



**Cruise Report**  
**FRV „SOLEA“ Cruise 694**  
**30.09. - 20.10.2014**

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

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

**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 27<sup>th</sup> 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, 1217 nm of regular and 82 nm of additional trial hydroacoustic transects were covered.

Mean NASC values per nautical mile in the majority of sampled rectangles were above the long-time mean values. In ICES SD 21, 22 and 23, mean overall NASC values were both higher than in 2013 and the long-term mean. Very high NASC values originating from dense aggregations of herring could be recorded in the Sound (SD 23), with mean NASC values mostly distinctly higher than the long term average and the values observed in previous years. An exception was ICES SD 24, where mean NASC values were distinctly lower than in the previous year and also lower than the long-term mean.

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. Rohlf

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 SB694:

- 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
- Day time replicates of transect sections for comparison of night vs. day distribution patterns of small pelagics

## 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 September 30<sup>th</sup>. On the same afternoon, "Solea" left Marienehe port for the calibration of hydroacoustic equipment. The calibration site off Kühlungsborn was chosen according to prevailing weather conditions providing acceptable conditions for calibration for the remaining evening and the next morning. The 38 kHz transducer was calibrated twice, the 120 kHz transducer once. Despite technical problems with the calibration gear and despite deteriorating weather conditions, calibration values were regarded as good. After calibration FRV "Solea" returned to Rostock/Warnemünde port on October 1<sup>st</sup> for embarkation of the rest of the scientific crew. Leaving of port and start of survey was scheduled for October 2<sup>nd</sup>. Hydroacoustic survey operations commenced October 2<sup>th</sup> at 06:00 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 10<sup>th</sup>, after covering 3 of 4 transects in SD 24 and after accomplishing survey operations in SD 22, FRV "Solea" entered Warnemünde port for a partial exchange of the scientific crew before leaving the harbor again to commence survey operations on the same evening in the northern part of SD 24. Both on the northernmost transect in SD 24 as well as on some sections of the transect in SD 23, the course had to be changed and measurements interrupted due to area closures of the Swedish armed forces. On October 14<sup>th</sup>, FRV "Solea" had to interrupt survey operations and steam to Copenhagen harbor due to a medical emergency. After an exchange of personnel, survey operations commenced in SD 21 but had to be interrupted again due to a medical emergency which required steaming to Warnemünde port. After another exchange of crew, FRV "Solea" steamed to the Kattegat again to cover as much of the survey area as possible in the remaining survey time. There, survey operations were shifted to daytime recordings to prevent further loss of survey time.

Despite the loss of several days due to medical emergencies and due to comparatively good weather conditions, the standard survey area could be fully covered.

On October 19<sup>th</sup>, 03:00 PM 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 20<sup>th</sup>, 07:00 AM.

Altogether, the following survey schedule was accomplished:

- Arkona Sea (SD 24) 02. - 06.10.
- Belt Sea (SD 22) 06. - 11.10.
- Arkona Sea (SD 24) 11. - 12.10.
- Sound (SD 23) 12. - 13.10.
- Kattegat (SD 21) 14. & 17 - 19.10.

Total survey time	12 nights & 3 days (+ daytime replicates on 2 days)
Fishery hauls	59
CTD-casts	80
Hydroacoustic transects	1217 nm (+ 82 nm daytime replicate transect sections)

Overall hydroacoustic transect length was 1299 nm including daytime replicates. Regular transect length was 1217 nm (2013: 1169 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/acceptable overall weather conditions. The 38 kHz transducer was calibrated twice, the 120 kHz transducer once on two consecutive days. Despite deteriorating weather conditions and technical problems with the calibration equipment, resulting calibration parameters were considered very good (38 kHz, RMS value 0.15 dB) and acceptable (120 kHz, RMS value 0.32 dB).

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 2014. In the majority of rectangles surveyed, mean NASC values per nautical mile were above the long-time survey average. However, on an ICES subdivision scale, differences compared to both previous years and long-time average were evident: While in SD 21 three out of five statistical rectangles, in SD 22 eight out of 11 and in SD 23 one out of two rectangles showed higher NASC values than both in 2013 and compared to the long-time mean resulting in overall higher NASC values in these rectangles, the situation was different in SD 24. There, the average NASC measured was distinctly lower than in 2013 and also lower than the long-time mean. This was reflected in only one (compared to 2013) and two (compared to the long-time average) rectangles showing higher NASC values as opposed to 8 (7) rectangles with partially significantly lower NASC values.

In SD 21, NASC values were slightly higher than in the previous year in the southern part of the Kattegat. In the northern part of rectangle 42G1 as well as in rectangle 43G1 NASC values were distinctly higher than in the other areas of that subdivision. In SD 22, NASC values were higher than in previous years especially in the Kiel Bight (38G0) but also north and south of the little Belt (e.g. 40G0, 39F9). In SD 23, the usual large aggregations of big herring in the Öre Sound near Ven Island were also present in autumn 2014, with mean NASC values in this area significantly exceeding previous years and the long-time average. From comparisons with distribution patterns in 2013 and additional daytime transects covered in 2014 it was evident that distribution patterns of this dense aggregations seem to shift rather fast according to prevailing currents. No southward expansion of these aggregations out of the Sound was detected in 2014. In SD 24, highest fish densities were recorded north and east of Rügen Island and to a lesser extent in the central to eastern parts of the Arkona Sea, however at partially much lower NASC values than in previous years. The differences were most pronounced in rectangles 37G3 and 38G3, i.e. around Rügen Island, where dense aggregations of herring had been observed in 2013. A similar decline was observed in rectangle 39G4 (Bornholmstätt). This however could be an artefact as in that rectangle only a fraction of the planned cruisetrack could be covered due to area closures.

As in the year before, a preliminary analysis of daytime replicate transects revealed different small-scale distribution patterns of clupeids (which were especially pronounced in SD 23 as indicated above) but indicated similar overall NASC values as compared to night-time sampling.

The final analysis of hydroacoustic data will be accomplished by end of 2014.

### 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	15
22	20
23	4
24	20

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):

- 1.739 herring, 884 sprat, 513 European anchovies and 32 sardines.

