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Cruise Report
FRV „Solea“ cruise 827
04.10. - 24.10.2023

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

Cruise Leader: Dr. Matthias Schaber/Dr. Boris Cisewski (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 36th 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 2022.

Altogether, 1168 nautical miles of hydroacoustic transects 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 48 fishery hauls were conducted. Vertical hydrography profiles were measured on 67 stations.

Mean NASC values per nautical mile per ICES statistical rectangle were higher in 3 and similar in 1 out of 7 rectangles covered in SD 21. In SD 22, the values recorded were lower in 9 out of 11 rectangles. In SD 23, 2 out of 3 rectangles yielded lower mean NASC values than in 2022. In SD 24 however, the measurements were higher than the previous year in 6 out of 9 rectangles. Compared to the long-time survey mean since 1991, mean NASC values were lower in 22 out of 28 rectangles covered. On ICES subdivision scale, mean NASC values were overall distinctly higher than in the previous year in subdivisions 21 and 24, while in SD 22 and 23 lower mean NASC values were recorded.

Verteiler:

Schiffsführung FFS „Solea“
BA für Landwirtschaft und Ernährung (BLE) Fischereiforschung
BM für Ernährung und Landwirtschaft (BMEL), Ref. 614
BA für Seeschifffahrt und Hydrographie (BSH), Hamburg
Deutscher Angelfischerverband e.V.
Deutsche Fischfang-Union, Cuxhaven
Deutscher Fischereiverband, Hamburg
Doggerbank Seefischerei GmbH, Bremerhaven
Erzeugergemeinschaft der Deutschen Krabbenfischer GmbH
Euro-Baltik Mukran
GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Kutter- und Küstenfisch Sassnitz
LA für Landwirtschaft, Lebensmittels. und Fischerei (LALLF)
LFA für Landwirtschaft und Fischerei MV (LFA)
Landesverband der Kutter- u. Küstenfischer MV e.V.
Leibniz-Institut für Ostseeforschung Warnemünde
Thünen-Institut – Institut für Fischereiökologie
Thünen-Institut – Institut für Seefischerei
Thünen-Institut – Institut für Seefischerei
Thünen-Institut – Pressestelle
Thünen-Institut – Präsidialbüro
Thünen-Institut – Reiseplanung Forschungsschiffe, Dr. Rohlf
Fahrtteilnehmer*innen

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 SB827:

- 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
- Comparison of day and night-time transects with FRV "Clupea" in ICES Subdivision 23

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 1168 nautical miles (2022: 1208 nmi) (Figure 1).

3. Cruise narrative and preliminary results

3.1 Cruise narrative

The 827th cruise of FRV "Solea" represented the 36th 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. Loading of scientific equipment and embarkation of scientific crew took place on October 4th in Kiel port. FRV "Solea" left port in the late afternoon of that day for a calibration of the echosounders, which after having to be postponed due to the participation in a joint search and rescue operation was conducted and accomplished in the early morning of October 5th. In the evening, survey operations commenced in SD 24 (Arkona Sea) but had to be interrupted in the morning of October 6th northeast of Rügen Island due to severe weather. FRV "Solea" had to seek shelter near Sassnitz until weather conditions improved and survey operations continued in the evening of October 7th. After accomplishing the southern transect in SD 24, survey operations once again had to be interrupted because of medical issues of survey participants who had to disembark in Rostock port on October 9th. In the evening of that day, a short transect section in SD 22 was covered to not lose further survey time through steaming to the next transect in SD 24. Afterwards, FRV "Solea" relocated to SD 24 again during daytime to continue with the survey work in the Arkona Sea, which was accomplished in the morning of October 12th. Then, survey operations continued in SD 23 (the Sound). Due to forecasts of severe weather in the Kattegat (SD 21), "Solea" steamed west through the southern Kattegat afterwards and commenced survey work in the northern sections of SD 22 (Belt Sea) in the evening of October 13th. In the morning of October 15th, survey operations were interrupted for a planned crew change in Rostock harbor. Due to inclement weather, the survey could not be continued before October 16th, when survey operations in SD 22 commenced in the evening. After accomplishing SD 22 in the morning of October 18th, survey work continued in the evening of that day in the southern Kattegat (SD 21) until deteriorating and severe weather required another longer interruption of the survey until the evening of October 21st. Then, the remaining transect sections in SD 21 were covered with a shortening of the northernmost sections required due to the accumulated loss of survey time until then. Survey operations were accomplished in the morning of October 23rd, and FRV "Solea" returned to Rostock harbor, where the survey ended after unloading of the scientific equipment and samples on October

24th. The accumulated loss of survey time prevented day-time data collection in SD 23, which usually is conducted within the framework of the GERAS survey for comparison.

Altogether, the following survey schedule was accomplished:

Belt Sea	(SD 22)	9.10. & 13.-18.10.
Arkona Sea	(SD 24)	5.-9.10. & 10.-12.10.
Sound	(SD 23)	12.10.
Kattegat	(SD 21)	18.- 23.10.

