

Cruise Report

**FRV "Solea", cruise no. 672
02.05. – 22.05.2013**

Acoustic Survey on Pelagic Fish Stocks in the Baltic Sea

Scientist in charge: Dr. Uwe Böttcher

1 Background

The main objective of the cruise no. 672 of FRV "Solea" was to assess the sprat stock in the Baltic Proper. The cruise is part of the **Baltic International Acoustic Spring Survey (BASS)**, which is coordinated within the scope of ICES. This acoustic survey is conducted every year to supply the ICES 'Baltic Fisheries Assessment Working Group (WGBFAS)' with an index value for the stock size of sprat in the Baltic area (Subdivisions 24 - 26 and 28). The acoustic survey was accompanied by extensive hydrographic investigations.

Timing, surveying area and the principal methods of investigations were internationally co-ordinated by the WGBIFS (ICES Baltic International Fish Survey Working Group). Germany covered the ICES Subdivisions 24, 25 and the western parts of Subdivisions 26 and 28 (Figure 1).

Verteiler:

BLE, Hamburg
Schiffsführung FFS „Solea“
BMELV, Ref. 614
TI, Präsidialbüro (M. Welling)
TI, Verwaltung Hamburg
TI, FI
TI, OF
TI, SF
TI, FIZ-Fischerei
Schiffseinsatzplanung, Herr Dr. Rohlf
BFEL Hamburg, FB Fischqualität
IFM-GEOMAR, Kiel
Institut für Fischerei der Landesforschungsanstalt
LA für Landwirtschaft, Lebensmittels. u. Fischerei
BSH, Hamburg

Deutscher Fischerei-Verband e. V., Hamburg
Leibniz Institut für Ostseeforschung
Doggerbank GmbH
Mecklenburger Hochseefischerei Sassnitz
Kutter- und Küstenfisch Sassnitz
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2 Narrative

The cruise started on 02th May in Warnemünde and ended on 22th May in Warnemünde. Eighteen days were utilized for fulfilling the survey purposes. Additional two days were used for the departure/arrival to the port of Rostock. On the 04th May a member of the deck crew had to be transferred to a rescue vessel north of Rügen due to acute health problems. In the following FRV "SOLEA" had to call two times the port of Sassnitz to take over substitute crew members (04th and 10th May). Another emergency concerned the master. He had to be transferred to a lifeboat on 16th May near Gotland. The chief mate took over the function of the captain for the rest of the trip.

Survey design

The investigation of FRV "Solea" covered the whole Subdivisions 24 and 25 as well the Polish and Swedish areas of Subdivision 26 and 28 (Fig. 1).

The acoustic and ichthyologic sampling stratification was based on ICES statistical rectangles. The size of these rectangles amounts 0.5 degree in latitude and 1 degree in longitude, whereby only areas with water deeper than 10 m were taken into account. The daily surveyed distance amounted to approximately 90-100 nautical miles. In agreement with the rules the acoustic measurements were conducted on parallel transects with a distance of 15 - 18 nautical miles.

The standard acoustic investigations and the fishing hauls were carried out at daylight from 4:00 - 18:00 UTC (6:00 and 20:00 local time). The survey speed was 10 knots. In general, each ICES-rectangle was covered with two transects, corresponding to acoustic measurements of approx. 60 nautical miles per statistical rectangle

Calibration

The hull mounted 38 kHz transducer was calibrated on the first day of the cruise in the coastal area of the Mecklenburg Bay. The calibration procedure was carried out as described in the 'Manual for International Baltic Acoustic Surveys (IBAS)' (ICES 2013).

Acoustic data collection

Acoustic data were recorded with an echosounder SIMRAD EK60. The standard frequency for the survey was 38 kHz. The specific settings of the acoustic equipment were used according the IBAS-manual.

Biological data – fishing stations

Trawling was done with the pelagic gear "PSN388" in the midwater as well as near the bottom to identify the echo signals. The intention was to conduct at least two hauls per ICES statistical rectangle. The trawling time lasted usually 30 minutes. According to the IBAS-manual codend-inlets with stretched mesh sizes of 20 mm was used in the Subdivision 24 and 12 mm in Subdivision 25 to 28.

