



Leibniz Institute for Baltic Sea Research Warnemünde

Cruise Report

r/v "Elisabeth Mann Borgese"

Cruise-No. 06EZ/12/13

Monitoring Cruise
25 July – 4 August 2012
Kiel Bight to Northern Baltic Proper

This report is based on preliminary data

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1. **Cruise No.:** 06EZ/12/13
2. **Dates of the cruise:** from 25 July to 4 August 2012
3. **Name:** "Elisabeth Mann Borgese"
Nationality: Germany
Operating Authority: Leibniz Institute of Baltic Sea Research (IOW)

4. **Geographical area in which ship has operated:**
Kiel Bight to Northern Baltic Proper

5. **Dates and names of ports of call**
28.07.2012: Saßnitz

6. **Purpose of the cruise**
Baltic monitoring in the frame of the COMBINE Programme of HELCOM

7. **Crew:**
Name of master: Uwe Scholz
Number of crew: 10

8. **Research staff:**
Chief scientist: Dr. N. Wasmund

Participants: Donath, Jan
Schuffenhauer, Ingo
Jakobs, Gunnar
Sadkowiak, Birgit
Lerz, Astrid
Tschakste, Andrea
Pöttsch, Michael
Kießlich, Katrin
Oestmann, Jan
Puk, Laura

9. **Co-operating institutions:**
All institutions dealing with HELCOM monitoring programmes.

10. **Scientific equipment**
CTDO bathysonde, water samplers, plankton nets, in-situ-pump

11. **General remarks and preliminary results**

The area under investigation extended from Kiel Bight to the Northern Gotland Sea (station map see Figs. 1 and 2). On the way back, selected HELCOM stations in the Bornholm Sea, Arkona Sea and Mecklenburg Bight were sampled a second time for nutrient, phytoplankton and zooplankton data. The hydrographical, chemical and biological investigations were performed according to the Manual of the COMBINE Programme of HELCOM.

Concerning the conditions, the cruise can roughly be divided into 4 periods:

- 1.) The first part of the cruise covered the western Baltic and the Arkona Sea; it ended on the evening of 27 July in the port of Saßnitz, where one participant left the ship after her task was fulfilled. The first part of the cruise was characterized by high air pressure (1014-1016 hPa), low wind (<5 m/s, air temperature during the day > 18°C

and blue sky. Due to the calm conditions, the water column was strongly stratified. In Mecklenburg Bight and Kiel Bight, a lot of jellyfish (*Aurelia aurita*) drifted in the water with maximum occurrence in the Fehmarn Belt. The halocline started at a depth of 17 m in Kiel Bight, but in the deeper areas of Mecklenburg Bight (Stat. TF0012), salinity increased continuously with depth from 12 g/kg at the surface to 24 g/kg near the bottom. In the Arkona Sea, an intrusion of higher temperature (15 °C) and slightly higher salinity (9.5 g/kg) was found at stations TF0115 and TF0114 at a depth of 18-22 m and 24-29 m, respectively, and even at stat. TF0111 (19-24 m), but it dissipated at stations TF0069 and FT0113, forming some deeper temperature peaks. This roughness in the vertical T and O₂ profiles indicated quite recent water substitution processes. In the strong salinity gradient near the bottom, the oxygen concentration decreased to <2 ml/l in some deeper areas (> 43 m). Jellyfish was rare in the Arkona Sea and Pomeranian Bight, but cyanobacteria aggregates appeared, which enriched to surface blooms in some areas: east of station TF0115, at stations TF0069 and TF0152 and in the central Pomeranian Bight. The cruise was continued in the morning of the 28 July 2012, simultaneously with a change of weather conditions.

