

Cruise Report
FRV „Solea“ cruise 798
08.10. - 28.10.2021

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 34th 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). The survey effort was comparable to 2020, although two statistical rectangles in the northern part of SD 21 could not be covered.

Altogether, 1124 nautical miles of hydroacoustic transects (plus 67 nmi daytime transects for comparison) were covered. For species allocation and identification as well as to collect biological data for an age stratified abundance estimation of the target species herring and sprat, altogether 50 fishery hauls were conducted. Vertical hydrography profiles were measured on 90 stations.

In all subdivisions covered, mean NASC values per nautical mile per ICES statistical rectangle were equally either distinctly lower or distinctly higher than the values measured in 2020. However, compared to the long-time survey mean since 1991, mean NASC values were lower in all but two rectangles covered. On ICES subdivision scale, mean NASC values were overall distinctly lower than in the previous year in subdivisions 21 and 22, slightly increased in SD 24, and almost fivefold increased in SD 23.

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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 SB798:

- 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 sardine, European anchovy and cod for further analyses

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 (2020: 1204 nmi) (Figure 1).

3. Cruise narrative and preliminary results

3.1 Cruise narrative

The 798th cruise of FRV "Solea" represents the 34th subsequent GERAS survey. Generally, survey operations during the GERAS/BIAS are conducted during nighttime to account for a more pelagic distribution of clupeids at that time. Equipment of the vessel as well as calibration of echosounders took place on October 8th. After leaving Rostock port, the survey commenced in ICES SD24 (Arkona Sea) on October 9th. Due to deteriorating weather and sea state, survey operations had to be interrupted for one day on October 11th, and parts of a transect in that SD had to be repeated after weather conditions had improved. After accomplishing the southern transects in SD24, the survey continued in SD22 (Mecklenburg Bight) from October 13th. On October 14th, due to again deteriorating weather conditions, the survey had to be interrupted in the Kiel Bight. FRV "Solea" steamed into Kiel port, where an exchange of scientific crew members took place. In the evening of October 15th, the survey commenced from the position where the interruption had occurred. Subdivision 22 was accomplished in the early morning of October 19th. Due to the weather forecast indicating deteriorating conditions in SD 24 the survey continued in the comparatively sheltered SD 23 (the Sound), and this subdivision was accomplished in the morning of October 20th. In the evening of that day, the survey continued in still inclement but workable conditions in the southern Kattegat (SD 21). With the weather deteriorating, survey operations had to be interrupted for another 2 days.

Since conditions in the Kattegat only improved slowly but seemed acceptable in SD 24, it was decided to steam south and accomplish the two missing transects in SD 24 (Arkona Sea) on October 23rd and 24th. Afterwards, the remaining transects in SD 21 were covered. However, the previous loss of survey time due to several days of inclement weather required shortening of the transects and omitting the two northernmost statistical rectangles in SD 21. In the early morning of October 26th, survey operations were accomplished and FRV "Solea" returned to Rostock harbor, where the survey ended on October 28th.

Altogether, the following survey schedule was accomplished:

Arkona Sea (SD 24)	09. - 12.10. & 23.-24.10.
Belt Sea (SD 22)	13. - 18.10.
Sound(SD 23)	19. - 20.10.
Kattegat (SD 21)	20. 10. & 25. - 26.10.

Total survey time	18 nights (incl. 3.5 days loss due to bad weather)
Fishery hauls	50
CTD-casts	90
Hydroacoustic transects	1124 nmi (+ 67 nmi daytime 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 a drifting vessel in the Mecklenburg Bight (54°12.5 N, 11°45.7 E) on October 8th. Overall calibration results were considered good based on calculated RMS values. Resulting transducer parameters were applied for the 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 12 software (Echoview Software Pty Ltd, 2021). 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). During fishing operations, additional data on distribution of fishes in the water column were used and recorded from an omnidirectional Simrad CS90 sonar to adjust –where applicable- the trawl net position.

Figure 2 depicts the spatial distribution of mean NASC values (5 nmi intervals) measured on the hydroacoustic transects covered in 2021. In general, the majority of these NASC measurements can be allocated to clupeids. Altogether, 25 ICES statistical rectangles were covered in the survey 2021 (27 in 2020). In 10 of those, the mean NASC was higher than in 2020 (partly significantly), in three rectangles the mean NASC was in the range of 2020. In the 12 other rectangles, mean NASC values were partly well below the already low values measured in 2020. In all but two rectangles, the mean NASC measured in 2021 was below the long term survey mean (1991-2020). On ICES subdivision scale, mean NASC values were distinctly lower than in the previous year in SD 21 and SD 22, but slightly higher in SD 24 - and significantly higher in SD 23 (the Sound).

In the rectangles of SD 21 covered both in 2021 and 2020, overall NASC values measured were lower than those measured in the previous year along the Swedish coast of the Kattegat (41G2, 42G2). In the central and southern Kattegat (42G1, 41G1, 41G0), the mean NASC per 1 nmi EDSU measured was higher or similar to the values measured in the previous year. As in before, aggregations were mostly patchy along the cruisetrack.

In SD 22, the mean overall NASC values recorded were lower than in the previous year in 5 out of 11 rectangles surveyed. In the southern parts of that subdivision (rectangles 37G0 and 37G1) as well as in areas north of the Belt Sea adjacent to the Kattegat (40F9, 40G1, 41G0) mean NASC was higher than in 2020, but at generally low values measured.

As in the previous years, the large aggregations of big herring that usually could be observed in the inner Sound area of SD 23 were not present in autumn 2021 to the extent observed prior to 2016. NASC values in rectangles 39G2 and 40G2 were again below the survey mean and also lower than the - slightly

increased- values measured in 2020. In rectangle 41G2 however, the mean NASC measured was about 70-fold higher compared to the measurements made in 2020. This was, however, based on the detection of one massive school of fishes located at the narrow isthmus in the northern Sound in an otherwise rather “empty” rectangle. Since that school consisted of spawning herring and accordingly did not yield a NASC value considered valid for providing a WBSH estimate, the corresponding NASC was omitted from further analyses (see below).

