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2022-10-14
Dnr: S/Gbg-2022-123

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

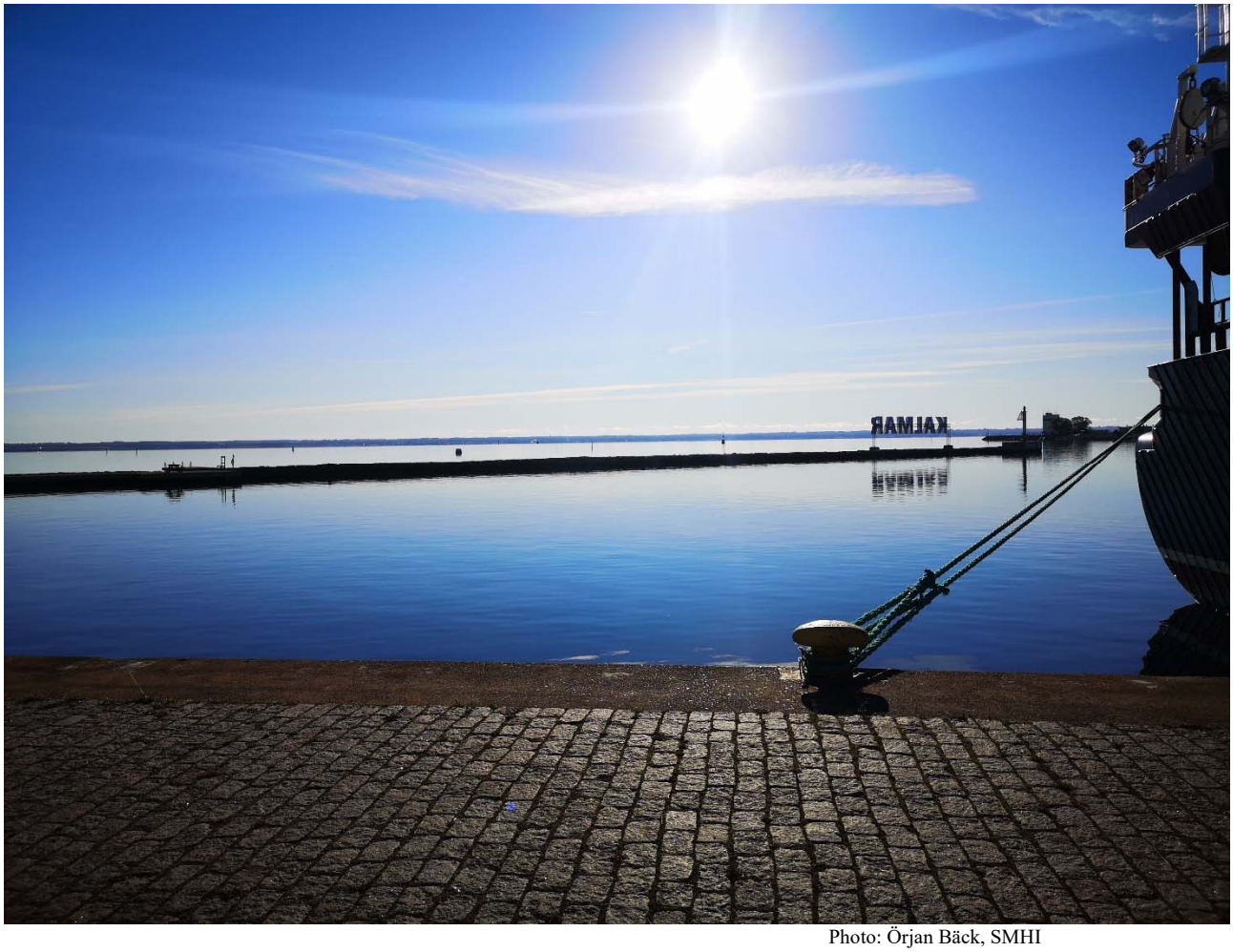

Photo: Örjan Bäck, SMHI

Sunny and calm morning in Kalmar after the end of the expedition, a contrast to the windy conditions at sea during the past week.

Survey period: 2022-09-16 to 2022-09-22

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

The Skagerrak, the Kattegat, The Sound and the Baltic Proper was visited during this cruise, which is part of the national marine monitoring programme of Sweden.

The temperature in the surface water was normal and varied between 15 and 17 degrees Celsius in all visited areas. The surface salinity was lower than normal at the outermost stations in the Skagerrak and somewhat higher than normal in the Sound and in the Eastern Gotland Basin.

The halocline in the Kattegat was shallower than normal and the salinity below the halocline was somewhat higher than the monthly mean. At station BY38, between Öland and Gotland, the stratification was instead deeper than normal and the oxygen did not reach zero until at around 85 metres depth.

The nutrient concentration was overall at normal levels for the season. In the surface water in the Western Gotland Basin somewhat elevated concentrations of dissolved inorganic nitrogen (DIN) were measured, probably because of earlier occasions of upwelling; https://www.smhi.se/en/theme/upwelling-1.12275.
Higher than normal concentrations of DIN were also encountered in the Gotland Basins below 100 metres depth, also at the bottom in the Bornholm Basin.

The oxygen condition in the Skagerrak and the Kattegat was good, values higher than normal was measured at the bottom in the Kattegat. In the Arkona Basin oxygen concentrations higher than normal were also present closest to the bottom, in the rest of the Baltic Proper the oxygen condition is very poor, with hydrogen sulphide concentrations closest to the bottom at, or close to, record high values.

SMHI's next cruise with R/V Svea is planned for 19th to 24th of October, starting in Kalmar and ending in Lysekil.

RESULTS

The cruise was performed onboard R/V Svea and began in Lysekil on September 16th and ended in Kalmar the 22nd.

The weather varied but with continuous northerly winds. During the second half of the expedition the wind speed increased during the passage through the Eastern Gotland Basin and the sampling became harder, as an example the zooplankton sampling had to be cancelled at BY15 Gotlandsdjupet. The air temperature was around 17 degrees Celsius on the west coast at the start of the expedition but decreased gradually to around 12 degrees Celsius at the last day of the expedition.

Two guests from the World Wide Fund for Nature (WWF) participated during the first two days of the expedition to learn more about R/V Svea and what we do during our expeditions. There where fruitful conversations for everybody.

There was also another guest, a Post Doc from Umeå University that participated on the entire expedition. She measured light parameters a few meters down in the water column and took water samples for further analysis.

Measurements with Svea's MVP (Moving Vessel Profiler) which is used to measure temperature, salinity and oxygen profiles underway, could not be used at all due to lack of regular ship technician, hopefully the MVP can be used on future cruises.

Both of Svea's ADCPs (current measurement) were running during the expedition. The Ferrybox (continuous measurements at a depth of 4 meters) only ran during a limited time, mainly due to lack of regular staffing.

The bottom measurement rig at station P22 outside Kullen north of the Sound was recovered and a new one was deployed on behalf of the County Administrative Board of Skåne.

In addition to the regular sampling we also took extra phytoplankton samples for Stockholm University at three stations on the west coast. This extra sampling continues until February 2023.

Reference measurements of current was made with the Ship mounted ADCPs east of Gotska Sandön where the CABLE project measure currents with bottom mounted ADCPs. Both a stationary measurement as well as a transect over several instrument positions were performed.

A reference sampling was also made with the CTD close to the ocean buoy at Huvudskär Ost to be used to validate buoy data.

The station Hanöbukten was cancelled due to a misunderstanding of the route plans, actions have been taken to prevent it from happening again.

This report is based on data that has undergone an initial quality control. When additional quality control has been performed, certain values may change. Data from this cruise is published as soon as possible on the data host's website, this usually takes place within a week after the cruise has ended. Some analyses are made after the cruise and are published later.
Data can be downloaded from SHARKweb here: https://www.smhi.se/en/services/open-data/national-archive-for-oceanographic-data/download-data-1.153150

The Skagerrak

The temperature in the surface water was around 16 °C, somewhat higher at the coastal station Släggö; about 17 °C. The salinity varied from as low as around 22 psu in the surface at Släggö in Gullmarsfjorden up to barely 32 psu at most at P2. At the Å-stations there was a shallow layer of low saline water down to about 10 metres where a strong stratification was found, a halocline. Highest salinity in the surface, and hence weakest stratification, was found at Å13 closest to the coast, at Å15 to Å17 the stratification was stronger with a lower salinity in the surface (the values at the surface were a fair bit lower than the season mean). Usually it is the other way around, with increasing salinity further from the coast. The halocline at Släggö was very shallow, less than 5 metres deep, which is shallower than normal in September.

The concentration of inorganic nutrients, nitrogen (DIN[1]) and phosphorus (DIP[2]), in the surface water was still low, the nitrogen was fully consumed in the surface which is normal for September. Below the stratification all nutrient concentrations increased, at Å15 higher concentrations of phosphate and DIN than normal was found between 30 and 100 metres, at Å13 the concentrations were somewhat higher than normal between 15 and 50 metres, otherwise normal values for the season where measured. The highest nutrient concentrations were observed at the coastal station Släggö.

The oxygen conditions at the bottom were good along the Å transect and at P2 with concentrations between 5.1 to 5.8 ml/l. The lowest dissolved oxygen concentration was observed at Släggö; 3.4ml/l which is within normal for the station and season.

Chlorophyll fluorescence is a measure of plankton activity measured with a sensor mounted on the CTD[3]. No really large peaks in chlorophyll fluorescence was observed but some plankton presence was noted between the surface and 30 metres, usually highest around the halocline. At Släggö the Secchi depth was 9 metres and at Å13 12 metres.

The Kattegat and the Sound

The temperature in the surface water was around 16 °C in the entire area. The surface layer was well mixed with a homogenous water mass down to the halocline which was observed at around 5 metres depth in the north at Fladen, at 5 to 10 metres at N14 Falkenberg and Anholt E and at just over 10 metres in the Sound. The salinity in the surface was at most just over 22 psu in the north, lowest values were found in the south with just over 18 psu, which is higher than normal. The halocline in the Kattegat was shallower than normal and the salinity below the halocline was some somewhat higher than the monthly mean.

There were still very low concentrations of nutrients in the surface water which is normal for this time of year. The DIN concentrations in the surface layer were lower than the reporting limit at 0.1 µmol/l in the Kattegat, in the Sound the concentration varied between 0.3 to 0.6 µmol/l. The phosphate concentrations were just below 0.1 µmol/l in the Kattegat surface water and just above in the Sound. The silicate concentration in the surface water varied in the Kattegat between 1 to 2 µmol/l and in the Sound between 4 to 6 µmol/l. Most values were within what is normal for September. Since the stratification was shallower than normal and the fact that nutrient

[1] DIN - dissolved inorganic nitrogen, the sum of nitrate, nitrite and ammonium.
[2] DIP – dissolved inorganic phosphorus, only appears in the form of phosphate.
[3] CTD is a profiling instrument and is an abbreviation of Conductivity, Temperature and Depth. SMHI's CTD is also equipped with sensors that measure dissolved oxygen and fluorescence among others.

concentrations increase below the stratification meant that values just below the stratification were just over what is normal.

The dissolved oxygen concentration in the bottom water was somewhat higher than normal for September in the entire Kattegat; 5 ml/l at Fladen in the north and just below 4 ml/l at Anholt E in the south. In the Sound the dissolved oxygen concentration was just over 2 ml/l between 15 to just over 50 metres, which is within normal.

Highest measurements of chlorophyll fluorescens were found around or just below the halocline at all stations in the Kattegat, however no really high values were noted. In the Sound low values of fluorescens were measured. The Secchi depth in the Kattegat was 9 metres at Anholt E and 7 metres at N14 Falkenberg.

The Baltic Proper

The temperature in the surface layer in the Baltic Proper was normal for the season, barely 17 °C around Bornholm and 15 to 16 °C at the rest of the stations, coldest in the northeast. The salinity varied from barely 8 psu in the surface layer around Bornholm to just over 6 psu as lowest in the north. The salinity was somewhat higher than normal in the well mixed upper layer in the Eastern Gotland Basin, otherwise mostly values within normal for the area.

The permanent halocline in the Baltic Proper was observed between 60 to 70 metres as usual, somewhat shallower around Bornholm. Deviating in September was BY38 Karslödjupet where strongest stratification together with dissolved oxygen concentration close to zero was observed at around 85 metres, compared to at 65 metres in August. Similar variations have been discovered earlier with MVP measurements between BY38 and BY32, probably caused by internal waves in the pycnocline in the Western Gotland Basin, possibly a standing wave, which causes the stratification to move up and down in depth, especially in the southern part of the basin at BY38. Beyond the permanent halocline in the Baltic Proper there was also a thermocline at around 30 metres around Bornholm and at 20 to 25 metres depth in the rest of the Baltic Proper. East and North of Gotland there was also a weak halocline in conjunction with the thermocline, strongest in the north.

The concentration of DIN was overall low above the halocline but within what's normal for the season. Values higher than normal was measured in the Western Gotland Basin and at the coastal station REF M1V1, probably caused by upwelling events that have brought up nutrients from underlying water masses. Below the permanent halocline nutrient concentrations increase, both in the Eastern and Western Gotland Basin DIN values higher than normal were found below 100 metres depth, values of DIP somewhat higher than normal were found below 100 metres depth in the Eastern Gotland Basin. Silicate values somewhat above normal were observed in the deep water in the Eastern and Western Gotland Basin. In the Bornholm Basin high values of DIN, DIP and silicate were observed closest to the bottom at BY5, partially also DIP and silicate at the bottom at BY4. In the Arkona Basin, normal or just below normal levels of DIN, DIP and silicate were measured in the deep water.

Dissolved oxygen concentrations higher than usual were observed close to the bottom in the Arkona Basin, otherwise the oxygen situation in the Baltic Proper was very serious with concentrations of hydrogen sulphide near the bottom at or near record high levels. In the water mass below the halocline there is oxygen deficiency, all stations with a depth > 80 metres have acute oxygen deficiency, O_2 < 2 ml/l, starting from 80 metres in the Western Gotland Basin and from 70 metres

in the other areas. Oxygen levels very close to zero or measured hydrogen sulphide were found from 90 metres and deeper in the Western Gotland Basin and from 80 metres in the other areas.

Fluorescence measurements with the CTD showed some plankton activity in the surface layer above the thermocline at all stations, very low values were measured below the thermocline. No major peaks in chlorophyll fluorescence were observed. The Secchi depth in the Baltic Proper between 6 and 8 meters in all sampled areas.

More information about the algal situation can be found in the Algaware report for August: https://www.smhi.se/publikationer/publikationer/algrapporter (only available in Swedish).

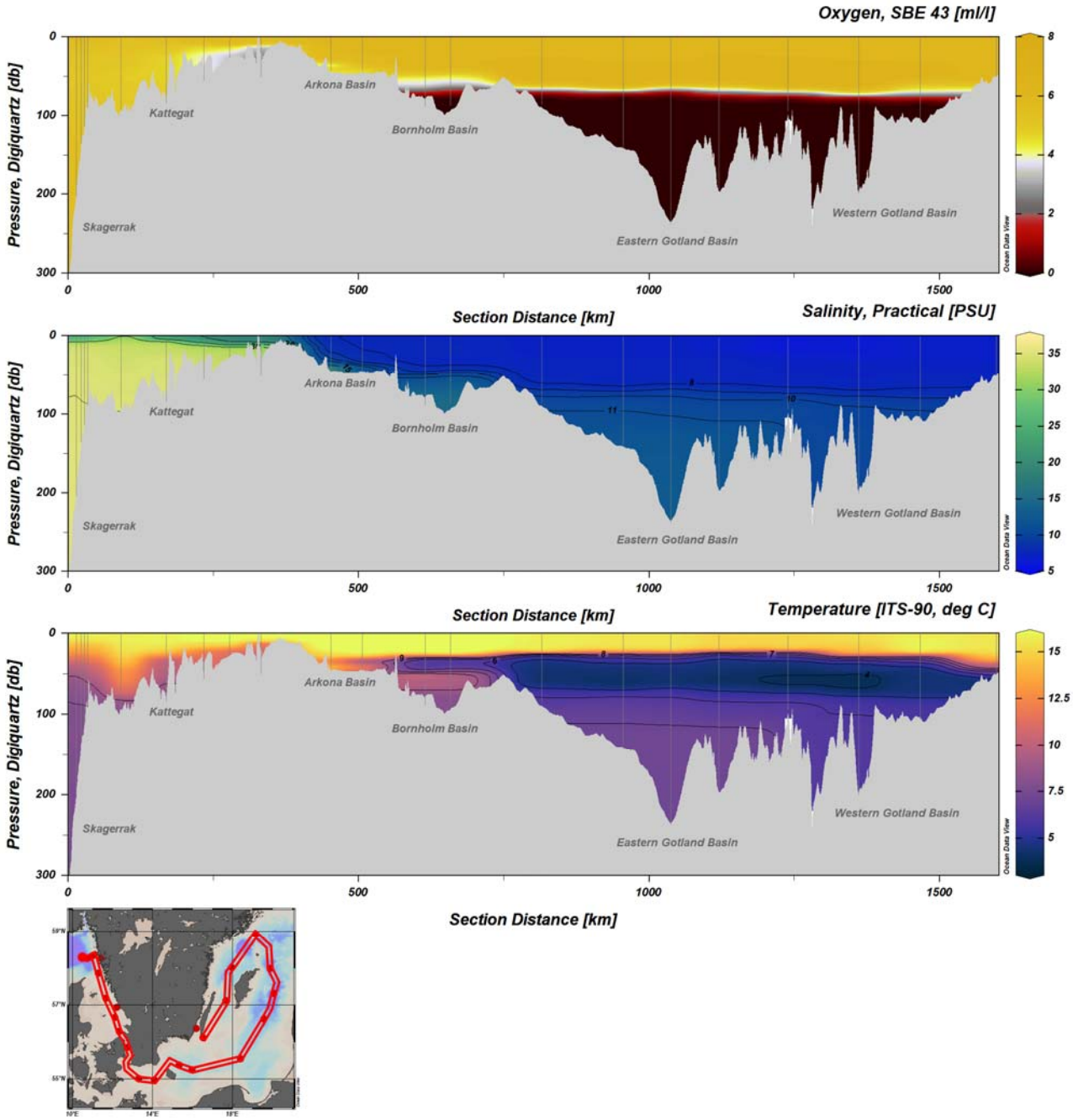


Figure 1. Transect showing CTD measurements of dissolved oxygen, salinity and temperature from Skagerrak, Kattegat, the Sound, further into the Baltic Proper, ending in the Western Gotland Basin. Vertical lines show the positions where data is collected, also shown in the map.

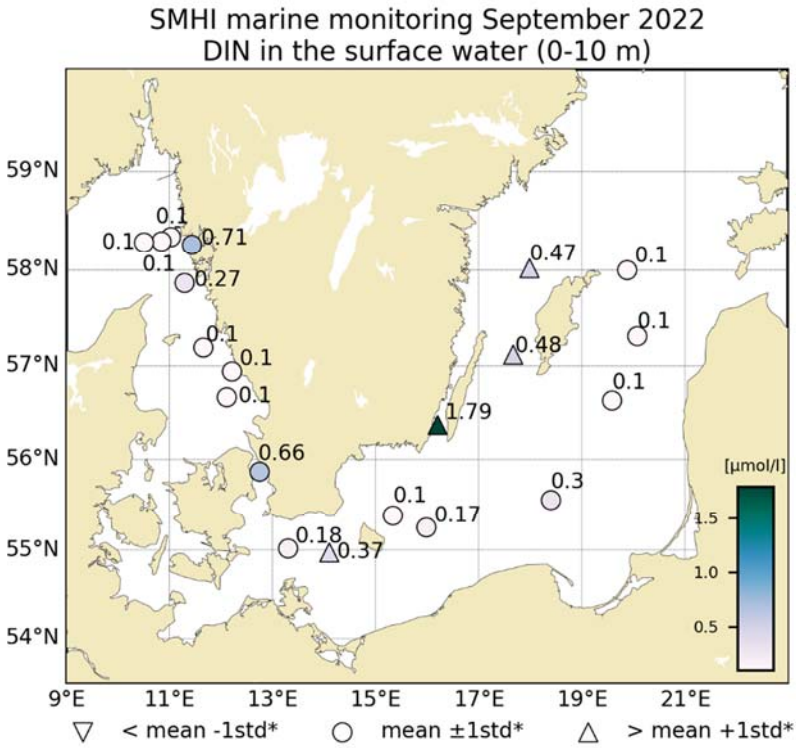


Figure 2. Concentration (µmol/l) of dissolved inorganic nitrogen in the surface water (0-10m).

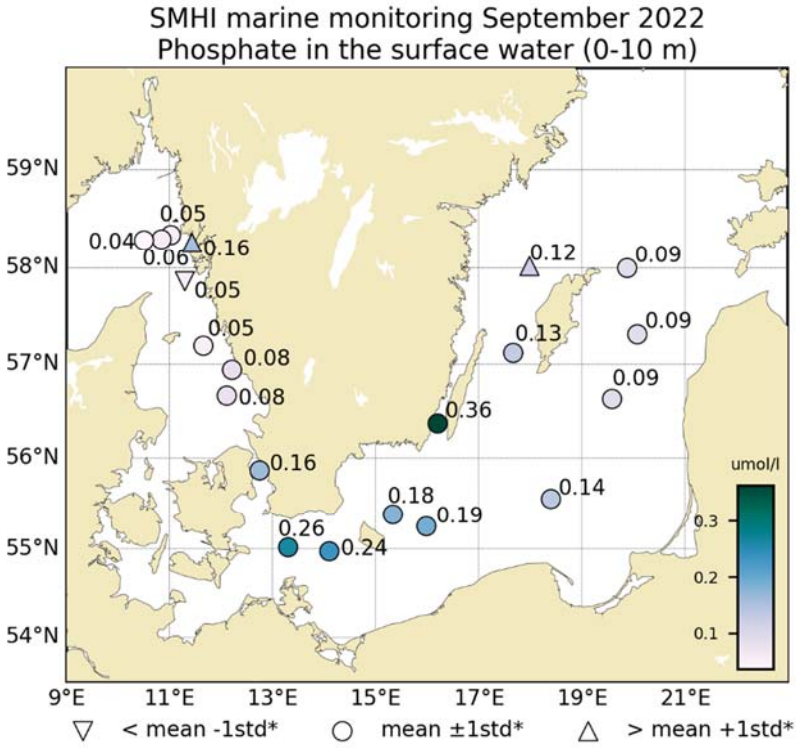


Figure 3. Concentration (µmol/l) of phosphate in the surface water (0-10m).

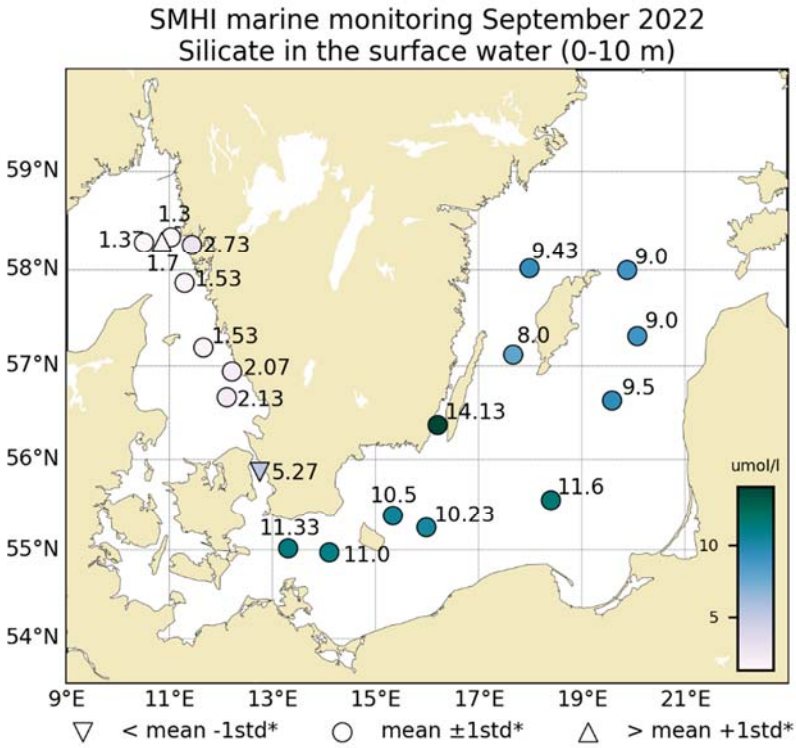


Figure 4. Concentration (µmol/l) of silicate in the surface water (0-10m).

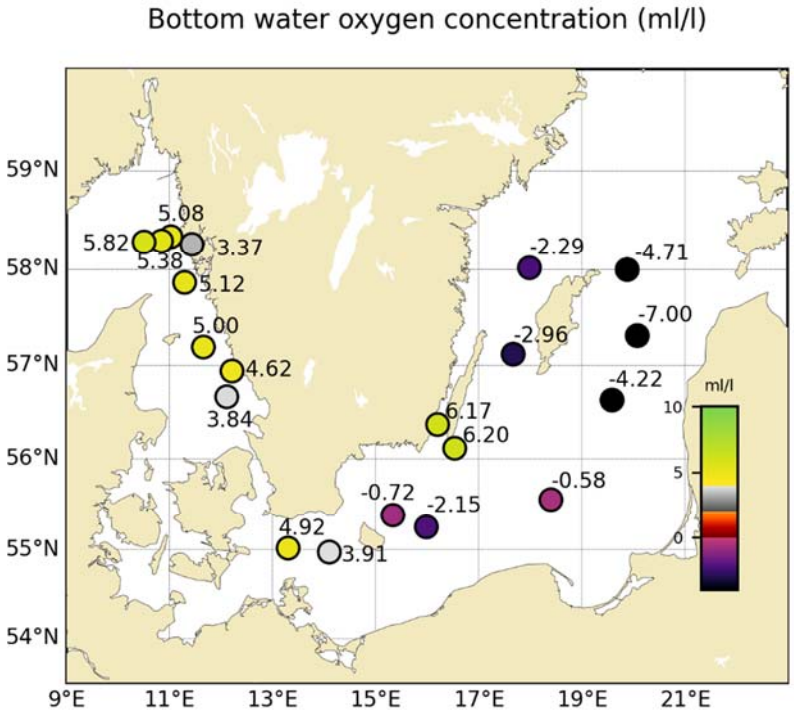


Figure 5. Oxygen concentration (ml/l) in the bottom water.

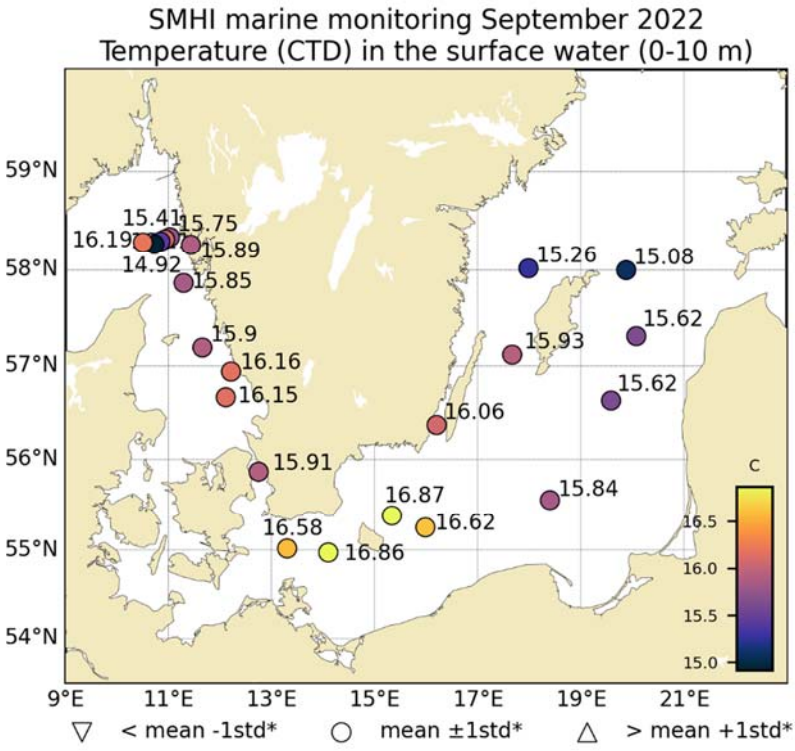


Figure 6. Temperature in the surface water (0-10m).

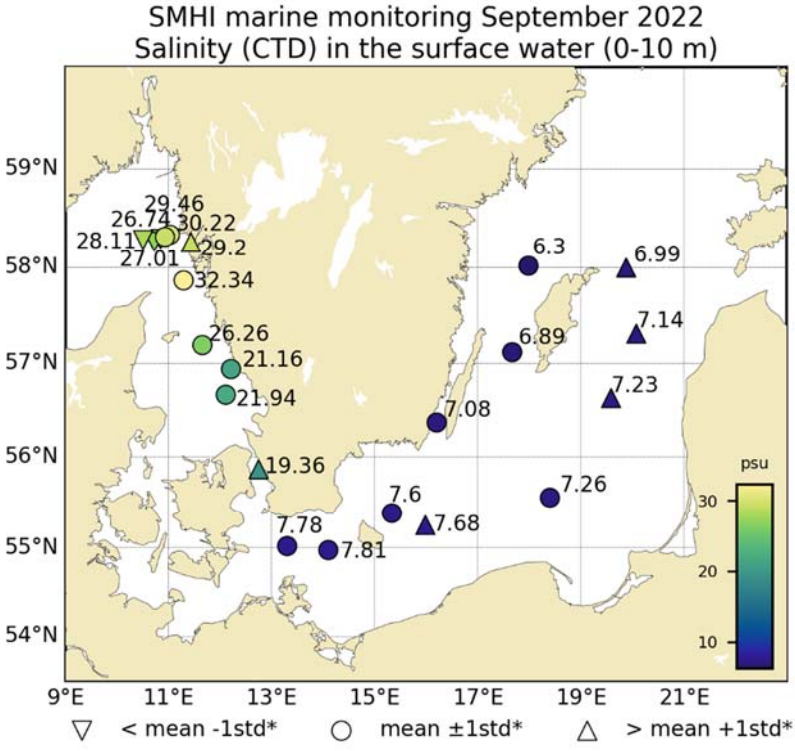


Figure 7. Salinity in the surface water (0-10m).

