

Report from the SMHI monitoring cruise with R/V Aranda



Survey period:

2019-11-09 – 2019-11-14

Principal:

Swedish Meteorological and Hydrological Institute (SMHI),
Swedish Agency for Marine and Water Management (SwAM).

Cooperation partners:

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SUMMARY

During the expedition, which is part of the Swedish national marine monitoring program, the Skagerak, the Kattegat, the Sound, the Baltic Proper and the Gulf of Finland was visited.

The surface temperature was normal for the season and varied between 8-11° C. At the west coast a pycnocline was observed at 10-20 meters and in the Baltic Proper the surface water was well mixed down to 30-40 meters.

The levels of nutrients in the surface water (0-10 m) were low but had started to increase at some stations. The concentration of phosphate, dissolved inorganic nitrogen and silicate was lower than normal in the surface at Skagerak and Kattegat, the dissolved inorganic nitrogen was close to the detection limit. Phosphate levels were normal in the Baltic Proper while the dissolved inorganic nitrogen was lower than normal in the Western Gotland Basin. Silicon levels were above normal at most stations in the Baltic Sea.

In Hanö Bight and in the Bornholm Basin hypoxia was noted from 70 meters and it were anoxic conditions close to the bottom at the Bornholm Basin. Hypoxia was noted from 60-70 meters in the Eastern Gotland Basin and hydrogen sulphide was measured from 135 meters at station BY15 and from 70 meters at station BY20. At BY20 it was small amounts of oxygen at 115 meters but anoxia occurred again below that. In the Western Gotland Basin hypoxia was noted from 60-80 meters and anoxia from 70-90 meters.

The next regular expedition is scheduled around 4th December.

Front page: R/V Aranda. Photo: Anna-Kerstin Thell.

RESULT

The expedition was conducted on board the Finnish research vessel Aranda and started in Helsinki on November 9th, 2019 and ended in Lysekil on November 14th. Weather was grey and it was mainly moderate winds, 6-8 m/s, from southeast to east. However, when the cruise reached Huvudskär the wind increased and the planned service on the Huvudskär buoy had to be cancelled.

Since this was the final cruise with R/V Aranda and the cruise ended in Lysekil, Anholt E was only visited once. Next cruise will be made with the Swedish research vessel Svea.

During the expedition, in addition to regular sampling, sampling was also performed to determine DNA within the project "DNA barcoding of marine phytoplankton" financed by the Swedish Agency for Marine and Water Management (SwAM) which includes all national monitoring stations where plankton is tested and will continue throughout 2019. Additional water and plankton samples were also taken to measure the selenium for EAWAG in Switzerland (Swiss Federal Institute of Aquatic Science and Technology).

Normally, no biological samples have been analyzed at the time of writing this report, but eventually there will be an algae report for the current month where more information on phytoplankton is available: <https://www.smhi.se/publikationer/publikationer/algrapporter>

This report is based on data that have passed a first quality control. When data are published at the national oceanographic data centre some values might have changed after further quality controls have been performed. Data from this cruise will be published as soon as possible at the data center's webpage, normally within a week after the cruise.

Data can be downloaded here: <http://www.smhi.se/klimatdata/oceanografi/havsmiljodata> (only available in Swedish).

The Skagerak

The temperature in the surface water (0-10 m) varied from 8.5 °C at the coast to 10.9 °C at the off shore Skagerak where it was a bit warmer than normal. With decreasing air temperatures the surface temperature has also decreased, but it was still higher temperature below the top layer and down to 50 meters where it again got colder. The sea surface salinity varied between 22.4-32.0 and was below normal at the stations Å13 and Å15. There was a pycnocline at 10-20 meters at all stations and another one at 50 meters.

At the outermost station in Skagerak, the levels of nutrients in the surface water were normal for the season and had started to increase a little, however, below the pycnocline and to 75 meters the levels were below normal. At the other stations, which are closer to the coast, nutrients levels were instead below normal. The concentrations of nutrients in the Skagerak surface water varied for phosphate with 0.12-0.28 µmol/l, dissolved inorganic nitrogen 0.24-1.51 µmol/l and silicate 0.33-1.13 µmol/l.

Oxygen concentrations in the bottom water were normal at all stations. A minor increase in the chlorophyll fluorescence was noted at about 10-15 meters.

The Kattegat and the Sound

The temperature in the surface water (0-10 m) was normal and about 9 °C. The salinity in the surface water varied between 19.8-22.9 in Kattegat, which is normal, while it was lower than

normal in the Sound (9.1). A pycnocline was found at about 20 m, where the salinity increased to 34-35 in the bottom water, the temperature below the pycnocline first increased a couple of degrees and then dropped again towards the bottom. The pycnocline in the Sound was sharp and found at 10 meters.

The levels of dissolved inorganic nitrogen were below normal for the season, in Kattegat close to the detection limit and in the Sound 1.2 $\mu\text{mol/l}$. The concentration of phosphate and silicate was lower than normal at the stations N14 Falkenberg and Anholt E but normal in the Sound. Phosphate varied between 0.14-0.37 $\mu\text{mol/l}$ and silicate 0.4-9.5 μmol . Highest levels of nutrients were observed in the Sound.

Small peaks in chlorophyll fluorescence were noted at 13 meters at Fladen and 17 meters at N14 Falkenberg and Anholt E. No oxygen deficiency was noted and the oxygen concentration was normal in both surface water and bottom water at all stations

The Baltic Proper

The sea surface temperature in November varied between 8-11°C and had decreased since October. At some stations, BY5 in Arkona, BY15 in the Eastern Gotland Basin and BY29 in the Northern Gotland Basin, the temperature was slightly above normal. The sea surface salinity varied between 6.6-8.25 and was slightly above normal at BY15 and BY29 and below normal in the Bornholm- and Western Gotland Basin. The surface water was well mixed down to 30-40 meters at all stations. The halocline was found at 40 meters in Arkona, 50 meters in Bornholm and about 60 meters in the rest of the basins. In the deep water, the salinity and temperature were above normal, which it has been since the last major inflow to the Baltic in the winter of 2014-2015.

No oxygen deficiency (hypoxia, oxygen concentrations < 2ml/l) was observed in the Arkona Basin. In Hanö Bight and in the Bornholm Basin hypoxia was noted from 70 meters and it were anoxic conditions close to the bottom at the Bornholm Basin. At the station BCS III-10 in the southern part of the Eastern Gotland Basin, low concentrations of oxygen was measured at the bottom at 90 meters but above that at 80 meters small concentrations of hydrogen sulphide was observed. Hypoxia was noted from 60-70 meters in the Eastern Gotland Basin and hydrogen sulphide was measured from 135 meters at station BY15 and from 70 meters at station BY20. At BY20 it was small amounts of oxygen at 115 meters but anoxia occurred again below that. In the Western Gotland Basin hypoxia was noted from 60-80 meters and anoxia from 70-90 meters.

The surface concentrations (0-10 m) of mainly phosphate and silicate, but at some stations also dissolved inorganic nitrogen, had started to increase again after the summer, which is normal for the season. The levels of phosphate were normal (0.23-0.46 $\mu\text{mol/l}$) except at the station RefM1V1 where it was above normal (0.72 $\mu\text{mol/l}$). It was large variations of dissolved inorganic nitrogen (DIN) in the surface water. In the north at BY29, DIN was higher than normal (2.2 $\mu\text{mol/l}$) and in the Western Gotland Basin DIN was below normal (0.31-0.41 $\mu\text{mol/l}$), at the other stations DIN was normal. The surface levels of silicate were above normal at most of the stations and were 9.7-15.2 $\mu\text{mol/l}$ in the open parts and 19.3 $\mu\text{mol/l}$ at the coastal station RefM1V1.

The nutrient levels in the deep water were normal in the Arkona- and Bornholm Basins and increased towards the bottom. In the Eastern Gotland Basin, the levels were mostly normal but clearly influenced by the variations between completely anoxic and weakly oxygenated water below the halocline. The levels of both DIN and phosphate increased at 70-80 m, where the oxygen was completely exhausted, and then decreased again when low oxygen levels were measured. Clear connections between oxygen and nutrients were seen at the station BY15. In the northern part at

station BY29, silicate was below normal under the halocline. In the Western Gotland Basin, the levels of DIN were well above normal in the anoxic water with high levels of hydrogen sulphide. Phosphate and silicate were slightly higher than normal around 40-60 m where oxygen was also lower than normal.

The chlorophyll fluorescence was higher in the top 30 meters but no major peaks were noted.

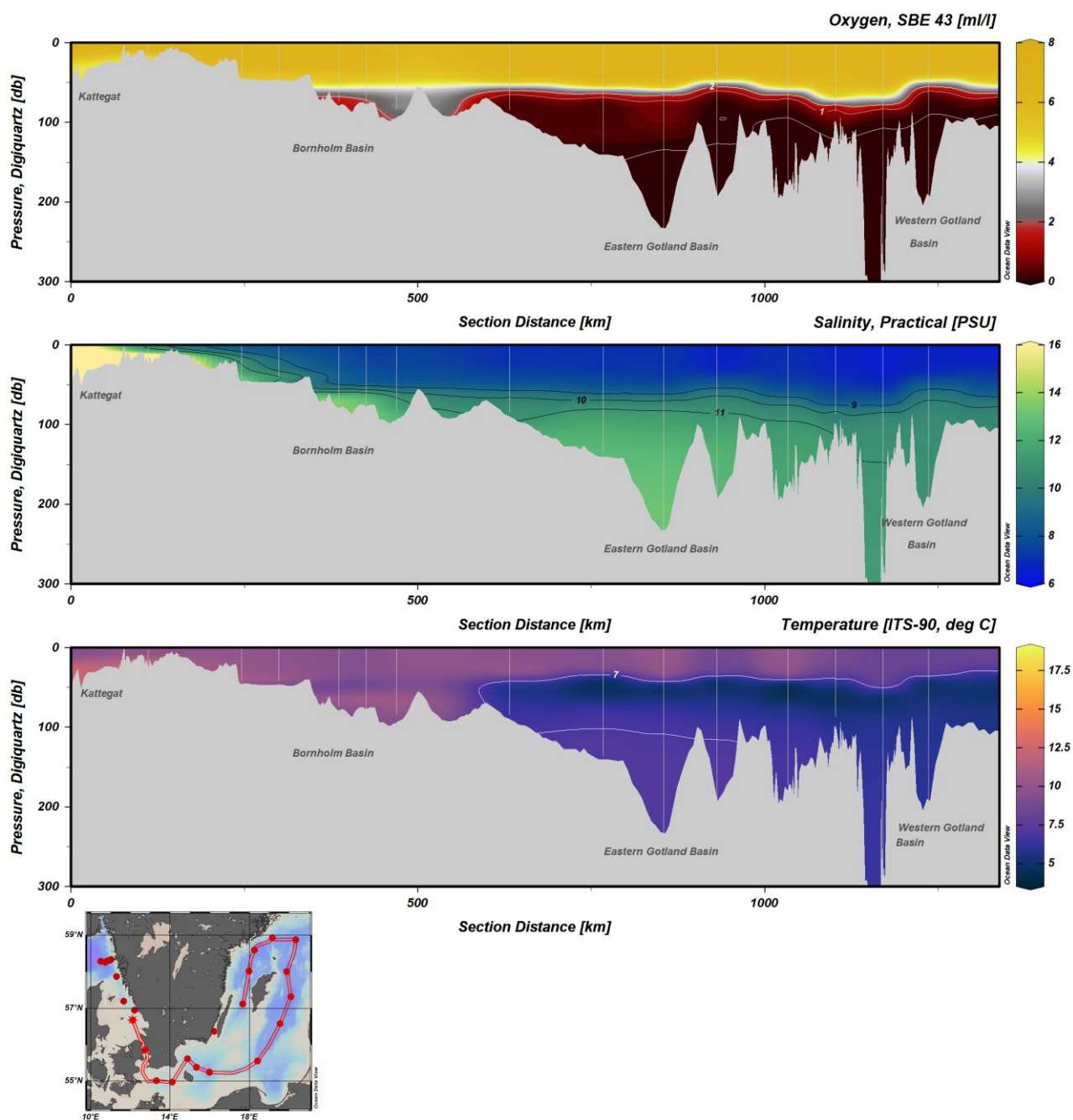


Figure 1. Transect showing dissolved oxygen, salinity and temperature from the Sound, through the Baltic Proper, to the Western Gotland Basin. Grey lines mark the positions that the plots are based on and below is a map showing these positions.

Participants

Name	Role	Section	From
Anna-Kerstin Thell	Expeditionsledare		SMHI
Sara Johansson			SMHI
Johan Kronsell			SMHI
Jenny Lycken	Kvalitetsansvarig		SMHI
Madeleine Nilsson			SMHI

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



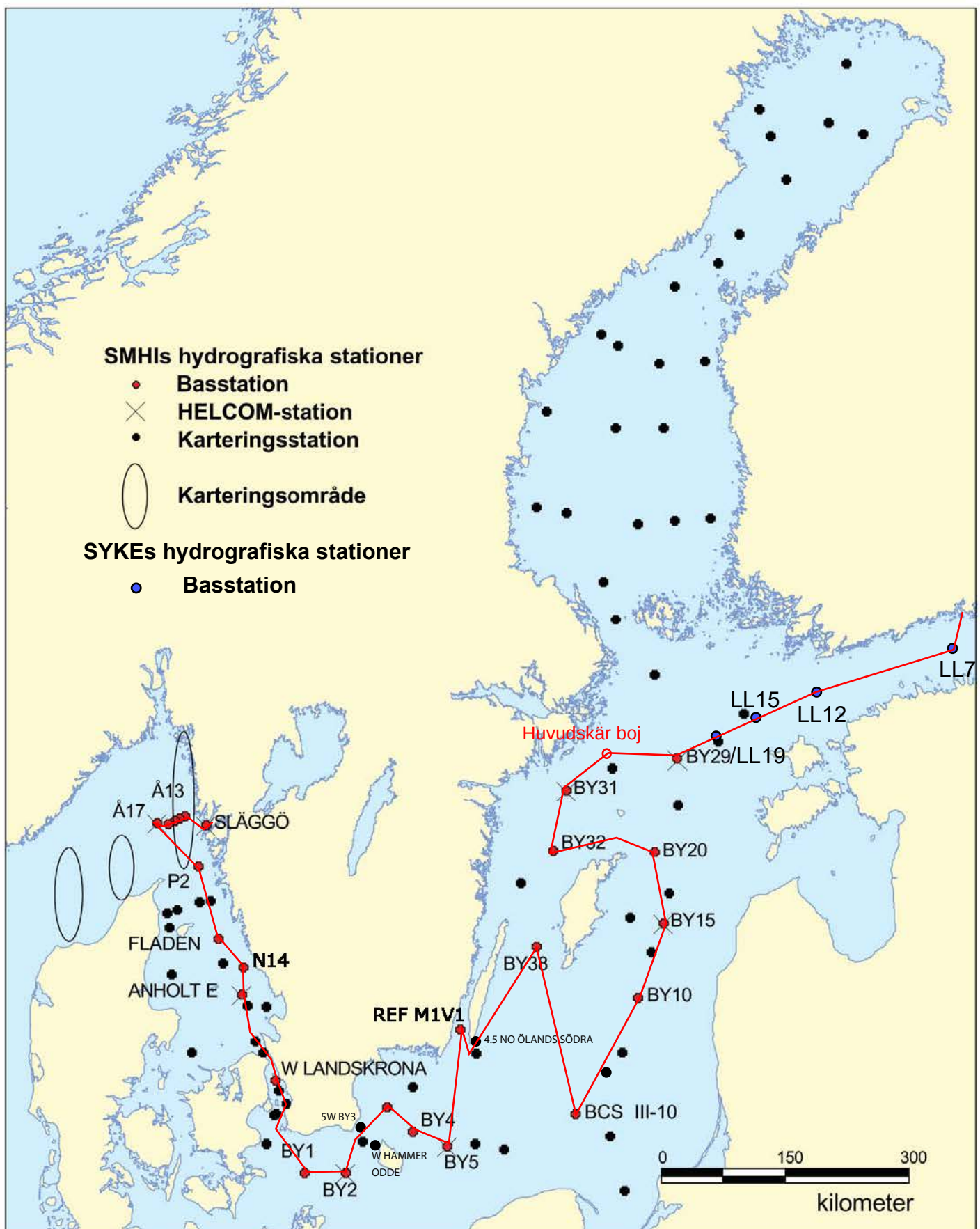
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Date:	20191109-20191114
Series:	0685-0713

Ship: R/V Aranda

Ship: R/V Aranda

Date: 20191109-20191114

Series: 0685-0713



Date: 2019-11-19
Time: 10:59

Ship: AR
Year: 2019

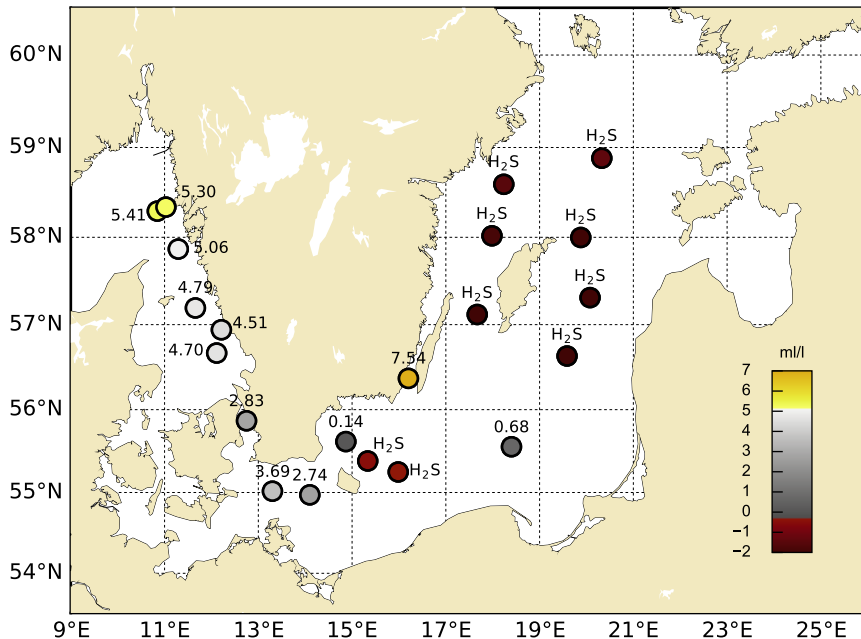
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0685	20	GFX29	SYK	BY23 / LL7	5950.78	02450.24	20191109	0940	103		15 10	6.8	1008	2830	x---	13	x x x x - x x - x x x x x x x - x - -
0686	20	BPNX60	SYK	LL12	5929.01	02253.78	20191109	1550	84		14 8	7.6	1005	6990	x---	11	x x x x - - x x x x x x x x x - x - -
0687	20	BPNX35	BAS...	BY29 / LL19	5852.93	02019.63	20191110	0030	176		13 3	10.1	1001	6990	x-x-	16	x x - x - x x x x x x x x x - x - x
0688	20	BPNX00	EXT...	HUVUDSKÄR	5855.91	01909.57	20191110	0430	91		34 12	5.5	1000	9990	----	12	- x - x - - x - - - - - - - - x -
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0692	20	BPEX26	BAS...	BY20 FÄRÖDJ	5759.88	01952.73	20191110	2020	196		32 6	5.2	1008	9990	x---	17	x x - x - x x x x x x x x x x - x - -
0693	20	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.73	02004.57	20191111	0100	239		31 5	6.4	1009	9990	xxx-	24	x x - x x x x x x x x x x x x x x -
0694	20	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.73	02004.56	20191111	0235	240		28 4	6.1	1009	9990	----	19	- x - x - - x - - - - - - - - - -
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Bottom water oxygen concentration (ml/l)

Ship: Aranda

Date: 20191110-20191114

Series: 0687-0713



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

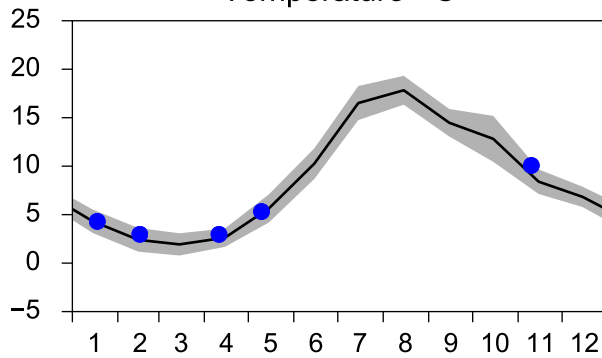
Annual Cycles

— Mean 2001-2015

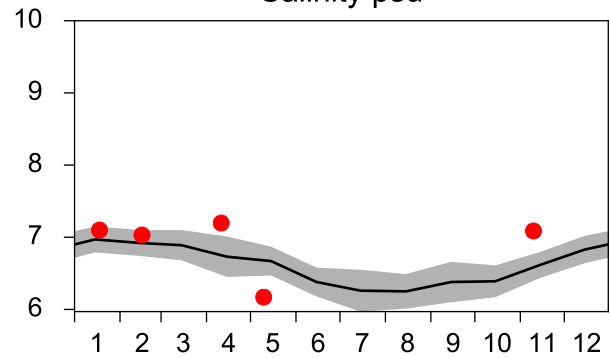
■ St.Dev.

● 2019

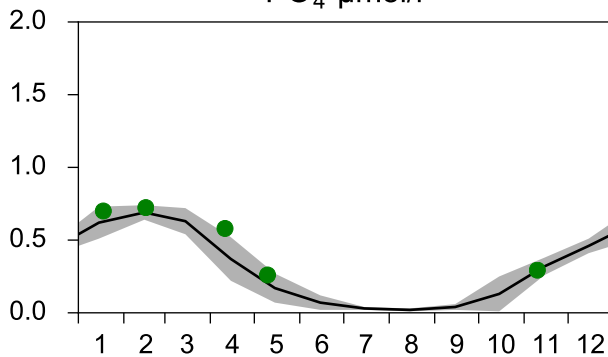
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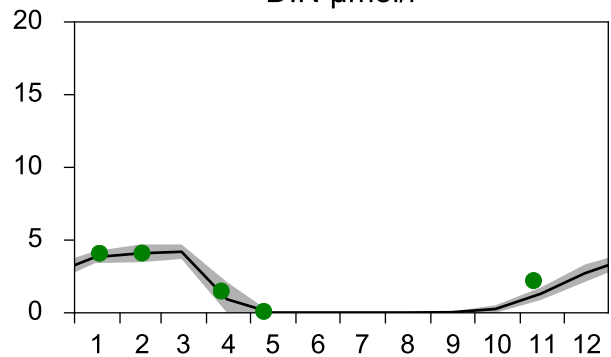
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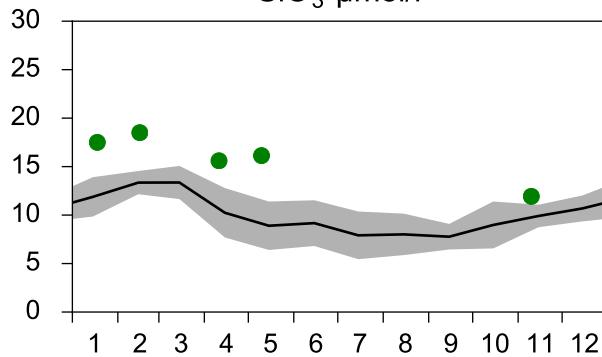
PO₄ µmol/l



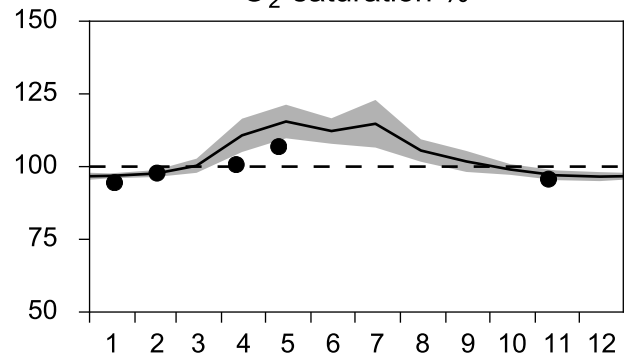
DIN µmol/l



SiO₃ µmol/l

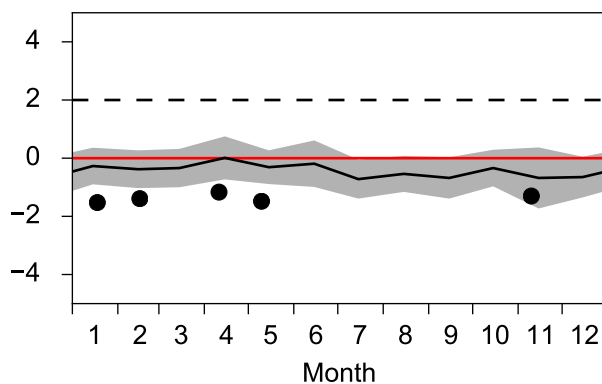


O₂ saturation %

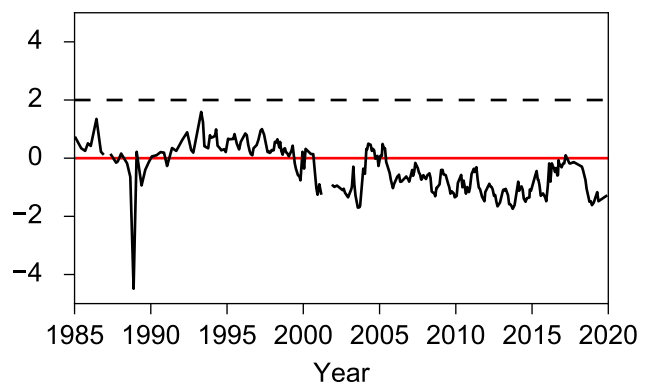


OXYGEN IN BOTTOM WATER (depth >= 150 m)

