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Cruise Report
FRV Solea cruise 750
29.06. - 19.07.2018

The 2018 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 pilchard (*Sardina pilchardus*) were another objective of the survey.

The distribution of backscatter values allocated to clupeid fishes was similar to previous years with highest concentrations of schools in the southern strata and along coastal areas. Altogether, 2074 nautical miles of hydroacoustic transects were covered. To allocate biological information to echorecordings and for the collection of biological samples, 39 fishery hauls were conducted.

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As in previous years, sprat showed the highest presence in the hauls and also contributed the bulk biomass to total catch weight. Herring often co-occurred with sprat in mixed schools but herring contributions to catch weight were comparatively low with only few exceptions. While pilchard were caught in one haul in notable numbers, anchovies were completely absent from catches in 2018.

Vertical profiles of ambient hydrographic parameters were measured on 89 stations.

1. Cruise objectives

The following objectives were planned for SB750 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, pilchard, 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. Survey effort was maintained at a similar level to 2017. Altogether, 23 strata were covered by all participants in the 2018 HERAS survey, out of which 4 had been allocated to Germany by the HERAS survey coordinator of the ICES Working Group of International Pelagic Surveys WGIPS (Fig. 1) (ICES, 2018).

2. Cruise narrative and preliminary results

2.1 Cruise narrative

After loading and preparation of the scientific equipment, FRV “Solea” left Cuxhaven port around noon on June 29th to calibrate the echosounder northwest of Helgoland Island during slack tide the same evening. Survey operations commenced the following day on the southernmost transect of stratum 71 in the eastern German bight. This stratum was accomplished on July 3rd in the afternoon, when survey operations continued in the southerly adjacent stratum 61 along the southeastern German Bight coast. In the late afternoon of July 6th stratum 61 was accomplished and FRV “Solea” steamed to the nearest transect of stratum 51 to continue the survey. On July 10th, the survey had to be interrupted due to inclement weather affecting both hydroacoustic data quality and trawl haul operations. By July 11th overall weather conditions had improved to a degree that allowed continuing the survey. Stratum 51 was accomplished on July 13th in the evening. Stratum 131 was covered from July 14th until July 18th in the late afternoon. Then, survey operations were finished and FRV “Solea” steamed to Cuxhaven port where the survey ended on July 19th in the morning. The survey area and all transects were covered as planned with a total transect distance of 2074 nautical miles.

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 in comparatively inclement conditions with low winds but notable swell while the vessel was drifting northwest of Helgoland Island at water depths of ca. 40 m. Conditions improved during the calibration process, so all transducers could be calibrated in CW-mode with acceptable results based on calculated RMS-values. Calibration in FM-mode was not

possible due to the prevailing swell and time constraints. Resulting transducer parameters were applied for consecutive data-collection and post-processing of hydroacoustic 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 or 10 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 9 software (Echoview Software Pty Ltd, 2018).

Clupeids in the survey area are discernible from echograms by their typical pillar shaped schools (Figure 8). 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 resembled patterns observed in the previous years: While NASC values were particularly high around Helgoland and in the coastal areas of stratum 61 as well as along the western coastal boundary of stratum 51, no clupeids were detected in large parts of strata 71 and 131 (Fig. 2). 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 North Sea (see hydrography) and along the coasts. Echoes from those two strata can mostly be allocated to sprat (see below). Notable NASC values were measured in the western part of the central stratum 131 in the Dogger Bank area. Based on corresponding catches, these registrations mostly originated from herring. Compared to previous years, NASC values in stratum 71 were very low with only few notable aggregations of clupeids in the northwestern coastal area of this stratum.

2.3 Biological sampling (N. Rohlf)

Thirty-nine 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 60 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. 1. Catches were sorted according to species, and length- and weight-distributions of individual species were measured. Of all clupeids (herring, sprat and pilchard were caught), 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 to enable age estimation.

Altogether, 14 different fish and one cephalopod species were caught during the survey. A detailed overview on catch compositions (CPUE in kg 30min-1) of all 39 trawl hauls is given in Tab. 1. As in the previous years, sprat dominated the catches (present in 27 hauls or 69 % of the total 39) and contributed the bulk of biomass of total catch weight (10.1 t, i. e. 90 %). Herring was less abundant in the survey area when compared to the previous year. The total catch weight of herring summed up to 1.0 tonnes (2017: 1.8 tonnes, obtained in 28 hauls). While herring in most parts of their distribution range within the survey area of FRV “Solea” occurred in mixed schools together with sprat, the echoregistrations and corresponding catches in the Dogger Bank area of the central stratum 131 indicated clean herring schools. However, catches alone are not representative for abundance of small pelagics. Detailed

conclusions on abundance cannot be given 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 and pilchard sampled is given in Tab. 2a-c, together with their proportion on the total catch. Figures 3 - 5 show length distributions of these species as derived from total catches. Herring lengths ranged from 5 to 21 cm, but the length distribution is dominated by small fish below 10 cm TL. Sprat lengths ranged from 4 to 15 cm.

Pilchard were only present in one haul, but constituted the only clupeid species in that haul. Anchovies were not caught in the allocated survey area during HERAS 2018.

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 (Stox, 2015). This will be accomplished during a post-cruise meeting scheduled for November 2018 at the Institute of Marine Research IMR, Bergen/Norway. Results will subsequently 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, 89 CTD casts were conducted during this survey.

