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2024-03-21
Dnr: 2024/33/3.1.3

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

Photo: Sunset over the Skagerrak. Lena Viktorsson, SMHI

Survey period: 2024-01-11 to 2024-01-17

Principal: 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 pelagic monitoring program, Skagerrak, Kattegat, Öresund, and the Baltic Proper were visited. In the Kattegat, a limited mapping survey of nutrients was carried out through sampling from Svea's ferrybox. Nutrients and chlorophyll were analyzed in these samples. Among the mapping stations in the Kattegat, only the Kullen station was sampled with a full profile. Additional CTD stations were sampled in Arkona and the Bornholm Basin to monitor the inflow that occurred in mid-December.

The surface water temperature had decreased since December and was around 2 degrees Celsius, which is normal for January.

Nutrient concentrations had increased at several stations in the Kattegat and Skagerrak and were within the normal range for January. In the Baltic Proper, nutrient concentrations were also within the normal range and had not increased as much as in the western seas since December.

The oxygen situation remained poor, with oxygen deficiency from 50-60 meters and completely anoxic conditions from 70-90 meters. The inflow at the end of December had affected the oxygen concentration in the Hanö Bay and the Bornholm Basin.

SMHI's next regular cruise with R/V Svea is scheduled for February 7-14, starting and ending in Lysekil. Before that, SMHI will participate in SLU Aqua's IBTS Q1 from January 21 to February 4.

RESULT

The cruise was conducted aboard R/V Svea, starting in Gothenburg on January 10 and concluding in Lysekil on January 18. Due to strong winds, only three stations in Skagerrak could be sampled, all close to the coast.

Normally, winter mapping of nutrients is carried out by sampling at about 12 extra stations spread across the entire Kattegat. Due to budget cuts in 2024, the number of cruise days had to be reduced, resulting in the cancellation of sampling at some stations in the western part of Kattegat. At the remaining mapping stations, only surface water was sampled using R/V Svea's ferrybox system. The western part of Kattegat will be partially covered by the sampling conducted by SMHI during SLU Aqua's expedition in January, IBTS Q1, where SMHI participates and carries out nutrient mapping in both Skagerrak and Kattegat. To monitor the inflow that occurred in mid-December, five extra CTD stations were sampled in the Arkona Basin and the Bornholm Basin.

Unfortunately, Svea's Moving Vessel Profiler (MVP) instrument, used for measuring profiles while underway, was lost during the second part of the cruise in December. A search effort is planned during SMHI's next regular cruise in February.

The ferrybox system was operated continuously throughout the cruise. Tests of the automatic sampling system were conducted throughout the cruise.

This report is based on data that has undergone initial quality control and is compared to monthly means from the period 1991 - 2020. When additional quality control has been performed, certain values may change. Values in the report have been rounded and can differ a bit from values published in the data base. Data from this cruise are 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 here:
https://www.smhi.se/en/services/open-data/national-archive-for-oceanographic-data/download-data-1.153150

Skagerrak

Due to strong winds, only three stations in Skagerrak could be sampled, all relatively close to the coast. At all stations, the water was well-mixed down to a depth of 10 meters, the temperature was around 2 degrees Celsius, and the salinity varied between 25-27 psu. At station P2 off Marstrand, the salinity in the surface water was 25 psu, which is below normal. At the two more northern stations, the salinity was around 27 psu, which is normal for the month. Below the well-mixed surface layer, the temperature increased to around 7 degrees, and the salinity to about 34 psu, which is within the normal range.

The concentration of nutrients had increased since December and was within the normal range at all three stations, both in the surface water and below the thermocline.

The oxygen situation was good at all stations in Skagerrak, with normal values for the season, with concentrations between 5.9-6.1 ml/l.

Chlorophyll fluorescence is a measure of plankton activity measured with a sensor mounted on the CTD[1]. No strong chlorophyll fluorescence peaks were measured, but some activity was noted at all stations in the well-mixed surface layer.

Kattegat and the Sound

The surface water temperature varied around 2 degrees Celsius, and the salinity ranged between 19-22 psu. The salinity was within the normal range for the month, while the temperature was slightly below normal at Fladen and during the second visit to station Anholt E. During the first passage through Kattegat, there was no clear thermocline; temperature and salinity increased continuously from the surface down to about 20 meters, where salinity and temperature stabilized at 33-34 psu and 7-8 degrees, respectively. During the second passage through Kattegat, the surface water had mixed and was well-mixed down to about 10 meters deep.

The reduced mapping of nutrients in Kattegat showed that the concentration of nutrients in the surface water was relatively similar across the visited parts of the sea area. Additional nutrient sampling in Kattegat will be conducted during SLU Aqua's IBTS Q1 expedition, January 22-31. This expedition will cover larger parts of Kattegat and Skagerrak. The concentration of inorganic phosphorus and nitrogen in the surface water had increased in Kattegat but decreased in Öresund since December and was within the normal range for the month. The concentration of silica remained above normal except at station N14 Falkenberg. In the deep water, all nutrient levels were within the normal range.

Oxygen levels in Kattegat's bottom water were normal for the season. All values were above 4 ml/l (the threshold for oxygen deficiency) and ranged between 4.9-6.2 ml/l, with the lowest in Öresund.

Peaks in plankton activity, as indicated by the chlorophyll fluorescence sensor, were noted at station Anholt E and N14 Falkenberg around 10 meters depth.

[1] The CTD is a profiling measuring instrument and stands for Conductivity, Temperature, Depth. SMHI's CTD is also equipped with sensors that measure oxygen and fluorescence, among other parameters.

The Baltic Proper

The surface layer temperature had decreased since December and varied between 2-4 degrees Celsius, which was within the normal range. The salinity in the surface layer varied between 6-8 psu, from the Arkona Basin to the northern Baltic Proper. In the Eastern Gotland Basin, the salinity was about 7.5 psu, which is above normal. In other basins, the salinity was below normal at some stations. In the Gotland Basins, the water was well-mixed down to the halocline at 50-70 meters. The halocline was sharper and somewhat shallower in the Eastern Gotland Basin compared to the Western Gotland Basin. In the deep water below the halocline, the temperature was slightly above normal. In the Arkona Basin, Hanö Bay, and the Bornholm Basin, five extra stations were sampled to track the extent of the inflow that occurred at the end of December. In Arkona, the new salty water was found from about 40 meters to the bottom (42-45 meters) at all stations, with a salinity of about 19 psu and a temperature of about 5.5 degrees Celsius. In the Bornholm Basin and Hanö Bay, a slight increase in salinity (around 15 psu) and a decrease in temperature (5.6-6.0 degrees Celsius) were observed only very close to the bottom. It was not entirely clear if this was a trace of the December inflow or an earlier, smaller inflow. At station BY5, no increase in salinity or decrease in temperature was seen near the bottom. During the next expedition in February, these extra stations will be revisited to see if the inflow has reached further into the Bornholm Basin.

The concentration of DIN varied between about 3-5 µmol/l and was normal except in the northern parts of the Western Gotland Basin (BY31 and BY32). The concentration of phosphate varied between 0.6-0.8 µmol/l and was normal at all stations except BY20 Fårödjupet, where higher levels than normal were noted. The concentration of silica was above normal at most stations and varied between 14-18 µmol/l.

The oxygen situation in the Baltic Proper remained poor. Acute oxygen deficiency (< 2 ml/l) was present from 50-60 meters, and anoxic water with hydrogen sulfide was found from 90 meters in the Western Gotland Basin and from 70 meters in the Eastern Gotland Basin. The inflow had affected the oxygen concentration near the bottom at the Hanö Bay station and BY4 Christiansø, where the bottom water concentration was around 6 ml/l. Above the bottom water, at 70-80 meters at these stations, water with oxygen deficiency was still present. The inflow had not affected the oxygen concentration in the bottom water at station BY5 Bornholm Basin, where a low level of hydrogen sulfide was measured.

Fluorescence measurements from the CTD showed low or no plankton activity in the surface layer above the thermocline at all stations, with very low values below the thermocline. The highest activity was measured in the Arkona Basin. No significant peaks in chlorophyll fluorescence were observed.

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

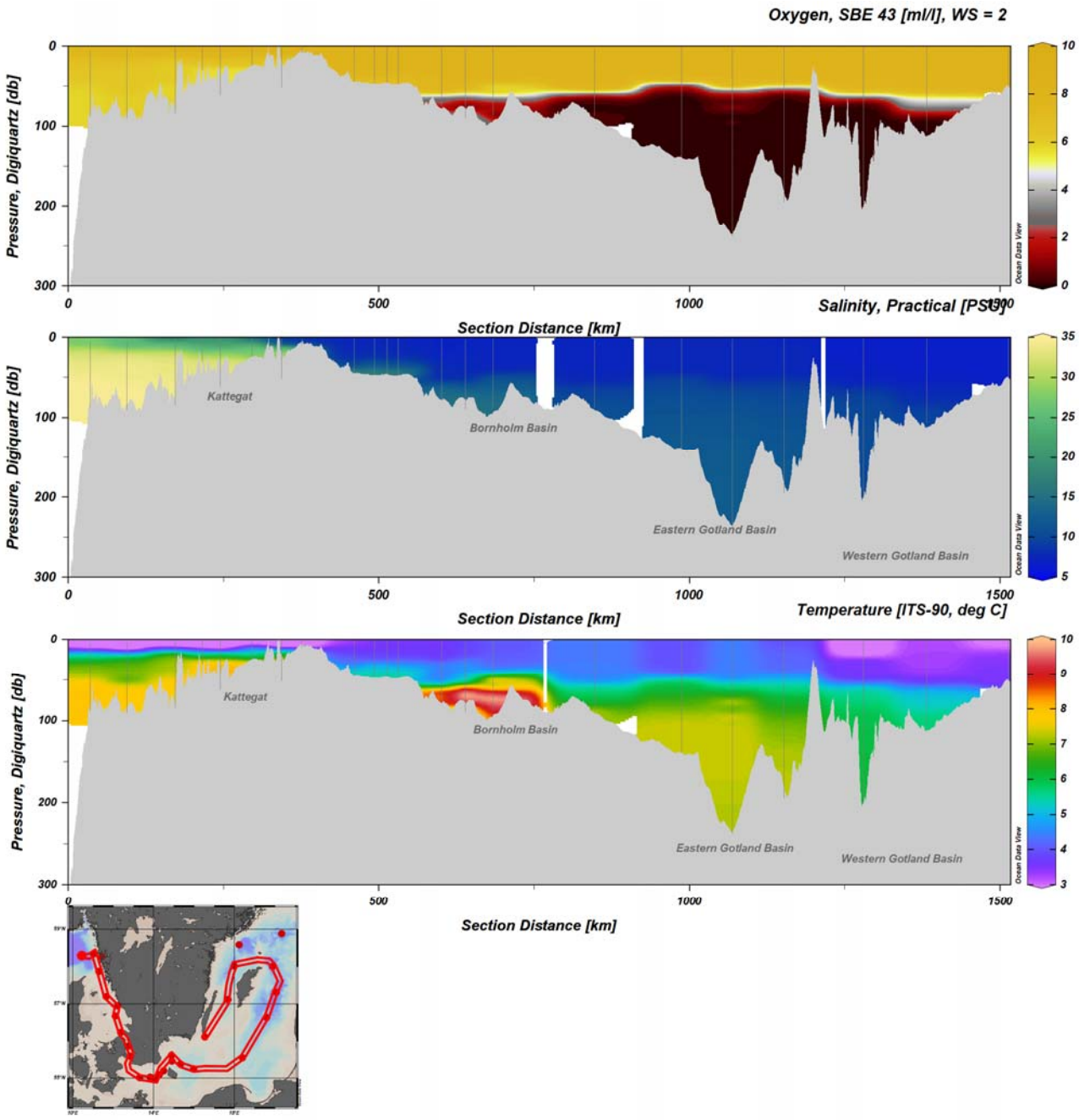

Figure 1. Transect showing oxygen concentration, salinity and temperature measured with CTD. stretching from Skagerrak through Kattegat and the Sound, into the Baltic Proper.

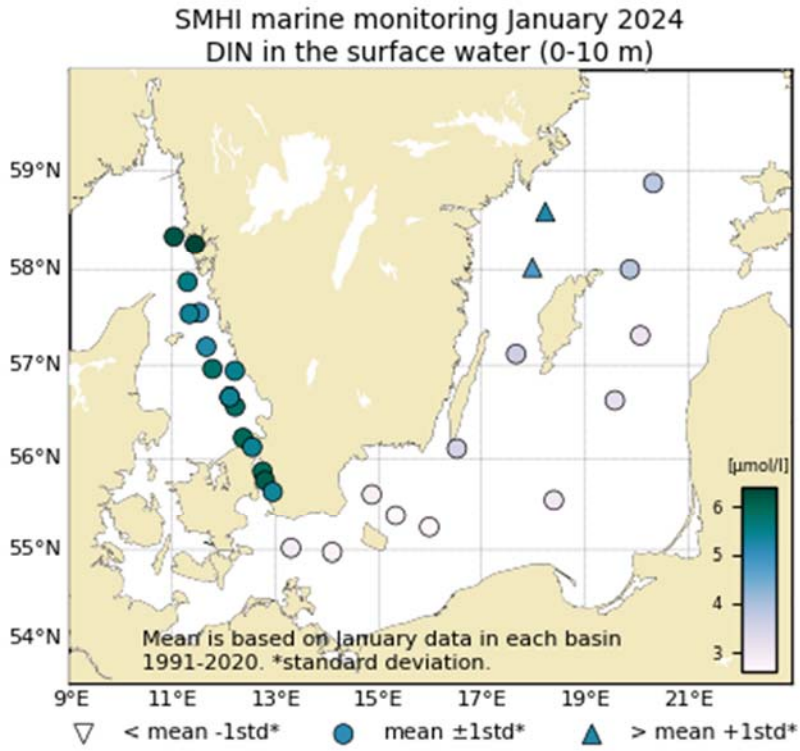

Figure 2. Concentration (µmol/l) of dissolved inorganic nitrogen (DIN) in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

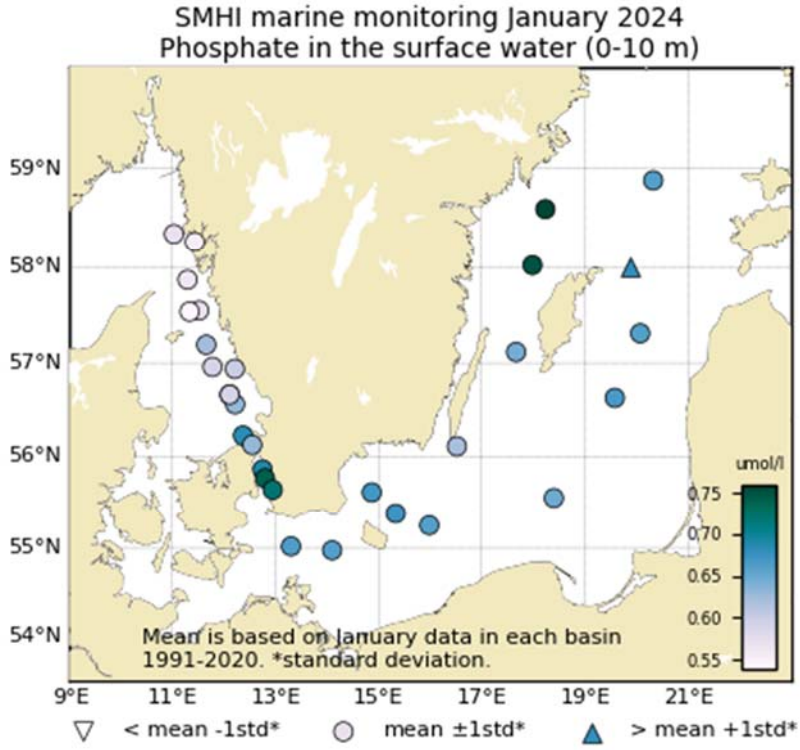

Figure 3. Concentration (µmol/l) of phosphate in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

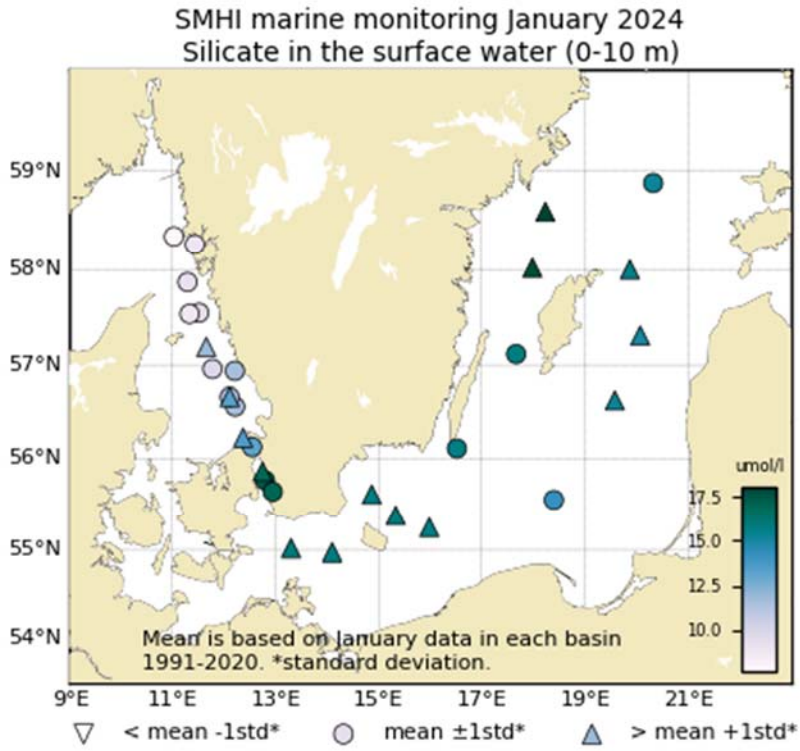

Figure 4. Concentration (µmol/l) of silicate in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

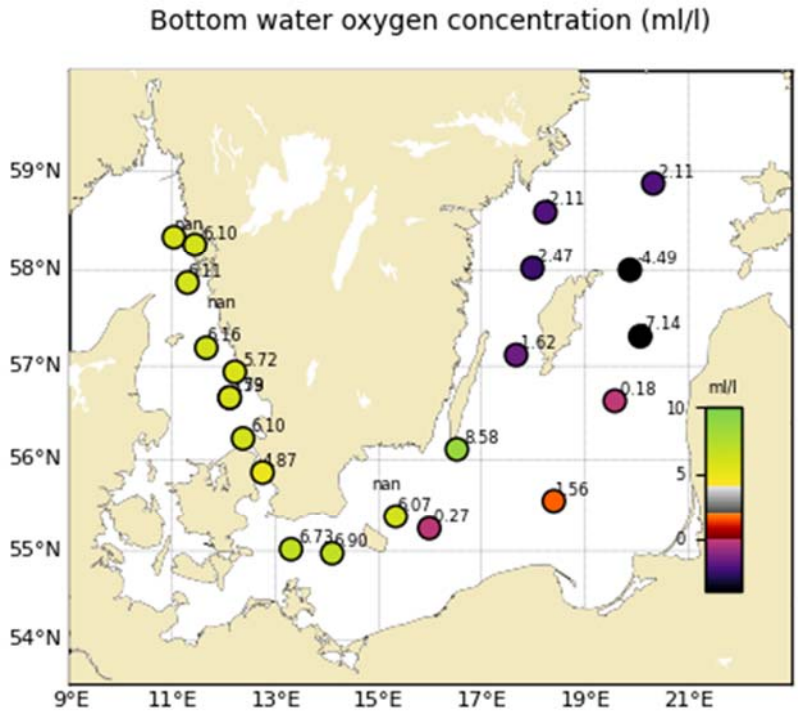

Figure 5. Dissolved oxygen concentration in ml/l in the bottom water, approximately 1 metre above the seabed. Note that the values have not been compared to statistics in the same way as in figures 2–6, that's why only circles are shown.

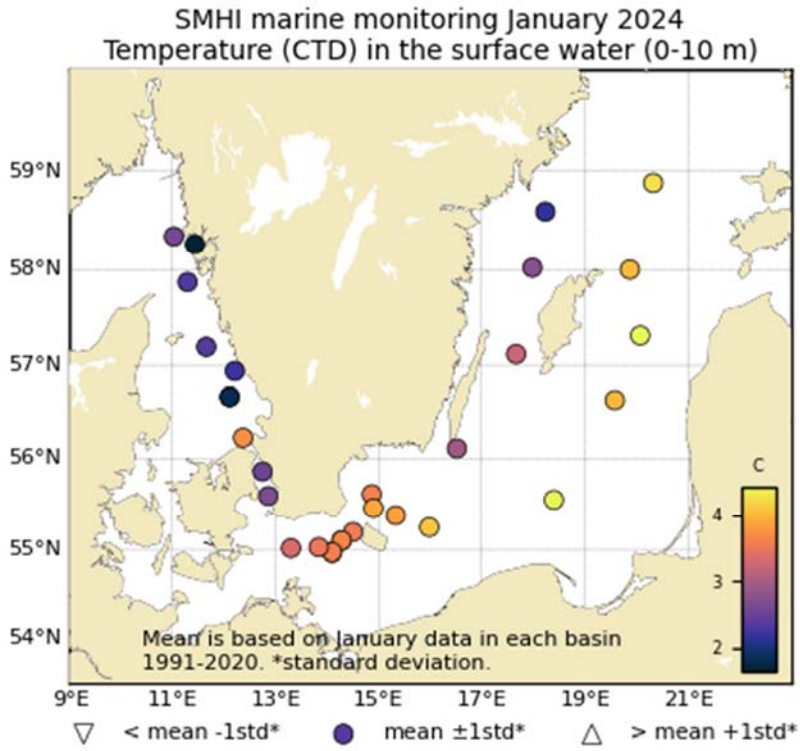

Figure 6. Temperature in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

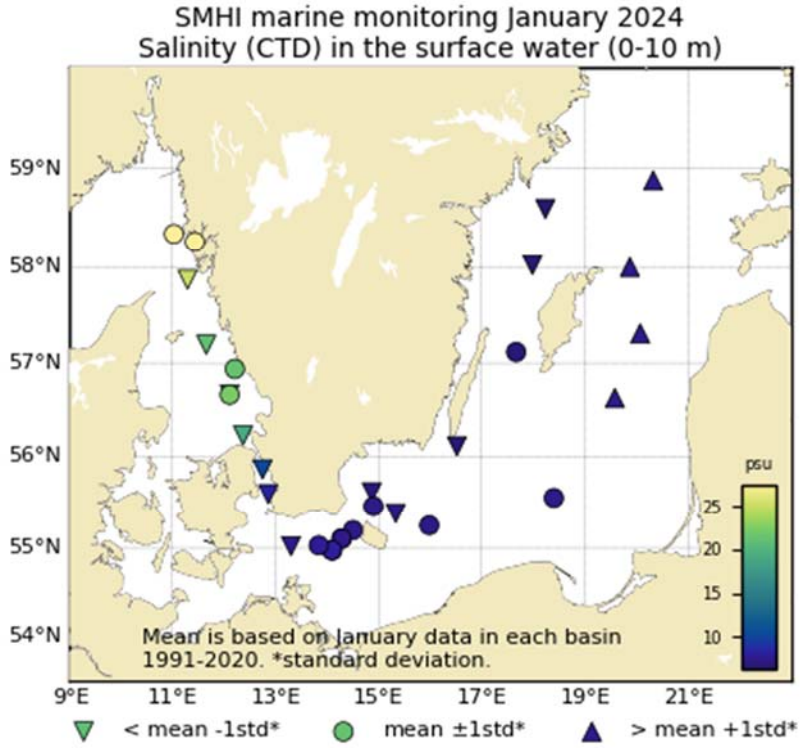

Figure 7. Salinity in the surface water (0-10m). Mean is based on data from the month within each basin during the years 1991 – 2020.

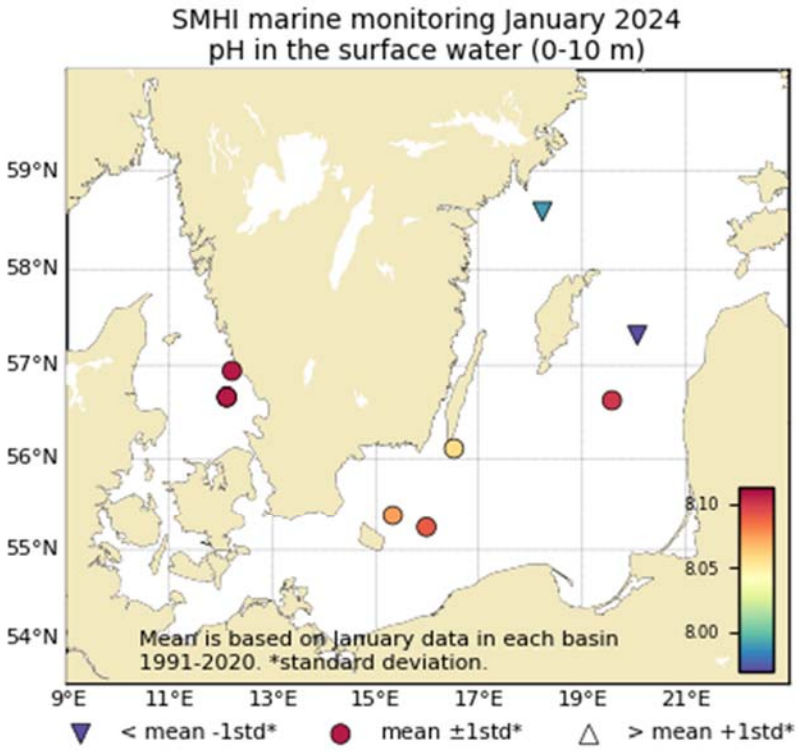

Figure 8. pH in the surface water (0-10m).

PARTICIPANTS

Name	Role	From
Madeleine Nilsson	Cruise leader, Marine chemist	SMHI
Lena Viktorsson	Oceanographer	SMHI
Johanna Linders	Oceanographer	SMHI
Johan Håkansson	Marine chemist	SMHI
Helena Björnberg	Oceanographer	SMHI

APPENDICES

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

SMHI

SWEDAC ACKREDITERING
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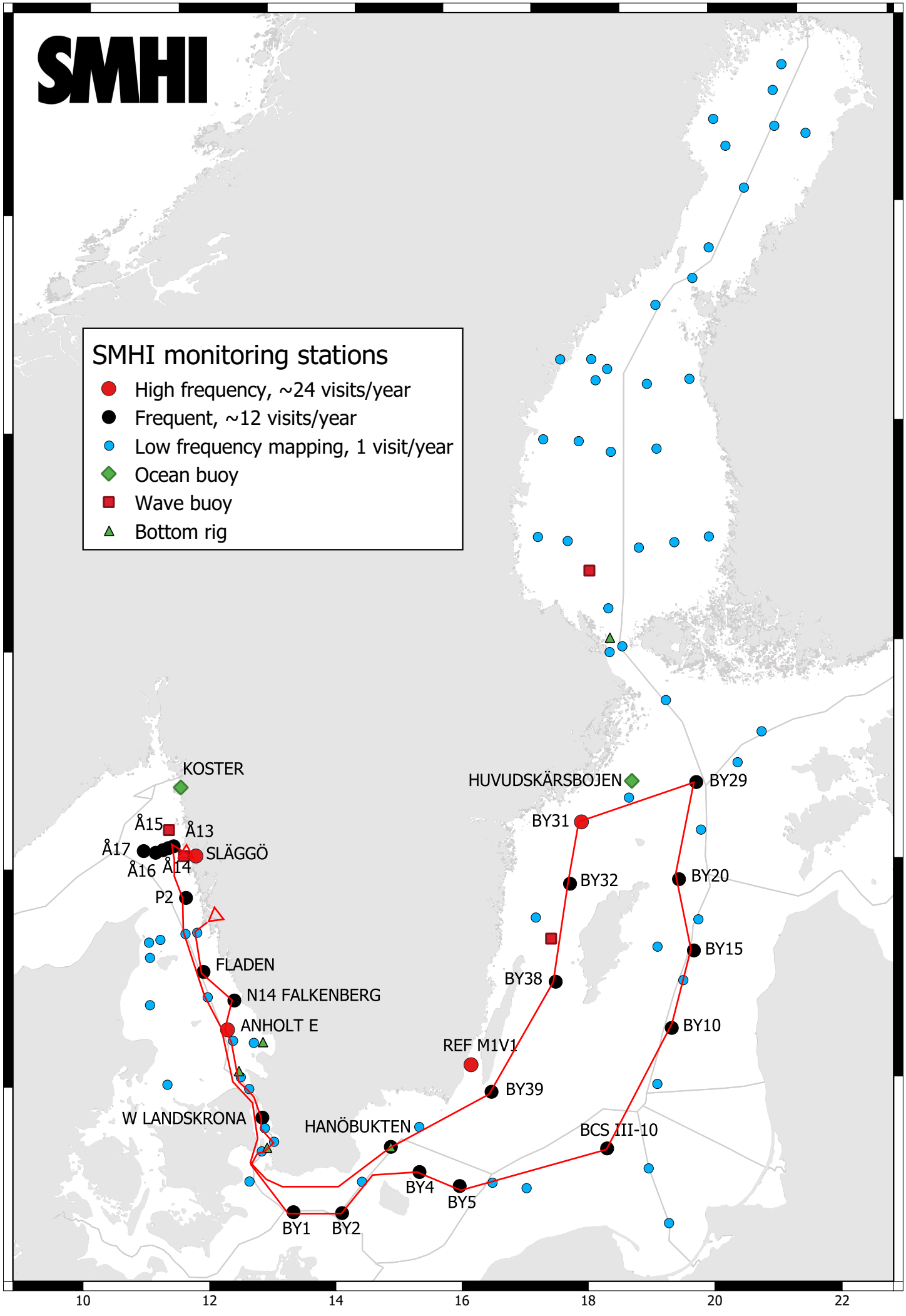
ISO/IEC 17025

Havs och Vatten myndigheten


SMHI
SMHI monitoring stations
High frequency, ~24 visits/year
Frequent, ~12 visits/year
Low frequency mapping, 1 visit/year
Ocean buoy
Wave buoy
Bottom rig
KOSTER
Å15
Å13
Å17
SLÄGGÖ
Å16
Å14
P2
FLADEN
N14 FALKENBERG
ANHOLT E
W LANDSKRONA
HANÖBUKTEN
REF M1V1
BY39
BY38
BY4
BY5
BY1
BY2
HUVUDSKÄRSBOJEN
BY31
BY29
BY32
BY20
BY15
BY10
BCS III-10
64
62
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58
56
10
12
14
16
18
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22