- 2.) The main part of the cruise extended from Saßnitz (28.7.2012) via Bornholm Sea, Eastern Gotland Basin (station 271), Landsort Deep (station 284) and western Gotland Sea back to the Bornholm Sea (3.8.2012). In this period, two deep-pressure fronts (1004 hPa) crossed the area while cruising in the Bornholmgat (on 28.7.2012) and in the southern Gotland region (on 29.7.2012; this time with thunderstorm and wind up to 14 m/s), From 30 July to the morning of 2 August, i.e. during the track from the Eastern Gotland Sea (Stat. 271) to the Landsort Deep (Stat. 284), air pressure increased from 1011 to 1018 hPa and it became partly sunny with wind speed from 5 to 12 m/s. The 3.8.2012 was cloudy (1012-1015 hPa). Due to wind and waves the surface water was mixed what inhibits the development of cyanobacteria blooms. During an earlier cruise with R/V "Meteor" during the first three weeks of July 2012, the expected cyanobacteria bloom development in the Eastern Gotland Sea and the northern Baltic Proper was not detected. Also during the present cruise, only few cyanobacteria aggregates were visible in the water and no bloom appeared in the investigated areas of the Baltic Proper (except for Arkona Sea). The halocline started at about 50-53 m in the Bornholm Basin and at about 60-65 m in the Eastern Gotland Basin. In contrast to the summer cruise from 2011, when oxygen concentrations became zero below approximately 80 m depth in the Bornholm Basin, no oxygen depletion was found in that area in July 2012. In the Gotland Deep (stat. TF0271), oxygen was depleted below a depth of 89 m and in the Farö Deep (stat. TF0286), Landsort Deep (stat. TF0284) and Karlsö Deep (stat. 245) at about 90 m. The inflow event from December 2011 was obviously too small to reach the Gotland Basin.
- 3.) When the Arkona Sea was reached on 3 August 2012, it became sunny and the wind decreased. Correspondingly, cyanobacteria enriched at the surface in smaller areas, e.g. 3 nm east of station TF0113. At that station, a layer of slightly increased salinity and temperature was still found at 15-19m depth. In Mecklenburg Bight (on 4.8.2012, stat. TF0046), the wind calmed down to about 1 m/s and cyanobacteria appeared at the surface in larger areas. Nevertheless, Secchi depth was 7.5 m. Also *Aurelia aurita* appeared again.

The surface water temperatures (0-10 m; °C) of selected stations of this cruise are compared with early long-term mean values (1971-1990, numbers in brackets) collected during our summer cruises (end of July-beginning of August) in the 1970s and 1980s in the table below. They reflect that the summer 2012 was nearly as cold (cloudy and windy) as that of 2011, which becomes obvious in comparison with surface water temperatures of a warm summer (2010):

Area:	2012	2011:	2010:	1971-1990:
Mecklenburg Bight (stat. TF0012)	17.3	17.2	19.0	17.7
Arkona Sea (stat. TF0113)	19.1	17.3	22.6	17.0
Bornholm Sea (stat. TF0213)	18,4	18.5	18.4	17.6
Eastern Gotland Sea (stat. TF0271)	16.9	19.1	22.0	17.3
Farö Deep (stat. TF0286)	17.1	19.4	20.9	17.7
Landsort Deep (stat. TF0284)	15.9	17.9	19.4	18.2
Karlsö Deep (stat. TF0245)	17.7	17.3	20.9	16.9

The long-term trend of increasing water temperature [°C] in the deep water layers in the western and northern deeps was not continuing but nevertheless recent deep-water temperatures are still higher than the mean values of the 1970s and 1980s:

	July 2012	Aug. 2011	July 2010	July 2007	July 2005	July 2003	Mean 1971-1990
Bornholm Deep	6.6	6.1	7.5	8.8	7.0	3.7	6.1
Gotland Deep	6.4	6.4	6.4	6.8	6.0	4.6	5.6
Farö Deep	6.2	6.4	6.8	6.1	6.0	6.0	5.2
Landsort Deep	5.4	5.9	6.1	5.7	5.8	5.9	4.8
Karlsö Deep	5.3	5.4	5.5	5.1	5.3	4.9	4.2

