



Cruise Report
FRV „SOLEA“ Cruise 710
01. - 19.10.2015

Hydroacoustic survey for the assessment of small pelagics in the Baltic Sea

Scientists in charge: Dr. Tomas Gröhsler (TI-OF) & Dr. Matthias Schaber (TI-SF)

1. In a nutshell

The cruise was part of an international hydroacoustic survey providing information on stock parameters of small pelagics in the Baltic Sea, coordinated by the ICES Working Group of International Pelagic Surveys (WGIPS) and the ICES Baltic International Fish Survey Group (WGBIFS). 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 SD 21, 22, 23 and 24). Altogether, 1230 nm of hydroacoustic transects were covered.

In the majority of sampled rectangles, mean NASC values per nautical mile were distinctly below the high values measured in 2014 but also below the long-time mean values recorded. Only in few rectangles in ICES SD 23 and SD 24 mean NASC values were higher than in the previous year. Additionally, NASC values above the long-term mean were only measured in one rectangle (in SD 23). In this area, like in previous years, very high NASC values originating from dense aggregations of herring were recorded.

For species allocation and identification, altogether 59 fishery hauls were conducted.

Distribution list:

BLE, Hamburg
Schiffsführung FFS „SOLEA“
Deutsche Fischfang-Union
Sassnitzer Seefischerei e. G.
Landesverband der Kutter- u. Küstenfischer
DFFU Cuxhaven
BMEL, Ref. 614
Thünen-Institut - Pressestelle, Dr. Welling
Thünen-Institut - Präsidialbüro
Thünen-Institut - Institut für Fischereiökologie
Thünen-Institut - Institut für Seefischerei
Thünen-Institut - Institut für Ostseefischerei
Thünen-Institut - FIZ-Fischerei

BFEL HH, FB Fischqualität
Reiseplanung Forschungsschiffe, Herr Dr. Rohlif
Fahrtteilnehmer
Bundesamt für Seeschifffahrt und Hydrographie, Hamburg
Mecklenburger Hochseefischerei Sassnitz
Doggerbank Seefischerei GmbH, Bremerhaven
Deutscher Fischerei-Verband e. V., Hamburg
Leibniz-Institut für Meereswissenschaften IFM-GEOMAR
BSH, Hamburg
Leibniz-Institut für Ostseeforschung Warnemünde
Institut für Fischerei der Landesforschungsanstalt
LA für Landwirtschaft, Lebensmittels. und Fischerei
Euro-Baltic Mukran

2. Cruise objectives

The following objectives were planned for SB710:

- Hydroacoustic measurements for the assessment of small pelagics in Kattegat and western Baltic Sea including Belt Sea, Sound and Arkona Sea (ICES SD 21, 22, 23, 24)
- (Pelagic) trawling according to hydroacoustic measurements
- Hydrographic measurements on hydroacoustic transects and after each fishery haul
- Identification and recording of species- and length-composition of trawl catches
- Collection of biological samples of herring, sprat and additionally European anchovy and cod for further analyses

3. Cruise narrative and preliminary results

3.1 Cruise narrative (Matthias Schaber & Tomas Gröhsler)

FRV "Solea" was equipped with all hydroacoustic equipment and biological sampling gear on October 1st. On the same afternoon, "Solea" left Marienehe port for the calibration of scientific echosounders. The calibration site off Kühlungsborn was chosen according to prevailing weather conditions providing good conditions for calibration. Both the 38 and 120 kHz transducer were calibrated with calibration values regarded as very good. After calibration FRV "Solea" returned to Marienehe port the same evening for preparation of further equipment and embarkation of rest of scientific crew. Leaving of port and start of survey was scheduled for October 3rd. Hydroacoustic survey operations commenced October 3rd at 05:00 PM in SD 24.

Generally, survey operations were conducted during nighttime to account for the more pelagic distribution of clupeids during that time. On October 6th, after covering 3 of 5 transects in SD 24 survey operations were located to SD 22 due to the forecast of bad weather. However, survey operations in SD 22 had also to be interrupted after the first night due to unfavorable weather conditions. The survey commenced on 7th October in SD23. The remaining two northernmost transects of SD 24 were covered thereafter. The survey continued on 10th October in SD 22. After accomplishing two transects in SD 22, FRV "Solea" entered Kiel port on 12th October for a partial exchange of the scientific crew before leaving the harbor again to commence survey operations on the same evening in SD 22. Survey operations in SD 21 started on 14th October and could be accomplished afterwards without any loss of time.

On October 18th, 01:17 AM the scientific program was finished near Kullen area (Kattegat) and FRV "Solea" left the survey area to steam to Copenhagen port (disembarking of one member of scientific crew) and onward to Marienehe port, where the ship arrived on October 18th, 16:00 PM. All hydroacoustic equipment and biological sampling gear was disarmed on 19th October.