Total survey time	18 nights (incl. 4.5 days/nights loss due to bad weather etc)
Fishery hauls	48
CTD-casts	67
Hydroacoustic transects	1168 nmi

3.2 Hydroacoustics

3.2.1 Calibration

All transducers (38, 70, 120 and 200 kHz) were calibrated in CW and FM mode from a drifting vessel in Strande Bay (54°25.985 N, 10°11.622 E) on October 5th. Overall calibration results were considered very 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 14 software (Echoview Software Pty Ltd, 2023). Mean volume backscattering values (S_v) were integrated over 1 nmi intervals from 10 m below the surface to ca. 0.5 m over the seafloor (NASC - Nautical Area Scattering Coefficient). Interferences from surface turbulence, bottom structures and scattering layers were removed from the echogram. In post-processing, no species-specific NASC values were allocated to echo registrations, but a MIX category was used for the combined acoustic backscatter per EDSU. 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 occasionally recorded from an omnidirectional Simrad CS90 sonar and used 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 2023. In general, the majority of these NASC measurements can be allocated to clupeids, but in some areas/rectangles, contributions of other organisms to the measurements were assumed, which will be accounted for in the further analyses. Altogether, 28 ICES statistical rectangles were covered in the 2023 survey. The mean NASC per rectangle in 2023 was higher than in 2022 (partly significantly) in 10 rectangles. In three rectangles the mean NASC was in the range of 2022. In the 15 remaining rectangles, mean NASC values were partly well below the already low values measured in 2022. Compared with the long-term survey mean (1991-2022), the mean NASC measured in 2023 was again lower in 22 out of 28 rectangles. On ICES subdivision scale, mean NASC values were overall (partly) distinctly higher than in the previous year in subdivisions 21 (Kattegat) and 24 (Arkona Sea), while in SD 22 (Belt Sea) and SD 23 (the Sound), lower mean NASC values were recorded.

In the rectangles covered in SD 21, mean NASC values measured were distinctly higher than those measured in the previous year in the southern Kattegat (41G0, 41G1, 41G2), while along the Swedish coast of the Kattegat (42G2) and in the northern Kattegat (43G1) the mean NASC per 1 nmi EDSU measured was slightly lower than the values measured in the previous year. In general, patchy

aggregations of clupeids were observed along the transect in almost all parts of SD 21 covered, except for along the Swedish coast.

In SD 22, the mean overall NASC values recorded were (partly distinctly) lower than in the previous years in 9 out of 11 rectangles surveyed. Only along the comparatively short transect sections in rectangles 40G0 and 41G1, mean NASC per 1 nmi EDSU was higher than in 2022.

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 2023 to the extent observed prior to 2016. NASC values in rectangles 39G2 and 40G2 were again lower than in the previous year and well below the survey mean. Also in 2023, a notable aggregation of herring was detected in rectangle 41G2 located at the narrow isthmus in the northern Sound in an otherwise rather "empty" rectangle.

In SD 24, mean NASC values were (partly distinctly) higher than the levels measured in 2022 in 6 out of 9 rectangles (similar to 2022 in 2 rectangles). Only in 39G2 (northwestern Arkona Sea, Fakse Bugt), the mean NASC values per rectangle were lower than the values measured in 2022. Mean NASC values were lower than the long-term survey average (1991-2021) in all rectangles covered in SD 24. Notable aggregations were detected around Rügen Island (37G3, 38G3), the eastern Arkona Sea (37G4, 38G4, 39G4) and along the Swedish south coast (39G3).

3.3 Biological sampling (S. Haase, TI-OF)

Fishery hauls according to ICES Subdivision (Figure 1):

SD	Hauls (n)
21	12
22	16
23	5
24	15

Altogether, 828 individual herring, 563 sprat, 584 European anchovies and 61 cod were frozen for further investigations (e.g. determining sex, maturity, age). Results of catch compositions by Subdivision are presented in Tables 1-4. Altogether, 33 different fish species were recorded. Out of 48 hauls in total, herring were caught in 48, sprat in 42 and anchovies in 36. In contrast to previous years, no sardines were caught. Contrary to previous years, SD 23 did not show the highest mean herring catch rates per station (kg 0.5 h^{-1}) in the data series. In 2023, catch rates in SD 21 (CPUE in SD21 = 257 kg 0.5 h^{-1}) were considerably above average (CPUE in all SDs = 76 kg 0.5 h^{-1}). Similar to previous years, anchovies (*Engraulis encrasicolus*) were present in most parts of the survey. Small amounts were also caught in the Sound (SD 23). 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)
Agonus cataphractus	1	1
Alosa fallax	3	3
Aphia minuta	122	10
Arnoglossus laterna	1	1
Belone belone	52	17
Callionymus lyra	1	1
Clupea harengus	7 157	48
Ctenolabrus rupestris	50	16
Cyclopterus lumpus	4	3
Engraulis encrasicolus	2 143	36
Eutrigla gurnardus	37	9
Gadus morhua	101	26
Gasterosteus aculeatus	1484	39
Gobius niger	15	9

Hippoglossoides platessoides	3	2
Limanda limanda	504	33
Lumpenus lampretaeformis	1	1
Melanogrammus aeglefinus	1	1
Merlangius merlangus	404	32
Merluccius merluccius	16	3
Mullus surmuletus	2	2
Platichthys flesus	42	13
Pleuronectes platessa	119	26
Pomatoschistus minutus	315	19
Scomber scombrus	372	15
Scophthalmus rhombus	1	1
Solea vulgaris	2	2
Sprattus sprattus	5 353	43
Symphodus melops	7	6
Syngnathus sp.	2	2
Trachinus draco	738	23
Trachurus trachurus	128	19
Trisopterus minutus	2	2

Figure 4 shows the relative length-frequency distributions of herring and sprat in ICES subdivisions 21, 22, 23 and 24 for the years 2023 and 2022. Compared to results from the previous survey in 2022, the following conclusions for **herring** can be drawn:

- In 2023, catches showed a bi-modal length distribution with modes at ca. 13 and 19 cm and almost equal contributions. In 2022, catches in SD 21 were exclusively dominated by the incoming year class at around the former length mode and a 12-17 cm length range with almost no contributions of larger herring.
- As in the previous year, catches in SD 22 were dominated by the incoming year class (ca. ≤15 cm), but with slightly lower contributions of small herring <10 cm than in 2022.
- In SD 23, catches of herring were very low. Still, a significant contribution of herring >20 cm was again recorded. Catches showed a mode at 27.75 cm (2022: 26.75 cm). Very low contributions of smaller herring (10-20 cm) were registered.
- Catches in SD 24 were clearly dominated by the incoming year class (ca. ≤15 cm), with lower contributions of herring in the range of 18-23 cm. This bimodal distribution was much more pronounced in 2022 with similar contributions of the incoming year class and older herring. Similar to the previous years, herring larger than ca. 25 cm were absent.

