

Report from the SMHI monitoring cruise with R/V Aranda



Survey period:

2019-10-13 - 2019-10-20

Principal:

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

Cooperation partners:

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SUMMARY

During the expedition, which is part of the Swedish national marine monitoring program, the Skagerrack, the Kattegat, the Sound and the Baltic Proper, was visited. The weather was unusually calm for the season with only one day of harsher winds at the beginning of the expedition.

The surface temperature was normal for the season and varied between 10-14 ° C, much colder than in the previous expedition in September. A thermocline still existed in the Baltic Sea at about 30 m depth, about 15 m depth in the Kattegat and in the Skagerrack almost no thermocline was left. The salinity in the surface water (0-10 m) was higher than normal in the Skagerrack and the southern Baltic Sea.

The levels of nutrients in the surface water (0-10 m) were still low after the summer. Dissolved inorganic nitrogen was lower than normal at several stations in the Baltic Sea, especially in the southern parts. Phosphate was mostly normal except for the Eastern Gotland Basin, the Sound and the outermost Skagerrack where it was lower than normal. Silicon levels were lower than normal in the Skagerrack and Kattegat and above normal at most stations in the Baltic Sea.

In the Western Gotland Basin, the water was completely anoxic from 70-80 m depth and acute oxygen deficiency (<2 ml / l) was measured at 60 m depth, which is significantly lower than normal at this depth. Hydrogen sulphide was also measured at 70-80 m depth in the Eastern Gotland Basin, but oxygen was also measured below it, and hydrogen sulphide did not increase significantly until at about 130 m. In the Bornholm Basin there was an oxygen deficiency from 80 m and hydrogen sulphide was measured near the bottom in the Bornholm deep. In the Arkona Basin, acute oxygen deficiency was measured only closest to the bottom.

The station RefM1V1 south of Öland had to be cancelled.

The next regular expedition is scheduled for 9 - 15 November.

Front page, view from the CTD-room at R/V Aranda. Photo Lena Viktorsson.

RESULT

The expedition was conducted on board the Finnish research vessel Aranda and started in Helsinki on October 13, 2019 and ended in Åbo on October 20. The weather was unusually calm for the season, moderate winds and no big waves. At the start of the expedition, a low pressure passed over the western parts of the Baltic with slightly stronger winds. Visibility was poor but sometimes the sun shone through.

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).

During the expedition, equipment belonging to Uppsala University and the Finnish Meteorological Institute (FMI) at Östergarnsholm, just east of Gotland, was also serviced. FMI had one person on board that changed their wave buoy and the crew on Aranda retrieved a cage with pCO₂ sensors and an ADCP belonging to Uppsala University.

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 on 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 Skagerack

The temperature was normal for the season and around 12 (12.1-13.9) ° C in the surface water (0-10 m) at all stations in Skagerack. In contrast, the salinity in the surface water was higher than normal at all stations in the Å-section, about 32-34. At P2 further south, the salinity in the surface water was about 28. At stations Å17 and P2 there was a pycnocline at about 15 m, while the water column at other stations was relatively well-mixed down to 50 m depth. The salinity under the pycnocline was about 34 at all stations.

The levels of phosphate and dissolved inorganic nitrogen (DIN) were normal in the whole profile, except at Å17 where the concentration of phosphate in the surface water was slightly lower than normal (0.07 µmol / l). The content of silicon was lower than normal in the surface water (0-10 m) at station Å17 and Å15 (0.7-1.03 µmol / l).

Oxygen concentrations were normal at all stations. A small peak in chlorophyll fluorescence was noted at just over 10 m depth at P2.

The Kattegat and the Sound

The temperature in the surface water (0-10 m) varied between 12.0-12.9 ° C, which is normal for the season. The salinity in the surface water was about 24 in the open Kattegat, about 21 at the coastal station N14 Falkenberg and about 14 in the Sound. A pycnocline was found at about 15 m, where the temperature increased by about 2°C and then dropped again towards the bottom. The salinity under the pycnocline was about 30, except at Fladen where the salinity was about 32.

The levels of DIN were still close to the detection limit except in the Sound where the concentration was about 1.5 µmol / l, normal for the season. Phosphate levels were also still low, about 0.2 µmol / l in the Kattegat and 0.3 µmol / l in the Sound, lower than normal for the Sound but normal for the Kattegat. Silicate concentrations were below normal throughout the Kattegat and in the Sound.

Small peaks in chlorophyll fluorescence were noted at just over 15 m deep at Fladen and 17 m deep at the second visit to 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

As in September, the surface water was well-mixed down to about 30 but had cooled further and the temperature in the Eastern Gotland Basin varied between 12-13 ° C, compared to 14-17 ° C in September. In the Bornholm Basin and at the station BCS III-10 in the southeast, the salinity above the thermocline was just above normal. Here, the salinity has also been slightly above normal during summer. The permanent stratification in the Baltic Sea (the halocline) was approximately 60 m deep. 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.

In the Bornholm Basin, traces of a smaller inflow appeared just under 60 m with slightly warmer and saltier water compared to September.

In the Eastern Gotland Basin, hydrogen sulphide was first measured at depths of 70-80 m, but below that hydrogen sulphide decreased again. At the station BY15, low oxygen levels were measured between 90-130 m, at stations BY20 there were no measurable levels of oxygen below 70 m, but a clear reduction of hydrogen sulphide at 125 m depth. In the Bornholm Basin, low levels of hydrogen sulphide were only measured closest to the bottom at the station BY5, but there was oxygen deficiency of from 70 m and at both BY5 and BY4 the oxygen was close to zero from 80 m. In the Arkona Basin, the water was oxygenated all the way to the bottom and oxygen deficiency (<2 ml/l) was measured only closest to the bottom at BY2. In the Western Gotland Basin, however, it was completely anoxic and high levels of hydrogen sulphide from 70-80 m to the bottom. At the station BY32, hydrogen sulphide was measured at 60 m depth in September and now the oxygen levels above the halocline were lower than normal and there was oxygen deficiency at 60 m depth. However, hydrogen sulphide was not measured until the next sampling depth, 70 m.

The surface contents (0-10 m) of both dissolved inorganic nitrogen (DIN) and phosphate had started to increase again after the summer, but the levels of phosphate were slightly below normal in the Eastern Gotland Basin, but normal in general. DIN levels were lower than normal at most stations except at station BCS III-10 in the south-east. The silicate concentrations in the surface water were above normal in the Western Gotland Basin and at stations BY5, BCS III-10 and BY20. In the

Arkona and Bornholm basins, the levels of nutrients were normal in the deep water and increased with reduced oxygen to 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 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.

No chlorophyll fluorescence peaks were noted.

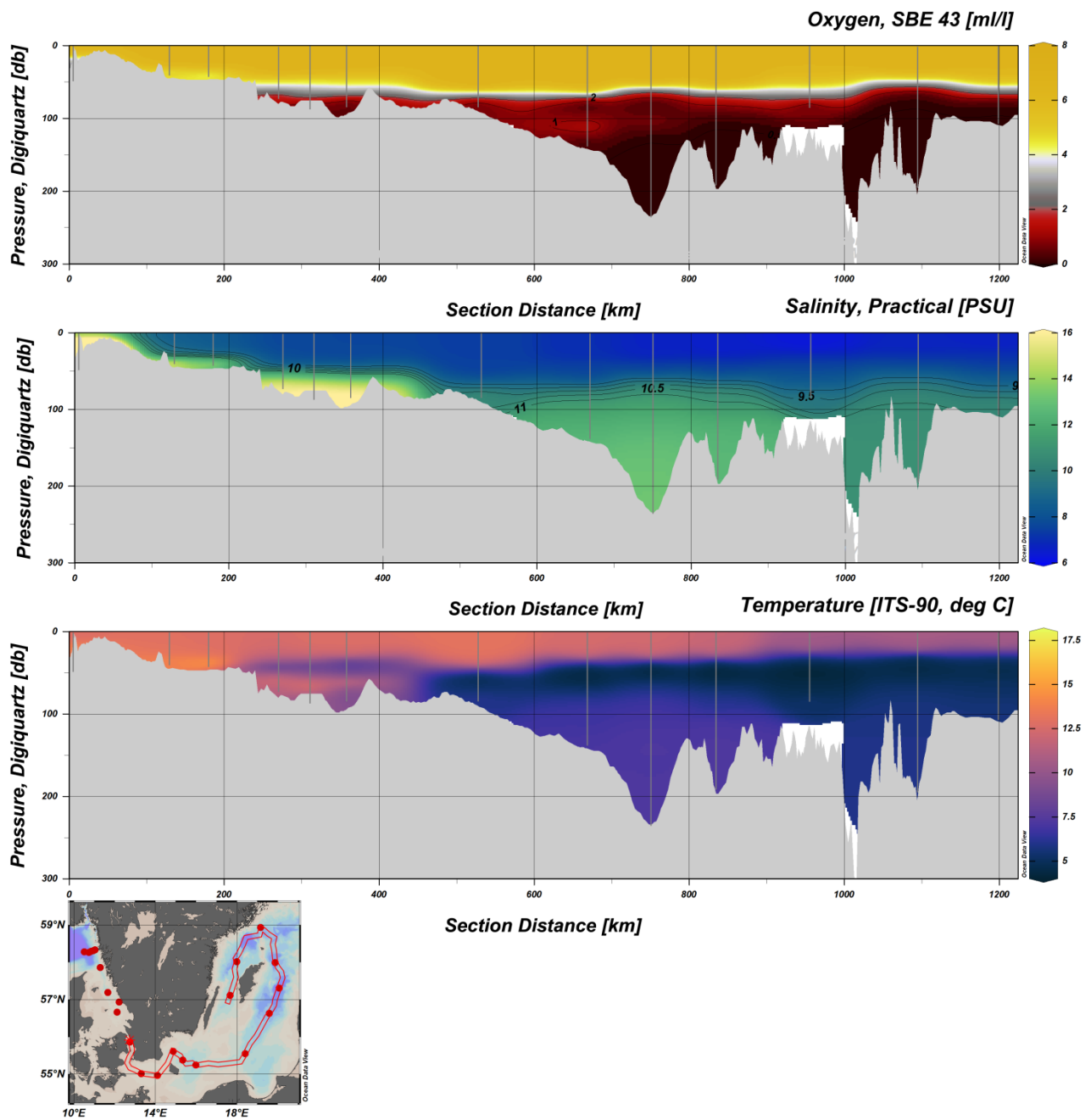


Figure 1. Transect showing dissolved oxygen, salinity and temperature from the Sound, through the Baltic Proper, to the Western Gotland Basin. Grey lines mark the positions that the plots are based on and below is a map showing these positions.

Participants

Name	Role	Section	From
Lena Viktorsson	Expeditionsledare		SMHI
Sari Sipilä			SMHI
Ann-Turi Skjevik			SMHI
Kristin Andreasson	Kvalitetsansvarig		SMHI
Jenny Lycken			SMHI
Heini Jalli		Helsinki - Gothenburg	FMI

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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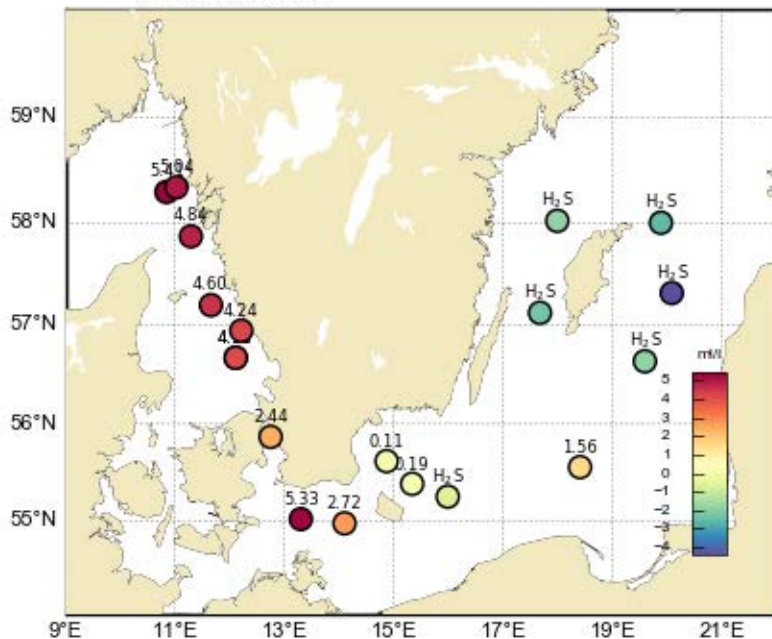
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Bottom water oxygen concentration (ml/l)

Ship: Aranda

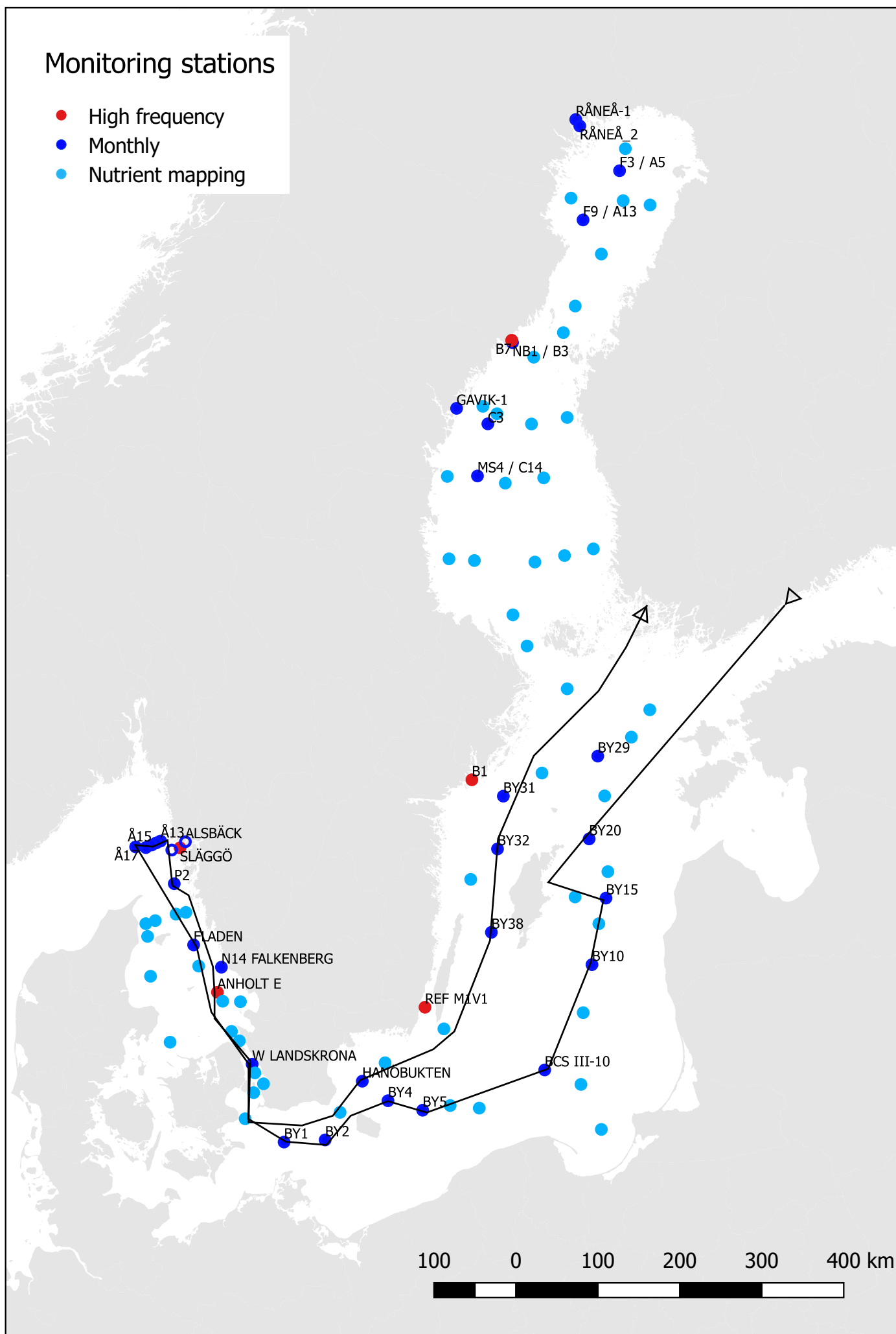
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Series: 0661-0684



Monitoring stations

- High frequency
- Monthly
- Nutrient mapping



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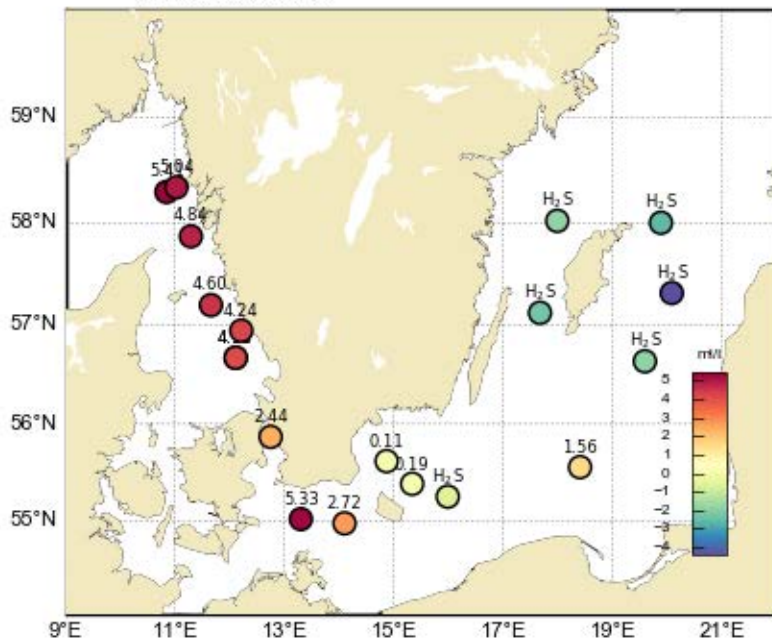
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Bottom water oxygen concentration (ml/l)

Ship: Aranda

Date: 20191014-20191019

Series: 0661-0684



STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

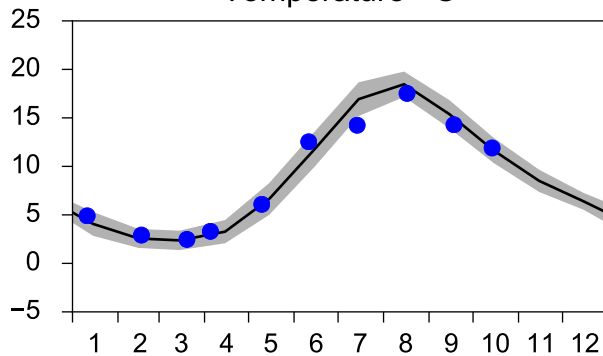
Annual Cycles

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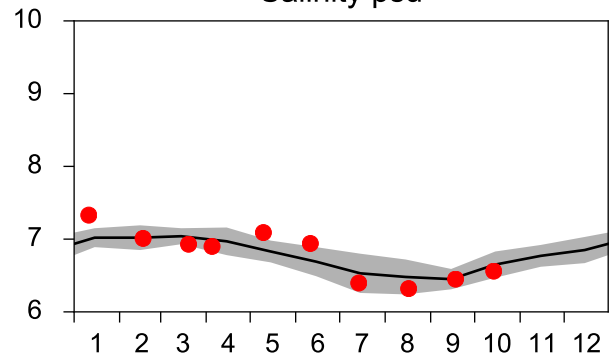
■ St.Dev.

● 2019

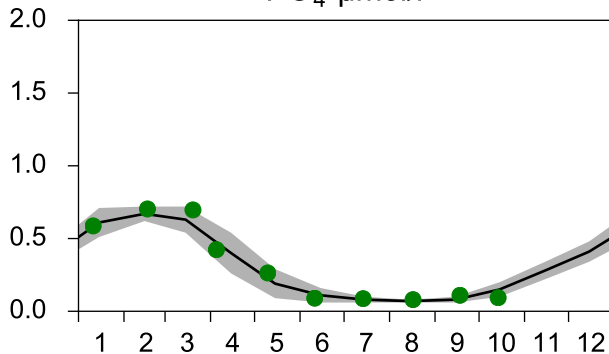
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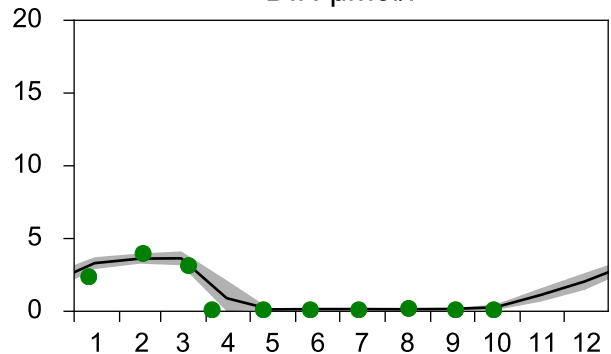
Salinity psu



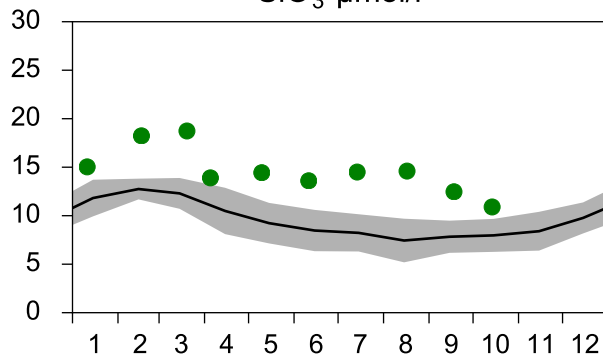
PO₄ µmol/l



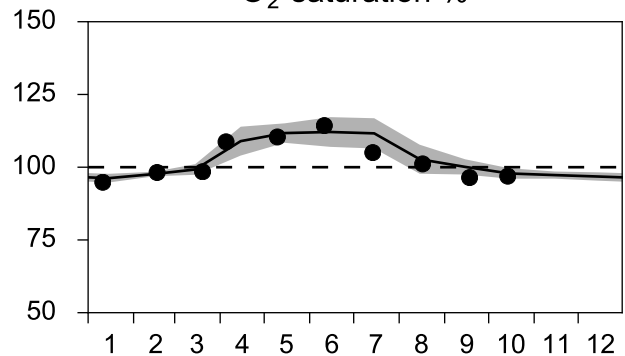
DIN µmol/l



SiO₃ µmol/l

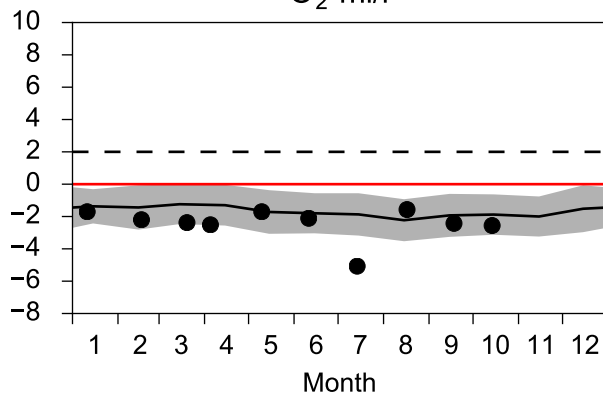


O₂ saturation %

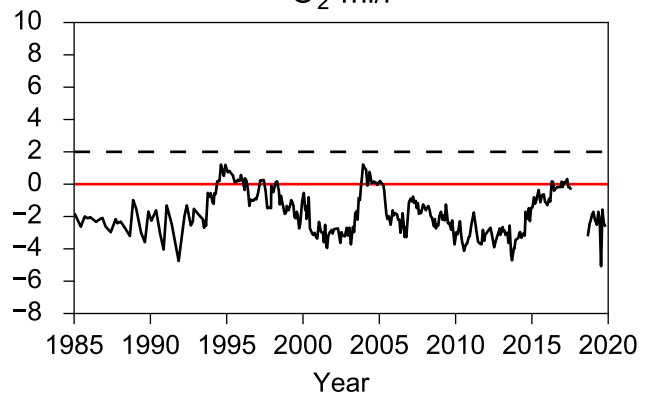


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l



O₂ ml/l

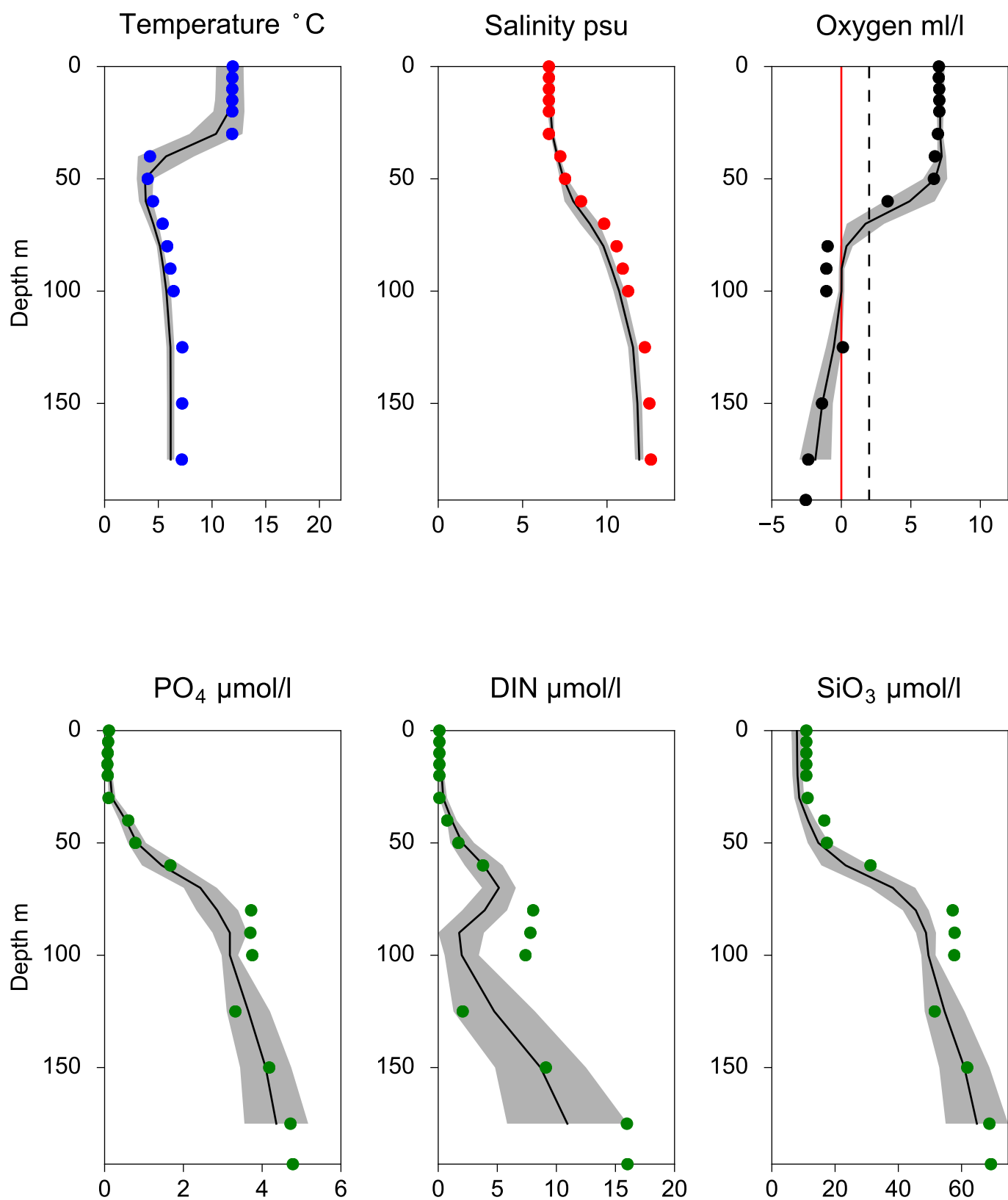


Vertical profiles BY20 FÅRÖDJ October

— Mean 2001-2015

■ St.Dev.