O₂ ml/l

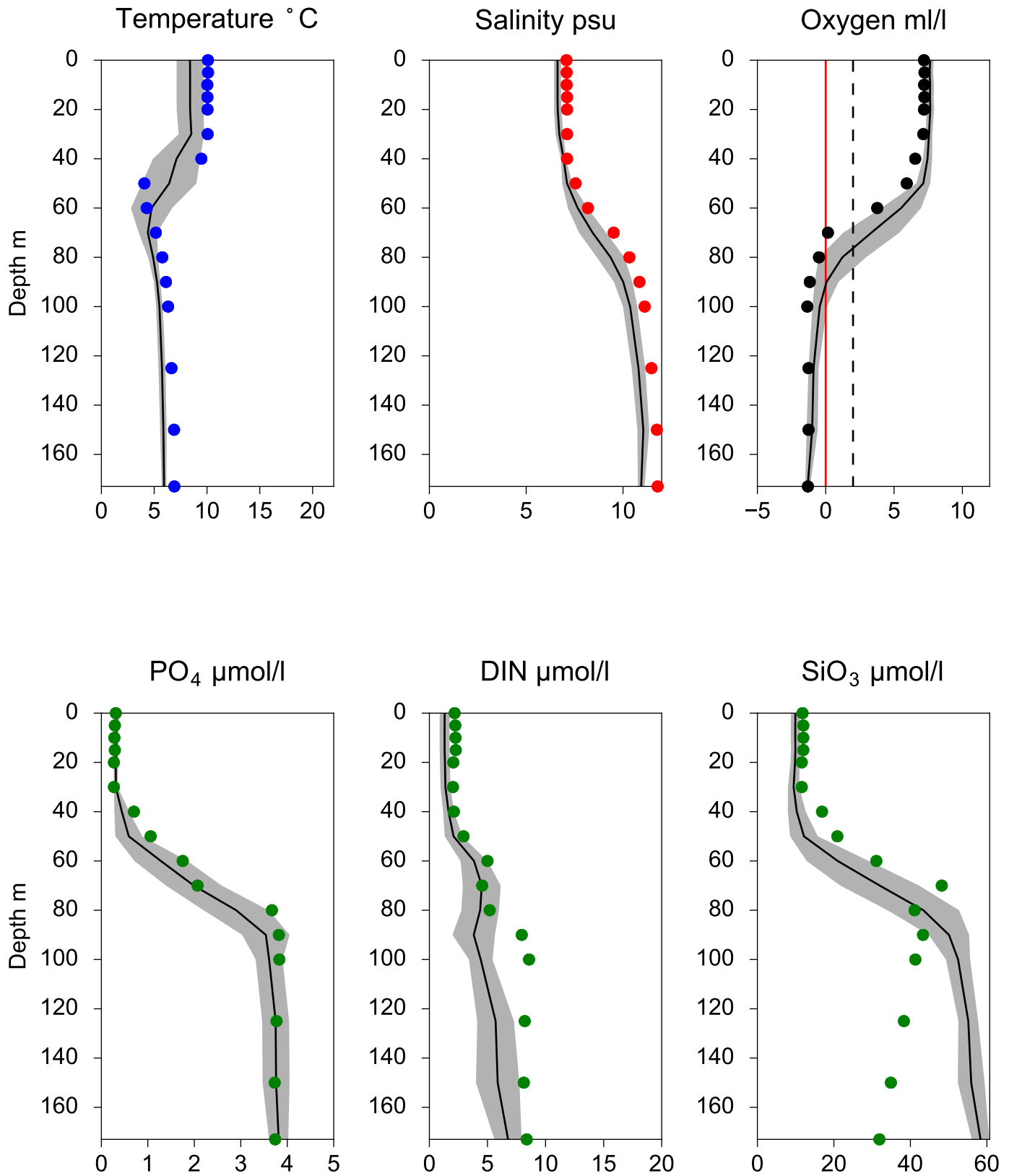


O₂ ml/l



Vertical profiles BY29 / LL19 November

— Mean 2001-2015 St.Dev. • 2019-11-10



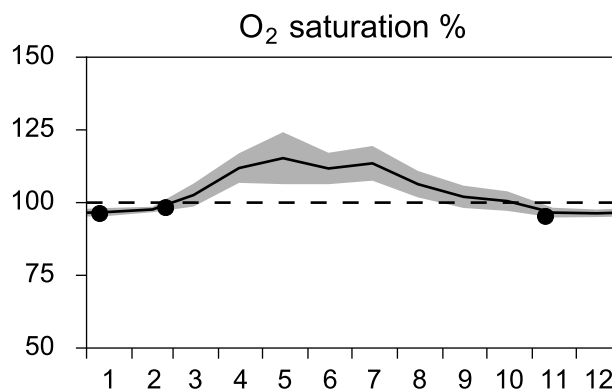
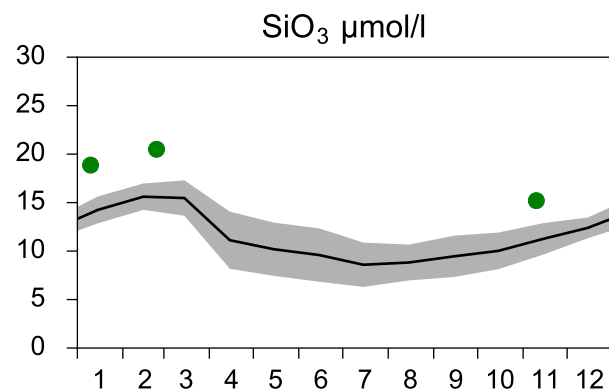
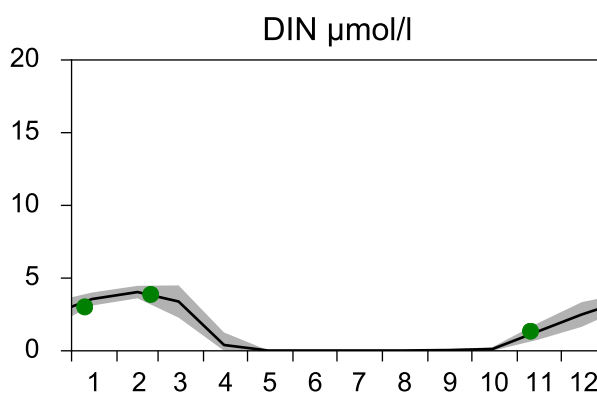
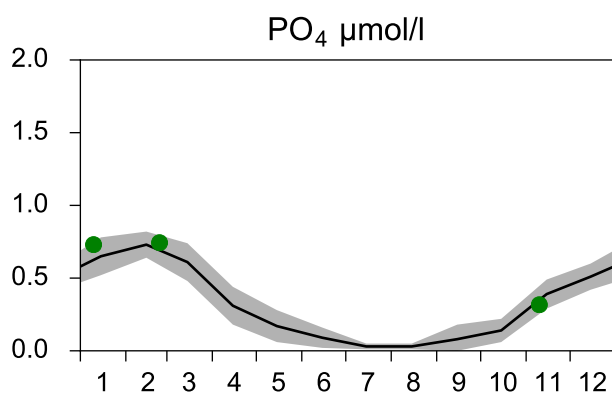
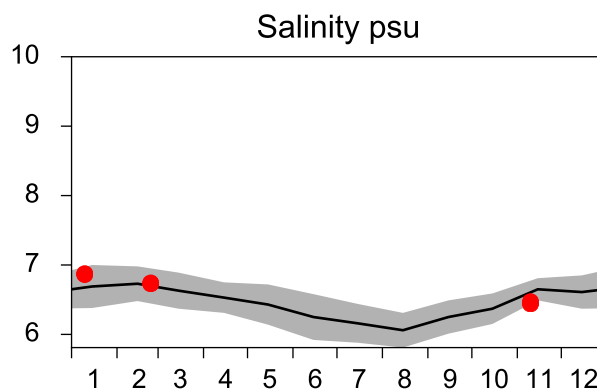
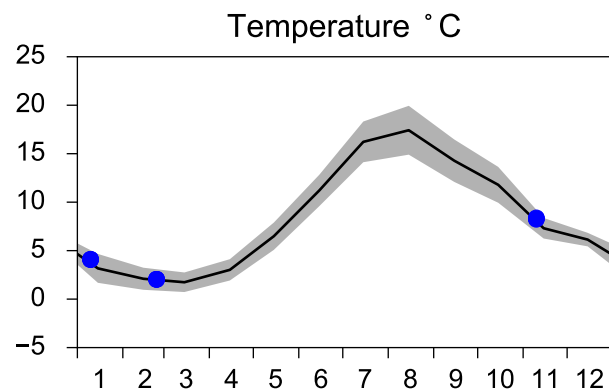
STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

Annual Cycles

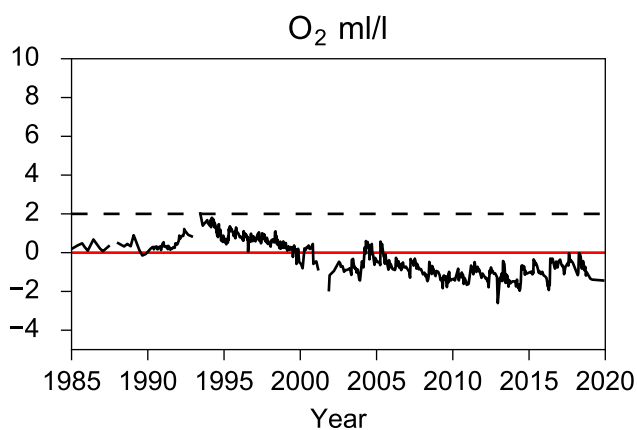
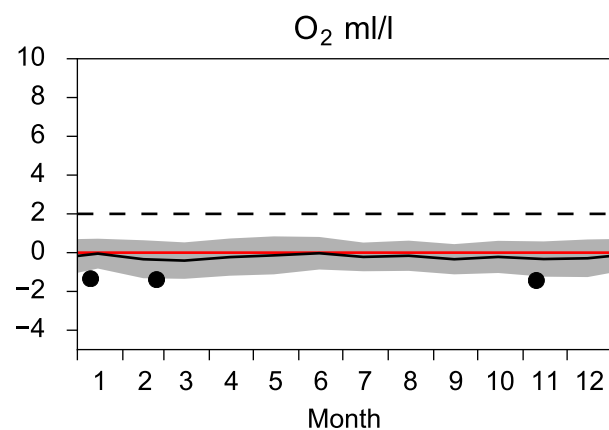
— Mean 2001-2015

■ St.Dev.

● 2019

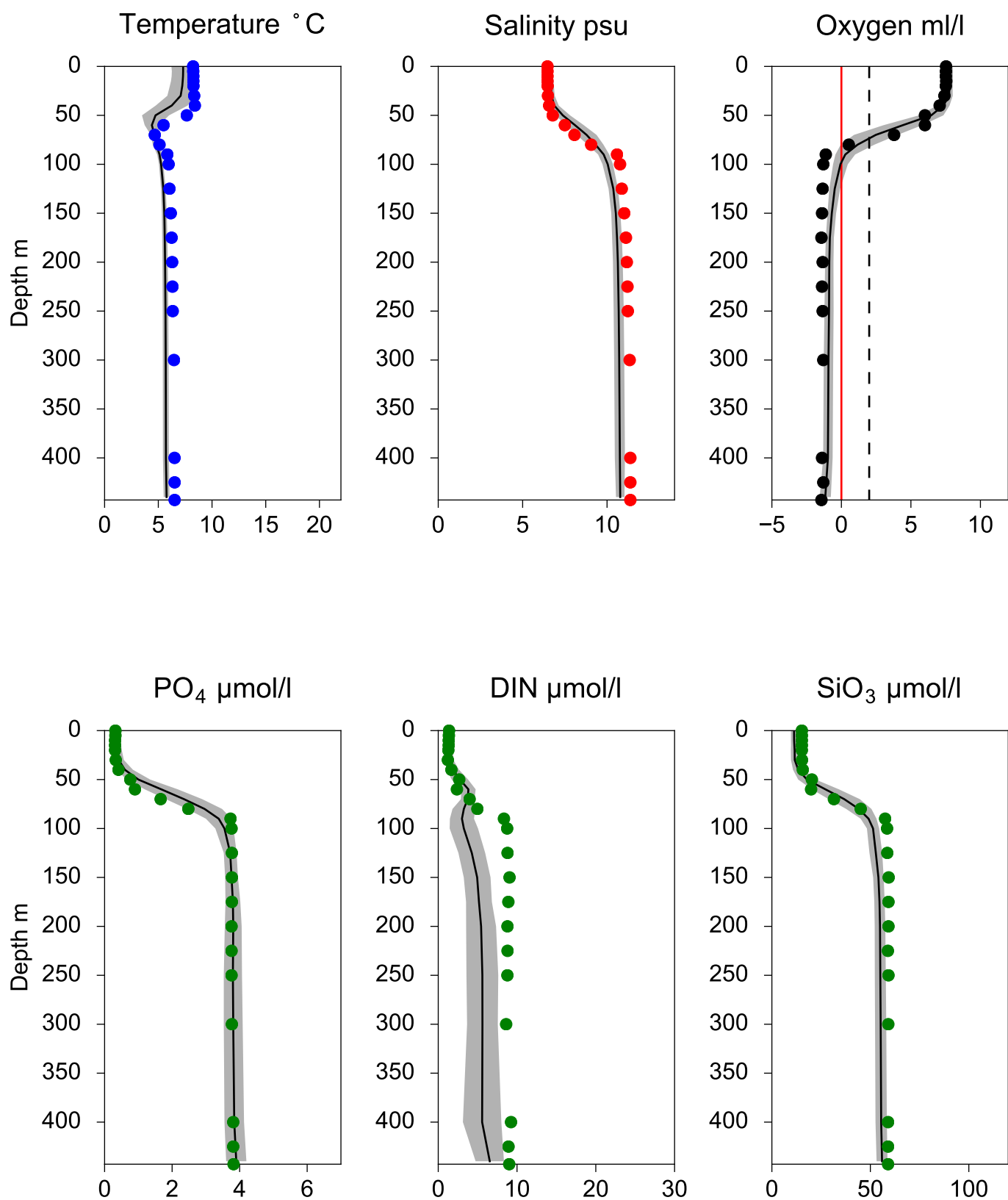


OXYGEN IN BOTTOM WATER (depth >= 425 m)



Vertical profiles BY31 LANDSORTSDJ November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-10



STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

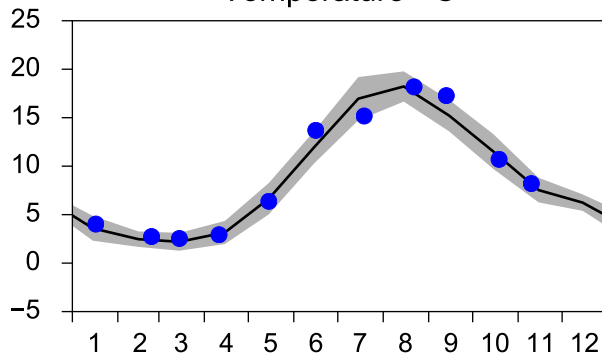
Annual Cycles

— Mean 2001-2015

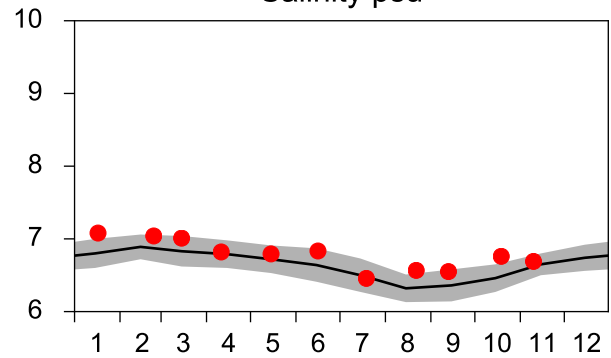
■ St.Dev.

● 2019

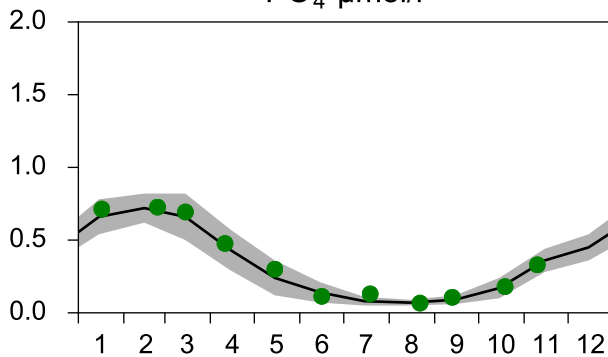
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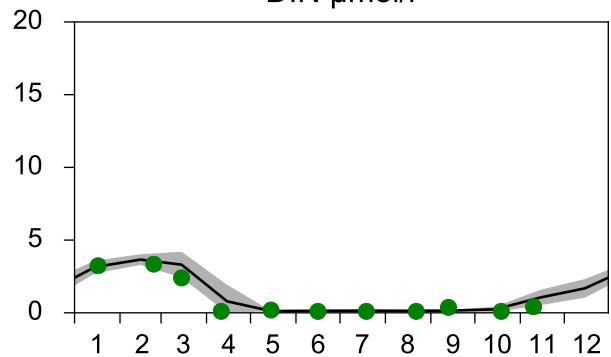
Salinity psu



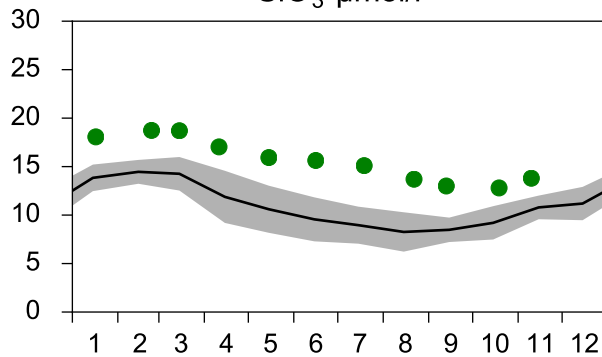
PO₄ µmol/l



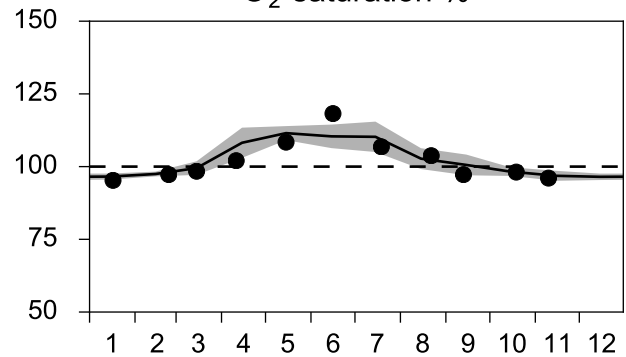
DIN µmol/l



SiO₃ µmol/l

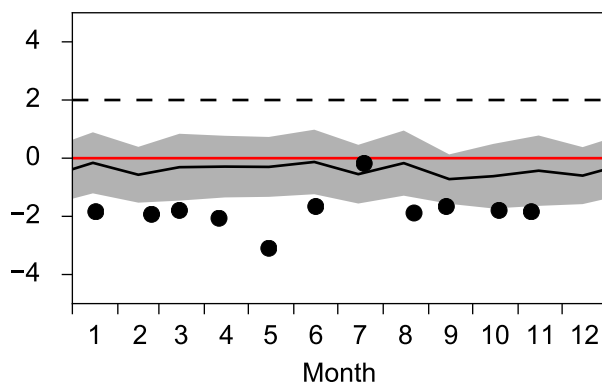


O₂ saturation %

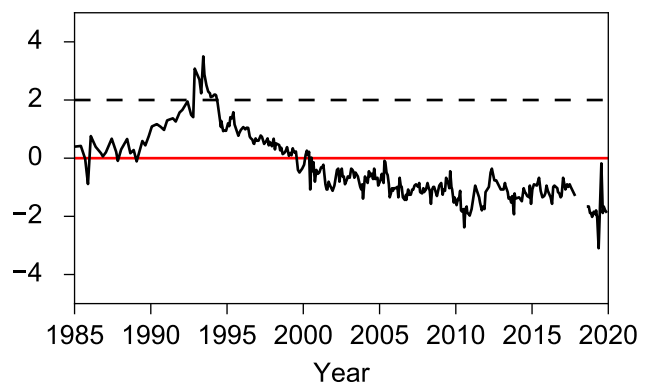


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l

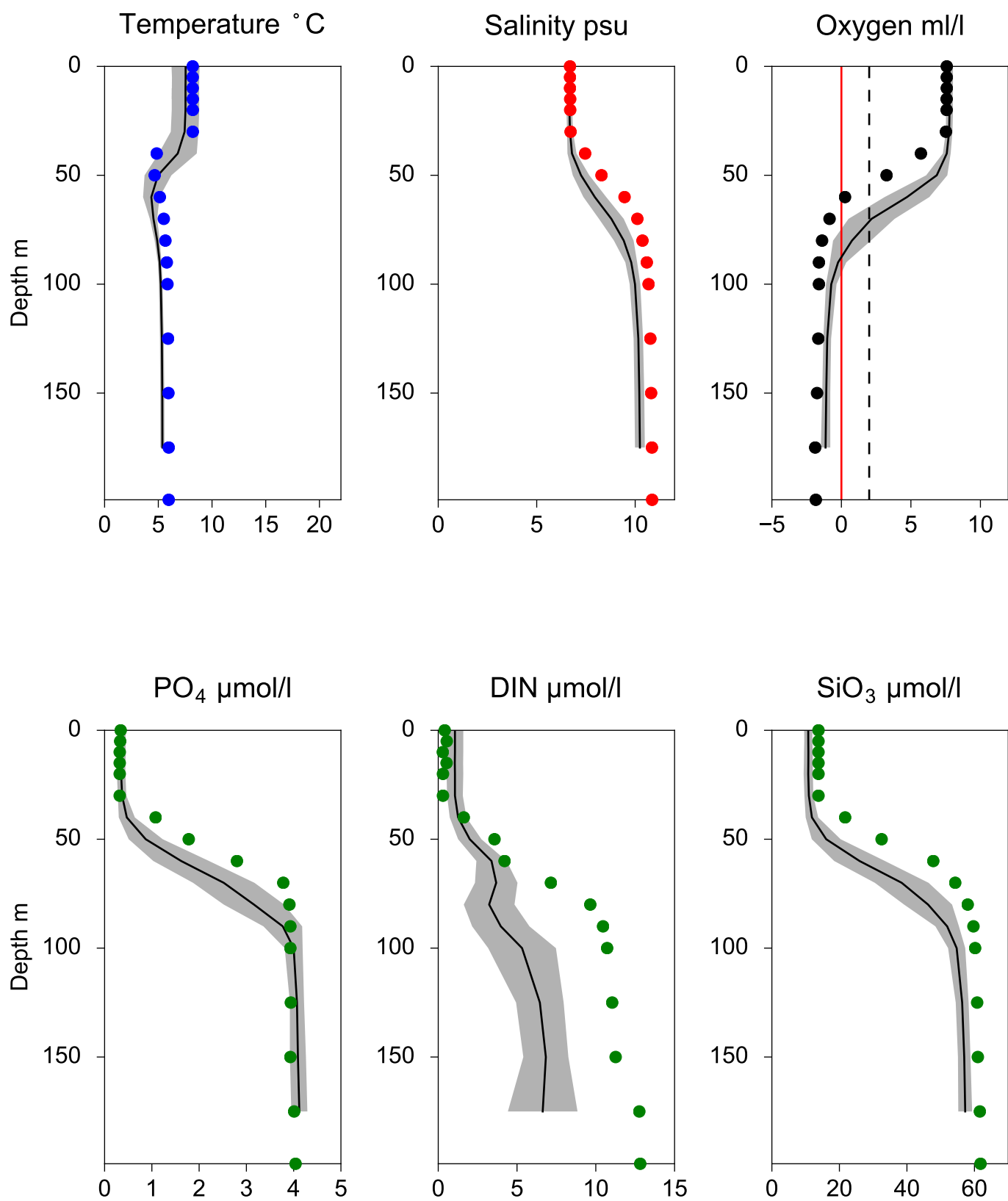


O₂ ml/l



Vertical profiles BY32 NORRKÖPINGSDJ November

— Mean 2001-2015 St.Dev. • 2019-11-10



STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

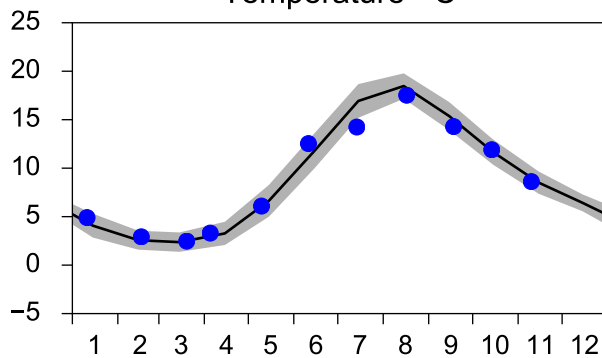
Annual Cycles

— Mean 2001-2015

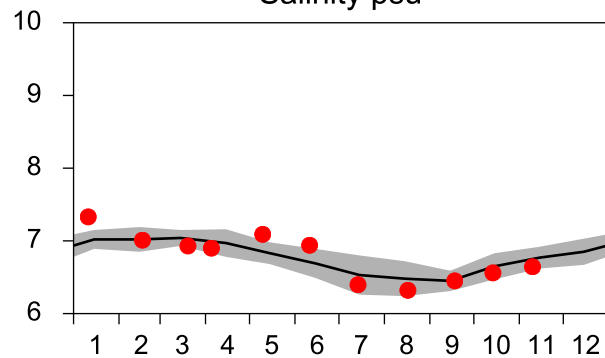
■ St.Dev.

● 2019

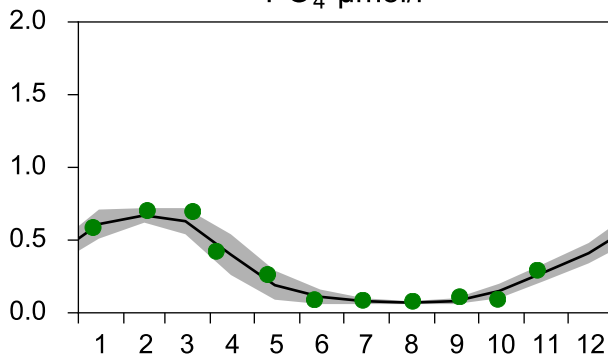
Temperature °C



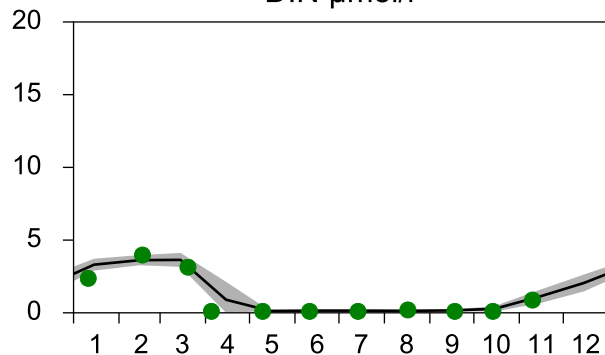
Salinity psu



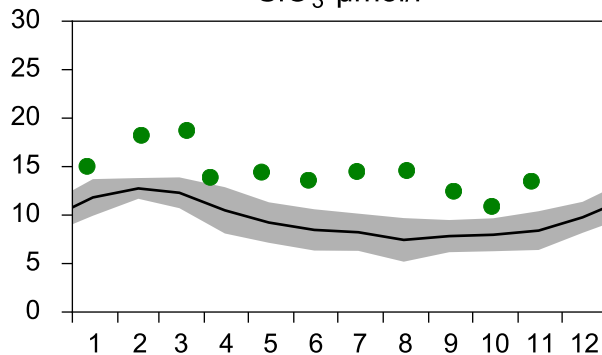
PO₄ µmol/l



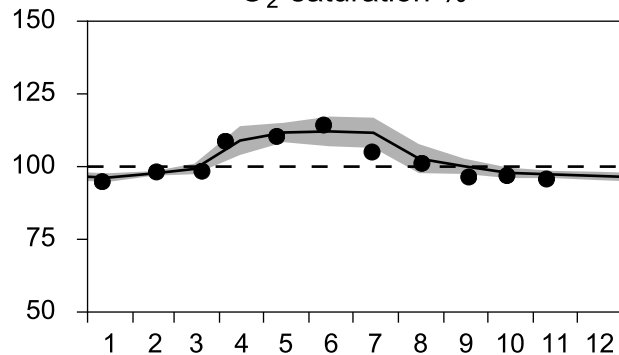
DIN µmol/l



SiO₃ µmol/l

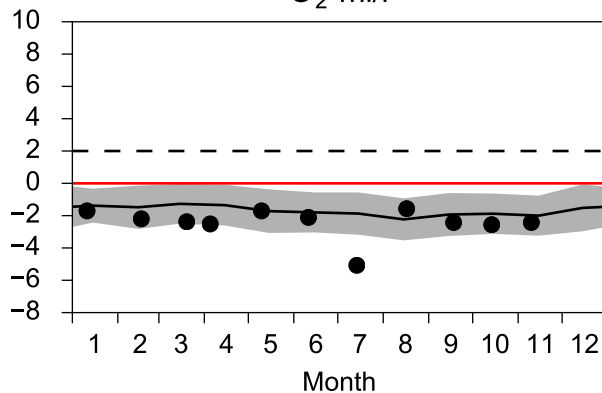


O₂ saturation %

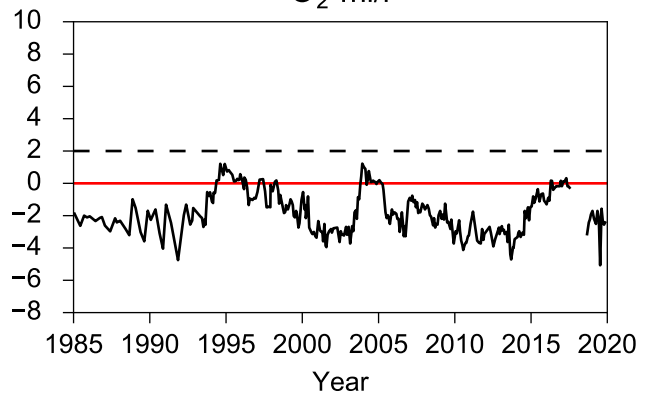


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l

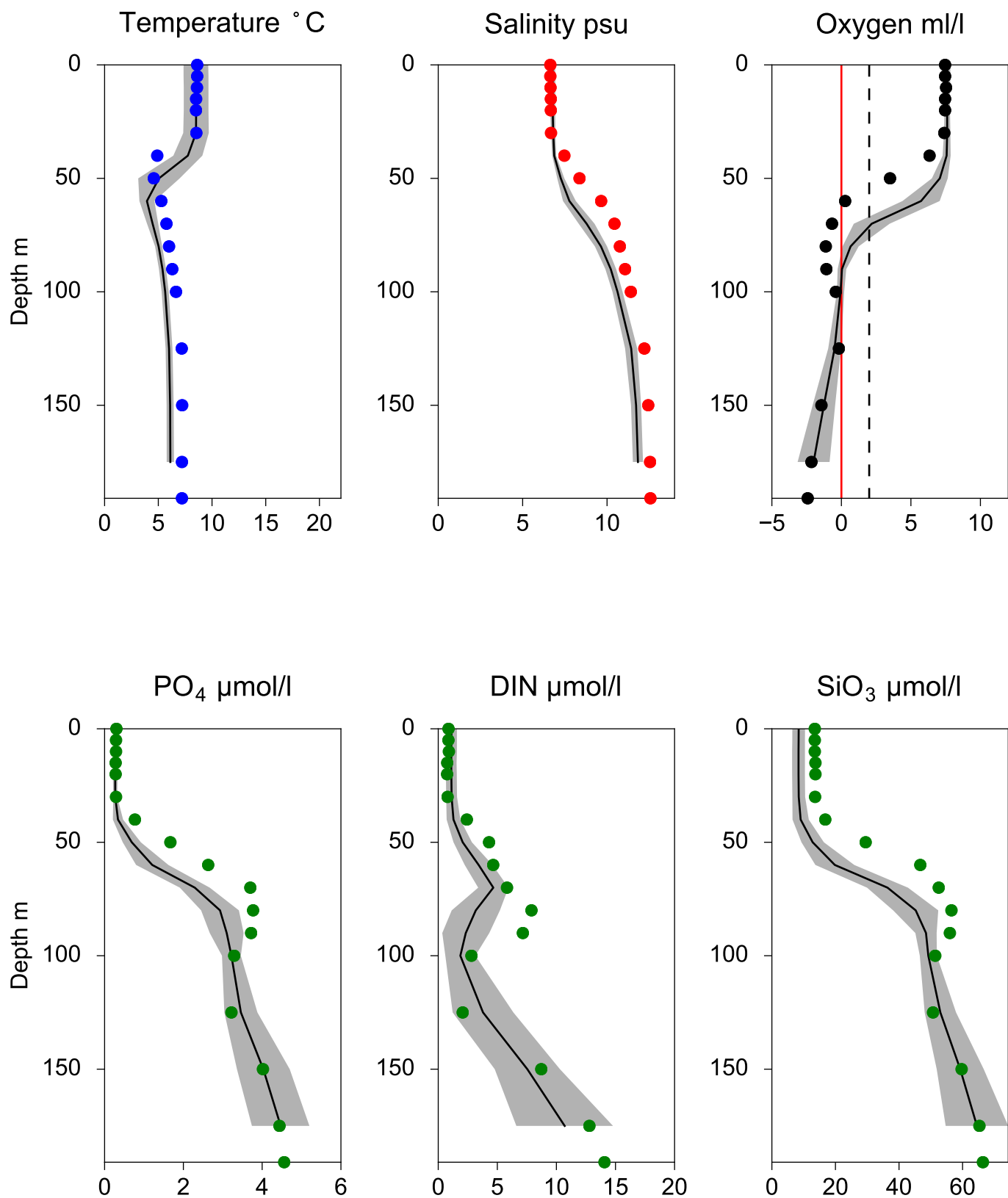


O₂ ml/l



Vertical profiles BY20 FÅRÖDJ November

— Mean 2001-2015 St.Dev. • 2019-11-10



STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

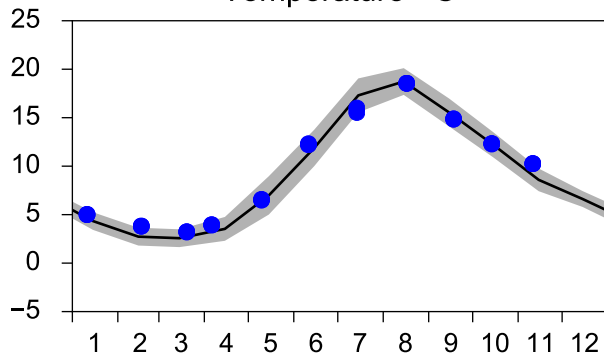
Annual Cycles

— Mean 2001-2015

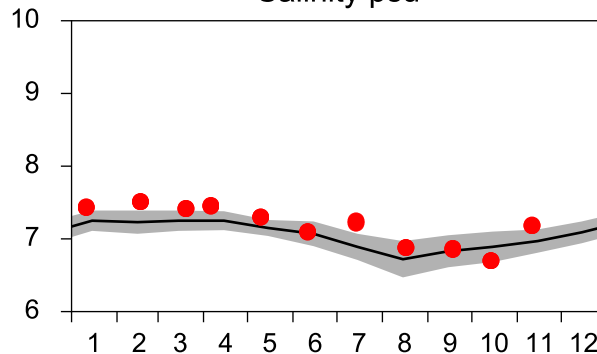
■ St.Dev.

