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

Photo: Martin Hansson, SMHI

Survey period: 2021-12-07 to 2021-12-18

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

Cooperation partners: Umeå Marine Research Centre (UMF),
Swedish University of Agricultural Sciences (SLU),
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SUMMARY

During the cruise, which is part of the Swedish pelagic surveillance program, the Skagerrak, the Kattegat, the Sound, the Baltic Proper and the Gulf of Bothnia were visited.

The surface water (0–10 m) had cooled down about 4-5 degrees since November, but the temperature was normal for the season at most stations in the Skagerrak, the Kattegat, the Baltic Proper and the Gulf of Bothnia. In the deeper parts of the Bothnian Sea and the Baltic Proper, water with temperatures above or well above normal was found. The salinity of the surface water remained higher than normal in parts of the central Baltic Proper, while it was lower than normal at some stations in the southern Baltic Proper, as well as in the Gulf of Bothnia and the eastern and north-eastern Bothnian Sea.

The concentrations of inorganic nutrients in the surface water had increased since November and were now close to the maximal winter pool, which is normal for the autumn when phytoplankton activity decreases and the water mass mixes. The concentration of inorganic dissolved nitrogen and phosphorus in the surface water was slightly lower than normal in parts of the Baltic Proper. The concentration of silicate was above normal at several stations in the Baltic Proper. The mapping of nutrients in the Gulf of Bothnia showed that the concentrations of phosphate were higher than normal in both the Bothnia Bay and the Bothnian Sea. Concentrations of silicate were higher than normal in the eastern part of the Gulf of Bothnia. The concentrations of dissolved inorganic nitrogen (DIN) were normal throughout the Gulf of Bothnia except for two stations in the north-eastern part of the Bothnian Sea where higher than normal levels were measured.

The oxygen situation in the Baltic Proper remains problematic. In the Bornholm Basin, the deep water was oxygen-free and hydrogen sulphide was measured. In Hanö Bight, low but measurable concentrations of oxygen from 70 m were still found. With the exception of BCSIII-10 and BY15, hydrogen sulphide from 70–80 m depth was measured in the remaining basins in the Baltic Proper. At BY15 it was oxygen-free or very low oxygen concentration from 80 m and hydrogen sulphide was first measured from 125 m. At BCSIII-10 it was almost oxygen-free from 70–80 m depth while in the groundwater there was acute oxygen deficiency.

In the Kattegat, no oxygen deficiency was noted and the oxygen levels were normal. In the Sound, on the other hand, oxygen deficiency was measured already at a depth of 15 m with concentrations around 3 ml / l from 15 m to the bottom. There was no oxygen deficiency in the Skagerrak, at the Släggö station where oxygen deficiency was measured in November, the oxygen concentration had now increased and the levels were above the limit for oxygen deficiency. In the Gulf of Bothnia, no oxygen deficiency was noted, which is normal.

The next regular cruise is planned for January 10–17 with R/V Svea, then there will also be winter mapping of nutrients in the Kattegat.

RESULTS

The cruise was carried out on board R/V Svea and started in Kalmar on December 7. After the regular stations in the Western Gotland Basin and the Åland Sea had been sampled, a harbour visit was made to the port of Gävle on December 9 to pick up staff from Umeå Marine Research Center (UMF), who participated on the cruise in the Gulf of Bothnia to carry out a joint nutrient mapping and sample comparison. This first part of the cruise ended in the port of Gävle on December 13 when UMF's staff left R/V Svea and SMHI carried out a staff change. During the second half of the cruise, the remaining regular stations in the Baltic Proper, the Skagerrak and the Kattegat were visited.

The purpose of the joint cruise between UMF and SMHI in the Gulf of Bothnia was to get to know each other, exchange experiences and compare a number of analyses and results that are carried out directly on board or ashore after the cruise. The results from the joint cruise will be presented in a separate report that will be available on SMHI's and UMF's website during the beginning of 2022.

In the Gulf of Bothnia, three mapping stations were cancelled (SR8, US7, US3), instead the four offshore stations included in the part of the environmental monitoring program that is normally carried out by UMF were sampled. In the Baltic Proper, all planned stations and an additional CTD station in the Northern Baltic Proper were sampled.

The weather during the first half of the cruise was cloudy, with very few hours of sunshine. The air temperature varied around zero. At the beginning of the cruise between Kalmar and Gävle, the winds were weak, 5-7 m/s with varying directions from north to east. In the Bothnian Sea, the wind increased to around gale now from the southeast. In the Gulf of Bothnia, the wind decreased and remained around 4-8 m/s until the port visit in Gävle on December 13. During the second part of the cruise, the winds were initially south to southwest between 10–14 m/s during the entire passage south through the Baltic Proper. In the Sound, the wind had calmed down and was around 6 m/s during the rest of the cruise through the Kattegat and Skagerrak. In the Kattegat, the previously cloudy sky cleared and the sun and moon came out over a relatively calm sea. The air temperature varied around 5-7 degrees throughout the last part of the cruise.

Extra phytoplankton samples were taken at the Å17 station in the Skagerrak for a project at Uppsala University.

Svea instruments for continuous measurements of surface water and current (Ferryboxes and ADCPs) were in operation throughout the cruise. Tests were also done with the sample distributor in the ferry box. Svea's instrument for measuring profiles under way, MVP (Moving Vessel Profiler) was in service and was not used.

This report is based on data that has undergone an initial quality control. When additional quality review has been performed, certain values may change. Data from this cruise is published as soon as possible on the data host's website, this usually takes place within a week after the cruise has ended. Some analyses are made after the cruise and are published later.

Data can be downloaded from SHARKweb here:
https://www.smhi.se/klimatdata/oceanografi/havsmiljodata

The Skagerrak

The surface water (0–10 m) had cooled down by about 5–6 degrees since the cruise in November and was 6 degrees in December, which is normal for the month. Only at the westernmost station, Å17, was it slightly colder, about 5 degrees, which was just below normal for the month at that station. Here (Å17) the salinity was also lower than normal (27.5 psu), which was also the lowest salinity of all stations in the Skagerrak. At the other stations, the salinity varied between 28.4-31.9 psu and was within the normal range for the month. Low salinity in the Skagerrak may indicate water originating in the German rivers that runoff into the North Sea, west of Denmark. These river waters also have a higher concentration of silicate than is normal in the Skagerrak and we see that at this measurement occasion, the concentration of silicate was also higher than normal at Å17. The same pattern was also found at this year's first cruise in January 2021. At all stations there was a surface layer with colder and sweeter water, at Å17 the halocline was situated at10 m while the other stations had a thinner surface layer and a halocline at about 5 m depth. Below the halocline the temperature increased to 8-9 degrees and at the two deepest stations the temperature decreased again at about 150 m to about 7 degrees. The temperature and salinity below the halocline were normal.

The concentration of nutrients in the surface water had increased markedly since November at all stations, except Släggö, and is now approaching annual maximums which are normally measured during December or January. Only at station Å17 the measured concentration of silicate was above normal for the month, otherwise the concentration of all nutrients was within the normal range in the Skagerrak. At stations Släggö and P2, the concentration of nutrients had increased already in November and therefore did not show as clear an increase between November and December as for other stations. Slightly elevated levels of silicate were measured below the halocline at the Å15 station, otherwise the concentration of nutrients in the deep water was normal in the Skagerrak.

There was no oxygen deficiency in the Skagerrak, at the Släggö station where oxygen deficiency was measured in the bottom water in November, the oxygen concentration had now increased from 2.7 ml/l to 5.0 ml/l.

The plankton activity, assessed on the basis of chlorophyll fluorescence measured with a sensor on the CTD, showed low activity in the surface layer at all stations.

The Kattegat and the Sound

The temperature in the surface water (0–10 m) was normal for the month and varied between 5-6 degrees, coldest at the stations Anholt E and N14 Falkenberg and warmest in the Sound and at the station Fladen. The salinity of the surface water (0–10 m) increased from 20 psu in the Sound to 24 psu at the northernmost station in the Kattegat, Fladen.

In the Sound, there was a strong southern current, about 3 knots, and the water was well mixed down to 5 m. In the Kattegat, the well-mixed surface layer was about 10–15 m, below this surface layer the temperature and salinity increased. At stations N14 Falkenberg and Fladen the temperature in the bottom water was about 8.5 degrees, at stations Anholt E just over 10 degrees and in the Sound around 11 degrees. The temperature was normal for the season except in the Sound where it was slightly warmer than normal.
The concentrations of nutrients had increased markedly since November and are now approaching winter maxima. The concentrations of dissolved inorganic phosphorus and nitrogen were normal for

the month at all depths. Silicate was above normal below the halocline in the Sound, in the surface water at Fladen and at 10-15 m at N14 Falkenberg.

In the Kattegat, the oxygen concentration in the bottom water had increased since November when oxygen deficiency was measured at the stations Anholt E and Fladen. Now no oxygen deficiency was measured and the oxygen concentration was normal for the month at all stations in the Kattegat from the surface to the bottom. In the Sound, on the other hand, oxygen deficiency was measured already at a depth of 15 m with concentrations around 3 ml/l from 15 m to the bottom.

The plankton activity, assessed on the basis of chlorophyll fluorescence measured with a sensor on the CTD, showed a low activity in the surface layer at all stations.

The Baltic Proper

The temperature in surface water (0-10 m) was about 6 degrees at all stations except the shallow coastal station Ref M1V1 in the Kalmar strait where it was slightly colder, just below 5 degrees. The temperature was normal at all stations except BCSIII-10 in the south eastern Baltic Proper. This is a large difference compared to December 2020 when the temperature in the surface water was above normal after an unusually warm autumn. The salinity of the surface water varied between 7.0–8.0 psu, lowest in the Northern Baltic Proper and highest in the Arkona Basin. The salinity around 7.0-7.5 psu in the Western and Eastern Gotland basins was above normal, while the salinity at the station BY4 in the north eastern Bornholm Basin and in Hanö Bight was below normal, with 6.9 psu. There was a relatively large difference in surface salinity between the two stations BY4 and BY5 in the Bornholm Basin, 7.0 psu at BY4 and 7.6 psu at BY5.

The water was well mixed down to the halocline, which varied slightly in depth, about 60 m at most stations in the Gotland Basins and the Northern Baltic Proper, somewhat shallower in the south eastern part of the Eastern Gotland Basin (BY10 and BCSIII-10). In the Western Gotland Basin at the station BY32 there was still a layer with slightly warmer water left around 40 meters deep. In parts of the Western and Eastern Gotland Basins, the deep water was warmer than normal. In the Bornholm Basin and Hanö Bight, the halocline was about 40–50 m deep and in Arkona the water was well mixed down to 15–20 m, where the salinity increased gradually towards the bottom. At the station BCSIII-10 station, traces of an inflow into the bottom water were seen with a sharp increase in temperature, salinity and oxygen concentration. In Hanö Bight and the Bornholm Basin, there was warmer water, up to ten degrees, in a layer between 50–70 m, where the oxygen concentration decreased rapidly to zero or close to zero. At the Ref M1V1 station in Kalmar strait and the station BY39, there was no stratification.

In the Bornholm Basin, the bottom water was anoxic and hydrogen sulphide was measured from a depth of 80 m. In Hanö Bight there were still measurable concentrations of oxygen, but very low from 70 m to the bottom. In the Arkona basin, no oxygen deficiency was found. With the exception of the stations BCSIII-10 and BY15, hydrogen sulphide was measured from a depth of 70–80 m in the remaining basins in the Baltic Proper. At BY15 it was anoxic or very low oxygen concentration from 80 m and hydrogen sulphide was first measured at 125 m. At BCSIII-10 it was almost oxygen-free from 70-80 while in the bottom water there was acute oxygen deficiency with an oxygen concentration of 1.5 ml/l.

The concentrations of inorganic dissolved nitrogen and phosphorus in the surface water (0-10 m) was slightly lower than normal in the Western Gotland Basin and Hanö Bight and station BY4 in the Bornholm Basin. At all other stations, the concentrations were normal in the surface water. Even the silicate concentration was below normal at a couple of stations in the Western Gotland Basin while the concentration of silicate in the Eastern Gotland Basin, Arkona and at station BY5 in Bornholm Basin was above normal. In the anoxic deep water of the Bornholm Basin, the concentration of nitrogen and phosphorus was above normal, the same pattern was seen in the oxygen-poor bottom water of Hanö Bight. In the entire deep water of the Western Gotland Basin, the concentrations of ammonium (DIN) were much higher than normal, about twice as high as the 15-year average value. At the station BY31, some measured values for ammonium had to be discarded as, despite dilution before analysis, they had too high a concentration to give correct results. Also in the Eastern Gotland Basin, the concentration of ammonium was above normal, but not as much above as in the Western Gotland Basin. The concentration of phosphate was normal in the deep water, except at the two stations in the southeast, BY10 and BCSIII-10 where it was above normal. The concentration of silicate in the deep water was above normal in the Bornholm Basin, Hanö Bight and the Western Gotland Basin.

The plankton activity, assessed on the basis of chlorophyll fluorescence measured with a sensor on the CTD, showed a low activity in the surface layer at all stations.

The Bothnian Sea and the Åland Sea

The stratification in the Bothnian Sea is weakly developed compared to the Baltic Proper, but there is some stratification in temperature and salinity. In parts of the southern Bothnian Sea, a well-mixed surface layer was found down to about 50-60 m depth. Below a warmer and saltier water was found. The temperature in the surface water was normal for the season and varied between 3 to 5 degrees, except at the station US2 where the surface water was much colder than normal, probably due to the surface current that usually flows south along the Swedish coast and brings colder surface water from the Gulf of Bothnia. The salinity was also much lower than normal at the US2 station. In the deeper parts of the Bothnian Sea, water was found with temperatures above or well above normal. At some stations, the salinity was also higher or much higher than normal. This was especially evident at F33 in the southern Bothnian Sea, where the deep water was just below 7 degrees and the salinity was around 7 psu. The salinity was mostly at normal values in the surface water, except in the Åland Sea and in the central and western parts of the Bothnian Sea where the salinity was slightly below normal.

The levels of dissolved inorganic nitrogen were in the surface water in the Åland Sea of about 2.8 µmol/l, in the Bothnian Sea between 2.3–3.5 µmol/l, which are generally normal levels. In the deep water, the concentrations increased from depths exceeding 40-50 m. In the deep water at some of the stations along the Swedish coast, concentrations were found much above normal. The content of phosphate in the surface water was above normal at almost all stations, the levels varied between 0.3-0.4 µmol/l in the whole area. The phosphate content also increased with depth and the levels in the deep water were well above normal. The silicate levels were also higher than normal in the surface water in large parts of the area. The levels in the surface varied between 17-24 µmol/l. Here, too, the concentrations increased with depth and at many stations concentrations were noted above normal.

No oxygen deficiency was noted in the Bothnian Sea or in the Åland Sea, which is normal. The lowest concentrations were noted at the two deepest stations C3 and US2 in the northern part of the Bothnian Sea, with concentrations just below 5 ml/l.

Plankton activity, assessed on the basis of chlorophyll fluorescence measured with the CTD probe, was low throughout the study area. The Secchi disk depth was measured to 5-6 m. The turbidity measured with the CTD turbidity meter showed high particle concentrations at several stations in the deeper parts of the Bothnian Sea. This could also be observed in the images from the camera mounted on the CTD rosette and showing video in real time.

The Bothnian Bay and the Northern Kvark

The stratification in the Gulf of Bothnia and the Northern Kvark is even weaker than in the Bothnian Sea. A weak temperature and salinity stratification in the surface layer down to about 20 m can be seen at some stations that are affected by freshwater. Further down in the water column, a slight stratification can be seen at a depth of about 40-70 m.

The temperature in the surface water was lower than normal at the stations closest to the coasts and in Northern Kvark and slightly higher in the central parts. The temperature varied between 0.7-2.8 degrees. In the deep water the temperature increased and here temperatures of 3-5 degrees were found. The salinity of the surface was normal for the season and varied between 2.7-3.6 psu. Lowest at the stations closest to the Swedish coast. The salinity of the deep water was normal.

The content of dissolved inorganic nitrogen was normal or slightly below normal and varied between 4.7-5.8 µml/l. Phosphate levels in the surface water were low but still above normal, 0.09-0.1 µmol/l. The silicate content in the surface water is naturally high due to the large runoff to the Gulf of Bothnia. Normal or levels above normal were noted and they varied between 33-43 µmol/l. All nutrients were the same as in the surface or increased slightly with depth and were within the normal or slightly lower, except in the Kvark, at station F18, where very high levels of nitrogen, phosphorus and silicate were noted between 60-100 m depth. In this depth range, the oxygen content also decreased from 8 to 6 ml/l.

No oxygen deficiency was noted in the Bothnia Bay or the Northern Kvark, which is normal. The levels in the deep water were above 6 ml/l at all stations.

Plankton activity, assessed on the basis of chlorophyll fluorescence measured with a CTD probe, was low throughout the study area. The Secchi disk depth was measured to 6 m. The turbidity measured with the CTD turbidity meter showed smaller particle concentrations in the deeper parts of the Bothnian Bay compared to the Bothnian Sea.

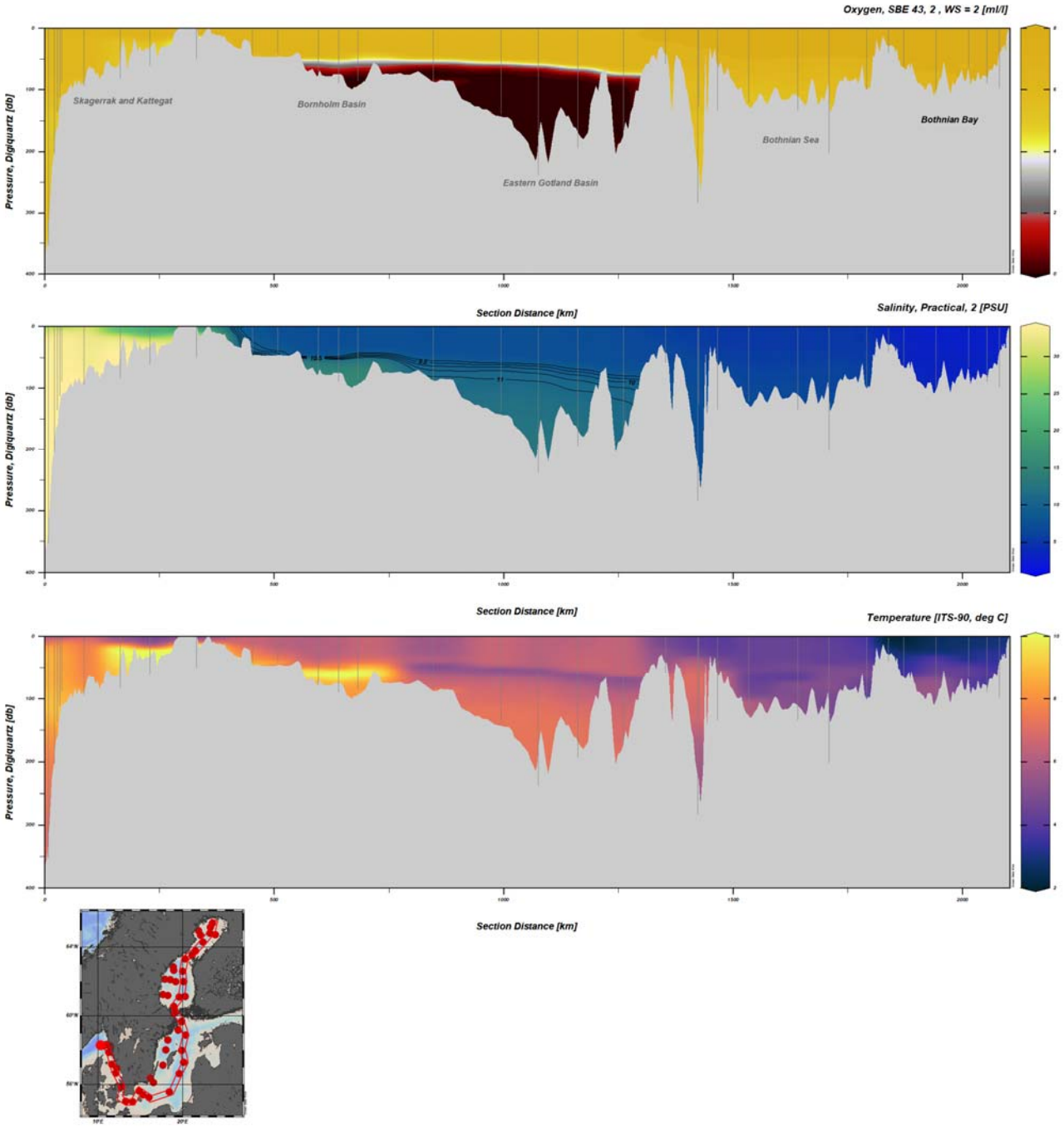

Figure 1. Transect showing CTD measurements of dissolved oxygen, salinity and temperature from Kattegat, the Sound through the Eastern Gotland Basin and through the Gulf of Bothnia.

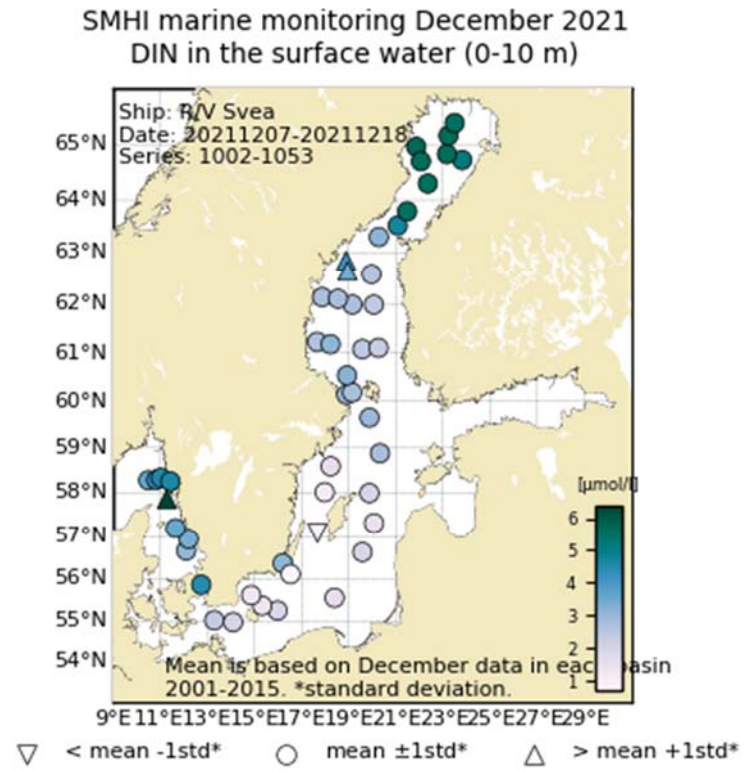

Figure 2. Concentration of dissolved inorganic nitrogen in the surface water (0-10m).

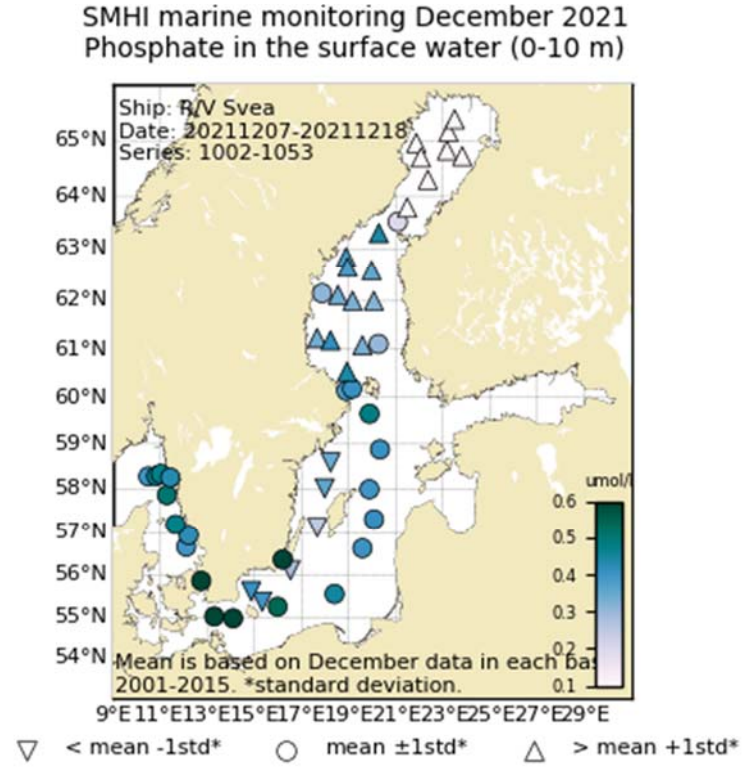

Figure 3. Concentration of phosphate in the surface water (0-10m).

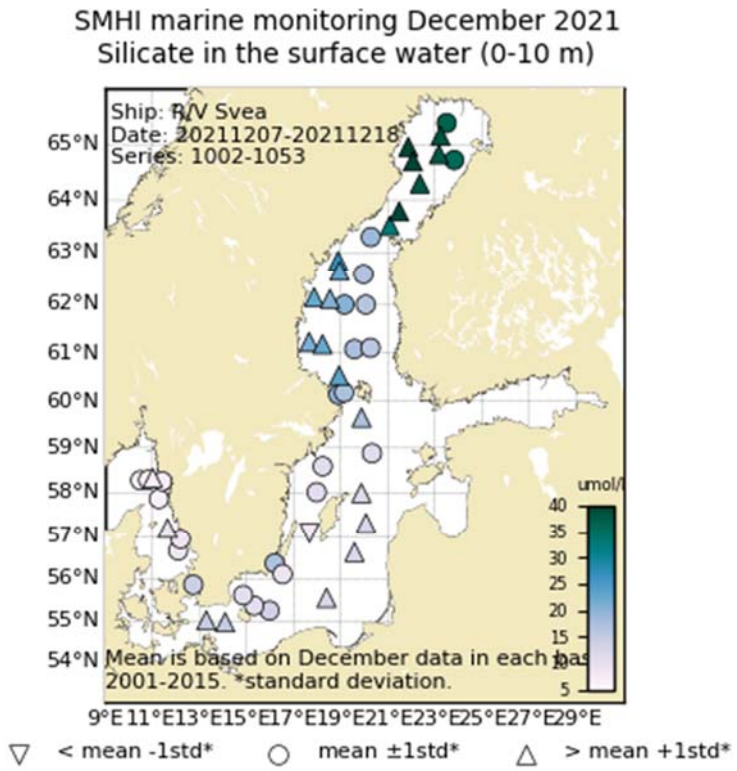

Figure 4. Concentration of silicate in the surface water (0-10m).

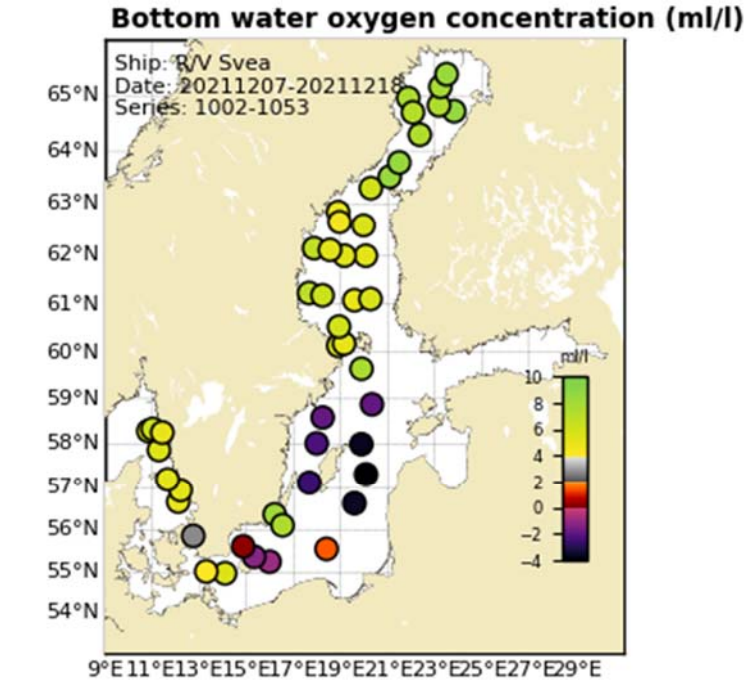

Figure 5. Oxygen concentration in the bottom water.

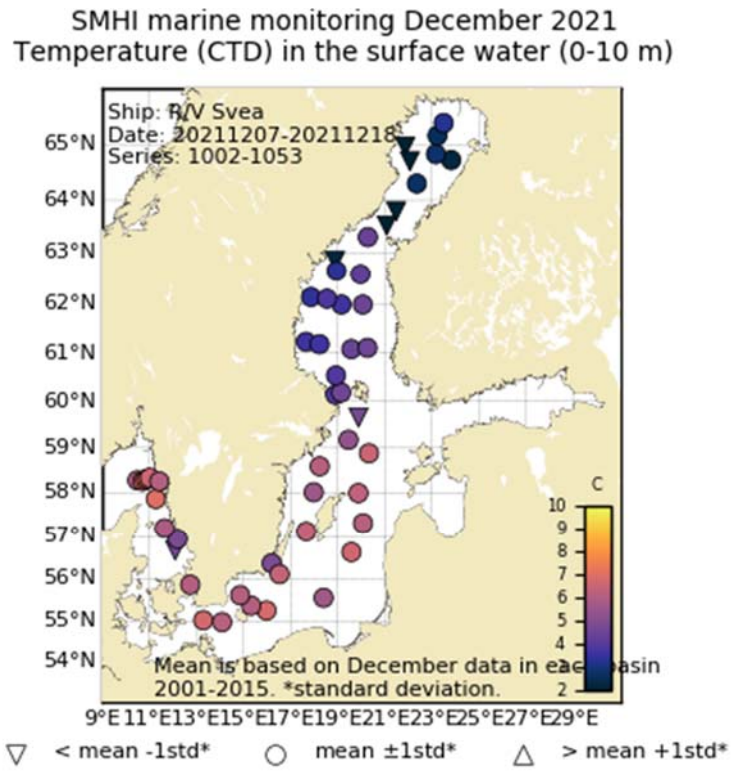

Figure 6. Temperature in the surface water (0-10m).

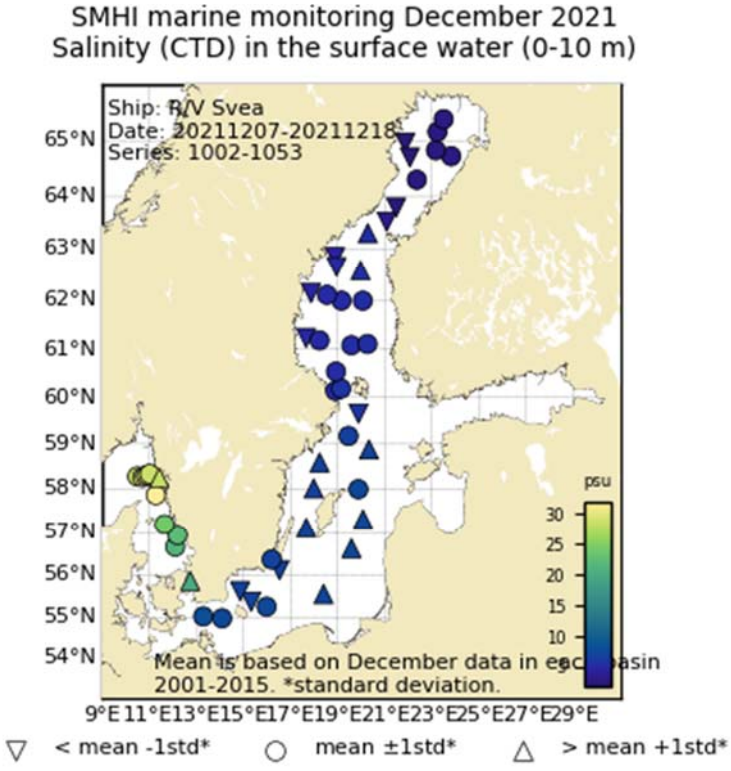

Figure 7. Salinity in the surface water (0-10m).

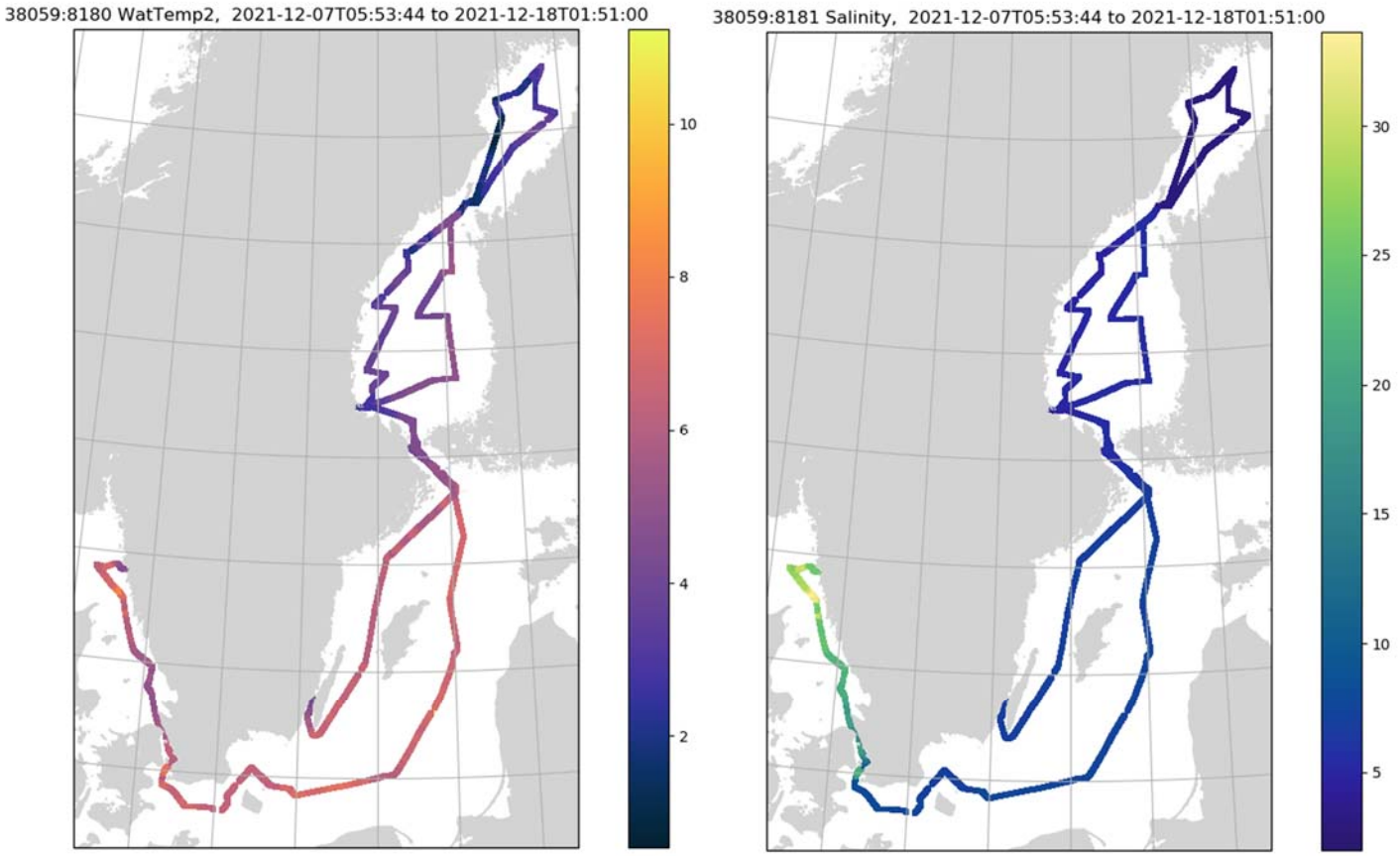

Figure 8. Surface water temperature (left) and salinity (right) from the ferrybox on Svea. Data has only undergone a rough quality control.

PARTICIPANTS

Name	Leg	Role	Institute
Martin Hansson	Kalmar-Gävle-Gävle	Chief scientist, Ben 1	SMHI
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APPENDICES

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

SMHI
Havs
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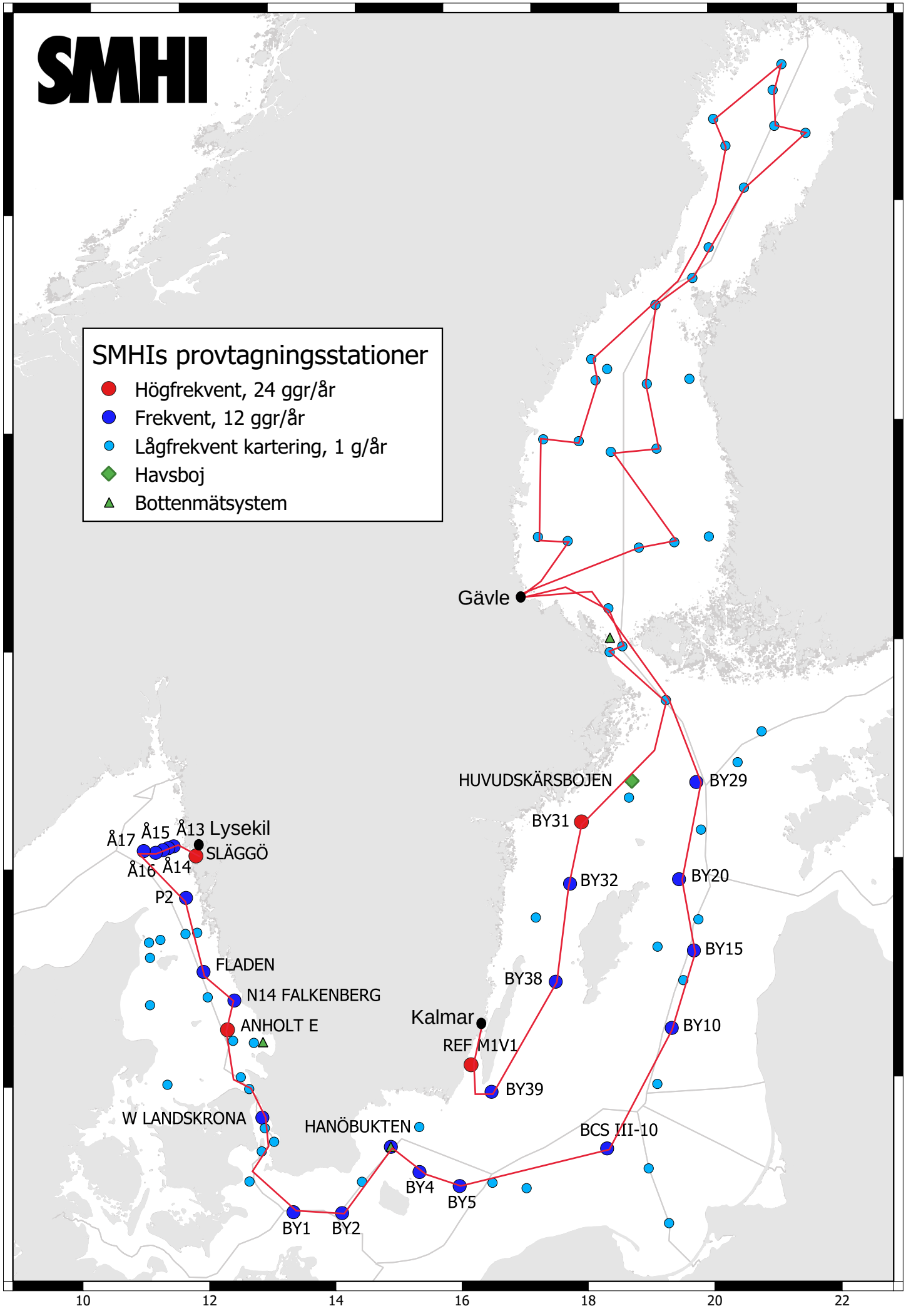
SMHI
SMHIs provtagningsstationer
Högfrekvent, 24 ggr/år
Frekvent, 12 ggr/år
Lågfrekvent kartering, 1 g/år
Havsboj
Bottenmätsystem
Gävle
HUVUDSKÄRSBOJEN
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Date: 2021-12-20
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Ship: SE
Year: 2021

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
1002	23	BPWK01	BAS...	REF M1V1	5622.24	01612.11	20211207	0800	21		03	6	-1.7	1015	2820	-x--	5		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1003	23	BPSE49	BAS...	BY39 ÖLANDS S UDDE	5606.97	01632.16	20211207	1110	51	8	12	7	1.0	1014	2830	----	8		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1004	23	BPWX45	BAS...	BY38 KARLSÖDJ	5707.03	01740.12	20211207	1800	109		08	5	0.2	1019	9990	----	14		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	x	-
1005	23	BPWX38	BAS...	BY32 NORRKÖPINGSDJ	5801.00	01759.05	20211208	0020	201		11	6	0.1	1015	9990	----	17		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	x	-
1006	23	BPNX37	BAS...	BY31 LANDSORTSDJ	5835.62	01814.18	20211208	0500	449		09	7	0.2	1015	9990	-x--	23		-	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	x	-
1007	23	BPNX00	EXT...	10E ALMAGRUNDET	5910.36	01927.58	20211208	1200	114		16	7	1.9	1019	2840	----	16		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	x	-
1008	23	BPST08	BAS...	U19 NORRA RANDEN	6008.34	01854.14	20211208	2040	130		15	11	1.1	1016	9990	----	15		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1009	23	GBAX02	BAS...	F64 SOLOVJEVA	6011.01	01908.99	20211208	2235	289		15	15	1.3	1017	9990	----	20		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1010	23	GBSX03	BAS...	F33 GRUNDKALLEN	6032.41	01855.85	20211209	0205	137		16	16	1.7	1020	9990	----	15		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1011	23	GBSX07	BAS...	SR5 / C4	6105.02	01935.06	20211209	1720	125		14	12	-0.3	1018	9990	----	14		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1012	23	GBSX06	BAS...	SS29	6106.57	02015.92	20211209	2015	112		13	16	-2.3	1018	9990	----	14		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1013	23	GBSX22	BAS...	F26 / C15	6158.96	02004.09	20211210	0205	137		15	12	-0.9	1011	9999	----	15		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1014	23	GBSX17	BAS...	MS6	6159.01	01909.87	20211210	0530	72		14	11	-0.4	1009	7999	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1015	23	GBSX26	BAS...	US5B / C1	6235.25	01958.22	20211210	0950	207		15	12	0.4	1013	9990	----	17		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1016	23	GBSX30	BAS...	F18 SYDOSTBROTTEN	6318.55	02016.82	20211210	1520	102		11	7	-1.4	1011	9999	----	13		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1017	23	GBQX31	BAS...	F16	6331.54	02104.90	20211210	1855	42		13	8	-3.0	1013	7999	----	7		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1018	23	GBBX32	BAS...	F13	6347.47	02129.01	20211210	2115	64		15	7	-2.5	1014	7999	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1019	23	GBBX33	BAS...	BO3 / A3	6418.30	02221.46	20211211	0125	107		16	4	-2.2	1019	9990	----	14		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1020	23	GBBX35	BAS...	RR7	6443.92	02349	20211211	0615	39		16	6	-1.7	1017	9990	----	7		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1021	23	GBBX37	BAS...	RR5	6450.25	02310.17	20211211	0830	66		16	6	-1.3	1017	2830	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1022	23	GBBX45	BAS...	F3 / A5	6510.03	02313.98	20211211	1110	91	6	14	6	-0.3	1017	2830	----	12		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1023	23	GBBX46	BAS...	F2	6523.33	02329.71	20211211	1330	100		12	5	-0.7	1017	9999	----	13		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1024	23	GBBX40	BAS...	RR1	6458.08	02152.08	20211211	1830	88		17	4	-1.4	1019	7990	----	12		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1025	23	GBBX43	BAS...	F9 / A13	6442.54	02203.88	20211211	2045	124		17	5	-1.0	1019	7990	----	15		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1026	23	GBSX28	BAS...	US2 ULVÖDJ	6250.97	01853.54	20211212	1130	201	5	21	7	2.3	1018	1230	----	17		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1027	23	GBSX31	BAS...	C3	6239.15	01857.13	20211212	1340	197		19	7	2.6	1019	1430	----	17		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1028	23	GBSX13	BAS...	MS2	6207.91	01752.41	20211212	1835	74		20	8	1.4	1018	9990	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1029	23	GBSX15	BAS...	MS4 / C14	6205.96	01832.87	20211212	2110	87		21	8	2.6	1018	9990	----	12		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1030	23	GBSX10	BAS...	SR1A	6113.92	01739.71	20211213	0555	63		24	7	1.2	1019	9990	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1031	23	GBSX09	BAS...	SR3	6111.02	01813.93	20211213	0815	72	6	23	7	2.0	1020	1230	----	10		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1032	23	GBAX01	BAS...	TRÖSKELN ÅLANDS HAV	5939.09	01953.09	20211214	0445	59		23	8	4.5	1010	9999	----	9		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1033	23	BPNX35	BAS...	BY29 / LL19	5852.85	02019.70	20211214	1015	177		26	11	5.9	1011	2840	----	16		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	x
1034	23	BPEX26	BAS...	BY20 FÅRÖDJ	5759.89	01952.74	20211214	1600	197		28	9	5.6	1015	9999	----	17		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
1035	23	BPEX21	BAS...	BY15 GOTLANDSDJ	5718.72	02004.55	20211214	2100	240		27	9	5.0	1019	9990	-x--	22		x	x	-	x	x	x	x	x	x	-	x	x	x	x	-	-	x	-	-	x
1036	23	BPEX13	BAS...	BY10	5638.02	01935.10	20211215	0255	143		25	14	6.1	1018	9990	----	15		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	x