● 2019-10-14



STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

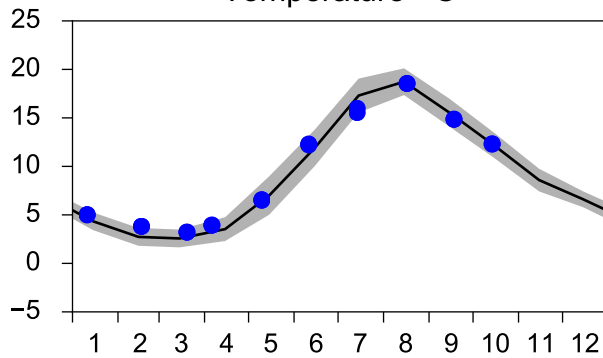
Annual Cycles

— Mean 2001-2015

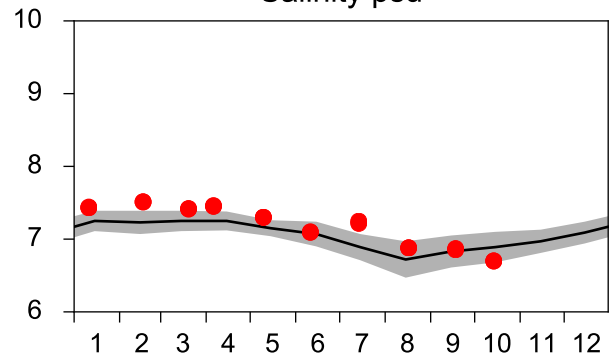
■ St.Dev.

● 2019

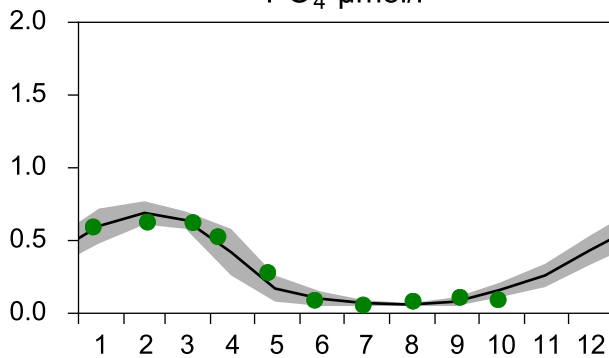
Temperature °C



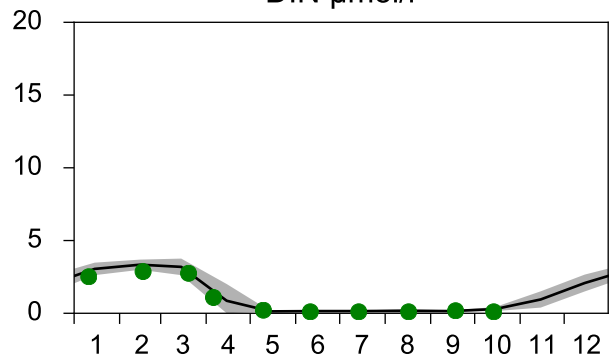
Salinity psu



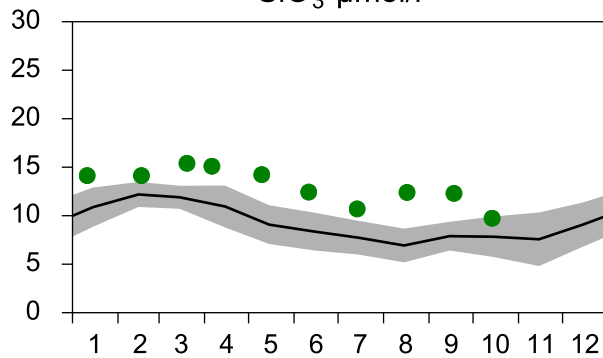
PO₄ µmol/l



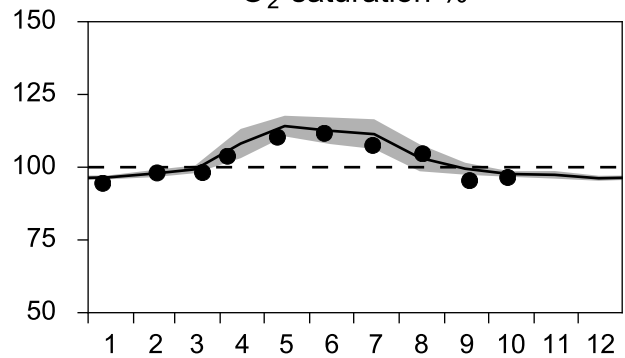
DIN µmol/l



SiO₃ µmol/l

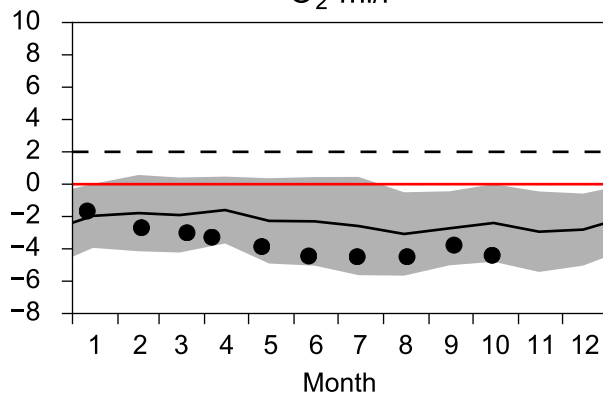


O₂ saturation %

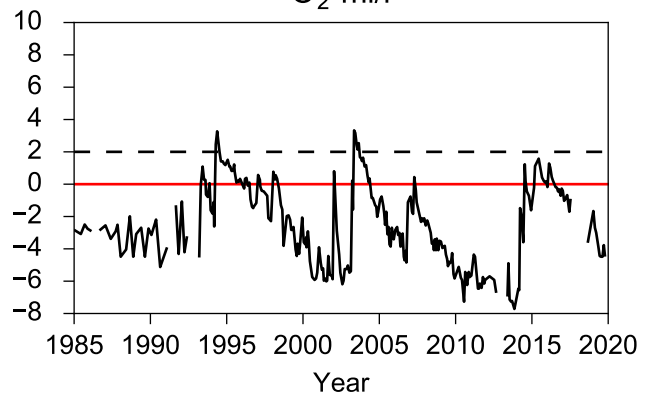


OXYGEN IN BOTTOM WATER (depth >= 225 m)

O₂ ml/l

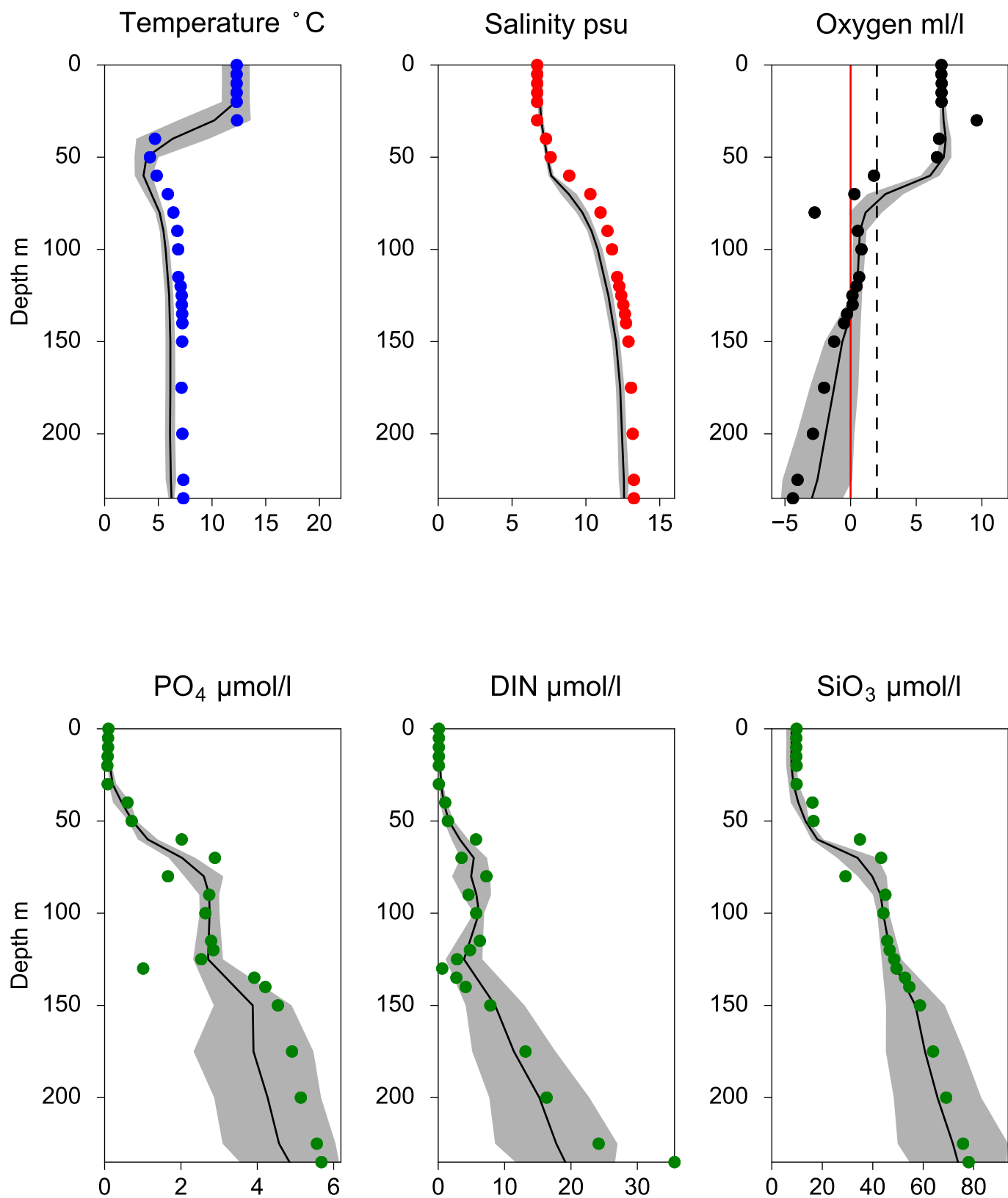


O₂ ml/l



Vertical profiles BY15 GOTLANDSDJ October

— Mean 2001-2015 St.Dev. • 2019-10-14



STATION BY10 SURFACE WATER (0-10 m)

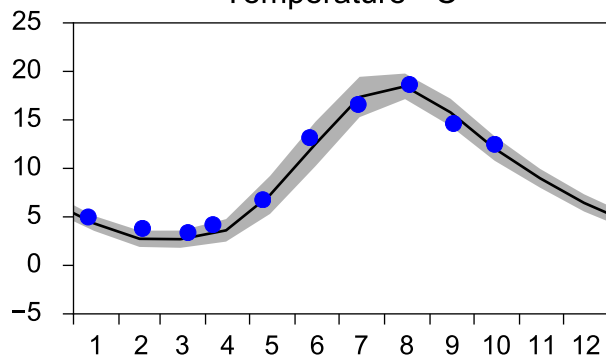
Annual Cycles

— Mean 2001-2015

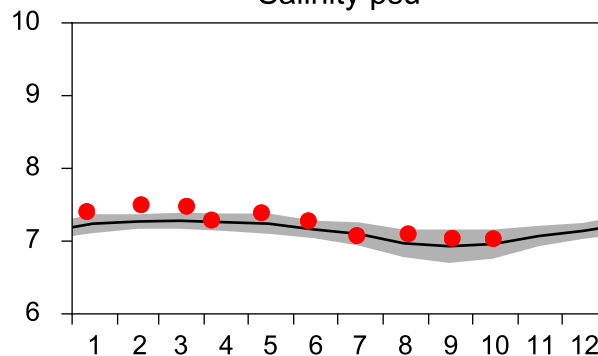
■ St.Dev.

● 2019

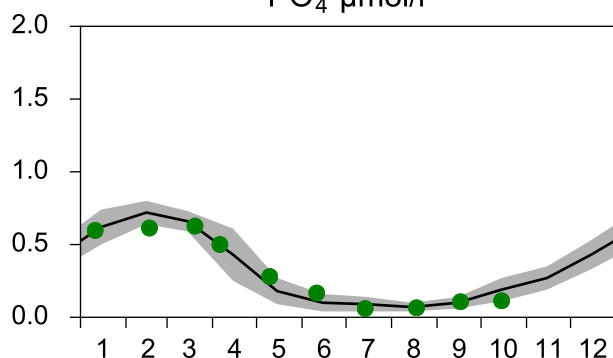
Temperature °C



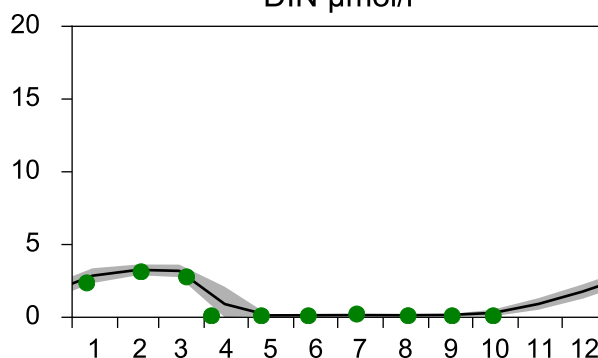
Salinity psu



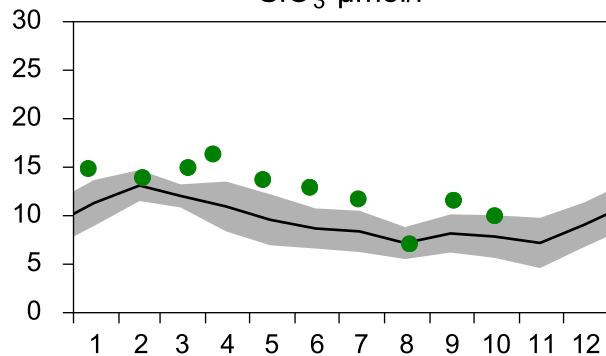
PO₄ µmol/l



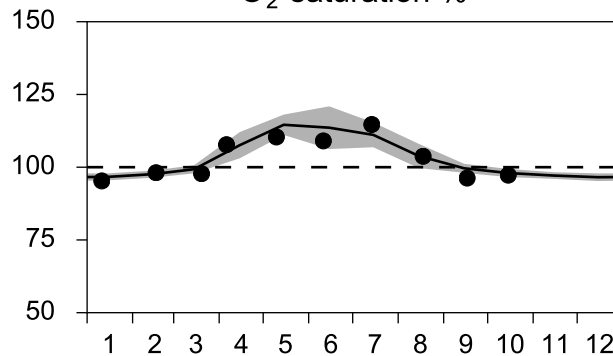
DIN µmol/l



SiO₃ µmol/l

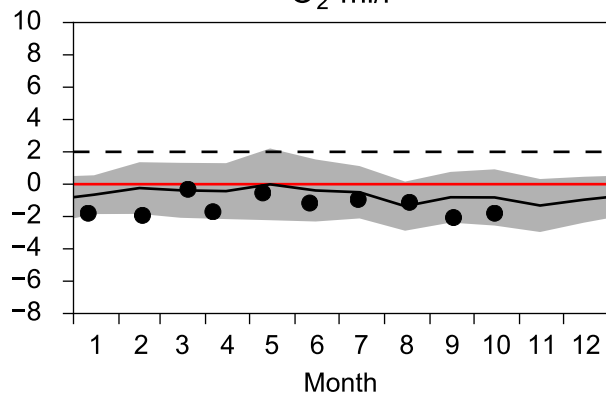


O₂ saturation %

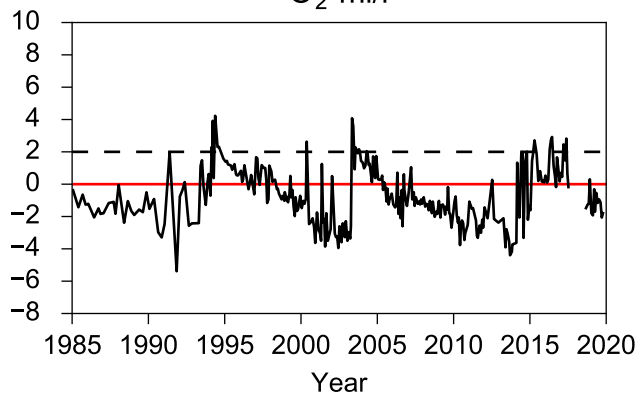


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

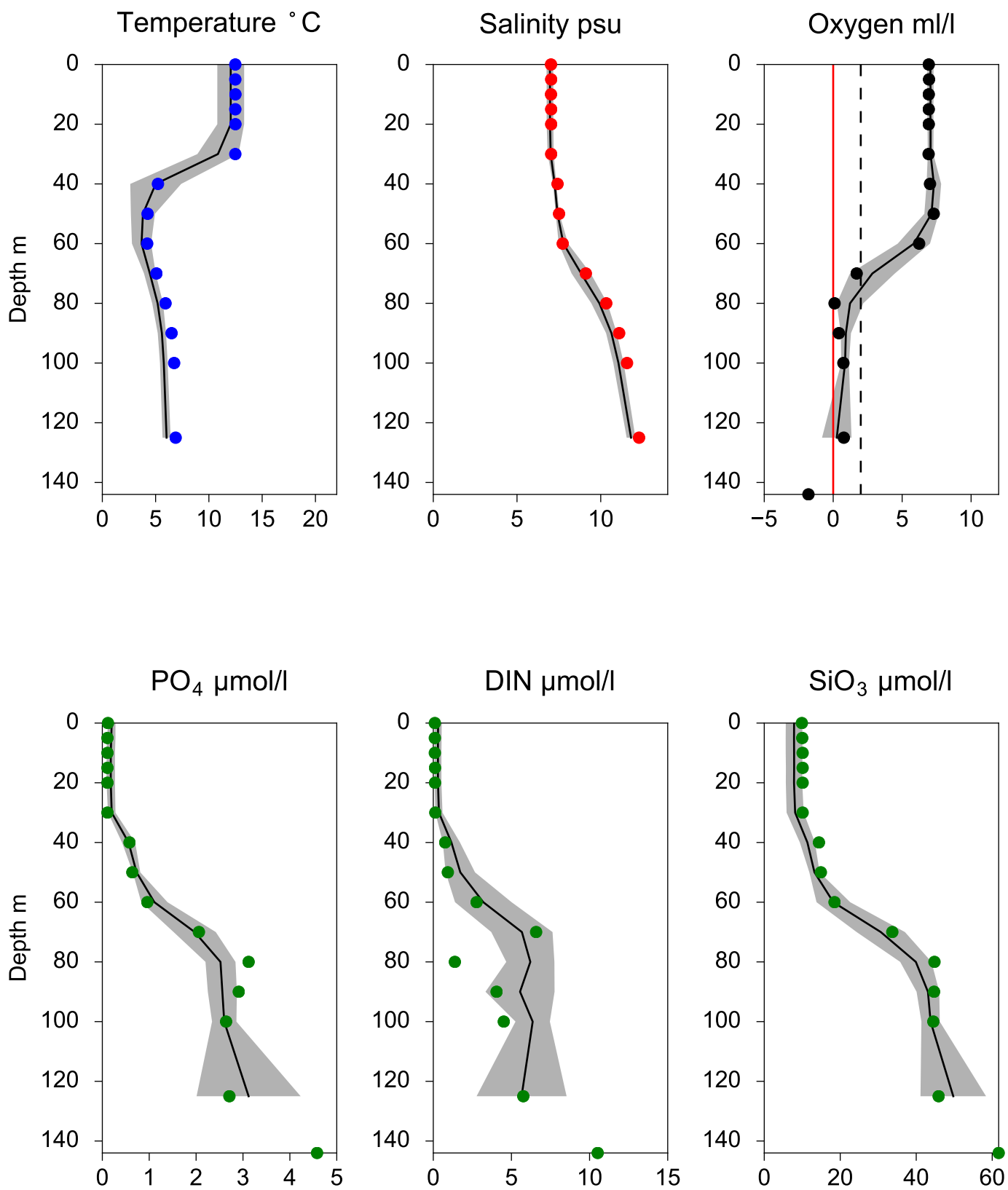


O₂ ml/l



Vertical profiles BY10 October

— Mean 2001-2015 ■ St.Dev. ● 2019-10-15



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

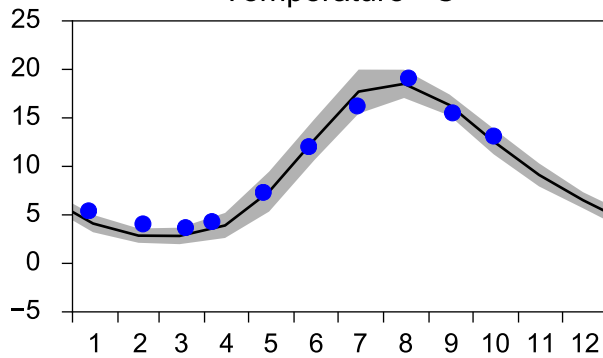
Annual Cycles

— Mean 2001-2015

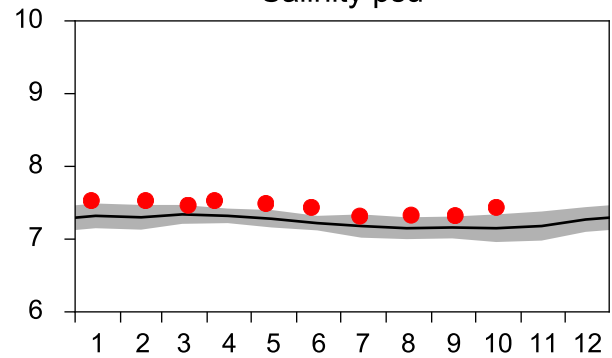
■ St.Dev.

