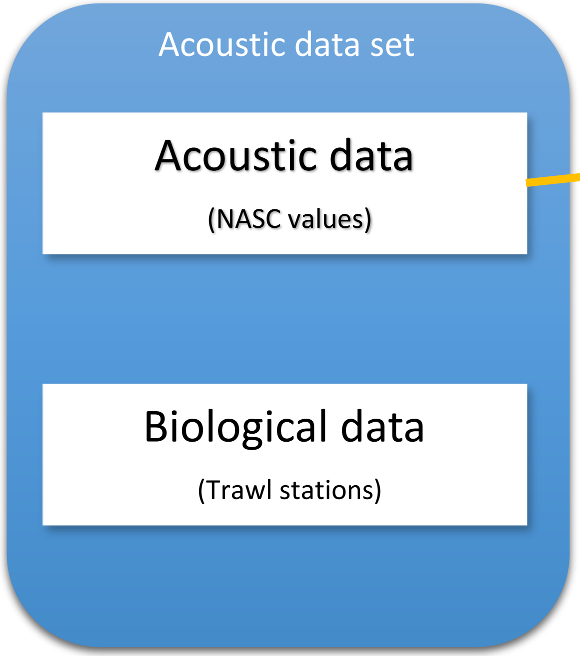
FishFrame

Science for sustainable seas

Acoustic Portal Overview



Acoustic data format



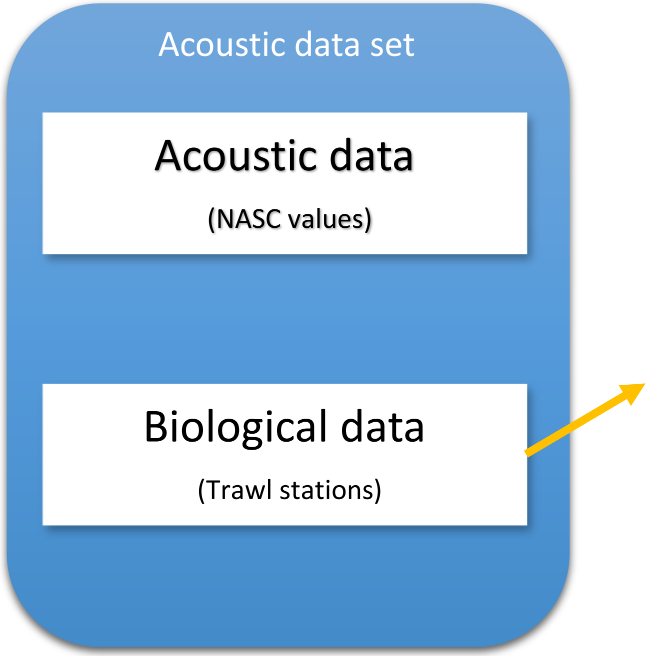
Acoustic information (AI)

No	Fields	DataType	Mandatory	Codes and values	Description
1	RecordType	char	Yes	AI	
2	Country	char	Yes		ISO_3166 country and region codes
3	Ship	char	Yes		ICES DATRAS ship reference code.
4	Cruise	char	Yes		Cruise identifier
5	Log	int	Yes		Min 4 digits (Nm)
6	Year	char	Yes	YYYY	
7	Month	char	Yes	MM	
8	Day	char	Yes	DD	
9	Hour	char	Yes	HH	
10	Min	char	Yes	MM	
11	Latitude	decimal4	Yes	range	Decimal degrees, negative latitude south 0° “0.0000”
12	Longitude	decimal4	Yes	range	Decimal degrees, negative longitude west of 0° “0.0000”
13	Logint	decimal1	Yes	range	Nm, Log_end-Log start
14	Frequency	int	Yes	range	KHz [38 KHz as standard]
15	Sv_threshold	int	Yes	range	DB [-70 dB as standard]

Acoustic values (AV)

No	Fields	DataType		Codes and values	Description
1	RecordType	char	Yes	AV	
2	Country	char	Yes		
3	Ship	char	Yes		
4	Cruise	char	Yes		
5	Log	int	Yes		
6	Year	char	Yes	YYYY	
7	Month	char	Yes	MM	
8	Day	char	Yes	DD	
9	SACat	char	Yes	controlled vocabulary	Species code: HER, WHB,...MIX, CLU
10	ChUppDepth	int	Yes	range	Upper channel depth (m) Rel. to surface
11	ChLowDepth	int	Yes	range	Lower channel depth (m) Rel. to surface
12	ChRange	int	Yes	range	Define reporting range [1m]a]stdstandard]
13	NASC	decimal4	Yes	range	Acoustic readings (m2/nm2)
14	MixHaulID	char	Yes	controlled vocabulary	Identifies the haul allocation to MIX or CLU

Biological data format



Haul information (HH)

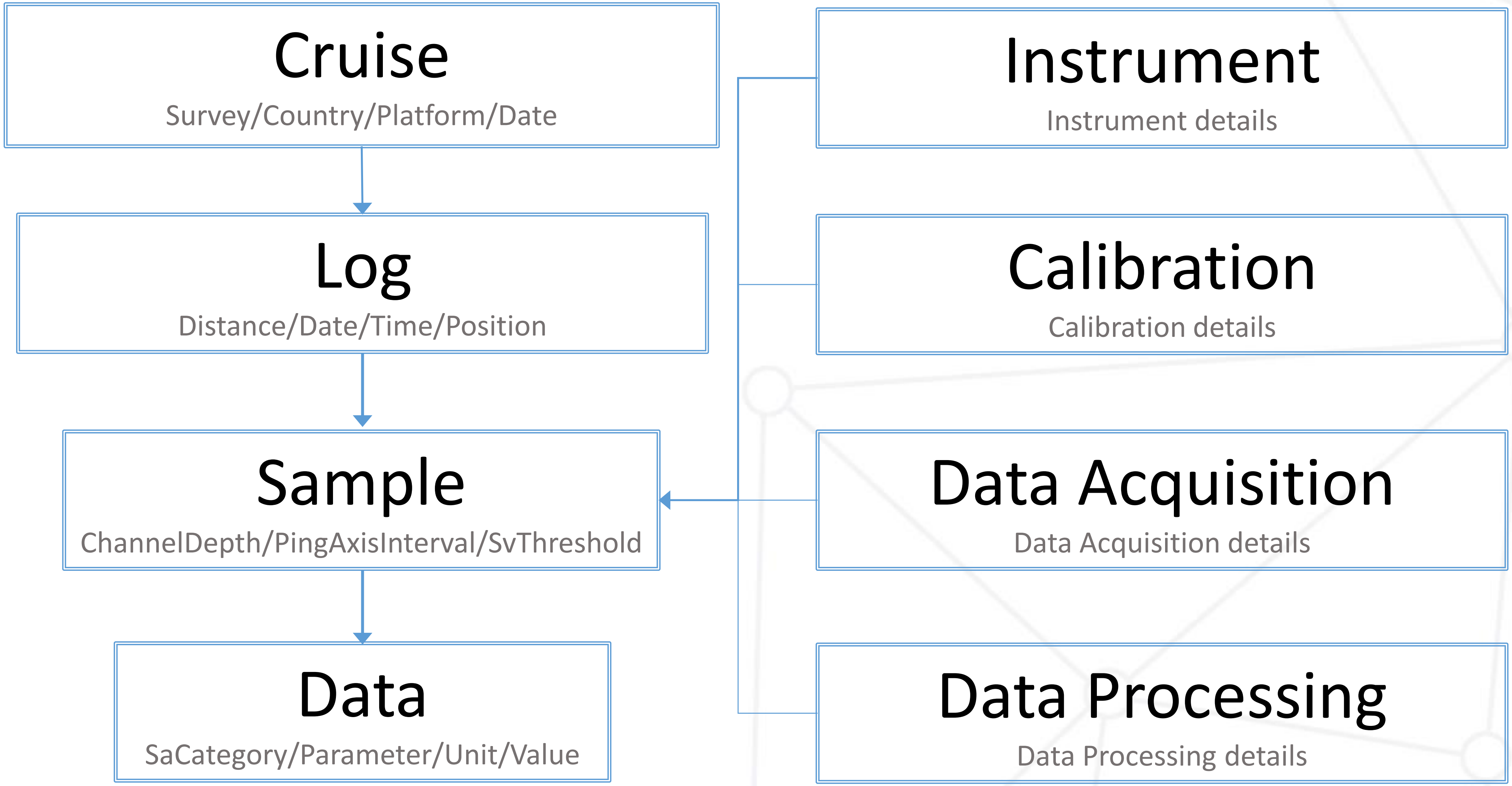
Length-based information (HL)

Age-based information (CA)

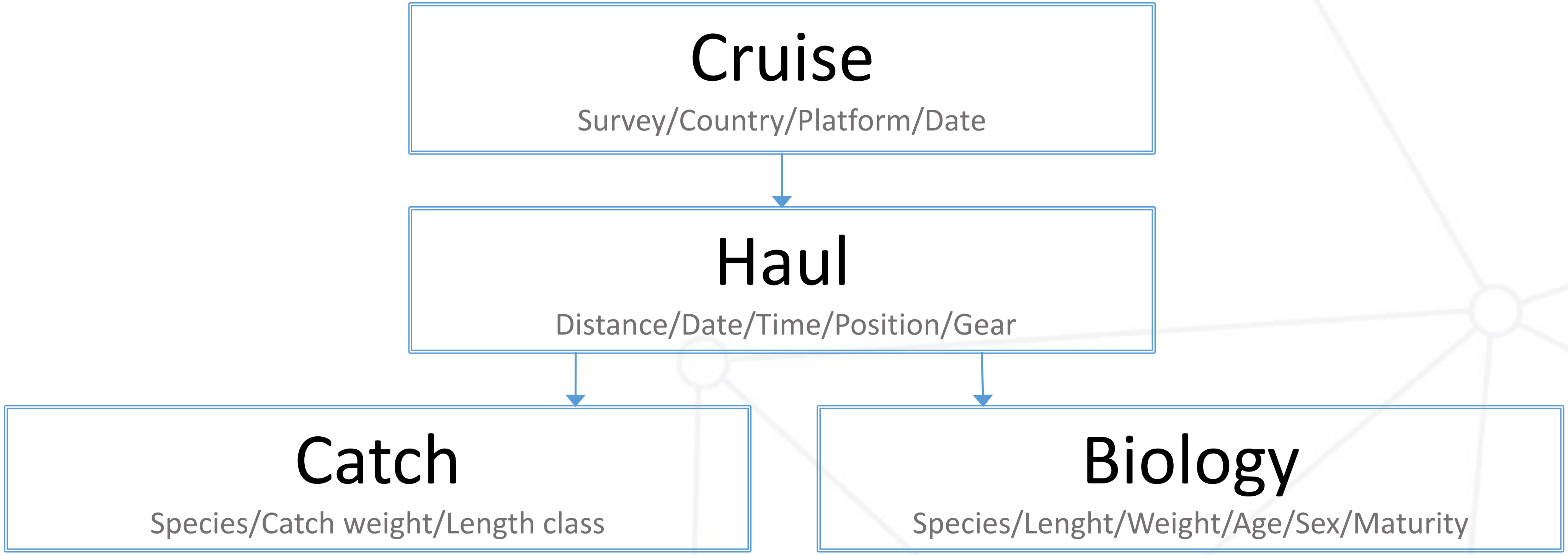
No	Fields	DataType	Mandatory	Code and values	Description
1	RecordType	char	Yes	CA	The field consists of a 2-character code, which defines the record type and thus the layout of the data fields included on that record. Codes are as follows: HH - Haul Information, HL - Length Frequency Distribution, CA - SMALKS.
2	Quarter	int	Yes	1,2,3,4	Report the actual quarter for the haul. In case the cruise was made in several quarters, data for each quarter should be reported separately.
3	Country	char	Yes		ISO_3166 country and region codes
4	Ship	char	Yes		DATRAS ship reference code.
5	Cruise	char			
6	Gear	char	Yes		Gear type code
7	StNo	char	Yes		Station number. National coding system, not defined by ICES.
8	HaulNo	int	Yes		Sequential numbering of hauls during cruise.
9	Year	char	Yes		Year of cruise.
10	SpecCodeType	char	Yes		Type of species code used for species definition at the record. Use 'W' for WoRMS AphiaID
11	SpecCode	char	Yes		Official WoRMS AphiaID code of species reported at the record. Historical records from DATRAS may refer to ITIS TSN species codes
12	LngtCode	char	Yes		Length class code for the given species. 0.1cm for shellfish (reporting units mm), 0.5 cm for herring and sprat (reporting units mm), and 1 cm for all other species (reporting units cm).
13	LngtClass	int	Yes		Length classes registered for this catch category as specified at the LngthCode. Species-sensitive. Indicates the lower bound of length distribution at this category. F.ex. 65-70cm=65.
14	Sex	char	Yes		Gender of the described speciman defined by dissection. If no determination was performed, report '-9'. If determination failed, report 'U'.
15	Maturity	char	Yes		Maturity code of the reported speciman. Requires dissection.
16	AgeRings	int	Yes		Age of specimen in years. -9 - unknown age. Age source is defined in a separate field
17	IndWgt	decimal1			Mean weight of fish in this category in grams.
18	FishID	int			Fish identification number - running sampling number of the specimen
19	AgeSource	char			Age reading source material
12	StomFullness	char			
13	Icthyophonous	char			
14	VertCount	char			
15	StockID	char			
16	FAOCode	char			

Acoustic data model

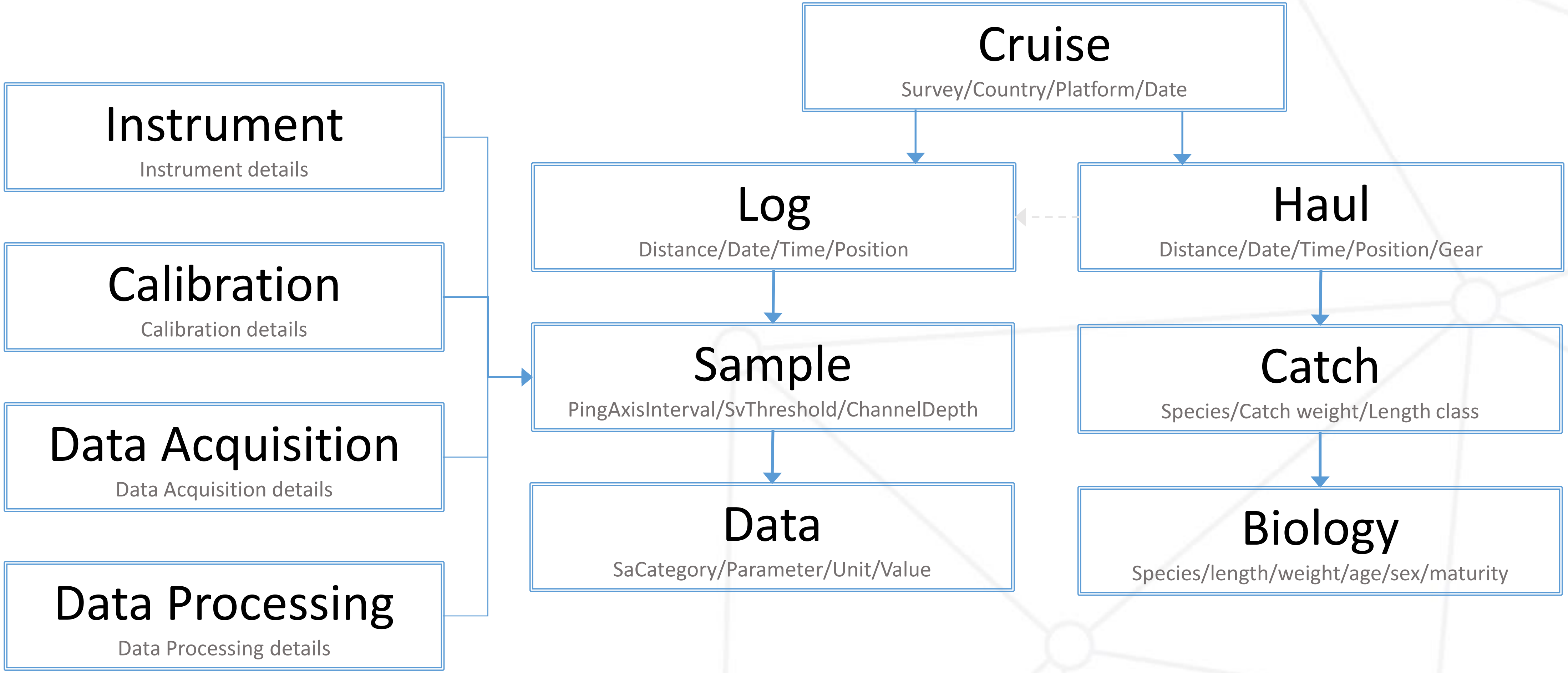
ICES
CIEM



Trawl data model



Acoustic Trawl data model



Science for sustainable seas

AtlantOS Project page at ICES

- Project page
  - http://www.ices.dk/explore-us/projects/pages/atlantos.aspx
- Acoustic Specification document
  - http://www.ices.dk/marine-data/documents/specification%20of%20the%20acoustic%20database.docx

WGBIFS March 2016

ICES CIEM

To discuss the current Acoustic data content and hierarchy

- Are you able to supply the mandatory fields?
- Are the content fields (mandatory as optional) sufficient?
- Is the hierarchy appropriate?

Science for sustainable seas

Thanks for your attention

Science for sustainable seas

Large Fish Indicator (LFI) and Mean Maximum Length (MML)

Rainer Oeberst

WGBIFS 2016

THÜNEN

ToR

ToR: Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators, (ToR l)

Discussions be mail:

Many scientists are working with LFI and MML
Data of BITS are used

What is the background of the assumption that WGBIFS can define methods within 2 or 3 days

Aim of Indicators

The **LFI** initially was developed by Greenstreet et al. 2011

The indicators **LFI** and **MML** are intended to reflect the status of the fish community

The **LFI** is sensitive and specific to fishing pressure (Houle et al., 2012) that truncates the upper end of the fish size spectrum (Sheldon et al., 1972).