Altogether, 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.

Total survey time	15 nights
Fishery hauls	59
CTD-casts	84
Hydroacoustic transects	1230 nm

Overall hydroacoustic transect length was 1230 nm (2014: 1217 nm).

3.2 Hydroacoustic sampling (Matthias Schaber)

Hydroacoustic data were recorded with a Simrad EK60 scientific echosounder with hull-mounted 38 kHz and 120 kHz transducers. Post-processing and analysis were accomplished with Myriax EchoView 6 software. The transducer settings applied were in accordance with the specifications provided in ICES (2014).

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.

During the survey, hydroacoustic data were recorded at a standard ship speed of 10 kn leading to daily transect lengths of roughly 90 to 100 nm. Figure 1 depicts the spatial distribution of mean NASC values (5 nm intervals) measured on the hydroacoustic transects covered 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).

The final analysis of hydroacoustic data will be accomplished in the first quarter of 2016.

3.3 Biological sampling (Tomas Gröhsler)

To validate and allocate echorecordings, altogether 59 fishery hauls were conducted (Figure 2). Trawling time was 30 minutes. On all stations a pelagic trawl net „Krake“ (PSN 388) was employed.

Fishery hauls according to ICES Subdivision:

Subdivision	Hauls (n)
21	19
22	18
23	3
24	19

The following samples were collected and frozen for further processing at TI-OF to identify additional biological parameters of stock structure (e. g. sex, maturity, age):

- 1,745 herring, 904 sprat and 287 European anchovies.

The following numbers of frozen samples for genetic investigations, stock discrimination and evaluation of distribution patterns in Danish waters were further collected for DTU aqua, Charlottenlund, DK:

- 44 herring (*Clupea harengus*)
- 18 anchovy (*Engraulis encrasicolus*)

Altogether, the following species were sampled and processed:

Species	Length measurements	Number of hauls
CLUPEA HARENGUS	11,178	58
CRYSTALLOGOBIUS LINEARIS	33	10
CTENOLABRUS RUPESTRIS	14	6
CYCLOPTERUS LUMPUS	4	3
ENGRAULIS ENCRASICOLUS	1,666	43
EUTRIGLA GURNARDUS	32	10
GADUS MORHUA	312	27
GASTEROSTEUS ACULEATUS	427	19
GOBIUS NIGER	15	5
HIPPOGLOSSOIDES PLATESSOIDES	11	3
LIMANDA LIMANDA	639	31
MERLANGIUS MERLANGUS	614	46
MERLUCCIUS MERLUCCIUS	13	6
MYOXOCEPHALUS SCORPIUS	3	3
OSMERUS EPERLANUS	4	3
PLATICHTHYS FLESUS	55	20
PLEURONECTES PLATESSA	42	9
POMATOSCHISTUS MINUTUS	154	24
PSETTA MAXIMA	5	3
SCOMBER SCOMBRUS	333	12
SPRATTUS SPRATTUS	9,235	54
SQUALUS ACANTHIAS	5	3
SYNGNATHUS TYPHLE	9	8
TRACHINUS DRACO	428	26
TRACHURUS TRACHURUS	53	22
TRISOPTERUS ESMARKI	79	4
Others	404	57

The overall catch composition (kg 0.5 h⁻¹) per trawl haul according to ICES Subdivision 21, 22, 23 and 24 is given in Tables 1-4. Altogether, 39 different species were recorded. Herring were caught in 58, sprat in 54 hauls. As in previous years, 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 3 and 4 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. 3):

- Catches in SD 21 show a bimodal distribution characterized by the presence of the incoming year class (≤ 15 cm) and older herring (> 15 cm). 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 previous year.

Relative length-frequency distributions of sprat in the years 2015 and 2014 (Fig. 4) can be characterized as follows:

- In SD 21, 22 and 23 catch numbers of the incoming year class (≤ 10 cm) are virtually absent. 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.

3.4 Hydrography (Matthias Schaber)

Profiles of hydrographic parameters temperature, salinity and oxygen concentration were measured with a "Sea-Bird SBE 19 plus"-CTD probe with water sampler after each fishery haul or in regular intervals on the transects to allow for a sufficient coverage of the survey area. Additional water samples from different depth layers were collected daily for the calibration of salinity measurements and oxygen concentration measurements (the latter with Winkler titration).

