Bodil
Thorstensson

Swedish Meteorological and Hydrological Institute
Oceanographical Laboratory

1997-11-18
Dnr: SaO-1997-0239

CRUISE REPORT FROM R/V ARGOS

Survey period: 971110-971115

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

Principal: SMHI

SUMMARY

The expedition was performed within SMHIs regular marine monitoring program and covered the Skagerrak, the Kattegatt, the Sound and the Baltic Proper. A special sampling program was performed in the Hanö Bight. The winds during the expedition were moderate and had most of the time a direction from between south and east. The weather was mild with an air temperature of about 8°C. The surface water temperatures were normal. The thermocline was found below 10 meters in the Kattegatt and in the Sound, and below 35-40 meters in the Baltic. The nutrient concentrations were mostly much above than the detection limit but had not reached the high winter levels.
The oxygen concentrations in the Bornholm Basin were below 2 ml/l from a depth of 70m. Hydrogen sulphide was found in the deep water of the East Gotland Basin.

Address:
Byggnad 31 Nya Varvet
SE-426 71 Västra Frölunda
SWEDEN

Telephone:
+46 31 696500
Telefax:
+46 31 690418

E-mail:
shark@smhi.se
WWW:
http://www.smhi.se/sgn0102/nodc/

PRELIMINARY RESULTS

The expedition, which was a part of SMHI's regular monitoring programme, commenced in Göteborg and ended in Karlskrona. The winds were moderate and the dominating direction was between south and east, at Gotland towards west. The weather was mild with a temperature about 8°C. Apart from the regular monitoring programme sampling was done in the Hanö bight according to the Hanö Bight programme.

The Skagerrak

The sea surface temperature was between 8.3 and 9.3°C. The phosphate concentrations were still low with a higher concentration at station P2 compared to the previous measurement (0.31 µmol/l). No thermocline was found and station HS5 outside the Danish coast was not stratified at all.

The Kattegatt and the Sound

The sea surface temperature was between 8.0 and 8.5°C. The water was stratified in the whole area. A pronounced halocline and thermocline was present below 10m depth in the Sound and at the Läsö Ränna. The fluorescence in the eastern Kattegatt indicated a biological activity. The nutrients concentrations were between summer and winter values. The ammonium concentration was high at Läsö Ränna, 1.3-1.4 µmol/l, and in the Sound, 1.0 µmol/l. The nitrate concentration was higher at Kullen (1.4-1.5 µmol/l) compared to the rest of the area.
The lowest oxygen concentration was found at station Anholt E 20m, 3.90 ml/l (61% saturation) and Kullen 15m, 2.47 ml/l (41% saturation). In the Sound at station W Landskrona the oxygen saturation was 41% (2.47 ml/l) at 44 meters.

The Baltic Proper

The sea surface temperature was between 6.7°C at station BY29 in the north and 9.1°C in the Arkona Basin in the south. The thermocline resided between 35 and 40m in the whole Baltic Proper. The fluorescence was higher in the southern part of the Baltic Proper and at station BY39 than for the area in all.
The nitrate concentrations were between 0.2 and 1.0 µmol/l, except at station BY1 where it was below the detection limit of 0.1 µmol/l. The phosphate concentrations were between 0.17 and 0.32 µmol/l, and silicate between 6.2 and 8.5 µmol/l.
The oxygen concentration in the Bornholm Basin was below 2 ml/l beneath 70 meters, which implied an oxygen saturation below 28%. Hydrogen sulphide was present in the eastern Gotland Basin below 150m at the Fårö deep, 175m at the Gotland deep and at 140m at BY10.

PARTICIPANTS

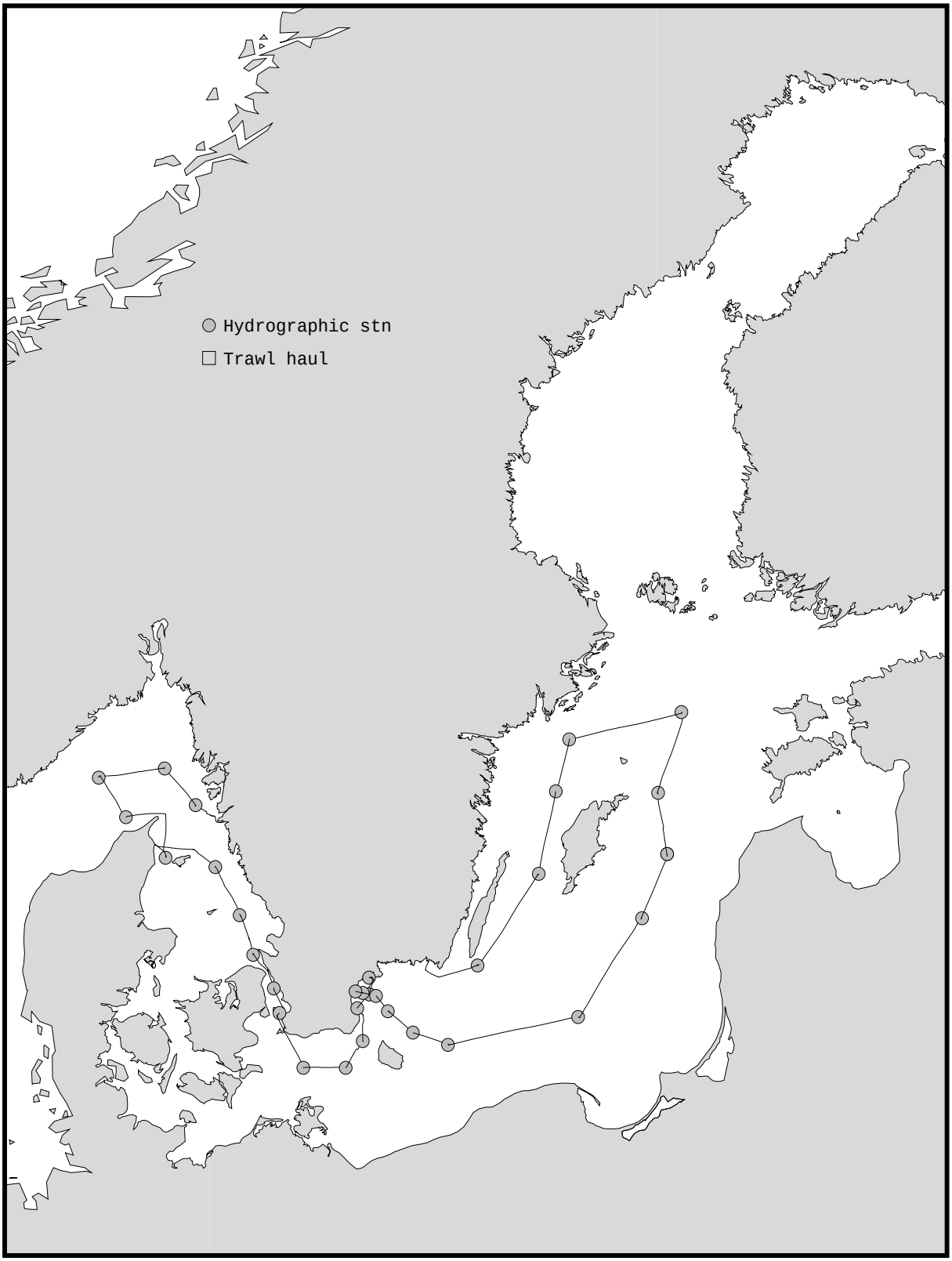
Name	From
Bodil Thorstensson, chief scientist	SMHI Oceanographical lab.
Tuulikki Jaako	- ″ -
Mats Ohlson	- ″ -
Björn Sjöberg	- ″ -
Jan Szaron	- ″ -

APPENDICES

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

T R A C K C H A R T

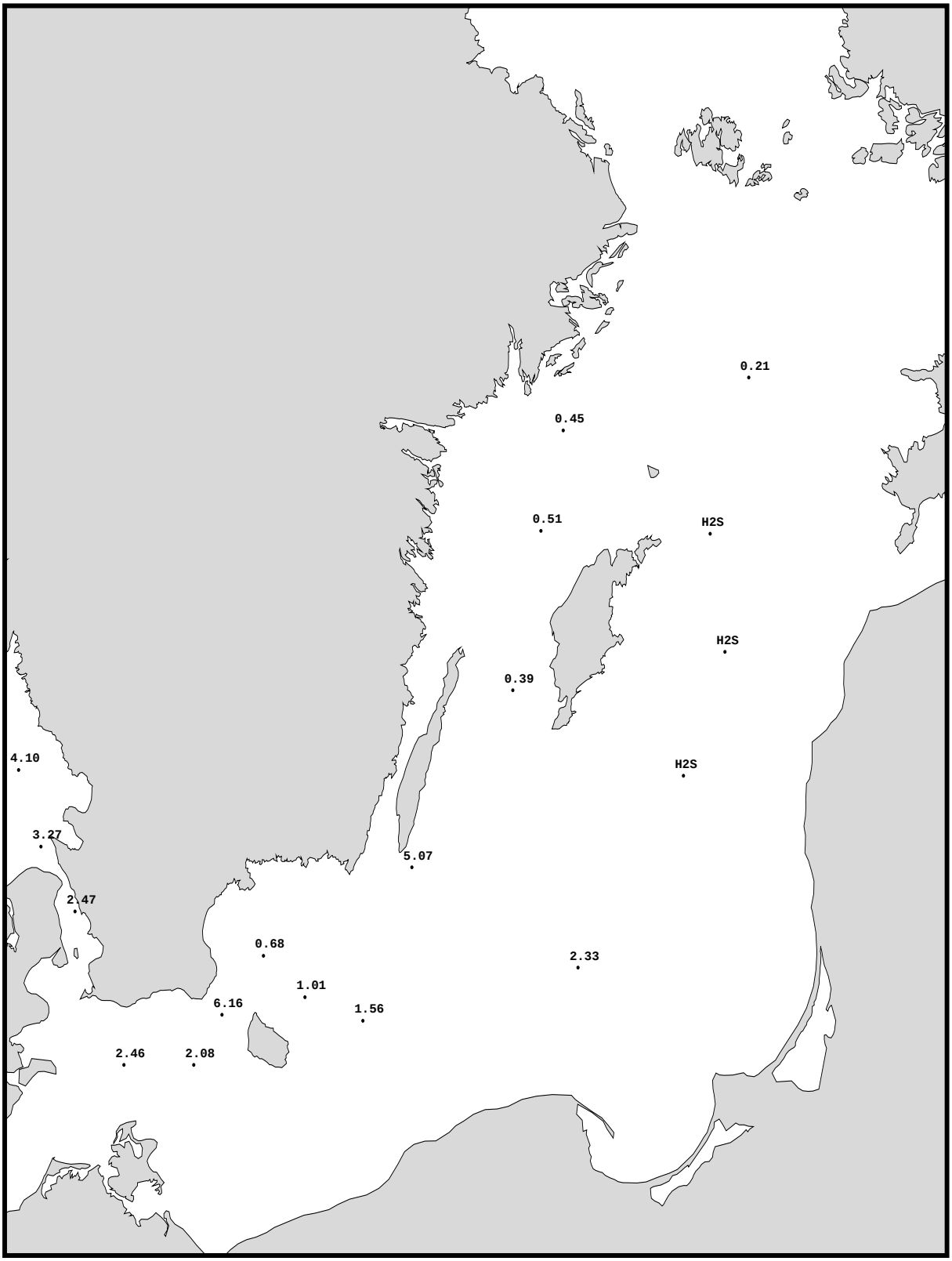
Country: Sweden
Ship : Argos
Date : 971110-971115
Series : 0695-0726