Large Fish Indicator

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LFI is defined as the proportion by biomass of large fish in demersal trawl surveys, where fish are considered as large if they exceed a length threshold, for example, 40 cm (Greenstreet et al., 2011)

The **LFI** is sensitive and specific to fishing pressure (Houle et al., 2012) that truncates the upper end of the fish size spectrum (Sheldon et al., 1972)

LFI quantifies a **characteristic of marine food webs** that are slow to recover and often under intense pressure (WKGMSFDD4_II, 2015)

Large Fish Indicator

The indicator is dependent on different parameters

- List of species taken into account
- Defined length limit
- Area which is taken into account (different spatial distribution pattern of species taken into account
- Variability of the abundance of new year classes
- Human activities – change in the fishing activity can results in changing LFI

Mean Maximum Length

MML is calculated as the average maximum potential length of individuals making up a community and takes no account of length of individuals at the time of sampling

although it is a community indicator it does reflect a shift in species composition (WKGMSFDD3 Final Report)

The method needs unbiased estimates of L_{∞} for all species taken into account which requires unbiased and validated age length data
(not available for species sampled during BITS)

Analyses

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LFI was adapted to the Baltic Sea by Oesterwind et al. (2013) due to

mainly lower diversity of marine fish species and lower mean length of marine commercial fish species in the Baltic Sea.

Furthermore, strong environmental gradients from West to East, e.g. salinity, the fish communities occur in the Baltic Sea.

BITS 2001 – 2011, 900 fishing stations of BITS
Used demersal, commercially important species:
cod, dab, flounder, whiting, plaice, turbot, brill and sole

species representing more than 98% of the biomass

Analyses

Assessment and advice is avialable for most species

cod is the dominating species; cod makes up

71% (±5%) of the biomass of individuals larger 20 cm,

86% (±3%) of biomass larger 30 cm and

96% (±1%) of biomass larger 40 cm

Conclusion:

There is no agreed upon boundary for Good Environmental Status (GES) of **LFI** in the Baltic Sea

Analyses

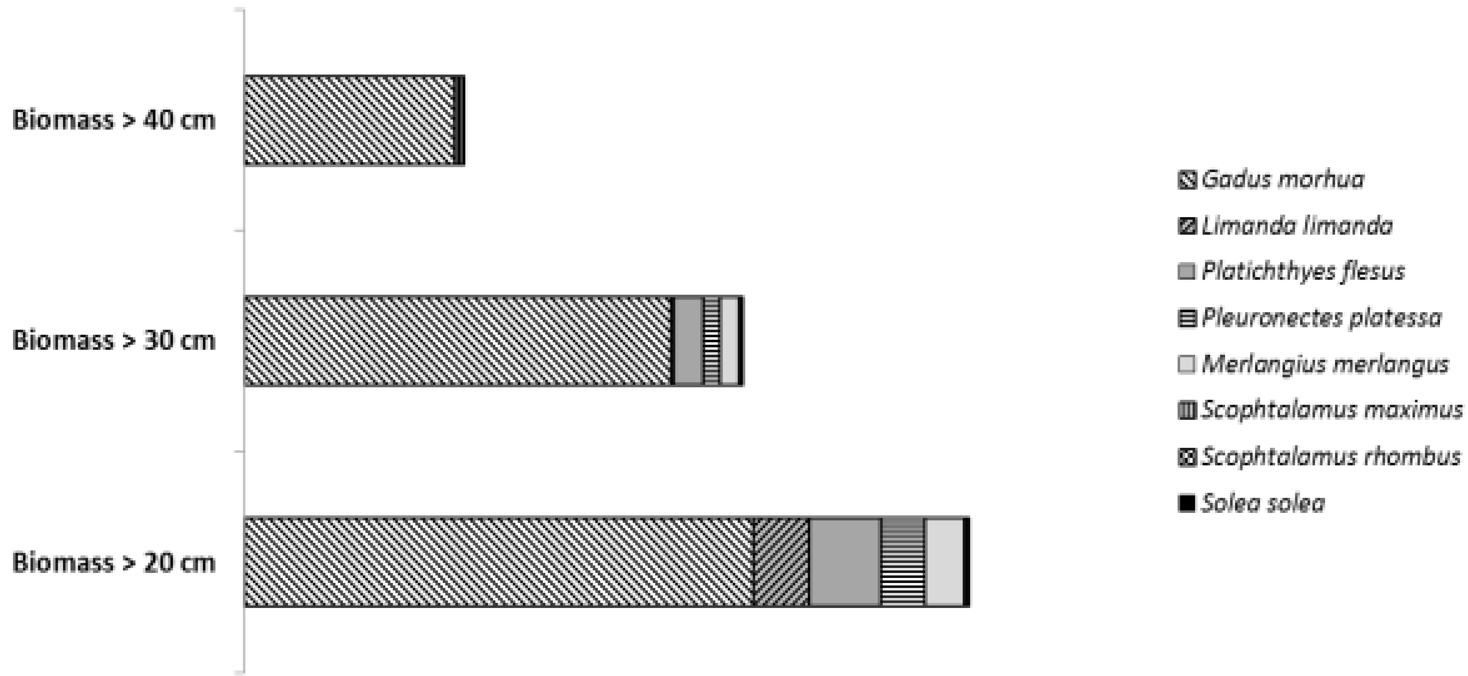

Figure 7. *Species biomass in percentage of the eight selected demersal fish species, concerning the different length classes caught during the Baltic International Trawl Survey in Quarter 1 between 2001 and 2011 in SD 22-24 (Oesterwind et al., in prep).*

Conclusions

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MML is not suitable for the Baltic Sea due to missing validated age data

FLI is dependent on the defined length limit and the used species composition. Therefore, different defined LFI can produce different assessments of development

Defined **LFI** is influenced by the gradient of hydrographical conditions from west to east which can significantly influence the spatial distribution and the species composition of analysed species .

It is necessary to be careful with the interpretation of the **LFI**

Conclusions

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ToR: Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators, (ToR l)

No idea for definitions

Doors for TVS

Rainer Oeberst, WGBIFS 2016

Different information in the BITS manual concerning the doors for TVS

The doors are used by Solea, Darius and Estonian commercial cutter

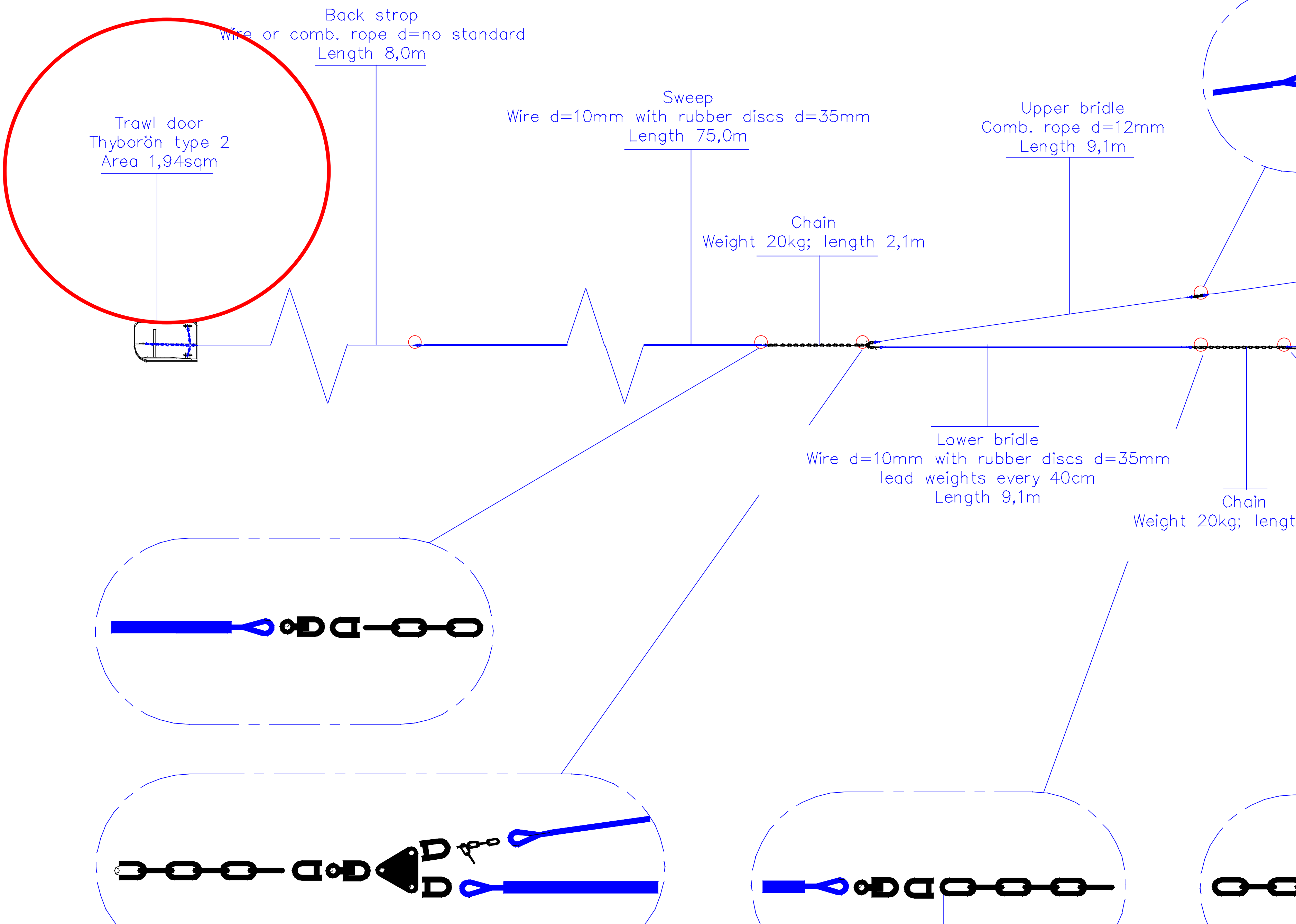
3#520

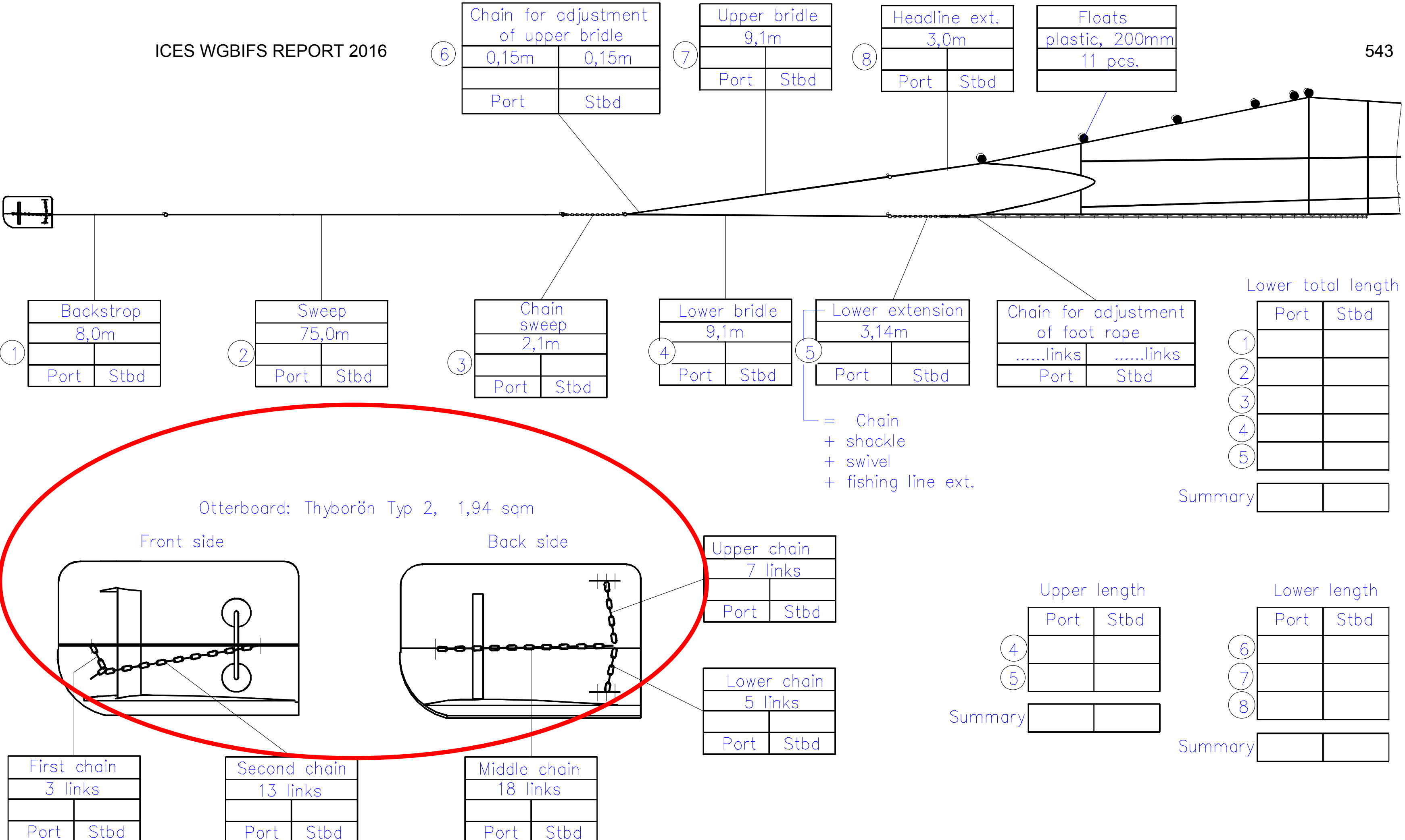
List

International Standard Trawl for Baltic Demersal Surveys

Note: In this list, the term weight is used for mass and the unit is kg.

	No	Item	Description	Size
Trawl doors				
	2	Doors	Cambered V-doors, Type: Thyborøn Trawl Doors Type 2	1.78 m^2 (63 inch) Weight 235 kg


Back strop
Wire or comb. rope d=no standard
Length 8,0m
Trawl door
Thyborön type 2
Area 1,94sqm
Sweep
Wire d=10mm with rubber discs d=35mm
Length 75,0m
Chain
Weight 20kg; length 2,1m
Upper bridle
Comb. rope d=12mm
Length 9,1m
Lower bridle
Wire d=10mm with rubber discs d=35mm
lead weights every 40cm
Length 9,1m
Chain
Weight 20kg;



Check list for rigging of trawl TV3-520x80

Which doors are used?

Information from Germany:
No change of the doors between inter-calibration experiments and now

Currently used doors by Germany:

Thyborön Type 2 with 1.78 m², 63 " and 205 kg

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The Latvian experimental research connected with the acoustic surveys and performed in the frames of the BONUS EEIG INSPIRE Project

Preliminary Calculations

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Species composition

$$f_i = \frac{1}{M}\sum_{k=1}^{M}\frac{n_{ik}}{N_k} \qquad f_i = \frac{\sum_{k=1}^{M} n_{ik}}{\sum_{k=1}^{M} N_k}$$

Length distribution

$$f_{ij} = \frac{1}{M_i}\sum_{k=1}^{M_i}\frac{n_{ijk}}{N_{ik}} \qquad f_{ij} = \frac{\sum_{k=1}^{M} n_{ijk}}{\sum_{k=1}^{M_i} N_{ik}}$$

Age distribution

$$f_a = \frac{1}{M}\sum_k f_{ak} \qquad f_a = \frac{\sum_{k=1}^{M} n_{ak}}{\sum_{k=1}^{M} N_k}$$

Weight distribution

$$w_a = \frac{1}{M}\sum_k w_{ak} \qquad w_a = \frac{\sum_{k=1}^{M} w_{ak} * n_{ak}}{\sum_{k=1}^{M} n_{ak}}$$

Mean target strength of fish in the ICES rectangle

$$<\sigma> = \sum_i f_i \sum_j f_{ij} * \sigma_{ij} \qquad <\sigma> = \frac{\sum_{k=1}^{M} \sum_i \sigma_{ij} * n_{ij}}{\sum_{k=1}^{M} \sum_i N_i}$$

Abundance estimation

$$N = \frac{Sa}{<\sigma>} * A$$

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Trawl No	NASC	[kg]	N_{spr}	N_{her}
1	168	230.65		230.65
2	127	121.31	0.06	107.38
3	1044	850.60		850.60
4	1104	1046.79	1046.54	
5	316	196.36	41.47	154.13
6	438	398.78	366.64	31.45
7	547	557.74	335.04	222.43
8	1911	1700.10	445.40	1254.70
9	309	88.72		86.46
10	193	592.03	592.03	
11	972	1620.00	1610.30	9.70
12	735	637.01	306.78	328.37
13	1266	1429.60	1429.60	
14	917	171.17	120.98	49.65
15	1032	539.20	305.69	232.49
16	121	199.78	145.79	53.92
17	574	222.44	194.22	28.00
18	1834	1834.00	1745.90	88.10
19	270	203.38	116.42	85.70
	R	**0.86**	**0.63**	**0.56**

WGBIFS - Rostock, Germany, 30.03-03.04.2016

Step 1: Calculations of Sa

Haul	Catch, kg	Measureings	Catch, N	Sa
	Spr	n_{spr}	N_{spr}	Sa_{spr}
1	Her	n_{her}	N_{her}	Sa_{her}
	Cod	n_{cod}	N_{cod}	Sa_{cod}
Total	**Total catch, kg**	**$\sum n$**	**$\sum N$**	**$\sum Sa$**
	Spr	n_{spr}	N_{spr}	Sa_{spr}
2	Her	n_{her}	N_{her}	Sa_{her}
	Cod	n_{cod}	N_{cod}	Sa_{cod}
Total	**Total catch, kg**	**$\sum n$**	**$\sum N$**	**$\sum Sa$**
	Spr	n_{spr}	N_{spr}	Sa_{spr}
3	Her	n_{her}	N_{her}	Sa_{her}
	Cod	n_{cod}	N_{cod}	Sa_{cod}
Total	**Total catch, kg**	**$\sum n$**	**$\sum N$**	**$\sum Sa$**

