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Cruise Report
FRV Solea cruise 779
29.06. - 19.07.2020

The 2020 ICES Coordinated Acoustic Survey in the Skagerrak and Kattegat, the North Sea, West of Scotland and the Malin Shelf area (HERAS)

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

Summary

The survey was part of an international hydroacoustic survey providing information on stock parameters of small pelagics (Acoustic Survey in the Skagerrak and Kattegat, the North Sea, West of Scotland and the Malin Shelf area, HERAS) coordinated by the ICES Working Group of International Pelagic Surveys (WGIPS). Denmark, Ireland, the Netherlands, Norway and Scotland also participated in the survey. In general, this survey provides the most important fisheries independent contribution to the assessment of herring stocks in the North Sea, Western Baltic Sea, Skagerrak/Kattegat as well as areas west of Scotland and the Irish Sea. The total survey area largely covers ICES Divisions IIIa, IVa, IVb and VIa.

The survey design has been standardized across participants and the survey area is partitioned into 23 strata out of which four strata comprising the southern North Sea have been allocated to Germany and were covered during this survey. Main focus was set on herring (*Clupea harengus*) and sprat (*Sprattus sprattus*), whereas distribution patterns and abundance of anchovy (*Engraulis encrasicolus*) as well as sardine (*Sardina pilchardus*) were another objective of the survey.

Altogether, 1427 nautical miles of hydroacoustic transects were covered, which is less than planned. Adverse weather conditions at the beginning of the survey and also during the course of the survey led to the loss of several survey days which had to be compensated through an adapted survey design. Accordingly, transect spacing was increased and transects were dropped in strata 51, 71 and 131. Nevertheless, the whole survey area was covered and all strata were sampled.

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The distribution of backscatter values allocated to clupeid fishes was comparable to previous years with generally highest concentrations of schools in the southern strata and along coastal areas. Both in the northern coastal as well as the central stratum (71 and 131, respectively), overall NASC values registered were comparatively low, with only occasional detections of notable clupeid aggregations. To allocate biological information to echorecordings and for the collection of biological samples, 40 fishery hauls were conducted. As in previous years, sprat contributed the bulk biomass to total catch weight, although mackerel had the most frequent occurrence in the hauls. Herring often co-occurred with sprat in mixed schools. Herring catches distinctly increased compared to the lowest catches on record in the previous year. As in the previous year, sardines were only caught in few hauls in notable numbers but always contributed the bulk of (clupeid) catch in those, anchovies were largely only caught in low individual numbers in four hauls altogether.

Vertical profiles of ambient hydrographic parameters were measured on 81 stations.

1. Cruise objectives

The following objectives were planned for SB779 HERAS:

- Calibration of hydroacoustic equipment
- Hydroacoustic measurements for the estimation of stock parameters (indices of abundance, SSB etc.) for the assessment of small pelagics (herring, sprat, sardine, anchovy) in the allocated survey area (strata 51, 61, 71 and 131)
- (Targeted) biological sampling including species composition and length-frequency/age distribution of key species in the survey area
- Measurements of hydrographic parameters (e.g. temperature and salinity) in the survey area

1.1 Survey design

The survey design has been standardized across participants. Where applicable, systematic parallel transect lines with randomized starting points and with transects running perpendicular to lines of bathymetry were followed. Planned survey effort was maintained at a similar level to the previous years. Altogether, 23 strata were covered by all participants in the 2020 HERAS survey, out of which four had been allocated to Germany by the HERAS survey coordinator of the ICES Working Group of International Pelagic Surveys WGIPS (Fig. 1) (ICES, 2020).

2. Cruise narrative and preliminary results

2.1 Cruise narrative

The scientific equipment was loaded in the morning of June 29th. Despite the weather situation and forecast not expected to allow survey operations in the following days, FRV “Solea” left Cuxhaven port in the late morning of that day to sail to Helgoland Island to seek shelter there if conditions required and to be in the survey area once calmer seas allow starting survey operations. After sheltering from inclement weather and a calibration of the hydroacoustic equipment in the harbor out of necessity, actual survey operations could commence on July 1st in Stratum 61. On July 3rd weather conditions deteriorated again to a degree that required interruption of survey operations ca 8 nautical miles short of accomplishing all transects in S61.

On July 4th and 5th FRV “Solea” seeked shelter in a downwind coastal UK area of S51. By then it was evident that the loss of survey time to adverse weather was not expected to allow accomplishing all remaining transects and strata as planned. Accordingly, in close communication with the survey coordinator, it was decided to shorten overall transect length through dropping one transect each in the remaining strata 51, 71 and 131 and to increase overall transect distance in those strata to allow a full coverage of the stratum areas.

On July 6th, survey operations commenced in S51, the stratum was accomplished on July 10th. Based on remaining survey time and expected total sailing distance until accomplishing the survey it was decided

to combine survey operations in strata 131 and 71 by mostly following the remaining transects from their westernmost to the easternmost waypoint (and vice versa) to reduce un-sampled but necessary inter-transect and inter-stratum travel to an absolute minimum. Altogether, these strata were then accomplished on July 17th.

After the end of HERAS 2020 survey operations, it was decided to undertake another calibration of the vessel transducers to corroborate or refine calibration results derived from the harbor calibration at the beginning of the survey. This time, the calibration took place offshore from a drifting vessel. After accomplishing the second calibration with good results, FRV "Solea" set sail for Cuxhaven port where the survey ended on July 19th.

Altogether, all planned strata were covered during SB779, however with reduced overall transect length and increase inter-transect spacing in the strata - mostly in S51, S71 and S131. The total transect distance measured (excluding inter-transects and maneuvering) was 1427 nautical miles (ca. 450 nautical miles short of the planned coverage).

2.2 Hydroacoustics

2.2.1 Calibration

All transducers of the Simrad EK80 scientific echosounder (38, 70, 120 and 200 kHz) were calibrated prior to the beginning of the survey. Calibration took place during seeking shelter in adverse weather conditions in Helgoland Island harbor. All transducers were calibrated in CW-mode as well as in FM-mode (for trial data acquisition) with good/acceptable results based on calculated RMS-values. To validate calibration results, a post-cruise underway calibration was conducted under good conditions after survey operations had been accomplished. Transducer parameters from combined calibration results were applied for data-collection and post-processing of survey data.

2.2.2 Echo recording

Hydroacoustic data were recorded continuously along the transects with a Simrad EK80 scientific echosounder with hull-mounted 38, 70, 120 and 200 kHz transducers at a standard ship speed of 10 kn. Transducer and sample settings applied were in accordance with the specifications provided in the HERAS survey manual (ICES, 2015). Survey operations were conducted during daytime between 4 am and 6 pm UTC to allocate for the diurnal activity patterns of clupeids schooling at daytime and dispersing and migrating into shallower water layers during nighttime, rendering the fishes indiscernible from other scattering sources and distributed within the transducer nearfield. In some instances, the sampling of hydroacoustic data was extended to ca. 9 – in two instances 10:30- pm in areas with low or no clupeid signals to make up lost survey time (see below) or to be able to accomplish a transect without losing time steaming to the next transect the following day. This is considered uncritical since the light intensity during that time was still high without any dispersion of schools occurring until after the end of daily survey operations. Post-processing and analysis of data were conducted with Echoview 11 software (Echoview Software Pty Ltd, 2020).