The trawling depth and the net opening were controlled by a Scanmar net probe. Generally a net opening of about 6 to 8 m was achieved. The trawl depth (headrope below the surface) on the fishing stations which ranged from 9 to 90 m was chosen in accordance to 'characteristic indications' of the echogram. At pelagic trawling positions the bottom depth varied from 20 to 250 m.

Samples were taken from each haul in order to determine the length and weight distribution of fish. Sub-samples of cod, herring and sprat were investigated concerning sex, maturity and age. Samples of whole fishes and parts of different organs/tissues were taken for later investigations in the lab.

Hydrography

A Seabird-CTD-probe with a carousel water sampler and oxygen sensor was used for hydrographical measurements. Vertical profiles were acquired on a fixed station grid along the track and after each trawl station. The profiles covered the entire water column to about 2 m above the sea bottom. Additionally, water samples were taken once per day from different depths to check the oxygen data by Winkler titration and to collect reference salinity samples. The hydrological row data were aggregated to 1 m depth strata. Additional meteorological observations of air temperature, atmospheric pressure, wind speed and direction were recorded on all hydrographical stations.

3 First Results

Summarized activities during the survey:

Hydroacoustic transects	1450 nmi
Pelagic trawl hauls	63
CTD vertical profiles	117
Water bottle samples for oxygen (Winkler titration) and for salinity determination	38

The tracks of the acoustic measurements and the geographical distribution of fishing and CTD-stations are presented in Figures 1 and 2. The results of the trawl hauls are given in Table 1 and Figure 3.

The CPUE ranged from 0 to 638 kg/0.5h. The mean CPUE amounted 159 kg/0.5h. Overall 11 fish species were recorded in 63 pelagic hauls. In general the catch composition was dominated by sprat. Herring and cod also occurred regularly in the trawl catches. The biomass of species other than herring, sprat and cod was negligible.

The table below gives the number of investigated individuals. Detailed ichthyological analyses were made according to the standard procedure (i.e. sex, maturity, otolith dissection).

species	total of hauls with the species	length-measured individuals	detailed ichthyological analyses
BELONE BELONE	1	1	
CLUPEA HARENGUS	58	6297	1001
CYCLOPTERUS LUMPUS	1	3	
GADUS MORHUA	37	1544	443
GASTEROSTEUS ACULEATUS	22	1280	
HYPEROPLUS LANCEOLATUS	2	16	
MERLANGIUS MERLANGUS	6	9	
PLATICHTHYS FLESUS	14	34	
SALMO TRUTTA	1	1	
SCOMBER SCOMBRUS	3	3	
SPRATTUS SPRATTUS	59	14289	650

The length distributions of sprat and herring by Subdivision of the years 2012 and 2013 are presented in Figure 4. The length distribution shows the typical shift to smaller individuals from the western to the eastern areas. However, larger sprat (>11 cm) dominated in all Subdivisions. The contribution of the new incoming year-class (<10 cm) is especially in SD 25 and 27 very low.

The seawater temperature varied from 5 °C to 7 °C in the surface layer (Fig. 5). This is in the normal range of values for this season. However, the winter cooling of the intermediate water layer about the halocline was higher than in the previous year. Because of that the temperature of this layer was about 1-2 degrees lower in most survey areas.

The oxygen content shows in the last two years a slightly increasing trend in the bottom near water of the Bornholm basin and south-west Gotland basin. Aerobic conditions were found in the bottom near water layer in the whole area of the Bornholm basin and Stolpe Channel as well as in the south western part of the Gotland basin (Fig 6).

The analysis of the acoustic data is still pending.

