



Cruise Report
FRV „SOLEA“ Cruise 679
30.09. - 19.10.2013

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 Planning Group for Herring Surveys. FRV "Solea" participated for the 26th time. The survey area covered the western Baltic Sea including Kattegat, Belt Sea, Sound and Arkona Sea (ICES Subdivisions 21, 22, 23 and 24). Altogether, 1169 nm of regular and 140 nm of additional trial hydroacoustic transects were covered.

Mean NASC values per nautical mile in most rectangles of the different sub divisions were above the long-time mean values. Additionally, in all but four (five as compared to 2012) Rectangles (SD 21, 22, 23 and 24) NASC values in 2013 were –sometimes distinctly- higher than those observed in the previous years. Again, dense aggregations of herring could be recorded in the Sound (SD 23), with mean NASC values mostly higher than the long term average and the values observed in previous years. Higher scattering values were also recorded in different parts of the Arkona Sea (SD 24), especially east of Rügen Island, which is in accordance with the high catches yielded in this area (see below). NASC values from SDs 22 and 21 also were largely above the levels recorded in 2011 and 2012.

For species allocation and identification, altogether 51 fishery hauls were conducted, whereupon trawl haul no. 1 was not further accounted for due to technical problems with the trawl sensor.

Distribution list:

BLE, Hamburg
Schiffsführung FFS „SOLEA“
Deutsche Fischfang-Union
Sassnitzer Seefischerei e. G.
Landesverband der Kutter- u. Küstenfischer
DFFU Cuxhaven
BMELV, Ref. 614
TI – Pressestelle, Dr. Welling
TI - Präsidialbüro
TI - Institut für Fischereiökologie
TI - Institut für Seefischerei Hamburg
TI – Institut für Ostseefischerei
TI - 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 SB679:

- 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 (Tomas Gröhsler & Matthias Schaber)

FRV "Solea" was equipped with all hydroacoustic equipment and biological sampling gear on September 30th. On the same afternoon, "Solea" left Marienehe port for the calibration of hydroacoustic equipment. The calibration site off Wustrow/Salzhaff was chosen according to prevailing weather conditions providing acceptable conditions for calibration for the remaining evening and the next morning. Both the 38 and 120 kHz transducer were calibrated twice with calibration values regarded as very good. After calibration FRV "Solea" returned to Rostock/Warnemünde port on October 1st for embarkation of rest of scientific crew. Leaving of port and start of survey was scheduled for October 2nd. However, due to technical problems with the cooling system of ship engine, which could not be fixed prior to morning of October 4th, FRV "Solea" left port at 04:00 PM that day with an according delay. Hydroacoustic survey operations commenced October 4th 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. The first trawl haul was not accounted for due to technical problems with the trawl sensor. No hydrographic measurements could be conducted in SD 24 after trawl haul no. 8 onwards due to failure of oceanographic equipment. After accomplishing all transects in SD 24 on October 9th, FRV "Solea" returned to Rostock/Warnemünde port the same day to repair oceanographic equipment and to exchange cruise leadership. After another delay due to sickness of the first mate and according exchange of crew, the survey continued on October 10th. Then, FRV "Solea" left the port at 4:00 PM and steamed towards the south-easterly start point of the hydroacoustic transect in SD 22, where survey operations started the same day at 06:00 PM. In SD 22 and afterwards in SD 23 weather conditions were mostly favorable allowing accomplishing all transects and comparative day-recordings on selected transect sections. Due to the significant loss of time at the start of the survey, hydroacoustic recordings and survey operations in SD 21 were carried out continuously without interruption during daytime. Despite an according lack of trawl hauls in some areas, this allowed for coverage of the minimum survey area required.

On October 18th, 01:30 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 in the afternoon of the same day.

Altogether, the following survey schedule was accomplished:

- Arkona Sea (SD 24) 04. - 09.10.
- Belt Sea (SD 22) 10. - 15.10.
- Sound (SD 23) 15. - 16.10.
- Kattegat (SD 21) 16. - 18.10.

Total survey time	13 nights (daytime replicates on 3 days)
Fishery hauls	51
CTD-casts	65
Hydroacoustic transects	1169 nm (+ 140 nm daytime replicate transect sections)

Overall hydroacoustic transect length was 1309 nm including daytime replicates. Regular transect length was 1169 nm (2012: 1280 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 Sonardata EchoView 5 software. The transducer settings applied were in accordance with the specifications provided in ICES (2012).

Calibration of both 38 and 120 kHz transducer took place off Wustrow/Salzhauff at acceptable weather conditions. Both transducers were calibrated several times on two days with improving weather conditions. Resulting calibration parameters were considered as very good.

During the survey, hydroacoustic data were recorded at a ship speed of 10 to 11 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 2013. Mean NASC values were mostly and sometimes distinctly above (SD 23 and SD 24) the long time survey average (1999-2012) with only few exceptions in all subdivisions. In comparison with the previous years, mean NASC values were higher in all subdivisions with an exception of altogether four (2012) and five (2011) rectangles, where –mostly marginally- higher NASC values were measured in corresponding years. The only distinct exception was one rectangle in SD24 (39G3, northern Arkona Basin), where NASC values were distinctly lower than in 2011 and 2012. In SD 23, the usual large aggregations of big herring in the Öre Sound near Ven Island were also present in autumn 2013, with mean NASC values in SD 23 exceeding previous years. However, no southward expansion of these aggregations was detected in 2013 (compared to 2012). 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. In SD 22 and SD 21, mean NASC values also were mostly higher than in the previous years and often higher than the long time survey average. As in the year before, a preliminary analysis of daytime replicate transects revealed different small-scale (vertical) distribution patterns of clupeids but indicated similar overall NASC values as compared to night-time sampling. The final analysis of hydroacoustic data will be accomplished by end of 2013.