PARTICIPANTS

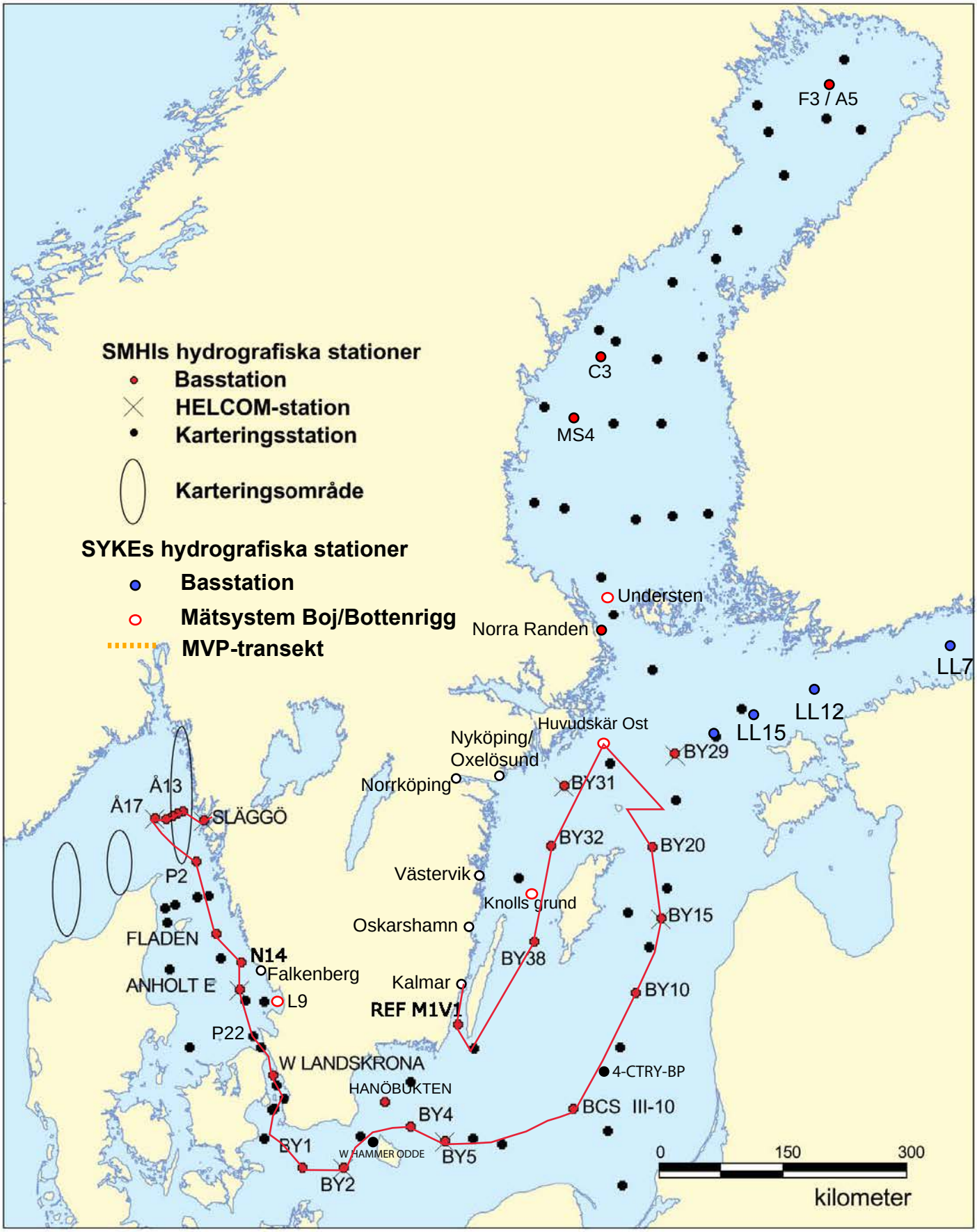
Namn	Role	Institute
Örjan Bäck	Chief scientist	SMHI
Sara Johansson	Quality manager	SMHI
Ola Kalén		SMHI
Johan Kronsell		SMHI
Sari Sipilä		SMHI
Helena Björnberg		SMHI
Inger Melander	Guest (Lysekil-Landskrona)	WWF
Inger Näslund	Guest (Lysekil-Landskrona)	WWF
Elizabeth Sands	Guest Post Doc	Umeå University

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

TRACKCHART
Country: Sweden
Ship: R/V Svea
Date: 20220712-18
Series:



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Time: 13:39

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 elac aove tueo hdsb	CZPP hohp loy apt o p	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
0833	16	FIBG27	BAS...	SLÄGGÖ	5815.57	01126.11	20220916	1050	74	8	34	5.7	14.6	992	1120	xxx-	9	9	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0834	16	SKEX14	BAS...	Å13	5820.33	01101.67	20220916	1400	90	7	33	10.2	16.8	994	1230	x---	10	10	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0835	16	SKEX15	BAS...	Å14	5818.97	01055.92	20220916	1515	110		32	10	17.0	944	2430	----	11	0	-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0836	16	SKEX16	BAS...	Å15	5817.67	01050.71	20220916	1620	135		34	11	16.3	995	3530	x---	12	12	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	x
0837	16	SKEX17	BAS...	Å16	5816.02	01043.49	20220916	1740	202		35	8	16.2	995	9990	----	13	0	-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0838	16	SKEX18	BAS...	Å17	5817.07	01030.35	20220916	1910	340		31	7	15.6	996	9990	xxx-	15	15	x	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	x
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0840	16	KANX25	BAS...	FLADEN	5711.57	01139.44	20220917	0532	84		36	11	13.7	998	0020	x---	13	13	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0841	16	KANX50	BAS...	N14 FALKENBERG	5656.42	01212.76	20220917	0840	30	7	34	6	12.4	919	1220	xxx-	7	7	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
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0843	16	KAEX00	EXT...	P22	5617.32	01220.10	20220917	1530	26		32	9.8	15.4	999	0020	----	6		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0844	16	SOCX39	BAS...	W LANDSKRONA	5551.99	01244.88	20220917	1832	50		30	5.3	14.8	1000	9999	x---	9	9	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0845	16	BPSA02	BAS...	BY1	5500.93	01318.08	20220918	0210	47		29	8	14.1	1000	9990	x---	8	8	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0846	16	BPSA03	BAS...	BY2 ARKONA	5458.24	01406.02	20220918	0606	47	8	27	5.4	14.0	999	2720	xxx-	8	8	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	x	-	-
0847	16	BPSB06	BAS...	BY4 CHRISTIANSÖ	5522.95	01520.05	20220918	1300	94	6	30	4.8	14.1	1000	2820	x--x	12	12	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	-
0848	16	BPSB07	BAS...	BY5 BORNHOLMSDJ	5515	01559.03	20220918	1700	91		23	5	13.4	1001	2420	xxx-	12	12	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-
0849	16	BPSE11	BAS...	BCS III-10	5533.29	01824.03	20220919	0205	90		01	8.5	14.5	1000	9990	x---	12	12	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	-	-
0850	16	BPEX13	BAS...	BY10	5637.96	01935.16	20220919	1100	147	8	34	14	13.5	1000	2640	x--x	15	15	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	-
0851	16	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.72	02004.57	20220919	1600	249		32	14.2	13.8	1002	2740	x-x-	24	24	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-
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0853	16	BPNX00	BAS...	HUVUDSKÄR	5855.62	01909.79	20220920	1110	98		34	13.7	11.8	1012	2750	----	12		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
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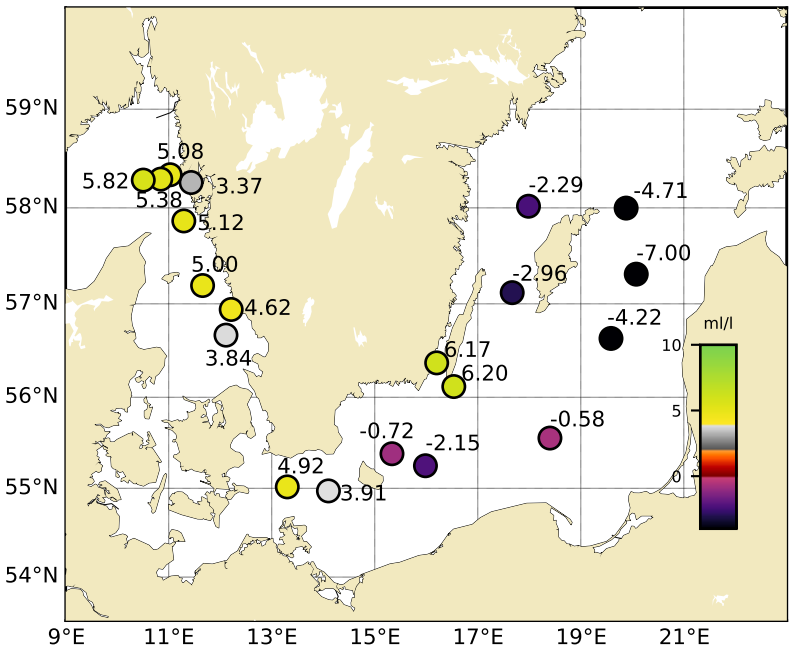
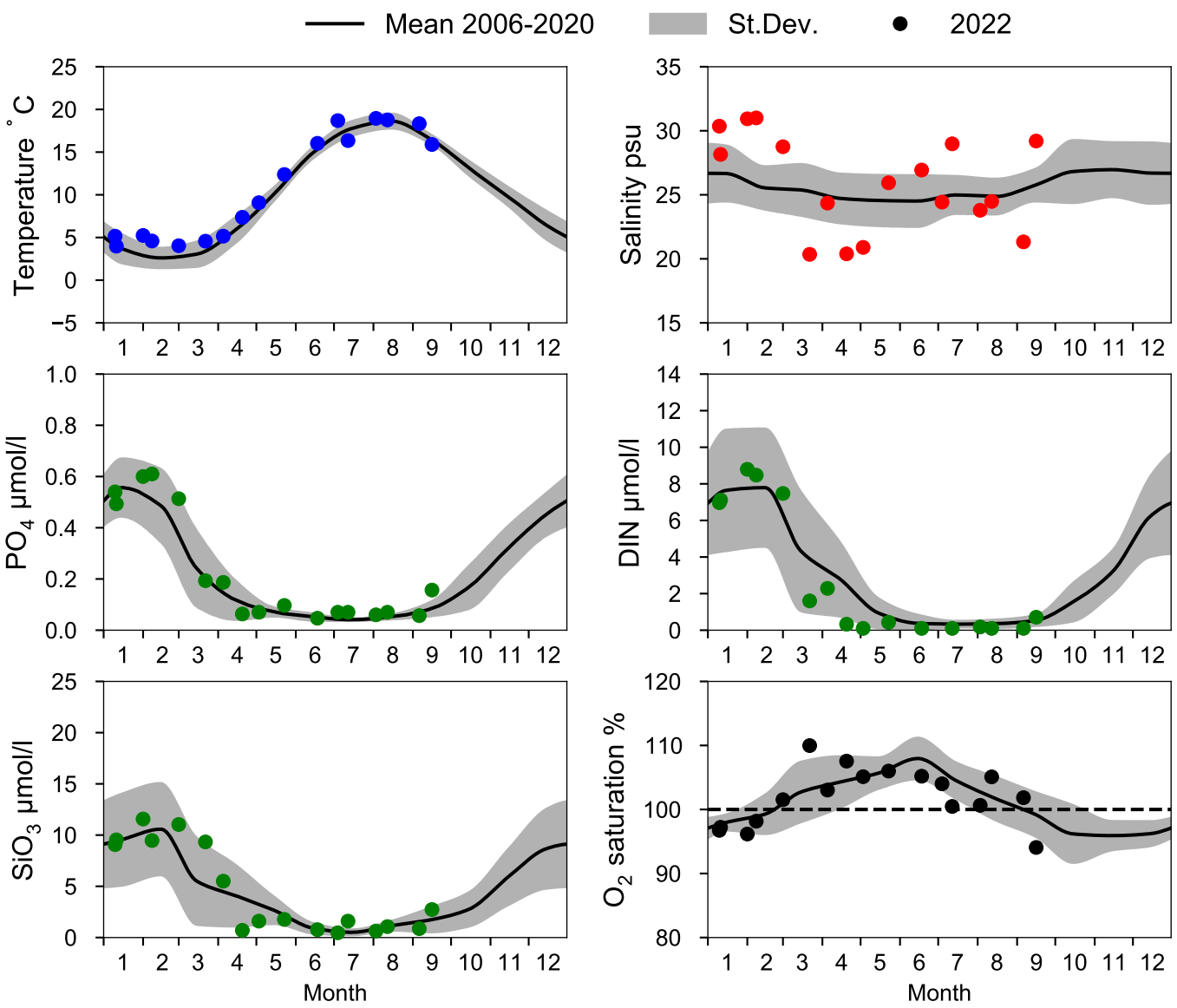
0856	16	BPSE49	BAS...	BY39 ÖLANDS S UDDE	5606.96	01632.06	20220921	0745	50	6	36	8	11.7	1022	1220	x---	8	8	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0857	16	BPWK01	BAS...	REF M1V1	5622.26	01612.11	20220921	1034	21	8	02	6	12.6	1023	1120	xxx-	5	5	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-

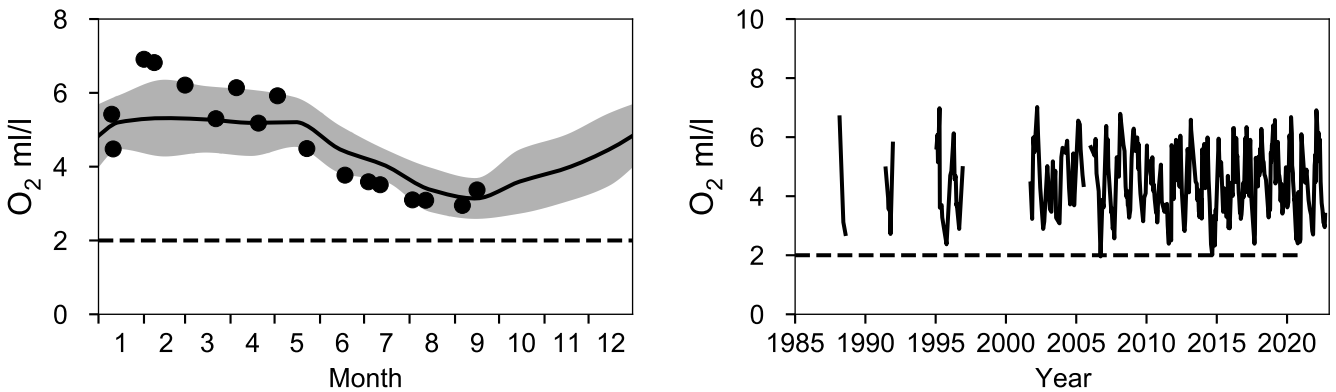

Bottom water oxygen concentration (ml/l)
59°N
58°N
57°N
56°N
55°N
54°N
9°E
11°E
13°E
15°E
17°E
19°E
21°E
5.08
5.82
3.37
5.38
5.12
5.00
4.62
3.84
-2.29
-4.71
-7.00
-2.96
-4.22
6.17
6.20
-0.58
-0.72
-2.15
4.92
3.91
ml/l
10
5
0

STATION SLÄGGÖ SURFACE WATER (0-10 m)

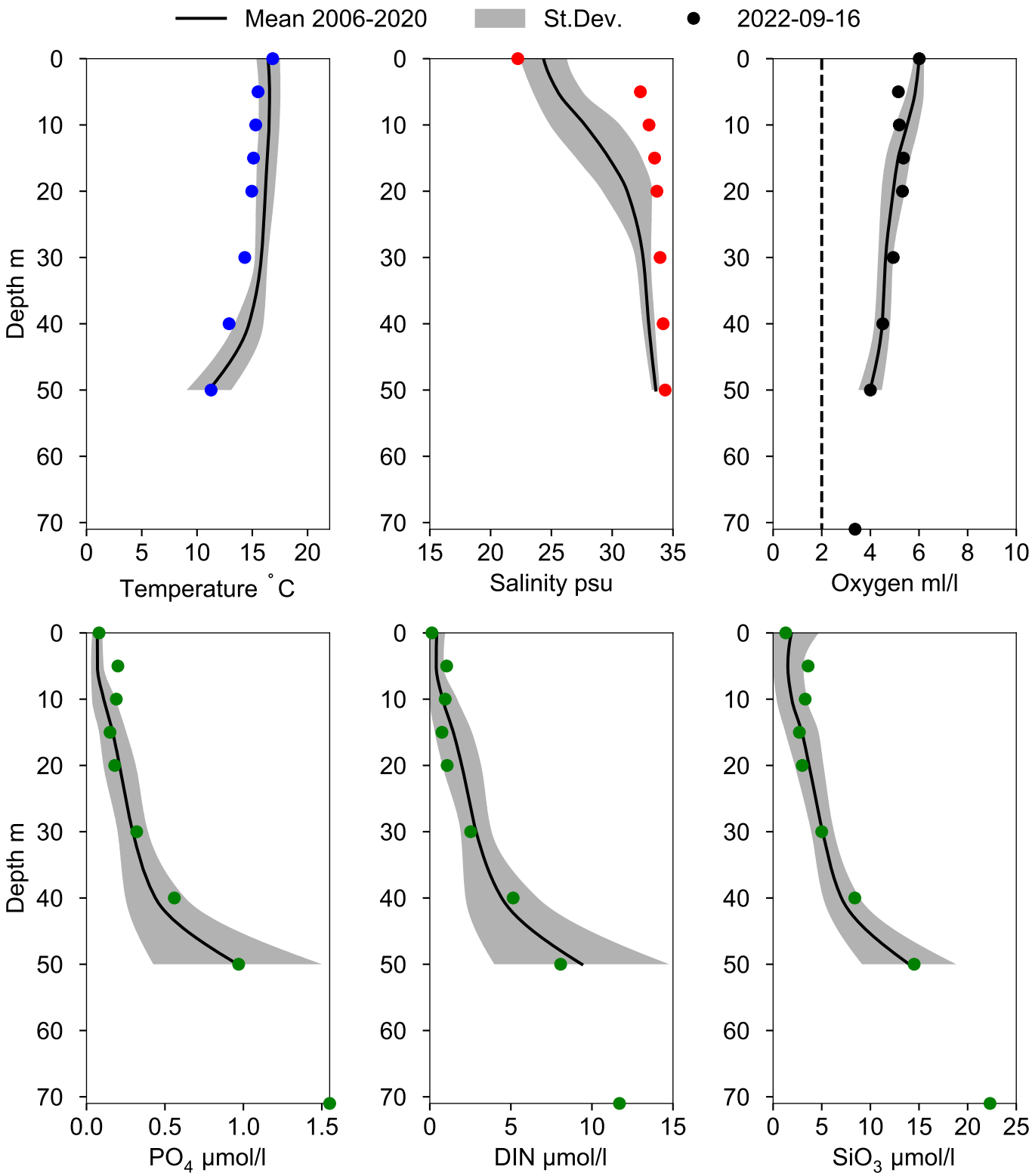
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)

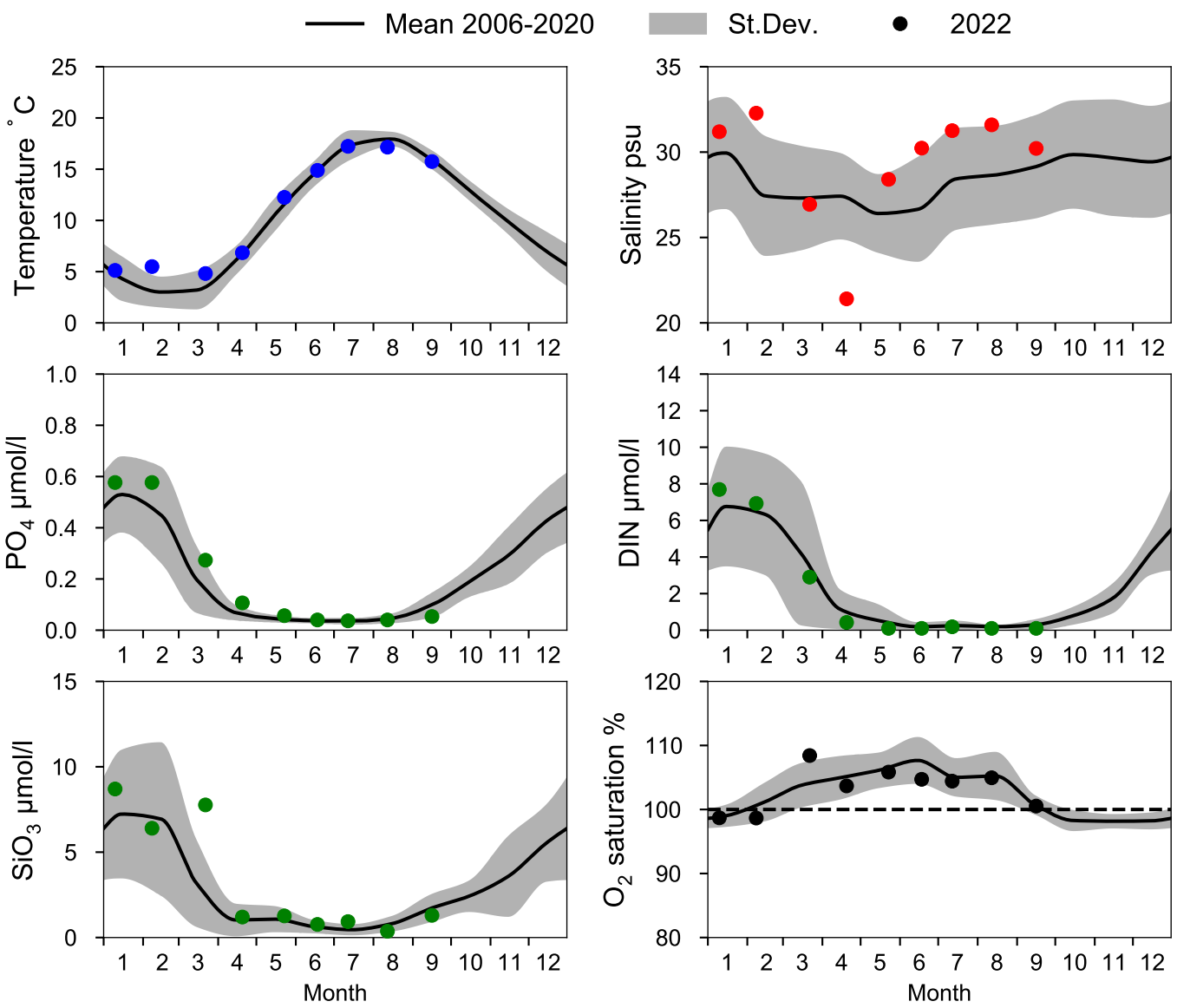


Vertical profiles SLÄGGÖ
September

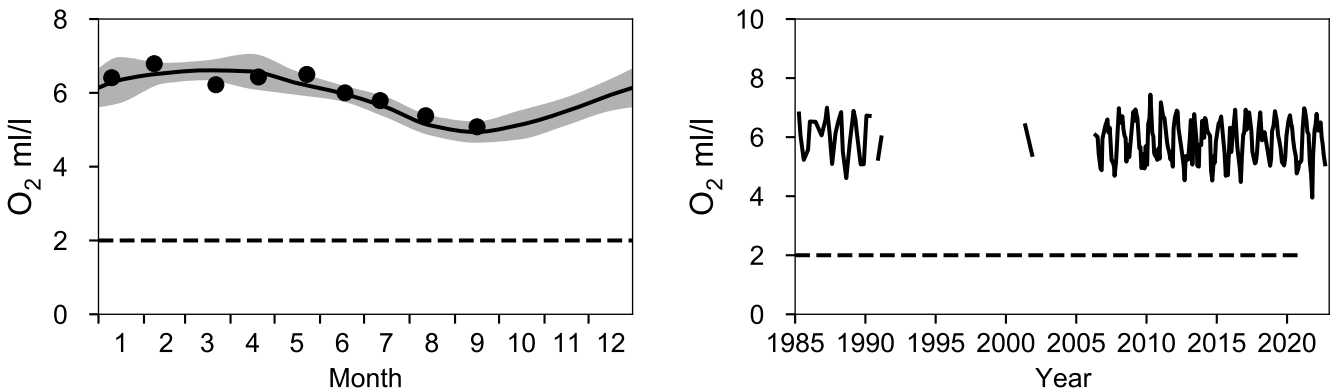


STATION Å13 SURFACE WATER (0-10 m)

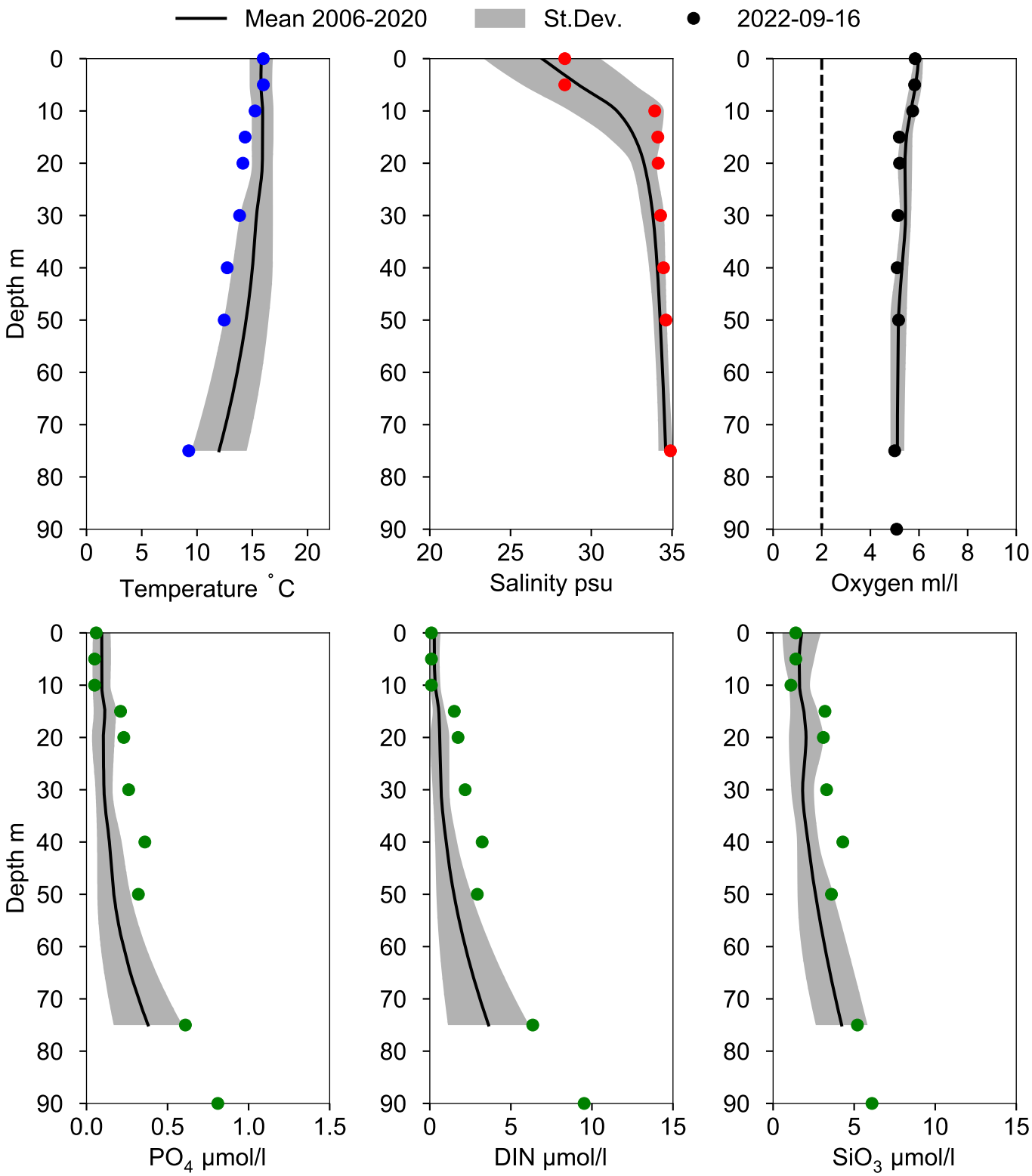
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 82 m)