● 2019

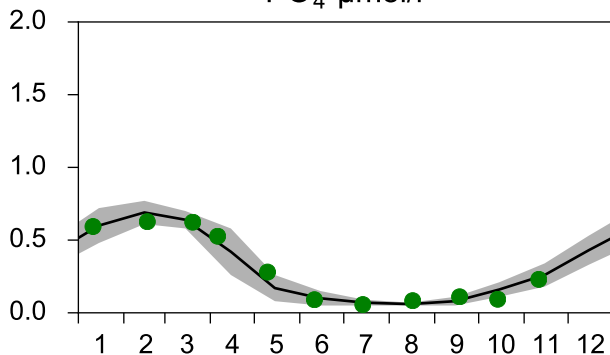
Temperature °C



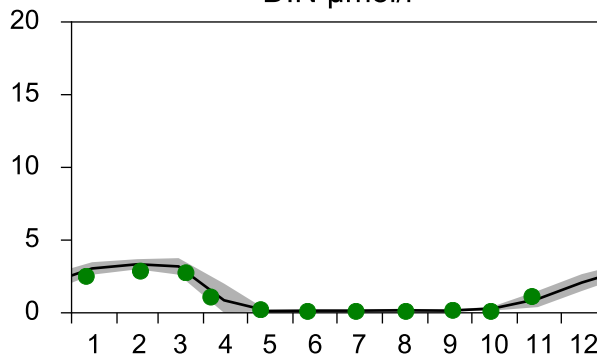
Salinity psu



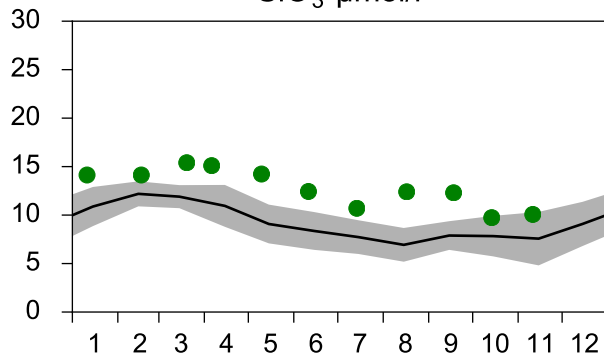
PO₄ μmol/l



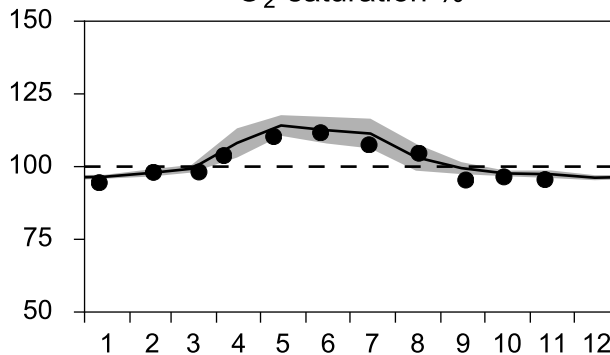
DIN μmol/l



SiO₃ μmol/l

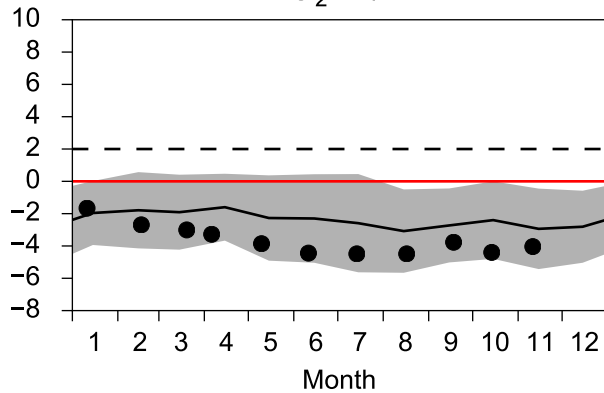


O₂ saturation %

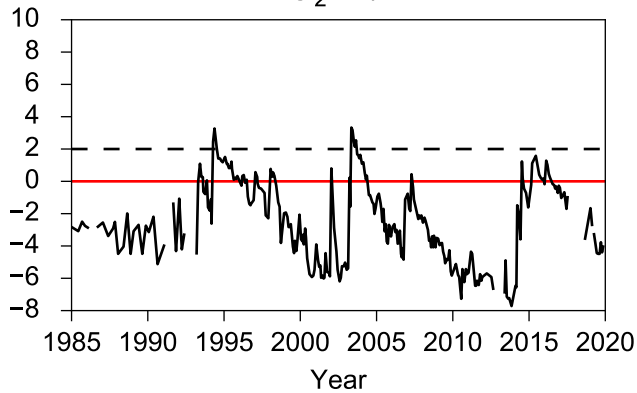


OXYGEN IN BOTTOM WATER (depth >= 225 m)

O₂ ml/l

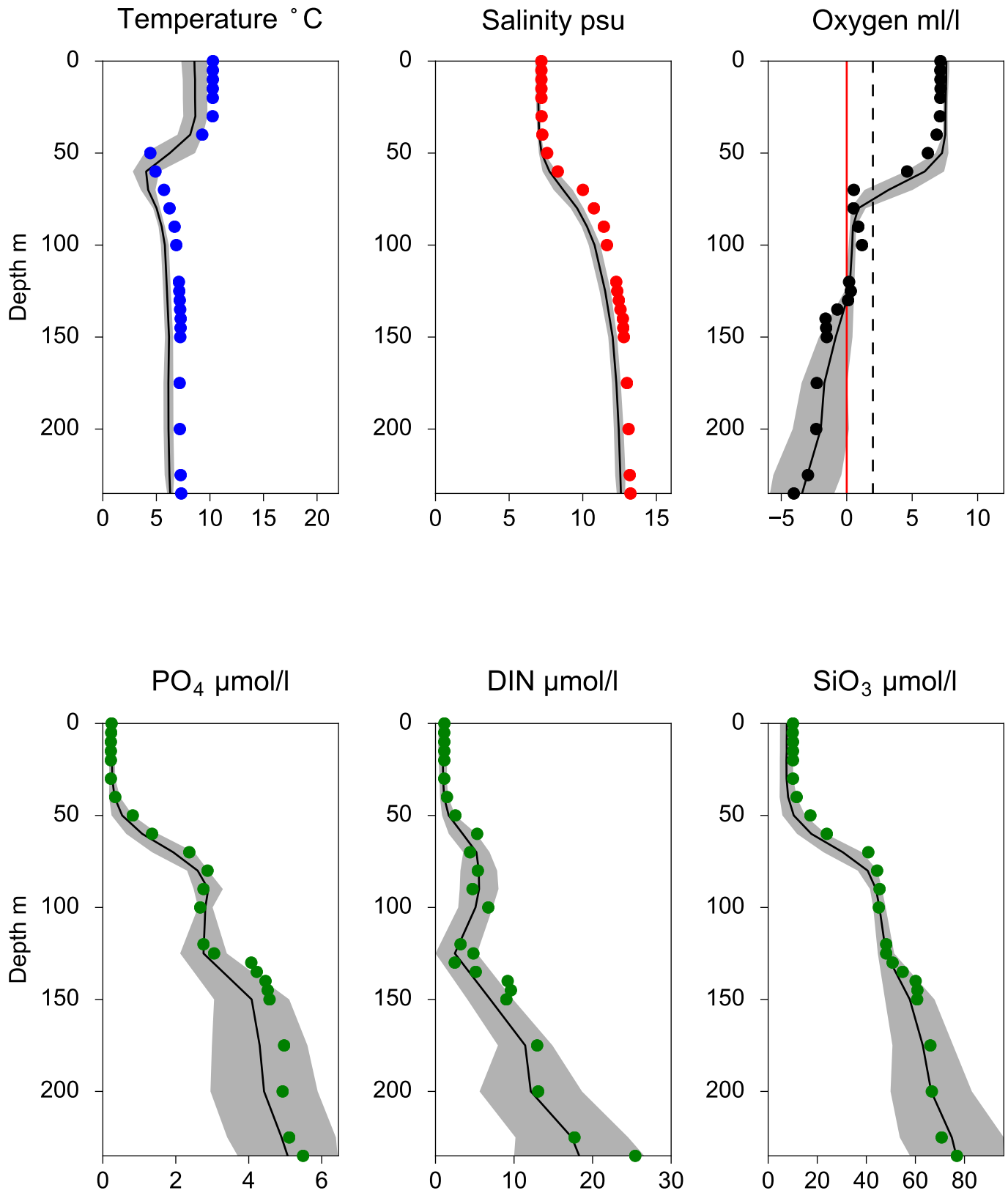


O₂ ml/l



Vertical profiles BY15 GOTLANDSDJ November

— Mean 2001-2015 St.Dev. • 2019-11-11



STATION BY10 SURFACE WATER (0-10 m)

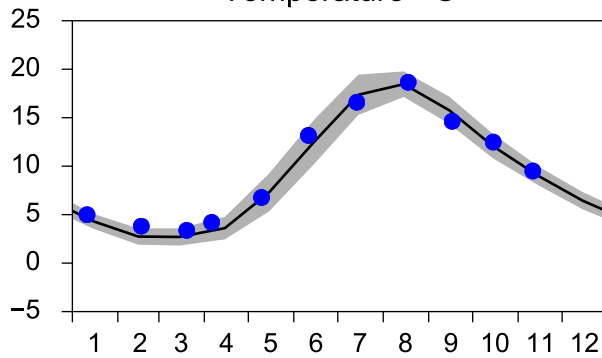
Annual Cycles

— Mean 2001-2015

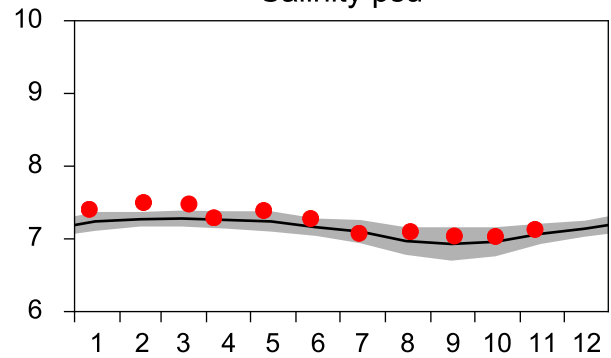
■ St.Dev.

● 2019

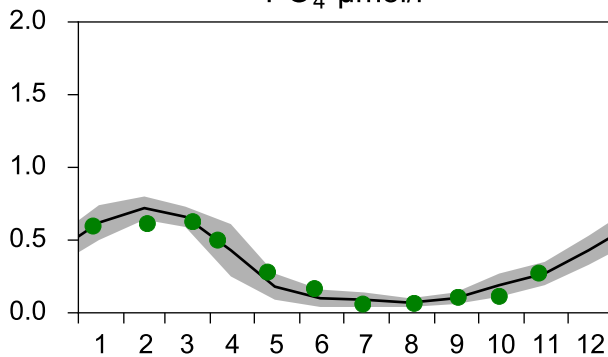
Temperature °C



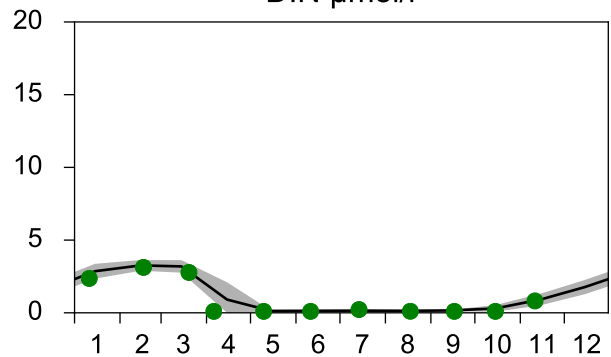
Salinity psu



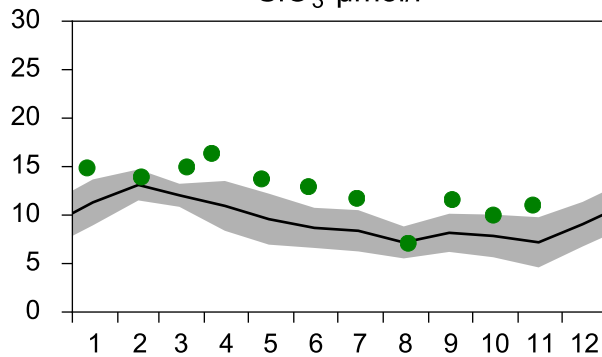
PO₄ μmol/l



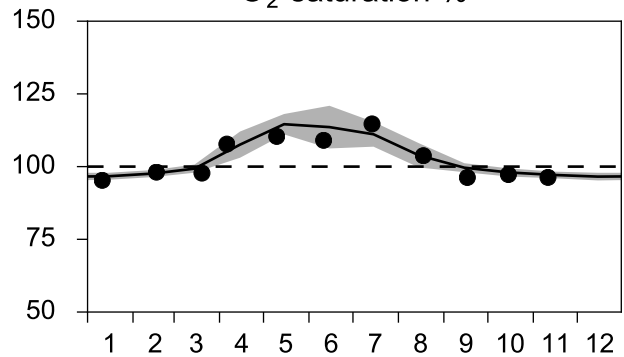
DIN μmol/l



SiO₃ μmol/l

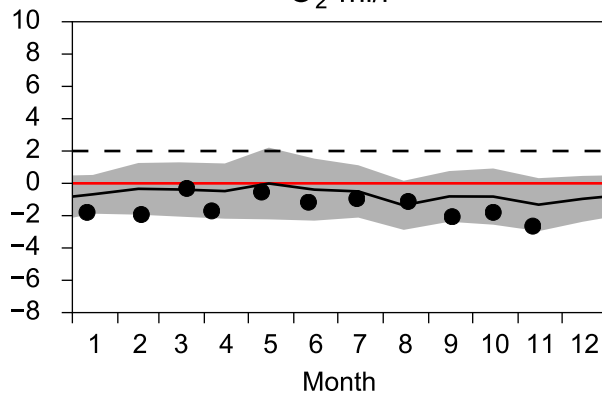


O₂ saturation %

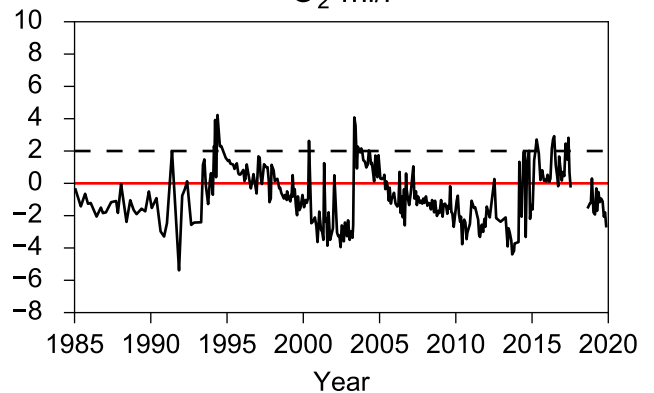


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

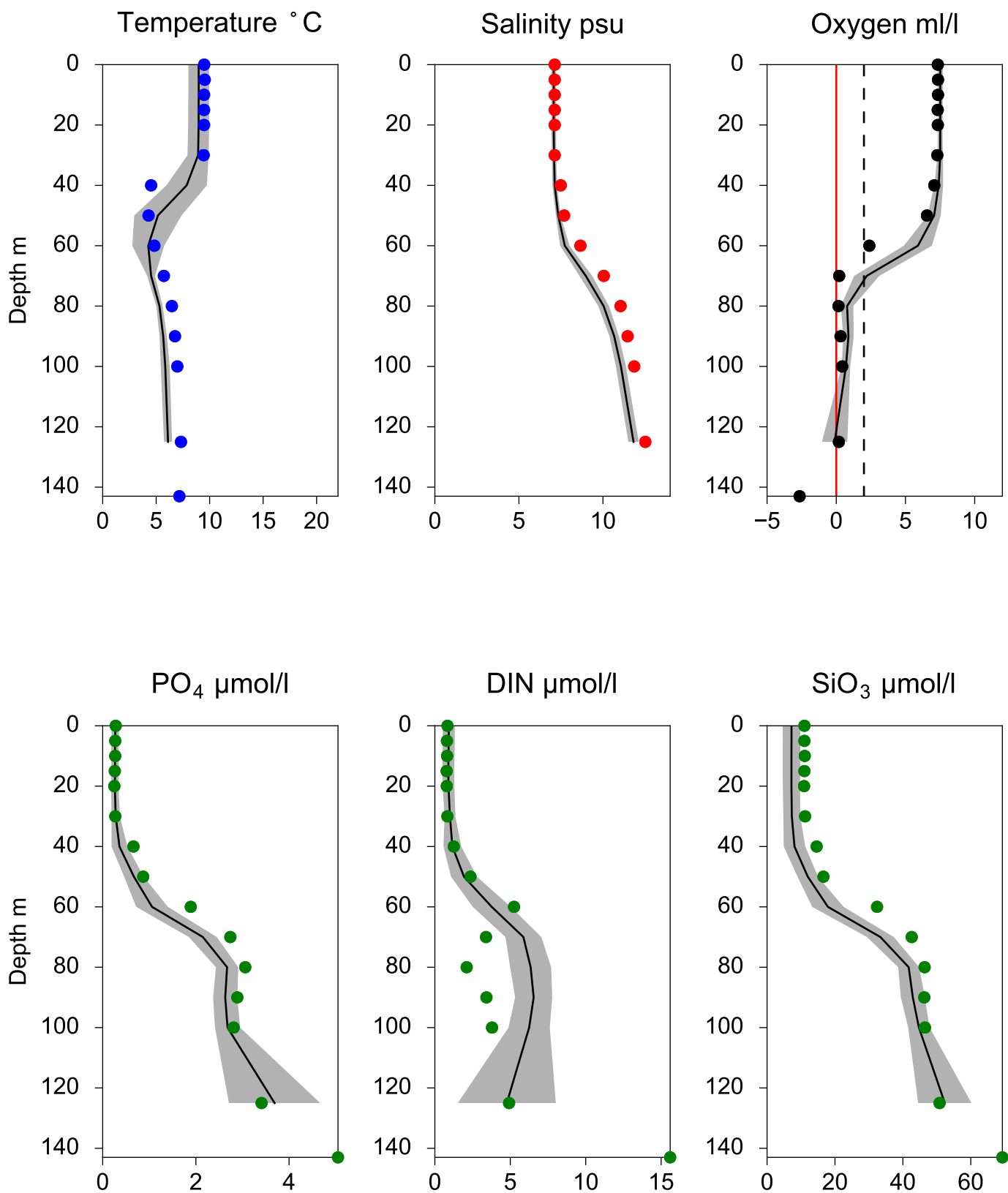


O₂ ml/l



Vertical profiles BY10 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-11



STATION BCS III-10 SURFACE WATER (0-10 m)

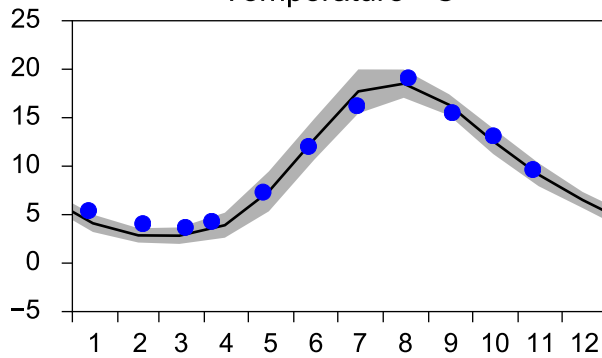
Annual Cycles

— Mean 2001-2015

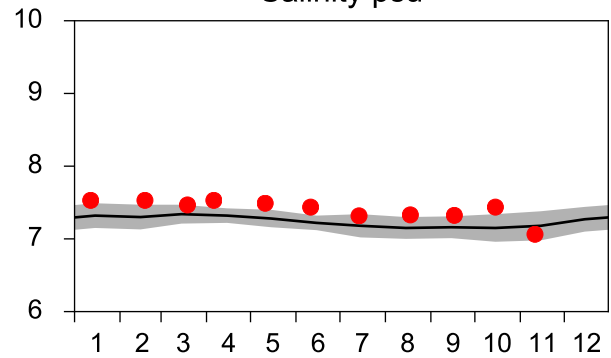
■ St.Dev.

● 2019

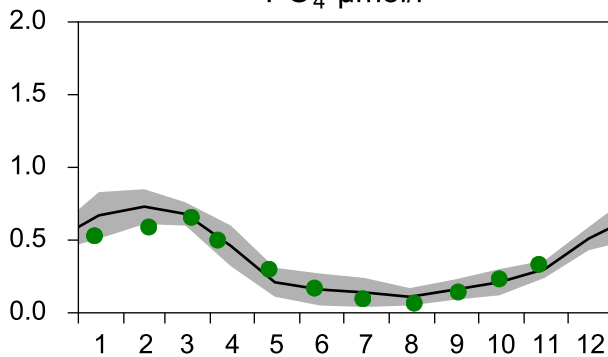
Temperature °C



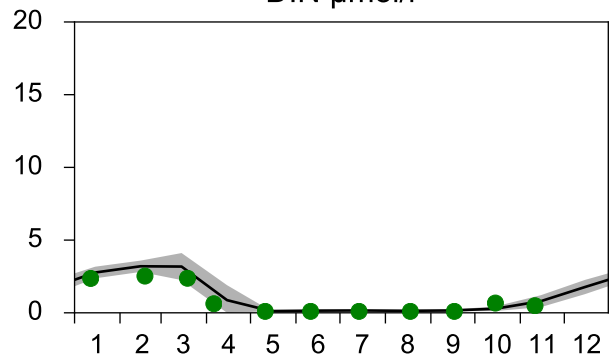
Salinity psu



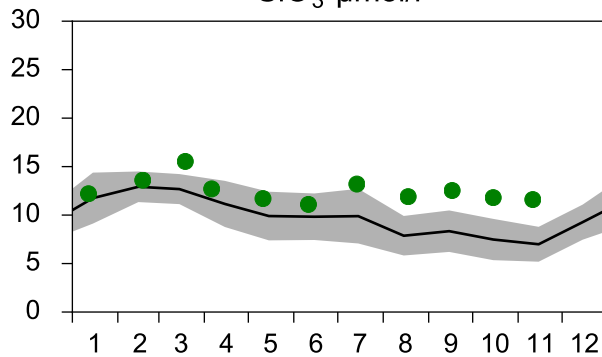
PO₄ µmol/l



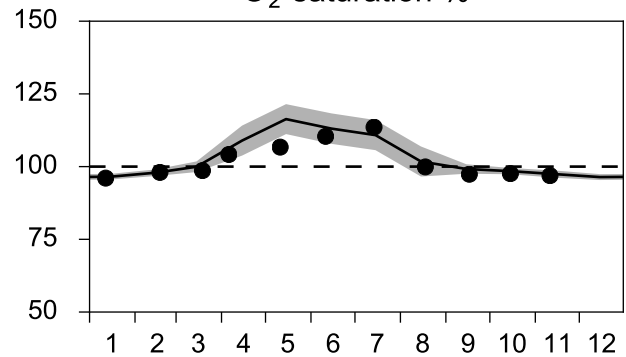
DIN µmol/l



SiO₃ µmol/l

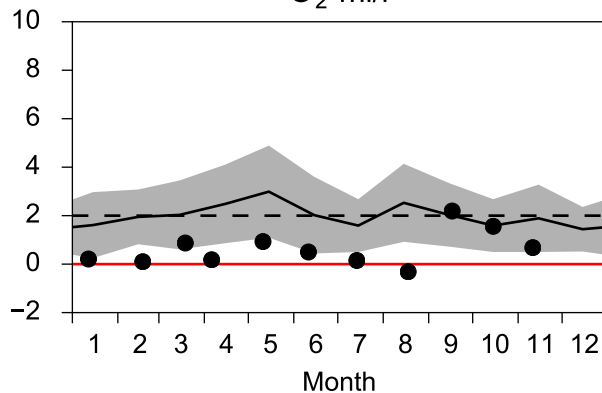


O₂ saturation %

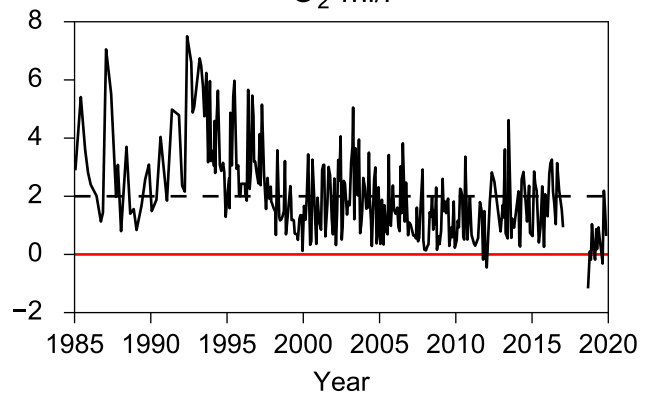


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

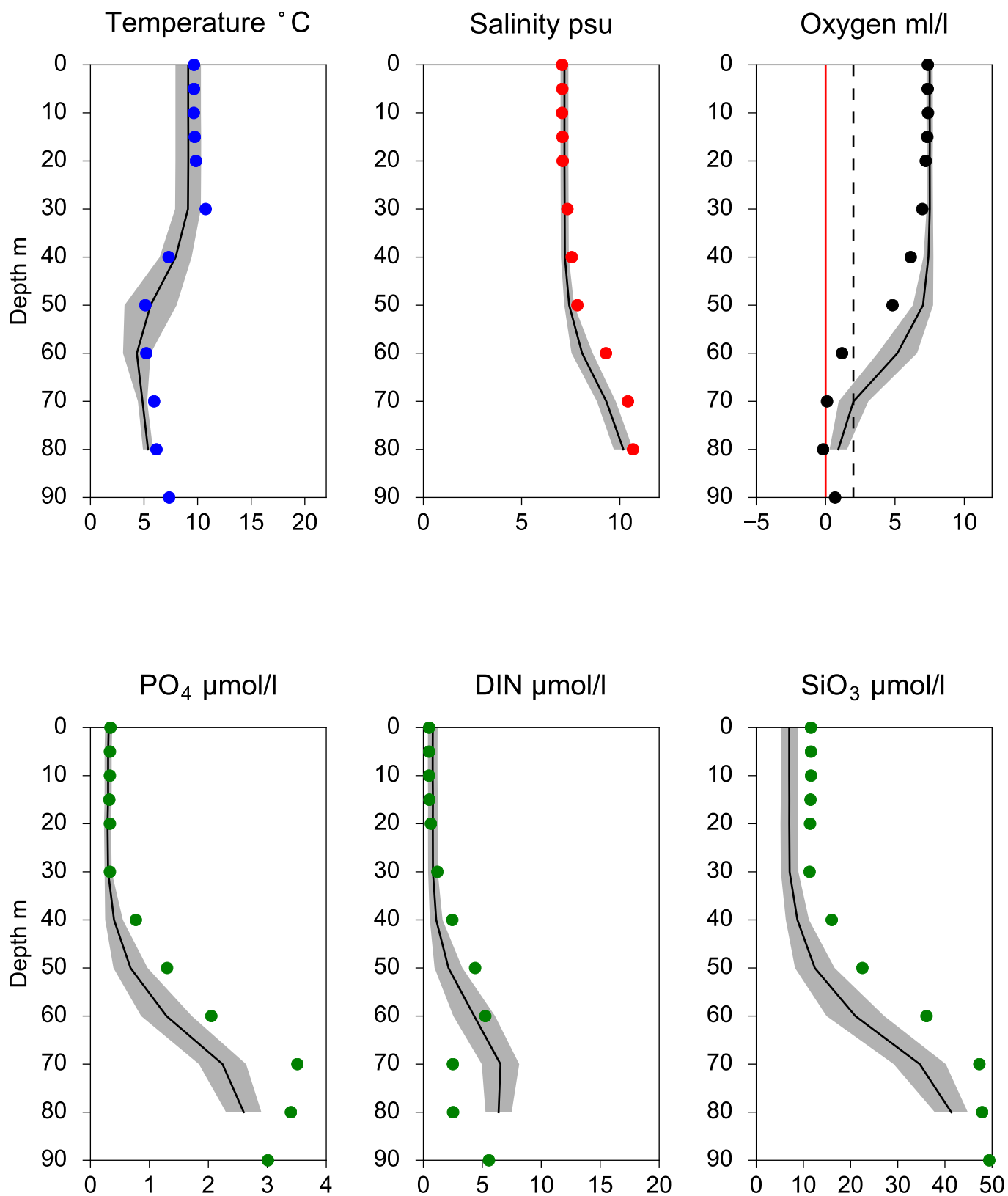


O₂ ml/l



Vertical profiles BCS III-10 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-11



STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

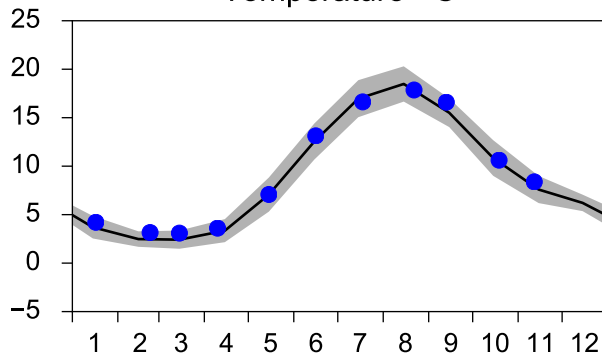
Annual Cycles

— Mean 2001-2015

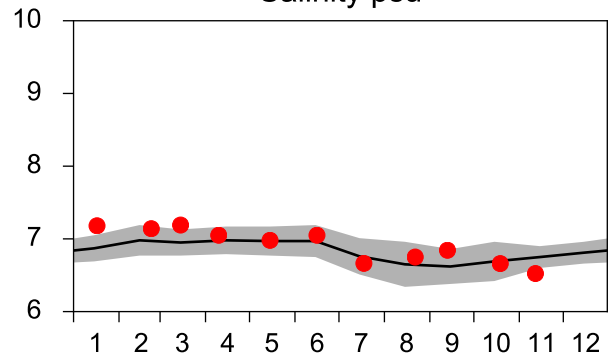
■ St.Dev.