● 2019

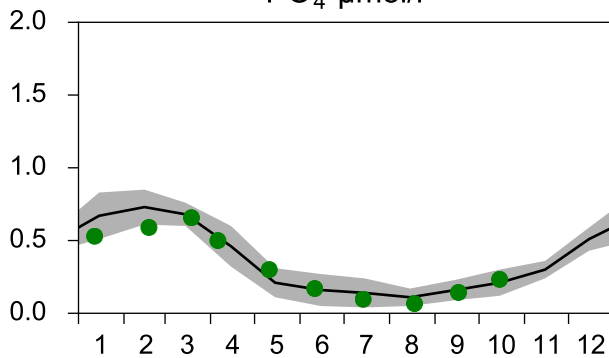
Temperature °C



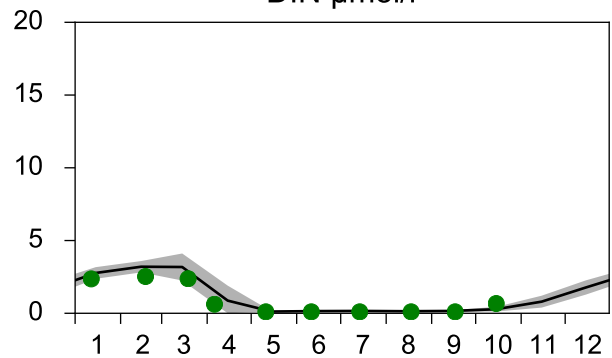
Salinity psu



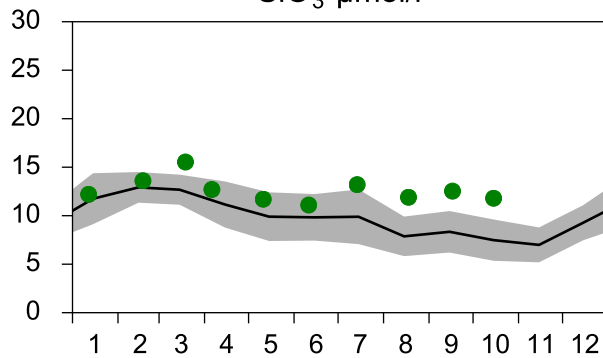
PO₄ µmol/l



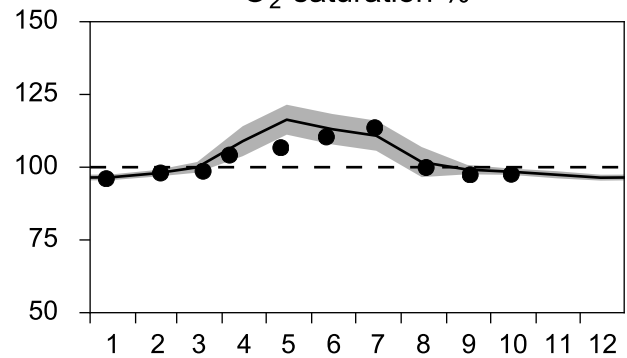
DIN µmol/l



SiO₃ µmol/l

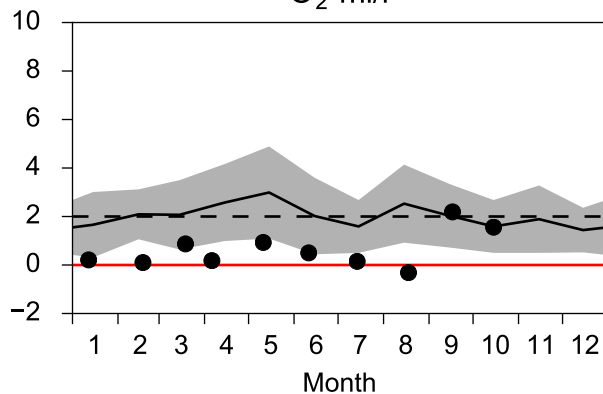


O₂ saturation %

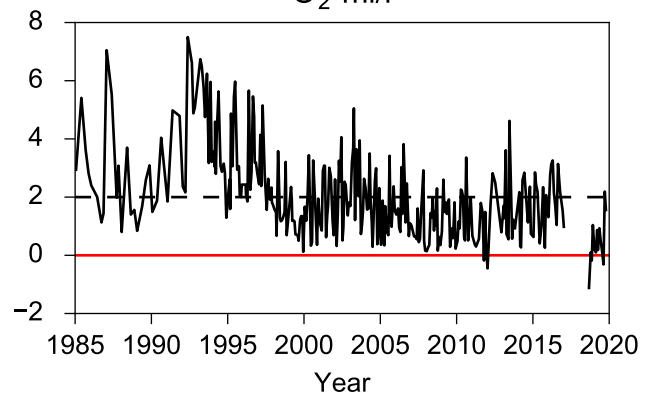


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

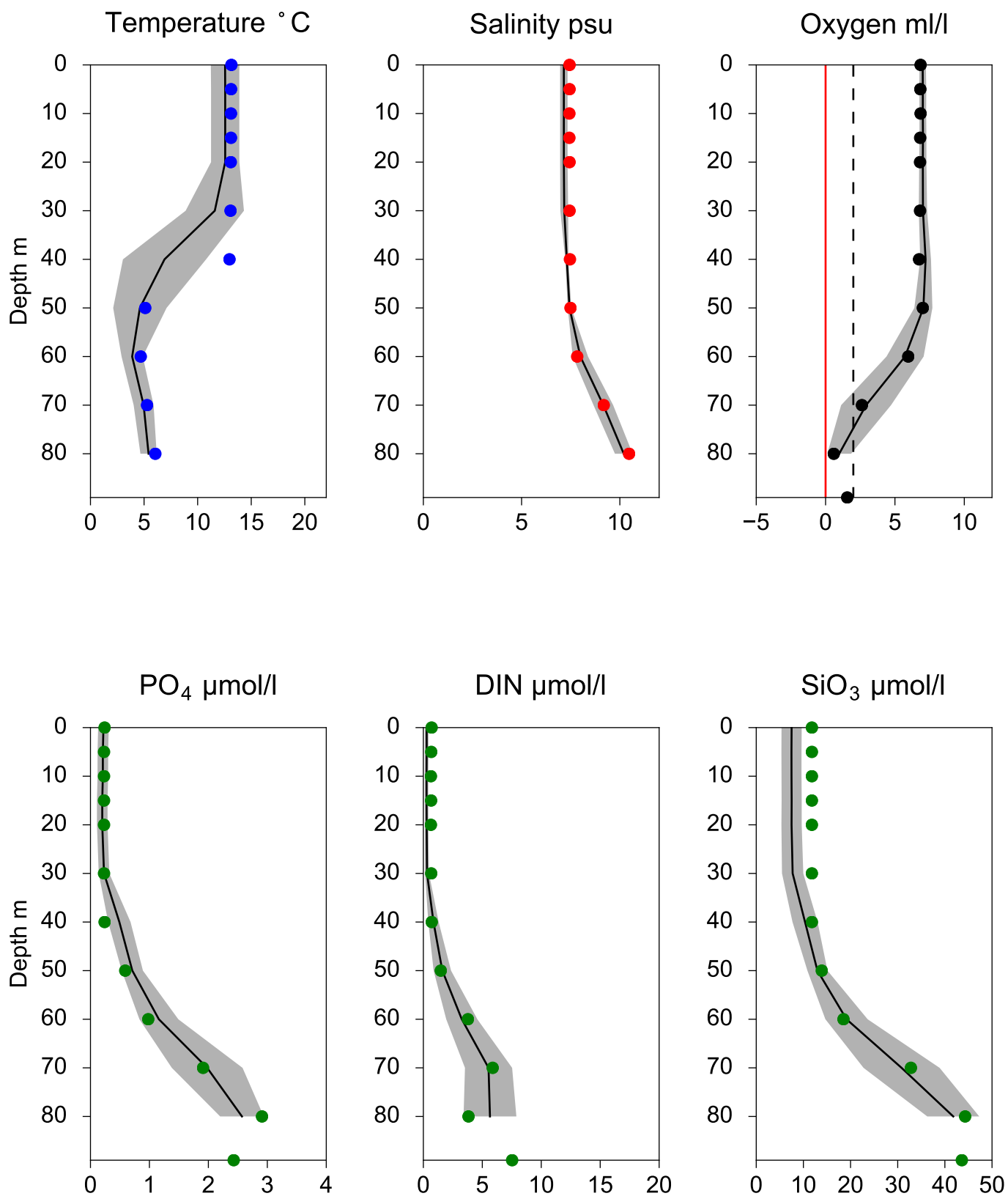


O₂ ml/l



Vertical profiles BCS III-10 October

— Mean 2001-2015 ■ St.Dev. ● 2019-10-15



STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

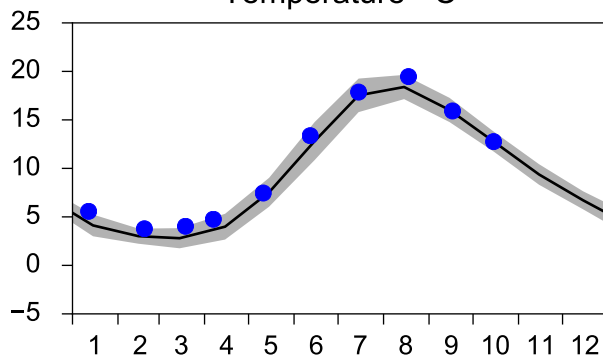
Annual Cycles

— Mean 2001-2015

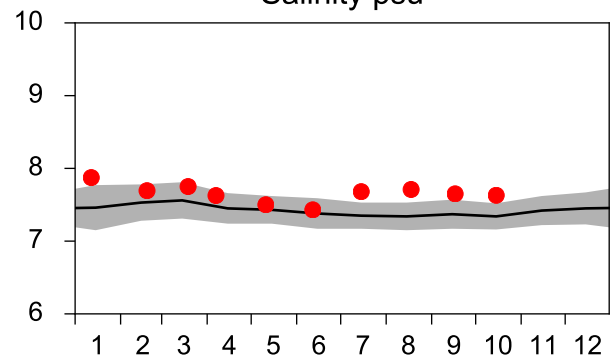
■ St.Dev.

● 2019

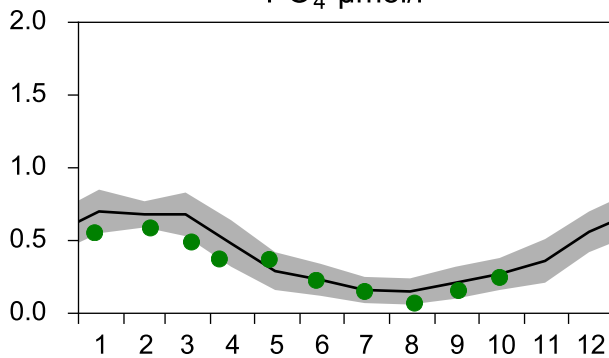
Temperature °C



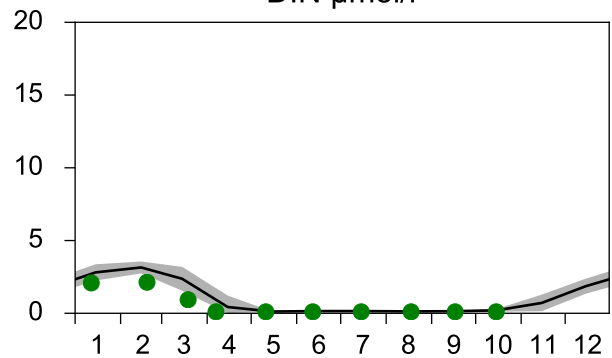
Salinity psu



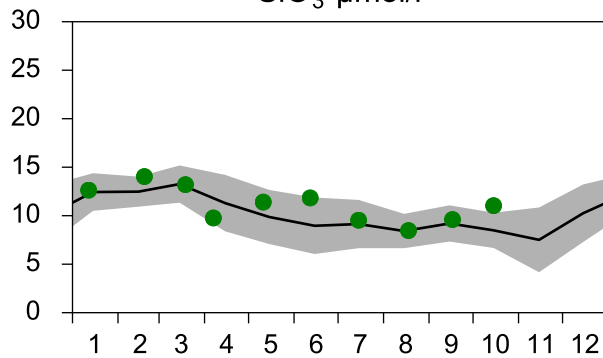
PO₄ µmol/l



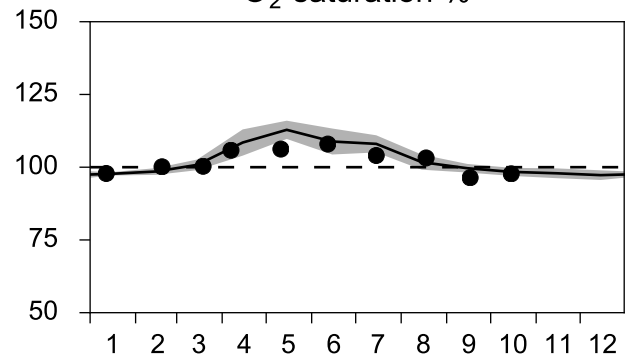
DIN µmol/l



SiO₃ µmol/l

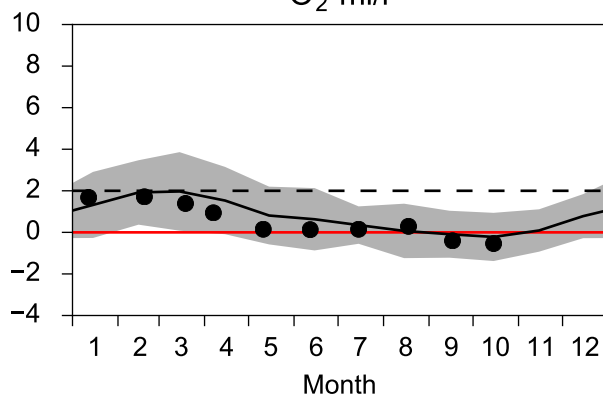


O₂ saturation %

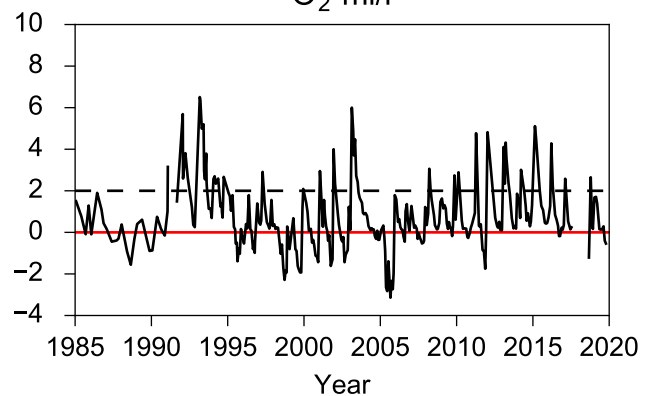


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

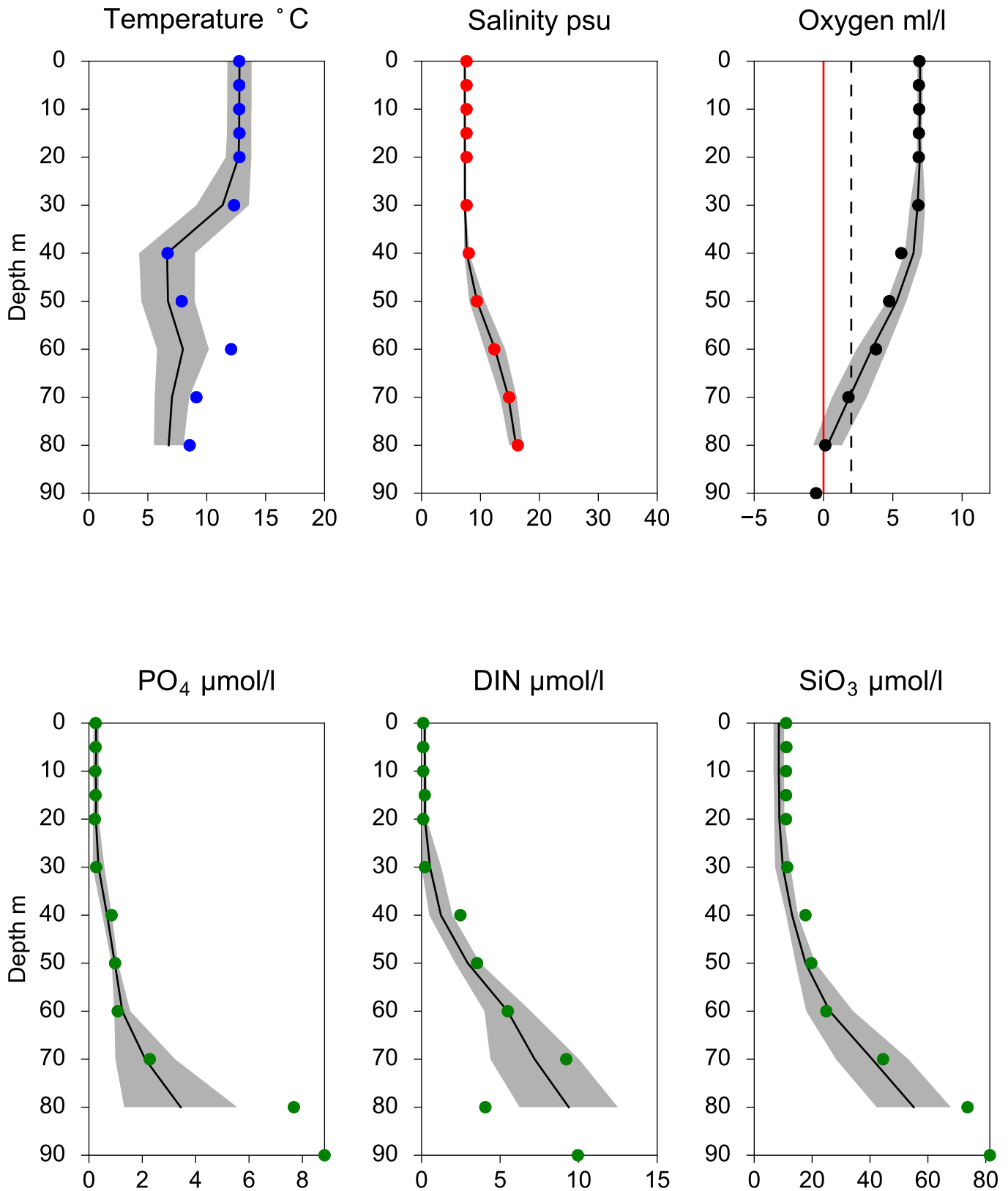


O₂ ml/l



Vertical profiles BY5 BORNHOLMSDJ October

— Mean 2001-2015 ■ St.Dev. ● 2019-10-15



STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

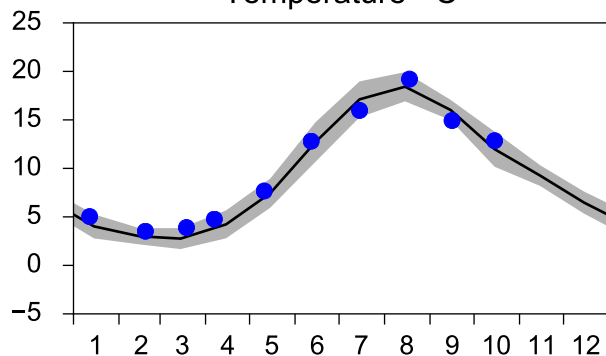
Annual Cycles

— Mean 2001-2015

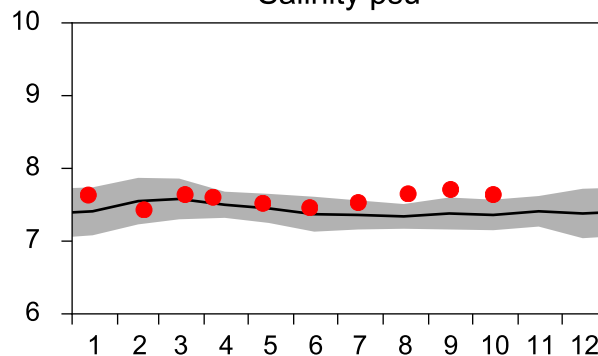
■ St.Dev.

● 2019

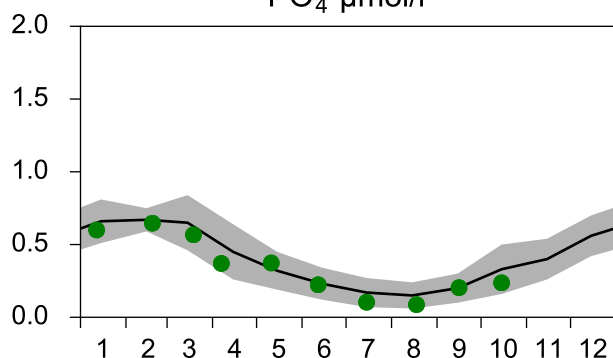
Temperature °C



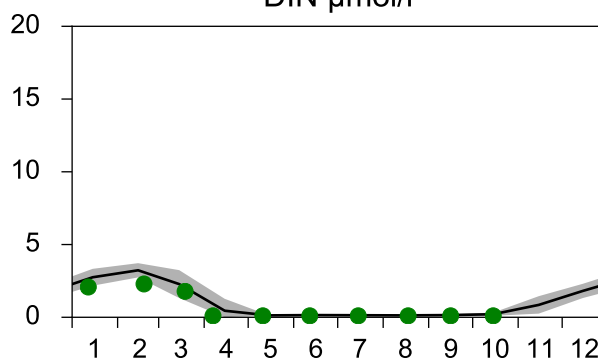
Salinity psu



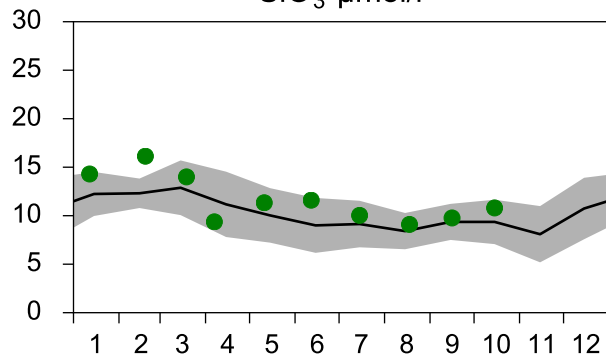
PO₄ µmol/l



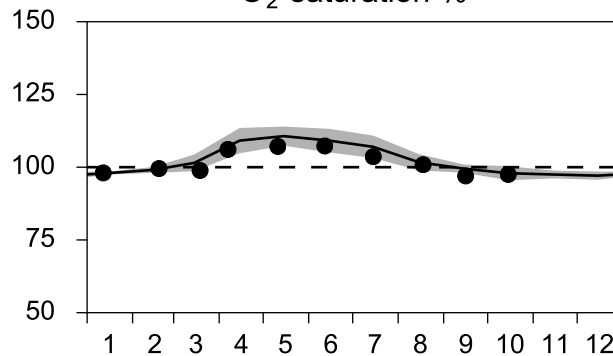
DIN µmol/l



SiO₃ µmol/l

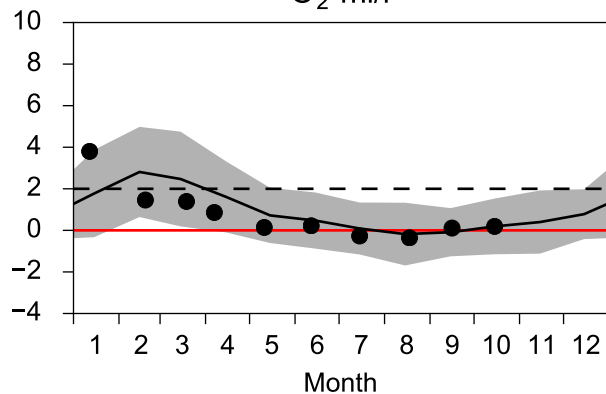


O₂ saturation %

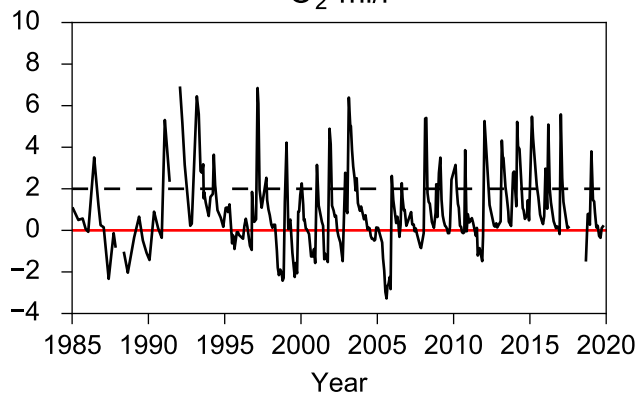


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l



O₂ ml/l

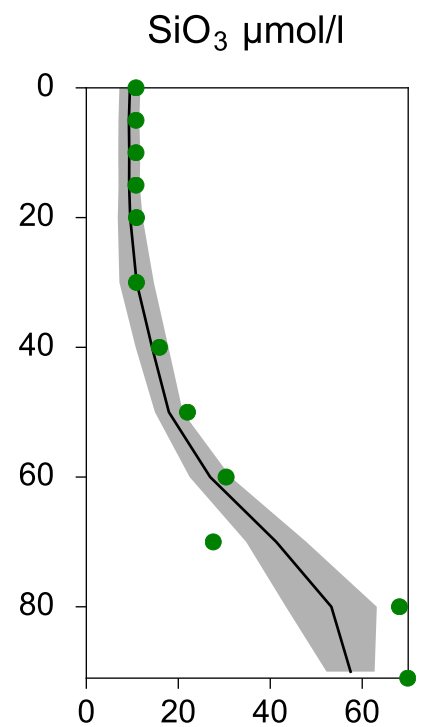
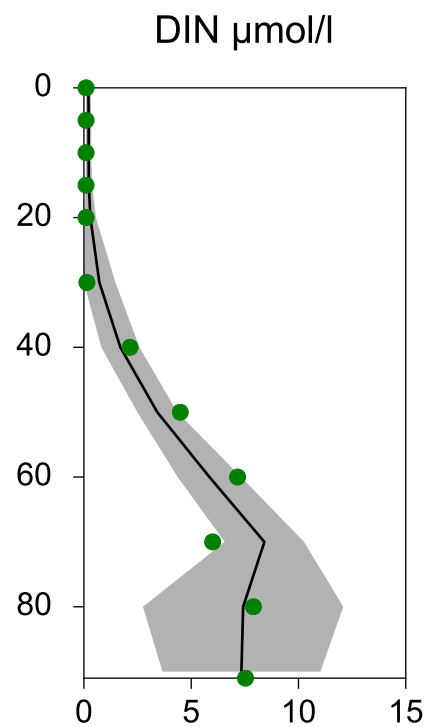
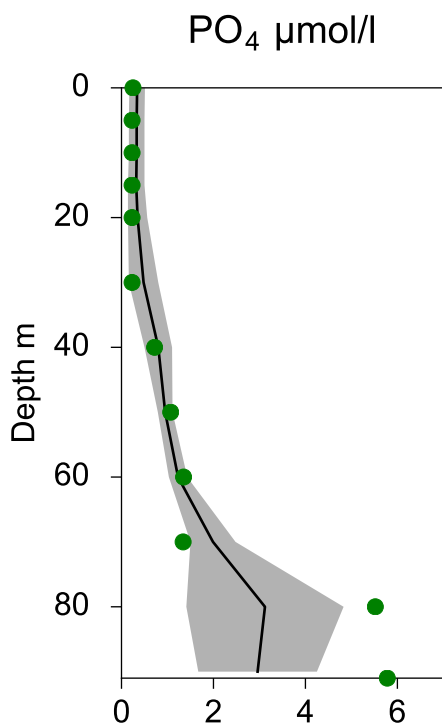
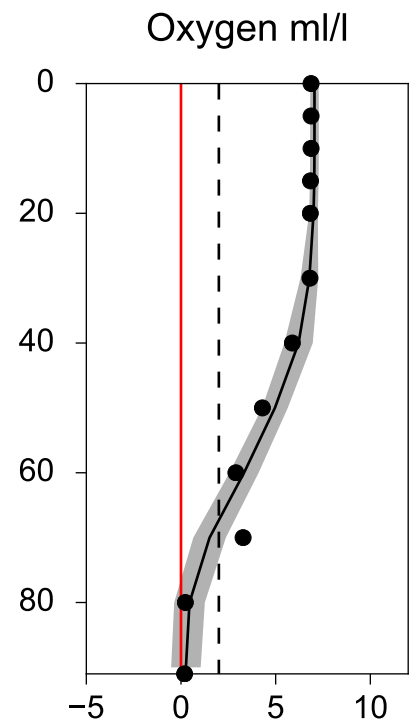
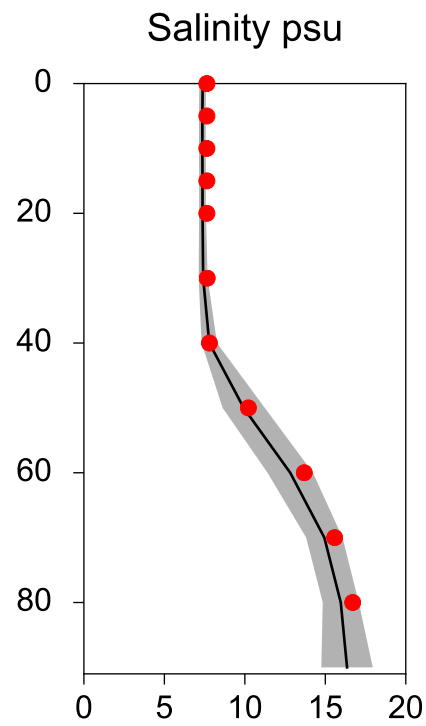
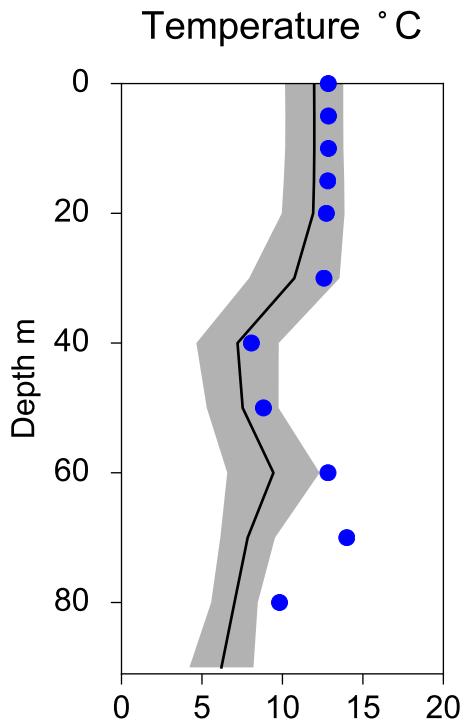


Vertical profiles BY4 CHRISTIANSÖ October

— Mean 2001-2015

■ St.Dev.

● 2019-10-15



STATION BY2 ARKONA SURFACE WATER (0-10 m)

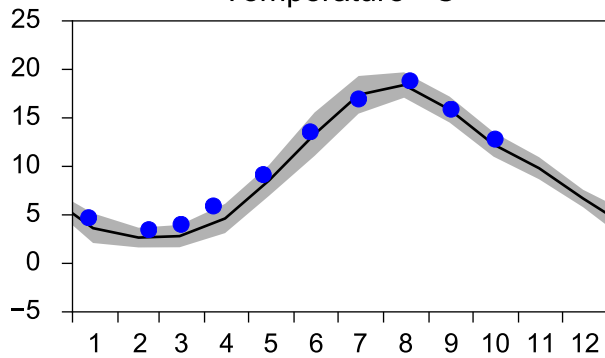
Annual Cycles

— Mean 2001-2015

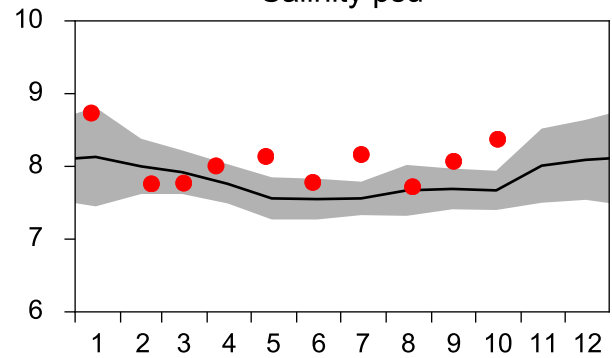
■ St.Dev.

