



Björn Sjöberg
Lars Edler

Swedish Meteorological and Hydrological Institute
Oceanographical Laboratory

1997-08-15
Dnr: SaO-1997-171

EXPEDITIONSRAPPORT FRÅN U/F ARGOS

CRUISE REPORT FROM R/V ARGOS

Expeditionens varaktighet: 970811-970815
Survey period:

Undersökningsområde: The Kattegat, the Sound,
Survey area: the south Baltic Proper, the
Pomeranian Bay and the Bay of Gdansk

Uppdragsgivare: SMHI, NSEPA
Principal:

SUMMARY

Due to the floodings in Poland and Germany, this expedition was carried out with the main purpose to study the spreading and material transports of river water into the Baltic. The expedition was carried out in cooperation between SMHI, NSEPA, The Fishery Board, IVL and the Swedish Coast Guard as well as with authorities in Germany and Poland. A 1-3 m thick surface layer in the western part of the Pomeranian Bay was strongly influenced by the water from the Oder. The water from the Wisla influenced the the western part of the Bay of Gdansk. In these waters there were elevated levels of phosphate and silica. Outside the Oder the water was depleted of nitrate while there was nitrate left in the water outside the Wisla. High chlorophyll concentrations were measured outside both rivers.

Preliminary results

The Kattegat och Öresund

The surface temperatures were about 22°C and the secchi depth varied between 9-11 m. In the Kattegat the surface layer contained only small amounts of phosphate (0.07-0.10 $\mu\text{mol/l}$) and was depleted of silica and nitrate. The oxygen saturation close to the bottom varied between 55 and 70%. The chlorophyll concentration ranged between 0.5 and 2.0 mg l^{-1} in the upper 5 m. Between 10 and 15 m depth values of 2.2-5.2 $\mu\text{g l}^{-1}$ were measured.

The plankton flora was dominated by numerous species of *dinoflagellates*, such as *Ceratium furca*, *C. fusus*, *C. tripos*, *Dinophysis acuminata*, *D. norwegica*, *Lingulodinium polyedra*, *Prorocentrum micans* and several species of *Protoperidinium*. *Prorocentrum minimum* increased considerably in density in the south Kattegat. In the Öresund it formed a bloom. *Emiliana huxleyi* was common in the northern part of the Kattegat. Only few diatoms were present (e.g. *Proboscia alata* and *Chaetoceros* spp.). Small amounts of the bluegreen algae *Aphanizomenon "baltica"*, *Anabaena* spp. and the potential toxic *Nodularia spumigena* were observed in the south part of the Kattegat. In Öresund they became more abundant.

The Arkona sea

The surface temperatures were about 21°C and the secchi depth 6-8 m. The surface layer was depleted of nitrate while phosphate and silica varied around 0.08 and 7 $\mu\text{mol/l}$ respectively. The oxygen saturation at the bottom was about 70%.

In the Arkona Sea the bluegreen algae *Nodularia spumigena*, *Aphanizomenon "baltica"* and *Anabaena* sp. were common and could be seen by the naked eye. However, surface accumulations were observed only in the eastern part. *Prorocentrum minimum* was present in very high densities. Several other dinoflagellates, such as *Ceratium. tripos*, *Dinophysis acuminata*, *Prorocentrum micans* and *Gymnodinium* sp. as well as diatoms such as *Chaetoceros danicus*, *C. cf. eibonii*, *Actinocyclus octonarius* and *Nitzschia cf. actinastroides* were observed

The Pomeranian bay

A 1-3 m thick surface layer strongly influenced by the flooding water from Oder covered the western part of the Pomeranian Bay. There was a pronounced plum with a frontal structure, reaching from the river mouth towards the NNW. West of the front the secchi depth was only 1-3 m and a strong bloom was observed. The flooding water was empty of nitrate but there were still elevated concentrations of phosphate and silica. In the plum water the chlorophyll concentration ranged between 6 and 25 $\mu\text{g l}^{-1}$.

In this area, with a surface layer of the flooding water from Oder, the bluegreen algae (*Nodularia spumigena*, *Aphanizomenon "baltica"* and *Anabaena* sp.) were present, but in much lower densities than in the Arkona Sea. The phytoplankton was dominated by large centric diatoms; *Coscinodiscus granii*, *Coscinodiscus* sp., *Actinocyclus octonarius* and *Chaetoceros cf. eibonii*. The freshwater was indicated by the presence of *Pediastrum* spp.

The Bay of Gdansk

The flooding water from Wisla influenced the north and western part of the Bay of Gdansk, especially north east of the peninsula Hela. However, the plum was more diluted and not so pronounced as outside Oder. The flooding water contained elevated concentrations of silica and phosphate, as outside Oder, but also of nitrate (1-2 $\mu\text{mol/l}$). In the plum water the chlorophyll concentration ranged between 7 and 30 $\mu\text{g l}^{-1}$.

North and west of the Gdansk Bay the plankton flora was dominated by dinoflagellates of the genus *Gymnodinium*. The bluegreen algae *Nodularia spumigena*, *Aphanizomenon "baltica"* and *Anabaena* sp. were common and could be seen by the naked eye in some areas.