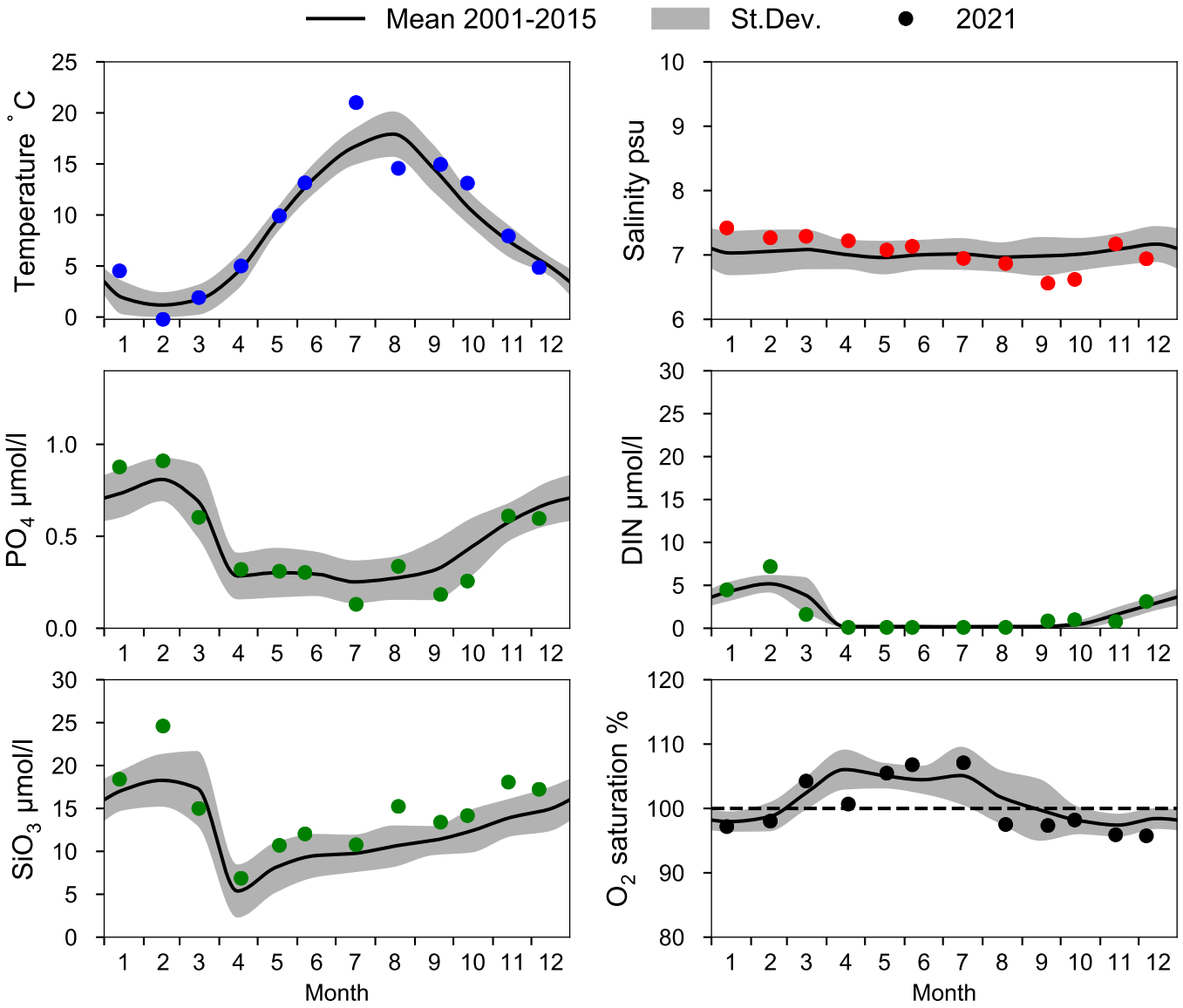
Date: 2021-12-20
Time: 14:10

Ship: SE
Year: 2021

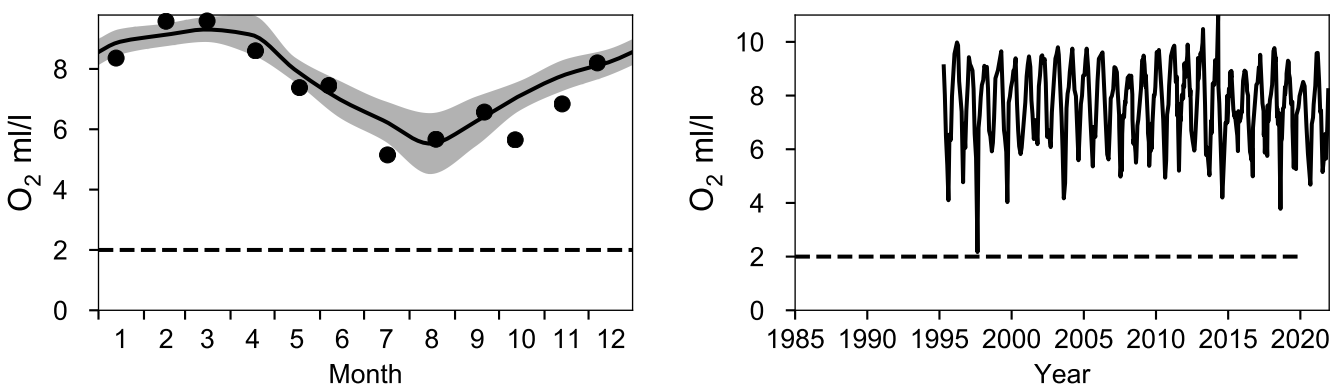
Ser no	Cru no	Stat code	Proj	Stat name	Lat	Lon	Start date yyyymmdd	Start time hhmm	Bottom depth m	Secchi depth m	Wind dir	Wind vel	Air temp C	Air pres hPa	WCWI elac aove tueo hdsb	CZPP hohp loy apt o p	No de	No btl	Temp_btl	Temp_ctd	Salt_btl	Salt_ctd	Ph	Doxy_btl	Doxy_ctd	H2s	Phos	Ptot	Ntri	Ntra	Ntrz	Amon	Ntot	Alky	Sio3-si	Humus	Comnt_visit	Comnt_samp
1037	23	BPSE11	BAS...	BCS III-10	5533.36	01824.14	20211215	1120	89	11	25	10	7.0	1019	2840	----	12		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
1038	23	BPSB07	BAS...	BY5 BORNHOLMSDJ	5515.00	01559.08	20211215	2015	90		26	12	7.4	1020	9990	-x--	12		x	x	-	x	x	x	x	x	x	-	x	x	x	x	-	x	x	-	-	-
1039	23	BPSB06	BAS...	BY4 CHRISTIANSÖ	5522.05	01520.05	20211216	0015	91		26	10	7.1	1021	9999	----	12		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
1040	23	BPSH05	BAS...	HANÖBUKTEN	5537.04	01452	20211216	0300	78		26	6	7.4	1021	9999	----	11		x	x	-	x	-	x	x	x	x	-	x	x	x	x	-	-	x	-	-	-
1041	23	BPSA03	BAS...	BY2 ARKONA	5458.22	01405.95	20211216	0800	46		29	12	7.5	1026	1140	-x--	8		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1042	23	BPSA02	BAS...	BY1	5500.95	01318.08	20211216	1200	46		30	11	7.4	1028	0040	----	8		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1043	23	SOCX39	BAS...	W LANDSKRONA	5552.01	01244.89	20211216	1940	51		31	6	6.5	1031	9999	----	9		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	x	-
1044	23	KAEX29	BAS...	ANHOLT E	5640.12	01206.69	20211217	0130	64		32	9	6.0	1031	9990	-x--	10		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	x	x	-	-	-
1045	23	KANX50	BAS...	N14 FALKENBERG	5656.39	01212.69	20211217	0420	32		32	8	5.7	1031	9990	----	7		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1046	23	KANX25	BAS...	FLADEN	5711.52	01139.5	20211217	0730	82		28	5	5.8	1032	1220	----	13		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1047	23	SKEX23	BAS...	P2	5752	01117.49	20211217	1215	94	7	28	6	7.3	1032	1120	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1048	23	SKEX18	BAS...	Å17	5817.05	01030.23	20211217	1715	352		30	5	7.4	1032	9990	-x--	15		x	x	-	x	x	x	x	-	x	-	x	x	x	x	-	x	x	-	-	-
1049	23	SKEX17	BAS...	Å16	5816.02	01043.44	20211217	1840	204		27	2	7.0	1032	9990	----	13		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
1050	23	SKEX16	BAS...	Å15	5817.67	01050.68	20211217	1950	138		23	6	6.6	1032	9990	----	12		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	x
1051	23	SKEX15	BAS...	Å14	5818.93	01056.04	20211217	2115	112		23	4	6.6	1032	9990	----	11		-	x	-	x	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
1052	23	SKEX14	BAS...	Å13	5820.36	01101.68	20211217	2210	92		23	4	6.5	1031	9990	----	10		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-
1053	23	FIBG27	BAS...	SLÄGGÖ	5815.59	01126.14	20211218	0045	73		08	2	0.8	1030	9999	-x--	9		x	x	-	x	-	x	x	-	x	-	x	x	x	x	-	-	x	-	-	-

STATION REF M1V1 SURFACE WATER (0-10 m)

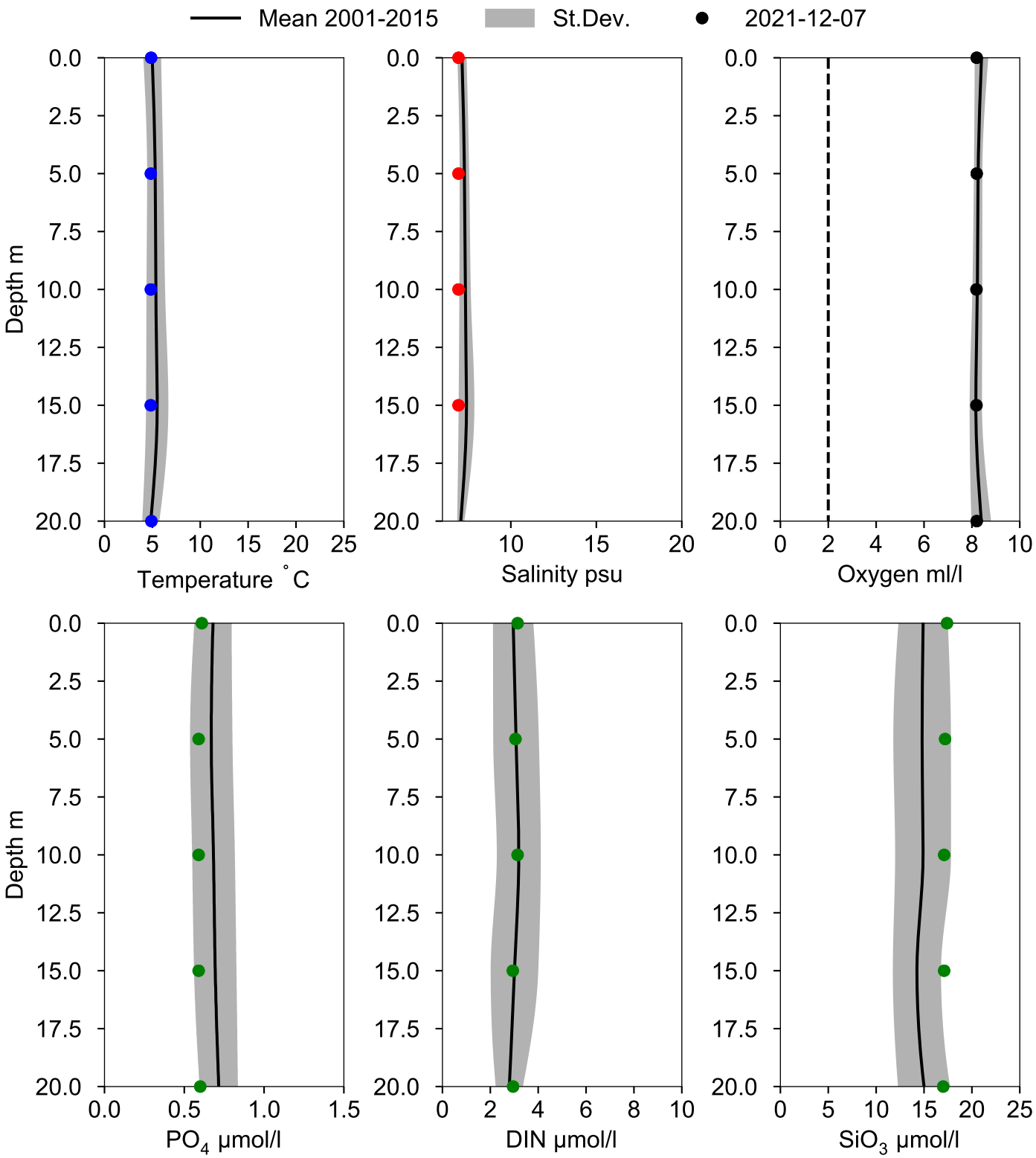
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 15 m)



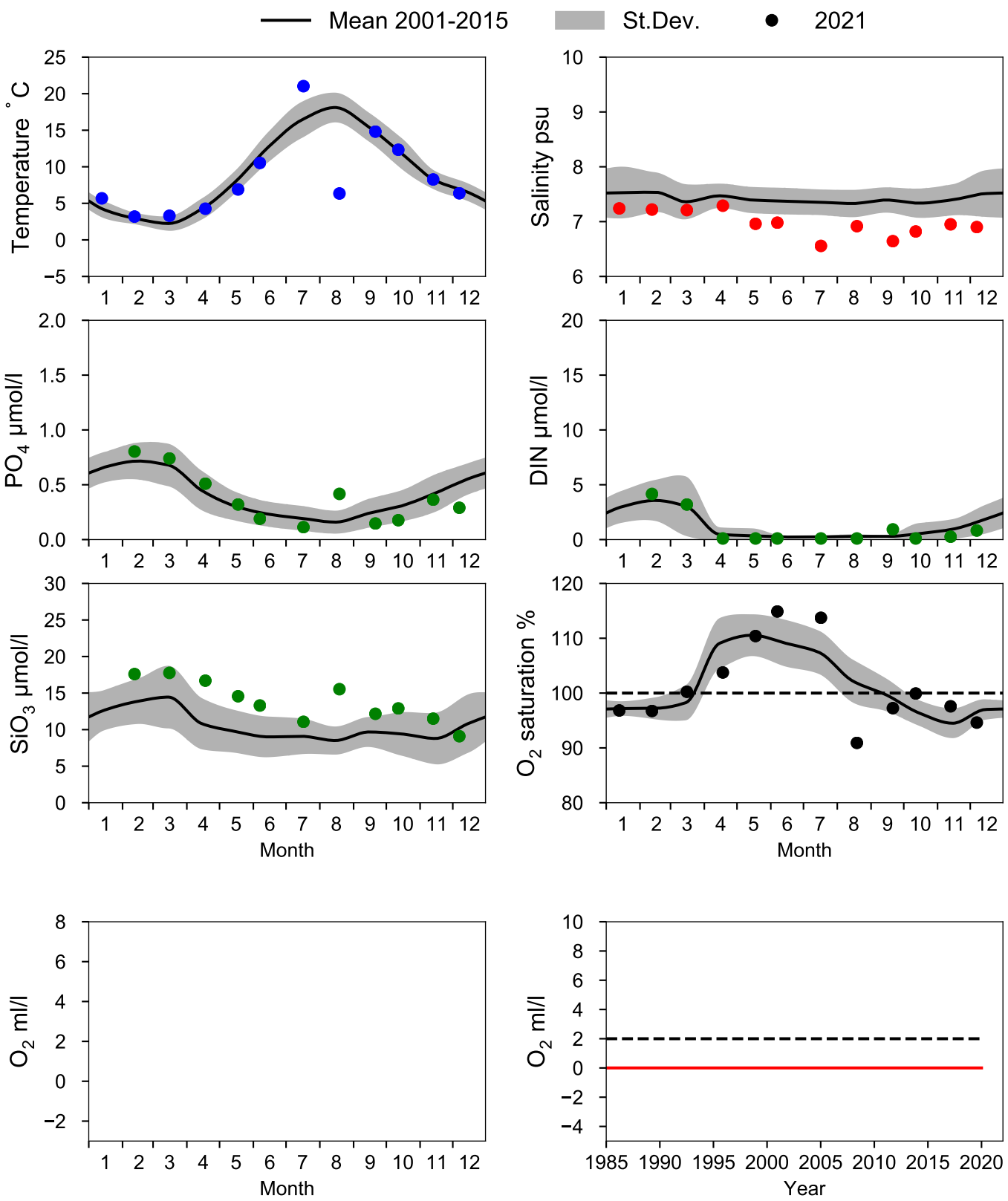
Vertical profiles REF M1V1
December



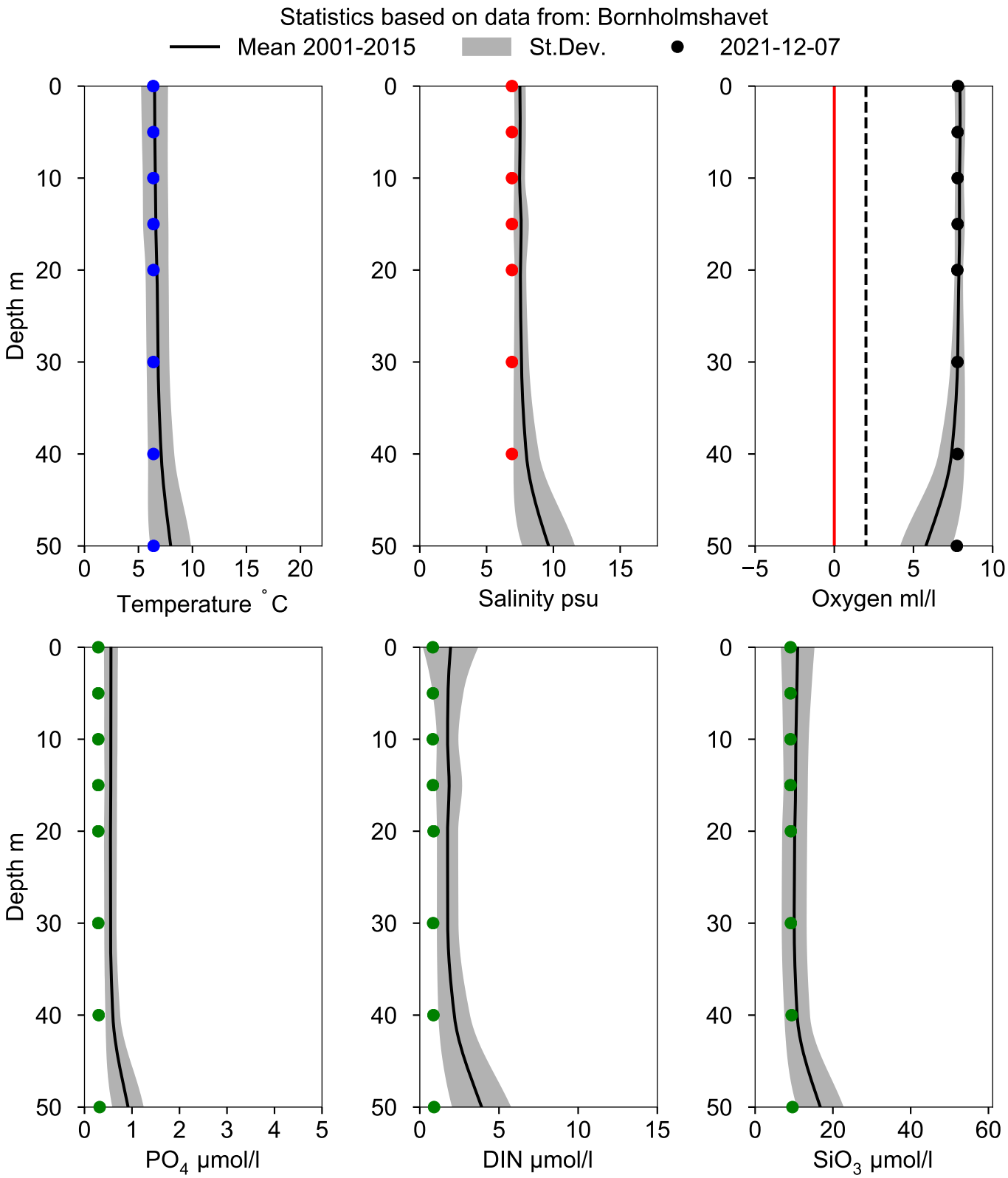
STATION BY39 ÖLANDS S UDDE SURFACE WATER (0-10 m)

Annual Cycles

Statistics based on data from: Bornholmshavet

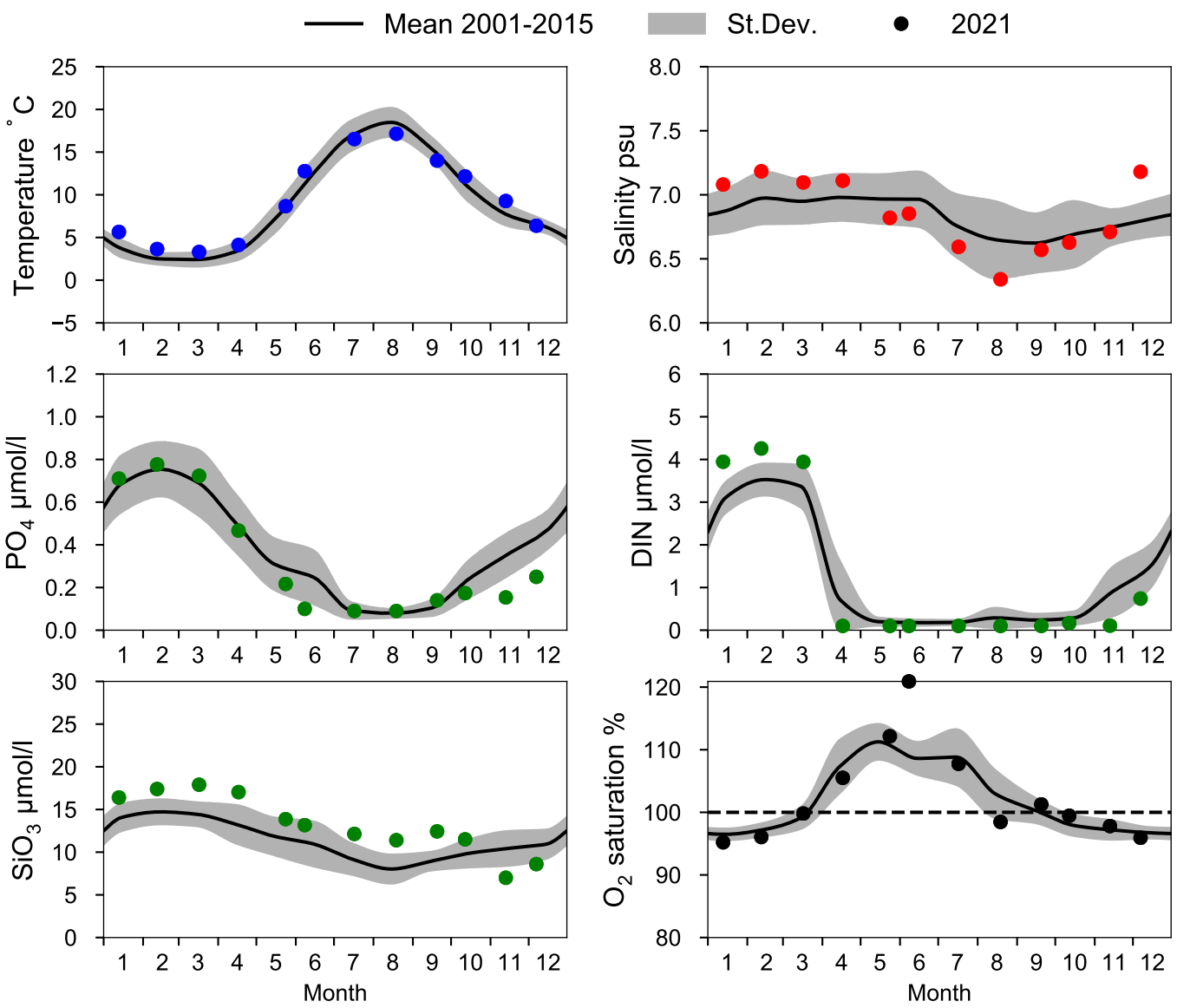


Vertical profiles BY39 ÖLANDS S UDDE
December

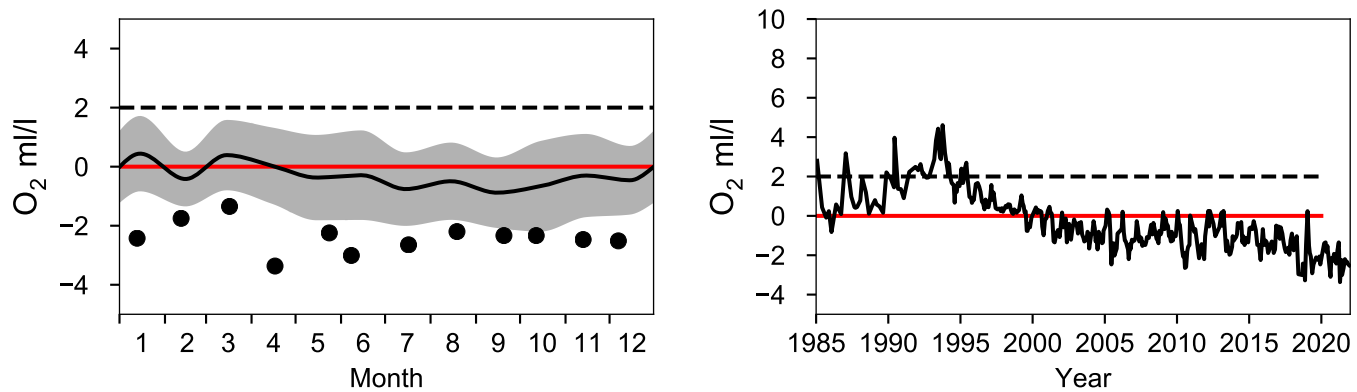


STATION BY38 KARLSÖDJ SURFACE WATER (0-10 m)

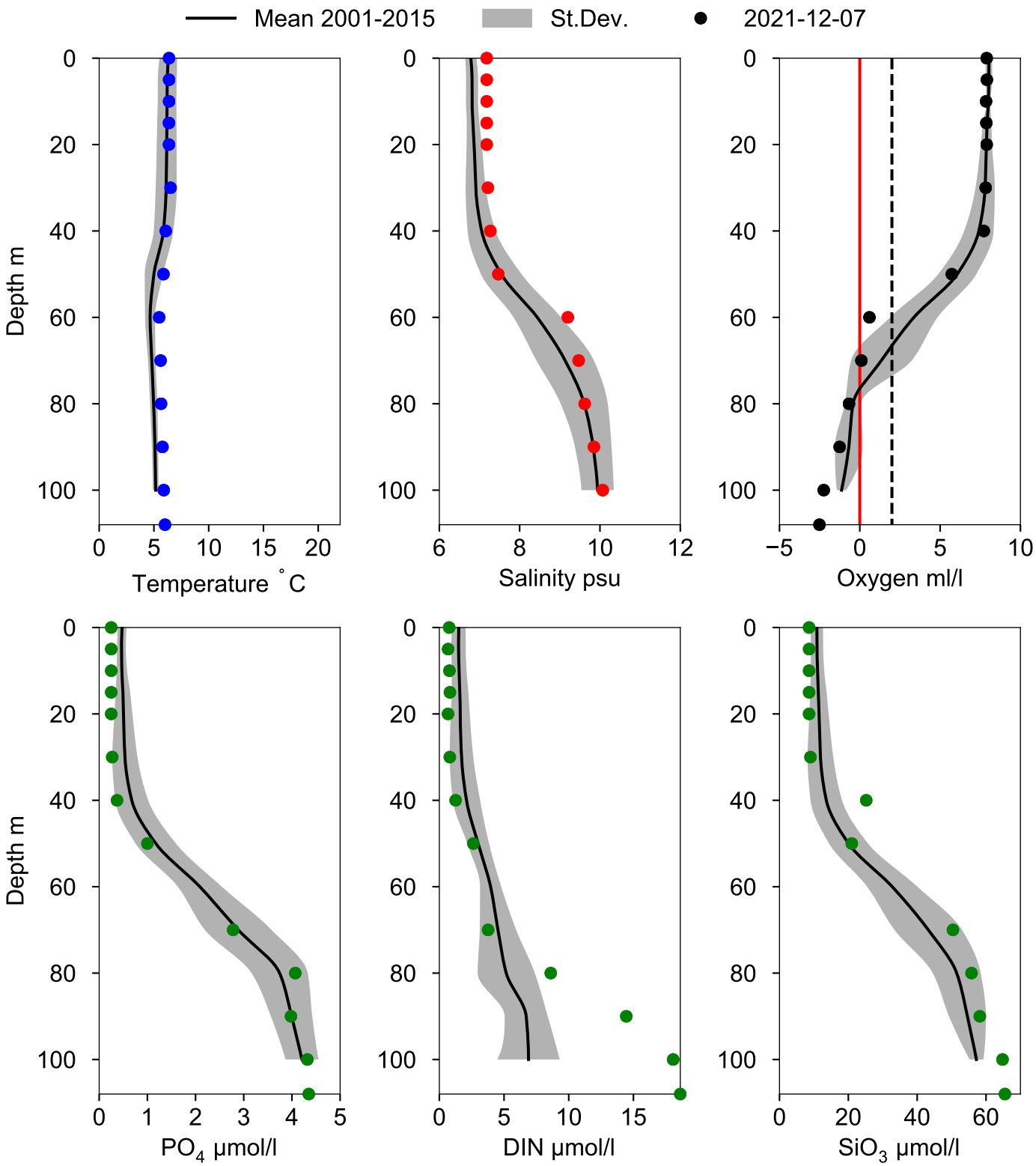
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 100 m)

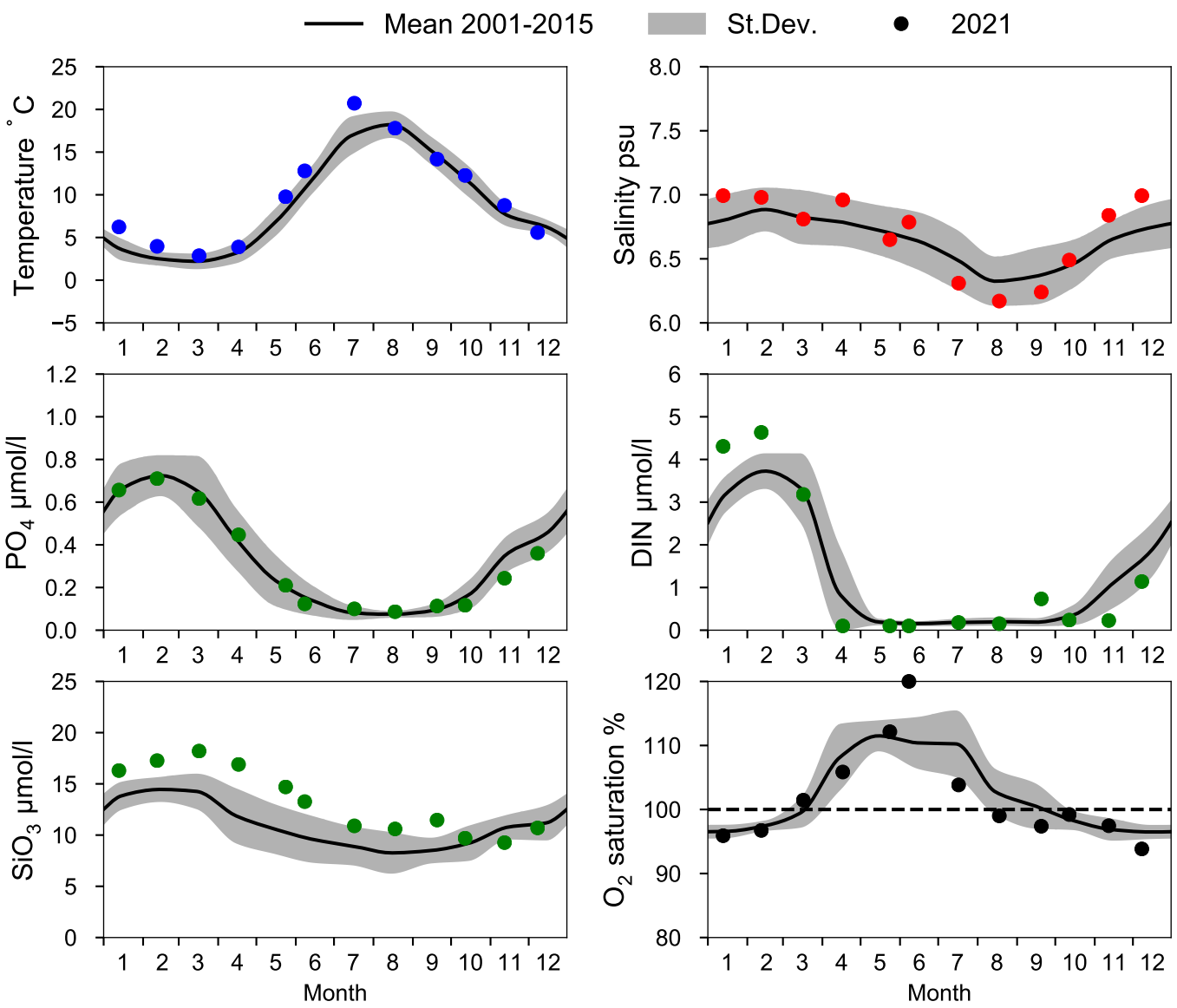


Vertical profiles BY38 KARLSÖDJ
December

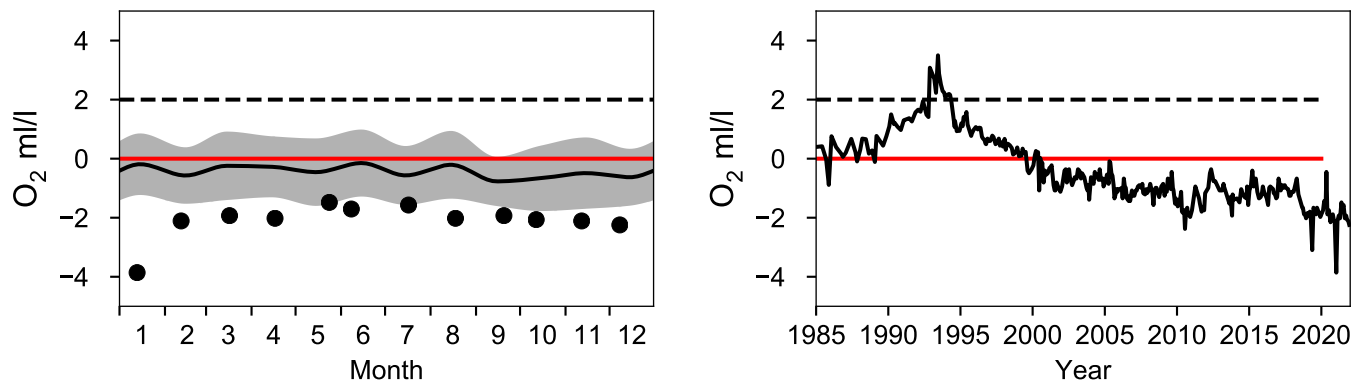


STATION BY32 NORRKÖPINGSDJ SURFACE WATER (0-10 m)

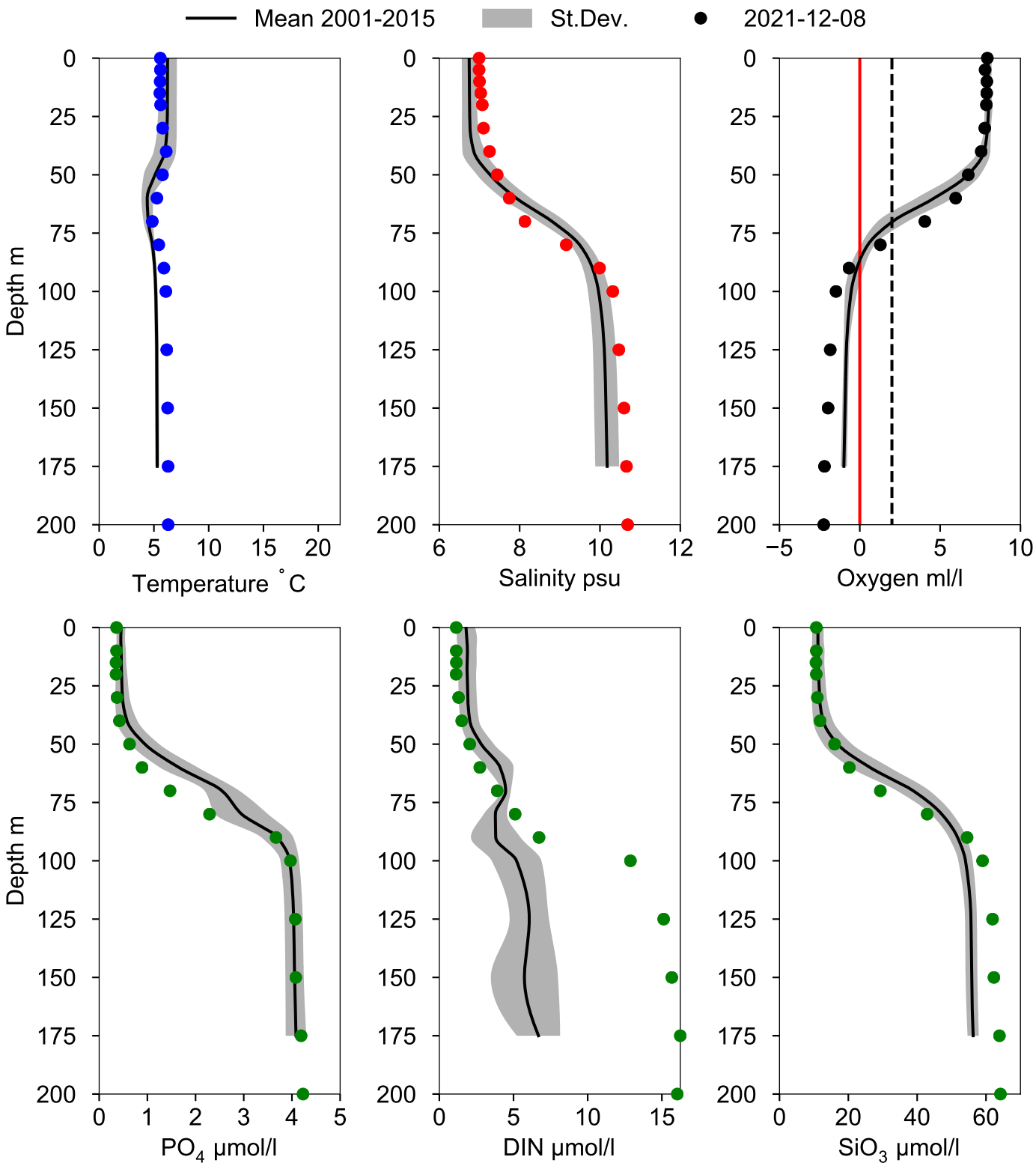
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

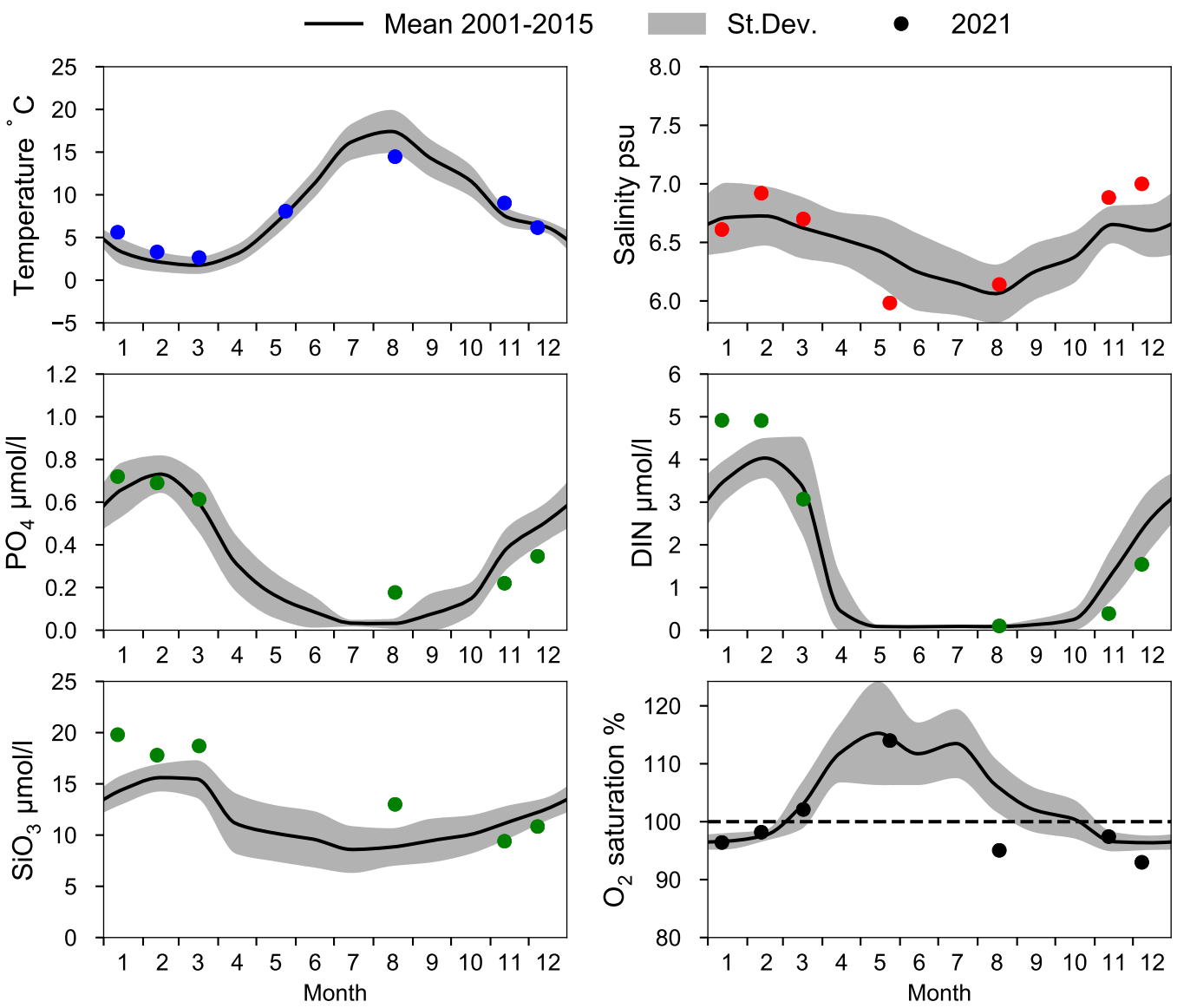


Vertical profiles BY32 NORRKÖPINGSDJ
December

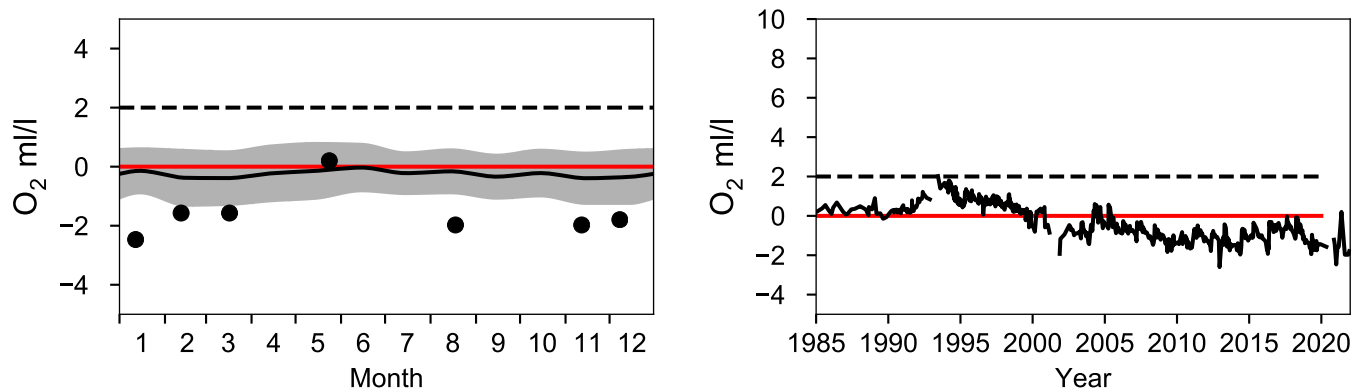


STATION BY31 LANDSORTSDJ SURFACE WATER (0-10 m)

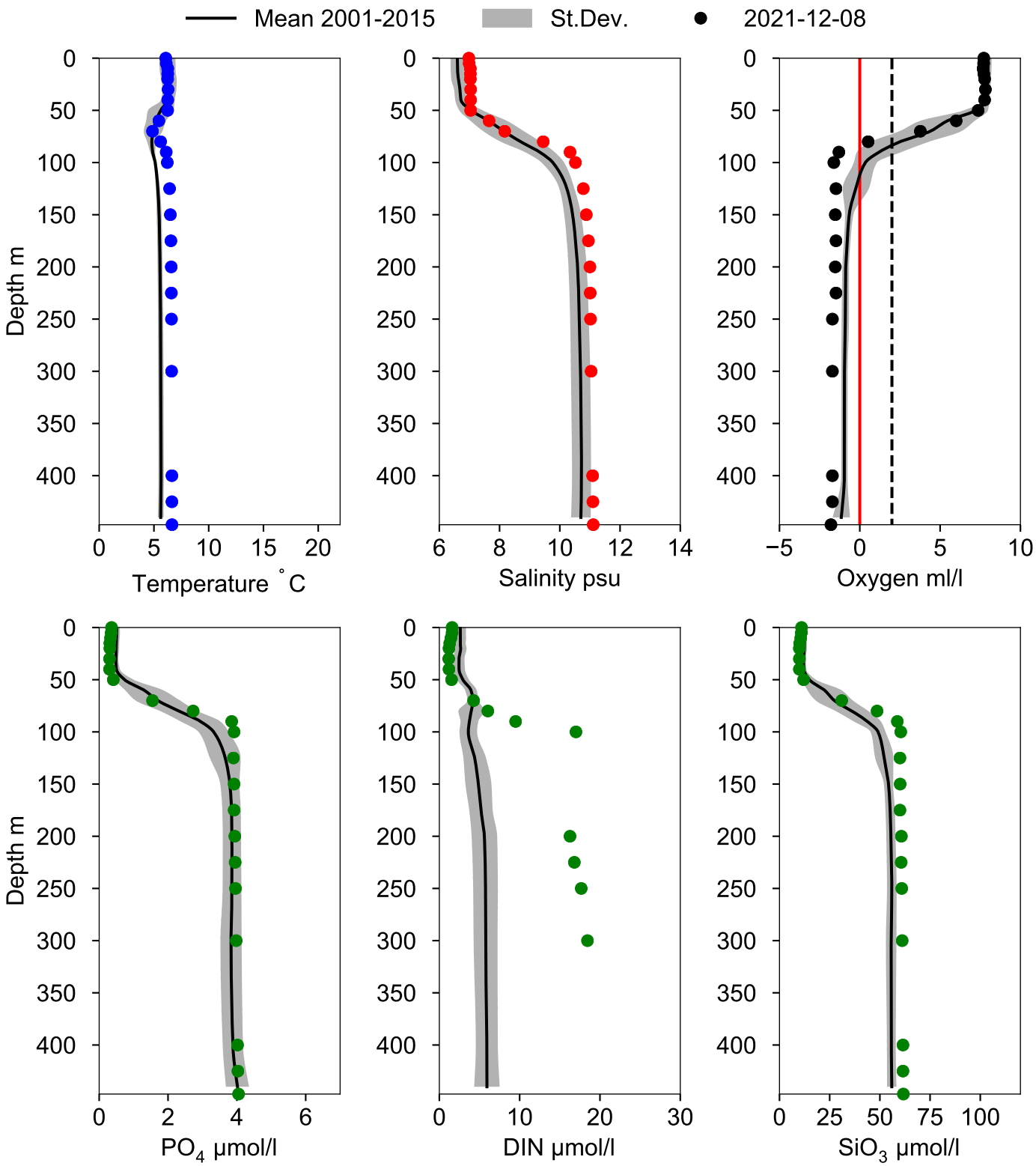
Annual Cycles



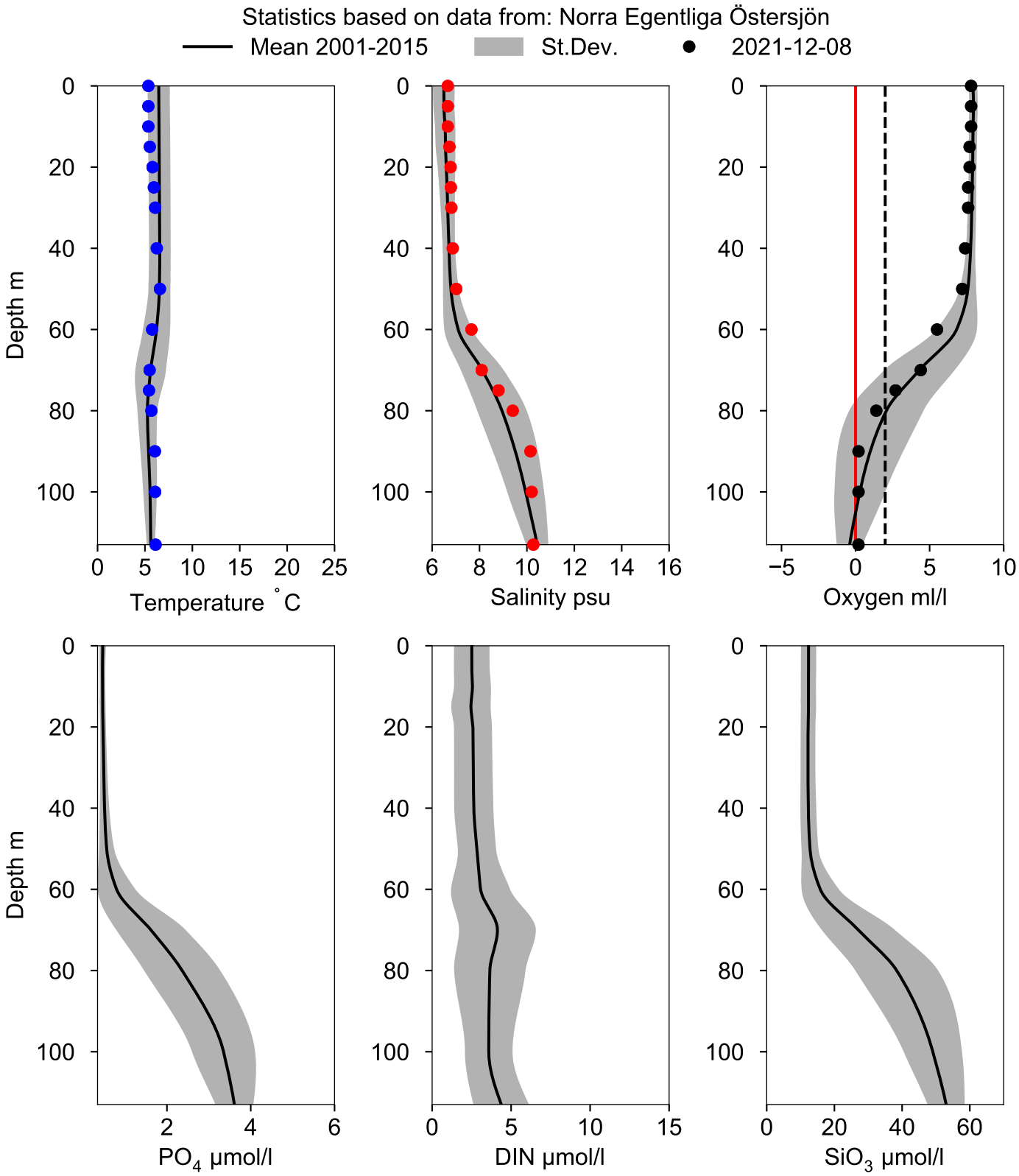
OXYGEN IN BOTTOM WATER (depth >= 419 m)