4 Personnel

Master: V. Koops, St. Meier

Scientific staff participating:

	Name	Institution	Task
1	Dr. U. Böttcher	vTI-OSF, Rostock	Cruise leader, hydrography, databases
2	Dr. E Bethke	vTI-SF, Hamburg	Acoustic, fisheries biology
3	D. Stephan	vTI-OSF, Rostock	Fisheries biology
4	M. Koth	vTI-OSF, Rostock	Fisheries biology
5	B. Stepputtis	vTI-OSF, Rostock	Fisheries biology
6	T. von Urban	University Hamburg	Fisheries biology

Uwe Böttcher

5 Figures and Tables

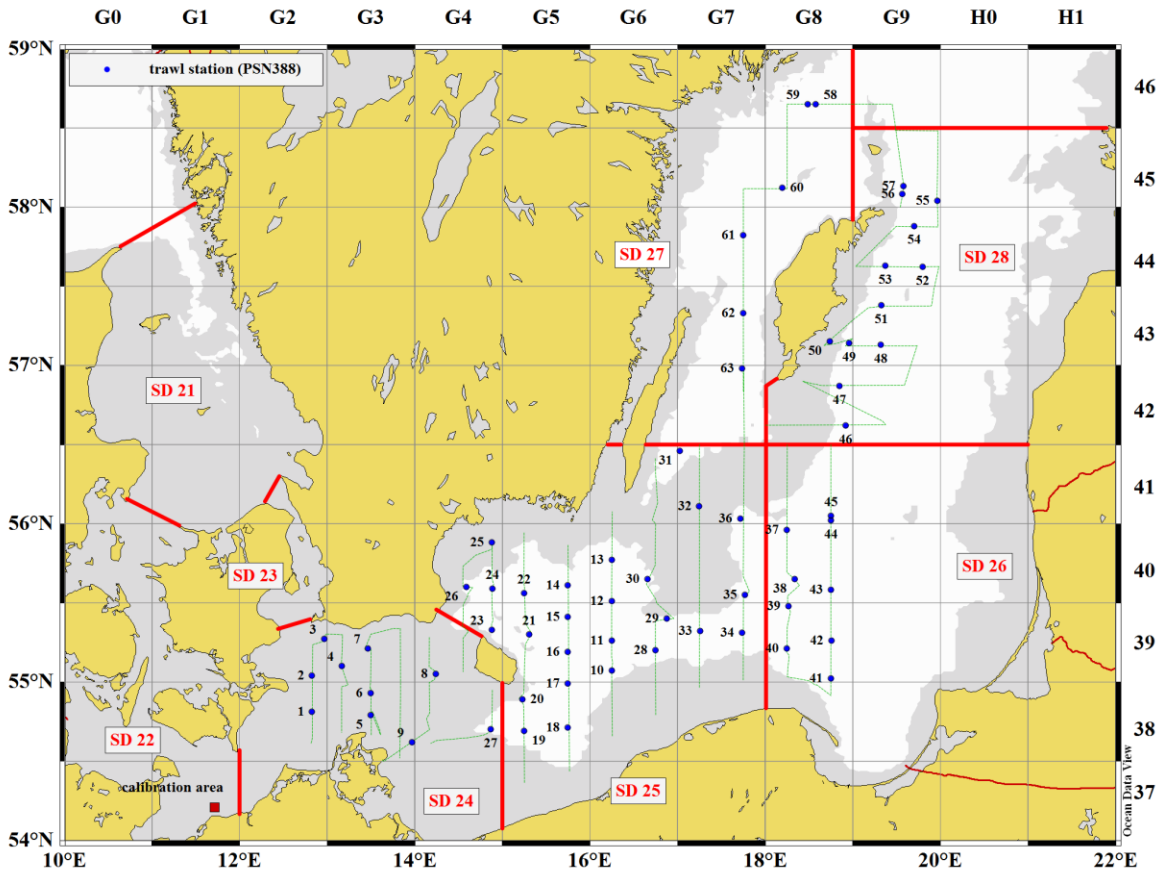


Figure 1: Hydroacoustic tracks, trawl stations and the position where the calibration was carried out (red square).Cruise No. 628 of FRV "SOLEA", May 2013.