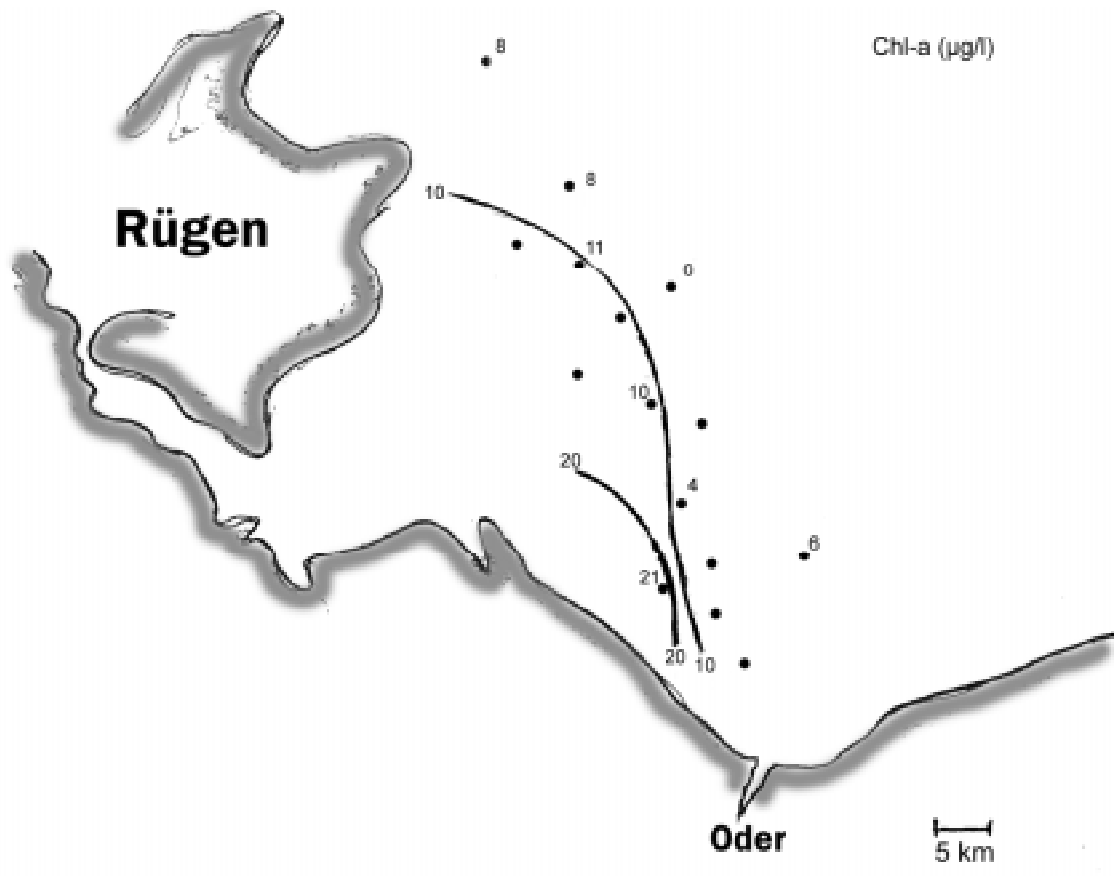
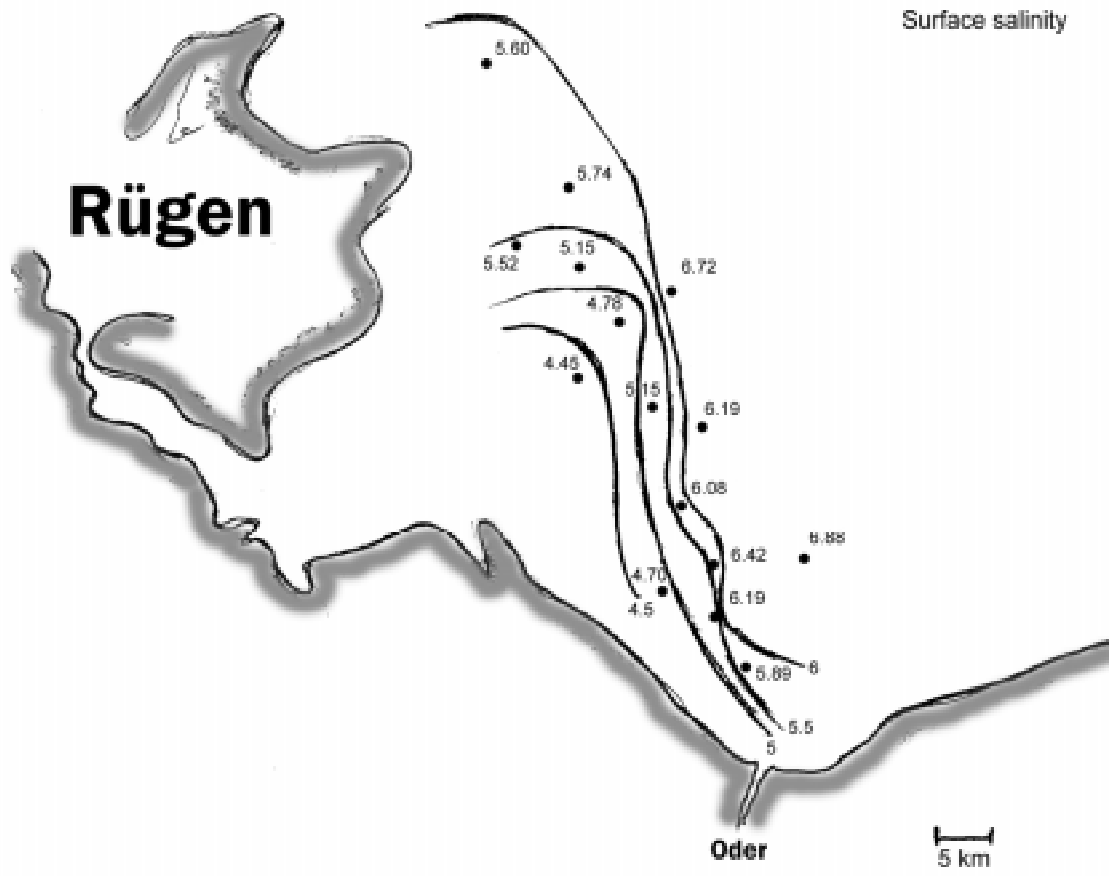
The plankton flora within the Bay in the plum water from the flooding Wisla was completely dominated by freshwater species. *Pediastrum* spp., *Scenedesmus* spp., *Melosira* spp. and *Cyclotella* were very common. Bluegreen algae, *Nodularia spumigena*, *Aphanizomenon "baltica"*, *Anabaena* sp. and *Microcystis* sp. occurred, as did the diatoms *Coscinodiscus* spp., *Actinocyclus octonarius* and *Chaetoceros* cf. *eibonii*. Among dinoflagellates *Dinophysis norwegica* and *Heterocapsa triquetra* were present.