Clupeids in the survey area are discernible on echograms by their typical pillar shaped schools, either sitting on the seafloor or in pelagic layers (see exemplary echogram in Figure 9). The Nautical Area Scattering Coefficient (NASC) values measured and allocated to clupeids through post-processing of the data were not distributed evenly throughout the survey area. Transect sections and regions with particularly high clupeid densities alternated with sometimes long sections without any detections of clupeid schools. The distribution of clupeid NASC measured mostly resembled patterns observed in the previous years: While NASC values were again particularly high on the easternmost transect in S61 around Helgoland and along the coastal boundaries (mostly eastern) and central areas of stratum 51, few clupeids were detected in large parts of strata 71 and 131 (Fig. 2). Compared to 2019, the high NASC values measured on the southern transect of stratum 131 were not detectable in 2020. In general, NASC values were highest in the two southern strata 51 and 61 with fishes concentrating in the warm, mixed layers in the shallow southern and southeastern North Sea (see hydrography) and along the coasts.

Echoes from those two strata can mostly be allocated to sprat (see below), although in this area - based on corresponding targeted hauls - herring (rather unexpected in coastal areas of S51) and sardines occasionally contributed significantly to the overall NASC measured and allocated to clupeids. NASC values measured in strata 71 and 131 were mostly based on only few notable aggregations.

2.3 Biological sampling (N. Rohlf)

Forty trawl hauls were conducted during the summer acoustic survey. Trawling was carried out using a PSN 388 pelagic trawl ("Krake"). Trawl duration varied between 10 and 41 minutes, but usually was set to 30 minutes. Hauls were conducted according to echo signals. Additionally, exclusion/validation hauls were shot in areas with echo signals of unclear origin. The positions of all hauls are depicted in Fig. 3. Catches were sorted according to species, and length- and weight-distributions of individual species were measured. Of all clupeids (herring, sprat, sardine and anchovy), 10 individuals per 0.5 cm length-class were sampled per trawl. Their individual weight, sex and maturity stage was determined and the otoliths were sampled for age estimation.

Altogether, 26 different fish species, two cephalopod species and one lamprey species were caught during the survey. A detailed overview on catch compositions (CPUE in kg 30min-1) of all 40 trawl hauls is given in Tab. 1.

As in the previous years, sprat contributed the bulk of total catch weight (69%, i.e. 8.6 t). However, mackerel had the most frequent occurrence (32 hauls or 80%). The amount of herring caught re-increased to 1.5 t, compared to the historic low level in 2019 (less than 100 kg). However, catches alone are not representative for abundance of small pelagics. Detailed conclusions on abundance cannot be drawn until echo integration is accomplished and trawl haul and hydroacoustic data are combined.

A detailed overview on numbers, weights and mean lengths of herring, sprat, sardines and anchovies sampled is given in Tab. 2a-d, together with their proportion in the total catch. Figures 5 - 8 show length distributions of these species as derived from total catches. Herring lengths ranged from 5 to 28 cm. The length distribution was dominated by small fish below 10 cm TL, but there was also a considerable amount of larger fish present. Sprat lengths ranged from 4 to 15 cm with the overall length frequency distribution highly comparable to the preceding year.

Sardines and anchovies were caught only on occasion and -usually- in relatively small quantities. However, sardine catch was 268 kg in haul 10, and whenever sardines were caught they were seldom found mixed with other clupeids. The corresponding catches consisted mostly of pure sardines.

Individual and combined abundance estimates for herring and sprat derived from survey data will be available after a final evaluation, combination and analysis of acoustic and trawl data with StoX software (Johnsen et al., 2019). This will be accomplished during a post-cruise meeting scheduled for November 2020 at the ICES headquarter in Copenhagen/Denmark. Results will subsequently be presented to ICES WGIPS.

2.4 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 (or before) a trawl haul or in regular intervals along the cruise track as well as the starting and end point of each transect. Altogether, 81 CTD casts were conducted during this survey.

Surface temperatures in the survey area ranged from comparatively cold 13° in the area southwest of the Dogger Bank to almost 19° C. Highest surface temperatures were measured along the German and Dutch North Sea coasts, but also along the Danish coast (Fig. 9). As in the previous years in summer, the water column was mixed in shallow coastal areas and in the shallow southern part of the North Sea south of ca 54° N. Further northward, a distinct thermocline appeared separating the warm surface water from cold deeper layers where temperatures dropped to below 8° C. As in the previous year, the

water appeared rather well mixed on the shallow Dogger Bank with bottom temperatures similar to surface temperatures.

Salinity in the survey area showed no notable gradient between surface and seafloor layers. Salinity was highest in the offshore areas of the central North Sea, and levels altogether ranged from ca. 31 to 35.5 PSU.

3. Survey participants

Dr. Matthias Schaber (cruise leader)	Hydroacoustics/Hydrography	TI-SF
Dr. Norbert Rohlf	Fish lab/Biology	TI-SF
Lea Hartkens	Hydroacoustics/Hydrography	TI-SF
Valeska Borges	Fish lab/Biology	TI-SF
Felix Zundel	Fish lab/Biology	TI-SF

4. References

Echoview Software Pty Ltd (2020). Echoview software, version 11. Echoview Software Pty Ltd, Hobart, Australia.

ICES (2020). Working Group of International Pelagic Surveys (WGIPS). ICES Scientific Reports 2(56). 473 pp. http://doi.org/10.17895/ices.pub.6088

ICES (2015). Manual for International Pelagic Surveys (IPS). Series of ICES Survey Protocols SISP 9 – IPS. 92 pp.

Johnsen, E., Totland, A., Skålevik, Å., Holmin, A. J., Dingsør, G. E., Fuglebakk, E., & Handegard, N. O. (2019). StoX: An open source software for marine survey analyses. Methods in Ecology and Evolution. 10 :1523 –1528. https://doi.org/10.1111/2041-210X.13250

5. 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 facilitated the successful accomplishment of this survey.