The following numbers of frozen samples for genetic investigations, stock discrimination, evaluation of distribution patterns in Danish waters and for the buildup of an otolith collection of different species were further collected for DTU aqua, Charlottenlund, DK:

- 61 herring (*Clupea harengus*)
- 12 cod (*Gadus morhua*)
- 33 anchovy (*Engraulis encrasicolus*)
- 41 mixed species

Altogether, the following species were sampled and processed:

Species	Length measurements	Number of hauls
CLUPEA HARENGUS	9.946	58
CRANGON CRANGON	75	9
CRYSTALLOGOBIUS LINEARIS	634	31
CTENOLABRUS RUPESTRIS	6	5
CYCLOPTERUS LUMPUS	10	9
ENGRAULIS ENCRASICOLUS	3.966	43
GADUS MORHUA	264	28
GASTEROSTEUS ACULEATUS	721	28
LIMANDA LIMANDA	135	21
LOLIGO FORBESI	591	26
MAUROLICUS MUELLERI	23	2
MERLANGIUS MERLANGUS	304	34
MERLUCCIUS MERLUCCIUS	4	3
MULLUS SURMULETUS	15	8
MYSIDACEA	119	2
OSMERUS EPERLANUS	133	7
PLATICHTHYS FLESUS	120	12
PLEURONECTES PLATESSA	27	4
POMATOSCHISTUS MINUTUS	366	28
SARDINA PILCHARDUS	40	8
SCOMBER SCOMBRUS	6	6
SPRATTUS SPRATTUS	8.051	56
SYNGNATHUS ROSTELLATUS	6	2
TRACHINUS DRACO	80	18
TRACHURUS TRACHURUS	354	35
OTHERS	44	22

The overall catch composition (kg 0.5 h<sup>-1</sup>) per trawl haul according to ICES Subdivision 21, 22, 23 and 24 is given in Tables 1-4. Altogether, 41 different species were recorded. Herring were

caught in 58, sprat in 56 hauls. As in previous years, mean catch rates per station ( $\text{kg } 0.5 \text{ h}^{-1}$ ) were lowest in SD 22 and highest in SD 23. In contrast to the last two years where no sardines (*Sardina pilchardus*) were caught, this species reappeared in SD 21 in 2014.

Figures 3 and 4 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2013 and 2014. Compared to results from the previous survey in 2013, the following conclusions for herring can be drawn (Fig. 3):

- Catch numbers in SD 21 were dominated by the incoming year class ( $<15 \text{ cm}$ ). In contrast to 2013, when a bimodal distribution indicated presence of both incoming year class and older herring (ca.  $>17 \text{ cm}$ ), the latter were mostly absent in 2014.
- SD 22 shows the incoming year class with two modes at  $12.75 \text{ cm}$  and  $15.25 \text{ cm}$  in 2014 and at  $11.75 \text{ cm}$  and  $14.25 \text{ cm}$  in 2013. A further mode of older herring at  $17.75 \text{ cm}$  was absent in 2013. In contrast to previous years, which only contained herring smaller than ca.  $20 \text{ cm}$ , this year's results show few larger herring.
- In SD23, very large herring ( $> 25 \text{ cm}$ ) dominated catches. The contribution of very large herring was less pronounced in 2013. Herring of the incoming year class show two modes at ca.  $7.25 \text{ cm}$  and at  $11.75 \text{ cm}$ , the latter only present in 2013.
- In SD24, the herring length-frequency distribution was similar compared to 2013. Both years were dominated by the incoming year class, which show a similar mode at  $10.75 \text{ cm}$  in 2014 and at  $11.25 \text{ cm}$  in 2013.
- Altogether, the present contribution of the incoming year class (ca.  $<15 \text{ cm}$ ) seemed to similar to the one in the previous year.

Relative length-frequency distributions of sprat in the years 2013 and 2014 (Fig. 4) can be characterized as follows:

- In SD 21, 22 and 23 catch numbers were dominated by the incoming year class ( $\leq 10 \text{ cm}$ ). In contrast to 2013, the contribution of larger sprat (ca.  $>10 \text{ cm}$ ) were less pronounced in 2014.
- In SD24, the sprat length-frequency distribution was similar compared to 2013 with a bimodal distribution of both incoming year class ( $< 10 \text{ cm}$ ) and older sprat. The contribution of largest sprat ( $>12 \text{ cm}$ ) is less pronounced in 2014.
- Altogether, the present contribution of the incoming year class (ca.  $<10 \text{ cm}$ ) seemed to be far stronger than the one in the previous year.

### 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, 80 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. In comparison with previous years it was evident that temperatures in the survey area were distinctly higher than in 2013 with surface temperatures ranging from  $13 \text{ }^\circ\text{C}$  in the Kattegat to more than  $16 \text{ }^\circ\text{C}$  in the Arkona Sea. Bottom temperatures in the largest part of the survey area were only slightly lower or –in the Arkona Sea- partially in the same range as surface temperatures. Surface salinities ranged from ca. 21 psu in the central Kattegat to ca. 8 psu in the eastern Arkona Sea. Bottom salinities showed a similar gradient but were generally higher in the range of  $> 31 \text{ psu}$  (SD 21) to ca. 8 psu (SD 24). Surface layers were well oxygenated throughout the survey area. Signs of oxygen depletion were as in previous years evident in bottom layers of some areas in SD 22. In SD 22, oxygen depletion in the inner Mecklenburg Bight and the southern part of the little Belt had proceeded to almost anoxic conditions near the seafloor.

#### 4. Cruise Participants

Name	Function	Institute
<b>30.09.-02.10.2014/Calibration of hydroacoustic equipment</b>		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
<b>02.-20.10.2014/Survey</b>		
Dr. T. Gröhsler	Hydroacoustics, Cruise leader	TI-OF (02.-11.10.)
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
F. Collard	Fishery biology	University Liege, (BE) (11.-16.10.)
M. Koth	Fishery biology	TI-OF
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
I. Rottgardt	Student assistant	TI-SF (02.-11.10.)
T. Kirchner	Student assistant	TI-SF (11.-20.10.)
D. Stephan	Fishery biology	TI-OF (11.-20.10.)
B. Stepputtis	Fishery biology	TI-OF (02.-11.10.)

#### 5. Acknowledgments

We hereby thank all participants, the crew of FRV "Solea" and Captains S. Meyer, J. Vandrey and V. Koops 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 2012/SSGESST:13