● 2019

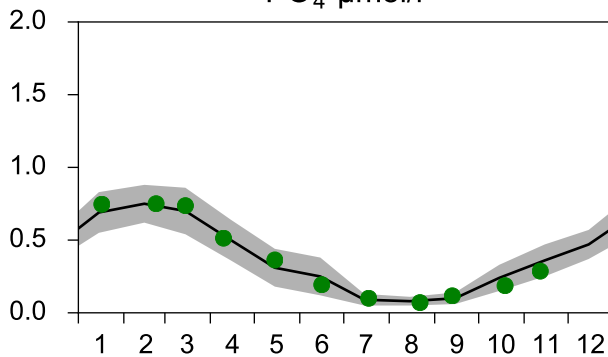
Temperature °C



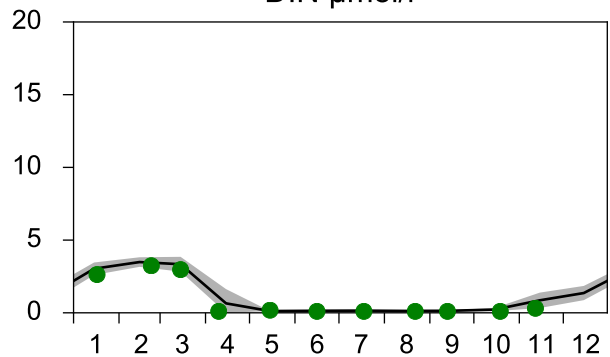
Salinity psu



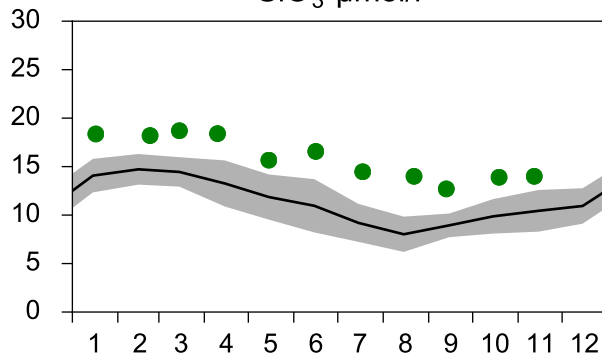
PO₄ µmol/l



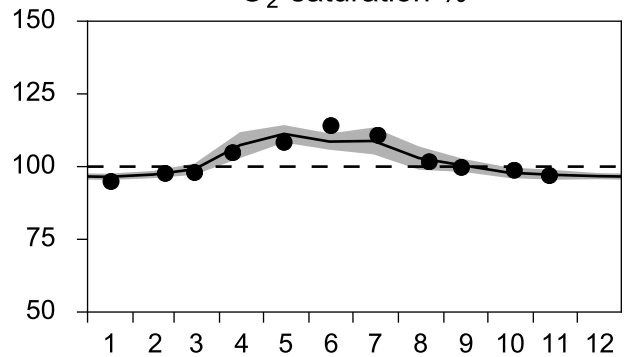
DIN µmol/l



SiO₃ µmol/l

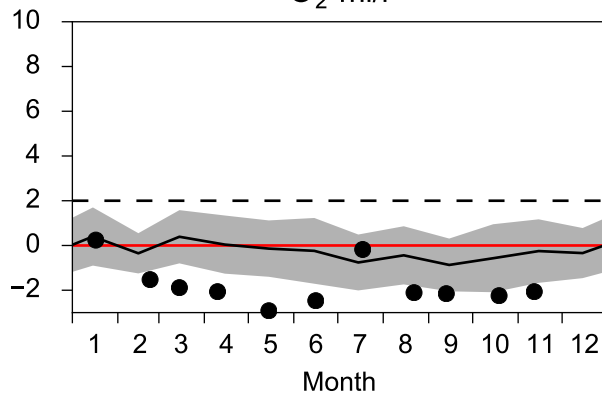


O₂ saturation %

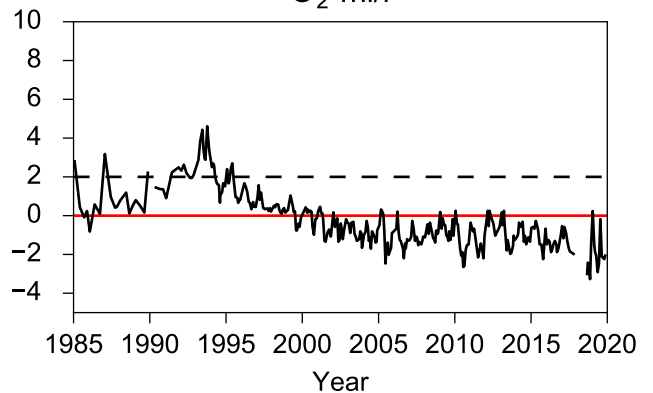


OXYGEN IN BOTTOM WATER (depth >= 100 m)

O₂ ml/l

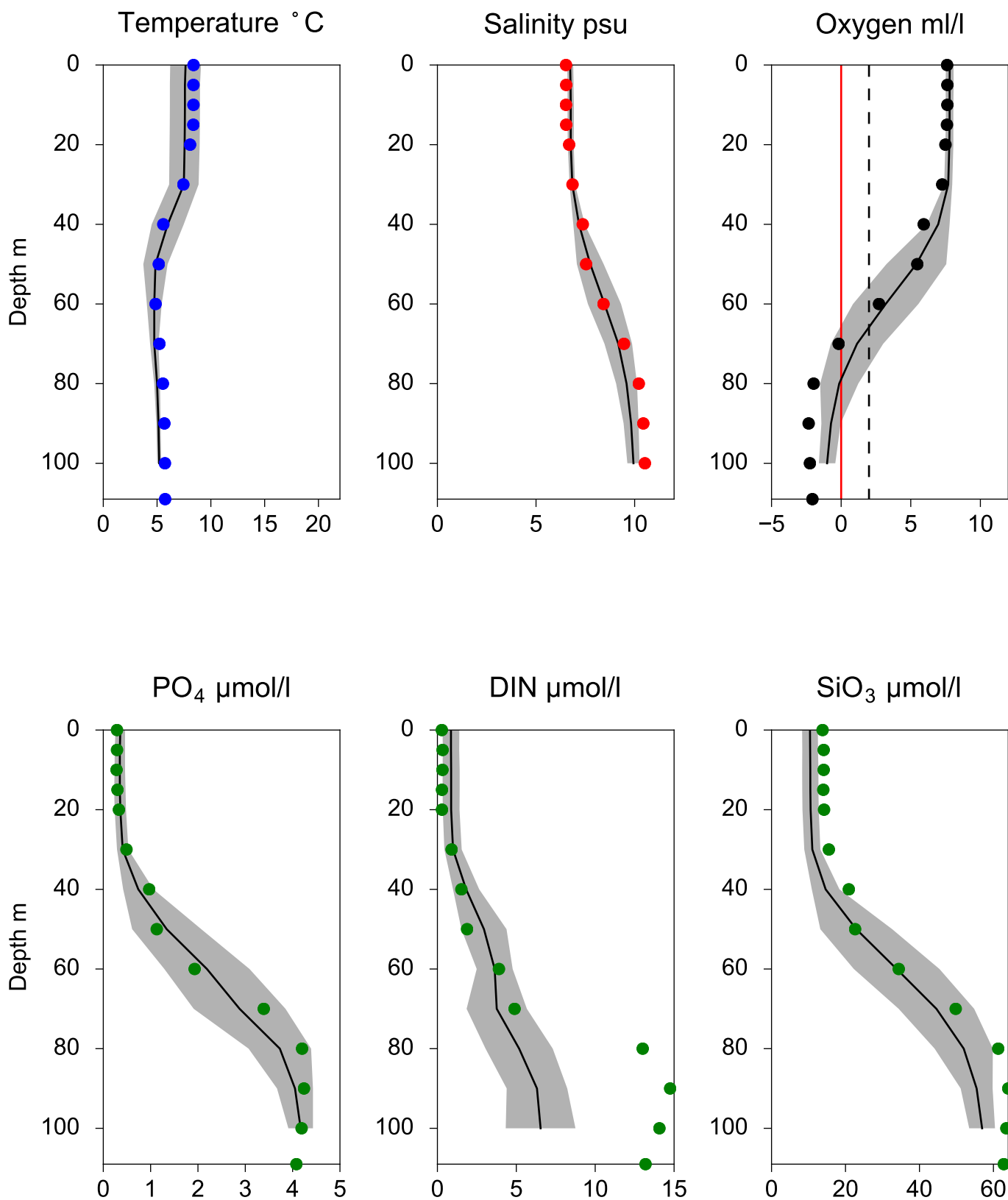


O₂ ml/l



Vertical profiles BY38 KARLSÖDJ November

— Mean 2001-2015 St.Dev. • 2019-11-12



STATION REF M1V1 SURFACE WATER (0-10 m)

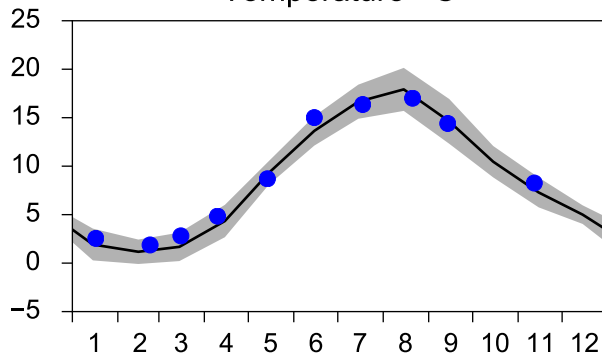
Annual Cycles

— Mean 2001-2015

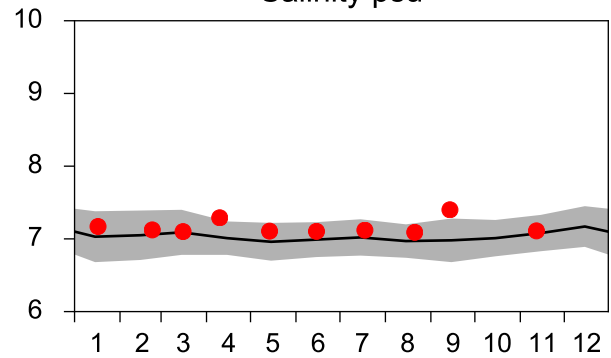
■ St.Dev.

● 2019

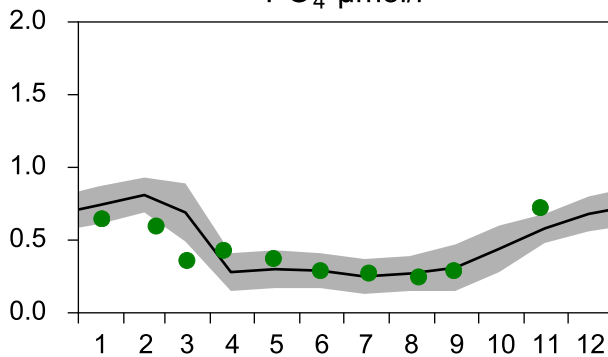
Temperature °C



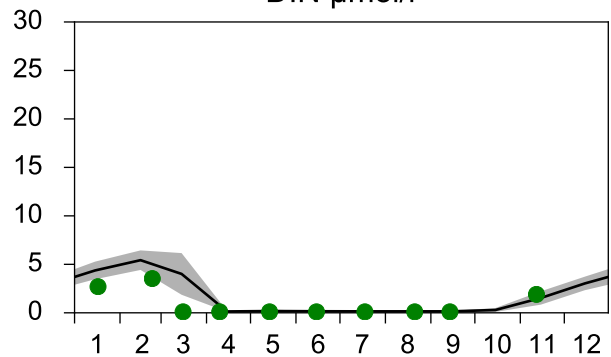
Salinity psu



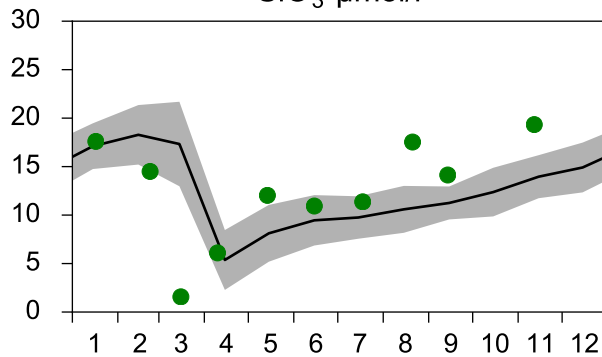
PO₄ µmol/l



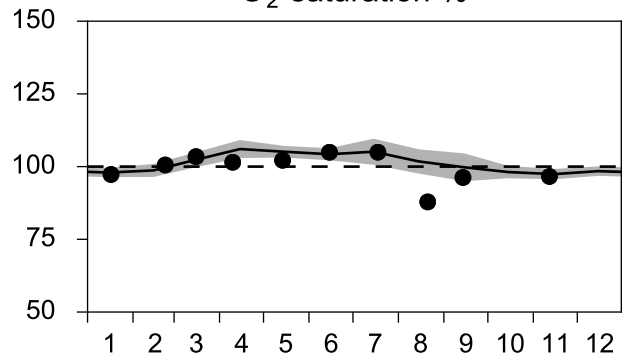
DIN µmol/l



SiO₃ µmol/l

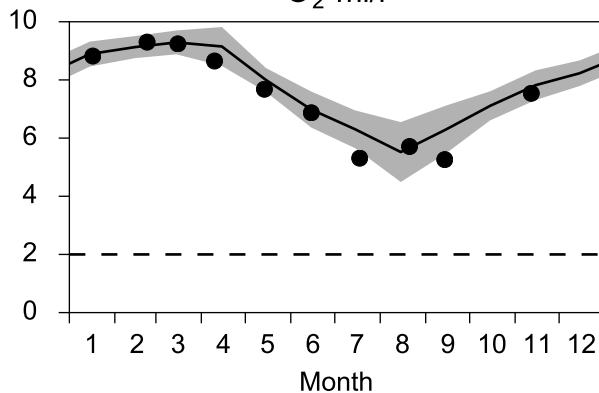


O₂ saturation %

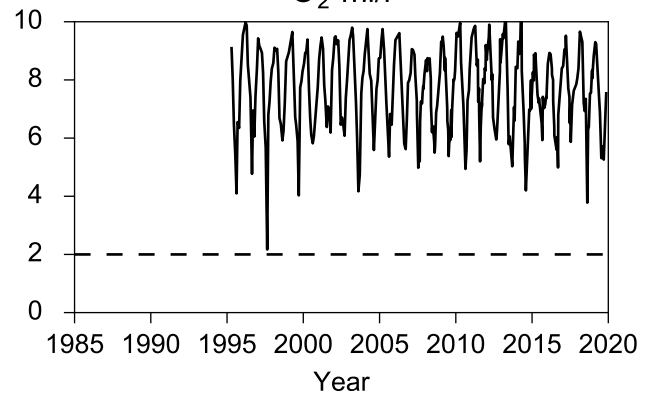


OXYGEN IN BOTTOM WATER (depth >= 17 m)

O₂ ml/l

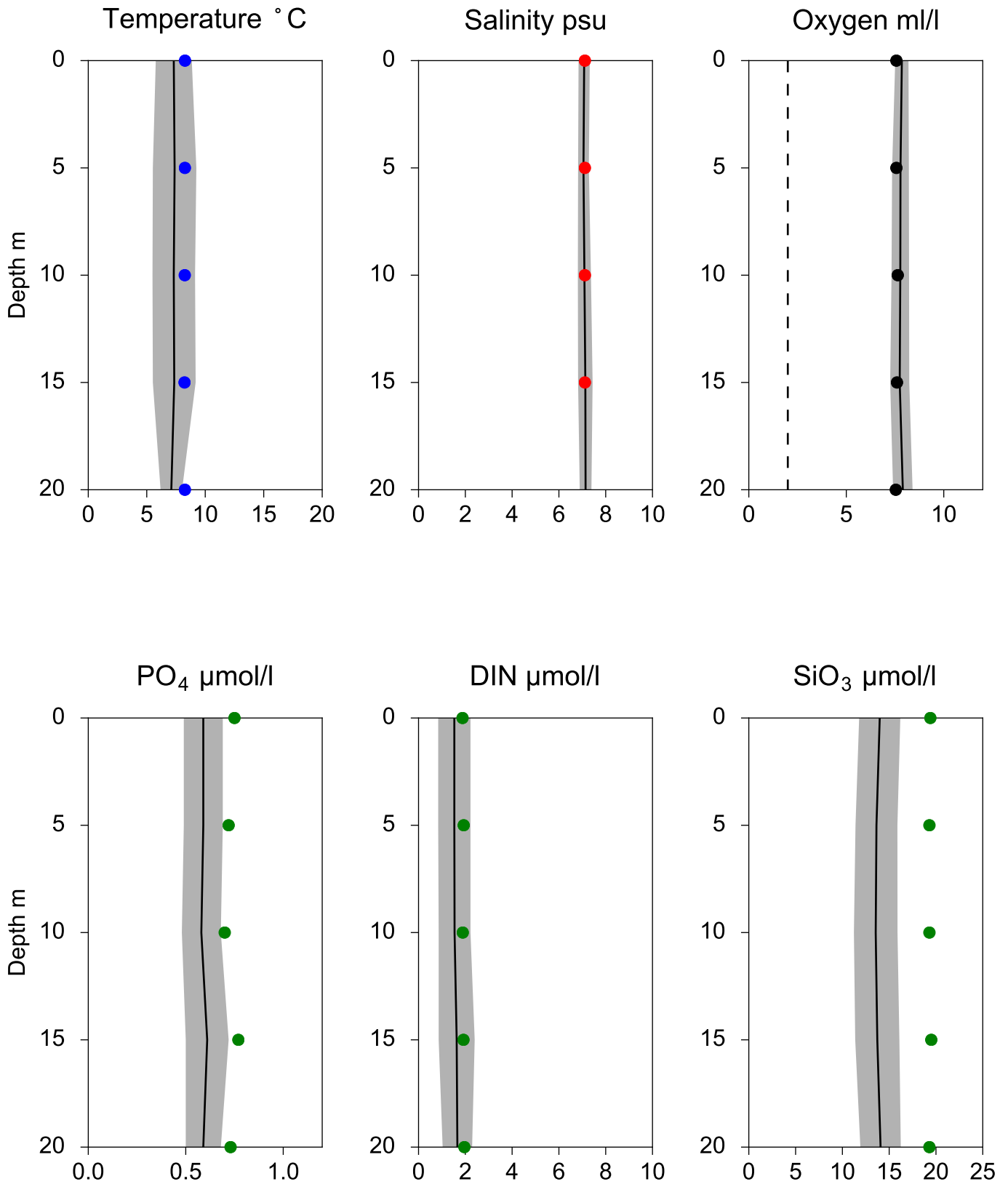


O₂ ml/l



Vertical profiles REF M1V1 November

— Mean 2001-2015 St.Dev. • 2019-11-12



STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

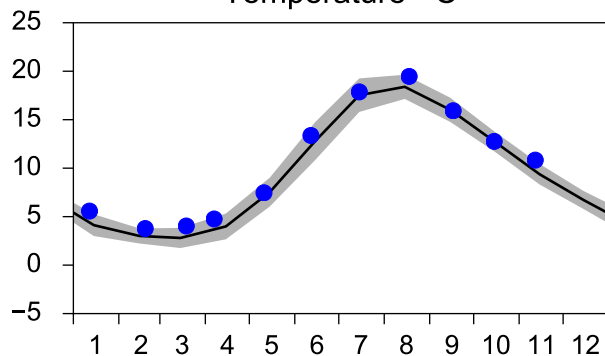
Annual Cycles

— Mean 2001-2015

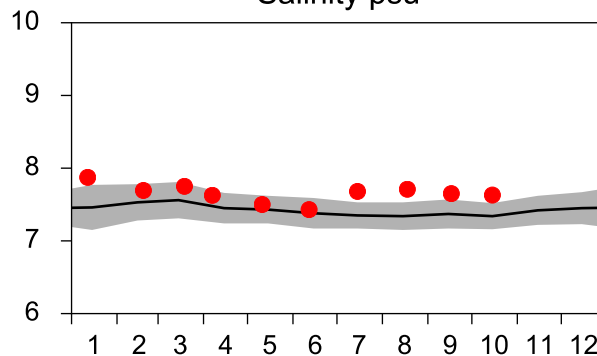
■ St.Dev.

● 2019

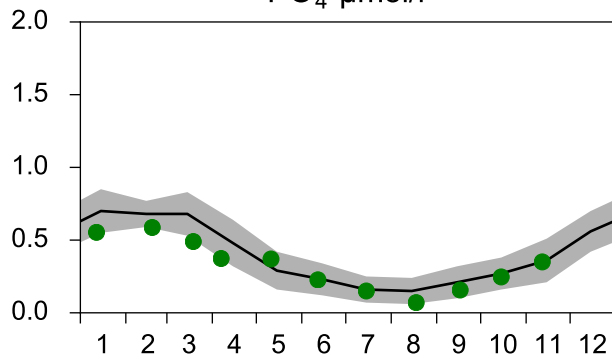
Temperature °C



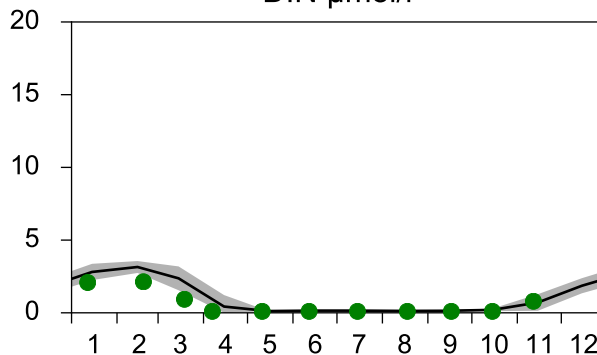
Salinity psu



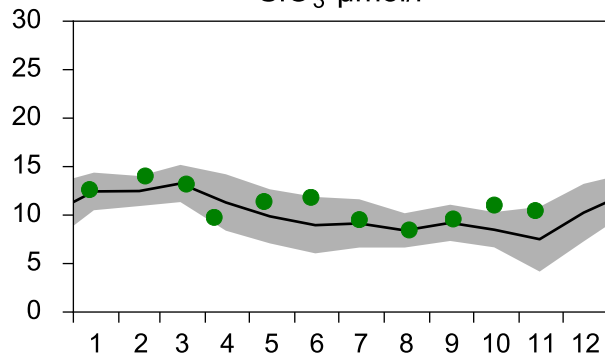
PO₄ μmol/l



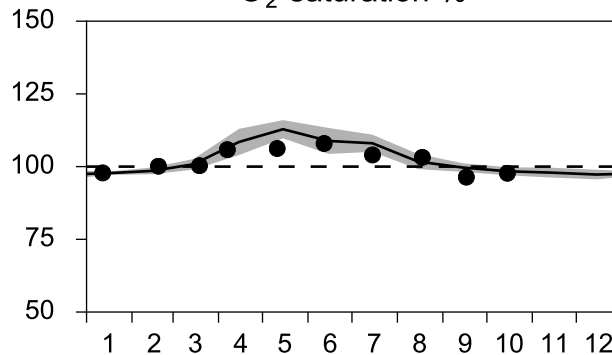
DIN μmol/l



SiO₃ μmol/l

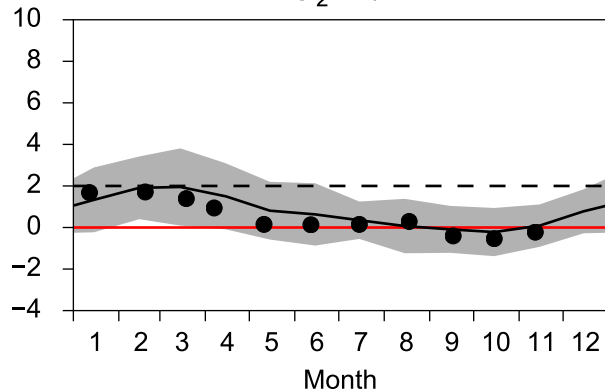


O₂ saturation %

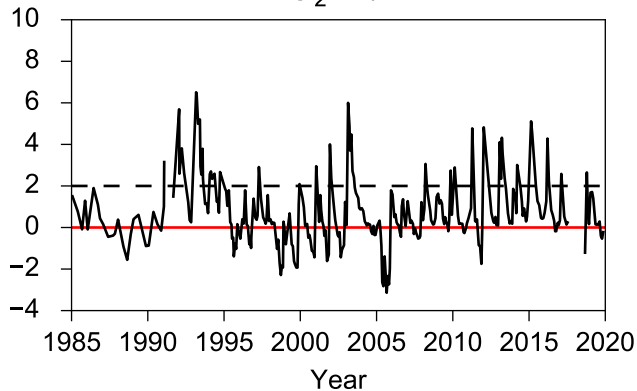


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

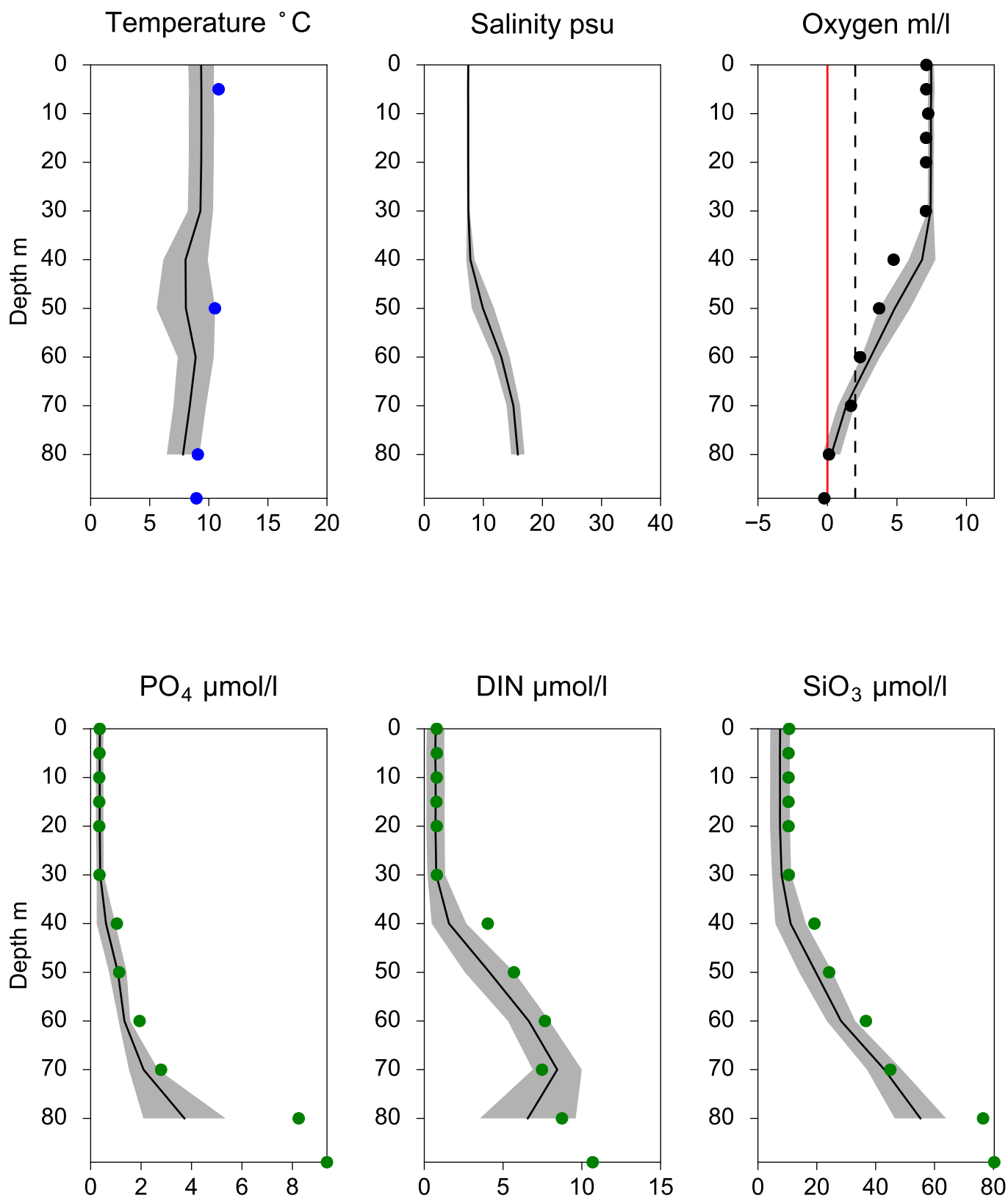


O₂ ml/l



Vertical profiles BY5 BORNHOLMSDJ November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-12



STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

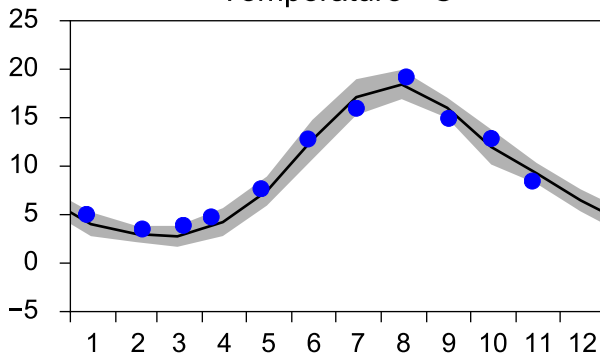
Annual Cycles

— Mean 2001-2015

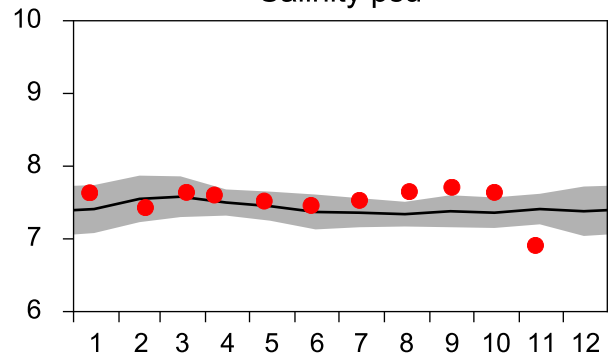
■ St.Dev.

