Suomen ympäristökeskus
Finlands miljöcentral
Finnish Environment Institute

ILMATIETEEN LAITOS

CRUISE REPORT

R/V Aranda

Cruise 03/2023

COMBINE 2/2023

30.5.2023 – 6.6.2023

This report is based on preliminary data and is subject to changes.

Objectives of the cruise

The COMBINE 2 cruise contributed to the HELCOM Baltic Sea integrated physical, chemical and biological monitoring programme and the Finnish marine management plan. The objectives of the cruise were:

1) Long-term monitoring of hydrography, nutrient concentrations, macrozoobenthos and zooplankton
2) Monitoring of radioactive substances in water and sediment
3) Collection of reseach samples for eDNA-analyses of zooplankton and zoobenthos
4) Deployments of wave buouys in the Bothnian Bay and in the southern Bothnian Sea
5) Deployment and retrieval of drifting floats in the Bothnian Sea

Table 1 The scientific crew

Name	On board	Organization
Henrik Nygård	30.05.2023 - 10.06.2023	Syke
Heini Jalli	30.05.2023 - 10.06.2023	IL
Sami Rantapusa	30.05.2023 - 10.06.2023	IL
Tanja Kinnunen	30.05.2023 - 10.06.2023	Syke
Pia Varmanen	30.05.2023 - 10.06.2023	Syke
Mira Granlund	30.05.2023 - 10.06.2023	Syke
Riikka Mattsson	30.05.2023 - 10.06.2023	Syke
Niklas Trebs	30.05.2023 - 10.06.2023	Syke
Tarja Katajisto	30.05.2023 - 10.06.2023	Syke
Anna-Riina Mustonen	30.05.2023 - 10.06.2023	Syke
Jyri Tirroniemi	30.05.2023 - 10.06.2023	Syke
Anna Kangas	30.05.2023 - 02.06.2023	Syke
Okko Outinen	02.06.2023 - 10.06.2023	Syke
Anne-Mari Lehto	30.05.2023 - 02.06.2023	Syke
Annaliina Skyttä	30.05.2023 - 10.06.2023	Syke
Panu Hänninen	30.05.2023 - 02.06.2023	Syke
Noora Haavisto	02.06.2023 - 10.06.2023	Syke

Cruise Route

The cruise started in Helsinki on the 30th of May 2023 and first headed towards the easternmost sampling stations in the Gulf of Finland. After sampling in the Gulf of Finland a short stop was made in Hanko to exchange some personnel. The cruise continued to the Archipelago Sea and onwards to the Bothnian Sea, the Quark and the Bothnian Bay, sampling the eastern side on the way north and the western side on the return south. Finally, the stations in the Åland Sea and the Northern Baltic Proper were sampled. The cruise ended in Hanko on the 10th of June 2023. The full cruise route is shown in Figure 1.

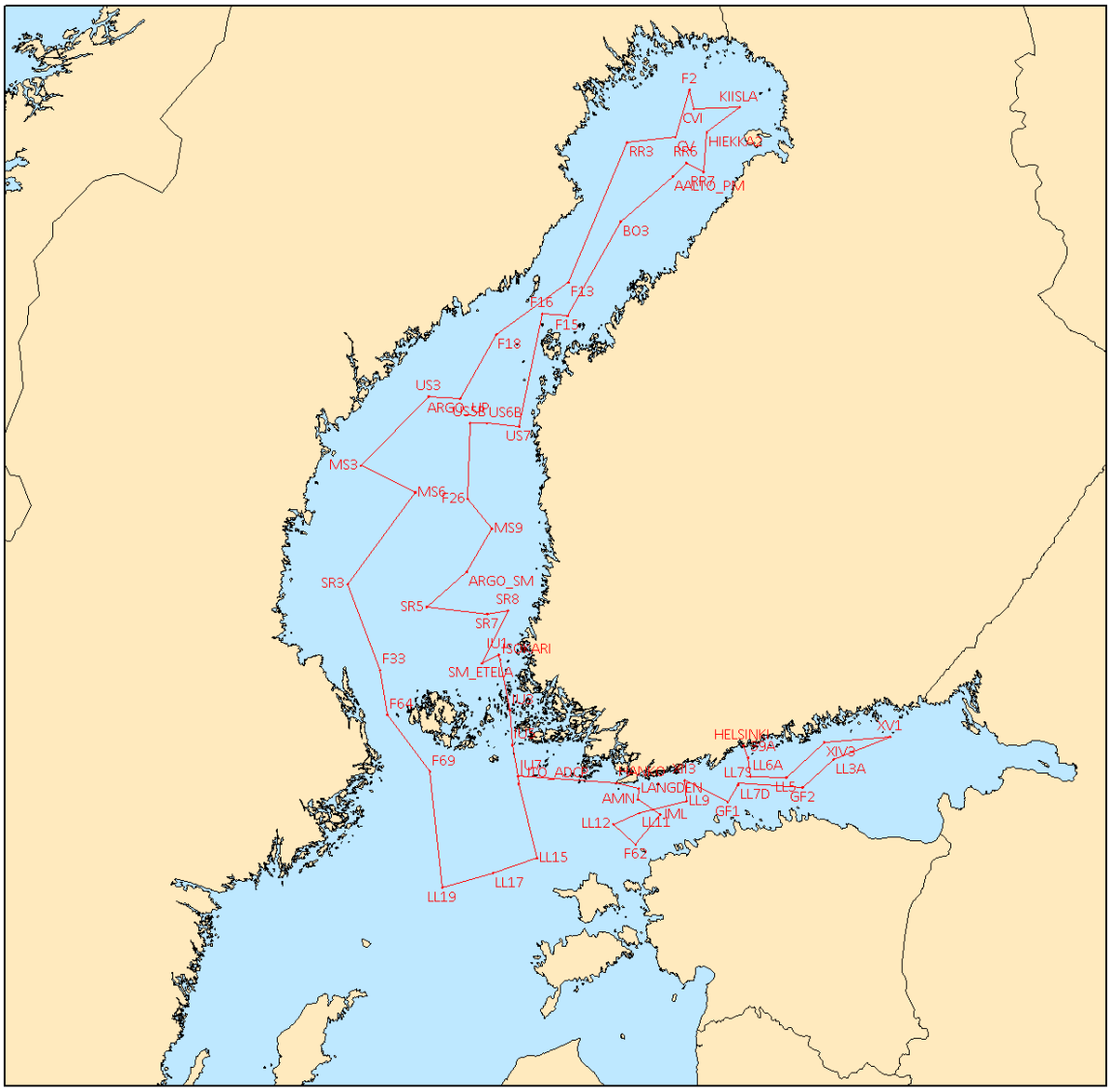

Figure 1. COMBINE 2/2023 cruise route

Sampling

A list of sampled stations and samples collected during the cruise is found in Annex 1. At each station a CTD profile was taken and when water samples were collected, the nutrient concentrations (NO_2, NO_X, NH_3, PO_4, SiO_4, Total N, Total P), chlorophyll-*a*, O_2 and pH were measured at standard depths. If anoxic conditions were observed, also H_2S was measured. The standard sampling depths were 1, 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 225 and 250 m, depending on the sampling station's depth. A water sample 1 m above the sea bottom was also taken. Chlorophyll-*a* samples were taken at 1, 5, 10, 15 and 20 m depth. Zooplankton samples were collected using a 100 µm WP-2 net, whereas macrozoobenthos were collected with van Veen grab. Sediment samples were collected using Gemax-corer. Secchi depth was recorded when station visits occurred during daytime.

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Observations

CTD profiles from selected stations can be found in Annex 2. Results for temperature, salinity, oxygen, hydrogen sulphide and nutrient parameters from the standard sampling depths at slected stations can be found in Annex 3, with a comparison to average of values measured in the same season since 2000. When referring to average values in the following section, the reference period is 2000-2022, using station specific measurements done in May and June.

Hydrography
In the Gulf of Finland, the thermocline depth varied among the sampling stations, but was generally situated between 10 and 20 meters. The surface water temperature was generally higher than the average value, but below the thermocline the temperature was close to the average values. No clear halocline was observed in the Gulf of Finland. The salinity was gradually increasing towards the bottom, being slightly above the average values throughout the water column.
In the Archipelago Sea, a thermocline was observed at around 18 m at IU7, but at the other sampling stations no clear thermocline was observed. The temperature was around the average values. Salinity values were close to the average values at the stations and only at IU7, increased salinity values was observed at depths between 30-50 m.
At the SR-transect in the Bothnian Sea, the temperature was around 8 degrees in the upper 30 m and then decreased towards the bottom. At the US-transect a similar pattern was seen, with the difference that only the upper 20 m were well mixed. In the Bothnian Sea the salinity was generally higher than the average measured values, especially deeper in the water column, but no halocline was observed. At F18 and US3, the surface water was clearly fresher than the average salinity conditions.
In the Quark, the temperature was around 5 degrees throughout the water column. The salinity was around average values gradually increasing from 3.5 psu in the surface water to 4.5 psu in the bottom water.
In the Bothnian Bay, the surface temperature varied between 4-6 degrees and was around or below 2 degrees in the deeper waters. The salinity was quite constant throughout the water column, being around 3 psu at the surface and 3.5 psu close to the bottom. Only at F2 and CVI the surface water was slightly fresher, around 2.5 psu.
In the Åland Sea, the surface temperature was around 9 degrees and a thermocline was seen at around 15 m. Below the thermocline, the temperature was quite stable at 4 to 5 degrees depending on sampling station. No halocline was observed, but at F64 the surface water above the thermocline was a bit fresher (around 5.5 psu) than below the halocline (around 7 psu). At F69 the bottom salinity slightly increased through the water column, being around 8.5 at the bottom.
In the Northern Baltic Proper the surface water temperature was around 11 degrees, with a thermocline situated around 18 m. Below the thermocline the water temperature dropped to less than 4 degrees, to increase again below the halocline. The temperature was slightly higher than the average. The halocline depth varied a bit between the sampling stations. At LL19 the halocline was situated at a shallower depth than normal, with the salinity increasing between 50 and 70 m to reach a quite stable level around 11 psu below 70 m.

Nutrient concentrations
In the Gulf of Finland the phosphate concentrations in the surface water were at many stations among the highest measured at this time of the year, generally between 0.4 and 0.5 µmol/l. Also throughout the water column phosphate were above the average values. Total phosphorus concentrations were above the average values, whereas total nitrogen concentrations were generally below the average values. The concentrations of the dissolved nitrogen parameters were very low or zero in the surface water, and around the avergae values deeper in the water column. Silicate concentrations were generally above the observed average values.
At the stations in the Archipelago Sea the nutrient concentrations were lower than the average values observed at this period of the year. In the Bothnian Sea the phasphate concentrations in the surface water were low, below the average values observed at this period of the year. Total phosphorus concentrations were around the average values, wheras total nitrogen concentrations

were slightly below the average. Also nitrate-nitrite, nitrite and ammonium concentrations were below the average concentrations. Silicate concetration was close to observed average values.
In the Quark and the Bothnian Bay, the phosphate concentration was close to zero in the surface water, whereas the total phosphorus concentration was close to the average values. However, at F2 phosphate concetrations were a bit elevated and above the average values in the surface layer. All measured nitrogen parameters were close to the average values. The silicate concentrations were slightly above the average values at this point of the year.
In the Åland Sea, the total phosphorus and total nitrogen concentrations were around the average, or slightly above, the values observed at this point of the year. The phosphate concentrations were low in the surface, <0.1 µmol/l, but slightly above the average values.The concentrations of the dissolved nitrogen parameters were low (zero, or close to) in the surface water. At F33, a peak in ammonium concentration, up to 0.5 µmol/l, was seen at 30 m depth. The silicate concentrations were close to, or slghtly above, the average values observed at this point of the year.
In the Northern Baltic Proper, the total phosphorus and total nitrogen concentrations were close to the average in the surface water. From the halocline and deeper, the total phosphorus and total nitrogen concentrations were slightly above the average. The phosphate concentrations followed the same pattern as the total phosphorus. The nitrate-nitrite and nitrite concentrations were low, close to the detection limit throughout the water column. The ammonium concentration was at the detection limit in the surface water. Below the halocline the ammonium concentration was above the average and among the highest measured during this time of the year in this area. The silicate concentration was around the average above the halocline and slightly above the average below the halocline.

Oxygen conditions
In the Gulf of Finland, the oxygen conditions were generally below the average conditions throughout the water column. In the water 1 m above the bottom the oxygen concentration was generally <1 ml/l. Anoxic bottoms were only observed at F62 and JML, where the water below approximately 70 m was anoxic and here hydrogen sulphide was found. In the Archipelago Sea, the Bothnian Sea, the Quark and the Bothnian Bay the oxygen conditions were around the average values and the whole water column was well oxygenated. In the Åland Sea the oxygen levels were close to the average values. At F69, the oxygen concetration decreased towards the bottom, reaching 3.4 ml/l in the bottom water.
In the Northern Baltic Proper, the oxygen concentrations were slightly below the average. Below halocline, from a depth of approximately 70 m, the water column was anoxic. Hydrogen sulphide was observed from a depth of 60 m. The hydrogen sulphide concentration below the halocline was among the highest measured at this time of the year at the specific sampling stations.

Notes on the zoobenthic community
The notes on the macrozoobenthic community are only preliminary, based on observations done during the cruise. A more detailed analysis of the zoobenthic community will be carried of in the laboratory at a later stage. In the Gulf of Finland, the benthic community was degraded and very sparse at most sampling stations. Only at AMN and Längden, which are a bit shallower and closer to the coast, more abundant communities were found. In the Archipelago Sea, the sampled bottoms had diverse communities. The bottom is partly covered by ferromanganese concretions, providing a more diverse substrate for the macrofauna. In the Bothnian Sea, bottoms were mainly dominated by amphipods and the *Marenzelleria* spp. polychaete. The abundance of amphipods seem to have decreased at some stations, but on the other hand very abundant amphipod communities were observed at some stations. For example, at SR3 aamphipod abundance of >10000 ind/m^2 was observed. In the Quark, the communities were dominated by amphipods, polychaetes and the clam *Macoma balthica*. In the Bothnian Bay, *Marenzelleria* spp., amphipods, mysids and occasional *Saduria entomon* were found. Total abundances were, however, quite low, generally 500-1000 ind/m^2. The situation in the Åland Sea was quite similar with total abundances <1000 ind/m^2 at F64 and a very sparse community at F69. All stations in the Northern Baltic Proper were anoxic and devoid of macroscopic fauna.

Other work
The water and sediment samples for analyses of radioactive substances were successfully taken and will be analysed at a later stage by the Radiation and Nuclear Safety Authority (STUK). The eDNA samples were collected according to the plan and will be further processed and analysed by the DNA-monitor project. The installations of wave buouys were effectively executed in the Bothnian Sea and the Bothnian Bay and the Argo floats were deployed in the Bothnian Sea without comlpications. Also the retrievals of instruments were successfully accomplished.

Conclusions

Although the water column was well ventilated during the winter in Gulf of Finland, oxygen conditions close to the bottom were degraded. Even if no clear halocline was observed, it is likely that an inflow of hypoxic water from the Baltic Proper has occurred indicated by increased salinity in the deeper water masses compared to earlier observed during the winter. Phosphate concentrations were high in the Gulf of Finland and Northern Baltic Proper. As the dissolved nitrogen parameters were depleted in the surface water, the phosphate will remain available and eventually fuel cyanobacterial blooms during the summer. In the Gulf of Bothnia, the phoshate concentrations in the surface water were low, indicating a lower risk for cyanobacterial blooms in this area.
The high hydrogen sulphide concentration below the halocline in the Northern Baltic Proper indicate that the oxygen debt is increasing in the Baltic Proper, as an indirect effect of eutrophication. This will potentially hamper the recovery of benthic habitats below the halocline and eventually also affect benthic habitats in the deeper areas of the Gulf of Finland.

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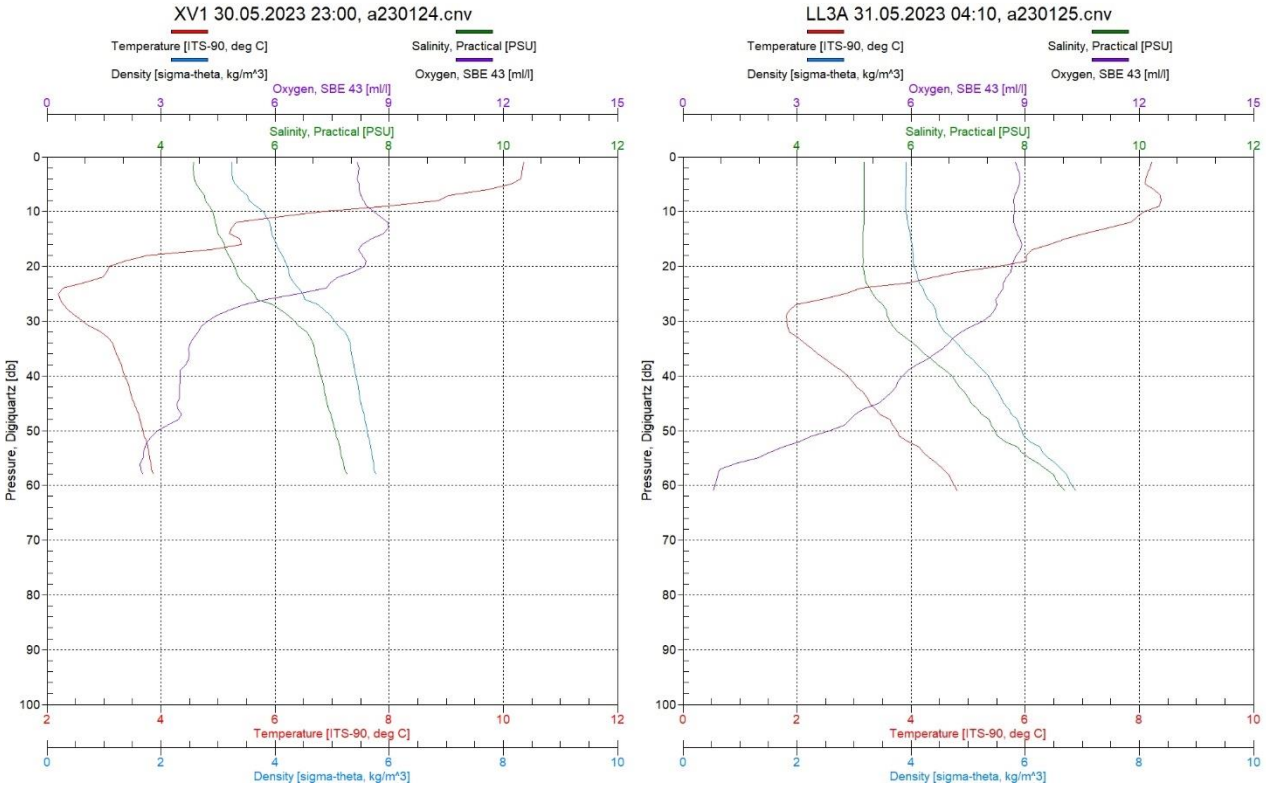
Annex 1. List of sampled stations of the cruise and sampling activities on the stations.