Step 1: Calculations of Sa

$$Sa_{(spr,her)} = \sum N_i \times 4\pi \times 10^{(-7.12)} \times {L_i}^2$$

$$Sa_{(cod)} = \sum N_i \times 4\pi \times 10^{(-6.75)} \times {L_i}^2$$

Step 2: Fish Number and Sa per catch calculations per rectangle

Total N in Catch in rect.	Total Sa in Catch in rect.
$N_{spr,tot=}N_{spr,tr1+}N_{spr,tr2+}N_{spr,tr3}$	$Sa_{spr,tot}=Sa_{spr,tr1}+Sa_{spr,tr2}+Sa_{spr,tr3}$
$N_{her,tot=}N_{her,tr1+}N_{her,tr2+}N_{her,tr3}$	$Sa_{her,tot}=Sa_{her,tr1}+Sa_{her,tr2}+Sa_{her,tr3}$
$N_{cod,tot=}N_{cod,tr1+}N_{cod,tr2+}N_{cod,tr3}$	$Sa_{cod,tot}=Sa_{cod,tr1}+Sa_{cod,tr2}+Sa_{cod,tr3}$
$\mathbf{N_{catch,tot=Nspr,tot+Nher,tot+Ncod,tot}}$	$\mathbf{Sa_{catch,tot}=Sa_{spr,tot}+Sa_{her,tot}+Sa_{cod,tot}}$

WGBIFS - Rostock, Germany, 30.03-03.04.2016

Step 3: Calculation of Coefficient

$$K = \frac{NASC_{rect.}}{Sa_{catch,tot}}$$

WGBIFS - Rostock, Germany, 30.03-03.04.2016

Step 4: Fish Abundance and Biomass Calculations

Abundance in rect.,mln	Biomass in rect.,tonn
$N_{spr.rect.} = N_{spr.tot.} \times K \times Area_{rect.}$	$N_{spr.rect.} = N_{spr.tot.\,.} \times K \times Area_{rect.}$
$N_{her.rect.} = N_{her.tot.} \times K \times Area_{rect.}$	$N_{her.rect.} = N_{her.tot.\,.} \times K \times Area_{rect.}$
$N_{cod.rect.} = N_{cod.tot.} \times K \times Area_{rect.}$	$N_{cod.rect.} = N_{cod.tot.} \times K \times Area_{rect.}$
$\mathbf{N_{tot.rect.} = N_{catch.tot.} \times K \times Area_{rect.}}$	$\mathbf{N_{tot.rect.} = N_{catch.tot.} \times K \times Area_{rect.}}$

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Spatial distribution of brill, cod, dab, flounder, plaice and turbot based on BITS in quarter 1 and 4 in 2015

Rainer Oeberst

WGBIFS 2016

CPUE per length per haul were downloaded from DATRAS in March 2016

CPUE of cod by station is given in units of TVL
CPUE of flatfish by station is given in units of used gear

Total length range were summarized to one value per haul

ODV was used to describe the spatial distribution of species

Weighted-average gridding was used to estimate the CPUE values for positions without sampling

Brill, Q1 2015 – total length range

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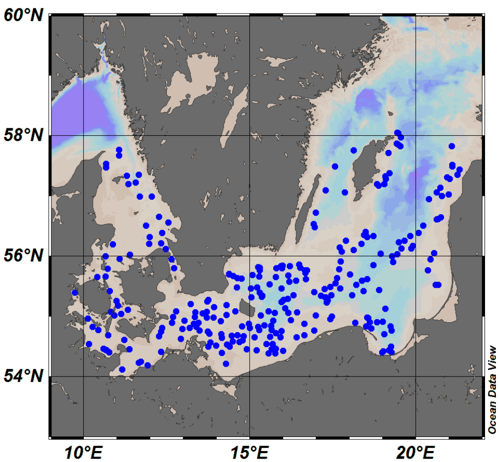
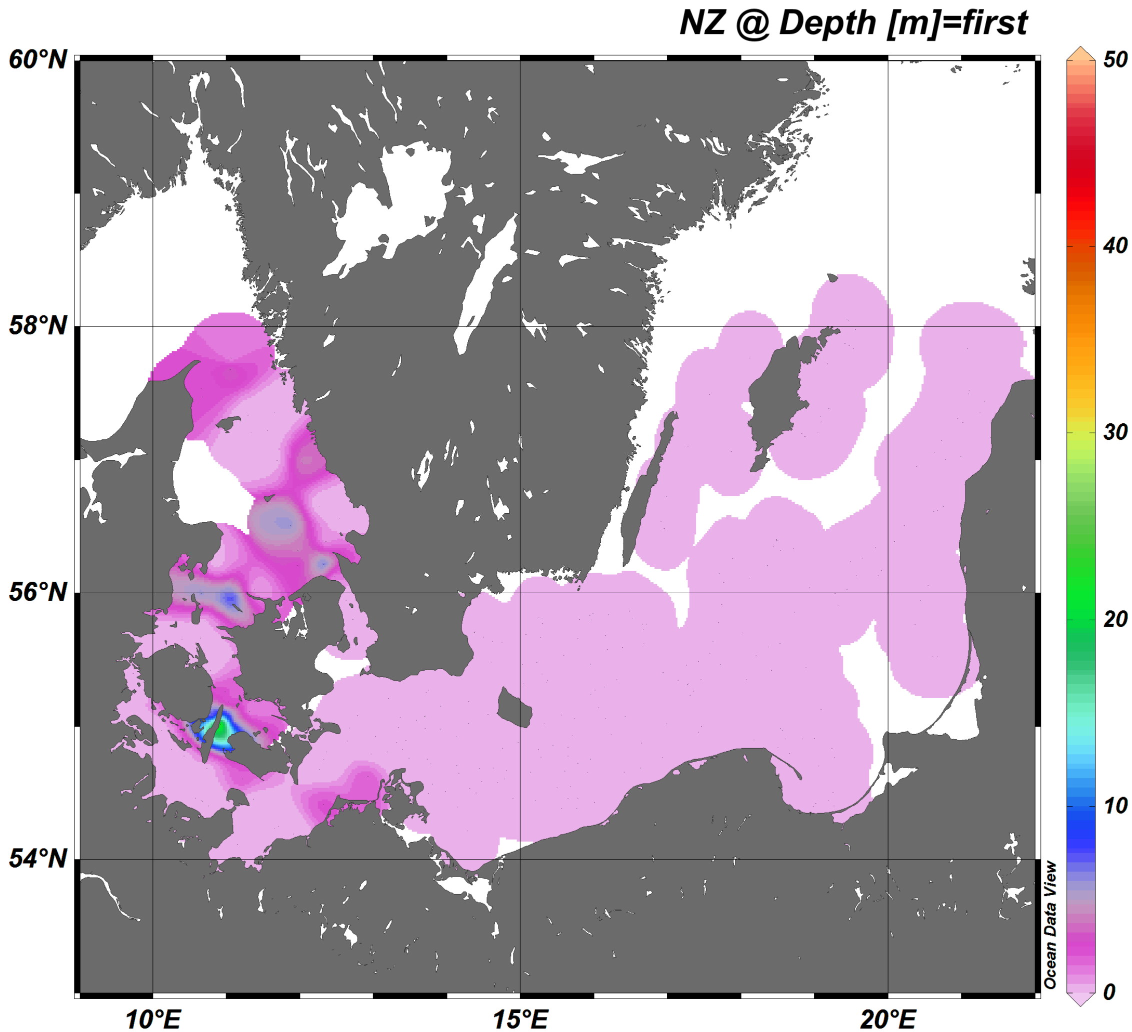
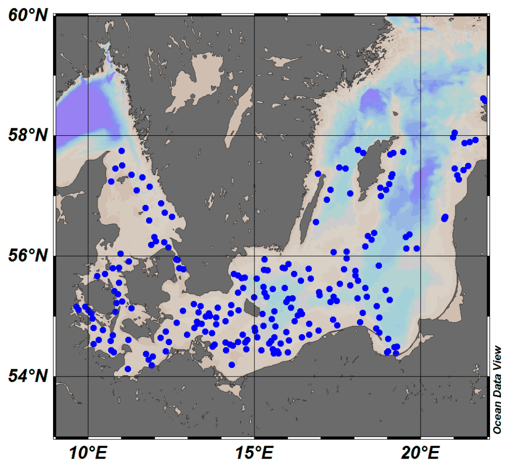
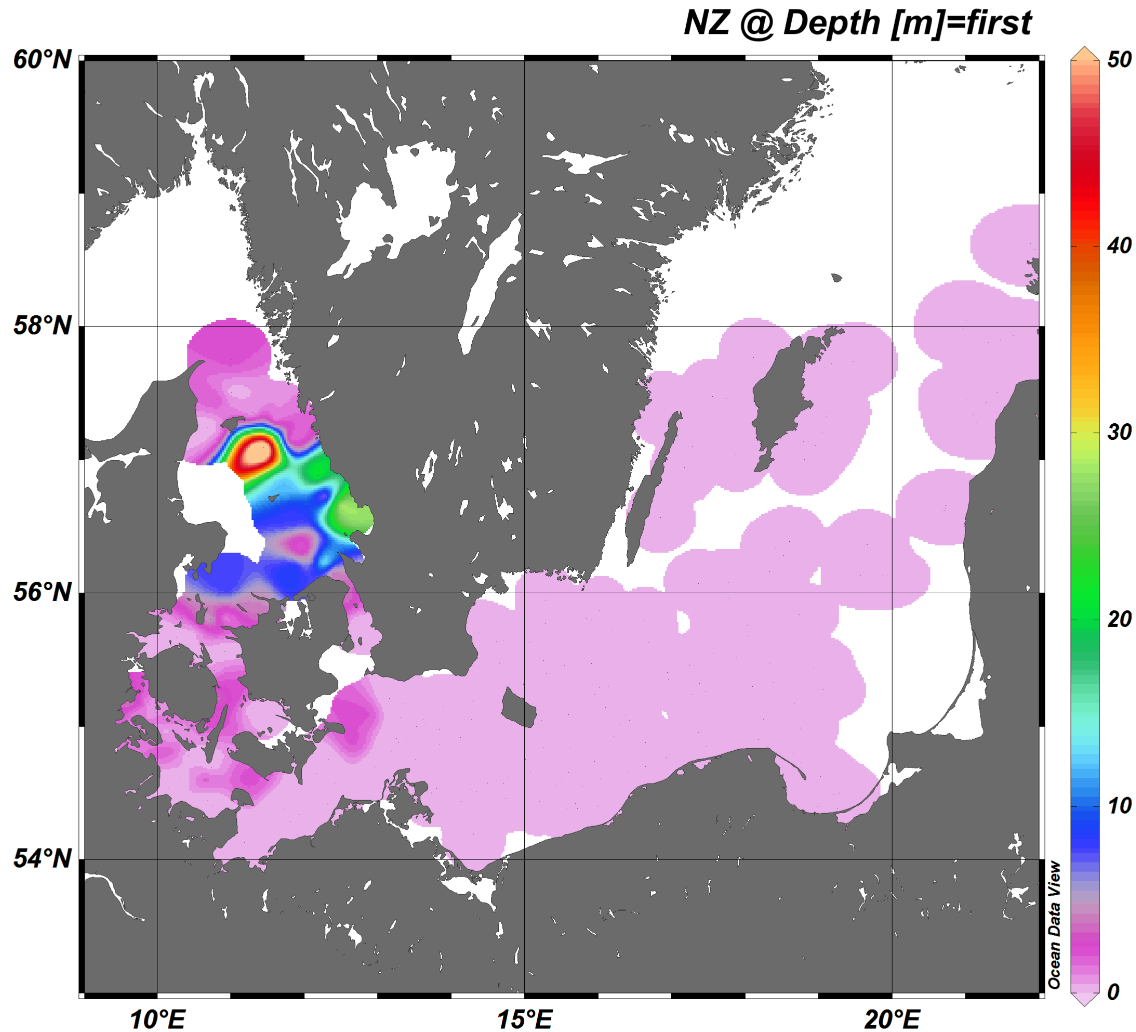