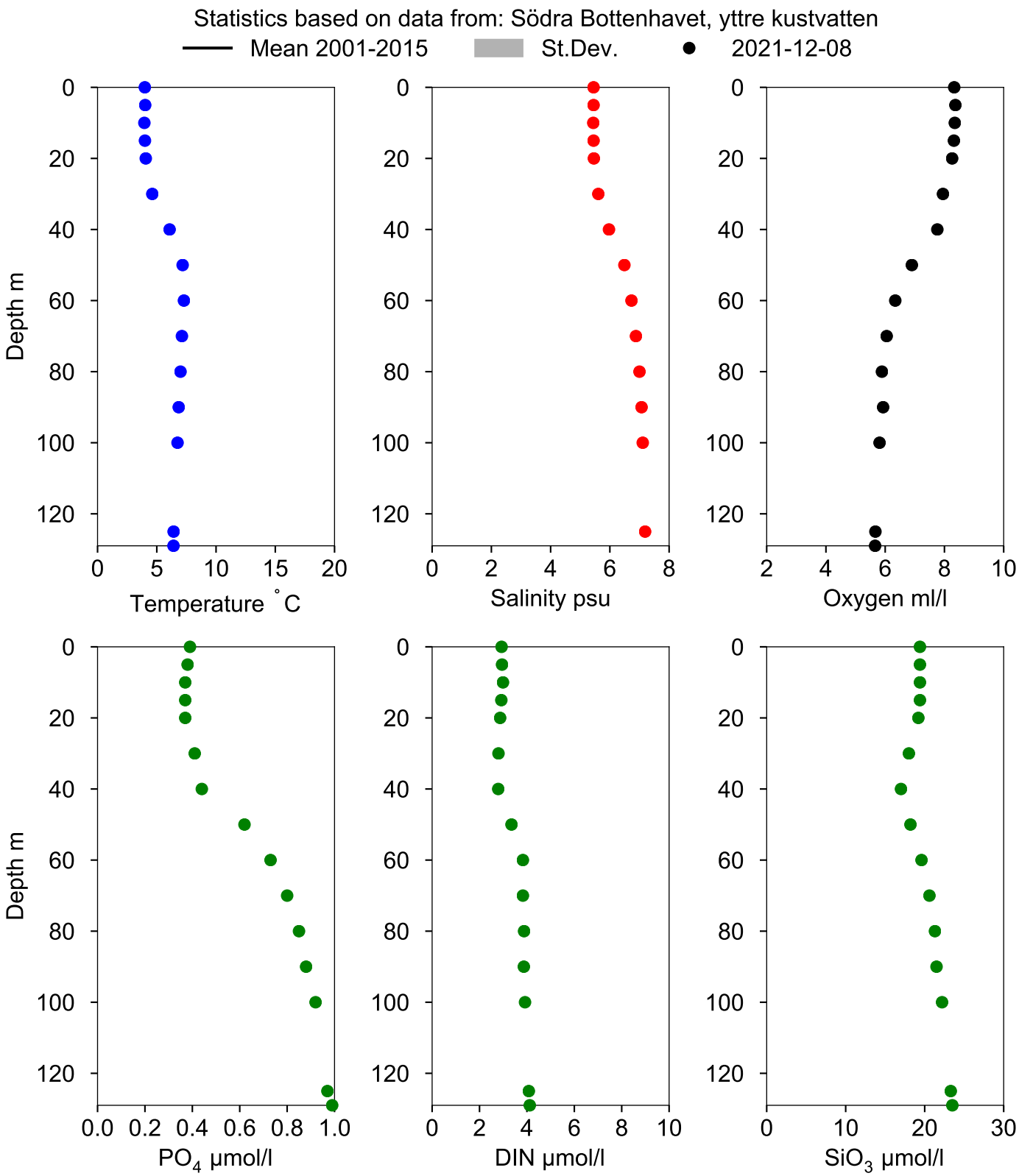
Vertical profiles BY31 LANDSORTSDJ
December



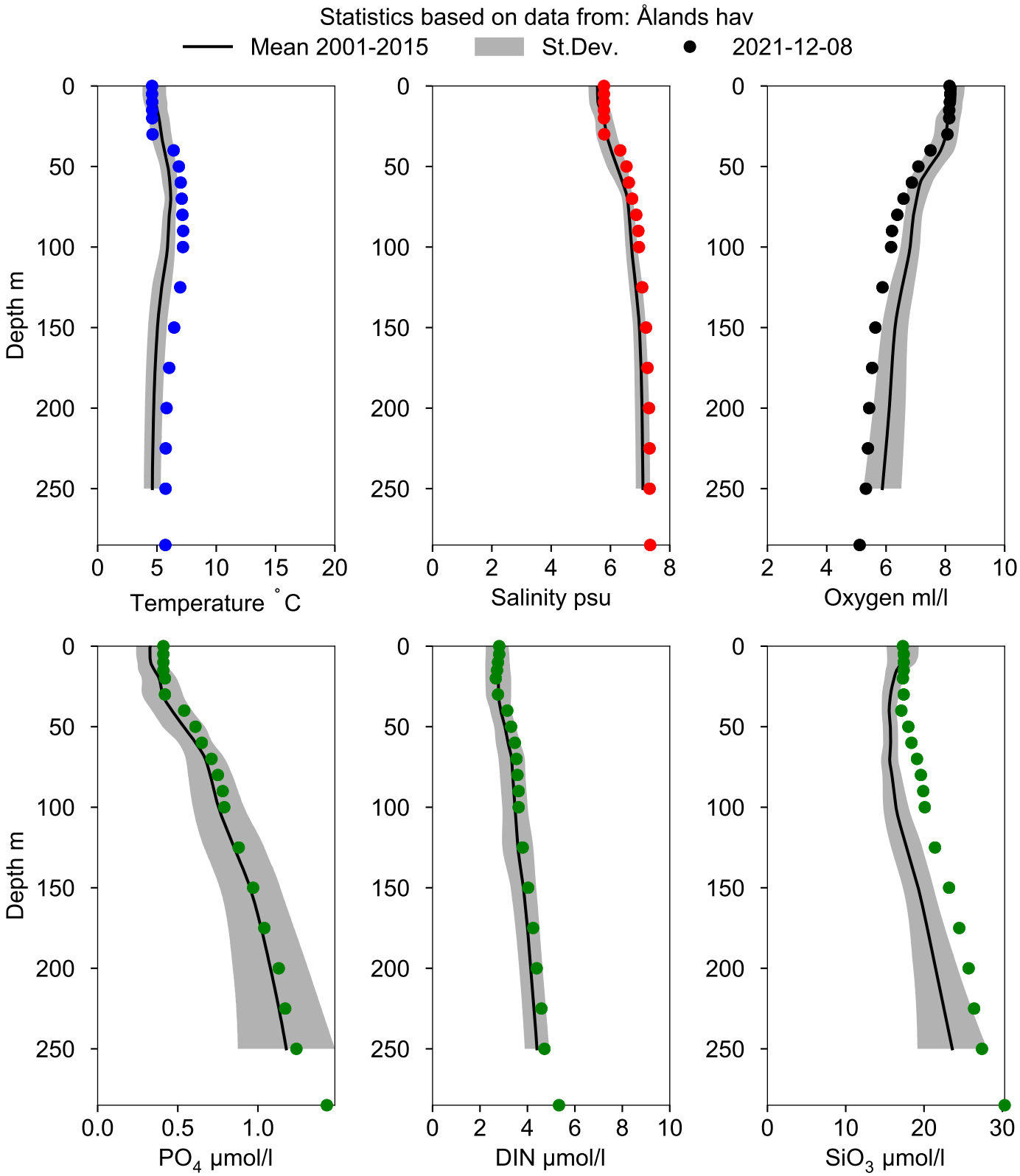
Vertical profiles 10E ALMAGRUNDET
December



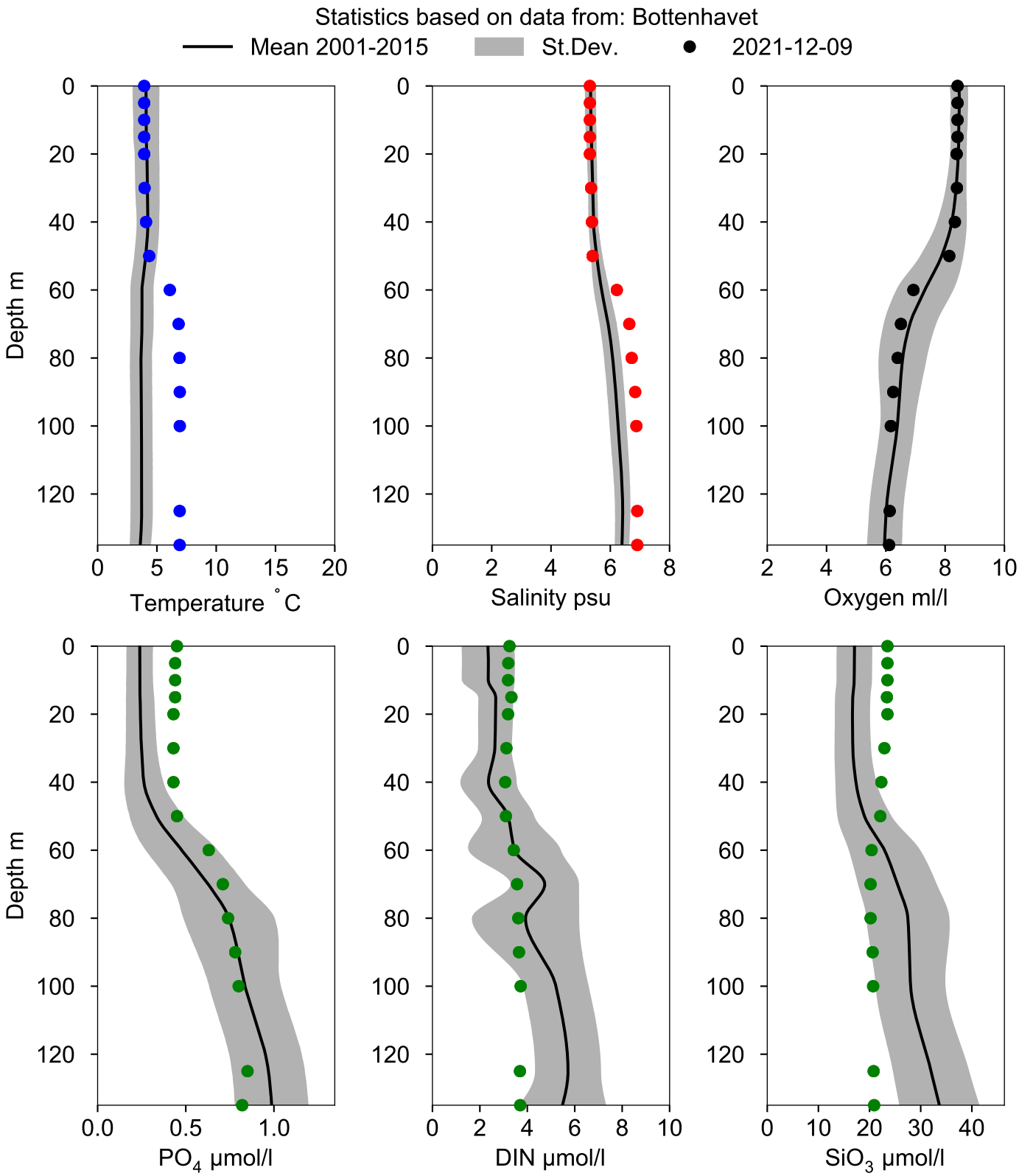
Vertical profiles U19 NORRA RANDEN
December



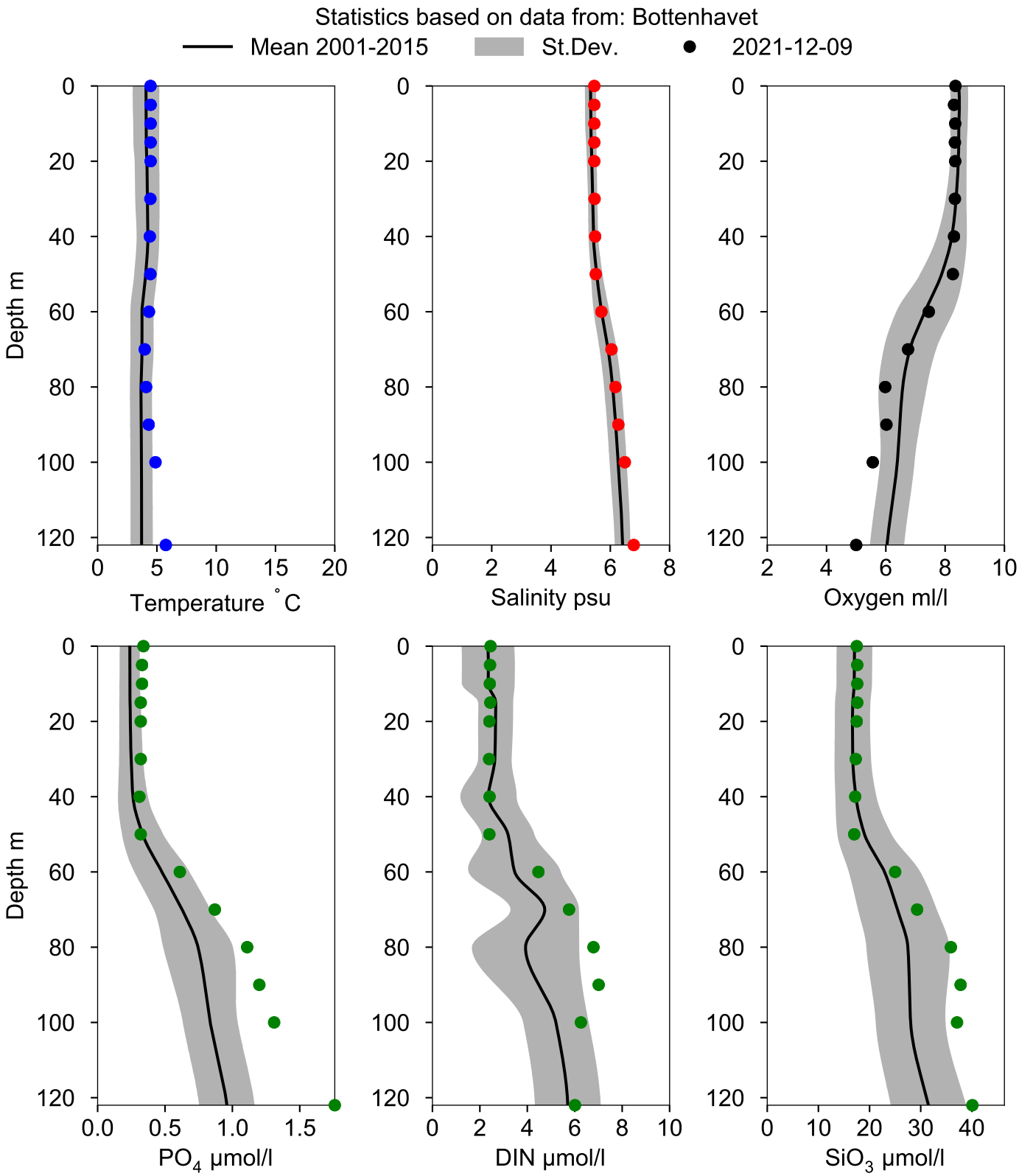
Vertical profiles F64 SOLOVJEVA
December



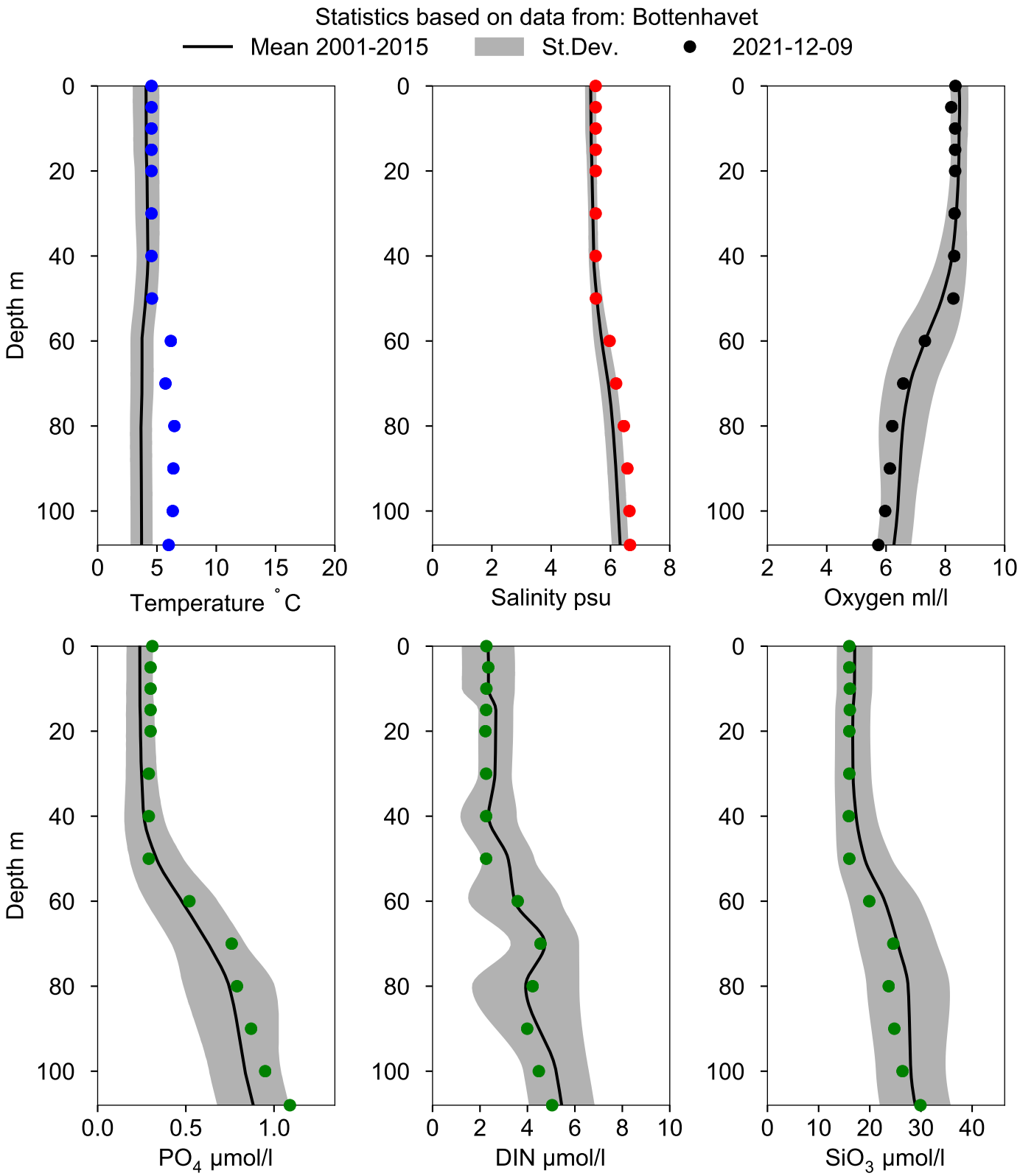
Vertical profiles F33 GRUNDKALLEN
December



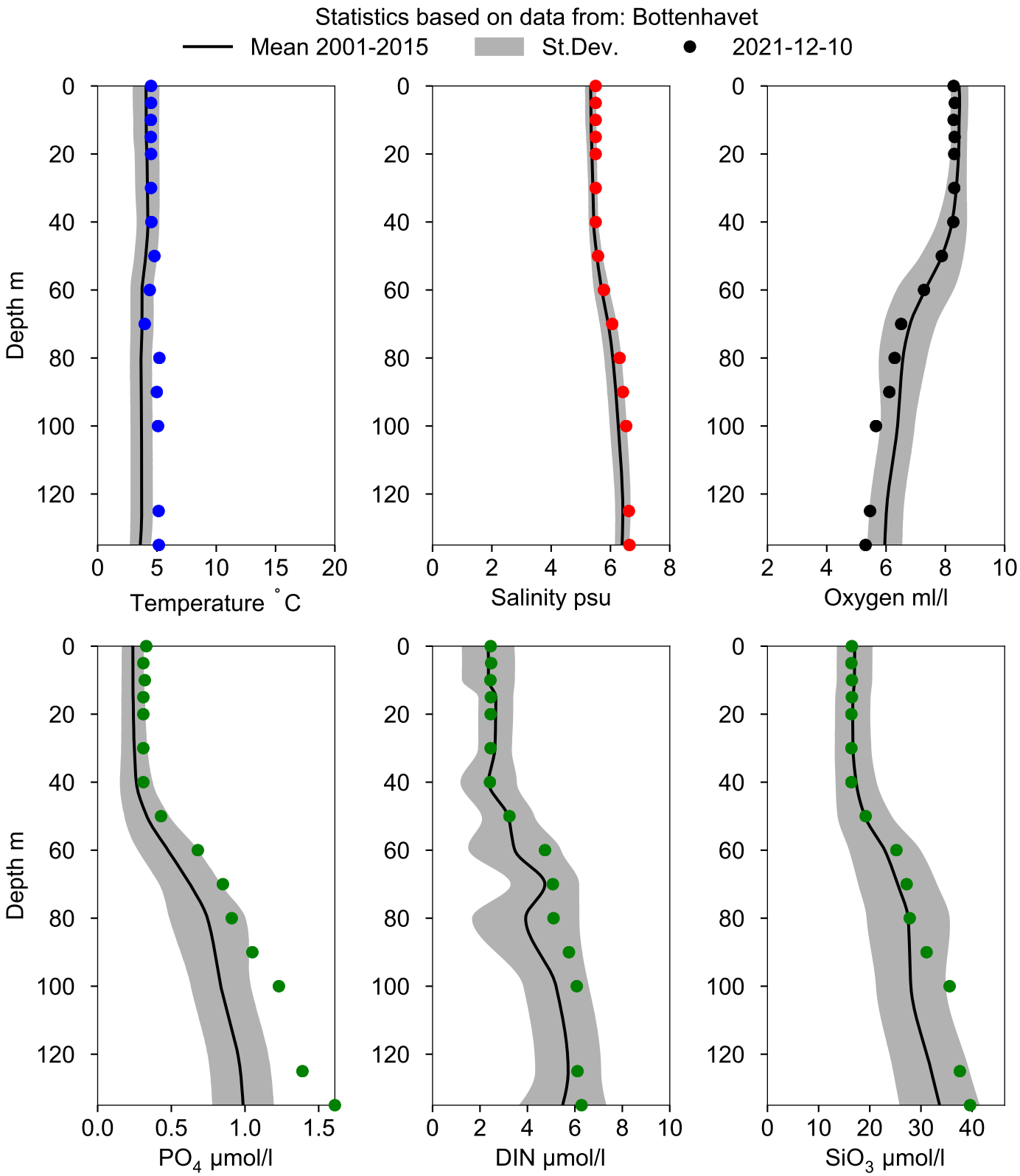
Vertical profiles SR5 / C4
December



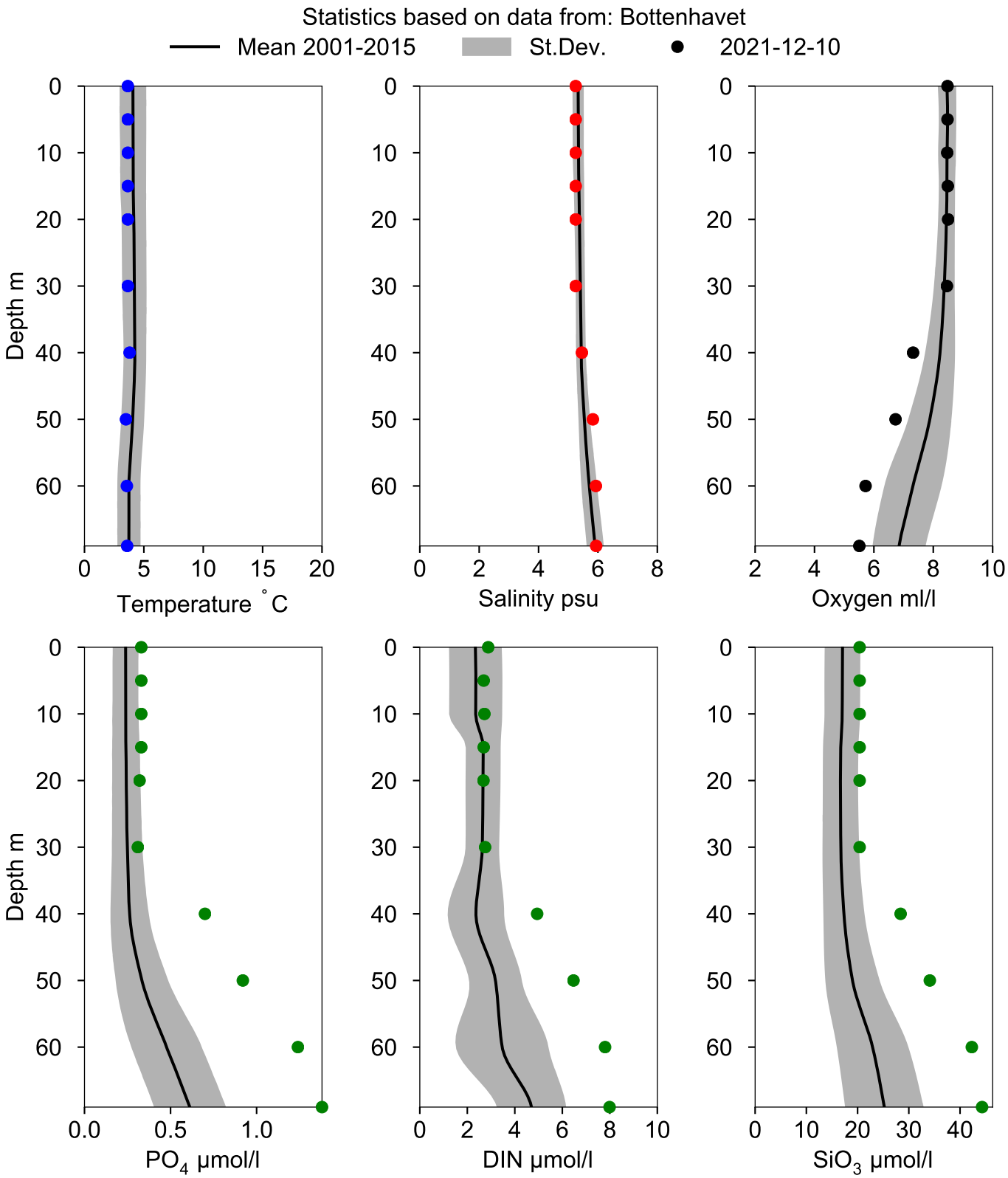
Vertical profiles SS29
December



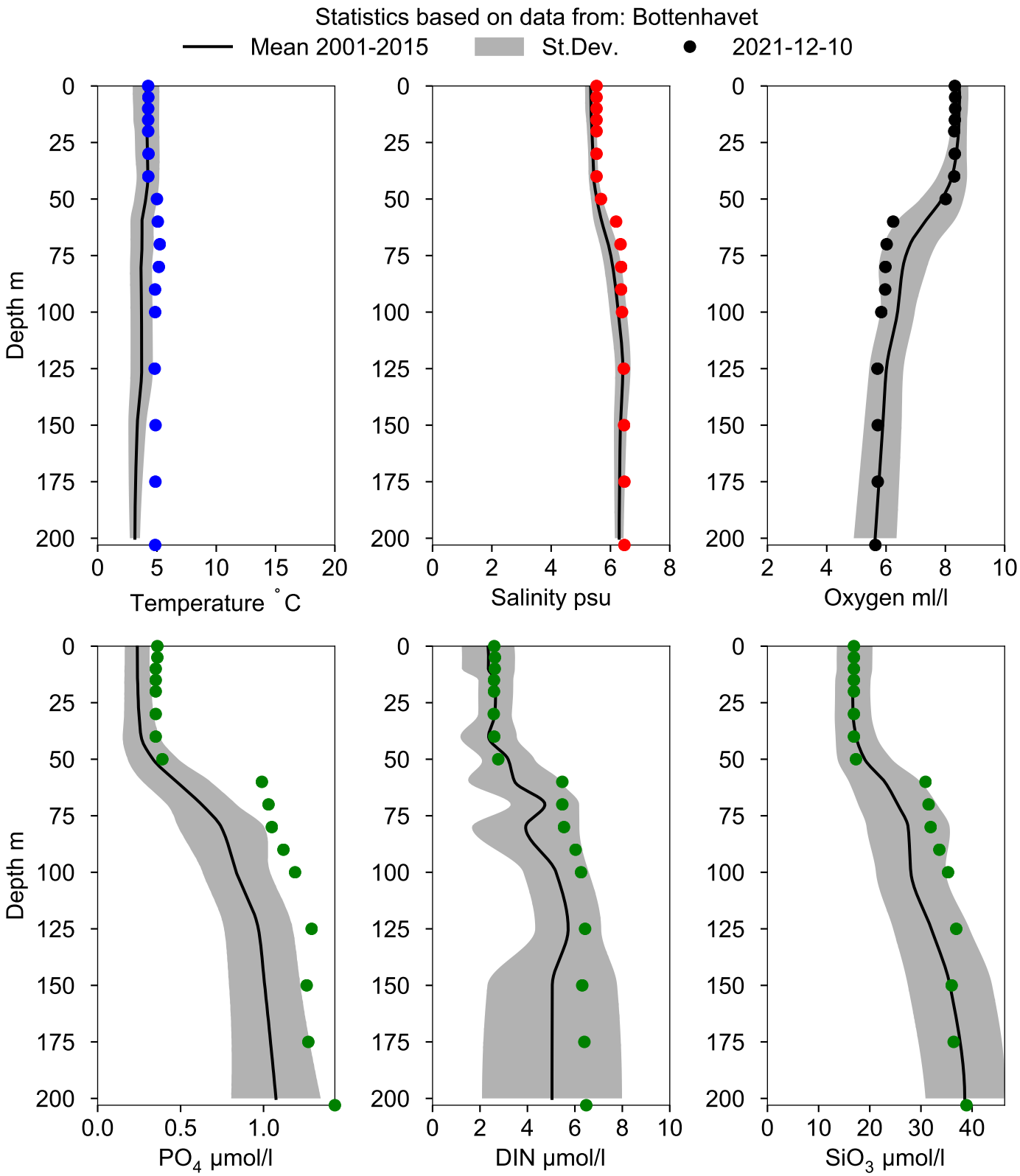
Vertical profiles F26 / C15
December



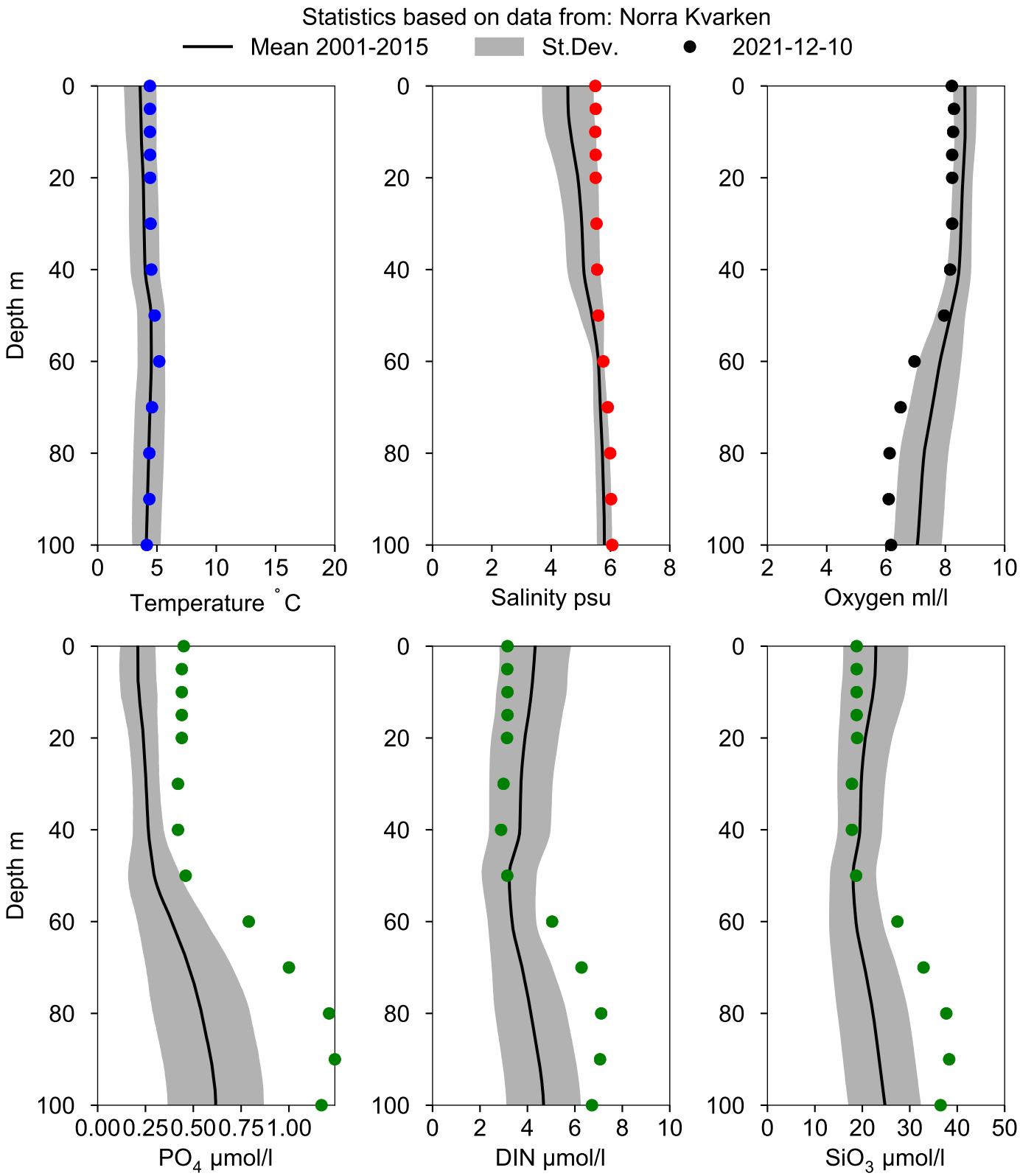
Vertical profiles MS6
December



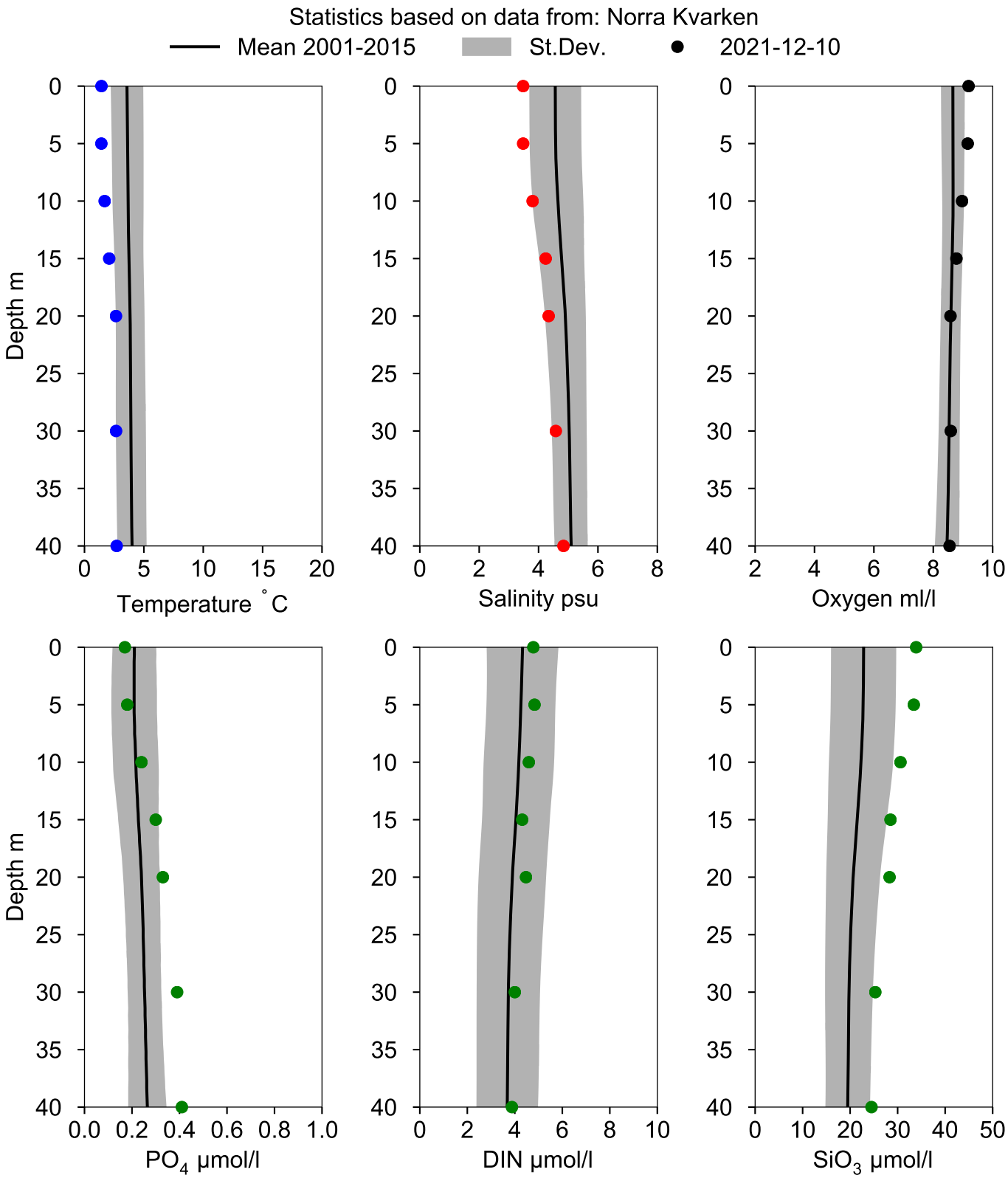
Vertical profiles US5B / C1
December



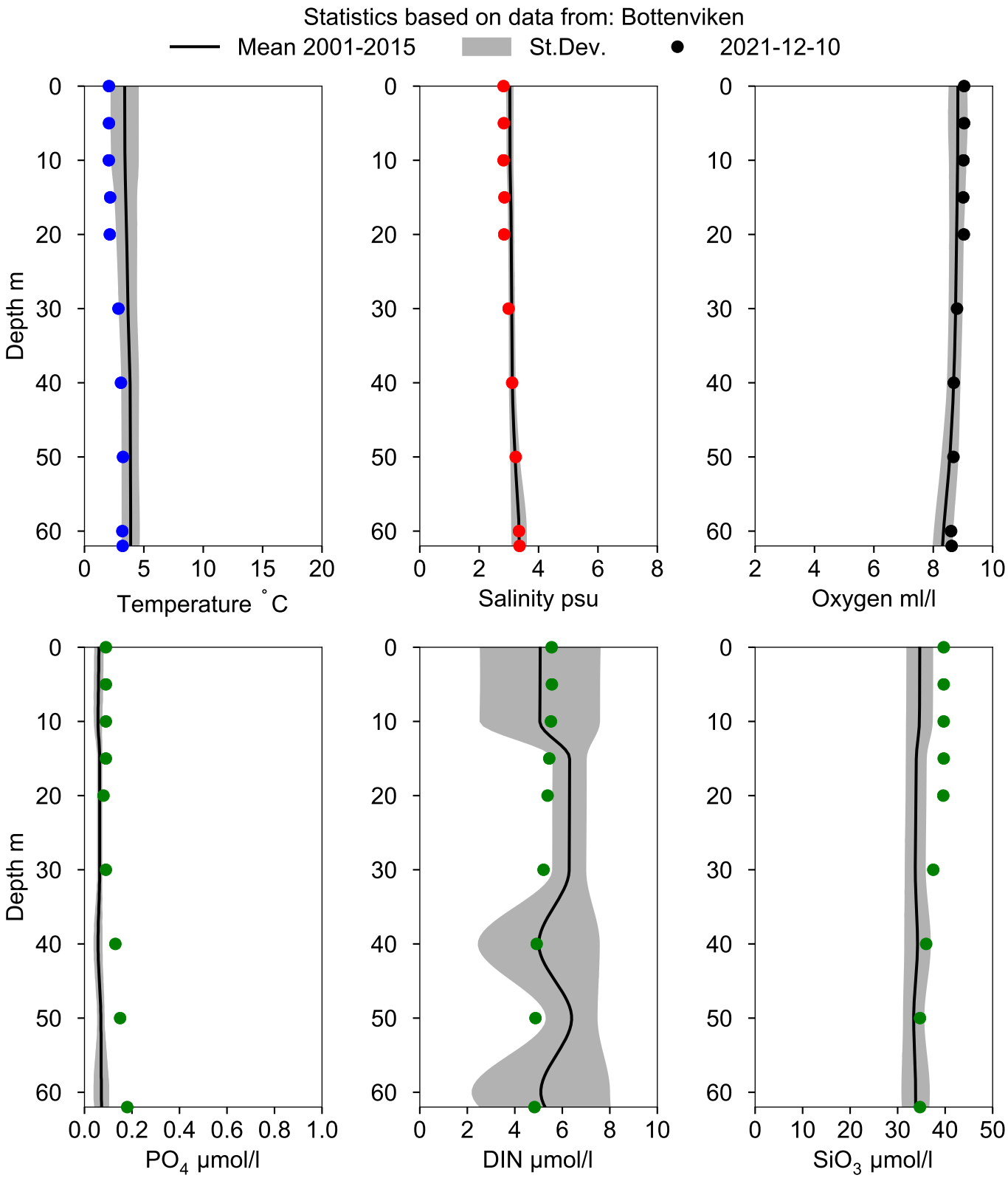
Vertical profiles F18 SYDOSTBROTTEN
December



