

Baltic Sea Research Institute Warnemünde

Cruise report

No. 40/04/11

r/v „Professor Albrecht Penck“

Monitoring cruise

30 April – 10 May 2004

Kiel Bight to northern Gotland sea

This report is based on preliminary data.

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Monitoring cruise
CruiseNo. 40/04/11
r/v „Gauss“

Warnemünde
11 May 2004

The third monitoring cruise in 2004 performed by the Baltic Sea Research Institute Warnemünde in the frame of the HELCOM COMBINE programme was carried out with r/v „Professor Albrecht Penck“ between April 30th and May 10th 2004.

Scientific staff participating:

Günther Nausch (scientist in charge)	30.04. – 10.05.2004
Felix Baumgart	30.04. – 10.05.2004
Bärbel Buuk	30.04. – 10.05.2004
Jutta Dankert	30.04. – 10.05.2004
Jan Donath	30.04. – 10.05.2004
Hartmut Huth	30.04. – 10.05.2004
Monika Nausch	30.04. – 10.05.2004
Sabine Schnell	30.04. – 10.05.2004
Anna-Maria Welz	30.04. – 10.05.2004

The area under investigation covered the Baltic Sea between Kiel Bight and the northern Gotland Sea. Marine meteorological, hydrographic, hydrochemical and hydrobiological investigations were performed according to the COMBINE programme of HELCOM. The station map is attached to this report.

During the whole time of the cruise weather was influenced by a low pressure cell lying over the British Island and moving slowly towards central Europe and a high pressure area over Russia. Air pressure varied only slightly between 1005 and 997 hPa. Consequently wind speed was low, in maximum Bft 6 was measured. During the first days of the cruise winds from ENE were dominating, followed by a longer period of easterly winds. Air temperature was around 9–10 °C. Only due to these favourable weather the complete programme could be realized.

The following hydrographic and hydrochemical characteristics have been observed during the cruise (cf. Tables 1 and 2 and Figs. 3 and 4):

- Surface temperatures varied between 9.73 °C (Lübeck Bight) and 5.32 °C (Landsort Deep). Due calm weather conditions before the cruise, these temperatures were in the shallow bights well above the long-term mean for the period 1971-1990 (in brackets).

Lübeck Bight	9.73°C (8.93°C)
Arkona Basin	7.59°C (7.44°C)
Bornholm Deep	6.32°C (6.75°C)
Gotland Deep	6.88°C (5.66°C)
Farö Deep	5.82°C (5.63°C)
Landsort Deep	5.32°C (6.09°C)
Karlsö Deep	5.72°C (6.76°C)

- The nutrient situation in the surface layer reflects the development of the spring bloom. In the western Baltic Sea and the Arkona Basin nutrients are more or less depleted. Remarkable are the low silicate concentrations indicating a diatom bloom. This is valid also for the SE Gotland Basin. In the central Baltic Sea, the nitrate reservoir is more or less exhausted whereas a certain phosphate pool remains in the surface layer as usual for the season.
- The effects of the major Baltic inflow from January 2003 can still be traced in most areas of the central Baltic Sea. In the **eastern Gotland Basin** all stations are free of hydrogen sulphide. An intermediate oxygen minimum zone can be found at all stations between 80m and 100m. At the central station 271 (BMP J1) oxygen concentrations decreased in the near bottom layer from 0.66ml/l in February, 0.79ml/l in March to 0.16ml/l in May. Possibly, hydrogen sulphide can reoccur in autumn or at the beginning of next year if no new inflow takes places. As in March (6.8°C), still high temperatures are measured in the near bottom-layer (6.61°C). The salinity increase near the ground observed since March 2003, indicating ongoing renewal processes, has stopped now. The value of 13.03 psu is slightly lower than in March (13.07 psu).
In the **Farö Deep** area, the entire water column is oxygenated. The near bottom temperature and salinity have increased from 5.65°C in March to 5.90°C in May, resp. 12.18 psu to 12.31 psu.
Also the **Landsort Deep** is influenced by the cold inflow from January 2003. Between 175m depth and the bottom now low oxygen concentrations can be measured (0.08 - 23ml/l). The renewed water masses have lifted up the anoxic layer which still remain between 80m and 150m (0.03 – 0.18 mg/l H₂S).
In the rest of the **western Gotland Basin** anoxic conditions the deeper water layer prevail. The ventilation was up to now not able to improve the conditions significantly.
- The nutrient situation in the bottom near layer reflects the water renewing as well. Stations in the oxygenated areas, are characterized by relatively low phosphate concentrations, low ammonium values and quite high nitrate concentrations. The anoxic stations in the western Gotland Basin show elevated phosphate and ammonium concentrations and consequently no nitrate.