Brill, Q4 2015

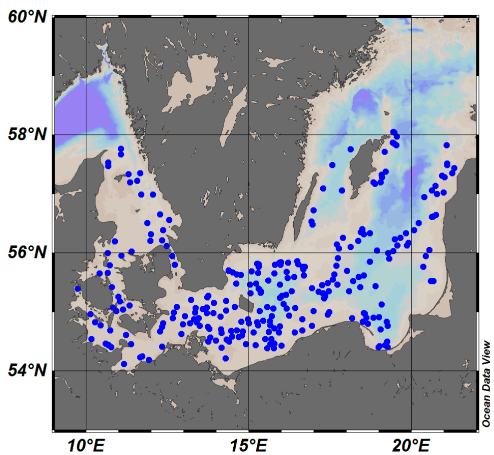
THÜNEN

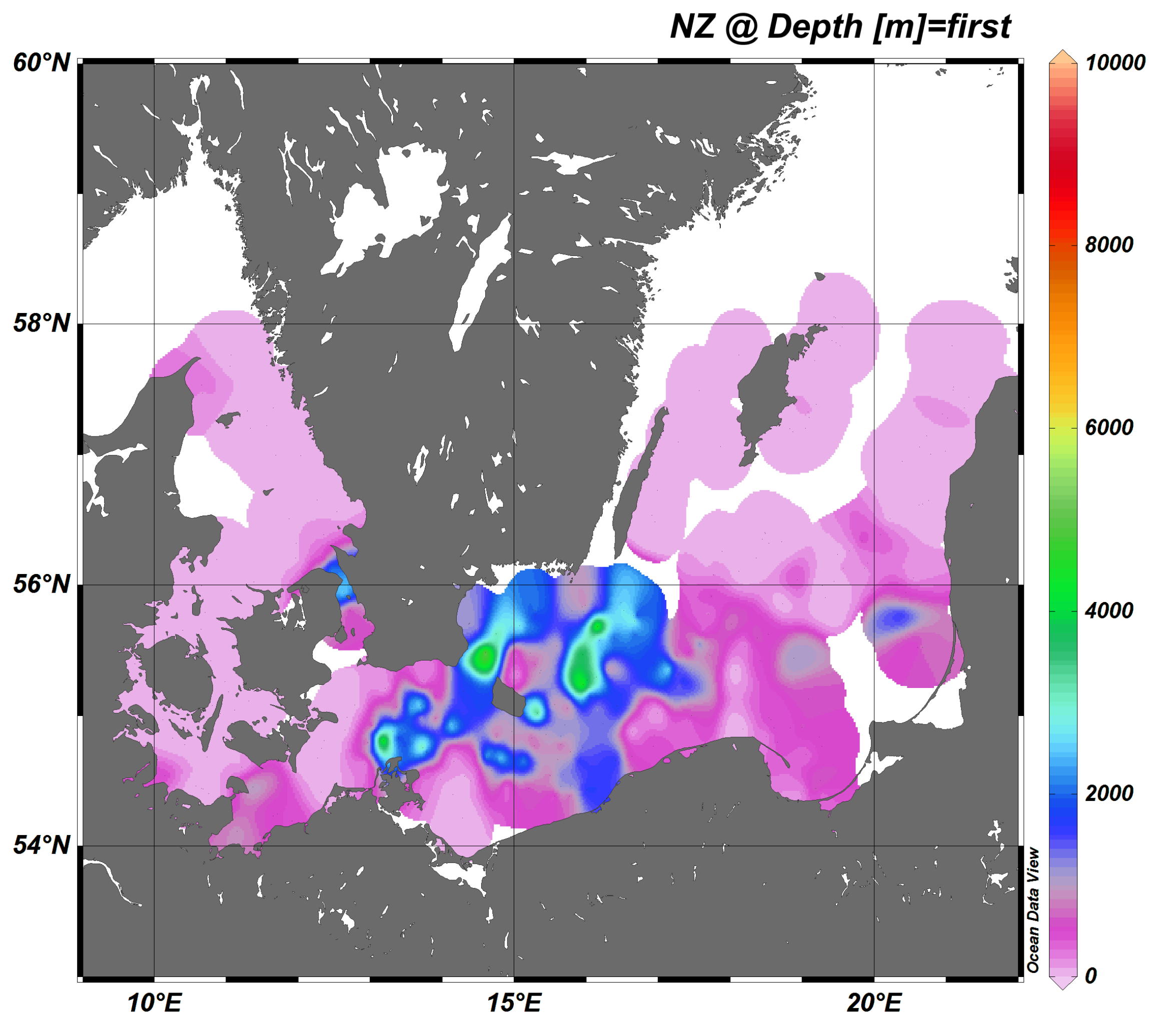




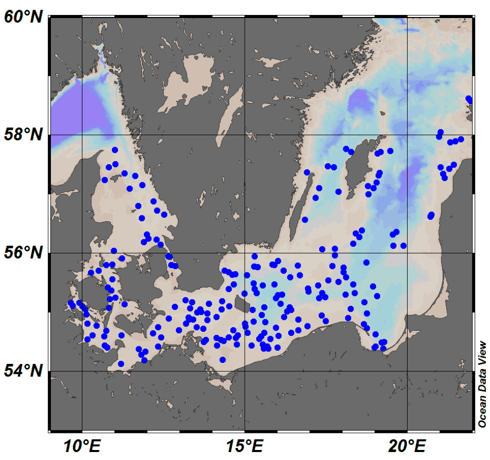
Cod, Q1 2015

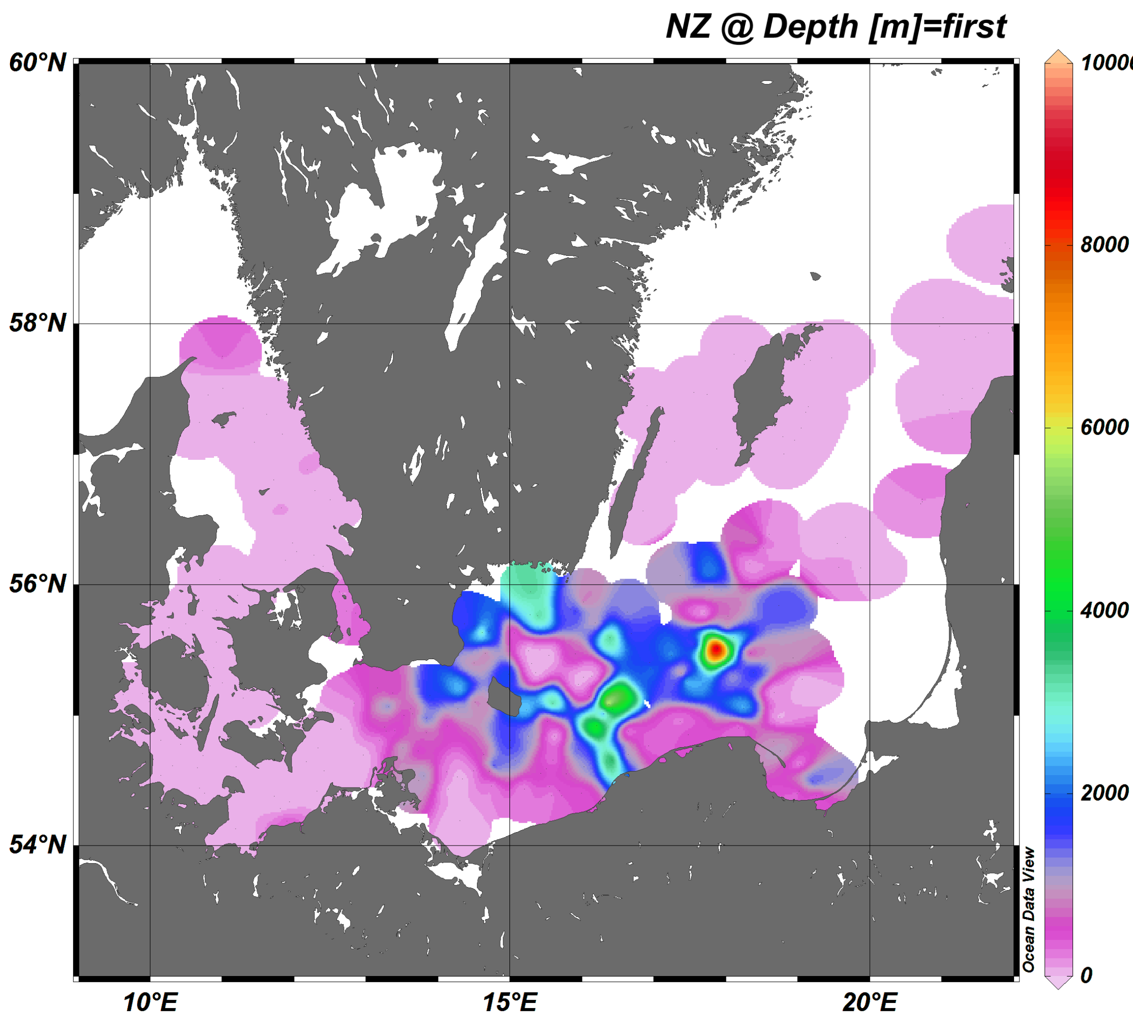
THÜNEN





Cod, Q4 2015


60°N
58°N
56°N
54°N
10°E
15°E
20°E
Ocean Data View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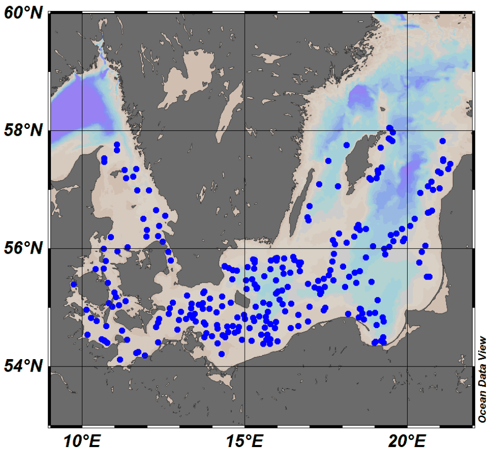
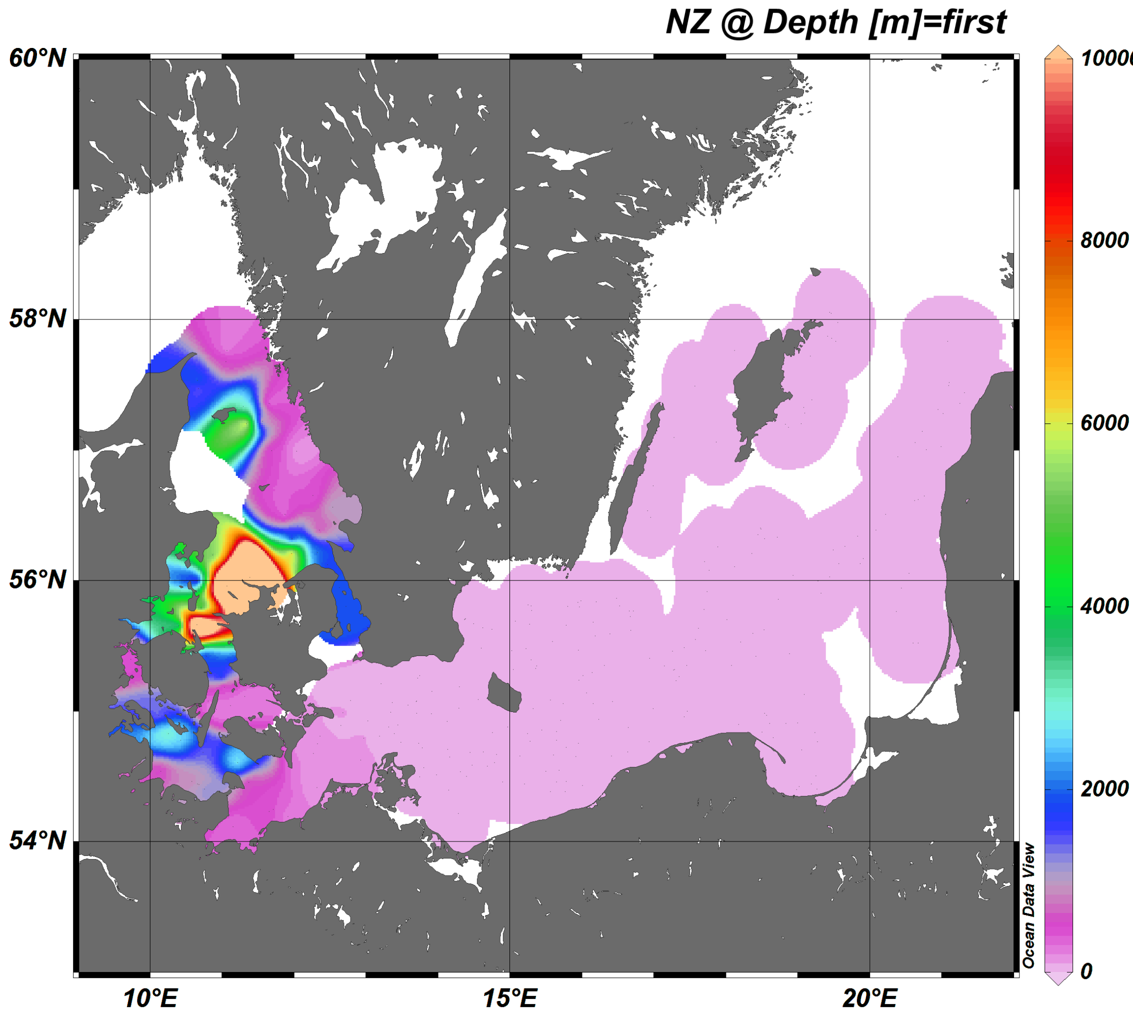
60°N
58°N
56°N
54°N
10°E
15°E
20°E
10000
8000
6000
4000
2000
0
Ocean Data View

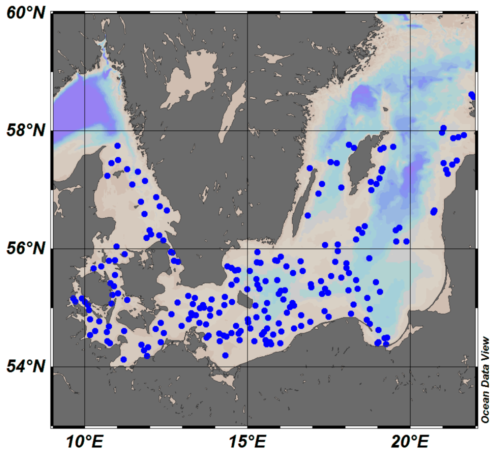
Dab, Q1 2015

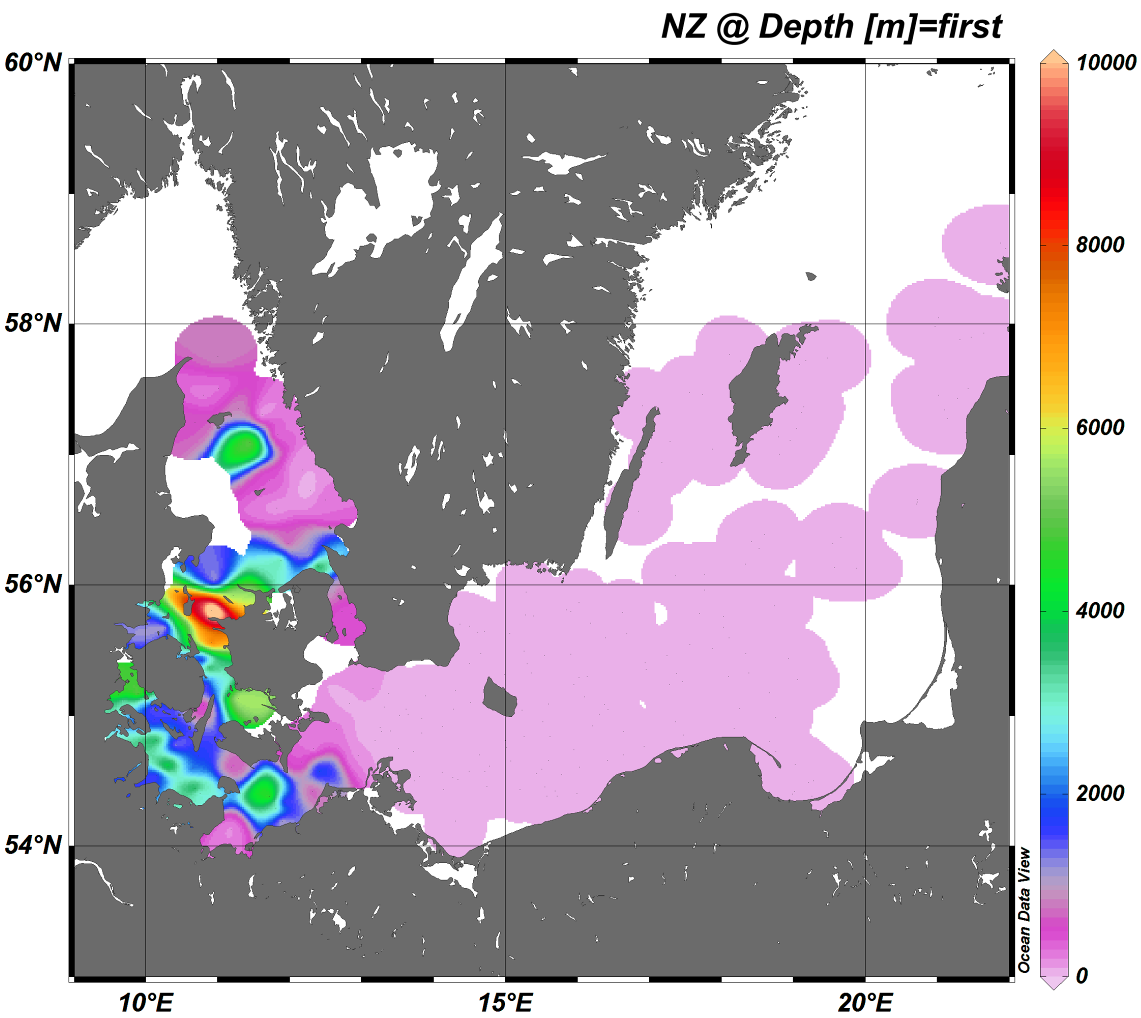

60°N
58°N
56°N
54°N
10°E
15°E
20°E
Ocean Data View


NZ @ Depth [m]=first
60°N
58°N
56°N
54°N
10°E
15°E
20°E
10000
8000
6000
4000
2000
0
Ocean Data View