Altogether, 84 CTD-profiles were measured. CTD stations as well as horizontal gradients of temperature, salinity and oxygen concentration both at the surface and at the seafloor are displayed in Figure 5. 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. Cruise Participants

Name	Function	Institute
01.-03.10.2015/Calibration of hydroacoustic equipment		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
V. Kalter	Student assistant	TI-SF
B. Stefanowitsch	Student assistant	TI-SF
03.-19.10.2015/Survey		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF (03.-12.10.)
Dr. T. Gröhsler	Hydroacoustics, Cruise leader	TI-OF (12.-19.10.)
I. Hennings	Fishery biology	TI-OF (12.-19.10.)
S. Hagemann	Fishery biology	TI-OF (03.-12.10.)
V. Kalter	Fishery biology, Student assistant	TI-SF
M. Koth	Fishery biology	TI-OF
T. Møller	Fishery biology	DTU Aqua, Charlottenlund, (DK)
B. Stefanowitsch	Hydroacoustics, Student assistant	TI-SF

5. Acknowledgments

We hereby thank all participants, the crew of FRV "Solea" and Captain S. Meyer for their outstanding cooperation and commitment.

6. Literature

ICES (2014). SISP Manual of International Baltic Acoustic Surveys (IBAS). Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2014/SSGESST:13



Dr. Tomas Gröhsler (TI-OF)
(Scientist in charge)



Dr. Matthias Schaber (TI-SF)
(Scientist in charge)

Figures

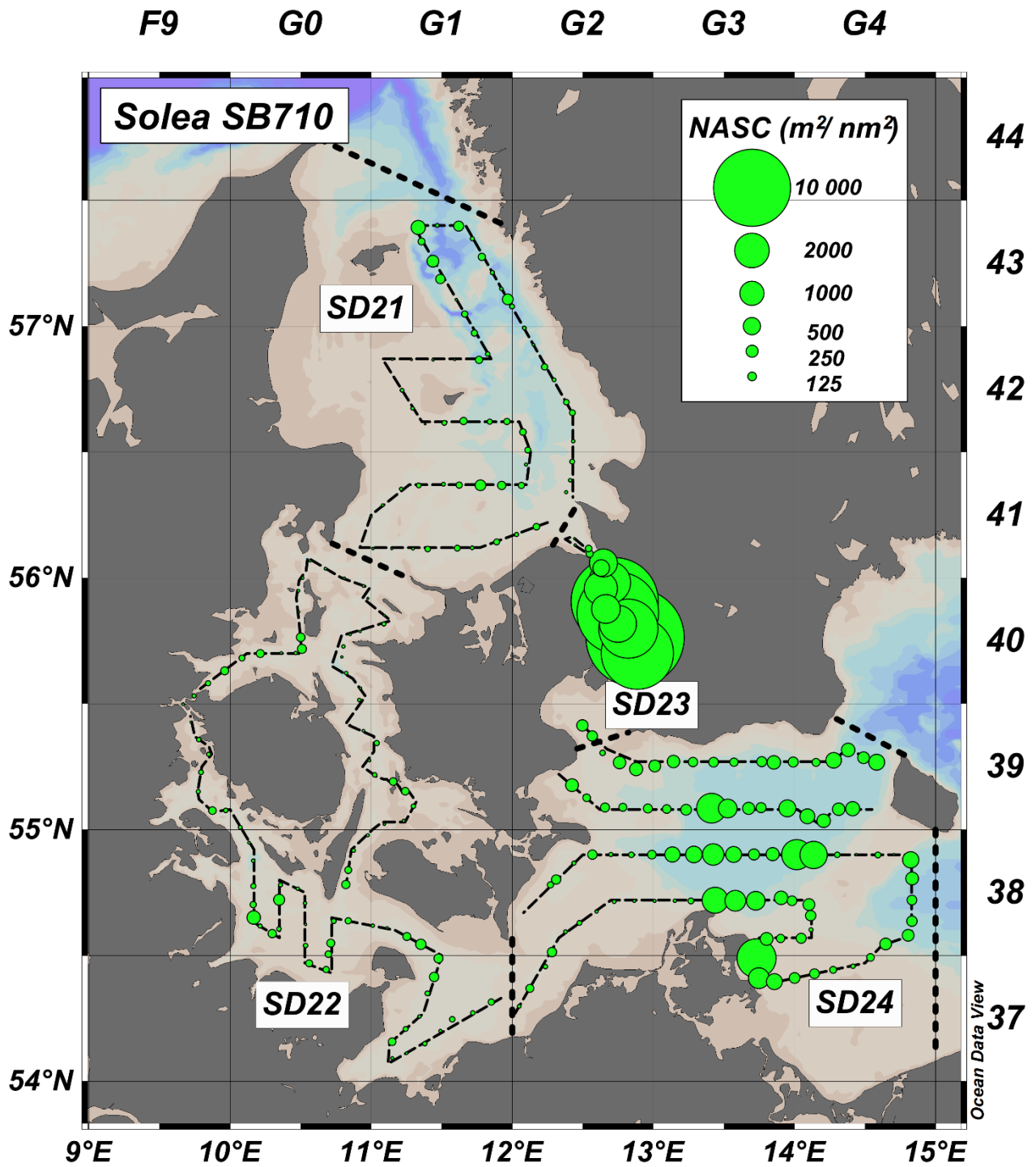


Figure 1: FRV "Solea" cruise 710/2015. Cruisetrack (thin dashed lines) and mean NASC (5nm intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