Attachments

Tables 1 and 2: Preliminary results of selected parameters in the surface layer and the near bottom layer (unvalidated results)

Figs. 1-2: Track charts

Fig. 3: Transect from the Kiel Bight to the northern Gotland Basin for temperature, salinity and oxygen (unvalidated data)

Fig. 4: Oxygen/hydrogen sulphide in the bottom near layer for selected stations

Günther Nausch

Scientist in charge

Table 1: Surface water layer (about 1 m depth)

Area Date	Stat. Name/No.**	Temp. °C	Sal. psu	PO ₄ ³⁻	NO ₂₃ ^{-*} µmol/l	SiO ₄
Kiel Bight 01.05.2004	360/0007	8.70	13.57	0.42	0.05	1.2
Meckl.Bight 30.04.2004	012/0002	7.46	12.63	0.08	0.19	2.1
Lübeck Bight 30.04.2004	023/0006	9.73	13.13	0.14	1.90	0.8
Arkona Basin 02.05.2004	113/0022	7.59	7.40	0	0	0
Pom. Bight 08.05.2004	162/0072	9.48	7.26	0.06	1.24	2.0
Bornholm Deep 03.05.2004	213/0035	6.32	7.43	0.29	0	6.4
Stolpe Channel 03.05.2004	222/0037	6.35	7.31	0.24	0	7.0
SE Gotland Basin 03.05.2004	259/0039	7.76	7.05	0.10	0.05	2.9
Gotland Deep 04.05.2004	271/0046	6.88	7.14	0.20	0.32	11.2
Farö Deep 04.05.2004	286/0048	5.82	6.50	0.24	0.02	9.2
Landsort Deep 05.05.2004	284/0050	5.32	6.32	0.28	0	9.2
Karlsö Deep 06.05.2004	245/053	5.72	7.05	0.54	0.02	15.9