Participants

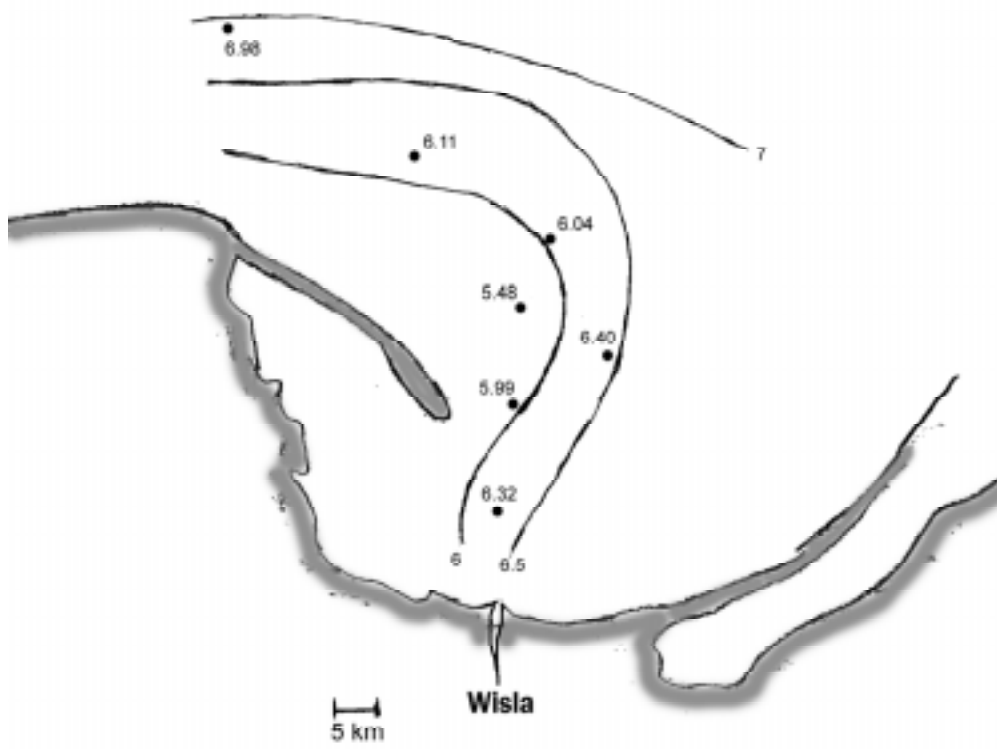
| Name | | From |
|------------------|----------------------|---------------------------|
| Björn Sjöberg | , Head of expedition | SMHI Oceanographical lab. |
| Lars Edler | | - " - |
| Nils Kajrup | | - " - |
| Eva Nyberg | | - " - |
| Jorge Valderrama | | - " - |

Appendix

- Track chart
- Table of stations, sampling depths and parameters
- Map bottom oxygen concentrations
- Monthly mean plots of some stations