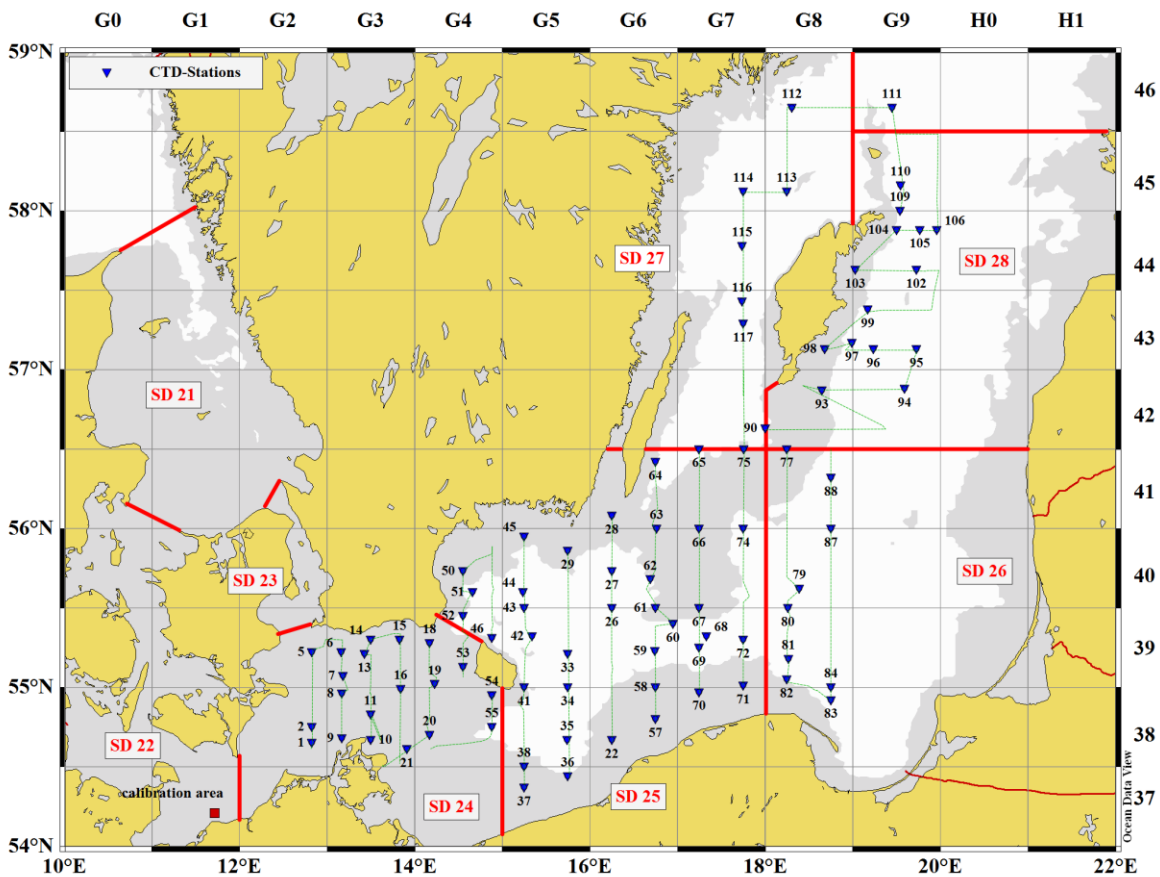


Figure 2: CTD-stations on the hydroacoustic transects.(Cruise No. 628 of FRV "SOLEA", May 2013).