* $\sum \text{NO}_2^- + \text{NO}_3^-$

** see attached map

Table 1: Near bottom layer

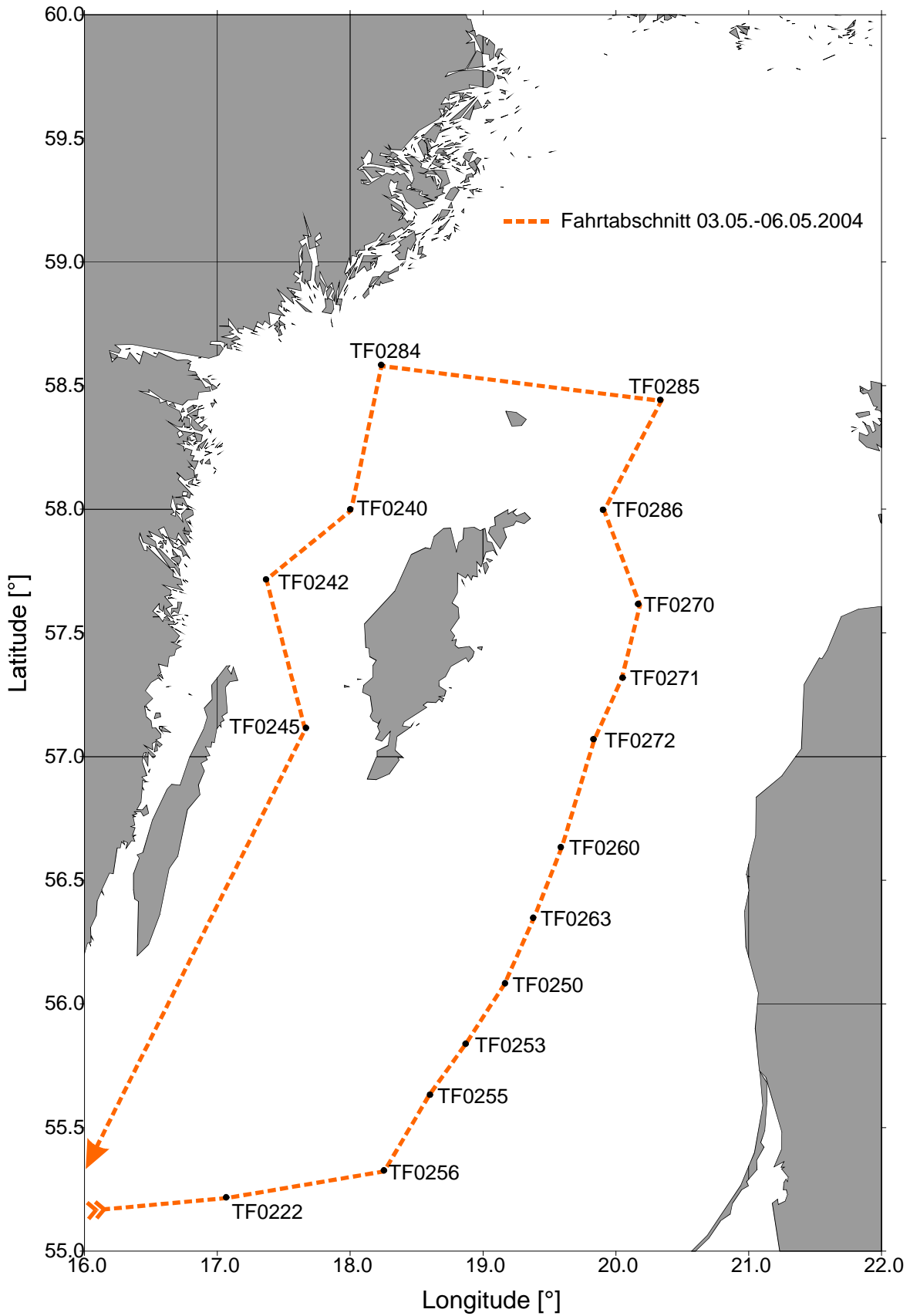
Area Date	Stat. Name/No.**	Depth m	Temp. °C	Sal. psu	O ₂ ml/l	PO ₄ ³⁻	NO ₂₃ ^{-*} µmol/l	SiO ₄
Kiel Bight 01.05.2004	360/0007	16	7.54	14.90	7.71	0.05	0.46	1.2
Meckl.Bight 30.04.2004	012/0002	22	5.02	21.95	5.97	0.31	2.22	8.8
Lübeck Bight 30.04.2004	023/0006	20	4.00	15.52	6.16	0.08	2.25	9.6
Arkona Basin 02.05.2004	113/0022	45	4.35	11.90	6.73	0.24	0.12	4.2
Pom. Bight 08.05.2004	162/0072	13	7.85	7.48	7.92	0.04	0.03	4.9
Bornholm Deep 03.05.2004	213/0035	87	5.41	17.37	0.84	0.95	9.34	40.4
Stolpe Channel 03.05.2004	222/0037	88	5.75	13.28	3.46	0.58	0.06	23.6
SE Gotland Basin 03.05.2004	259/0039	88	5.50	11.85	3.70	2.56	5.32	37.5
Gotland Deep 04.05.2004	271/0046	233	6.61	13.03	0.16	2.21	10.60	48.2
Farö Deep 04.05.2004	286/0048	188	5.90	12.31	0.70	2.22	9.42	46.4
Landsort Deep 05.05.2004	284/0050	433	5.58	10.90	0.08	3.53	1.66	53.2
Karlsö Deep 06.05.2004	245/00053	106	5.02	9.65	-0.73	4.70	0	57.8