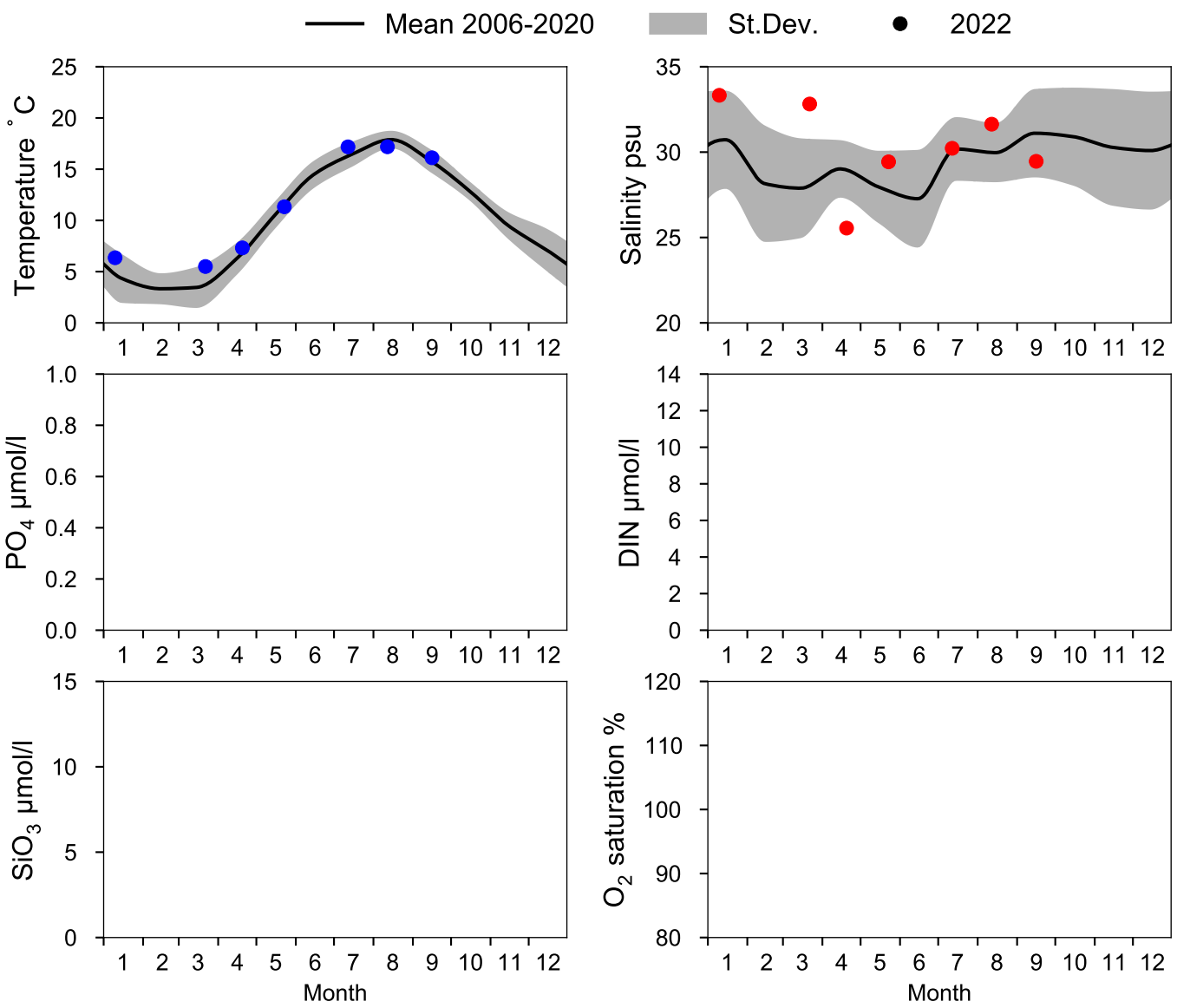


Vertical profiles Å13
September

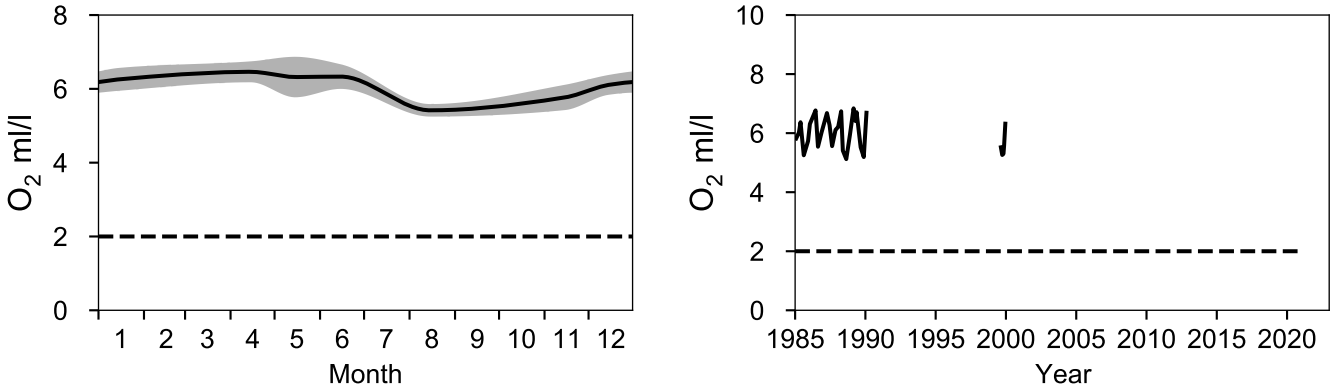


STATION Å14 SURFACE WATER (0-10 m)

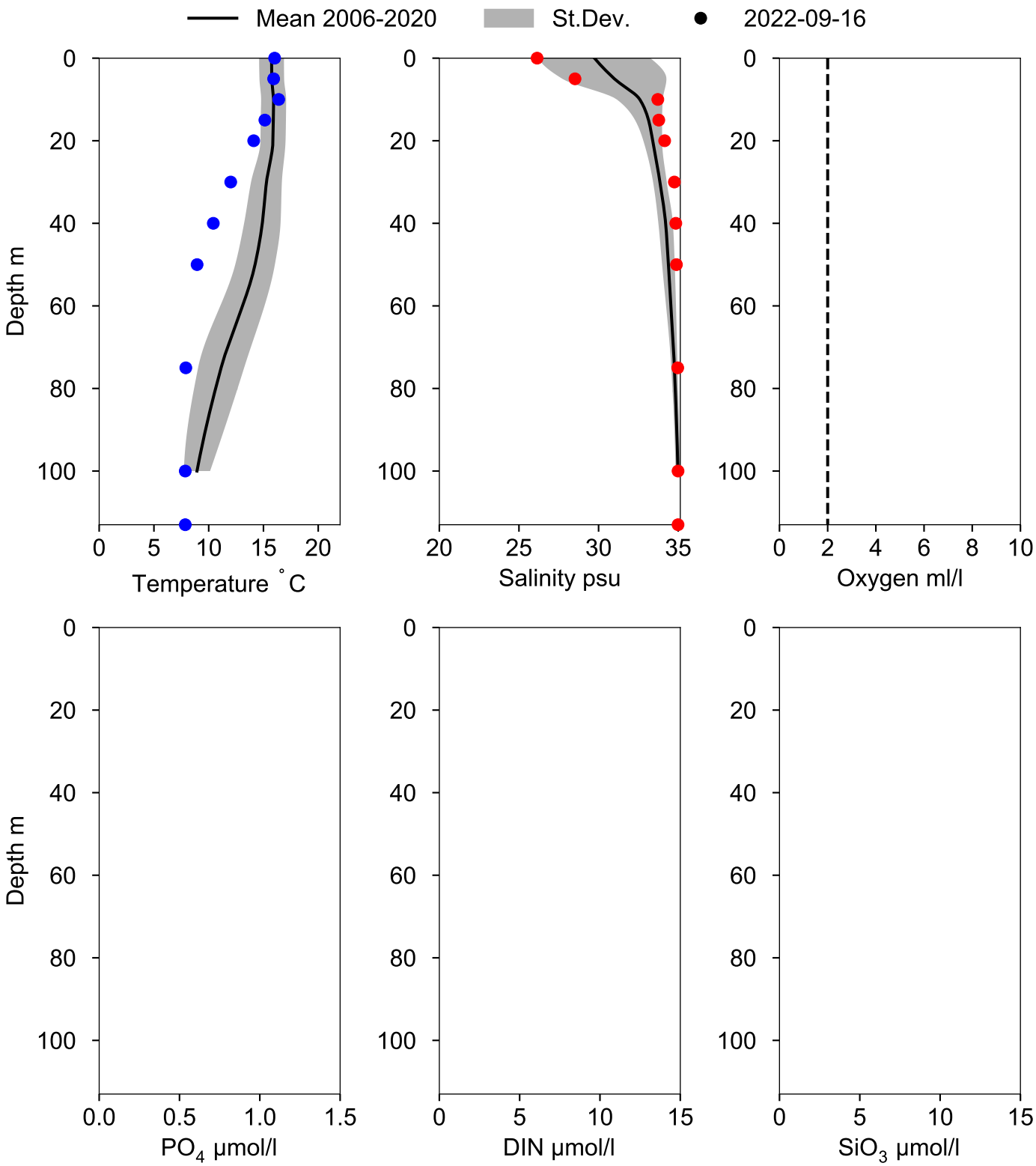
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

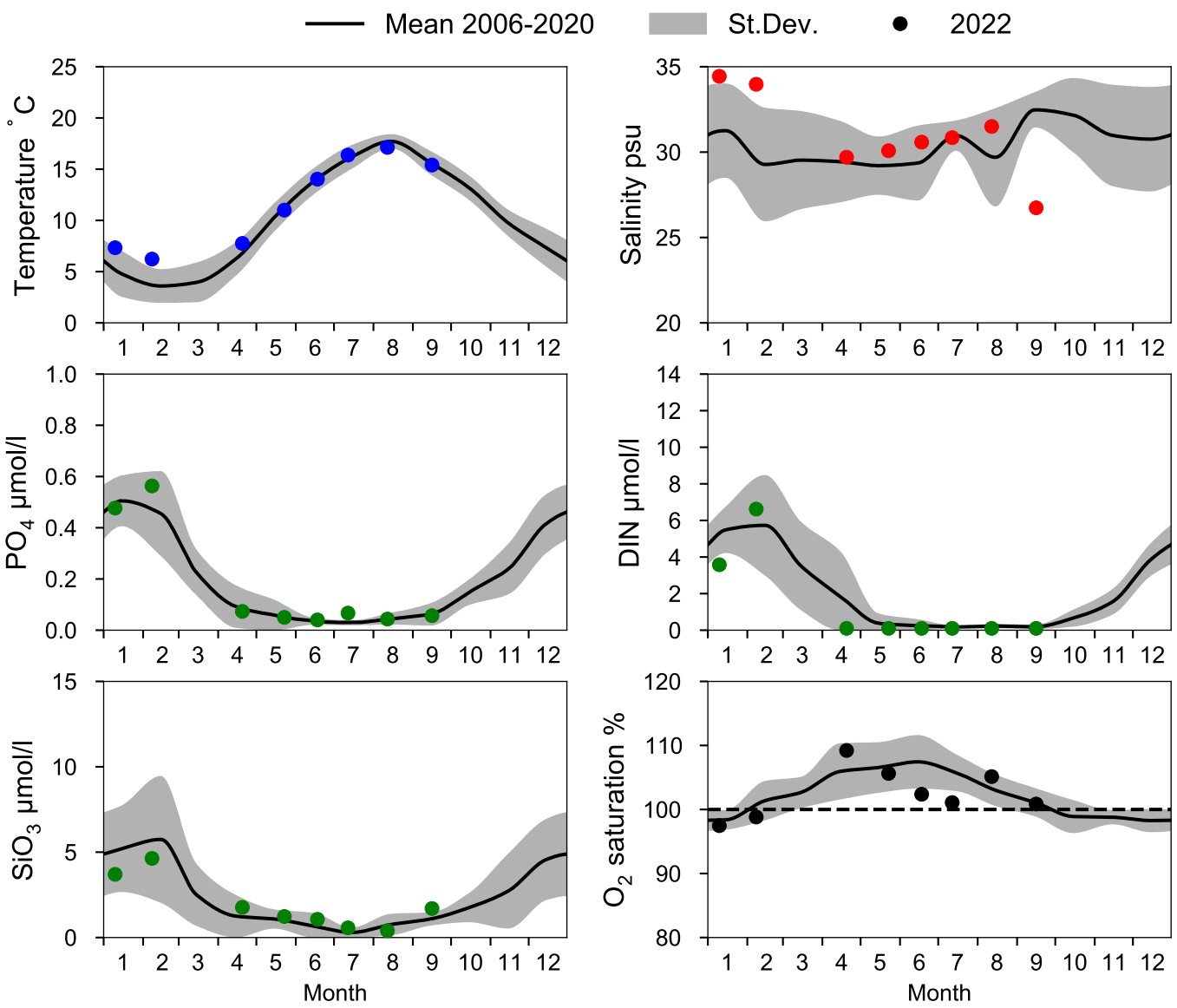


Vertical profiles Å14
September

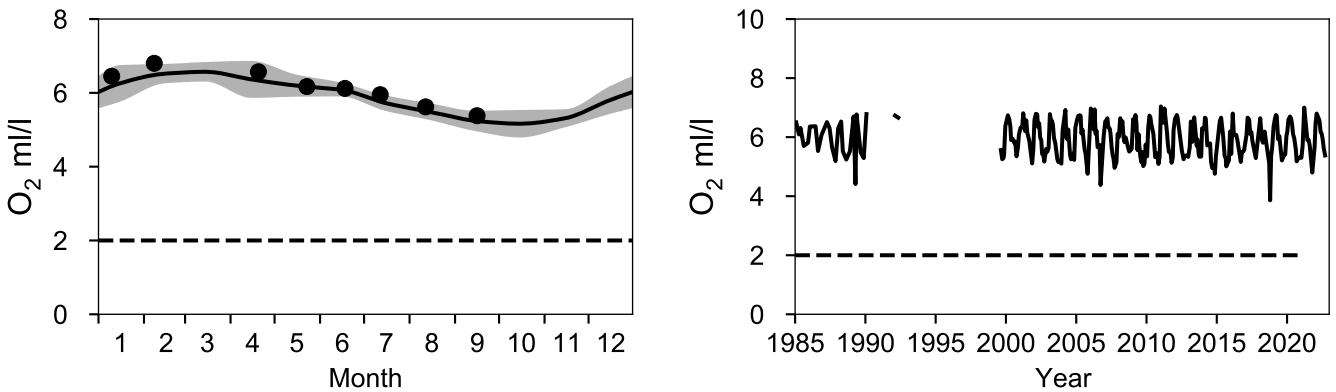


STATION Å15 SURFACE WATER (0-10 m)

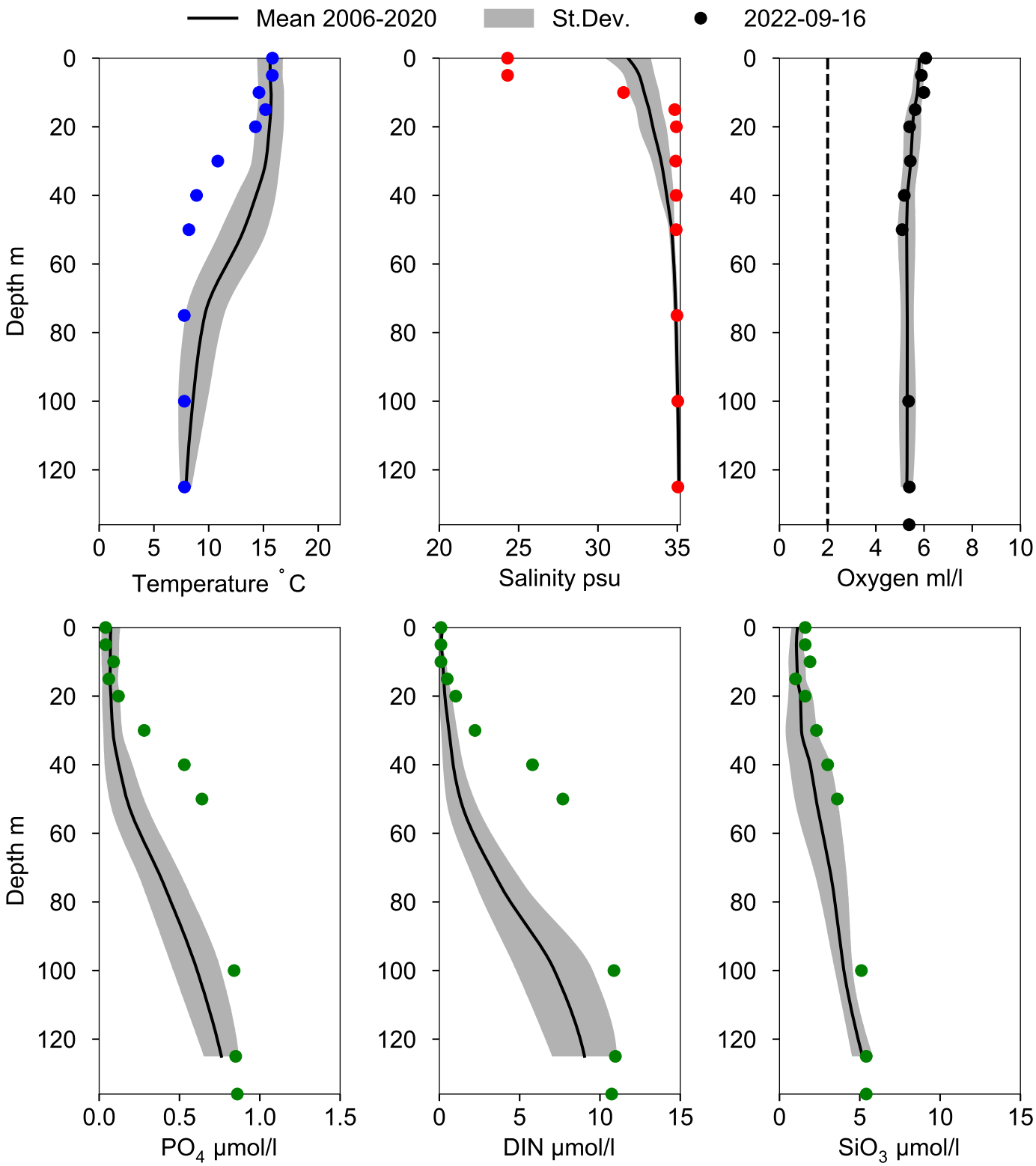
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

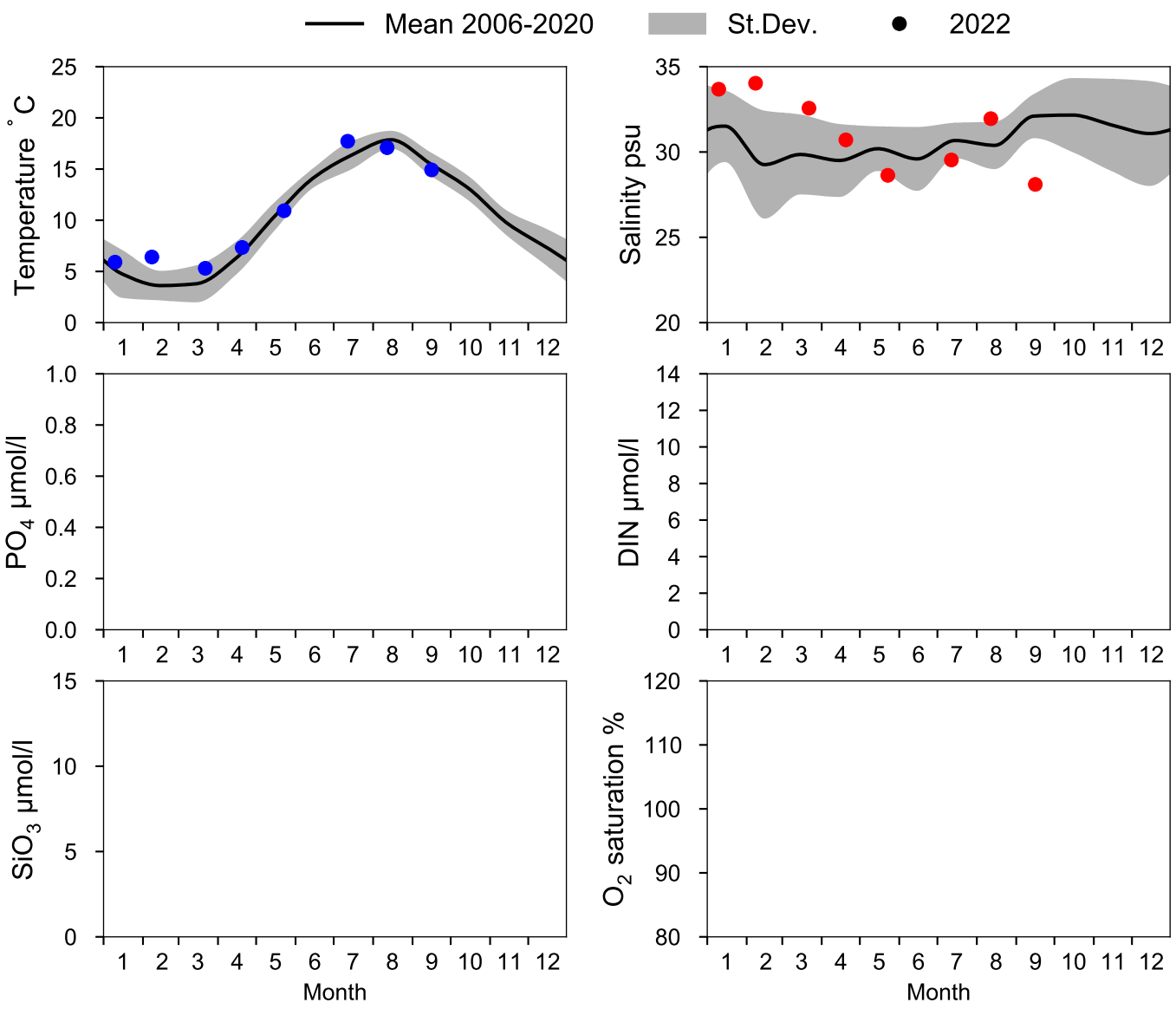


Vertical profiles Å15
September

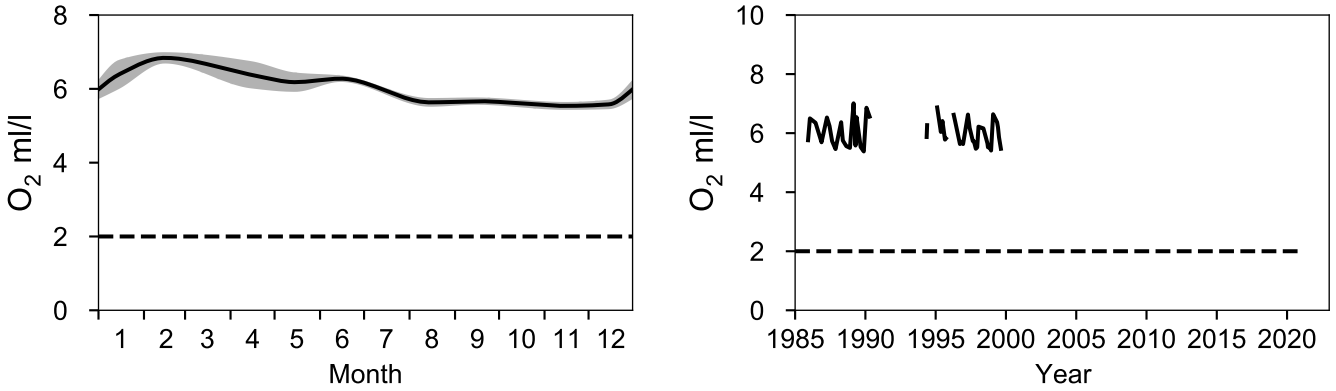


STATION Å16 SURFACE WATER (0-10 m)

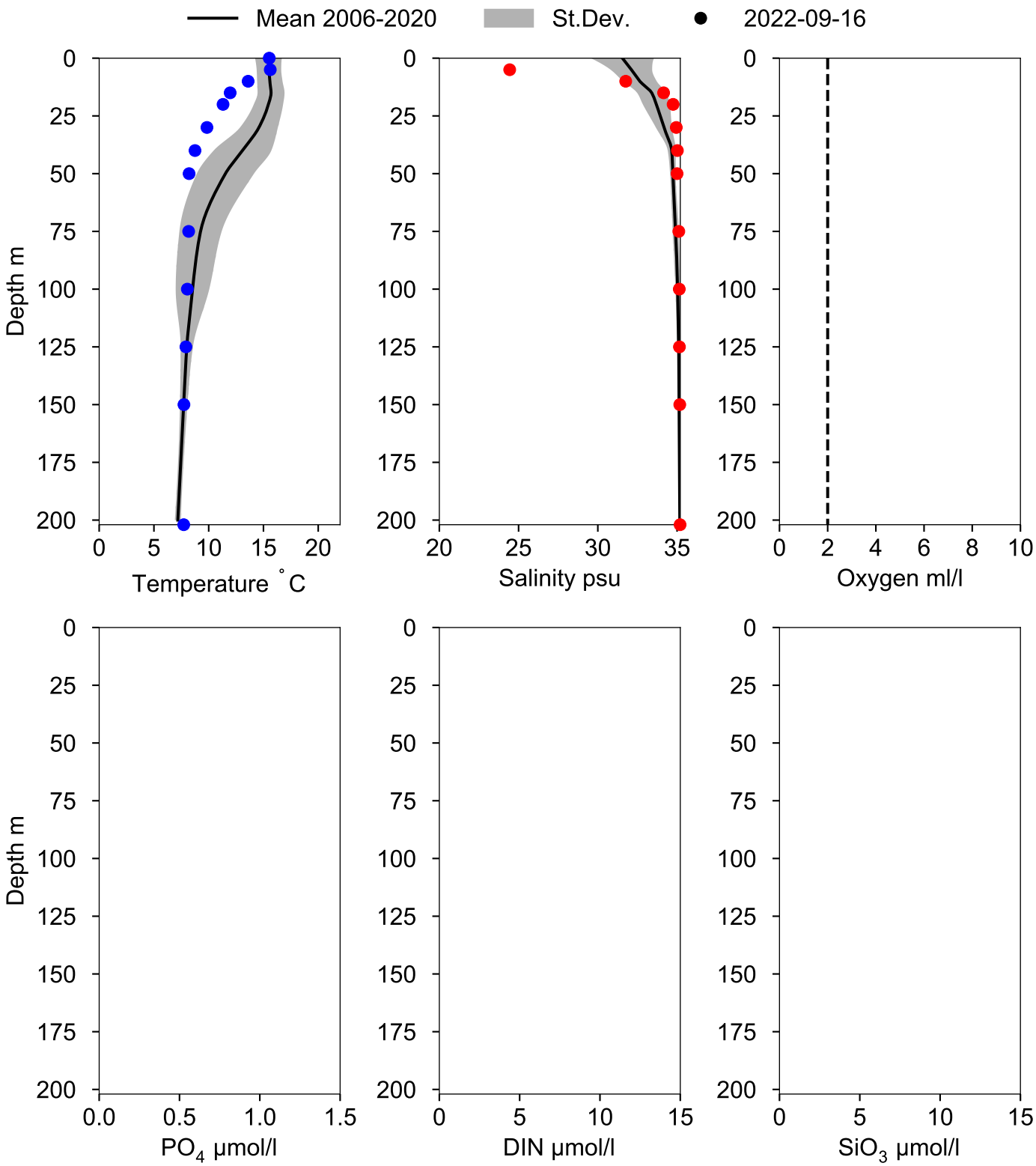
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 193 m)

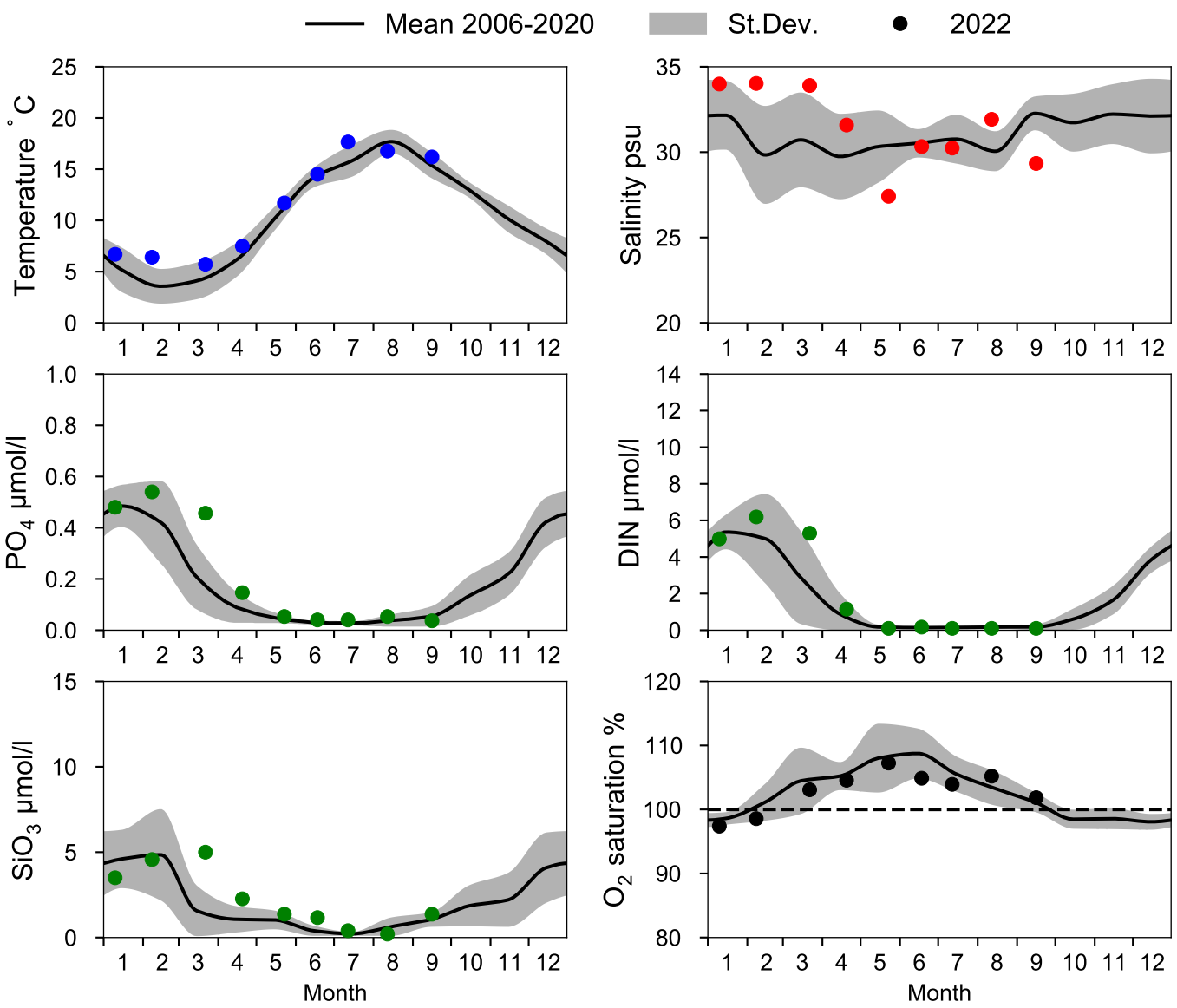


Vertical profiles Å16
September

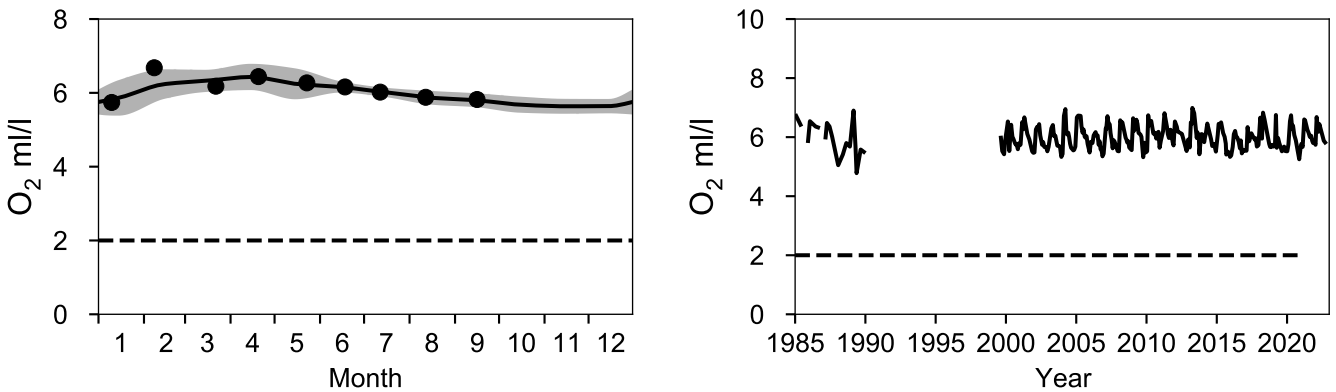


STATION Å17 SURFACE WATER (0-10 m)

