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Report from SMHI's marine monitoring cruise with R/V Svea – may 2024

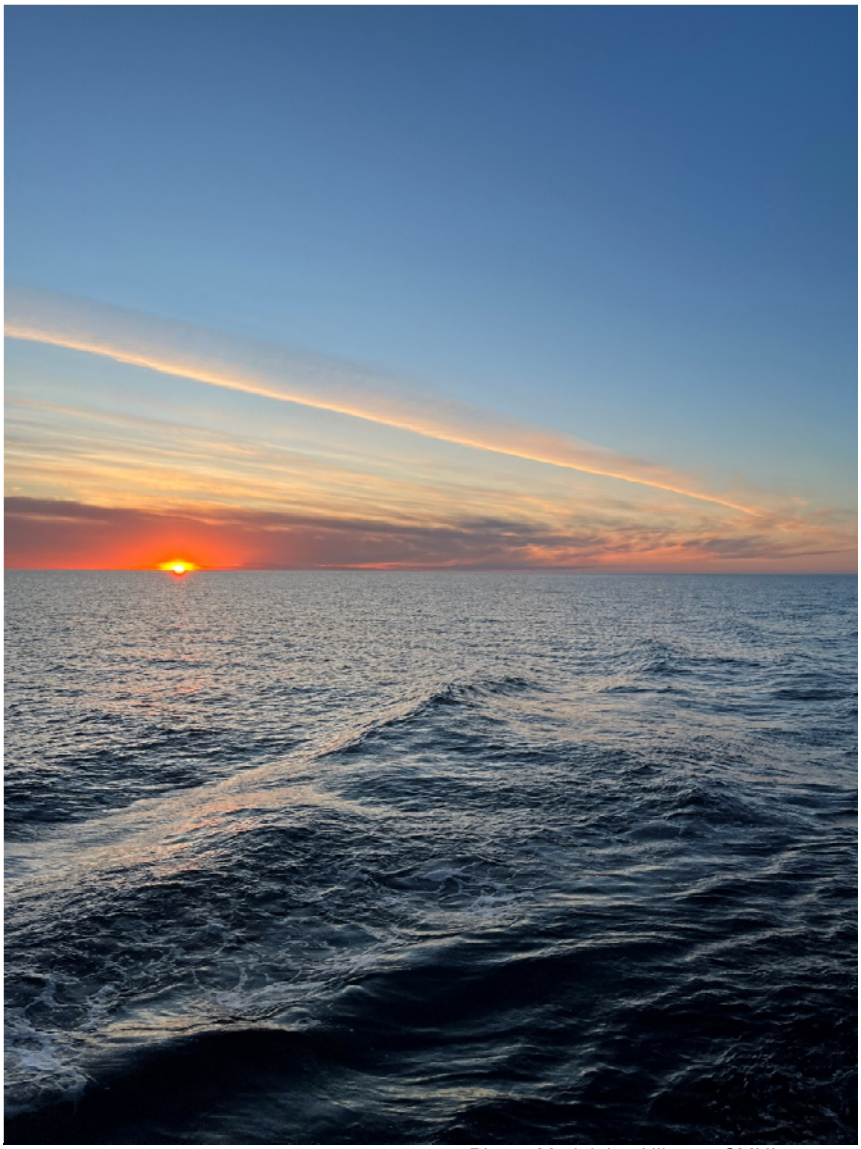

Photo: Madeleine Nilsson, SMHI

Survey period: 2024-05-06 to 2024-05-13

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 Agency (SMA)

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SUMMARY

During the expedition, which is part of the Swedish pelagic monitoring program, the Skagerrak, the Kattegat, the Öresund and the Baltic Proper were visited. The expedition was combined with bottom fauna sampling in the Baltic Proper performed by Stockholm University (SU).

The temperature in the surface water was normal for the month and varied between 5 – 8 °C in the Baltic Sea and 9 – 11 °C in the Skagerrak and the Kattegat. In the Skagerrak and the Kattegat and further into the southern Baltic (the Arkona and Bornholm Basins) the salinity of the surface water was below normal, while it was higher than normal in the Eastern Gotland Basin.

The concentration of dissolved inorganic nutrients in the surface water has continued to decrease since March and April, but the concentrations of dissolved inorganic nitrogen (DIN) and silicate remained high and above normal at several stations in the Skagerrak and the Kattegat with levels up to 3.5 µmol/l and 6.2 µmol/ l respectively. In the Baltic Sea, the concentration of DIN was at low levels around 0.1 µmol/l, while the phosphate concentration was between 0.2 – 0.3 µmol/l, which was slightly elevated for the area around the Eastern- and Western Gotland Basins. The phosphate concentration was around 0.1 µmol/l in the Skagerrak and the Kattegat. In the Eastern Gotland Basin, the levels of silicate were slightly elevated and were between 10 – 16 µmol/l.

The oxygen situation in the bottom water was good (>4 ml/l) at all stations in the Skagerrak, the Kattegat and the Öresund, no lack of oxygen was observed.

In the Arkona Basin, the oxygen situation was good with concentrations around 4 ml/l in the bottom water. In the Bornholm Basin and the Hanö Bay, there is once again a severe lack of oxygen (<2 ml/l) in the deep water. In the Eastern Gotland Basin, severe oxygen deficiency occurred from about 70 m depth, while hydrogen sulphide was measured first at 125 m and deeper. Hydrogen sulphide occurred from 80 m in the Western Gotland Basin, but the levels are lower than in the Eastern Gotland Basin.

The next expedition with R/V Svea is planned for 2 – 8 June, starting in Kalmar and ending in Lysekil.

RESULTS

The expedition was carried out with the research vessel R/V Svea and started after lunch in Lysekil on May 6. The weather during the expedition week was sunny with light winds and temperatures between +5 and +10 °C.

24 of the 26 planned stations were visited. Reference measurement at Flinten 7 and station Almagrundet had to be cancelled due to lack of time and to adjust our arrival time to SU's stations as their bottom sampling needs to take place during day time. In total, 7 bottom fauna areas were visited. Profiles of salinity, temperature, oxygen and fluorescence in the water column were measured with the CTD[1] mounted on a rosette with space for 24 water sampling bottles.

Svea's ferrybox was operating throughout the expedition but the Imaging Flow Cytobot (IFCB) was not installed during this trip. Daily, a reference sample was taken from the ferry box for chlorophyll analysis. The instrument for measuring profiles during walking; Moving Vessel Profiler (MVP), was only deployed at a transect between stations Å13 and Å17, because we could not maintain the low speed recommended for MVP run due to the intense sampling campaign that was to be carried out during this trip. Svea's ADCP was only run with the WH600 as the OS150 did not work.

Reference measurement with CTD at the sea buoy at Huvudskär was carried out when we passed on our way south.

This report is based on data that has undergone an initial quality control and which is compared against the monthly average for the period 1991 – 2020. When further quality control has been carried out, some values may change. Values stated in the report have been rounded to the nearest tenth and may therefore differ from published values. The data is published as soon as possible on the data host's website, normally within about a week after the end of the expedition. Some analyzes are carried out after the expedition and are therefore published later.

More information about SMHI as a data host and to download data see this link (in Swedish):
https://www.smhi.se/data/oceanografi/datavardskap-oceanografi-och-marinbiologi
The cruise reports are published here:
https://www.smhi.se/en/publications/publications/cruise-reports-from-the-marine-monitoring
More information about the algae situation can be found in the Algaware report:
https://www.smhi.se/publikationer/publikationer/algrapporter

[1] CTD; short for Conductivity, Temperature, Depth.

The Skagerrak

The thermocline had not fully developed, but the surface water has started to warm up and the temperature was between 9 – 11 degrees, which is normal for the month. The salinity in the surface water was lower than normal and was between 18 – 27 but closer to the coast, at Släggö the salinity was within normal around 22. The halocline was at about 15 – 20 m depth.

The concentration of dissolved inorganic nutrients in the surface water has continued to decrease since March and April, but the amount of dissolved inorganic nitrogen (DIN) and silicate is still high and above normal at several stations with levels that varied between 0.1 – 3.5 µmol/l and 3.2 – 6.2 µmol/l respectively. The phosphate content was around 0.1 µmol/l.

The oxygen situation at the bottom was good at all stations in the Skagerrak, normal levels for the month were measured with concentrations between 5.9 – 6.3 ml/l.

Fluorescence measurement gave the highest results between 0 – 15 m, some high peaks were noted at 7 and 11 m at stations Å15 and Å13, but the highest values were found in the surface at Släggö. At Å17, fluorescence was measured down to approx. 30 m.

The Kattegat and Öresund

The surface water temperature has increased from around 7 degrees since April and was now around 9 – 10 °C, which is normal for the month. The salinity in the surface water was also below normal in the area and varied from 7.8 in Öresund to 18.9 at Anholt E. The thermocline and halocline coincided and appeared around 5 – 15 meters.

The concentration of dissolved inorganic nutrients in the surface water was variable in the area. At Fladen, nutrient levels had increased slightly since April and were above normal for the month. At N14 Falkenberg and Anholt E, DIN and phosphate remained at low levels, while the silicate content had increased since April at both stations. Also in Öresund, the silicate content had increased, while DIN and phosphate had decreased since April. The levels of silicate were above normal for the month at all stations in the area and were between 6.3 – 11.4 µmol/l.

The oxygen levels in the Kattegat's bottom water were within the normal range and were around 4.8 - 6.0 ml/l at all stations, with the lowest concentration found in Öresund.

Chlorophyll fluorescence was highest between 7 and 12 meters.

The Baltic Proper

The temperature in the surface water was colder than in the Skagerrak and the Kattegat, but had increased at all stations since April and was between 4 - 8 °C, which is within the normal range for the month. The highest surface water temperature (8.1°C) was recorded at BCSIII-10. The salinity in the surface water was still below normal in both the Arkona and Bornholm Basins and was between 7.1 and 7.3. The salinity of the surface water was above normal in the Eastern Gotland Basin (7.2 – 7.5), while it was within normal range in the Western Gotland Basin (6.5 – 6.9).

The water was well mixed down to 30 m in the Arkona Basin, below was a somewhat warmer and saltier water. In the Bornholm Basin, we could see a slight warming of the surface water but no pronounced thermocline. The halocline was around 40 – 50 m deep in the Bornholm Basin, in the Eastern and Western Gotland Basin it stretched down to 60 – 70 m depth.

The levels of dissolved inorganic nutrients in the surface water had decreased throughout the Baltic Proper since April. DIN had decreased to or remained at low levels around 0.1 µmol/l, which was within normal for the month, while the levels of phosphate, which were between 0.2 – 0.3 µmol/l, were slightly elevated in some parts of the Eastern and Western Gotland Basin. The levels of silicate have dropped to normal levels in the Western Gotland Basin and were now between 11 – 14 µmol/l. In the Eastern Gotland Basin, the levels of silicate were still slightly above normal and were between 10 – 16 µmol/l. In the Arkona and Bornholm Basins, the levels of phosphate and DIN in the surface water were normal for the month and were around 0.2 and 0.1 µmol/l, respectively, while the levels of silicate were still slightly higher than normal in the Arkona Basin.

In the Arkona Basin, the oxygen situation in the bottom water was still good, but the concentration of oxygen had decreased slightly since April and was now around 4 ml/l.
In the Bornholm Basin and the Hanö Bay there is once again oxygen deficiency (<2 ml/l) in the deep water from approx. 70 – 80 m deep. At station BCSIII-10 slightly higher oxygen concentration was measured around 3 ml/l closest to the bottom, however, a shallower layer was observed at 80 m deep with oxygen content close to zero (0.3 ml/l).
In the Eastern Gotland Basin, oxygen was depleted from a depth of about 70 m, but no hydrogen sulphide was measured until 125 m. At BY10, hydrogen sulphide only occurred closest to the bottom (142 m). In the Western Gotland Basin, hydrogen sulphide was measured from 80 m and below. The highest hydrogen sulphide concentration occurred in the Eastern Gotland Basin at BY15 Gotland Deep.

The fluorescence measurements showed some plankton activity in the surface layer, mainly between 5 – 20 m. Fluorescence maxima were noted at 3 – 8 m depth in the Western Gotland Basin.

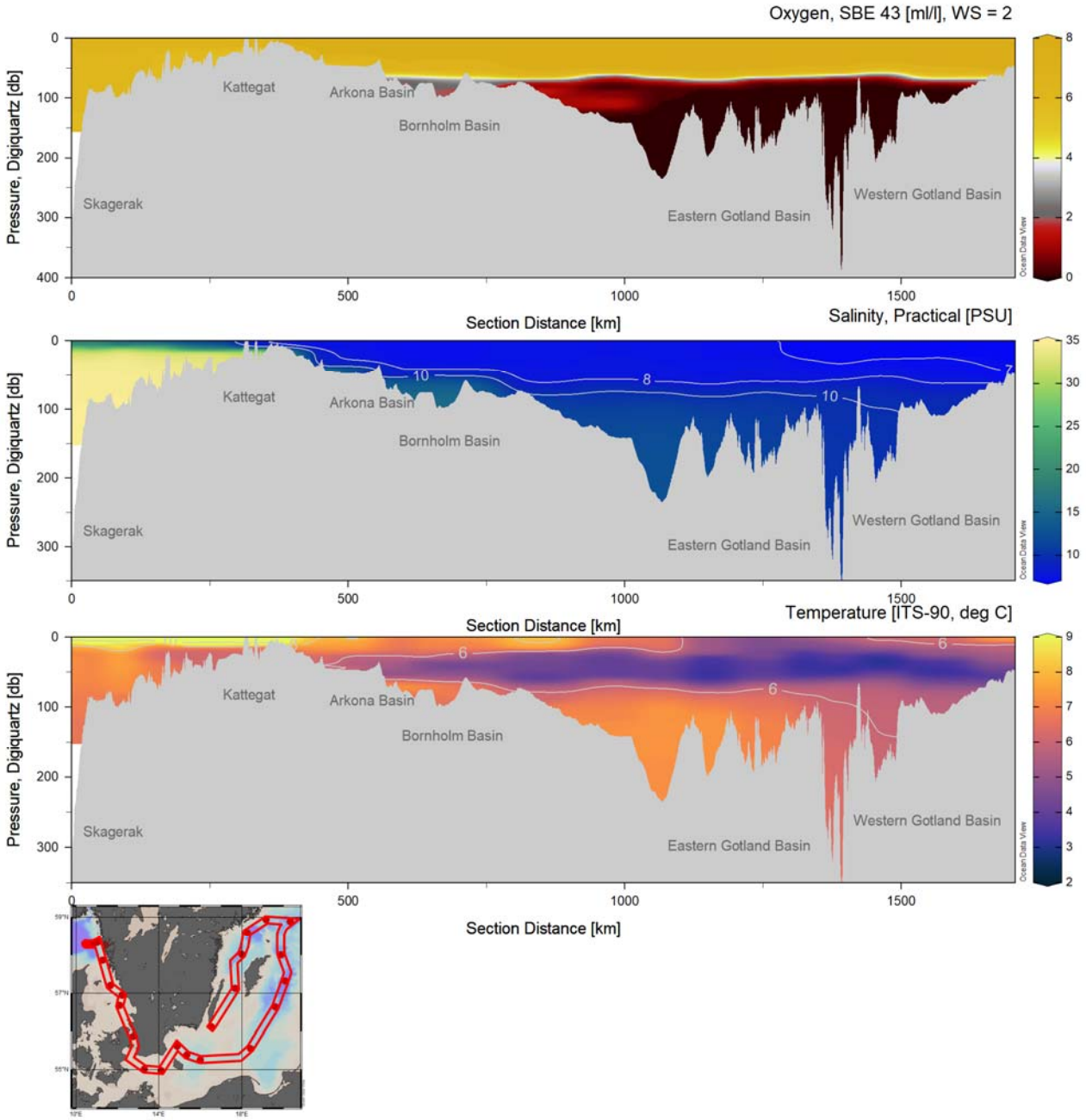


Figure 1. Cross section showing oxygen concentration, salinity and temperature from measurements with CTD, from the Skagerrak, through the Kattegat and further into the Baltic Proper, also shown in the map (bottom).

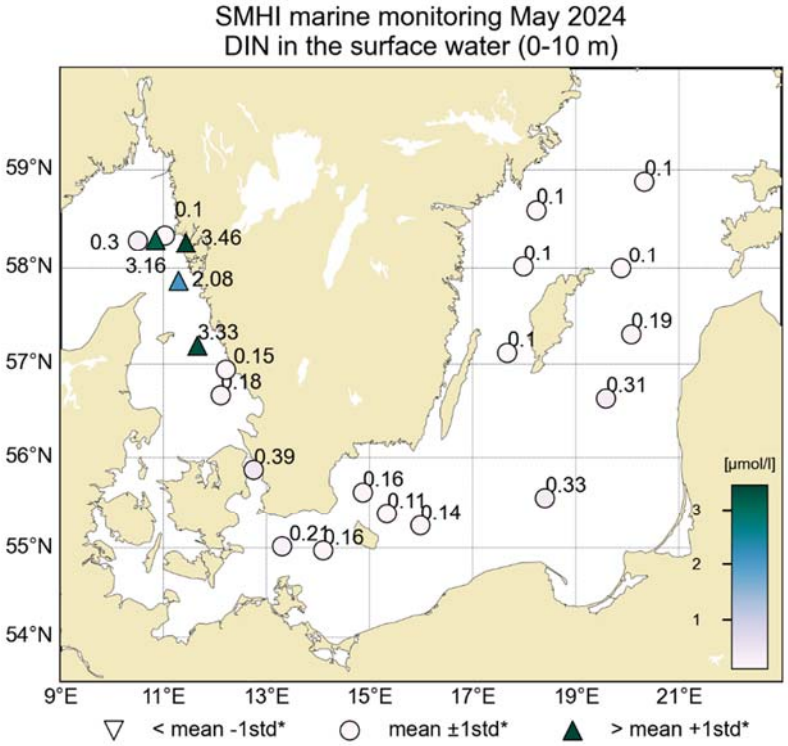


Figure 2. The concentration (µmol/l) of inorganic nitrogen (DIN) in the surface water (0 – 10 m). The mean value is based on data for the month within each basin during the years 1991 – 2020.

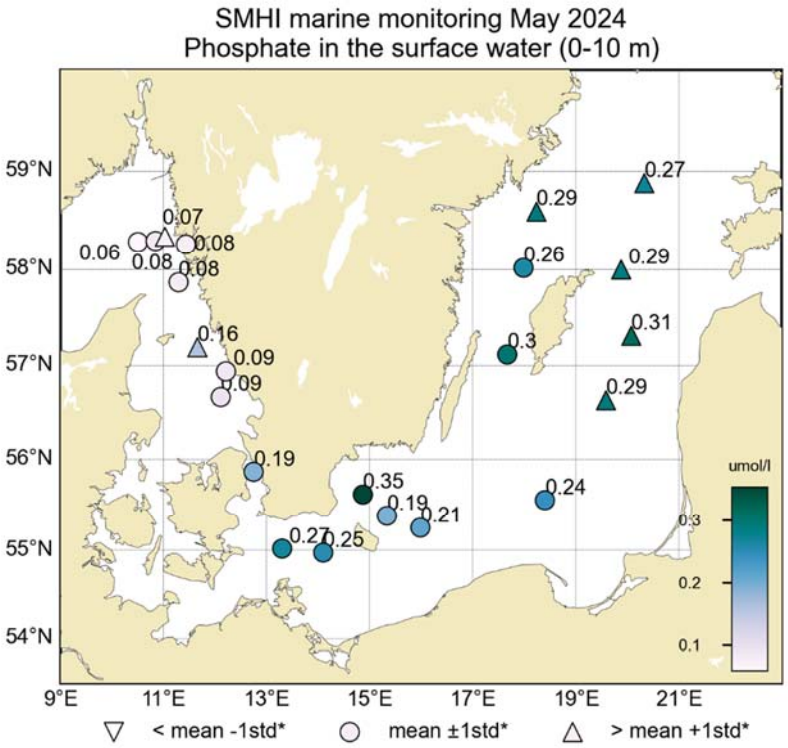


Figure 3. The concentration (µmol/l) of phosphate in the surface water (0 – 10 m). The mean value is based on data for the month within each basin during the years 1991 – 2020.

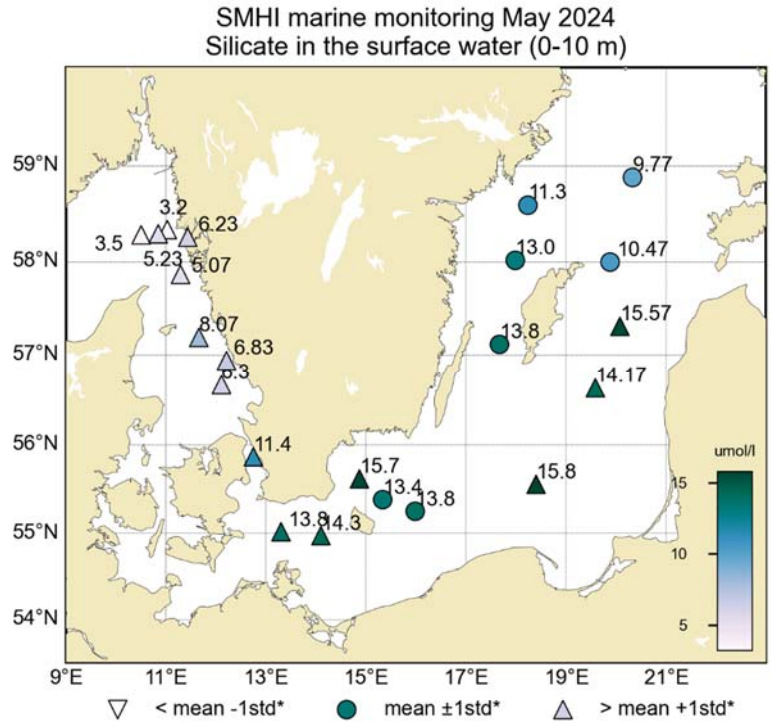


Figure 4. The concentration (µmol/l) of silicate in the surface water (0 – 10 m). The mean value is based on data for the month within each basin during the years 1991 – 2020.

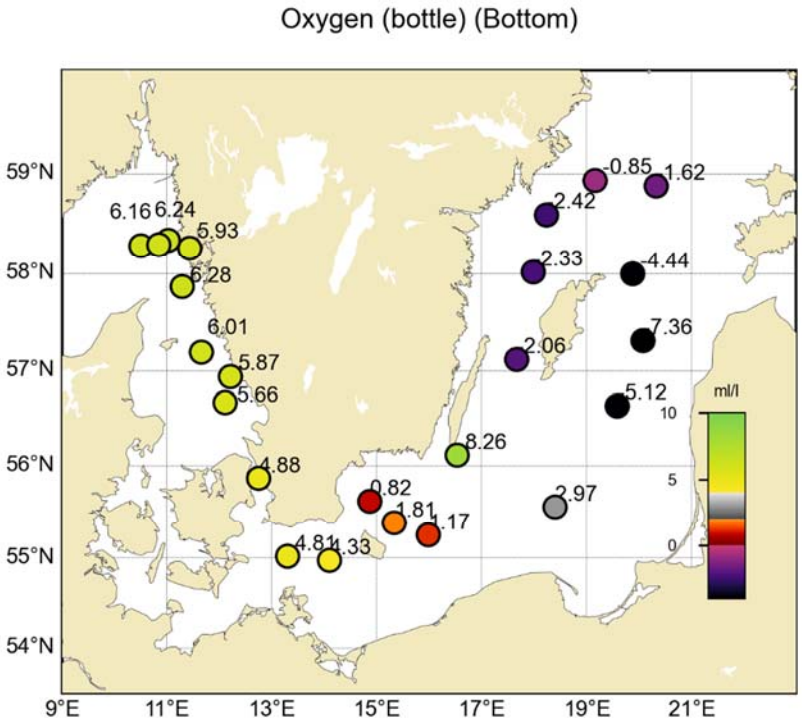


Figure 5. Dissolved oxygen concentration (ml/l) in the bottom water, approx. one meter above the seafloor. Presence of hydrogen sulphide is shown as negative oxygen. Note that the values have not been compared to statistics as in similar figures and only circles are shown.

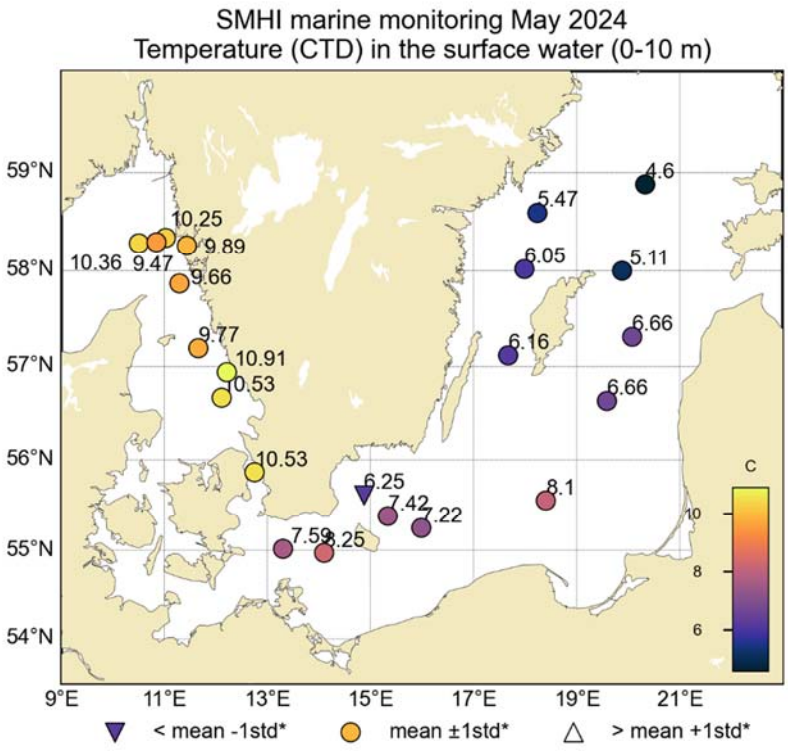


Figure 6. The temperature in the surface water (0 – 10 m). The mean value is based on data for the month within each basin during the years 1991 – 2020.

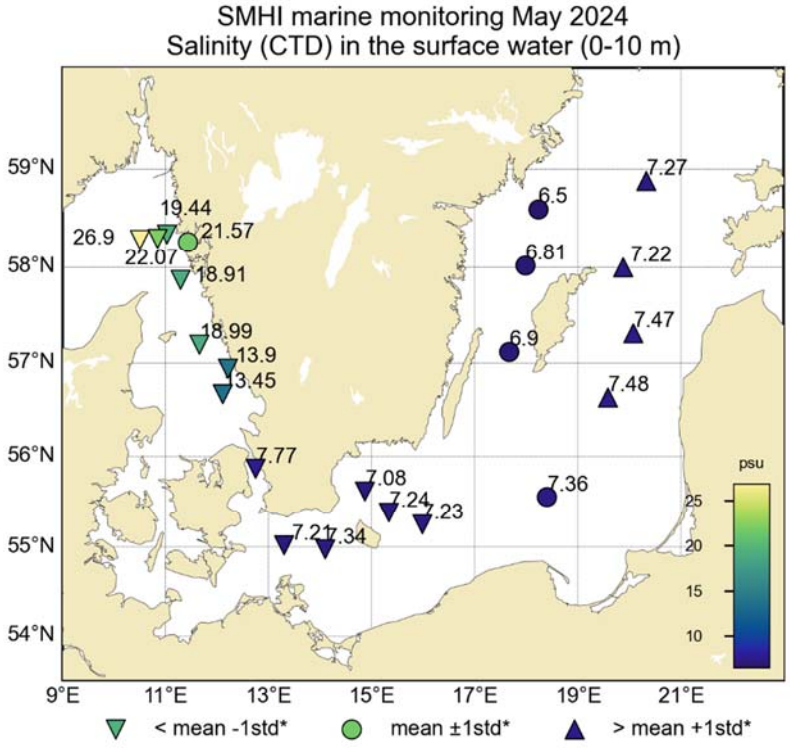


Figure 6. The salinity in the surface water (0 – 10 m). The mean value is based on data for the month within each basin during the years 1991 – 2020.