In SD 24, mean NASC values were comparable (1) or distinctly lower (4) than the levels measured in 2020 in 5 out of 9 rectangles. Increased NASC was measured in southern coastal areas and east of Rügen Island (37G2, 37G3) as well as in the southwestern (38G2) and southeastern Arkona Sea bordering the Bornholm Basin (38G4). 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	10
22	18
23	3
24	19

Altogether, 1 215 individual herring, 727 sprat, 400 European anchovies and 16 sardines were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 1-4. Altogether, 29 different species were recorded. Herring were caught in 41, sprat in 40 hauls. SD 23 showed the highest mean herring catch rate per station ($\text{kg } 0.5 \text{ h}^{-1}$) in the data series since 2002. However, this high mean value was only caused by one haul with exceptional large herring catches in the northern part of the Sound (Haul 32). Anchovy (*Engraulis encrasicolus*), which were present last year in the whole survey area, were not caught in SD 23 in 2021 but dominated catches in other parts of the survey area (SD 22). Sardines (*Sardina pilchardus*) appeared in catches from SD 21 and SD 22, whereas they were only caught in SD 21 in 2020. Figure 3 depicts a representation of the standardized clupeid catch per haul.

Altogether, the following fish species were sampled and processed:

Species	Length measurements (n)	Prevalence (n of hauls)
<i>Aphia minuta</i>	390	17
<i>Belone belone</i>	6	5
<i>Clupea harengus</i>	5,628	41
<i>Engraulis encrasicolus</i>	3,862	37
<i>Gadus morhua</i>	68	23
<i>Gasterosteus aculeatus</i>	1,296	35
<i>Limanda limanda</i>	15	8
<i>Platichthys flesus</i>	22	12
<i>Pleuronectes platessa</i>	12	12
<i>Pomatoschistus minutus</i>	295	18
<i>Sardina pilchardus</i>	16	4
<i>Scomber scombrus</i>	291	16
<i>Sprattus sprattus</i>	4,421	40
<i>Trachinus draco</i>	297	15
<i>Trachurus trachurus</i>	118	27
Others	80	-

Figures 4 and 5 show relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2020 and 2021. Compared to results from the previous survey in 2020, the following conclusions for **herring** can be drawn (Figure 4):

- In 2021 catches in SD 21 were dominated by herring larger 15 cm with a mode at 18.75 cm and some minor contribution of the incoming year class (ca. ≤ 15 cm). This is in contrast to the results in 2020, which were dominated by the incoming year class (ca. ≤ 15 cm) with a mode at 13.75 cm and a minor contribution of larger herring (>15 cm).
- Catches in SD 22, which were dominated by larger herring >15 cm in 2020 with a mode at 22.25-22.75 cm, were in 2021 dominated by the incoming year class (ca. ≤ 15 cm) with a mode at 11.25-12.75 cm.
- In SD 23 the contribution of herring larger 20 cm increased in 2021 compared to 2020. Catches in 2020 showed a mode at 19.25 cm, in 2021 at 26.25 cm.
- In 2020 catches in SD 24 showed a bimodal distribution with modes at 13.25-14.25 cm and 17.75-18.75 cm, whereas catches in 2021 were characterized by a trimodal distribution with modes at 9.25 cm, 13.25-14.25 cm and 17,25 cm. Both in 2021 as well as in the previous survey, herring larger than ca. 25 cm were almost absent.

Relative length-frequency distributions of **sprat** in the years 2020 and 2021 (Figure 5) can be characterized as follows:

- In SD 21 the incoming year class (ca. ≤ 10 cm) was virtually absent from catches in 2021, whereas some contribution of this year class had been observed in 2020. The catches in 2021 were dominated by the contribution of larger sprat (mode at 14.25 cm) compared to 2020 (mode at 11.25 cm).
- Catches in SD 22 show a tri-modal distribution with a contribution of the incoming year class (ca. ≤ 10 cm, mode at 9.75 cm) as well as of larger sprat (>10 cm, modes at 11.25 cm and at 13.25 cm, respectively). This is contrast to the results of 2020, when catches showed a bimodal distribution with a contribution of the incoming year class (ca. ≤ 10 cm, mode at 6.75 cm) and of larger sprat (>10 cm, mode at 11.25 cm).
- In SD 23, the incoming year class (ca. ≤ 10 cm) was almost absent from the catches, as also had been observed in the previous year. In both years the catches were dominated by larger sprat (>10 cm) with modes at 11.75 cm (2020) and 13.25-14.25 cm (2021).
- While catches in SD 24 had been dominated almost exclusively by larger sprat (>10 cm, mode at 11,75 cm) in 2020, a bimodal distribution with a higher contribution of the incoming year class (ca. ≤ 10 cm, mode at 8.75 cm) and lower contribution of larger older sprat (>10 cm, mode at 12.75 cm) was observed in 2021 in this subdivision.
- Altogether, the present contribution of the incoming year class (ca. ≤ 10 cm) seemed to be as low as in 2020.

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, 90 CTD casts were conducted during this survey (Figure 6).

Surface temperatures were lower than in the previous year ranging from ca. 11°C in the central Kattegat area (SD 21) to $> 14^\circ\text{C}$ in the southern Mecklenburg Bight (SD 22) and eastern Arkona Basin (SD 24). In general, surface temperatures were higher in the southern part of the survey area. Bottom temperatures showed a higher variability due to thermohaline layering and were lowest in the deep parts of the Bornholm Basin area in SD 24 ($< 7^\circ\text{C}$) and the deep parts of the Sound and the Kattegat (ca. 10.5°C) but distinctly higher in the shallower areas of SD 21-24. Also in the central and eastern parts of the Arkona Sea (SD 24), bottom temperatures were relatively high at $> 14^\circ\text{C}$ and exceeded surface temperatures.

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 southeastern Arkona Sea to > 29 PSU in the Kattegat). Surface salinities in the western parts of the survey area were higher than the values recorded in the previous years and exceeded 15 PSU south of the Belt Sea. Salinity near the seafloor ranged from 9 PSU in the Arkona Sea to ca. 34 PSU in the deep parts of the Kattegat. Especially in the Sound (SD 23), a very strong stratification with steep salinity gradients was again observed.