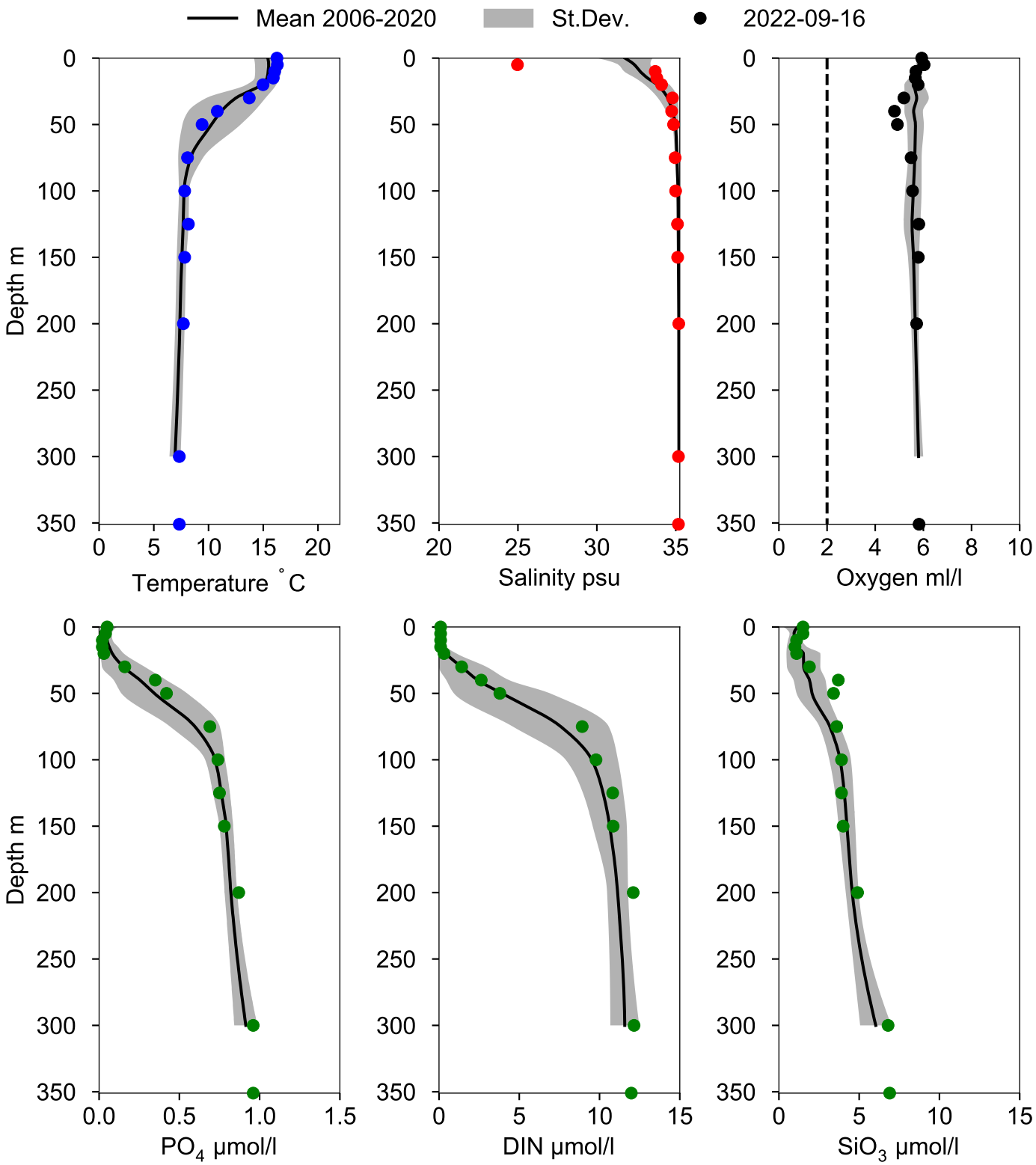
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 300 m)

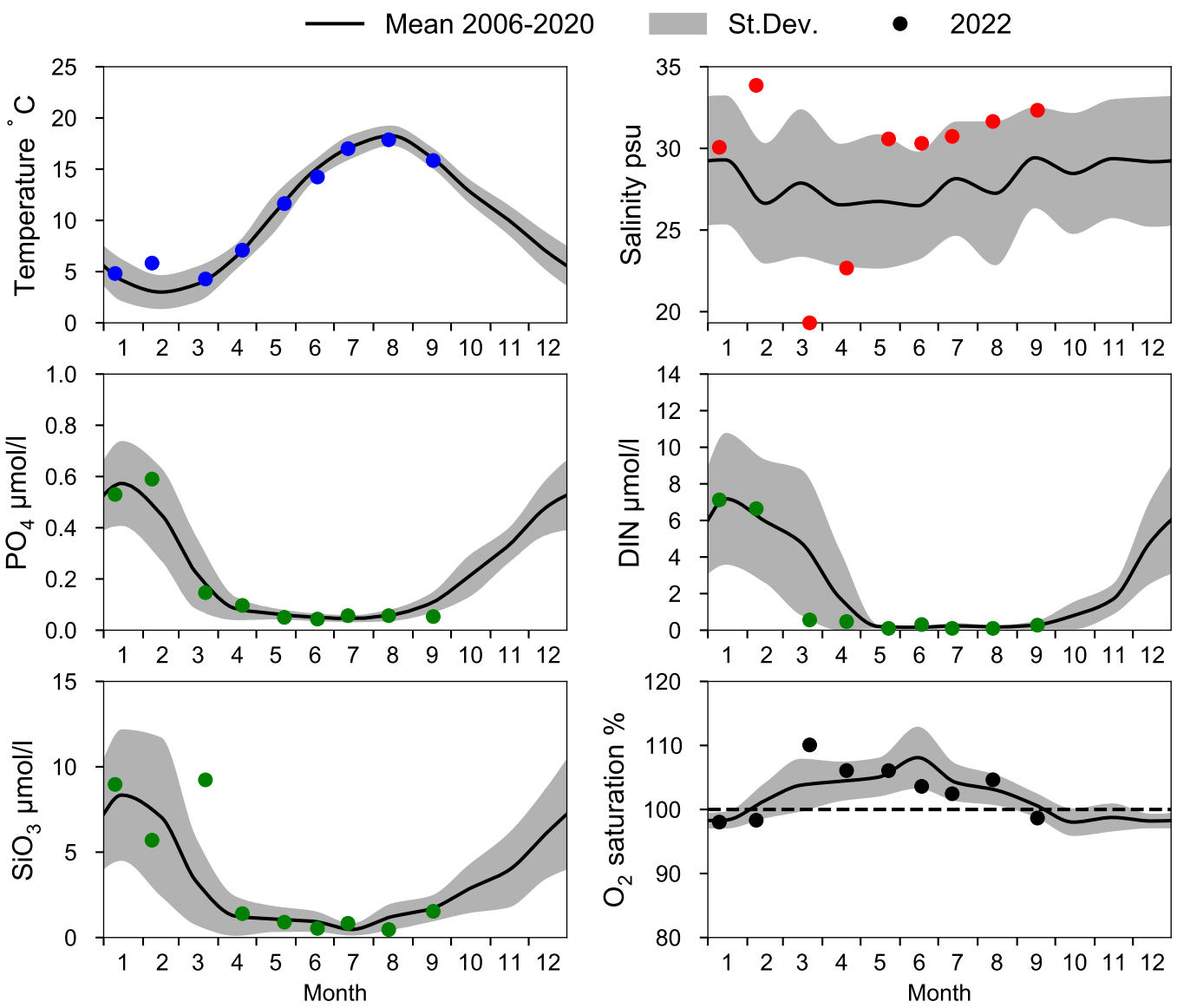


Vertical profiles Å17
September

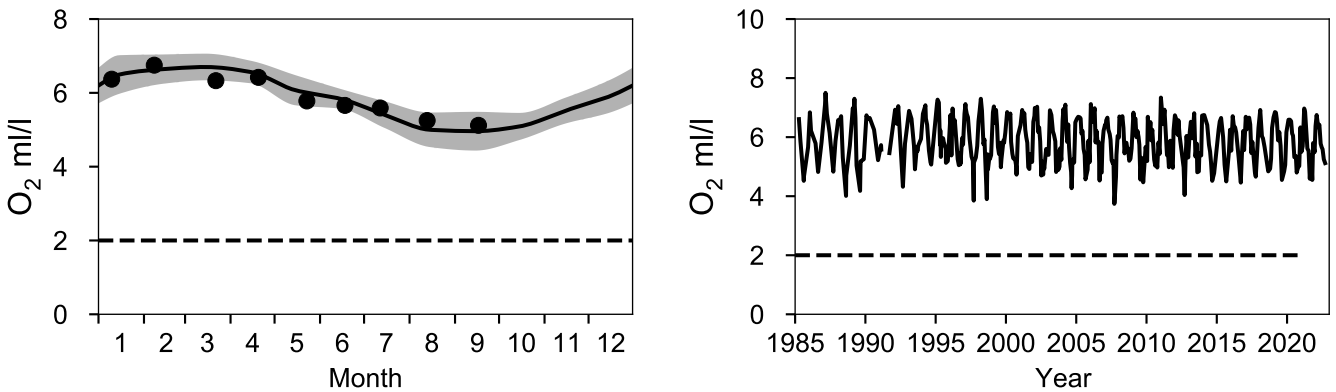


STATION P2 SURFACE WATER (0-10 m)

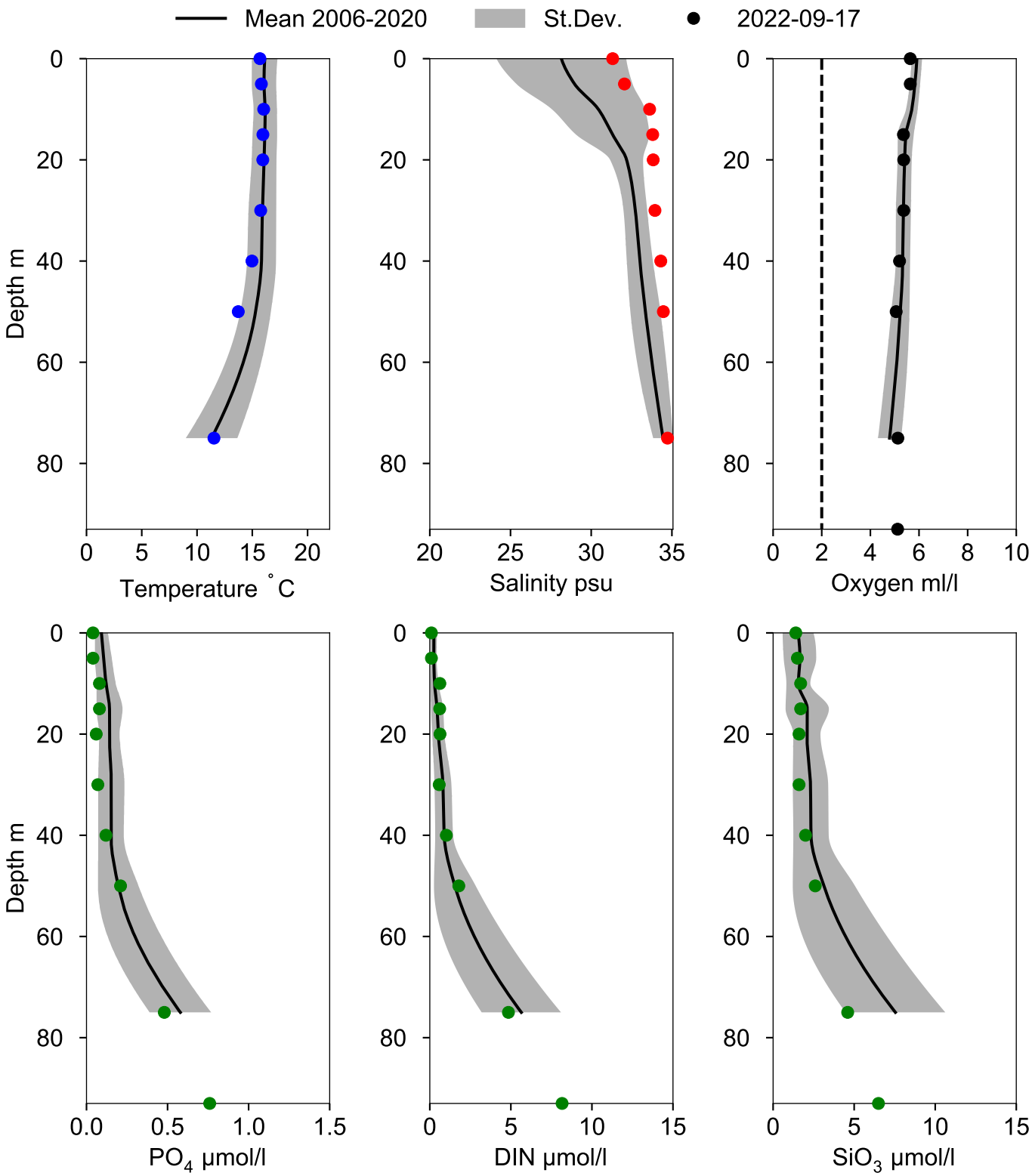
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 75 m)

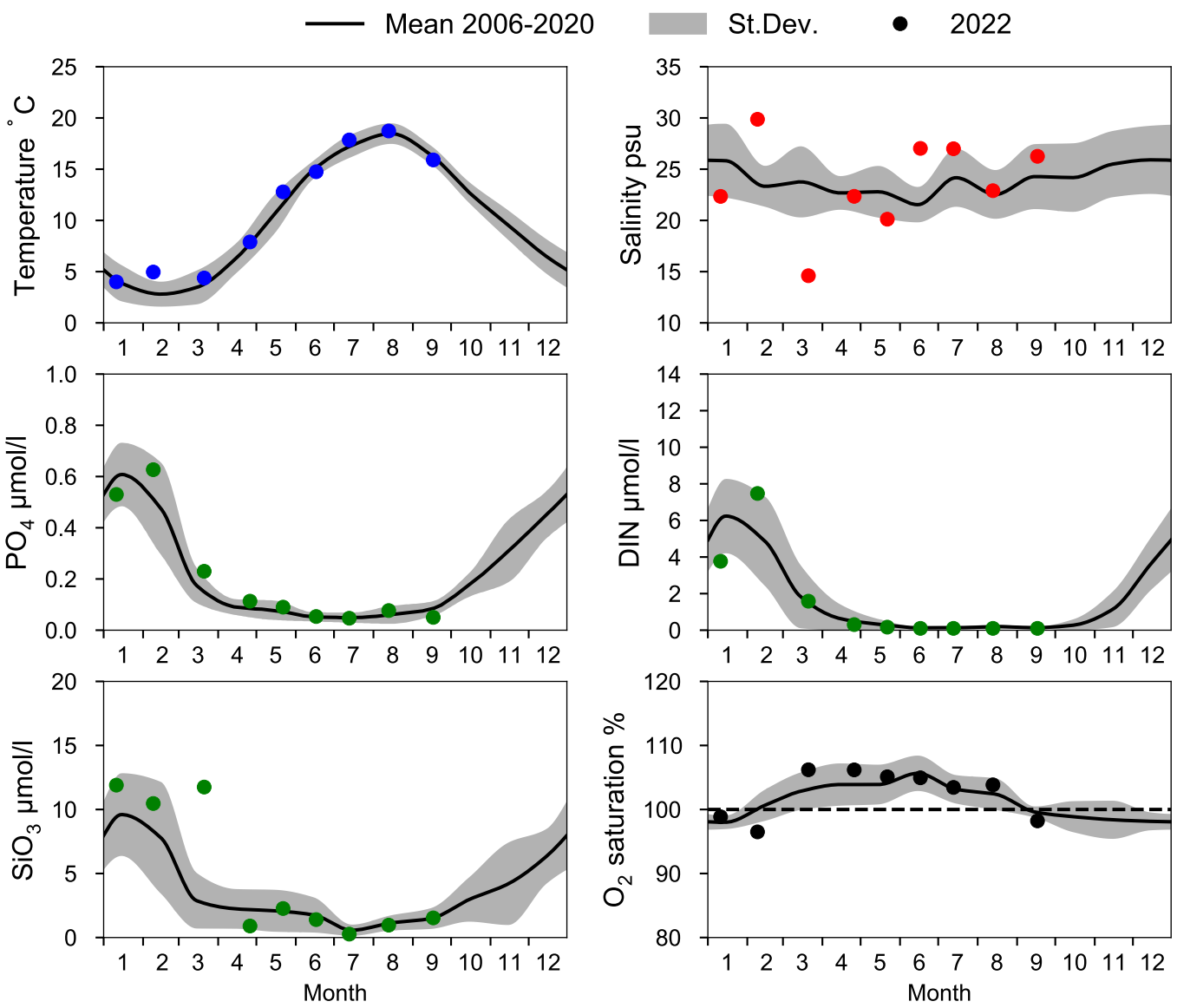


Vertical profiles P2
September

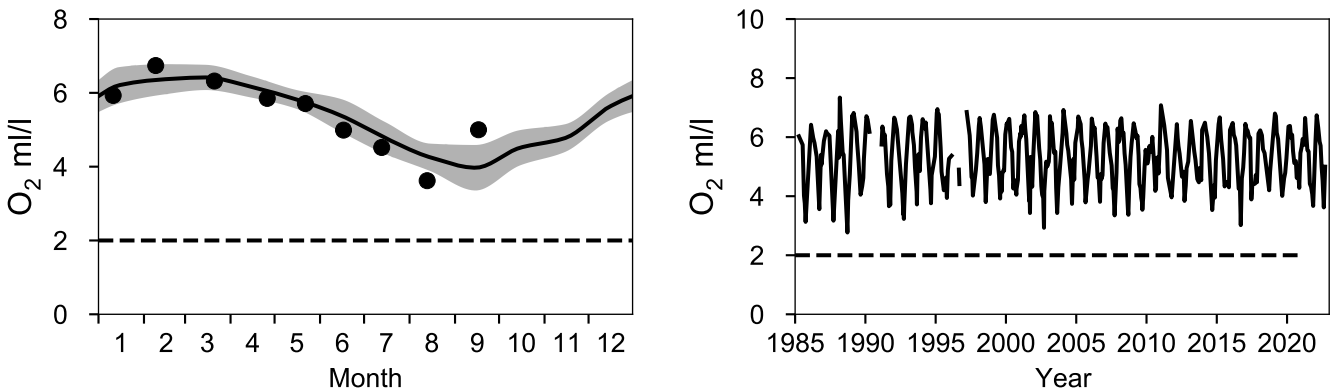


STATION FLADEN SURFACE WATER (0-10 m)

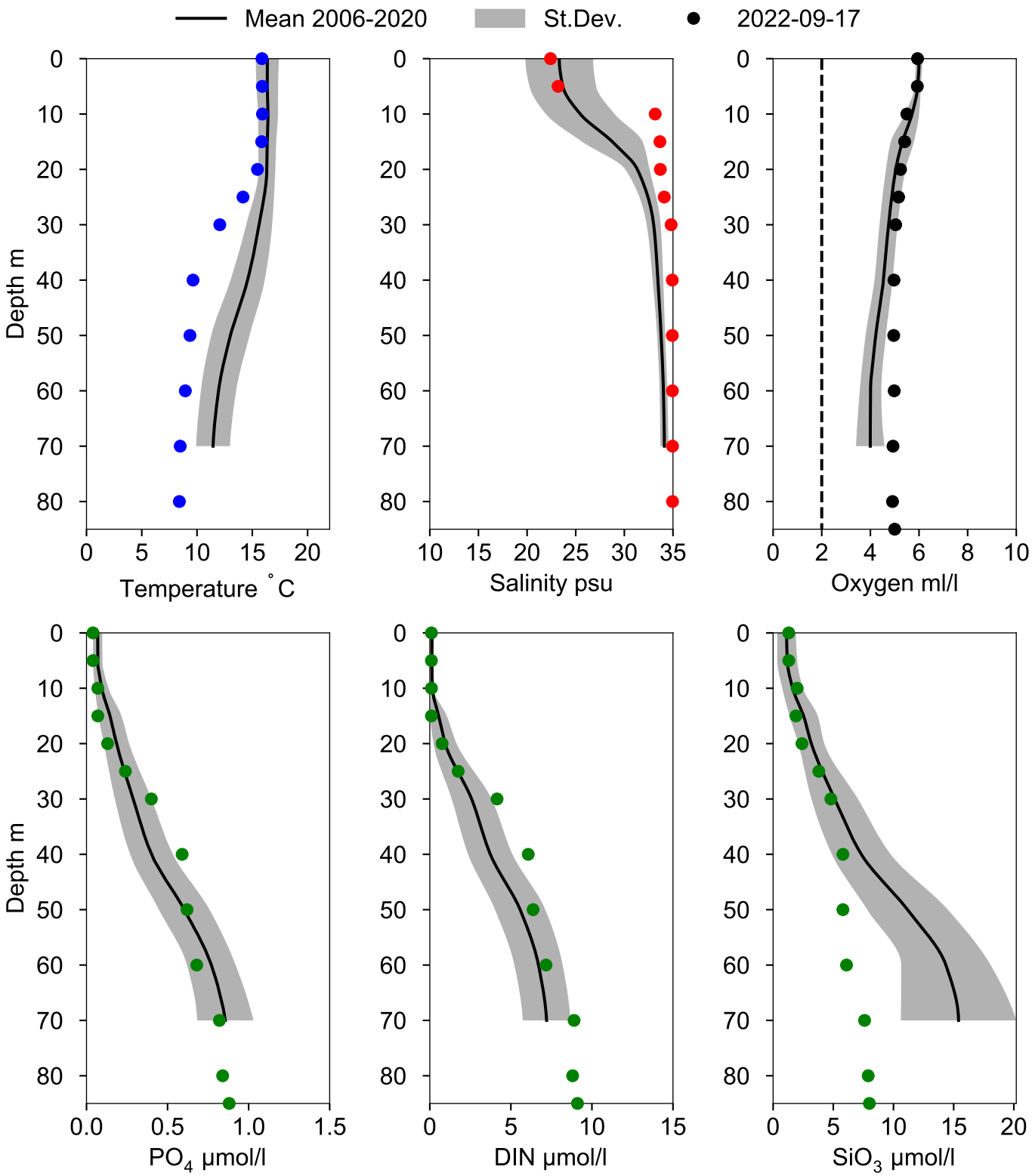
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 74 m)

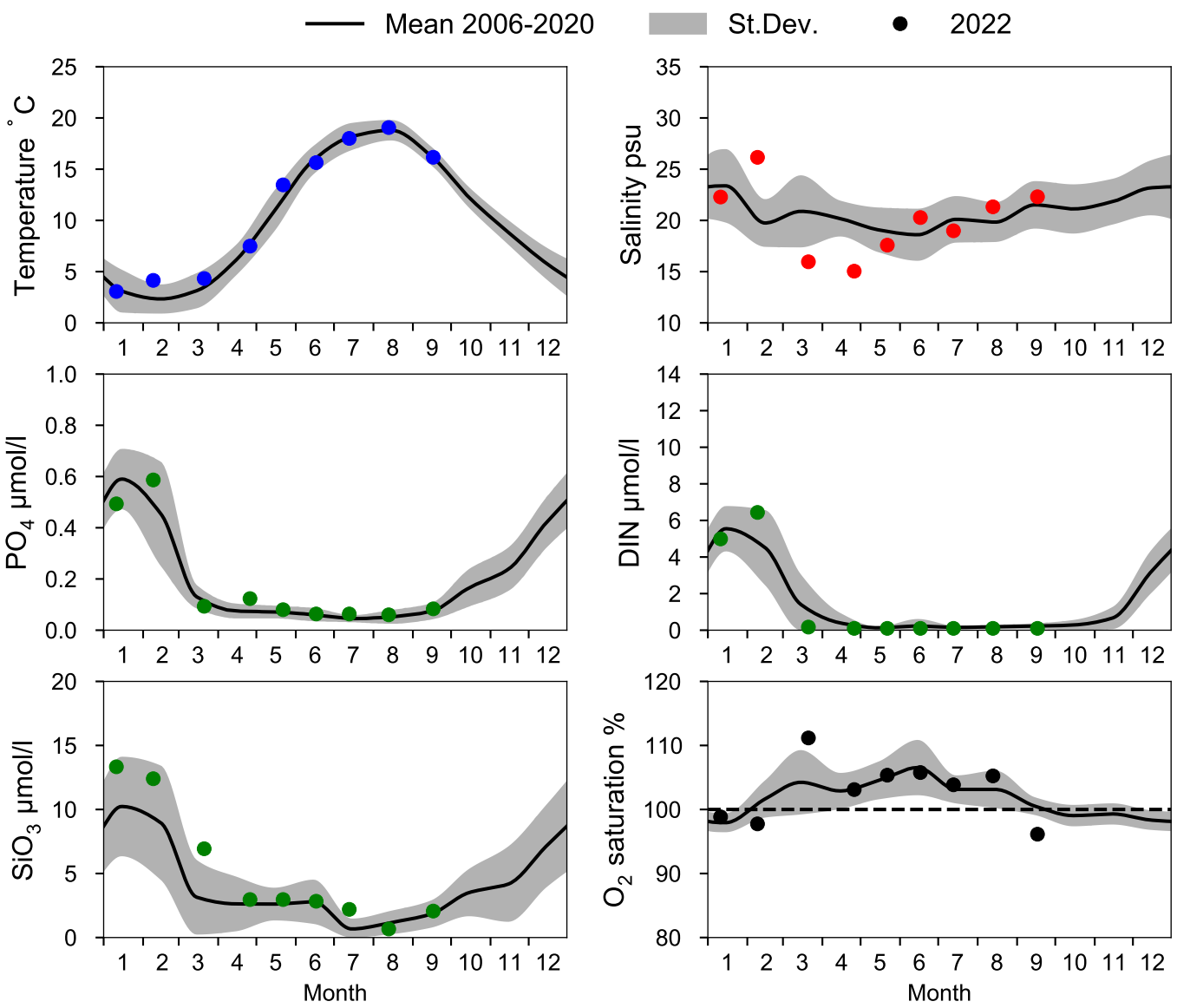


Vertical profiles FLADEN
September

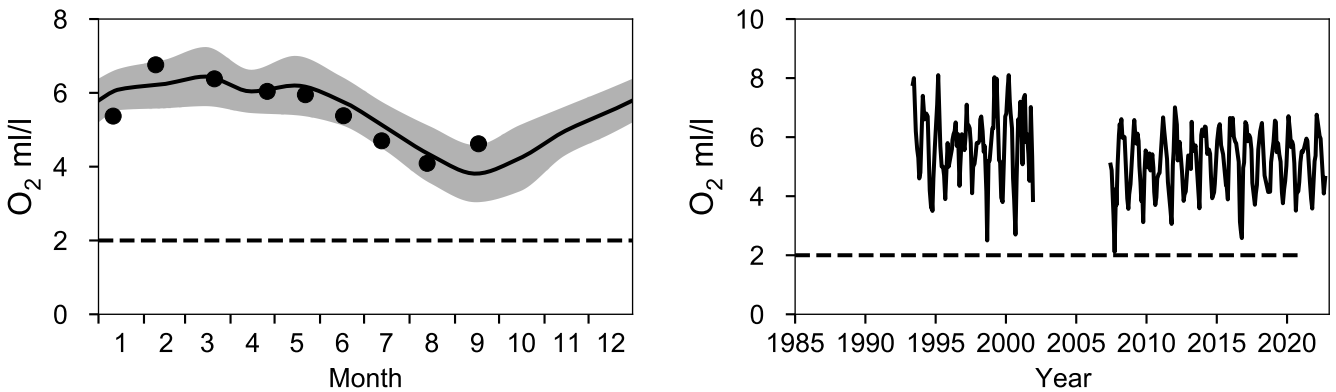


STATION N14 FALKENBERG SURFACE WATER (0-10 m)

