

Cruise Report
FRV Solea Cruise 740
04. - 23.10.2017

Cruise Leader: Dr. Matthias Schaber (TI-SF)

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

1. Summary

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 30th 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, 1167 nmi (plus 132 nmi night and daytime transects for comparison) of hydroacoustic transects were covered.

In the majority of sampled rectangles, mean NASC values per nautical mile were distinctly lower than the values measured in 2016 and also often lower than the long-time mean values. Only in altogether seven rectangles in ICES SD 21, 22 and 24, mean NASC values were occasionally distinctly higher than in the previous year (and in 3 cases than the long-time mean). In SD23, as in 2016, unusually low NASC values (even significantly lower than in the previous year) were measured, indicating absence of the dense aggregations of herring usually observed in that area at this time of the year. It has to be mentioned, that during a repetition of the transect in SD23 during daytime for comparison, NASC values measured and echorecordings clearly showed presence of a significant amount of clupeids in the area.

For species allocation and identification, altogether 57 fishery hauls were conducted. Vertical hydrography profiles were measured on 87 stations.

Verteiler:

TI – Seefischerei

via E-Mail:

BMEL, Ref. 614

BMEL, Ref. 613

Fischereiforschung BLE

Wolfgang Marle, Ingun Tveide – Auswärtiges Amt

Schiffsführung FFS Solea

Präsidiälbüro (Michael Welling)

Verwaltung Braunschweig

TI - Fischereiökologie

TI - Ostseefischerei Rostock

FIZ-Fischerei

TI - PR

MRI - BFEL HH, FB Fischqualität

Dr. Rohlf/SF - Reiseplanung Forschungsschiffe

Fahrtteilnehmer

Bundesamt für Seeschifffahrt und Hydrographie, Hamburg

Mecklenburger Hochseefischerei GmbH, Rostock

Doggerbank Seefischerei GmbH, Bremerhaven

Deutscher Fischerei - Verband e. V., Hamburg

Leibniz-Institut für Meereswissenschaften IFM-GEOMAR

H. Cammann-Oehne, BSH

Deutscher Hochseefischerei-Verband e.V.

DFFU

2. Cruise objectives

The following objectives were planned for SB740:

- Hydroacoustic measurements for the assessment of small pelagics in the Kattegat and western Baltic Sea including Belt Sea, Sound and Arkona Sea (ICES Subdivisions 21, 22, 23, 24)
- (Pelagic) trawling according to hydroacoustic registrations
- 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

The 740th cruise of FRV Solea represents the 30th subsequent GERAS survey. Embarkation of scientific crew as well as equipment of FRV Solea with all hydroacoustic equipment and biological sampling gear took place on the morning of October 4th in Kiel harbor. On the same afternoon, Solea left port for the calibration of scientific echosounders. A calibration site off Strande was chosen according to prevailing weather conditions providing acceptable conditions deteriorating towards the evening. After calibration the vessel returned to Kiel harbor in the late evening to allow switching of survey operations to night time. Leaving of port and start of survey was scheduled for October 5th. Hydroacoustic survey operations commenced October 5st at 06:50 PM in SD 22 southeast of Langeland Island.

Generally, survey operations were conducted during nighttime to account for the more pelagic distribution of clupeids during that time. Adverse weather conditions at the start of the survey required to start survey operations in the comparatively sheltered western Baltic SD 22. After finishing SD 22, FRV Solea steamed to Warnemünde port to allow disembarking of a scientific crew member on October 10th. Survey operations commenced the same evening in SD 24. Due to expected severe weather conditions during the following evening and afterwards, a cruise track waypoint southwest of Bornholm Island was approached the following day and survey operations commenced in an opposing direction to be able to enter Sassnitz harbor for an interruption of survey work the following morning. Accordingly, the survey had to be suspended for one night on October 12th due to bad weather. On October 13th, survey operations commenced on the waypoint near Bornholm Island in westerly directions according to the cruise plan. The rest of SD 24 as well as SD 23 were covered as planned due to favorable weather conditions. In SD 21 (Kattegat), the cruise track in the northernmost rectangles to be covered had to be shortened due to adverse weather conditions but was finished as planned in the remaining subdivision. After accomplishing the regular survey work, a comparative sampling (hydroacoustics and fishery) of the SD 23 (Sound) was conducted to validate weak registrations recorded during the regular, initial passage. Afterwards, Solea entered Copenhagen port on October 21st to switch survey operations back to day time. On October 22nd, a third passage of the Sound (SD 23) transect was conducted (hydroacoustics and fishery) to identify drivers for variable registrations of clupeids in that area. The scientific program was finished on October 22th, 05:15 PM. The ship arrived at Marienehe port on October 23rd, 07:00 AM.

Altogether, the following survey schedule was accomplished:

- Belt Sea (SD 22) 05. - 09.10.
- Arkona Sea (SD 24) 10. - 15.10.
- Sound (SD 23) 16.10.
- Kattegat (SD 21) 17. - 19.10.
- Sound (comp.) (SD 23) 20.10.
- Sound (day) (SD 23) 22.10.

Total survey time	15 nights (+ 1 night / 1 day comparison in SD 23)
Fishery hauls	57
CTD-casts	87
Hydroacoustic transects	1167 nmi (+ 132 nmi transects for comparison)

Overall hydroacoustic transect length was 1167 nmi (2016: 1179 nmi).

3.2 Hydroacoustics

3.2.1 Calibration

All transducers (38, 70, 120 and 200 kHz) were calibrated prior to the beginning of the survey in acceptable but increasingly inclement weather conditions from a drifting vessel in Strande Bay/Kiel Bight. Overall calibration results were considered good based on calculated RMS values. Resulting transducer parameters were applied for consecutive data-collection and post-processing of hydroacoustic survey data.

3.2.2 Echo recording

Hydroacoustic data were recorded with a Simrad EK80 scientific echosounder with hull-mounted 38, 70, 120 and 200 kHz transducers at a standard ship speed of 10 kn. Post-processing and analysis were conducted with Echoview 8 software (Echoview Software Pty Ltd, 2017). The transducer settings applied were in accordance with the specifications provided in ICES (2015, 2017).

Figure 1 depicts the spatial distribution of mean NASC values (5 nmi intervals) measured on the hydroacoustic transects covered in 2017, the majority of which can be allocated to clupeids. In almost all rectangles surveyed, mean NASC values were significantly lower than those recorded in 2016, and often also well below the long-time survey average. On ICES subdivision scale, mean NASC values were lower than in the previous year in all subdivisions covered.

