Helena Björnberg

SMHI

Swedish Meteorological and Hydrological Institute
Oceanographic Laboratory

2025-07-30
Dnr: 2025/69/3.1.3

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

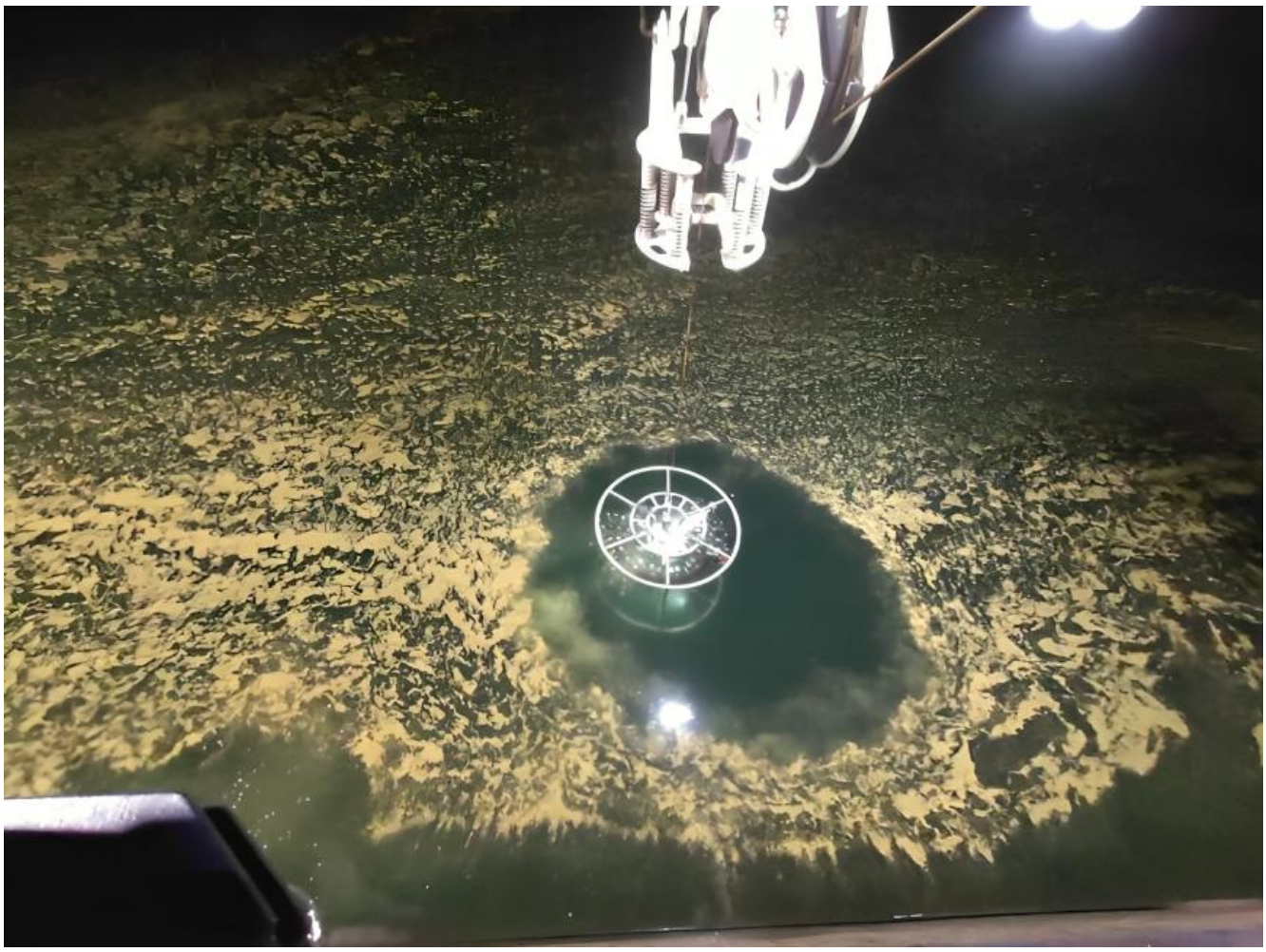

Photo: Anna-Kerstin Thell, SMHI

Survey period: 2025-07-14 till 2025-07-20
Principals: Swedish Meteorological and Hydrological Institute (SMHI), Swedish Agency for Marine and Water Management (SwAM)
Cooperation partners: Swedish University of Agricultural Sciences (SLU), Swedish Maritime Administration (SMA)

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SUMMARY

During the expedition, which is part of the Swedish pelagic monitoring program, Skagerrak, Kattegat, the Sound, and the Baltic Proper were visited.

Surface water temperatures in all sea areas were around normal, ranging between 16.3 – 19.8 °C. Dissolved inorganic nitrogen and phosphorus in the surface water showed low concentrations, which is normal for the season. Silicate concentrations in the surface water were ranging between slightly above to above normal at all stations in the Baltic Proper and in the Sound.

In the Baltic Proper, the oxygen situation remains very poor. Good oxygen conditions were only found in the Arkona Basin and at station BY39. Acute oxygen deficiency, meaning oxygen levels below 2 ml/l, was noted from 60 to 80 meters depth in the Western and Eastern Gotland Basins, except at the shallow station BY39. Hydrogen sulphide was measured from 70 to 80 meters depth in the Western Gotland Basin and from 80 to 145 meters depth in the Eastern Gotland Basin. In the Bornholm Basin and the Hanö Bay, acute oxygen deficiency was present from 70 meters depth, but no hydrogen sulphide was detected in the bottom water.

At several stations in the Baltic Proper, high peaks of chlorophyll fluorescence occurred from the surface down to 20 meters depth. In the Kattegat, large peaks were observed between 20 and 25 meters depth. Surface accumulations of cyanobacteria were noted throughout the Baltic Proper, with prominent surface blooms at the southern tip of Öland and in the Hanö Bay. It was evident that the cyanobacterial bloom was widespread throughout the Baltic Sea.

More information about the algae situation can be found in the Algaware report for July:

https://www.smhi.se/publikationer/publikationer/algrapporter.

The next cruise is planned to start on August 9 in Lysekil and end in Lysekil on August 15.

RESULTS

The expedition was carried out aboard R/V Svea and started in Lysekil on July 14 and ended in Lysekil on July 20.
The expedition was dominated by warm, calm, and clear weather with light winds. The highest wind speed recorded was 9.5 m/s in the Arkona Basin. Air temperatures ranged between 17 – 25 °C.

Svea's Ferrybox system, used for continuous surface water measurements, was operational throughout the expedition. In Skagerrak, between stations Å17 and Å15, and between Å15 and Å13, Svea's MVP (Moving Vessel Profiler) was deployed. This instrument provides profiles of temperature, salinity, oxygen, and chlorophyll fluorescence while underway.

At all stations in the Kattegat and the Baltic Sea, surface water was sampled for a project investigating algal toxins produced by cyanobacteria. The project is a collaboration between SMHI, SLU, and the Swedish Food Agency, with sampling planned during the July and August expeditions.
Gelatinous plankton, which is a new parameter in the monitoring program from 2025 onwards, was sampled using a net at several stations in both the Skagerrak/Kattegat area and the Baltic Sea. The gelatinous plankton samples were photographed in a photo box, and the images will later be analysed by the University of Gothenburg.

At several stations in the Baltic Sea, eDNA sampling was conducted as part of the SAMBAH II project, aiming to map the presence of porpoises in the Baltic Proper.
At stations BY5 and BY38 in the Baltic Sea, an intercalibration of phycocyanin was carried out in cooperation with VOTO. Water samples were collected from standard depths down to 30 meters to examine the occurrence of cyanobacteria in the water column. The goal is to investigate whether future cyanobacterial blooms can be predicted.

At Östergarnsholm, a pCO_2 sensor was replaced on behalf of Uppsala University.

Additional phytoplankton samples from surface water were taken at stations Anholt E and Å17 for Uppsala University. At Anholt E, microzooplankton samples were also collected for the University of Gothenburg.

During the expedition, phytoplankton samples were analysed onboard by phytoplankton expert Anders Torstensson. The results are presented in the AlgAware report for
July**:** https://www.smhi.se/publikationer/publikationer/algrapporter.

Daily algae monitoring via satellite is carried out by SMHI during the summer and is available here:
https://www.smhi.se/vader/observationer/algsituationen/alger

This report is based on data that has undergone an initial quality check.
Further review may result in some values being adjusted. Data from the expedition will be published as soon as possible on the data host's website (SMHI), typically within one to two weeks after the end of the expedition. Some analyses are conducted post-expedition and will be published later.
Data can be downloaded here:
https://sharkweb.smhi.se/hamta-data/

Skagerrak

Surface water temperatures ranged between 16.6 – 18.3 °C, which is normal for the season.
Salinity in the surface water varied between 27 – 32 psu, with the lowest values measured in the south and the highest in the north, which is slightly above normal. The halocline was weakly developed in the area. The thermocline was clearly visible at most stations at depths between 25 and 60 meters.

Surface concentrations of dissolved inorganic nitrogen (DIN) were normal for the season and were below the detection limit (0.1 µmol/l) at all stations.
Phosphate concentrations ranged between 0.03 – 0.05 µmol/l, also normal for the season.
Silicate concentrations in surface water were normal in the northern area, while in the southern and coastal areas, levels were above normal. Measured concentrations in the offshore area ranged between 0.1 – 0.9 µmol/l, with the highest values recorded at station Å15.

The lowest oxygen concentration in bottom water was measured at Släggö, at 4.0 ml/l. In offshore deep water, levels ranged between 5.5 – 5.8 ml/l, which is considered normal.
Chlorophyll fluorescence measurements using CTD, which indicate phytoplankton activity, showed activity between 5 and 50 meters in the area.

Kattegatt och the Sound

The surface water temperature ranged between 18.5 – 19.8 °C, which is slightly higher than normal for the season. The surface salinity in the Kattegat varied between 15 – 23 psu, which is normal for the season or slightly lower than normal. The lowest salinity was observed at Anholt E.

In the Sound, the surface salinity was 8 psu, which is lower than normal. In the Kattegat and in the Sound, the temperature and salinity stratification was found between 15 and 25 meters.
The concentrations of nutrients in the surface water were mostly normal to slightly above normal in the area. The concentration of DIN was <0.1 µmol/l and phosphate varied between 0.06 – 0.19 µmol/l. The silicate concentration varied between 0.1 – 13.07 µmol/l, the highest value measured in the Sound, which is much above normal.

Oxygen measurements showed normal values in the bottom water: around 4.2 – 5.3 ml/l in the Kattegat and 3.16 ml/l in the Sound.
In the Sound, a chlorophyll fluorescence peak was noted around 15 meters. In the Kattegat, the activity was moderate, but a large peak was observed at Anholt E at about 25 meters.

Baltic Proper

The surface water temperature was around normal throughout the Baltic Sea, with a few exceptions, with temperatures between 14.6 – 17.6 °C.

At BY39, south of Öland, the surface temperature was 17.6 °C, which is higher than normal.
Surface salinity was 6.4 – 7.9 psu and varied from being normal to slightly above normal throughout the investigated area.

A distinct stratification had formed in the area, with a pycnocline at approximately 20 – 30 meters depth across the entire area. The concentrations of dissolved inorganic nitrogen (DIN) in the surface water were below the detection limit, <0.10 µmol/l, at all stations except at BY20 The Fårö Deep, where the concentration was 0.17 µmol/l.

The phosphate concentration in the surface water was normal or slightly above normal for the season, with the highest values measured in the Bornholm Basin and in the northern Baltic Sea, ranging

between 0.1 – 0.29 µmol/l. The concentration of silicate in the surface water was above normal at all stations, with concentrations between 14.0 – 15.6 µmol/l.

In the Baltic Proper, the oxygen situation remains very poor, with good oxygen conditions only found in the Arkona Basin and at BY39. Acute oxygen deficiency, meaning oxygen concentrations below 2 ml/l, was noted from 60 – 80 meters in the Western and Eastern Gotland Basins, except at the shallow station BY39.

Hydrogen sulphide was measured from 70 to 80 meters depth in the Western Gotland Basin and from 80 to 145 meters depth in the Eastern Gotland Basin.
In the Bornholm Basin, acute oxygen deficiency occurred from 80 meters depth, and in the Hanö Bay from 70 meters depth, but no hydrogen sulphide was found in the bottom water.
In the Arkona Basin, the situation was better, with concentrations between 4.8 – 3.8 ml/l in the bottom water.

At several stations, high peaks of chlorophyll fluorescence were observed from the surface down to 15 meters depth. Prominent surface blooms of cyanobacteria were noted in most parts of the Baltic Proper, with particularly frequent occurrences at stations in the southern Baltic Sea, the Hanö Bay, and south of Öland.

More information about the algae situation can be found in the AlgAware report for July: https://www.smhi.se/publikationer/publikationer/algrapporter.

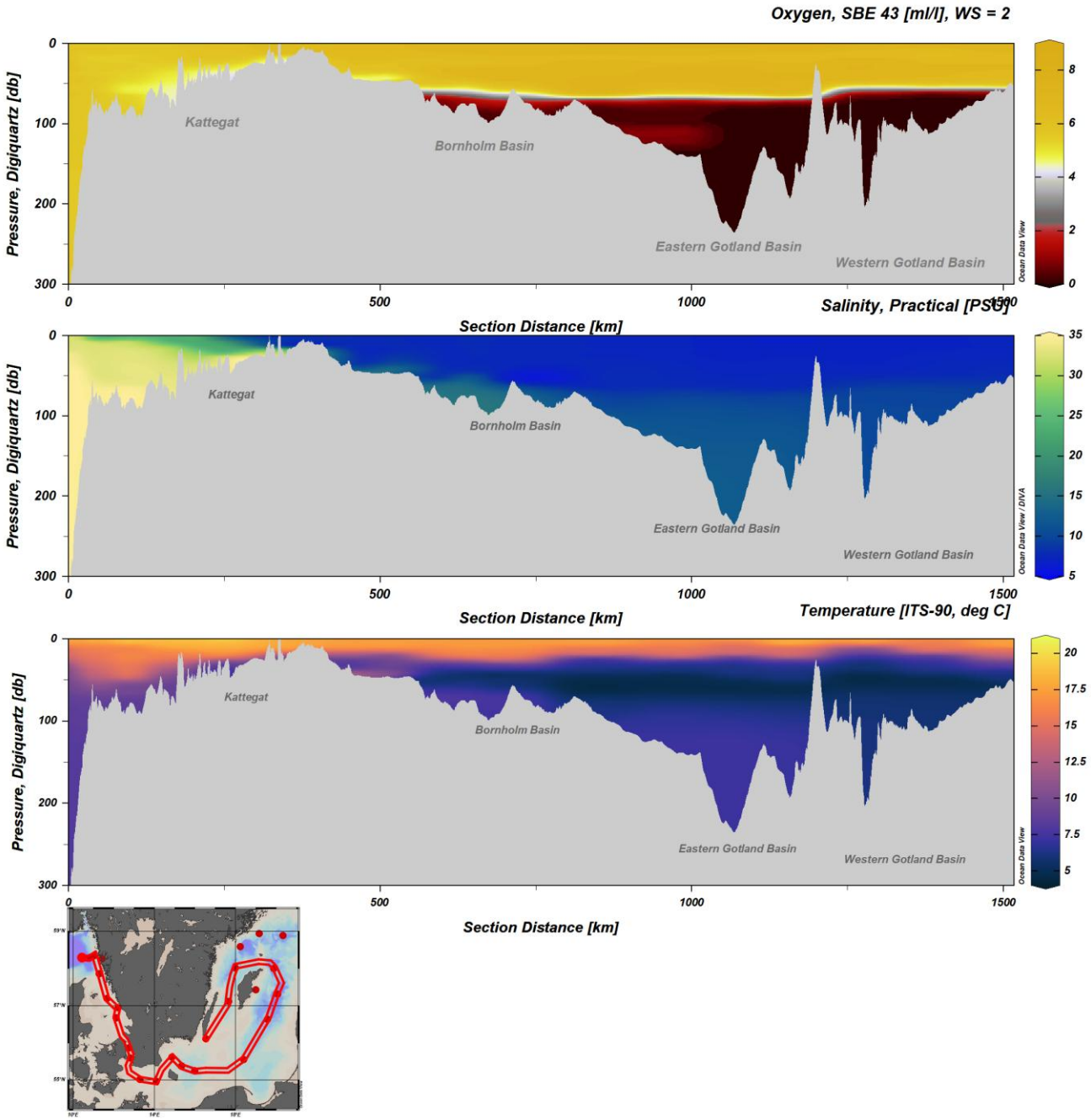


Figure 1. Transects ranging from the Skagerrak, through the Kattegat and The Sounds, further into the Baltic Proper, ending in the Western Gotland Basin shows the oxygen, salinity and temperature. Grey vertical lines indicate the positions where data is collected, also shown in the map.

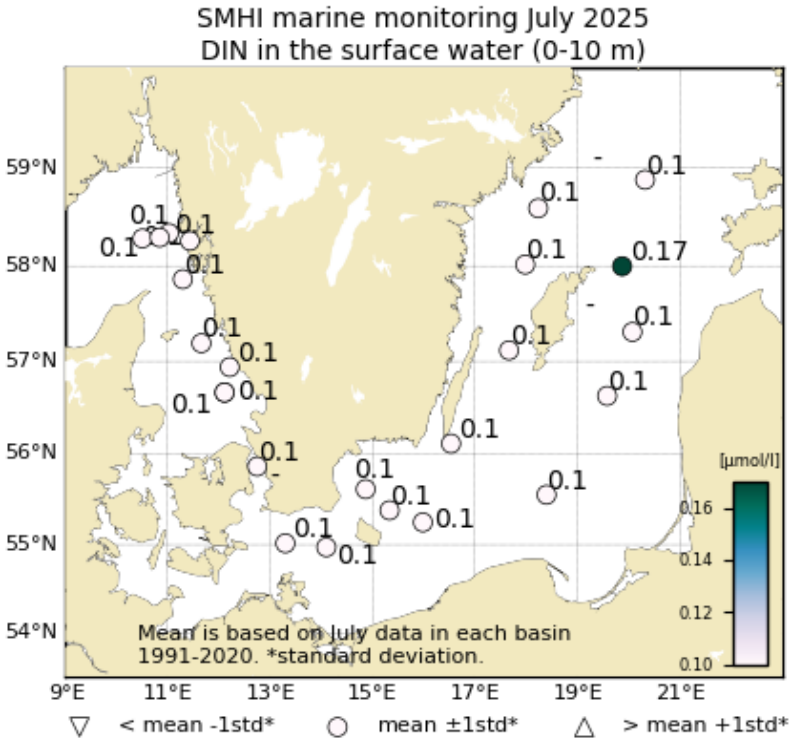


Figure 2. Concentration of dissolved inorganic nitrogen in the surface water (0-10m).

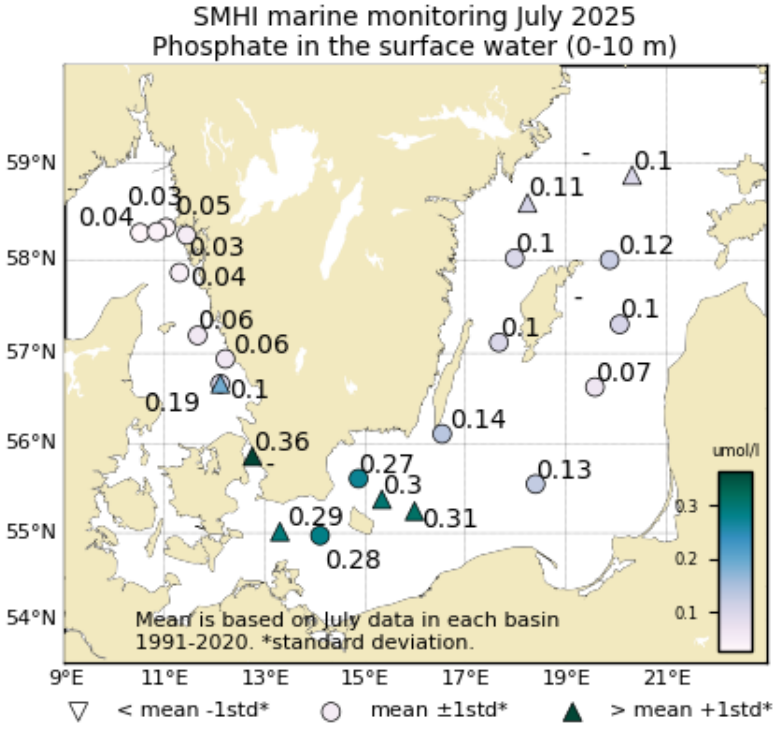


Figure 3. Concentration of phosphate in the surface water (0-10m).

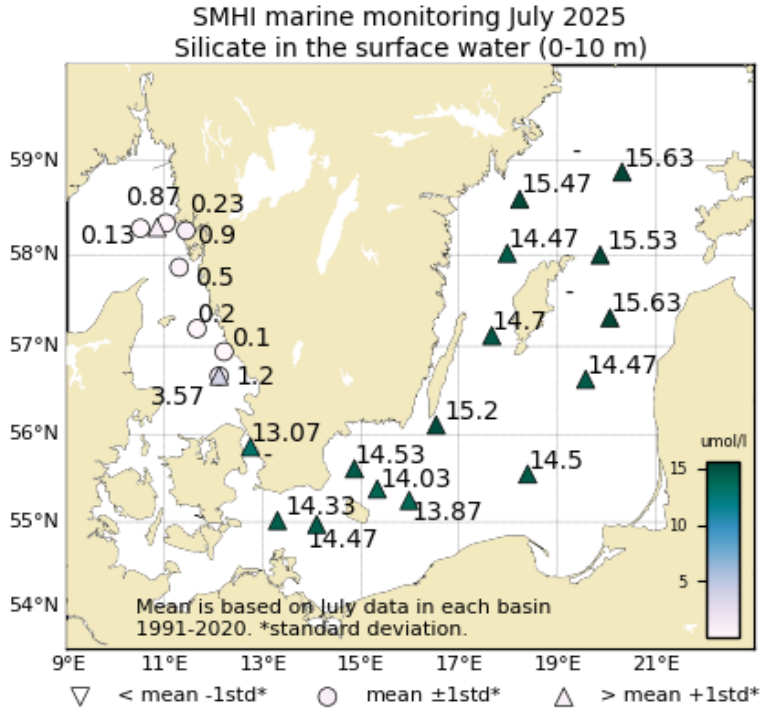


Figure 4. Concentration of silicate in the surface water (0-10m).

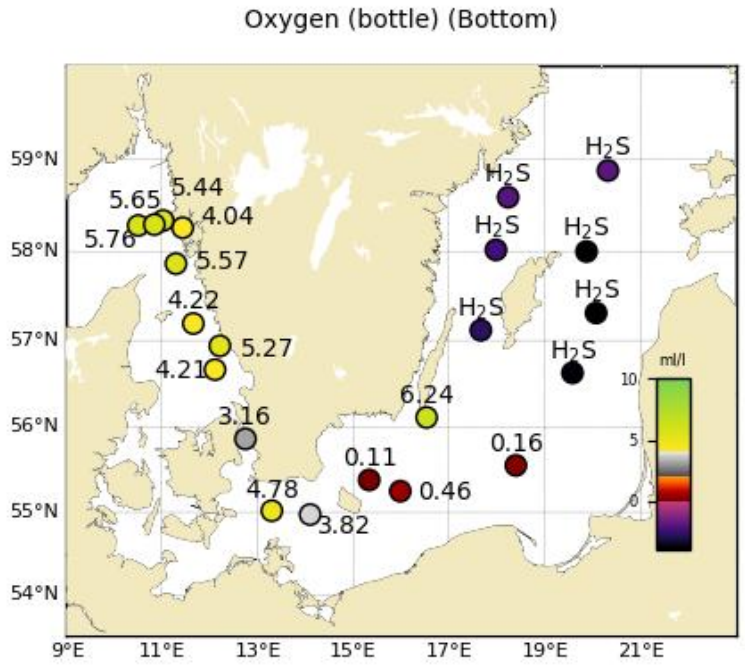


Figure 5. Oxygen concentration in the bottom water.

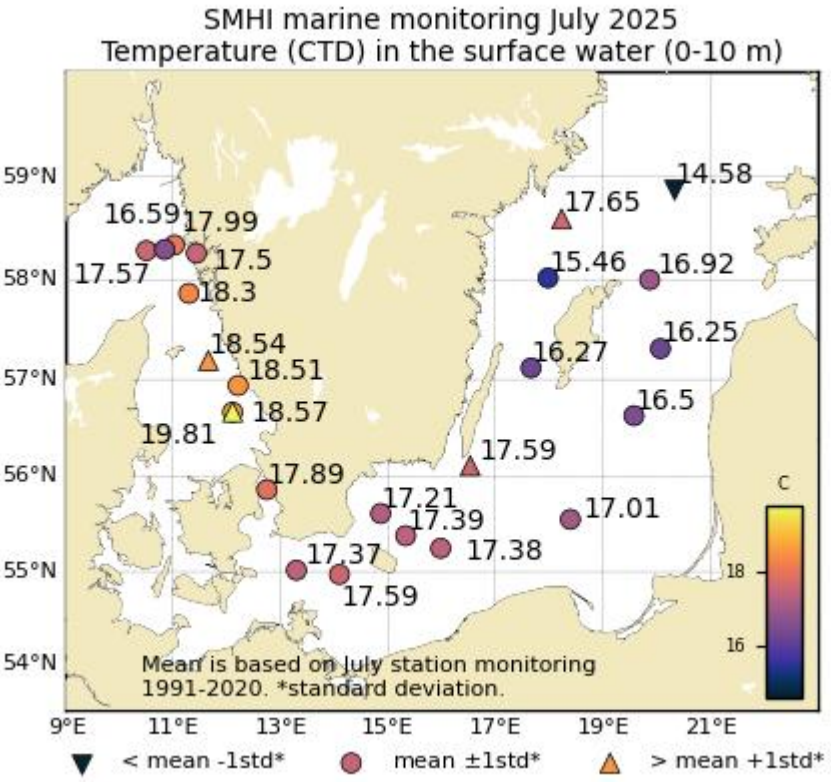


Figure 6. Temperature in the surface water (0-10m).

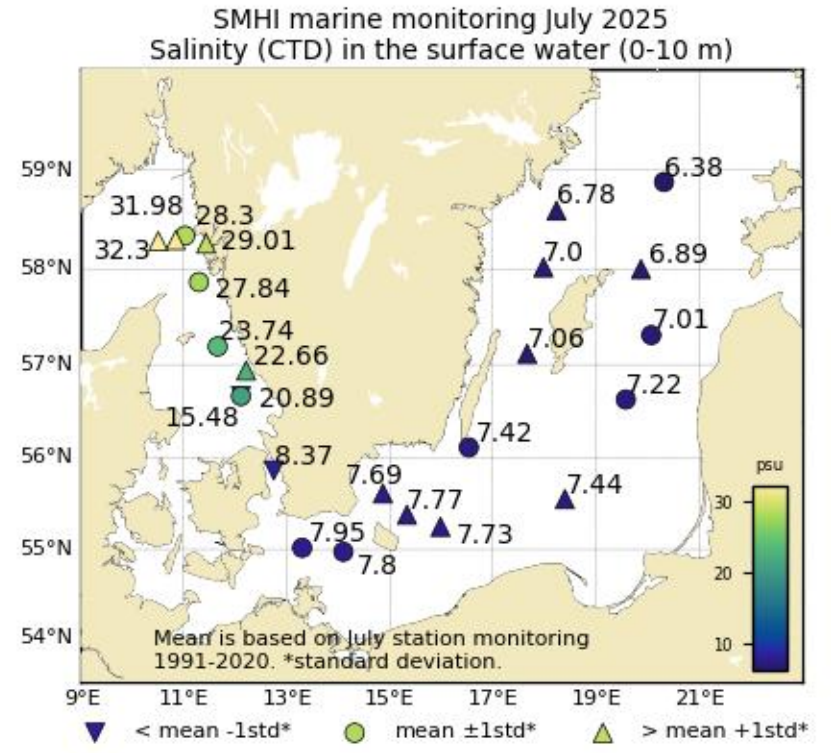


Figure 7. Salinity in the surface water (0-10m).

