

**Cruise report
Cruise number 756 FRV „SOLEA“
08/11/ - 25/11/2018**

**Baltic International Trawl Autumn Survey (BITS) in the
Arkona Sea, Mecklenburg- and Kiel Bight (ICES SD 24+22)**

Scientist in charge: **Dr. A. Velasco**

1. Summary

The 756th cruise of the FRV “SOLEA” is the 37st November survey since 1981. It was part of the Baltic International Trawl Survey (BITS) which was coordinated by ICES WGBIFS. The main objective of the survey was the estimation of fishery independent stock indices for both Baltic cod stocks, flounder and other flat fish.

In total 52 fishery and 52 hydrography stations were carried out.

A preliminary analysis of the survey results suggests a weak year class of cod in 2018 as compared with the previous year class 2017 (recruits at length range 10-25 cm). The proportion of cod between 26-40 cm was lower in all depth layers as compared to the previous year, with exception of the depth layer of 10–39 m in SD 24.

The abundance of flounder as compared to the previous year decreased in SD 22 and in SD 24.

The oxygen concentration close to the bottom was above 2.8 ml/l.

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2. Research programme

The cruise took place from 08th until 25th November 2018. Corresponding to the recommendations of the WGBIFS in 2007, the survey of the FRV "SOLEA" covered the subdivisions 22 and 24 (Figure 1).

The following stock assessment objectives were covered during the survey:

- Collecting data for assessing stock indices, the structure and recruitment of the stocks, especially for cod and flatfish
- Monitoring the composition of fish species in the western Baltic Sea
- Collecting samples of cod and flounder for biological investigations (i.e. sex, maturity, fecundity, age)
- Monitoring the actual hydrographical situation in the survey area

3. Narrative

The internationally coordinated trawl survey is planned as a Stratified Random Survey where ICES subdivisions and depth layers are used as strata. A total of 59 stations (45 in subdivision 24 and 14 in subdivision 22) were planned for the German part of the survey which covered the southern part of ICES subdivision 22 and subdivision 24 in total. The haul positions were selected from the TOW Database by the coordinator of the BITS surveys (ICES 2008, WGBIFS report as reference). 53 fishing stations were realized and can be used for stock assessment. The fishing hauls were carried out between 7:00 and 15:00 UTC (8:00 and 16:00 local time).

The positions of the trawl hauls are shown in Figure 1. 11 fishing hauls and 14 hydrographic stations were done in subdivision 22, and 38 fishing hauls and 44 hydrographic stations were realized in subdivision 24.

