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Cruise Report
FRV Solea cruise 768
01.10. - 21.10.2019

Hydroacoustic survey for the assessment of small pelagics in the Baltic Sea (GERAS/BIAS)

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

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 Working Group (WGBIFS). Further WGBIFS contributors to the Baltic survey are national fisheries research institutes of Sweden, Poland, Finland, Latvia, Estonia and Lithuania. FRV "Solea" participated for the 32nd 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, 1124 nautical miles of hydroacoustic transects (plus 103 nmi night and daytime transects for comparison) were covered. The survey effort was comparable to 2018 with a slightly reduced coverage in SD 21.

In roughly half of all sampled rectangles, mean NASC values per nautical mile were either comparable with or higher than the values measured in 2018, and lower in the remaining rectangles. Compared to the long-time survey mean however, mean NASC values in the large majority of rectangles covered were distinctly lower. On ICES subdivision scale, mean NASC values were overall lower than in the previous year in subdivision 21, slightly higher in SD 22, distinctly lower in SD 23 and almost identical to 2018 in SD 24.

For species allocation and identification, altogether 45 fishery hauls were conducted. Vertical hydrography profiles were measured on 76 stations.

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2. Cruise objectives and Survey design

The survey has the main objective to annually assess the clupeoid resources of herring and sprat in the Baltic Sea in autumn. The reported acoustic survey is conducted every year to supply the ICES Herring Assessment Working Group for the Area South of 62°N (HAWG) and Baltic Fisheries Assessment Working Group (WGBFAS) with an index value for the stock size of herring and sprat in the Western Baltic area (Kattegat/Subdivisions 21 and Subdivisions 22, 23 and 24).

The following objectives were planned for SB768:

- 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 and 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
- Parallel survey with RV "Clupea" (CLU338) on the regular transect in Subdivision 23 to compare day- and nighttime clupeid distribution and catchability.

ICES statistical rectangles were used as strata for all Subdivisions (ICES, 2017). The area was limited by the 10 m depth line. The survey area in the Western Baltic Sea is characterized by a number of islands and sounds. Consequently, parallel transects would lead to an unsuitable coverage of the survey area. Therefore a zig-zag track was adopted to cover all depth strata regularly and sufficiently. Overall, the covered regular cruise track length was 1124 nautical miles (2018: 1211 nmi) (Figure 1).

3. Cruise narrative and preliminary results

3.1 Cruise narrative

The 768th cruise of FRV "Solea" represents the 32nd subsequent GERAS survey. Equipment of the vessel as well as calibration of echosounders took place on October 1st, embarkation of scientific crew and beginning of survey was scheduled for the following day, when FRV "Solea" left Kiel harbor in the afternoon. The hydroacoustic survey operations commenced October 2nd in SD 22 (Kiel Bight).

Generally, survey operations were conducted during nighttime to account for the more pelagic distribution of clupeids during that time. Weather conditions at the beginning of the survey required to start survey operations in the westerly survey area of the comparatively sheltered western Baltic SD 22. Several scheduled changes of scientific crew during SB768 (exceptional case in 2019) required interruption of survey operations in SD 22 to enter Rostock-Warnemünde port for the first exchange of the chief scientist on October 7th. Afterwards, survey operations commenced in SD 22 (finished on October 8th) and continued in SD 24. There, adverse weather conditions required a one day interruption of survey work on October 11th. After conditions improved, the survey commenced in SD 24, where 2 out of 3 transect sections (SD 24 south, SD north) were finished before FRV "Solea" entered Copenhagen port for another exchange of the chief scientist on October 14th. In late afternoon of October 15th, FRV "Solea" left Copenhagen port to commence survey operations in SD 23, where after accomplishing the regular night time transect another parallel run of that transect was accomplished the following day together with FRV "Clupea" to collect hydroacoustic data (both vessels) and biological samples (FRV "Clupea") for a comparison of day-night distributions and catchability of herring in the Sound. Afterwards, SD 21 was covered with a reduced sampling effort (the two northernmost rectangles had to be omitted) due to the previous loss of survey time (crew change, weather conditions). After accomplishing SD 21 on October 18th, the remaining transect in SD

24 (SD24 middle) was covered on October 19th accomplishing survey operations in all ICES Subdivisions. The scientific survey program was finished on October 20th, 05:40 AM. Afterwards, FRV "Solea" steamed to Marienehe port, where the survey ended on October 21st.

Altogether, the following survey schedule was accomplished:

Belt Sea (SD 22)	02. - 07.10.
Arkona Sea (SD 24)	08. - 13.10. & 19.10.
Sound (SD 23)	15.10. & 18.10. (Additional fishery haul)
Kattegat (SD 21)	16. - 18.10.
Sound (SD 23) (day)	16.10. (Parallel survey with FRV "Clupea")

Total survey time	16 nights (+ 1 day comparison in SD 23), excl. 1 day loss (bad weather)
Fishery hauls	45
CTD-casts	76
Hydroacoustic transects	1124 nmi (+ 103 nmi transects for comparison)

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 weather conditions from an anchored vessel in Strande Bay/Kiel Bight (54°25.35 N, 10°12.29 E). 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

All acoustic investigations were performed during night time to account for the more pelagic distribution of clupeids during that time. 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 of hydroacoustic data were conducted with Echoview 10 software (Echoview Software Pty Ltd, 2019). Mean volume back scattering values (S_v) were integrated over 1 nmi intervals from 10 m below the surface to ca. 0.5 m over the seafloor. Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram. The transducer settings applied were in accordance with the specifications provided in ICES (2015, 2017).

Figure 2 depicts the spatial distribution of mean NASC values (5 nmi intervals) measured on the hydroacoustic transects covered in 2019. In general, the majority of these NASC measurements can be allocated to clupeids. In 13 out of 25 rectangles surveyed, mean NASC values were comparable (7) or (partly significantly) higher (6) than those recorded in 2018. However, in 20 out of 25 rectangles, mean NASC levels recorded were well below the long-term survey average. On ICES subdivision scale, mean NASC values were slightly lower than in the previous year in subdivision 21, slightly higher in SD 22, distinctly lower in SD 23 and almost identical to 2018 in SD 24.