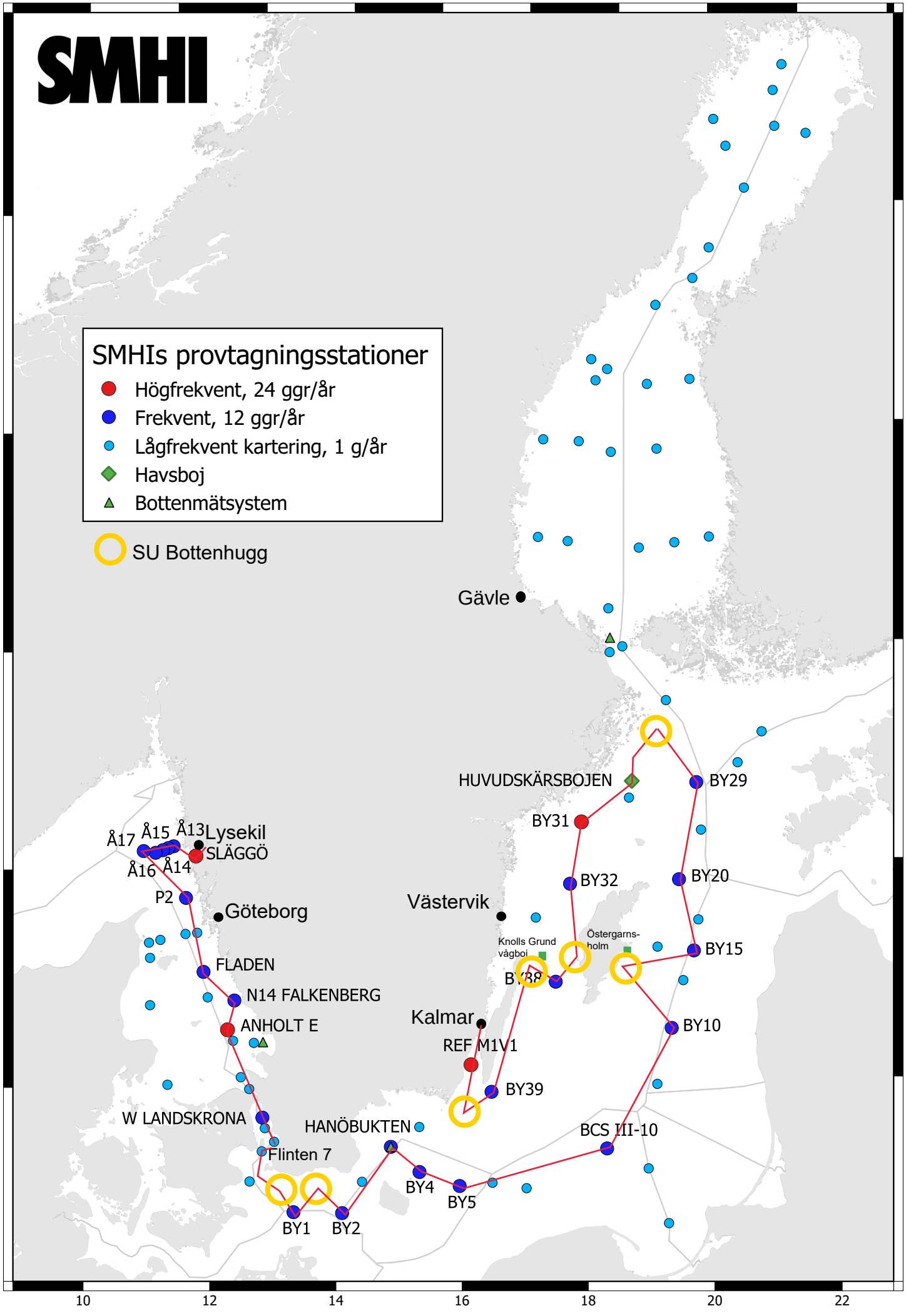
PARTICIPANTS

Name	Role	From
Madeleine Nilsson	Chief Scientist, Water sampling	SMHI
Lena Viktorsson	Water sampling	SMHI
Martin Hansson	CTD operator	SMHI
Örjan Bäck	CTD operator	SMHI
Sara Johansson	Nutrient analysis, Quality manager	SMHI
Johanna Honkanen	Chief Scientist, Bottom fauna sampling	SU
Marika Huldt	Bottom fauna sampling	SU
Malin Dahlgren	Bottom fauna sampling	SU
Linda Röjning	Bottom fauna sampling	SU
Samir Manda Avdi	Bottom fauna sampling	SU

APPENDICES

- Track chart
- Table with stations, analysed parameters and number of sampling depths
- Monthly average plots for surface water
- Vertical profiles

SMHI SWEDAC ACKREDITERING Ackred. nr. 1420 Provning ISO/IEC 17025 Havs och Vatten myndigheten


SMHI
SMHIs provtagningsstationer
Högfrekvent, 24 ggr/år
Frekvent, 12 ggr/år
Lågfrekvent kartering, 1 g/år
Havsboj
Bottenmätsystem
SU Bottenhugg
Gävle
HUVUDSKÄRSBOJEN
BY29
BY31
BY32
BY20
BY15
BY10
Västervik
Knolls Grund vågboj
Östergarns-holm
Kalmar
REF M1V1
BY39
BCS III-10
HANÖBUKTEN
Flinten 7
BY4
BY5
BY1
BY2
W LANDSKRONA
ANHOLT E
N14 FALKENBERG
FLADEN
Göteborg
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Lysekil
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Date: 2024-05-28
Time: 15:45

Ship: SE
Year: 2024

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	CZPP	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
0422	11	FIBG27	BAS...	SLÄGGÖ	5815.59	01126.14	20240506	1115	76	4	06	9	8.6	1011	2820	xxx-	9		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	x	x	-	x	-
0423	11	SKEX14	BAS...	Å13	5820.38	01101.64	20240506	1430	108	5	07	11	10.2	1014	2720	x---	10		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0424	11	SKEX18	BAS...	Å17	5817.07	01030.27	20240506	1825	353		08	8	11.2	1016	2730	xxx-	15		-	x	-	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	x	x
0425	11	SKEX16	BAS...	Å15	5817.69	01050.78	20240506	2130	136		06	6	10.5	1019	9999	x---	12		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0426	11	SKEX23	BAS...	P2	5752.06	01117.53	20240507	0130	93		10	6	9.1	1021	9999	x---	10		-	x	-	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0427	11	KANX25	BAS...	FLADEN	5711.57	01139.49	20240507	0630	84	6	13	5	8.3	1023	1520	x---	13		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0428	11	KANX50	BAS...	N14 FALKENBERG	5656.39	01212.69	20240507	0940	31	8	32	4	10.8	1024	1120	xxx-	7		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0429	11	KAEX29	BAS...	ANHOLT E	5640.13	01206.66	20240507	1200	62	8	31	5	10.5	1025	1110	xxxx	10		x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	x	-
0430	11	SOCX39	BAS...	W LANDSKRONA	5552.00	01244.90	20240507	1830	51		19	6	9.8	1026	0020	x---	9		x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	x
0438	11	BPSA02	BAS...	BY1	5500.95	01318.06	20240508	0815	46	8	10	2	8.4	1030	0120	x---	8		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
0444	11	BPSA03	BAS...	BY2 ARKONA	5458.26	01405.93	20240508	1618	46	9	22	4	9.2	1029	1120	xxx-	8		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	x	x	x	-	-
0445	11	BPSH05	BAS...	HANÖBUKTEN	5537.07	01452.12	20240508	2140	79		23	7	7.8	1029	9999	x---	11		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
0446	11	BPSB06	BAS...	BY4 CHRISTIANSÖ	5522.96	01520.02	20240509	0050	91		23	6	8.4	1029	9999	x---	12		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
0448	11	BPSB07	BAS...	BY5 BORNHOLMSDJ	5515	01559.04	20240509	0440	90	7	23	6	8.2	1028	2820	xxxx	12		x	x	x	x	x	x	x	-	x	-	x	x	x	x	-	x	x	x	x	-
0449	11	BPSE11	BAS...	BCS III-10	5533.36	01824.00	20240509	1410	90	8	24	8	9.4	1025	0130	x-x-	12		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	-	x	x	-	-
0450	11	BPEX13	BAS...	BY10	5638.04	01935.08	20240509	2140	143		26	8	7.8	1019	9990	x---	15		x	x	x	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
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0462	11	BPEX26	BAS...	BY20 FÅRÖDJ	5759.88	01952.78	20240510	1910	195		28	6.4	5.2	1024	9990	x---	17		-	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	x	-
0463	11	BPNX35	BAS...	BY29 / LL19	5852.87	02019.68	20240511	0115	175		30	8	5.4	1025	9999	x-x-	16		-	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
0471	11	BPNX00	BAS...	HUVUDSKÄR	5856.11	01909.77	20240511	1230	92	7	21	3	7.1	1028	1120	----	12		x	x	x	x	-	-	x	x	-	-	-	-	-	-	-	-	-	-	-	-
0472	11	BPNX37	BAS...	BY31 LANDSORTSDJ	5835.62	01814.18	20240511	1635	448	7	20	4	7.1	1026	0020	xxx-	20		-	x	-	x	x	x	x	x	x	-	x	x	x	x	-	x	x	x	-	-
0473	11	BPWX38	BAS...	BY32 NORRKÖPINGSDJ	5800.98	01759.10	20240511	2145	201		21	3.7	7.1	1027	9990	x---	17		-	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
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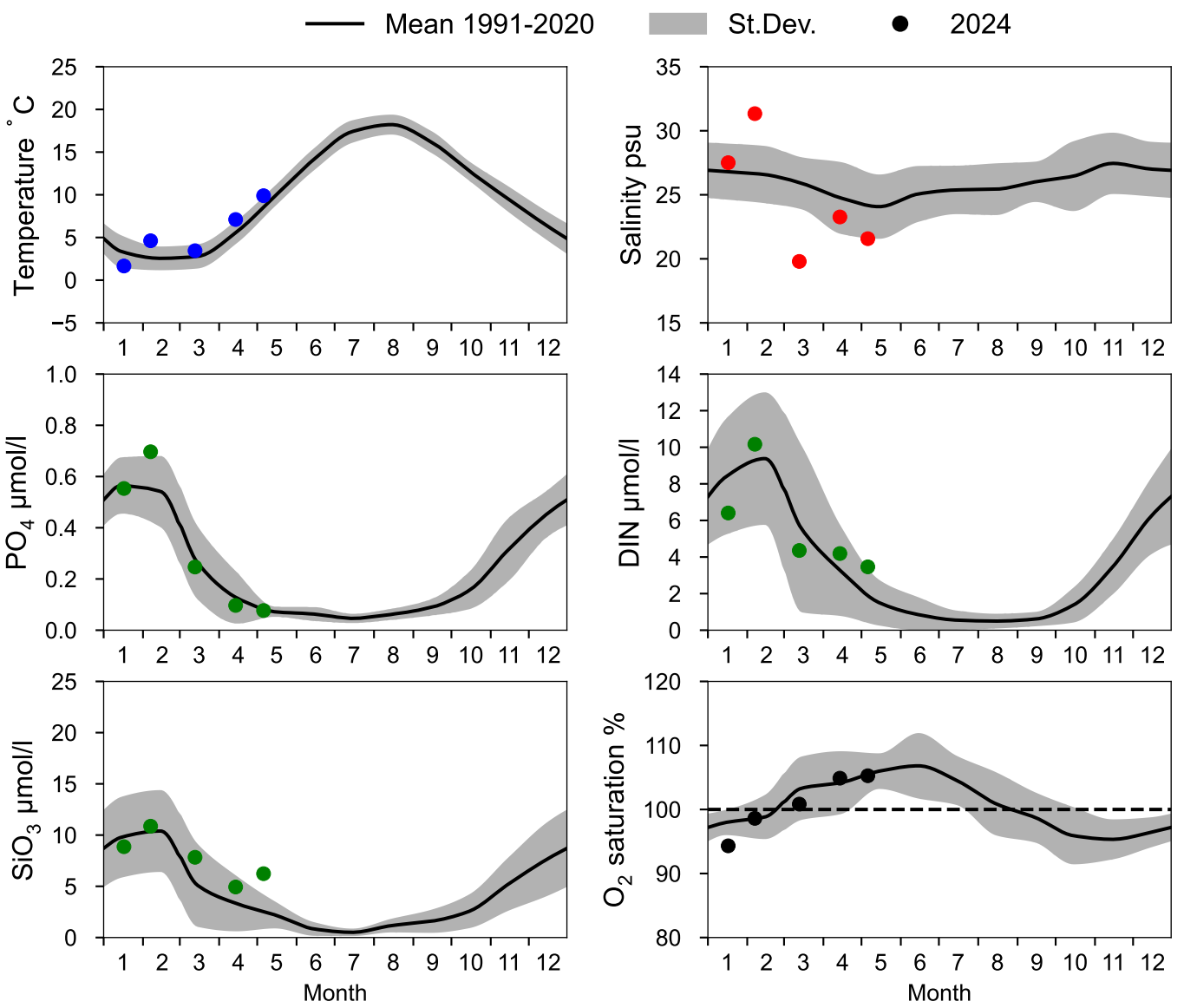
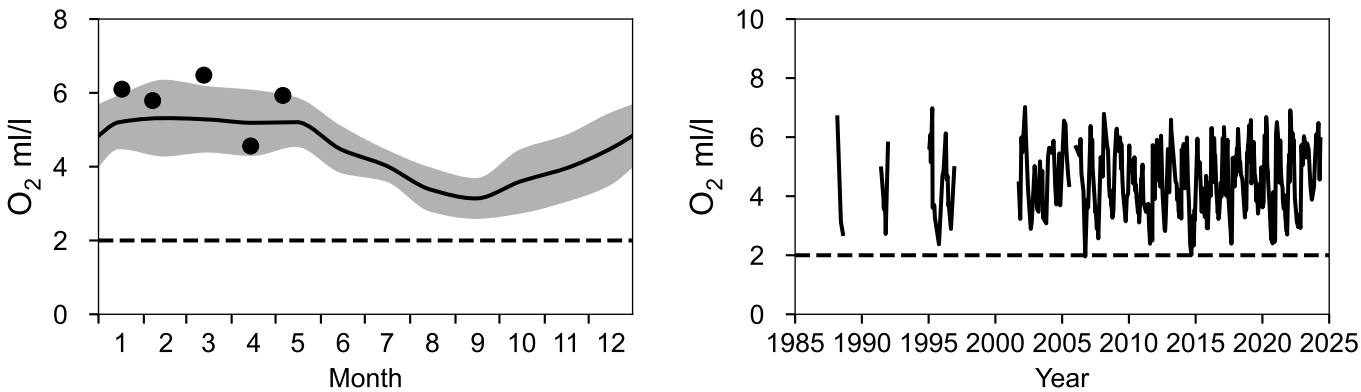
0491	11	BPSE49	BAS...	BY39 ÖLANDS S UDDE	5606.92	01632.02	20240512	2110	52		26	5	8.9	1025	9999	xxx-	8		x	x	x	x	-	x	x	-	x	-	x	x	x	x	-	x	x	-	-	-

STATION SLÄGGÖ SURFACE WATER (0-10 m)

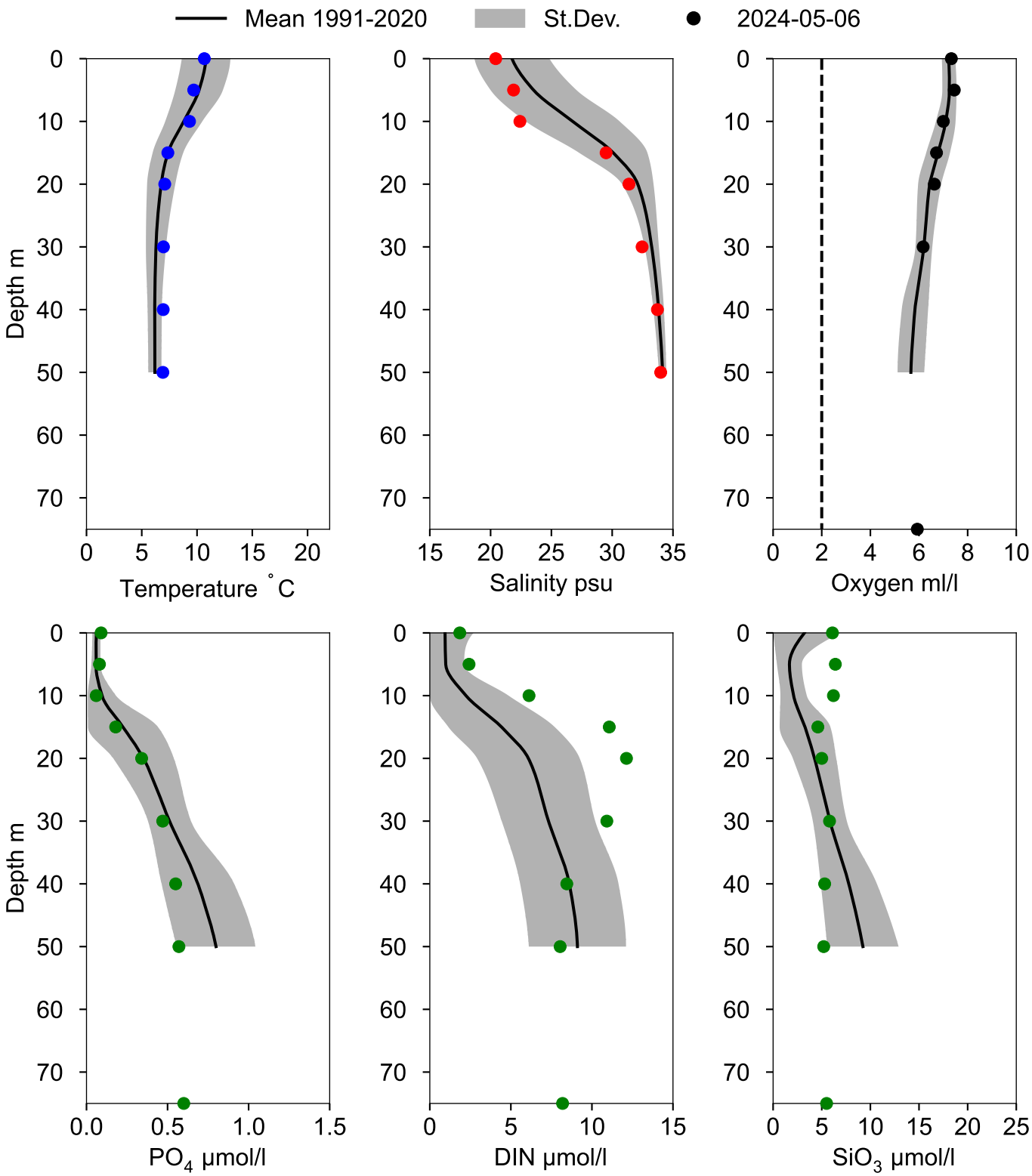
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)

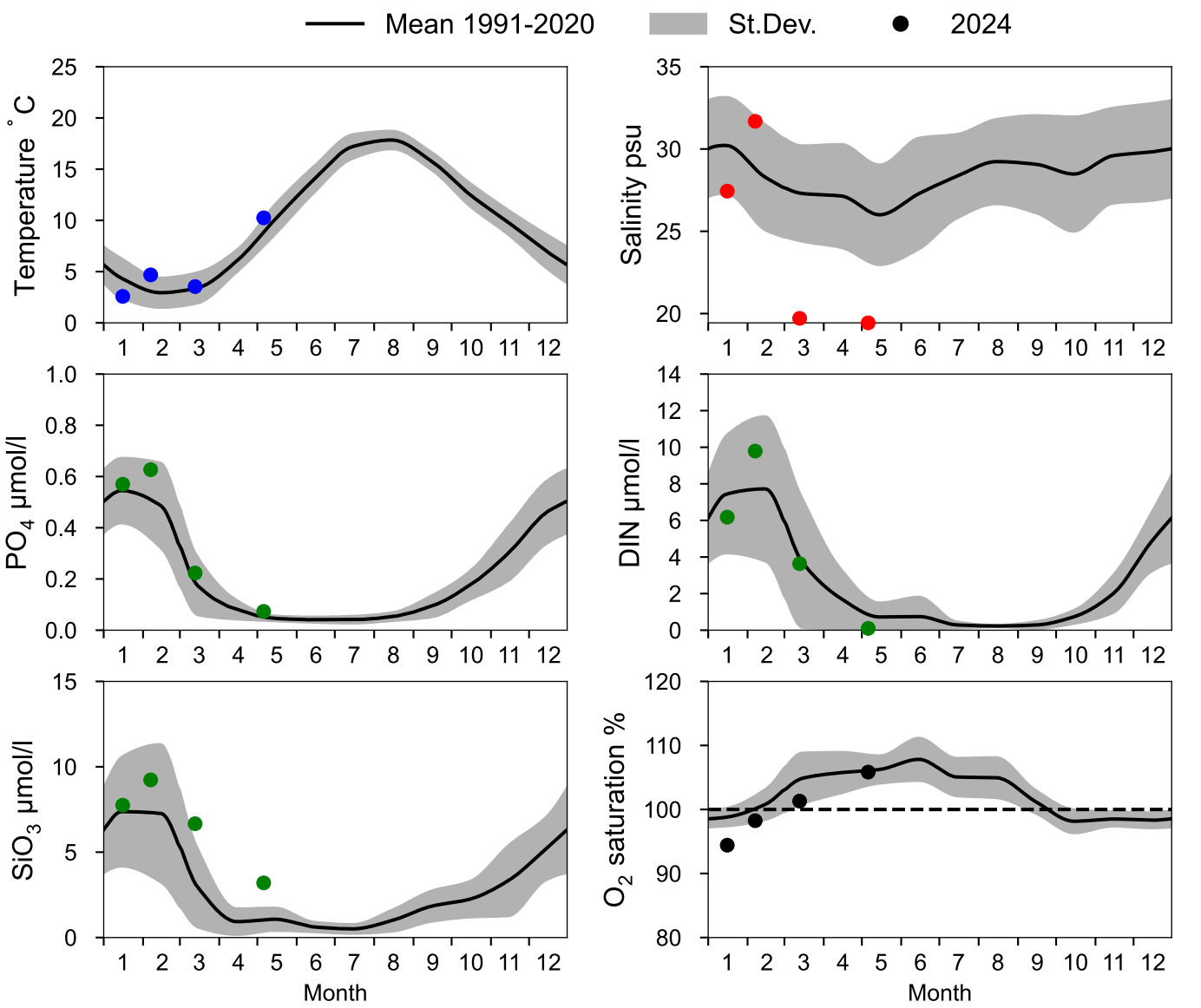


Vertical profiles SLÄGGÖ
May

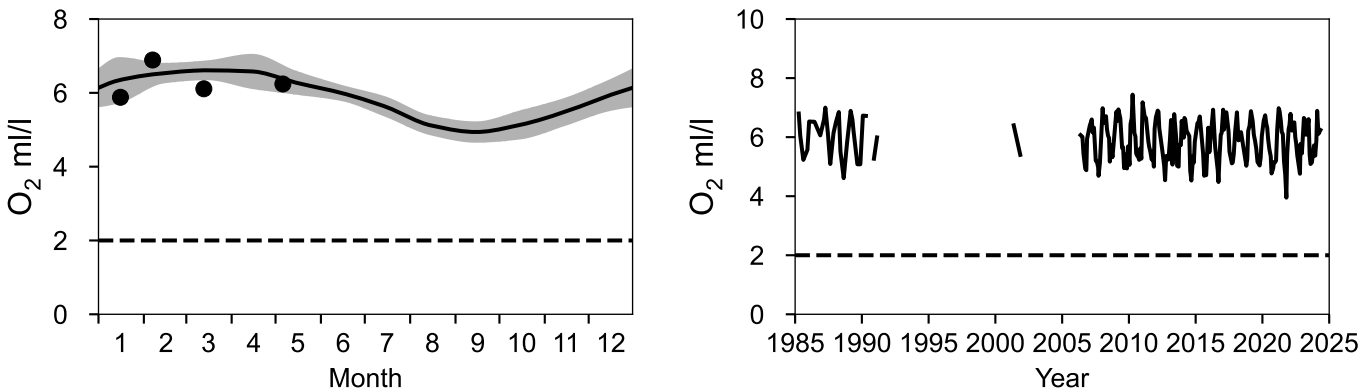


STATION Å13 SURFACE WATER (0-10 m)

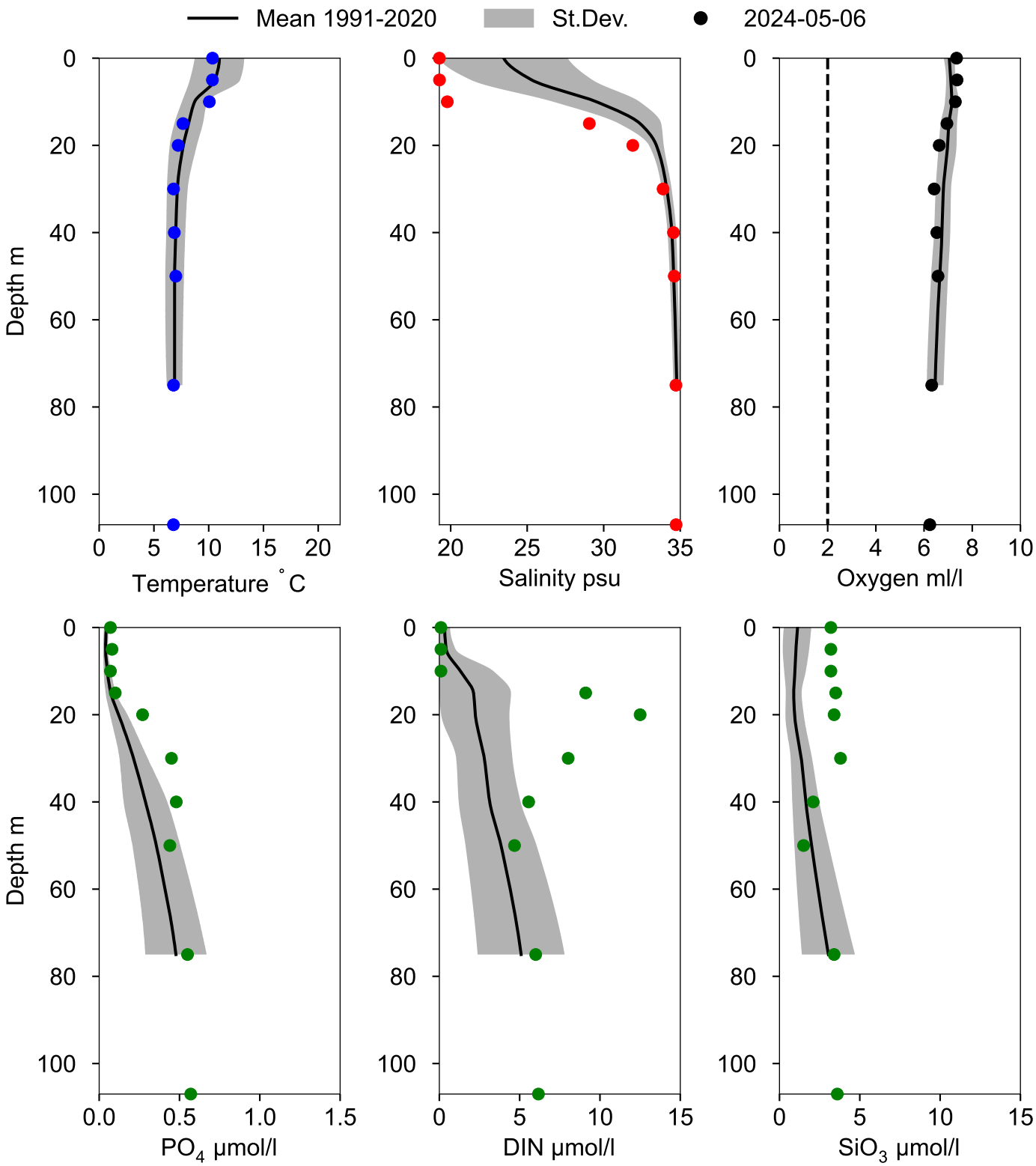
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 82 m)

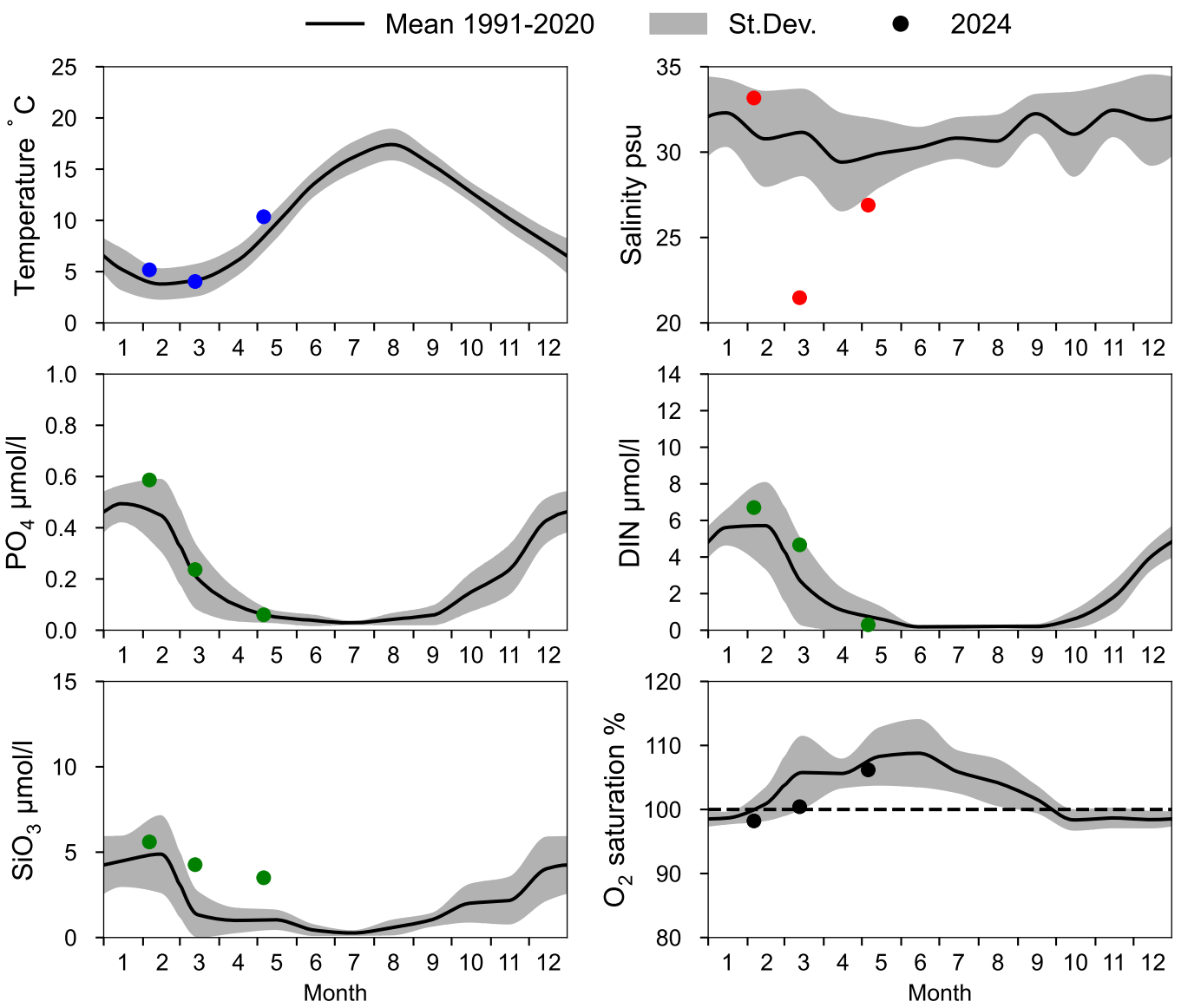


Vertical profiles Å13
May

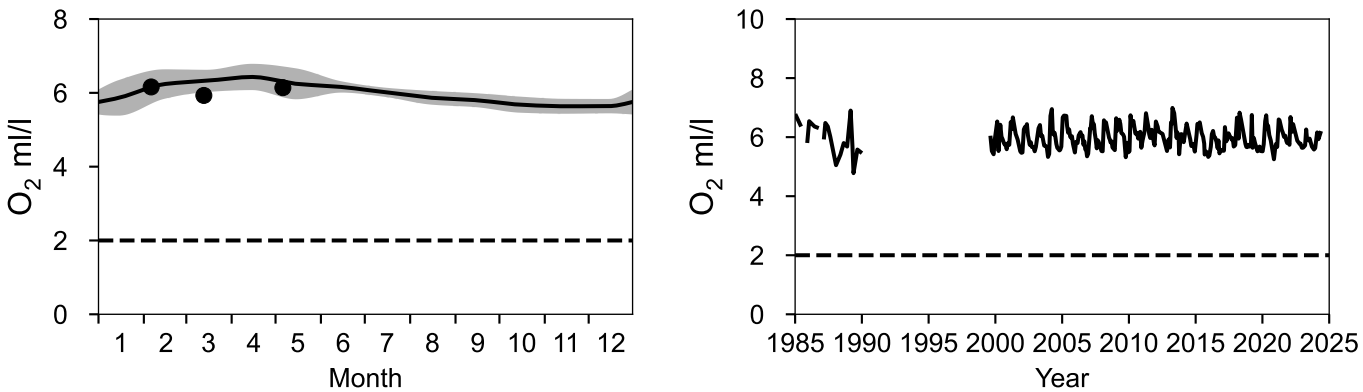


STATION Å17 SURFACE WATER (0-10 m)

