

Baltic Sea Research Institute Warnemünde

Cruise Report

r/v "ALKOR"

Cruise- No. 06AK0805

Monitoring Cruise
15 November – 26 November 2008
Kiel Bight to northern Gotland Sea

This report is based on preliminary data

Institut für Ostseeforschung Warnemünde
an der Universität Rostock
Seestraße 15
D-18119 Rostock- Warnemünde
GERMANY

☎ +49-381-5197-0
📠 +49-381-5197 440

1. **Cruise No.:** 06AK0805
2. **Dates of the cruise:** from 15 November to 26 November 2008
3. **Particulars of the research vessel:**
Name: "ALKOR"
Nationality: Germany
Operating Authority: IfM Geomar Kiel
4. **Geographical area in which ship has operated:**
Kiel Bight to Northern Gotland Sea
5. **Dates and names of ports of call**
Saßnitz, 18. November 2008 – 21. November 2008
6. **Purpose of the cruise**
Baltic monitoring in the frame of the COMBINE Programme of HELCOM and IOW's long term data series in the central Baltic Sea
7. **Crew:**
Name of master: Lass
Number of crew: 12
8. **Research staff:**
Chief scientist: Dr. M. Schmidt

Participants: Glockzin, Ines
Sadkowiak, Bernd
Heene, Toralf
Hehl, Uwe
Dr. Bick, Andreas
Dankert, Jutta
Weinreben, Stefan
Hand, Ines
Meyer, David
Hagenmeier, Anna
9. **Co-operating institutions:**
All institutions dealing with HELCOM monitoring programmes.
10. **Scientific equipment**
CTD SBE 911+ with Dr. Haard Fluorometer
Autosal 8400B,
SBE 35 Deep Sea Thermometer
rosette with water samplers
plankton nets WP2, filtration set
van Veen grab, dredge
autoanalyser, 716 DMS Titrino, DMA 5000
ships weather station (WERUM)

11. General remarks and preliminary results

The cruise was carried out in the Baltic Sea from Kiel Bight to northern Gotland Sea, (see the attached station maps). The meteorological, hydrographical, chemical and biological investigations were performed according to the COMBINE Programme of HELCOM. For quality control of the hydrographic data daily comparison measurements are carried out. 62 hydrographic stations were worked. Each station started with a CTD cast measuring pressure, temperature, conductivity (salinity), photosynthetic active radiation oxygen concentration, fluorescence, phycoerythrin and turbidity, at most stations combined with water sampling for oxygen and nutrient determination and other biochemical measurements.

Comparing underway measurements with the thermosalinograph with CTD surface data the instrument output revealed as irrelevant. Hence, thermosalinograph data are not used.

At several stations plankton was sampled with WP2 nets, sample depth are chosen according to the measured temperature and salinity profiles. Chlorophyll-a samples are filtrated and frozen, other phytoplankton samples are conserved with Lugol.

In summer and autumn 2006 ctenophores of the species *Mnemiopsis leidyi* that stems from the American east coast are found first time in the Baltic Sea. They are now established there (see Postel und Kube, 2008¹) and their distribution between Kiel Bight and Bornholm Sea is monitored. The abundance of ctenophores was estimated in the regular WP2 net samples (100 µm) from different depth and also from additional sampling with a 400 µm WP2 net over the whole water column. Since the season started later in 2008, the estimated abundances correspond to the values found in October 2007. Also the west-east gradient with higher numbers of individuals in Kiel Bight and Mecklenburg Bight and smaller numbers east of Darß Sill is verified. In the Arkona Basin the abundance of *Mnemiopsis leidyi* below the halocline is higher than in the surface layer, which indicates a transport with inflowing saline water. In the Bornholm Basin the estimated concentrations resemble values of the previous year with 1 Ind/m³ below the halocline and 0.1 Ind/m³ in the layer above.

To investigate the density anomaly of Baltic seawater, density was estimated at 6 stations with help of a density meter DMA 5000 to be compared with the density calculated from the equation of state of seawater from temperature and salinity, measured with a salinometer AUTOSAL 8400 B. Samples were taken from the surface and from 50 m depth.

Near Arkona Sea buoy a current meter was laid out.