In SD 21, overall NASC values measured were lower than those measured in the previous year. Only in one rectangle (41G0), mean NASC per 1 nmi EDSU was almost tenfold higher than the one measured in 2018, driving the overall only slightly lower mean NASC in this subdivision as compared to 2018. This rectangle however only contained a short section of transect. Aggregations were mostly patchy along the cruisetrack, with highest NASC levels measured in the southern parts of the Kattegat.

In SD 22, mean overall NASC values recorded were comparable or higher than in 2018 in 8 out of 11 rectangles surveyed. Lower values were measured in 3 rectangles. In some rectangles, the increase in

NASC measured was significant, but often originated from rather unusual aggregations of fishes in rectangles containing only short transect sections or in an area that usually is characterized by very low NASC levels. In comparison to the long-term survey mean, all but 2 rectangles in SD 22 again showed decreased NASC values. No clear aggregation or area of increased NASC measurements was evident, but highest measurements origin from distinct aggregations of (most likely) anchovies in the area north of the Little Belt.

As in the previous years, the large aggregations of big herring that usually could be observed in SD 23 in the Sound were not present in autumn 2019. Mean NASC values were again distinctly lower than the levels measured in 2018 in the relevant rectangles. They also were well below the long-term survey mean. Only in the southern part of the Sound, NASC levels were above the 2018 measurements (rectangle 39G2). A daytime replicate hydroacoustic measurement of the inner Sound parallel with FRV "Clupea" (hydroacoustics and fishing operations) showed differing but consistent distribution patterns with somewhat increased NASC values as compared to the regular nighttime transect coverage (Figure 3). This comparison will be fully evaluated in later steps.

In SD 24, mean NASC values were comparable to or higher than the levels measured in 2018 in 7 out of 9 rectangles. While an eightfold increase was measured in the southernmost transect parts of 37G4, NASC levels measured in the Kadetrinne area west of Fischland-Darß-Zingst (37G2) and northern Arkona Basin along the Swedish coast (39G3) were distinctly lower than in 2018. The former however had shown a fourfold increase in 2018 and is characterized as an area with usually rather low NASC measurements. As in the years before, somewhat notable aggregations were detected around Rügen Island.

3.3 Biological sampling (Tomas Gröhsler, TI-OF)

Fishery hauls according to ICES Subdivision (Figure 1):

SD	Hauls (n)
21	8 (incl. 1 invalid haul)
22	16
23	4
24	17

Altogether, 1 165 individual herring, 792 sprat, 318 European anchovies and 5 sardines were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 2-5. Altogether, 34 different species were recorded. Herring were caught in 42, sprat in 38 hauls. SD 23, which is typically characterized by the highest mean herring catch rates per station (kg 0.5 h^{-1}), showed the lowest values ever recorded (during nighttime hauls). In contrast to 2018, when sardines (*Sardina pilchardus*) only appeared in catches from SD 22 and SD 23, this species was caught in SD 21 and SD 23 in 2019. As in previous years, anchovy (*Engraulis encrasicolus*) were present in the whole survey area, albeit in a higher frequency of occurrence compared to 2018 (26 of 58 day- and nighttime hauls in 2018, 36 of 45 nighttime hauls in 2019).

Altogether, the following fish species were sampled and processed:

Species	Length measurements (n)	Prevalence (n of hauls)
Aphia minuta	307	21
Clupea harengus	5737	42
Ctenolabrus rupestris	3	3
Engraulis encrasicolus	1181	36
Eutrigla gurnardus	6	4
Gadus morhua	60	14

Gasterosteus aculeatus	452	23
Limanda limanda	72	14
Merlangius merlangus	274	30
Mullus surmuletus	3	3
Platichthys flesus	22	12
Pomatoschistus minutus	138	12
Sardina pilchardus	5	3
Scomber scombrus	125	11
Sprattus sprattus	4266	38
Syngnathus typhle	301	3
Trachinus draco	703	18
Trachurus trachurus	1	37
Others	42	-

Figures 4 and 5 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2018 and 2019. Compared to results from the previous survey in 2018, the following conclusions for **herring** can be drawn (Figure 4):

- Catches in SD 21 showed a bimodal distribution with modes at 15.25-15.75 cm and 18.75 cm. This is in contrast to 2018, when a multimodal distribution showed modes at 11.75 cm, 15.25-15.75 cm and 21.2.5-21.75 cm.
- Catches in SD 22 were dominated in the last two years by the incoming year class (ca. ≤15 cm) with a mode at 12.75-13.25 cm.
- As in the years 2016-2018, larger herring (>20 cm) were almost absent from night time catches conducted in SD 23 in 2019. Catches in 2019 showed – quite similar to the results in SD 21 - a bimodal distribution with modes at 14.25 cm and 18.75 cm. This is in contrast to 2018, when the catches were only dominated by the contribution of the incoming year class (ca. ≤15 cm), showing a mode at 13.25 cm.
- Catches in SD 24 showed in both years a similar bimodal distribution with modes at 13.25-13.75 cm and 17.75-18.25 cm accompanied by the almost absence of herring larger than ca. 23 cm.

Relative length-frequency distributions of **sprat** in the years 2018 and 2019 (Figure 5) can be characterized as follows:

- In SD 21 catches of the incoming year class (ca. ≤10 cm) were virtually absent in both years. In The catches were dominated by the contribution of larger sprat in both years.
- Catches in SD 22 were dominated in 2019 by the contribution of the incoming year class (ca. ≤10 cm). This is contrast to the results in 2018, where the contribution of larger sprat (>10 cm) was highest.
- In SD 23, the catches showed a bimodal distribution with a higher contribution of the incoming year class (ca. ≤10 cm, mode at 8.75 cm) compared to amount of older sprat (mode at 12.15 cm). This is in contrast to the results in 2018 where almost exclusively the incoming year class (ca. ≤10 cm) contributed to the catches.
- In SD 24, the bimodal sprat length-frequency distribution was characterized by a similar contribution of the incoming year class (ca. ≤10 cm) and older sprat in both years. The catches were dominated by the contribution of larger sprat (>10 cm) in 2018 and in 2019.
- Altogether, the present contribution of the incoming year class (ca. ≤10 cm) seemed to be higher than the lower one in 2018.