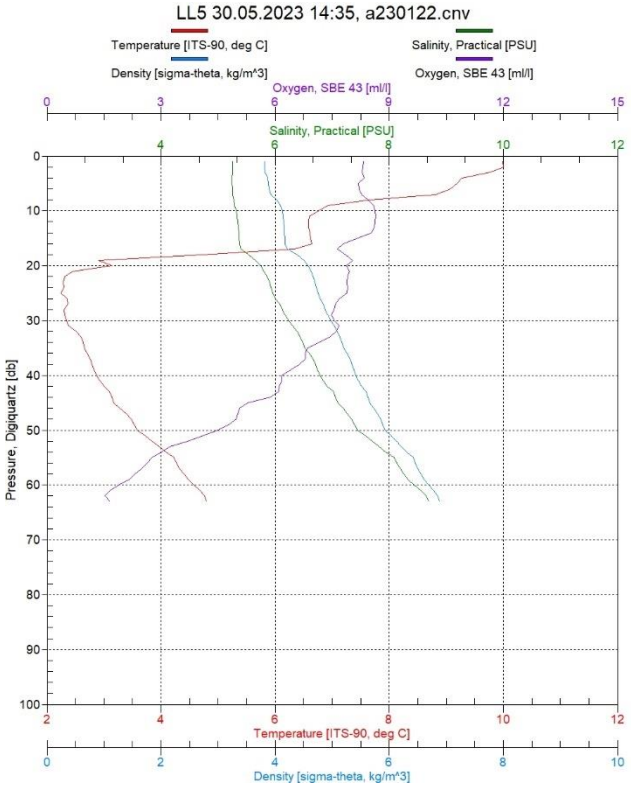
INDEX	STATION	latitude	longitude	depth	DATE	time	ctd	pH	ox	nu	zo	be	chl	secchi
HELSINKI	HELSINKI	60.16180	24.90153		2023-05-30	05.56								
2023010120	39A	60.06683	24.98017	42	2023-05-30	09.20	x	x	x	x			x	x
2023010121	LL6A	59.91683	25.03017	73	2023-05-30	11.28	x	x	x	x		x	x	x
2023010122	LL5	59.91677	25.59697	70	2023-05-30	14.40	x	x	x	x		x	x	x
2023010123	XIV3	60.20310	26.19280	78	2023-05-30	18.49	x	x	x	x			x	
2023010124	XV1	60.24988	27.24693	65	2023-05-30	23.08	x	x	x	x	x	x	x	
2023010125	LL3A	60.06713	26.34672	69	2023-05-31	04.29	x	x	x	x	x	x	x	x
2023010126	GF2	59.83843	25.85678	84	2023-05-31	09.30	x	x	x	x		x	x	x
2023010127	LL7S	59.85840	24.83837	77	2023-05-31	14.04	x	x	x	x	x	x	x	x
2023010128	LL7D	59.84643	24.83772	102	2023-05-31	17.02	x		x	x				
2023010129	GF1	59.70495	24.68205	84	2023-05-31	18.46	x	x	x	x	x	x	x	
2023010130	XII3	59.86412	23.98542	36	2023-05-31	23.00	x	x	x	x			x	
2023010131	LL9	59.70013	24.03003	66	2023-06-01	00.54	x	x	x	x	x	x	x	
2023010132	LL11	59.58350	23.29683	67	2023-06-01	05.49	x	x	x	x		x	x	x
2023010133	LL12	59.48353	22.89652	82	2023-06-01	09.14	x	x	x	x	x	x	x	
2023010134	F62	59.33350	23.26342	96	2023-06-01	12.35	x	x	x	x			x	x
2023010135	JML	59.58178	23.62668	80	2023-06-01	16.07	x	x	x	x		x	x	
2023010136	AMN	59.69048	23.25702	55	2023-06-01	19.37	x	x	x	x		x	x	
2023010137	LANGDEN	59.77683	23.26267	58	2023-06-02	02.14	x	x	x	x	x	x	x	
HANKO	HANKO	59.80992	22.90320		2023-06-02	05.31								
2023010138	IU7	59.81522	21.33638	92	2023-06-02	12.17	x	x	x	x			x	x
2023010139	IU5	60.05813	21.19820	89	2023-06-02	15.14	x	x	x	x		x	x	x
2023010140	IU3	60.33328	21.11323	51	2023-06-02	18.55	x	x	x	x		x	x	
2023010141	ISOKARI*	60.72727	20.88113	40	2023-06-02	22.48	x							
2023010142	IU1	60.76675	20.84640	33	2023-06-03	00.11	x	x	x	x			x	
2023010143	SM_ETELA*	60.68465	20.58308	46	2023-06-03	02.17	x							
2023010144	SR8	61.12648	20.92955	48	2023-06-03	05.55	x	x	x	x			x	x
2023010145	SR7	61.08347	20.59627	78	2023-06-03	07.57	x	x	x	x		x	x	x
2023010146	SR5	61.08323	19.57967	125	2023-06-03	12.21	x	x	x	x	x	x	x	x
2023010147	ARGO_SM**	61.39992	20.17997	125	2023-06-03	18.43	x							
2023010148	MS9	61.76678	20.53037	100	2023-06-03	21.56	x	x	x	x		x	x	
2023010149	F26	61.98348	20.06287	138	2023-06-04	01.21	x	x	x	x		x	x	
2023010150	US5B	62.58623	19.96852	222	2023-06-04	07.05	x	x	x	x	x	x	x	x
2023010151	US6B	62.60012	20.26278	81	2023-06-04	11.52	x	x	x	x		x	x	x
2023010152	US7	62.60010	20.82960	28	2023-06-04	14.22	x	x	x	x			x	x
2023010153	F16	63.51677	21.06267	49	2023-06-04	21.46	x	x	x	x	x	x	x	
2023010154	F15	63.51677	21.51285	48	2023-06-05	00.27	x	x	x	x		x	x	
2023010155	BO3	64.30207	22.34270	110	2023-06-05	06.37	x	x	x	x	x	x	x	x
2023010156	AALTO_PM*	64.68340	23.24120		2023-06-05	11.56	x							
2023010157	RR6	64.80028	23.47952	87	2023-06-05	14.17	x	x	x	x		x	x	x
2023010158	RR7	64.73360	23.81278	39	2023-06-05	16.51	x	x	x	x			x	x
2023010159	HIEKKA2	65.04992	23.83325	22	2023-06-05	19.38	x	x	x	x		x	x	
2023010160	KIISLA***	65.26225	24.43072	25	2023-06-05	22.43	x							
2023010161	CVI	65.23367	23.56283	69	2023-06-06	02.20	x	x	x	x		x	x	
2023010162	F2	65.38367	23.46267	83	2023-06-06	05.26	x	x	x	x	x		x	x
2023010163	CV	65.00023	23.24597	87	2023-06-06	09.28	x	x	x	x		x	x	x
2023010164	RR3	64.93355	22.34607	96	2023-06-06	13.10	x	x	x	x		x	x	
2023010165	F13	63.78358	21.47947	64	2023-06-06	21.06	x	x	x	x			x	
2023010166	F18	63.31437	20.27245	104	2023-06-07	02.25	x	x	x	x		x	x	
2023010167	ARGO_UP**	62.77067	19.74632	124	2023-06-07	07.06	x							
2023010168	US3	62.75872	19.19552	177	2023-06-07	09.36	x	x	x	x		x	x	x
2023010169	MS3	62.13450	18.16317	84	2023-06-07	16.02	x	x	x	x		x	x	x
2023010170	MS6	61.98360	19.16363	73	2023-06-07	20.16	x	x	x	x		x	x	
2023010171	SR3	61.18332	18.22987	73	2023-06-08	03.11	x	x	x	x		x	x	
2023010172	F33	60.53323	18.93743	134	2023-06-08	09.09	x	x	x	x			x	x
2023010173	F64	60.18908	19.14227	287	2023-06-08	12.37	x	x	x	x	x	x	x	x
2023010174	F69	59.78337	19.92985	191	2023-06-08	21.04	x	x	x	x		x	x	
2023010175	LL19	58.88073	20.31075	164	2023-06-09	05.10	x	x	x	x		x	x	x
2023010176	LL17	59.03345	21.07945	171	2023-06-09	09.46	x	x	x	x	x	x	x	x
2023010177	LL15	59.18335	21.74668	131	2023-06-09	15.20	x	x	x	x		x	x	x
2023010178	UTO_ADCP***	59.75550	21.35523	74	2023-06-09	21.05	x							
2023010179	IU7	59.81527	21.33653	92	2023-06-09	22.33	x	x	x	x	x		x	
HANKO	HANKO	59.80975	22.90327		2023-06-10	08.40								

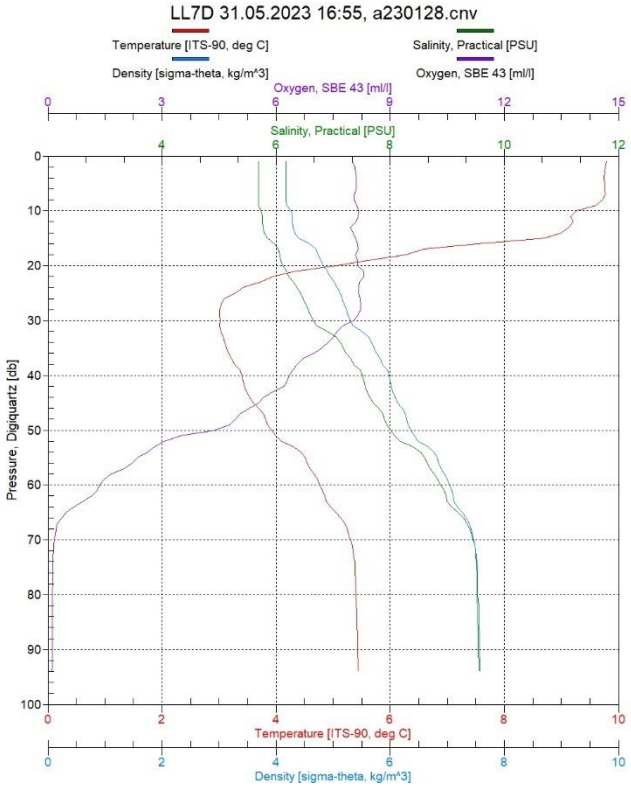
Parameters: ox = oxygen, nu = nutrients, zo = zooplankton, be = benthos, chl = chlorophyll a. * = wave buouy installation, ** = Argo float deployment/retrieval, *** = ADCP installation/retrieval

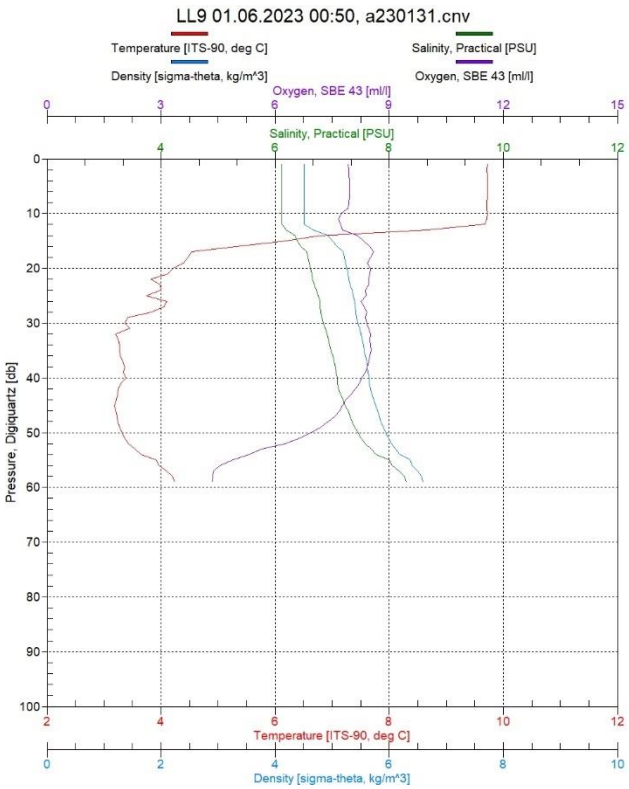
Annex 2. CTD profiles, including oxygen profiles, from selected stations.

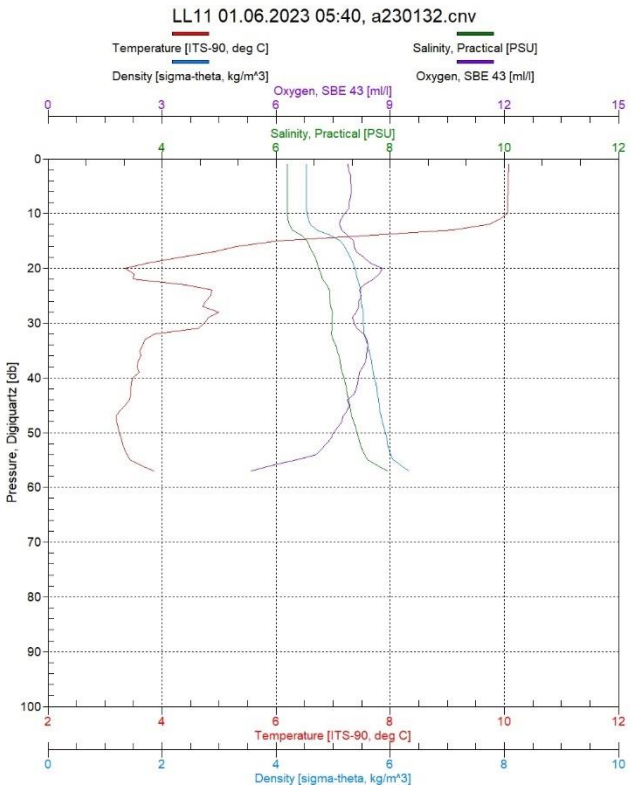
Gulf of Finland (stations XVI, LL3A, LL5, LL7D, LL9 and LL11):



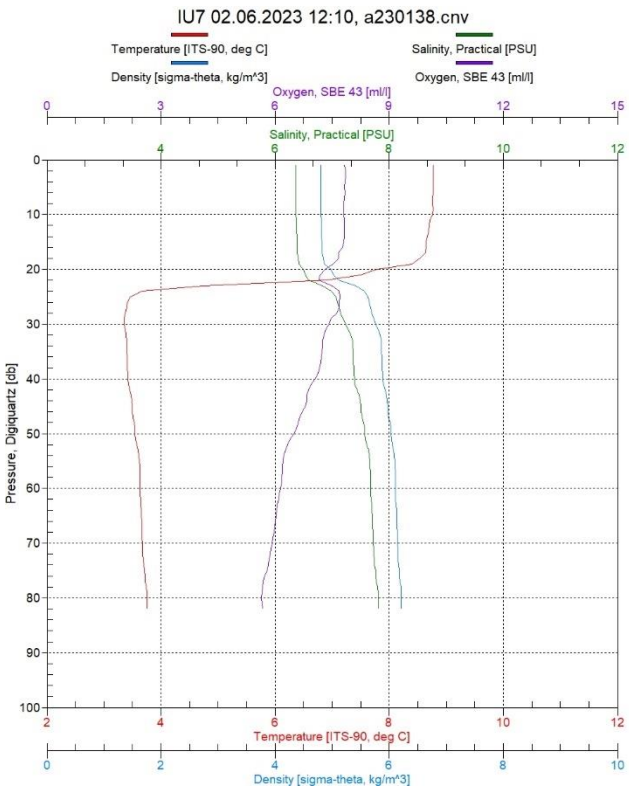


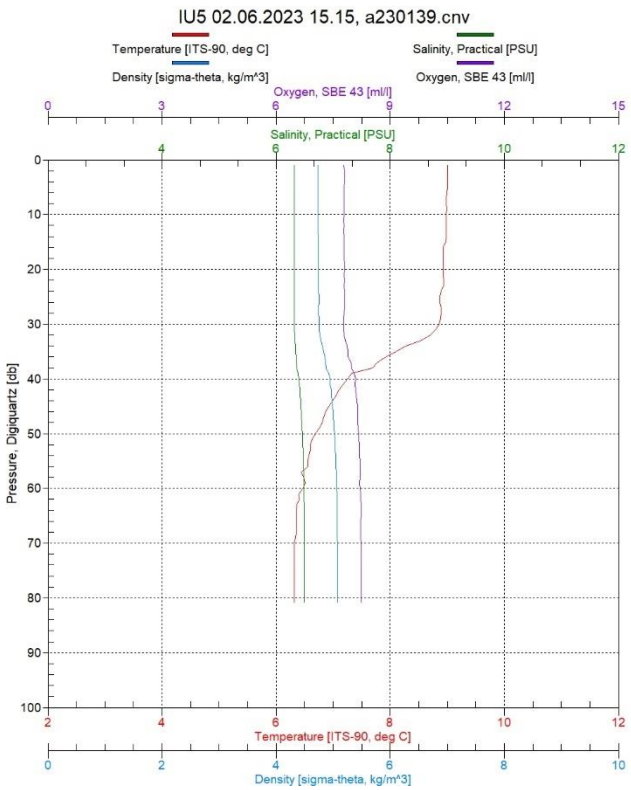




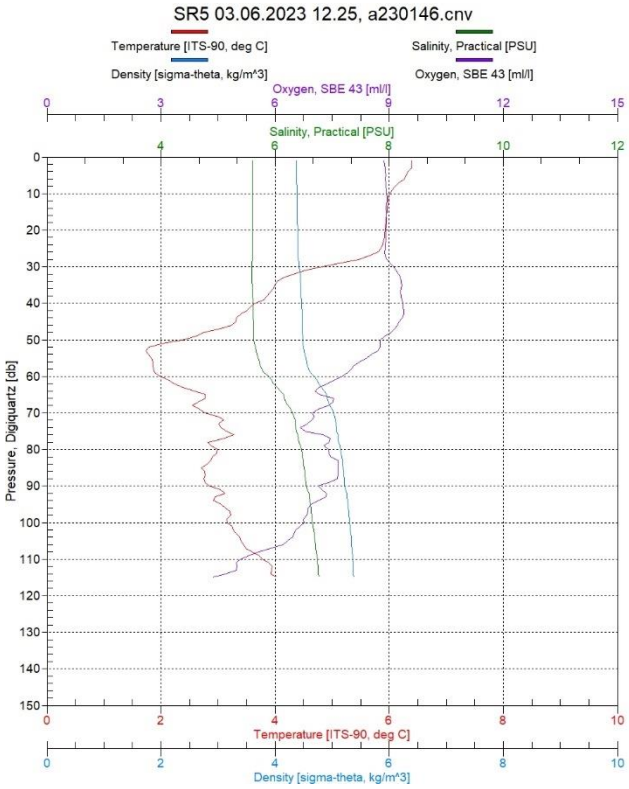


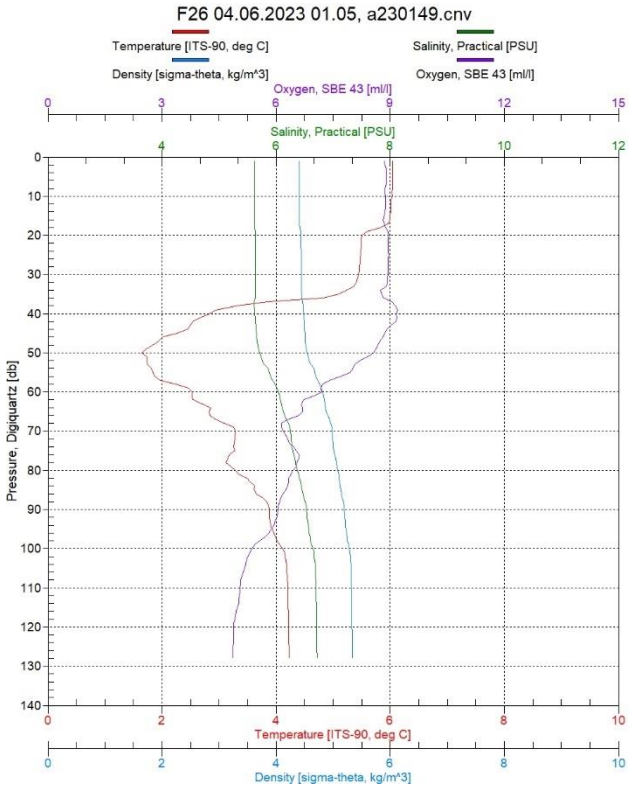
Archipelago Sea (stations IU7 and IU5):

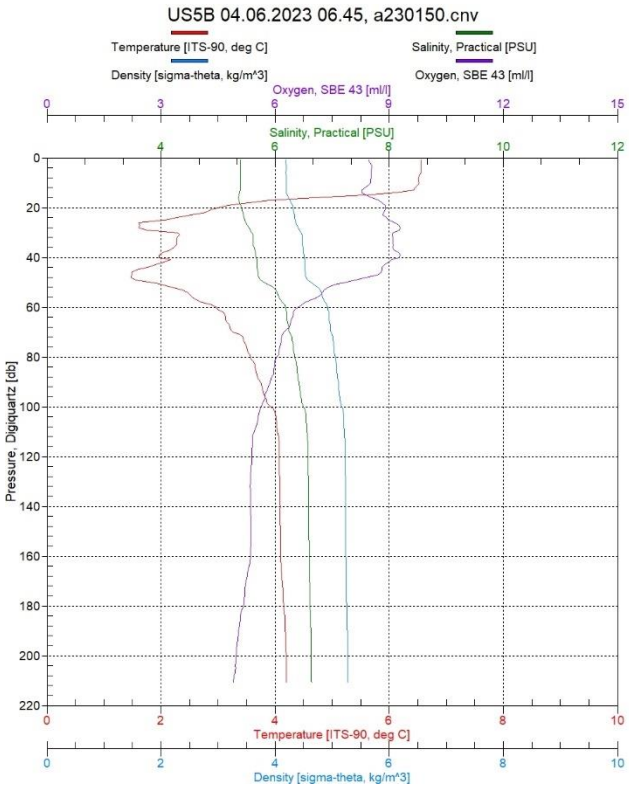


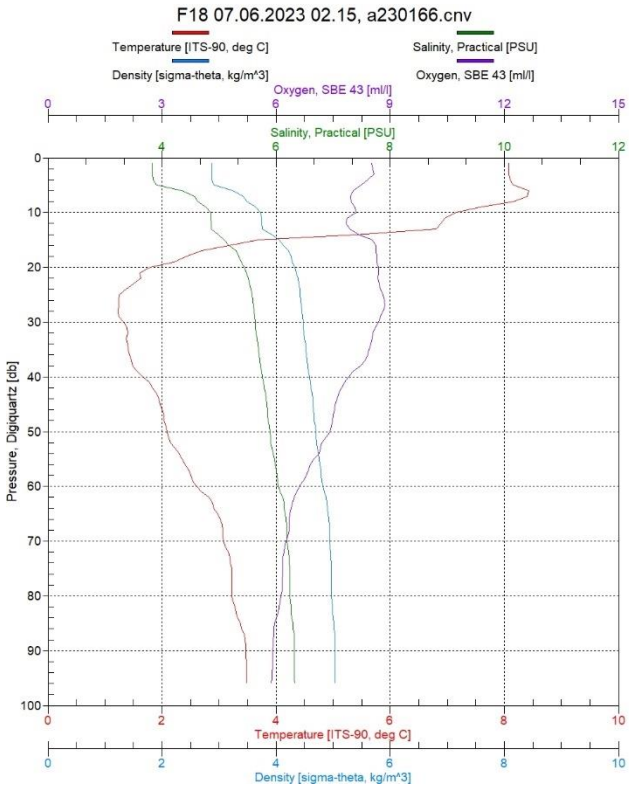


Bothnian Sea (stations SR5, F26, US5B and F18):