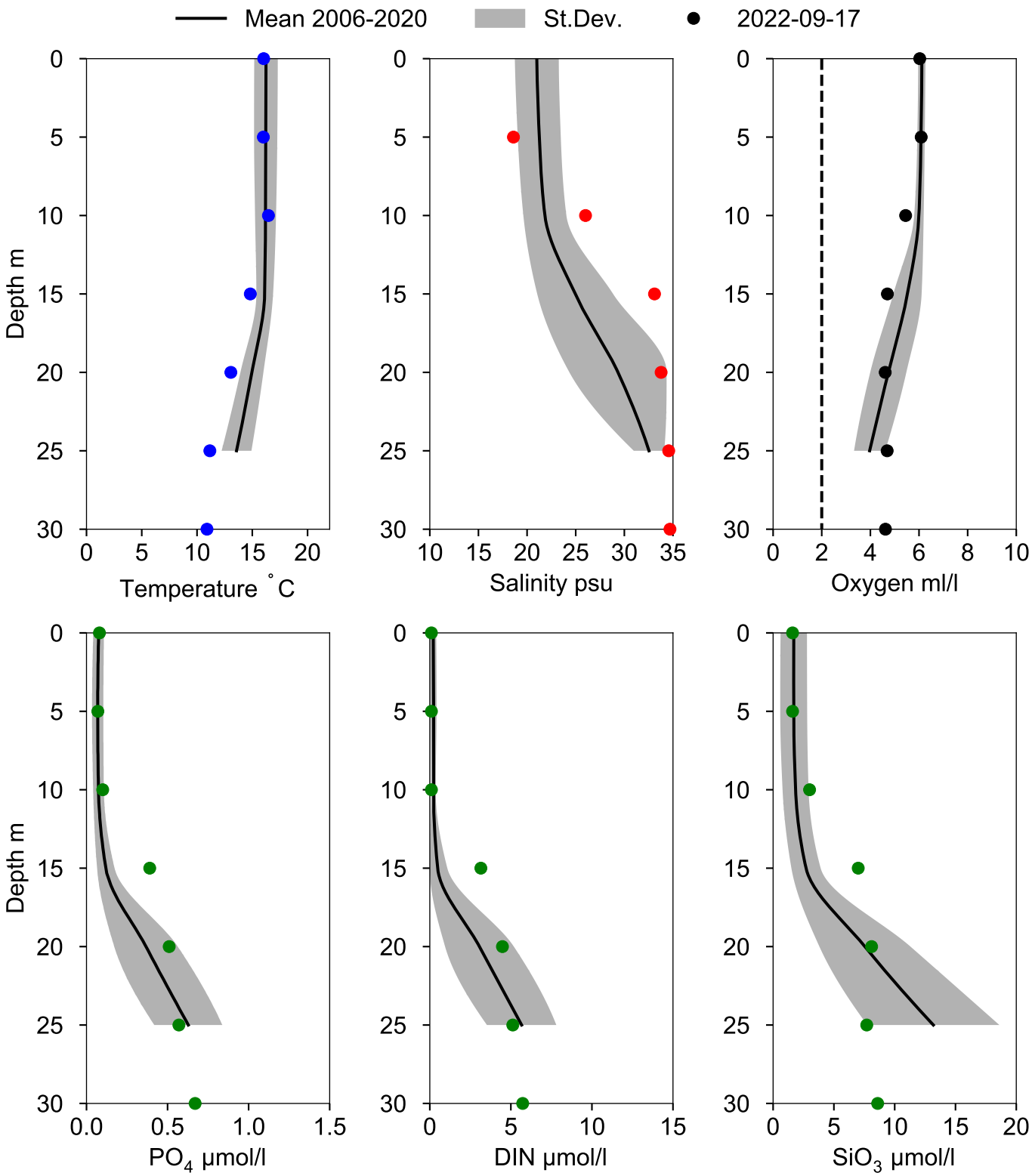
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 25 m)

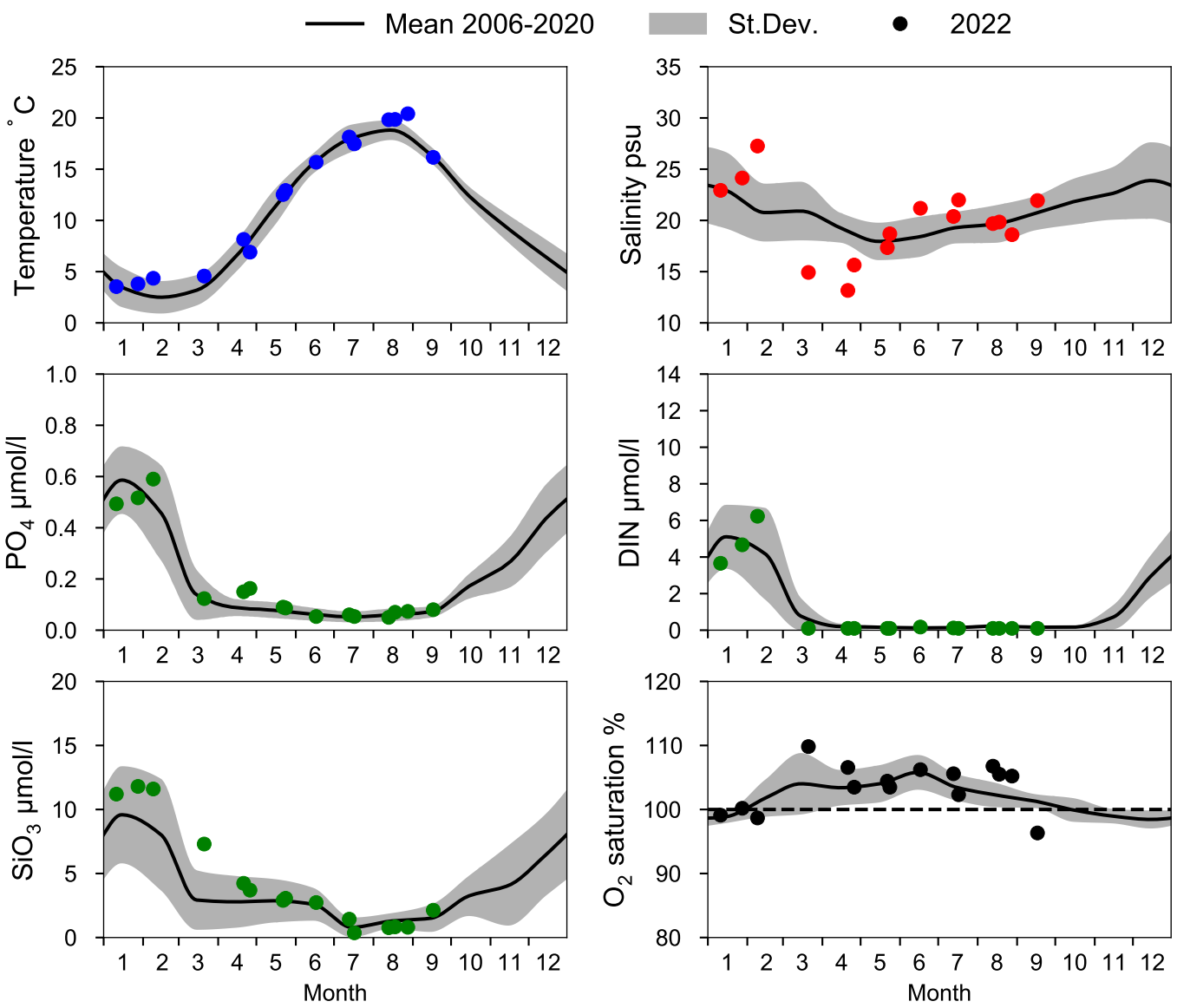


Vertical profiles N14 FALKENBERG
September

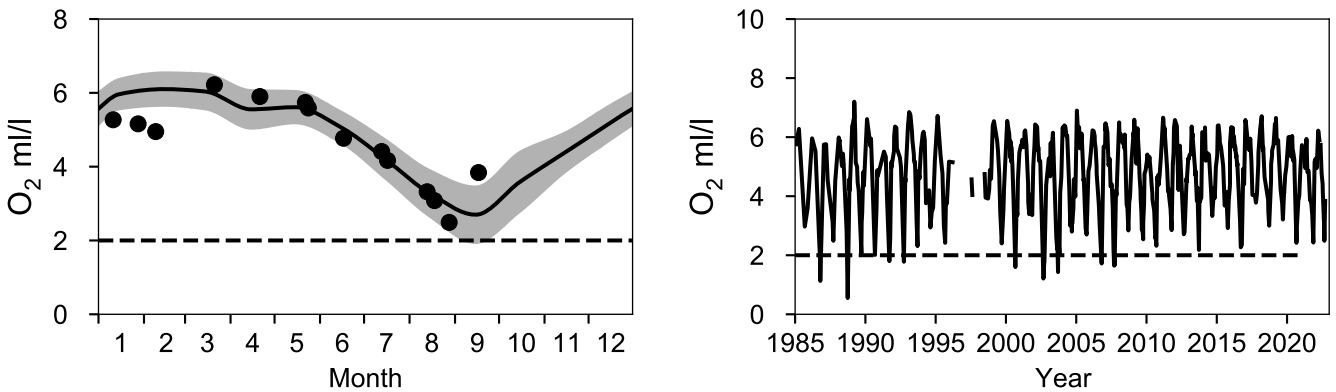


STATION ANHOLT E SURFACE WATER (0-10 m)

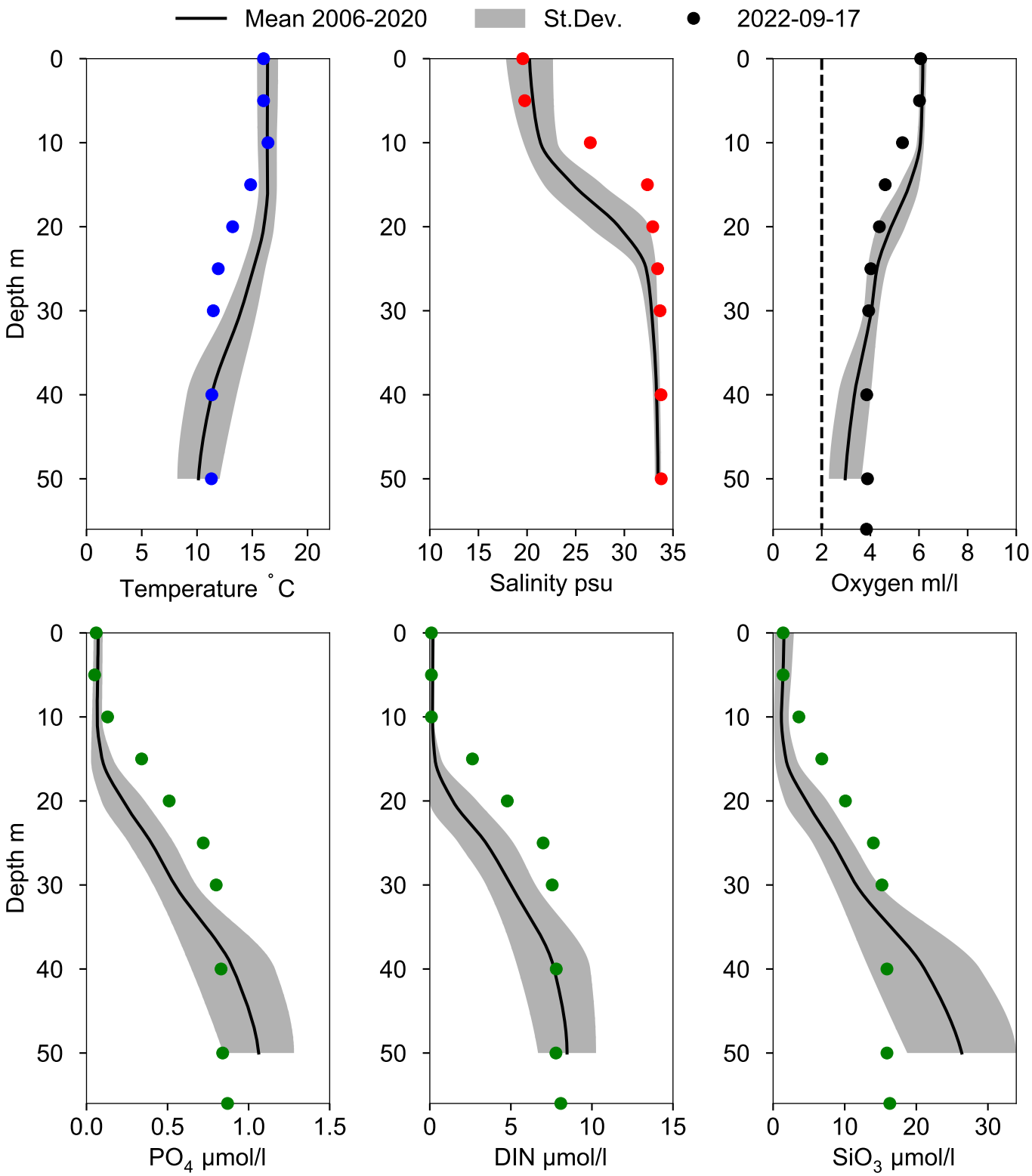
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

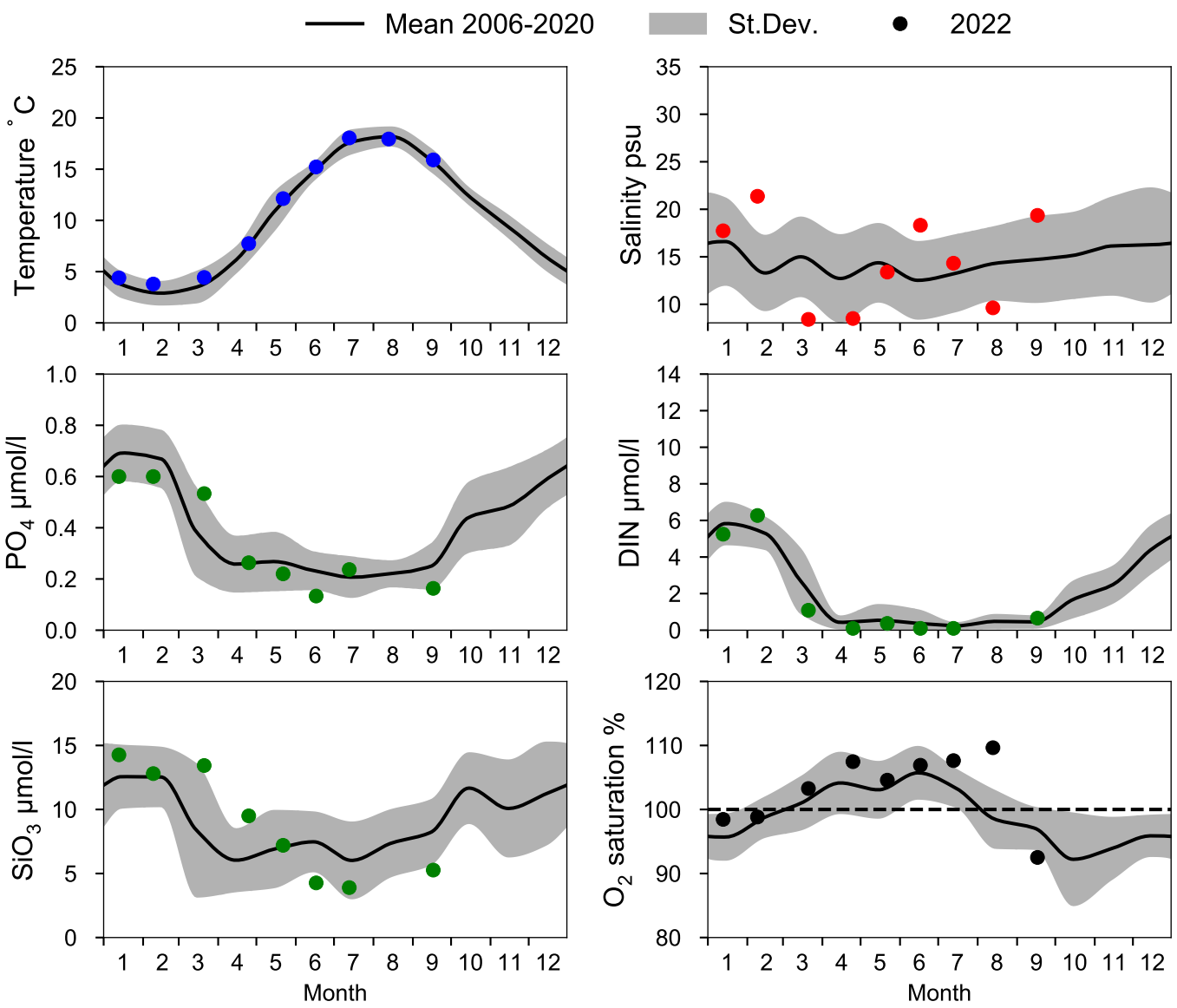


Vertical profiles ANHOLT E
September

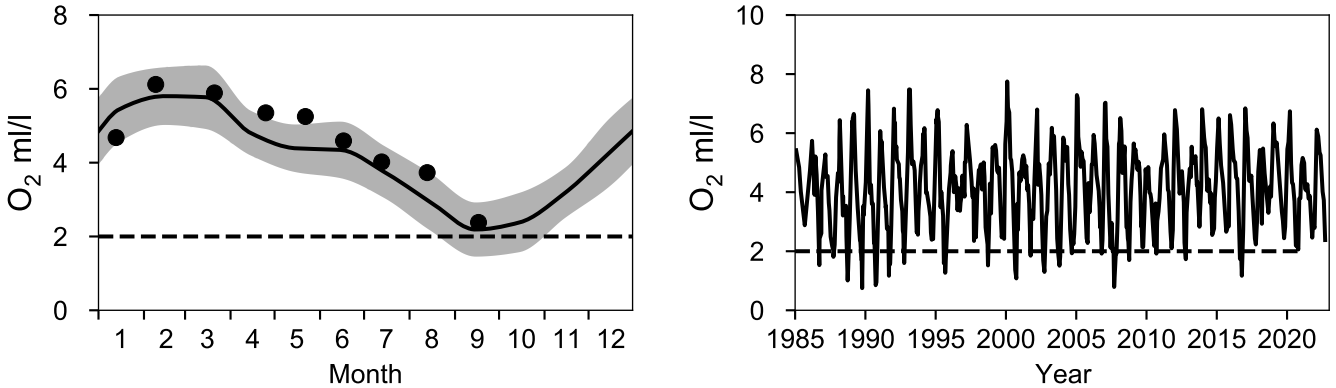


STATION W LANDSKRONA SURFACE WATER (0-10 m)

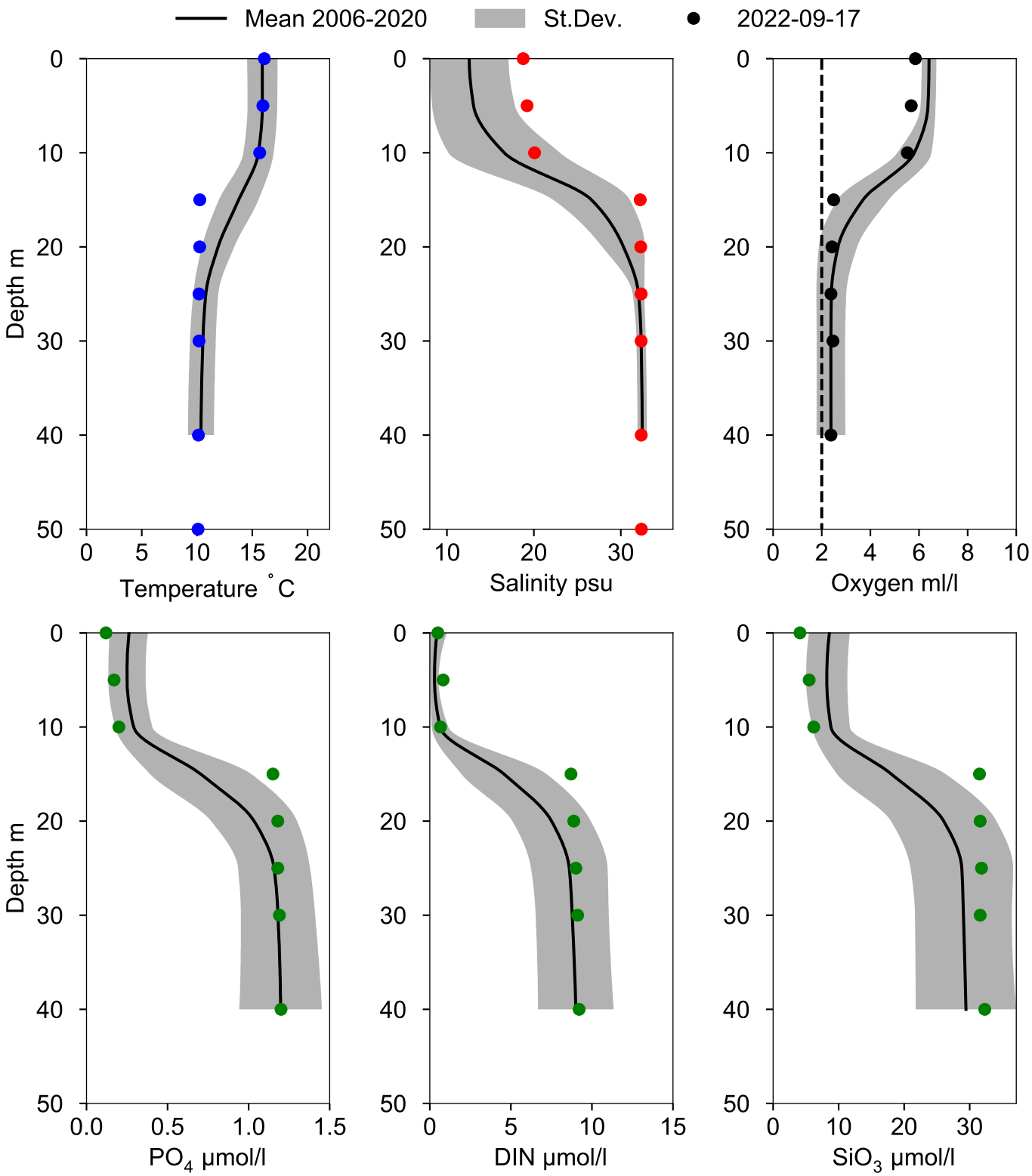
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

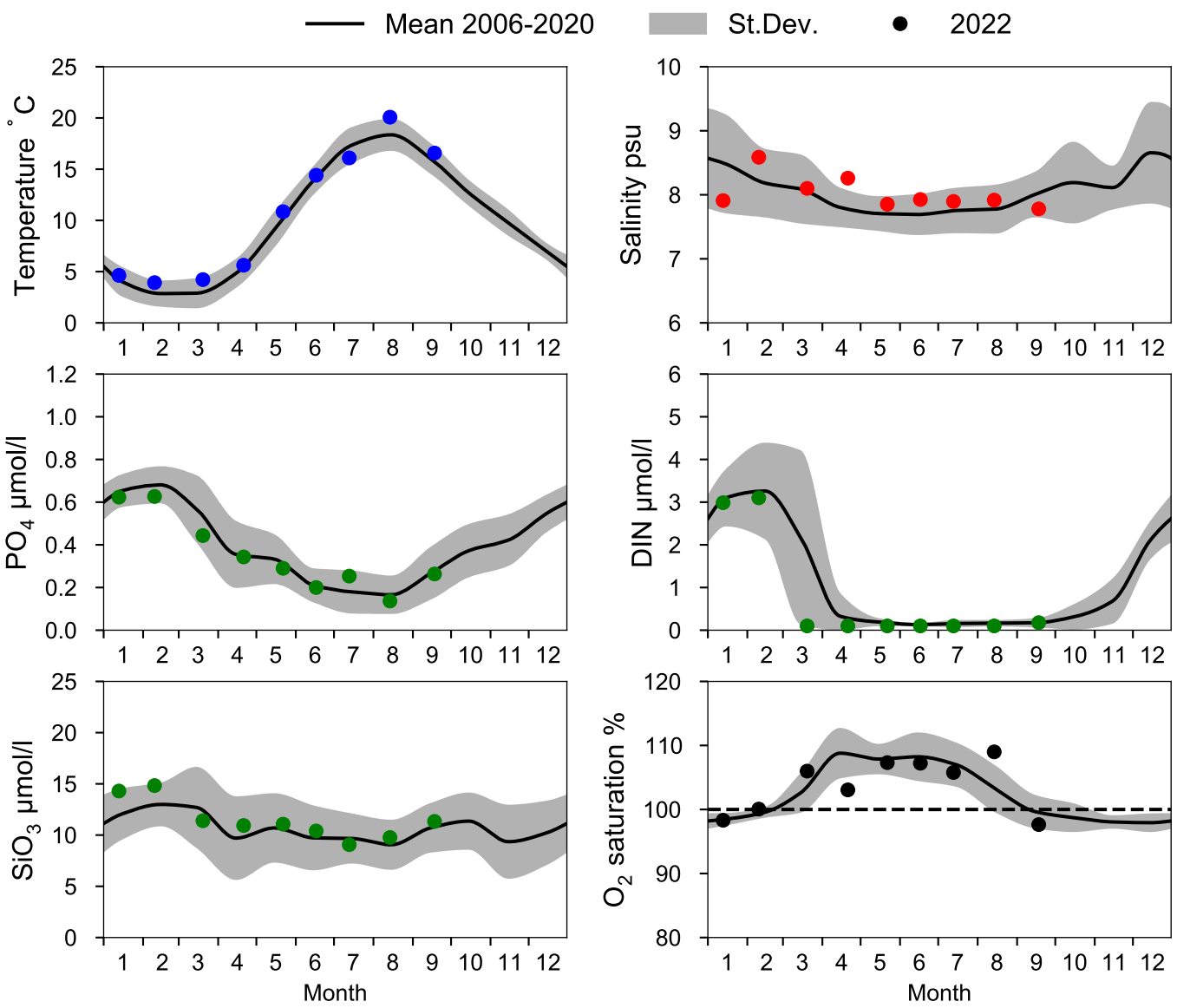


Vertical profiles W LANDSKRONA
September

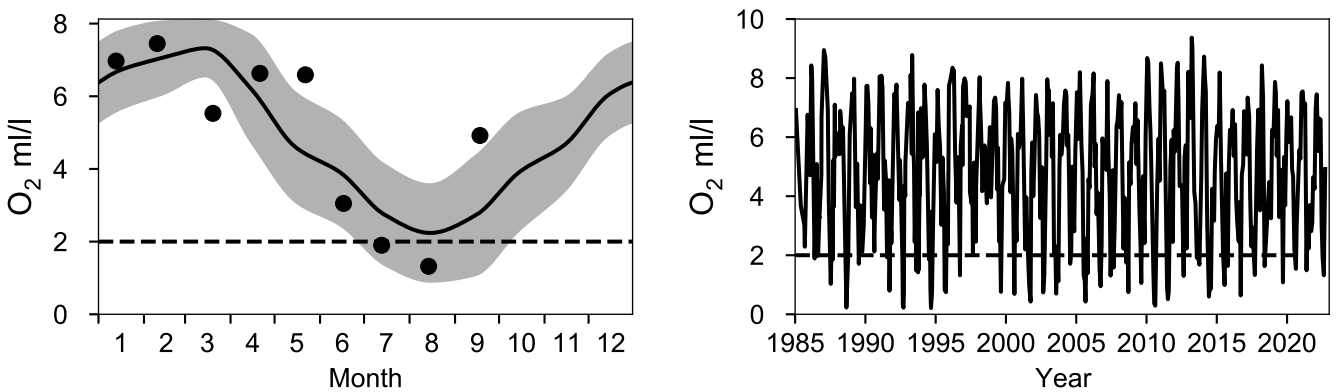


STATION BY1 SURFACE WATER (0-10 m)

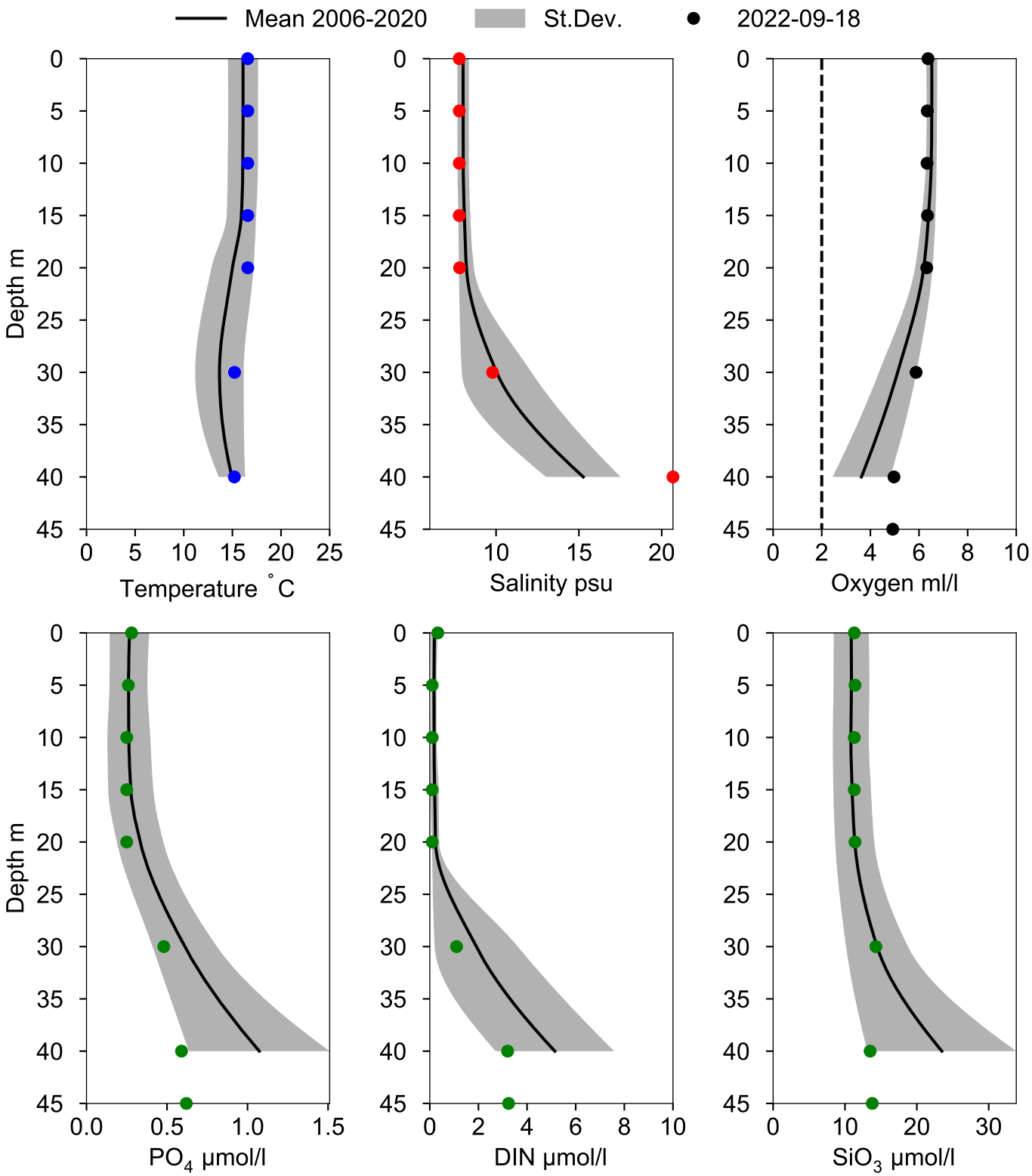
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 39 m)