Relative length-frequency distributions of **sprat** in the years 2023 and 2022 (Figure 4) can be characterized as follows:

- As in the previous year, the incoming year class (ca. ≤10 cm) was mostly absent from catches in SD 21. Catches were dominated by larger sprat as in 2022 and in 2021, but the mode in 2023 was slightly lower than in 2022 at ca. 11.75 cm (ca. 13 cm in 2022).
- In 2023, catches in SD 22 showed a bimodal length distribution with largest proportions of the incoming year class at a length range 7-10 cm (mode ca 8.25 cm) and lesser contributions of sprat 10-13 cm. In 2022, catches showed a unimodal distribution indicating an exclusive contribution of the incoming year class with a mode at ca. 8.5 cm and virtually no sprat measured >10.5 cm.
- In SD 23, catches of sprat were low. While in 2022 catches had been dominated by larger fish (>10 cm) at a mode of ca. 14.25 cm, only smaller fish in the length range 7.5-12.5 cm -mostly of the incoming year class- were caught.
- In SD 24, catches of sprat highly resembled the observations made in 2022 and showed a bimodal distribution with a distinct contribution of the incoming year class (ca. ≤10 cm, mode

at ca. 9.75 cm) and also a notable contribution of larger, older sprat (>10 cm, mode at ca. 13.25 cm).
- As in 2022, the contribution of the incoming year class (ca. ≤10 cm) seemed to be comparatively high.

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

Surface temperatures showed a stronger gradient than in the previous year and also were higher in the southern part of the survey area, ranging from 11°C in the central Kattegat area (SD 21) to >16°C in the southern parts of the Belt Sea (SD 22) and the Arkona Sea (SD 24). 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°C). The deeper parts of the western Belt Sea and the southwestern Arkona Sea as well as in the Kattegat were unusually warm with temperatures exceeding 15°C. In the southern parts of the survey area as well as in the Kattegat, bottom temperatures often exceeded surface temperatures.

As usual, due to the hydrographic nature of the western Baltic Sea, surface salinities showed a large gradient (from ca. 7 PSU in the southeastern Arkona Sea to > 30 PSU in the Kattegat). Surface salinities in the western parts of the survey area appeared higher than the values recorded in the previous year and exceeded 20 PSU in the Kiel Bight. Salinity near the seafloor ranged from ca. 8 PSU in the Arkona Sea to >33 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 again measured in the inner Mecklenburg Bight (SD 22) and the coastal areas of the Kiel Bight south of the Little Belt (SD 22). Low oxygen levels were also measured in the deep parts of the central Arkona Sea as well as in the Bornholm Basin area (SD 24). In all those regions, lowest oxygen concentrations measured near the seafloor were below 0.5 ml/l and occasionally in in the anoxic range.

4. Survey participants

Name	Function	Institute
Dr. M. Schaber (4.-15.10.)	Cruise Leader (Hydroacoustics, Hydrography)	TI-SF
Dr. B. Cisewski (15.-24.10.)	Cruise Leader (Hydroacoustics, Hydrography)	TI-SF
M. Bächtiger	Fishery biology	TI-SF
T. Burmester	Fishery biology	TI-OF
M. Golovaneva (4.-9.10.)	Fishery biology	TI-OF
N. Lyse (5.-15.10.)	Fishery biology	DTU-Aqua (DK)
M. Søgaard (15.-24.10.)	Fishery biology	DTU-Aqua (DK)
L. Thiel (15.-24.10.)	Fishery biology	TI-OF
S. Winning (4.-9.10.)	Fishery biology, Hydroacoustics	TI-SF

5. References

Echoview Software Pty Ltd (2023) Echoview software, version 14. 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 W. Stumpp as well as all participants for their outstanding cooperation and commitment that enabled the safe and successful accomplishment of this survey.