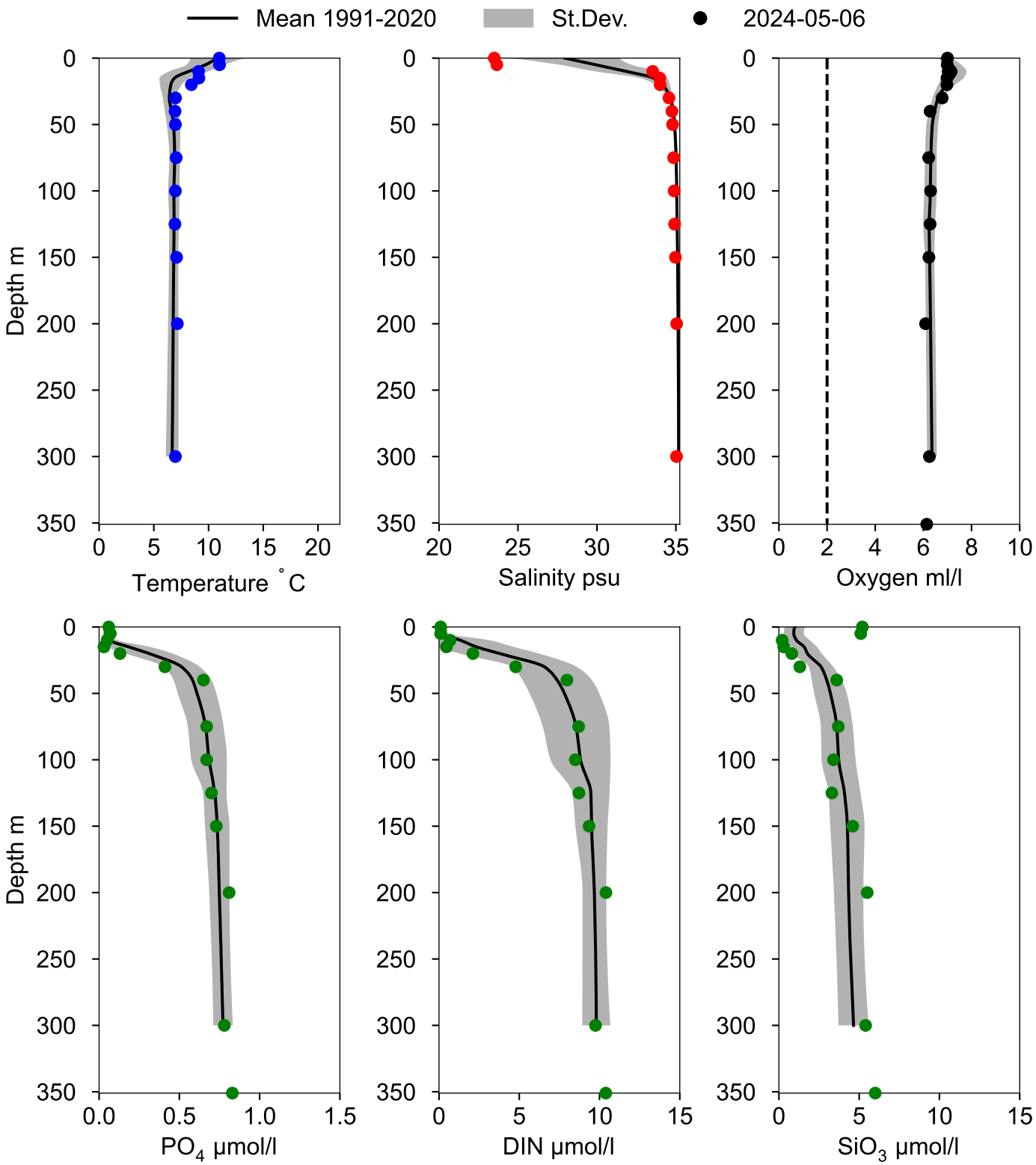
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 300 m)

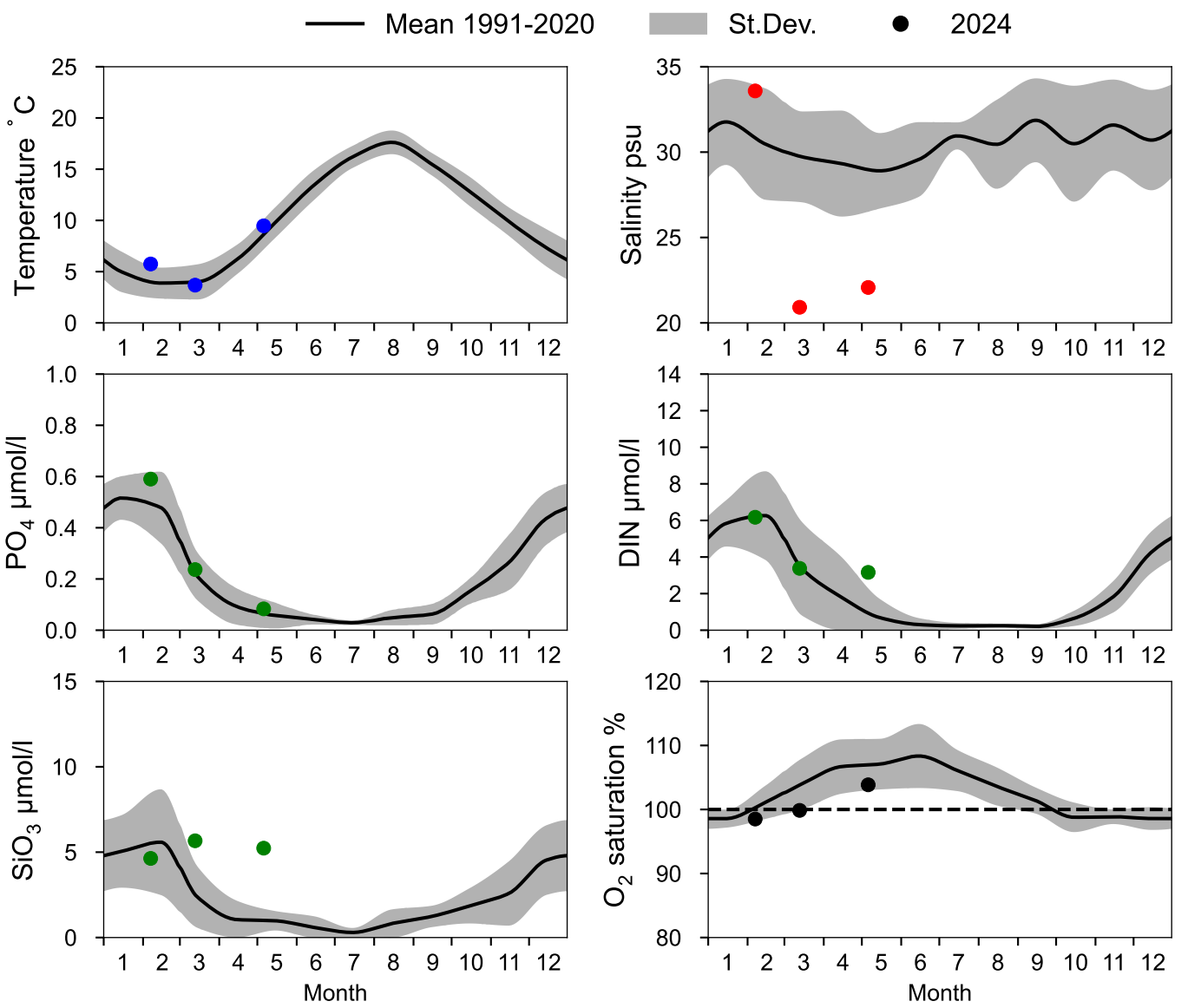


Vertical profiles Å17
May

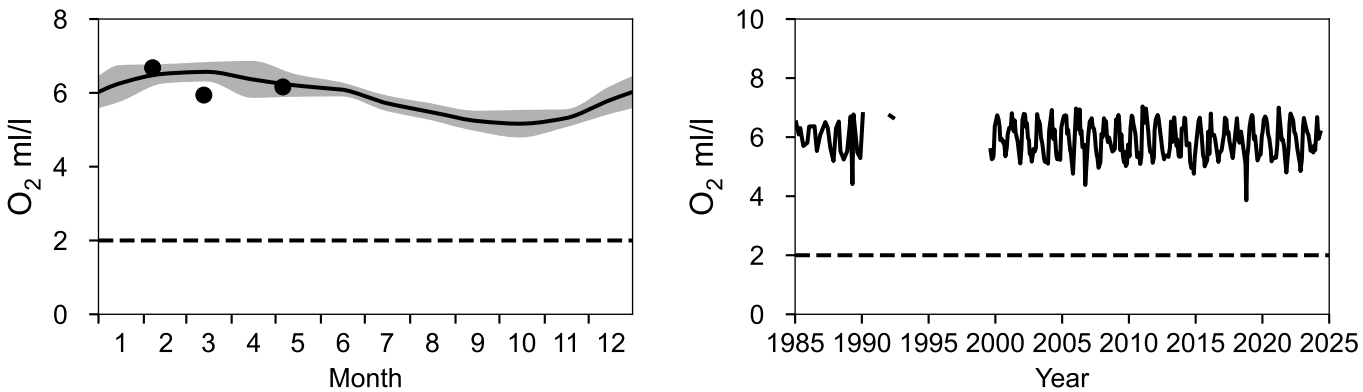


STATION Å15 SURFACE WATER (0-10 m)

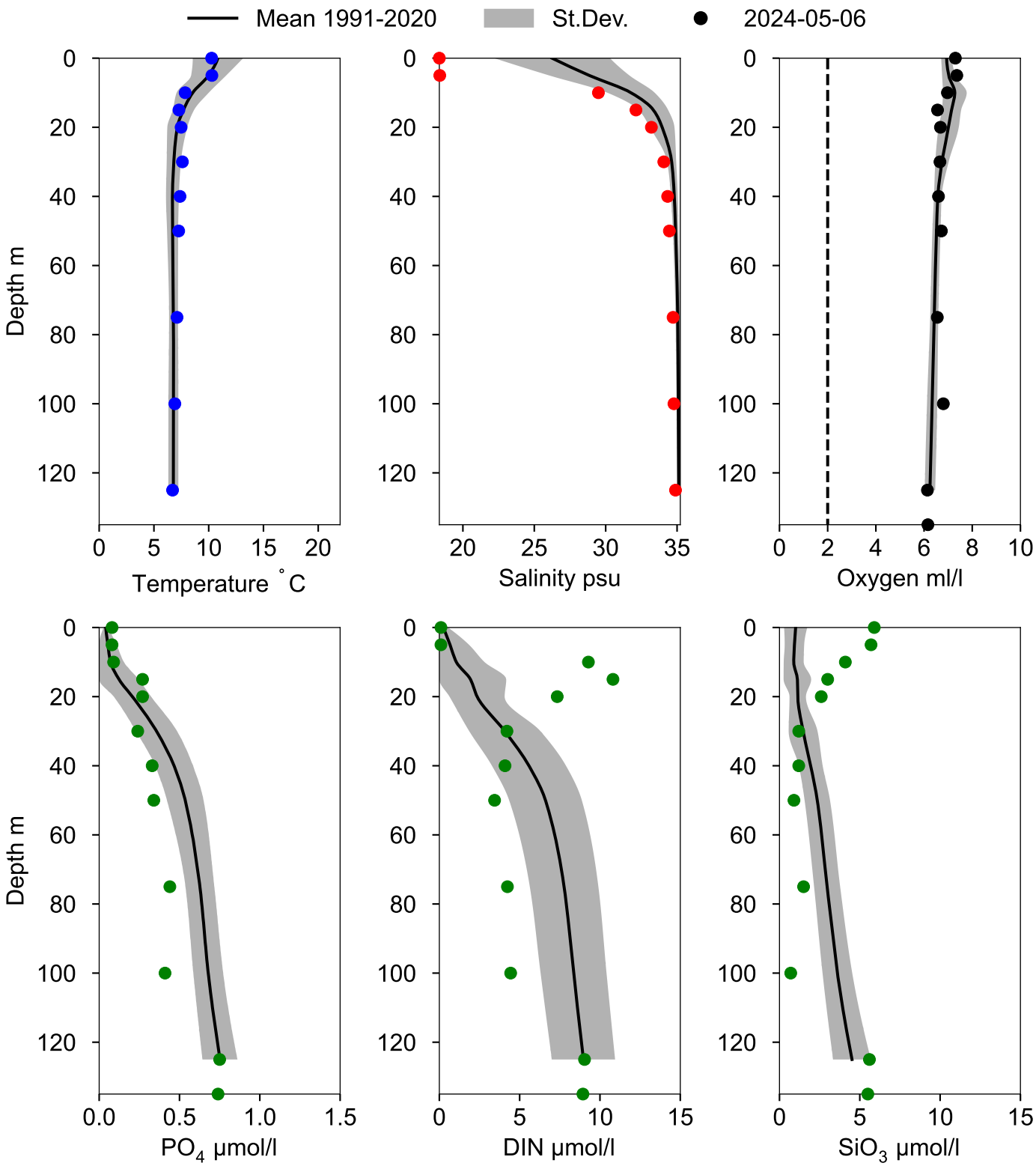
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

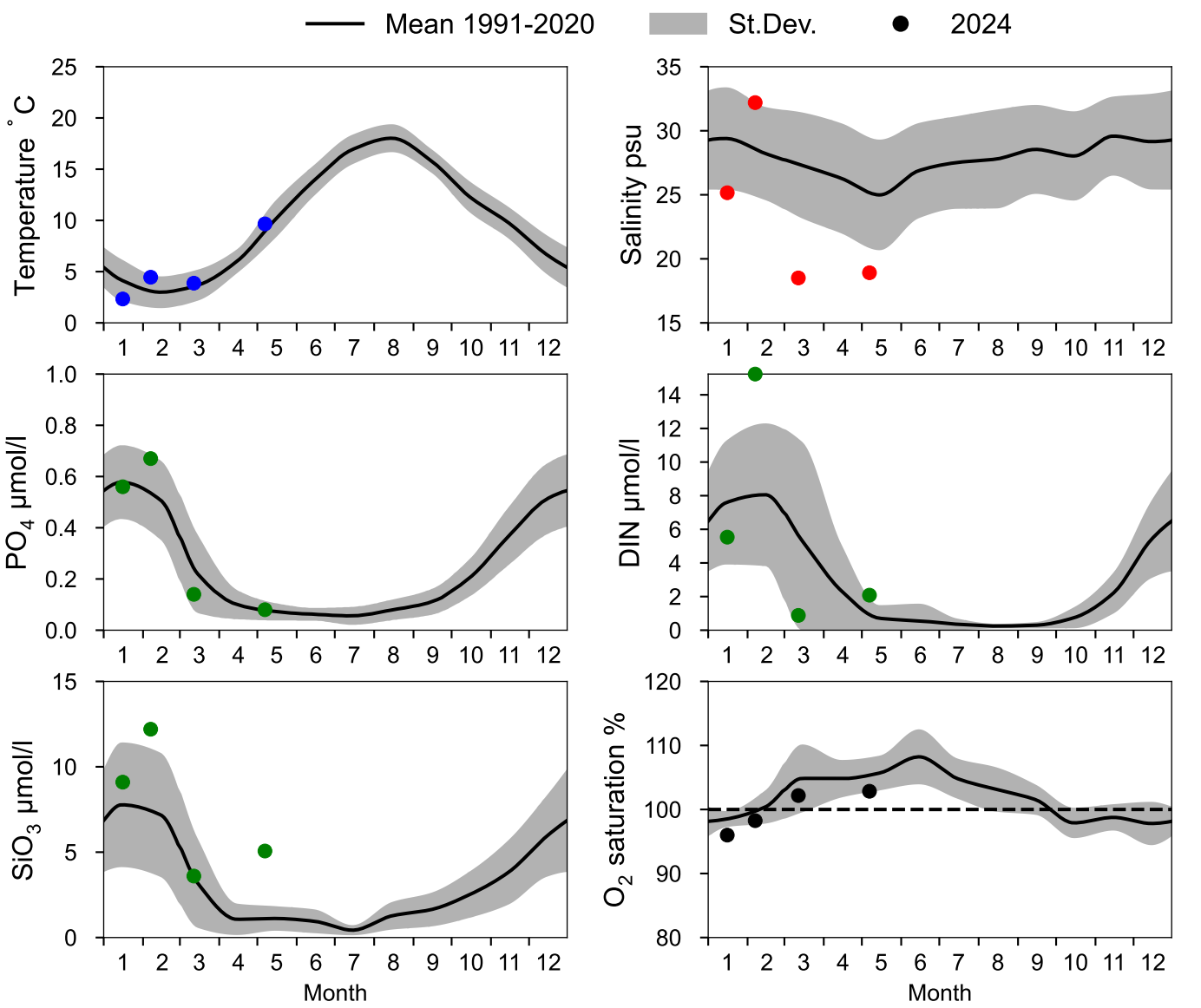


Vertical profiles Å15
May

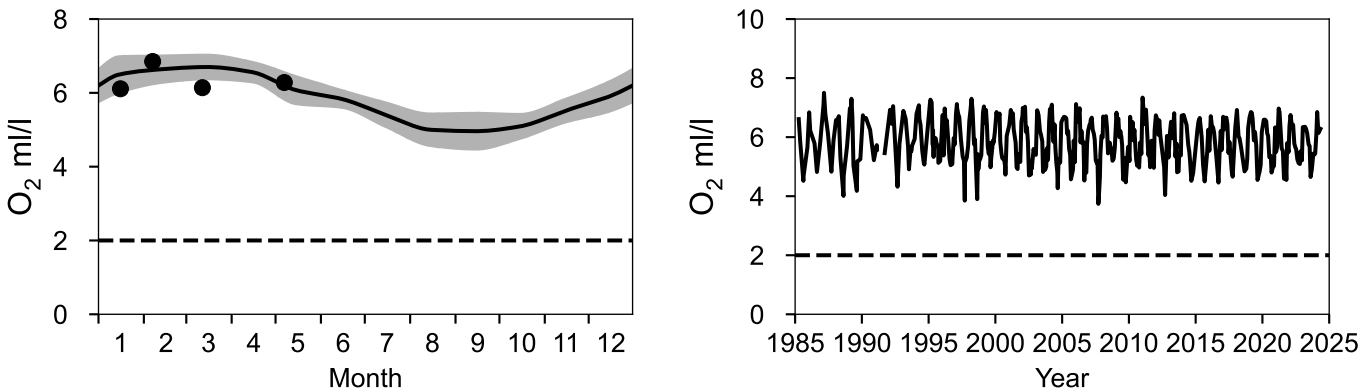


STATION P2 SURFACE WATER (0-10 m)

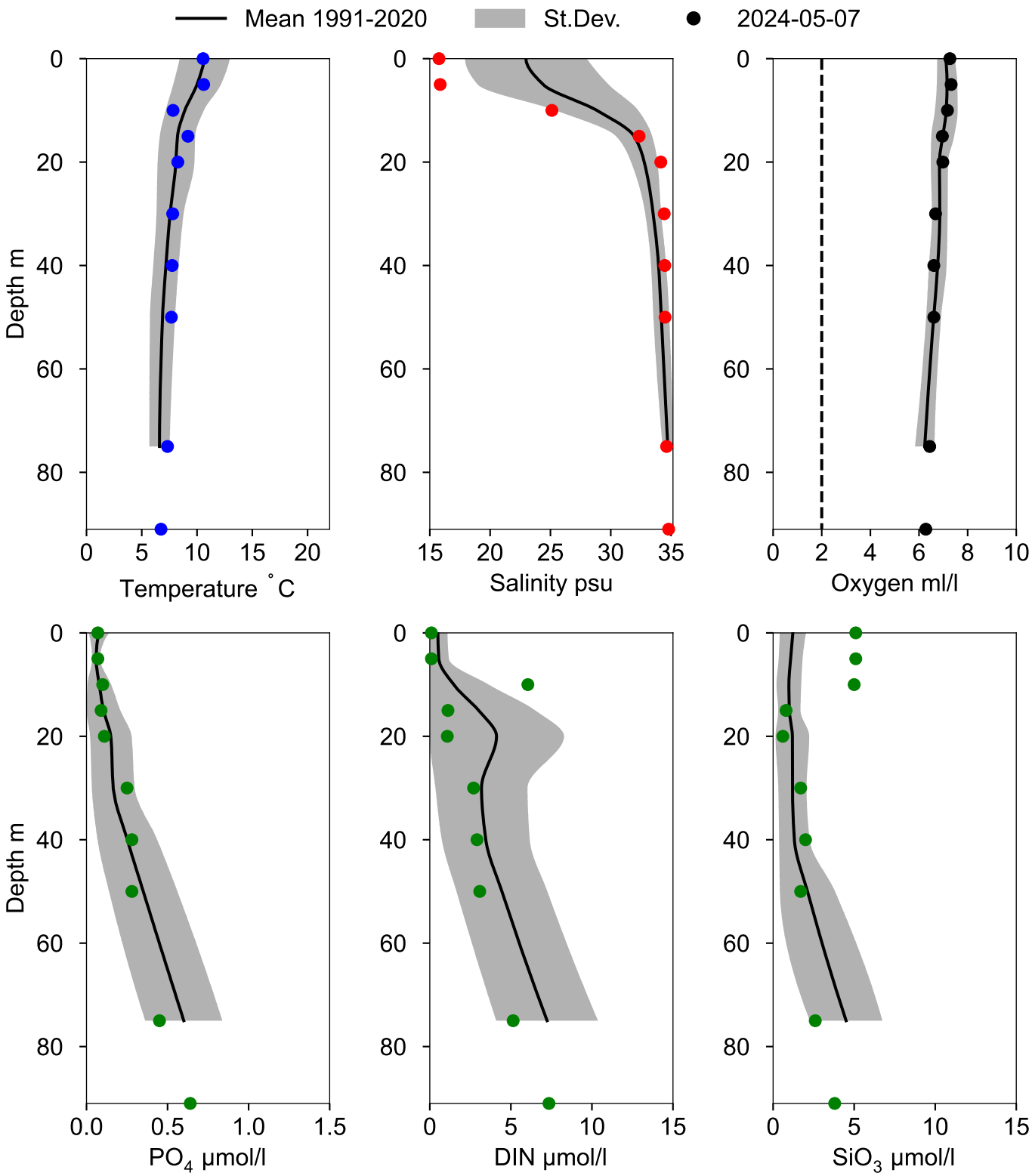
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 75 m)

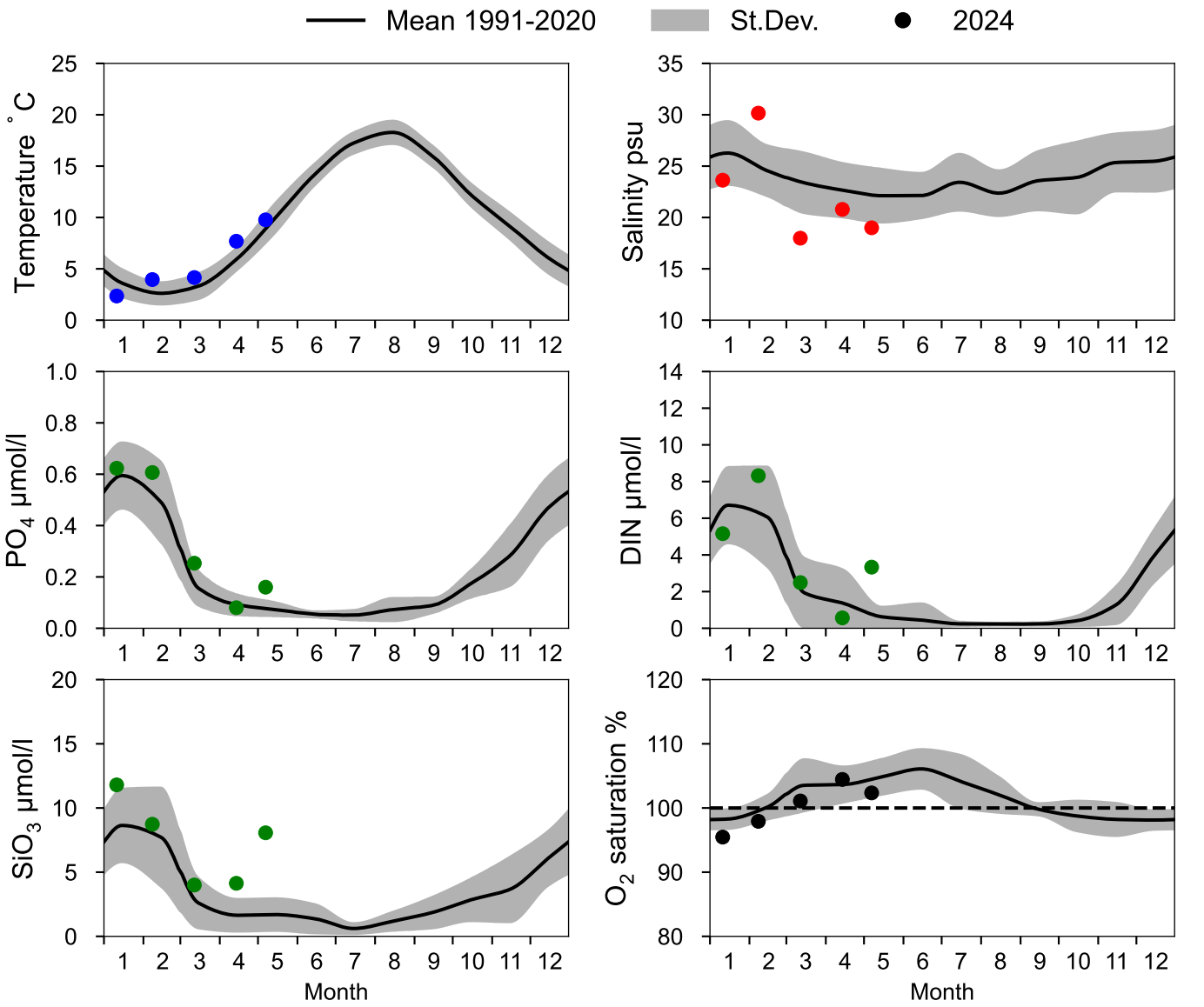


Vertical profiles P2
May

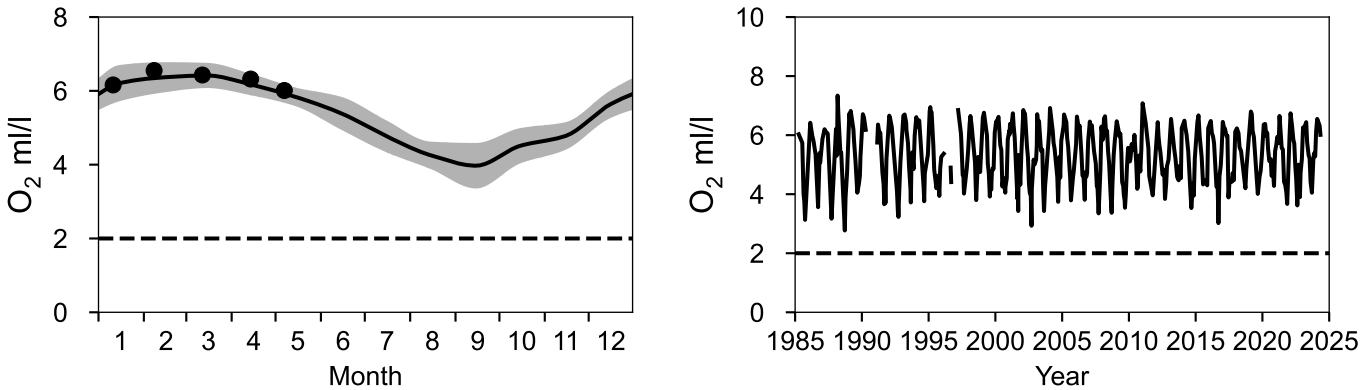


STATION FLADEN SURFACE WATER (0-10 m)

