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Report from SMHI's marine monitoring cruise with R/V Svea

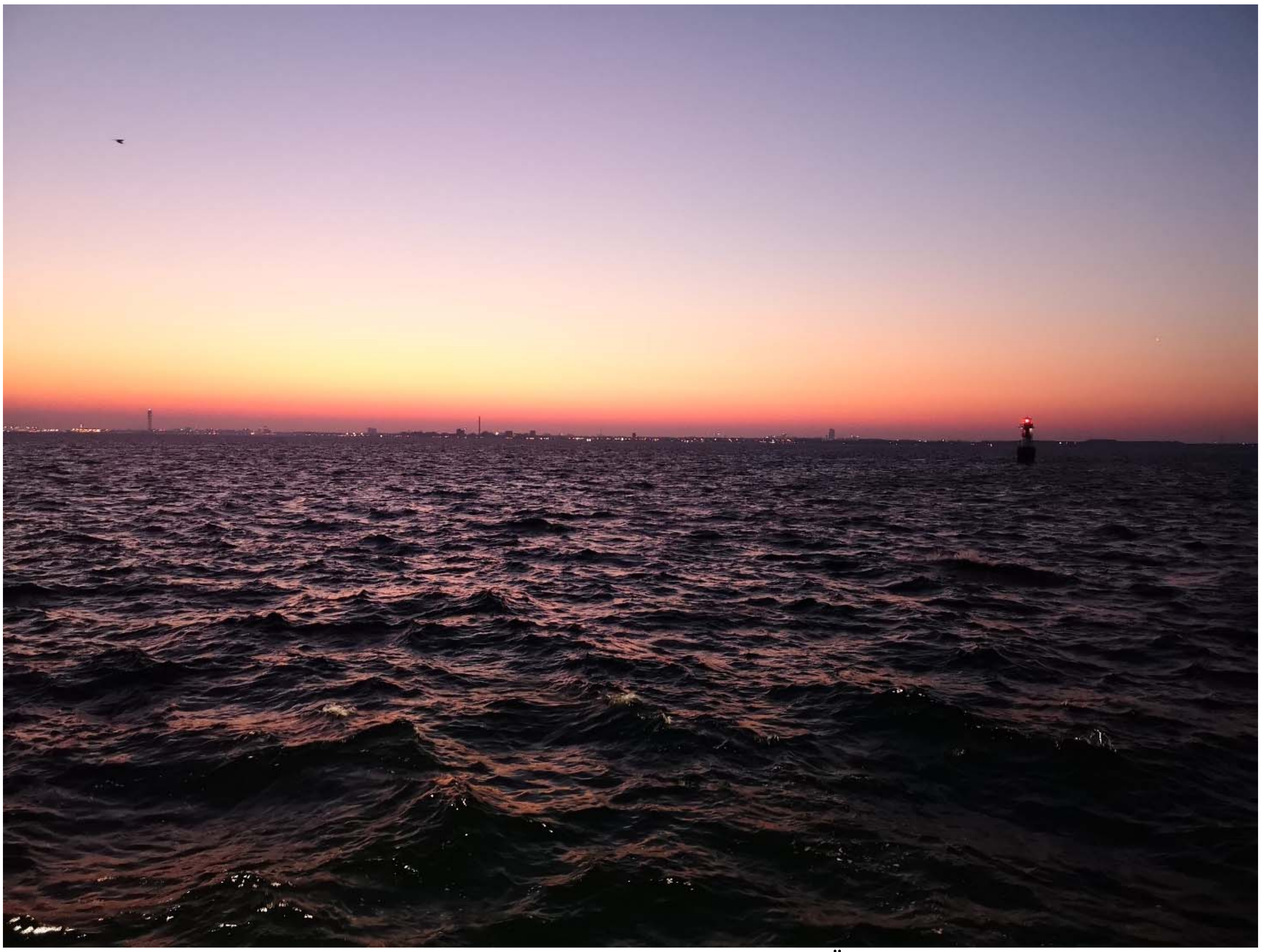

Photo: Örjan Bäck, SMHI.
Sunrise over Malmö, sampling beside the lighthouse Flinten 7, just north of the Öresund bridge.

Survey period: 2022-03-17 to 2022-03-22

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

Cooperation partners: Swedish University of Agricultural Sciences (SLU), Swedish Maritime Administration (SMA)

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Summary

During the cruise, which is part of the Swedish national marine monitoring programme, the Skagerrak, the Kattegat, the Sound and the Baltic Proper were visited.

The water in the Skagerrak was well mixed with weak stratification at the outer stations, low salinities in the surface with an underlying halocline at the more coastal stations. The concentrations of the nutrients DIN and DIP (dissolved inorganic nitrogen and dissolved inorganic phosphorus) correlated strongly with salinity, with high values in the surface at Å17 and very low values of DIN above the halocline at the other stations. The concentrations of silicate were higher than normal everywhere except below the halocline at Å17.

Strong haloclines were observed at every station in the Kattegat with lower than normal salinity in the surface layer. The concentrations of nutrient in the form of DIN and DIP were low but normal both above and below the halocline in the Kattegat. The concentrations of silicate were generally just above what is normal in the area for the season. All stations on the west coast were well oxygenated, with concentrations well above the limit for oxygen deficiency (4 ml/l).

In the Baltic proper there was a well-mixed upper layer with cold and low saline water above the permanent halocline. The salinity at the stations around Bornholm were at normal levels in the entire water mass, while the salinity in the rest of the Baltic Proper were higher than normal, both above and below the halocline. The concentrations of nutrients in the form of DIN were low in the well-mixed upper layer, in particular in the shallowest 20 metres. The concentrations of DIP were normal above the halocline in the entire Baltic Proper. Below the halocline higher values than normal were present at every area except for in the Arkona Basin. High concentrations of silicate were measured in the entire area below the halocline. The oxygen conditions were still very poor in large parts of the Baltic Proper, only in the Arkona Basin the water was well oxygenated. In the Eastern, Northern and Western Gotland Basin hydrogen sulphide concentrations higher than normal were measured closest to the bottom, several stations are now closing in on record high values of hydrogen sulphide.

Plankton activity measured by fluorescence from the CTD was generally low in all areas. No peaks in chlorophyll fluorescence were noted. The fluorescence was low and evenly distributed throughout the well mixed surface layer, then rapidly decreasing below the thermocline. Low nutrient concentrations indicated that a phytoplankton bloom had happened in the southern Baltic Proper but it was nothing that could be seen in the fluorescence data.

SMHIs next regular monitoring cruise with R/V Svea is planned to the 20th to 26th of April, with start and finish in Lysekil.

Results

The cruise was carried out on board the Swedish research vessel R/V Svea and started in Kalmar the 17th of March and ended in Lysekil the 22nd of March.

The cruise started with strong winds from south or southeast. The wind decreased during the second day and turned over to west, just in time for the deployment of the ocean buoy at Huvudskär. Around Bornholm the wind turned to east or southeast and dense fog arrived. In Öresund and in the Kattegat the southeastern wind continued with wind speeds at barely 10 m/s, to then decrease in the Skagerrak and turn to westly winds with sunny weather.

On behalf of the county administrative board of Skåne a bottom mounted measurement system at station P22, just outside Kullen, was recovered and a new system deployed.

The bottom mounted measurement system in the Laholm bay was recovered and no new system was deployed.

Extra phytoplankton samples were taken for Stockholm University as three stations on the west coast.

Transects with Svea's MVP (Moving Vessel Profiler) which are used to measure temperature, salinity and oxygen profiles during transit, were performed at several occasions during the expedition. Stationary profiles were also taken at different lower speeds at Å17 for validation against CTD data.

Both the Ferrybox (continuous measurements at a depth of 4 metres) and Svea's both ADCPs (current measurement) were running during the cruise.

This report is based on data that has undergone an initial quality control. When additional quality review has been performed certain values may change. Data from the cruise is published as soon as possible on the National Oceanographic Data Centre's – SMHI's website. This usually takes place within one to two weeks after the cruise has ended. Some analyses are made after the cruise and are published later.

Data download at SHARKweb: https://www.smhi.se/en/services/open-data/national-archive-for-oceanographic-data/download-data-1.153150

The Skagerrak

The water in the Skagerrak was well mixed at the outermost stations with very weak stratification and slowly increasing salinity with depth. Closest to the coast stronger stratification was observed; the salinity increased quickly at Å13 at around 10 metres and at P2 around 27 metres.

The temperature was just over 4 °C in the surface closest to the coast and barely 6 °C at the stations further out. The temperature increased slowly with depth to around 7 °C at the bottom (6 °C at the coastal station Släggö). The salinity was somewhat lower than normal in the surface at the innermost stations, barely 20 psu. At the outer stations the salinity increased to normal or even higher than normal values, up to 34 psu at the station Å17 furthest from the coast.

The concentrations of nutrients in the form of dissolved inorganic nitrogen (DIN[1]) were very low above the halocline, however just within what's normal for the season. At Å13 high concentrations were measured just below the halocline at 15 and 20 metres depth. At Å17 the water mass was mixed and higher concentrations originating from deeper water had come up to the surface layer where values around 5 µmol/l were observed. Phosphate, dissolved inorganic phosphorus (DIP[2]), also showed a similar distribution, but not quite as low values above the halocline and with the highest value at Å17 at barely 0.5 µmol/l. Concentrations of nutrients increased slowly with depth.

The silicate concentrations, which is used by diatoms to form shells, were higher than normal in the surface at all stations, highest values were found closest to the coast, around 8 µmol/l. At 10 to 20 metres, values over 10 µmol/l where observed and below that silicate concentration did not vary much with depth. The concentration of silicate at Å17 varied around 5 µmol/l in the entire water column.

Oxygen conditions in the Skagerrak were good with values over 6 ml/l closest to the bottom. At the coastal station Släggö, which is located within the fjord Gullmarn where low oxygen conditions sometimes occur in the bottom water, the oxygen concentration decreased to 5.3 ml/l.

Chlorophyll fluorescence measurements with the CTD[3] showed generally low plankton activity, somewhat higher values were observed above the halocline.

The Kattegat and the Sound

The temperature of the surface water in the Kattegat was normal or just over normal for the season, between 4 and 5 °C. Deeper in the water column the temperature varied very little, between 4 °C up towards 6 °C. The salinity was lower than normal above the halocline at every station, from just over 8 psu in Öresund to at most barely 15 psu at Anholt E. Strong haloclines were observed at all stations, in Öresund at W Landskrona at around 15 metres, at N14 Falkenberg at around 20 metres. At both Fladen and Anholt E double haloclines were observed, at 5 and 15 metres at Fladen and at 11 and 25 metres at Anholt E.

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1 Dissolved inorganic nitrogen, abbreviated DIN, the sum of nitrate, nitrite and ammonium.

2 Dissolved inorganic phosphorus, abbreviated DIP, only in the form of phosphate.

3 CTD is a profiling instrument which stands for Conductivity, Temperature and Depth. SMHI's CTD is also equipped with sensors that measure oxygen and fluorescence among others.

The nutrient concentrations in the form of DIN and DIP were low but within normal for the season both above and below the halocline in the Kattegat, in particular the DIN concentrations above the halocline were very low but not exceptional for the season. DIN values varied between 0.1 and 1.0 µmol/l above the halocline and between 7 to 10 µmol/l closest to the bottom, highest values were found in Öresund. The concentrations of DIP were around 0.1 µmol/l above the halocline in the Kattegat and 0.7 µmol/l at the bottom. Corresponding values were in Öresund 0.5µmol/l and 0.9 µmol/l respectively.

The concentrations of silicate were generally just above what is normal for the area and season, values around 10 to 15 µmol/l were observed with relatively small differences above and below the halocline.

The oxygen concentrations in the Kattegat and the sound were at normal levels and the oxygenation was good in the entire water column, lowest values were found at the bottom at around 6 ml/l at all stations.

CTD measurements of chlorophyll fluorescence showed low plankton activity without any peaks in fluorescence, highest values were observed above the halocline.

The Baltic Proper

In the Baltic Proper there was a well-mixed upper layer with cold, low saline water above the permanent halocline, the temperature varied from just over 2 °C in the north to just over 4 °C in the south. The temperature was somewhat higher below the halocline; between 6 and 8 °C. The halocline was most shallow in the Arkona Basin where it started at 35 – 40 metres, in the Bight of Hanö and the Bornholm Basin around 55 – 60 metres. In the rest of the areas of the Baltic Proper the halocline was found at between 60 to 80 metres depth, except at station BY38 where it was as shallow as barely 50 metres. At station BY15 there was another weak halocline at 25 metres where water originating from the north, with somewhat lower density, lay on top of water originating from the south, with somewhat higher density. A similar phenomenon, but much weaker, could be observed at the northern stations BY20, BY31 and BY32. The salinity at the stations around Bornholm were at normal levels in the entire water mass, around 7.5 to 8 psu in the surface. In the rest of the Baltic Proper, north east of Bornholm, the salinity was higher than normal, both above and below the halocline.

The nutrient concentrations in the form of DIN, dissolved inorganic nitrogen, were low in the well-mixed upper layer. In the Arkona Basin DIN was totally consumed down to 20 metres and in the Bornholm Basin almost fully consumed, a sign that the spring bloom of phytoplankton has taken place. Also in the Eastern and Western Gotland Basin the levels of DIN were lower than normal in the upper 20 metres. Furthest to the north at the stations BY29 and BY31, together with BCS III-10 in the southeast the concentrations were at normal levels for the month. Below the halocline the nutrient concentrations increase, around Bornholm concentrations at normal levels were measured, except closest to the bottom at BY4 where high values of ammonia were found, 17 µmol/l. This coincided with oxygen free conditions and measurable amounts of hydrogen sulphide. In the Eastern Gotland Basin higher than normal values, 20 – 30 µmol/l, were found closest to the bottom and at depths from around 150 metres and deeper. In the Western Gotland Basin high values were found from about 90 metres and deeper, around 15 µmol/l. In the north, high values were not measured until 300 metres and at the bottom at around 450 metres at the station BY31 Landsortsdjupet.

The concentrations of DIP, dissolved inorganic phosphorus in the form of phosphate, were normal above the halocline in the entire Baltic Proper. Below the halocline however, there were higher than normal values in all areas except for in the Arkona Basin. The highest values at each station varied between 4 to just over 8 µmol/l.

The silicate concentrations were normal in the Arkona Basin at around 10 µmol/l with somewhat higher values closest to the bottom. In the Bight of Hanö and in the Bornholm Basin there were normal values above the halocline at around 15 µmol/l while significantly higher concentrations occurred below the halocline, highest closest to the bottom with values between 66 and 77 µmol/l. At all stations in the Eastern, Northern and Western Gotland Basin values higher than normal occurred in the entire water column, the concentrations varied in the surface between 17 and 20 µmol/l, at the bottom between 60 and 75 µmol/l, highest value was barely 90 µmol/l at BY15.

The oxygen conditions were still very poor in large parts of the Baltic Proper, only in the Arkona Basin the water was well oxygenated. In the Bight of Hanö, at BY4 in the Bornholm Basin and at BCS III-10 in the southeast hydrogen sulphide[4] was found at the bottom and acute oxygen deficiency (<2ml O_2/l) was measured from 70 metres, in the Bight of Hanö already from 60 metres. In the Eastern, Northern and Western Gotland Basin hydrogen sulphide concentrations higher than normal were measured closest to the bottom, several stations are now closing in on record high values of hydrogen sulphide. Acute oxygen deficiency occurred in these areas from around 70 to 80 meters depth, at station BY38 already from 60 metres depth and at 50 metres concentration as low as 3.1 ml/l was measured.

Plankton activity measured with fluorescence from the CTD showed some concentration above the halocline in the southern parts of the Baltic Proper which coincides with consumed nitrogen through the spring bloom of phytoplankton. However, no clear fluorescence peaks were found which indicates that the spring bloom already peaked earlier in the southern parts and that it has not yet started further north.

More information about the algal situation can be read in the Algaware report for march: https://www.smhi.se/publikationer/publikationer/algrapporter

[4] Hydrogen sulphide, H_2S, forms in oxygen free conditions.

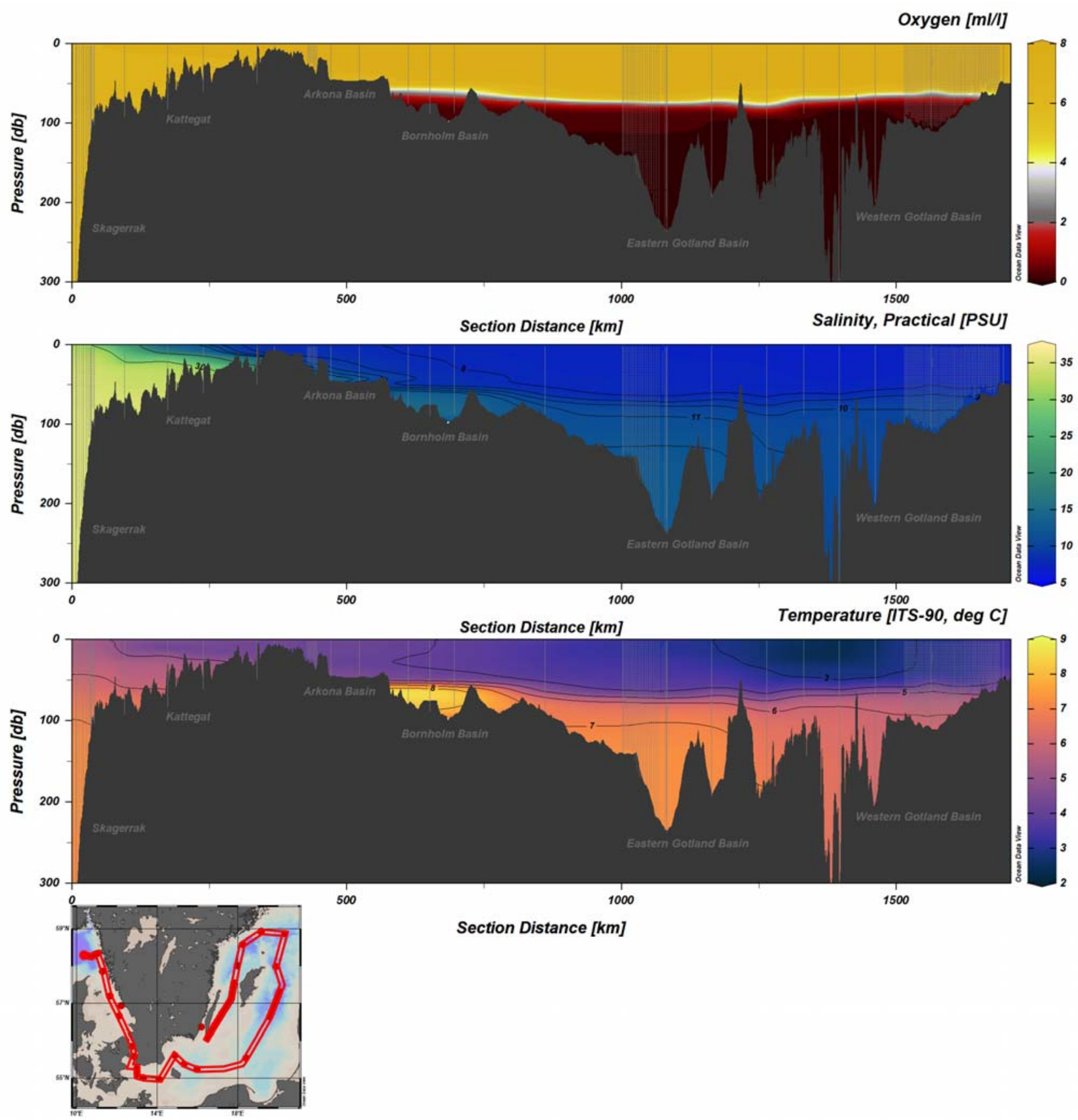


Figure 1. Transect showing oxygen concentration, salinity and temperature from measurements with CTD and MVP. Starting in Skagerrak via the Kattegat and the Sound to the Eastern Gotland Basin and further into the Western Gotland Basin.

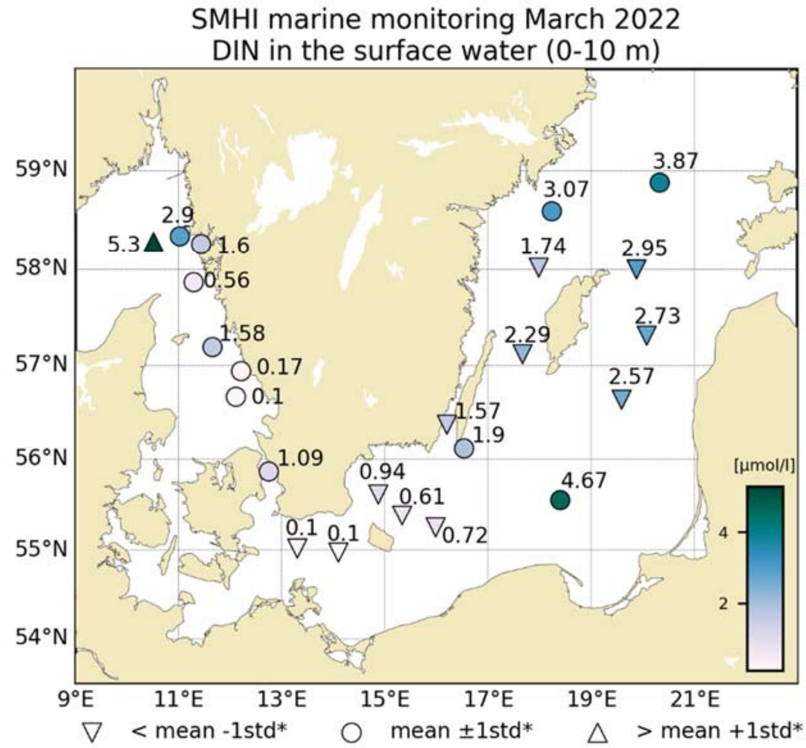


Figure 2. Concentration of dissolved inorganic nitrogen in the surface water (0 - 10m).

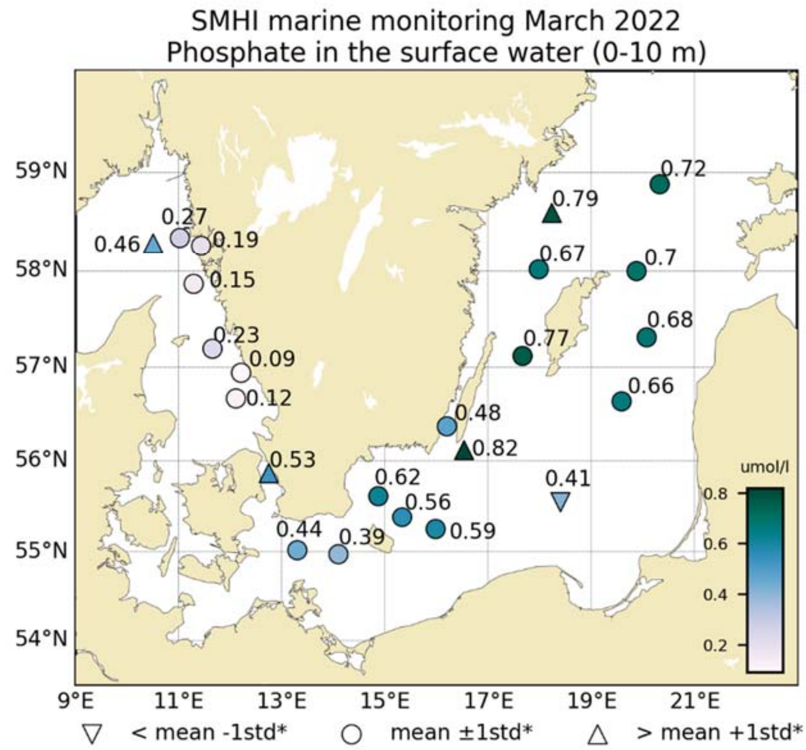


Figure 3. Concentration of phosphate in the surface water (0 - 10m).

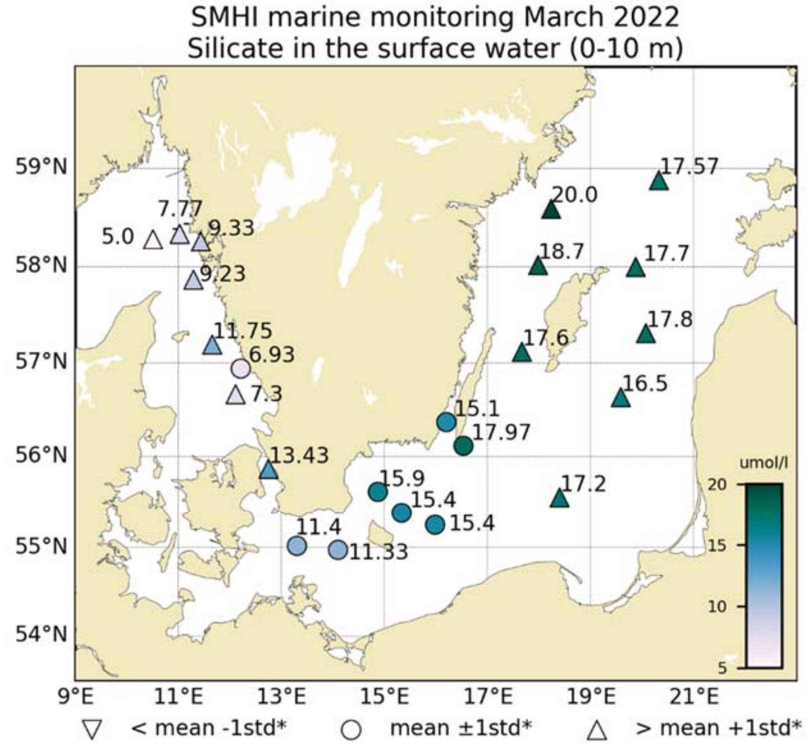


Figure 4. Concentration of silicate in the surface water (0 - 10m).

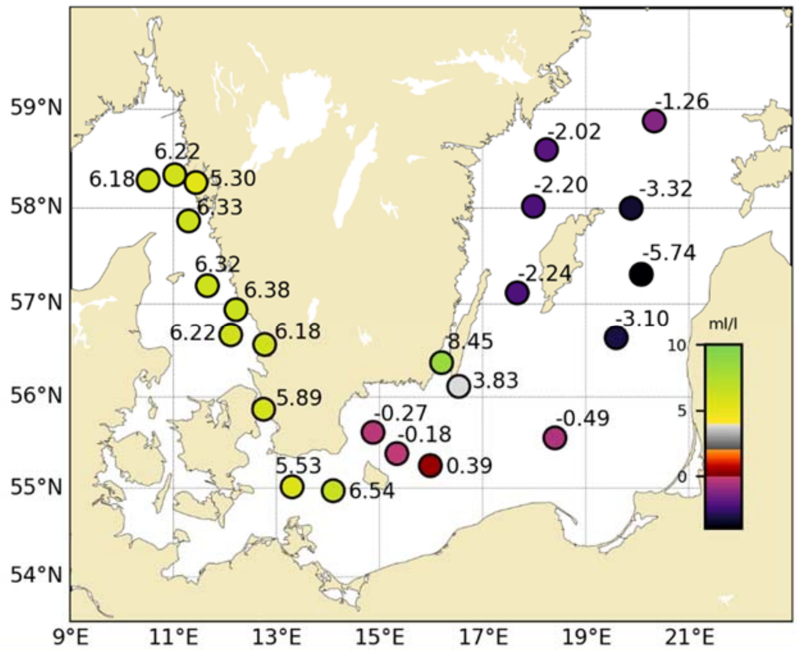


Figure 5. Oxygen concentration in the bottom water.

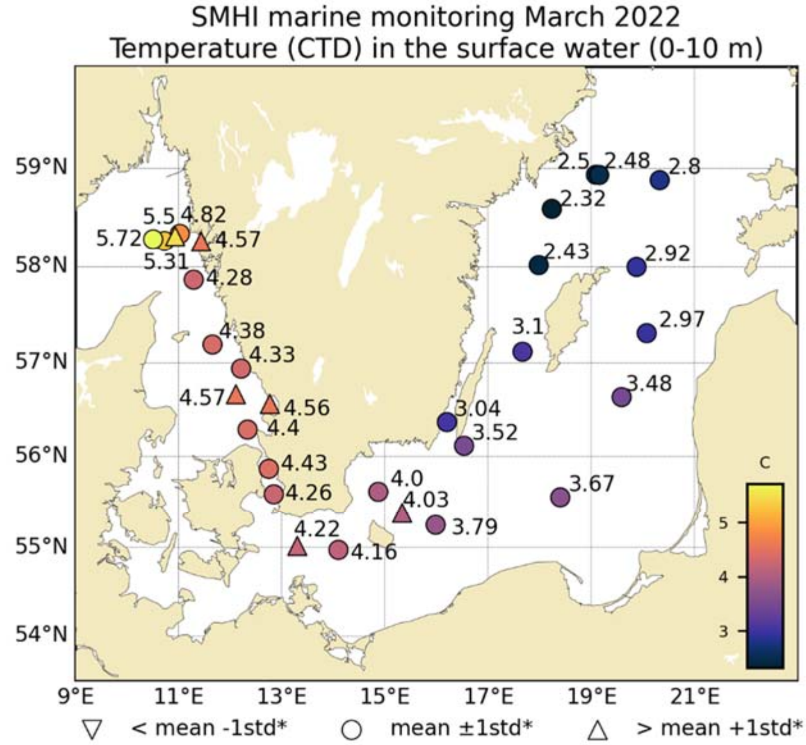


Figure 6. Temperature in the surface water (0 - 10m).

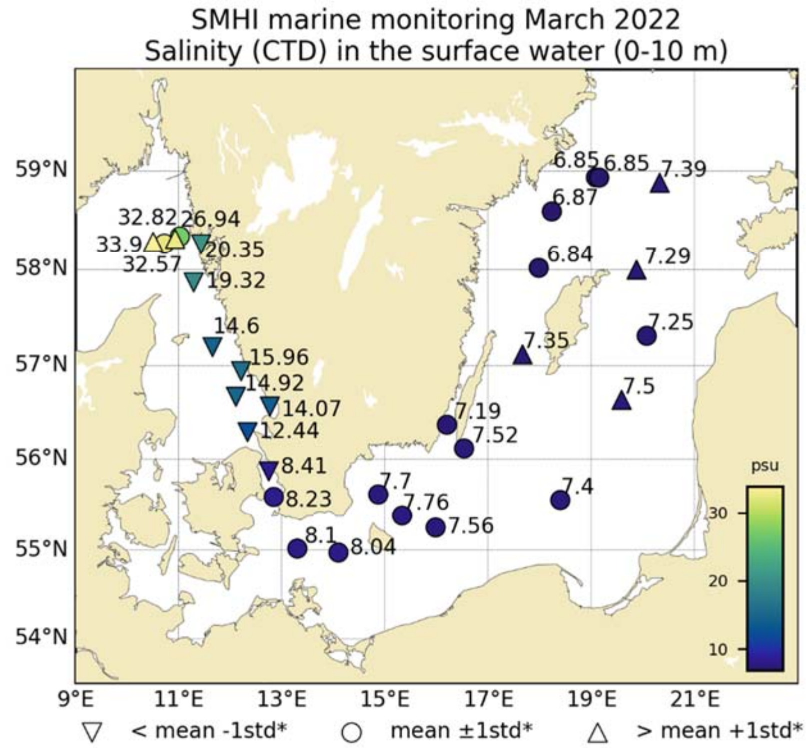


Figure 7. Salinity in the surface water (0 - 10m).