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

Figures

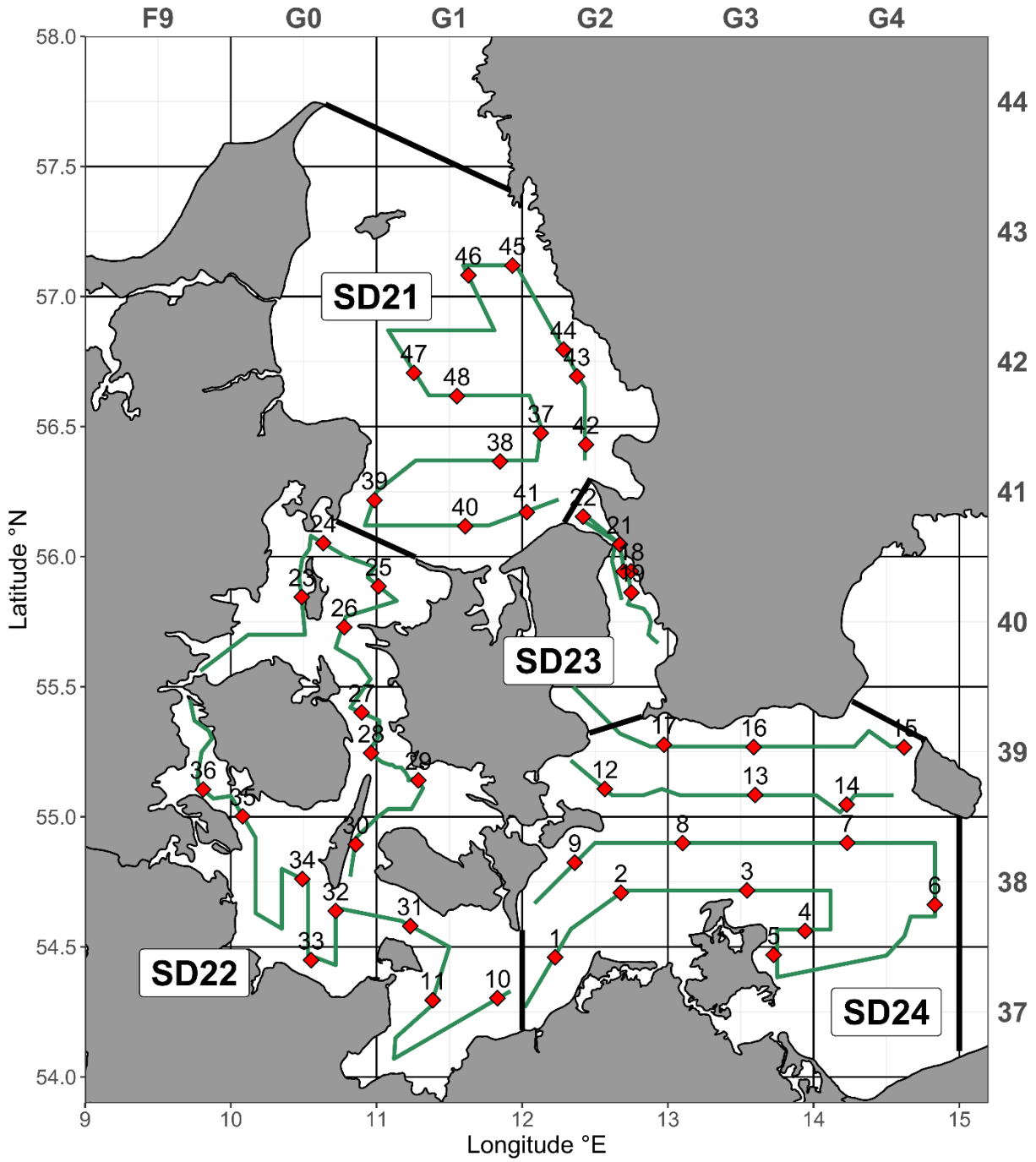

Figure 1: FRV "Solea" cruise 827/2023. Cruise track (dark green lines) and fishery hauls (red diamonds). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions (SD).

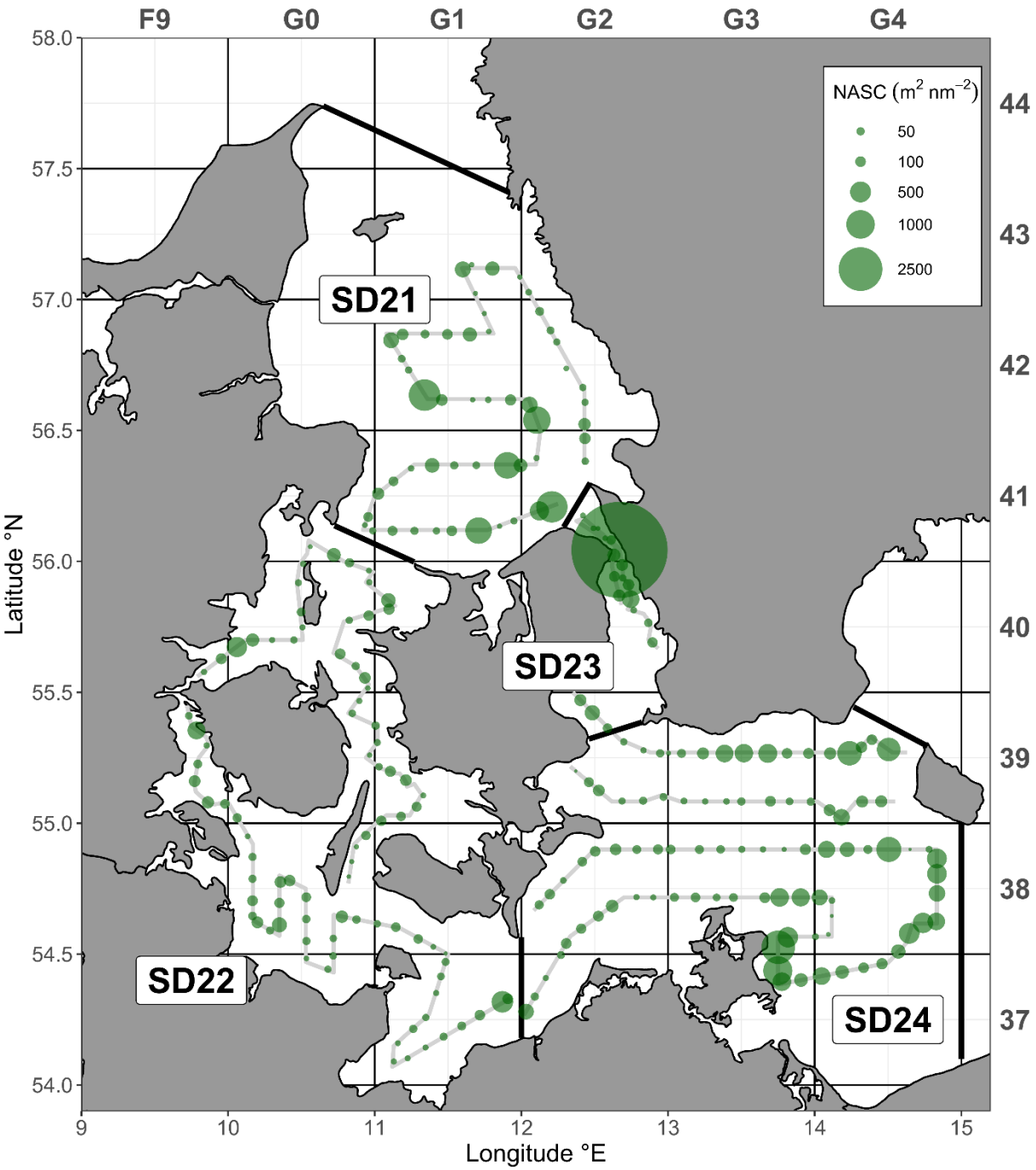

Figure 2: FRV "Solea" cruise 827/2023. Cruise track (thin grey lines) and mean NASC (5 nmi intervals, dots). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions.