PARTICIPANTS

Name	Position	From
Sara Johansson	Chief scientist, marine chemist	SMHI
Helena Björnberg	Oceanographer	SMHI
Johan Håkansson	Marine chemist	SMHI
Sari Sipilä	Marine chemist	SMHI
Anna-Kerstin Thell	Marine chemist	SMHI
Anders Torstensson	Marine biologist	SMHI

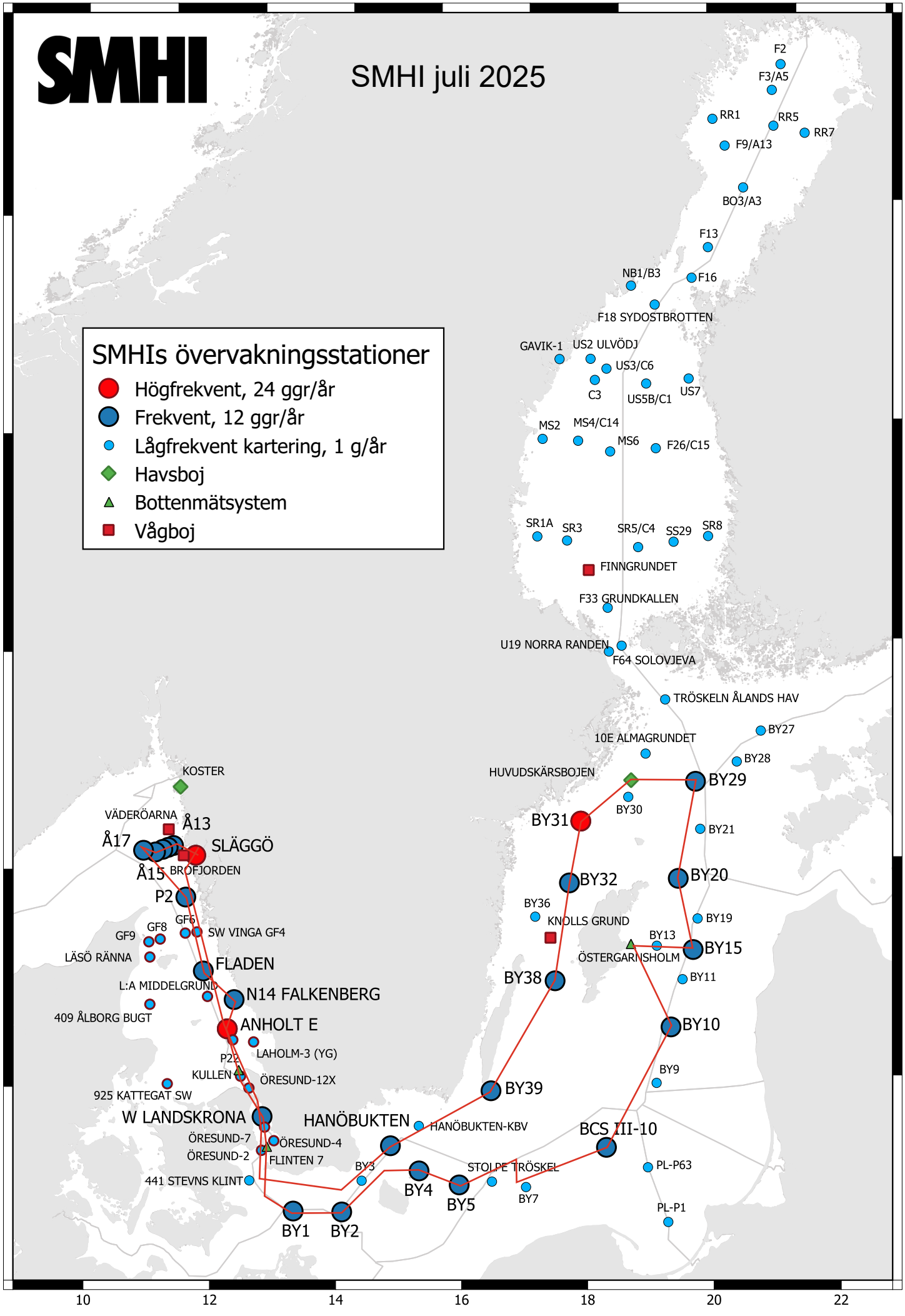
APPENDICES

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

SMHI

SWEDAC ACKREDITERING
Ackred. nr. 1420
Provning
ISO/IEC 17025

Havs och Vatten myndigheten


SMHI
SMHI juli 2025
SMHIs övervakningsstationer
Högfrekvent, 24 ggr/år
Frekvent, 12 ggr/år
Lågfrekvent kartering, 1 g/år
Havsboj
Bottenmätsystem
Vågboj
F2
F3/A5
RR1
RR5
RR7
F9/A13
BO3/A3
F13
NB1/B3
F16
F18 SYDOSTBROTTEN
GAVIK-1
US2 ULVÖDJ
US3/C6
C3
US5B/C1
US7
MS2
MS4/C14
MS6
F26/C15
SR1A
SR3
SR5/C4
SS29
SR8
FINNGRUNDET
F33 GRUNDKALLEN
U19 NORRA RANDEN
F64 SOLOVJEVA
TRÖSKELN ÅLANDS HAV
BY27
10E ALMAGRUNDET
BY28
HUVUDSKÄRSBOJEN
BY29
BY30
BY31
BY21
BY32
BY20
BY36
KNOLLS GRUND
BY19
BY13
ÖSTERGARNSHOLM
BY15
BY38
BY11
BY10
BY9
BY39
BCS III-10
PL-P63
PL-P1
HANÖBUKTEN
HANÖBUKTEN-KBV
STOLPE TRÖSKEL
BY7
BY3
BY4
BY5
BY1
BY2
441 STEVNS KLINT
ÖRESUND-7
ÖRESUND-4
ÖRESUND-2
FLINTEN 7
W LANDSKRONA
925 KATTEGAT SW
KULLEN
ÖRESUND-12X
P22
LAHOLM-3 (YG)
409 ÅLBORG BUGT
ANHOLT E
L:A MIDDELGRUND
N14 FALKENBERG
LÄSÖ RÄNNA
FLADEN
GF9
GF8
GF6
SW VINGA GF4
P2
Å15
BRÖFJORDEN
Å17
Å13
SLÄGGÖ
VÄDERÖARNA
KOSTER
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Date: 2025-07-30
Time: 11:33

Ship: 77SE
Year: 2025

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 (Weather Cloud Wave Ice)	CZPP (Chlorophyll Zooplankton Phytoplankton Phytoplankton op)	No de	No btl
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0573	17	KANX50	BAS...	N14 FALKENBERG	5656.39	01212.74	20250715	0611	32	12	17	4	18	1015	1230	-x--	7	
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0575	17	SOCX39	BAS...	W LANDSKRONA	5552.00	01244.89	20250715	1550	51	6	27	5	18.6	1013	2720	----	9	
0576	17	SOSX00	EXT...	FLINTEN-7	5535.33	01250.74	20250715	1840	9		03	4	18.9	1013	1620	----	3	
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0578	17	BPSA03	BAS...	BY2 ARKONA	5458.29	01405.97	20250716	0216	46		35	9.4	17	1012	9990	-x--	8	
0582	17	BPEX13	BAS...	BY10	5637.92	01935.02	20250716	0510	146		11	8.48	16	1009	4830	----	15	
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0568	x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
0569	-	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
0570	x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
0571	x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
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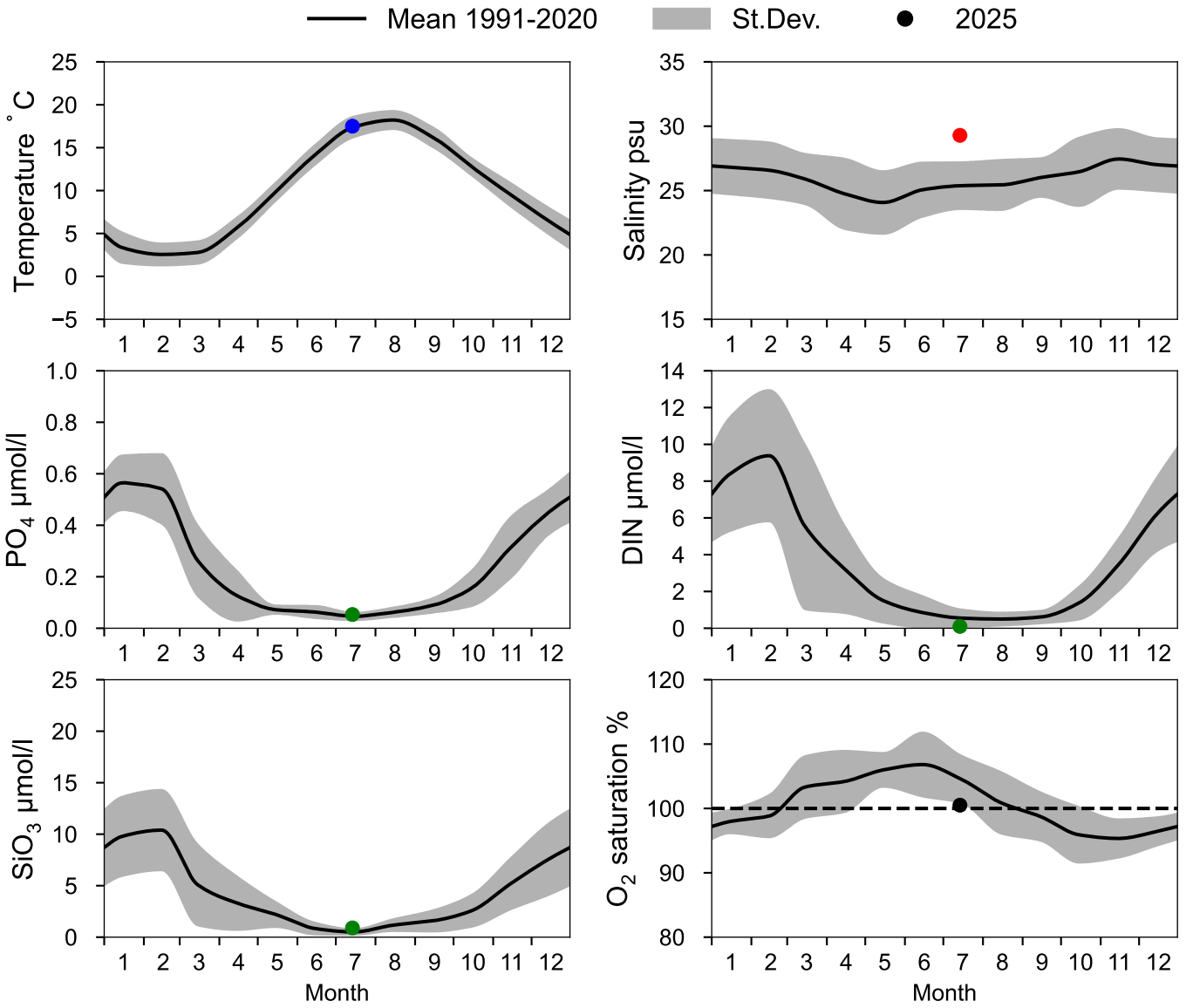
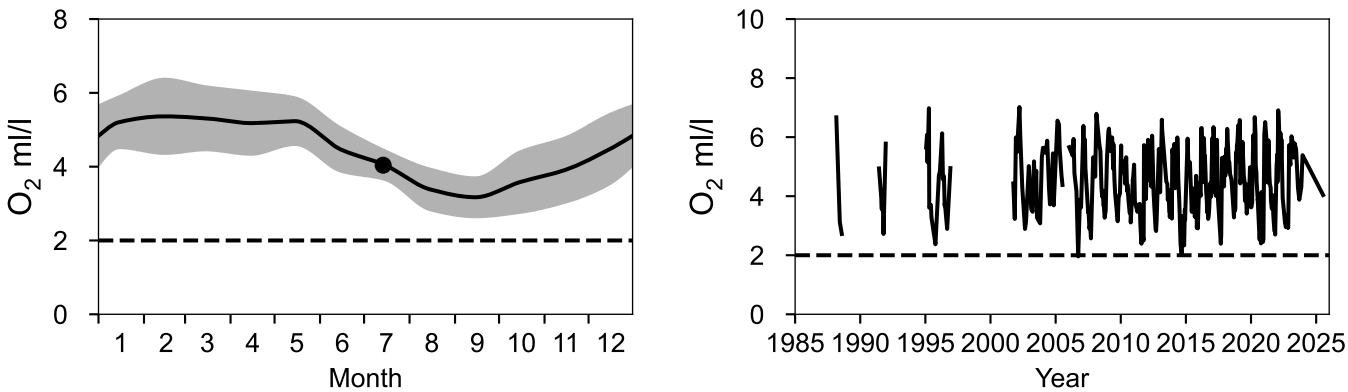
0592	x	x	-	x	-	-	x	-	x	-	x	x	x	x	-	-	x	-	x	-
0593	x	x	-	x	-	-	x	-	x	-	x	x	x	x	-	-	x	-	x	-

STATION SLÄGGÖ SURFACE WATER (0-10 m)

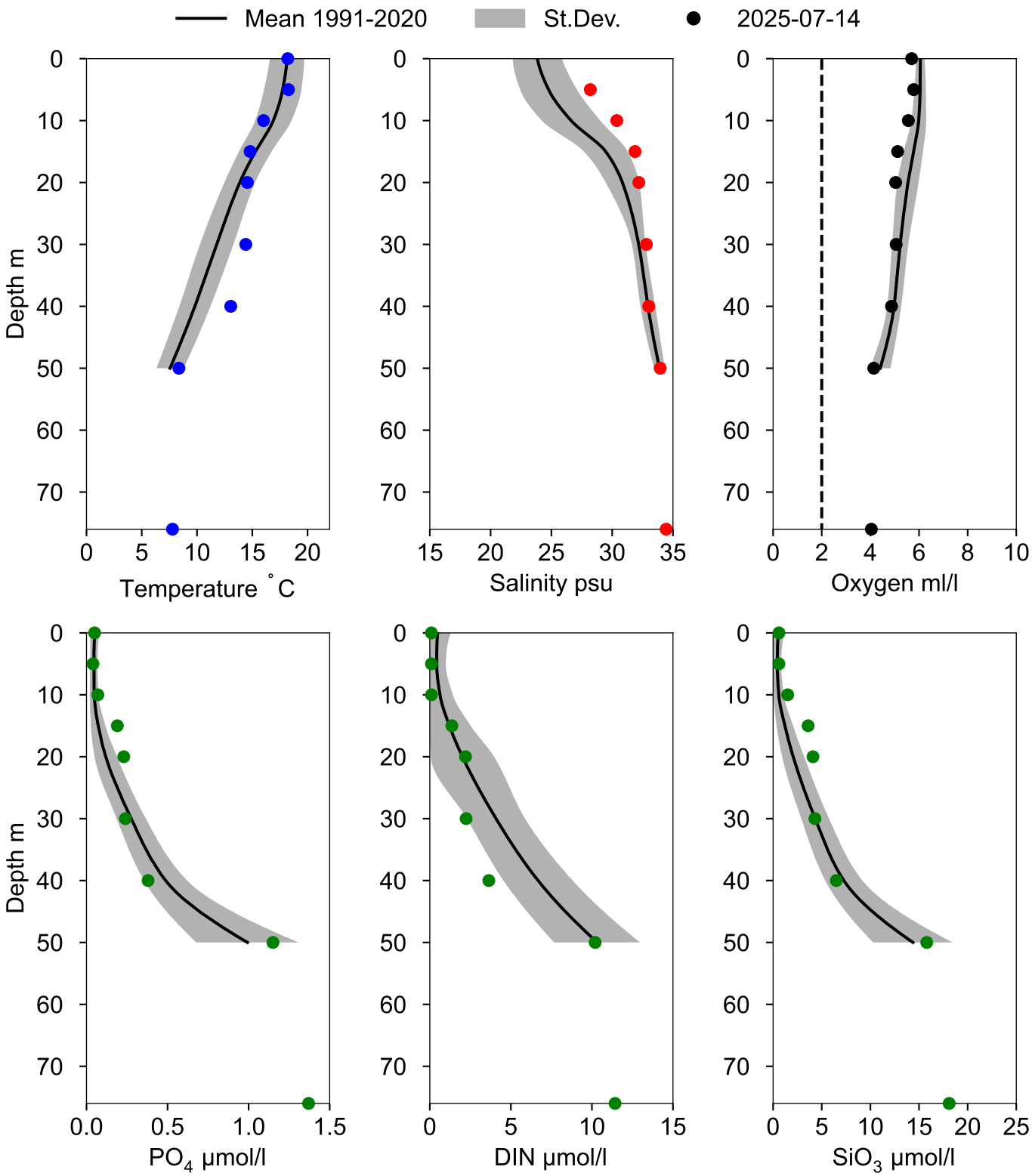
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)

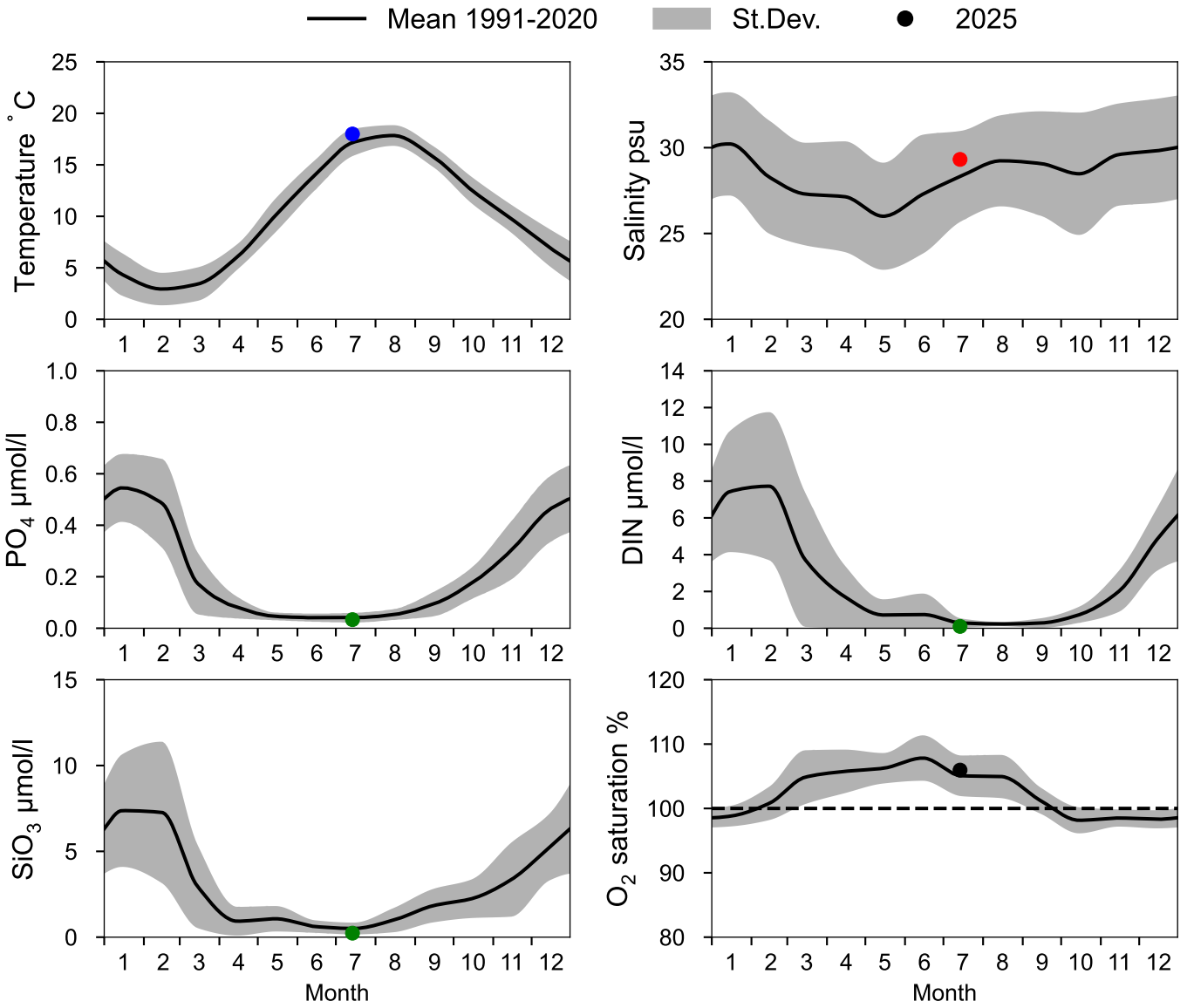


Vertical profiles SLÄGGÖ
July

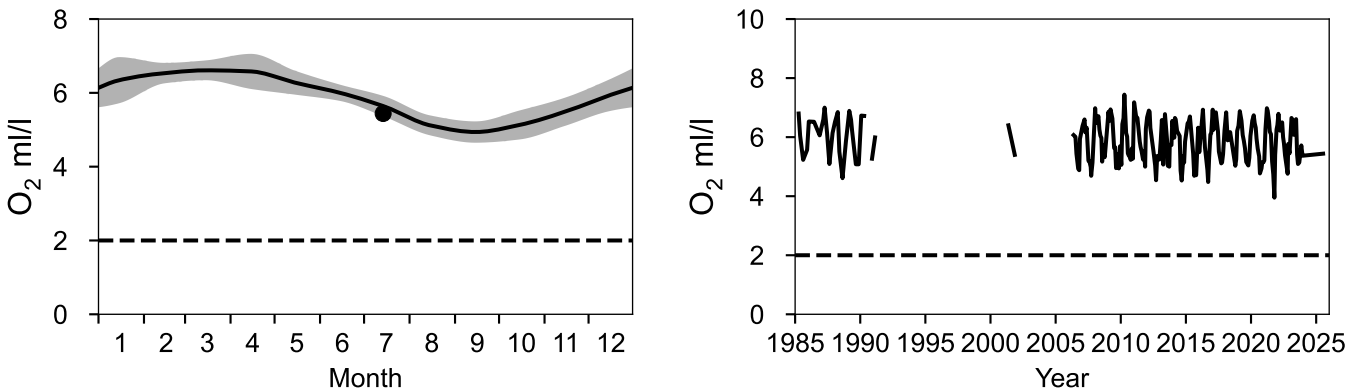


STATION Å13 SURFACE WATER (0-10 m)

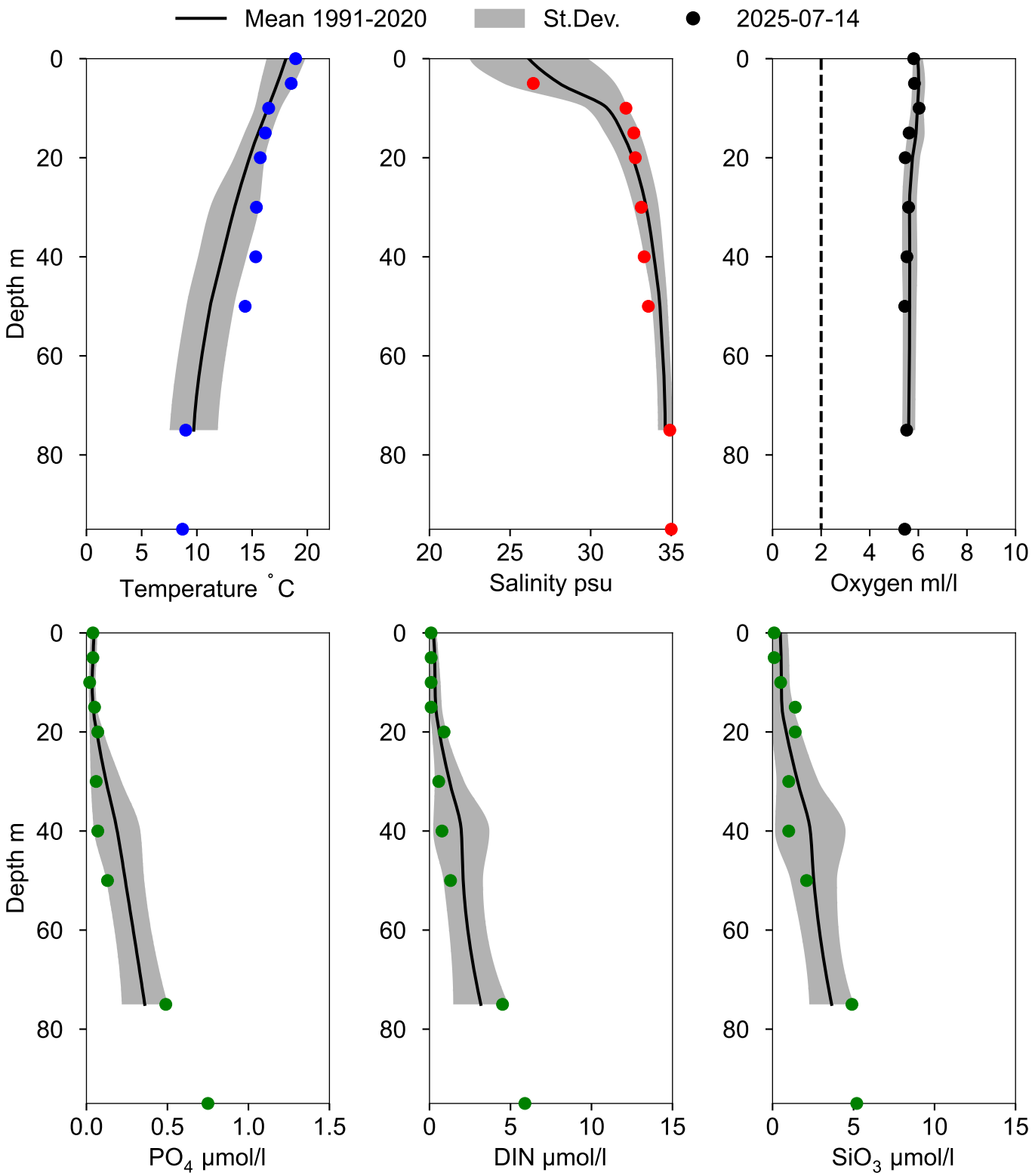
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 82 m)

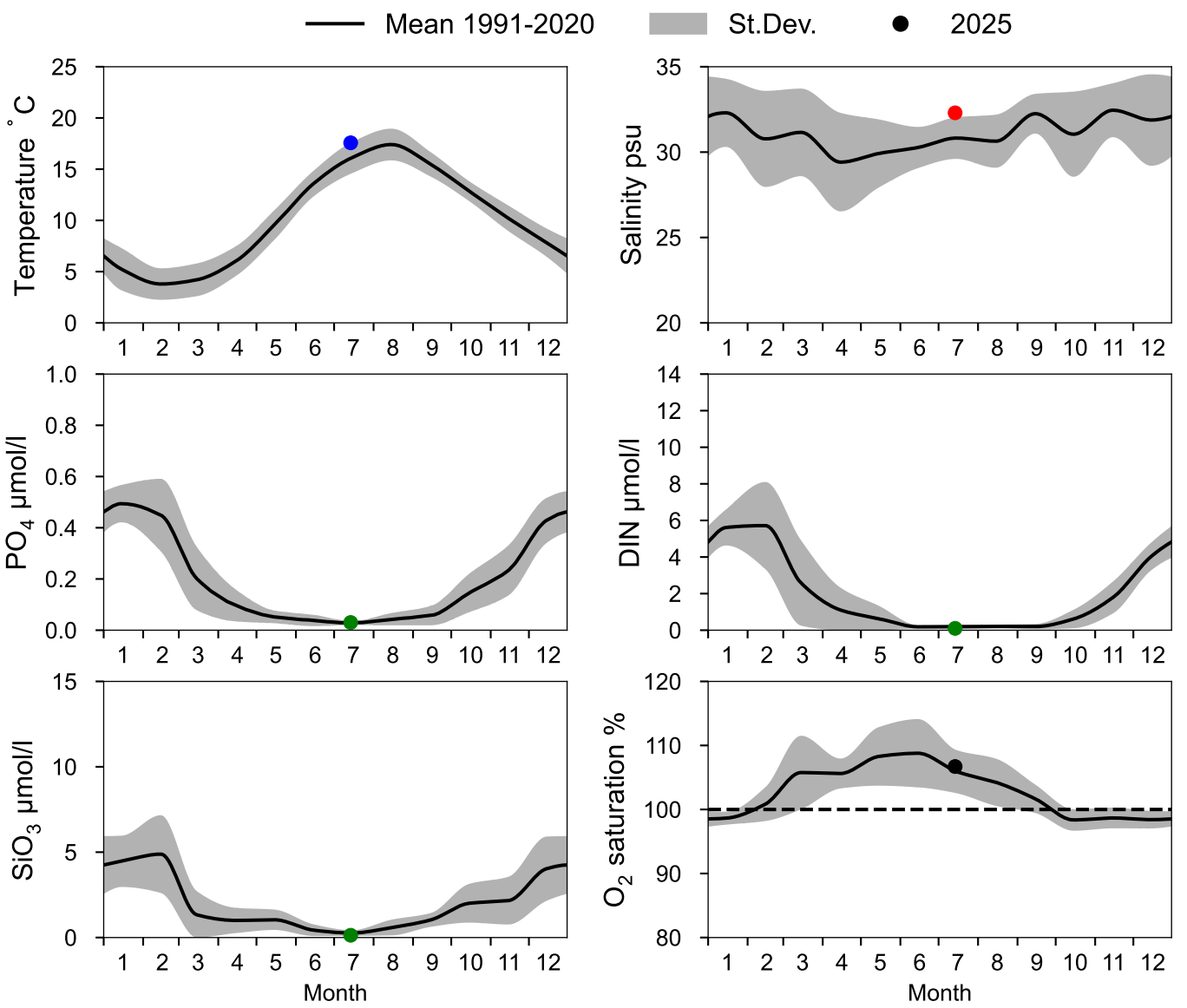


Vertical profiles Å13
July

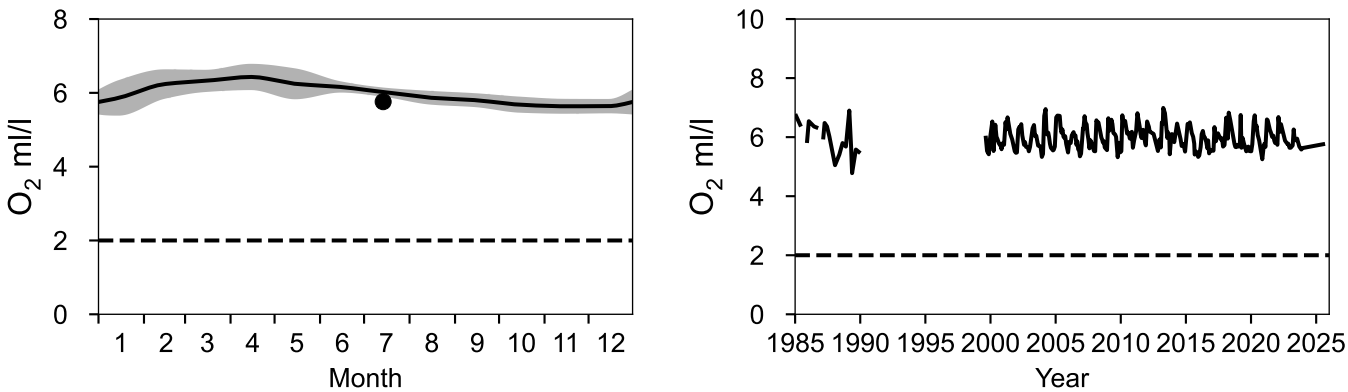


STATION Å17 SURFACE WATER (0-10 m)

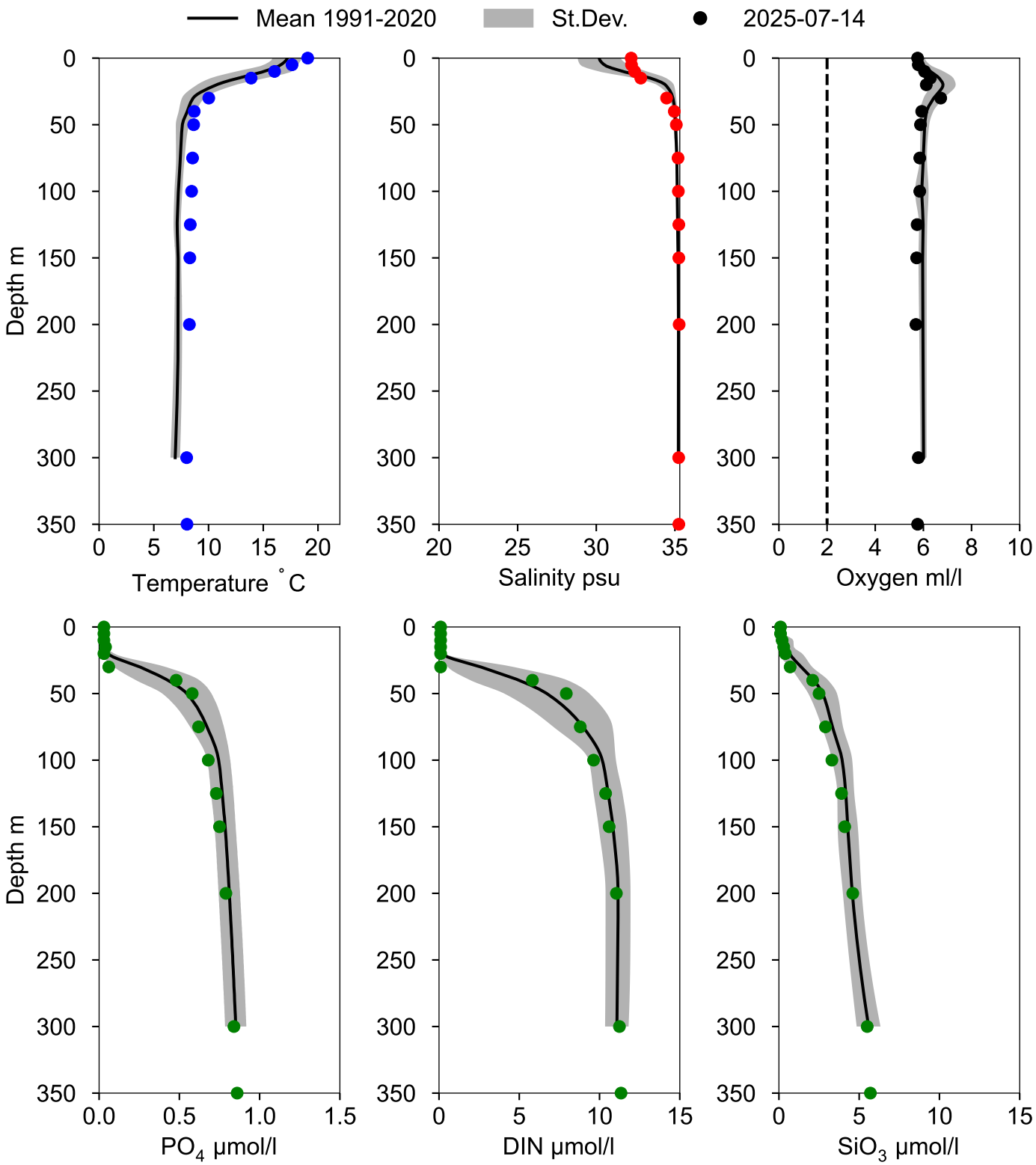
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 300 m)