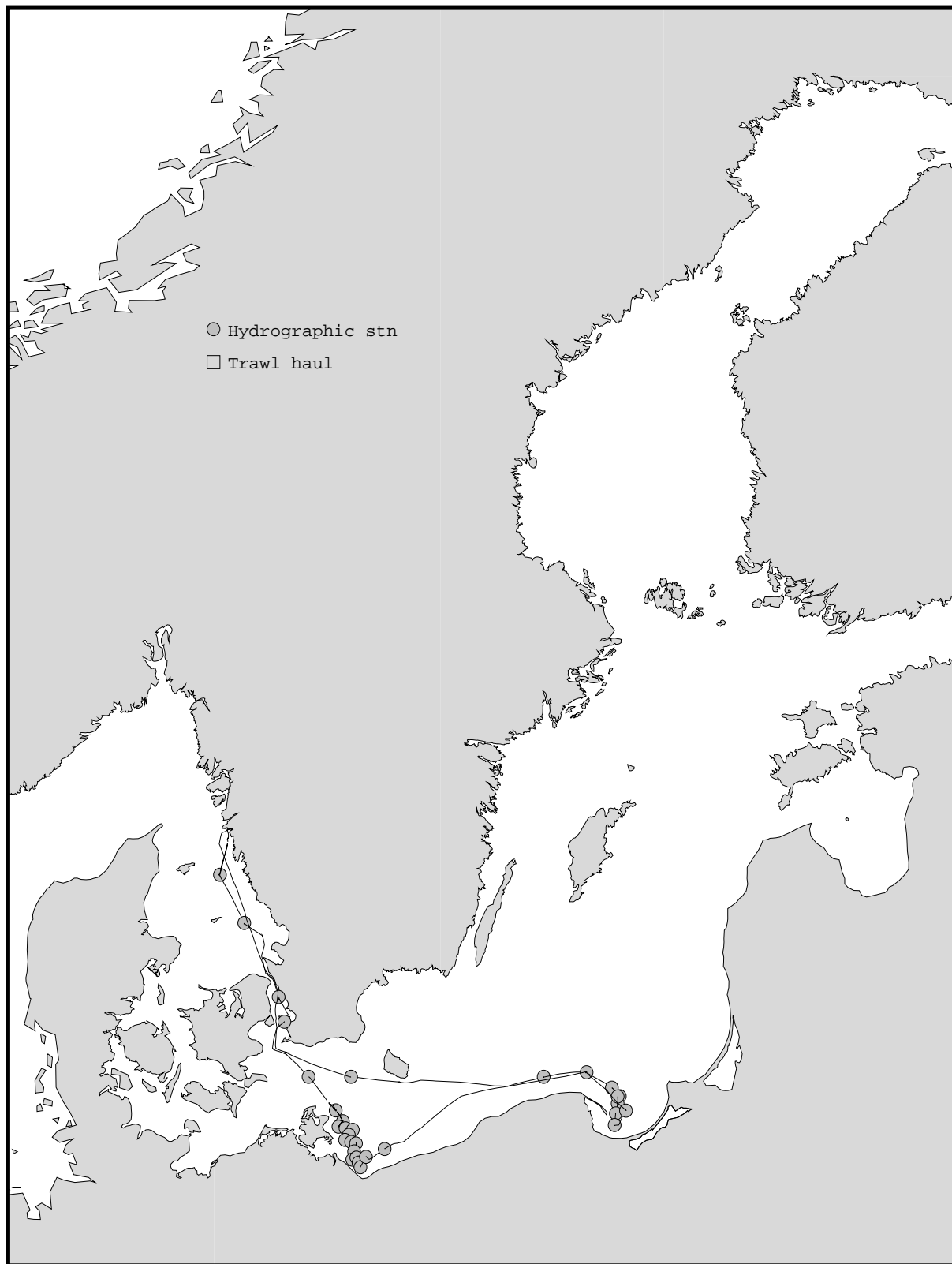


Surface salinity



TRACK CHART

Country: Sweden
Ship : Argos
Date : 970811-970815
Series : 0481-0511



Bottom water oxygen concentration (ml/l)

Country: Sweden
Ship: Argos
Date: 970811-970814
Series: 0481-0511



SMHI Ocean lab ***** Hydrographic series Ship: 14-Argos Year: 1997 ***** Date: 1997-08-15 Time: 11:56