3.3 Biological sampling (Tomas Gröhsler)

To validate and allocate echorecordings, altogether 51 fishery hauls were conducted, one of which was considered invalid due to equipment failure (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	7
22	19
23	4
24	21 (1 invalid)

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

- Frozen samples: 1.713 herring, 978 sprat und 181 European anchovies

Further frozen samples for bioenergetics, stock discrimination, distribution pattern in Danish waters and (mixed species) student courses were collected for DTU aqua, Charlottenlund, DK:

- 60 herring (*Clupea harengus*) samples
- 18 sprat (*Sprattus sprattus*) samples
- 14 Gobiidae samples
- 20 whiting (*Merlangius merlangus*) samples
- 5 cod (*Gadus morhua*) samples
- 10 anchovy (*Engraulis encrasicolus*) samples

- 6 common shrimp (*Crangon crangon*) samples
- 16 mixed species samples

Altogether, the following species were sampled and processed:

Species	Length measurements	Number of hauls
CLUPEA HARENGUS	13,480	48
CRANGON CRANGON	28	6
CRYSTALLOGOBIUS LINEARIS	621	19
CTENOLABRUS RUPESTRIS	9	5
CYCLOPTERUS LUMPUS	19	14
ENGRAULIS ENCRASICOLUS	388	19
GADUS MORHUA	162	25
GASTEROSTEUS ACULEATUS	805	29
GOBIUS NIGER	3	3
LIMANDA LIMANDA	137	18
LOLIGO FORBESI	353	19
MERLANGIUS MERLANGUS	451	40
MERLUCCIIUS MERLUCCIIUS	6	3
MYOXOCEPHALUS SCORPIUS	4	4
PLATICHTHYS FLESUS	21	11
POMATOSCHISTUS MINUTUS	661	34
SCOMBER SCOMBRUS	12	6
SEPIOLA	13	7
SPRATTUS SPRATTUS	8,089	45
SYNGNATHUS TYPHLE	4	4
TRACHINUS DRACO	33	12
TRACHURUS TRACHURUS	1,093	37
Others	39	17

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, 36 different species were recorded. Herring were caught in 48, sprat in 45 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. As in the last two years, sardines (*Sardina pilchardus*) were not recorded at all in the survey area.

Figures 3 and 4 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2012 and 2013. Compared to results from the previous survey in 2012, the following conclusions for herring can be drawn (Fig. 3):

- Catches in SD 21 show a bimodal distribution characterized by presence of the incoming year class (<15 cm) and older herring (ca. >17 cm). This is in contrast to 2012, where the fraction of older herring was mostly absent.
- SD 22 only shows the incoming year class with two modes at 11.75 cm and 14.25 cm, whereas in 2012 the incoming year class showed a trimodal distribution with modes at 9.25 cm, 12.75 cm and 14.75 cm, while older fishes showed another mode at 18.25 cm.
- In SD 23, the incoming year class (mode at 11.75 cm) and older herring (>20 cm) with modes at 22.25 cm and 23.75 cm dominated catches. In 2012, herring of the incoming year class (mode at ca. 13.25 cm) contributed to a far lesser extent, while the fraction of ca. one year old herring (mode at 18.75 cm) and very large herring (modes at 27.25 and 28.75 cm) were more existent.
- In SD 24, the herring length-frequency distribution consisted mostly of the incoming year class (mode at 10.75 cm), whereas in 2011 both incoming year class (mode at 12.25 cm) and older herring (mode at 21.25 cm) formed a bimodal distribution.
- Altogether, the present incoming year class (ca. <15 cm) seemed to be stronger than the one in previous year.

Relative length-frequency distributions of sprat in the years 2012 and 2013 (Fig. 4) can be characterized as follows:

- In SD 21, the incoming year class (<10 cm) and older sprat >12 cm were more represented compared to 2012, when catches almost exclusively consisted of sprat sizes between ca. 8.25 cm and 11.25 cm.
- In SD 22 and 24, continued growth of the stronger 2011 year class led to the dominance of bigger sprat as compared to 2012. As in 2012 the present incoming year class was again virtually absent in SD 23.
- Altogether, the present incoming year class (ca. <10 cm) seemed to be somehow stronger than the one in 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). Due to failure of the CTD (see cruise narrative), the coverage of SD 24 (Arkona Sea) with hydrographic measurements is limited.

Altogether, 65 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. Surface temperatures were similar at ca. 12°C throughout the survey area. Bottom temperatures were generally warmer in most parts of the survey area with the exception of comparatively cold water (< 6 °C) in the eastern Arkona Sea close to the Bornholm Basin. Surface salinities ranged from ca. 20 psu in the Kattegat to ca. 7 psu in the eastern Arkona Sea. Bottom salinities showed a similar gradient but were generally higher in the range of > 33 psu (SD 21) to ca. 8 psu (SD 24). Surface layers were well oxygenated throughout the surface area. Signs of oxygen depletion were as in previous years evident in bottom layers of SD 22 (southern Belt Sea and Mecklenburg Bight) and to a lesser extent SD 21 (Kattegat). In SD 22, oxygen depletion in some areas had proceeded to almost anoxic conditions near the seafloor.

4. Cruise Participants

Name	Function	Institute
30.09.-02.10.2013/Calibration of hydroacoustic equipment		
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
T. Kirchner	Student assistant	TI-SF
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
B. Stefanowitsch	Student assistant	TI-OF
04.-19.10.2013/Survey		
Dr. T. Gröhsler	Hydroacoustics, Cruise leader	TI-OF (04.-09.10.2013)
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF (09.-18.10.2013)
M. Koth	Fishery biology	TI-OF
S.-E. Levinsky	Fishery biology	DTU Aqua, Charlottenlund, (DK)
I. Rottgardt	Student assistant	TI-OF
T. Kirchner	Student assistant	TI-SF
D. Stephan	Fishery biology	TI-OF
B. Stefanowitsch	Student assistant	TI-OF

5. Acknowledgments

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

6. Literature

ICES (2012). Manual for International Baltic Acoustic Surveys (IBAS). Report of the Baltic International Fish Survey Working Group (WGBIFS). ICES CM 2012/SSGESST:02