3.4 Hydrography

Vertical profiles of temperature, salinity and oxygen concentration 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, 76 CTD casts were conducted during this survey (Figure 6).

Surface temperatures ranged from ca. 11°C in the northeastern Arkona Basin (SD 24) and ca. 13 °C in the Kattegat area (SD 21) to > 14°C in the southwestern coastal areas of SD 22 (Figure 6). Bottom temperatures were similar in most parts of Subdivisions 21, 22 and 23, but more variable due to strong thermohaline layering in some parts of SD 24 (eastern central Arkona) and SD 22 (inner Mecklenburg Bight). While bottom temperatures in the central and eastern Arkona Sea exceeded surface temperatures (maximum temperatures > 15 °C), lowest bottom temperatures were recorded in the inner Mecklenburg Bight at around 11-12 °C. Overall lowest temperatures of ca. 8 °C were recorded in the northeastern Arkona Sea in intermediate layers.

As usual due to the hydrographic nature of the western Baltic Sea, surface salinities showed a large gradient (from ca. 7.5 PSU in the eastern Arkona Sea to > 25 PSU in the Kattegat). As in the previous year, surface salinity in the western parts of the survey area (SD 22) was comparatively high at levels of ca. 20 PSU. Salinity near the seafloor ranged from 8 PSU in the Arkona Sea to ca. 34 PSU in the Kattegat. Especially in the Sound (SD 23), a very strong stratification with steep salinity gradients was observed.

Surface waters were well oxygenated throughout the survey area. Near the seafloor, local oxygen depletion was measured in the southwestern coastal area of SD 22 between the Little Belt and Kiel Bight.

4. Survey participants

Name	Function	Institute
Dr. M. Schaber (15.-21.10.)	Cruise Leader (Hydroacoustics, Hydrography)	TI-SF
M. Bleil (02.-07.10.)	Cruise Leader (Hydroacoustics, Hydrography)	TI-OF
Dr. A. Velasco (07.-14.10.)	Cruise Leader (Hydrography)	TI-OF
D. Andersen (15.-21.10.)	Fishery biology	DTU Aqua (DK)
M. Koth	Fishery biology	TI-OF
L. S. Lundgaard (02.-14.10.)	Fishery biology	DTU Aqua (DK)
S. Niemann	Fishery biology	TI-OF
S. Winning	Fishery biology, Hydroacoustics	TI-SF

5. References

Echoview Software Pty Ltd (2019). Echoview software, version 10 (10.0.293). 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. http://doi.org/10.17895/ices.pub.3368

ICES (2015). Report of the Workshop on scrutinisation procedures for pelagic ecosystem surveys (WKSCRUT). ICES CM 2015 / SSGIEOM: 18

6. Acknowledgements

I hereby thank the crew of FRV "Solea" and Captain V. Koops as well as all participants and for their outstanding cooperation and commitment as well as stepping in on short notice that facilitated the successful accomplishment of this "challenging" survey.

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

Figures

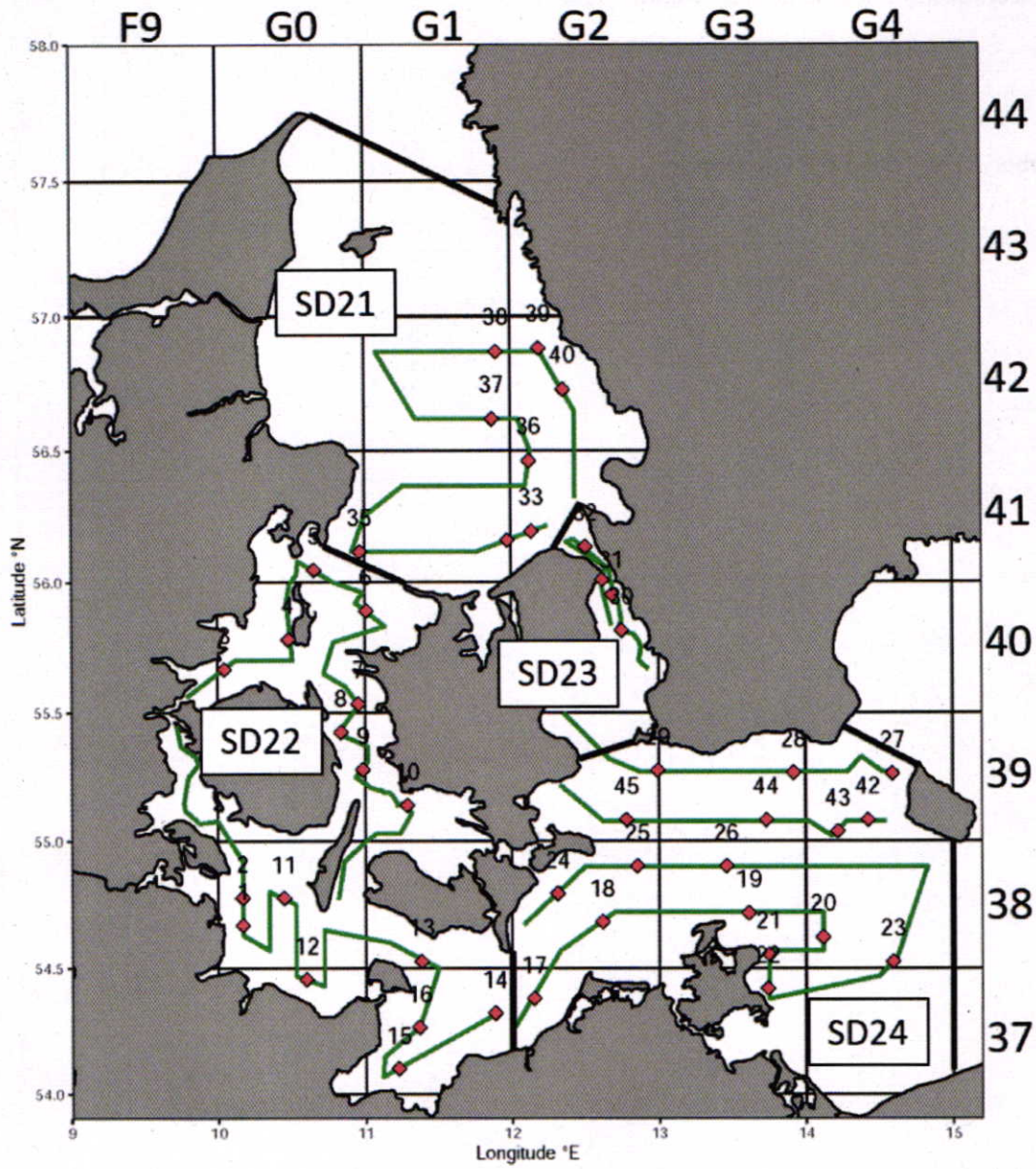

Figure 1: FRV "Solea" cruise 768/2019. Cruise track (dark green lines) and fishery hauls (red diamonds). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions (SD).