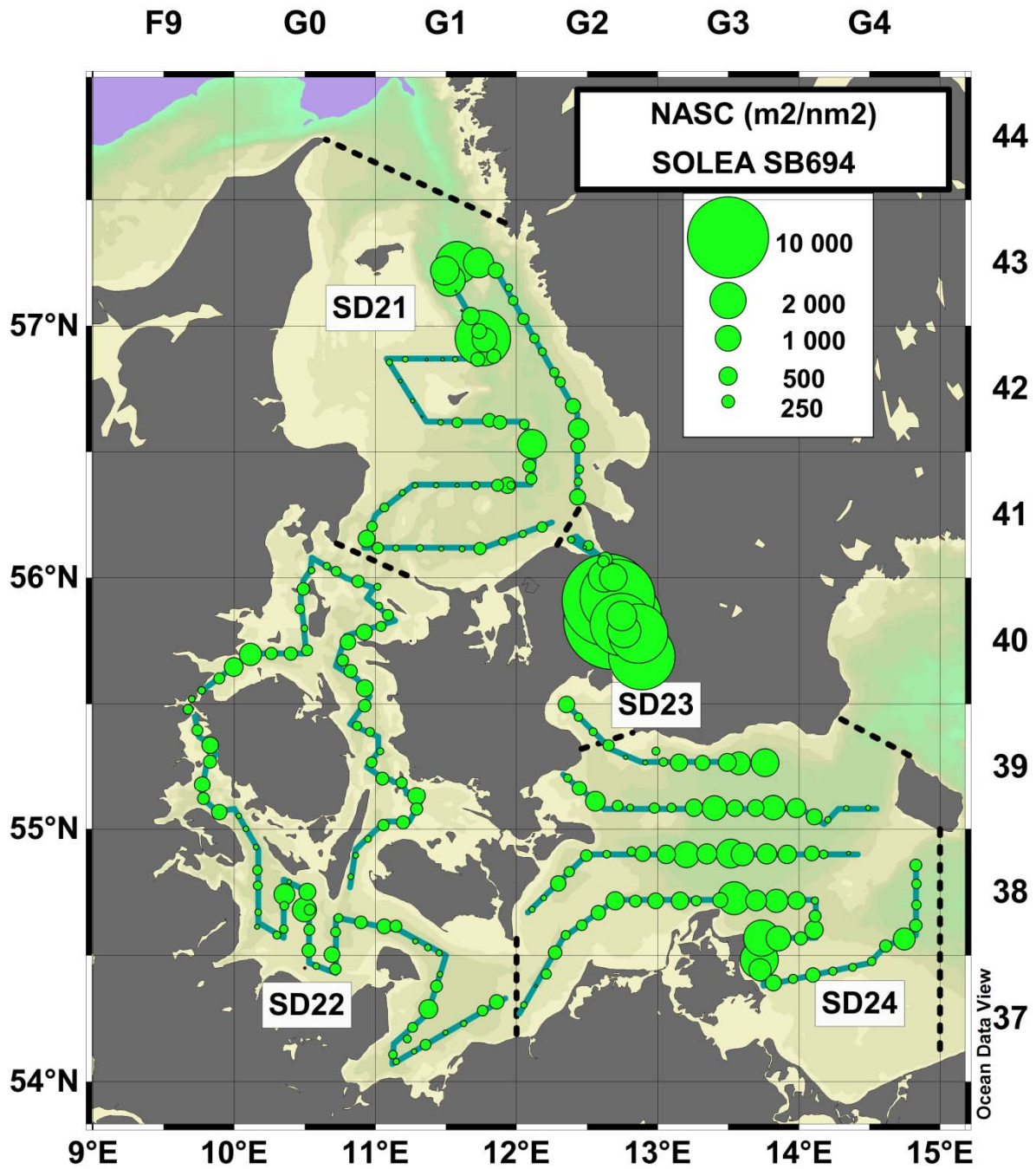


Dr. Matthias Schaber (TI-SF)  
(Scientist in charge)

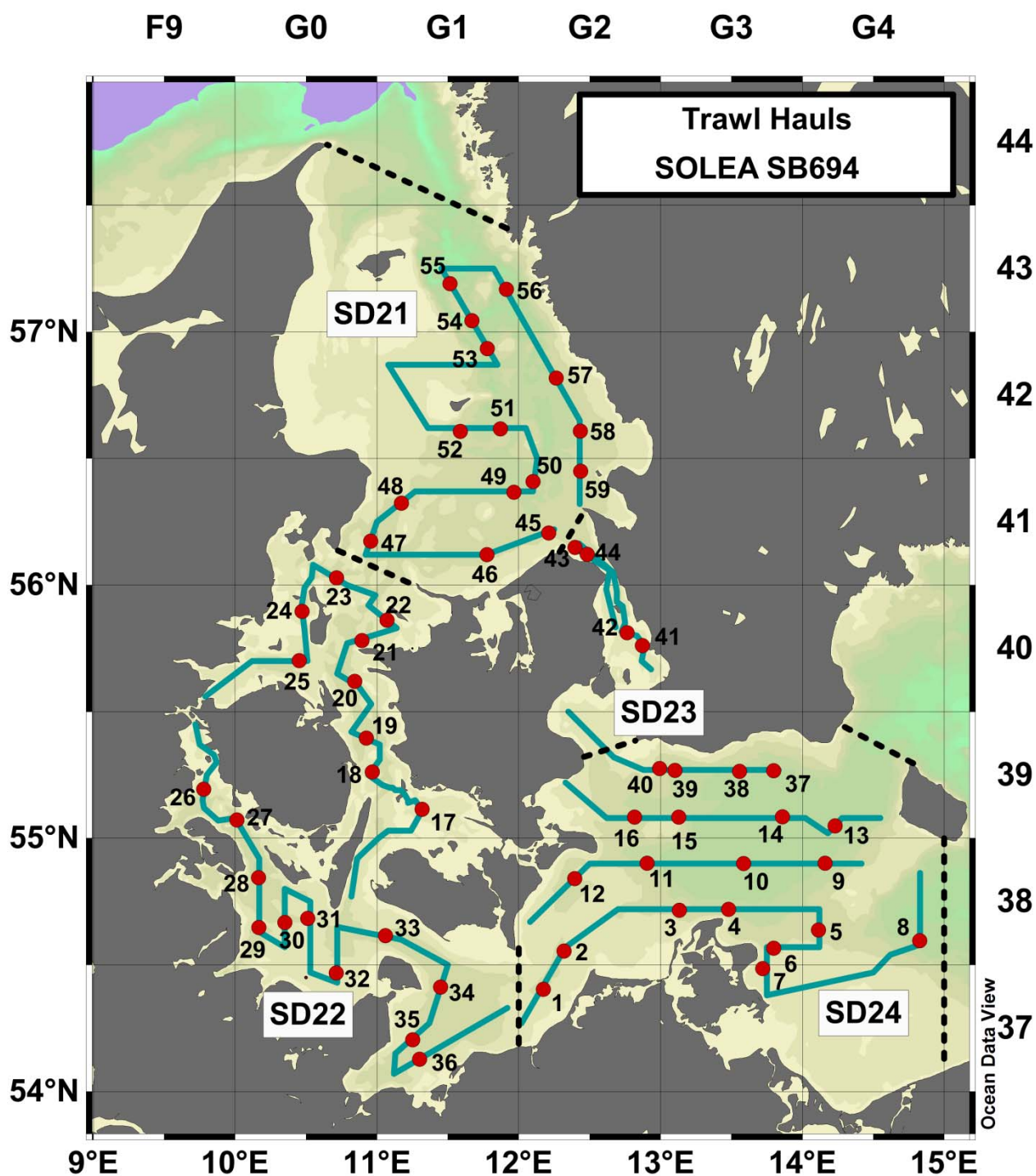


Dr. Tomas Gröhsler (TI-OF)  
(Scientist in charge)