CSR RefNo: 1997-77AR/0695-0726

Bottom water oxygen concentration (ml/l)

Country: Sweden
Ship: Argos
Date: 971110-971115
Series: 0695-0726



SMHI ***** Hydrographic Ship: 14-Argos ****** Date: 1997-11-17
Ocean lab ***** series Year: 1997 ****** Time: 08:37

Ser no	Stat code	Proj	Station	Lat	Lon	Date yymmdd	Time hhmm utc	Bott deph m	Mld m	Secc deph m	Wind di	Wind ve	Air temp C	Air pres hPa	WCSI elec aoae tu hd	C t d	PPCPZZT Hrhhoor Cilyooa motPBw PrP l	No de m p n	T e a l i	S a l g	P h x y	O x y g	H 2 S	P o o t P	T o o t P	N o o o 2 N	N o h 3 N	N o l 4 N	T t k	A l i a	S i O 3	H u m	L i g n	P O N	P O C	T O C	C o m m
0695	SKEX23PMK	P2		N5752	E1118	971110	1120	97		6.5	18	10	8.2	996	2730	-	--x----	11	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0696	SKEX17PMK	Å16		N5816	E1043.5	971110	1445	200			14	10	9.2	996	2830	x	--x----	14	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0697	SKNX21PMK	M6		N5810	E0930	971110	1930	620			14	10	8.6	995	9930	x	-xxx---	18	x	x	x	x	-	x	x	x	x	x	x	x	x	-	-	-	-	-	x
0698	SKEX69PMK	HS5		N5744.2	E1000.4	971111	0110	87			14	12	8.9	996	9930	x	--x----	10	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0699	KANX09BMP	LÄSÖ RÄNNA		N5717.6	E1044.5	971111	0645	43			16	8	8.4	998	6820	x	--x----	9	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0700	KANX25BMP	FLADEN		N5711.5	E1140	971111	1820	80			16	8	8.6	1002	9930	x	--x----	13	x	x	x	x	-	x	x	x	x	x	x	x	x	-	-	-	-	-	x
0701	KAEX29BMP	ANHOLT E		N5640.0	E1207.0	971111	2250	54			16	8	7.0	1003	9930	x	-xxx---	10	x	x	x	x	-	x	x	x	x	x	x	x	x	-	-	-	-	-	x
0702	KAEX33BAS	KULLEN		N5614	E1222.2	971112	0205	23			16	8	6.8	1003	9920	x	-------	5	-	-	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0703	SOCX39BMP	W LANDSKRONA		N5552.0	E1245.0	971112	0535	48			11	6	6.7	1003	9920	x	--x----	10	-	-	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0704	SOCX49BAS	OSKARSGRUNDET (NÄRA)		N5535.9	E1251.5	971112	0735	9			14	6	7.6	1003	4920	x	-------	3	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0705	BPSA02BMP	BY1		N5500	E1318	971112	1140	47		7	14	7	7.5	1000	4920	x	-------	8	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0706	BPSA03BMP	BY2 ARKONA		N5500	E1405	971112	1435	47			09	7	8		1003	2820	x	-xxx---	9	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-	-	x
0707	BPSA04HNO	BY3 HAMRARNE SUND		N5517.5	E1424	971112	1645	48			09	10	8		1003	9920	x	--x----	8	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0708	BPSH14HNO	HANÖ-4		N5539	E1418	971112	1900	18			09	7	8.6	1002	9920	x	--x----	4	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0709	BPSH20HNO	HANÖ-10		N5548	E1431.5	971112	2025	25			11	7	9.1	1001	9920	x	--x----	5	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0710	BPSH11HNO	HANÖ-1		N5559	E1431	971112	2200	14			11	7	9.1	1001	9920	x	--x----	3	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0711	BPSH19HNO	HANÖ-9		N5549	E1424	971112	2335	15			05	9	9		1000	9920	x	--x----	3	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0712	BPSH13HNO	HANÖ-3		N5550	E1416	971113	0020	17			05	5	9		999	9920	x	--x----	4	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0713	BPSH18HNO	HANÖ-8		N5547	E1439	971113	0155	43			05	7	8		998	9930	x	--x----	7	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0714	BPSH05BAS	HANÖBUKTEN		N5537	E1452	971113	0325	78			05	5	8.3	996	9920	x	--x----	11	-	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0715	BPSB06BMP	BY4 CHRISTIANSÖ		N5523	E1520	971113	0600	94			16	2	8.2	995	9920	x	-------	12	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	x
0716	BPSB07BMP	BY5 BORNHOLMSDJ		N5515	E1559	971113	0855	91		8	21	12	7.9	996	2830	x	-xxx---	13	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	-	-	-	x
0717	BPSE11BMP	BCS III-10		N5533.3	E1824	971113	1630	90			21	15	9		999	9940	x	-xx---	13	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	-	-	-	x
0718	BPEX13BMP	BY10		N5638	E1935	971114	0045	147			27	13	6.9	1003	9940	x	--x----	16	x	x	-	x	x	x	x	x	x	x	x	-	x	-	-	-	-	-	-
0719	BPEX21BMP	BY15 GOTLANDSDJ		N5720	E2003	971114	0610	249		10	27	6	7		1006	2830	x	-xxx---	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	-	-	-
0720	BPEX21BAS	BY15 GOTLANDSDJ		N5720	E2003	971114	0745	249		10	27	6	7		1006	2830	-	-------	4	x	x	-	x	x	x	-	x	x	-	-	-	x	-	-	-	-	-	-
0721	BPEX26BMP	BY20 FÅRÖDJ		N5800	E1953	971114	1130	202		10	27	4	7.3	1009	1630	x	--x----	18	x	x	-	x	x	x	x	x	x	x	x	-	x	-	-	-	-	-	-

SMHI ***** Hydrographic Ship: 14-Argos ****** Date: 1997-11-17
Ocean lab ***** series Year: 1997 ****** Time: 08:37

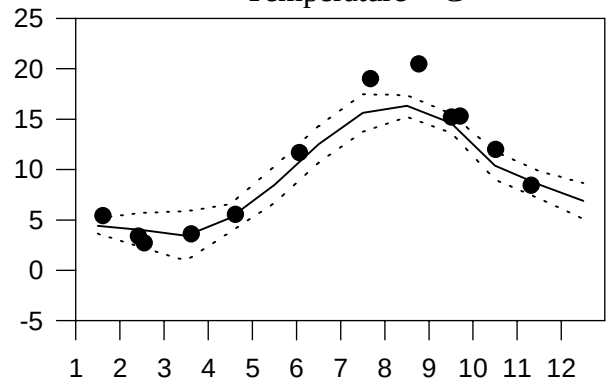
Ser no	Stat code	Proj	Station	Lat	Lon	Date yymmdd	Time hhmm utc	Bott deph m	Mld m	Secc deph m	Wind di	Wind ve	Air temp C	Air pres hPa	WCSI elec aoae tu hd	C t d	PPCPZZT Hrhhoor Cilyooa motPBw PrP l	No de m p i n	T e a l	S a l	P h x y g	O x 2 S	H o o 4 P	P o o t P	T o o 2 N	N o o 3 N	N o h 4 N	N o l t N	T a l	A S l 3	S i u s	H L i u n i	P O m g	P O N	T O C	C o m
0722	BPNX35BMP	BY29		N5853	E2019	971114	1700	179		25	6	6.4	1011	9930	x	-⁎xx---	17	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	-
0723	BPNX37BMP	BY31	LANDSORTSDJ	N5835	E1814	971114	2350	449		25	2	8		1014	9910	x	--x----	24	x	x	-	x	-	x	x	x	x	x	x	-	x	x	-	-	-	-	-
0724	BPWX38BMP	BY32	NORRKÖPINGSDJ	N5801	E1759	971115	0410	205		25	3	7.3	1015	9910	x	-------	17	x	x	-	x	-	x	x	x	x	x	x	-	x	-	-	-	-	-	-
0725	BPWX45BMP	BY38	KARLSÖDJ	N5707	E1740	971115	0940	113		11	00	0	9.0	1018	4810	x	-⁎xx---	15	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-	-	x
0726	BPSE49BAS	BY39	ÖLANDS S UDDE	N5607	E1632	971115	1520	50		11	3	7.8	1018	9910	x	-------	8	x	x	-	x	-	x	-	x	x	-	-	-	x	-	-	-	-	-	-

STATION P2 SURFACE WATER (0-15 m)

