

## CRUISE REPORT FROM R/V ARGOS

**Survey period:** 971012-971017

**Survey area:** The Skagerrak, the Kattegat, the Sound,  
and the Baltic Proper

**Principal:** SMHI

### SUMMARY

*The expedition was performed within SMHI's regular monitoring programme and covered the Skagerrak, the Kattegat, the Sound and the Baltic Proper. The weather was dominated by weak to moderate northerly winds. The surface water temperatures showed normal values. In the surface water of the Skagerrak the nutrient contents were low. In the surface water of the Kattegatt and the Baltic, outside the Sound area, the nitrogen compounds were below or close to the detection limit, whereas both phosphate, 0.1-0.2  $\mu\text{mol/l}$ , and silicate, 0.2-0.7, in the Kattegatt and, 6-10,  $\mu\text{mol/l}$  in the Baltic was present.*

*The oxygen conditions in the bottom water are displayed in a figure. Hydrogen sulphide was observed in the deep water of the East Gotland Basin (stations: BY10, BY15 and BY20). The concentration close to bottom in the Gotland deep is now almost 50  $\mu\text{mol/l}$ .*

*No visible algae blooms were observed in any of the sea areas.*

## **PRELIMINARY RESULTS**

The expedition, which was part of SMHI's regular marine monitoring programme, commenced in Karlskrona and ended in Göteborg. The weather during the expedition was dominated by weak to moderate northerly winds. During the last 24 hours of the expedition rather strong winds from south started.

### **The Skagerrak**

The temperature in the surface water varied between 11.0 and 12.3°C which is or the season normal. The nutrient concentrations in the surface water were low, which also is typical for this time of the year. The in situ fluorescens in the area was low which indicated that the primary production not went on.

### **The Kattegatt and the Sound**

The surface water temperatures varied between 10.7 and 11.8°C, which is normal for the season. The thermocline was weakly developed and was in the Kattegatt situated above 10 meters depth. The nitrogen components in the surface water outside the Sound area were exhausted, all registered values were below or very close to the detection limits, which is normal for the season. Also here was the in situ fluorescens low. The lowest oxygen value in the deep water of the Kattegatt was registered at station Anholt E, 2.13 ml/l at 50 m depth, corresponding to a saturation of 35%. The oxygen concentration in the deep water of the Sound was 3.81 ml/l (63% saturation) at station W Landskrona.

### **Östersjön**

The surface temperature was normal for the season and varied between 12.7°C and 10.0°C, with the lowest value in the north. The thermocline was found at 30 to 40 m depth in the whole area, except the Arkona basin where it was situated 10 m shallower. The nutrient concentrations in the surface water were typical for this time of the year; phosphate 0.10-0.20 µmol/l, nitrate around the detection limit of 0.10 µmol/l and silicate 6-10 µmol/l. The in situ fluorescens indicated that the autumn bloom not yet had started. The oxygen conditions in the bottom water are displayed in a figure. They were all low except in the Arkona Basin. Oxygen concentrations below 2 ml/l were found between 60 and 70 m in the Bornholm Basin, between 80 and 90 m in the Eastern Gotland Basin, between 70 and 80 m in the Northern Gotland Basin and between 70 to 90 m in the Western Gotland Basin. Hydrogen sulphide was found in the Gotland and Fårö deeps below 200 metres depth and at station BY10 at a depth of 140 meters. The concentration close to the bottom at the Gotland Deep is approaching 50 µmol/l.

## **PARTICIPANTS**

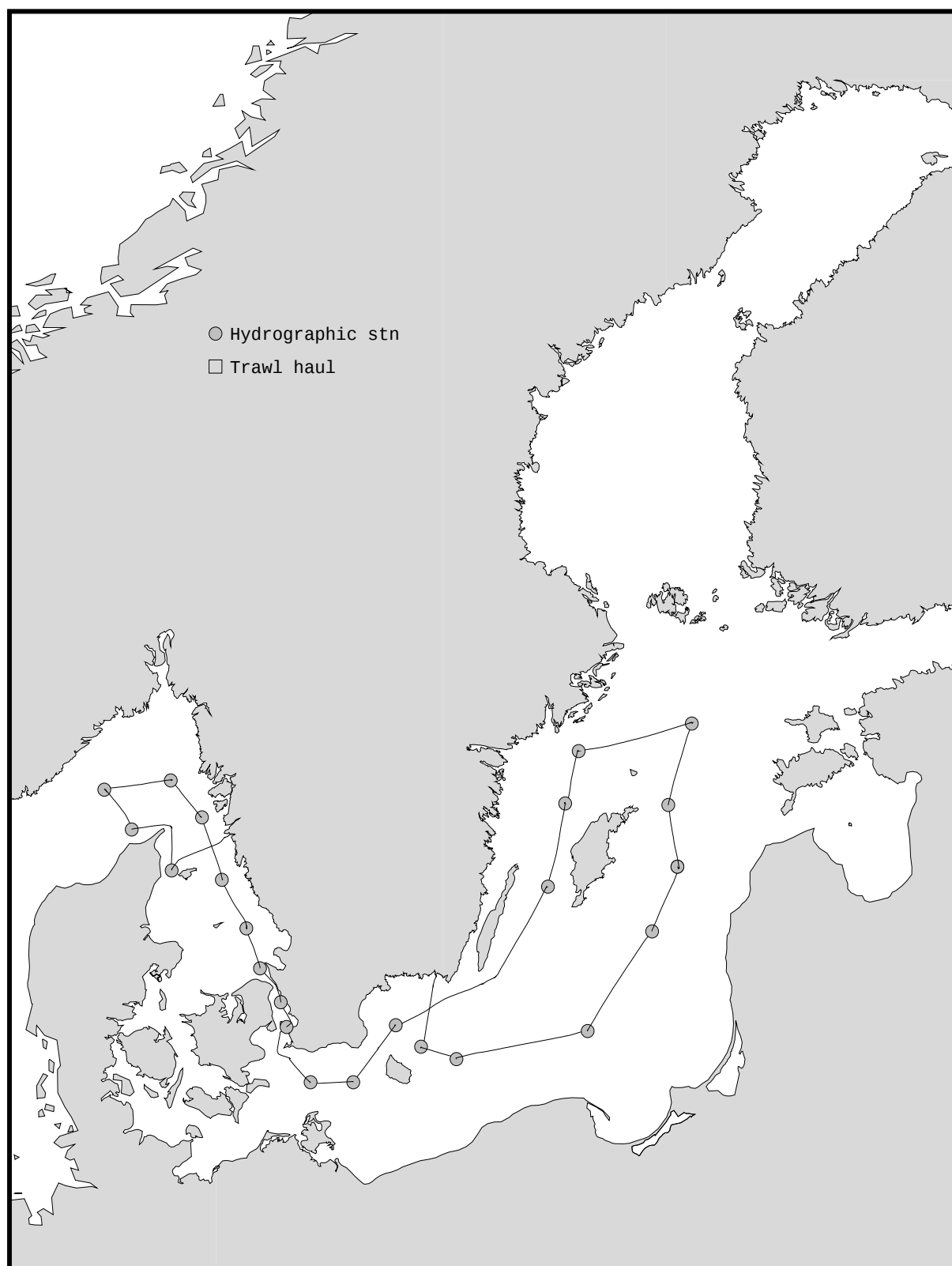
| Name                         | From                      |
|------------------------------|---------------------------|
| Bengt Yhlen, chief scientist | SMHI Oceanographical lab. |
| Markel Bertilsson            | - "-                      |
| Tuulikki Jaako               | - "-                      |
| Marie Larsson                | - "-                      |
| Mats Ohlson                  | - "-                      |

## **APPENDICES**

- Track chart
- Table over stations, parameters and sampling depths
- Map showing bottom water oxygen concentrations
- Monthly average plots for selected stations
- Profiles for selected stations