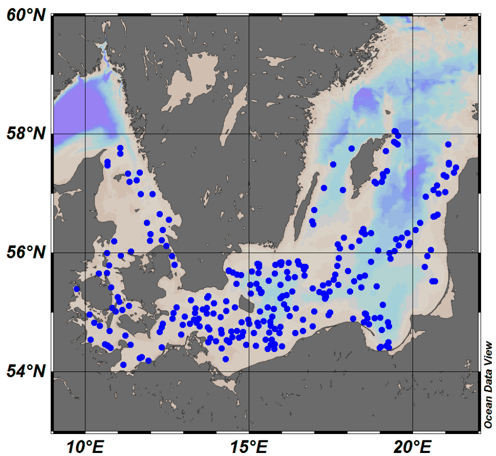
Dab, Q4 2015

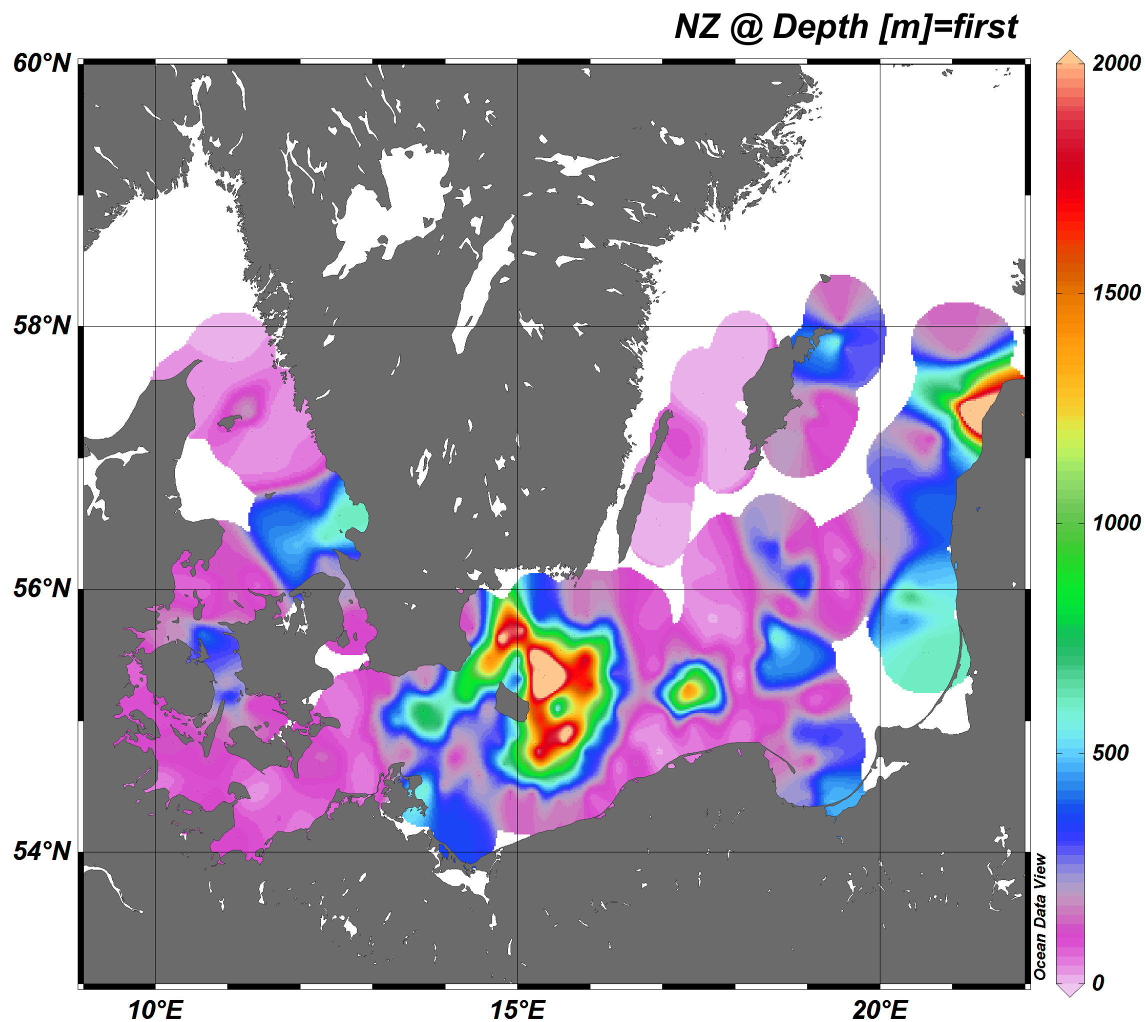
THÜNEN





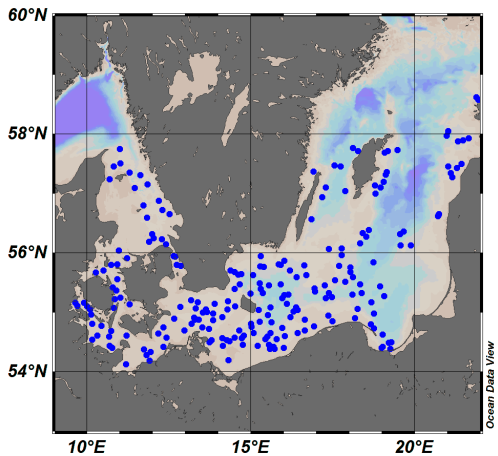
Flounder, Q1 2015

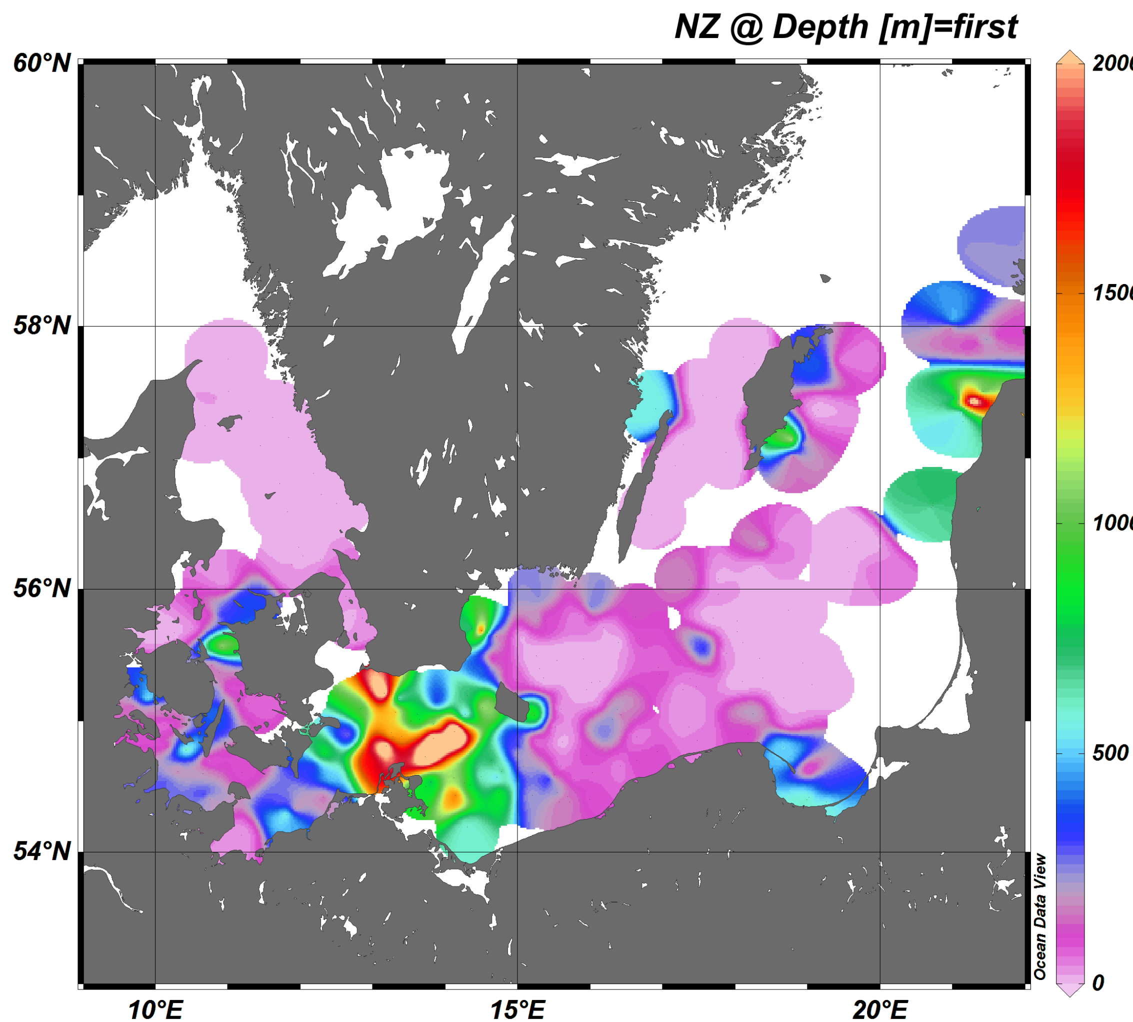




Flounder, Q4 2015

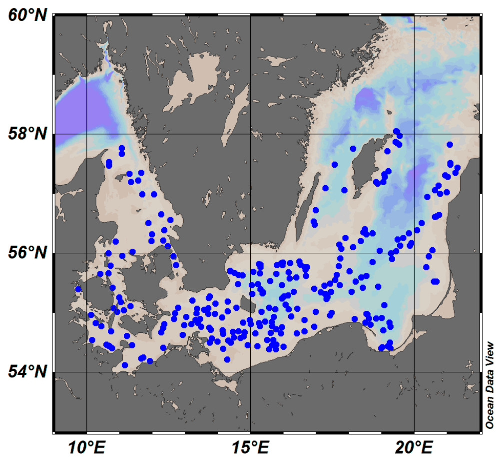
THÜNEN

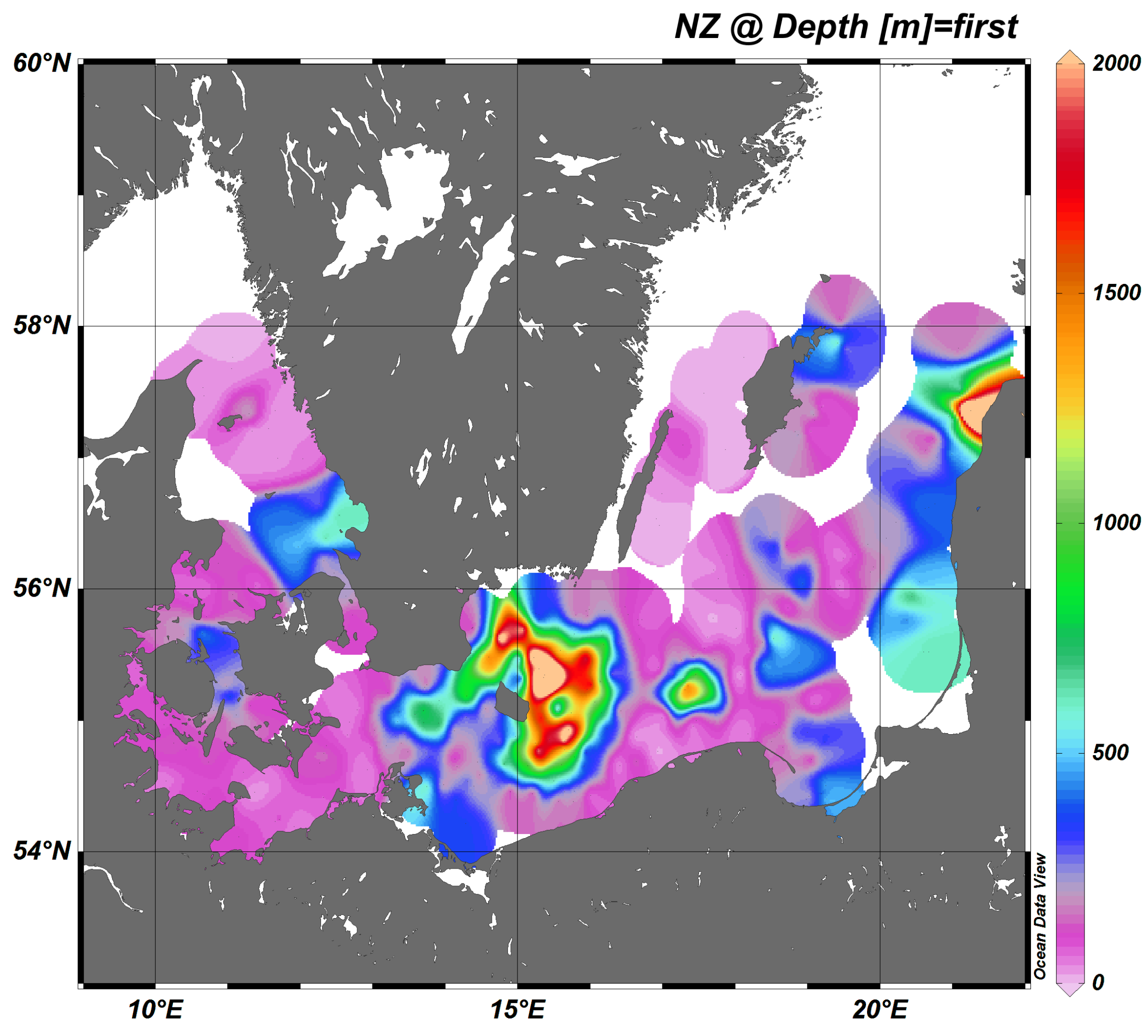




Plaice, Q1 2015

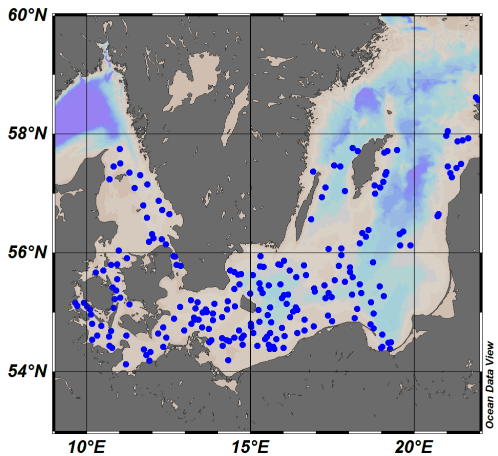
THÜNEN

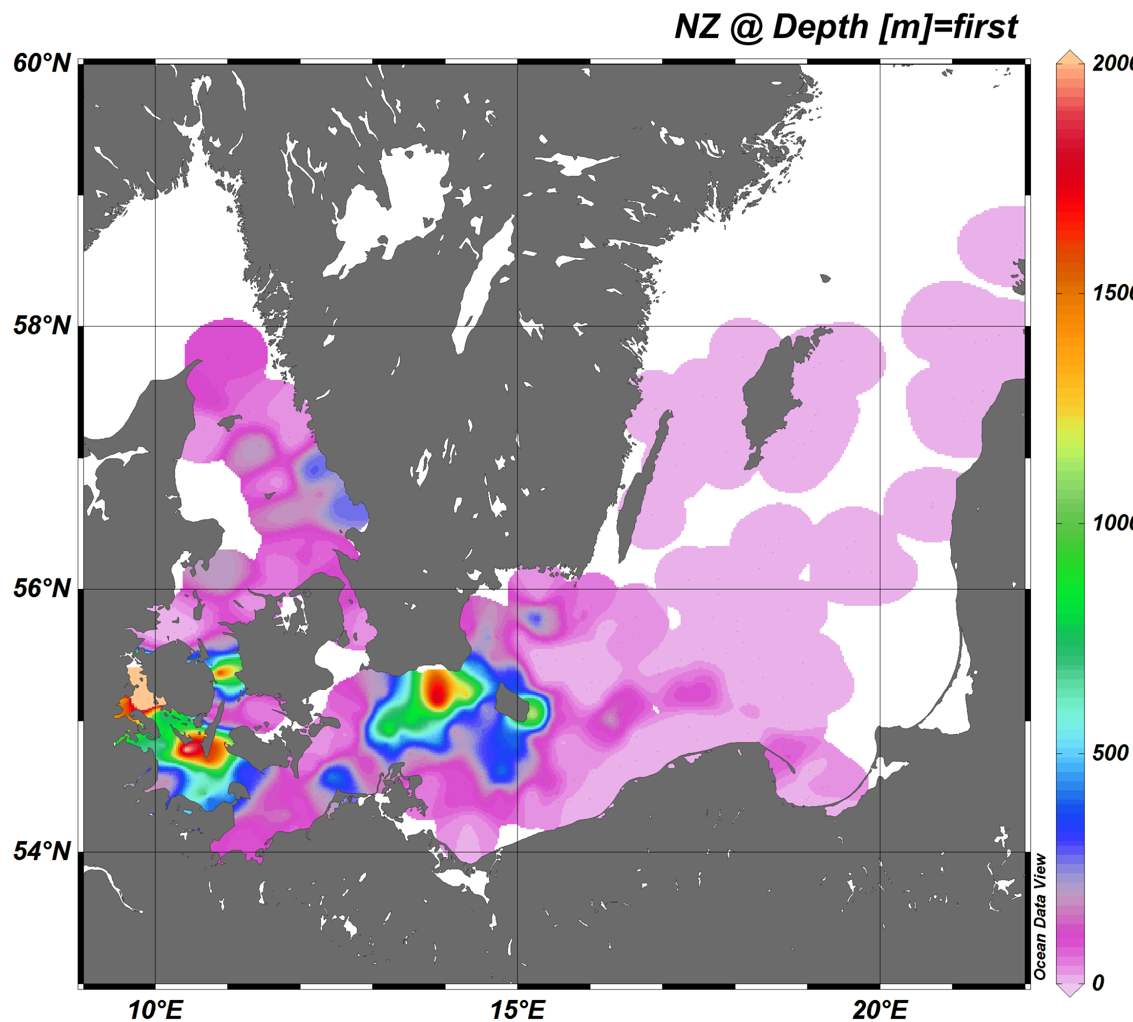




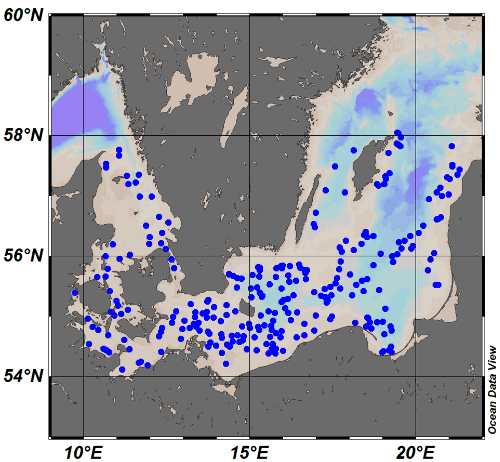
Plaice, Q42015

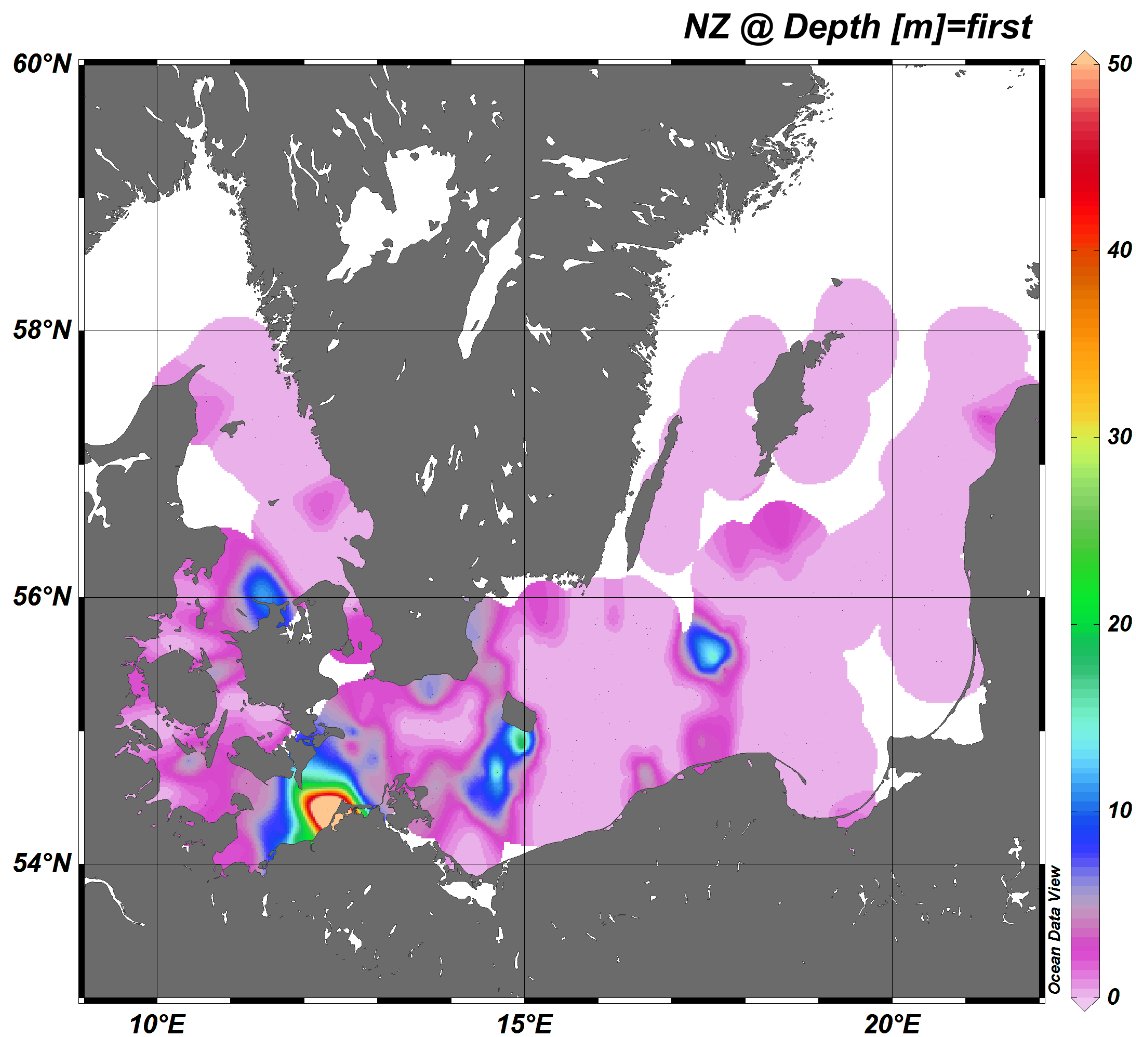
THÜNEN





Turbot, Q1 2015





Turbot, Q4 2015

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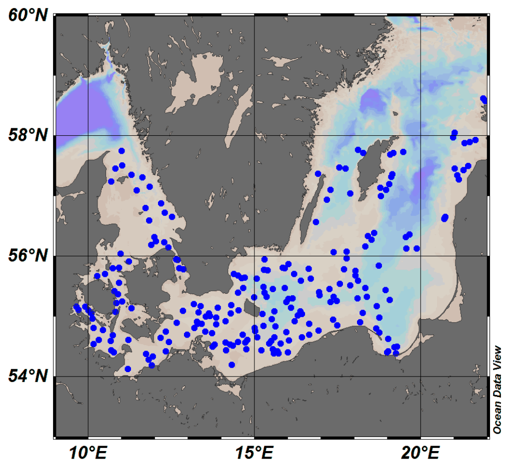
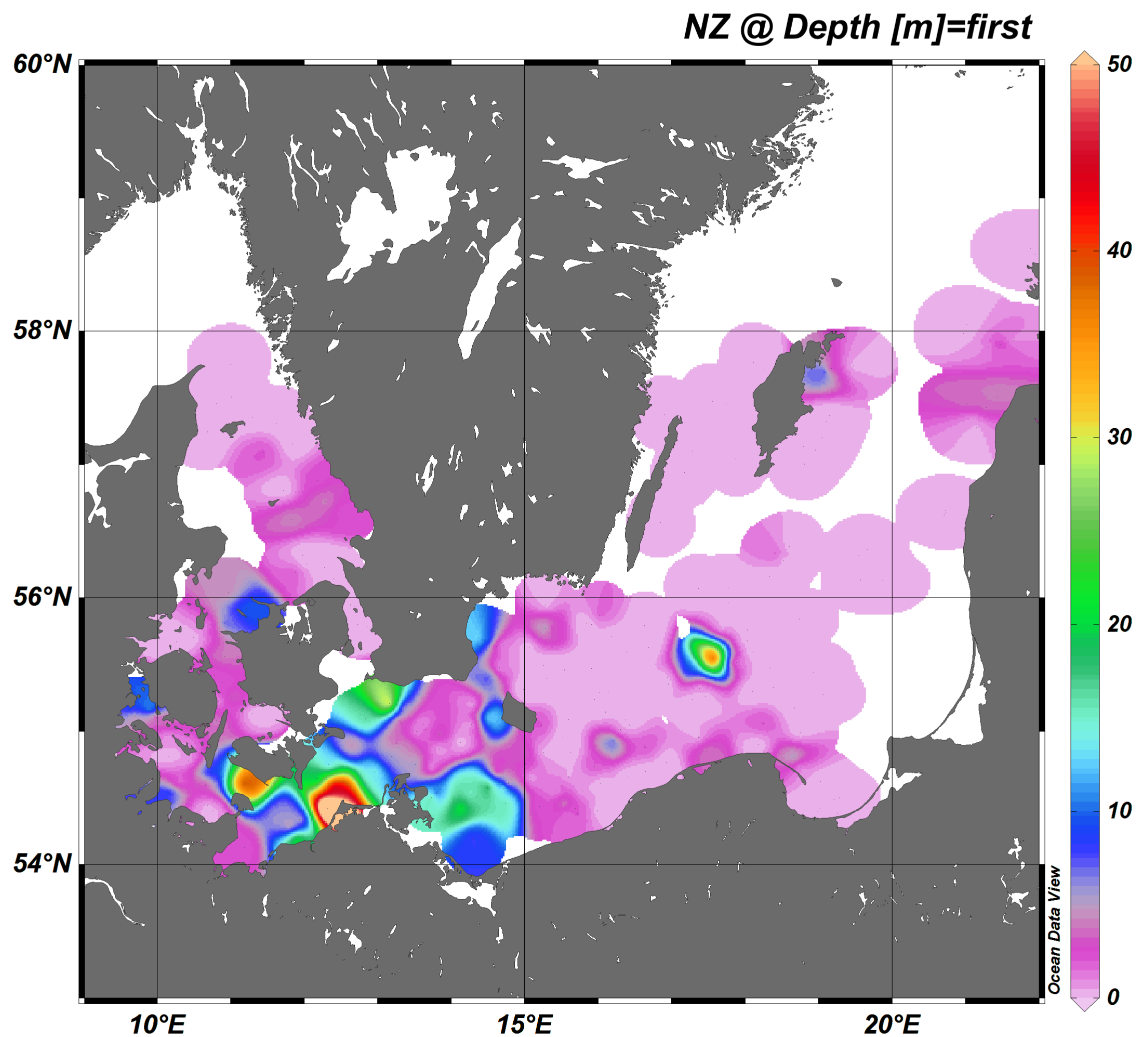




WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

What was done between consecutive WGBIFS meetings? The ToRs assigned on the WGBIFS-2016 meeting

Włodzimierz Grygiel (NMFRI, Gdynia - Poland)

What was done between consecutive WGBIFS meetings?

1) The First Interim Report of the WGBIFS-2015 meeting delivered on time to the ICES SCICOM/ACOM, composed from:

- 622 pages of the text, incl. 22 Annexes,
- description of 11 Terms of References,
- discussion and reply on 8 additional, non-routine ToRs, i.e. inquires from 4 other ICES expert groups (WGBIOP, WGBEAM, WGSAM, WGBFAS).

2) Outcomes from the Baltic fishery independent research surveys (BITS-1q, BITS-4q, BASS, BIAS) – uploaded to ICES databases were used by WGBFAS as input data in the fish stocks size assessment.

3) The overview concern results and recommendations from recent BITS, BASS and BIAS surveys, relevant for WGBFAS - the subject of presentation made by chair at the WGBFAS annual meeting.

cont. What was done between consecutive WGBIFS meetings?

The official letter prepared (03.06.2015) by General Secretary of ICES with cooperation of the WGBIFS chair was sent **to the Russian Delegate to ICES** and directors of the Institute AtlantNIRO in Kaliningrad and the Institute GostNIORH in St. Petersburg, and the Russian SCICOM member.

"I am therefore writing to you with a request to reconsider the indispensable participation of Russia in the Baltic International Trawl Surveys and at least the Baltic International Acoustic Survey for 2015 and beyond".

Response from the Russian Delegate to ICES (10.08.2015):

According to information provided by AtlantNIRO its vessel participated in a trawl-acoustic survey in the Baltic Sea in June 2015. In 2016 they plan one survey under the ICES programme in the Baltic Sea. Preliminarily this would be a trawl survey of demersal fish in February-March. However, it may be that a standard acoustic survey of pelagic stocks would be carried out instead either in May or October 2016.

cont. What was done between consecutive WGBIFS meetings?

A small group of WGBIFS members (incl. chairman) have been asked for **revision the BITS and IBAS manuals**, accordingly to suggestions made by reviewers.

Manuals were checked, however some details needs to be verified and supplemented during ongoing WGBIFS session, e.g. discrepancy between the text of manual vs. DATRAS, and technical parameters of ground trawls used by the Danish vessels.

Workshop on the review of the ICES acoustic-trawl survey database design (WKIACTDB) held on 1-2 Oct. 2015 in Copenhagen (chaired by Neil Holdsworth and Nils Olav Handegard) and some relations to the AtlantOS project *(Optimizing and Enhancing the Integrated Atlantic Ocean Observing System)*.

Danish request (26.10.2015) **about an advice concerns selection of the proper trawl doors for the small TV-3,** planned to use on board of the new r/v Havfisken II. Which type of trawl doors is proper one: the 63” inches (1.78 m^2 and 205 kg) or the 66” (1.94 m^2 and 230 kg), i.e. this one suggested by the BITS Manual, the ISDBITS project report (2001) or the Danish enterprise? Verification is needed in the BITS Manual.

cont. What was done between consecutive WGBIFS meetings?

Some WGBIFS members have been asked for fill in tables in the “Questionnaire on stomach sampling programs” (the fishPi project). The needed meta-data were transferred (e.g. by Poland) to coordinator of the project.

In order to standardize the pelagic gears applied in BIAS and BASS surveys - the WGBIFS members have been asked (January 2016) for submission the technical-scheme of national fishing gear used in the a.m. surveys.

The discrepancy in CatCatchWeights data in the DATRAS (HL record), resulted from various weight units used in 1990s – 2006 and in the recent years for submission the BITS surveys data to the DATRAS. The Excel table, accessible at the WGBIFS-2016 SharePoint, summing up information from some countries that uploaded the data to the DATRAS.

cont. What was done between consecutive WGBIFS meetings?

N.-O. Handegard - chair of Steering Group on Integrated Ecosystem Observation and Monitoring (SSGIEOM -ICES) requested (Nov. 2015) chairs of the fisheries-independent surveys expert groups about comments on the EFARO-ICES Pilot Survey New Initiative, which was provoked by following reasons:

- „In relation to the total cost of ICES advice most of the money is spent on data collection (ca. 95%), few on processing and using this data (ca. 5%) and only <1% on developing the advice".
- „Most of the fisheries-independent research surveys were designed 20-50 years ago…"