● 2019

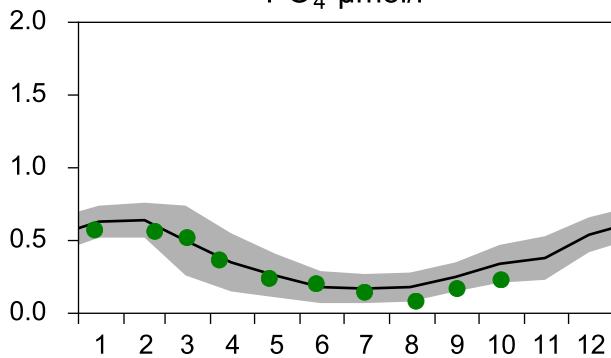
Temperature °C



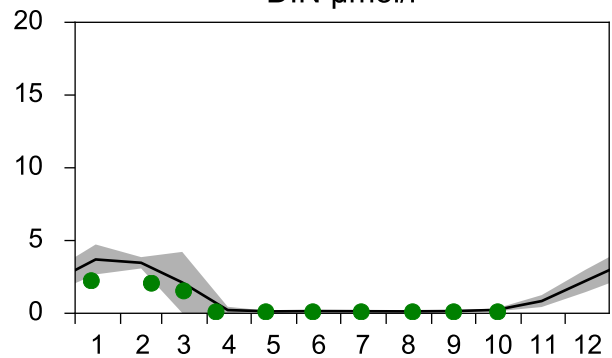
Salinity psu



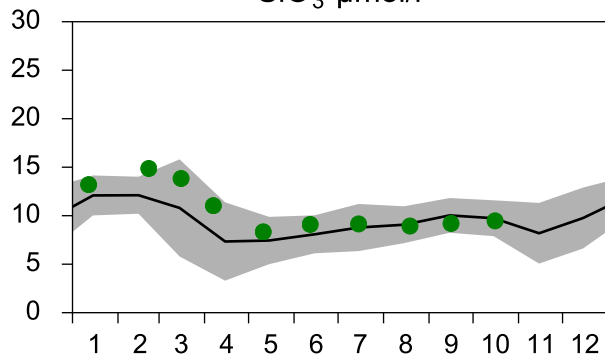
PO₄ µmol/l



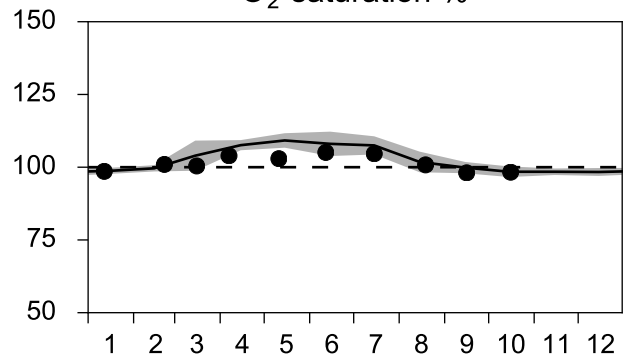
DIN µmol/l



SiO₃ µmol/l

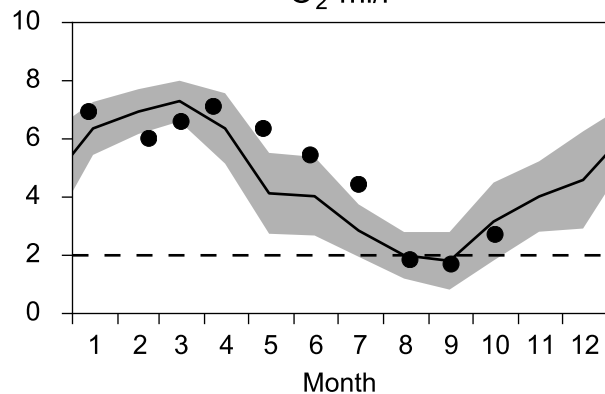


O₂ saturation %

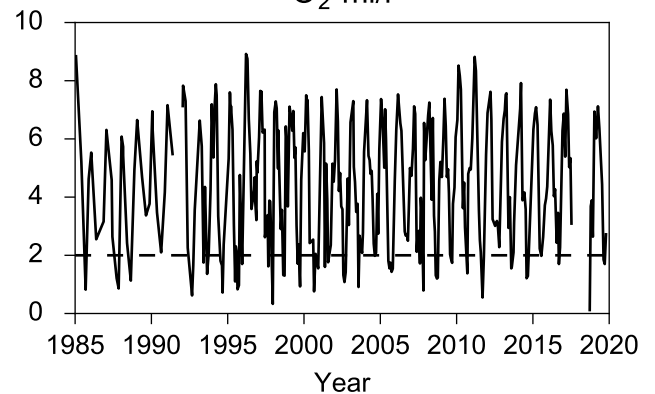


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

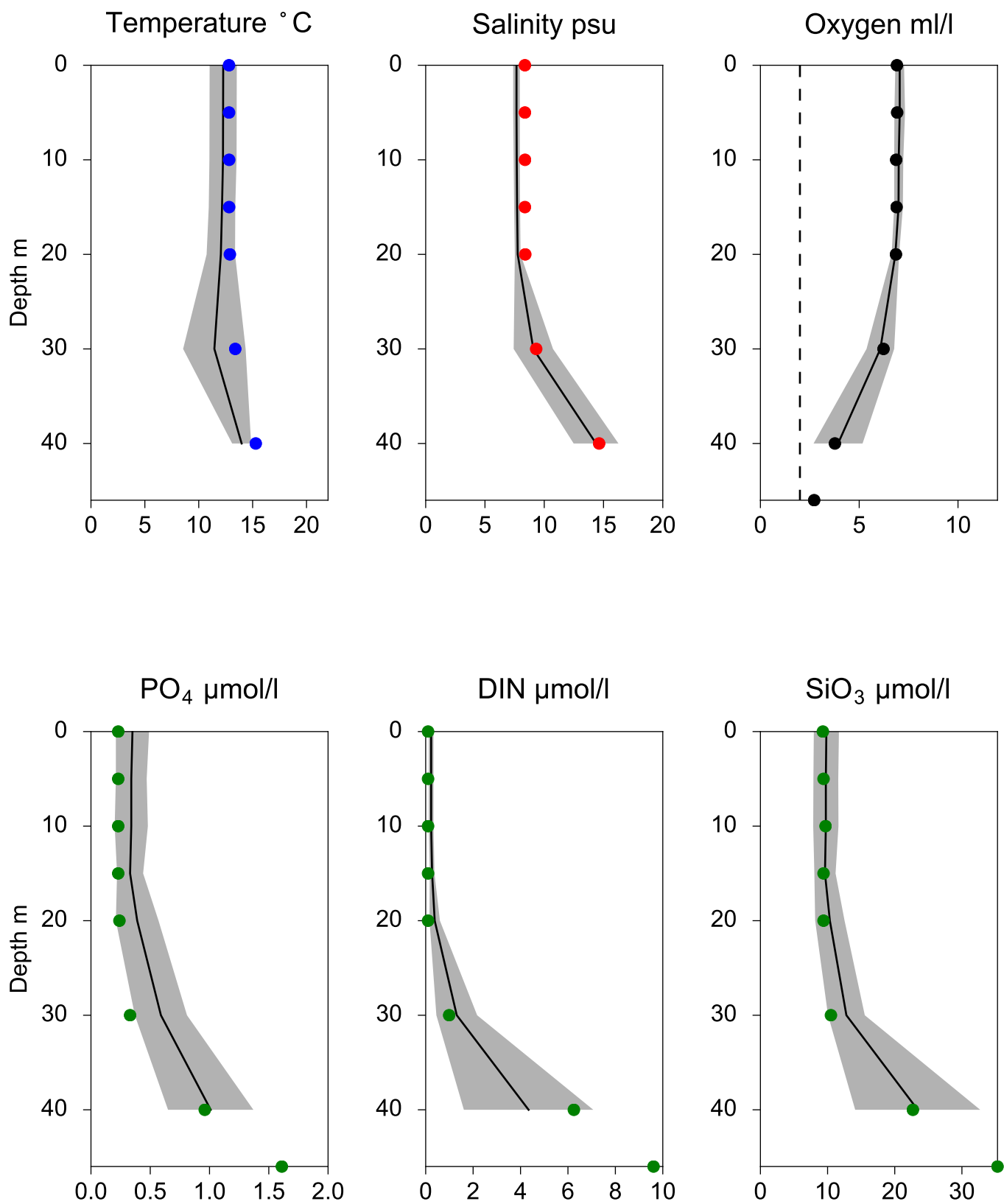


O₂ ml/l



Vertical profiles BY2 ARKONA October

— Mean 2001-2015 St.Dev. • 2019-10-16



STATION BY1 SURFACE WATER (0-10 m)

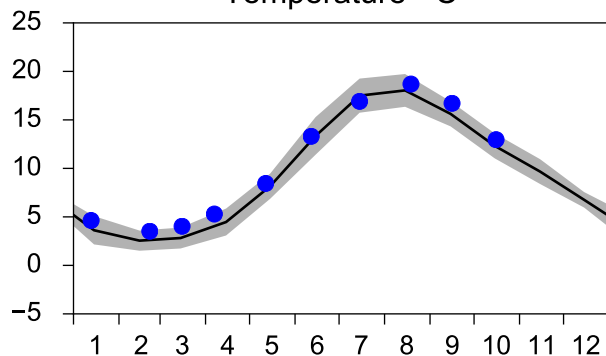
Annual Cycles

— Mean 2001-2015

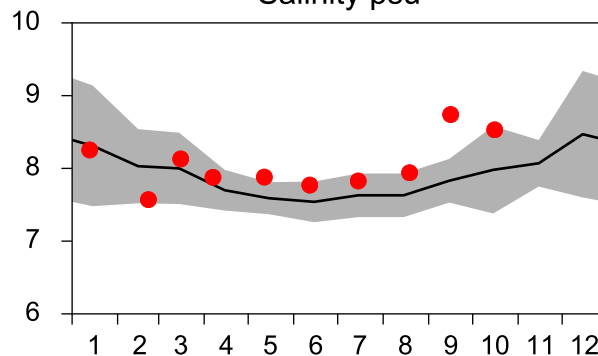
■ St.Dev.

● 2019

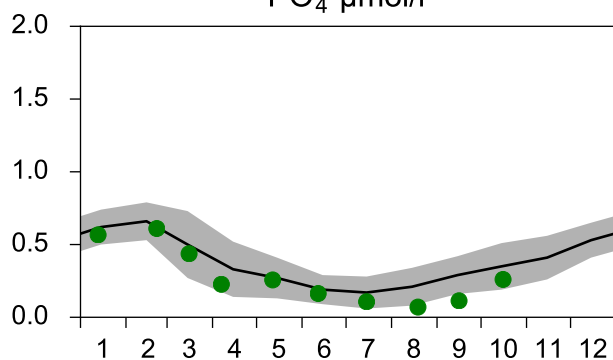
Temperature °C



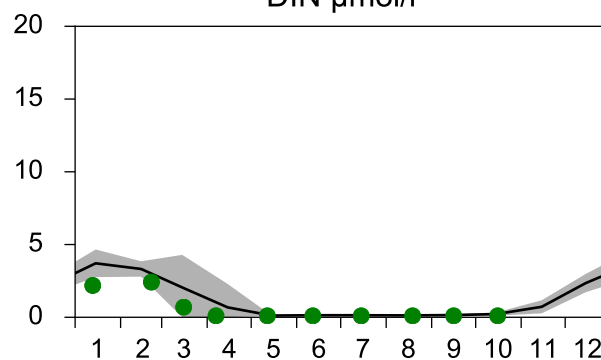
Salinity psu



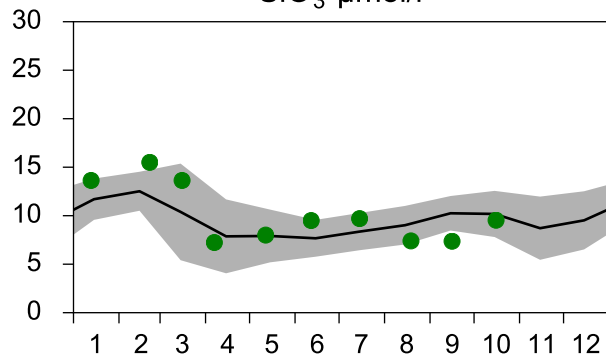
PO₄ μmol/l



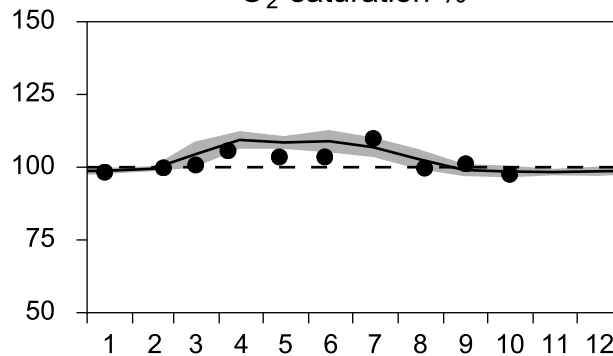
DIN μmol/l



SiO₃ μmol/l

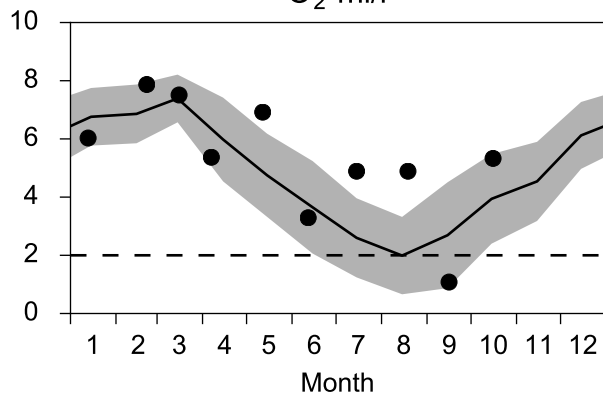


O₂ saturation %

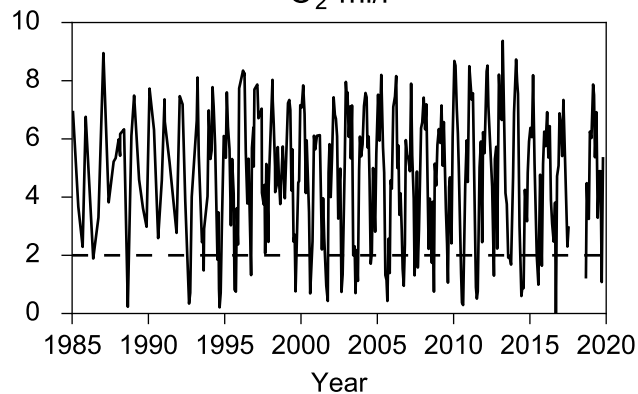


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

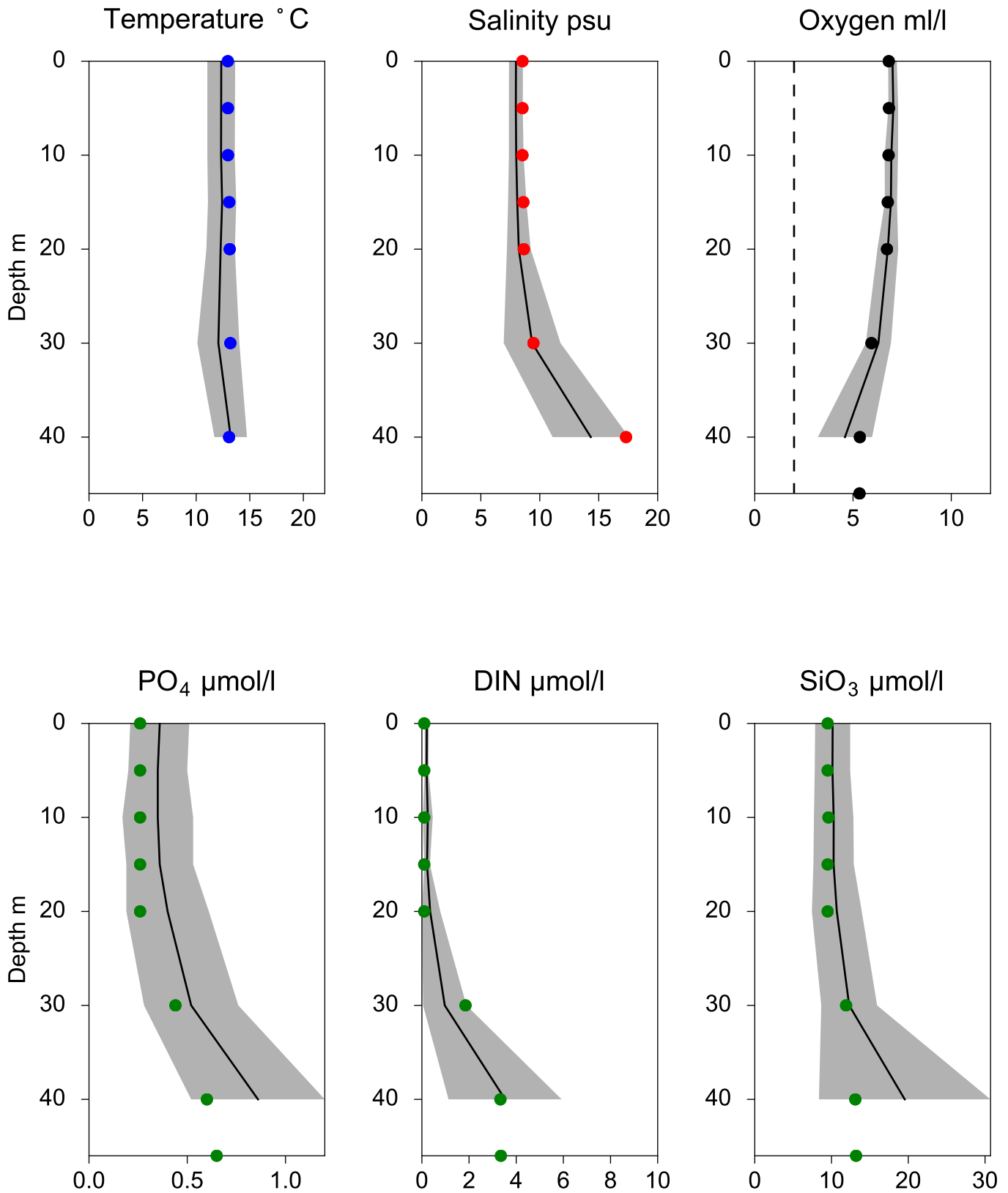


O₂ ml/l



Vertical profiles BY1 October

— Mean 2001-2015 ■ St.Dev. ● 2019-10-16



STATION W LANDSKRONA SURFACE WATER (0-10 m)

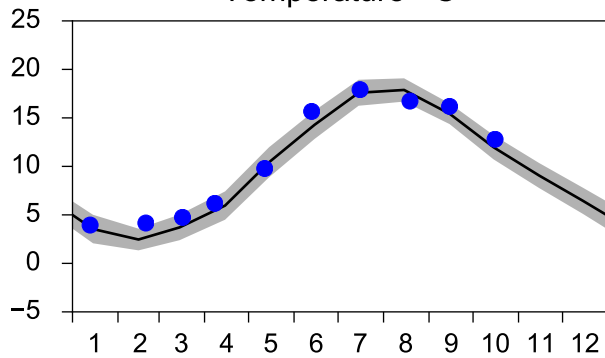
Annual Cycles

— Mean 2001-2015

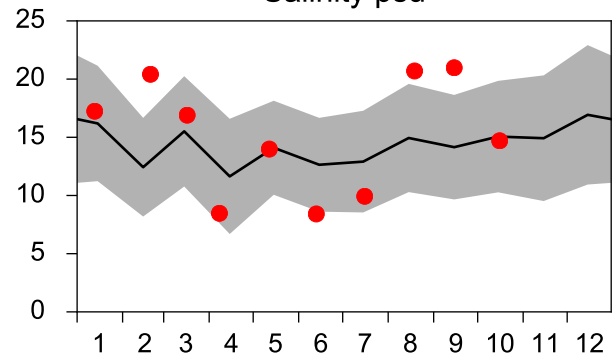
■ St.Dev.

● 2019

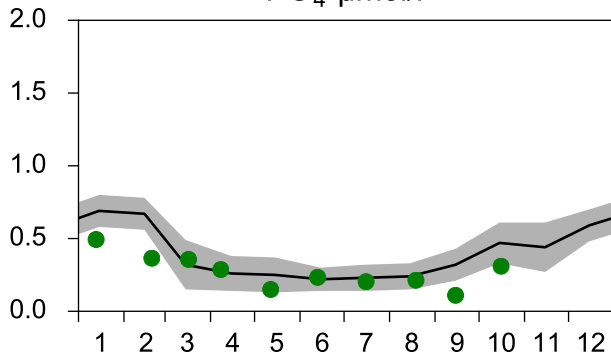
Temperature °C



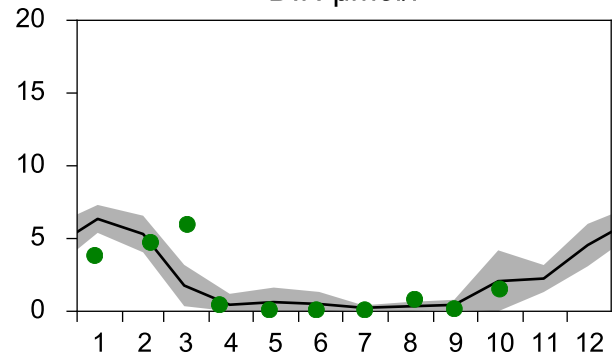
Salinity psu



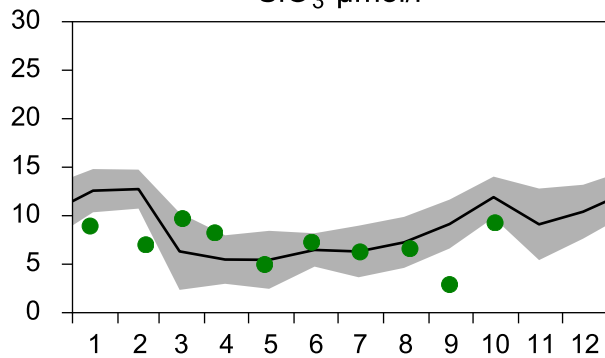
PO₄ µmol/l



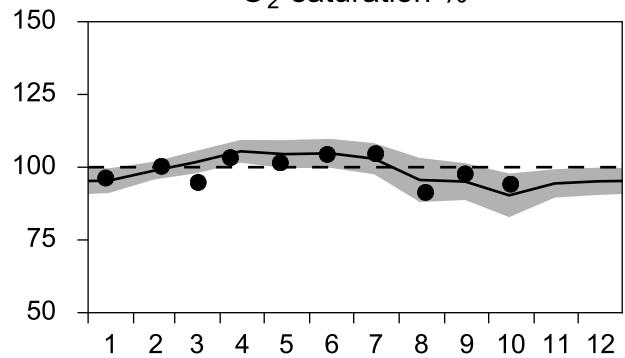
DIN µmol/l



SiO₃ µmol/l

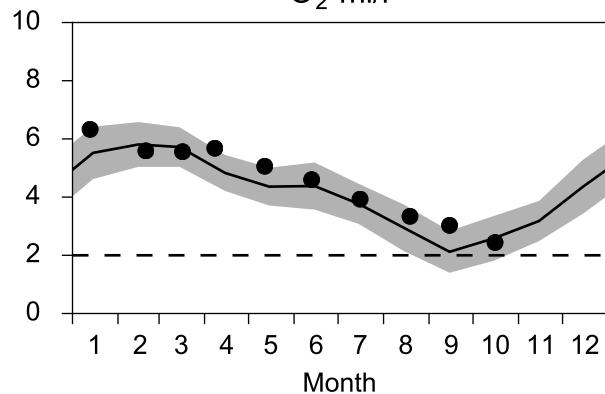


O₂ saturation %

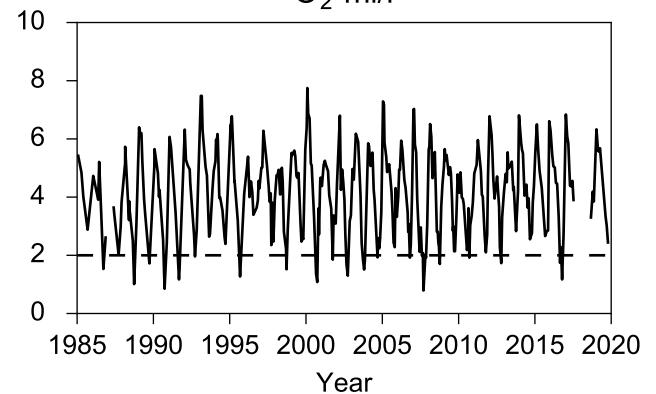


OXYGEN IN BOTTOM WATER (depth >= 40 m)

O₂ ml/l

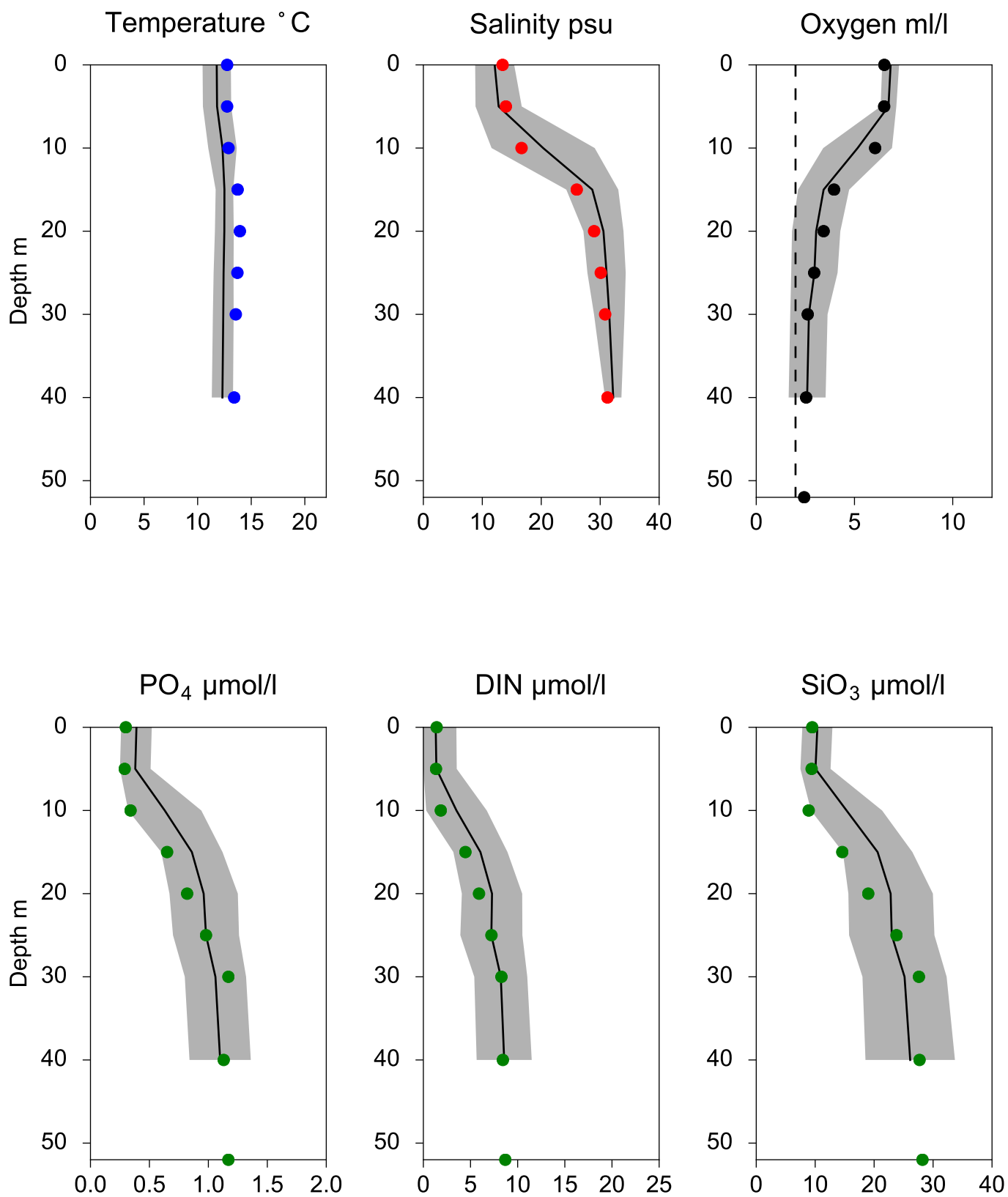


O₂ ml/l



Vertical profiles W LANDSKRONA October

— Mean 2001-2015 St.Dev. • 2019-10-16



STATION ANHOLT E SURFACE WATER (0-10 m)

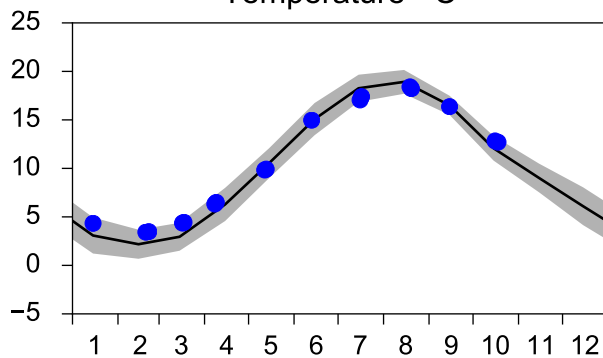
Annual Cycles

— Mean 2001-2015

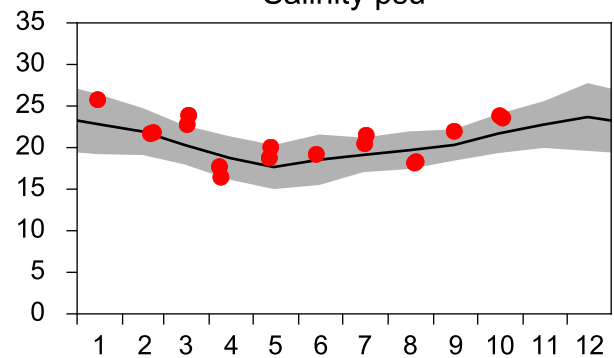
■ St.Dev.