Attachments

- Tables 1& 2: Preliminary results for selected parameters in the surface layer and the near-bottom layer (unvalidated results)
- Figs. 1-3: Station grid (total grid and two sub-maps)
- Fig. 4: Transsect from the Kiel Bight to the Farö Deep for temperature, salinity and oxygen (unvalidated data)
- Fig. 5: Oxygen /hydrogen sulphide concentrations in the near-bottom layer for selected stations

Dr. Norbert Wasmund
Scientist in charge

Table 1: Surface layer (0 - 10m)

Area	Station	Temperature	Salinity	PO ₄ ³⁻	NO ₂₃ ^{-*}
Date	Name/ No. **	°C	PSU	µmol/dm ³	µmol/dm ³
Kiel Bight 25.07.2012	TF0360/ 005	18.5	14.90	0.01	0.26
Meckl. Bight 26.07.2012	TF0012/ 007	17.3	12.02	0.07	0.18
Lübeck Bight 26.07.2012	TF0022/ 006	17.5	12.03	0.04	0.21
Arkona Basin 26.07.2012	TF0113/ 017	19.1	7.87	0.07	0.19
Bornholm Deep 29.07.2012	TF0213/ 040	18.4	7.55	0.21	0.14
Stolpe Channel 29.07.2012	TF0222/ 042	18.3	7.37	0.16	0.12
SE Gotland Basin 29.07.2012	TF0259/ 044	18.4	7.30	0.07	0.30
Gotland Deep 30.07.2012	TF0271/ 051	16.9	7.02	0.08	0.23
Fårö Deep 31.07.2012	TF0286/ 053	17.1	6.94	0.06	0.28
Landsort Deep 02.08.2012	TF0284/ 056	15.9	5.81	0.12	0.16
Karlsö Deep 02.08.2012	TF0245/ 058	17.7	6.70	0.09	0.21

* $\Sigma \text{NO}_2^- + \text{NO}_3^-$; NO₂ was present only in traces in most areas under investigation

** Station name see maps (Fig. 1 - 3)

Table 2: Bottom-near water layer

Area	Station	Sampl. Depth	Temp.	Salinity	O ₂	PO ₄ ³⁻	NO ₂₃ ^{-*}
Date	Name/ No. **	m	°C	PSU	cm ³ /dm ³	μmol/dm ³	μmol/dm ³
Kiel Bight 25.07.2012	TF0360/ 005	17	12.7	22.59	4.10	0.07	0.31
Meckl. Bight 26.07.2012	TF0012/ 007	23	10.4	24.18	3.71	0.87	2.12
Lübeck Bight 26.07.2012	TF0022/ 006	20	10.5	19.12	2.24	0.84	4.48
Arkona Basin 26.07.2012	TF0113/ 017	45	14.4	16.65	4.93	0.46	1.25
Bornholm Deep 29.07.2012	TF0213/ 040	86	6.6	15.66	0.64	1.33	11.41
Stolpe Channel 29.07.2012	TF0222/ 042	88	4.7	12.30	2.70	1.62	6.44
SE Gotland Basin 29.07.2012	TF0259/ 044	86	5.0	10.22	0.29	2.69	4.09
Gotland Deep 30.07.2012	TF0271/ 051	231	6.4	12.19	-7.60	5.45	0.00
Fårö Deep 31.07.2012	TF0286/ 053	186	6.2	11.64	-4.09	4.67	0.00
Landsort Deep 02.08.2012	TF0284/ 056	423	5.4	10.51	-0.60	3.80	0.00
Karlsö Deep 02.08.2012	TF0245/ 058	106	5.3	9.80	-0.92	3.65	0.00

* $\Sigma \text{NO}_2^- + \text{NO}_3^-$; NO₂ was present only in traces in most areas under investigation

