



Leibniz Institute for Baltic Sea Research Warnemünde

Cruise Report

r/v "Elisabeth Mann Borgese"


Cruise- No. 06EZ / 12 / 03


27 March – 04 April, 2012

Western and Central Baltic Sea

This report is based on preliminary data

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1. **Cruise No.:** 06EZ / 12 / 03
2. **Dates of the cruise:** from 27 March 2012 to 04 April 2012
3. **Particulars of the research vessel:**
 - Name: Elisabeth Mann Borgese
 - Nationality: Germany
 - Operating Authority: IOW Warnemünde
4. **Geographical area in which ship has operated:**
western and central Baltic Sea
5. **Dates and names of ports of call**
6. **Purpose of the cruise**
Monitoring cruise in the framework of HELCOM programme
7. **Crew:**
 - Name of master: U. Scholz
 - Number of crew: 11
8. **Research staff:**
 - Chief scientist: Dr. R. Feistel
 - Scientists: S. Jürgensmann
 - Engineers: J. Ruickoldt
 - Technicians: J. Donath, F. Pohl, Bi. Sadkowiak, A. Tschakste, S. Lage
9. **Co-operating institutions:**
10. **Scientific equipment**
CTDO bathysonde, plankton net, Secchi disk

11. General remarks and preliminary results

The cruise of r/v "Borgese" from 27 March till 04 April 2012 was carried out under mostly moderate wind (BF2-7) conditions that prevailed at the eastern flank of the high-pressure cell "Harry" over the British Islands. Exceptions were caused by the lows "Ellen" and "Fabiola" that passed the Central Baltic from NW to SE between the morning of 31 March and the evening of 2 April with wind speeds exceeding 20 m/s and harsh sea states. Sample filtering and related optional station work requested for external scientific projects at TF0271 for an expected duration of 24 h was cancelled when the storm approached. Related work could be carried out at TF0284, partially under shelter of the Swedish coast in the NW, and caused an additional delay of approximately 18 h of the regular program.

Surface water temperatures varied between 5.4 °C in the Kiel Bight and 2.7 °C north of Gotland. Air-temperature readings were in a similar range except 1 April when ice covered the ship's deck in the morning.

Two preconditions were expected to influence the observation results, (i) the negligible inflow activity from the North Sea during all of 2010 and two minor inflows in the first half of 2011, and (ii) the recent significant inflow event of November/December 2011. On the way from the Bornholm Deep to the Gotland Deep, a weak oxygen signal was observed in the near-bottom layer as far downstream as TF0263, a temperature signal preceding the actual inflow water could be registered already at TF0260, but TF0272 appeared still unaffected by the recent inflow. For estimating the inflow progress velocity, a related station series was visited again on the ship's way back.

As a result of the storms "Ellen" and "Fabiola", a quite recently developed inflow layer with cold oxygenated water is visible at the stations TF0113 (Arkona Basin) and TF0214 (Bornholm Basin) between the repeated casts during the cruise, see the two magnified transects below.

In this report, oxygen values marked with an asterisk refer to raw sensor data that may be corrected by post-processing after the cruise.*

In the **Arkona Basin**, TF0113, the near-bottom salinity is significantly higher than in March 2011 (Table 2), the water column is well ventilated.

In the **Bornholm Basin**, TF0213, salinity in the deep water is only slightly higher than in the year before, but the oxygen concentration is markedly improved (although already slightly worse than in January 2012). From about 52 to 57 m depth, oxygen drops sharply from about 8* ml/l to about 4* ml/l. The latter concentration is almost constant down to about 80 m, below which it drops again to about 2* ml/l. That lowest layer has a temperature of about 7 °C. Down from 58 m, the water column is warmer than 6 °C with a slow downward increase.

In the **Stolpe Channel**, TF0222, the near-bottom salinity exceeds that of last year, which indicates some inflow that had lifted water over the Stolpe Sill. The oxygen situation is similarly good as in last year. Bottom (87 m) water temperature is 5.7 °C, salinity 12.5 psu, containing oxygen at a level of 3.8* ml/l.

In the **South-Eastern Gotland Basin** at TF0259, no H₂S was detected. Minimum oxygen concentration at the bottom (86 m) is 1.6* ml/l at a temperature of 5.1 °C and a salinity of 10.3 psu. Lower than 83 m depth, oxygen exceeds 2* ml/l.

