



Baltic Sea Research Institute Warnemünde

C r u i s e R e p o r t


r/v "Gauss"


Cruise- No. 11 / 04 / 06

Monitoring Cruise
14 July – 23 July 2004
Kiel Bight to northern Gotland Sea

This report is based on preliminary data

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1. **Cruise No.:** 11 / 04 / 06
2. **Dates of the cruise:** from 14 July to 23 July 2004
3. **Particulars of the research vessel:**
 - Name: "Gauss"
 - Nationality: Germany
 - Operating Authority: Federal Maritime and Hydrographic Agency (BSH)
4. **Geographical area in which ship has operated:**
Kiel Bight to Northern Gotland Sea
5. **Dates and names of ports of call**
no port of call
6. **Purpose of the cruise**
Baltic monitoring in the frame of the COMBINE Programme of HELCOM
7. **Crew:**
 - Name of master: K.-P. Walde
 - Number of crew: 20
8. **Research staff:**
 - Chief scientist: Dr. N. Wasmund

 - Participants: Dr. Nausch, Monika
Donath, Jan
Weinreben, Stefan
Lehnert, Gerhard
Setzkorn, Doris
Sadkowiak, Birgit
Blaurock, Manuela
Disterheft, Henry
9. **Co-operating institutions:**
All institutions dealing with HELCOM monitoring programmes
10. **Scientific equipment**
CTD, water samplers, plankton net

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). In addition to the normal monitoring track, two transects along Darss Sill were carried out to study water exchange through this "bottle-neck" of the Baltic Sea. On the way back, selected HELCOM stations in the Bornholm Sea, Arkona Sea and Mecklenburg Bight were sampled a second time. The meteorological, hydrographical, chemical and biological investigations were performed according to the Manual of the COMBINE Programme of HELCOM.

The first two days of the cruise took place in Mecklenburg Bight during a deep pressure situation (air pressure down to 1007 hPa) with cloudy and rainy weather and westerly winds of 6-12 m/s. From the evening of the 15.7.04 to noon of the 18.7.04, air pressure increased steadily from 1011 to 1021 hPa, with clear sky all the time and westerly winds of 4-8 m/s. From the evening of the 18.7. to

the evening of the 19.7.04, the wind changed to south-eastern direction while the air pressure decreased to 1013 hPa and the weather became rainy and foggy. The 20.7.04 (in the Bornholm Sea) was sunny and the easterly wind increased to 17 m/s by the evening. From 21.7. to 22.7.03, the wind shifted from east (10 m/s) to west (down to 2 m/s) while the air pressure increased from 1012 to 1021 h Pa, but the sky stayed completely covered until the afternoon of the 22.7.03.

Surface water temperatures in the Baltic proper were 4.7 to 6.6 K lower than during the cruise of July 2003 and also lower than the long-term August means of the period 1971-1990 (in brackets):

Mecklenburg Bight (stat. 012)	15.4 °C (17.7 °C)
Arkona Sea (stat. 113)	13.8 °C (17.0 °C)
Bornholm Sea (stat. 213)	14.6 °C (17.6 °C)
Eastern Gotland Sea (stat. 271)	15.2 °C (17.3 °C)
Farö Deep (stat. 286)	15.3 °C (17.7 °C)
Landsort Deep (stat. 284)	15.8 °C (18.2 °C)
Karlsö Deep (stat. 245)	14.4 °C (16.9 °C)

In the inner part of Lübeck Bight and in the transitional area between Mecklenburg Bight and Arkona Sea, the pycnocline was rather shallow (at 6-8 m depth). In the central Arkona Sea, the upper border of the primary thermocline was found at about 16 m depth. At the central stations of the Baltic Sea basins, the primary thermocline appeared at a depth of about 25-30 m (Fig. 3a). A slight secondary thermocline was formed at 5-10 m depth under sunny conditions.