Date: 2024-05-20
Time: 11:32

Ship: 77SE
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 (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
0005	02	KANX25	BAS...	FLADEN	5711.56	01139.44	20240111	0720	84		29	7	-0.4	1031	1320	x---	13	13	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0006	02	KANX50	BAS...	N14 FALKENBERG	5656.39	01212.67	20240111	1040	30	8	34	9	1.7	1031	0010	xxx-	7	7	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0007	02	KAEX29	BAS...	ANHOLT E	5640.1	01206.63	20240111	1330	62		33	9	2.4	1031	1230	xxx-	10	10	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	-
0008	02	KAEX33	BAS...	KULLEN	5613.99	01222.19	20240111	1659	23		34	6.4	2	1032	9990	x---	6	6	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0009	02	SOCX39	BAS...	W LANDSKRONA	5551.99	01244.90	20240111	1953	50		31	3	1.2	1032	9990	x---	9	9	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0010	02	SOCX00	EXT...	FLINTEN/7	5535.82	01251.59	20240111	2254	8			2.2	1.5	1028	9990	----	3		-	x	-	x	-	-	x	-	-	x	-	-	-	-	x	-	-	-	-	-
0011	02	BPSA02	BAS...	BY1	5500.95	01318.06	20240112	0410	47		27	6	2.5	1030	9990	x---	8	8	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	-	-
0012	02	BPSA03	BAS...	BY2 ARKONA	5458.27	01405.93	20240112	0717	47		30	9.25	2.6	1027	1630	xxx-	8	8	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	x	-	-
0013	02	BPSA00	EXT...	INFLOW-1	5506.10	01417.01	20240112	0935	48		28	9.3	2.9	1026	1630	----	6		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0014	02	BPSA00	EXT...	INFLOW2	5511.73	01430.23	20240112	1050	46		28	9	2.9	1025	1230	----	6		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0015	02	BPSB06	BAS...	BY4 CHRISTIANSÖ	5522.96	01519.94	20240112	1422	94	10	27	10.07	3.1	1022	0030	x--x	12	12	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0016	02	BPSB07	BAS...	BY5 BORNHOLMSDJ	5515.00	01559.04	20240112	1737	91		27	13	1.9	1020	9990	xxx-	12	12	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-
0018	02	BPSE11	BAS...	BCS III-10	5533.32	01824.01	20240113	0346	90		12	4.7	1	1015	9990	x---	12	12	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	-	-
0019	02	BPEX13	BAS...	BY10	5638.02	01935.02	20240113	1206	147		18	15	1.1	1004	2830	x--x	15	15	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	-
0020	02	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.72	02004.57	20240113	1655	249		24	10	2.1	994	9990	x-x-	24	24	x	x	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-
0021	02	BPEX26	BAS...	BY20 FÅRÖDJ	5759.86	01952.54	20240113	2208	203		29	7	0.6	991	9990	x---	17	17	x	x	-	x	-	x	x	x	x	x	x	x	x	x	x	-	x	-	-	-
0022	02	BPNX35	BAS...	BY29 / LL19	5852.91	02019.67	20240114	0420	178		04	5	2.5	989	9990	x---	16	16	x	x	-	x	-	x	x	x	x	x	x	x	x	x	x	-	x	-	-	-
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0024	02	BPWX38	BAS...	BY32 NORRKÖPINGSDJ	5801.00	01759.07	20240114	1950	205		27	3	0	990	9990	x---	17	17	x	x	-	x	-	x	x	x	x	x	x	x	x	x	x	-	x	-	-	-
0025	02	BPWX45	BAS...	BY38 KARLSÖDJ	5707.03	01740.12	20240114	2348	114		21	5.9	1.4	984	9990	x---	14	14	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	x	x	-	-
0026	02	BPSE49	BAS...	BY39 ÖLANDS S UDDE	5606.98	01631.16	20240115	0630	50		31	4	0.9	980	9990	xxx-	8	8	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	-	-	-
0027	02	BPSH05	BAS...	HANÖBUKTEN	5537.02	01452.05	20240115	1410	80		35	16	-2.9	987	2840	x---	11	11	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	x	-
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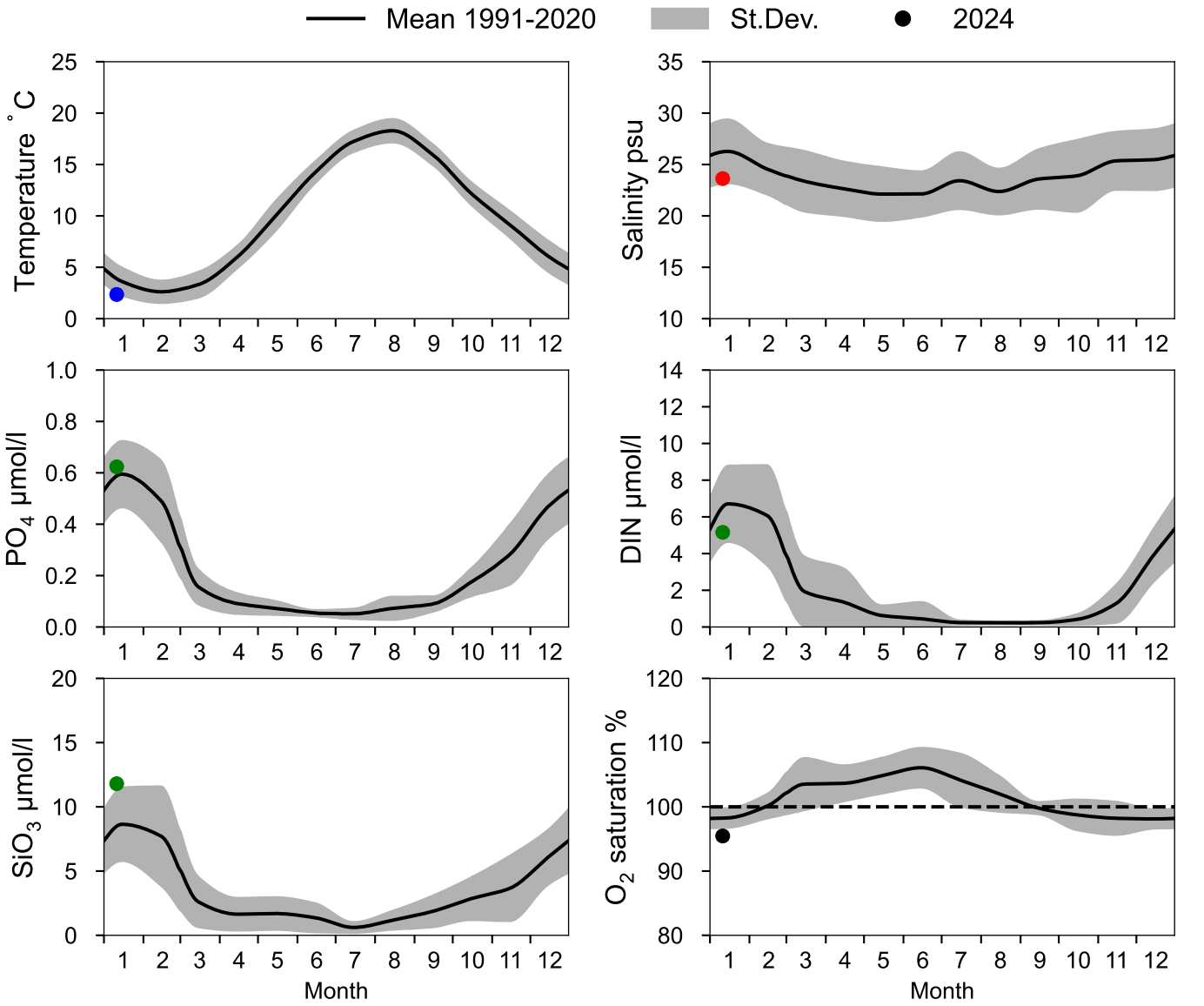
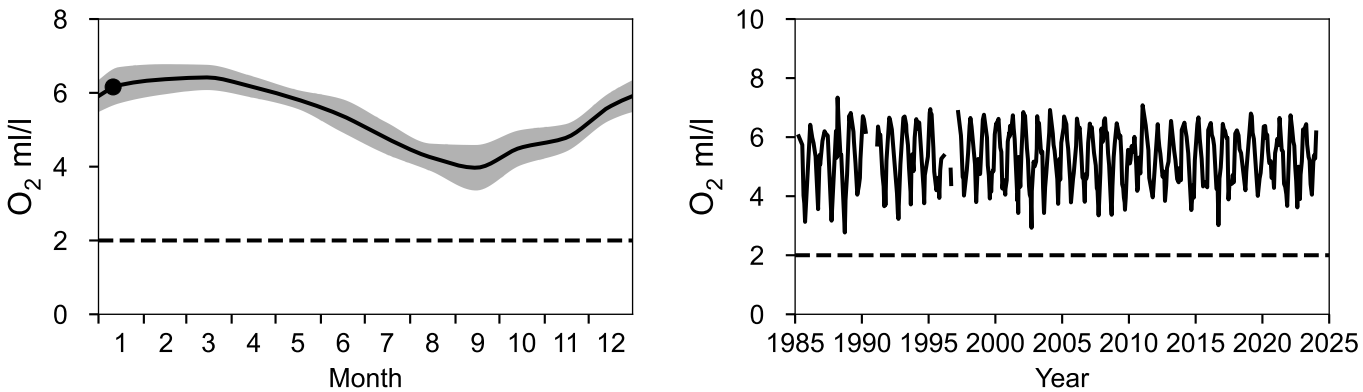
0030	02	BPSA03	EXT...	BY2 ARKONA	5458.27	01405.94	20240115	1939	47		05	12	-3.7	997	9990	----	8		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0031	02	BPSA00	EXT...	INFLOW-0	5501.59	01350.36	20240115	2130	47		02	10	-4.2	999	9990	----	6		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
0032	02	KAEX29	BAS...	ANHOLT E	5640.10	01206.68	20240116	1040	62	7	14	5	-4.7	1002	2720	xxxx	10	10	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	x	x	-	-
0033	02	SKEX23	BAS...	P2	5752.04	01117.62	20240116	1835	93		19	16	0.3	994	9990	x---	10	10	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	x	-
0034	02	SKEX14	BAS...	Å13	5820.4	01101.73	20240116	2205	90		20	12	0	989	9990	x---	10	10	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	x	-
0035	02	FIBG27	BAS...	SLÄGGÖ	5815.59	01126.14	20240117	0044	74		20	13	0.3	991	9990	x-x-	9	9	x	x	x	x	-	x	x	-	x	x	x	x	x	x	x	-	x	-	x	-

STATION FLADEN SURFACE WATER (0-10 m)

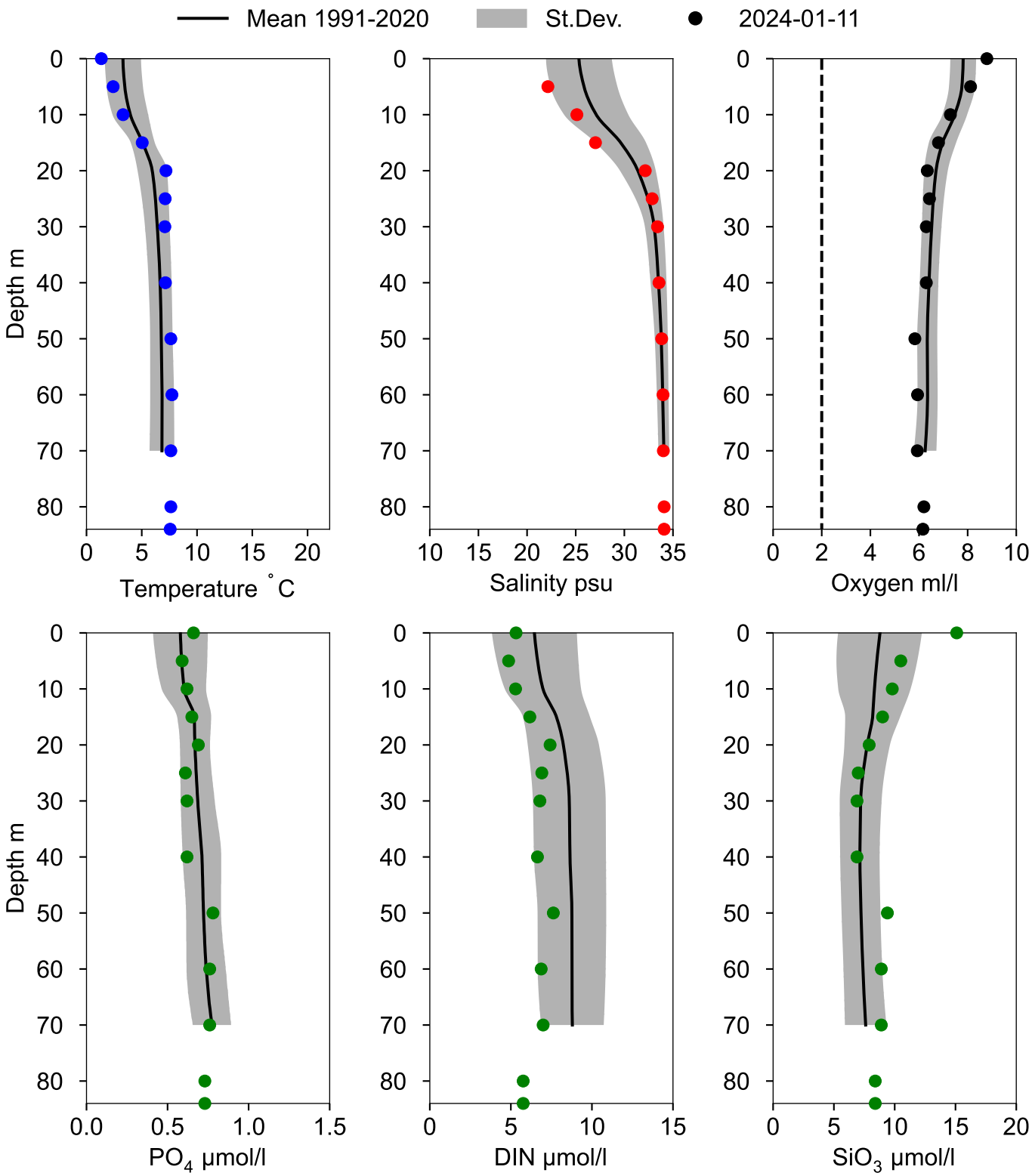
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 74 m)

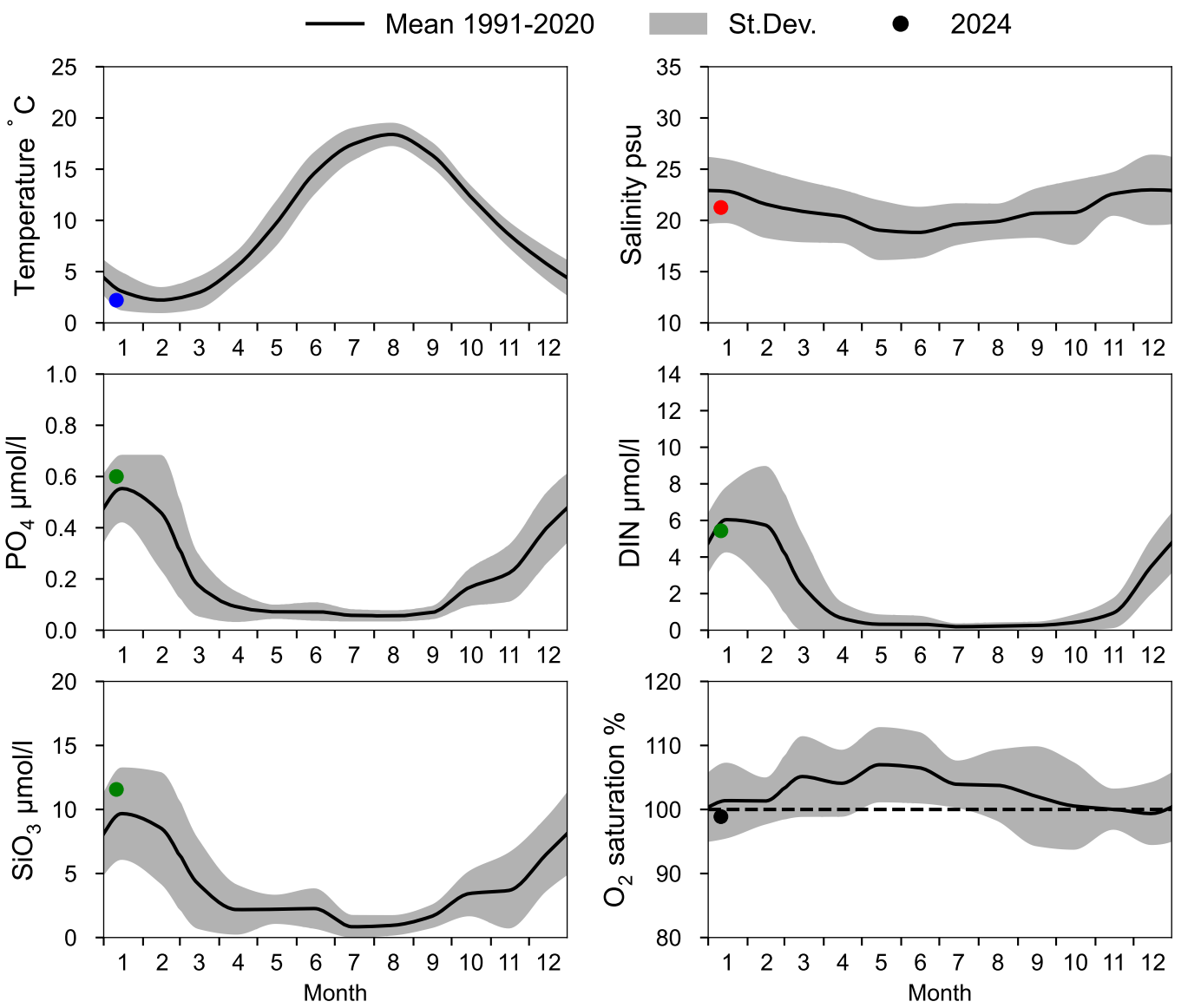


Vertical profiles FLADEN
January

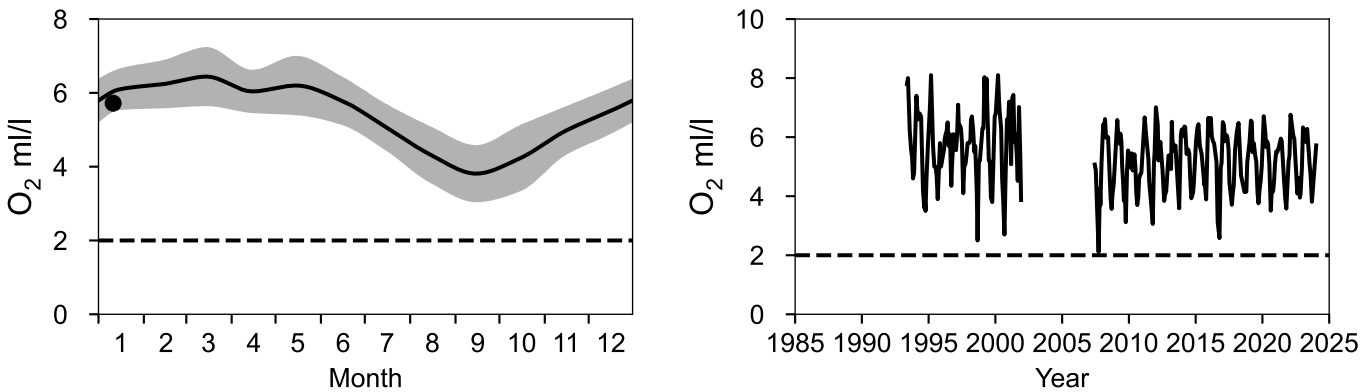


STATION N14 FALKENBERG SURFACE WATER (0-10 m)

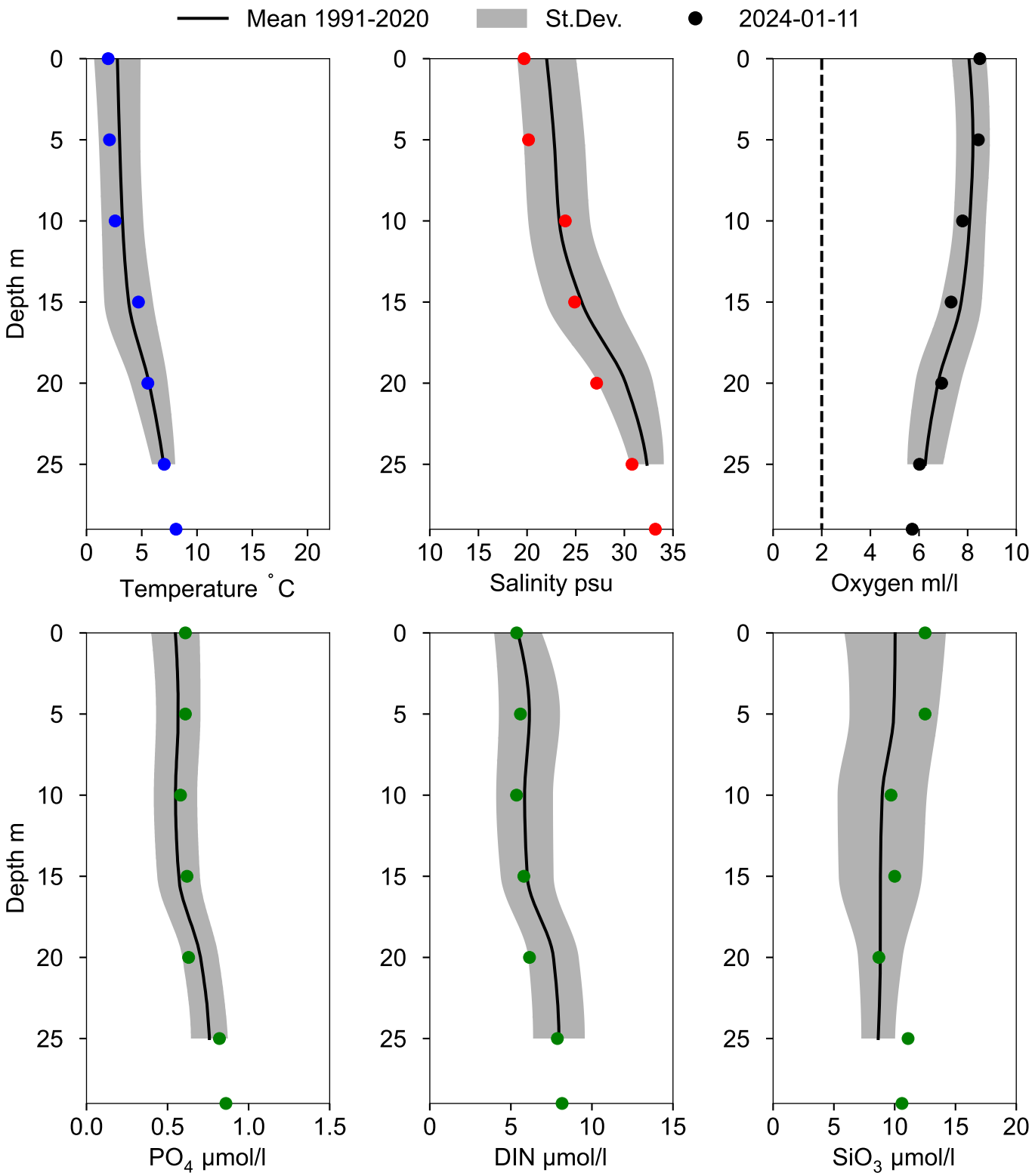
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 25 m)

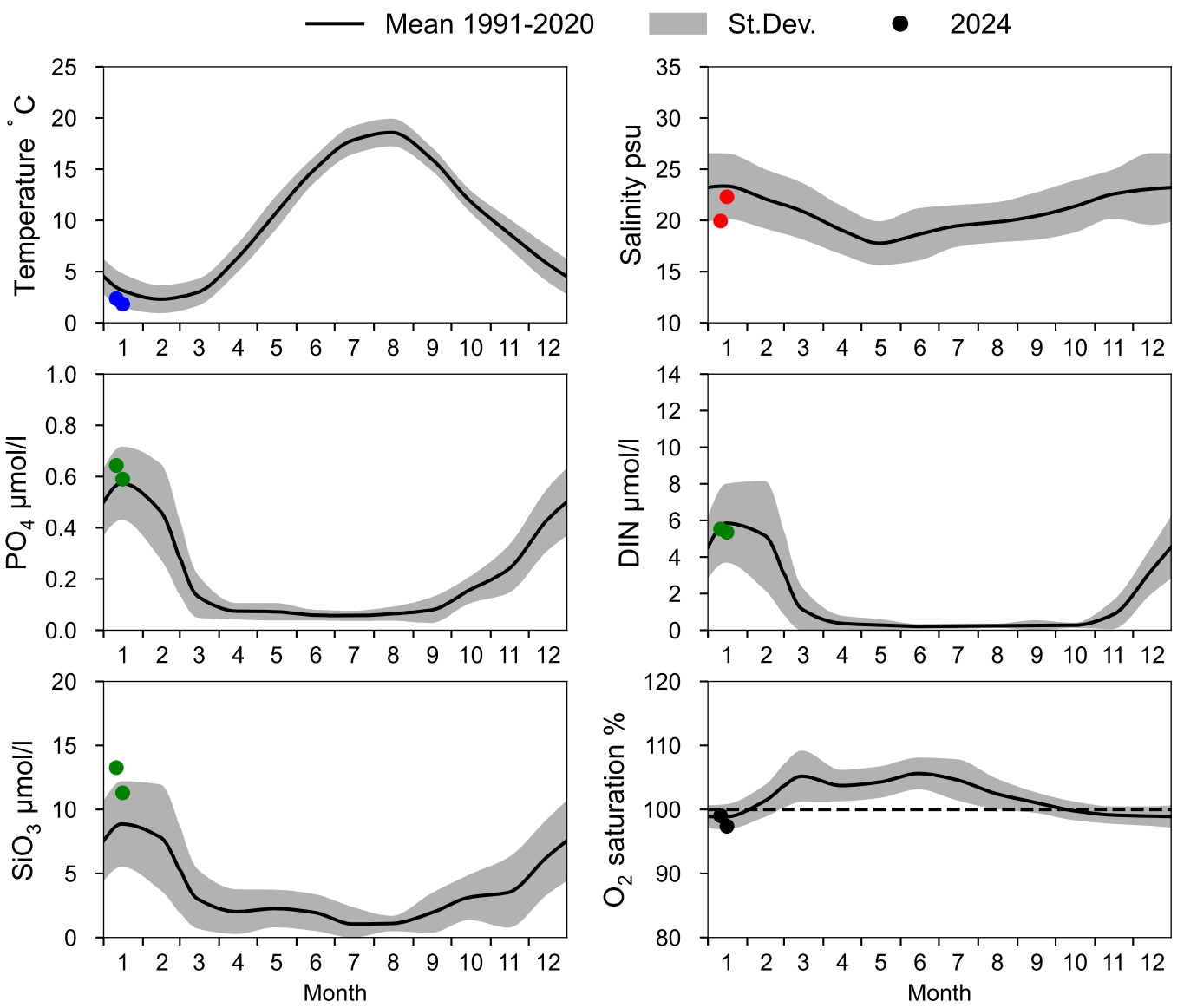


Vertical profiles N14 FALKENBERG
January

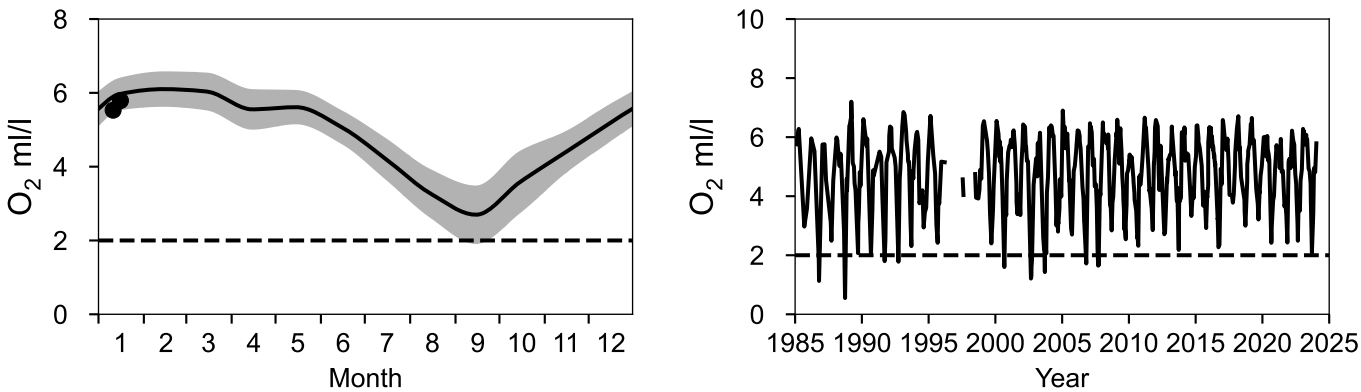


STATION ANHOLT E SURFACE WATER (0-10 m)

