

SMHI monitoring cruise report December, R/V Svea



Survey period:	2019-12-04 – 2019-12-16
Principal:	Swedish Meteorological and Hydrological Institute (SMHI), Swedish Agency for Marine and Water Management (SwAM).
Cooperation partners:	Swedish University of Agricultural Sciences (SLU)

SUMMARY

The December cruise was the first that SMHI conducted aboard Sweden's new research vessel R/V Svea. During the expedition, which is part of the Swedish pelagic surveillance program, Skagerrak, Kattegat, the Sound, the Baltic Sea and the Gulf of Bothnia were visited. Nutrient mapping was carried out in the Gulf of Bothnia.

Surface water temperature had dropped further since last month. The warmest surface water was found in the Skagerrak and the Baltic Proper Sea with 8°C and coldest water was found in the Gulf of Bothnia with around 2 °C.

The levels of nutrients in the surface water (0-10 m) had generally increased since the last measurement. In Skagerrak and Kattegat, the concentration of phosphate and inorganic nitrogen was normal for the season, while the silicate content was lower than normal. In the Baltic Proper, the levels of phosphate were normal but for inorganic nitrogen both levels were higher and lower than normal. Silicate levels were above normal at most stations in the Baltic Proper. In the Gulf of Bothnia the levels of inorganic nitrogen were lower than normal and in the Bothnian Sea normal levels were measured. The concentration of phosphate was elevated throughout the area studied, while the silicate content was normal in the Gulf of Bothnia and above normal in the Bothnian Sea.

In the Arkona basin no oxygen deficiency was measured in the bottom water. Here the oxygen situation was good as a result of an ongoing inflow. In the Hanö Bight and in the Bornholm Basin, oxygen deficiency (hypoxia) were found from 60-70 meters and closer to the bottom, from 70-80 meters depth, completely oxygen-free conditions (anoxia) were observed. In the Eastern Gotland Basin, hypoxia were found at 70 meters depth with anoxia just below. However, at about 100-125 meters depth, low levels of oxygen were found and from 150 meters depth it was completely oxygen free again. The oxygen found here is likely to stem from inflows that occurred earlier this year and that was stored in at intermediate depths. In the Northern and Western Gotland Basin, there was a lack of oxygen at 60 - 70 meters and completely oxygen free from 70 - 90 meters. In the Gulf of Bothnia no oxygen deficiency was measured, but the levels of oxygen in the deep water were in some places lower than normal.

The next regular cruise is scheduled to start on January 7, 2020. Then, mapping of nutrients in the Kattegat will also be carried out.

Front page: R/V Svea in the Gulf of Bothnia, photo taken from the KBV181 by colleagues from Umeå Marine Research station (UMF) that met up at one of the sampling stations.

RESULTS

This cruise was the first conducted on SMHI aboard the new Swedish research vessel R / V Svea. The cruise started in Åhus on December 4 and ended in Lysekil harbour on December 16. A cruise participant's exchange was carried out in Gävle on December 10.

The winds were mostly fresh between 10 m/s to at most 19 m/s in the northern Baltic Proper. When the cruise reached the offshore buoy, Huvudskärsbojen, the winds increased, so the planned uptake of the sea buoy had to be cancelled.

In the Gulf of Bothnia, SMHI's expedition coincided with the Umeå Marina Research Center's (UMF) expedition. The majority of stations sampled coincided both in time and space and will therefore be used to intercalibrate measurement methods and results between the two institutes.

The station BCSIII-10 in the southeastern Baltic Sea had to be cancelled due to lack of time.

During the expedition, new equipment was tested on board R / V Svea that SMHI will be able to use on future expeditions. A "Moving Vessel Profiler (MVP)" was run between stations in the Western Gotland Basin and in the Gulf of Bothnia. This is a form of towed instrument that can carry out profiling at full speed. The system can provide a large number of profiles (about 500 profiles this expedition) during the passage between stations and provides salt, temperature, oxygen content and fluorescence. SMHI also tested the ADCP equipment that is on board for measuring current and transport in the water profile as well as the ferrybox. The ferrybox continuously measures a variety of parameters in the surface water and can also be programmed to take water samples.

During the expedition, in addition to regular sampling, sampling was also carried out to determine DNA within the project "DNA barcoding of marine phytoplankton ". The project is funded by the Swedish Agency for Marine and Water Management until February 2020 and includes all national monitoring stations where plankton is sampled. At some stations, water and plankton samples were also taken to measure selenium for EAWAG in Switzerland (Swiss Federal Institute of Aquatic Science and Technology).

This report is based on data that has only undergone an initial quality control. When data is published, certain values may have changed when further quality control has been performed. Data from this expedition is published as soon as possible on the data host's website. This usually happens within a week of the expedition being completed. Some analyzes are done after the expedition and will be published later.

Data can be downloaded from SHARKweb here:

<http://www.smhi.se/klimatdata/oceanografi/havsmiljodata>

The Skagerrak

The temperature in the surface water (0 - 10 m) had cooled by about 2°C compared to November and now varied between the coldest 6.7 °C at the coast and the warmest 8.3 °C in the outer Skagerrak. In the offshore areas, the temperature was slightly warmer than normal but at the coast it was normal for the season. The surface salinity varied around 32 - 33 offshore and was about 27 at the coast. For the season, salinity was generally above or well above normal in the offshore areas.

At the stations Å13 and Å14 a clear stratification was missing, while further offshore, in the central parts of the Skagerrak, a distinct stratification was found at about 10-20 meters depth.

The nutrients in the offshore surface water had generally increased since the last cruise in November. For the season, the levels of inorganic nitrogen and phosphorus were normal while silicate showed lower levels than normal. In the deep water, the levels of inorganic nitrogen and silicate were much lower than normal at Å13 and Å15. The levels of nutrients in Skagerrak's surface water varied for phosphate between 0.4 - 0.5 $\mu\text{mol/l}$, inorganic nitrogen 3.4 - 6.3 $\mu\text{mol/l}$ and silicate 2.0 - 7.9 $\mu\text{mol/l}$.

The oxygen situation was normal for the season except for the station Släggö where the oxygen concentrations in the bottom water were much lower than normal, 4.0 ml/l.

The chlorophyll fluorescence, which is a measure of plankton activity, was low throughout the area.

The Kattegat and the Sound

The surface water temperature in the Kattegat and the Sound was normal, around 7 °C. The surface salinity varied between 23 and 28 in the Kattegat which is normal and in the Sound the salinity was 13. The halocline and thermocline was found in the Kattegat at 10 - 20 meters depth where the salinity increased to 34 - 35 in the deep water. In the Sound there was a sharp stratification at about 10 meters depth.

The levels of inorganic nitrogen in the surface water were normal for the season in Kattegat except at N14 where the levels were slightly higher than normal. The concentrations varied between 3.0 - 4.8 $\mu\text{mol/l}$, lowest in the central parts and highest in the Sound. Phosphate levels were normal throughout the investigated area and varied around 0.4 and 0.5 $\mu\text{mol/l}$. The silicate content was normal for the season and ranged from 4.3 - 5.4 $\mu\text{mol/l}$. In the Sound, the concentration was 12.1 $\mu\text{mol/l}$. The nutrient levels in the deep water were largely normal for the season.

Chlorophyll fluorescence was low throughout the area, indicating that plankton activity was low.

The oxygen situation in Kattegat and the Sound was good and no lack of oxygen was noted. However, it is very uncommon for oxygen deficiency in this area during this time of the year.

The Baltic Proper

The water temperature in the surface water was warmer than normal and the temperature varied between 6 - 8 °C. The salinity in the surface was normal and ranged from 6.7 - 8.4: highest in the southern parts and lowest in the north. In the deep water of the Eastern, Northern and Western Gotland Basins, temperatures were observed well above normal. Higher salinities than normal were also noted in these basins. In the Arkona Basin, at BY1, an inflow from Kattegat to the Baltic Sea, closest to the bottom, was noted, which gave rise to salinities above 22. Halocline and thermocline coincided and were found at depths between 40 and 60 meters.

In the Arkona Basin no oxygen deficiency (oxygen concentration <2 ml / l) was found in the bottom water. Here the oxygen situation was good as a result of the ongoing inflow. In the Hanö Bight and in the Bornholm Basin, oxygen deficiency was found from depths exceeding 60-70 meters. Closer

to the bottom from 70-80 meters depths hydrogen sulphide (completely oxygen-free) was observed. In the Eastern Gotland Basin, at BY15, oxygen deficiency was found from 70 meters depth and oxygen-free conditions just below. At about 100-125 meters depth, low levels of oxygen were measured, just above 0 ml/l, and from 150 meters depth it was completely oxygen free again. Also at BY20, slightly north of BY15, low oxygen levels were noted at 100-125 meters depth. This indicates that an inflow from earlier this year has been stored in at intermediate depth in the Eastern Gotland Basin. In the Northern Gotland Basin, there was a lack of oxygen from 70 meters and completely oxygen-free from 80 meters. In the Western Gotland Basin, there was a lack of oxygen already at 60 - 70 meters and completely oxygen free from 70 - 90 meters.

Nutrient concentrations in the surface water had generally increased since the last cruise in November. Phosphate levels were normal (0.4 - 0.6 $\mu\text{mol/l}$). As in November, there were still large variations in the concentration of inorganic nitrogen in the surface water. In the north, at station BY29, it was higher than normal (4.0 $\mu\text{mol/l}$) and concentrations had increased further compared to November. In the Western Gotland Basin the levels were lower but normal (1.6 - 2.2 $\mu\text{mol/l}$) and in the Eastern Gotland Basin, at BY10, levels above the normal (2.4 $\mu\text{mol/l}$) were noted. In the other areas normal levels were observed. The content of silicate in the surface water (0-10 m) was above normal in the Northern, Eastern and Western Gotland Basins but normal in the other areas. The concentrations varied between 11.1 - 15.4 $\mu\text{mol/l}$ in the offshore areas but were higher at the coastal station RefM1V where 17.3 were measured.

Conditions in the deep water were very similar to the conditions in November. In the southern parts of the Baltic Proper, nutrient levels were generally normal in the deep water and increased towards the bottom. BY1 was partially influenced by inflowing water from the Kattegat. In the Eastern Gotland Basin deep water, nutrient levels were clearly affected by the variations between completely oxygen-free and oxygenated water below the halocline. The levels of both inorganic nitrogen and phosphate increased at 70 - 80 m, where the oxygen was completely depleted, and then decreased again when low levels of oxygen were measured. A clear connection between oxygen and nutrients was seen at station BY15. In the Western Gotland Basin, the levels of inorganic nitrogen remained well above normal in the oxygen-free water, where there also was high levels of hydrogen sulphide. The same was noted in the northern part at BY29 where inorganic nitrogen was higher than normal below the halocline.

Plankton activity, measured as chlorophyll fluorescence from the CTD probe, was low throughout the investigated region.

The Gulf of Bothnia

The temperature in the surface water was normal for the season and varied between 2.0 °C in the northern Bothnian Bay to 5.7 °C in the Åland Sea. Salinity in the surface water was also normal and ranged from 2.9 in the north to 6.0 in the southern parts. Temperature and salinity in the deep water also showed normal conditions for the season. The stratification in the Bothnian Sea was found at about 40-50 meters depth, while in Bothnian Bay it was found shallower at 10-30 meters.

The levels of inorganic nitrogen in the surface water were lower than normal in the Bothnian Bay (about 0.4 $\mu\text{mol/l}$) and normal in the Bothnian Sea. The levels varied in the Bothnian Sea between 2.2 - 4.0 $\mu\text{mol/l}$. The concentration of phosphate was above normal throughout the area under study. The concentrations were lowest in the Bothnian Bay (0.1-0.3 $\mu\text{mol/l}$) and highest in the central parts of the Bothnian Sea (0.8-1.5 $\mu\text{mol/l}$). The silicate content was normal in the Bothnian Bay and

ranged between 36-38 $\mu\text{mol/l}$ and was above normal in the Bothnian Sea, 24-26 $\mu\text{mol/l}$. In the deep water, similar conditions were found as in the surface water: both the phosphate and silicate concentrations were elevated in the Bothnian Sea. In the Gulf of Bothnia, the amount of inorganic nitrogen was lower than normal in the deep water.

No oxygen deficiency was noted in the Gulf of Bothnia, which is normal. However, the oxygen levels in the deep water, at some stations, were slightly lower than it usually is at this time of year.

The plankton activity, assessed on the basis of chlorophyll fluorescence, was low throughout the area studied.

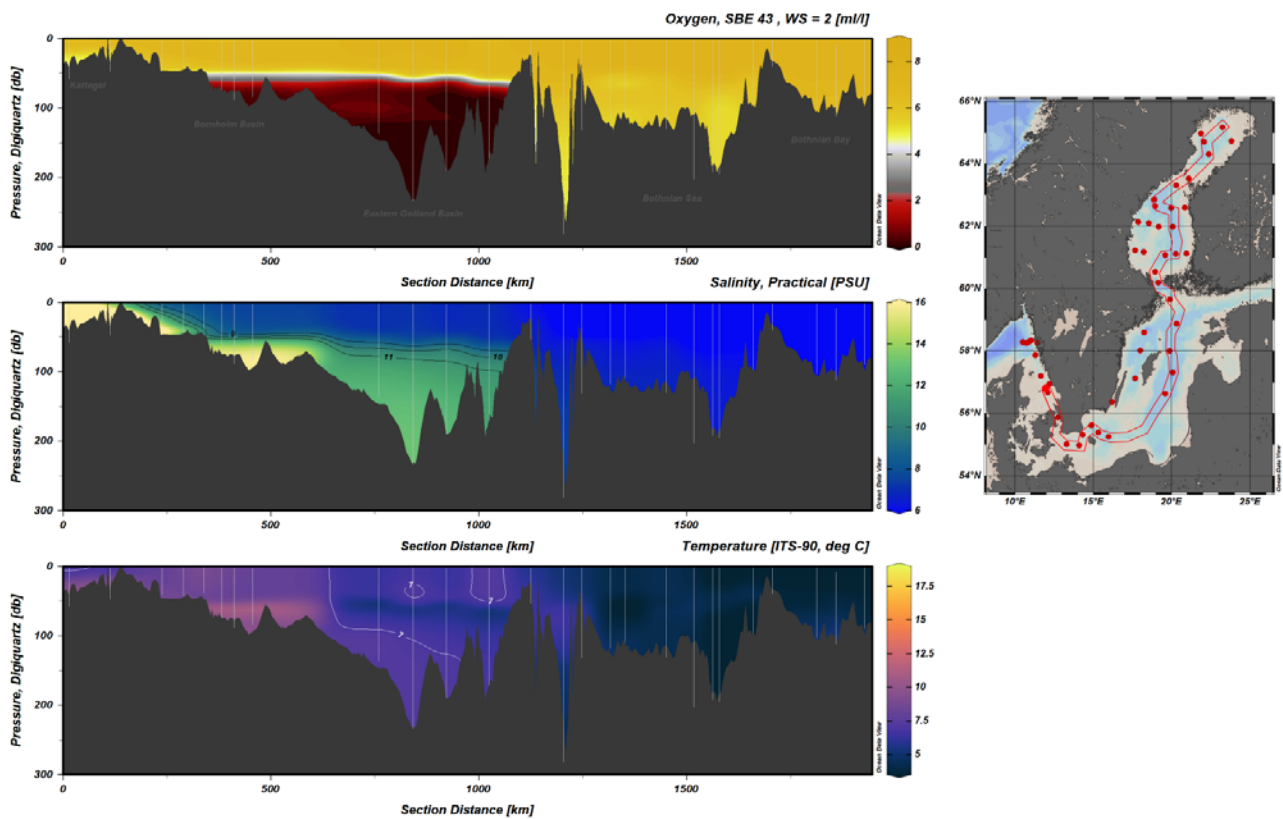


Figure 1. Transect showing dissolved oxygen, salinity and temperature from the Sound, through the Baltic Proper, the Western Gotland Basin and the Gulf of Bothnia. Grey/white lines mark the positions/stations that the plots are based on and to the right is a map showing these positions/stations.

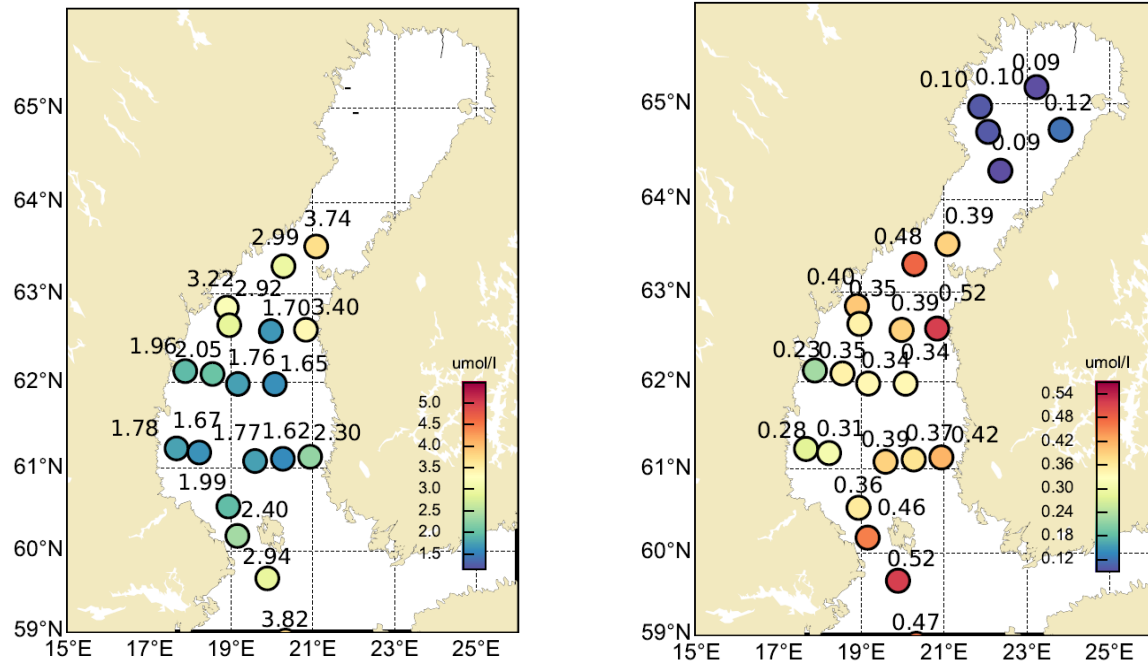


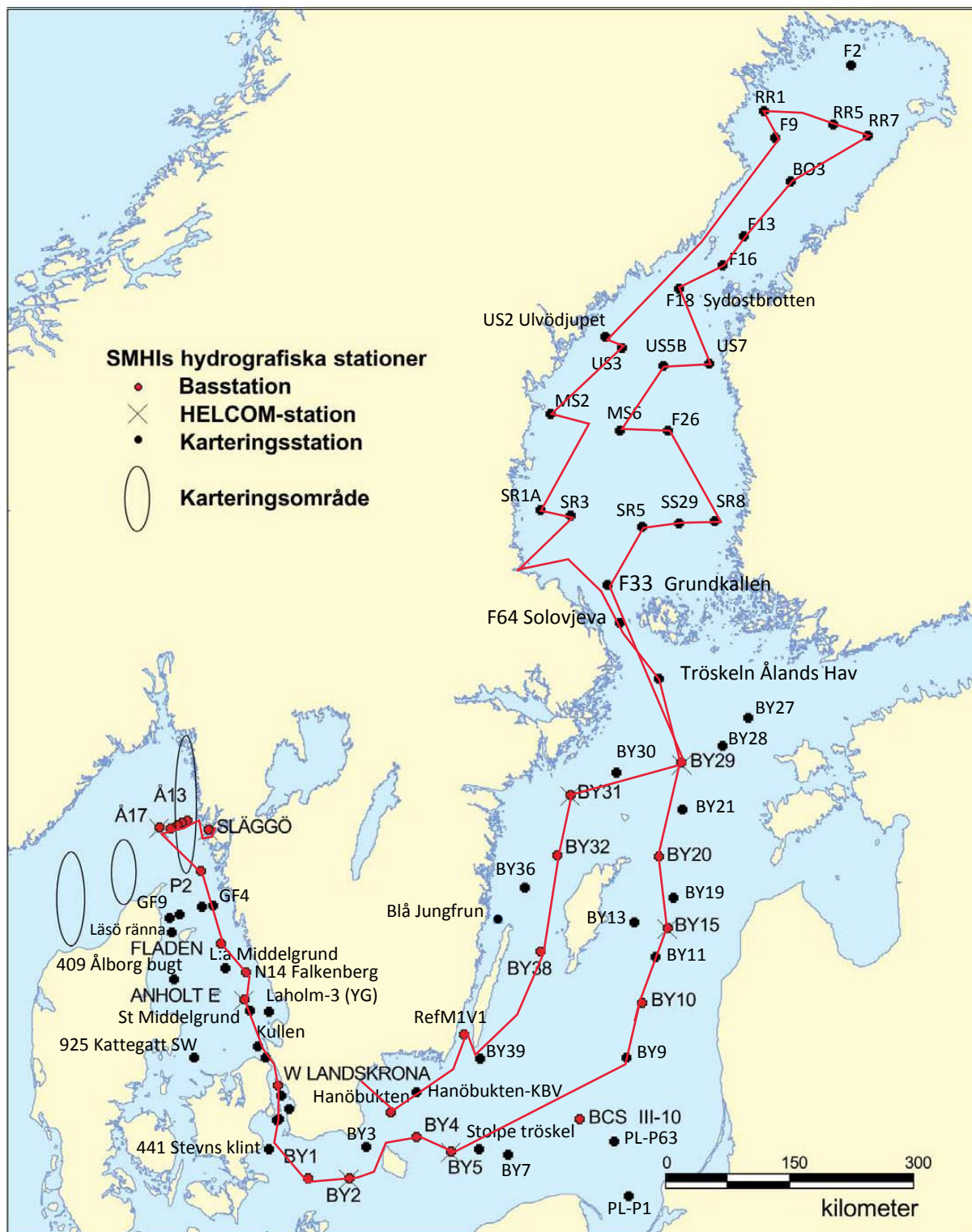
Figure 3. Nitrite + Nitrate in the Gulf of Bothnia (t.l) and phosphorus (t.r). Unfortunately, data from nitrite + nitrate in the Bay of Bothnia is missing due to malfunction of the nutrient analysis instrument.

Participants

Name	Role	Leg	From
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APPENDICES

- Track chart
- Table over stations, sampled parameters and number of sampling depths
- Map of bottom water oxygen/hydrogen sulphide concentration
- Vertical profiles for regular monitoring stations
- Monthly average surface water plots for regular monitoring stations



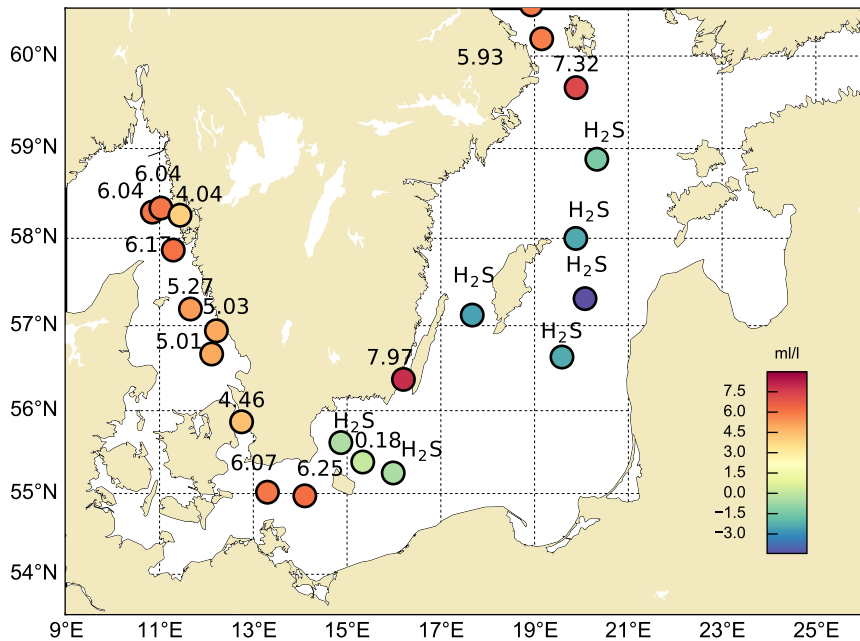
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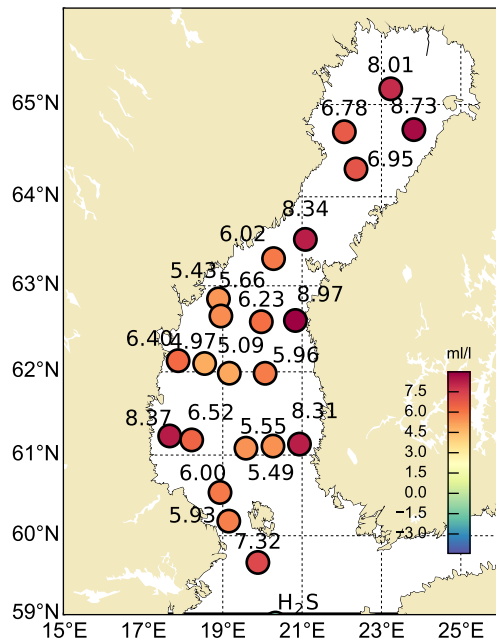
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0192	6	BPNX35	BAS...	BY29 / LL19	5852.91	02019.63	20191212	1150	178		16 13	4.0	999	2850	x---	16 16	16	x x - x	- x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	
0193	6	BPEX26	BAS...	BY20 FÅRÖDJ	5759.90	01952.73	20191212	2130	197		17 10	4.8	996	---	0 x---	17	17	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x
0194	6	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.73	02004.57	20191213	0300	249		17 10	5.2	997	9990	xxx-	24 24	24	x x - x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	
0195	6	BPEX13	BAS...	BY10	5638.02	01935.04	20191213	0945	147		11 12	4.8	993	2840	x---	15 15	15	x x x x	- x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	
0196	6	BPSB07	BAS...	BY5 BORNHOLMSDJ	5515.01	01559.05	20191214	0130	91		13 9	4.9	983	9990	xxx-	12 12	12	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	
0197	6	BPSB06	BAS...	BY4 CHRISTIANSÖ	5522.98	01520.04	20191214	0542	94		13 9	4.9	982	9990	x---	12 12	12	x x x x	- x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x	
0198	6	BPSA03	BAS...	BY2 ARKONA	5458.28	01405.95	20191214	1100	47	9	19 10	4.6	981	2830	xxx-	8 8	8	x x x x	- x	x - x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x	- x

Date: 2020-01-17
Time: 09:57

Ship: 10
Year: 2019

Ser no	Cru no	Stat code	Proj	Stat name	Lat	Lon	Start date yyyymmdd	Start time hhmm	Bottom depth m	Secchi depth m	Wind dir vel	Air temp C	Air pres hPa	WCWI elac	CZPP hozp	No de	No btl	T e	T e	S a	S a	P h	D o	D o	H 2	P h	P h	N t	N t	N t	N t	A m	A t	S l	H i	C o	C o
0199	6	BPSA02	BAS...	BY1	5500.95	01318.05	20191214	1520	47		20 14	4.8	983	9990	x---	8 8			x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-
0200	6	SOCX39	BAS...	W LANDSKRONA	5551.99	01244.98	20191214	2300	50		21 11	5.9	983	9990	x---	9 9			x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-
0201	6	KAEX29	BAS...	ANHOLT E	5640.12	01206.67	20191215	0430	62		20 13	6.5	986	9990	x-x-	10 10			x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	-
0202	6	KANX50	BAS...	N14 FALKENBERG	5656.40	01212.71	20191215	0700	30		16 9	6.2	985	2830	xxx-	7 7			x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	x	-
0203	6	KANX25	BAS...	FLADEN	5711.55	01139.48	20191215	1120	84		12 16	4.0	981	2850	x---	12 12			x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-
0204	6	SKEX23	BAS...	P2	5752.00	01117.52	20191215	1620	93		03 11	3.6	978	9990	x---	10 10			x	x	x	x	-	x	x	-	x	x	x	x	x	x	-	x	-	-	
0205	6	SKEX18	BAS...	Å17	5817.05	01030.26	20191215	2030	340		23 7	5.3	989	9990	xxx-	15 14			x	x	-	x	x	x	-	x	x	x	x	x	x	x	x	-	x	x	
0206	6	SKEX17	BAS...	Å16	5816.01	01043.36	20191215	2300	202		22 7	6.0	991	9990	----	13 0			-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	
0207	6	SKEX16	BAS...	Å15	5817.66	01050.71	20191216	0015	135		20 5	5.1	992	9990	x---	12 12			x	x	x	x	-	x	x	-	x	x	x	x	x	x	-	x	-	x	-
0208	6	SKEX15	BAS...	Å14	5818.93	01056.54	20191216	0140	110		20 7	6.8	993	9990	----	11 0			-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	
0209	6	SKEX14	BAS...	Å13	5820.37	01101.67	20191216	0245	90		22 8	6.6	994	9990	x---	10 10			x	x	x	x	-	x	x	-	x	x	x	x	x	x	-	x	-	-	
0210	6	FIBG27	BAS...	SLÄGGÖ	5815.59	01126.14	20191216	0745	74		16 9	5.9	996	1720	xxx-	9 9			x	x	x	x	-	x	x	-	x	x	x	x	x	x	-	x	-	-	





STATION HANÖBUKTEN SURFACE WATER (0-10 m)

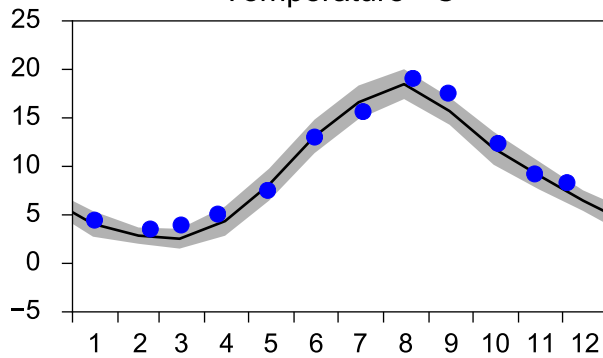
Annual Cycles

— Mean 2001-2015

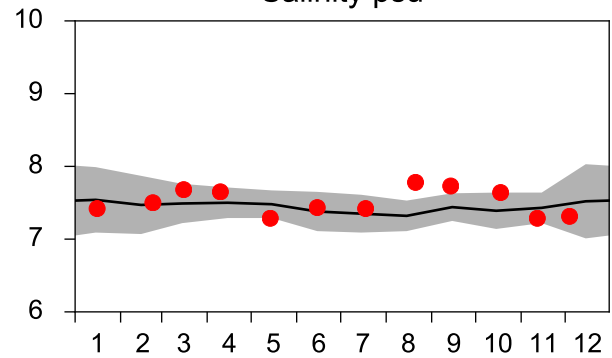
■ St.Dev.

● 2019

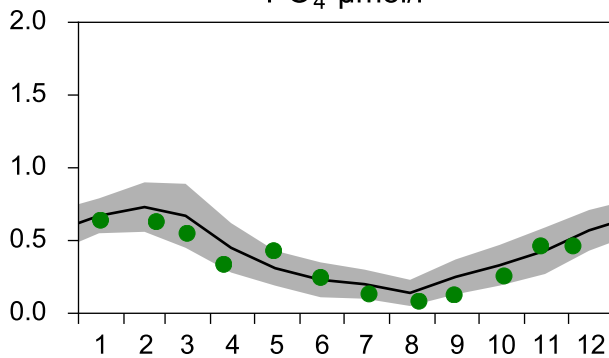
Temperature °C



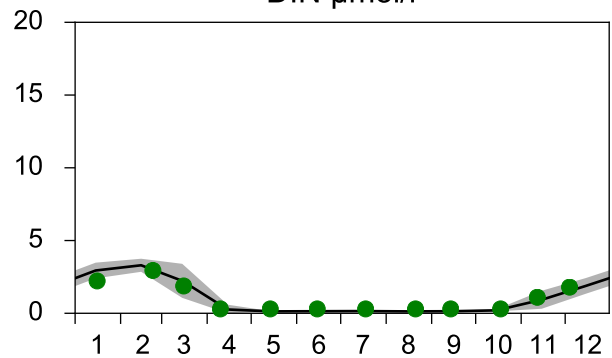
Salinity psu



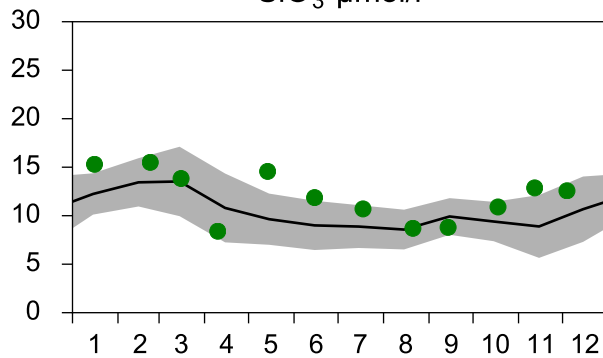
PO₄ µmol/l



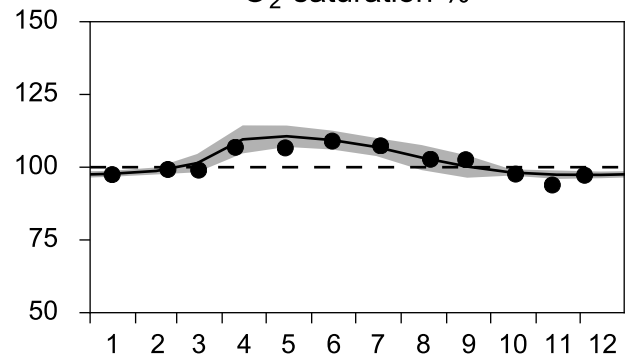
DIN µmol/l



SiO₃ µmol/l

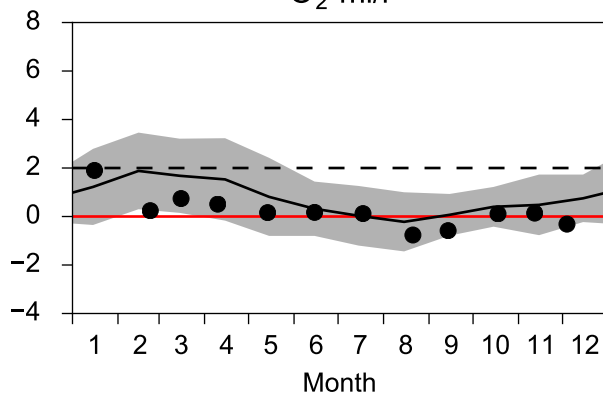


O₂ saturation %

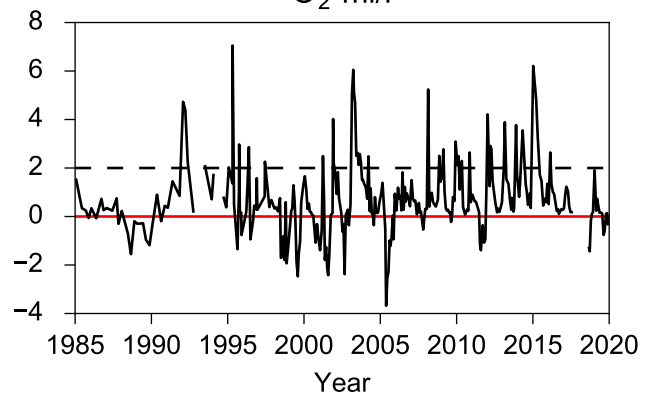


OXYGEN IN BOTTOM WATER (depth >= 70 m)

O₂ ml/l



O₂ ml/l

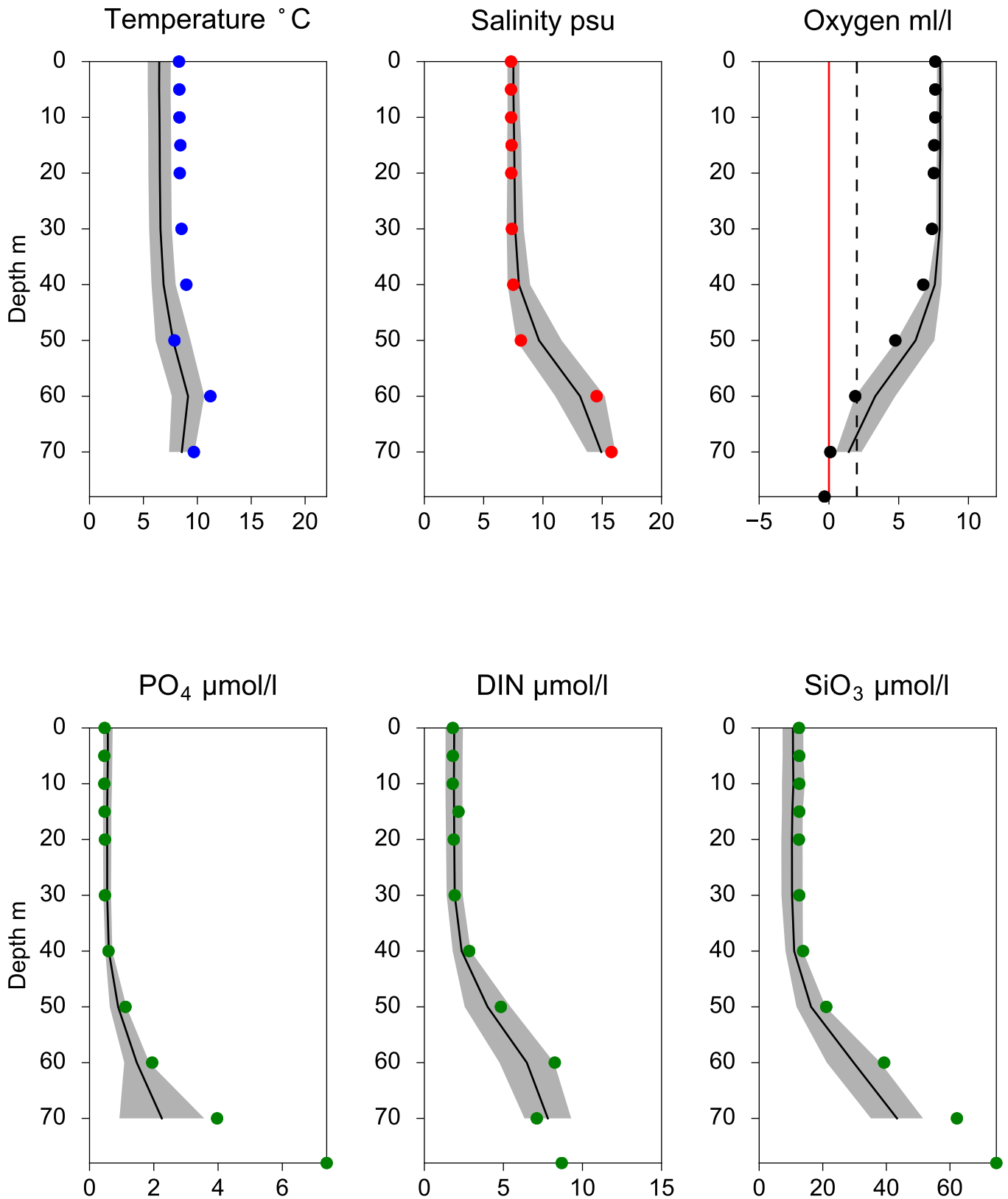


Vertical profiles HANÖBUKTEN December

— Mean 2001-2015

■ St.Dev.