In the **South-Eastern Gotland Basin** at TF0250, no H₂S was detected. Minimum oxygen concentration at the bottom (118 m) is 1.0* ml/l at a temperature of 5.9 °C and a salinity of 11.5 psu. Lower than 85 m depth, oxygen exceeds 2* ml/l.

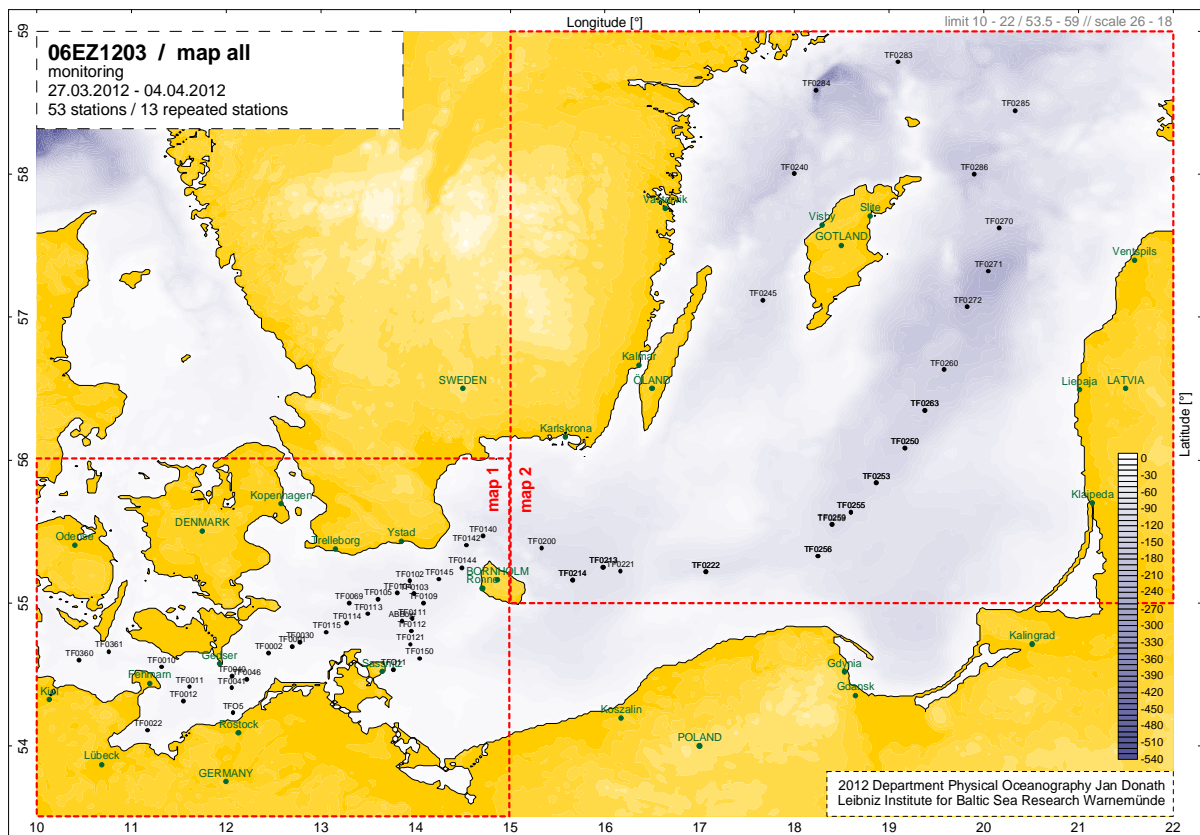
In the **South-Eastern Gotland Basin** at TF0263, H₂S was detected below 124 m depth. At the bottom (127 m) H₂S is -0.26 ml/l, the temperature is 6.1 °C and the salinity is 11.6 psu.