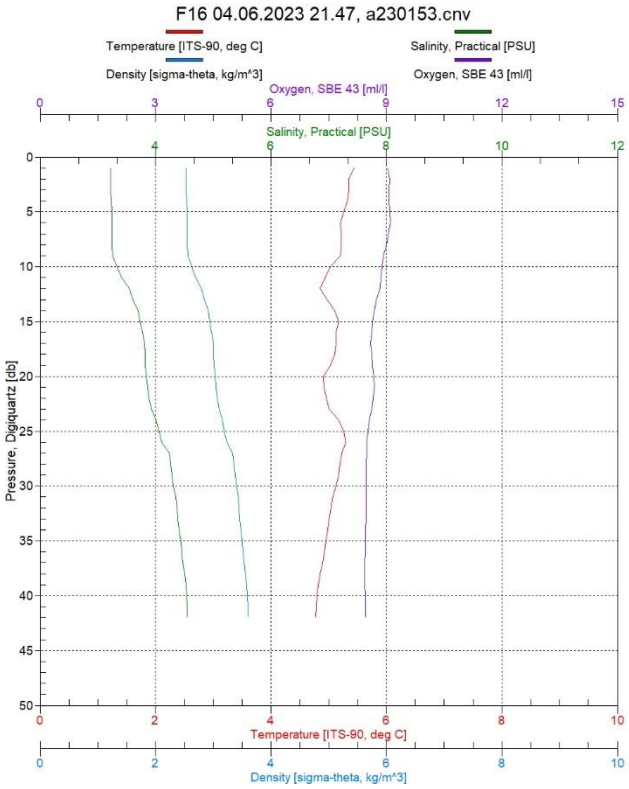


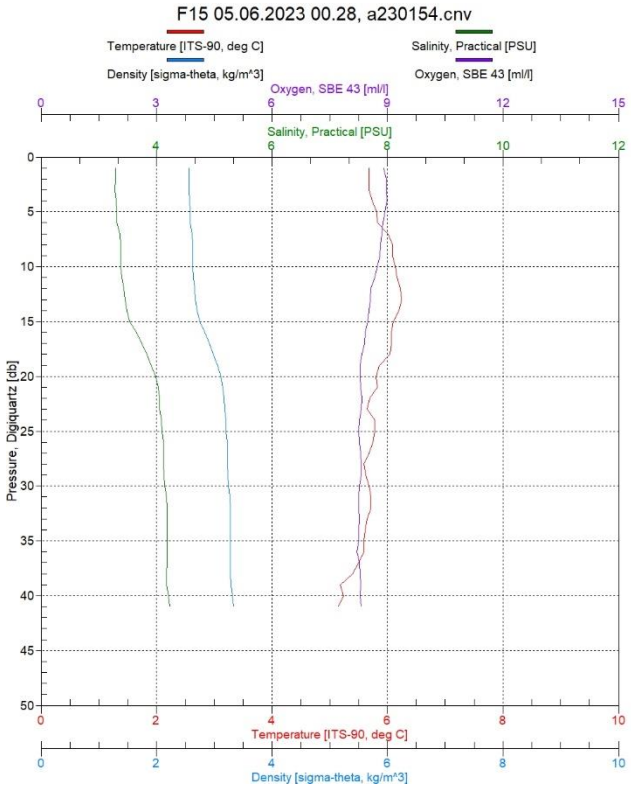




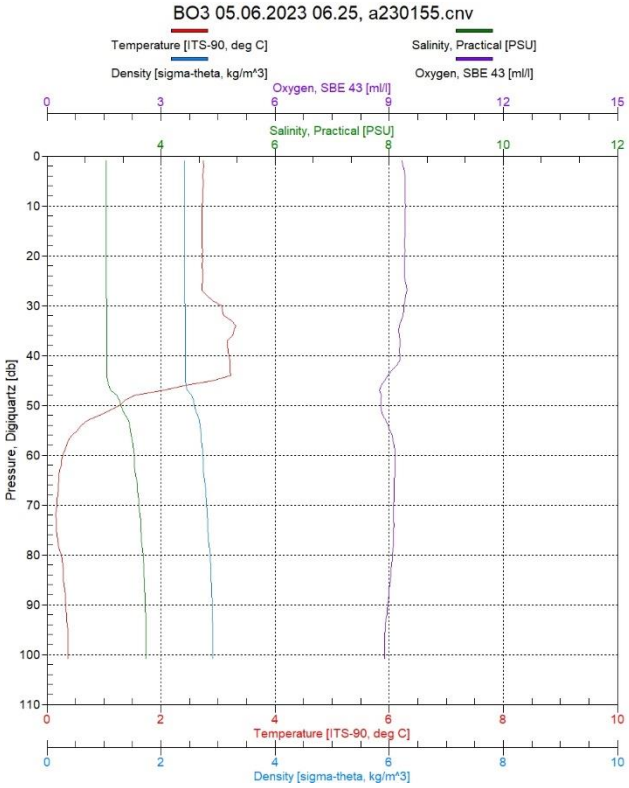


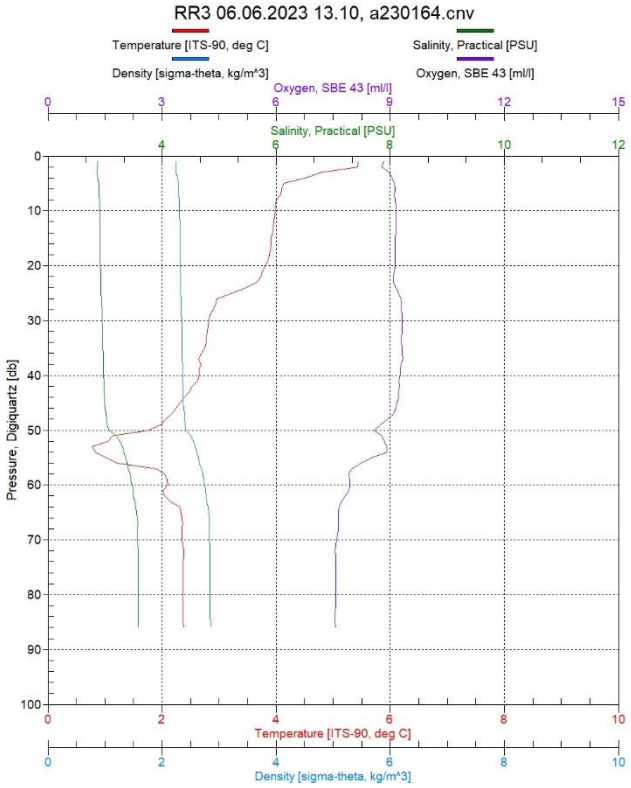
The Quark (stations F16 and F15):

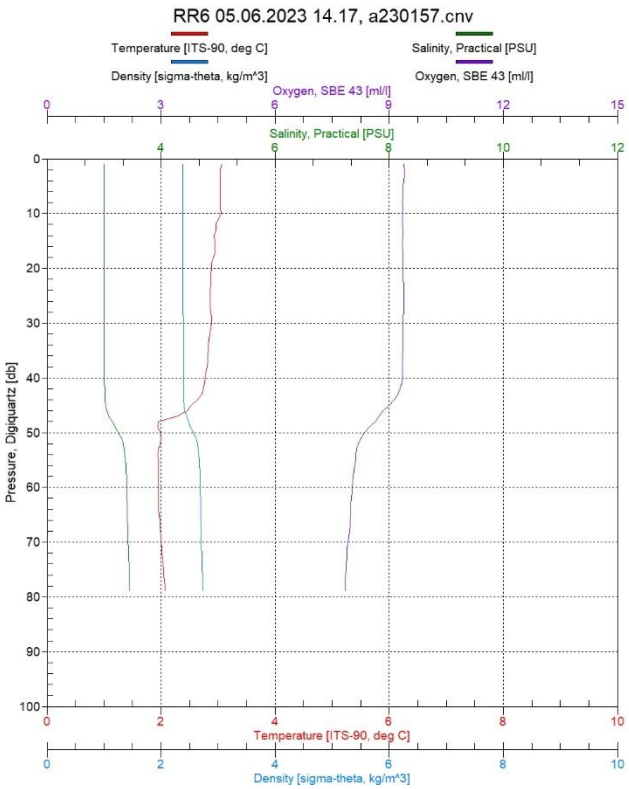


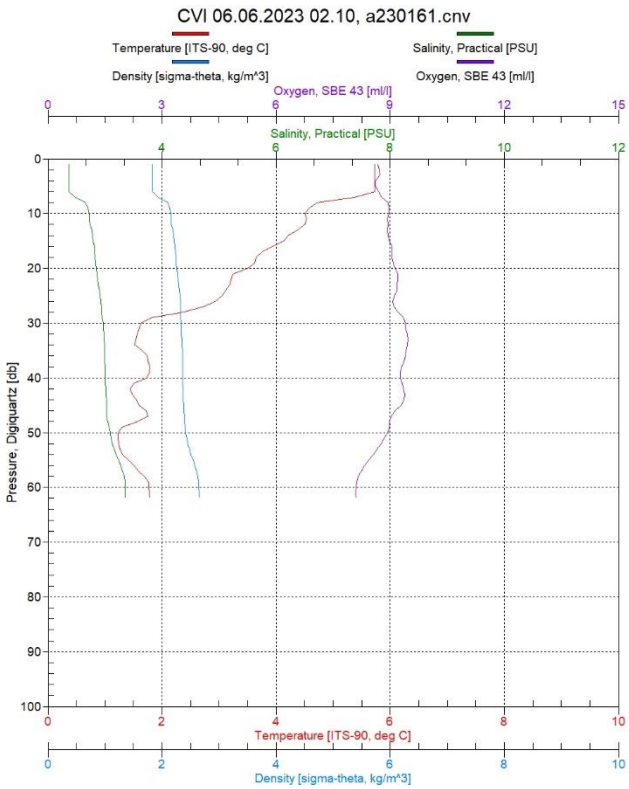


Bothnian Bay (BO3, RR3, RR6 and CV):

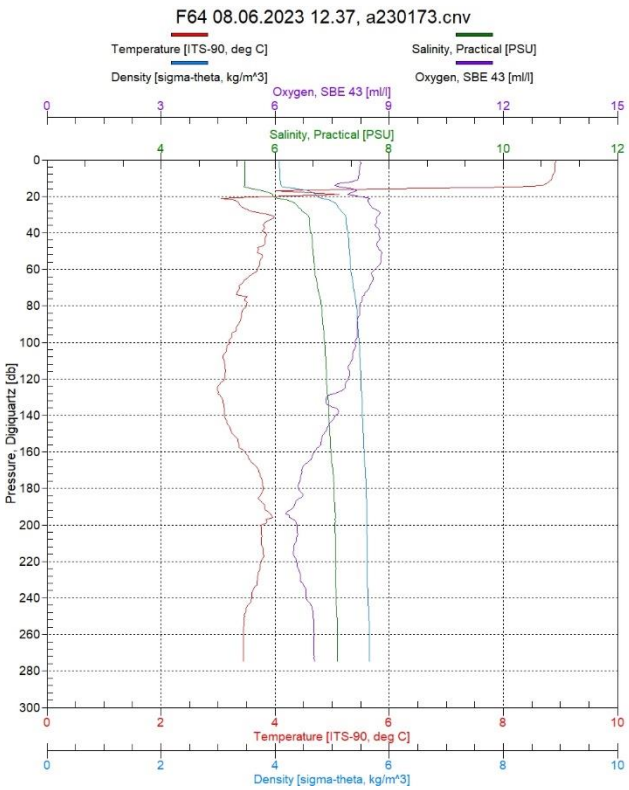


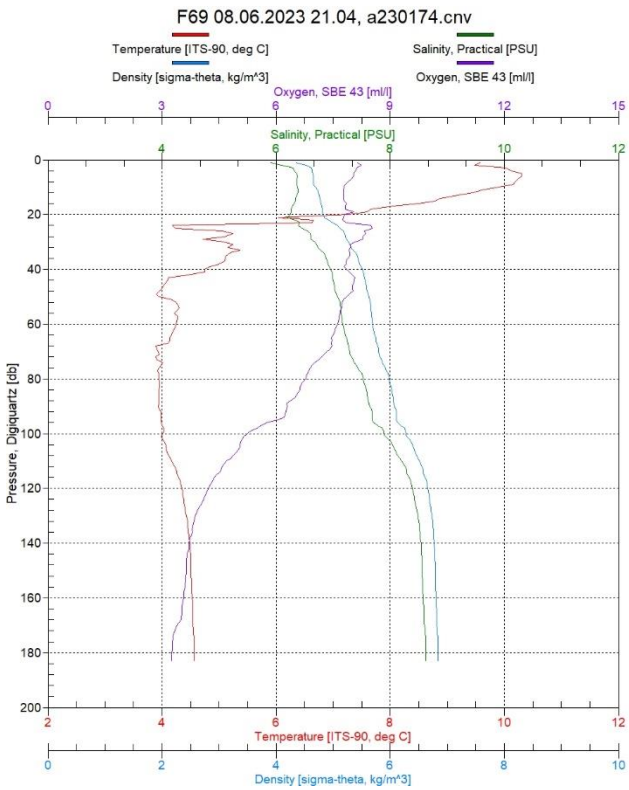




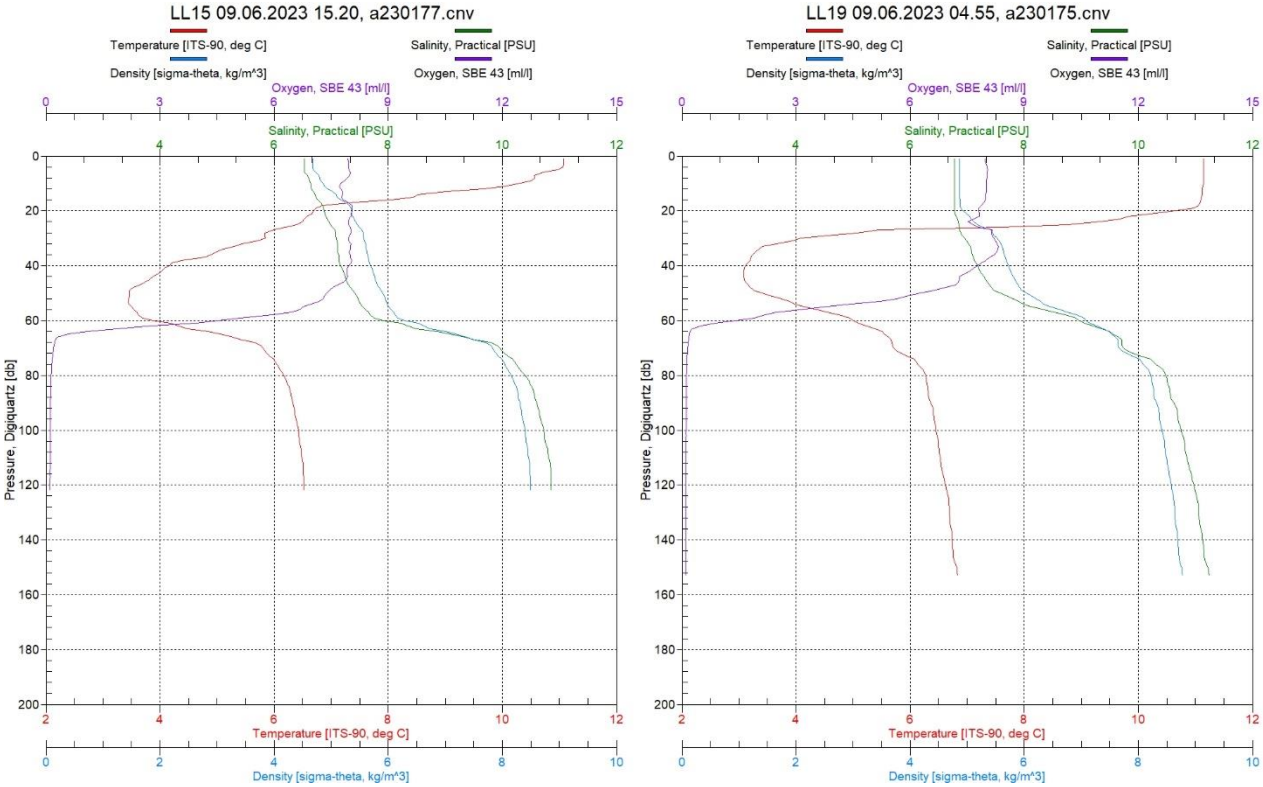


Åland Sea (stations F64 and F69):



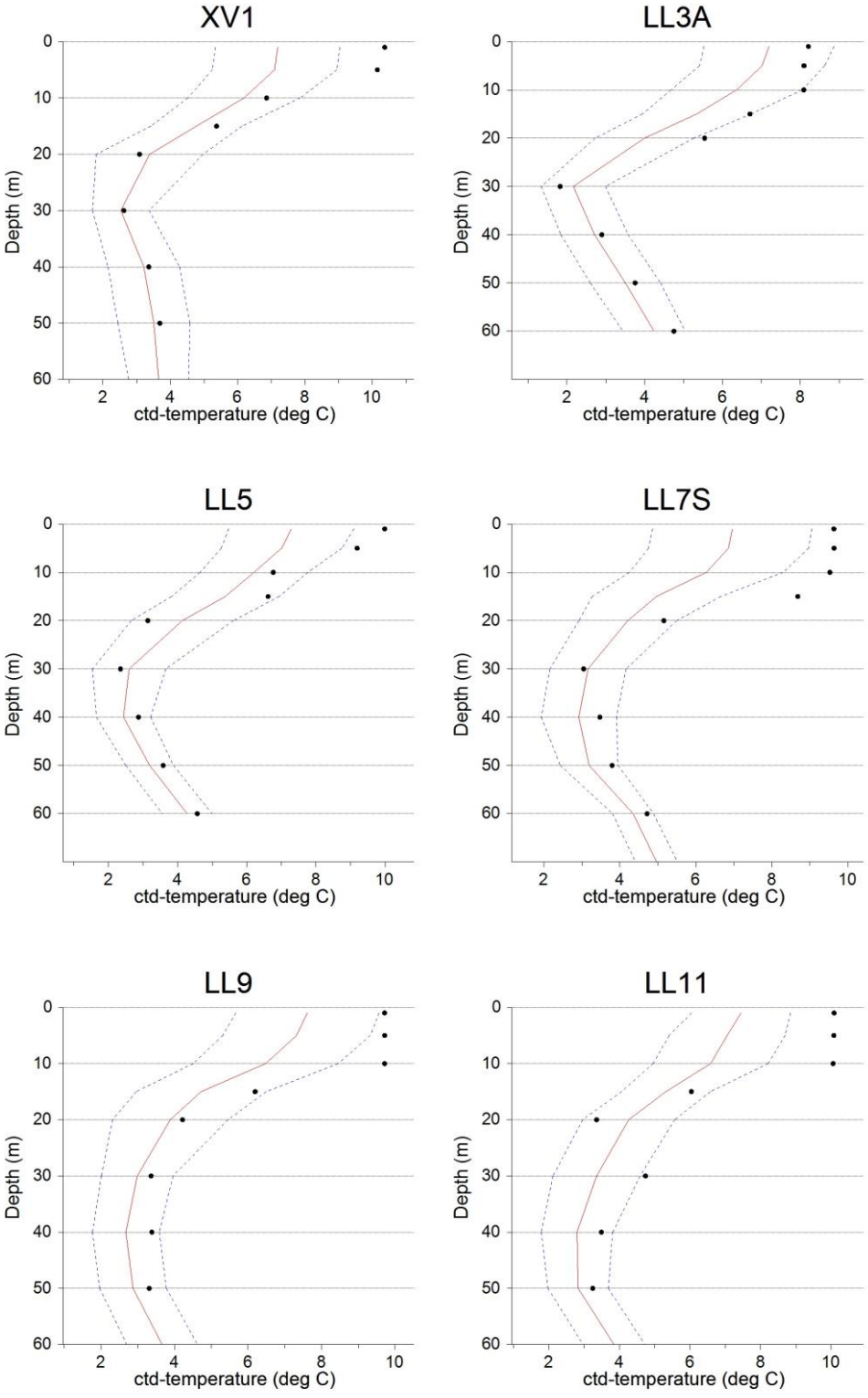


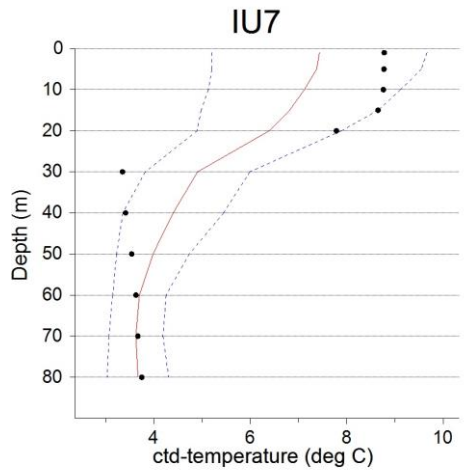
Northern Baltic Proper (stations LL15 and LL19):

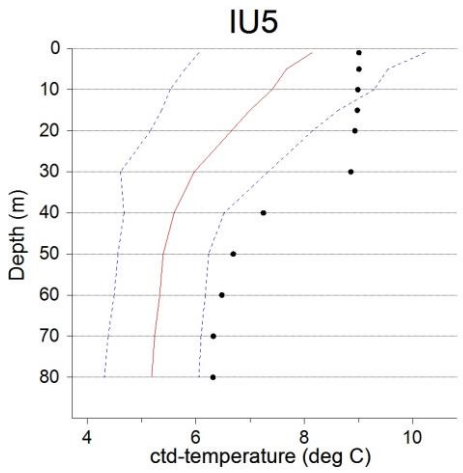


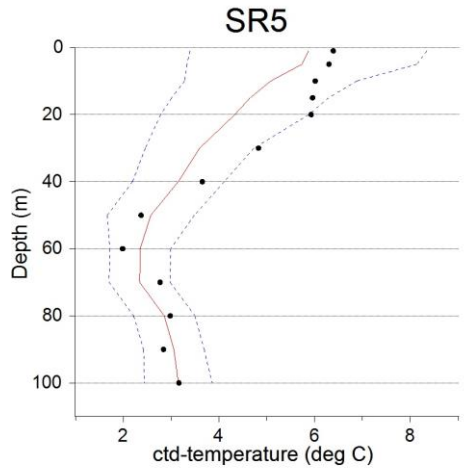
Annex 3. Selected variables at the stations XV1, LL3A, LL5, LL7S, LL9, LL11, IU7, IU5, SR5, F26, US5B, F18, F16, F15, BO3, RR3, RR6, CV, F64, F69, LL15 and LL19 measured at the standard sampling depths (black dots). Mean (red solid line) and standard deviation (blue dotted lines) represent the data collected at the same time of season (May-June) since the year 2000.