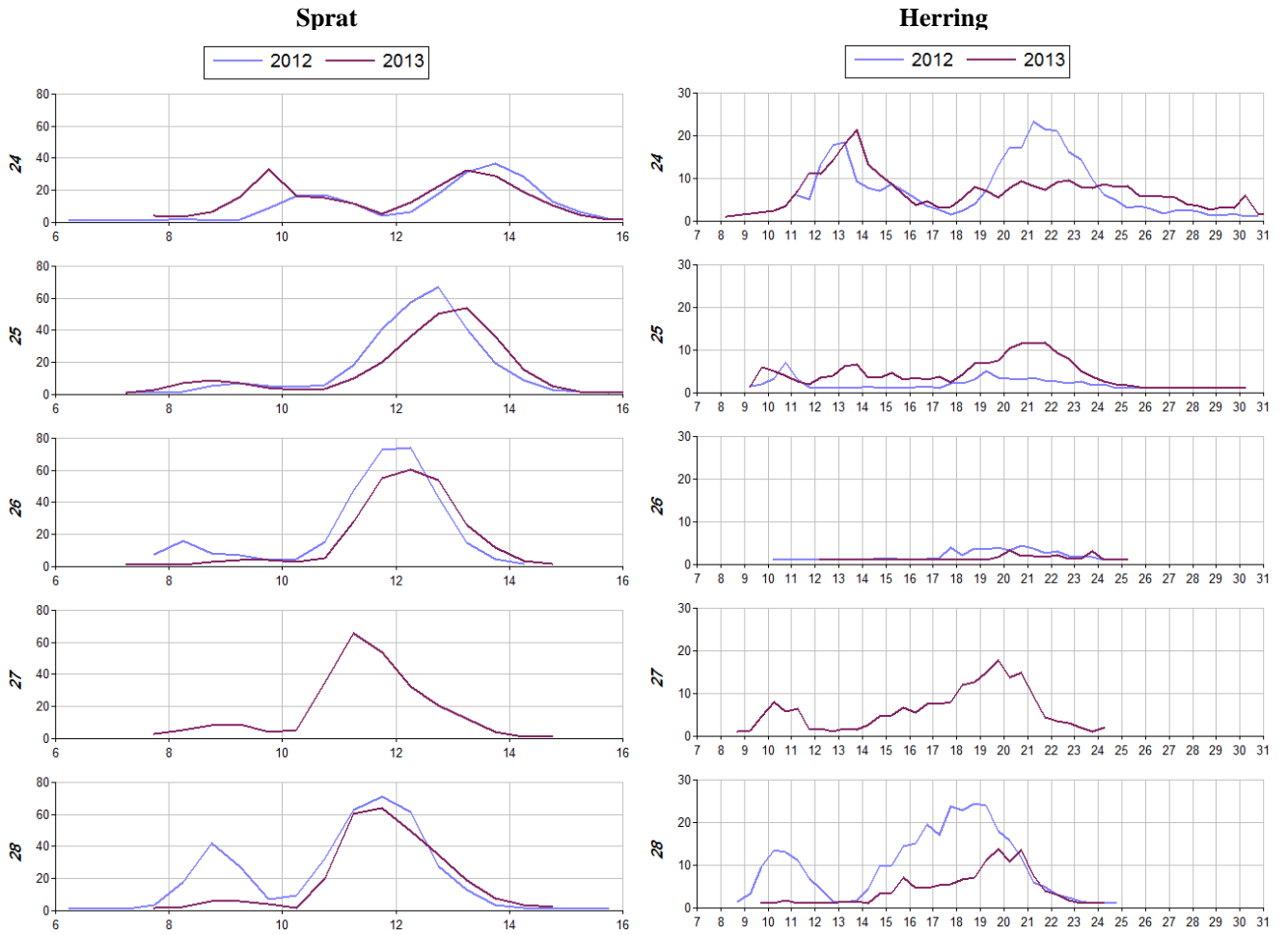


Figure 4: Length distribution in numbers of sprat (left) and herring (right) in Subdivisions 24 - 28 in May 2012 and 2013.