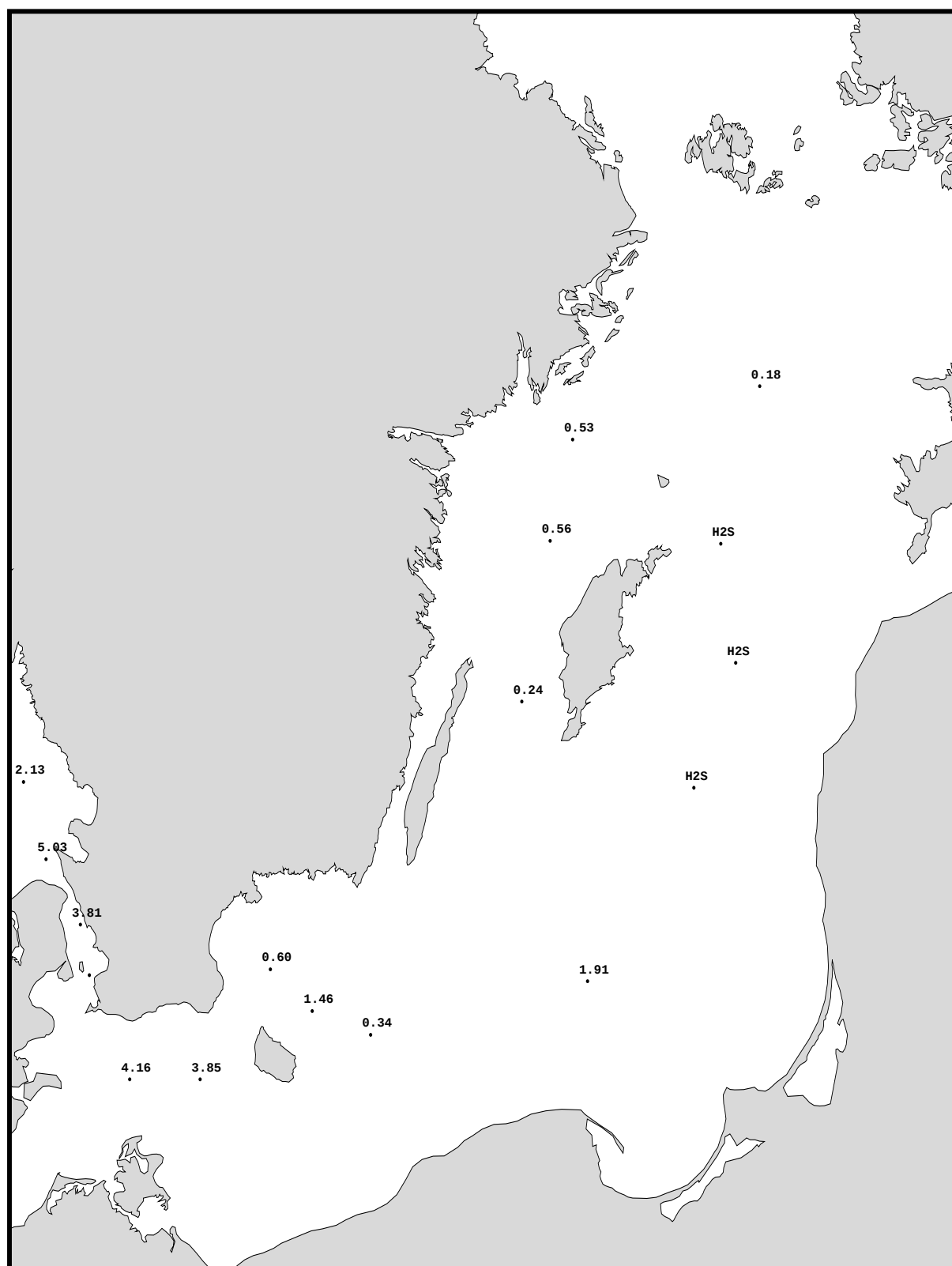
# TRACK CHART

Country: Sweden  
Ship : Argos  
Date : 971012-971017  
Series : 0671-0697



# Bottom water oxygen concentration (ml/l)

Country: Sweden  
Ship: Argos  
Date: 971013-971017  
Series: 0671-0694



SMHI  
Ocean lab

\*\*\*\*\*  
\*\*\*\*\*

Hydrographic  
series

Ship: 14-Argos  
Year: 1997

\*\*\*\*\*  
\*\*\*\*\*

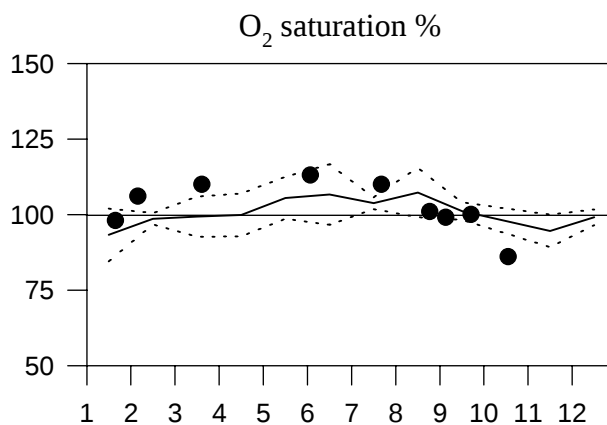
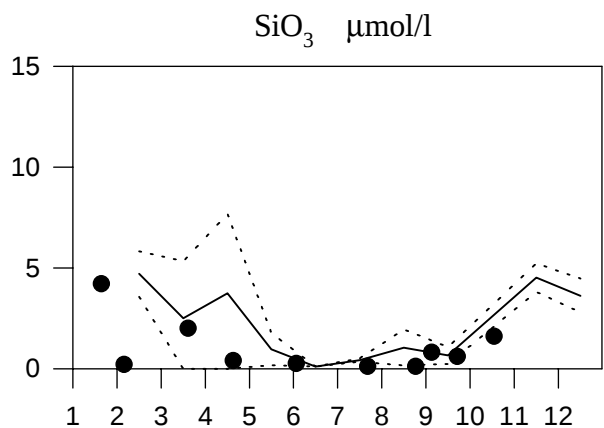
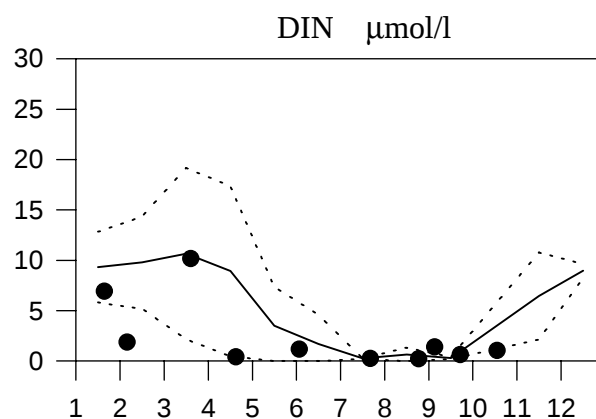
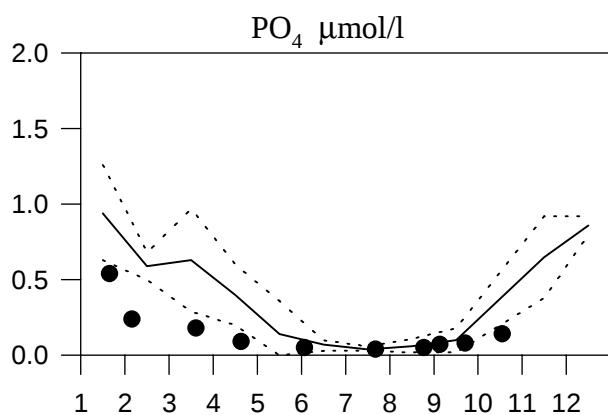
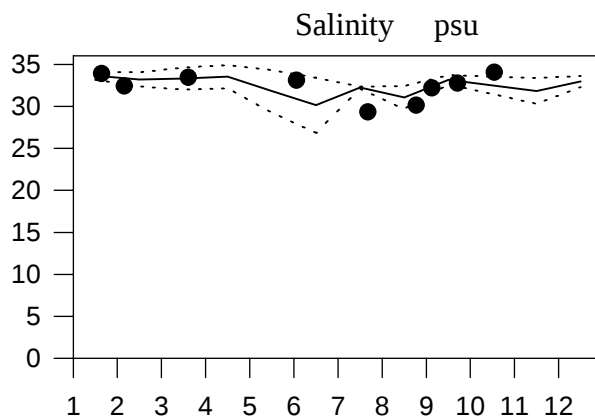
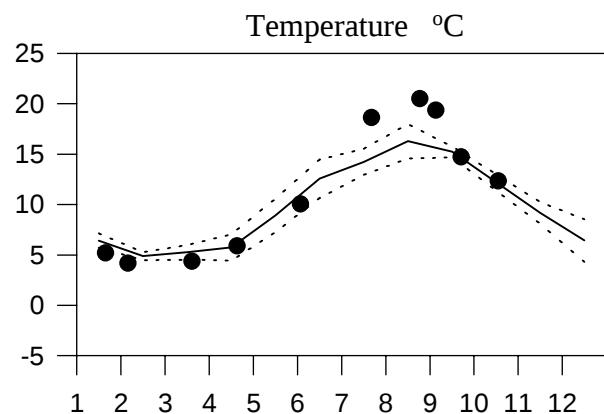
Date: 1997-10-20  
Time: 10:01

| Ser<br>no | Stat<br>code | P<br>r<br>o<br>j | Station-----       | Lat----- | Lon----- | Date<br>yymmdd | Time<br>hhmm<br>utc | Bott<br>deph<br>m | Mld<br>m | Secc<br>deph<br>m | Wind<br>di ve | Air<br>temp<br>C | Air<br>pres<br>hPa | WCSI<br>elec<br>tu<br>hd | C<br>Hr | PPCPZZT<br>hhoor | No<br>de | T<br>e | S<br>a | P<br>h | O<br>x | H<br>2 | P<br>o | T<br>o | N<br>o | N<br>o | T<br>h | A<br>o | S<br>l | L<br>i | P<br>u | P<br>i | T<br>o | C<br>o |   |
|-----------|--------------|------------------|--------------------|----------|----------|----------------|---------------------|-------------------|----------|-------------------|---------------|------------------|--------------------|--------------------------|---------|------------------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|
| 0671      | BPSB06BAS    | BY4              | CHRISTIANSÖ        | N5523    | E1520    | 971013         | 0245                | 94                |          |                   | 32 7          | 8.5              | 996                | 9930                     | x       | -----            | 12       | xx     | -      | x      | -      | x      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | - |
| 0672      | BPSB07BAS    | BY5              | BORNHOLMSDJ        | N5515    | E1559    | 971013         | 0540                | 93                | 6        | 32 6              | 10.4          | 996              | 1330               | x                        | xxx---  | 13               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | -      | xx     | -      | -      | -      | -      | -      | -      | -      |   |
| 0673      | BPSE11BAS    | BCS              | III-10             | N5533.3  | E1824    | 971013         | 1325                | 90                | 8        | 30 5              | 10.6          | 1000             | 1330               | x                        | xxx---  | 13               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0674      | BPEX13BAS    | BY10             |                    | N5638    | E1935    | 971013         | 2015                | 148               |          | 34 6              | 8.9           | 1000             | 9920               | x                        | --x---- | 16               | xx       | -      | x      | x      | x      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      |   |
| 0675      | BPEX21BAS    | BY15             | GOTLANDSDJ         | N5720    | E2003    | 971014         | 0105                | 249               |          | 32 7              | 7.3           | 1002             | 9930               | x                        | xxx---  | 20               | xx       | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     | xx     |   |
| 0676      | BPEX21BAS    | BY15             | GOTLANDSDJ         | N5720    | E2003    | 971014         | 0220                | 249               |          | 32 7              | 7.3           | 1002             | 9930               | -                        | -----   | 6                | xx       | -      | x      | x      | x      | x      | x      | x      | -      | x      | -      | x      | -      | -      | -      | -      | -      | -      |   |
| 0677      | BPEX26BAS    | BY20             | FÄRÖDJ             | N5800    | E1953    | 971014         | 0705                | 205               | 8        | 36 9              | 6.0           | 1005             | 2730               | x                        | --x---- | 18               | xx       | -      | x      | x      | x      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      |   |
| 0678      | BPNX35BAS    | BY29             |                    | N5853    | E2019    | 971014         | 1245                | 175               | 6        | 34 10             | 5.7           | 1006             | 1630               | x                        | --x---- | 17               | xx       | -      | x      | -      | x      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      |   |
| 0679      | BPNX37BAS    | BY31             | LANDSORTSDJ        | N5835    | E1814    | 971014         | 1930                | 460               |          | 32 6              | 6.0           | 1009             | 9930               | x                        | -xx---  | 24               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0680      | BPWX38BAS    | BY32             | NORRKÖPINGSDJ      | N5801    | E1759    | 971015         | 0015                | 215               |          | 32 7              | 6.6           | 1008             | 9930               | x                        | --x---- | 17               | xx       | -      | x      | -      | x      | x      | x      | x      | -      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0681      | BPWX45BAS    | BY38             | KARLSÖDJ           | N5707    | E1740    | 971015         | 0625                | 114               |          | 34 7              | 5.7           | 1008             | 7730               | x                        | --x---- | 15               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0682      | BPSH05BAS    |                  | HANÖBUKTEN         | N5537    | E1452    | 971015         | 1725                | 80                |          | 02 8              | 7.2           | 1010             | 9920               | x                        | -----   | 11               | xx       | -      | x      | -      | x      | -      | x      | x      | -      | -      | x      | -      | -      | -      | -      | -      | -      | x      |   |
| 0683      | BPSA03BAS    | BY2              | ARKONA             | N5500    | E1405    | 971015         | 2145                | 48                |          | 36 8              | 7.0           | 1011             | 9930               | x                        | xxx---  | 9                | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0684      | BPSA02BAS    | BY1              |                    | N5500    | E1318    | 971016         | 0055                | 47                |          | 36 8              | 6.4           | 1011             | 9930               | x                        | -----   | 8                | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0685      | SOCX00BAS    |                  | OSKARSGRUNDET NÄRA | N5535.9  | E1251.5  | 971016         | 0545                | 8                 |          | 02 7              | 1.0           | 1013             | 1220               | x                        | -----   | 2                | -        | x      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      | -      |   |
| 0686      | SOCX39BAS    | W                | LANDSKRONA         | N5552.0  | E1245.0  | 971016         | 0725                | 48                | 6.5      | 02 8              | 5.0           | 1015             | 0020               | x                        | --x---- | 8                | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0687      | KAEX33BAS    |                  | KULLEN             | N5614    | E1222.2  | 971016         | 0935                | 24                | 7        | 36 5              | 5.0           | 1016             | 1120               | x                        | -----   | 5                | xx       | -      | x      | -      | x      | -      | x      | x      | -      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0688      | KAEX29BAS    |                  | ANHOLT E           | N5640.0  | E1207.0  | 971016         | 1200                | 53                | 8.0      | 34 3              | 11            | 1016             | 1320               | x                        | xxx---  | 10               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | x      |   |
| 0689      | KANX25BAS    |                  | FLADEN             | N5711.5  | E1140    | 971016         | 1530                | 75                |          | 34 3              | 11            | 1016             | 2720               | x                        | -xx---  | 11               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0690      | SKEX23BAS    | P2               |                    | N5752    | E1118    | 971016         | 1935                | 96                |          | 09 5              | 11.0          | 1017             | 9920               | x                        | --x---- | 11               | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0691      | SKEX17BAS    | Å16              |                    | N5816    | E1043.5  | 971016         | 2235                | 190               |          | 18 3              | 7.8           | 1016             | 9920               | x                        | --x---- | 13               | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0692      | SKNX21BAS    | M6               |                    | N5810    | E0930    | 971017         | 0240                | 640               |          | 18 15             | 7.3           | 1014             | 6930               | x                        | xxx---  | 18               | xx       | xx     | x      | -      | x      | x      | x      | x      | x      | x      | -      | -      | -      | -      | -      | -      | -      | -      |   |
| 0693      | SKEX69BAS    | HS5              |                    | N5744.2  | E1000.4  | 971017         | 0615                | 83                | 8        | 18 9              | 7.4           | 1006             | 2830               | x                        | --x---- | 10               | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |
| 0694      | KANX09BAS    |                  | LÄSÖ RÄNNA         | N5717.6  | E1044.5  | 971017         | 1055                | 40                | 7        | 18 13             | 9.3           | 1016             | 7830               | x                        | --x---- | 7                | xx       | -      | x      | -      | x      | x      | x      | x      | x      | -      | x      | -      | -      | -      | -      | -      | -      | -      |   |