● 2019-12-04



STATION REF M1V1 SURFACE WATER (0-10 m)

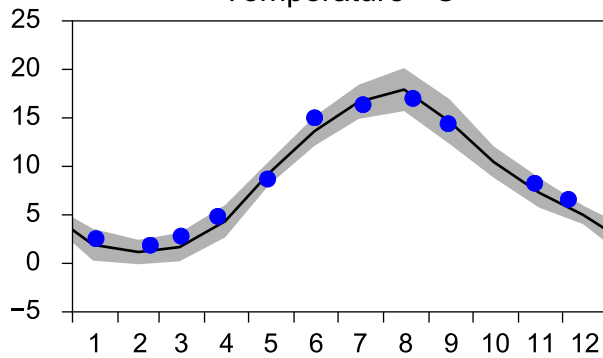
Annual Cycles

— Mean 2001-2015

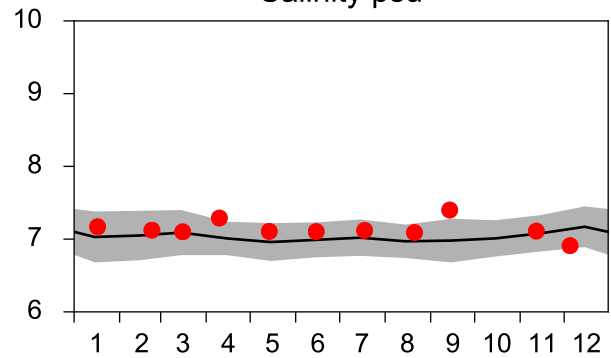
■ St.Dev.

● 2019

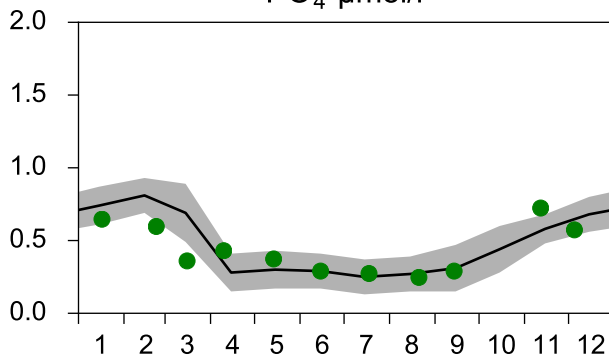
Temperature °C



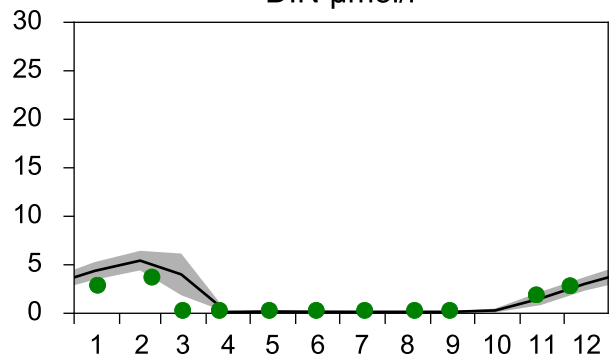
Salinity psu



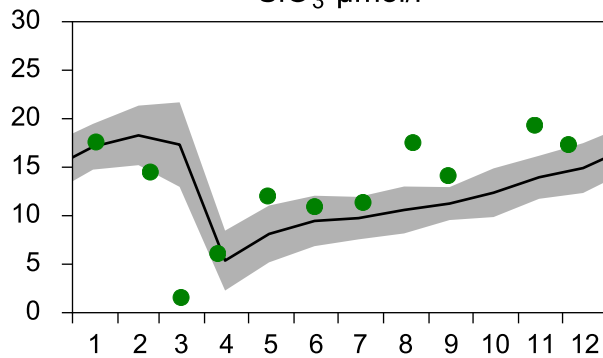
PO₄ μmol/l



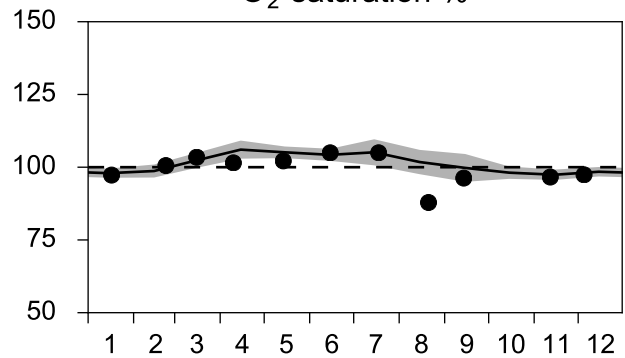
DIN μmol/l



SiO₃ μmol/l

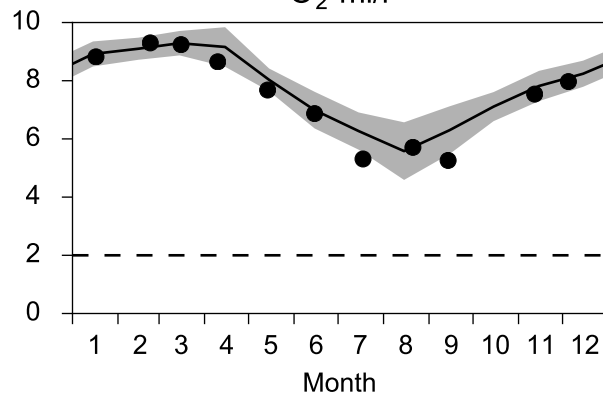


O₂ saturation %

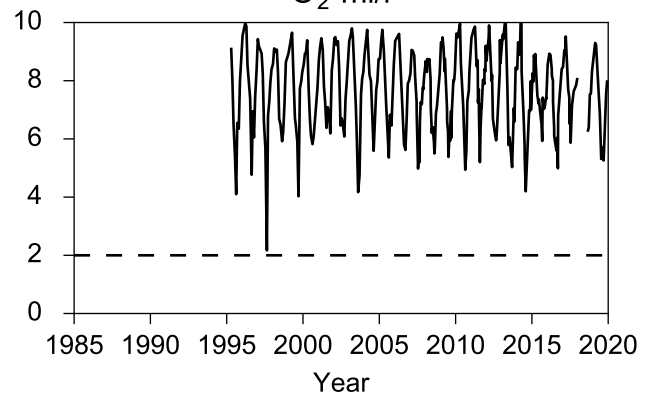


OXYGEN IN BOTTOM WATER (depth >= 17 m)

O₂ ml/l

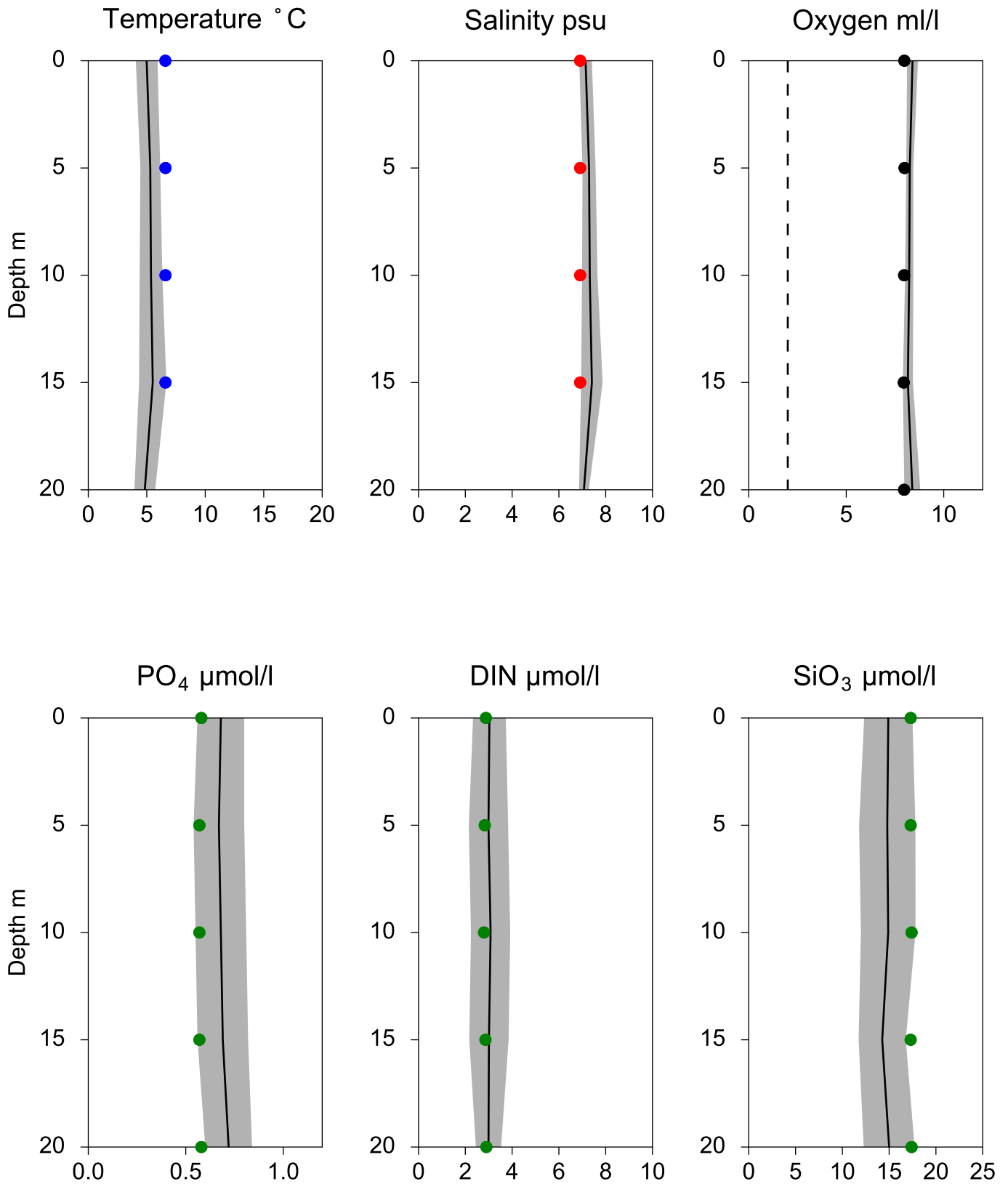


O₂ ml/l



Vertical profiles REF M1V1 December

— Mean 2001-2015 St.Dev. • 2019-12-05



STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

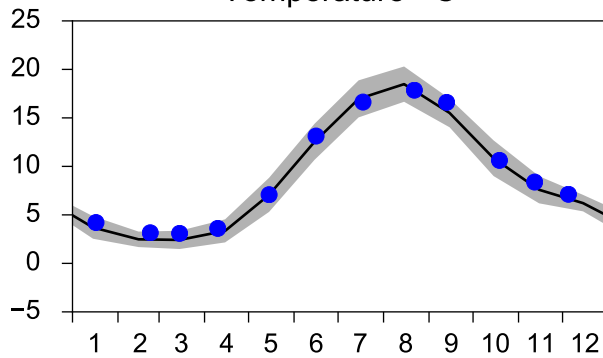
Annual Cycles

— Mean 2001-2015

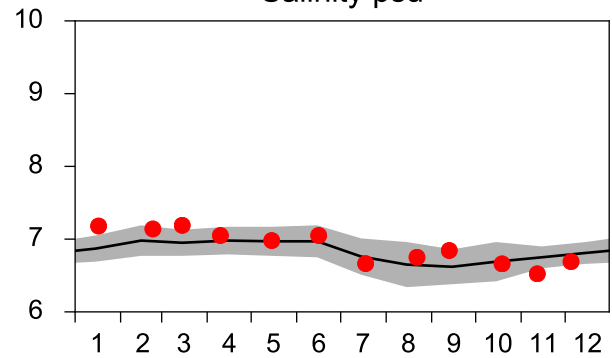
■ St.Dev.

● 2019

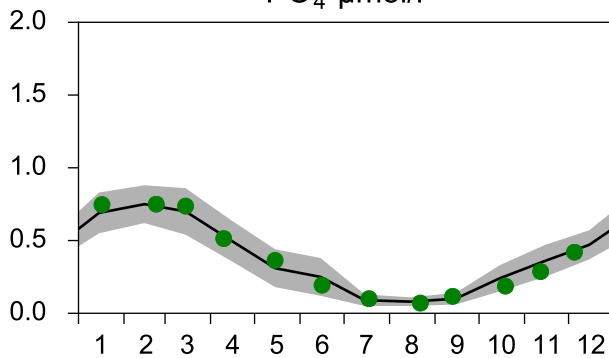
Temperature °C



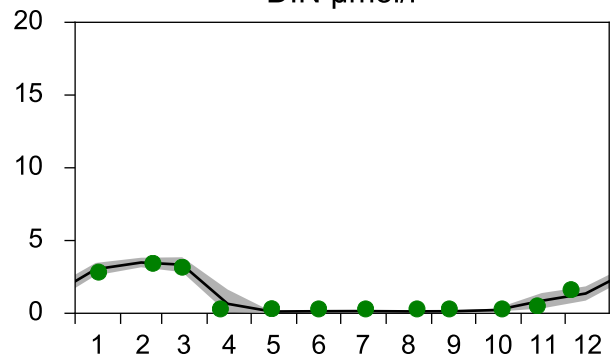
Salinity psu



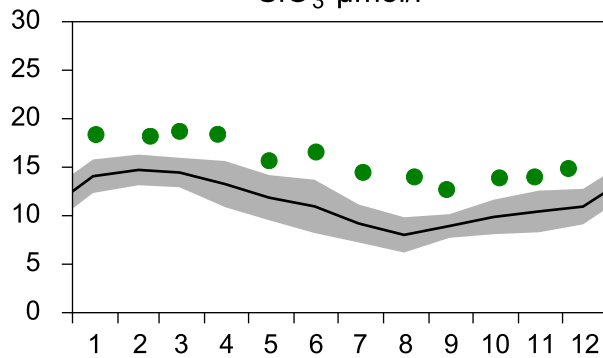
PO₄ µmol/l



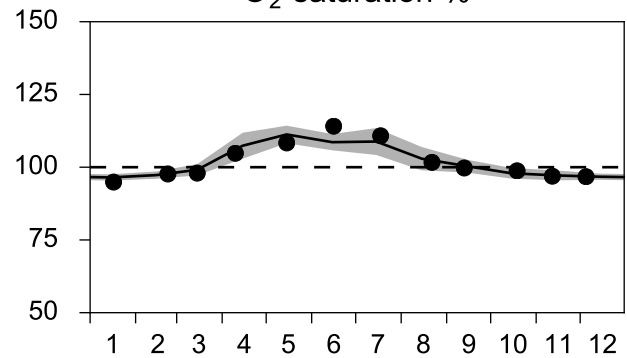
DIN µmol/l



SiO₃ µmol/l

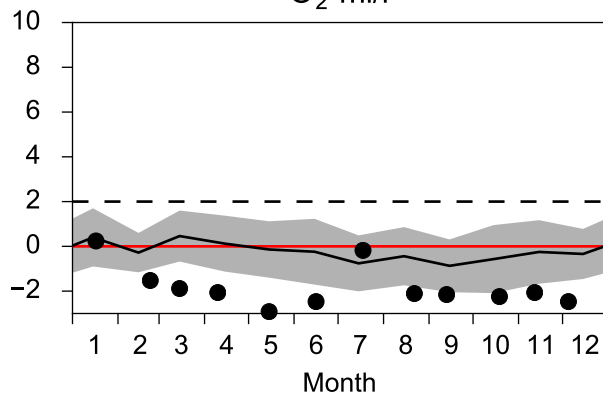


O₂ saturation %

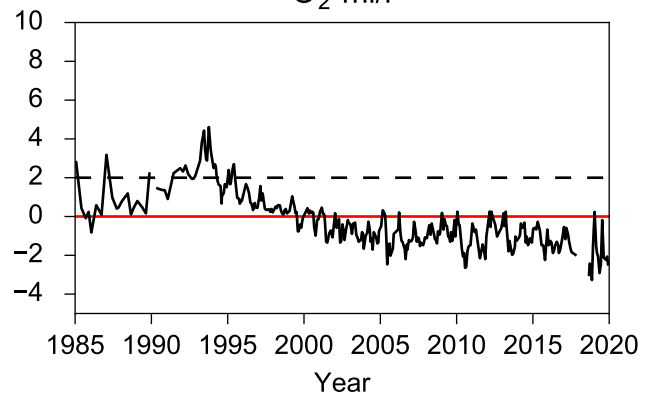


OXYGEN IN BOTTOM WATER (depth >= 100 m)

O₂ ml/l

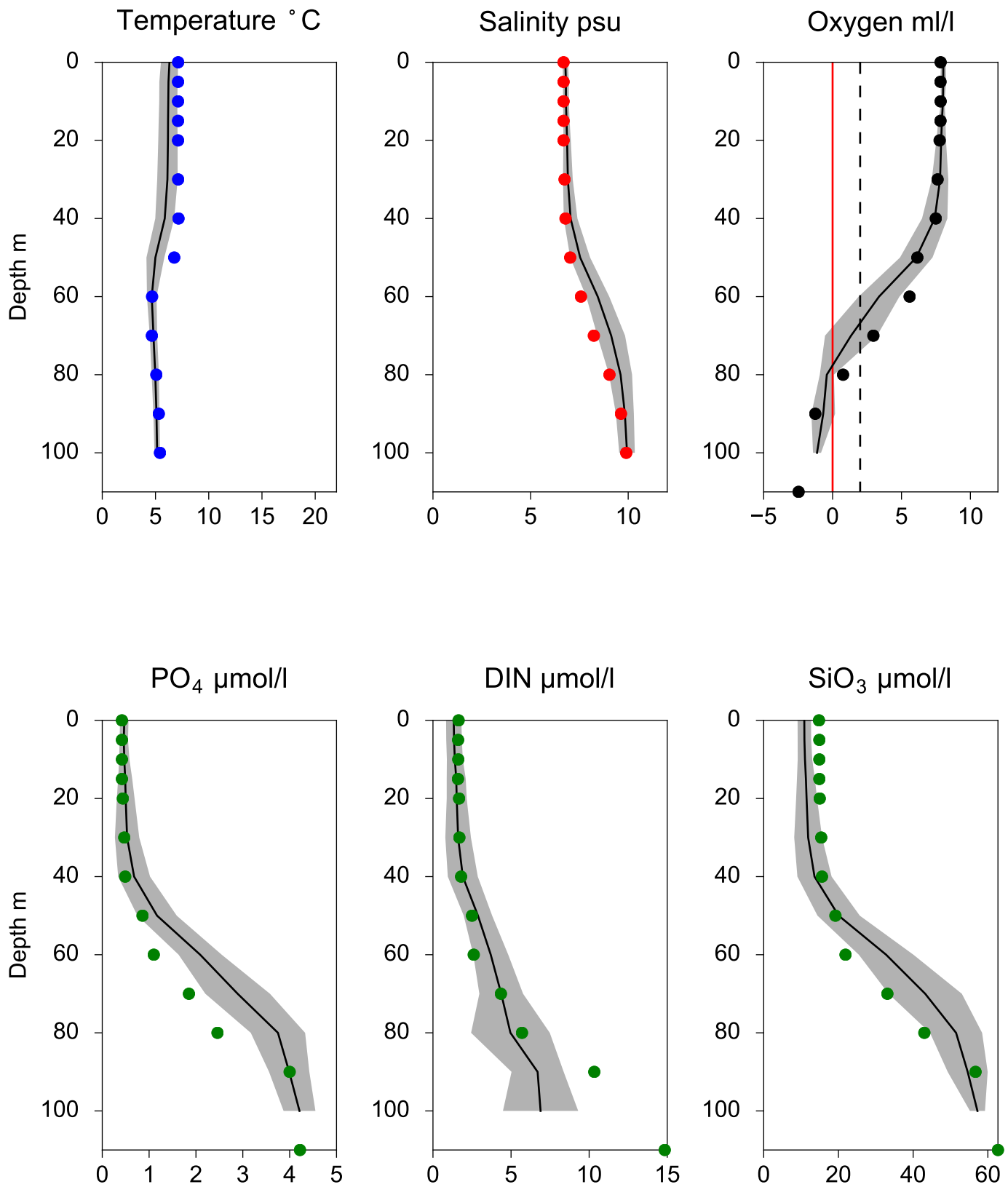


O₂ ml/l



Vertical profiles BY38 KARLSÖDJ December

— Mean 2001-2015 St.Dev. • 2019-12-05



STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

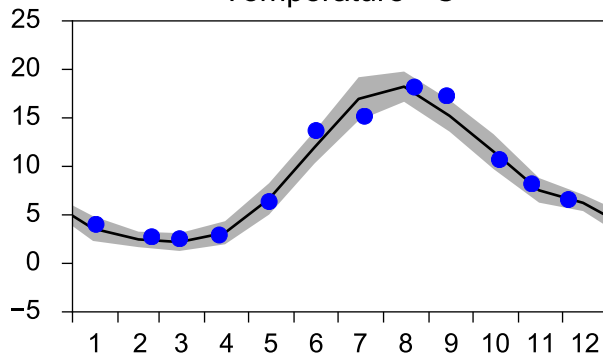
Annual Cycles

— Mean 2001-2015

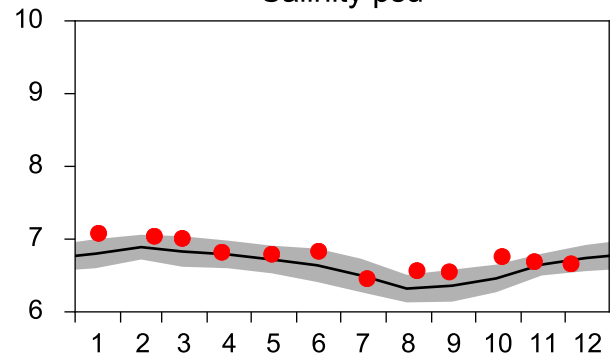
■ St.Dev.

● 2019

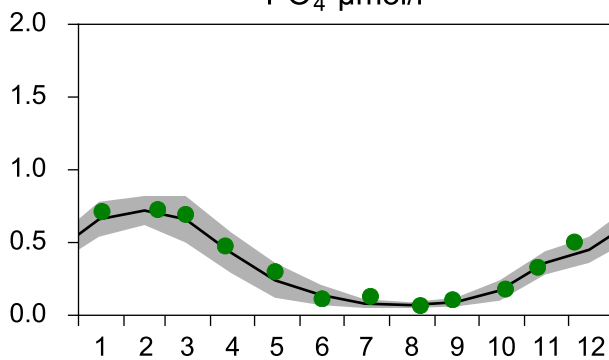
Temperature °C



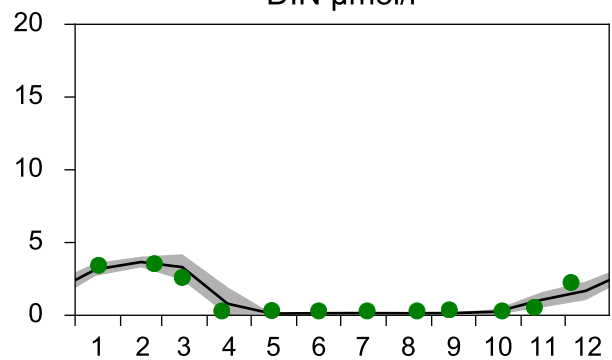
Salinity psu



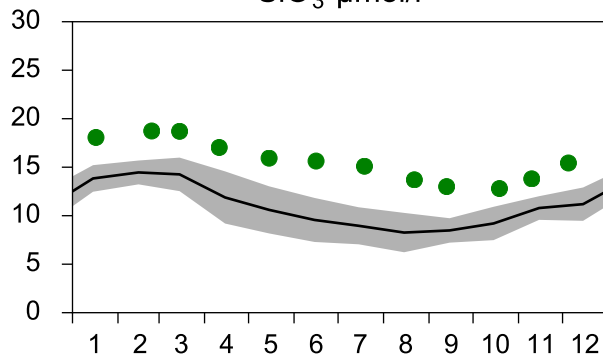
PO₄ µmol/l



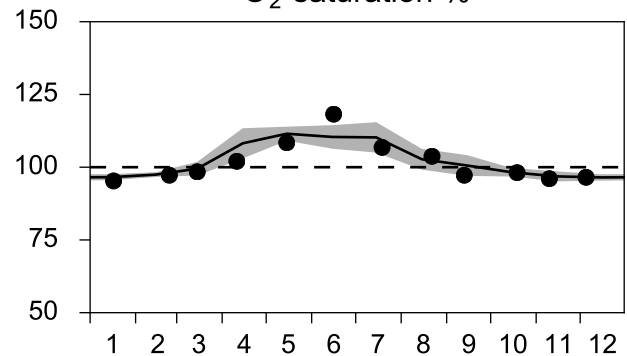
DIN µmol/l



SiO₃ µmol/l

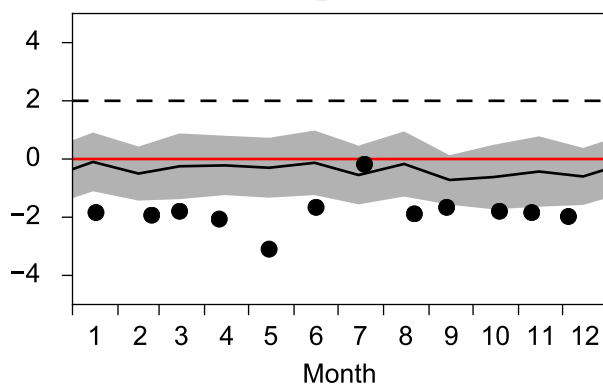


O₂ saturation %

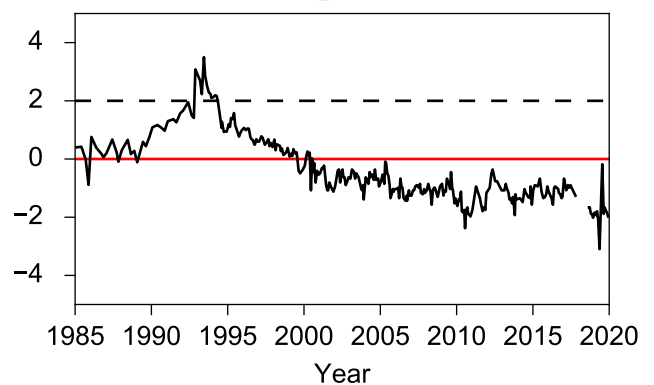


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l

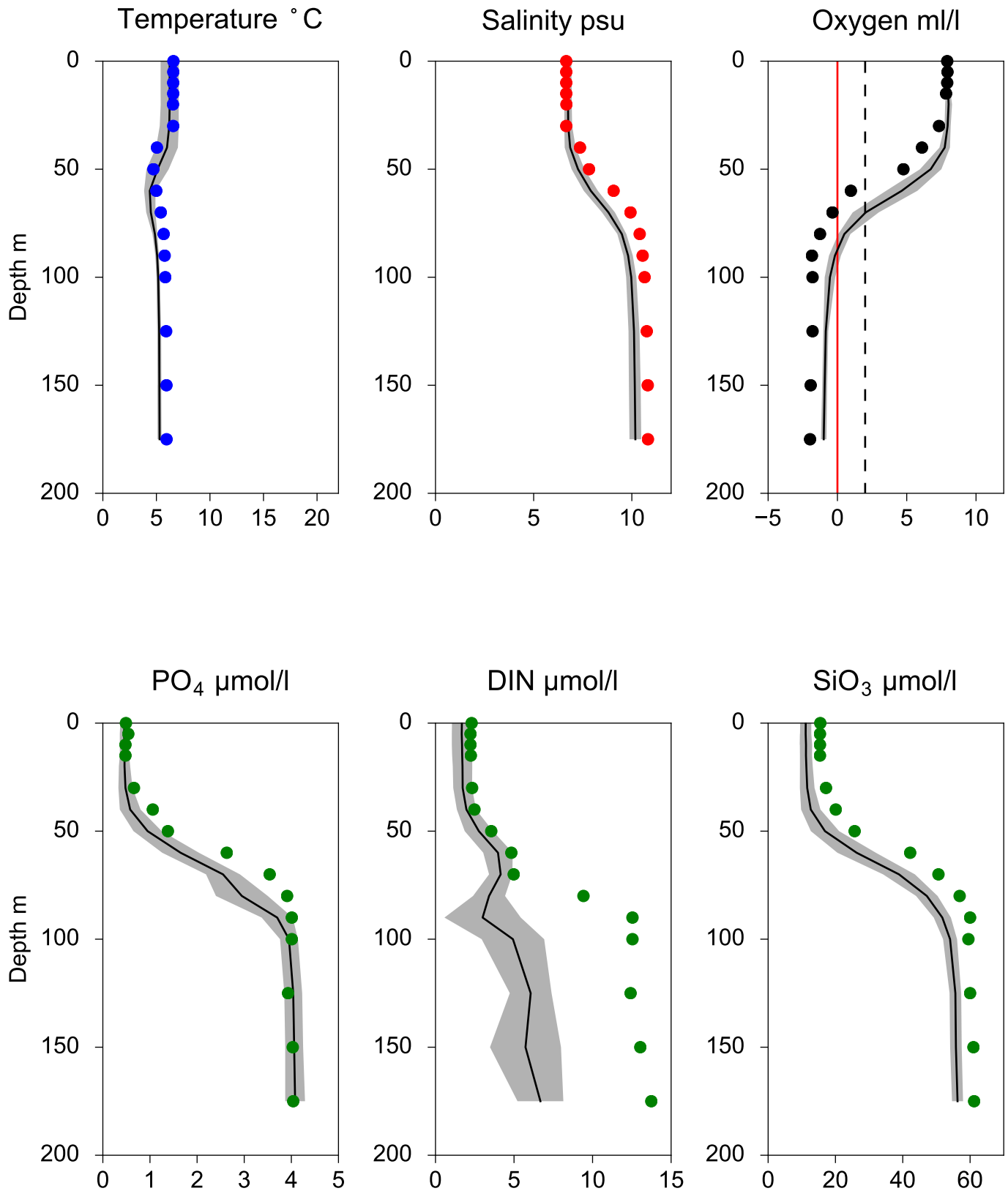


O₂ ml/l



Vertical profiles BY32 NORRKÖPINGSDJ December

— Mean 2001-2015 St.Dev. • 2019-12-05



STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

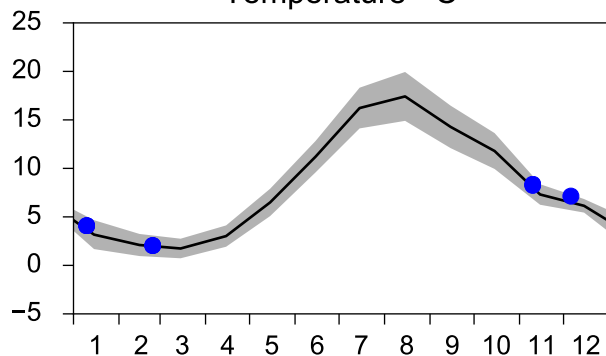
Annual Cycles

— Mean 2001-2015

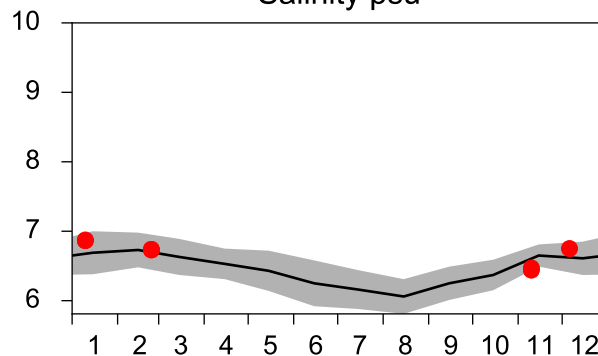
■ St.Dev.