When the cruise started, a chain of low pressure areas was passing through with fresh westerly winds. Air temperature was below sea surface temperature favouring convective mixing. Accordingly, the seasonal thermocline was already dissolved in the area of investigation. In the evening of 16th station work was interrupted by severe north-westerly winds. Between 18th and 21th November the ship had to search for shelter in Sassnitz, because a severe westerly storm with sea state too high for field work. Later Bornholm Sea stations could be worked, but there was no chance to continue towards the central Baltic Sea. After a second break behind Greifswalder Oie the Ystad transect was worked completely. Later, the sea state was too high again for station work and the cruise was finished after repeating stations TF0046, TF0030 and TF0012. Hence, neither stations in the Western nor in the Eastern Gotland Basin could be worked. This gap in IOW's long term data series is hopefully closed later from other cruises.

¹Postel, L., and Kube, S. 2008.

A Matter of Time and Temperature: The Spread of *Mnemiopsis leidyi*. ICES Insight, 45: 16 -19

West of Darß Sill, in the **Lübeck Bight** (TF0022) and the entrance to **Kiel Bight** (TF0360) the surface water temperature is horizontally uniform about 10°C. Surface salinity varies between 12 off Kühlungsborn and 19.5 at TF0360. A thin bottom layer with saline and warmer water is found in the west but weak intrusions and haloclines indicate strong horizontal transport and mixing processes. Near Darß Sill the water column is completely mixed. Accordingly surface nitrate, phosphate and silicate are already enhanced and the vertical nutrient gradients are minor. In this area bottom oxygen concentration is never below 5 ml/l.

East of Darß Sill surface salinity is uniform around 8.4 (except station TF0160 under the influence of the Odra and Peene outflow). In the **Arkona Basin** surface layer thickness amounts about 30-35 m. Water in the bottom boundary layer is warmer and more saline, temperature is about 12°C, bottom water salinity reaches 18 at stations in the central Arkona Basin. However, working transect from Pommeranian Bight towards Ystad again at 22th and 23th of November reveals the halocline elevated to 15 m depth at stations at southern slope of the Arkona Basin, which indicates strong internal wave activity. Towards the Pommeranian Bight at stations shallower than 30 m, the saline bottom boundary layer is absent. At stations where depth exceeds the mixed layer depth, bottom nitrate concentration exceeds 7 µmol/l, phosphate is about 1 µmol/l but nutrient concentration in the surface water is low. Repeating station TF0030 at 25th of November salinity is considerably enhanced up to 16 at depth below 14 m. This indicates some inflow across Darß Sill, which, however, did not reach the central Arkona Basin during the cruise.

In the **Bornholm Sea** the typical main water bodies are found, i) a well mixed about 45-50 m thick surface layer with a temperature of 9 °C and salinity of 7.5, ii) a thin cold winter water layer with temperature of 6.6 °C and salinity of 8, iii) intrusions of warm more saline water, which lift up the winter water, iv) a slightly colder layer salinity above 15 and oxygen concentration below 1 ml/l and v) a more saline but warmer bottom layer. Bottom water at station TF0213 is oxic.

Between Kiel Bight and Arkona Basin (TF0360, TF0012, TF0010, TF0018, TF0030, TF0109, TF0152, TF0160) benthos is sampled with a grab and by dredging with drifting ship. At each station three parallel grab samples are taken supplemented by an additional sample for sediment type determination in the laboratory. Prevailing sediment type is fine sand, sand with silt and silt and the corresponding typical spectrum of species is found. Compared with previous years, nothing special could be noticed. Frequently found species are *Mytilus edulis*, *Macoma baltica*, *Crangon crangon*, *Arcatica islandica*, *Asterias rubens* and *Ophinra albida*. In the frame of an UBA-project of the University of Rostock additional samples are taken to find species of genus *spio*.

Dr. Martin Schmidt
Scientist in charge

Attachments

- Tables 1 and 2: Preliminary results for selected parameters in the surface layer and the near bottom layer (unvalidated results)
- Fig. 1: Station grid and cruise track
- Fig. 2: Transect from the Kiel Bight to the Bornholm Basin for temperature, salinity and oxygen (unvalidated data)
- Fig. 3: Meridional transect from Ystad to Odra Bight for temperature, salinity and oxygen (unvalidated data)
- Fig. 4: Repeated meridional transect from Ystad to Odra Bight for temperature, salinity and oxygen (unvalidated data)
- Fig. 5: Oxygen concentrations in the bottom near layer for selected stations

Table 1: Surface layer (0 - 10m)