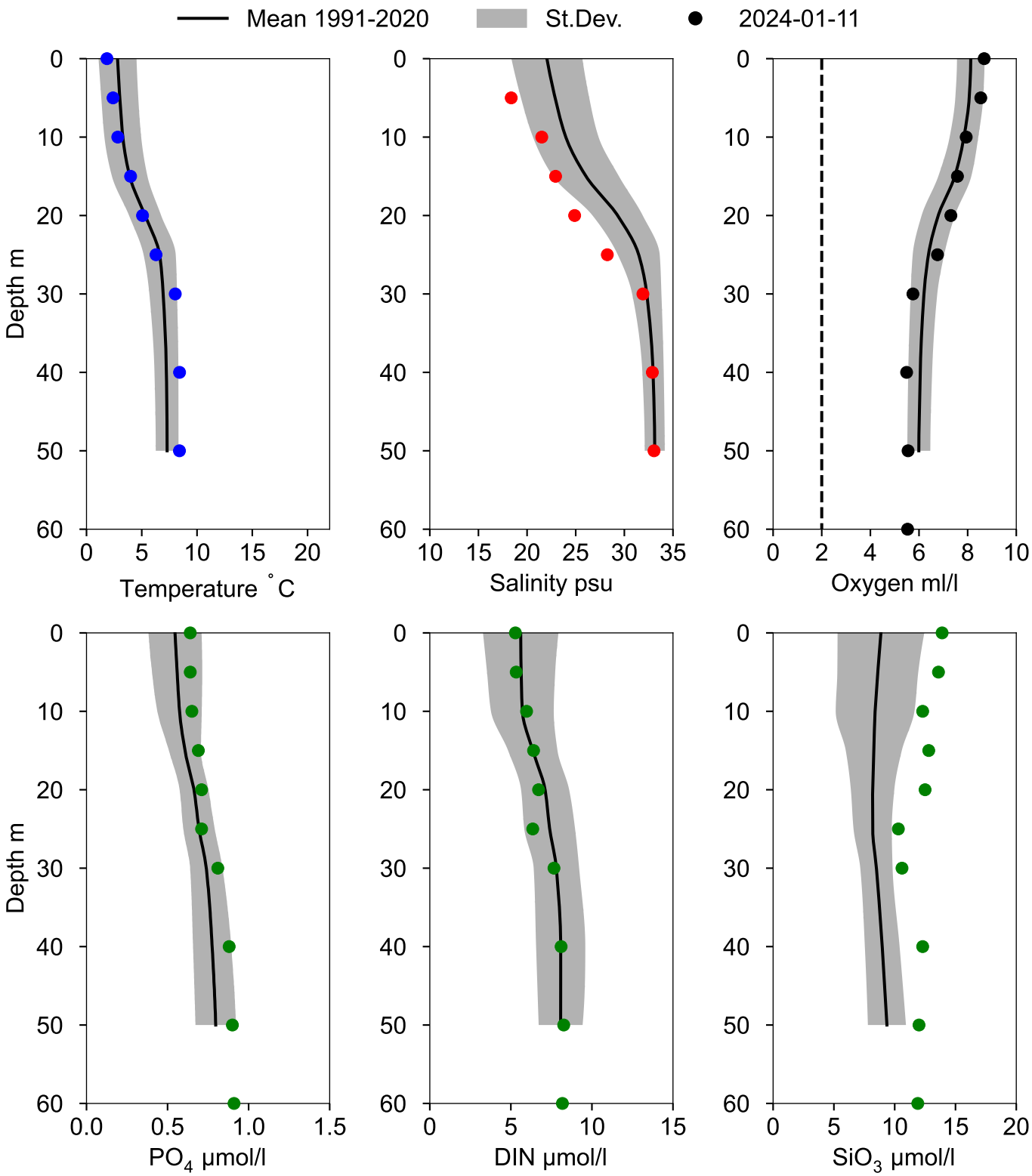
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

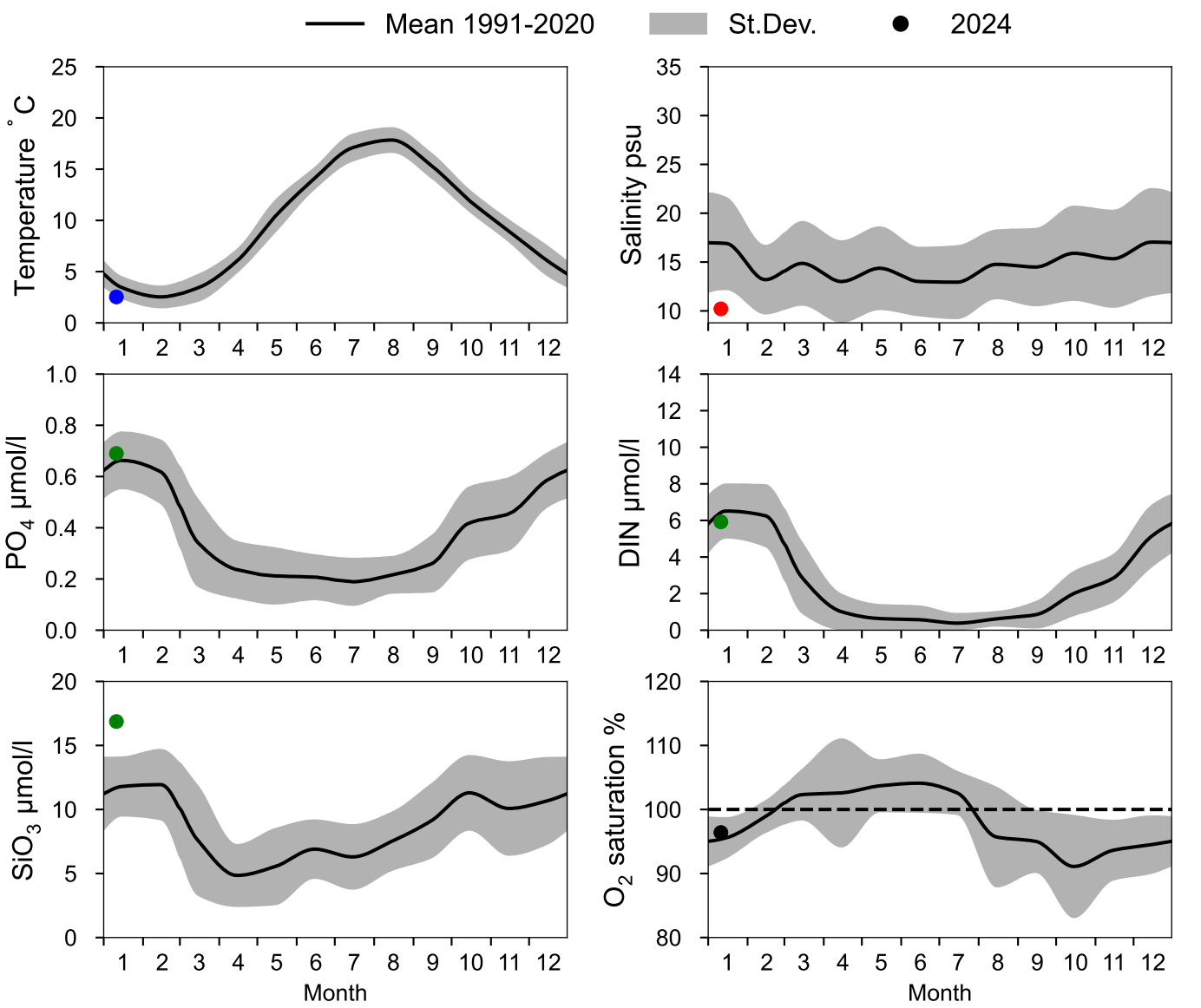


Vertical profiles ANHOLT E
January

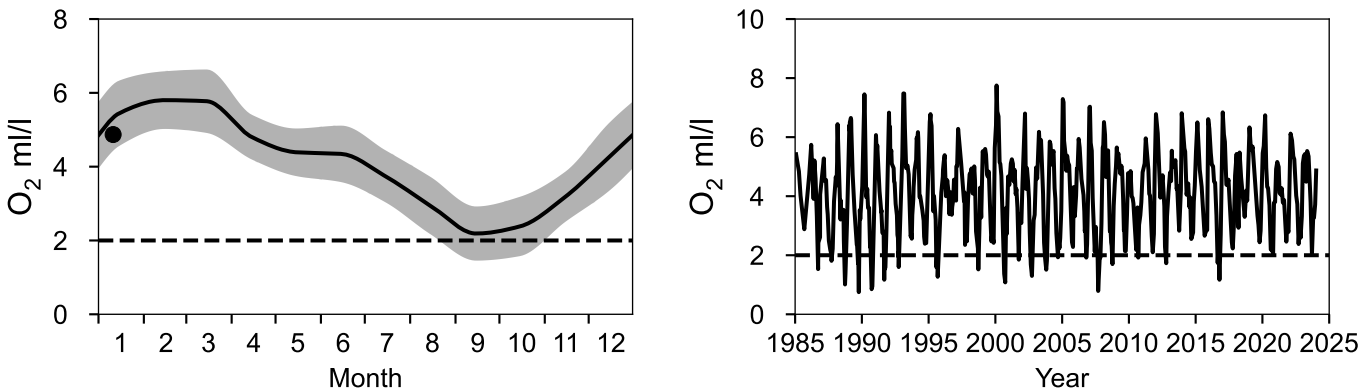


STATION W LANDSKRONA SURFACE WATER (0-10 m)

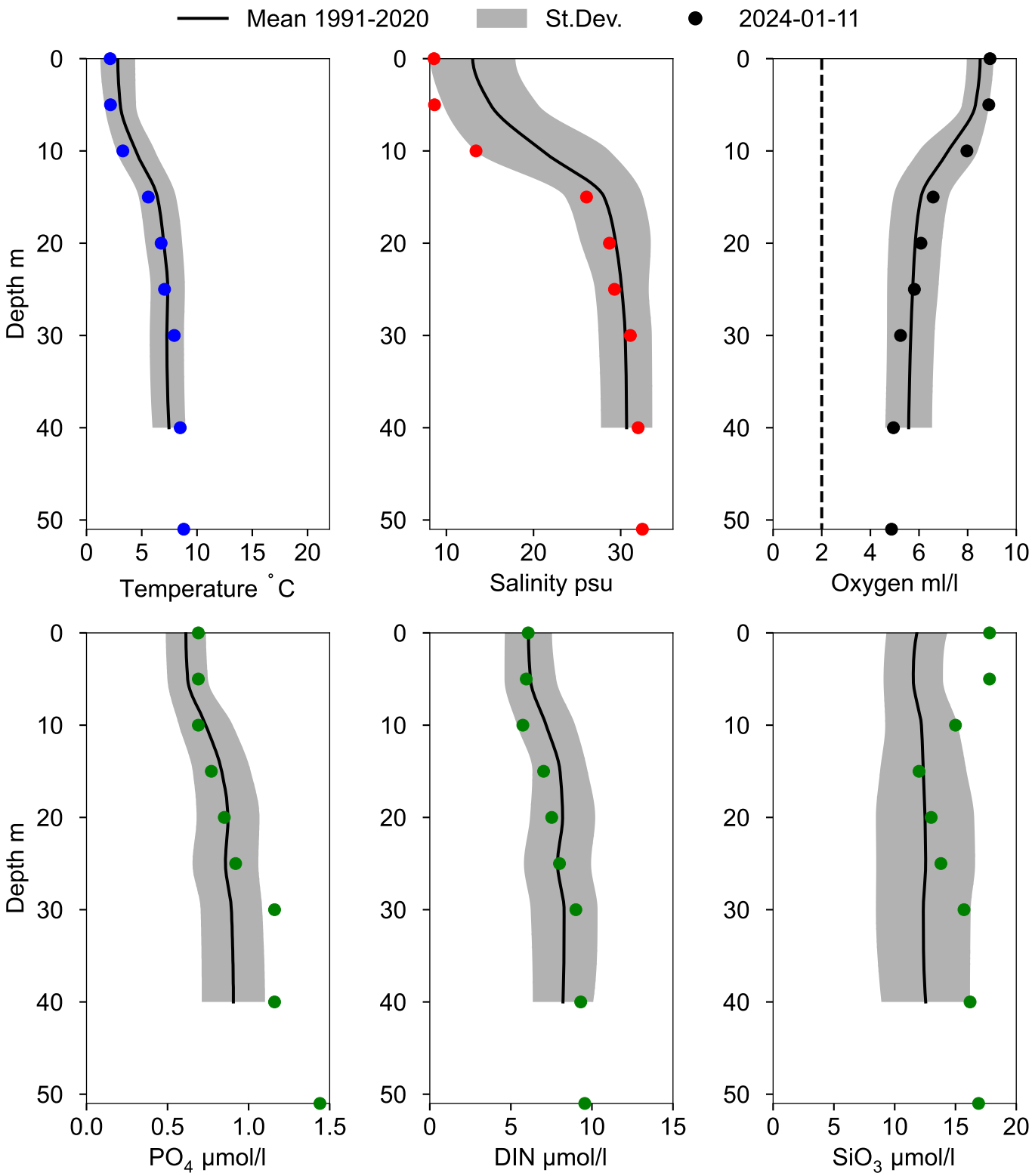
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

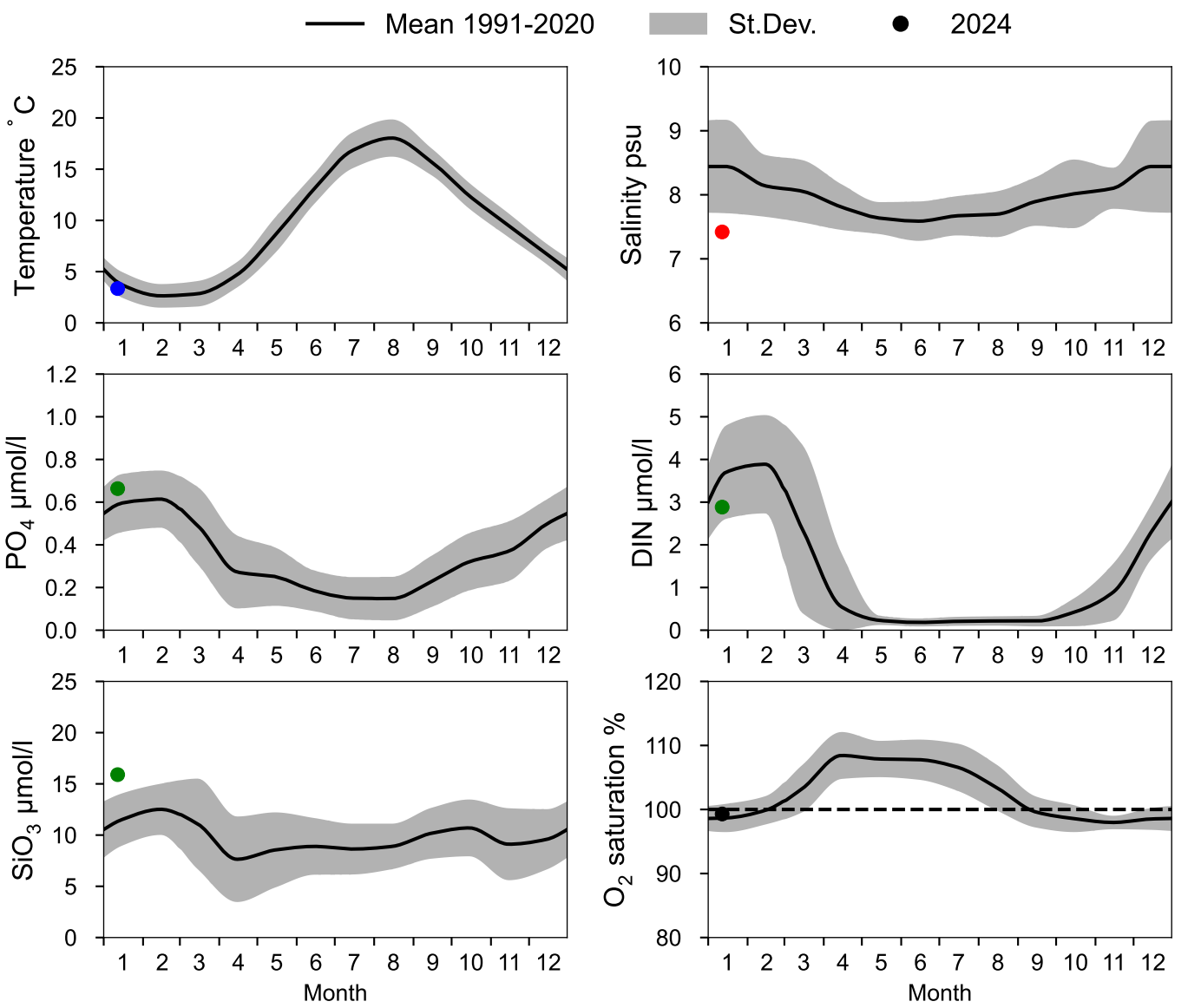


Vertical profiles W LANDSKRONA
January

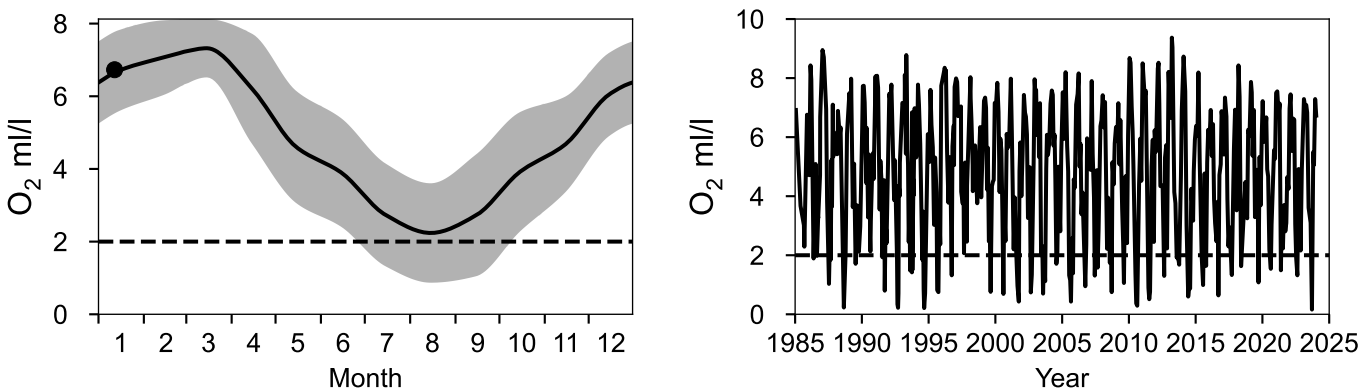


STATION BY1 SURFACE WATER (0-10 m)

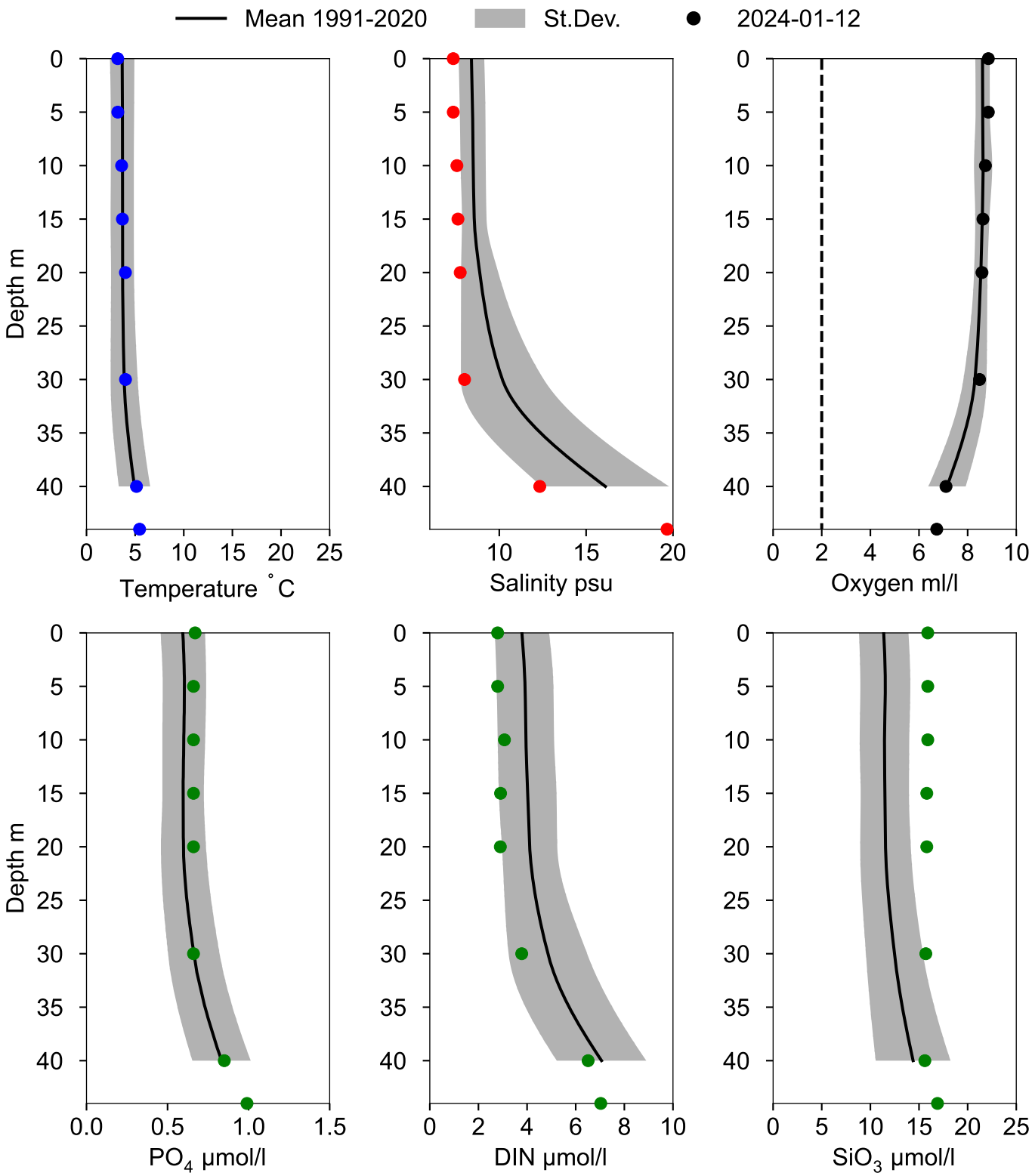
Annual Cycles



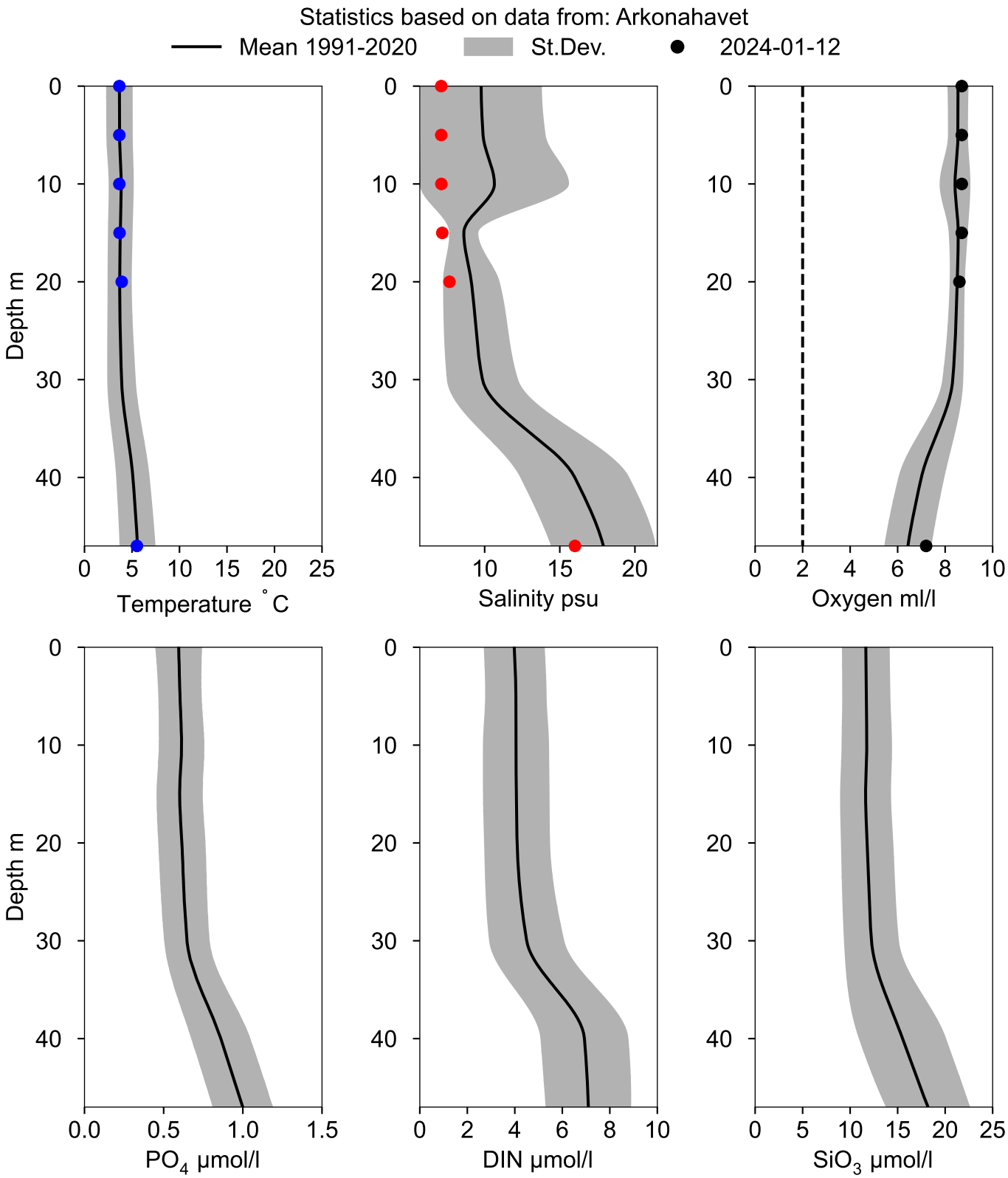
OXYGEN IN BOTTOM WATER (depth >= 39 m)



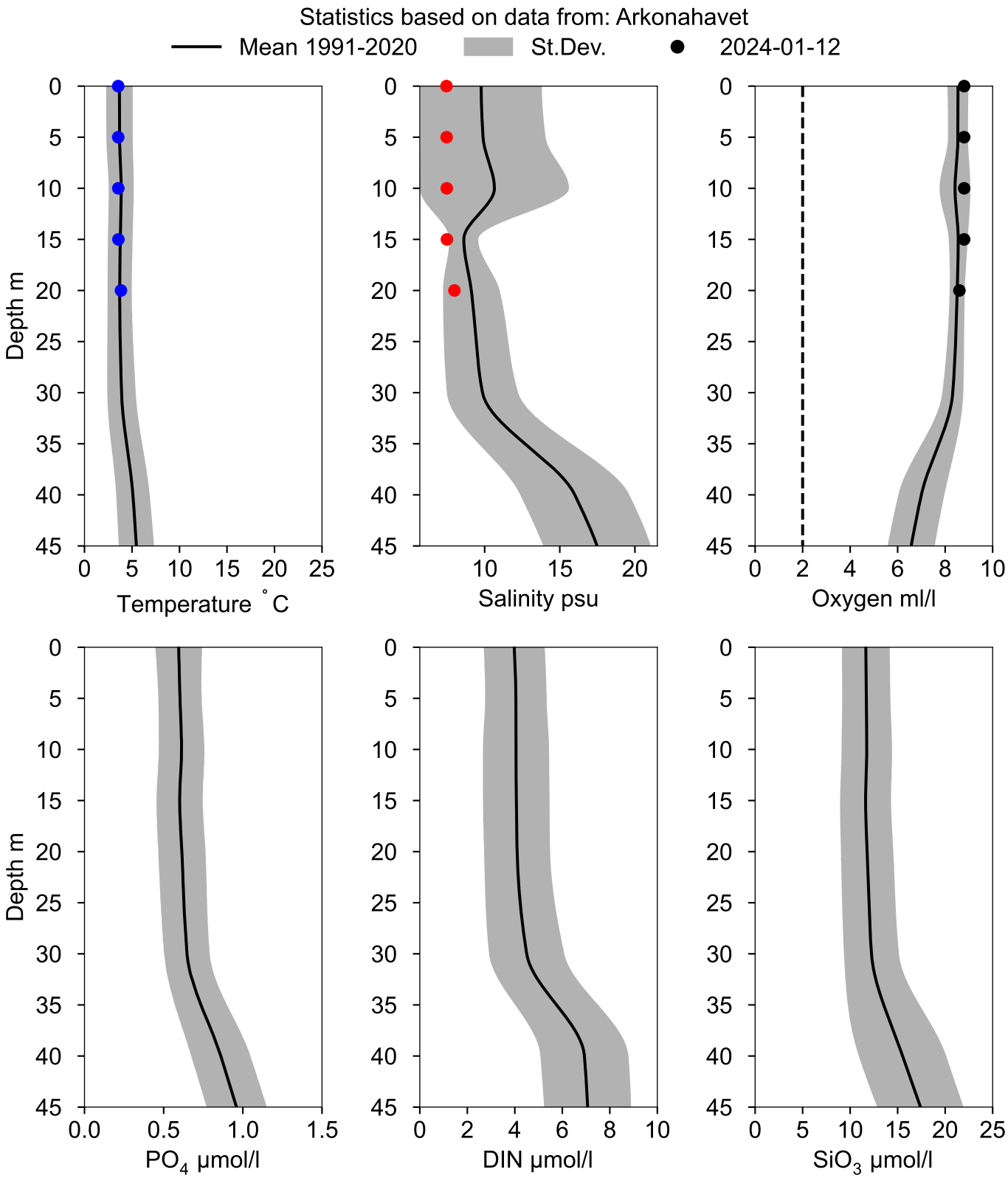
Vertical profiles BY1
January



Vertical profiles INFLOW-1
January

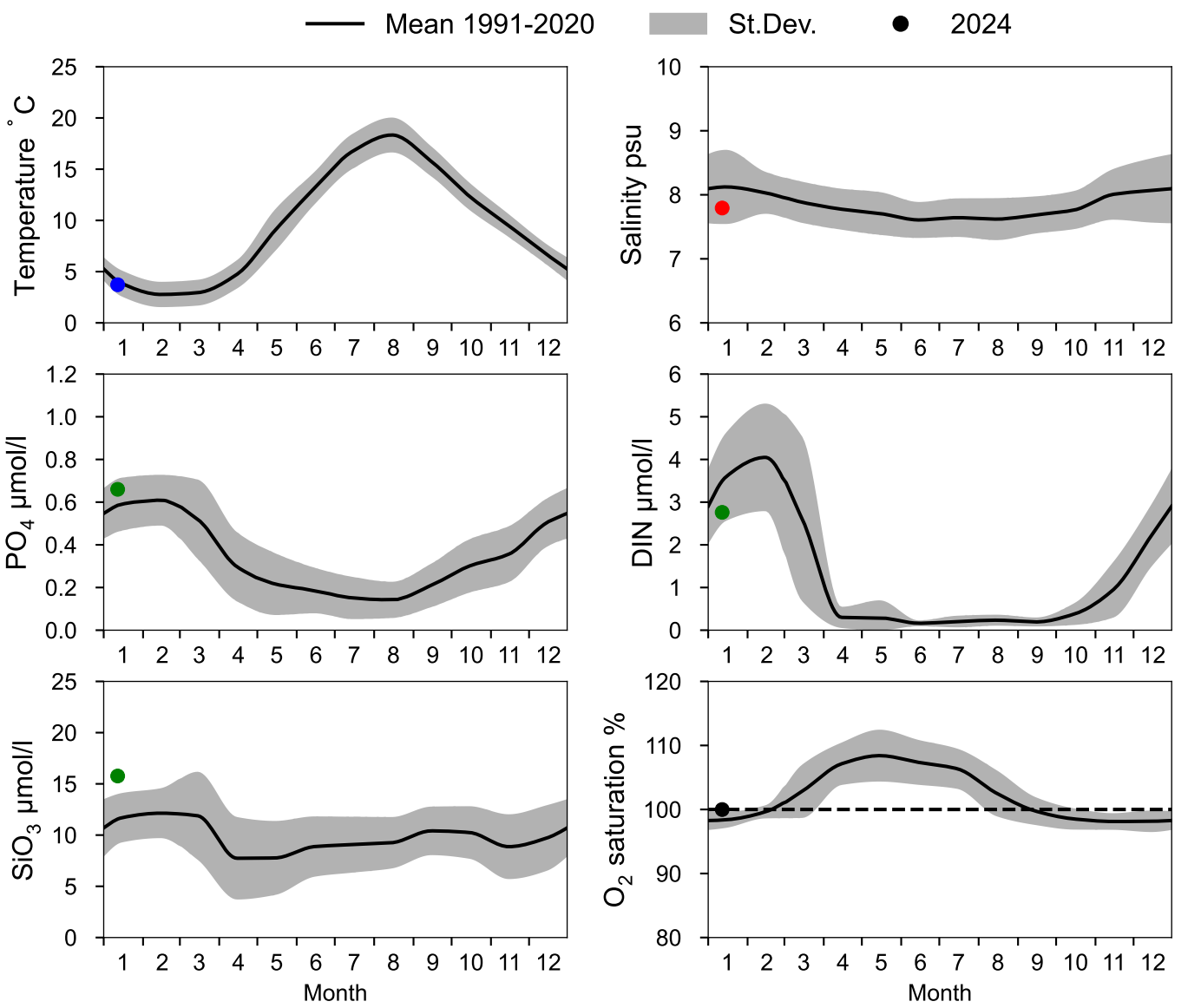


Vertical profiles INFLOW2
January

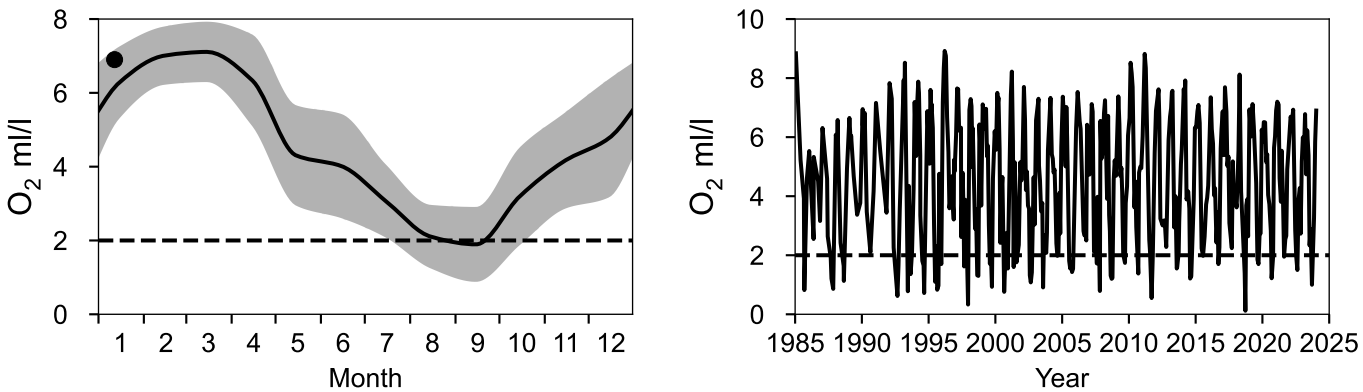


STATION BY2 ARKONA SURFACE WATER (0-10 m)