- In terms of moving forward, WGISUR (Working Group on Integrating Survey for the Ecosystem Approach) have identified two scenarios of proposed future works design:

i) the *denovo* design of purpose built ecosystem survey: abandonment of current monitoring approach,

ii) the adoption of current fisheries surveys to include additional objectives.

Currently several initiatives within ICES to start looking on the research surveys and what they deliver; see the reports from WGISUR, WKSUREQ, PGDATA, WGISDAA.

Comments from WGBIFS chair (26.11.2015):

- in fact, the EU and the national Institutes budgets are spent for the Baltic fish research surveys realization but, not the ICES budget is used for this works, however, in fact the public money are utilised,
- the materials collected during the surveys are utilized for many others studies and experiments at national and international level, without additional costs,
- the methods, research devices on board of vessels, professionalism of research team and sampling intensities, internationally harmonized, were much improved in time; having consistent time series of data from BITS or BIAS surveys for trend analyses and assessment of fish stocks it is a great gain from surveys,
- the *denovo* design of these surveys is to much revolutionary and from two proposals indicated by WGISUR, the second one can be acceptable and in fact from many years, some vessels realized more or less integrated ecosystem monitoring in the framework of BITS and BIAS surveys.

cont. What was done between consecutive WGBIFS meetings?

Some information from WGCHAIRS-2016 Meeting:

a) DATRAS ref. to fish trawl surveys in NE Atlantic, Baltic Sea, North Sea, Irish Sea, Bay of Biscay, and contain data about CPUE, length, age and maturity of main fish species from 70 000 stations monitored from 51 years, starting from 1965 up to present. Data are accessible at website: *datras.ices.dk*

b) *ad hoc* meeting of the ICES Secretariat Data Center employees, incl. Neil Holdsworth (manager) and the WGBIFS chair for discussing the logistic aspects of some ToRs dedicated on ongoing WGBIFS meeting,

c) an opinion – the EGs have been very good at addressing the ToRs related to advisory tasks but less on other ToRs,

d) Scientific, Technical and Economic Committee for Fisheries (STECF) – 2015 comments on end-user feedback:

- end-user (incl. experts groups) should specify:
  - which data were requested but not provided,
  - the impact on the assessment,
  - which action is required,
- end-users (incl. WGs) should specifically address the country the crash applies to and apply the comment exclusively to the relevant country.

cont. What was done between consecutive WGBIFS meetings?

Proposals, which are originated from the Working Group on Integrating Survey for the Ecosystem Approach (WGISUR 2014 Meeting) and developed at the **Planning Group on Data Needs for Assessments and Advice (PGDATA) - 2016 Meeting**:

- to join various WGs, which working on the same main topic in different seas, e.g. WGs involved with planning, coordinating and assessing the results of fish catching with research bottom trawls in NE Atlantic, Baltic Sea, North Sea, Irish Sea, Bay of Biscay,
- the fish control-hauls needs to be shortened for 15 minutes each and instead of spared time about 10% more hauls can be realised in given survey – the proposal will be developed on the WKCOSTBEN (end of June 2016),
- the BITS control-catches in many cases (e.g. assigned to the r/v „Dana” 4Q-2015) were too close to each other, which only increased the costs of realizations of not improved knowledge about the distribution of fish,
- 2, NEA cod otoliths per 5-cm length-class per station bin suffice for ALK – conclusion based on Norwegian investigations.

On 01 Feb. 2016, was activated as obligatory, the Regulation originated from 21 March 1991, which concerns the Polish Marine Waters and the Maritime Administration, and in details among-others decision, that:

- the Polish administrative observer must be present on board of the foreign research vessels during researches, particularly fishing operations in our waters.

The current ToRs and additional tasks dedicated on the WGBIFS-2016 meeting

WGBIFS Interim report by 16 May 2016 to SSGIEOM, SCICOM and ACOM: response on 12 fixed (standard) ToRs, and a few additional inquires.

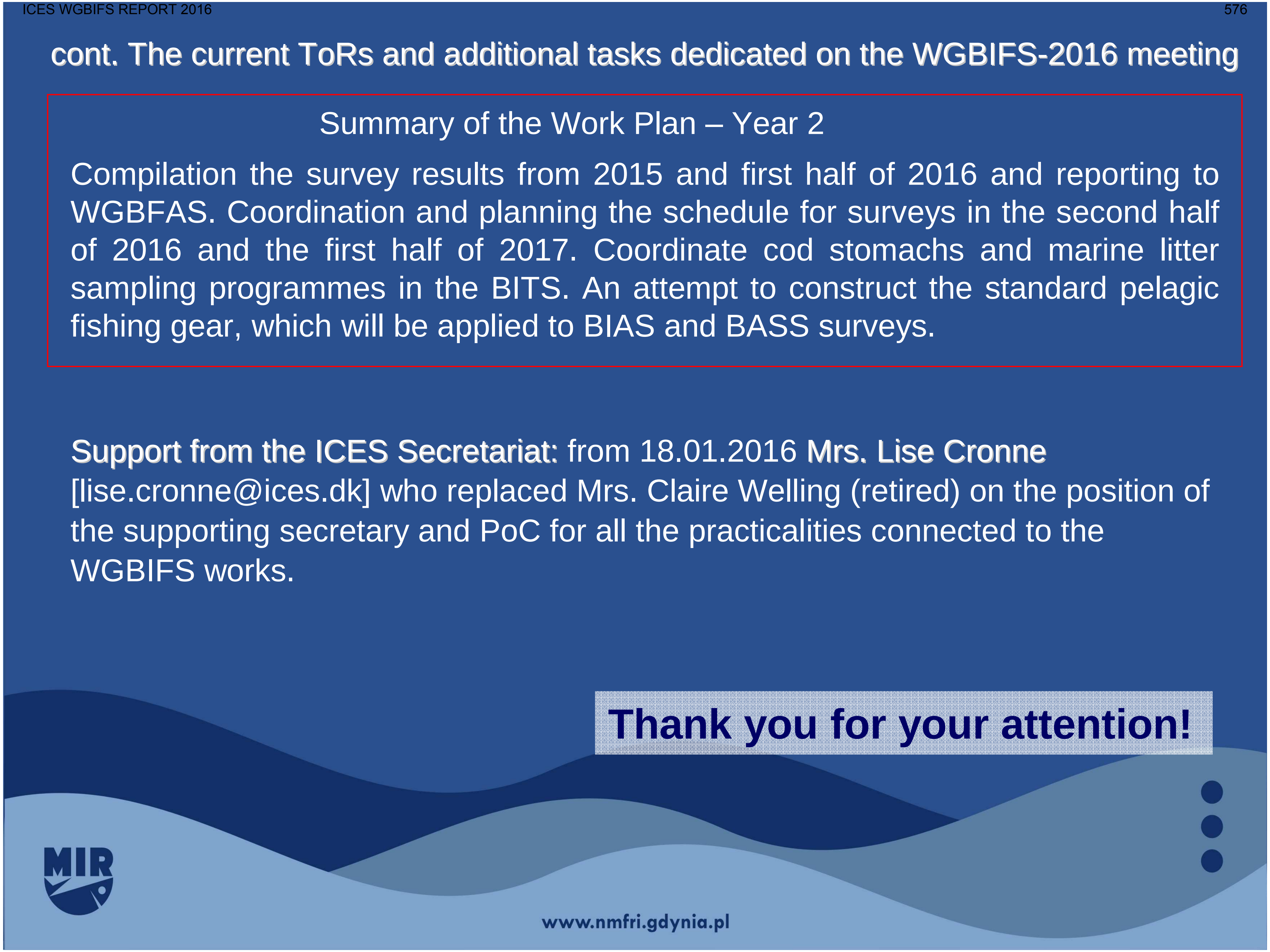
TOR	Description	Background	Science plan topics addressed	Duration	Expected deliverables
a	Combine and analyse the results of spring and autumn acoustic surveys and experiments	Acoustic surveys provide important fishery-independent stock estimates for Baltic herring and sprat stocks		Year 1, 2 and 3	Updated 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

cont. The current ToRs and additional tasks dedicated on the WGBIFS-2016 meeting

Additional tasks originated from WGBFAS (2015 meeting):
"To produce maps showing the abundance and biomass distribution of all size groups of Baltic cod, flounder and plaice in the previous two seasons (BITS surveys data)"
"To produce maps showing the distribution of cod, flounder, plaice, turbot, dab and brill stocks abundance (age group 1) index from BITS surveys"

Other topics proposed to consideration at WGBIFS-2016 meeting please find in the folders **Agenda of WGBIFS**, and **Allocation of tasks** or **WGBIFS 2016 time-schedule**.