Surface temperatures in the survey area ranged from ca. 15° to almost 18° C. Highest temperatures were measured in the central part of the survey area and along the German and Dutch North Sea coasts (Fig. 7). While the water column was mixed in shallow coastal areas and in the shallow southern part of the North Sea south of ca 54° N, a distinct thermocline appeared northward separating the warm surface water from cold deeper layers where temperatures dropped to below 6° C near the seafloor. In the shallow Dogger Bank area, bottom temperatures were lower than surface temperatures but distinctly higher than those measured in the deeper areas surrounding the Bank.

Salinity in the survey area showed no notable gradient between surface and seafloor layers, except for the northeastern part of the survey area and the inner German Bight near the Elbe river estuary, where surface salinity was lower than salinity near the seafloor. Altogether, salinity was highest in the offshore areas of the southern North Sea and particularly in the southernmost region near the English channel. Salinity levels altogether ranged from ca. 31 to 35 PSU.

3. Survey participants

Dr. Matthias Schaber (cruise leader)	Hydroacoustics	TI-SF
Dr. Norbert Rohlf	Fish lab/Biology	TI-SF
Lea Hartkens	Hydroacoustics/Hydrography	TI-SF
Jörg Appel	Fish lab/Biology	TI-SF
Gitta Hemken	Fish lab/Biology	TI-SF
Michael Sasse	Fish lab/Biology	TI-SF

4. References

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ICES (2018). Report of the Working Group on International Pelagic Surveys (WGIPS). ICES WGIPS Report 2018. 15-19 January 2018. Den Helder, the Netherlands. 340 pp.

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

StoX (2015). StoX: An open source approach to acoustic and swept area survey calculations. Institute of Marine Research, Bergen, Norway. URL: http://www.imr.no/stox.

5. Acknowledgements

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

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

Figures

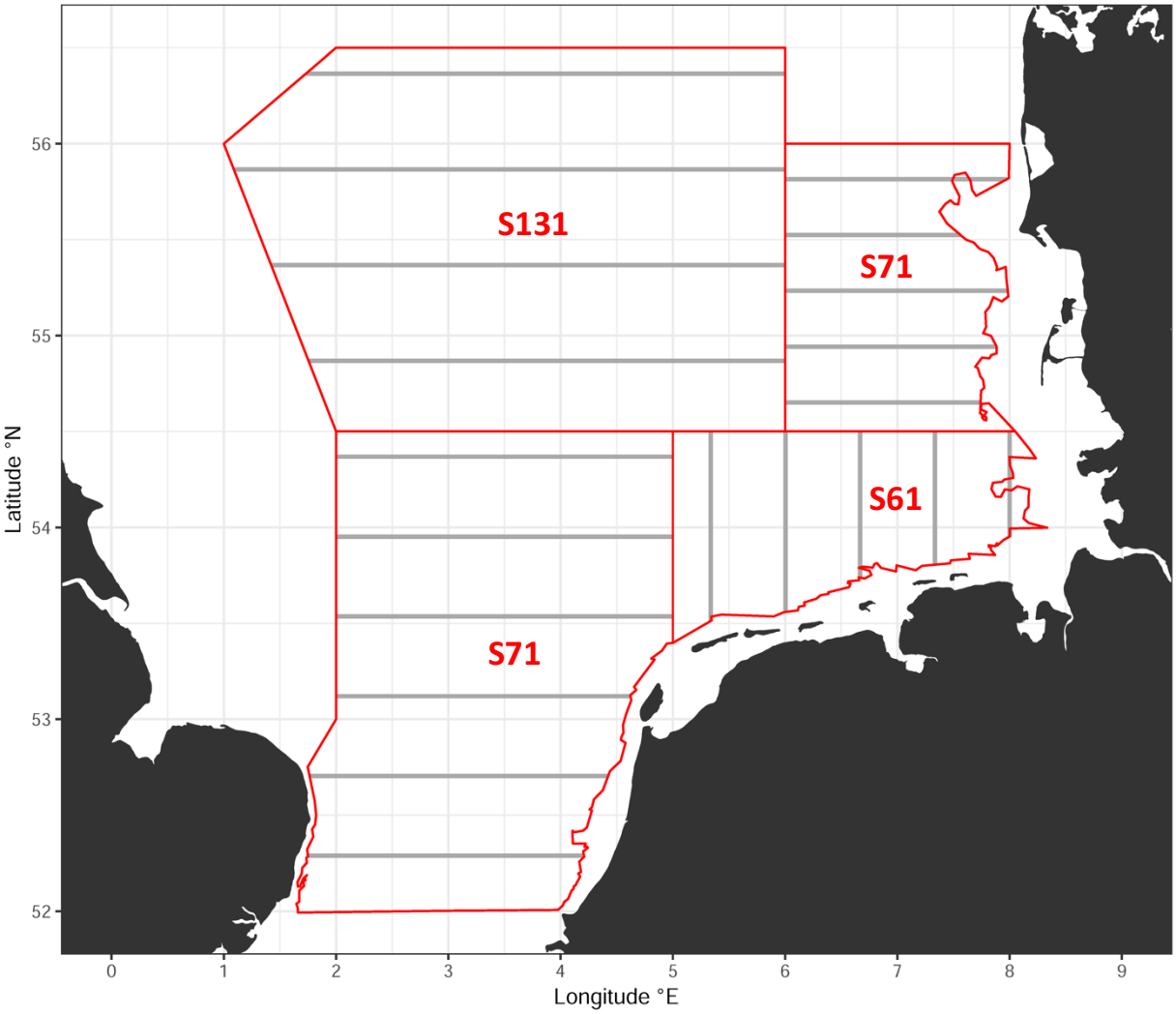

Figure 1: FRV "Solea" cruise 750/2018. Survey plan. Total survey area and strata covered (S51, S61, S71, S131) outlined in red. Transect lines followed indicated as grey lines.