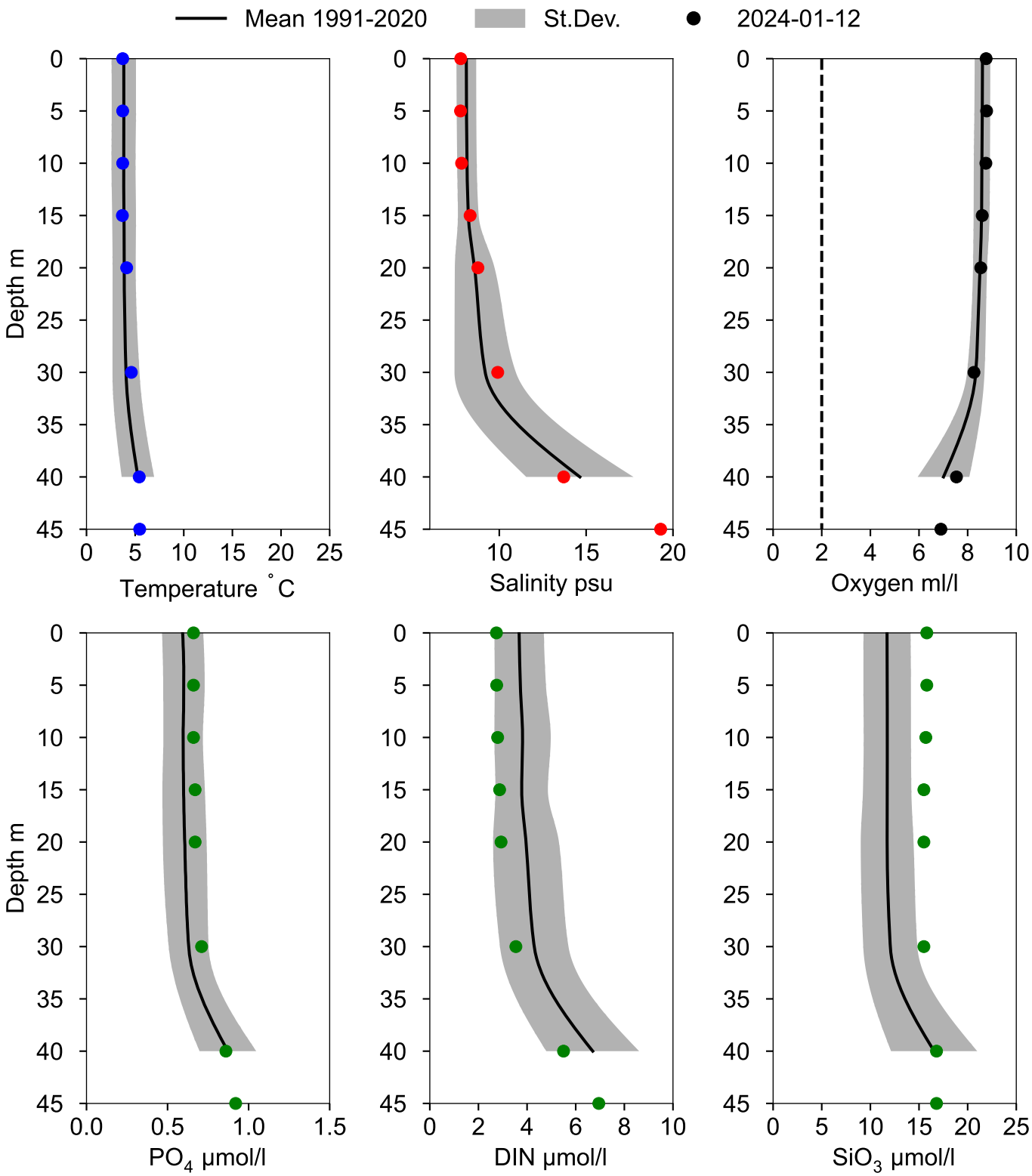
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

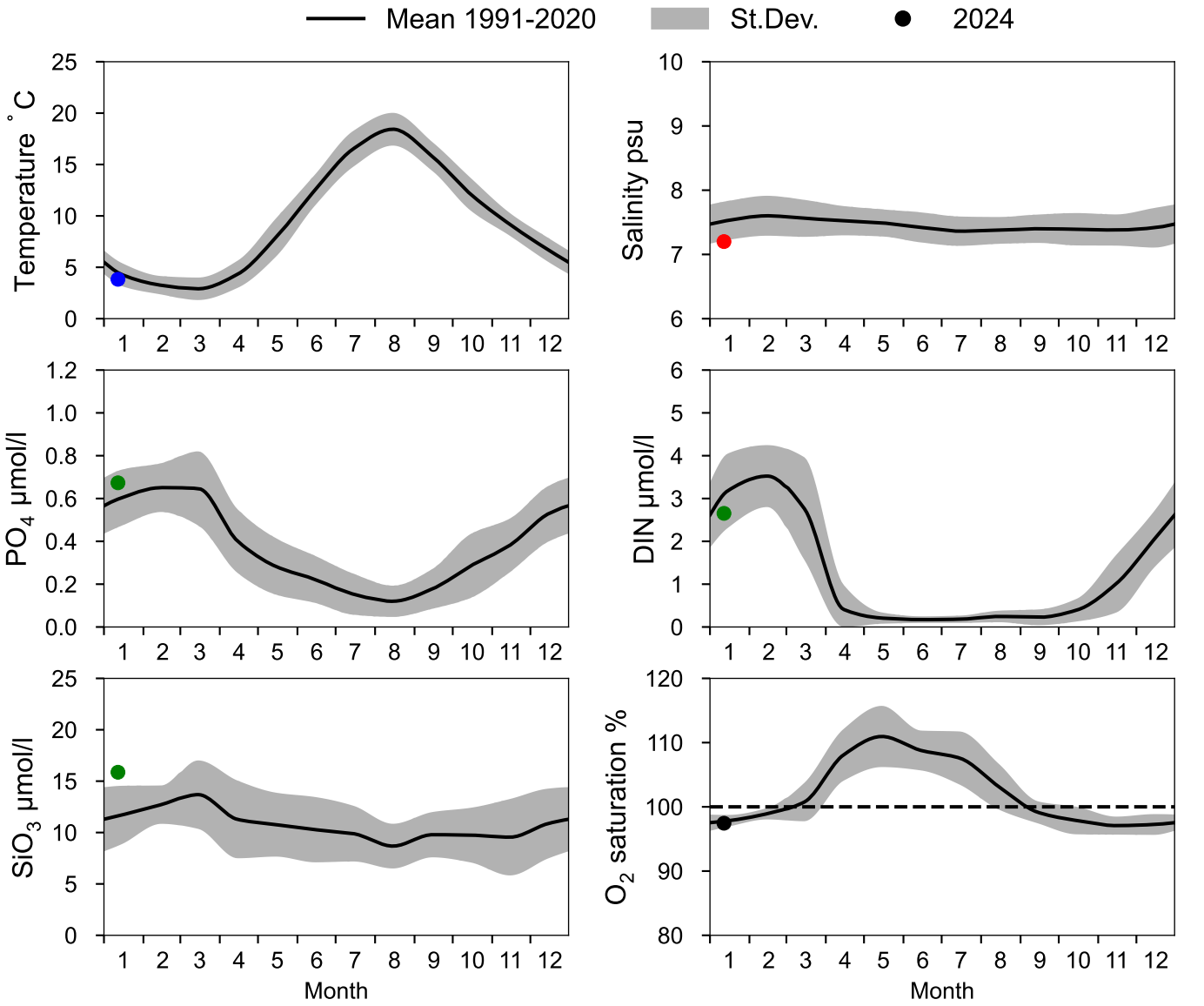


Vertical profiles BY2 ARKONA
January

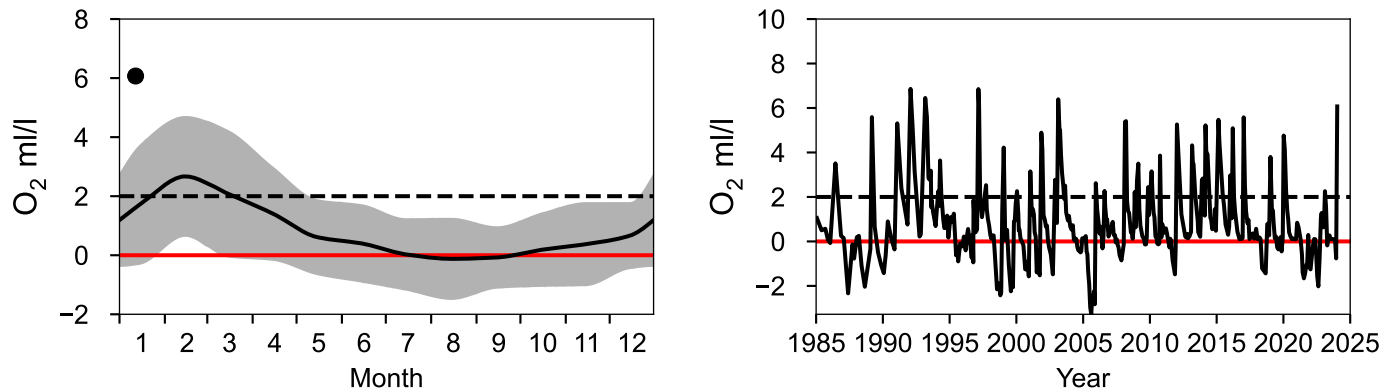


STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

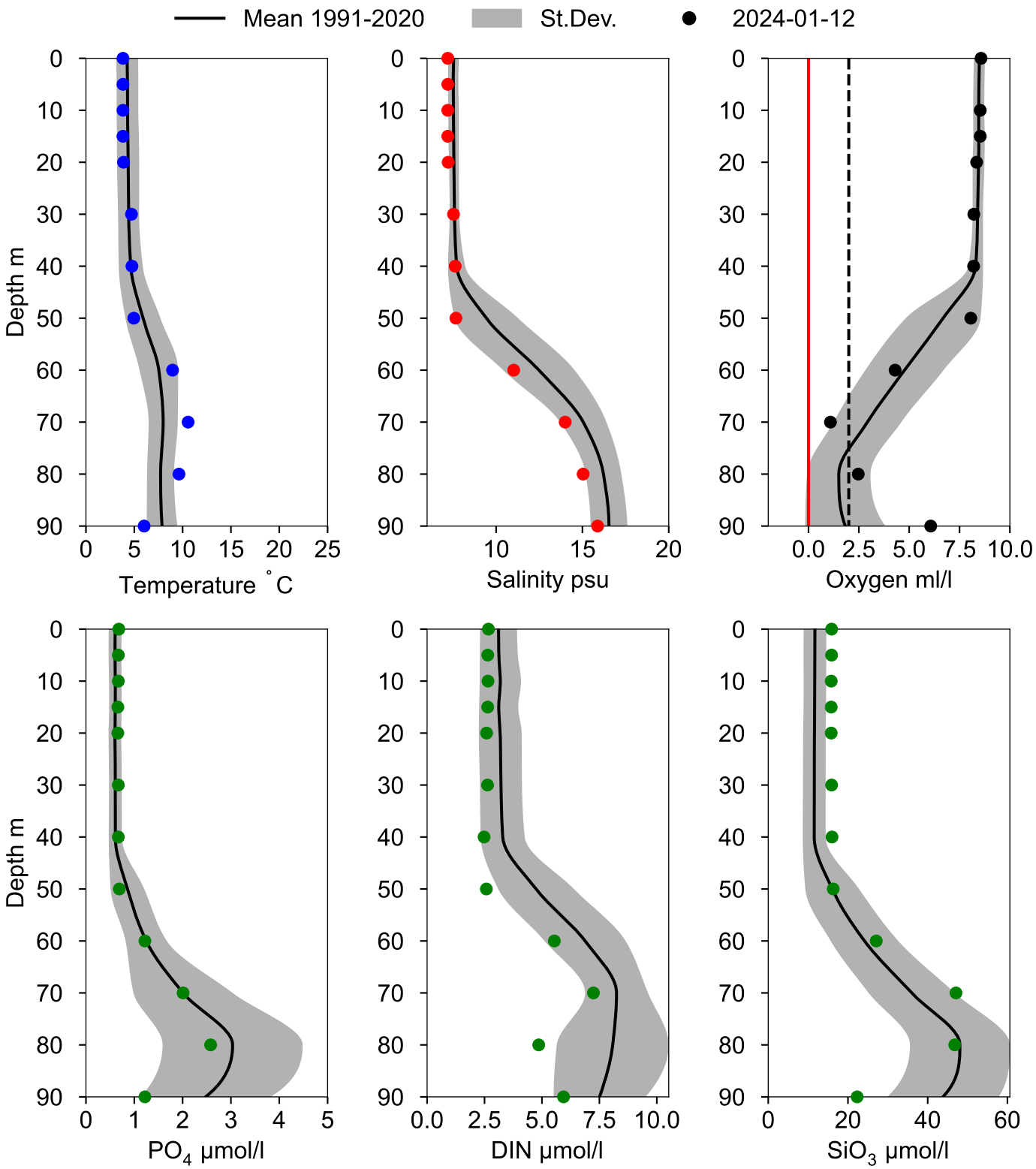
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

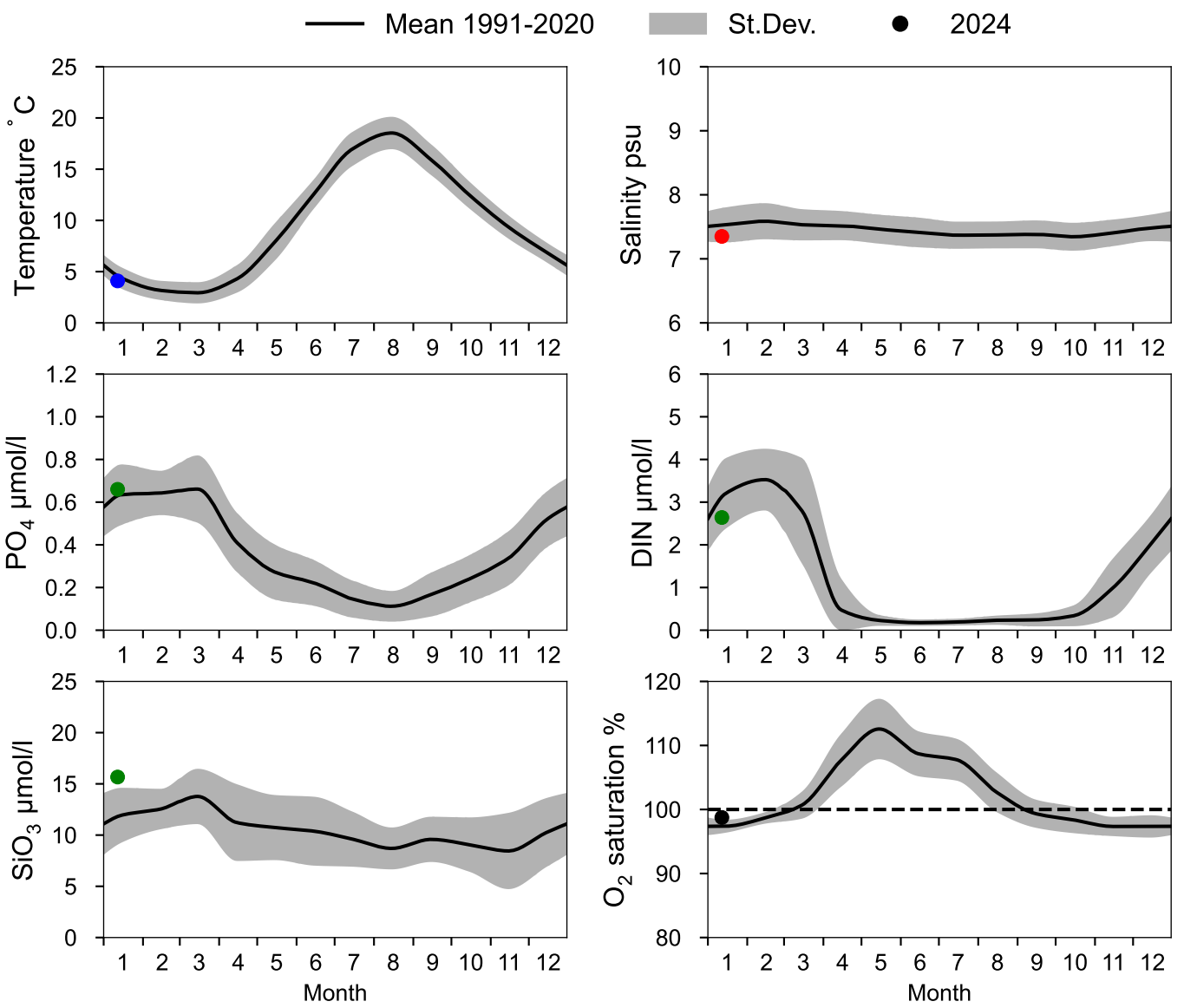


Vertical profiles BY4 CHRISTIANSÖ
January

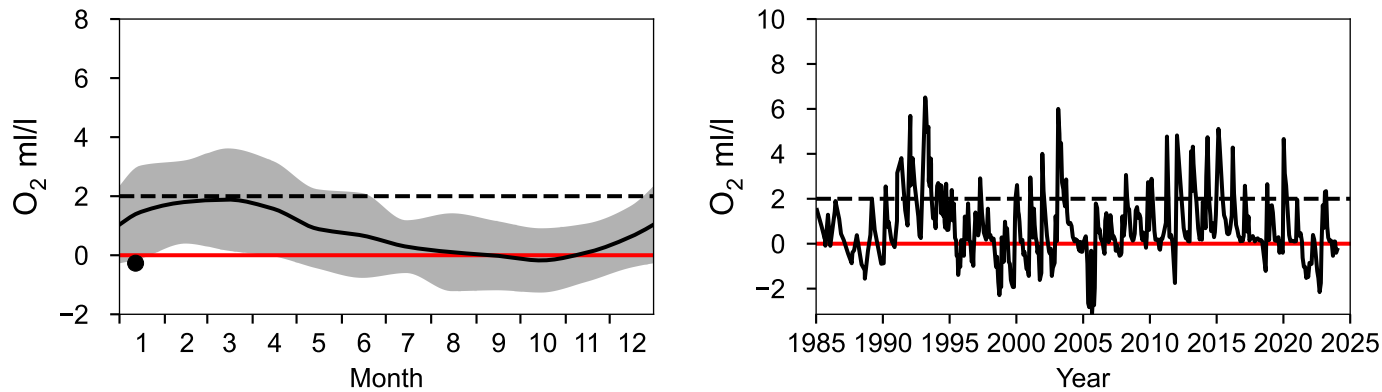


STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

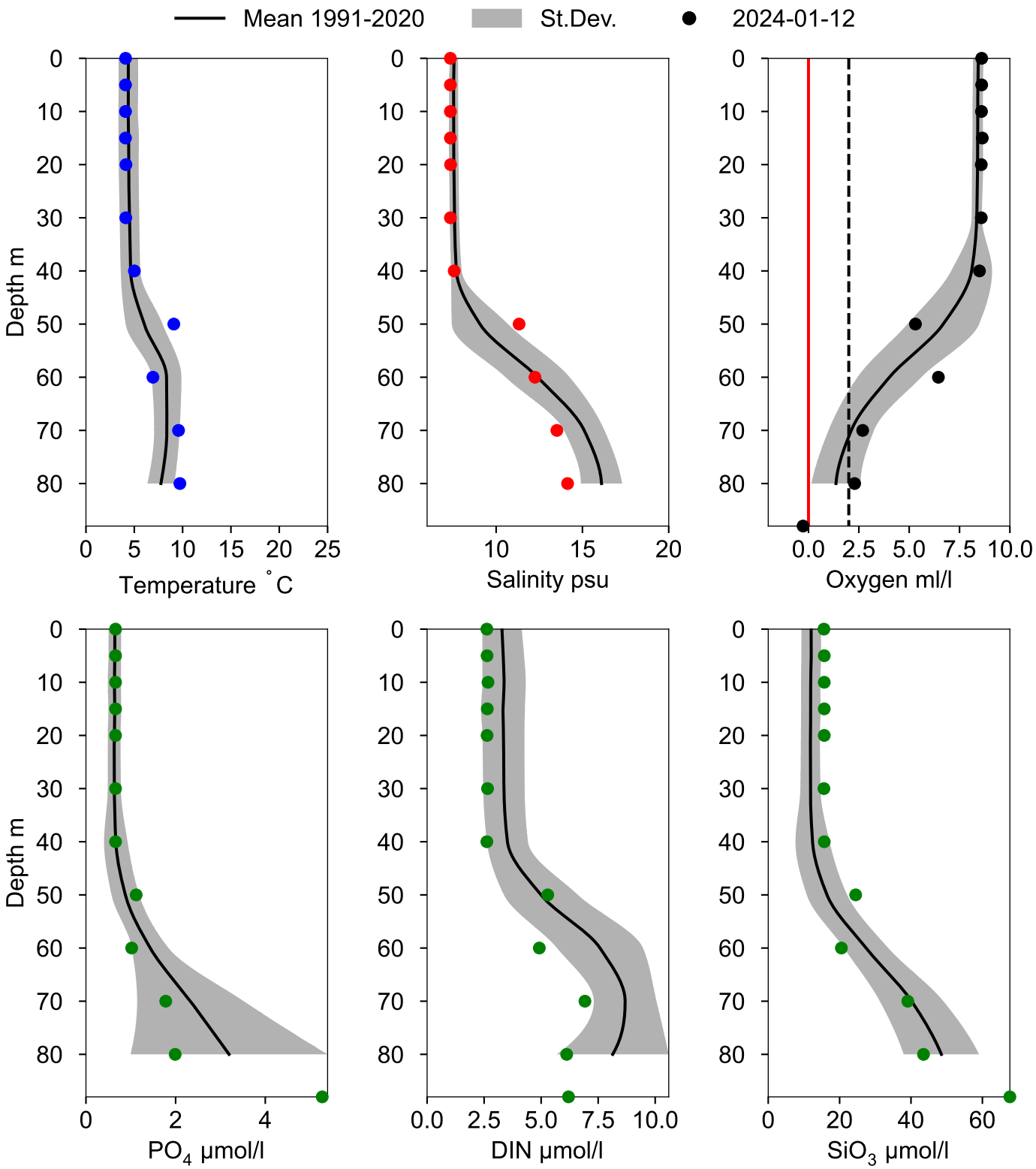
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

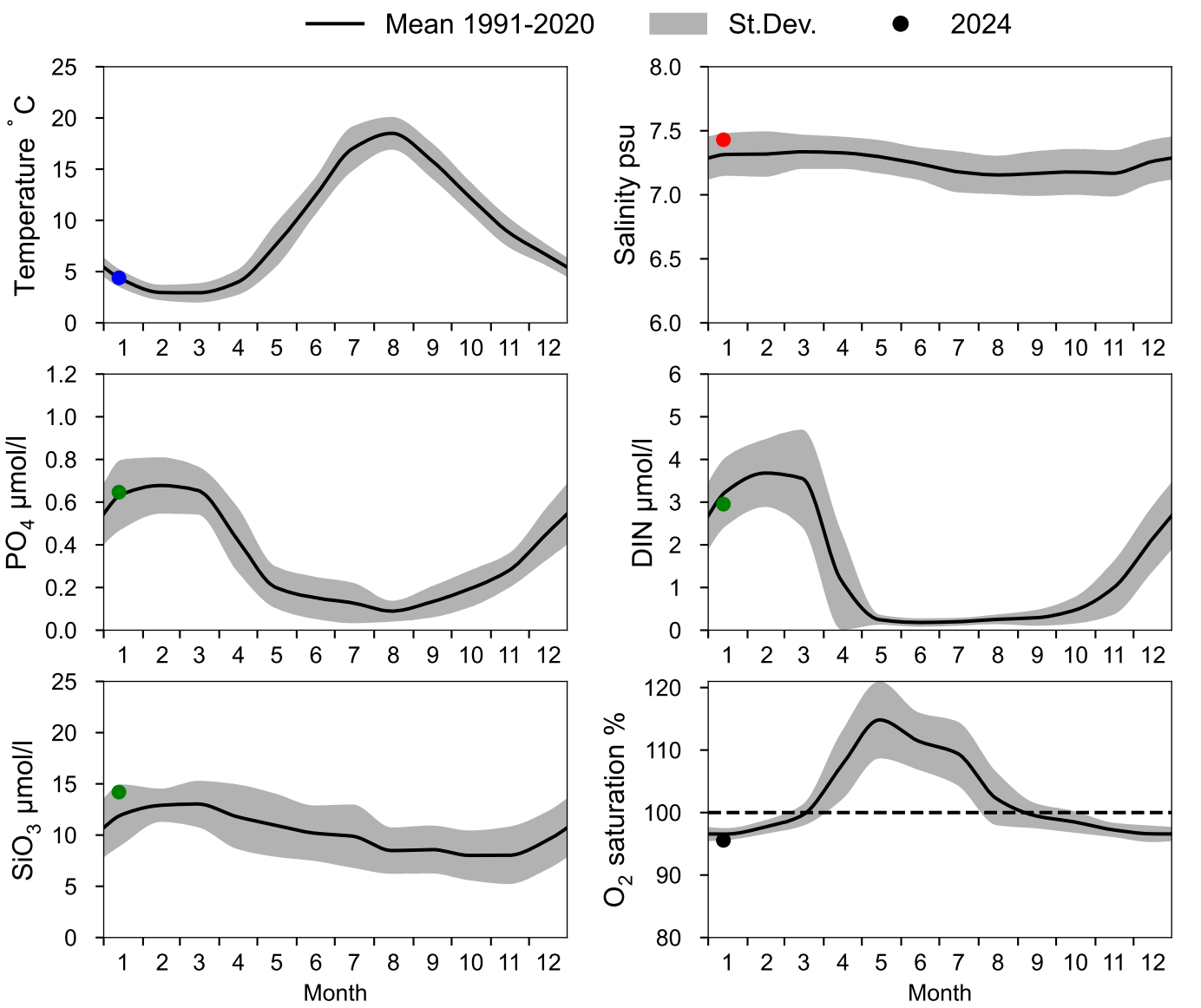


Vertical profiles BY5 BORNHOLMSDJ
January

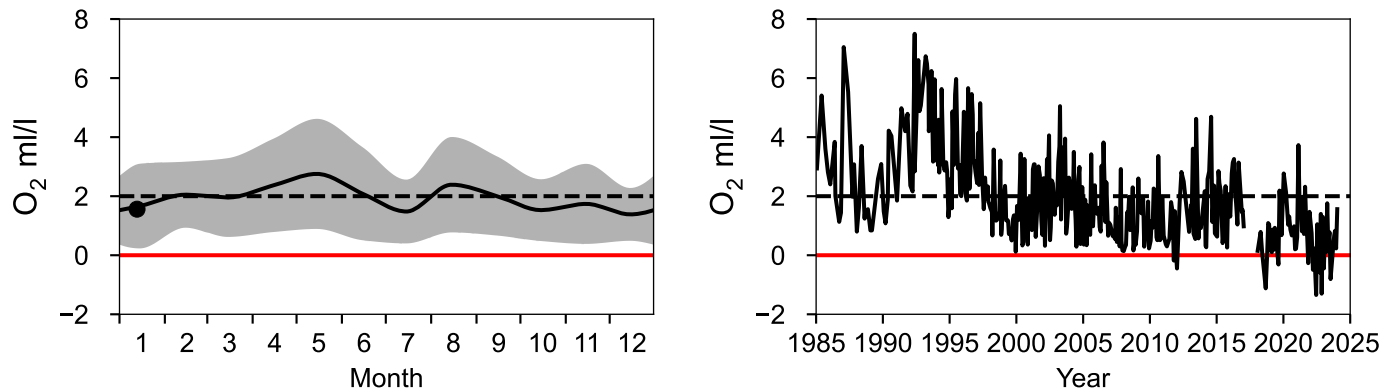


STATION BCS III-10 SURFACE WATER (0-10 m)