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



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

Figures

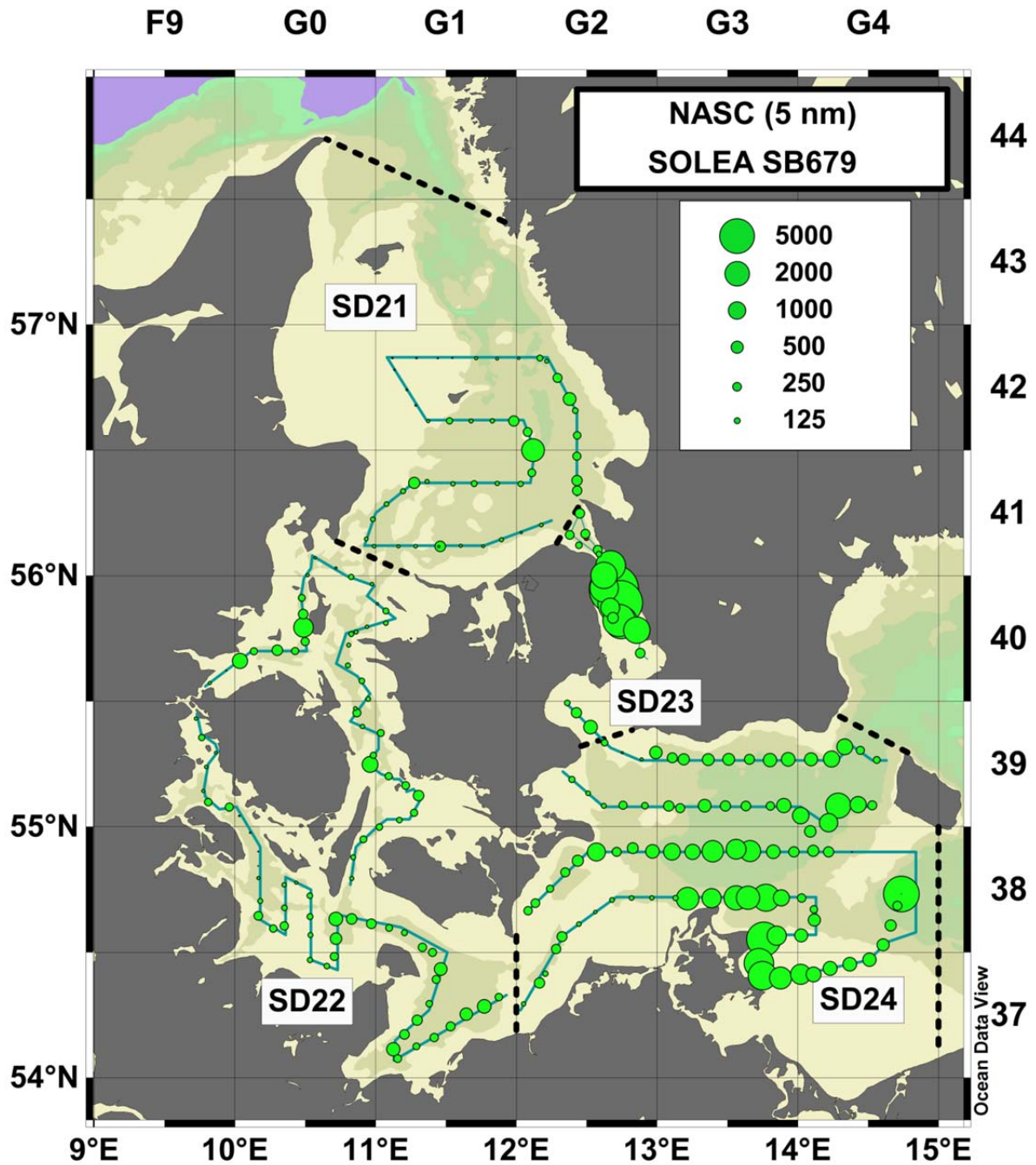


Figure 1: Cruisetrack (lines) and mean NASC (5nm intervals) of FRV "Solea" cruise 679/2013. ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD). Deviations of cruisetrack in SE SD 24 due to temporal/navigational constraints.