● 2019

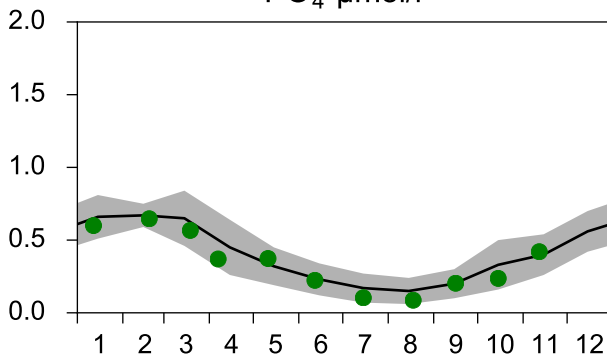
Temperature °C



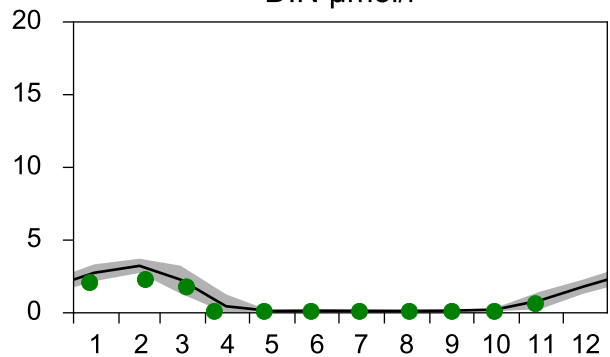
Salinity psu



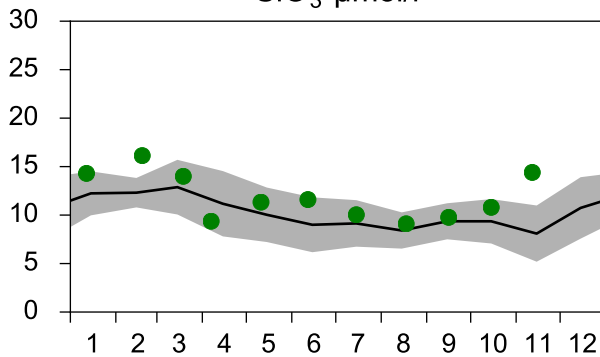
PO₄ µmol/l



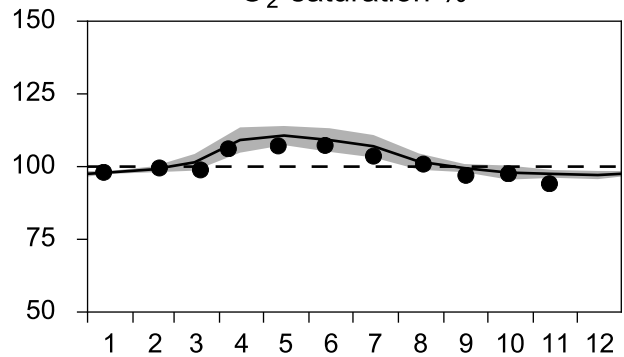
DIN µmol/l



SiO₃ µmol/l

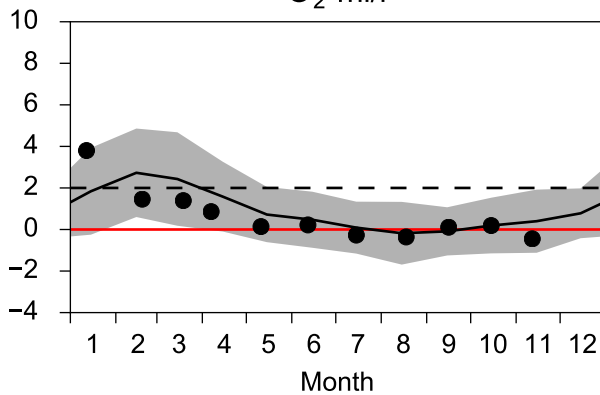


O₂ saturation %

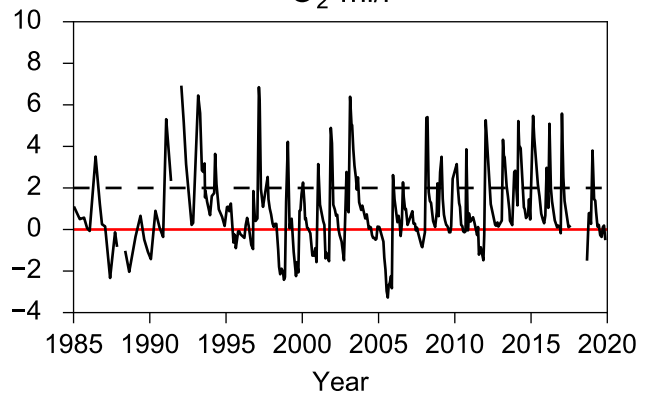


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l



O₂ ml/l

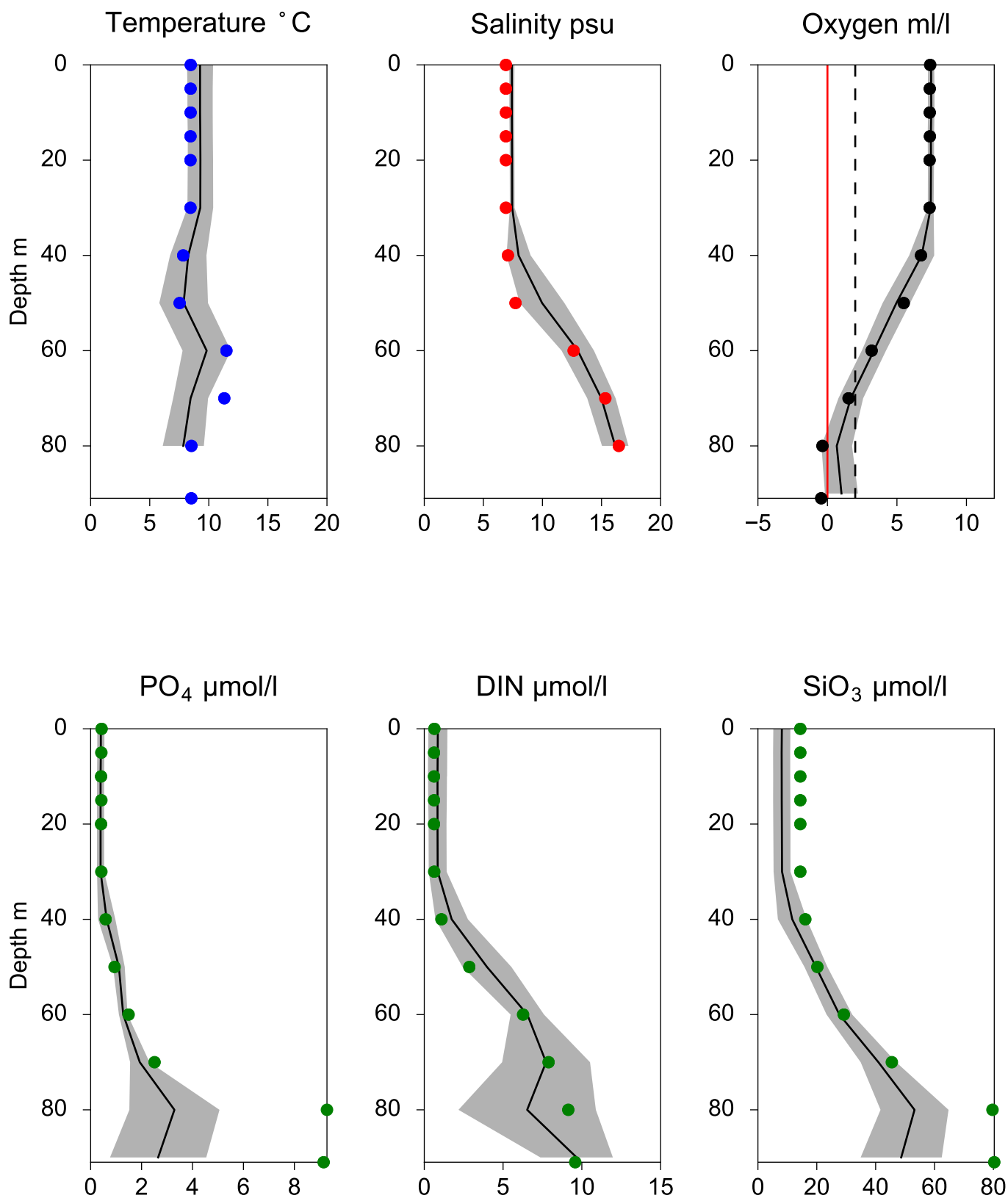


Vertical profiles BY4 CHRISTIANSÖ November

— Mean 2001-2015

■ St.Dev.

● 2019-11-12



STATION HANÖBUKTEN SURFACE WATER (0-10 m)

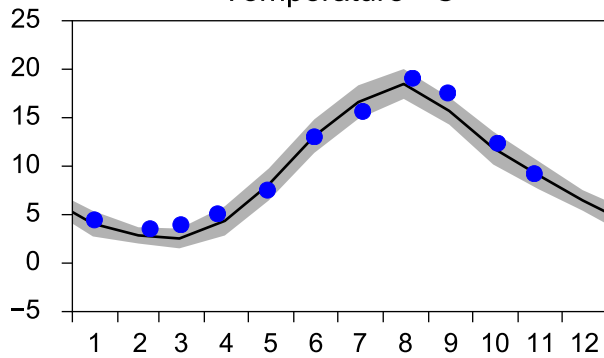
Annual Cycles

— Mean 2001-2015

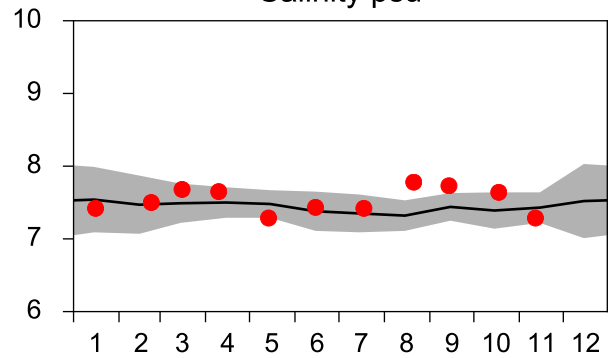
■ St.Dev.

● 2019

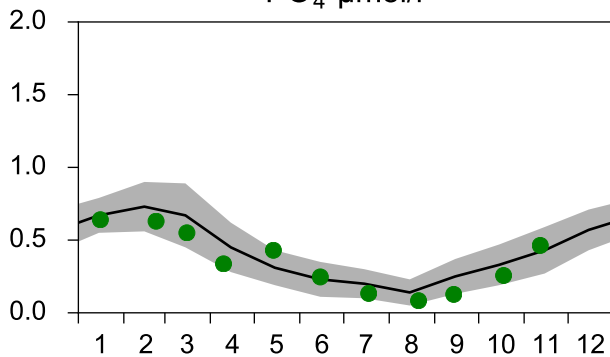
Temperature °C



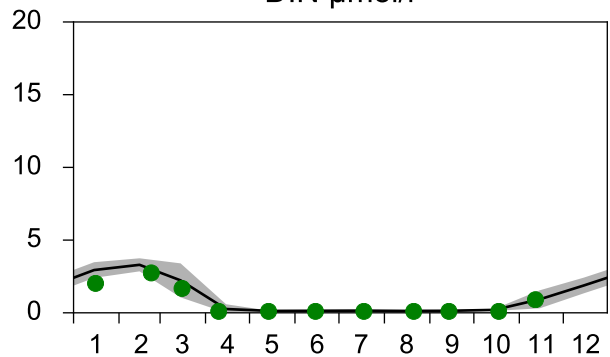
Salinity psu



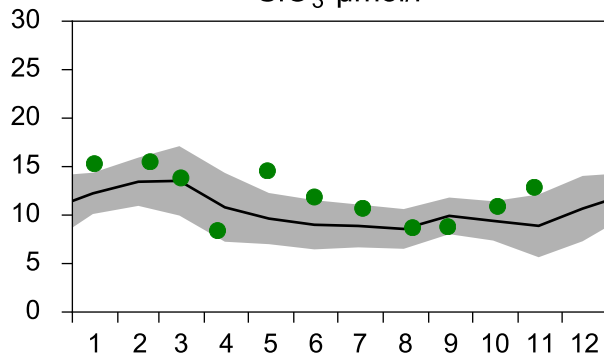
PO₄ µmol/l



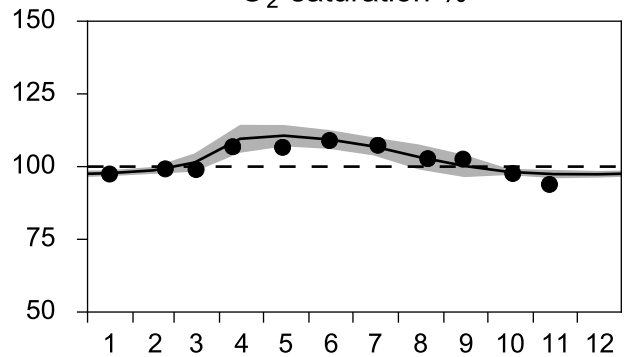
DIN µmol/l



SiO₃ µmol/l

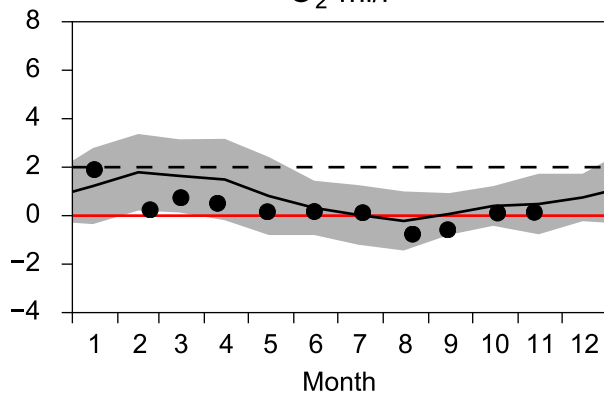


O₂ saturation %

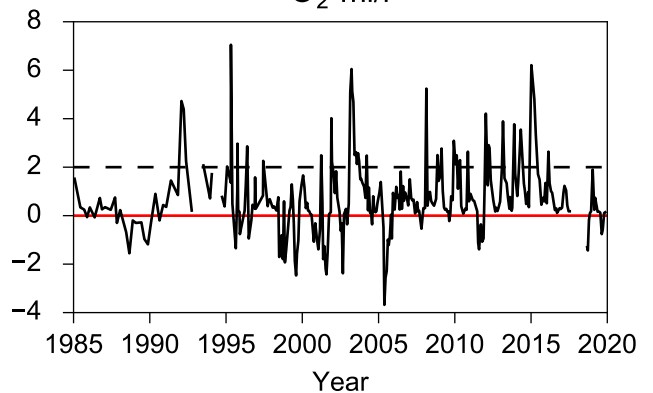


OXYGEN IN BOTTOM WATER (depth >= 70 m)

O₂ ml/l



O₂ ml/l

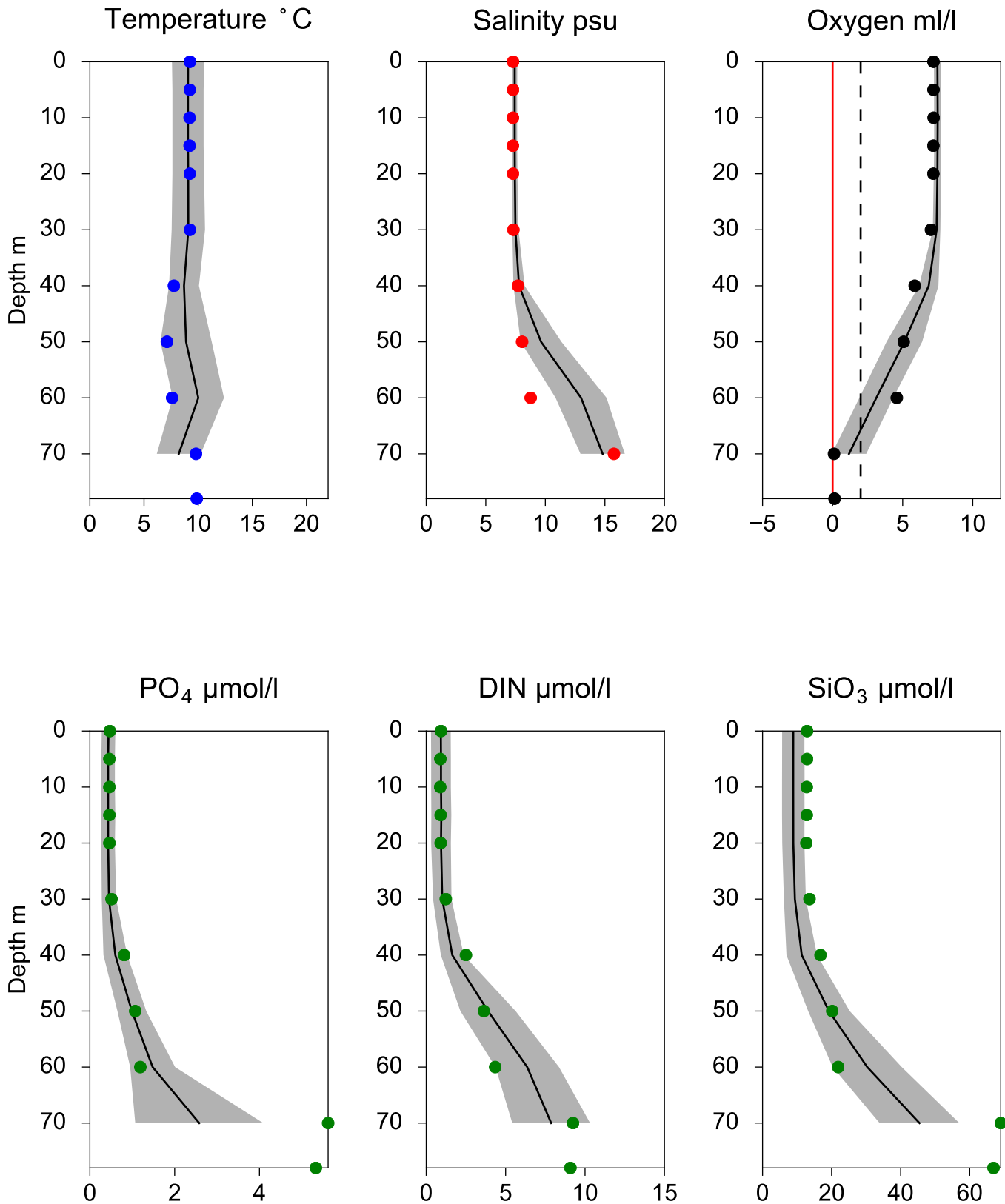


Vertical profiles HANÖBUKTEN November

— Mean 2001-2015

■ St.Dev.

● 2019-11-12



STATION BY2 ARKONA SURFACE WATER (0-10 m)

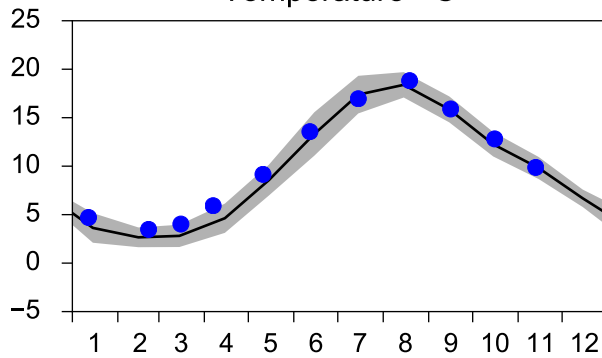
Annual Cycles

— Mean 2001-2015

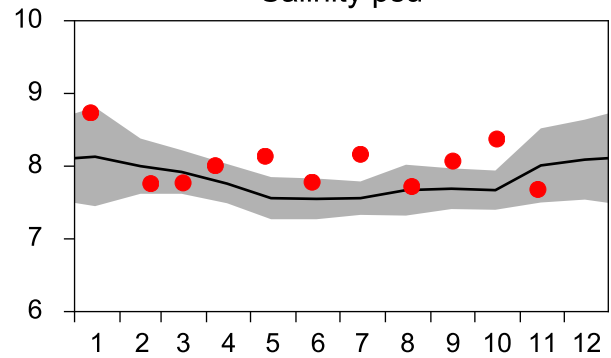
■ St.Dev.

● 2019

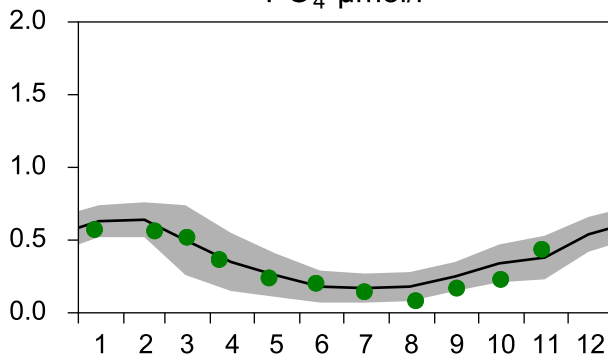
Temperature °C



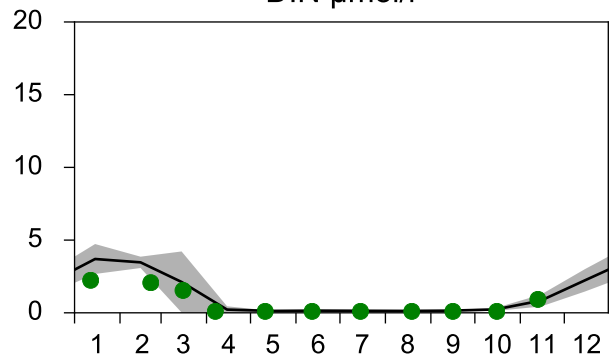
Salinity psu



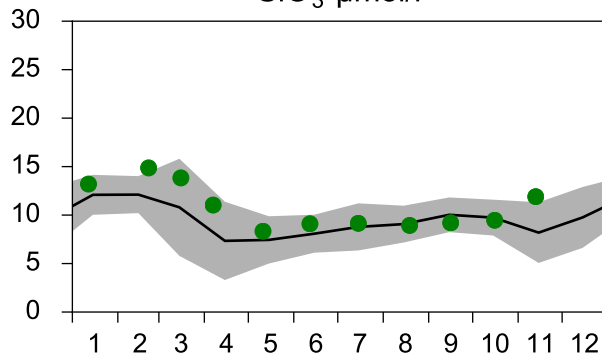
PO₄ µmol/l



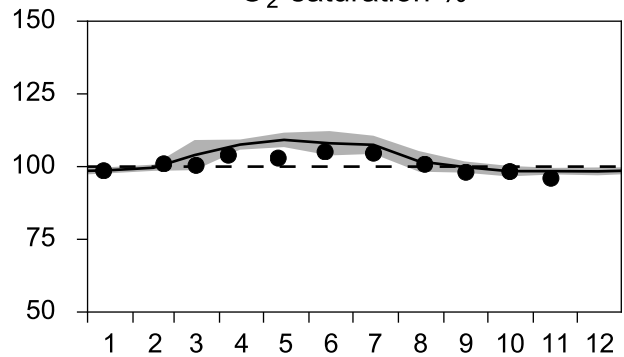
DIN µmol/l



SiO₃ µmol/l

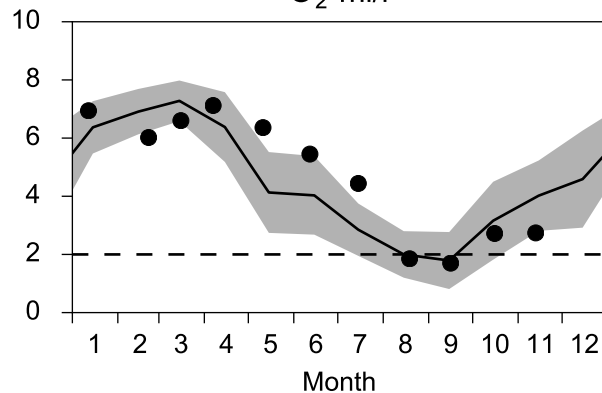


O₂ saturation %

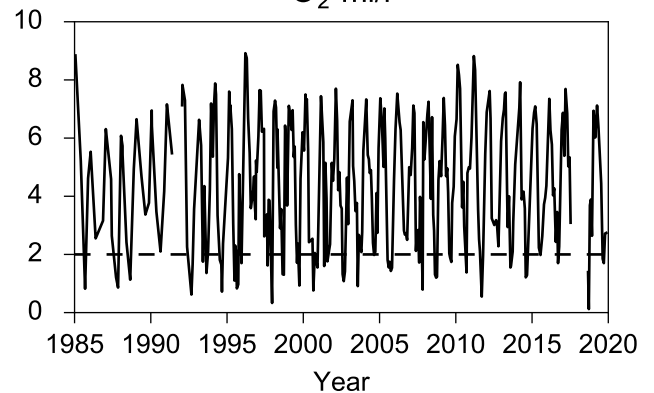


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

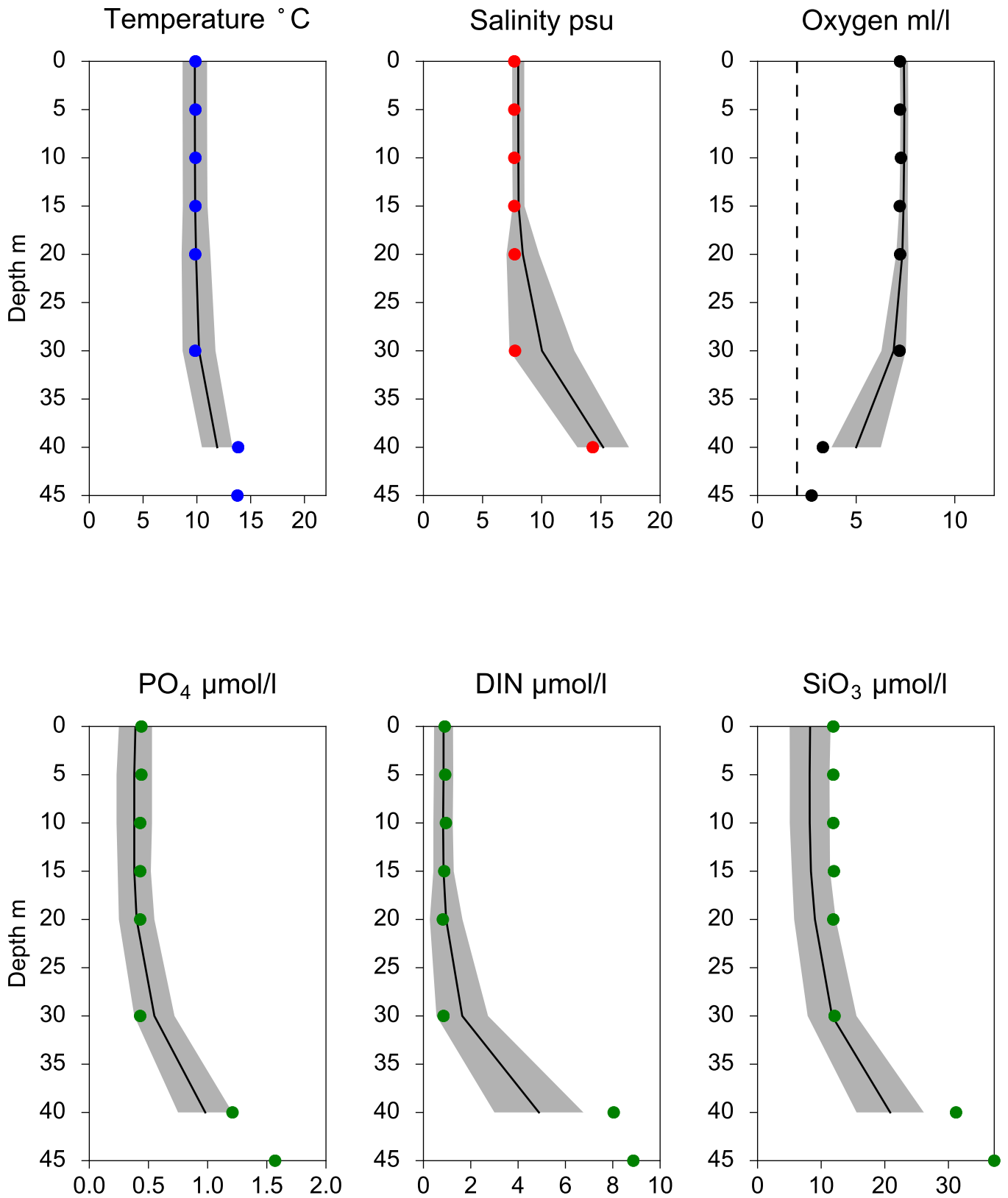


O₂ ml/l



Vertical profiles BY2 ARKONA November

— Mean 2001-2015 St.Dev. • 2019-11-13



STATION BY1 SURFACE WATER (0-10 m)

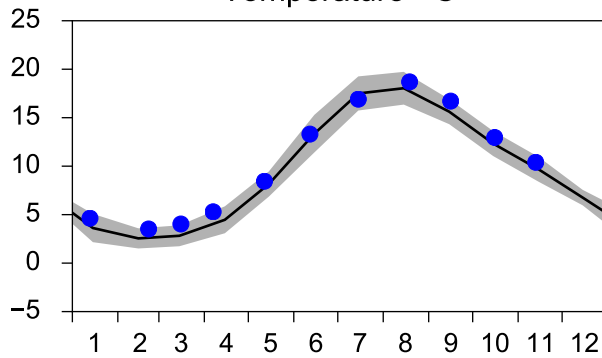
Annual Cycles

— Mean 2001-2015

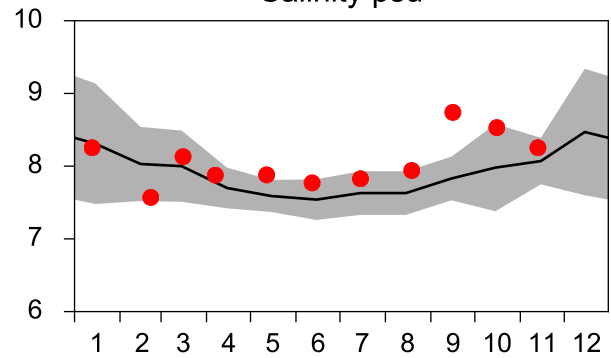
■ St.Dev.