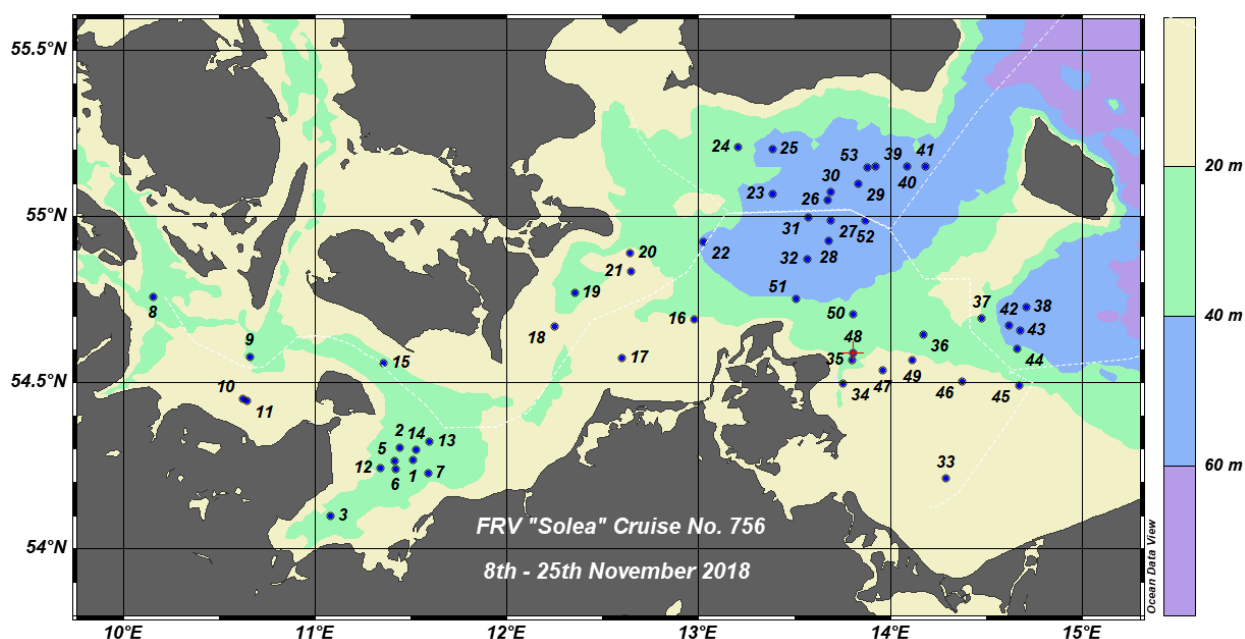


Fig. 1 Stations of the 756th FRV "SOLEA" cruise (Ocean Data View, R. Schlitzer, www.awi-bremerhaven.de/GEO/ODV)

The numbers of fishing hauls and hydrographic stations by subdivision and 10 m depth layers are given in Table 1. The 14 hauls in subdivision 22 were located at depths from 10 m to 29 m and 20 of 38 hauls in subdivision 24 between 40 and 59 m.

Tab. 1 Sampling intensity (evaluated fishing stations)

Area		Stations		
Subdivision	Stratum Depth [m]	Total trawl distance [sm]	Fishing [n]	Hydrography [n]
22	1 [10-19]	3.2	2	2
	2 [20-29]	20.6	12	12
24	1 [10-19]	12.2	8	8
	2 [20-39]	8.3	6	6
		5.4	4	4
	3 [40-59]	28.3	18	18
		3.1	2	2

Trawling was done with the standard BITS trawl "TV3 520#". The stretched mesh size in the codend was 20 mm. The duration of each haul was 30 minutes at a velocity of 3 kn as required in the BITS manual. The total catch of a haul was analysed to determine species composition in weight and number as well as the length distribution of all species. Subsamples of cod, flounder, plaice, dab and turbot were investigated concerning sex, maturity and age.

Vertical profiles of the hydrographical parameters temperature, salinity and oxygen were sampled from the surface to the bottom immediately after every fishing haul with a CTDO probe (Sea Bird 19 +).

4. Preliminary results

4.1. Biological data

In total 787 cod, 574 flounder, 831 plaice, 594 dab, 211 turbot and 34 brill were collected for measuring length, weight, sex, maturity and age. The total catches and numbers of length samples of cod and flounder are given in Table 2 by subdivision and depth stratum.

Tab. 2 Numbers of length measurements of cod and flounder by depth stratum and ICES subdivision

Area		Sample			
		Cod		Flounder	
Subdivision	Depth [m]	Weight [kg]	Number [n]	Weight [kg]	Number [n]
22	10-29	23.7	82	59.5	197
24	10-19	275.5	742	260.7	1063
	20-39	1642.6	3269	636.6	2675
	40-59	1578.2	4157	731.5	3256

Area		Sample			
		Plaice		Dab	
Subdivision	Depth [m]	Weight [kg]	Number [n]	Weight [kg]	Number [n]
22	10-29	468.3	2253	809.9	8176
24	10-19	83.2	349	100.3	761
	20-39	172.0	988	75.6	603
	40-59	1935.3	10045	44.2	273

The mean catch per hour (CPUE) was 86,8 kg of cod and 41,6 kg of flounder. In general the catch composition was dominated by cod and flounder. However, plaice and dab were also abundant in the catches. The mean fraction of cod biomass in the hauls was 32,7 % and mean fraction of flounder, plaice and dab was 15,7 %, 24,7 % and 9,6 %, respectively. sprat and herring represented 6.5 % of the total biomass in mean.