| Ser no | Stat code | P r o j | Station----- | Lat----- | Lon----- | Date yymmdd | Time hhmm utc | Bott m | Mld m | Secc m | Wind dir | Air temp C | Air pres hPa | WCSI elec tu | PPCPZT C | No de | T e a h m l y S 4 t 2 3 4 t k O m g N C C m | S P O H P T N N N T A S H L P P T C |
|--------|-----------|---------|--------------|----------|----------|-------------|---------------|--------|-------|--------|----------|------------|--------------|--------------|----------------------|-------|---|-------------------------------------|
| 0481 | KANX25BAS | | FLADEN | N5711.5 | E1140 | 970811 | 1200 | 77 | | 11.0 | 14 2 | 25.0 | 1027 | 1310 | x --x---- | 12 | - x x x - x x x x x x x x x x - - - x | |
| 0482 | KAEX29BAS | | ANHOLT E | N5640.0 | E1207.0 | 970811 | 1815 | 54 | | 9 | 05 2 | 25.0 | 1026 | 1110 | x xxx --- | 10 | x x x x - x x x x x x x x x x - - - x | |
| 0483 | SOCX39BAS | | W LANDSKRONA | N5552.0 | E1245.0 | 970812 | 0020 | 50 | | | 14 2 | 21 | 1027 | 9910 | x --x---- | 9 | x x - x - x x x x x x - x - - - - - - | |
| 0484 | SOSX00BAS | | ÖRESUND S | N5535.9 | E1251.3 | 970812 | 0230 | 9 | | | 14 2 | 21 | 1027 | 9910 | x ----- | 2 | - x - - - - - - - - - - - - - - - - - | |
| 0485 | BPSA02BAS | | BY1 | N5500 | E1318 | 970812 | 0750 | 46 | | 8 | 14 5 | 23 | 1027 | 1130 | x ----- | 8 | x x - x - x x x x x x - x - - - - - - | |
| 0486 | BPSA00BAS | | PB-1 | N5438.2 | E1348.1 | 970812 | 0955 | 27 | | 3 | 09 5 | 24 | 1027 | 1320 | x xxx --- | 7 | - x - x - x x x x x x - x - - - - - x | |
| 0487 | BPSA00BAS | | PB-2 | N5431.1 | E1356.0 | 970812 | 1105 | 18 | | 2.5 | 09 5 | 24 | 1027 | 1330 | x --x---- | 6 | - x - x - x x x x x x - x - - - - - - | |
| 0488 | BPSA00BAS | | PB-3 | N5427.6 | E1351.2 | 970812 | 1150 | 16 | | 1.8 | 09 5 | 24 | 1027 | 1220 | x ----- | 4 | - x - x - x - x x - - - x - - - - - x | |
| 0489 | BPSA00BAS | | PB-4 | N5426.6 | E1358.8 | 970812 | 1330 | 16 | | 1.5 | 09 5 | 24 | 1027 | 1220 | x xx ---- | 5 | - x - x - x x x x x x - x - - - - - x | |
| 0490 | BPSA00BAS | | PB-5 | N5425.5 | E1407.0 | 970812 | 1415 | 15 | | 3 | 09 5 | 24 | 1027 | 1220 | x --x---- | 5 | - x - x - x - x x - - - x - - - - - - | |
| 0491 | BPSA00BAS | | PB-6 | N5422.2 | E1402.5 | 970812 | 1500 | 13 | | 1.7 | 09 5 | 23 | 1026 | 1220 | x ----- | 4 | - x - x - x x x x x x - x - - - - - - | |
| 0492 | BPSA00BAS | | PB-7 | N5419.0 | E1358.3 | 970812 | 1545 | 17 | | 1.2 | 09 5 | 23 | 1026 | 1220 | x ----- | 4 | - x - x - x x x x x x - x - - - - - - | |
| 0493 | BPSA00BAS | | PB-8 | N5417.7 | E1405.2 | 970812 | 1630 | 18 | | 2.0 | 09 4 | 23 | 1025 | 1220 | x xxx --- | 6 | - x - x - x x x x x x - x - - - - - x | |
| 0494 | BPSA00BAS | | PB-9 | N5416.6 | E1410.5 | 970812 | 1700 | 17 | | 2 | 09 4 | 23 | 1025 | 1220 | x ----- | 4 | - x - x - x - x x - - - x - - - - - - | |
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| 0496 | BPSA00BAS | | PB-11 | N5406.2 | E1406.4 | 970812 | 1840 | 15 | | | 09 4 | 23 | 1025 | 1220 | x xxx --- | 5 | - x - x - x x x x x x - x - - - - - - | |
| 0497 | BPSA00BAS | | BP-12 | N5407.5 | E1410.9 | 970812 | 1910 | 14 | | | 09 4 | 23 | 1025 | 1220 | x ----- | 4 | - x - x - x - x x - - - x - - - - - - | |
| 0498 | BPSA00BAS | | PB-13 | N5404.2 | E1413.3 | 970812 | 1945 | 14 | | | 09 4 | 22 | 1025 | 1220 | x ----- | 4 | - x - x - x x x x x x - x - - - - - - | |
| 0499 | BPSA00BAS | | PB-14 | N5401.2 | E1415.3 | 970812 | 2030 | 14 | | | 09 3 | 22 | 1025 | 9990 | x ----- | 3 | - x - x - x x x x x x - x - - - - - x | |
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| 0503 | BPSE00BAS | | PLX-3 | N5503 | E1825.5 | 970813 | 1230 | 73 | | 6.0 | 27 6 | 24 | 1021 | 1230 | x xxx --- | 9 | - x - x - x x x x x x - x - - - - - - | |
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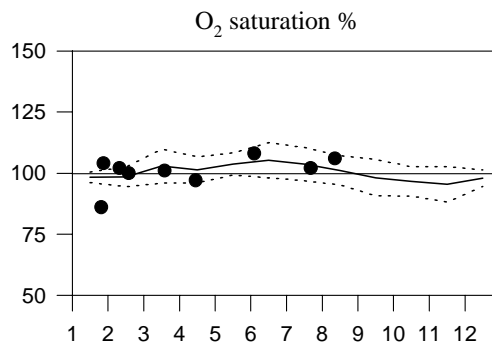
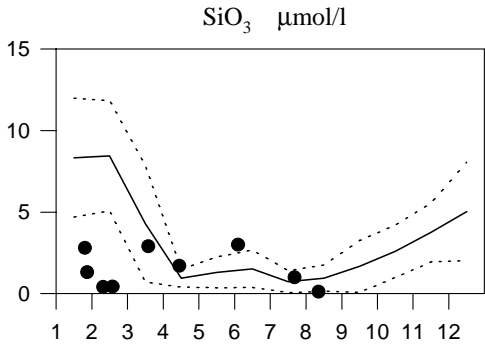
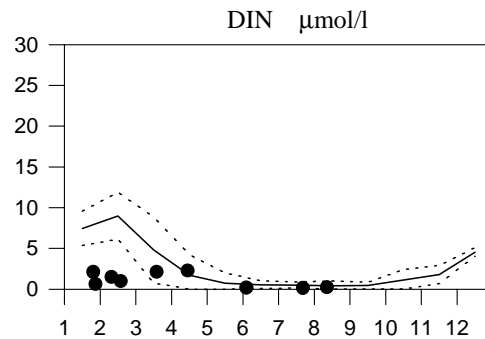
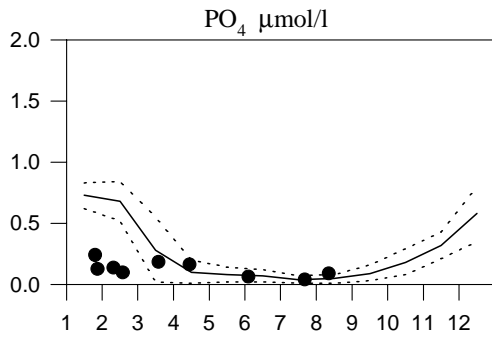
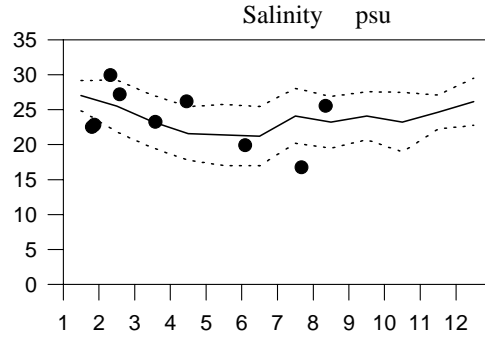
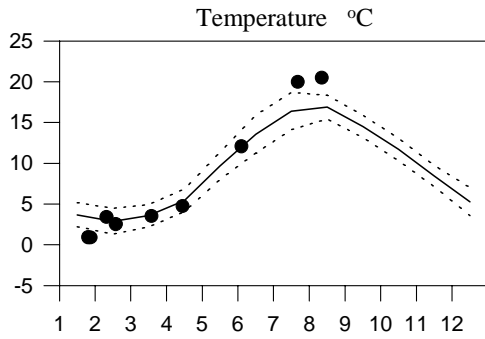
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|--------|-----------|--------|--------------|----------|----------|----------------|--------------|--------------|-----|--------------|---------------|-------------|-------------|--------------|--------|--------------------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|
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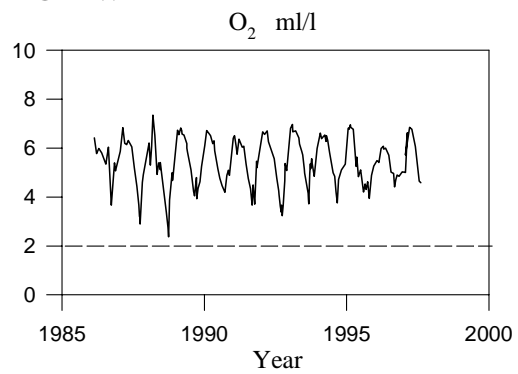
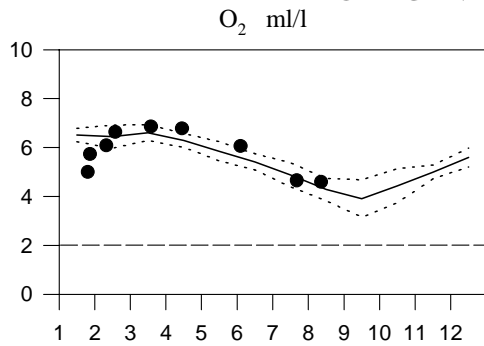
STATION FLADEN SURFACE WATER (0-15 m)