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

Figures

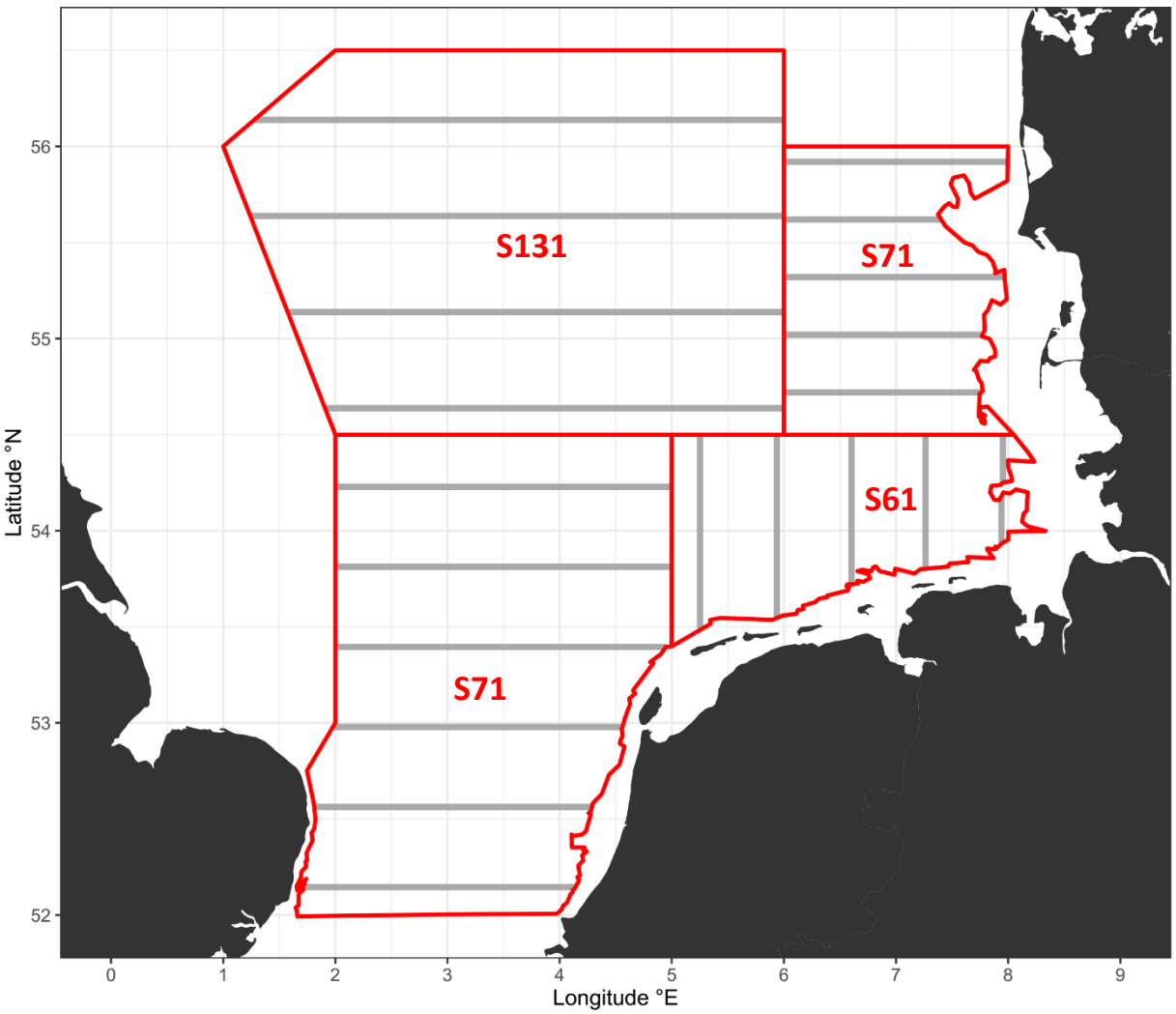

Figure 1: FRV "Solea" cruise 779/2020. Survey plan. Total survey area and strata covered (S51, S61, S71, S131) outlined in red. Planned transect lines depicted as grey lines. Refer to Figures 2 and 3 for realized transects.

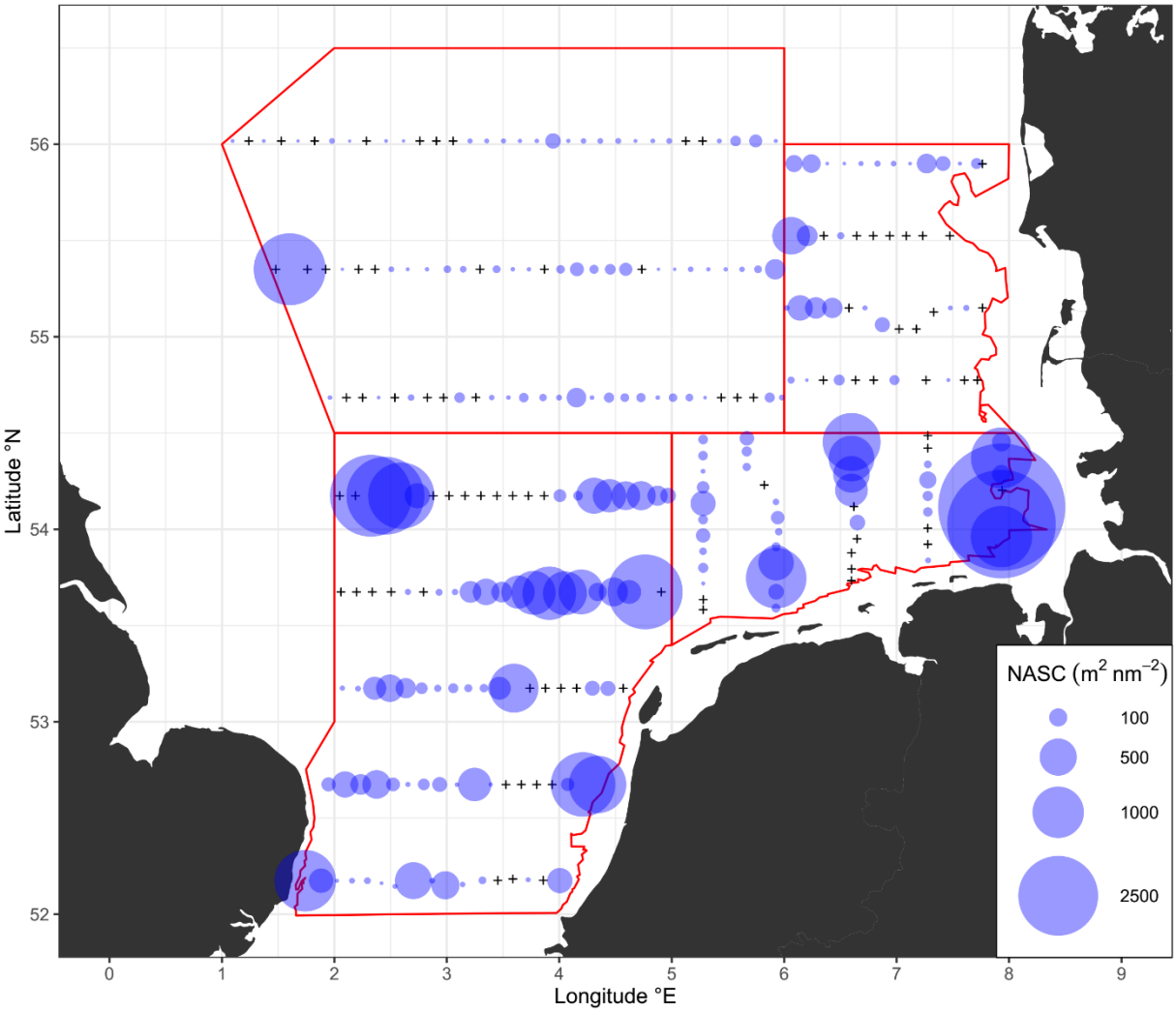

Figure 2: FRV "Solea" cruise 779/2020. Mean Nautical Area Scattering Coefficient (NASC) measured (blue dots, 5 nmi intervals) along the realized transects and allocated to Clupeids. Empty intervals indicated by crosses. Total survey area and strata outlined in red.