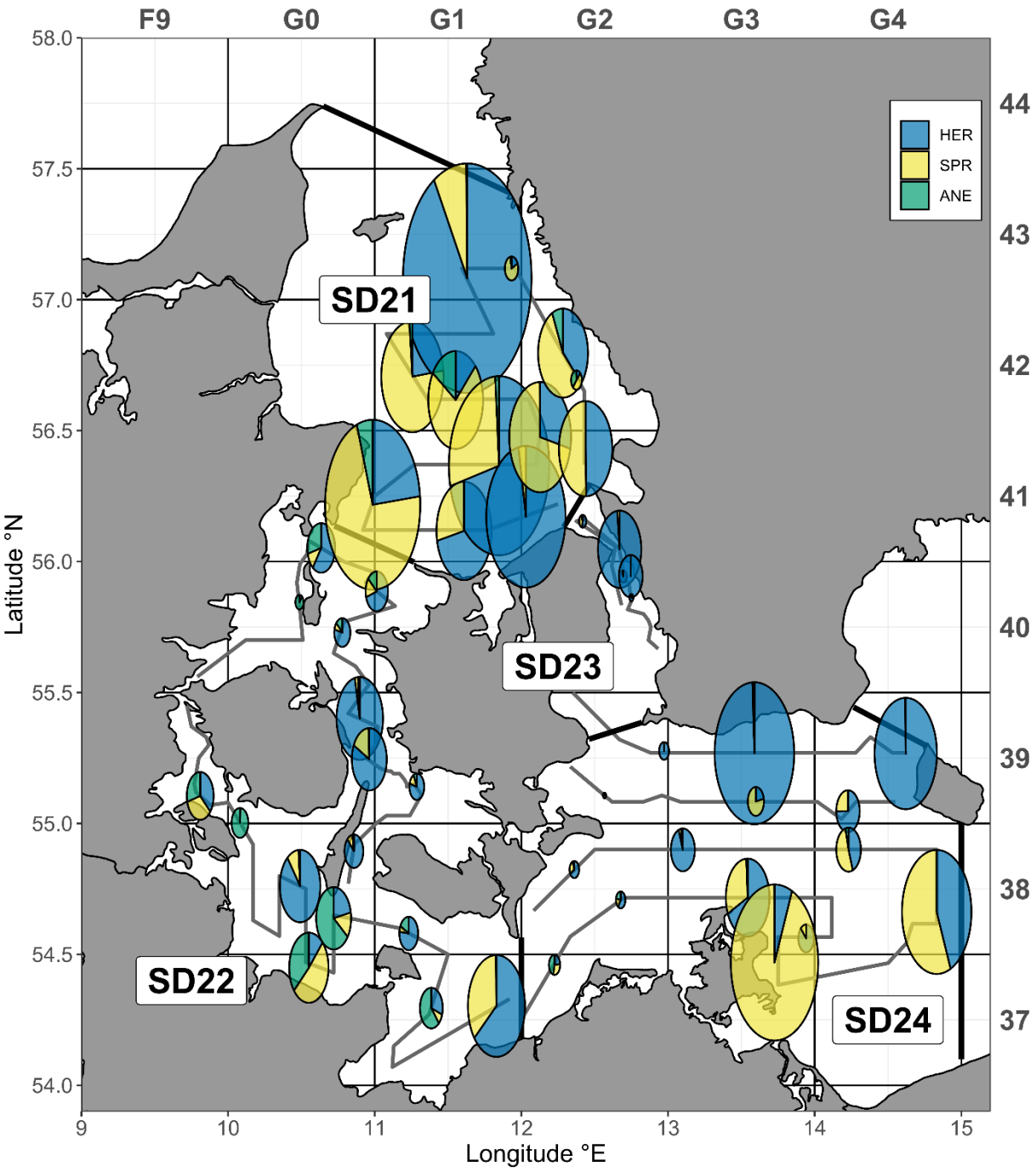

Figure 3: FRV "Solea" cruise 827/2023. Clupeid catch per haul (pie size = log scale of CPUE kg 30min^{-1}). ANE = European anchovy (*Engraulis encrasicolus*), HER = Herring (*Clupea harengus*), SPR = Sprat (*Sprattus sprattus*). ICES statistical rectangles are indicated in the top and right axis. Thick black lines separate ICES subdivisions. Thin grey lines indicate cruise track.