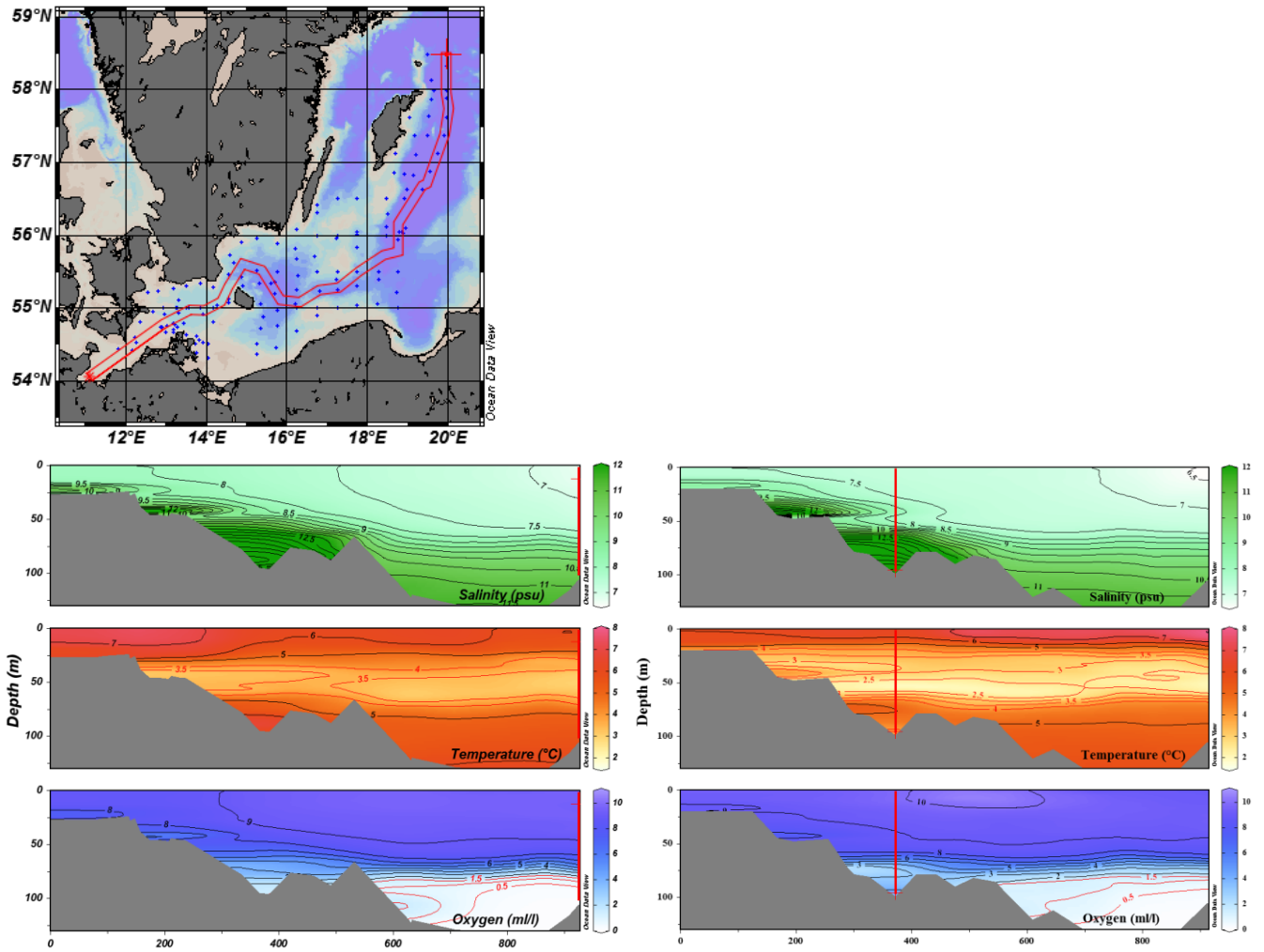


Figure 5: Vertical distribution of salinity, temperature and oxygen on a transect from west to east through the investigated area in 2012 (left) and 2013 (right).

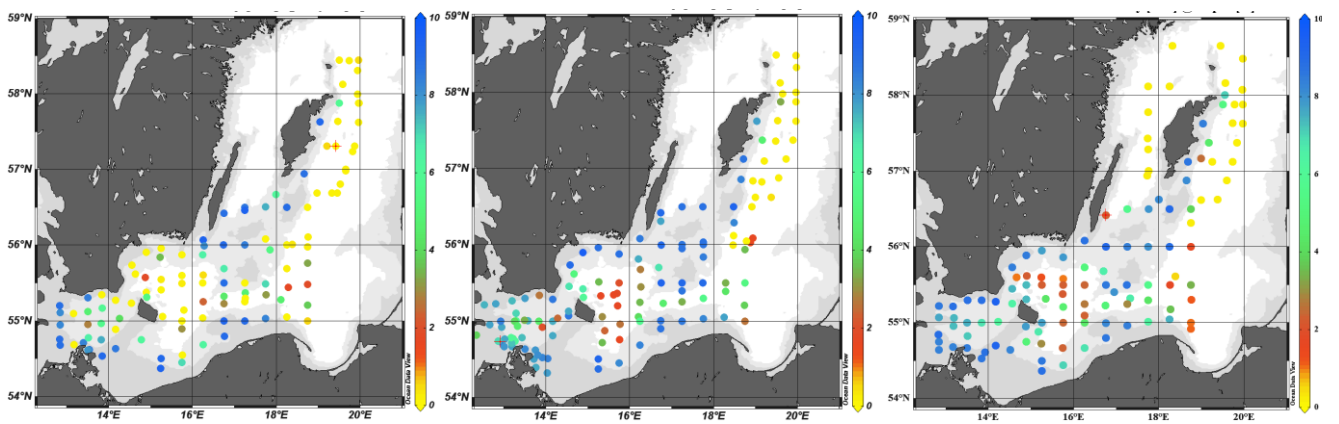


Figure 6: Oxygen content in the bottom-near water on the CTD-stations in 2011 (left) 2012 (mid) and 2013 (right).