Participants

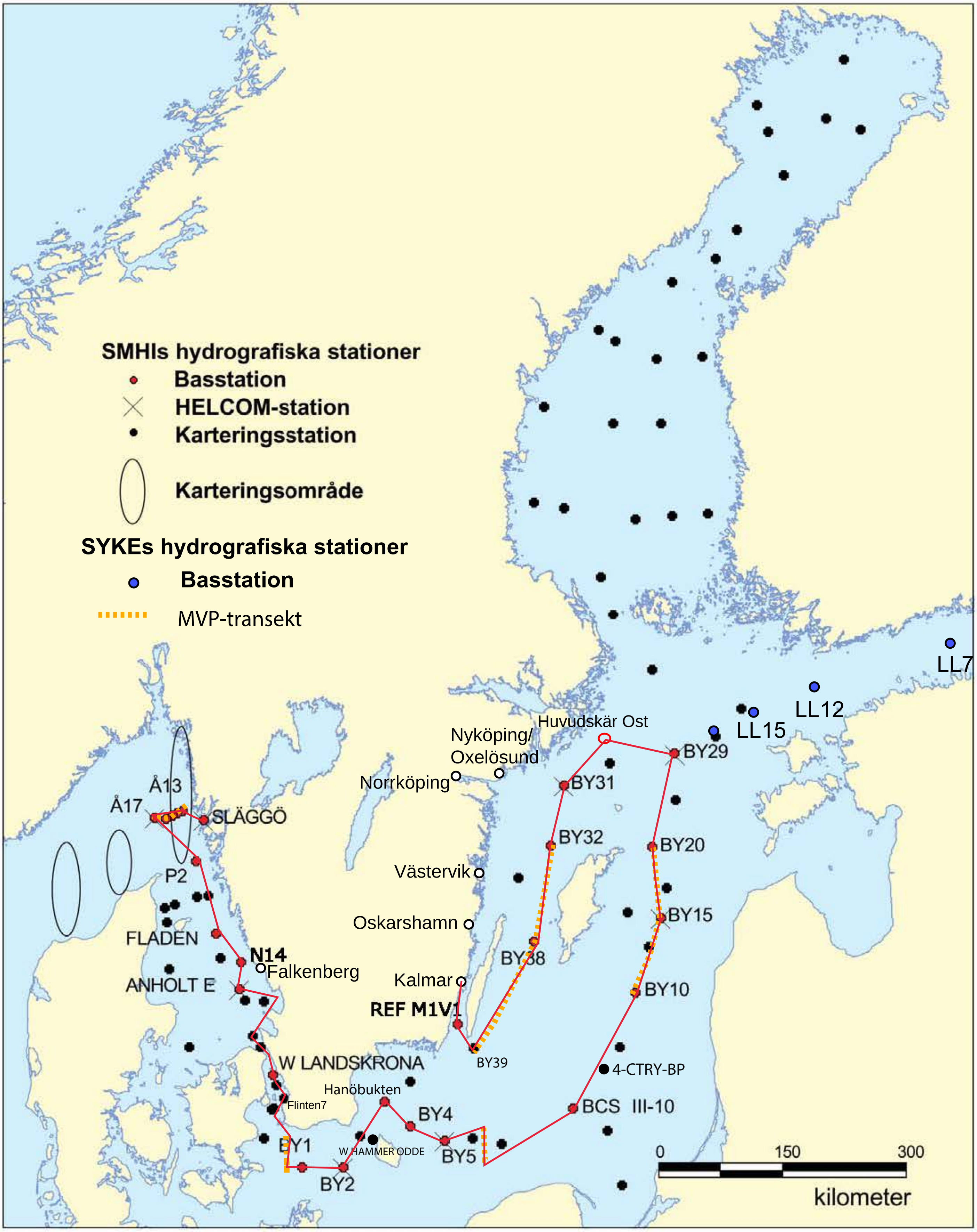
Name	Role	Institute
Örjan Bäck	Chief scientist	SMHI
Monica Lindner	Quality manager	SMHI
Ola Kalén		SMHI
Madeleine Nilsson		SMHI
Johanna Linders		SMHI
Erik Udehn	Technician ocean buoy	SMHI
Daniel Bergman Sjöstrand	Technician ocean buoy	SMHI

Appendices

- Track chart
- Table over stations, sampled parameters and number of sampling depths
- Vertical profiles for regular monitoring stations
- Monthly average surface water plots for regular monitoring stations

SMHI

Havs
och Vatten
myndigheten


SMHIs hydrografiska stationer
Basstation
HELCOM-station
Karteringsstation
Karteringsområde
SYKEs hydrografiska stationer
Basstation
MVP-transekt
LL7
LL12
LL15
Huvudskär Ost
BY29
Nyköping/
Oxelösund
Norrköping
BY31
Å13
Å17
SLÄGGÖ
BY32
BY20
P2
Västervik
BY15
FLADEN
Oskarshamn
BY38
N14
Falkenberg
Kalmar
BY10
ANHOLT E
REF M1V1
BY39
W LANDSKRONA
4-CTRY-BP
Hanöbukten
Flinten7
BCS III-10
BY4
BY1
W HAMMER ODDE
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0
150
300
kilometer

Date: 2022-03-28
Time: 15:08

Ship: SE
Year: 2022

Ser no	Cru no	Stat code	Proj	Stat name	Lat	Lon	Start date yyyymmdd	Start time hhmm	Bottom depth m	Secchi depth m	Wind dir	Wind vel	Air temp C	Air pres hPa	WCWI (Weath, Cloud, Waves, Iceob)	CZPP (Chla, Zoop, Phytop, PP)	No de	No btl	Temp_btl	Temp_ctd	Salt_btl	Salt_ctd	Ph	Doxy_btl	Doxy_ctd	H2s	Phos	Ptot	Ntri	Ntra	Ntrz	Amon	Ntot	Alky	Sio3-si	Humus	Comnt_visit	Comnt_samp
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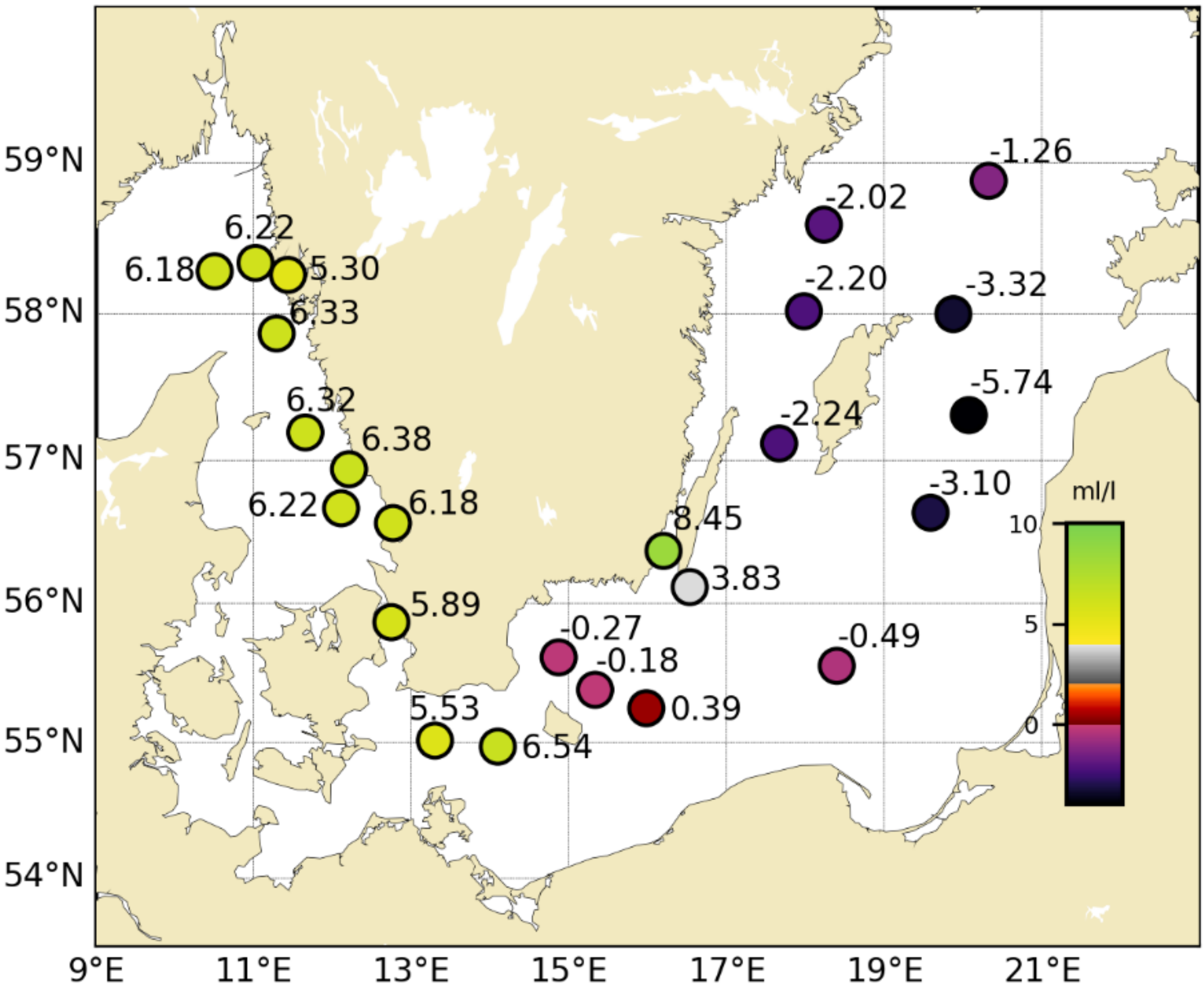
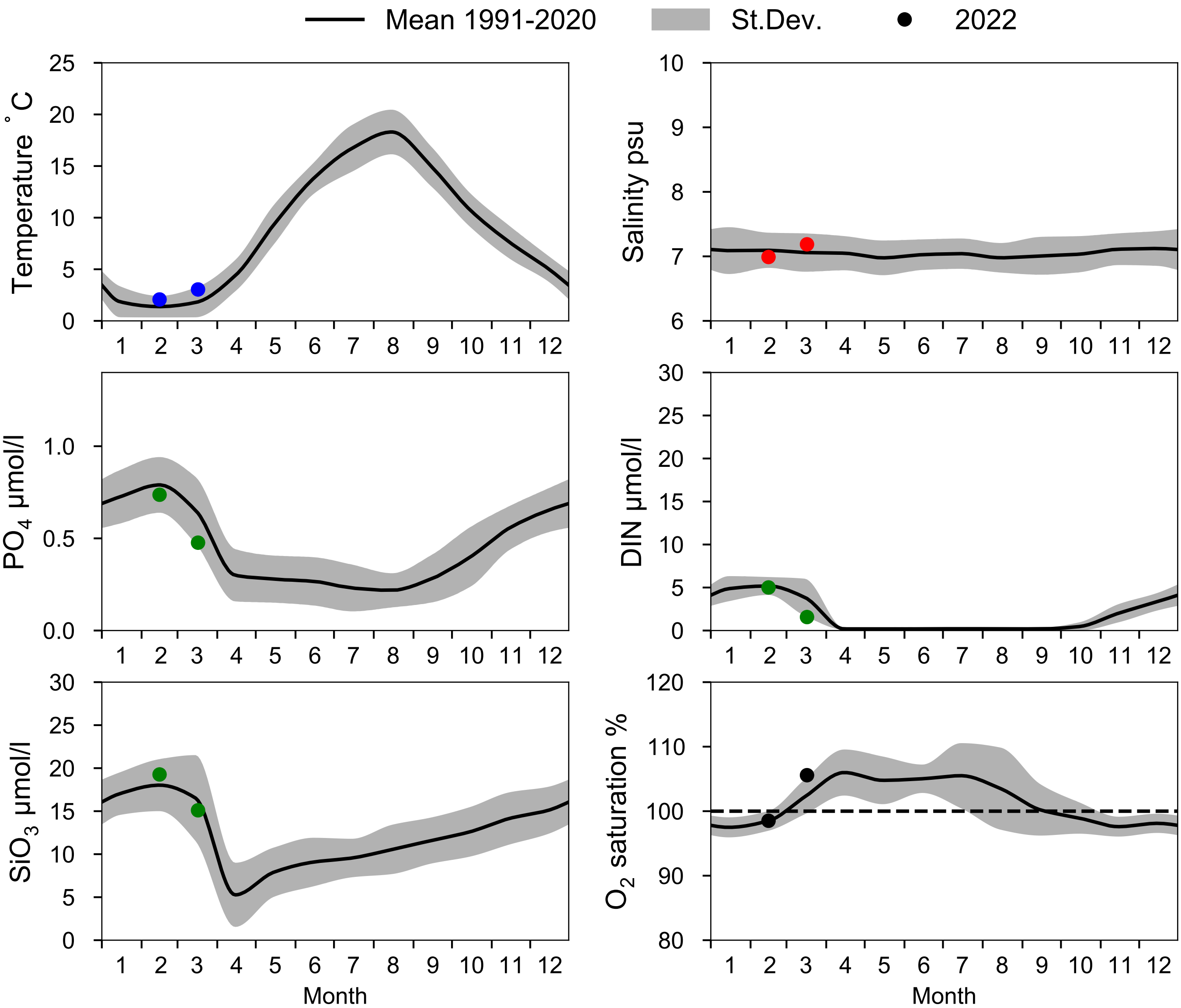
0249	05	SKEX18	BAS...	Å17	5817.05	01030.37	20220322	1045	340	11	25	6	5.8	1032	4020	xxx-	15	15	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0250	05	SKEX14	BAS...	Å13	5820.39	01101.47	20220322	1600	90		25	5	5.6	1031	2830	x---	10	10	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0251	05	FIBG27	BAS...	SLÄGGÖ	5815.59	01126.18	20220322	1945	74		21	4	4.4	1032	9990	xxx-	9	9	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-

Bottom water oxygen concentration (ml/l)
Ship: R/V Svea
Date: 20220317-20220322
Series: 0222-0251

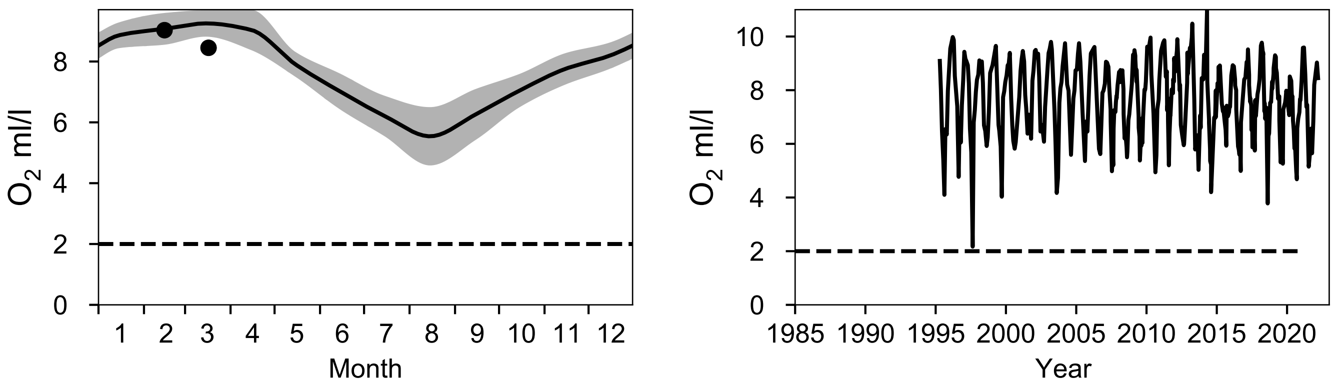


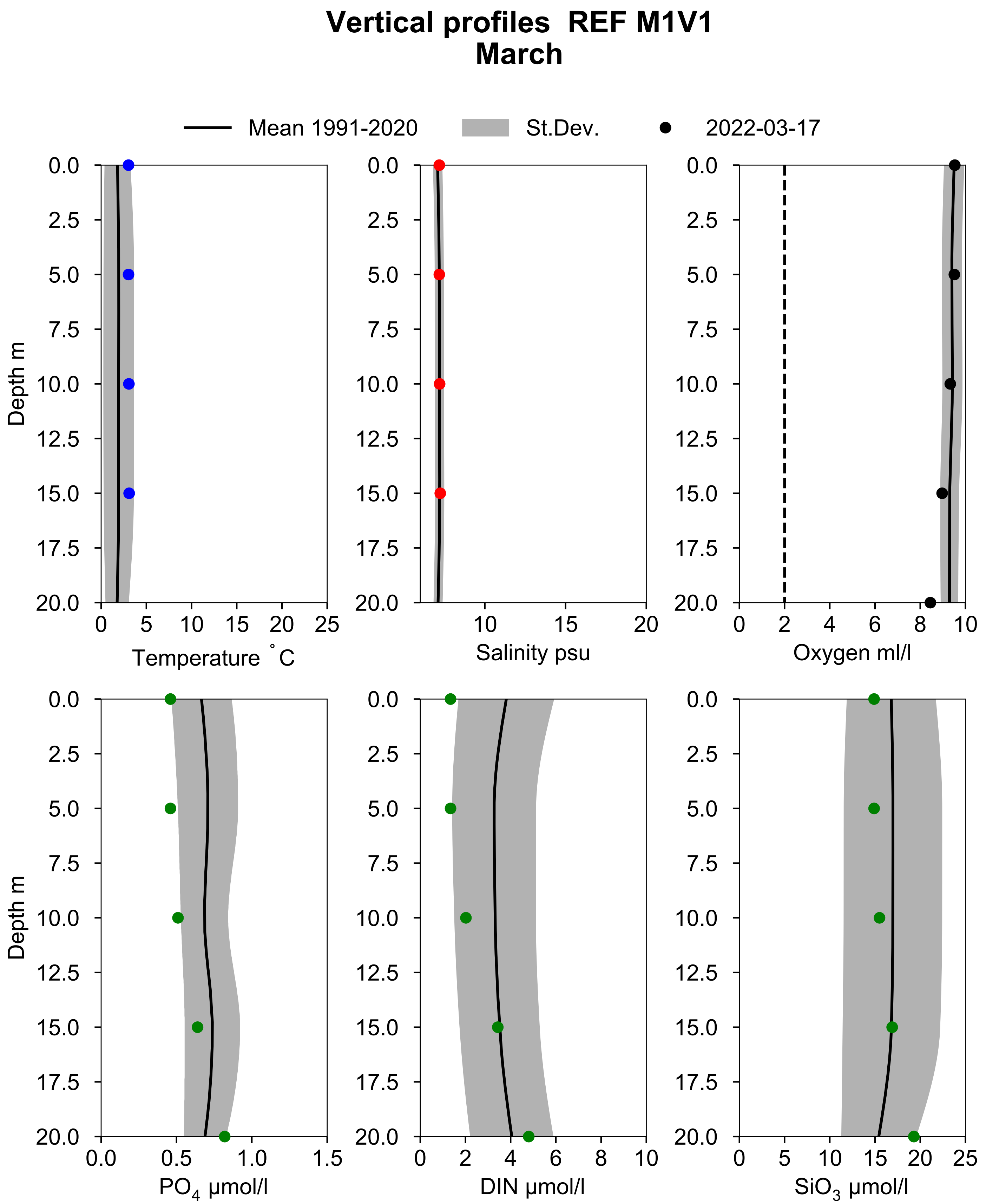
STATION REF M1V1 SURFACE WATER (0-10 m)

Annual Cycles



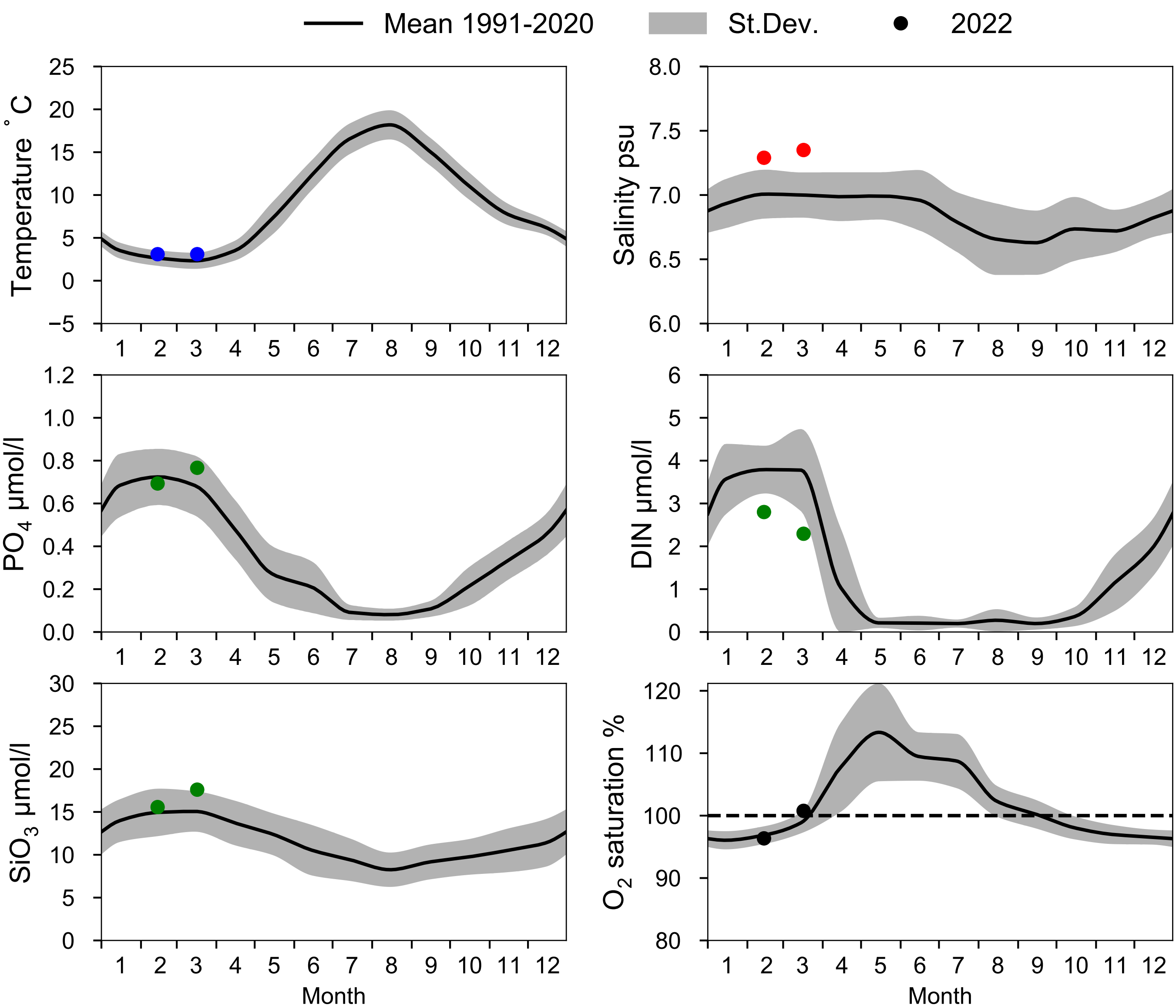
OXYGEN IN BOTTOM WATER (depth >= 15 m)



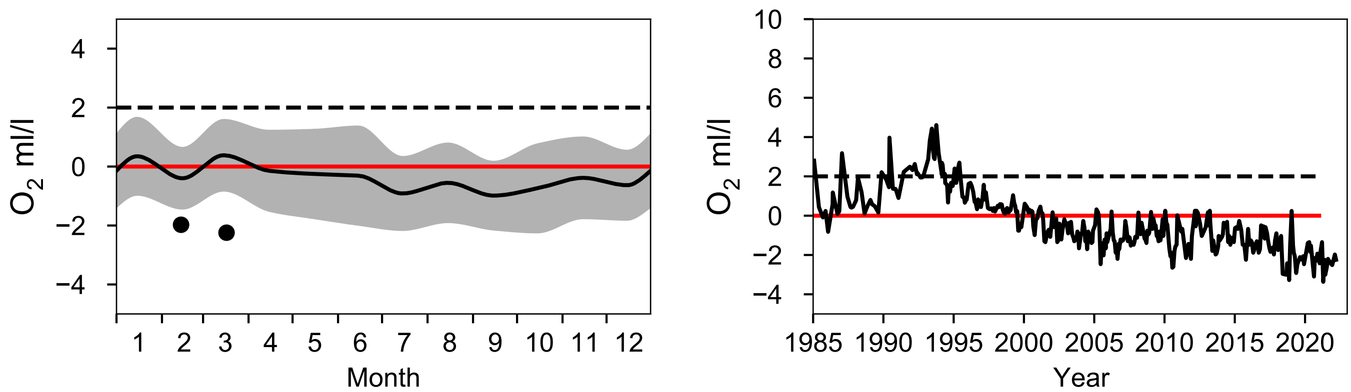

Vertical profiles REF M1V1
March
Mean 1991-2020
St.Dev.
2022-03-17
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

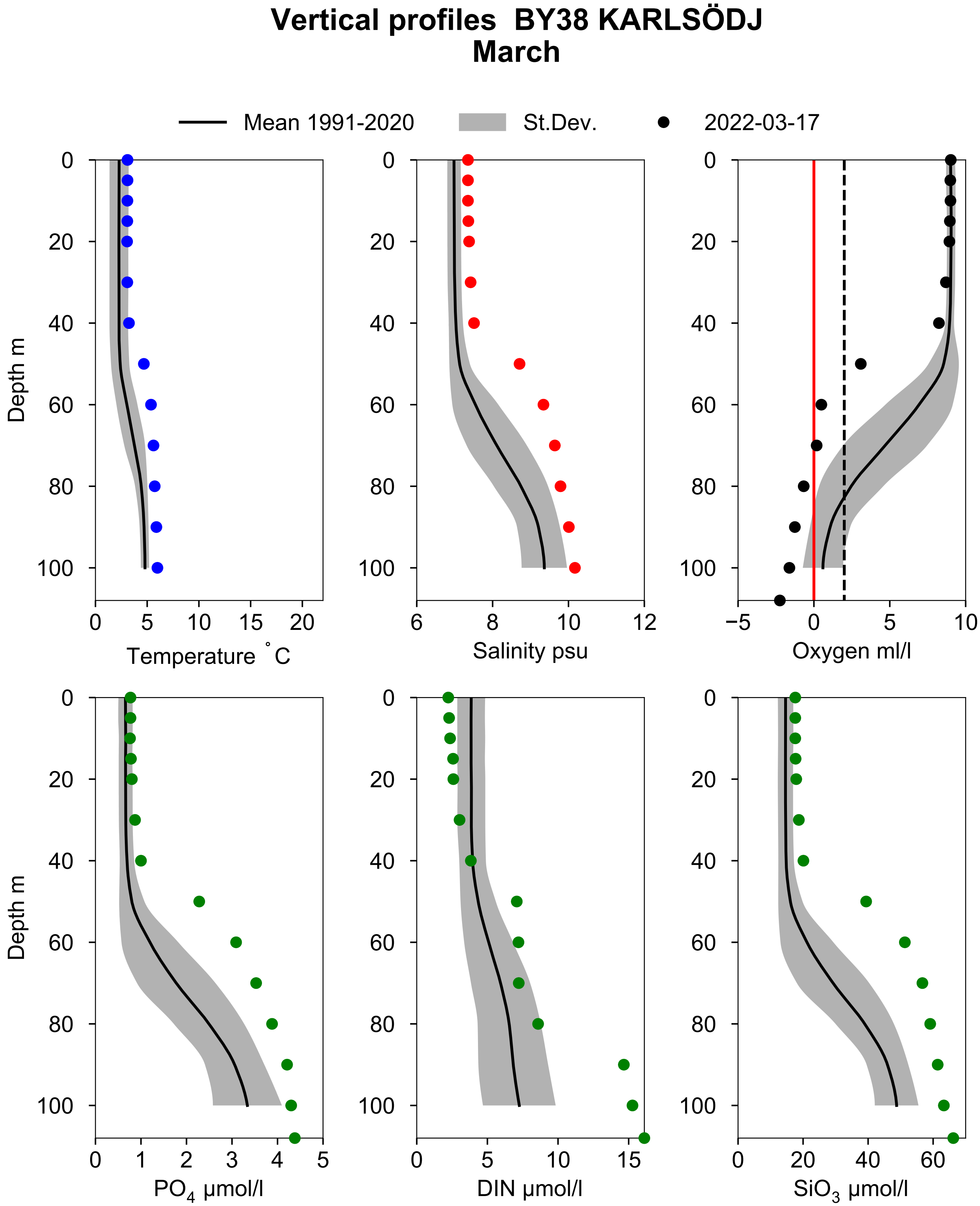
STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

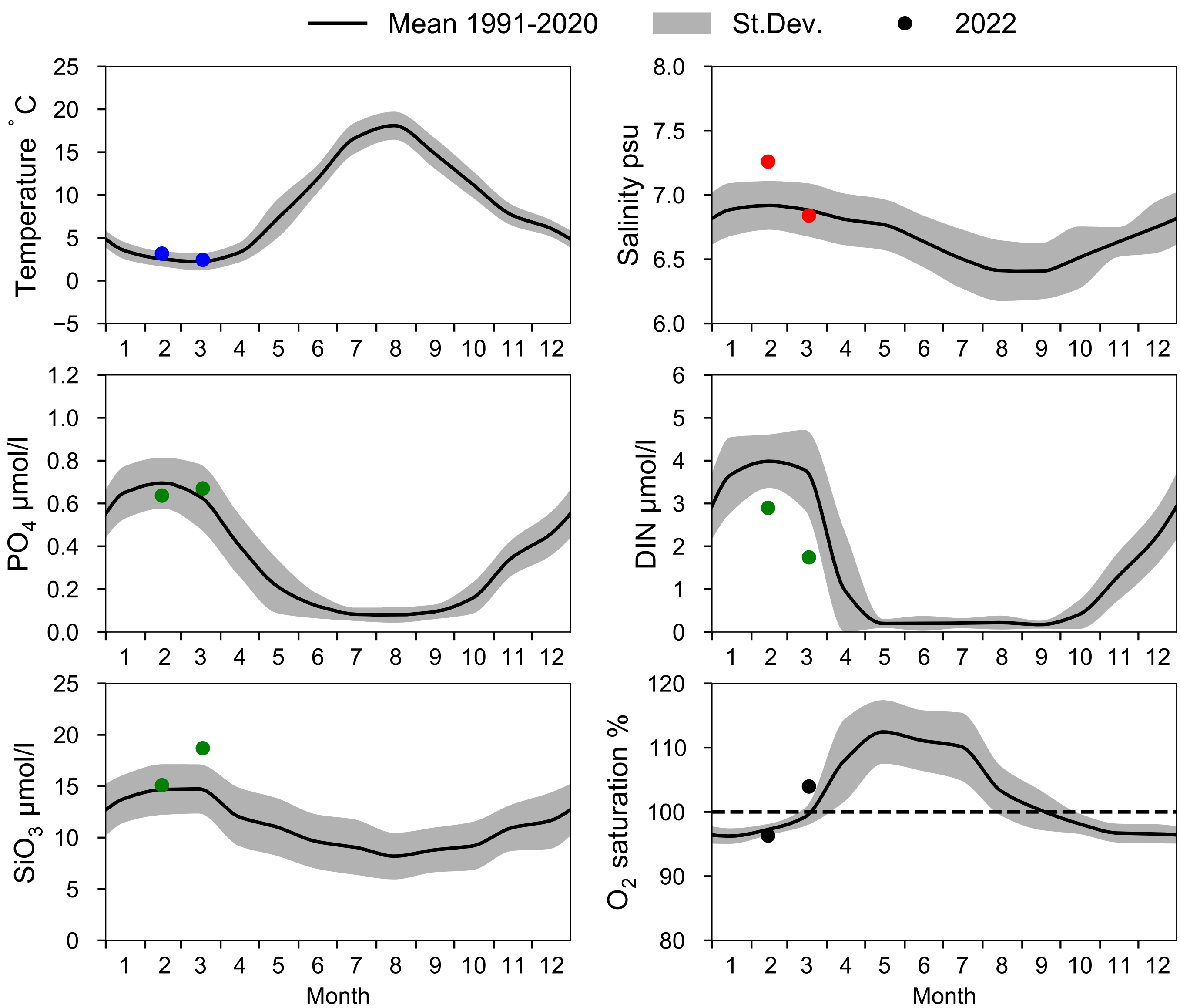




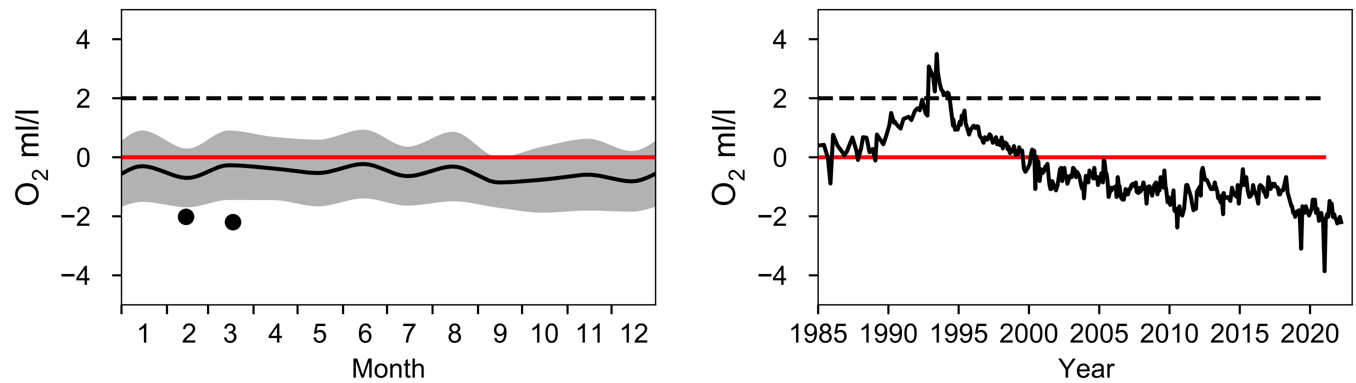
Vertical profiles BY38 KARLSÖDJ
March
Mean 1991-2020
St.Dev.
2022-03-17
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