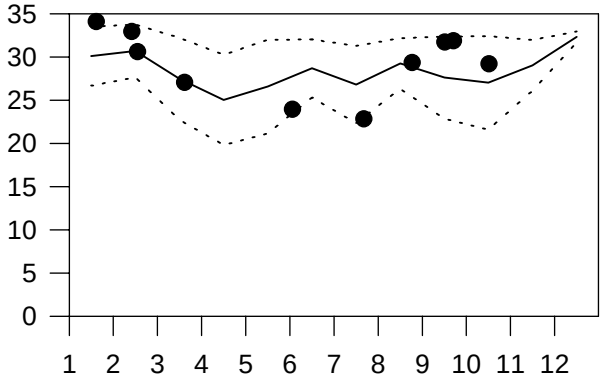
Annual Cycles

Mean 1986-1995 St.Dev. 1997

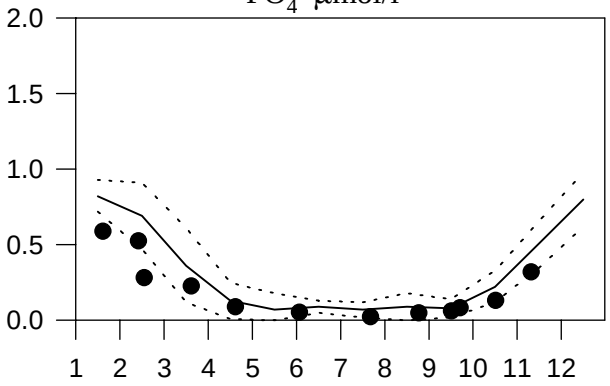
Temperature °C



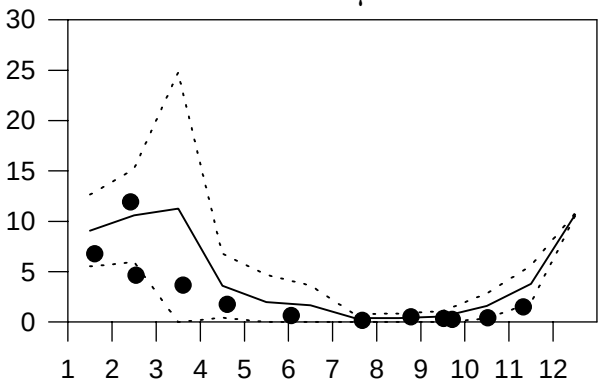
Salinity psu



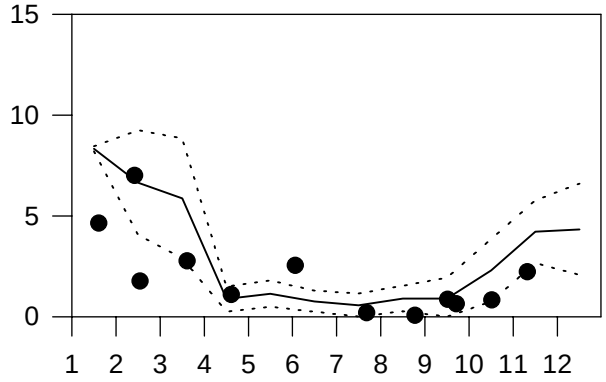
PO_4 µmol/l



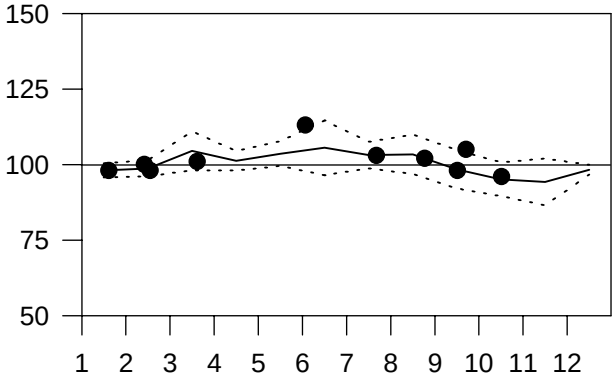
DIN µmol/l



SiO_3 µmol/l

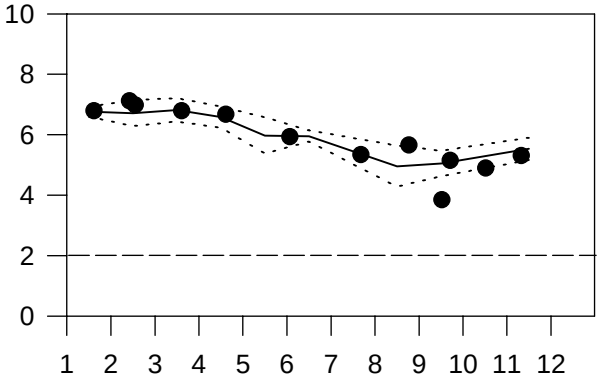


O_2 saturation %

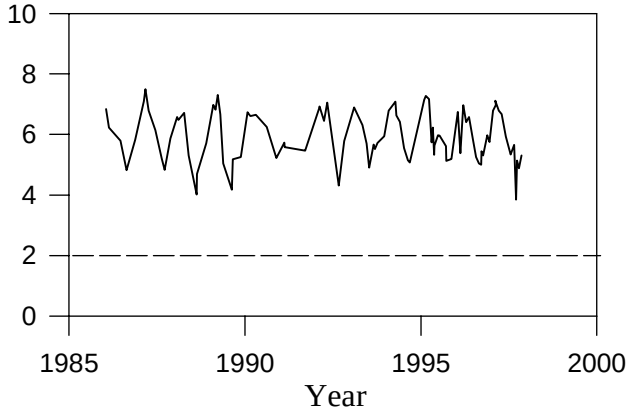


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

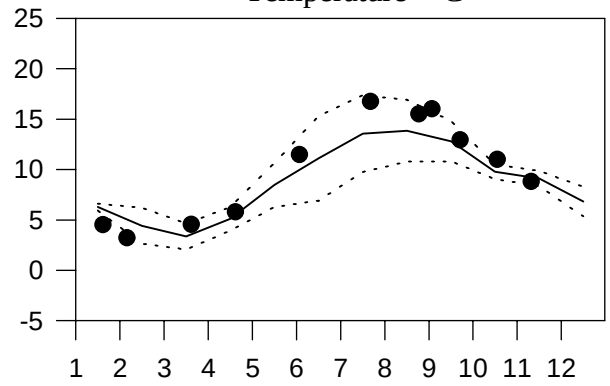


STATION M6 SURFACE WATER (0-15 m)