Surface waters were well oxygenated throughout the survey area. In contrast, pronounced oxygen depletion was measured in the inner Mecklenburg Bight (SD 22) and the western SD 22 area of the southern Little Belt. In those regions, lowest oxygen concentrations measured near the seafloor were below 0.5 ml/l and occasionally in the anoxic range.

4. Survey participants

Name	Function	Institute
Dr. M. Schaber (15.-28.10.)	Cruise Leader (Hydroacoustics, Hydrography)	TI-SF
L. Hartkens	Cruise Leader (Hydroacoustics, Hydrography)	TI-SF
M. Koth	Fishery biology	TI-OF
L. Schmidt (8.-15.10.)	Fishery biology	TI-OF
S. Winning (8.-15.10.)	Fishery biology	TI-SF
A. Finke (15.-28.10.)	Fishery biology	TI-OF
P. Christiansen (8.-15.10.)	Fishery biology	DTU-Aqua (DK)
N. Kolding (15.-28.10.)	Fishery biology	DTU-Aqua (DK)

5. References

- Echoview Software Pty Ltd (2021) Echoview software, version 12 (12.0.337). 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 S. Meier as well as all participants for their outstanding cooperation and commitment that enabled the safe and successful accomplishment of this survey during this still challenging times.



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

Figures

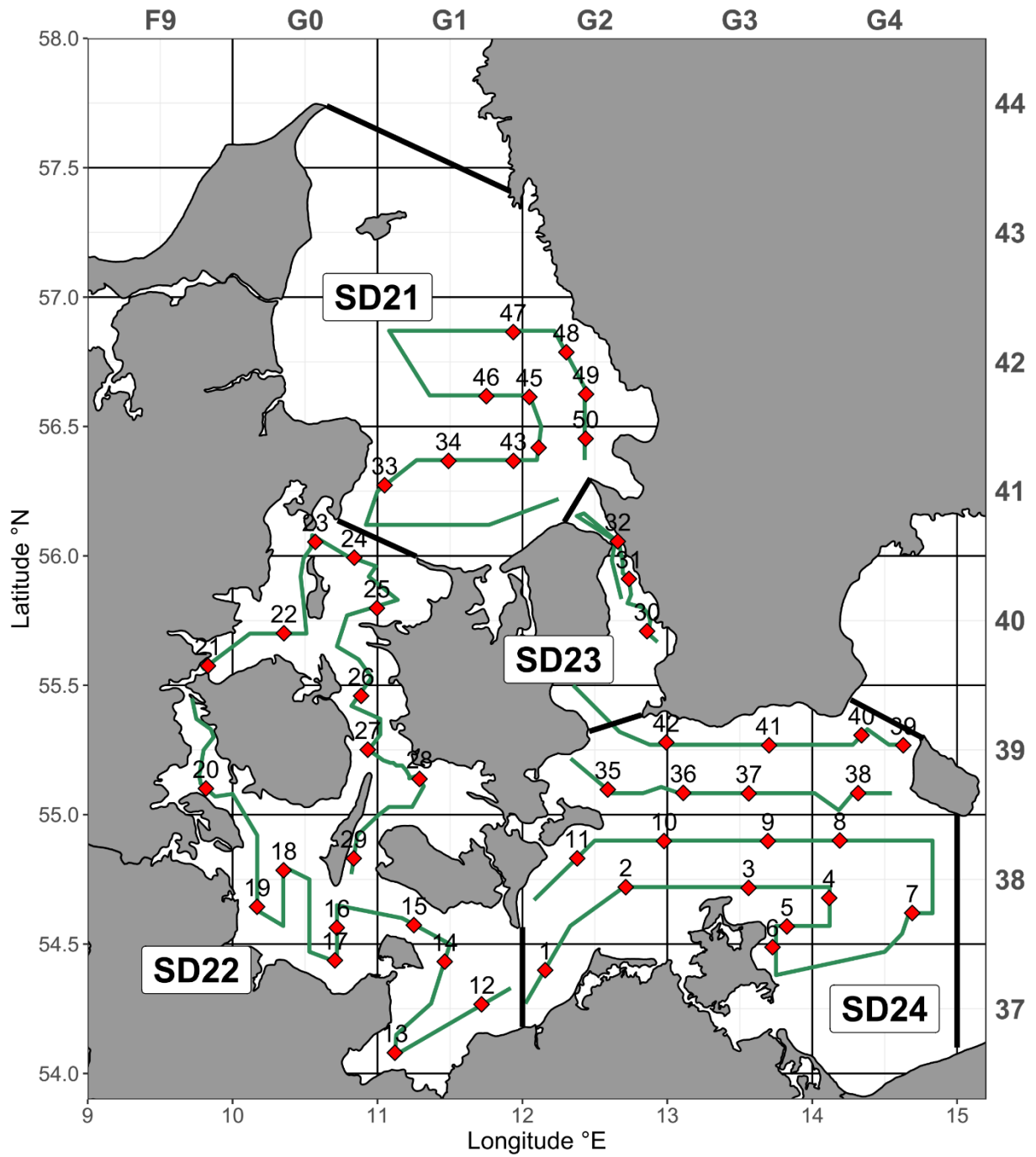


Figure 1: FRV "Solea" cruise 798/2021. Cruise track (dark green lines) and fishery hauls (red diamonds). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions (SD).