● 2019

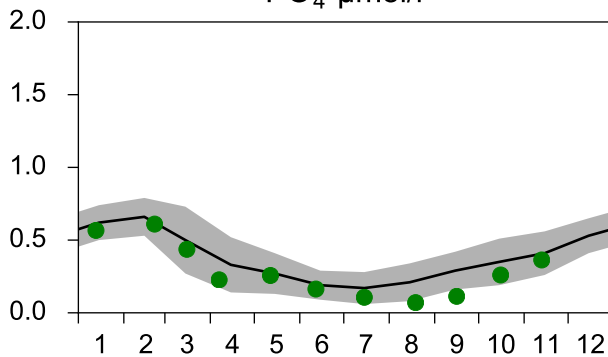
Temperature °C



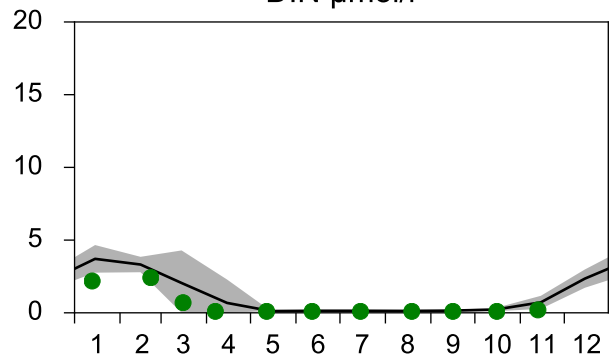
Salinity psu



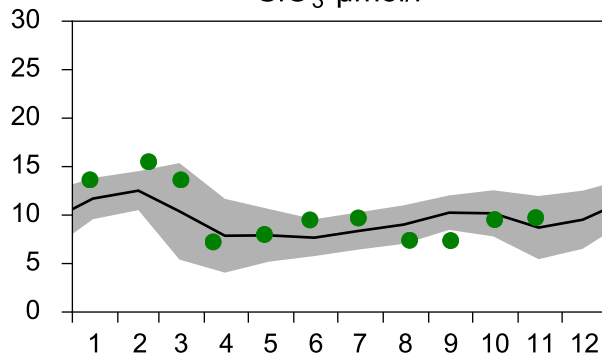
PO₄ μmol/l



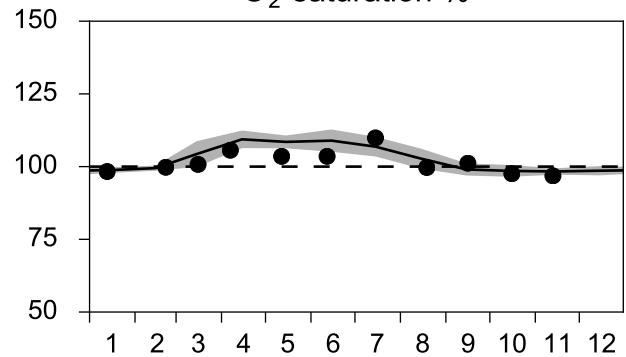
DIN μmol/l



SiO₃ μmol/l

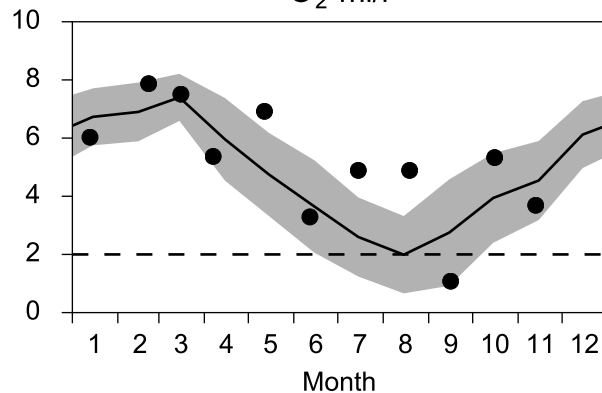


O₂ saturation %

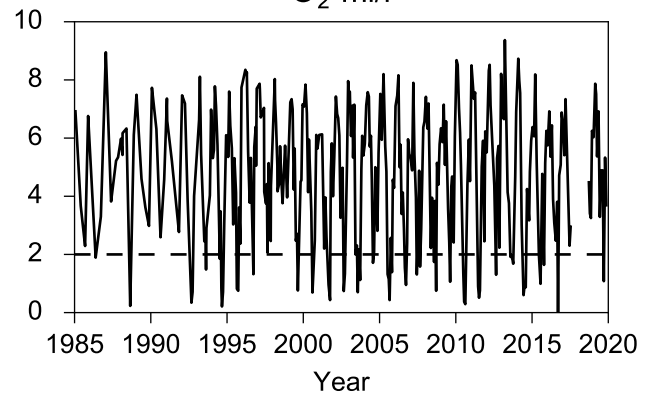


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

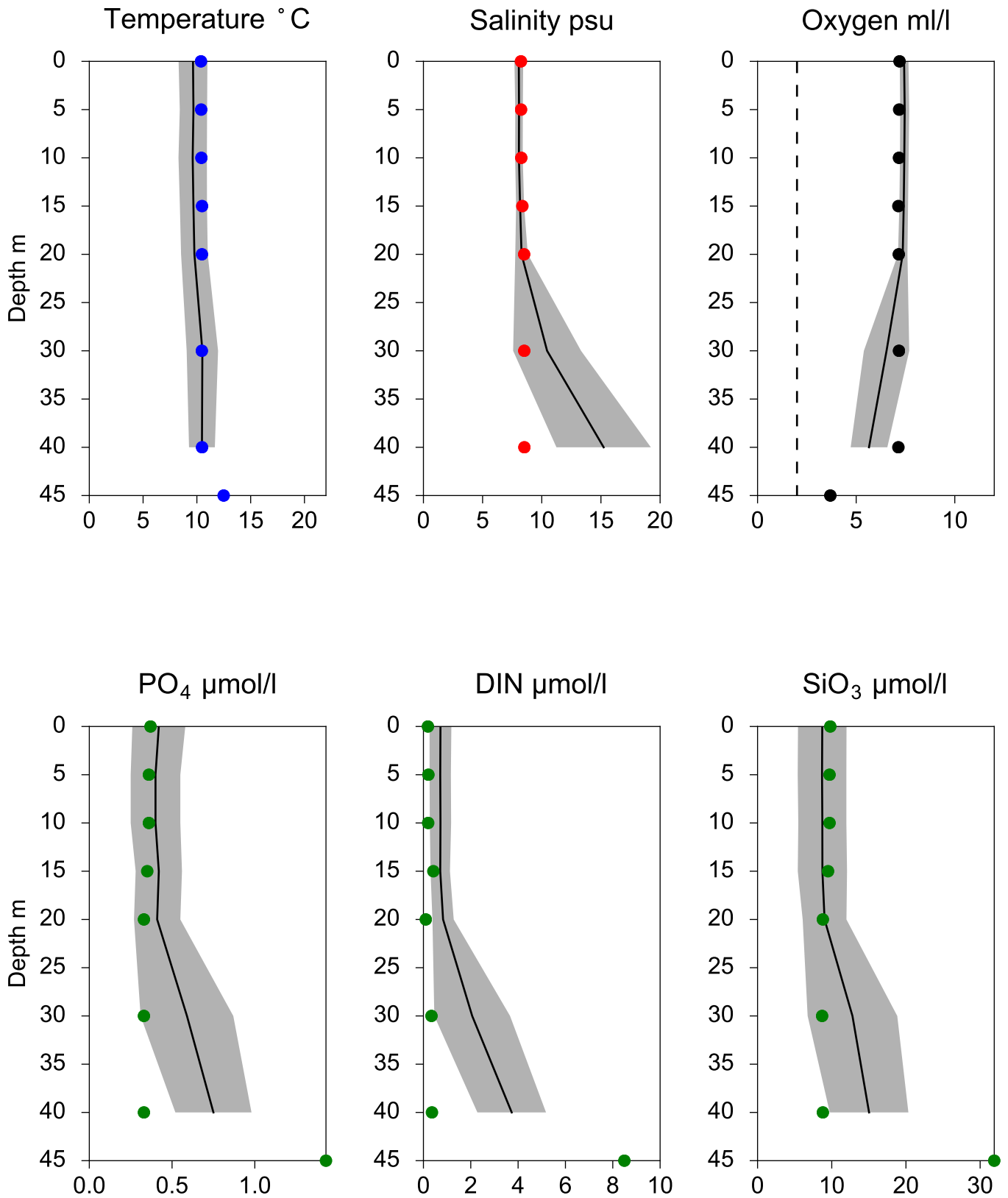


O₂ ml/l



Vertical profiles BY1 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-13



STATION W LANDSKRONA SURFACE WATER (0-10 m)

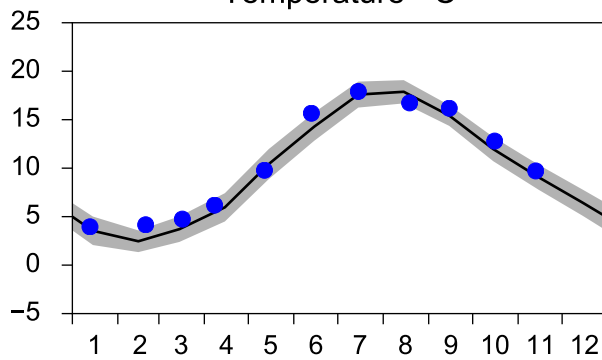
Annual Cycles

— Mean 2001-2015

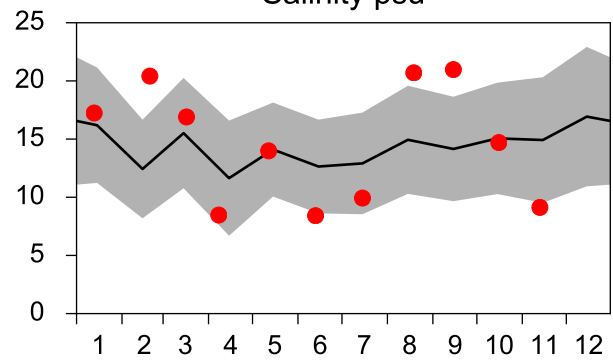
■ St.Dev.

● 2019

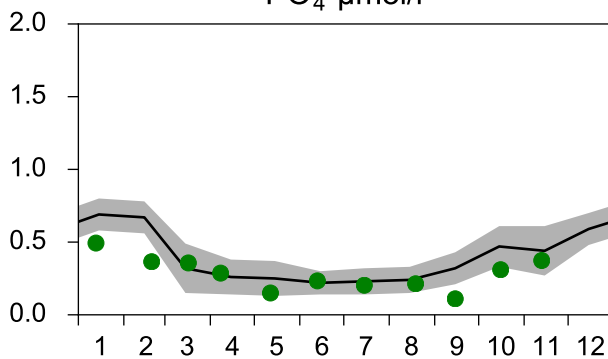
Temperature °C



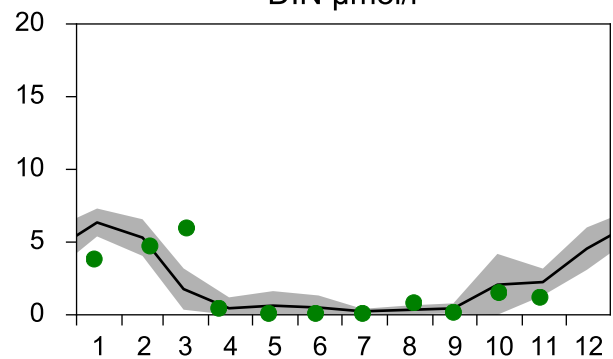
Salinity psu



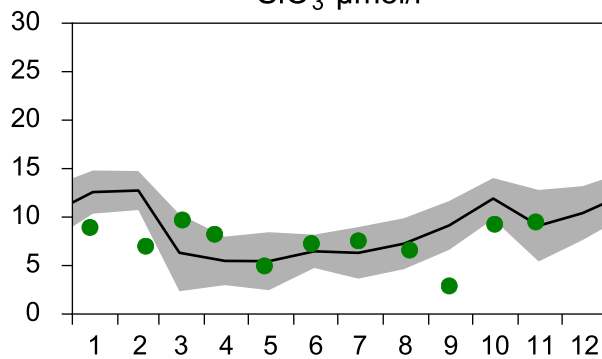
PO₄ µmol/l



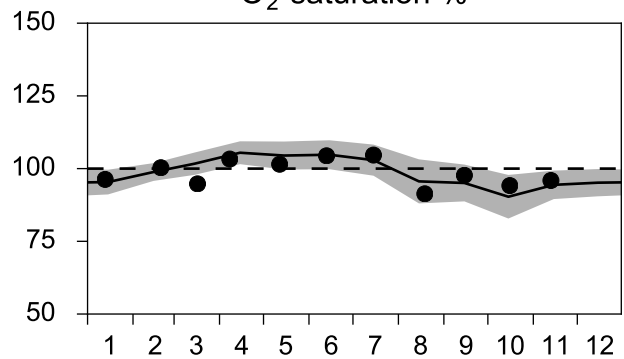
DIN µmol/l



SiO₃ µmol/l

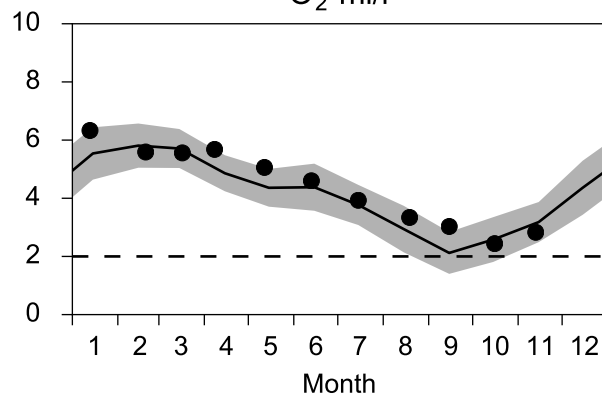


O₂ saturation %

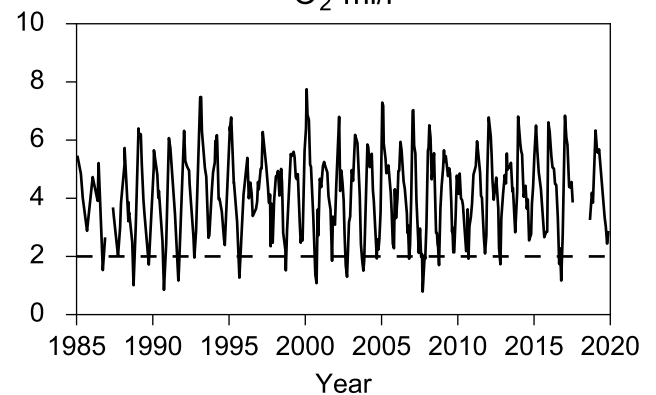


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

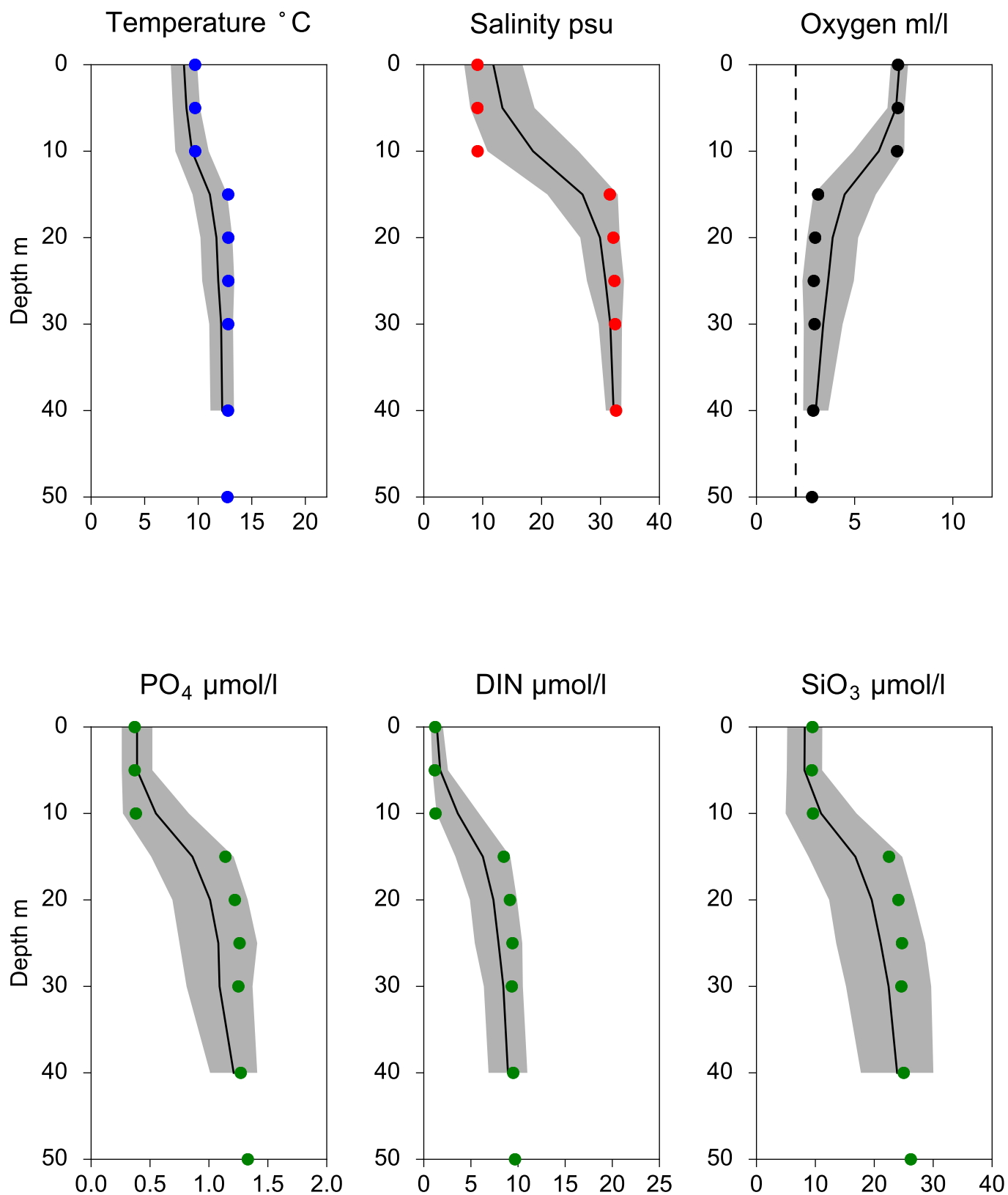


O₂ ml/l



Vertical profiles W LANDSKRONA November

— Mean 2001-2015 St.Dev. • 2019-11-13



STATION ANHOLT E SURFACE WATER (0-10 m)

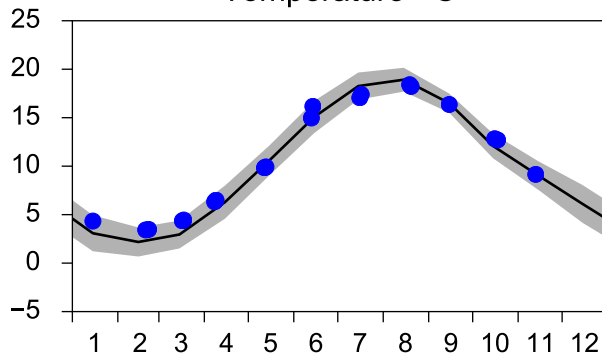
Annual Cycles

— Mean 2001-2015

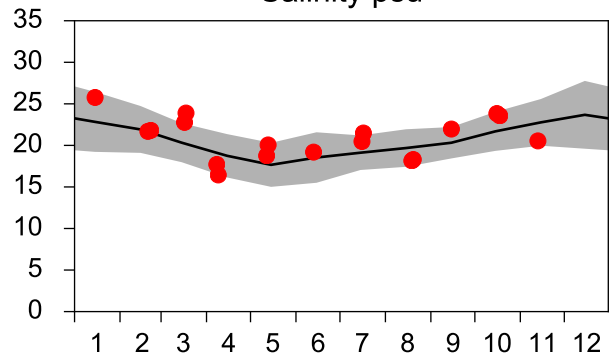
■ St.Dev.