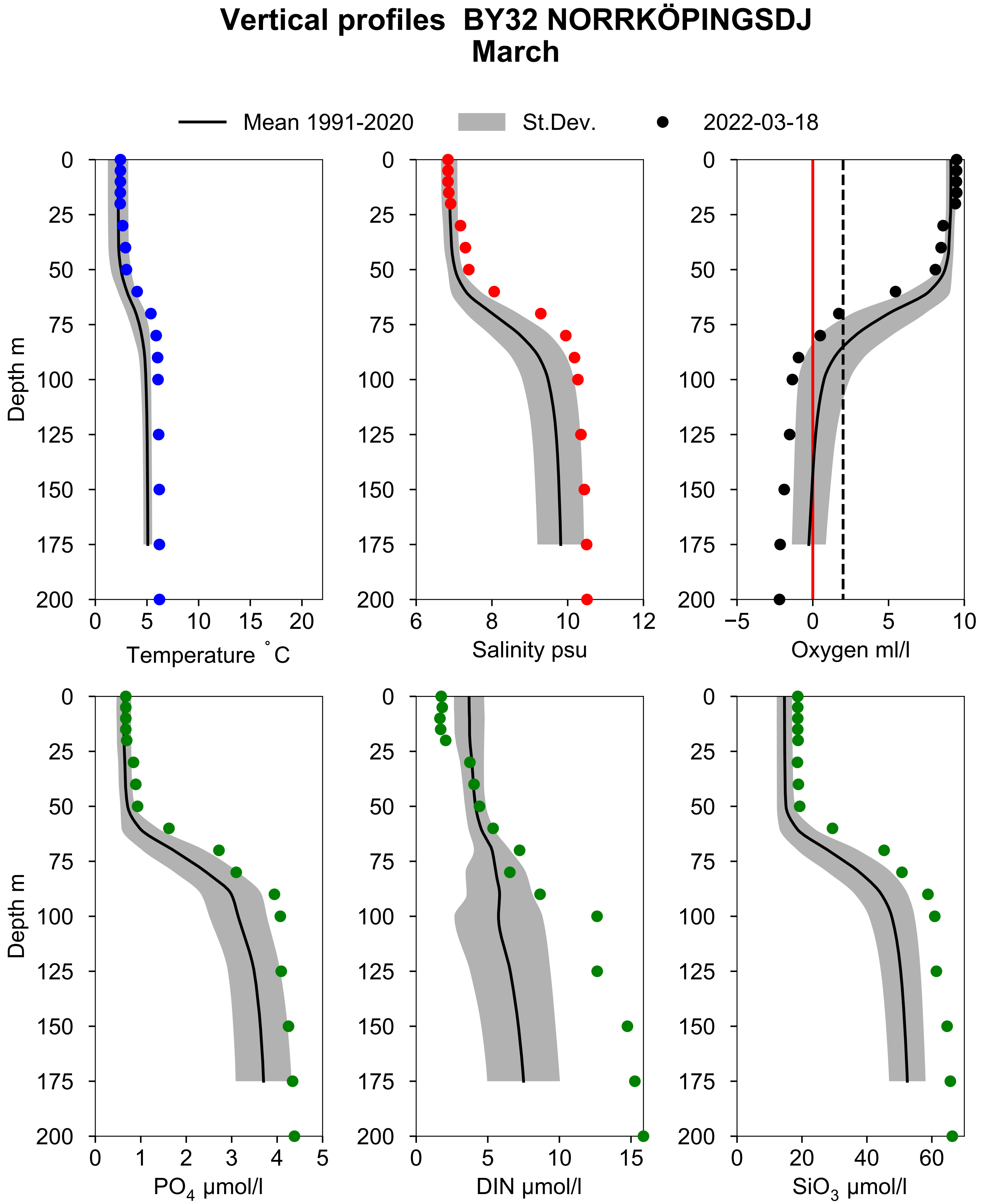
STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

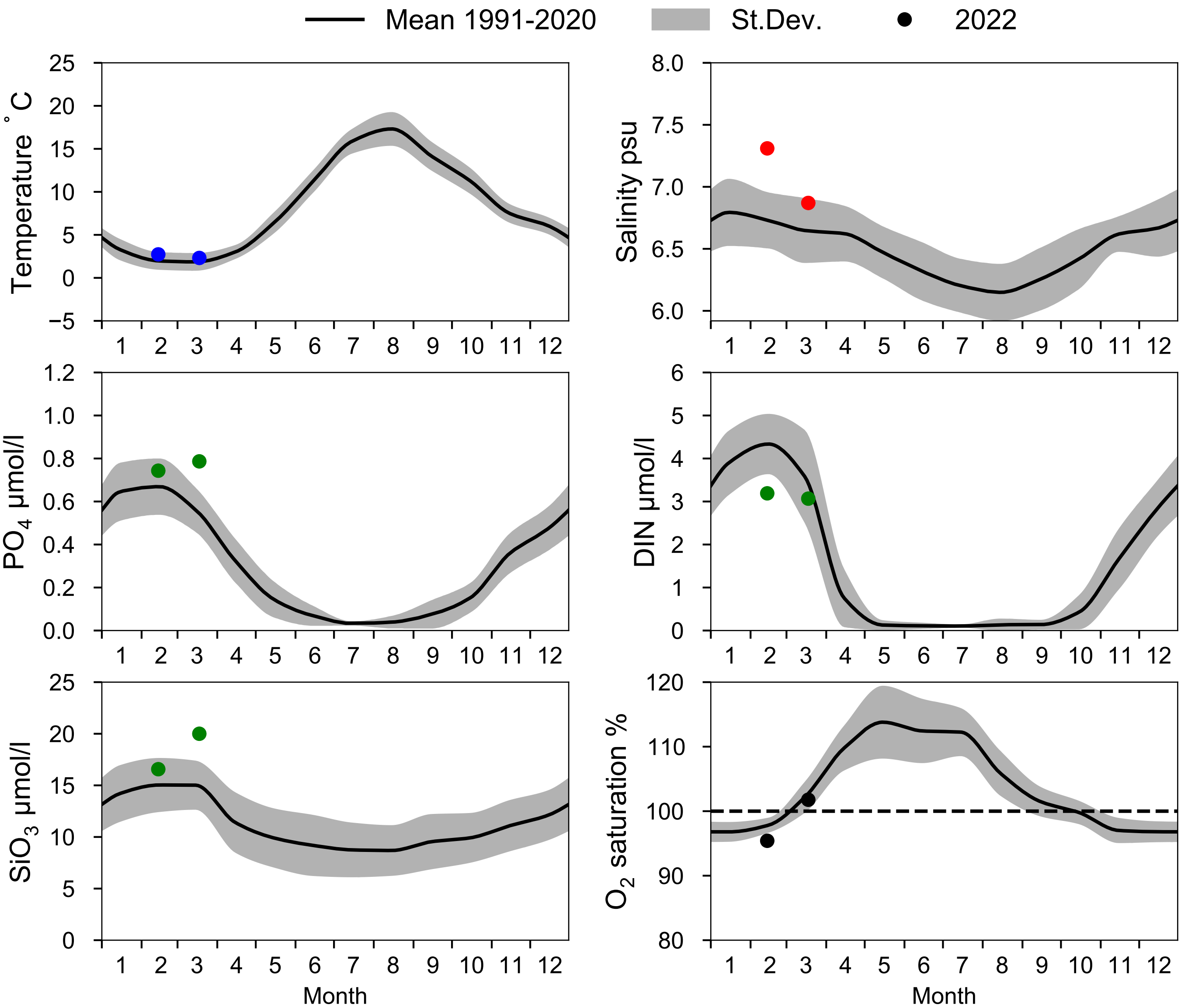




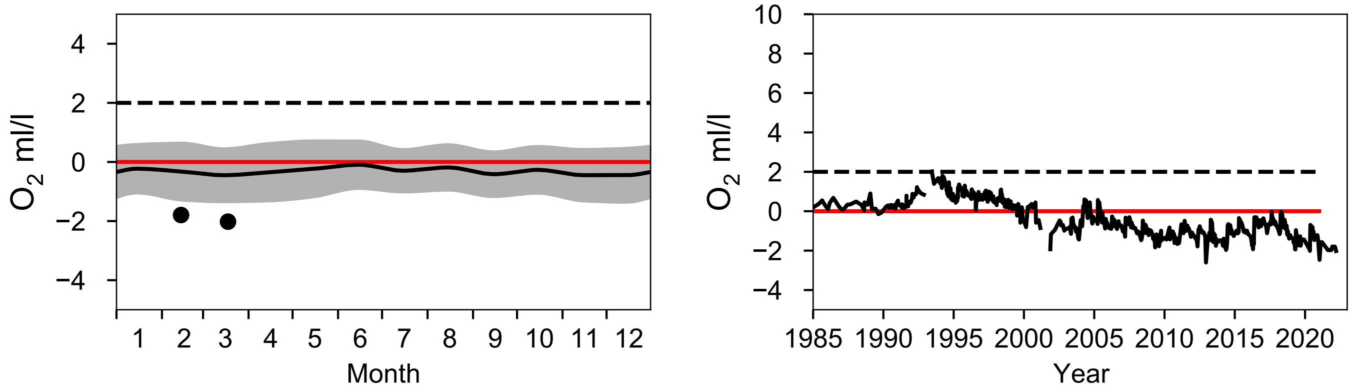
Vertical profiles BY32 NORRKÖPINGSDJ
March
Mean 1991-2020
St.Dev.
2022-03-18
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

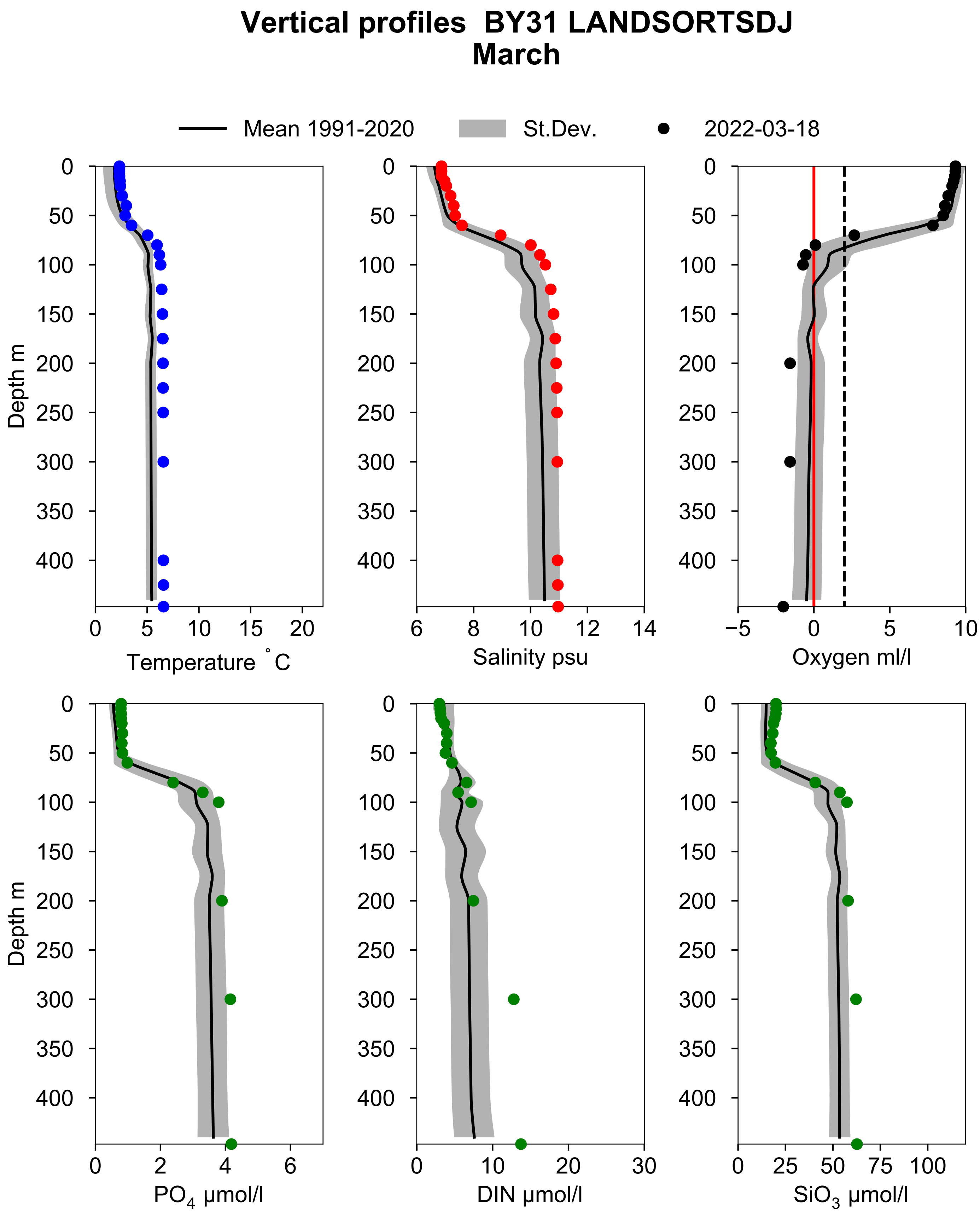
STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

Annual Cycles



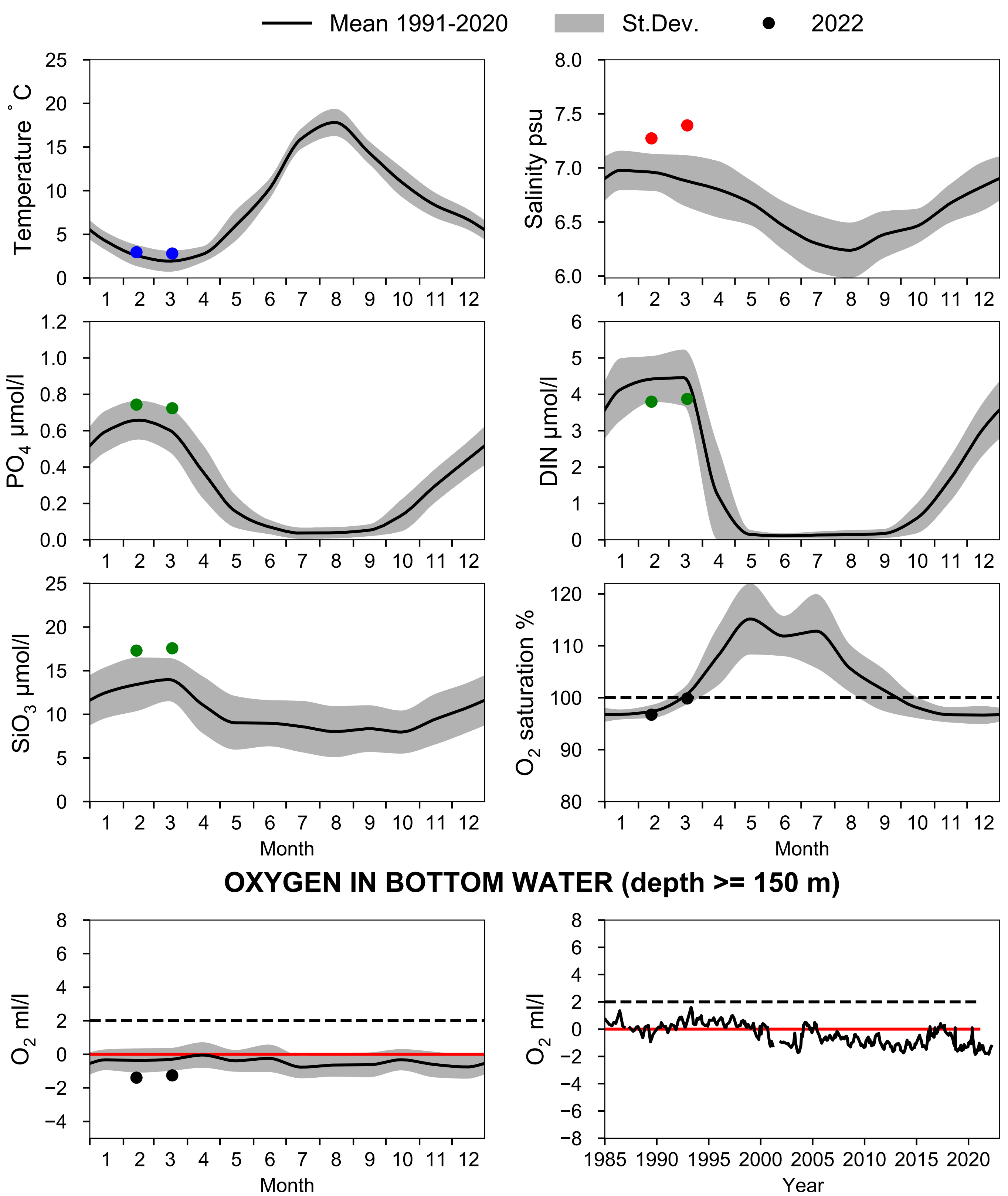
OXYGEN IN BOTTOM WATER (depth >= 419 m)

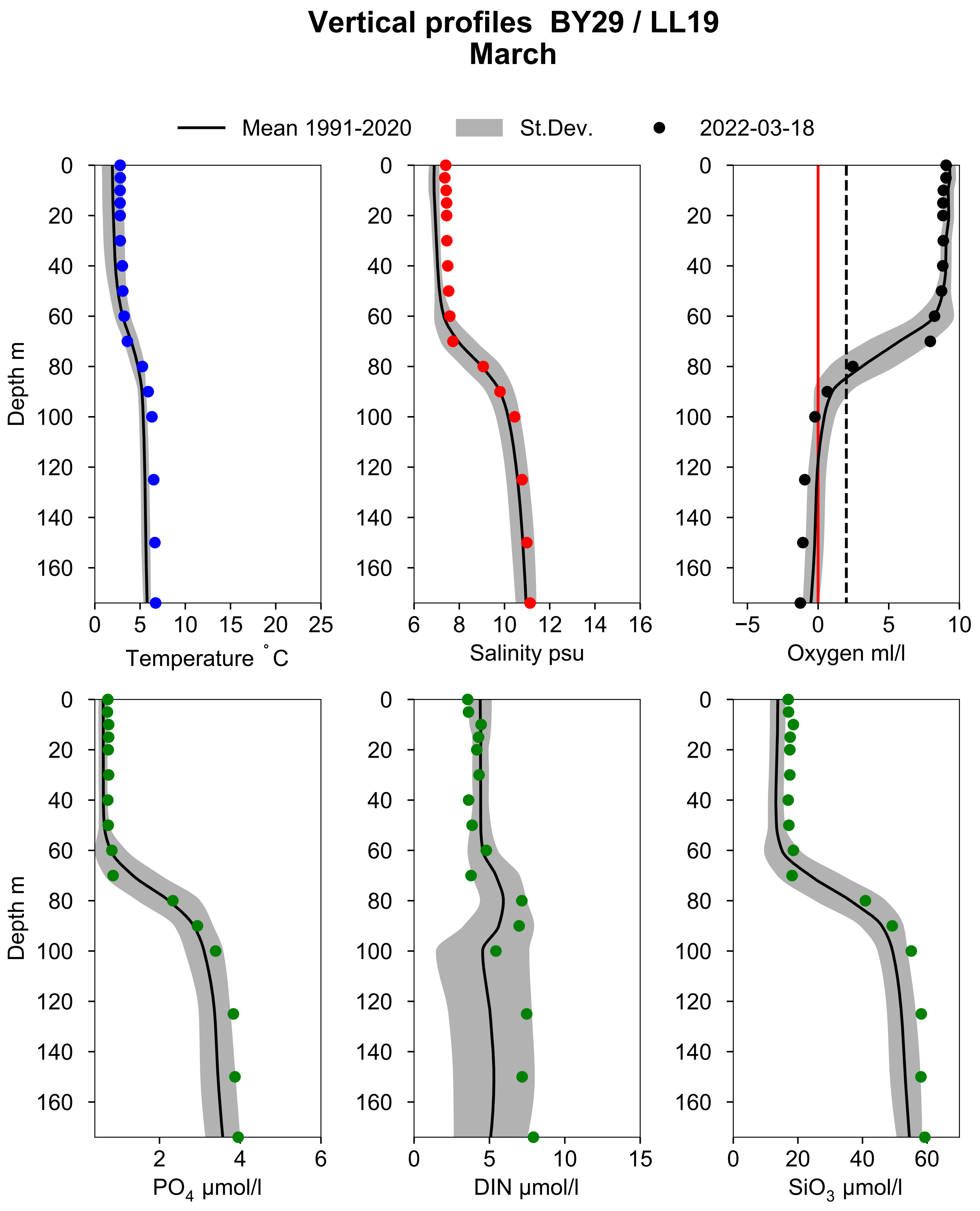



Vertical profiles BY31 LANDSORTSDJ
March
Mean 1991-2020
St.Dev.
2022-03-18
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

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

Annual Cycles

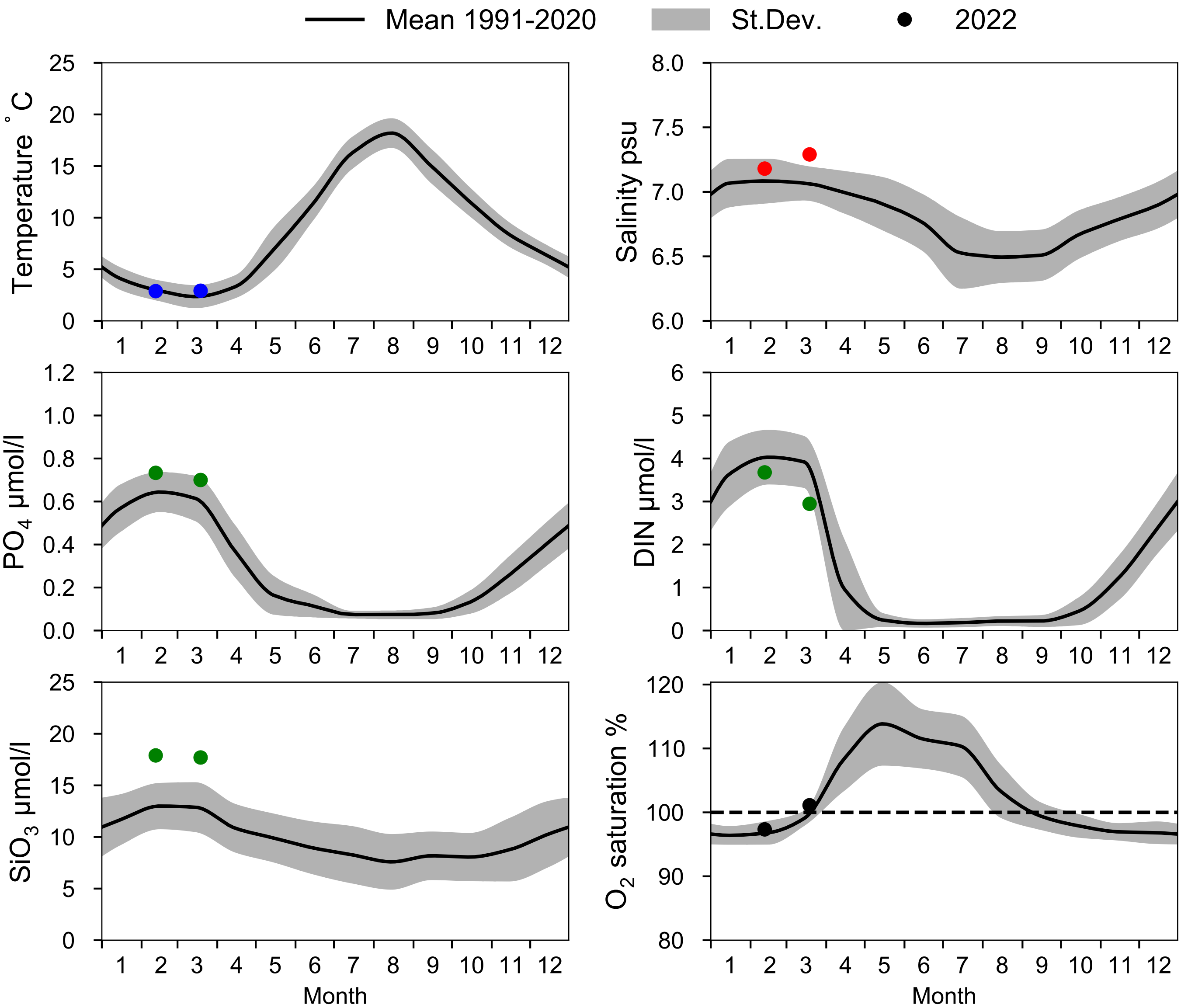




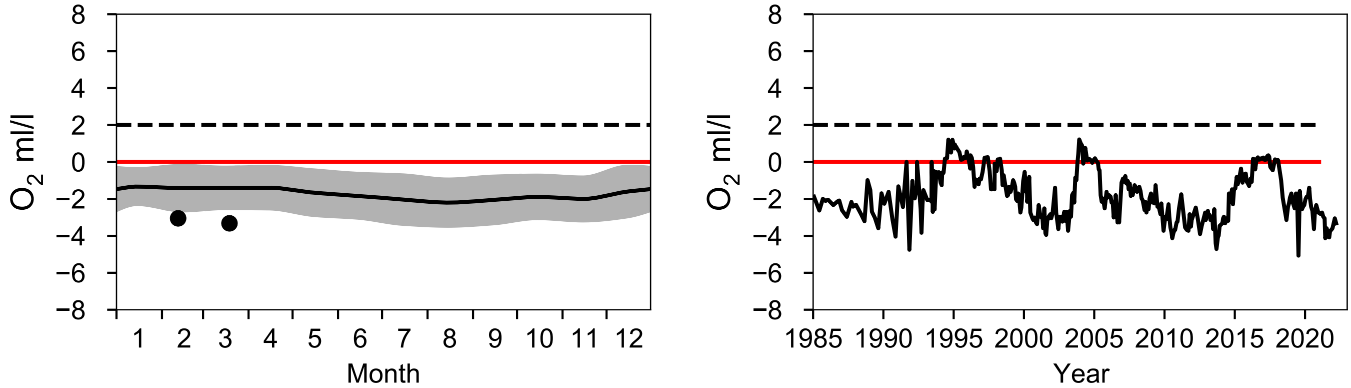
Vertical profiles BY29 / LL19
March
Mean 1991-2020
St.Dev.
2022-03-18
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
Depth m
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

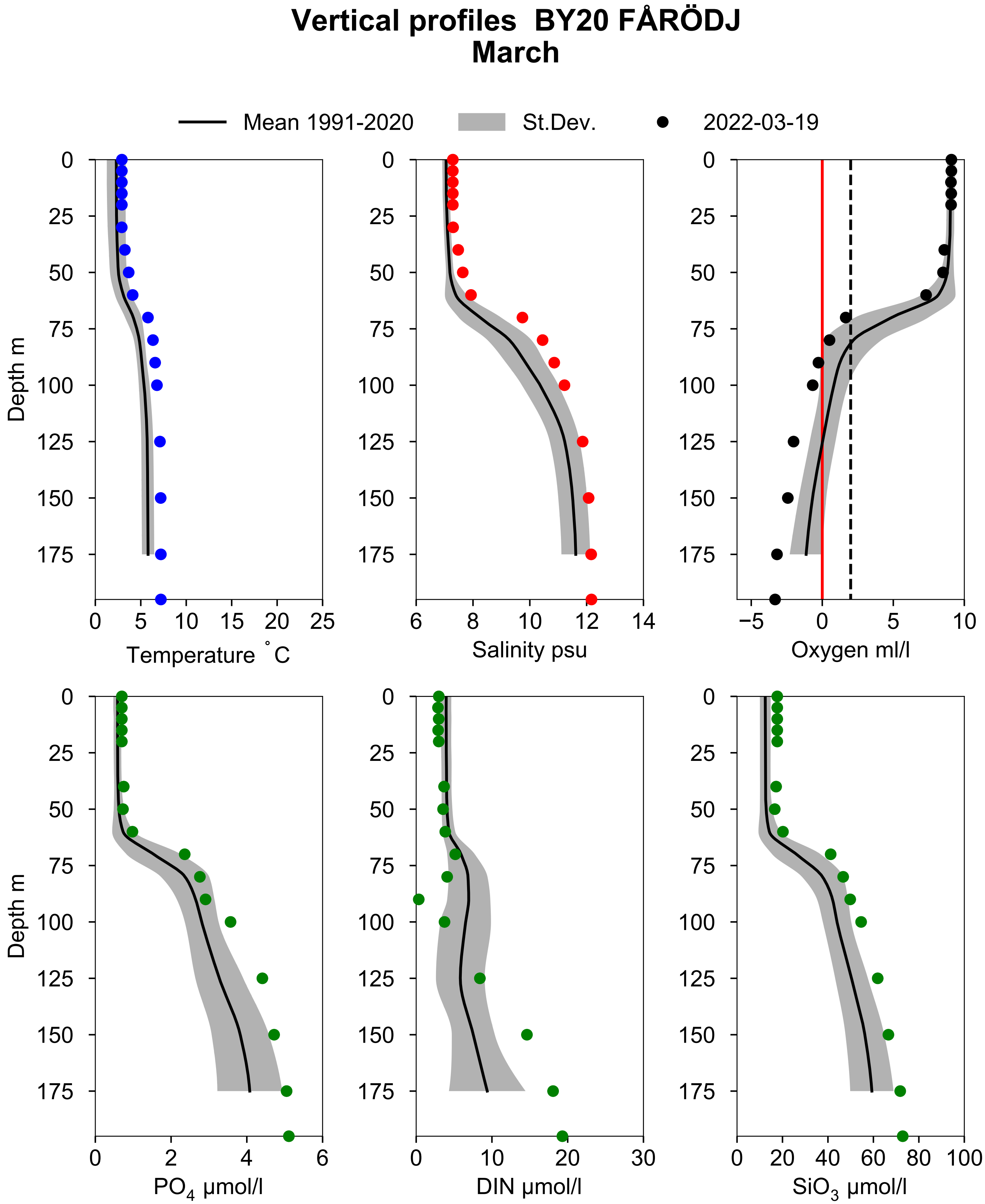
STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