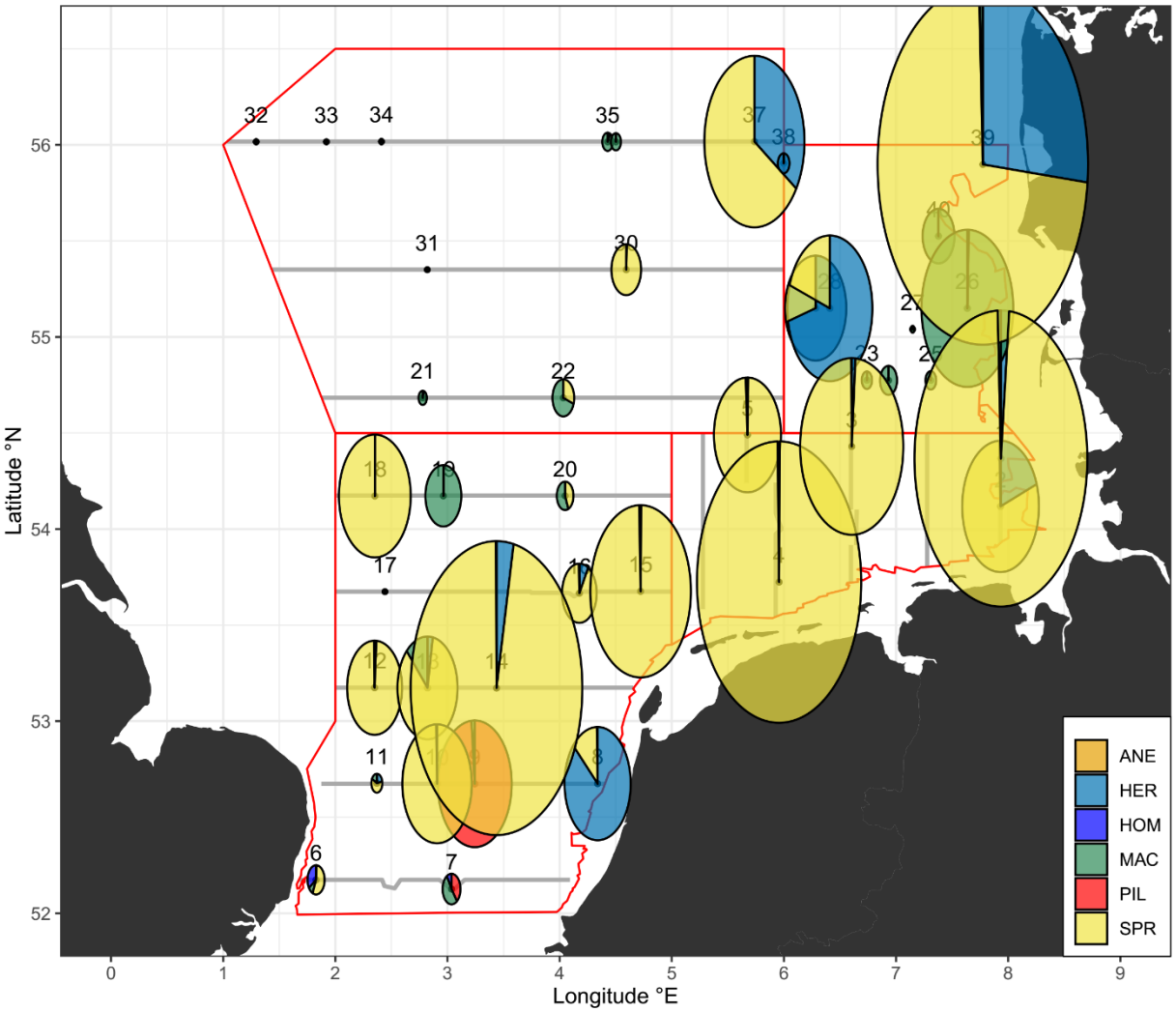

Figure 3: FRV "Solea" cruise 779/2020. Catches (kg/30 min) and catch composition of pelagic/schooling fishes (ANE - anchovy *Engraulis encrasicolus*, HER - herring *Clupea harengus*, HOM - horse mackerel *Trachurus trachurus*, MAC - mackerel *Scomber scombrus*, PIL - sardine *Sardina pilchardus*, SPR - sprat *Sprattus sprattus*). Numbers indicate haul/station number. Survey area/strata outlined in red. Accomplished transects depicted as grey lines.

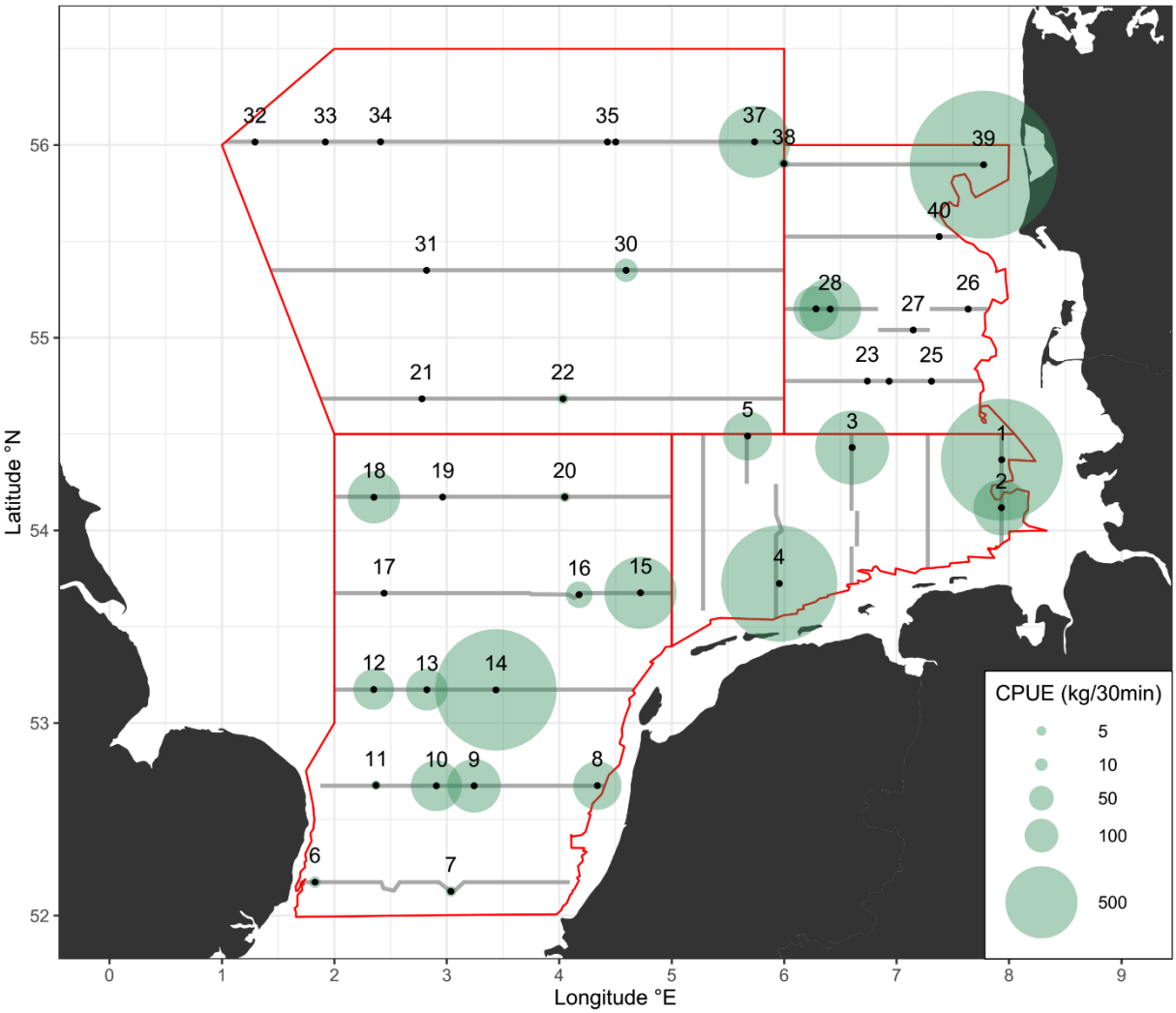

Figure 4: FRV "Solea" cruise 779/2020. Combined clupeid (herring *Clupea harengus*, sprat *Sprattus sprattus*, sardine *Sardina pilchardus*, and anchovy *Engraulis encrasicolus*) catches (kg/30 min). Numbers indicate haul/station number. Survey area/strata outlined in red. Accomplished transects depicted as grey lines.