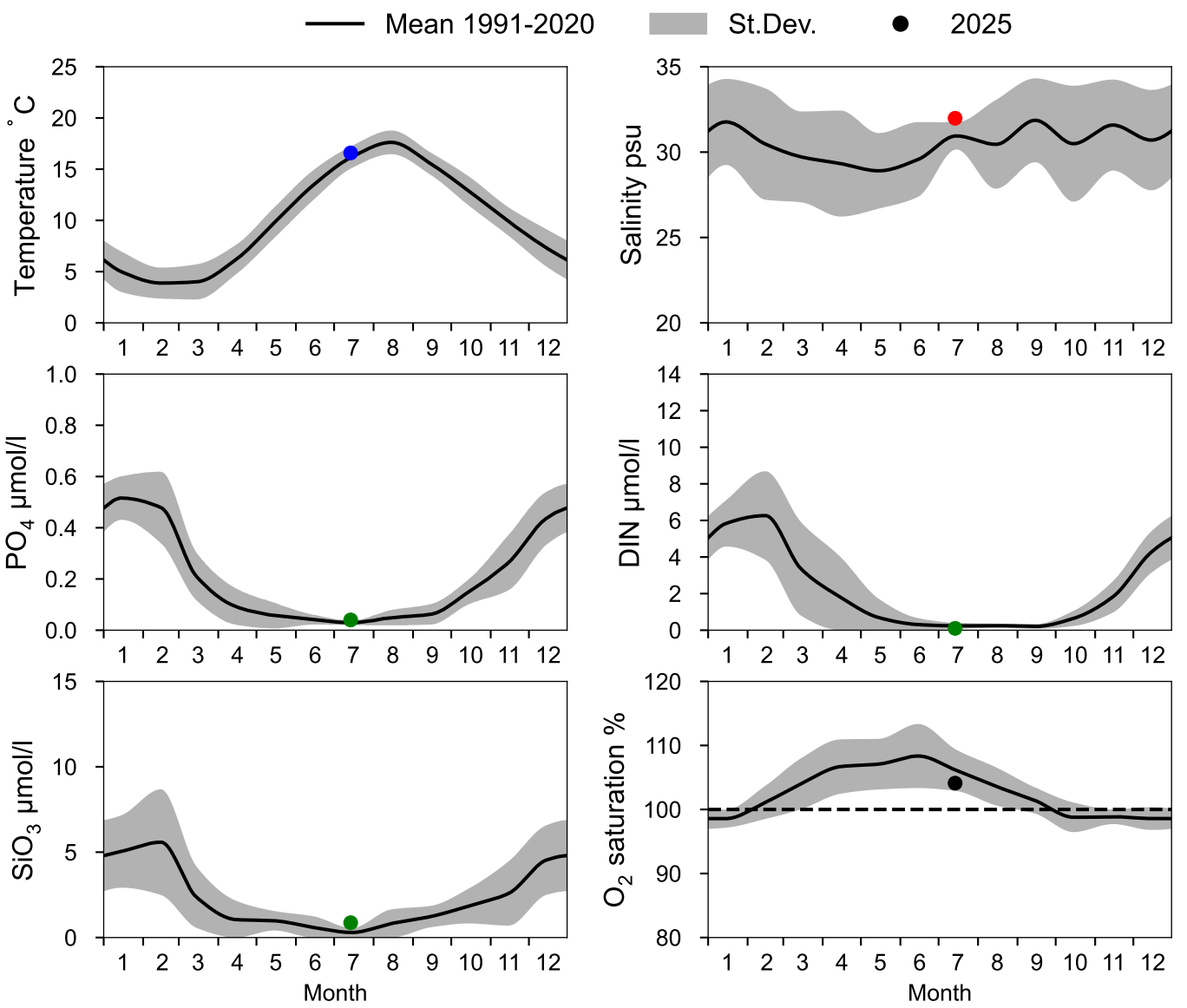


Vertical profiles Å17
July

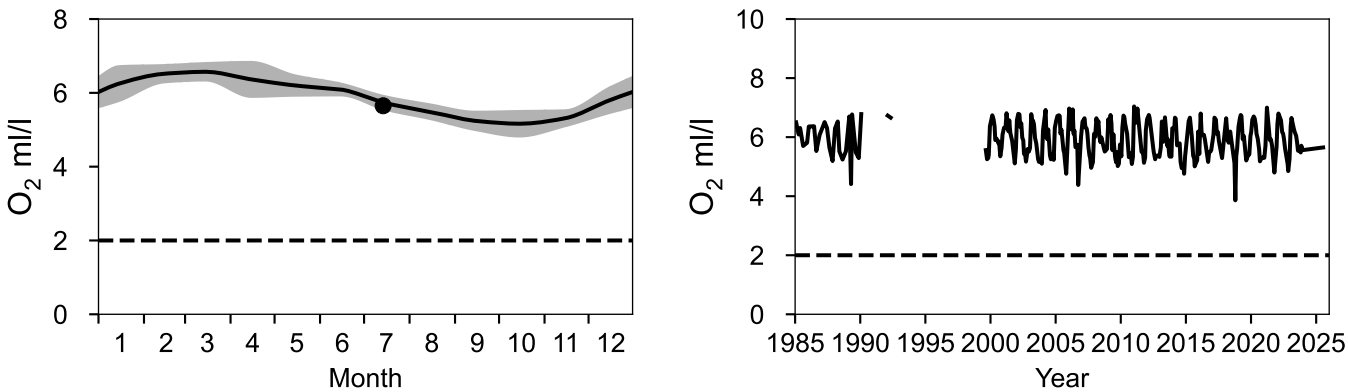


STATION Å15 SURFACE WATER (0-10 m)

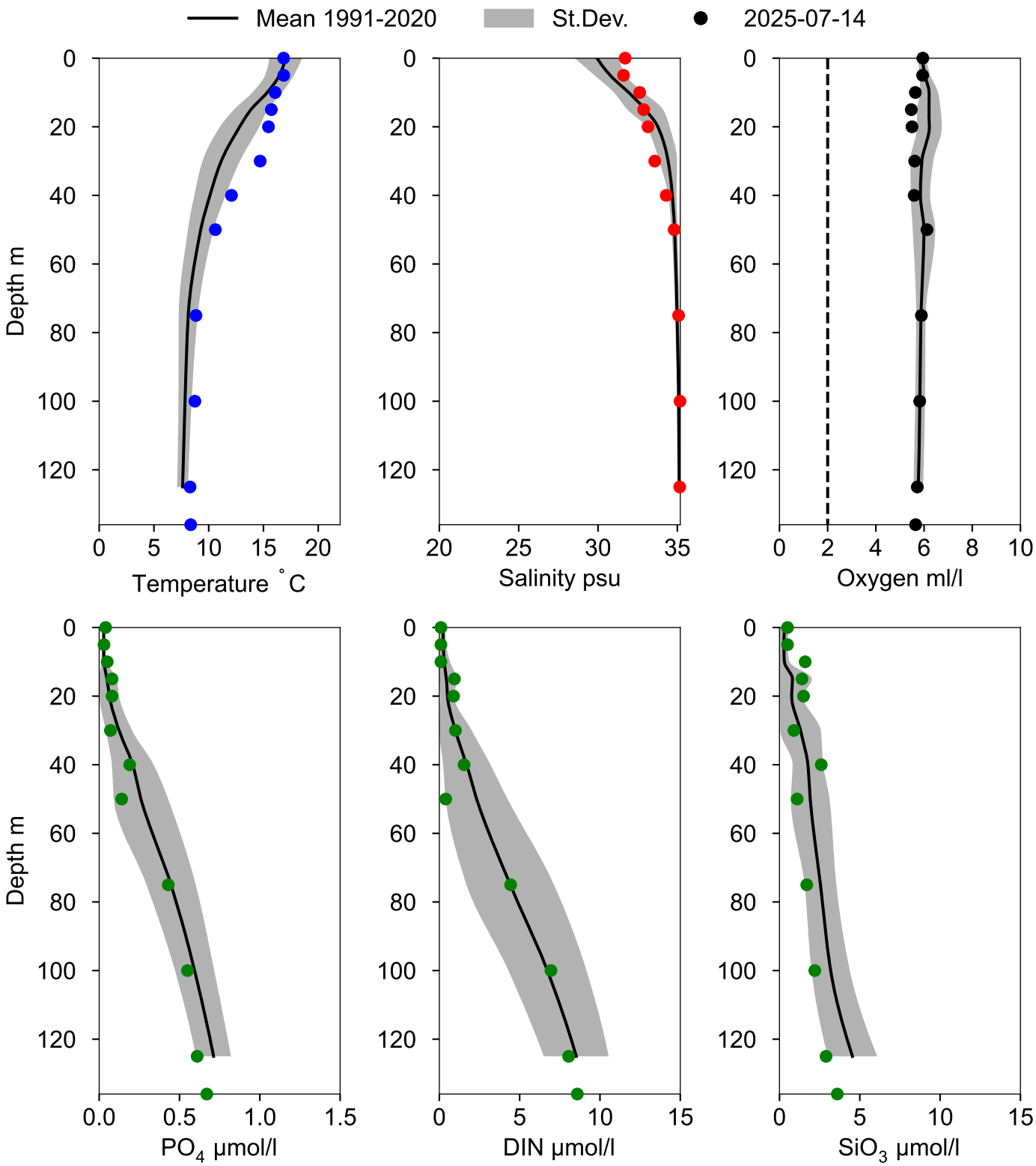
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

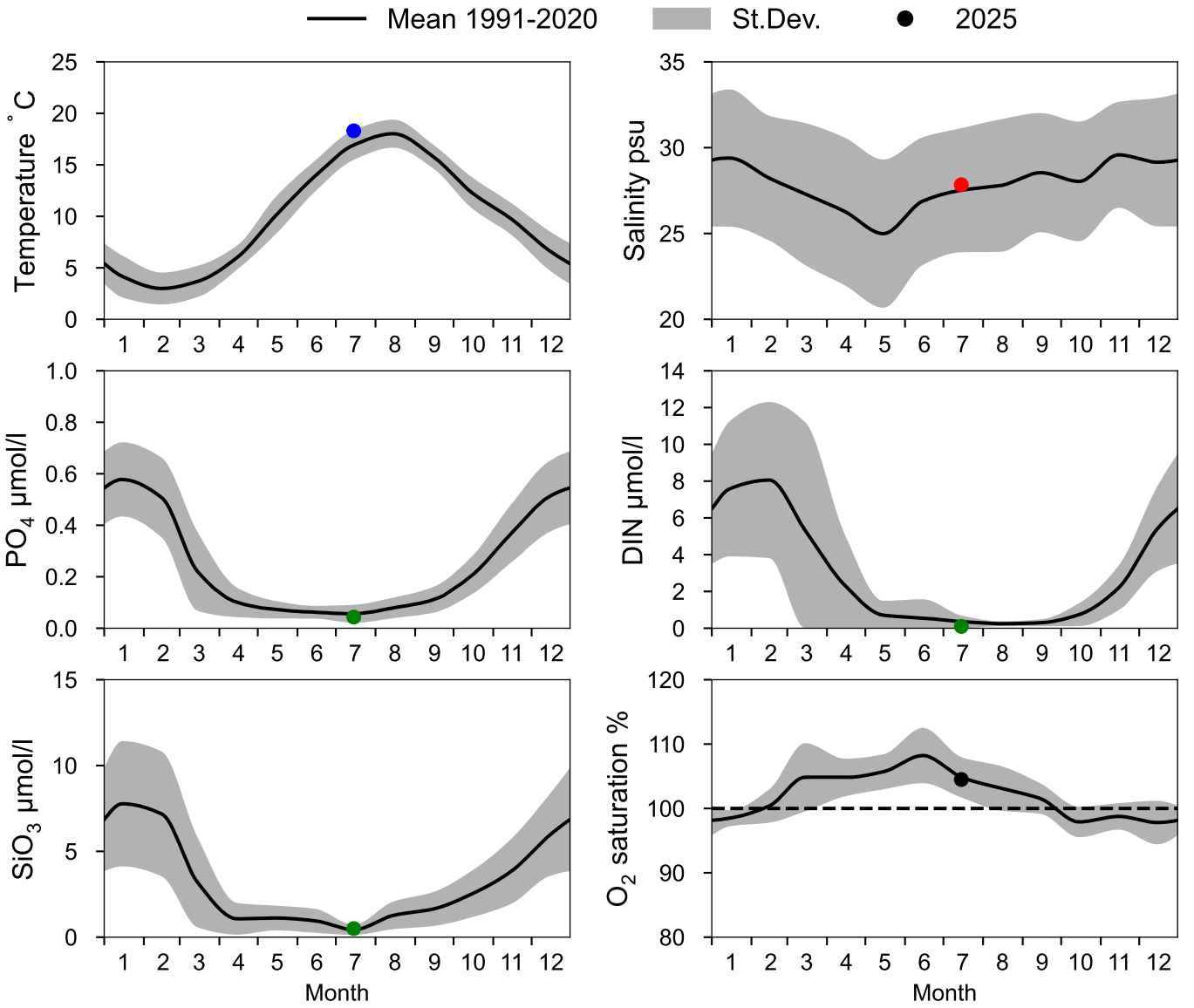


Vertical profiles Å15
July

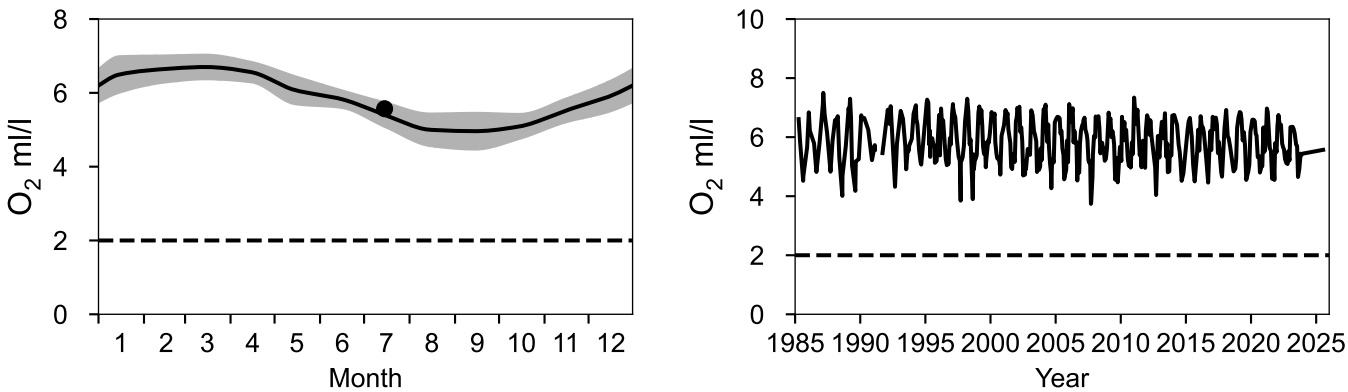


STATION P2 SURFACE WATER (0-10 m)

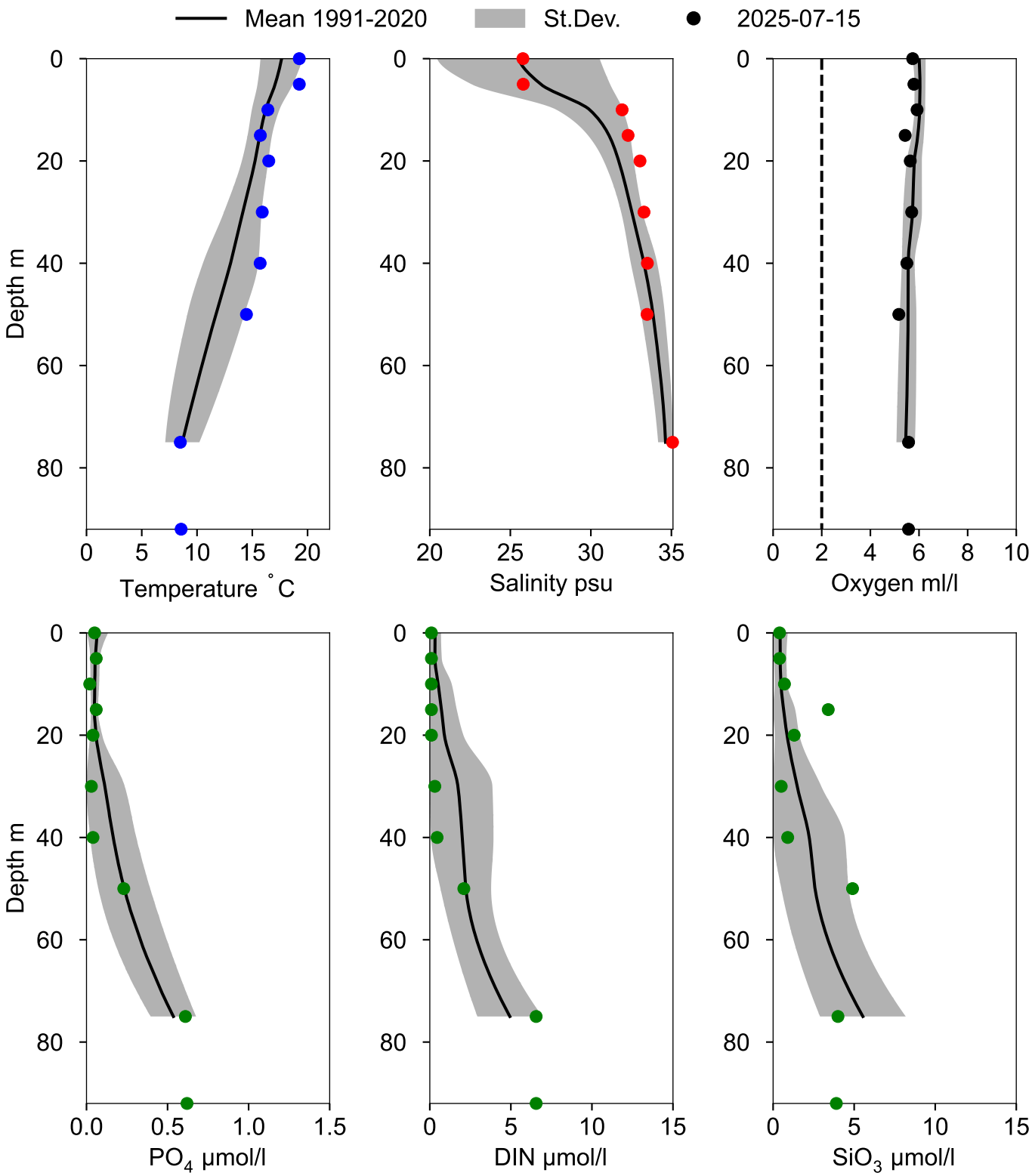
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 75 m)

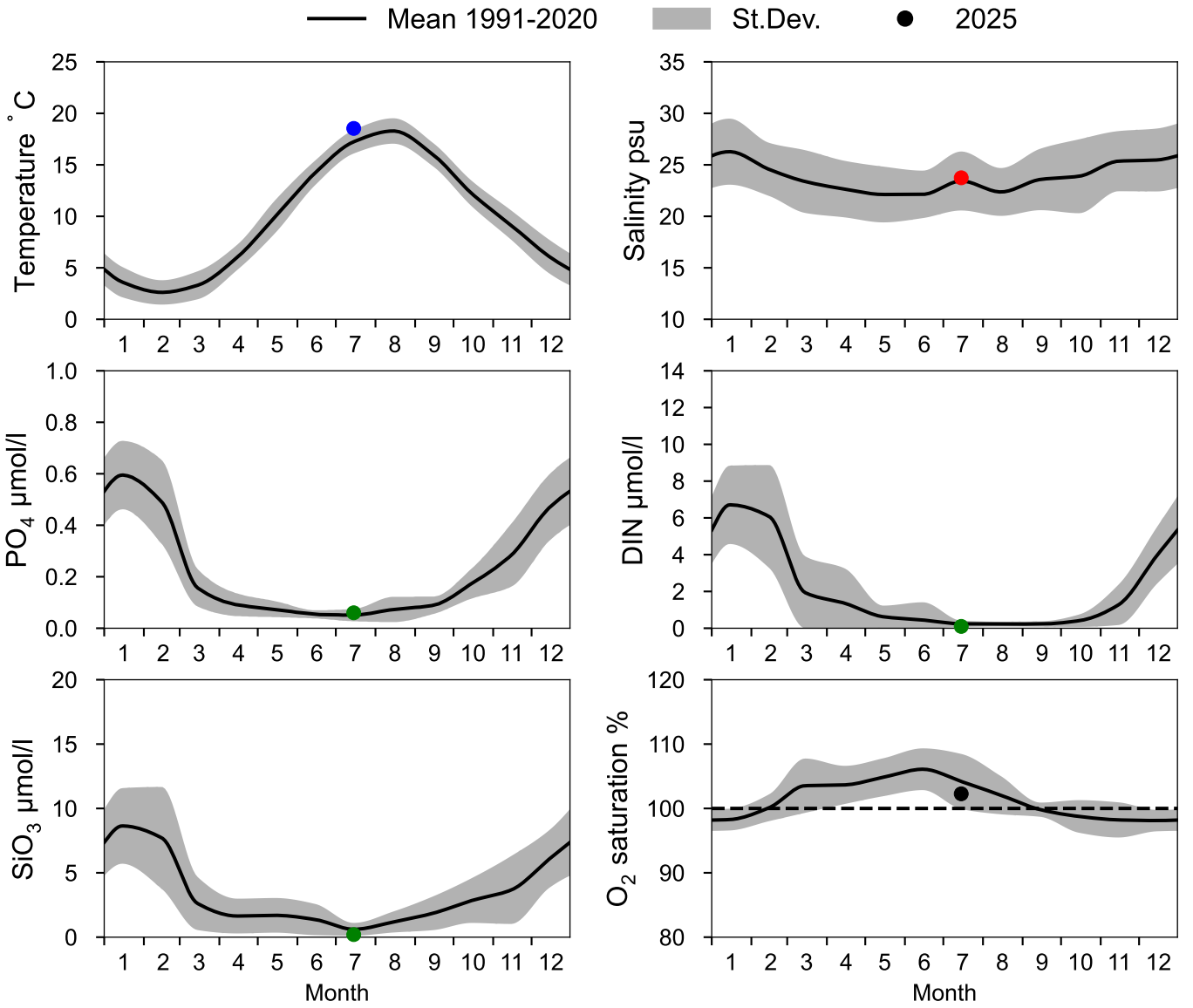


Vertical profiles P2
July

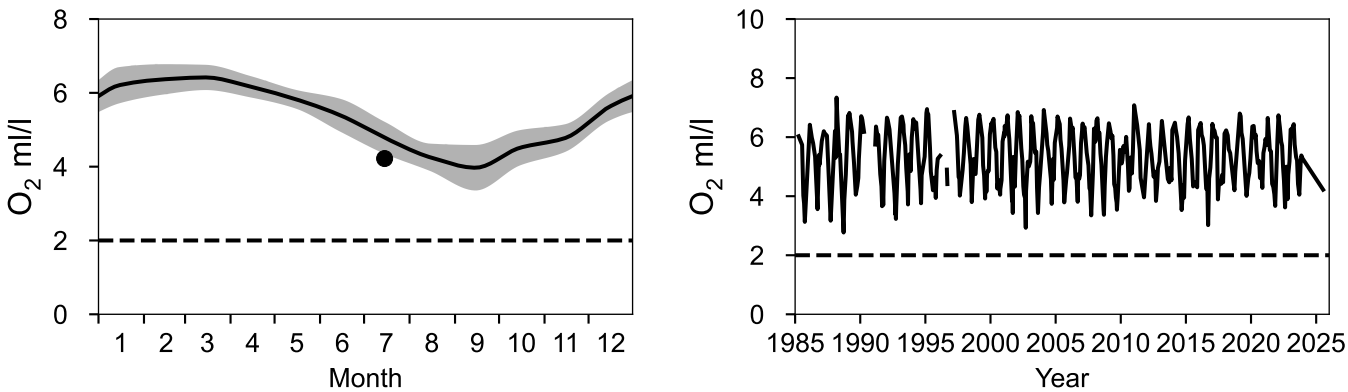


STATION FLADEN SURFACE WATER (0-10 m)

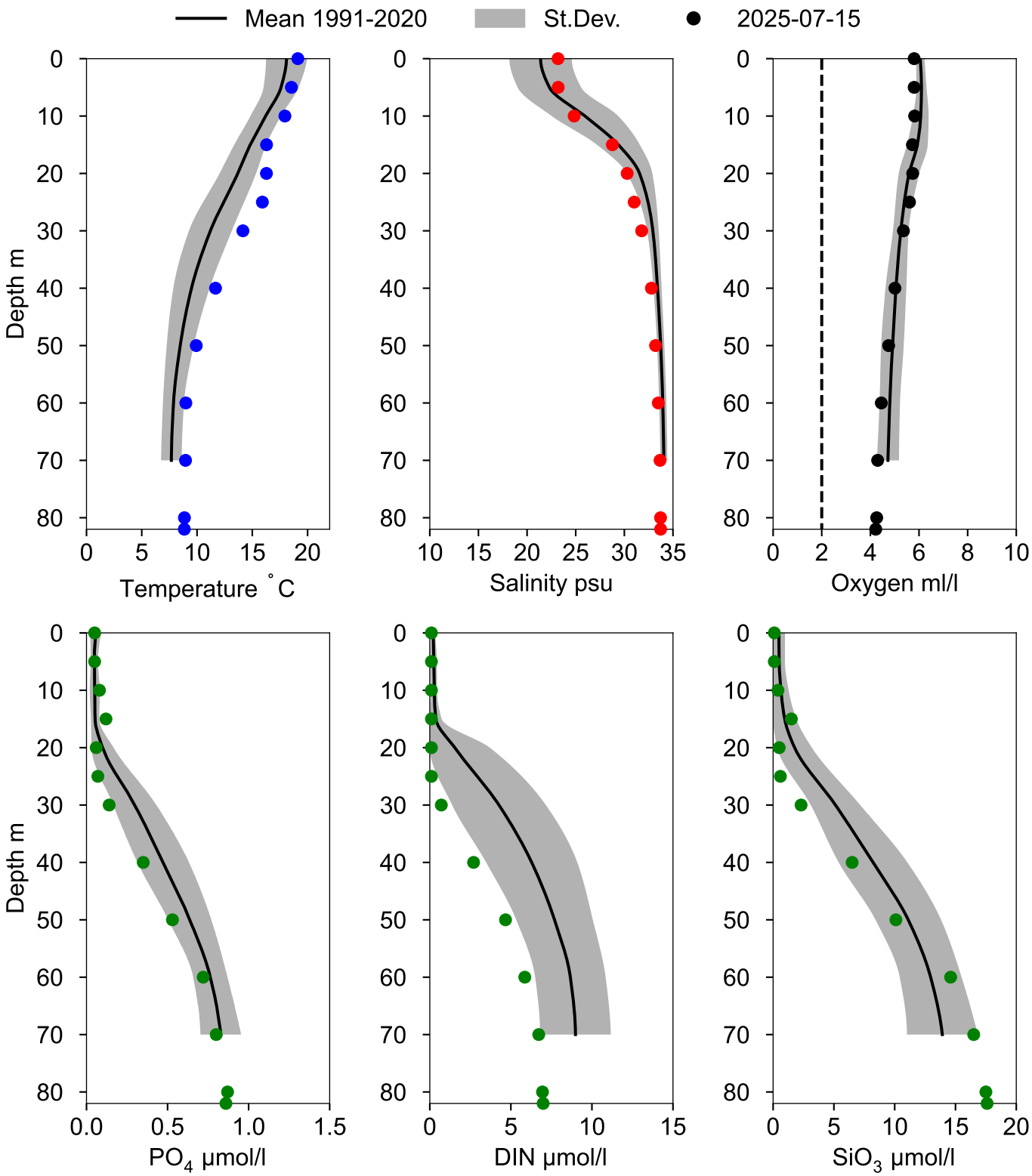
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 74 m)

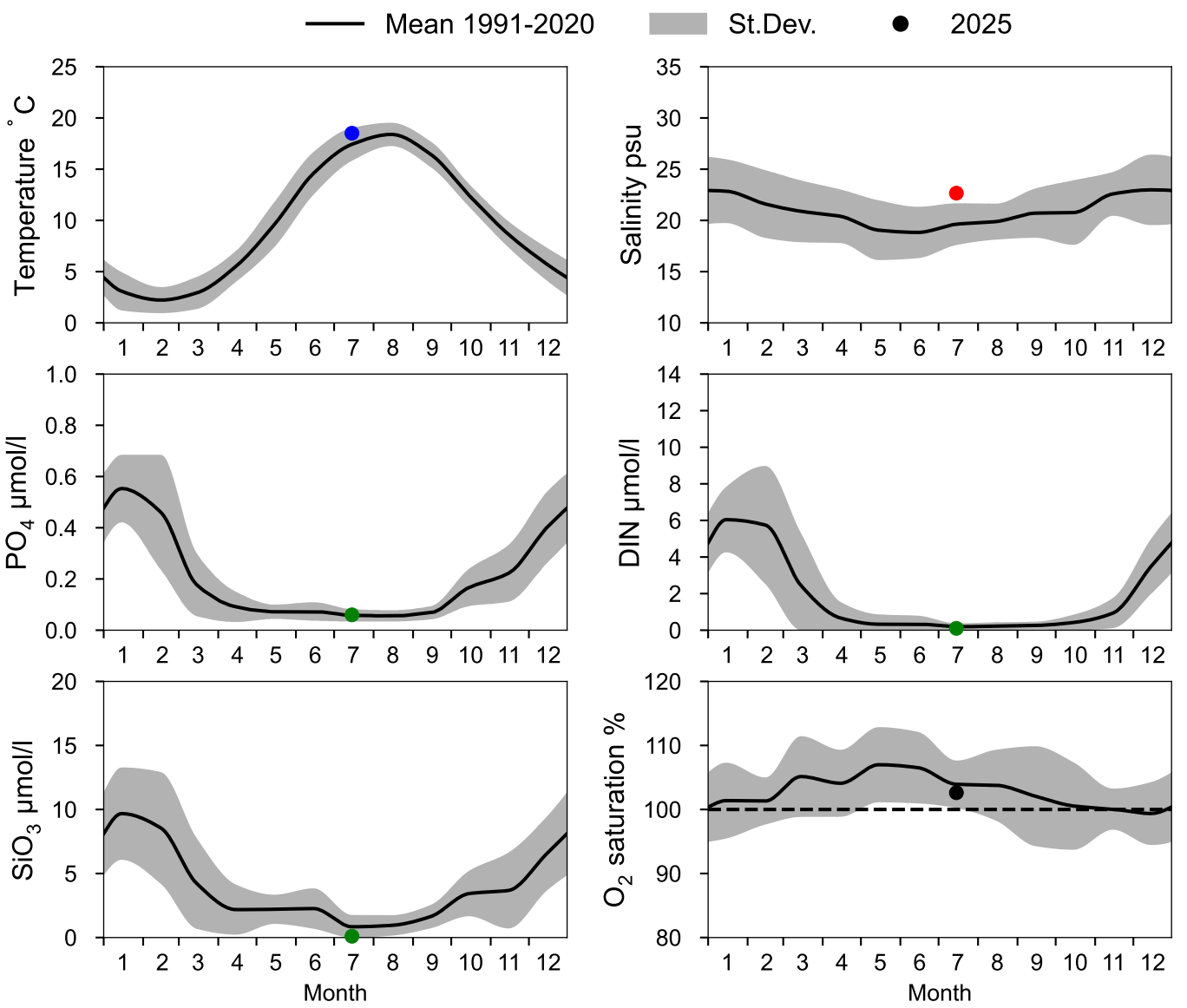


Vertical profiles FLADEN
July

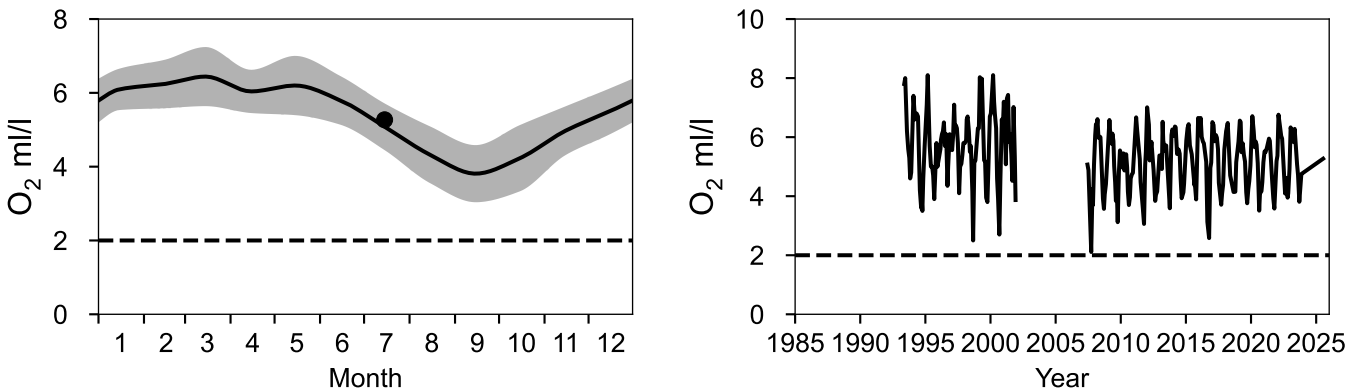


STATION N14 FALKENBERG SURFACE WATER (0-10 m)