Annual Cycles



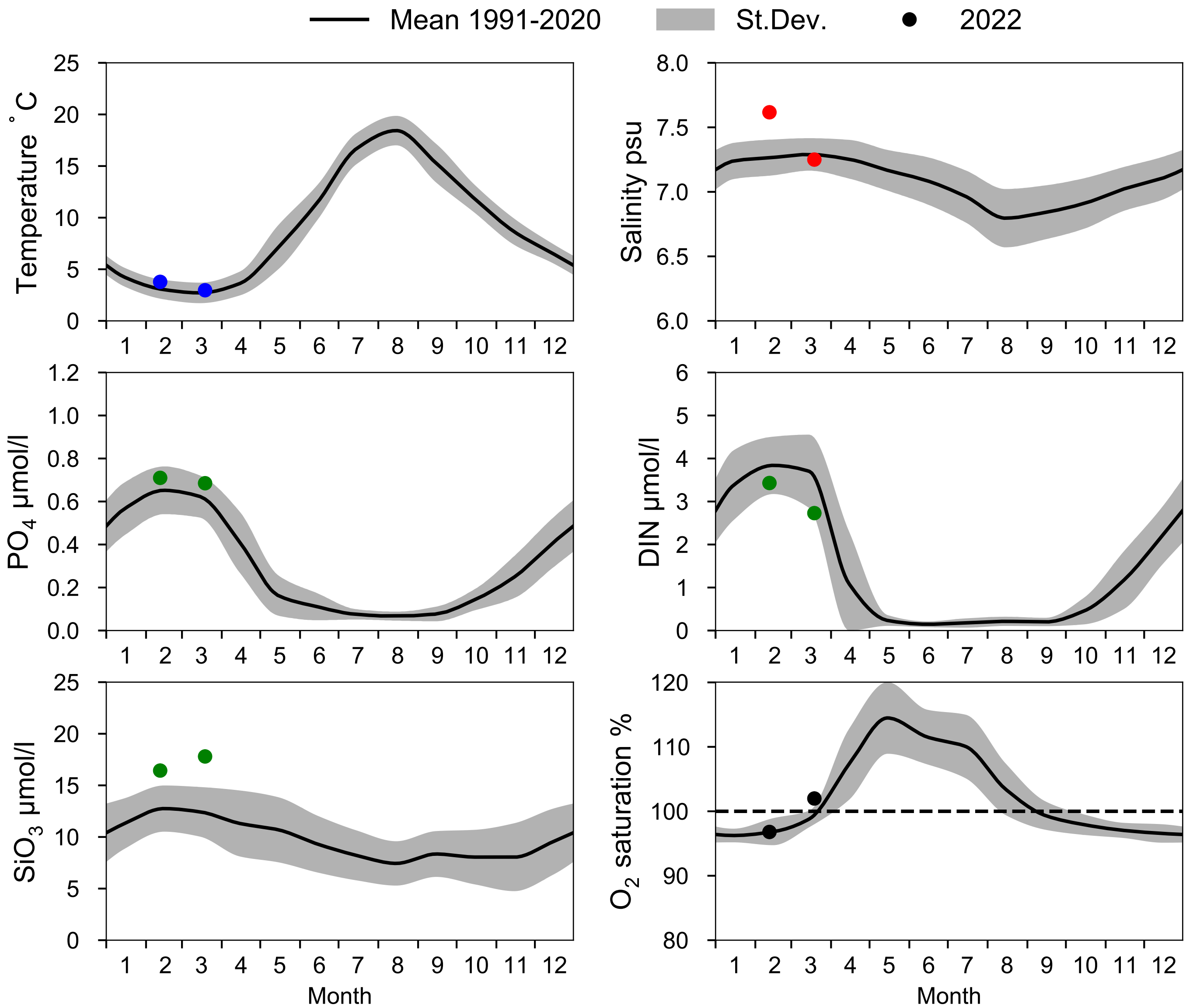
OXYGEN IN BOTTOM WATER (depth >= 175 m)



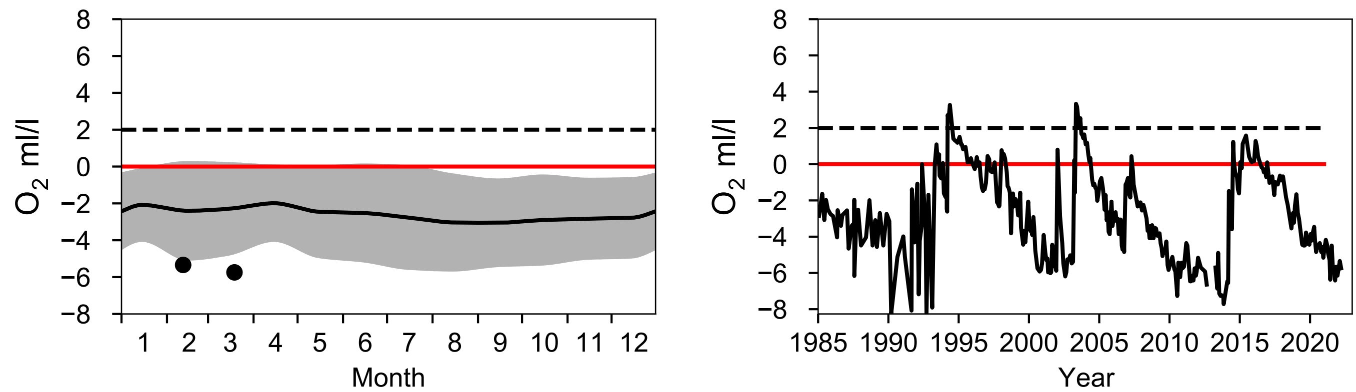

Vertical profiles BY20 FÅRÖDJ
March
Mean 1991-2020
St.Dev.
2022-03-19
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

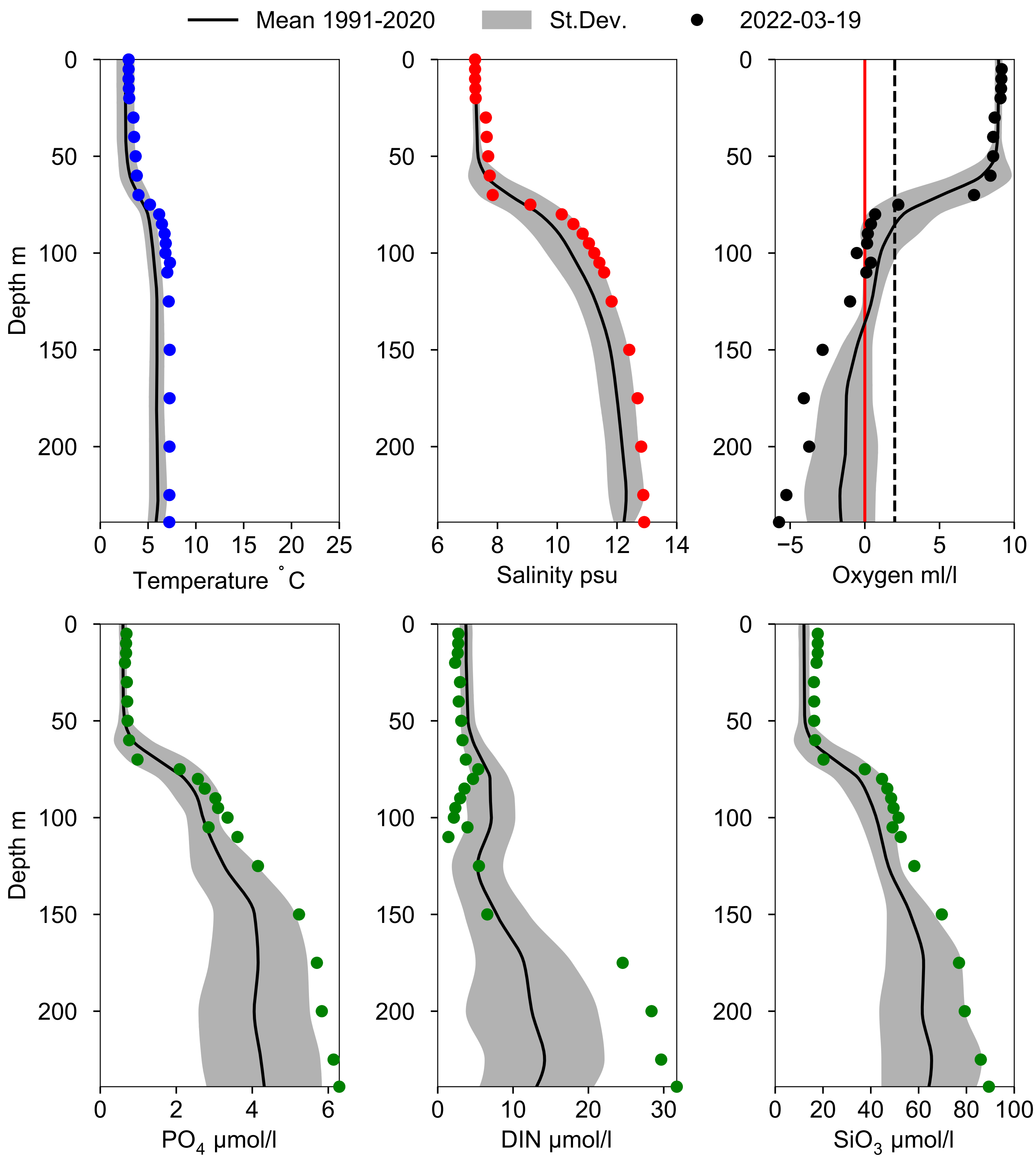
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 225 m)

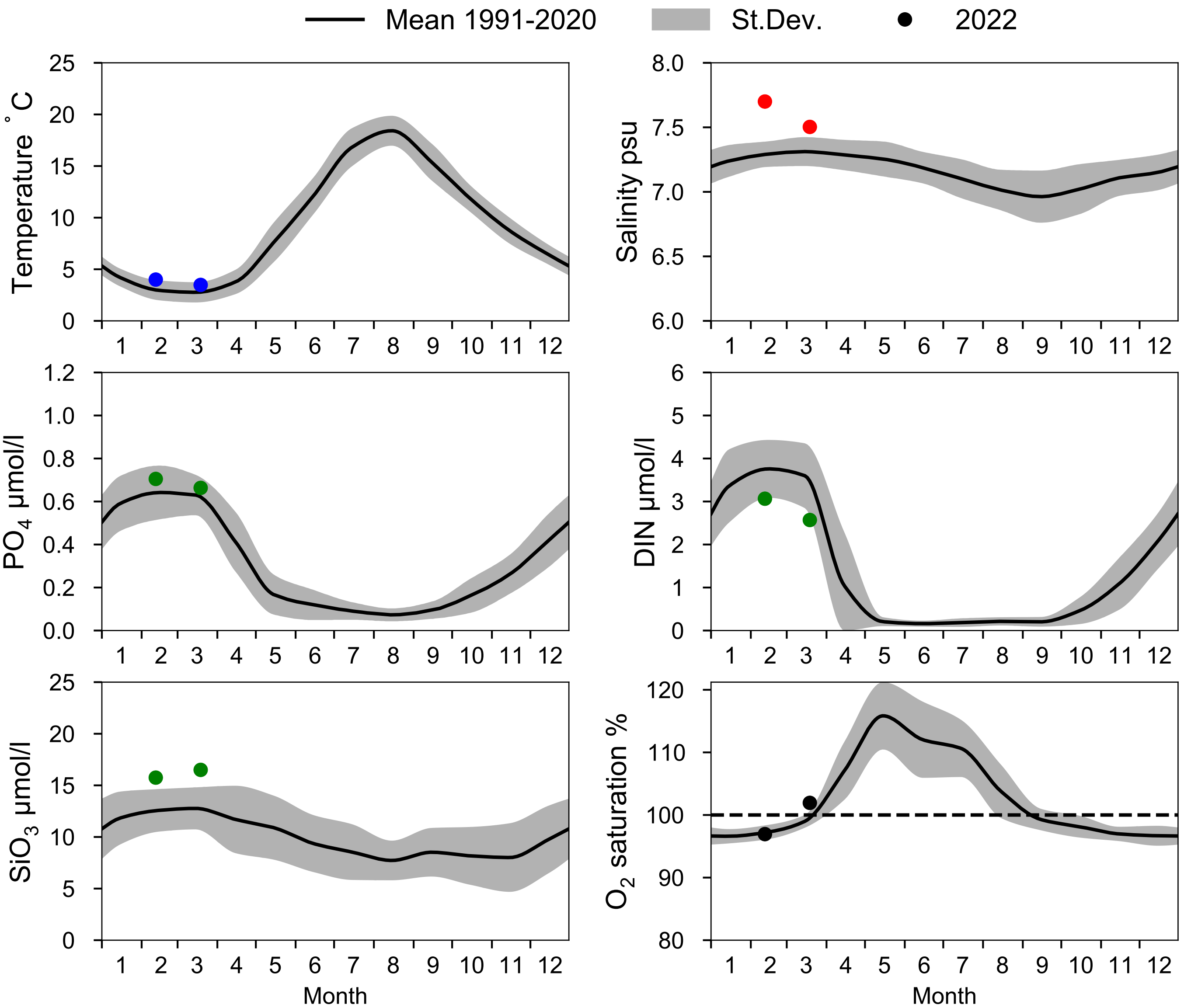


Vertical profiles BY15 GOTLANDSDJ
March

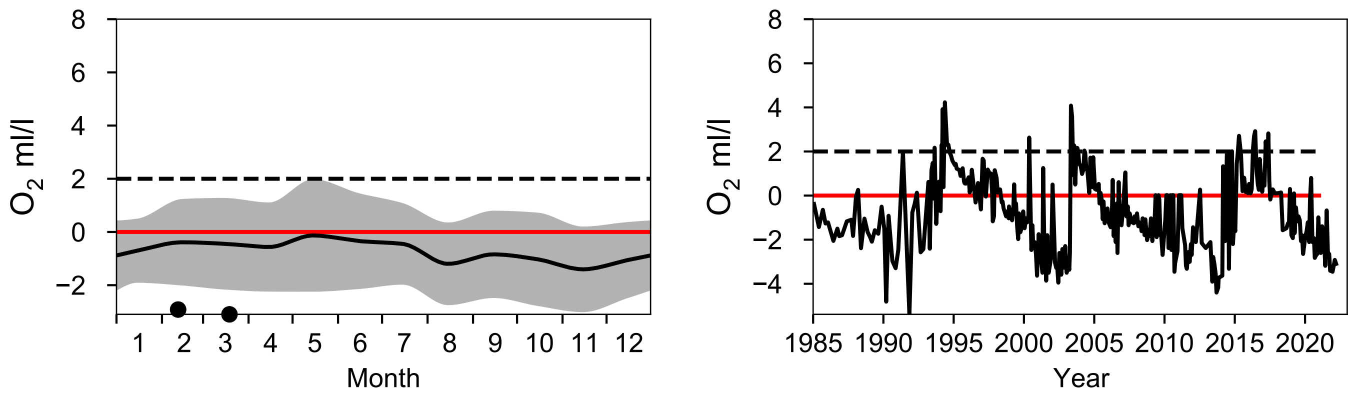


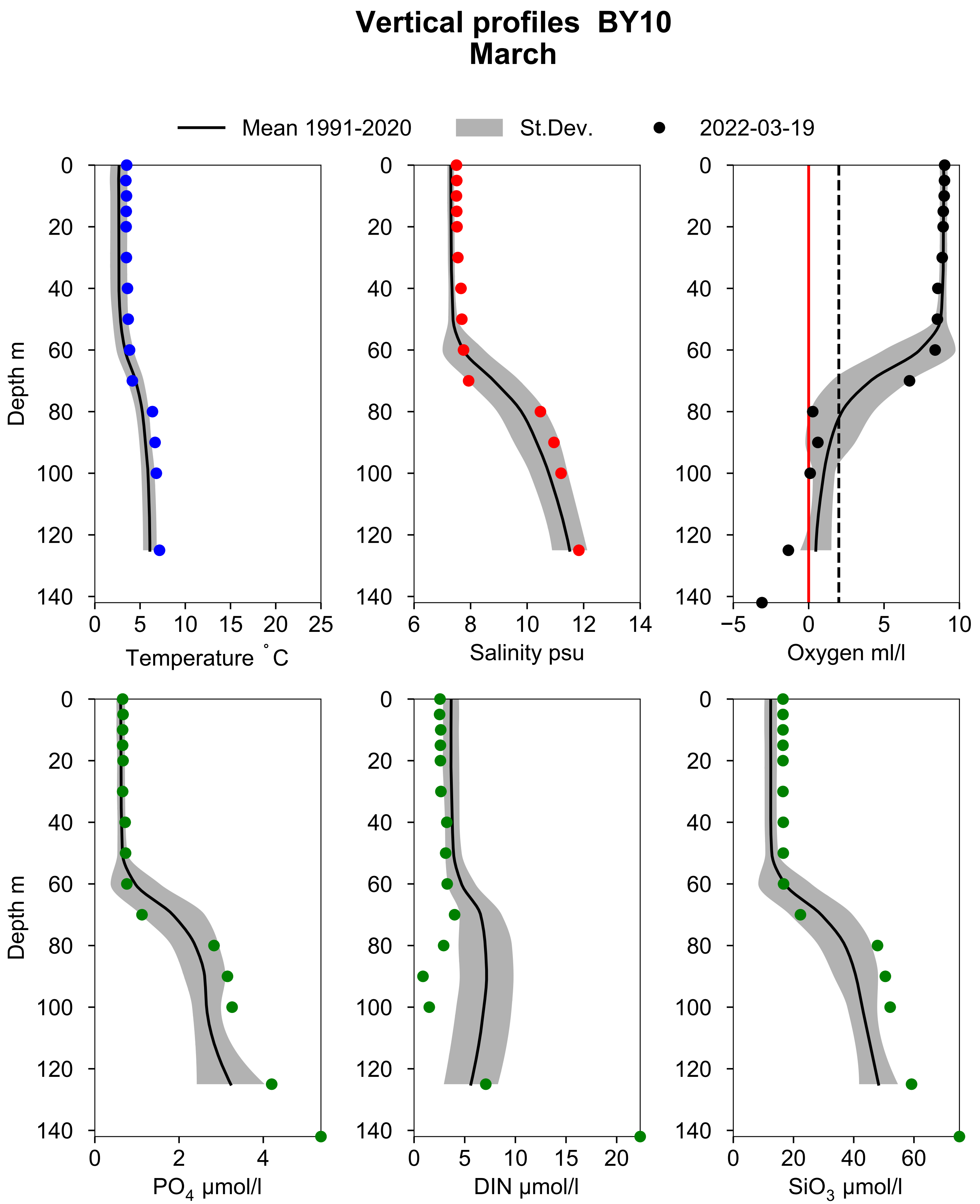
STATION BY10 SURFACE WATER (0-10 m)

Annual Cycles



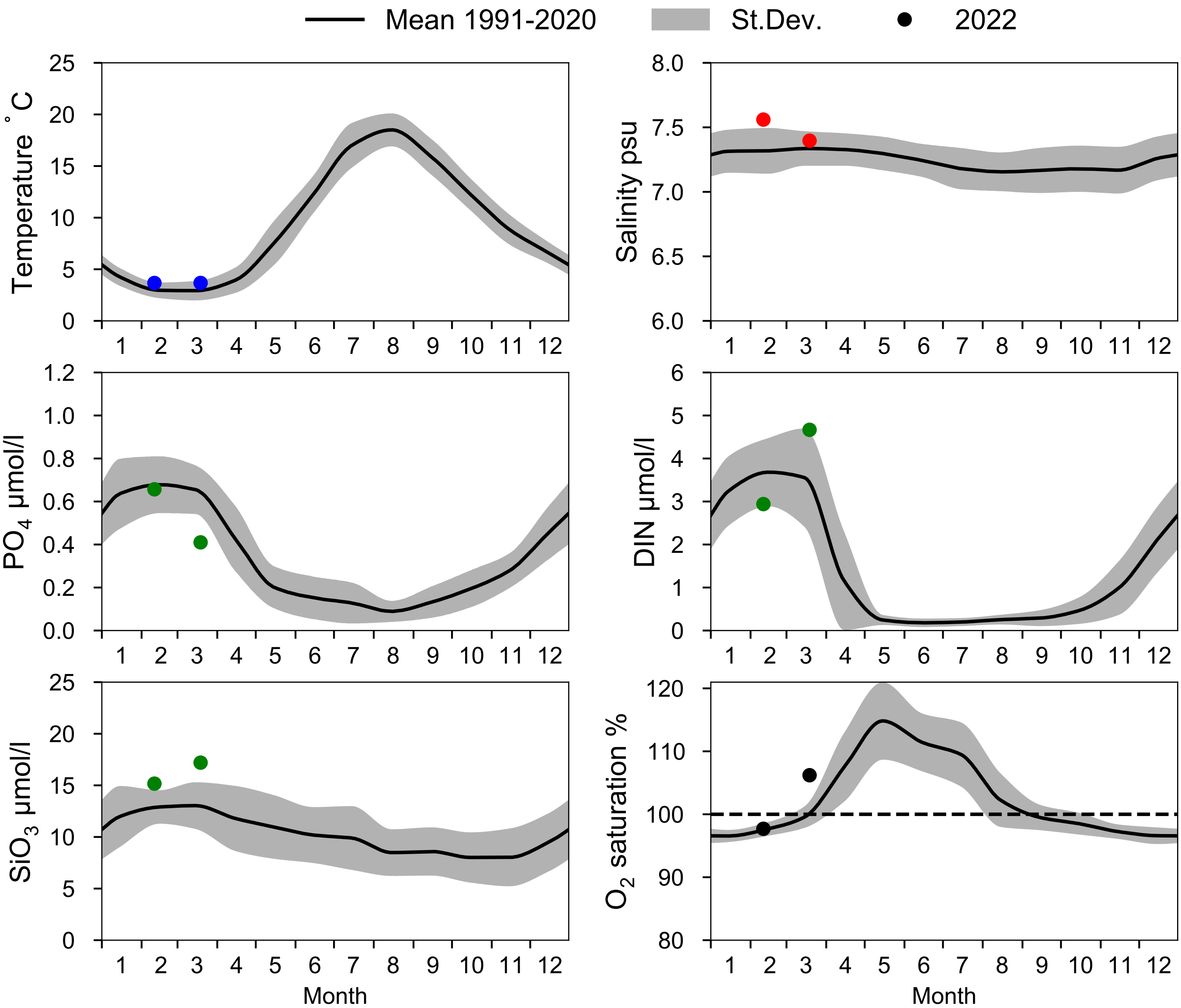
OXYGEN IN BOTTOM WATER (depth >= 125 m)



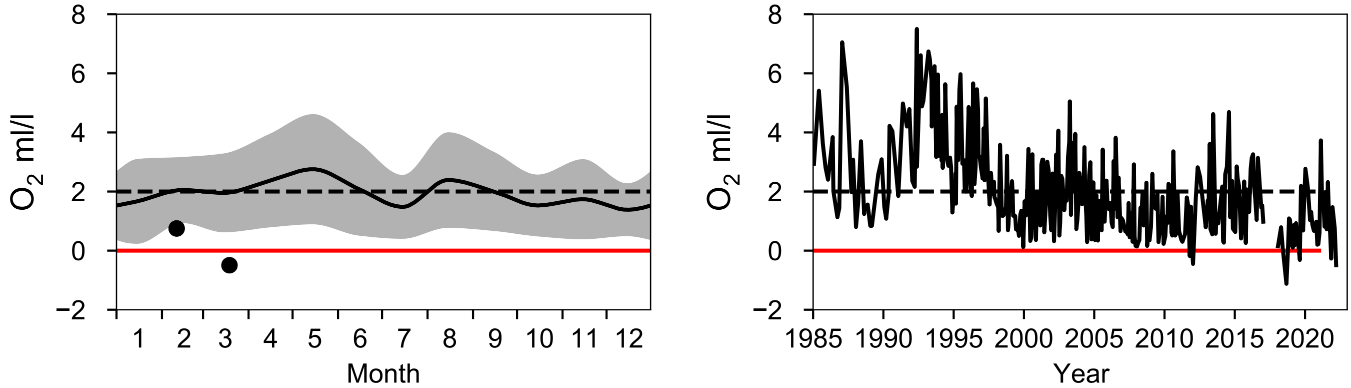

Vertical profiles BY10
March
Mean 1991-2020
St.Dev.
2022-03-19
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

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

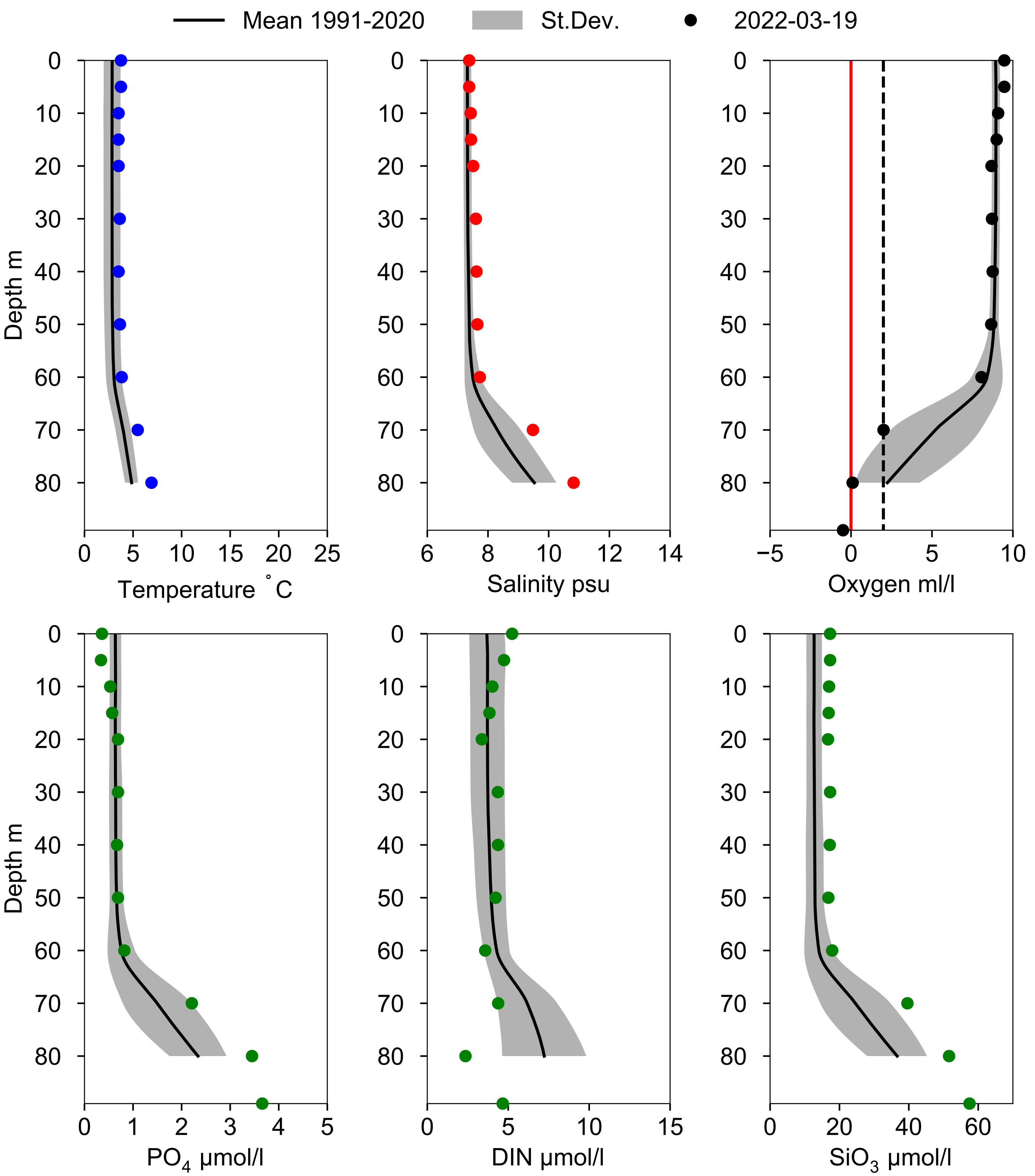
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