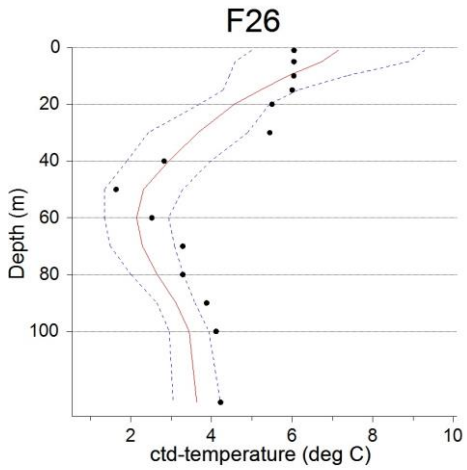
Temperature:

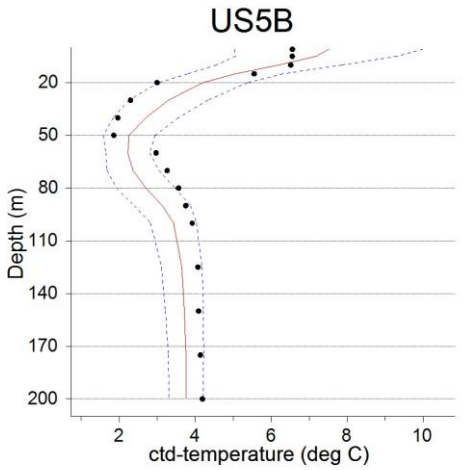


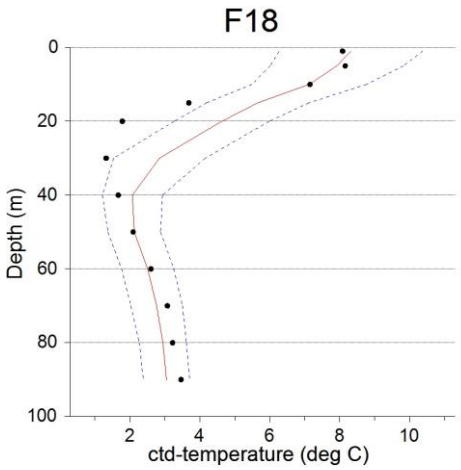

IU7
Depth (m)
0
10
20
30
40
50
60
70
80
4
6
8
10
ctd-temperature (deg C)

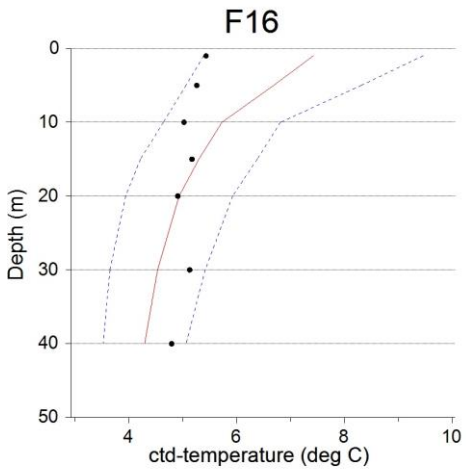

IU5
Depth (m)
0
10
20
30
40
50
60
70
80
4
6
8
10
ctd-temperature (deg C)

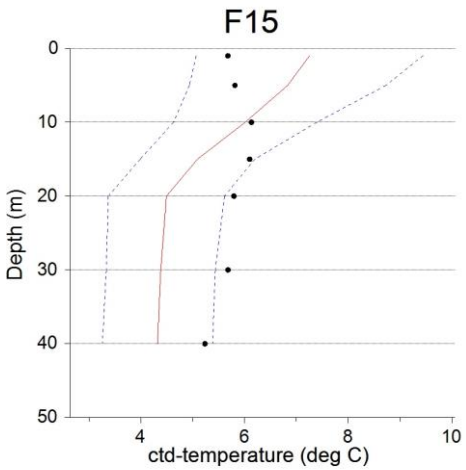

SR5
Depth (m)
0
20
40
60
80
100
2
4
6
8
ctd-temperature (deg C)

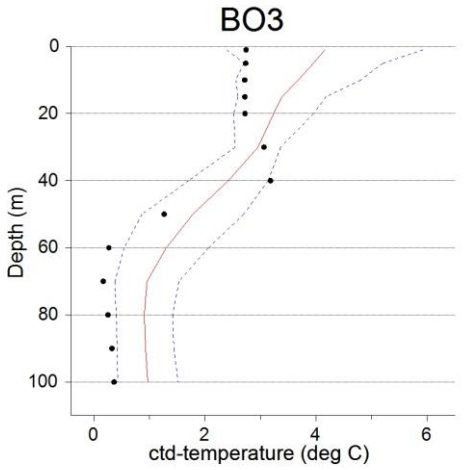

F26
Depth (m)
0
20
40
60
80
100
2
4
6
8
10
ctd-temperature (deg C)

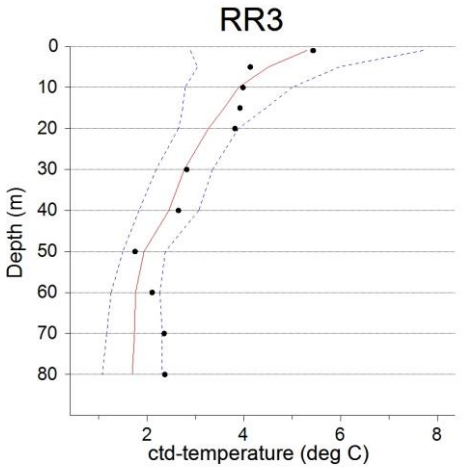

US5B
Depth (m)
20
50
80
110
140
170
200
2
4
6
8
10
ctd-temperature (deg C)

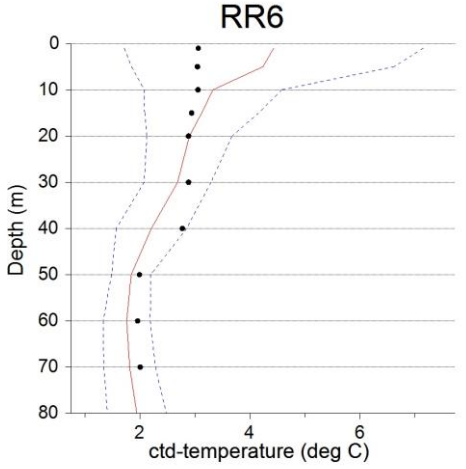

F18
Depth (m)
0
20
40
60
80
100
2
4
6
8
10
ctd-temperature (deg C)

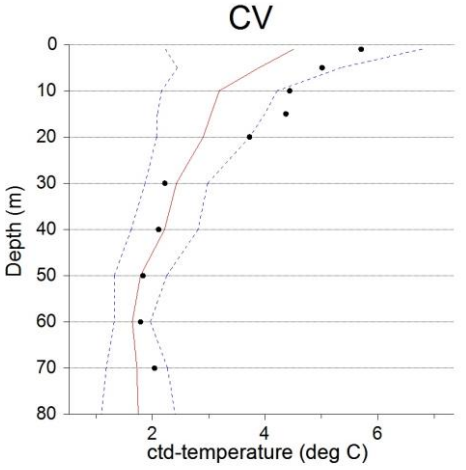

F16
Depth (m)
0
10
20
30
40
50
4
6
8
10
ctd-temperature (deg C)

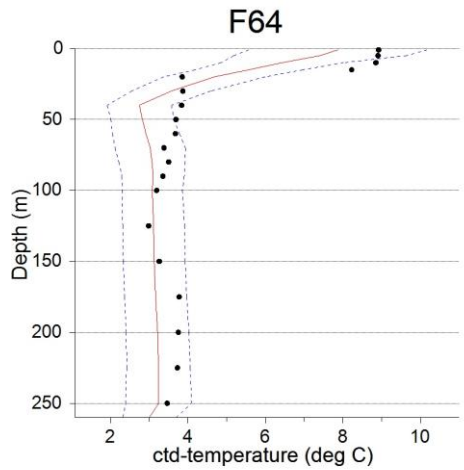

F15
Depth (m)
0
10
20
30
40
50
4
6
8
10
ctd-temperature (deg C)

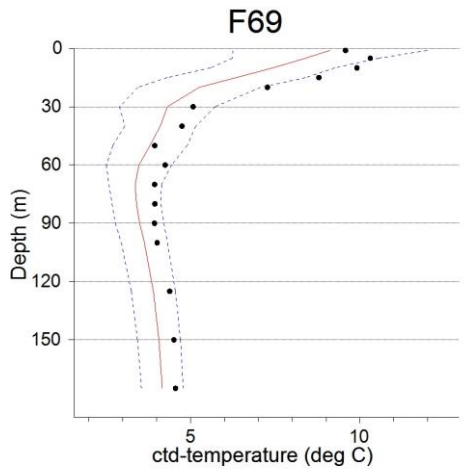

BO3
Depth (m)
0
20
40
60
80
100
0
2
4
6
ctd-temperature (deg C)

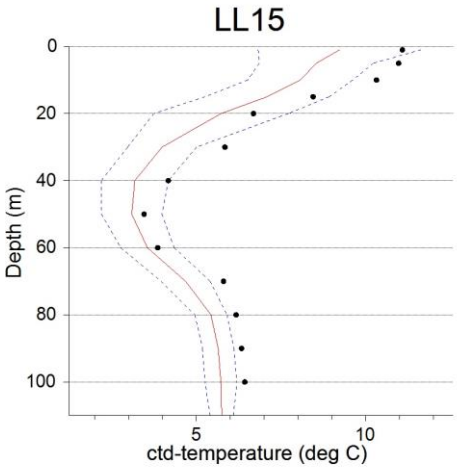

RR3
Depth (m)
0
10
20
30
40
50
60
70
80
2
4
6
8
ctd-temperature (deg C)

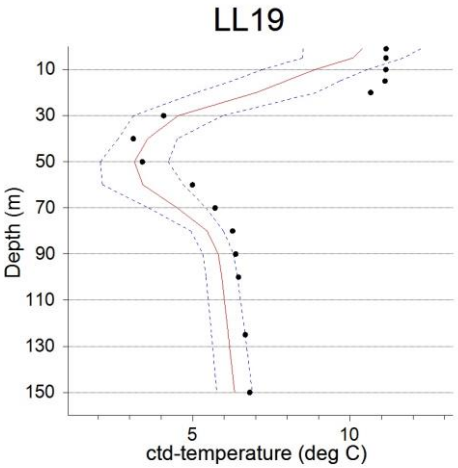

RR6
Depth (m)
0
10
20
30
40
50
60
70
80
2
4
6
ctd-temperature (deg C)


CV
Depth (m)
0
10
20
30
40
50
60
70
80
2
4
6
ctd-temperature (deg C)

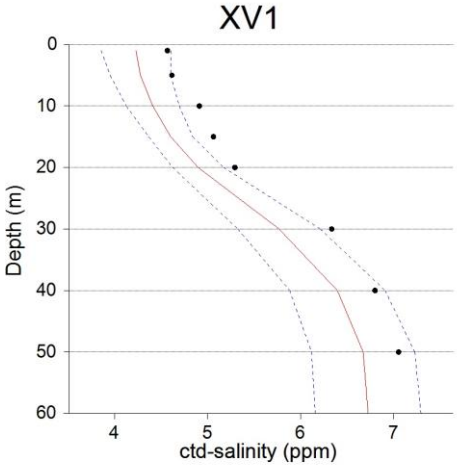

F64
Depth (m)
0
50
100
150
200
250
2
4
6
8
10
ctd-temperature (deg C)

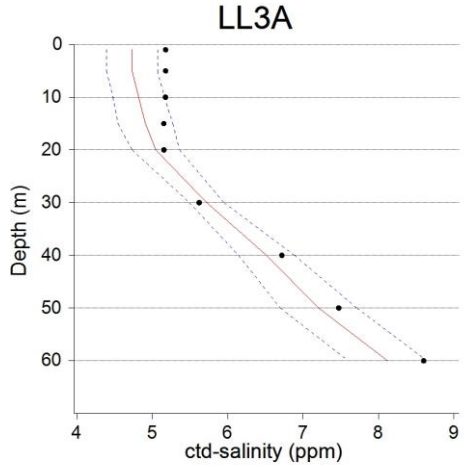

F69
Depth (m)
0
30
60
90
120
150
5
10
ctd-temperature (deg C)

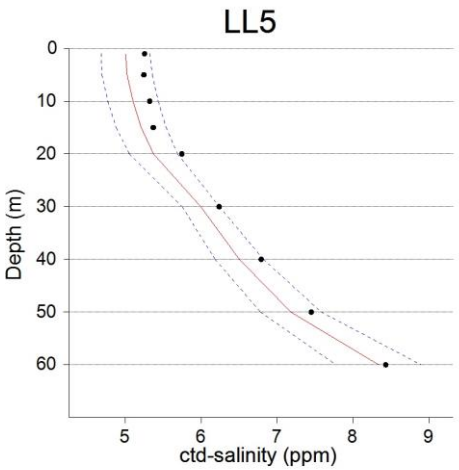

LL15
Depth (m)
0
20
40
60
80
100
5
10
ctd-temperature (deg C)

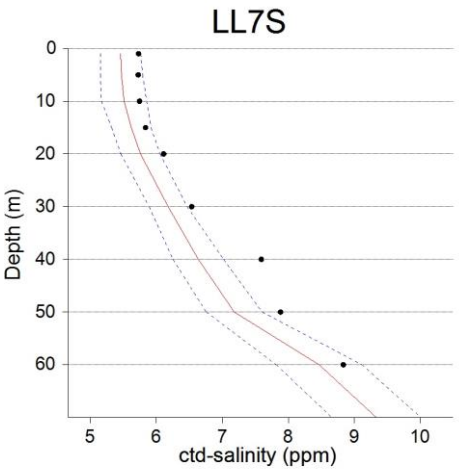

LL19
Depth (m)
10
30
50
70
90
110
130
150
5
10
ctd-temperature (deg C)

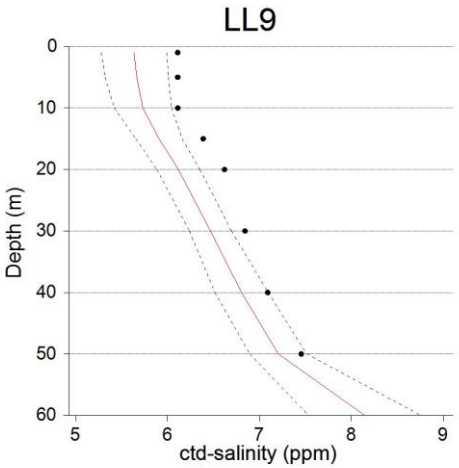
Salinity:

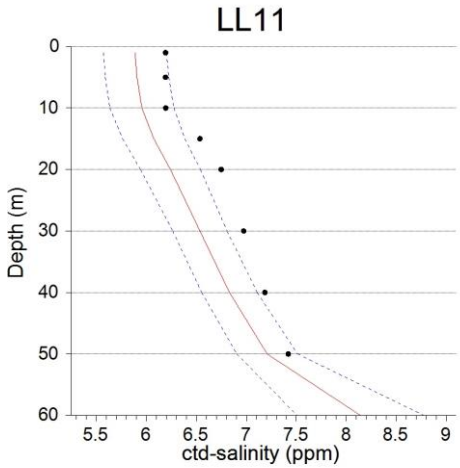

XV1
Depth (m)
0
10
20
30
40
50
60
4
5
6
7
ctd-salinity (ppm)

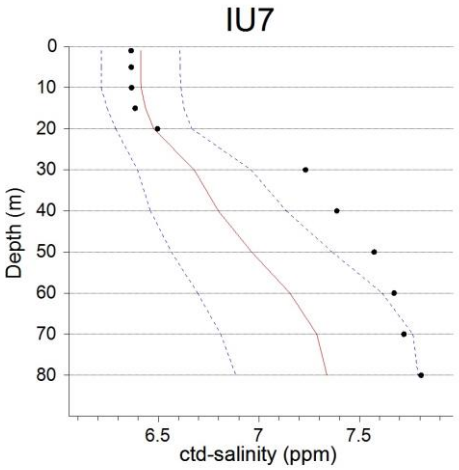

LL3A
Depth (m)
0
10
20
30
40
50
60
4
5
6
7
8
9
ctd-salinity (ppm)

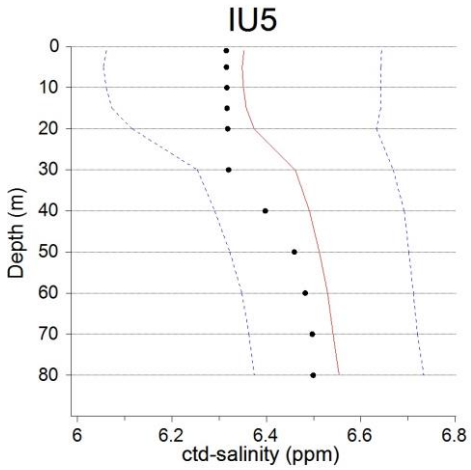

LL5
Depth (m)
0
10
20
30
40
50
60
5
6
7
8
9
ctd-salinity (ppm)

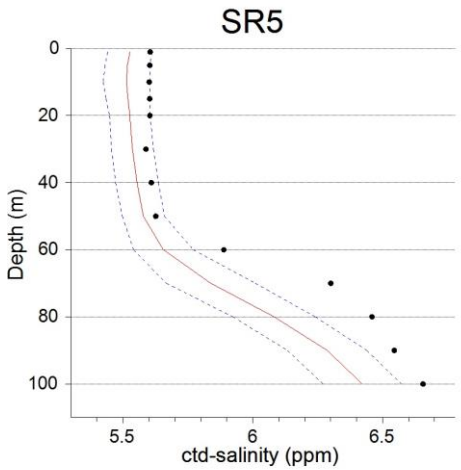

LL7S
Depth (m)
0
10
20
30
40
50
60
5
6
7
8
9
10
ctd-salinity (ppm)

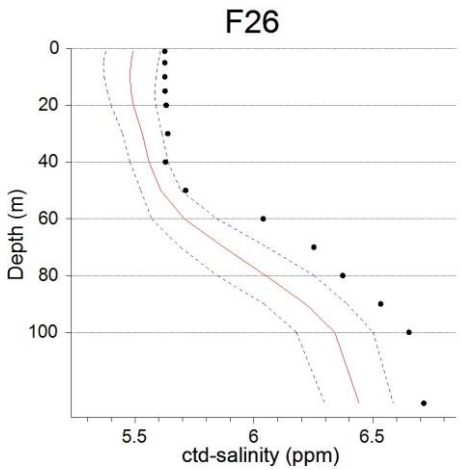

LL9
Depth (m)
0
10
20
30
40
50
60
5
6
7
8
9
ctd-salinity (ppm)

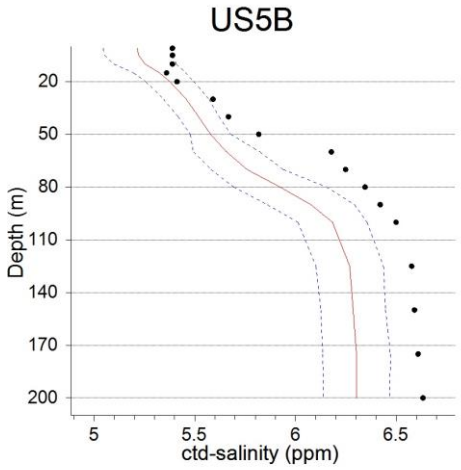

LL11
Depth (m)
0
10
20
30
40
50
60
5.5
6
6.5
7
7.5
8
8.5
9
ctd-salinity (ppm)

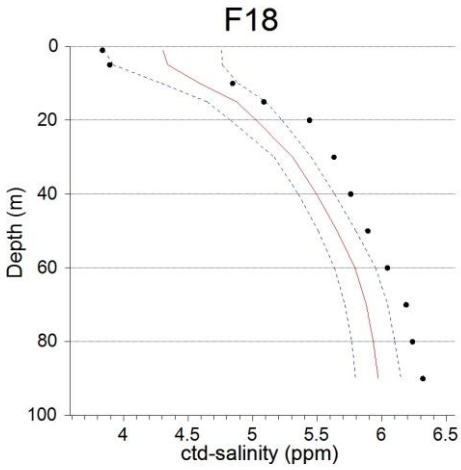

IU7
Depth (m)
0
10
20
30
40
50
60
70
80
6.5
7
7.5
ctd-salinity (ppm)

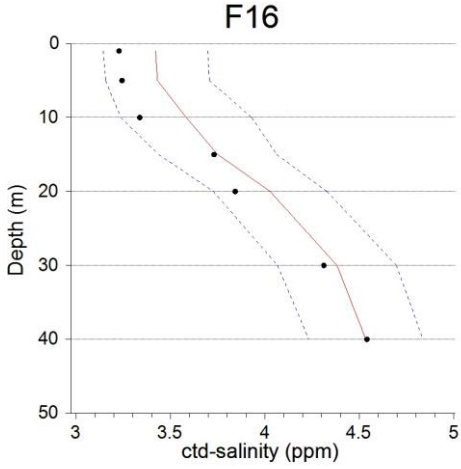

IU5
Depth (m)
0
10
20
30
40
50
60
70
80
6
6.2
6.4
6.6
6.8
ctd-salinity (ppm)

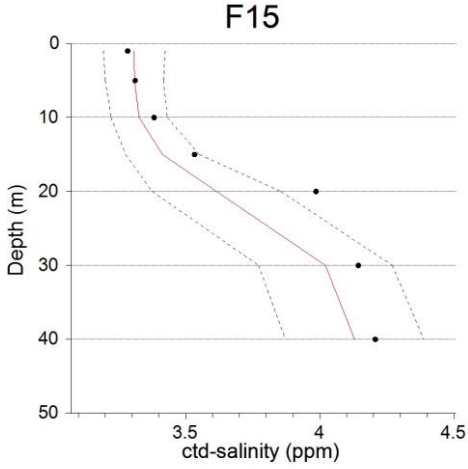

SR5
Depth (m)
0
20
40
60
80
100
5.5
6
6.5
ctd-salinity (ppm)

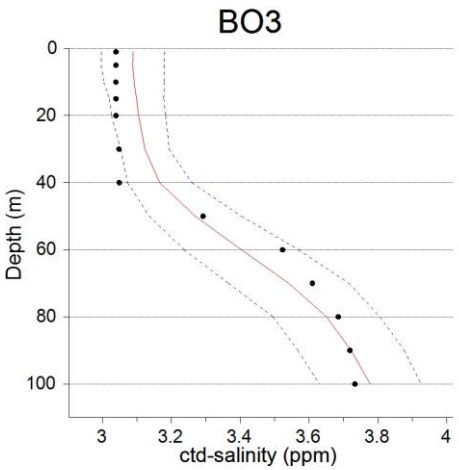

F26
Depth (m)
0
20
40
60
80
100
5.5
6
6.5
ctd-salinity (ppm)

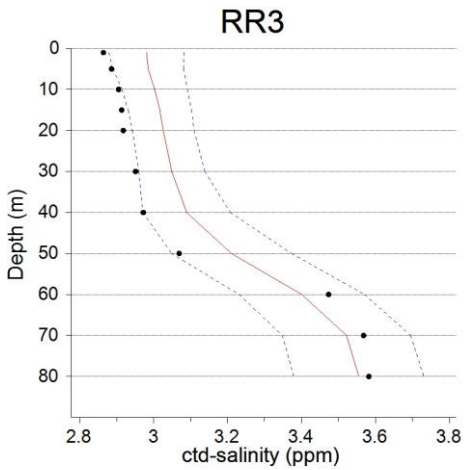

US5B
Depth (m)
20
50
80
110
140
170
200
5
5.5
6
6.5
ctd-salinity (ppm)