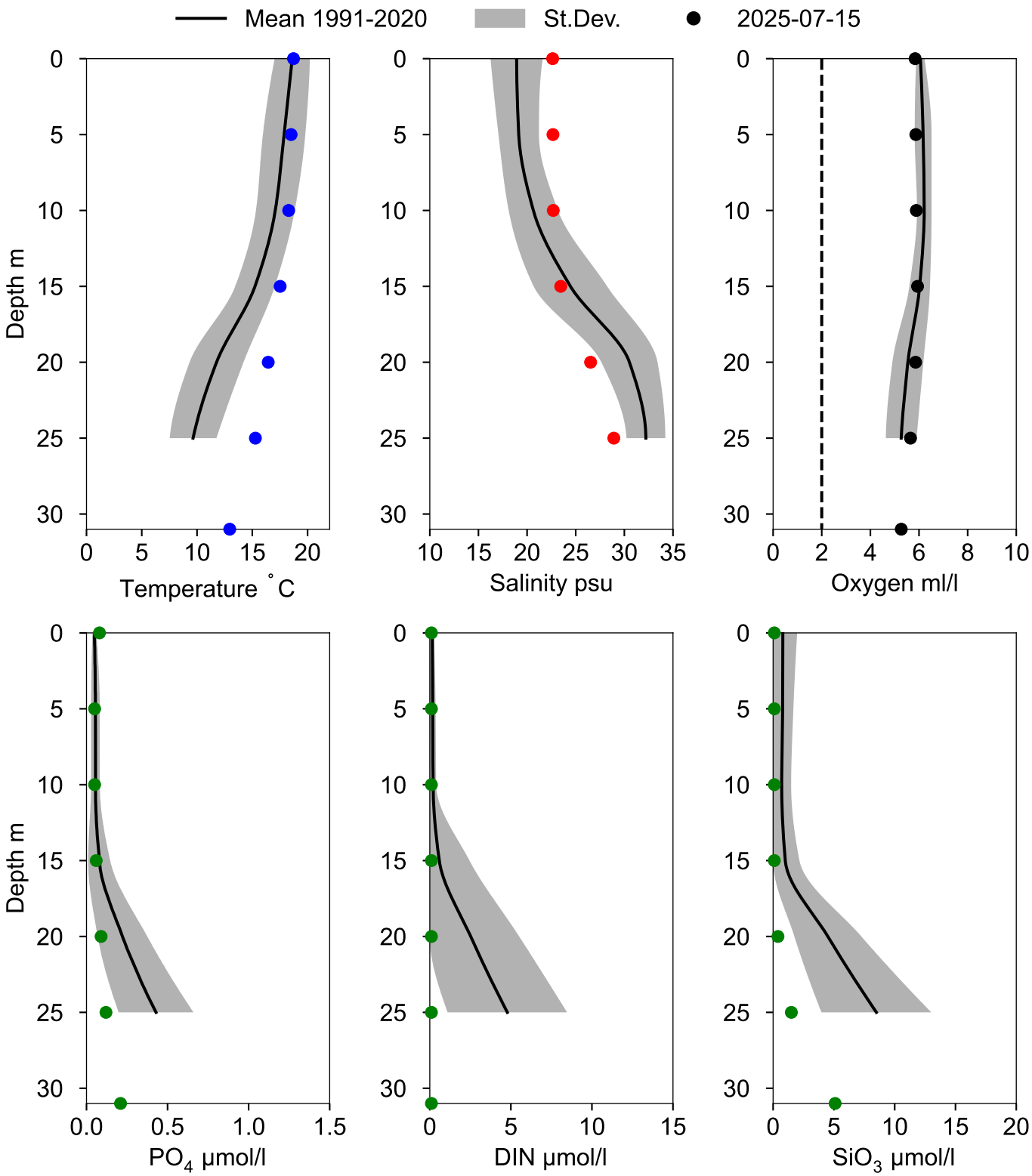
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 25 m)

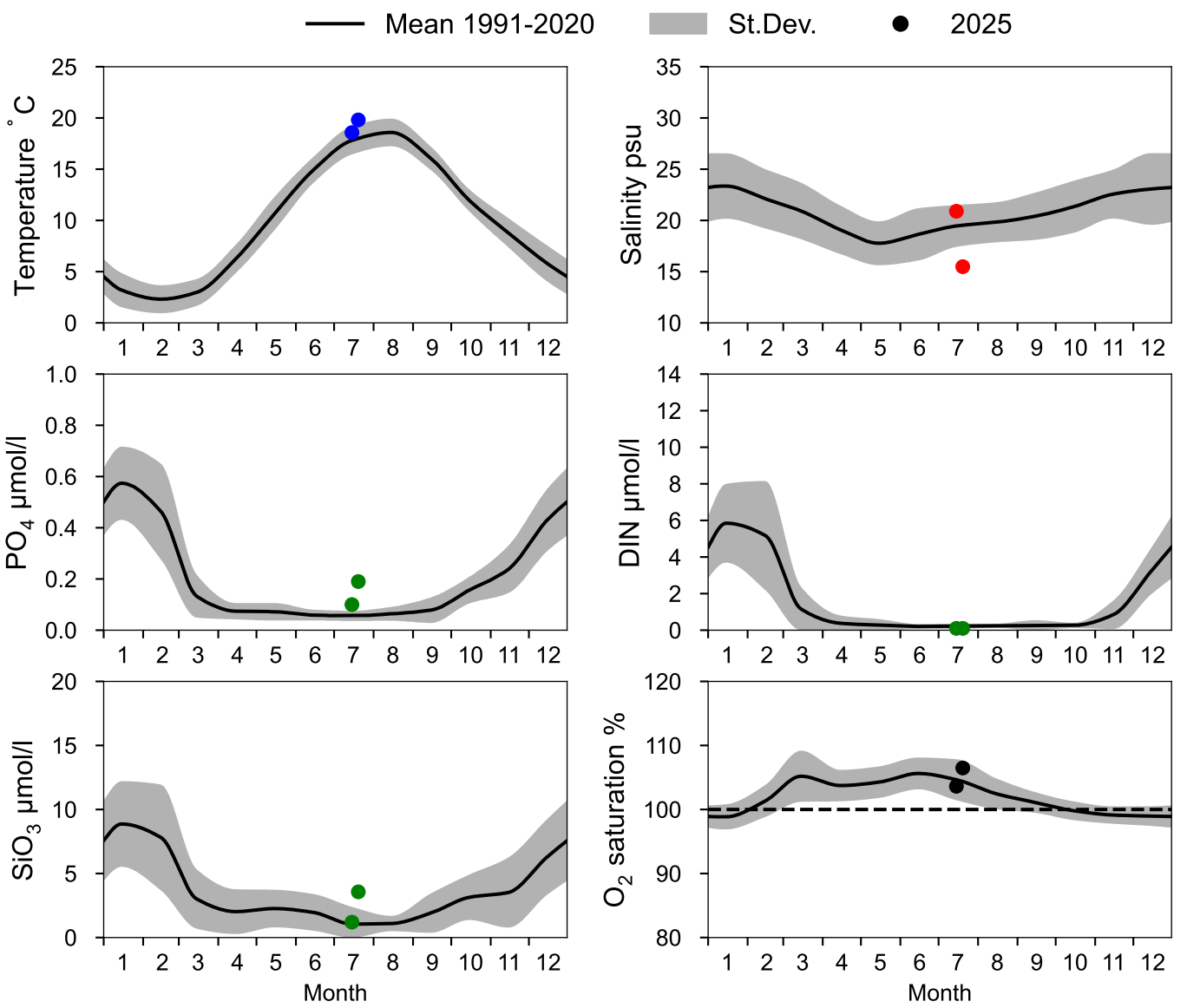


Vertical profiles N14 FALKENBERG
July

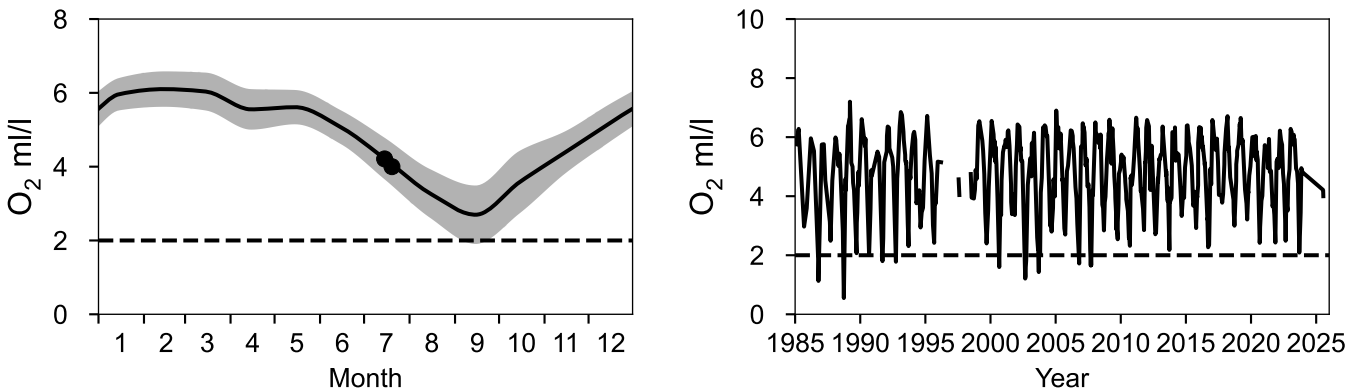


STATION ANHOLT E SURFACE WATER (0-10 m)

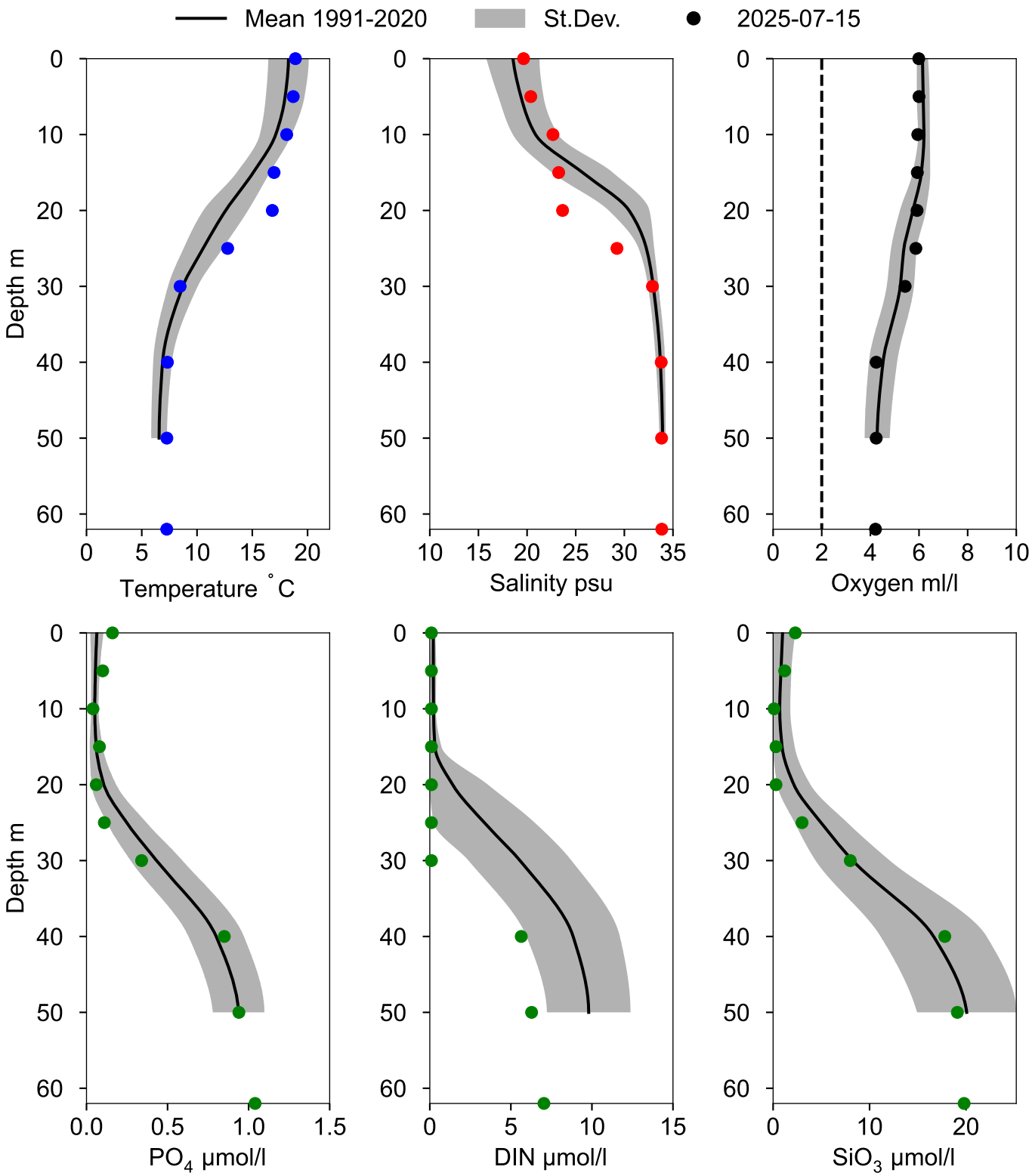
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

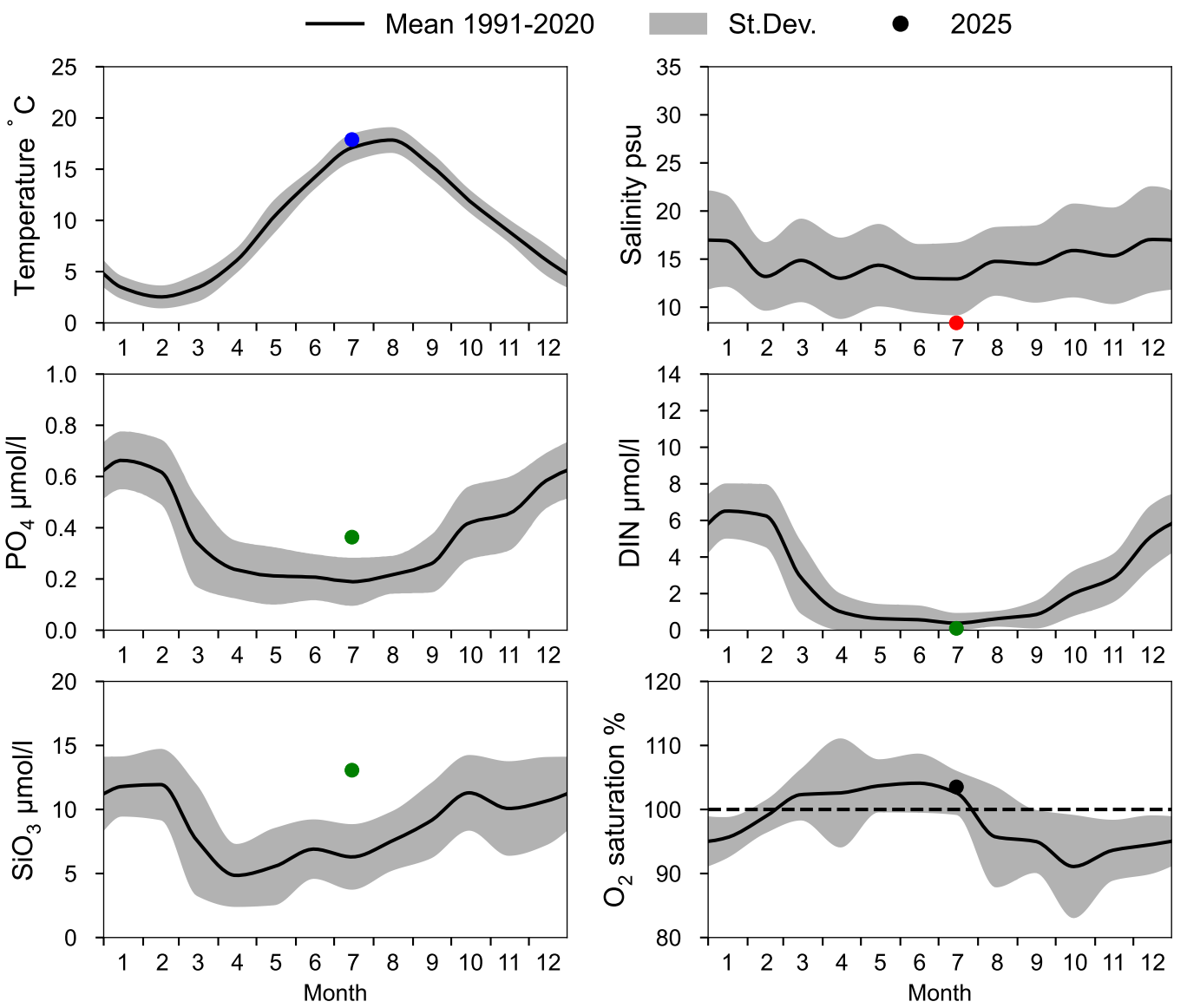


Vertical profiles ANHOLT E
July

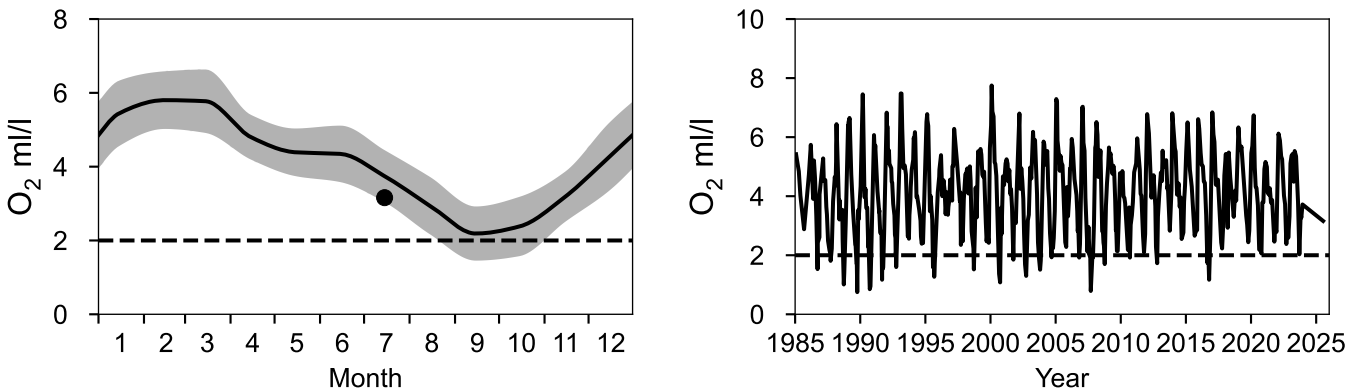


STATION W LANDSKRONA SURFACE WATER (0-10 m)

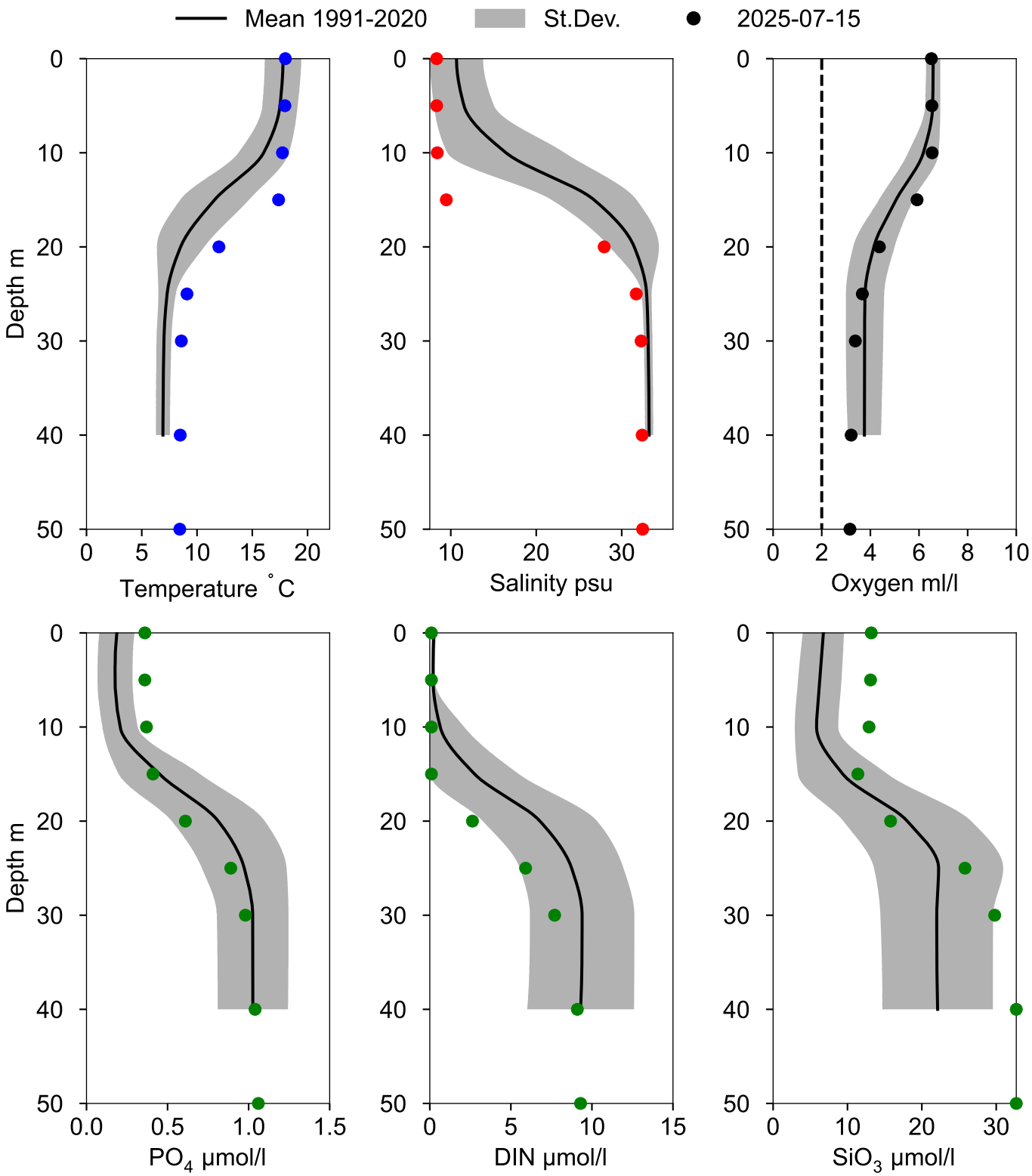
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

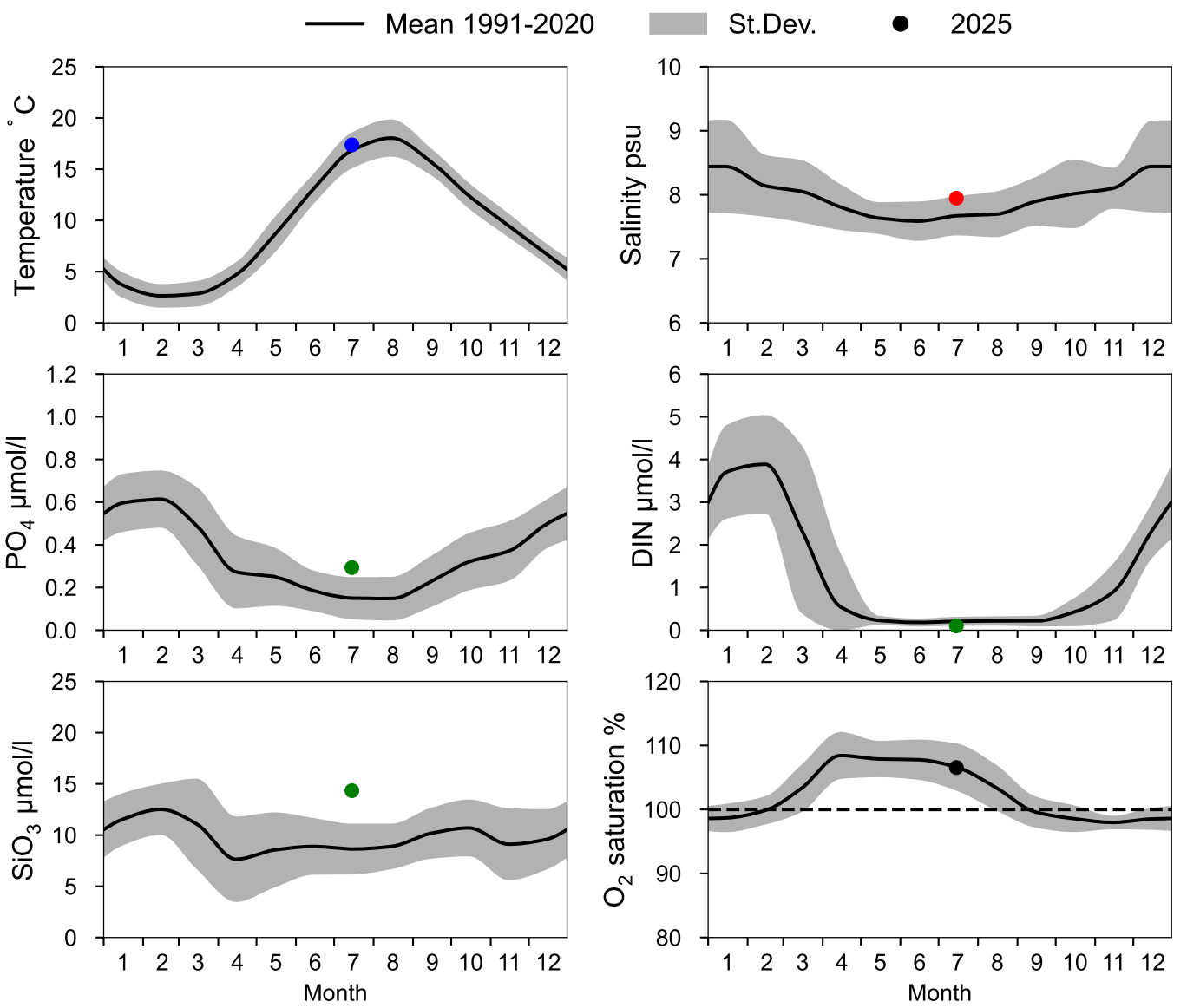


Vertical profiles W LANDSKRONA
July

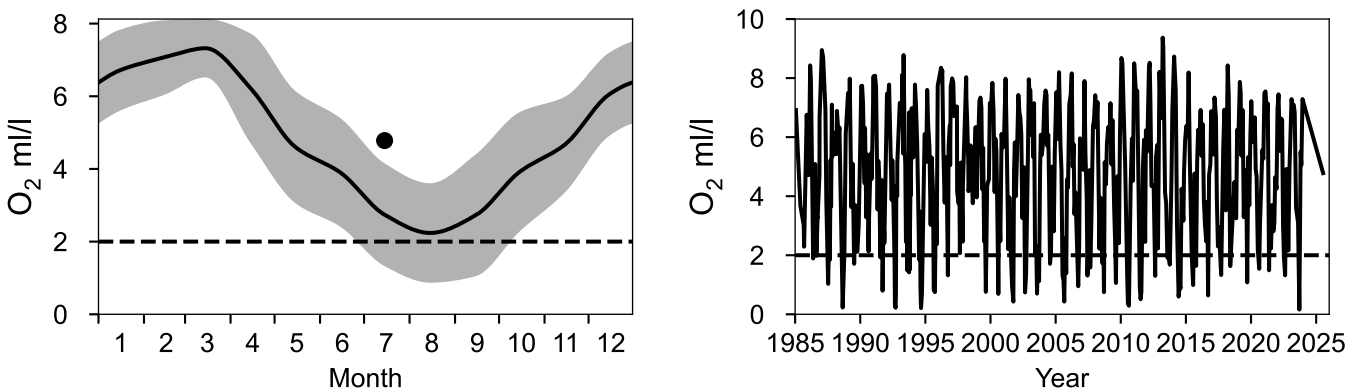


STATION BY1 SURFACE WATER (0-10 m)

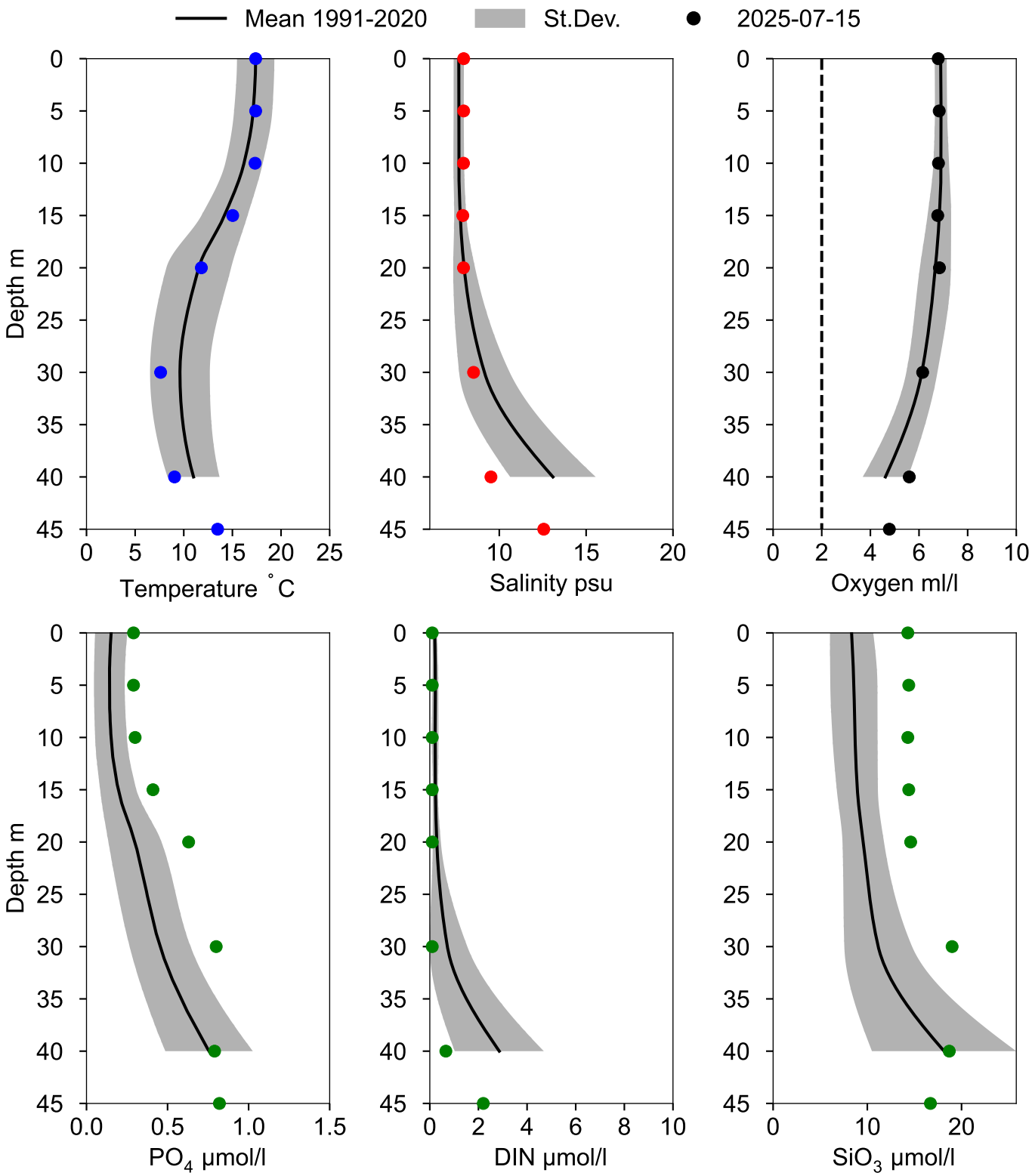
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 39 m)