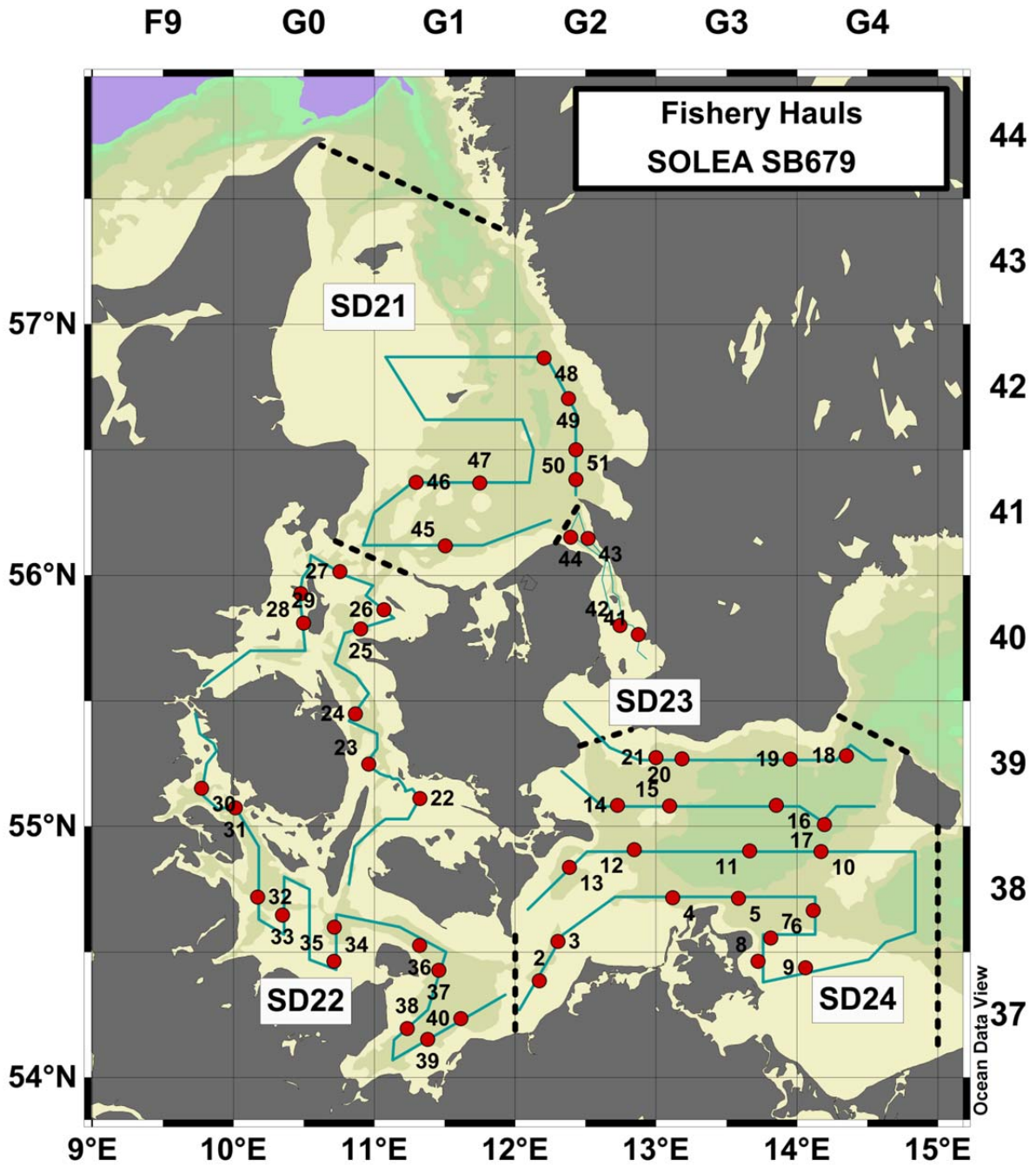


Figure 2: Cruisetrack (lines) and fishery hauls (red dots) of FRV "Solea" cruise 679/2013. ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

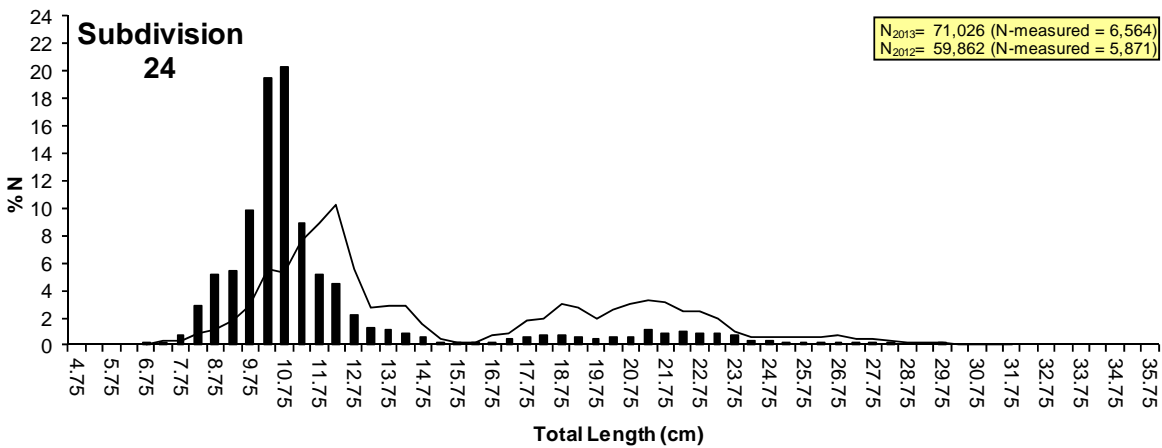
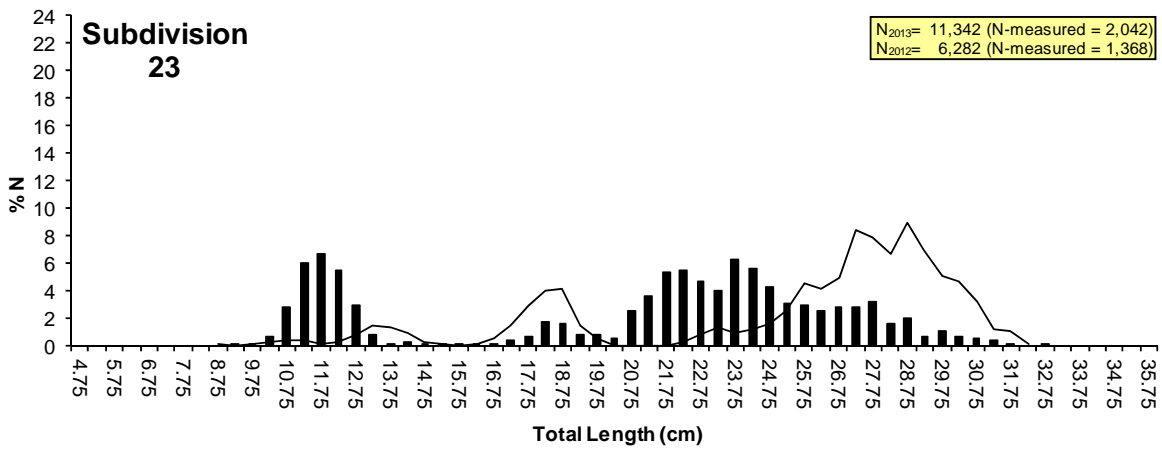
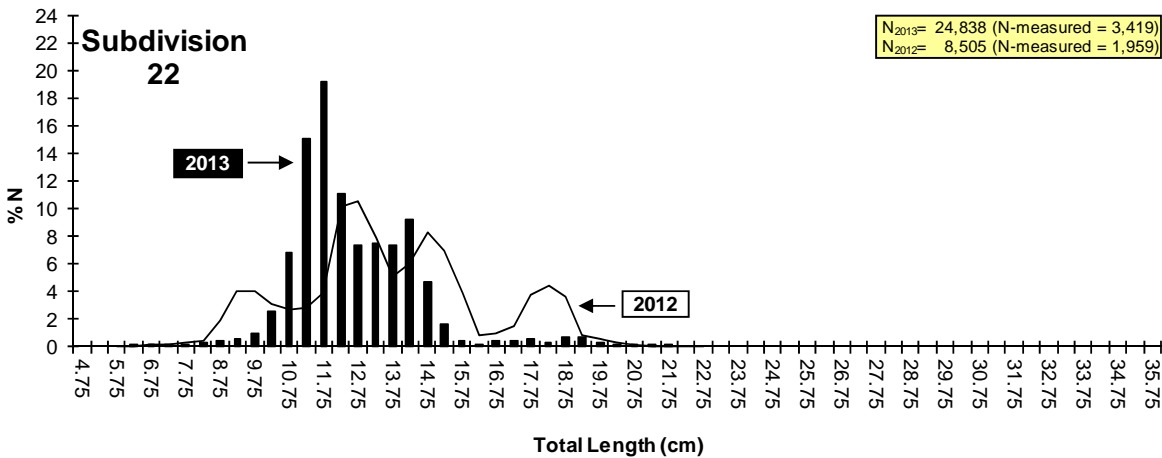
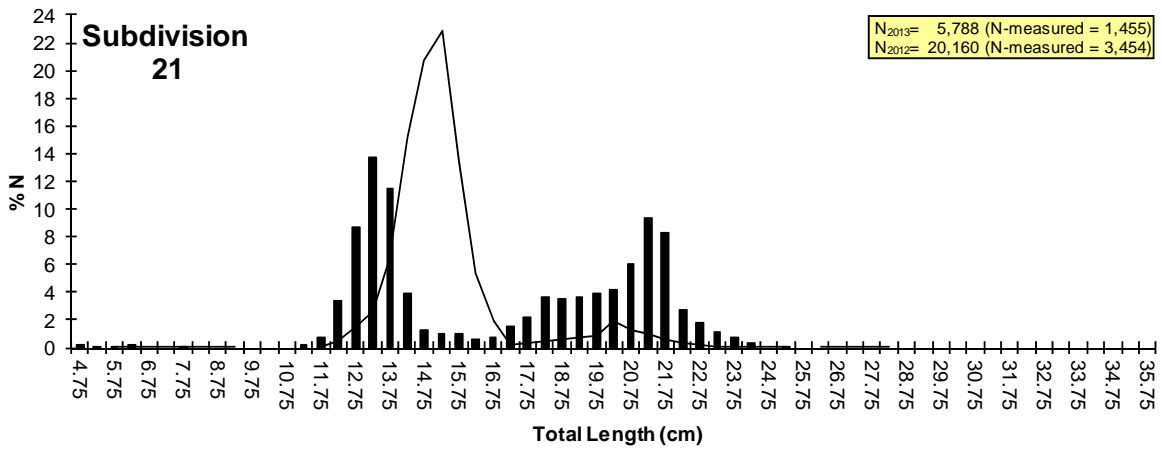