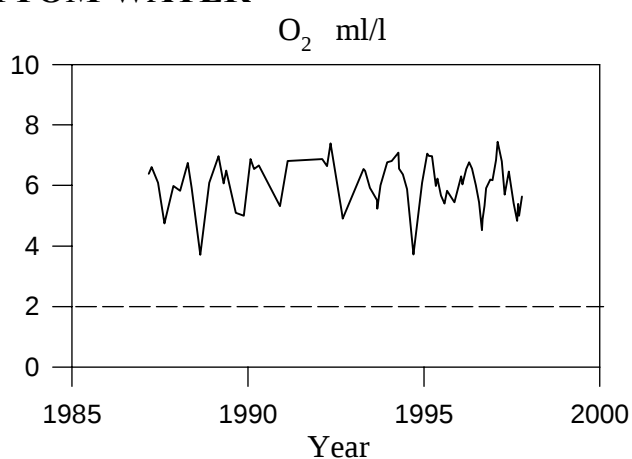
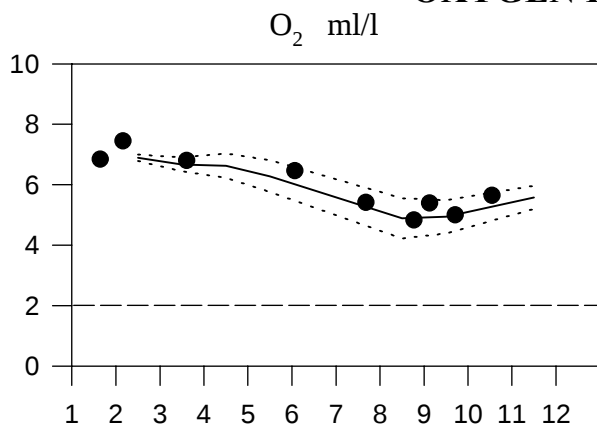
# STATION HS5 SURFACE WATER (0-15 m )

## Annual Cycles

— Mean 1986-1995      - - - St.Dev.      ● 1997



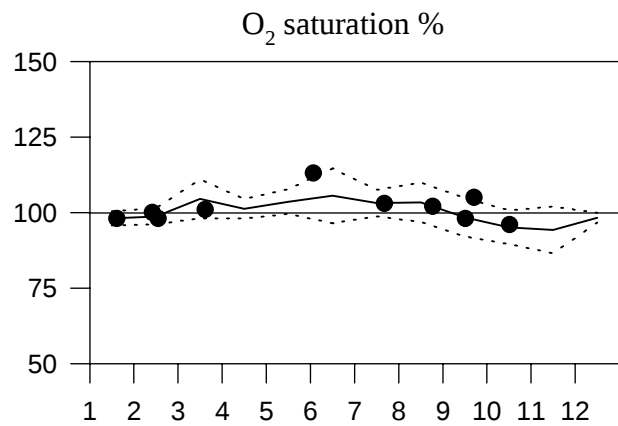
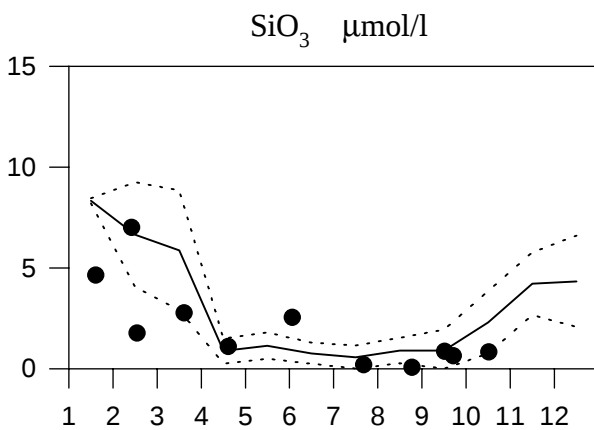
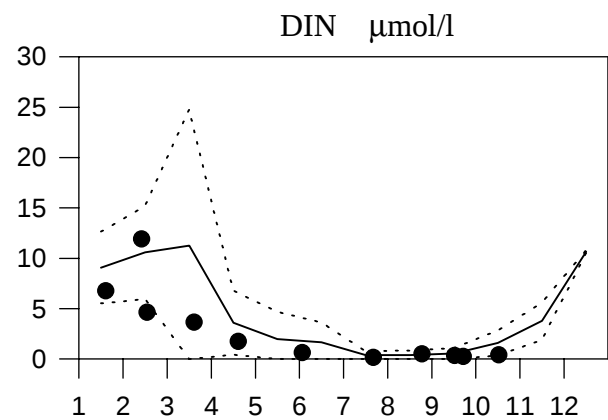
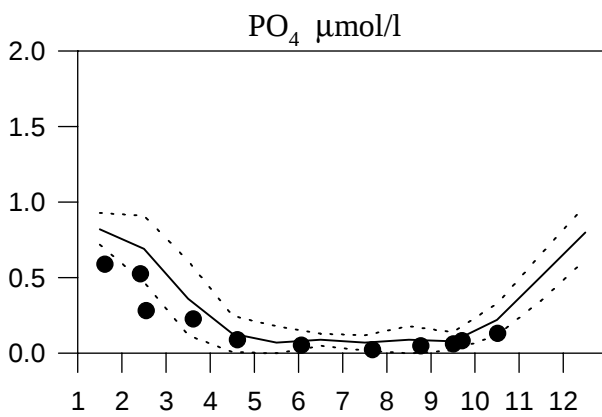
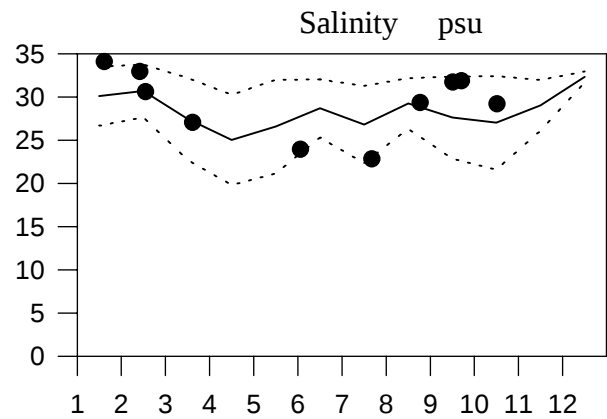
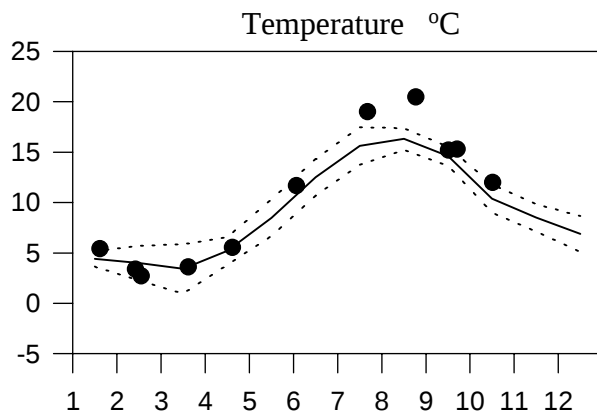
## OXYGEN IN BOTTOM WATER



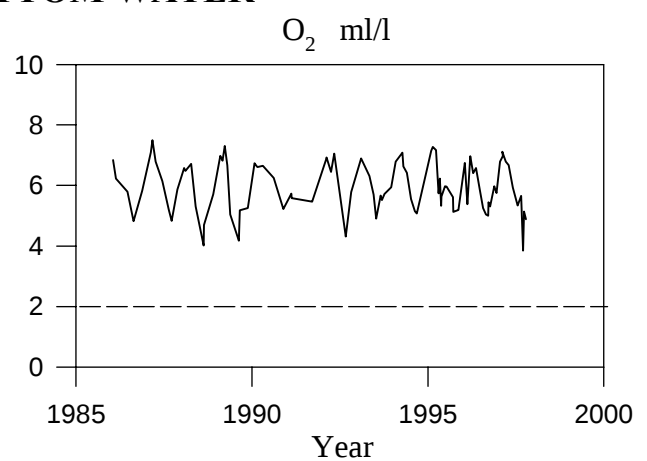
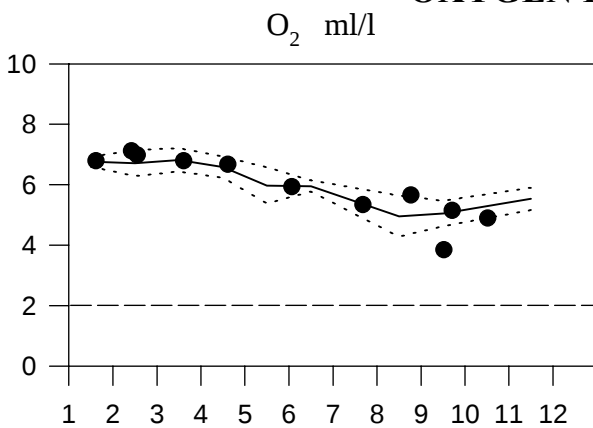
# STATION P2 SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



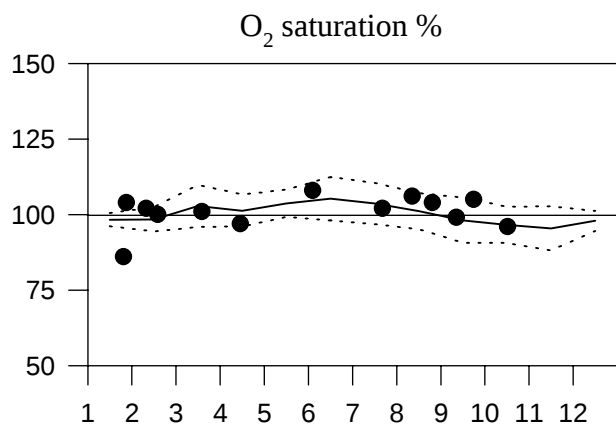
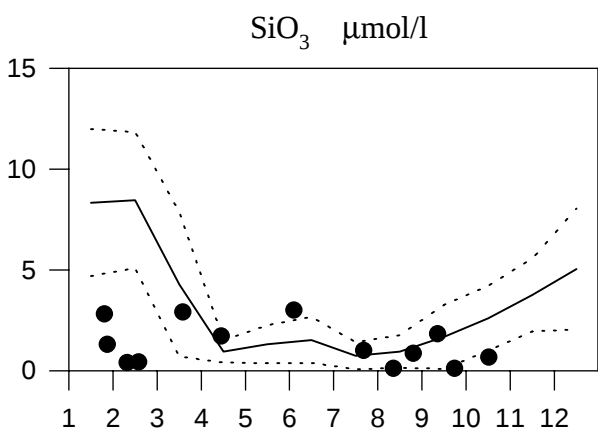
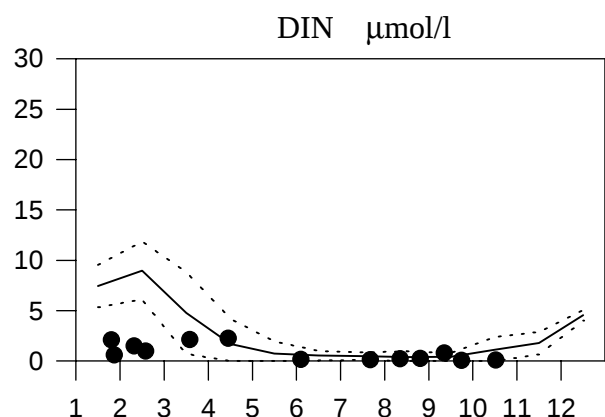
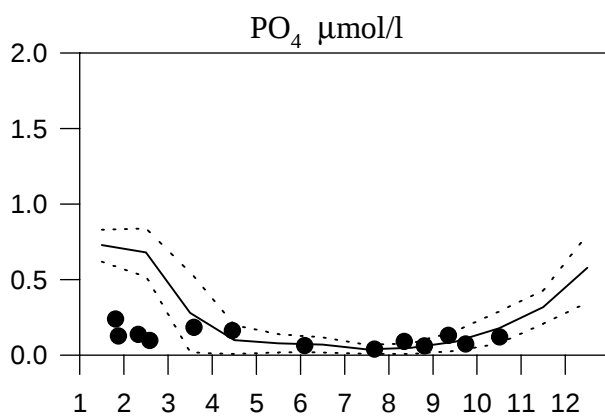
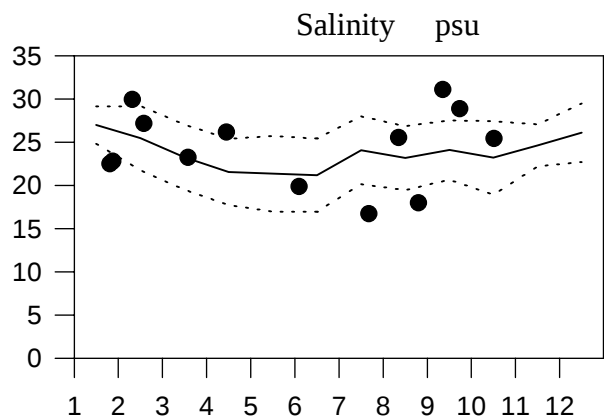
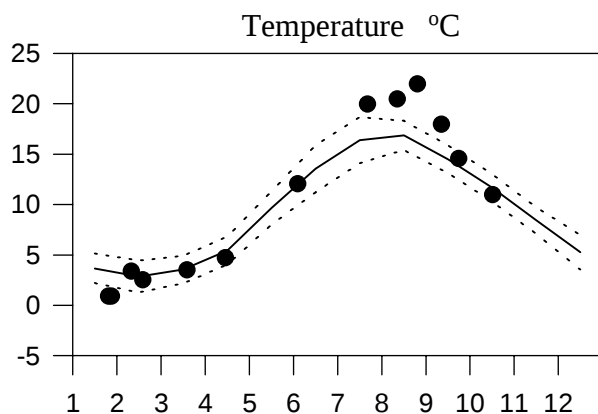
## OXYGEN IN BOTTOM WATER