● 2019

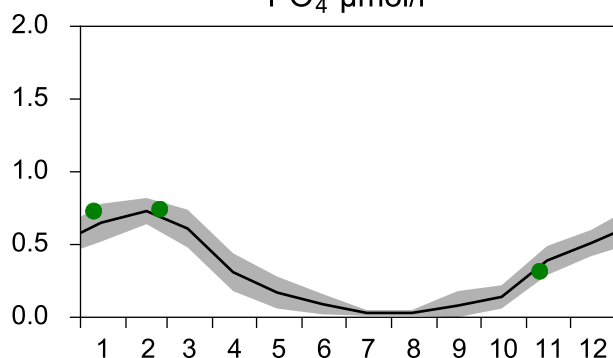
Temperature °C



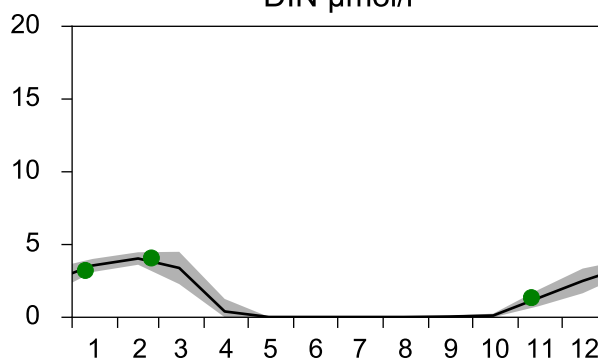
Salinity psu



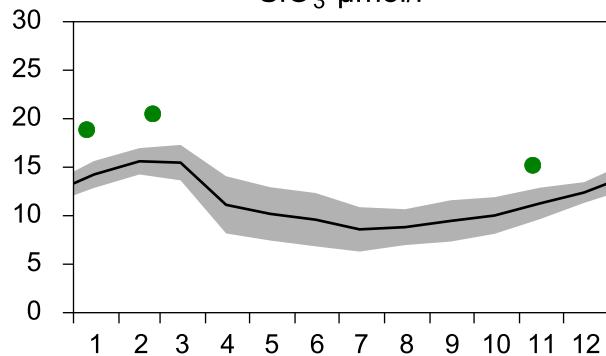
PO₄ µmol/l



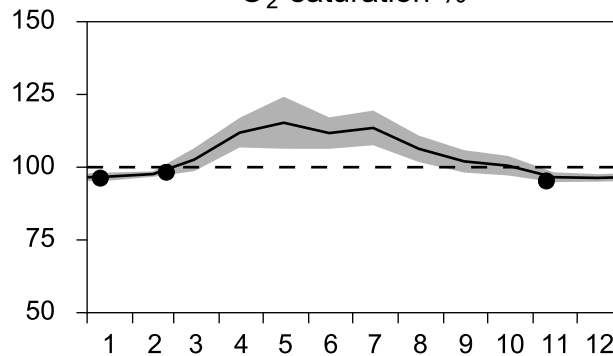
DIN µmol/l



SiO₃ µmol/l

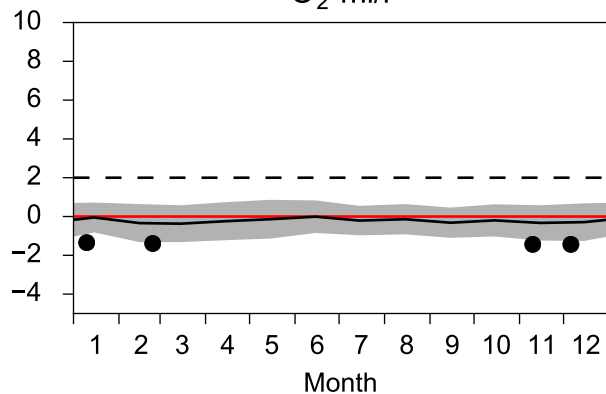


O₂ saturation %

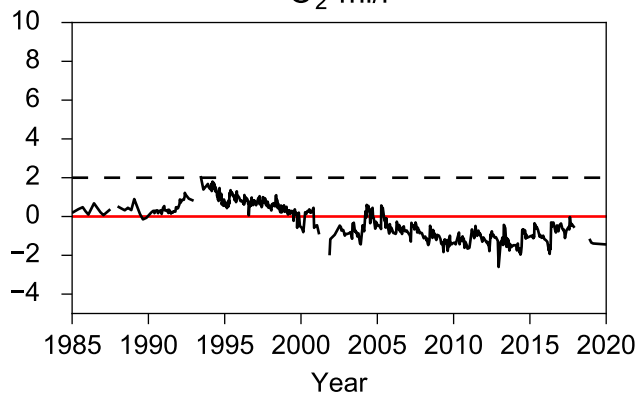


OXYGEN IN BOTTOM WATER (depth >= 425 m)

O₂ ml/l

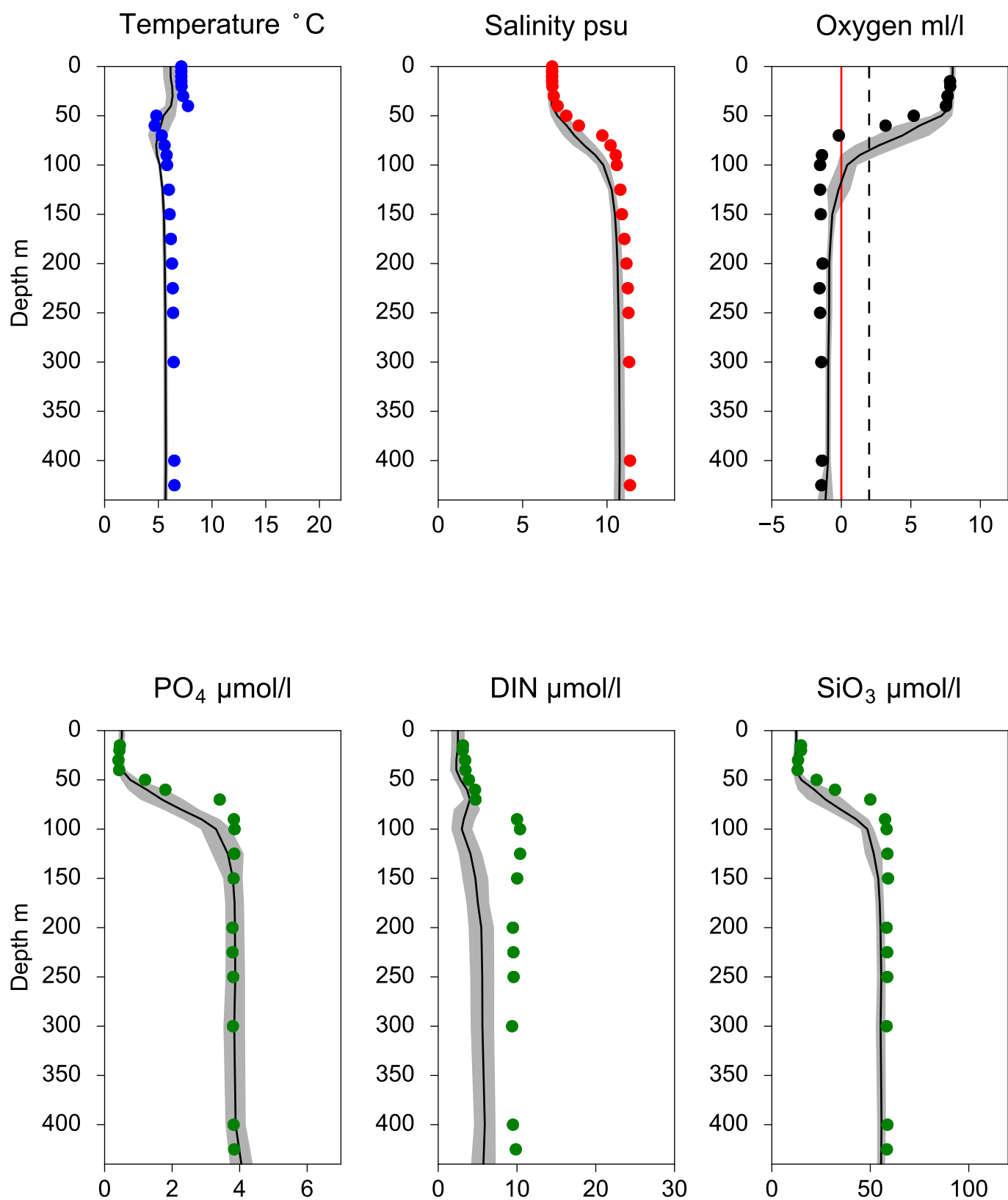


O₂ ml/l



Vertical profiles BY31 LANDSORTSDJ December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-06



STATION F3 / A5 SURFACE WATER (0-10 m)

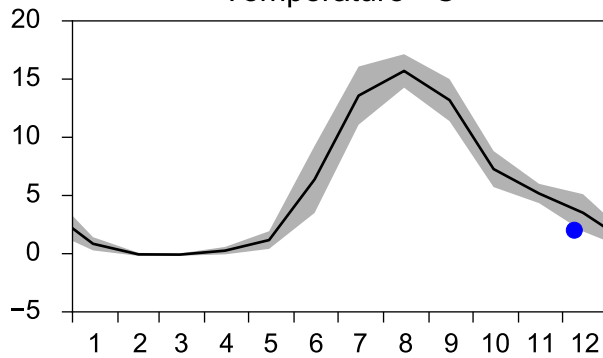
Annual Cycles

— Mean 2001-2015

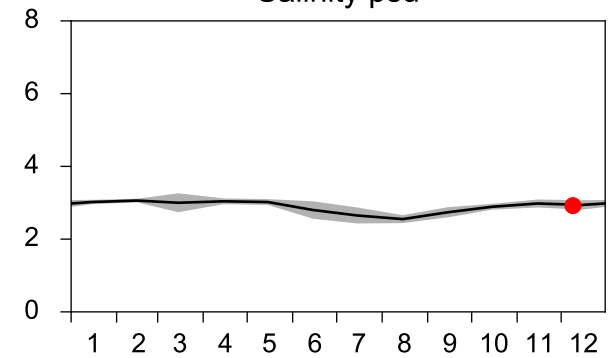
■ St.Dev.

● 2019

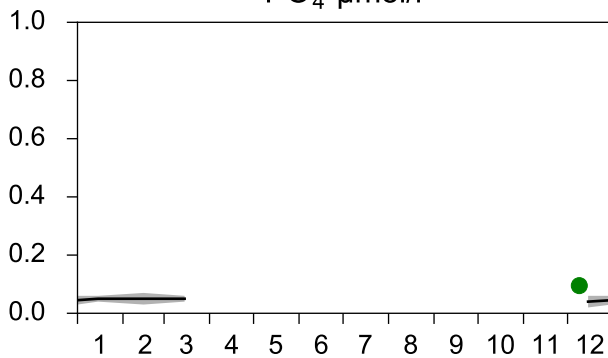
Temperature °C



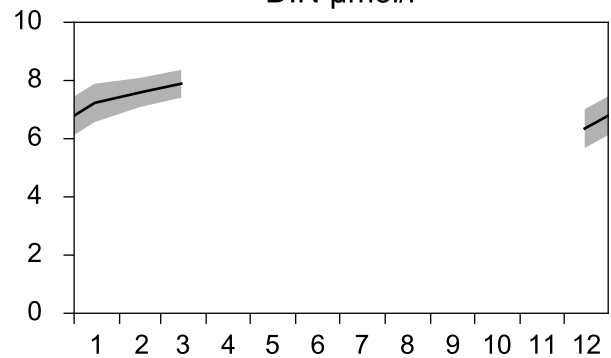
Salinity psu



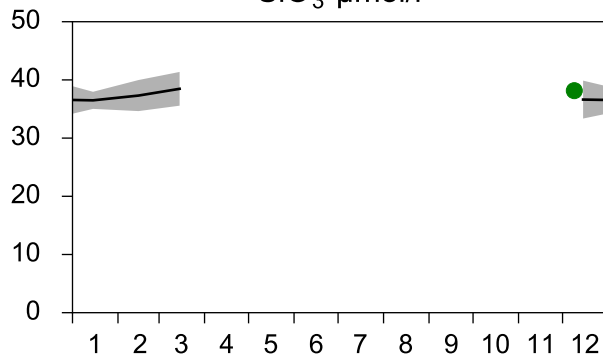
PO₄ µmol/l



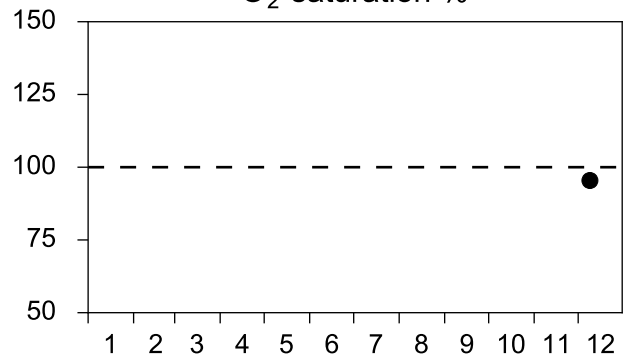
DIN µmol/l



SiO₃ µmol/l

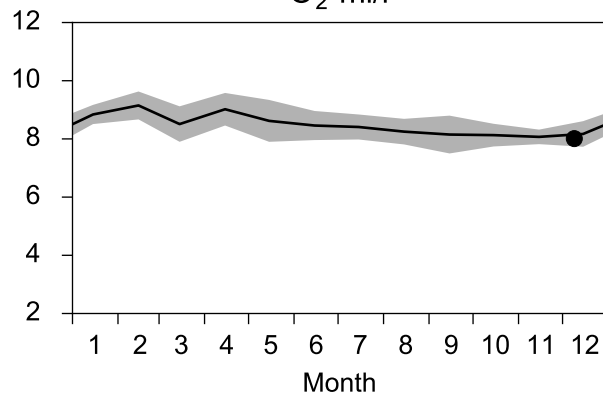


O₂ saturation %

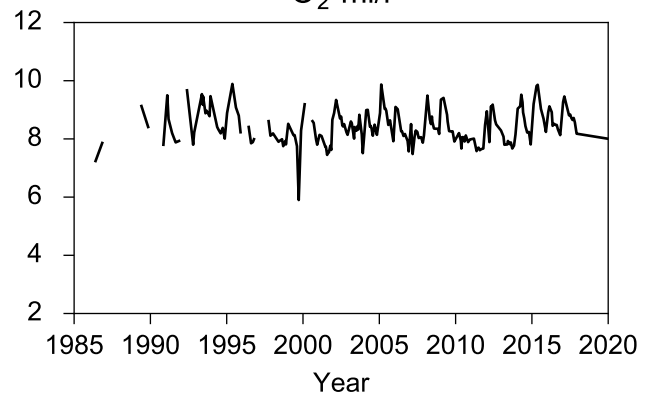


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

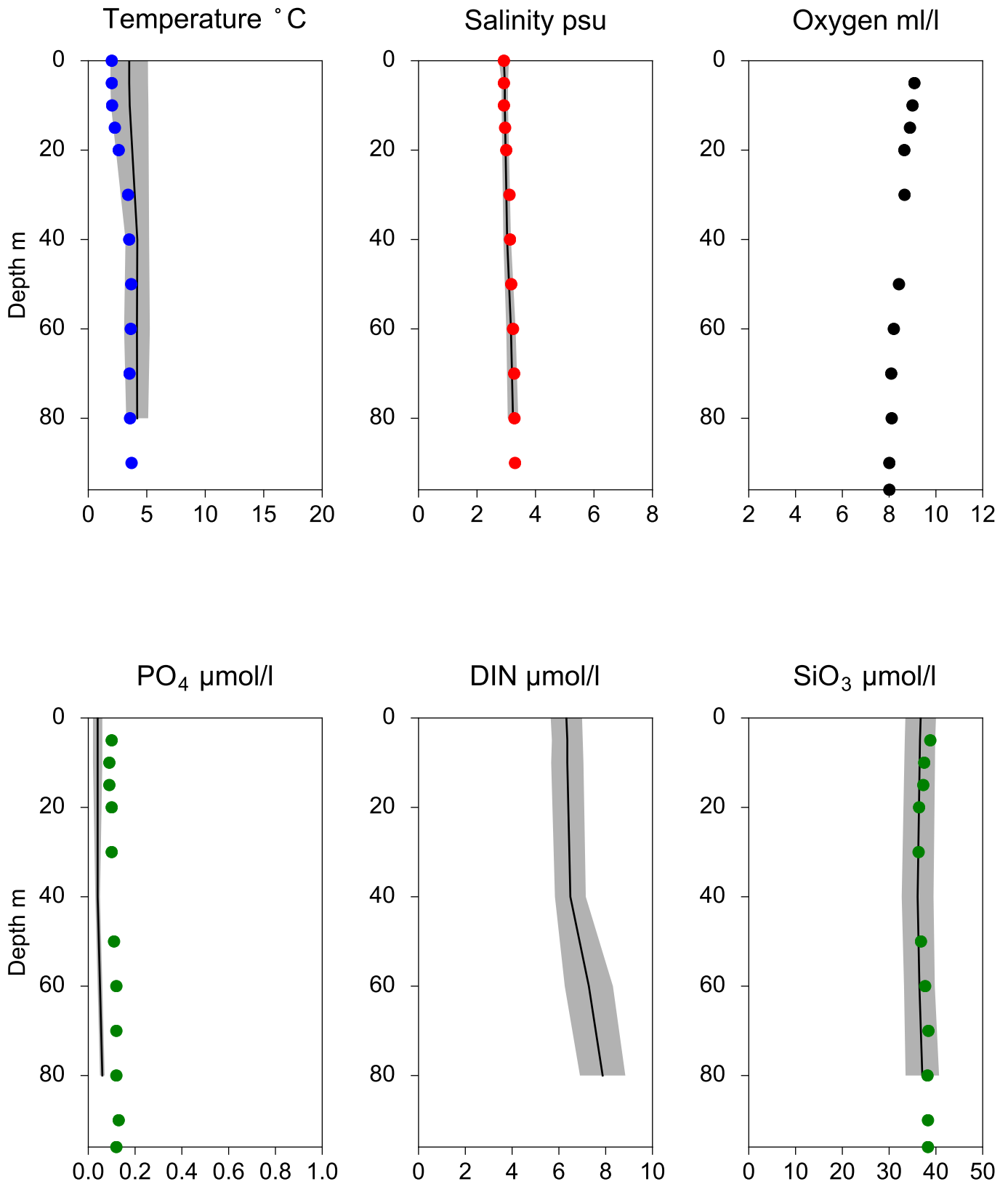


O₂ ml/l



Vertical profiles F3 / A5 December

— Mean 2001-2015 St.Dev. • 2019-12-09



STATION F9 / A13 SURFACE WATER (0-10 m)

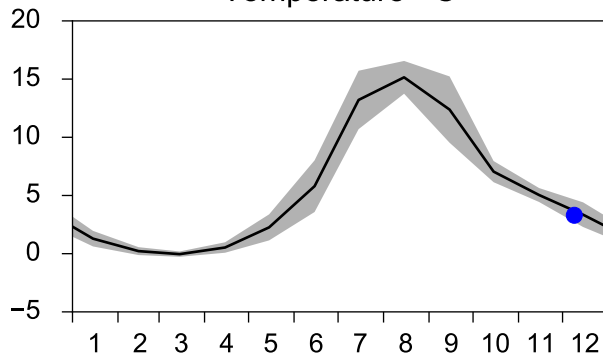
Annual Cycles

— Mean 2001-2015

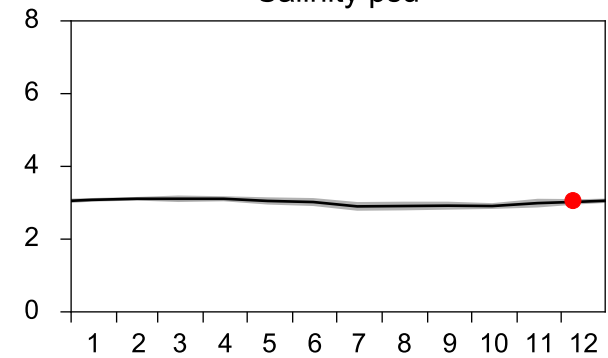
■ St.Dev.

● 2019

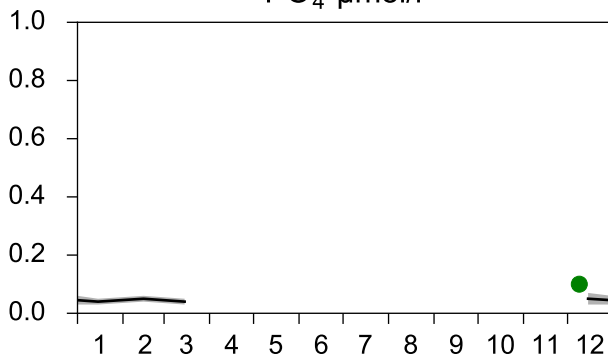
Temperature °C



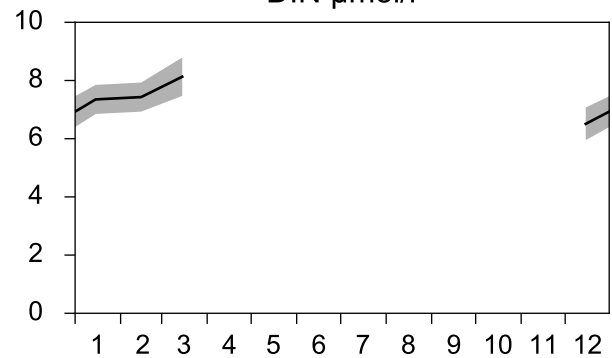
Salinity psu



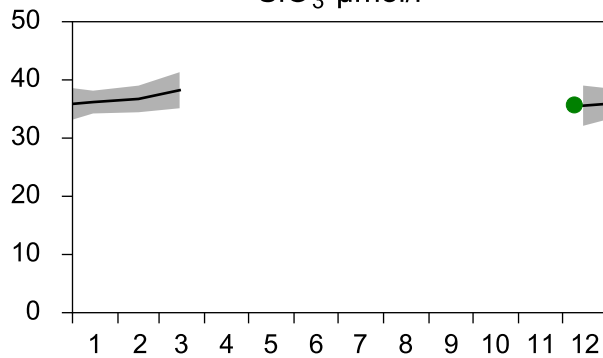
PO₄ µmol/l



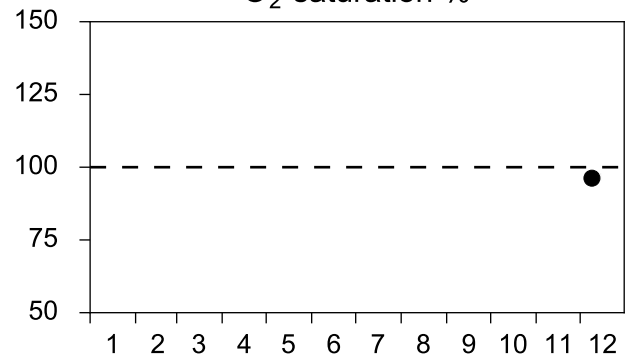
DIN µmol/l



SiO₃ µmol/l

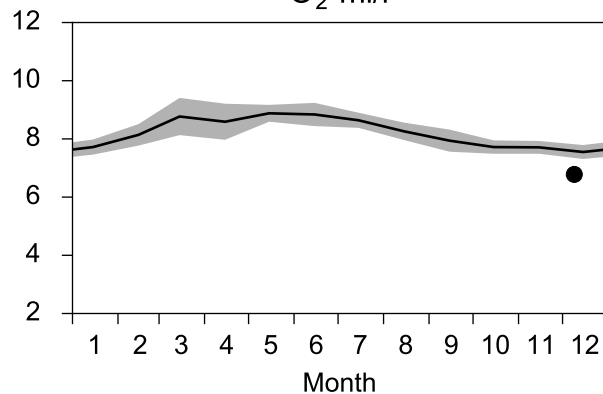


O₂ saturation %

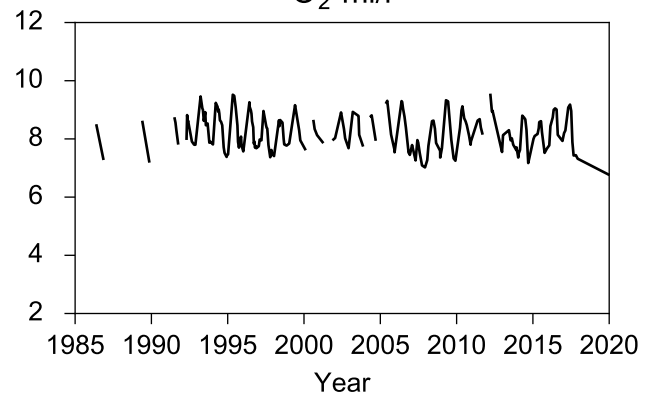


OXYGEN IN BOTTOM WATER (depth >= 120 m)

O₂ ml/l

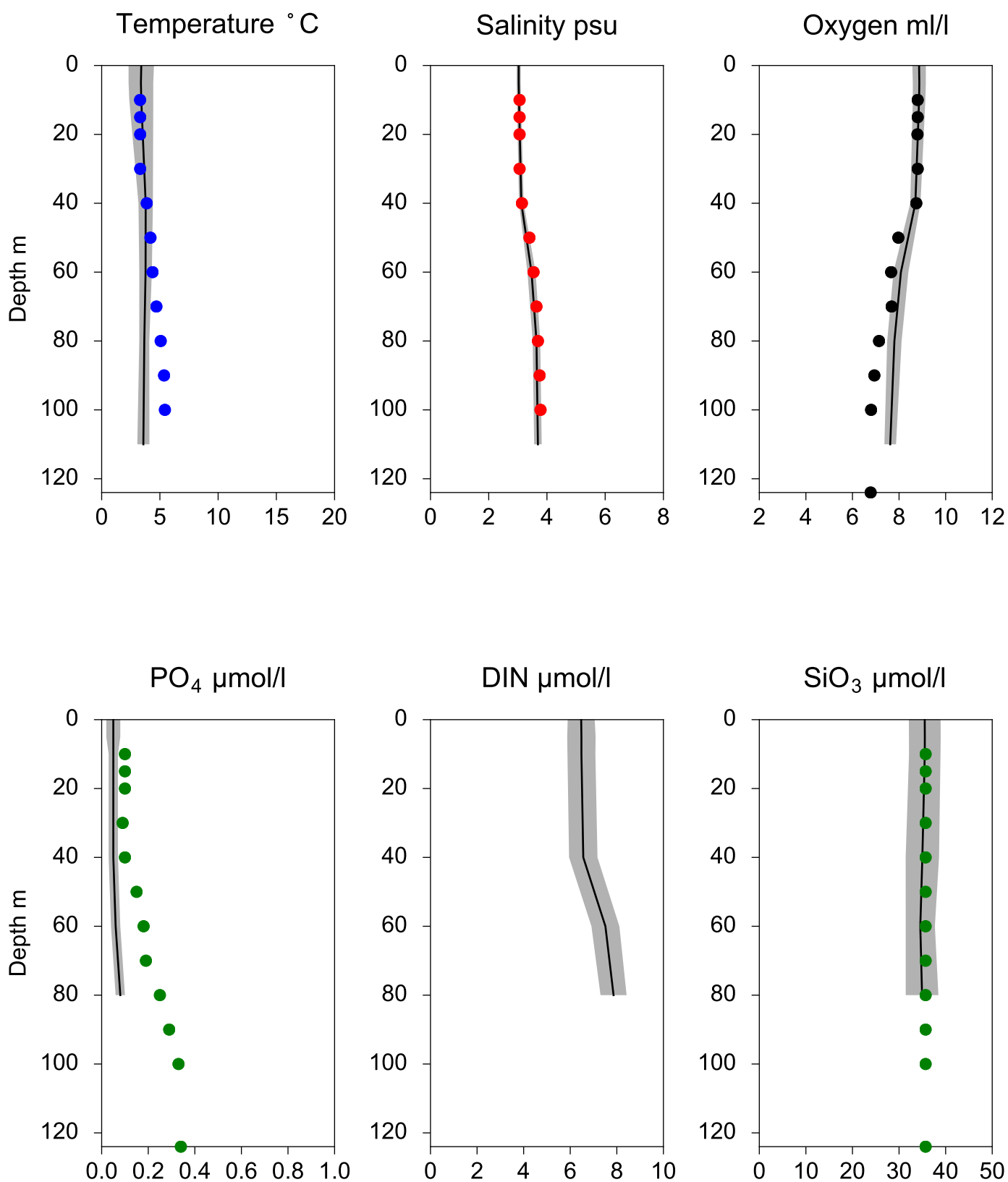


O₂ ml/l



Vertical profiles F9 / A13 December

— Mean 2001-2015 St.Dev. • 2019-12-09



STATION C3 SURFACE WATER (0-10 m)

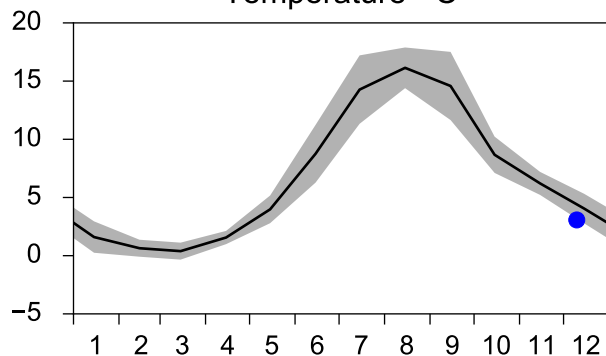
Annual Cycles

— Mean 2001-2015

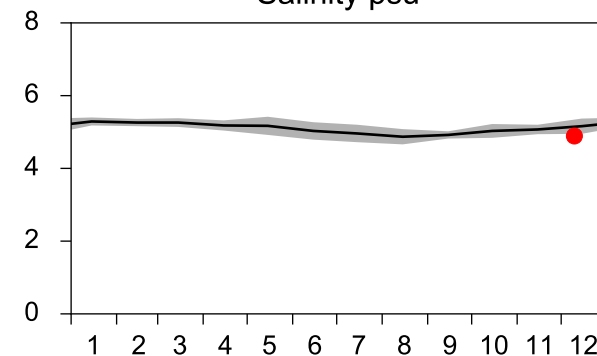
■ St.Dev.

● 2019

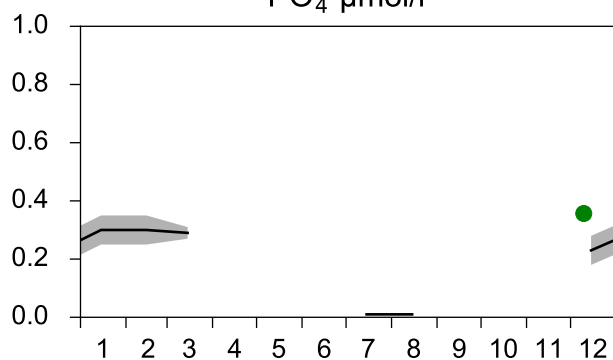
Temperature °C



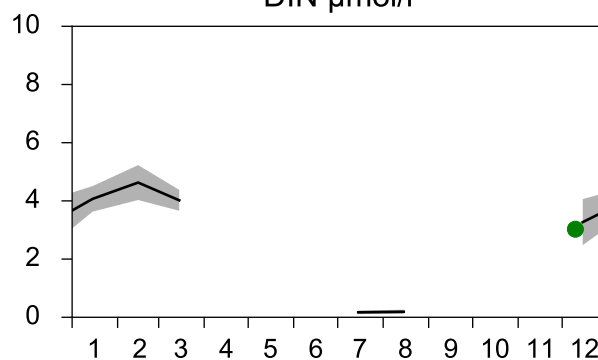
Salinity psu



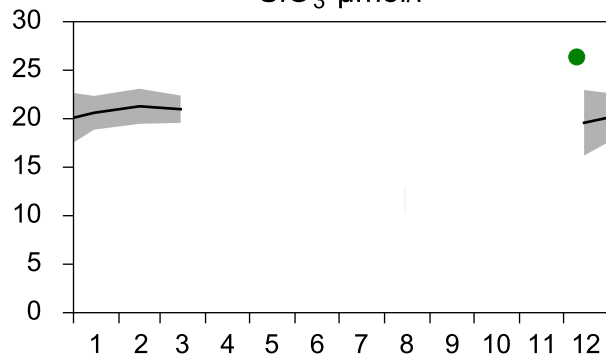
PO₄ µmol/l



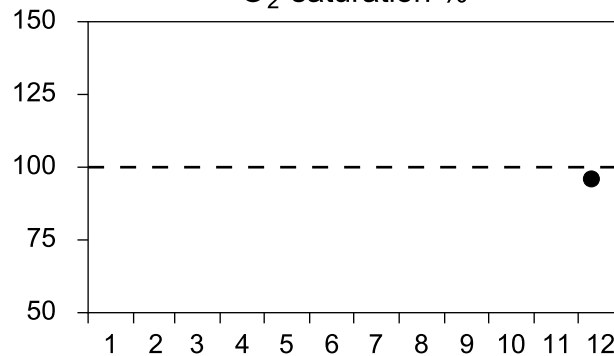
DIN µmol/l



SiO₃ µmol/l

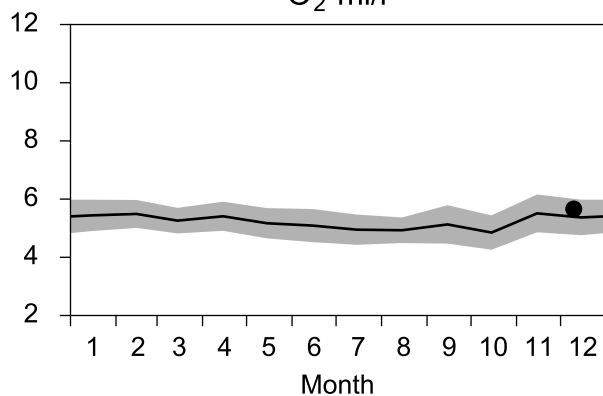


O₂ saturation %

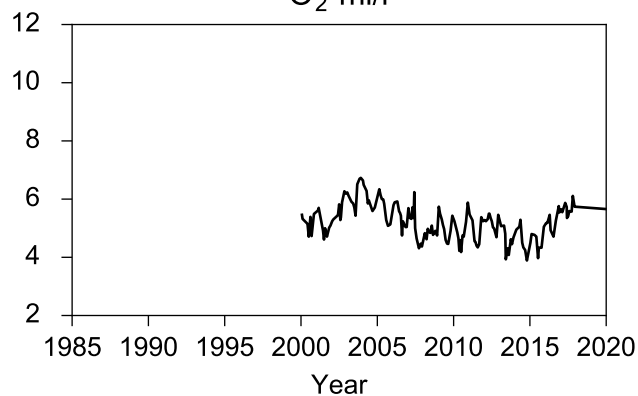


OXYGEN IN BOTTOM WATER (depth >= 184 m)