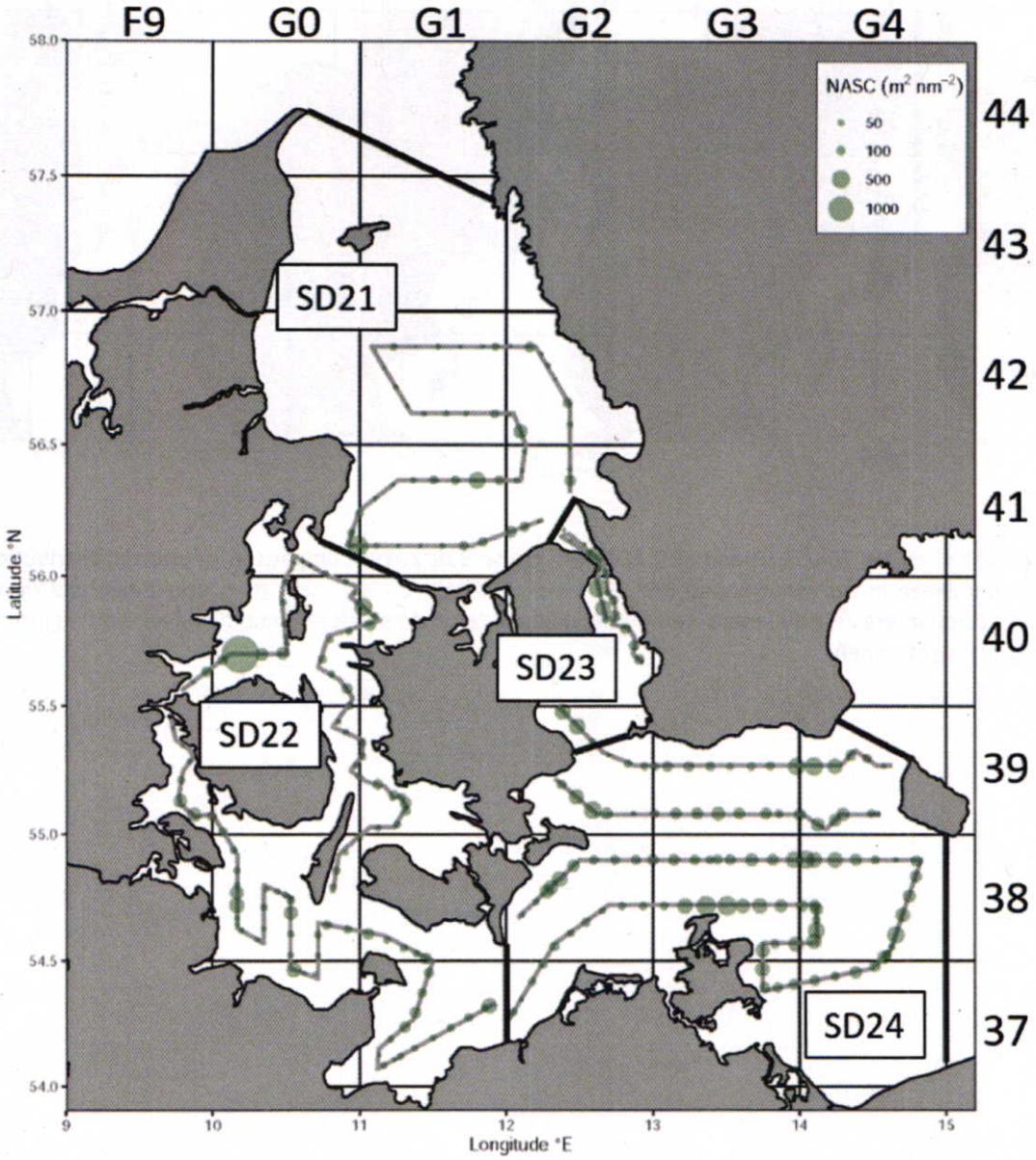

Figure 2: FRV "Solea" cruise 768/2019. Cruise track (thin grey lines) and mean NASC (5 nmi intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions (SD).