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 multispecies approach. Collected and registered information about the marine litter (mostly anthropogenic origin), occasionally appeared in the ground trawl fish control-catches, are additional source of data about present ecological status of marine seabed in investigated areas of the Baltic.	Year 1, 2 and 3	Coordinated cod stomachs and marine litter sampling programmes in the Baltic International Trawl Survey (BITS).
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.
l	Define methods for the appropriate processing of the survey data and output products from the BITS survey to fee the Baltic LFI and MML indicators	The 2nd holistic assessment of the Baltic Sea by HELCOM will draw on ICES competence to provide D3 indicators; through the BalticBoost project the ICES Data Centre is given resources to implement the indicators based on an appropriate methodology to be defined by WGBIFS as the survey experts.	Year 2	Processing method for BITS survey data including any caveats to its use and applicability to the indicators.


cont. The current ToRs and additional tasks dedicated on the WGBIFS-2016 meeting
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 the second half of 2016 and the first half of 2017. Coordinate cod stomachs and marine litter sampling programmes in the BITS. An attempt to construct the standard pelagic fishing gear, which will be applied to BIAS and BASS surveys.
Support from the ICES Secretariat: from 18.01.2016 Mrs. Lise Cronne [lise.cronne@ices.dk] who replaced Mrs. Claire Welling (retired) on the position of the supporting secretary and PoC for all the practicalities connected to the WGBIFS works.
Thank you for your attention!
MIR
www.nmfri.gdynia.pl

ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The logistic aspects of the WGBIFS-2016 meeting. A few facts from the history of Rostock city

Włodzimierz Grygiel (NMFRI, Gdynia - Poland)

Participants of the meeting: respected 29 persons incl. 7 attendees for a part-time only.
Timing of the WGBIFS meeting: 30.03. – 03.04.2016

Time-schedule of the meeting:

- on 30.03.2016, from 10:00 to 17:30 o'clock,
- on 31.03. – 03.04.2016, from 9:00 to 17:00 o'clock,
- coffee breaks: the 1st at 10:30-10:50 and the 2nd one at 15:00-15:20,
- lunch break at 12:30-13:30,
- meeting will be finalised on 03.04.2016 at about 13:00-13:30 o'clock.

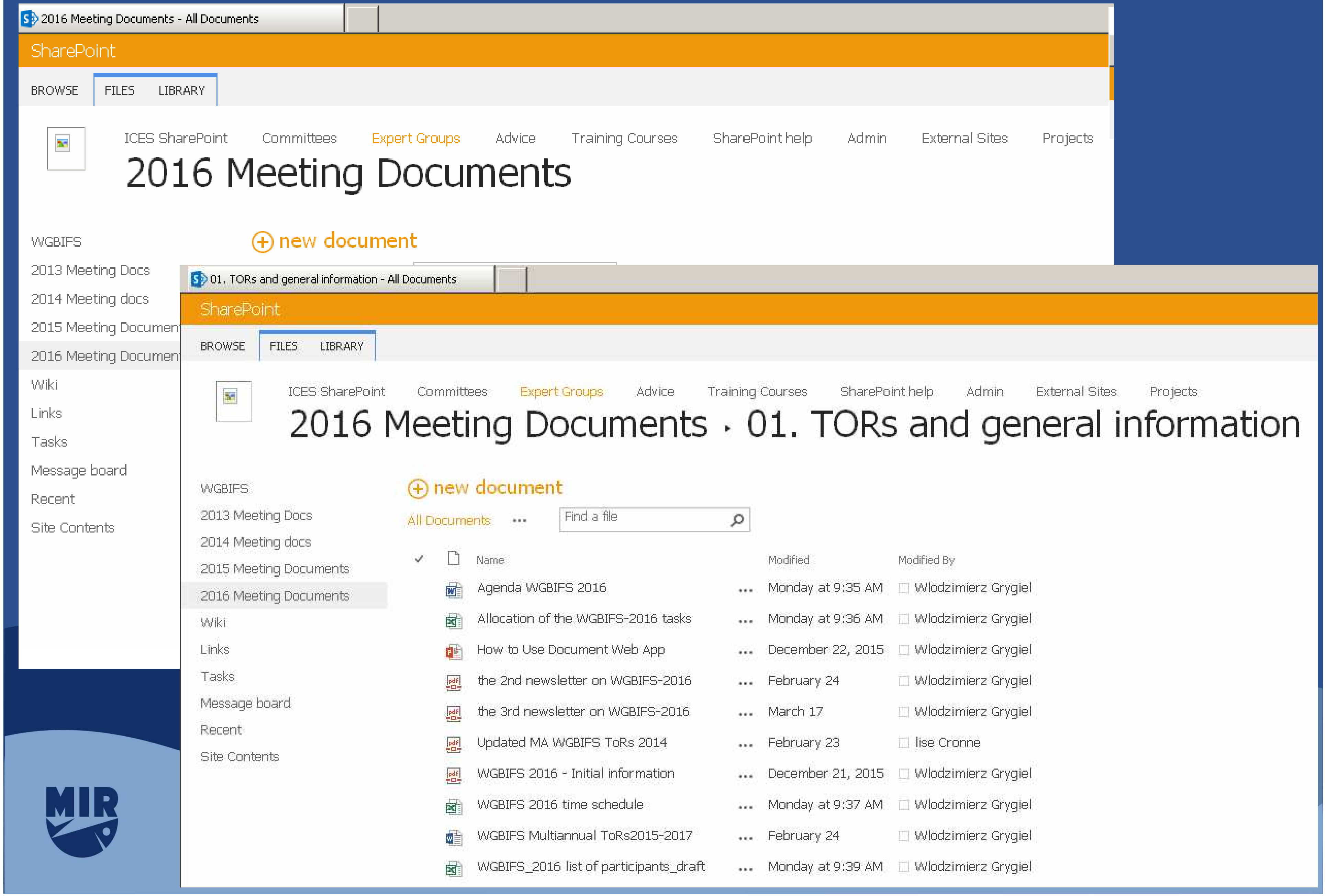
note: working hours at the Institute TI-OF in Rostock are limited to 18:00 o'clock.

The meeting venue: Rostock – Germany, at the Institute of Baltic Sea Fisheries (TI-OF) - Johann Heinrich von Thünen-Institut für Ostseefischerei,
Address: Alter Hafen Süd 2 - the local organizer and host of the meeting

The Baltic International Fish Survey Working Group (WGBIFS) is 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 is one from three Steering Groups within SCICOM/ACOM.

ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The structure of ICES SharePoint designated to the WGBIFS-2016 Meeting



ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The structure of ICES SharePoint designated to the WGBIFS-2016 Meeting; the case of 2016 Meeting Documents. 01. ToRs and general information

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ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The structure of ICES SharePoint designated to the WGBIFS-2016 Meeting

02. Background documents - All Documents

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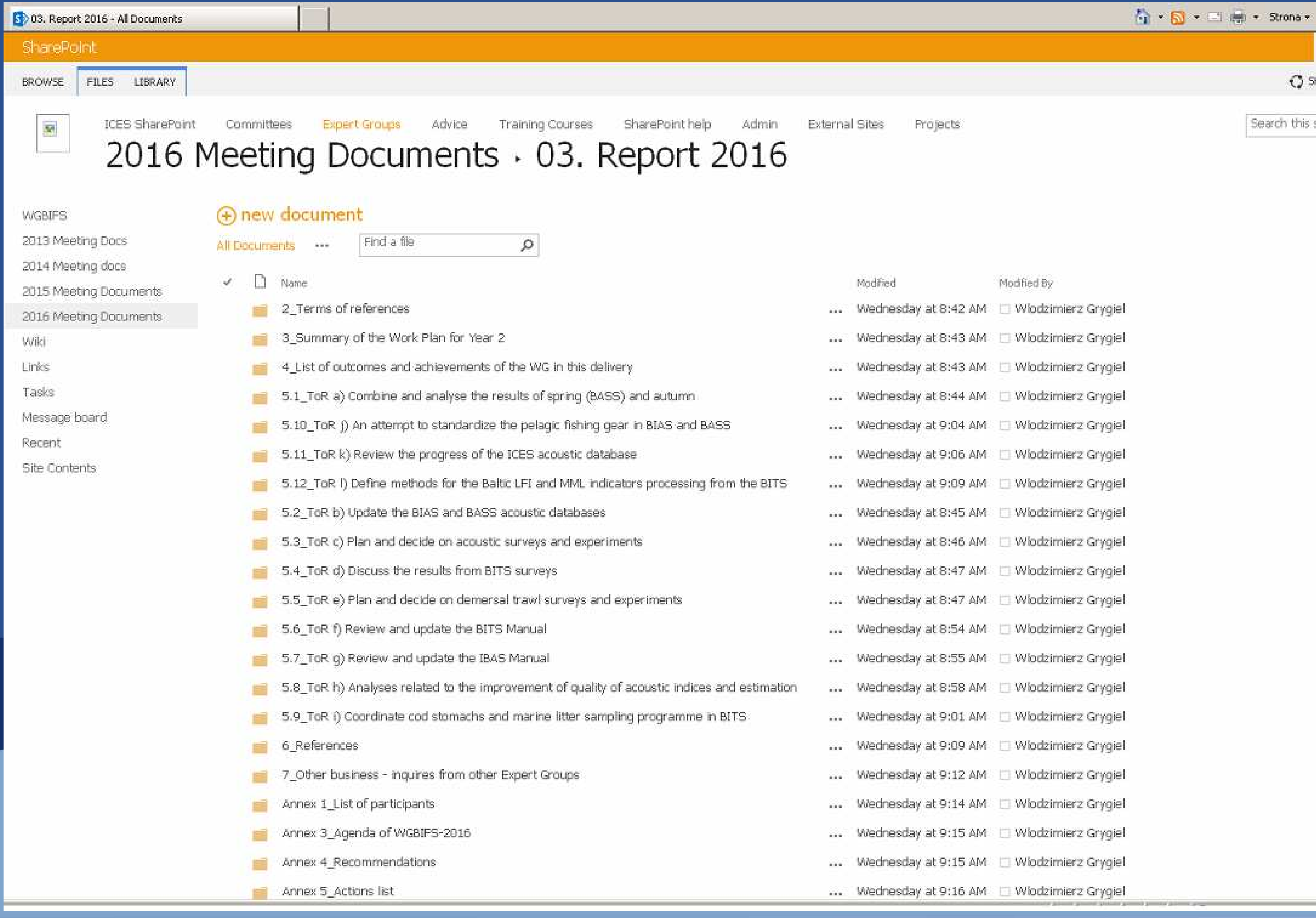
Name	Modified	Modified By
01_BITS survey reports	Wednesday at 7:58 AM	Wlodzimierz Grygiel
02_BIAS survey reports	Wednesday at 7:56 AM	Wlodzimierz Grygiel
03_BASS survey reports	Wednesday at 8:11 AM	Wlodzimierz Grygiel
Acoustic data to special WK at WGBIFS-2016	March 17	Wlodzimierz Grygiel
BITS Manual - background documents	February 18	Wlodzimierz Grygiel
Corrections needed in DATRAS	January 19	Wlodzimierz Grygiel
IBAS Manual - background documents	February 18	Wlodzimierz Grygiel
Map of the Baltic Sea and EC regulations	February 11	Wlodzimierz Grygiel
Pelagic gear in BIAS_BASS surveys	January 12	Wlodzimierz Grygiel
Protocols from measurements of the TV-3 technical parameters	Wednesday at 11:30 AM	Wlodzimierz Grygiel

ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The structure of ICES SharePoint designated to the WGBIFS-2016 Meeting



WGBIFS meetings venue in 2000-2016:

Year	Location
2000	Copenhagen ICES HQ
2001	Kaliningrad (Russia)
2002	Copenhagen ICES HQ
2003	Copenhagen ICES HQ
2004	Rostock (Germany)
2005	Rostock (Germany)
2006	Copenhagen ICES HQ
2007	Rostock (Germany)
2008	Gdynia (Poland)
2009	Lysekil (Sweden)
2010	Klaipeda (Lithuania)
2011	Kaliningrad (Russia)
2012	Helsinki (Finland)
2013	Tartu (Estonia)
2014	Gdynia (Poland)
2015	Öregrund (Sweden)
2016	Rostock (Germany)

Please consider the WGBIFS 2017 venue!

MIR

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ICES - WGBIFS meeting in Rostock/Germany; 30.03. – 03.04.2016

The Institute of Baltic Sea Fisheries in Rostock is the German federal research institution responsible for monitoring the state of exploited fish stocks in the Baltic, and giving policy advice to the German government and the EU commission.

The Institute fields of research:

* fish population development,
* recruiting fish populations,
* modelling/statistics, population estimates, monitoring in the Baltic Sea,
* trapping technology.

Rostock, 07.04.2005 – WGBIFS meeting at the Institute

Rostock from the historical point of view:

- In the 11th century, Polabian Slavs founded a settlement at the Warnow River called Roztoc (means in Slavic „fork of a river”).
- Initially there were three separate cities: Old, Middle and New Town.
- In 1252 began the considerable rise of the city in effect of its membership of the Hanseatic League, from 1251.
- In 1323, the formerly independent fishing village of Warnemünde at the Baltic Sea became a part of Rostock, to secure the city's access to the Baltic Sea.
- In 1419, one of the earliest universities in Europe, the University of Rostock, was founded.
- In the mid of 19th century, the first propeller-driven steamers in Germany were constructed in Rostock shipyards.

(https://en.wikipedia.org/wiki/Rostock; access 28.10.2015)

The coat of arms of the city (from 1367 known as the *Signum*). The *Signum* depicts a golden griffin on a blue background, with bars of silver and red, i.e. the colours of the Hanseatic League, below.

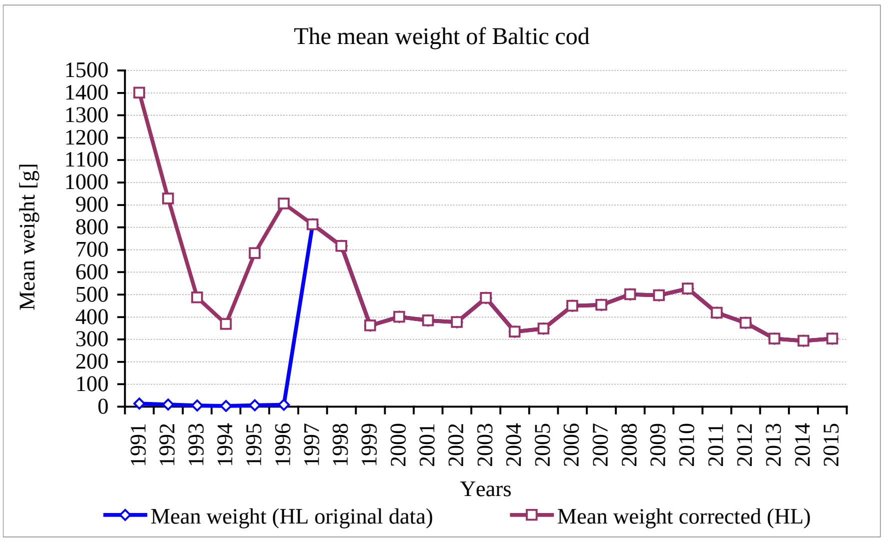
Rostock at present time:

- is the largest city in the north Germany,
- located on the Warnow River, 12 kilometres north from the Baltic Sea coast,
- is considered as the only *regiopolis* in the state Mecklenburg-Vorpommern,
- the area of city is 181.4 km^2,
- population (2013) is 203,431.

Thank you for your attention!

Annex 10. Other issues emerged before and during the meeting – correction needed in DATRAS

On the end of 2015, scientist from the DTU-Aqua (Charlottenlund) requested WGBIFS about verification the set of data concerns the mean weight of fish (HL records) originated from the BITS surveys and uploaded in the period of 1991-2015 to DATRAS (Ch. 7.2). The ICES Data-Center supported an effort in correction the above-mentioned parameter and prepared the Excel table, which indicate particular reasons needed to be corrected. In January 2016 was distributed the Excel table, accessible at the ICES WGBIFS-2016 SharePoint, Meeting Documents (folder - Background documents, Corrections needed in DATRAS), summing up information from countries that uploaded the data to the DATRAS. Before the WGBIFS-2016 meeting the list of such errors was submitted by Denmark, Germany, Poland, Russia, Lithuania and Latvia. The individual action regarding amendments for fish weight misreporting in the DATRAS HL.CatCatchWgt **are respected soon as possible**. The discrepancy in CatCatchWeights data from years before 1997 and after resulted from various weight units of fish used historically and currently in the DATRAS. The effect of various (incorrect) weight units used for cod data is presented in figure below.



Countries are start looking into the incorrect BITS surveys data, and a status of such action is listed below:

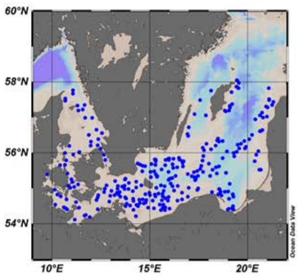
	DEN	SWE	GFR	LAT	RUS	POL	EST	LTU
Checked theirs files	x	x	x	x		x		**x**
Provided explanations	x	x		x		x		**x**
Correct data in DATRAS			x					

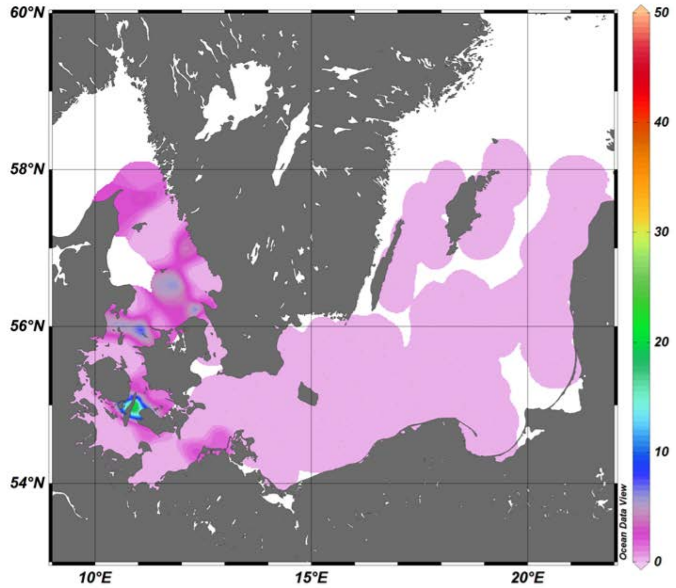
x= Done
%=In progress

Annex 11. Inquires from the WGBFAS

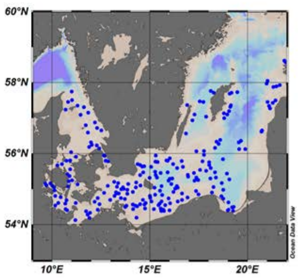
The WGBFAS at the meeting in 2015 requested WGBIFS about preparation the set of maps showing abundance distribution (cpue in numbers/h) of brill, cod, dab, flounder, turbot and plaice in the Baltic, during the BITS-Q1/2015 and BITS-Q4/2015 surveys. Below are shown distribution maps for the above-mentioned species (all ages). The maps are based on download of cpue data from DATRAS March 2016 but before all data from the 1st quarter, 2016 were available. cpue of cod by catch-stations is given in units of TVL and cpue of flatfish by stations is given in units of used gear, as no conversion factors are available for standardization for other species than cod. It should be mentioned that, for relatively rare species in the Baltic, like brill and dab, the attached maps shows distribution of this species in very limited areas of the western Baltic only.