In SD 21, overall NASC values measured were low. Only in 2 rectangles (41G1 and 42G1), mean NASC per 1 nmi EDSU was marginally higher in almost all rectangles observed than in the previous year, but still lower than the long-time survey average, as in all rectangles surveyed.

In SD 22, mean NASC values recorded were lower than the previous year in 9 out of 11 rectangles surveyed. In comparison to the long-term survey mean of rectangles in SD 24, the NASC measured was lower in all but 1 rectangles. Increased aggregations of clupeids were measured in Kiel Bight and Mecklenburg Bight as well as near the northern entrance to the Little Belt, where mean NASC was almost 10fold higher than in the previous year. This area however contains only a short transect distance and is usually characterized by extremely low NASC levels.

As in the previous year, the large aggregations of big herring that usually can be observed in SD 23 in the Sound were not present in autumn 2017. NASC values were significantly lower than the already low levels measured in 2016 as well as the long-term survey mean. A replicate measurement of the transect in SD 23 during night time a few days later corroborated these findings. It has to be mentioned however, that on another replicate measurement 2 days later during daytime, significant NASC values were measured and dense aggregations of clupeids were detected on the echosounder (see Figure 6).

In SD 24, mean NASC values were significantly lower than the values measured in 2016 in 3 out of 6 rectangles surveyed. In rectangle 38G4 and 39G4 (eastern part of Arkona Basin) however, mean NASC levels were around twice as high as the levels measured during the previous survey in 2016. As in the years before, higher aggregations were also detected north of Rügen Island.

The analysis of hydroacoustic data will be finalized in the first quarter of 2018, when results will be reported to the ICES Working Group of International Pelagic Surveys (WGIPS).

3.3 Biological sampling (Tomas Gröhsler)

To validate and allocate echorecordings, altogether 57 fishery hauls were conducted (Figure 2), out of which 54 (night time) hauls were utilized for further processing. 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	11
22	16
23	11 (incl. 3 daytime hauls)
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):

- 1,701 herring (*Clupea harengus*), 957 sprat (*Sprattus sprattus*), 15 European anchovies (*Engraulis encrasicolus*) and 5 sardines (*Sardina pilchardus*).

Further, frozen samples of different fishes (e.g. herring, anchovy etc.) for genetic investigations, stock discrimination and evaluation of distribution patterns in Danish waters were further collected for DTU aqua, Kgs. Lyngby, DK.

Altogether, the following species were sampled and processed:

Species	Length measurements	Number of hauls
<i>Clupea harengus</i>	11,021	49
<i>Crystallogobius linearis</i>	224	23
<i>Ctenolabrus rupestris</i>	7	3
<i>Cyclopterus lumpus</i>	7	6
<i>Engraulis encrasicolus</i>	15	7
<i>Eutrigla gurnardus</i>	40	8
<i>Gadus morhua</i>	269	23
<i>Gasterosteus aculeatus</i>	366	26
<i>Limanda limanda</i>	108	22
<i>Merlangius merlangus</i>	378	37
<i>Mullus surmuletus</i>	3	3
<i>Platichthys flesus</i>	47	20
<i>Pleuronectes platessa</i>	8	5
<i>Pomatoschistus minutus</i>	193	27
<i>Sardina pilchardus</i>	5	4
<i>Scomber scombrus</i>	255	12
<i>Sprattus sprattus</i>	8,624	51
<i>Trachinus draco</i>	233	20
<i>Trachurus trachurus</i>	84	21
<i>Trisopterus esmarckii</i>	5	4
Others	798	-

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 49, sprat in 51 hauls. SD 23, which is typically characterized by the highest mean catch rates per station (kg 0.5 h⁻¹), showed the lowest values ever recorded (during nighttime hauls). In contrast to 2016, when sardines (*Sardina pilchardus*) were caught in SD 22-24, this species only appeared in catches from SD 21 in 2017. As in previous years, anchovy (*Engraulis encrasicolus*) were present in in the whole survey area, albeit in a lower frequency of occurrence (41 of 55 hauls in 2016; 7 of 57 hauls in 2017).

Figures 3 and 4 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2016 and 2017. Compared to results from the previous survey in 2016, the following conclusions for **herring** can be drawn (Fig. 3):

- In contrast to 2016, catches in SD 21 showed a less pronounced bimodal distribution characterized by the presence of the incoming year class (≤ 15 cm) and older herring (>15 cm). The fraction of the incoming year class dominated in 2016, whereas in 2017 older herring accounted for the largest share.
- The catches in SD 22 showed a multimodal distribution with two modes at 11.25 cm and 15.26 cm corresponding to the incoming year class (≤ 15 cm) and one mode of 18.75 cm for older herring (>15 cm). This was in contrast to the dominant contribution of herring <10 cm (mode at 9.75 cm) in 2016.
- In contrast to the years before, larger herring (>20 cm) were more or less absent from night time catches conducted in SD 23. The catches in 2017 were dominated by the contribution of the incoming year class (≤ 15 cm).
- In SD 24, the herring length-frequency distribution was characterized by a similar contribution of the incoming year class (≤ 15 cm) and older herring (>15 cm) in both years. However, the bimodal distribution in 2017 showed more larger herring (≤ 15 cm: mode 2016/9.75 cm and mode 2017/11.75 cm; >15 cm: mode 2016/17.75 cm and mode 2017/18.25 cm).
- Altogether, the present contribution of the incoming year class (ca. <15 cm) seemed to be rather low.

Relative length-frequency distributions of **sprat** in the years 2016 and 2017 (Fig. 4) can be characterized as follows:

- In SD 21 catch numbers of the incoming year class (≤ 10 cm) were virtually absent in both years. The catches were dominated by the contribution of larger sprat (>10 cm).
- In SD 22 - 24 catch numbers of the incoming year class (≤ 10 cm) dominated in 2016, whereas the catches now show a larger contribution of larger sprat (>10 cm) in 2017.
- Altogether, as for herring the present contribution of the incoming year class (<10 cm) seemed to be rather low.

3.4 Hydrography

Vertical profiles of temperature and salinity were measured with a SeaBird SBE CTD-probe on a station grid covering the whole survey area. Hydrography measurements were either conducted directly after a trawl haul or, in case of no fishing activity, in regular intervals along the cruise track. Altogether, 87 CTD casts were conducted during this survey.

Surface temperatures ranged from ca. 11°C in the eastern Arkona Basin and ca. 13 °C in the Kattegat area to around 14°C in the Kiel Bight and southern Belt Sea (Fig. 5). Bottom temperatures were also mostly around 14°C in the largest part of the survey area except for the deeper western parts of the Bornholm Basin, where temperatures near the seafloor were below 7°C.