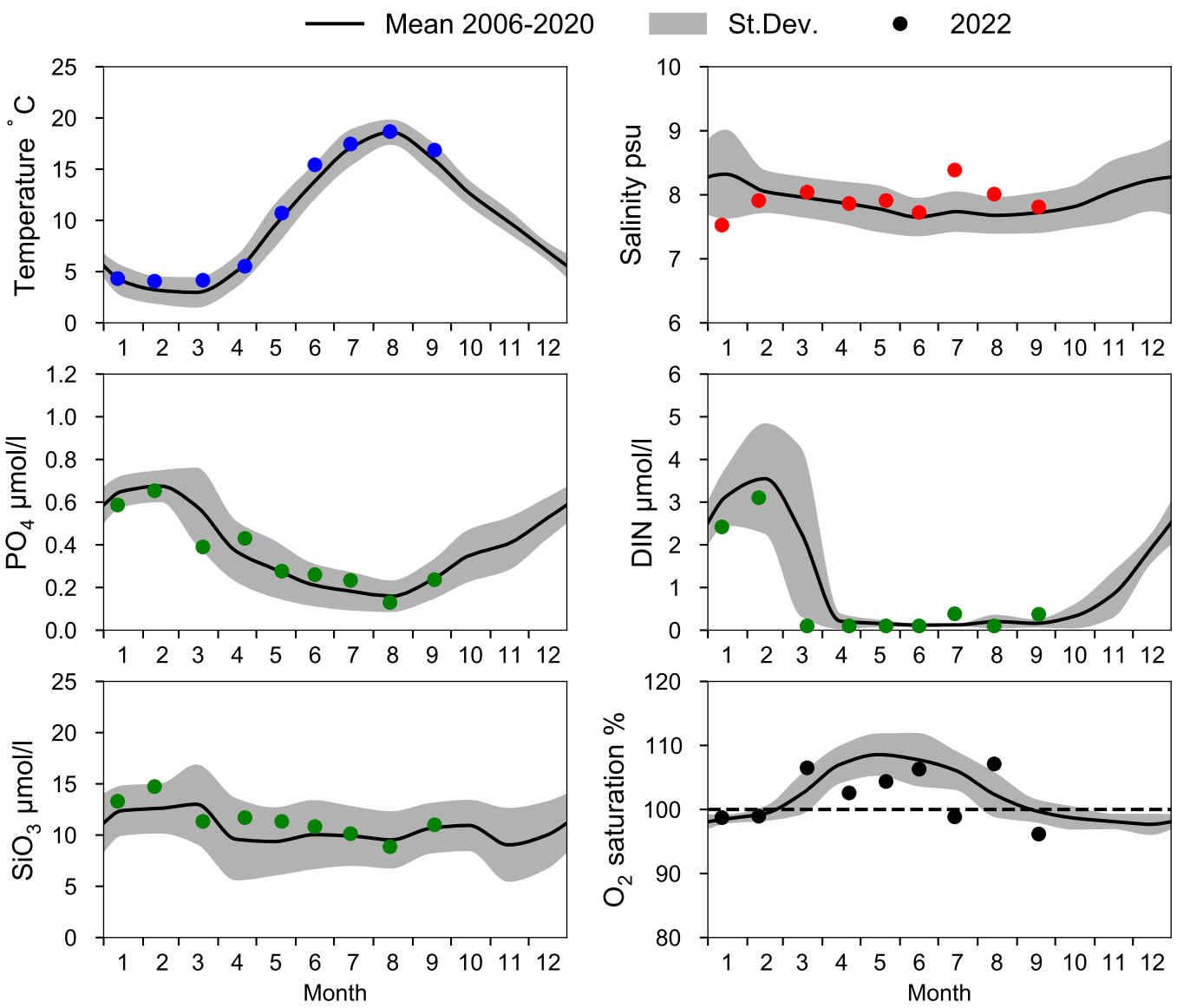


Vertical profiles BY1
September

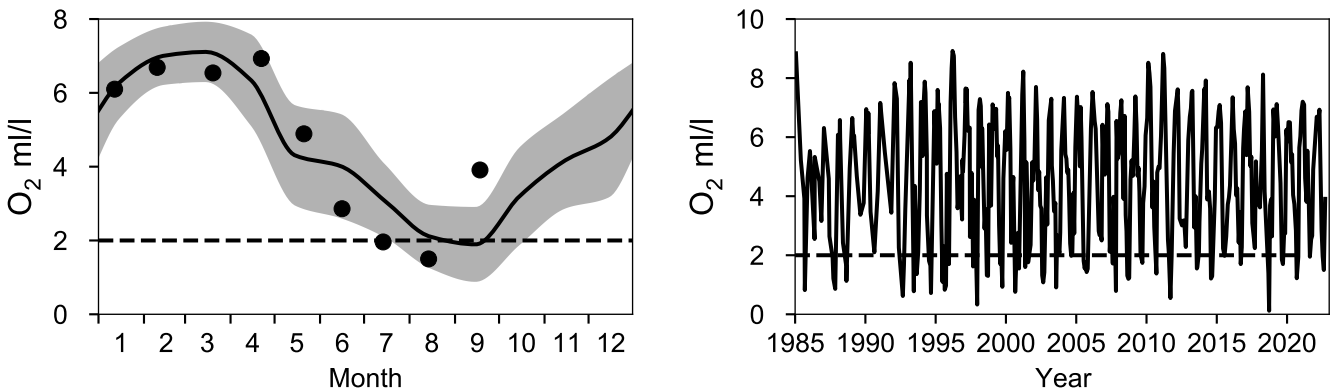


STATION BY2 ARKONA SURFACE WATER (0-10 m)

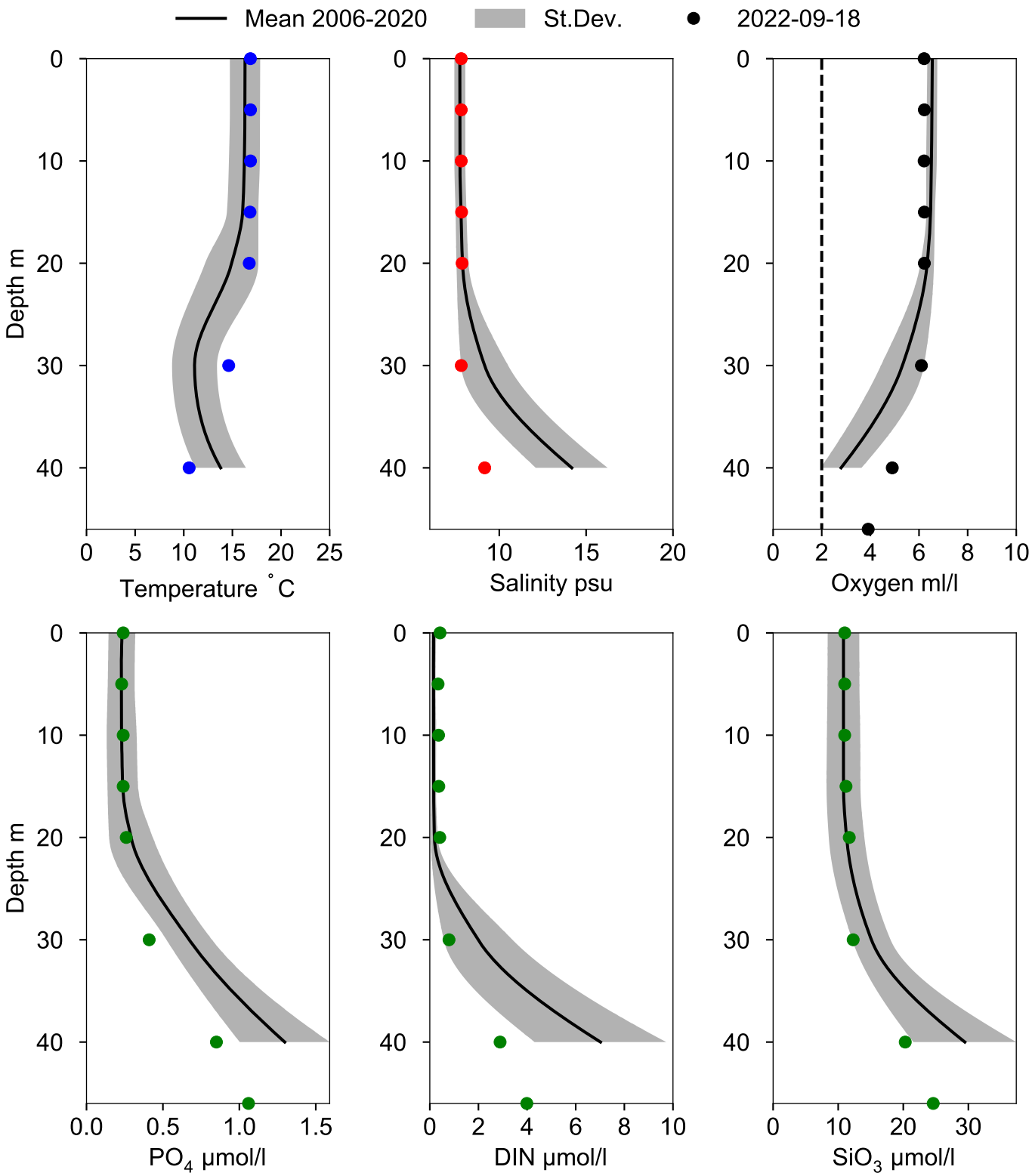
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

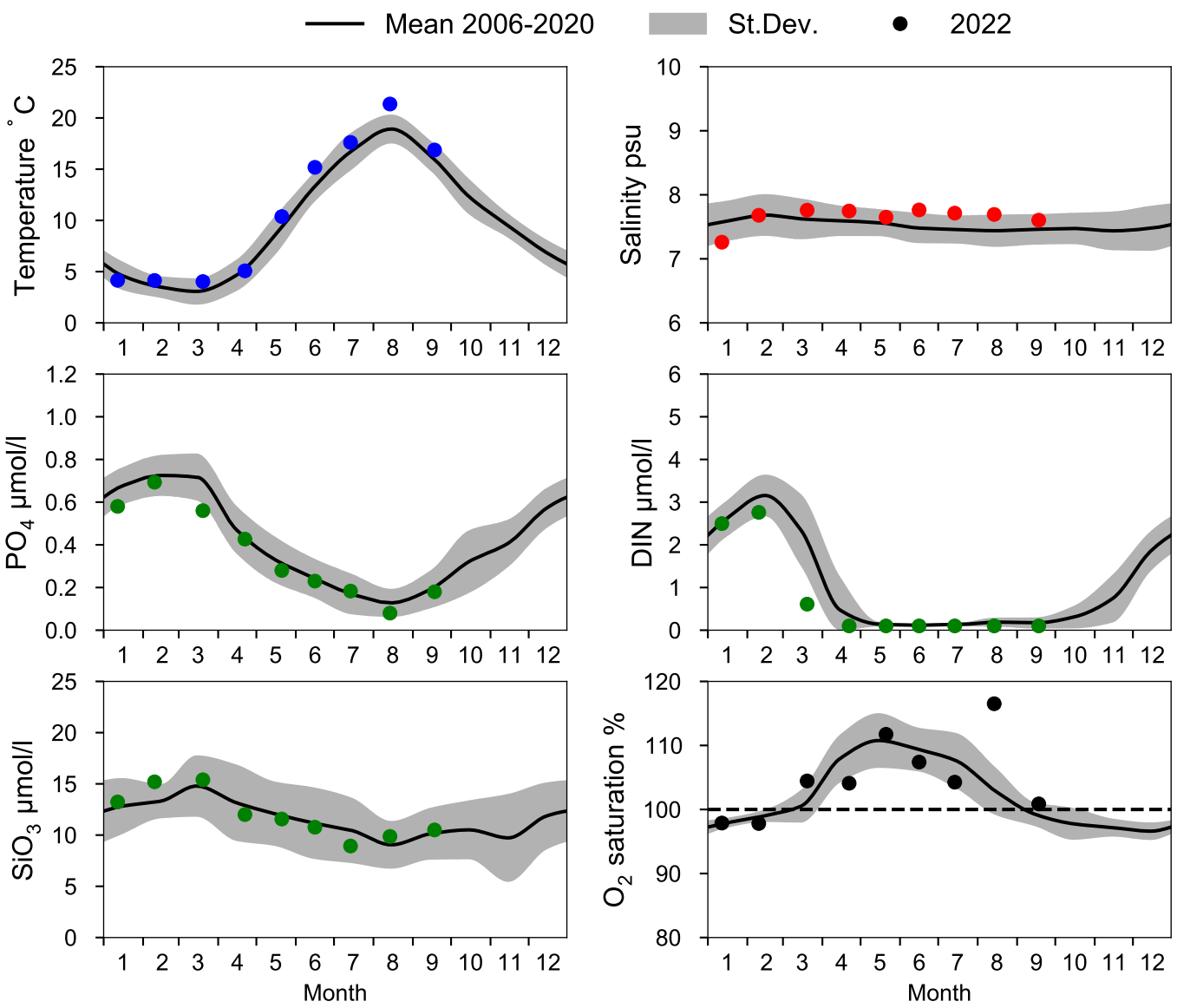


Vertical profiles BY2 ARKONA
September

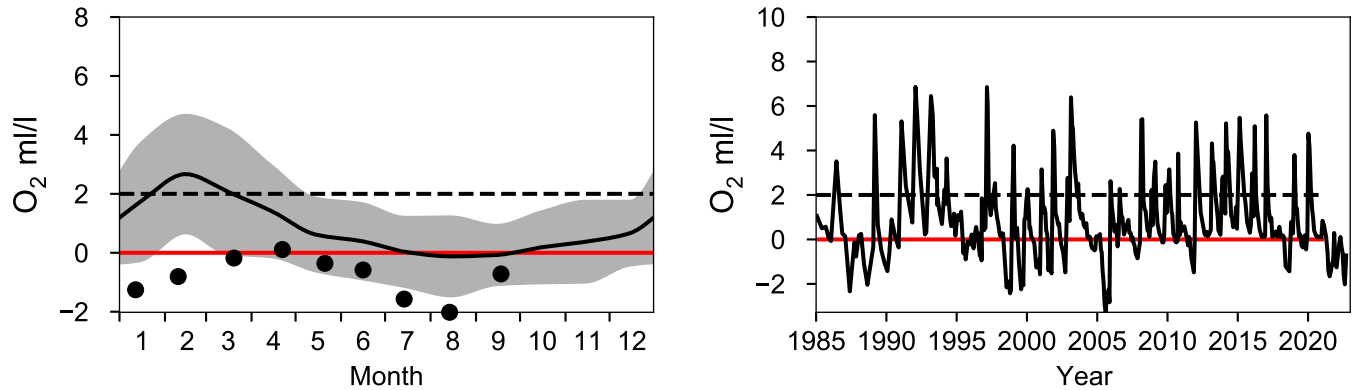


STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

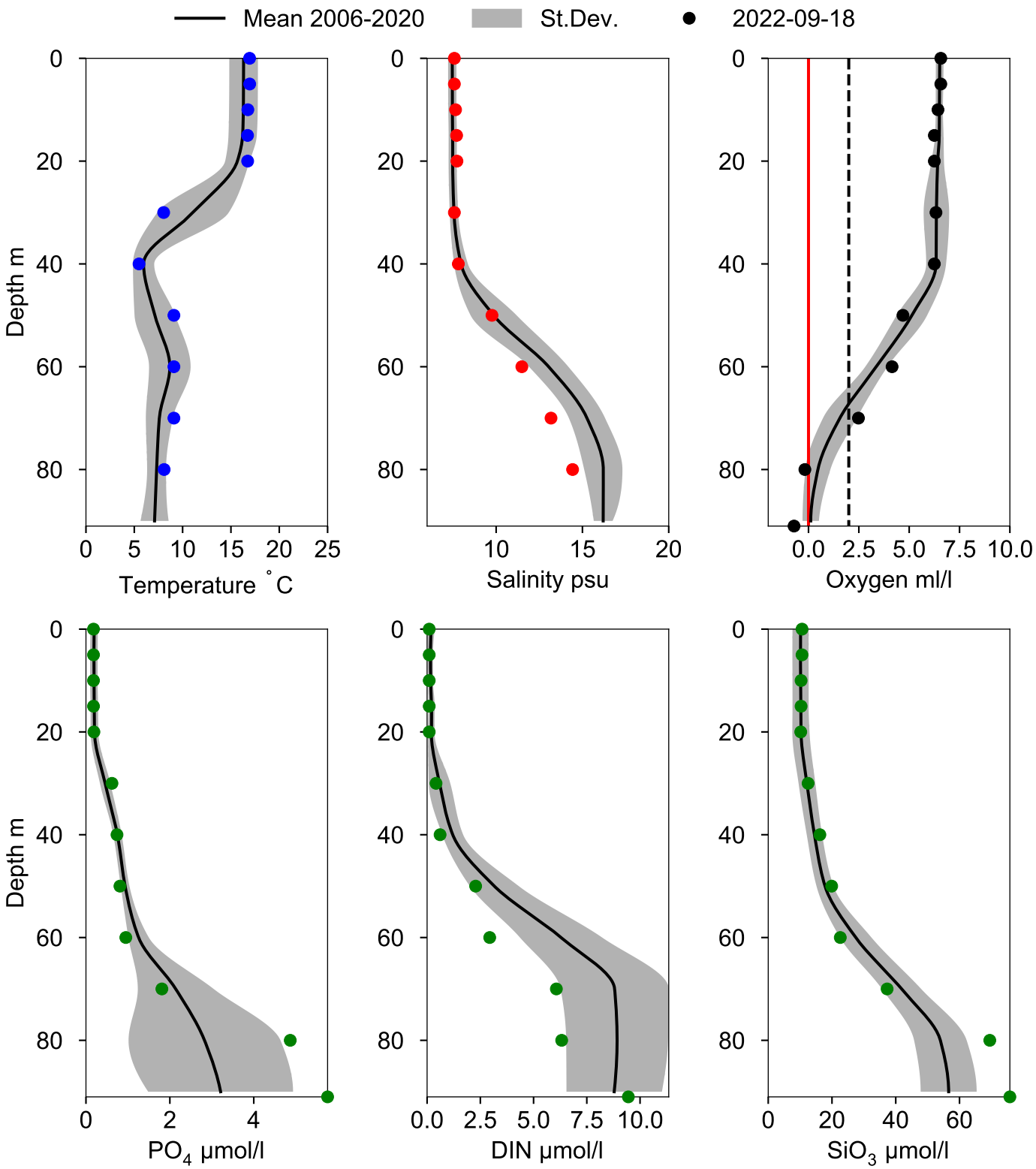
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

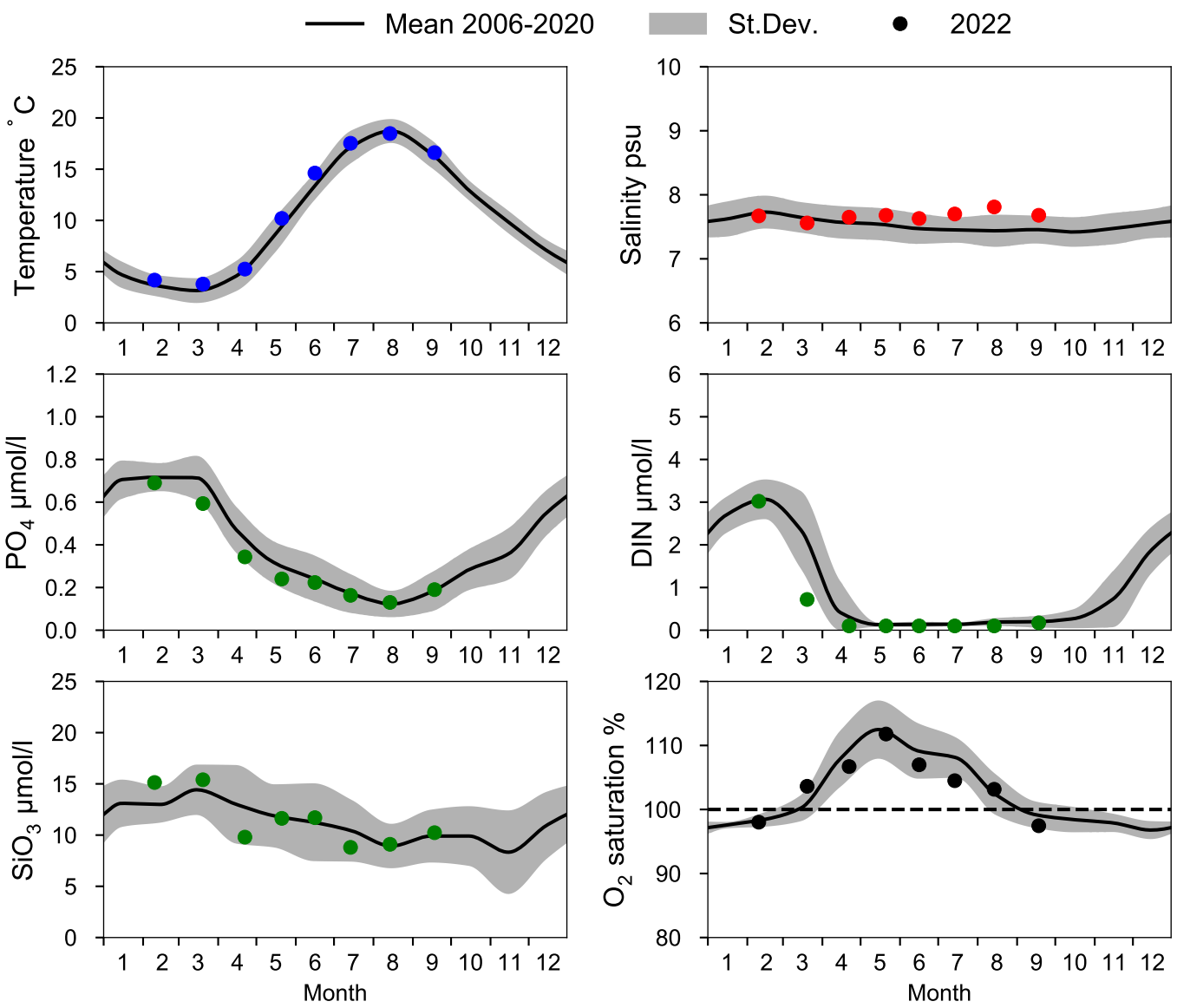


Vertical profiles BY4 CHRISTIANSÖ
September

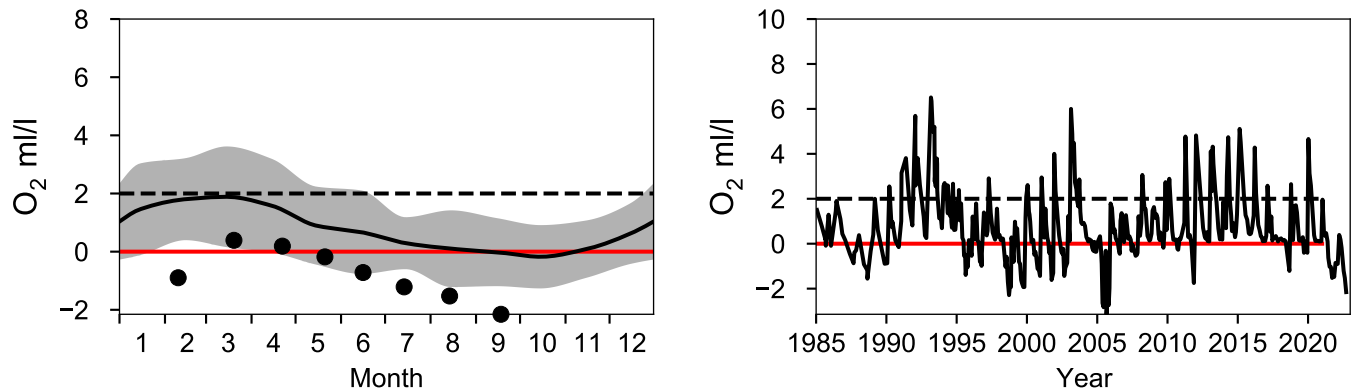


STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

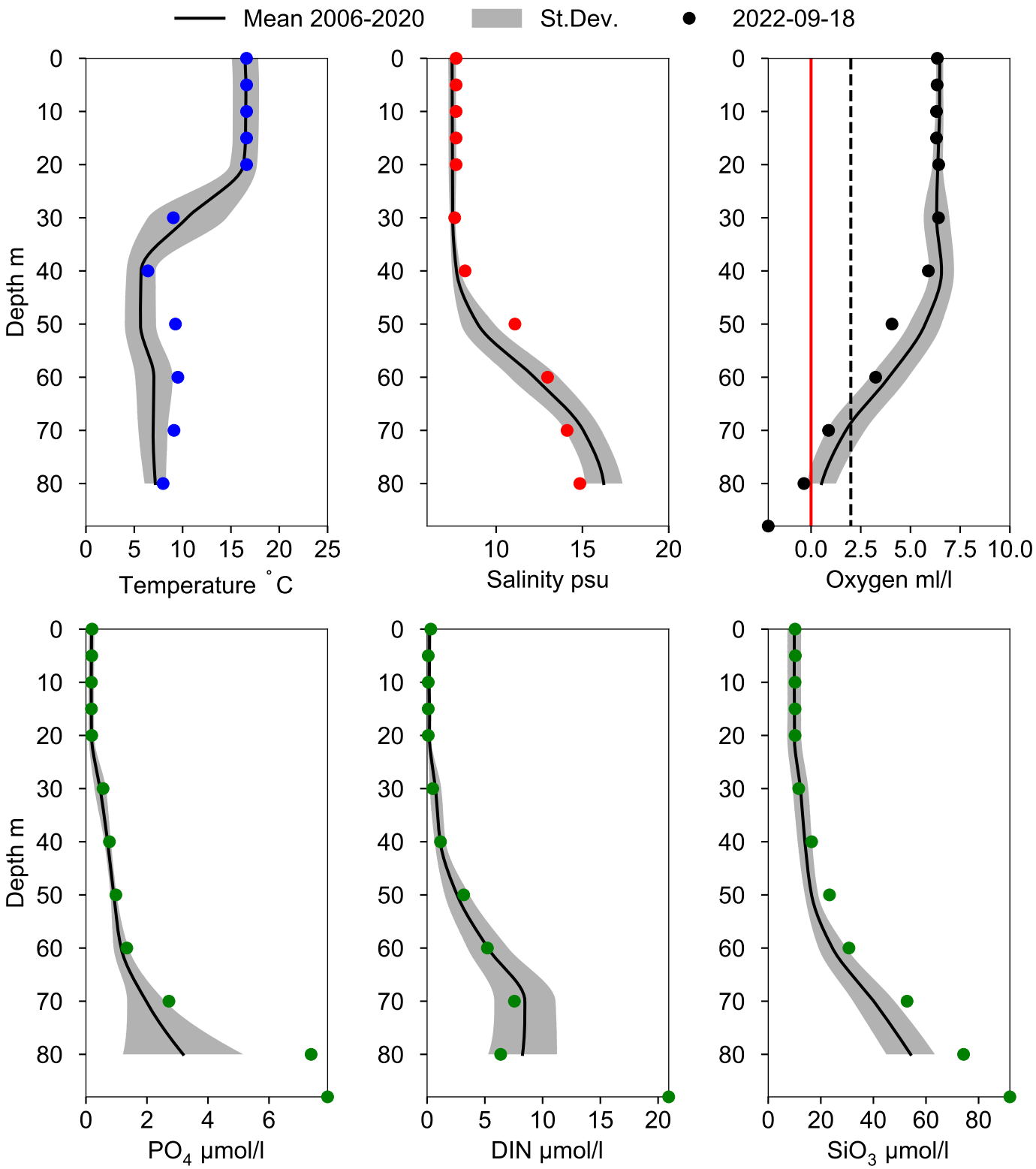
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