* $\sum \text{NO}_2^- + \text{NO}_3^-$

** see attached map

Monitoring

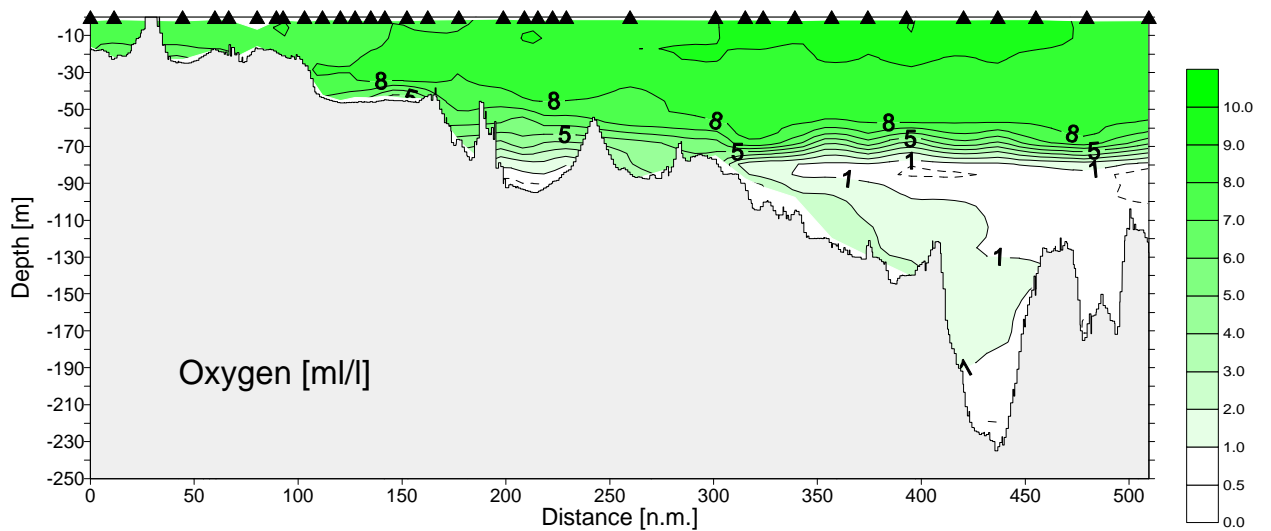
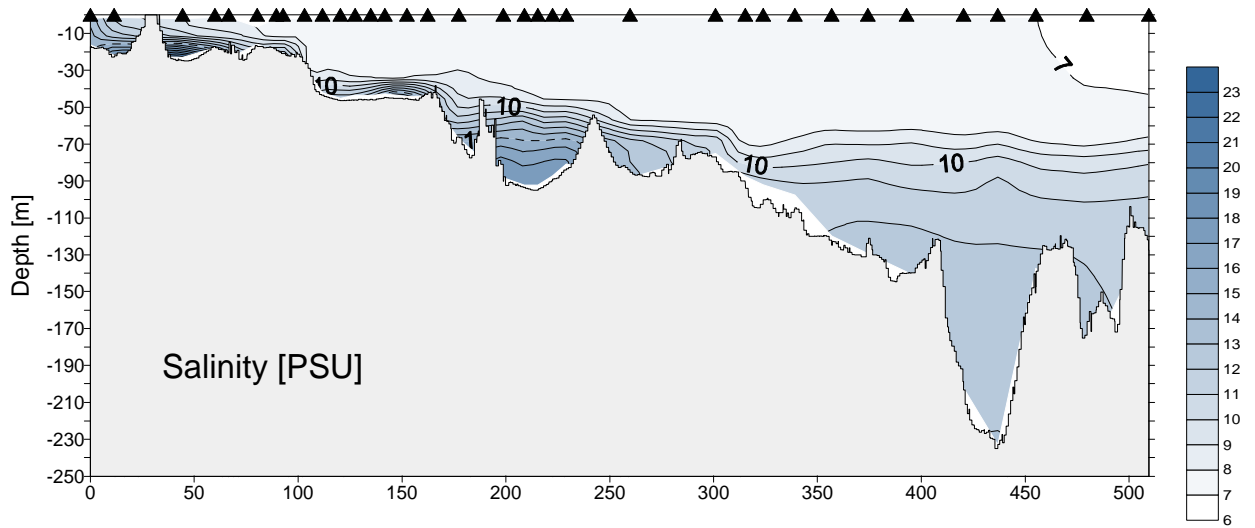
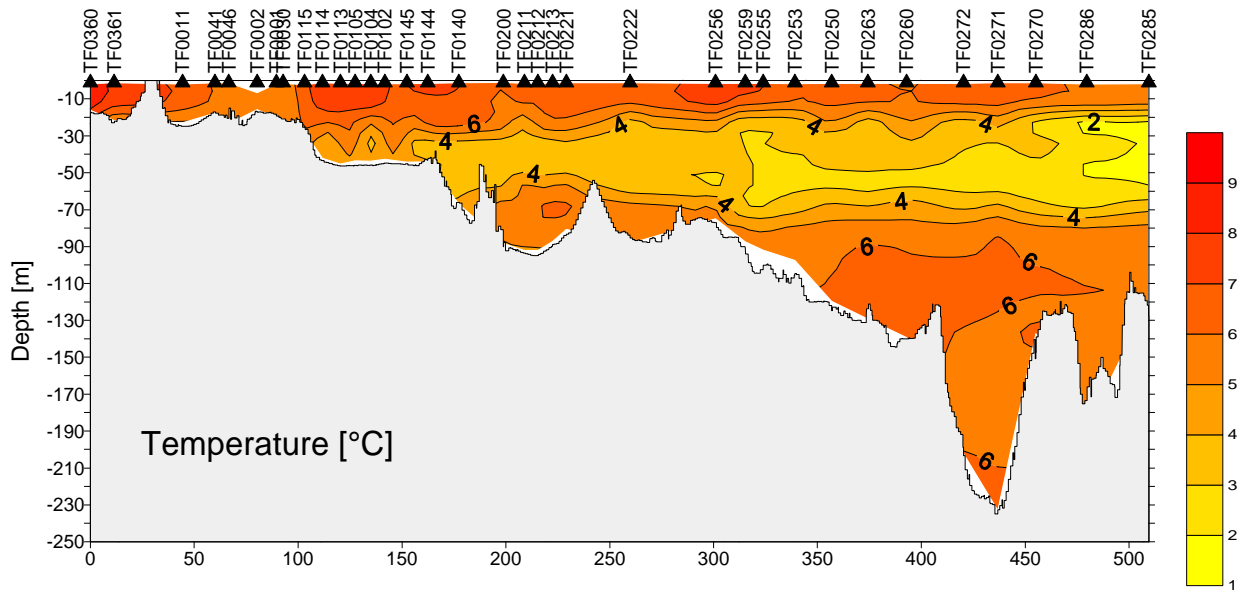
Station map TF400411
30.04.2004 - 10.05.2004
17 Station (Part2)



Kiel Bight - Gotland Sea

TF400411

01.05.2004 02:12 - 06.05.2004 17:35 UTC



Monitoring

TF400411

30.04.2004 - 10.05.2004

Oxygen bottom concentration [ml/l]