Surface salinities showed a large gradient from ca. 7 PSU in the eastern Arkona Sea to ca. 15 PSU in the Kiel Bight and over 20 PSU in the Kattegat. Salinity near the seafloor ranged from 8 PSU in the Arkona Sea to ca. 33 PSU in the Kattegat. Especially in the Sound, a very strong stratification with steep salinity gradients was observed.

Surface waters were well oxygenated throughout the survey area. Near the seafloor, low oxygen levels were measured in the central eastern parts of the Arkona Basin. Anoxic conditions above the seafloor were observed in the southern part of the Little Belt and the inner Mecklenburg Bight.

5. Survey participants

Name	Function	Institute
Dr. M. Schaber	Hydroacoustics, Cruise leader	TI-SF
B. Stefanowitsch	Hydroacoustics	TI-SF (student assistant)
M. Koth	Fishery biology	TI-OF
S.-E. Levinsky	Fishery biology	DTU Aqua, Kgs. Lyngby, (DK)
F. Müller	Fishery biology	TI-SF (student assistant)
M. Püts	Fishery biology	TI-SF
L. Wietrzynski	Fishery biology	TI-OF (04.- 10.10.)

6. References

- Echoview Software Pty Ltd (2017). Echoview software, version 8. Echoview Software Pty Ltd, Hobart, Australia
- ICES (2017). SISP Manual of International Baltic Acoustic Surveys (IBAS). Series of ICES Survey Protocols SISP 8 – IBAS. 47pp.
- ICES (2015). Report of the Workshop on scrutinisation procedures for pelagic ecosystem surveys (WKSCRUT). ICES CM 2015 / SSGIEOM: 18

7. Acknowledgements

We hereby thank the crew of FRV Solea and Captain V. Koops as well as all participants for their outstanding cooperation and commitment that facilitated the successful accomplishment of this survey.



(Dr. M. Schaber, TI-SF / Scientist in charge)

Figures

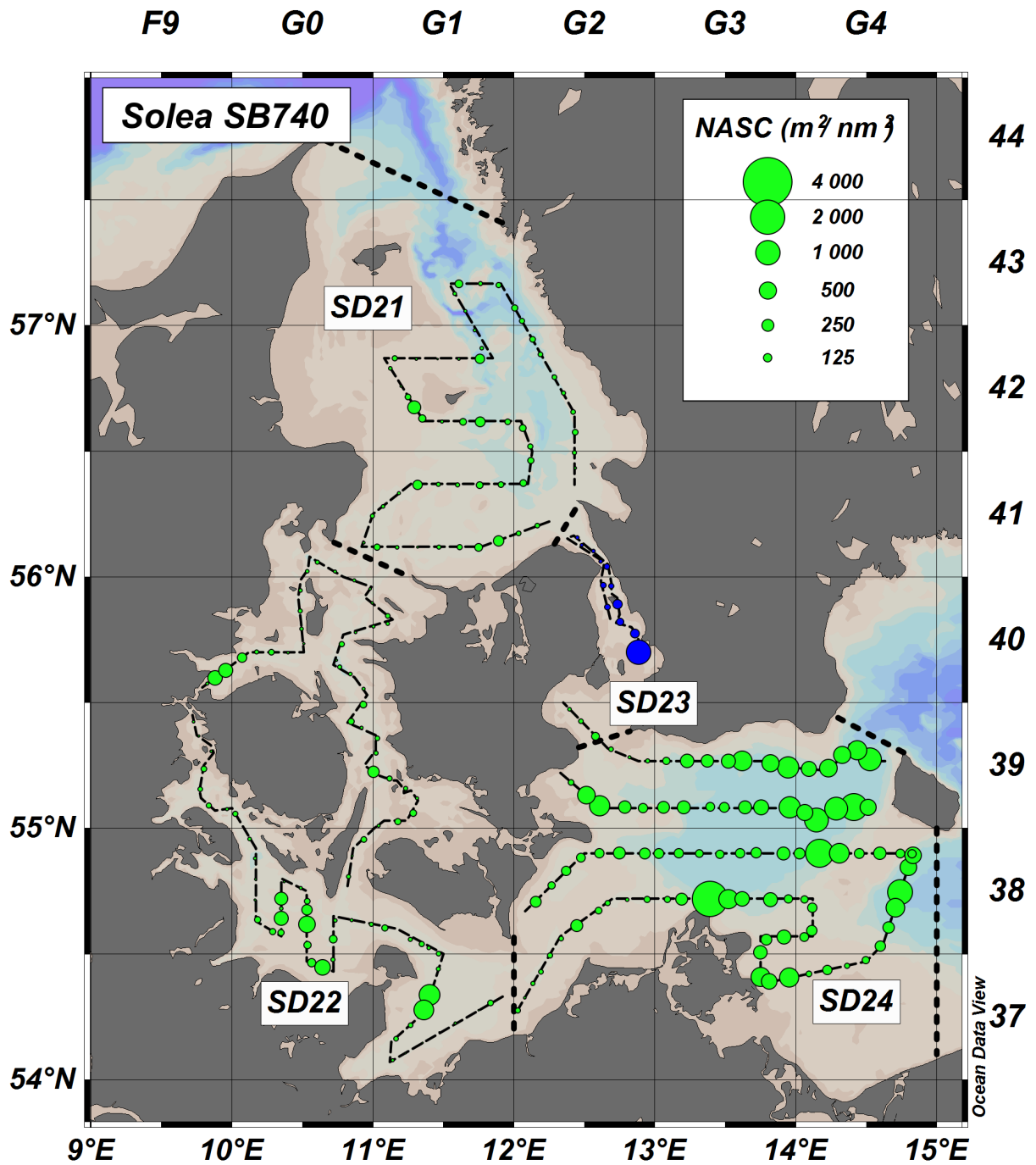


Figure 1: FRV Solea cruise 740/2017. Cruise track (thin dashed lines) and mean NASC (5 nmi intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD). Blue NASC values in Subdivision 23 (Sound) represent mean of two (night time) recordings.