The highest abundances in weight and number of cod and flounder were observed in subdivision 24 in depths between 20 - 39 m.

Mean CPUE of cod and flounder are given in Table 3 by subdivision and depth stratum.

Tab. 3 Mean CPUE of cod and flounder and average individual weights by subdivision and depth

Area		Catch							
		Cod				Flounder			
Subdivision	Depth [m]	Weight [kg/sm]	Number [n/sm]	Average Weight [g]	Stations [n]	Weight [kg/sm]	Number [n/sm]	Average Weight [g]	Stations [n]
22	10-29	1	3	288.7	14	2.5	8	302.1	14
24	10-19	22.5	61	371.3	8	21.3	87	245.3	8
	20-39	119.6	238	502.5	10	46.3	195	238	10
	40-59	50.3	132	379.6	20	23.3	104	224.7	20

Area		Catch							
		Plaice				Dab			
Subdivision	Depth [m]	Weight [kg/sm]	Number [n/sm]	Average Weight [g]	Stations [n]	Weight [kg/sm]	Number [n/sm]	Average Weight [g]	Stations [n]
22	10-29	19.7	95	207.9	14	34.1	345	99.1	14
24	10-19	6.8	29	238.4	8	8.2	62	131.9	8
	20-39	12.5	72	174.1	10	5.5	44	125.4	10
	40-59	61.7	320	192.7	20	1.4	9	162.3	20

The frequencies of cod grouped by subdivision and depth strata are presented in Figures 1 to 3.

Noteworthy is the low abundance of young cod ranging in length from 10 to 25 cm in the subdivisions 24 and 22. The length range 26–40 cm of cod recruits compared to the previous year has significantly decreased in all depths layers in the subdivisions 24 and 22 with exception of the depth layer 10-39 m in subdivision 24 (Table 4 and Figures 2 to 4).

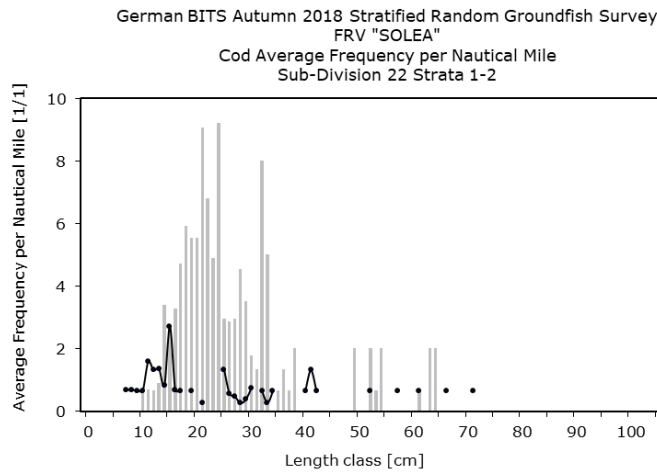


Fig. 2 Length frequencies of cod in number per mile in depth strata 10 m to 29 m in SD 22 2018 (line) and 2017 (bars), (14 Hauls)

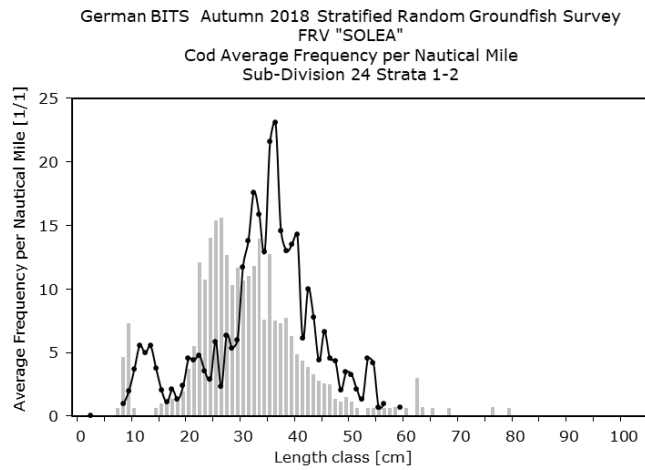


Fig. 3 Length frequencies of cod in number per mile in depth strata 10 m to 39 m in SD 24 2018 (line) and 2017 (bars), (18 Hauls)