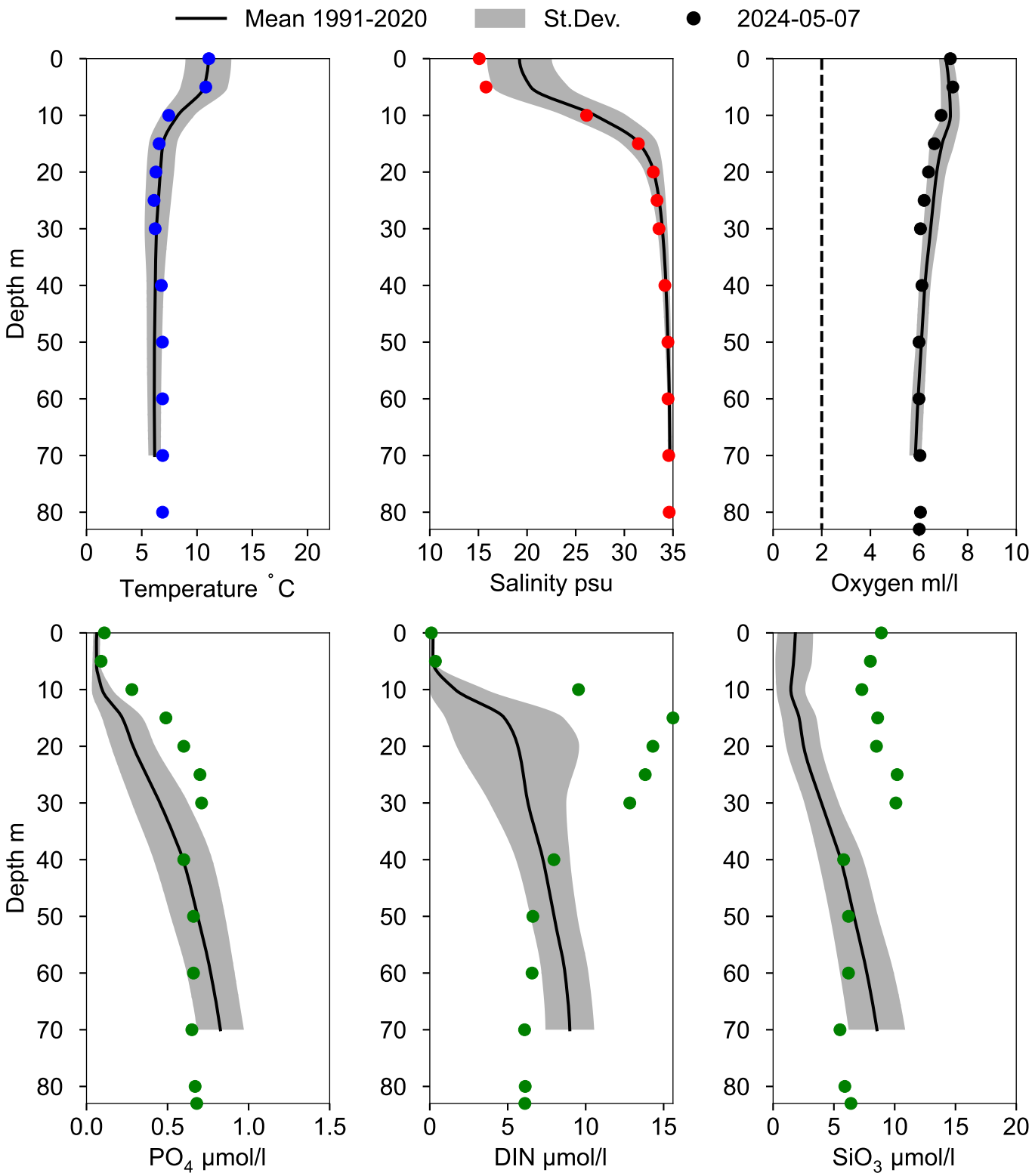
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 74 m)

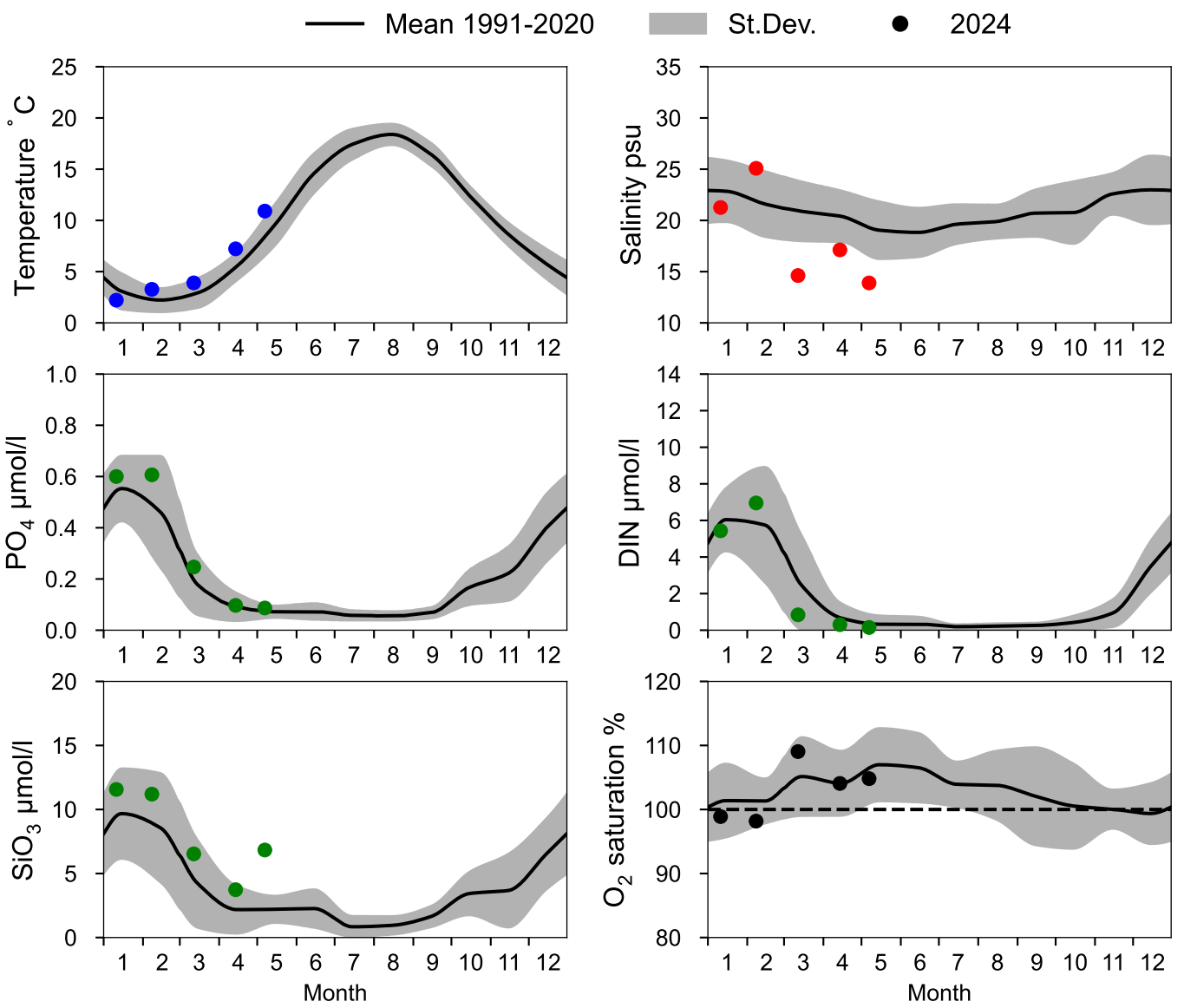


Vertical profiles FLADEN
May

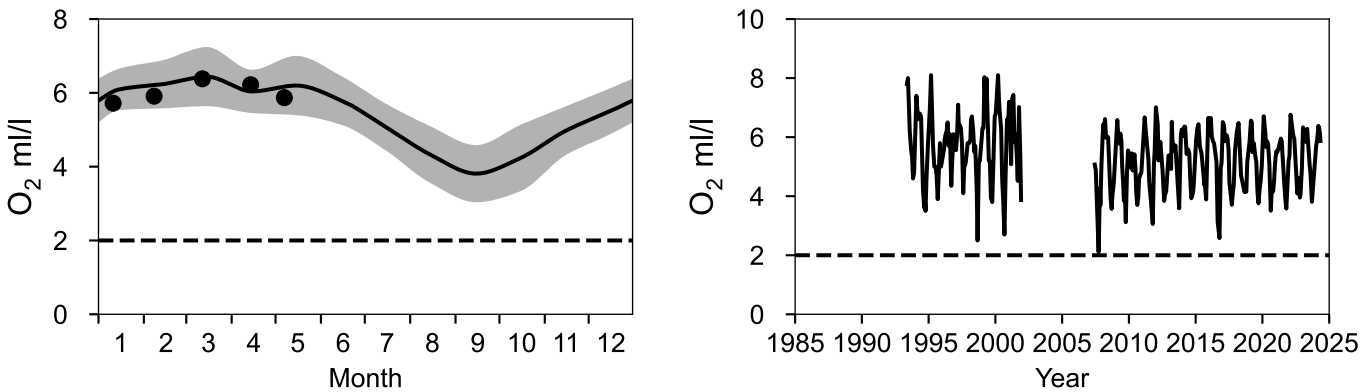


STATION N14 FALKENBERG SURFACE WATER (0-10 m)

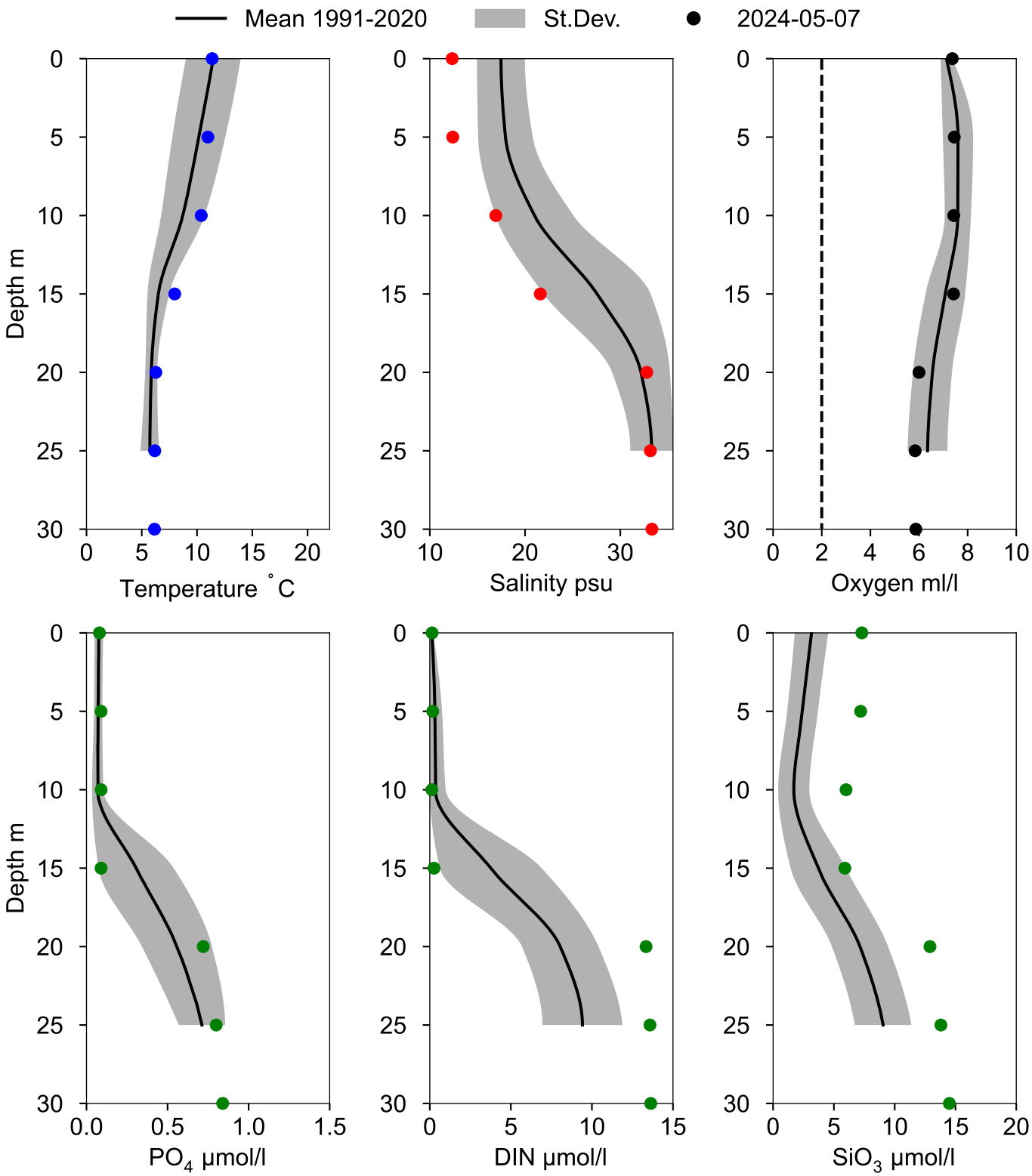
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 25 m)

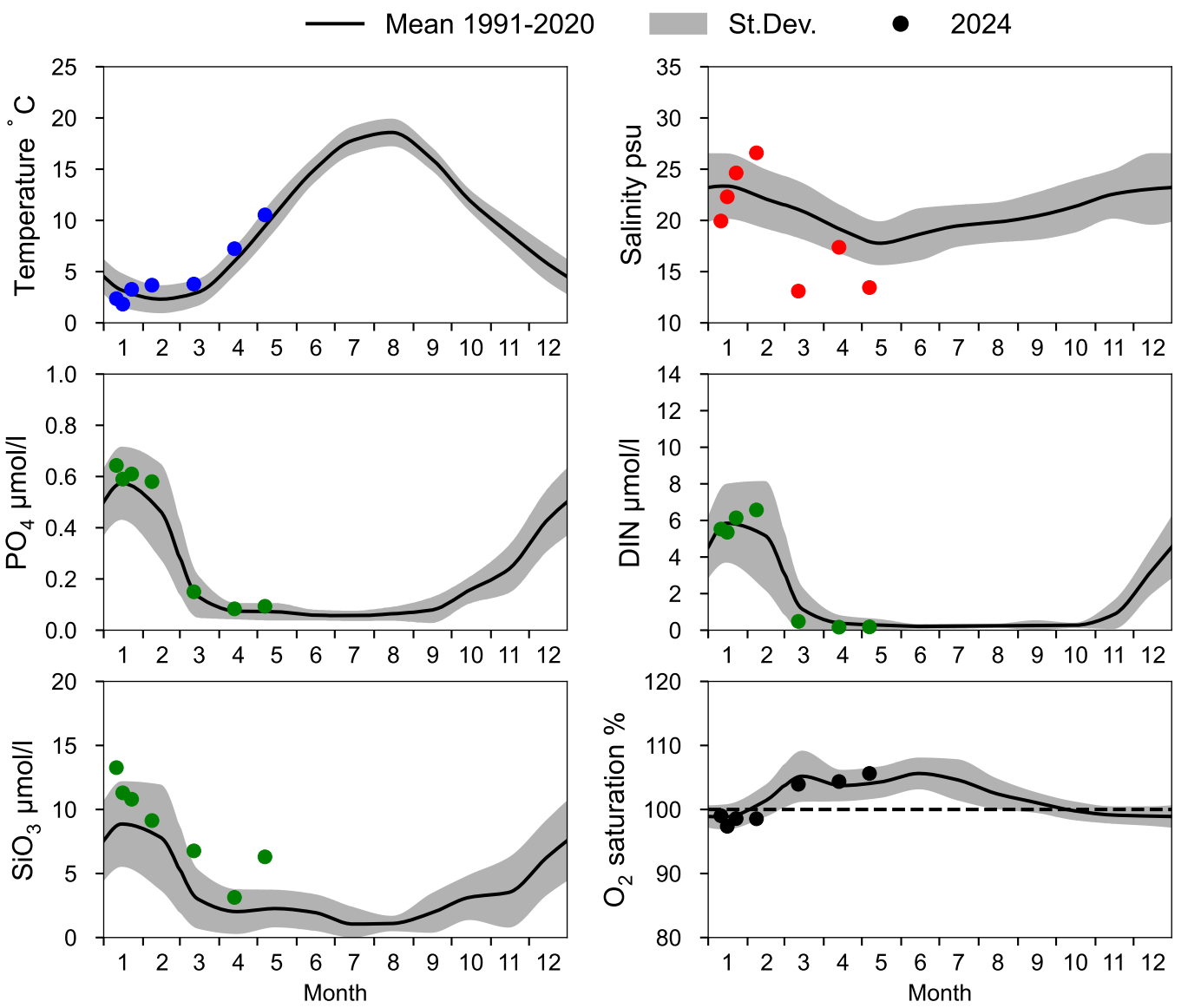


Vertical profiles N14 FALKENBERG
May

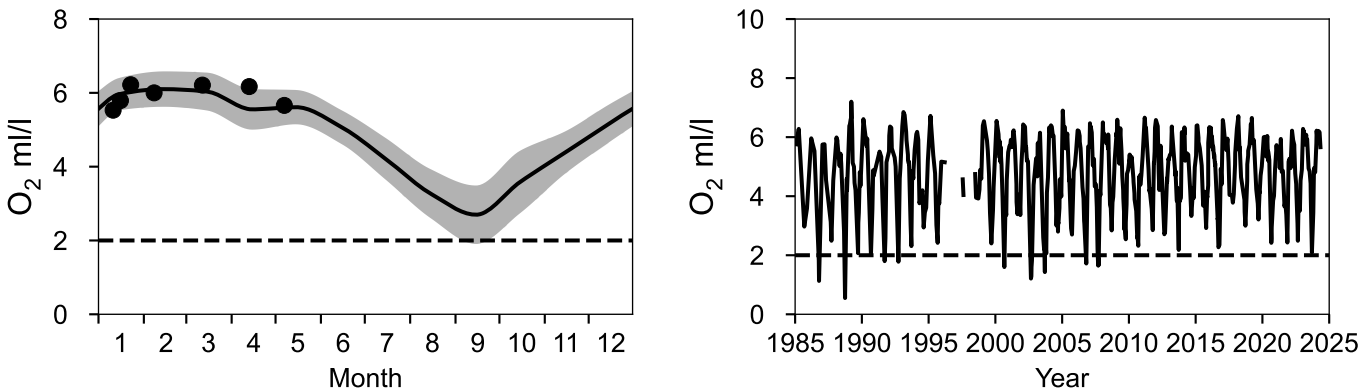


STATION ANHOLT E SURFACE WATER (0-10 m)

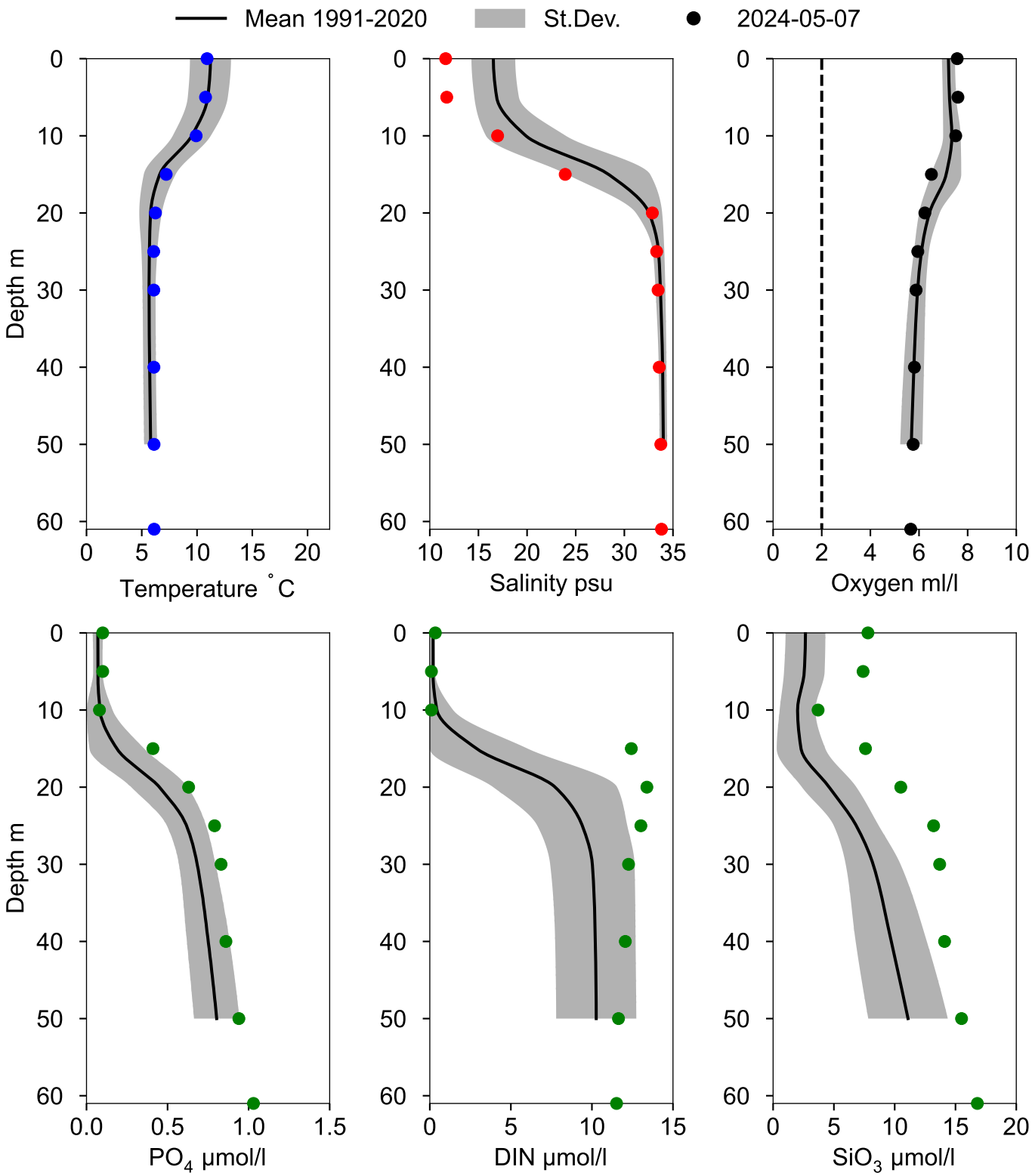
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

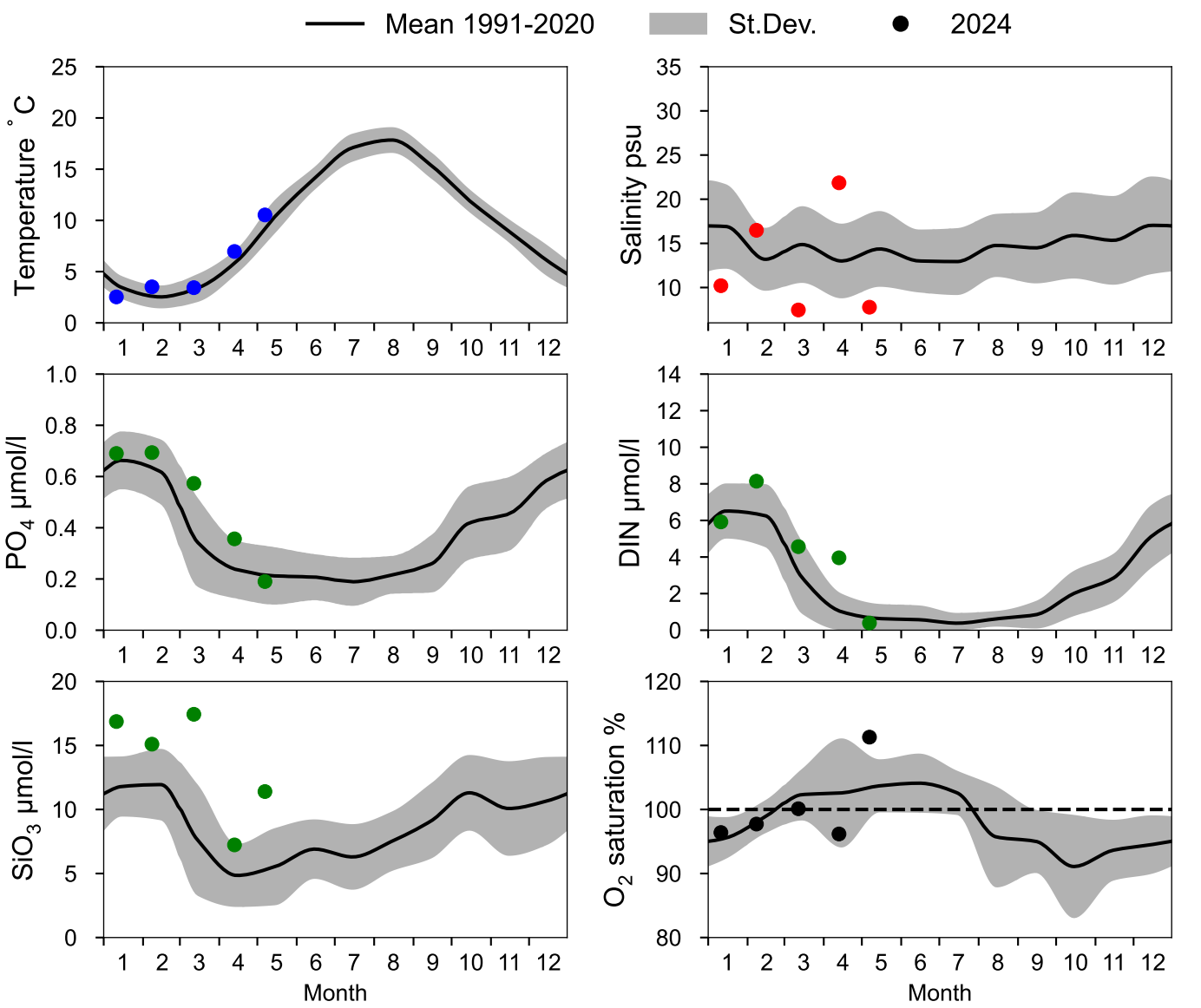


Vertical profiles ANHOLT E
May

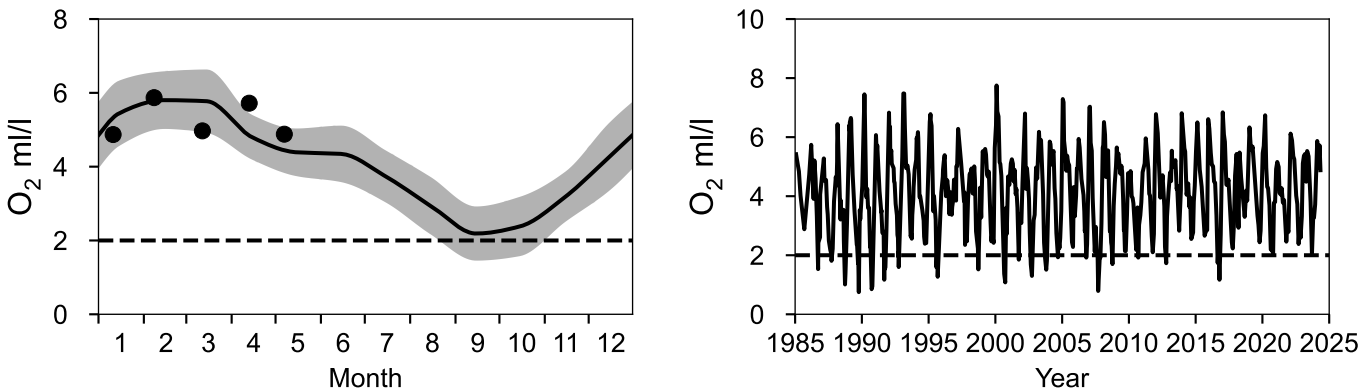


STATION W LANDSKRONA SURFACE WATER (0-10 m)