Table 1: Catch composition (kg/0.5 h) per fishing haul (Cruise No. 628 of FRV "SOLEA", May 2013)

station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
sub-division	24	24	24	24	24	24	24	24	24	25	25	25	25	25	25	25	25	25	25	25	25		
rectangle	38G2	39G2	39G2	39G3	38G3	38G3	39G3	39G4	38G3	39G6	39G6	40G6	40G6	40G5	39G5	39G5	38G5	38G5	38G5	38G5	39G5		
trawl-typ	PSN388																						
# cod-end (mm)	20	20	20	20	20	20	20	20	20	12	12	12	12	12	12	12	12	12	12	12	12		
haul	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
trawl-time (min)	30	30	30	30	30	20	20	30	30	20	30	30	20	20	26	20	30	30	30	30	20		
bottom-depth (m)	21	29	24.5	39.5	44.5	47	43	47.5	23	76.5	74.5	75	65	71.5	93	89.5	81.5	64	65.5	63	92		
mean-headline-depth (m)	6.5	18	9	29	36	36	33	39	14	68	66	66	55	63	79	79	75	56	59	57	83		
trawl-distance (nmi)	2.01	1.85	1.79	1.88	1.97	1.26	1.26	1.84	1.92	1.34	1.97	1.95	1.88	1.27	1.40	1.68	1.35	1.97	1.85	1.79	1.30		
BELONE BELONE	0.93																						
CLUPEA HARENGUS	13.07	6.41	24.88	6.69	6.73	16.22	25.54	38.84	4.31	2.19	1.01	2.12	15.59	2.23	1.85	1.83	2.80	9.53	4.89	6.81	8.00		
CYCLOPTERUS LUMPUS	0.84																						
GADUS MORHUA			0.07							0.48			0.20	10.37	0.75	8.17			0.64	0.56	14.92	14.03	3.21
GASTEROSTEUS ACULEATUS																							
HYPEROPLUS LANCEOLATUS			0.06							0.23													
MERLANGIUS MERLANGUS			1.32	0.42		1.18														0.19			
PLATICHTHYS FLESUS													0.89						0.25				
PLEURONECTES PLATESSA																							
SALMO TRUTTA																							
SCOMBER SCOMBRUS													0.29						0.20				
SPRATTUS SPRATTUS	0.01	0.34	1.42	90.38		550.73	3.93	25.06	0.49	338.46	325.74	194.24	268.10	761.67	232.56	107.10	229.74	62.64	17.10	174.66	98.67		
	13.92	8.07	26.43	7.11	97.11	568.13	30.40	64.38	5.03	340.65	326.96	196.36	294.06	764.94	243.46	108.93	233.18	72.72	37.55	195.50	109.89		