The unusually low bottom layer temperatures in some Baltic basins in July 2003, caused by a strong salt water inflow in January 2003, have increased meanwhile and have more or less approached to the long-term means until July 2004:

	July 2004	July 2003	Mean 1971-1990
Bornholm Deep	5.12 °C	3.71 °C	6.12 °C
Gotland Deep	6.51 °C	4.63 °C	5.62 °C
Farö Deep	5.87 °C	6.00 °C	5.20 °C
Landsort Deep	5.69 °C	5.88 °C	4.76 °C
Karlsö Deep	5.29 °C	4.90 °C	4.18 °C

The halocline begins at a depth of about 22 m in the north-eastern Arkona Sea, at 30 m in the Bornholm Basin (with the strongest gradient below 50 m !) and at 55-65 m in the Eastern Gotland Sea (Fig. 3b).

The oxygen concentrations decreased to zero a few metres above ground in the Bornholm Basin and at the deepest stations of the Gotland Basin (Fig. 4). An intermediate oxygen minimum was found at 80 m depth in the Gotland Basin (Fig. 3 c). Oxygen depletion occurred at stations 285, 284, 240 and 245 below approximately 80 m depth (Fig. 4).

Concerning the phytoplankton, *Proboscia alata* and *Dactyliosolen fragilissimus* dominated in Lübeck, Kiel and Mecklenburg Bights on 14./15.7. and 22.7.2004, accompanied by *Ceratium* species. In Mecklenburg Bight, also *Anabaena* sp. occurred and especially in the eastern Mecklenburg Bight *Cerataulina pelagica*. *Chaetoceros impressus* was the dominating diatom in the Arkona and Bornholm Seas besides of *Woronichinia compacta*, *Ebria tripartita*, *Cyanodictyon* sp. and *Aphanizomenon* sp. In the eastern Gotland Sea, *Gymnodinium* sp. and *Dinophysis norvegica* were predominant. Also the

typical filamentous cyanobacteria *Aphanizomenon* sp., *Nodularia spumigena* and *Anabaena* sp. were scattered in the waters of the the western and eastern Gotland Sea but they did not form the expected blooms. Only in the south-eastern Gotland Sea, between stations TF0253 and TF0250, a slight cyanobacteria bloom occurred.

Attachments

- Tables 1and 2: Preliminary results for selected parameters in the surface layer and the near bottom layer (unvalidated results)
- Figs. 1-2: Station grid and cruise track
- Fig. 3 Transsect from the Kiel Bight to the northern Gotland Basin for temperature, salinity and oxygen (unvalidated data)
- Fig. 4: Oxygen /hydrogen sulphide concentrations in the bottom near 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 14.7.04	360/7	15.21	17.01	0.06	0.10
Meckl. Bight 14.7.04	012/6	15.35	13.51	0.03	0.03
Lübeck Bight)*** 14.7.04	023/2	15.26	14.01	0.05	0.01
Arkona Basin 16.7.04	113/30	13.78	7.78	0.14	0.01
Pom. Bight 20.7.04	162/65	16.35	7.67	0.13	0.01
Bornholm Deep 16.7.04	213/37	14.64	7.42	0.21	0
Stolpe Channel 17.7.04	222/44	14.41	7.26	0.32	0.01
SE Gotland Basin 17.7.04	259/46	14.55	7.18	0.34	0.01
Gotland Deep 18.7.04	271/53	15.20	6.25	0.01	0.01
Fårö Deep 18.7.04	286/55	15.3	6.53	0.03	0.01
Landsort Deep 19.7.04	284/57	15.81	5.73	0.01	0.01
Karlsö Deep 19.7.04	245/59	14.41	6.76	0.24	0.01