Figure 3: FRV "Solea" cruise 679/2013: Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 662/2012).

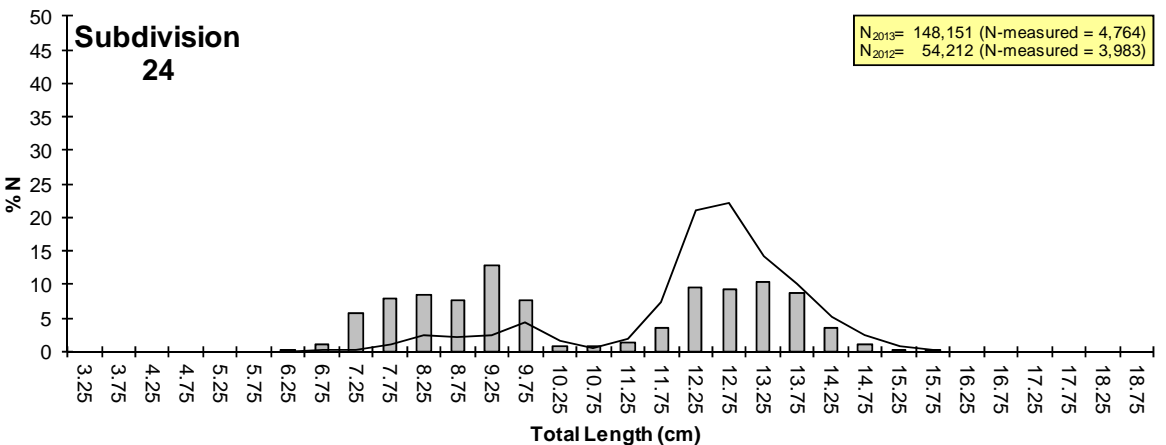
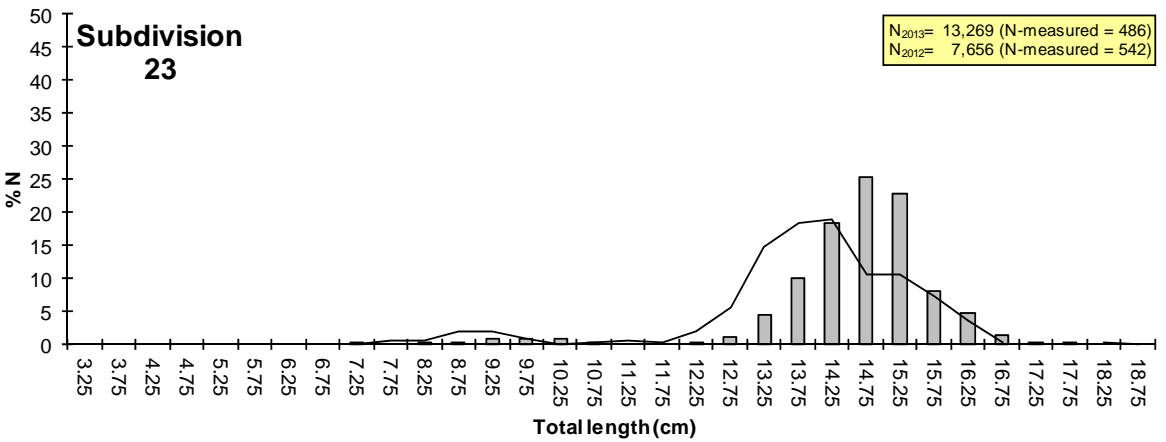
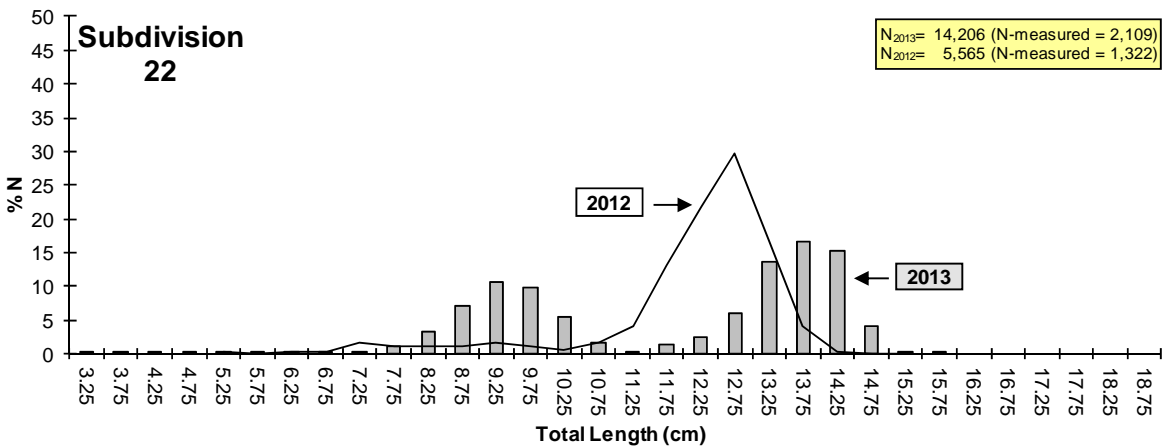
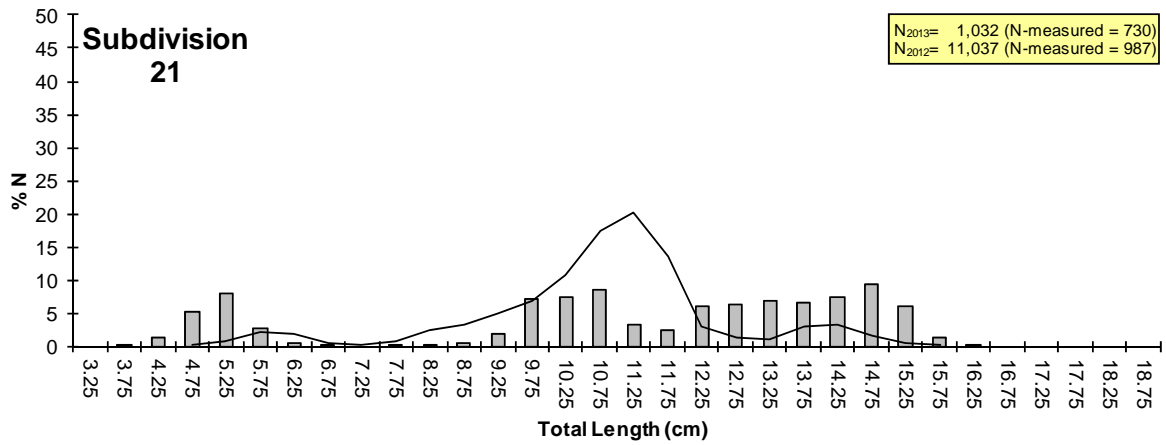