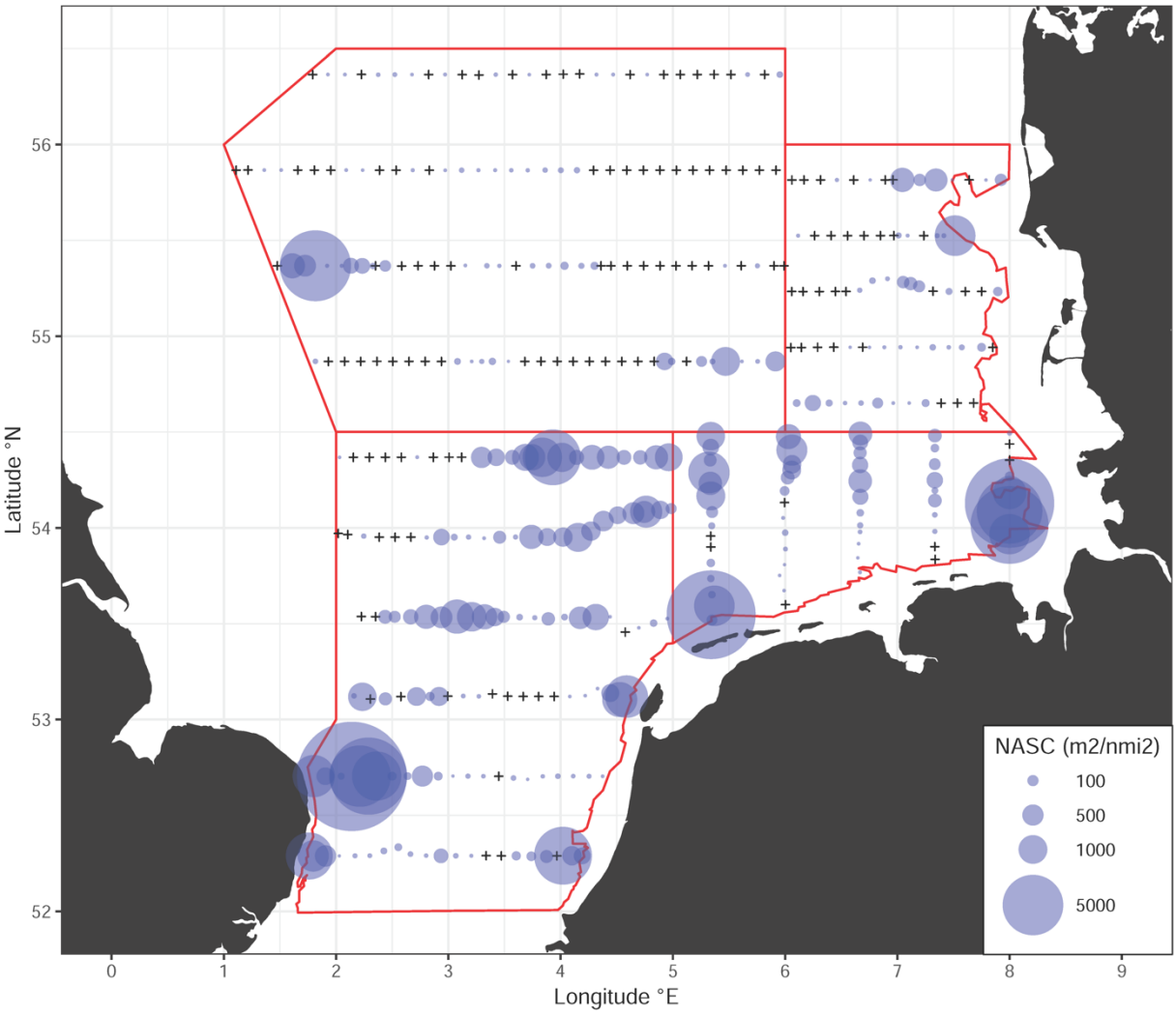

Figure 2: FRV "Solea" cruise 750/2018. Mean Clupeid Nautical Area Scattering Coefficient (NASC) measured (blue dots, 5 nmi intervals). Empty intervals indicated by crosses. Total survey area and strata outlined in red.