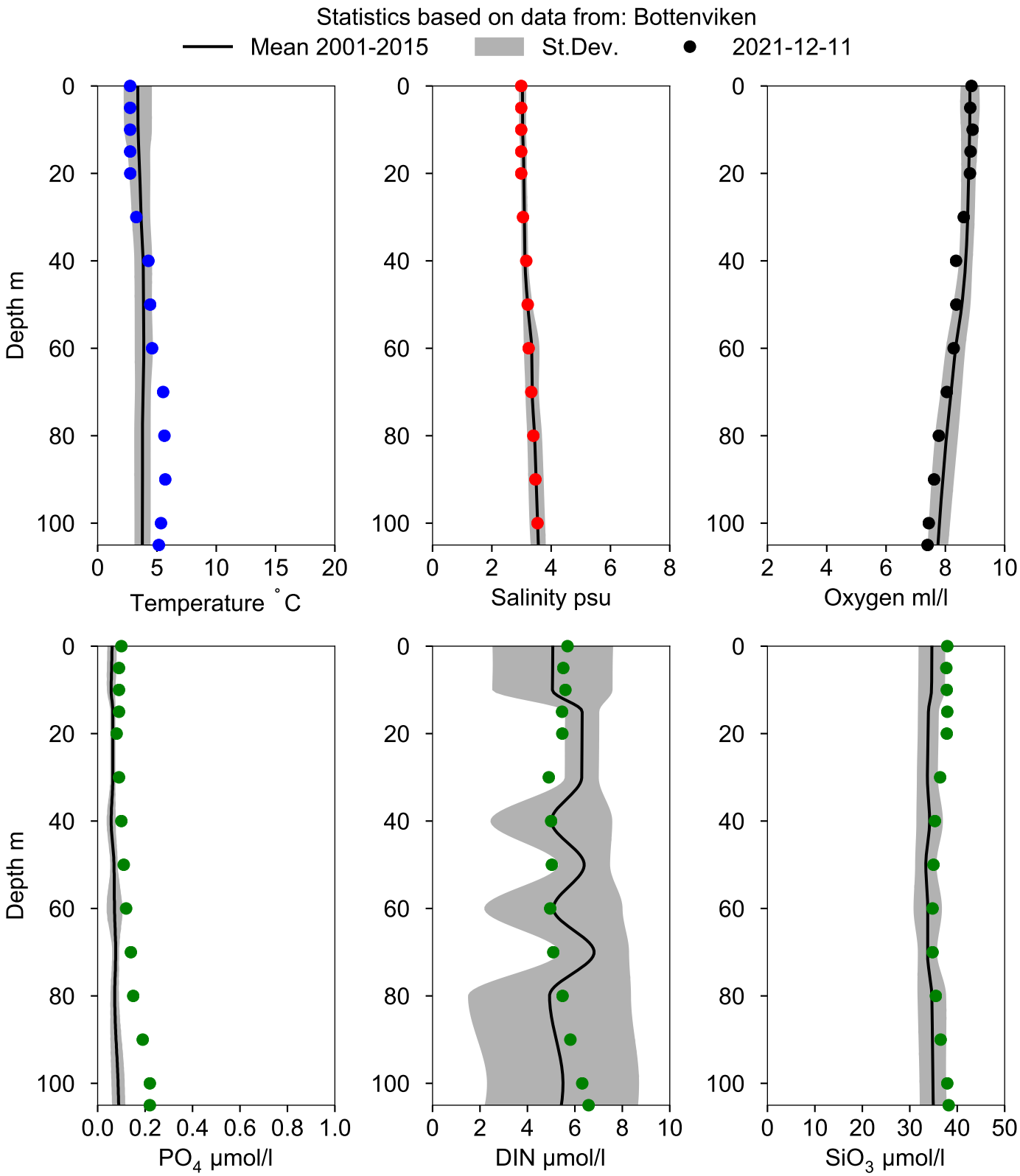
Vertical profiles F16
December



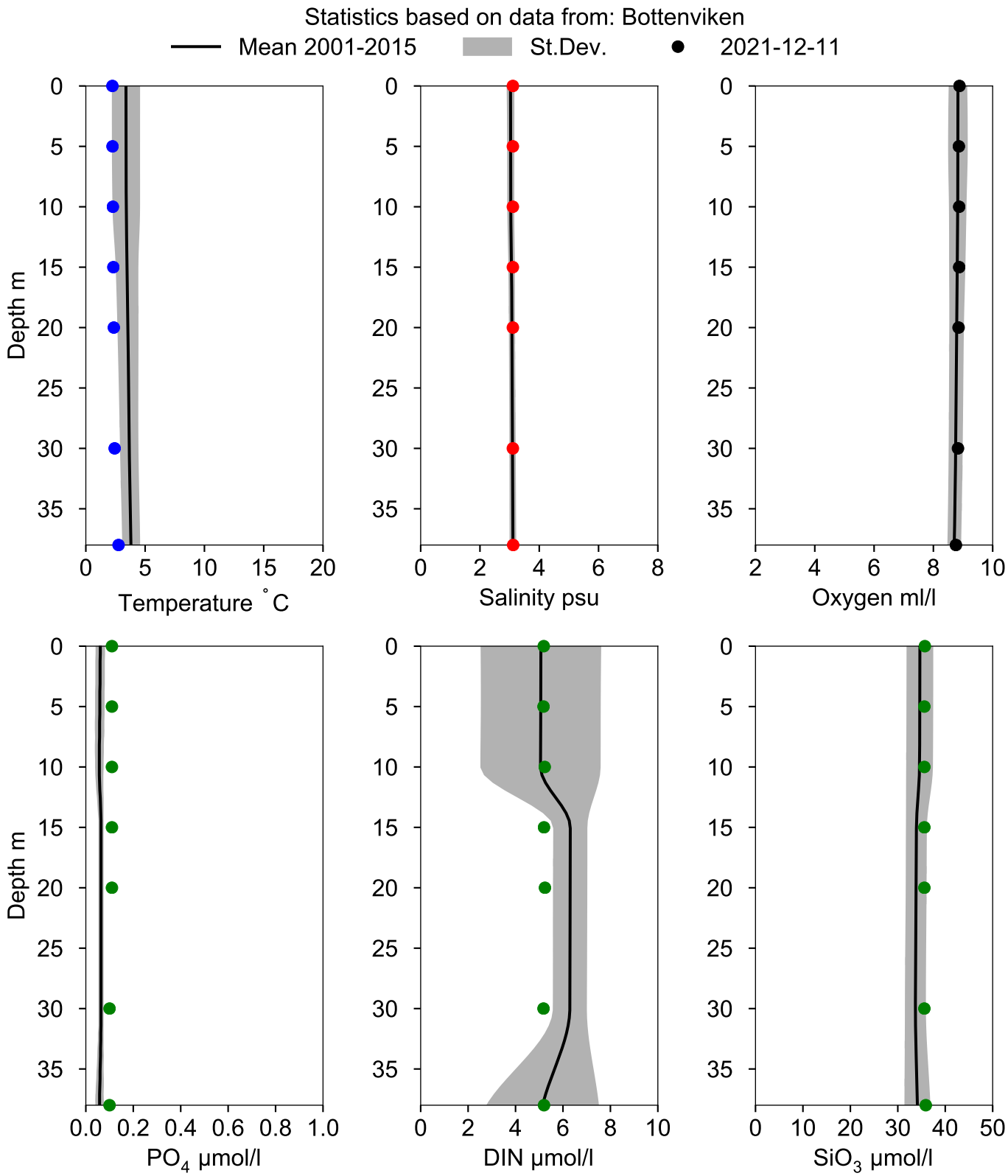
Vertical profiles F13
December



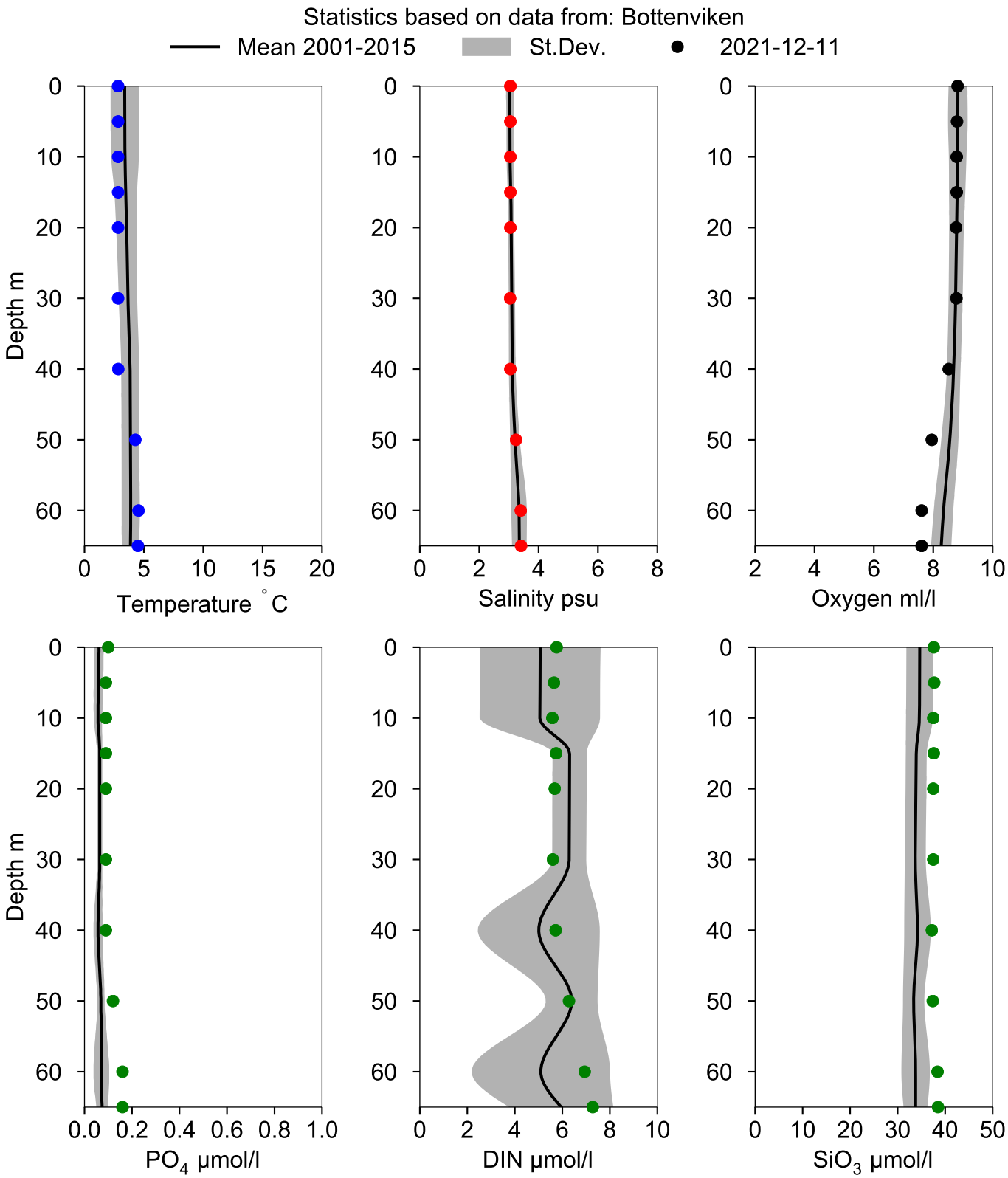
Vertical profiles BO3 / A3
December



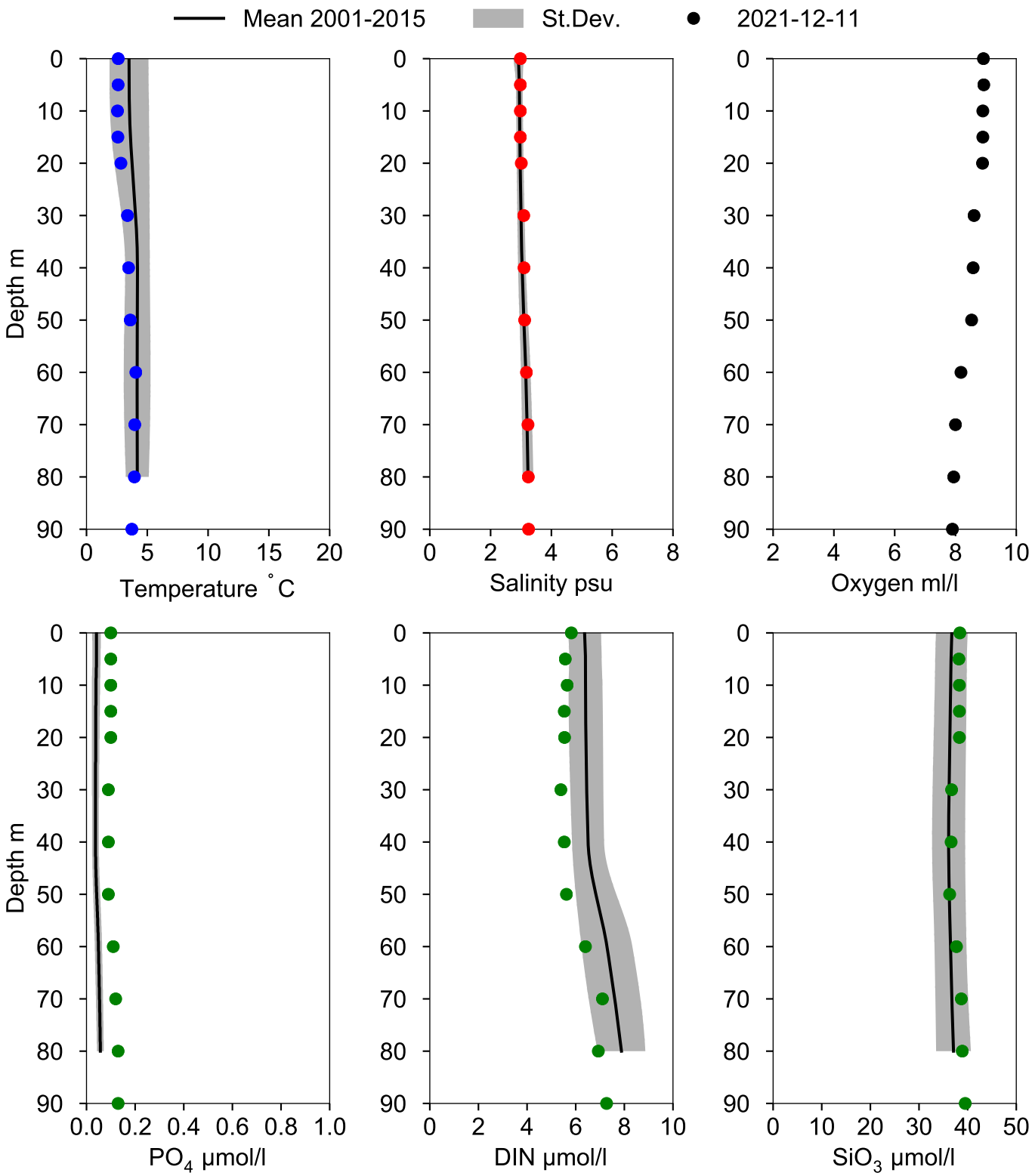
Vertical profiles RR7
December



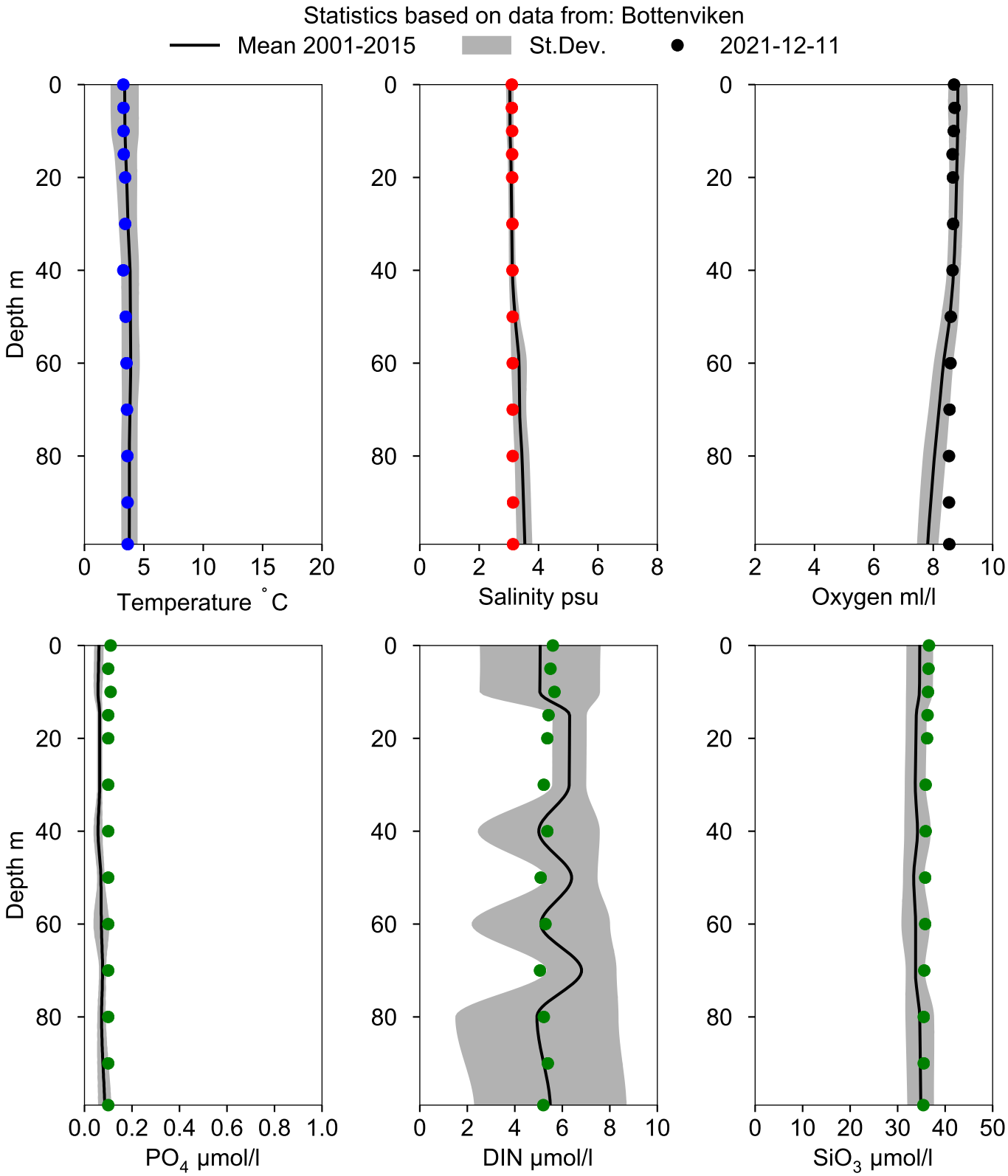
Vertical profiles RR5
December



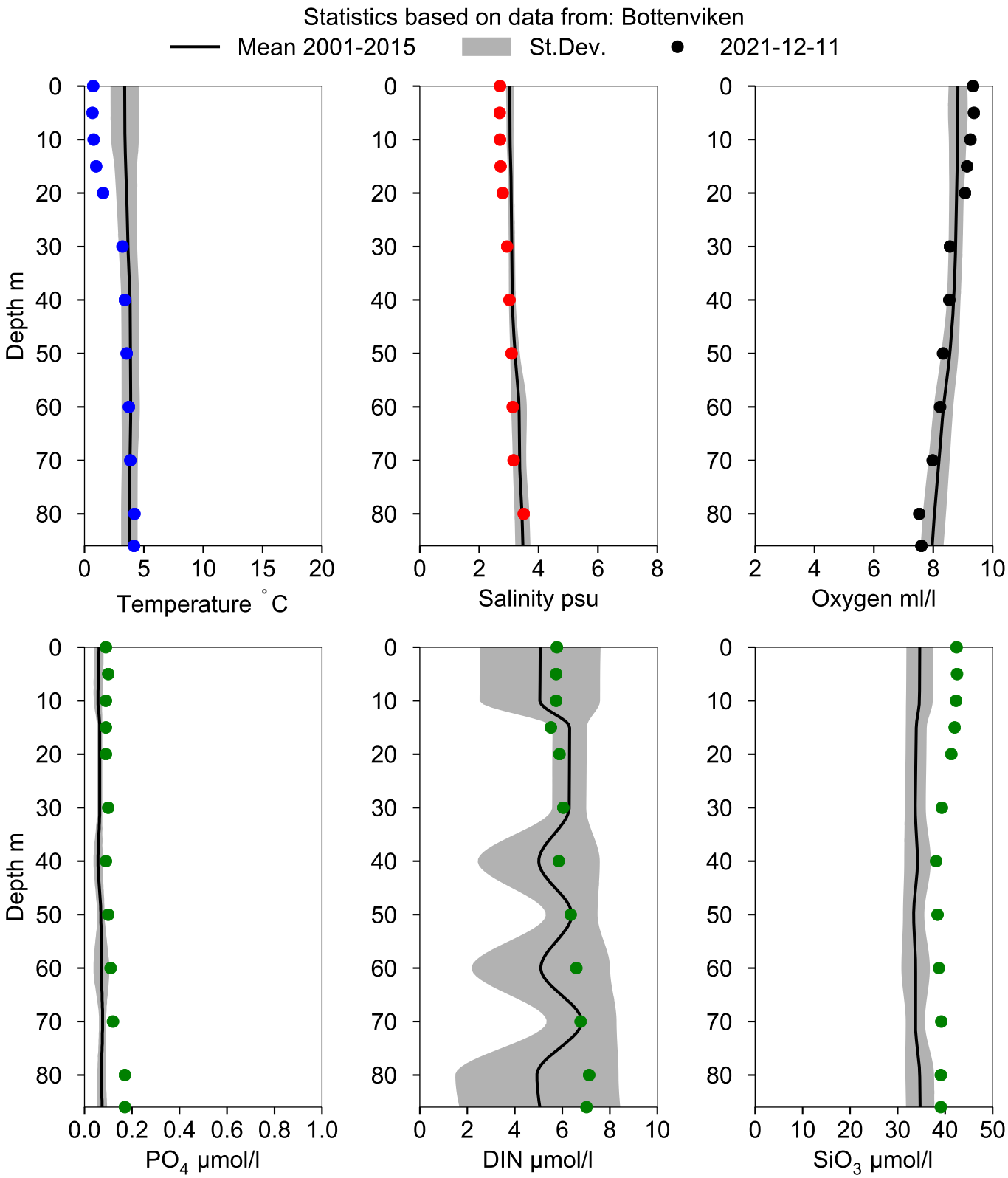
Vertical profiles F3 / A5
December



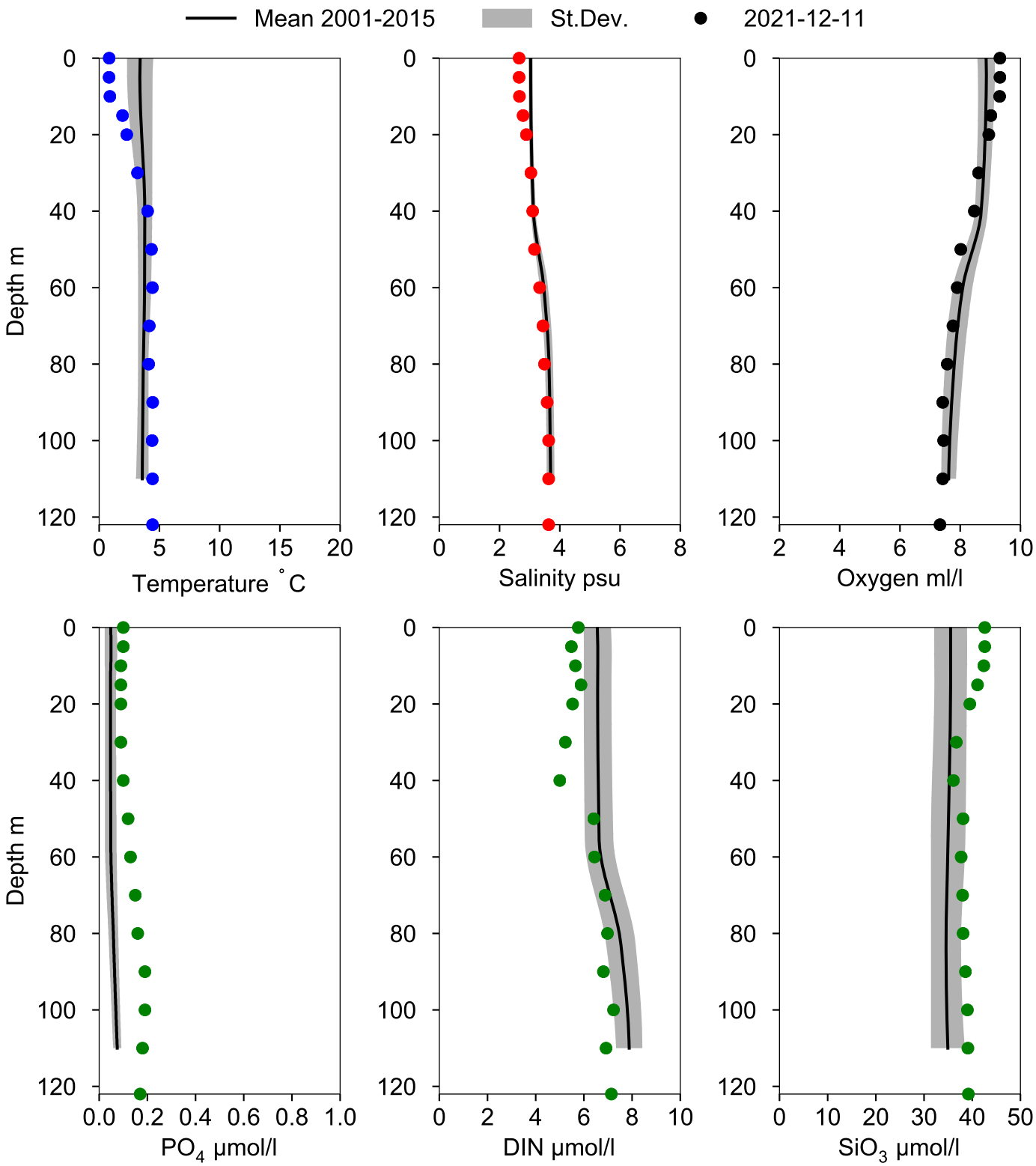
Vertical profiles F2
December



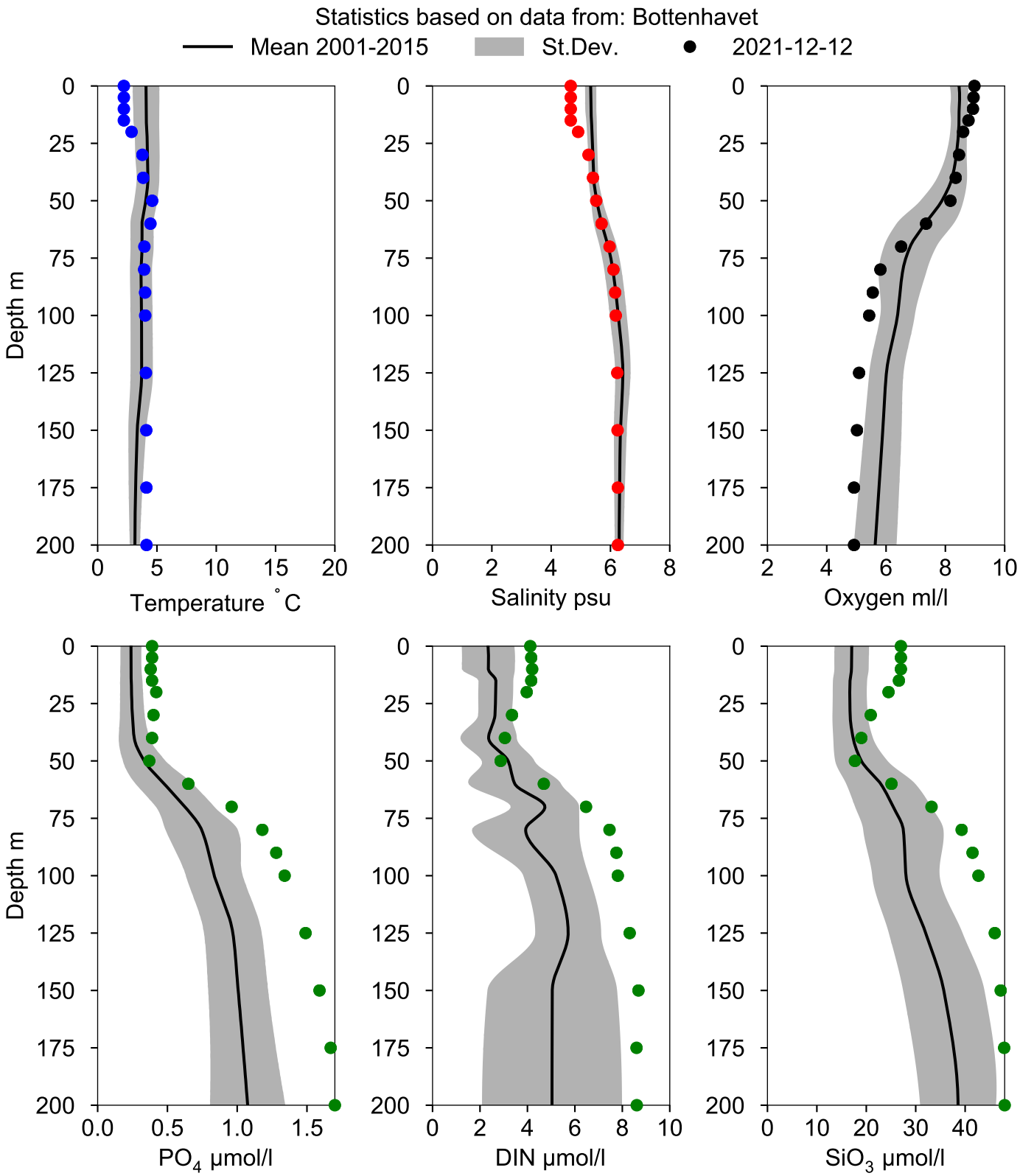
Vertical profiles RR1
December



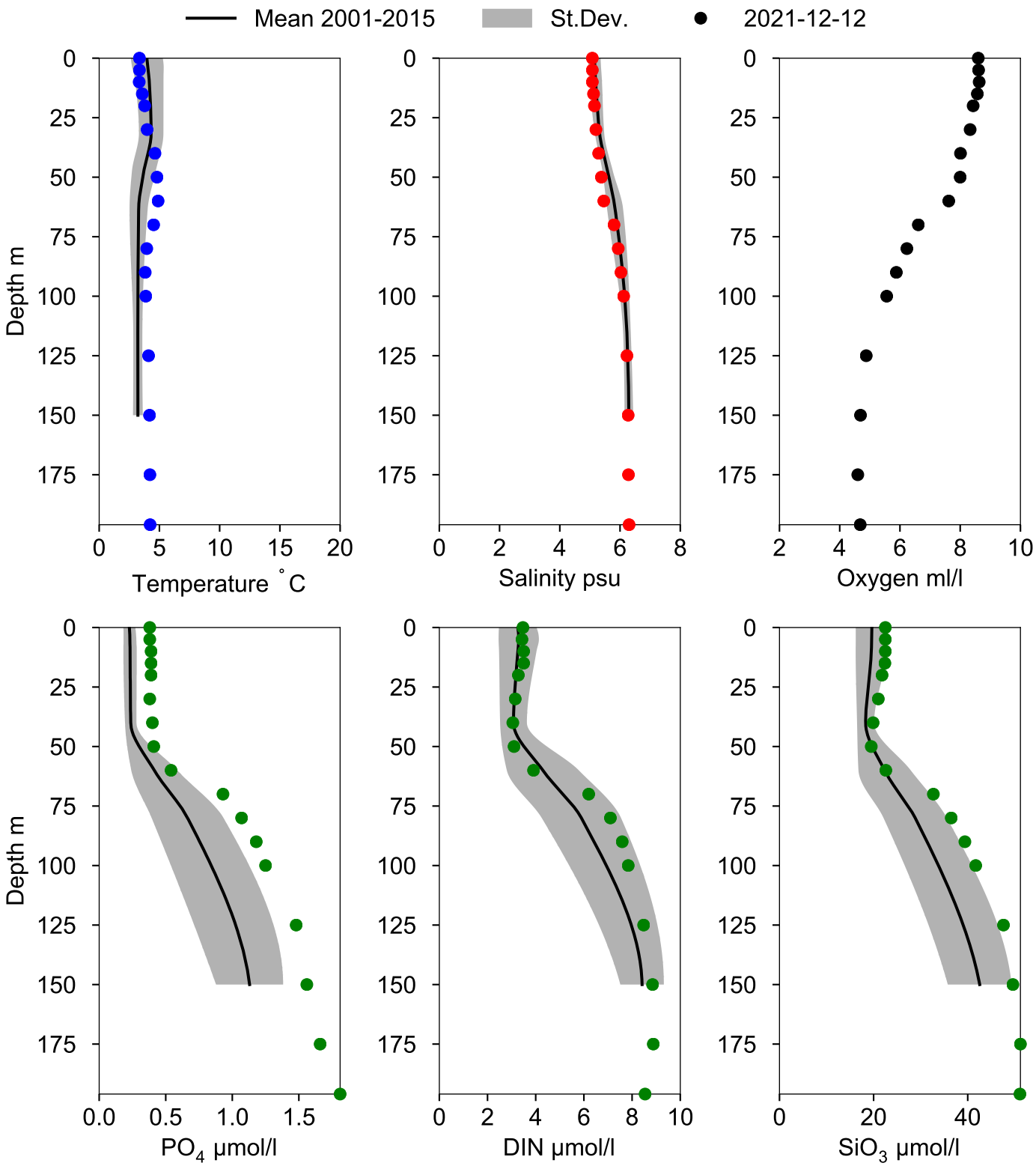
Vertical profiles F9 / A13
December



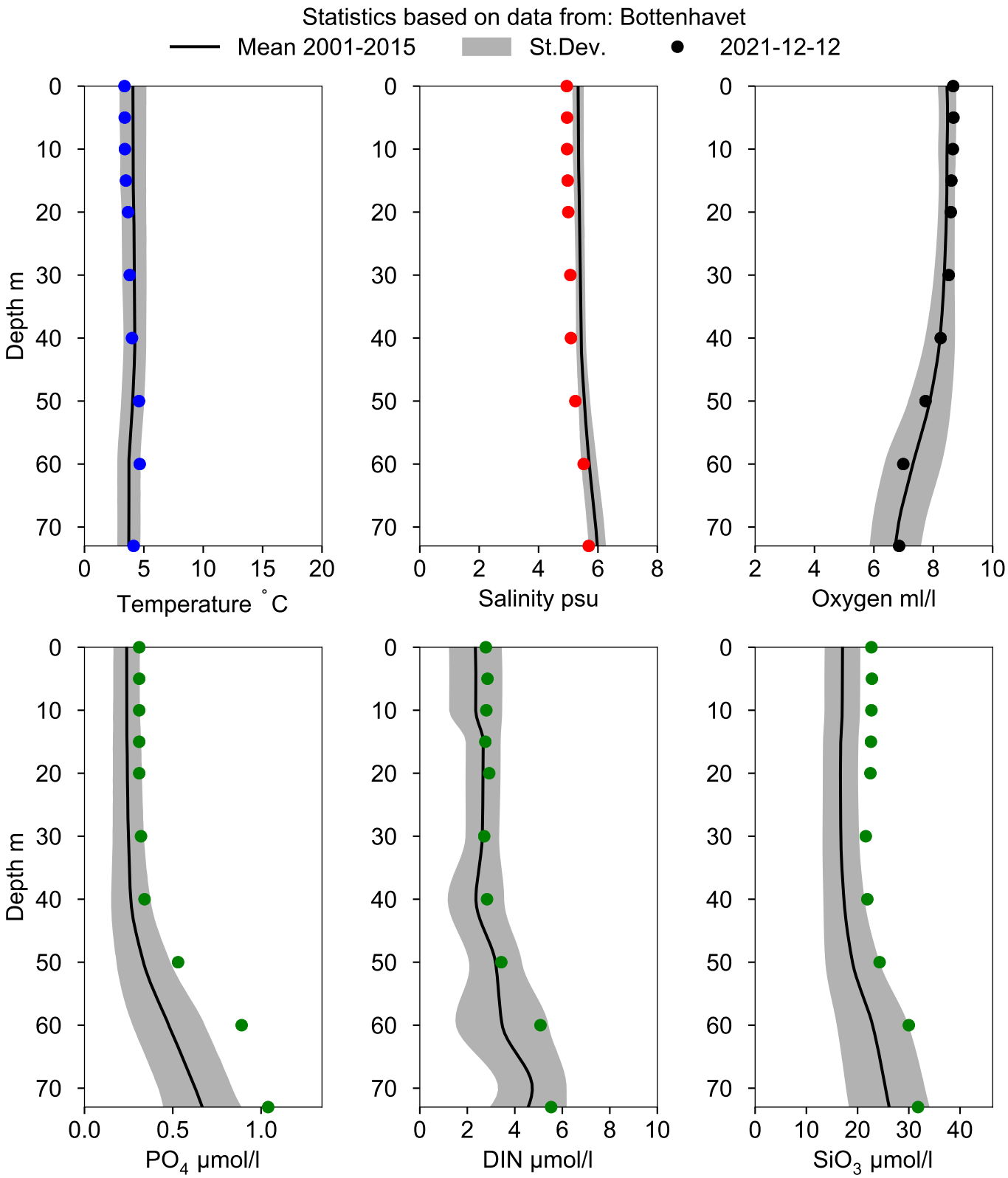
Vertical profiles US2 ULVÖDJ
December



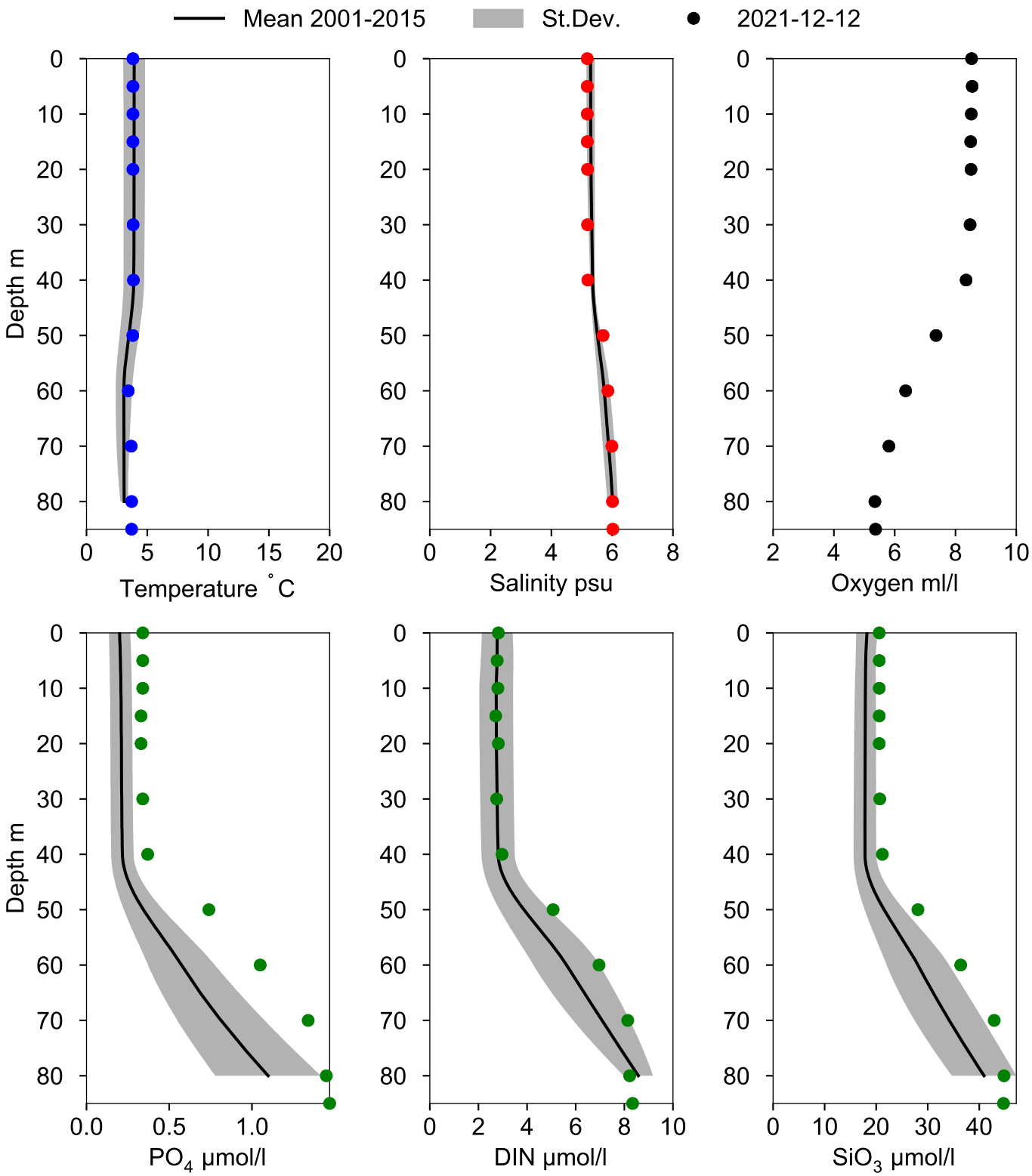
Vertical profiles C3
December



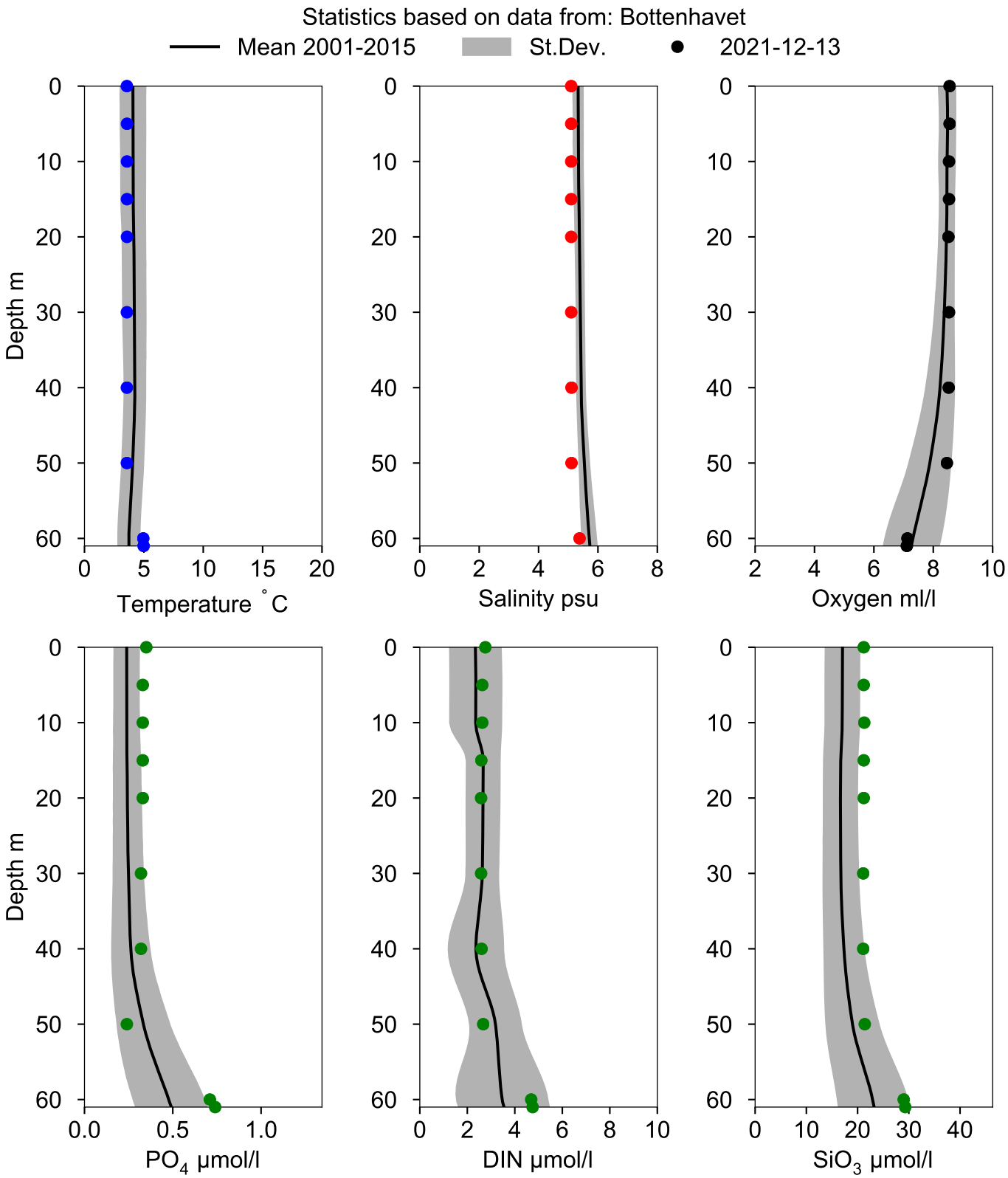
Vertical profiles MS2
December



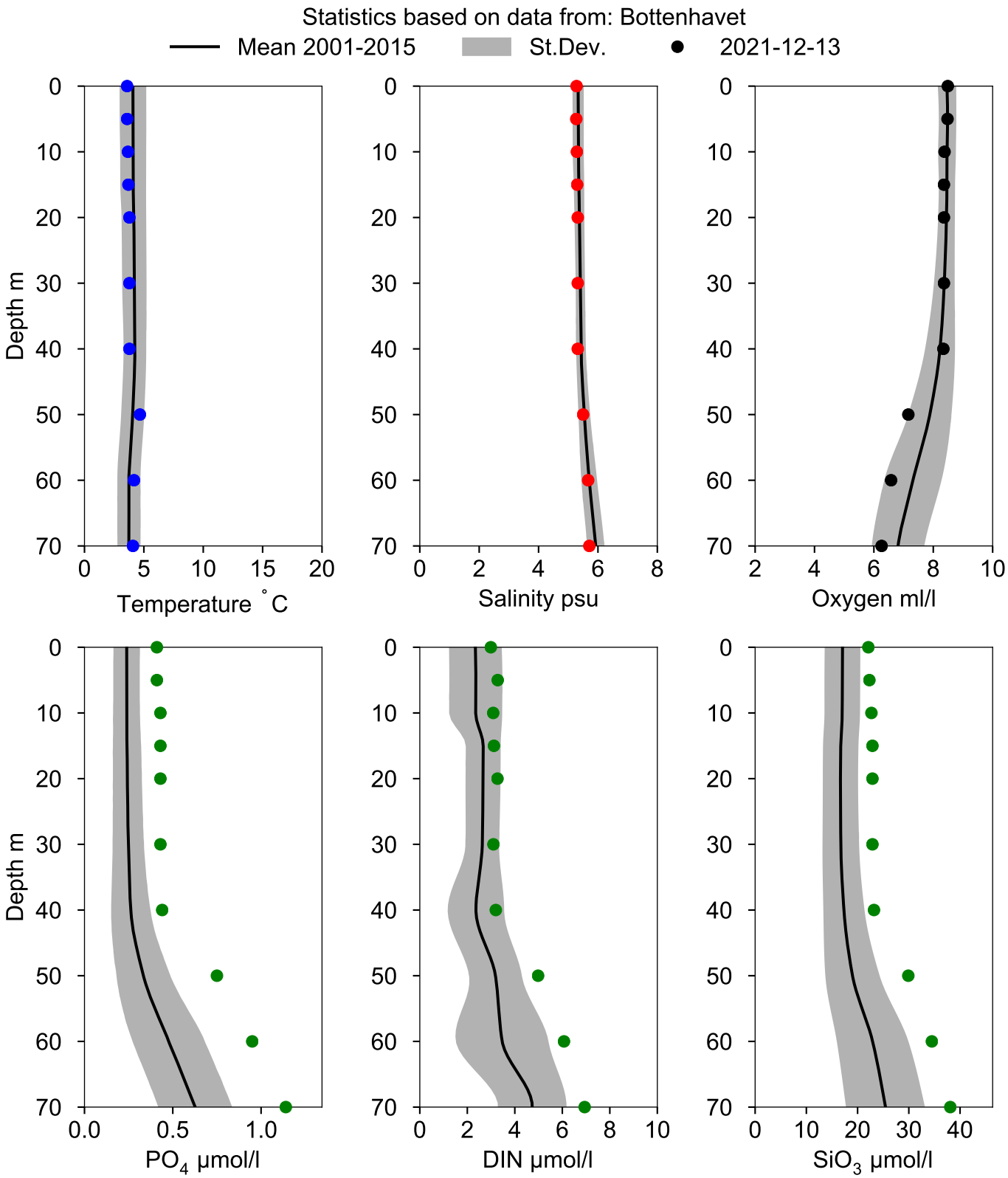
Vertical profiles MS4 / C14
December



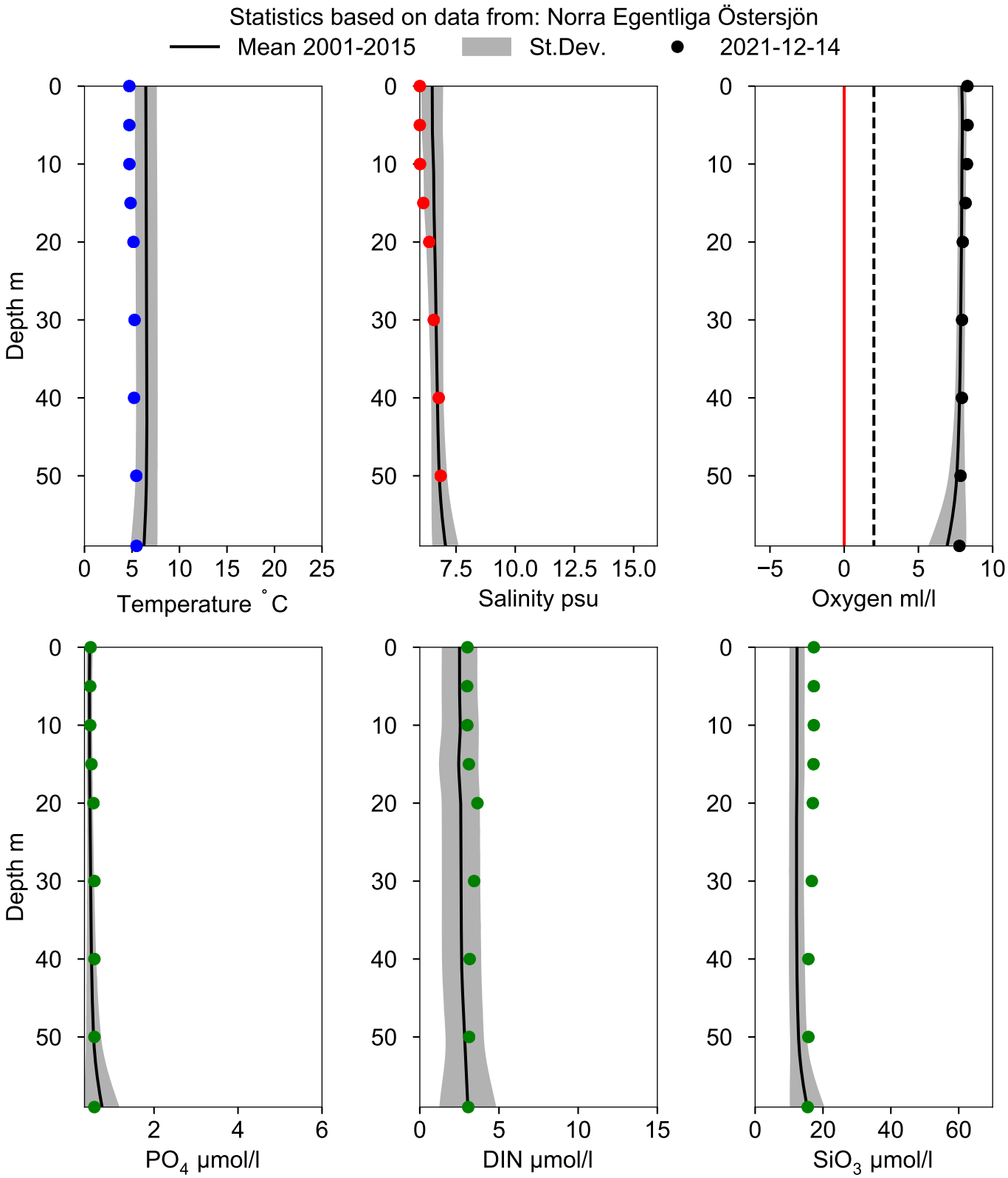
Vertical profiles SR1A
December



Vertical profiles SR3
December

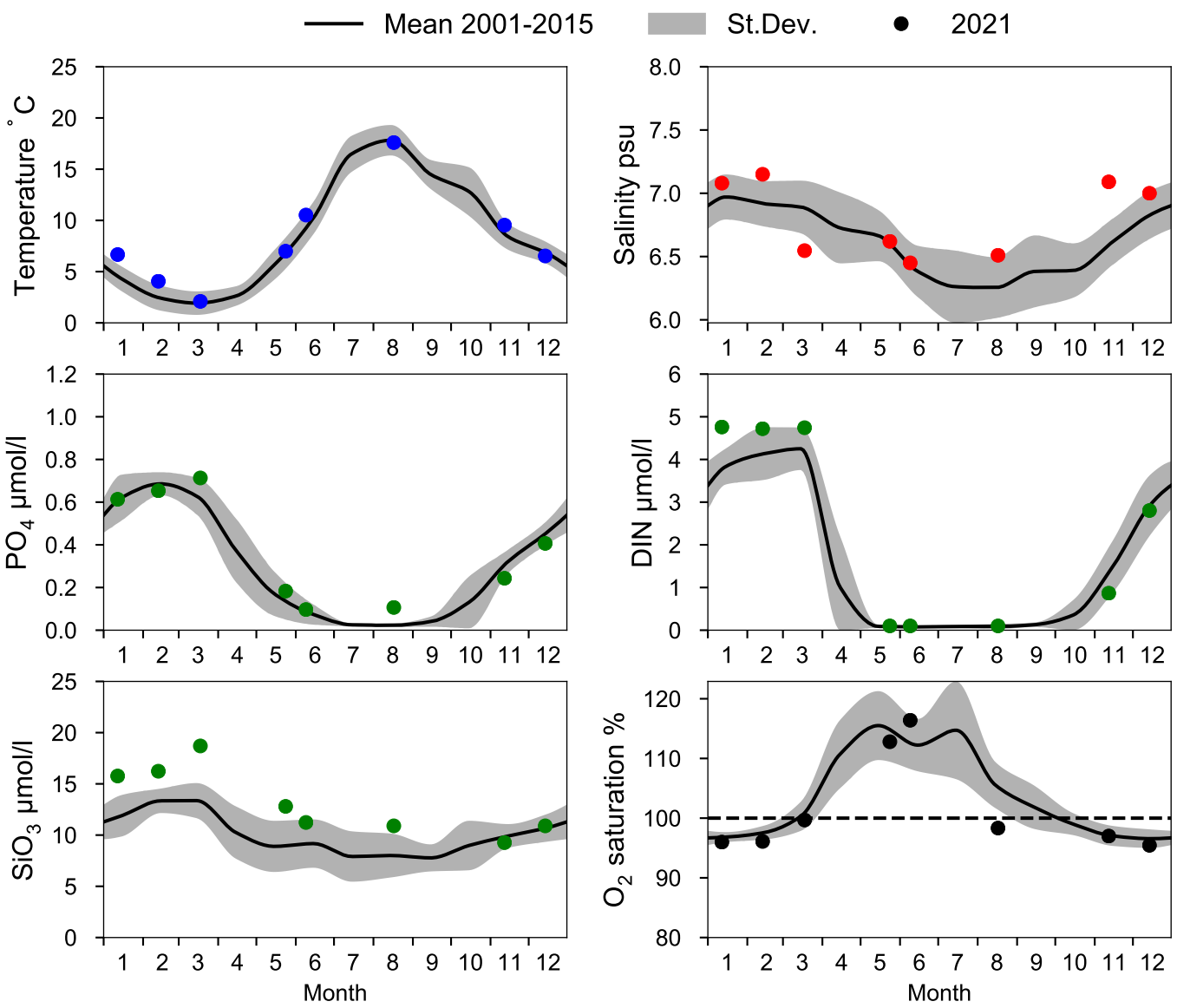


Vertical profiles TRÖSKELN ÅLANDS HAV
December

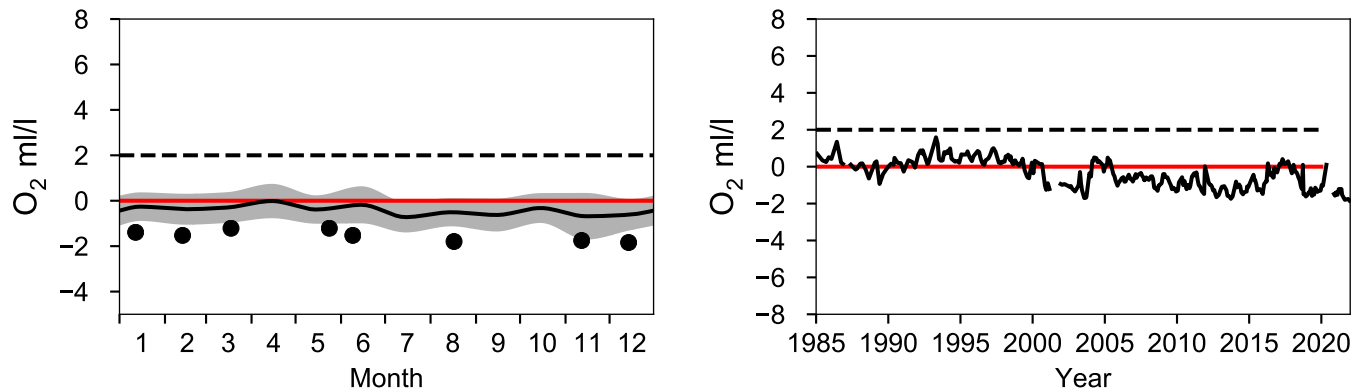


STATION BY29 / LL19 SURFACE WATER (0-10 m)