Annual Cycles

— Mean 1986-1995 - - - St.Dev. ● 1997



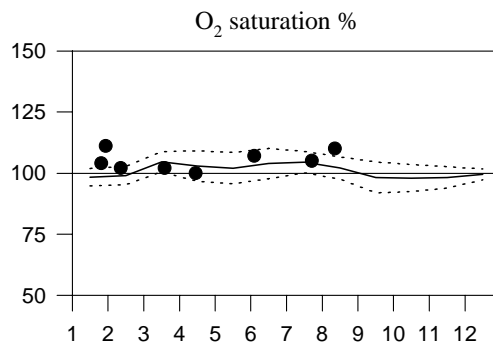
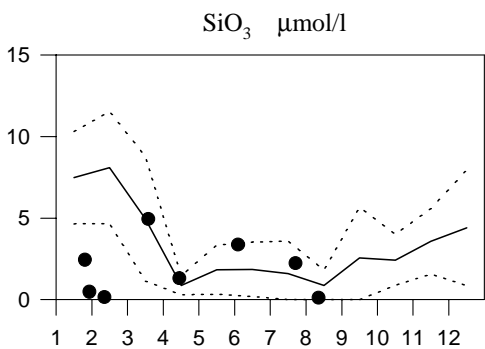
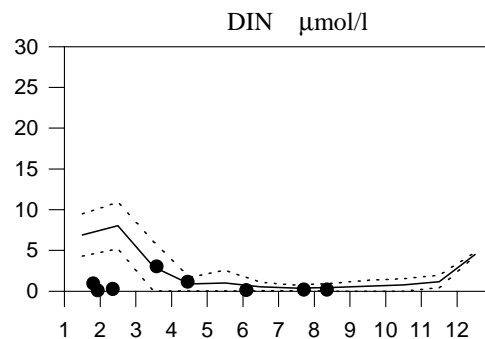
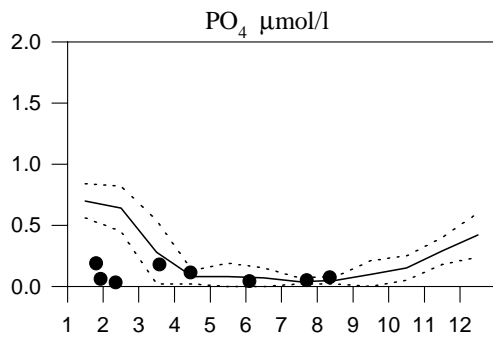
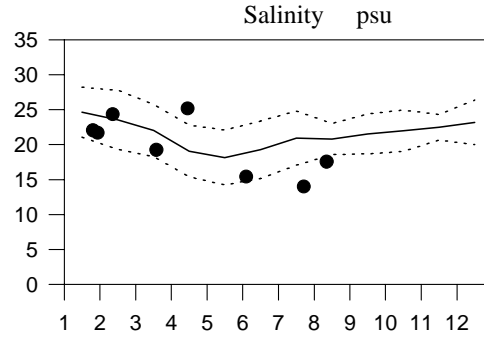
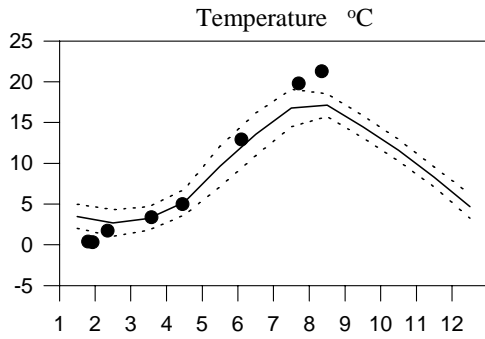
OXYGEN IN BOTTOM WATER