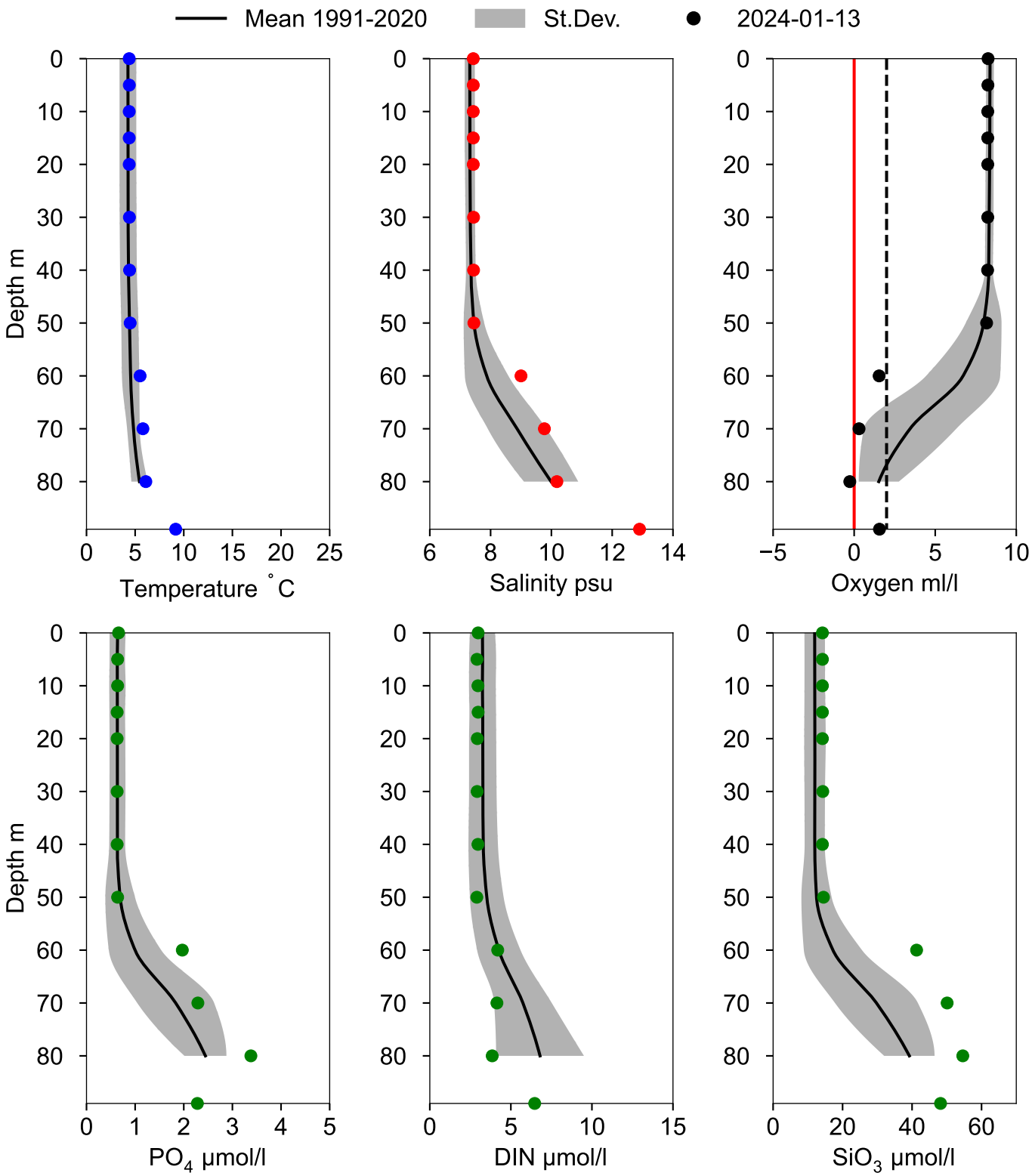
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

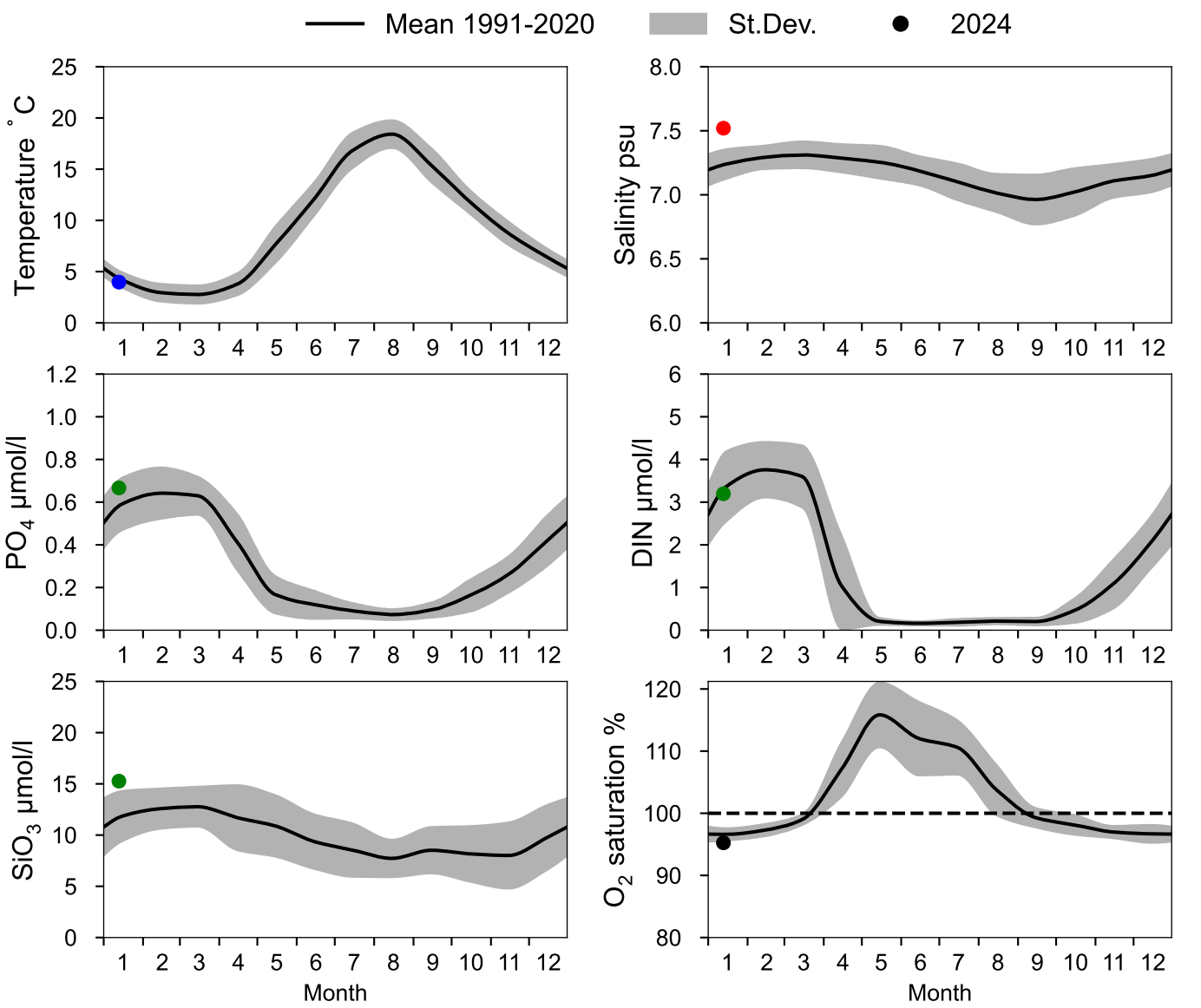


Vertical profiles BCS III-10
January

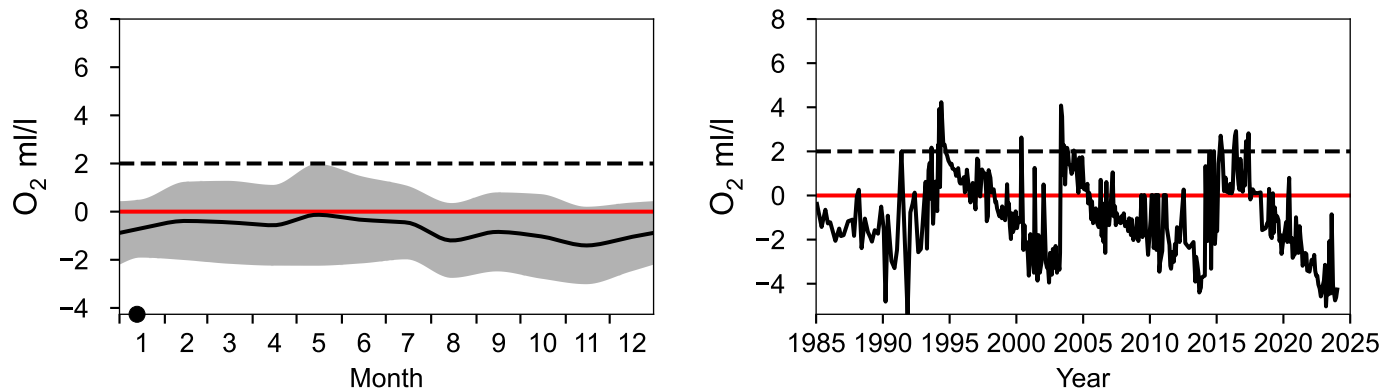


STATION BY10 SURFACE WATER (0-10 m)

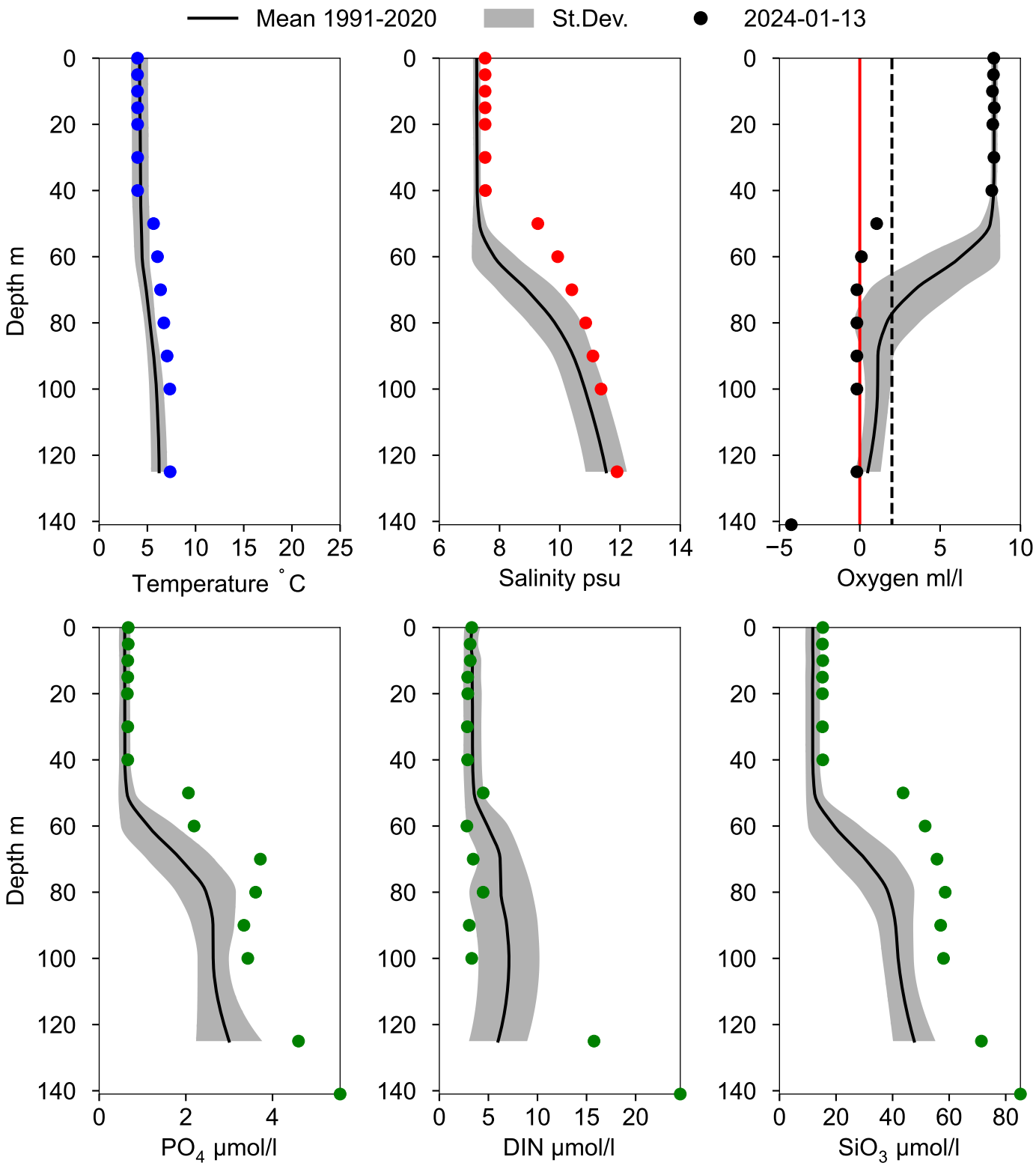
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

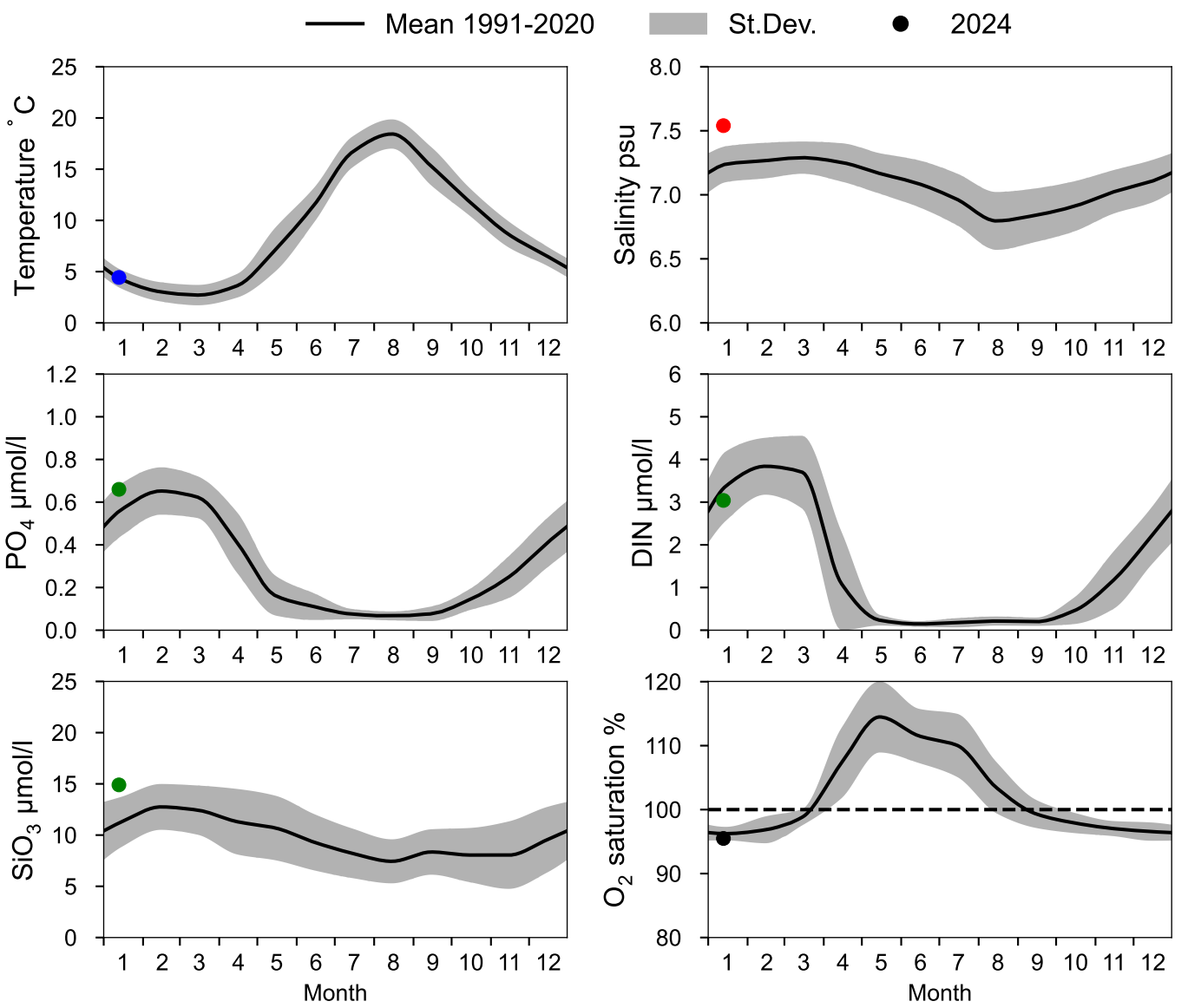


Vertical profiles BY10
January

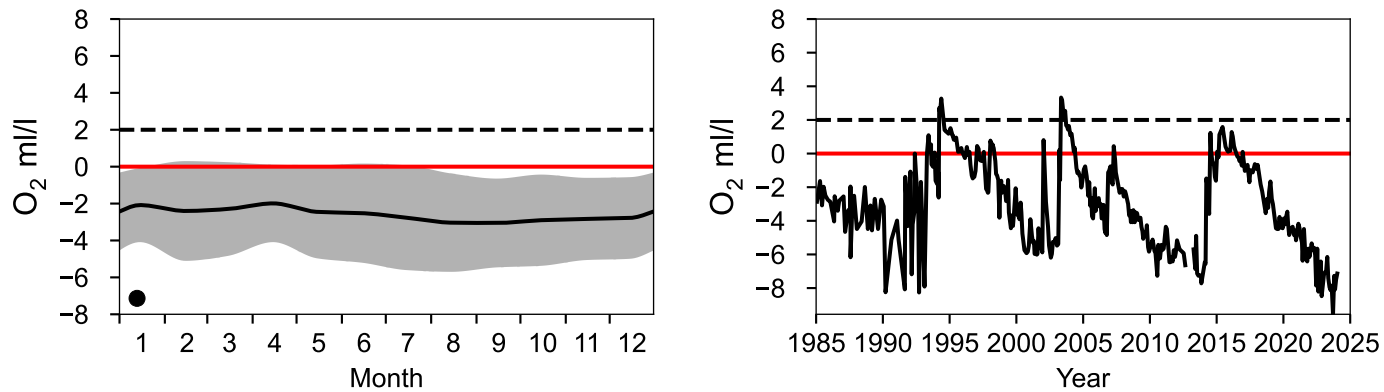


STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

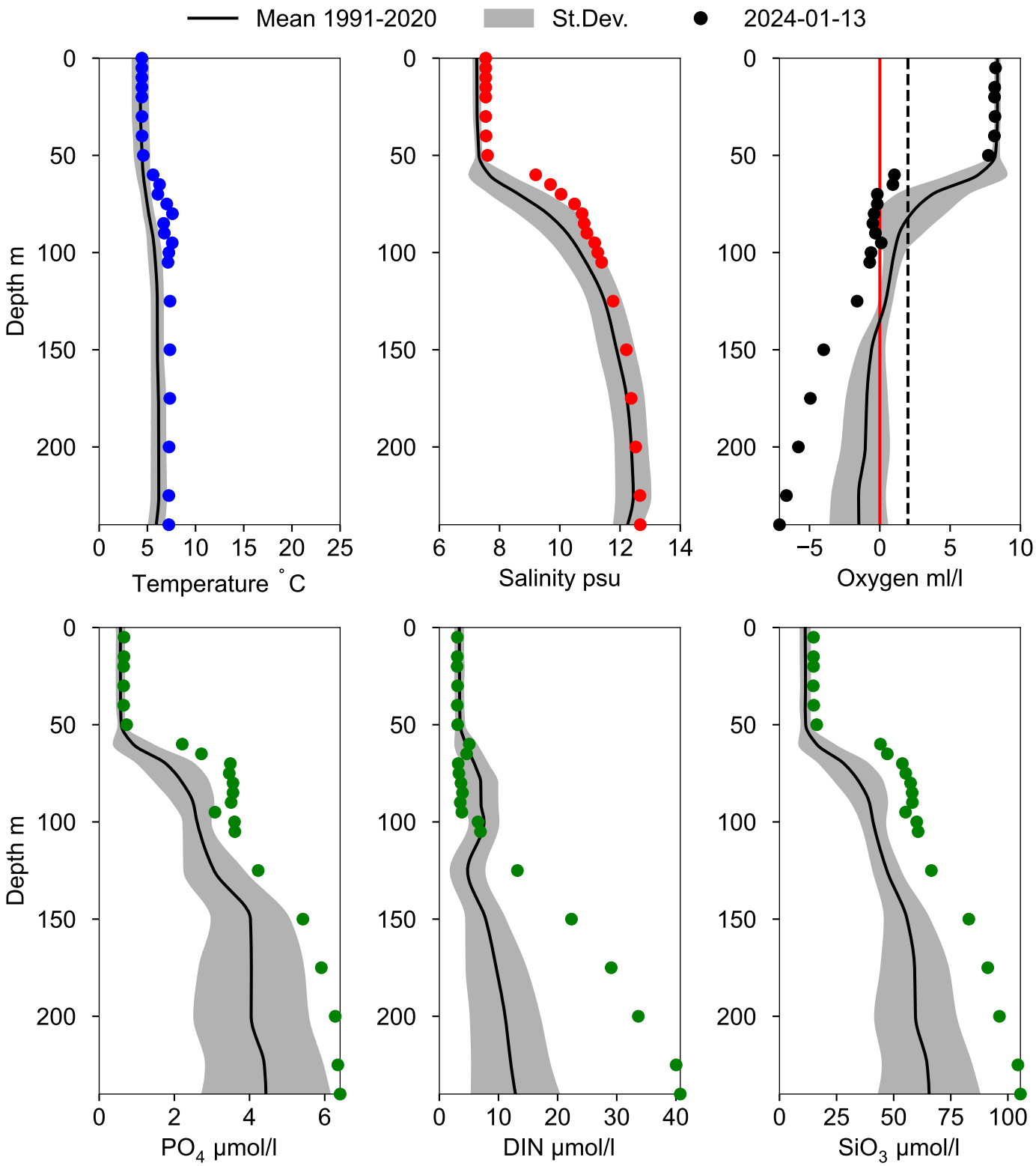
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 225 m)

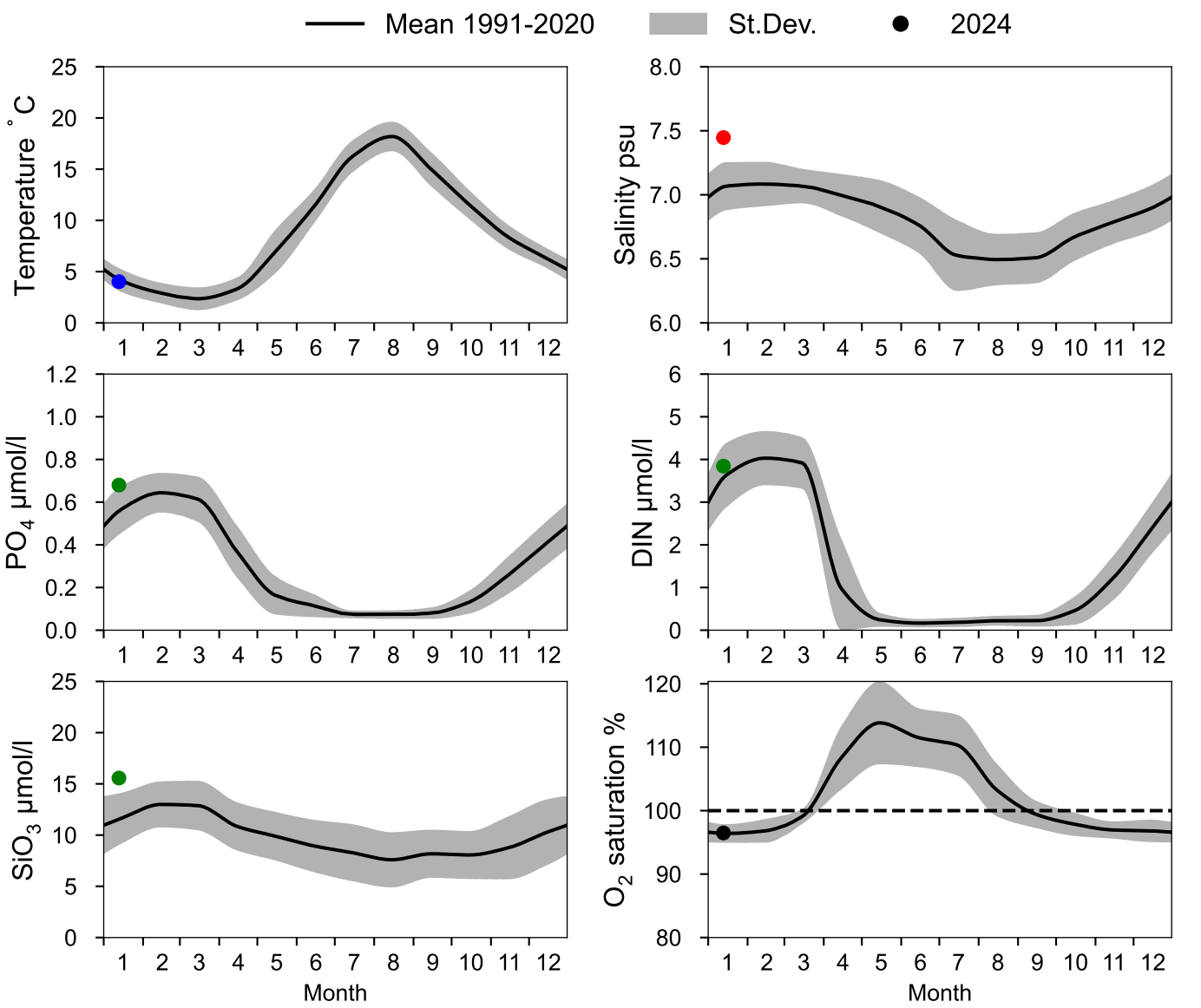


Vertical profiles BY15 GOTLANDSDJ
January

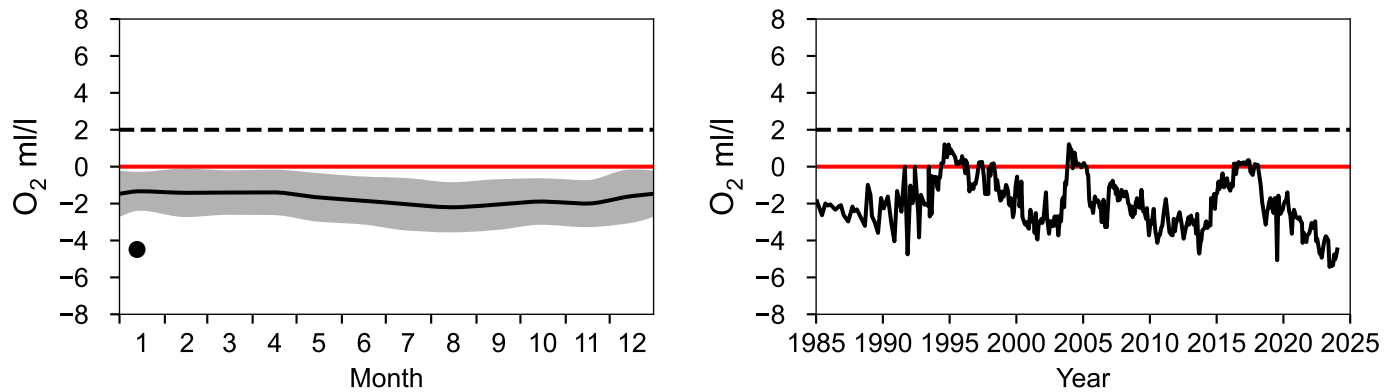


STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

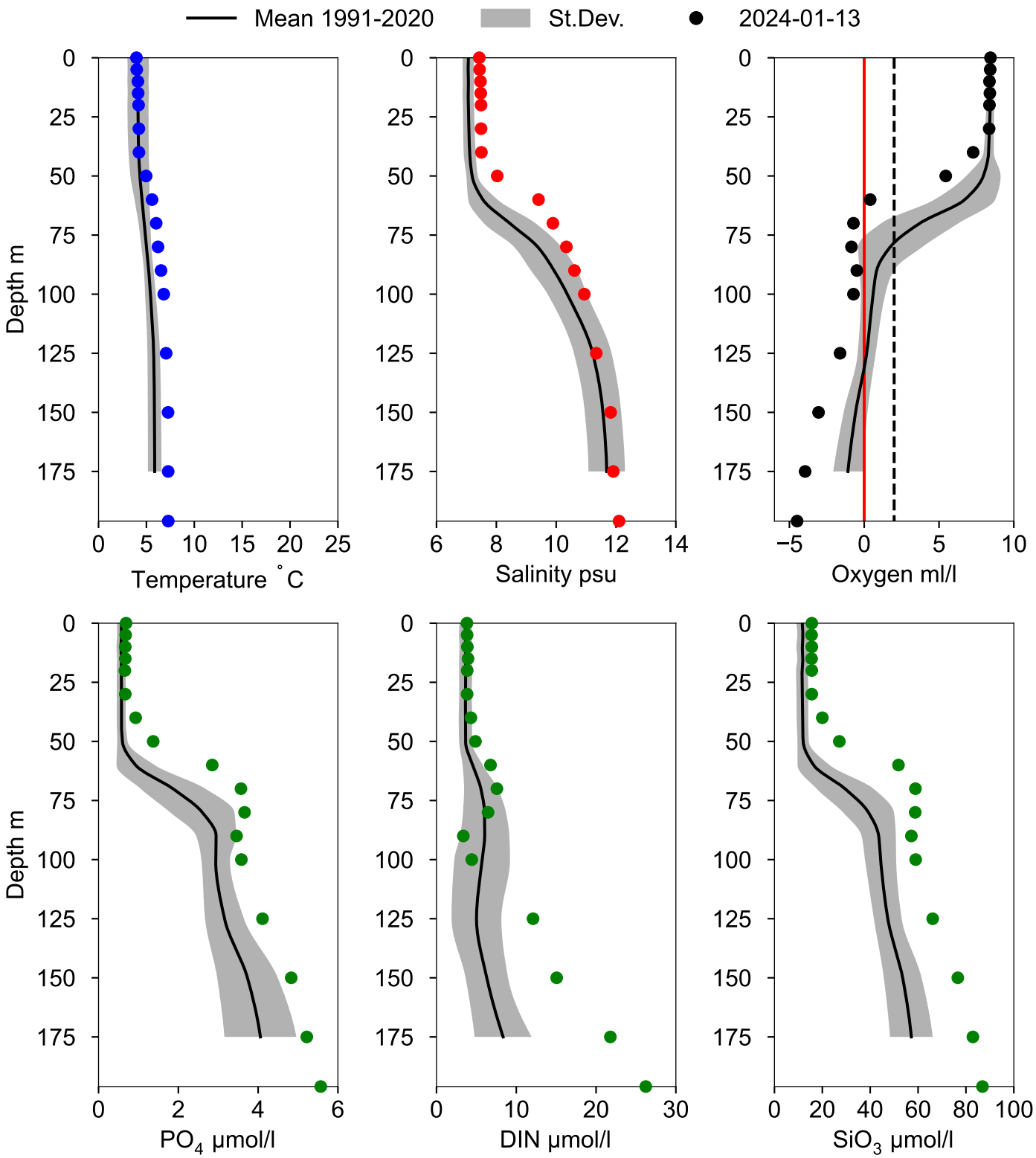
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