** Station name see maps (Fig. 1 - 3)

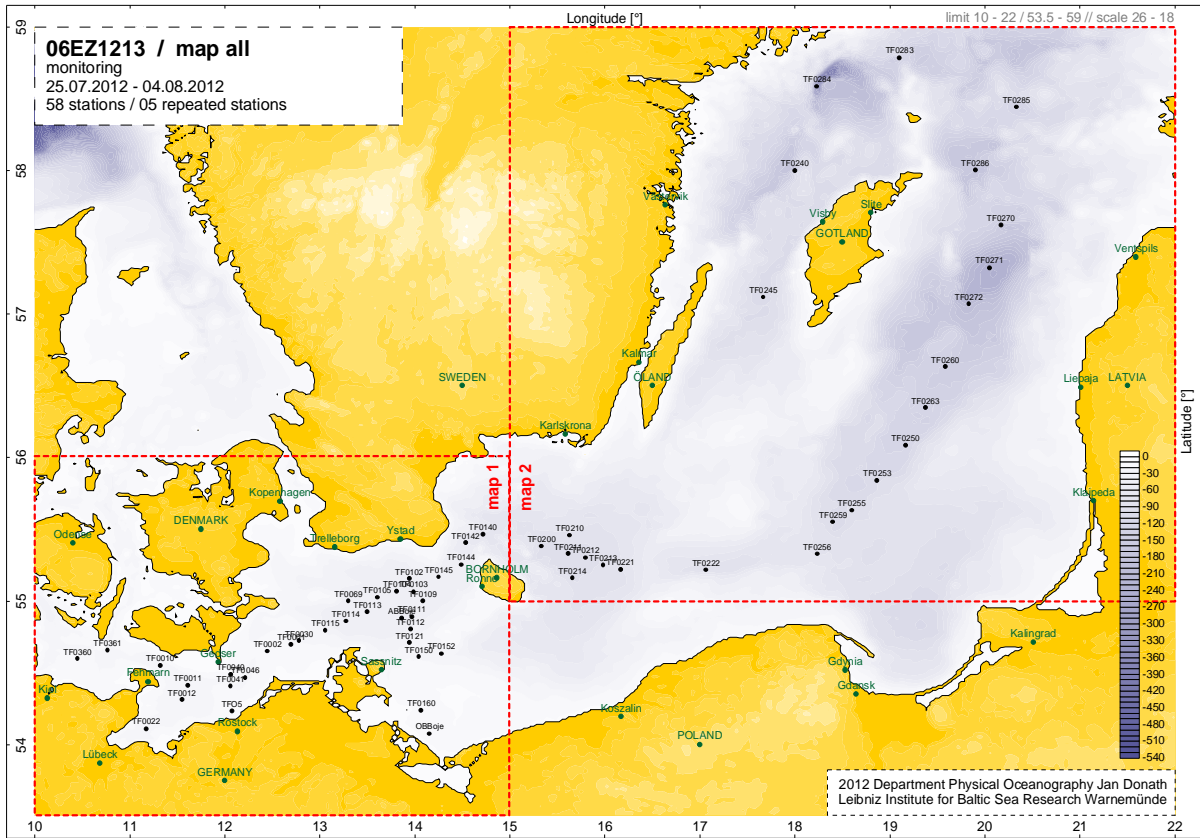


Fig. 1: Total map of the stations of the cruise 06EZ1213.