Area	Station	Temp.	Salinity	NO ₂₃ ^{-*}	NH ₄	PO ₄ ³⁻	SiO ₄
Date	Name/ No. **	°C		μmol/l	μmol/l	μmol/l	μmol/l
Kiel Bight 16.11.08	TF0360/ 008	9.78	19.19	1.50	0.64	0.79	17.9
Meckl. Bight 15.11.08	TF0012/ 003	9.94	15.55	2.00	0.78	0.98	13.5
Lübeck Bight 15.11.08	TF0022/ 006	10.29	18.26	2.29	NA	0.86	18.4
Arkona Basin 17.11.08	TF0113/ 020	9.69	8.40	0.55	0.35	0.33	3.3
Pom. Bight 18.11.08 (0-6m)	TF0160/ 033	8.43	7.76	2.64	NA	0.70	7.36
Bornholm Deep 21.11.08	TF0213/ 035	9.20	7.62	1.32	0.22	0.43	7.00

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

** Station name see maps (Fig. 1)

Table 2: Bottom-near water layer

Area	Station	Sample Depth	Temp.	Salin.	O ₂	NO ₂₃ ^{-*}	NH ₄	PO ₄ ³⁻
Date	Name/ No. **	m	°C		ml/l	μmol/l	μmol/l	μmol/l
Kiel Bight 16.11.08	TF0360/ 008	17.5	10.21	20.72	6.45	2.48	0.56	0.93
Meckl. Bight 15.11.08	TF0012/ 003	23.5	10.69	20.76	5.97	1.71	1.29	0.86
Lübeck Bight 15.11.08	TF0022/ 006	22	10.32	18.38	6.34	2.96	NA	0.92
Arkona Basin 17.11.08	TF0113/ 020	46	12.36	18.47	3.66	7.32	0.09	1.16
Pom. Bight 18.11.08	TF0160/ 033	13	8.52	7.80	7.36	2.64	NA	0.7
Bornholm Deep 21.11.08	TF0213/ 035	87	8.21	15.20	0.3	7.15	NA	2.60