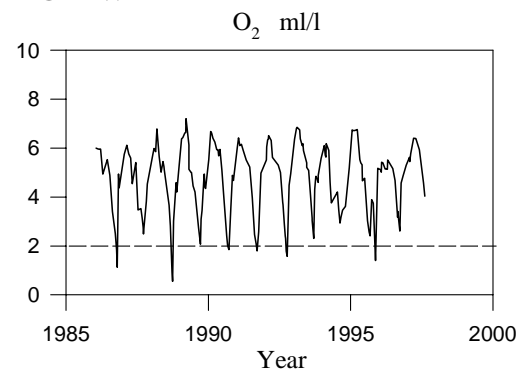
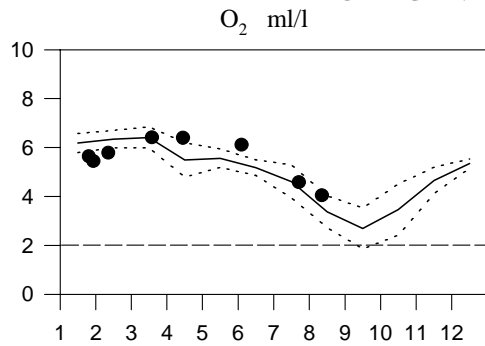
STATION ANHOLT E SURFACE WATER (above halocline)

Annual Cycles

— Mean 1986-1995 - - - St.Dev. ● 1997



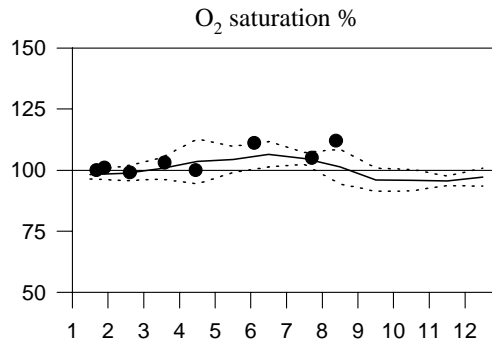
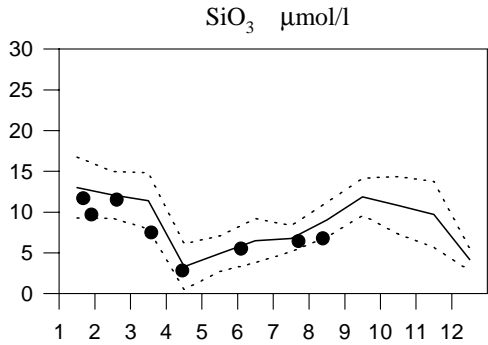
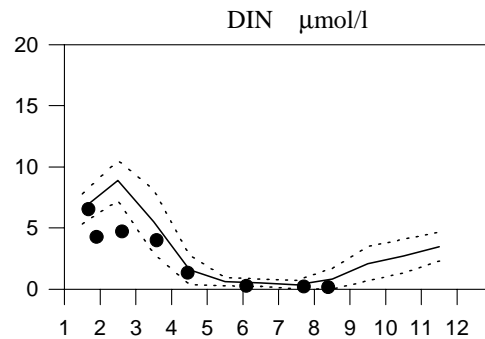
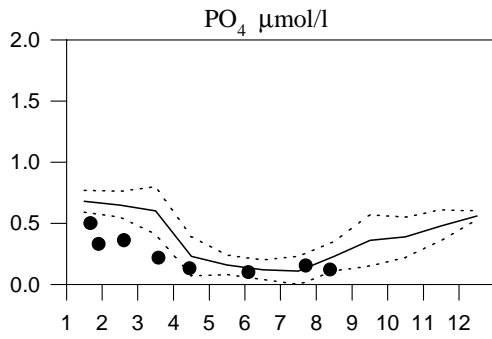
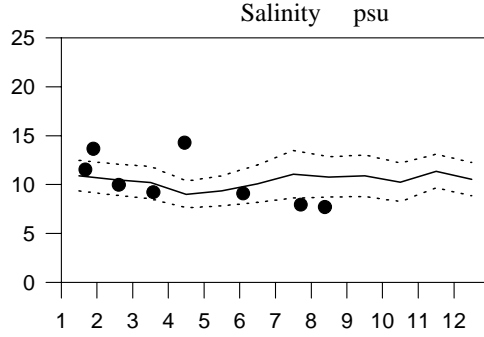
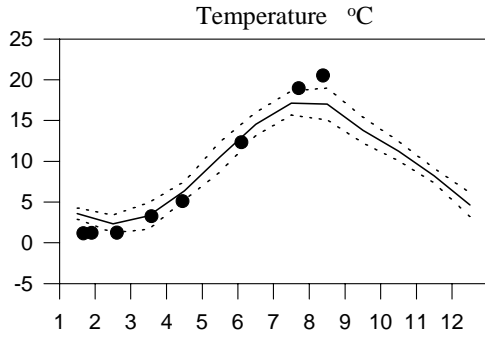
OXYGEN IN BOTTOM WATER