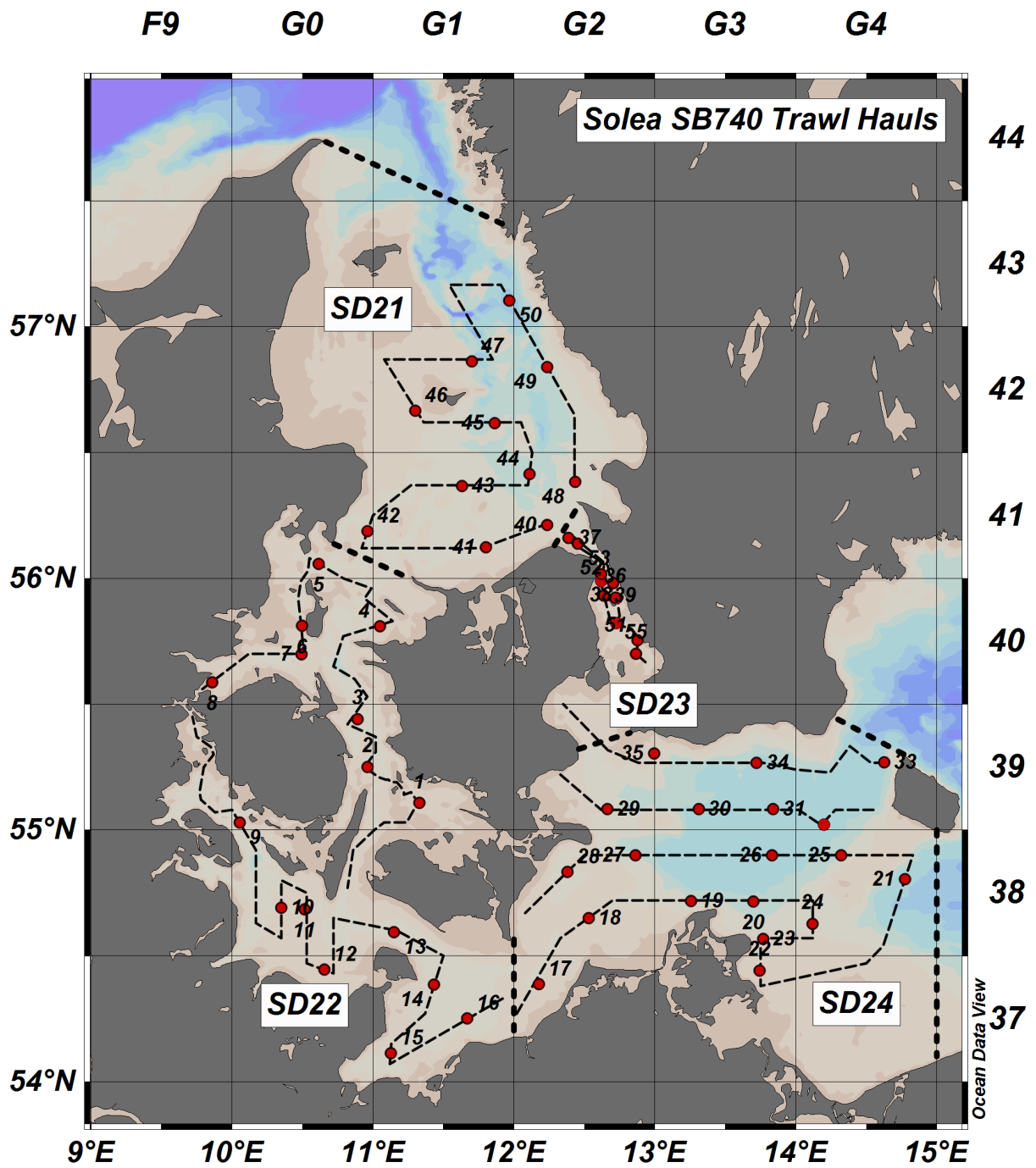


Figure 2: FRV Solea cruise 740/2017. Cruise track (thin dashed lines) and fishery hauls (red dots). ICES statistical rectangles are indicated in the top and right axis. Thick dashed lines separate ICES subdivisions (SD).

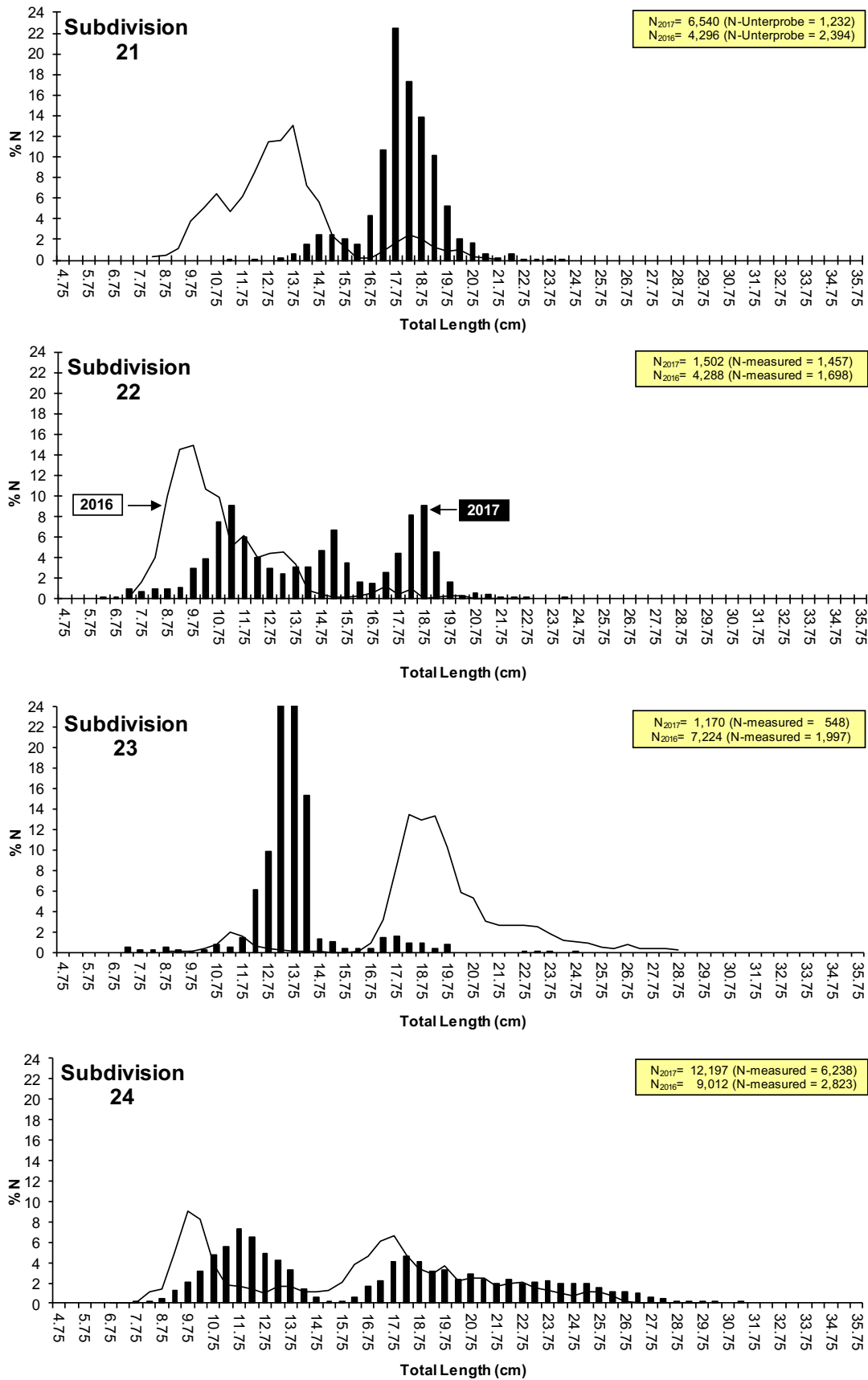


Figure 3: FRV Solea cruise 740/2017. Herring (*Clupea harengus*) length-frequency distribution compared to previous year (cruise 726/2016).