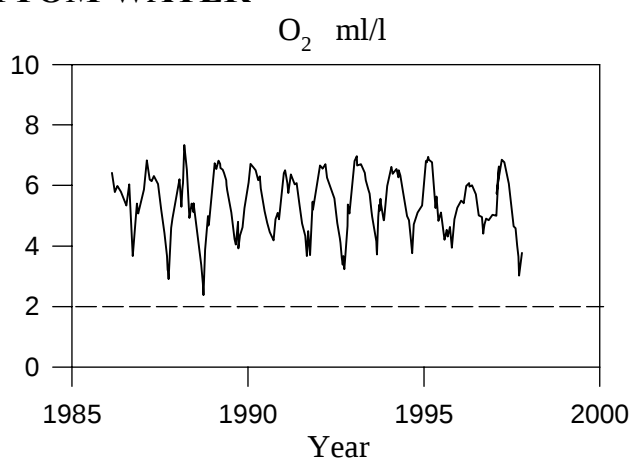
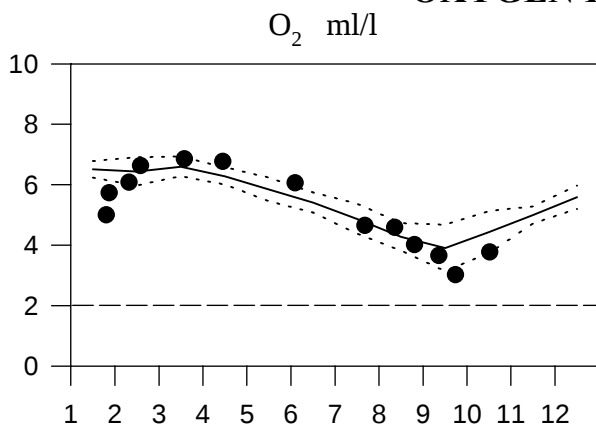
# STATION FLADEN SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



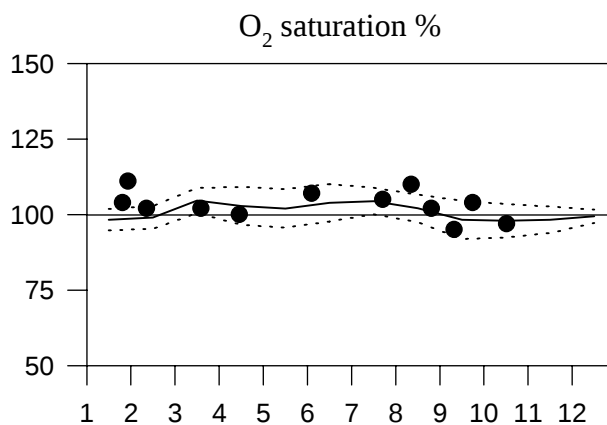
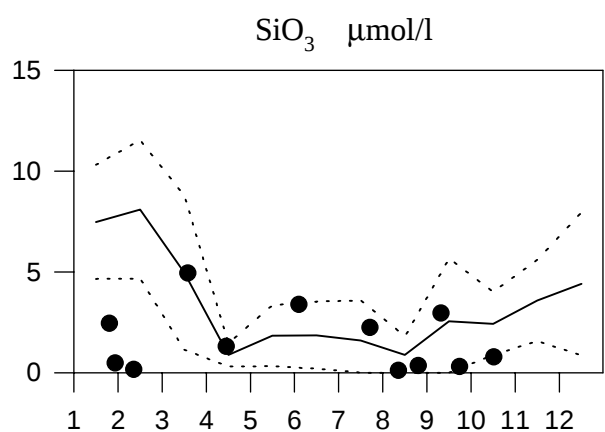
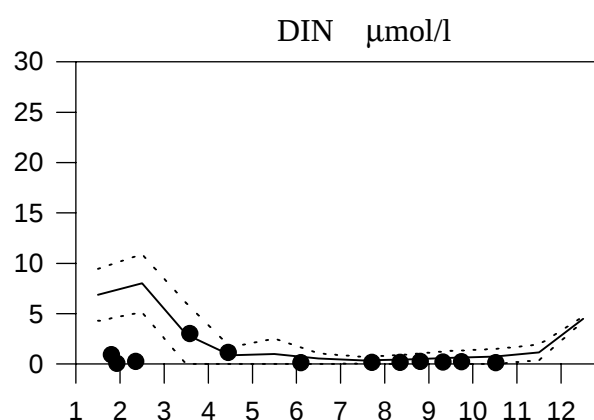
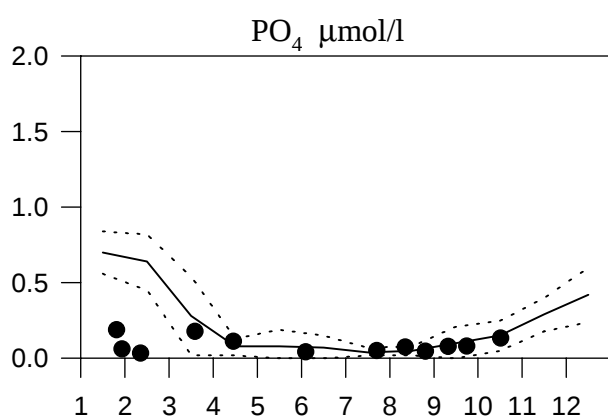
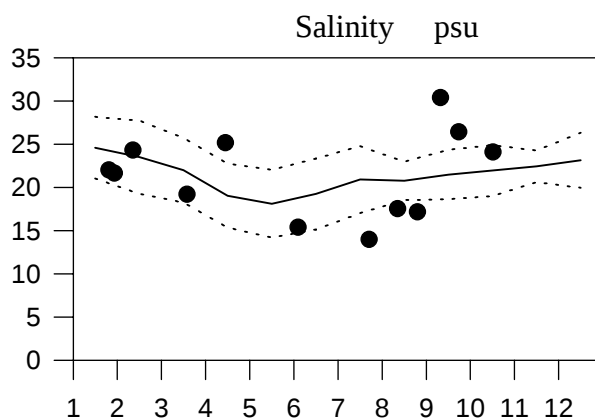
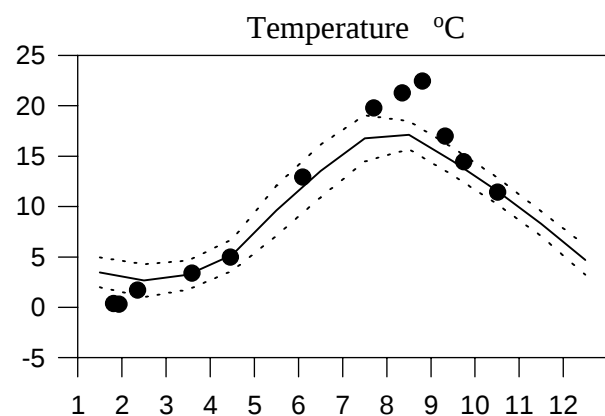
## OXYGEN IN BOTTOM WATER



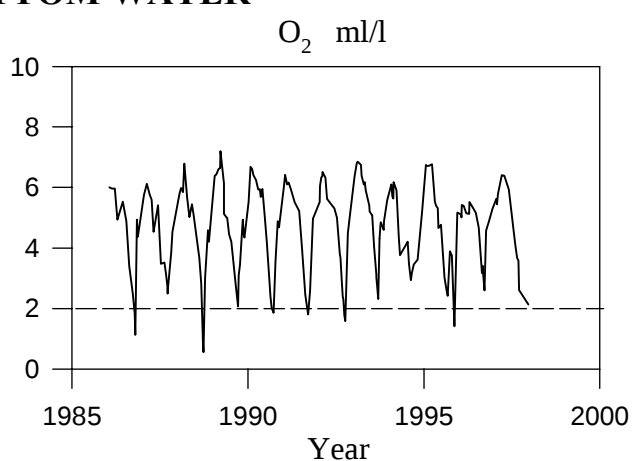
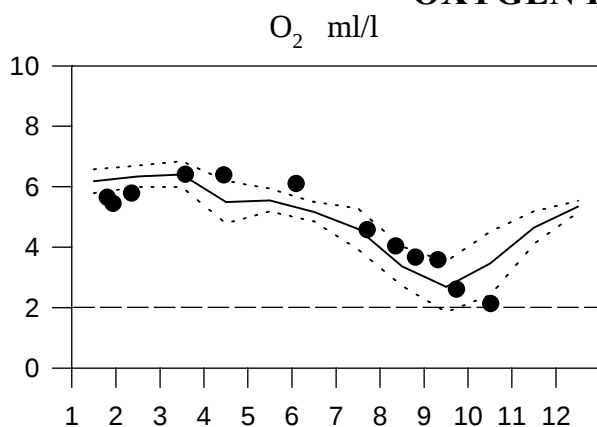
# STATION ANHOLT E SURFACE WATER (above halocline)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