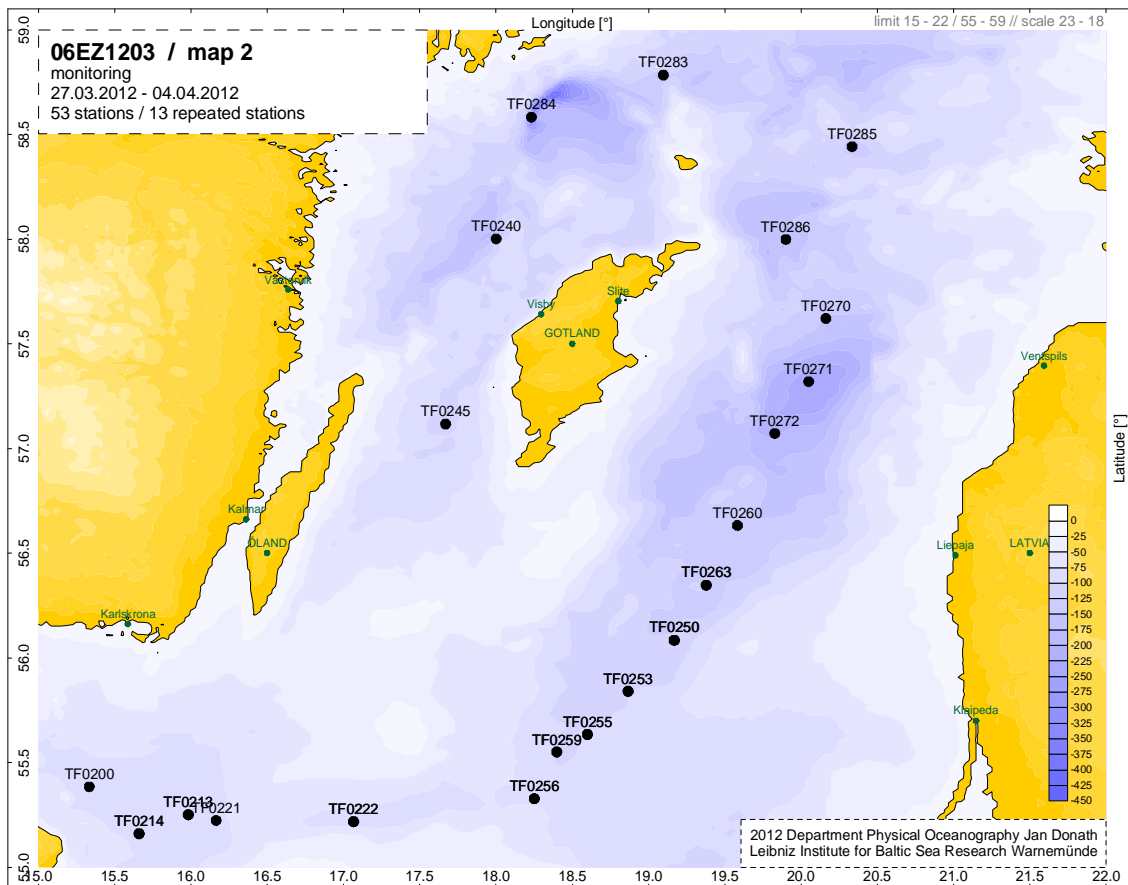
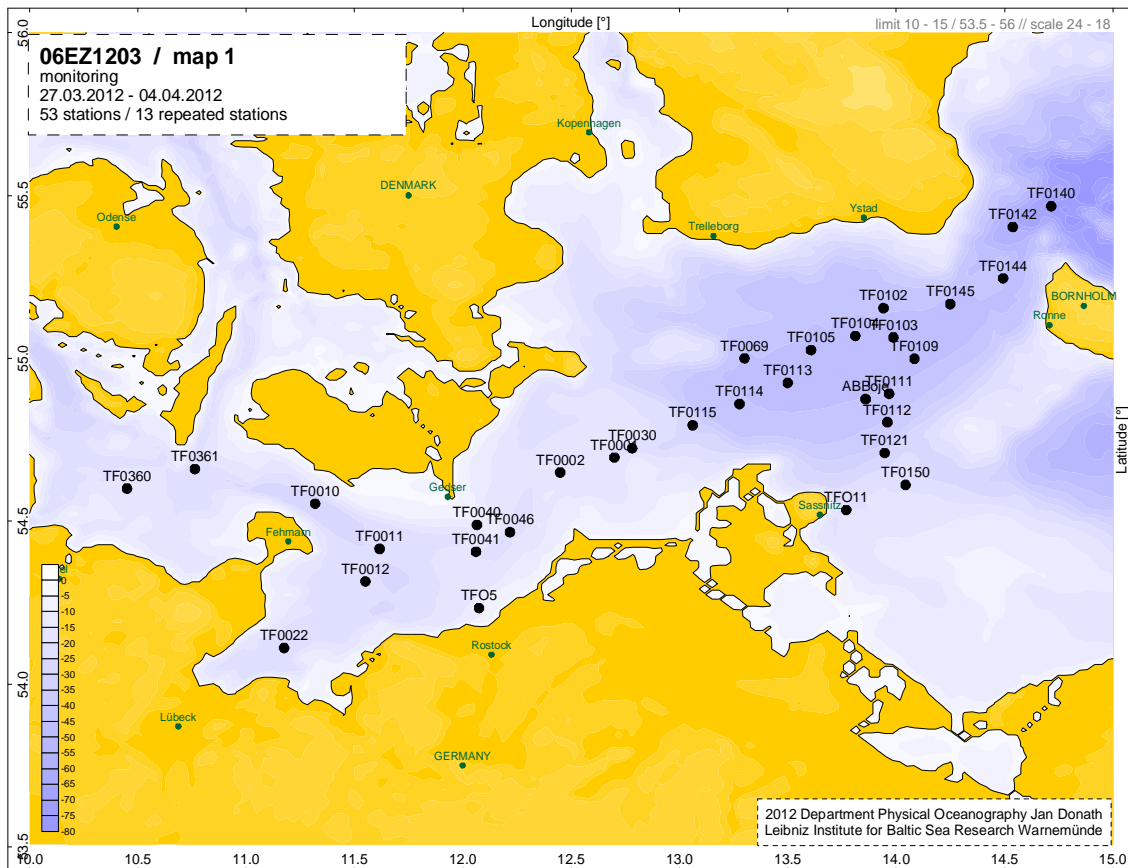
In the **South-Eastern Gotland Basin** at TF0260, H₂S was detected below 100 m depth. At the bottom (138 m) H₂S is -2.25 ml/l, the temperature is 6.2 °C and the salinity is 11.7 psu.