Figure 4: FRV "Solea" cruise 679/2013: Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 662/2012).

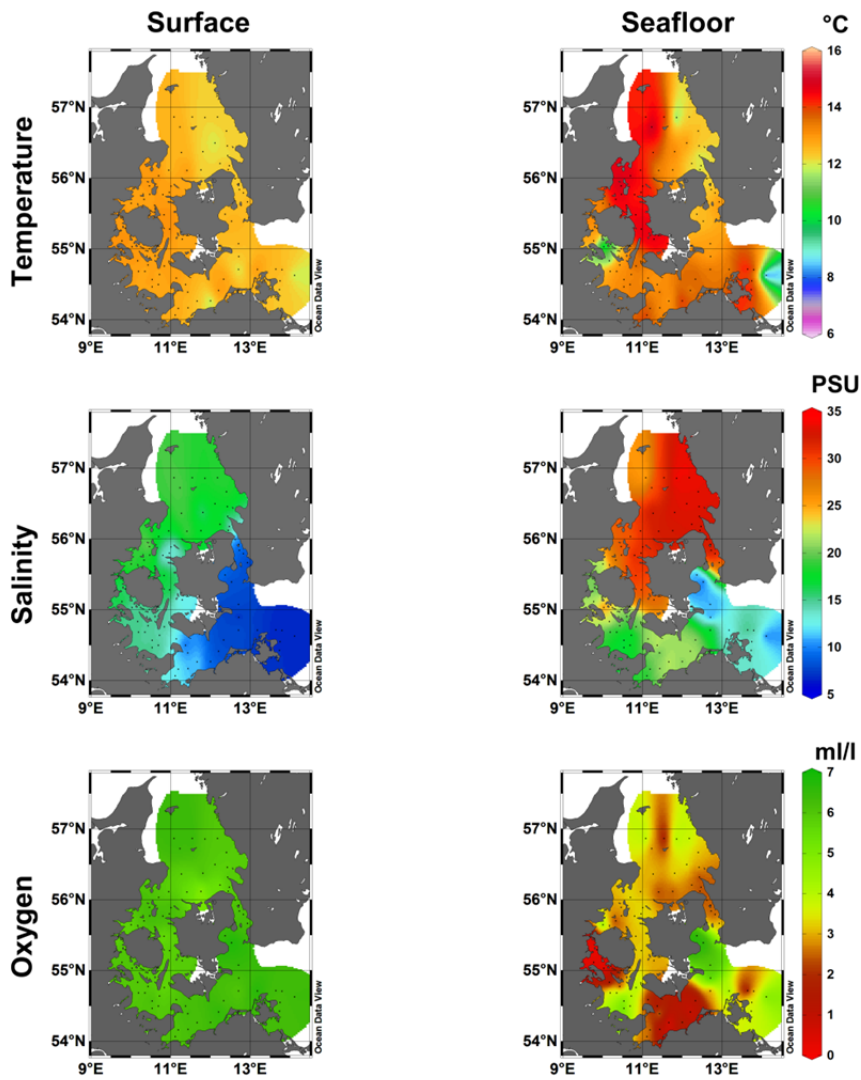


Figure 5: FRV "Solea" cruise 679/2013: Hydrography. CTD stations are depicted as black dots. Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right). Note that hydrographic measurements did not take place in parts of the Arkona Sea (SD 24) due to equipment failure.