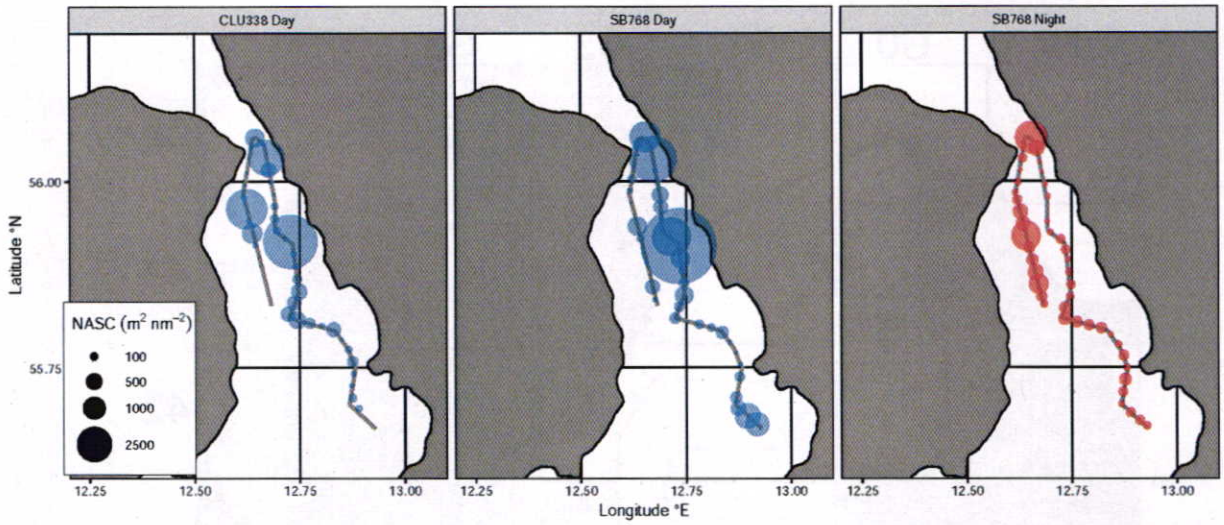

Figure 3: FRV "Solea" cruise 768/2019 and FRV "Clupea" cruise 338/2019: Comparison of clupeid distribution and abundance in the inner Sound (SD 23) 15.-16.10.2019. Cruise tracks (thin grey lines) and mean NASC (1 nmi intervals, dots) measured during daytime (blue dots, left and middle panel) and nighttime (red dots, right panel).

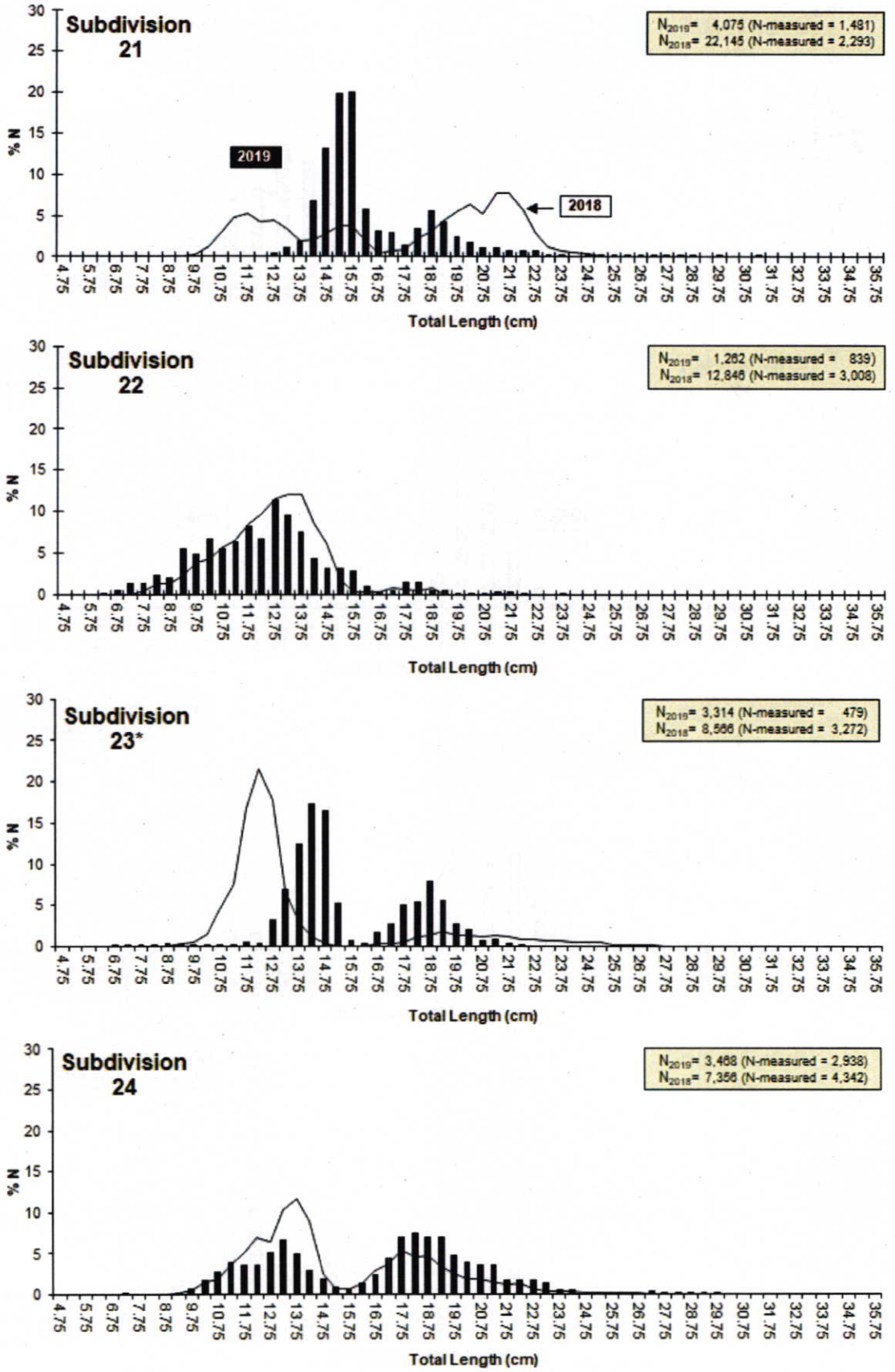

Figure 4: FRV "Solea" cruise 768/2019. Herring (Clupea harengus) length-frequency distribution (bars) compared to the previous year (cruise 754/2018, lines). In 2018, daytime comparison hauls conducted in SD 23 were included.