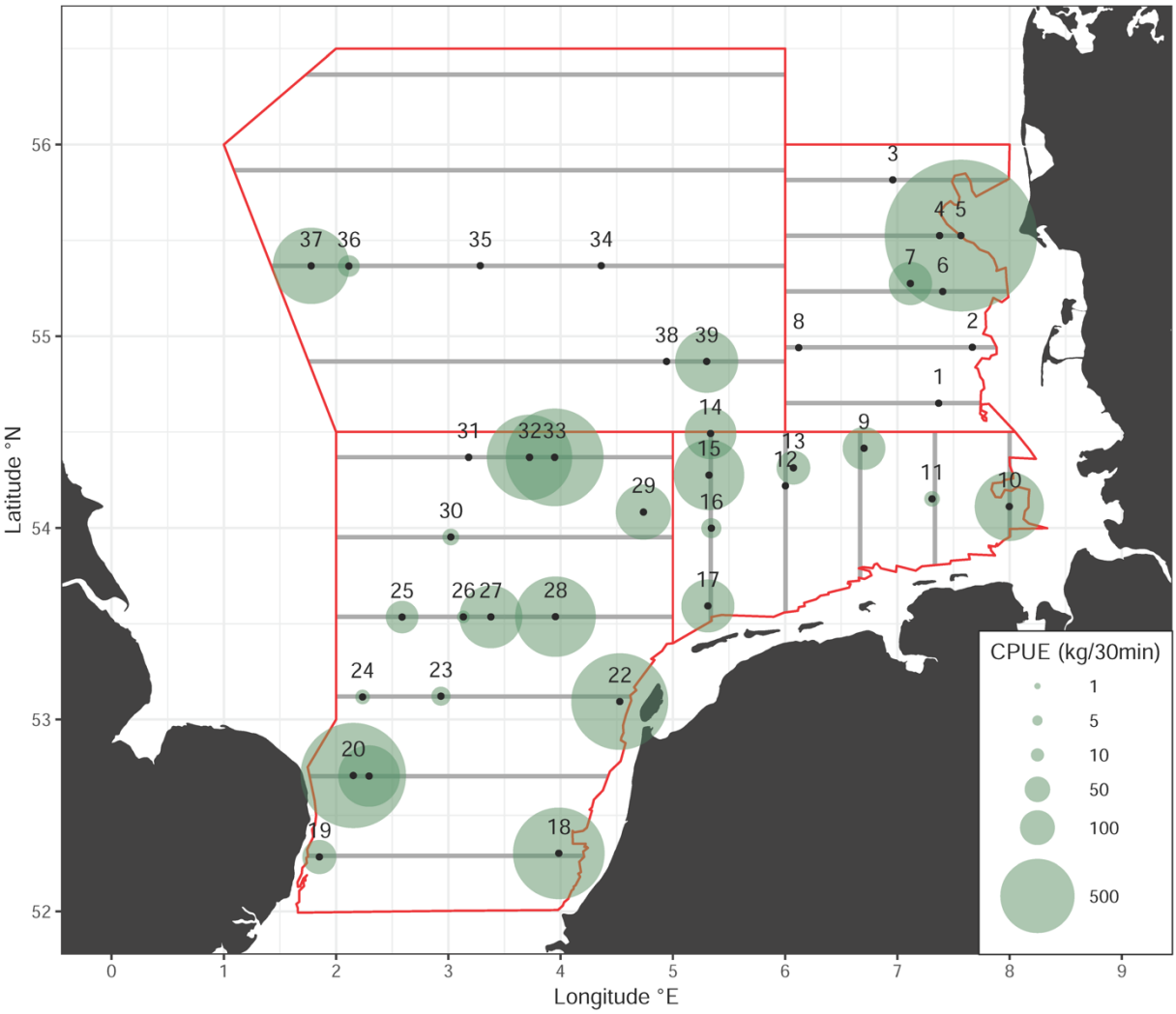

Figure 3: FRV "Solea" cruise 750/2018. Combined clupeid (herring *Clupea harengus*, sprat *Sprattus sprattus* and pilchard *Sardina pilchardus*) catches (kg/30 min). Numbers indicate haul/station number. Survey area/strata outlined in red. Transects depicted as grey lines.

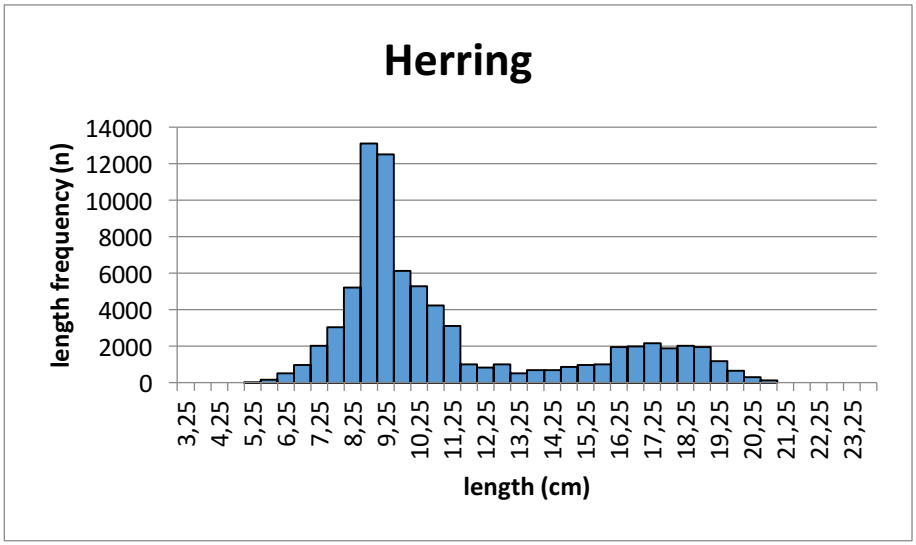

Figure 4: FRV "Solea" cruise 750/2018. Herring (*Clupea harengus*) length-frequency distribution.