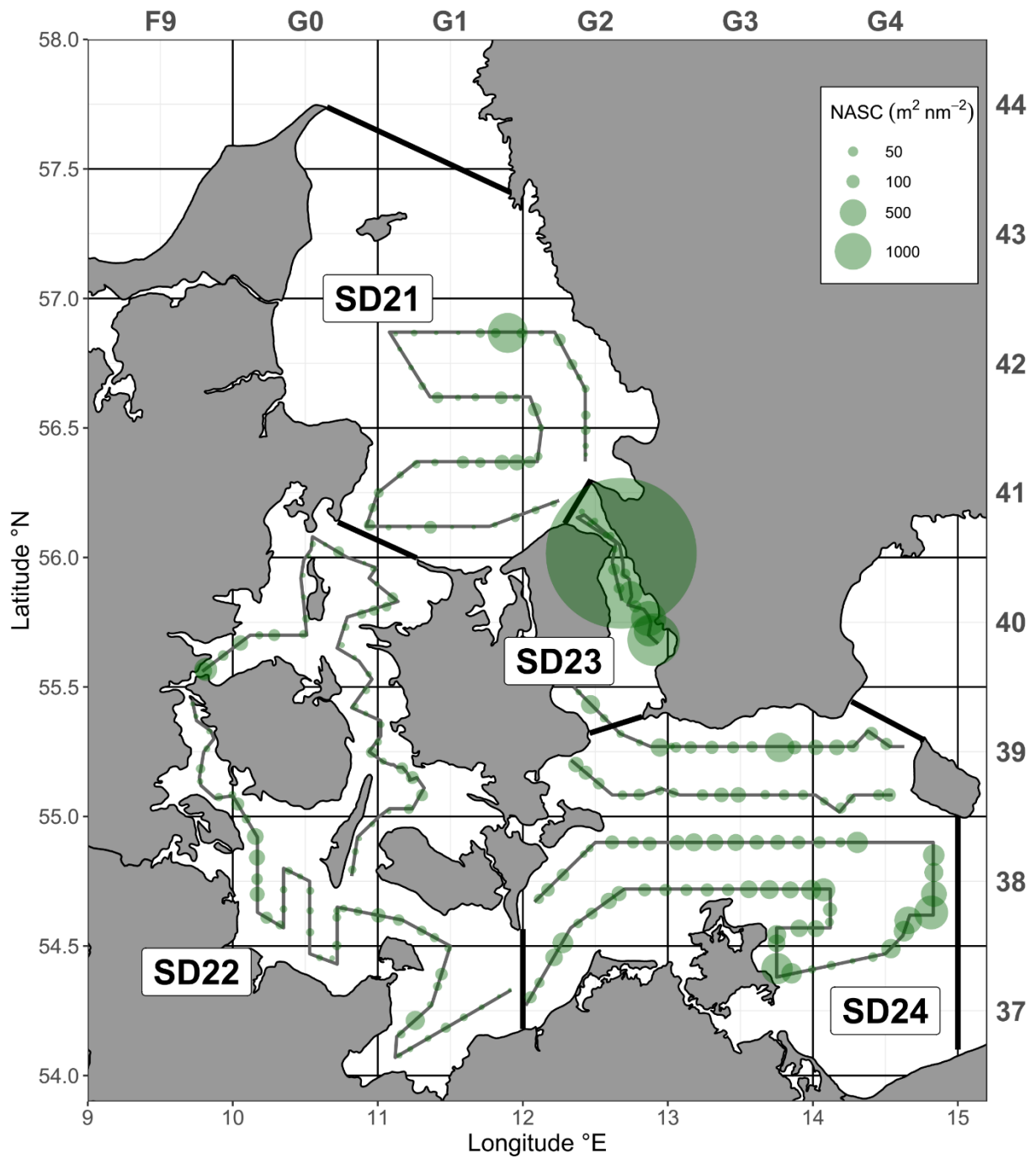


Figure 2: FRV "Solea" cruise 798/2021. Cruise track (thin grey lines) and mean NASC (5 nmi intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions. Note the large NASC value measured in 41G2 (SD 23) which had to be removed from the WBSSH estimate (see above).