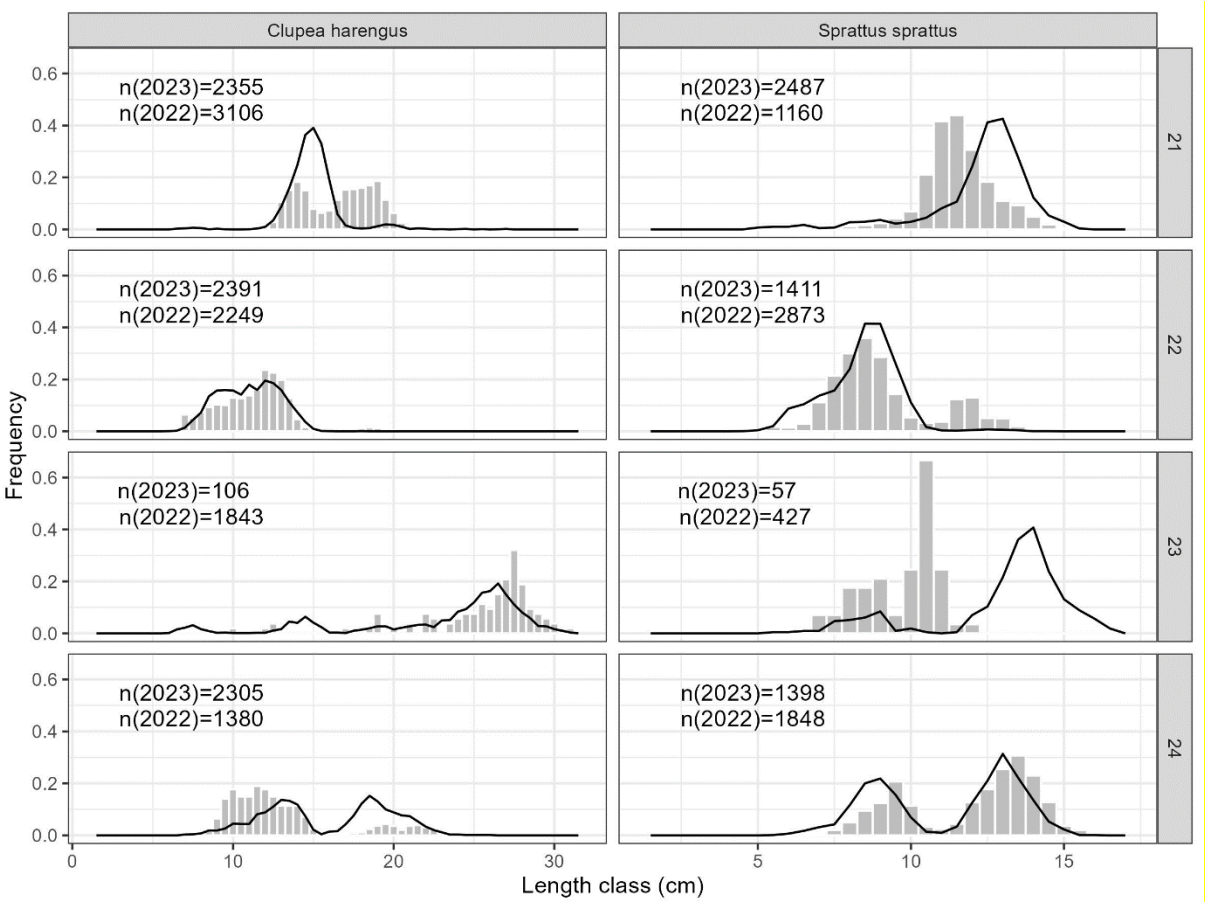

Figure 4: FRV "Solea" cruise 827/2023. Herring (*Clupea harengus*, left) and sprat (*Sprattus sprattus*, right) length-frequency distribution (bars) compared to the previous year (cruise 812/2022, lines).