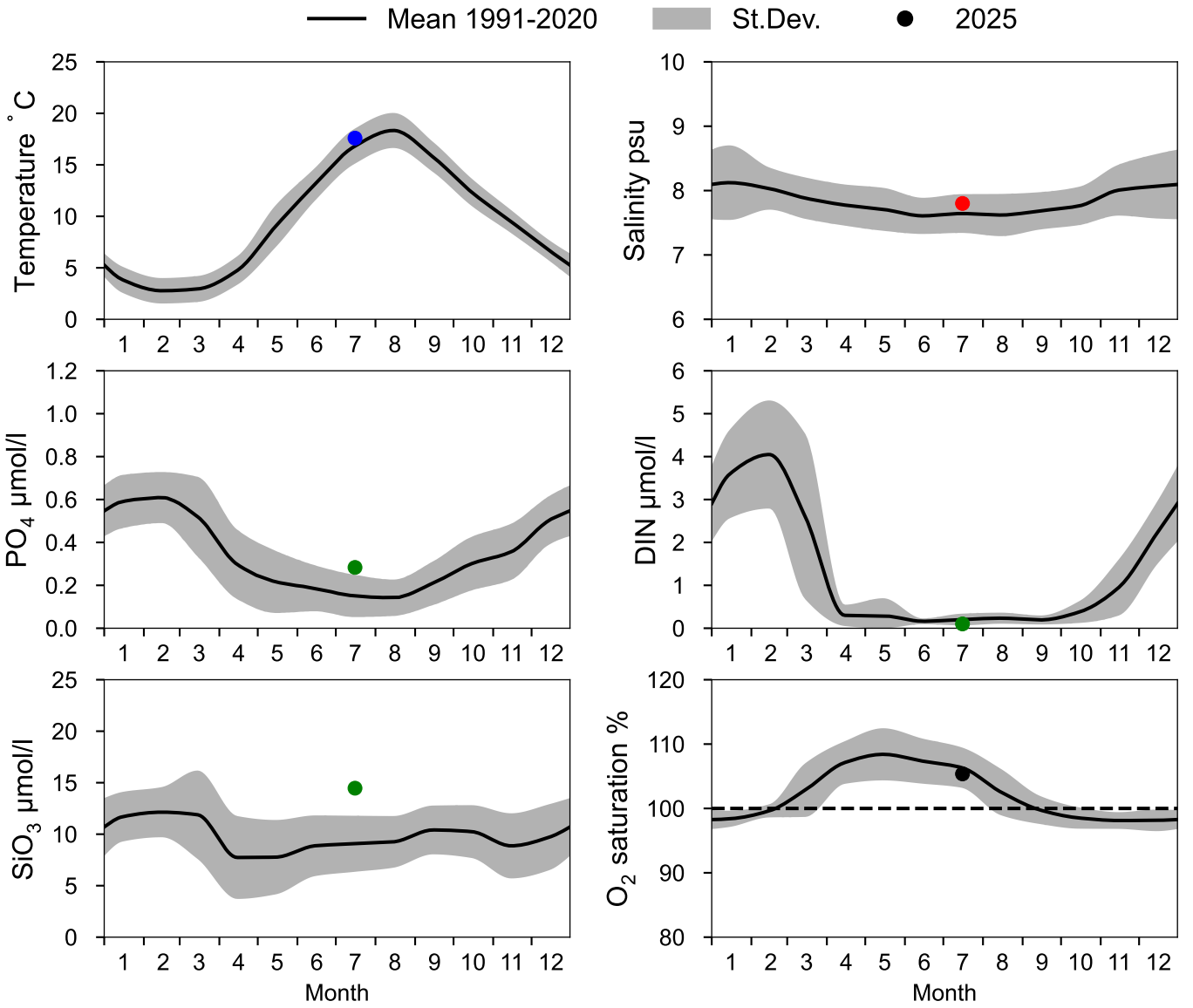


Vertical profiles BY1
July

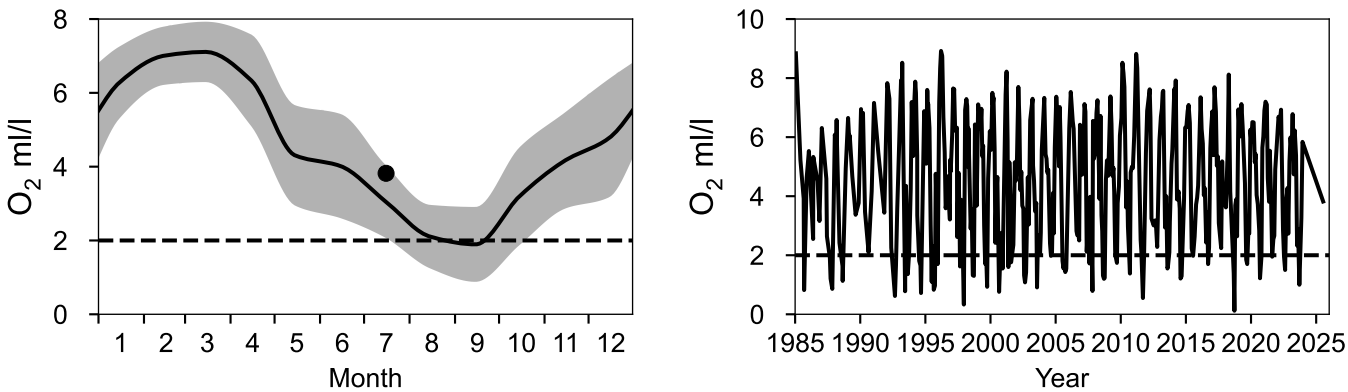


STATION BY2 ARKONA SURFACE WATER (0-10 m)

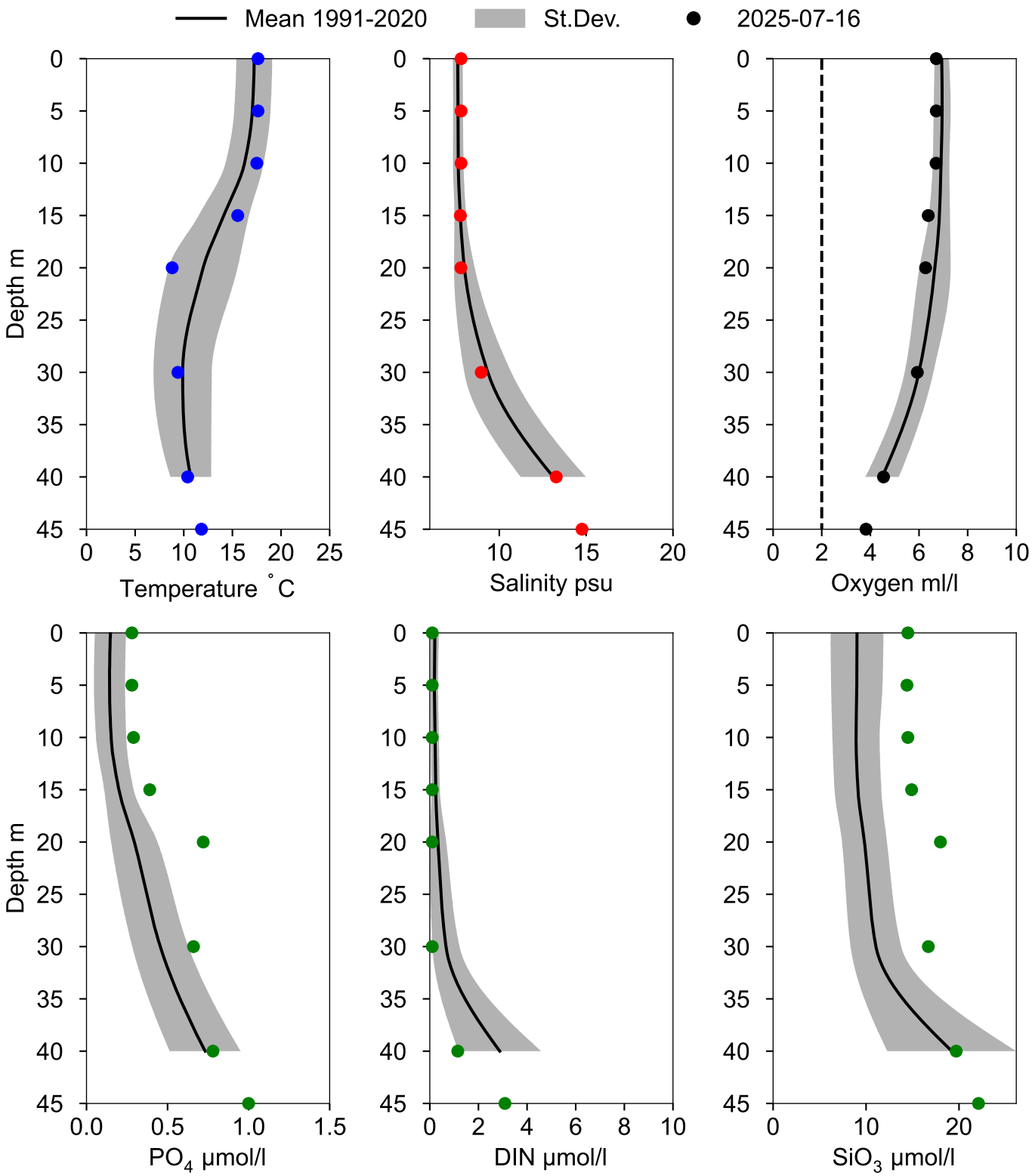
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

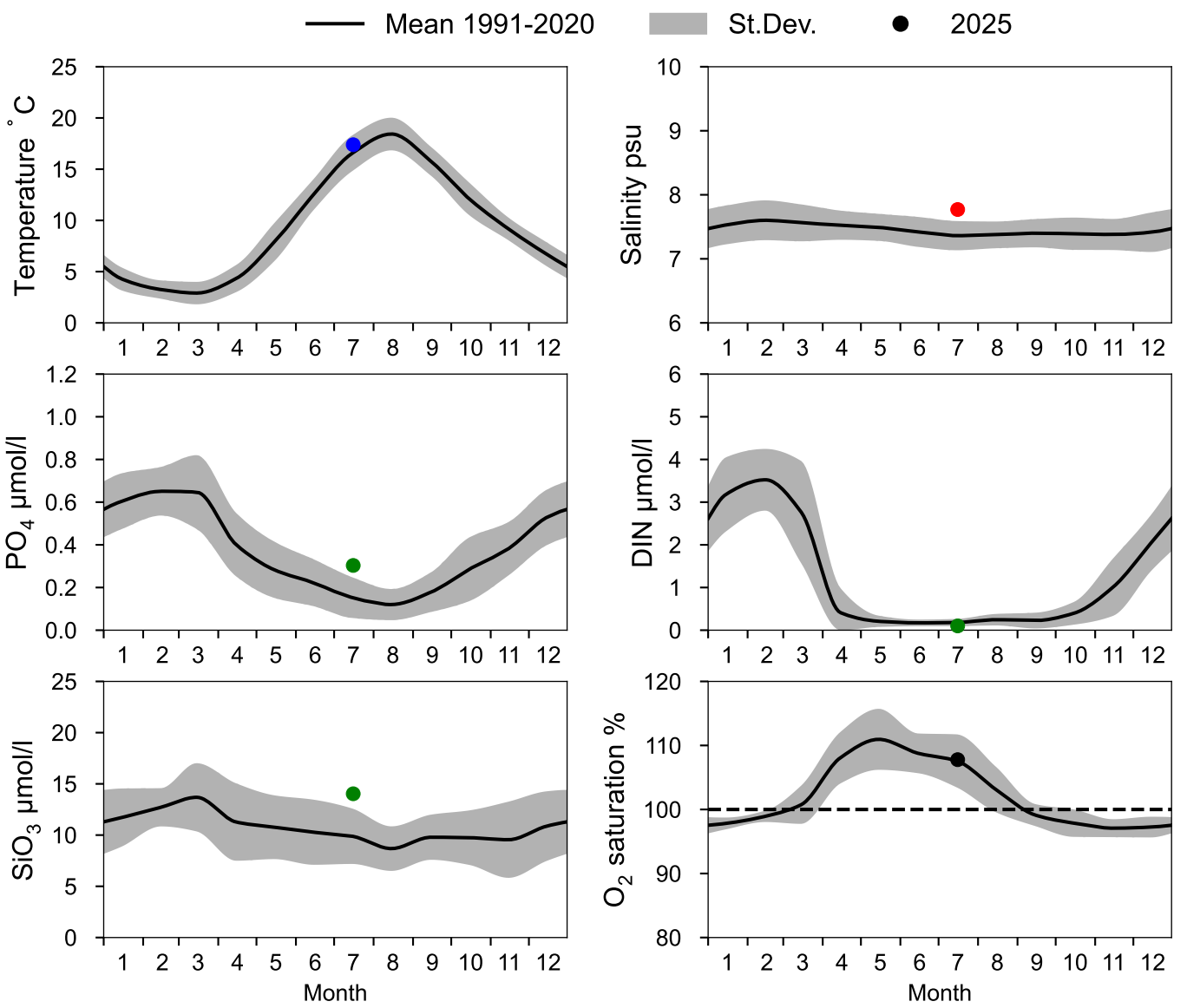


Vertical profiles BY2 ARKONA
July

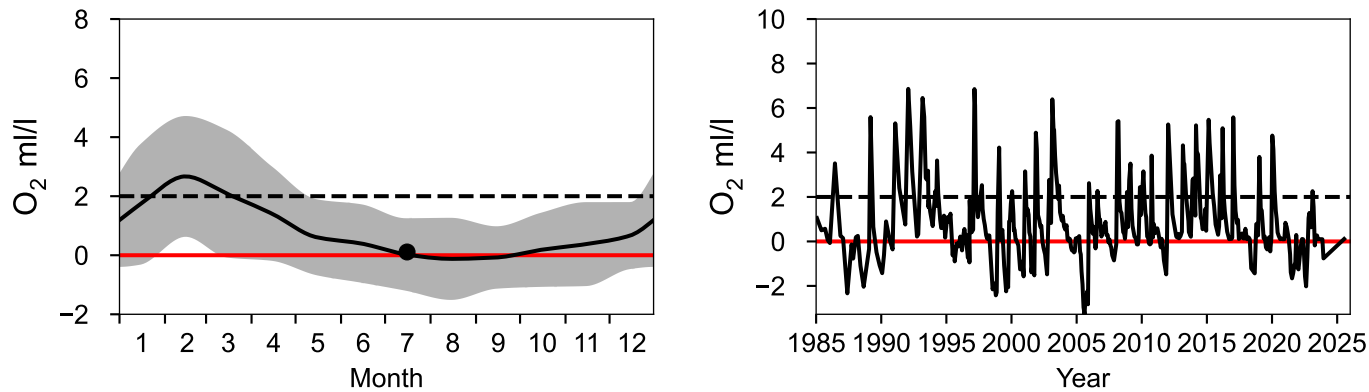


STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

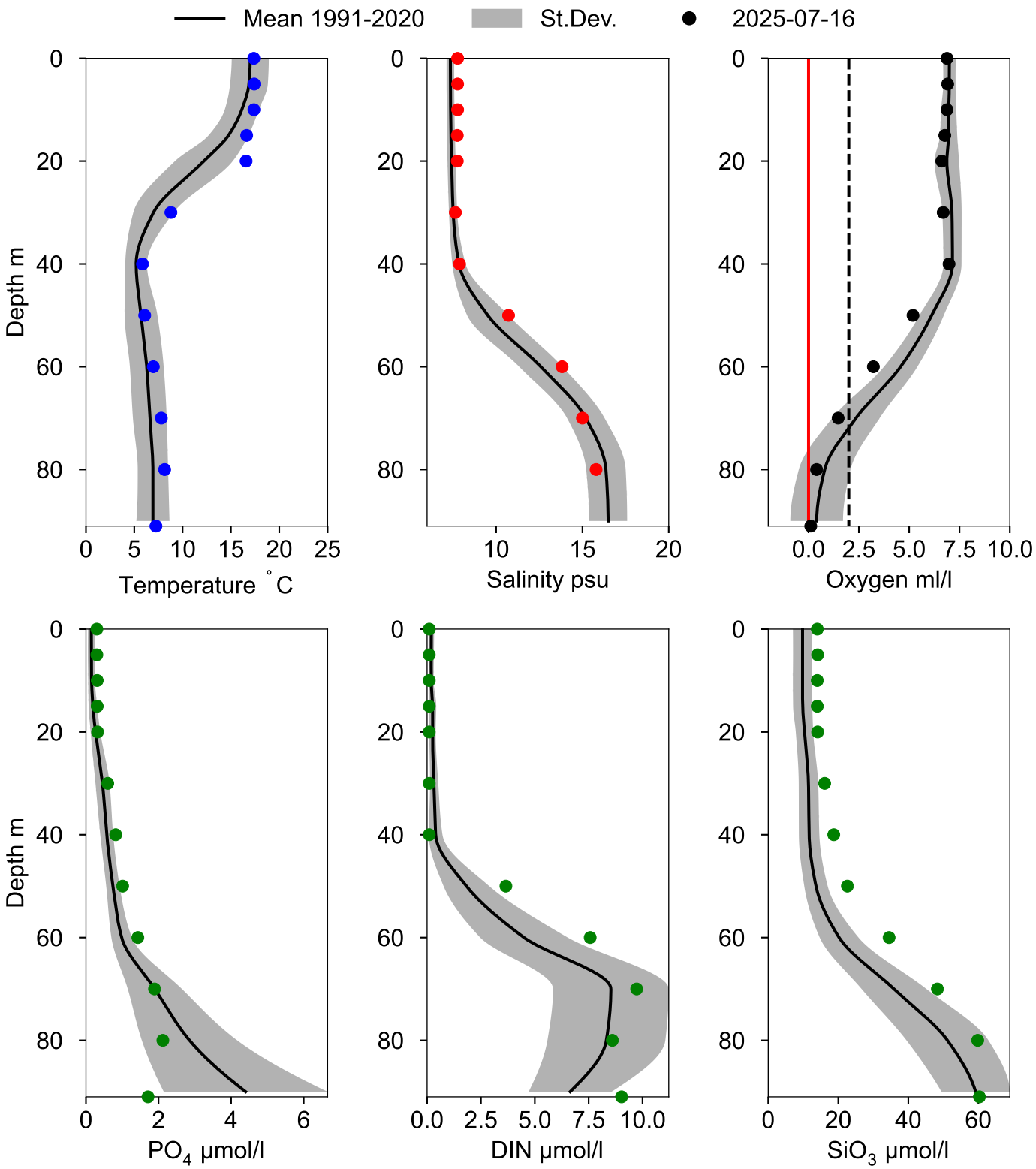
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

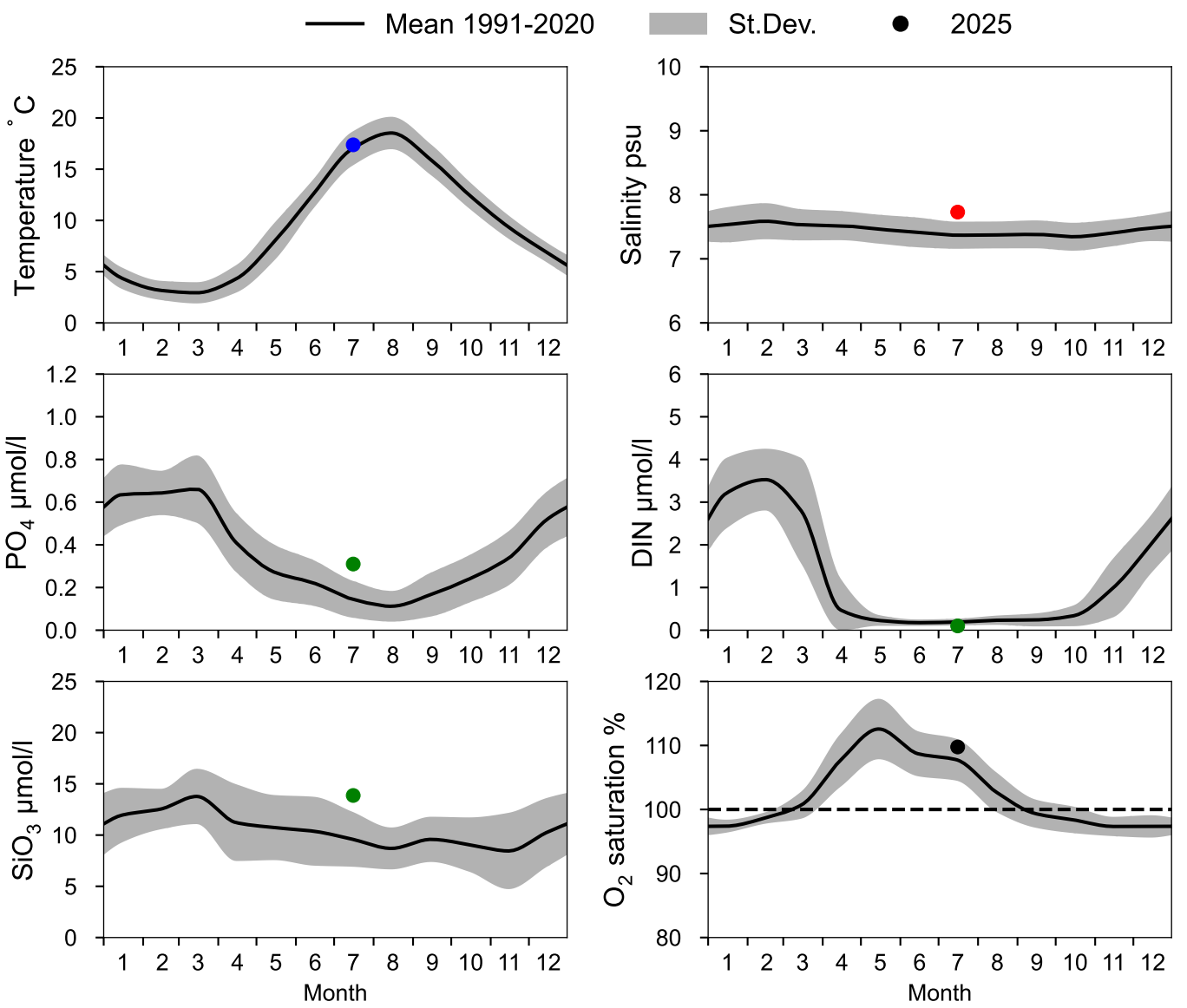


Vertical profiles BY4 CHRISTIANSÖ
July

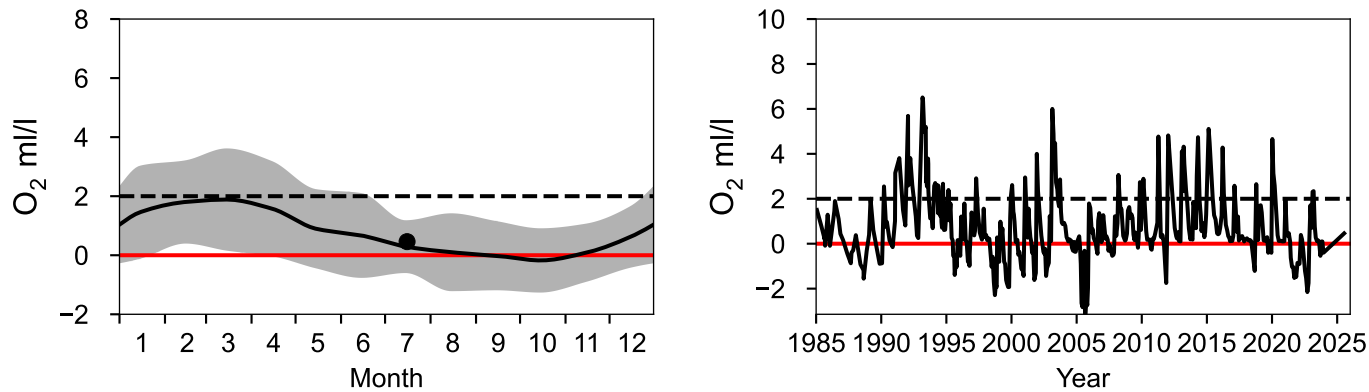


STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

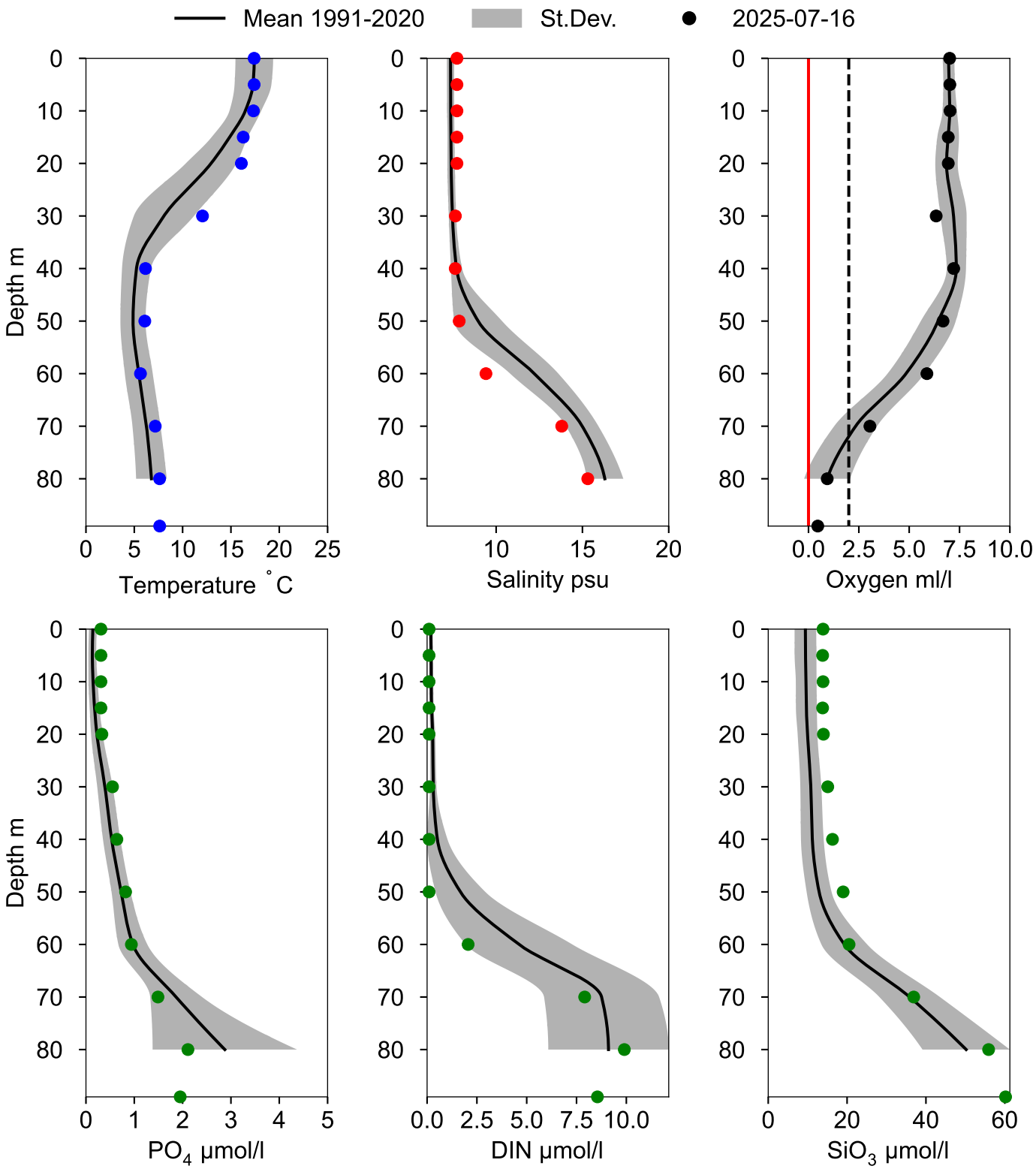
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

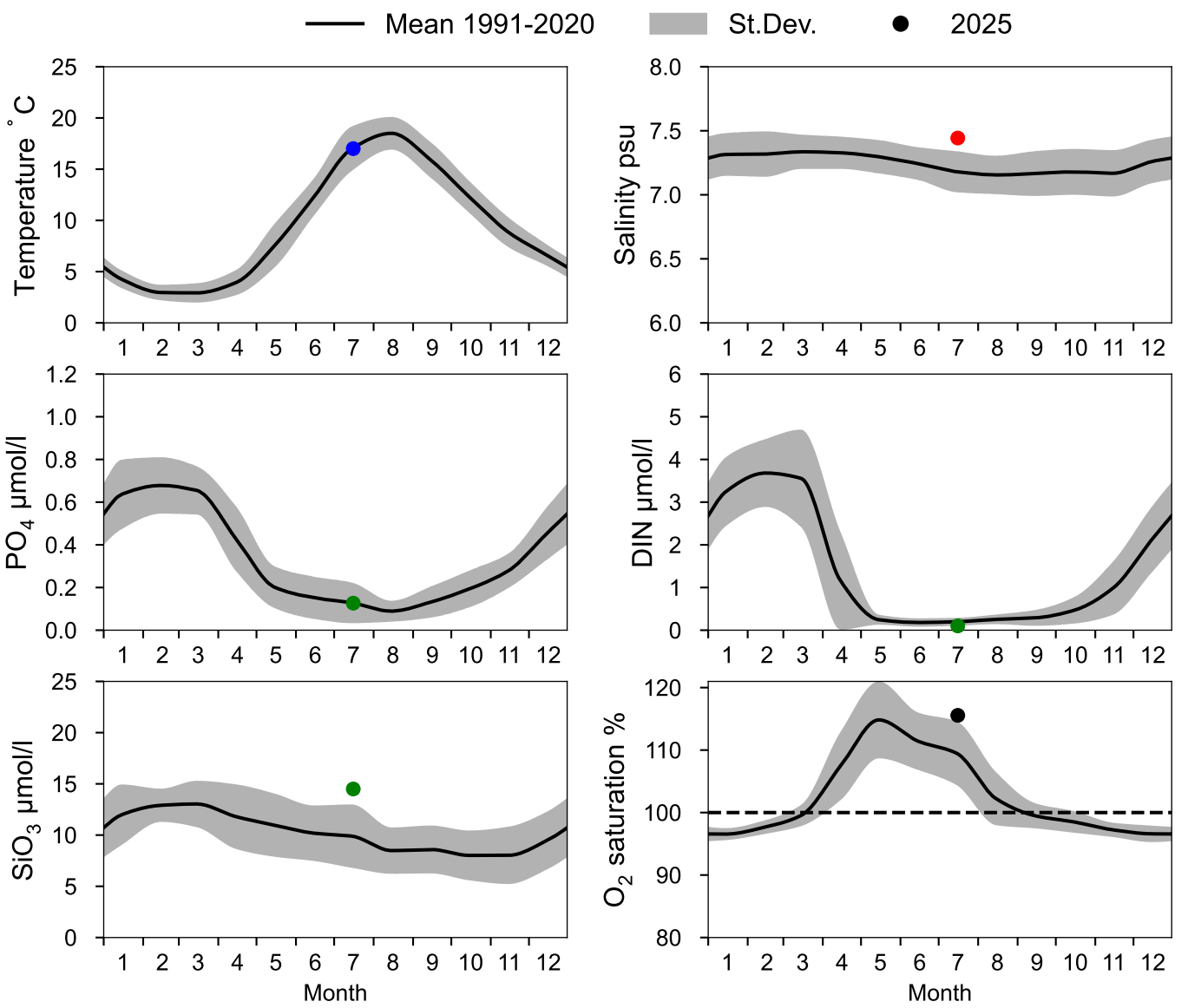


Vertical profiles BY5 BORNHOLMSDJ
July

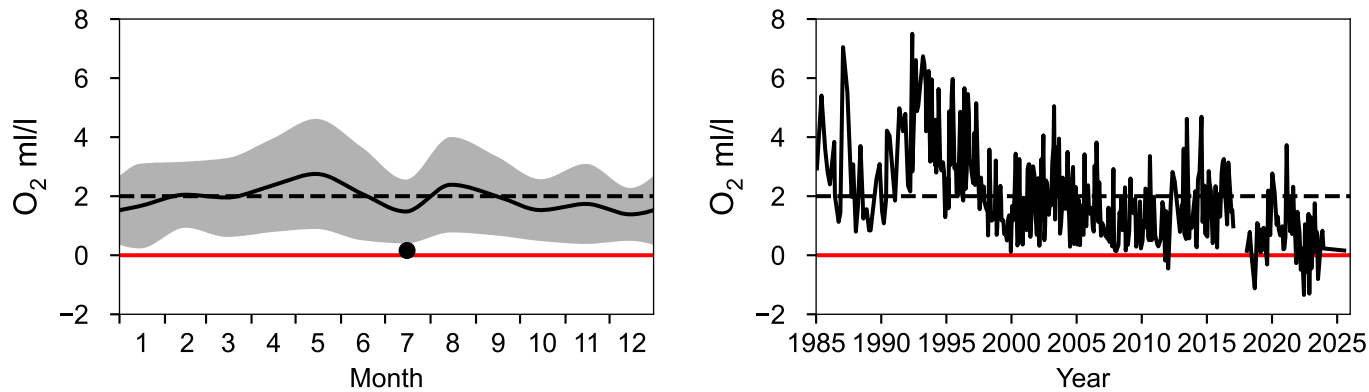


STATION BCS III-10 SURFACE WATER (0-10 m)