● 2019

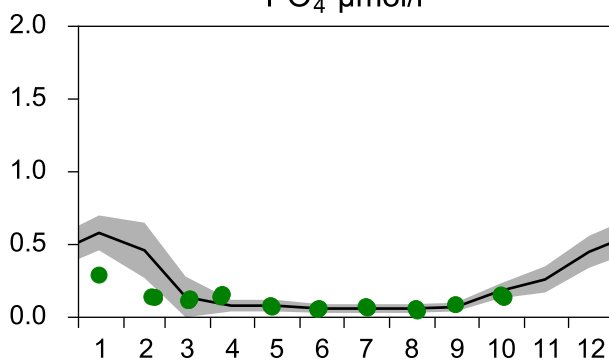
Temperature °C



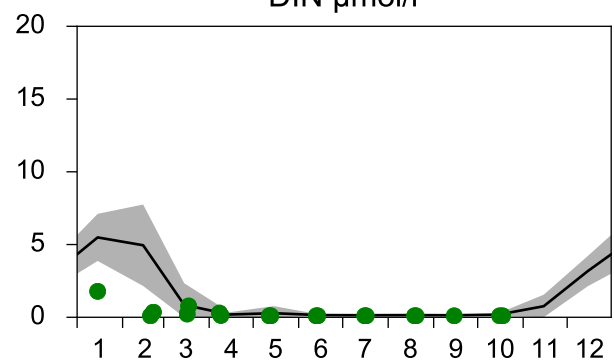
Salinity psu



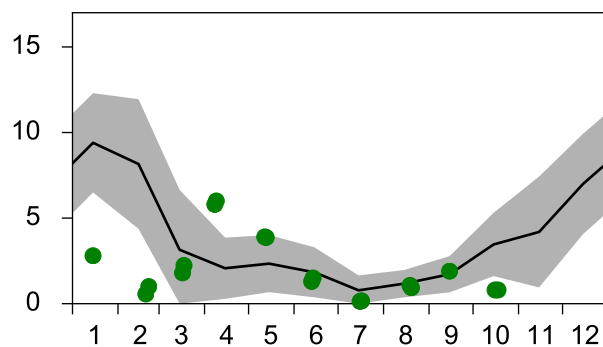
PO₄ µmol/l



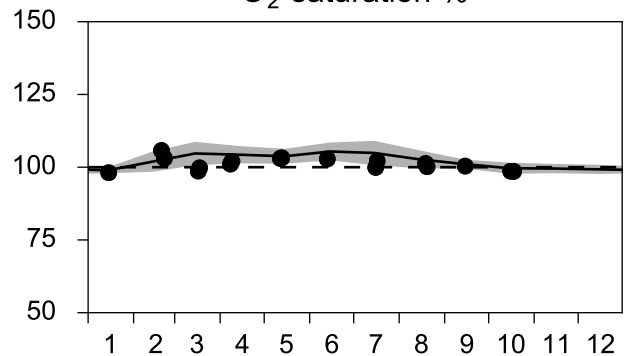
DIN µmol/l



SiO₃ µmol/l

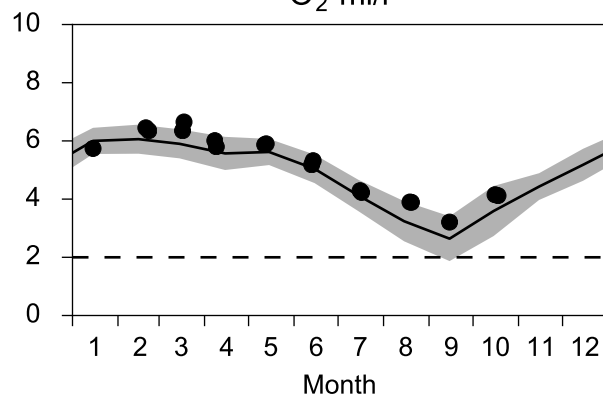


O₂ saturation %

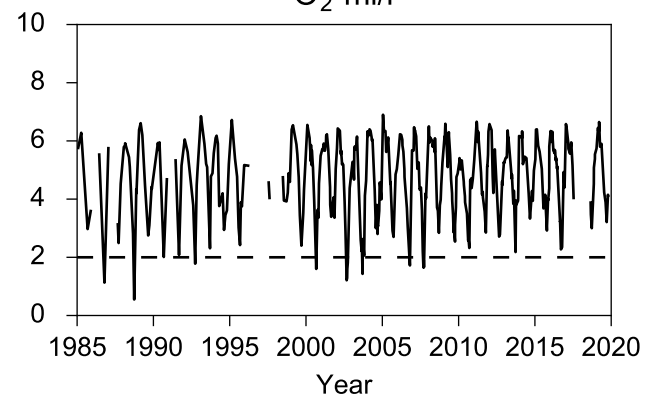


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

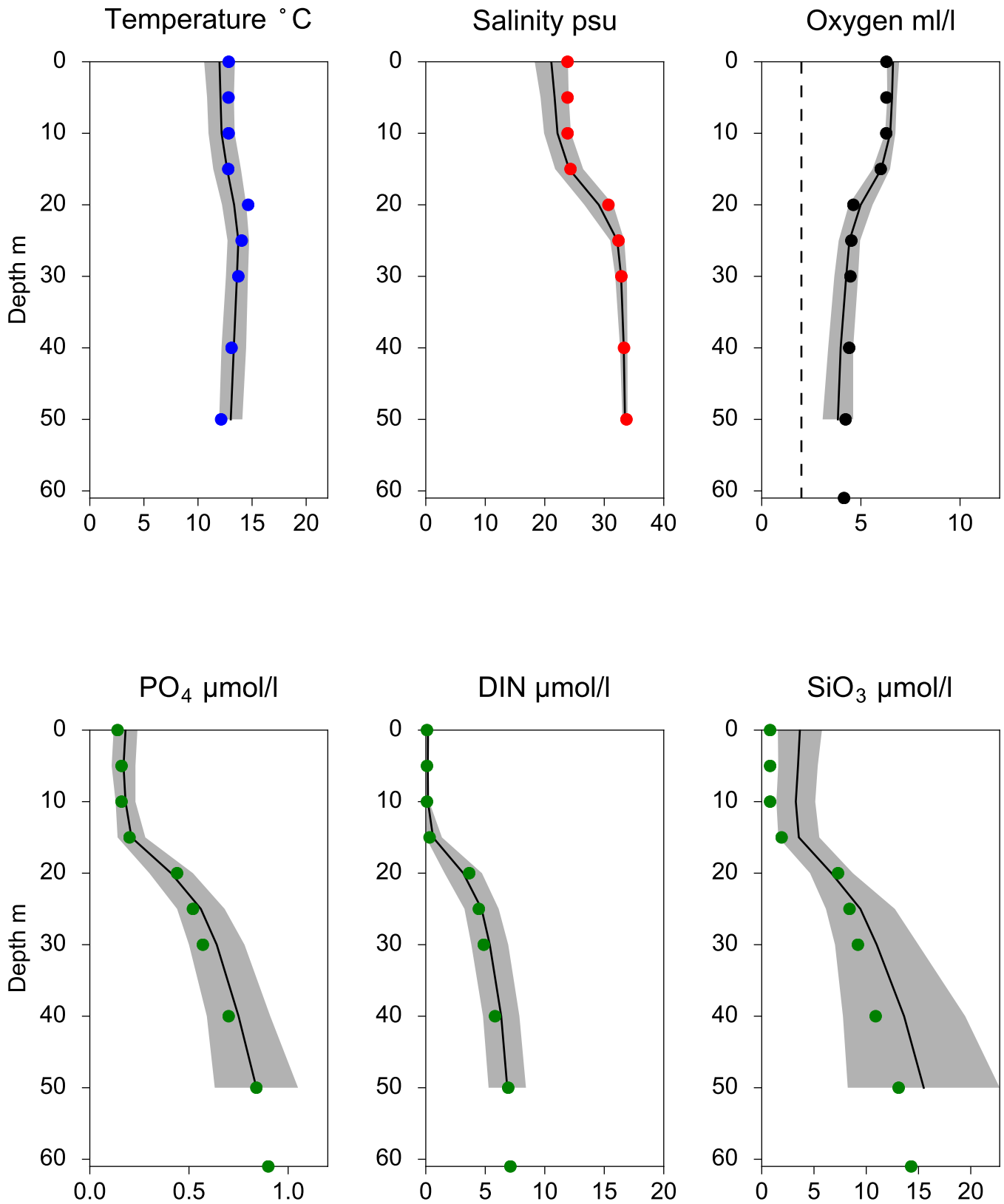


O₂ ml/l



Vertical profiles ANHOLT E October

— Mean 2001-2015 St.Dev. • 2019-10-16



STATION FLADEN SURFACE WATER (0-10 m)

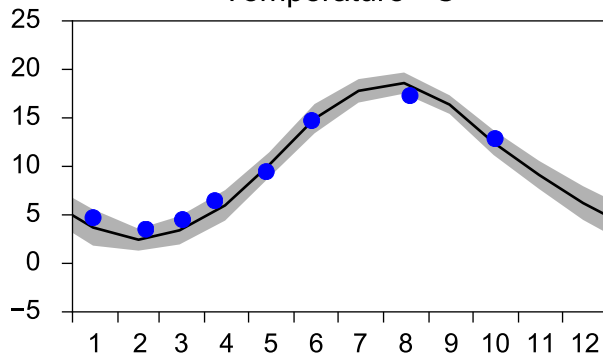
Annual Cycles

— Mean 2001-2015

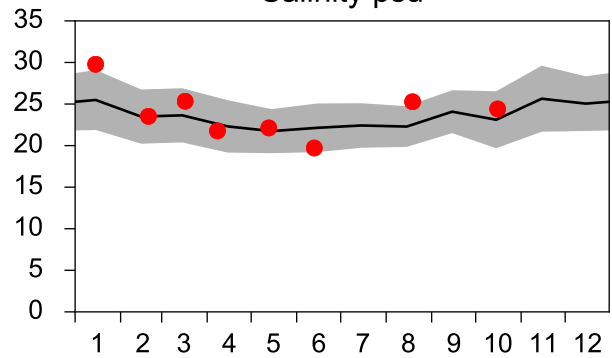
■ St.Dev.

● 2019

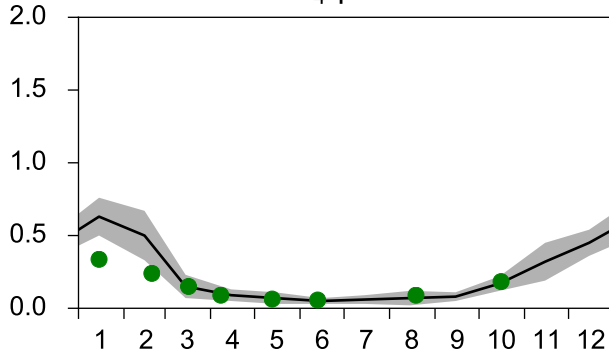
Temperature °C



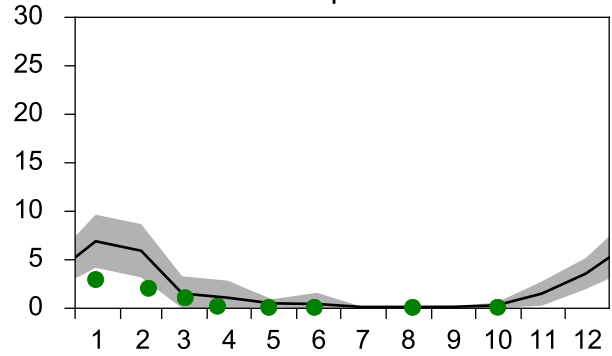
Salinity psu



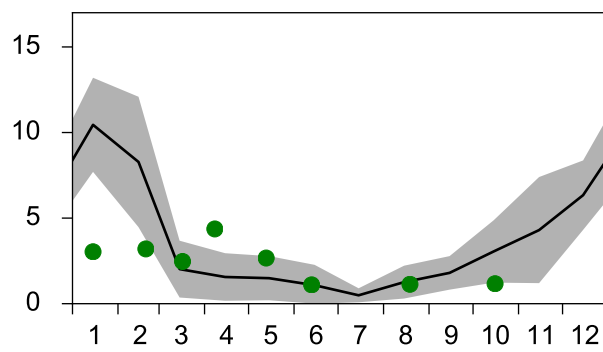
PO₄ µmol/l



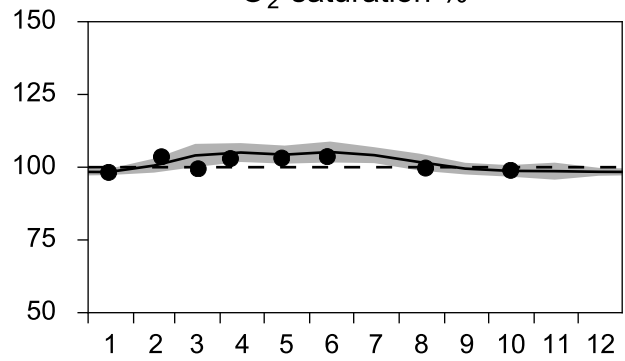
DIN µmol/l



SiO₃ µmol/l

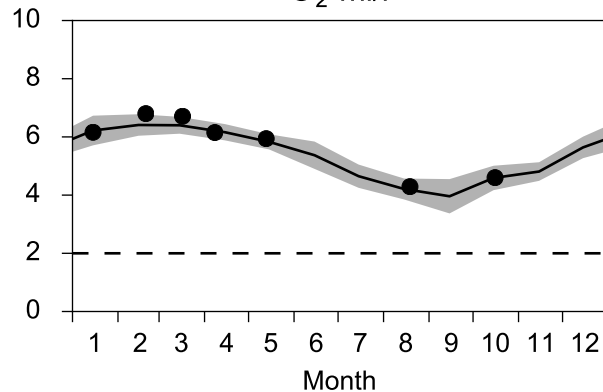


O₂ saturation %

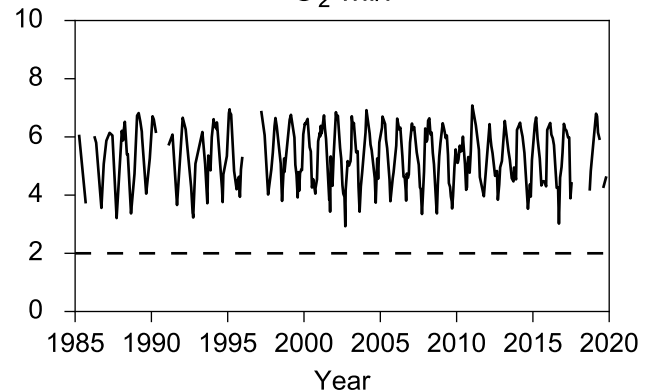


OXYGEN IN BOTTOM WATER (depth >= 74 m)

O₂ ml/l

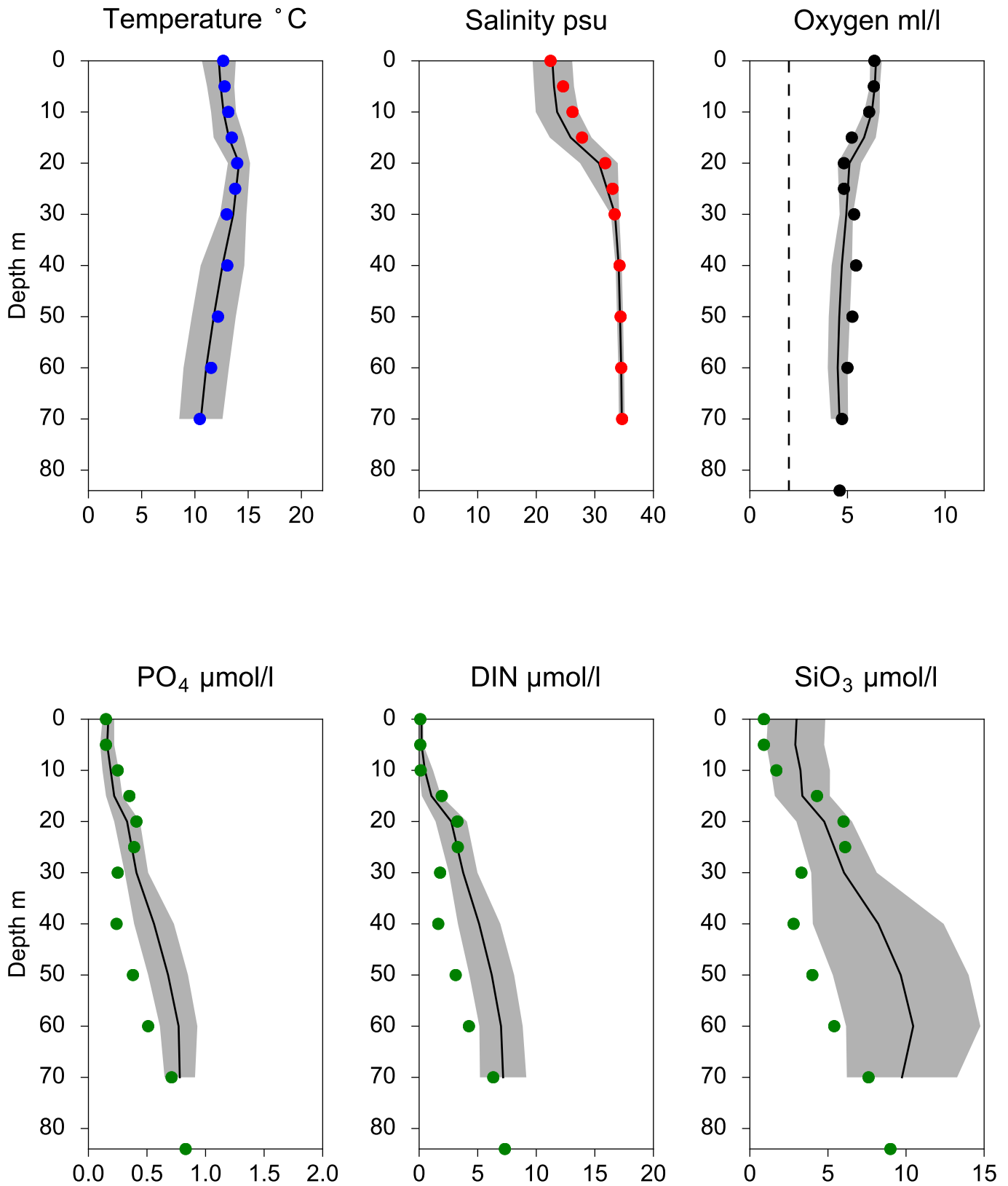


O₂ ml/l



Vertical profiles FLADEN October

— Mean 2001-2015 St.Dev. • 2019-10-16



STATION Å17 SURFACE WATER (0-10 m)

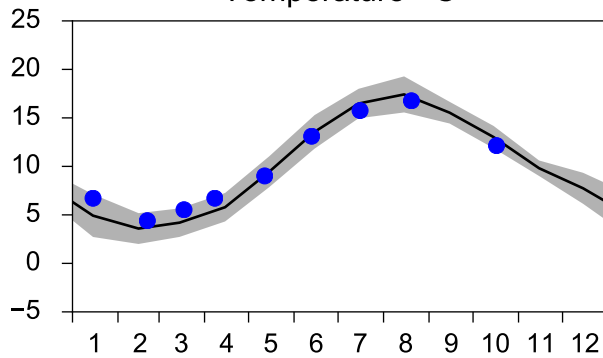
Annual Cycles

— Mean 2001-2015

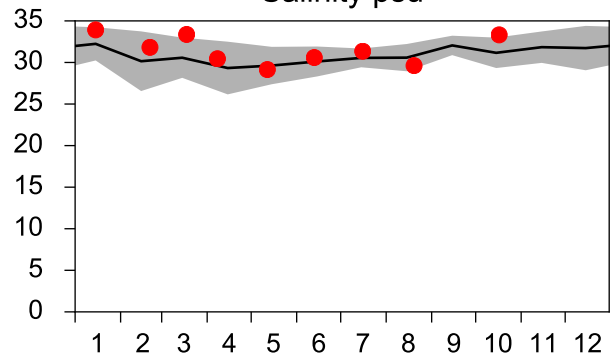
■ St.Dev.