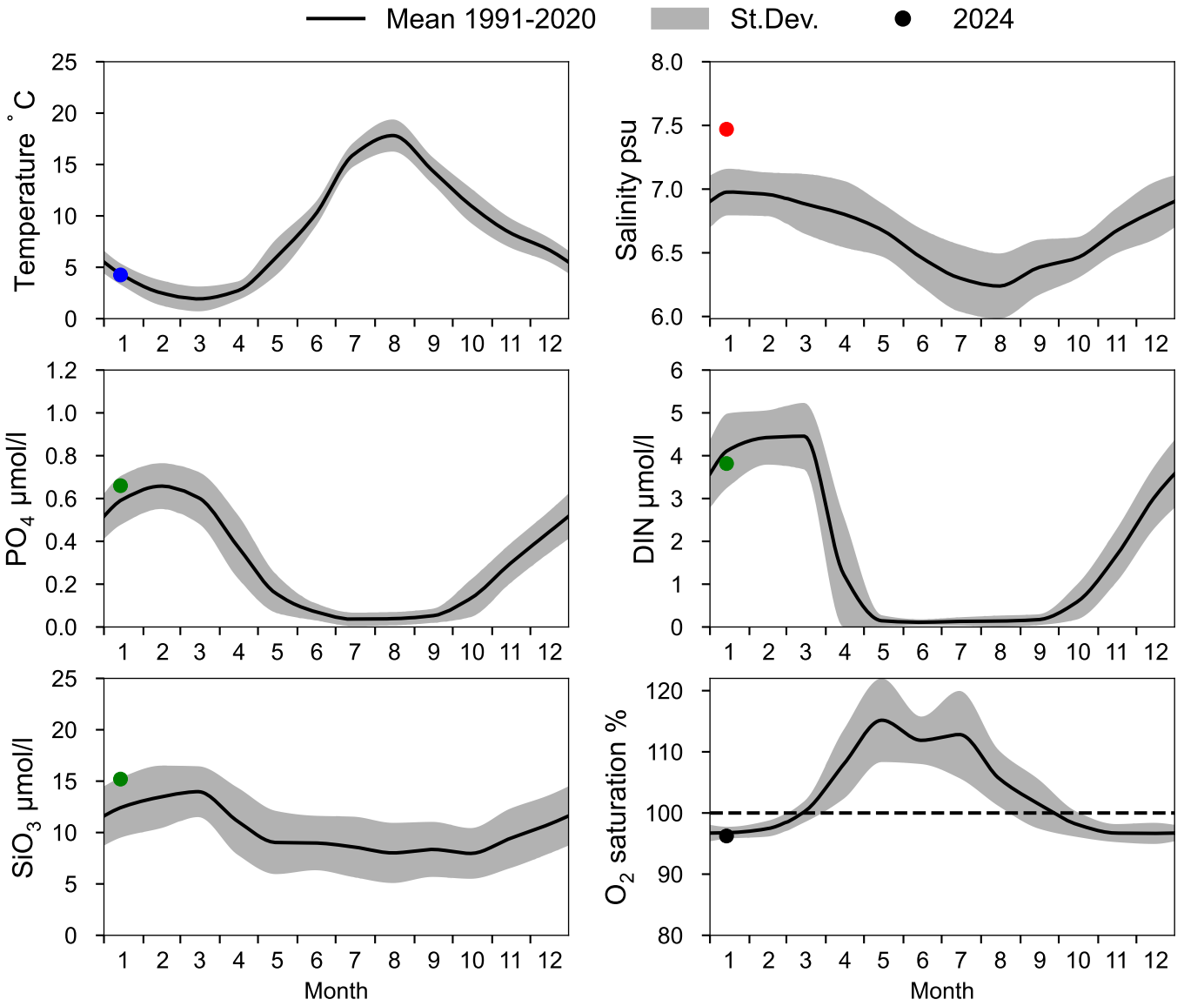


Vertical profiles BY20 FÅRÖDJ
January

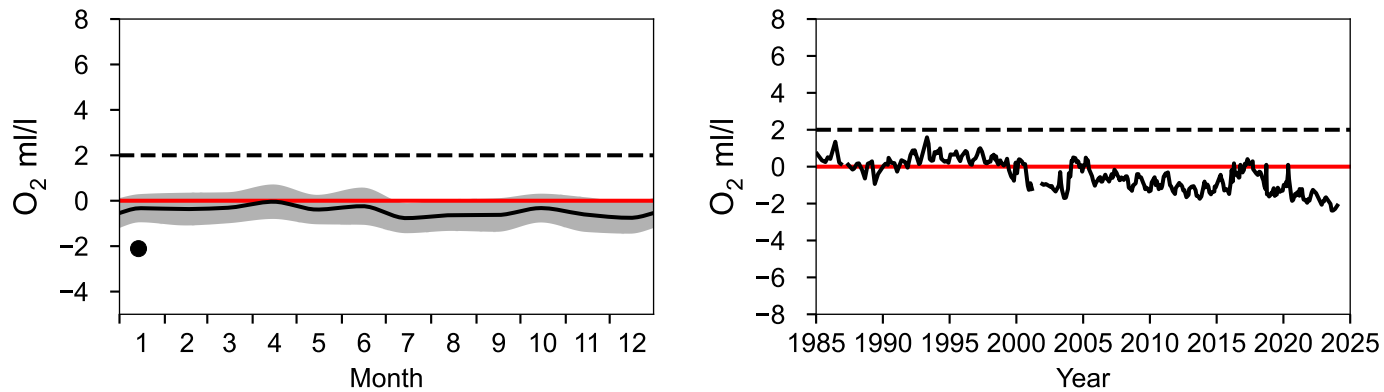


STATION BY29 / LL19 SURFACE WATER (0-10 m)

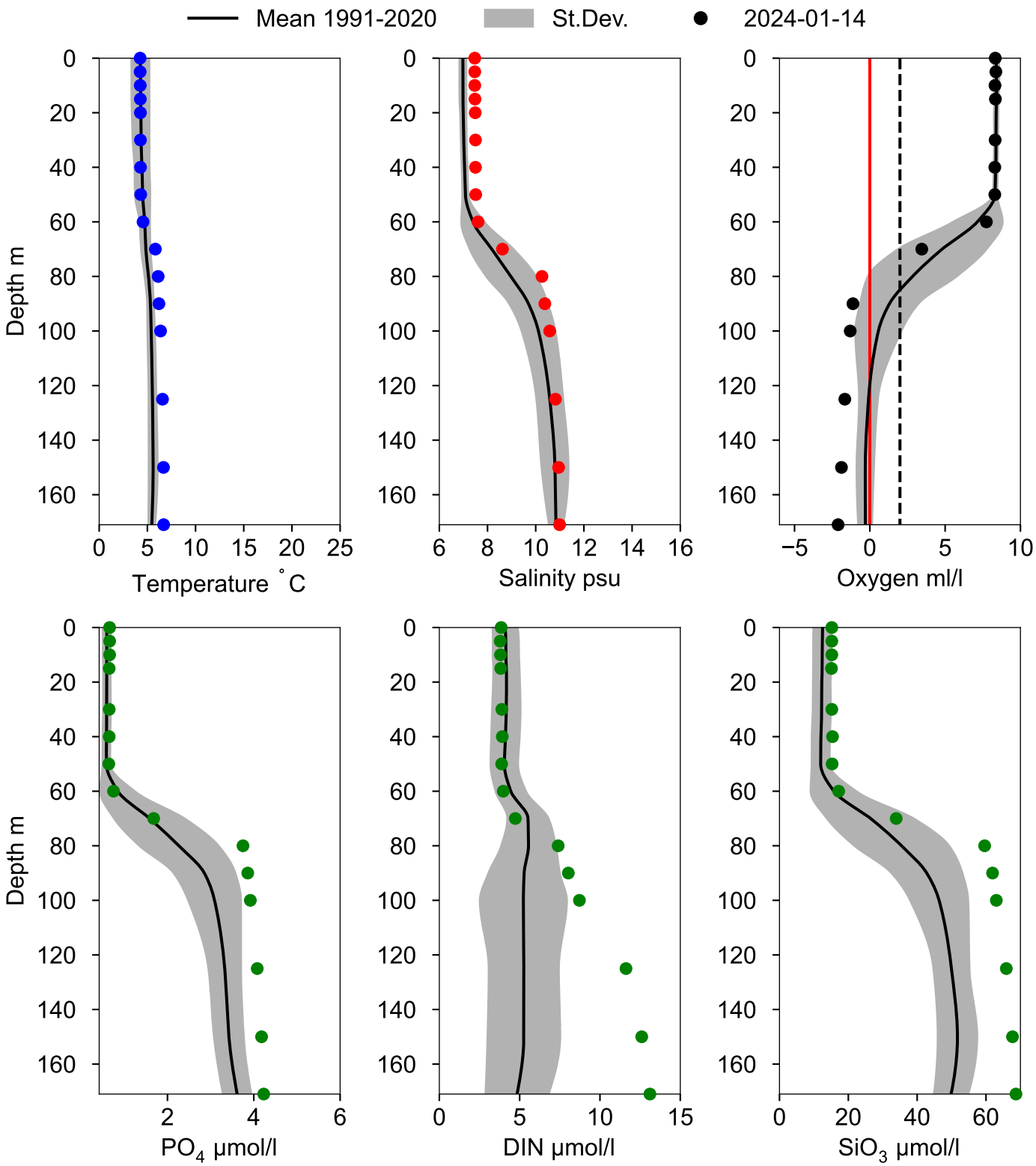
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 150 m)

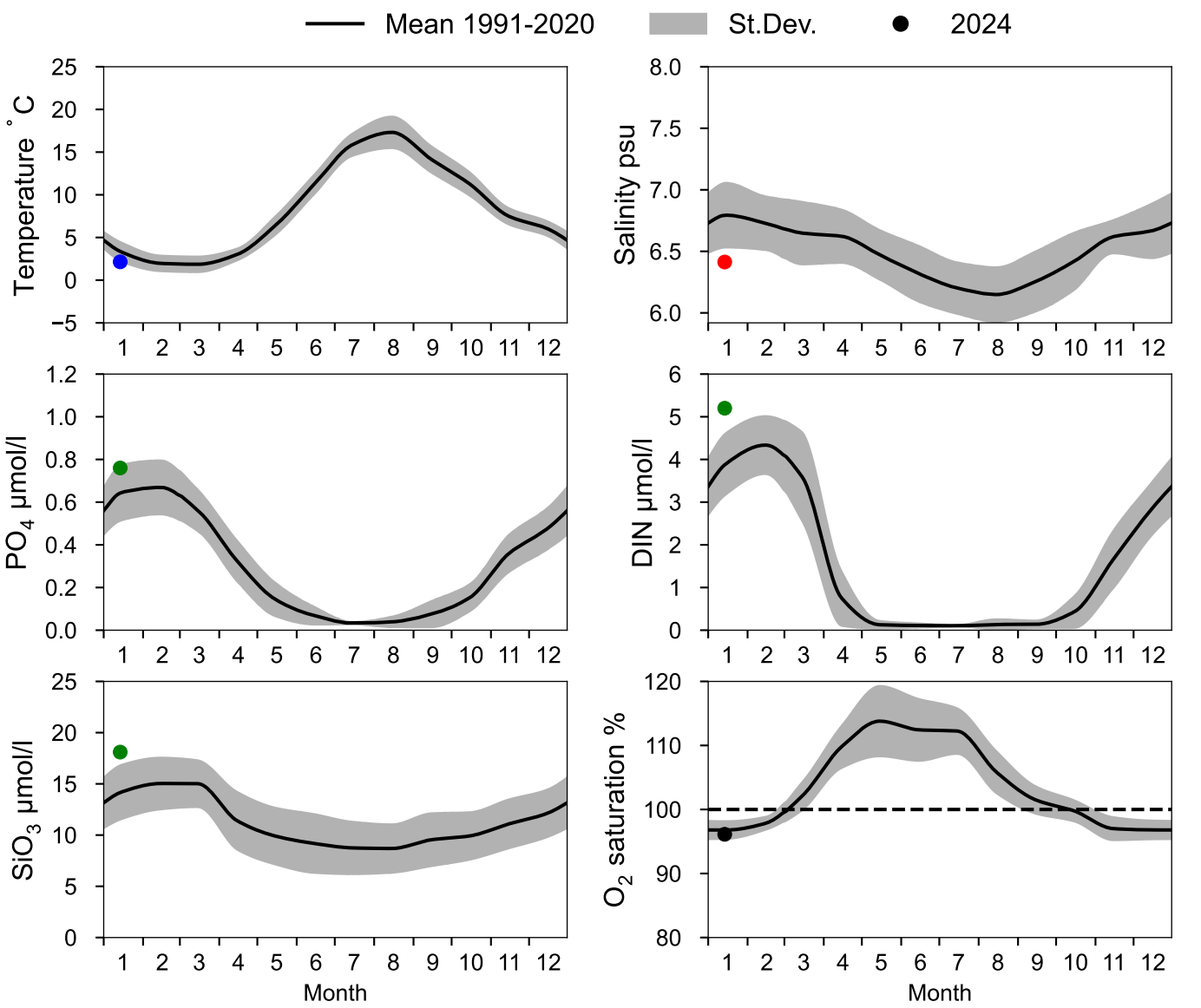


Vertical profiles BY29 / LL19
January

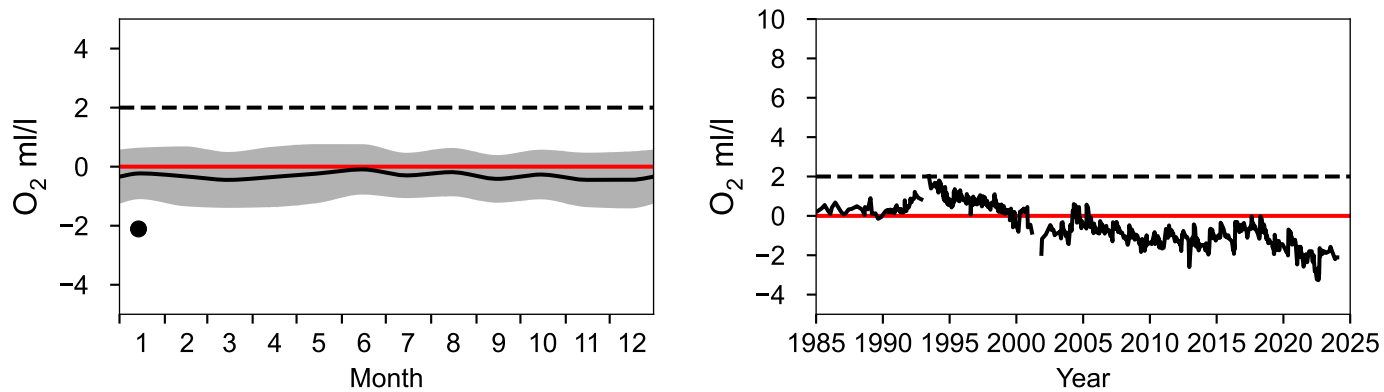


STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

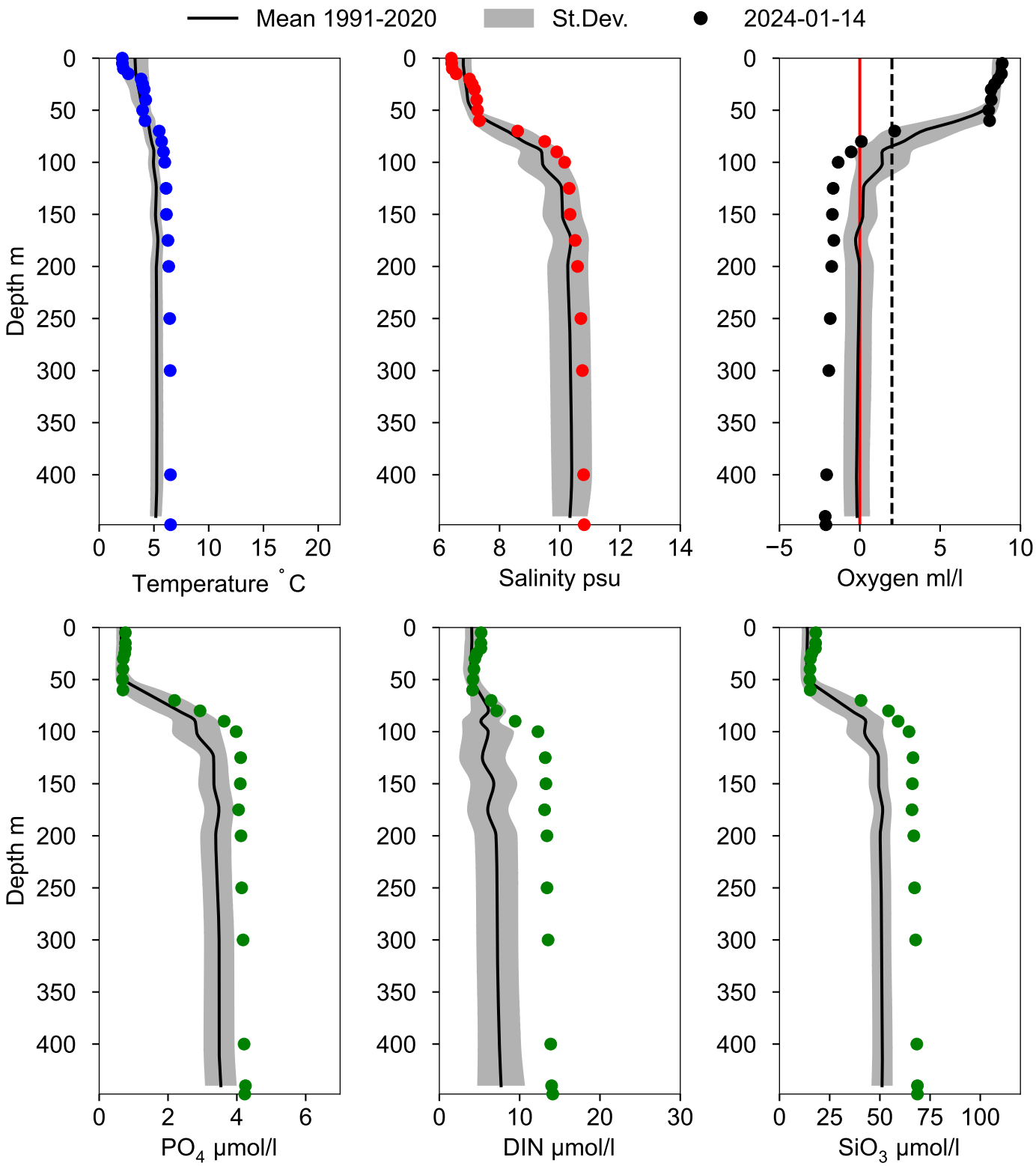
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 419 m)

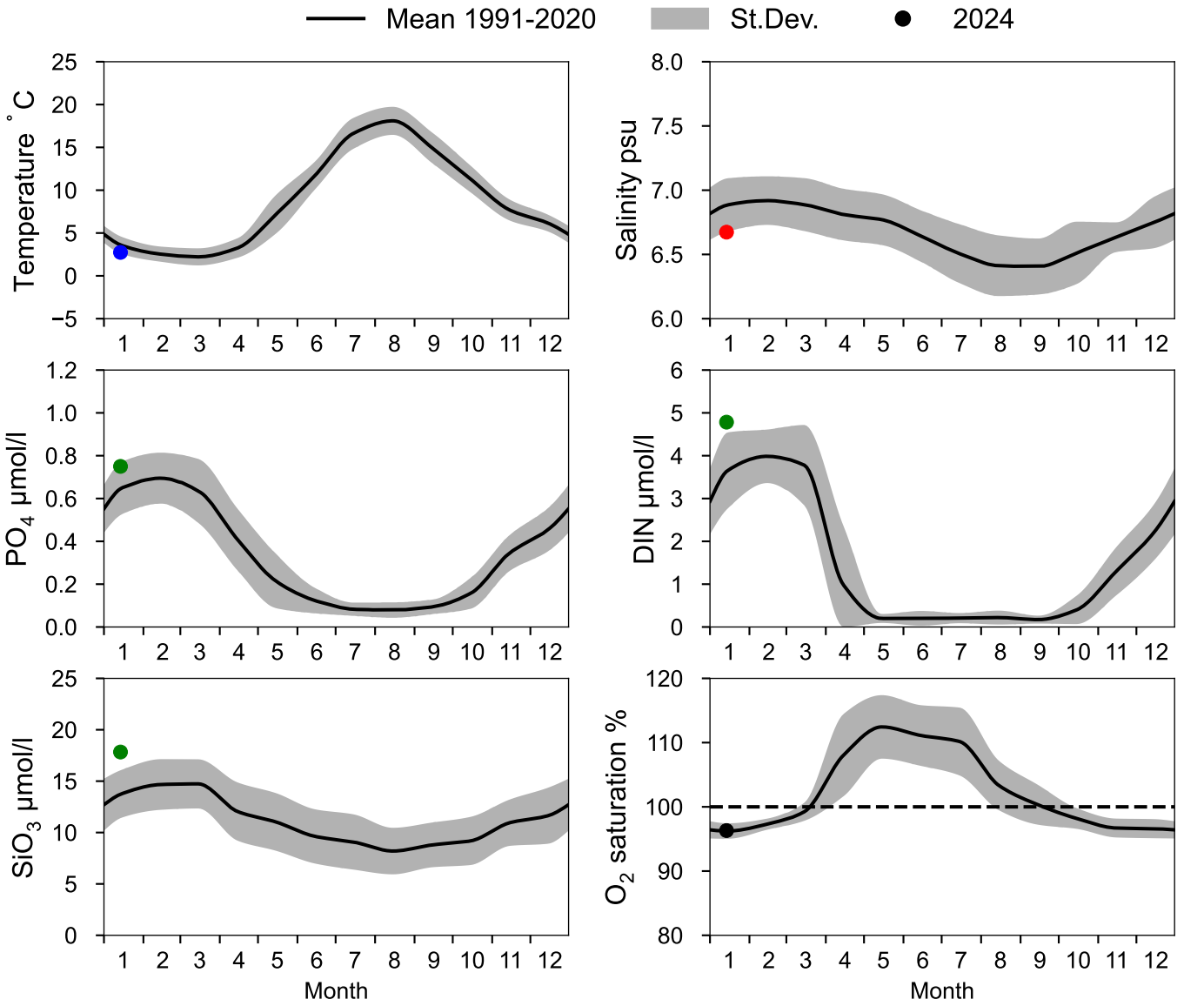


Vertical profiles BY31 LANDSORTSDJ
January

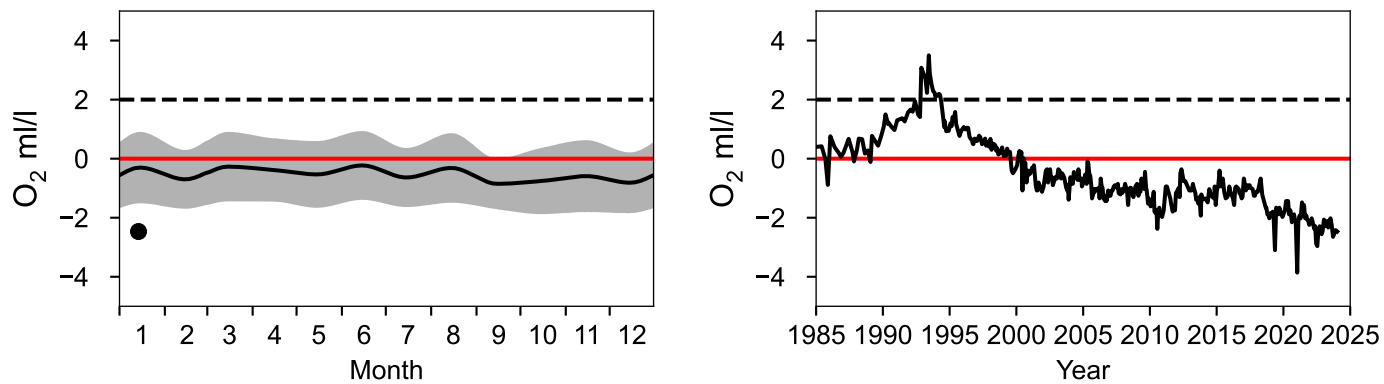


STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

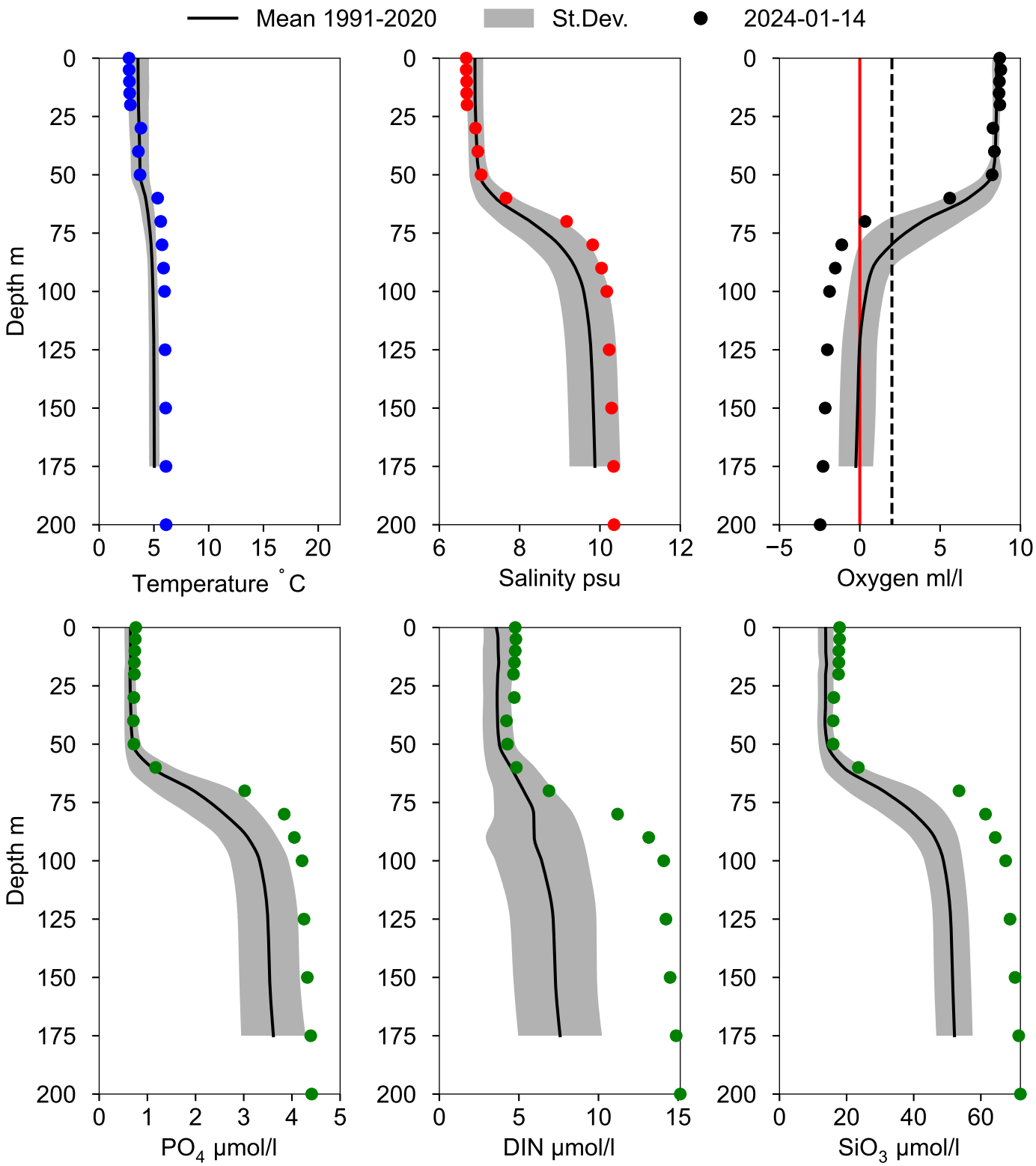
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