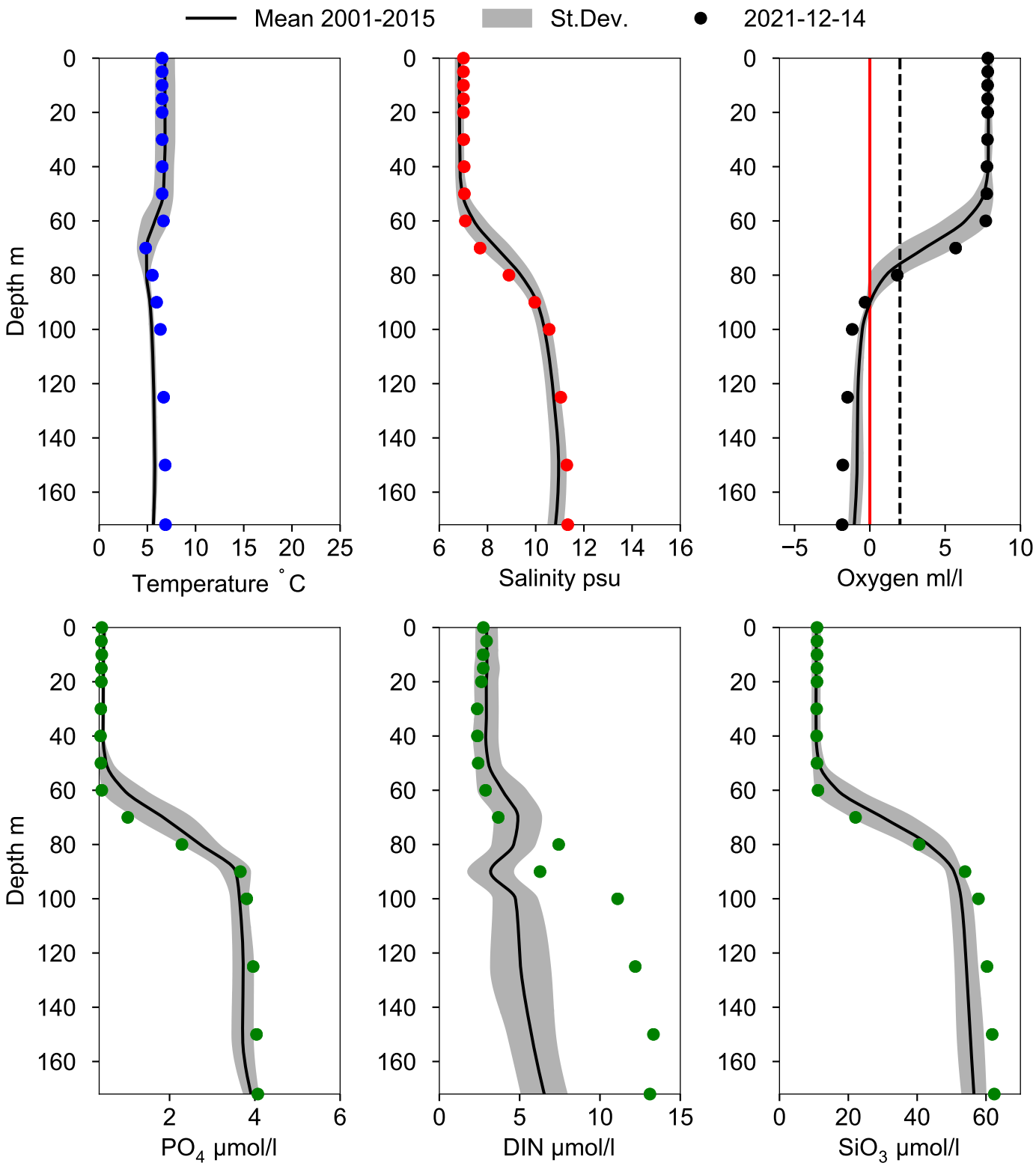
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 150 m)

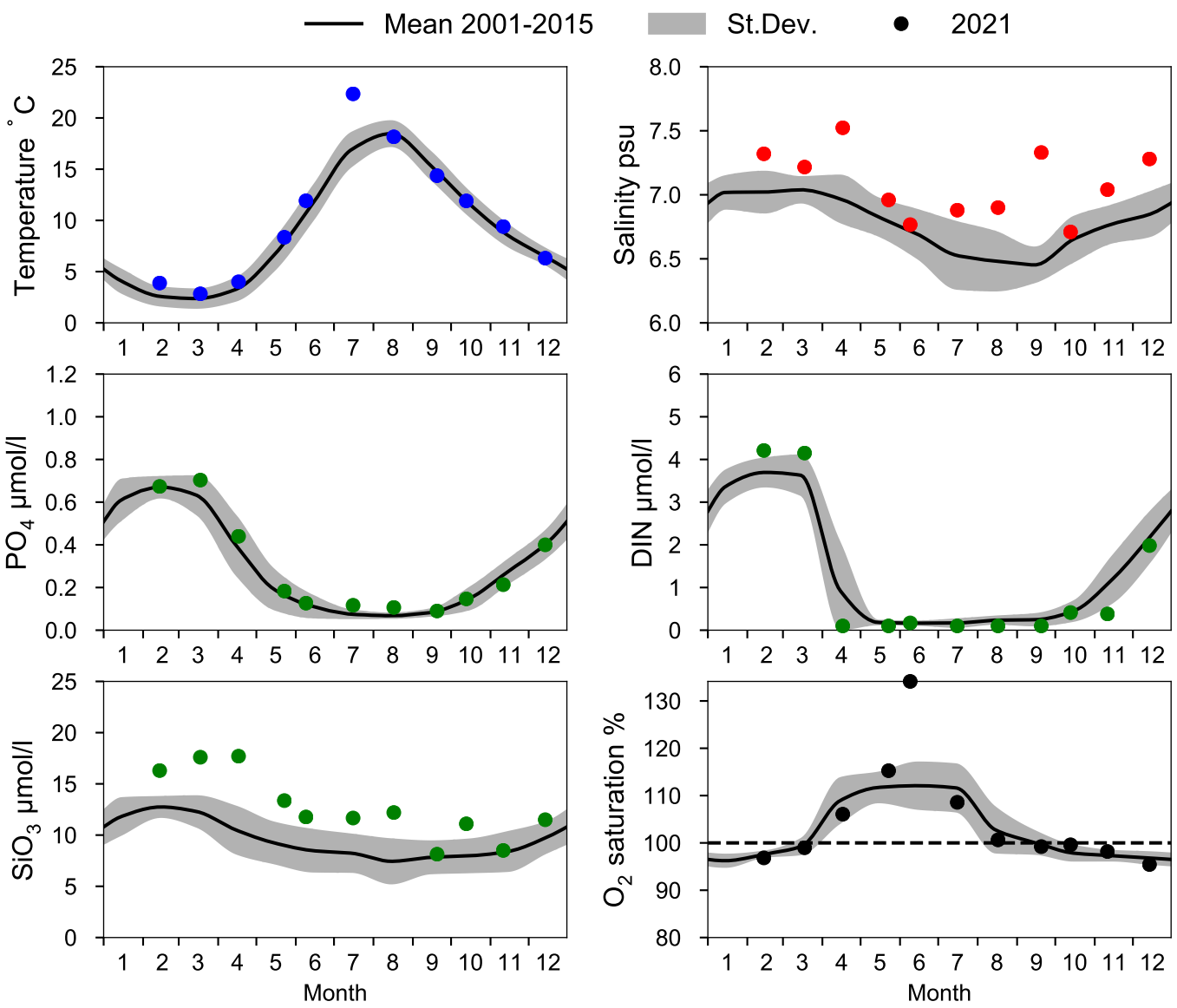


Vertical profiles BY29 / LL19
December

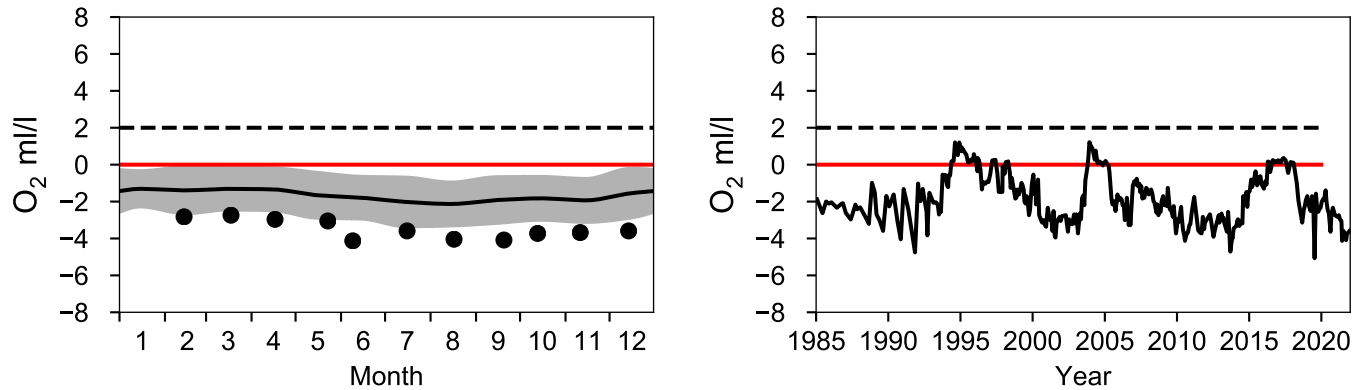


STATION BY20 FÅRÖDJ SURFACE WATER (0-10 m)

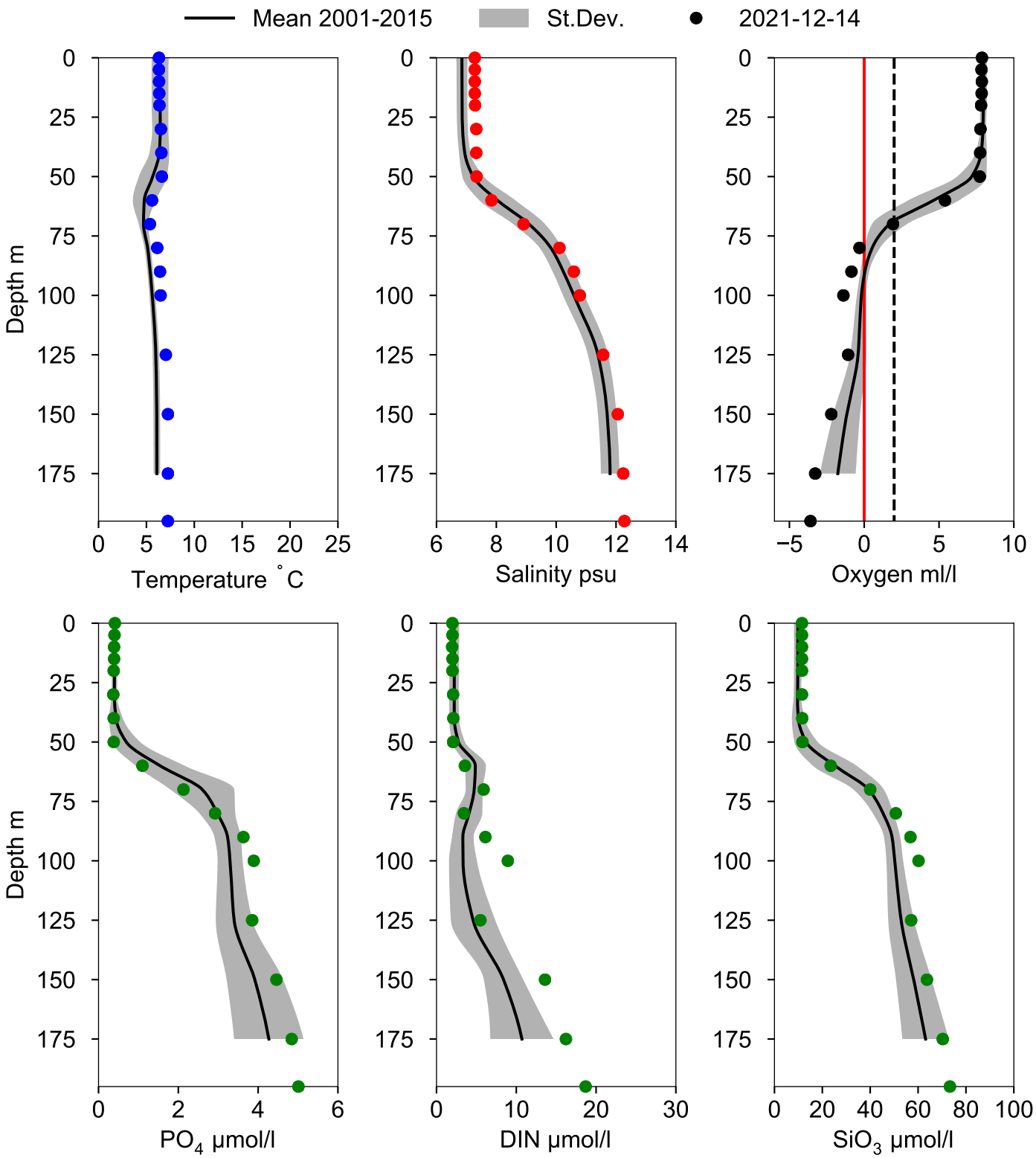
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 175 m)

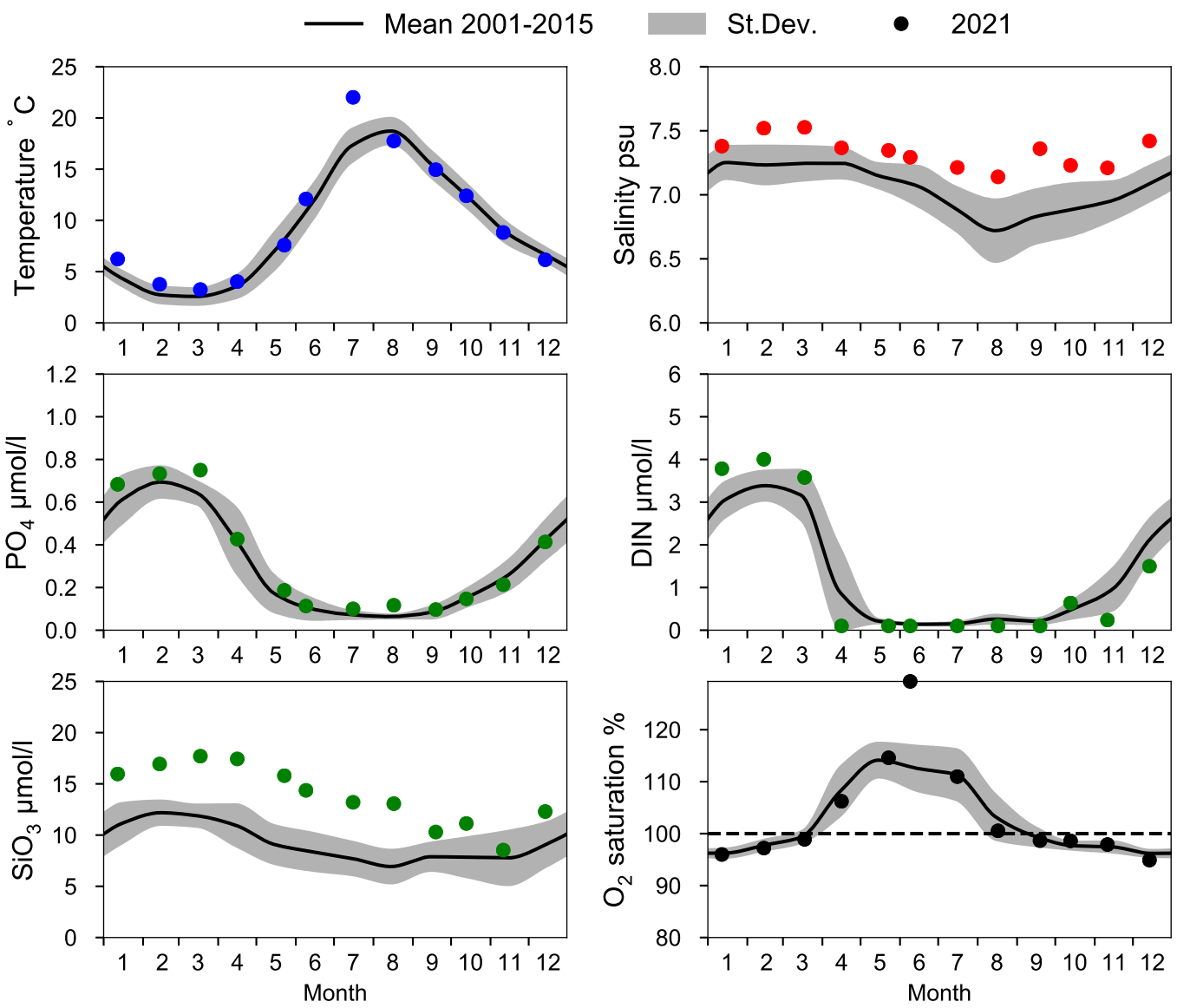


Vertical profiles BY20 FÅRÖDJ
December

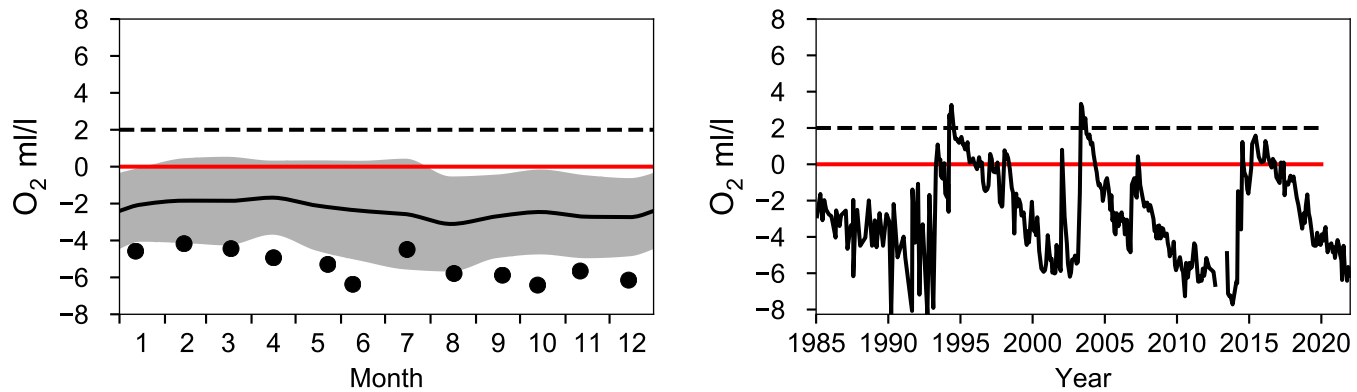


STATION BY15 GOTLANDSDJ SURFACE WATER (0-10 m)

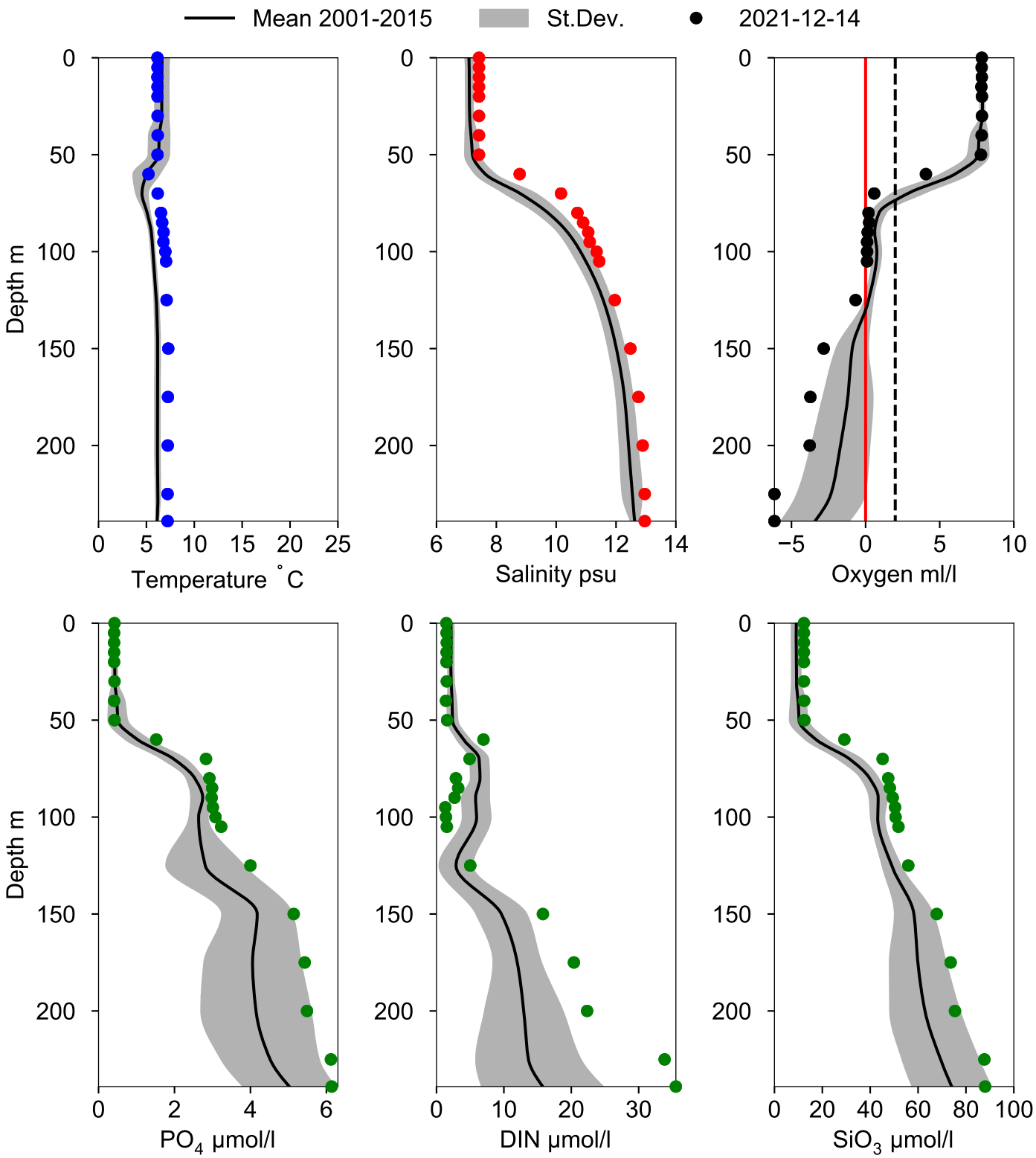
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 224 m)

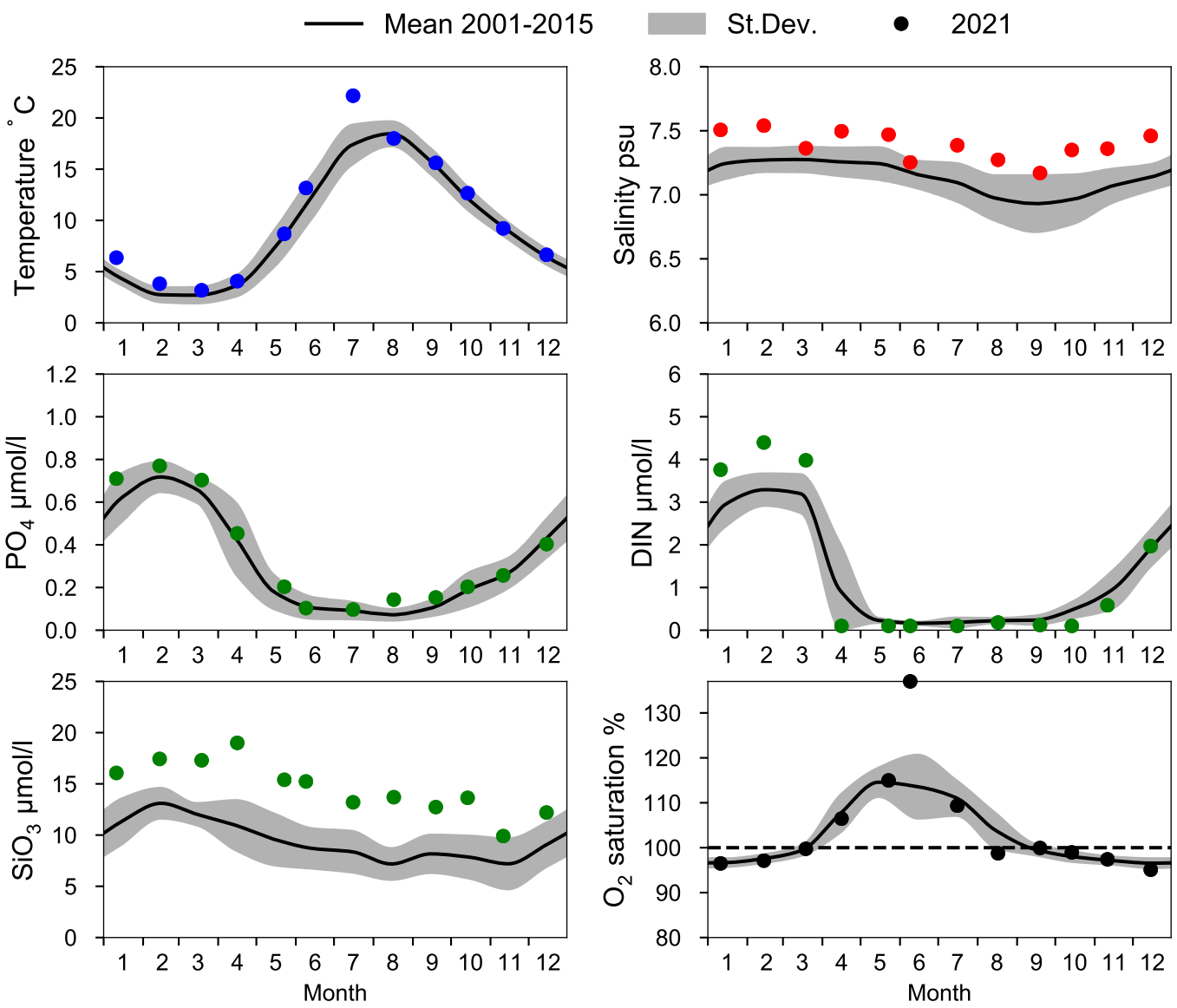


Vertical profiles BY15 GOTLANDSDJ
December

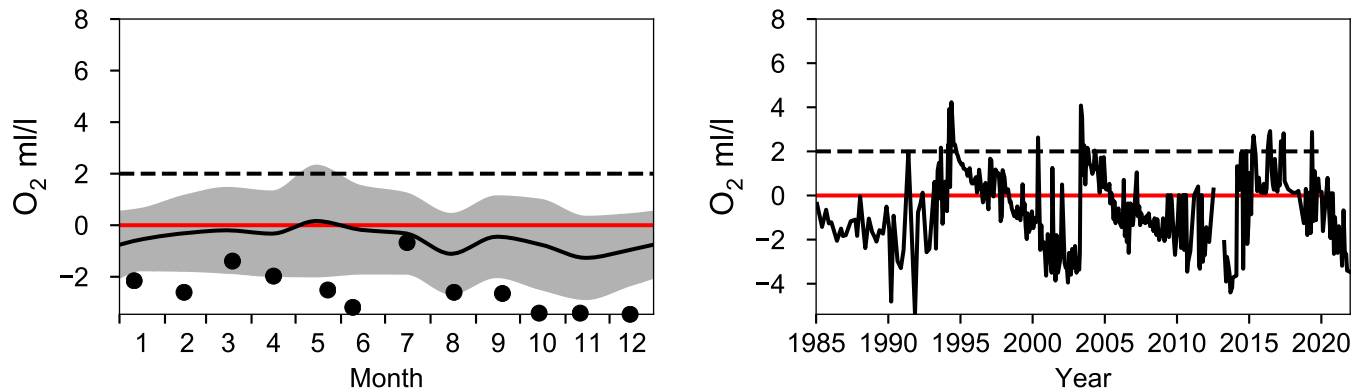


STATION BY10 SURFACE WATER (0-10 m)

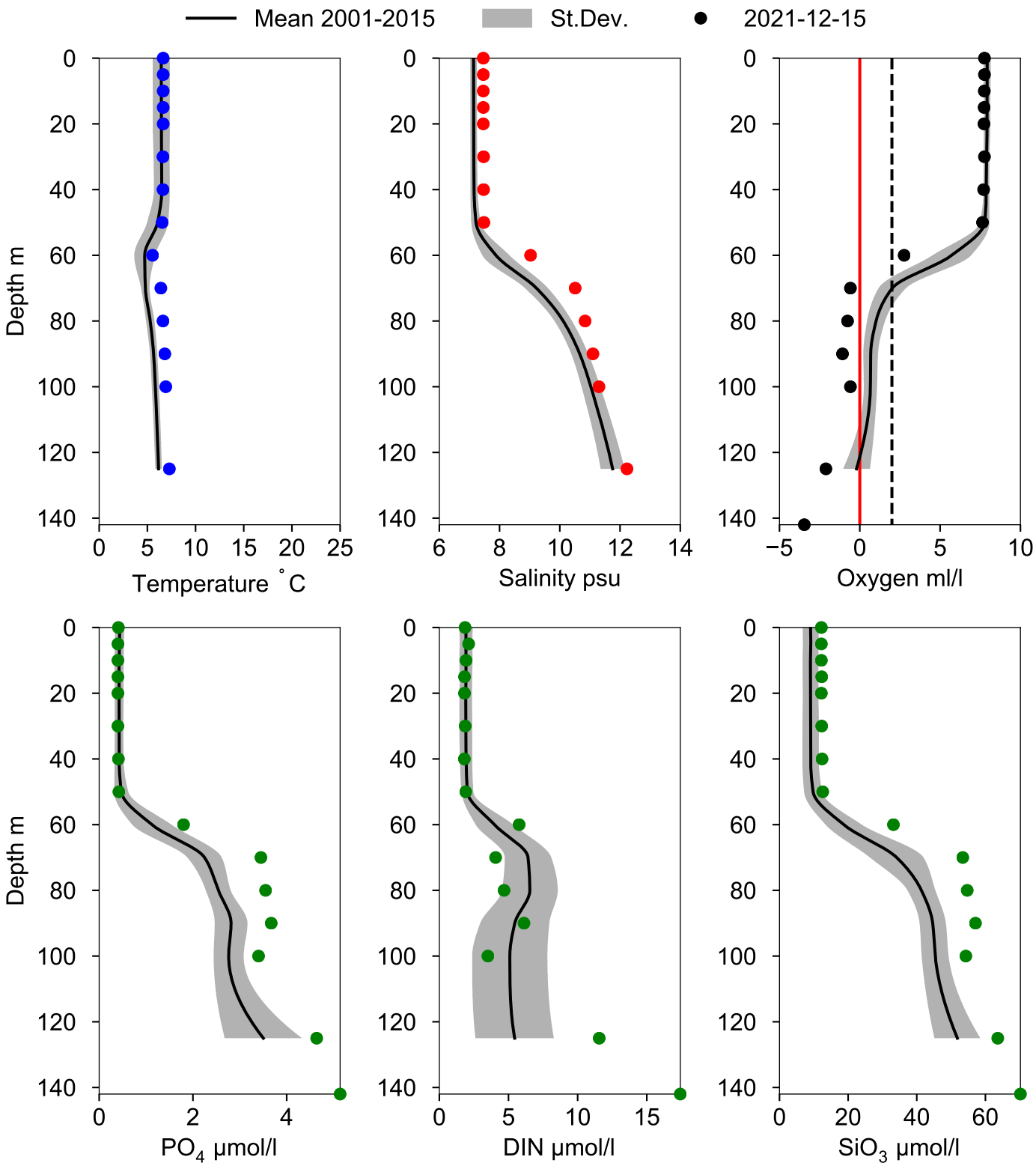
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)

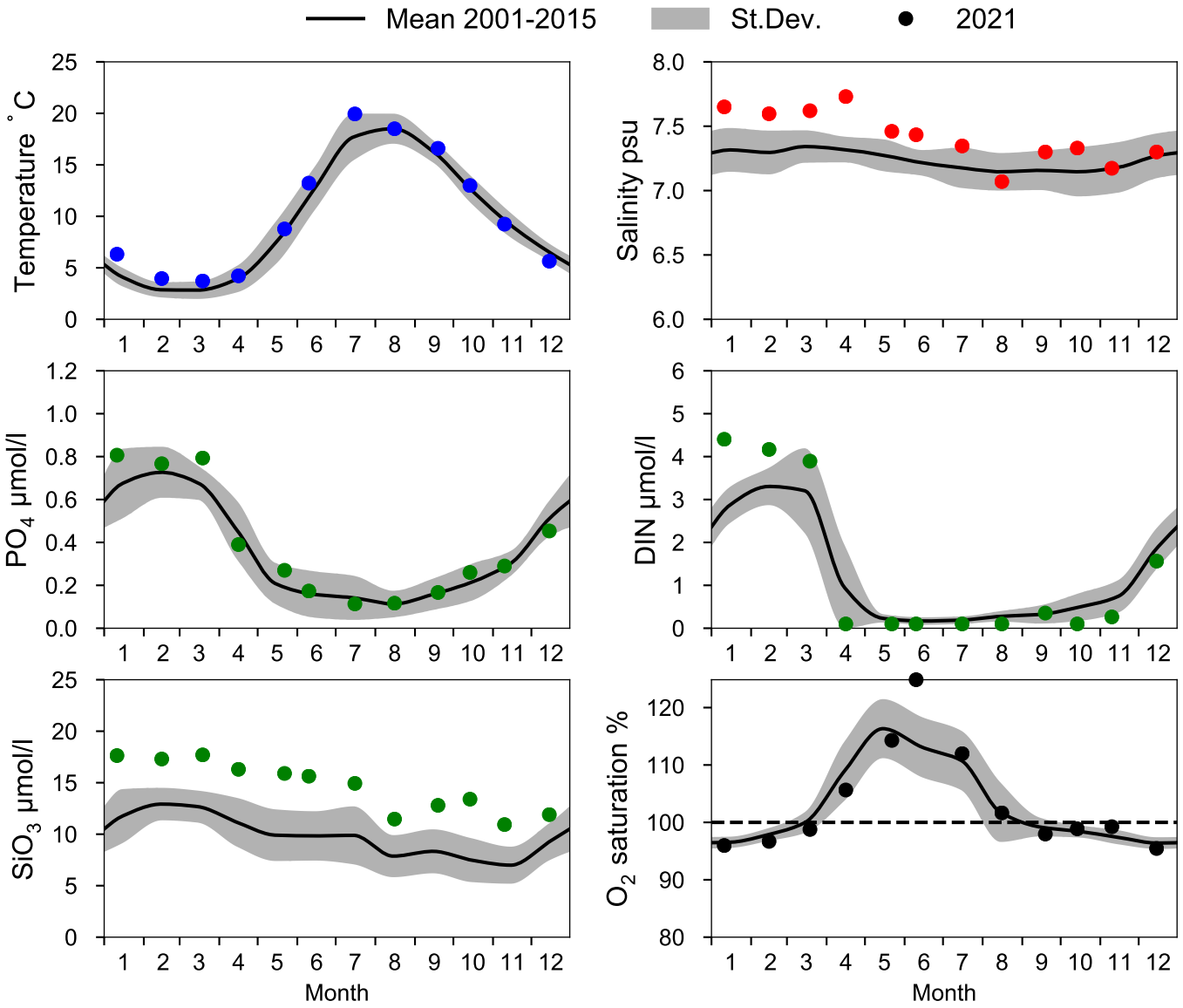


Vertical profiles BY10
December

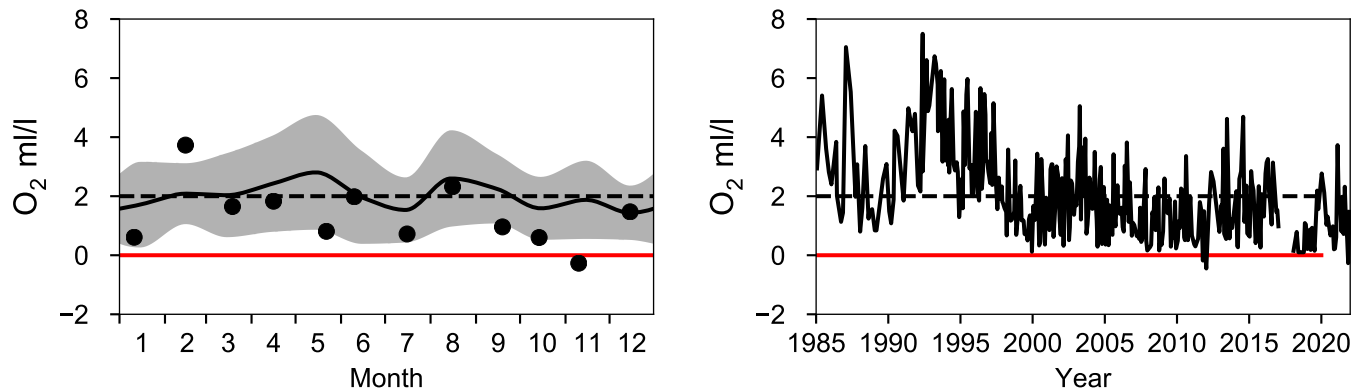


STATION BCS III-10 SURFACE WATER (0-10 m)

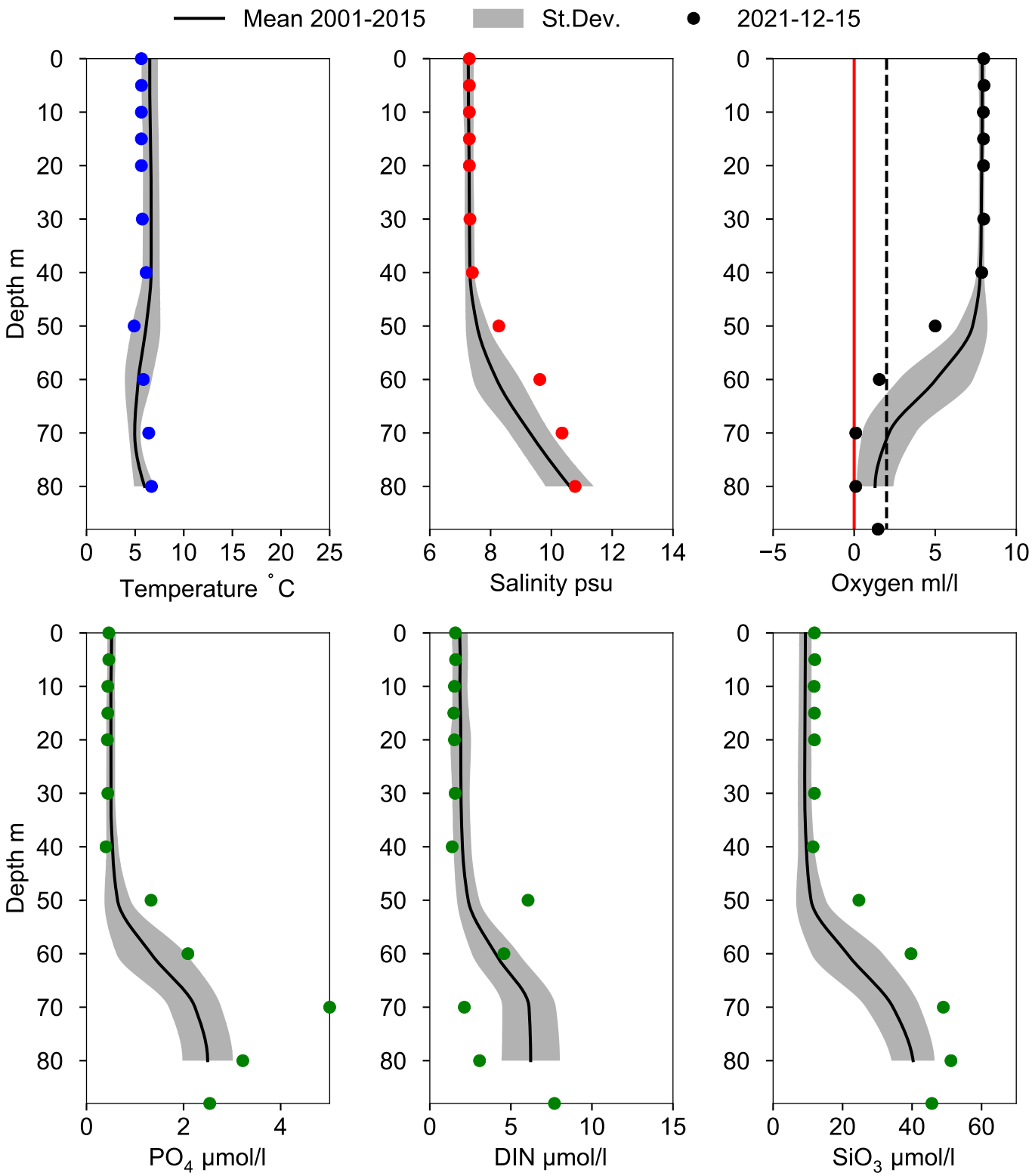
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