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

** Station name see maps (Fig. 1)

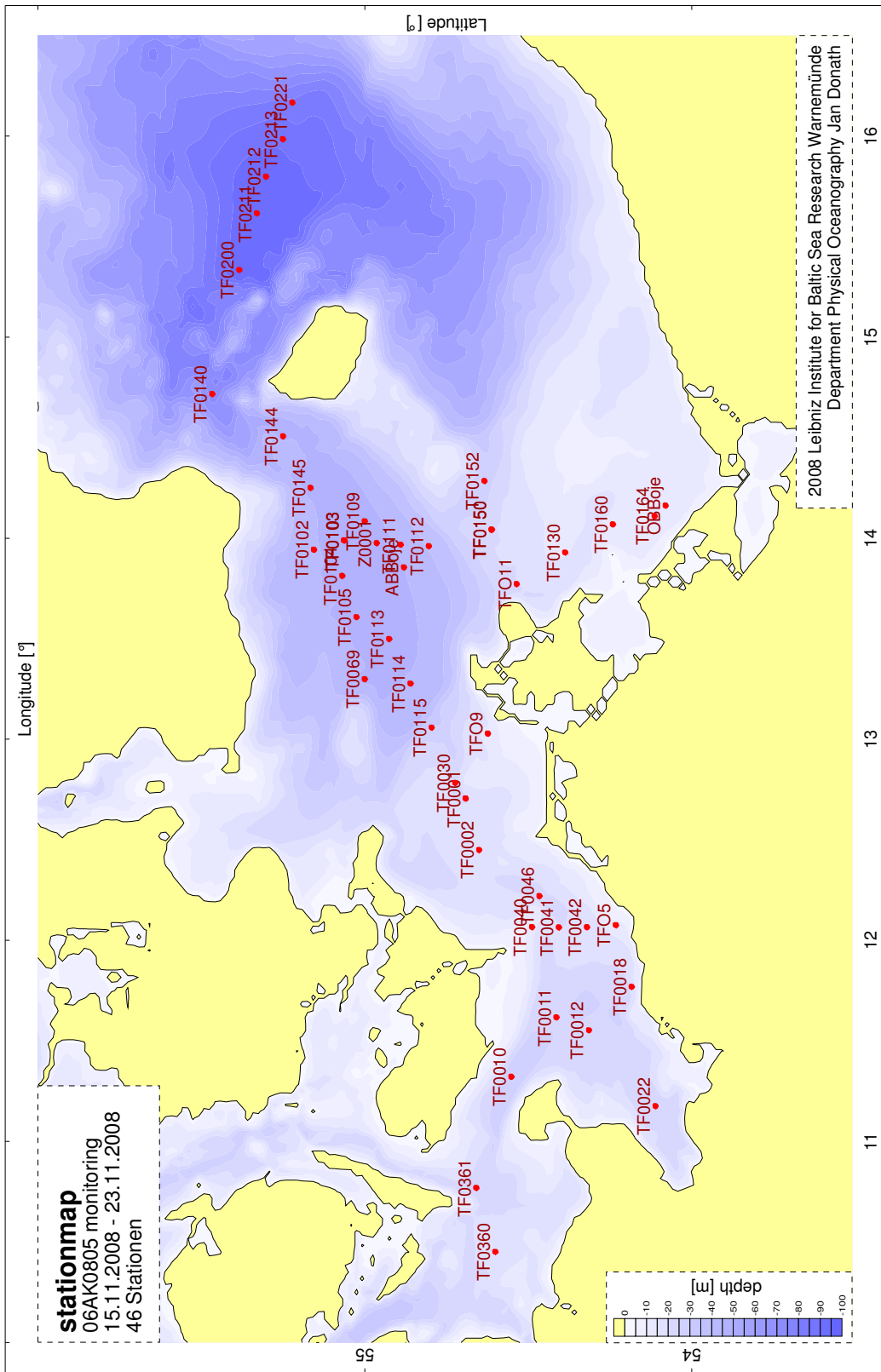


Figure 1

CTD Transect
15.11.2008 16:08 - 22.11.2008 07:17 UTC

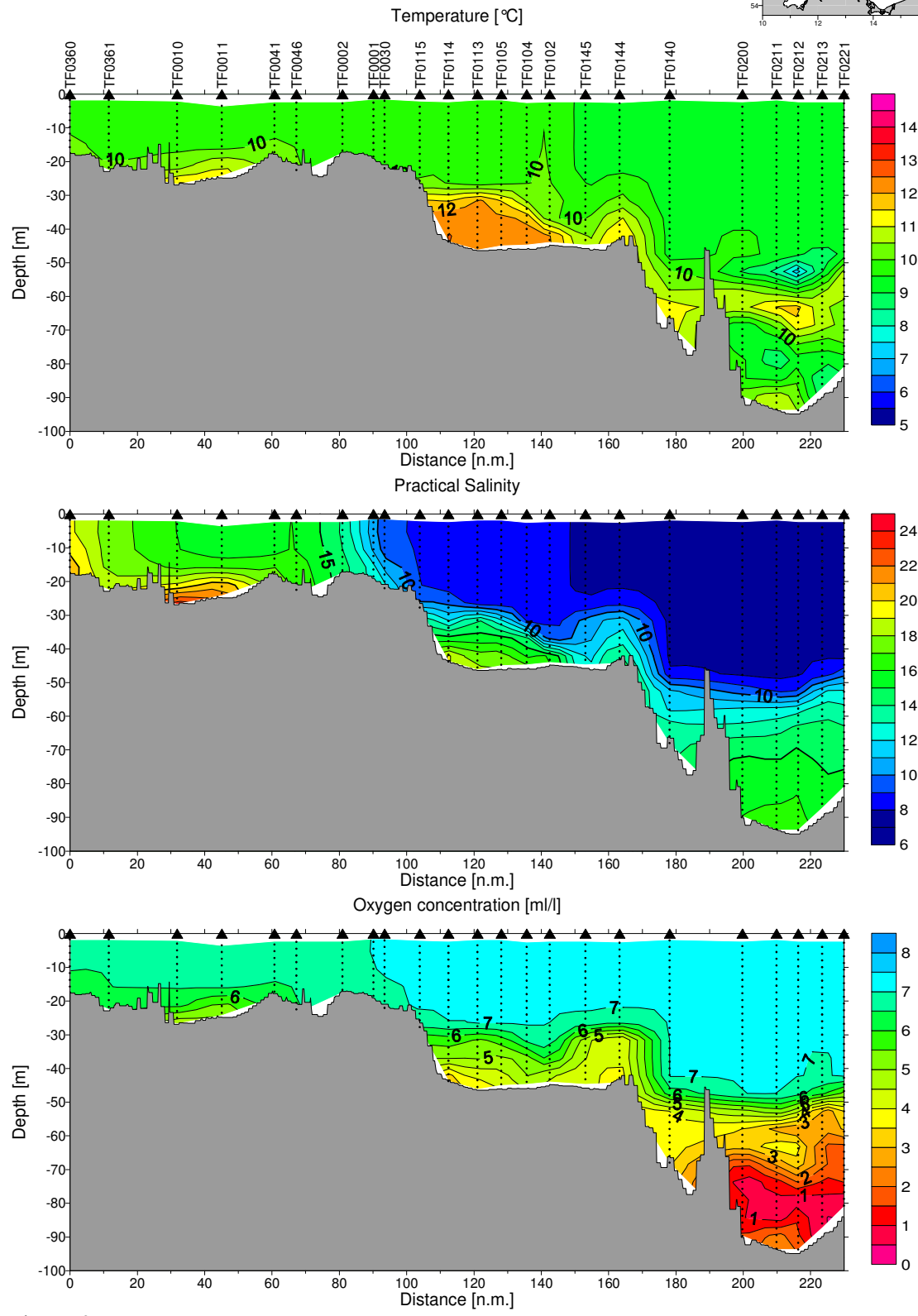
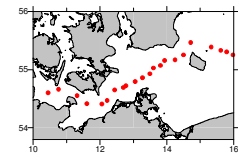