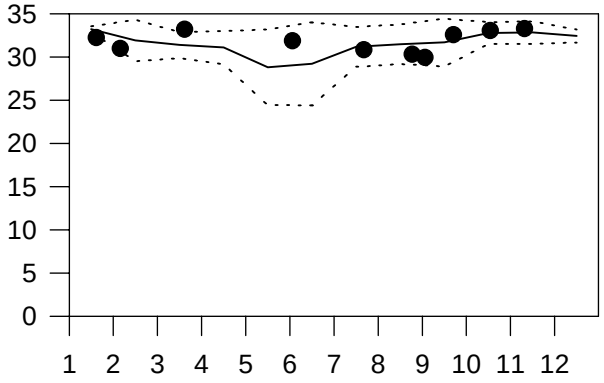
Annual Cycles

Mean 1986-1995 St.Dev. 1997

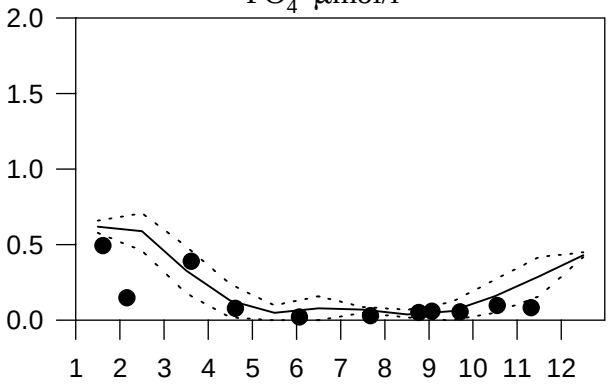
Temperature °C



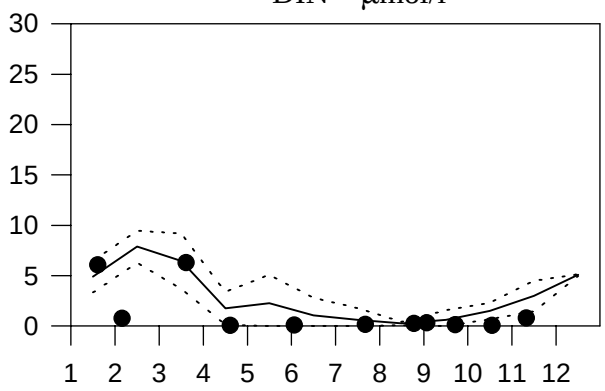
Salinity psu



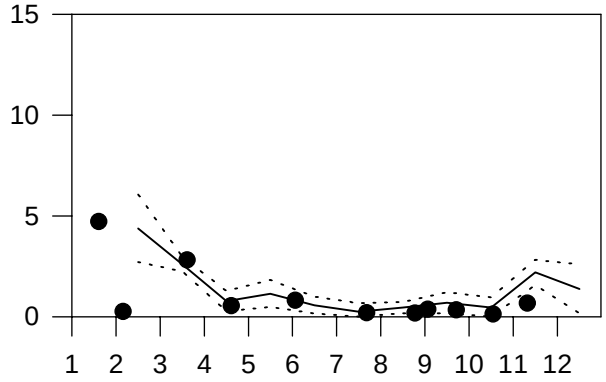
PO_4 µmol/l



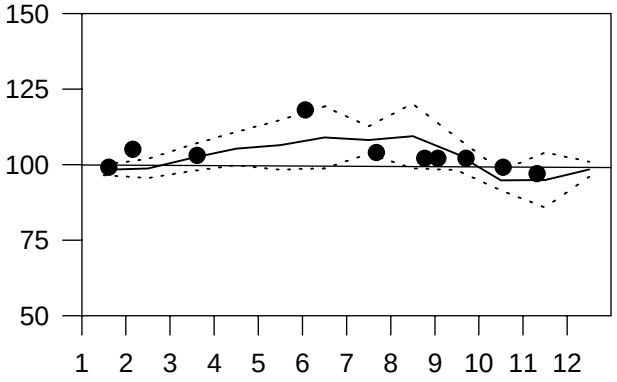
DIN µmol/l



SiO_3 µmol/l

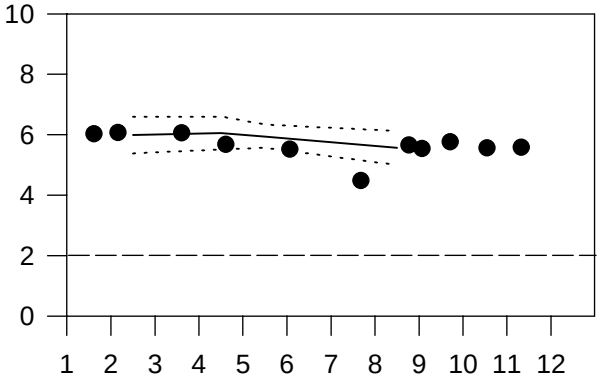


O_2 saturation %

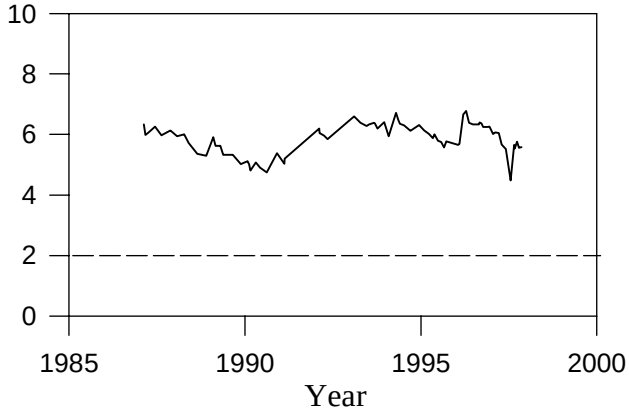


OXYGEN IN BOTTOM WATER

O_2 ml/l



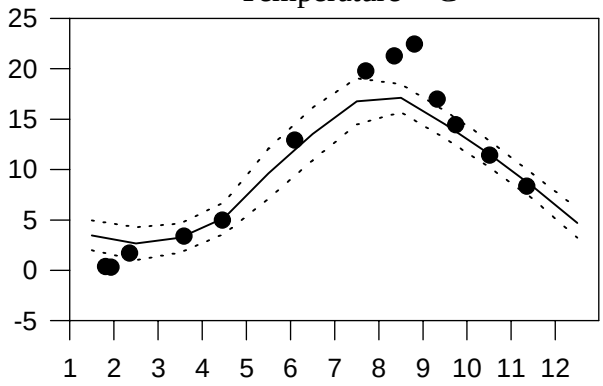
O_2 ml/l



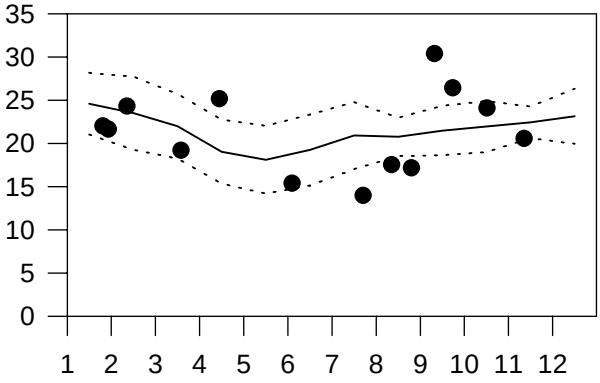
STATION ANHOLT E SURFACE WATER (above halocline)

Annual Cycles

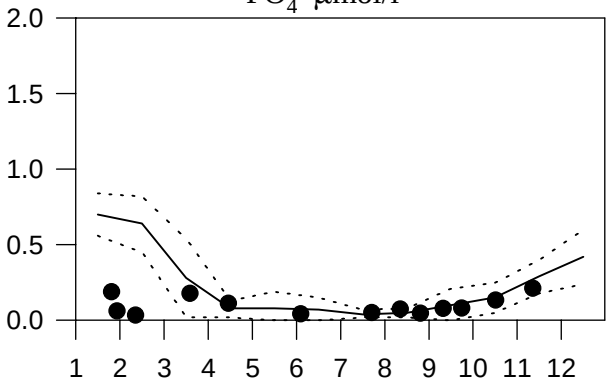
Temperature °C



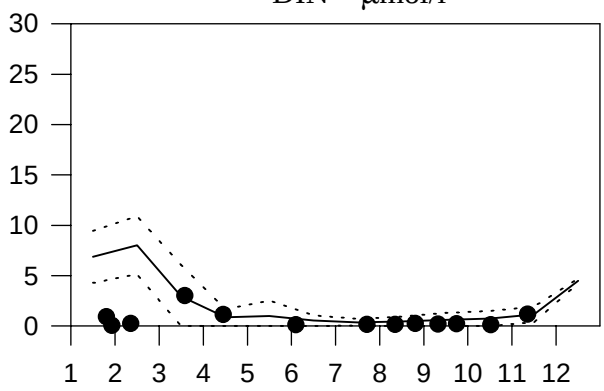
Salinity psu



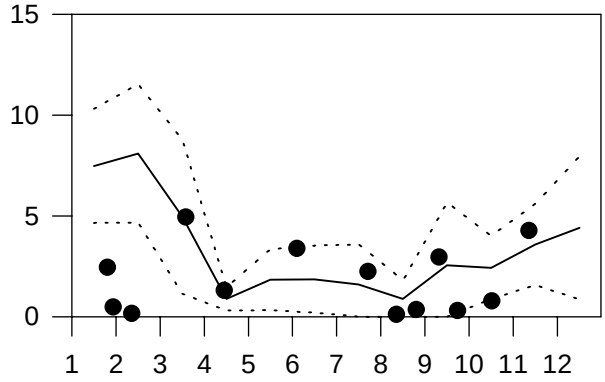
PO_4 µmol/l



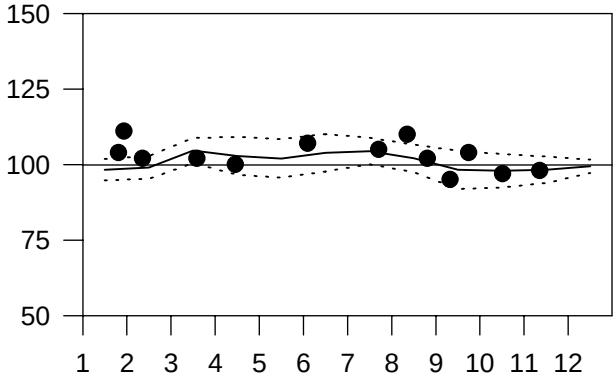
DIN µmol/l



SiO_3 µmol/l

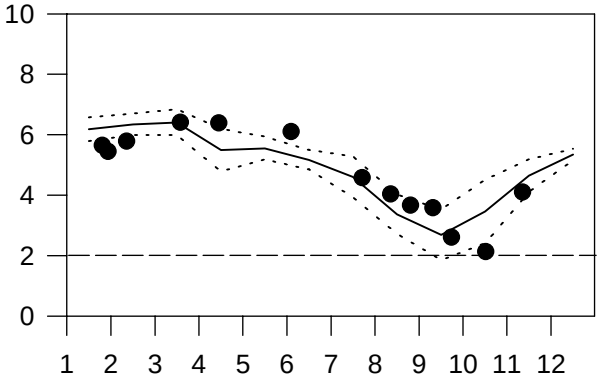


O_2 saturation %

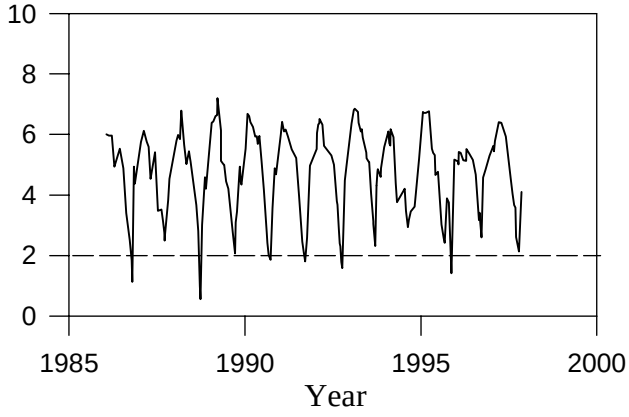


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

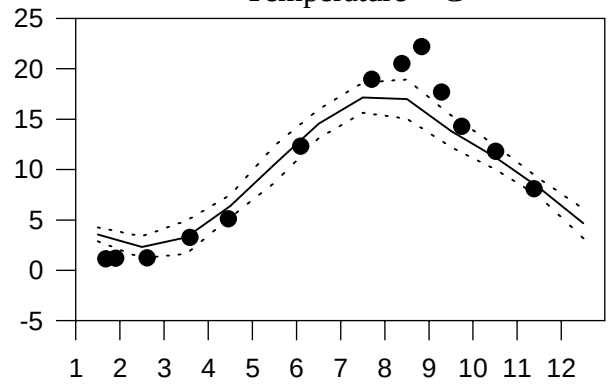


STATION W LANDSKRONA SURFACE WATER (0-15 m)