In the **Eastern Gotland Basin** at TF0271, H₂S is detected from 100 m downward with a maximum of -6.93 ml/l. At the **Farö Deep** at TF0286, H₂S is detected from 100 m downward with a maximum of -1.24 ml/l, at the **Landsort Deep**, TF0284, from 100 m downward up to -1.7 ml/l, and at the **Karlsö Deep**, TF0245, only a minor H₂S value of -0.01 ml/l could be measured in the bottom layer at 104 m.

Rainer Feistel, scientist in charge

- Attachments:**
- station charts
 - tables of preliminary results (surface layer and near-bottom layer)
 - transects of T, S and O₂ from Kiel Bight to Eastern Gotland Basin
 - two subsequent magnified transects east of the Bornholm Basin
 - near-bottom O₂/H₂S chart





**Table 1: Preliminary data of 2012 from the surface layer (2 m) of selected regions.
Oxygen values from titration. In brackets, related data of March 2011.**

| Location / Date | Station / Number | Temp. °C | Salinity psu | O ₂ ml/l | NO ₂₊₃ µmol/l | PO ₄ µmol/l | SiO ₄ µmol/l |
|---------------------------------|---------------------|----------------|------------------|------------------------|-----------------------------|---------------------------|----------------------------|
| Kiel Bight 27.03.2012 | TF0360 5 | 5.37 (2.74) | 14.40 (12.46) | 8.94 (9.54) | 0.17 (0.02) | 0.03 (0.10) | 1.10 (6.60) |
| Mecklenburg Bight 28.03.2012 | TF0012 7 | 5.55 (2.30) | 11.72 (12.11) | 9.20 (9.44) | 0.15 (0.07) | 0.13 (0.07) | 3.1 (5.80) |
| Lübeck Bight 27.03.2012 | TF0022 6 | 5.57 (2.06) | 12.81 (12.08) | 9.74 (9.87) | 0.15 (0.12) | 0.04 (0.05) | 0.8 (4.90) |
| Darss Sill 28.03.2012 | TF0030 13 | 3.63 (1.55) | 8.15 (8.35) | 9.12* (10.54) | (0.41) | (0.13) | (8.20) |
| Arkona Basin 28.03.2012 | TF0113 17 | 3.46 (1.14) | 7.80 (7.51) | 8.82* (10.28) | (2.59) | (0.32) | (11.90) |
| Bornholm Deep 29.03.2012 | TF0213 29 | 3.15 (1.43) | 7.67 (7.27) | 8.75* (9.20) | (3.39) | (0.62) | (13.40) |
| Stolpe Channel 29.03.2012 | TF0222 31 | 3.21 (1.48) | 7.56 (7.30) | 9.06 (9.53) | 2.41 (5.55) | 0.82 (0.65) | 17.2 (15.20) |
| SE Gotland Basin 29.03.2012 | TF0259 33 | 3.18 (1.30) | 7.41 (7.25) | 8.96 (9.58) | 3.03 (4.06) | 0.67 (0.63) | 14.00 (13.90) |
| Gotland Deep 30.03.2012 | TF0271 40 | 3.04 (0.78) | 7.34 (7.32) | 8.91 (8.99) | 3.18 (3.70) | 0.66 (0.60) | 13.50 (11.50) |
| Farö Deep 31.03.2012 | TF0286 42 | 2.75 (0.66) | 6.92 (7.24) | 9.10 (9.24) | 4.79 (3.91) | 0.63 (0.60) | 14.20 (11.80) |
| Landsort Deep 31.03.2012 | TF0284 45 | 3.11 (0.69) | 6.96 (6.92) | 9.09 (9.30) | 3.44 (2.84) | 0.59 (0.57) | 15.20 (16.30) |
| Karlsö Deep 01.04.2012 | TF0245 47 | 3.05 (0.71) | 7.24 (6.94) | 9.05 (9.64) | 3.02 (3.39) | 0.65 (0.60) | 14.70 (9.64) |

Table 2: Preliminary data of 2012 from the near-bottom layer of selected regions.