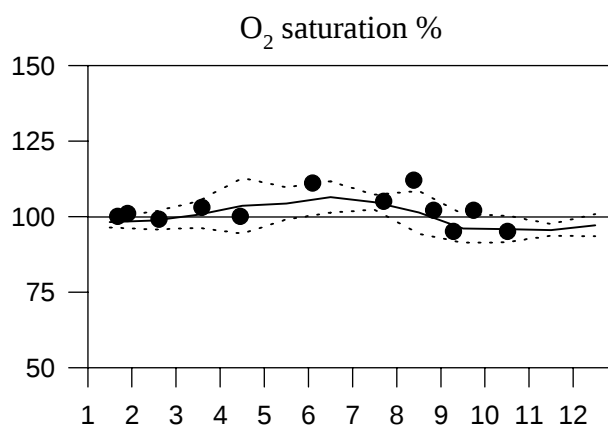
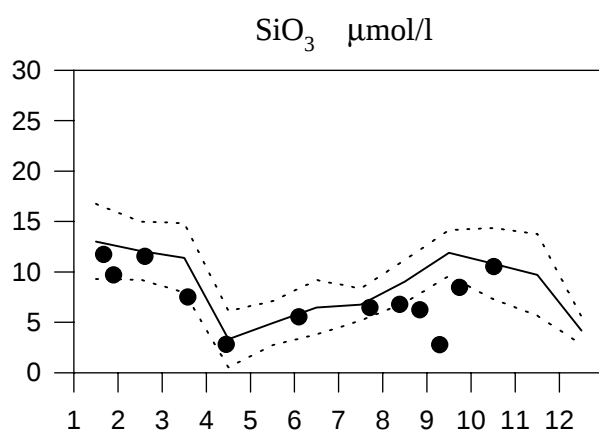
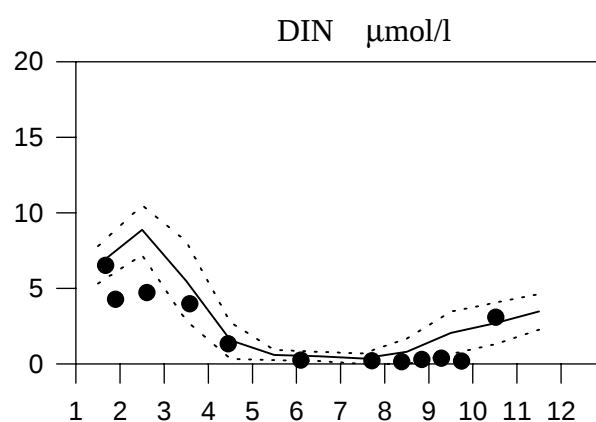
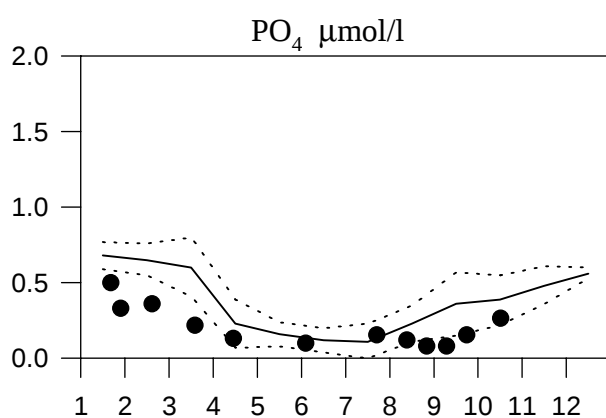
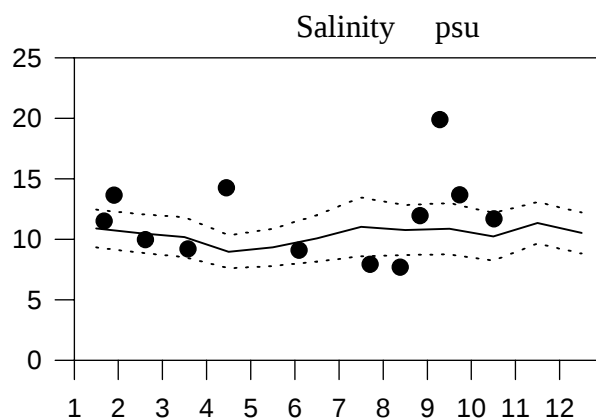
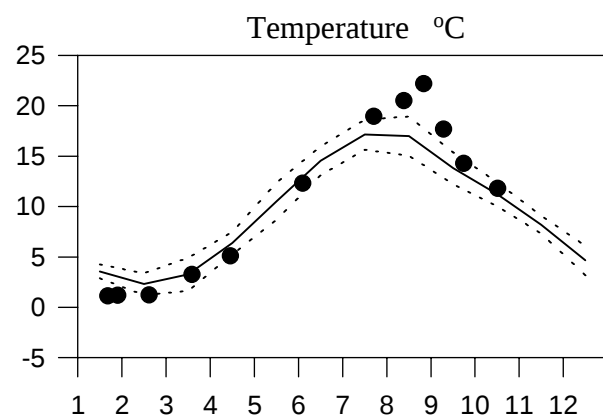
## OXYGEN IN BOTTOM WATER



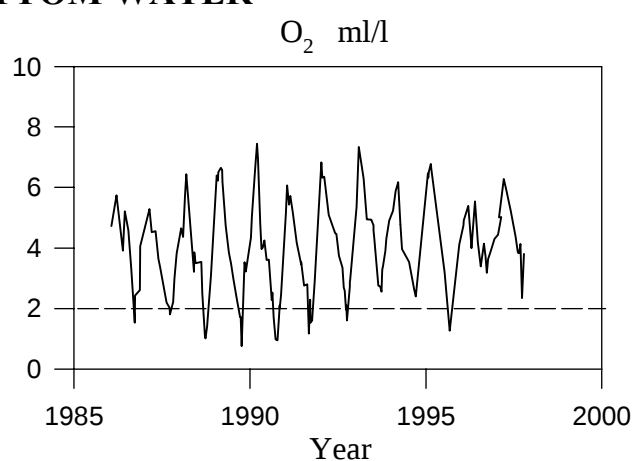
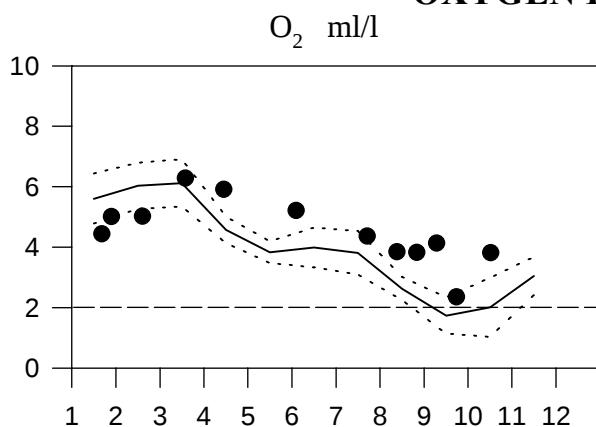
# STATION W LANDSKRONA SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



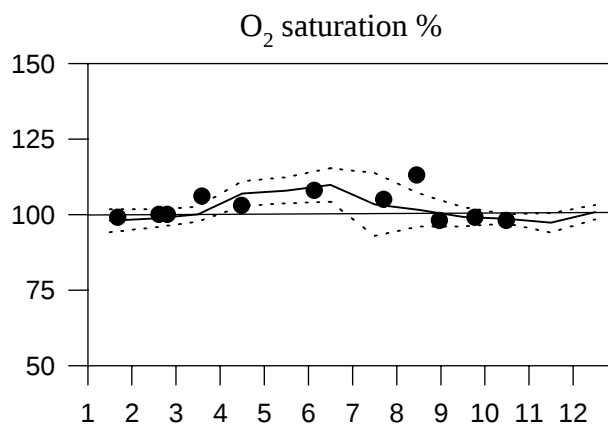
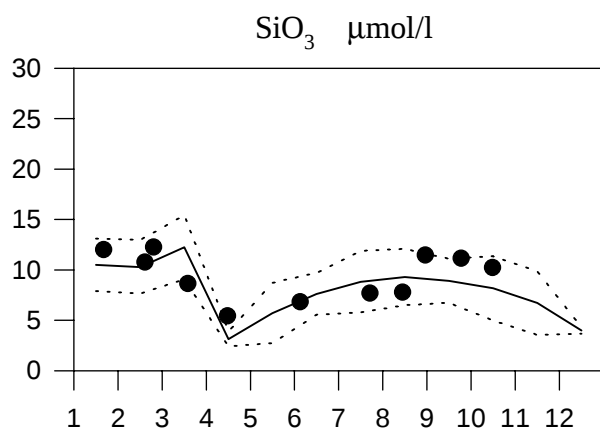
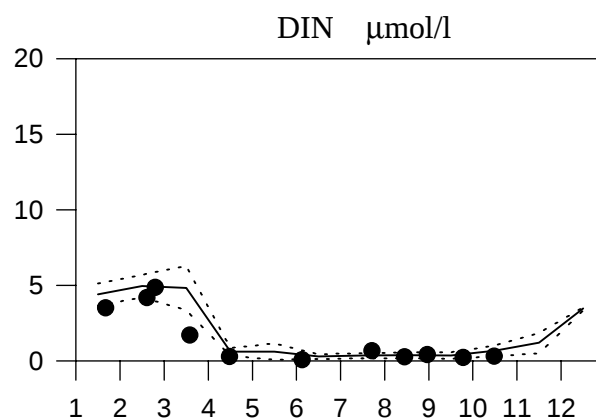
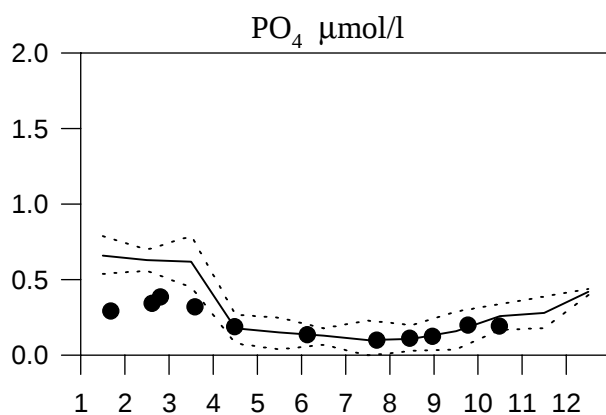
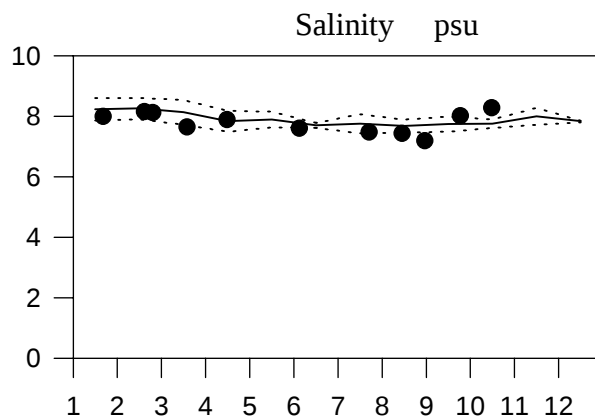
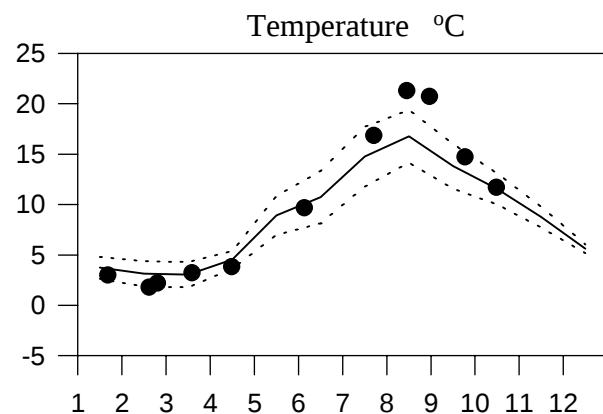
## OXYGEN IN BOTTOM WATER



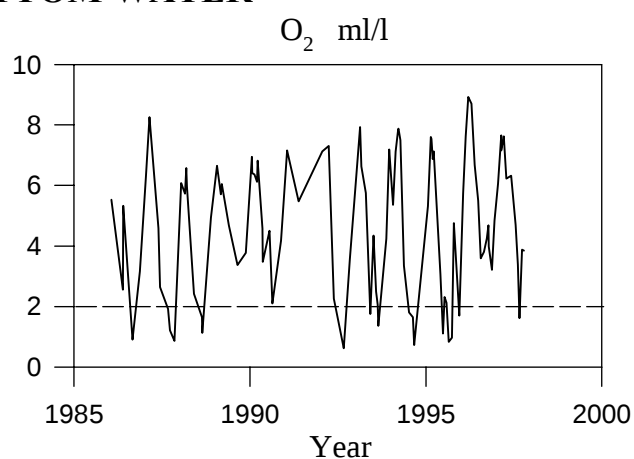
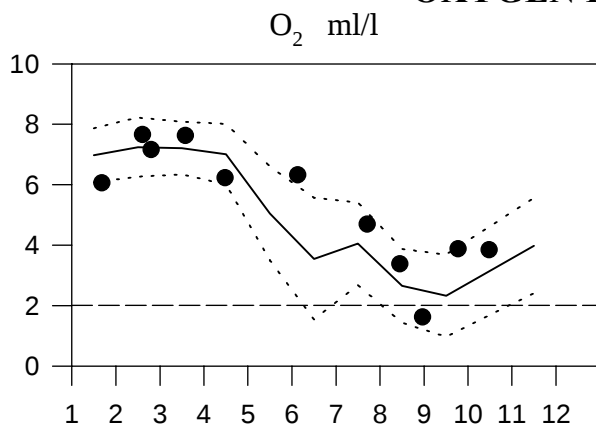
# STATION BY2 SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