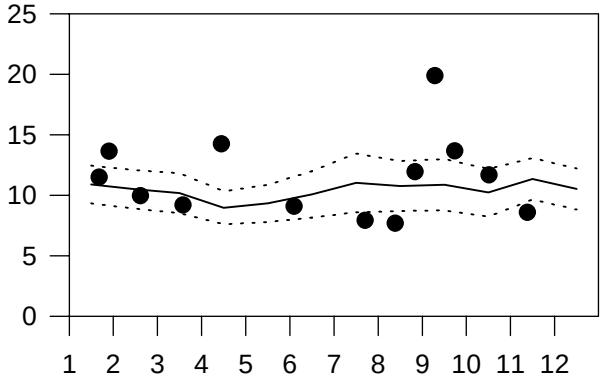
Annual Cycles

Mean 1986-1995 St.Dev. 1997

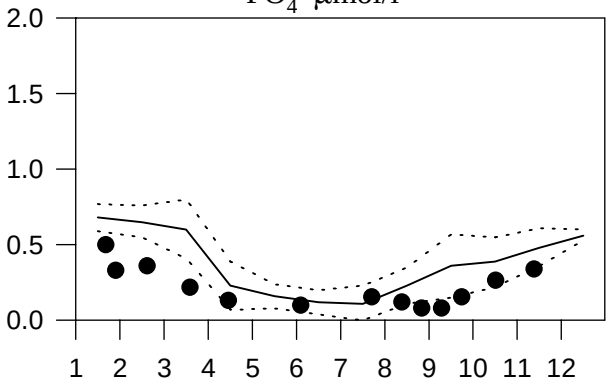
Temperature °C



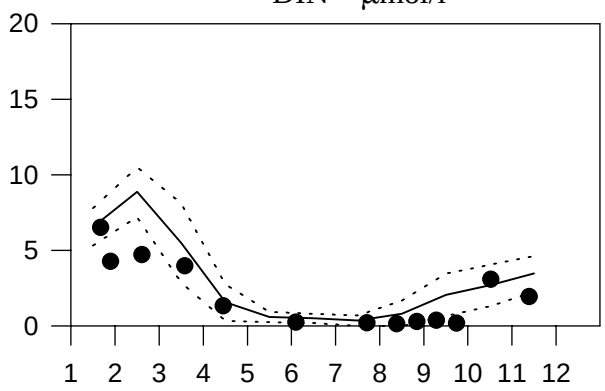
Salinity psu



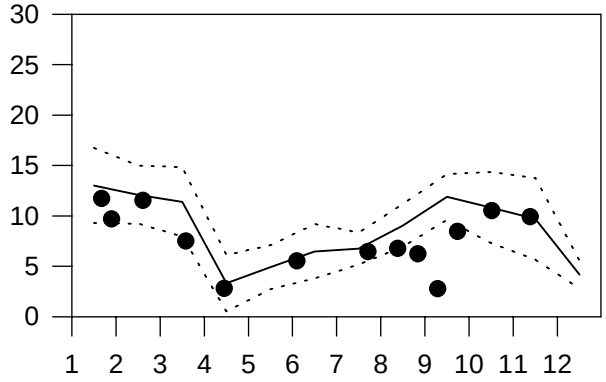
PO_4 µmol/l



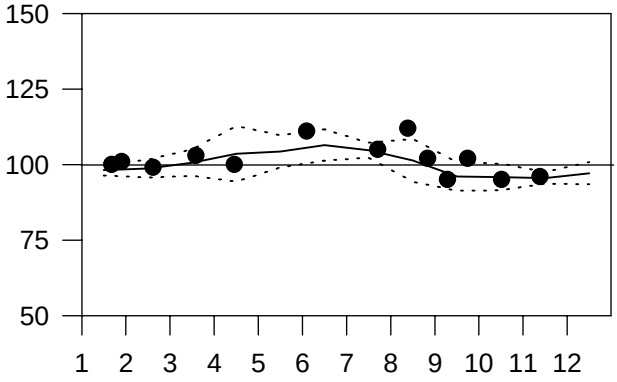
DIN µmol/l



SiO_3 µmol/l

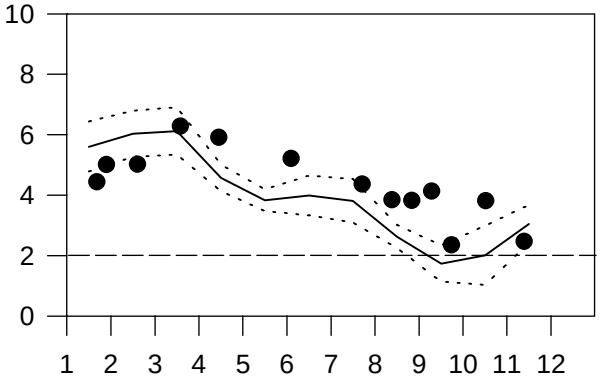


O_2 saturation %

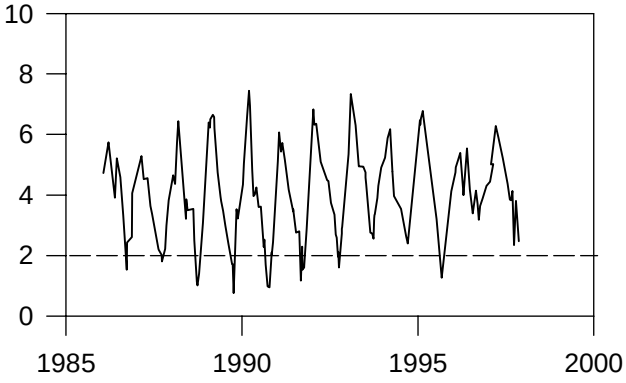


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

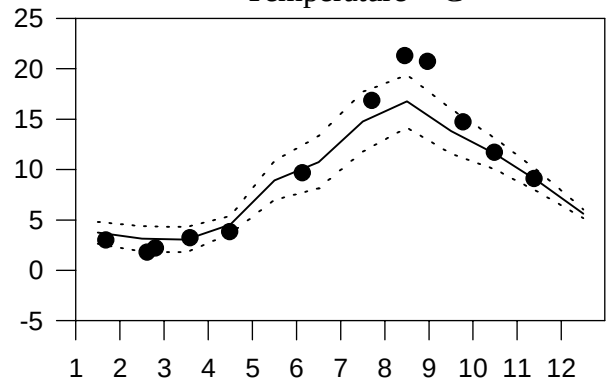


STATION BY2 SURFACE WATER (0-15 m)

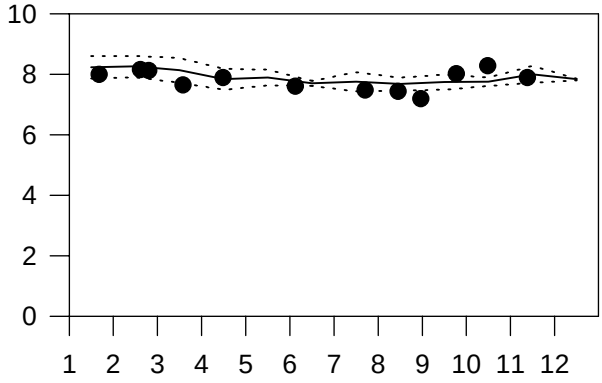
Annual Cycles

Mean 1986-1995 St.Dev. 1997

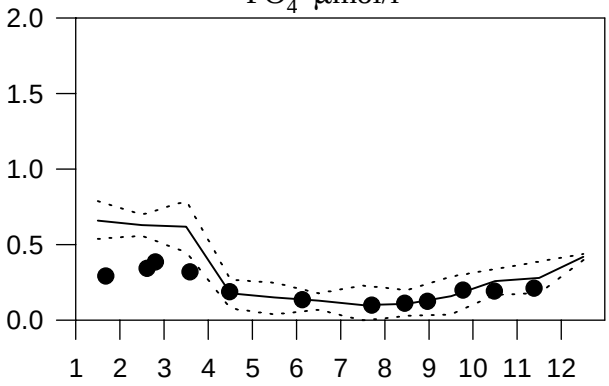
Temperature °C



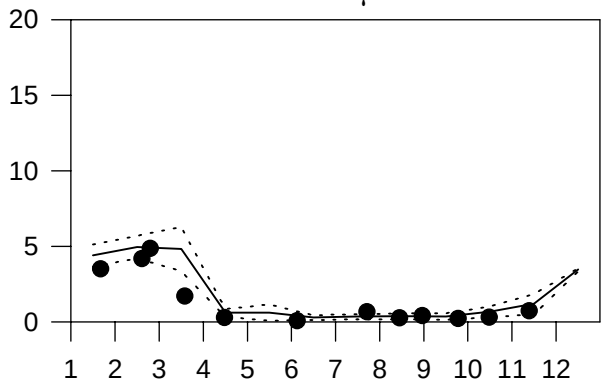
Salinity psu



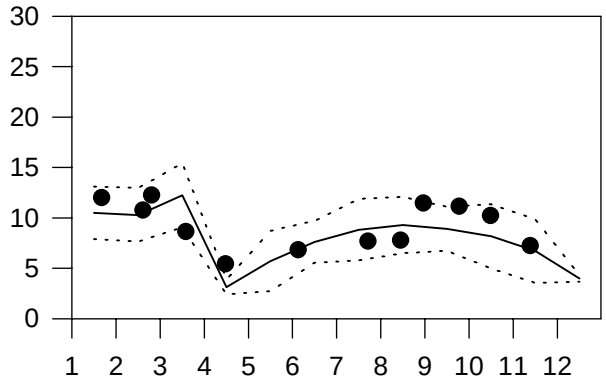
PO_4 µmol/l



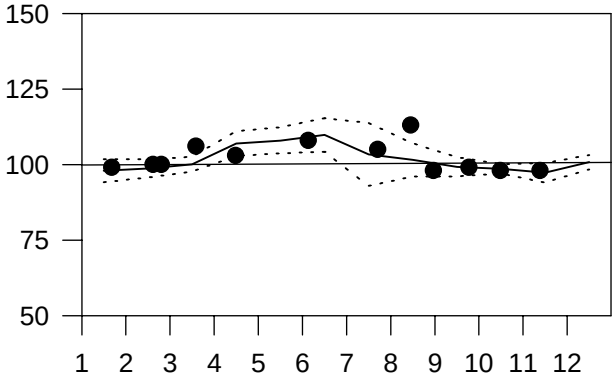
DIN µmol/l



SiO_3 µmol/l

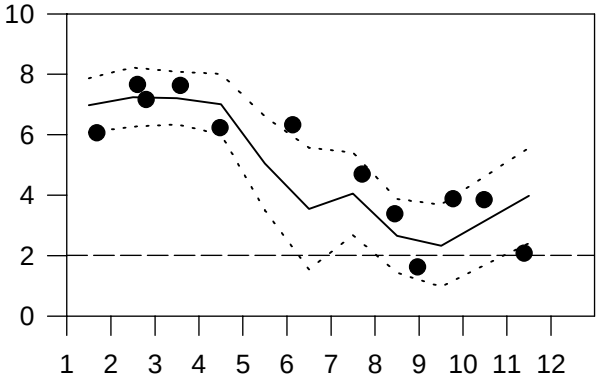


O_2 saturation %

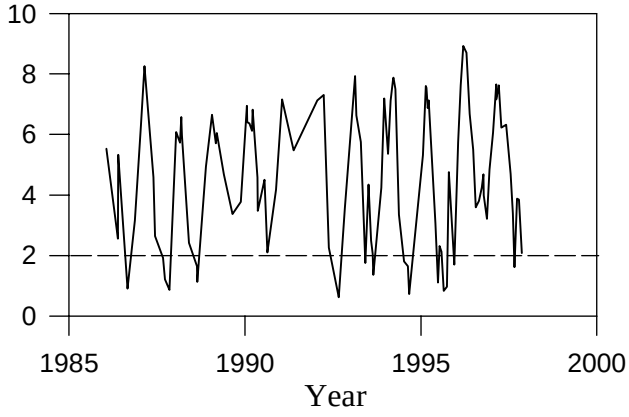


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

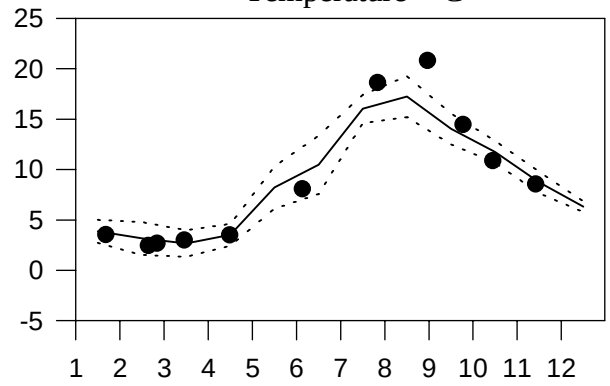


STATION BY5 SURFACE WATER (0-15 m)