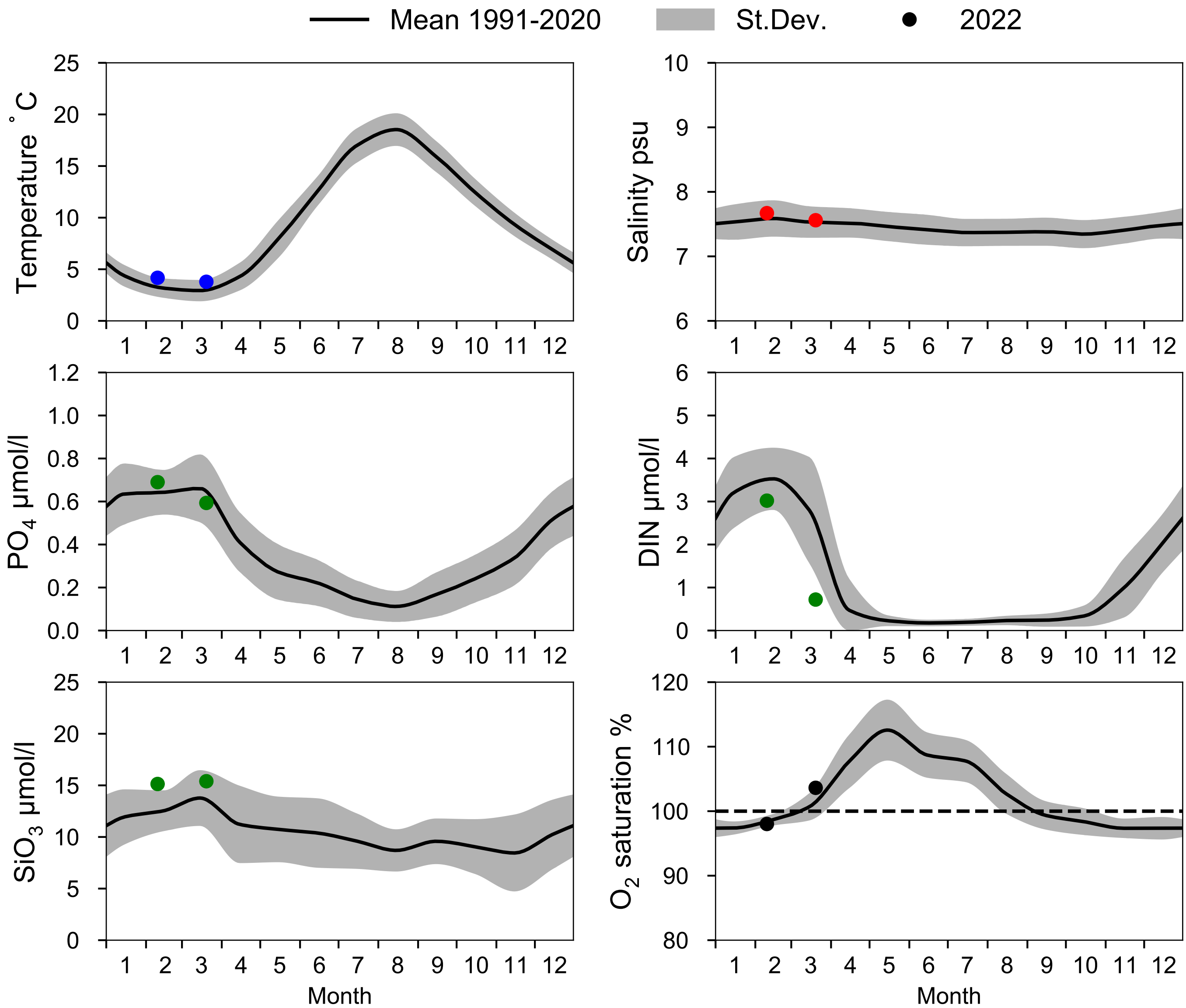


Vertical profiles BCS III-10
March

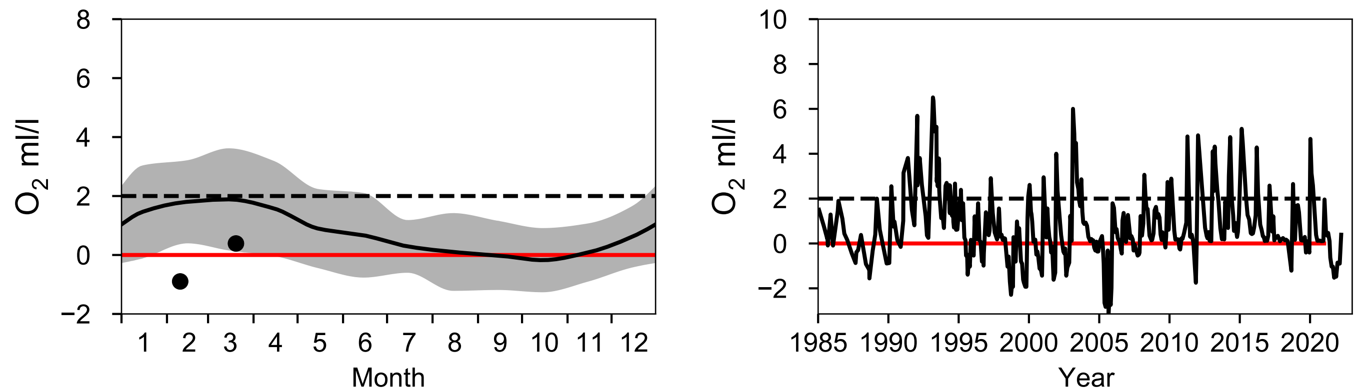


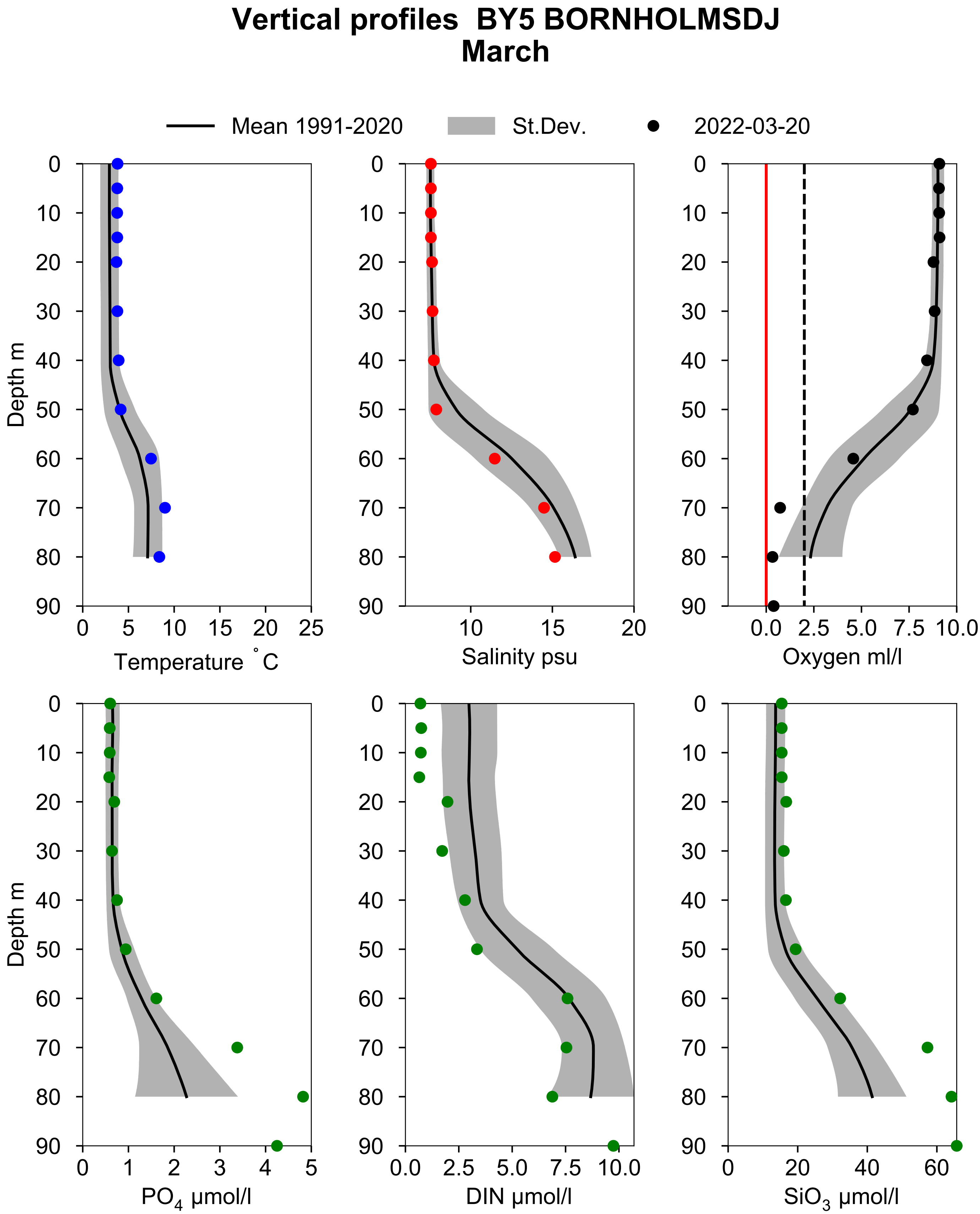
STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

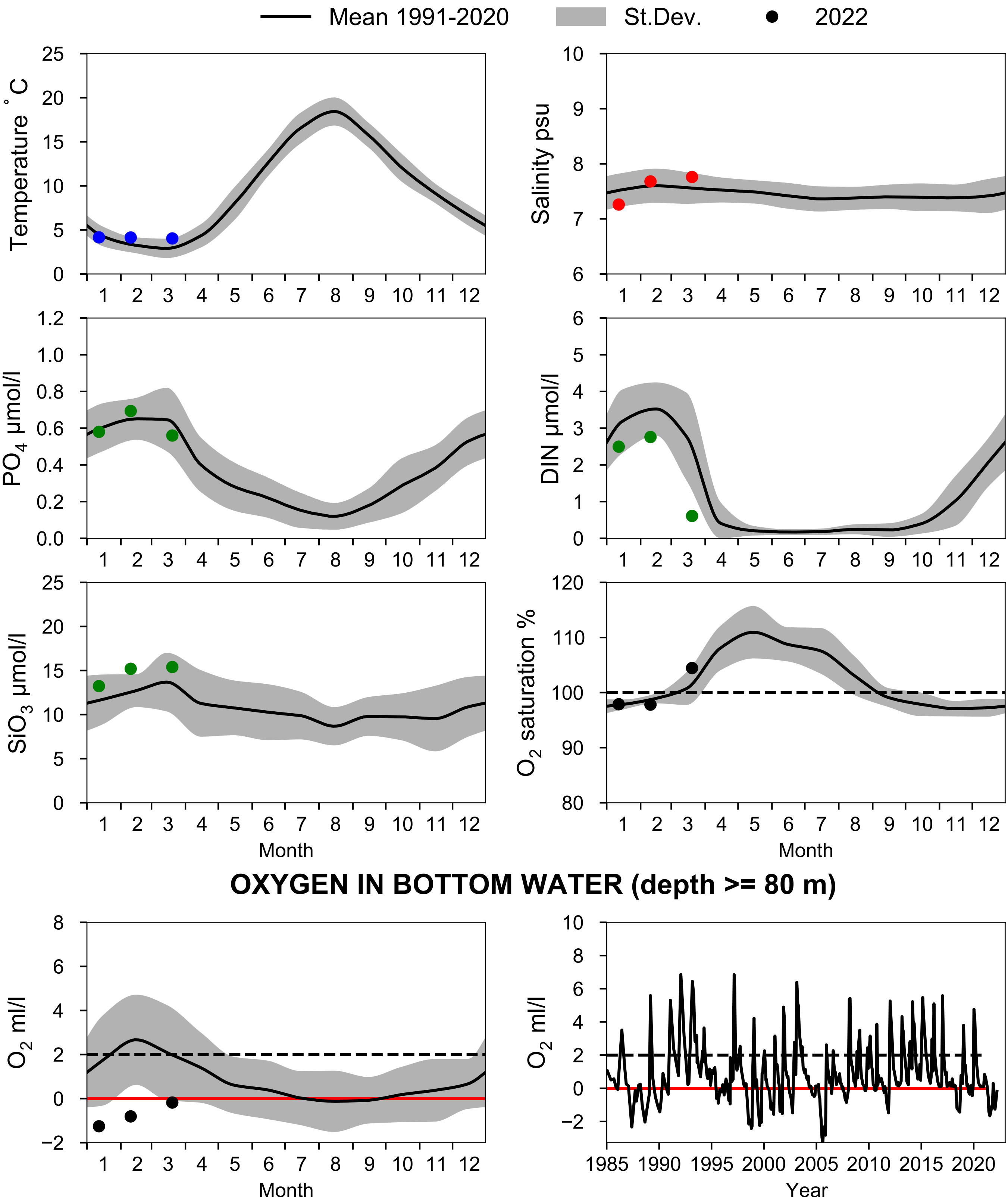


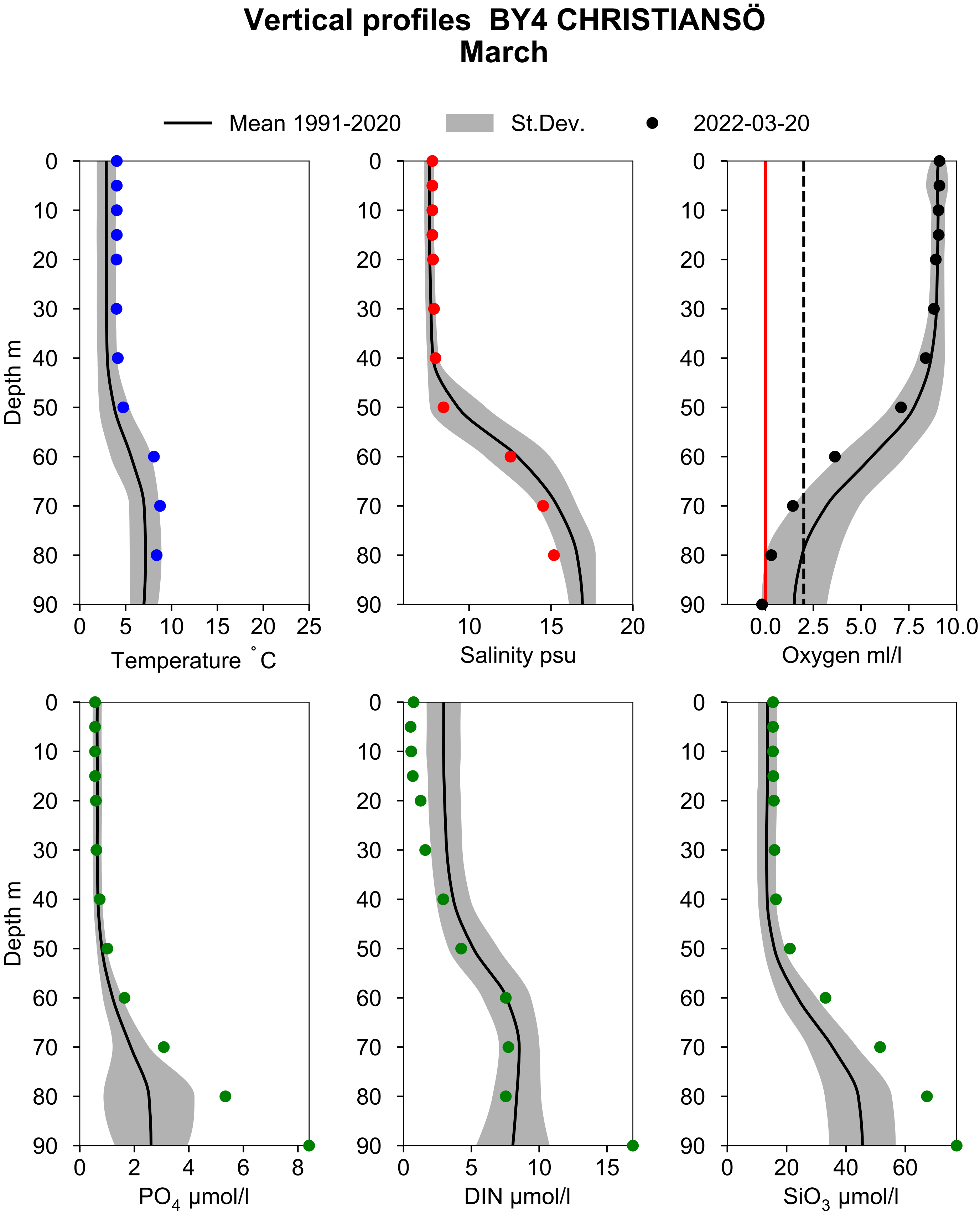


Vertical profiles BY5 BORNHOLMSDJ
March
Mean 1991-2020
St.Dev.
2022-03-20
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

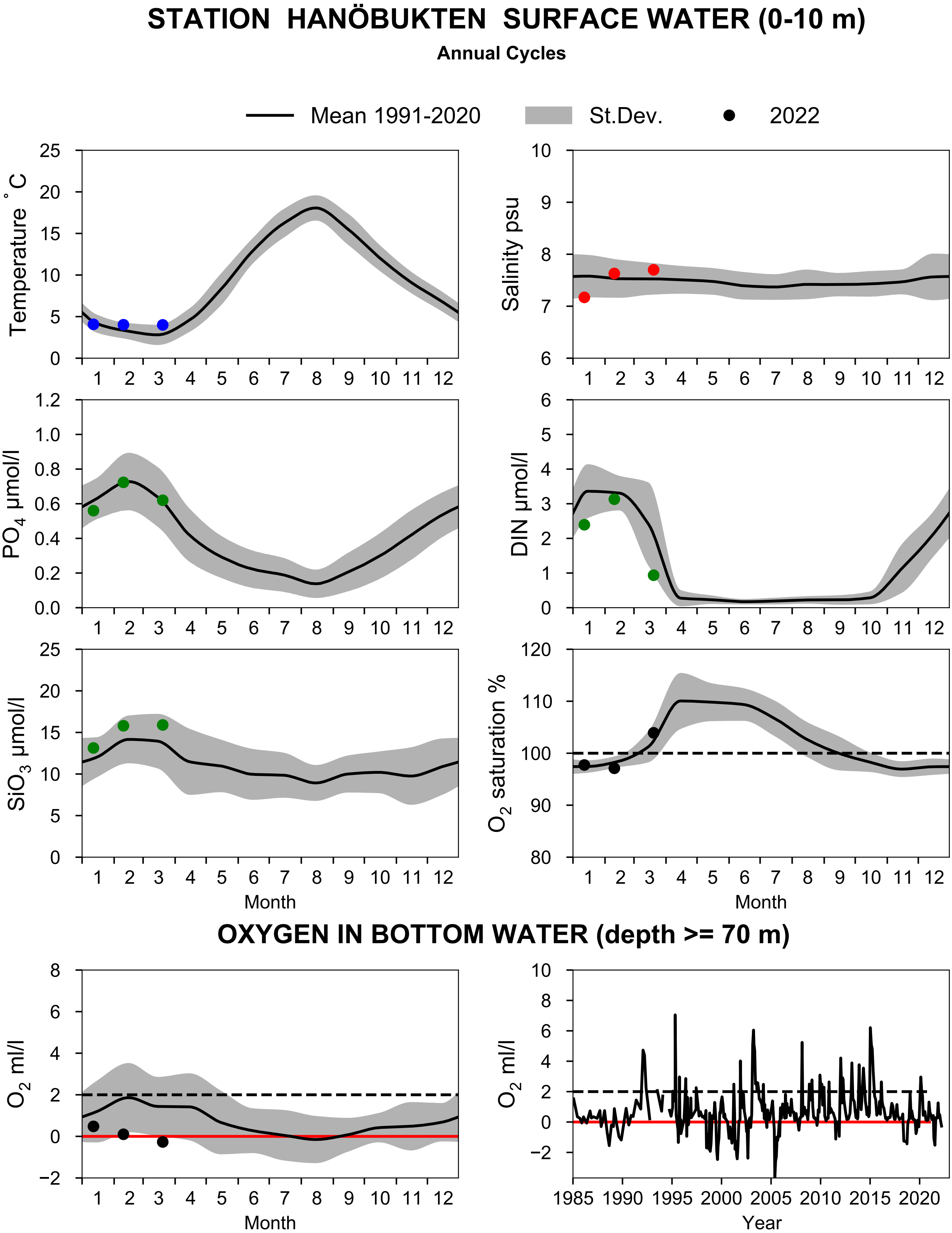
STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

Annual Cycles



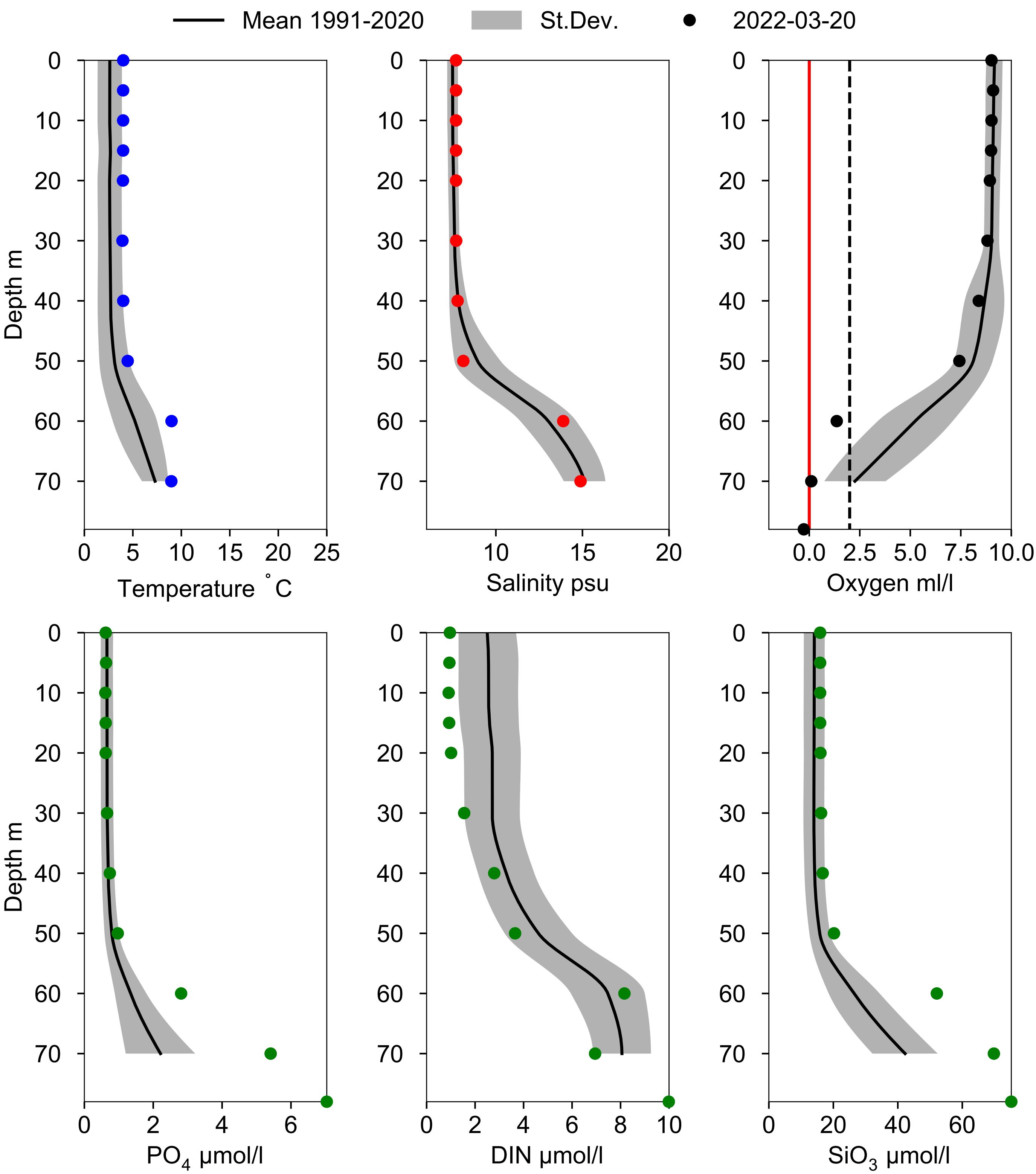


Vertical profiles BY4 CHRISTIANSÖ
March
Mean 1991-2020
St.Dev.
2022-03-20
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l



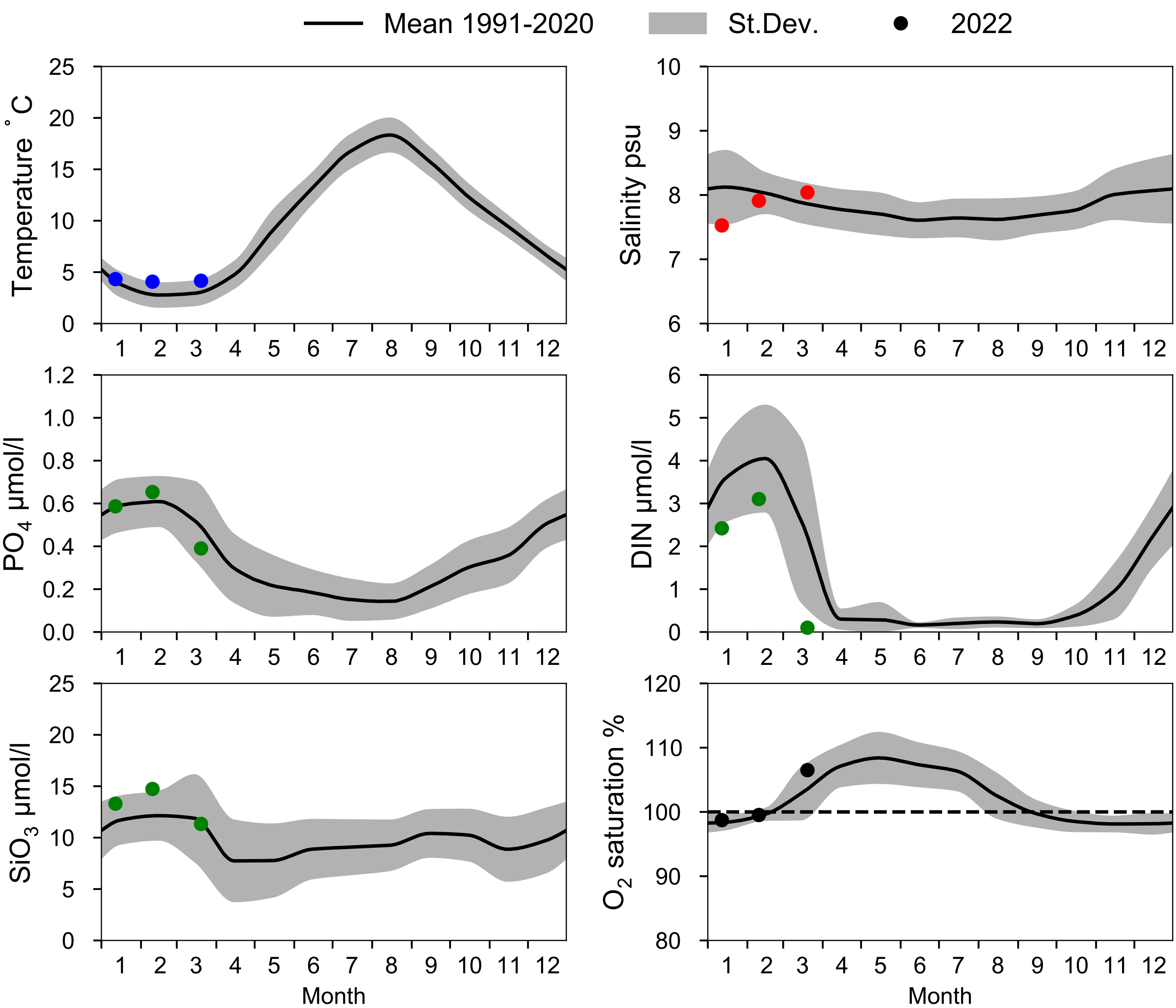
STATION HANÖBUKTEN SURFACE WATER (0-10 m)
Annual Cycles
Mean 1991-2020
St.Dev.
2022
Temperature °C
Salinity psu
PO_4 µmol/l
DIN µmol/l
SiO_3 µmol/l
O_2 saturation %
Month
OXYGEN IN BOTTOM WATER (depth >= 70 m)
O_2 ml/l
Year

Vertical profiles HANÖBUKTEN
March

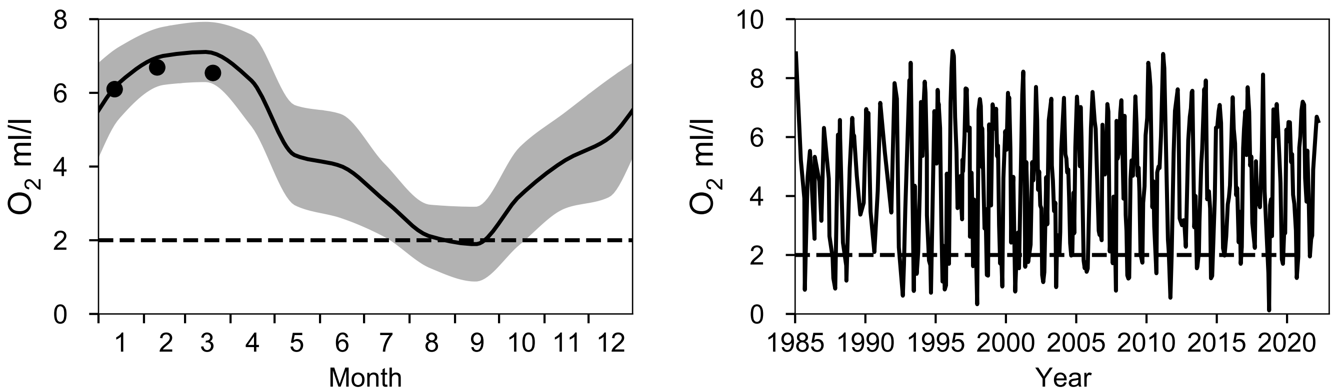


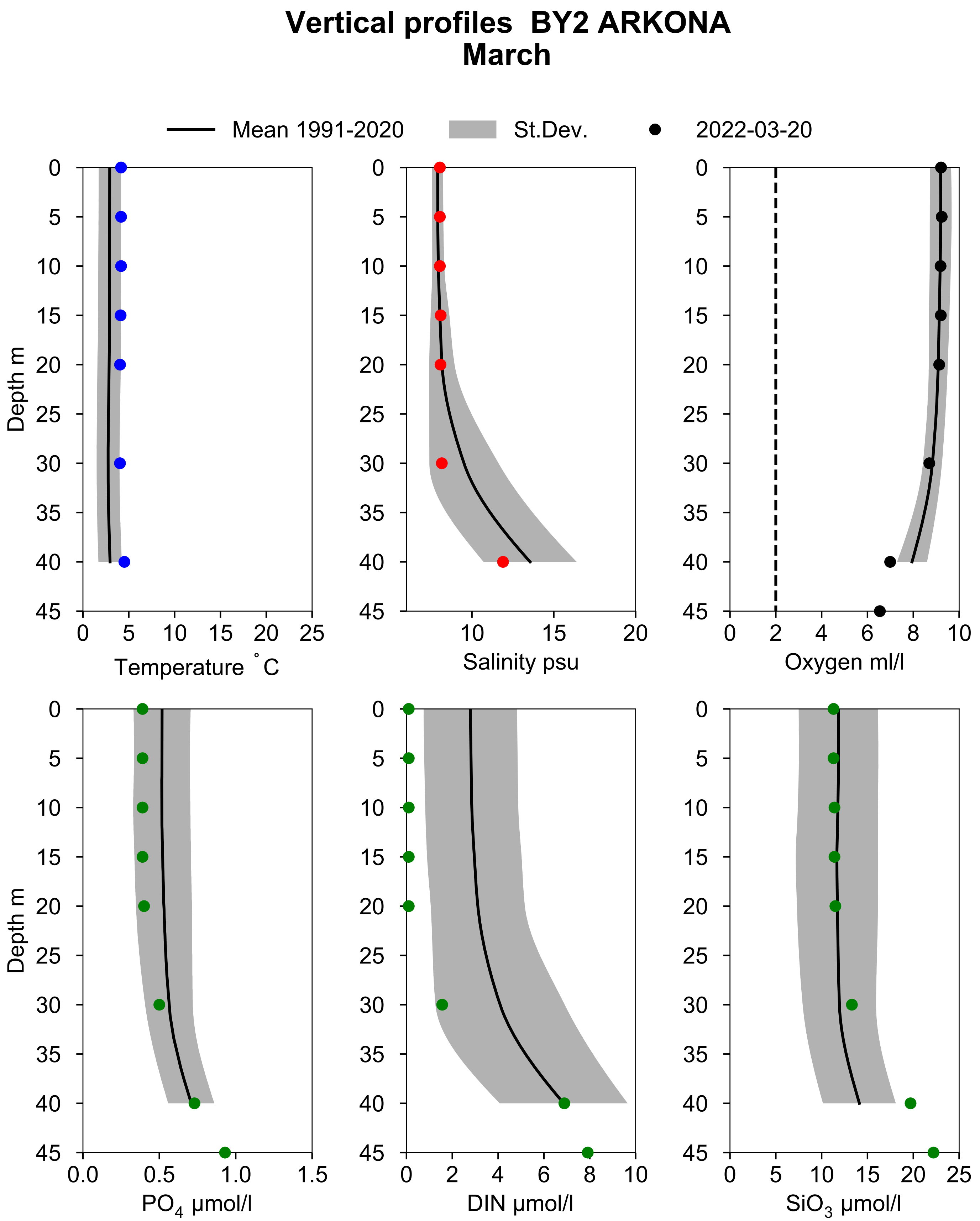
STATION BY2 ARKONA SURFACE WATER (0-10 m)

Annual Cycles



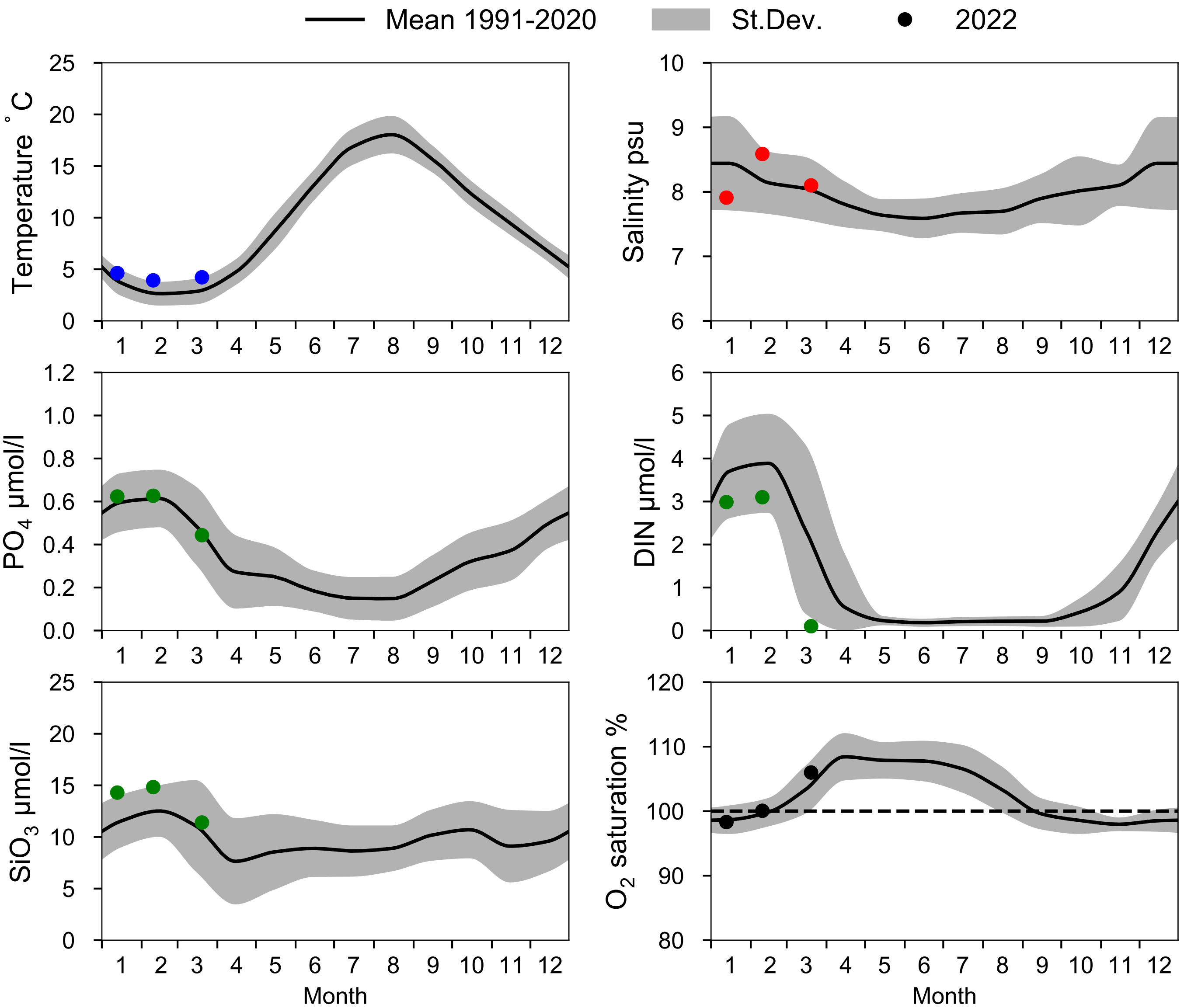
OXYGEN IN BOTTOM WATER (depth >= 40 m)