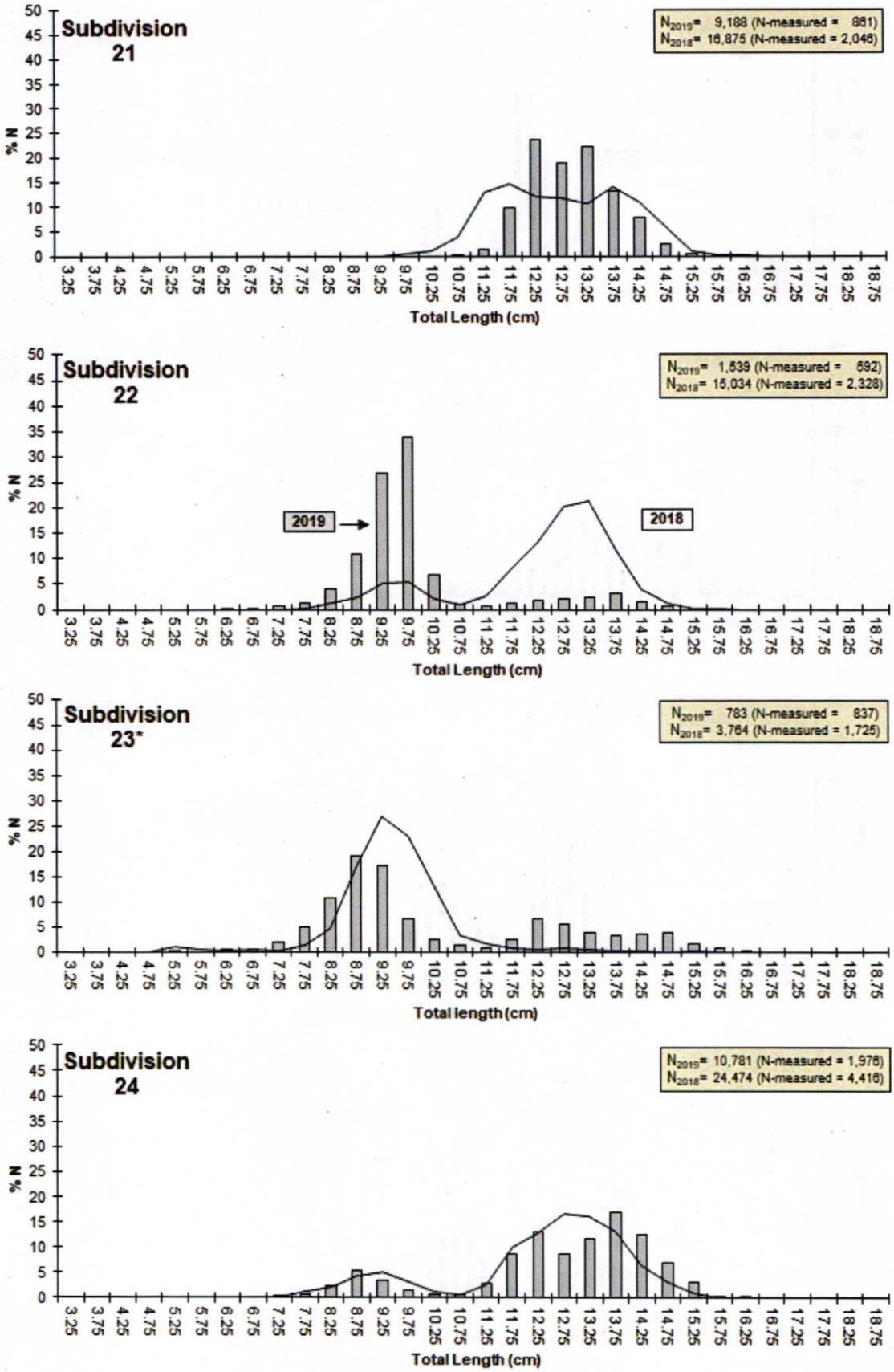

Figure 5: FRV "Solea" cruise 768/2019. Sprat (*Sprattus sprattus*) length-frequency distribution (bars) compared to the previous year (cruise 754/2018, lines). In 2018, daytime comparison hauls conducted in SD 23 were included.