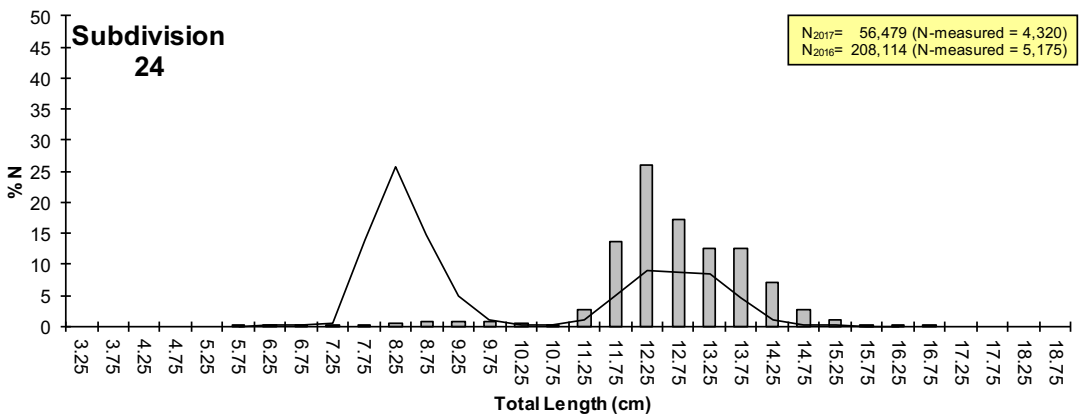
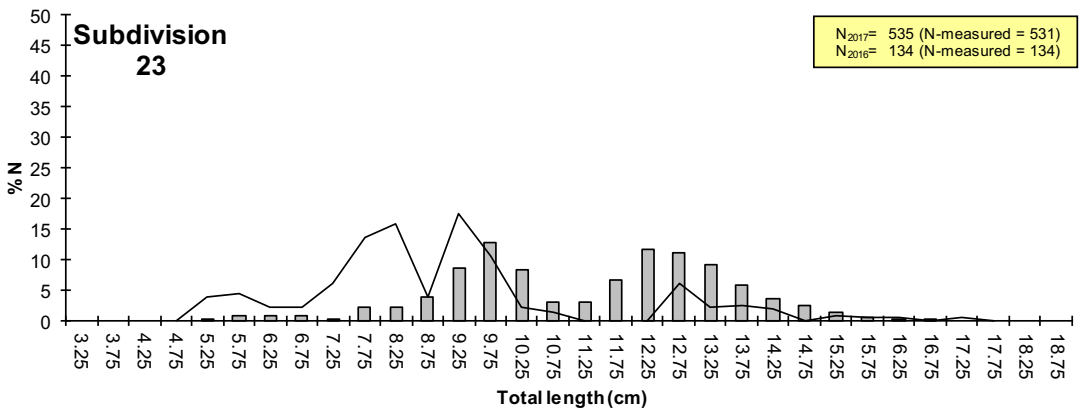
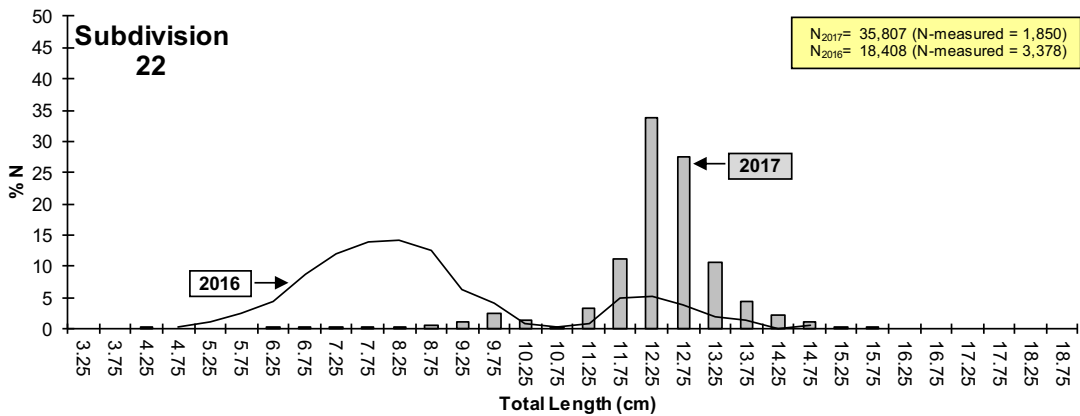
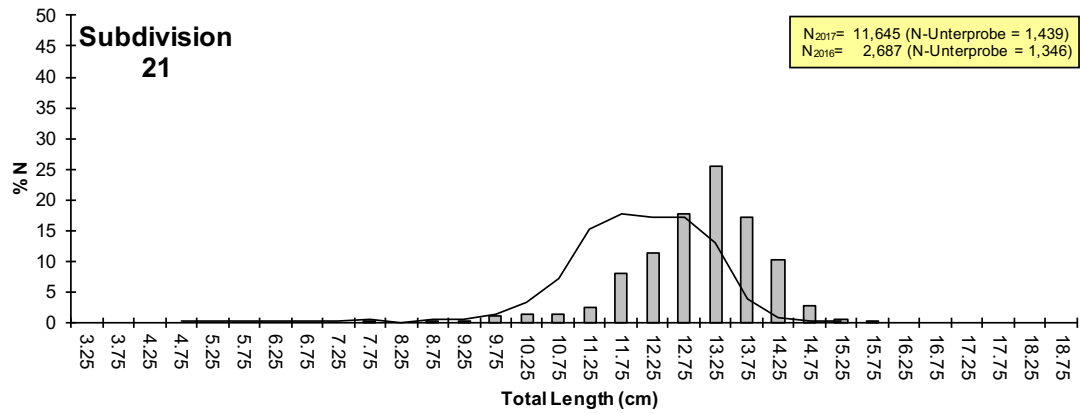


Figure 4: FRV Solea cruise 740/2017. Sprat (*Sprattus sprattus*) length-frequency distribution compared to previous year (cruise 726/2016).