Figures

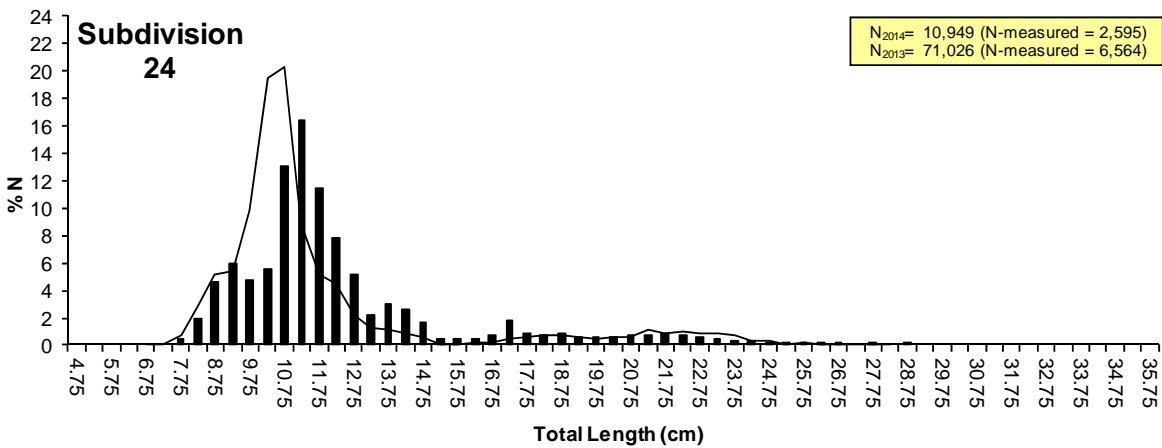
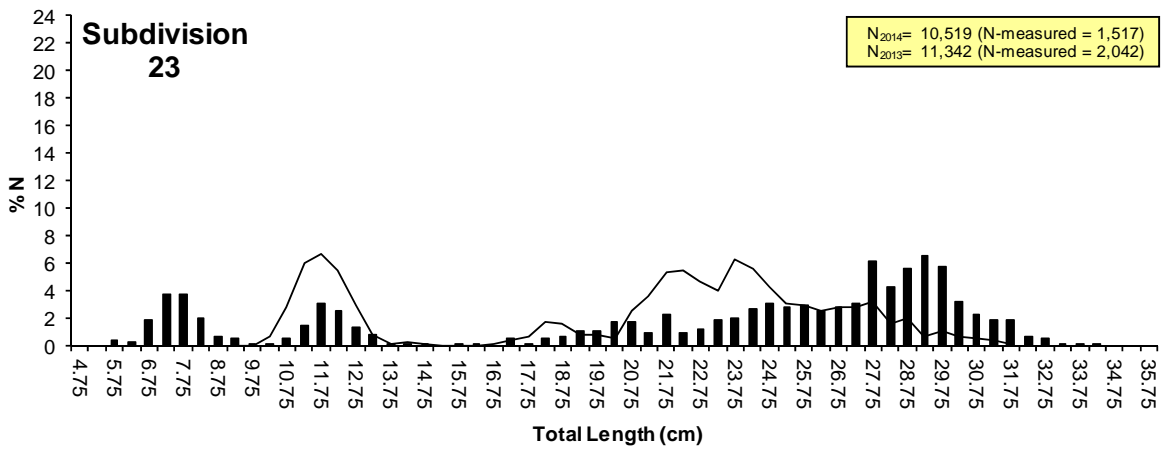
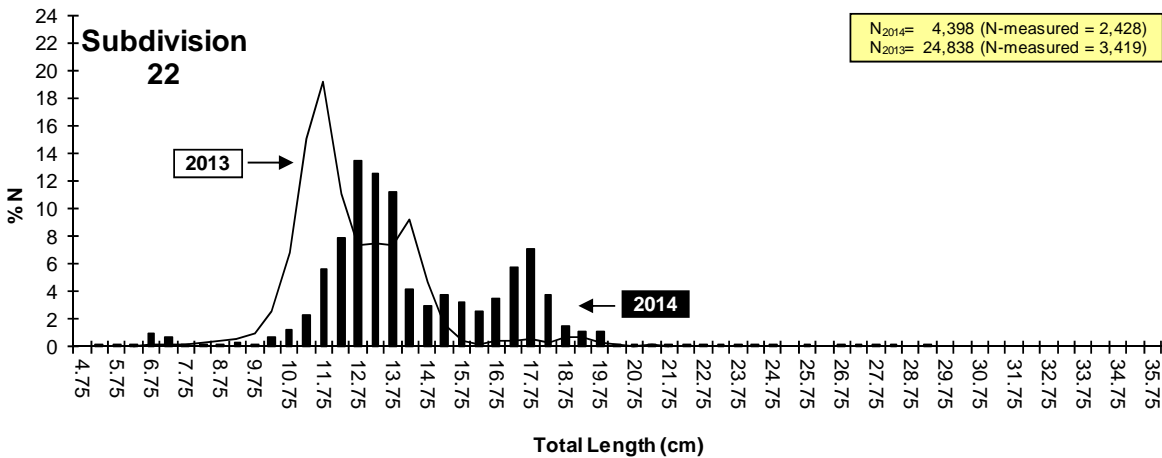
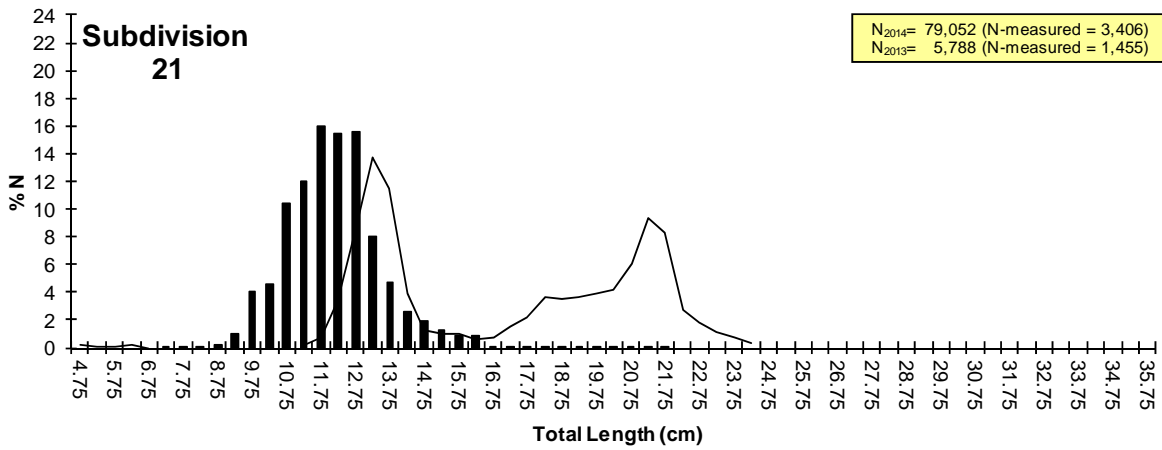


**Figure 1:** FRV "Solea" cruise 694/2014. Cruisetrack (lines) and mean NASC (5nm intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