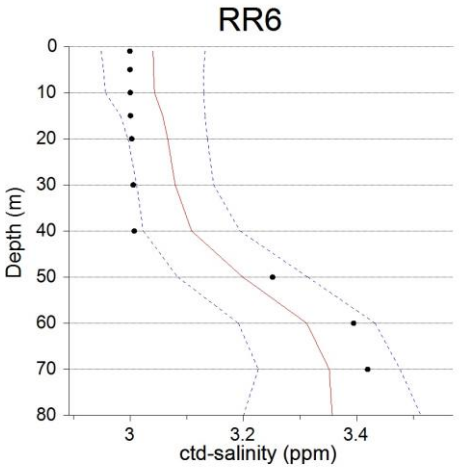

F18
Depth (m)
0
20
40
60
80
100
4
4.5
5
5.5
6
6.5
ctd-salinity (ppm)

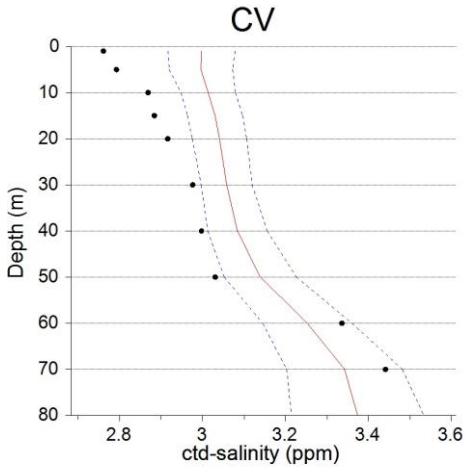

F16
Depth (m)
0
10
20
30
40
50
3
3.5
4
4.5
5
ctd-salinity (ppm)

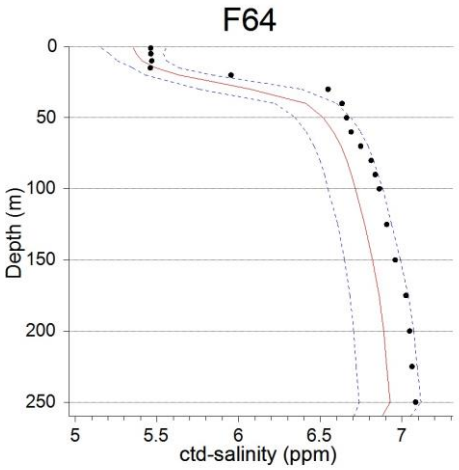

F15
Depth (m)
0
10
20
30
40
50
3.5
4
4.5
ctd-salinity (ppm)

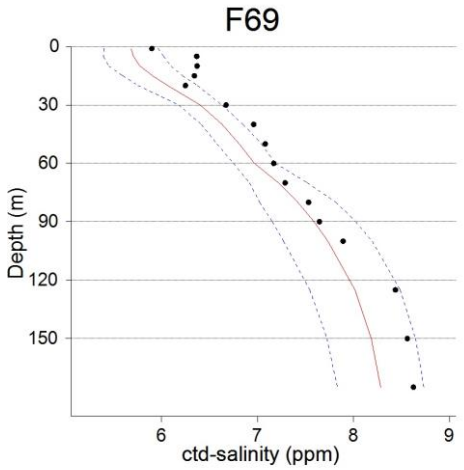

BO3
Depth (m)
0
20
40
60
80
100
3
3.2
3.4
3.6
3.8
4
ctd-salinity (ppm)

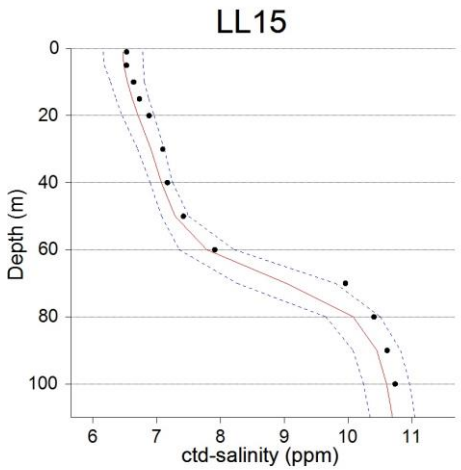

RR3
Depth (m)
0
10
20
30
40
50
60
70
80
2.8
3
3.2
3.4
3.6
3.8
ctd-salinity (ppm)

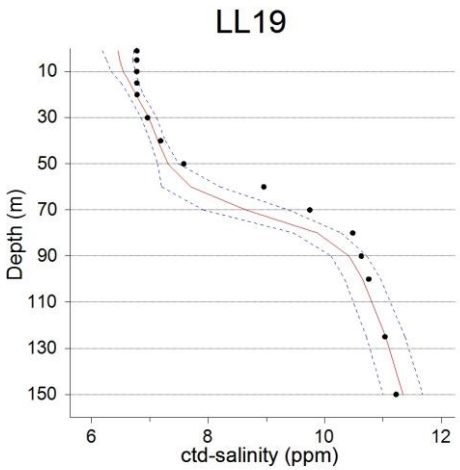

RR6
Depth (m)
0
10
20
30
40
50
60
70
80
3
3.2
3.4
ctd-salinity (ppm)


CV
Depth (m)
0
10
20
30
40
50
60
70
80
2.8
3
3.2
3.4
3.6
ctd-salinity (ppm)

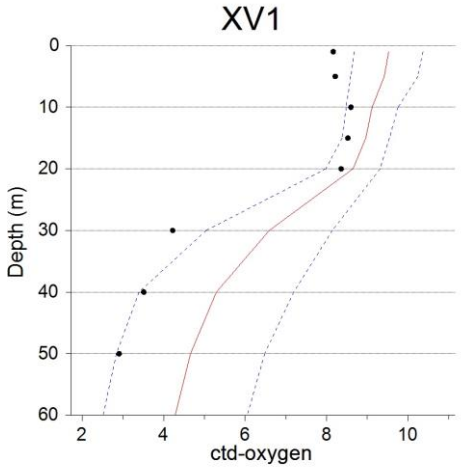

F64
Depth (m)
0
50
100
150
200
250
5
5.5
6
6.5
7
ctd-salinity (ppm)

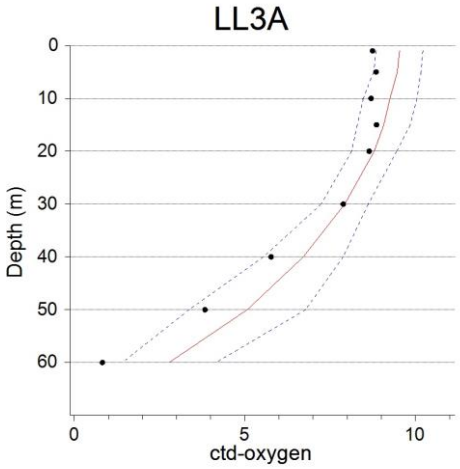

F69
Depth (m)
0
30
60
90
120
150
6
7
8
9
ctd-salinity (ppm)

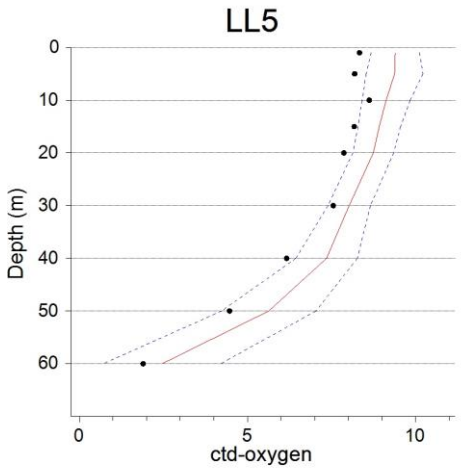

LL15
Depth (m)
ctd-salinity (ppm)

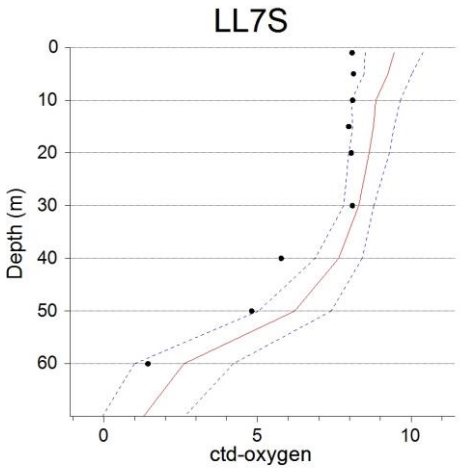

LL19
Depth (m)
ctd-salinity (ppm)

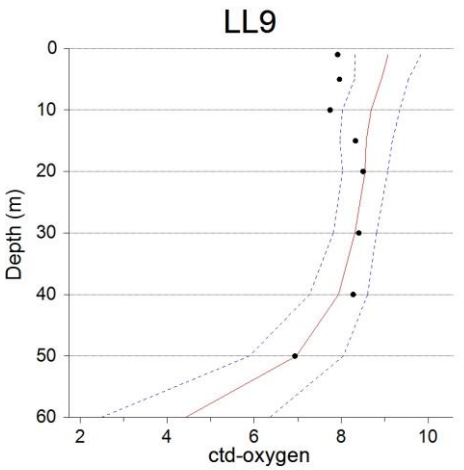
Oxygen:

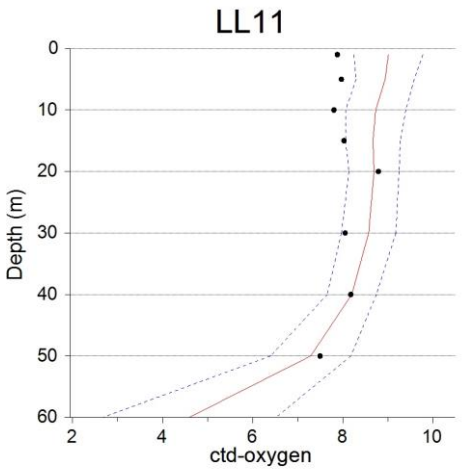

XV1
Depth (m)
ctd-oxygen

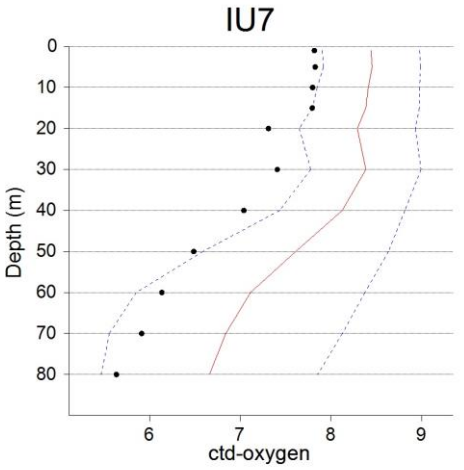

LL3A
Depth (m)
ctd-oxygen

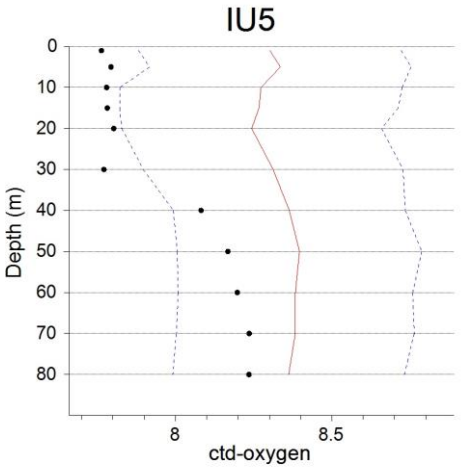

LL5
Depth (m)
ctd-oxygen

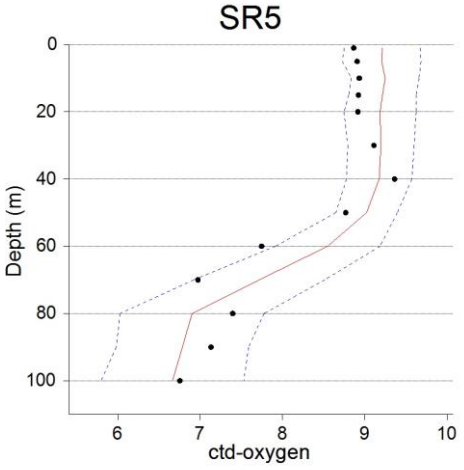

LL7S
Depth (m)
ctd-oxygen

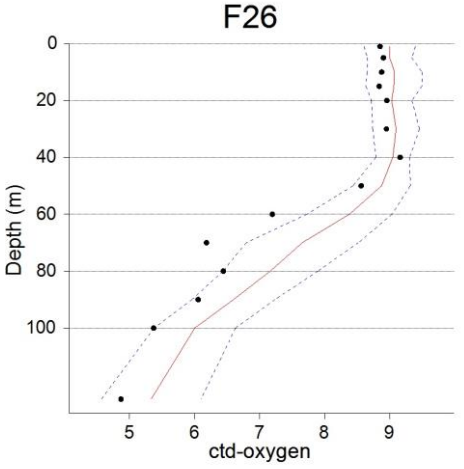

LL9
Depth (m)
0
10
20
30
40
50
60
2
4
6
8
10
ctd-oxygen

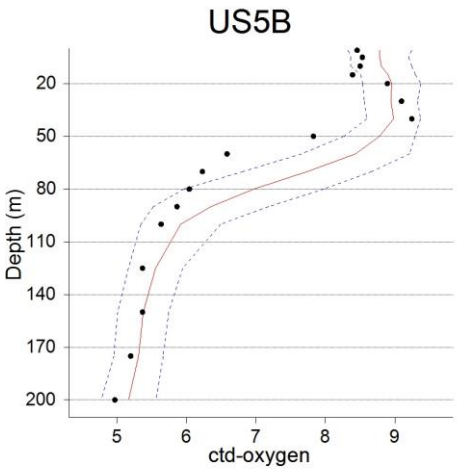

LL11
Depth (m)
0
10
20
30
40
50
60
2
4
6
8
10
ctd-oxygen

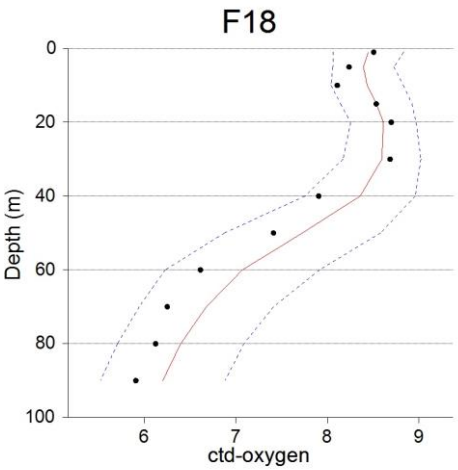

IU7
Depth (m)
0
10
20
30
40
50
60
70
80
6
7
8
9
ctd-oxygen

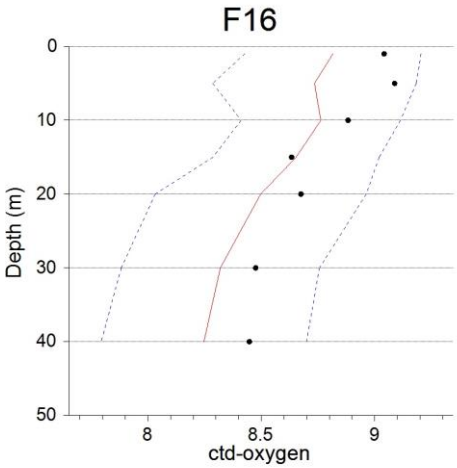

IU5
Depth (m)
0
10
20
30
40
50
60
70
80
8
8.5
ctd-oxygen

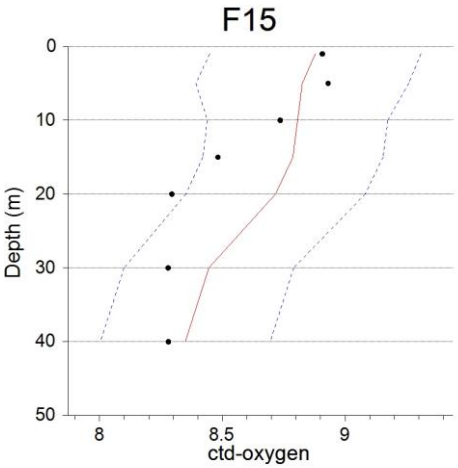

SR5
Depth (m)
0
20
40
60
80
100
6
7
8
9
10
ctd-oxygen

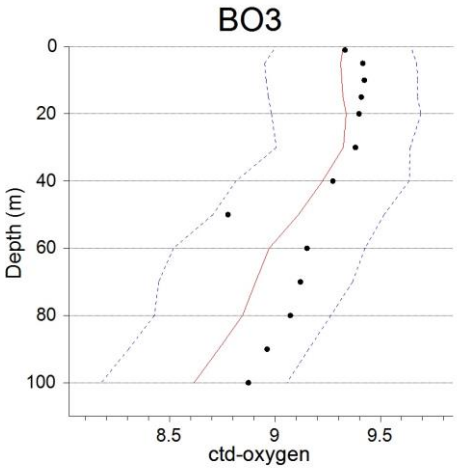

F26
Depth (m)
0
20
40
60
80
100
5
6
7
8
9
ctd-oxygen

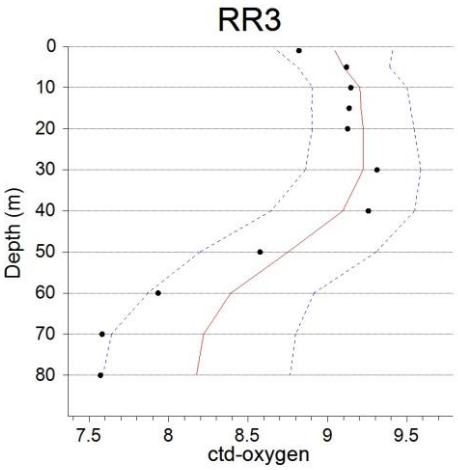

US5B
Depth (m)
20
50
80
110
140
170
200
5
6
7
8
9
ctd-oxygen

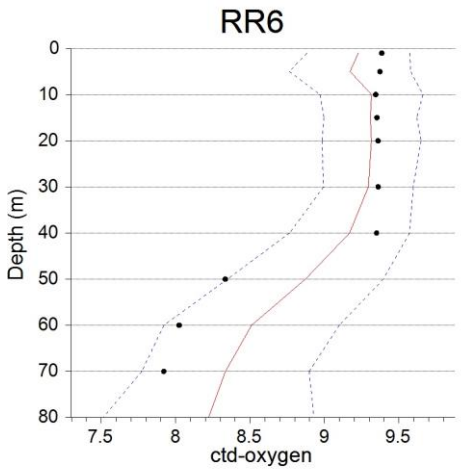

F18
Depth (m)
0
20
40
60
80
100
6
7
8
9
ctd-oxygen

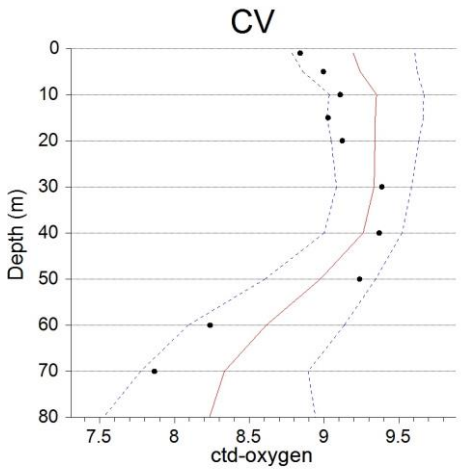

F16
Depth (m)
0
10
20
30
40
50
8
8.5
9
ctd-oxygen

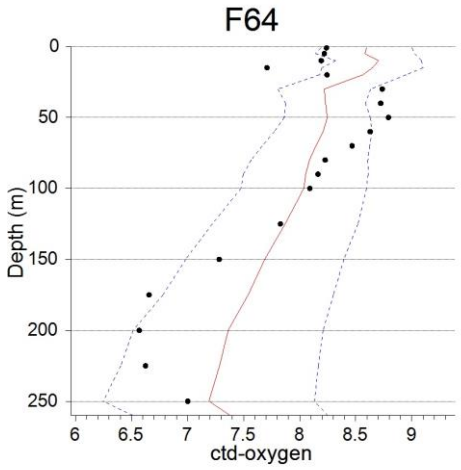

F15
Depth (m)
0
10
20
30
40
50
8
8.5
9
ctd-oxygen

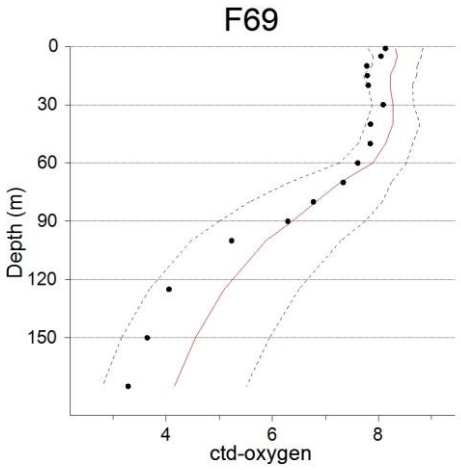

BO3
Depth (m)
0
20
40
60
80
100
8.5
9
9.5
ctd-oxygen

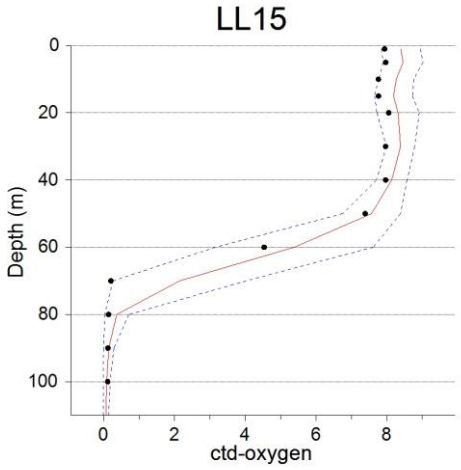

RR3
Depth (m)
0
10
20
30
40
50
60
70
80
7.5
8
8.5
9
9.5
ctd-oxygen

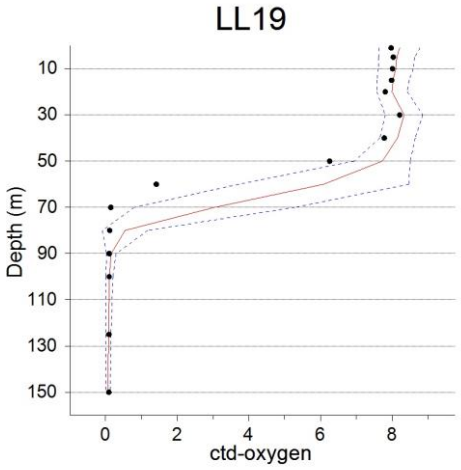

RR6
Depth (m)
0
10
20
30
40
50
60
70
80
7.5
8
8.5
9
9.5
ctd-oxygen


CV
Depth (m)
0
10
20
30
40
50
60
70
80
7.5
8
8.5
9
9.5
ctd-oxygen

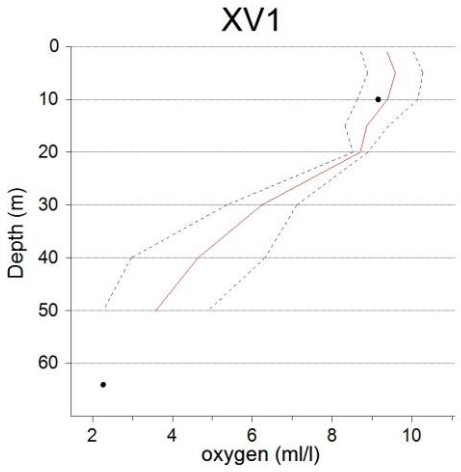

F64
Depth (m)
0
50
100
150
200
250
6
6.5
7
7.5
8
8.5
9
ctd-oxygen

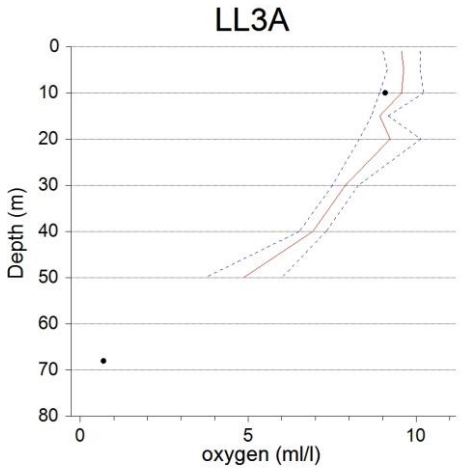

F69
Depth (m)
0
30
60
90
120
150
4
6
8
ctd-oxygen

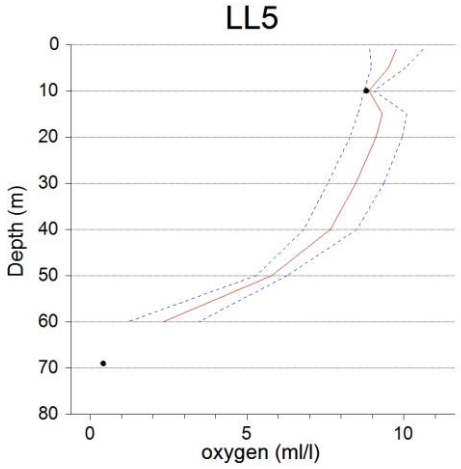

LL15
Depth (m)
0
20
40
60
80
100
0
2
4
6
8
ctd-oxygen

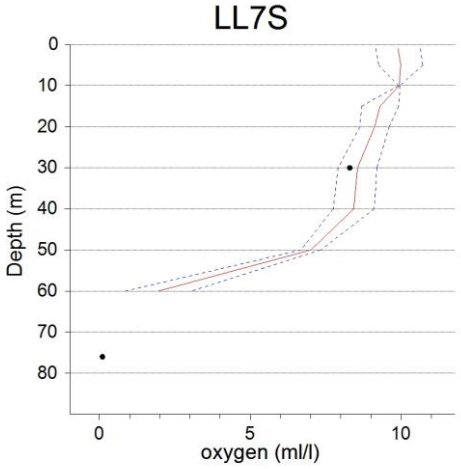

LL19
Depth (m)
10
30
50
70
90
110
130
150
0
2
4
6
8
ctd-oxygen

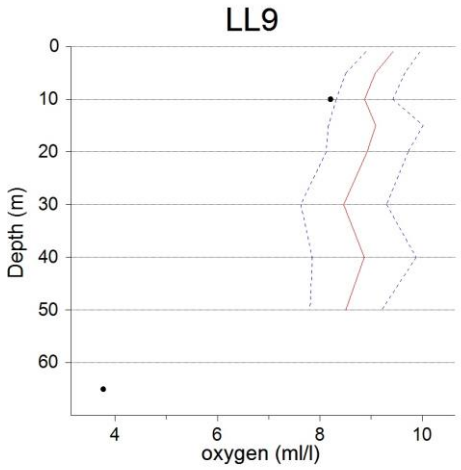
Bottom water oxygen:

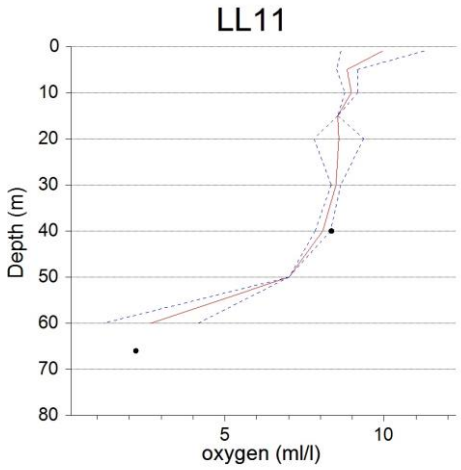


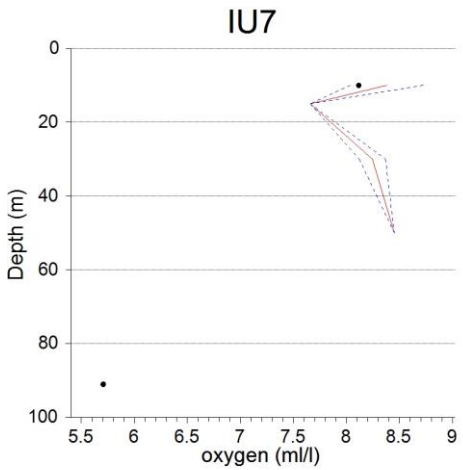


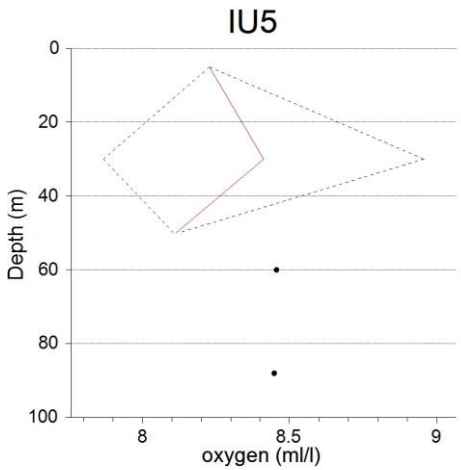


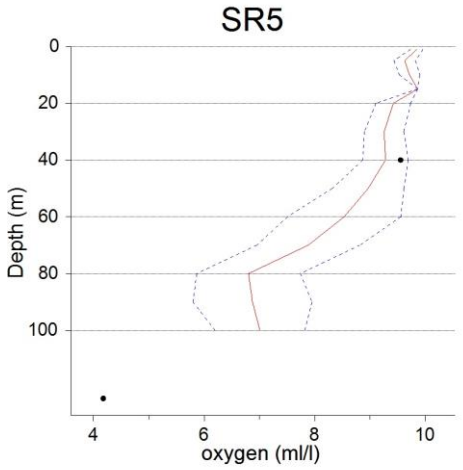


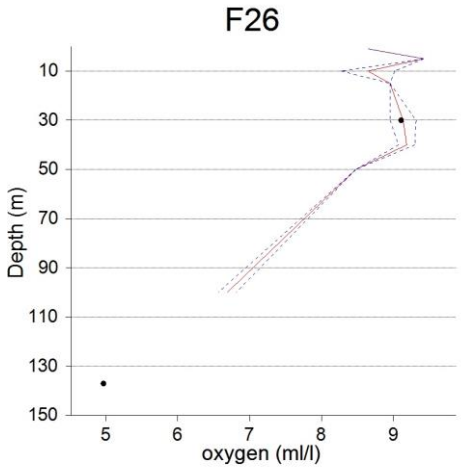


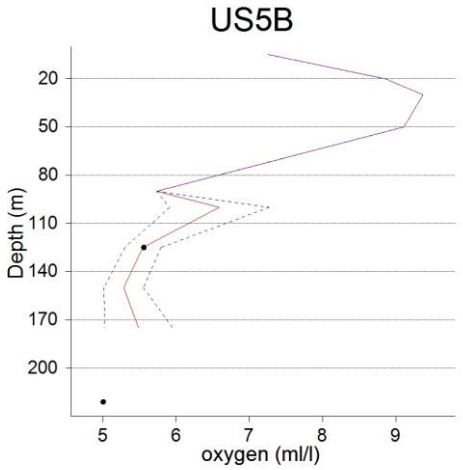


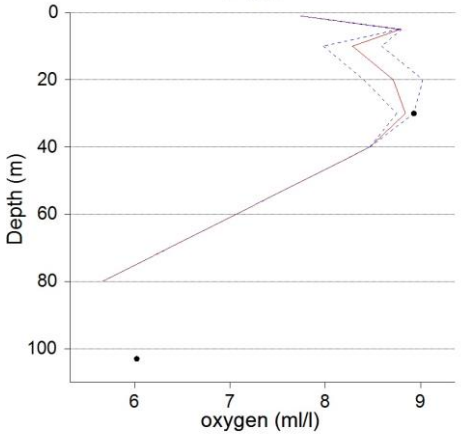

IU7
Depth (m)
0
20
40
60
80
100
5.5
6
6.5
7
7.5
8
8.5
9
oxygen (ml/l)

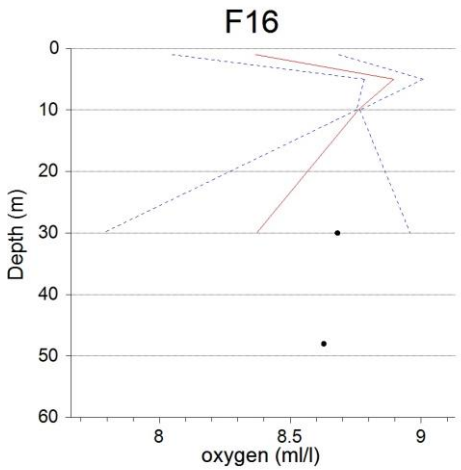

IU5
Depth (m)
0
20
40
60
80
100
8
8.5
9
oxygen (ml/l)

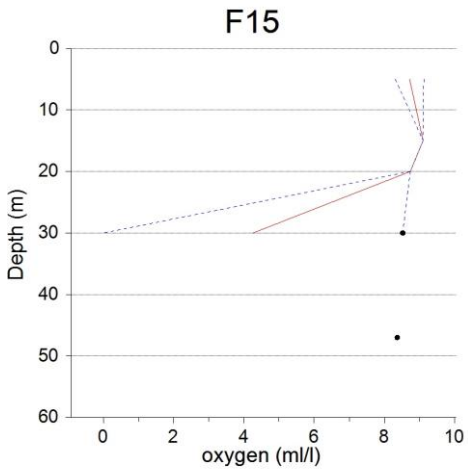

SR5
Depth (m)
0
20
40
60
80
100
4
6
8
10
oxygen (ml/l)

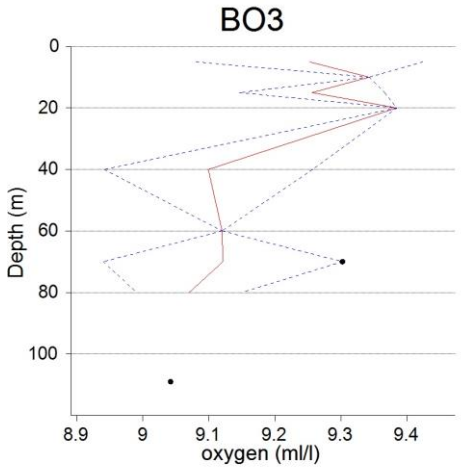

F26
Depth (m)
10
30
50
70
90
110
130
150
5
6
7
8
9
oxygen (ml/l)

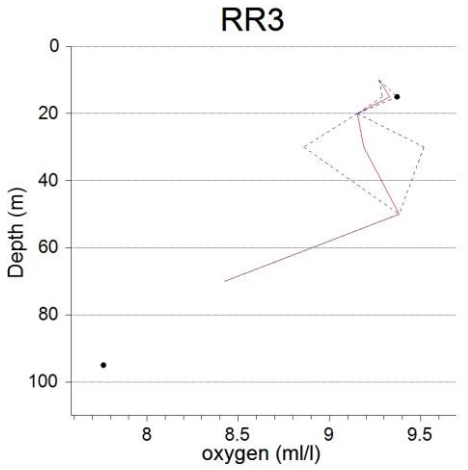

US5B
Depth (m)
20
50
80
110
140
170
200
5
6
7
8
9
oxygen (ml/l)

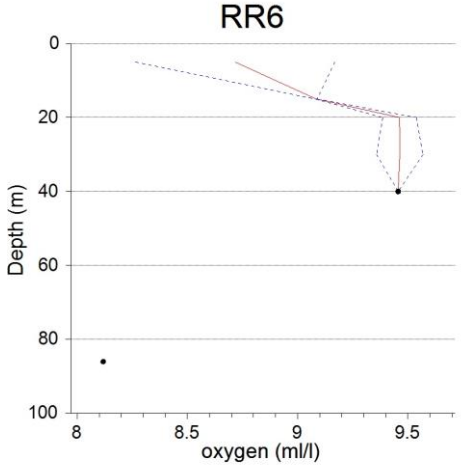

F18
Depth (m)
0
20
40
60
80
100
6
7
8
9
oxygen (ml/l)

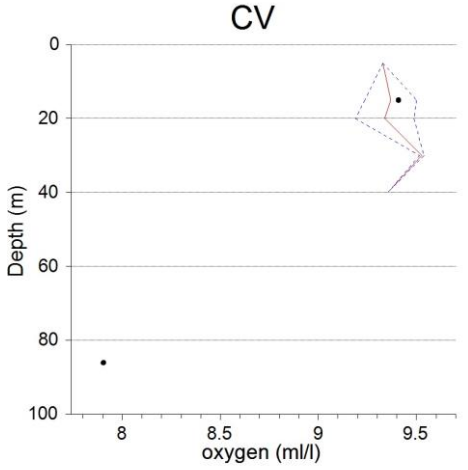

F16
Depth (m)
0
10
20
30
40
50
60
8
8.5
9
oxygen (ml/l)

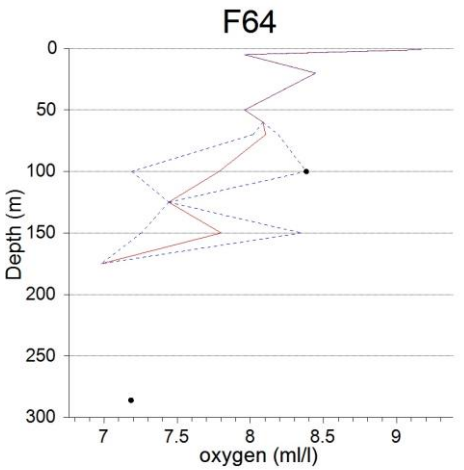

F15
Depth (m)
0
10
20
30
40
50
60
0
2
4
6
8
10
oxygen (ml/l)

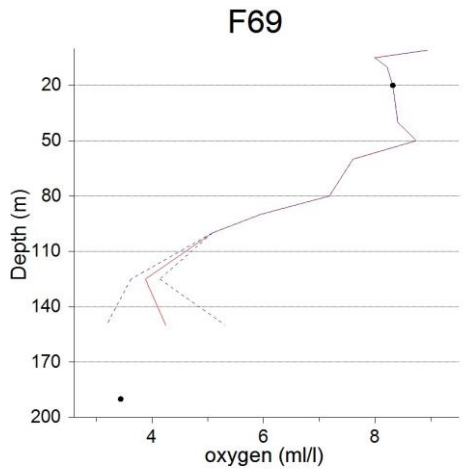

BO3
Depth (m)
0
20
40
60
80
100
8.9
9
9.1
9.2
9.3
9.4
oxygen (ml/l)

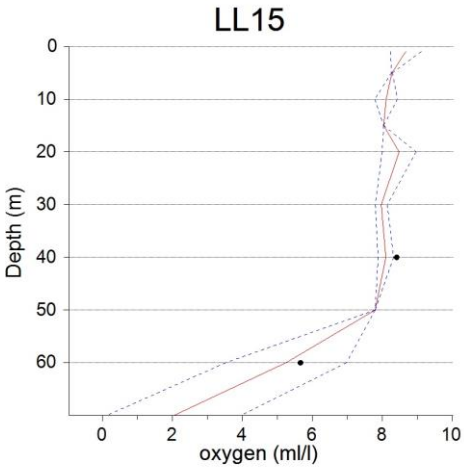

RR3
Depth (m)
0
20
40
60
80
100
8
8.5
9
9.5
oxygen (ml/l)

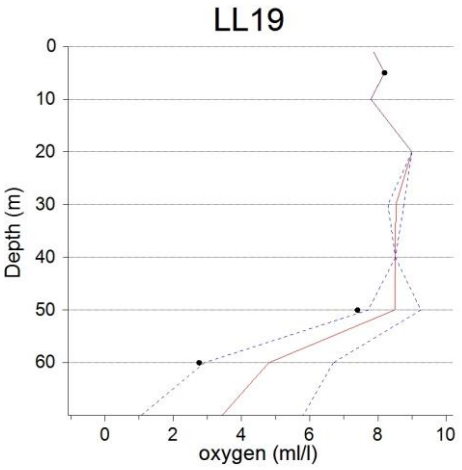

RR6
Depth (m)
0
20
40
60
80
100
8
8.5
9
9.5
oxygen (ml/l)


CV
Depth (m)
0
20
40
60
80
100
8
8.5
9
9.5
oxygen (ml/l)

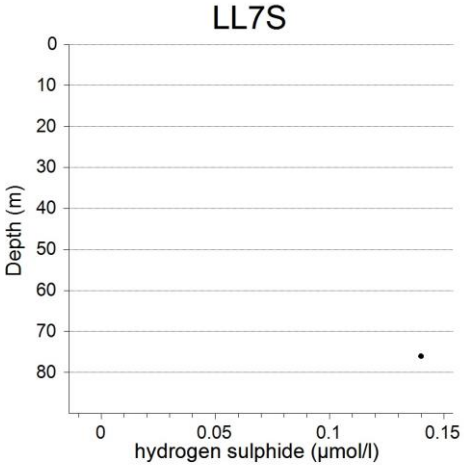


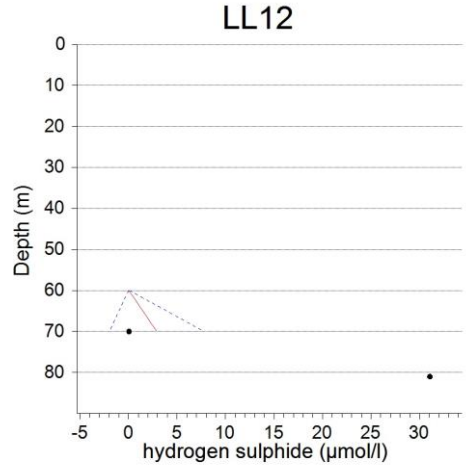


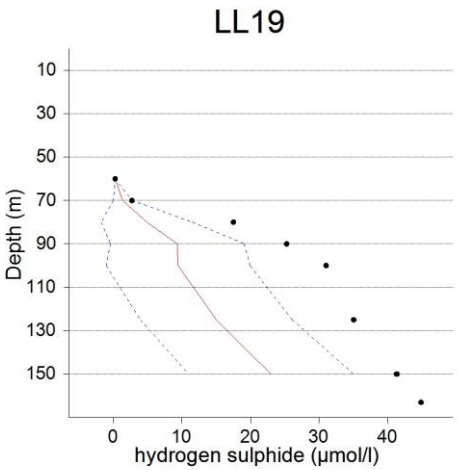


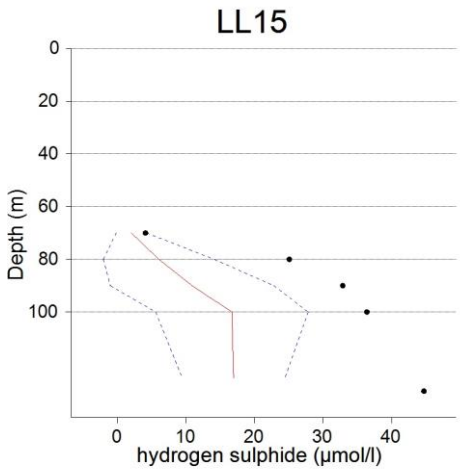


Hydrogen sulphide:

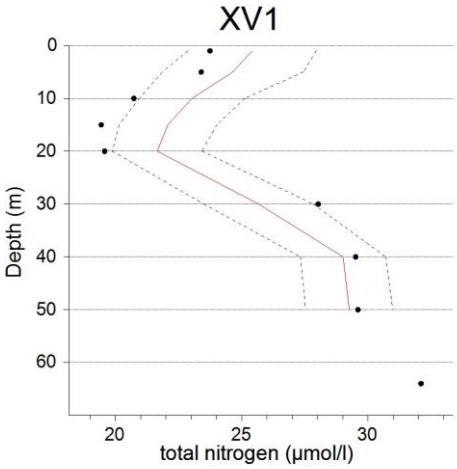


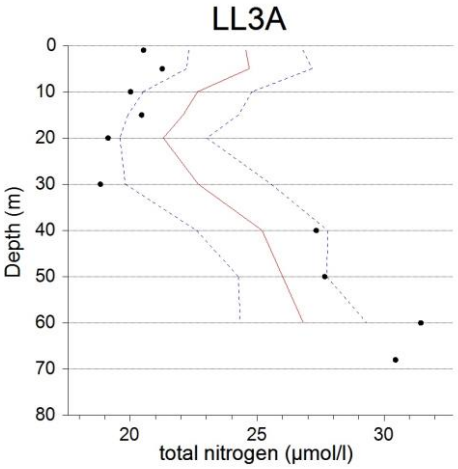


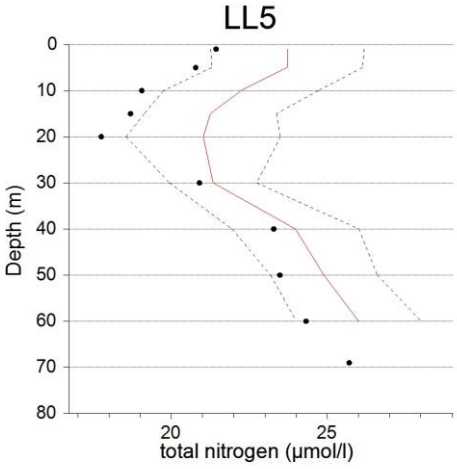


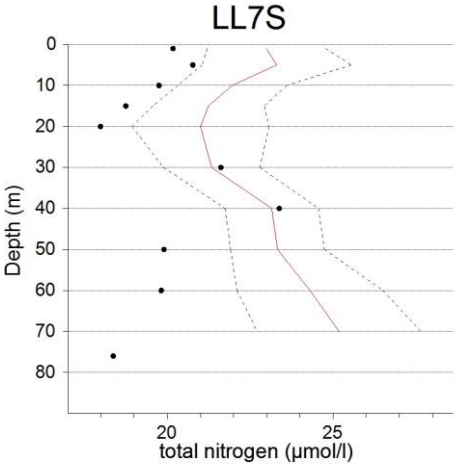


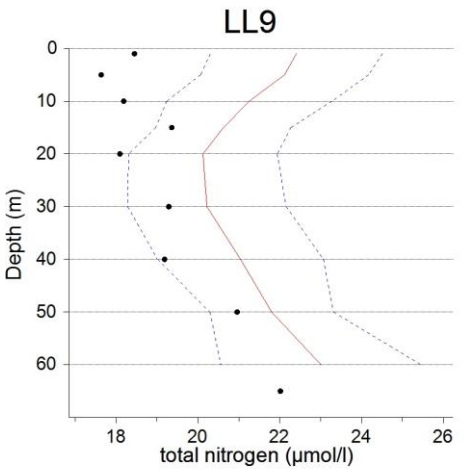
Total nitrogen:

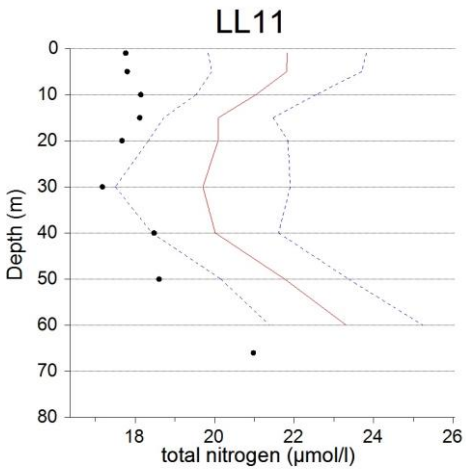


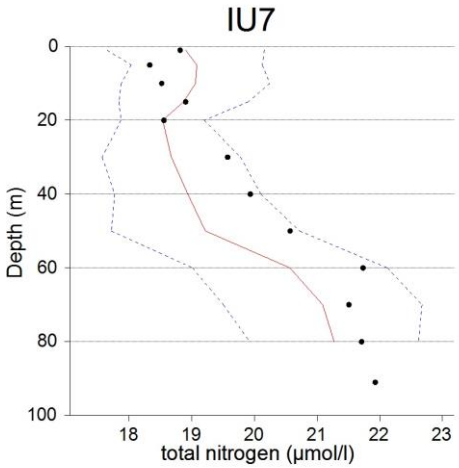


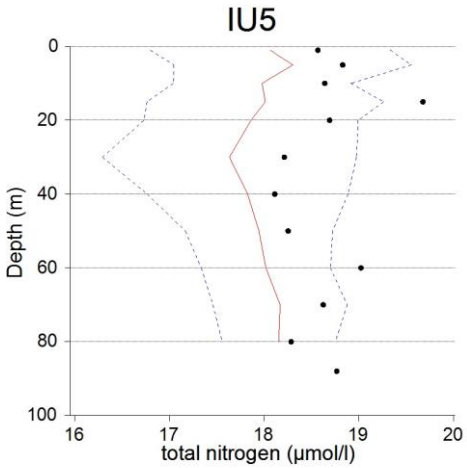


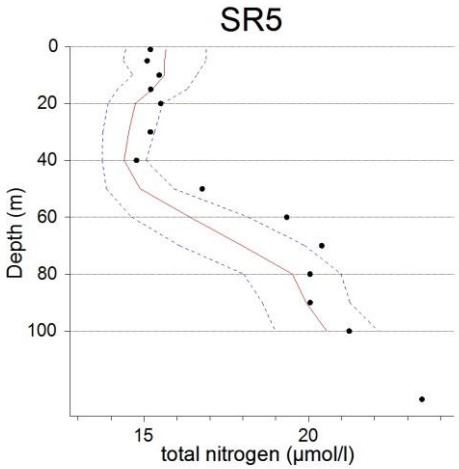


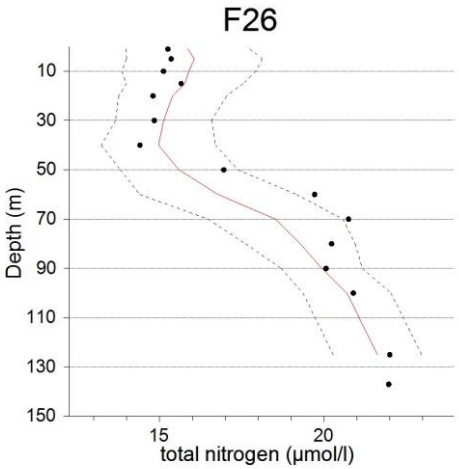

LL9
Depth (m)
0
10
20
30
40
50
60
18
20
22
24
26
total nitrogen (µmol/l)

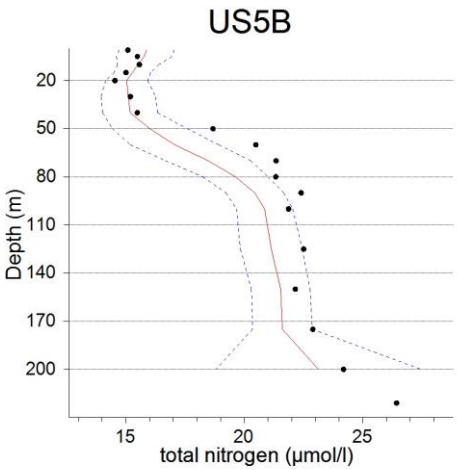

LL11
Depth (m)
0
10
20
30
40
50
60
70
80
18
20
22
24
26
total nitrogen (µmol/l)

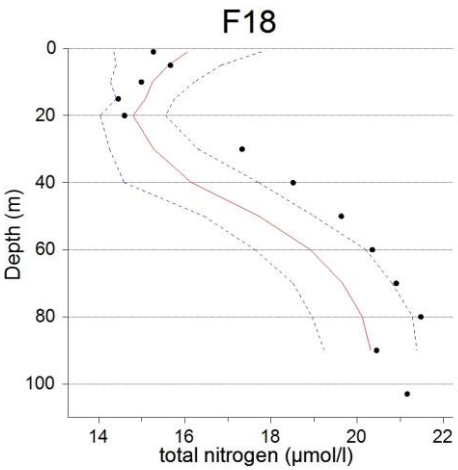

IU7
Depth (m)
0
20
40
60
80
100
18
19
20
21
22
23
total nitrogen (µmol/l)

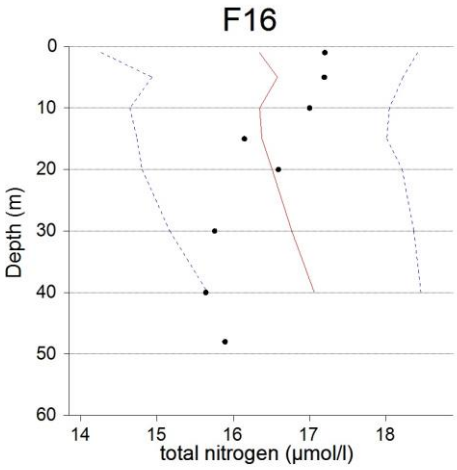

IU5
Depth (m)
0
20
40
60
80
100
16
17
18
19
20
total nitrogen (µmol/l)

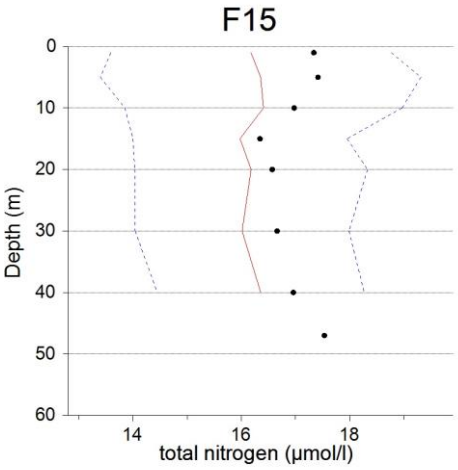

SR5
Depth (m)
0
20
40
60
80
100
15
20
total nitrogen (µmol/l)

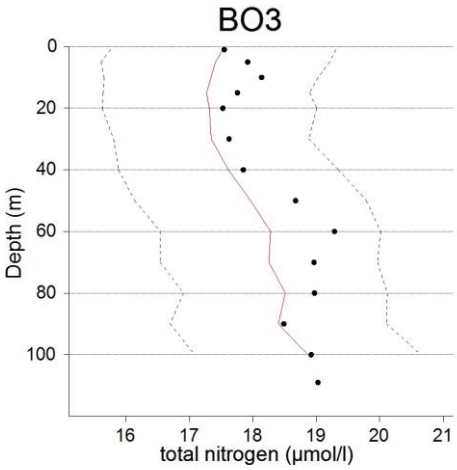

F26
Depth (m)
10
30
50
70
90
110
130
150
15
20
total nitrogen (µmol/l)

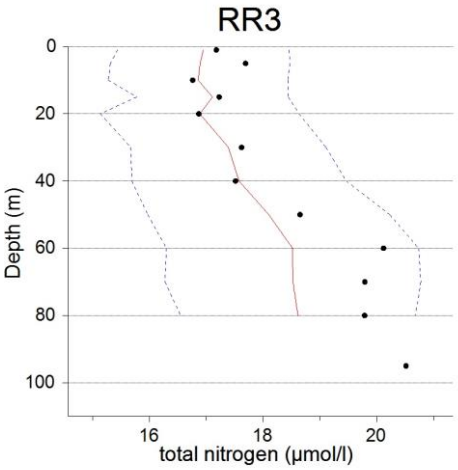

US5B
Depth (m)
20
50
80
110
140
170
200
15
20
25
total nitrogen (µmol/l)

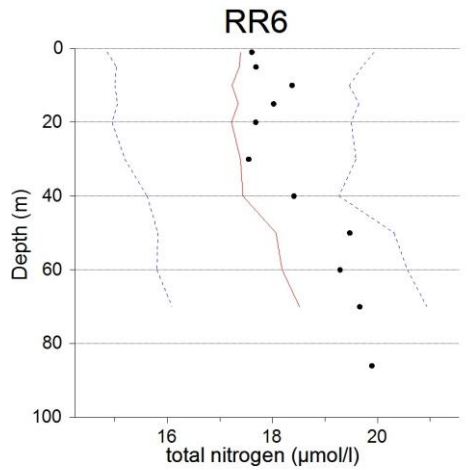

F18
Depth (m)
0
20
40
60
80
100
14
16
18
20
22
total nitrogen (µmol/l)

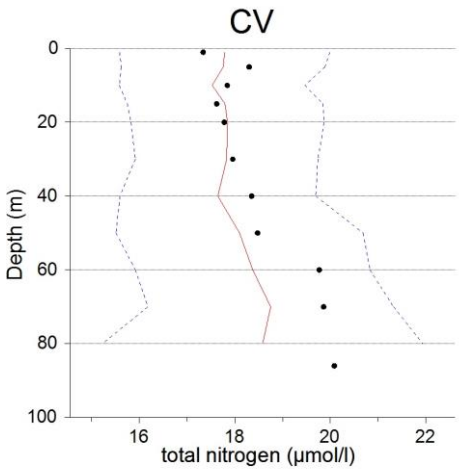

F16
Depth (m)
0
10
20
30
40
50
60
14
15
16
17
18
total nitrogen (µmol/l)

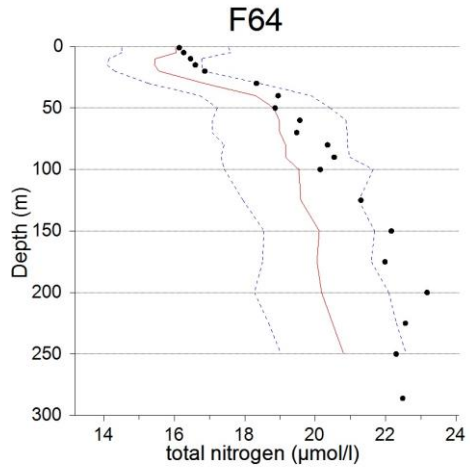

F15
Depth (m)
0
10
20
30
40
50
60
14
16
18
total nitrogen (µmol/l)

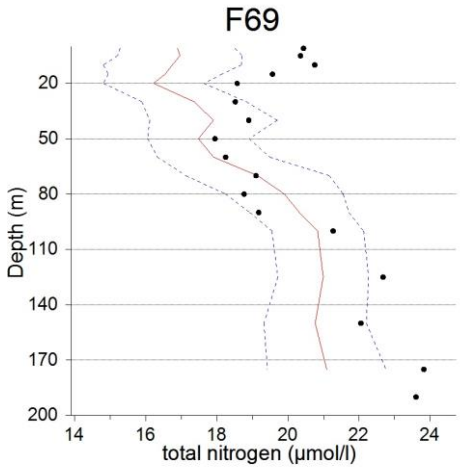

BO3
Depth (m)
0
20
40
60
80
100
16
17
18
19
20
21
total nitrogen (µmol/l)

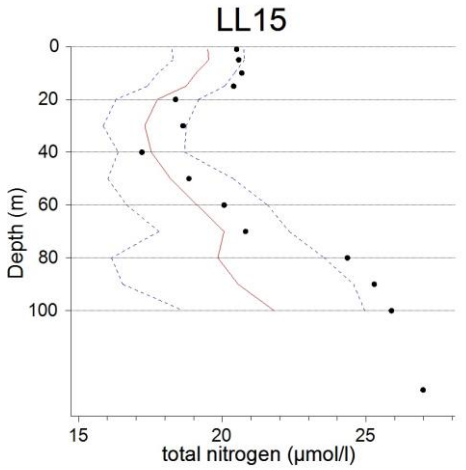

RR3
Depth (m)
0
20
40
60
80
100
16
18
20
total nitrogen (µmol/l)

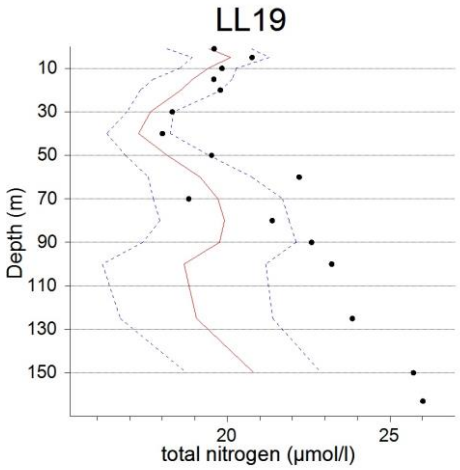

RR6
Depth (m)
0
20
40
60
80
100
16
18
20
total nitrogen (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
16
18
20
22
total nitrogen (µmol/l)

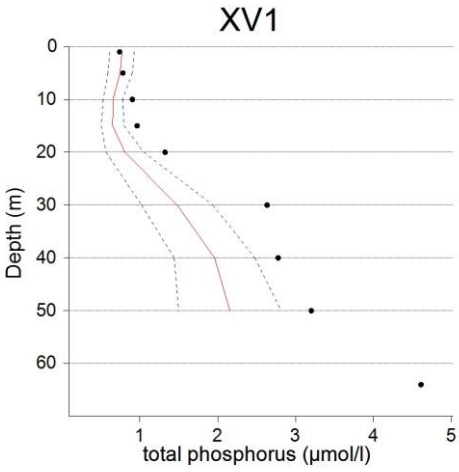

F64
Depth (m)
0
50
100
150
200
250
300
14
16
18
20
22
24
total nitrogen (µmol/l)

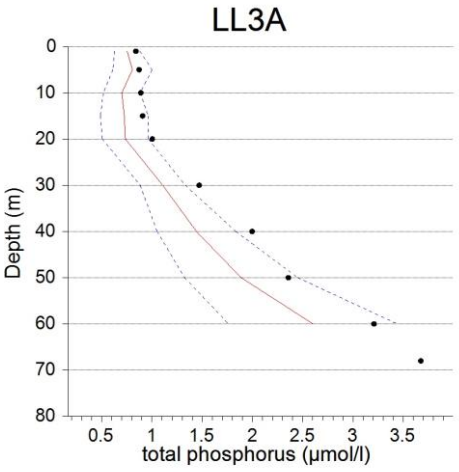

F69
Depth (m)
20
50
80
110
140
170
200
14
16
18
20
22
24
total nitrogen (µmol/l)

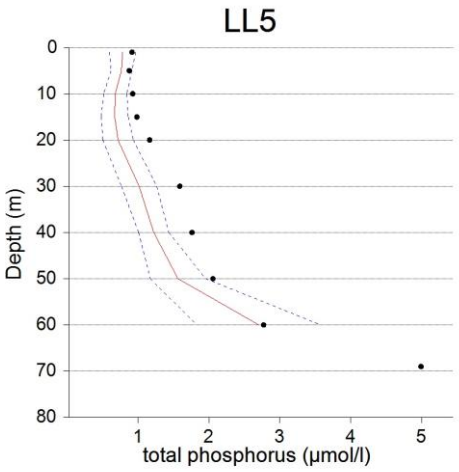

LL15
Depth (m)
0
20
40
60
80
100
15
20
25
total nitrogen (µmol/l)

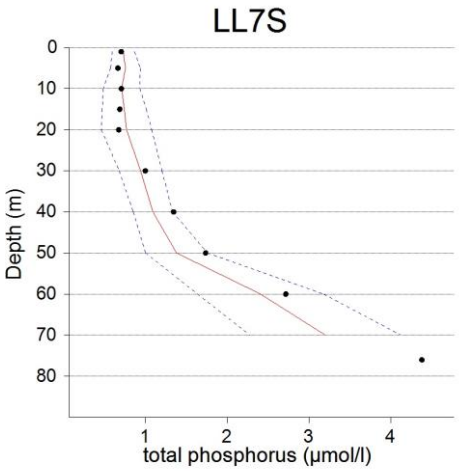

LL19
Depth (m)
10
30
50
70
90
110
130
150
20
25
total nitrogen (µmol/l)

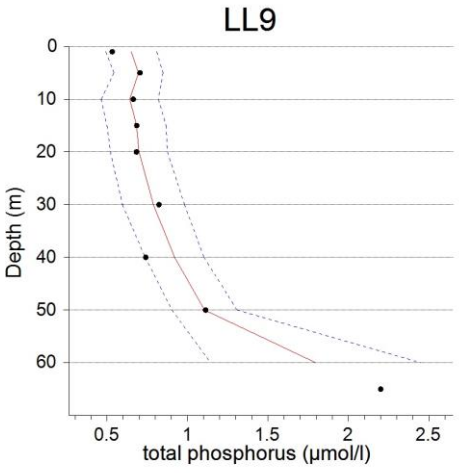
Total phosphorus:

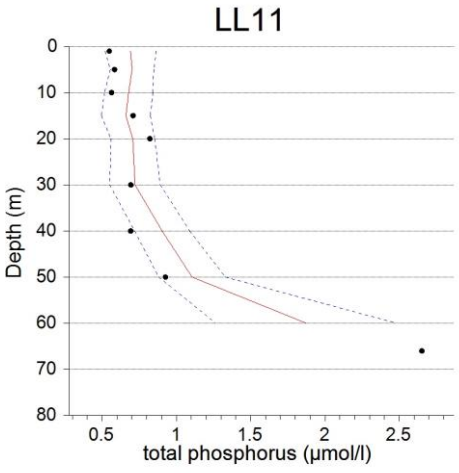


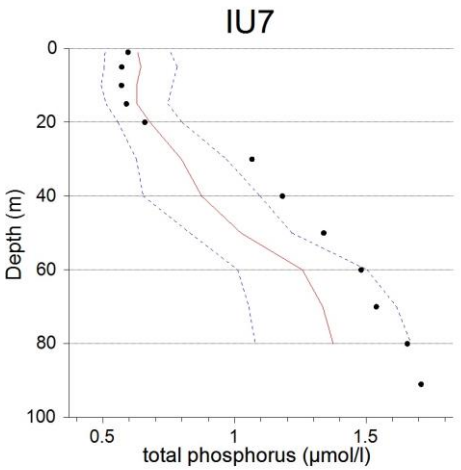


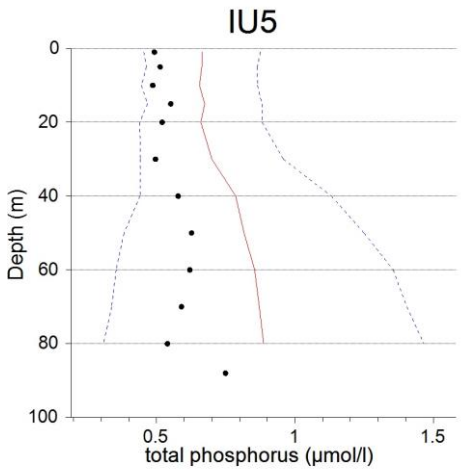


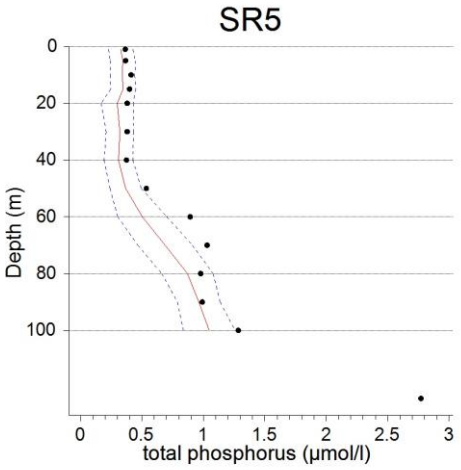


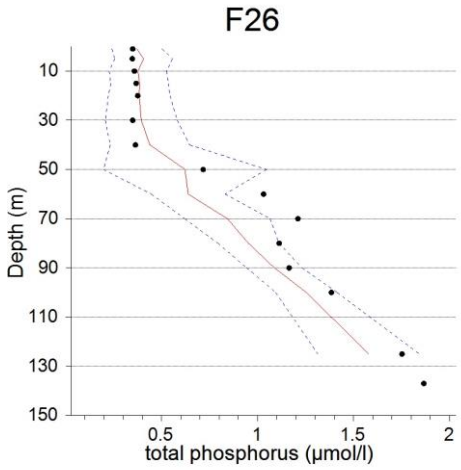


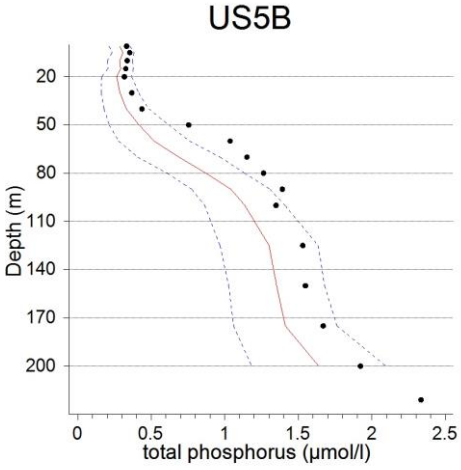


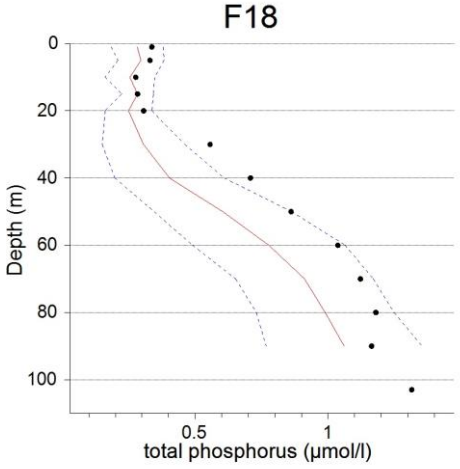

IU7
Depth (m)
0
20
40
60
80
100
0.5
1
1.5
total phosphorus (µmol/l)