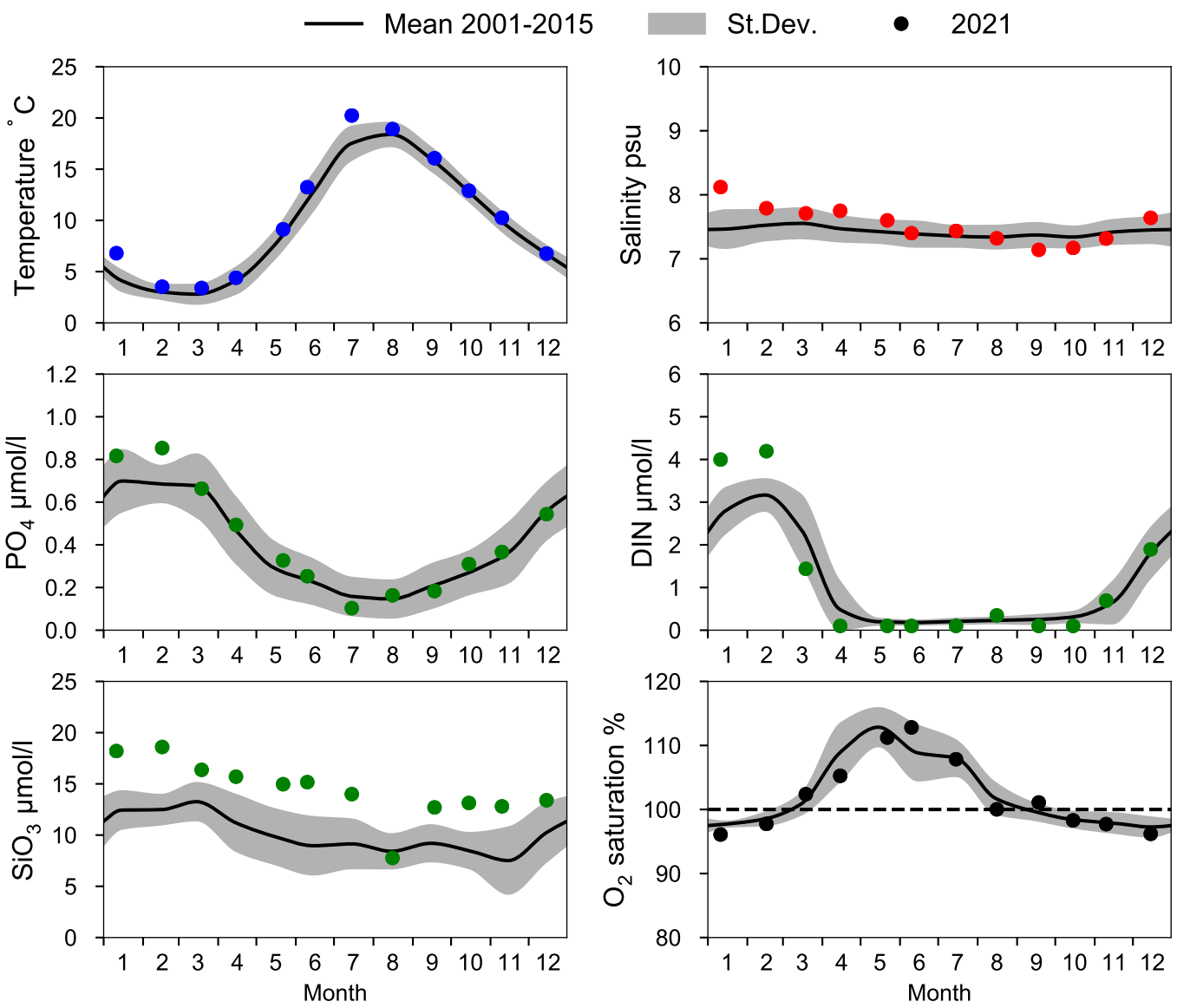


Vertical profiles BCS III-10
December

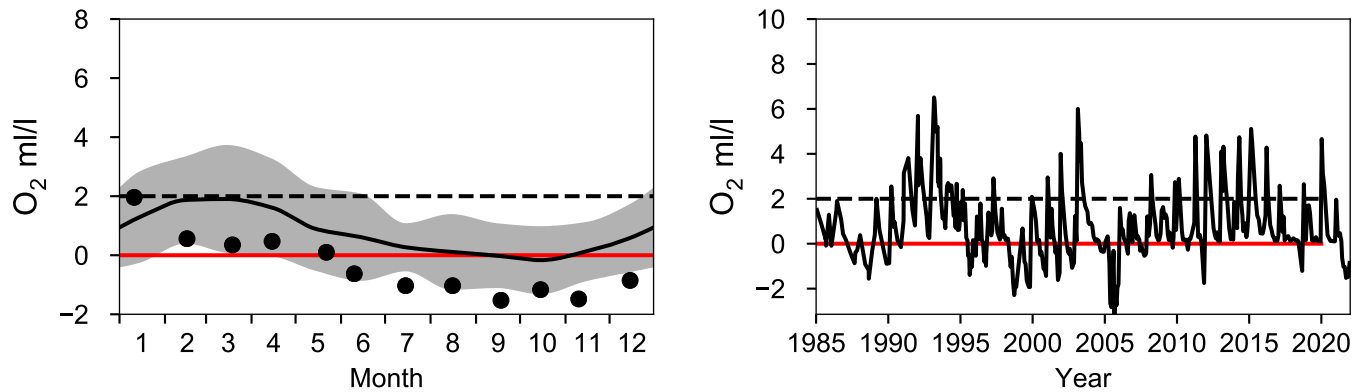


STATION BY5 BORNHOLMSDJ SURFACE WATER (0-10 m)

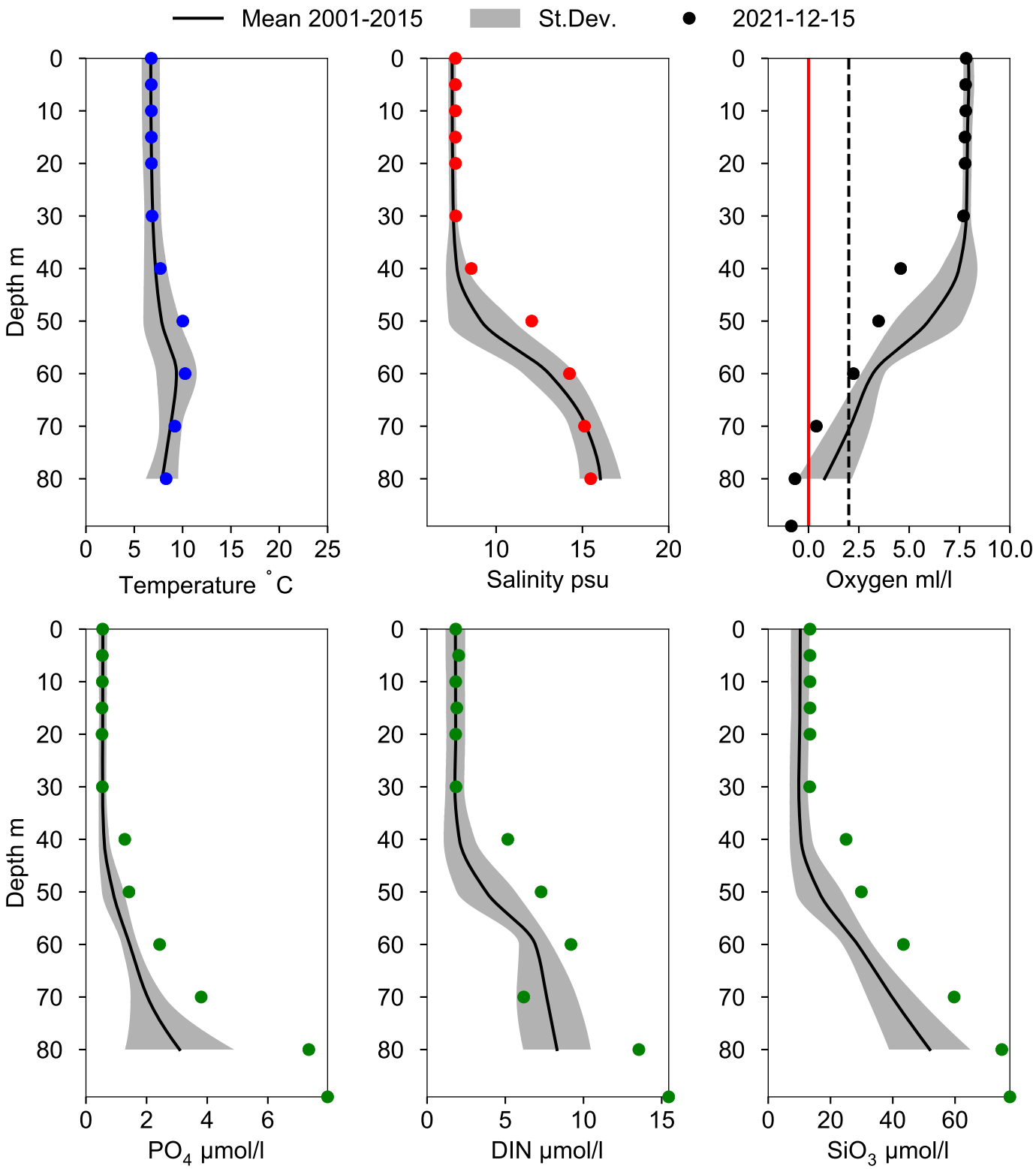
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

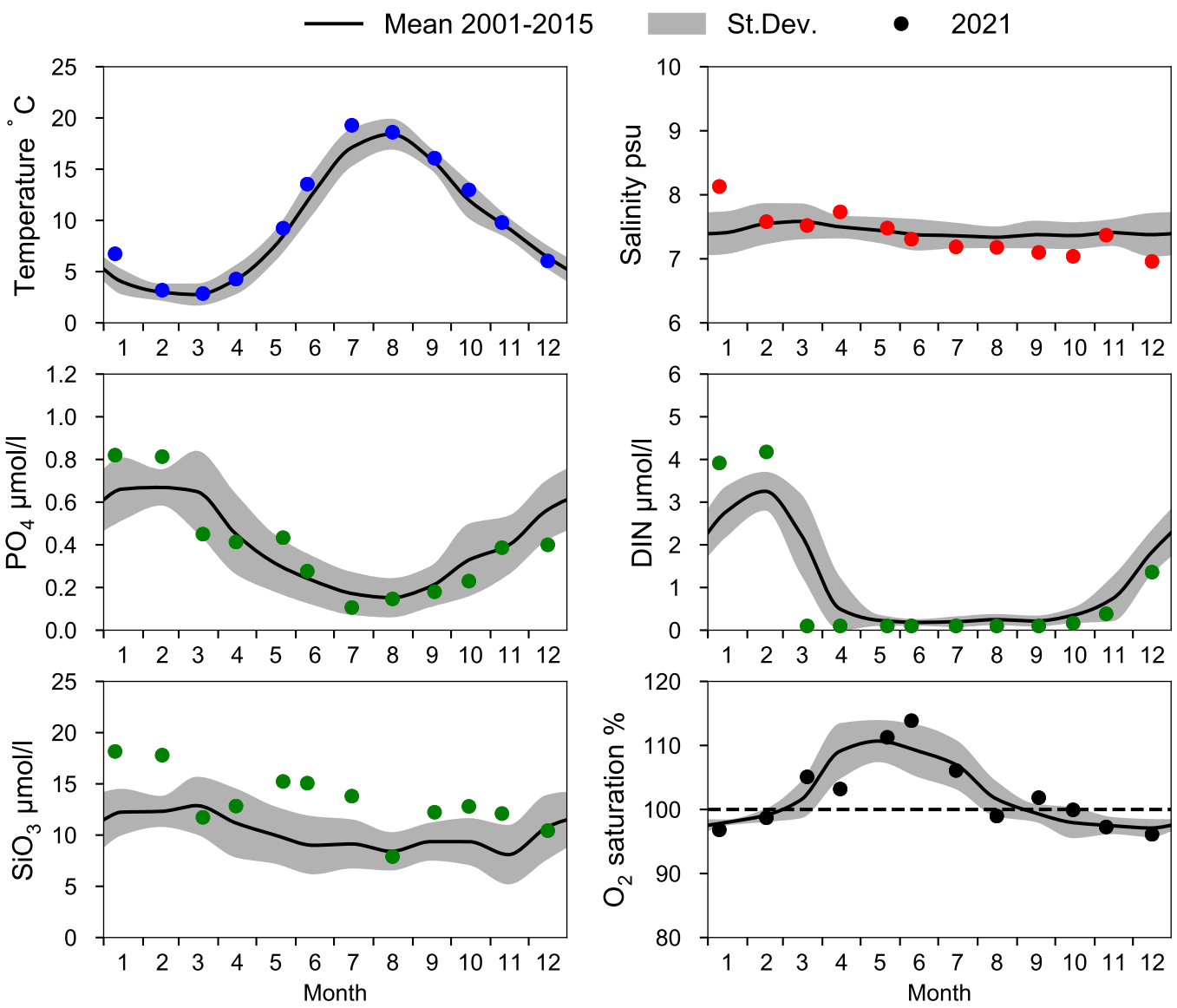


Vertical profiles BY5 BORNHOLMSDJ
December

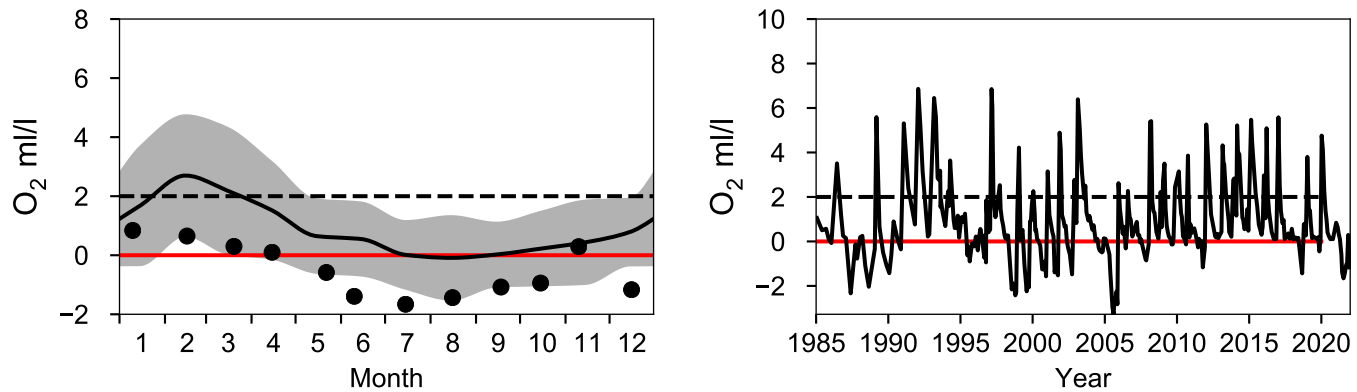


STATION BY4 CHRISTIANSÖ SURFACE WATER (0-10 m)

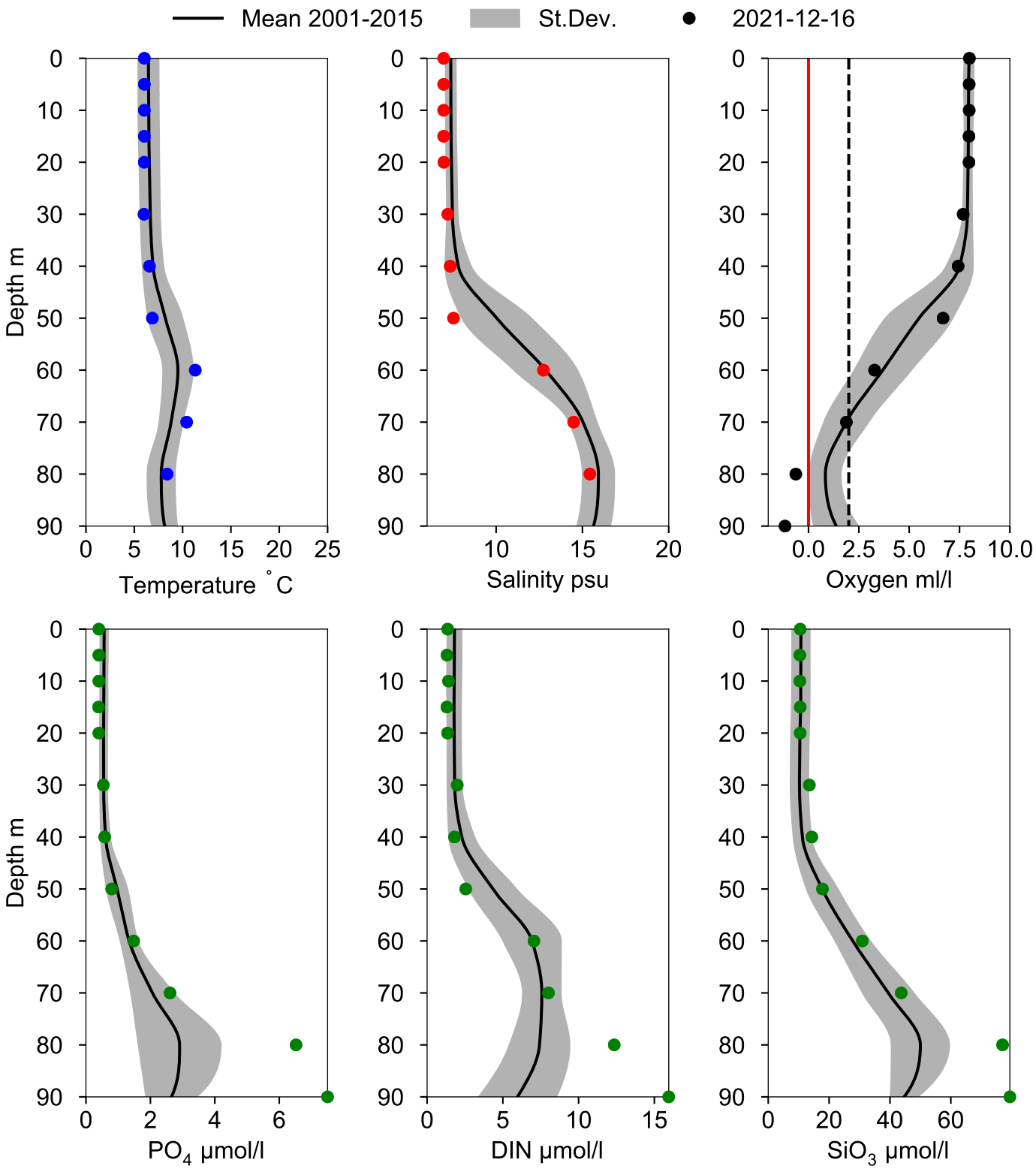
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

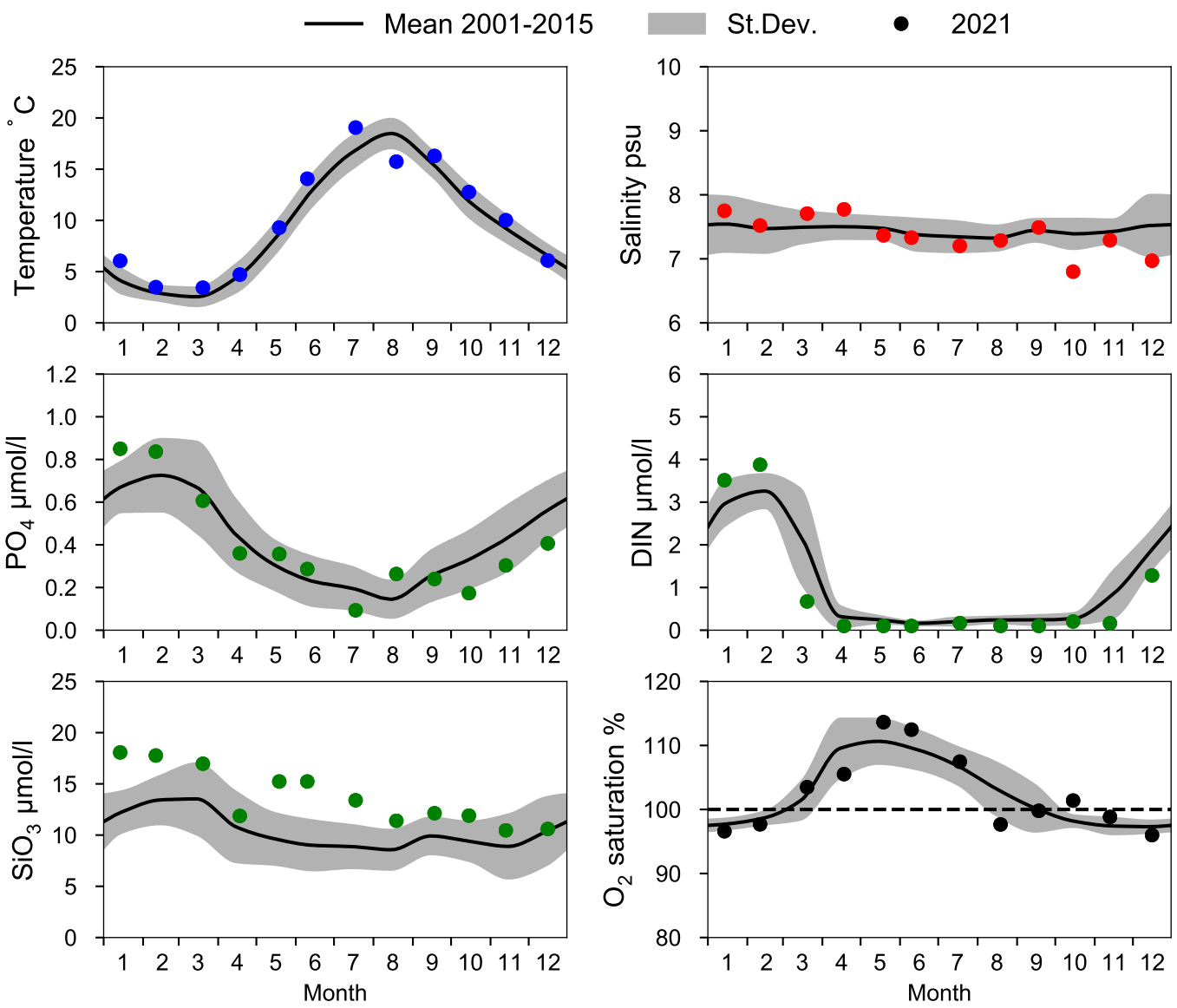


Vertical profiles BY4 CHRISTIANSÖ
December

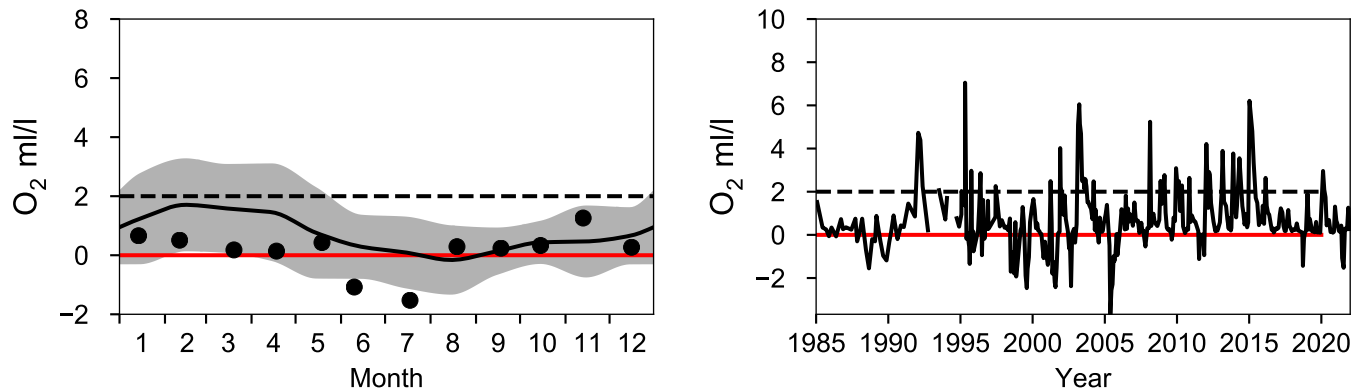


STATION HANÖBUKTEN SURFACE WATER (0-10 m)

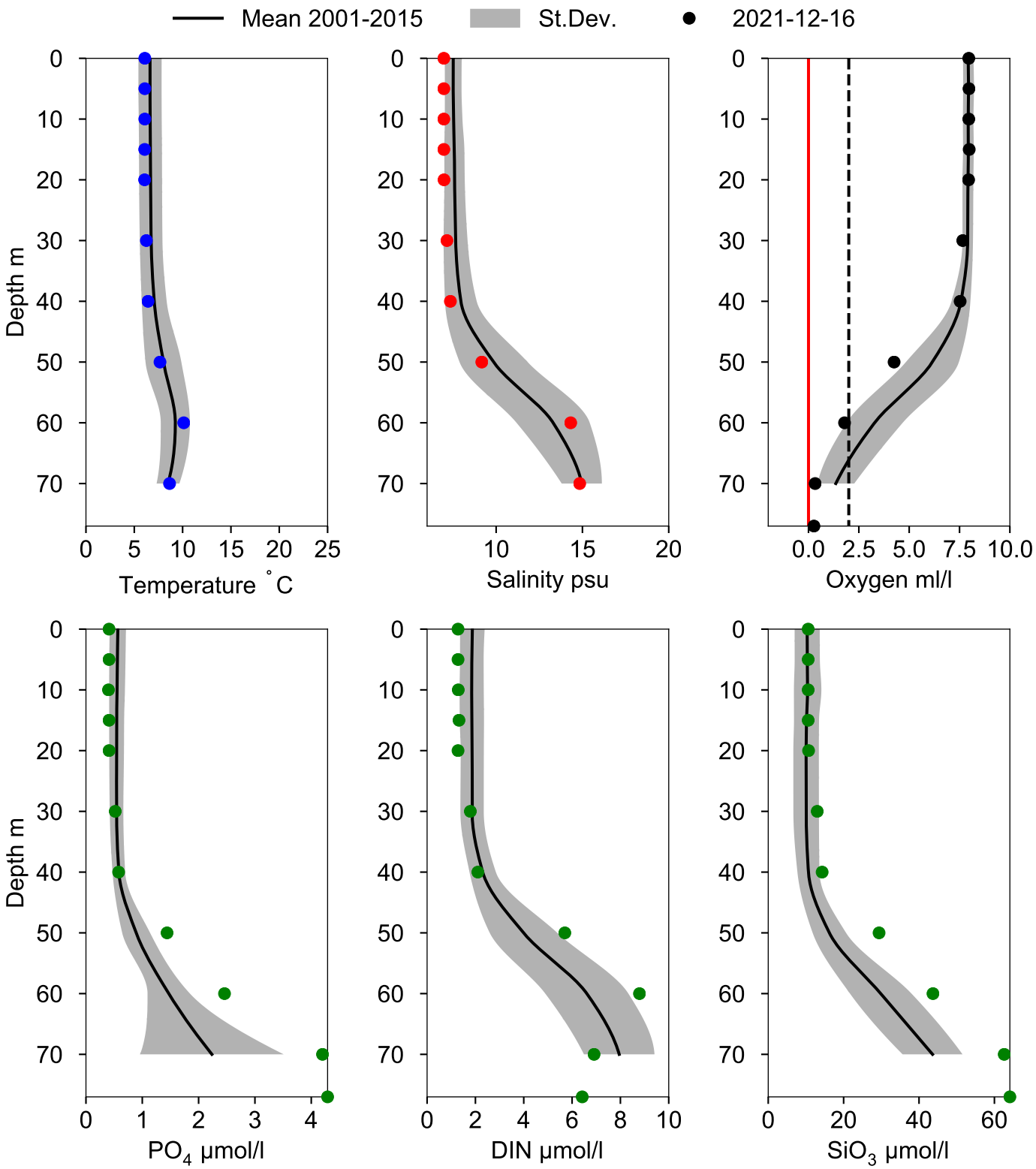
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 70 m)

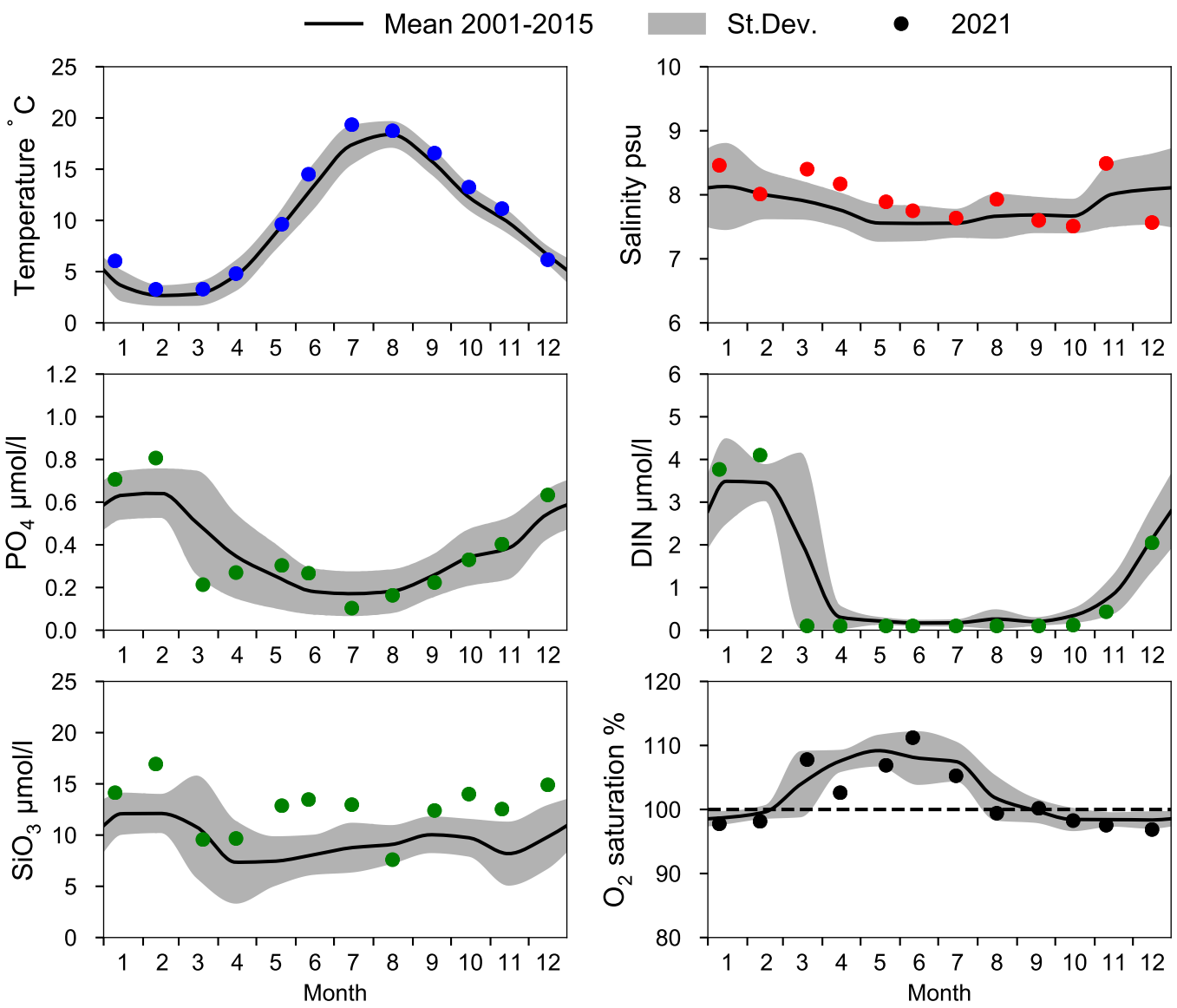


Vertical profiles HANÖBUKTEN
December

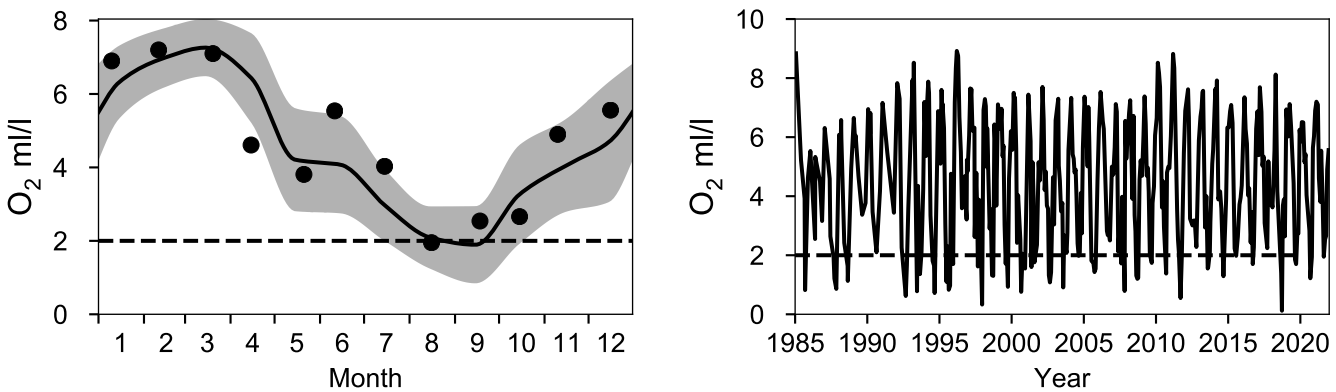


STATION BY2 ARKONA SURFACE WATER (0-10 m)

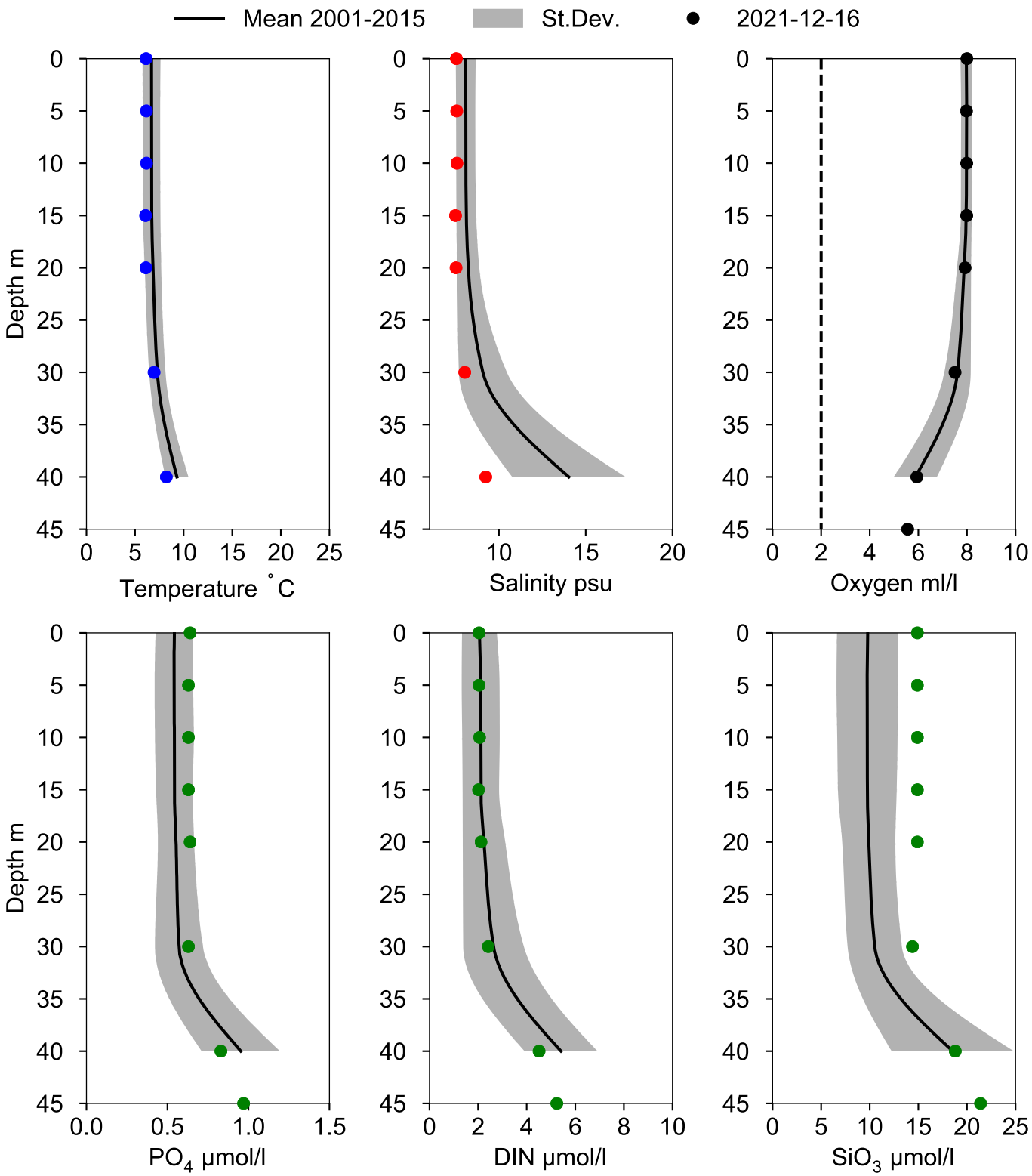
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

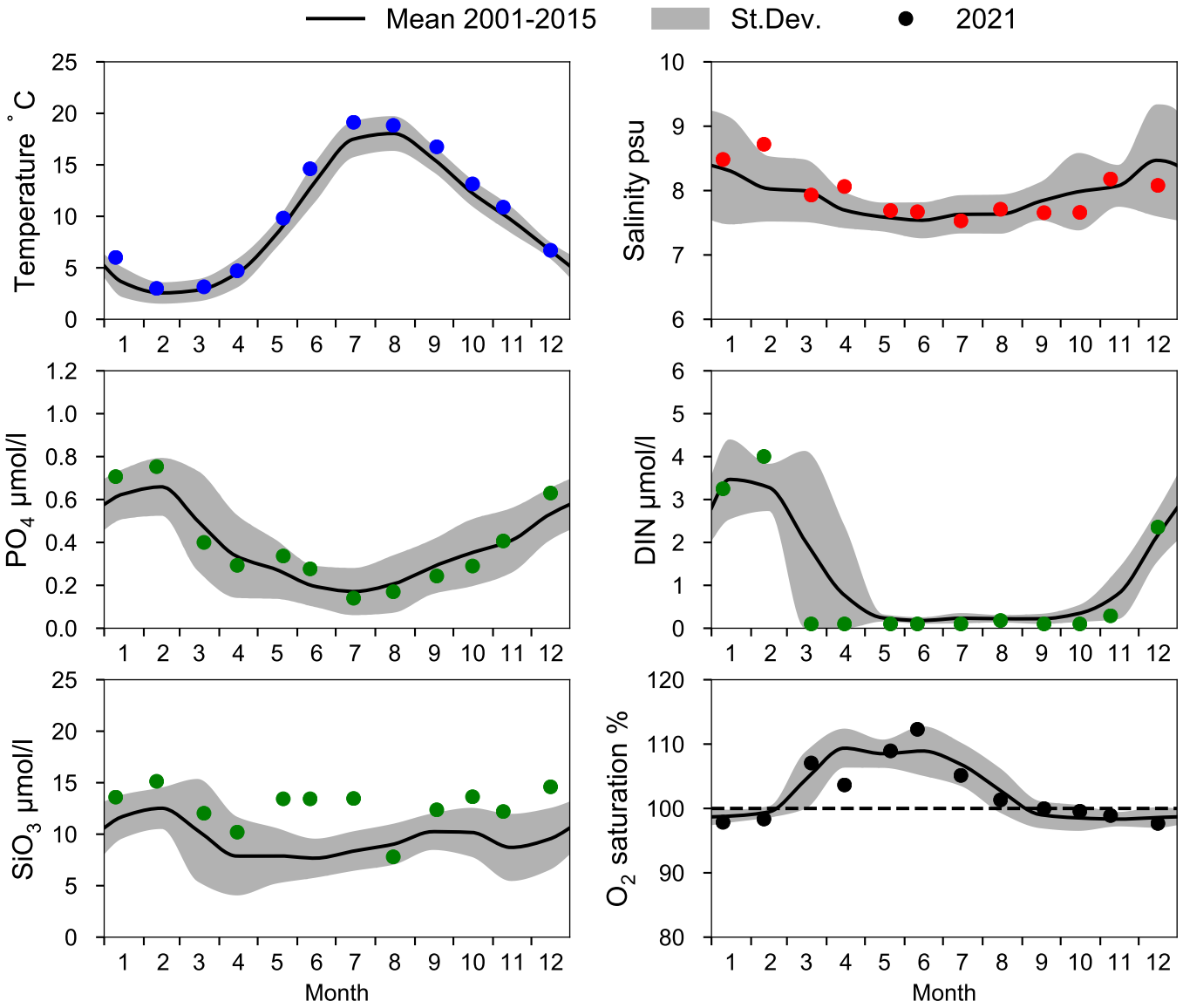


Vertical profiles BY2 ARKONA
December

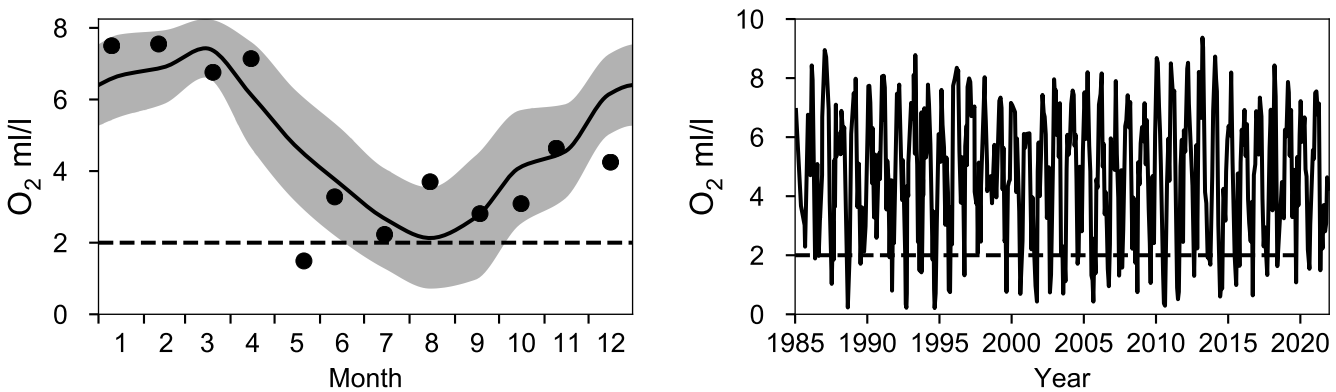


STATION BY1 SURFACE WATER (0-10 m)

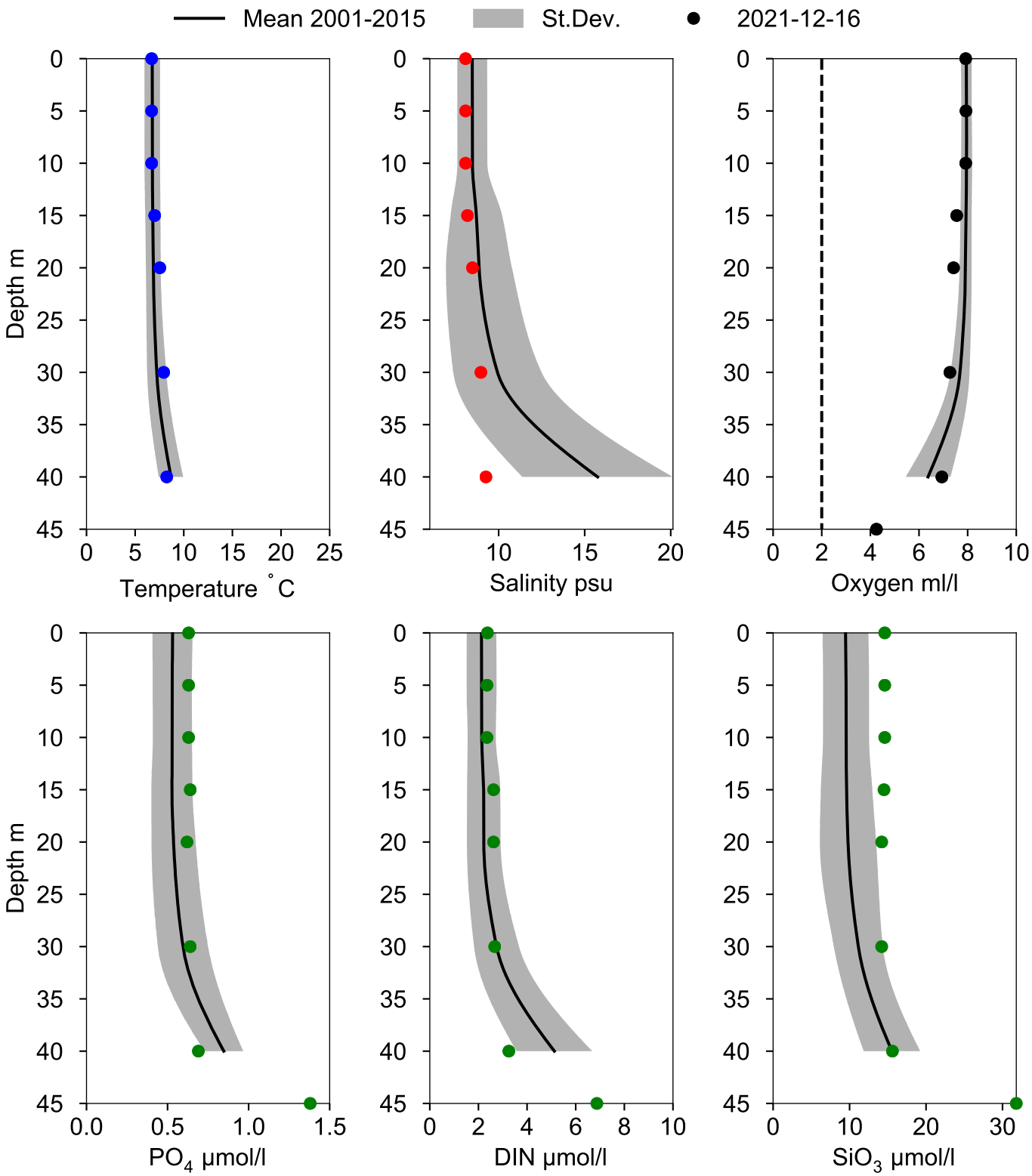
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 39 m)