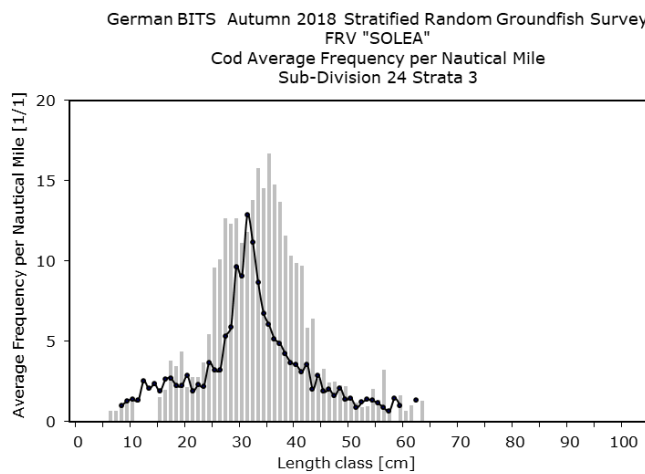


Fig. 4 Length frequencies of cod in number per mile in depth strata 40 m to 59 m in SD 24 2018 (line) and 2017 (bars), (20 Hauls)

Tab. 4 Recruitment of length groups of the year 2018 in comparison to the previous year

Area		Catch	2018		
Subdivision	Depth [m]	Length range [cm]	Number [n]	Number/ Mile [n/sm]	Trawl distance [sm]
22	10-29	26 - 40	21	1	23,7
24	10-19		396	32	12.2
	20-39		2448	178	13.7
	40-59		2951	94	31.4
22 - 24	10-59		5816	72	81.1
22	10-29	10 - 25	48	2	23.7
24	10-19		209	17	12.2
	20-39		150	11	13.7
	40-59		571	18	31.4
22 - 24	10-59		978	12	81.1

Area		Catch	2017		
Subdivision	Depth [m]	Length range [cm]	Number [n]	Number/ Mile [n/sm]	Trawl distance [sm]
22	10-29	26 - 40	147	9	16.4
24	10-19		342	29	12.0
	20-39		2288	139	16.5
	40-59		6878	190	36.1
22 - 24	10-59		9655	119	80.9
22	10-29	10 - 25	668	41	16.4
24	10-19		74	6	12.0
	20-39		1041	63	16.5
	40-59		842	23	36.1
22 - 24	10-59		2625	32	80.9

Under the assumption that the survey covered all nursery grounds of cod, a weak year class 2018 (top table) compared to the year class 2017 (table below) can be assumed.

4.2 Hydrographical data

Figure 5 shows the distribution of temperature, salinity and oxygen near the bottom and at the surface in the covered area.

The hydrography was characterised by typical autumn conditions with surface temperatures between 7.7 °C and 11.4 °C. The salinity of the surface water decreased from 20.3 to 7.3 from west to east. The lowest temperature value was found in front of Møn at 7.7 °C. The salinity above the permanent halocline at a water depth of 23.6 m south of Bornholm was approx. 7.7. The salinity increased below the halocline at a depth of 45 m in the Arkona Basin up to 20.1

The oxygen concentration close to the bottom was between 2.1-11.8 ml/l.