● 2019

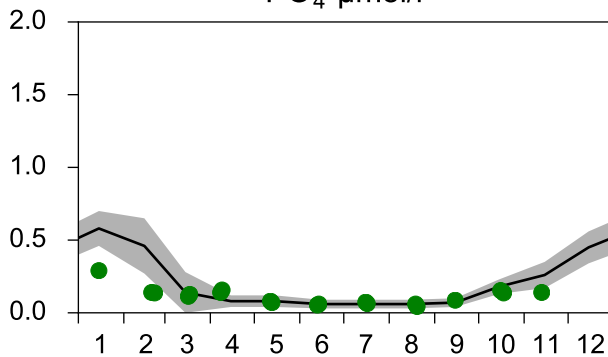
Temperature °C



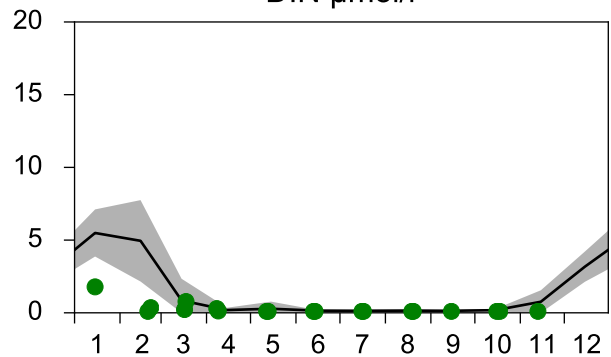
Salinity psu



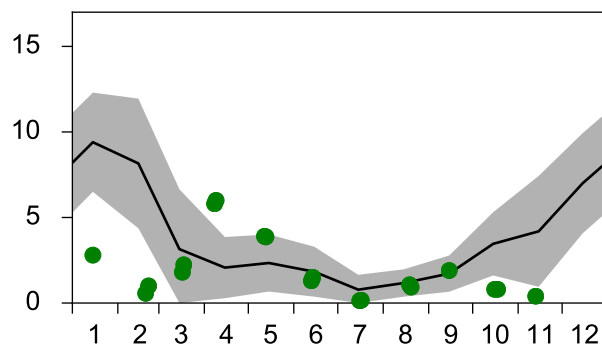
PO₄ µmol/l



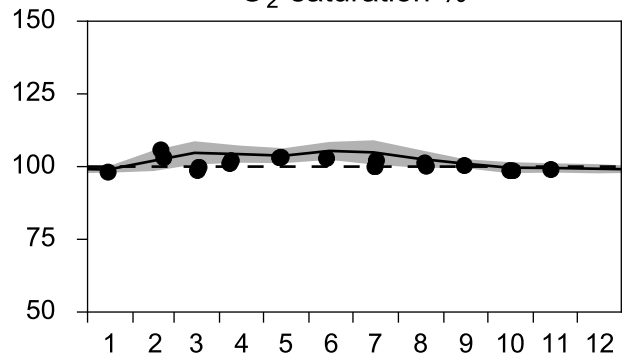
DIN µmol/l



SiO₃ µmol/l

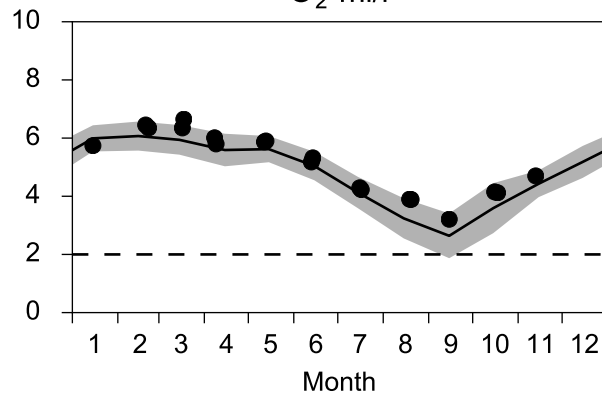


O₂ saturation %

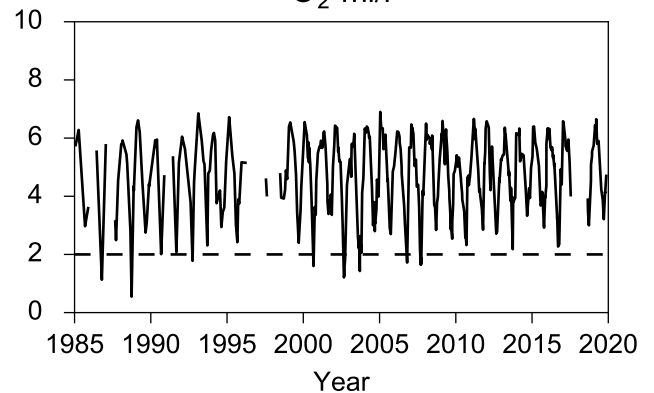


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

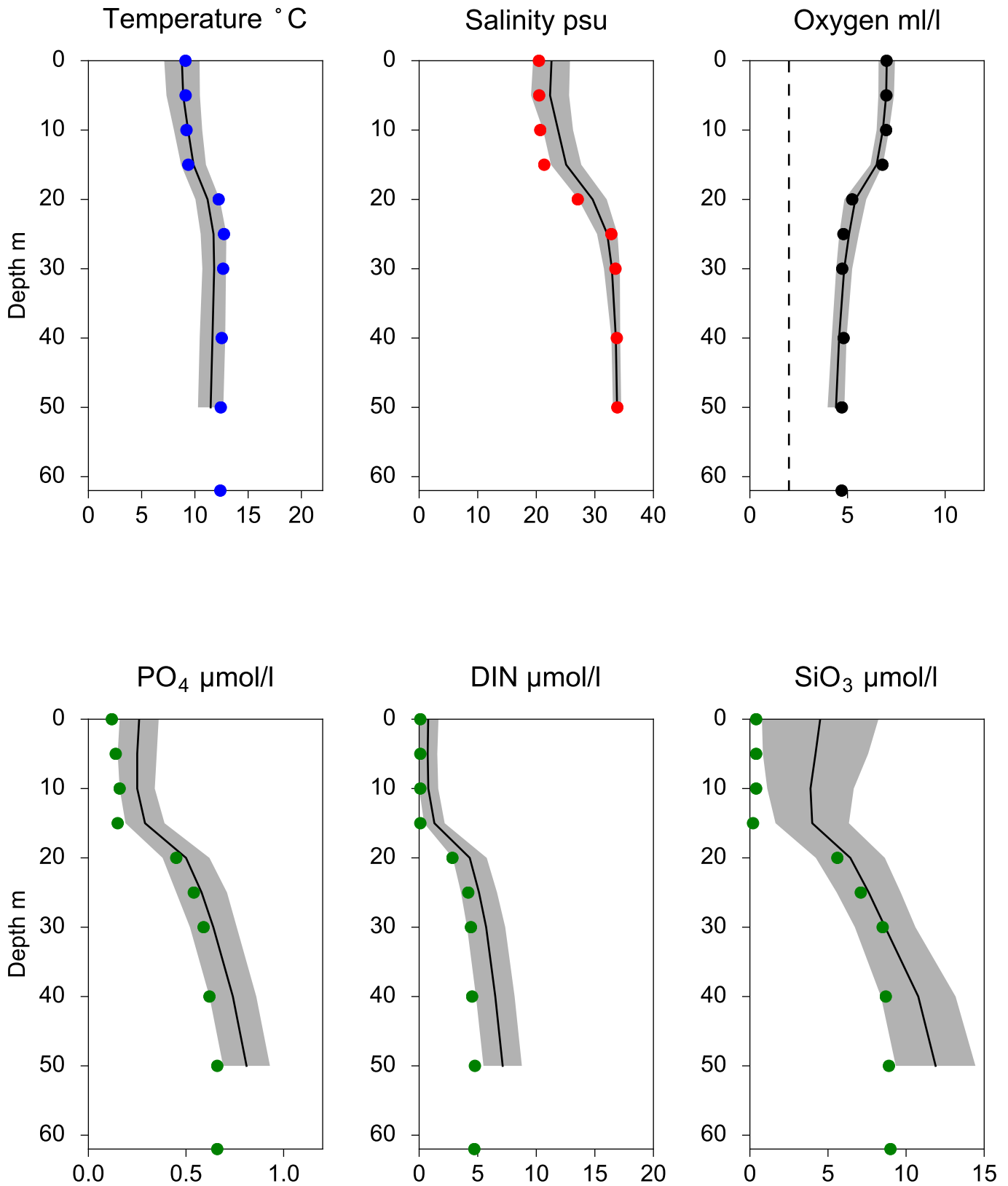


O₂ ml/l



Vertical profiles ANHOLT E November

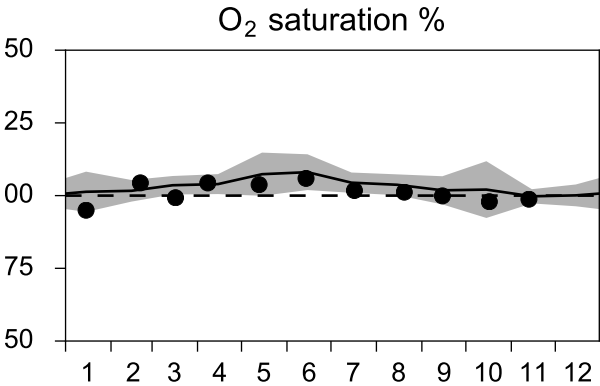
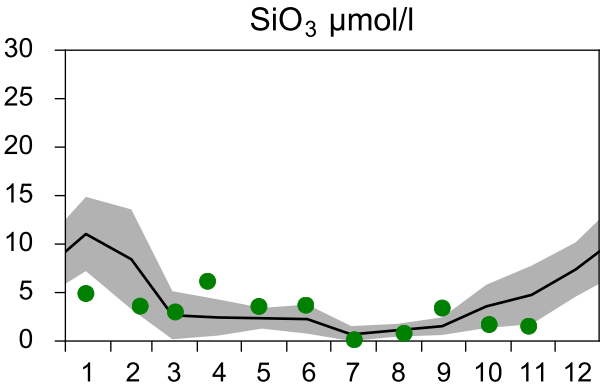
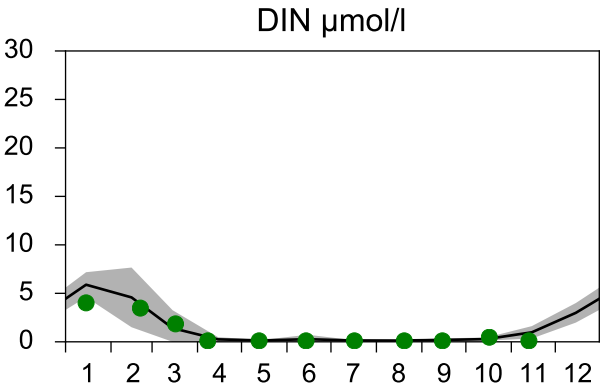
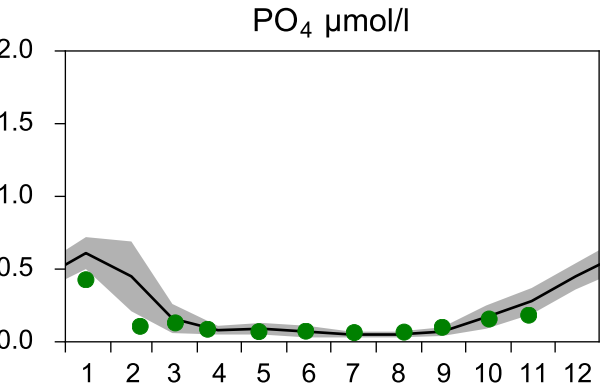
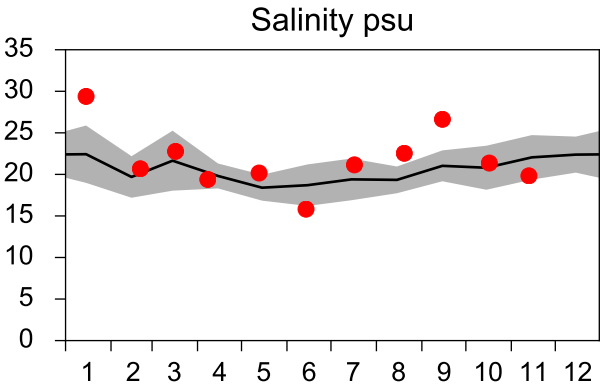
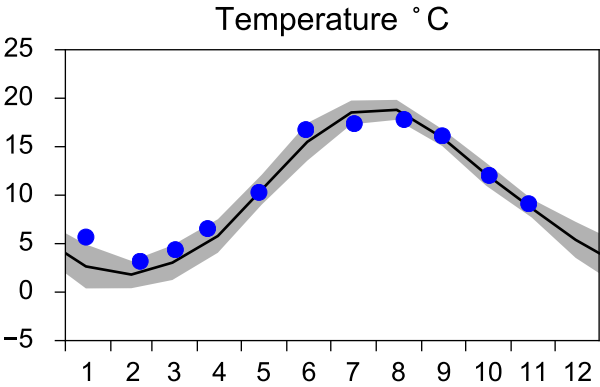
— Mean 2001-2015 St.Dev. • 2019-11-13



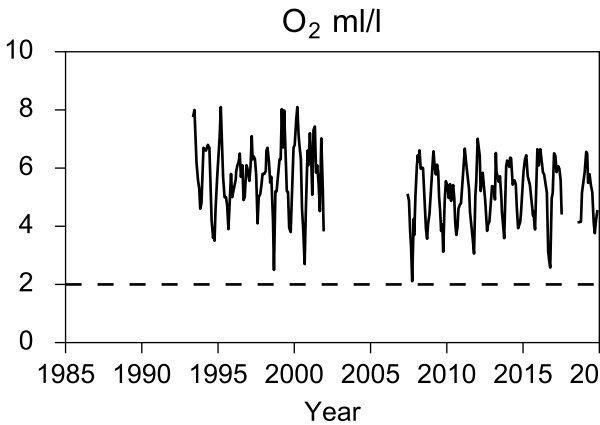
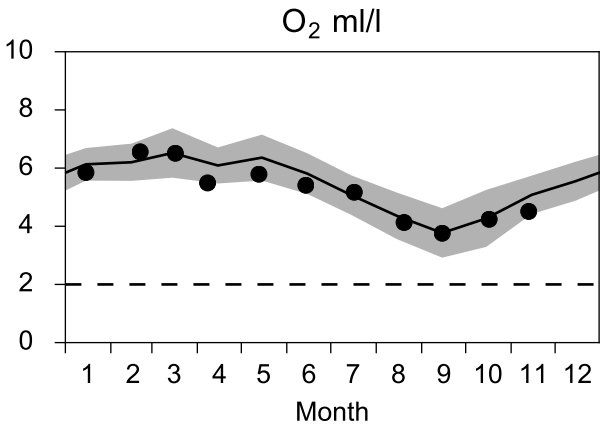
STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

— Mean 2001-2015 St.Dev. ● 2019

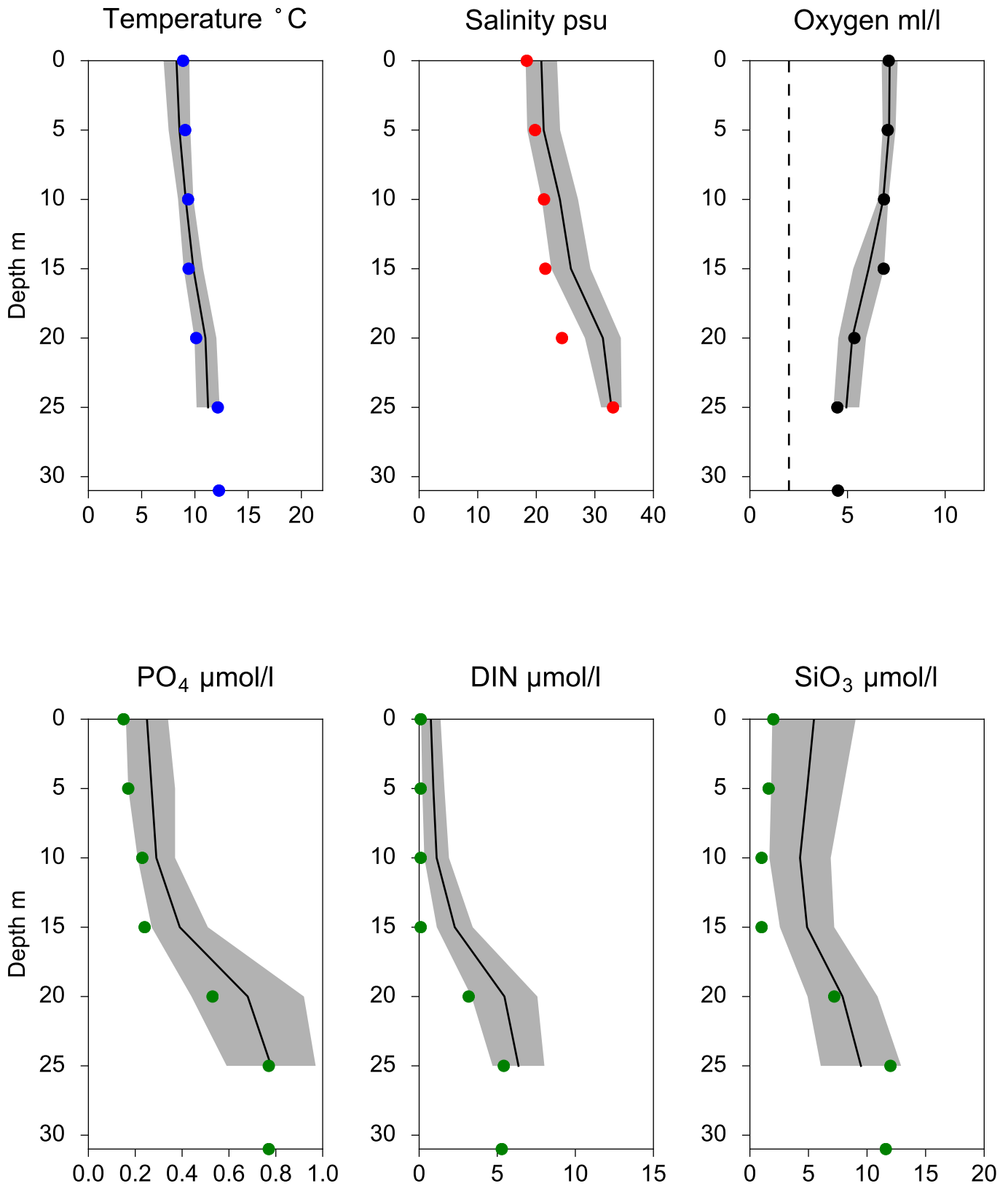


OXYGEN IN BOTTOM WATER (depth >= 25 m)



Vertical profiles N14 FALKENBERG November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-13



STATION FLADEN SURFACE WATER (0-10 m)

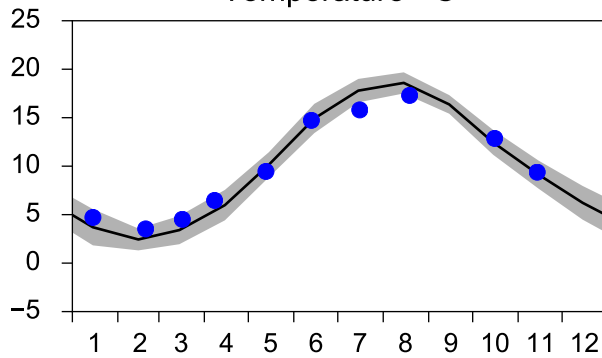
Annual Cycles

— Mean 2001-2015

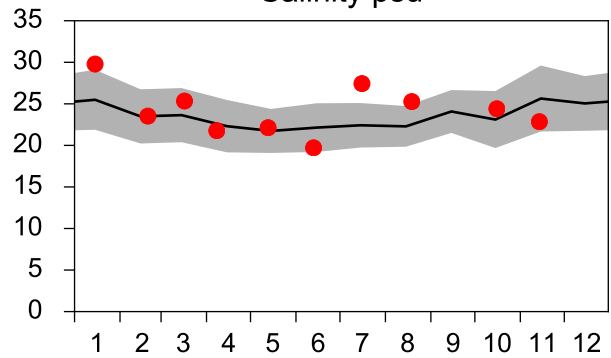
■ St.Dev.

● 2019

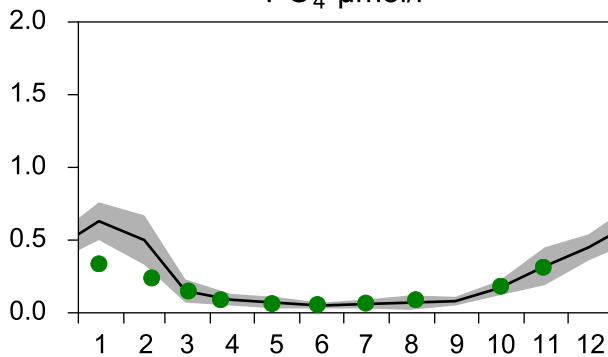
Temperature °C



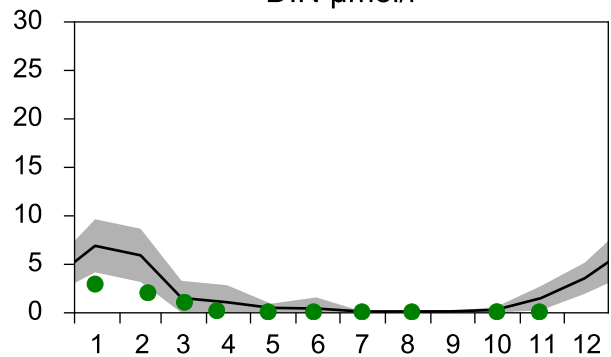
Salinity psu



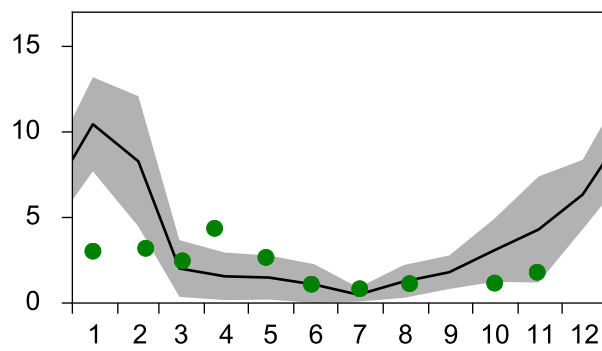
PO₄ µmol/l



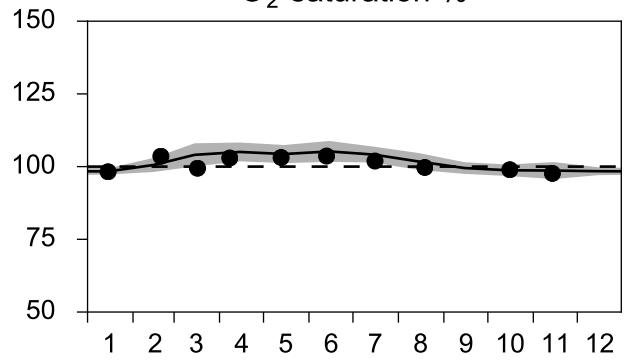
DIN µmol/l



SiO₃ µmol/l

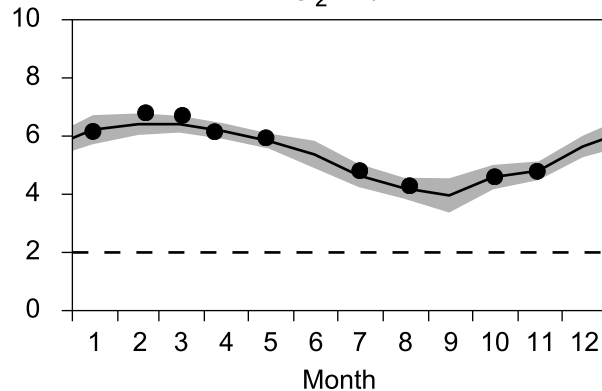


O₂ saturation %

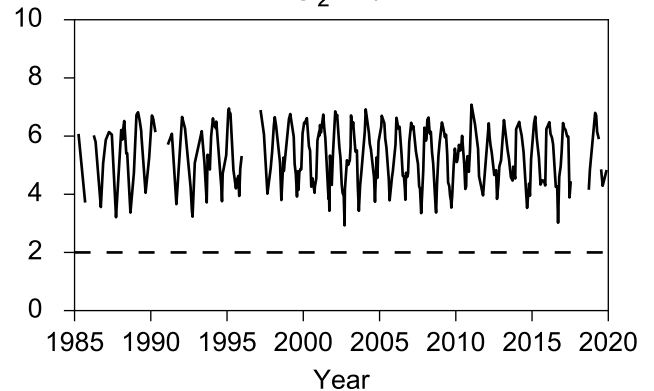


OXYGEN IN BOTTOM WATER (depth >= 74 m)

O₂ ml/l

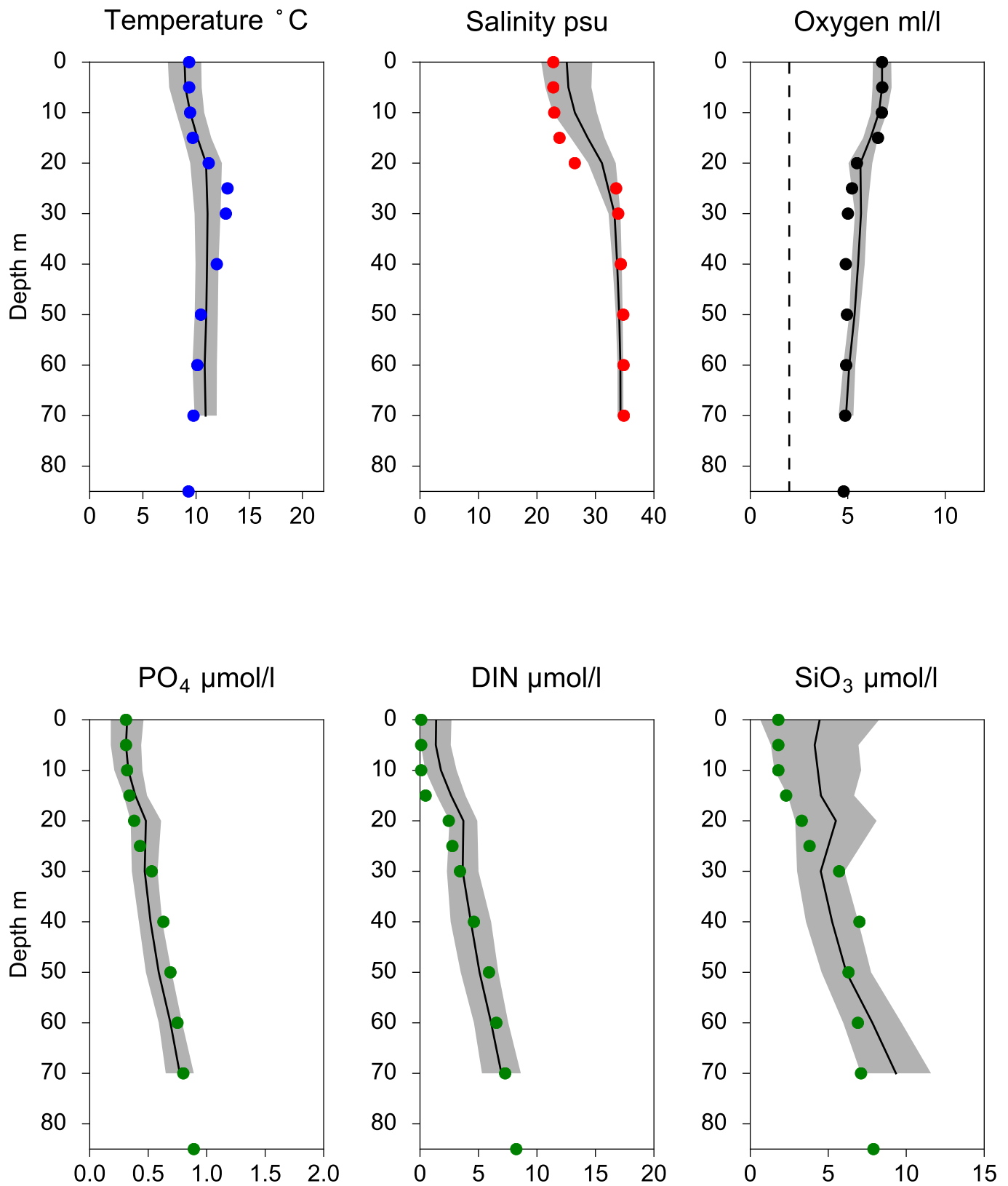


O₂ ml/l



Vertical profiles FLADEN November

— Mean 2001-2015 St.Dev. • 2019-11-14



STATION P2 SURFACE WATER (0-10 m)

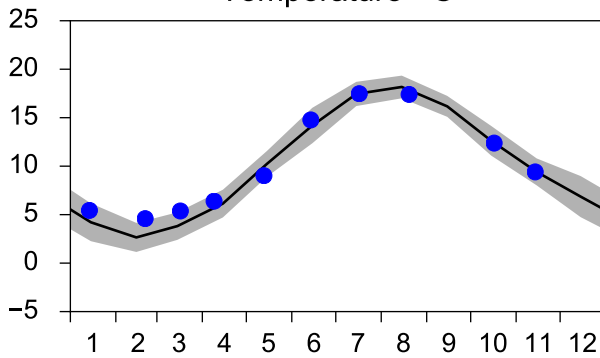
Annual Cycles

— Mean 2001-2015

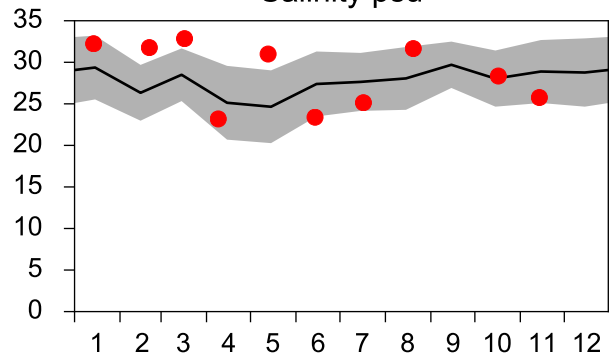
■ St.Dev.

● 2019

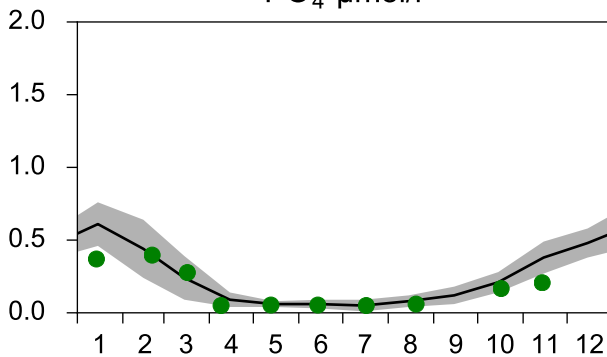
Temperature °C



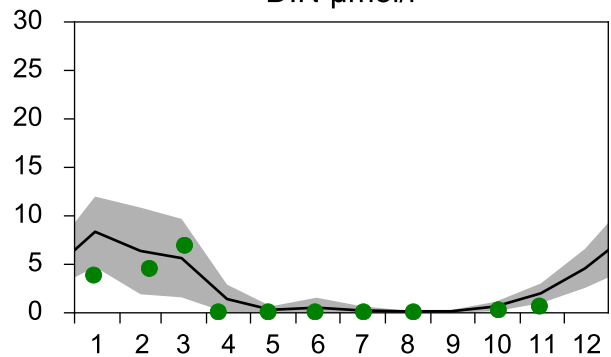
Salinity psu



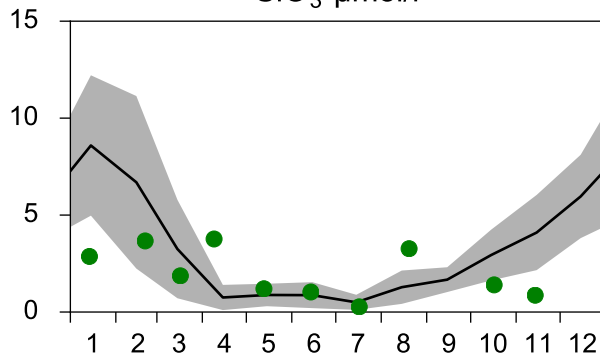
PO₄ μmol/l



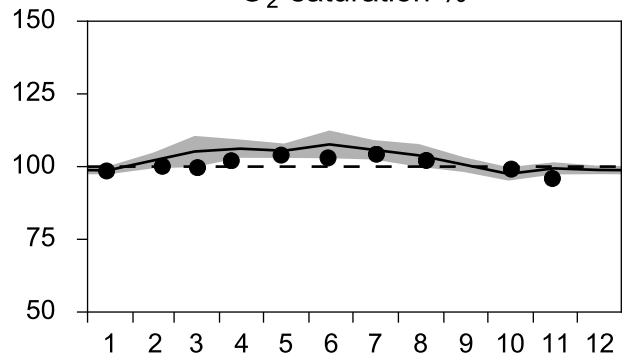
DIN μmol/l



SiO₃ μmol/l

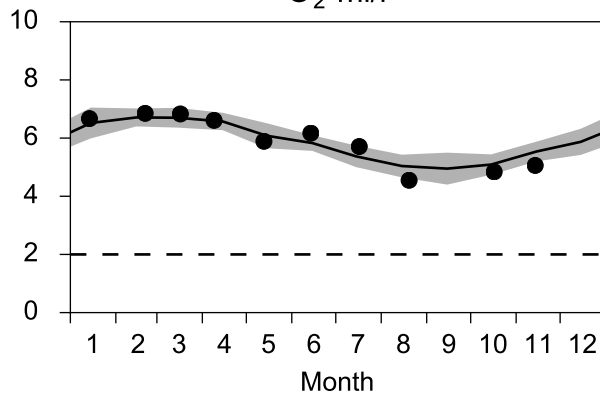


O₂ saturation %

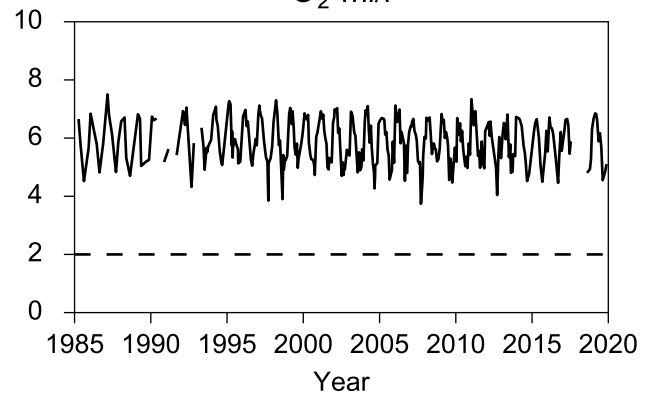


OXYGEN IN BOTTOM WATER (depth >= 75 m)