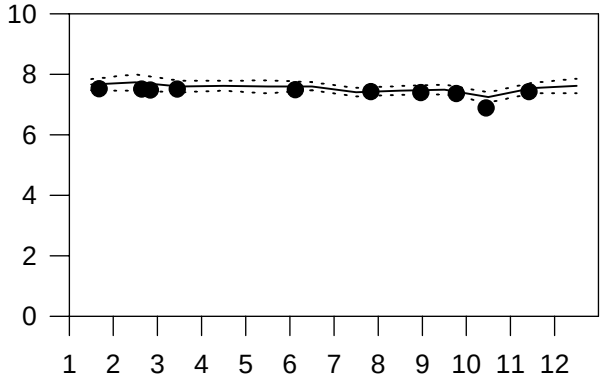
Annual Cycles

Mean 1986-1995 St.Dev. 1997

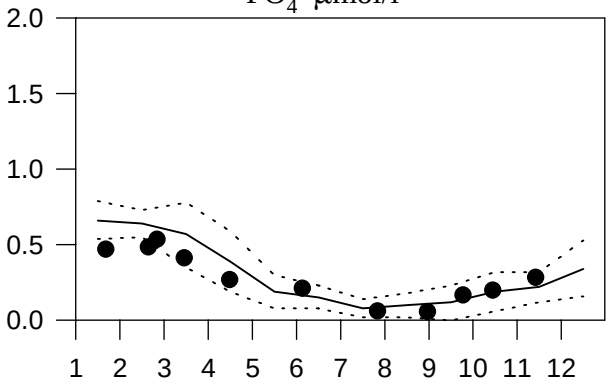
Temperature °C



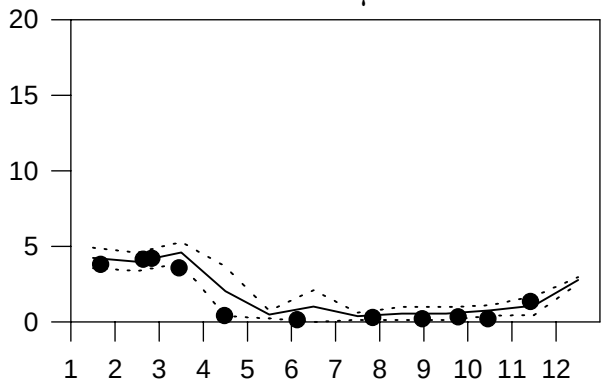
Salinity psu



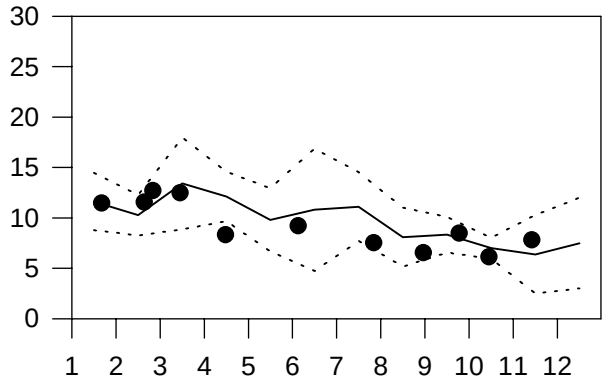
PO_4 µmol/l



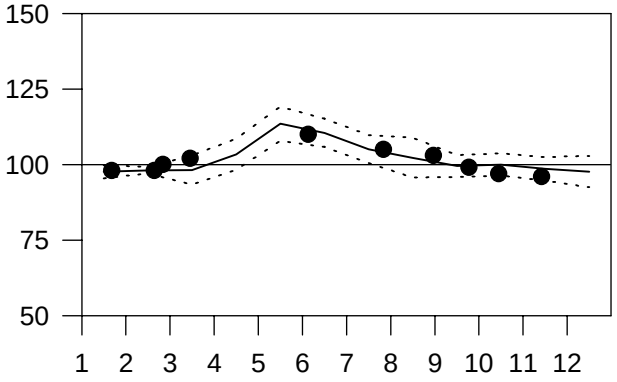
DIN µmol/l



SiO_3 µmol/l

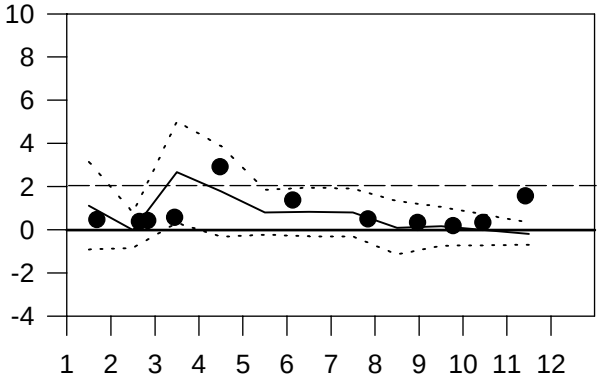


O_2 saturation %

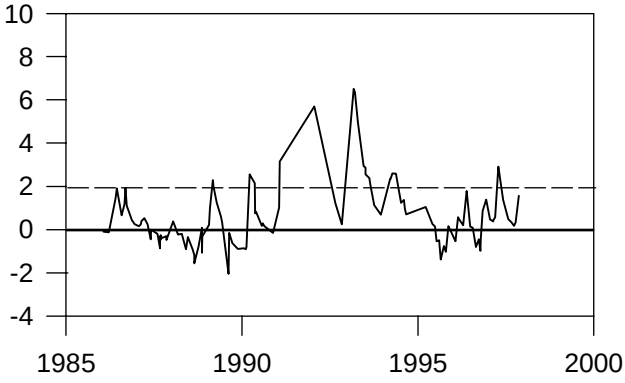


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

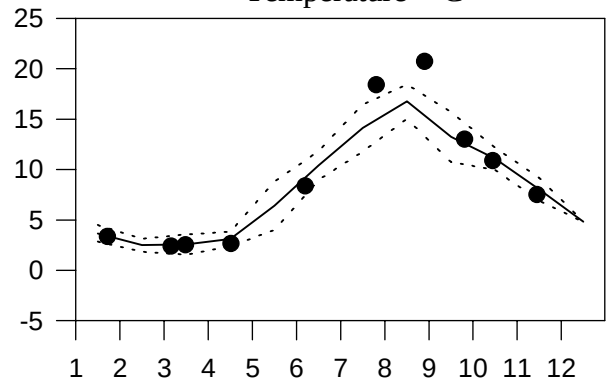


STATION BY15 SURFACE WATER (0-15 m)