● 2019

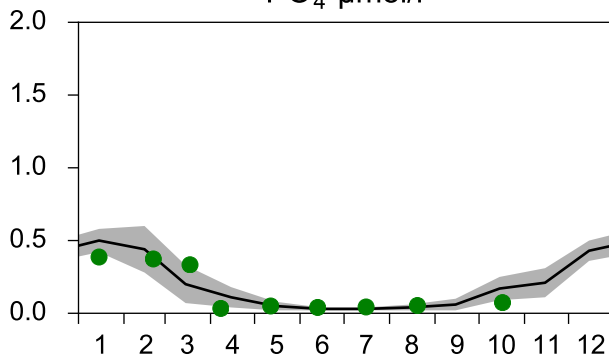
Temperature °C



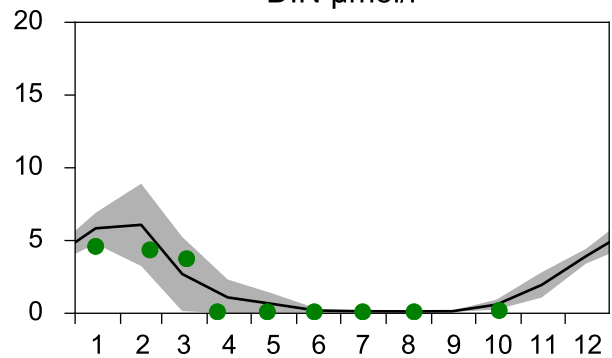
Salinity psu



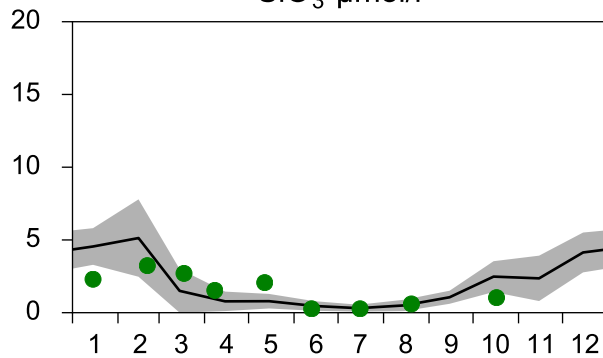
PO₄ µmol/l



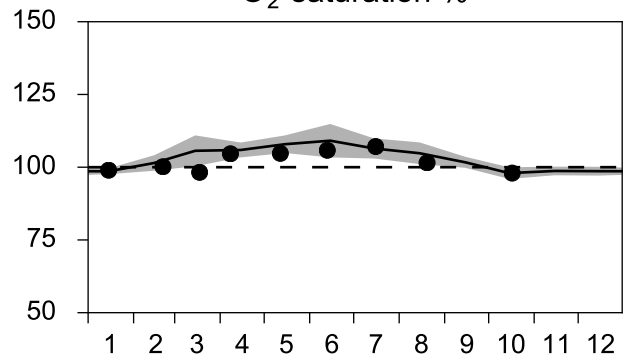
DIN µmol/l



SiO₃ µmol/l

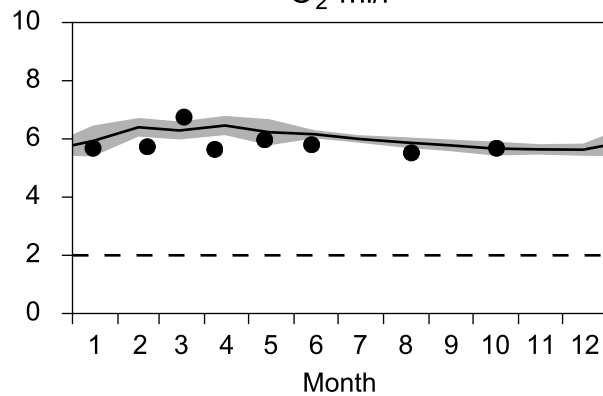


O₂ saturation %

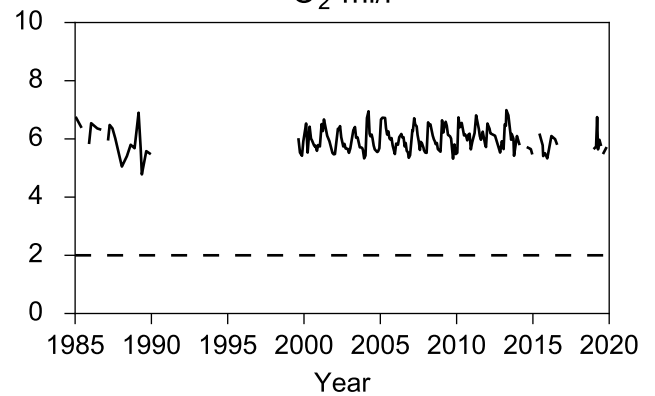


OXYGEN IN BOTTOM WATER (depth >= 300 m)

O₂ ml/l



O₂ ml/l

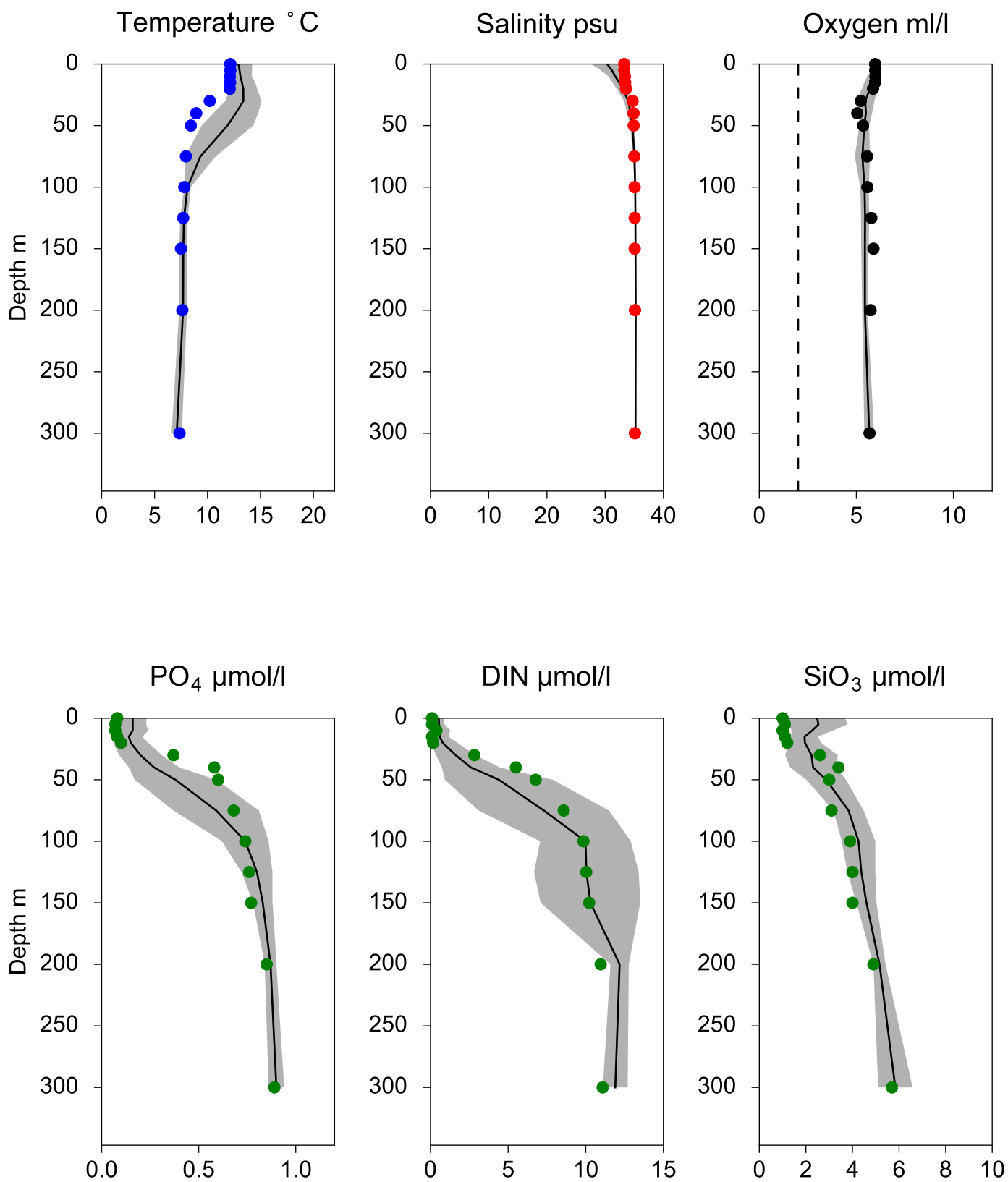


Vertical profiles Å17 October

— Mean 2001-2015

■ St.Dev.

● 2019-10-17



STATION Å15 SURFACE WATER (0-10 m)

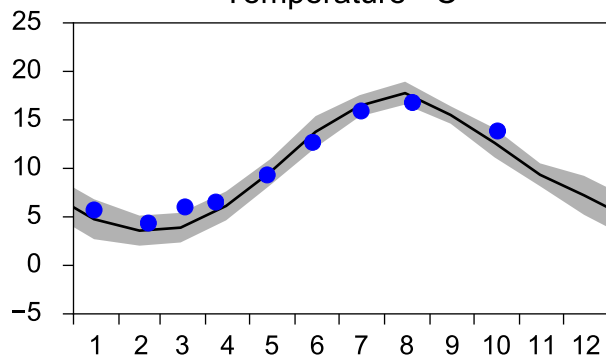
Annual Cycles

— Mean 2001-2015

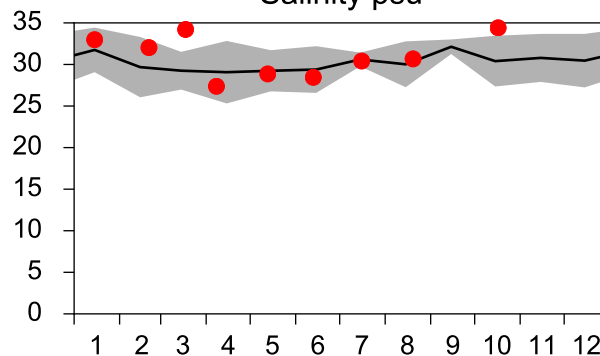
■ St.Dev.

● 2019

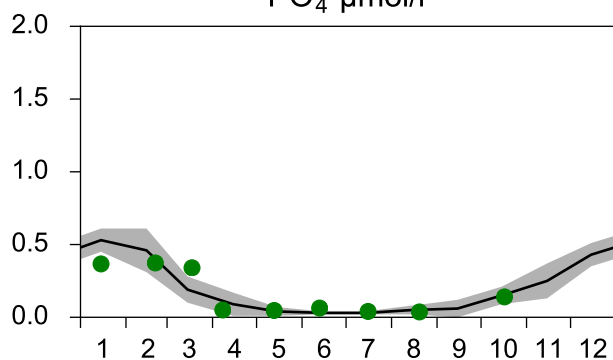
Temperature °C



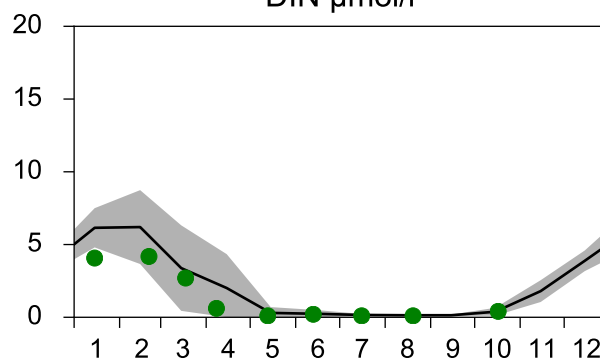
Salinity psu



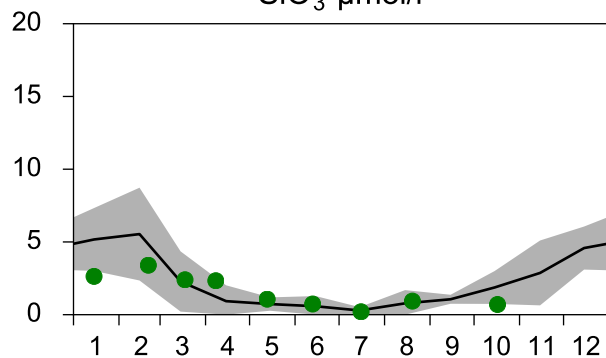
PO₄ µmol/l



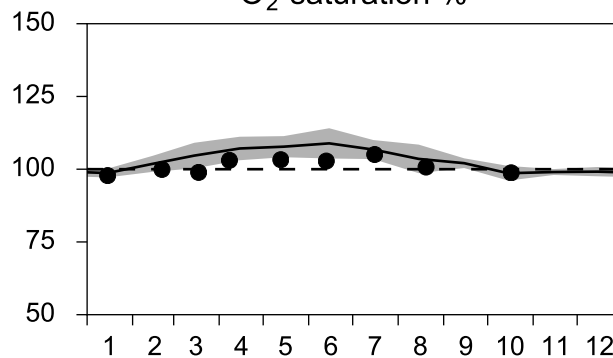
DIN µmol/l



SiO₃ µmol/l

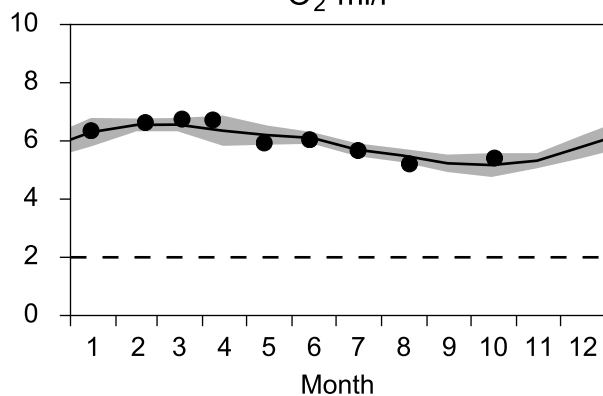


O₂ saturation %

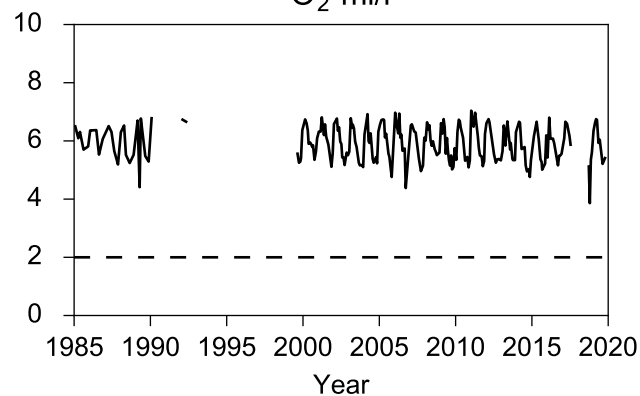


OXYGEN IN BOTTOM WATER (depth >= 125 m)

O₂ ml/l

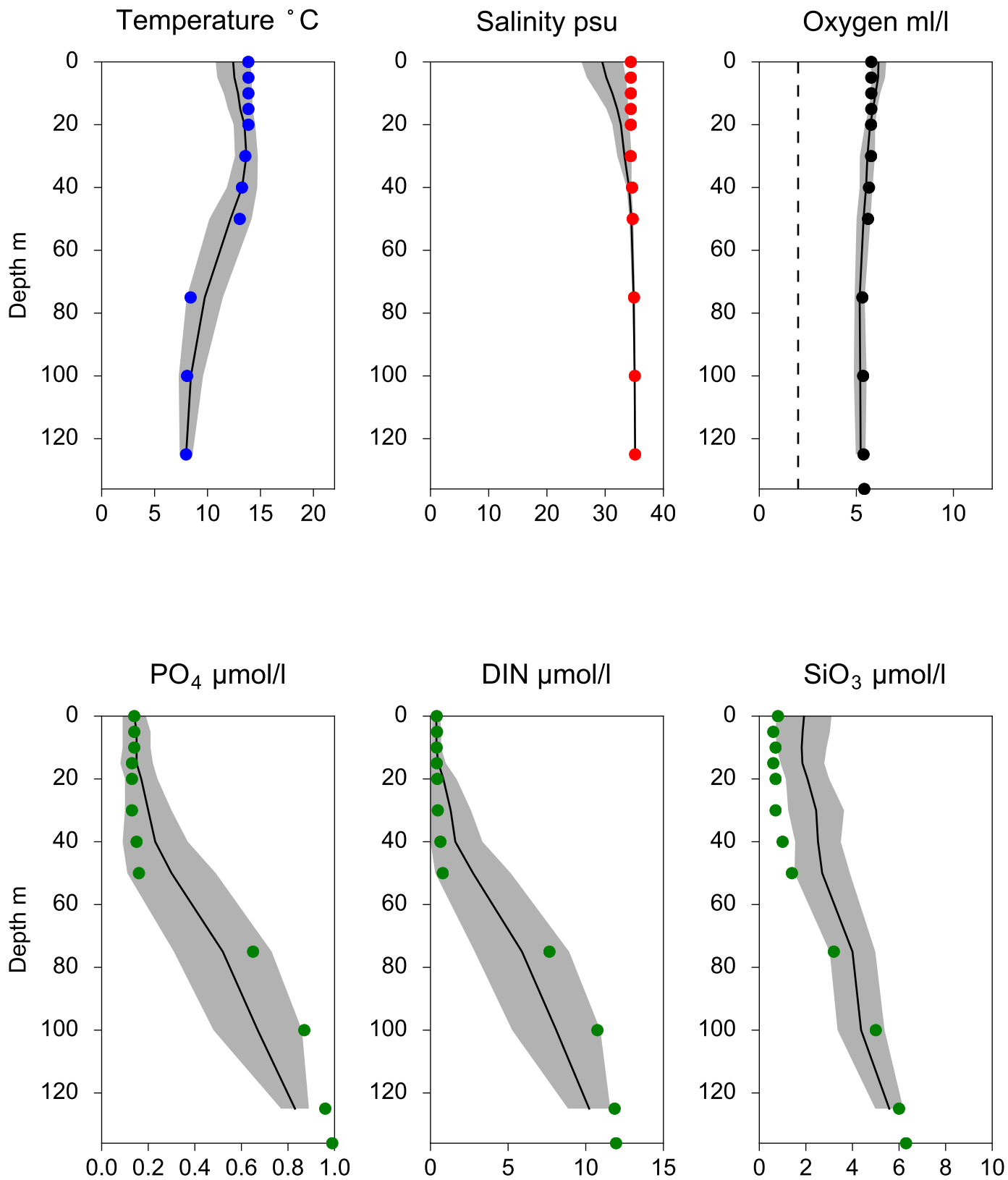


O₂ ml/l



Vertical profiles Å15 October

— Mean 2001-2015 St.Dev. • 2019-10-17



STATION Å13 SURFACE WATER (0-10 m)

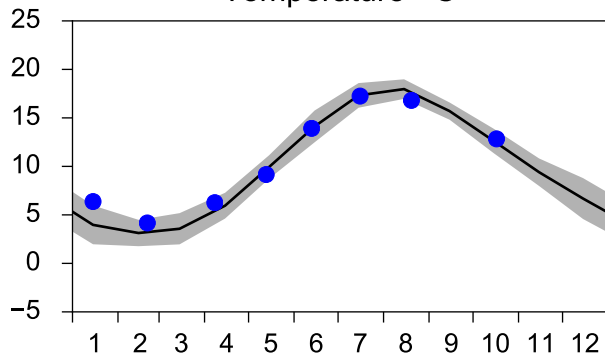
Annual Cycles

— Mean 2001-2015

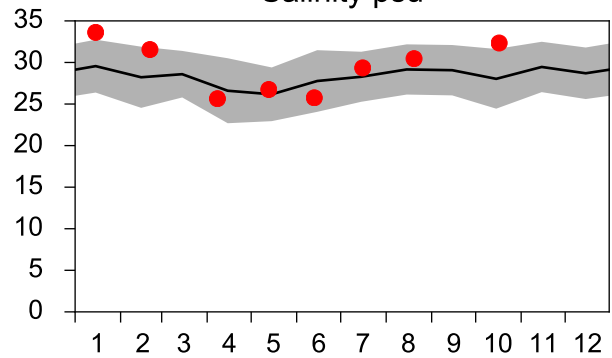
■ St.Dev.

● 2019

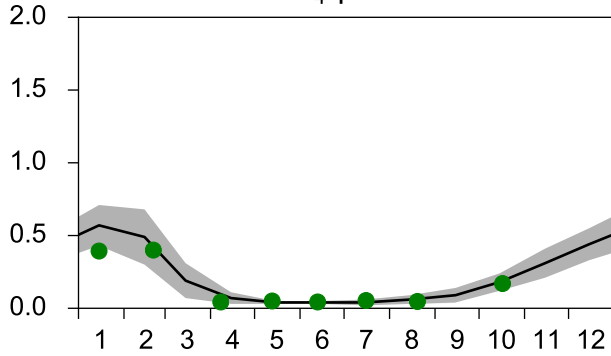
Temperature °C



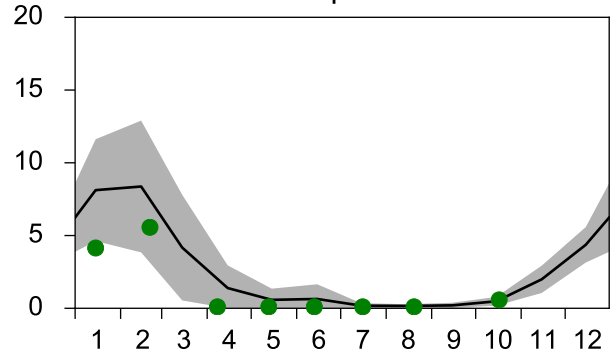
Salinity psu



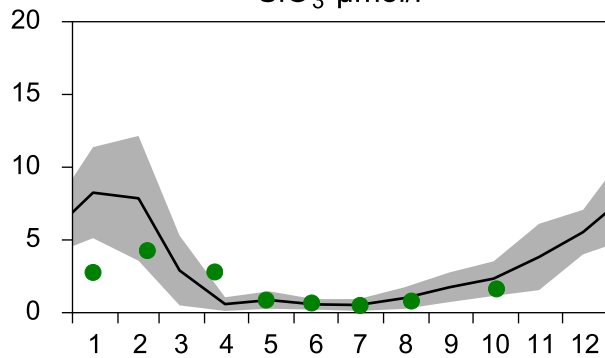
PO₄ µmol/l



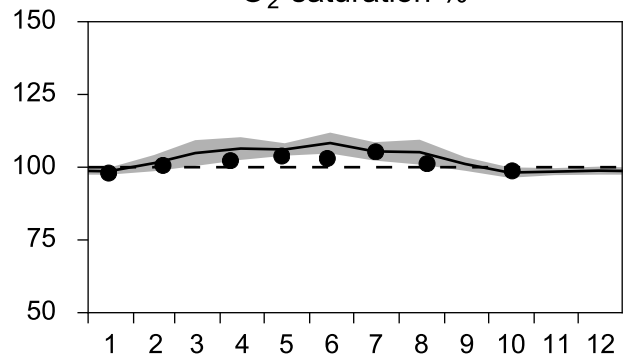
DIN µmol/l



SiO₃ µmol/l

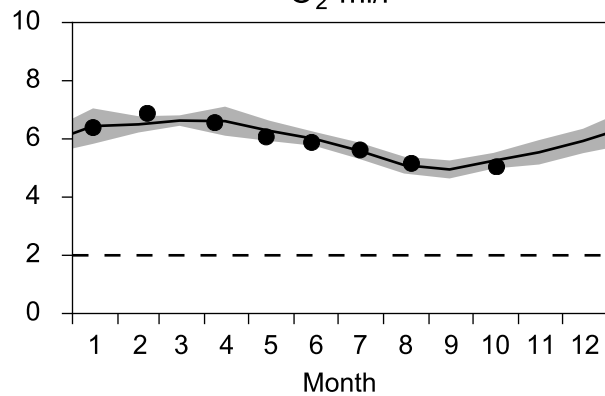


O₂ saturation %

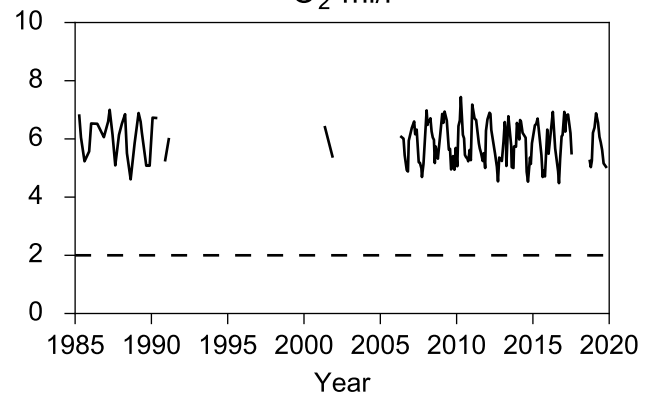


OXYGEN IN BOTTOM WATER (depth >= 80 m)

O₂ ml/l

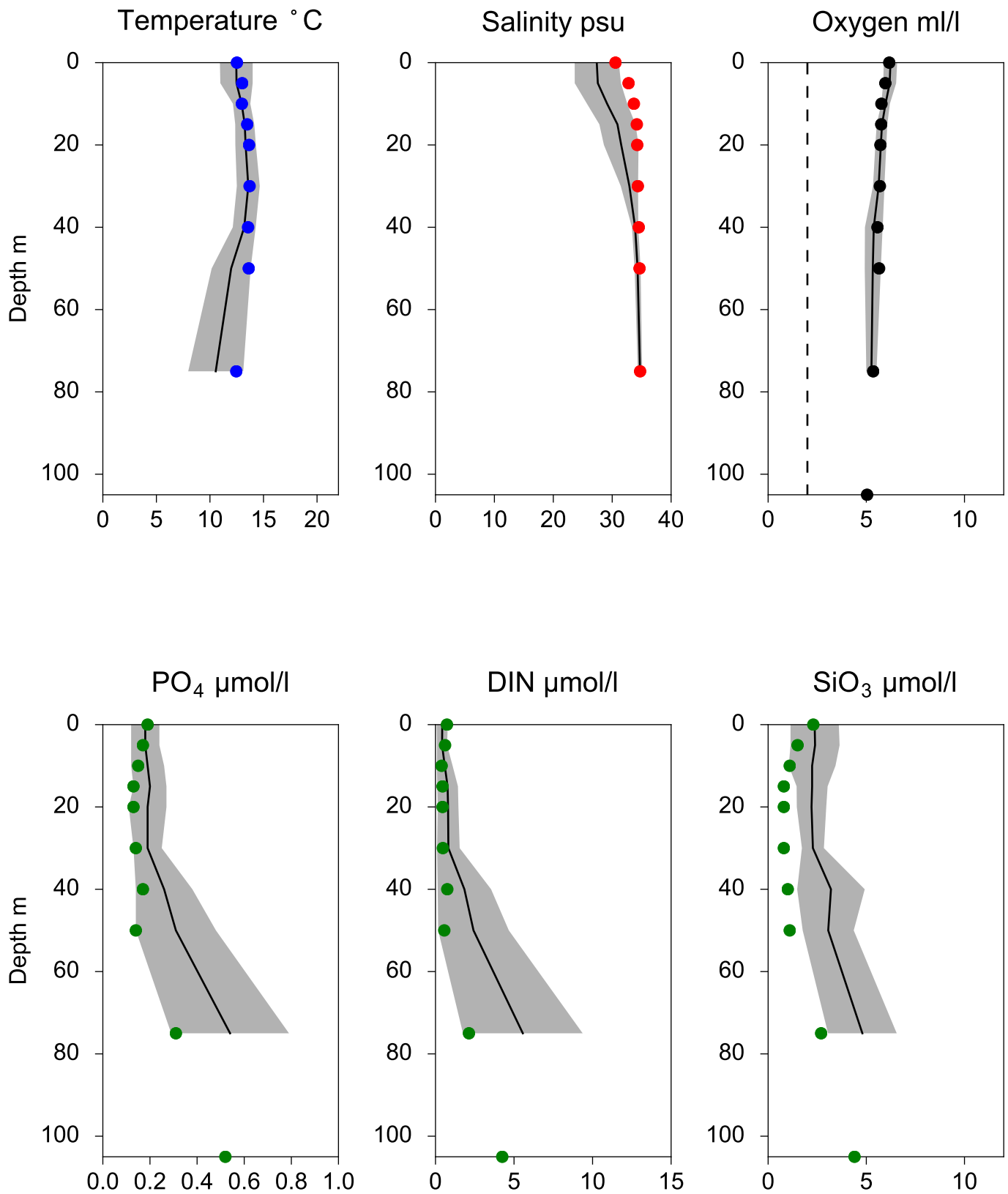


O₂ ml/l



Vertical profiles Å13 October

— Mean 2001-2015 St.Dev. • 2019-10-17



STATION P2 SURFACE WATER (0-10 m)

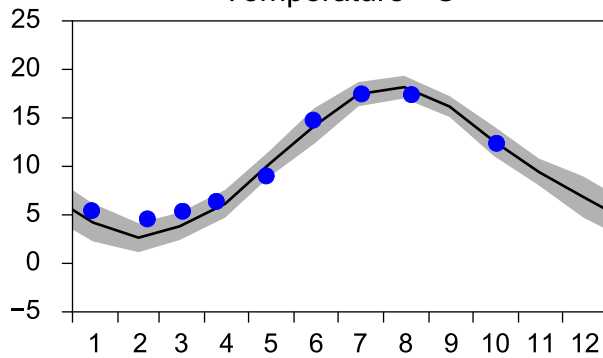
Annual Cycles

— Mean 2001-2015

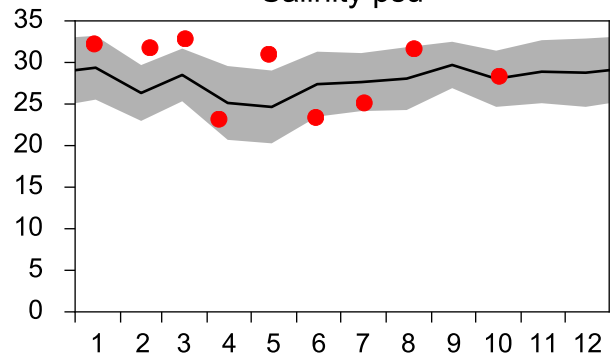
■ St.Dev.