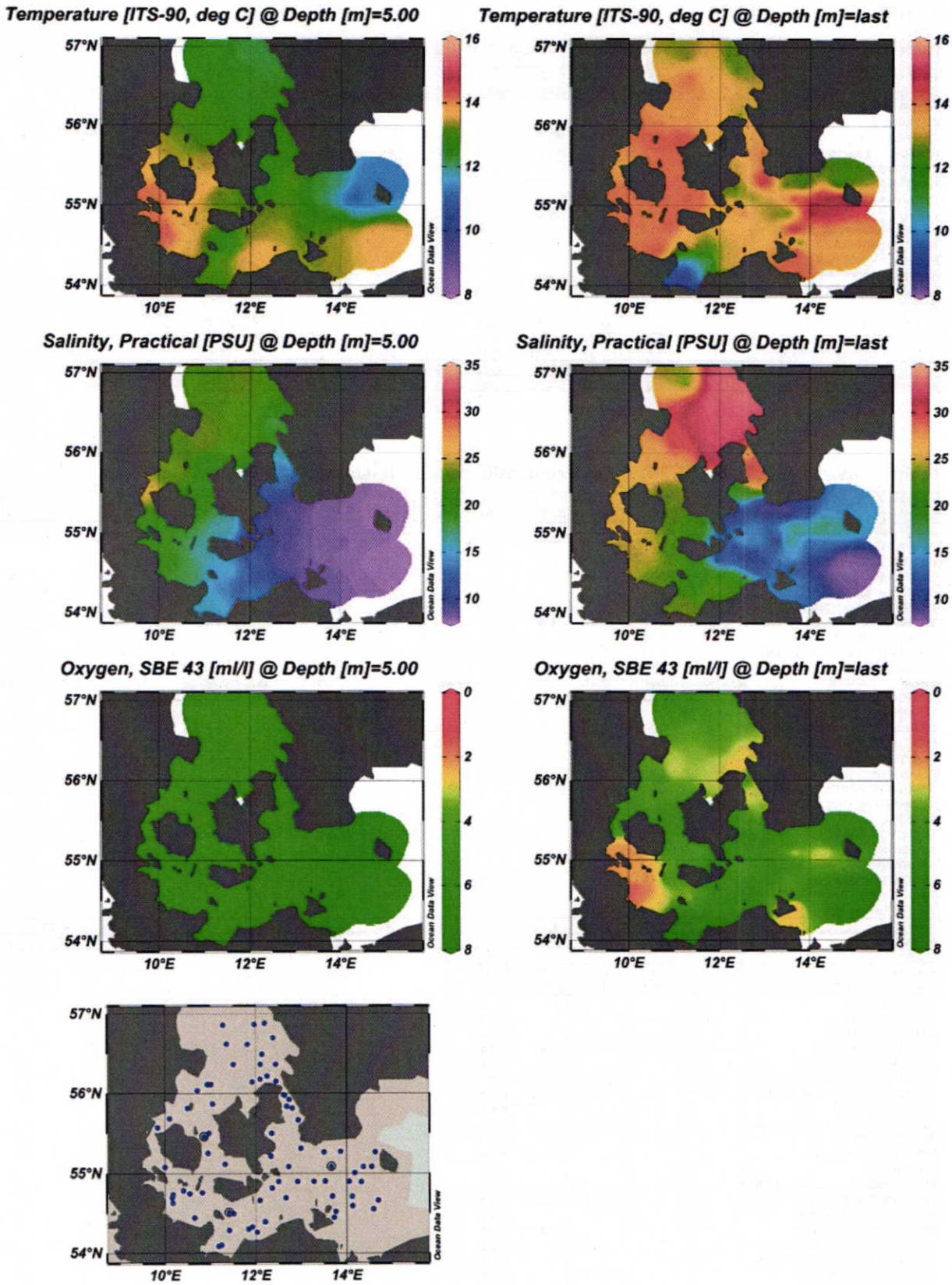

Figure 6: FRV "Solea" cruise 768/2019: Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) near the surface (left) and near the seafloor (right).

Tables

Table 1: FRV "Solea" cruise 768/2019: Catch composition (kg 0.5 h^{-1}) by haul in SD 21.

Haul No.	33	34	35	36	37	38	39	40	Total
Species/ICES Rectangle	41G2	41G1	41G0	41G2	42G1	42G1	42G2	42G2	
APHIA MINUTA					+		0.22	0.05	**0.27**
CARCINUS							0.01		**0.01**
CLUPEA HARENGUS	3.37	41.85	45.23	0.95	0.17	31.50		0.11	**123.18**
ENGRAULIS ENCRASICOLUS		0.03	263.68	0.05	10.14	0.07			**273.97**
EUTRIGLA GURNARDUS	0.07			0.04					**0.11**
GASTEROSTEUS ACULEATUS								+	**+**
LIMANDA LIMANDA	0.09	0.15							**0.24**
LOLIGO	0.08	0.03	0.03	0.03	0.22	0.01	0.15	0.02	**0.57**
MERLANGIUS MERLANGUS	0.03	0.09		+	0.08	0.05		0.10	**0.35**
MULLUS SURMULETUS	+	0.01							**0.01**
POMATOSCHISTUS MINUTUS	+								**+**
SARDINA PILCHARDUS			0.12						**0.12**
SCOMBER SCOMBRUS		2.95	0.90	0.08	3.26	0.89			**8.08**
SEPIOLA		+							**+**
SPRATTUS SPRATTUS	0.79	11.74	115.88	9.64	0.25	14.48		0.28	**153.06**
TRACHINUS DRACO	2.87	10.62	0.15	0.17	0.55	22.10	0.04	0.11	**36.61**
TRACHURUS TRACHURUS	1.47	0.23	0.21	0.04	0.07	0.06		+	**2.08**
Total	**8.77**	**67.70**	**426.20**	**11.00**	**14.74**	**69.16**	**0.42**	**0.67**	**598.66**
Medusae	1.58	3.02	1.60	1.65	1.71	0.86	4.85	9.90	25.16

+ = < 0.01 kg Haul 39 not valid

Table 2: FRV "Solea" cruise 768/2019: 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	38G0	38G0	40G0	40G0	41G0	40G1	40G0	39G0	39G0	39G1	38G0	37G0	38G1
ALLOTEUTHIS					+								
APHIA MINUTA	+	+	0.01	+	+		0.01	+	+	+		+	
BELONE BELONE										0.05			
CLUPEA HARENGUS	1.60	0.23	5.46		0.04	0.02	0.11	0.14	0.10		0.02	1.06	2.61
CRANGON CRANGON							+					+	
CTENOLABRUS RUPESTRIS					+		+						
ENGRAULIS ENCRASICOLUS	0.17	0.01	2.46	0.15	0.38	0.05	0.01	0.07	0.28	0.04	0.02	0.35	0.01
GADUS MORHUA	0.01												
GASTEROSTEUS ACULEATUS	0.71	0.38		+				+		1.70	0.01		+
GOBIUS NIGER	0.02												
LIMANDA LIMANDA	2.29	0.29		0.13	0.08		0.01	0.05	0.03			1.53	1.07
LOLIGO				+		+	0.01	+					
LUMPENUS LAMPRETAEFORMIS	0.02												
MERLANGIUS MERLANGUS	0.04	0.05	0.06		0.01		0.01	0.02			0.04	0.35	0.12
MULLUS SURMULETUS					0.01								
PLATICHTHYS FLESUS	0.12												
PLEURONECTES PLATESSA	0.52												
POMATOSCHISTUS MINUTUS	0.01												
SCOMBER SCOMBRUS					0.13	0.01			0.99		0.18		
SEPIOLA					+								
SPRATTUS SPRATTUS	2.02	0.28	0.60			0.21	0.02	0.02	0.08	0.01		0.59	0.69
SYNGNATHUS				+									
SYNGNATHUS TYPHLE				+	+					+			
TRACHINUS DRACO			0.06	0.02	0.38	0.09	0.25	0.01					
TRACHURUS TRACHURUS			0.08	0.01	0.02	0.05	0.13	0.12	0.09	0.09	+	0.24	0.17
TRISOPTERUS MINUTUS				+									
Total	**7.53**	**1.24**	**8.73**	**0.31**	**1.05**	**0.43**	**0.56**	**0.43**	**1.57**	**1.89**	**0.27**	**4.12**	**4.67**
Medusae	33.53	64.40	17.76	41.95	21.78	14.98	15.93	26.10	12.98	4.81	34.56	34.72	15.30