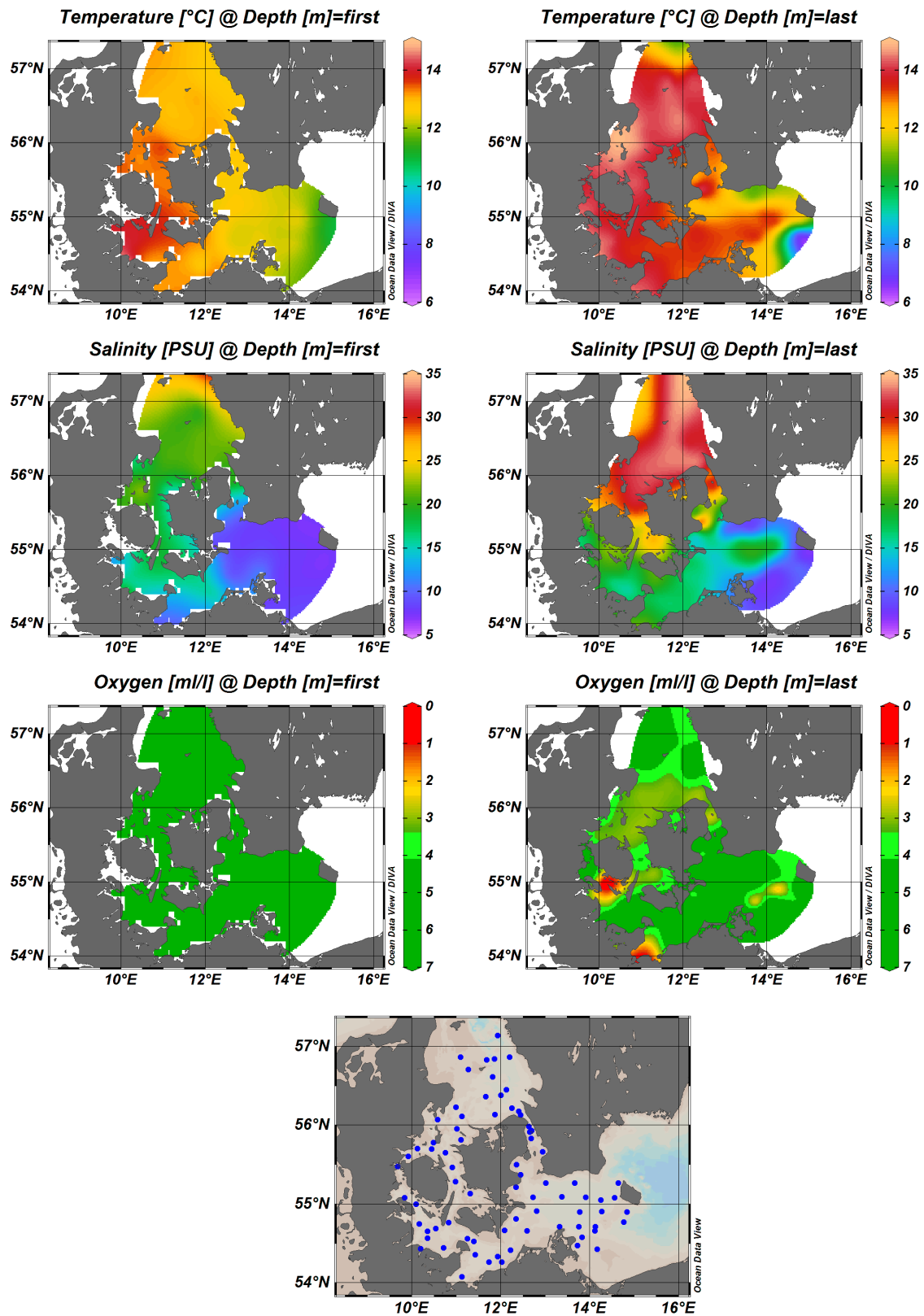


Figure 5: FRV Solea cruise 740/2017: Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right).

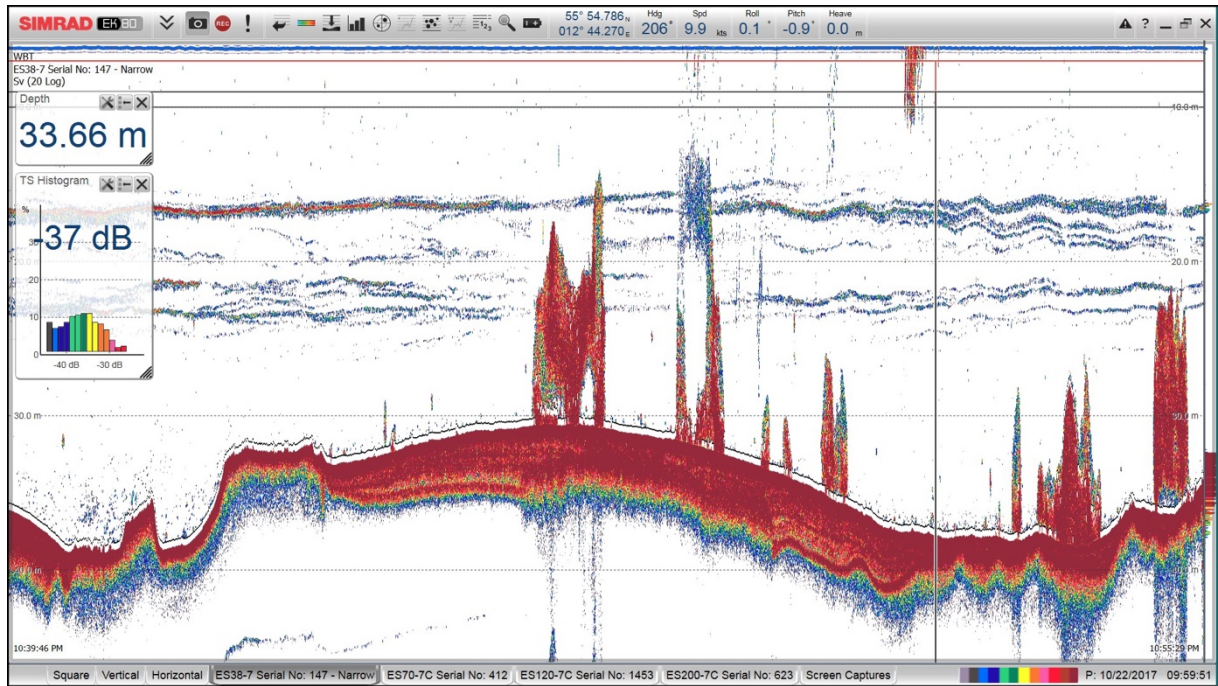


Figure 6: FRV Solea cruise 740/2017. Echosounder EK80 screenshot (38 kHz) of large clupeid schools measured during a day time sampling of the SD23 transect in the Sound for comparison with the virtually absent detections recorded during night time during two preceding recordings.