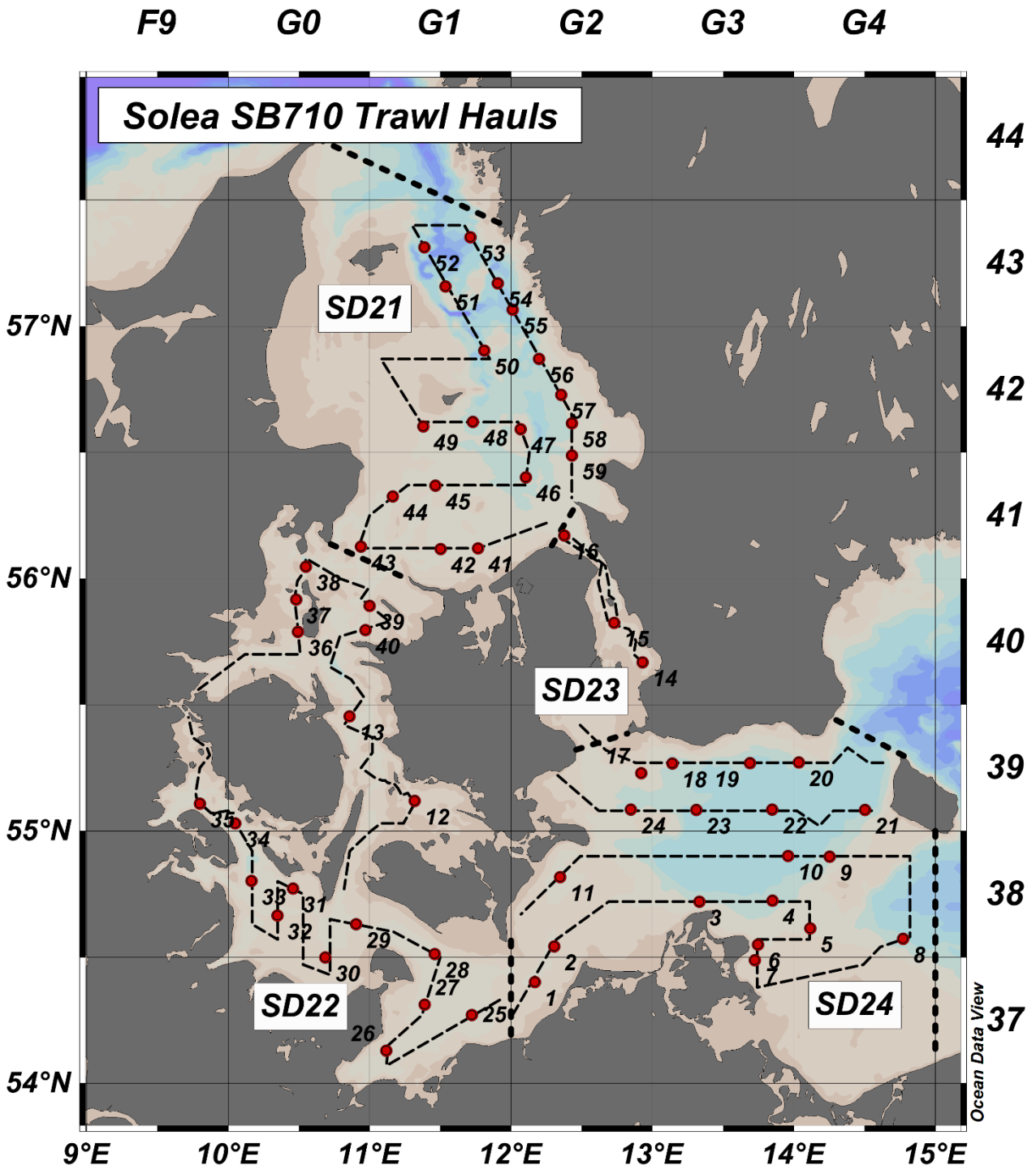


Figure 2: FRV "Solea" cruise 710/2015. Cruisetrack (thin dashed lines) and fishery hauls (red dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