Figure 2

CTD Transect
17.11.2008 17:13 - 18.11.2008 03:52 UTC

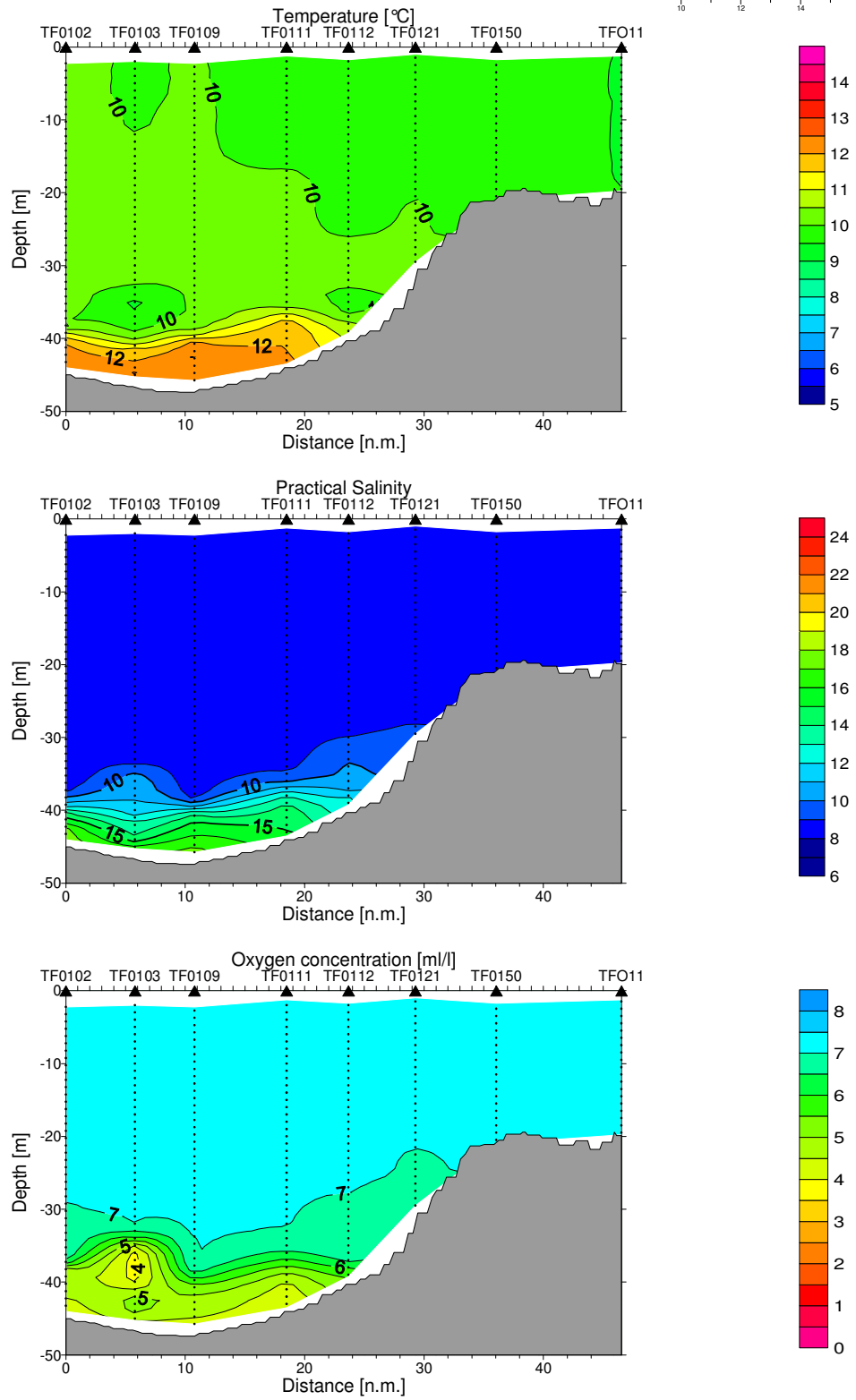
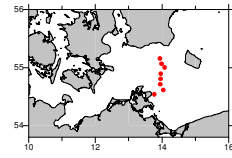