Tables

Table 1: FRV "Solea" cruise 679/2013: Catch composition (kg 0.5 h⁻¹) by haul in Subdiv. 21.

Haul No.	45	46	47	48	49	50	51	Total
Species/ICES Rectangle	41G1	41G1	41G1	42G2	42G2	41G2	41G2	
CLUPEA HARENGUS	129.80	31.59	0.62		8.95	26.01	25.20	222.17
CRYSTALLOGOBIUS LINEARIS		0.01	+	0.10	0.37	0.22	0.05	0.75
CYCLOPTERUS LUMPUS	0.30					0.18	0.18	0.66
ENGRAULIS ENCRASICOLUS	+		0.12	0.01	+	0.03	0.02	0.18
GASTEROSTEUS ACULEATUS	+							+
LIMANDA LIMANDA		0.09	0.05					0.14
LOLIGO FORBESI	+	0.05	0.06	0.14	0.13	+	+	0.38
MERLANGIUS MERLANGUS	0.01	0.01	0.07		0.40	0.06	0.02	0.57
MERLUCCIIUS MERLUCCIIUS					0.03	+		0.03
POMATOSCHISTUS MINUTUS		0.01	0.01	+		+	+	0.02
SEPIOLA		+	0.01		0.03	0.01		0.05
SPRATTUS SPRATTUS	0.10	3.96			3.14	5.96	0.38	13.54
TRACHINUS DRACO		+	0.19	0.12	0.64	0.17	+	1.12
TRACHURUS TRACHURUS	0.43	0.05	0.06		0.12	0.03	0.04	0.73
Total	130.64	35.77	1.19	0.37	13.81	32.67	25.89	240.34
Medusae	1.69	5.04	6.15	5.84	2.93	2.78	3.53	27.96

+ = < 0.01 kg

Table 2: FRV "Solea" cruise 679/2013: Catch composition (kg 0.5 h⁻¹) by haul in Subdiv. 22.

Haul No.	22	23	24	25	26	27	28	29	30	31
Species/ICES Rectangle	39G1	39G0	39G0	40G0	40G1	41G0	40G0	40G0	39F9	39G0
CARCINUS		+								
CLUPEA HARENGUS	0.45	15.44	10.04		0.12	0.62	5.70	98.19	0.52	0.50
CRANGON CRANGON	+	+					+	0.01		
CRYSTALLOGOBIUS LINEARIS	0.08	0.09	0.04	0.03	0.01	+	0.06	0.01		
CTENOLABRUS RUPESTRIS	+		0.01		0.01					+
CYCLOPTERUS LUMPUS	0.39								0.14	0.22
ENGRAULIS ENCRASICOLUS	0.11	0.12	0.07	0.09	0.02	0.01	0.13	2.47		
EUTRIGLA GURNARDUS					+					
GADUS MORHUA	0.19						0.11	0.01	0.17	
GASTEROSTEUS ACULEATUS	2.93				+	+	+		0.18	0.04
GOBIUS NIGER		+							0.01	
LEANDER		+								
LIMANDA LIMANDA	0.15	0.06	0.03		0.07		0.03	0.87	0.13	0.29
LOLIGO FORBESI	0.03	0.01	+	+	0.06	0.02	+	0.02		
MERLANGIUS MERLANGUS	+	0.11	0.05	+	0.02	0.07	0.12		0.01	0.17
MULLUS SURMULETUS								0.01		
MYOXOCEPHALUS SCORPIUS										
POMATOSCHISTUS MINUTUS	0.02	0.04	0.01	+	0.02	0.01	0.03	0.03	+	+
SCOMBER SCOMBRUS	0.02	0.06						0.52		
SEPIOLA	+	+	+			+				
SOLEA VULGARIS								0.01		
SPINACHIA SPINACHIA							+			
SPRATTUS SPRATTUS	0.04	3.84	2.58			0.08	0.23	0.33	+	
SYNGNATHUS TYPHLE	+			+	+				+	
TRACHINUS DRACO	+	+			0.29	0.22	0.00			
TRACHURUS TRACHURUS	0.24	1.86	0.69	11.12	2.59	0.57	0.02	0.53	+	+
TRISOPTERUS ESMARKI		+								
Total	4.65	21.63	13.52	11.24	3.21	1.60	6.43	103.01	1.16	1.22
Medusae	5.4	2.3	3.7	0.4	5.8	7.0	4.8	4.4	13.8	8.6

Haul No.	32	33	34	35	36	37	38	39	40	Total
Species/ICES Rectangle	38G0	38G0	37G0	38G0	38G1	37G1	37G1	37G1	37G1	
CARCINUS										+
CLUPEA HARENGUS	0.70	19.43	44.12	58.76	19.50	9.54	15.75	9.62	28.57	337.57
CRANGON CRANGON										0.01
CRYSTALLOGOBIUS LINEARIS			+			0.01				0.33
CTENOLABRUS RUPESTRIS					+					0.02
CYCLOPTERUS LUMPUS				1.47	0.22					2.44
ENGRAULIS ENCRASICOLUS	0.01						+			3.03
EUTRIGLA GURNARDUS										+
GADUS MORHUA				8.73		0.01	2.26	1.32		12.80
GASTEROSTEUS ACULEATUS	+	0.23	0.03			0.01	0.01	0.30	0.03	3.76
GOBIUS NIGER								+		0.01
LEANDER										+
LIMANDA LIMANDA			0.01	0.99	0.38	0.06				3.07
LOLIGO FORBESI										0.14
MERLANGIUS MERLANGUS		0.03	0.09	0.04	0.01	0.40	0.53	0.05	0.02	1.72
MULLUS SURMULETUS										0.01
MYOXOCEPHALUS SCORPIUS									0.04	0.04
POMATOSCHISTUS MINUTUS	+		+		+	+				0.16
SCOMBER SCOMBRUS										0.60
SEPIOLA										+
SOLEA VULGARIS										0.01
SPINACHIA SPINACHIA										+
SPRATTUS SPRATTUS	0.64	0.01	2.54	1.42	3.81	16.88	145.65	0.86	2.07	180.98
SYNGNATHUS TYPHLE										+
TRACHINUS DRACO										0.51
TRACHURUS TRACHURUS	0.02	0.02	0.06	0.01	0.07	0.06	0.08	0.36	0.47	18.77
TRISOPTERUS ESMARKI										+
Total	1.37	19.72	46.85	71.42	23.99	26.97	164.28	12.51	31.20	565.98
Medusae	11.3	7.6	8.4	20.3	14.5	11.1	45.1	16.5	12.4	203.3

+ = < 0.01 kg

Table 3: FRV "Solea" cruise 679/2013: Catch composition (kg 0.5 h⁻¹) by haul in Subdiv. 23.