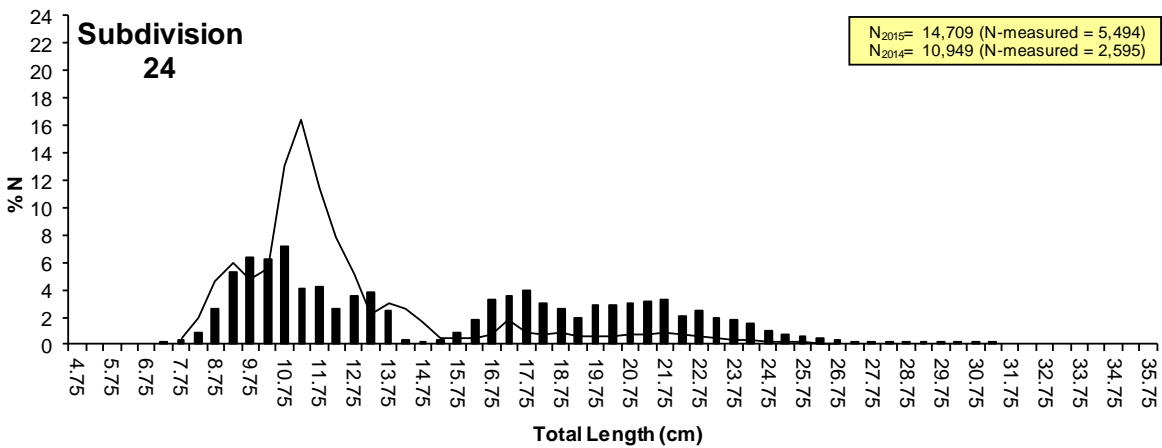
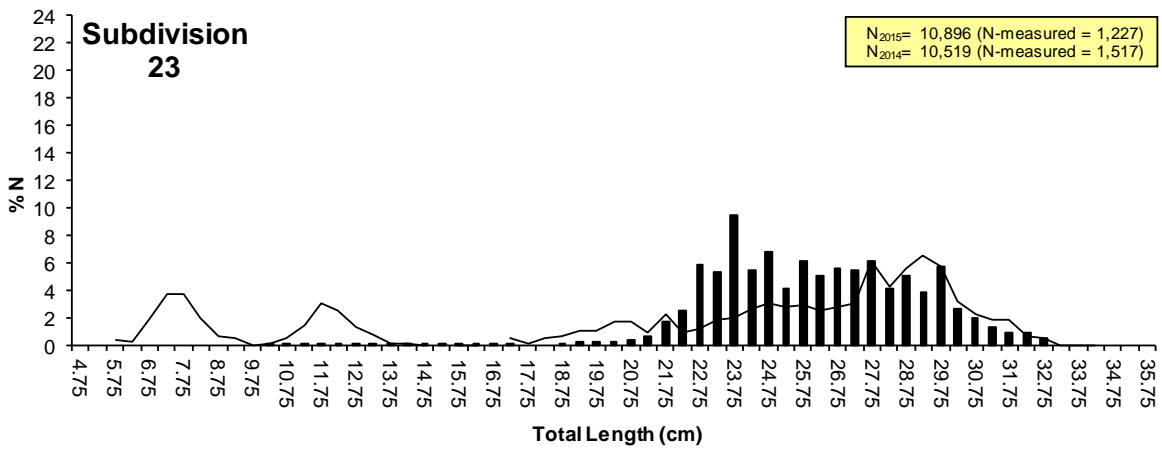