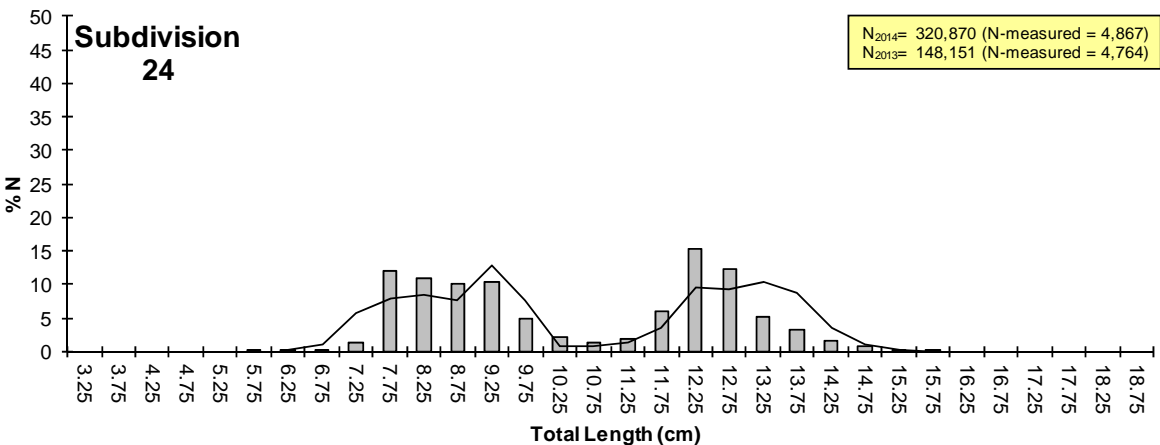
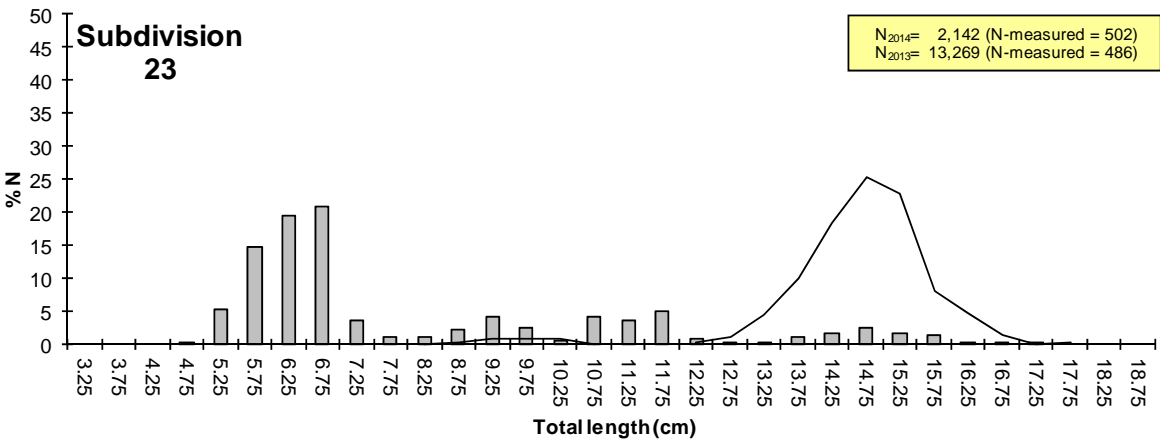
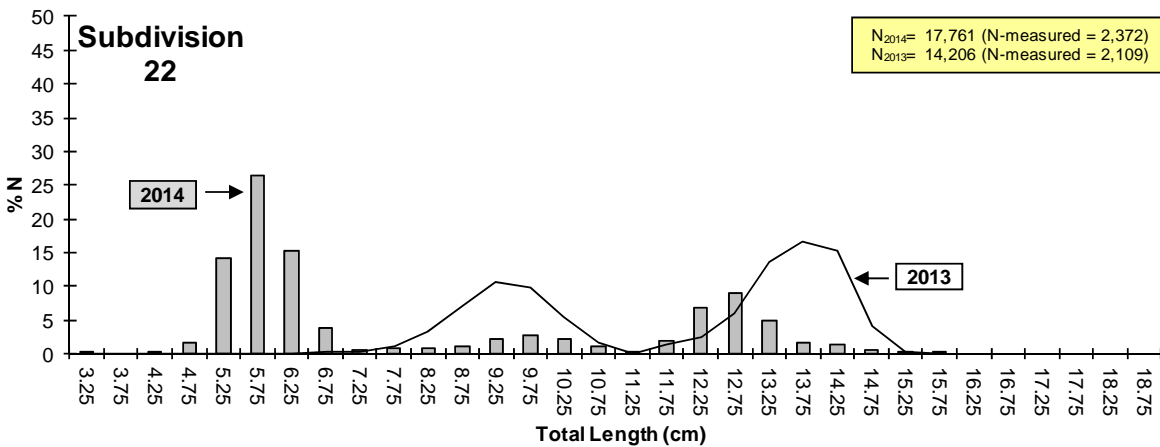
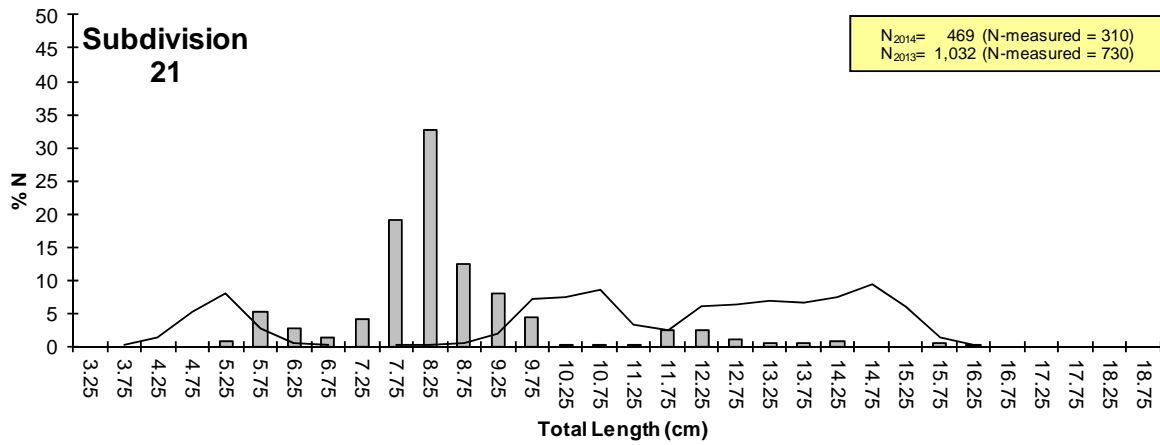


**Figure 2:** FRV "Solea" cruise 694/2014. Cruisetrack (lines) and fishery hauls (red dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