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

** Station name see maps (Fig. 1 und 2)

*** Data from 10 m not included because of shallower pycnocline

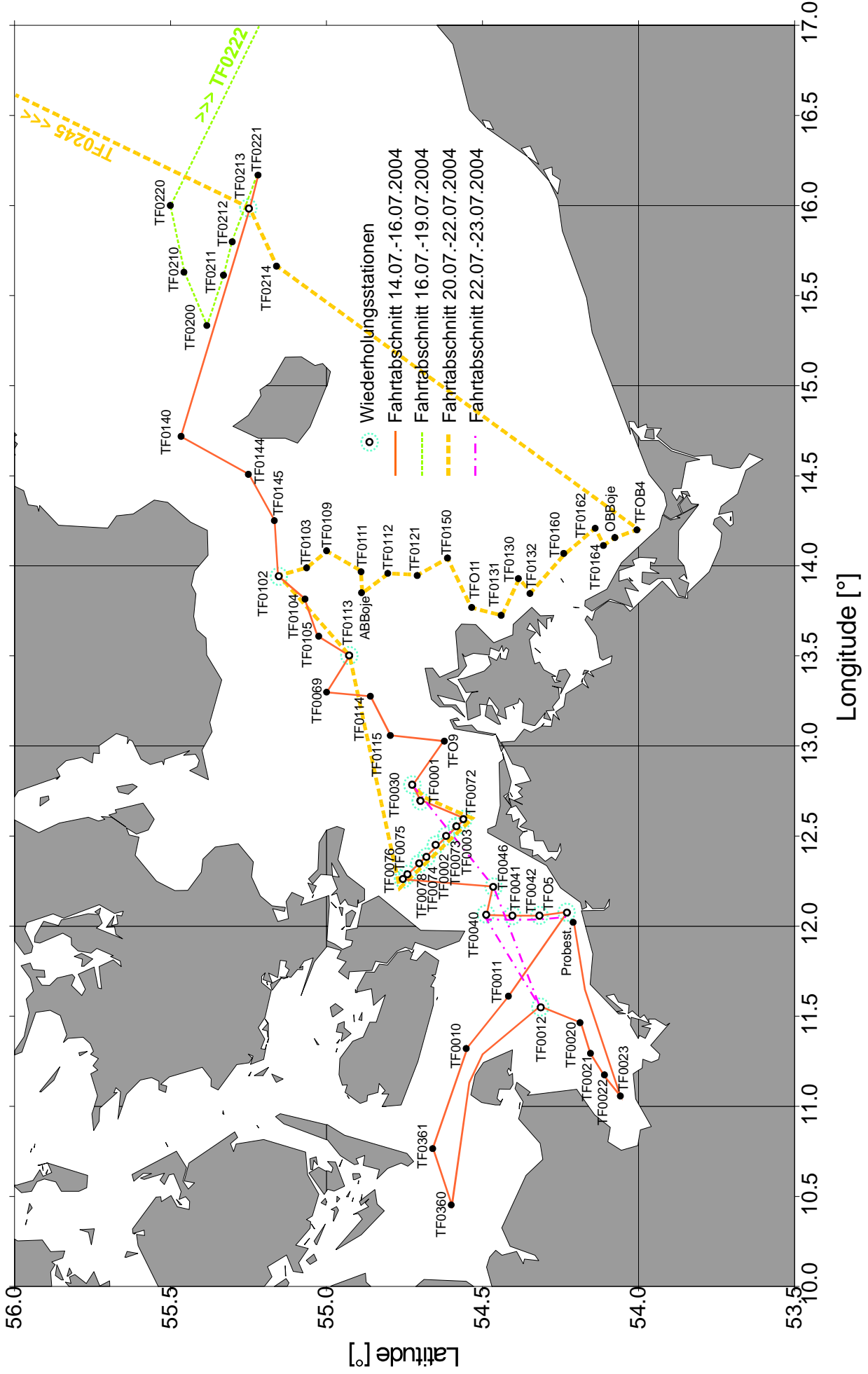
Table 2: Bottom-near water layer

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 14.7.04	360/7	17.1	12.76	21.01	3.49	0.27	0.83
Meckl. Bight 14.7.04	012/6	22.8	11.30	21.31	3.84	0.55	2.37
Lübeck Bight 14.7.04	023/2	21.6	9.37	19.97	3.05	0.71	6.14
Arkona Basin 16.7.04	113/30	44.5	9.56	17.41	2.27	1.16	5.88
Pom. Bight 20.7.04	162/	13.0	15.94	7.69	6.22	0.15	0.02