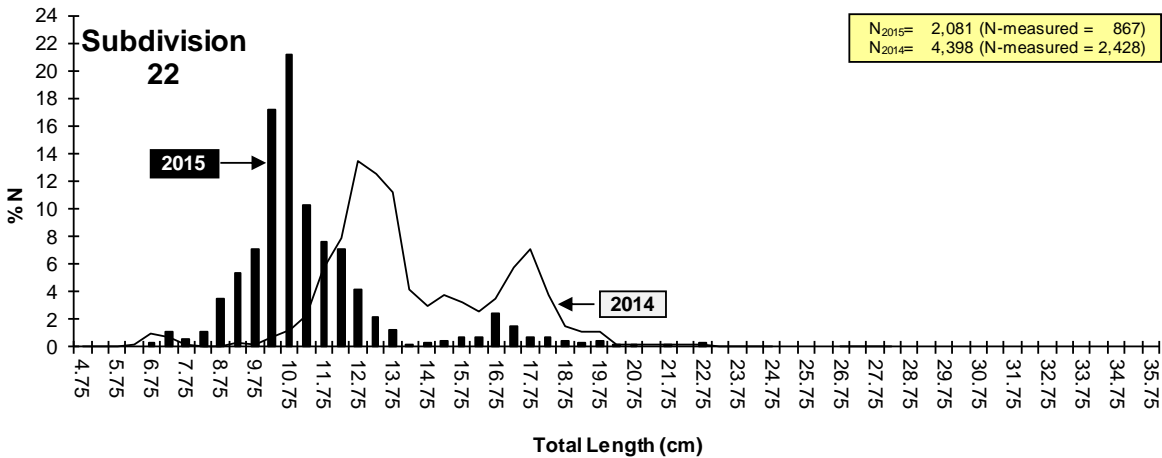
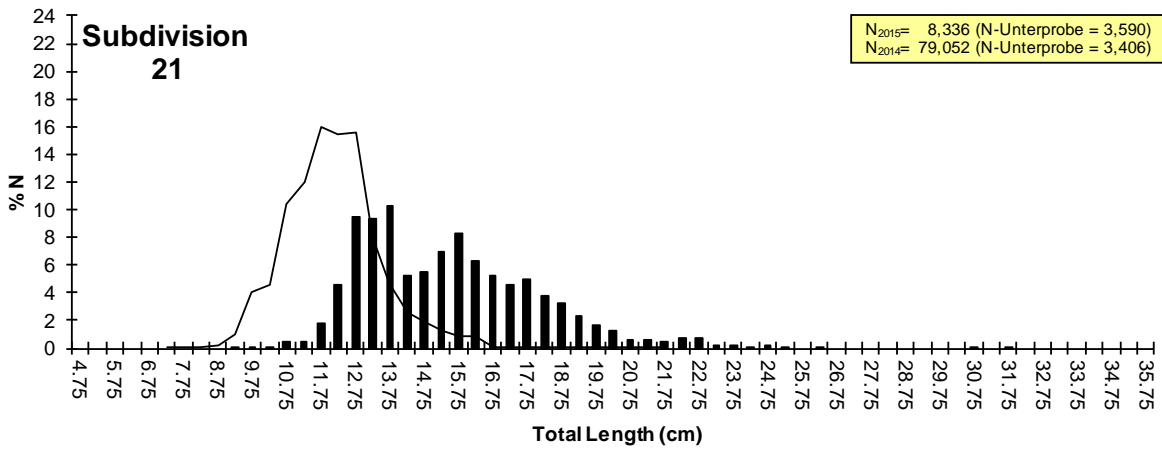