O₂ ml/l

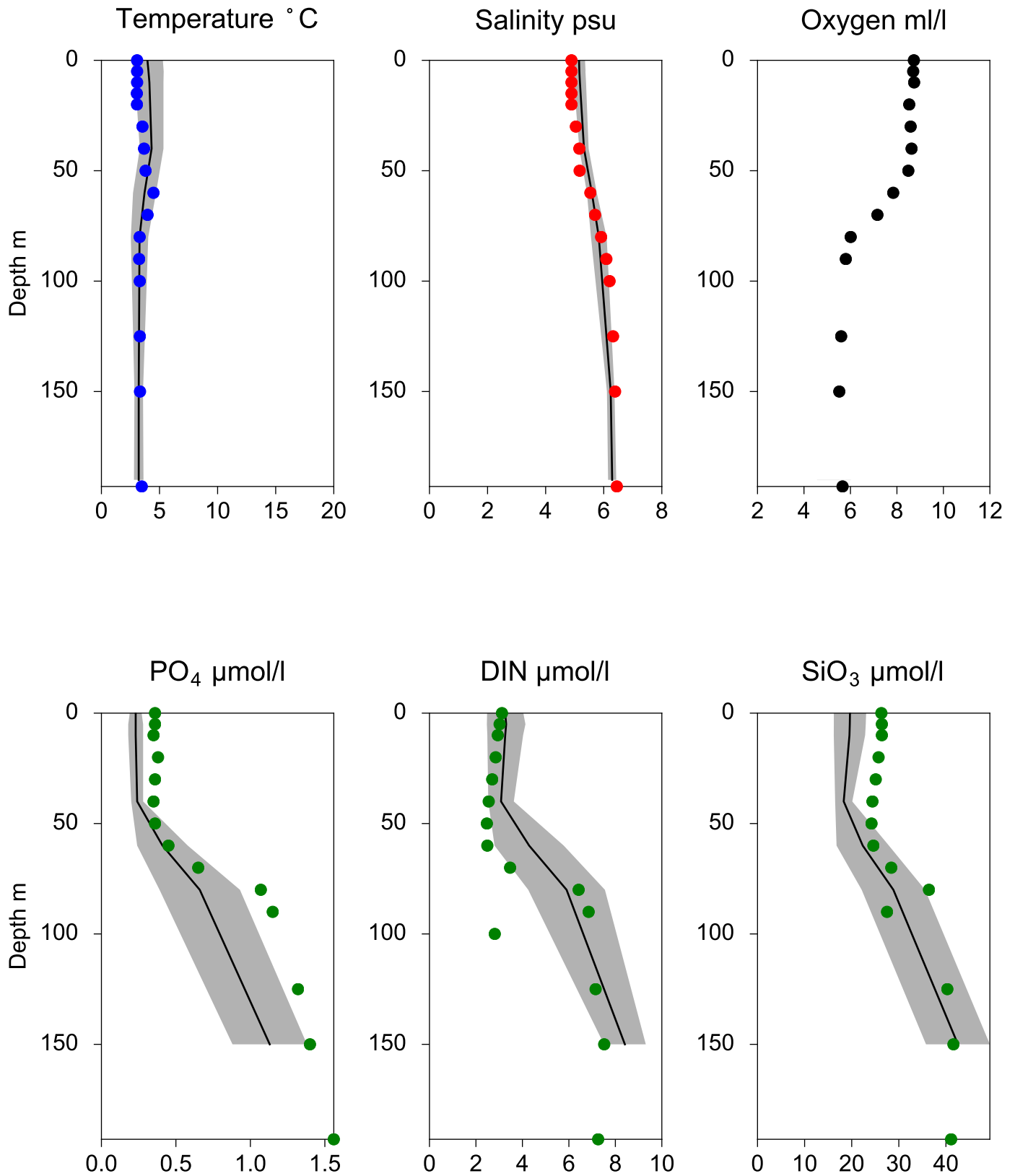


O₂ ml/l



Vertical profiles C3 December

— Mean 2001-2015 St.Dev. • 2019-12-10



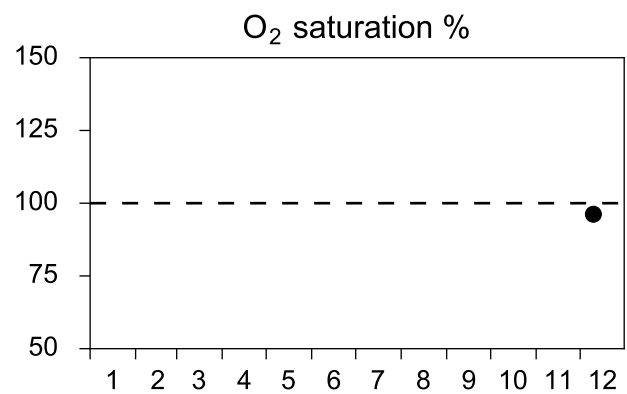
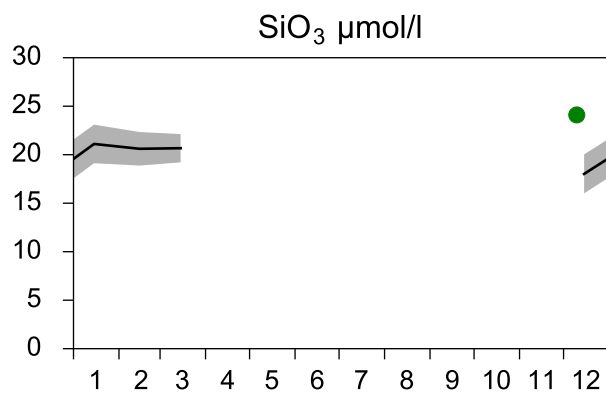
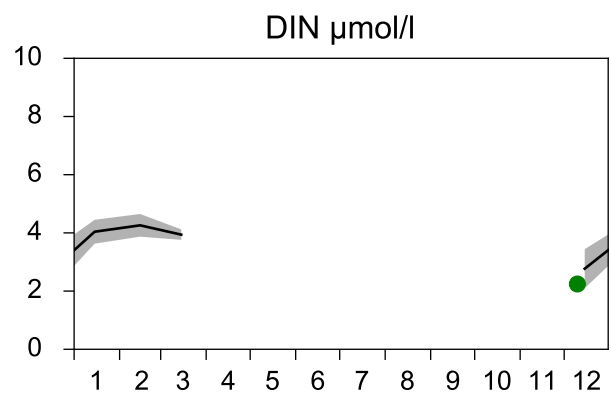
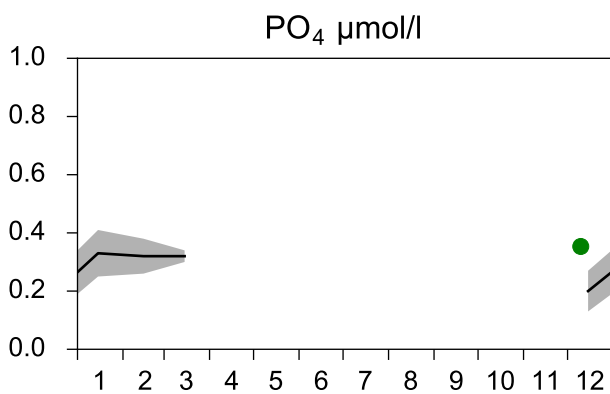
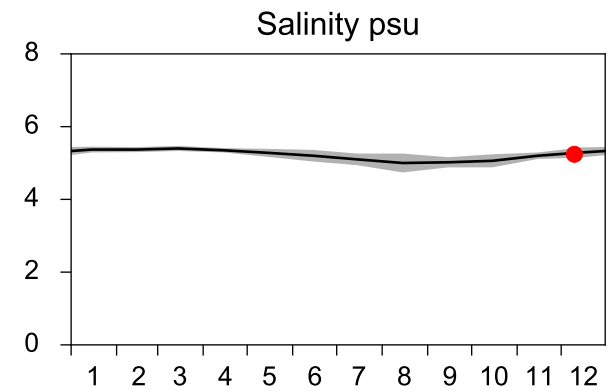
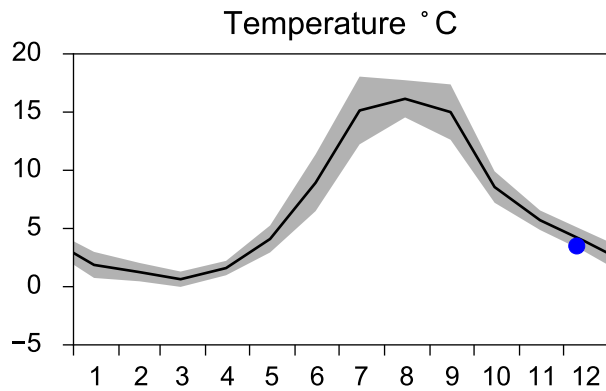
STATION MS4 / C14 SURFACE WATER (0-10 m)

Annual Cycles

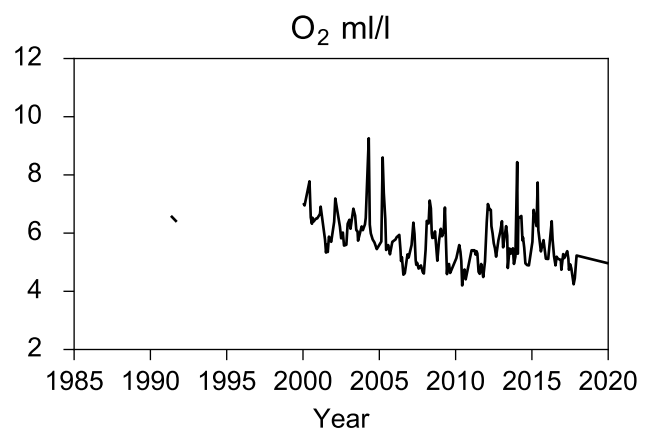
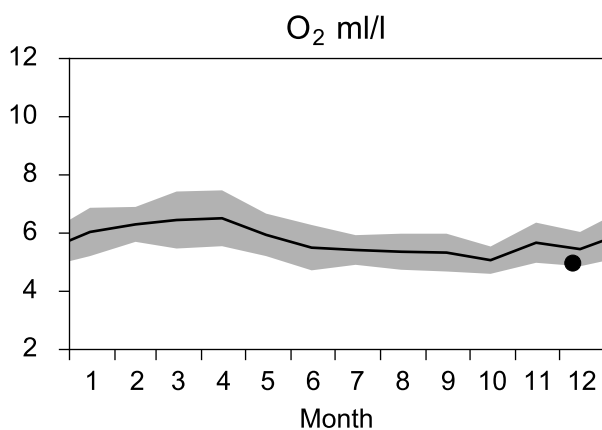
— Mean 2001-2015

■ St.Dev.

● 2019

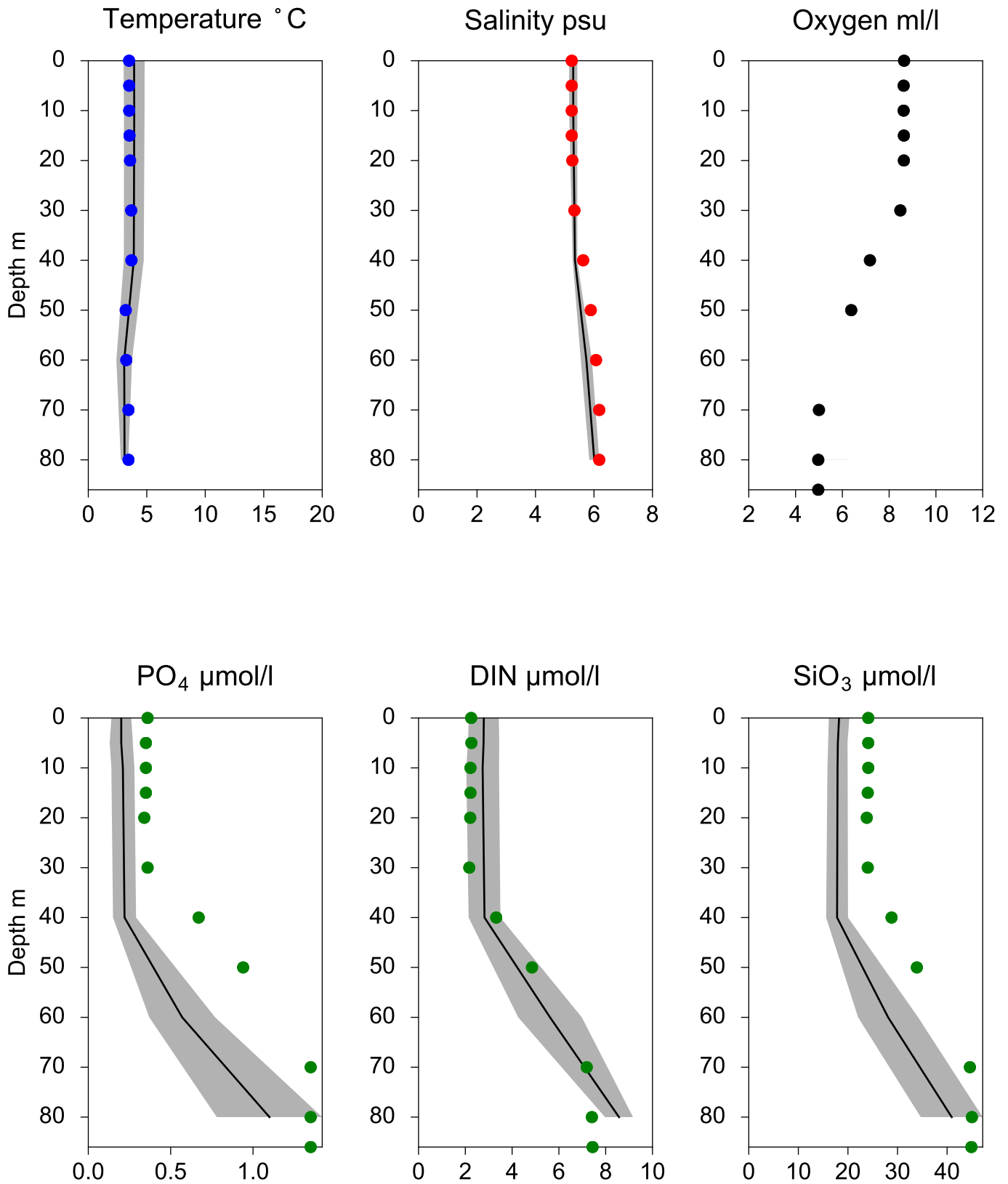


OXYGEN IN BOTTOM WATER (depth >= 80 m)



Vertical profiles MS4 / C14 December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-10



STATION BY29 / LL19 SURFACE WATER (0-10 m)

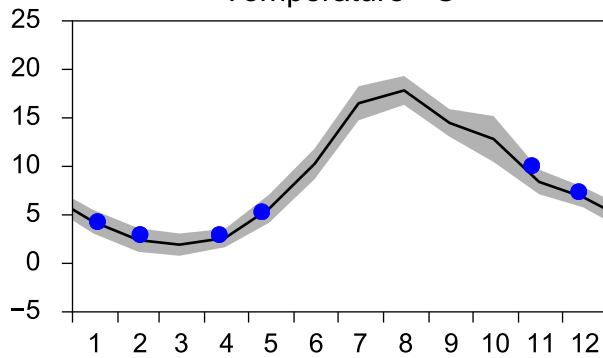
Annual Cycles

— Mean 2001-2015

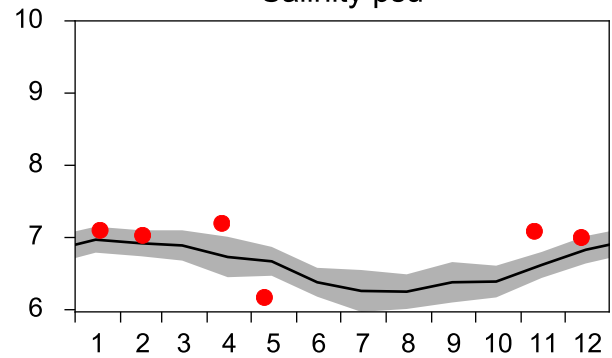
■ St.Dev.

● 2019

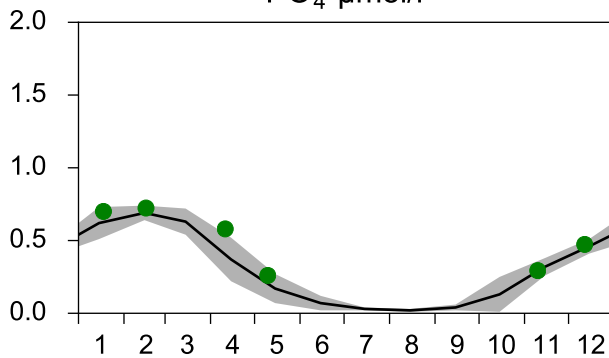
Temperature °C



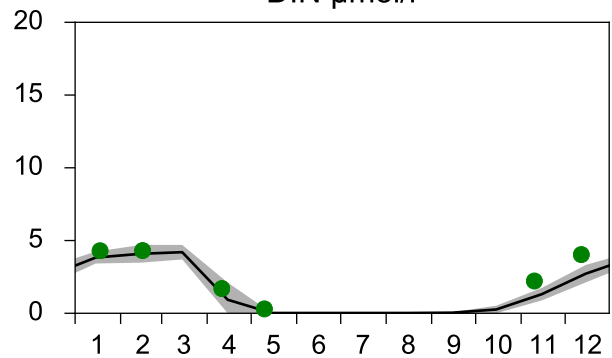
Salinity psu



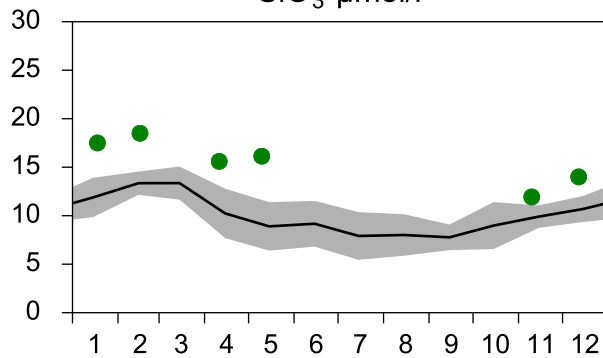
PO₄ µmol/l



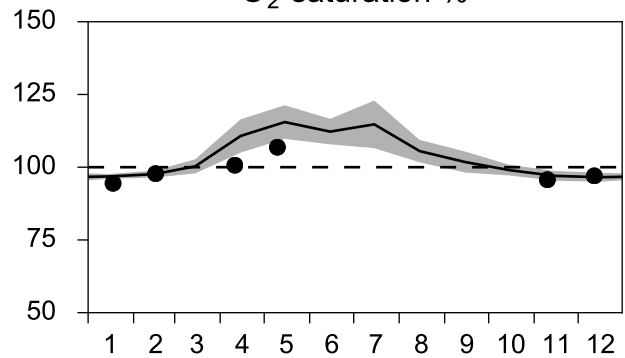
DIN µmol/l



SiO₃ µmol/l

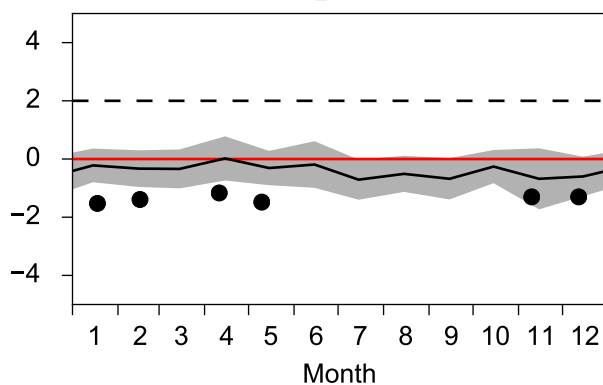


O₂ saturation %

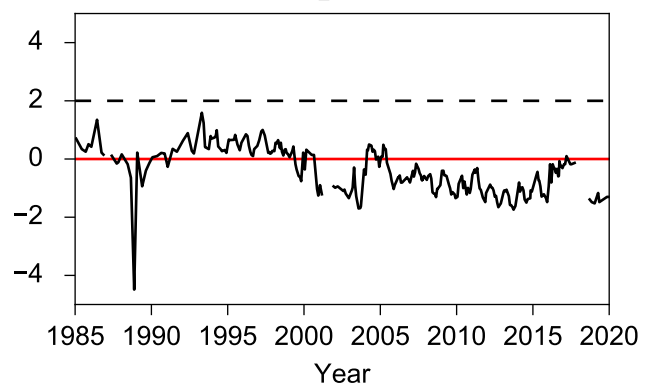


OXYGEN IN BOTTOM WATER (depth >= 150 m)

O₂ ml/l

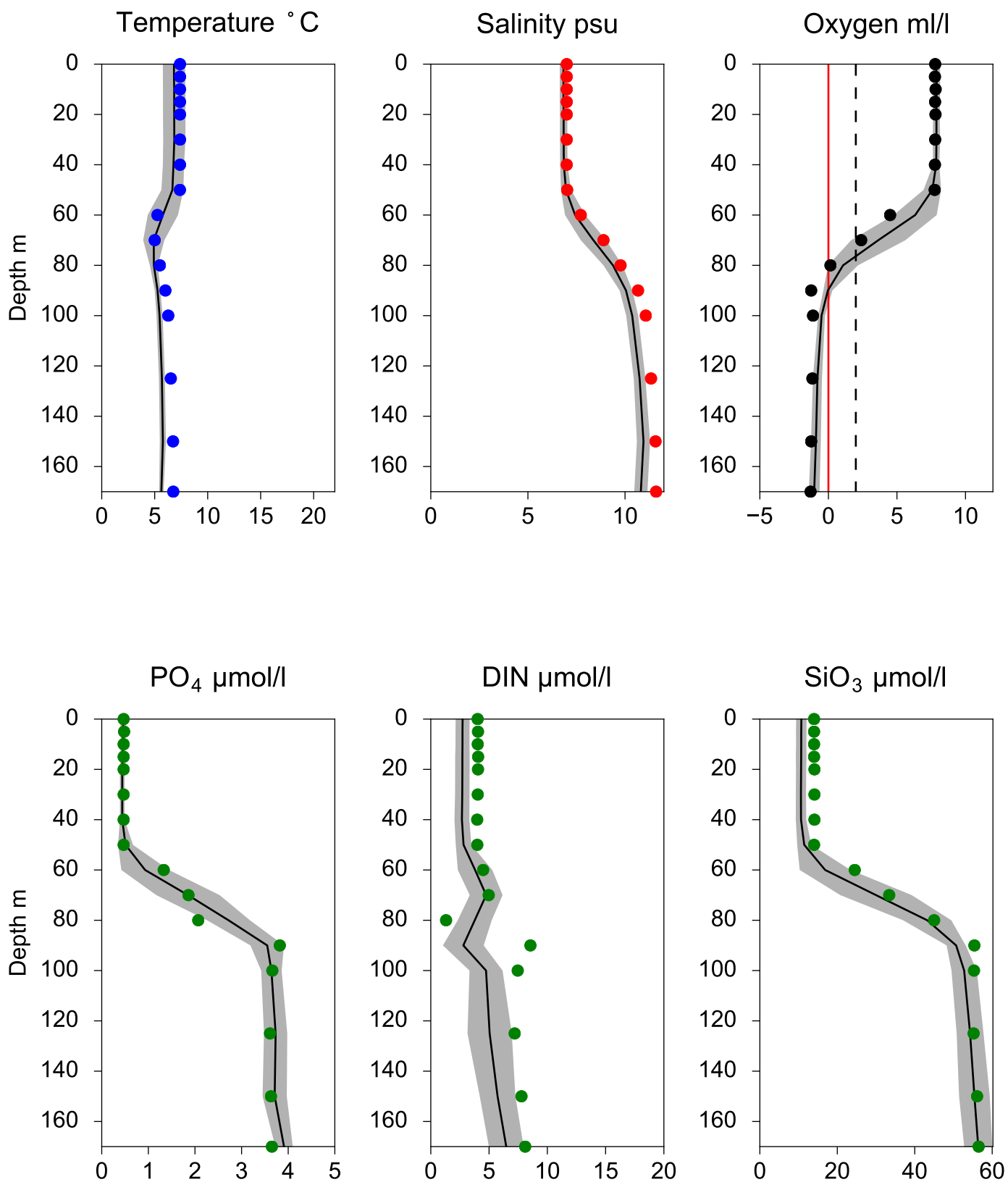


O₂ ml/l



Vertical profiles BY29 / LL19 December

— Mean 2001-2015 St.Dev. • 2019-12-12



STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

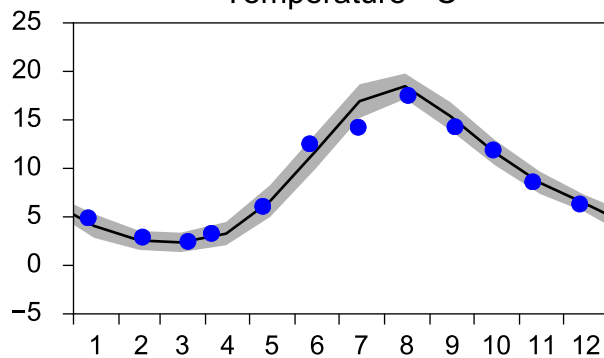
Annual Cycles

— Mean 2001-2015

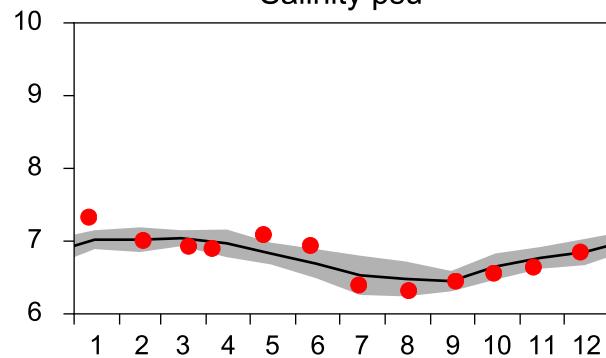
■ St.Dev.

● 2019

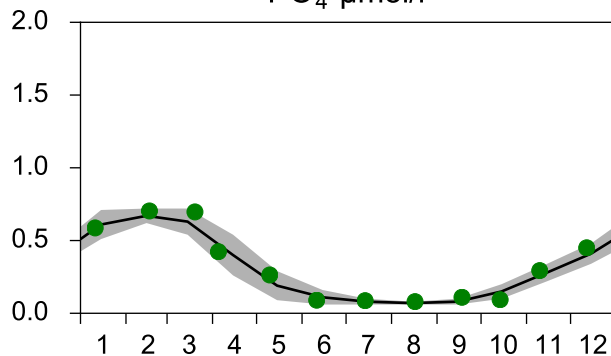
Temperature °C



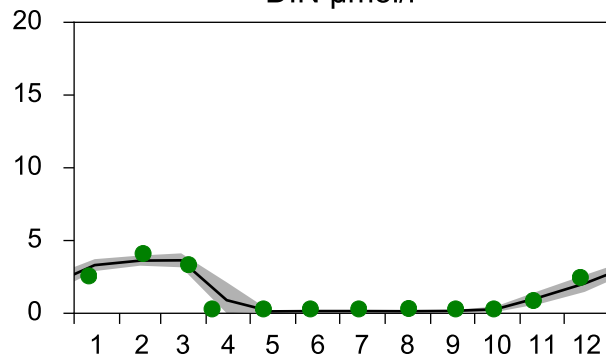
Salinity psu



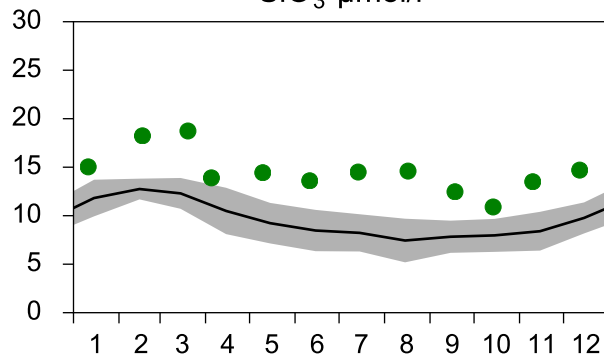
PO₄ µmol/l



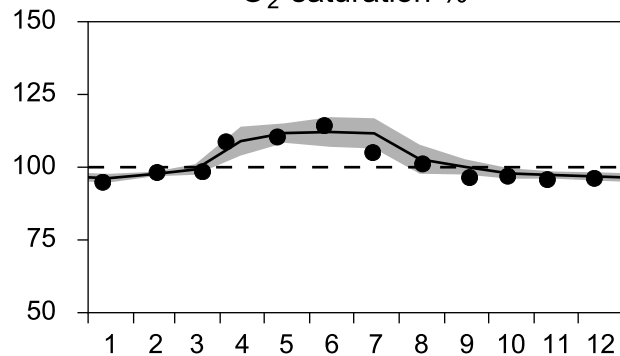
DIN µmol/l



SiO₃ µmol/l

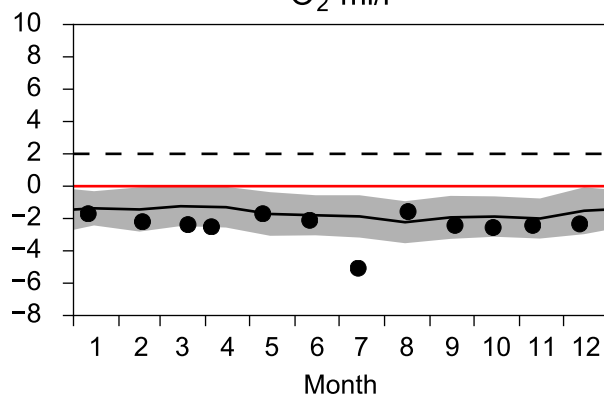


O₂ saturation %

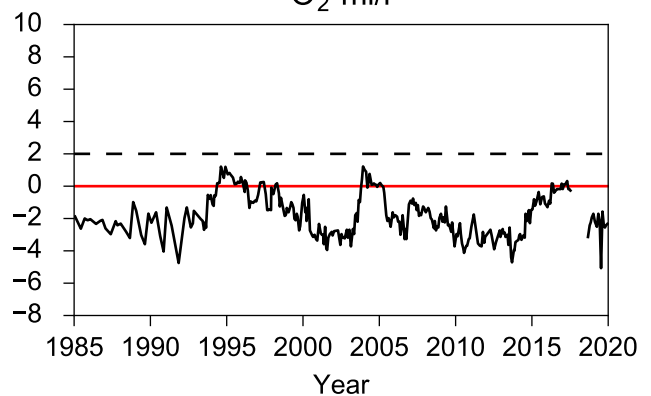


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l

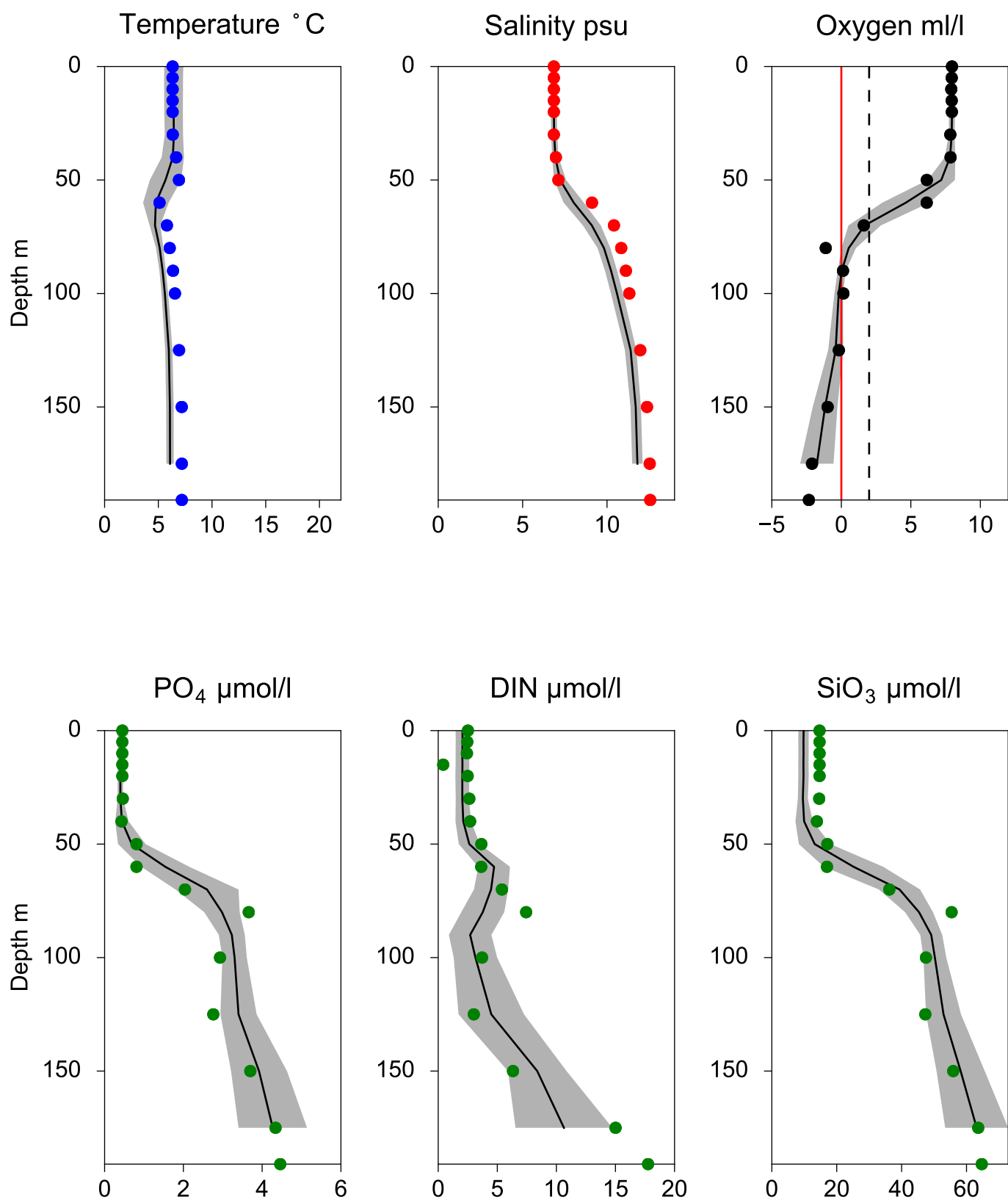


O₂ ml/l



Vertical profiles BY20 FÅRÖDJ December

— Mean 2001-2015 St.Dev. • 2019-12-12



STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

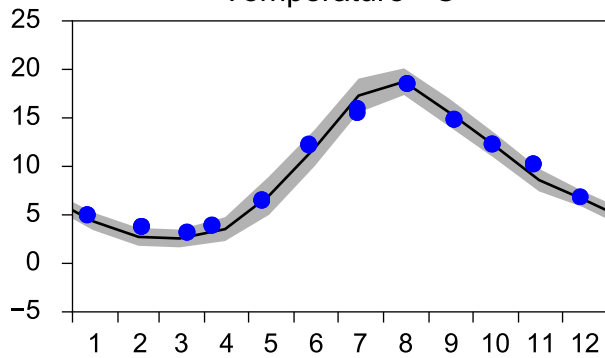
Annual Cycles

— Mean 2001-2015

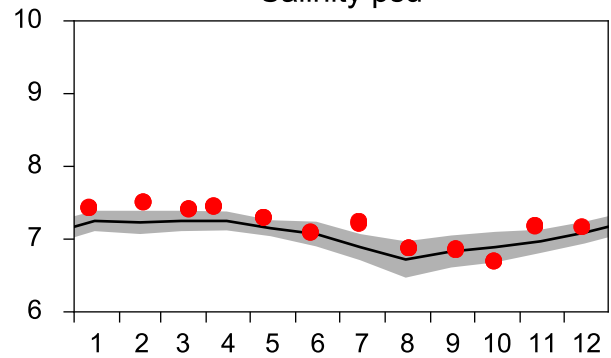
■ St.Dev.