Bornholm Deep 16.7.04	213/37	87.3	5.12	17.69	-0.03	2.66	3.83
Stolpe Channel 17.7.04	222/44	88.5	6.23	13.48	2.83	1.01	5.63
SE Gotland Basin 17.7.04	259/46	86.7	5.71	11.18	0	2.86	5.98
Gotland Deep 18.7.04	271/53	233.3	6.51	13.01	-1.73	3.70	0
Fårö Deep 18.7.04	286/55	189.6	5.87	12.24	0	2.55	3.69
Landsort Deep 19.7.04	284/57	430.4	5.69	11.15	0	3.20	1.36
Karlsö Deep 19.7.04	245/59	106.5	5.29	10.19	-1.68	4.25	0

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

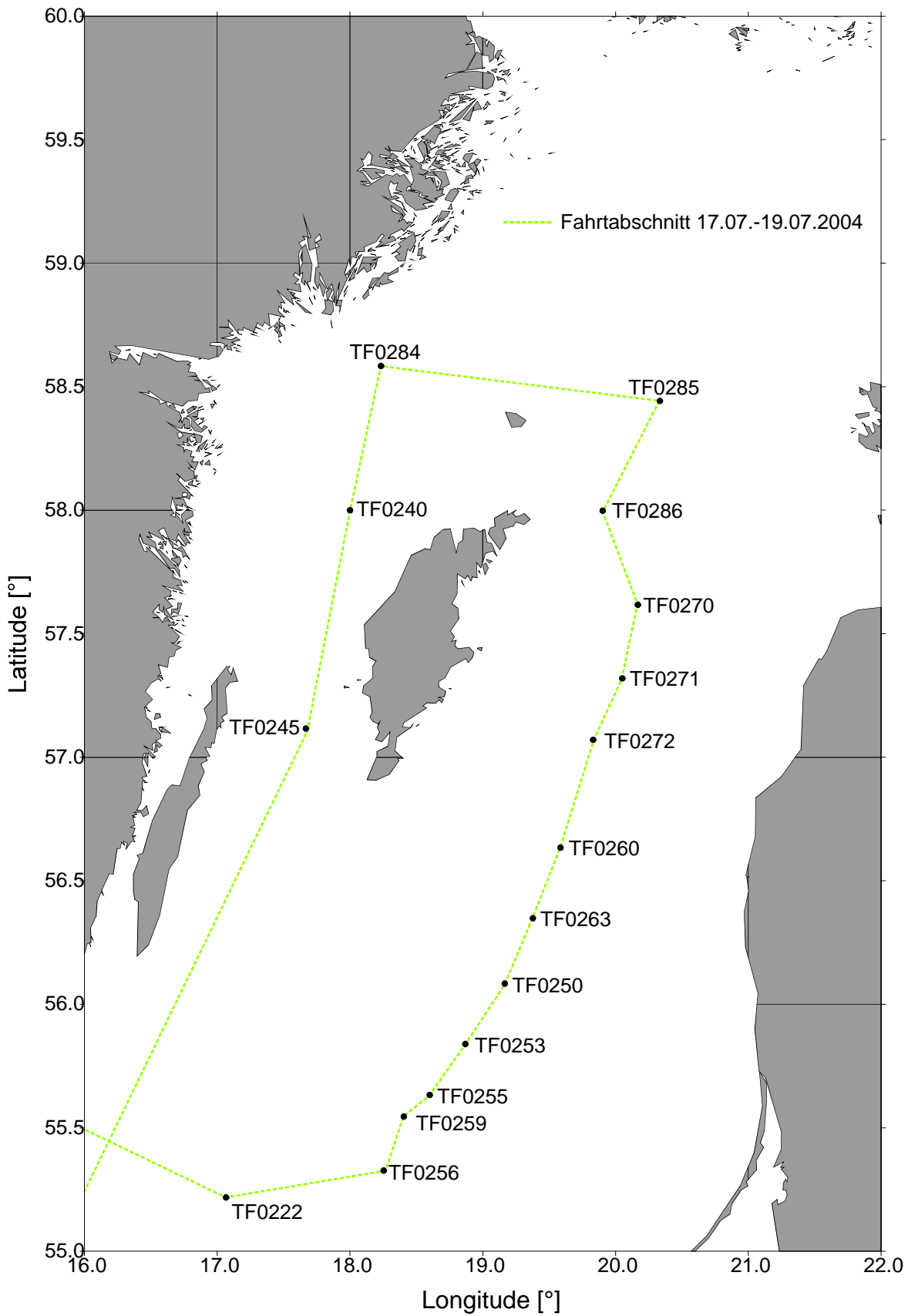
** Station name see maps (Fig. 1 und 2)