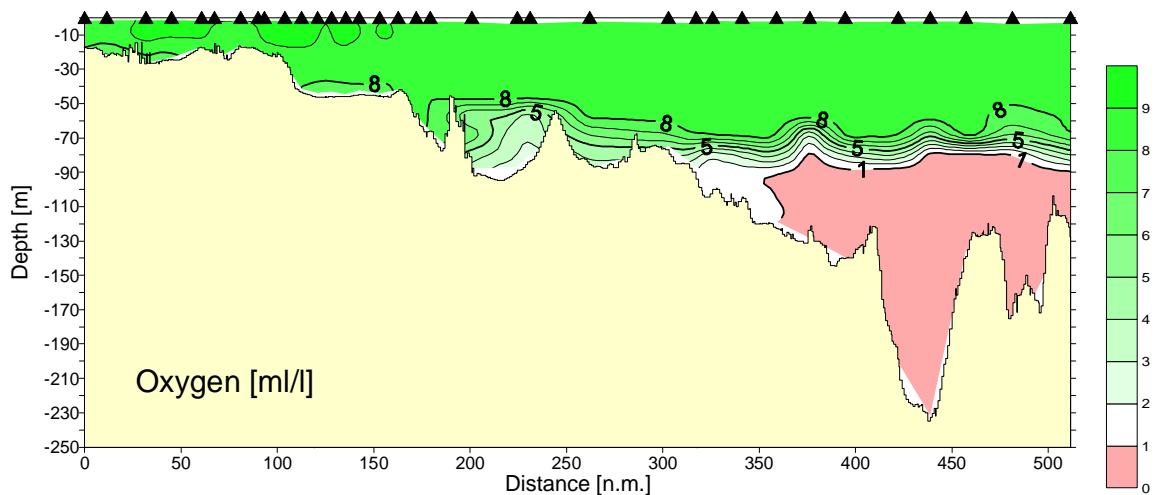
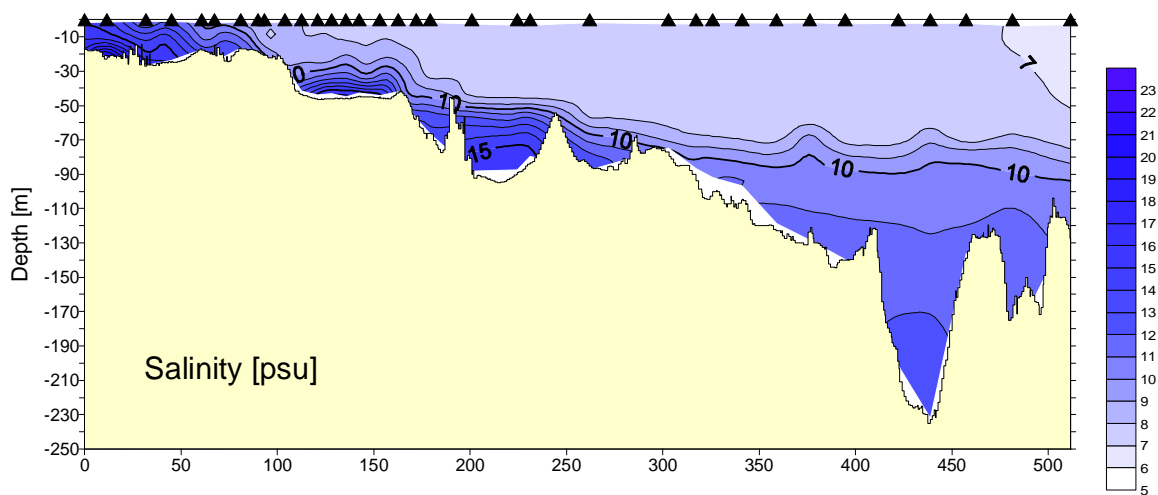
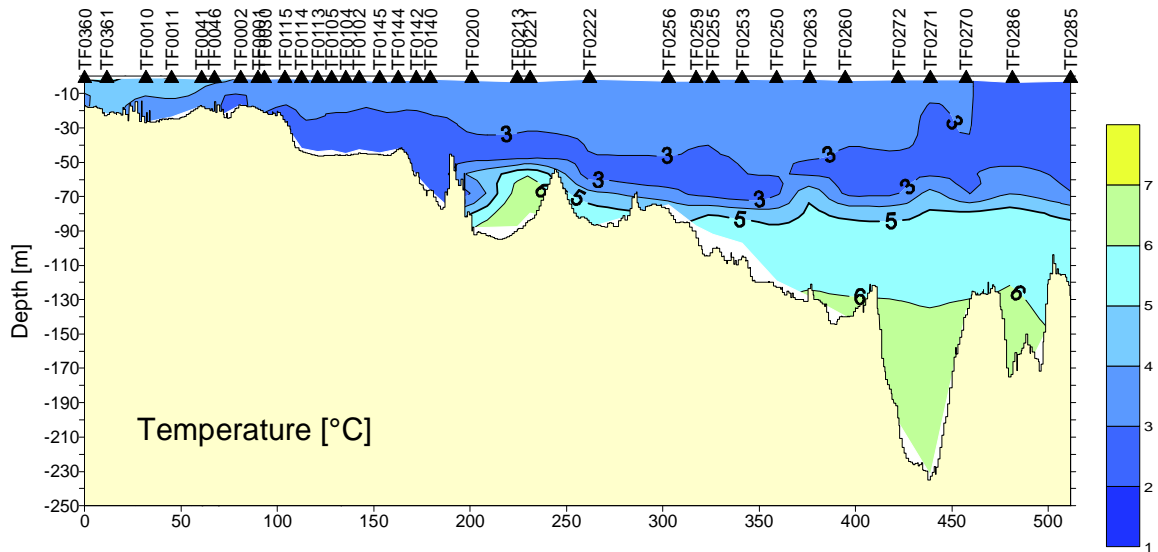
Oxygen values from titration. Negative oxygen values are equivalents of H₂S.

In brackets, related data of March 2011.