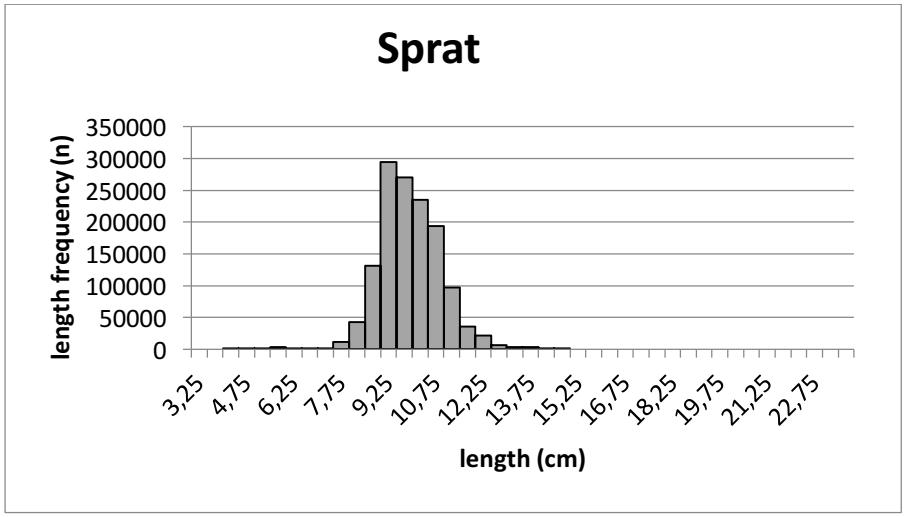

Figure 5: FRV "Solea" cruise 750/2018. Sprat (*Sprattus sprattus*) length-frequency distribution.

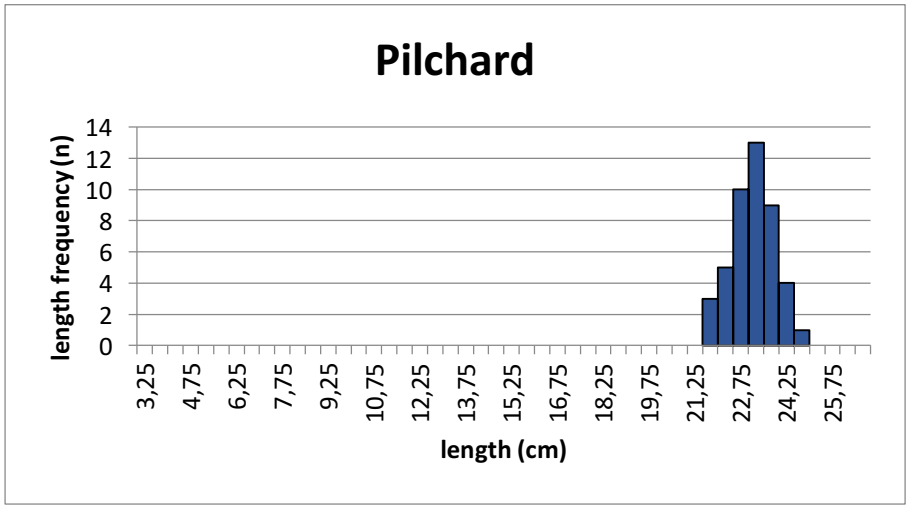

Figure 6: FRV "Solea" cruise 750/2018. Pilchard (*Sardina pilchardus*) length-frequency distribution.