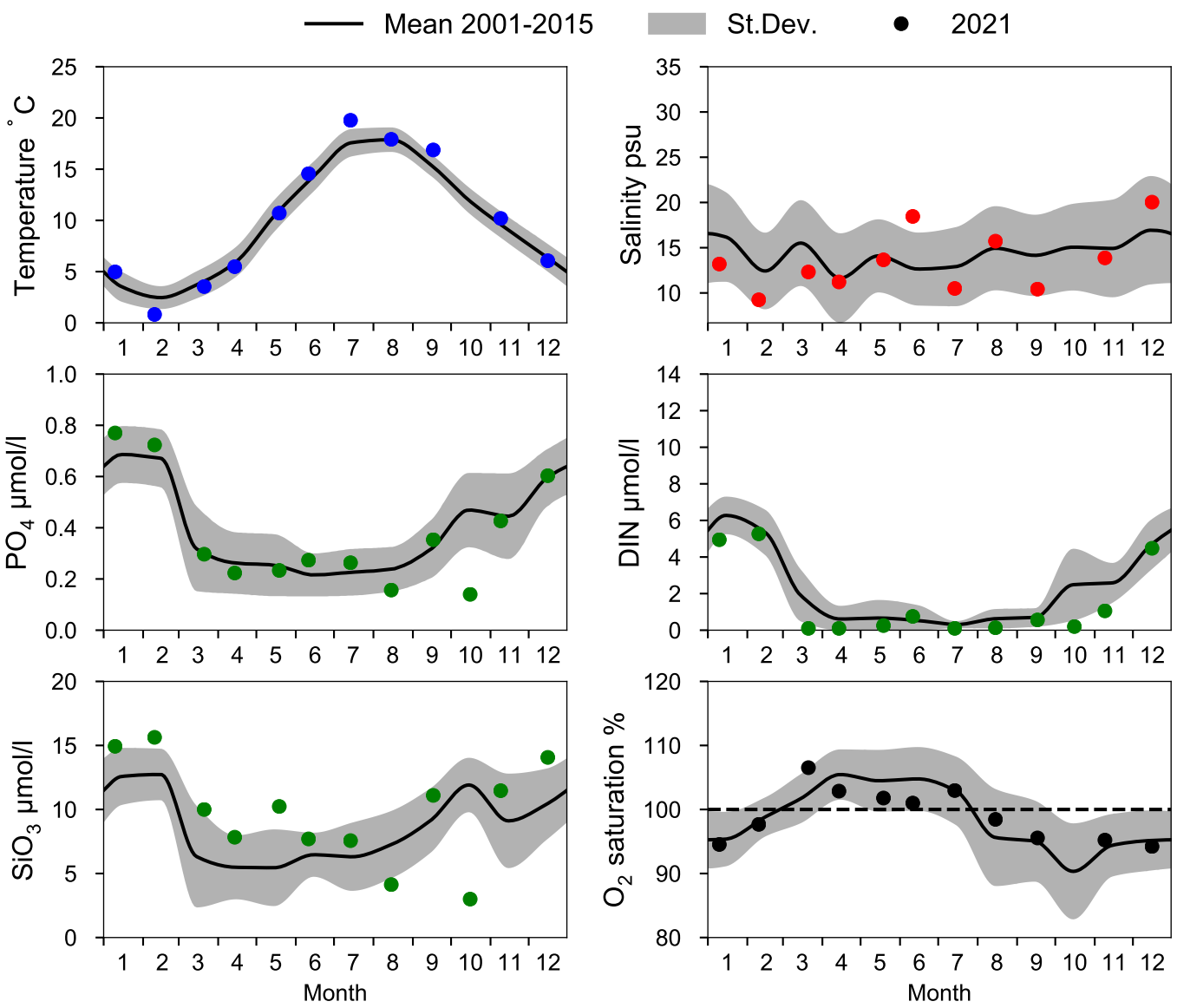


Vertical profiles BY1
December

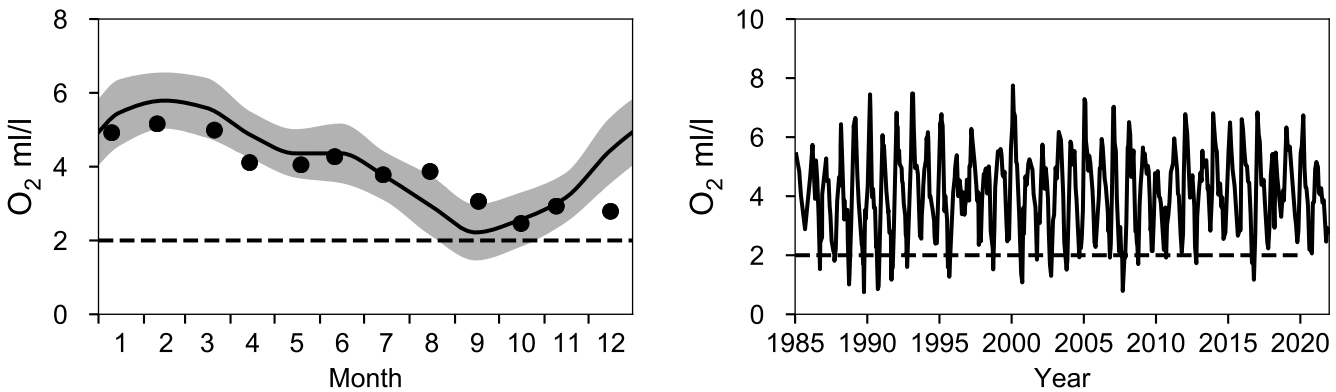


STATION W LANDSKRONA SURFACE WATER (0-10 m)

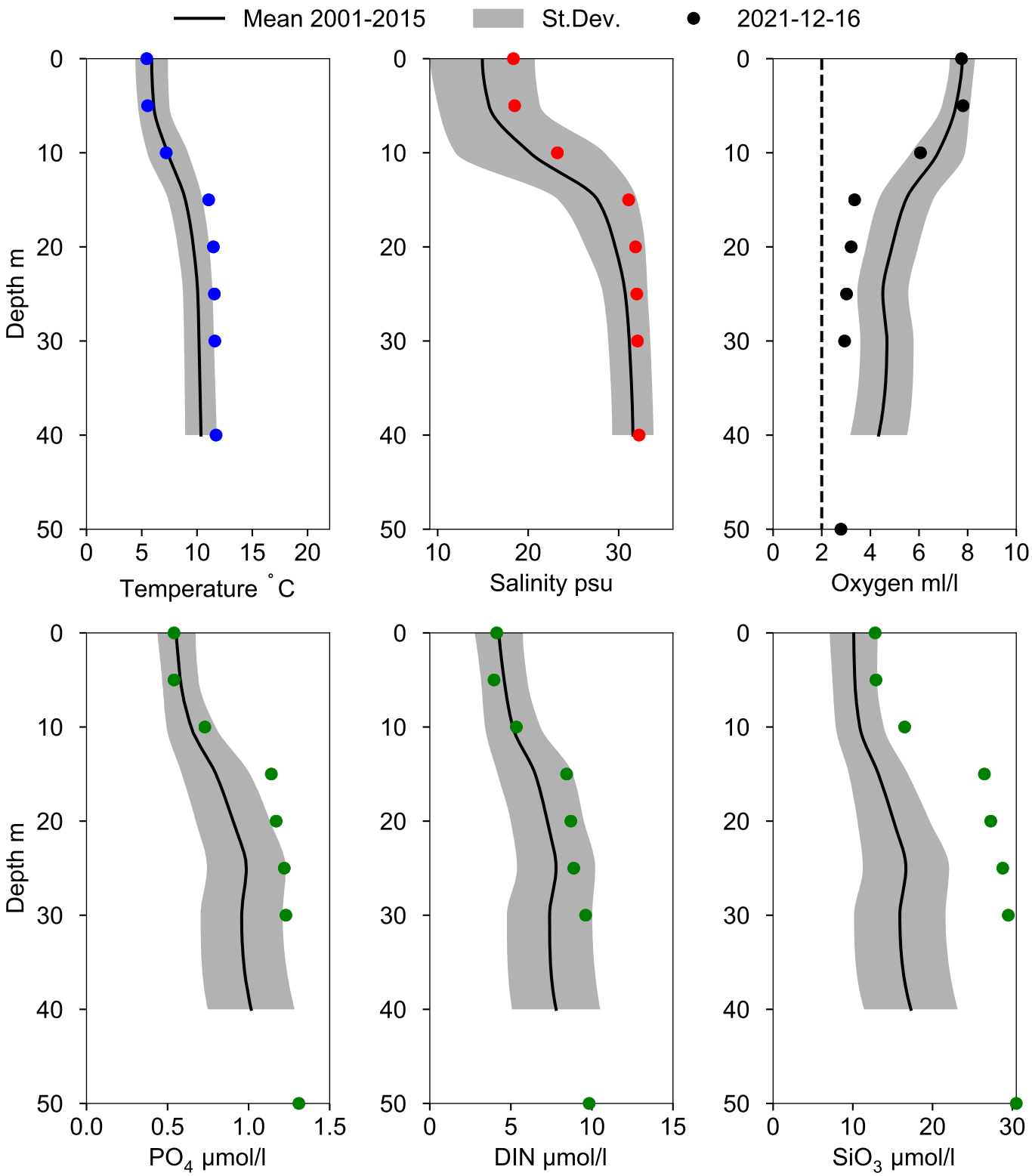
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 40 m)

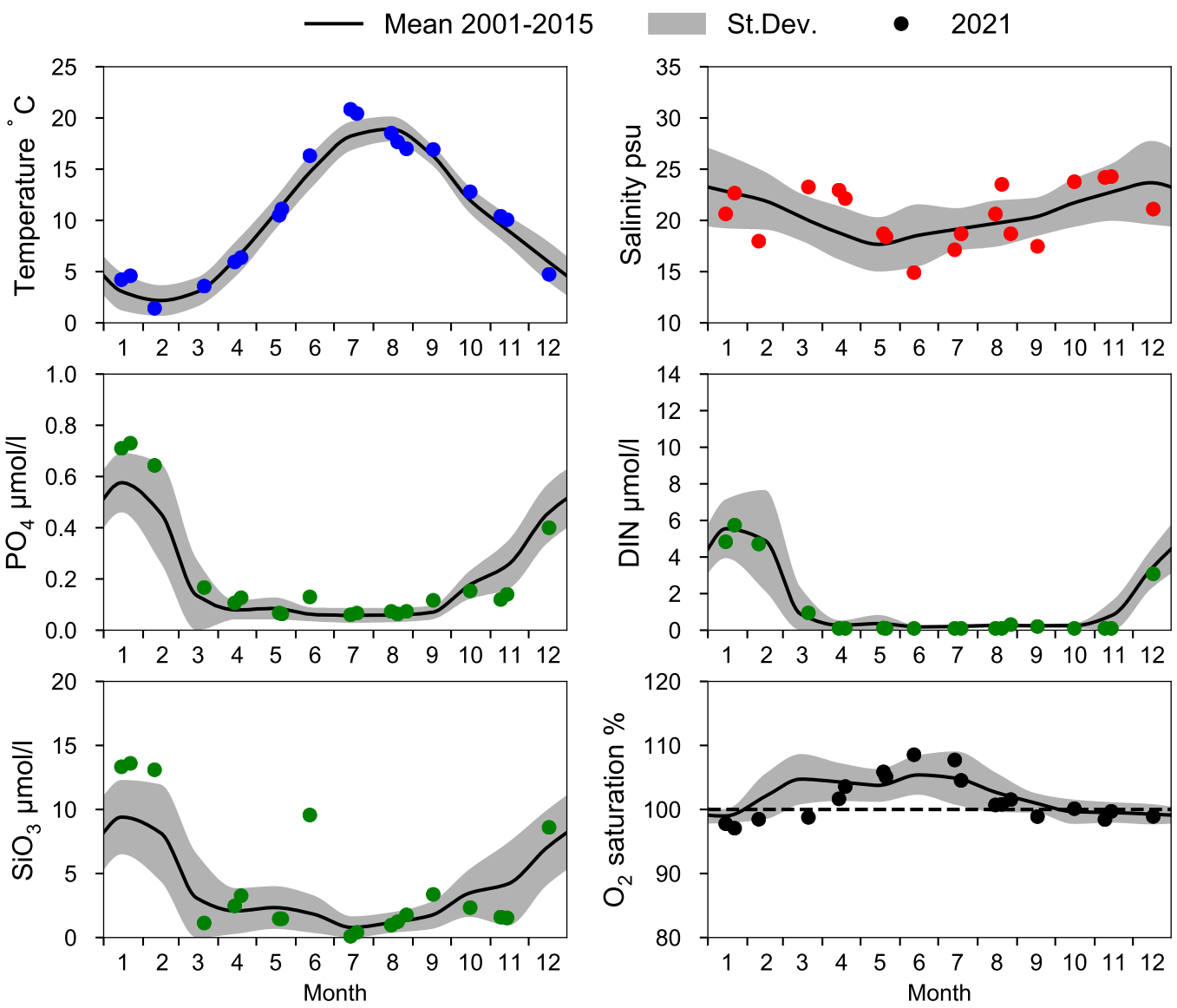


Vertical profiles W LANDSKRONA
December

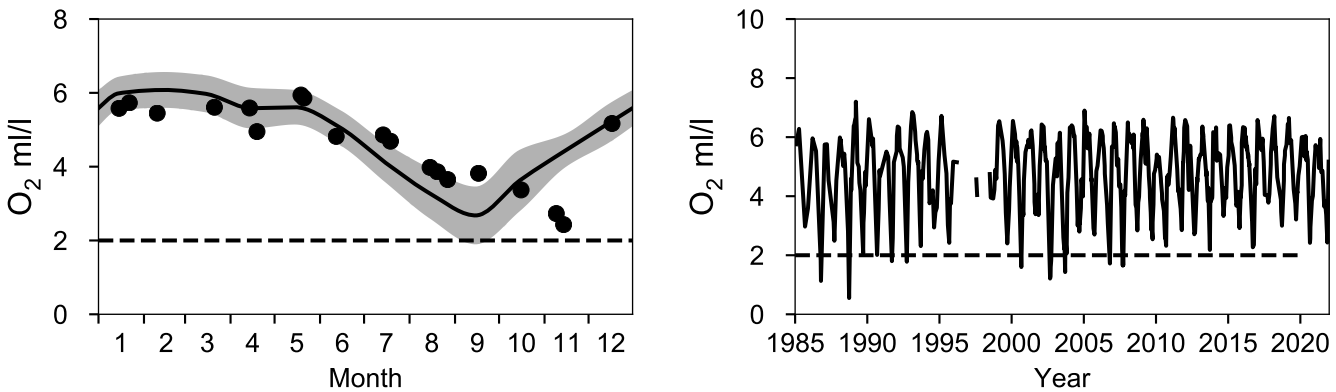


STATION ANHOLT E SURFACE WATER (0-10 m)

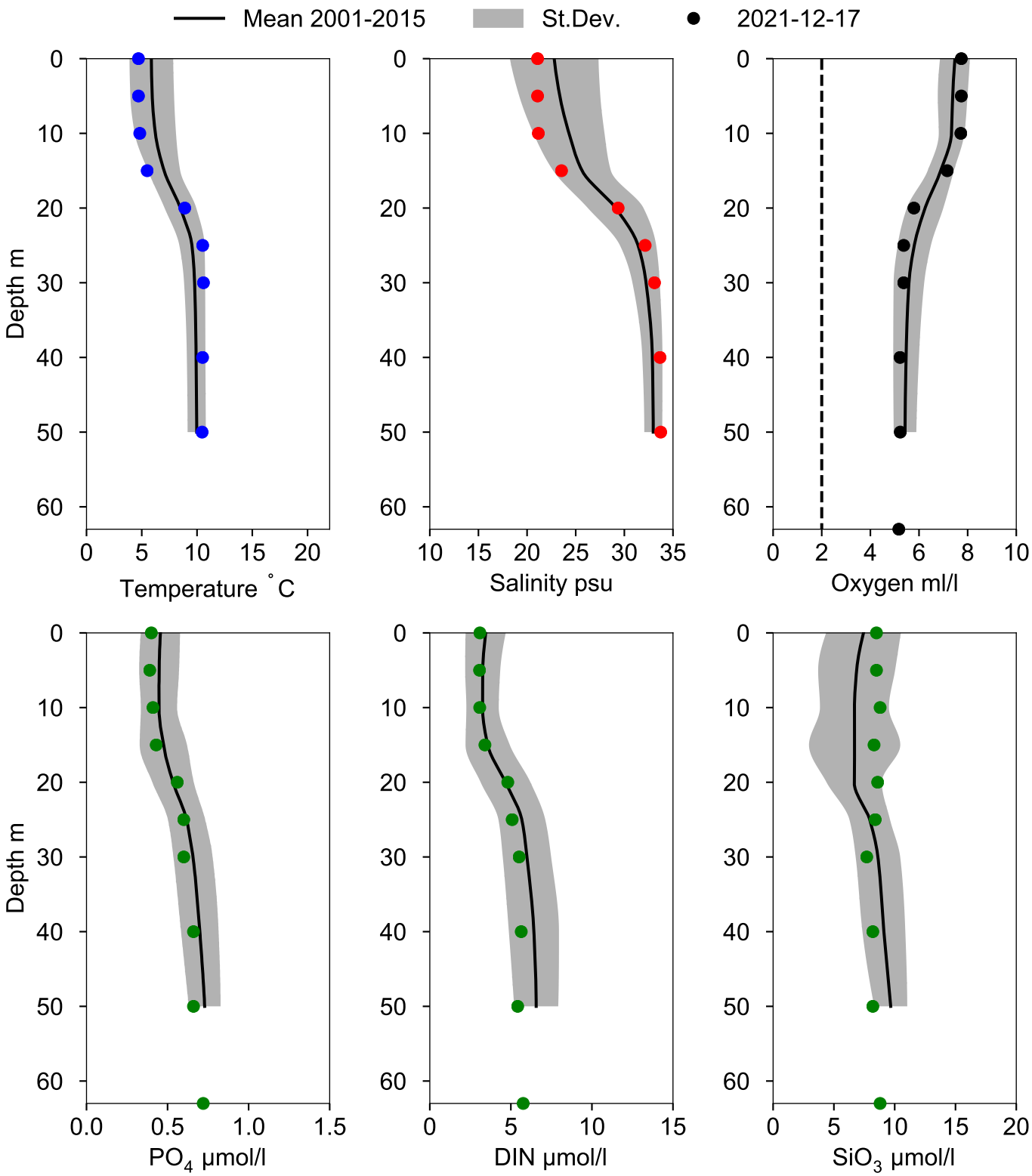
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 52 m)

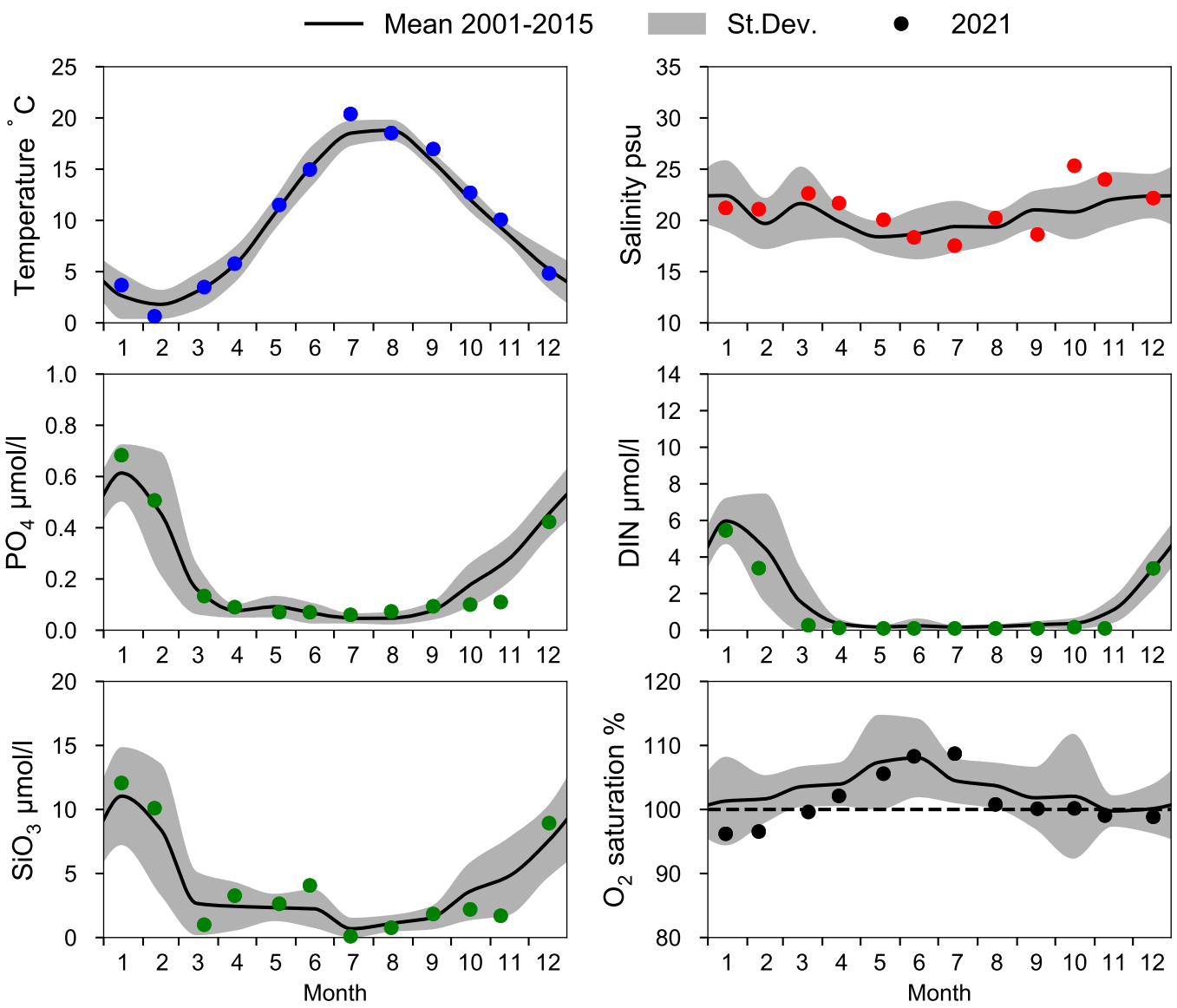


Vertical profiles ANHOLT E
December

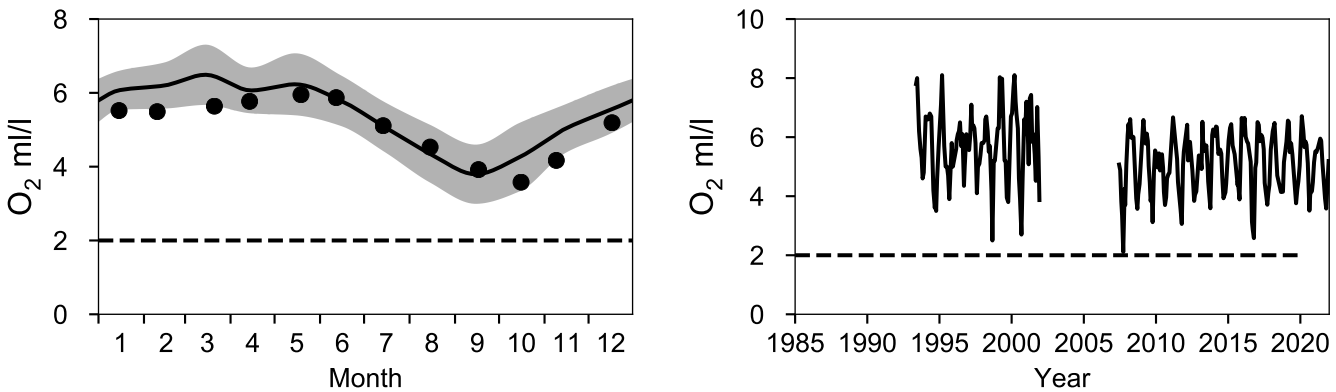


STATION N14 FALKENBERG SURFACE WATER (0-10 m)

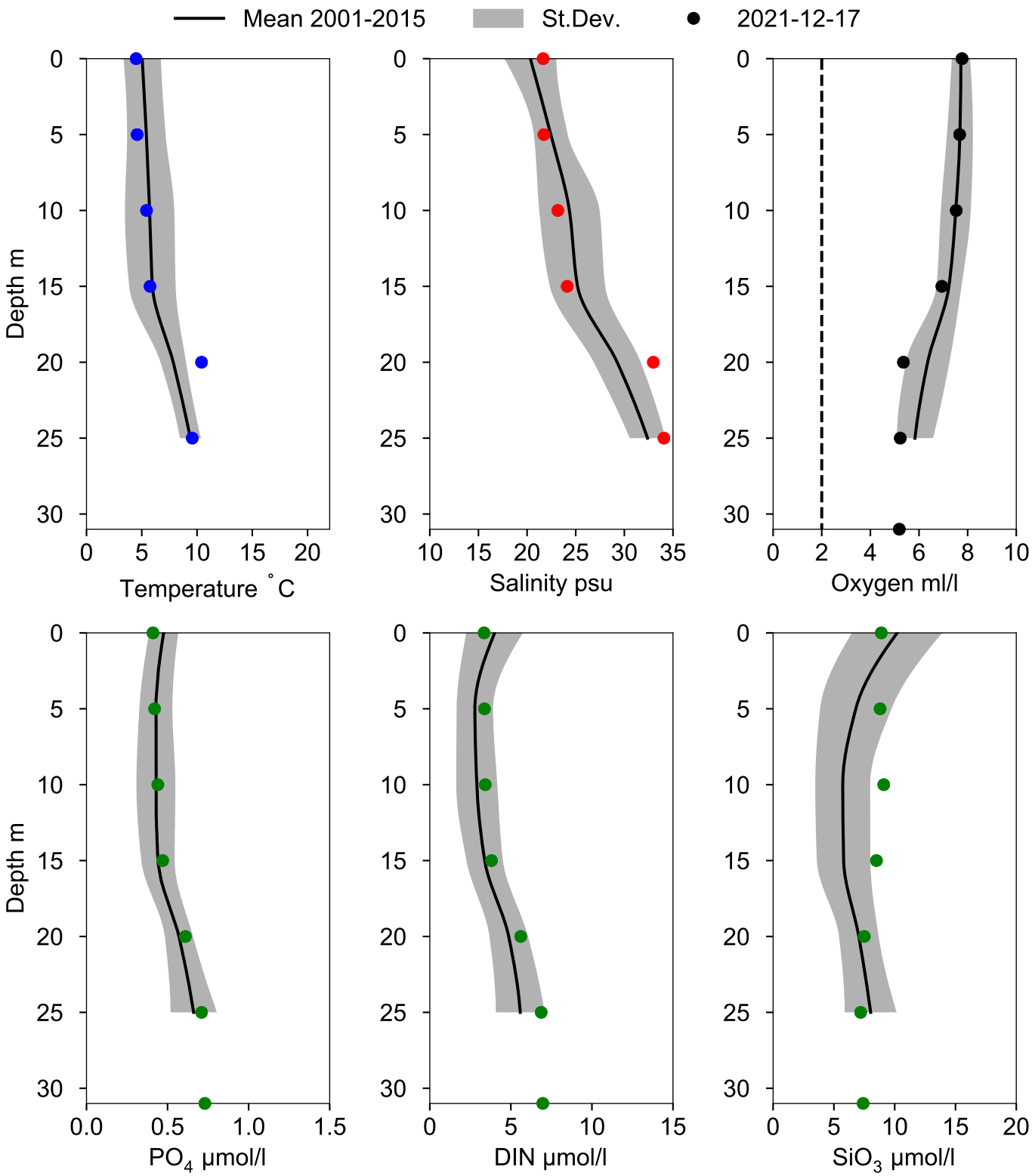
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 20 m)

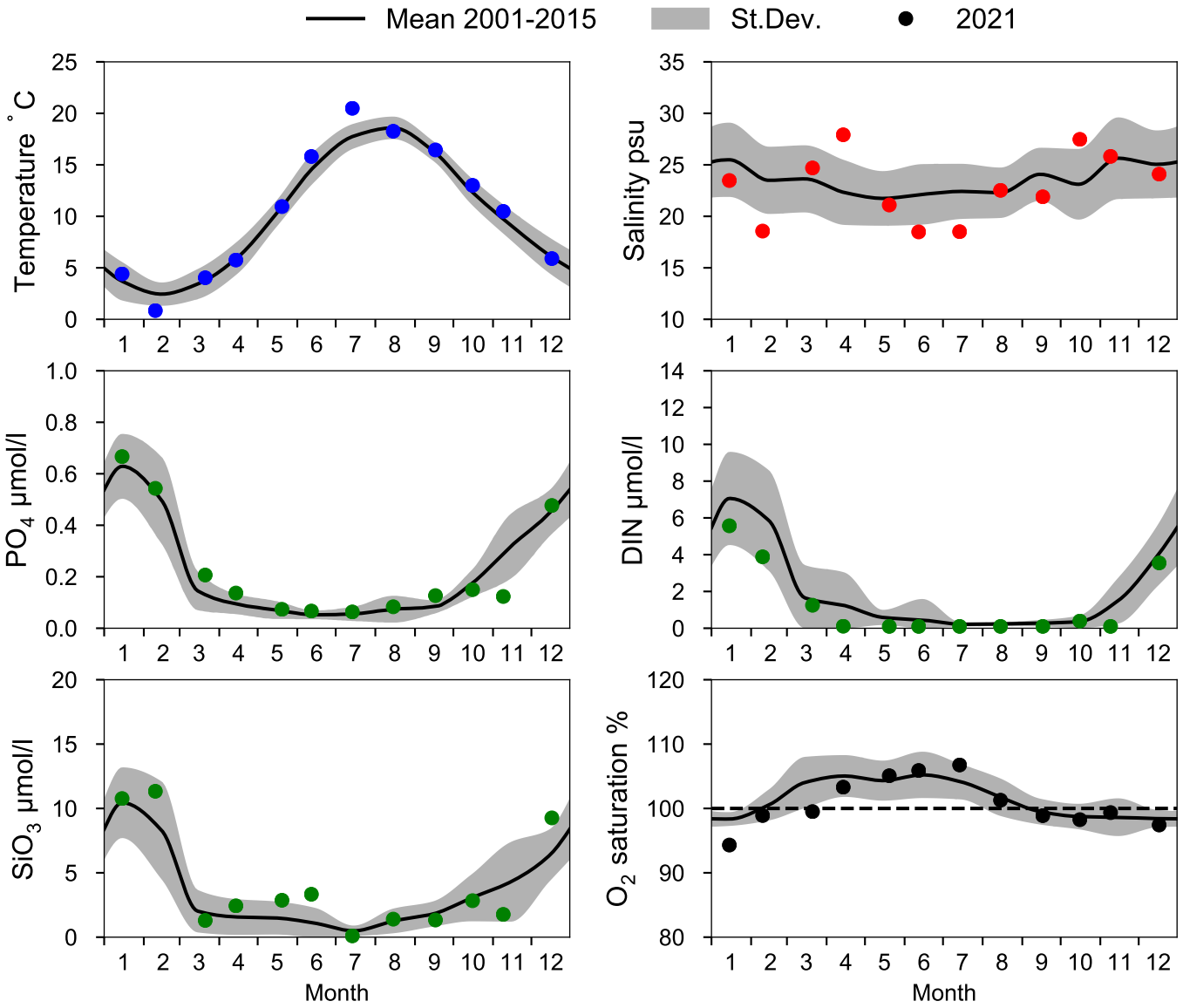


Vertical profiles N14 FALKENBERG
December

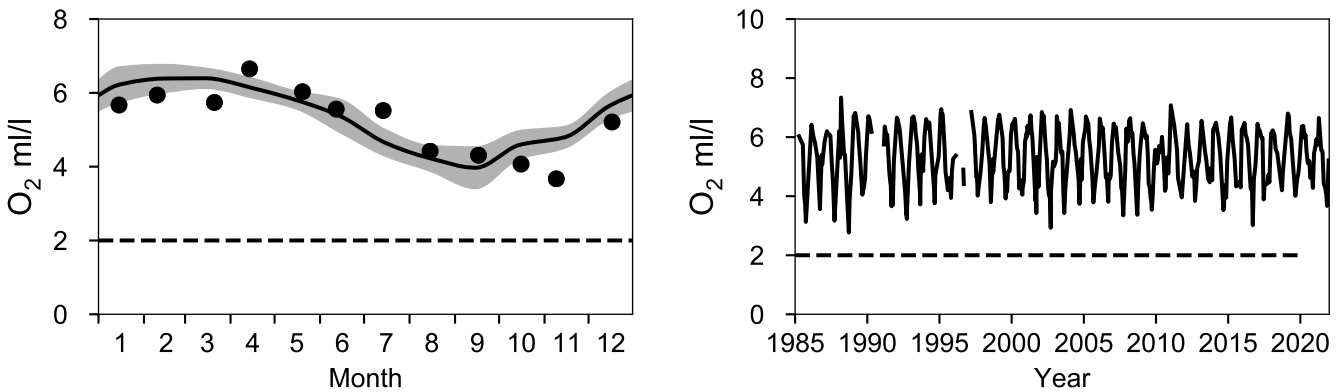


STATION FLADEN SURFACE WATER (0-10 m)

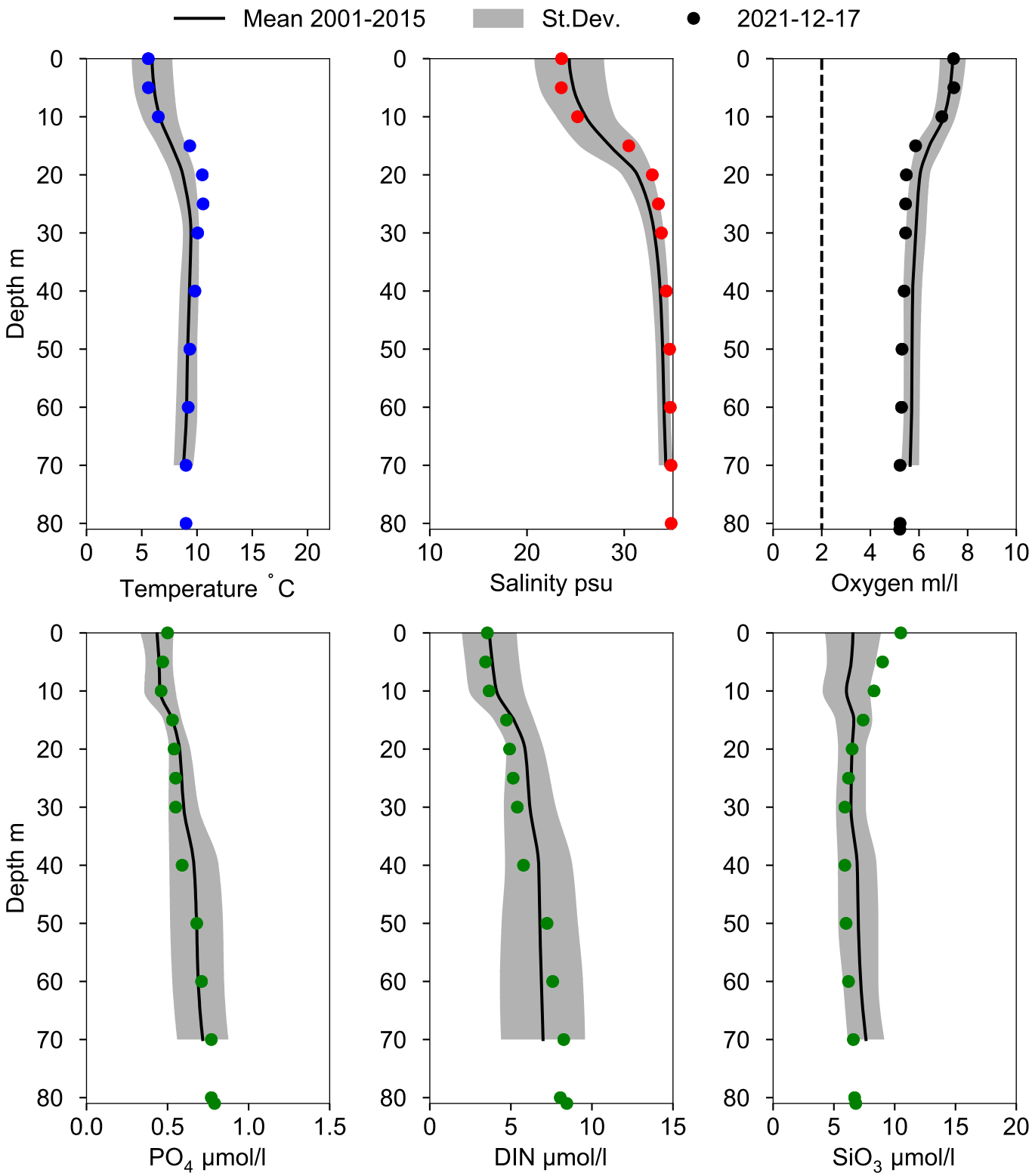
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 74 m)

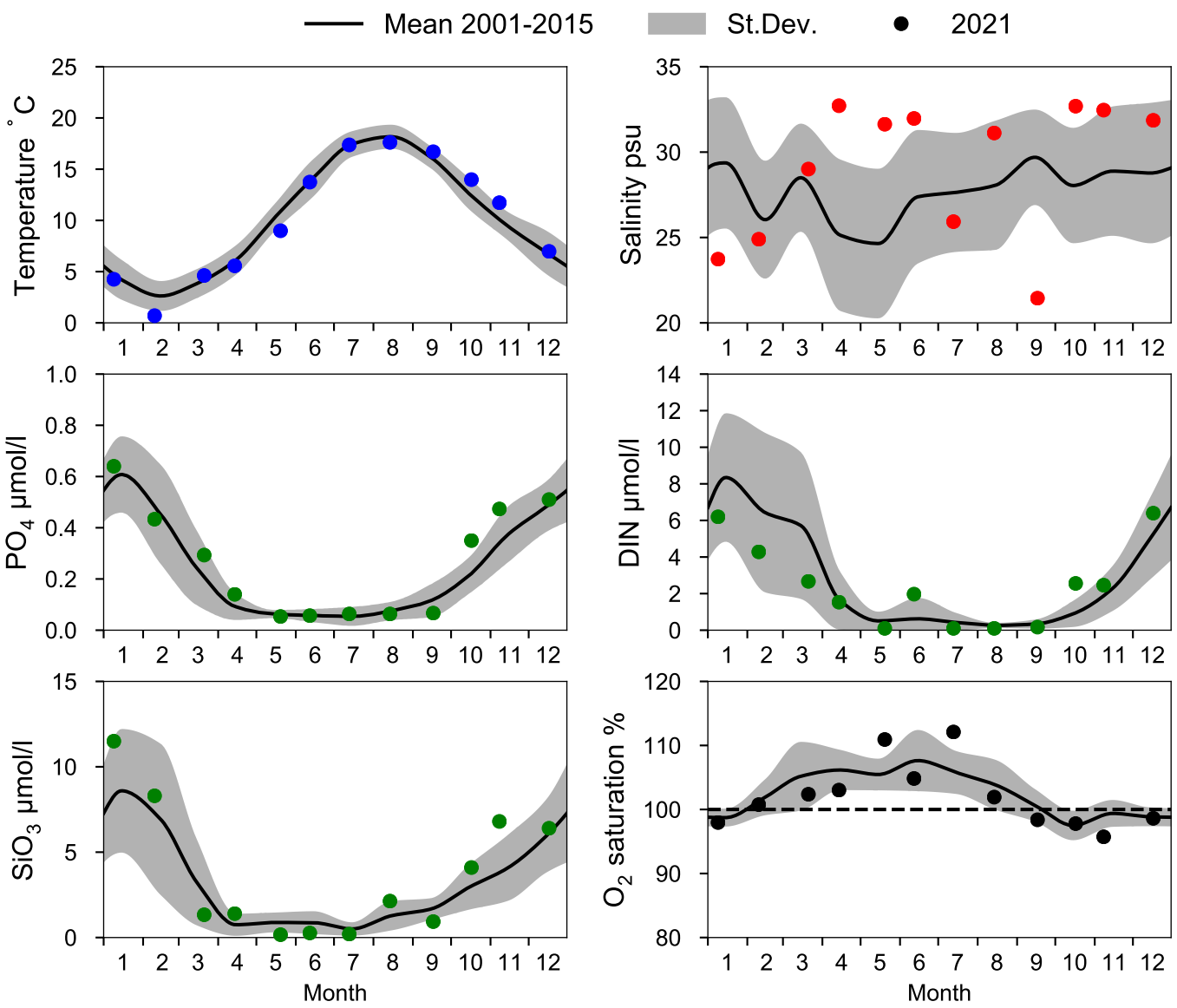


Vertical profiles FLADEN
December

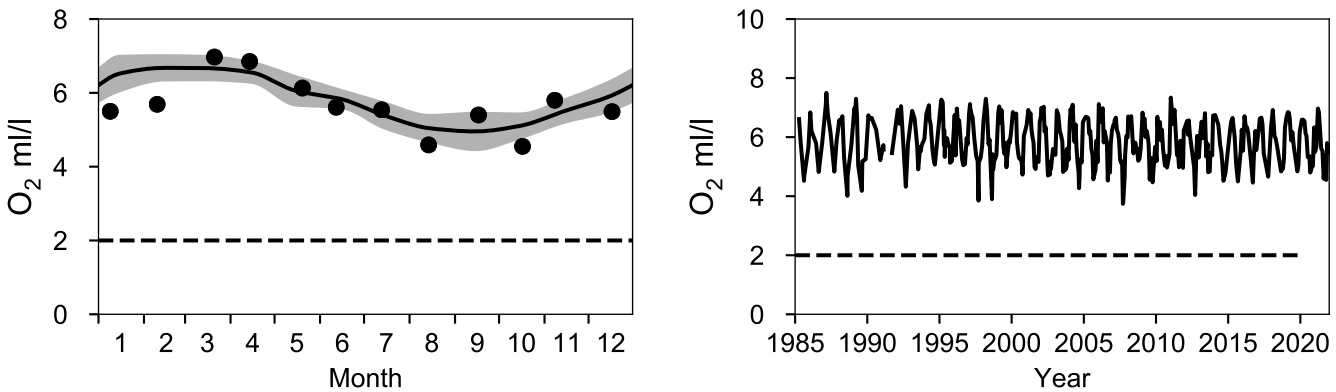


STATION P2 SURFACE WATER (0-10 m)

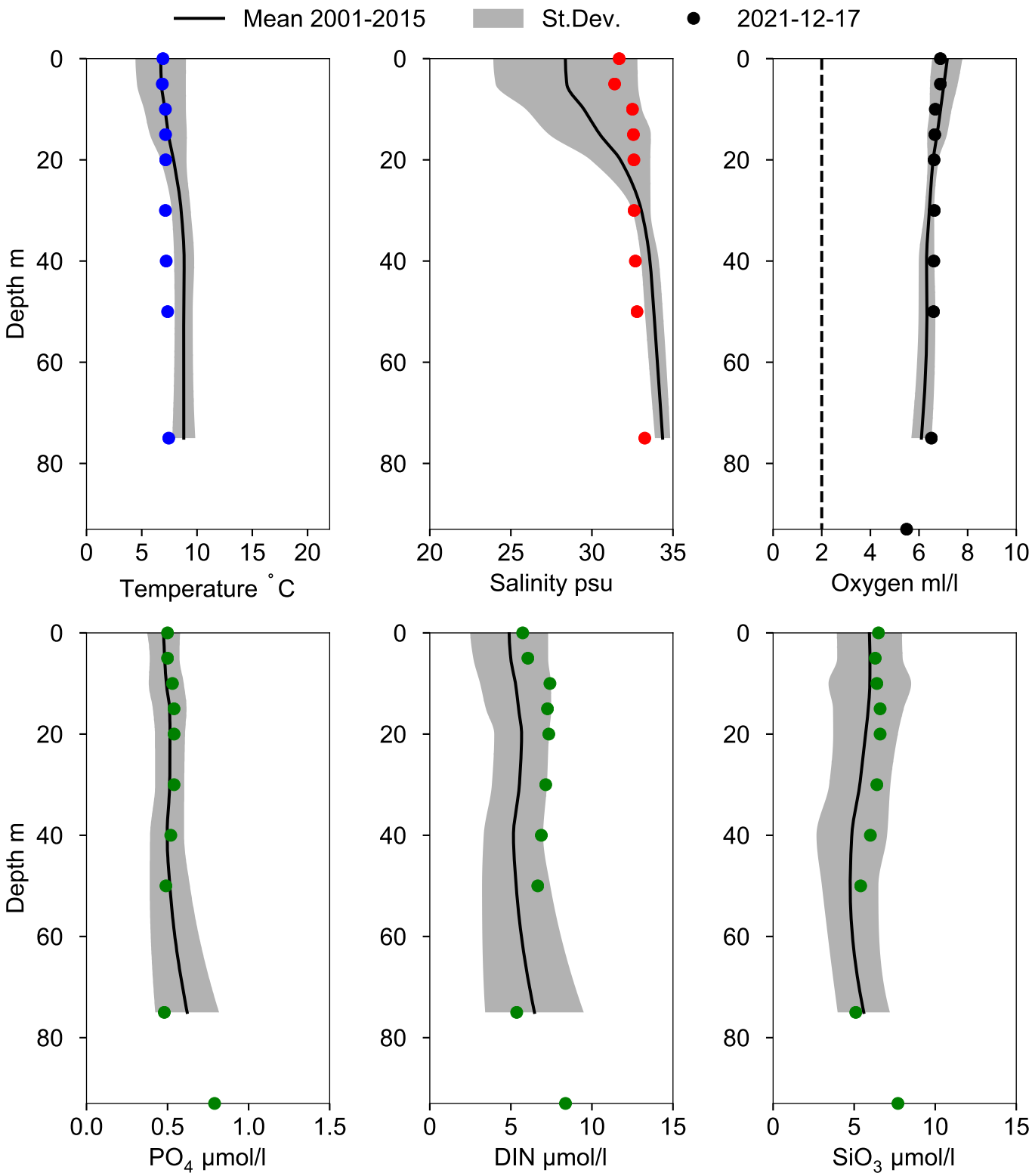
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 75 m)

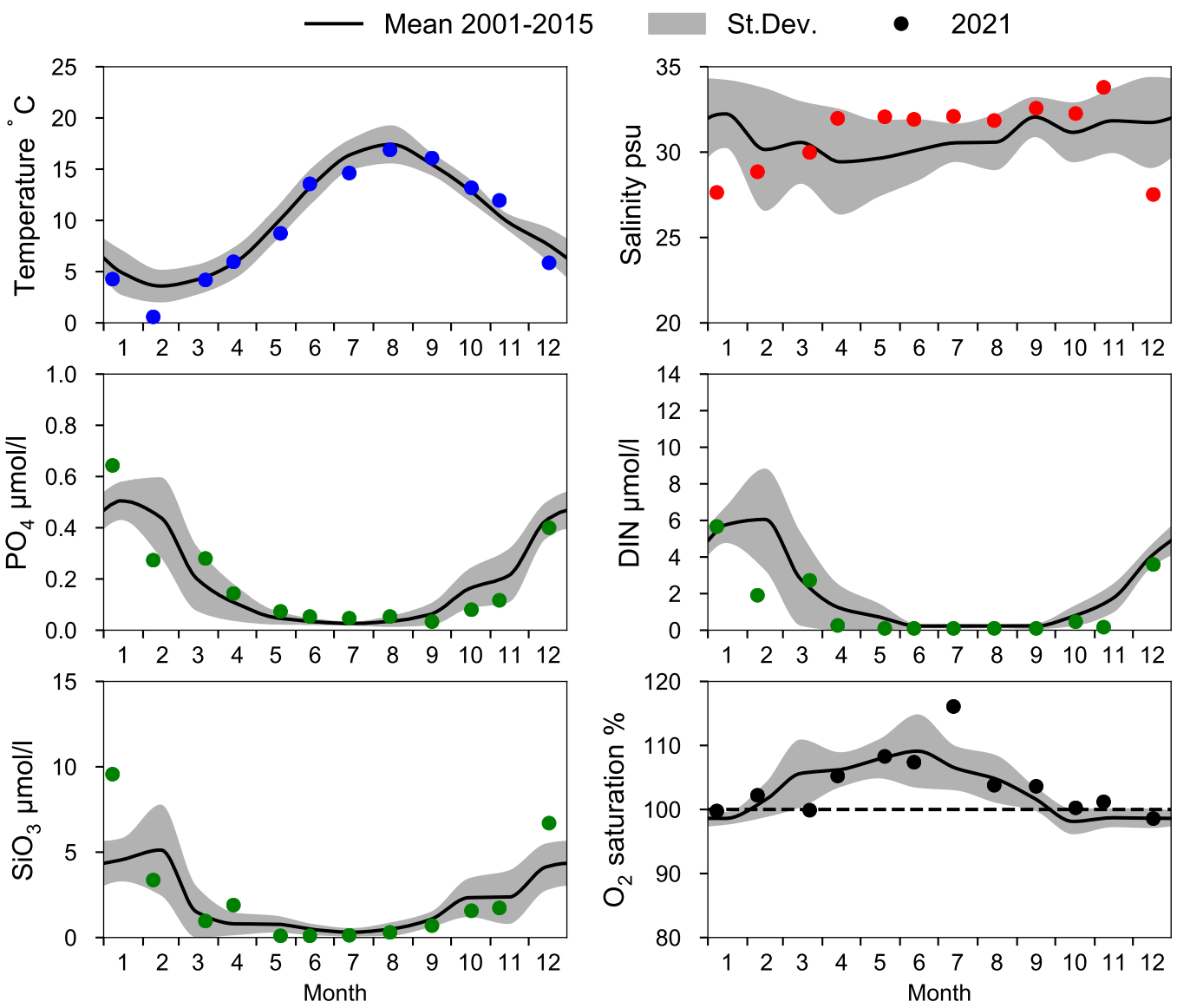


Vertical profiles P2
December

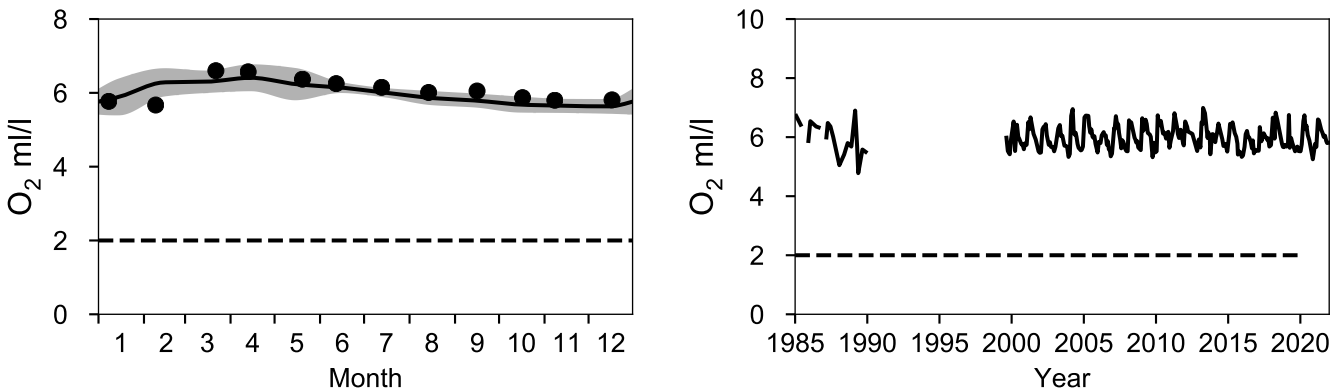


STATION Å17 SURFACE WATER (0-10 m)