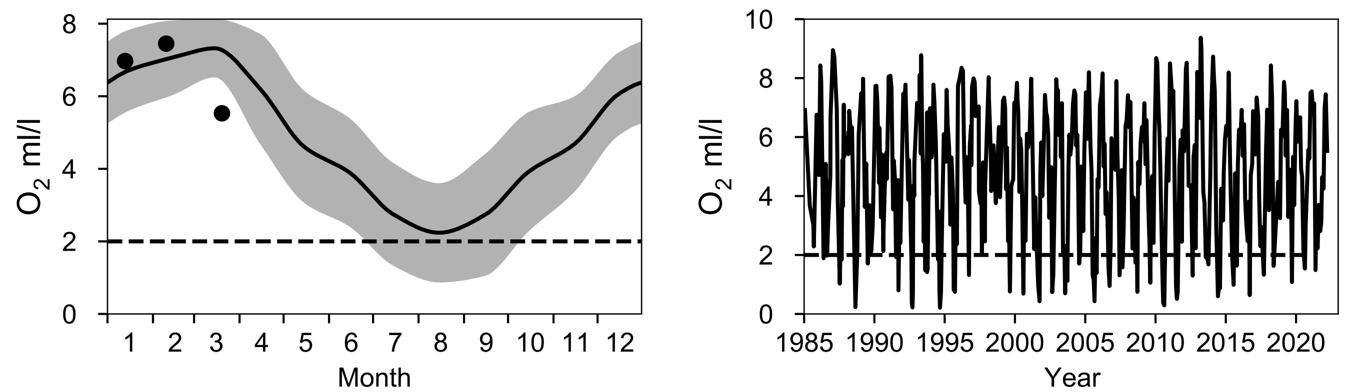

Vertical profiles BY2 ARKONA
March
Mean 1991-2020
St.Dev.
2022-03-20
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

STATION BY1 SURFACE WATER (0-10 m)

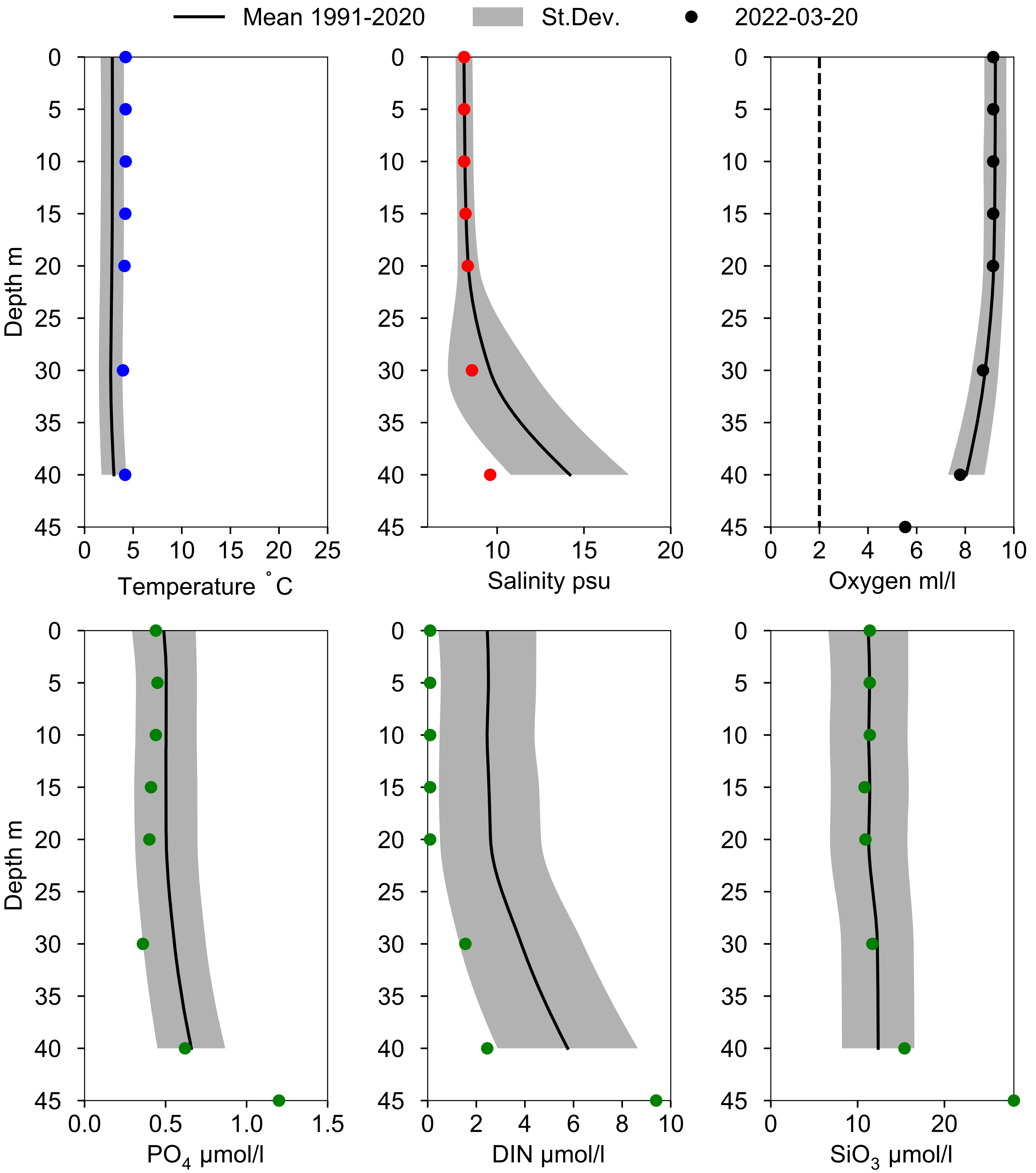
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 39 m)

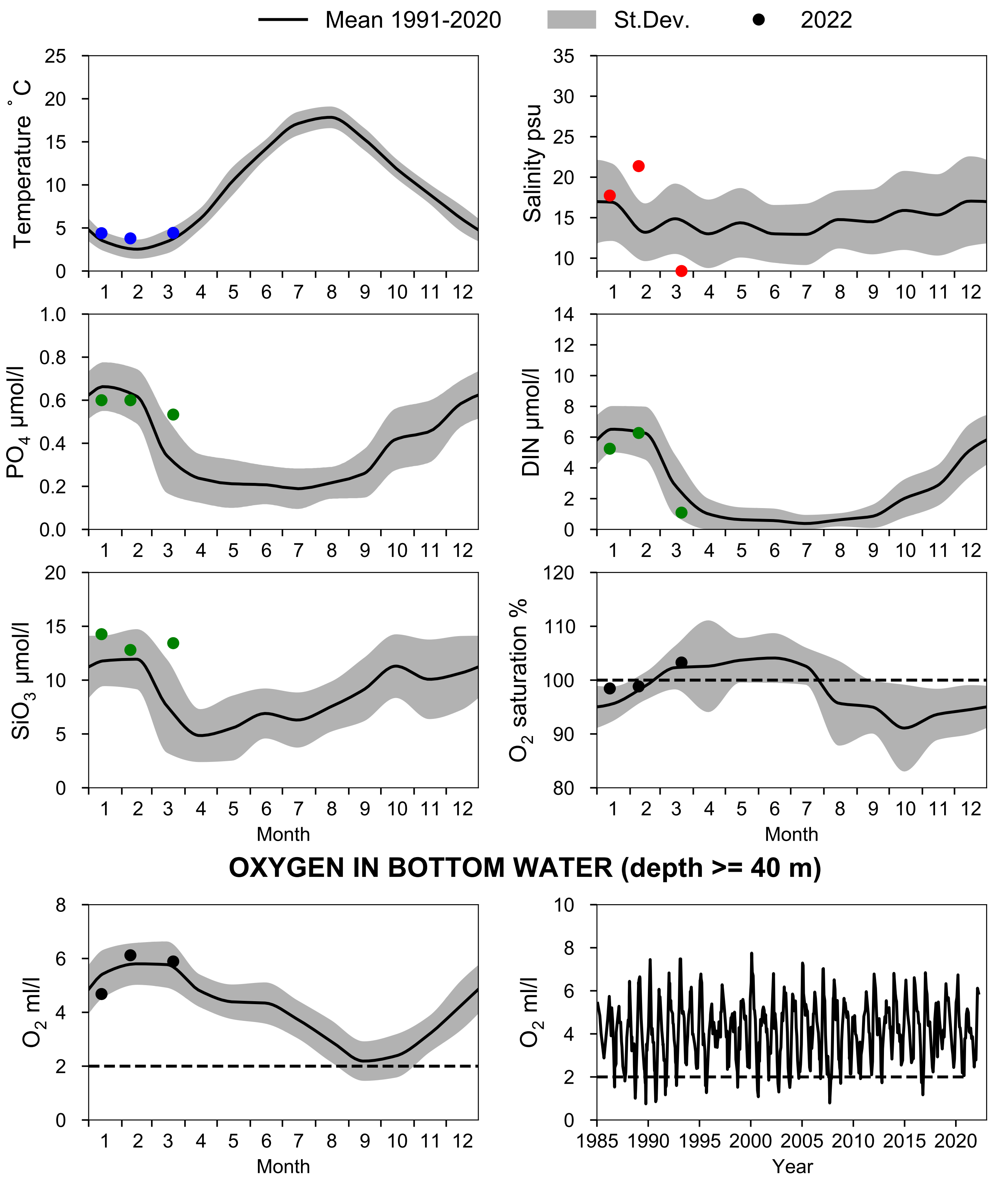


Vertical profiles BY1
March

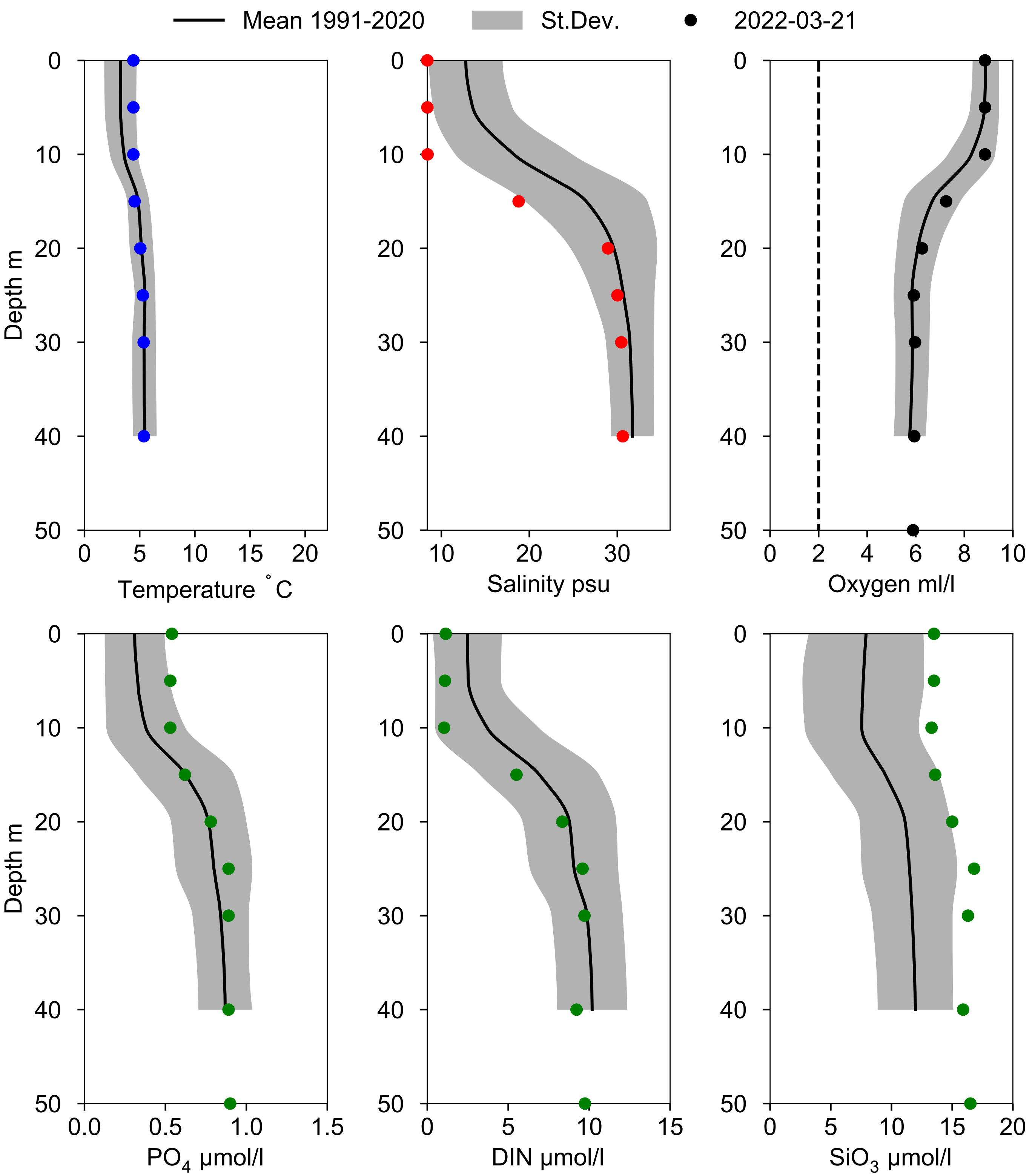


STATION W LANDSKRONA SURFACE WATER (0-10 m)

Annual Cycles

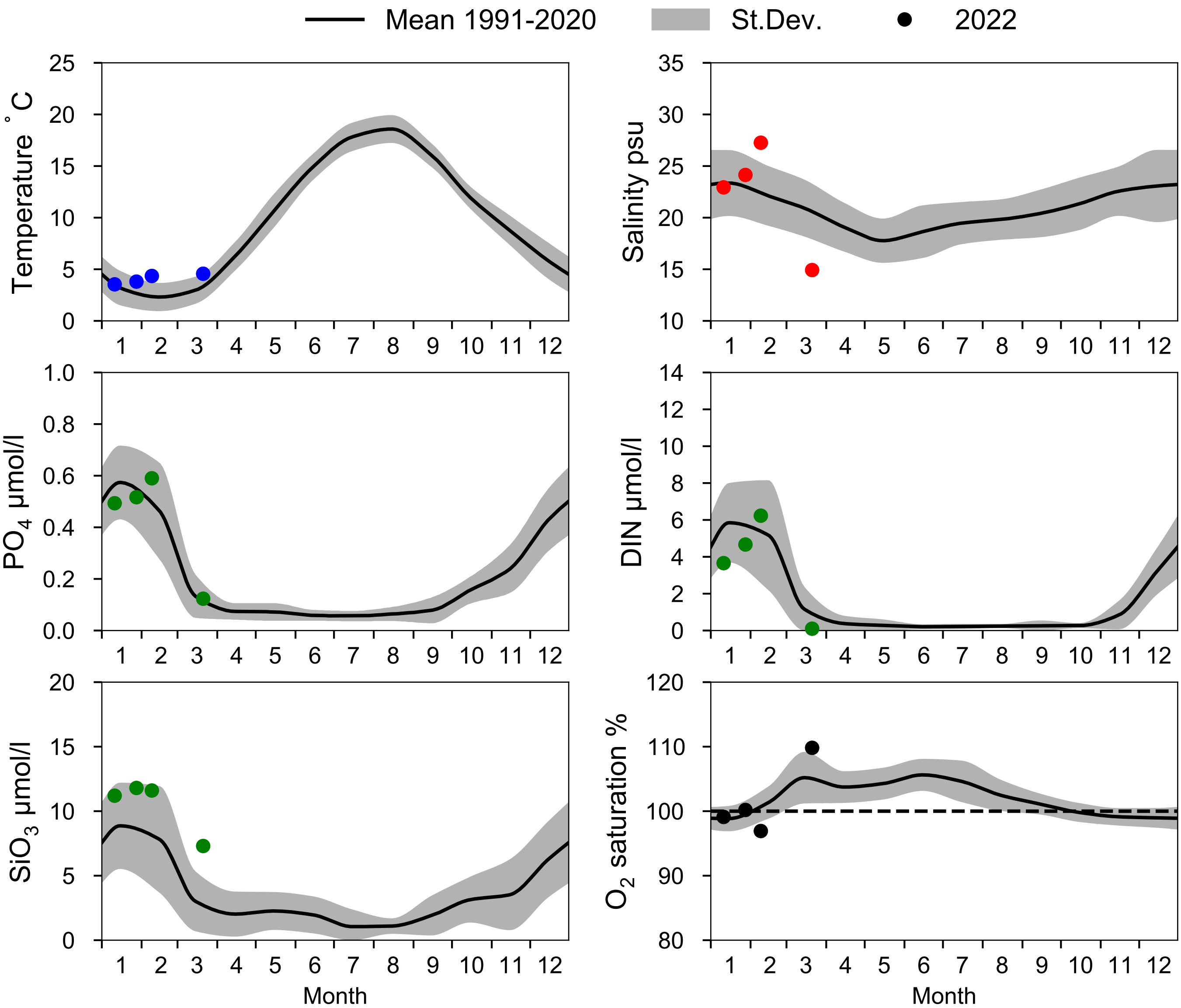


Vertical profiles W LANDSKRONA
March

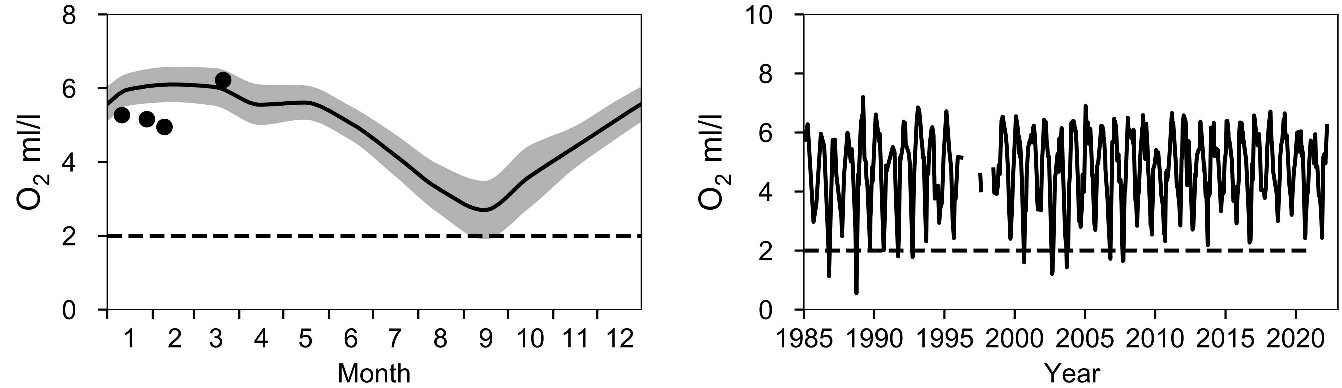


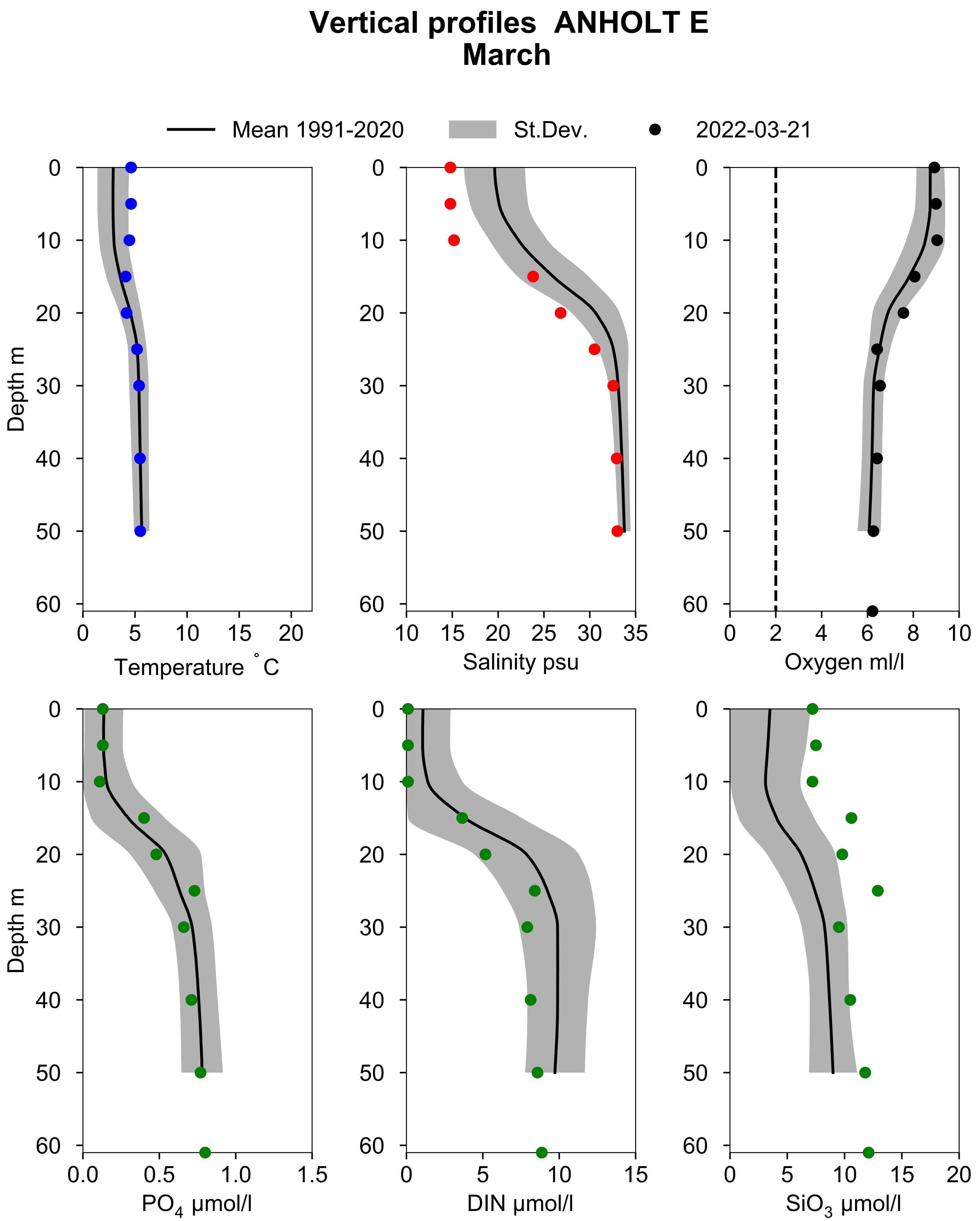
STATION ANHOLT E SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

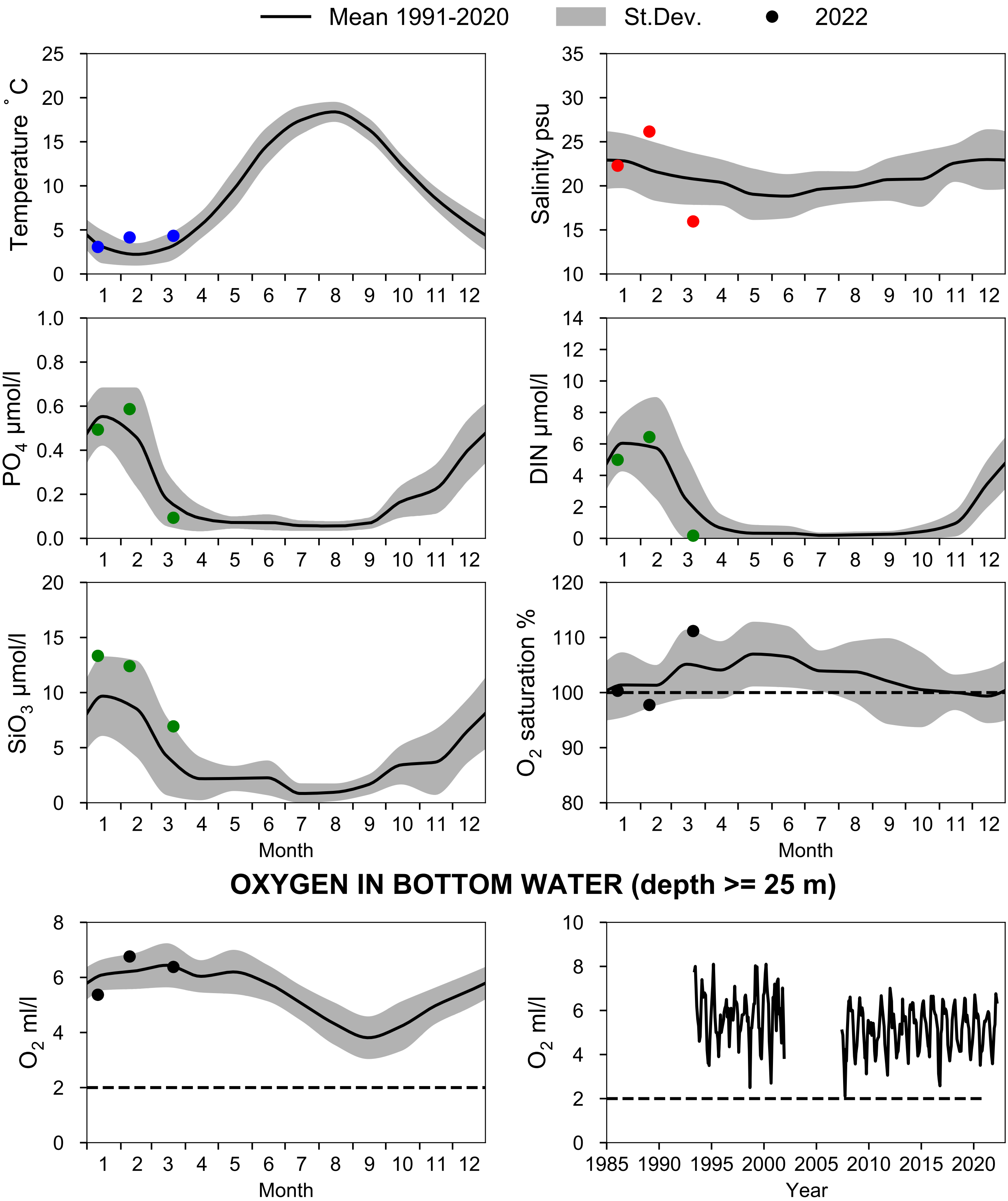




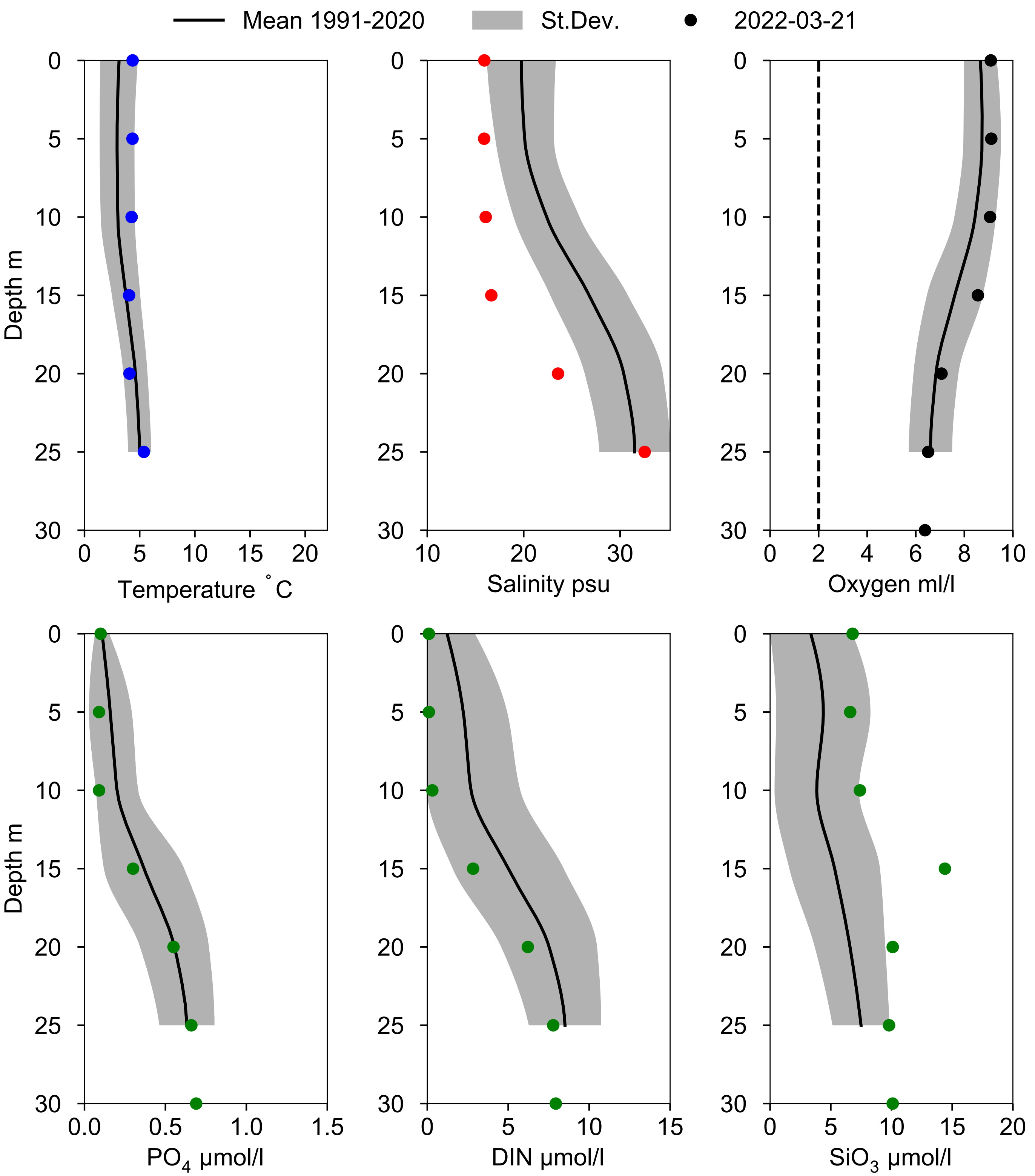
Vertical profiles ANHOLT E
March
Mean 1991-2020
St.Dev.
2022-03-21
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

STATION N14 FALKENBERG SURFACE WATER (0-10 m)