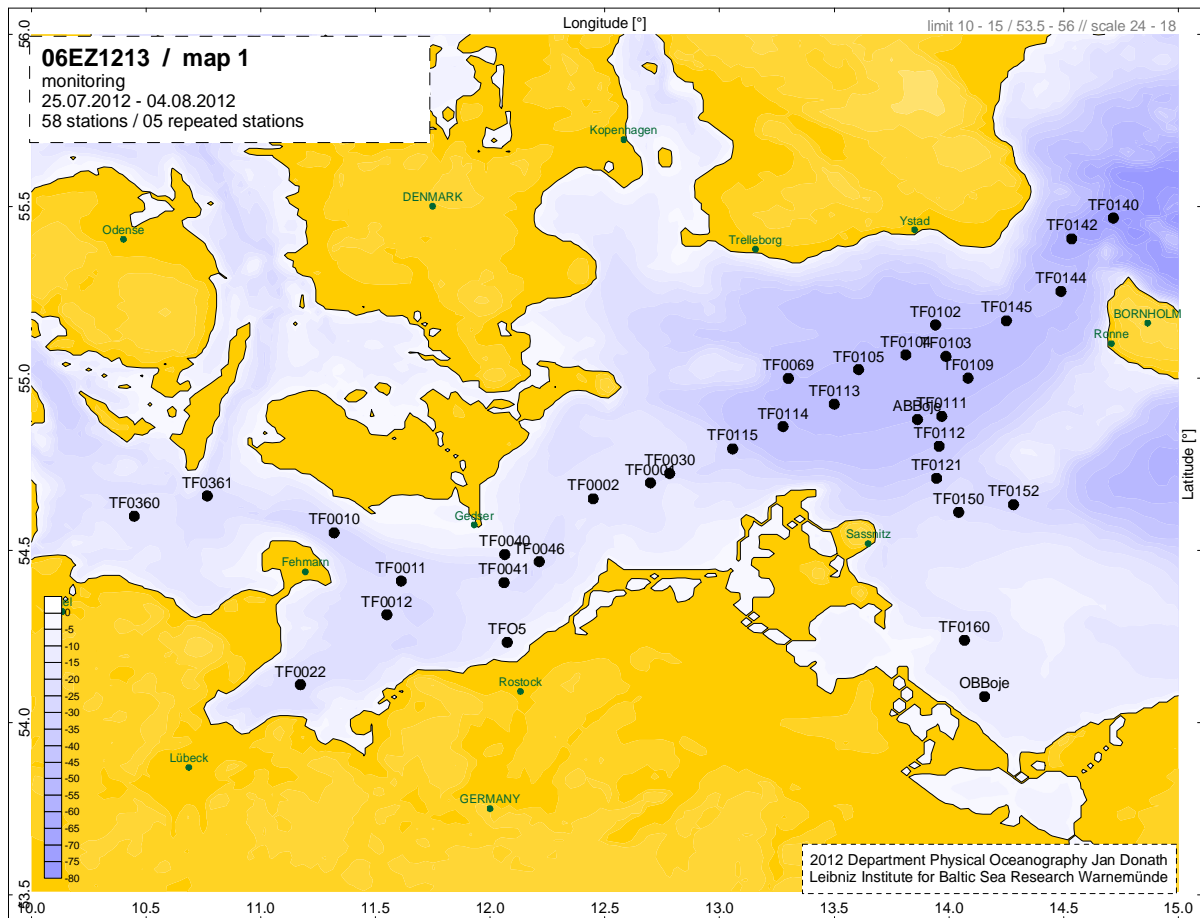


Fig. 2: Detailed map of the western Baltic Sea with sampling stations of cruise 06EZ1213.