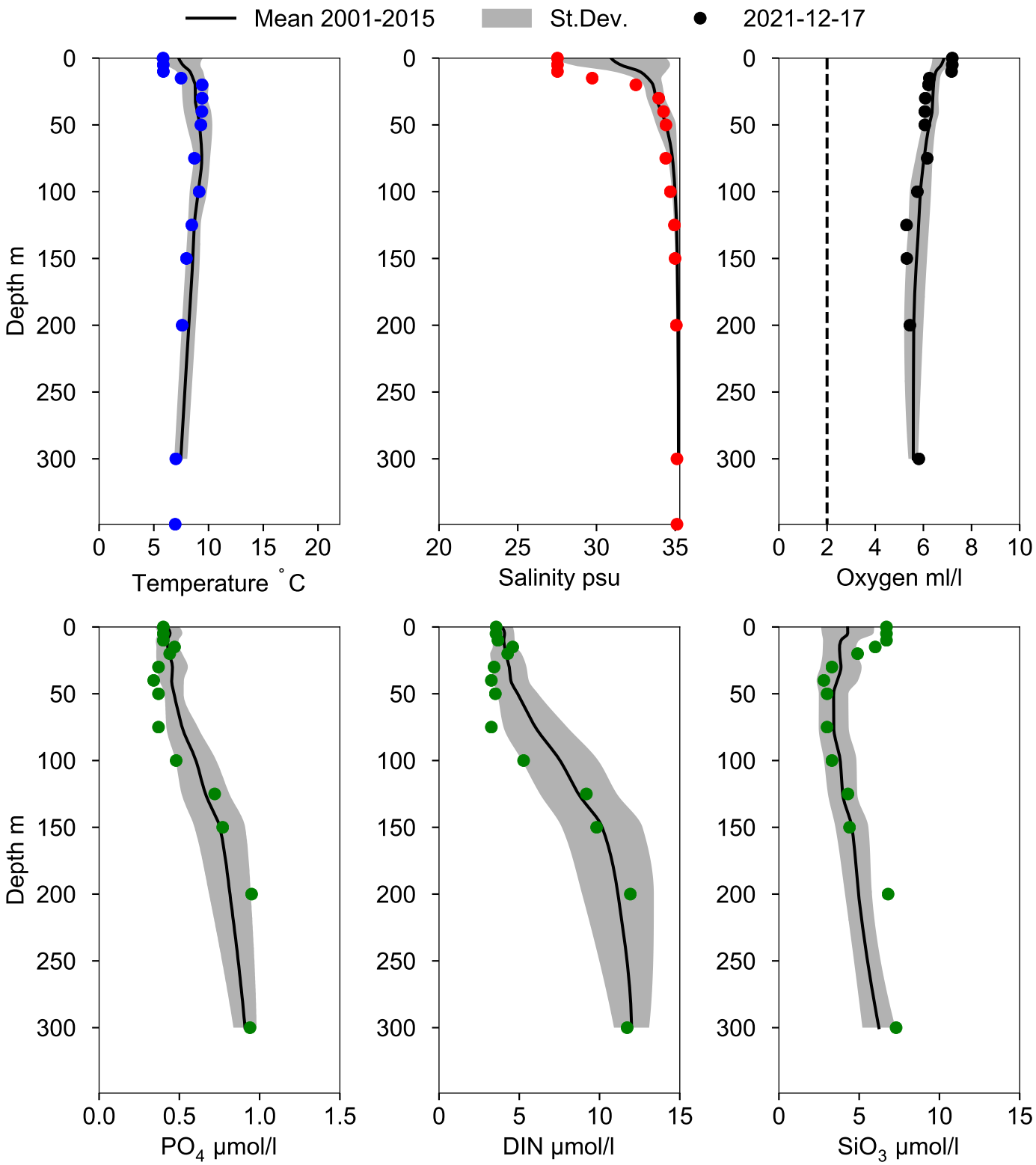
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 300 m)



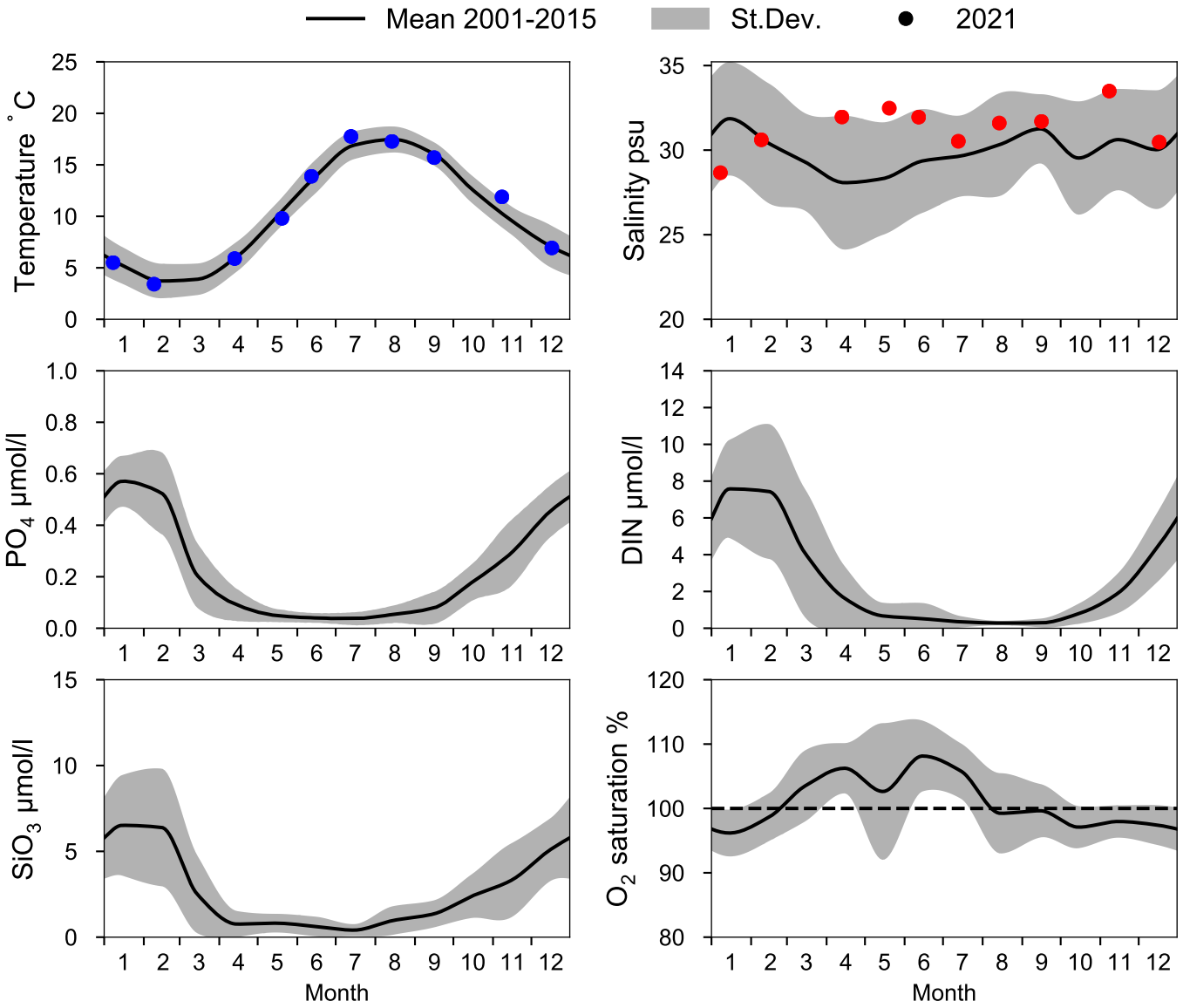
Vertical profiles Å17
December



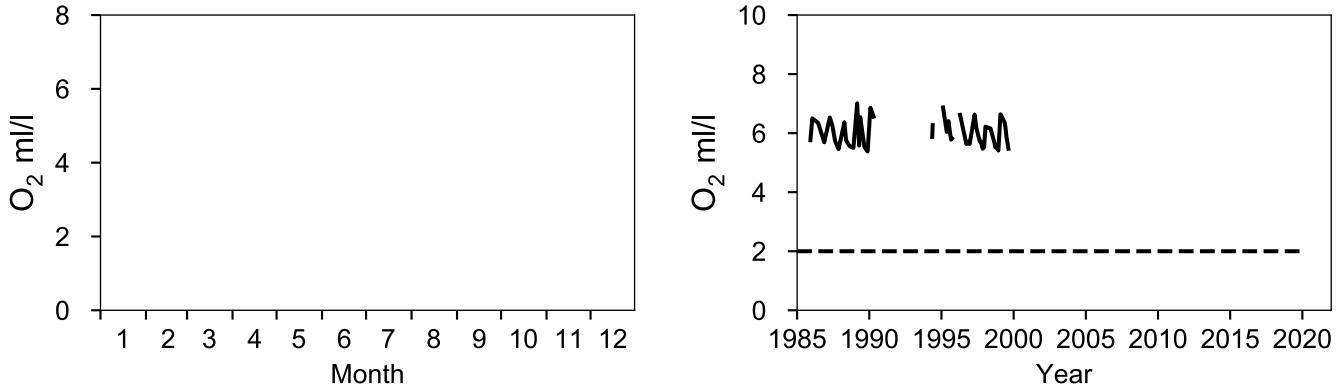
STATION Å16 SURFACE WATER (0-10 m)

Annual Cycles

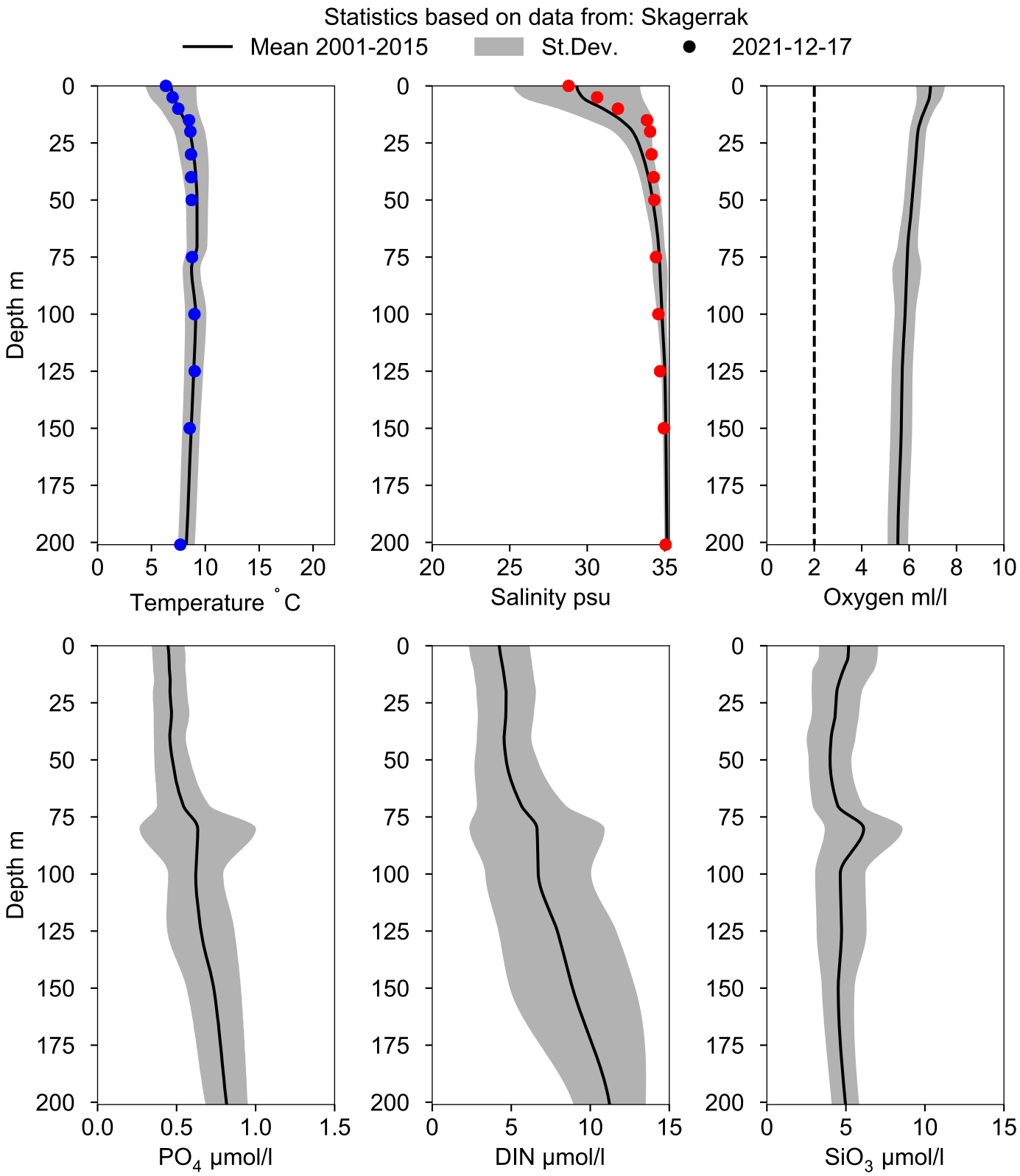
Statistics based on data from: Skagerrak



OXYGEN IN BOTTOM WATER (depth >= 192 m)

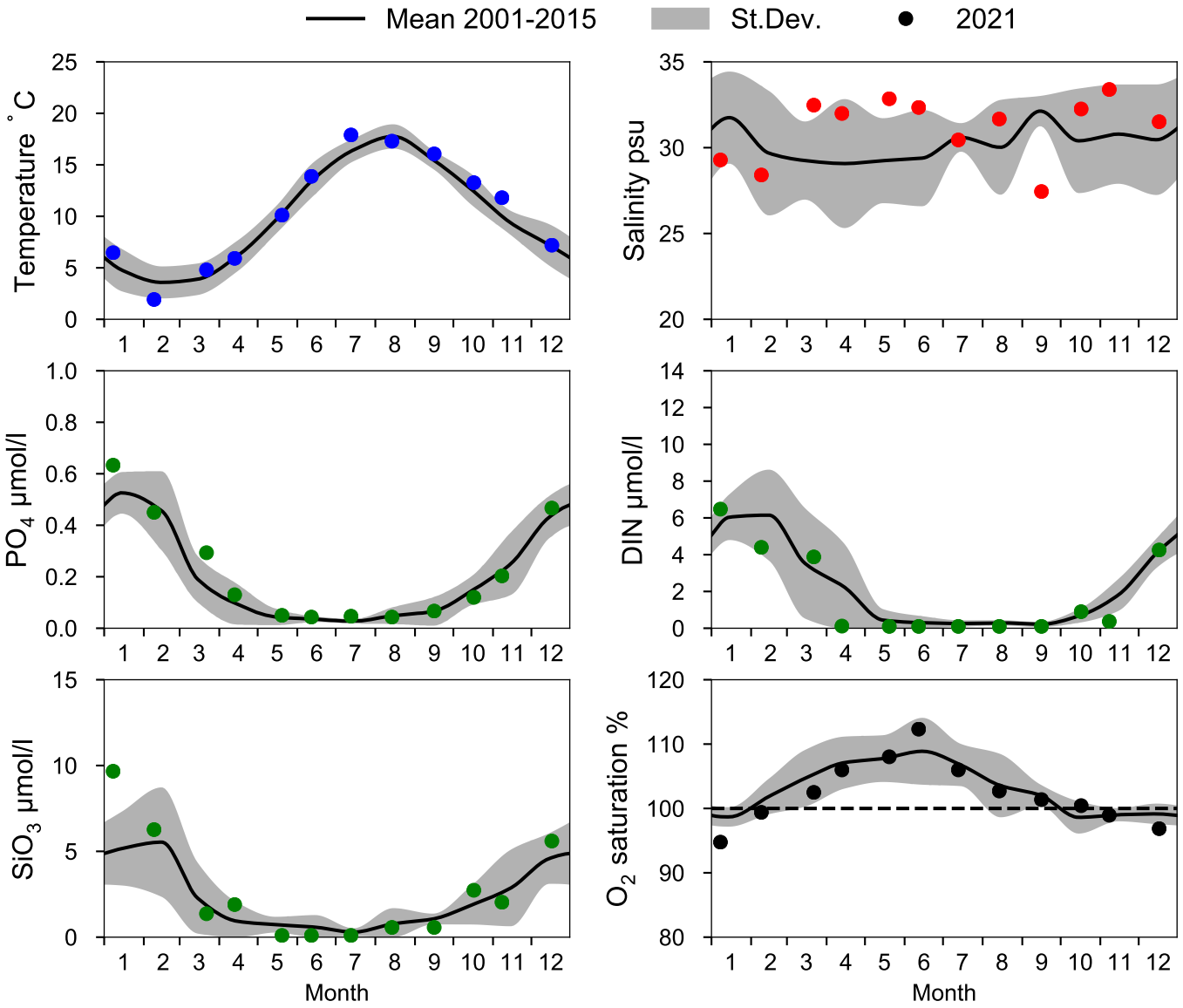


Vertical profiles Å16
December

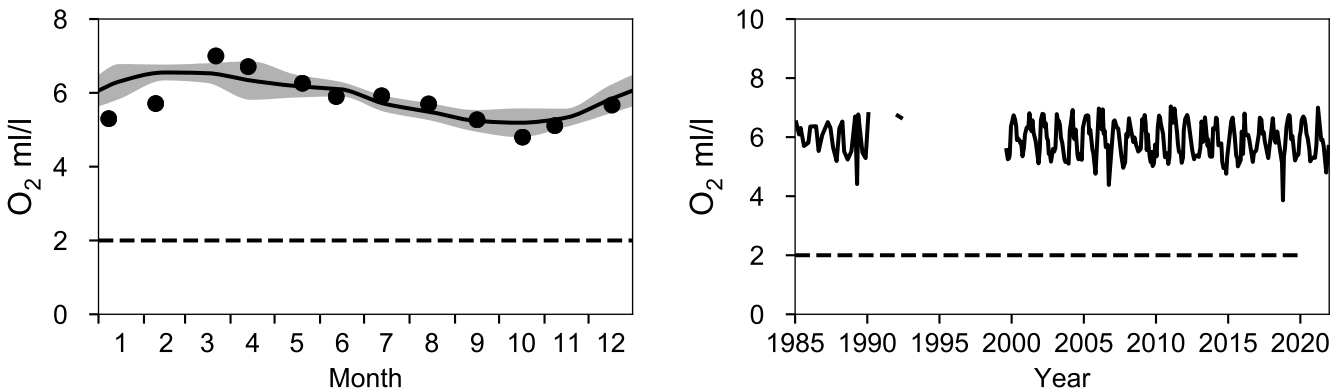


STATION Å15 SURFACE WATER (0-10 m)

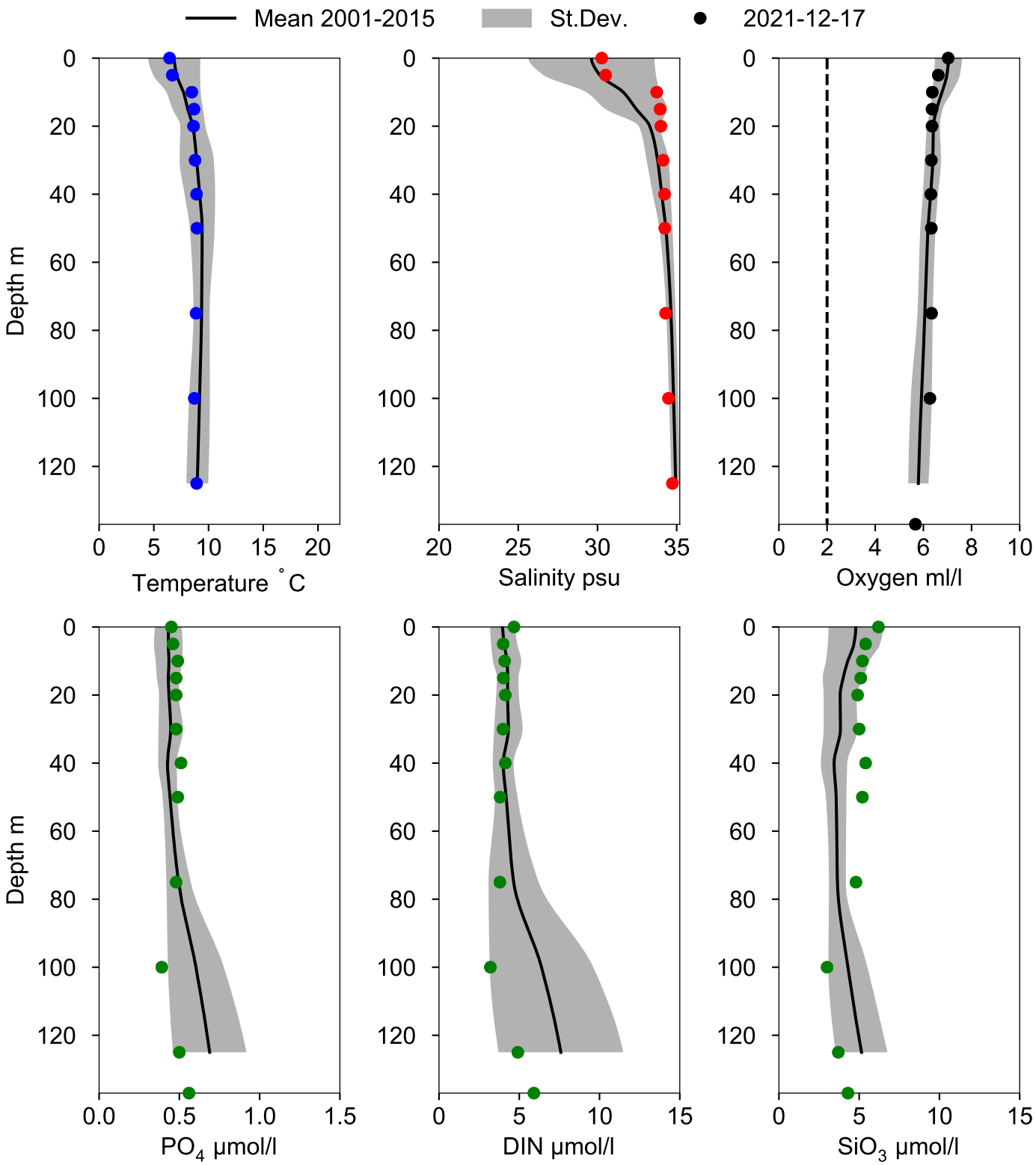
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 125 m)



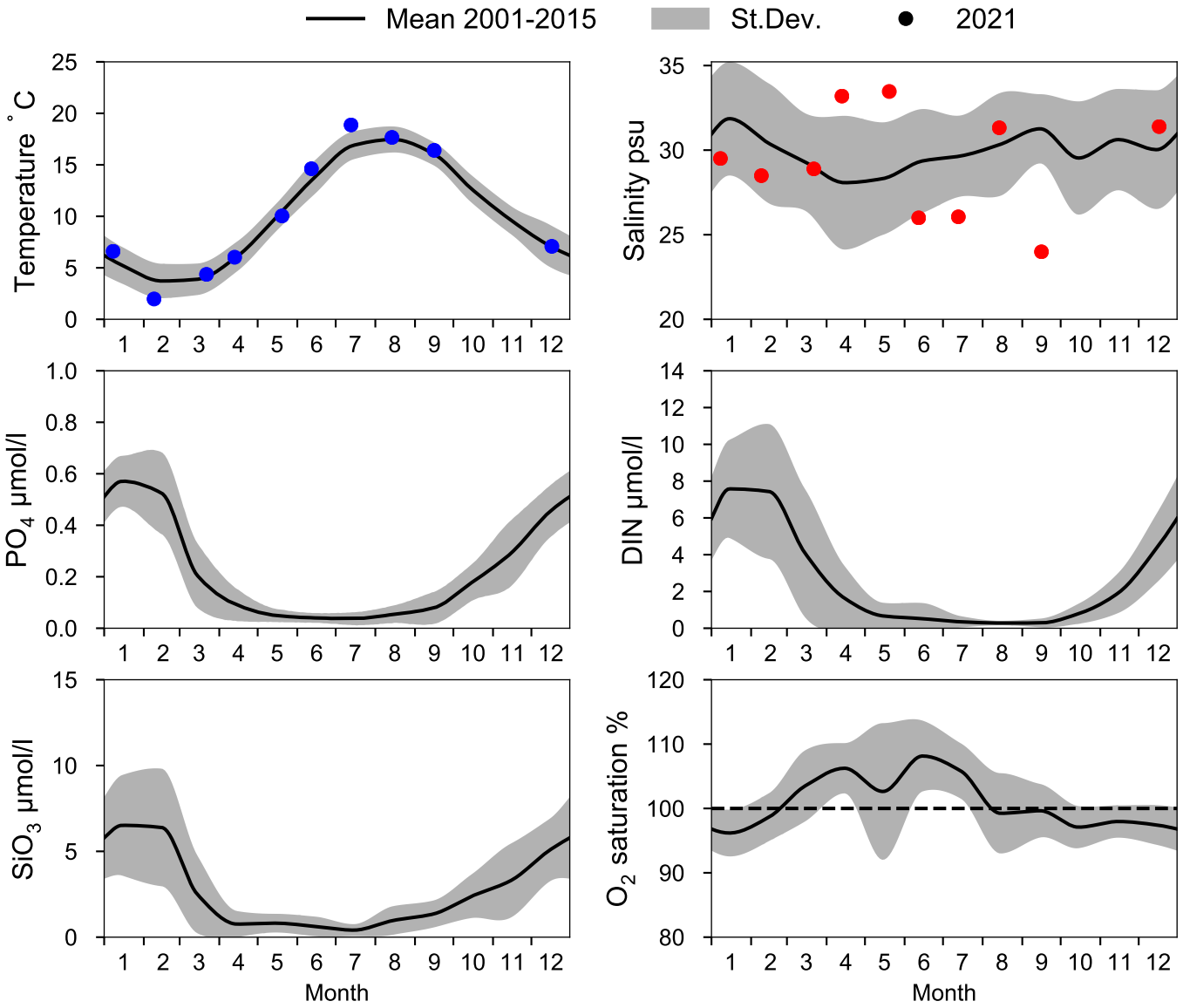
Vertical profiles Å15
December



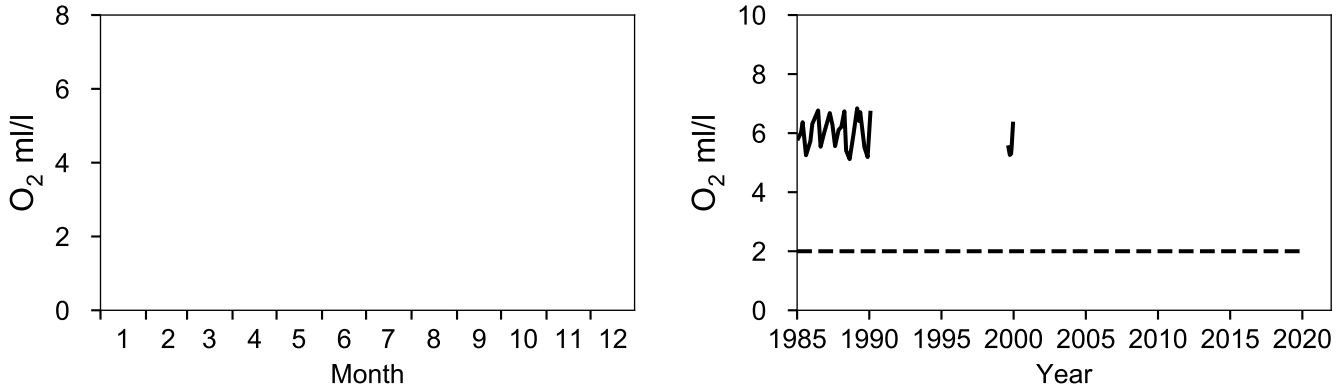
STATION Å14 SURFACE WATER (0-10 m)

Annual Cycles

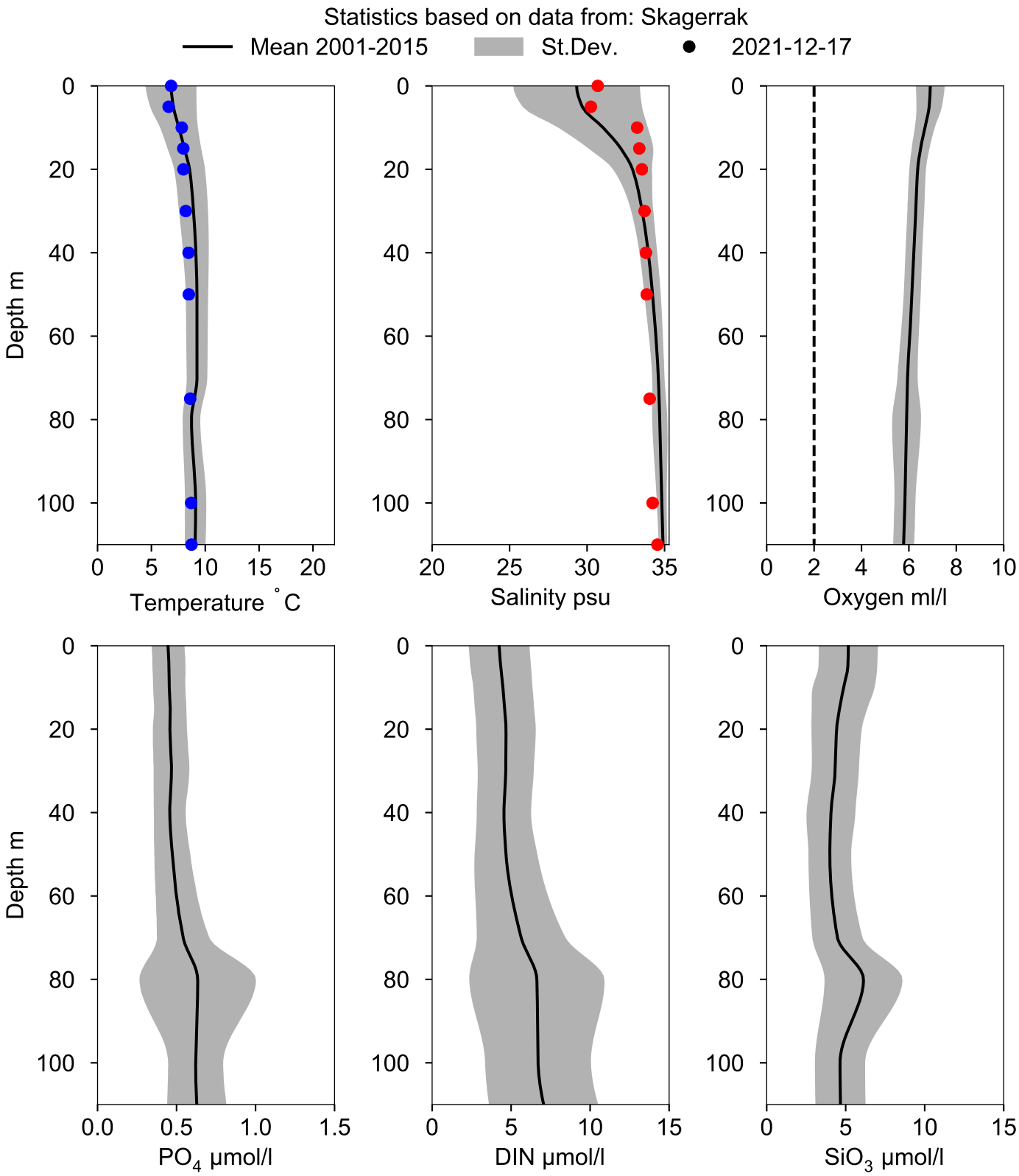
Statistics based on data from: Skagerrak



OXYGEN IN BOTTOM WATER (depth >= 100 m)

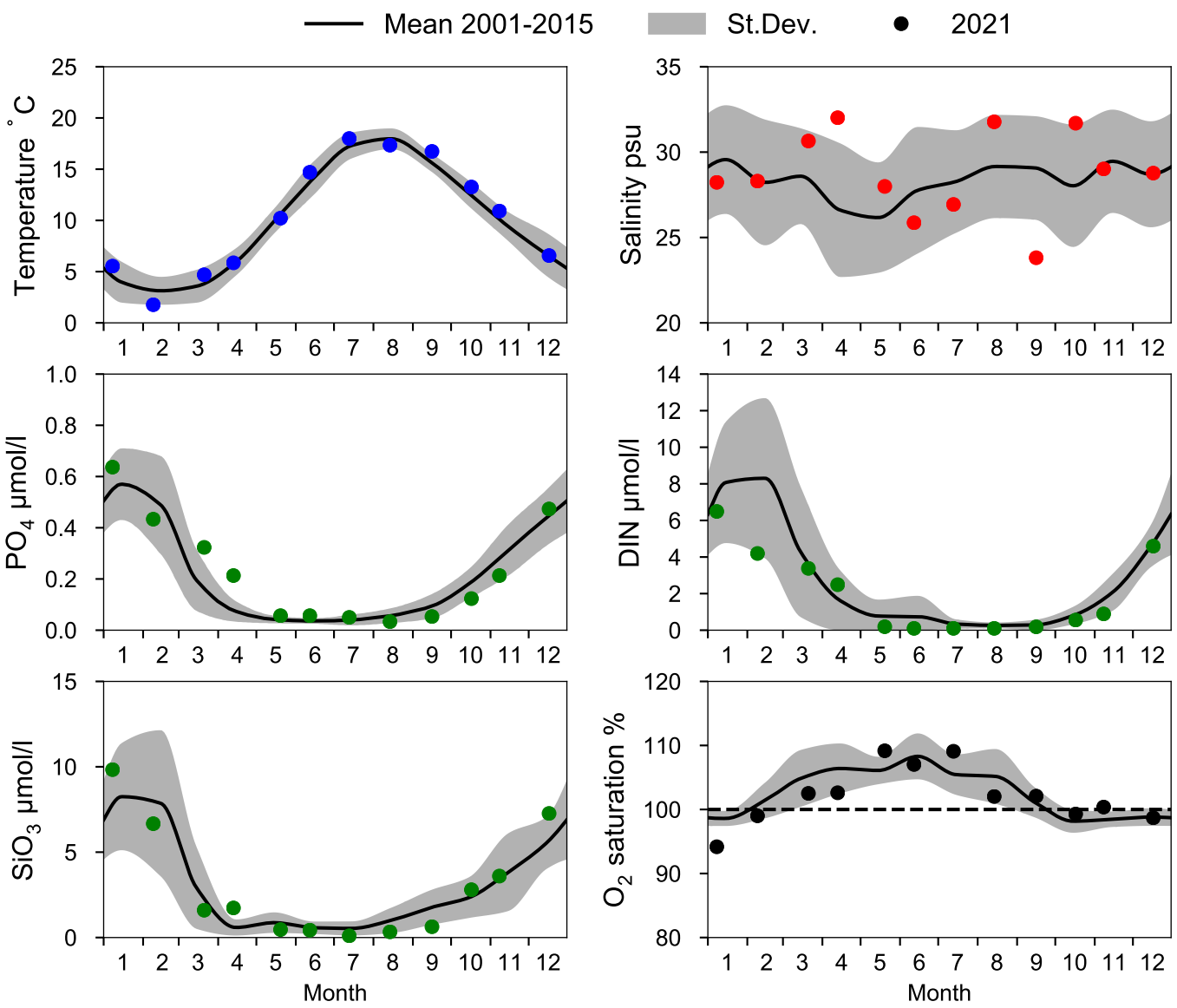


Vertical profiles Å14
December

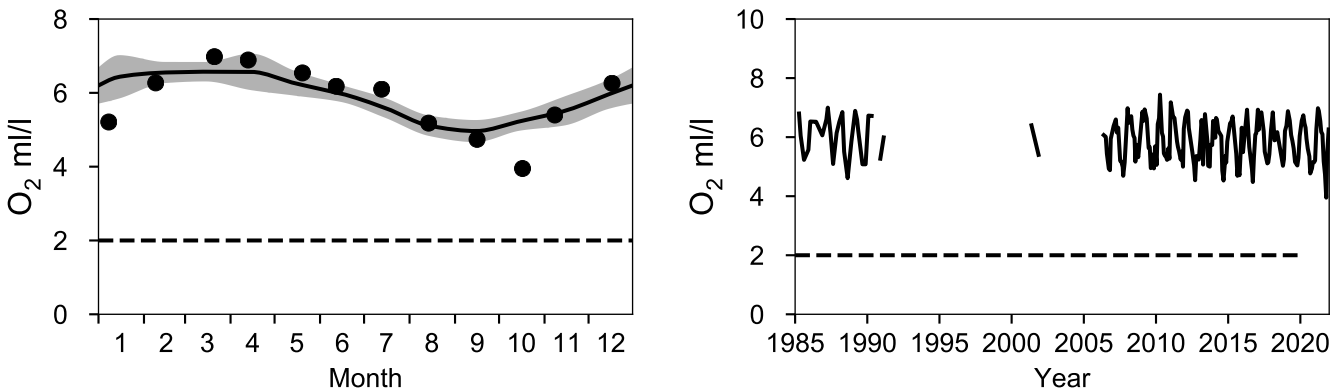


STATION Å13 SURFACE WATER (0-10 m)

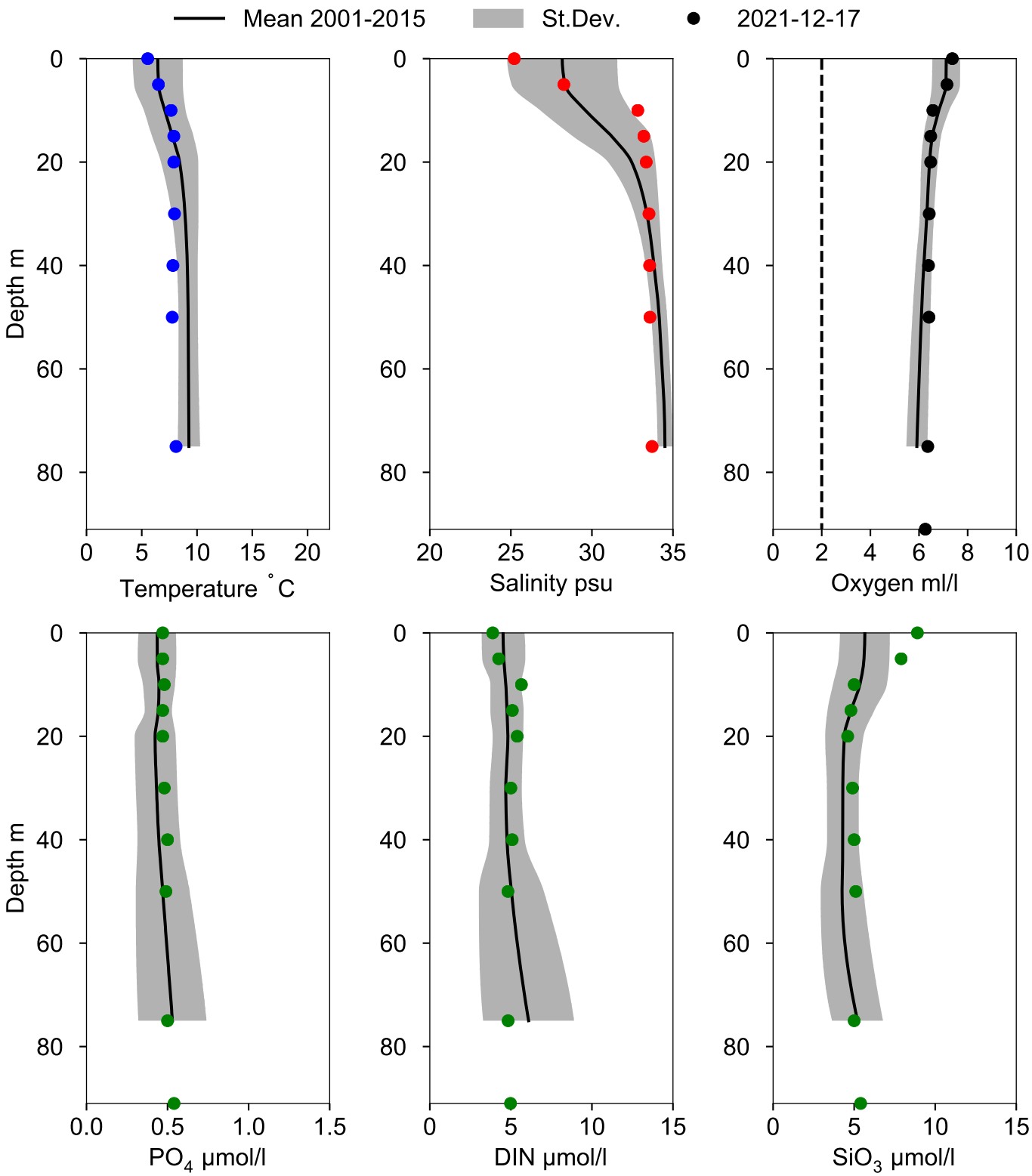
Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 80 m)

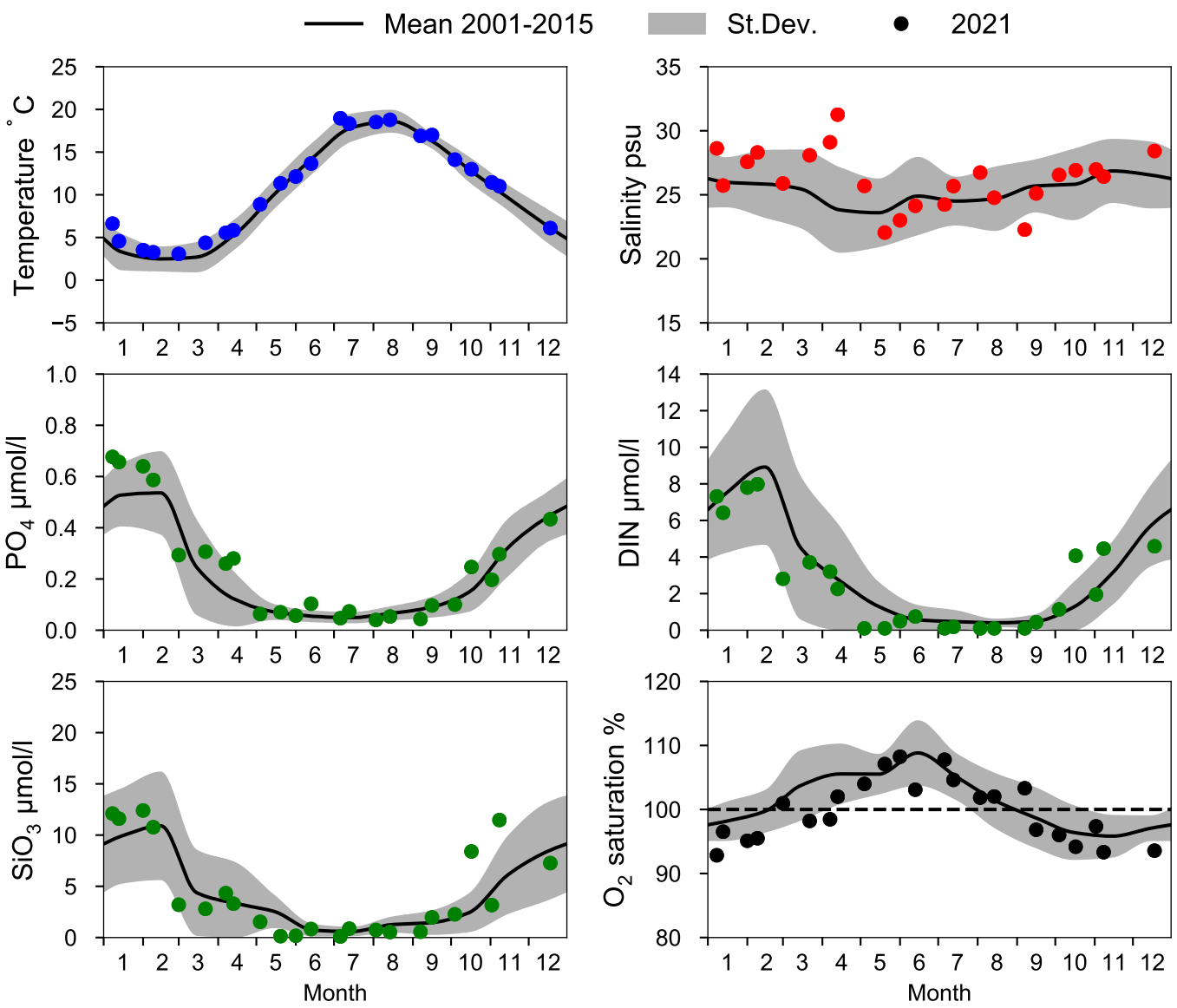


Vertical profiles Å13
December

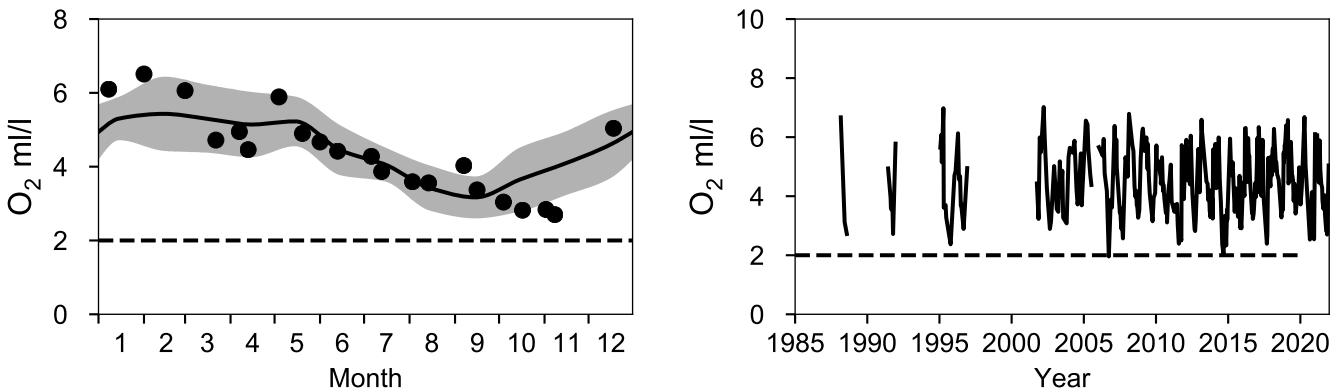


STATION SLÄGGÖ SURFACE WATER (0-10 m)

Annual Cycles



OXYGEN IN BOTTOM WATER (depth >= 64 m)



Vertical profiles SLÄGGÖ
December