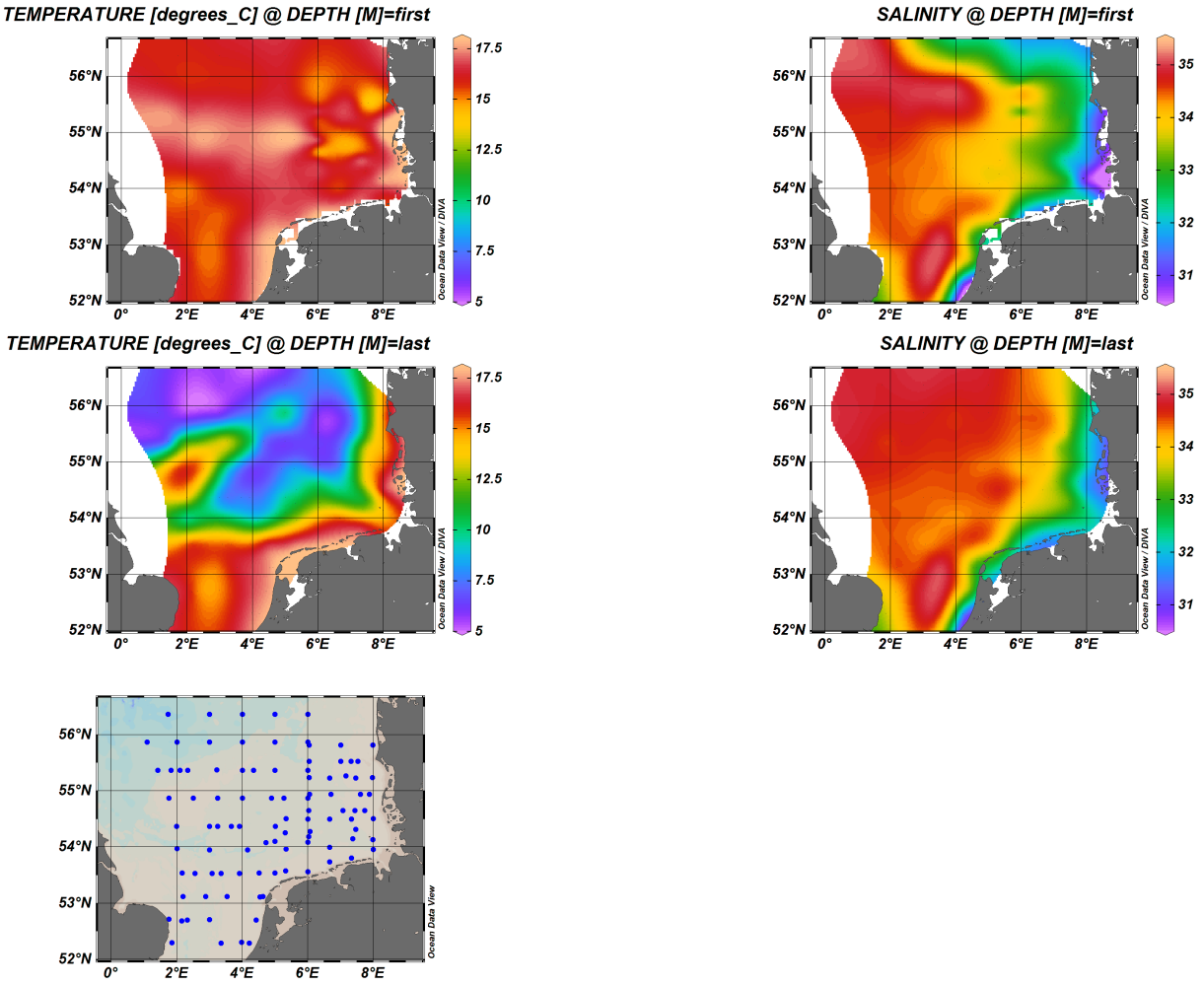

Figure 7: FRV “Solea” cruise 750/2018. Hydrography. CTD stations are depicted as blue dots in the area map (lower panel). Temperature (°C, left panels) and salinity (PSU, right panels at the surface (top) and near the seafloor (lower).

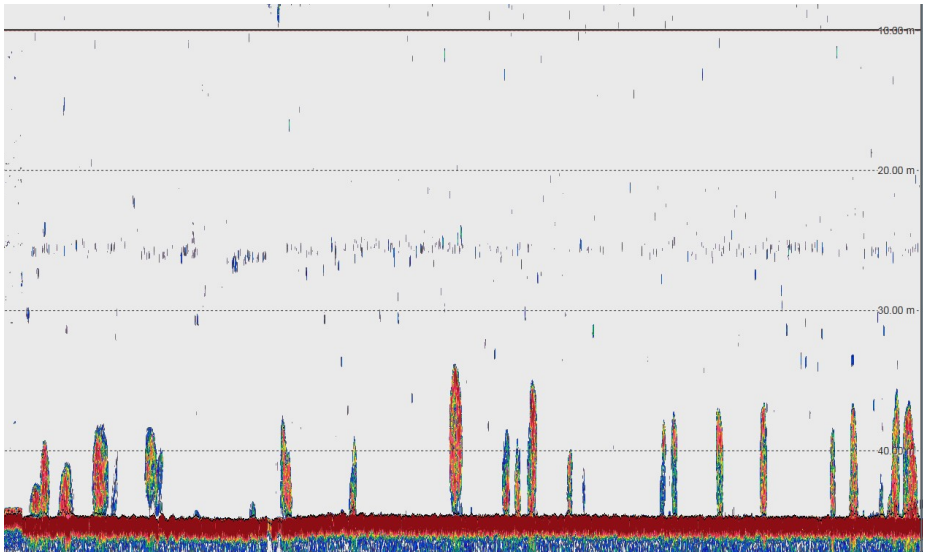

Figure 8: FRV “Solea” cruise 750/2018. Exemplary echogram (38 kHz, FM-mode) showing pillar shaped schools typical for clupeids distributed at the seafloor during daytime.

Tables

Table 1: FRV "Solea" cruise 750/2018. Catch composition (CPUE in kg) standardized to 30 minutes tow duration.