Figure 3: FRV "Solea" cruise 710/2015: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 694/2014).

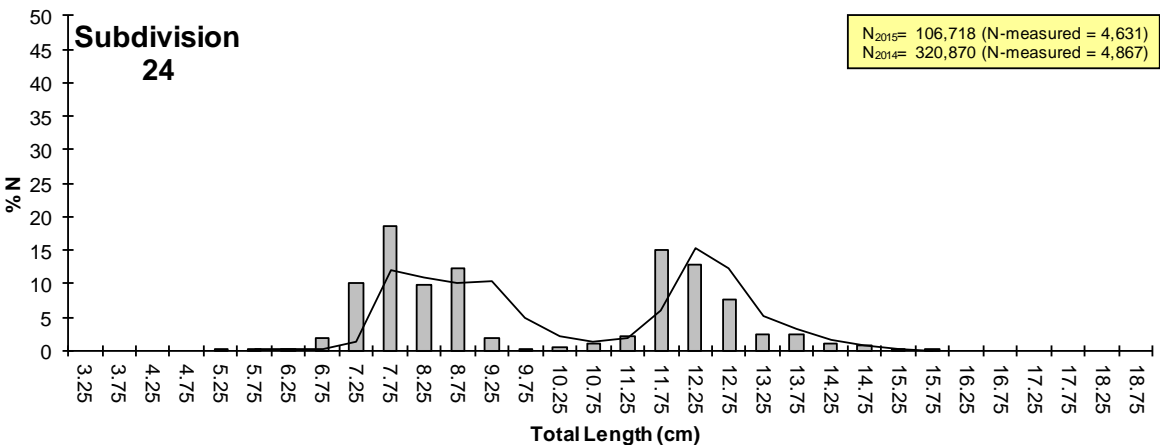
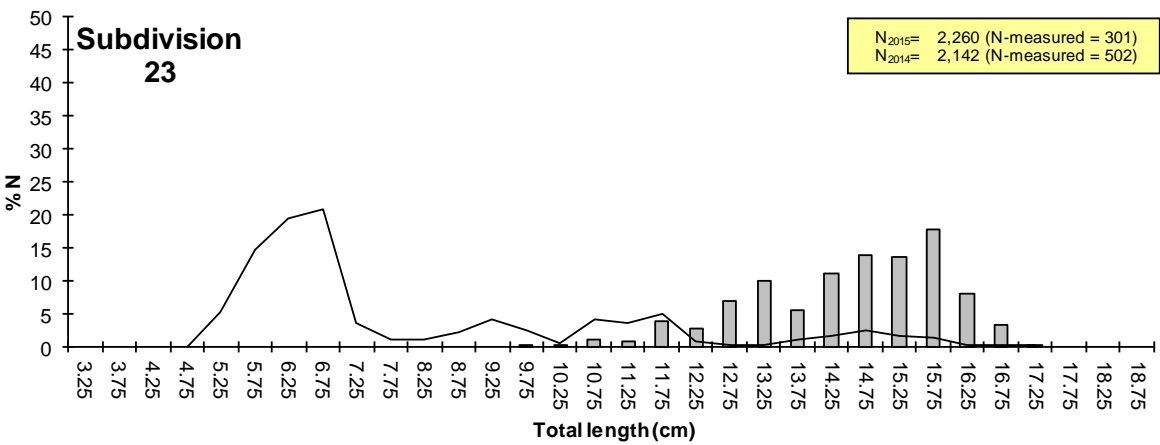
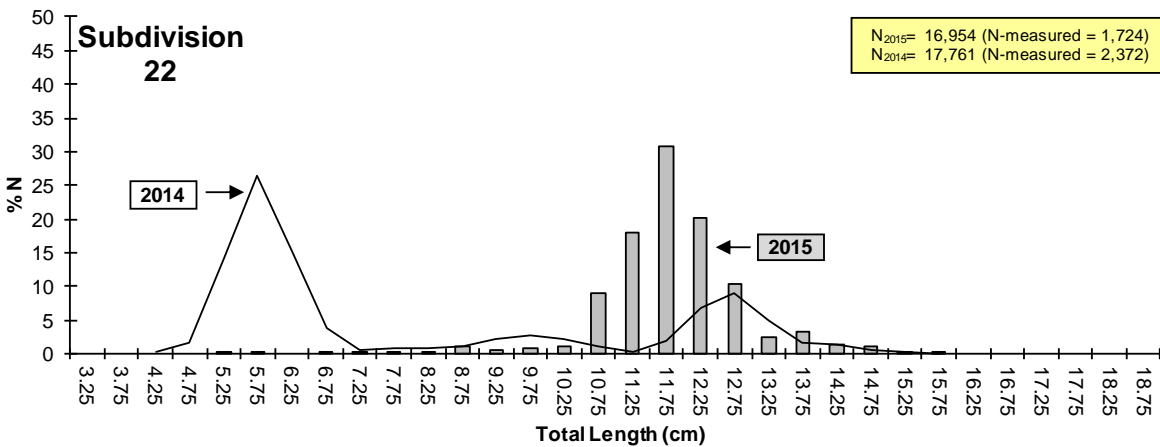
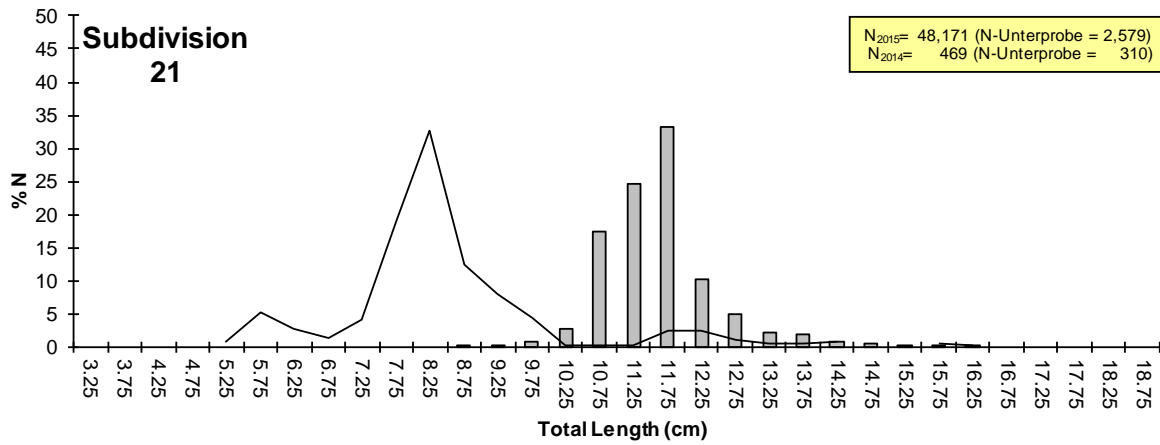


Figure 4: FRV "Solea" cruise 710/2015: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 694/2014).