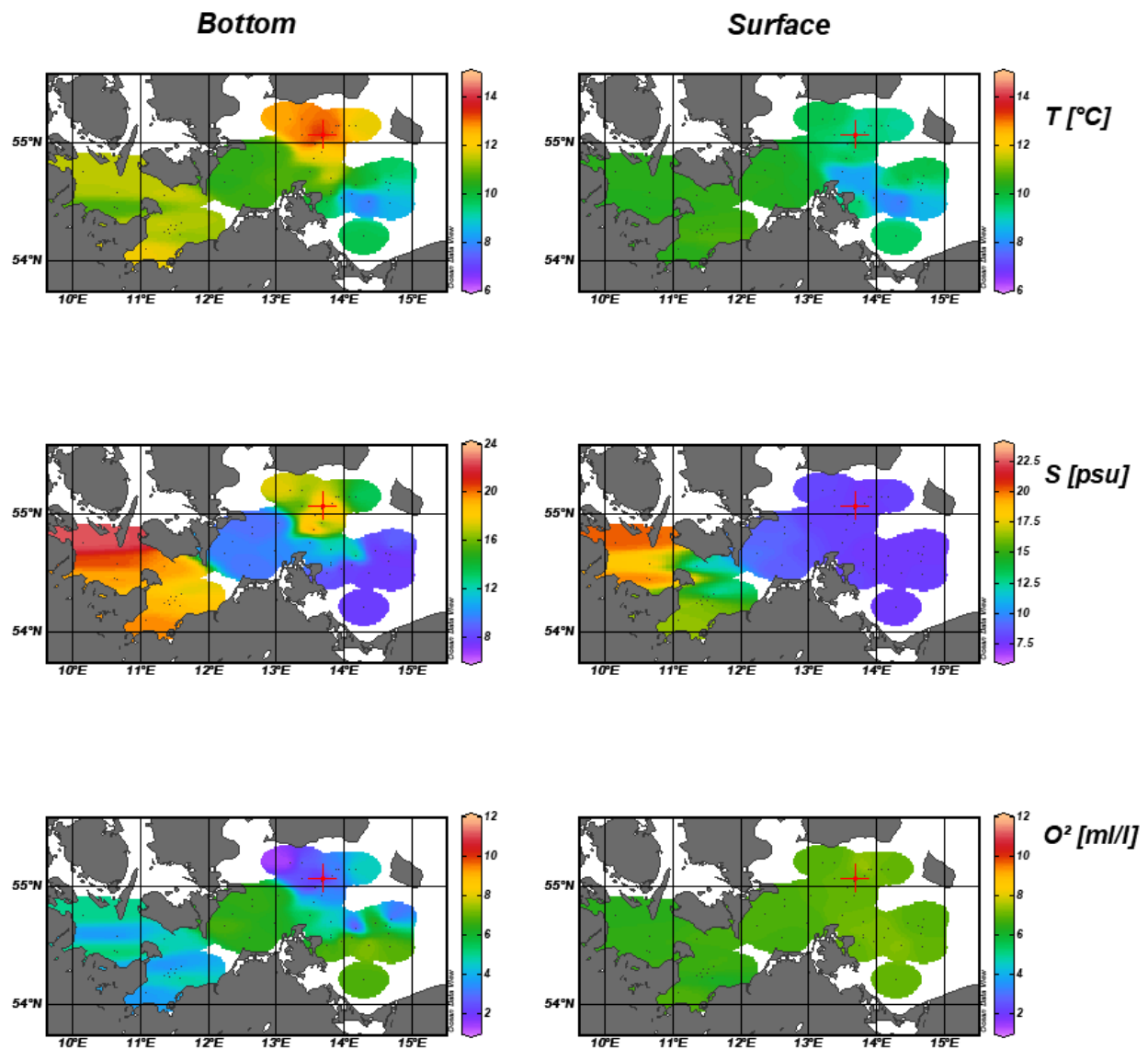


Fig. 5 Hydrography of the survey near the bottom (left) and at the surface (right)

5. Participants

A. Velasco	TI-OF	Scientist in charge
C. Albrecht	TI-OF	Technician
S. Dressler	TI-OF	Technician
S. Winning	TI-OF	Student helper
R. Wiechert	TI-OF	Technician
R. Klinger	University of Hamburg	Ph. D. Student
S. Eskildsen	DTU Aqua, DK	Technician
M. Bächtiger	University of Hamburg	Student helper

6. Acknowledgements

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sgd. Scientist in charge