● 2019

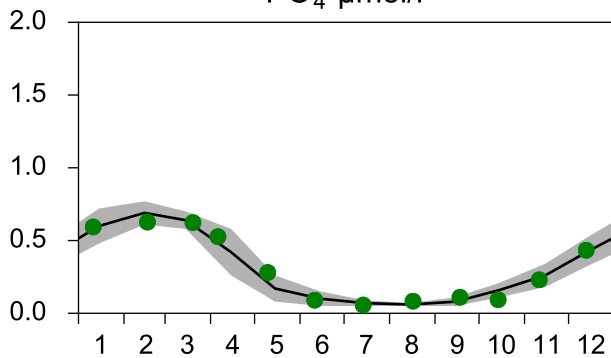
Temperature °C



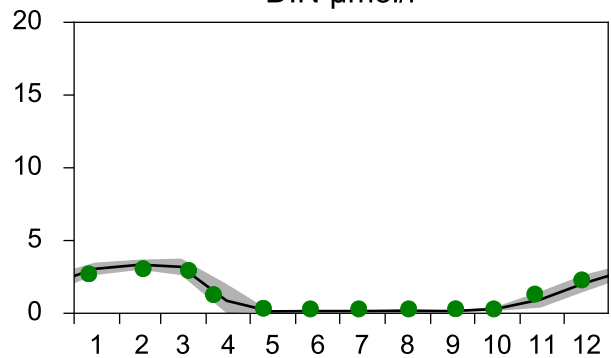
Salinity psu



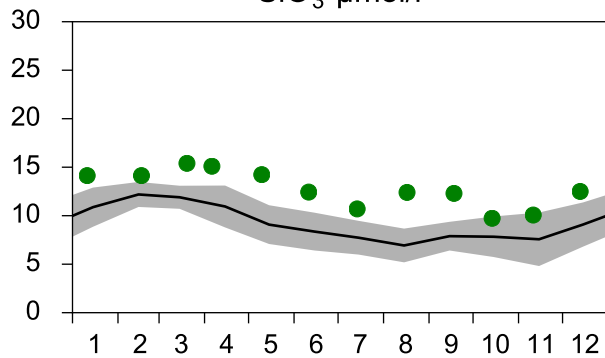
PO₄ µmol/l



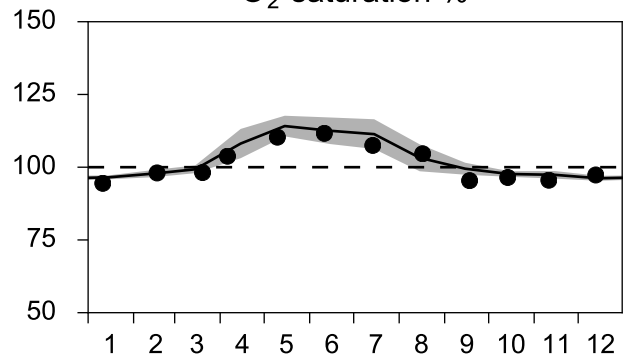
DIN µmol/l



SiO₃ µmol/l

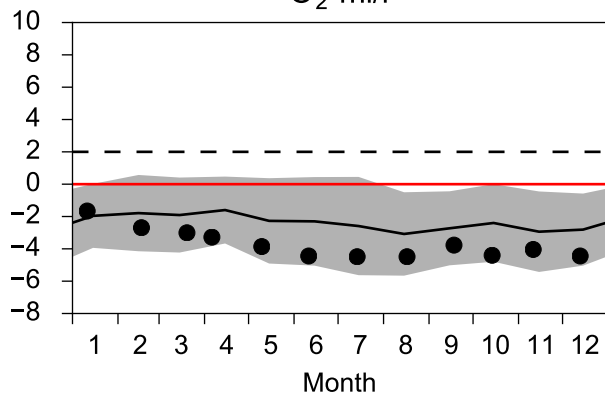


O₂ saturation %

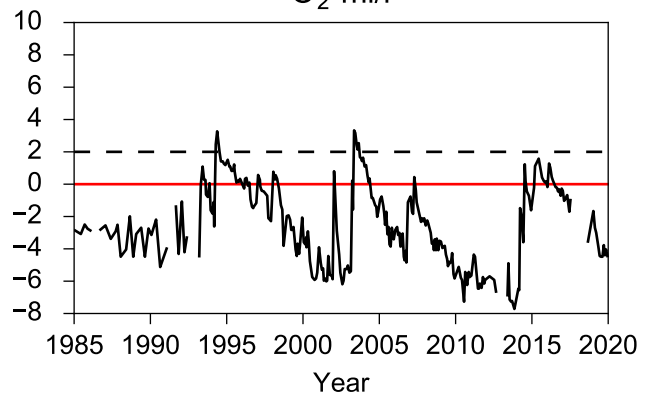


OXYGEN IN BOTTOM WATER (depth >= 225 m)

O₂ ml/l

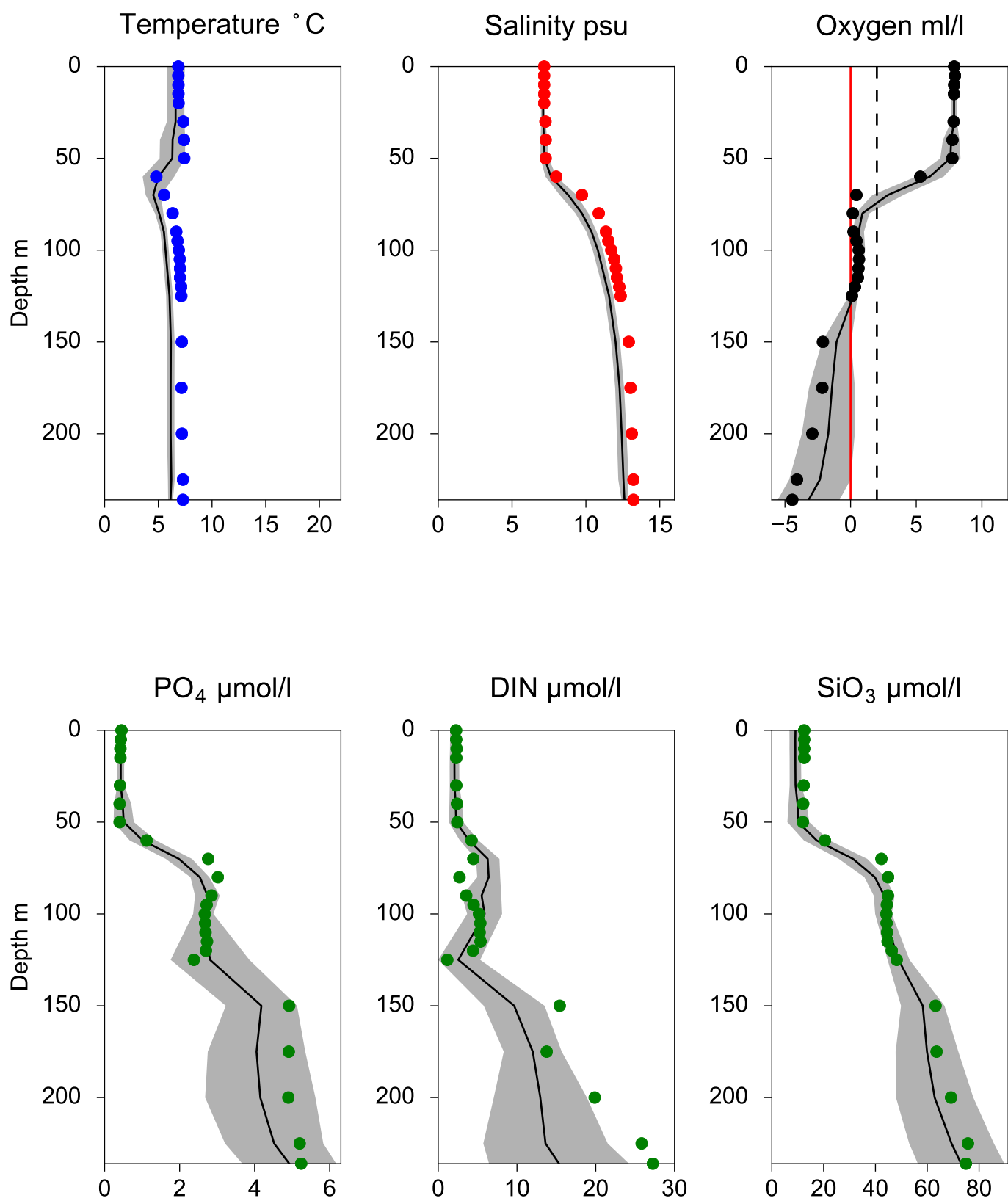


O₂ ml/l



Vertical profiles BY15 GOTLANDSDJ December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-13



STATION BY10 SURFACE WATER (0-10 m)

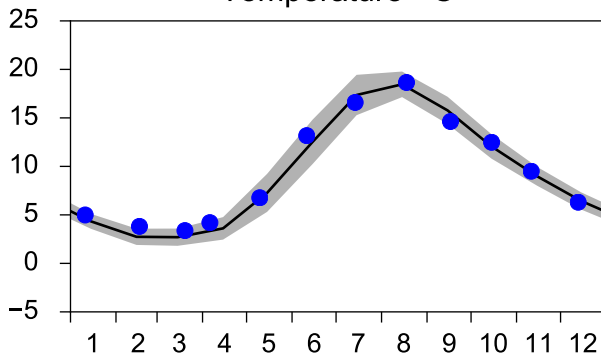
Annual Cycles

— Mean 2001-2015

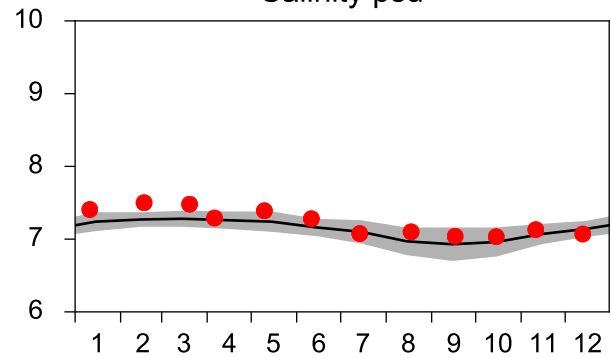
■ St.Dev.

● 2019

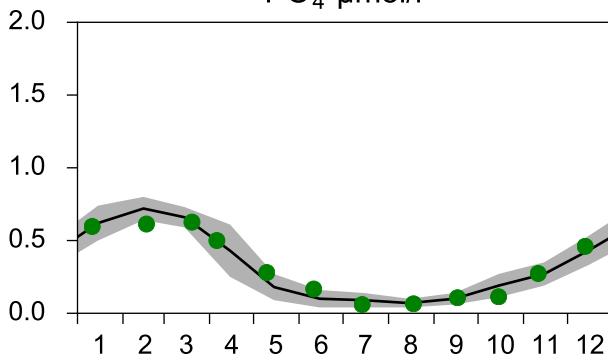
Temperature °C



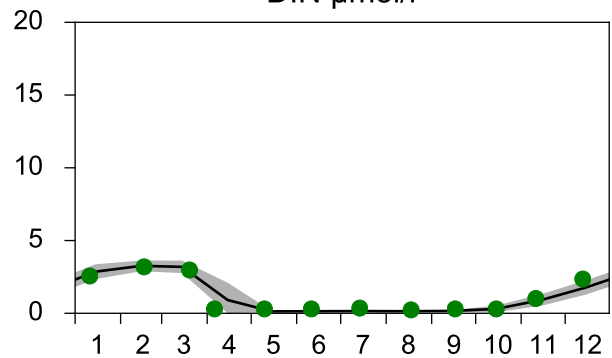
Salinity psu



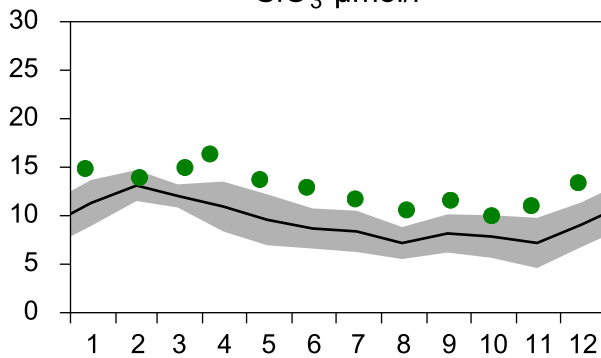
PO₄ µmol/l



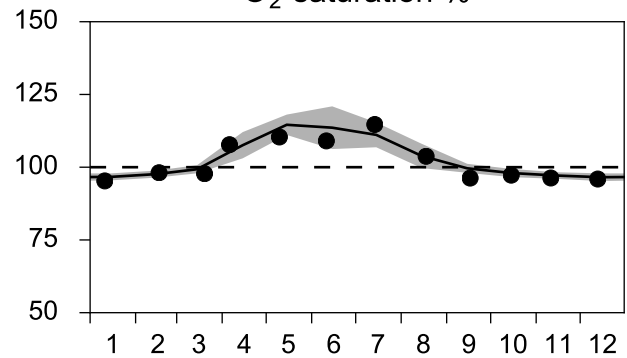
DIN µmol/l



SiO₃ µmol/l

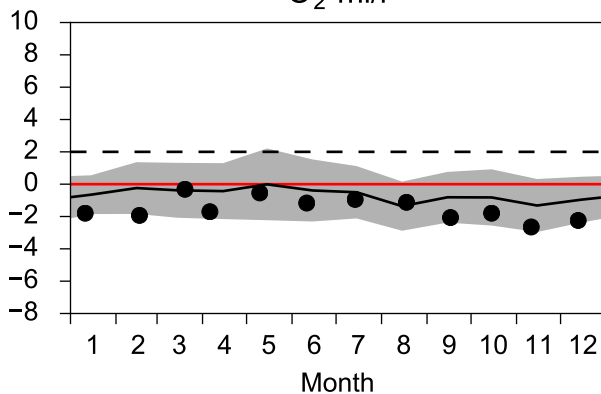


O₂ saturation %

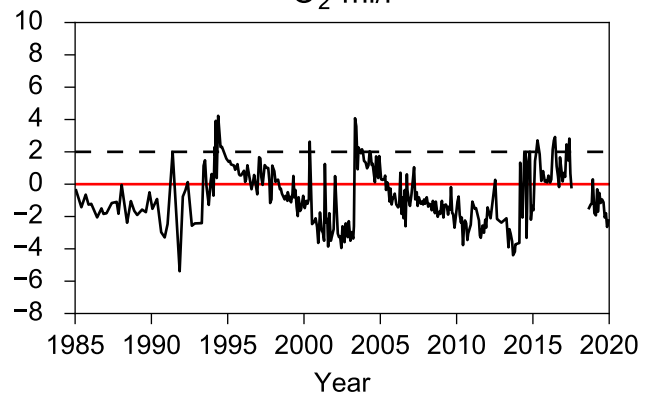


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

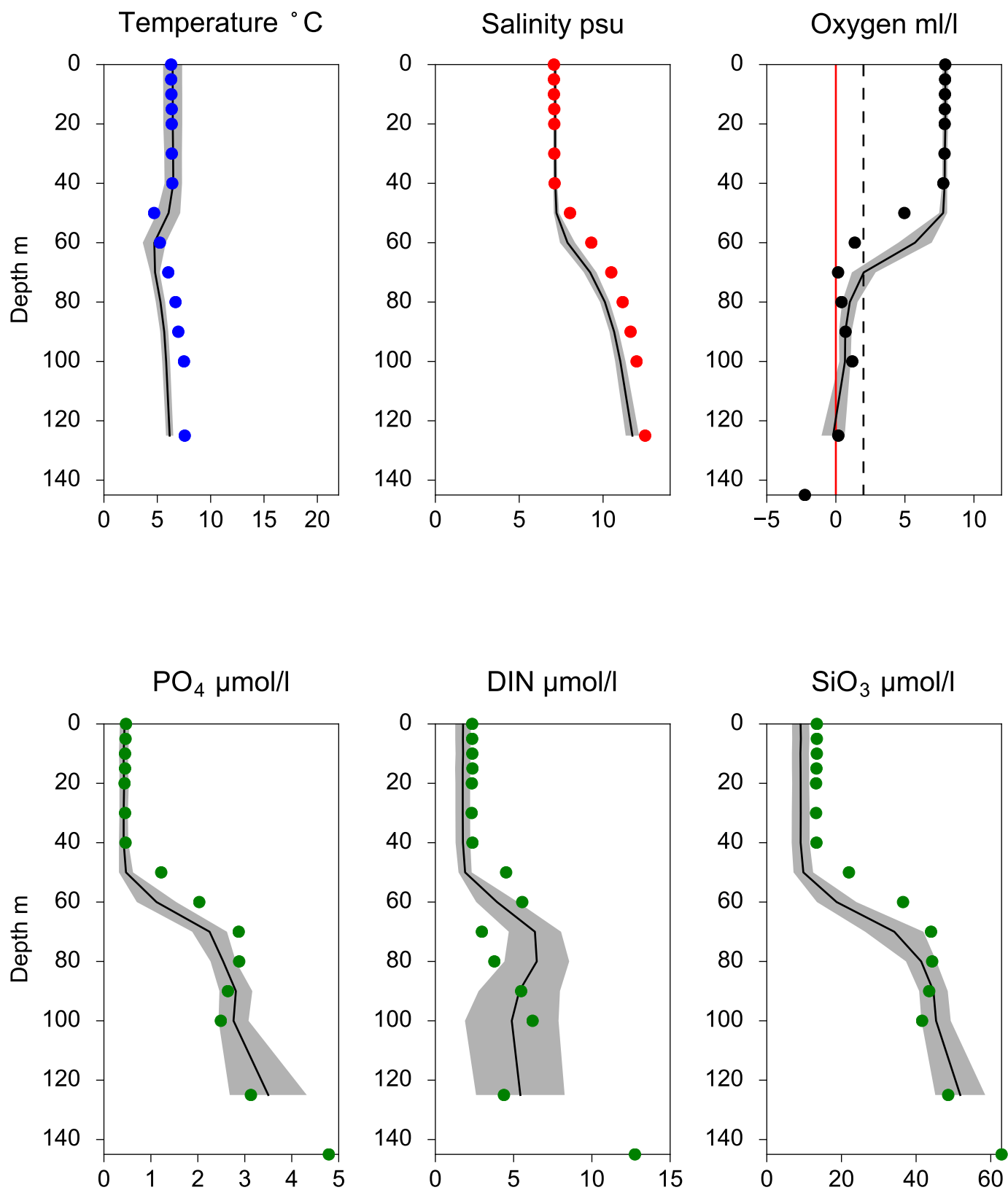


O₂ ml/l



Vertical profiles BY10 December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-13



STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

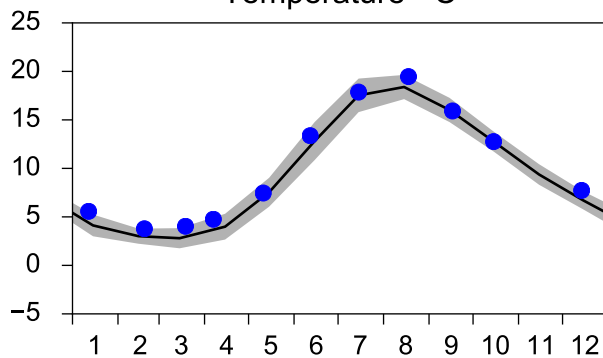
Annual Cycles

— Mean 2001-2015

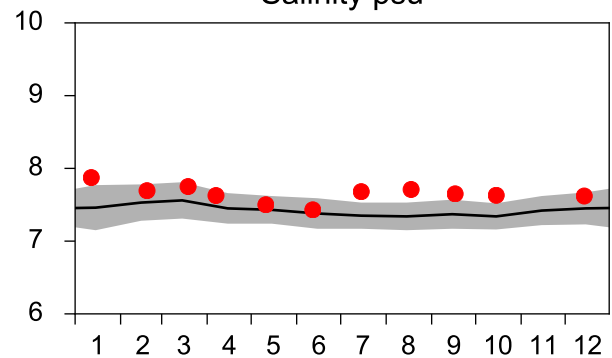
■ St.Dev.

● 2019

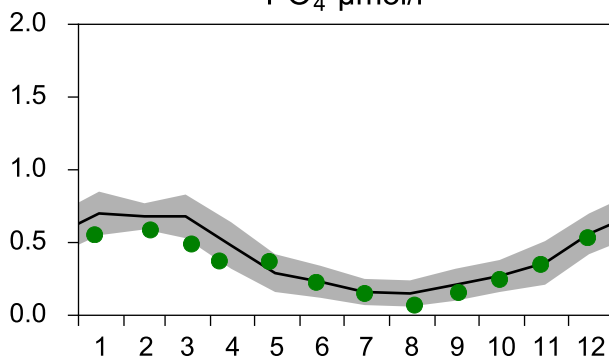
Temperature °C



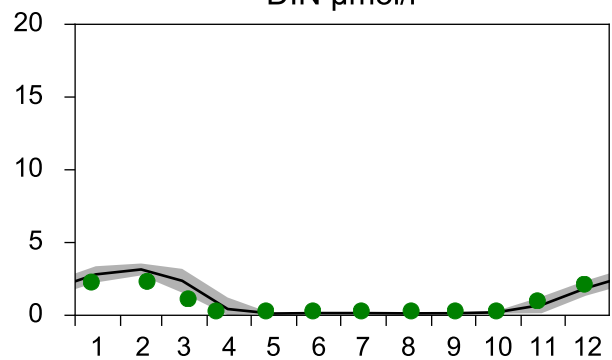
Salinity psu



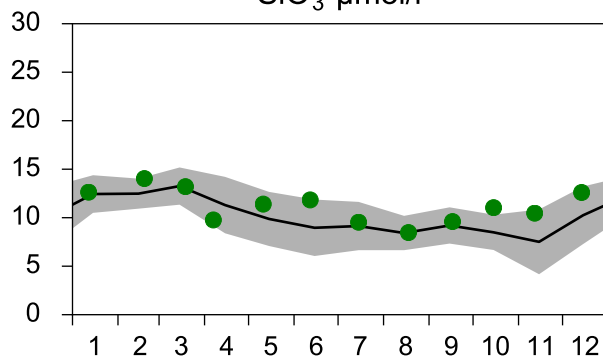
PO₄ µmol/l



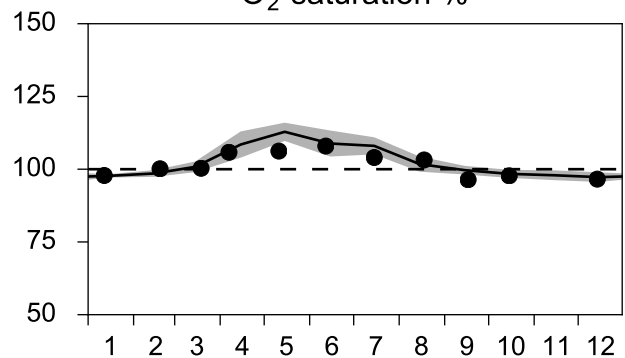
DIN µmol/l



SiO₃ µmol/l

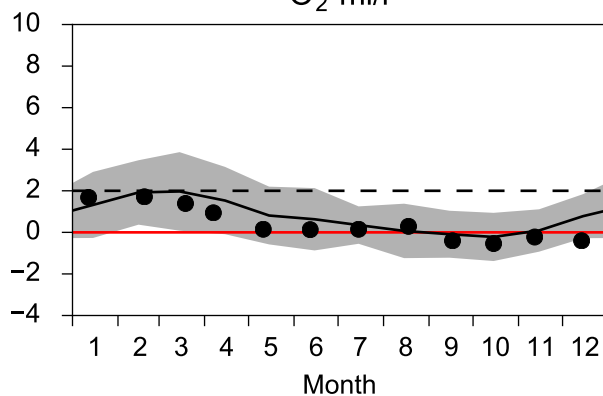


O₂ saturation %

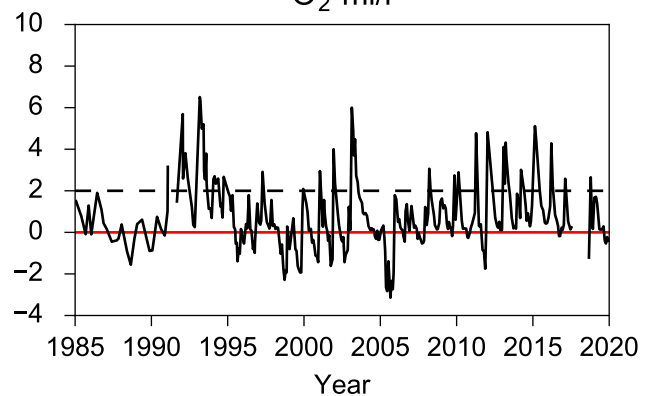


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

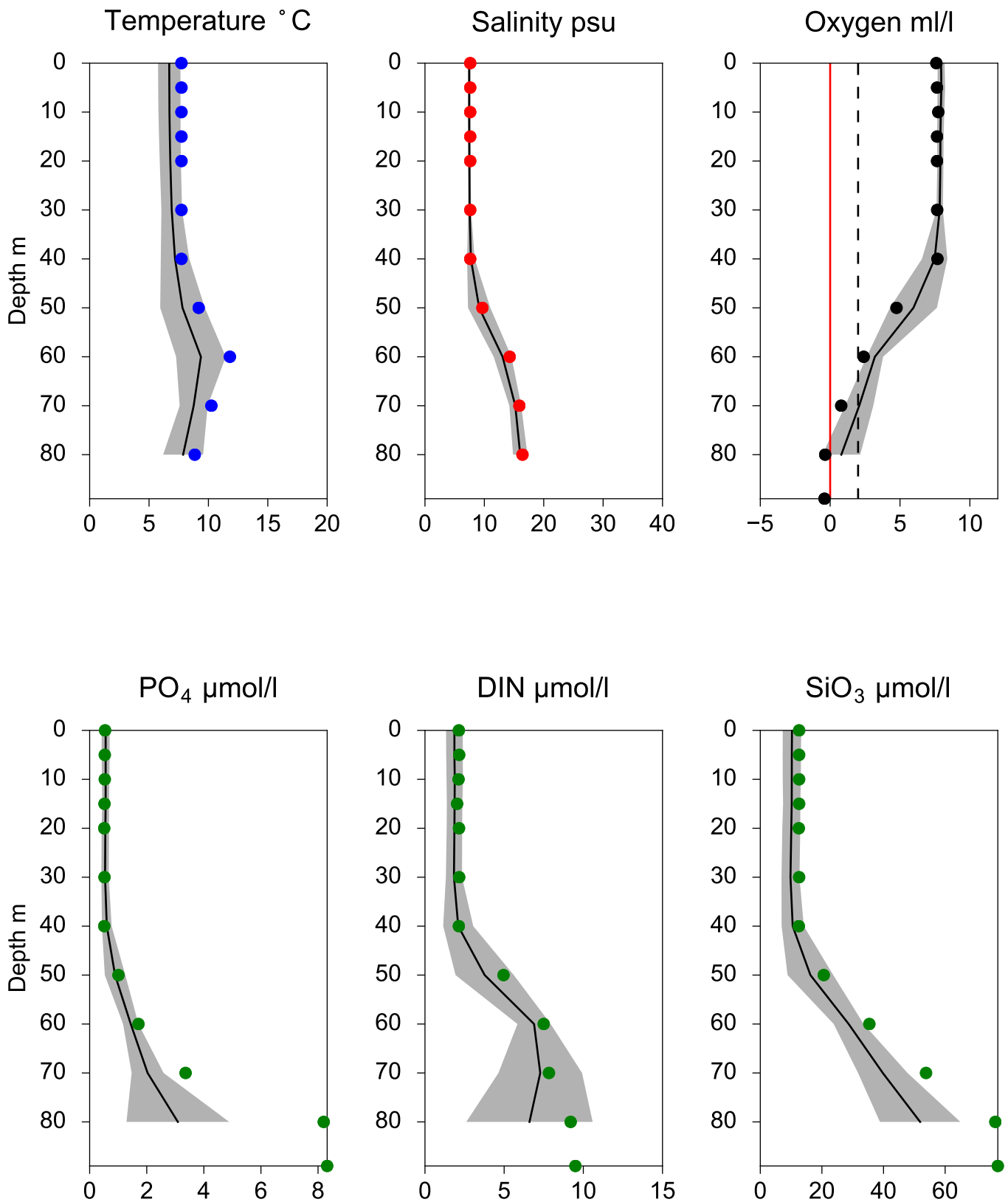


O₂ ml/l



Vertical profiles BY5 BORNHOLMSDJ December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-14



STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

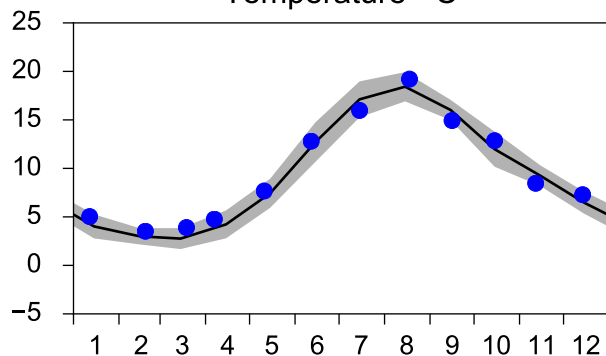
Annual Cycles

— Mean 2001-2015

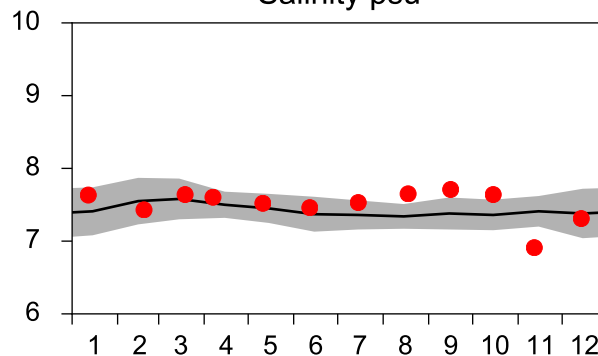
■ St.Dev.

● 2019

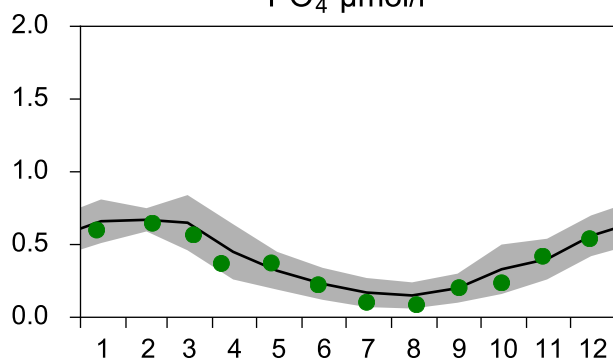
Temperature °C



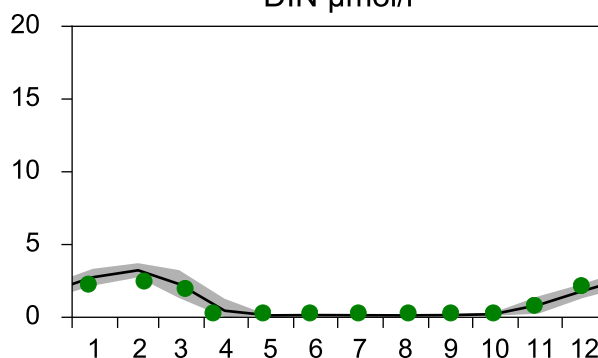
Salinity psu



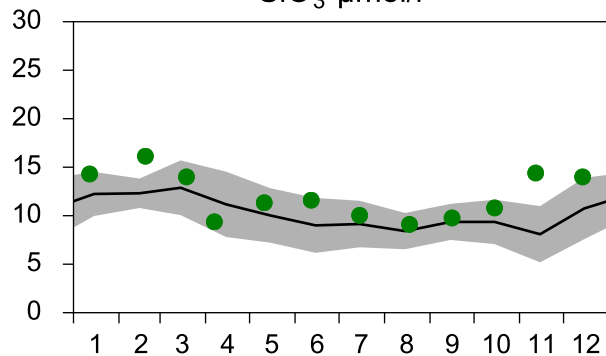
PO₄ µmol/l



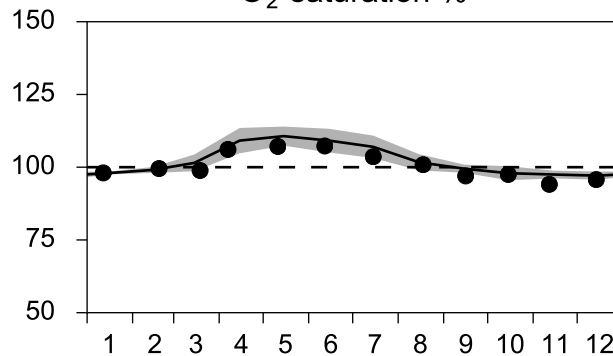
DIN µmol/l



SiO₃ µmol/l

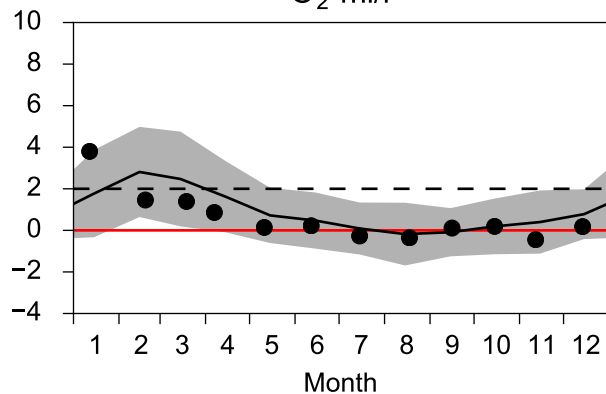


O₂ saturation %

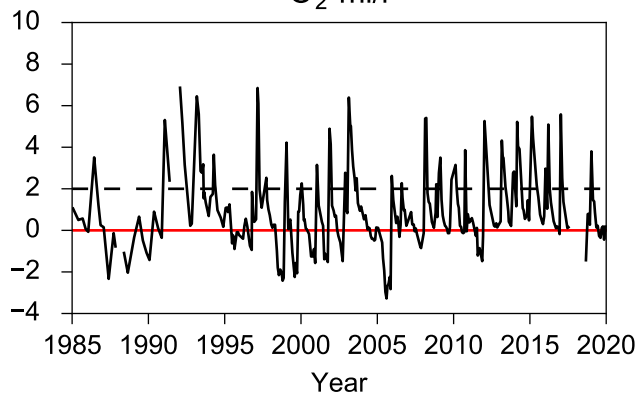


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

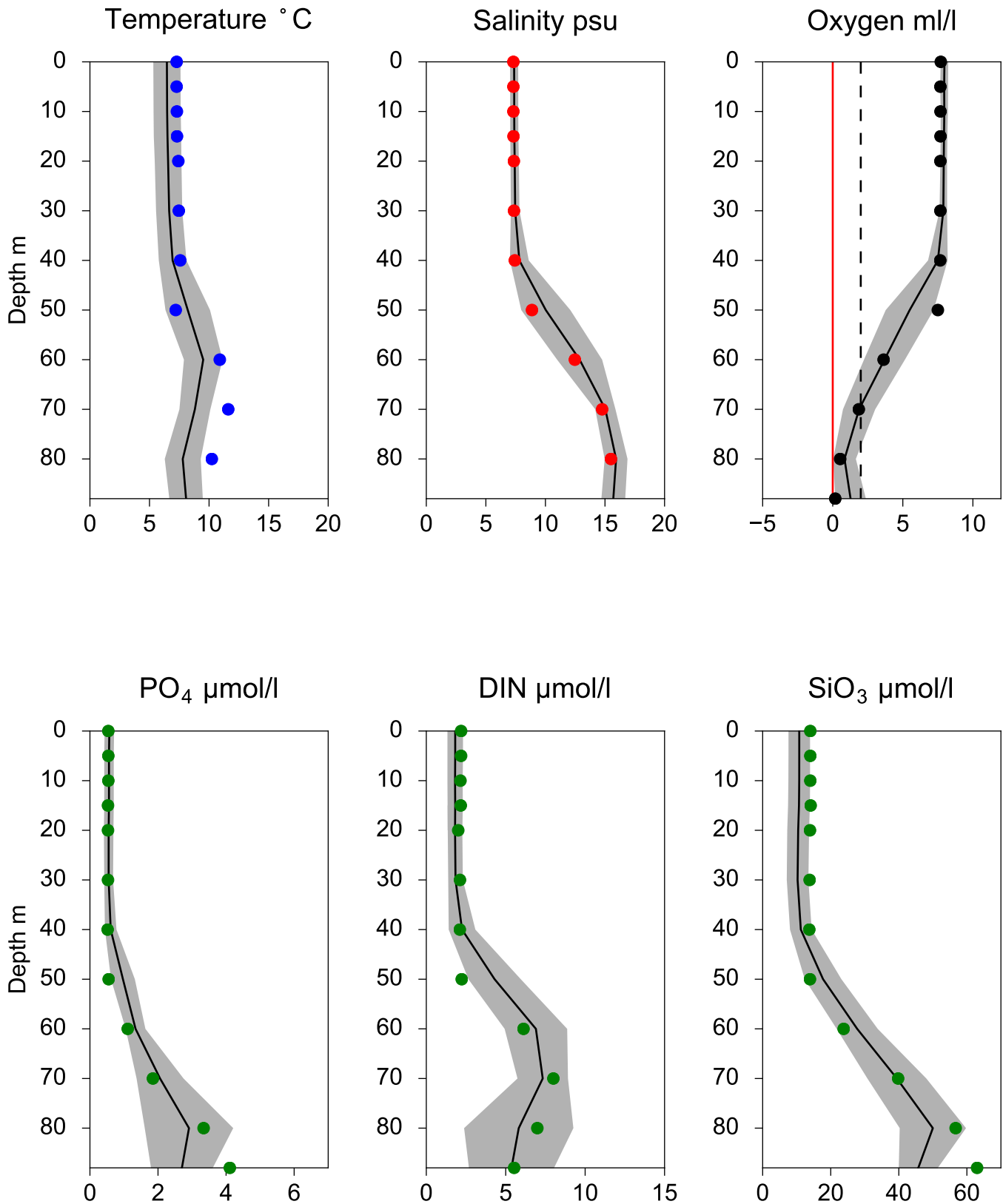


O₂ ml/l



Vertical profiles BY4 CHRISTIANSÖ December

— Mean 2001-2015 St.Dev. • 2019-12-14



STATION BY2 ARKONA SURFACE WATER (0-10 m)

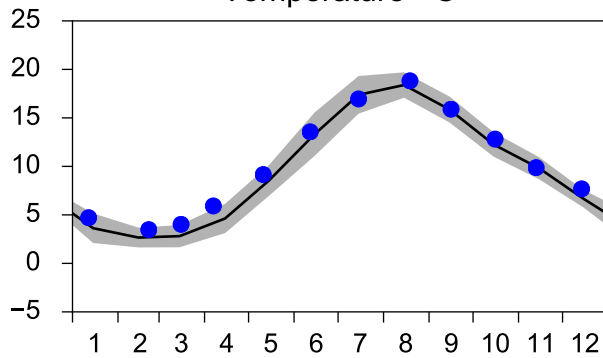
Annual Cycles

— Mean 2001-2015

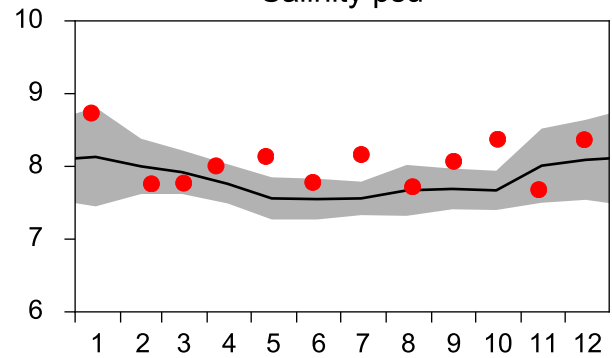
■ St.Dev.