Annual Cycles

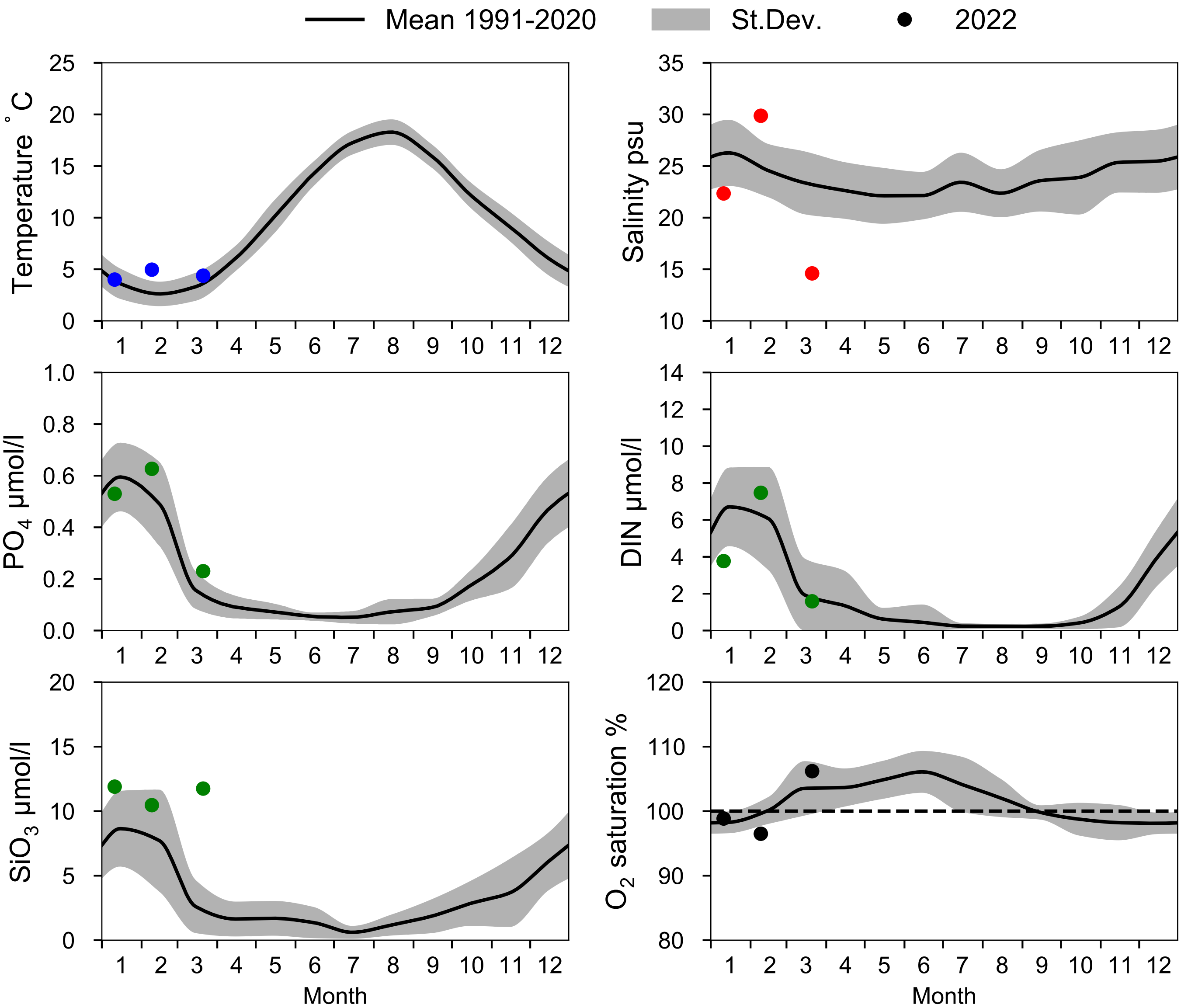


Vertical profiles N14 FALKENBERG
March

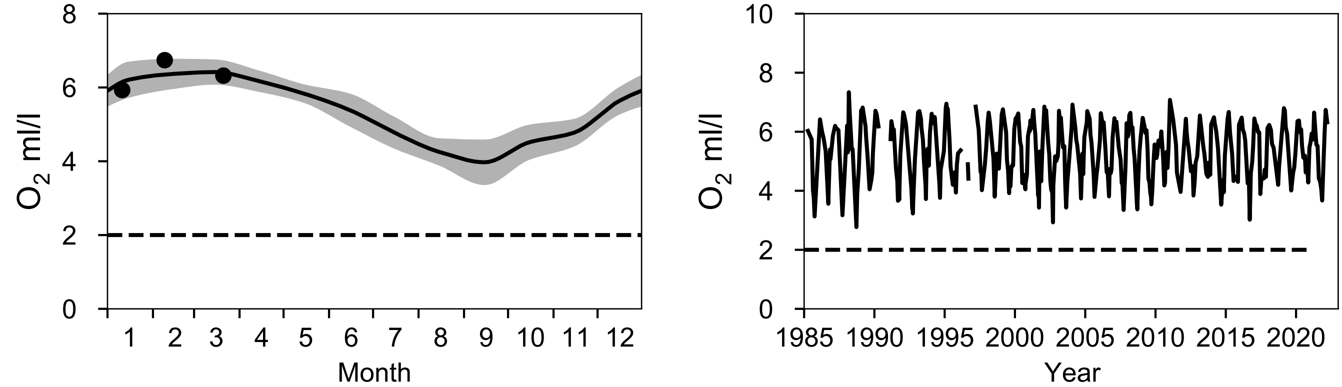


STATION FLADEN SURFACE WATER (0-10 m)

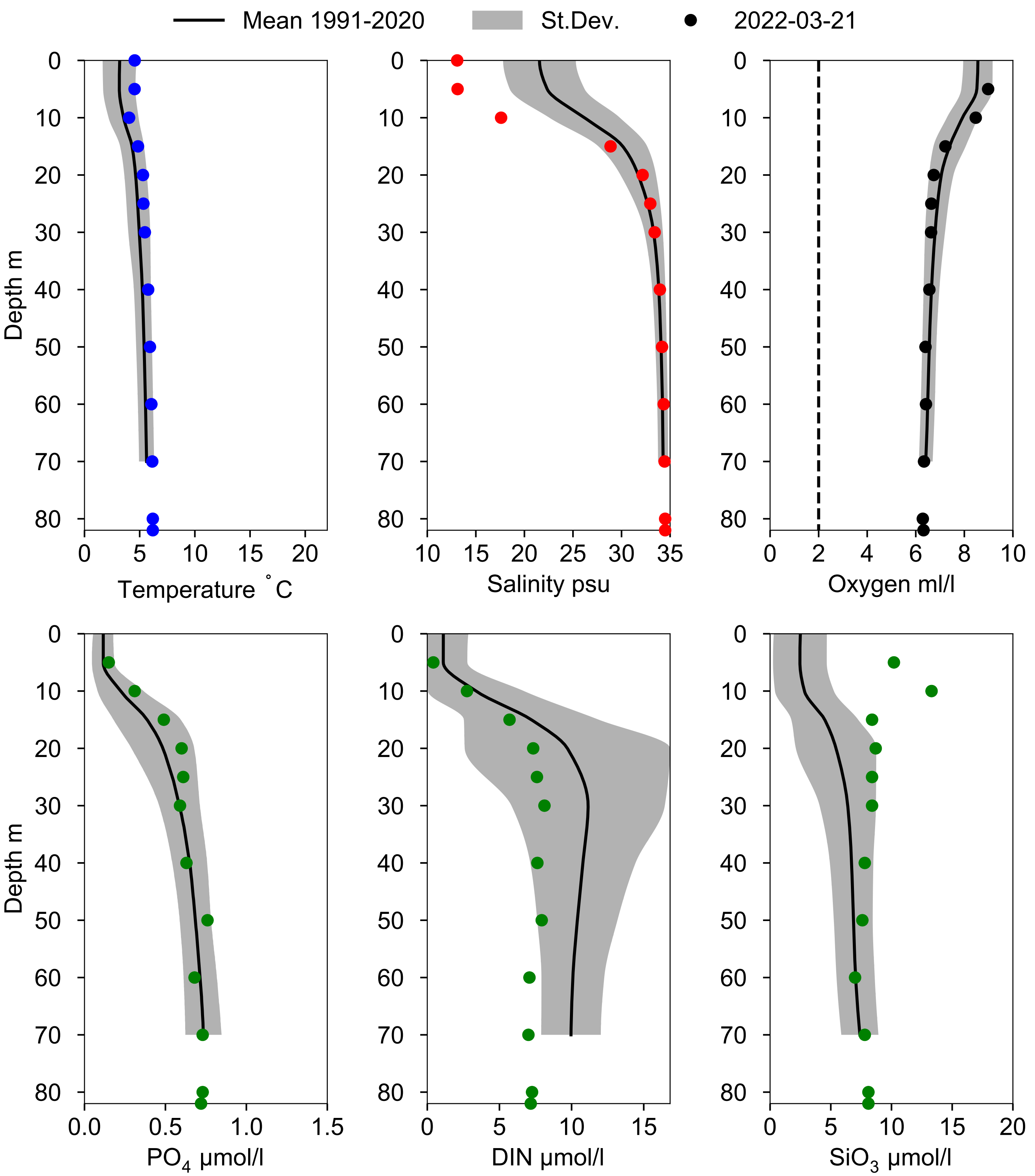
Annual Cycles

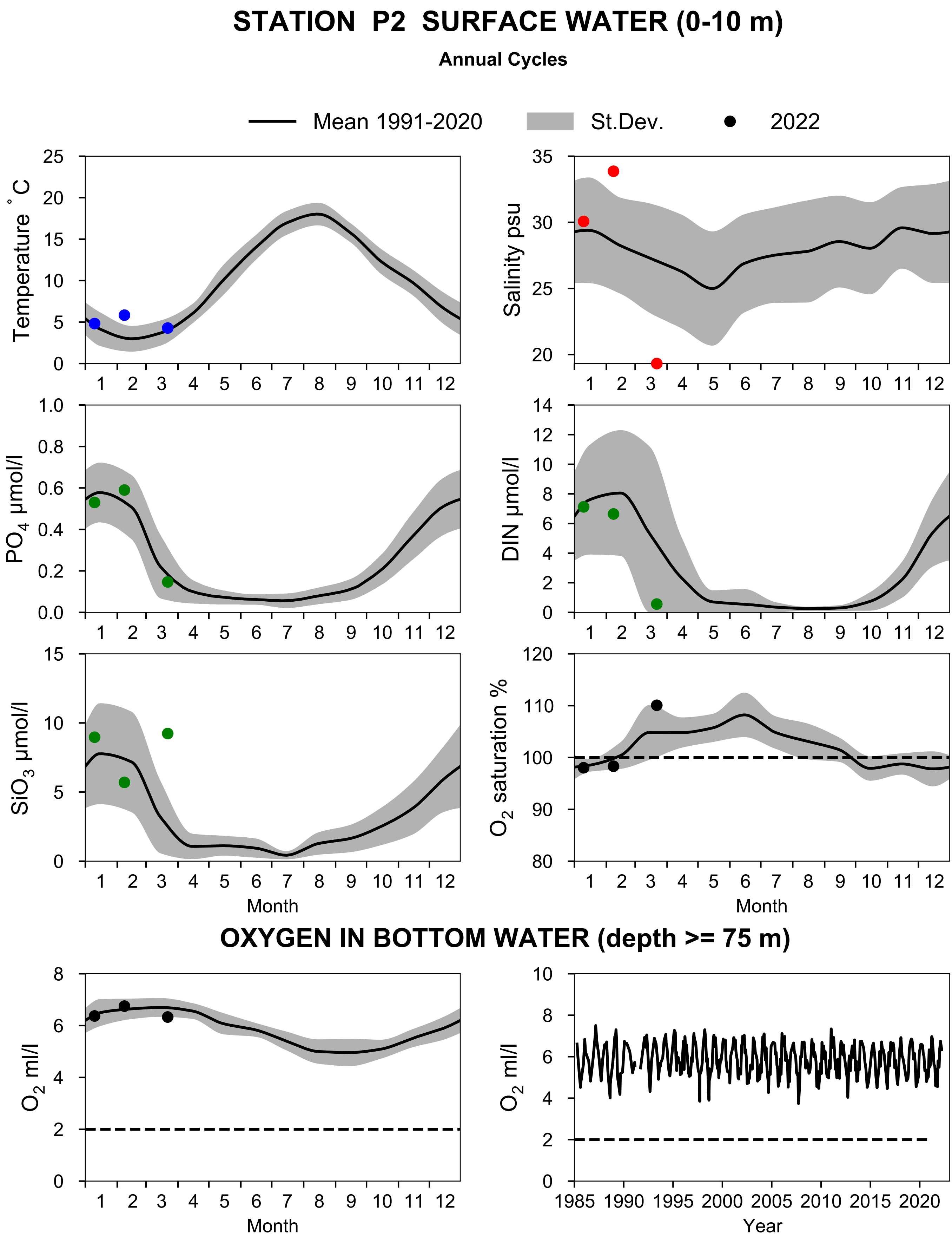


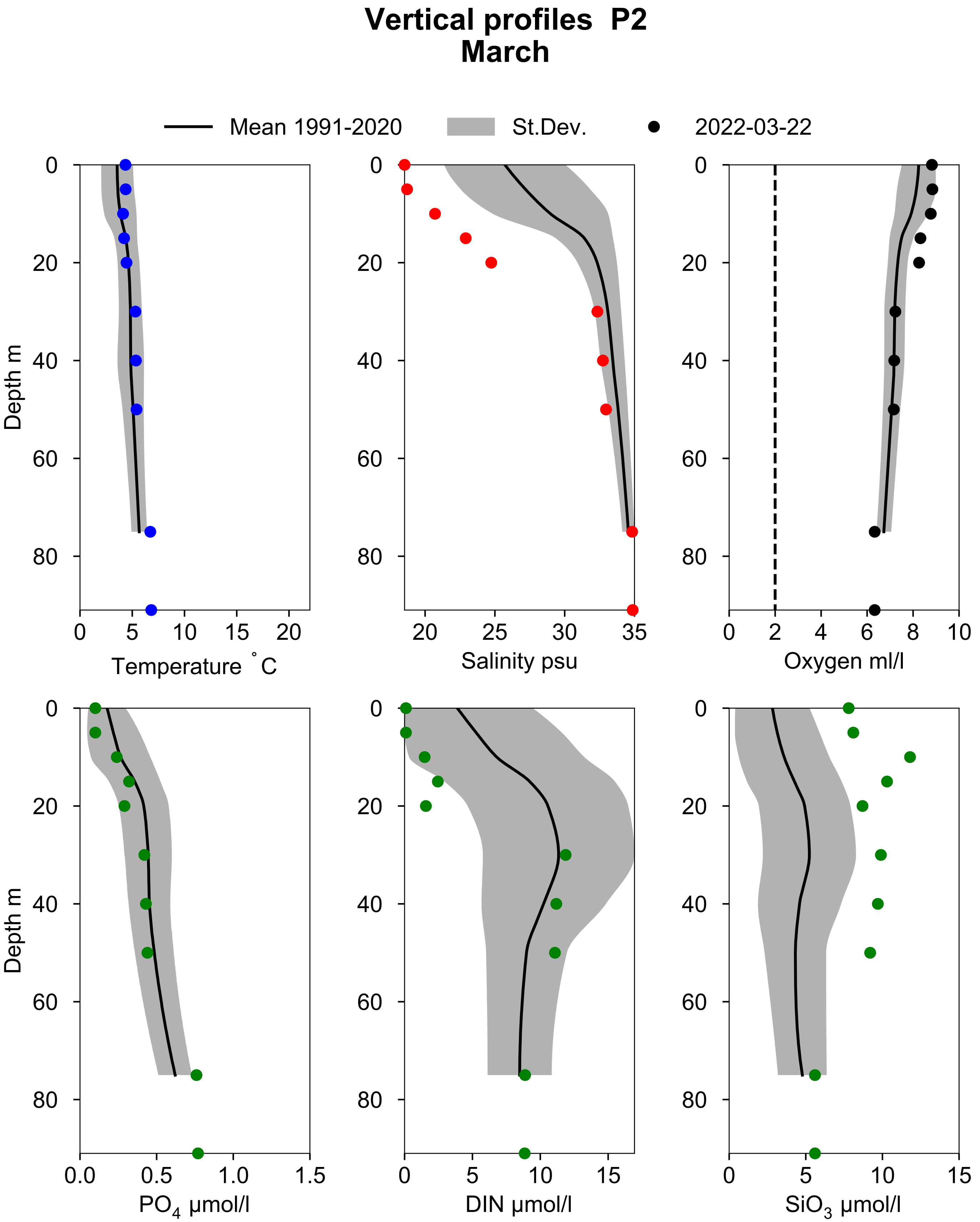
OXYGEN IN BOTTOM WATER (depth >= 74 m)



Vertical profiles FLADEN
March



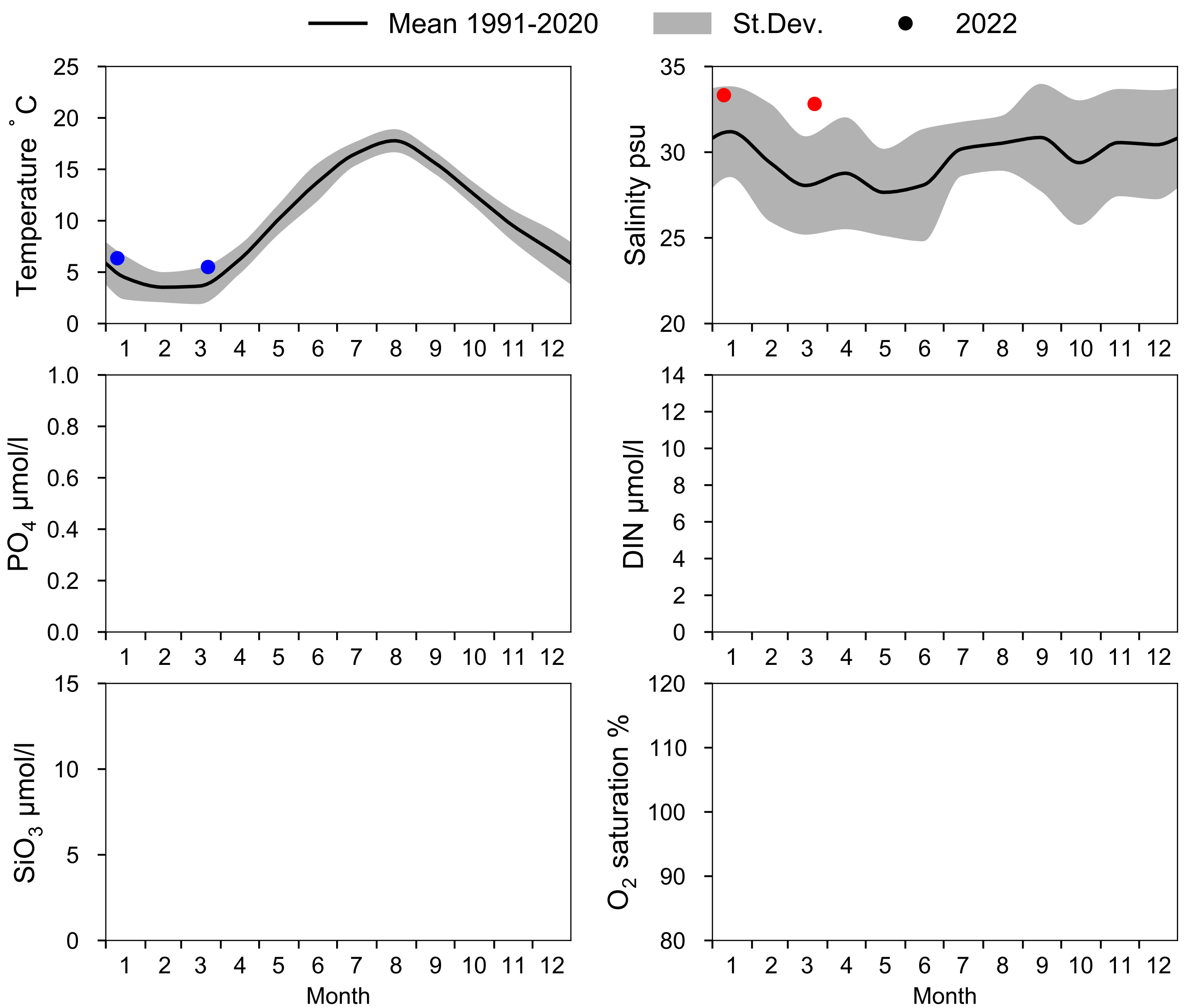

STATION P2 SURFACE WATER (0-10 m)
Annual Cycles
Mean 1991-2020
St.Dev.
2022
Temperature °C
Salinity psu
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l
O2 saturation %
Month
OXYGEN IN BOTTOM WATER (depth >= 75 m)
O2 ml/l
Month
Year



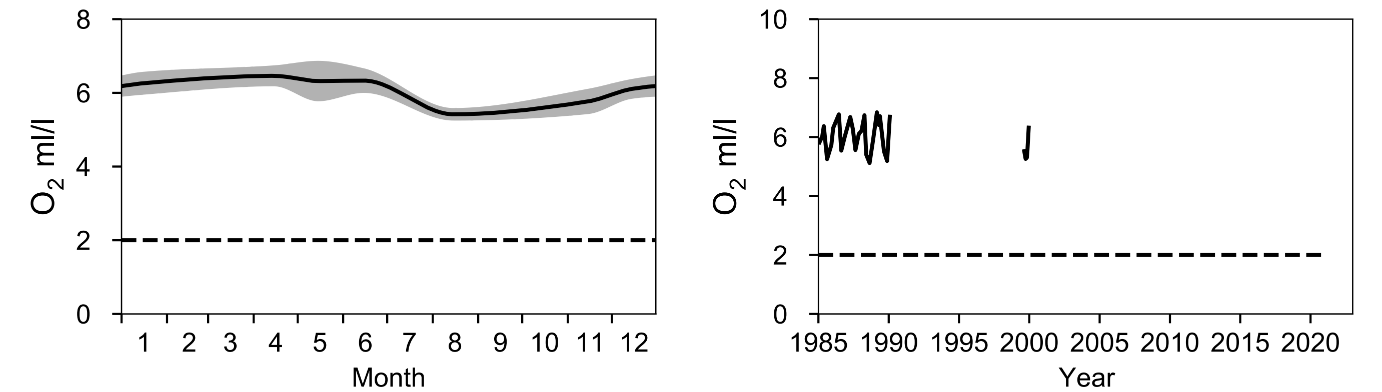
Vertical profiles P2
March
Mean 1991-2020
St.Dev.
2022-03-22
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
Depth m
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

STATION Å14 SURFACE WATER (0-10 m)

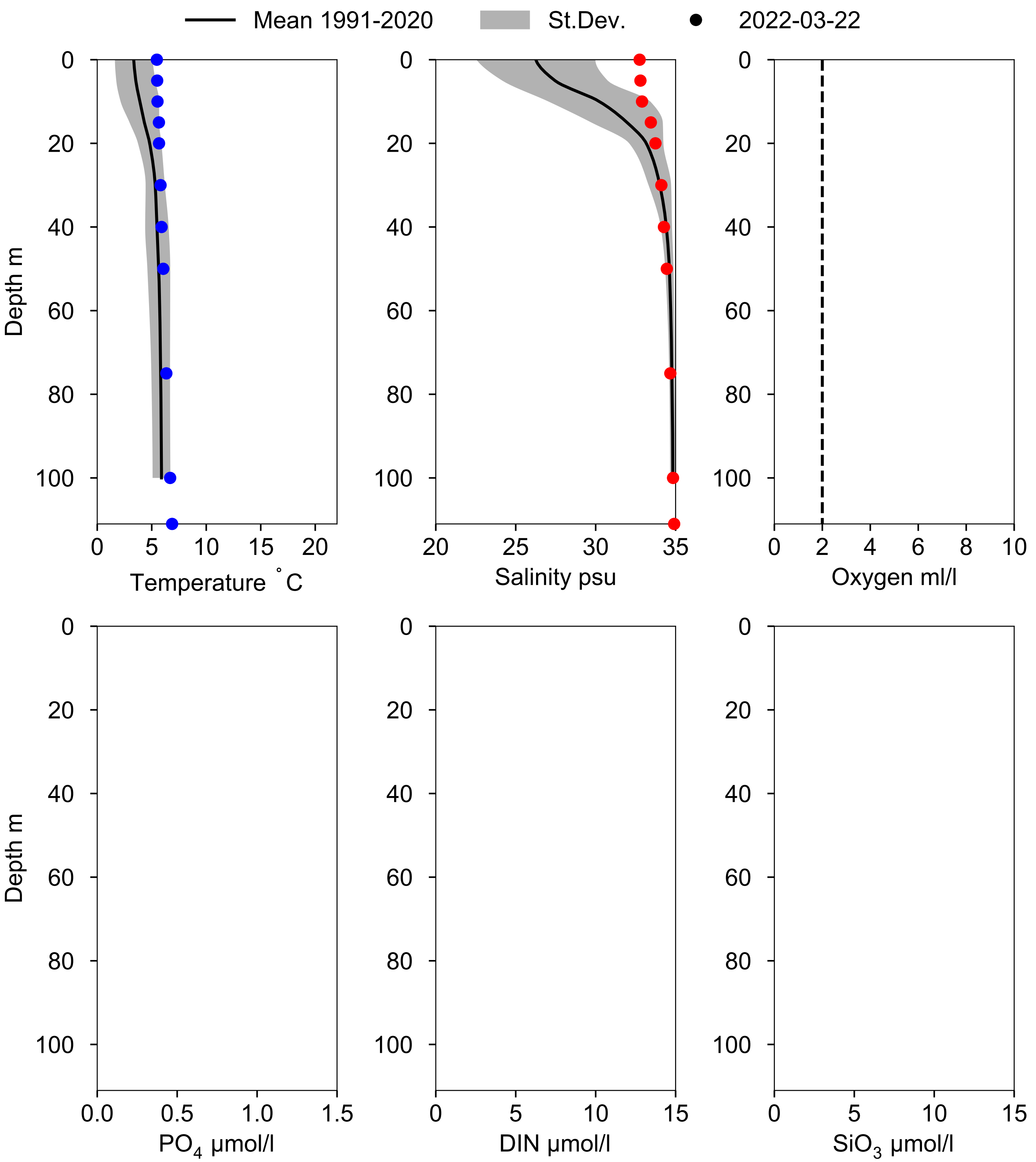
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

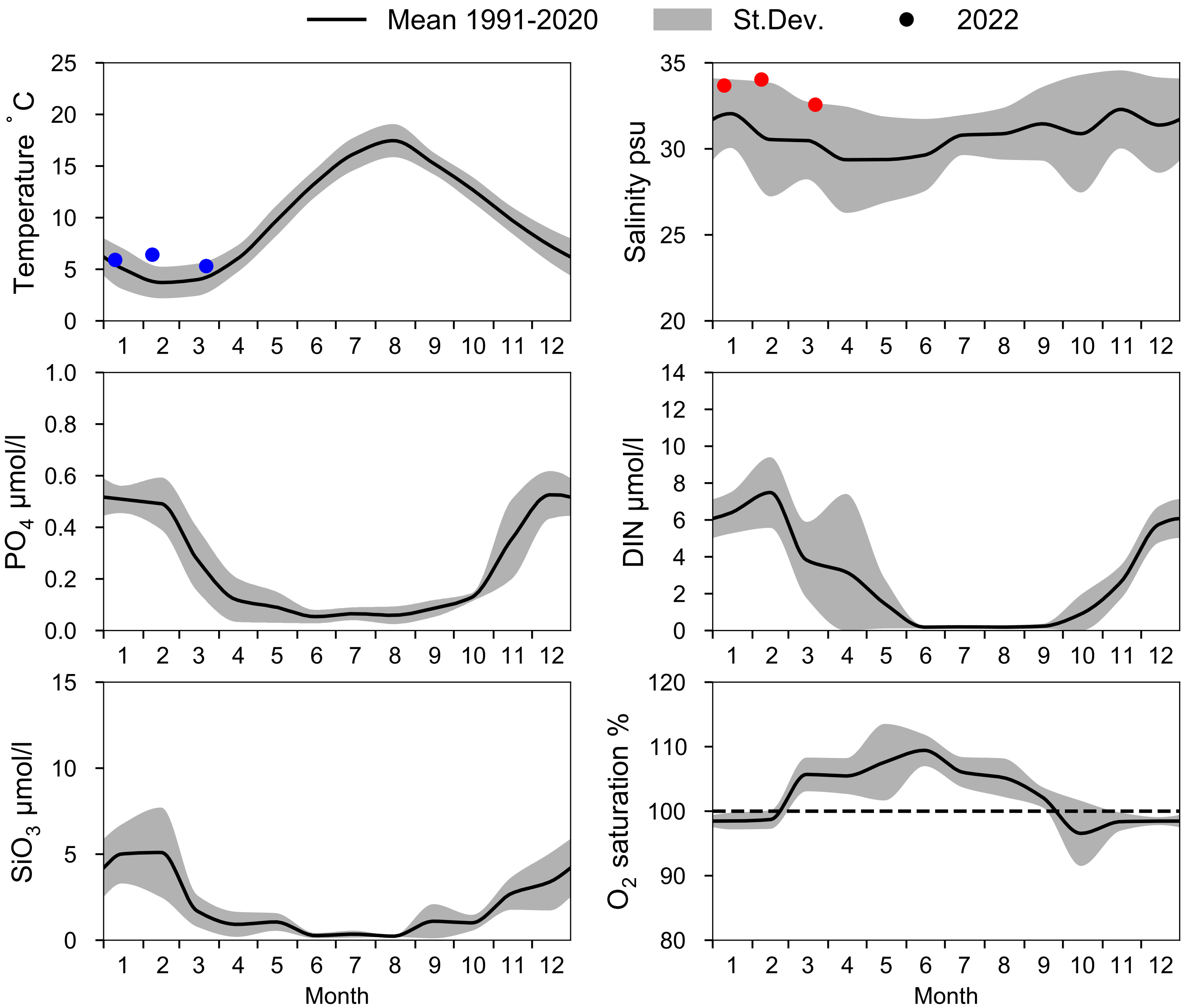


Vertical profiles Å14
March

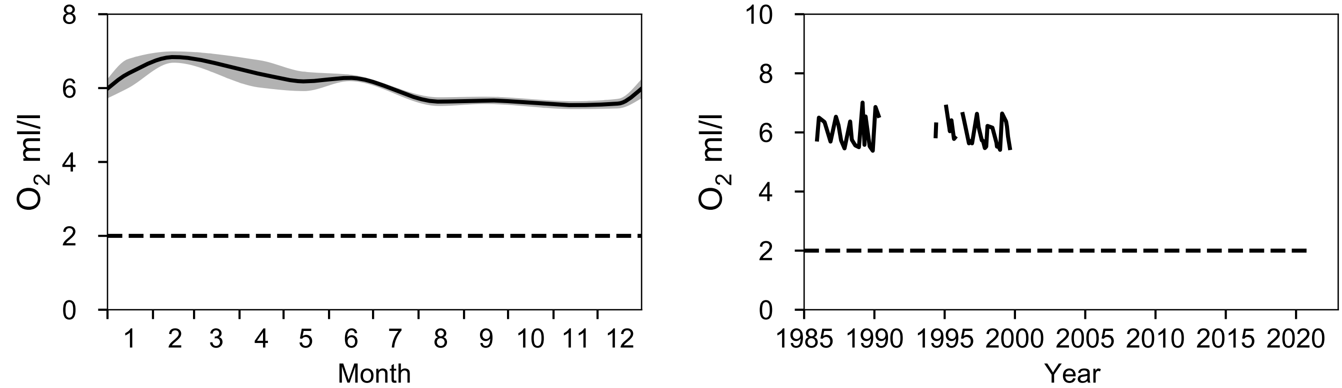


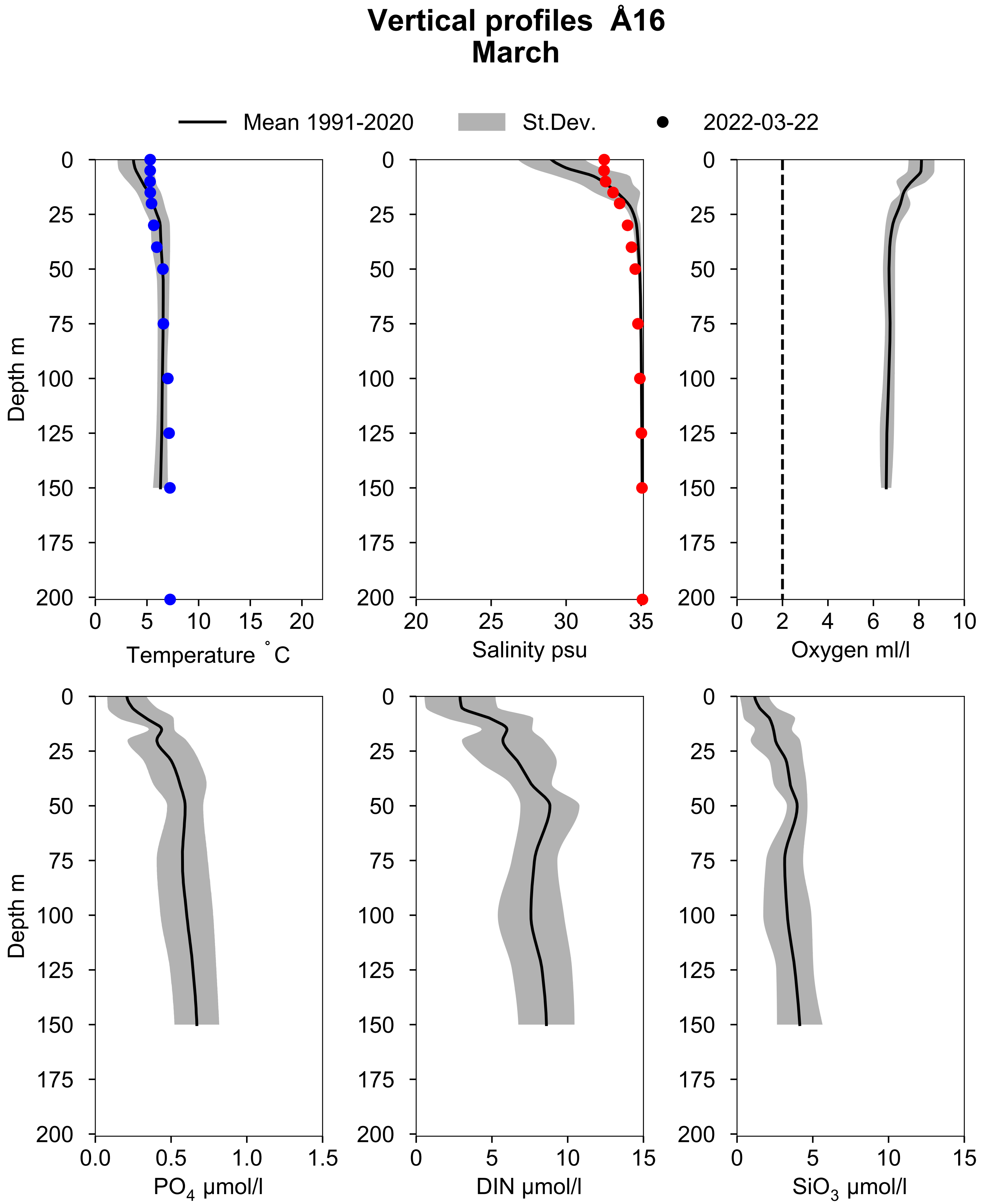
STATION Å16 SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 193 m)