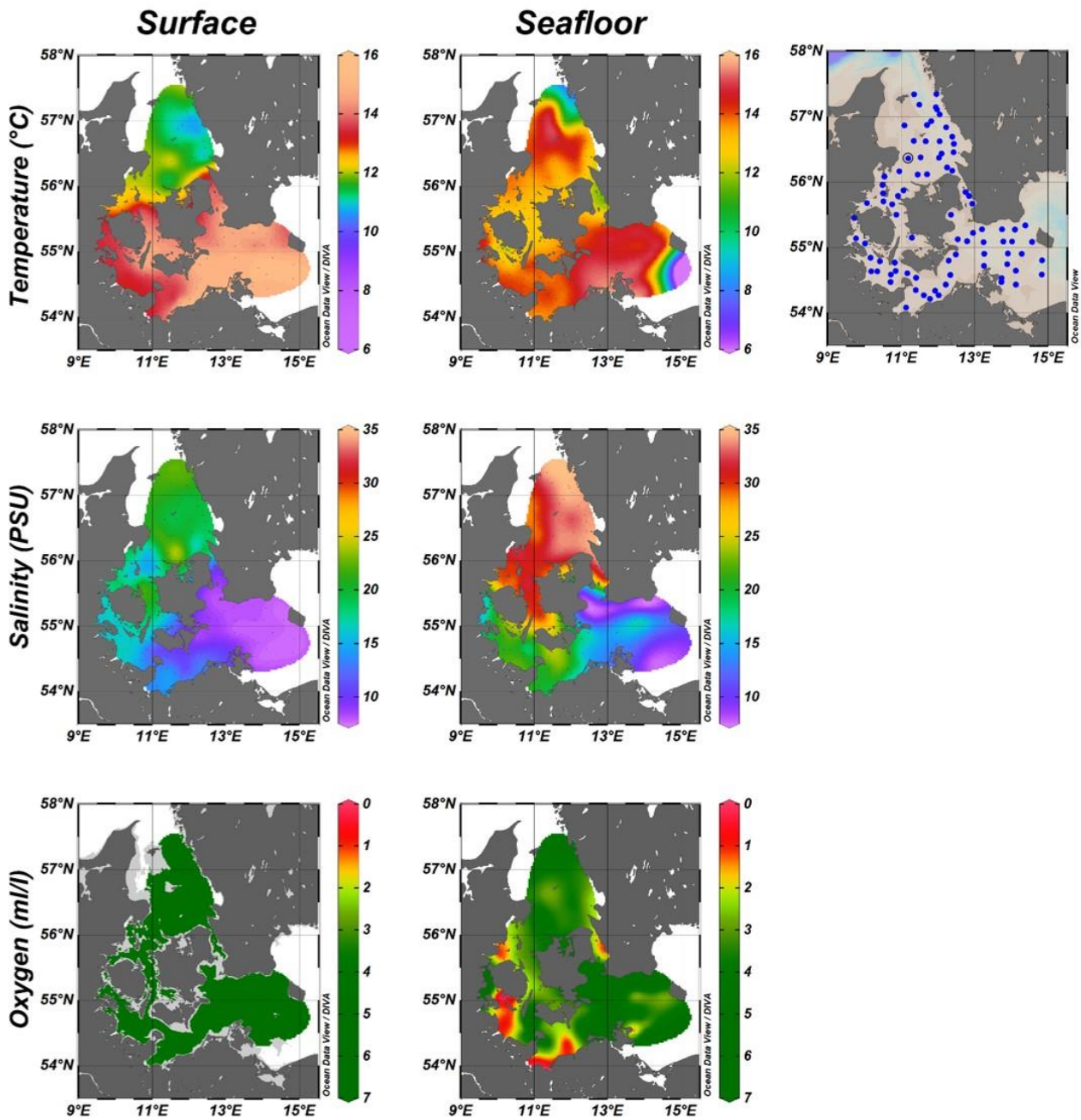


Figure 5: FRV "Solea" cruise 710/2015: Hydrography. CTD stations are depicted as blue dots in the area map (far right). Temperature ($^{\circ}\text{C}$, top panels), salinity (PSU, middle panels) and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right). Surface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

Tables

Table 1: FRV "Solea" cruise 710/2015: Catch composition (kg 0.5 h⁻¹) by 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
MERLUCCIIUS MERLUCCIIUS											
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		
MERLUCCIIUS MERLUCCIIUS		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 2: FRV "Solea" cruise 710/2015: Catch composition (kg 0.5 h⁻¹) by 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										
PLATICTHYS 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
PLATICTHYS 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 3: FRV "Solea" cruise 710/2015: Catch composition (kg 0.5 h⁻¹) by haul in SD 23.

Haul No.	14	15	16	Total
Species/ICES Rectangle	40G2	40G2	41G2	
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
PLATICTHYS 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 4: FRV "Solea" cruise 710/2015: Catch composition (kg 0.5 h⁻¹) by haul in SD 24.

Haul No.	1	2	3	4	5	6	7	8	9	10	11
Species/ICES Rectangle	37G2	38G2	38G3	38G3	38G4	38G3	37G3	38G4	38G4	38G3	38G2
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.	17	18	19	20	21	22	23	24	Total
Species/ICES Rectangle	39G2	39G3	39G3	39G4	39G4	39G3	39G3	39G2	
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