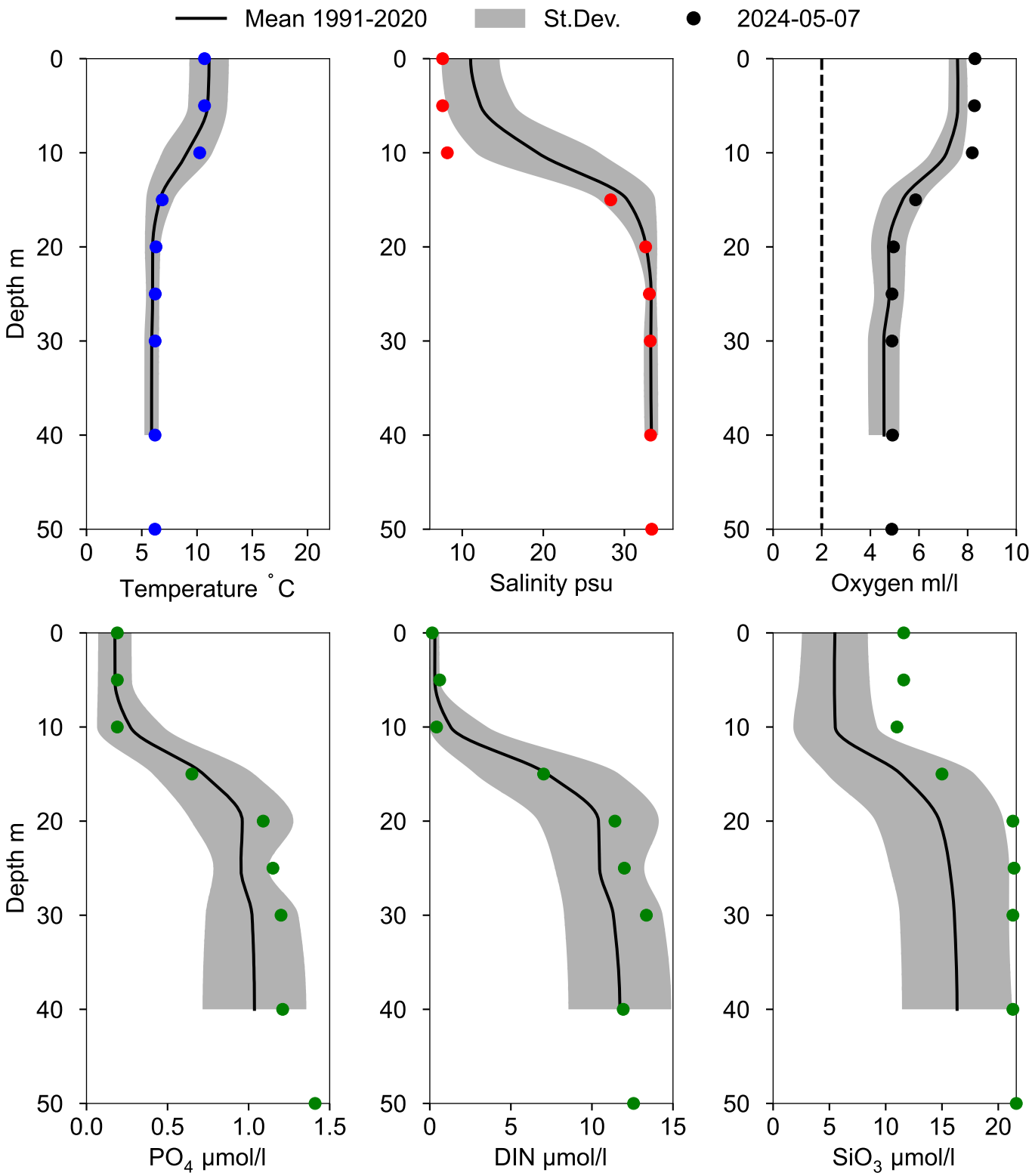
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

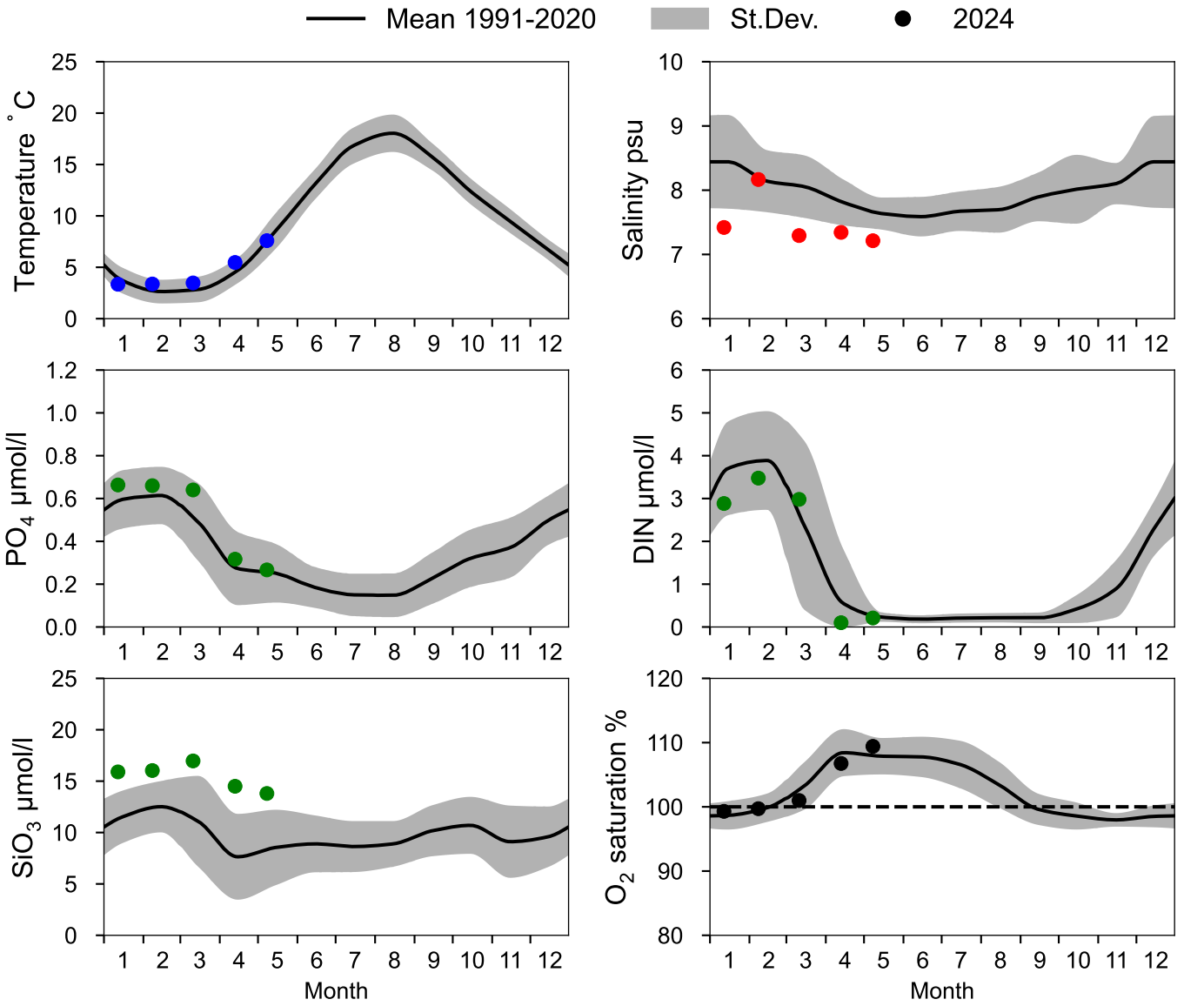


Vertical profiles W LANDSKRONA
May

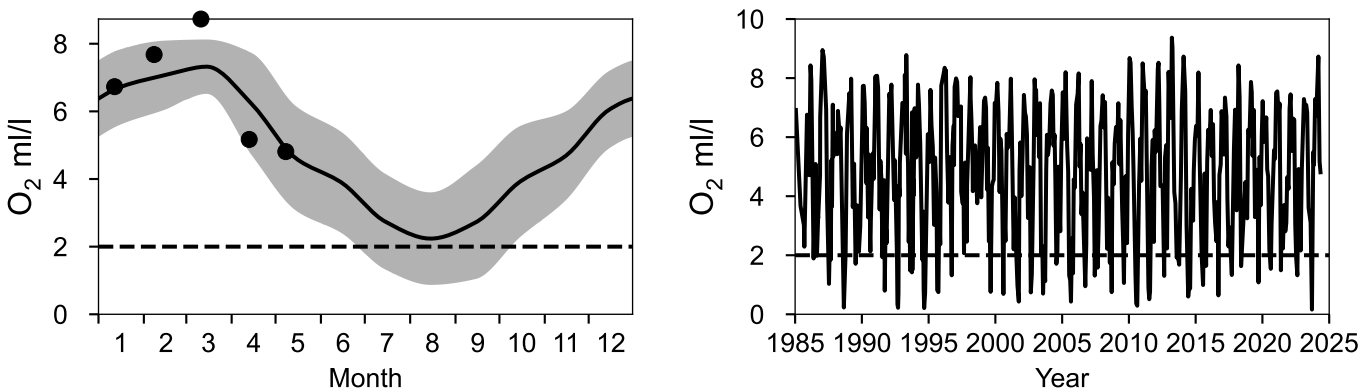


STATION BY1 SURFACE WATER (0-10 m)

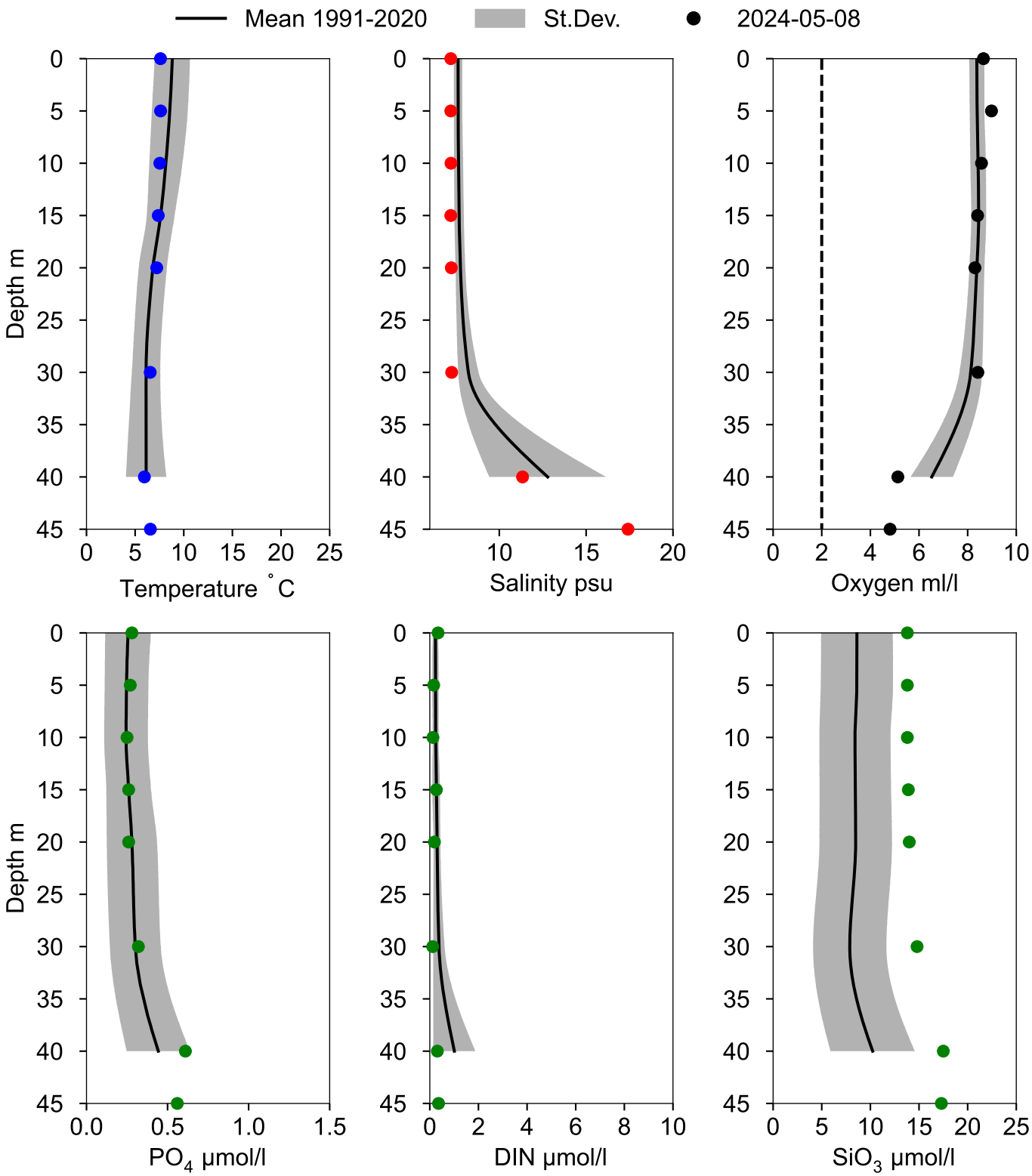
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 39 m)

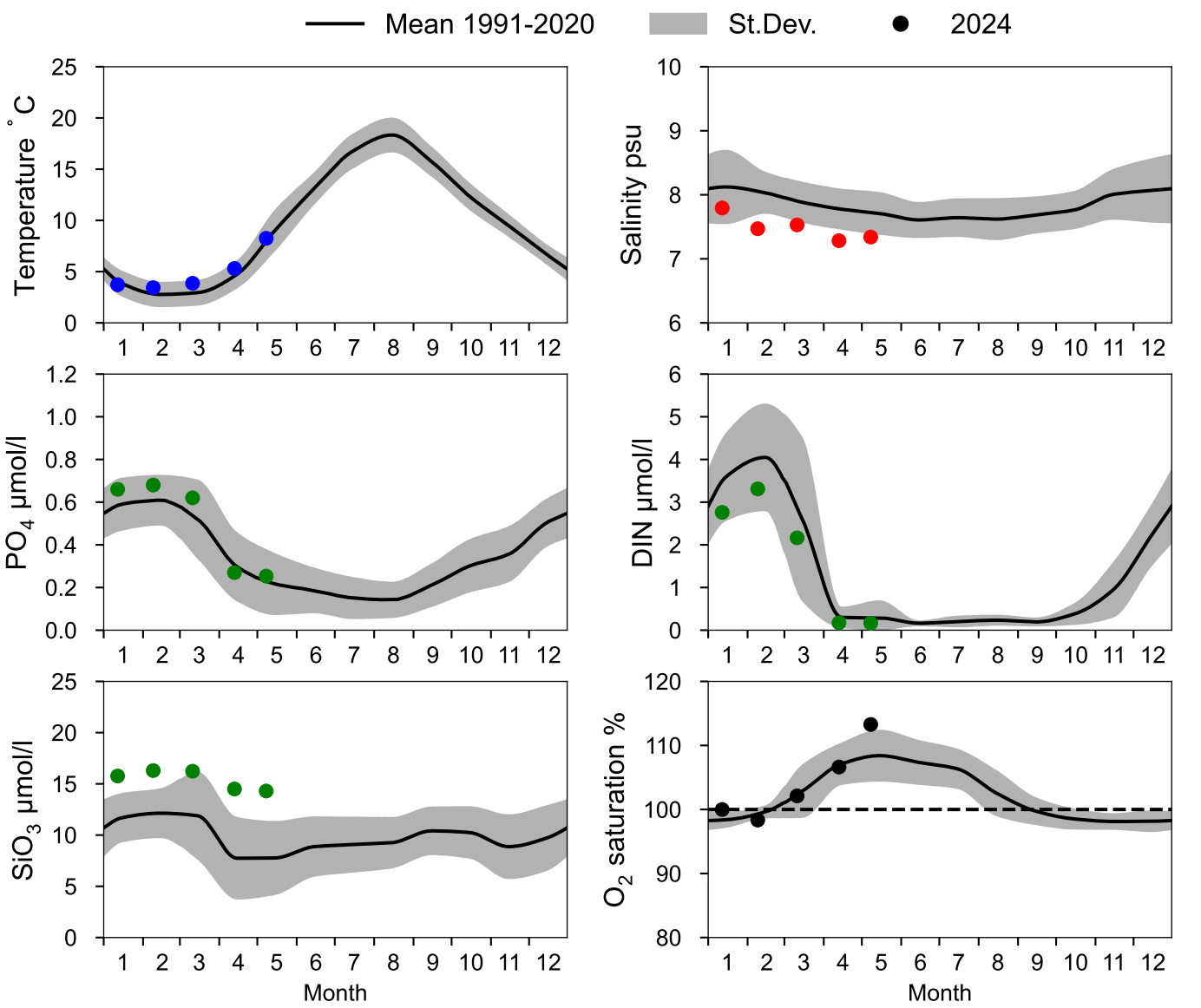


Vertical profiles BY1
May

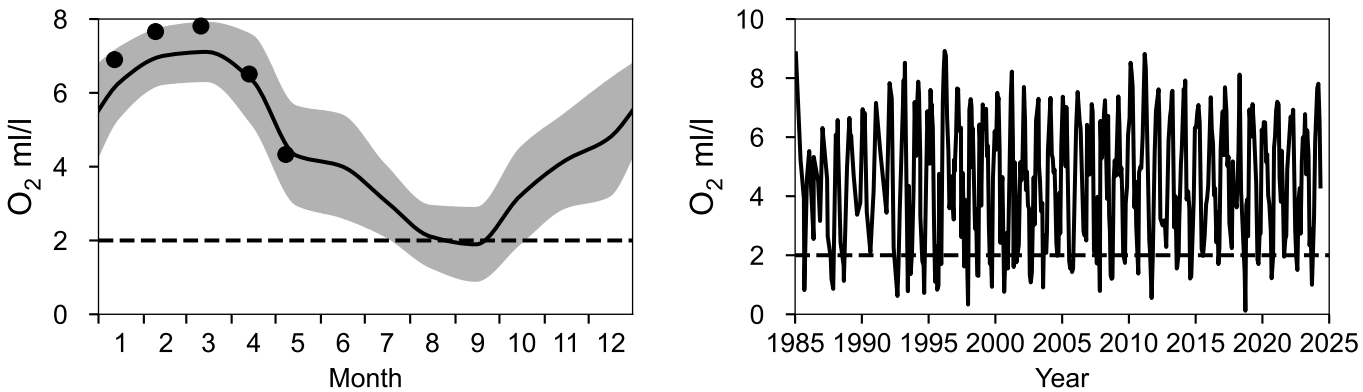


STATION BY2 ARKONA SURFACE WATER (0-10 m)

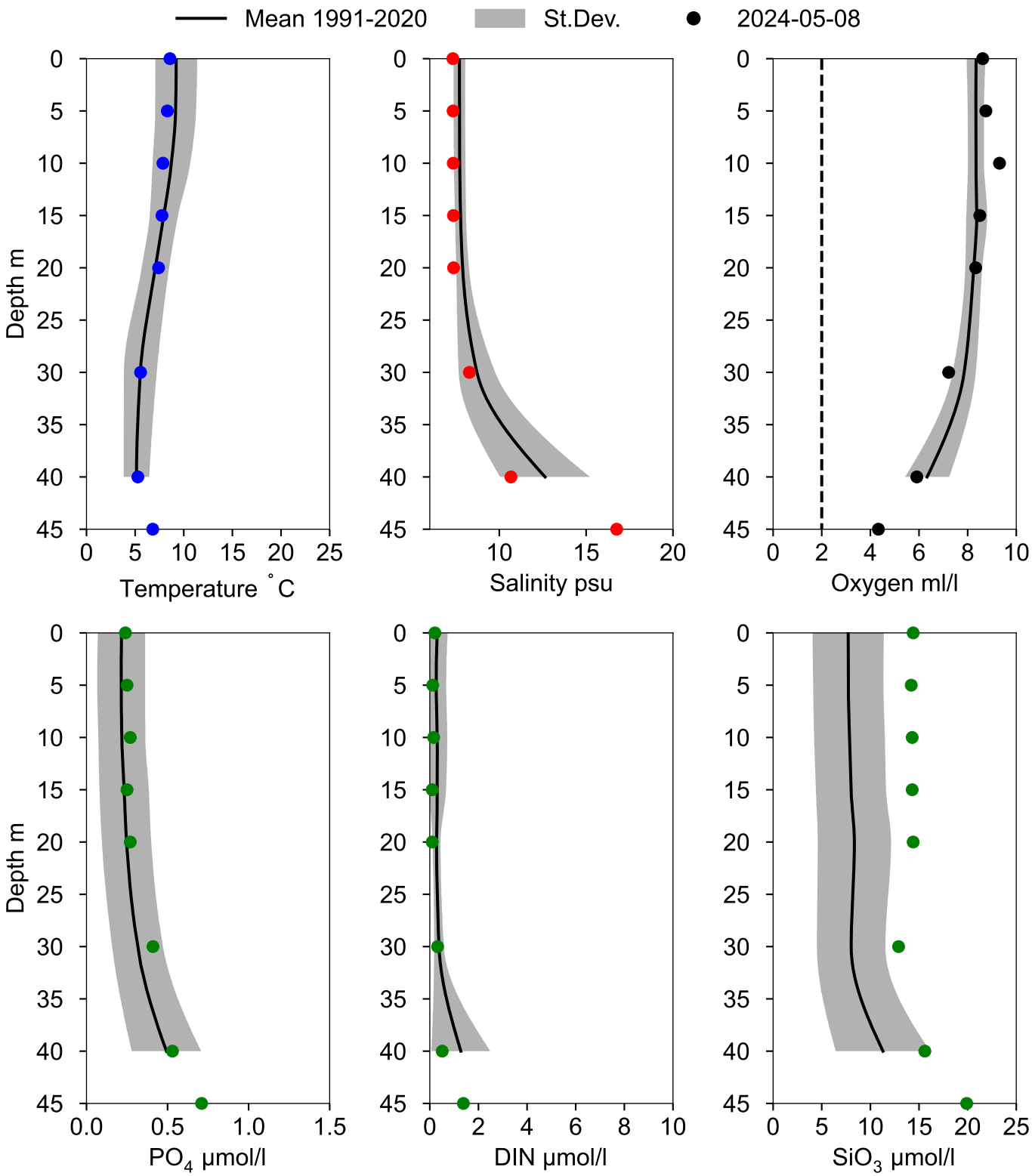
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

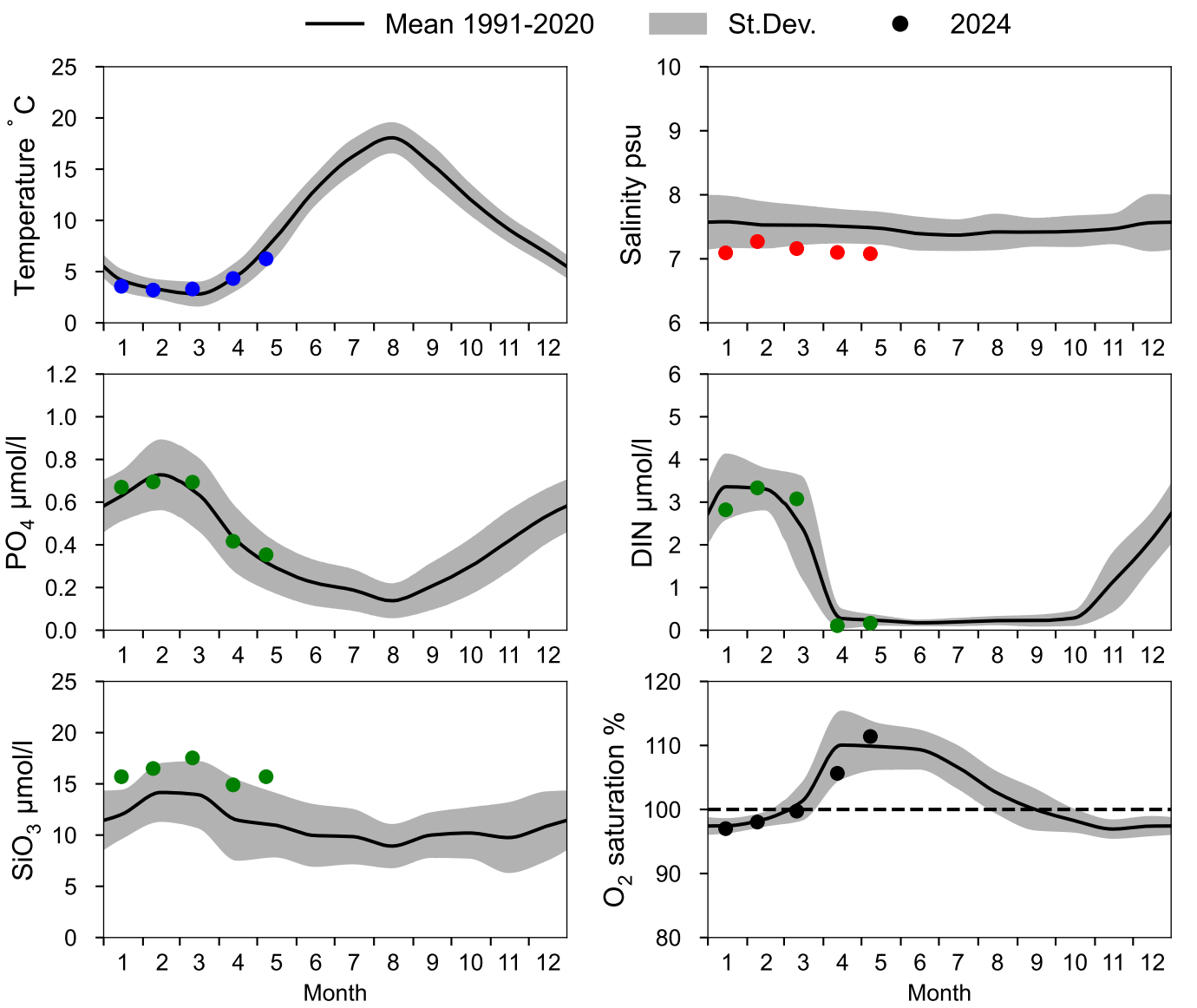


Vertical profiles BY2 ARKONA
May

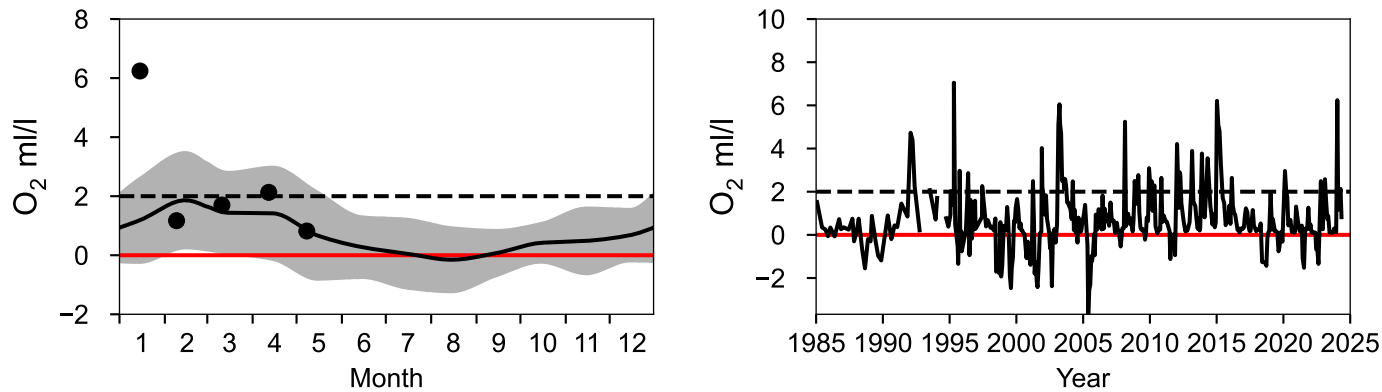


STATION HANÖBUKTEN SURFACE WATER (0-10 m)

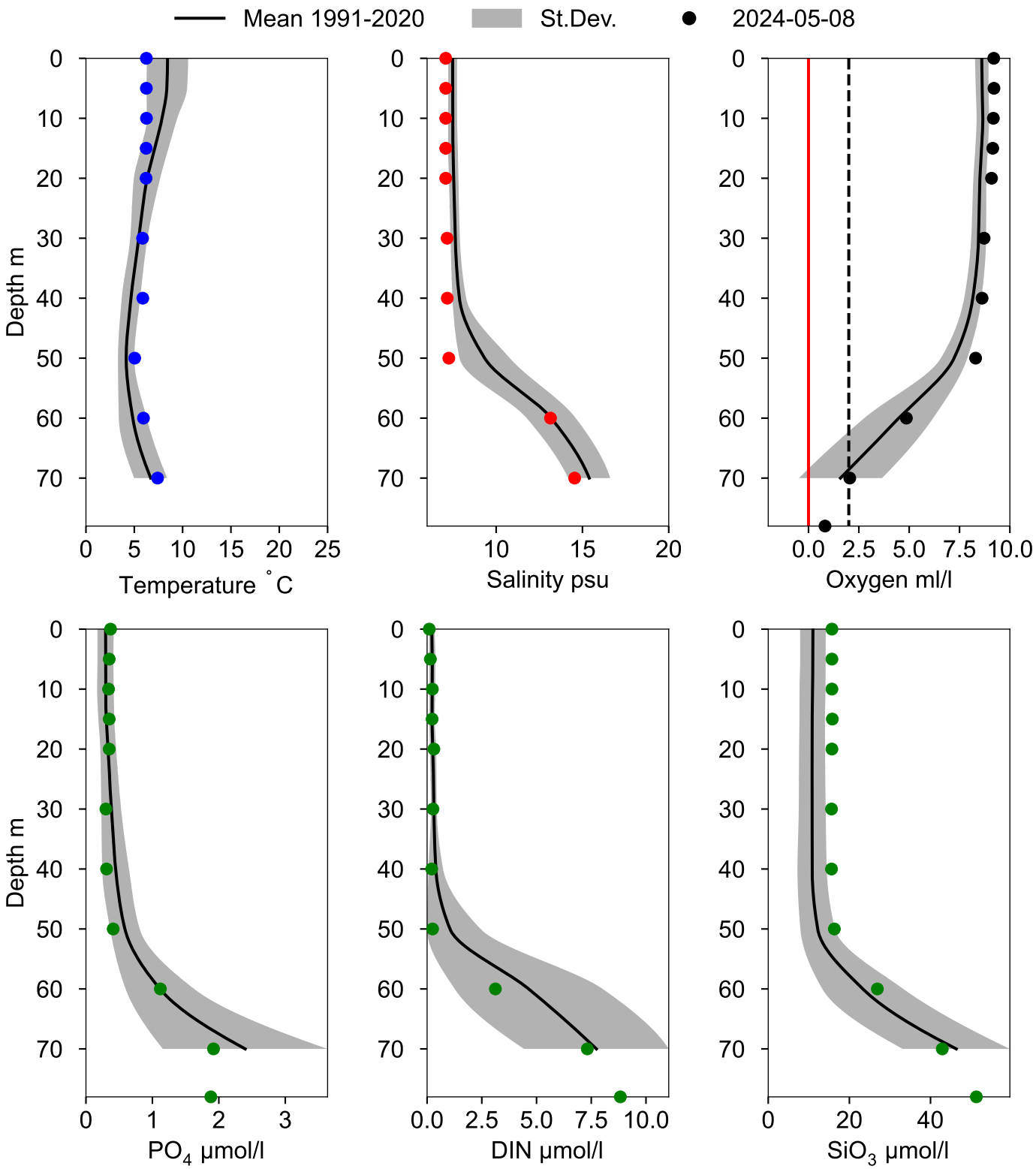
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 70 m)