Haul No.	41	42	43	44	Total
Species/ICES Rectangle	40G2	40G2	41G2	41G2	
CLUPEA HARENGUS	69.35	815.63	27.63	12.17	924.78
CRYSTALLOGOBIUS LINEARIS	+		0.10	0.02	0.12
ENGRAULIS ENCRASICOLUS				0.03	0.03
GADUS MORHUA	56.41	49.11			105.52
GASTEROSTEUS ACULEATUS			0.01		0.01
LIMANDA LIMANDA			0.06		0.06
LOLIGO FORBESI	0.01	0.02	0.09	0.12	0.24
MERLANGIUS MERLANGUS	3.03	1.37	0.08	0.02	4.50
MERLUCCIIUS MERLUCCIIUS				+	+
PLATICHTHYS FLESUS	0.17		0.19		0.36
POMATOSCHISTUS MINUTUS			+	+	+
SCOMBER SCOMBRUS		1.13			1.13
SPRATTUS SPRATTUS	41.36	255.20	+	0.02	296.58
TRACHINUS DRACO				0.01	0.01
TRACHURUS TRACHURUS	0.29	0.15	+	0.14	0.58
Total	170.62	1122.61	28.16	12.53	1333.92
Medusae	1.2	1.9	4.2	4.0	11.4

+ = < 0.01 kg

Table 4: FRV "Solea" cruise 679/2013: Catch composition (kg 0.5 h⁻¹) by haul in Subdiv. 24.

Haul No.	1	2	3	4	5	6	7	8	9	10	11
Species/ICES Rectangle	37G2	37G2	38G2	38G3	38G3	38G4	38G3	37G3	37G4	38G4	38G3
AGONUS CATAPHRACTUS	-	0.04									
BELONE BELONE	-				0.51						
CLUPEA HARENGUS	-	9.01	30.15	8.15	5.29	58.89	9.21	17.41	8.67	14.28	25.06
CRANGON CRANGON	-										
CYCLOPTERUS LUMPUS	-			0.43							
ENGRAULIS ENCRASICOLUS	-										
GADUS MORHUA	-	1.99	0.02			0.02	0.64	3.30	3.16	0.75	0.30
GASTEROSTEUS ACULEATUS	-	0.01	0.03	0.12	0.10	0.18	0.03	0.22	0.52	0.07	0.02
LIMANDA LIMANDA	-	2.61	0.69								
MERLANGIUS MERLANGUS	-	0.50	0.12		0.68		3.03	0.58		0.30	3.31
MYOXOCEPHALUS SCORPIUS	-	0.26					0.28				
OSMERUS EPERLANUS	-							0.98	0.06		
PLATICHTHYS FLESUS	-				0.73	0.49	0.16	1.13	0.32		
PLEURONECTES PLATESSA	-										
POMATOSCHISTUS MINUTUS	-		+	+	0.06	+	+	0.12			
RHINONEMUS CIMBRIUS	-	0.04									
SALMO TRUTTA	-						1.54		1.66		
SCOMBER SCOMBRUS	-										0.71
SPRATTUS SPRATTUS	-	0.34	11.49	1.04	47.45	48.55	41.19	84.38	2.40	10.15	613.25
STIZOSTEDION LUCIOPERCA	-							0.10			
TRACHURUS TRACHURUS	-	0.03	0.01				0.01		+		
Total	-	14.83	42.51	9.74	54.82	108.13	56.09	108.22	16.79	25.55	642.65
Medusae	-	89.40	59.46	53.60	11.51	18.63	43.95	6.01	12.67	6.42	7.03

Haul No.	12	13	14	15	16	17	18	19	20	21	Total
Species/ICES Rectangle	38G2	38G2	39G2	39G3	39G3	39G4	39G4	39G3	39G3	39G2	
AGONUS CATAPHRACTUS											0.04
BELONE BELONE											0.51
CLUPEA HARENGUS	25.81	229.03	16.01	22.39	15.29	121.21	151.50	149.34	41.35	20.21	978.26
CRANGON CRANGON	+									+	+
CYCLOPTERUS LUMPUS		0.15	0.16		0.37		0.36	2.07			3.54
ENGRAULIS ENCRASICOLUS			+								+
GADUS MORHUA		0.02		24.36	0.33	2.01	2.15	2.13		0.62	41.80
GASTEROSTEUS ACULEATUS	0.12		0.02	+					+		1.44
LIMANDA LIMANDA		0.03									3.33
MERLANGIUS MERLANGUS	0.01		+	0.09		8.03	0.24			0.01	16.90
MYOXOCEPHALUS SCORPIUS	+										0.54
OSMERUS EPERLANUS											1.04
PLATICHTHYS FLESUS		0.34	0.20		0.28	0.22					3.87
PLEURONECTES PLATESSA				0.35	0.21						0.56
POMATOSCHISTUS MINUTUS	+		+	0.08			0.01	+	+	0.01	0.28
RHINONEMUS CIMBRIUS											0.04
SALMO TRUTTA											3.20
SCOMBER SCOMBRUS						0.29					1.00
SPRATTUS SPRATTUS	6.82	130.93	0.50	0.44	19.22	201.08	62.30	3.44	20.73	7.82	1313.52
STIZOSTEDION LUCIOPERCA											0.10
TRACHURUS TRACHURUS	0.10		0.24	0.41						0.01	0.81
Total	32.86	360.50	17.13	48.12	35.49	333.05	216.56	156.98	62.08	28.68	2370.78
Medusae	8.06	111.69	16.46	2.66	22.09	8.30	5.02	1.60	4.09	18.55	507.2

+ = < 0.01 kg