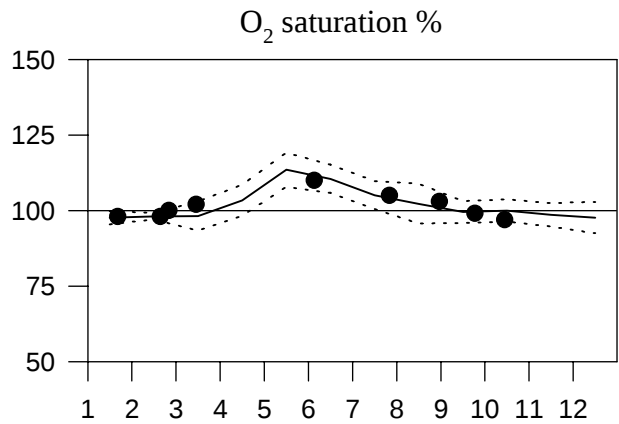
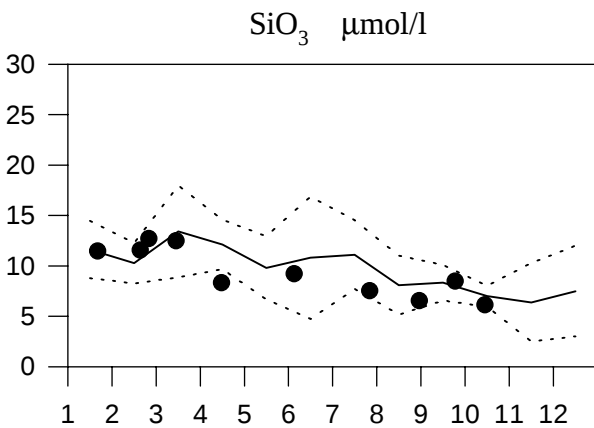
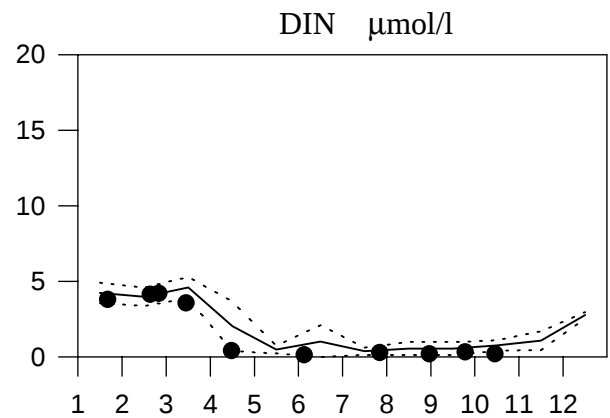
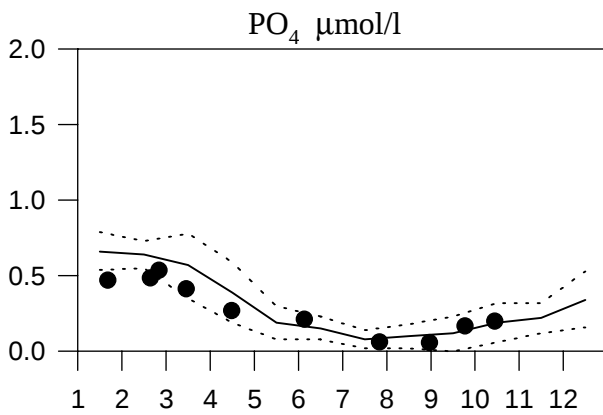
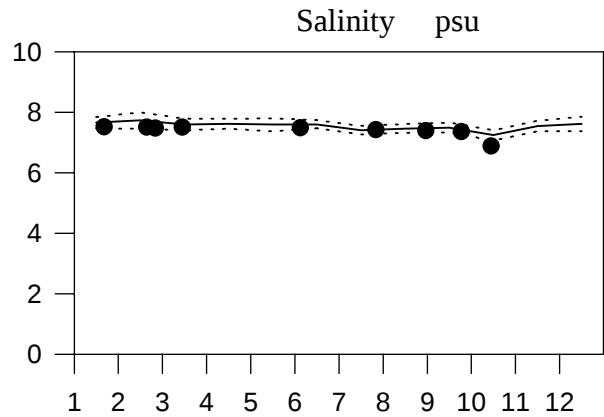
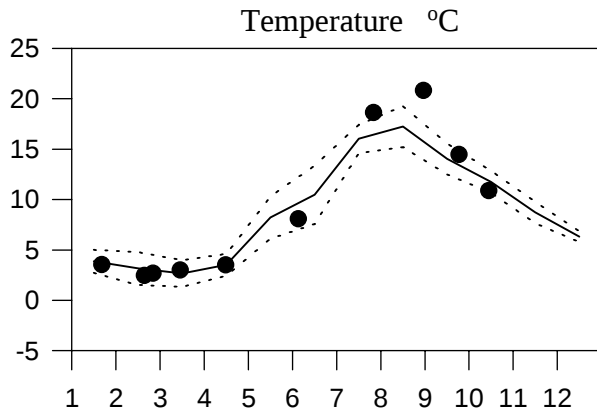
## OXYGEN IN BOTTOM WATER



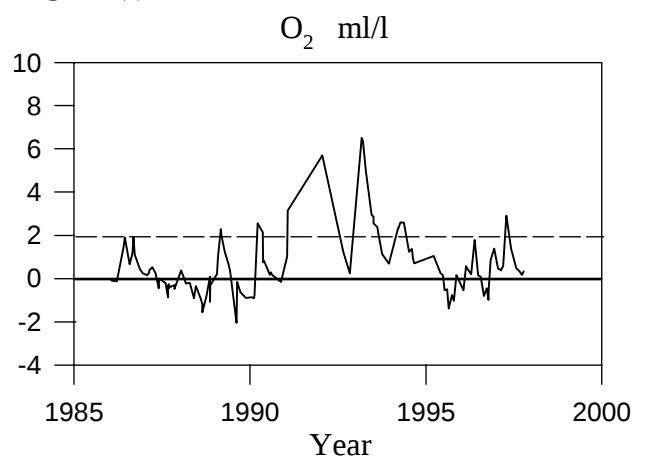
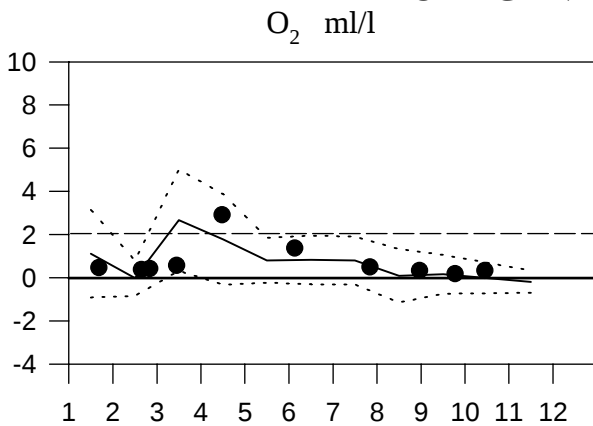
# STATION BY5 SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



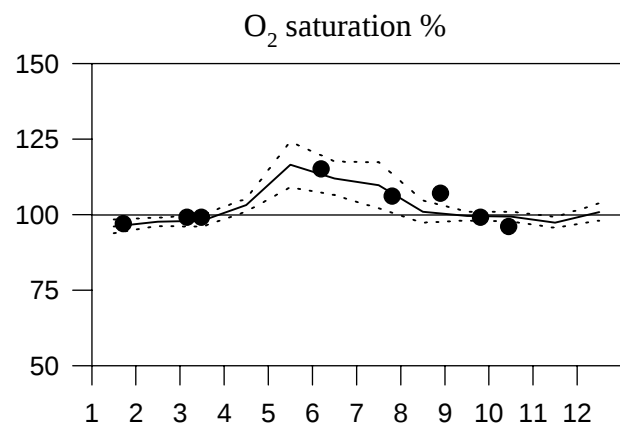
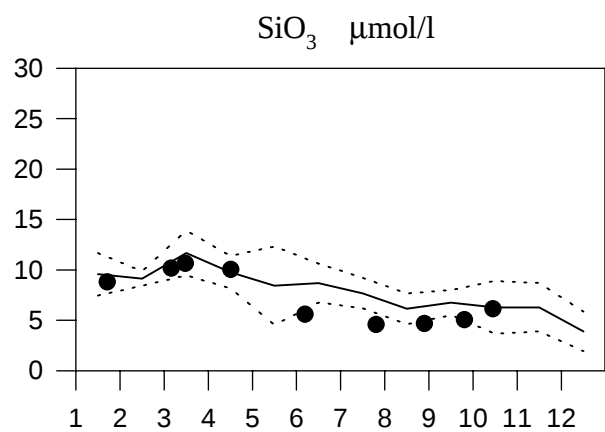
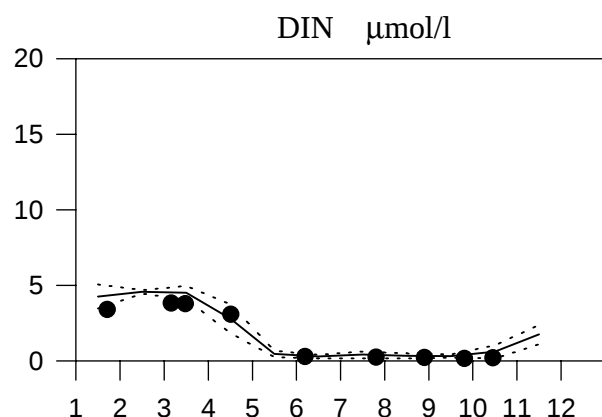
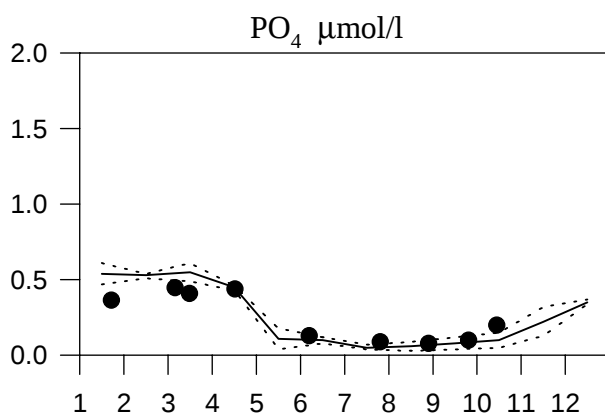
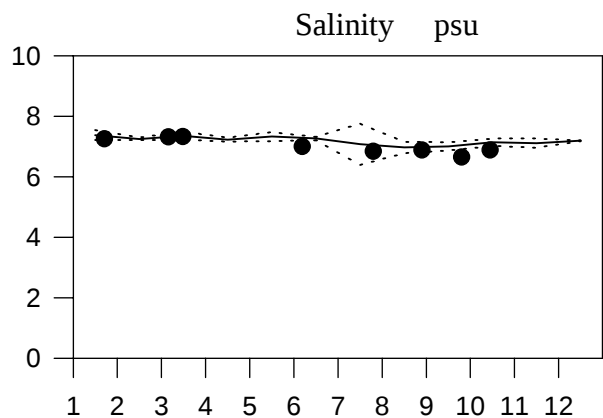
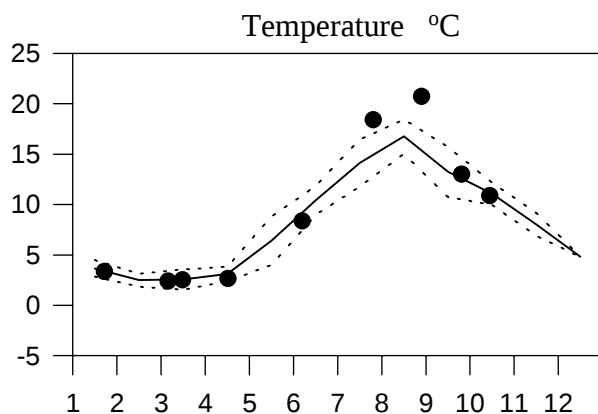
## OXYGEN IN BOTTOM WATER