| Location / Date | Station / Number | Depth dbar | Temp. °C | Salinity psu | O ₂ ml/l | NO ₂₊₃ µmol/l | PO ₄ µmol/l | SiO ₄ µmol/l |
|---------------------------------|---------------------|---------------|----------------|------------------|------------------------|-----------------------------|---------------------------|----------------------------|
| Kiel Bight 27.03.2012 | TF0360 5 | 15 | 3.77 (1.33) | 18.04 (17.80) | 7.53 (8.48) | 0.14 (0.73) | 0.13 (0.10) | 1.4 (12.10) |
| Mecklenburg Bight 28.03.2012 | TF0012 7 | 20 | 2.60 (1.02) | 15.88 (15.43) | 7.68 (8.15) | 4.15 (5.49) | 0.52 (0.42) | 14.1 (16.80) |
| Lübeck Bight 27.03.2012 | TF0022 6 | 20 | 2.95 (1.31) | 17.13 (18.29) | 5.20 (7.74) | 9.02 (3.70) | 0.63 (0.41) | 27.5 (15.80) |
| Darss Sill 28.03.2012 | TF0030 13 | 20 | 2.91 (1.19) | 10.34 (13.89) | 8.50* (9.48) | (1.43) | (0.17) | (11.60) |
| Arkona Basin 28.03.2012 | TF0113 17 | 40 | 2.38 (0.85) | 16.31 (11.83) | 7.23* (9.15) | (6.46) | (0.53) | (17.70) |
| Bornholm Deep 29.03.2012 | TF0213 29 | 80 | 7.01 (7.26) | 15.80 (15.34) | 2.97* (0.28) | (6.36) | (2.31) | (60.00) |
| Stolpe Channel 29.03.2012 | TF0222 31 | 80 | 5.53 (5.67) | 12.26 (11.86) | 4.21 (4.95) | 7.54 (7.87) | 1.57 (1.52) | 33.9 (34.80) |
| SE Gotland Basin 29.03.2012 | TF0259 33 | 80 | 4.80 (5.60) | 9.75 (10.26) | 3.06 (0.46) | 5.36 (5.68) | 1.99 (2.80) | 36.5 (47.60) |
| Gotland Deep 30.03.2012 | TF0271 40 | 200 | 6.42 (6.43) | 12.15 (12.18) | -5.45 (-4.34) | 0 (0.36) | 5.67 (5.40) | 88.3 (79.10) |
| Farö Deep 31.03.2012 | TF0286 42 | 150 | 6.23 (6.46) | 11.62 (11.80) | -2.65 (-1.77) | 0 (0.61) | 4.47 (4.35) | 69.4 (63.80) |
| Landsort Deep 31.03.2012 | TF0284 45 | 400 | 5.75 (6.00) | 10.52 (10.62) | -1.54 (-0.72) | 0 (0.23) | 3.65 (3.70) | 57.9 (56.30) |
| Karlsö Deep 01.04.2012 | TF0245 47 | 100 | 5.03 (5.48) | 9.51 (10.02) | 0.0 (-1.10) | 0.24 (0.14) | 3.20 (3.95) | 54.6 (57.50) |