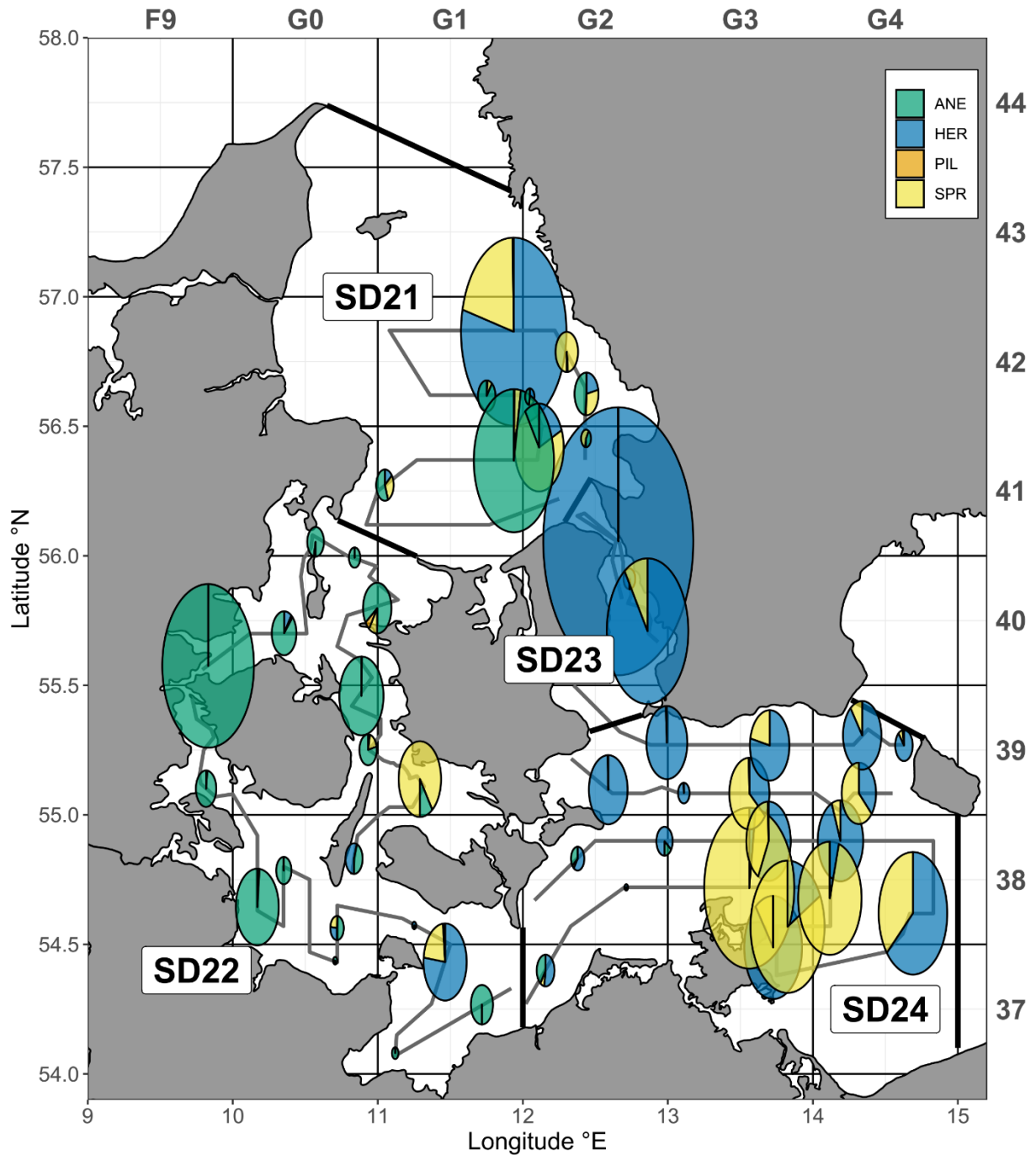


Figure 3: FRV "Solea" cruise 798/2021. Clupeid catch per haul ($\text{kg } 30\text{min}^{-1}$). ANE = European anchovy (*Engraulis encrasicolus*), HER = Herring (*Clupea harengus*), PIL = Sardine (*Sardina pilchardus*), SPR = Sprat (*Sprattus sprattus*). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions. Thin grey lines indicate cruise track. Note the large herring catches in rectangle 41G2 (SD23) which had to be removed from the WBSH survey estimate (see above).

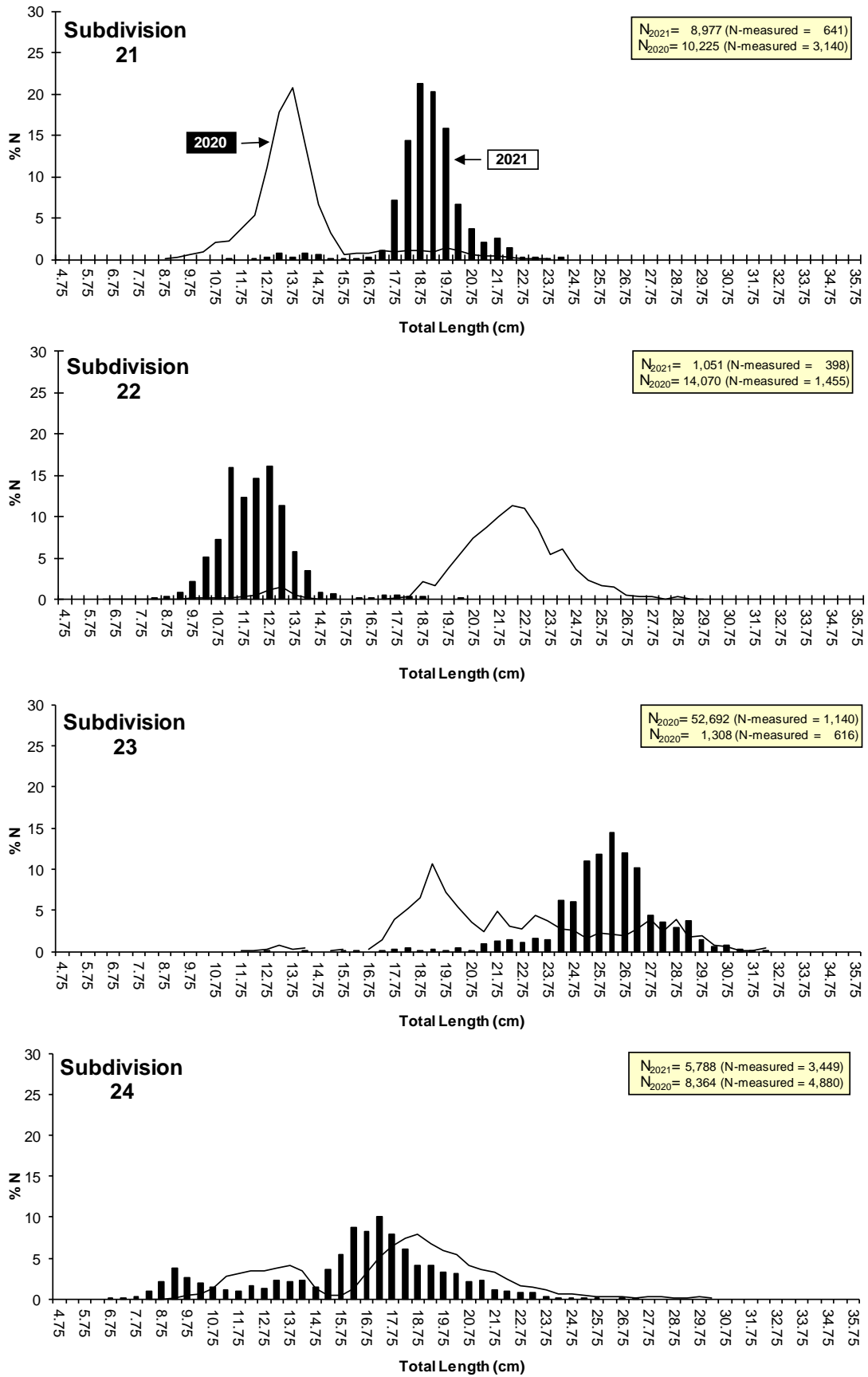


Figure 4: FRV “Solea” cruise 798/2021. Herring (*Clupea harengus*) length-frequency distribution (bars) compared to the previous year (cruise 783/2020, lines). Note that the LFD in SD 23 contains data from haul 32 which had to be removed from the calculation of WBSSH abundance/biomass indices.