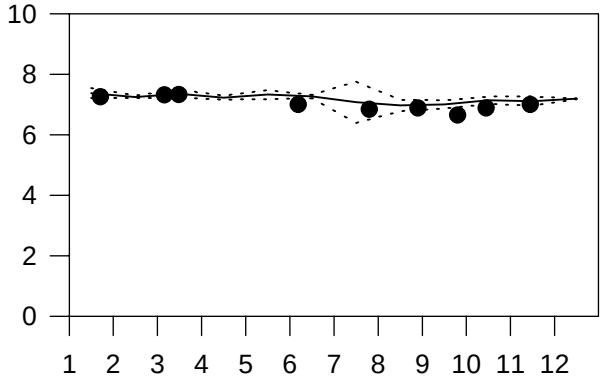
Annual Cycles

Mean 1986-1995 St.Dev. 1997

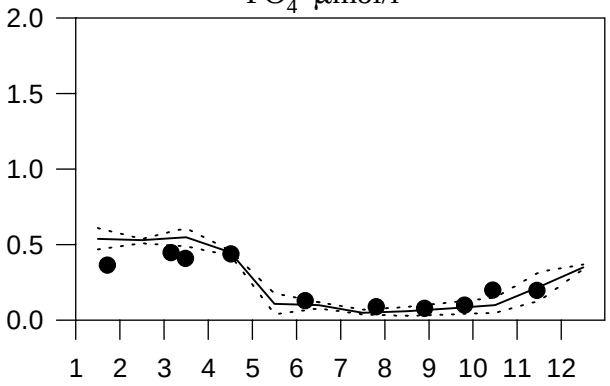
Temperature °C



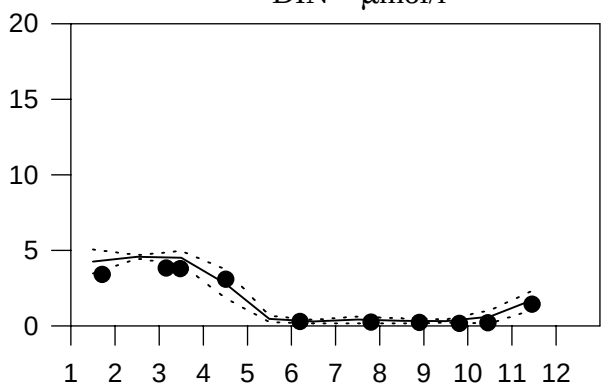
Salinity psu



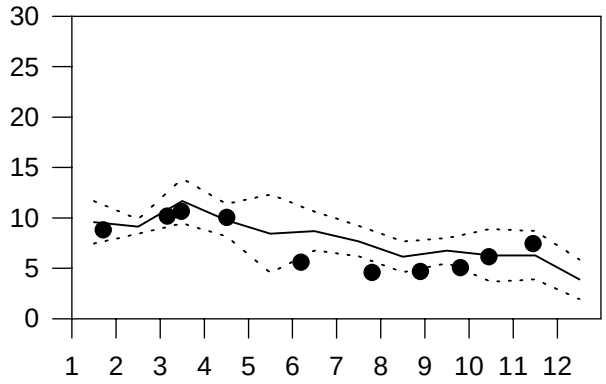
PO_4 µmol/l



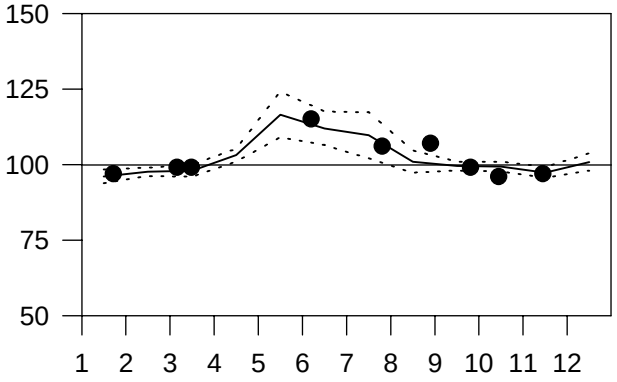
DIN µmol/l



SiO_3 µmol/l

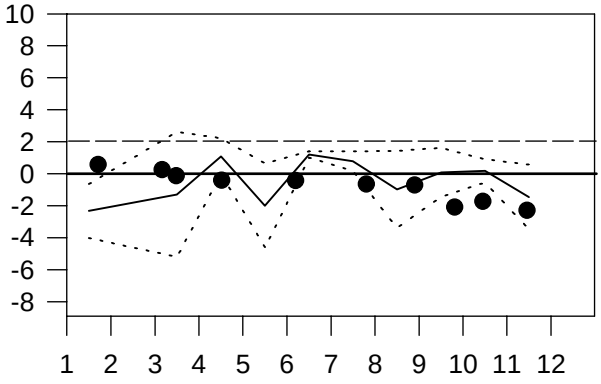


O_2 saturation %

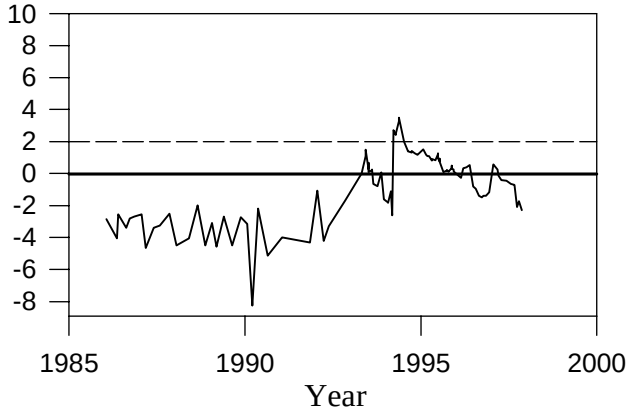


OXYGEN IN BOTTOM WATER

O_2 ml/l



O_2 ml/l

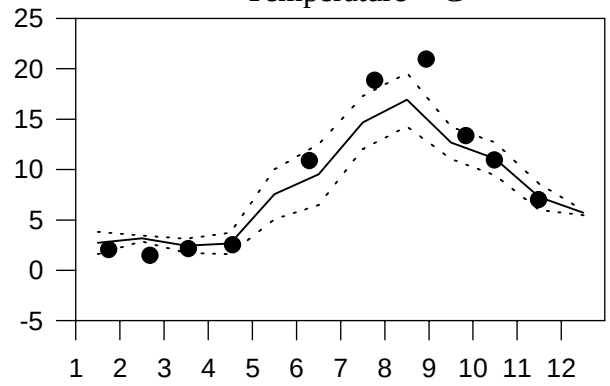


STATION BY38 SURFACE WATER (0-15 m)