Tables

Table 1: FRV Solea cruise 740/2017: Catch composition ($\text{kg } 0.5 \text{ h}^{-1}$) by haul in SD 21.

Haul No.	40	41	42	43	44	45	46	47	48	49	50	Total
Species/ICES Rectangle	41G2	41G1	41G0	41G1	41G2	42G1	42G1	42G1	41G2	42G2	43G1	
ALLOTEUTHIS SUBULATA						0.03				0.02	0.01	0.06
CANCER PAGURUS											0.47	0.47
CARCINUS											0.01	0.01
CLUPEA HARENGUS	0.19	139.22	2.06		8.41	77.54	8.10	10.79		0.42		246.73
CRANGON CRANGON											0.03	0.03
CRYSTALLOGOBIUS LINEARIS	+			+	+	+			+	+	+	+
CTENOLABRUS RUPESTRIS				+								+
ENGRAULIS ENCRASICOLUS						0.03			0.01	0.02		0.06
EUTRIGLA GURNARDUS						0.83		0.02		0.12	0.03	1.00
GASTEROSTEUS ACULEATUS				0.02								0.02
HIPPOGLOSSOIDES PLATESSOIDES										0.01		0.01
LEANDER											+	+
LIMANDA LIMANDA		0.24	0.44		0.20	1.29		0.22		0.08		2.47
LOLIGO FORBESI	0.04	0.01	0.07	0.07	0.01	0.22	0.01	0.09	0.01	0.17	0.12	0.82
MERLANGIUS MERLANGUS	0.06	0.84	0.03			0.74	+	0.10	0.05	0.67	0.02	2.51
MERLUCCIIUS MERLUCCIIUS						0.07						0.07
MYSIDACEA											+	+
NEPHROPS NORVEGICUS									0.57			0.57
PLEURONECTES PLATESSA											0.10	0.10
POMATOSCHISTUS MINUTUS			+	+		+					+	+
SARDINA PILCHARDUS	+	0.04			0.01				+			0.05
SCOMBER SCOMBRUS	2.50	7.16	0.05		1.12	0.37		5.16		0.14	9.68	26.18
SEPIOLA			+					0.00			0.04	0.04
SPRATTUS SPRATTUS	2.47	72.82	6.66		0.71	85.66	0.05	16.76	0.10	0.98		186.21
SYNGNATHUS TYPHLE	+											+
TRACHINUS DRACO		1.67	1.38	0.36	0.59	1.83	0.10	5.18		0.49	0.40	12.00
TRACHURUS TRACHURUS	0.06	0.27		+	+	0.01		0.02	0.01		0.01	0.38
TRISOPTERUS ESMARKI						+				0.01	+	0.01
Total	5.32	222.27	10.69	0.45	11.05	168.62	8.26	38.34	0.75	3.13	10.92	479.80
Medusae	1.19	0.22	0.75	6.45	0.91	0.15	33.90	6.20	2.29	1.51	3.01	56.59

+ = < 0.01 kg

Table 2: FRV Solea cruise 740/2017: Catch composition (kg 0.5 h⁻¹) by haul in SD 22.

Haul No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Species/ICES Rectangle	39G1	39G0	39G0	40G1	41G0	40G0	40G0	40F9	39G0	38G0	38G0	37G0	38G1
CLUPEA HARENGUS	0.72	10.47	0.38	1.24				11.28		0.68	0.65	0.31	0.24
CRANGON CRANGON													
CRYSTALLOGOBIUS LINEARIS	0.01		+		+						+		
CYCLOPTERUS LUMPUS			0.10										0.10
ENGRAULIS ENCRASICOLUS	+												
GASTEROSTEUS ACULEATUS	+			+				0.01	0.42	+		0.01	+
GوبيUS NIGER	+												0.02
LIMANDA LIMANDA		0.06	0.04		0.04						0.44	0.11	0.16
LOLIGO FORBESI	0.01		+	+	0.06	0.01							
MERLANGIUS MERLANGUS			+	0.07	0.01			+	+	+	0.29		+
MULLUS SURMULETUS			0.01	0.01									
PLATICHTHYS FLESUS													
POMATOSCHISTUS MINUTUS	+					+					0.01		
SCOMBER SCOMBRUS							11.80	0.31					
SOLEA VULGARIS							0.01						
SPRATTUS SPRATTUS	0.07	64.18	0.03	0.16			0.03	0.02	8.78		6.36	3.15	29.96
SYNGNATHUS TYPHLE			+										
TRACHINUS DRACO			0.05	0.10	0.49								
TRACHURUS TRACHURUS		0.01	0.01	+	0.03	0.01		+	0.03	+			
TRISOPTERUS ESMARKI	+												
Total	0.81	74.72	0.62	1.58	0.63	11.86	0.33	20.10	0.42	7.04	4.54	30.39	0.52
Medusae	1.11	1.19	4.15	2.00	2.11	3.56	29.26	26.90	22.59	8.72	9.63	11.63	7.32

Haul No.	14	15	16	Total
Species/ICES Rectangle	37G1	37G1	37G1	
CLUPEA HARENGUS	2.00	3.31	1.10	32.38
CRANGON CRANGON				+
CRYSTALLOGOBIUS LINEARIS	0.01	+		0.02
CYCLOPTERUS LUMPUS				0.20
ENGRAULIS ENCRASICOLUS				+
GASTEROSTEUS ACULEATUS	0.01	0.05	0.02	0.52
GوبيUS NIGER				0.02
LIMANDA LIMANDA	0.19			1.04
LOLIGO FORBESI				0.08
MERLANGIUS MERLANGUS	0.14			0.51
MULLUS SURMULETUS				0.02
PLATICHTHYS FLESUS		0.15	0.23	0.38
POMATOSCHISTUS MINUTUS	+			0.01
SCOMBER SCOMBRUS				12.11
SOLEA VULGARIS				0.01
SPRATTUS SPRATTUS	56.18	0.40	338.71	508.03
SYNGNATHUS TYPHLE				+
TRACHINUS DRACO		0.07		0.71
TRACHURUS TRACHURUS				0.09
TRISOPTERUS ESMARKI				+
Total	58.53	3.98	340.06	556.13
Medusae	1.23	0.78	13.38	145.55

+ = < 0.01 kg

Table 3: FRV Solea cruise 740/2017: Catch composition (kg 0.5 h⁻¹) by haul in SD 23.