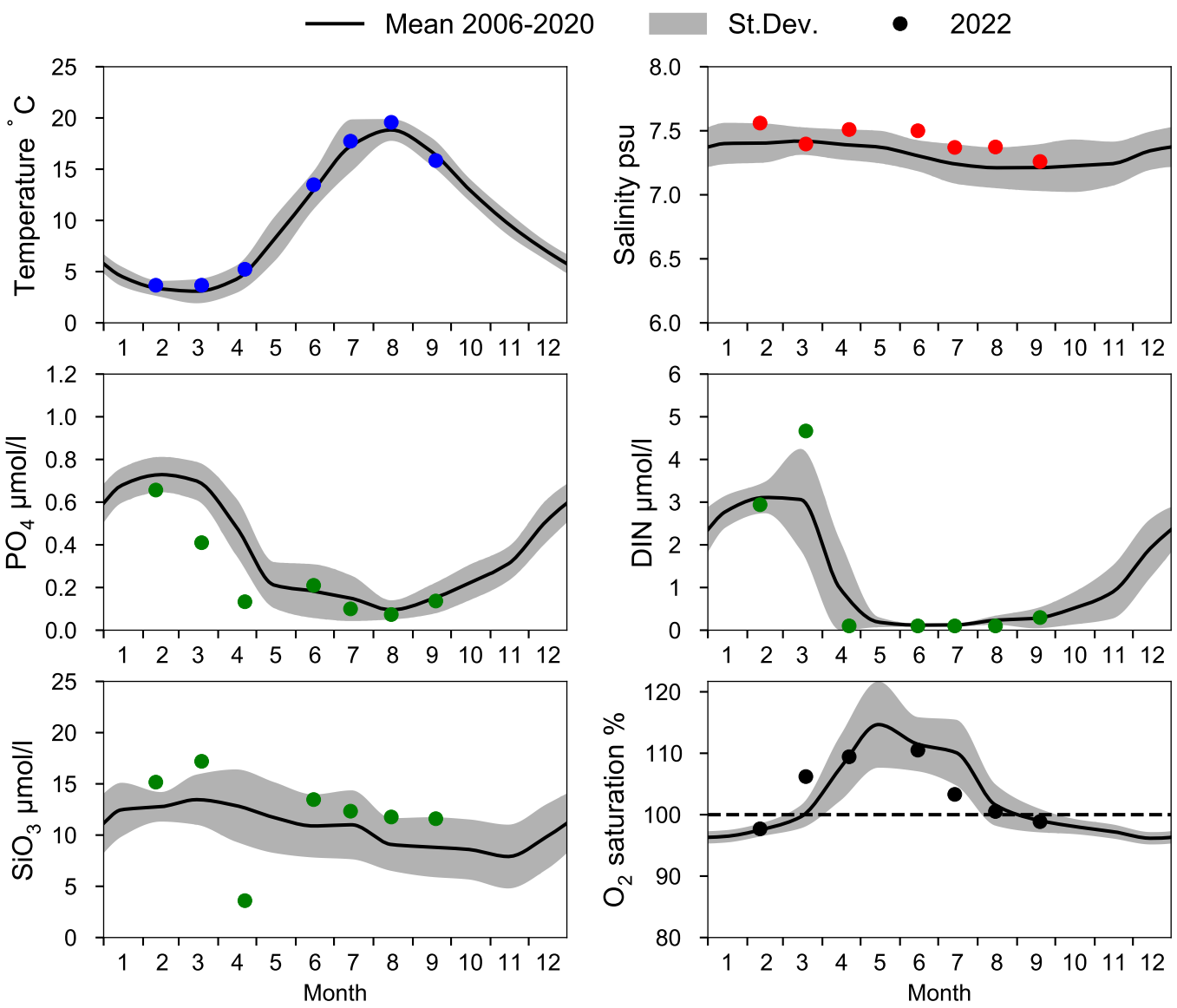


Vertical profiles BY5 BORNHOLMSDJ
September

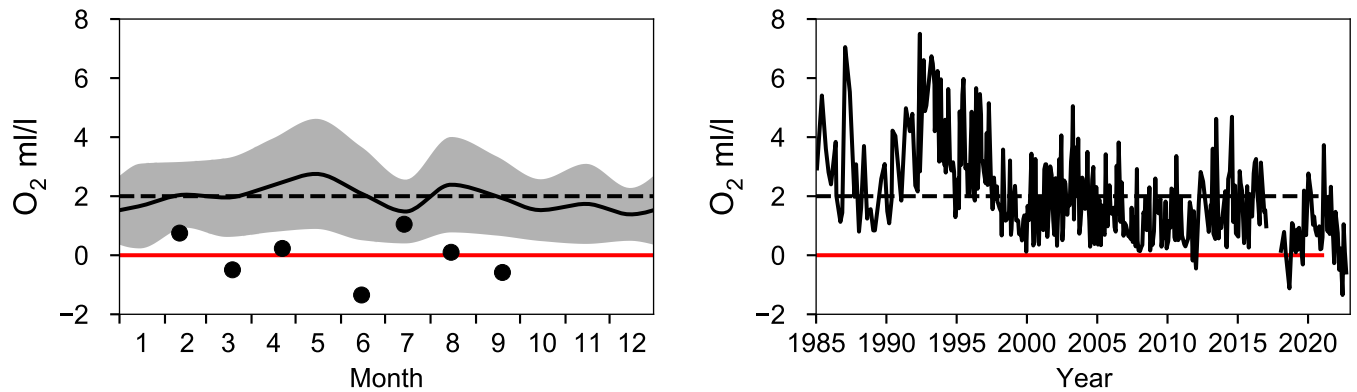


STATION BCS III-10 SURFACE WATER (0-10 m)

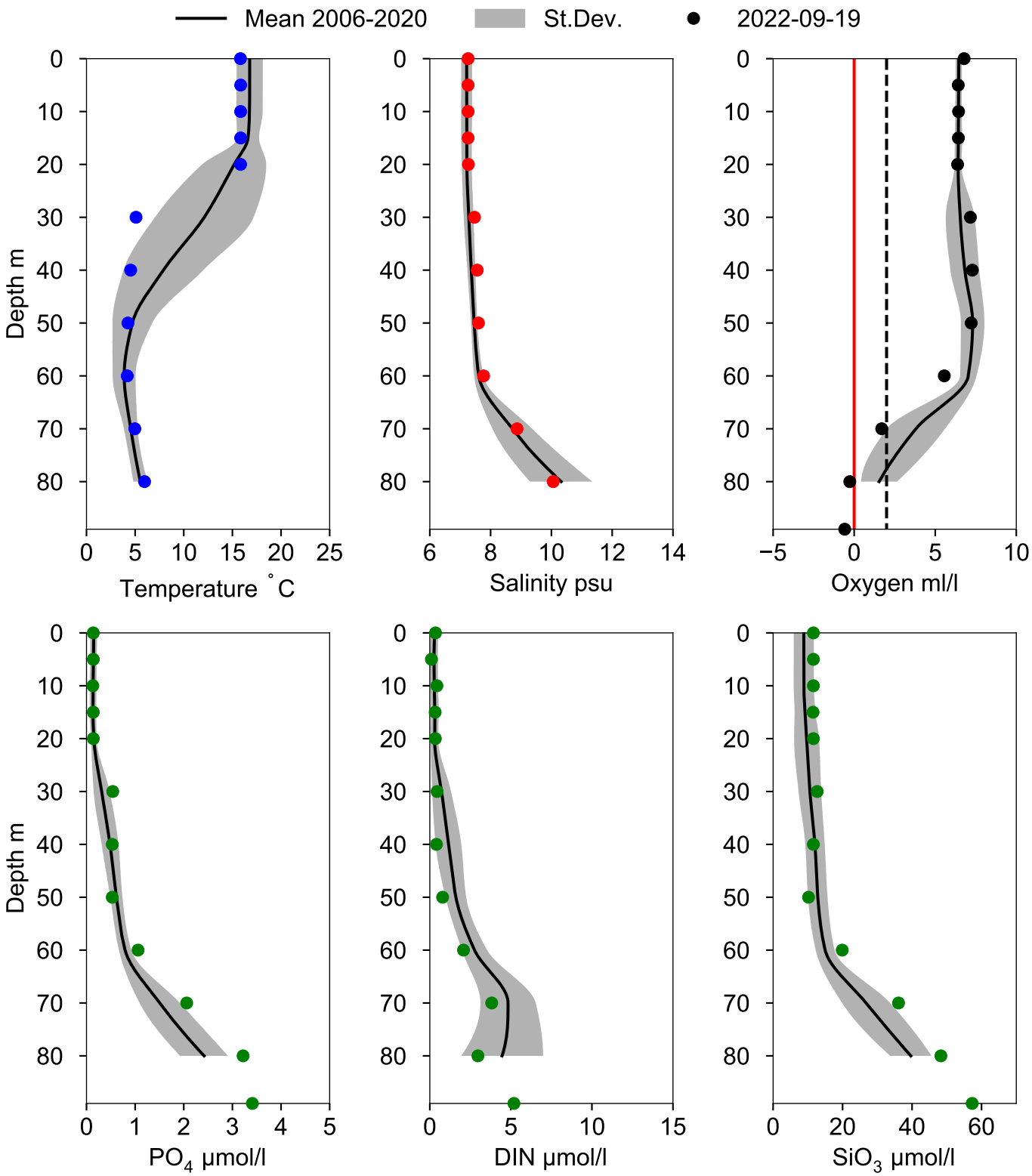
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

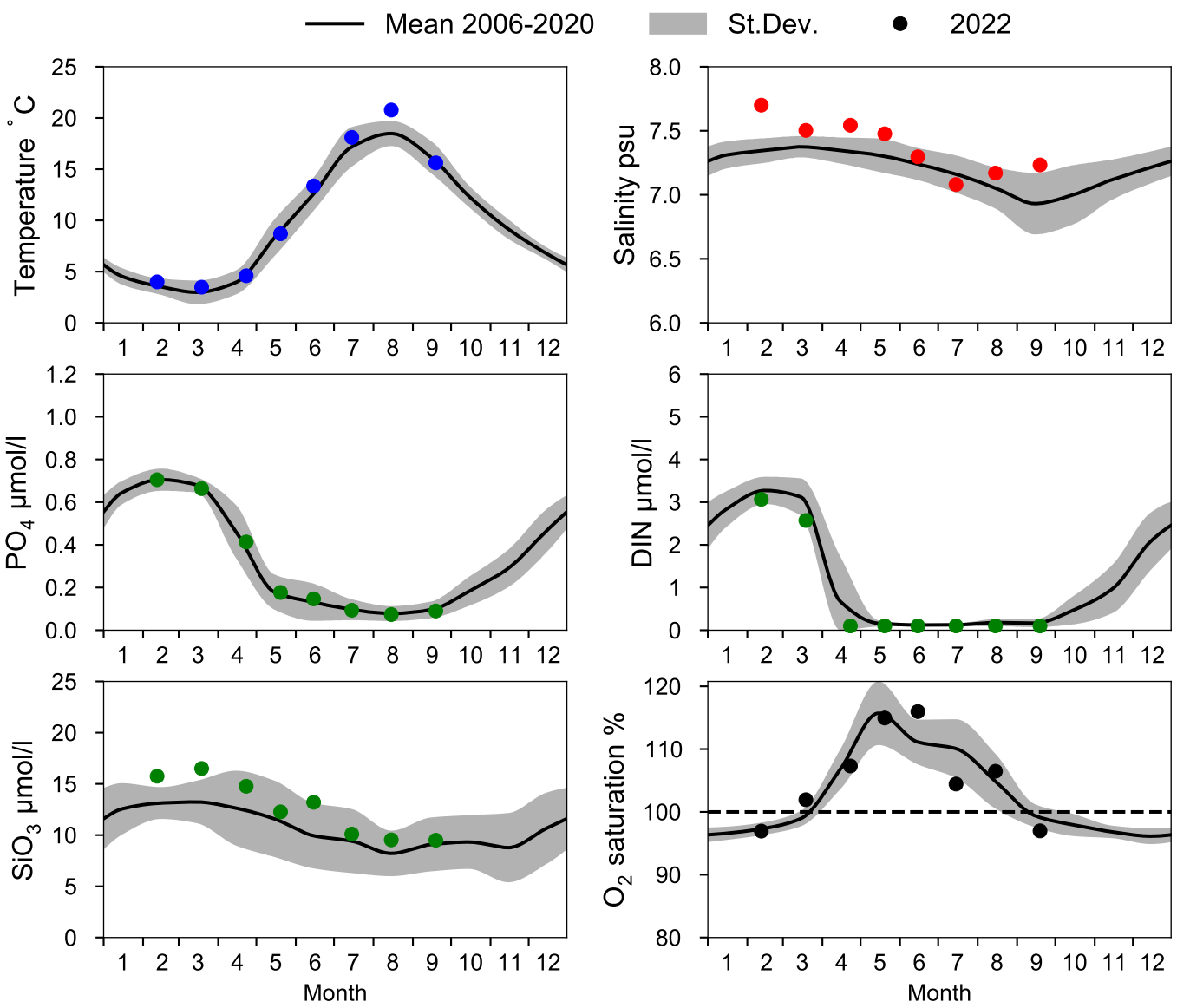


Vertical profiles BCS III-10
September

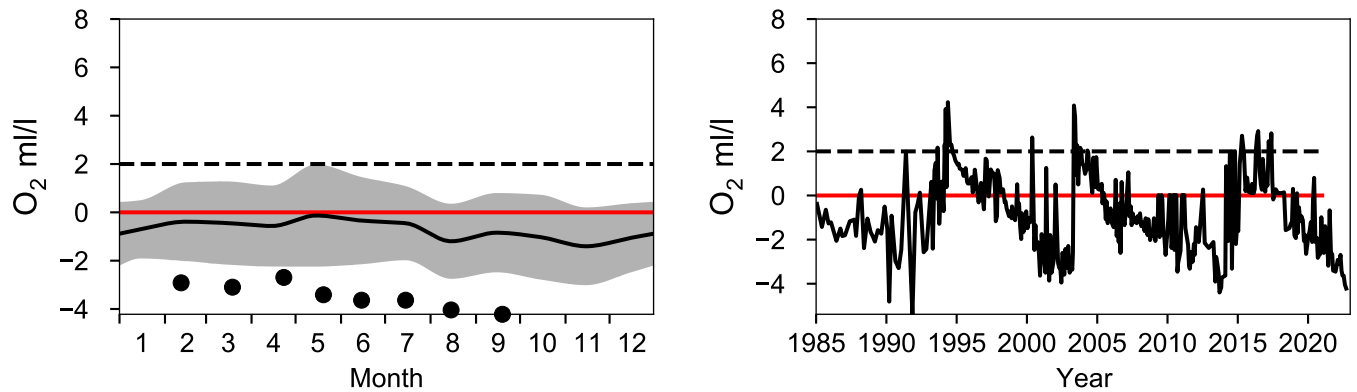


STATION BY10 SURFACE WATER (0-10 m)

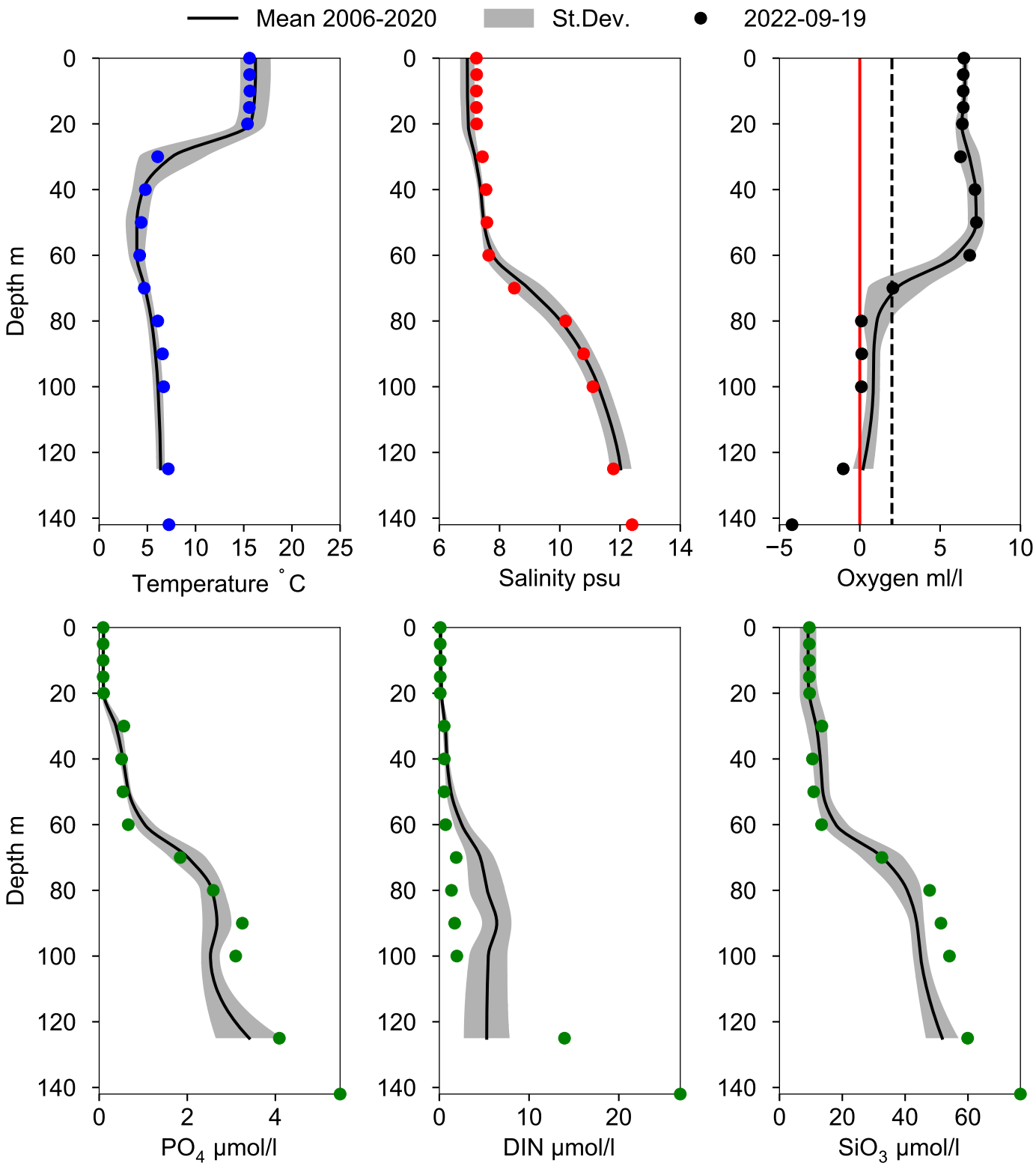
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

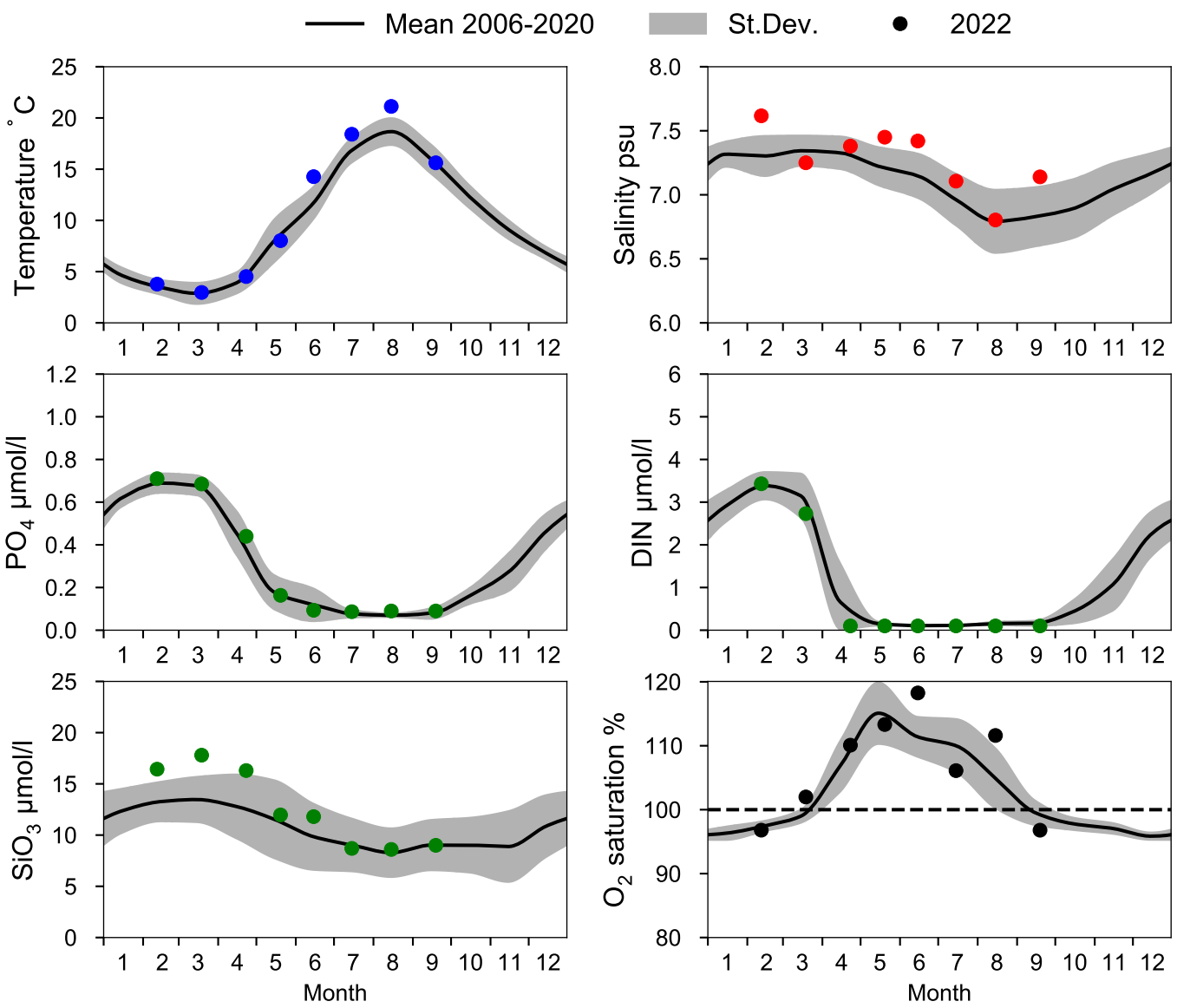


Vertical profiles BY10
September

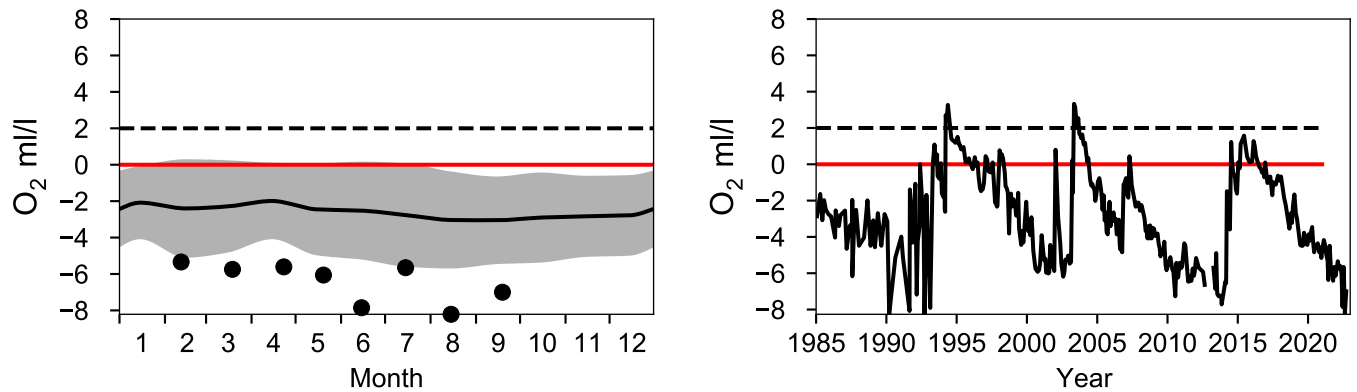


STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

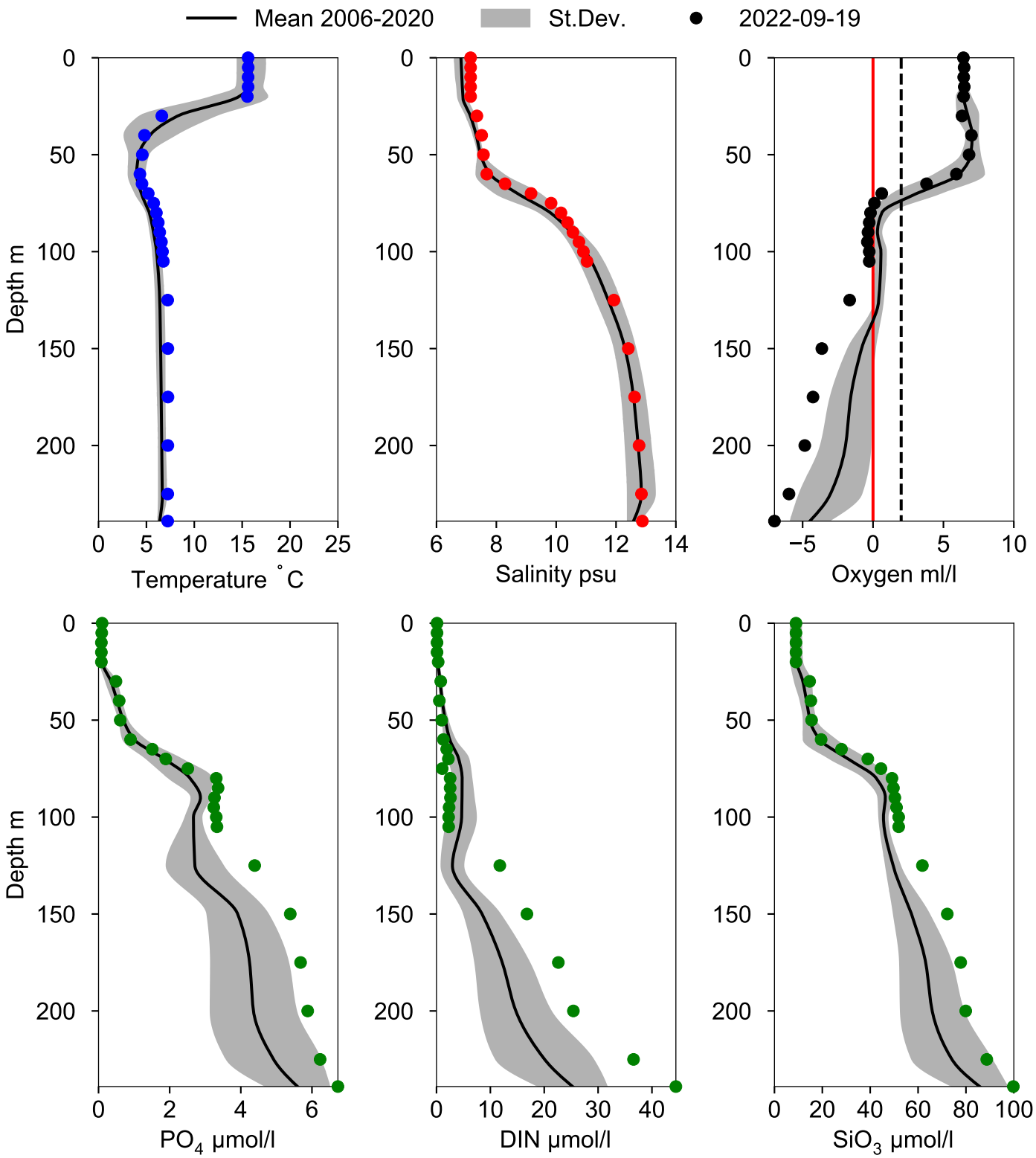
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 225 m)