Haul No.	14	15	16	Total
Species/ICES Rectangle	37G1	37G1	37G1	
ALLOTEUTHIS				**+**
APHIA MINUTA				**0.02**
BELONE BELONE				**0.05**
CLUPEA HARENGUS	0.29	0.24	5.42	**17.34**
CRANGON CRANGON				**+**
CTENOLABRUS RUPESTRIS			0.01	**0.01**
ENGRAULIS ENCRASICOLUS	0.04	1.83	1.12	**6.99**
GADUS MORHUA				**0.01**
GASTEROSTEUS ACULEATUS		0.01	0.04	**2.85**
GOBIUS NIGER				**0.02**
LIMANDA LIMANDA			0.11	**5.59**
LOLIGO				**0.01**
LUMPENUS LAMPRETAEFORMIS				**0.02**
MERLANGIUS MERLANGUS		0.01	0.01	**0.72**
MULLUS SURMULETUS				**0.01**
PLATICHTHYS FLESUS			0.37	**0.49**
PLEURONECTES PLATESSA				**0.52**
POMATOSCHISTUS MINUTUS		+		**0.01**
SCOMBER SCOMBRUS				**1.31**
SEPIOLA				**+**
SPRATTUS SPRATTUS	0.03	0.03	6.94	**11.52**
SYNGNATHUS				**+**
SYNGNATHUS TYPHLE				**+**
TRACHINUS DRACO				**0.81**
TRACHURUS TRACHURUS	0.06	0.10	0.36	**1.52**
TRISOPTERUS MINUTUS				**0.00**
Total	**0.42**	**2.22**	**14.38**	**49.82**
Medusae	12.46	17.71	12.79	381.77

+ = < 0.01 kg

Table 3: FRV "Solea" cruise 768/2019: Catch composition (kg 0.5 h^{-1}) by haul in SD 23.

Haul No.	30	31	32	41	Total
Species/ICES Rectangle	40G2	40G2	41G2	41G2	
APHIA MINUTA	0.02	0.00	0.00		**0.02**
CLUPEA HARENGUS	2.00	0.31	0.03	80.66	**83.00**
CRANGON CRANGON		+			**+**
ENGRAULIS ENCRASICOLUS	0.04	0.03		0.02	**0.09**
EUTRIGLA GURNARDUS		0.07		0.42	**0.49**
GADUS MORHUA	15.53	11.24	2.08	7.35	**36.20**
GASTEROSTEUS ACULEATUS	+		+		**+**
LIMANDA LIMANDA			0.03	0.40	**0.43**
LOLIGO	0.03	0.15	0.07	0.03	**0.28**
MELANOGRAMMUS AEGLEFINUS		8.09			**8.09**
MERLANGIUS MERLANGUS	0.11	0.01		1.96	**2.08**
MYSIDACEA		+			**+**
POMATOSCHISTUS MINUTUS	+				**+**
SARDINA PILCHARDUS	0.01			0.01	**0.02**
SCOPHTHALMUS RHOMBUS	0.39			0.21	**0.60**
SEPIOLA		0.02	0.01	0.01	**0.04**
SPRATTUS SPRATTUS	2.16	0.71		4.26	**7.13**
SYMPHODUS MELOPS				0.05	**0.05**
TRACHINUS DRACO	0.02	0.03	0.06	0.01	**0.12**
TRACHURUS TRACHURUS	0.09	0.08	0.02	0.28	**0.47**
Total	**20.40**	**20.74**	**2.30**	**95.67**	**139.11**
Medusae	2.04	1.99	3.45	0.38	**7.86**

+ = < 0.01 kg

Table 4: FRV "Solea" cruise 768/2019: 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	38G4	38G3	37G3	38G4	38G2	38G2	38G3	39G4	39G3	39G2
APHIA MINUTA			+					+	+				
CLUPEA HARENGUS	0.13	0.52	2.49	6.95	2.14	5.11	14.13	8.99	2.07	2.63	0.68	14.26	4.69
CRANGON CRANGON			+		+								
CYCLOPTERUS LUMPUS	0.24												
ENGRAULIS ENCRASICOLUS	0.25	0.02	0.07		0.02	+	0.03	0.10	0.04	0.01			
GADUS MORHUA		0.02			3.75	9.27	0.47					7.23	
GASTEROSTEUS ACULEATUS	0.01	+	+					0.18	0.06	0.17	0.01		+
MERLANGIUS MERLANGUS	0.01		10.04		1.61	5.44		0.08	+	0.19		1.55	0.38
PLATICHTHYS FLESUS		0.58	0.83		0.10		0.27		0.35	0.17	0.51		
PLEURONECTES PLATESSA													
POMATOSCHISTUS MINUTUS			0.02		+					+			+
SCOMBER SCOMBRUS			1.05										
SPRATTUS SPRATTUS	0.02		40.36	65.76	4.84	2.06	3.33	0.52	0.07	0.17		9.48	5.83
TRACHURUS TRACHURUS	0.06	0.02	0.01		0.01	0.01	+	0.02	0.02	0.01	0.01		
Total	**0.72**	**1.16**	**54.87**	**72.71**	**12.47**	**21.89**	**18.23**	**9.89**	**2.61**	**3.35**	**1.21**	**32.52**	**10.90**
Medusae	12.22	17.35	12.32	27.58	11.21	3.84	18.03	19.17	4.15	10.77	6.97	3.16	7.36

Haul No.	42	43	44	45	Total
Species/ICES Rectangle	39G4	39G4	39G3	39G2	
APHIA MINUTA			0.01	0.01	**0.02**
CLUPEA HARENGUS	7.96	29.86	10.86	1.15	**114.62**
CRANGON CRANGON		+	+		**+**
CYCLOPTERUS LUMPUS					**0.24**
ENGRAULIS ENCRASICOLUS	0.09		0.02	0.02	**0.67**
GADUS MORHUA	0.30	+	0.42	0.04	**21.50**
GASTEROSTEUS ACULEATUS		+	+	0.09	**0.52**
MERLANGIUS MERLANGUS			1.85		**21.15**
PLATICHTHYS FLESUS		0.17	0.57	0.87	**4.42**
PLEURONECTES PLATESSA			0.30		**0.30**
POMATOSCHISTUS MINUTUS	+	0.03	0.02	+	**0.07**
SCOMBER SCOMBRUS	0.30				**1.35**
SPRATTUS SPRATTUS	0.16	1.26	6.45	0.02	**140.33**
TRACHURUS TRACHURUS	0.01			0.01	**0.19**
Total	**8.82**	**31.32**	**20.50**	**2.21**	**305.38**
Medusae	6.80	0.83	5.15	9.47	**176.37**

+ = < 0.01 kg