● 2019

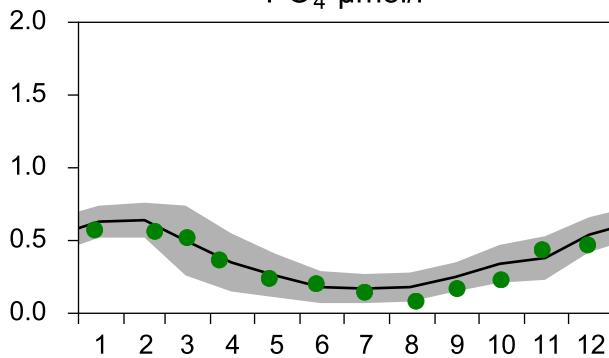
Temperature °C



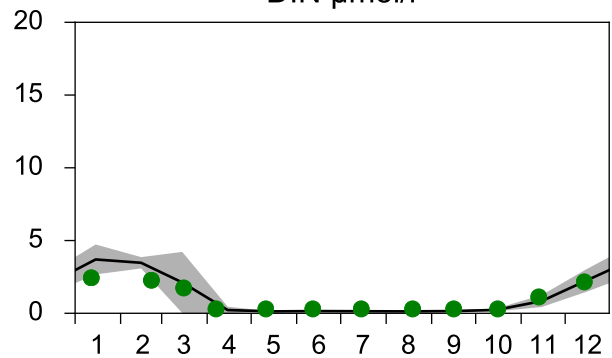
Salinity psu



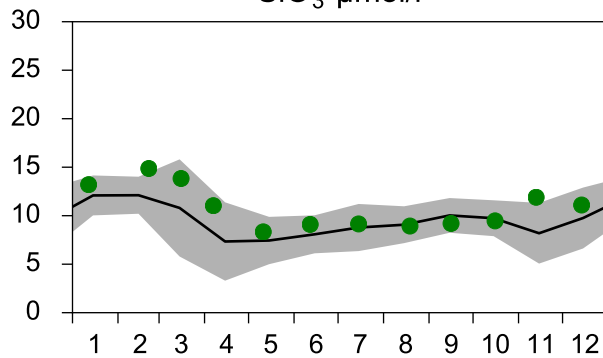
PO₄ µmol/l



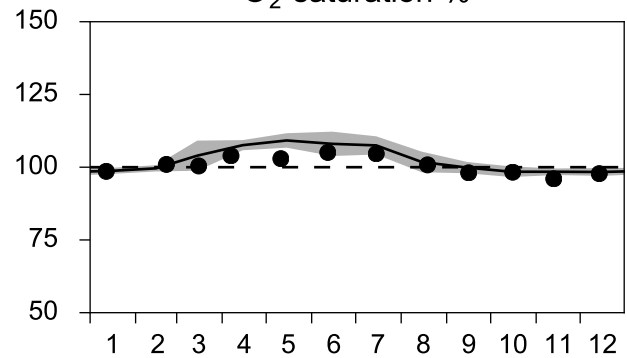
DIN µmol/l



SiO₃ µmol/l

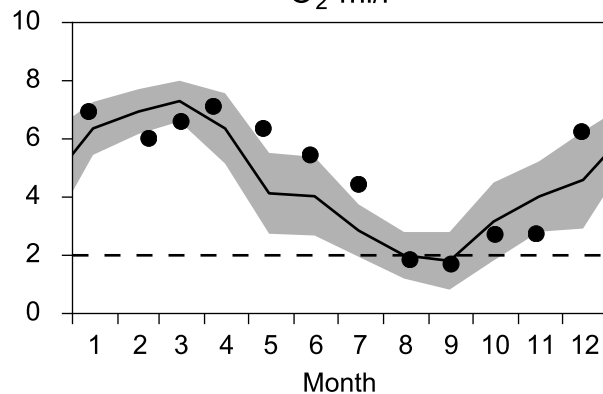


O₂ saturation %

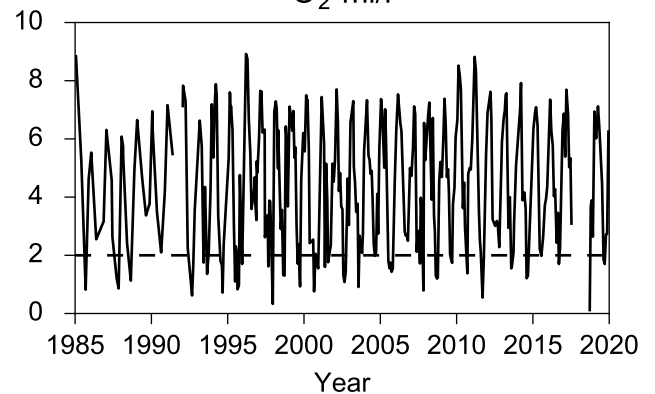


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

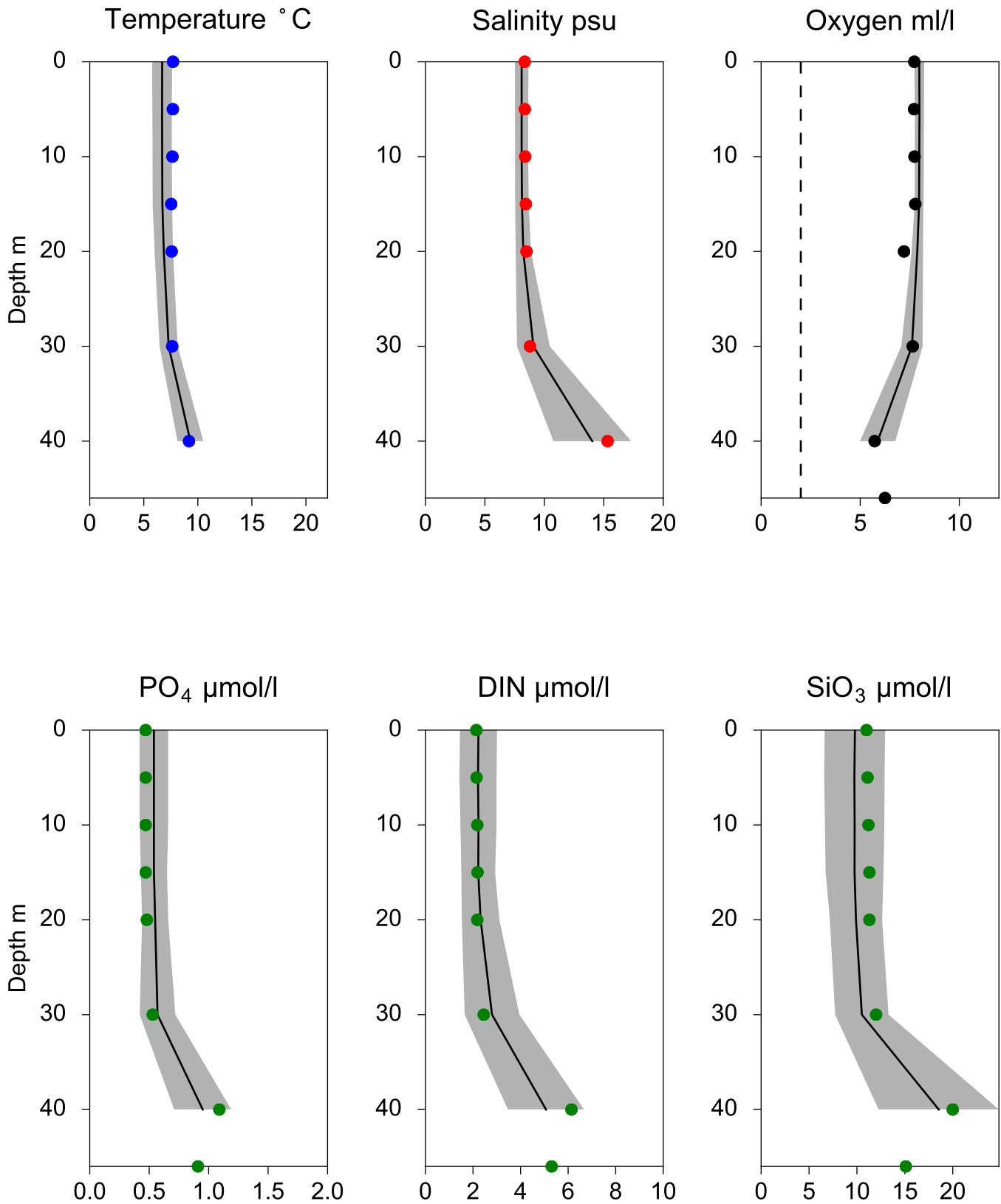


O₂ ml/l



Vertical profiles BY2 ARKONA December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-14



STATION BY1 SURFACE WATER (0-10 m)

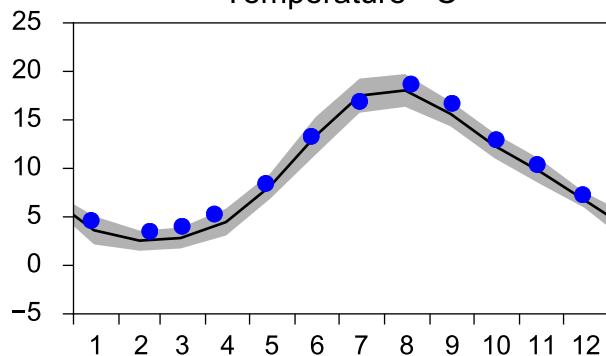
Annual Cycles

— Mean 2001-2015

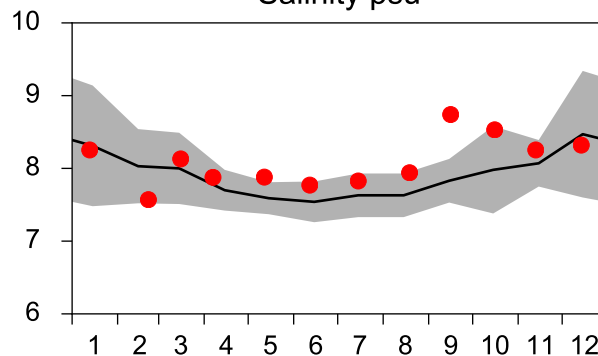
■ St.Dev.

● 2019

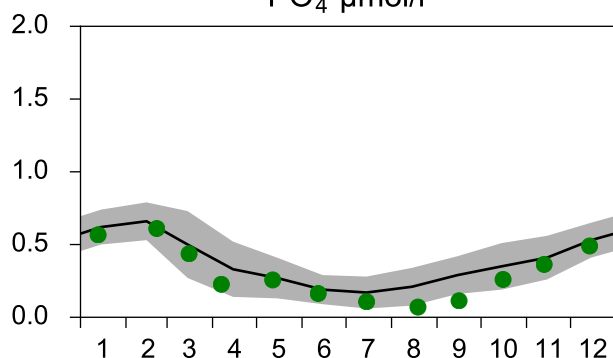
Temperature °C



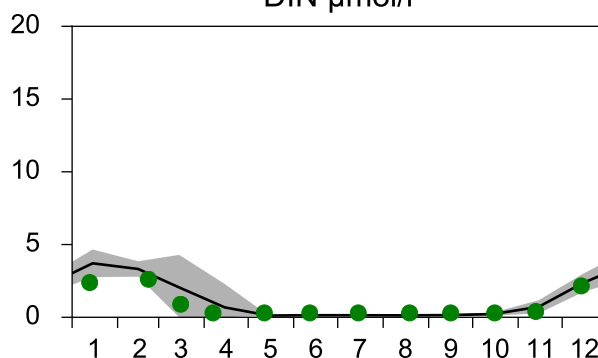
Salinity psu



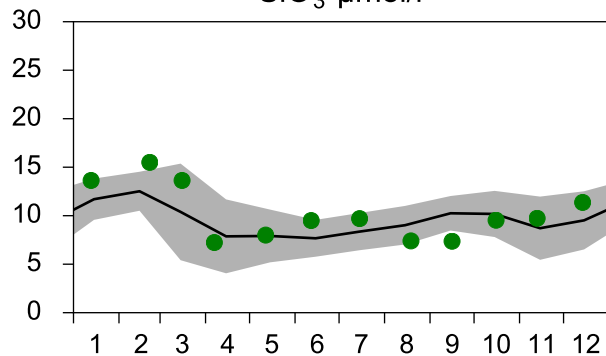
PO₄ µmol/l



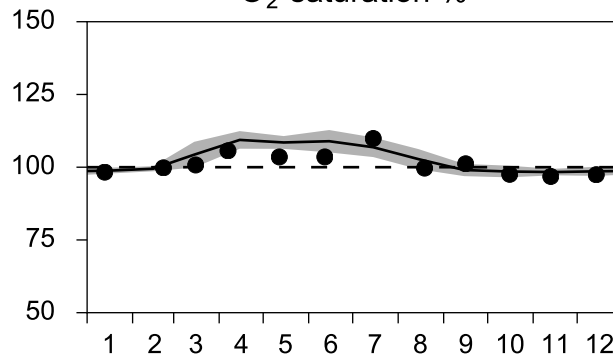
DIN µmol/l



SiO₃ µmol/l

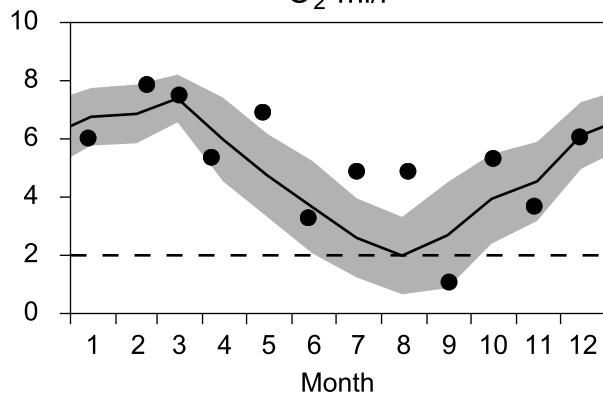


O₂ saturation %

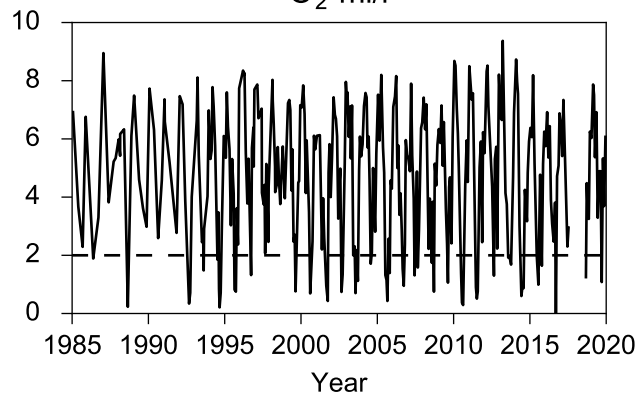


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

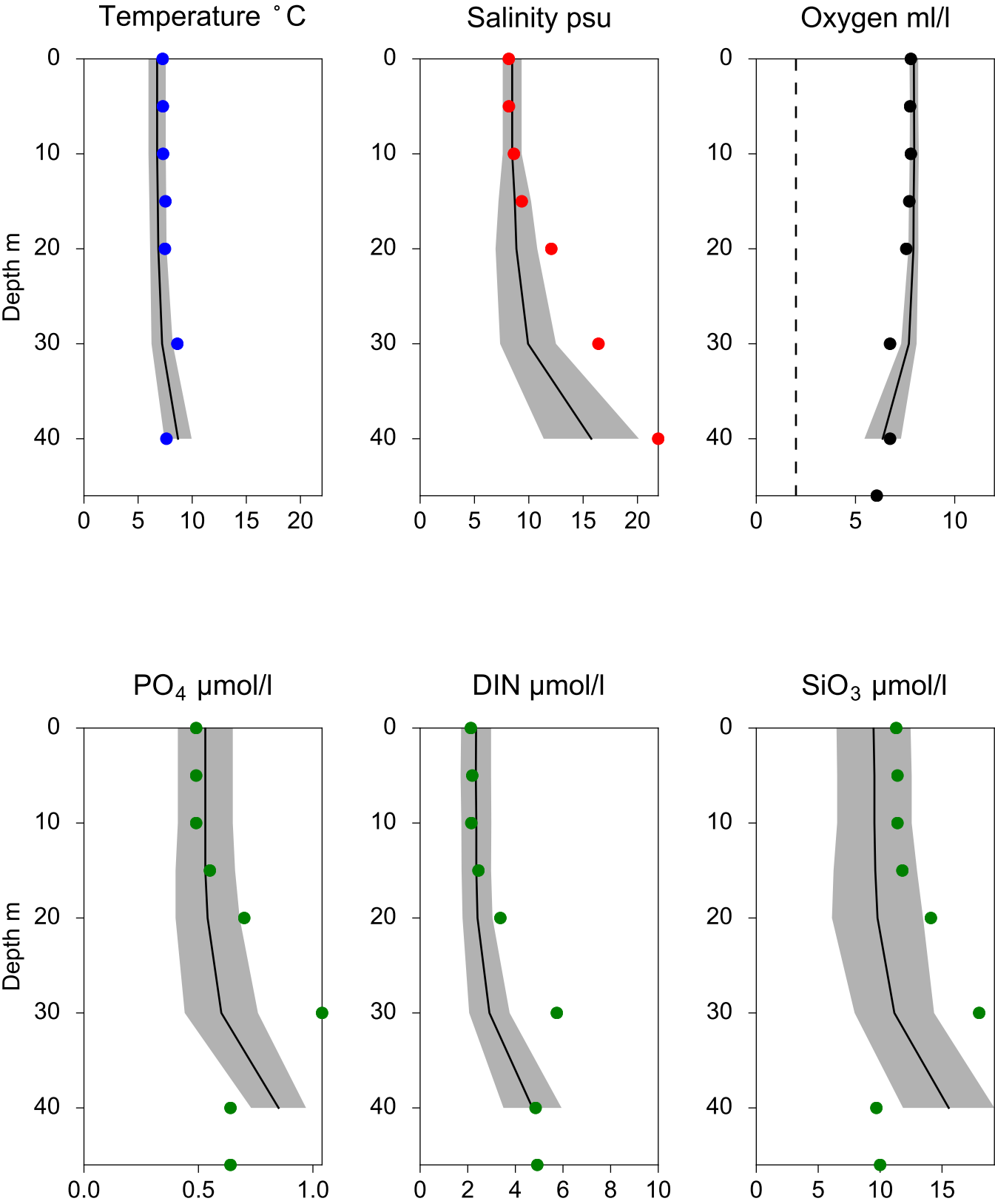


O₂ ml/l



Vertical profiles BY1
December

— Mean 2001-2015 St.Dev. • 2019-12-14



STATION W LANDSKRONA SURFACE WATER (0-10 m)

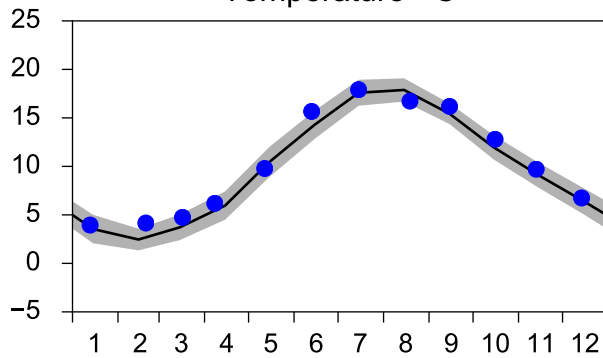
Annual Cycles

— Mean 2001-2015

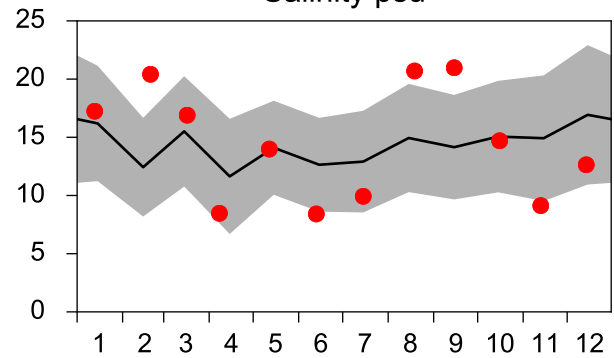
■ St.Dev.

● 2019

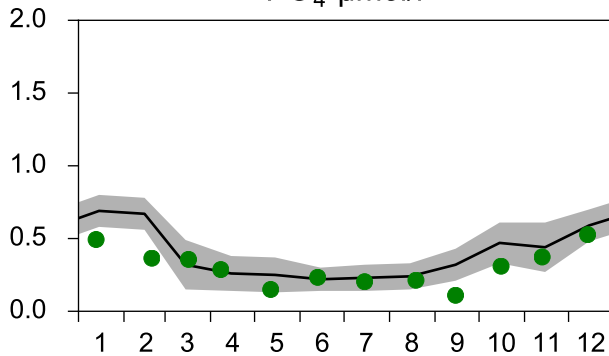
Temperature °C



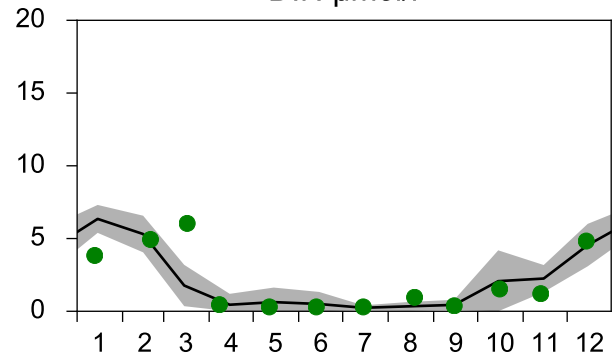
Salinity psu



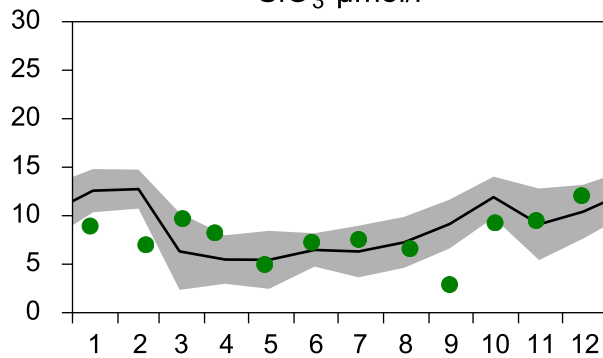
PO₄ µmol/l



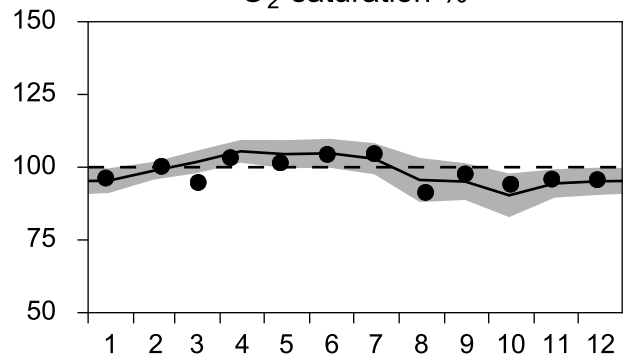
DIN µmol/l



SiO₃ µmol/l

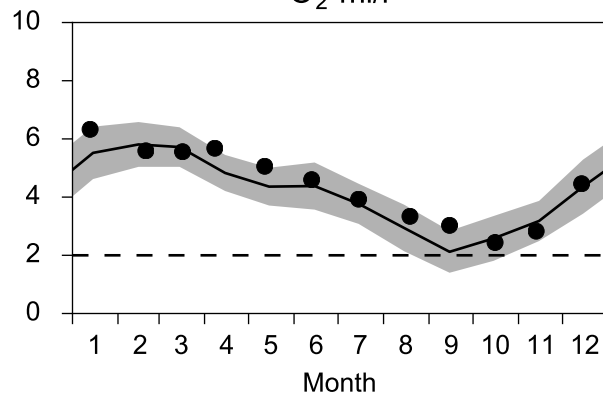


O₂ saturation %

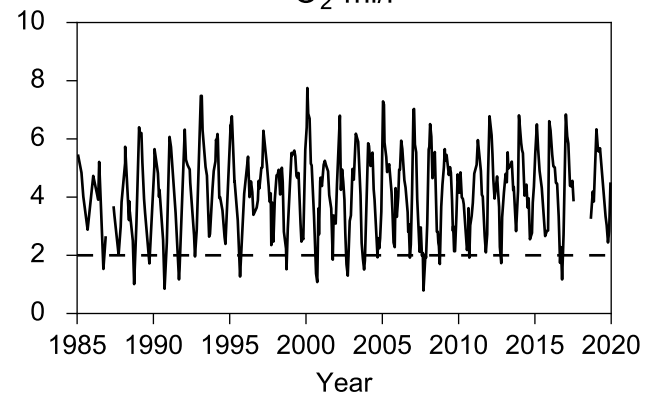


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

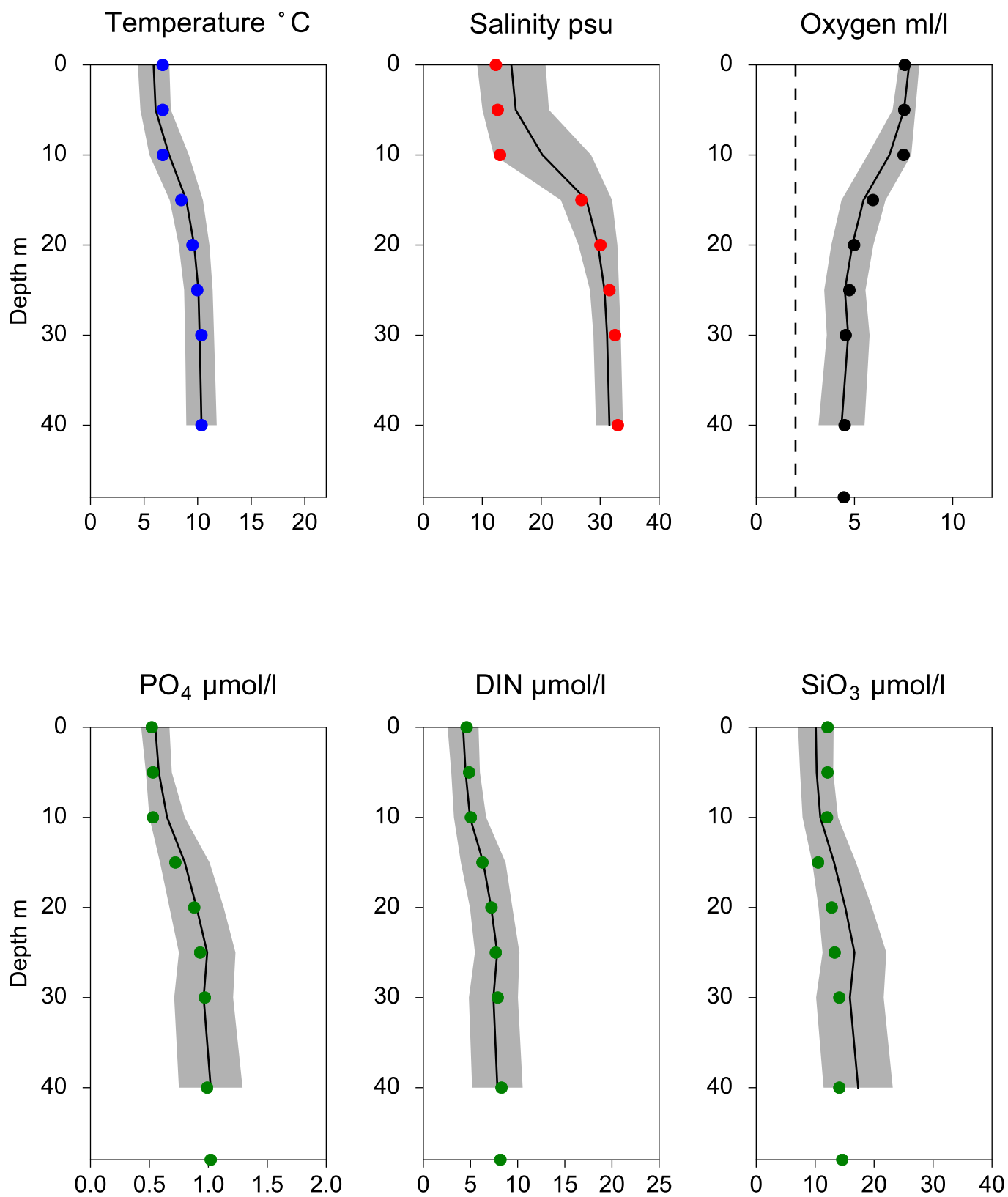


O₂ ml/l



Vertical profiles W LANDSKRONA December

— Mean 2001-2015 St.Dev. • 2019-12-14



STATION ANHOLT E SURFACE WATER (0-10 m)

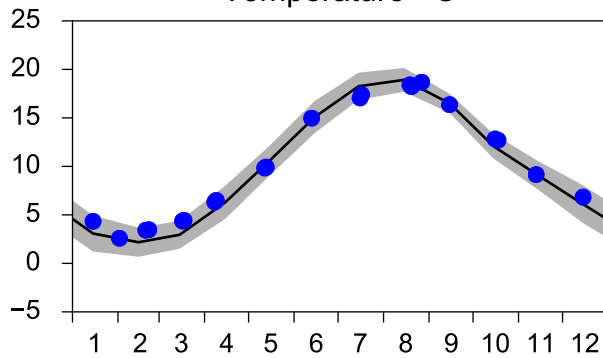
Annual Cycles

— Mean 2001-2015

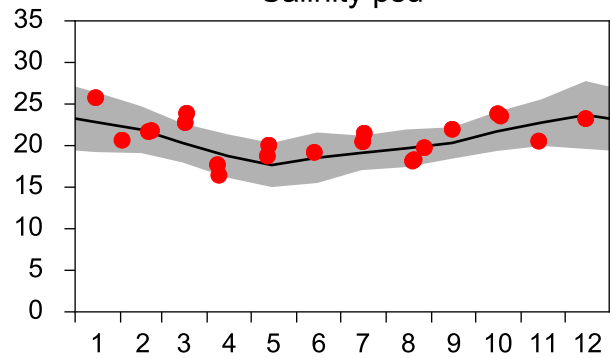
■ St.Dev.