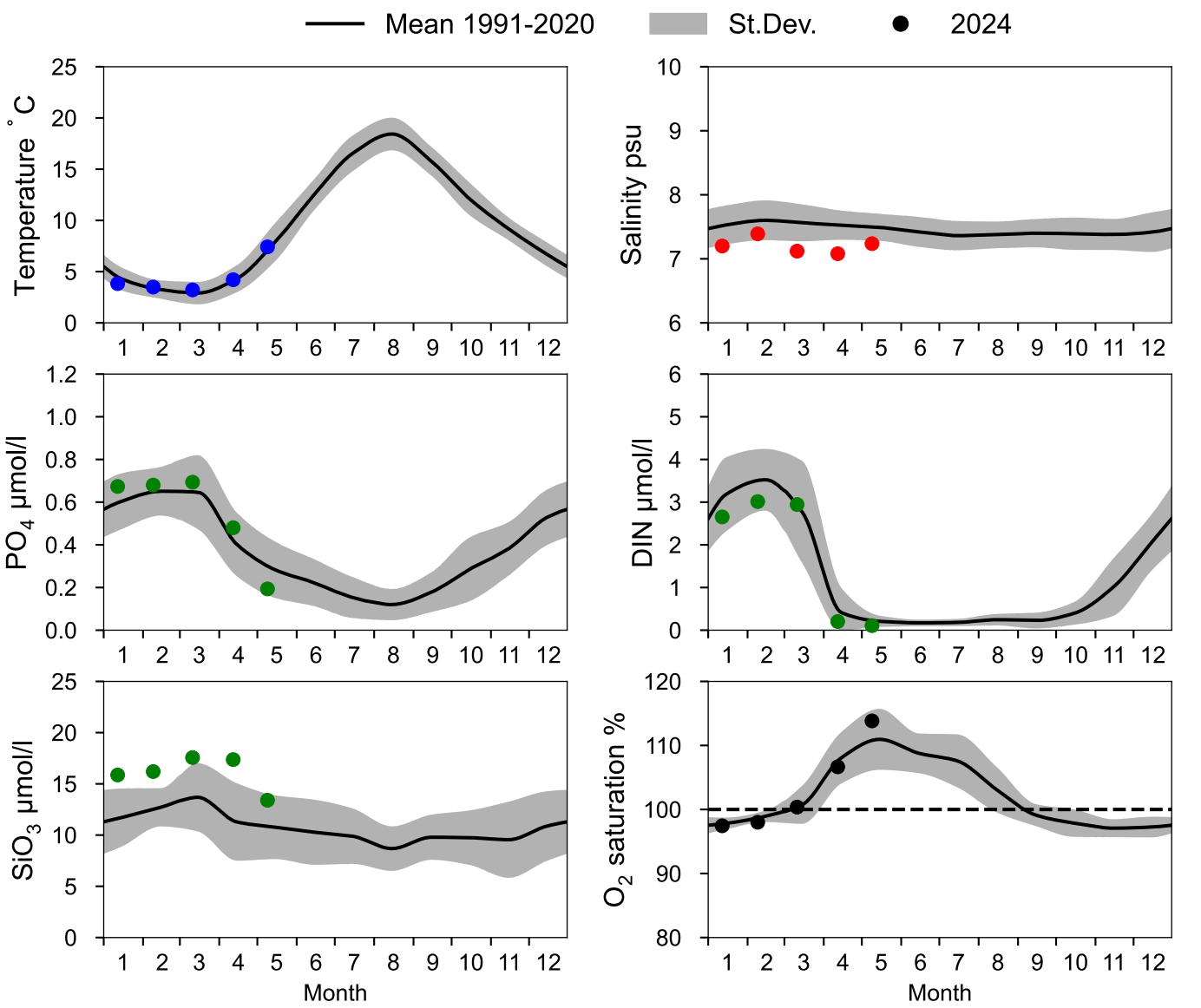


Vertical profiles HANÖBUKTEN
May

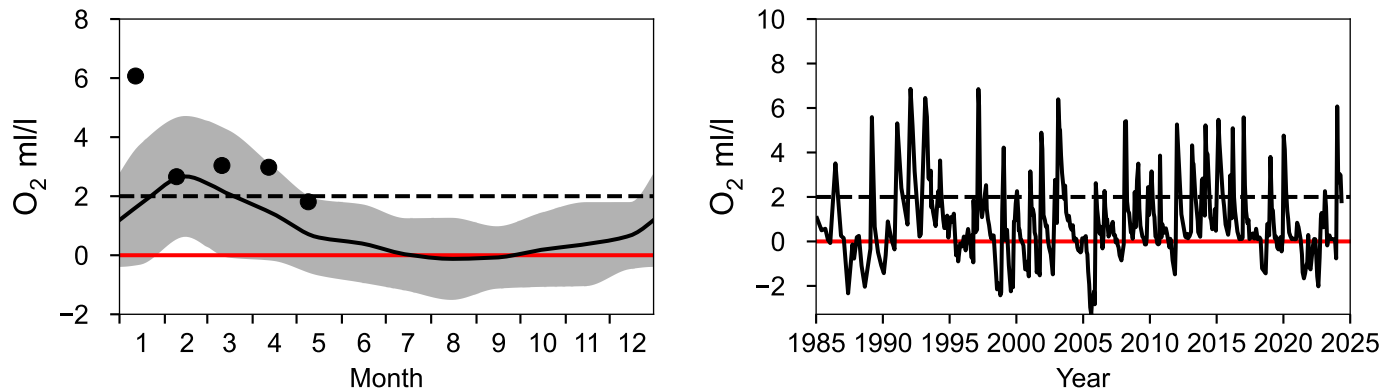


STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

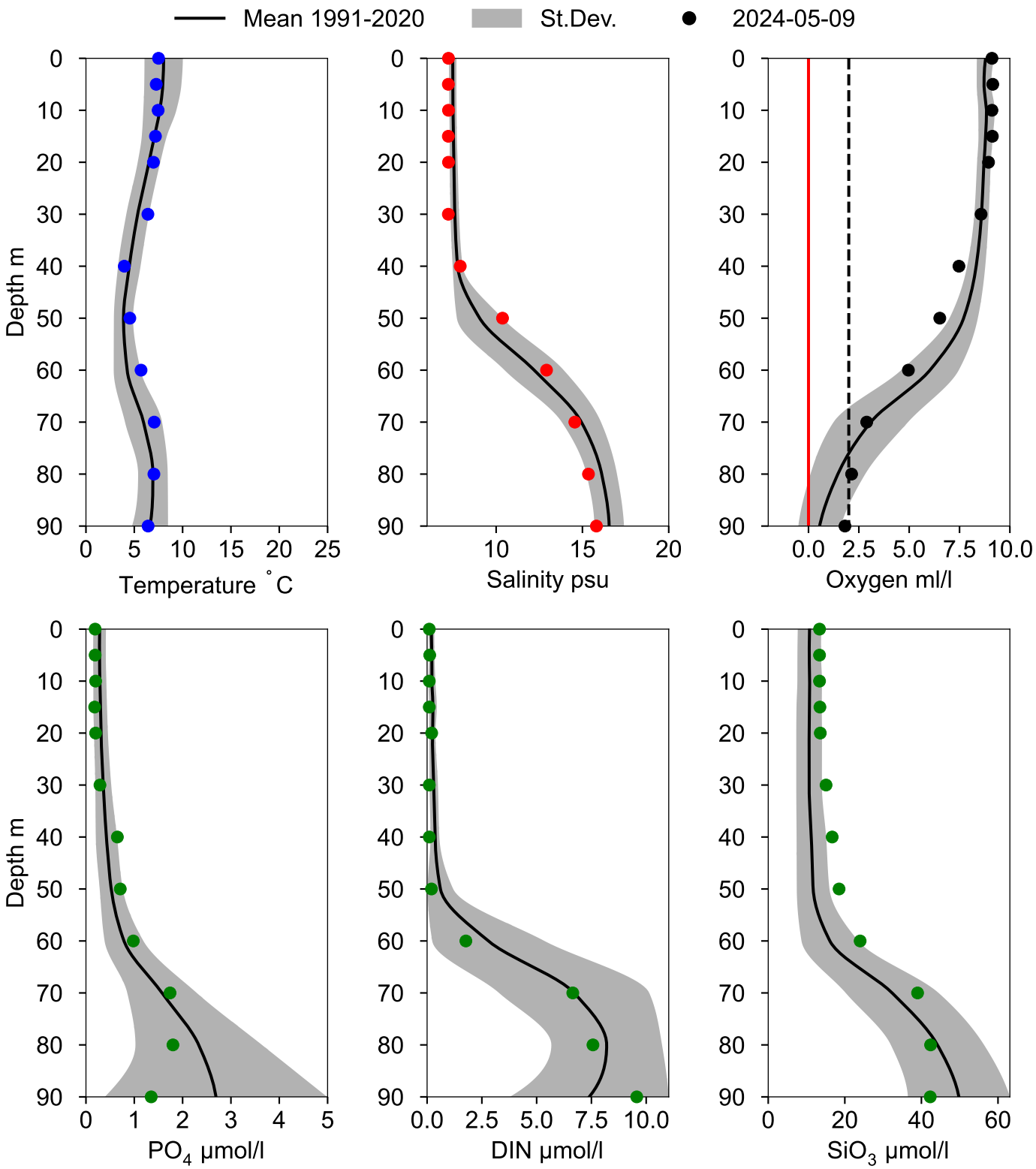
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

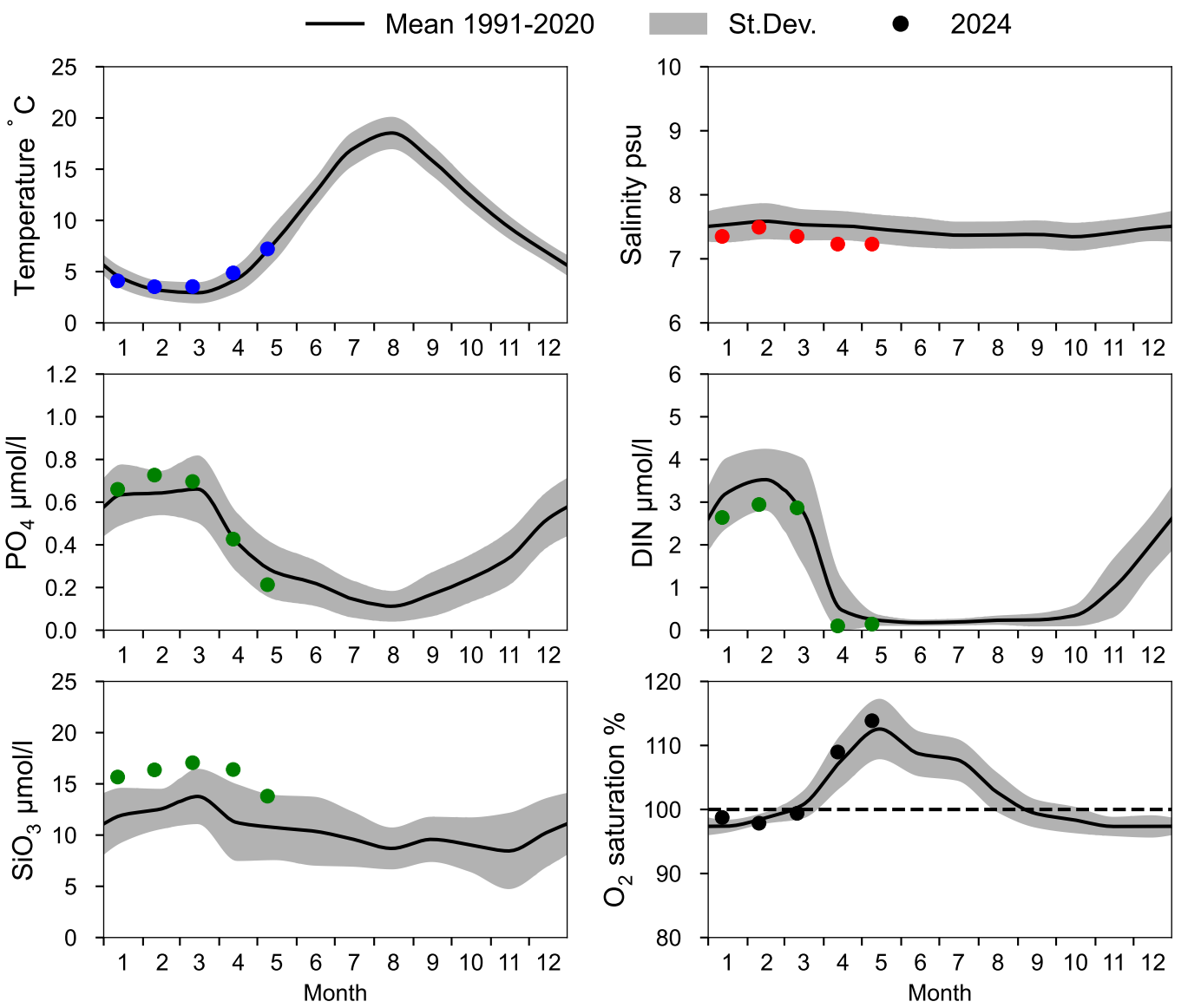


Vertical profiles BY4 CHRISTIANSÖ
May

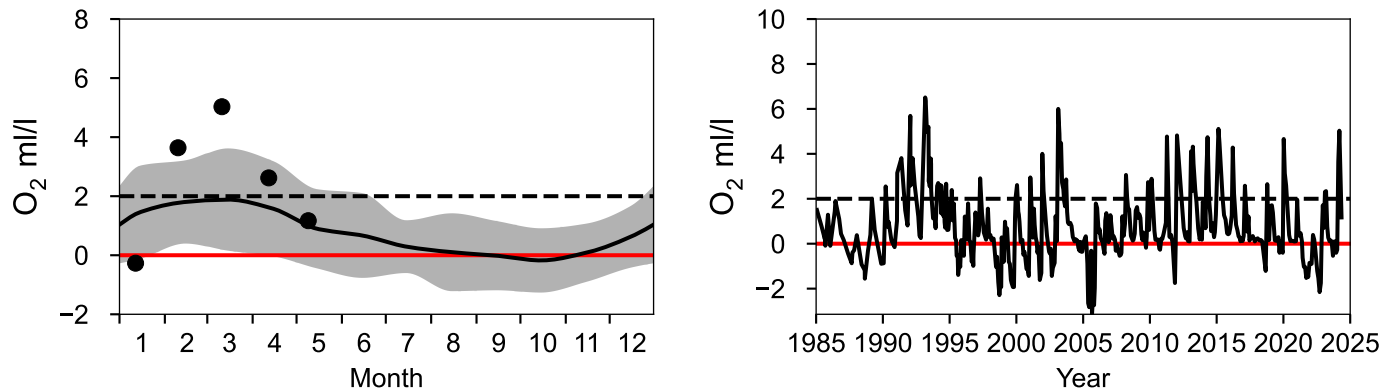


STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

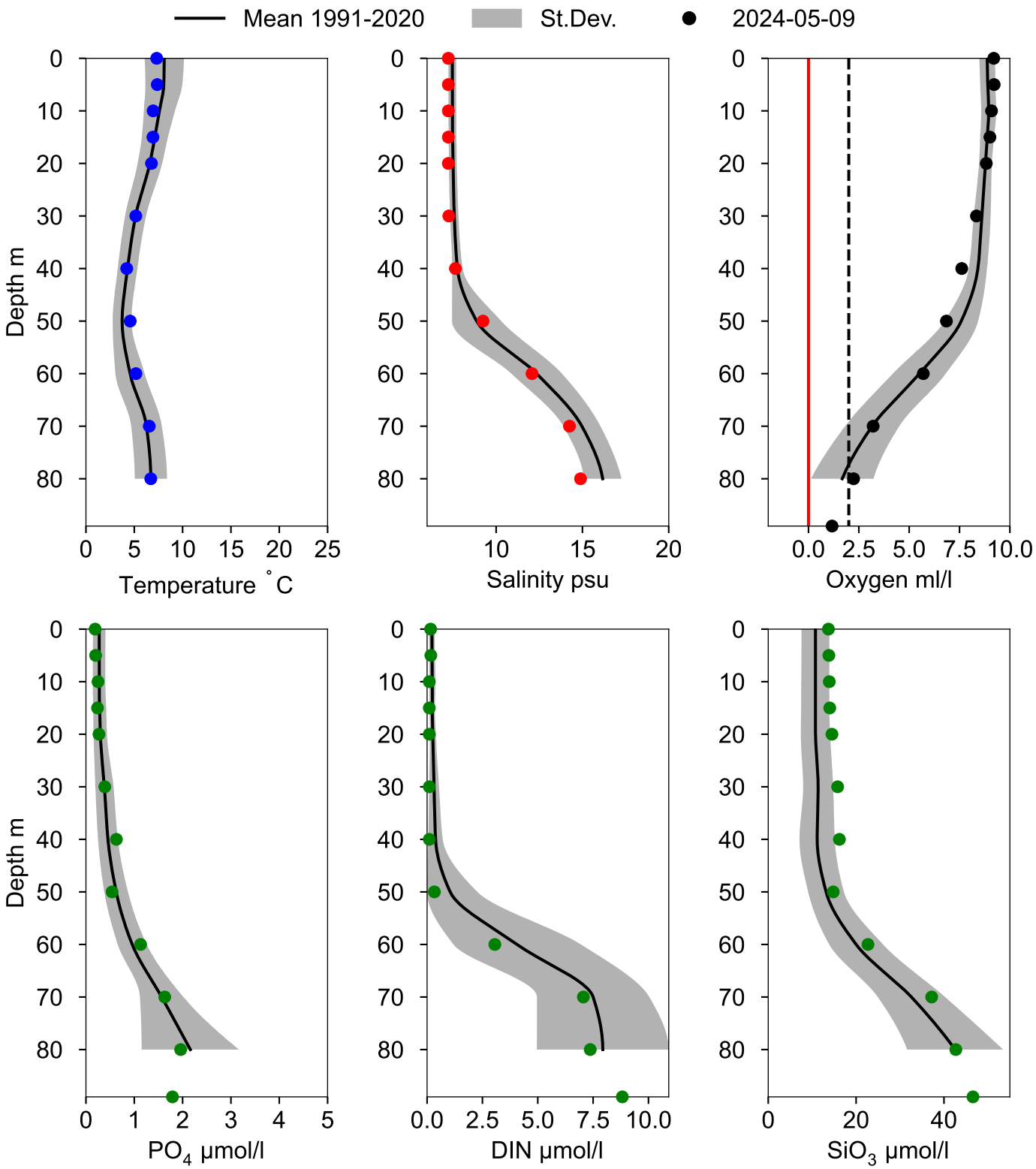
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

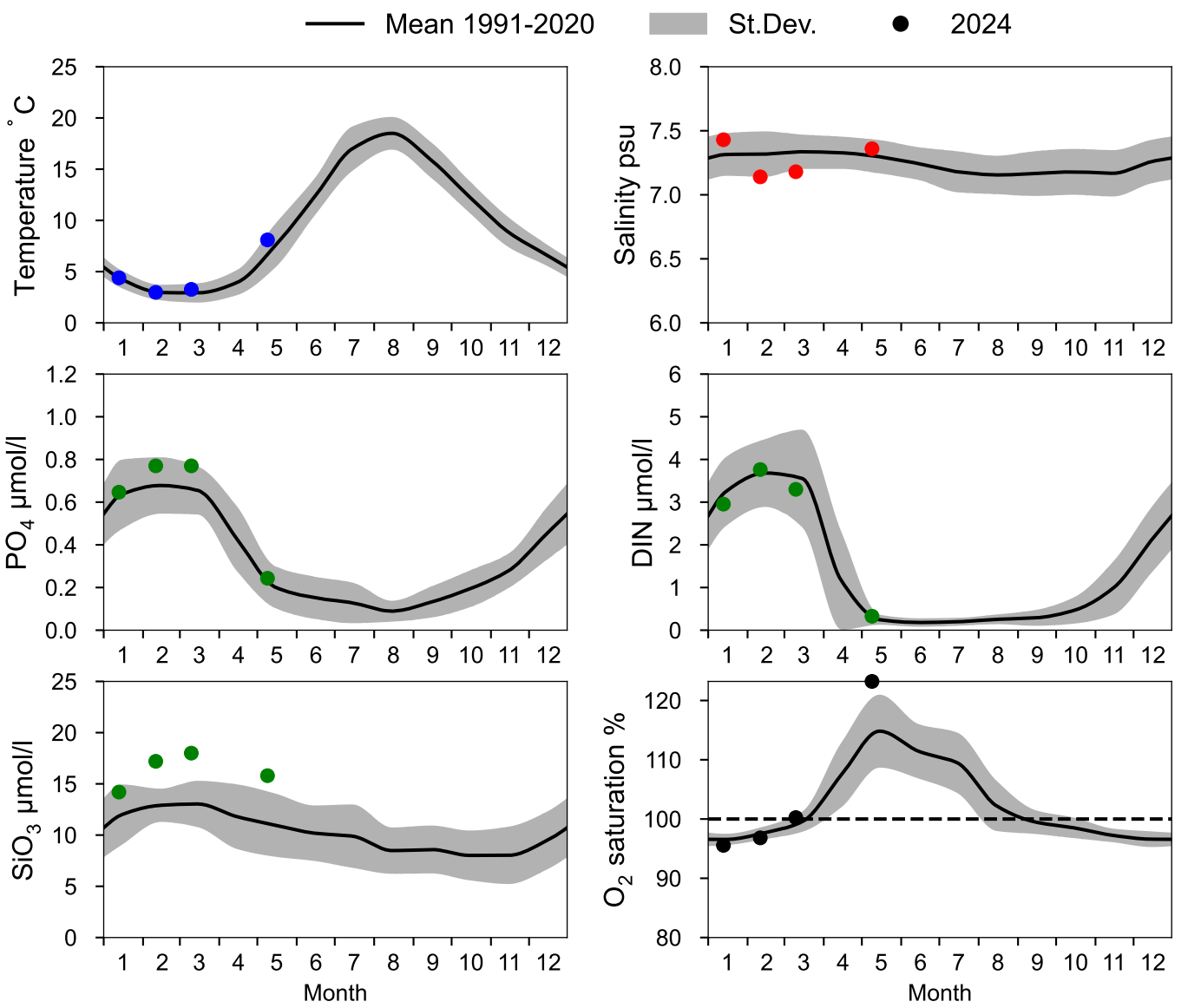


Vertical profiles BY5 BORNHOLMSDJ
May

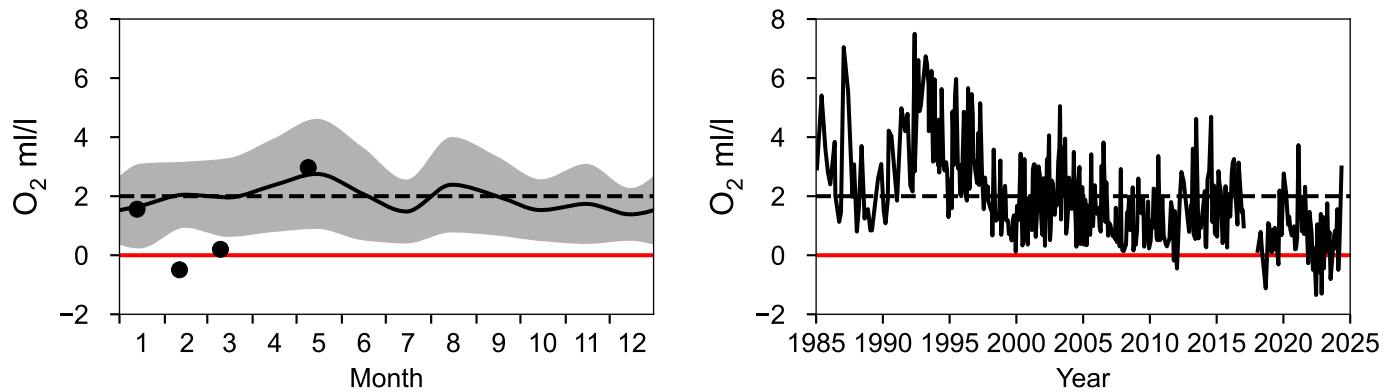


STATION BCS III-10 SURFACE WATER (0-10 m)

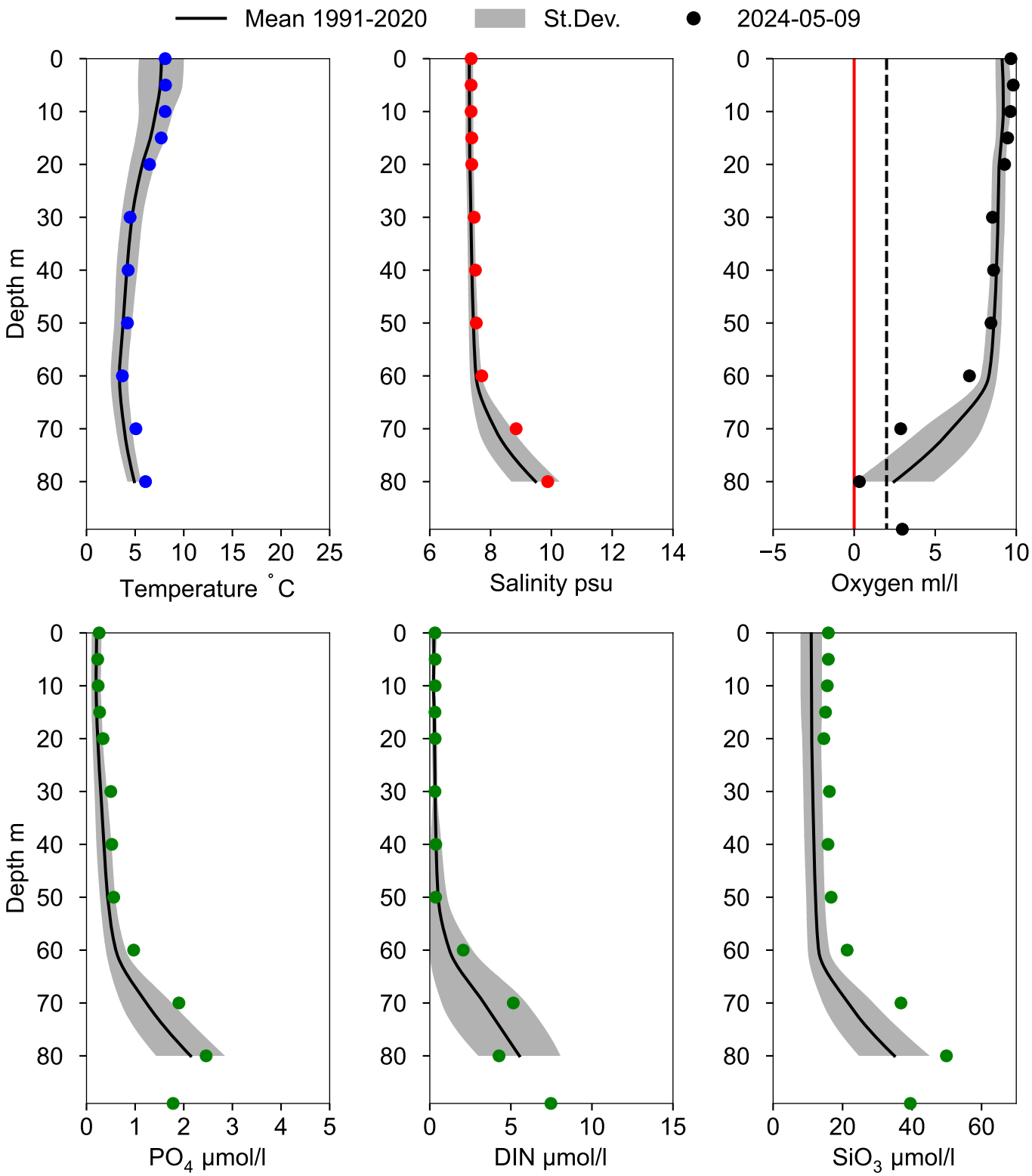
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