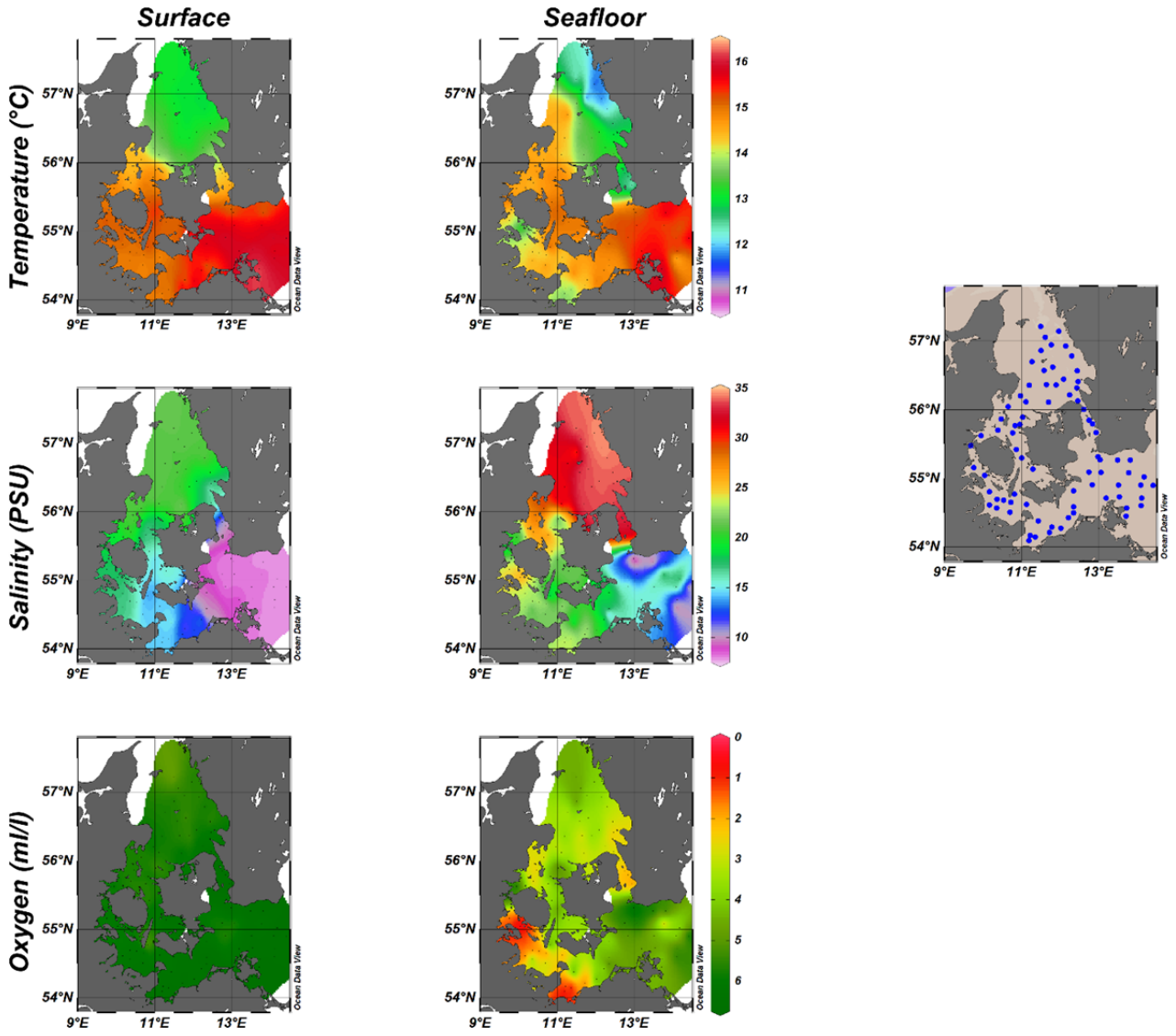




**Figure 3:** FRV "Solea" cruise 694/2014: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 679/2013).



**Figure 4:** FRV "Solea" cruise 694/2014: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 679/2013).



**Figure 5:** FRV "Solea" cruise 694/2014: 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).

## Tables

**Table 1:** FRV "Solea" cruise 694/2014: Catch composition (kg 0.5 h<sup>-1</sup>) by haul in SD 21.

Haul No.	45	46	47	48	49	50	51	52	53	54	55
Species/ICES Rectangle	41G2	41G1	41G0	41G1	41G1	41G2	42G1	42G1	42G1	43G1	43G1
CLUPEA HARENGUS	17.94	8.86	2.97	0.25	9.30	2.09	7.08	0.06	20.25	6.75	689.44
CRYSTALLOGOBIUS LINEARIS	0.02	+	+	+						+	
CYCLOPTERUS LUMPUS	0.92			0.28			0.21	0.14	1.17		
ENGRAULIS ENCRASICOLUS	0.46	12.04	46.02	4.60	21.70	3.16	13.40		0.06	0.02	
EUTRIGLA GURNARDUS	0.01										
GADUS MORHUA	0.95			4.45					3.43		
GASTEROSTEUS ACULEATUS		+									
LIMANDA LIMANDA	0.06	0.03	0.04								
LOLIGO FORBESI	1.90	0.58	0.03	0.01	0.02	+	0.01		0.42	0.28	1.420
MAUROLICUS MUELLERI									0.05	+	
MERLANGIUS MERLANGUS	0.38	0.04	0.01						0.2		
MERLUCCIIUS MERLUCCIIUS	+										
MULLUS SURMULETUS		0.01	0.01								
MYSIDACEA									1.37	0.02	
POLLACHIUS VIRENS									5.78		
POMATOSCHISTUS MINUTUS	+										
SARDINA PILCHARDUS	0.03	0.01	0.02		0.02	0.01	0.01				
SCOMBER SCOMBRUS			0.05						0.06		
SEPIOLA	0.03										
SPRATTUS SPRATTUS	0.06	+	0.02	0.02	0.01		0.1	0.4	0.03	0.07	
SQUALUS ACANTHIAS									1.57		
TRACHINUS DRACO	0.32	0.06	0.04	0.04	0.19	0.12	0.13		0.18	0.62	0.33
TRACHURUS TRACHURUS	0.04	0.06	0.04	0.01					0.01		
TRISOPTERUS ESMARKI									0.04		
<b>Total</b>	<b>23.12</b>	<b>21.69</b>	<b>49.25</b>	<b>9.66</b>	<b>31.24</b>	<b>5.38</b>	<b>20.94</b>	<b>0.60</b>	<b>34.62</b>	<b>7.76</b>	<b>691.19</b>
<b>Medusae</b>	<b>0.25</b>	<b>1.47</b>	<b>0.08</b>	<b>1.75</b>	<b>3.40</b>	<b>0.12</b>	<b>0.05</b>	<b>0.63</b>	<b>2.00</b>	<b>0.17</b>	<b>0.00</b>