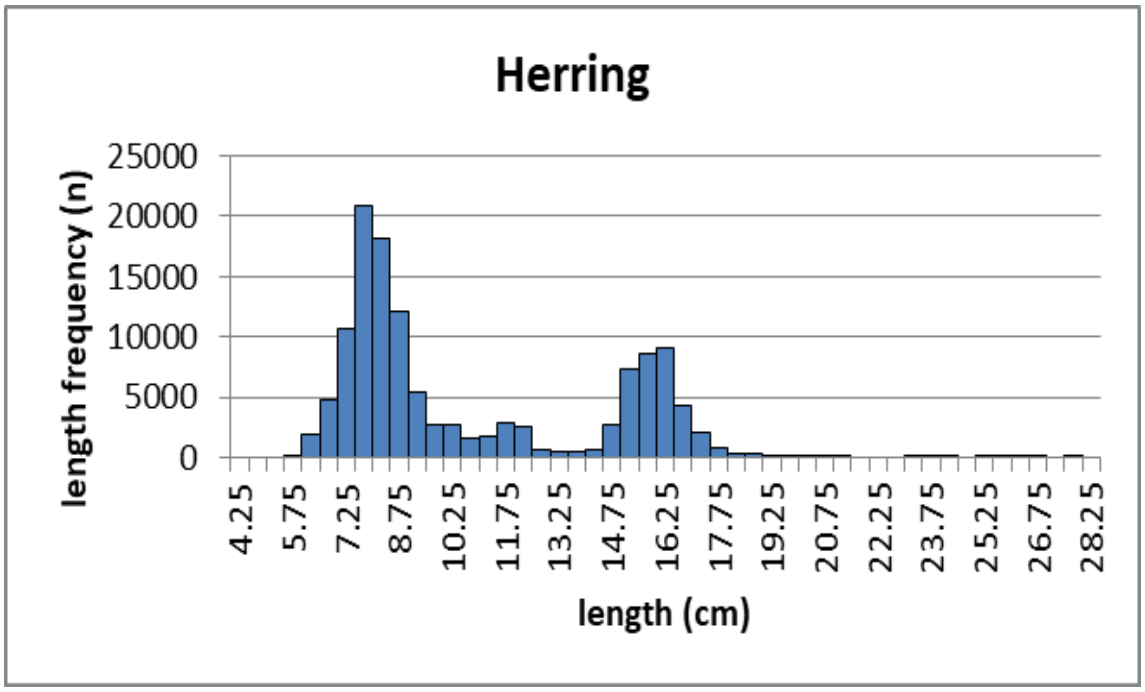

Figure 5: FRV "Solea" cruise 779/2020. Herring (*Clupea harengus*) length-frequency distribution.

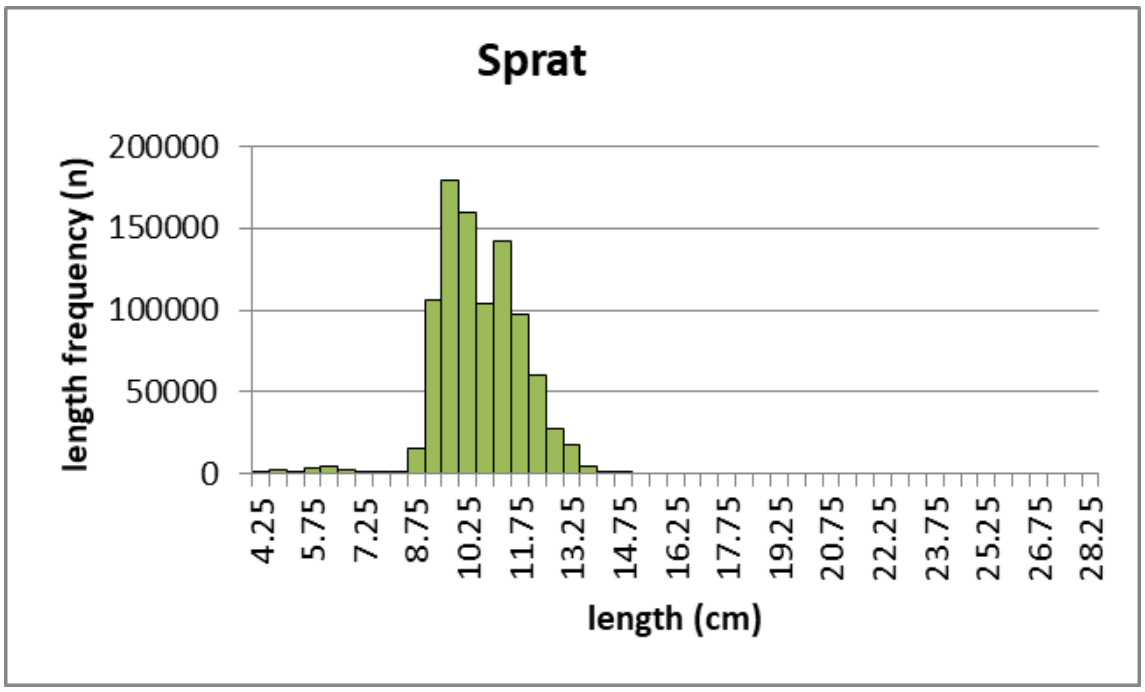

Figure 6: FRV "Solea" cruise 779/2020. Sprat (*Sprattus sprattus*) length-frequency distribution.

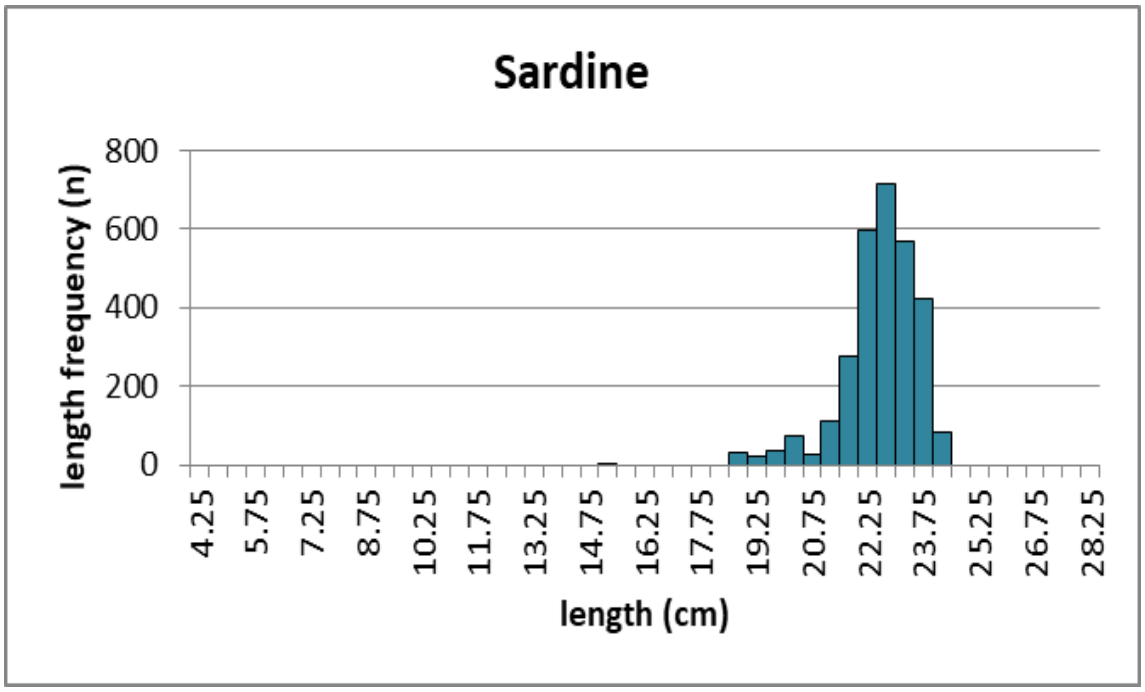

Figure 7: FRV "Solea" cruise 779/2020. Sardine (*Sardina pilchardus*) length-frequency distribution.