station	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42		
sub-division	25	25	25	25	25	24	25	25	25	25	25	25	25	25	25	26	26	26	26	26	26		
rectangle	40G5	39G4	40G4	40G4	40G4	38G4	39G6	39G6	40G6	41G7	41G7	39G7	39G7	40G7	41G7	40G8	40G8	39G8	39G8	39G8	39G8		
trawl-typ	PSN388																						
# cod-end (mm)	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12		
haul	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42		
trawl-time (min)	30	30	20	30	30	30	20	30	30	30	30	20	30	30	30	30	30	30	30	30	30		
bottom-depth (m)	75.5	68.5	79	39.5	68	55.5	80.5	58	60.5	67.5	34.5	75	80	64.5	64	67	96.5	86	62.5	95	91		
mean-headline-depth (m)	69	61	68	12	58	49	72	52	55	57	57	68	64	55	58	50	82	75	42	77	77		
trawl-distance (nmi)	1.90	1.95	1.35	2.00	1.93	1.97	1.35	1.98	1.90	1.98	2.12	1.95	1.34	2.03	1.94	1.94	2.04	2.01	1.91	2.07	2.03		
BELONE BELONE																							
CLUPEA HARENGUS	6.23	0.09	5.59	55.91		10.56	4.73	21.02	146.91	5.94			7.03	0.18	29.50		0.51		1.13	0.02	0.35	0.29	
CYCLOPTERUS LUMPUS																							
GADUS MORHUA	548.97	0.84	2.27	7.26		27.99	1.47		1.60				47.61	2.01		0.93		9.91		3.27			
GASTEROSTEUS ACULEATUS	0.00	0.00									4.04		0.00		0.01								
HYPEROPLUS LANCEOLATUS																							
MERLANGIUS MERLANGUS	0.08	0.23																					
PLATICHTHYS FLESUS	0.10						0.40							0.70				0.33					
PLEURONECTES PLATESSA																							
SALMO TRUTTA																							
SCOMBER SCOMBRUS	0.39																					1.01	
SPRATTUS SPRATTUS	220.38	23.62	681.84	306.52		198.76	154.74	462.16	341.24	443.13				34.96	141.42	0.15	164.98	11.19	12.29	532.06	8.49	3.17	49.18
	775.76	24.55	690.10	0.00	369.92	237.30	159.86	484.65	489.75	449.07	4.04	90.30	141.60	0.15	196.49	11.20	12.80	534.11	9.52	13.76	52.75		

station	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	
sub-division	26	26	26	28	28	28	28	28	28	28	28	28	28	27	27	27	27	27	27	27	27	
rectangle	40G8	41G8	41G8	42G8	42G8	43G9	43G8	43G8	43G9	44G9	44G9	44G9	45G9	45G9	45G9	46G8	46G8	45G8	44G7	43G7	42G7	
trawl-typ	PSN388																					
# cod-end (mm)	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
haul	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	
trawl-time (min)	30	30	30	30	30	30	30	30	30	22	30	30	30	30	30	30	30	30	30	30	30	
bottom-depth (m)	87.5	118.5	119.5	99	110.5	162.5	77	28.5	120	120	75	132	177	140	149	239	235.5	126.5	98.5	105	91.5	
mean-headline-depth (m)	77	90	107	86	75	80	70	15	75	80	70	75	75	75	75	75	25	80	70	70	70	
trawl-distance (nmi)	2.04	2.14	2.01	1.97	1.90	1.93	1.81	1.99	1.83	1.88	1.37	1.89	1.91	1.98	1.82	1.94	1.85	1.95	1.90	1.92	1.95	
BELONE BELONE																						
CLUPEA HARENGUS	1.60	0.14	0.31	0.12	1.27	0.97	55.55	6.21	3.12	1.33	32.58	7.70	0.78	6.40	2.59		1.79	5.32	15.79	43.15	23.79	
CYCLOPTERUS LUMPUS																						
GADUS MORHUA	0.66	0.41		0.05		0.11		0.13	0.74	1.26	0.47	0.43	0.73		0.87		0.94	0.96	7.63			
GASTEROSTEUS ACULEATUS			0.09	0.66		0.12	13.62	0.07	0.03	0.33	0.41	0.21	0.65	13.50	4.00	10.16	2.34	0.71	0.60	0.09		
HYPEROPLUS LANCEOLATUS																						
MERLANGIUS MERLANGUS																						
PLATICHTHYS FLESUS				0.53	0.36	0.34						0.25	0.25	0.70			0.25	0.11				
PLEURONECTES PLATESSA													0.70									
SALMO TRUTTA																						
SCOMBER SCOMBRUS																						
SPRATTUS SPRATTUS	107.36	57.76	13.54	9.45	113.06	76.78	31.06	5.74	303.50	15.88	187.08	95.34	36.40	65.67	7.20		0.70	11.42	47.68	7.32	37.82	
	109.62	57.90	13.85	10.59	114.70	78.80	86.73	25.57	306.80	17.62	220.73	104.96	38.56	73.84	13.50	14.52	12.64	19.95	65.37	52.03	69.43	