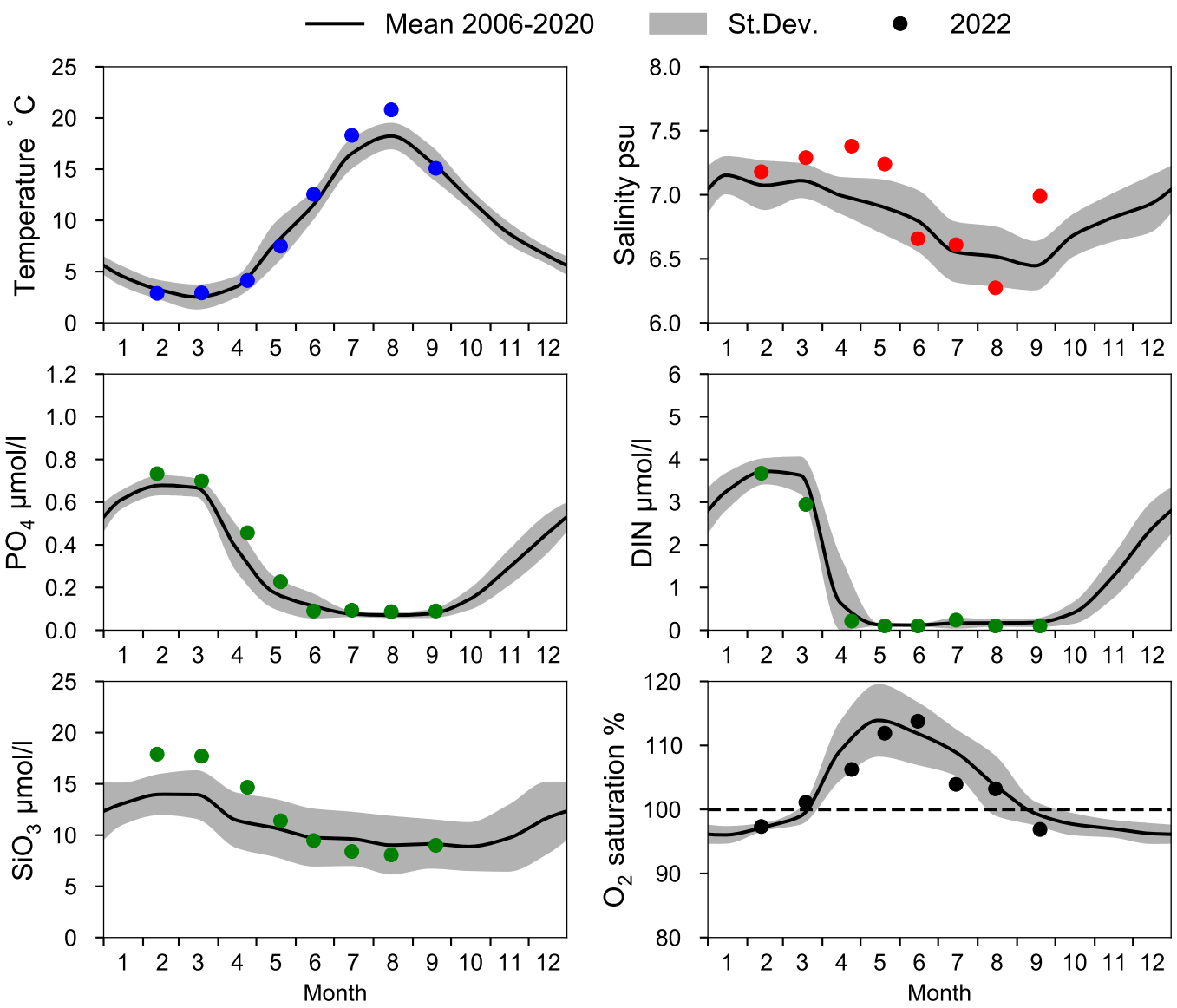


Vertical profiles BY15 GOTLANDSDJ
September

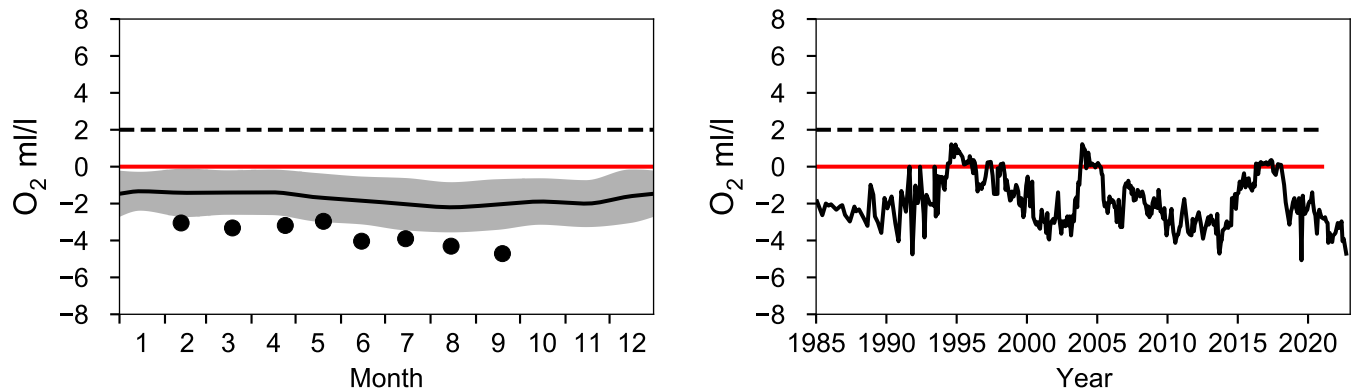


STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

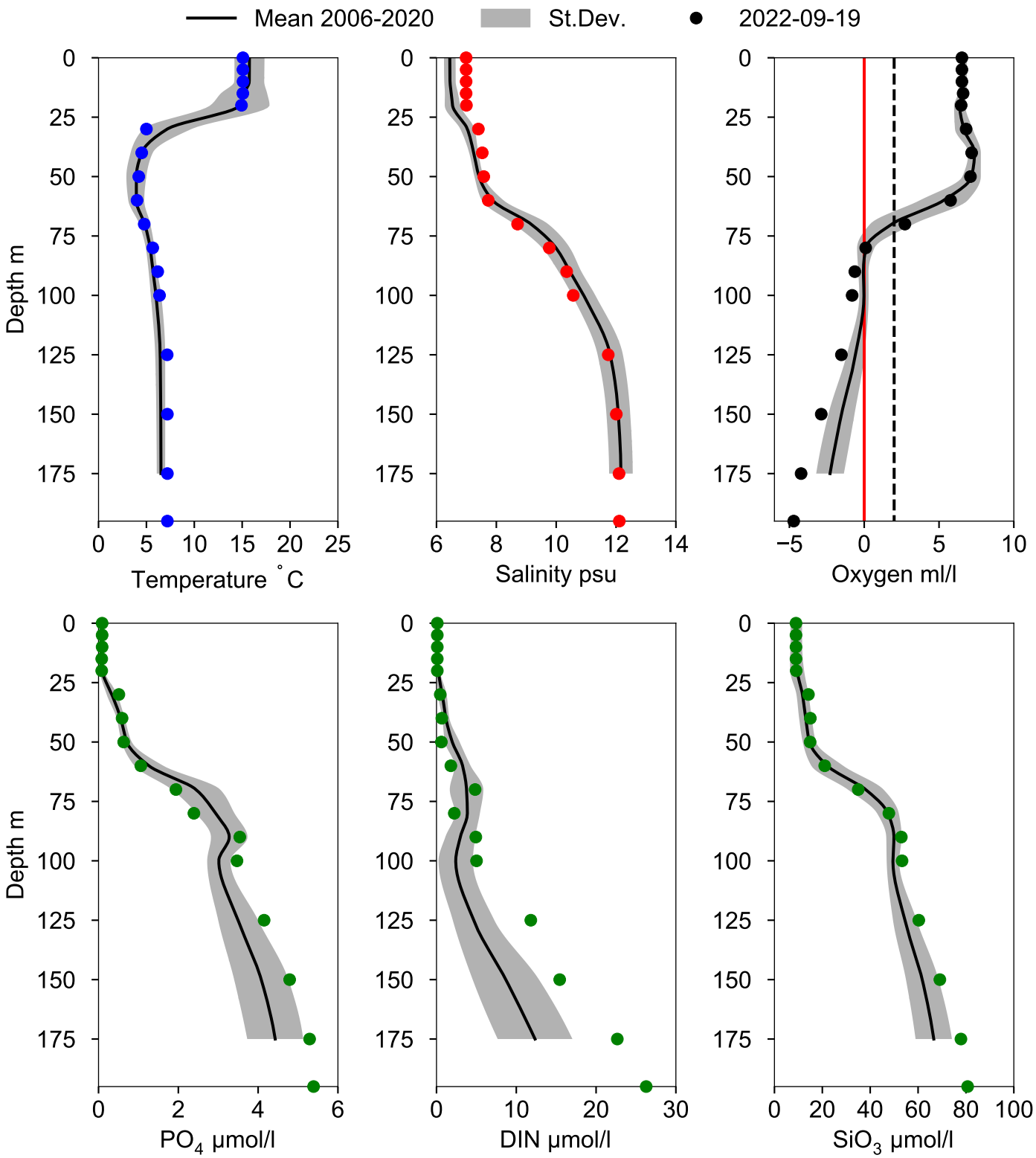
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

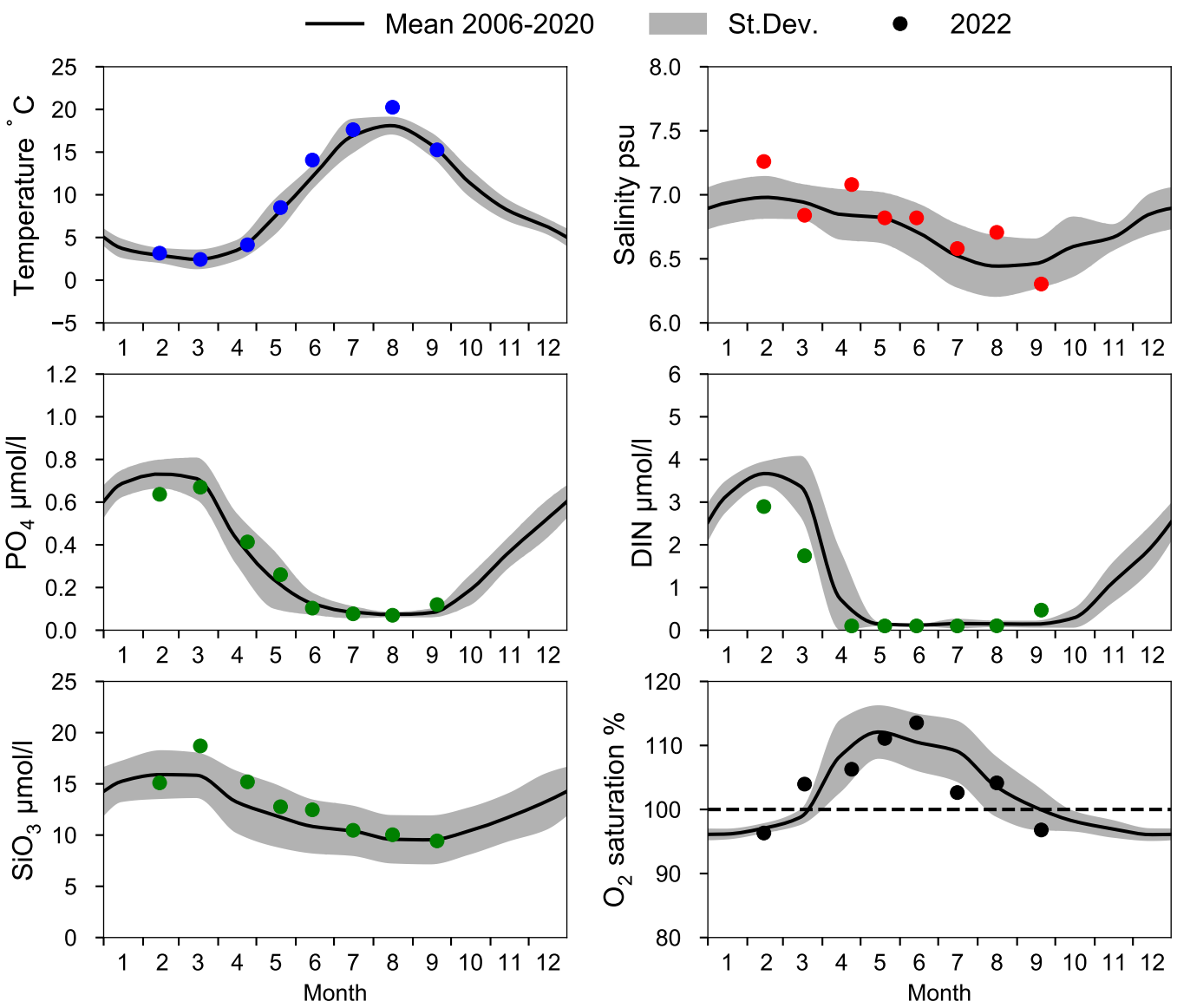


Vertical profiles BY20 FÅRÖDJ
September

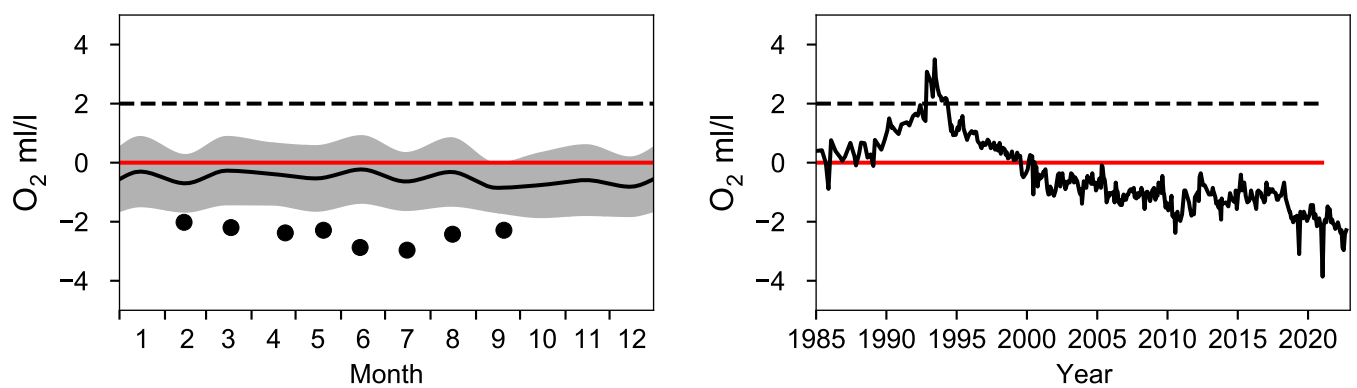


STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

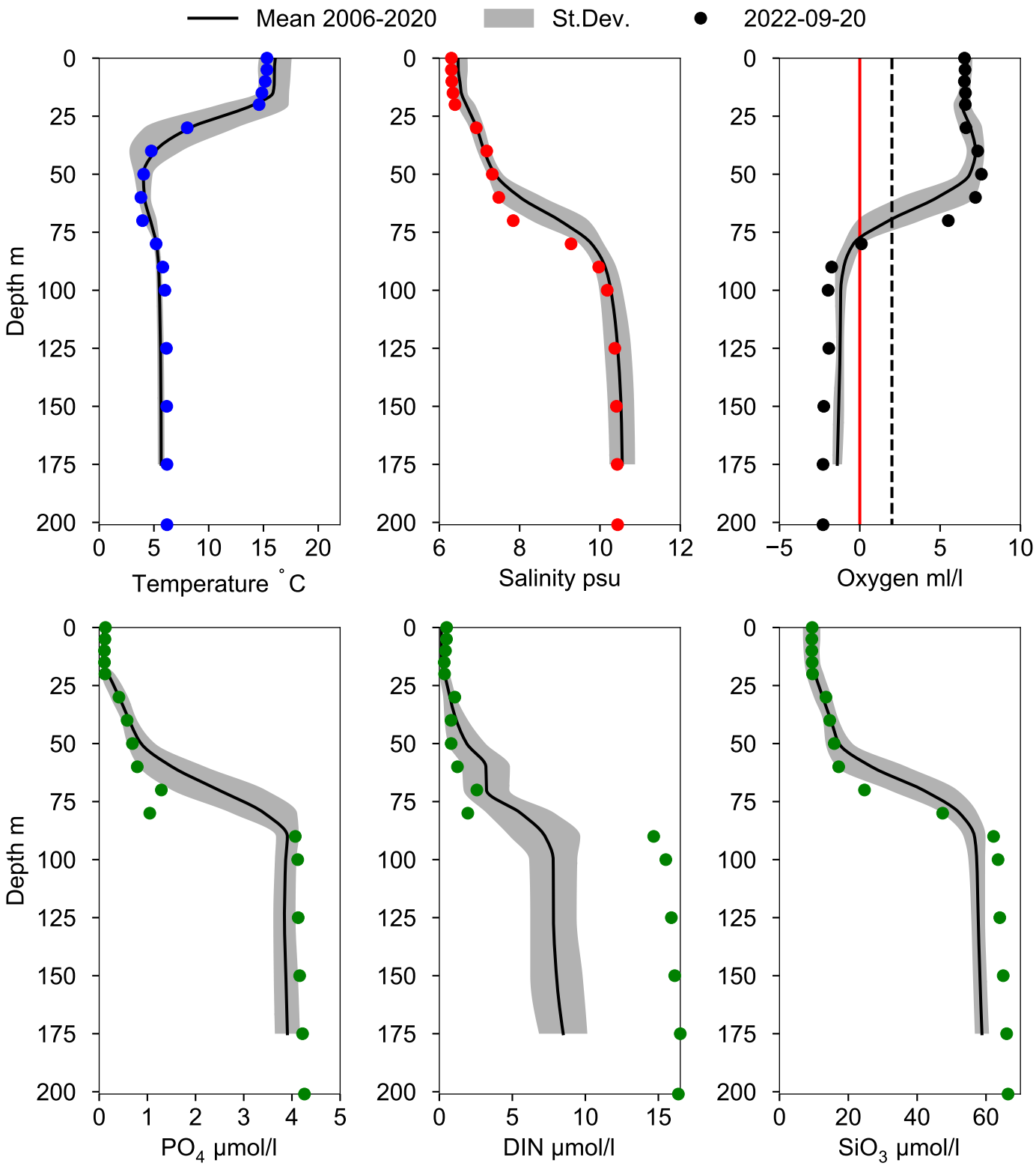
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

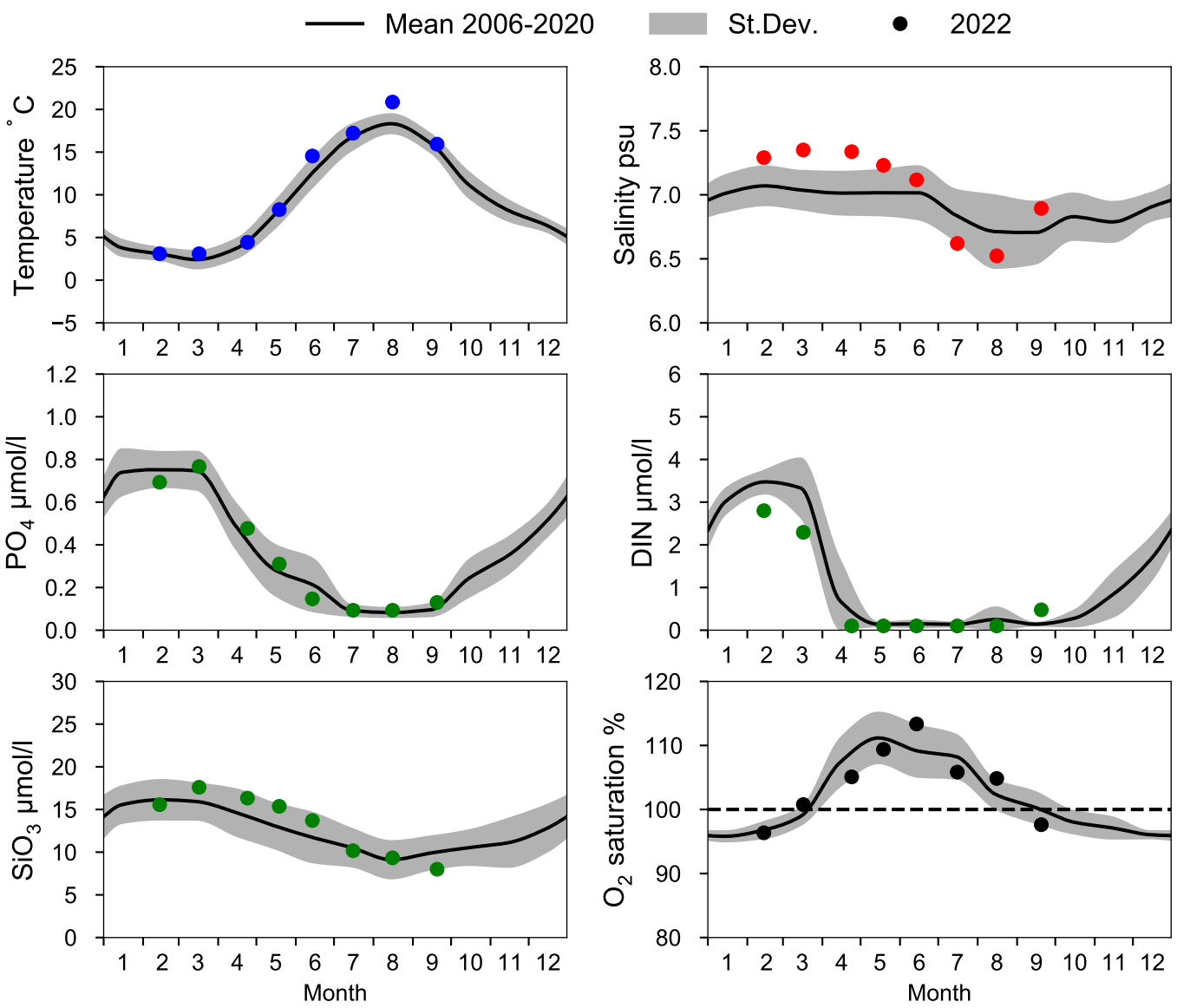


Vertical profiles BY32 NORRKÖPINGSDJ
September

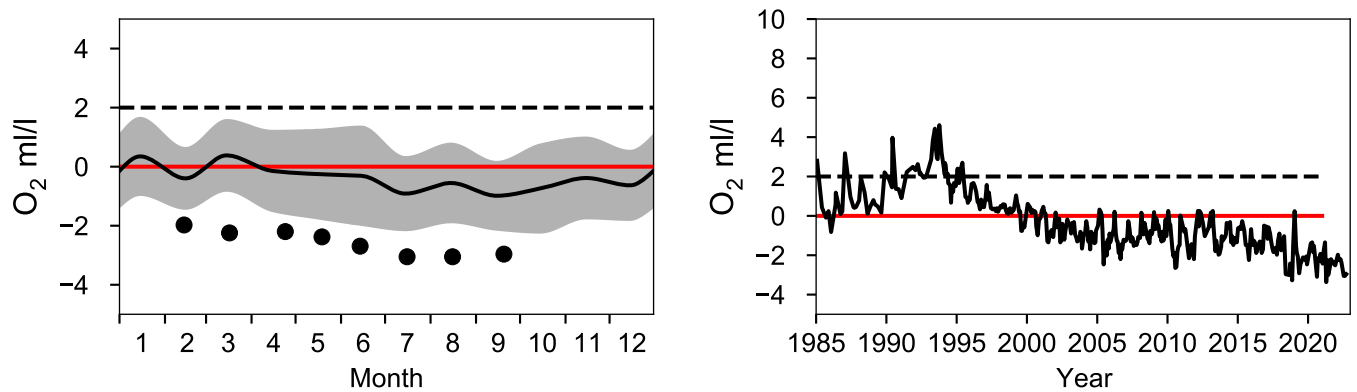


STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

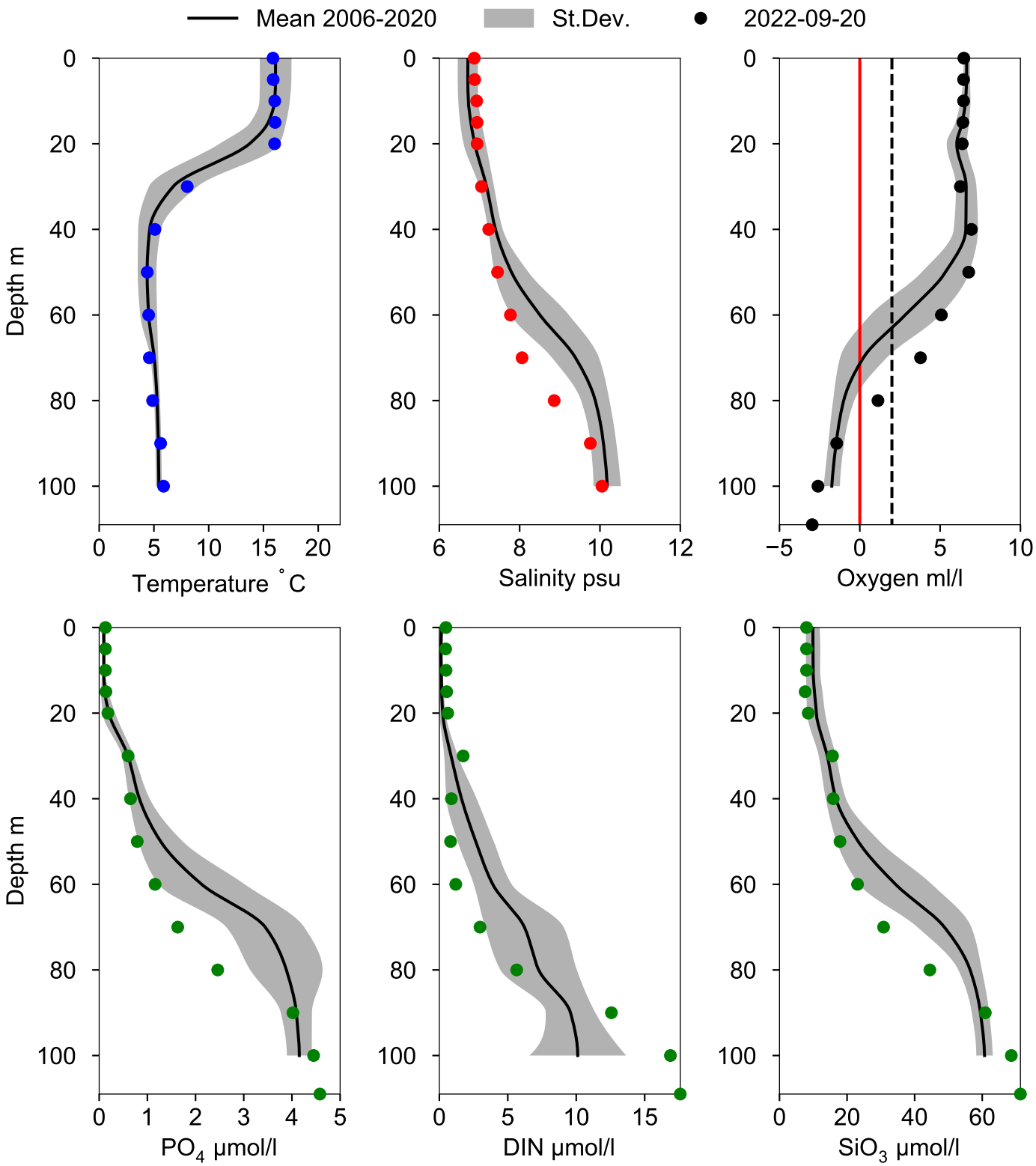
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

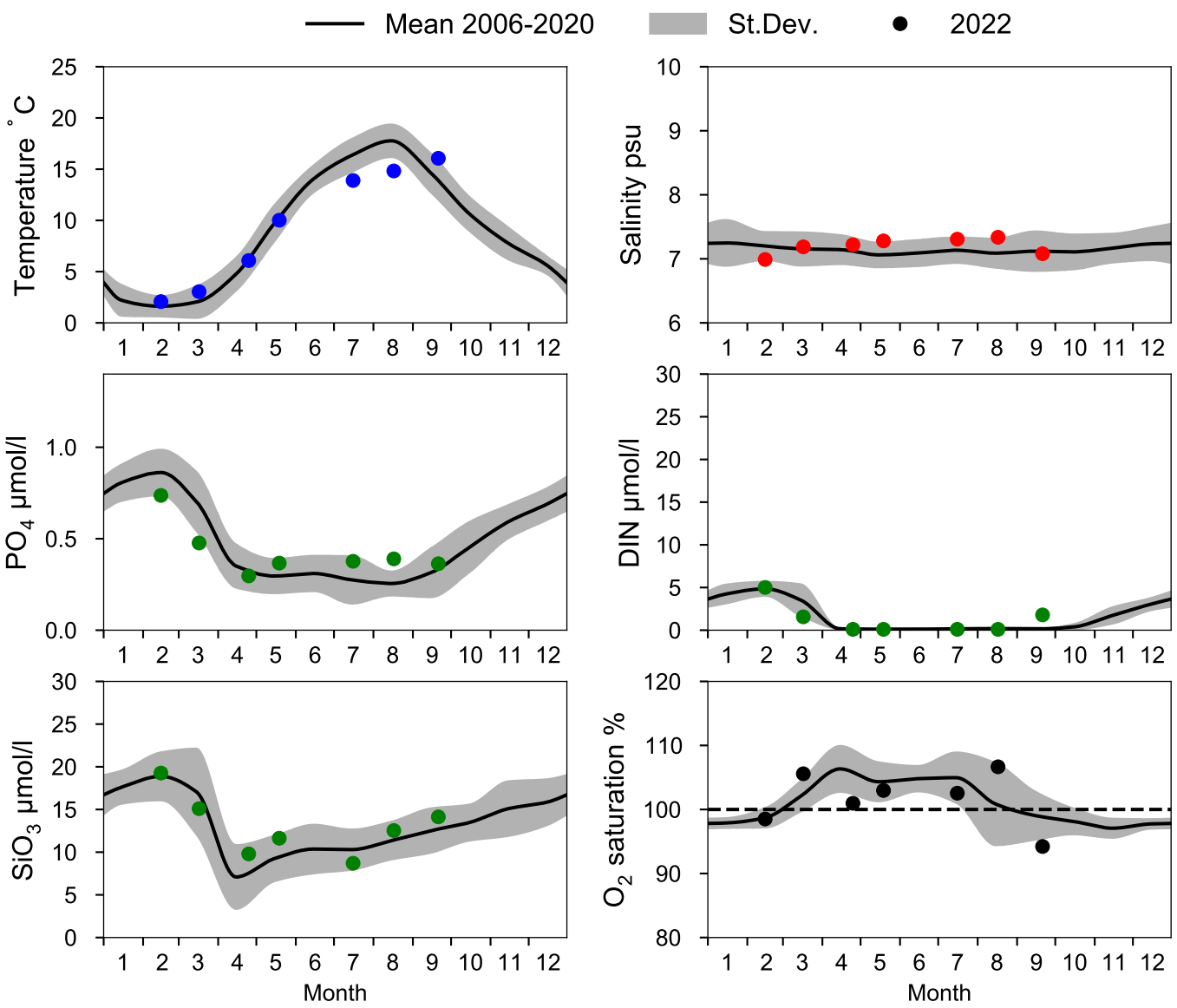


Vertical profiles BY38 KARLSÖDJ
September

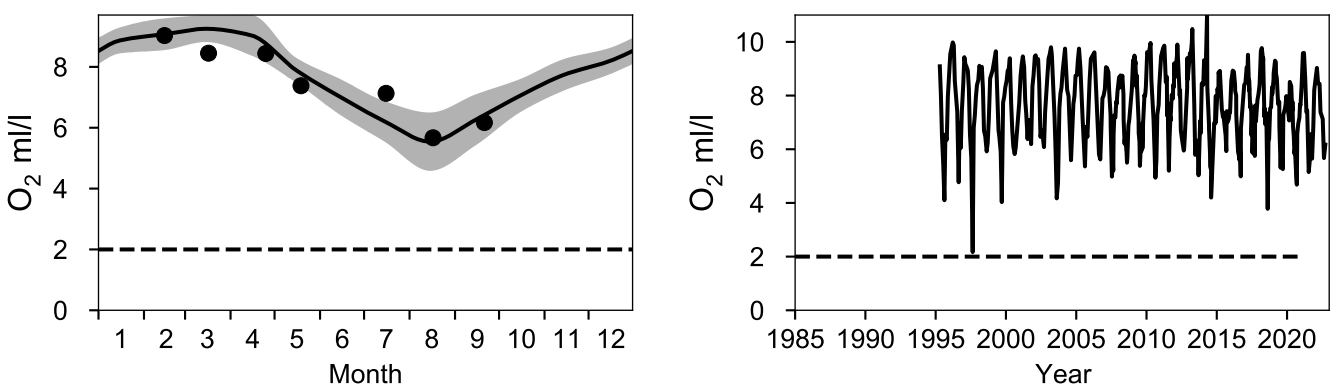


STATION REF M1V1 SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 15 m)



Vertical profiles REF M1V1
September