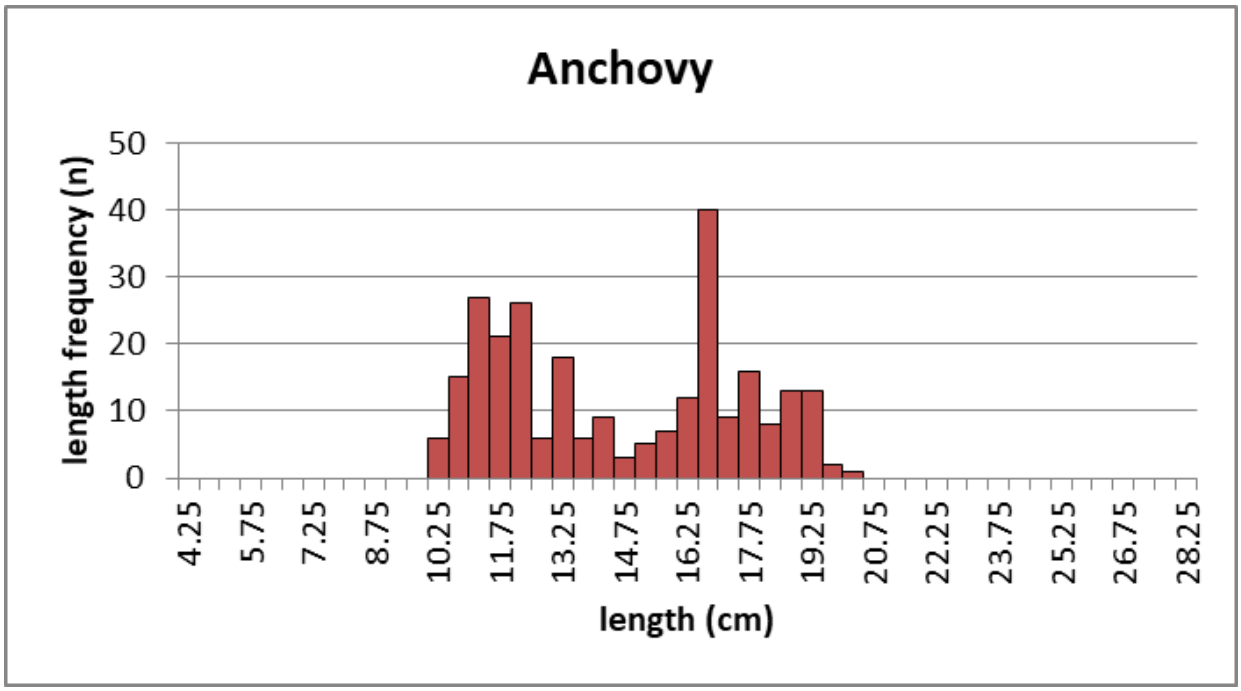

Figure 8: FRV "Solea" cruise 779/2020. Anchovy (*Engraulis encrasicolus*) length-frequency distribution.

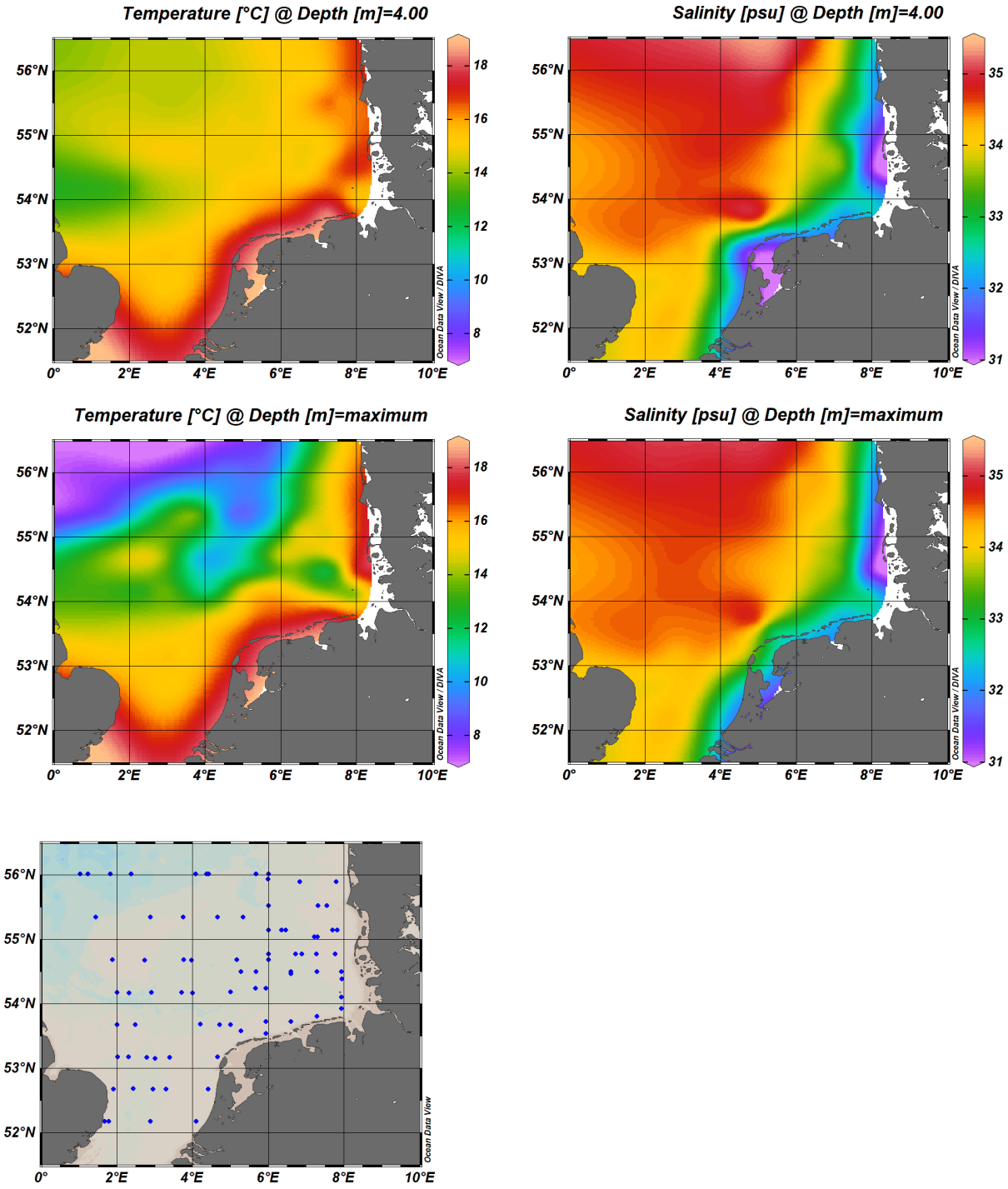

Figure 9: FRV “Solea” cruise 779/2020. Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, left panels) and salinity (PSU, right panels near the surface (top) and near the seafloor (lower).