Figure 3

CTD Transect
22.11.2008 19:08 - 23.11.2008 21:01 UTC

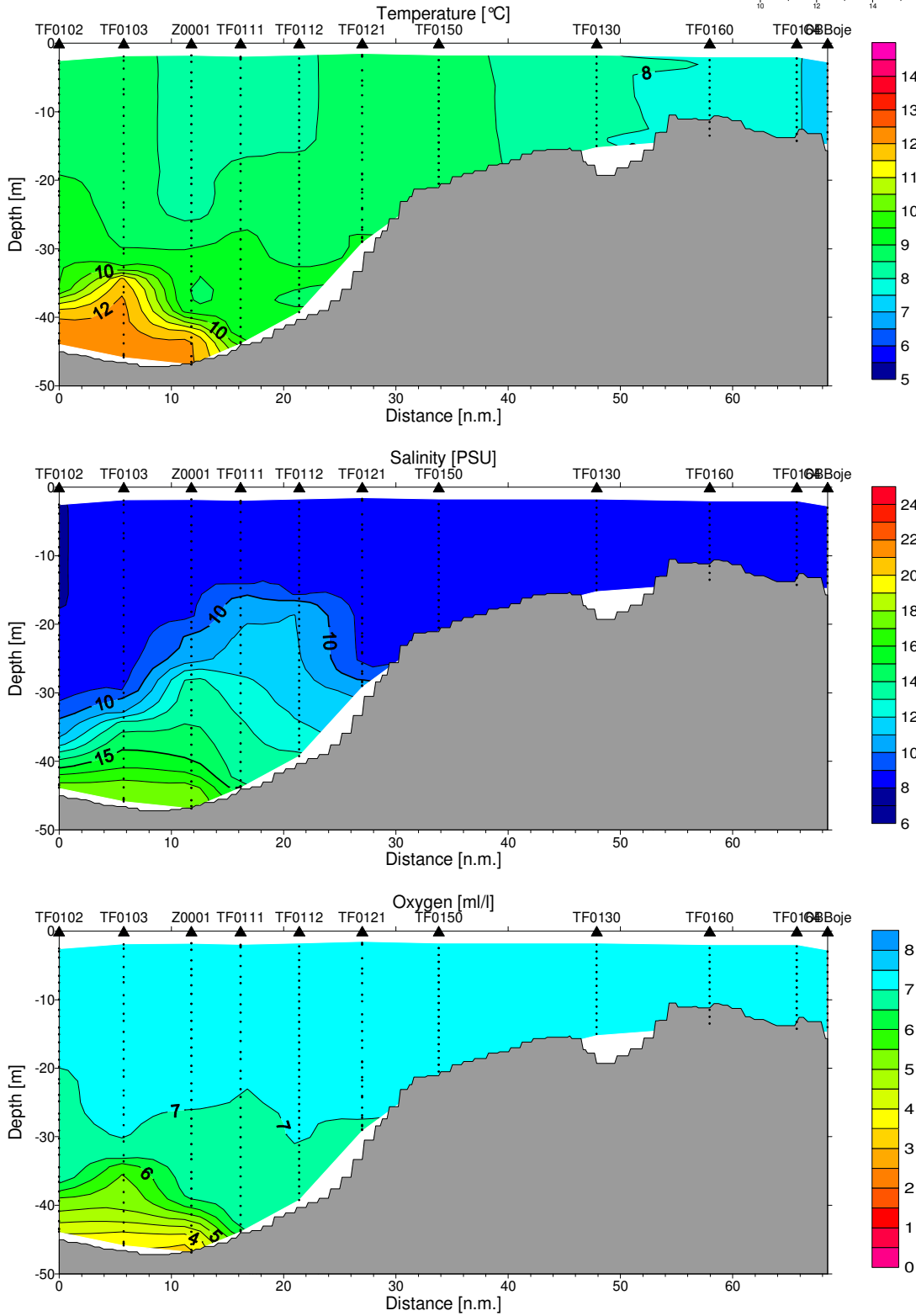
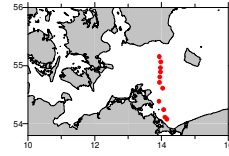