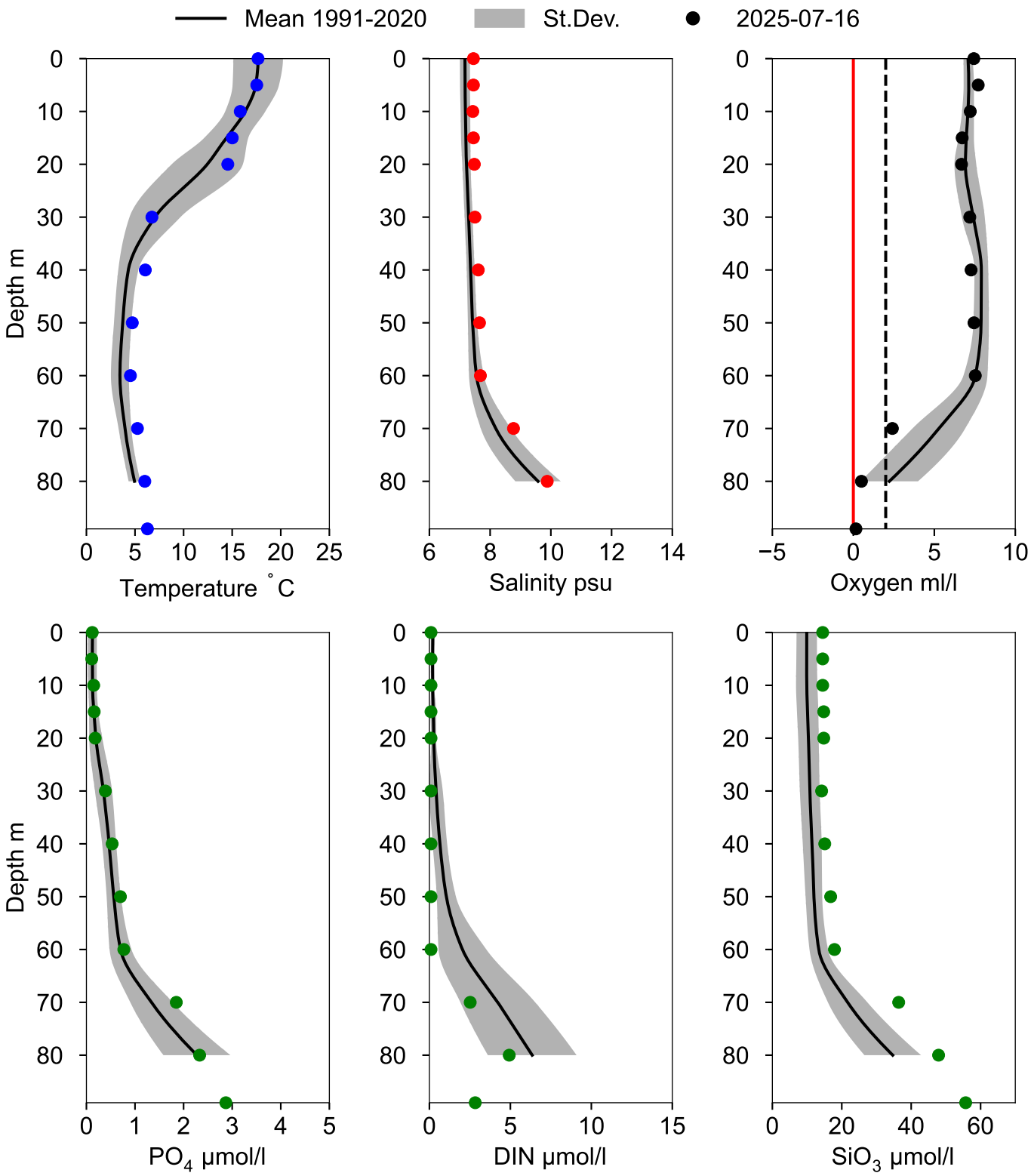
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

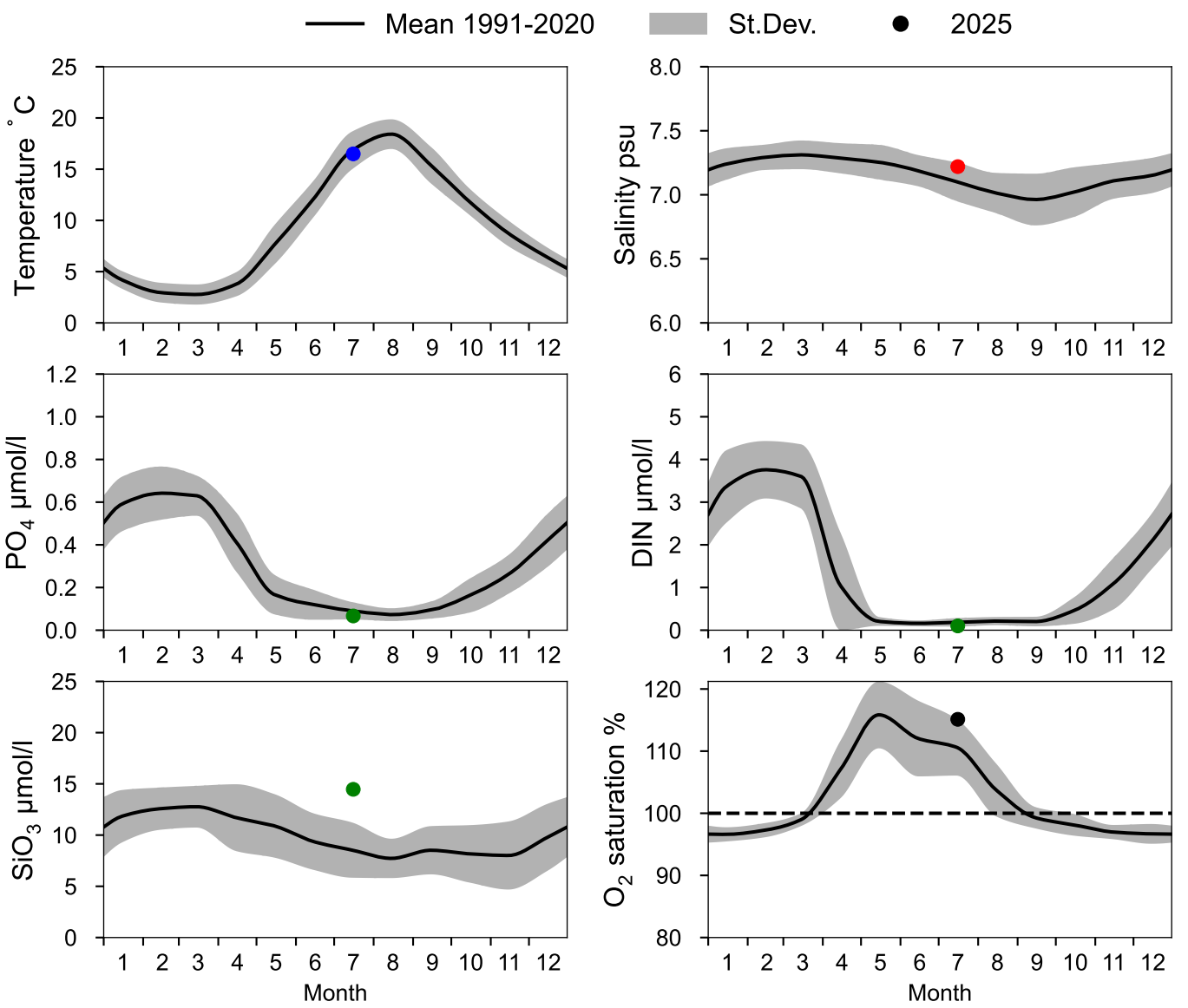


Vertical profiles BCS III-10
July

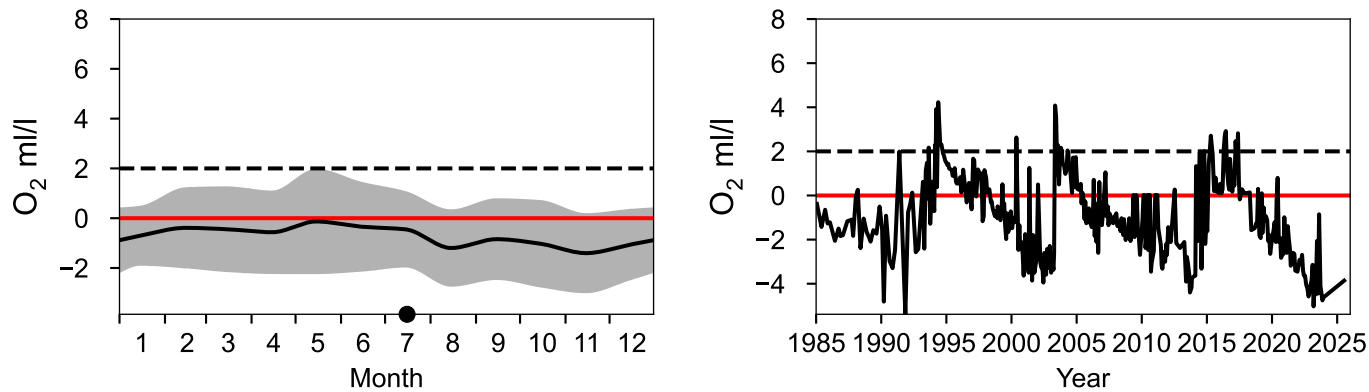


STATION BY10 SURFACE WATER (0-10 m)

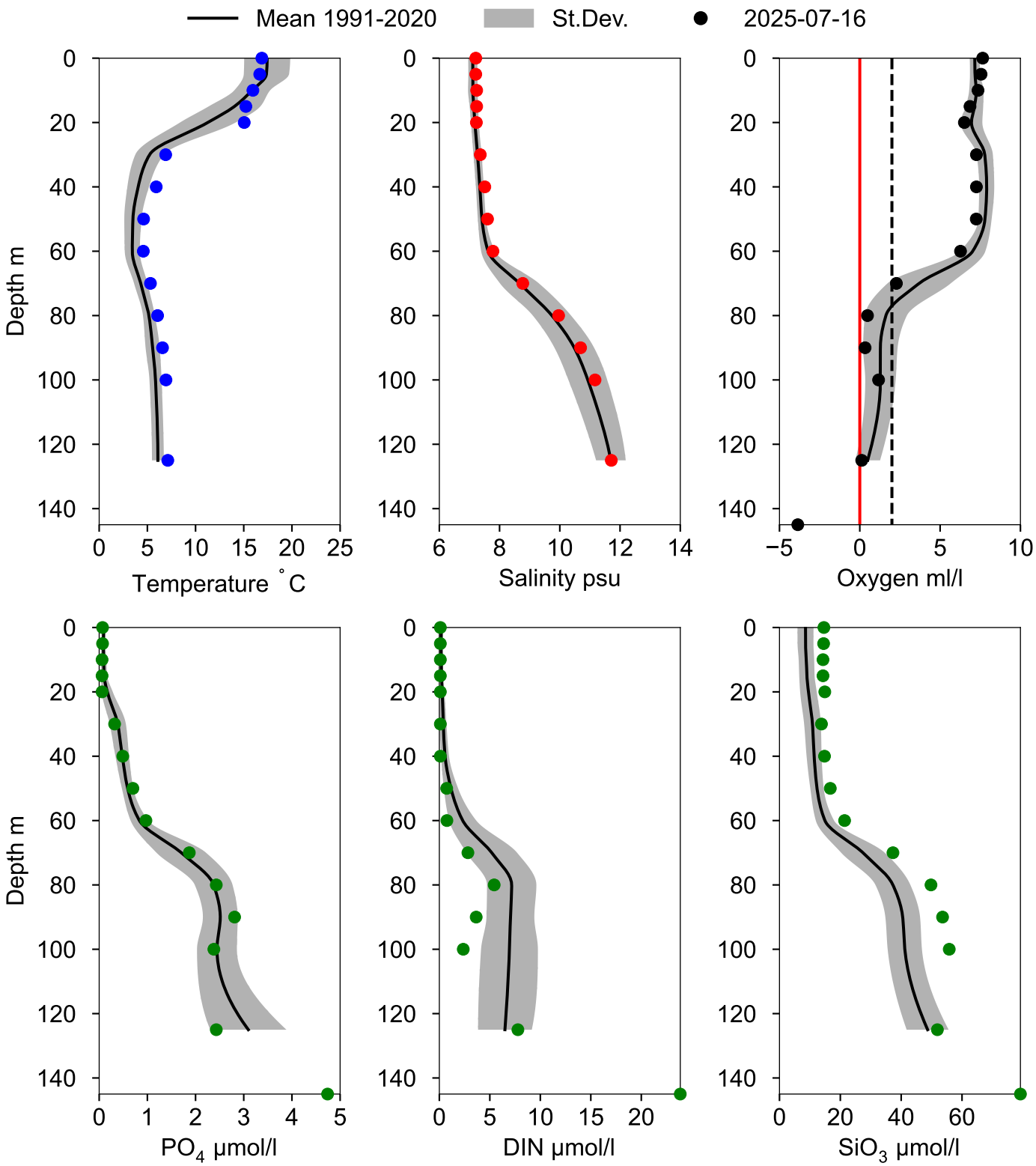
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

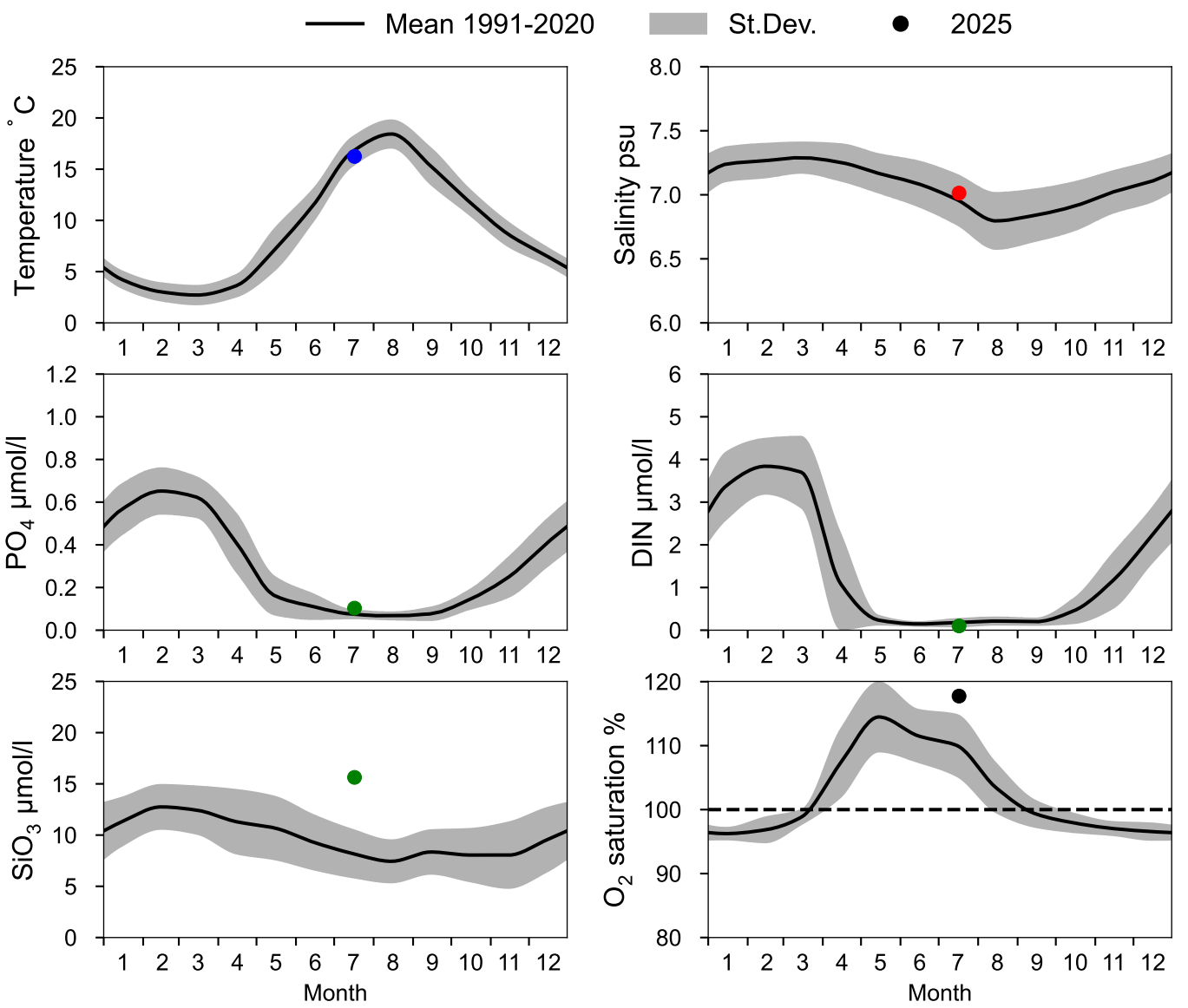


Vertical profiles BY10
July

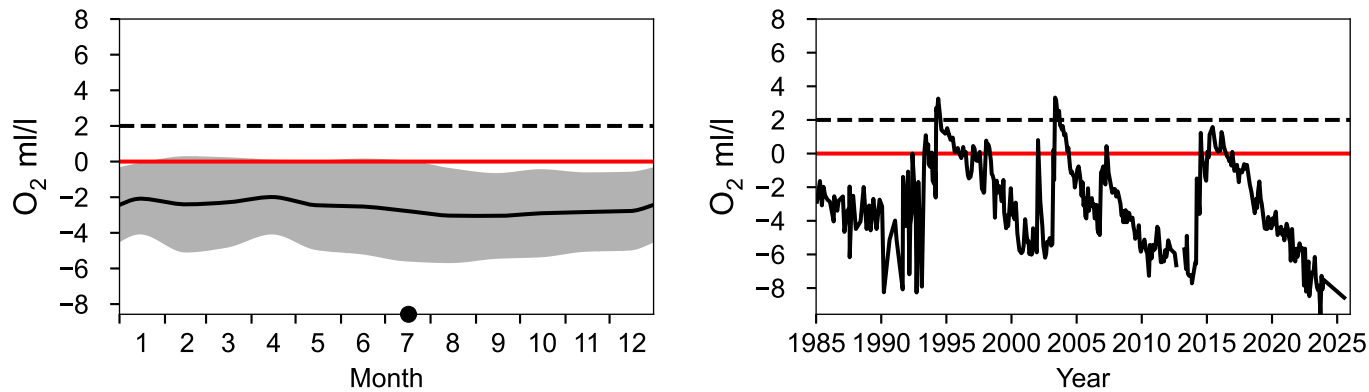


STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

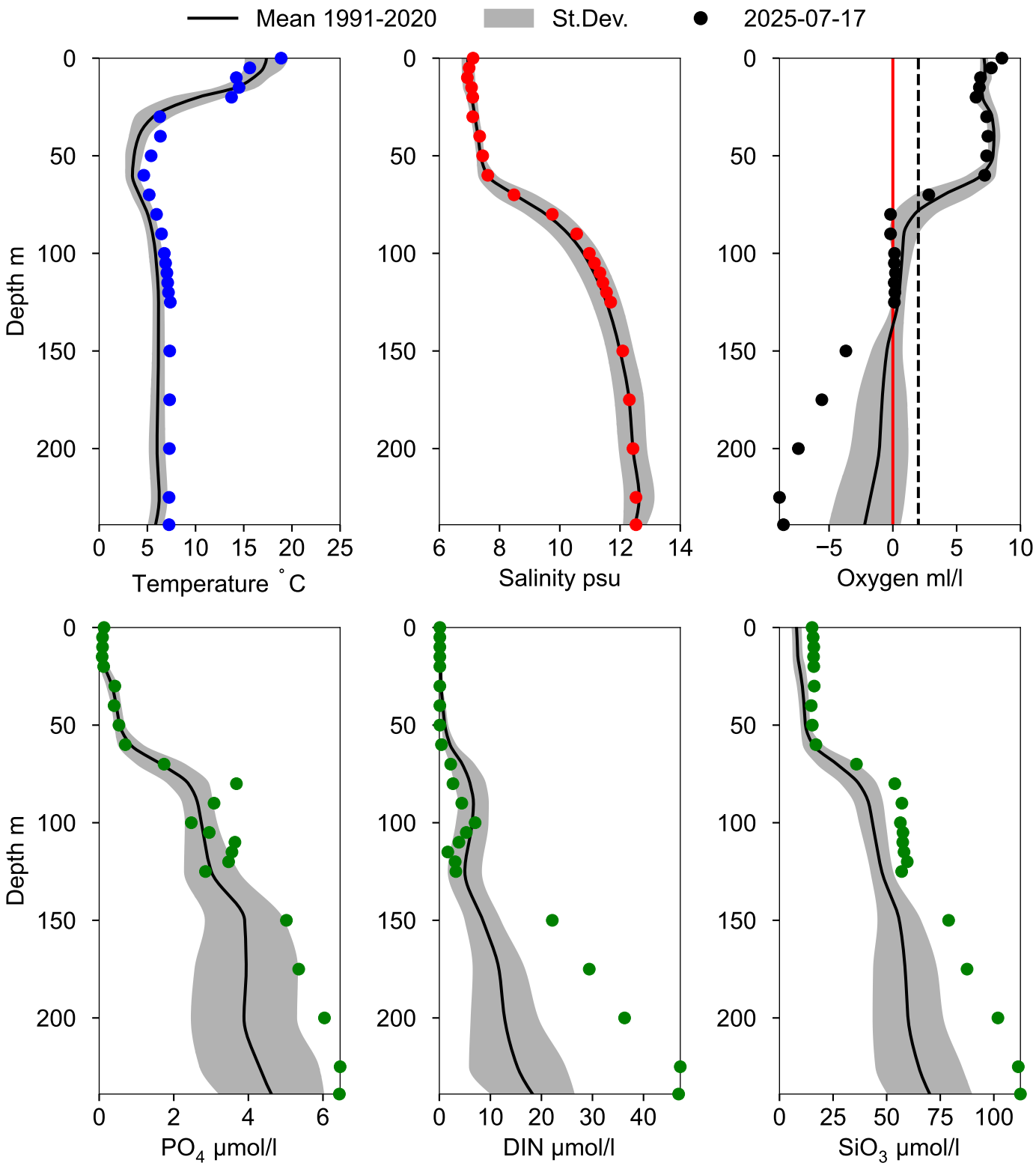
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 225 m)

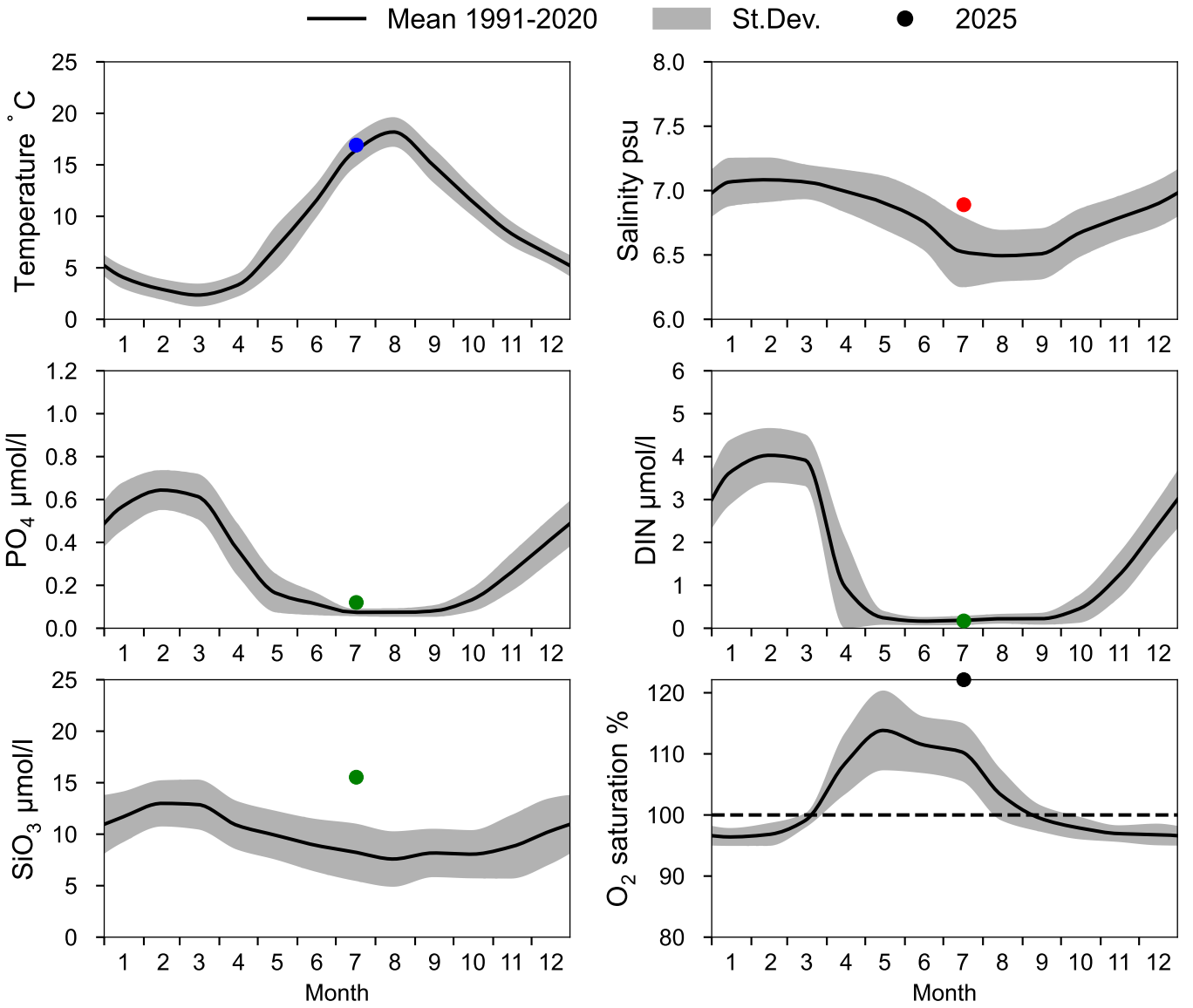


Vertical profiles BY15 GOTLANDSDJ
July

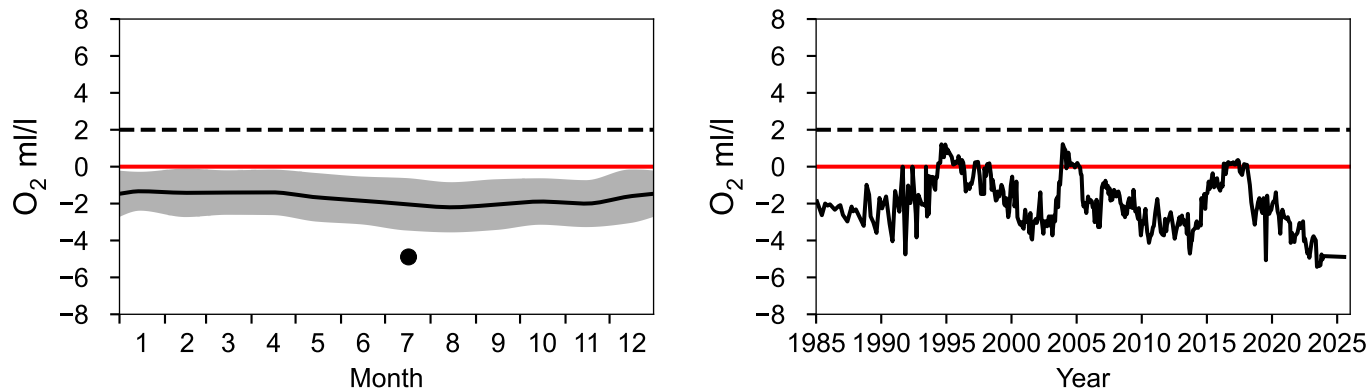


STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

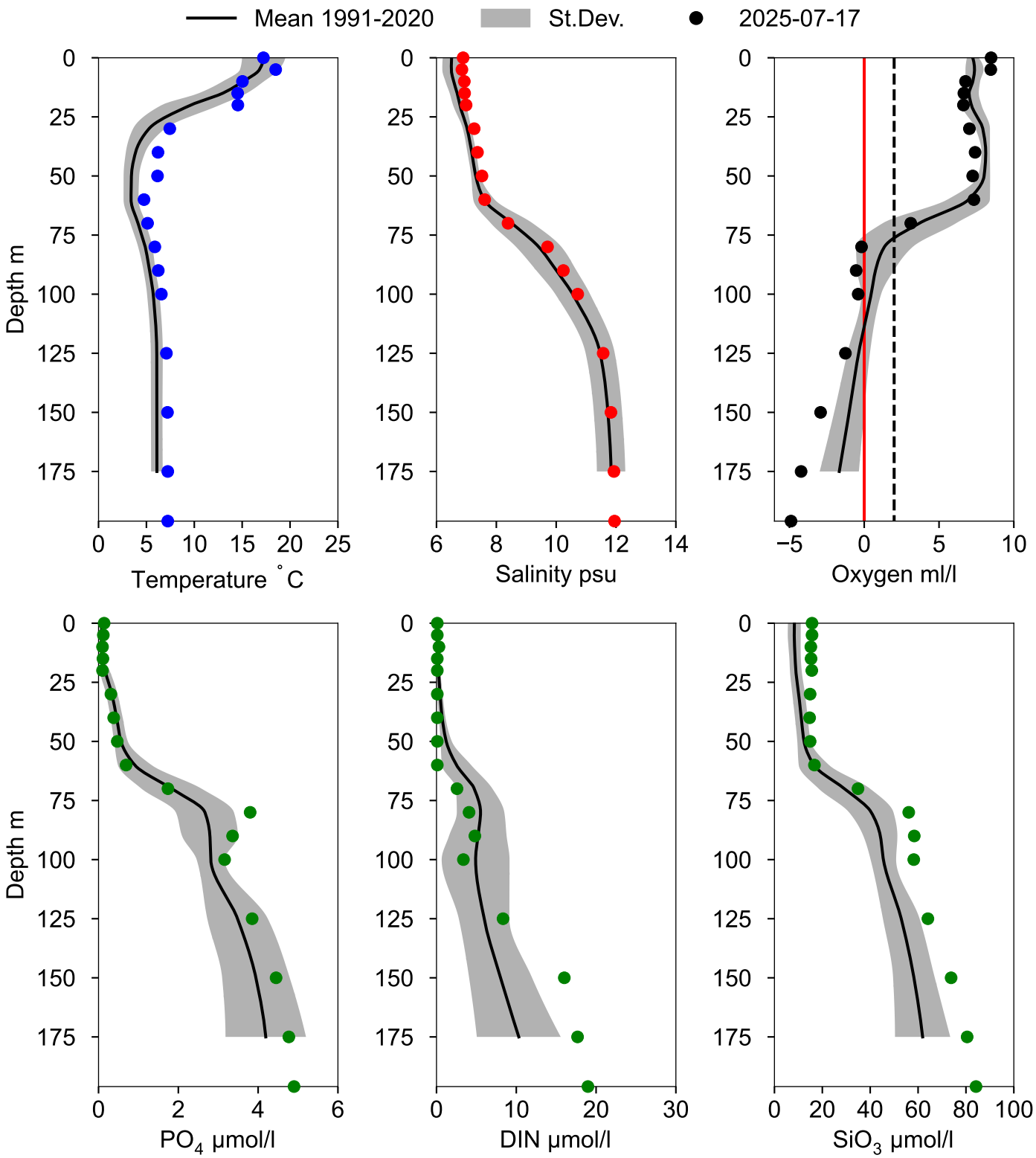
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