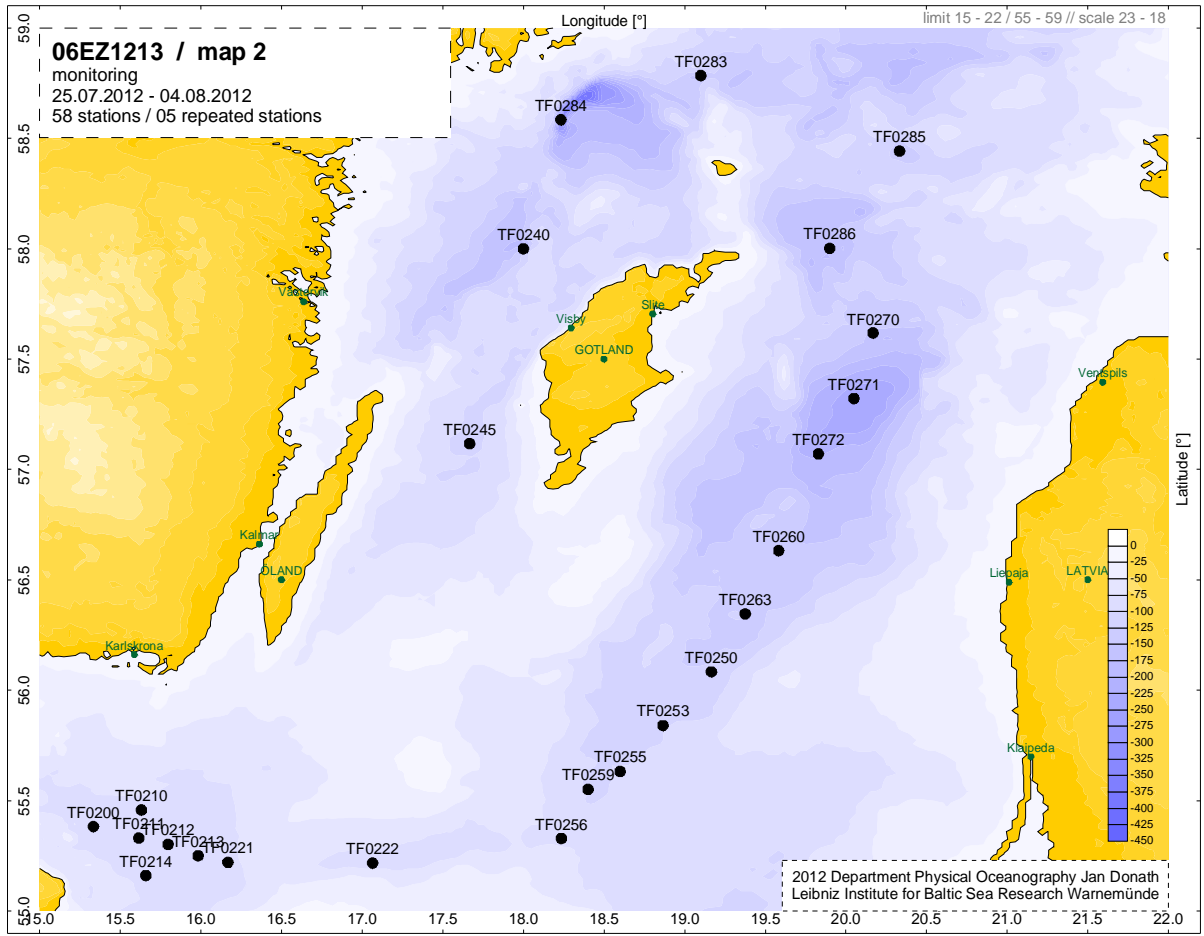


Fig. 3: Detailed map of the Baltic Proper with sampling stations of cruise 06EZ1213.