● 2019

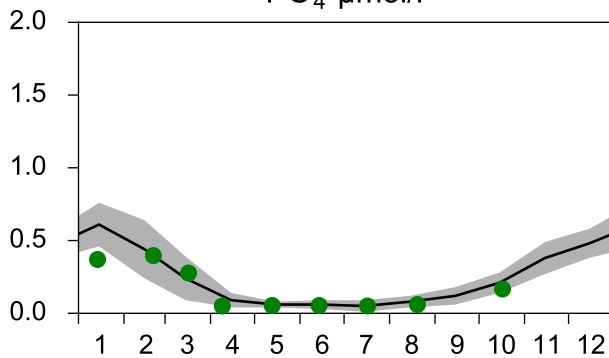
Temperature °C



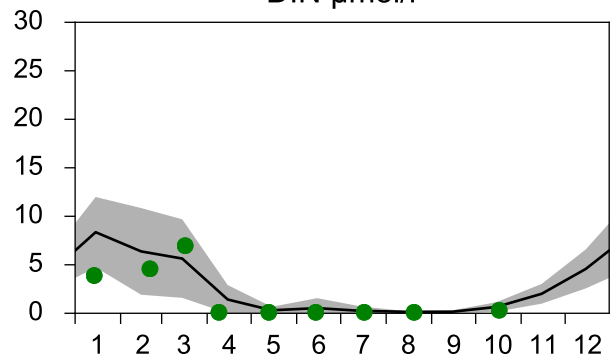
Salinity psu



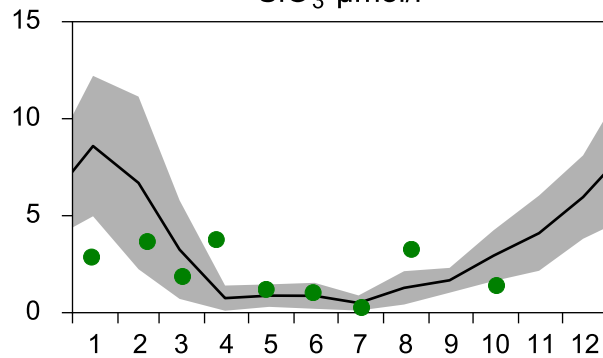
PO₄ μmol/l



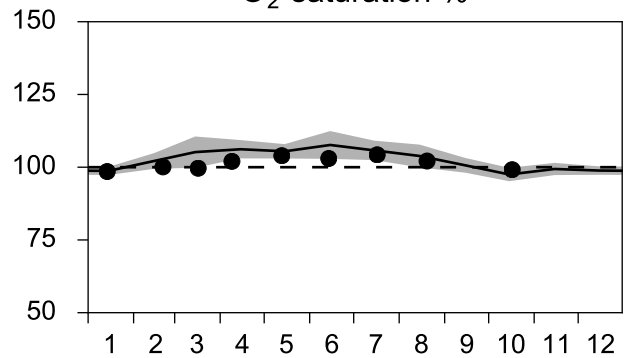
DIN μmol/l



SiO₃ μmol/l

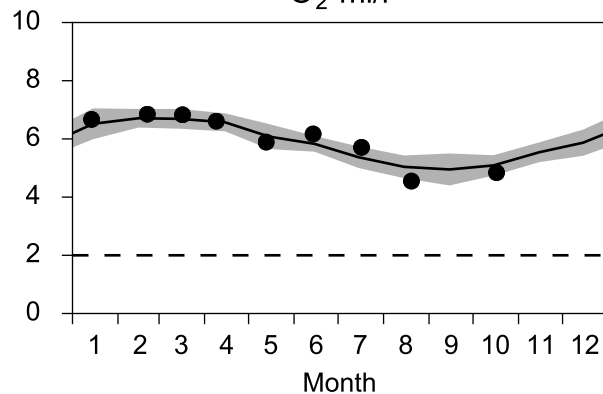


O₂ saturation %

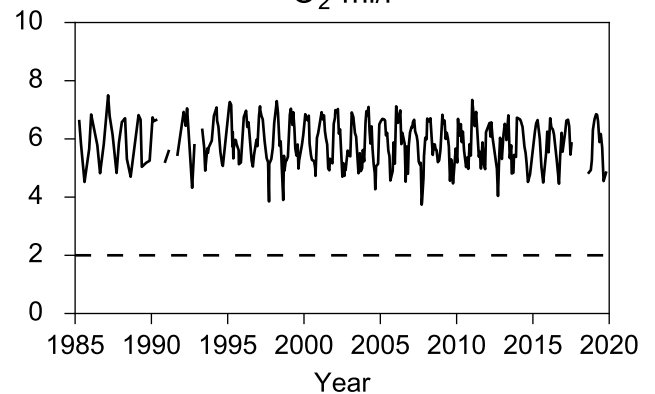


OXYGEN IN BOTTOM WATER (depth >= 75 m)

O₂ ml/l

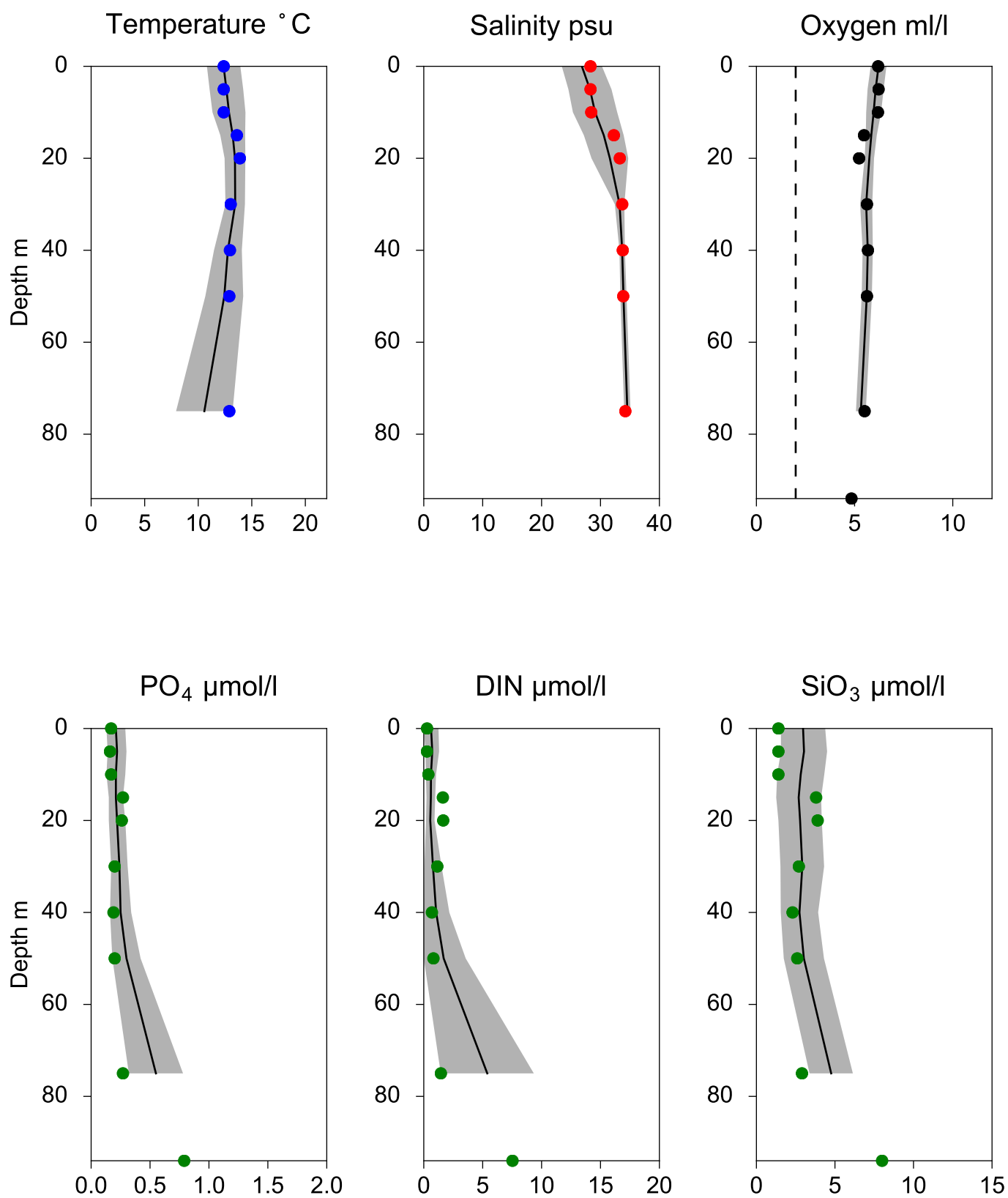


O₂ ml/l



Vertical profiles P2 October

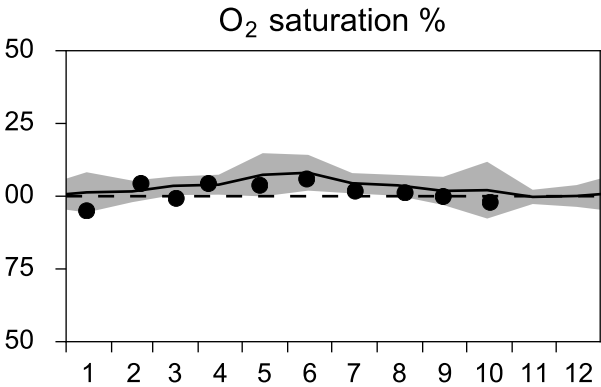
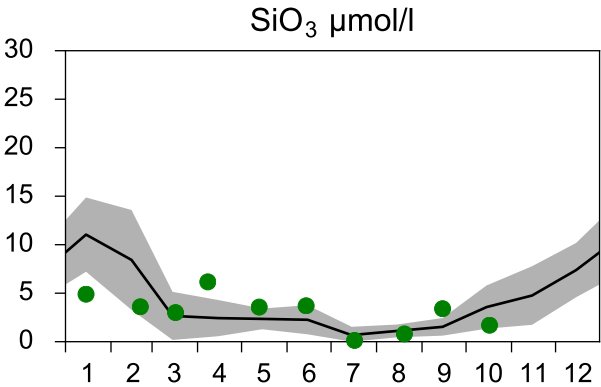
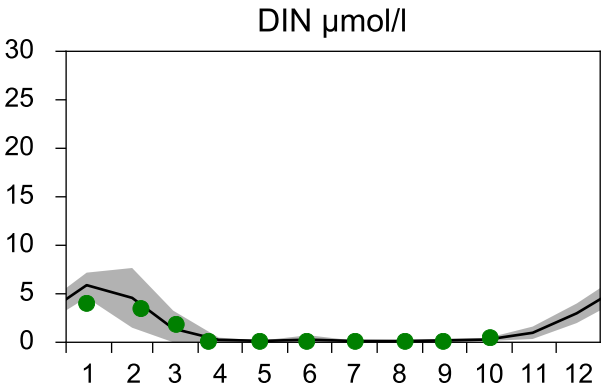
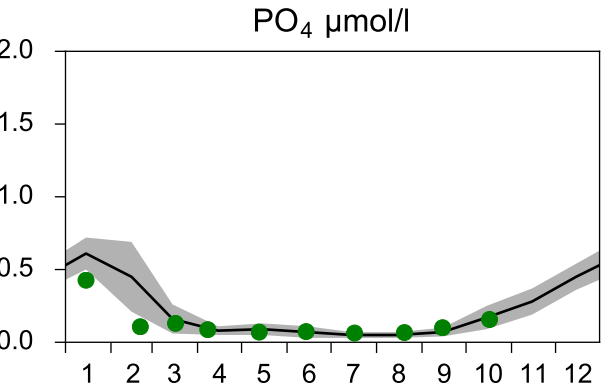
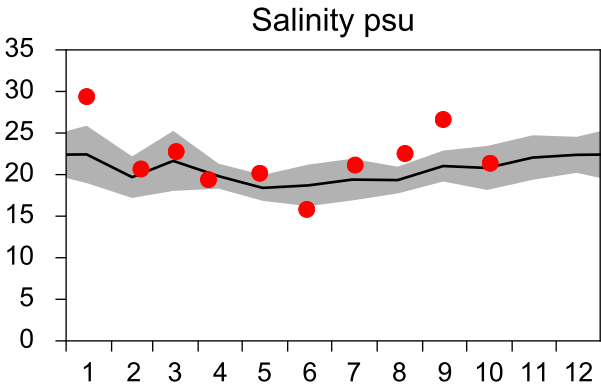
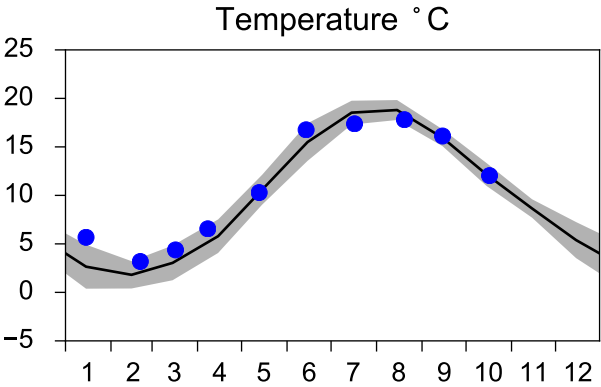
— Mean 2001-2015 St.Dev. • 2019-10-17



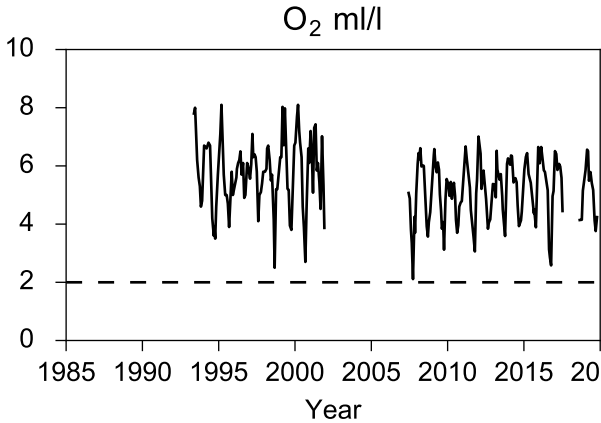
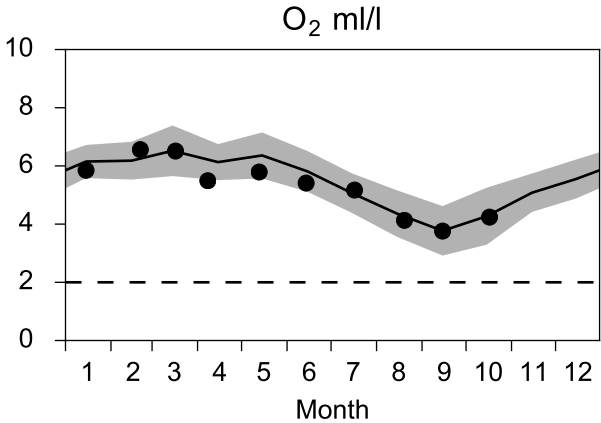
STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

— Mean 2001-2015 St.Dev. ● 2019

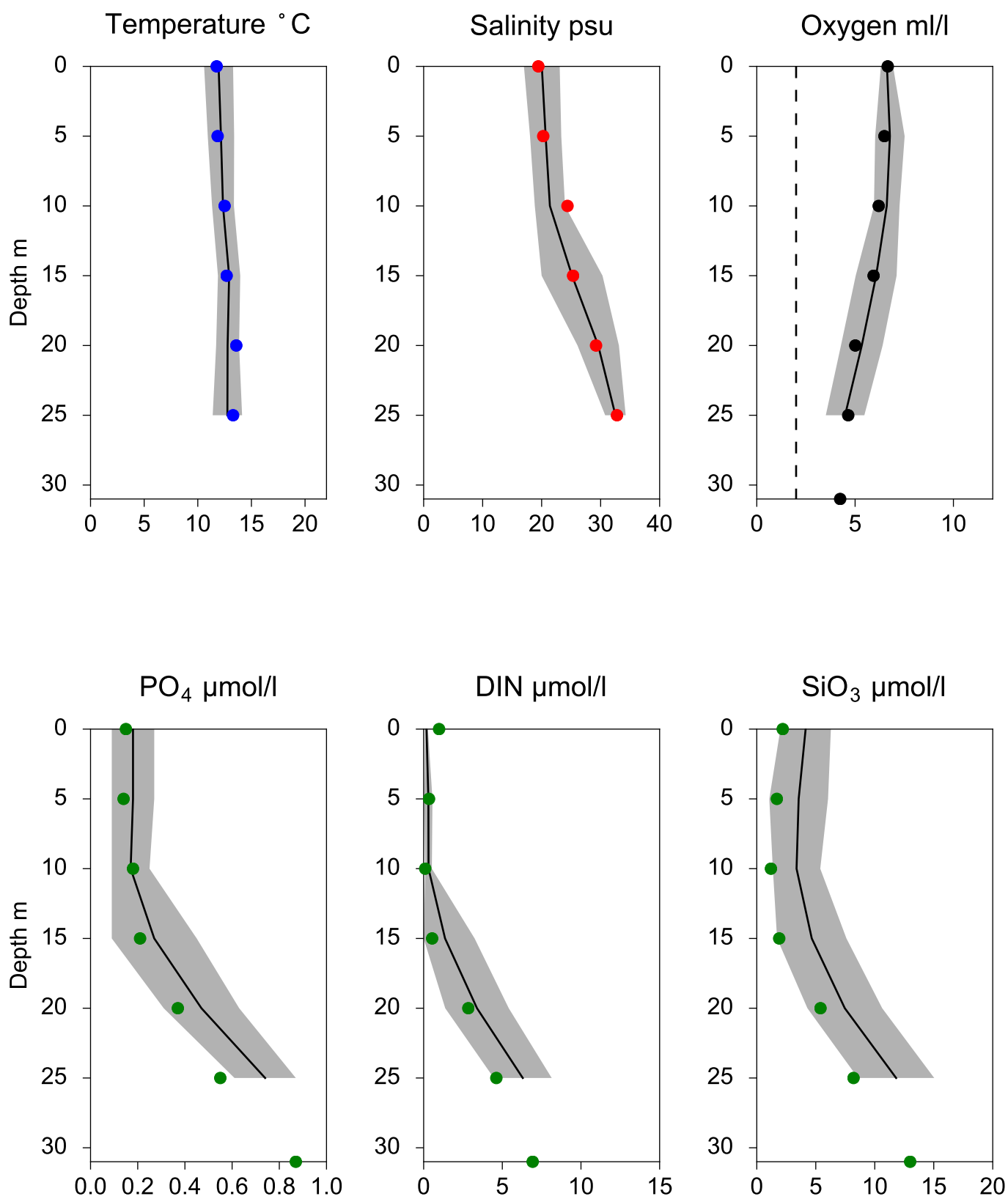


OXYGEN IN BOTTOM WATER (depth >= 25 m)



Vertical profiles N14 FALKENBERG October

— Mean 2001-2015 St.Dev. • 2019-10-17



STATION ANHOLT E SURFACE WATER (0-10 m)

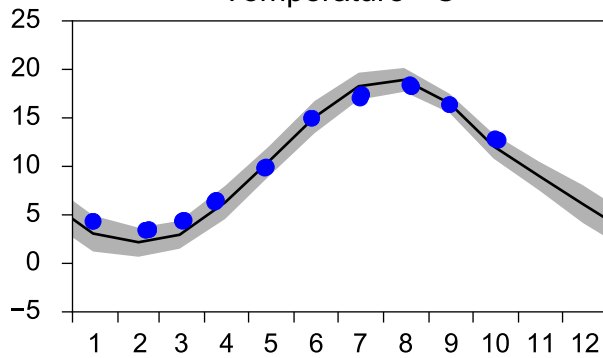
Annual Cycles

— Mean 2001-2015

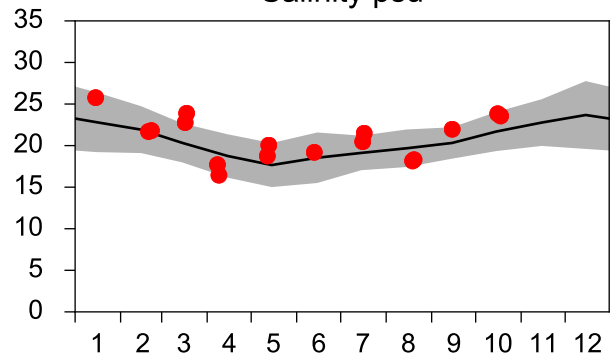
■ St.Dev.

● 2019

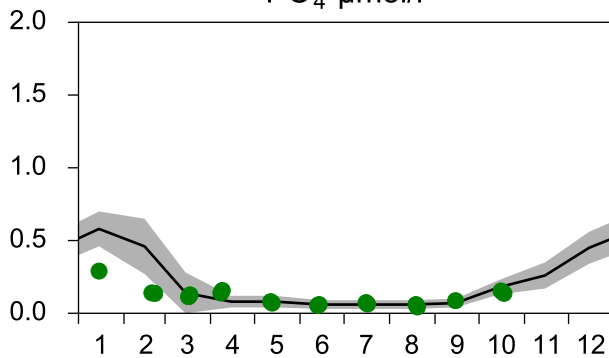
Temperature °C



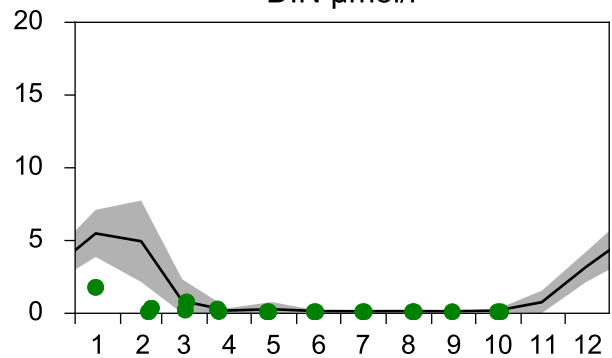
Salinity psu



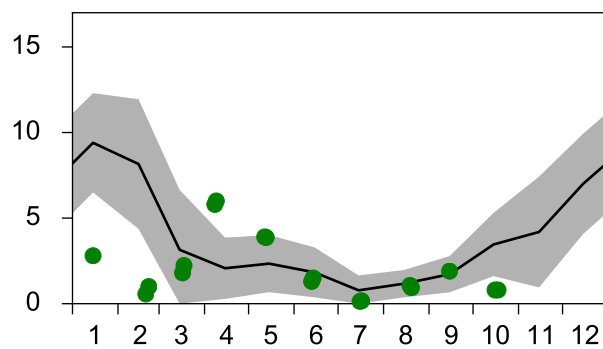
PO₄ µmol/l



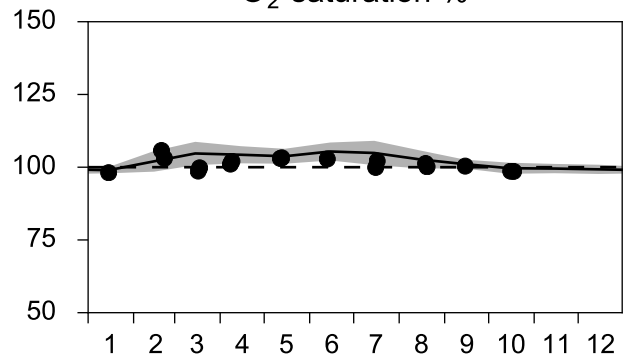
DIN µmol/l



SiO₃ µmol/l

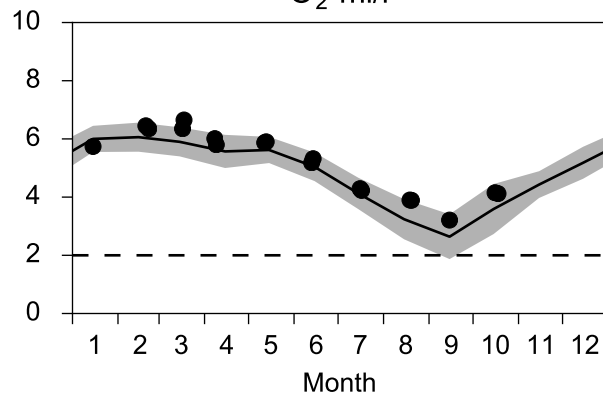


O₂ saturation %

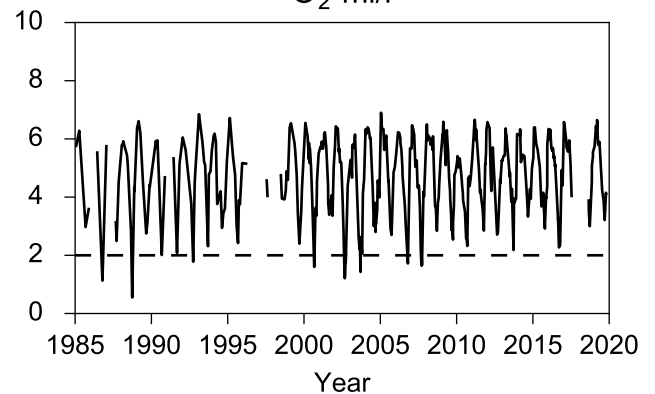


OXYGEN IN BOTTOM WATER (depth >= 52 m)

O₂ ml/l

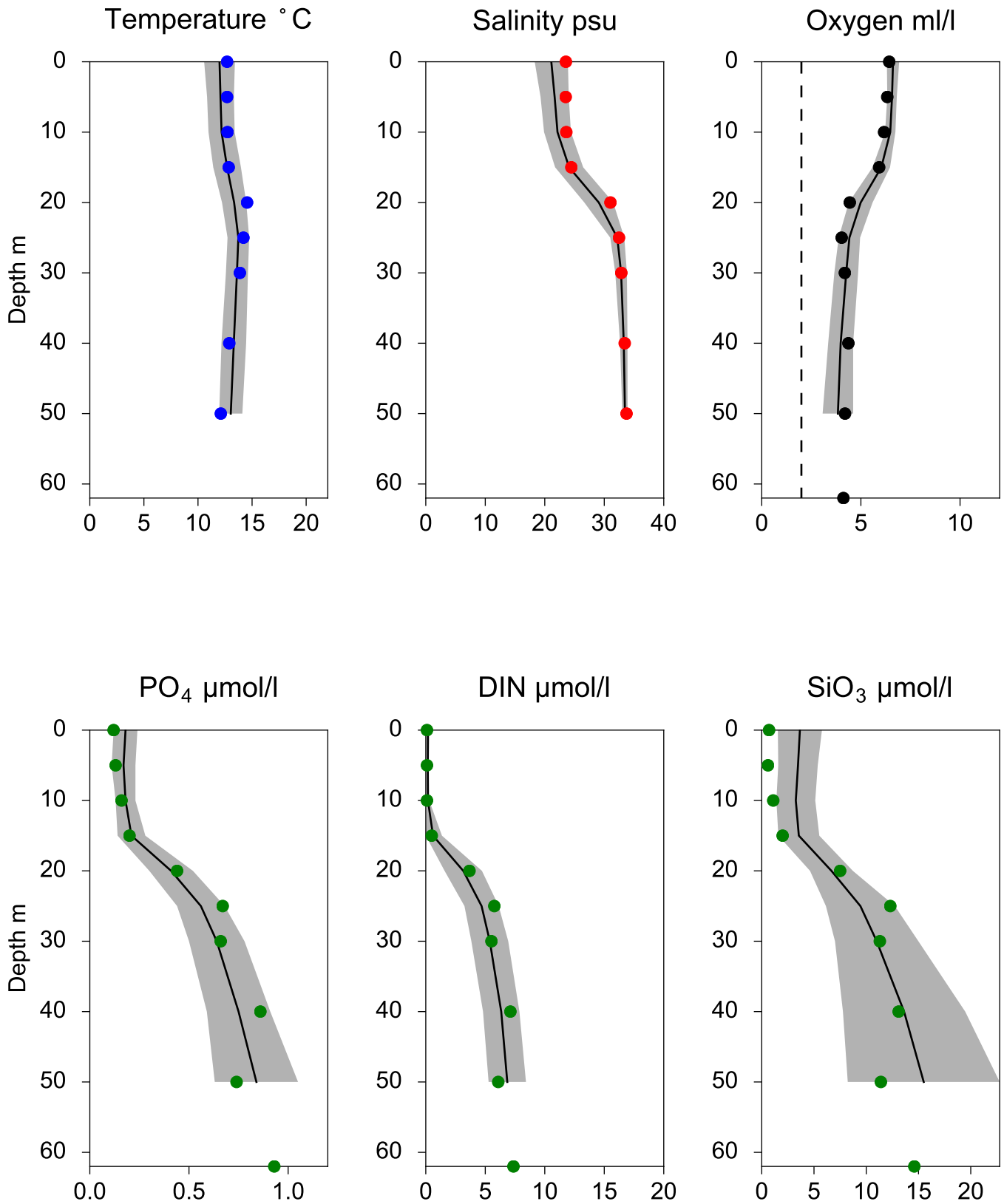


O₂ ml/l



Vertical profiles ANHOLT E October

— Mean 2001-2015 St.Dev. • 2019-10-18



STATION HANÖBUKTEN SURFACE WATER (0-10 m)

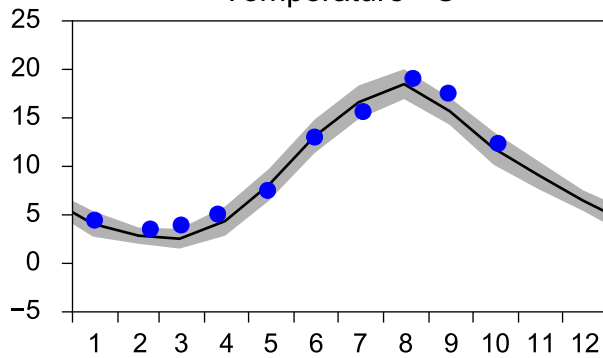
Annual Cycles

— Mean 2001-2015

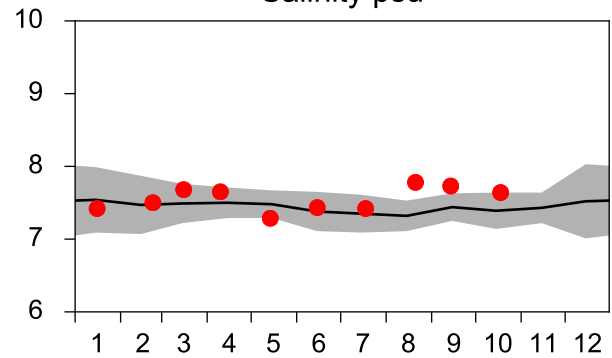
■ St.Dev.