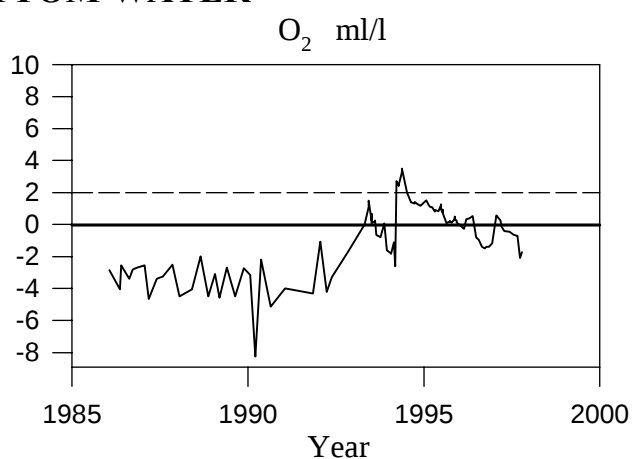
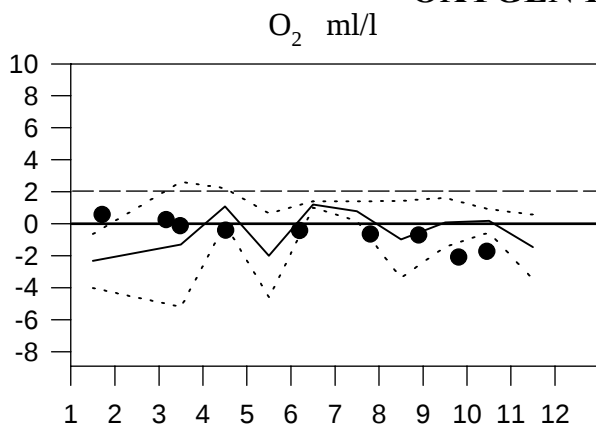
# STATION BY15 SURFACE WATER (0-15 m)

## Annual Cycles

— Mean 1986-1995    - - - St.Dev.    ● 1997



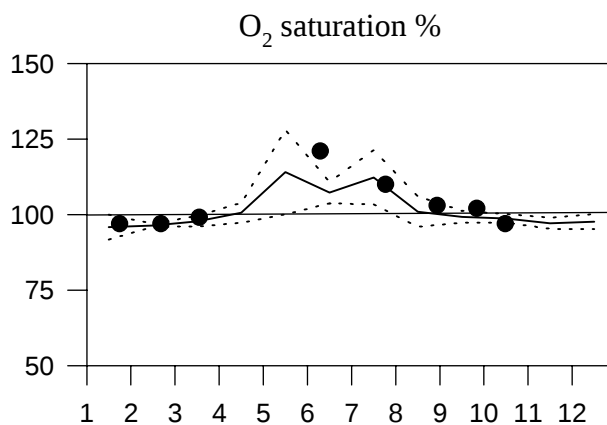
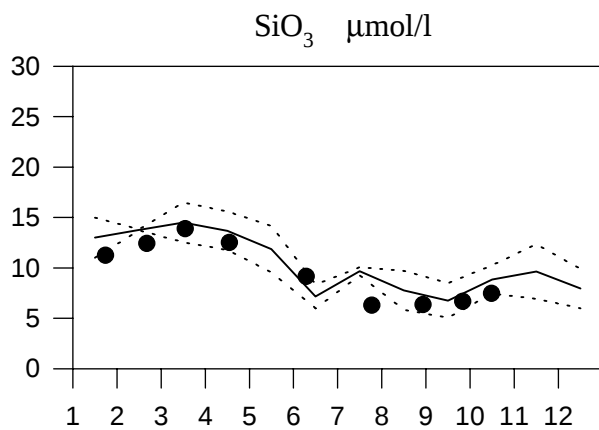
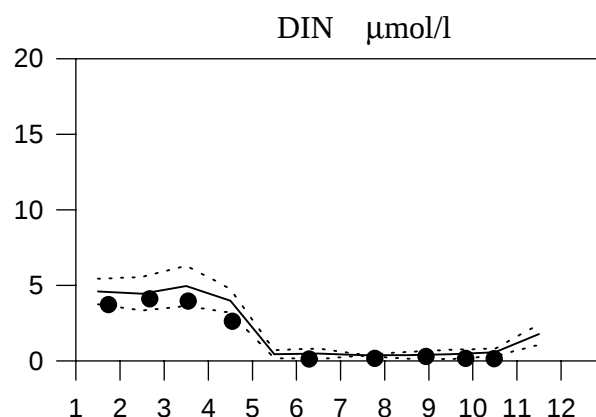
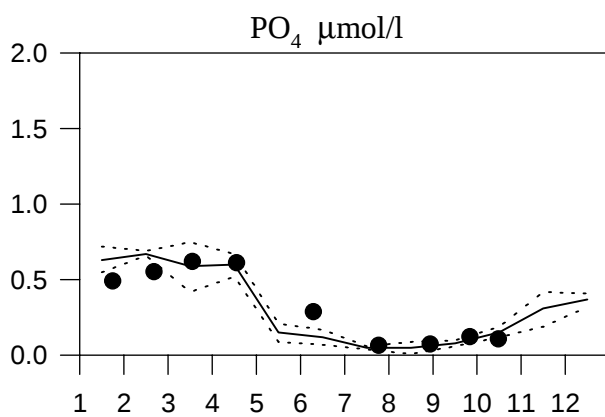
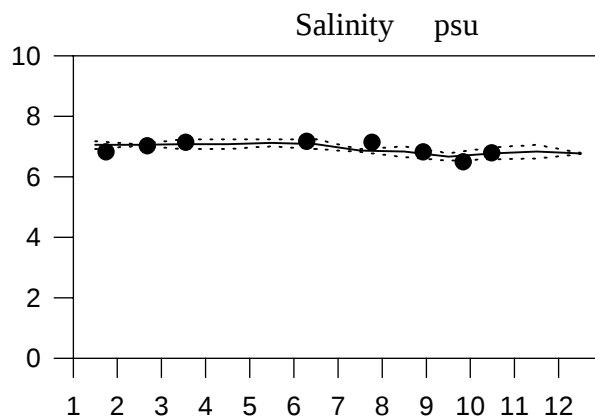
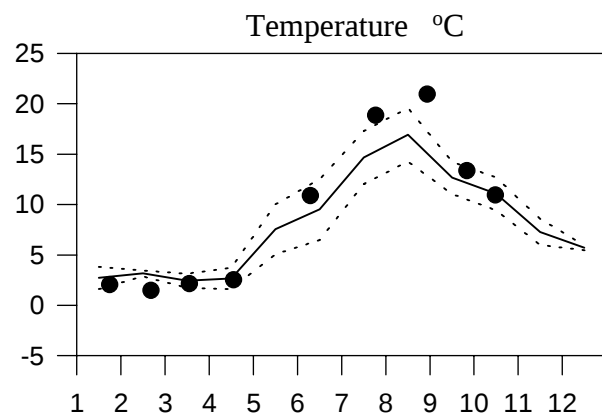
## OXYGEN IN BOTTOM WATER



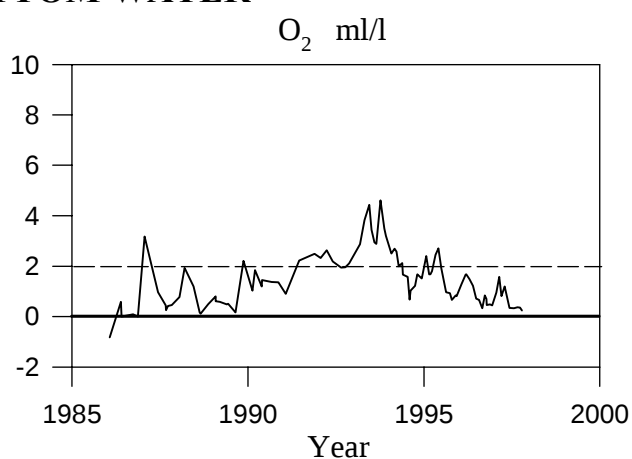
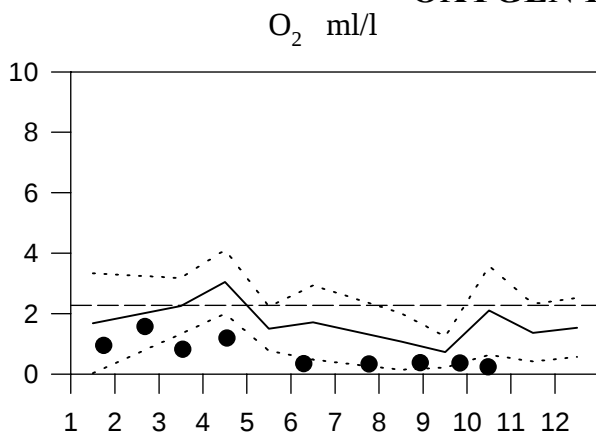
# STATION BY38 SURFACE WATER (0-15 m)

## Annual Cycles

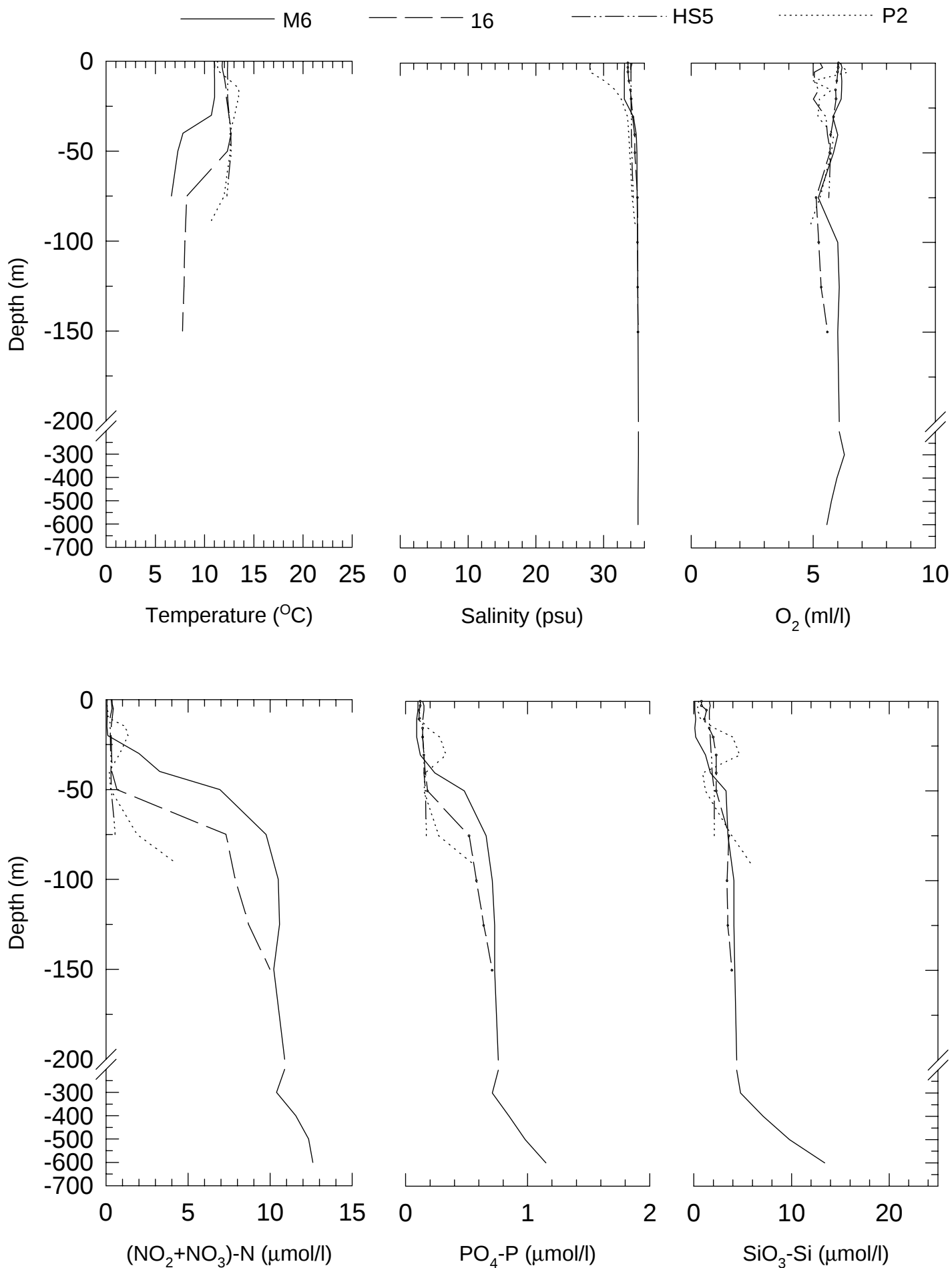
— Mean 1986-1995    - - - St.Dev.    ● 1997