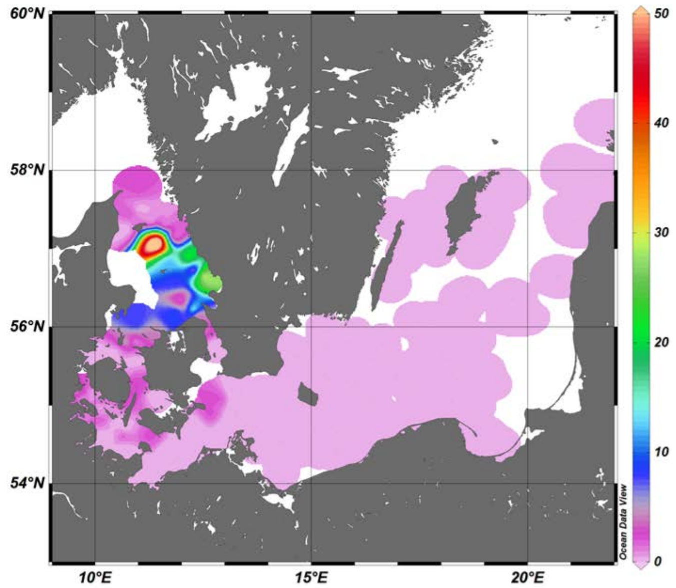
Brill, Q1 2015



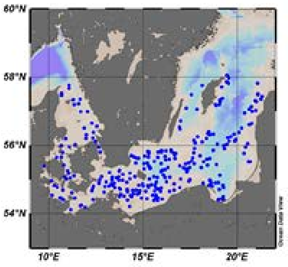


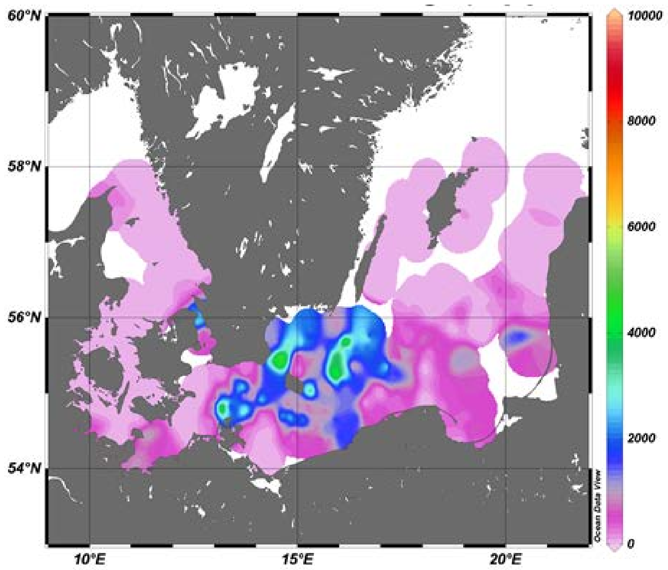
Brill, Q4 2015



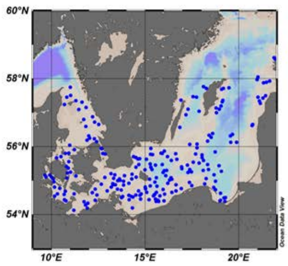


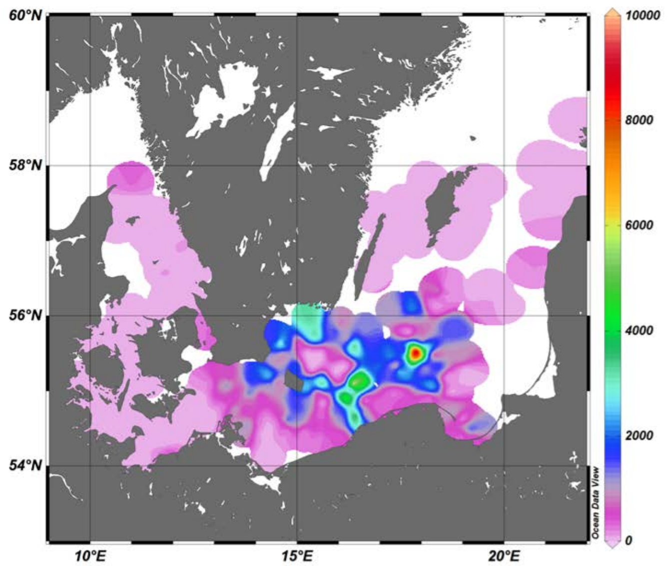
Cod, Q1 2015



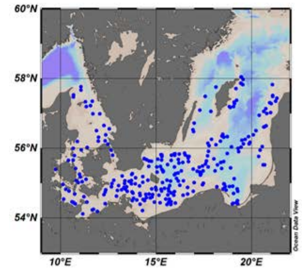


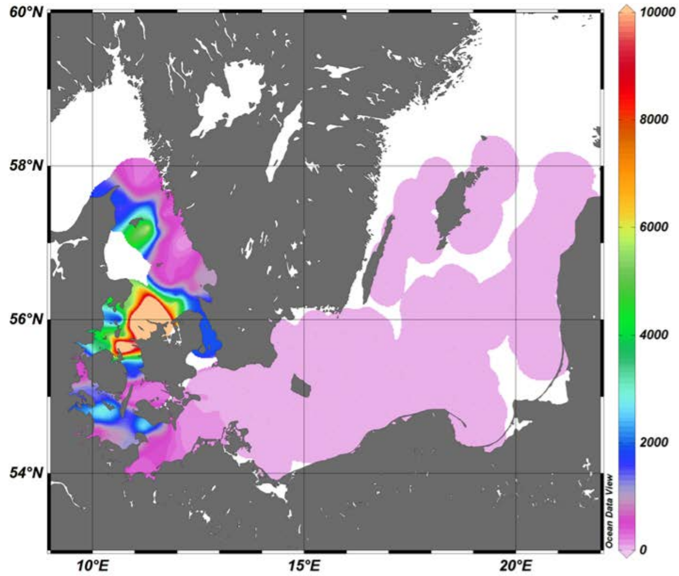
Cod, Q4 2015



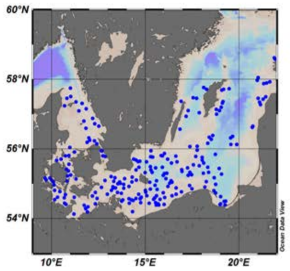


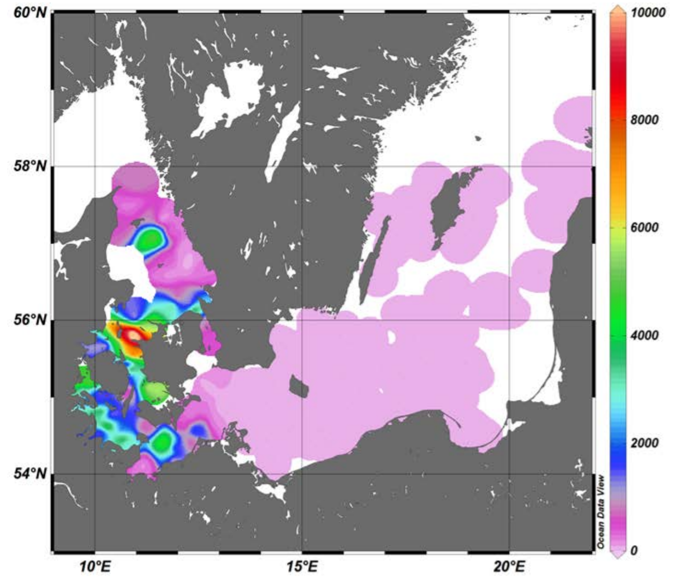
Dab, Q1 2015





Dab, Q4 2015





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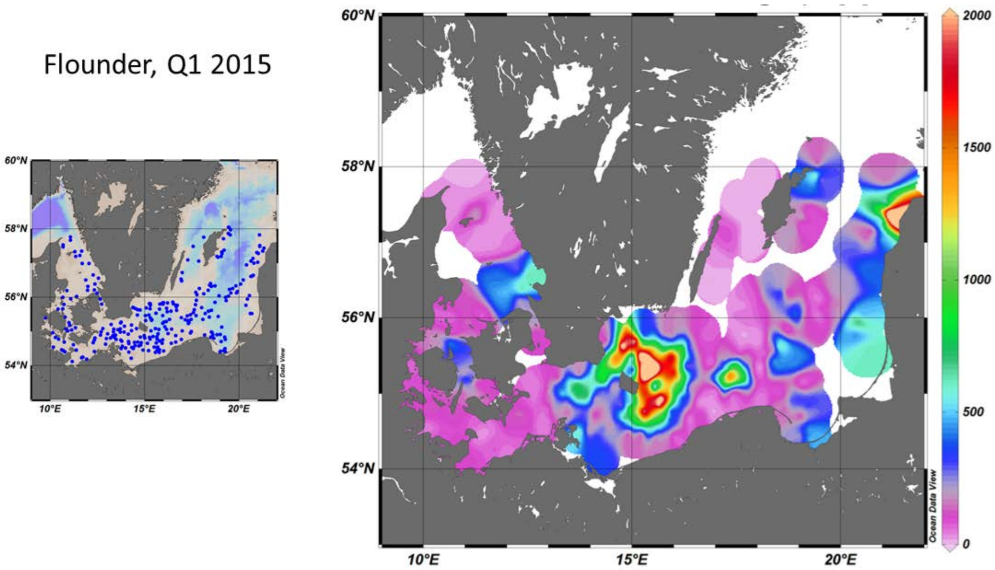

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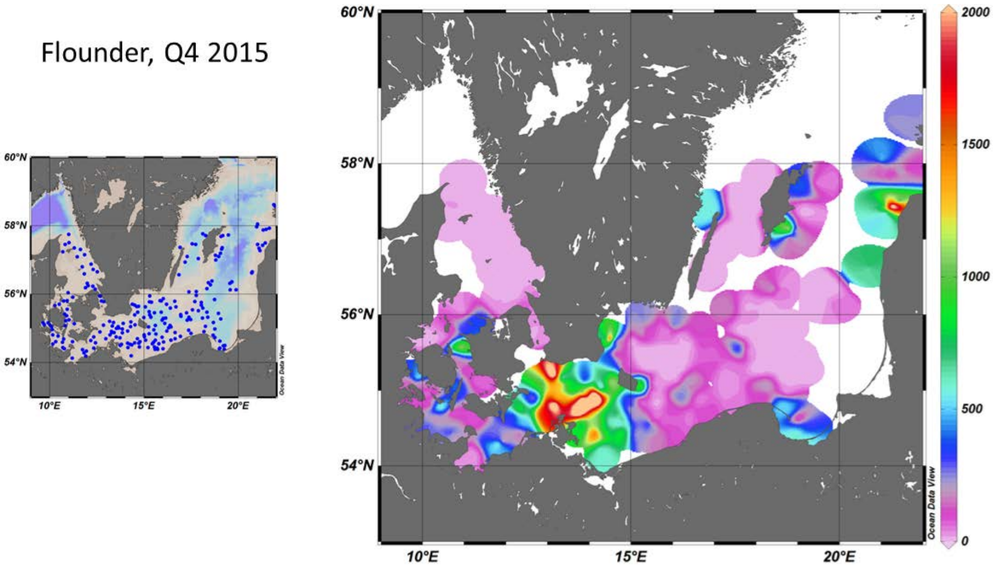

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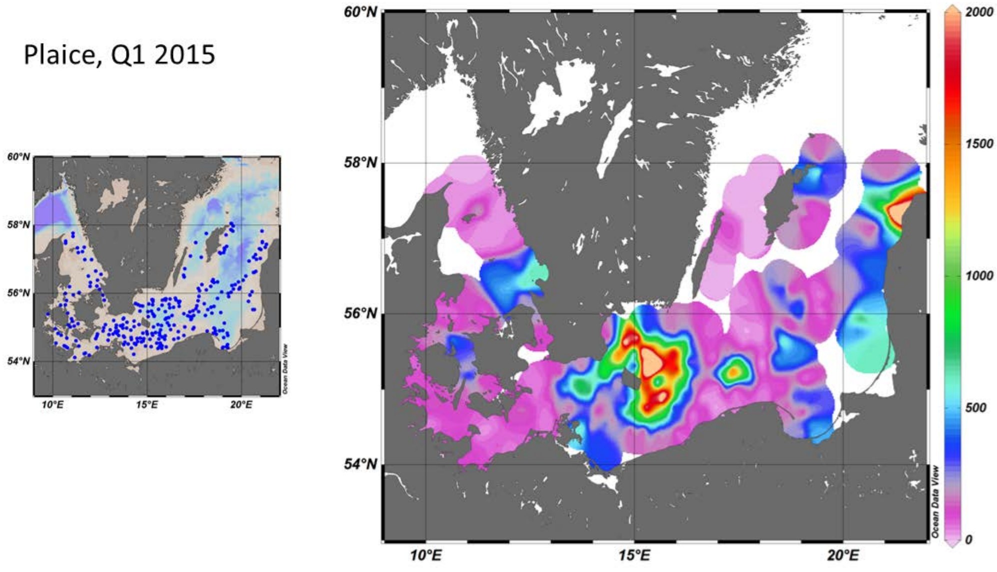

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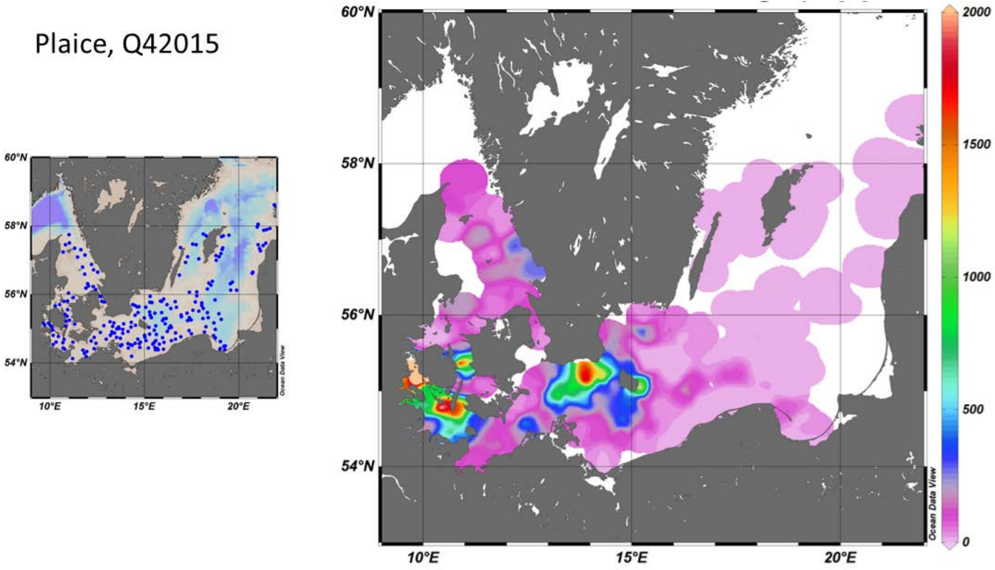

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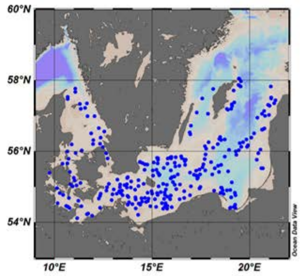

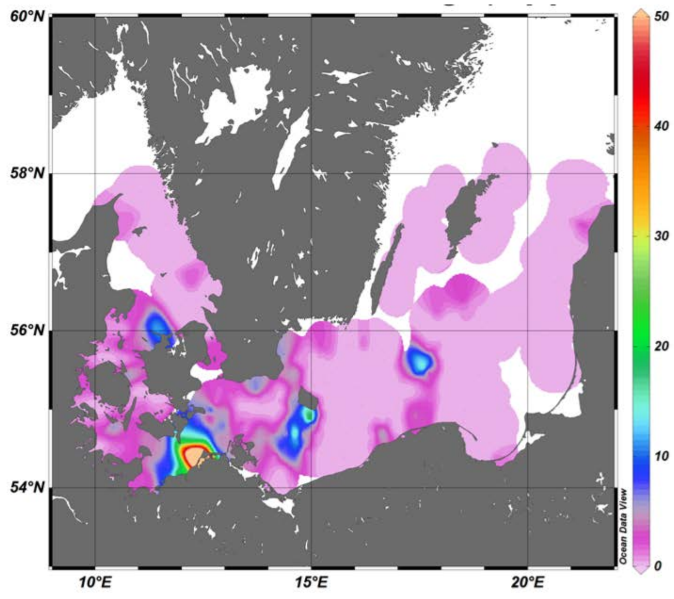

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