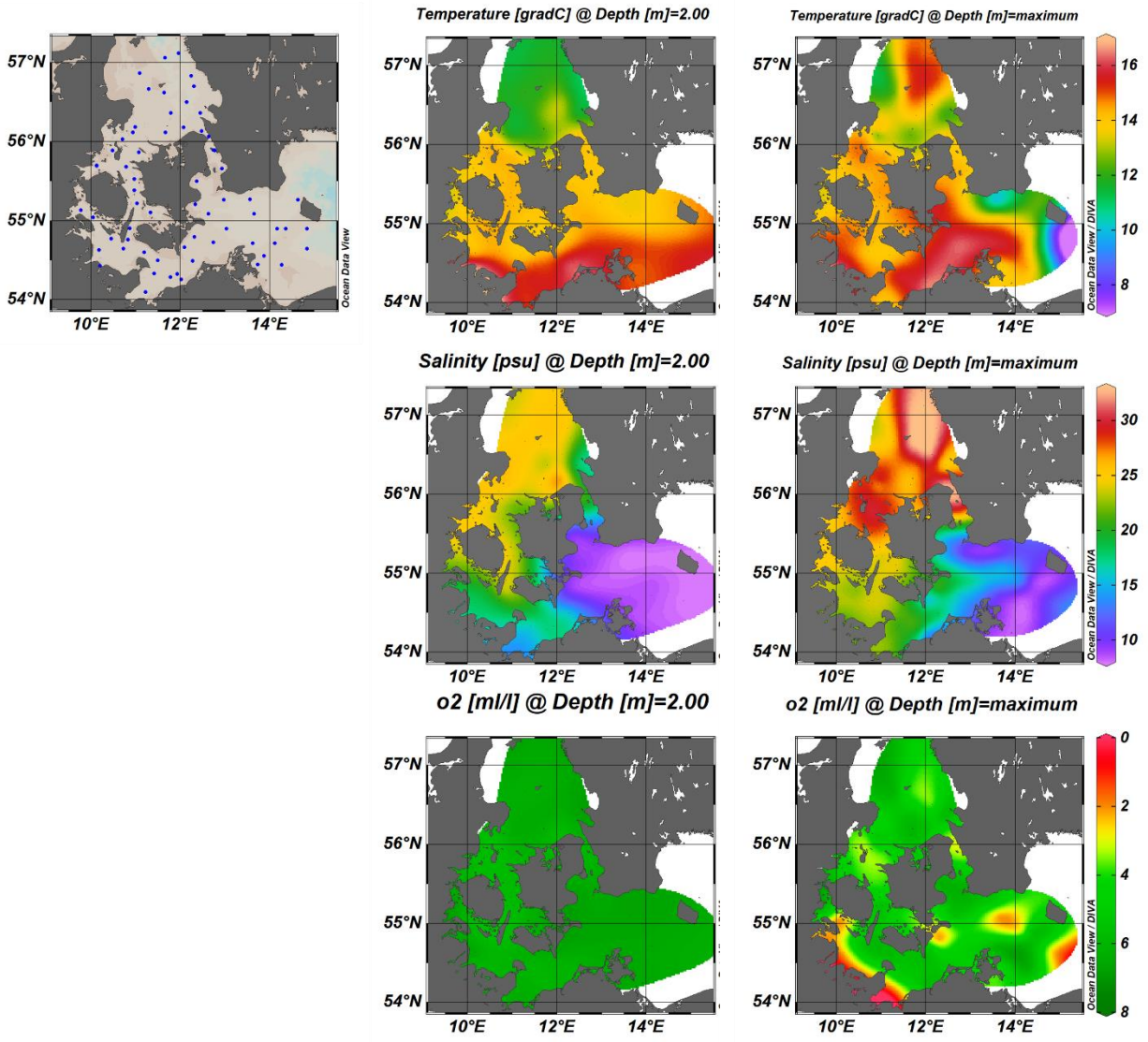

Figure 6: FRV "Solea" cruise 827/2023: Hydrography. CTD stations (n=67) are depicted as blue dots in the area map (top left). Temperature (°C, top panels), salinity (PSU, middle panels) and oxygen concentration (ml/l, lower panels) at the surface (left) and near the seafloor (right).

Tables

Table 1: FRV "Solea" cruise 827/2023: Catch composition (kg 0.5 h^{-1}) by haul in SD 21 (+ = <0.01 kg).

Haul No.	25	37	38	39	40	41	42	43	44	45	46	47	48
Species / ICES Rectangle	42G1	41G2	41G1	41G0	41G1	41G2	41G2	42G2	42G2	43G1	43G1	42G1	42G1
ALOSA FALLAX							0.23						
APHIA MINUTA					+		0.03		0.01	+			
BELONE BELONE	0.06										3.09	0.03	
CALLIONYMUS LYRA									0.01				
CLUPEA HARENGUS	1.92	10.48	261.57	63.30	17.69	102.12	10.98	0.11	6.60	0.22	1765.29	8.87	3.11
CTENOLABRUS RUPESTRIS	0.02				0.02		0.01					0.02	
ENGRAULIS ENCRASICOLUS	0.38	0.04	4.53	14.66	0.02			0.35	1.29	0.04	4.70	0.60	3.80
EUTRIGLA GURNARDUS			0.13		0.06		0.09		0.41			0.09	0.21
GADUS MORHUA			0.16						2.53				0.03
GASTEROSTEUS ACULEATUS	0.08	0.02		0.01	+	+	+					+	
HIPPOGLOSSOIDES PLATESSOIDES									0.05	0.02			
LIMANDA LIMANDA	0.43		5.45	1.54	0.20	0.08	0.89	0.12	6.72		0.16	1.06	9.05
MERLANGIUS MERLANGUS	0.22		7.92	0.62	0.48	0.55	1.38	0.06	7.28	0.54	0.75	0.65	3.52
MERLUCCIUS MERLUCCIUS							0.16		0.29	+			
MULLUS SURMULETUS							0.02						+
PLEURONECTES PLATESSA			0.29	0.15				0.08	0.45			0.12	0.11
POMATOSCHISTUS MINUTUS							+		+				
SCOMBER SCOMBRUS	0.40		1.55	9.73				1.25		0.06	117.42		0.42
SPRATTUS SPRATTUS	0.43	26.40	100.52	192.39	6.94	3.20	11.14	0.44	9.97	0.95	162.81	28.68	17.26
SYMPHODUS MELOPS	0.04				0.04	0.13							
SYNGNATHUS SP.	+												
TRACHINUS DRACO	3.29	0.08	2.73	0.54	3.90	21.18	1.23	0.54	2.78	0.69	2.16	12.07	2.86
TRACHURUS TRACHURUS	0.09	+		0.11	0.11	0.06	0.05		0.06			0.43	0.22
Total	**7.36**	**37.02**	**384.85**	**283.05**	**29.45**	**127.33**	**26.21**	**2.95**	**38.43**	**2.52**	**2056.38**	**52.61**	**40.61**

Table 2: FRV "Solea" cruise 827/2023: Catch composition (kg 0.5 h^{-1}) by haul in SD 22 (+ = <0.01 kg).