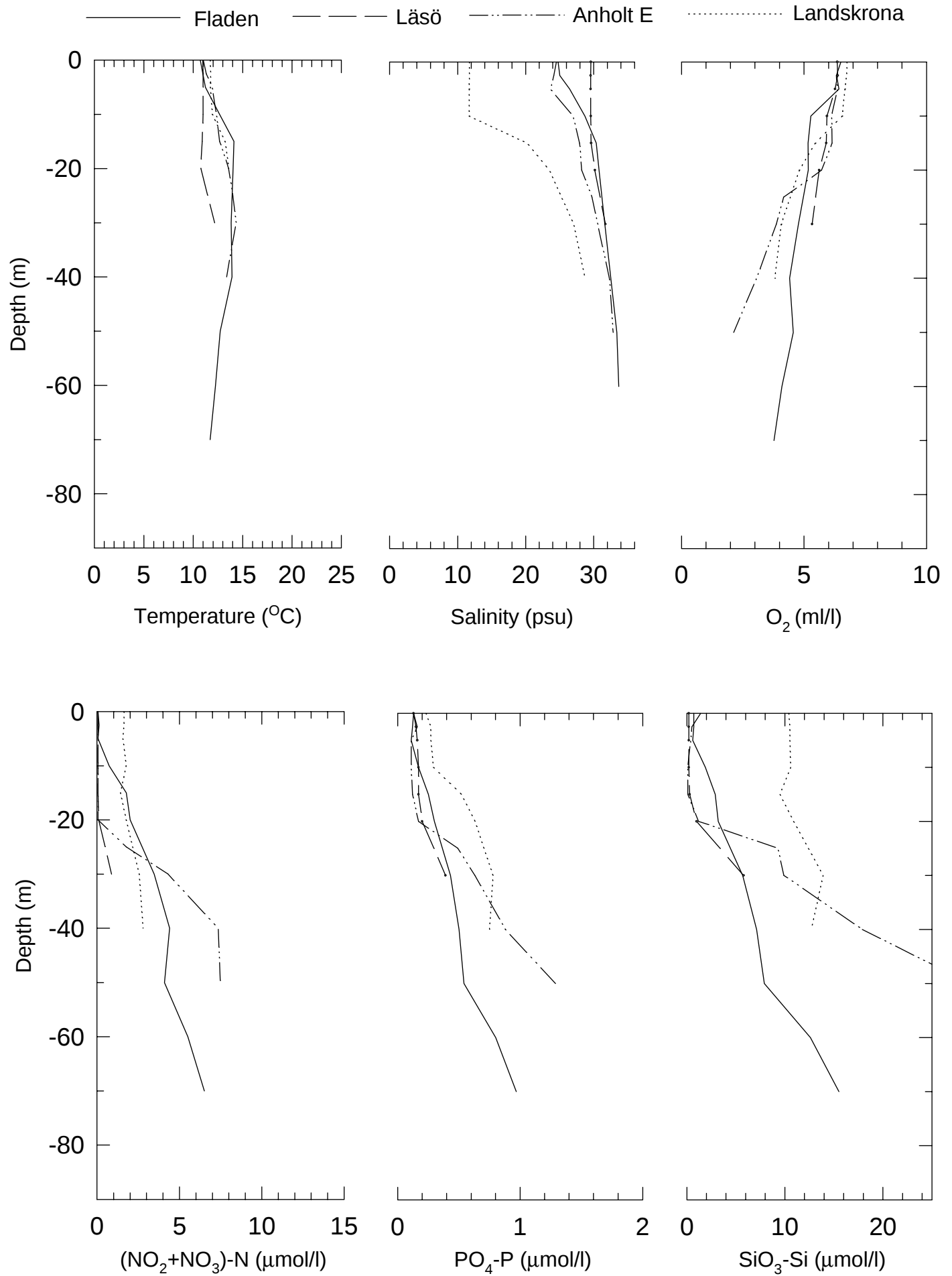
## OXYGEN IN BOTTOM WATER



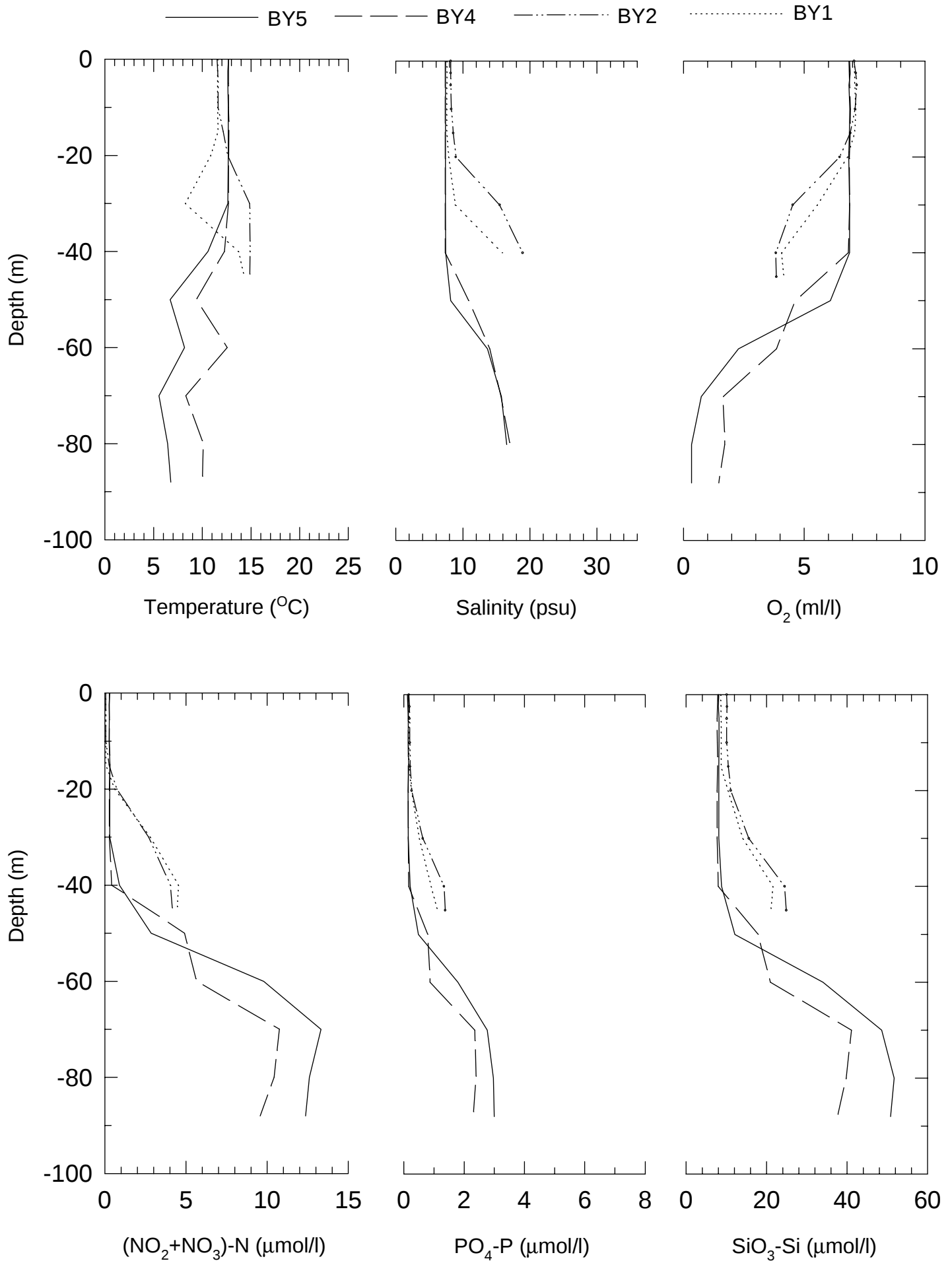
# SKAGERRAK week 42 -97



# KATTEGAT and THE SOUND week 42 -97

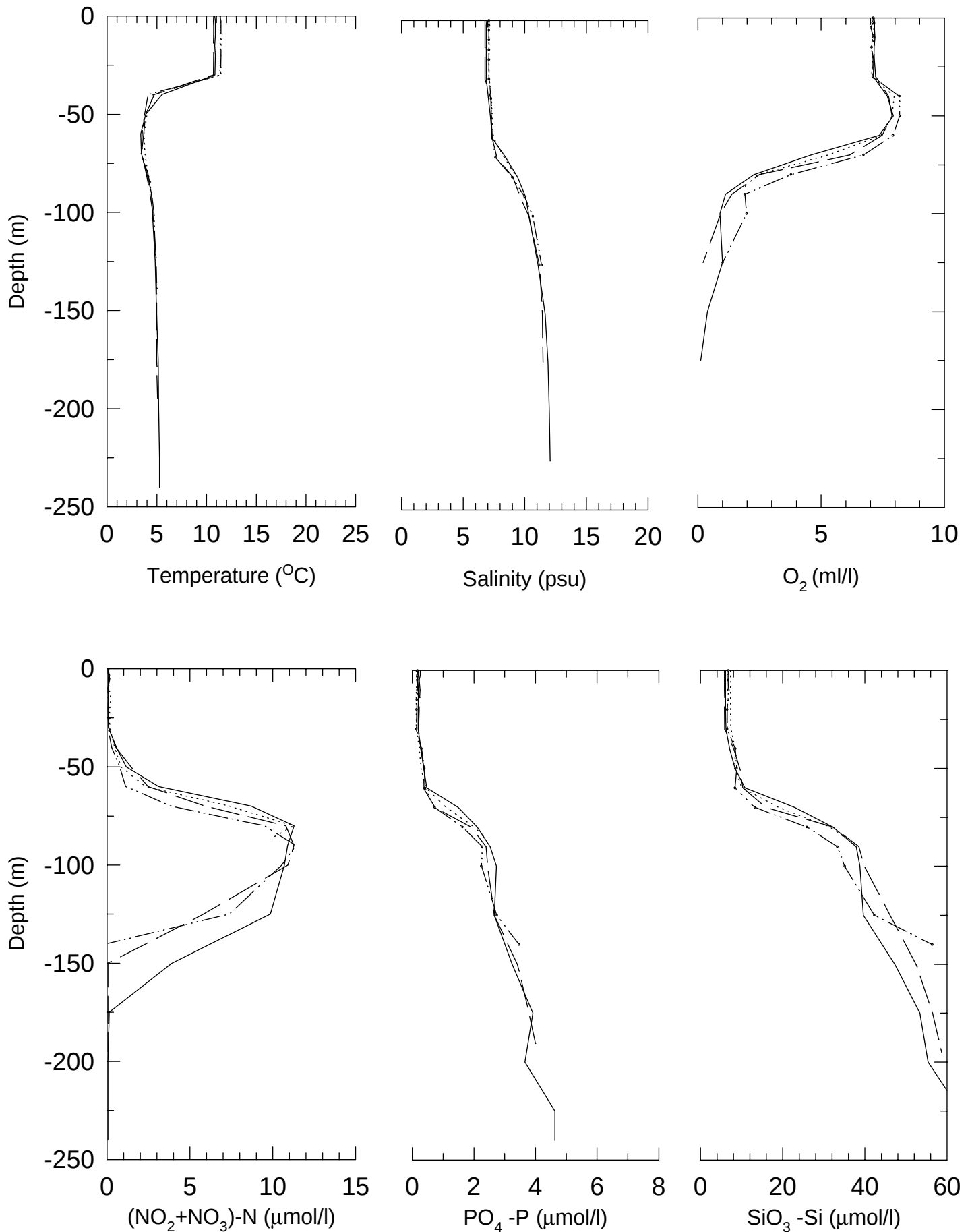


# SOUTH BALTIC week 42 -97



# EAST BALTIC week 42 -97

— BY20    — BY15    - - - BY10    ..... BCS III-10



# WEST BALTIC week 42 -97

—— BY31

- - - BY32

..... BY38