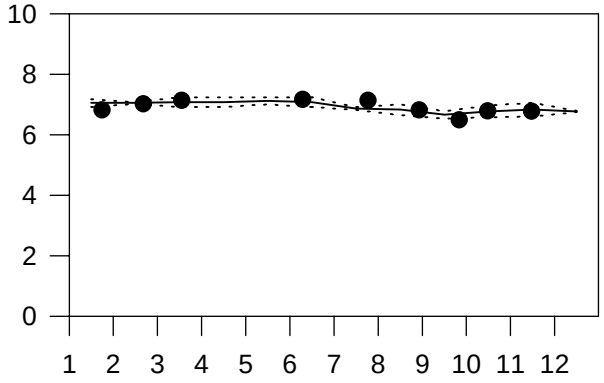
Annual Cycles

Mean 1986-1995 St.Dev. 1997

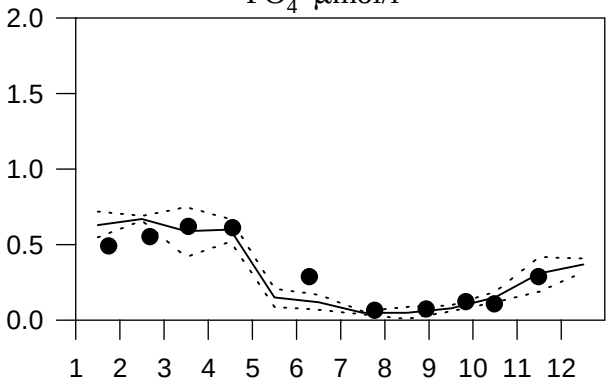
Temperature °C



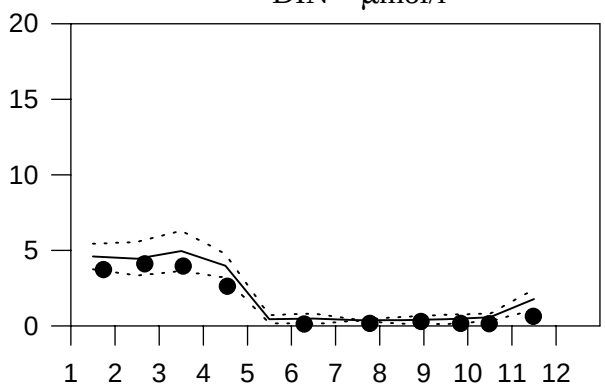
Salinity psu



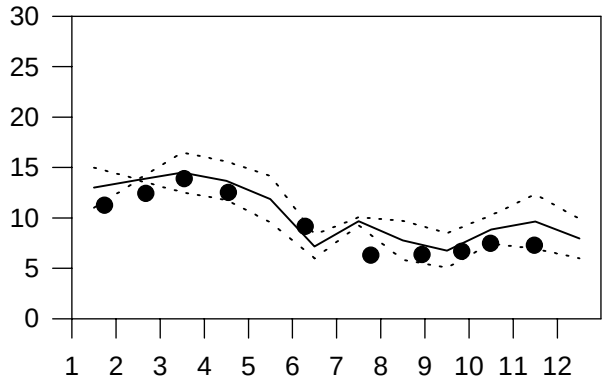
PO_4 µmol/l



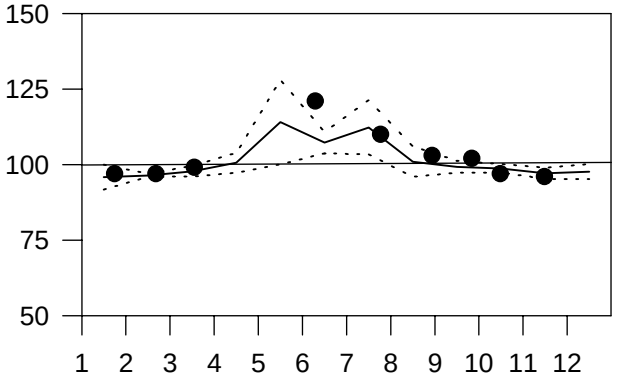
DIN µmol/l



SiO_3 µmol/l

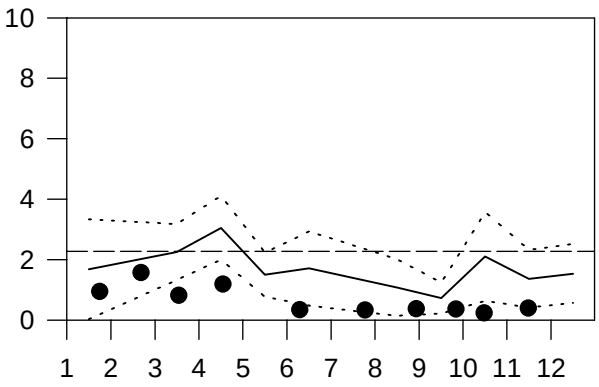


O_2 saturation %

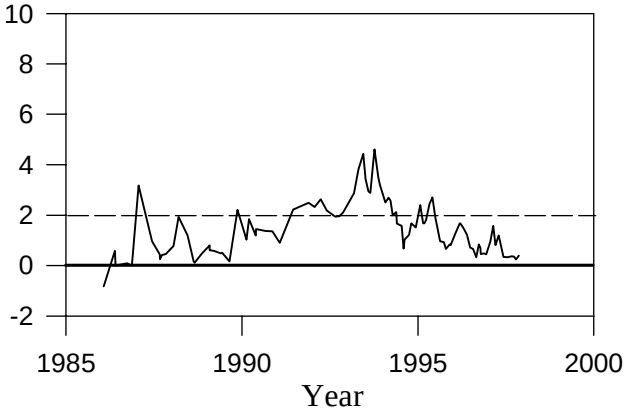


OXYGEN IN BOTTOM WATER

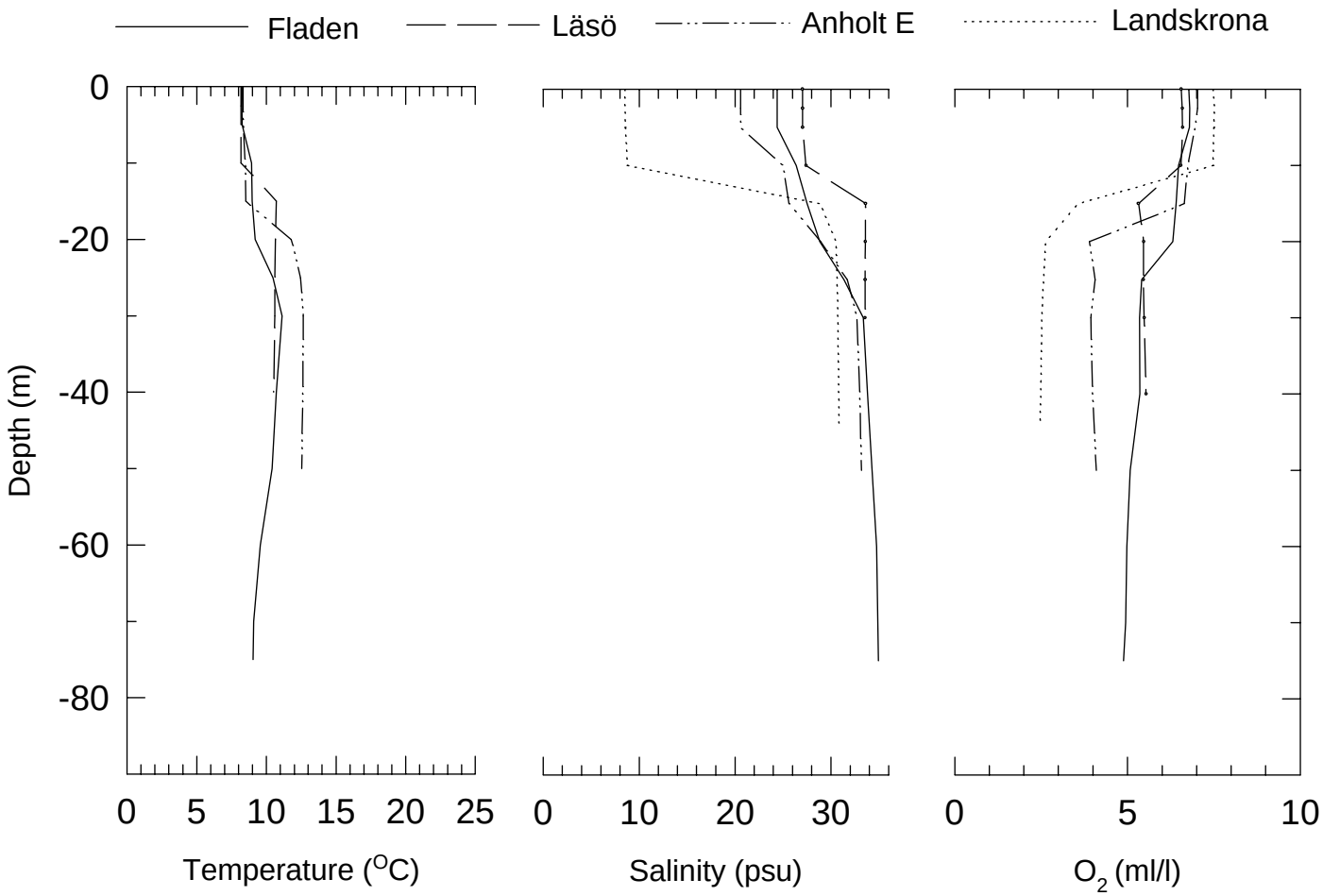
O_2 ml/l

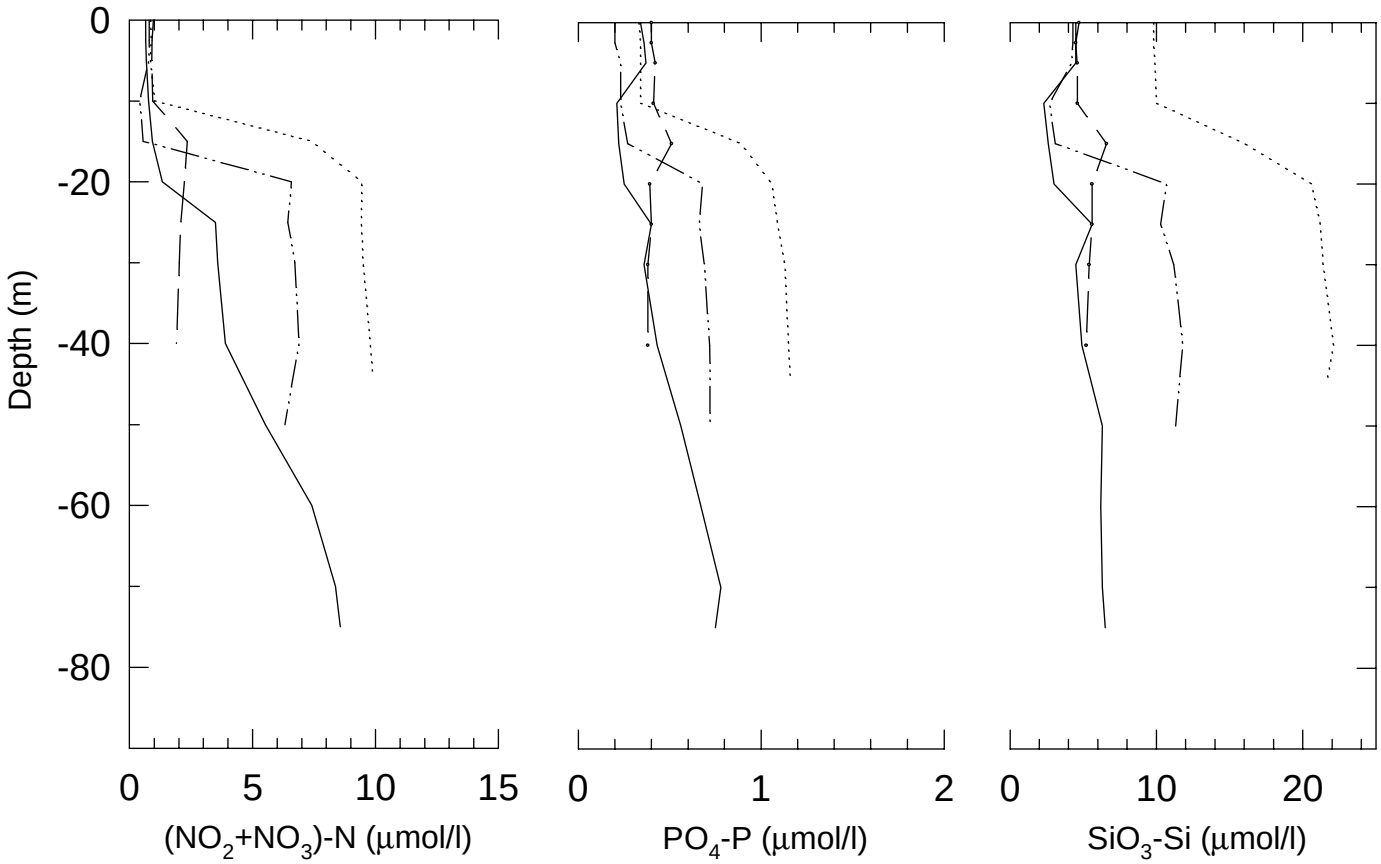


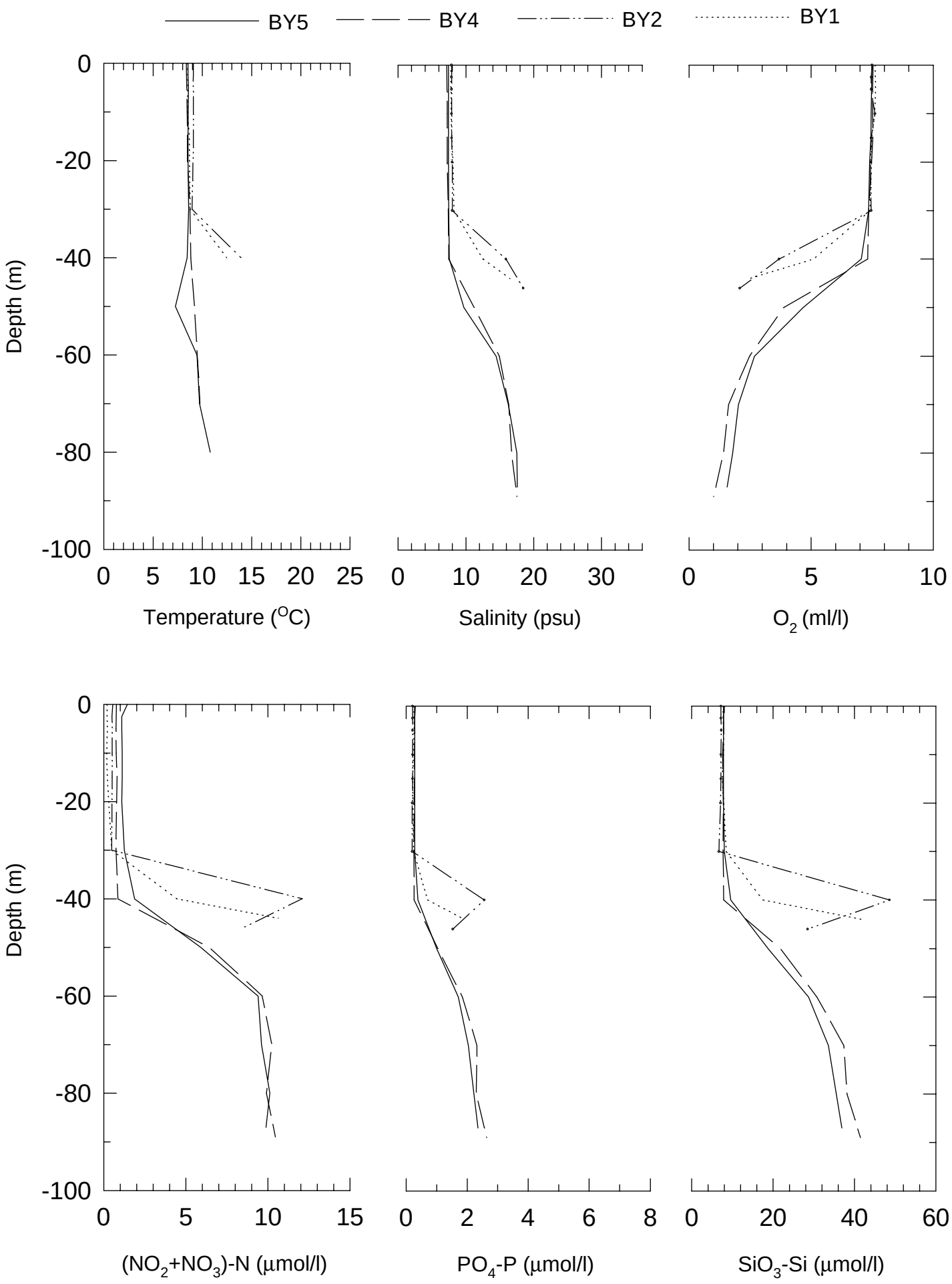
O_2 ml/l



KATTEGAT and THE SOUND week 46 -97






SOUTH BALTIC week 46 -97
BY5
BY4
BY2
BY1
Depth (m)
0
-20
-40
-60
-80
-100
0 5 10 15 20 25
Temperature (°C)
0 10 20 30
Salinity (psu)
0 5 10
O2 (ml/l)
0 5 10 15
(NO2+NO3)-N (µmol/l)
0 2 4 6 8
PO4-P (µmol/l)
0 20 40 60
SiO3-Si (µmol/l)

EAST BALTIC week 46 -97