06EZ1206

Kiel Bight - Bornholm
25.07.2012 09:55 - 01.08.2012 04:59 UTC

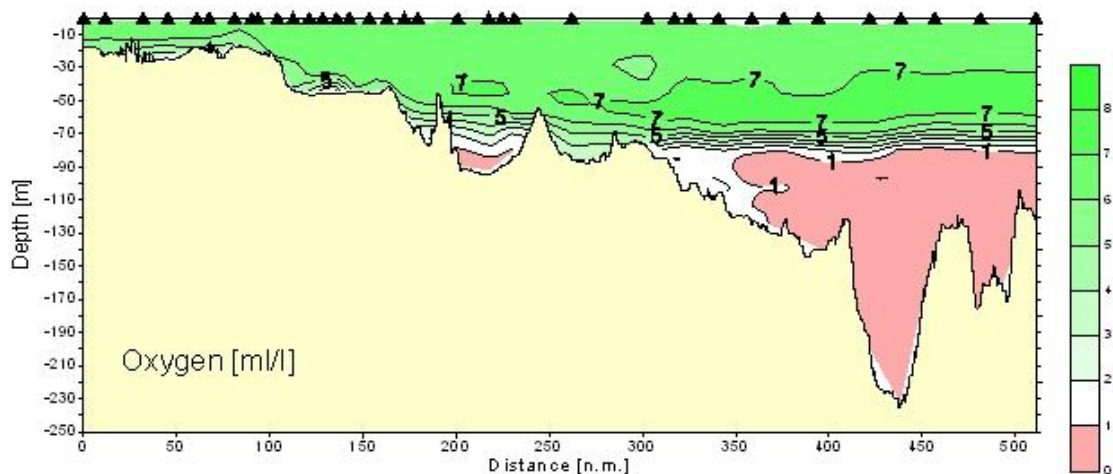
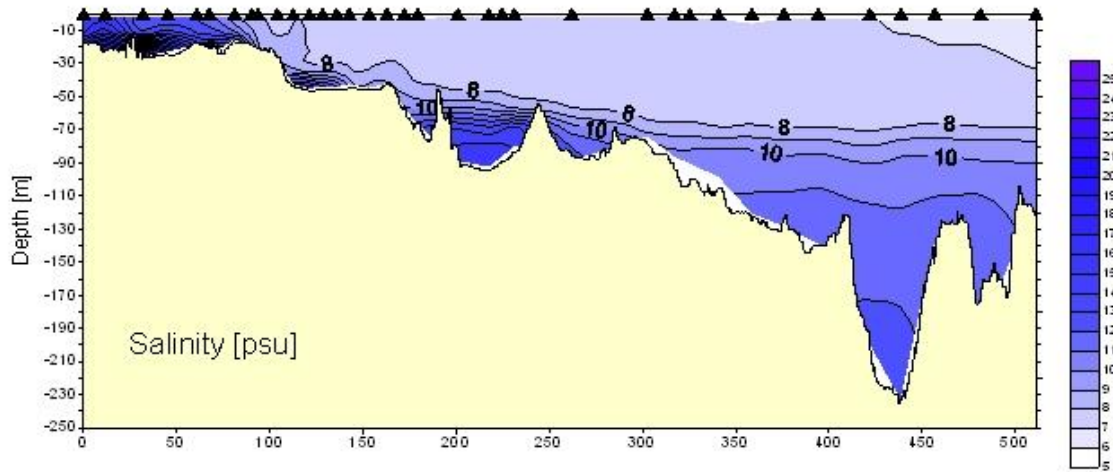
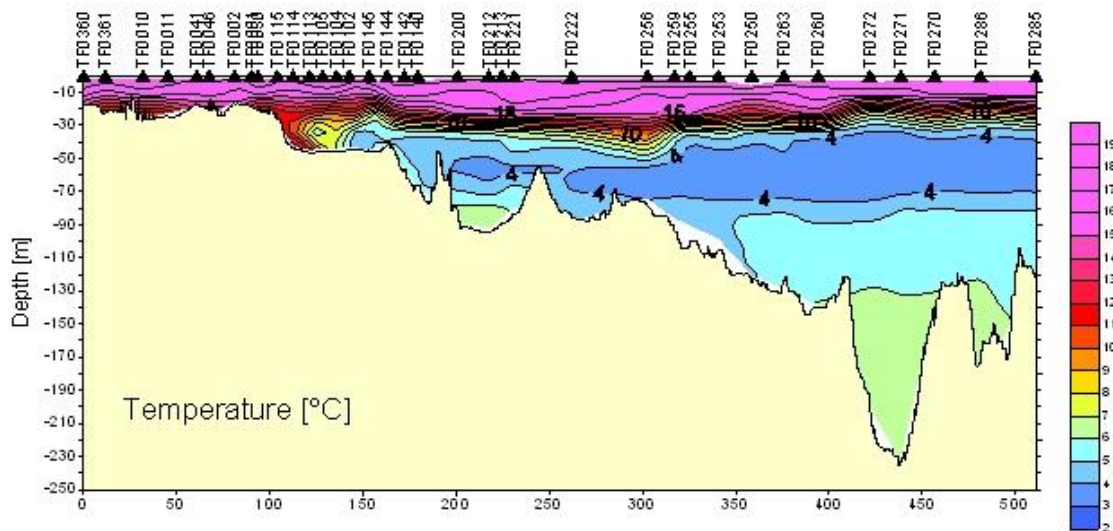


Fig. 4: Transect from the Kiel Bight to the Farø Deep for temperature, salinity and oxygen (unvalidated data)