HAUL	STATION	RECTANGLE	TOTAL (kg/30 min)	*ALLOTEUTHIS SUBULATA*	*AMMODYTES MARINUS*	*CLUPEA HARENGUS*	*CLUPEIDAE*	*ECHIICHTHYS VIPERA*	*EUTRIGLA GURNARDUS*	*HYPEROPLUS IMMACULATUS*	*HYPEROPLUS LANCEOLATUS*	*LIMANDA LIMANDA*	*MERLANGIUS MERLANGUS*	*PLEURONECTES PLATESSA*	*POMATOSCHISTUS MINUTUS*	*SARDINA PILCHARDUS*	*SCOMBER SCOMBRUS*	*SPRATTUS SPRATTUS*	*TRACHURUS TRACHURUS*	NUMBER OF SPECIES
1	568	38F7	6.3						0.6	0.0			0.0				5.6			4
2	571	38F7	19.4						0.5			0.2				4.8	13.9			4
3	575	40F6	5.7						1.6			0.1					4.0			3
4	579	40F7	2.1						1.5		0.0	0.2					0.4			4
5	580	40F7	2204.5			111.1			0.5								3.2	2089.7		4
6	582	39F7	3.8						1.7								2.1			2
7	583	39F7	170.3			30.3			2.7		0.7	0.1	0.0				5.8	130.7		7
8	587	38F6	0.3						0.3				0.0							2
9	589	37F6	156.8			4.5			1.4			0.1	0.0					150.8		5
10	592	37F7	446.0			4.7					0.1						13.9	427.3		4
11	595	37F7	17.6			4.1			2.0				0.0				0.2	11.4		5
12	600	37F6	1.9						0.5								1.5			2
13	601	37F6	97.7			0.8			1.7				0.0					95.3		4
14	604	37F5	234.3			7.8			1.3				0.0					225.3		4
15	605	37F5	449.3			6.3			0.7									442.3		3
16	606	36F5	29.3			0.0		0.0	0.6								0.1	28.4	0.3	6
17	607	36F5	248.4			4.1			0.2									244.1		3
18	610	33F3	777.3			8.2					0.0						1.9	767.1		4
19	612	33F1	95.6			0.0											0.8	94.8		3
20	614	34F2	1038.1			0.1												1038.0		2
21	615	34F2	455.3			2.8		2.5			0.0		0.8					449.1		5
22	619	35F4	871.0	0.0		71.2					0.1							799.7		4
23	621	35F2	25.7	0.0		0.0						0.1						25.6		4
24	622	35F2	13.3			1.6							0.0					11.7		3
25	624	36F2	87.2	0.8		0.4		0.1	0.1									85.8		5
26	625	36F3	11.4	0.1		0.5	1.6		0.5				0.0		0.0			8.7		7
27	626	36F3	354.8	0.3		13.9			0.2			0.2						340.2		5
28	627	36F3	596.0	0.1		5.5		0.0	0.5			0.1	0.1				0.2	589.5		8
29	630	37F4	271.8			5.4			0.8				0.0					265.5		4
30	632	36F3	18.8	0.0		6.7			0.1				0.1					11.9		5
31	636	37F3	12.4						12.3				0.0							2
32	637	37F3	673.1			9.9			3.3									659.9		3
33	638	37F3	889.0			71.6			2.7									814.8		3
34	653	39F4	1.8		0.1		0.0		1.7				0.0							4
35	655	39F3	0.6						0.5				0.0							2
36	657	39F2	34.3			34.0			0.2									0.1		3
37	658	39F1	534.7	0.1	0.0	534.3			0.1		0.1	0.1								6
38	664	38F4	0.2						0.2											
39	665	38F5	356.4			97.4			1.2					0.4				257.4		4
	total (kg)		**11212.4**	1.3	0.1	1037.3	1.6	2.6	42.3	0.0	1.0	1.0	1.2	0.4	0.0	4.8	53.6	10065.0	0.3	
	proportion (%)			0.0	0.0	9.3	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	89.8	0.0	
	number of catches			8	2	28	2	4	31	1	7	9	16	1	1	1	14	27	1	
	presence (%)			21	5	72	5	10	79	3	18	23	41	3	3	3	36	69	3	

Table 2a: FRV "Solea" cruise 750/2018. Numbers, weights and mean lengths of herring (*Clupea harengus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

Haul	Stat	Rect	total catch (kg)	clupeid catch (kg)	clupeid pro-portion	herring					herring proportion of clupeids
						catch	count	range (cm)			
						(kg)	(n)	min	max	mean	
1	568	38F7	6.3	0	0%	0.0	0	0	0	0	0%
2	571	38F7	19.4	5	25%	0.0	0	0	0	0	0%
3	575	40F6	5.7	0	0%	0.0	0	0	0	0	0%
4	579	40F7	2.1	0	0%	0.0	0	0	0	0	0%
5	580	40F7	2204.5	2201	100%	111.1	17952	7.25	17.25	9.7	5%
6	582	39F7	3.8	0	0%	0.0	0	0	0	0	0%
7	583	39F7	170.3	161	95%	30.3	1652	9.75	17.25	13.5	19%
8	587	38F6	0.3	0	0%	0.0	0	0	0	0	0%
9	589	37F6	156.8	155	99%	4.5	902	8.25	16.25	9.1	3%
10	592	37F7	446.0	432	97%	4.7	558	7.25	14.75	10.2	1%
11	595	37F7	17.6	15	88%	4.1	1231	6.25	9.75	8.3	26%
12	600	37F6	1.9	0	0%	0.0	0	0	0	0	0%
13	601	37F6	97.7	96	98%	0.8	129	8.25	15.25	9.6	1%
14	604	37F5	234.3	233	99%	7.8	1392	6.25	17.25	9.7	3%
15	605	37F5	449.3	449	100%	6.3	1976	6.75	15.75	8.2	1%
16	606	36F5	29.3	28	97%	0.0	3	12.75	12.75	12.8	0%
17	607	36F5	248.4	248	100%	4.1	246	10.25	16.75	12.8	2%
18	610	33F3	777.3	775	100%	8.2	1132	9.25	15.25	10.1	1%
19	612	33F1	95.6	95	99%	0.0	2	12.75	12.75	12.8	0%
20	614	34F2	1038.1	1038	100%	0.1	4	13.75	14.25	14.0	0%
21	615	34F2	455.3	452	99%	2.8	396	8.25	14.75	9.8	1%
22	619	35F4	871.0	871	100%	71.2	15254	8.25	10.25	9.0	8%
23	621	35F2	25.7	26	100%	0.0	1	10.25	10.25	10.3	0%
24	622	35F2	13.3	13	100%	1.6	723	5.25	14.25	6.9	12%
25	624	36F2	87.2	86	99%	0.4	48	6.25	14.75	10.2	0%
26	625	36F3	11.4	11	95%	0.5	177	5.75	13.25	7.4	5%
27	626	36F3	354.8	354	100%	13.9	3000	6.75	12.25	8.7	4%
28	627	36F3	596.0	595	100%	5.5	682	7.75	15.75	10.0	1%
29	630	37F4	271.8	271	100%	5.4	1928	5.25	12.75	7.5	2%
30	632	36F3	18.8	19	99%	6.7	2349	6.25	9.25	7.8	36%
31	636	37F3	12.4	0	0%	0.0	0	0	0	0	0%
32	637	37F3	673.1	670	100%	9.9	698	9.75	17.25	12.3	1%
33	638	37F3	889.0	886	100%	71.6	8097	7.25	18.25	10.8	8%
34	653	39F4	1.8	0	0%	0.0	0	0	0	0	0%
35	655	39F3	0.6	0	0%	0.0	0	0	0	0	0%
36	657	39F2	34.3	34	99%	34.0	837	15.25	20.75	17.7	100%
37	658	39F1	534.7	534	100%	534.3	12321	15.25	20.75	17.9	100%
38	664	38F4	0.2	0	0%	0.0	0	0	0	0	0%
39	665	38F5	356.4	355	100%	97.4	4548	9.75	18.75	14.2	27%