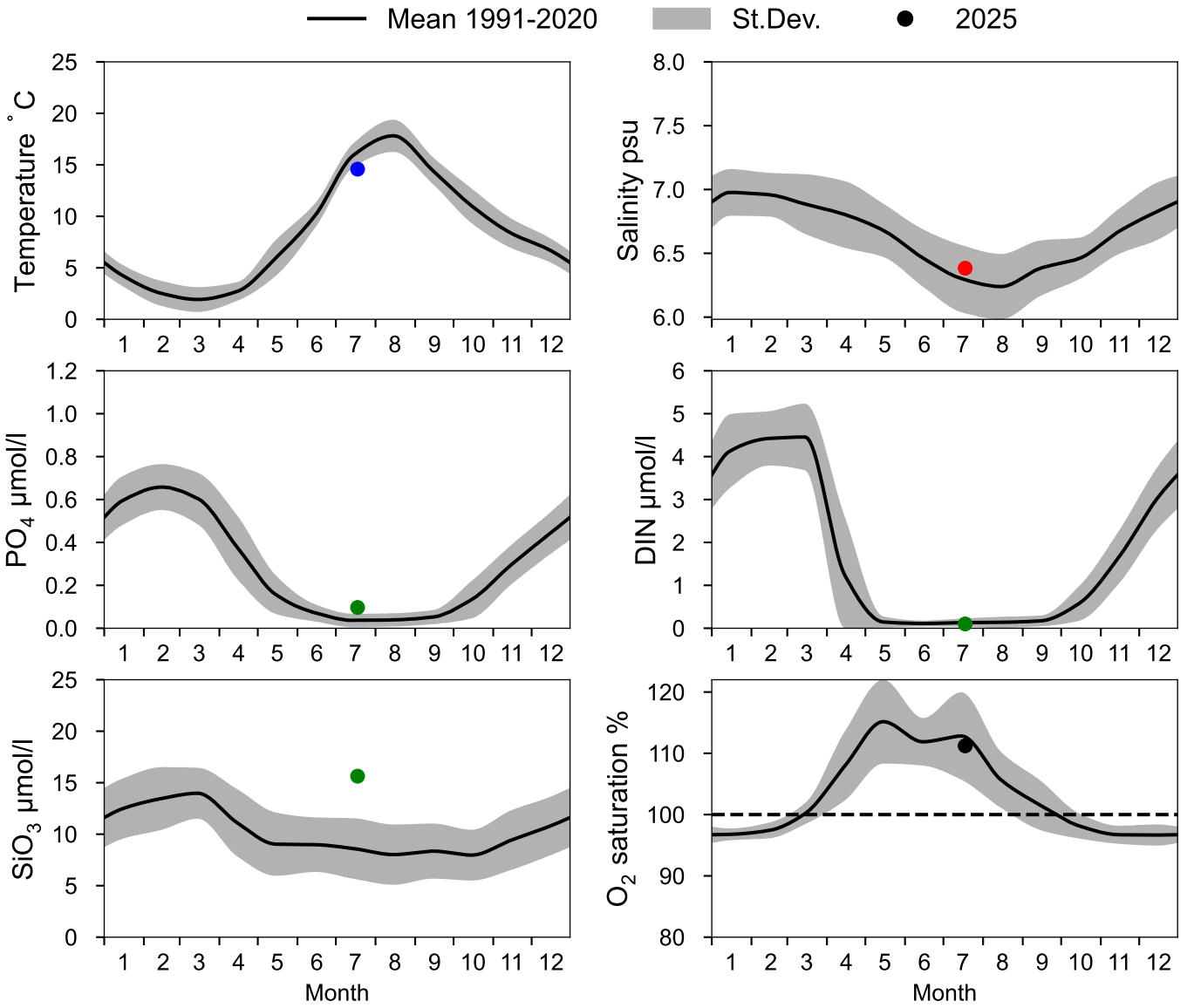


Vertical profiles BY20 FÅRÖDJ
July

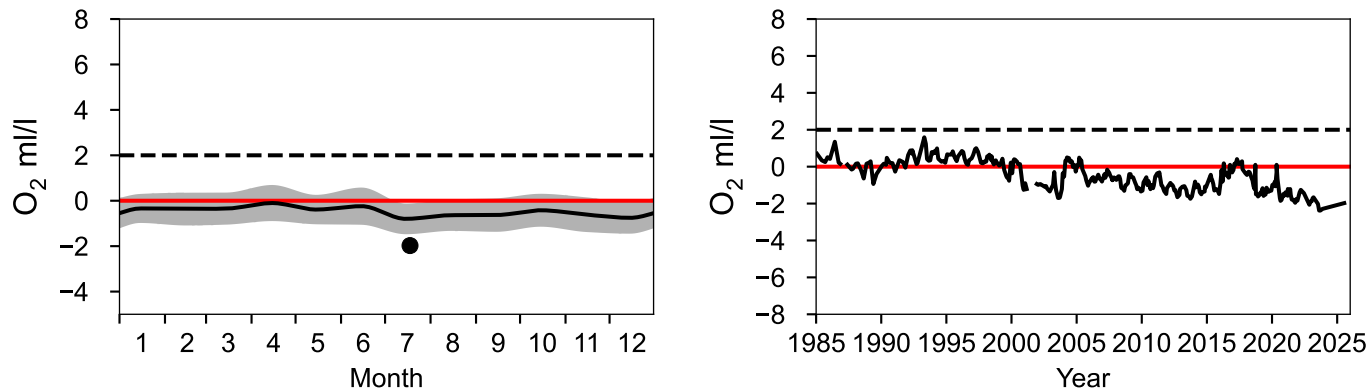


STATION BY29 / LL19 SURFACE WATER (0-10 m)

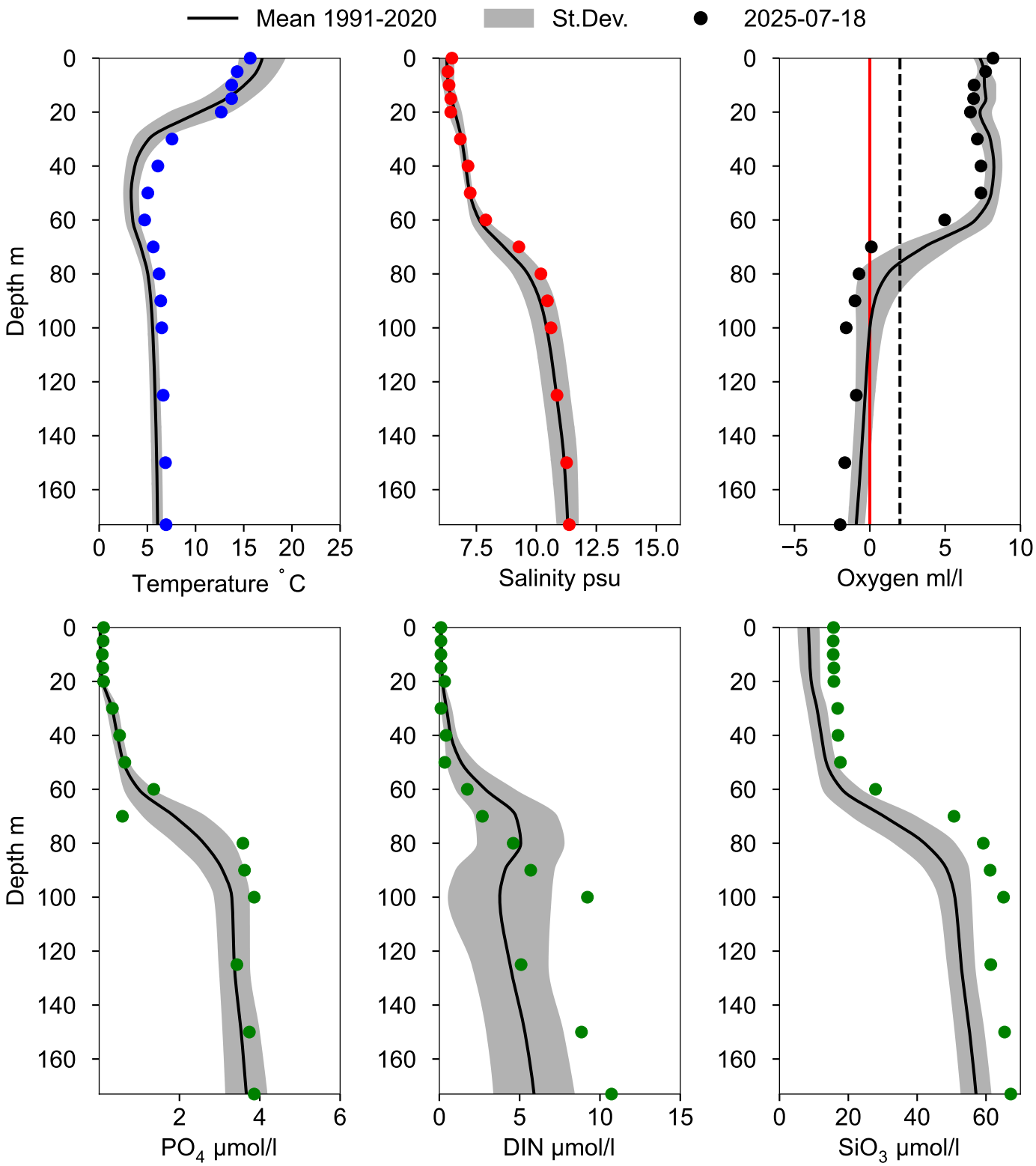
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 150 m)

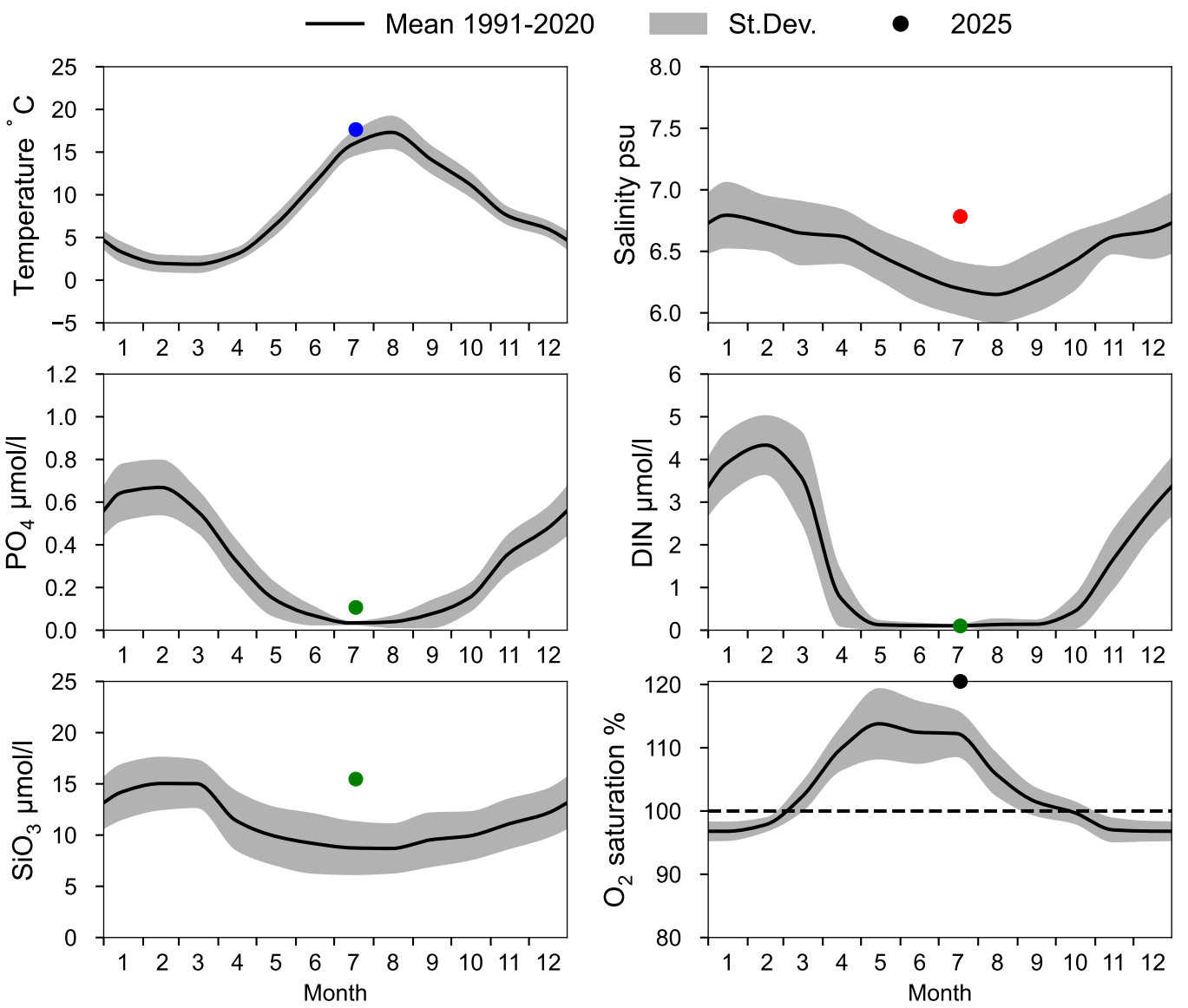


Vertical profiles BY29 / LL19
July

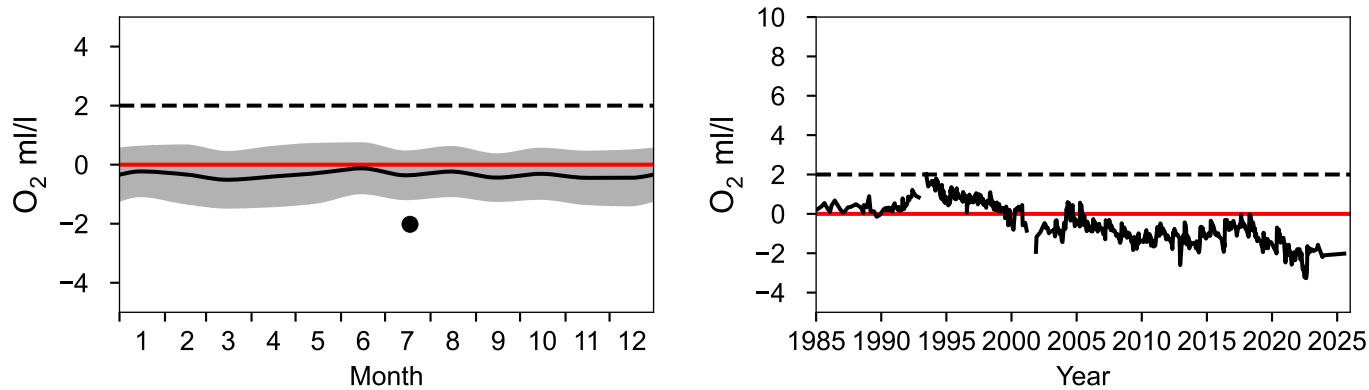


STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

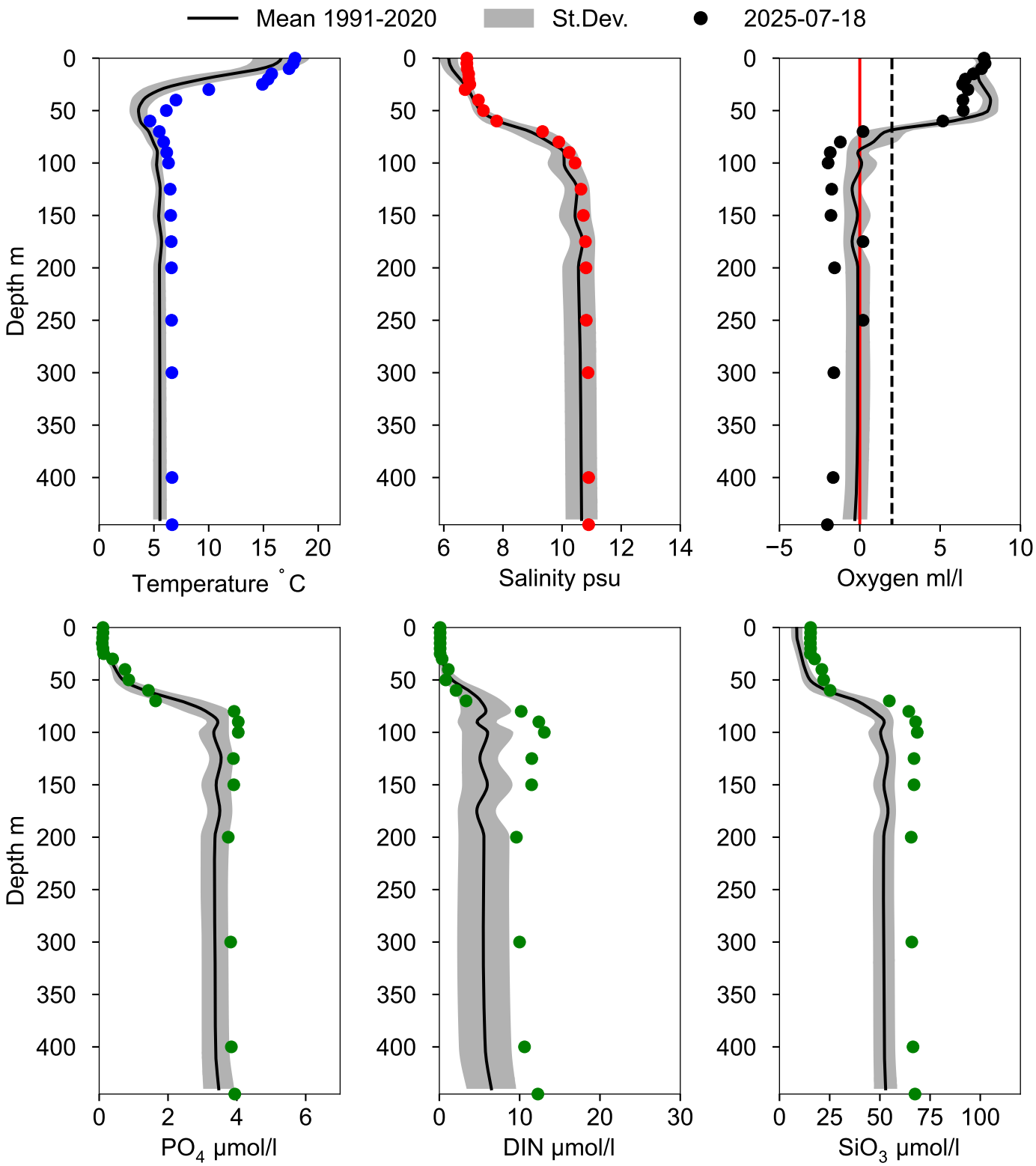
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 419 m)

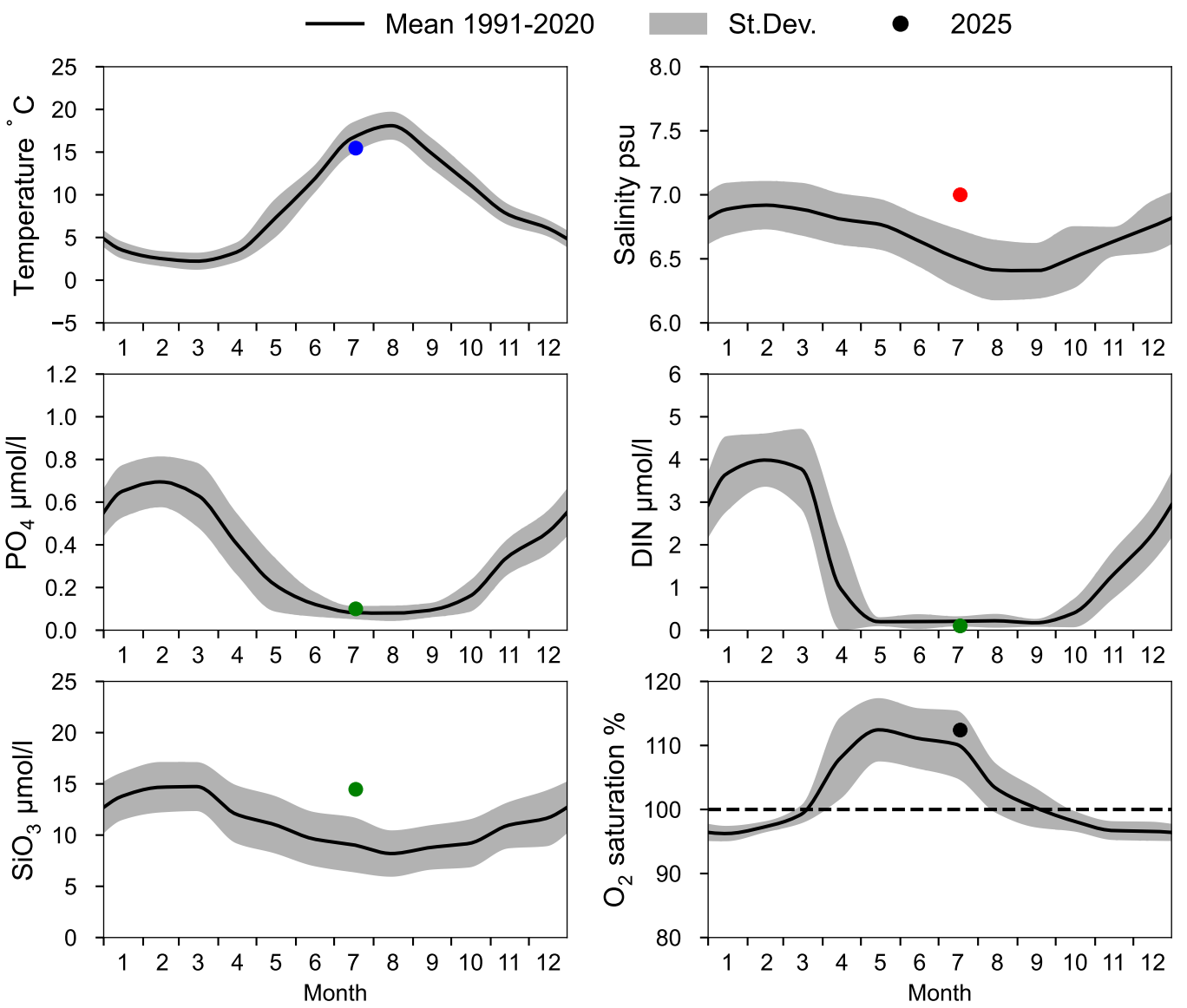


Vertical profiles BY31 LANDSORTSDJ
July

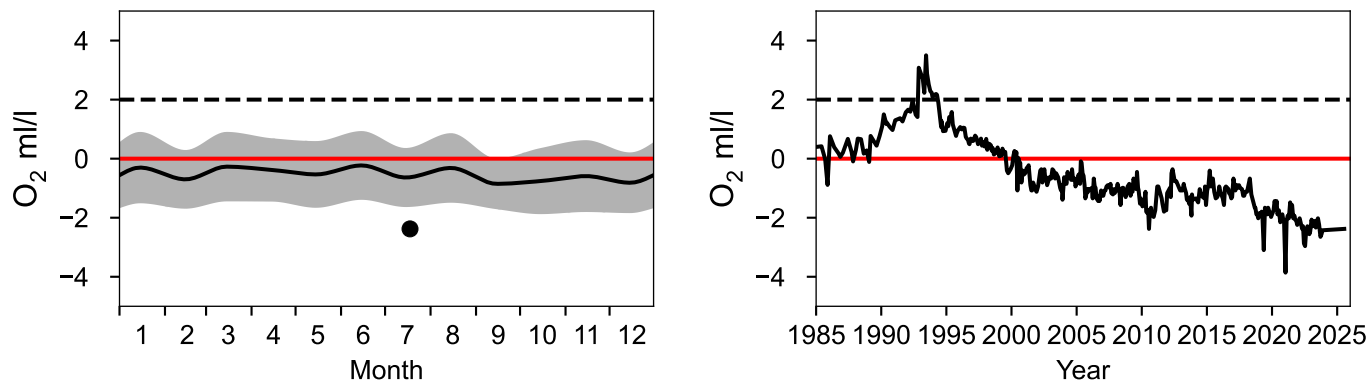


STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

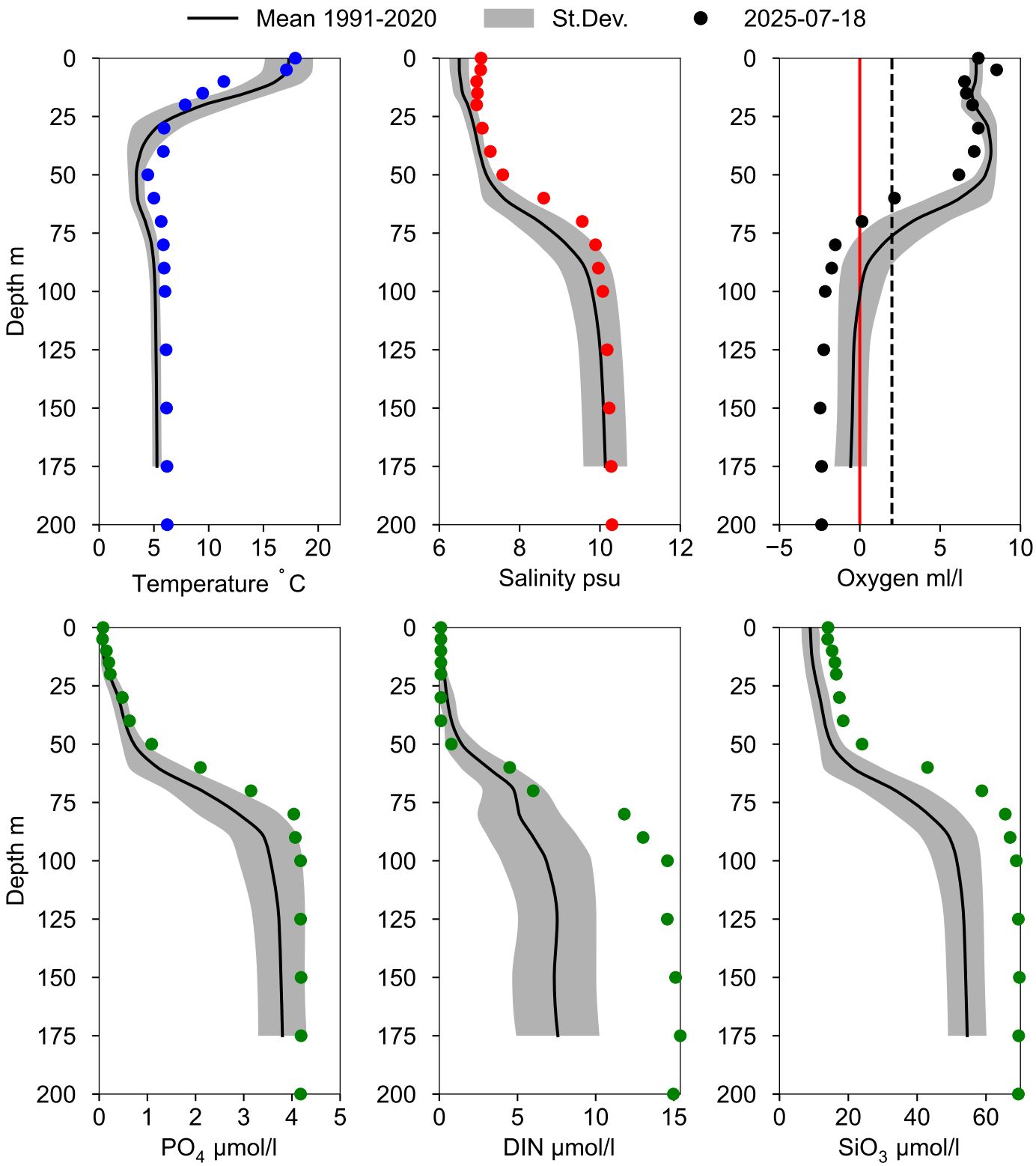
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