Haul No.	36	37	38	39	51	52	53	54	*55	*56	*57	Total
Species/ICES Rectangle	40G2	41G2	41G2	40G2	40G2	40G2	41G2	40G2	40G2	40G2	40G2	
ALLOTEUTHIS SUBULATA				0.04	0.01		0.01					0.06
CARCINUS					0.04							0.04
CLUPEA HARENGUS	0.54		1.42	1.19	1.49	0.34	0.77	12.74	858.51	22.53	30.87	930.40
CRANGON CRANGON	0.02				+	+						0.02
CRYSTALLOGOBIUS LINEARIS	+	+	+	+			+	+				0.00
CTENOLABRUS RUPESTRIS	0.03		+									0.03
ENGRAULIS ENCRASICOLUS							+	0.01				0.01
EUTRIGLA GURNARDUS	0.21		+	0.21				0.16				0.58
GADUS MORHUA	6.35		10.96	18.96	88.34	8.28	3.19	1.85		19.52	18.84	176.29
GASTEROSTEUS ACULEATUS	+						+	+				0.00
HIPPOGLOSSOIDES PLATESSOIDES					+							0.00
LIMANDA LIMANDA	0.50	0.05	0.09	0.06			0.87	0.40				1.97
LOLIGO FORBESI	0.07	0.05	0.02	0.02	0.02	0.15	0.18	0.01			+	0.52
MELANOGRAMMUS AEGLEFINUS	1.71					7.26						8.97
MERLANGIUS MERLANGUS	0.16	0.05	0.08		0.47		0.10	0.83			0.17	1.86
MULLUS SURMULETUS				+								0.00
MYSIDACEA	+											0.00
PLATICHTHYS FLESUS	0.22					0.47	0.51					1.20
POLLACHIUS POLLACHIUS								0.03				0.03
POMATOSCHISTUS MINUTUS	0.05	+	0.01	0.03		0.01		+				0.10
SCOMBER SCOMBRUS			0.62								0.69	1.31
SEPIOLA	0.03				+	0.04	0.03					0.10
SPRATTUS SPRATTUS	0.02	+	0.06	0.07	4.81	0.02	0.28	0.54	4.41	5.32		15.53
TRACHINUS DRACO	0.04	0.05	0.05		0.02	0.04	0.02	0.05				0.27
TRACHURUS TRACHURUS		+	+	0.01				0.01				0.02
Total	9.95	0.20	13.31	20.59	95.20	16.61	5.96	16.63	862.92	47.37	50.57	1139.31
Medusae	2.79	3.49	2.84	13.64	0.77	1.22	0.08	4.94	1.80	1.16	0.59	33.32

* = recording during daytime + = < 0.01 kg

Table 4: FRV Solea cruise 740/2017: Catch composition (kg 0.5 h⁻¹) by haul in SD 24.

Haul No.	17	18	19	20	21	22	23	24	25	26	27	28	29
Species/ICES Rectangle	37G2	38G2	38G3	38G3	38G4	37G3	38G3	38G4	38G4	38G3	38G2	38G2	39G2
BELONE BELONE	0.03												
CLUPEA HARENGUS	0.81	4.10	7.14	23.12	25.78	45.10	22.37	21.11	17.89	11.85	55.40	4.51	12.08
CRYSTALLOGOBIUS LINEARIS		+							+				+
CYCLOPTERUS LUMPUS	0.27				0.30				0.41				
ENGRAULIS ENCRASICOLUS	+												
GADUS MORHUA				4.02	+	21.66	5.17	2.38	13.24	0.64			2.25
GASTEROSTEUS ACULEATUS	0.04	0.06	+		+					+	0.03	0.03	0.05
LAMPETRA FLUVIATILIS				0.16									
LIMANDA LIMANDA	0.30	0.01											
MERLANGIUS MERLANGUS	+			20.77		4.03	8.56		0.56	3.85		+	
OSMERUS EPERLANUS						0.01	0.01						
PLATICHTHYS FLESUS	1.08		0.46	0.62		0.41	0.59		2.02	0.16	0.58	0.99	
PLEURONECTES PLATESSA	0.17			0.46									
POMATOSCHISTUS MINUTUS	+	+	+	+	+				+	+	+	+	+
SPRATTUS SPRATTUS	0.05	1.59	14.87	40.22	2.01	6.85	11.15	46.40	7.49	42.34	1.62	3.79	0.83
TRACHURUS TRACHURUS													+
Total	2.75	5.76	22.47	89.37	28.09	78.06	47.85	69.89	41.61	58.84	57.63	9.32	15.21
Medusae	4.55	6.38	7.99	1.42	5.59	18.19	9.05	2.14	1.28	2.01	15.10	17.00	8.04

Haul No.	30	31	32	33	34	35	Total
Species/ICES Rectangle	39G3	39G3	39G4	39G4	39G3	39G2	
BELONE BELONE							0.03
CLUPEA HARENGUS	6.18	31.50	26.33	5.19	166.67	15.27	502.40
CRYSTALLOGOBIUS LINEARIS							+
CYCLOPTERUS LUMPUS			0.19				1.17
ENGRAULIS ENCRASICOLUS							+
GADUS MORHUA	0.00	1.46	+	0.54	11.92	4.08	67.36
GASTEROSTEUS ACULEATUS	0.11	0.04			0.04		0.40
LAMPETRA FLUVIATILIS							0.16
LIMANDA LIMANDA	0.03						0.34
MERLANGIUS MERLANGUS	0.16	1.54	6.88		6.48	0.16	52.99
OSMERUS EPERLANUS							0.02
PLATICHTHYS FLESUS	0.70	0.24	0.99	0.15	0.53	0.28	9.80
PLEURONECTES PLATESSA	0.85				0.20		1.68
POMATOSCHISTUS MINUTUS	0.01	+				0.01	0.02
SPRATTUS SPRATTUS	17.30	154.48	229.05	14.03	137.36	11.06	742.49
TRACHURUS TRACHURUS							+
Total	25.34	189.26	263.44	19.91	323.20	30.86	1378.86
Medusae	6.58	2.34	2.58	4.99	0.57	3.76	119.54

+ = < 0.01 kg