Table 2b: FRV "Solea" cruise 750/2018. Numbers, weights and mean lengths of sprat (*Sprattus sprattus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

			total	clupeid	clupeid	sprat					sprat
			catch	catch	pro-portion	catch	count	range (cm)			proportion of clupeids
Haul	Stat	Rect	(kg)	(kg)		(kg)	(n)	min	max	mean	
1	568	38F7	6.3	0	0%	0.0	0	0	0	0	0%
2	571	38F7	19.4	5	25%	0.0	0	0	0	0	0%
3	575	40F6	5.7	0	0%	0.0	0	0	0	0	0%
4	579	40F7	2.1	0	0%	0.0	0	0	0	0	0%
5	580	40F7	2204.5	2201	100%	2089.7	237321	9.25	13.75	10.4	95%
6	582	39F7	3.8	0	0%	0.0	0	0	0	0	0%
7	583	39F7	170.3	161	95%	130.7	11991	10.25	13.75	11.1	81%
8	587	38F6	0.3	0	0%	0.0	0	0	0	0	0%
9	589	37F6	156.8	155	99%	150.8	25084	8.25	10.25	9.5	97%
10	592	37F7	446.0	432	97%	427.3	78276	8.75	12.75	9.2	99%
11	595	37F7	17.6	15	88%	11.4	1188	8.25	14.25	11.0	74%
12	600	37F6	1.9	0	0%	0.0	0	0	0	0	0%
13	601	37F6	97.7	96	98%	95.3	12313	9.25	13.75	10.1	99%
14	604	37F5	234.3	233	99%	225.3	29243	8.75	13.75	9.6	97%
15	605	37F5	449.3	449	100%	442.3	65134	8.75	12.25	9.8	99%
16	606	36F5	29.3	28	97%	28.4	3345	9.25	12.75	10.6	100%
17	607	36F5	248.4	248	100%	244.1	21088	8.75	14.25	11.5	98%
18	610	33F3	777.3	775	100%	767.1	65124	10.75	13.75	11.5	99%
19	612	33F1	95.6	95	99%	94.8	9326	9.25	14.75	11.2	100%
20	614	34F2	1038.1	1038	100%	1038.0	167456	8.75	11.25	9.4	100%
21	615	34F2	455.3	452	99%	449.1	100188	5.25	14.25	8.5	99%
22	619	35F4	871.0	871	100%	799.7	124400	8.75	13.25	9.5	92%
23	621	35F2	25.7	26	100%	25.6	2448	9.25	14.25	11.3	100%
24	622	35F2	13.3	13	100%	11.7	1932	4.25	14.25	8.8	88%
25	624	36F2	87.2	86	99%	85.8	19362	7.25	12.75	8.6	100%
26	625	36F3	11.4	11	95%	8.7	1961	7.25	10.25	8.9	80%
27	626	36F3	354.8	354	100%	340.2	51364	7.75	12.25	9.6	96%
28	627	36F3	596.0	595	100%	589.5	83249	7.75	12.75	9.8	99%
29	630	37F4	271.8	271	100%	265.5	45278	8.25	12.25	9.4	98%
30	632	36F3	18.8	19	99%	11.9	2340	5.25	13.75	9.0	64%
31	636	37F3	12.4	0	0%	0.0	0	0	0	0	0%
32	637	37F3	673.1	670	100%	659.9	75908	9.25	12.75	10.6	99%
33	638	37F3	889.0	886	100%	814.8	93843	9.25	11.75	10.7	92%
34	653	39F4	1.8	0	0%	0.0	0	0	0	0	0%
35	655	39F3	0.6	0	0%	0.0	0	0	0	0	0%
36	657	39F2	34.3	34	99%	0.1	8	10.75	14.25	12.0	0%
37	658	39F1	534.7	534	100%	0.0	0	0	0	0	0%
38	664	38F4	0.2	0	0%	0.0	0	0	0	0	0%
39	665	38F5	356.4	355	100%	257.4	24722	9.75	14.25	11.2	73%

Table 2c: FRV "Solea" cruise 750/2018. Numbers, weights and mean lengths of pilchard (*Sardina pilchardus*) and according proportion of total clupeid catch (normalized to 30 minutes tow duration).

			total	clupeid	clupeid	pilchard					pilchard
			catch	catch	pro-portion	catch	count	range (cm)			proportion of clupeids
Haul	Stat	Rect	(kg)	(kg)		(kg)	(n)	min	max	mean	
2	571	38F7	19.4	4.8	25%	4.8	45	21.75	24.75	23.2	100%