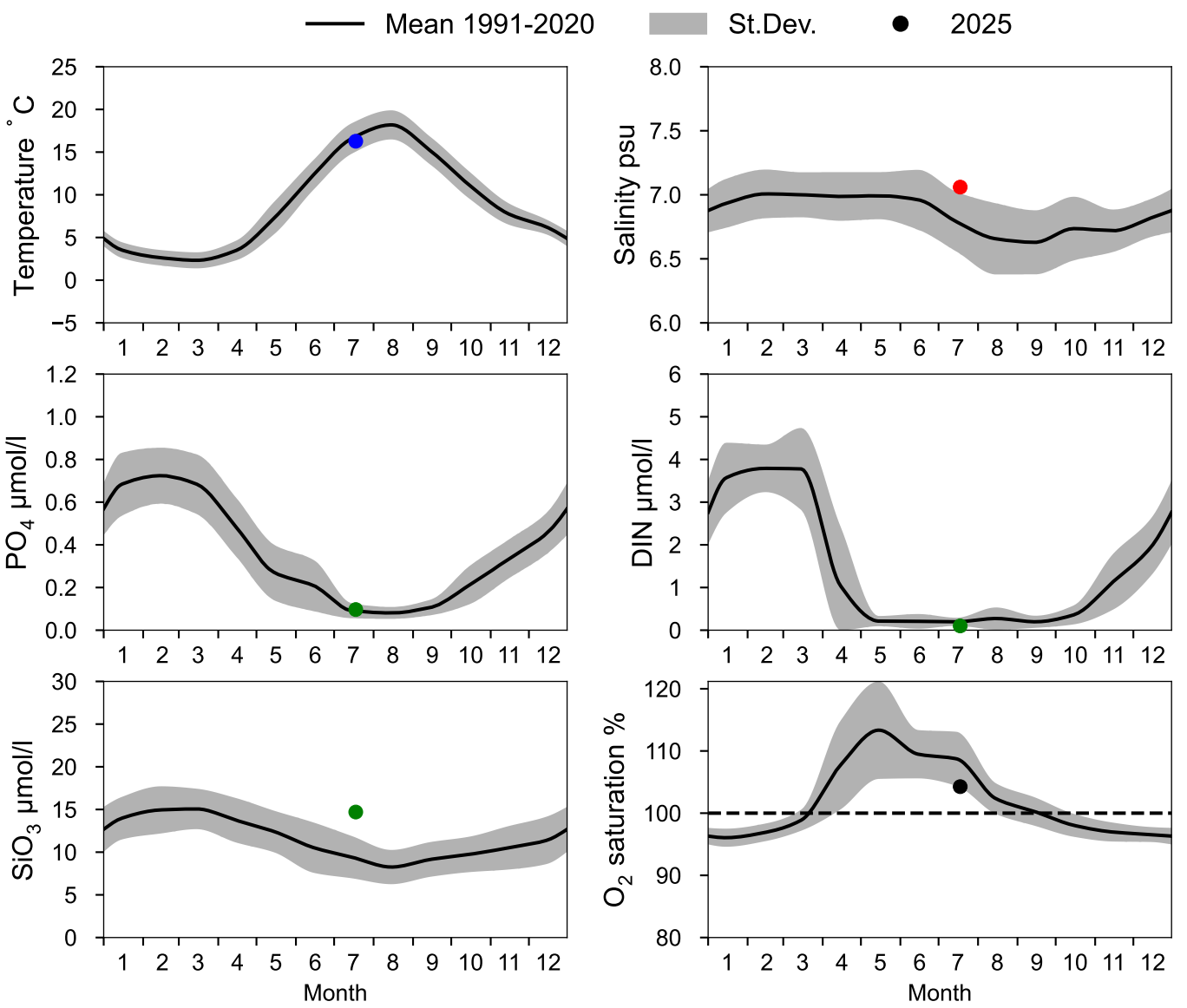


Vertical profiles BY32 NORRKÖPINGSDJ
July

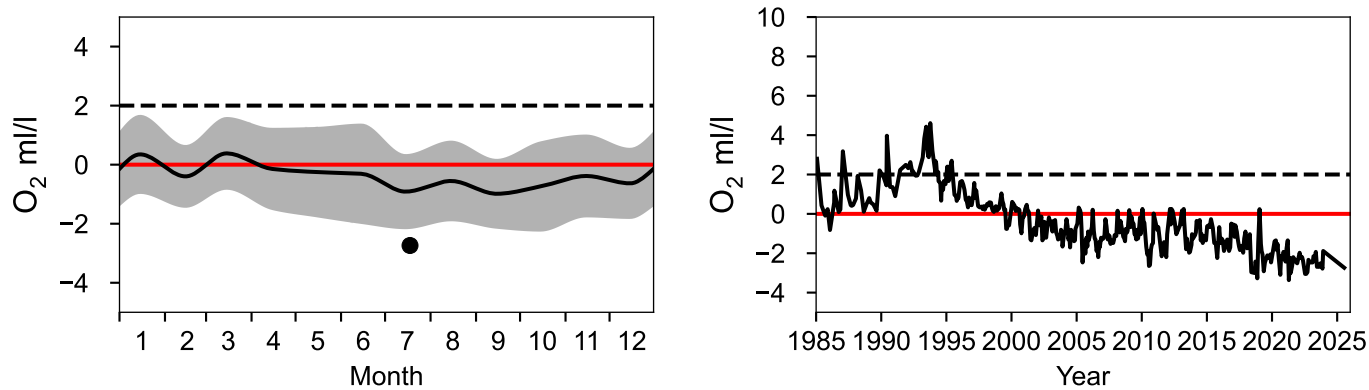


STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

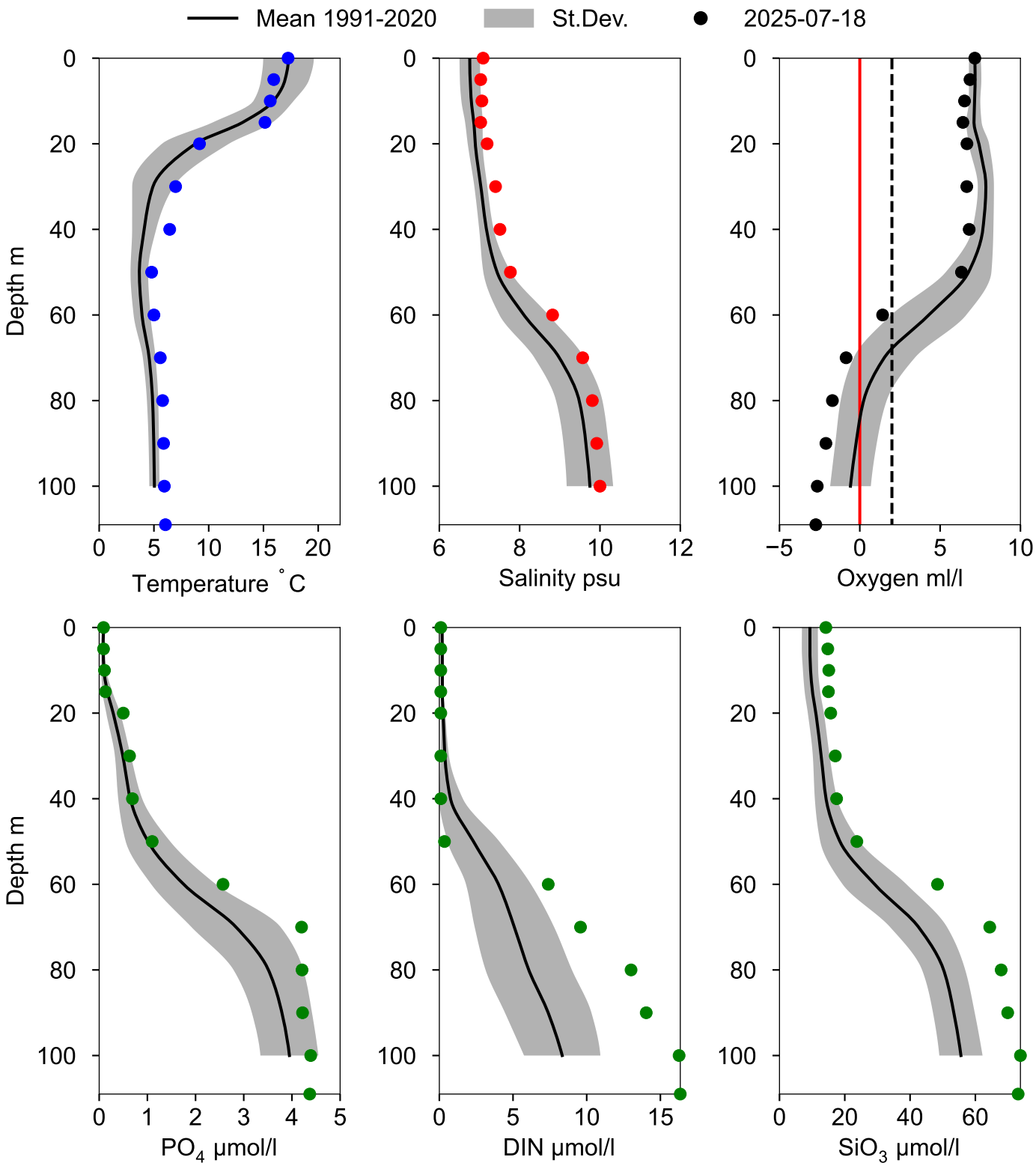
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

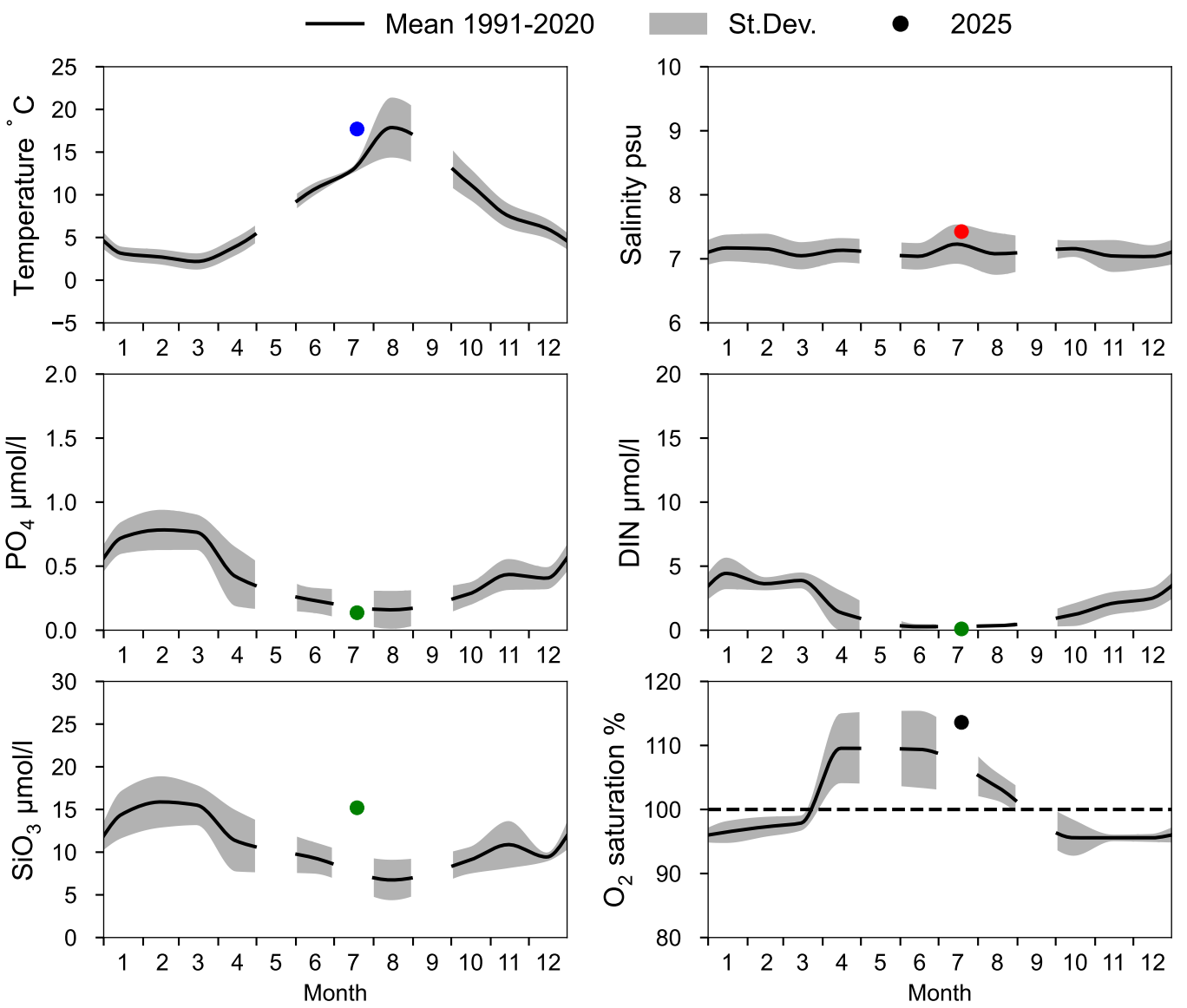


Vertical profiles BY38 KARLSÖDJ
July

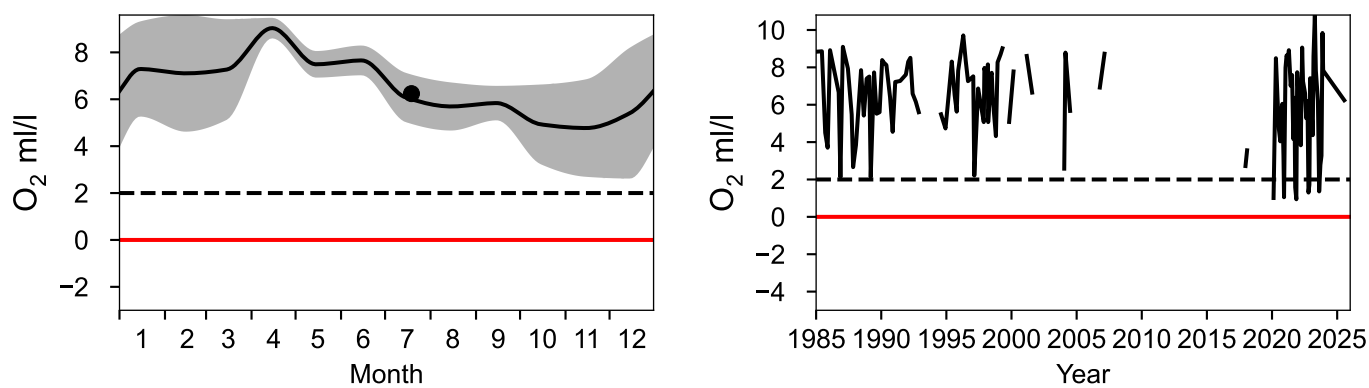


STATION BY39 ÖLANDS S UDDE SURFACE WATER (0-10 m)

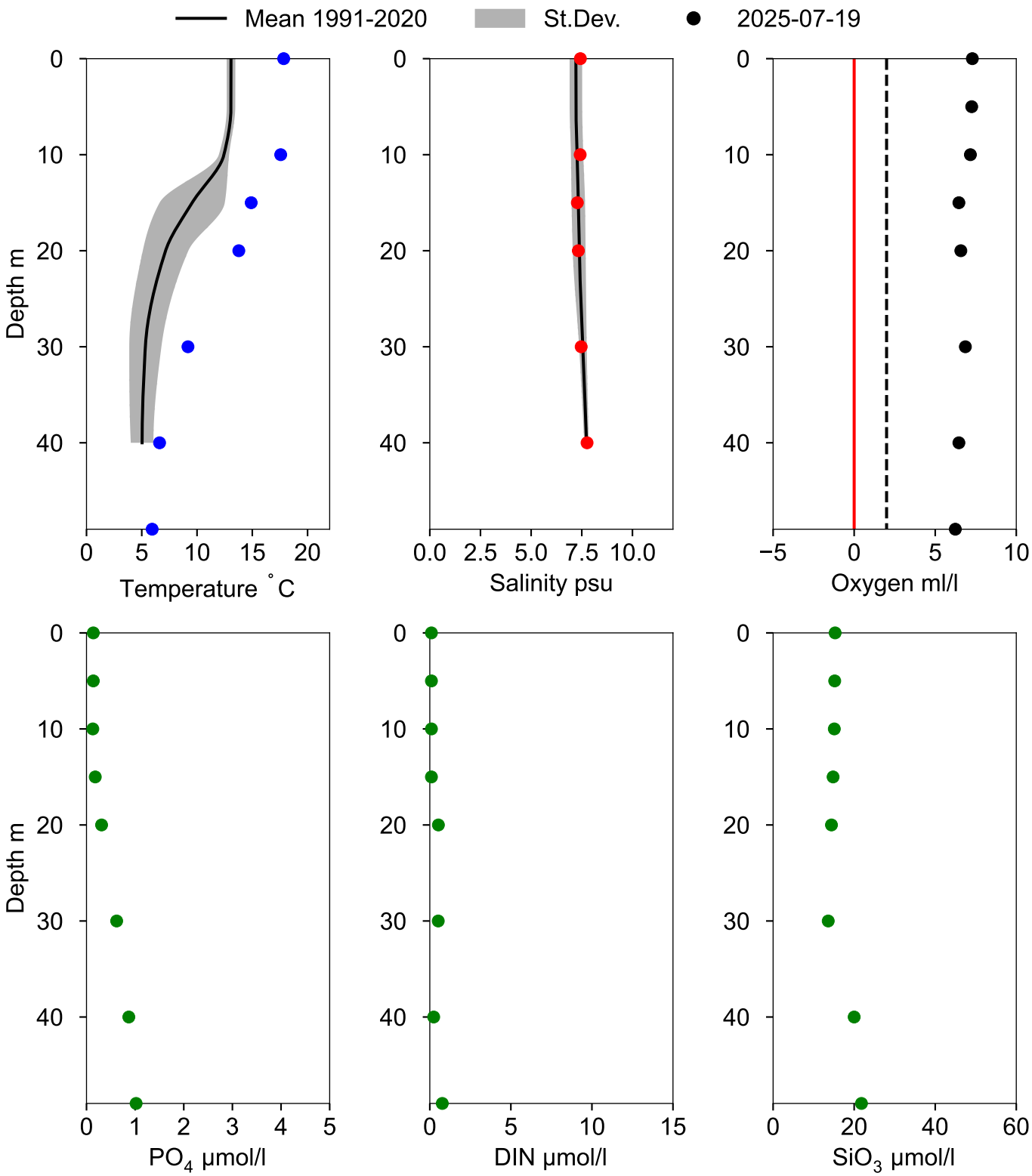
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

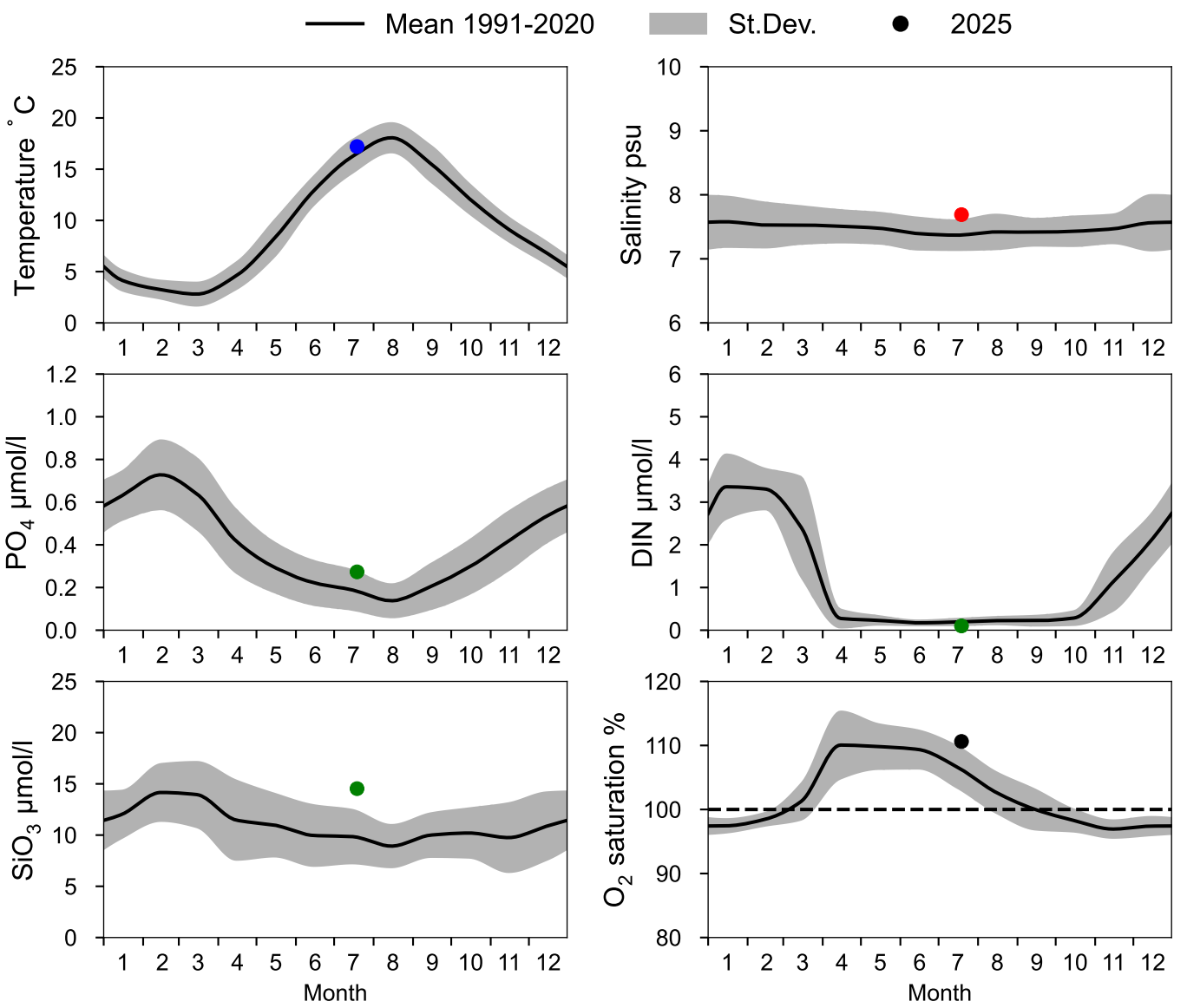


Vertical profiles BY39 ÖLANDS S UDDE
July

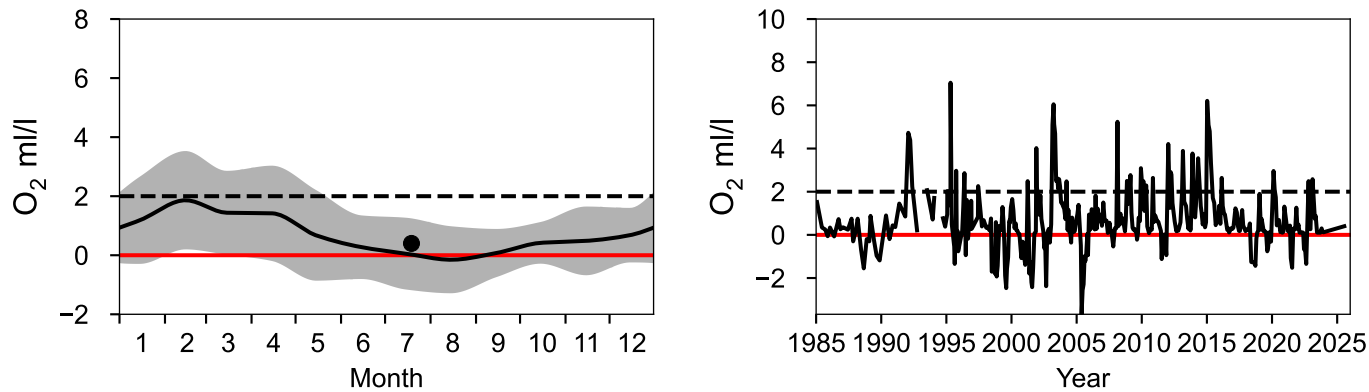


STATION HANÖBUKTEN SURFACE WATER (0-10 m)

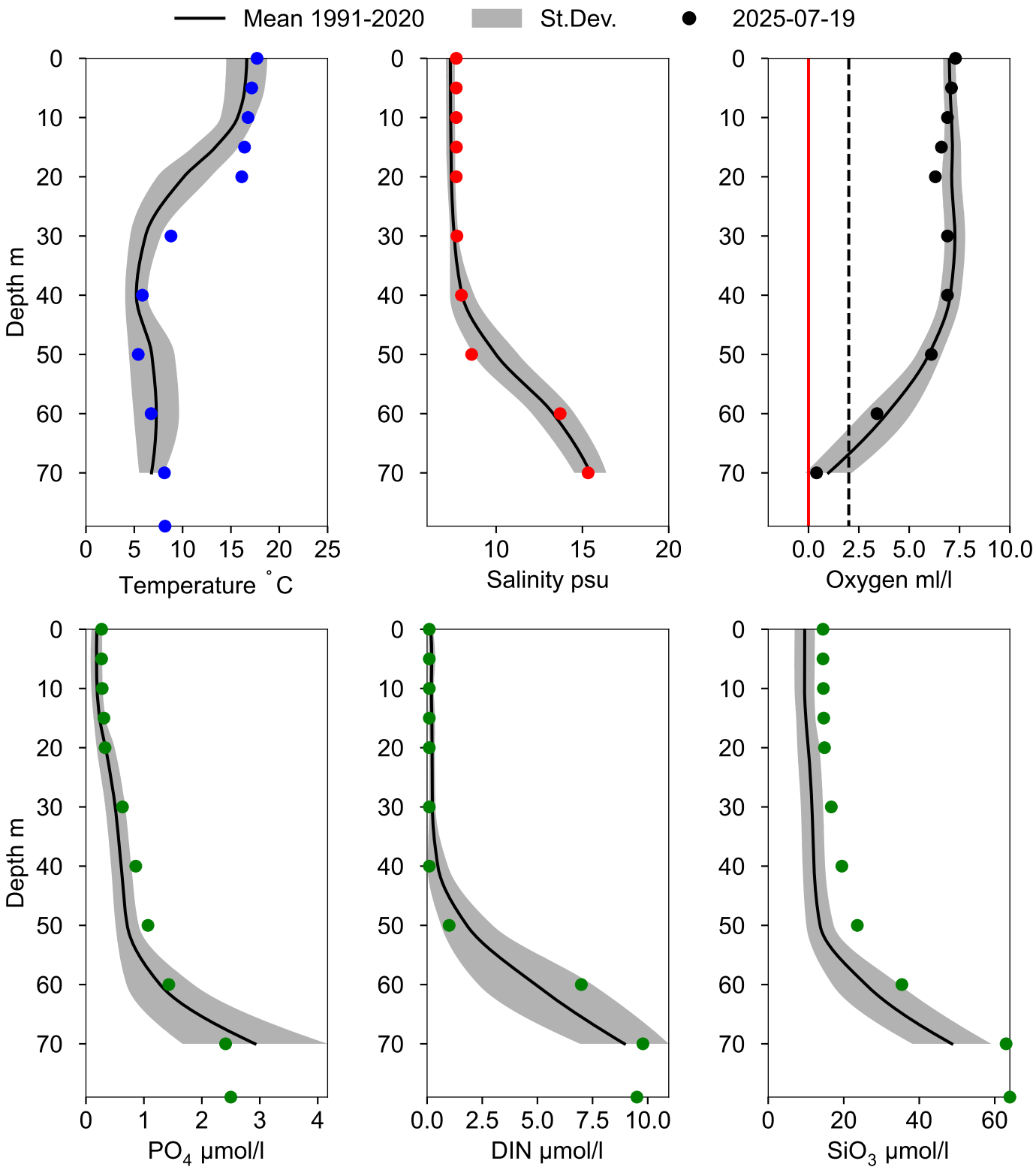
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 70 m)

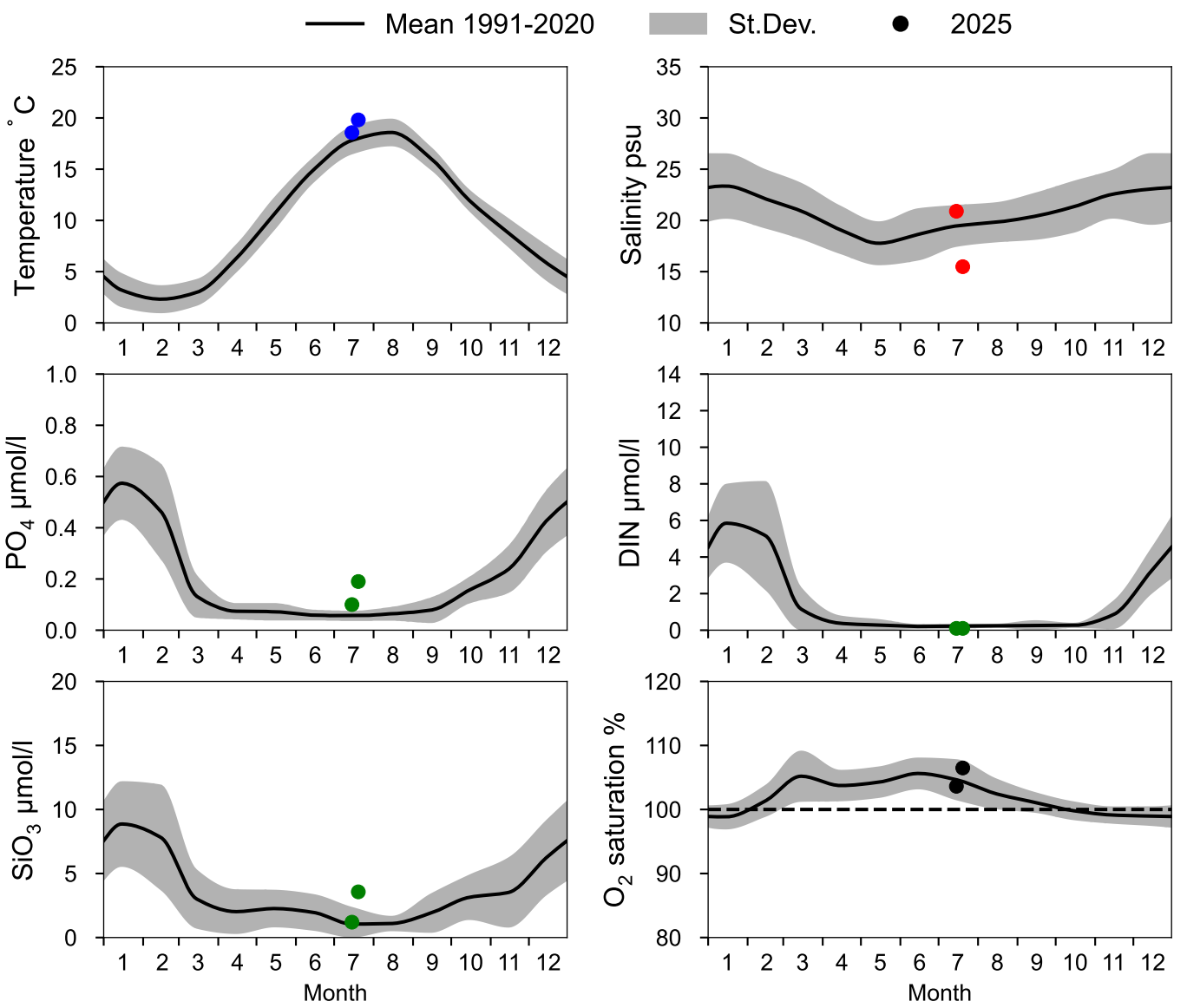


Vertical profiles HANÖBUKTEN
July

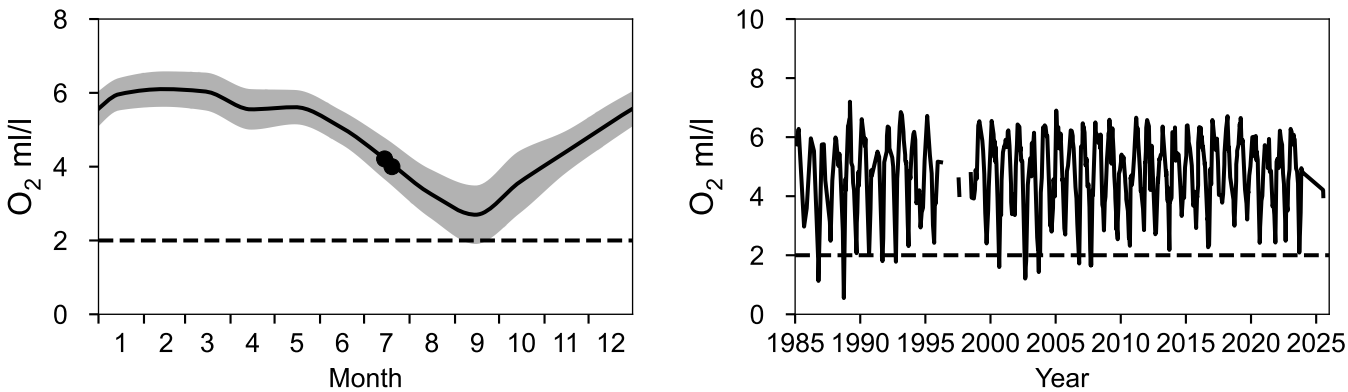


STATION ANHOLT E SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)



Vertical profiles ANHOLT E
July