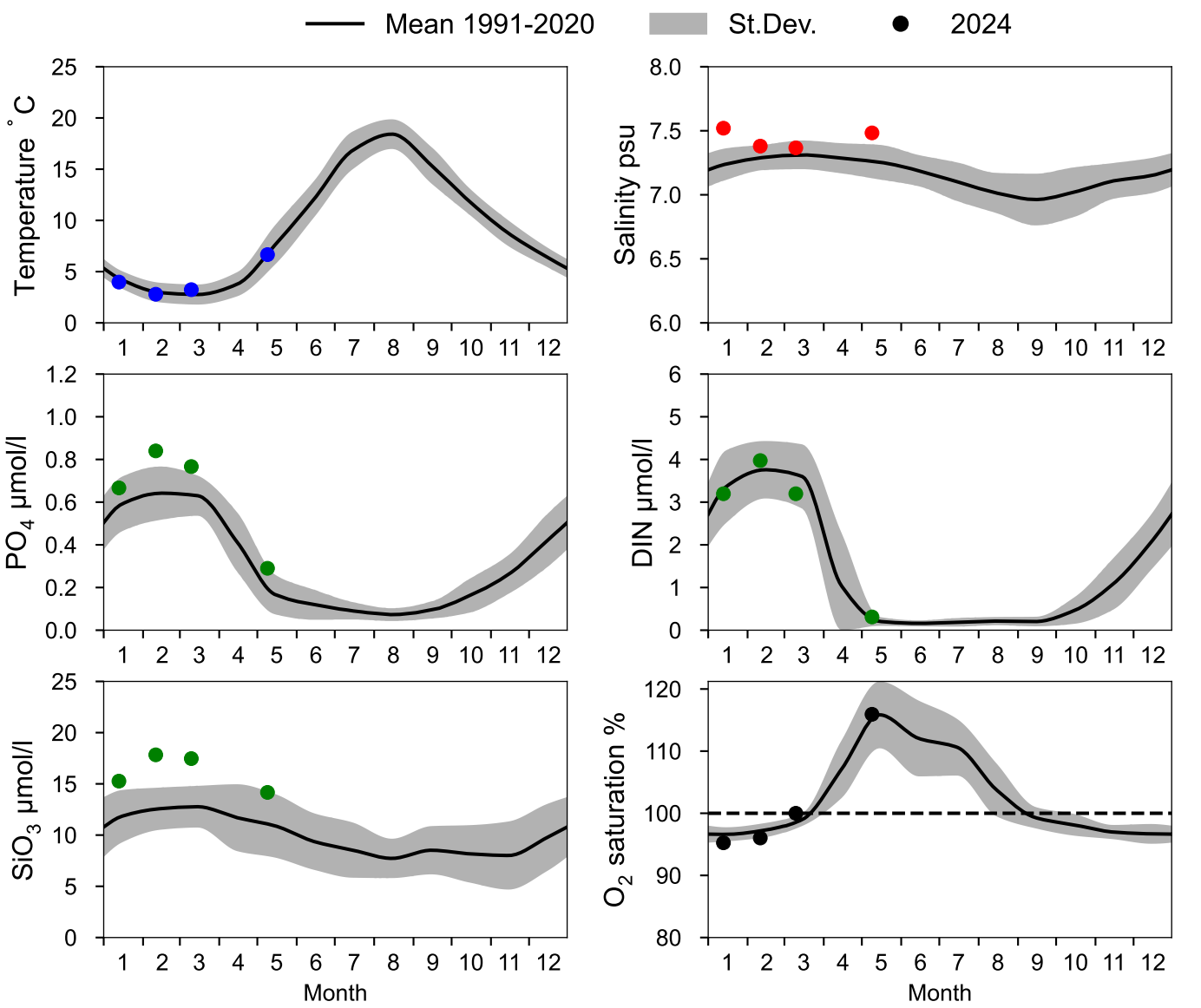


Vertical profiles BCS III-10
May

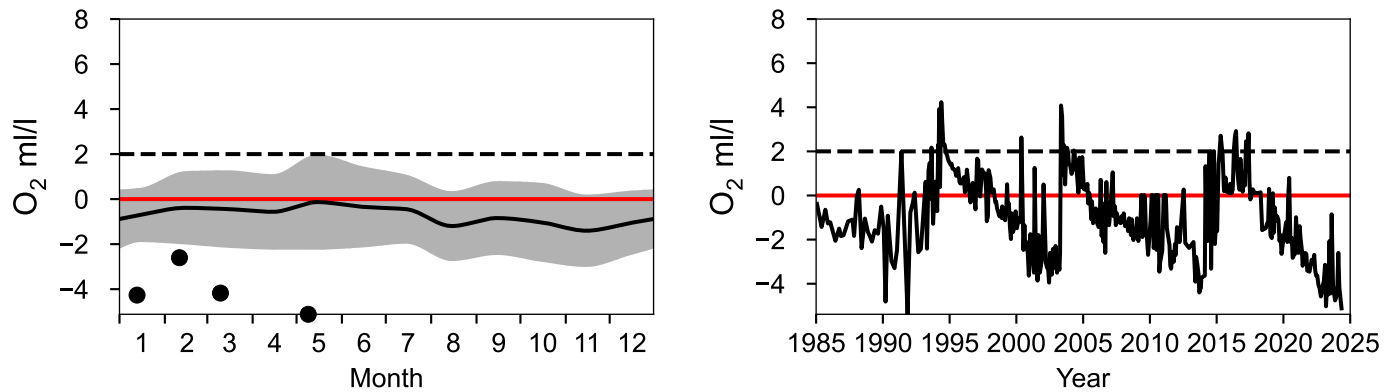


STATION BY10 SURFACE WATER (0-10 m)

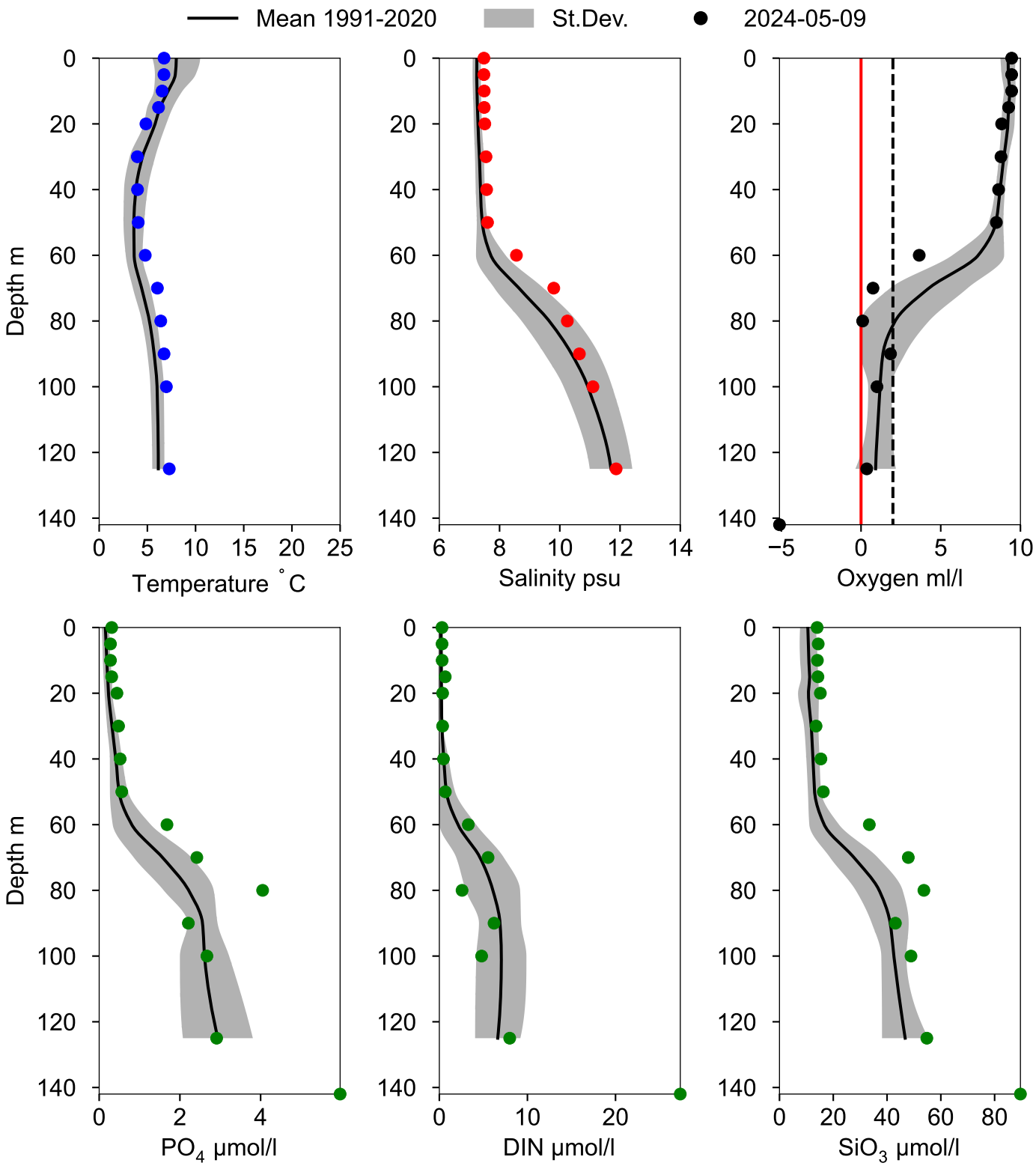
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

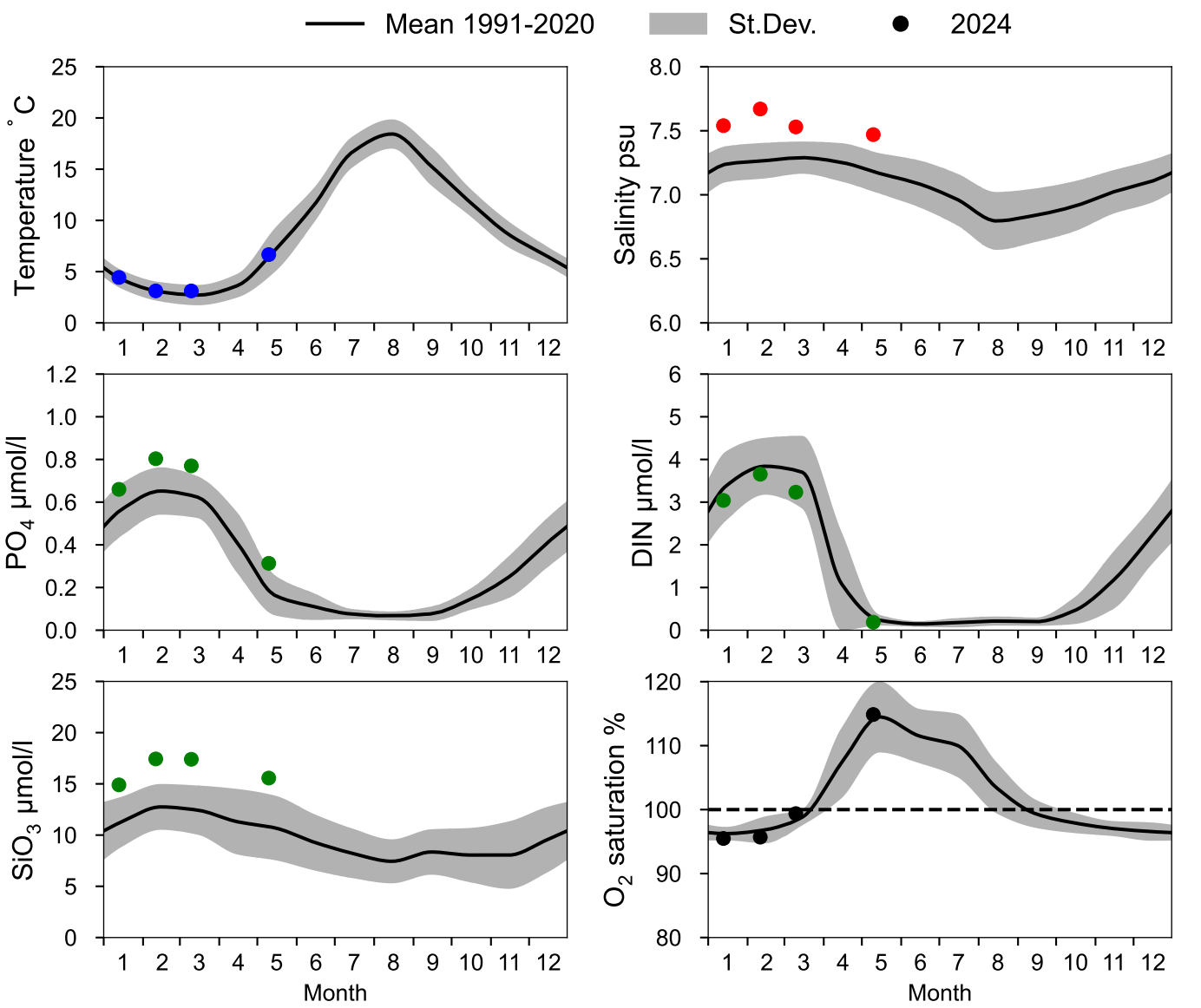


Vertical profiles BY10
May

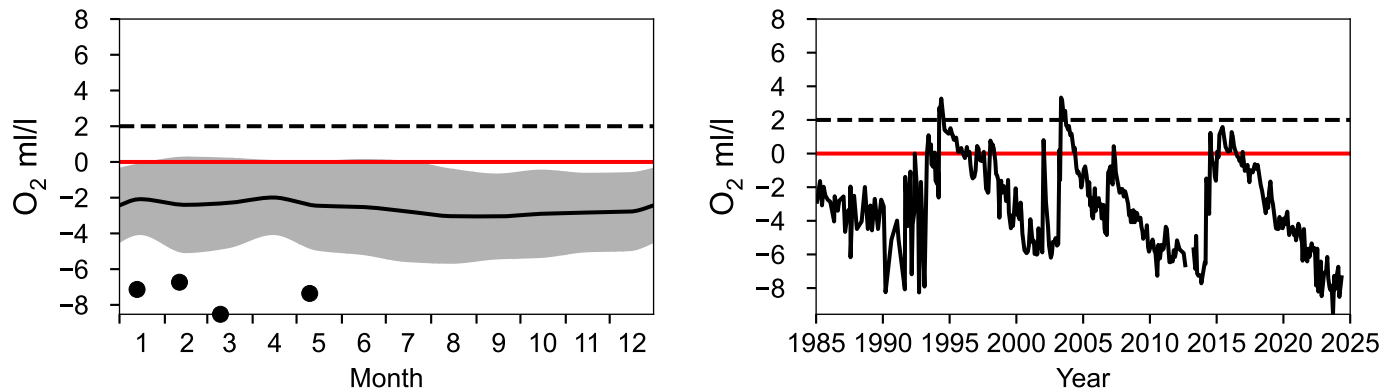


STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

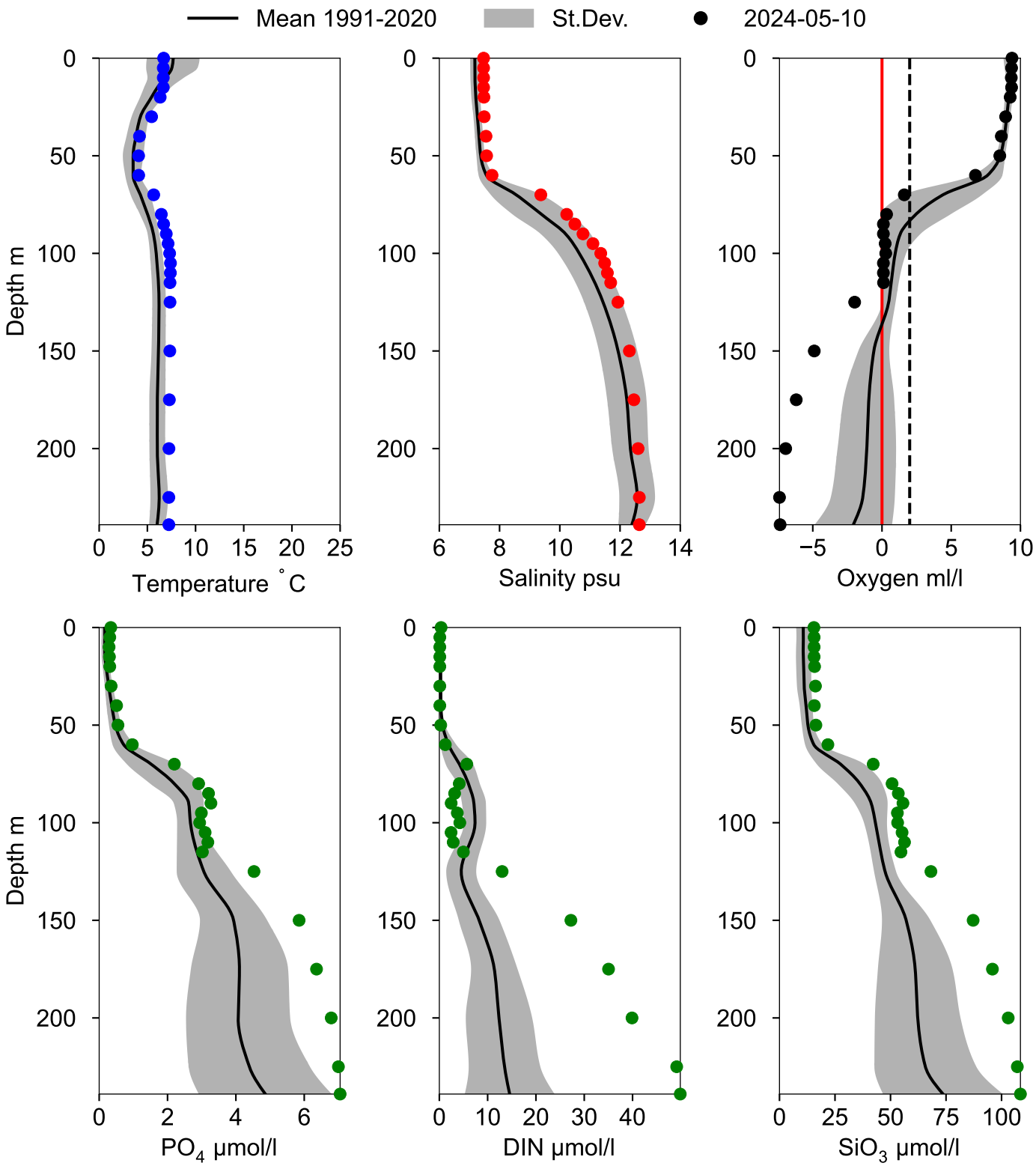
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 225 m)

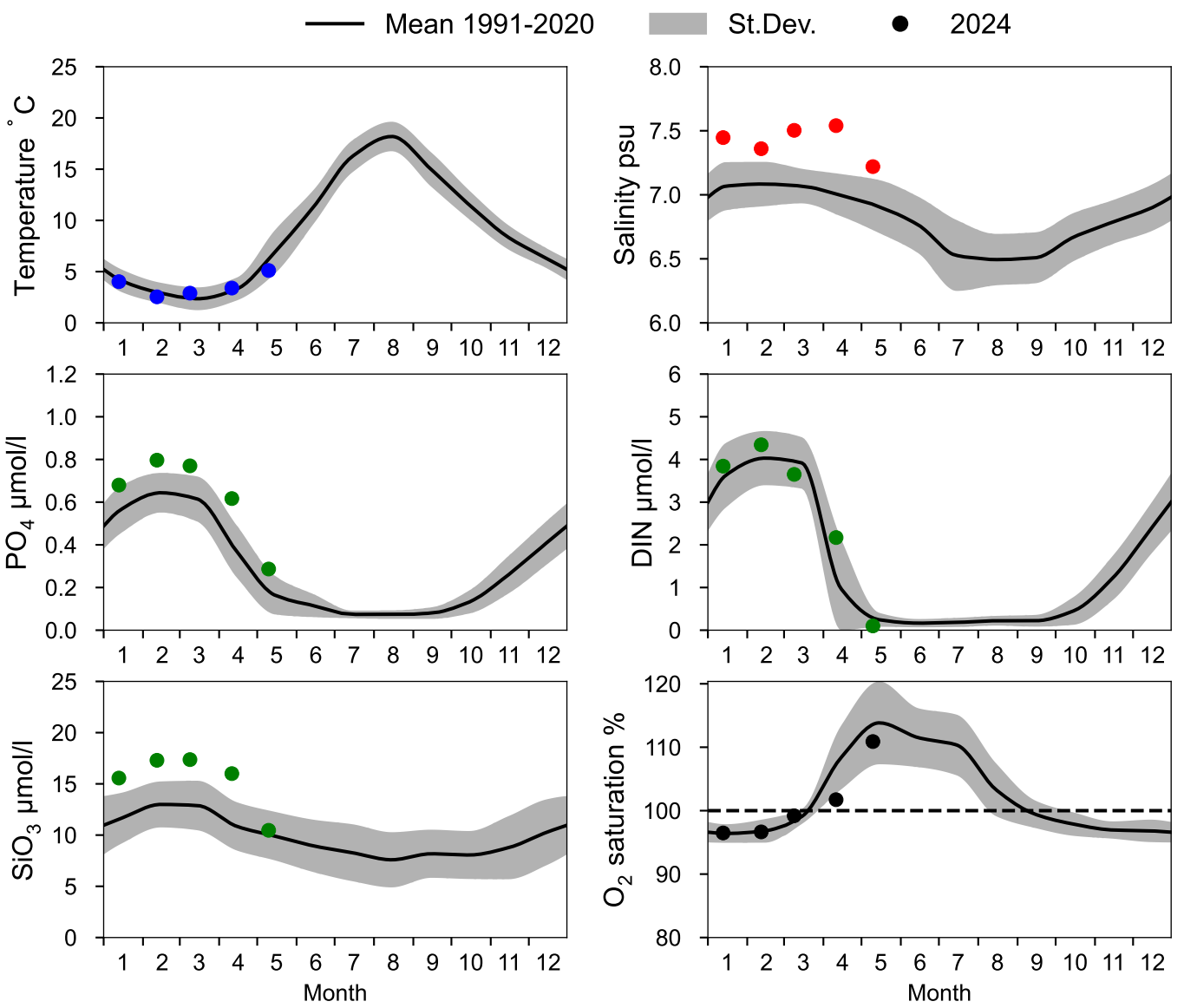


Vertical profiles BY15 GOTLANDSDJ
May

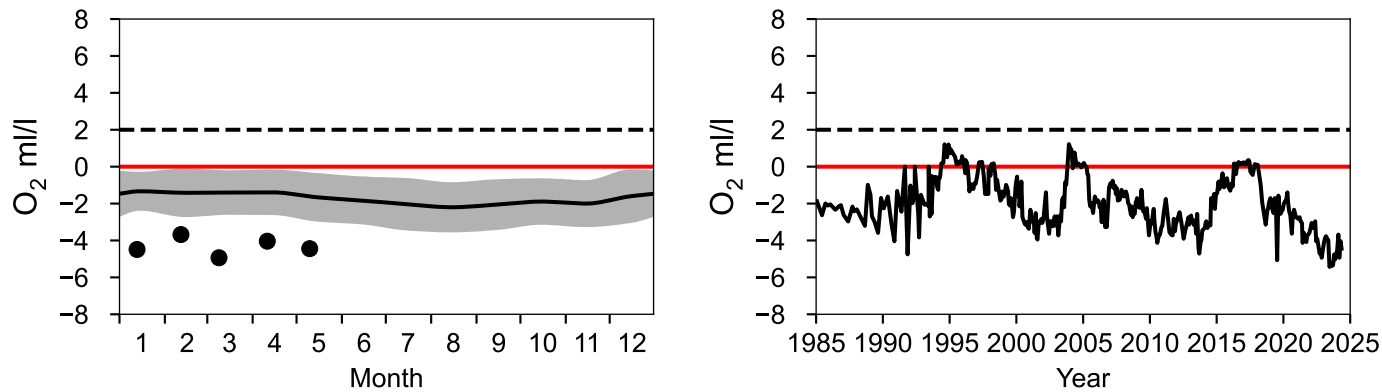


STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

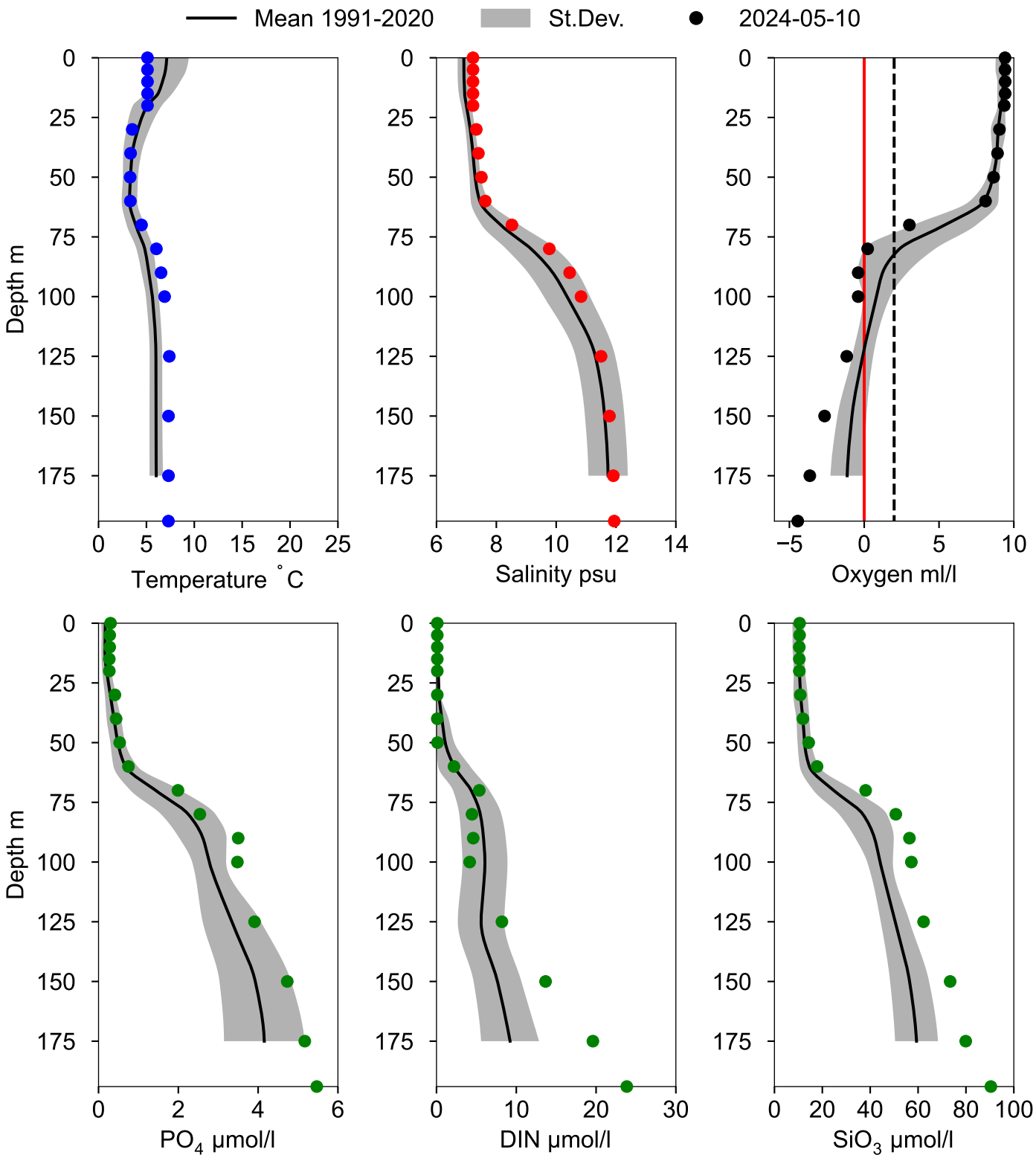
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

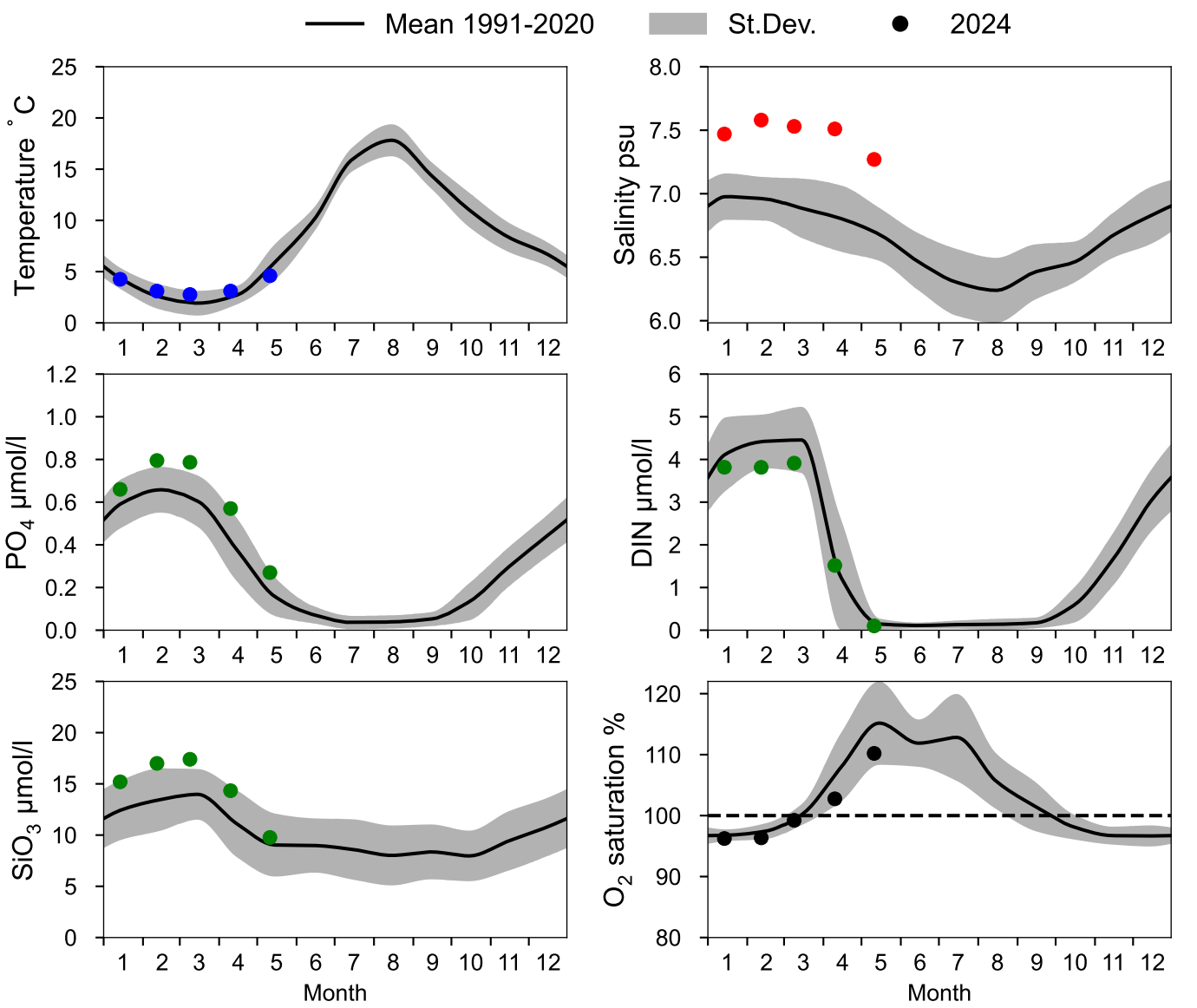


Vertical profiles BY20 FÅRÖDJ
May

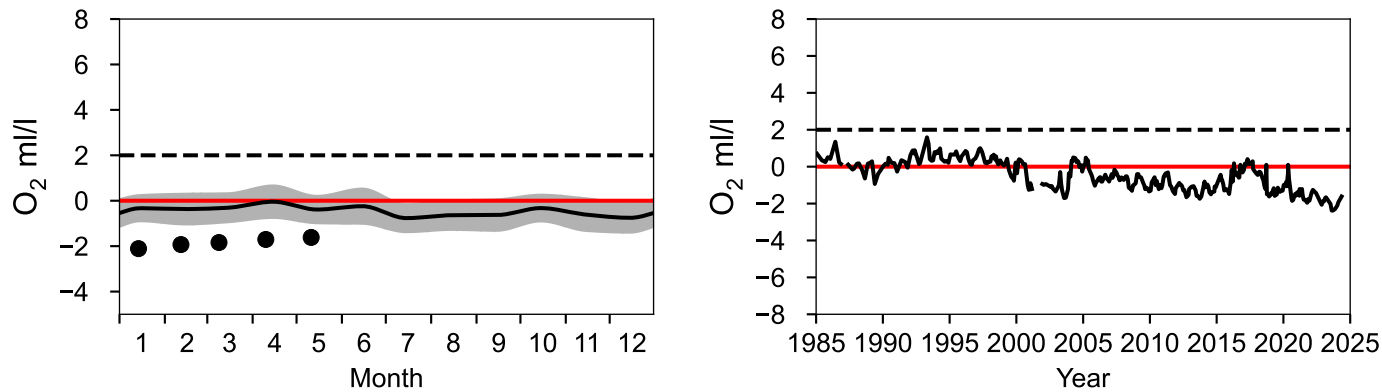


STATION BY29 / LL19 SURFACE WATER (0-10 m)