● 2019

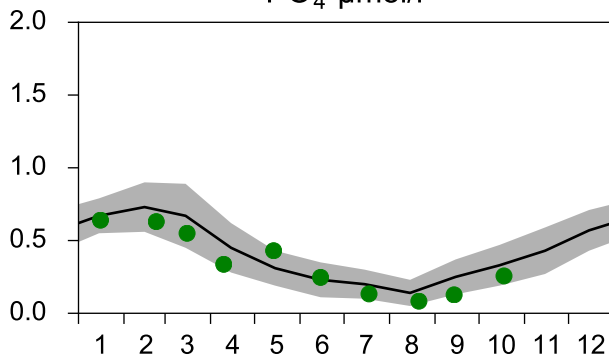
Temperature °C



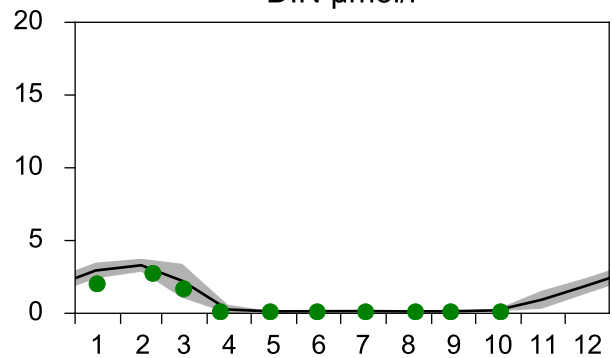
Salinity psu



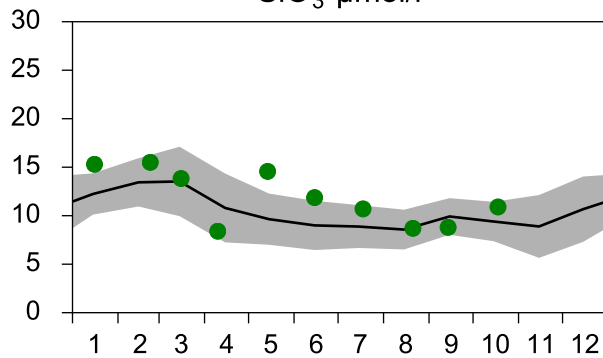
PO₄ µmol/l



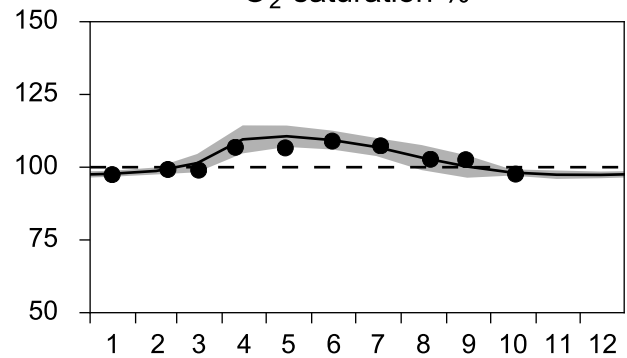
DIN µmol/l



SiO₃ µmol/l

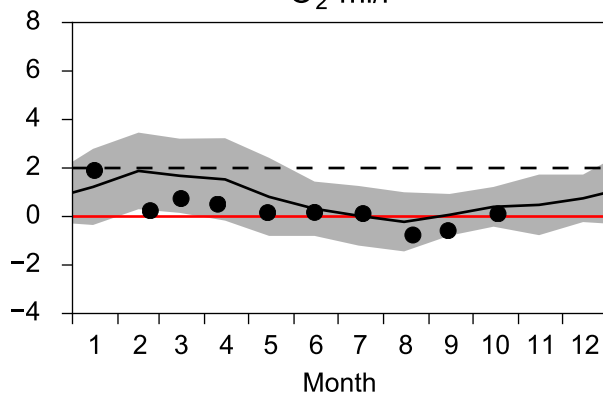


O₂ saturation %

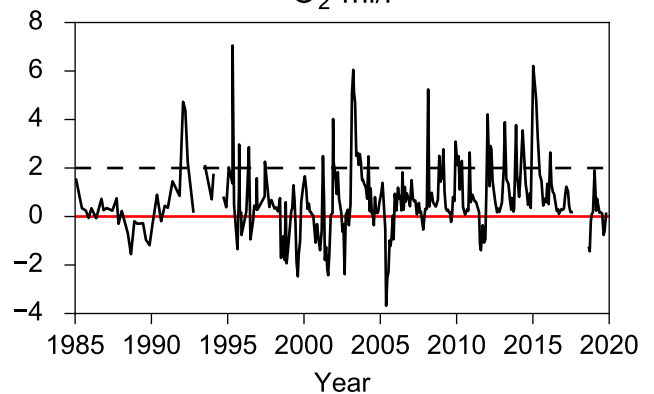


OXYGEN IN BOTTOM WATER (depth >= 70 m)

O₂ ml/l

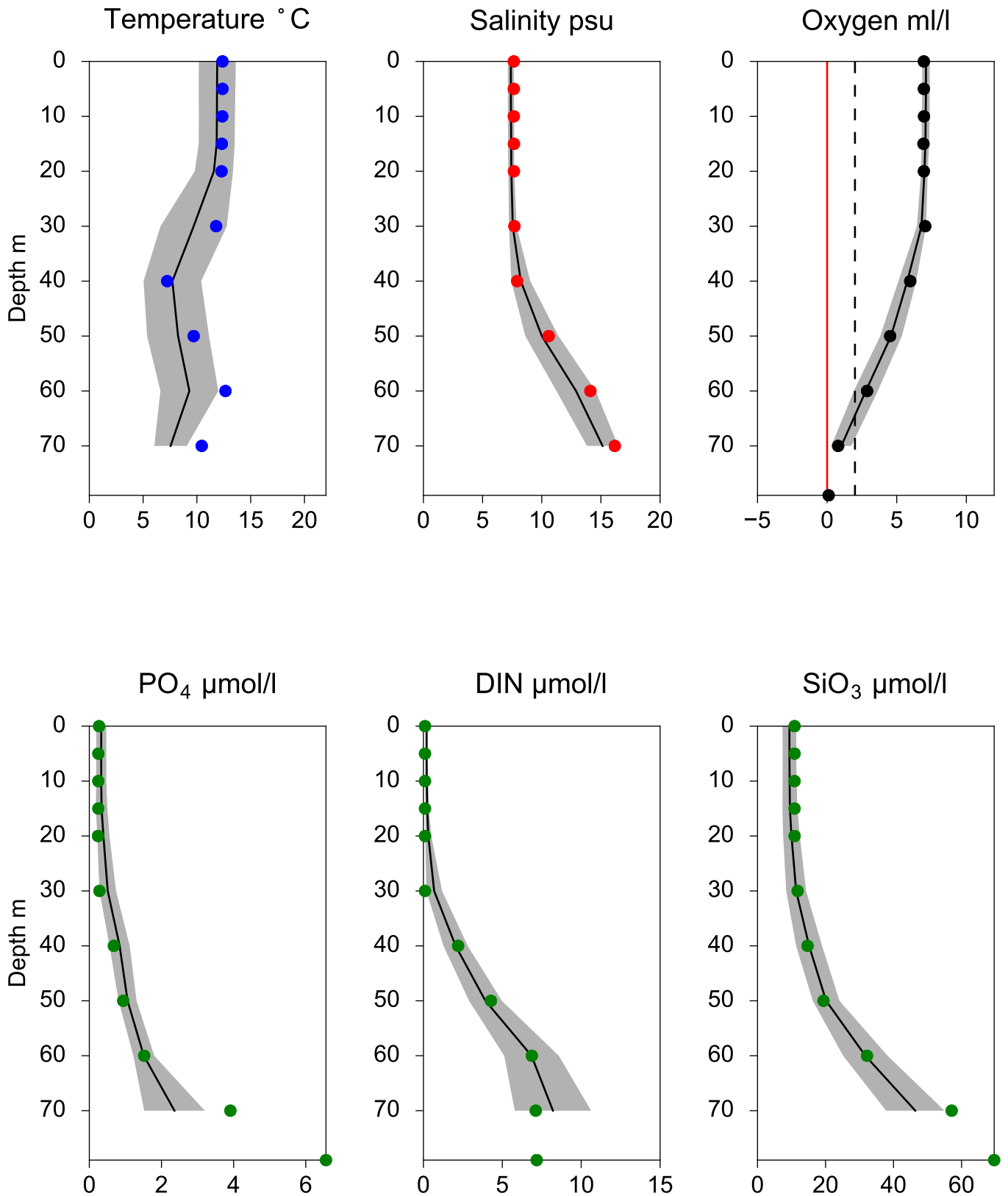


O₂ ml/l



Vertical profiles HANÖBUKTEN October

— Mean 2001-2015 St.Dev. • 2019-10-18



STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

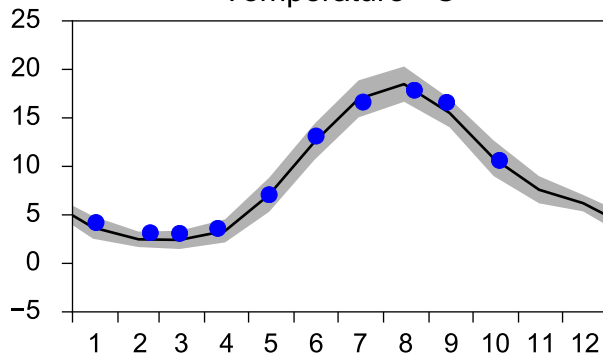
Annual Cycles

— Mean 2001-2015

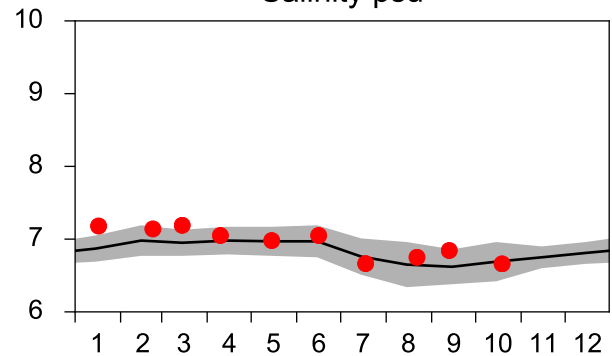
■ St.Dev.

● 2019

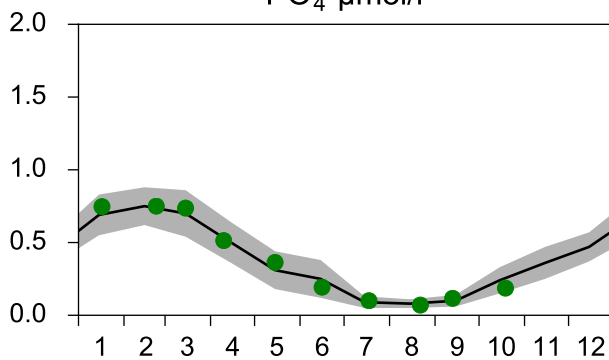
Temperature °C



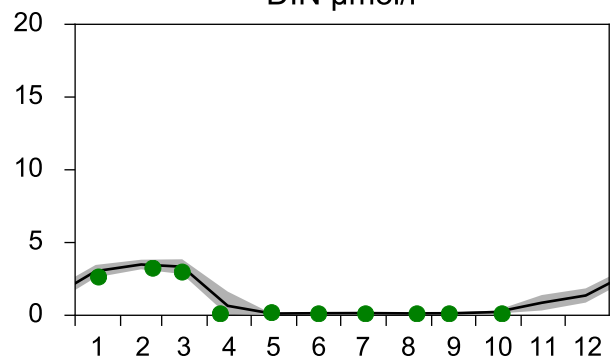
Salinity psu



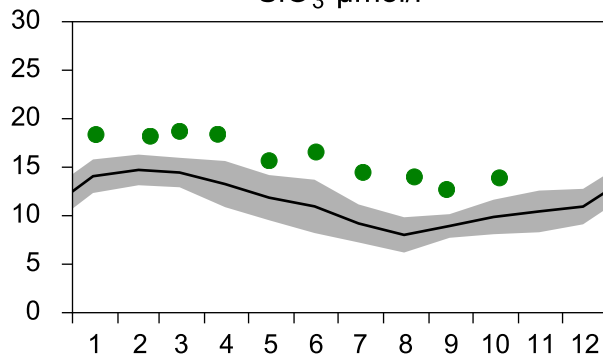
PO₄ µmol/l



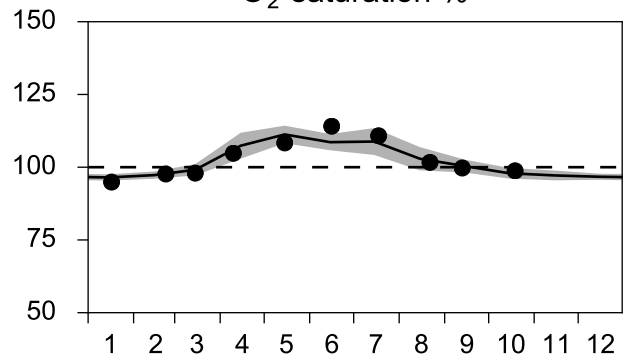
DIN µmol/l



SiO₃ µmol/l

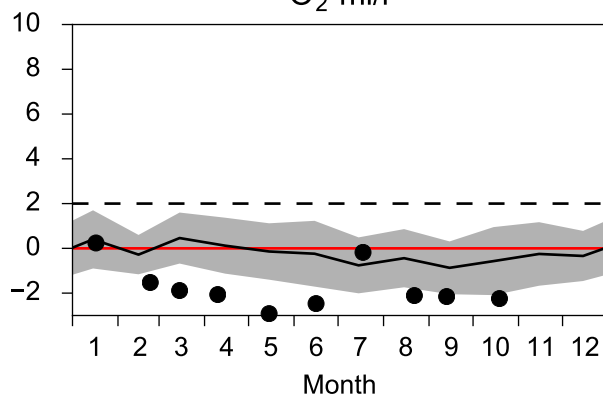


O₂ saturation %

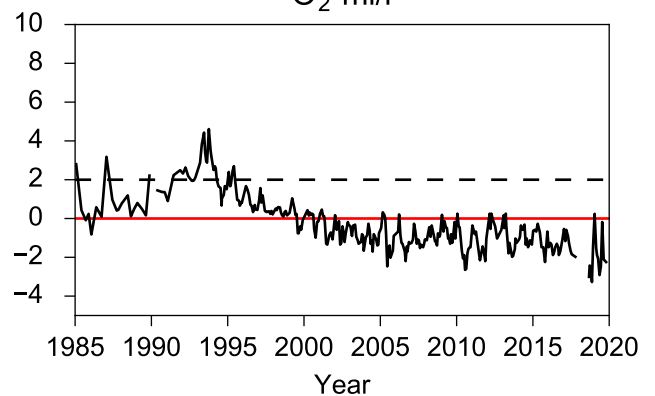


OXYGEN IN BOTTOM WATER (depth >= 100 m)

O₂ ml/l

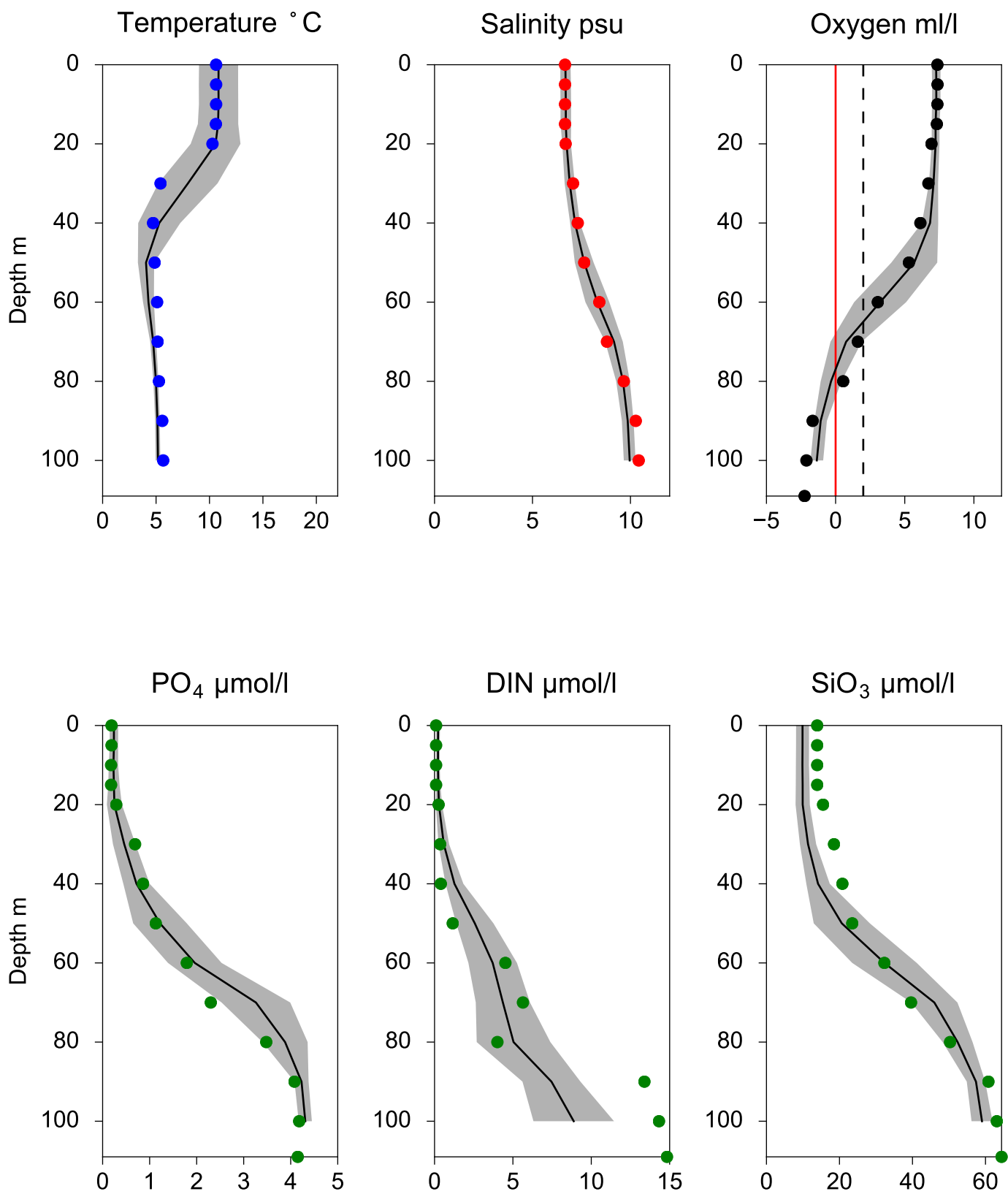


O₂ ml/l



Vertical profiles BY38 KARLSÖDJ October

— Mean 2001-2015 St.Dev. • 2019-10-19



STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

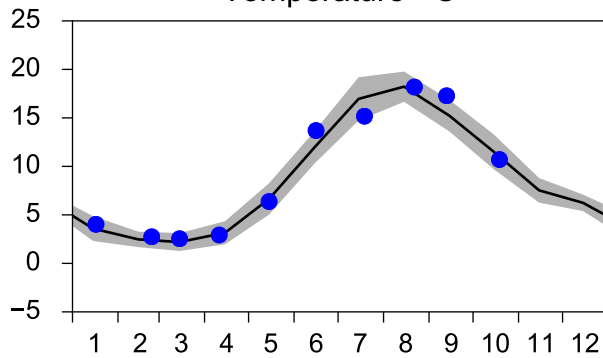
Annual Cycles

— Mean 2001-2015

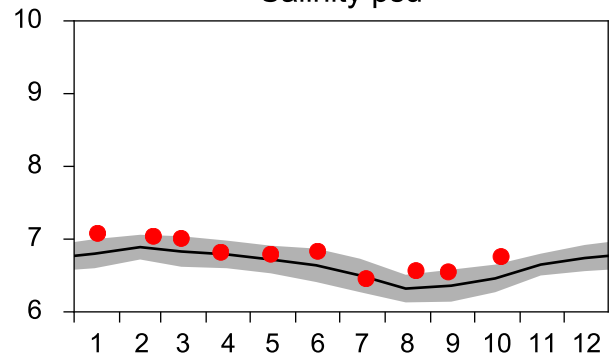
■ St.Dev.

● 2019

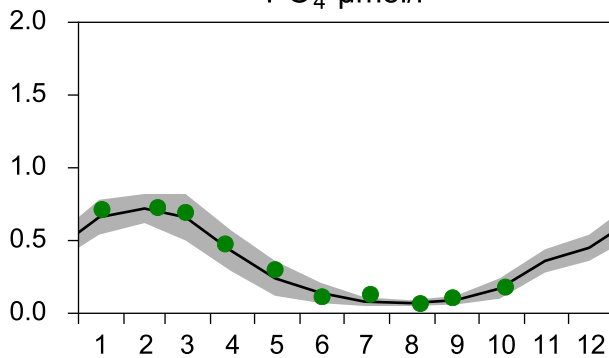
Temperature °C



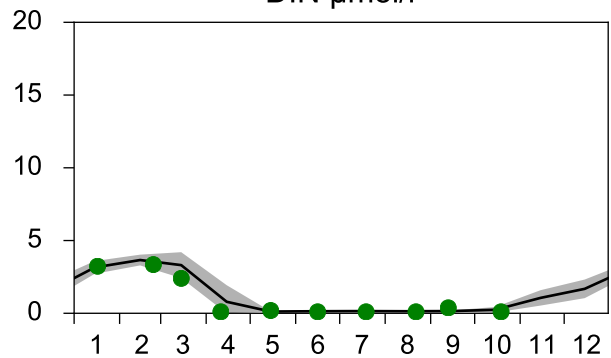
Salinity psu



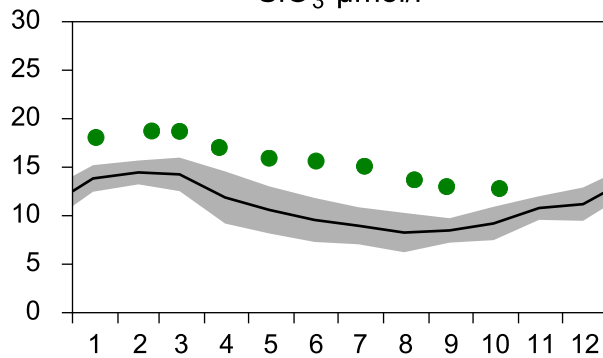
PO₄ µmol/l



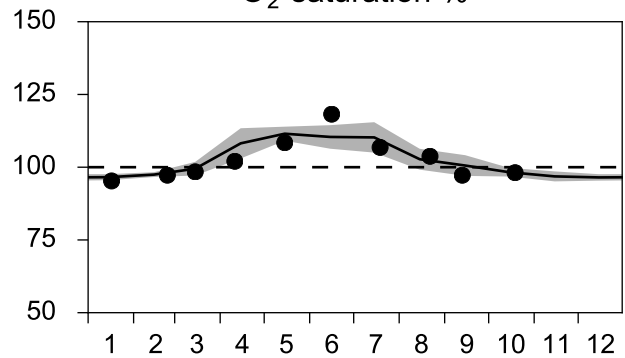
DIN µmol/l



SiO₃ µmol/l

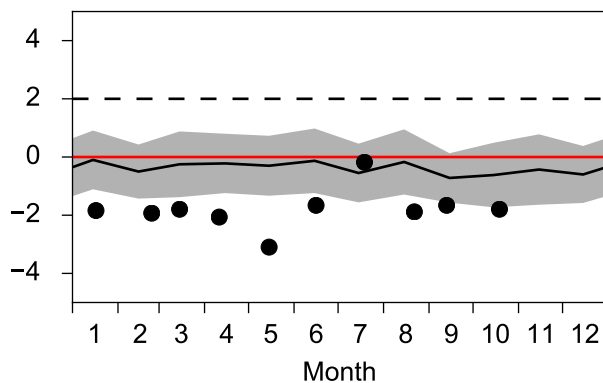


O₂ saturation %

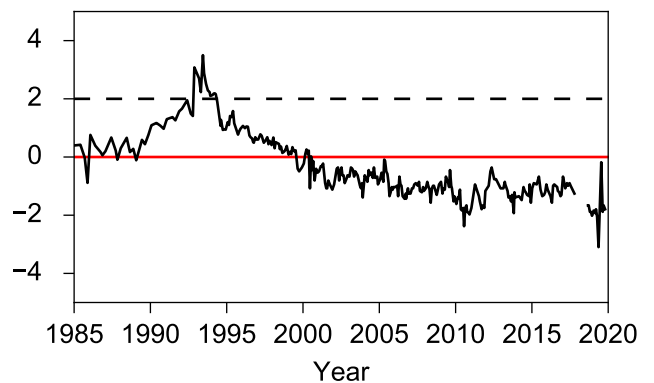


OXYGEN IN BOTTOM WATER (depth >= 175 m)

O₂ ml/l



O₂ ml/l



Vertical profiles BY32 NORRKÖPINGSDJ October

— Mean 2001-2015 St.Dev. • 2019-10-19