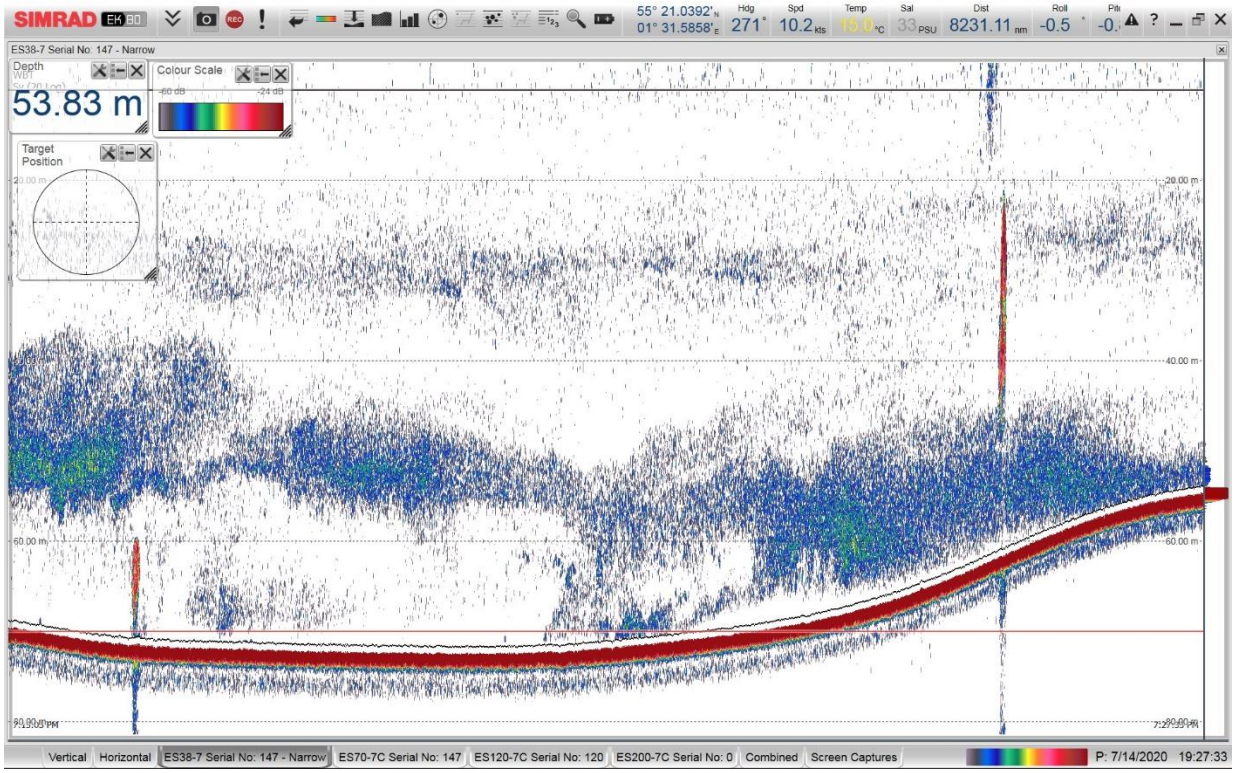

Figure 9: FRV “Solea” cruise 779/2020. Exemplary echogram (screen-capture from EK80 38 kHz transducer display) showing pillar shaped schools typical for clupeids distributed on the seafloor and also across pelagic layers.

Tables

Table 1: FRV "Solea" cruise 779/2020. Catch composition (CPUE in kg) standardized to 30 minutes tow duration.

HAUL	STATION	TOTAL (kg/30 min)	*ALLOTEUTHIS SUBULATA*	*AMMODYTES MARINUS*	*CALLIONYMUS LYRA*	*CALLIONYMUS RETICULATUS*	*CLUPEA HARENGUS*	*ECHIICHTHYS VIPERA*	*ENGRAULIS ENCRASICOLUS*	*EUTRIGLA GURNARDUS*	*GADUS MORHUA*	*HIPPOGLOSSOIDES PLATESSOIDES*	*HYPEROPLUS LANCEOLATUS*	*LAMPETRA FLUVIATILIS*	*LIMANDA LIMANDA*	*LOLIGO FORBESI*	*MELANOGRAMMUS AEGLEFINUS*	*MERLANGIUS MERLANGUS*
1	2	1484.9	0.2				22.7		0.4									
2	3	293.7	0.0				57.0						1.1	0.1	0.1	0.2		0.0
3	8	529.5	0.0				6.1			0.4					0.6			0.2
4	11	1341.2					1.5											
5	14	190.2	0.0				0.6			0.3					2.7		0.0	1.1
6	18	18.0	0.6				0.1	2.9										
7	20	15.8																
8	22	217.7	0.2				188.3	0.1										0.0
9	23	271.9						0.1										
10	24	242.2					0.1	2.5										
11	25	31.0	0.0				1.3	0.6							0.0			23.5
12	28	150.8	0.0				1.5	0.6										
13	29	181.1	0.0				5.0	1.8										0.1
14	30	1464.5					46.9	0.6										
15	33	504.6	0.1				1.0		1.5						0.3			1.4
16	34	60.2	0.4				5.1			0.2								
17	35	0.8						0.6					0.10					0.0
18	38	257.5								1.9								
19	39	64.6	0.0					0.0		0.2			0.03		0.4			0.0
20	41	18.8								4.9			0.02					0.0
21	44	3.7	0.0				0.1			0.1					0.1			0.1
22	46	25.6								2.1								0.1
23	50	8.4								0.7			0.16		2.0			0.2
24	51	47.3		18.1						0.2			14.77					
25	52	5.8		0.0									0.04					0.0
26	55	418.5							2.2	0.1								0.0
27	57	1.1								0.3								
28	59	362.9					288.0			3.6								0.1
29	60	186.9					132.0			0.2								
30	63	45.2					0.0			1.4					0.1		0.0	0.0
31	65	2.9		0.0				0.1		1.2					1.4			0.1
32	68	47.3	0.1				0.5			0.1		0.04			0.2	0.5	34.8	11.1
33	69	1.3	0.0				0.1			0.0	0.01						0.1	0.1
34	70	1146.6	0.0				0.6			19.5	0.58	0.64			4.5	1.3	472.5	645.0
35	72	7.6					0.4			1.7		0.03			0.0		0.0	0.1
36	73	40.4	0.0							6.2			0.10			0.1	11.6	17.4
37	74	500.2					170.6			1.3					0.1	0.2		0.5
38	76	11.3					6.7			0.7			0.13			0.3	3.5	0.0
39	78	2211.0	0.0		0.1	0.0	585.4		2.2	4.2					5.8			
40	80	50.8								0.2								
total (kg)		**12463.5**	1.8	18.1	0.1	0.0	1521.6	10.0	6.1	51.9	0.6	0.7	16.5	0.1	18.2	2.6	522.5	701.0
proportion (%)			0.0	0.1	0.0	0.0	12.2	0.1	0.0	0.4	0.0	0.0	0.1	0.0	0.1	0.0	4.2	5.6
number of catches			18	3	1	1	25	11	4	25	2	3	9	1	15	6	8	25
presence (%)			45	8	3	3	63	28	10	63	5	8	23	3	38	15	20	63

Table 1 cont´d: FRV "Solea" cruise 779/2020. Catch composition (CPUE in kg) standardized to 30 minutes tow duration.

HAUL	STATION	TOTAL (kg/30 min)	*MERLANGIUS MERLANGUS*	*MICROSTOMUS KITT*	*PLEURONECTES PLATESSA*	*RAJA CLAVATA*	*SARDINA PILCHARDUS*	*SCOMBER SCOMBRUS*	*SEBASTES VIVIPARUS*	*SPRATTUS SPRATTUS*	*SYNGNATHUS ROSTELLATUS*	*TRACHURUS TRACHURUS*	*TRISOPTERUS ESMARKI*	*TRISOPTERUS LUSCUS*	*TRISOPTERUS MINUTUS*	NUMBER OF SPECIES
1	2	1484.9						8.5		1453.2						2
2	3	293.7	0.0					1.2		234.0						3
3	8	529.5	0.2					0.8		521.5						3
4	11	1341.2						3.9		1335.8						2
5	14	190.2	1.1		0.1			1.6		183.8						4
6	18	18.0						1.3		8.1		5.0		0.1		4
7	20	15.8					6.3	8.2				1.4				3
8	22	217.7	0.0		0.2			0.3		28.0	0.0	0.5				6
9	23	271.9					268.0	3.8				0.1				3
10	24	242.2						0.9		238.6						2
11	25	31.0	23.5			0.7		1.0		3.6		0.1				5
12	28	150.8						0.4		148.2						2
13	29	181.1	0.1					22.0		152.2						3
14	30	1464.5						1.5		1415.4						2
15	33	504.6	1.4					0.8		499.5						3
16	34	60.2						0.3		54.1				0.0		3
17	35	0.8	0.0					0.1								2
18	38	257.5								255.6						1
19	39	64.6	0.0	0.1				63.8								3
20	41	18.8	0.0					7.8		6.0						3
21	44	3.7	0.1					3.3								2
22	46	25.6	0.1					16.3		7.1						3
23	50	8.4	0.2		0.2			5.2								3
24	51	47.3						14.3								1
25	52	5.8	0.0					5.7								2
26	55	418.5	0.0					416.2								2
27	57	1.1						0.8								1
28	59	362.9	0.1							71.3						2
29	60	186.9						0.1		54.6						2
30	63	45.2	0.0	0.1						43.5						3
31	65	2.9	0.1													1
32	68	47.3	11.1													1
33	69	1.3	0.1					0.2		0.0					0.7	4
34	70	1146.6	645.0	1.3					0.2				0.2		0.4	5
35	72	7.6	0.1					5.2								2
36	73	40.4	17.4					5.0								2
37	74	500.2	0.5							327.6						2
38	76	11.3	0.0													1
39	78	2211.0					0.1	10.9		1602.2						3
40	80	50.8						50.6								1
total (kg)		**12463.5**	701.0	1.5	0.5	0.7	274.3	662.3	0.2	8643.8	0.0	7.1	0.2	0.1	1.1	
proportion (%)			5.6	0.0	0.0	0.0	2.2	5.3	0.0	69.4	0.0	0.1	0.0	0.0	0.0	
number of catches			25	3	3	1	3	32	1	23	1	5	1	2	2	
presence (%)			63	8	8	3	8	80	3	58	3	13	3	5	5	