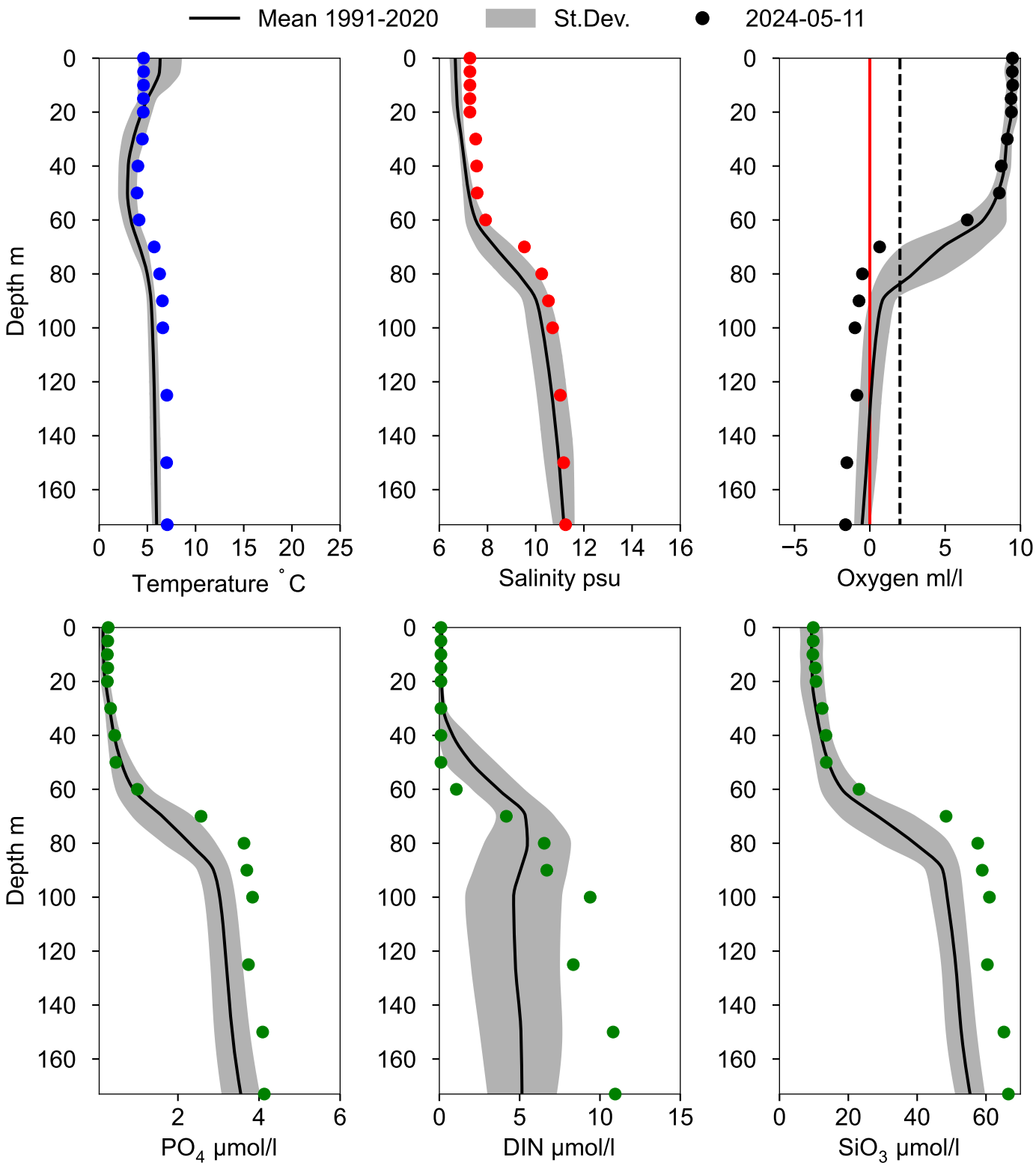
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 150 m)

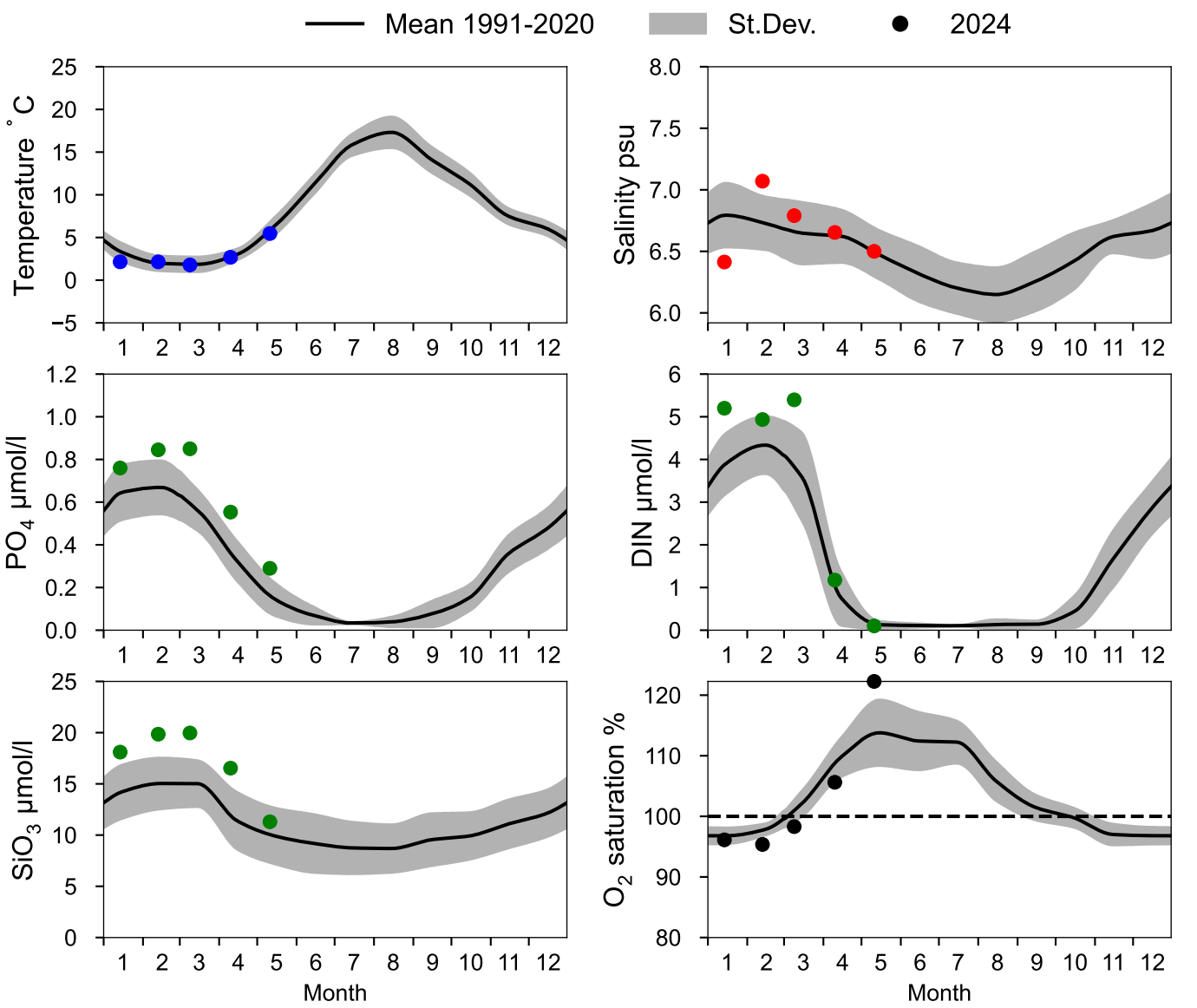


Vertical profiles BY29 / LL19
May

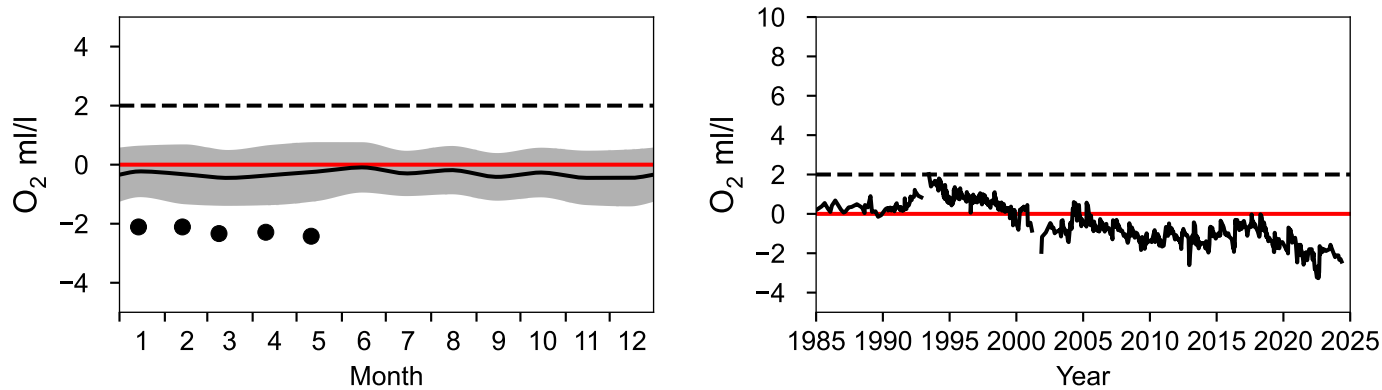


STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

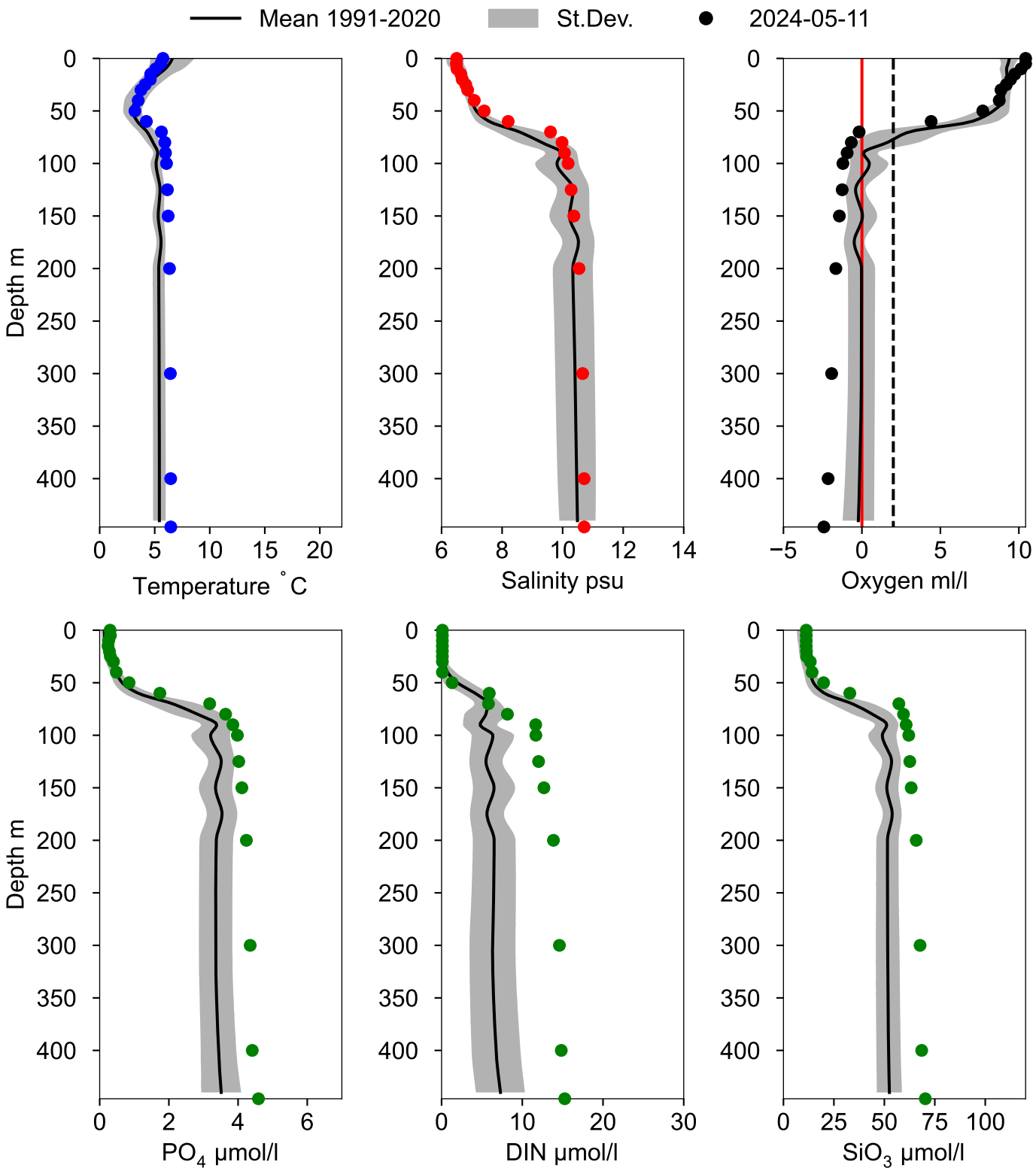
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 419 m)

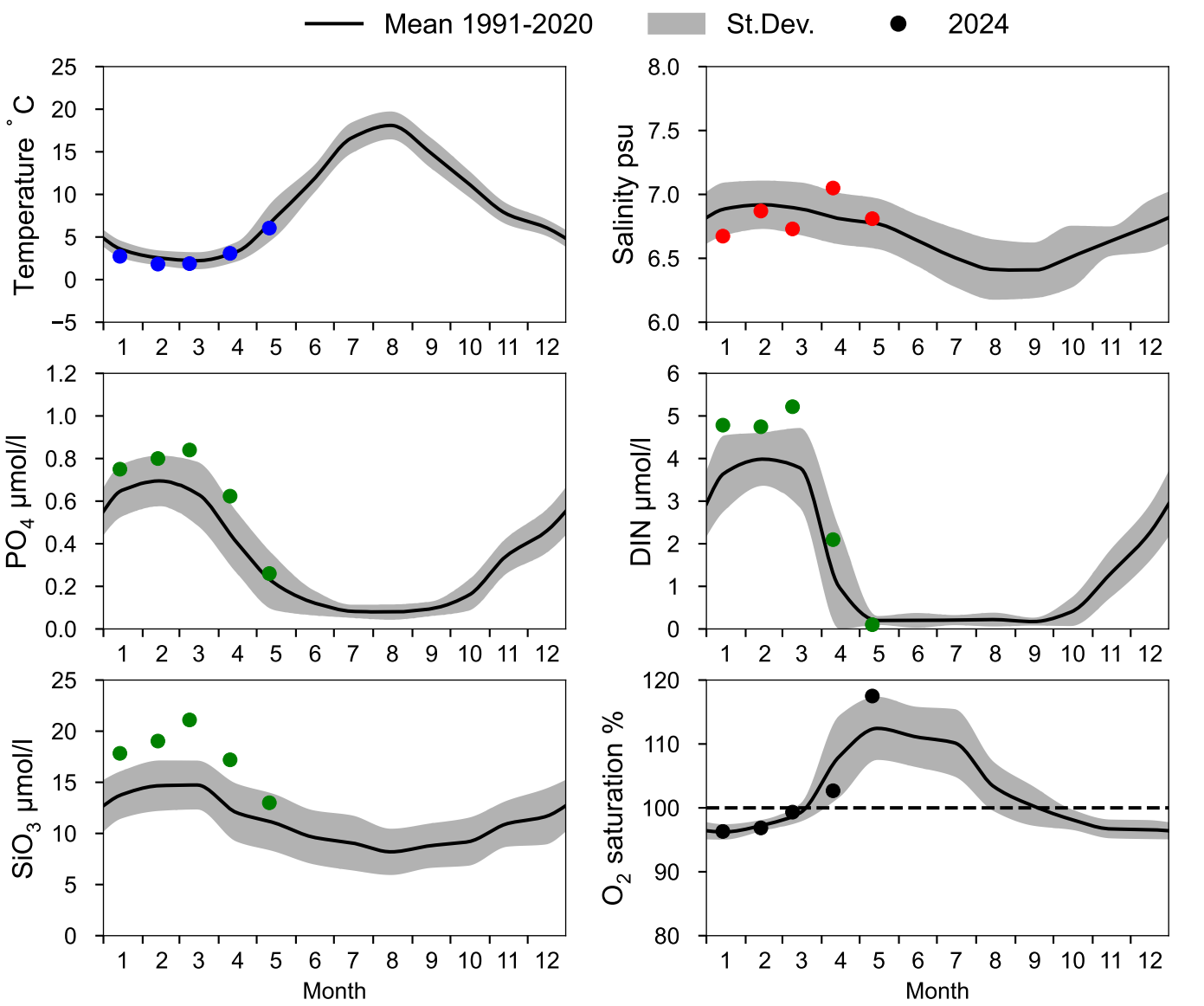


Vertical profiles BY31 LANDSORTSDJ
May

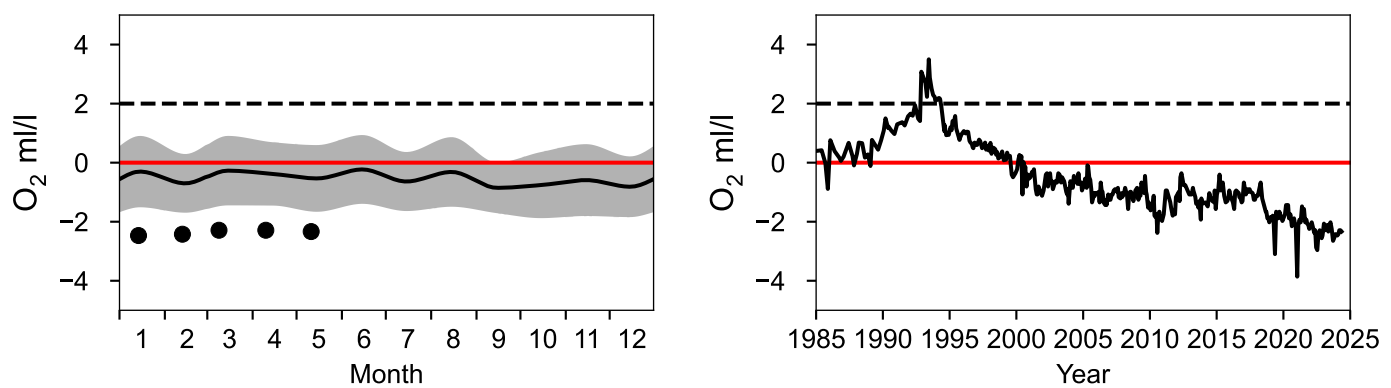


STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

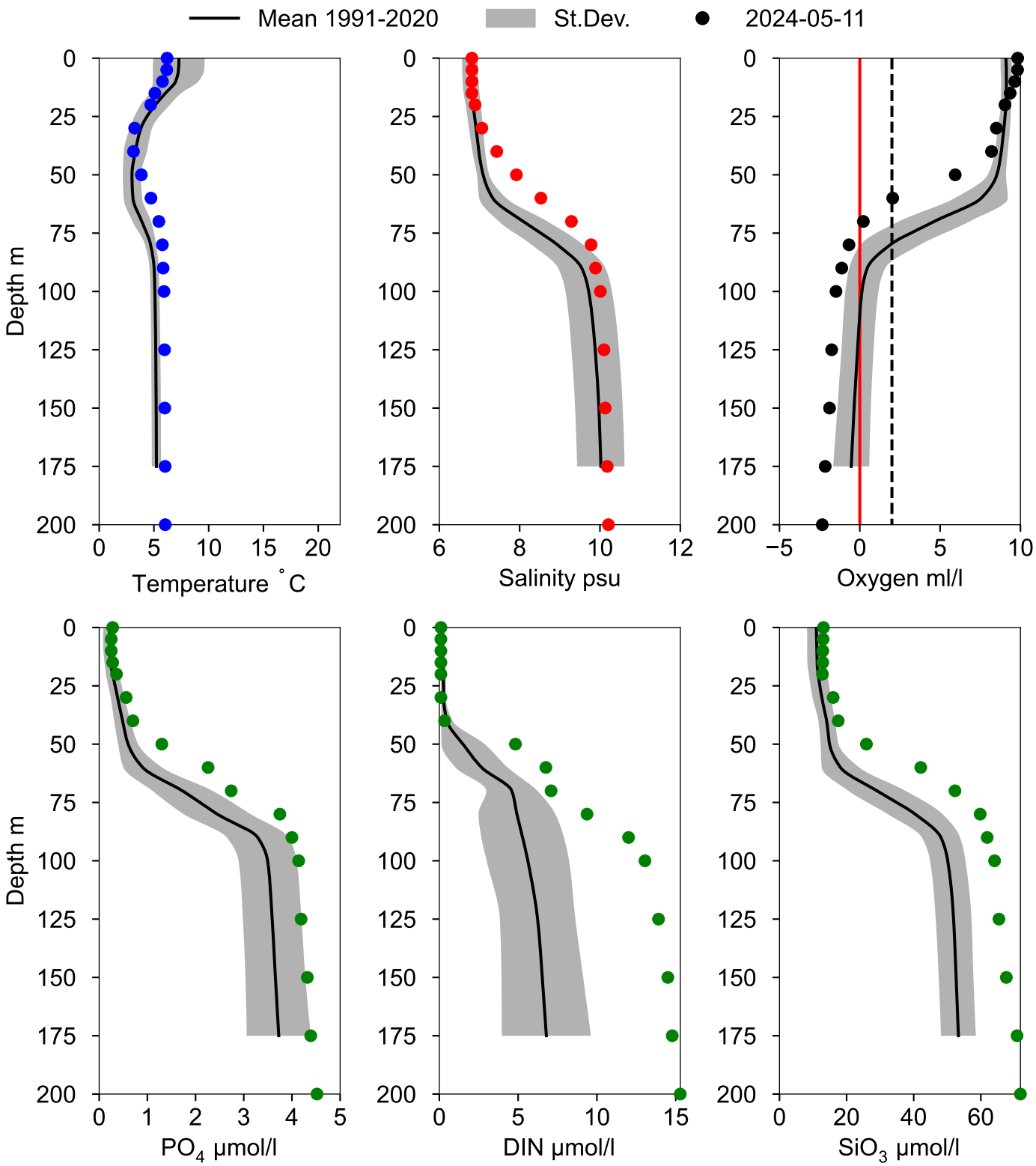
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

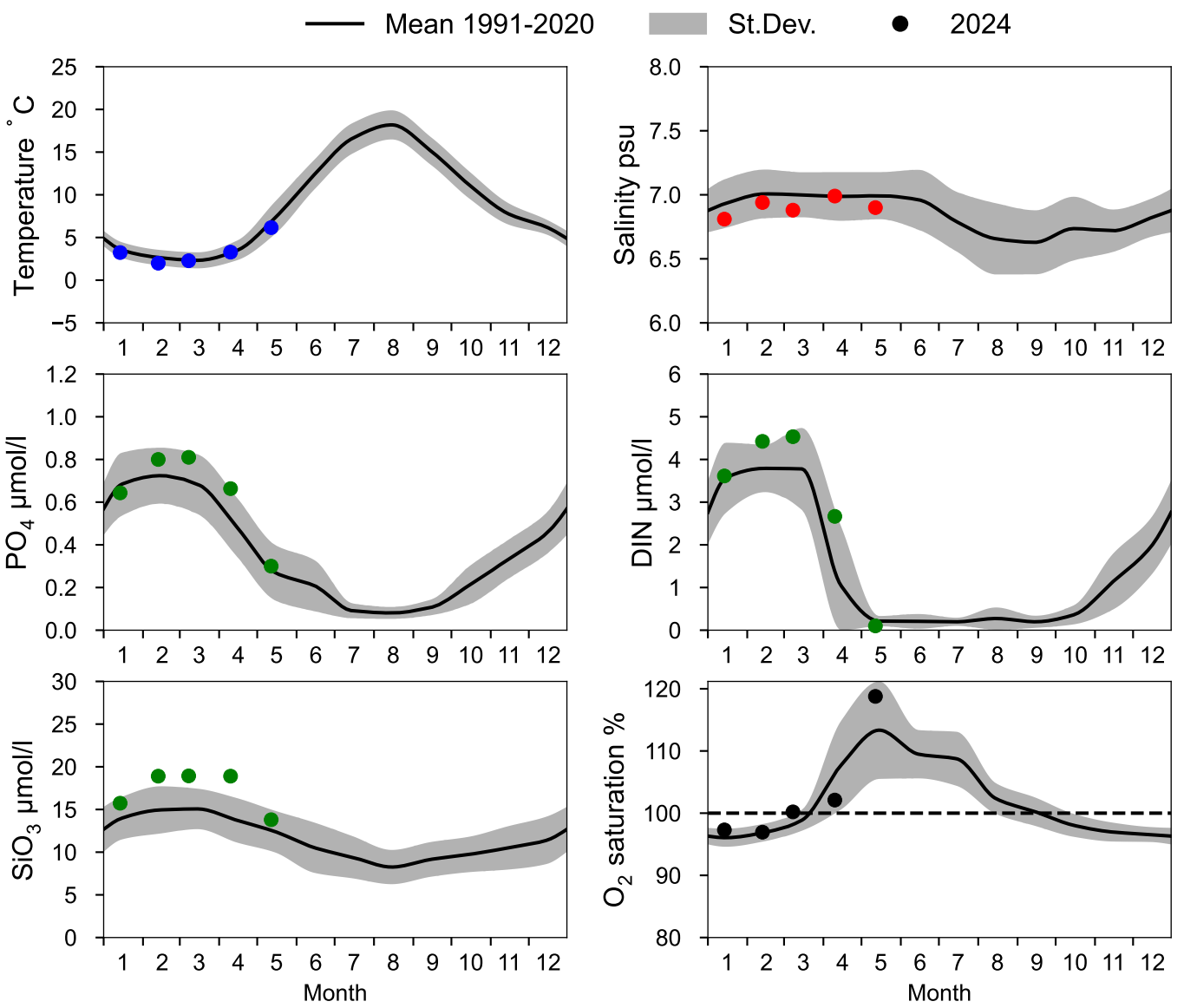


Vertical profiles BY32 NORRKÖPINGSDJ
May

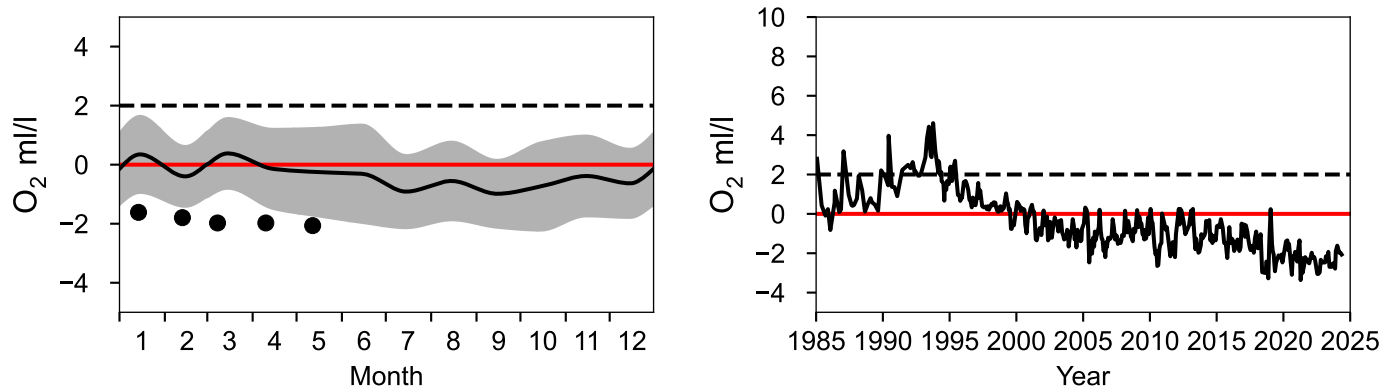


STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)



Vertical profiles BY38 KARLSÖDJ
May