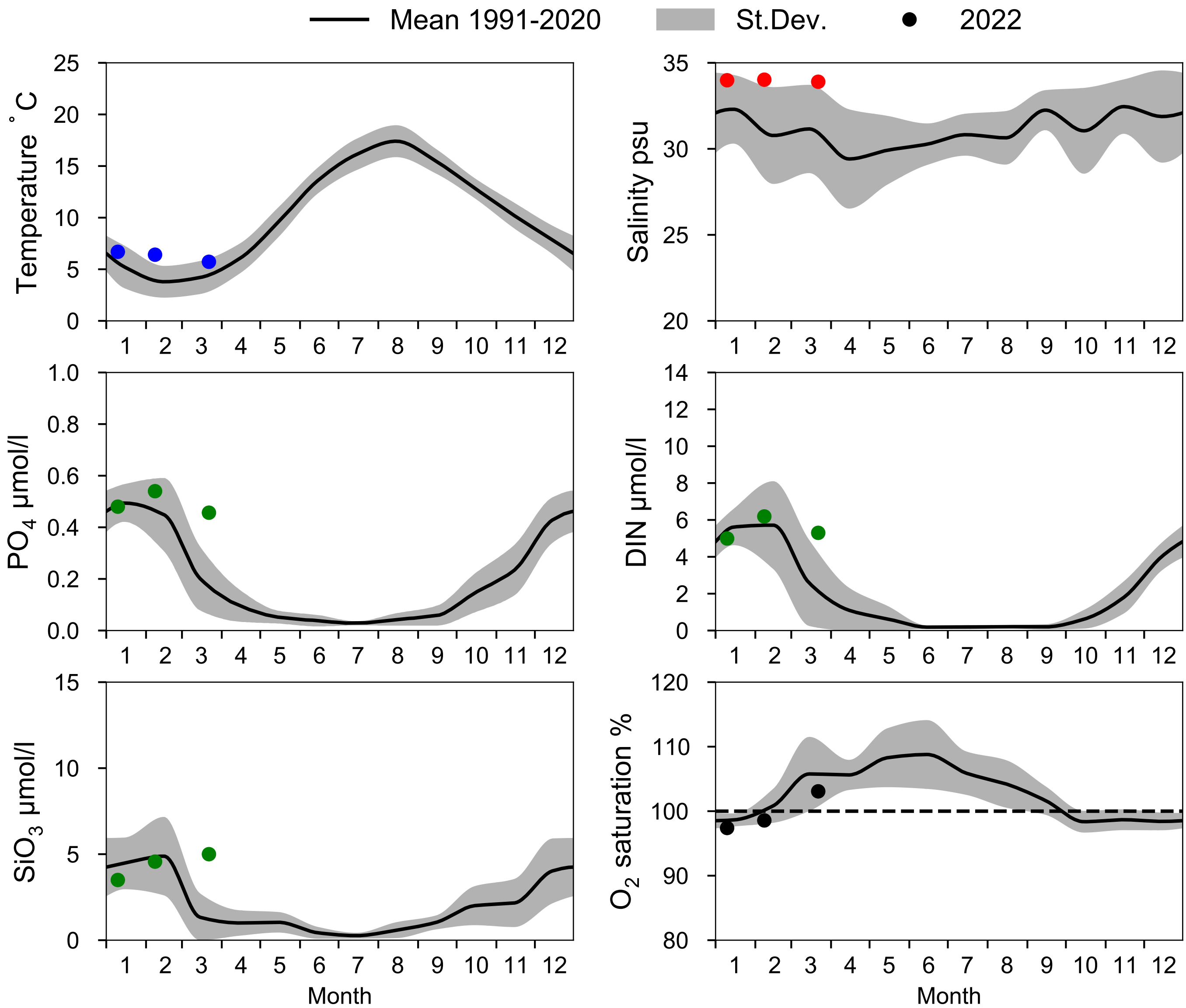




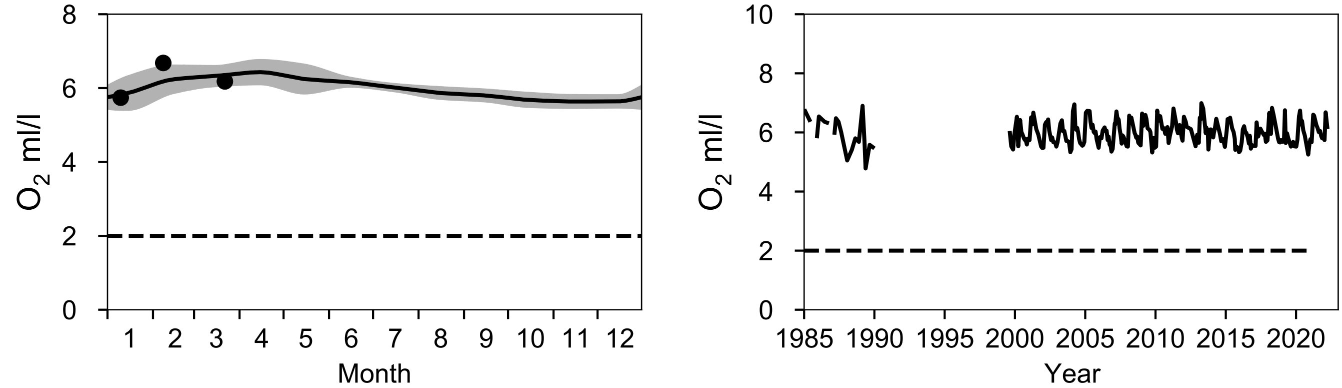
Vertical profiles Å16
March
Mean 1991-2020
St.Dev.
2022-03-22
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

STATION Å17 SURFACE WATER (0-10 m)

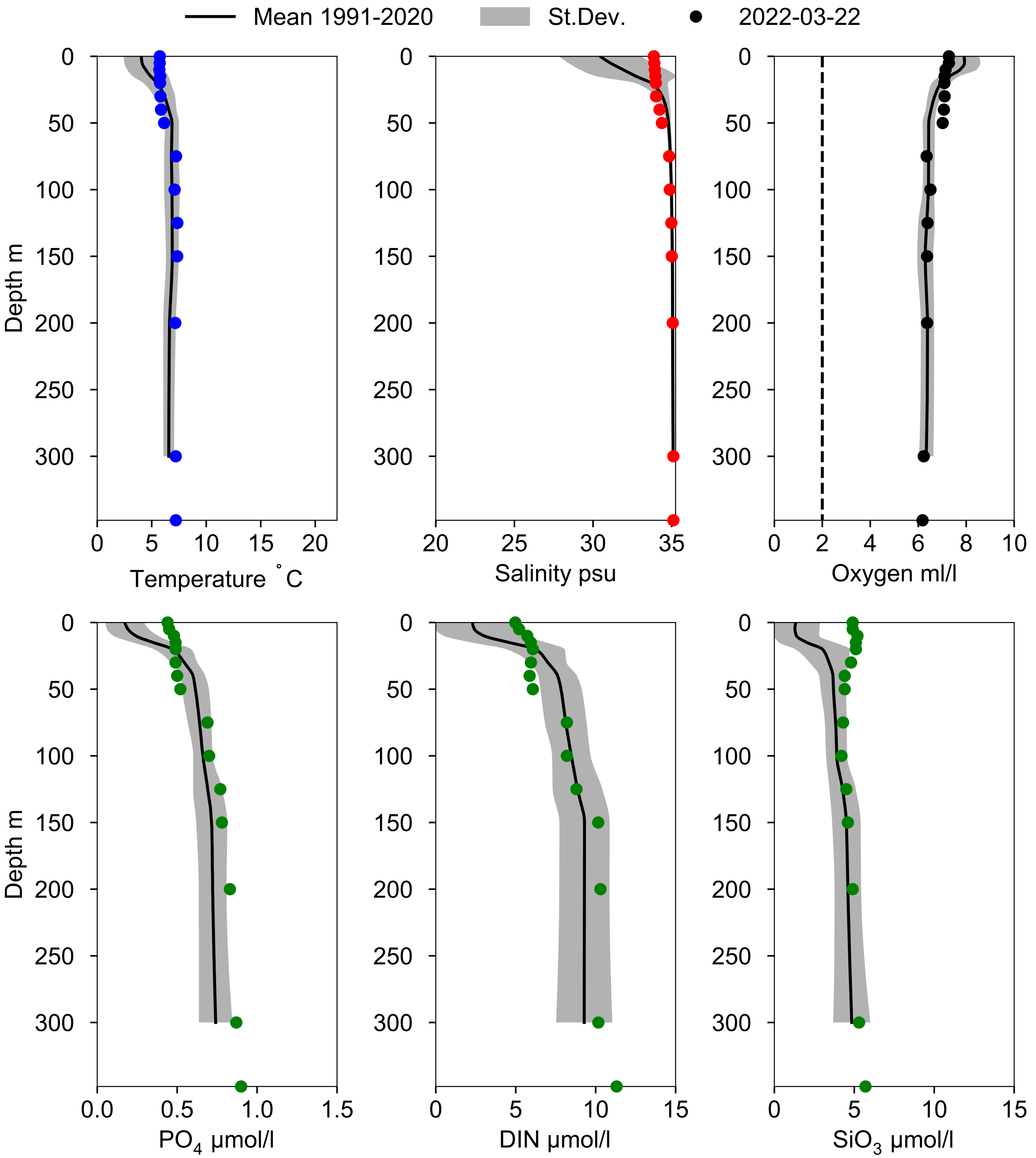
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 300 m)

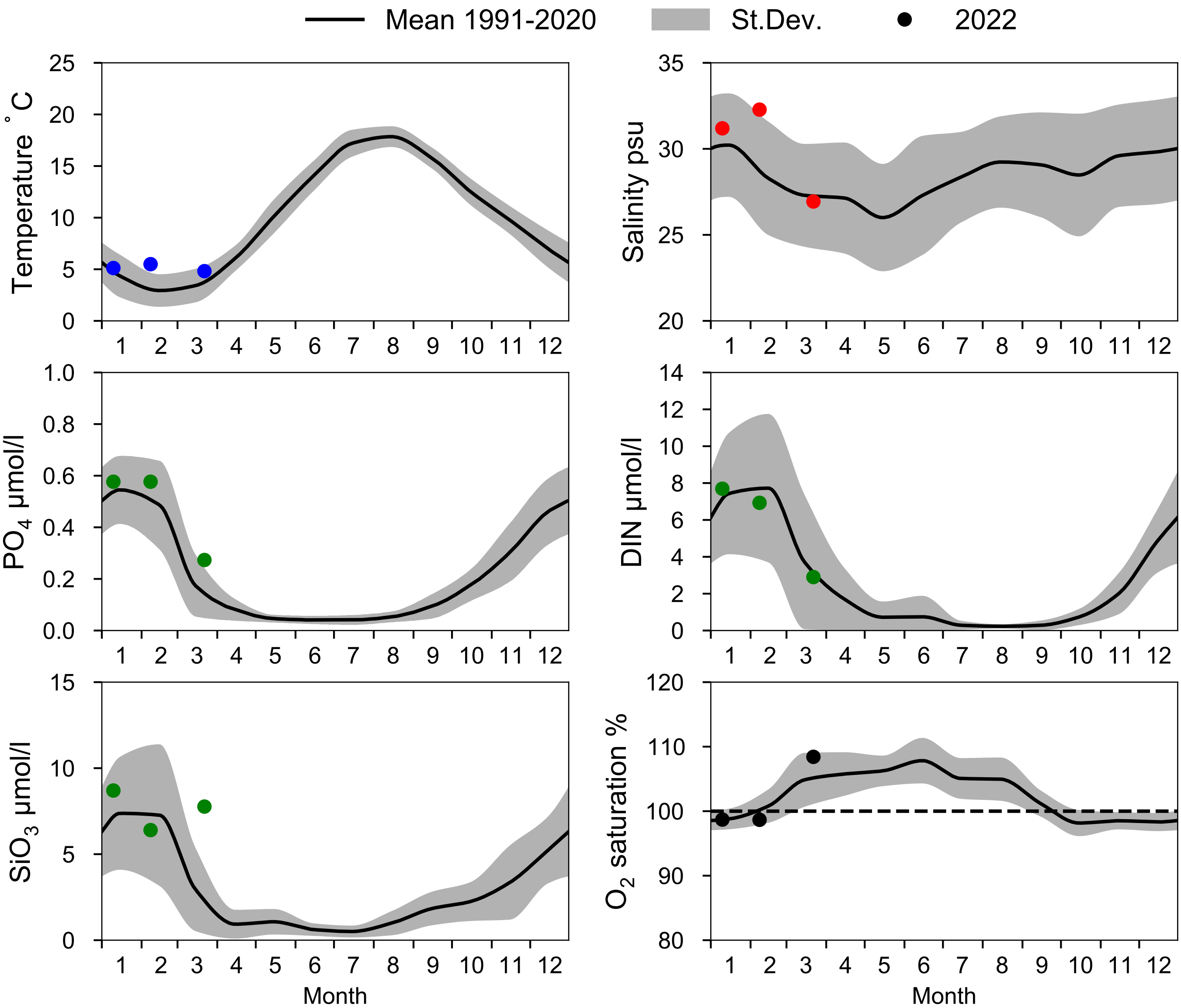


Vertical profiles Å17
March

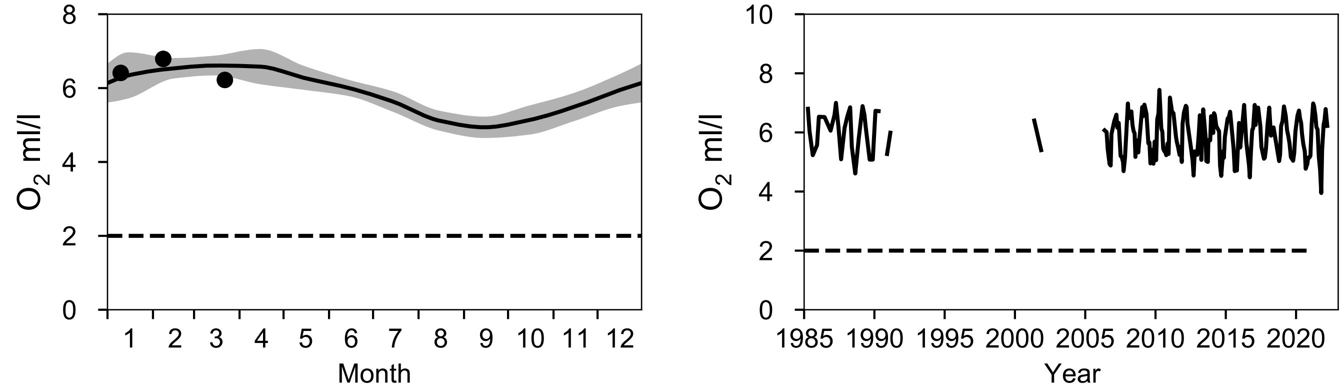


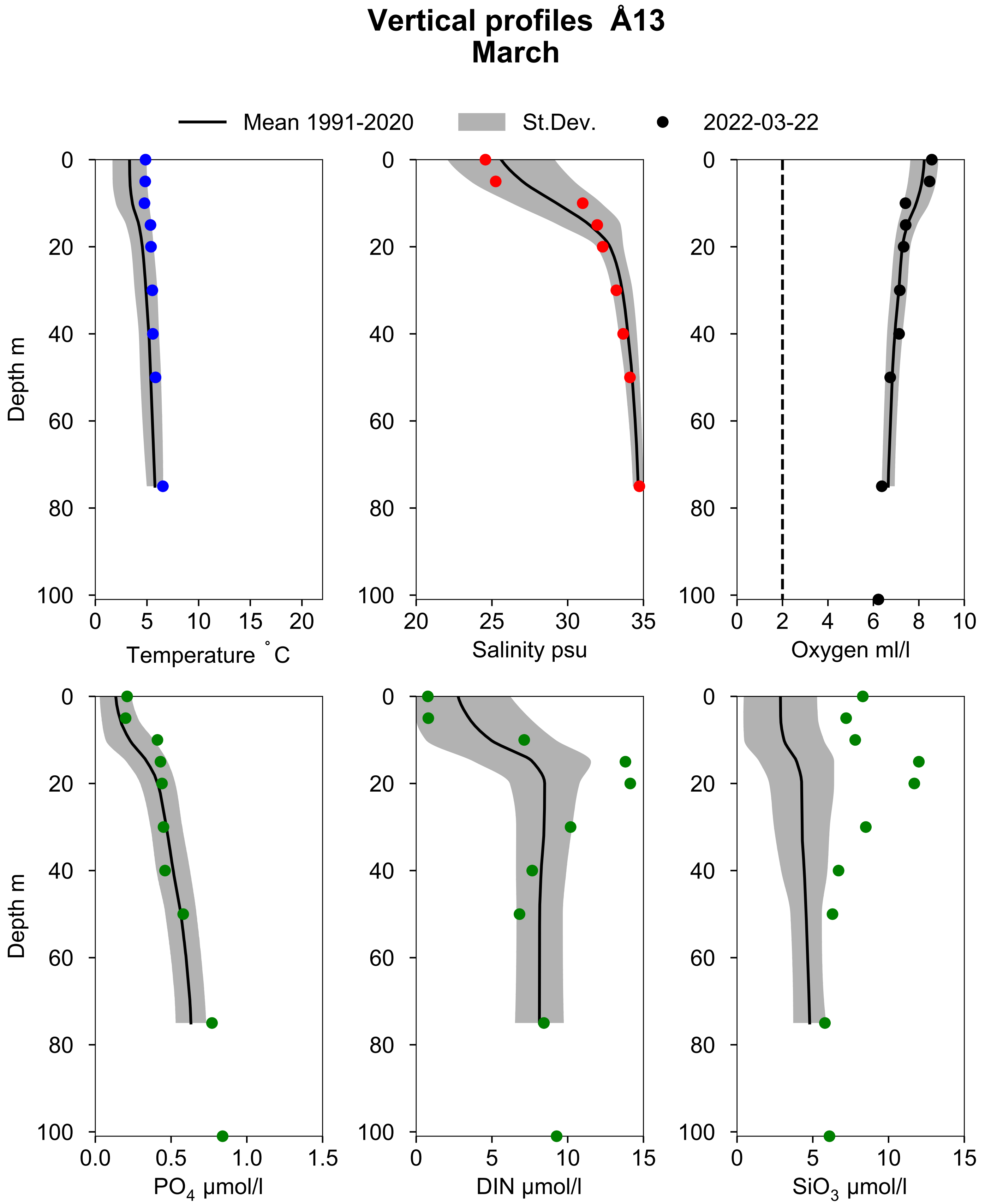
STATION Å13 SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 82 m)

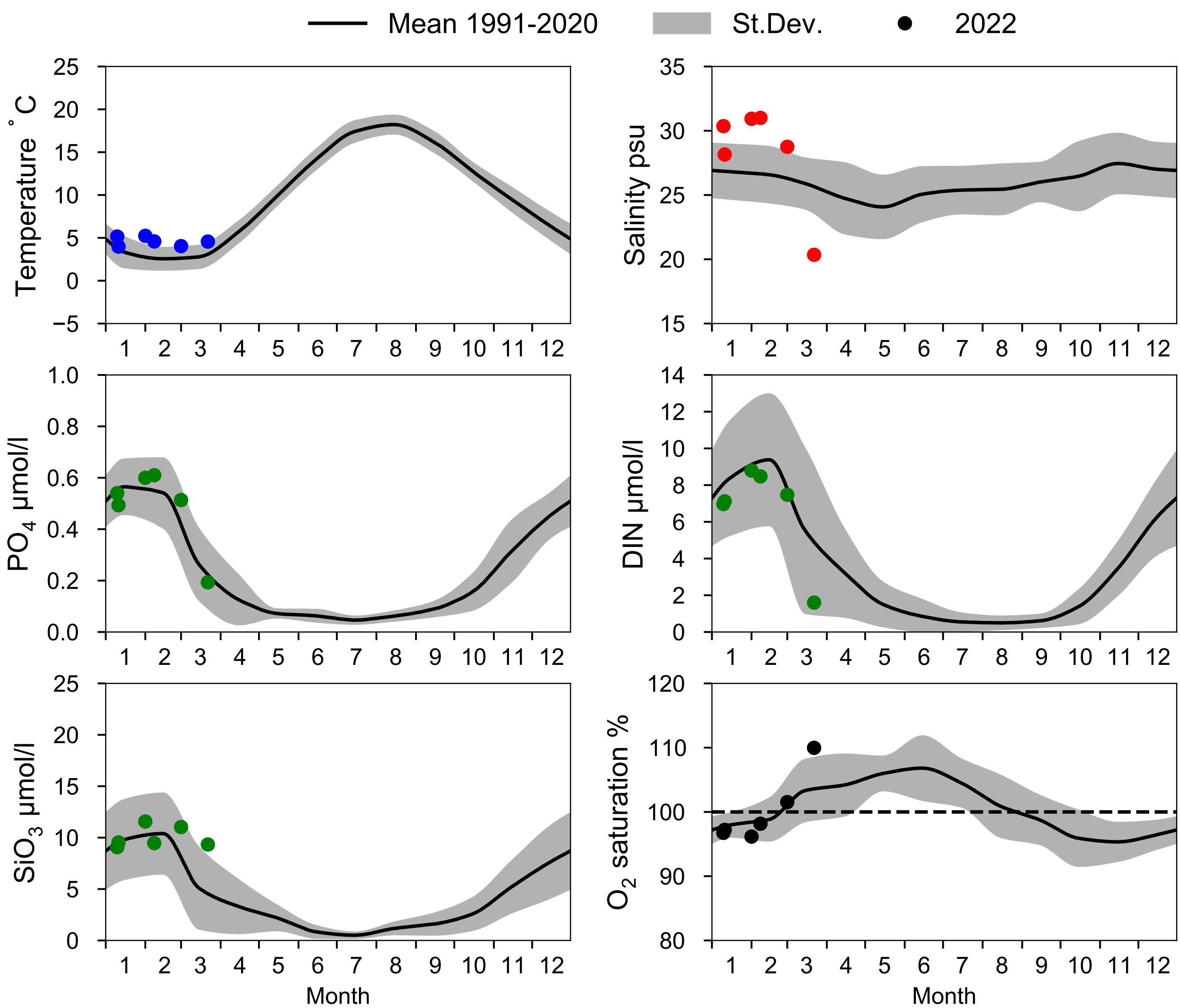




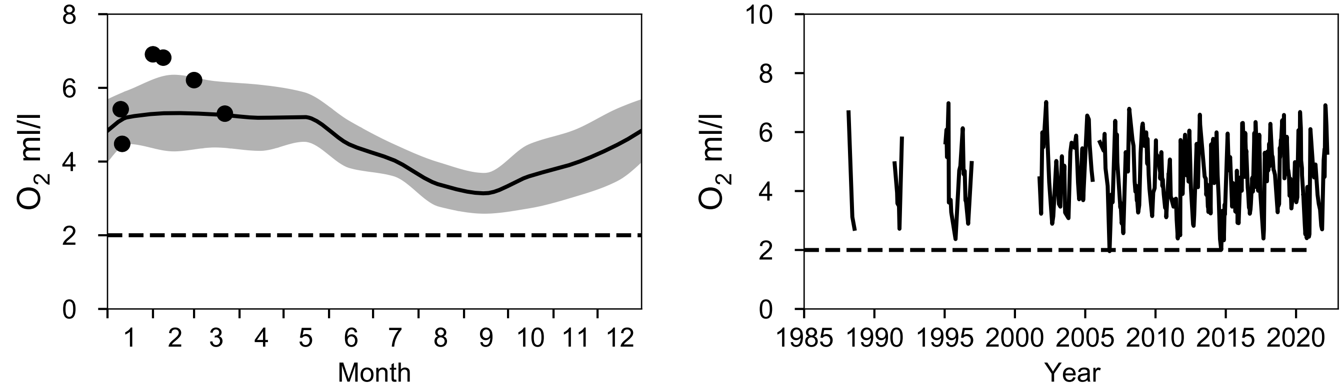
Vertical profiles Å13
March
Mean 1991-2020
St.Dev.
2022-03-22
Depth m
Temperature °C
Salinity psu
Oxygen ml/l
PO4 µmol/l
DIN µmol/l
SiO3 µmol/l

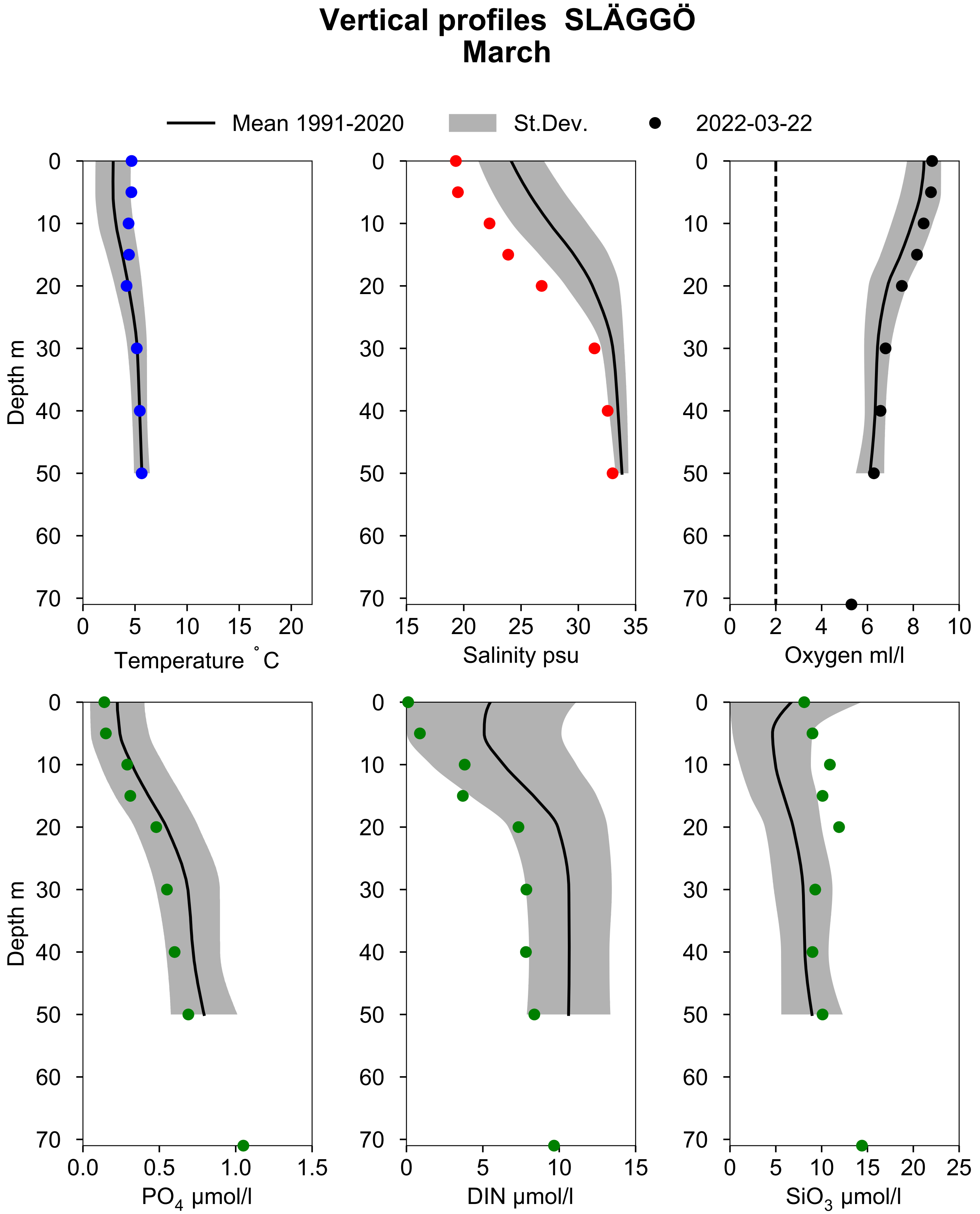
STATION SLÄGGÖ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)




Vertical profiles SLÄGGÖ
March
Mean 1991-2020
St.Dev.
2022-03-22
Depth m
Temperature ˚C
Salinity psu
Oxygen ml/l
PO_4 µmol/l
DIN µmol/l
SiO_3 µmol/l