Table 2a: FRV "Solea" cruise 779/2020. Numbers, weights and mean lengths of **herring** (*Clupea harengus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

Haul	Stat	Total Catch (kg)	clupeid catch (kg)	clupeid portion (%)	herring					herring (% clups)
					catch	count	range (cm)			
					(kg)	(n)	min	max	mean	
1	2	1484.9	1476.3	99%	22.7	4412	7.75	17.25	9.08	2%
2	3	293.7	291.0	99%	57.0	18954	5.75	14.75	7.74	20%
3	8	529.5	527.5	100%	6.1	656	8.25	15.25	10.92	1%
4	11	1341.2	1337.2	100%	1.5	120	9.25	18.25	11.38	0%
5	14	190.2	184.4	97%	0.6	40	8.25	16.75	12.52	0%
6	18	18.0	8.2	46%	0.1	33	7.25	9.75	8.39	1%
8	22	217.7	216.4	99%	188.3	50736	6.75	18.75	8.25	87%
10	24	242.2	238.7	99%	0.1	2	17.25	19.25	18.25	0%
11	25	31.0	5.0	16%	1.3	372	6.75	13.25	8.29	27%
12	28	150.8	149.7	99%	1.5	407	6.75	15.75	8.22	1%
13	29	181.1	157.2	87%	5.0	526	8.25	16.75	10.49	3%
14	30	1464.5	1462.3	100%	46.9	4836	9.25	15.25	10.63	3%
15	33	504.6	502.0	99%	1.0	75	8.25	17.75	11.31	0%
16	34	60.2	59.2	98%	5.1	1948	5.75	9.25	7.54	9%
21	44	3.7	0.1	4%	0.1	1	26.25	26.25	26.25	100%
28	59	362.9	359.2	99%	288.0	8000	10.75	27.75	16.51	80%
29	60	186.9	186.6	100%	132.0	4665	7.75	21.25	15.51	71%
30	63	45.2	43.5	96%	0.0	1	11.75	11.75	11.75	0%
32	68	47.3	0.5	1%	0.5	3	25.25	25.75	25.58	100%
33	69	1.3	0.1	7%	0.1	4	18.25	24.25	21.25	91%
34	70	1146.6	0.6	0%	0.6	4	19.25	23.25	20.88	100%
35	72	7.6	0.4	6%	0.4	9	11.25	19.75	17.80	100%
37	74	500.2	498.1	100%	170.6	5120	14.25	21.25	16.63	34%
38	76	11.3	6.7	60%	6.7	194	14.25	20.75	16.80	100%
39	78	2211.0	2189.9	99%	585.4	26070	10.25	18.75	14.59	27%

Table 2b: FRV "Solea" cruise 779/2020. Numbers, weights and mean lengths of **sprat** (*Sprattus sprattus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

Haul	Stat	total	clupeid	clupeid	sprat	sprat

		catch	catch	portion	catch	count	range (cm)			(% clups)
		(kg)	(kg)	(%)	(kg)	(n)	min	max	mean	
1	2	1484.9	1476.3	99%	1453.2	203706	8.75	11.25	9.68	98%
2	3	293.7	291.0	99%	234.0	35144	8.25	12.75	9.74	80%
3	8	529.5	527.5	100%	521.5	65589	8.75	12.25	10.18	99%
4	11	1341.2	1337.2	100%	1335.8	99090	9.25	13.75	11.75	100%
5	14	190.2	184.4	97%	183.8	16704	9.25	14.25	11.12	100%
6	18	18.0	8.2	46%	8.1	6601	4.25	11.25	5.60	99%
8	22	217.7	216.4	99%	28.0	7054	5.75	11.75	7.63	13%
10	24	242.2	238.7	99%	238.6	14389	11.25	14.25	12.88	100%
11	25	31.0	5.0	16%	3.6	1370	5.25	10.75	7.17	73%
12	28	150.8	149.7	99%	148.2	12908	8.75	13.75	11.59	99%
13	29	181.1	157.2	87%	152.2	33498	7.25	12.25	10.13	97%
14	30	1464.5	1462.3	100%	1415.4	145040	9.25	13.25	10.71	97%
15	33	504.6	502.0	99%	499.5	68646	8.75	14.75	9.95	100%
16	34	60.2	59.2	98%	54.1	10804	4.25	11.25	8.25	91%
18	38	257.5	255.6	99%	255.6	21897	10.75	13.25	11.72	100%
20	41	18.8	6.0	32%	6.0	454	10.75	13.75	12.01	100%
22	46	25.6	7.1	28%	7.1	539	11.25	14.25	12.37	100%
28	59	362.9	359.2	99%	71.3	6402	9.75	13.75	11.41	20%
29	60	186.9	186.6	100%	54.6	5868	9.25	13.75	11.02	29%
30	63	45.2	43.5	96%	43.5	3604	5.25	14.75	11.80	100%
33	69	1.3	0.1	7%	0.0	1	12.75	12.75	12.75	9%
37	74	500.2	498.1	100%	327.6	27420	10.25	13.75	11.60	66%
39	78	2211.0	2189.9	99%	1602.2	146529	9.75	13.25	11.41	73%

Table 2c: FRV "Solea" cruise 779/2020. Numbers, weights and mean lengths of **sardine** (*Sardina pilchardus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

		total	clupeid	clupeid	pilchard					pilchard
		catch	catch	portion	catch	count	range (cm)			(% clups)
Haul	Stat	(kg)	(kg)	(%)	(kg)	(n)	min	max	mean	
7	20	15.8	6.3	39%	6.3	80	19.25	24.25	21.18	100%
9	23	271.9	268.0	99%	268.0	2889	18.75	24.25	22.63	100%
39	78	2211.0	2189.9	99%	0.1	3	15.25	15.25	15.25	0%

Table 2d: FRV "Solea" cruise 779/2020. Numbers, weights and mean lengths of **anchovy** (*Engraulis encrasicolus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

		total	clupeid	clupeid	anchovy			anchovy
Haul	Stat	catch	catch	portion	catch	count	range (cm)	(% clups)

		(kg)	(kg)	(%)	(kg)	(n)	min	max	mean	
1	2	1484.9	1476.3	99%	0.4	14	12.25	17.75	15.54	0.02%
15	33	504.6	502.0	99%	1.5	132	10.25	14.25	12.07	0.29%
26	55	418.5	2.2	1%	2.2	54	15.25	20.25	17.80	100%
39	78	2211.0	2189.9	99%	2.2	63	14.75	19.25	17.15	0.10%