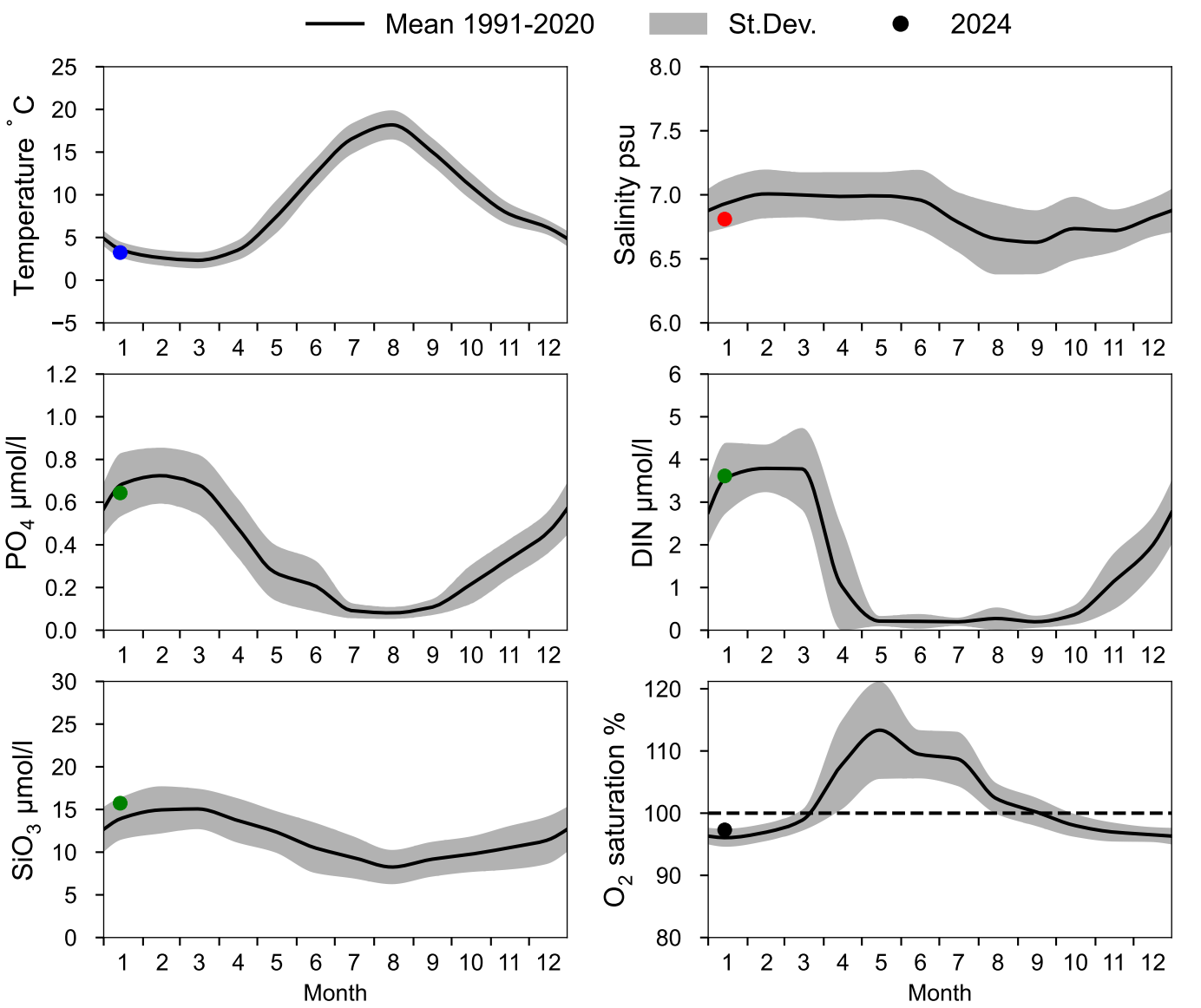


Vertical profiles BY32 NORRKÖPINGSDJ
January

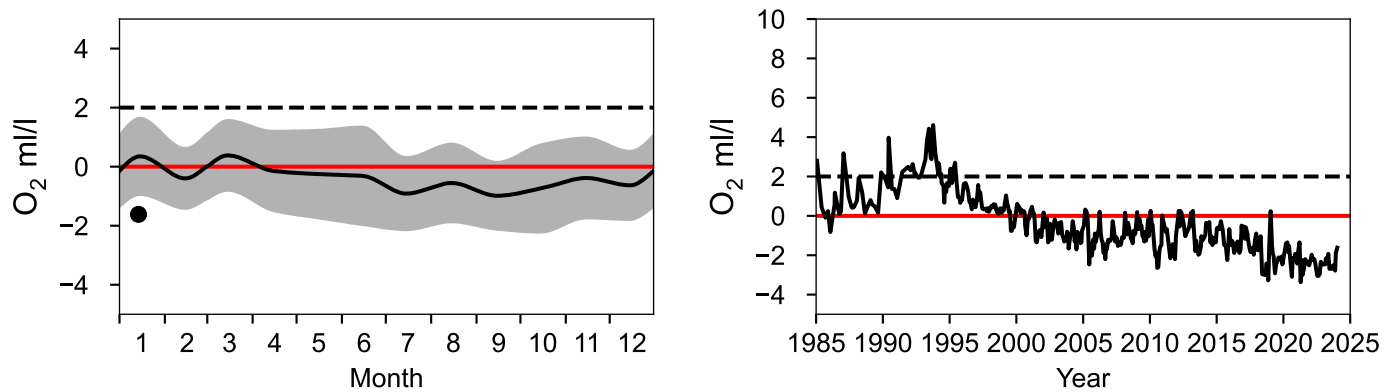


STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

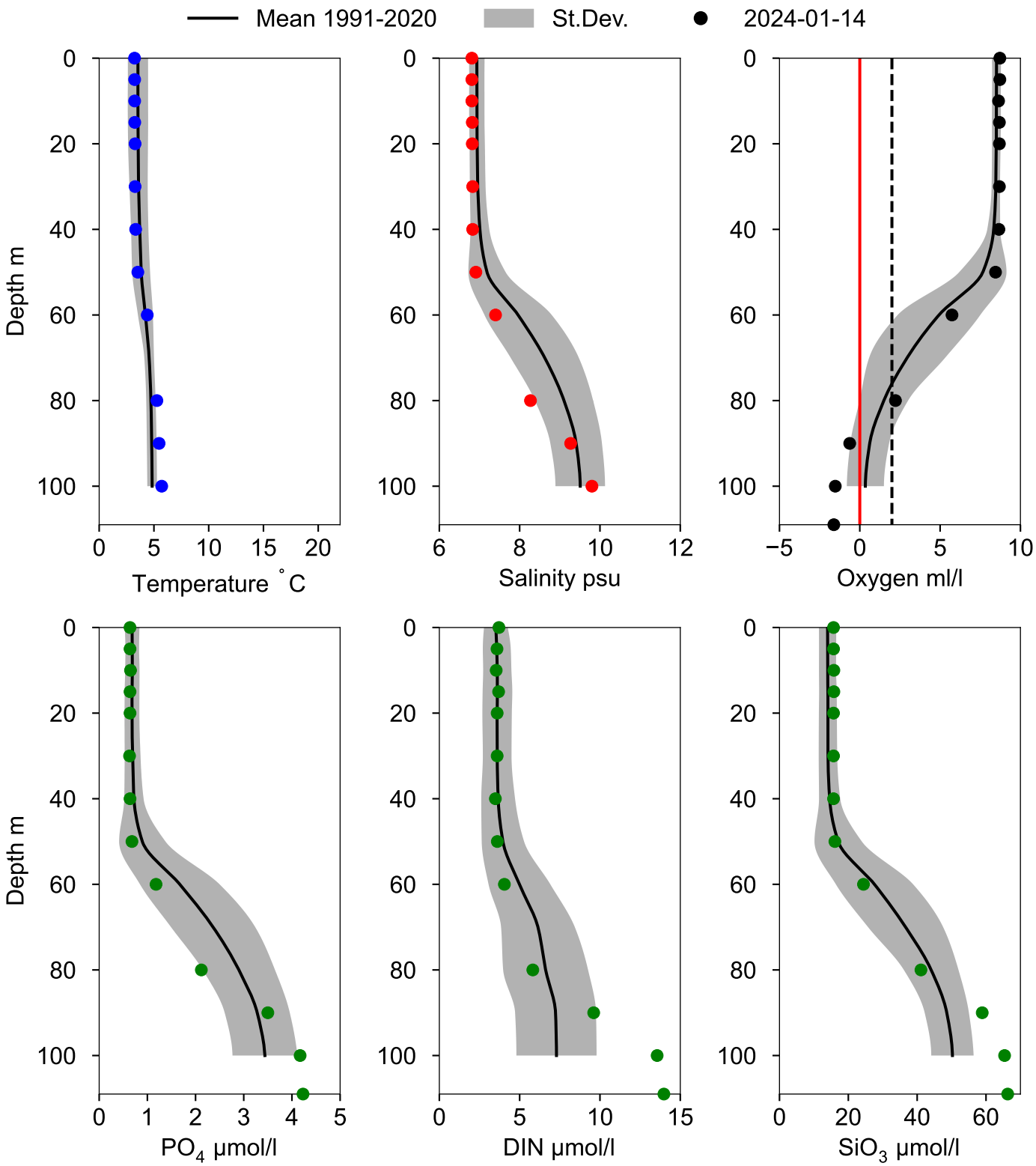
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

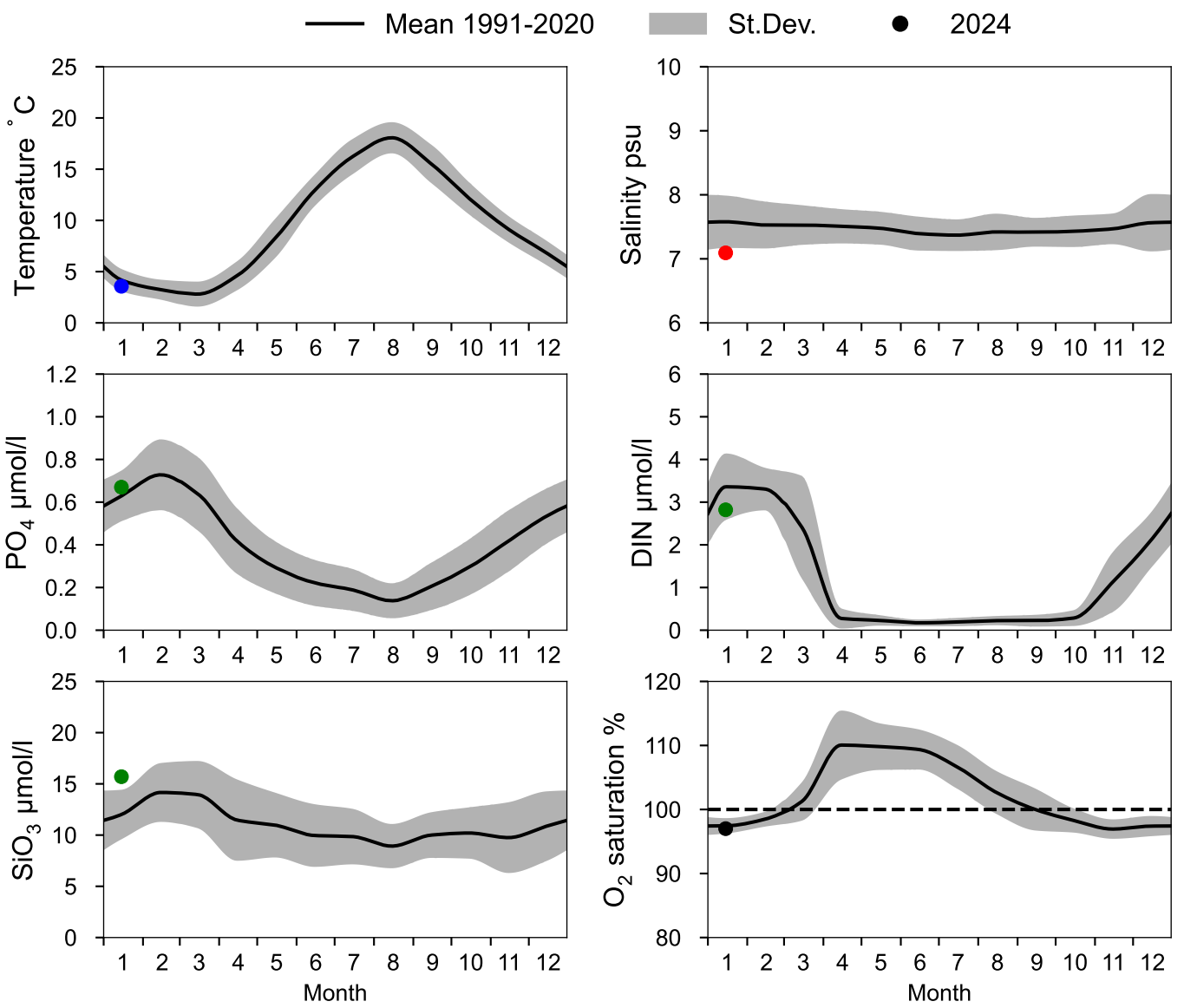


Vertical profiles BY38 KARLSÖDJ
January

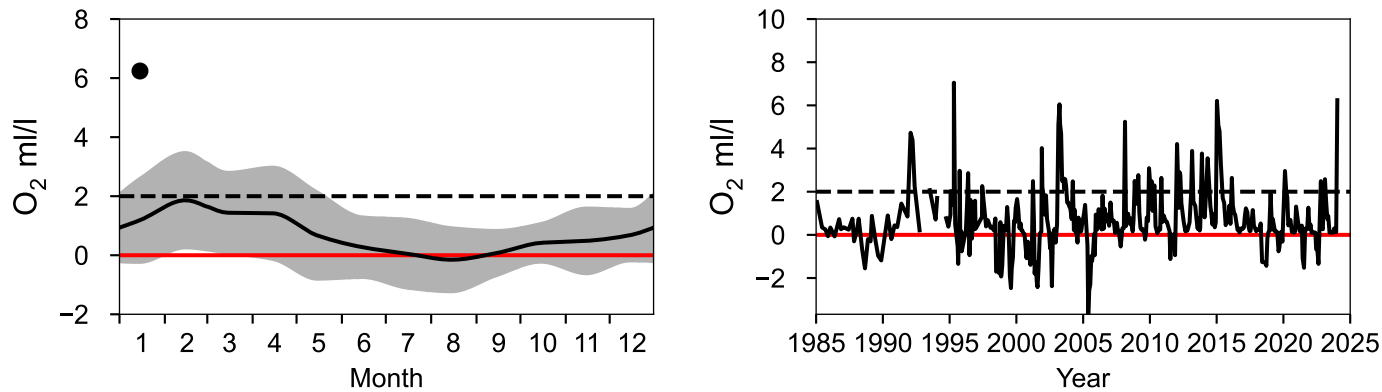


STATION HANÖBUKTEN SURFACE WATER (0-10 m)

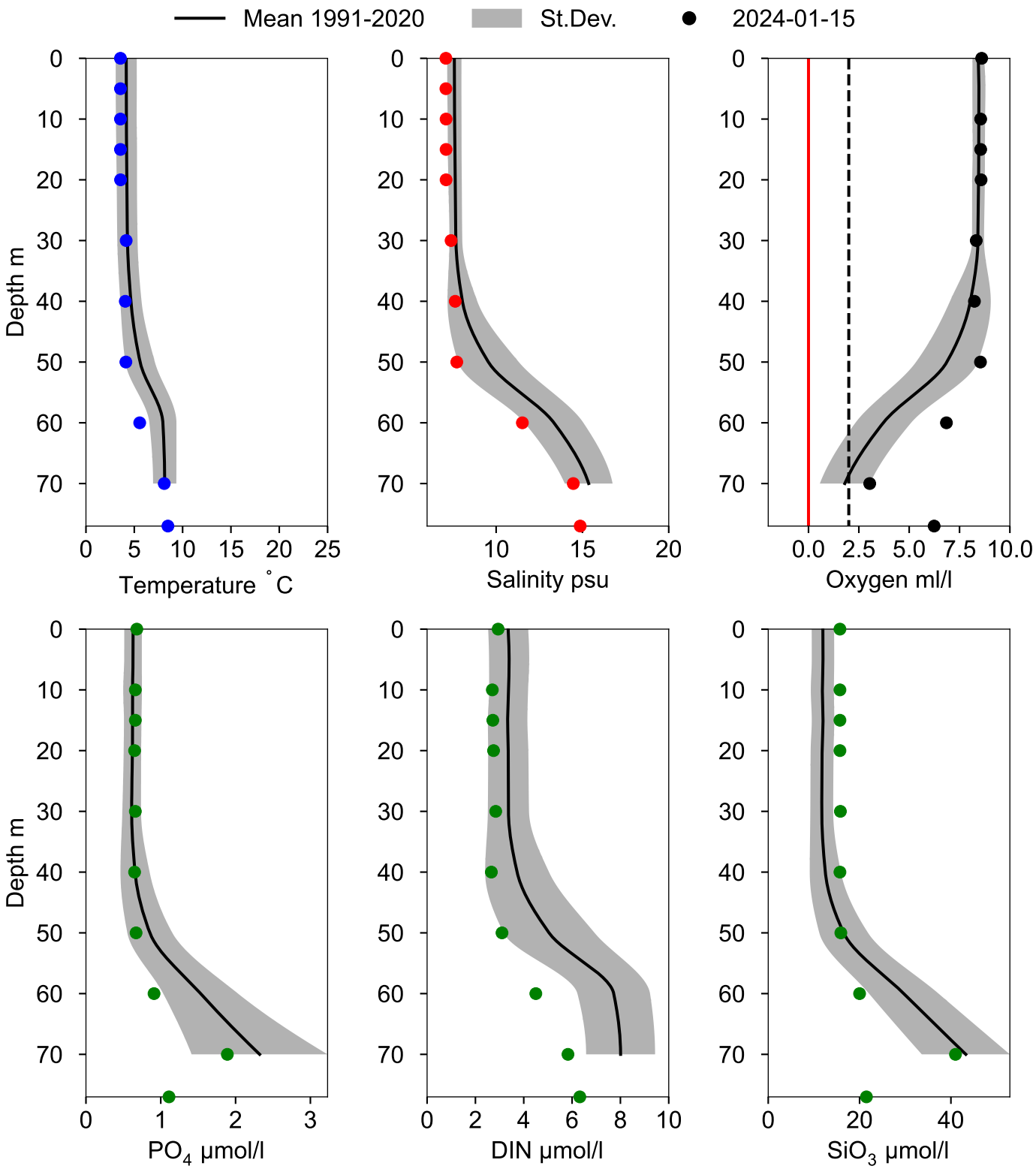
Annual Cycles



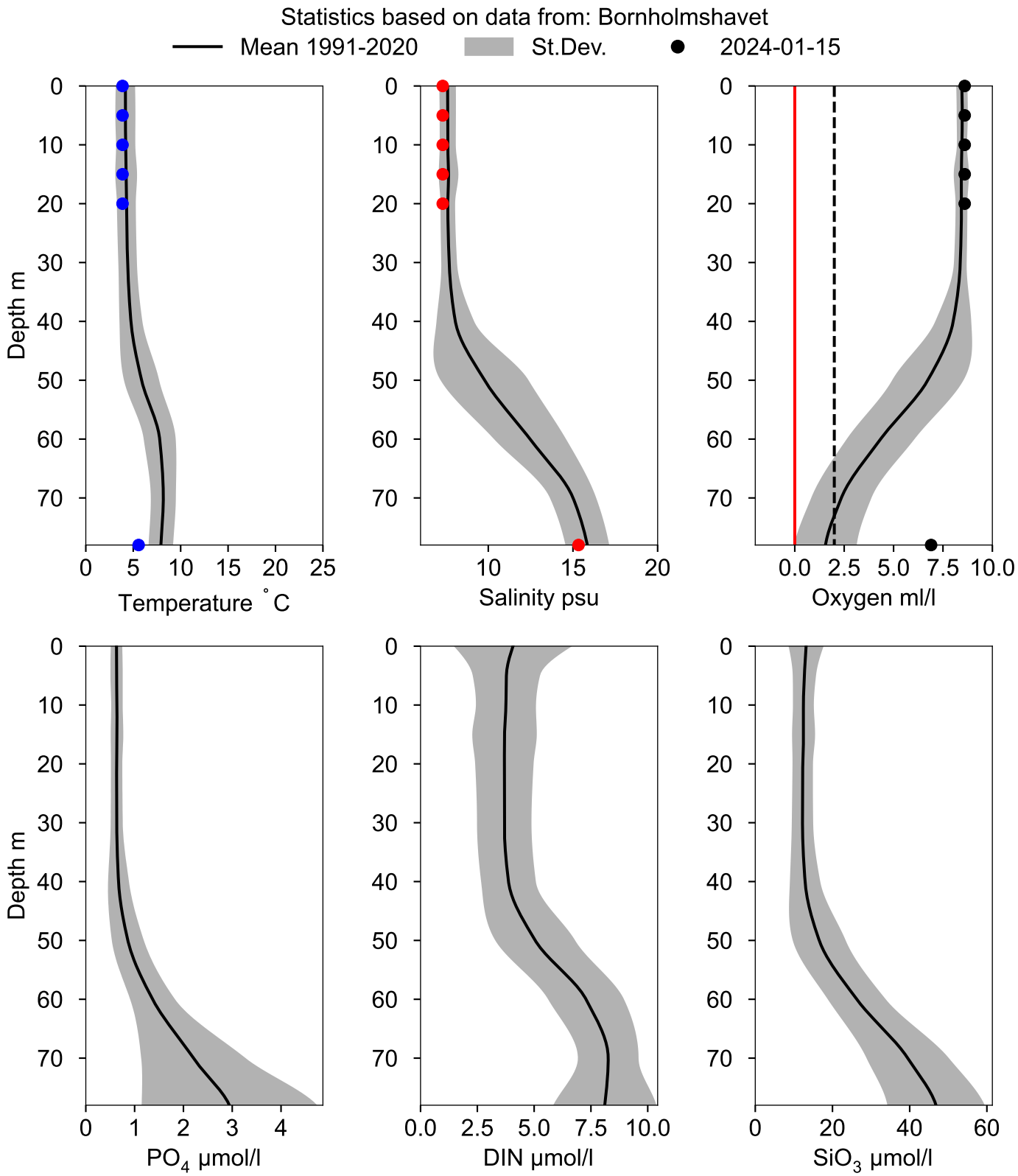
OXYGEN IN BOTTOM WATER (depth >= 70 m)



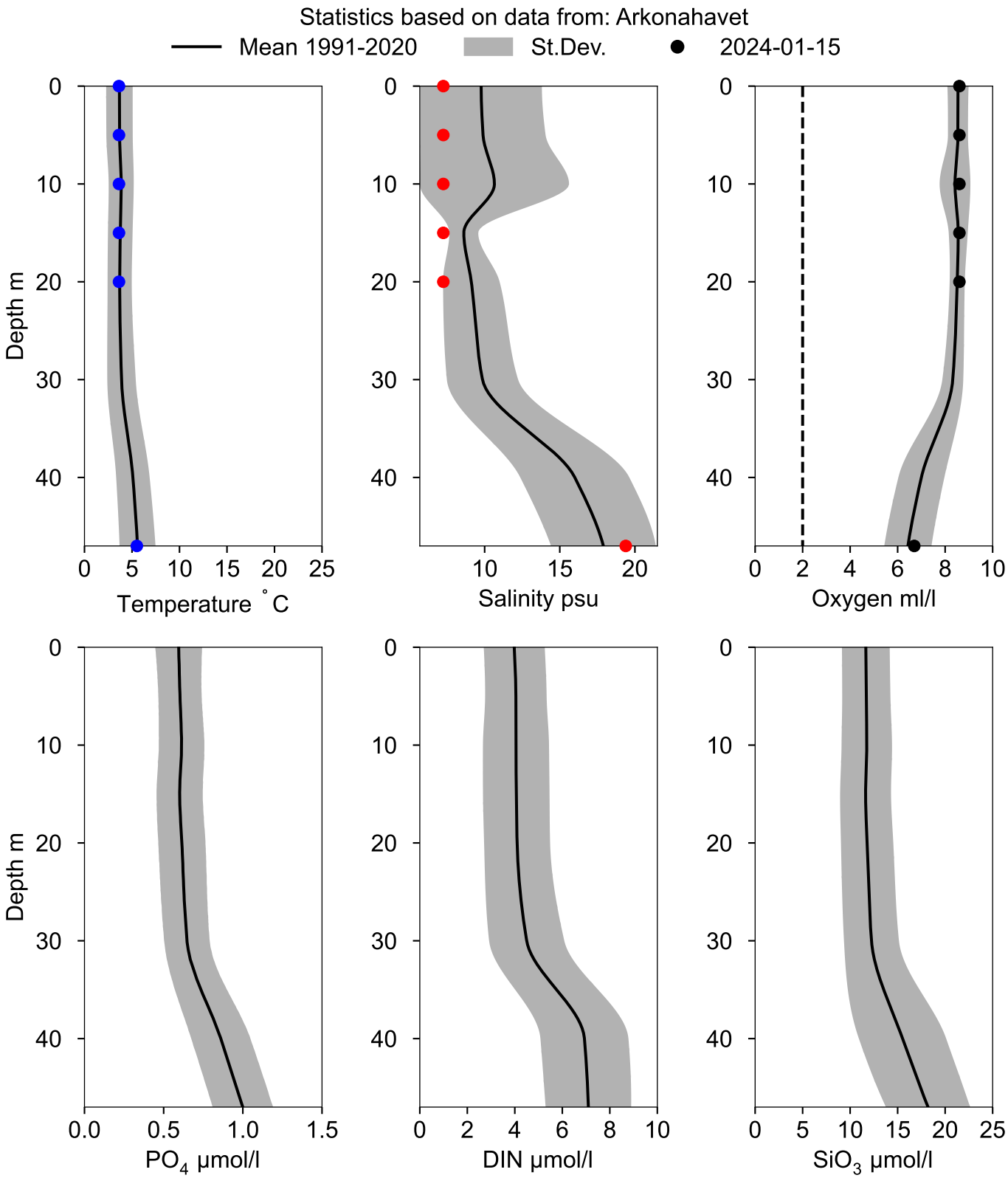
Vertical profiles HANÖBUKTEN
January



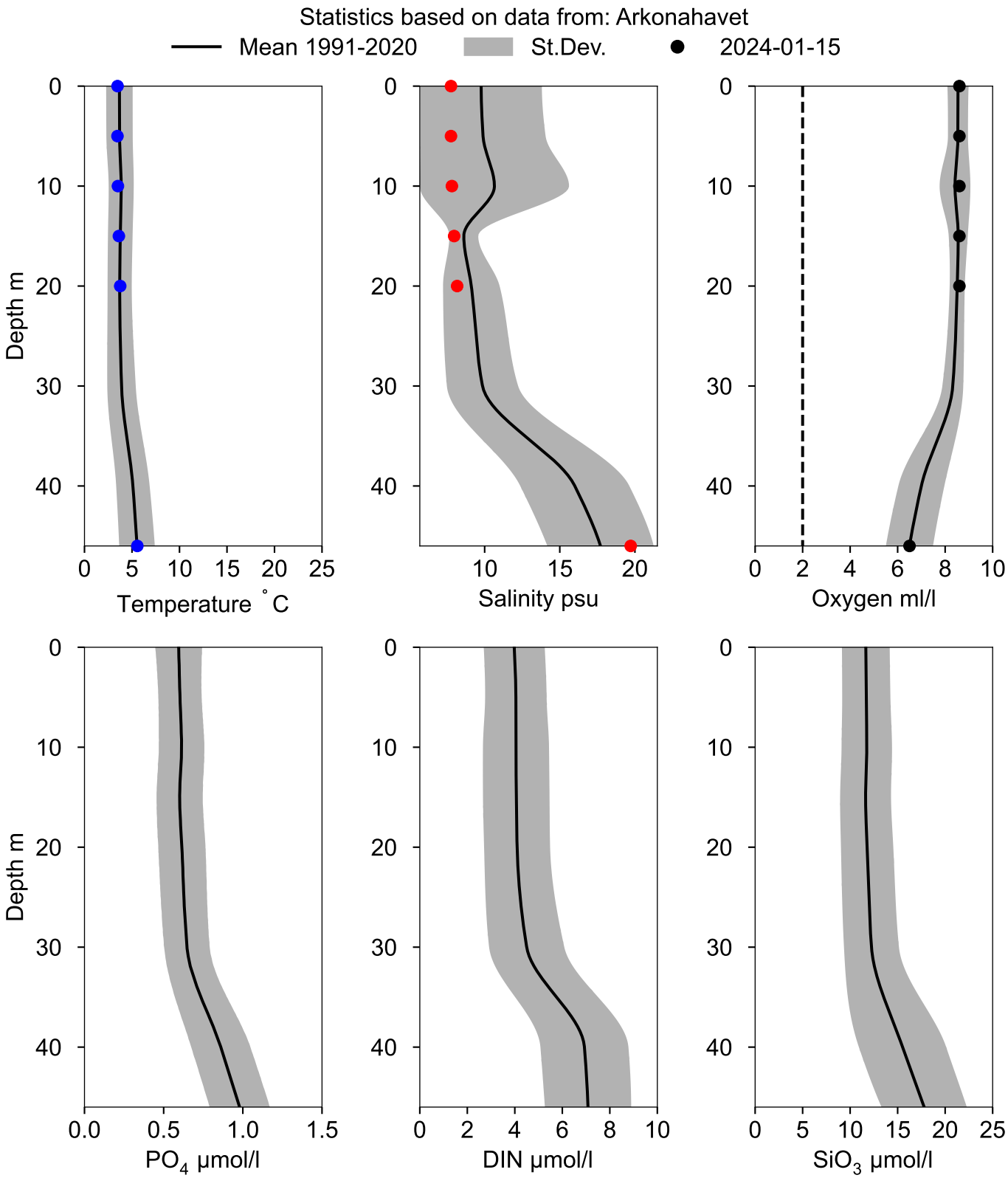
Vertical profiles INFLOW-3
January



Vertical profiles INFLOW-1
January

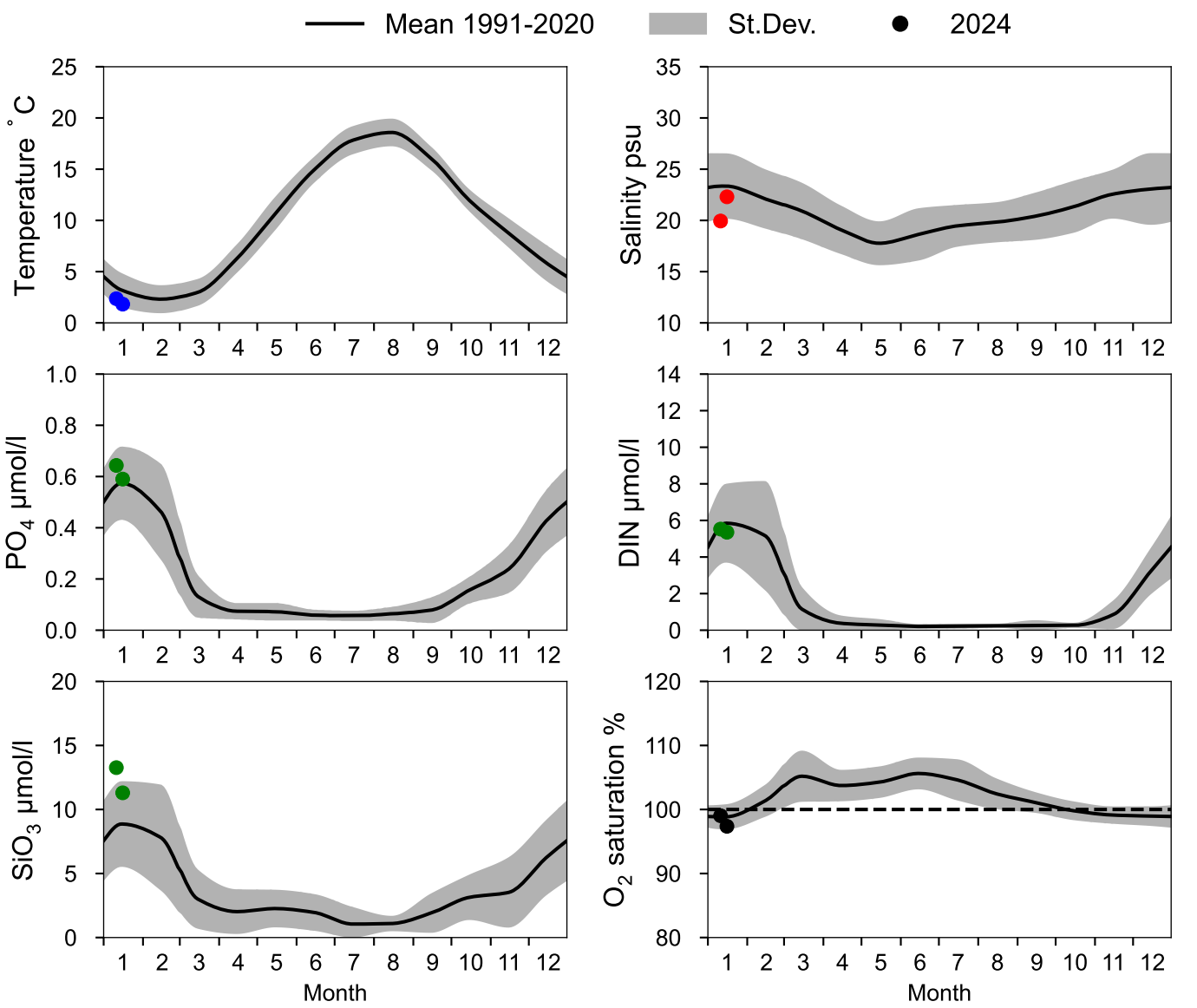


Vertical profiles INFLOW-0
January

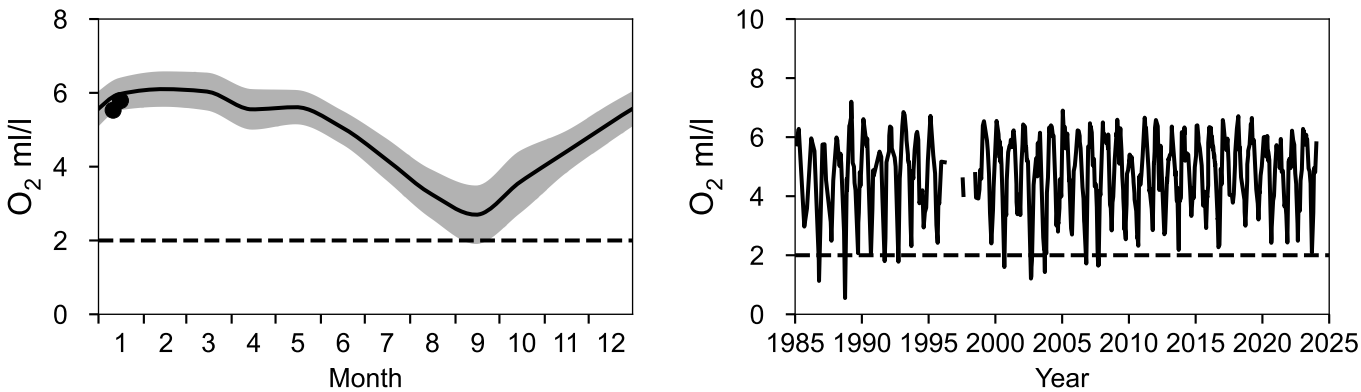


STATION ANHOLT E SURFACE WATER (0-10 m)