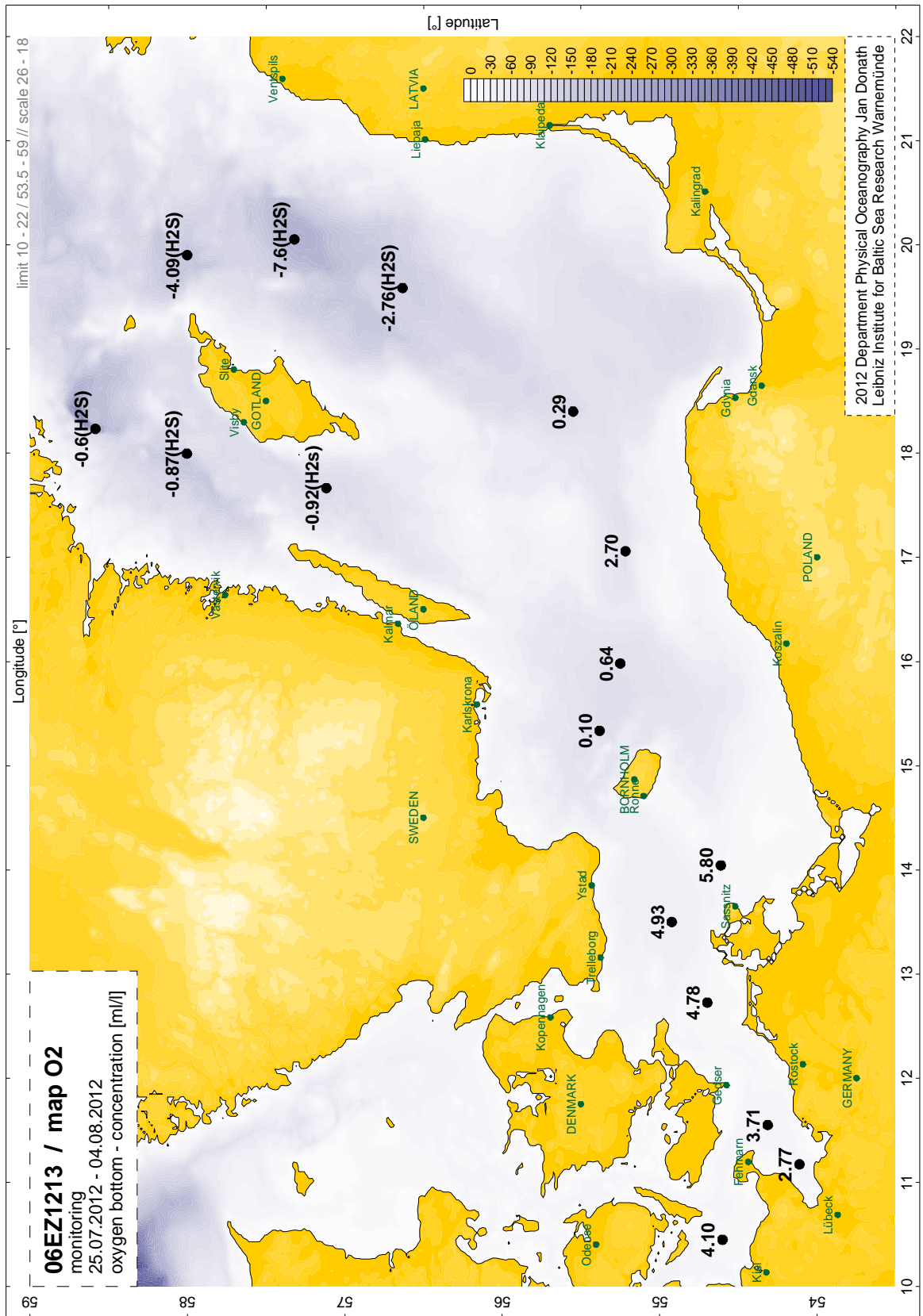


Fig. 5: Oxygen /hydrogen sulphide concentrations in the near-bottom layer for selected stations