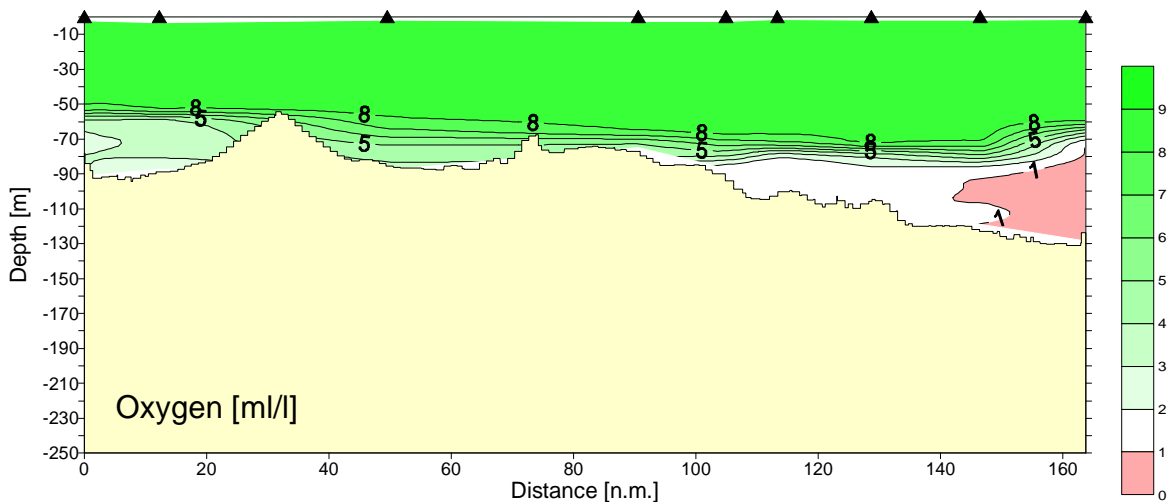
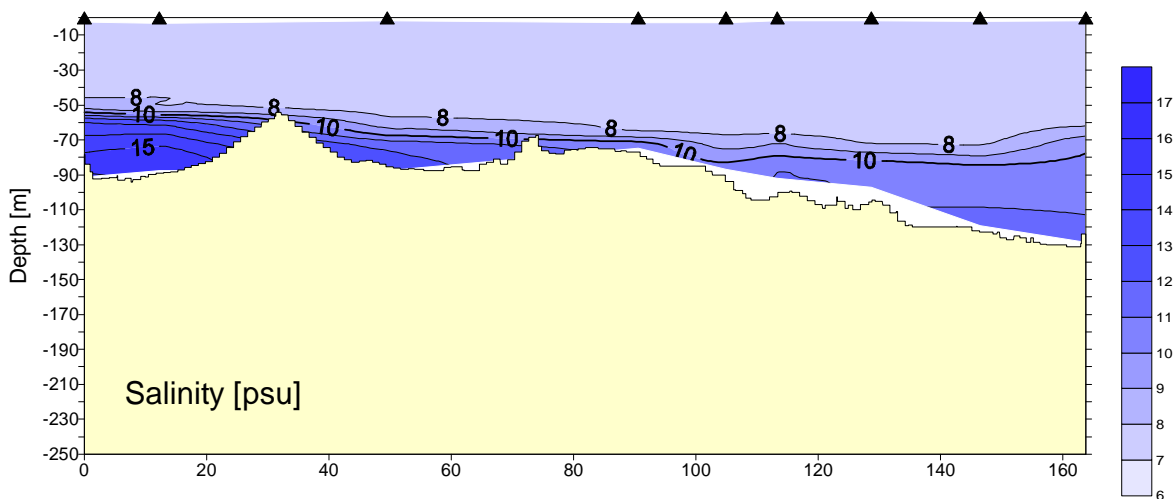
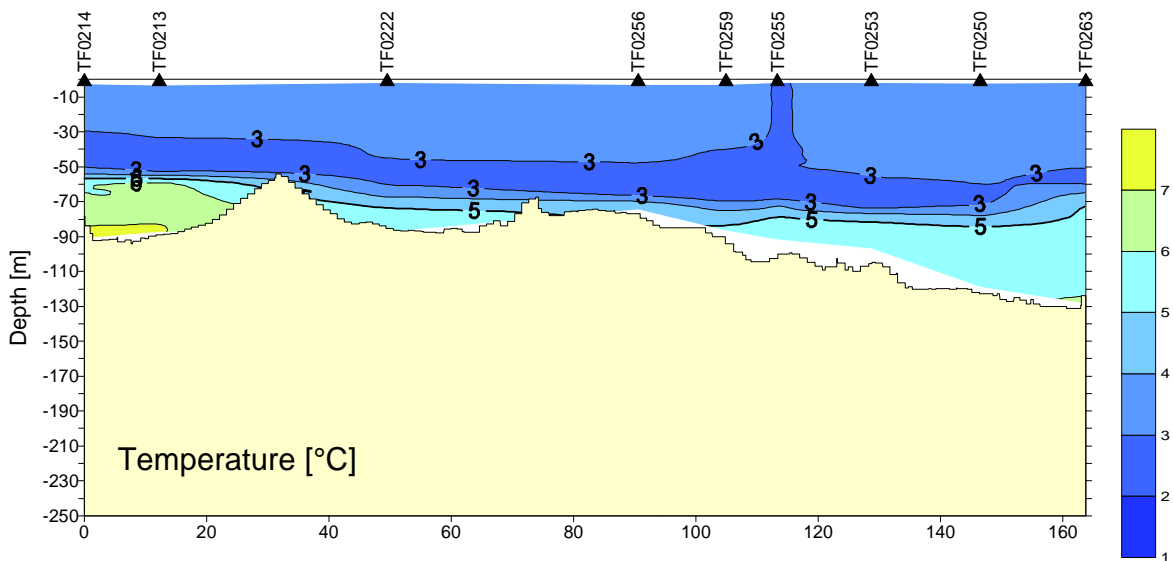
06EZ1203

Kiel Bight - Gotland
 27.03.2012 13:19 - 31.03.2012 04:41 UTC



06EZ1203

TF0214 - TF0263 Hinweg
 29.03.2012 05:19 - 30.03.2012 01:44 UTC



06EZ1203

TF0214 - TF0263 Rückweg
 02.04.2012 00:24 - 21:02 UTC