Figure 4

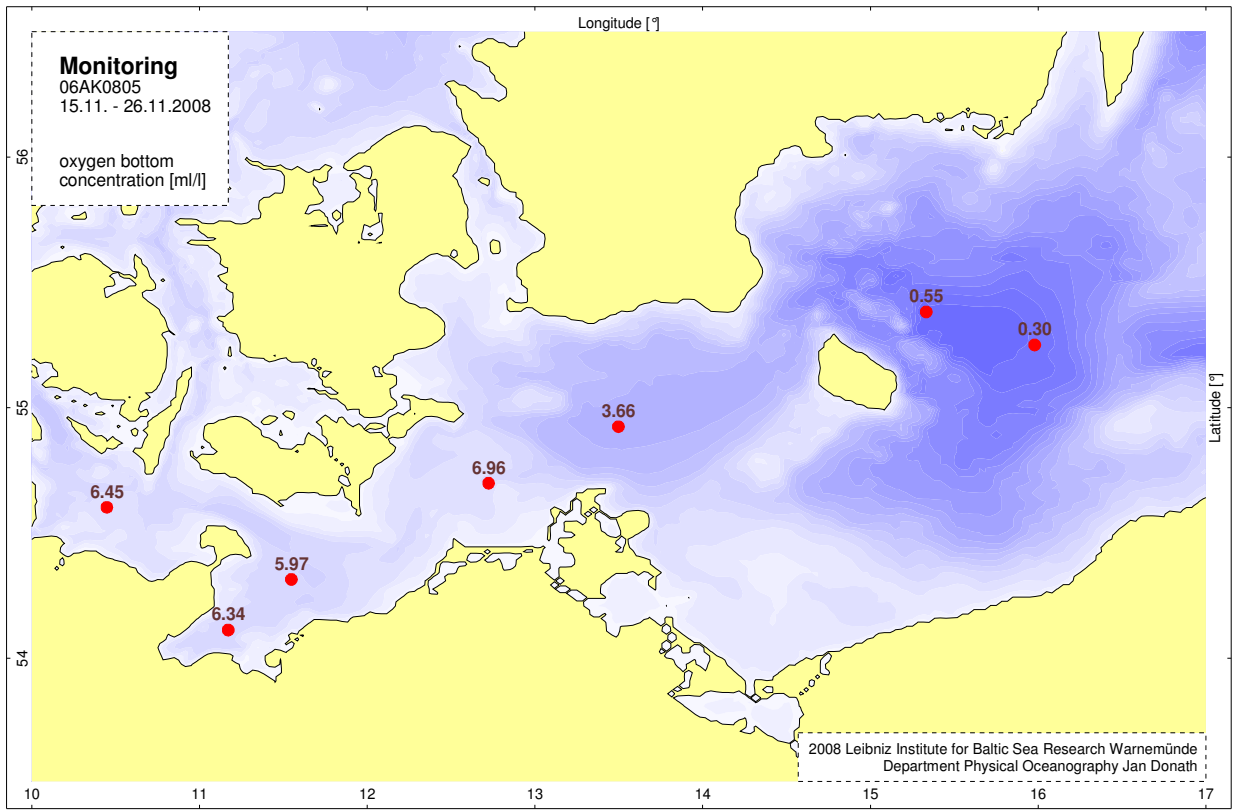


Figure 5