Monitoring
 Station map TF110406
 14.07.2004 - 23.07.2004
 60 Station (Part1)



Monitoring

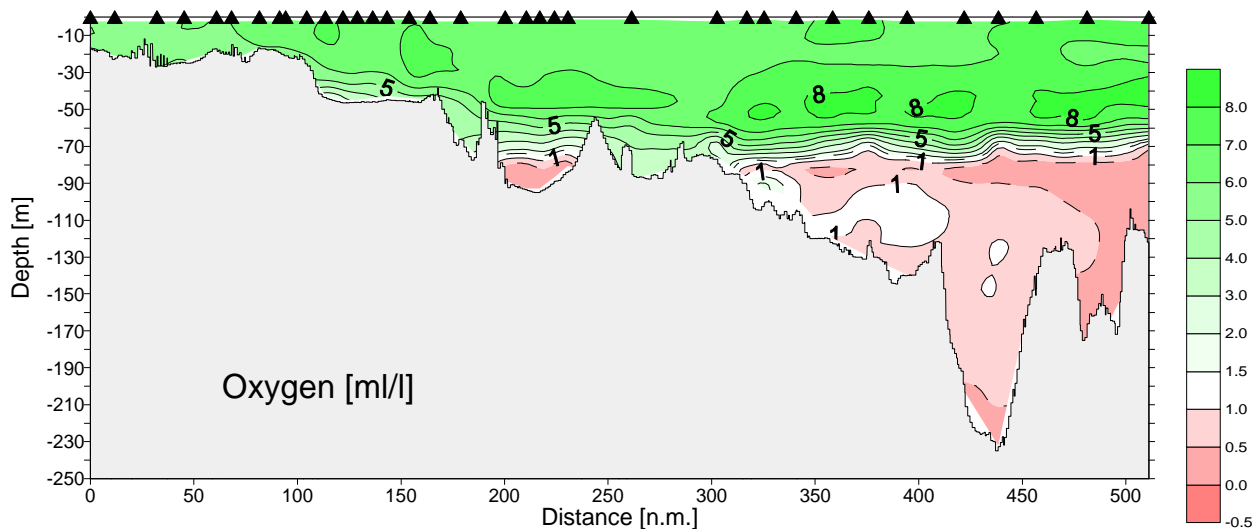
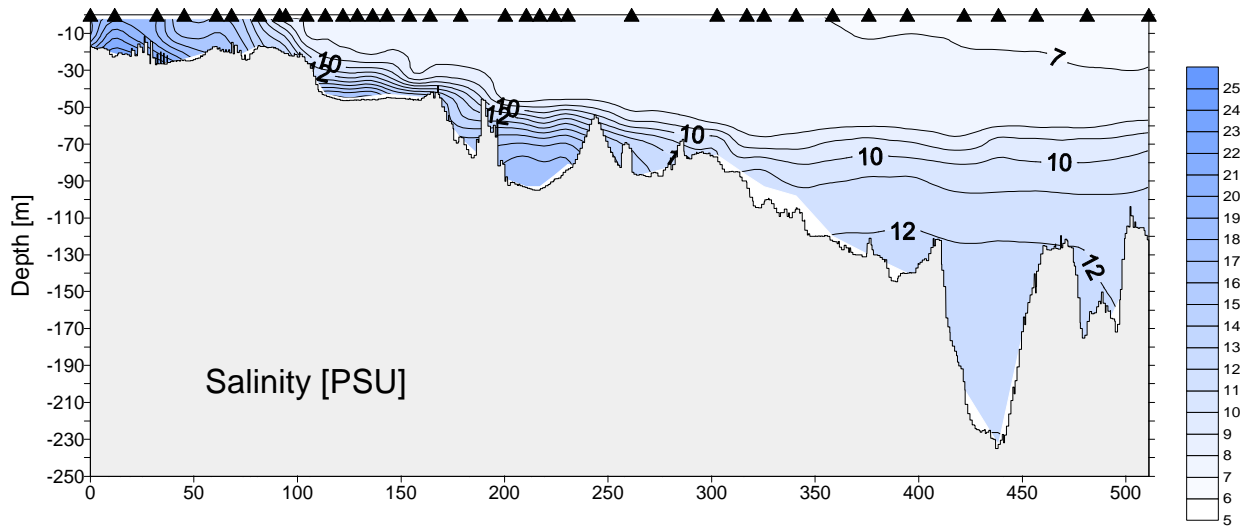
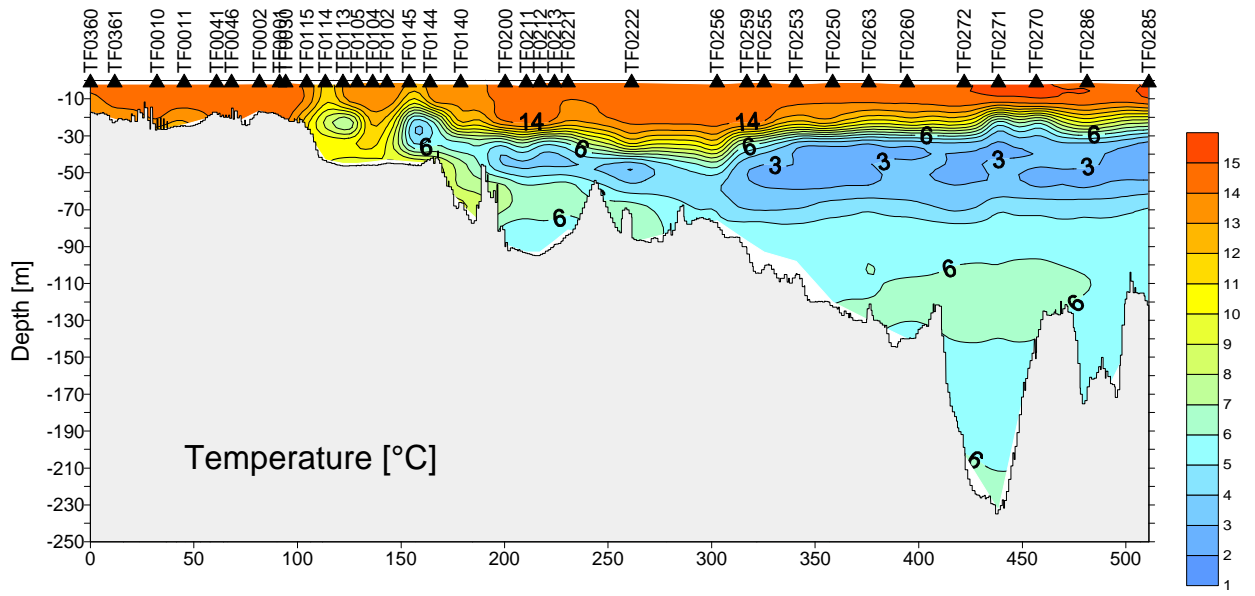
Station map TF110406
14.07.2004 - 23.07.2004
16 Station (Part2)



Kiel Bight - Gotland Sea

TF110406

14.07.2004 21:59 - 18.07.2004 17:55 UTC



Monitoring

TF110406

14.07.2004 - 23.07.2004

Oxygen bottom concentration [ml/l]