● 2019

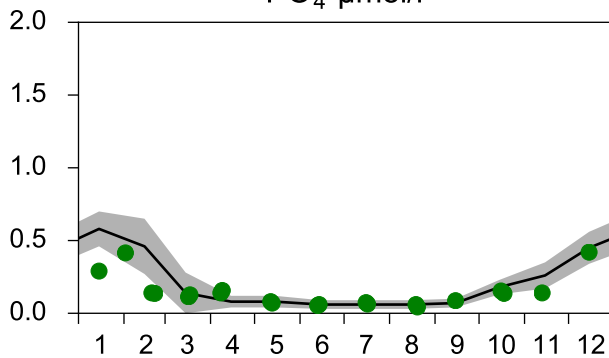
Temperature °C



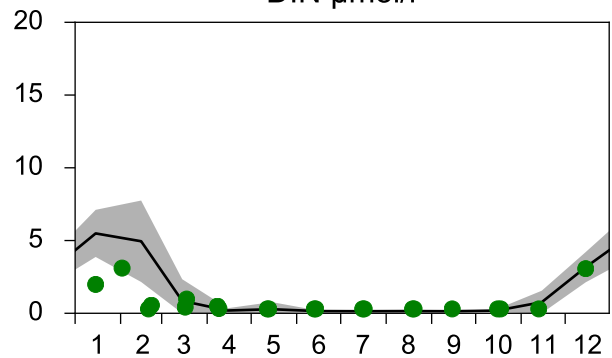
Salinity psu



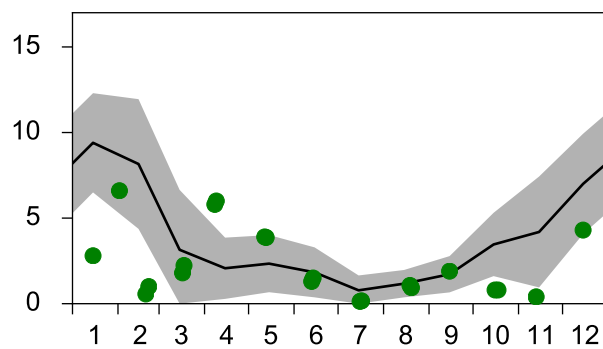
PO₄ µmol/l



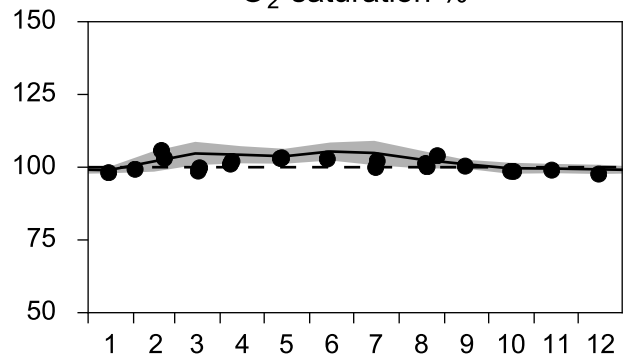
DIN µmol/l



SiO₃ µmol/l

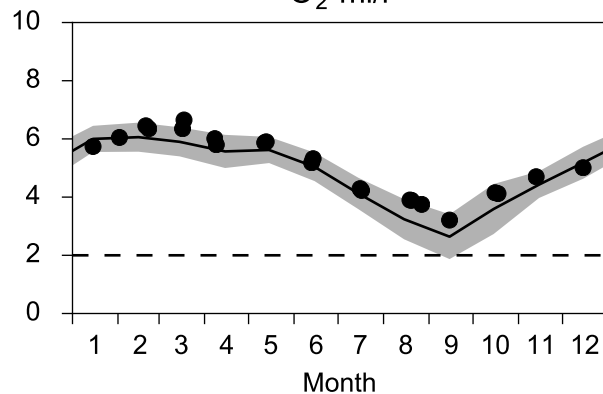


O₂ saturation %

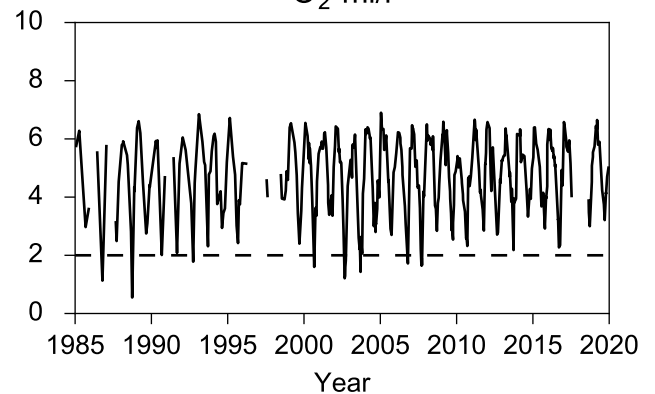


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

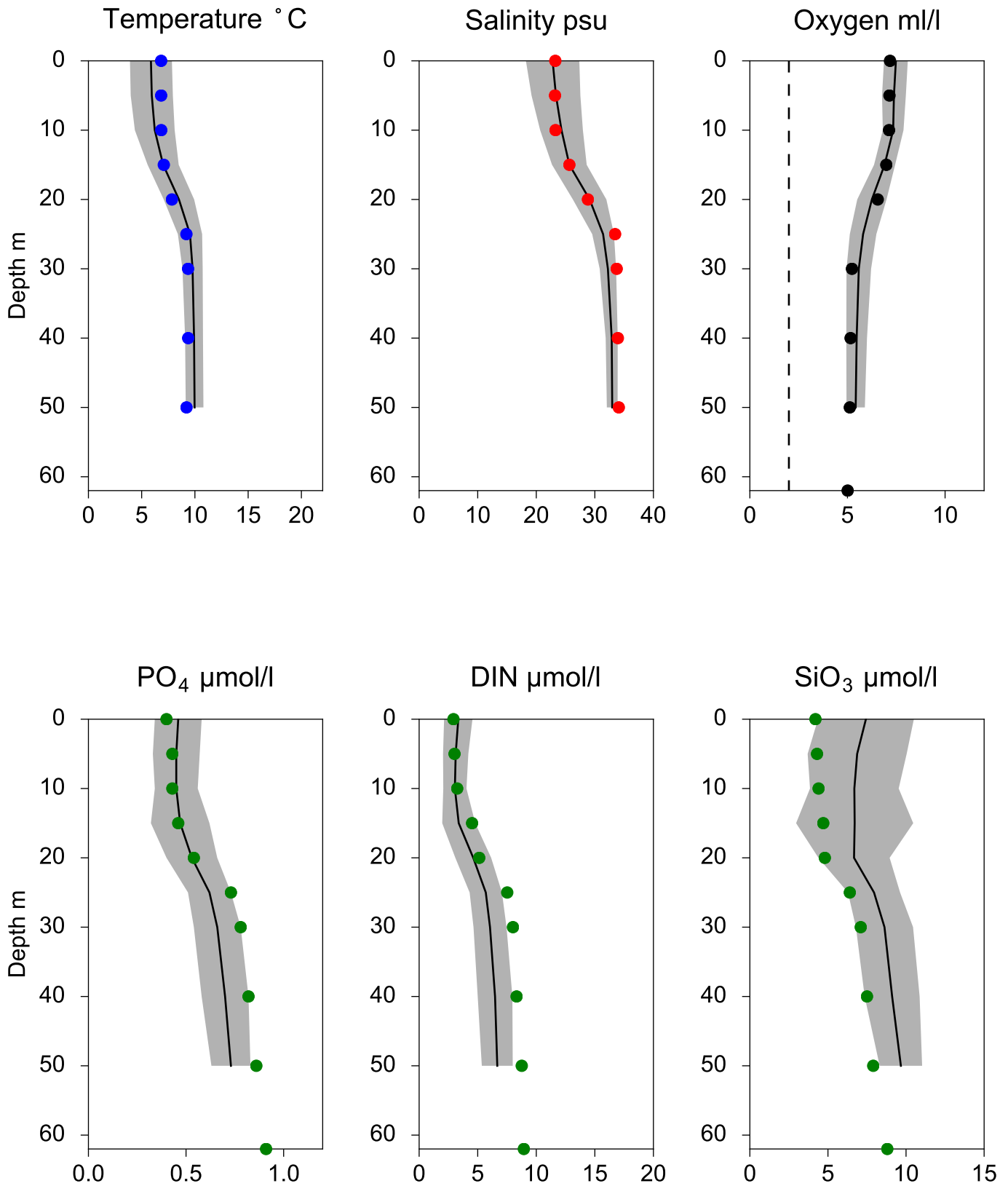


O₂ ml/l



Vertical profiles ANHOLT E December

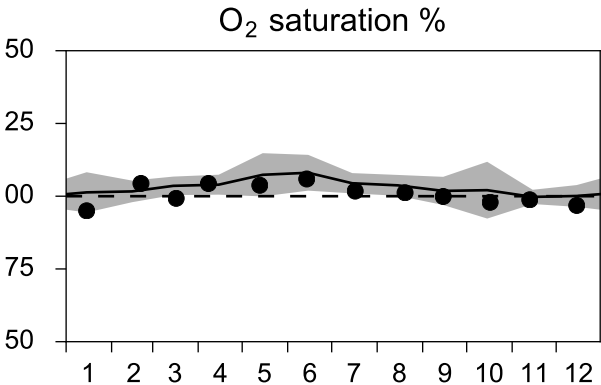
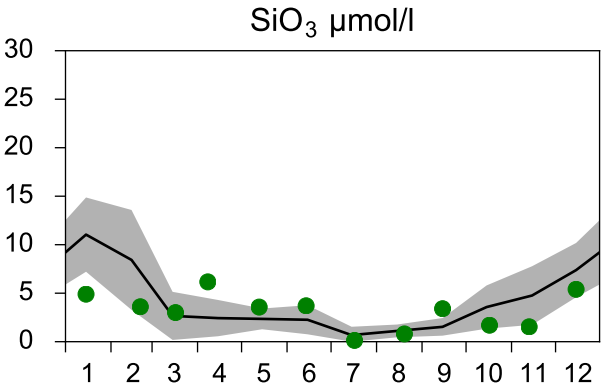
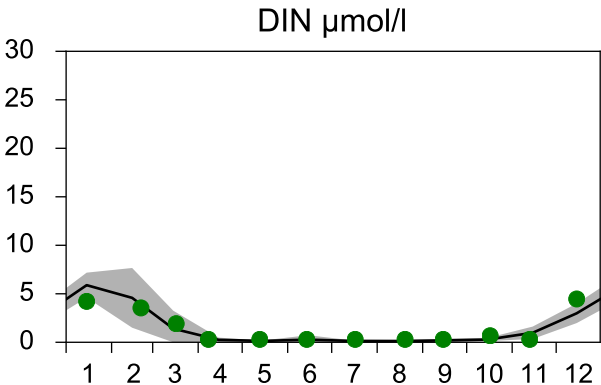
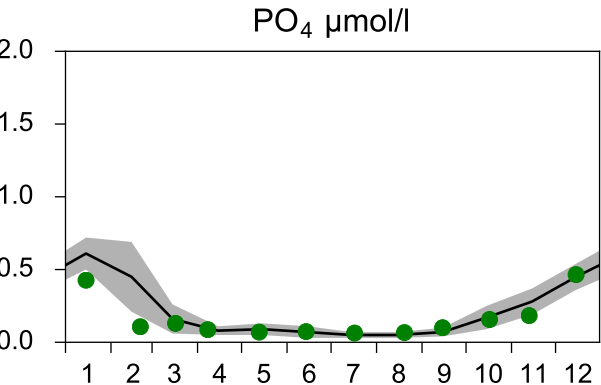
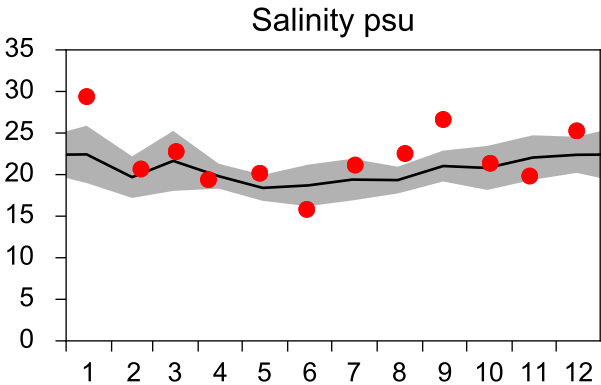
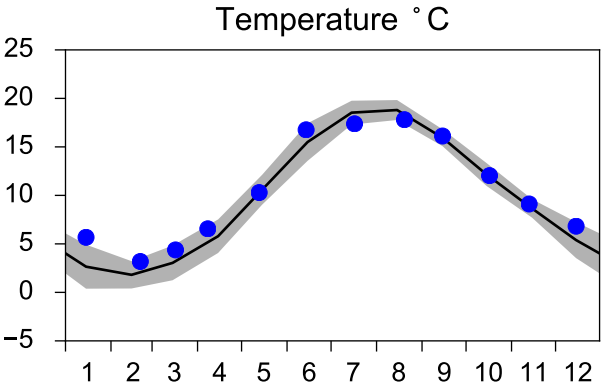
— Mean 2001-2015 St.Dev. • 2019-12-15



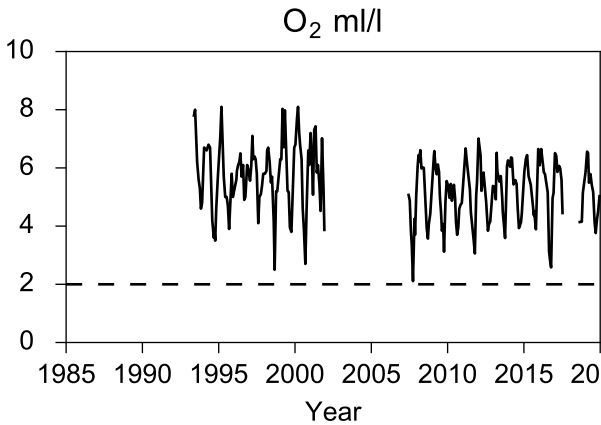
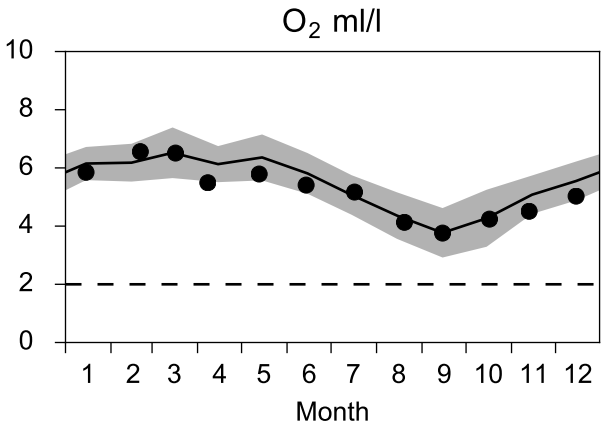
STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

— Mean 2001-2015 St.Dev. ● 2019

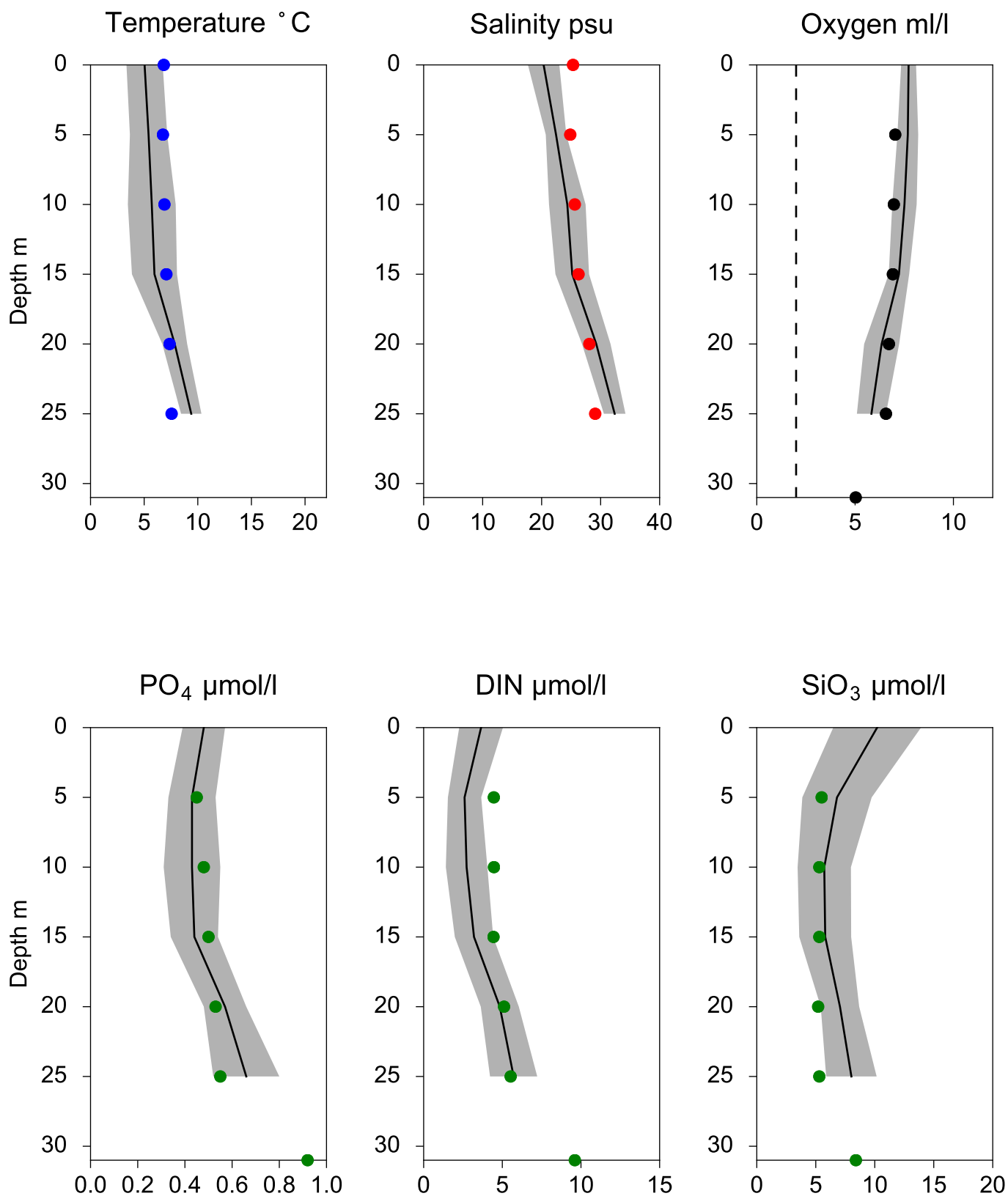


OXYGEN IN BOTTOM WATER (depth >= 25 m)



Vertical profiles N14 FALKENBERG December

— Mean 2001-2015 St.Dev. • 2019-12-15



STATION FLADEN SURFACE WATER (0-10 m)

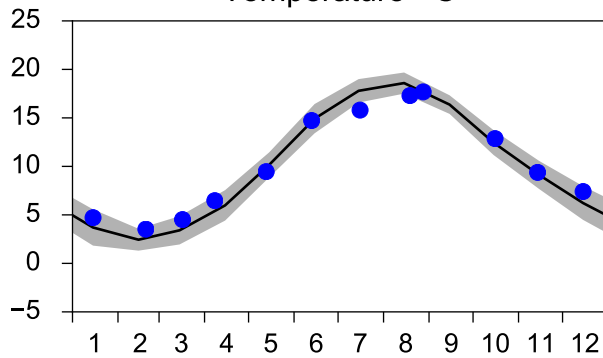
Annual Cycles

— Mean 2001-2015

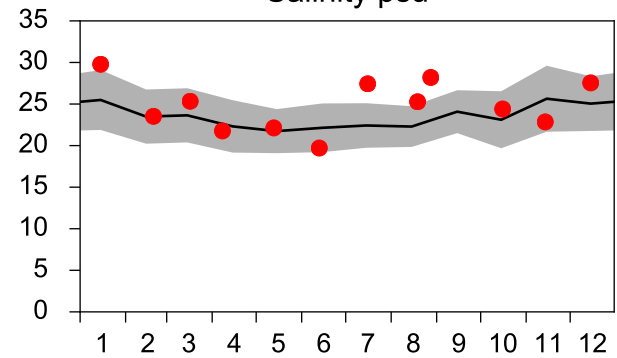
■ St.Dev.

● 2019

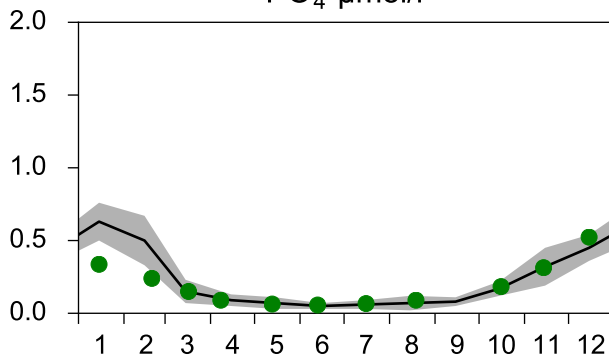
Temperature °C



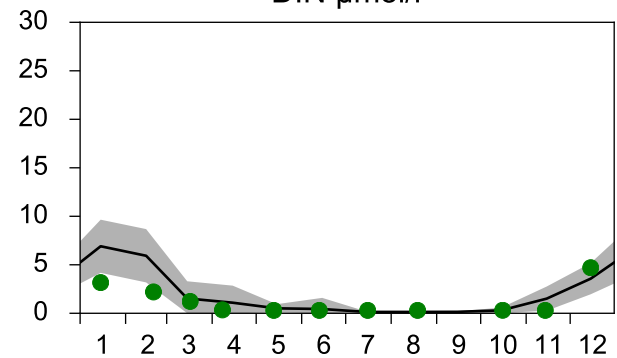
Salinity psu



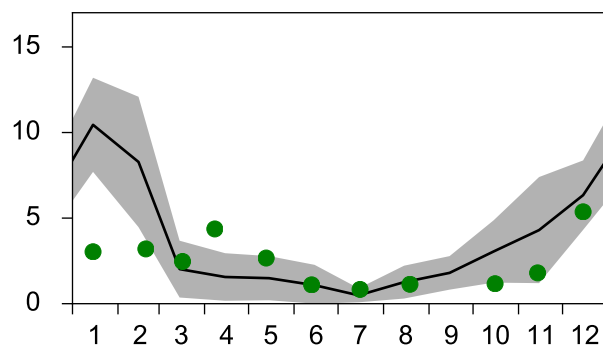
PO₄ µmol/l



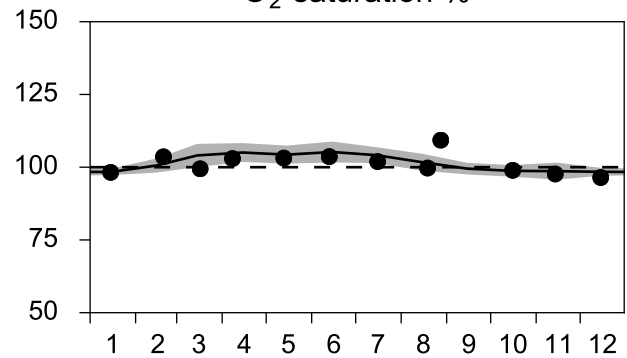
DIN µmol/l



SiO₃ µmol/l

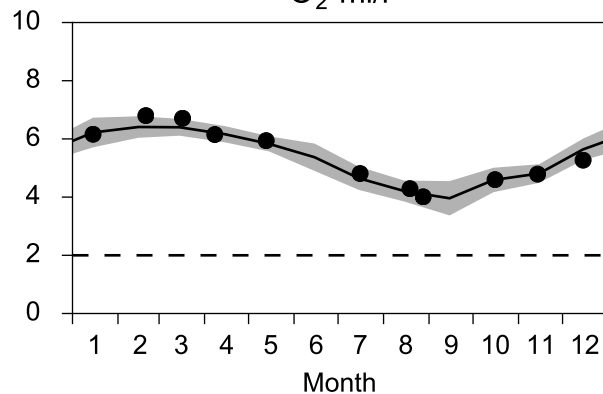


O₂ saturation %

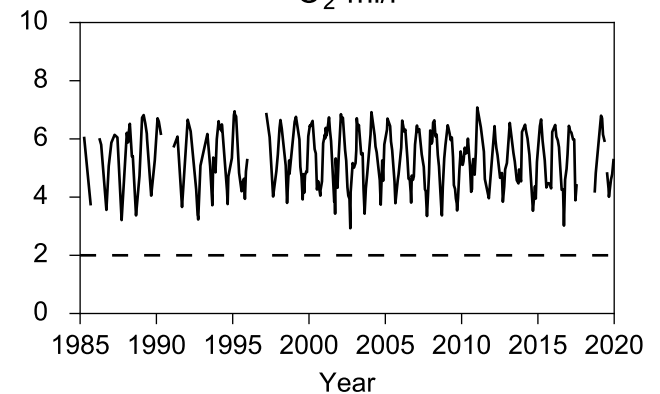


OXYGEN IN BOTTOM WATER (depth >= 74 m)

O₂ ml/l

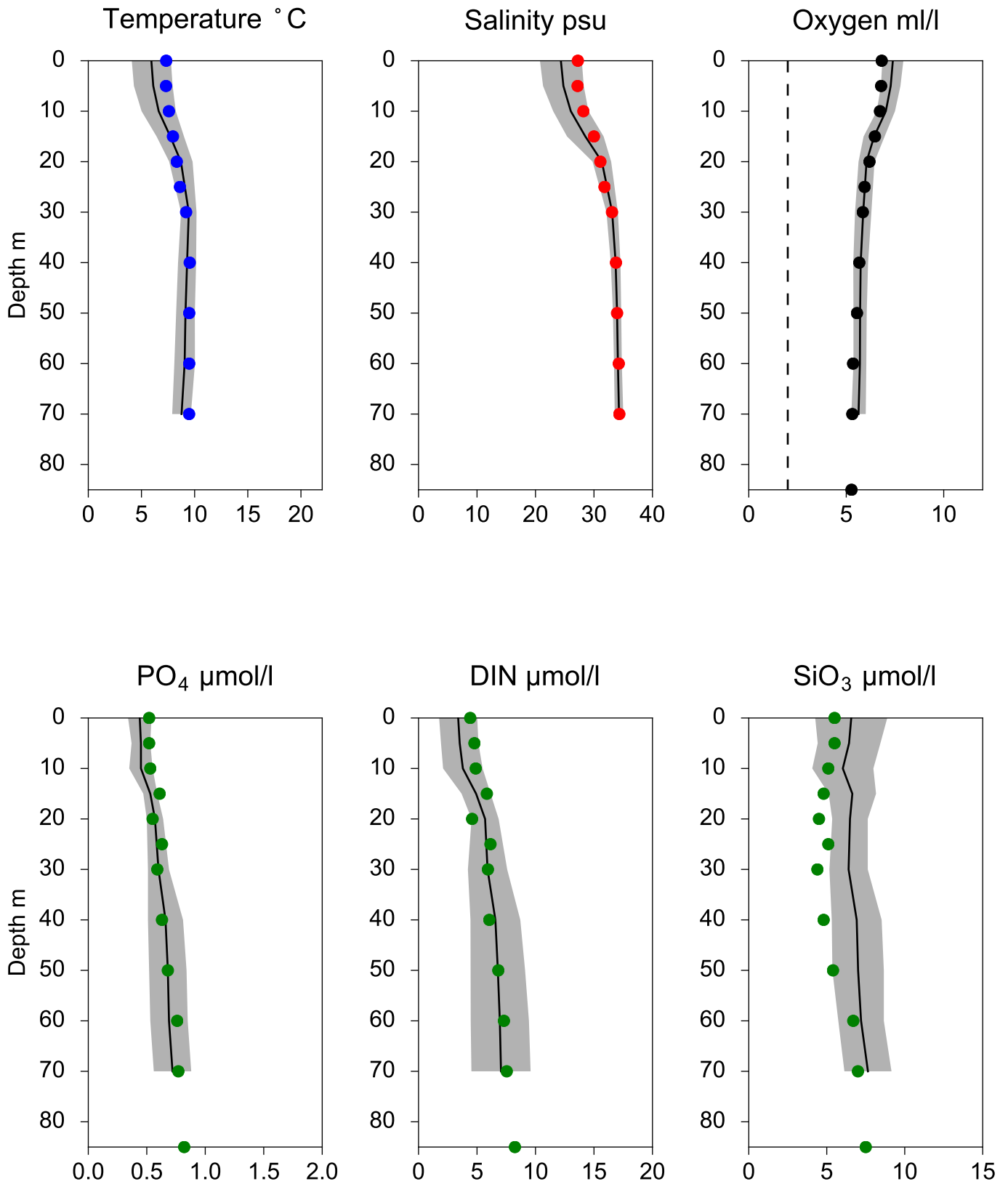


O₂ ml/l



Vertical profiles FLADEN December

— Mean 2001-2015 St.Dev. • 2019-12-15



STATION P2 SURFACE WATER (0-10 m)

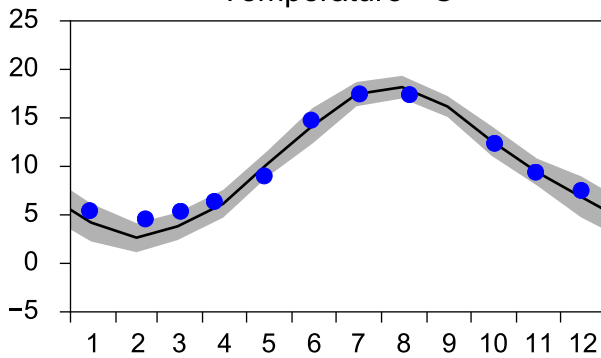
Annual Cycles

— Mean 2001-2015

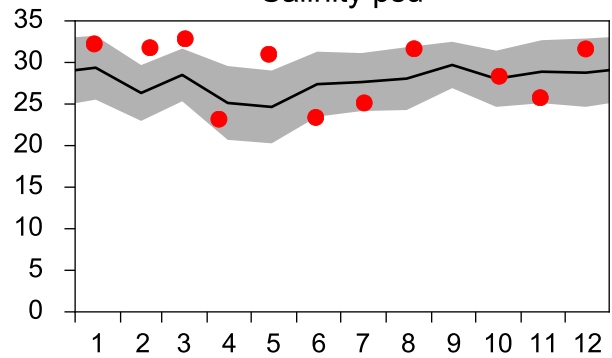
■ St.Dev.

● 2019

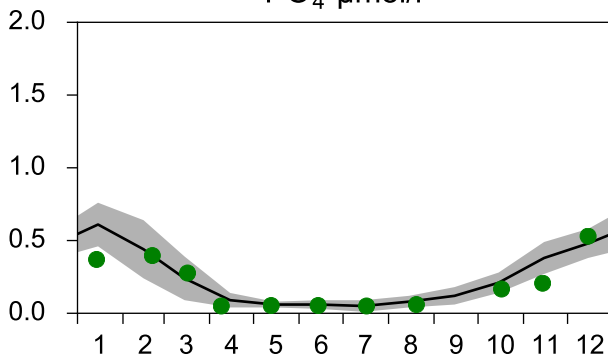
Temperature °C



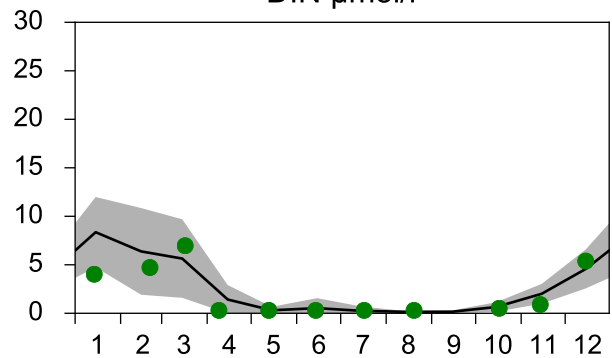
Salinity psu



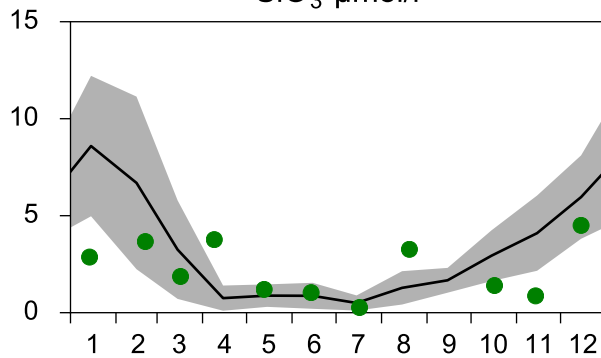
PO₄ μmol/l



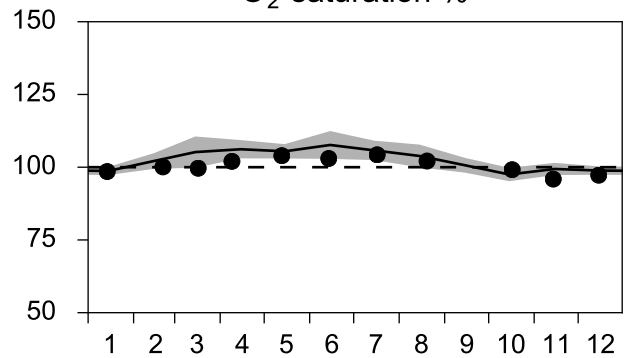
DIN μmol/l



SiO₃ μmol/l

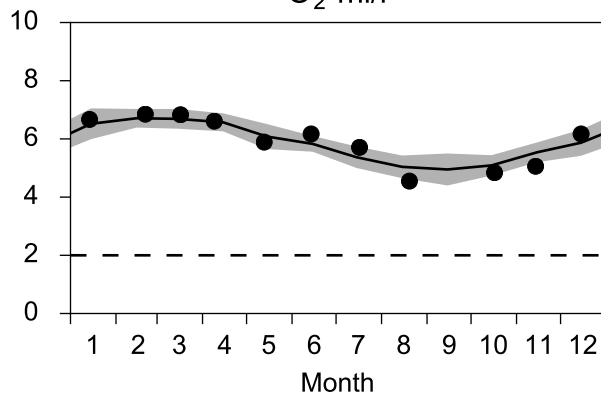


O₂ saturation %

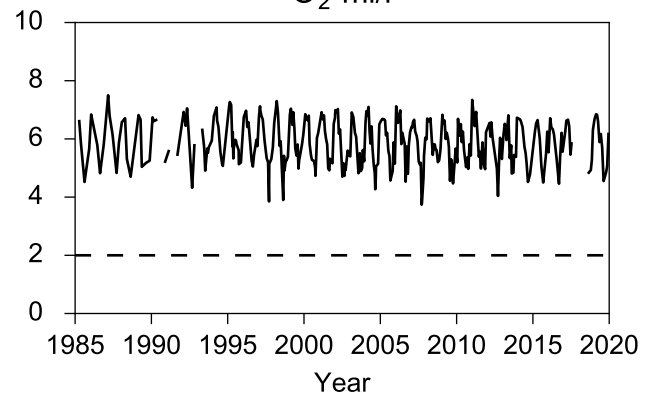


OXYGEN IN BOTTOM WATER (depth >= 75 m)

O₂ ml/l



O₂ ml/l

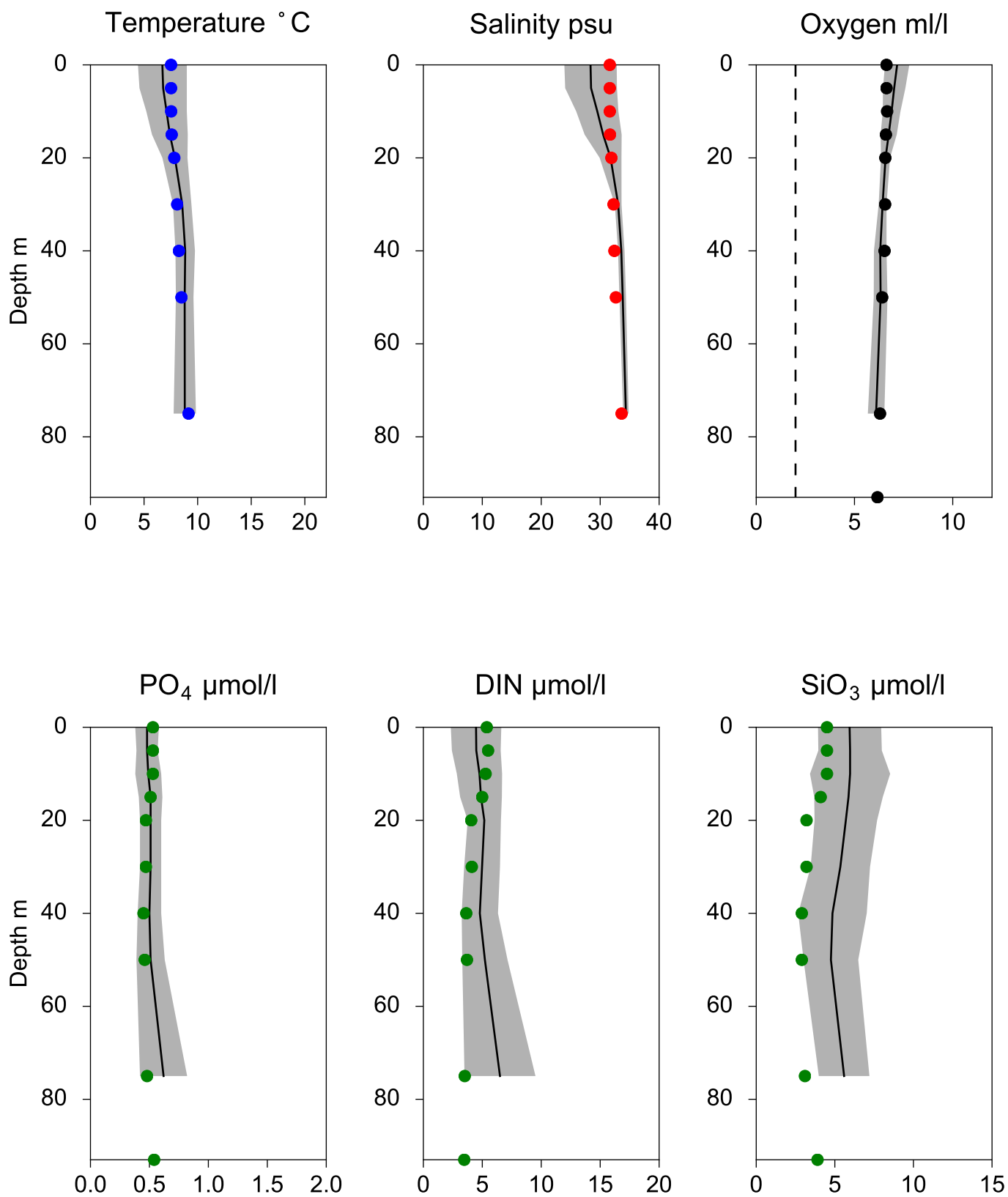


Vertical profiles P2 December

— Mean 2001-2015

■ St.Dev.