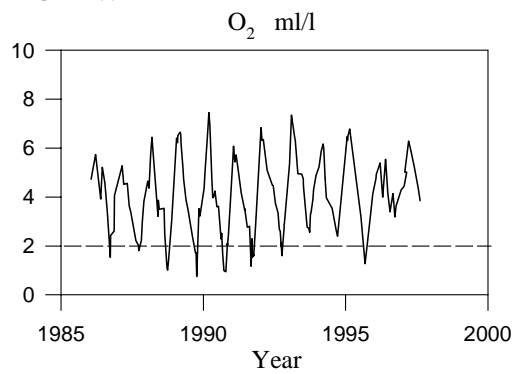
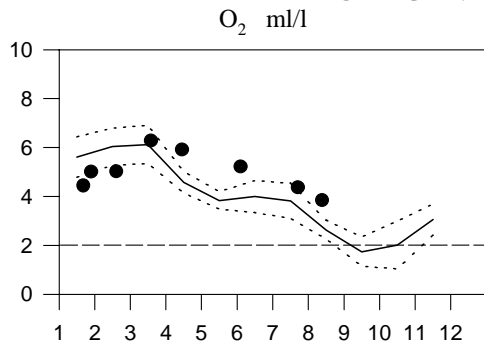
STATION W LANDSKRONA SURFACE WATER (0-15 m)

Annual Cycles

— Mean 1986-1995 - - - St.Dev. ● 1997



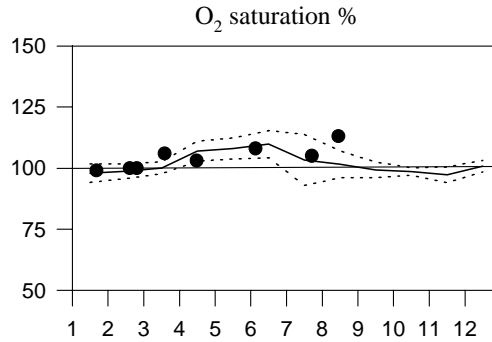
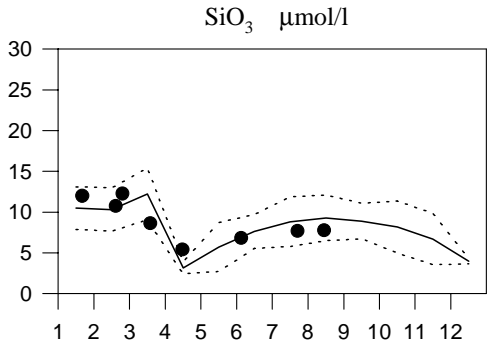
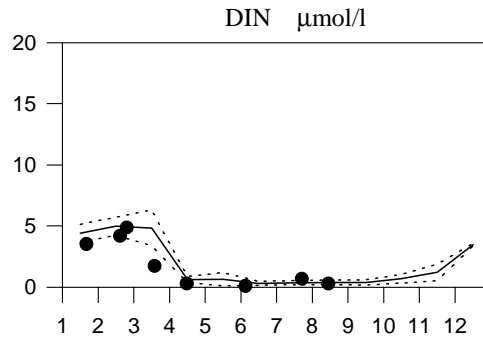
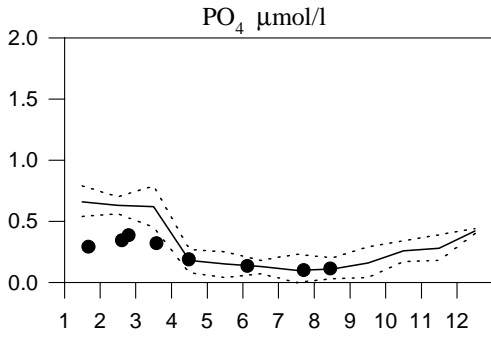
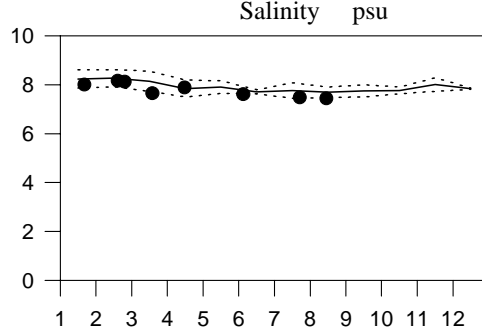
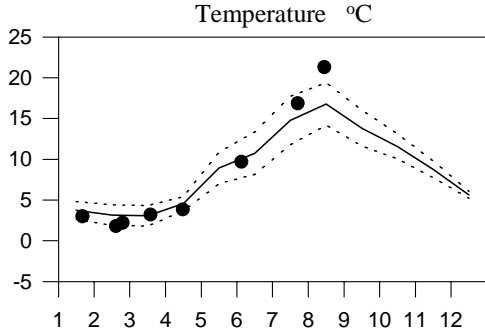
OXYGEN IN BOTTOM WATER



STATION BY2 SURFACE WATER (0-15 m)

Annual Cycles

— Mean 1986-1995 - - - St.Dev. ● 1997



OXYGEN IN BOTTOM WATER