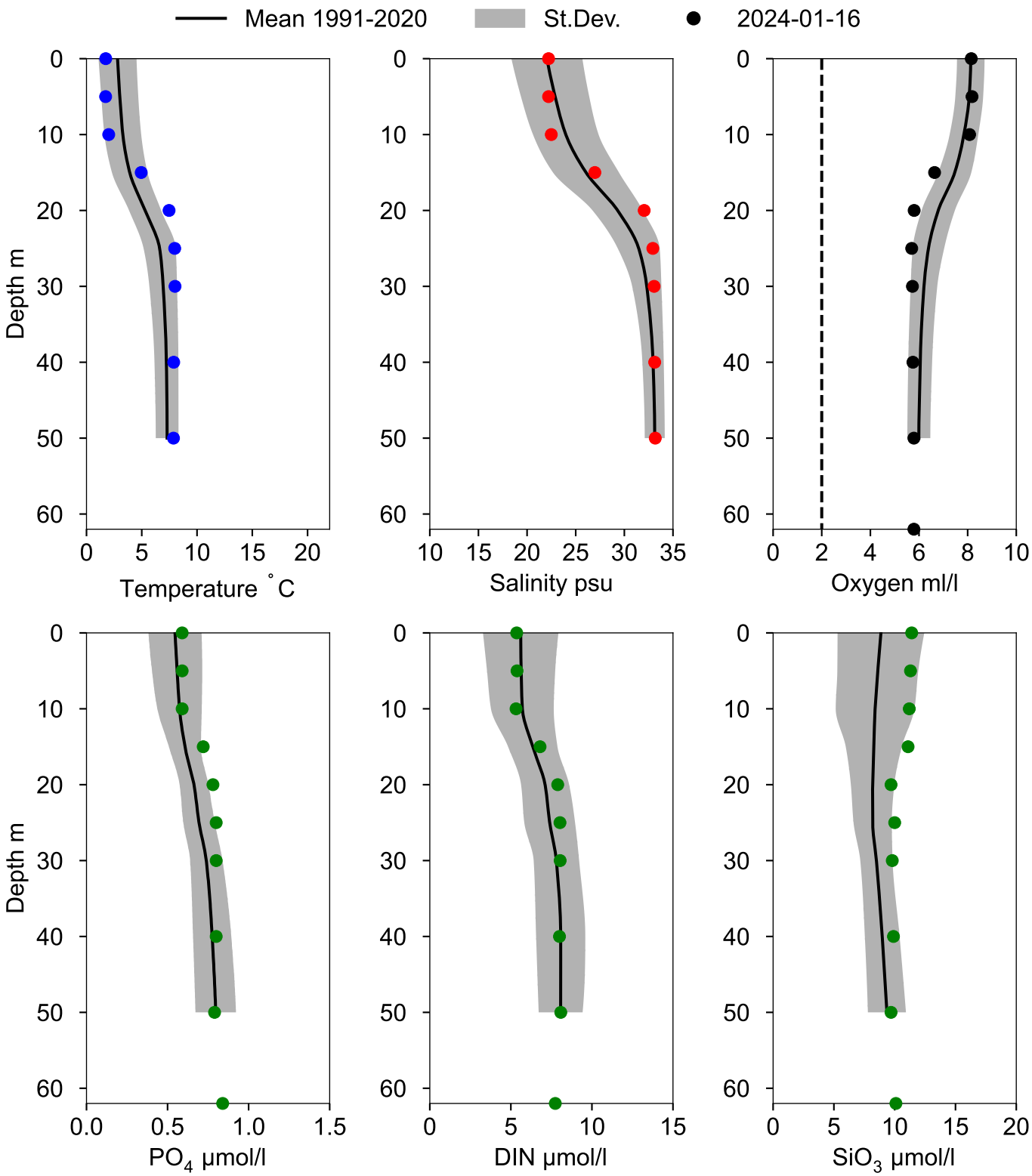
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

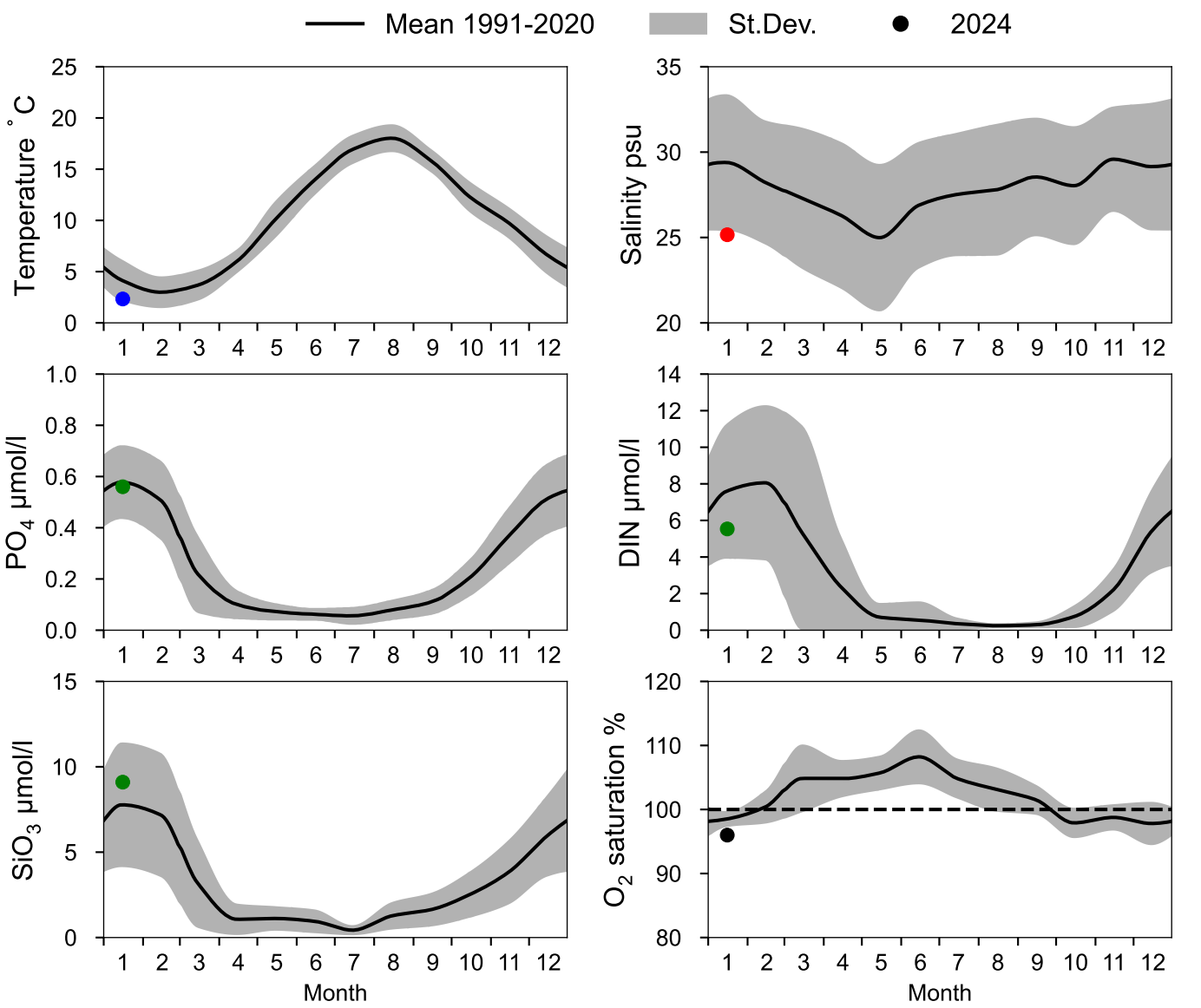


Vertical profiles ANHOLT E
January

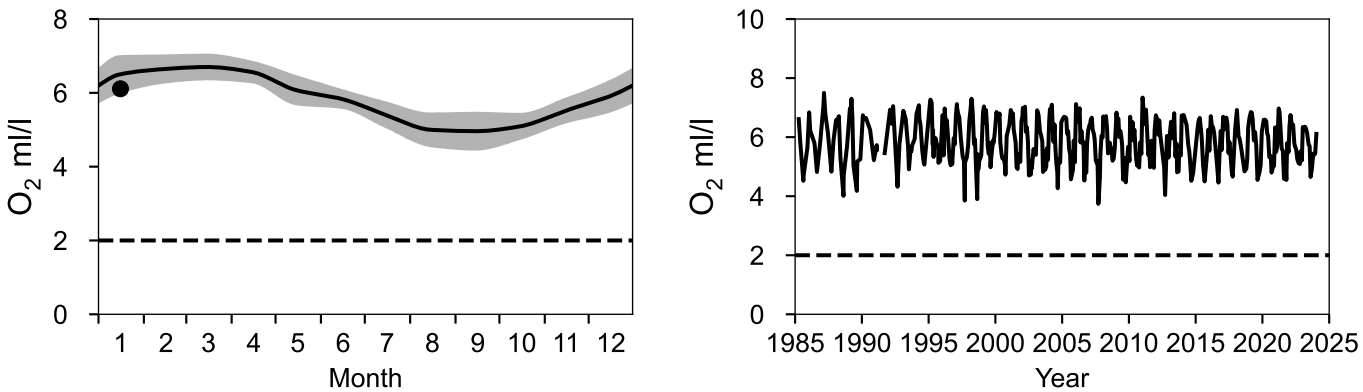


STATION P2 SURFACE WATER (0-10 m)

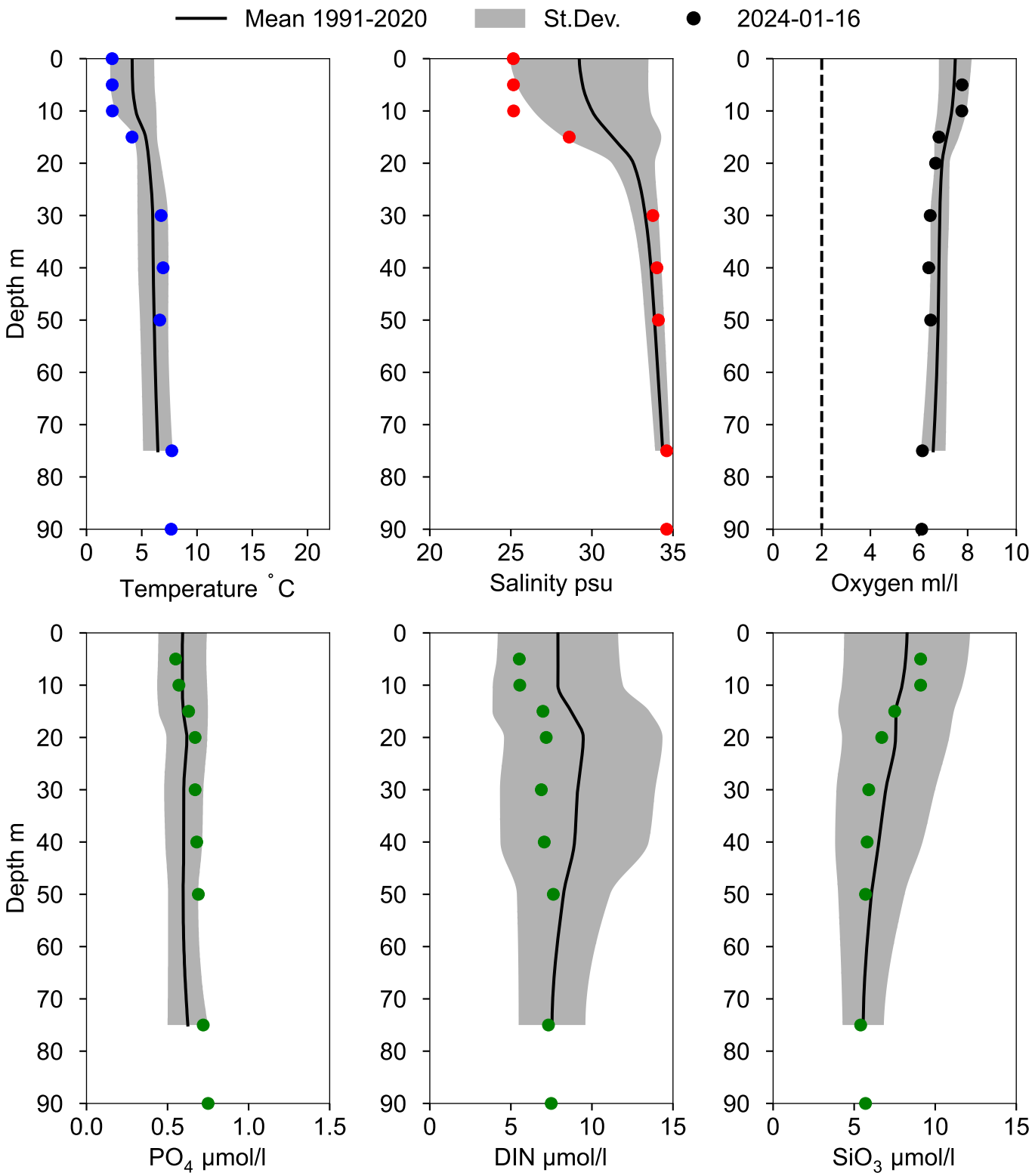
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 75 m)

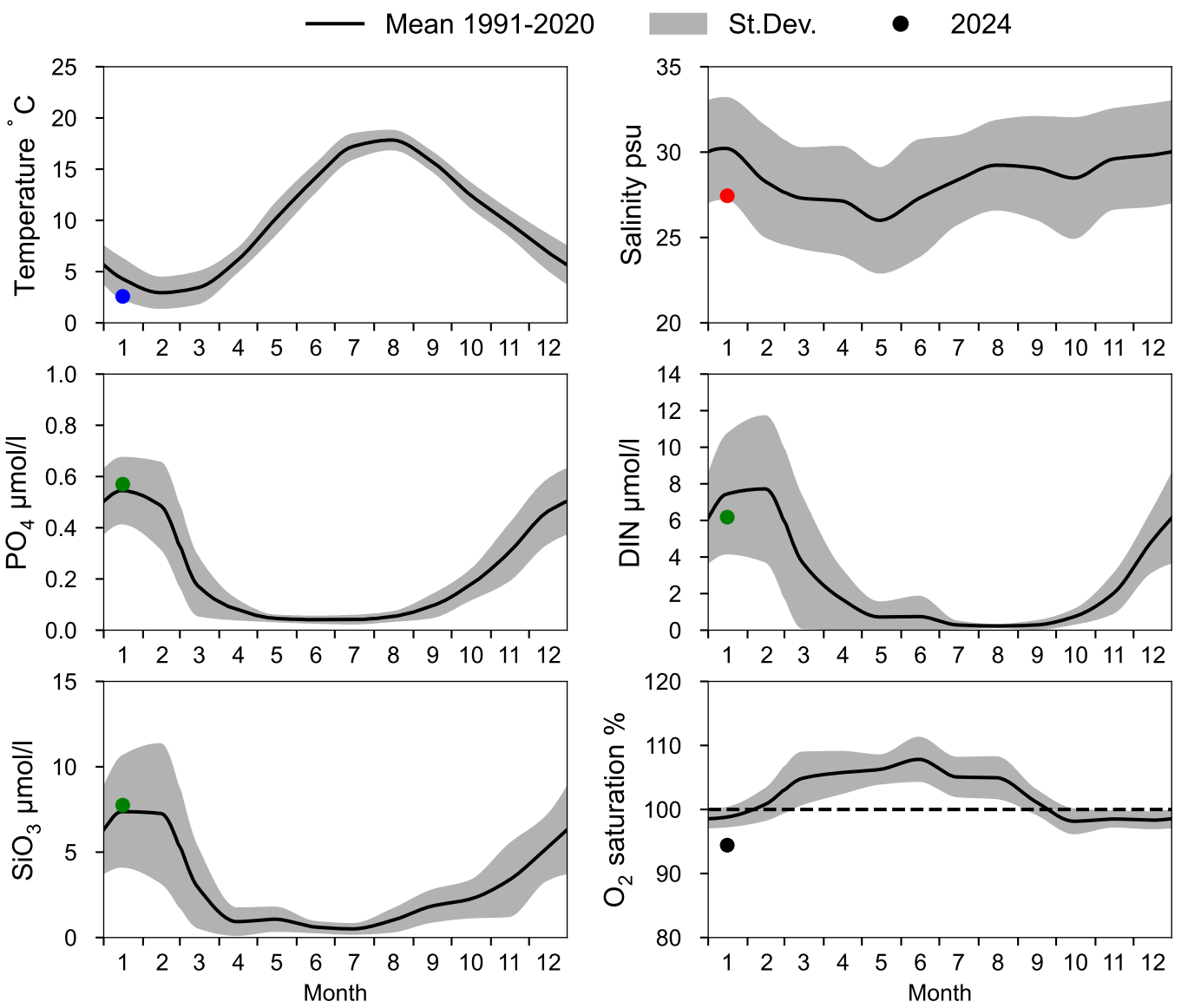


Vertical profiles P2
January

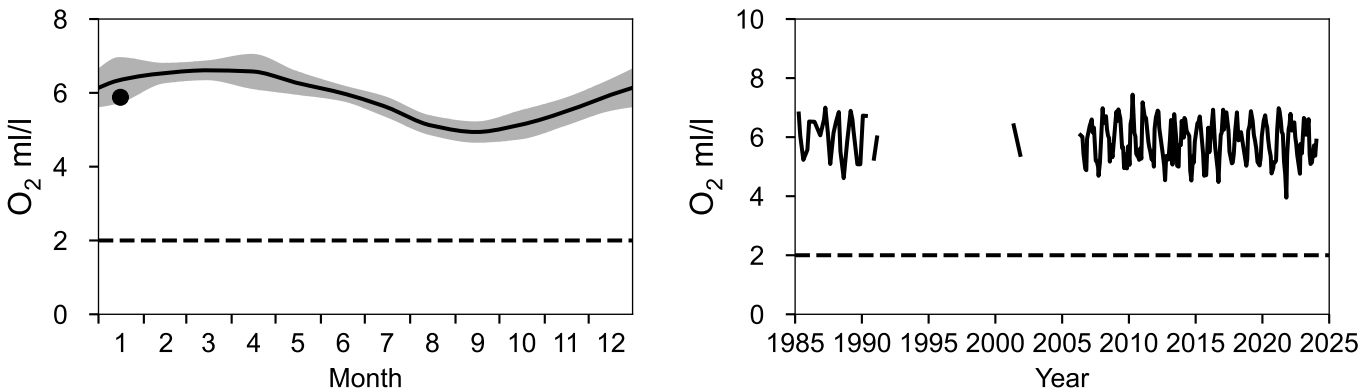


STATION Å13 SURFACE WATER (0-10 m)

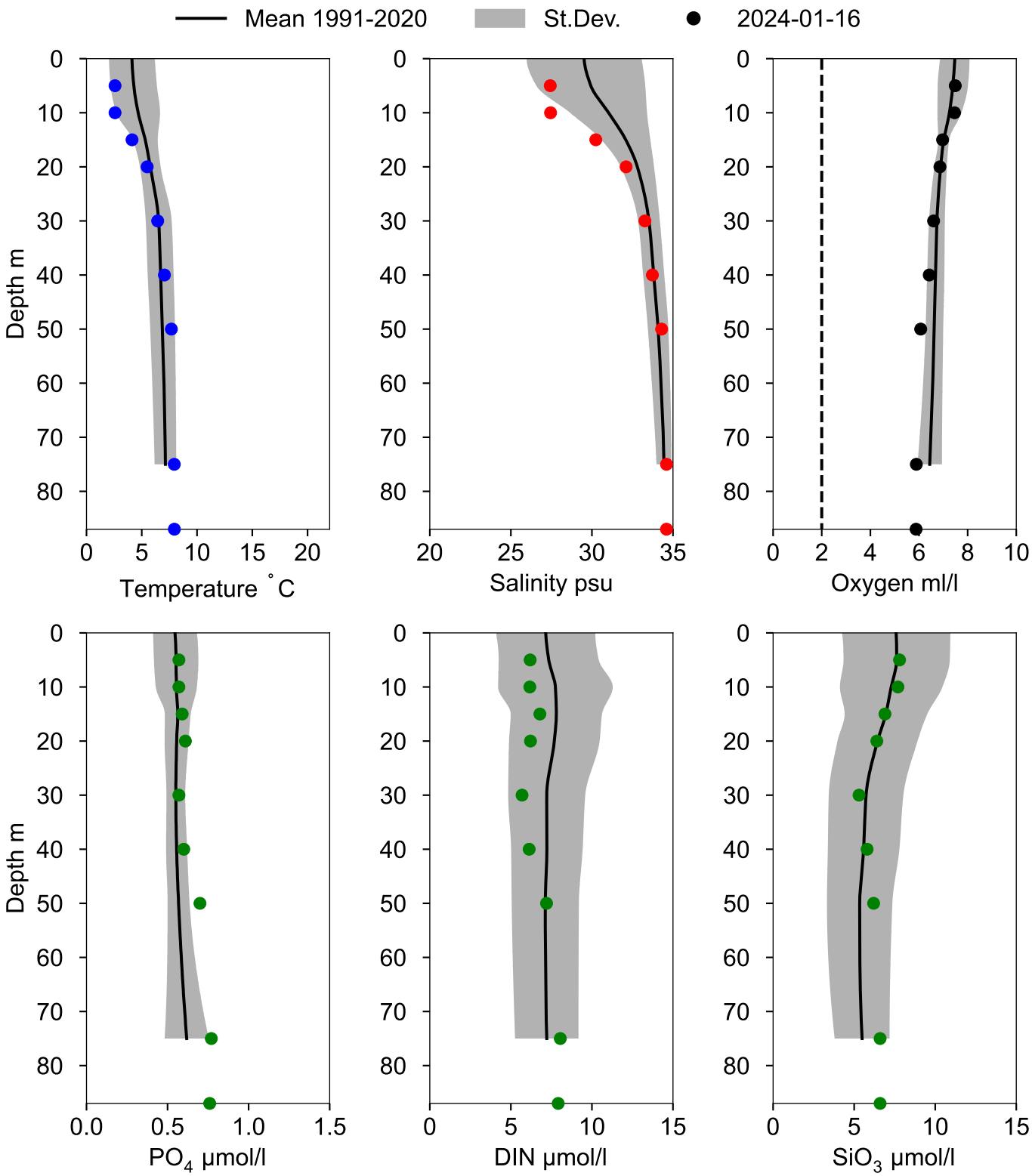
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 82 m)

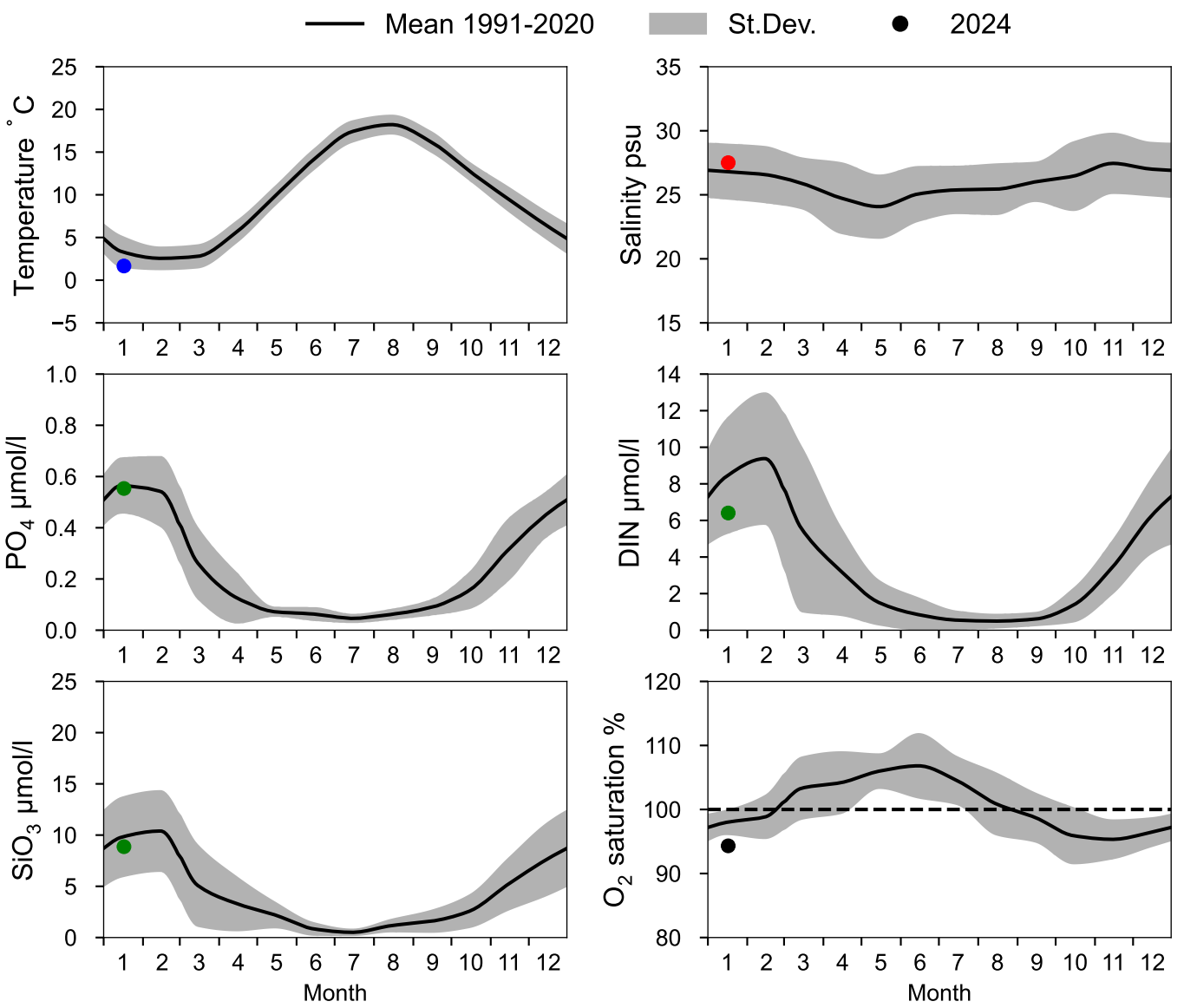


Vertical profiles Å13
January

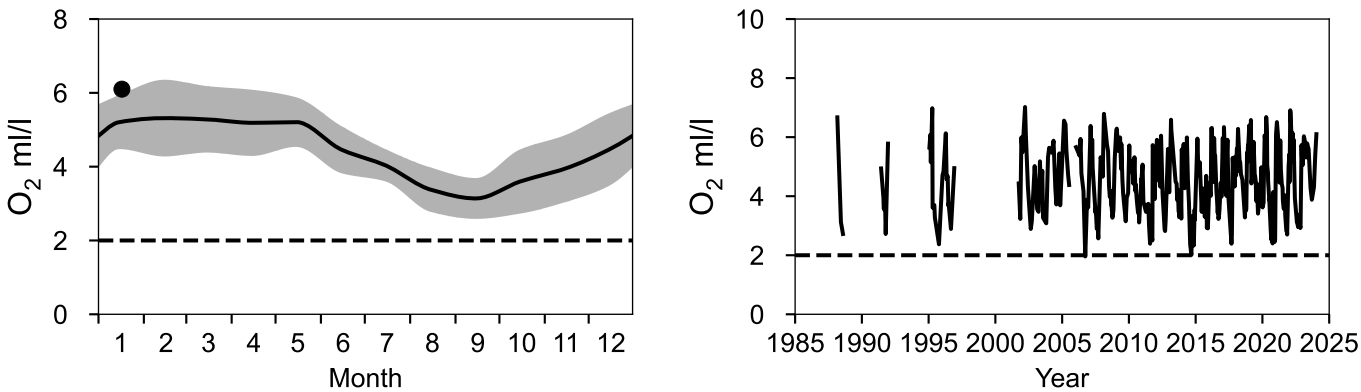


STATION SLÄGGÖ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)



Vertical profiles SLÄGGÖ
January