● 2019-12-15



STATION Å17 SURFACE WATER (0-10 m)

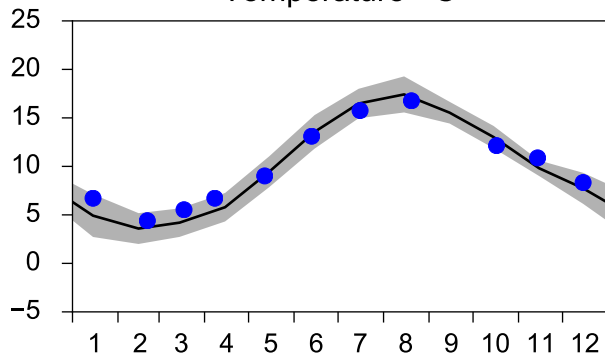
Annual Cycles

— Mean 2001-2015

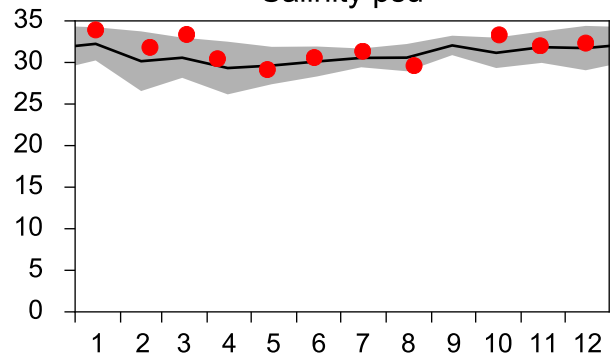
■ St.Dev.

● 2019

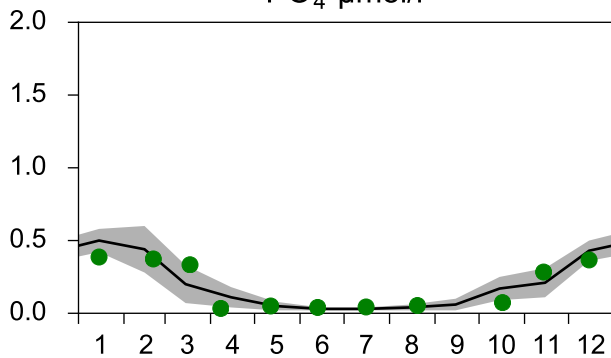
Temperature °C



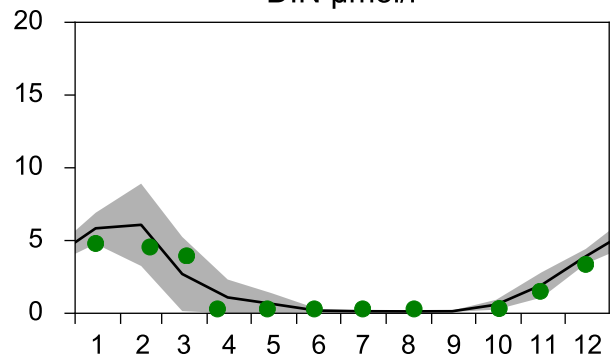
Salinity psu



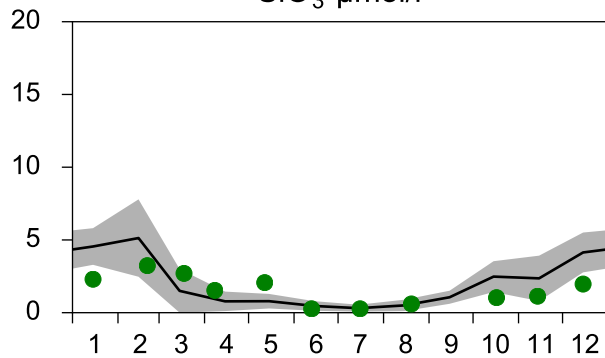
PO₄ µmol/l



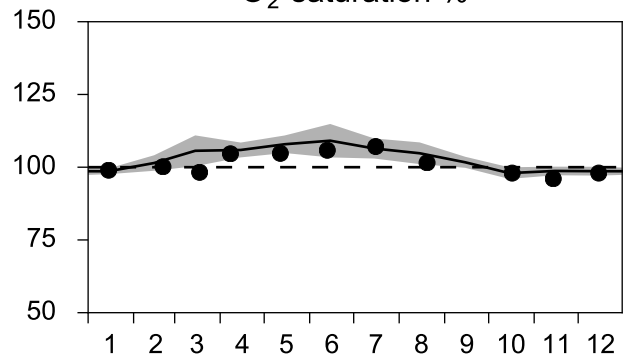
DIN µmol/l



SiO₃ µmol/l

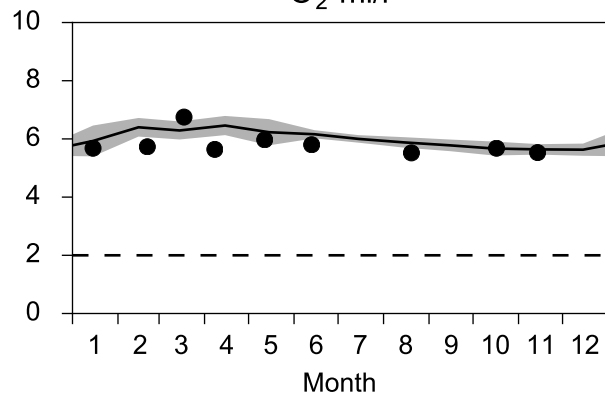


O₂ saturation %

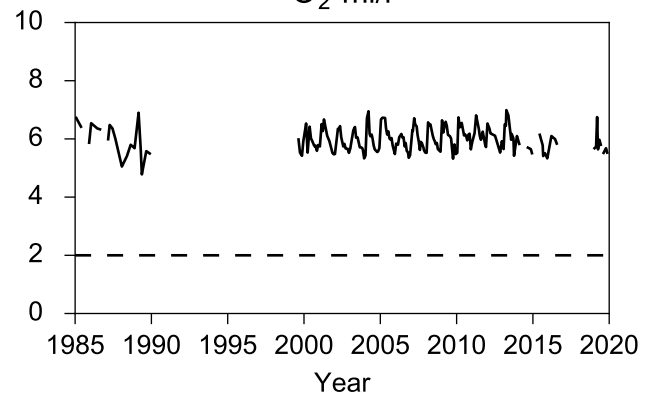


OXYGEN IN BOTTOM WATER (depth >= 300 m)

O₂ ml/l

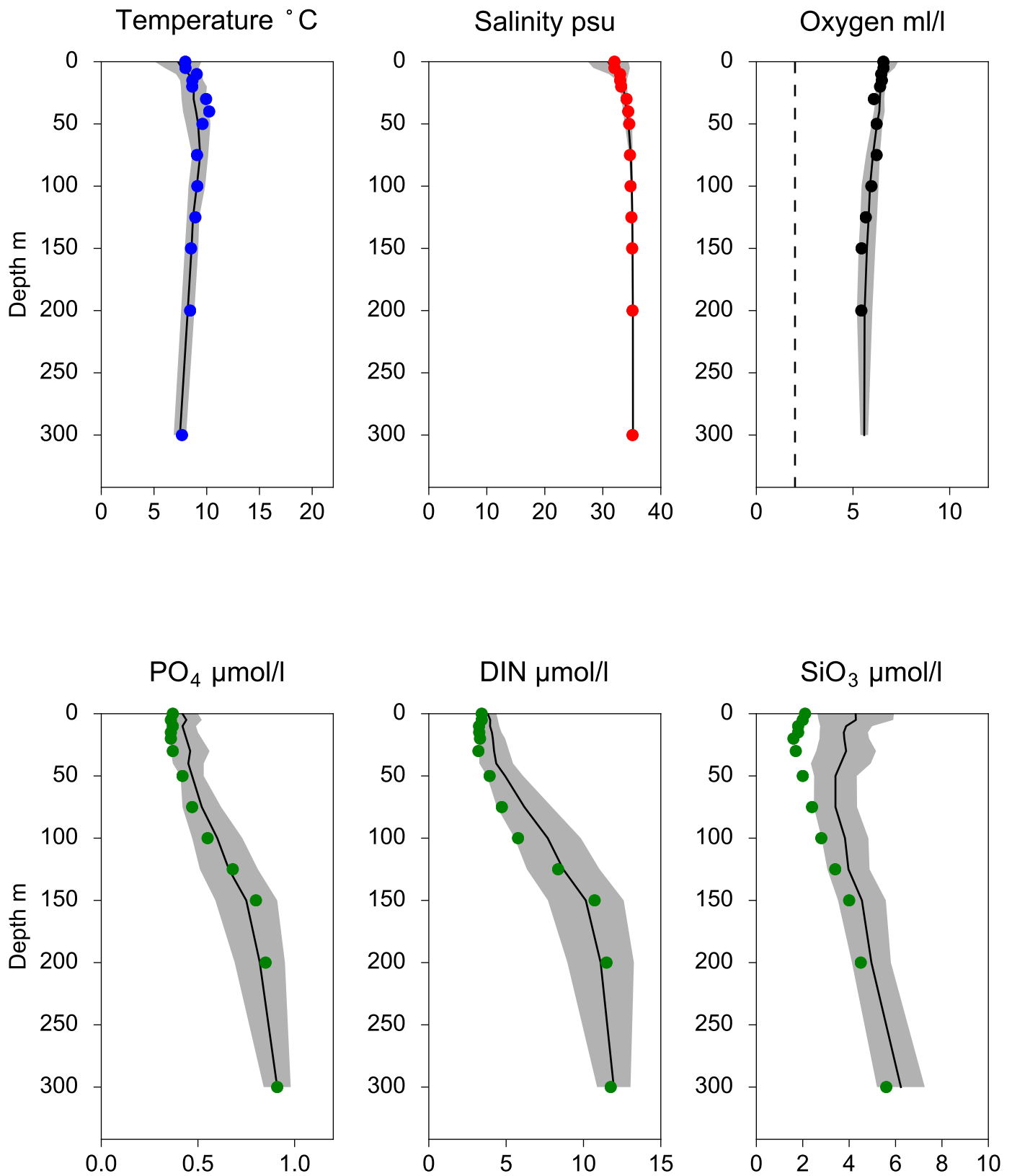


O₂ ml/l



Vertical profiles Å17 December

— Mean 2001-2015 St.Dev. • 2019-12-15



STATION Å15 SURFACE WATER (0-10 m)

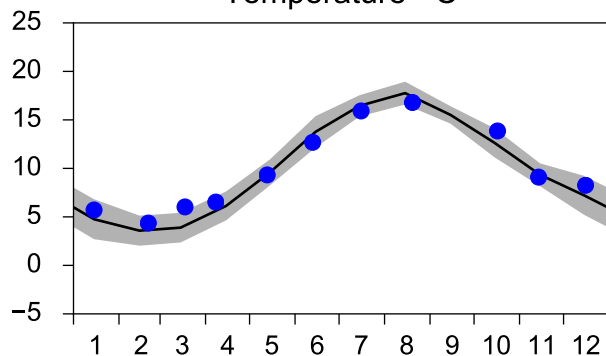
Annual Cycles

— Mean 2001-2015

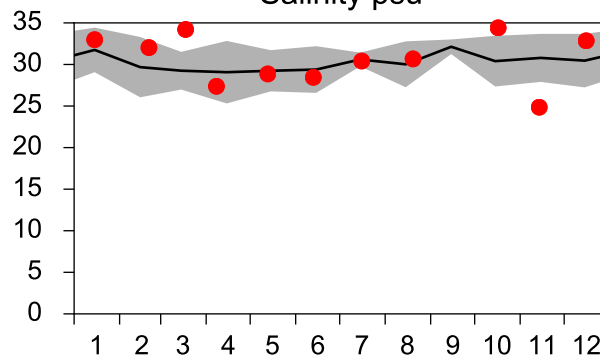
■ St.Dev.

● 2019

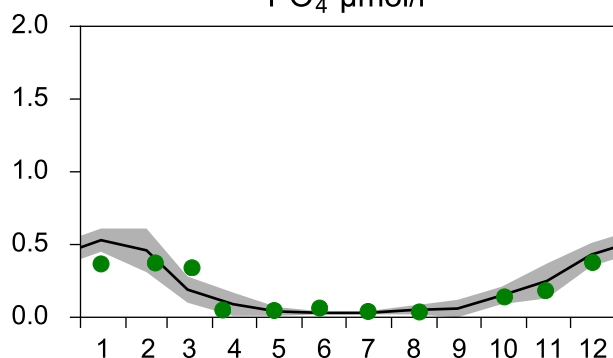
Temperature °C



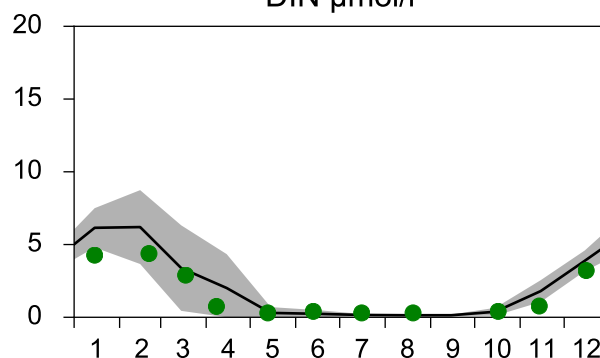
Salinity psu



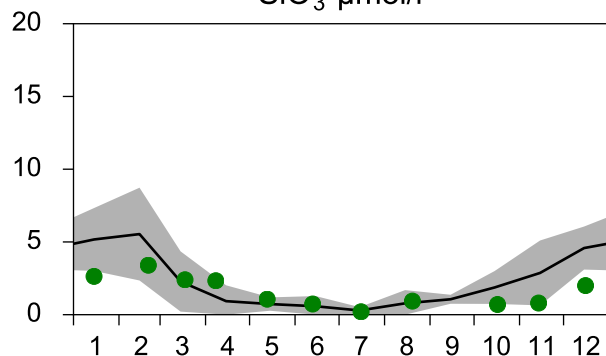
PO₄ µmol/l



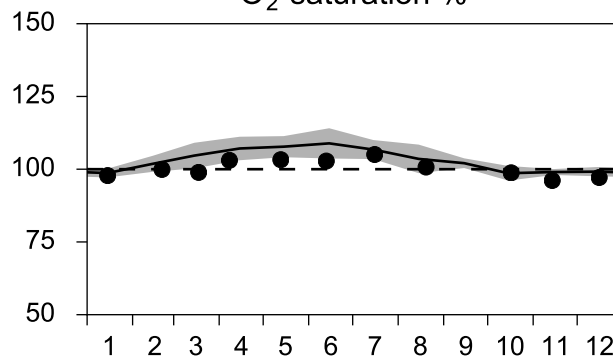
DIN µmol/l



SiO₃ µmol/l

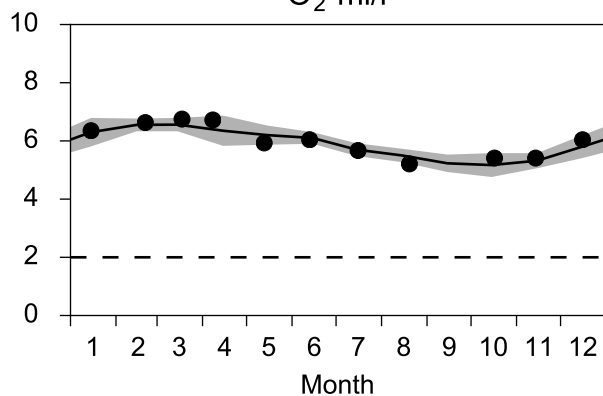


O₂ saturation %

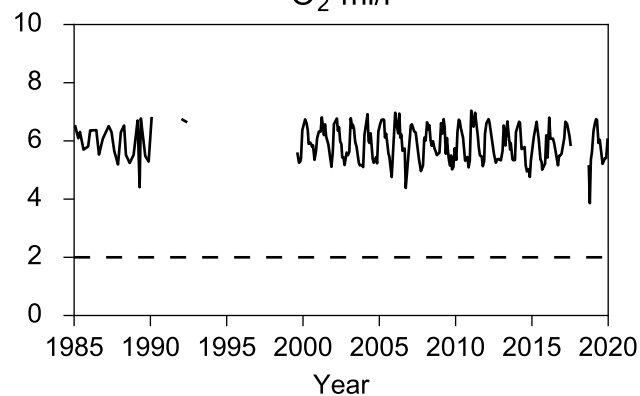


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

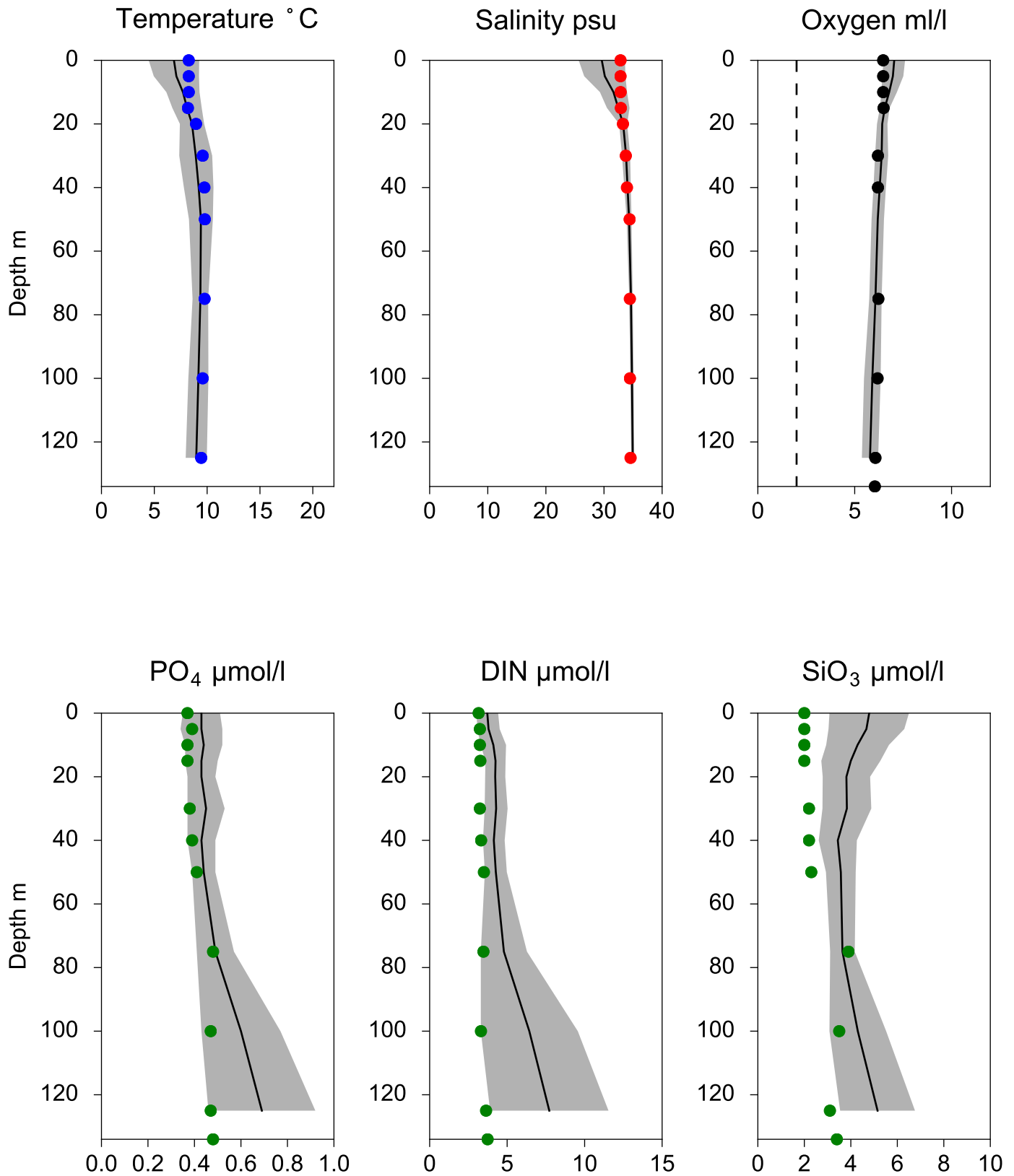


O₂ ml/l



Vertical profiles Å15 December

— Mean 2001-2015 St.Dev. • 2019-12-16



STATION Å13 SURFACE WATER (0-10 m)

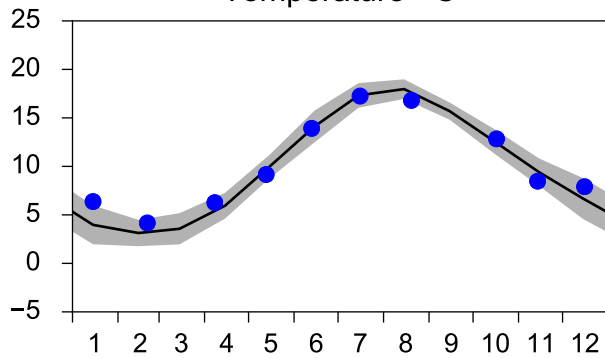
Annual Cycles

— Mean 2001-2015

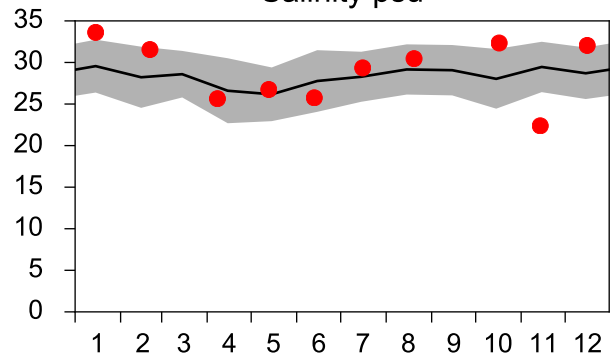
■ St.Dev.

● 2019

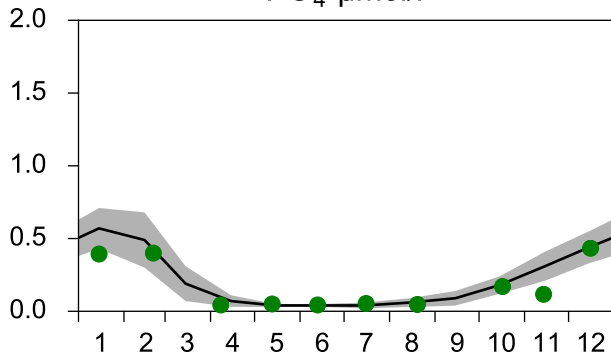
Temperature °C



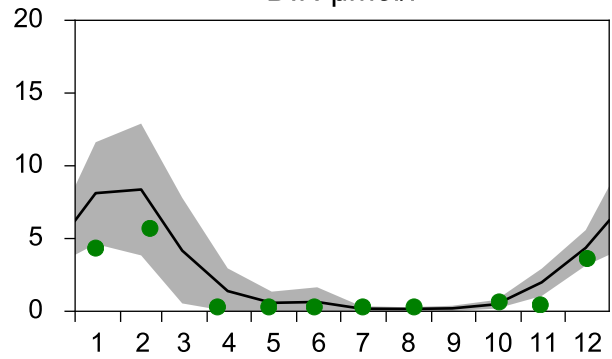
Salinity psu



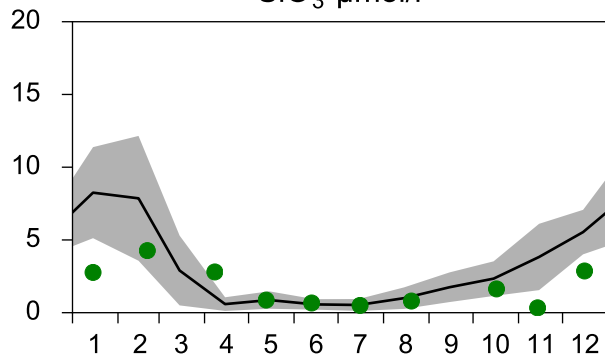
PO₄ µmol/l



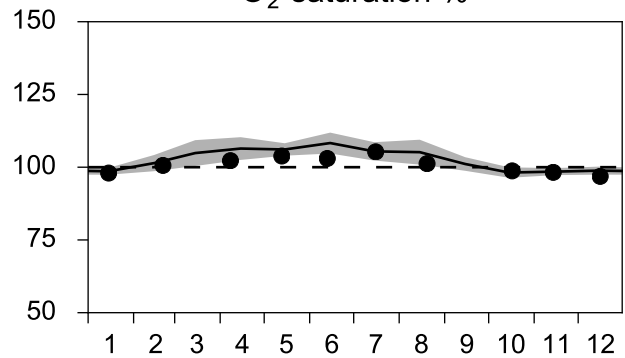
DIN µmol/l



SiO₃ µmol/l

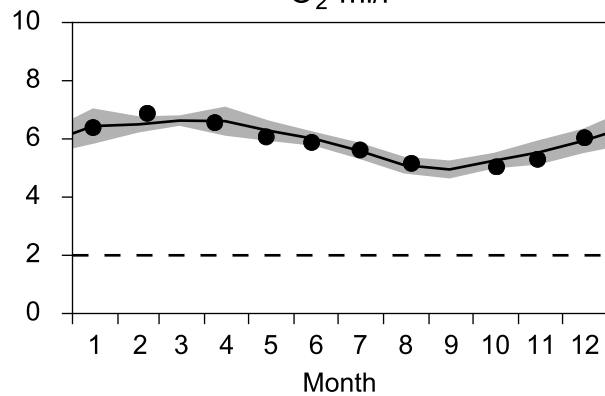


O₂ saturation %

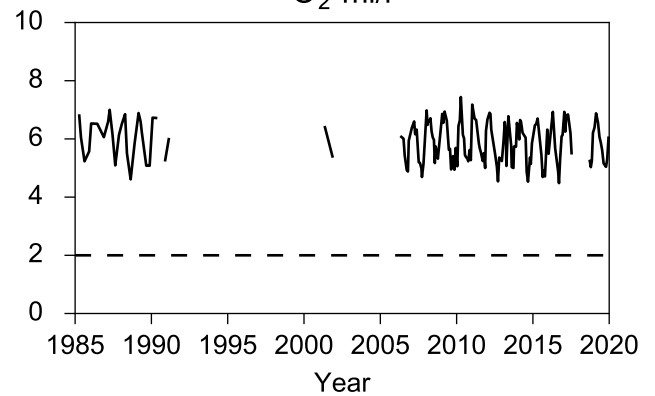


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

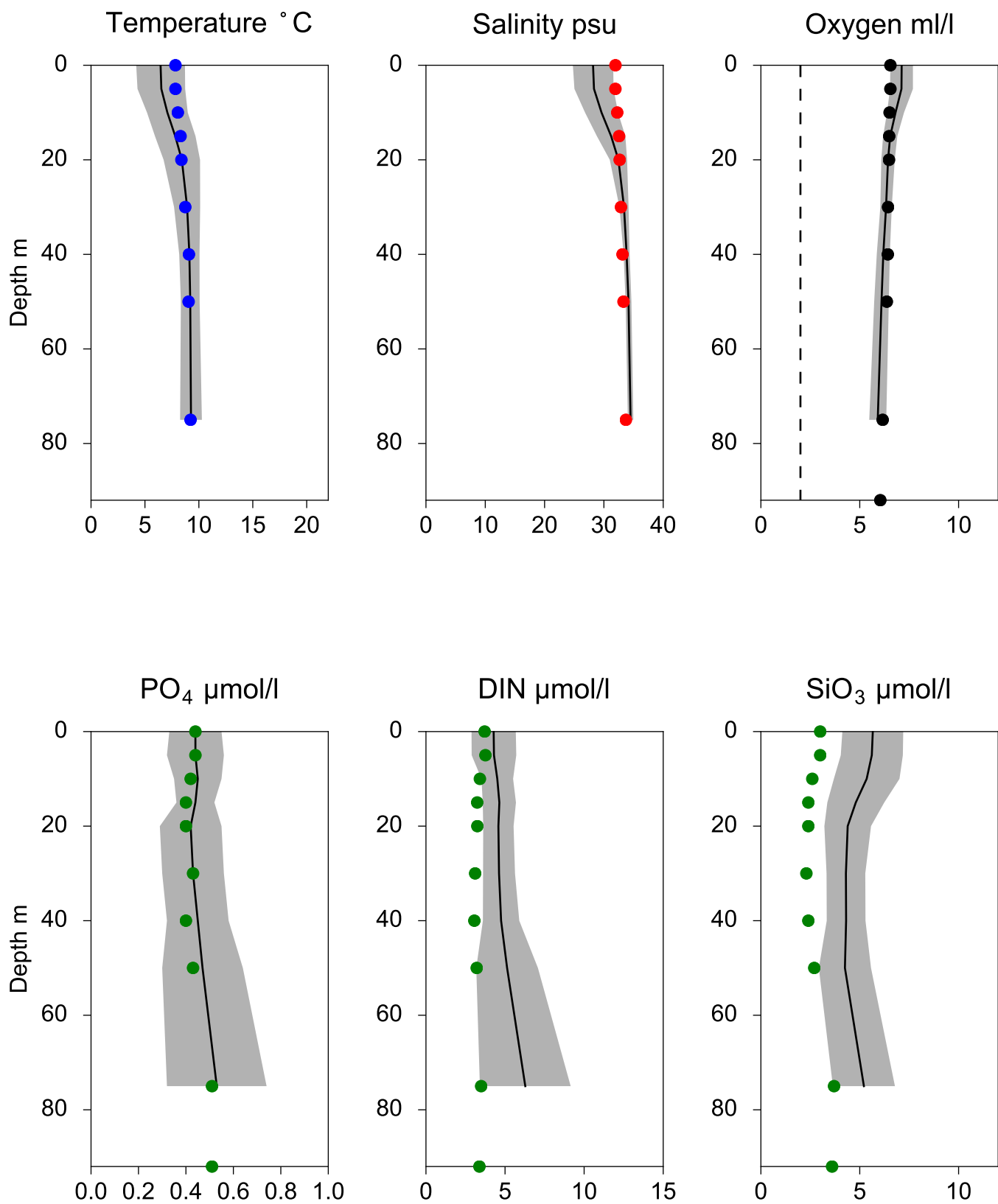


O₂ ml/l



Vertical profiles Å13 December

— Mean 2001-2015 ■ St.Dev. ● 2019-12-16



STATION SLÄGGÖ SURFACE WATER (0-10 m)

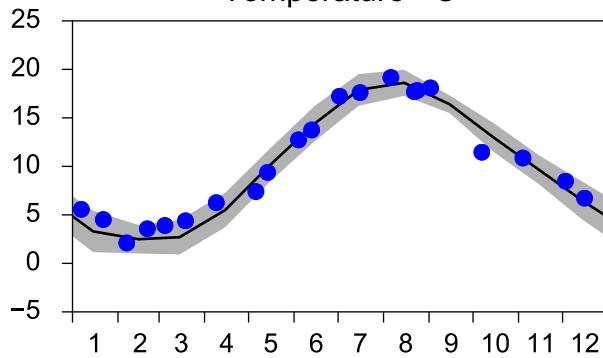
Annual Cycles

— Mean 2001-2015

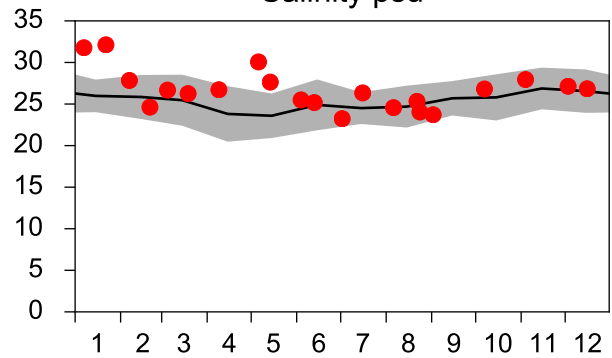
■ St.Dev.

● 2019

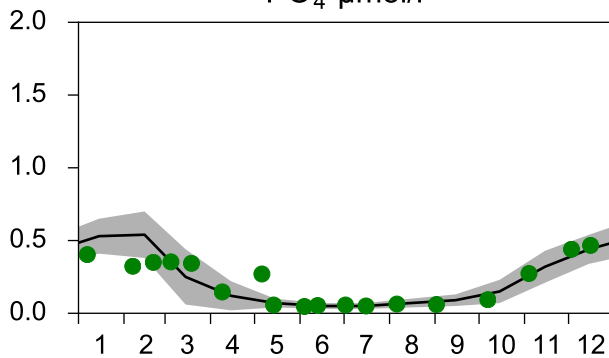
Temperature °C



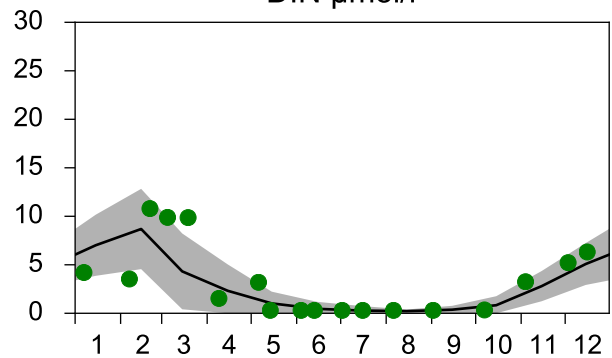
Salinity psu



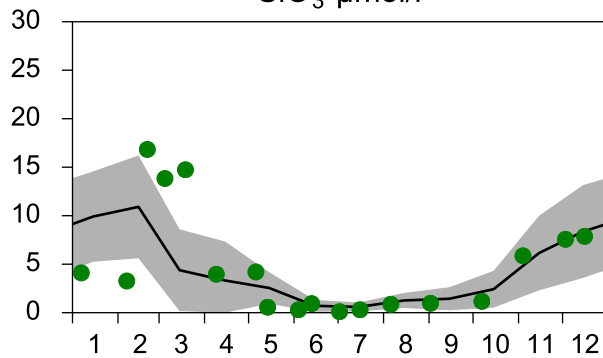
PO₄ µmol/l



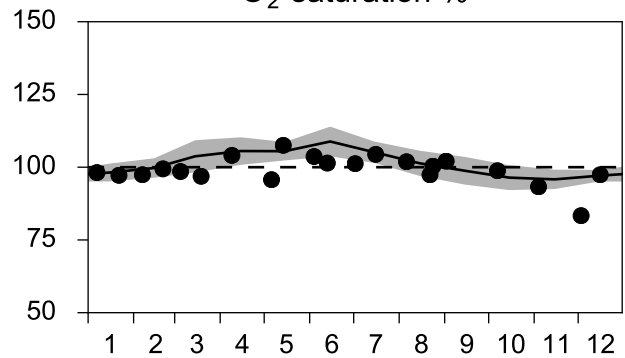
DIN µmol/l



SiO₃ µmol/l

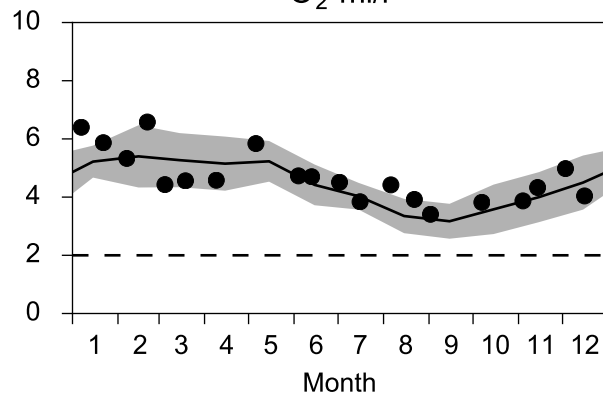


O₂ saturation %

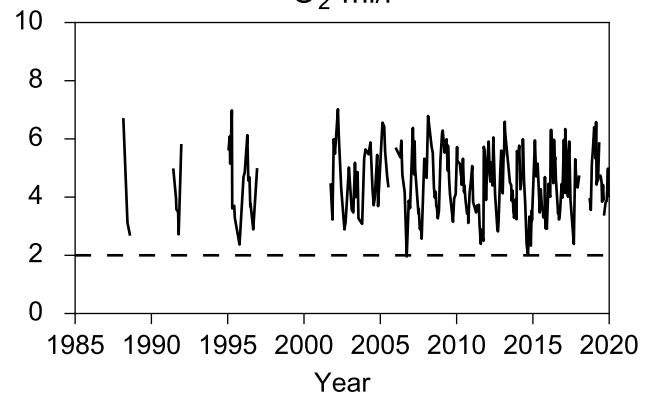


OXYGEN IN BOTTOM WATER (depth >= 64 m)

O₂ ml/l



O₂ ml/l



Vertical profiles SLÄGGÖ December

— Mean 2001-2015

■ St.Dev.

● 2019-12-16