Haul No.	56	57	58	59	Total
Species/ICES Rectangle	43G1	42G2	42G2	41G2	
CLUPEA HARENGUS	8.87	6.37	74.65	7.66	862.54
CRYSTALLOGOBIUS LINEARIS					0.02
CYCLOPTERUS LUMPUS					2.72
ENGRAULIS ENCRASICOLUS	0.31	6.40	8.40	0.36	116.93
EUTRIGLA GURNARDUS					0.01
GADUS MORHUA			9.31		18.14
GASTEROSTEUS ACULEATUS					+
LIMANDA LIMANDA					0.13
LOLIGO FORBESI	0.44	0.03		0.01	5.15
MAUROLICUS MUELLERI					0.05
MERLANGIUS MERLANGUS		0.17			0.80
MERLUCCIIUS MERLUCCIIUS					+
MULLUS SURMULETUS					0.02
MYSIDACEA					1.39
POLLACHIUS VIRENS					5.78
POMATOSCHISTUS MINUTUS					+
SARDINA PILCHARDUS		0.04	0.12		0.26
SCOMBER SCOMBRUS				0.06	0.17
SEPIOLA					0.03
SPRATTUS SPRATTUS	+		1.59	0.02	2.32
SQUALUS ACANTHIAS					1.57
TRACHINUS DRACO					2.03
TRACHURUS TRACHURUS					0.16
TRISOPTERUS ESMARKI					0.04
<b>Total</b>	<b>9.62</b>	<b>13.01</b>	<b>94.07</b>	<b>8.11</b>	<b>1020.26</b>
<b>Medusae</b>	<b>0.22</b>	<b>1.56</b>	<b>0.12</b>	<b>0.02</b>	<b>11.84</b>

+ = < 0.01 kg

**Table 2:** FRV "Solea" cruise 694/2014: Catch composition (kg 0.5 h<sup>-1</sup>) by haul in SD 22.

Haul No.	17	18	19	20	21	22	23	24	25	26	27
Species/ICES Rectangle	39G1	39G0	39G0	40G0	40G0	40G1	41G0	40G0	40G0	39F9	39G0
AGONUS CATAPHRACTUS						0.01		0.01	0.01		
BELONE BELONE										0.03	
CLUPEA HARENGUS	0.31	22.73	5.78	2.86	1.64	1.75	3.00	0.49	0.25	0.32	
CRANGON CRANGON				+							
CRYSTALLOGOBIUS LINEARIS	3.04	0.04	+	0.03	0.01	0.06	0.03	0.03	0.32	0.01	+
CTENOLABRUS RUPESTRIS	0.02		0.01					0.03			
CYCLOPTERUS LUMPUS	0.36							0.19			
ENGRAULIS ENCRASICOLUS		9.16	6.03	3.81	6.46	0.05	6.95	1.39	0.51	0.08	+
GADUS MORHUA	0.02	6.16	5.14					0.10	0.12		
GASTEROSTEUS ACULEATUS	1.38	0.03	+	0.03		0.01	+	0.24	7.20	5.82	0.09
GOBIUS NIGER										0.01	
LIMANDA LIMANDA	0.68	0.21	0.07	0.27			0.21	0.52	0.18		0.14
LOLIGO FORBESI			+	+		0.06	0.28	0.21	0.01		
MERLANGIUS MERLANGUS		0.01		0.08			0.25	0.02	0.03		0.01
MULLUS SURMULETUS		0.02		0.02		0.05	0.04				
MYOXOCEPHALUS SCORPIUS	0.32							0.11			
OSMERUS EPERLANUS											
PLATICHTHYS FLESUS								0.06	0.07		
PLEURONECTES PLATESSA						0.05					
POMATOSCHISTUS MINUTUS				+		+		+	+	0.01	+
PSETTA MAXIMA							0.30				
PUNGITIUS PUNGITIUS											
SCOMBER SCOMBRUS									0.04		
SPRATTUS SPRATTUS	1.76	14.80	0.48	0.11	0.40	0.19	0.65	0.21	0.11	11.38	4.23
SYMPHODUS MELOPS							0.06				
SYNGNATHUS ROSTELLATUS	0.01									0.01	
TRACHINUS DRACO		0.04		0.17		0.16	0.52	0.02			
TRACHURUS TRACHURUS	0.14	0.24	0.05	0.17	0.14	0.13	0.1	0.01	0.06		
<b>Total</b>	<b>8.04</b>	<b>53.44</b>	<b>17.56</b>	<b>7.55</b>	<b>8.65</b>	<b>2.52</b>	<b>12.39</b>	<b>3.64</b>	<b>8.91</b>	<b>17.67</b>	<b>4.47</b>
Medusae	32.0	3.8	8.5	2.2	9.9	12.8	4.9	5.4	7.8	0.0	4.5

Haul No.	28	29	30	31	32	33	34	35	36	Total
Species/ICES Rectangle	38G0	38G0	38G0	38G0	37G0	38G1	37G1	37G1	37G1	
AGONUS CATAPHRACTUS										0.03
BELONE BELONE										0.03
CLUPEA HARENGUS	0.15	0.17	14.97	0.29	6.40	10.34	3.90	11.37	5.76	92.48
CRANGON CRANGON										+
CRYSTALLOGOBIUS LINEARIS	+			+	0.14	+	0.05	+		3.76
CTENOLABRUS RUPESTRIS										0.06
CYCLOPTERUS LUMPUS										0.55
ENGRAULIS ENCRASICOLUS	0.05	0.03			0.66	0.03	0.03	0.08	4.76	40.08
GADUS MORHUA		+		8.90	+	12.39		3.17		36.00
GASTEROSTEUS ACULEATUS	0.09	0.08		+		0.03			0.06	15.06
GOBIUS NIGER										0.01
LIMANDA LIMANDA	0.13	0.10	0.24	0.27		0.97	0.03			4.02
LOLIGO FORBESI	+									0.56
MERLANGIUS MERLANGUS	+	0.02	0.87	+	0.06		0.13	2.11		3.59
MULLUS SURMULETUS										0.13
MYOXOCEPHALUS SCORPIUS										0.43
OSMERUS EPERLANUS				+						+
PLATICHTHYS FLESUS						0.40		0.46		0.99
PLEURONECTES PLATESSA										0.05
POMATOSCHISTUS MINUTUS	+	+		0.01	+	+			+	0.02
PSETTA MAXIMA										0.30
PUNGITIUS PUNGITIUS										+
SCOMBER SCOMBRUS										0.04
SPRATTUS SPRATTUS	0.06	0.07	1.50	0.10	2.08	0.03	59.24	6.09	0.16	103.65
SYMPHODUS MELOPS										0.06
SYNGNATHUS ROSTELLATUS										0.02
TRACHINUS DRACO	0.02									0.93
TRACHURUS TRACHURUS		0.09	0.42	0.01	0.07	0.02	0.12	0.06	0.27	2.10
<b>Total</b>	<b>0.50</b>	<b>0.56</b>	<b>18.00</b>	<b>9.58</b>	<b>9.41</b>	<b>24.21</b>	<b>63.50</b>	<b>23.34</b>	<b>11.01</b>	<b>304.95</b>
Medusae	1.5	2.8	6.2	1.8	5.6	10.9	1.6	2.5	6.8	131.4