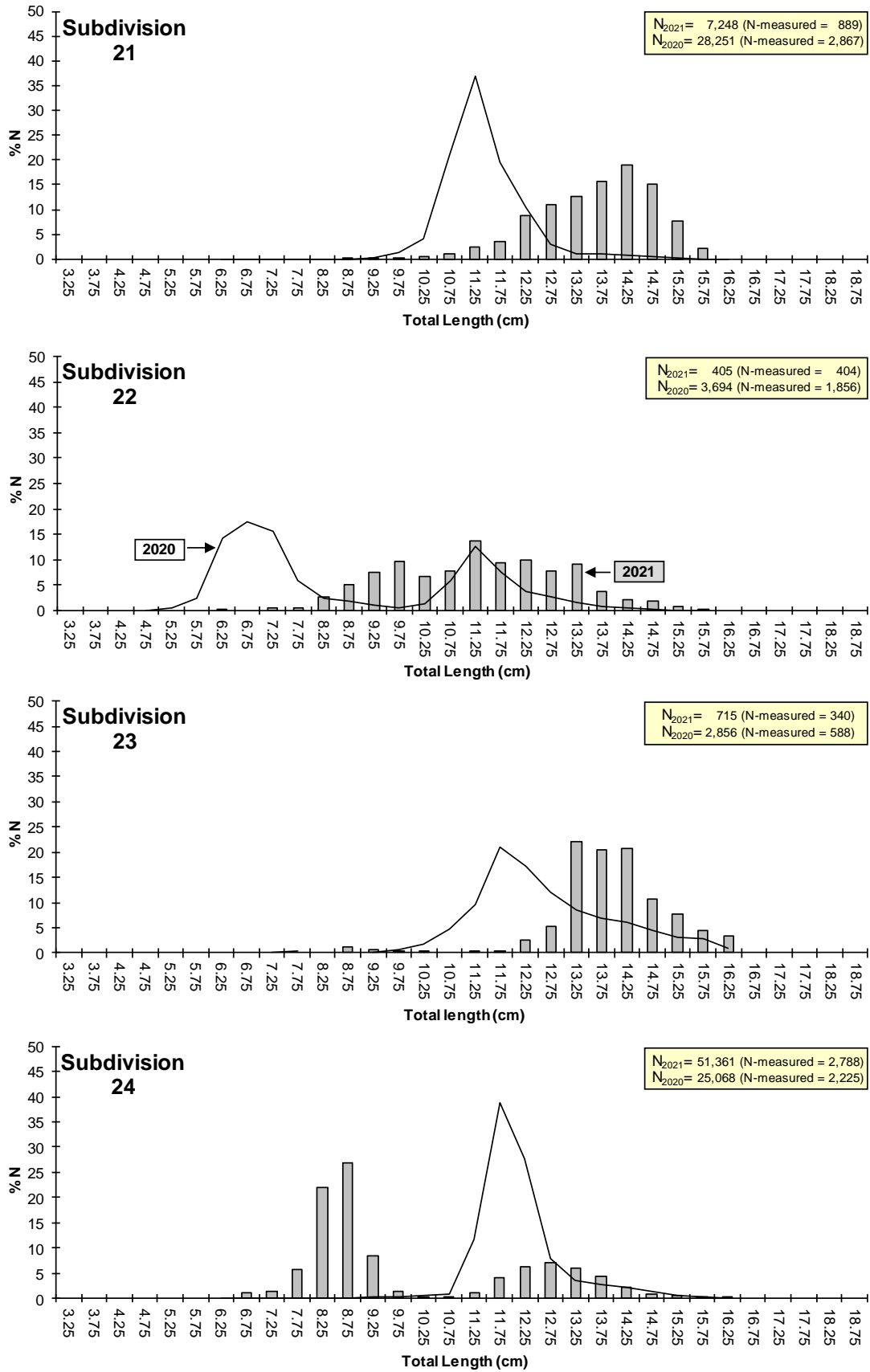


Figure 5: FRV “Solea” cruise 798/2021. Sprat (*Sprattus sprattus*) length-frequency distribution (bars) compared to the previous year (cruise 783/2020, lines).