Haul No.	10	11	23	24	26	27	28	29	30	31	32	33	34	35	36
Species / ICES Rectangle	37G1	37G1	40G0	41G0	40G0	39G0	39G0	39G1	38G0	38G1	38G0	37G0	38G0	39G0	40F9
ALOSA FALLAX							0.18								
APHIA MINUTA										+		+		+	+
BELONE BELONE		0.02		0.03		0.02			0.36			0.05			
CLUPEA HARENGUS	17.78	0.85	0.07	2.49	1.24	13.92	5.60	1.10	1.77	1.54	1.50	1.12	8.82	0.01	1.40
CTENOLABRUS RUPESTRIS	+			+			+	0.08		0.05		0.01			0.01
CYCLOPTERUS LUMPUS												0.18			
ENGRAULIS ENCRASICOLUS	0.08	1.74	0.55	1.19	0.21	0.17	0.06	0.10	0.05	0.36	4.41	3.31	0.12	1.67	1.11
EUTRIGLA GURNARDUS						0.18						+			
GADUS MORHUA	+		0.02	0.02		0.31			0.11	+			0.02	0.01	
GASTEROSTEUS ACULEATUS	0.35	0.07	0.01	0.01	0.02	0.03	0.06	0.09	0.03	0.19	0.01	0.20	0.81	0.20	1.25
GOBIUS NIGER			0.01		+			0.01		0.01				0.01	0.01
LIMANDA LIMANDA	2.97	0.63	0.09	0.32	0.06	0.30	0.59	0.06	0.37	0.17	0.54	0.26	0.38	0.06	0.12
LUMPENUS LAMPRETAEFORMIS		0.01													
MERLANGIUS MERLANGUS	0.13	0.01				0.11	0.60		0.39			0.02		0.01	
PLATICHTHYS FLESUS		0.26													
PLEURONECTES PLATESSA	1.17	0.03		0.05	0.13		0.06	0.08	0.72		0.32	1.42	0.17	0.15	0.47
POMATOSCHISTUS MINUTUS	0.01		0.01					+	+	0.01	+	0.02	+		+
SCOMBER SCOMBRUS		0.22			0.35				0.86						
SCOPHTHALMUS RHOMBUS				0.05											
SOLEA VULGARIS								0.01							
SPRATTUS SPRATTUS	9.84	0.23	+	0.45	0.13	0.32	1.14	0.19	0.20	0.12	0.90	4.69	0.95		1.33
SYMPHODUS MELOPS					0.02			0.03							
SYNGNATHUS SP.														+	
TRACHINUS DRACO			0.35	0.60	0.41	0.44	0.10	0.18							+
TRACHURUS TRACHURUS					0.06	0.15	0.02		0.04	+		0.03			
Total	**32.34**	**4.08**	**1.10**	**5.21**	**2.62**	**15.95**	**8.40**	**1.92**	**4.90**	**2.44**	**7.68**	**11.32**	**11.26**	**2.10**	**5.78**

Table 3: FRV "Solea" cruise 827/2023: Catch composition (kg 0.5 h^{-1}) by haul in SD 23 (+ = <0.01 kg).

Haul No.	18	19	20	21	22
Species / ICES Rectangle	40G2	40G2	40G2	41G2	41G2
AGONUS CATAPHRACTUS		+			
ARNOGLOSSUS LATERNA	+				
BELONE BELONE	0.08		0.03		
CLUPEA HARENGUS	3.04	0.27	0.48	11.56	0.28
CTENOLABRUS RUPESTRIS	0.01	0.02	+		
ENGRAULIS ENCRASICOLUS			0.01		0.03
EUTRIGLA GURNARDUS		0.02			
GADUS MORHUA		3.76		1.97	0.06
GASTEROSTEUS ACULEATUS	+		0.01		
GOBIUS NIGER		+			
LIMANDA LIMANDA	0.33	0.31		0.06	0.07
MELANOGRAMMUS AEGLEFINUS		0.45			
MERLANGIUS MERLANGUS	0.03	0.42	+		0.02
PLATICHTHYS FLESUS		0.16			
PLEURONECTES PLATESSA	0.06	0.79			
POMATOSCHISTUS MINUTUS	0.02	0.20	+		
SCOMBER SCOMBRUS				0.12	
SOLEA VULGARIS		0.01			
SPRATTUS SPRATTUS			+	0.21	0.21
SYMPHODUS MELOPS				0.09	
TRACHINUS DRACO			0.35	0.36	0.10
TRACHURUS TRACHURUS			0.01	0.03	0.01
TRISOPTERUS MINUTUS			+	+	
Total	**3.57**	**6.39**	**0.90**	**14.40**	**0.77**

Table 4: FRV "Solea" cruise 827/2023: Catch composition (kg 0.5 h^{-1}) by haul in SD 24 (+ = <0.01 kg).

Haul No.	1	2	3	4	5	6	7	8	9	12	13	14	15	16	17
Species / ICES Rectangle	**37G2**	**38G2**	**38G3**	**38G3**	**37G3**	**38G4**	**38G4**	**38G3**	**38G2**	**39G2**	**39G3**	**39G4**	**39G4**	**39G3**	**39G2**
ALOSA FALLAX									0.21						
APHIA MINUTA			0.06			+									
BELONE BELONE	0.19	0.04	0.12		0.11						0.01	0.02		0.05	
CLUPEA HARENGUS	0.22	0.44	8.22	1.32	11.21	25.50	1.45	2.92	0.50	0.02	0.35	2.22	38.22	106.11	0.79
CTENOLABRUS RUPESTRIS		0.01							+						
CYCLOPTERUS LUMPUS											0.14			0.92	
ENGRAULIS ENCRASICOLUS	0.43	0.17	0.12		0.20		0.14	0.07	0.04	0.19					
GADUS MORHUA		0.01	0.03	0.12	0.05	0.08	4.20	0.01	0.15		0.55	0.09	1.07		0.02
GASTEROSTEUS ACULEATUS	0.06	0.11	0.07	0.07	10.10	0.07	0.08	0.21	0.57	0.01	1.67	0.04	0.01	5.30	0.02
GOBIUS NIGER		+		+											
LIMANDA LIMANDA	0.37								0.17			0.14			
MERLANGIUS MERLANGUS	0.02	0.01	+		0.03		3.50	0.26			5.51	1.08	0.32		
PLATICHTHYS FLESUS	0.19		0.19	0.47	1.98		0.97	0.69	0.30	0.73	2.40	0.88	0.44		
PLEURONECTES PLATESSA	0.87	0.33						0.26	0.74		0.32	0.27			
POMATOSCHISTUS MINUTUS							0.05	0.01	+			0.05	0.02		
SCOMBER SCOMBRUS	3.42		0.38					0.19		5.71					
SPRATTUS SPRATTUS	0.28	0.14	3.71	0.19	159.21	33.20	1.68	0.11	0.21		1.24	0.75	0.10	0.84	
TRACHURUS TRACHURUS									+						
Total	**6.05**	**1.26**	**12.89**	**2.18**	**182.89**	**58.85**	**12.06**	**4.72**	**2.91**	**6.65**	**12.20**	**5.53**	**40.17**	**113.22**	**0.84**