+ = < 0.01 kg

**Table 3:** FRV "Solea" cruise 694/2014: Catch composition (kg 0.5 h<sup>-1</sup>) by haul in SD 23.

Haul No.	41	42	43	44	Total
Species/ICES Rectangle	40G2	40G2	41G2	41G2	
ANGUILLA ANGUILLA		0.42			0.42
CLUPEA HARENGUS	220.33	1016.93	14.08	5.02	1256.36
CRYSTALLOGOBIUS LINEARIS			+	+	+
CTENOLABRUS RUPESTRIS	+				+
EUTRIGLA GURNARDUS			+		+
GADUS MORHUA	29.88	57.97			87.85
LIMANDA LIMANDA			0.55	0.36	0.91
LIPARIS LIPARIS					0.00
LOLIGO FORBESI	+	+	0.47	0.33	0.80
MERLANGIUS MERLANGUS	0.54	0.56	0.13	+	1.23
MERLUCCIUS MERLUCCIUS			0.08	0.03	0.11
MULLUS SURMULETUS			0.07	0.01	0.08
PLEURONECTES PLATESSA		0.17			0.17
SPRATTUS SPRATTUS	4.87	0.13	6.33	0.37	11.70
TRACHINUS DRACO			0.14		0.14
TRACHURUS TRACHURUS			0.21	0.04	0.25
<b>Total</b>	<b>255.62</b>	<b>1076.18</b>	<b>22.06</b>	<b>6.16</b>	<b>1360.02</b>
Medusae	0.1	0.1	0.5	0.1	0.7

+ = < 0.01 kg

**Table 4:** FRV "Solea" cruise 694/2014: Catch composition (kg 0.5 h<sup>-1</sup>) by haul in SD 24.

Haul No.	1	2	3	4	5	6	7	8	9	10	11
<b>Species/ICES Rectangle</b>	<b>37G2</b>	<b>38G2</b>	<b>38G3</b>	<b>38G3</b>	<b>38G4</b>	<b>38G3</b>	<b>37G3</b>	<b>38G4</b>	<b>38G4</b>	<b>38G3</b>	<b>38G2</b>
CLUPEA HARENGUS	0.85	23.15	4.05	11.26	0.97	8.48	9.70	8.97	0.56	1.79	1.68
CRANGON CRANGON		0.01	1.30	0.02				+			+
CRYSTALLOGOBIUS LINEARIS	+	0.01	+	+							
CTENOLABRUS RUPESTRIS				+							
CYCLOPTERUS LUMPUS								0.37	0.18		
ENGRAULIS ENCRASICOLUS	0.61		0.01	0.03	0.01	0.16			0.04	0.02	0.02
GADUS MORHUA		0.50	1.46	4.76		4.70	14.10	0.77		0.49	
GASTEROSTEUS ACULEATUS	+	0.28	0.28	0.02			0.01			0.07	0.93
LIMANDA LIMANDA		9.93	0.46								
LIPARIS LIPARIS				+							
LOLIGO FORBESI	+	0.01									
MERLANGIUS MERLANGUS		0.28	0.59	0.15		4.53	6.47		0.01	1.75	
MYOXOCEPHALUS SCORPIUS		0.14									
OSMERUS EPERLANUS	0.01		0.01	0.09		0.81	2.32	0.01			
PLATICHTHYS FLESUS		2.28	27.02	3.53		0.15	0.01	0.52			
PLEURONECTES PLATESSA		0.19	9.38								
POMATOSCHISTUS MINUTUS		0.05	0.71	0.09		0.04	0.02	+		0.03	0.03
PSETTA MAXIMA				0.49							
SALMO TRUTTA						1.09					
SCOMBER SCOMBRUS		0.05								0.03	
SPRATTUS SPRATTUS	0.01	1306.30	13.57	121.75	29.73	47.13	114.98	21.80	4.69	246.94	0.33
STIZOSTEDION LUCIOPERCA							1.97				
TRACHINUS DRACO		0.03									
TRACHURUS TRACHURUS	0.01	0.49	0.29	0.11		0.03	0.01		0.01		+
<b>Total</b>	<b>1.49</b>	<b>1343.70</b>	<b>59.13</b>	<b>142.30</b>	<b>30.71</b>	<b>67.12</b>	<b>149.59</b>	<b>32.44</b>	<b>5.49</b>	<b>251.12</b>	<b>2.99</b>
<b>Medusae</b>	<b>4.27</b>	<b>7.84</b>	<b>7.12</b>	<b>31.18</b>	<b>15.67</b>	<b>9.88</b>	<b>29.23</b>	<b>2.47</b>	<b>50.30</b>	<b>21.72</b>	<b>6.50</b>

Haul No.	12	13	14	15	16	37	38	39	40	Total
<b>Species/ICES Rectangle</b>	<b>38G2</b>	<b>39G4</b>	<b>39G3</b>	<b>39G3</b>	<b>39G2</b>	<b>39G3</b>	<b>39G3</b>	<b>39G3</b>	<b>39G2</b>	
CLUPEA HARENGUS	25.04	3.94	8.90	1.43	16.50	21.87	6.21	1.57	4.94	161.86
CRANGON CRANGON		0.00		+	+					1.33
CRYSTALLOGOBIUS LINEARIS				+				+	0.01	0.02
CTENOLABRUS RUPESTRIS										+
CYCLOPTERUS LUMPUS										0.55
ENGRAULIS ENCRASICOLUS				0.05	0.22		0.01	0.03	0.01	1.22
GADUS MORHUA		3.14	1.25				4.94	2.81	1.57	40.49
GASTEROSTEUS ACULEATUS	0.17	+		0.01	0.16				+	1.93
LIMANDA LIMANDA										10.39
LIPARIS LIPARIS										+
LOLIGO FORBESI										0.01
MERLANGIUS MERLANGUS		2.85	0.14	0.02	0.02	0.23				17.04
MYOXOCEPHALUS SCORPIUS										0.14
OSMERUS EPERLANUS		0.02								3.27
PLATICHTHYS FLESUS				0.19			0.30			34.00
PLEURONECTES PLATESSA										9.57
POMATOSCHISTUS MINUTUS		0.16	0.01	0.04	0.04		+	0.04	+	1.26
PSETTA MAXIMA										0.49
SALMO TRUTTA										1.09
SCOMBER SCOMBRUS										0.08
SPRATTUS SPRATTUS	330.53	2.08	71.78	11.51	17.93	486.62	66.90	0.95	0.36	2895.89
STIZOSTEDION LUCIOPERCA										1.97
TRACHINUS DRACO										0.03
TRACHURUS TRACHURUS		0.01		0.02	0.02					1.00
<b>Total</b>	<b>355.74</b>	<b>12.20</b>	<b>82.08</b>	<b>13.27</b>	<b>34.89</b>	<b>508.72</b>	<b>78.36</b>	<b>5.40</b>	<b>6.89</b>	<b>3183.63</b>
<b>Medusae</b>	<b>17.18</b>	<b>10.42</b>	<b>29.28</b>	<b>10.00</b>	<b>5.78</b>	<b>7.59</b>	<b>1.95</b>	<b>9.50</b>	<b>5.35</b>	<b>283.2</b>

+ = < 0.01 kg