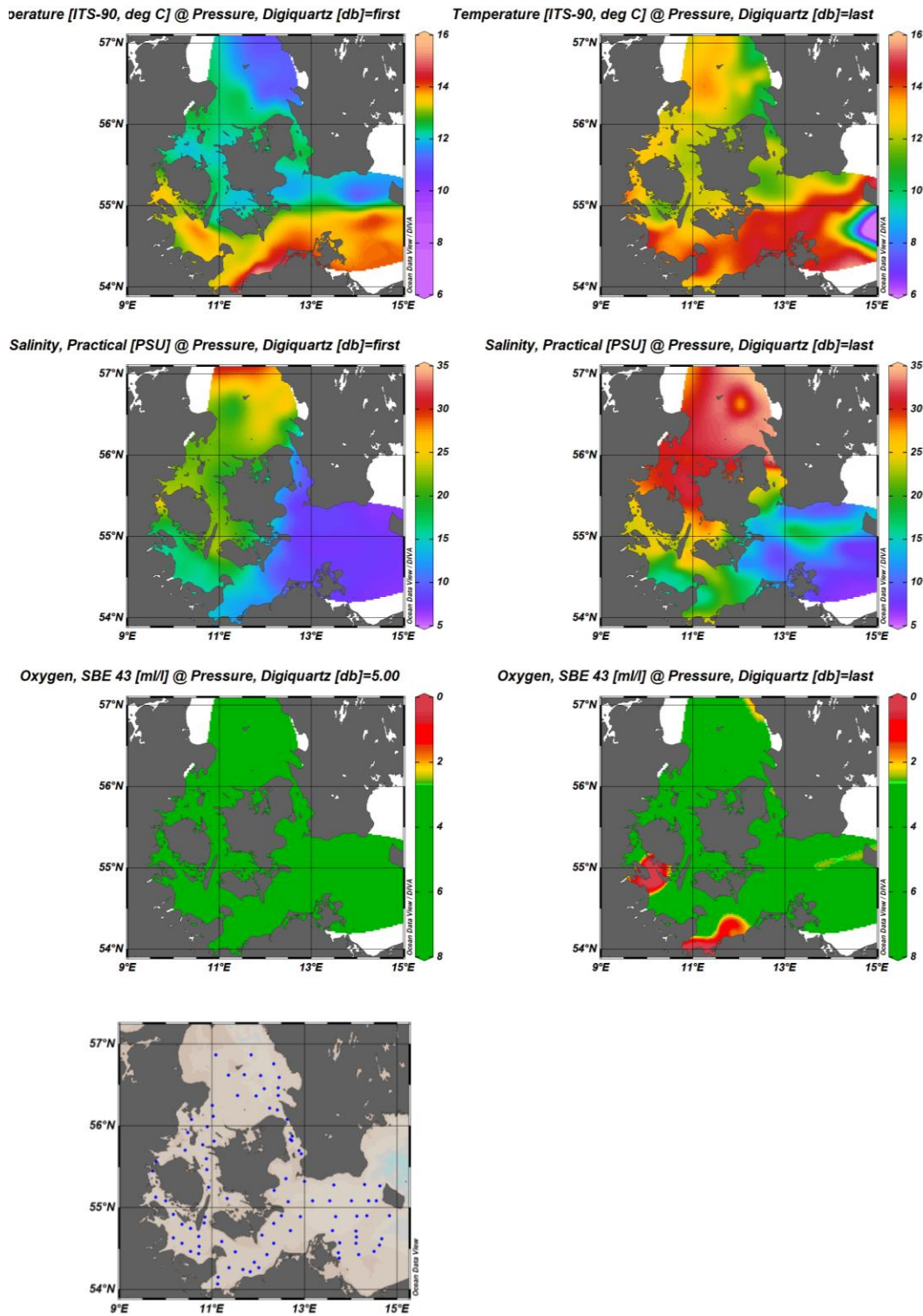


Figure 6: FRV “Solea” cruise 798/2021: Hydrography. CTD stations are depicted as blue dots in the area map. Temperature ($^{\circ}\text{C}$, top panels), salinity (PSU, middle panels and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right).

Tables

Table 1: FRV "Solea" cruise 798/2021: Catch composition (kg 0.5 h⁻¹) by haul in SD 21.

Haul No.	33	34	43	44	45	46	47	48	49	50	Total
Species/ICES Rectangle	41G1	41G1	41G1	41G2	42G2	42G1	42G1	42G2	42G2	41G2	
ALLOTEUTHIS	+	+	0.04	0.06	0.04	0.19	0.01	0.07	0.03	0.04	0.48
APHIA MINUTA	+					+		0.02	0.01	+	0.03
CLUPEA HARENGUS	0.41		0.27	3.46	0.59	0.04	417.77		0.91	0.02	423.47
ELEDONE				0.01	0.01			0.02	0.01		0.05
ENGRAULIS ENCRASICOLUS	1.58		114.54	1.79	0.82	2.54	1.70	+	2.00	0.23	125.20
EUTRIGLA GURNARDUS				0.02							0.02
GASTEROSTEUS ACULEATUS			0.01							+	0.01
LIMANDA LIMANDA									0.04		0.04
MERLANGIUS MERLANGUS	0.01		0.15	0.10	0.01	+		0.05	0.25	0.03	0.60
PLEURONECTES PLATESSA						0.03		0.01			0.04
SARDINA PILCHARDUS									0.04		0.04
SCOMBER SCOMBRUS	0.78	75.58	0.08	6.14	0.31	0.52	16.12	0.04	0.05	0.07	99.69
SPRATTUS SPRATTUS	0.84		3.06	13.42	0.32	0.25	110.88	0.26	1.20	0.31	130.54
TRACHINUS DRACO	1.17	0.26	0.21	1.59	5.74	0.38	25.86	0.03	0.09	0.06	35.39
TRACHURUS TRACHURUS	0.06	0.01	0.05	0.01	0.01	0.01			0.01	0.03	0.19
Total	4.85	75.85	118.41	26.60	7.85	3.96	572.34	0.50	4.64	0.79	815.79
Medusae	0.24	1.09	1.43	0.08	1.11	1.83	0.00	1.38	2.36	2.68	12.20

+ = < 0.01 kg

Table 2: FRV "Solea" cruise 798/2021: Catch composition (kg 0.5 h⁻¹) by haul in SD 22.

Haul No.	12	13	14	15	16	17	18	19	20	21	22	23	24
Species/ICES Rectangle	37G1	37G1	37G1	38G1	38G0	37G0	38G0	38G0	39F9	40F9	40G0	41G0	40G0
AGONUS CATAPHRACTUS				+									
ALLOTEUTHIS											0.01	0.01	0.01
APHIA MINUTA			+			+							
BELONE BELONE		0.07		0.02	0.06	0.01	0.09						
CLUPEA HARENGUS		0.01	10.04	0.61	0.12	0.03		0.15		0.05	0.43		
CTENOLABRUS RUPESTRIS				+			+						
ENGRAULIS ENCRASICOLUS	0.27	1.47	0.21	0.17	0.22	0.55	2.48	12.70	3.31	233.44	3.81	0.36	1.97
GADUS MORHUA	+	0.01	0.02	0.13		0.02	+		0.01	0.04			
GASTEROSTEUS ACULEATUS	0.07	0.03	0.02	0.05		0.15	0.20	1.31	0.95	0.95	0.02		+
LIMANDA LIMANDA		0.15	0.47	0.32		0.07		0.20					
MERLANGIUS MERLANGUS	0.03	0.01	0.47	+		0.04	0.03	0.14	0.03	0.03	0.01		
MYOXOCEPHALUS SCORPIUS													
PLATICHTHYS FLESUS		0.45	0.22										
PLEURONECTES PLATESSA		0.17		0.06			0.16		0.11				
POMATOSCHISTUS MINUTUS	+		0.01			0.01					+		
SARDINA PILCHARDUS										0.12			0.01
SCOMBER SCOMBRUS										0.09	0.20		
SPRATTUS SPRATTUS			2.82		0.11	0.19		0.06	0.06	0.09	0.09	0.01	
TRACHINUS DRACO										0.08		0.31	0.18
TRACHURUS TRACHURUS	+	0.01	0.02	+		0.04		0.01		0.28	0.01		0.00
Total	0.37	2.38	14.30	1.36	0.51	1.11	2.96	14.57	4.47	235.17	4.58	0.69	2.17
Medusae	15.68	14.18	5.25	5.80	1.64	3.89	10.51	13.90	1.72	0.27	1.50	1.54	1.12