O₂ ml/l

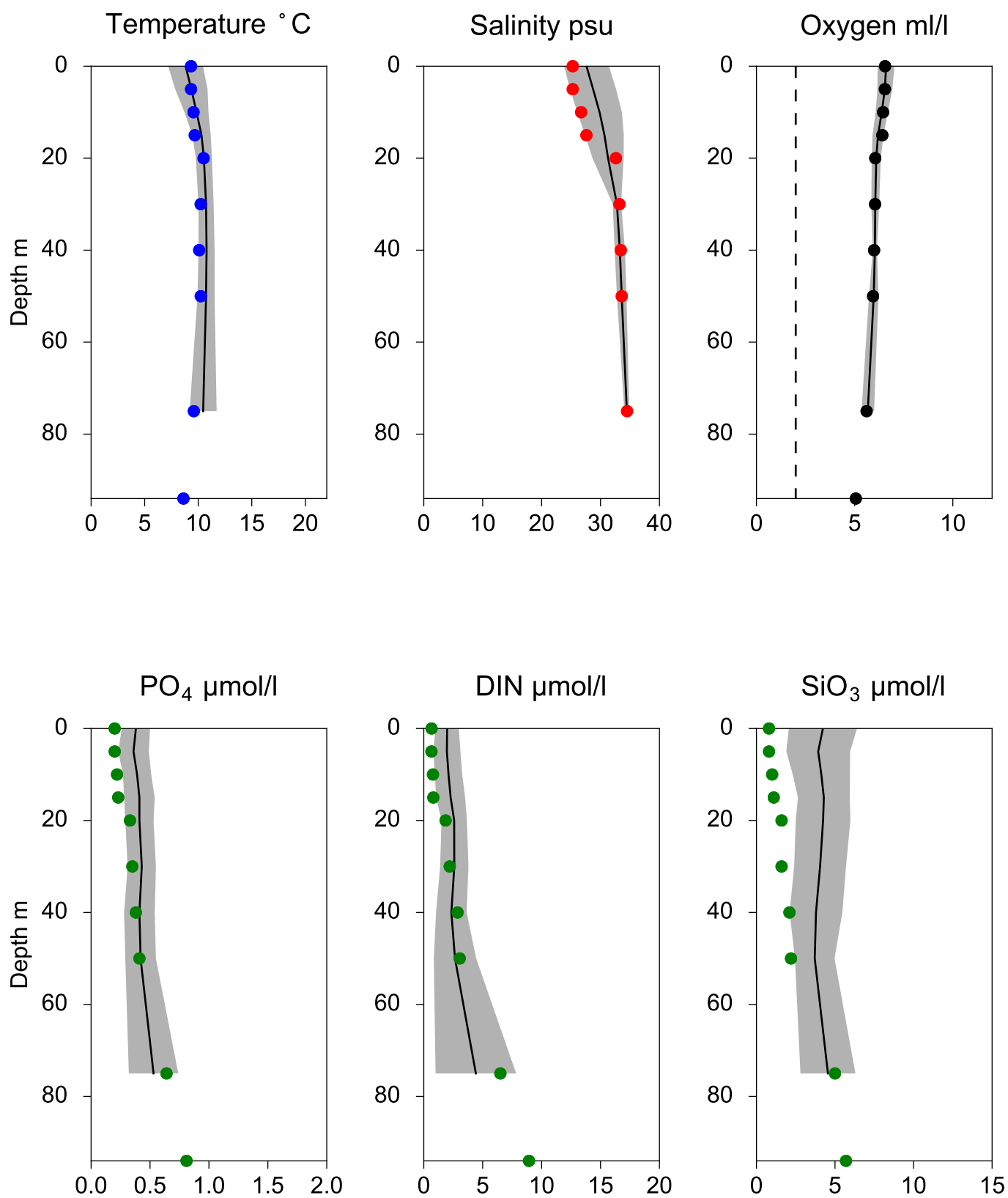


O₂ ml/l



Vertical profiles P2 November

— Mean 2001-2015 St.Dev. • 2019-11-14



STATION Å17 SURFACE WATER (0-10 m)

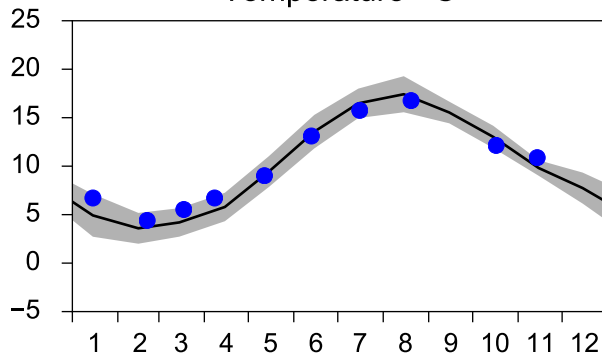
Annual Cycles

— Mean 2001-2015

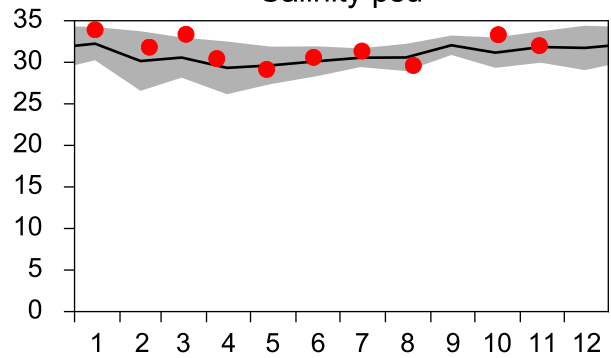
■ St.Dev.

● 2019

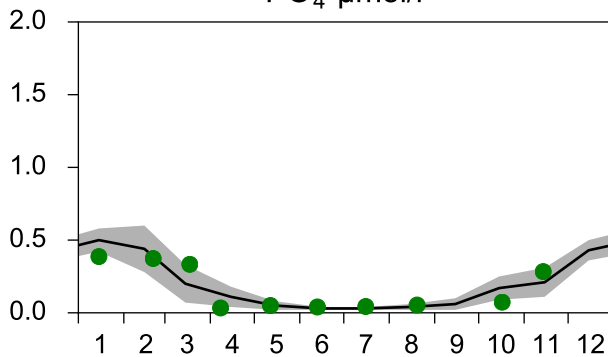
Temperature °C



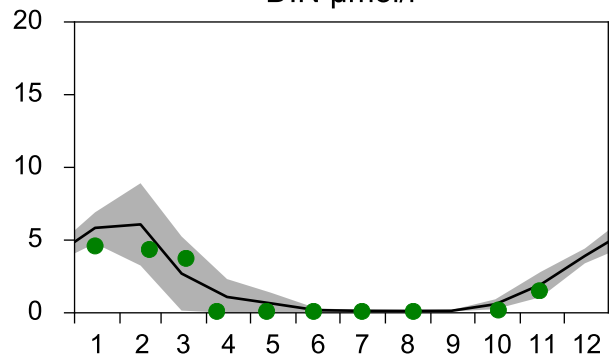
Salinity psu



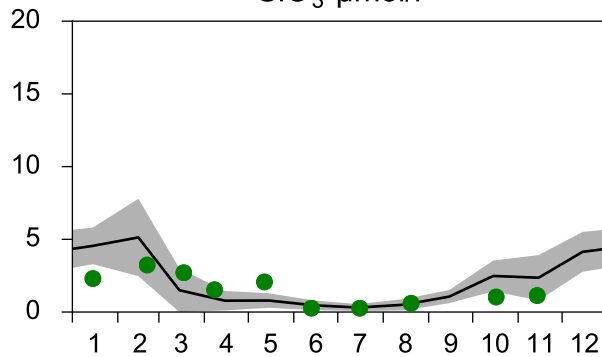
PO₄ µmol/l



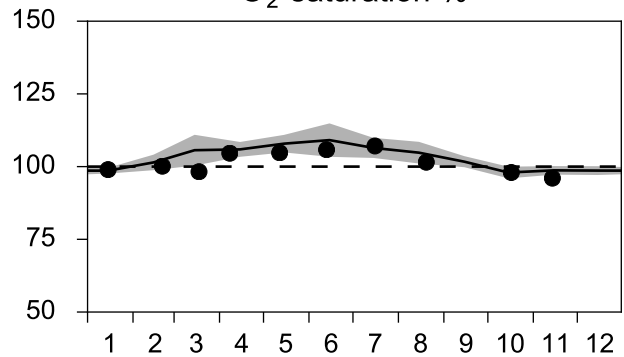
DIN µmol/l



SiO₃ µmol/l

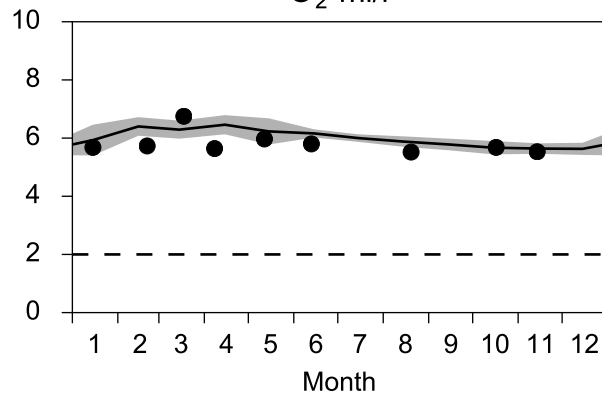


O₂ saturation %

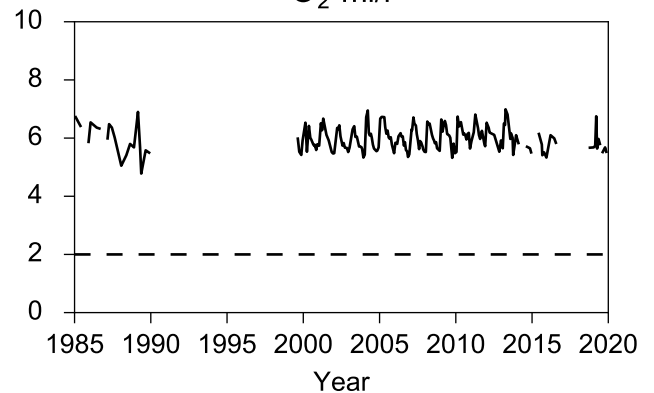


OXYGEN IN BOTTOM WATER (depth >= 300 m)

O₂ ml/l

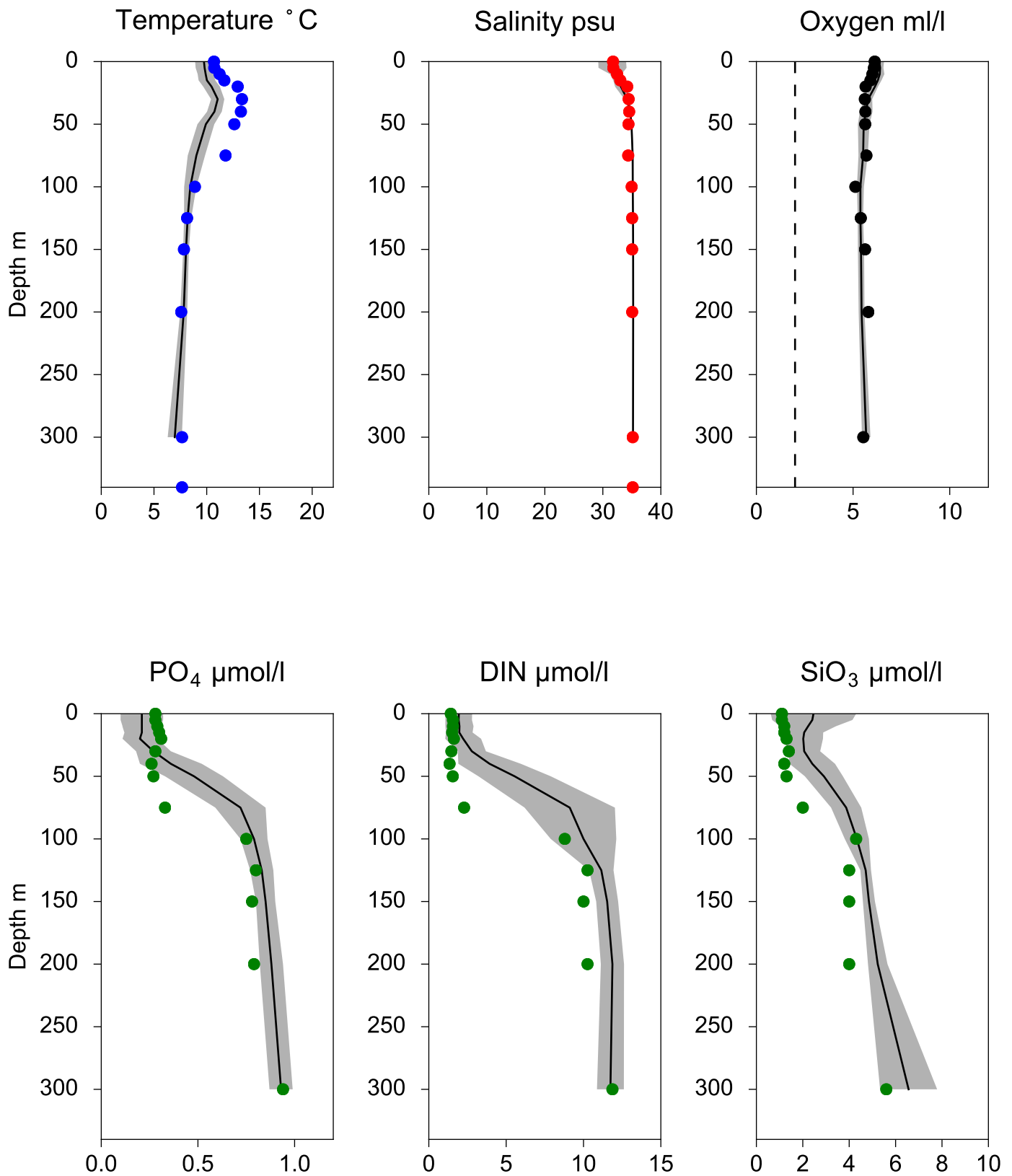


O₂ ml/l



Vertical profiles Å17 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-14



STATION Å15 SURFACE WATER (0-10 m)

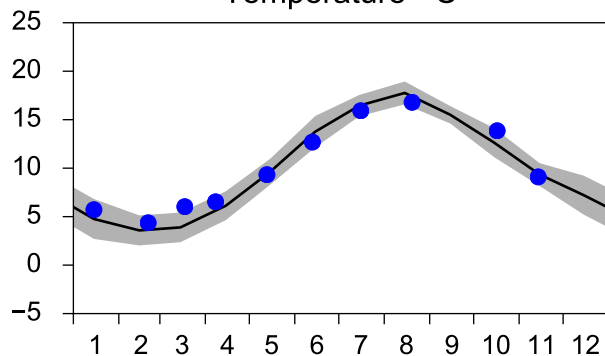
Annual Cycles

— Mean 2001-2015

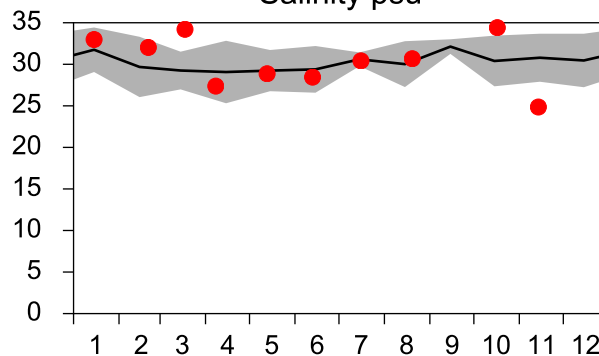
■ St.Dev.

● 2019

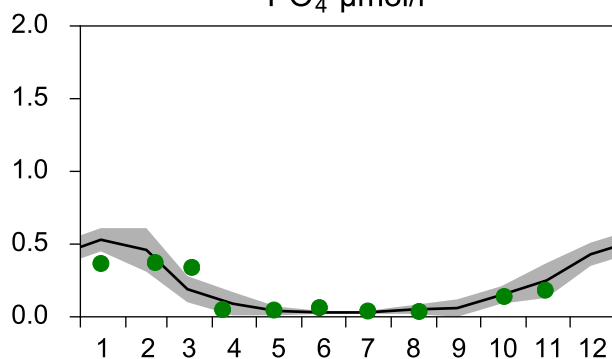
Temperature °C



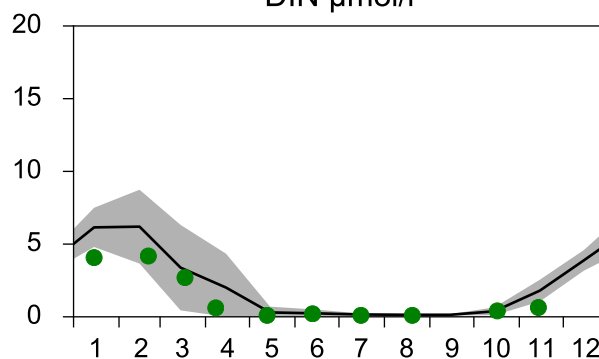
Salinity psu



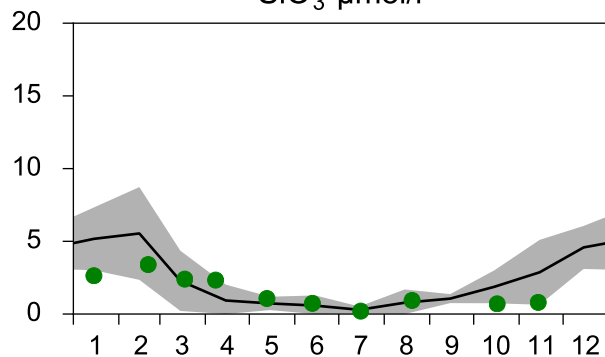
PO₄ µmol/l



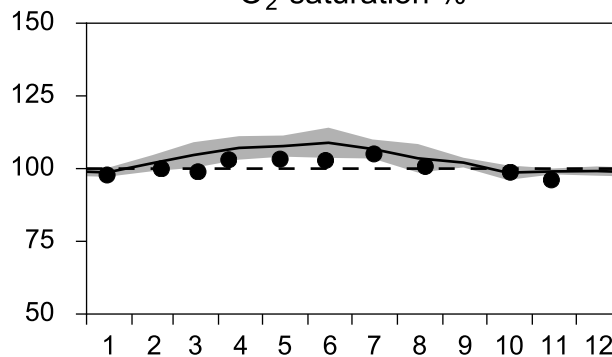
DIN µmol/l



SiO₃ µmol/l

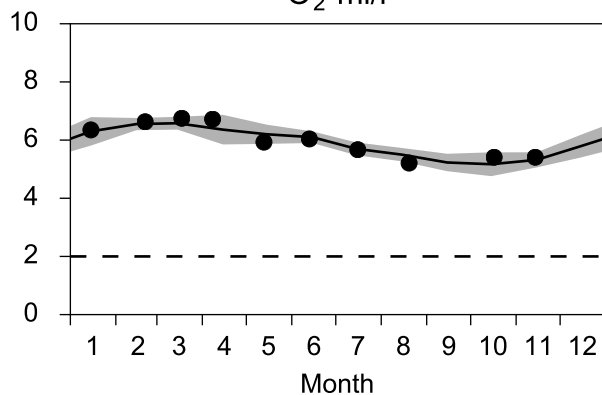


O₂ saturation %

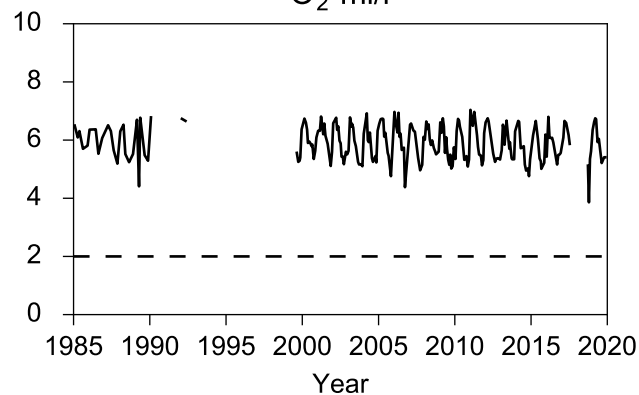


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

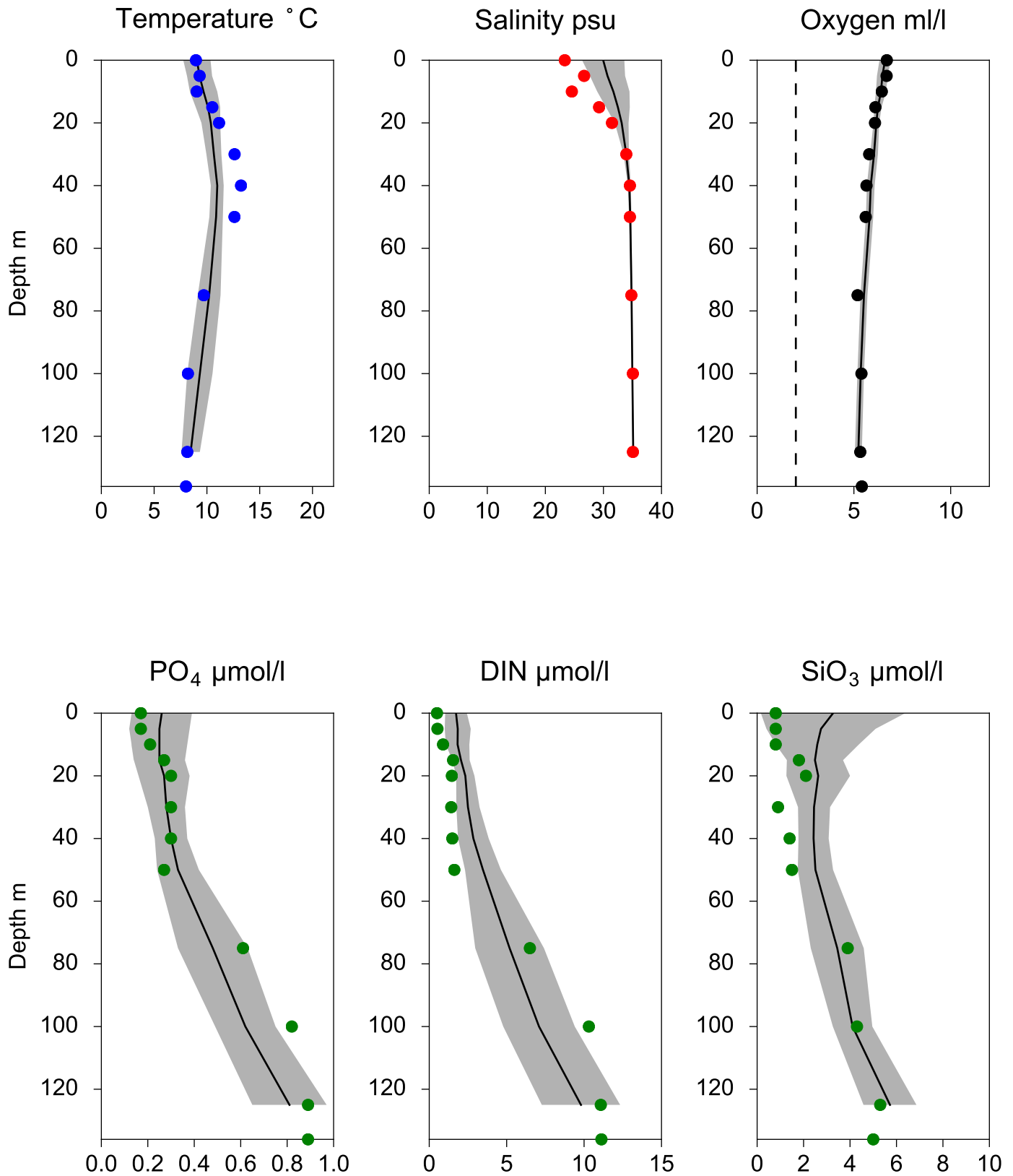


O₂ ml/l



Vertical profiles Å15 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-14



STATION Å13 SURFACE WATER (0-10 m)

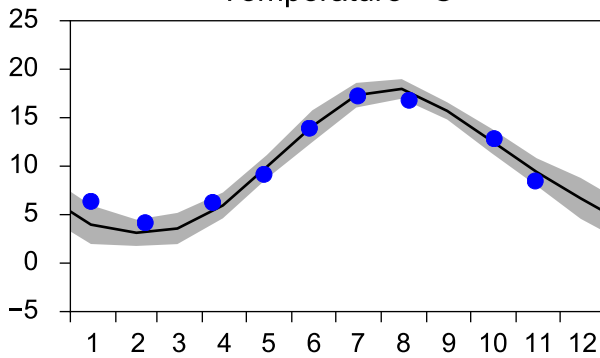
Annual Cycles

— Mean 2001-2015

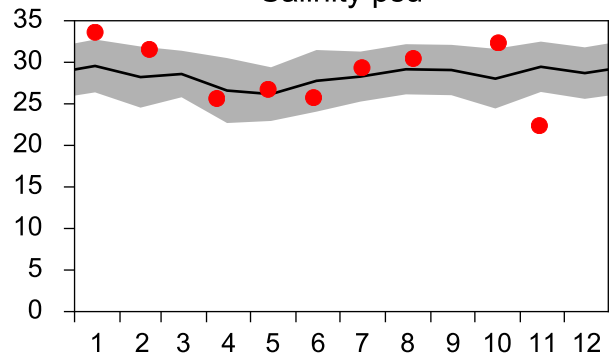
■ St.Dev.

● 2019

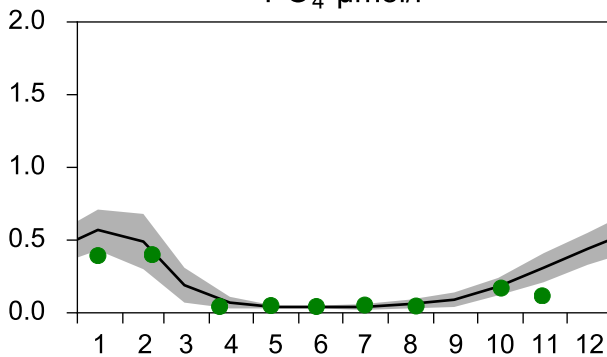
Temperature °C



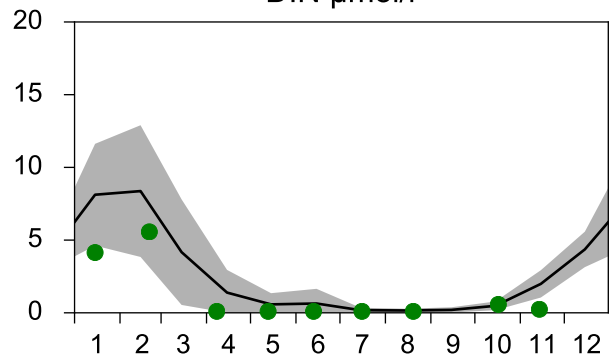
Salinity psu



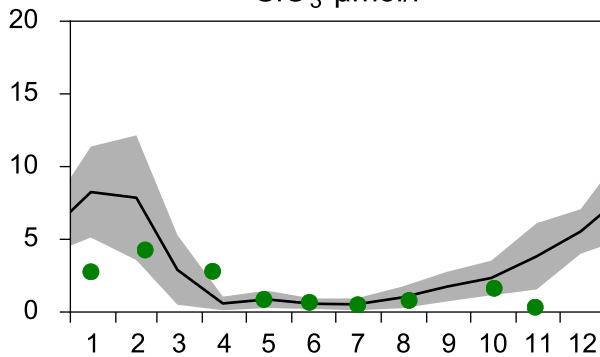
PO₄ µmol/l



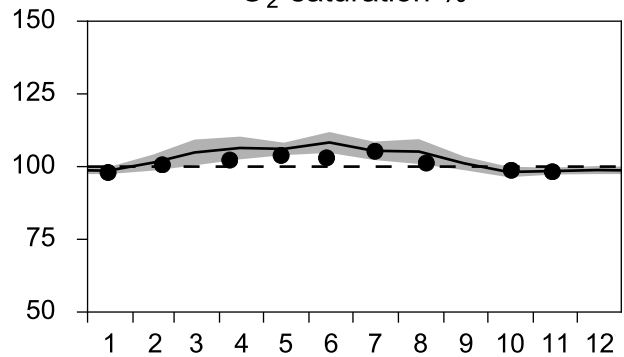
DIN µmol/l



SiO₃ µmol/l

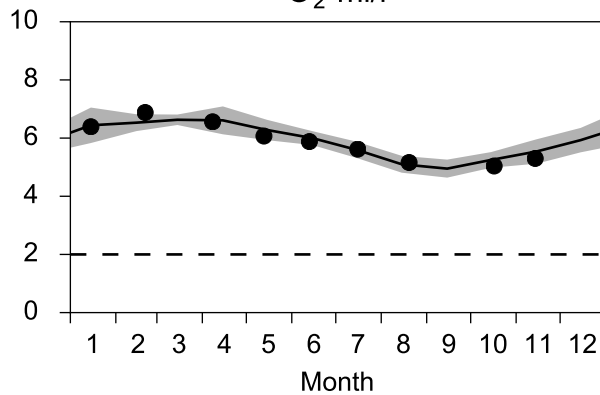


O₂ saturation %

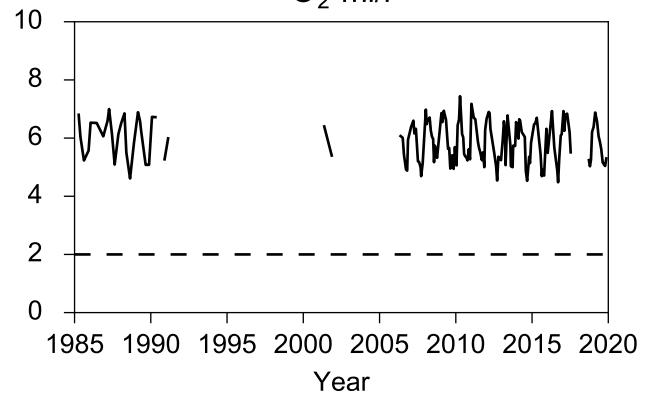


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l



O₂ ml/l



Vertical profiles Å13 November

— Mean 2001-2015 ■ St.Dev. ● 2019-11-14