Haul No.	25	26	27	28	29	Total
Species/ICES Rectangle	40G0	39G0	39G0	39G1	38G0	
AGONUS CATAPHRACTUS				+		+
ALLOTEUTHIS	0.02		+	0.01		0.06
APHIA MINUTA	0.07	+	+	4.89		4.96
BELONE BELONE						0.25
CLUPEA HARENGUS		0.05	0.10		0.30	11.89
CTENOLABRUS RUPESTRIS						+
ENGRAULIS ENCRASICOLUS	0.16	13.78	2.19	0.01	0.24	277.34
GADUS MORHUA					0.15	0.38
GASTEROSTEUS ACULEATUS		0.02		1.36	6.72	11.85
LIMANDA LIMANDA					0.09	1.30
MERLANGIUS MERLANGUS		+				0.79
MYOXOCEPHALUS SCORPIUS	0.06					0.06
PLATICHTHYS FLESUS						0.67
PLEURONECTES PLATESSA						0.50
POMATOSCHISTUS MINUTUS				0.01		0.03
SARDINA PILCHARDUS	0.01					0.14
SCOMBER SCOMBRUS	1.24					1.53
SPRATTUS SPRATTUS	0.02		0.51	0.07		4.03
TRACHINUS DRACO	0.03	0.13				0.73
TRACHURUS TRACHURUS	0.02	0.01	0.03	0.02		0.45
Total	1.63	13.99	2.83	6.37	7.50	316.96
Medusae	2.80	8.33	2.47	4.18	0.80	95.58

+ = < 0.01 kg

Table 3: FRV "Solea" cruise 798/2021: Catch composition (kg 0.5 h⁻¹) by haul in SD 23.

Haul No.	30	31	32	Total
Species/ICES Rectangle	40G2	40G2	41G2	
APHIA MINUTA		+		+
CLUPEA HARENGUS	116.20	0.49	7565.28	7681.97
GADUS MORHUA	10.37	9.70		20.07
GASTEROSTEUS ACULEATUS	0.10	0.01		0.11
MERLANGIUS MERLANGUS	0.83			0.83
PLEURONECTES PLATESSA		0.49		0.49
POMATOSCHISTUS MINUTUS	+			+
SCOMBER SCOMBRUS			17.15	17.15
SPRATTUS SPRATTUS	12.05	0.01	0.98	13.04
TRACHURUS TRACHURUS	0.23	0.01	0.47	0.71
Total	139.78	10.71	7583.88	7734.37
Medusae	0.33	0.45	0.00	0.78

+ = < 0.01 kg

Table 4: FRV "Solea" cruise 798/2021: Catch composition (kg 0.5 h⁻¹) by haul in SD 24.

Haul No.	1	2	3	4	5	6	7	8	9	10	11	35	36
Species/ICES Rectangle	37G2	38G2	38G3	38G4	38G3	37G3	38G4	38G4	38G3	38G2	38G2	39G2	39G3
ALOSA FALLAX								0.03					
APHIA MINUTA	+	+									+	+	
CLUPEA HARENGUS	1.51	0.59	4.90	2.00	14.16	27.90	37.80	14.00	8.12	0.32	1.33	9.95	1.97
CRANGON CRANGON		+	+		+	+	+			+			
CYCLOPTERUS LUMPUS									0.12				
ENGRAULIS ENCRASICOLUS	1.15	0.20		0.01		0.02			0.07	0.06	0.78		0.02
GADUS MORHUA				0.19	0.02	0.07	1.70	0.58	1.06	0.02	0.02		
GASTEROSTEUS ACULEATUS	0.13	0.03	0.23	+	0.05		0.07	0.06	0.21	0.01	0.58	+	+
LIMANDA LIMANDA	0.13												
MERLANGIUS MERLANGUS	0.06		0.01		0.03	7.92	+	0.16	0.70		+	0.02	0.03
NEOGOBIOUS MELANOSTOMUS										+	+		
PLATICHTHYS FLESUS		0.32	0.80		0.49	0.66	0.19	0.72				0.74	
PLEURONECTES PLATESSA	0.07		0.20					0.11					
POMATOSCHISTUS MINUTUS	0.01	0.02	0.02		+	+	0.01	+	0.03	0.05	+		
SCOMBER SCOMBRUS		0.19			0.36								
SPRATTUS SPRATTUS	0.22	0.02	208.55	41.58	67.91	3.23	21.44	0.95	5.89		0.11	0.05	
STIZOSTEDION LUCIOPERCA					0.06	3.44							
TRACHURUS TRACHURUS	0.01	0.03										0.02	
Total	3.29	1.40	214.71	43.78	83.08	43.24	61.24	16.70	16.08	0.46	2.82	10.78	2.02
Medusae	1.59	0.96	0.30	0.63	0.39	3.07	0.50	0.66	3.10	3.05	2.58	0.72	16.50

Haul No.	37	38	39	40	41	42	Total
Species/ICES Rectangle	39G3	39G4	39G4	39G4	39G3	39G2	
ALOSA FALLAX							0.03
APHIA MINUTA							+
CLUPEA HARENGUS	3.89	2.84	2.52	8.80	8.19	11.33	162.12
CRANGON CRANGON							+
CYCLOPTERUS LUMPUS							0.12
ENGRAULIS ENCRASICOLUS	0.05		0.07				2.43
GADUS MORHUA	1.64		0.01	0.86	0.01		6.18
GASTEROSTEUS ACULEATUS	0.03	+	0.01		0.03	0.02	1.46
LIMANDA LIMANDA							0.13
MERLANGIUS MERLANGUS			0.25		0.67		9.85
NEOGOBIOUS MELANOSTOMUS							+
PLATICHTHYS FLESUS	0.24				0.31	0.23	4.70
PLEURONECTES PLATESSA				0.13	0.16		0.67
POMATOSCHISTUS MINUTUS					0.01	+	0.15
SCOMBER SCOMBRUS							0.55
SPRATTUS SPRATTUS	6.96	4.90	0.23	1.02	2.29	0.09	365.44
STIZOSTEDION LUCIOPERCA							3.50
TRACHURUS TRACHURUS							0.06
Total	12.81	7.74	3.09	10.81	11.67	11.67	557.39
Medusae	27.46	4.89	14.97	4.09	2.70	1.40	89.56

+ = < 0.01 kg