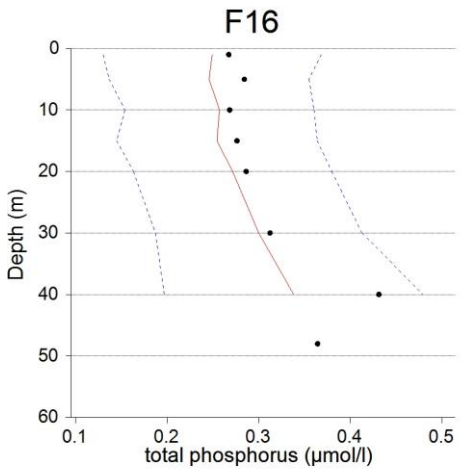

IU5
Depth (m)
0
20
40
60
80
100
0.5
1
1.5
total phosphorus (µmol/l)

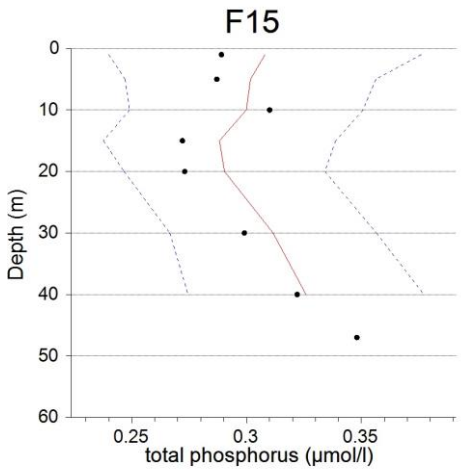

SR5
Depth (m)
0
20
40
60
80
100
0
0.5
1
1.5
2
2.5
3
total phosphorus (µmol/l)

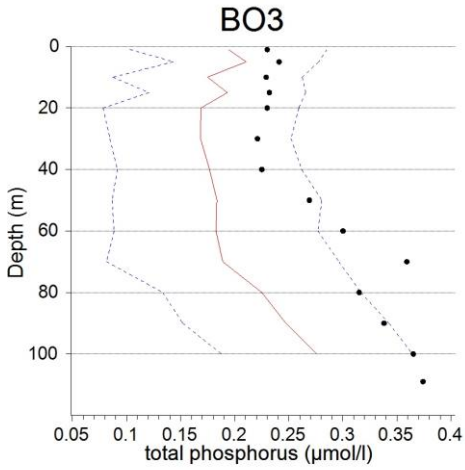

F26
Depth (m)
10
30
50
70
90
110
130
150
0.5
1
1.5
2
total phosphorus (µmol/l)

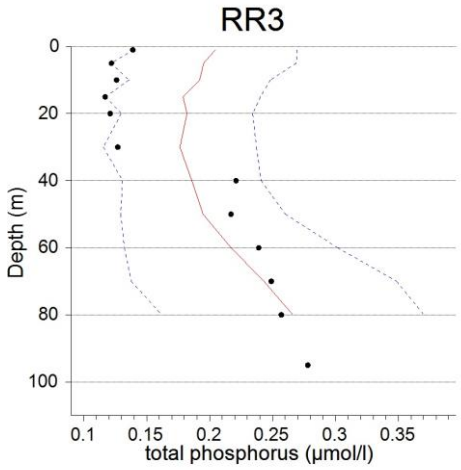

US5B
Depth (m)
20
50
80
110
140
170
200
0
0.5
1
1.5
2
2.5
total phosphorus (µmol/l)

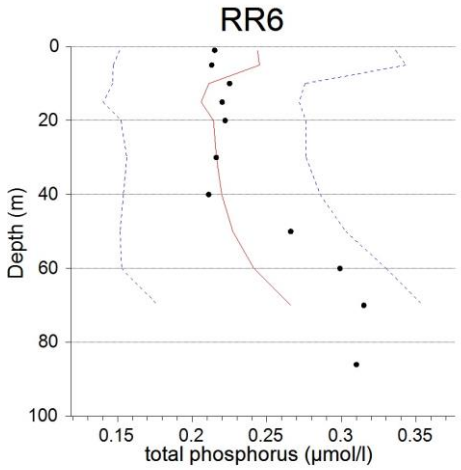

F18
Depth (m)
0
20
40
60
80
100
0.5
1
total phosphorus (µmol/l)

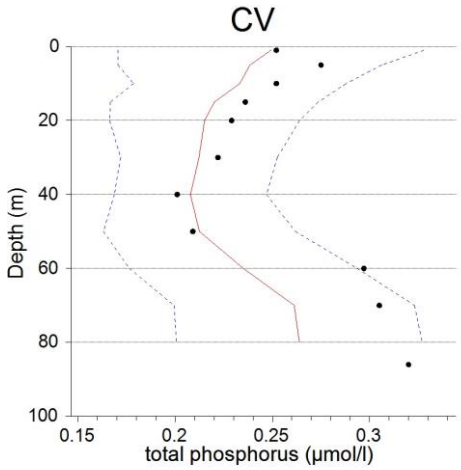

F16
Depth (m)
0
10
20
30
40
50
60
0.1
0.2
0.3
0.4
0.5
total phosphorus (µmol/l)

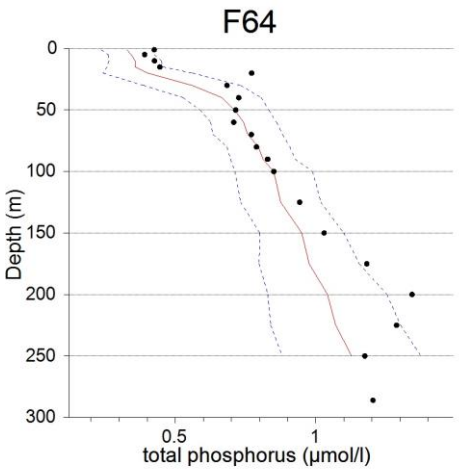

F15
Depth (m)
0
10
20
30
40
50
60
0.25
0.3
0.35
total phosphorus (µmol/l)

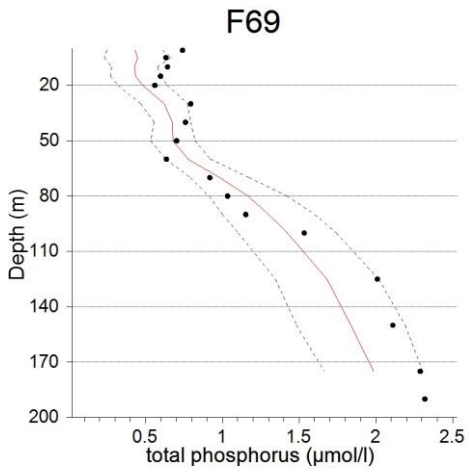

BO3
Depth (m)
0
20
40
60
80
100
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
total phosphorus (µmol/l)

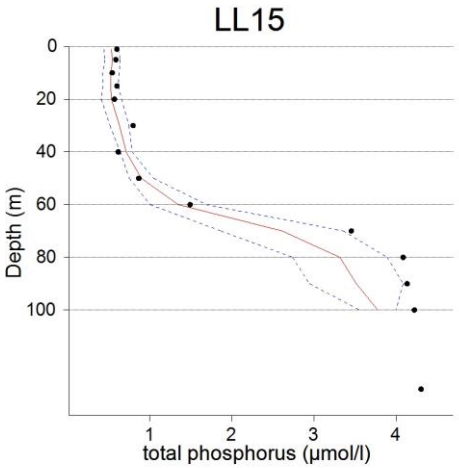

RR3
Depth (m)
0
20
40
60
80
100
0.1
0.15
0.2
0.25
0.3
0.35
total phosphorus (µmol/l)

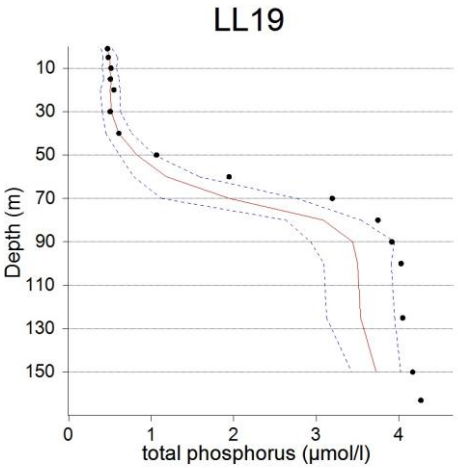

RR6
Depth (m)
0
20
40
60
80
100
0.15
0.2
0.25
0.3
0.35
total phosphorus (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
0.15
0.2
0.25
0.3
total phosphorus (µmol/l)

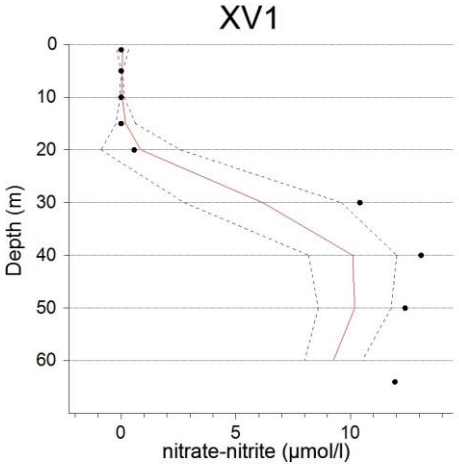


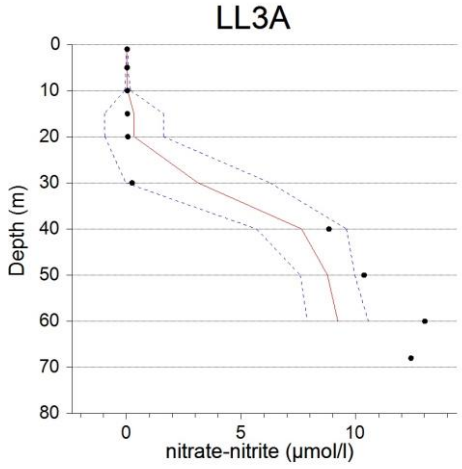


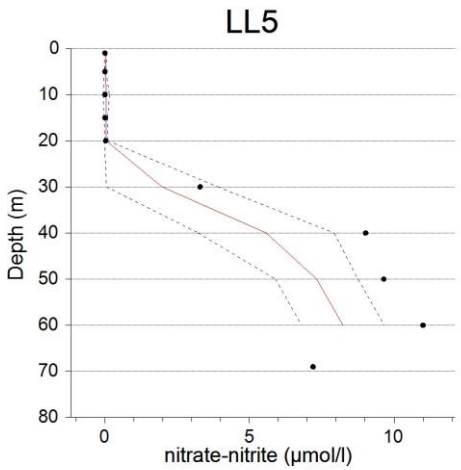


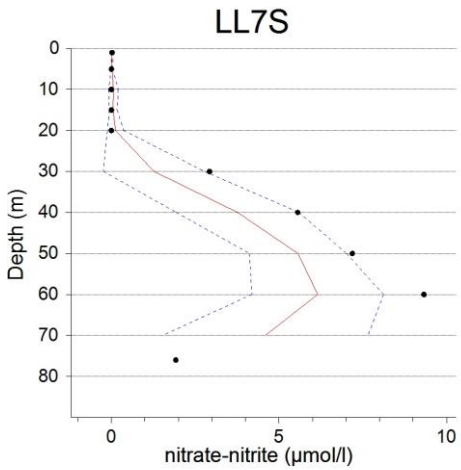


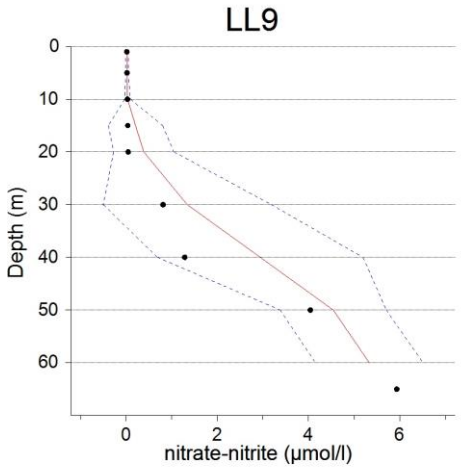
Nitrate-nitrite:

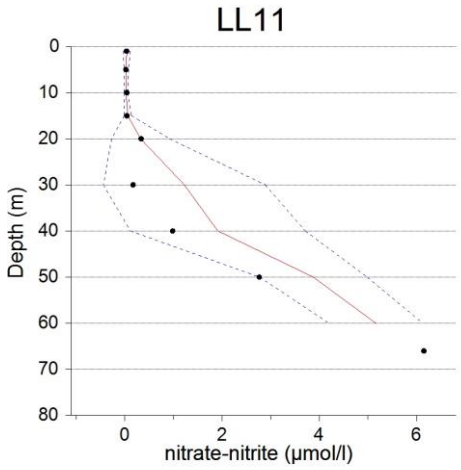


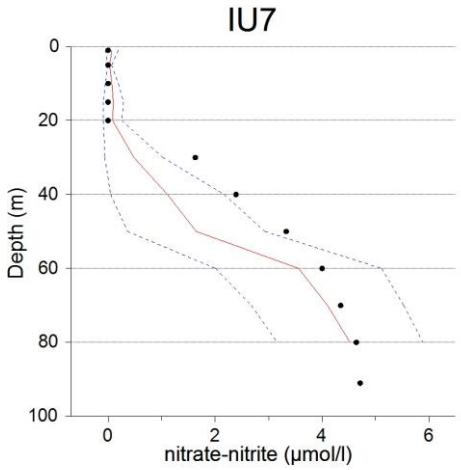


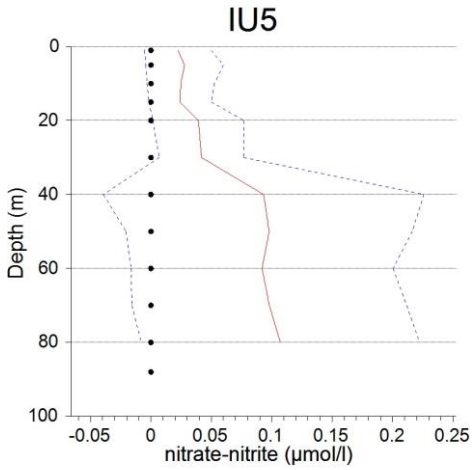

LL5
Depth (m)
0
10
20
30
40
50
60
70
80
0
5
10
nitrate-nitrite (µmol/l)

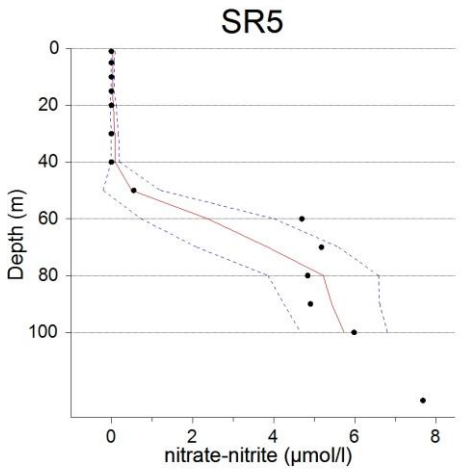

LL7S
Depth (m)
0
10
20
30
40
50
60
70
80
0
5
10
nitrate-nitrite (µmol/l)

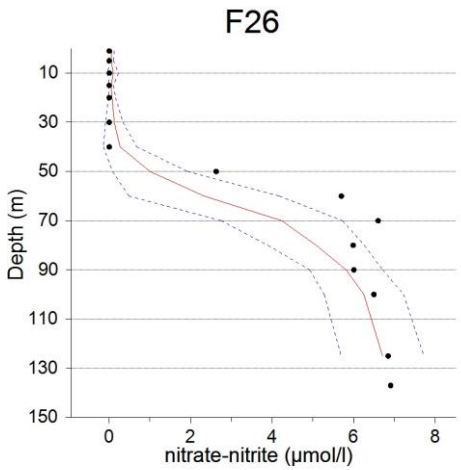

LL9
Depth (m)
0
10
20
30
40
50
60
0
2
4
6
nitrate-nitrite (µmol/l)

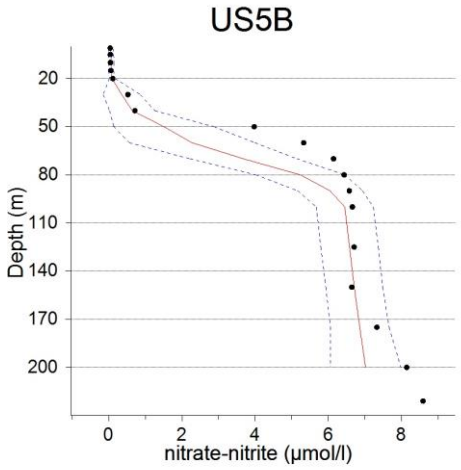

LL11
Depth (m)
0
10
20
30
40
50
60
70
80
0
2
4
6
nitrate-nitrite (µmol/l)

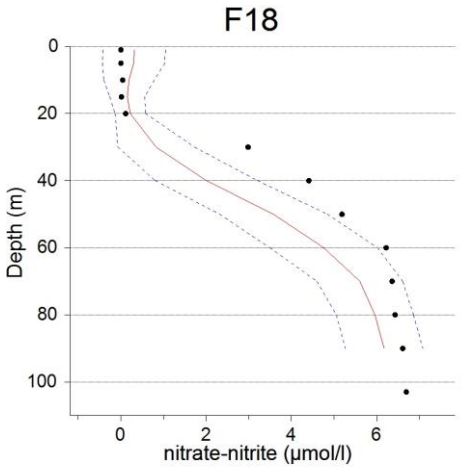

IU7
Depth (m)
0
20
40
60
80
100
0
2
4
6
nitrate-nitrite (µmol/l)

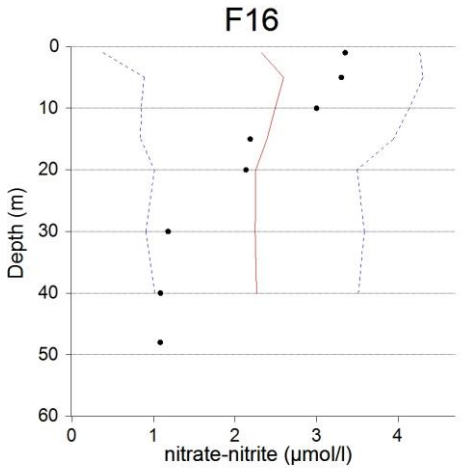

IU5
Depth (m)
0
20
40
60
80
100
-0.05
0
0.05
0.1
0.15
0.2
0.25
nitrate-nitrite (µmol/l)

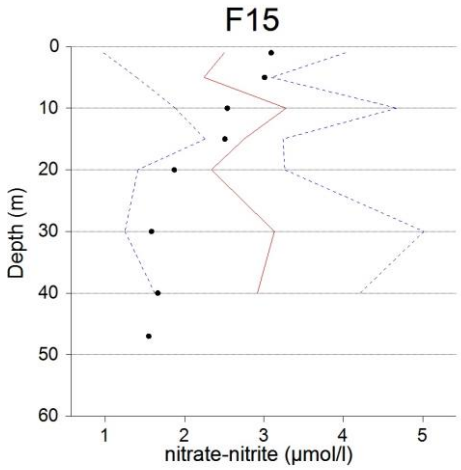

SR5
Depth (m)
0
20
40
60
80
100
0
2
4
6
8
nitrate-nitrite (µmol/l)

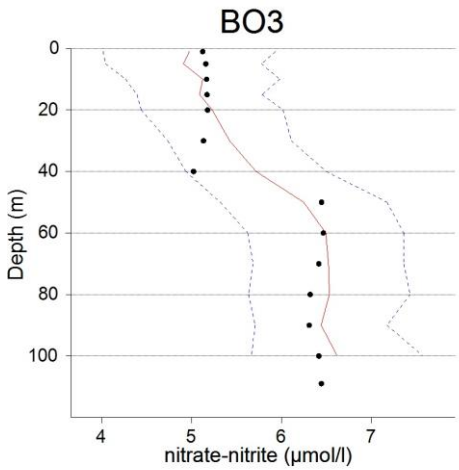

F26
Depth (m)
10
30
50
70
90
110
130
150
0
2
4
6
8
nitrate-nitrite (µmol/l)

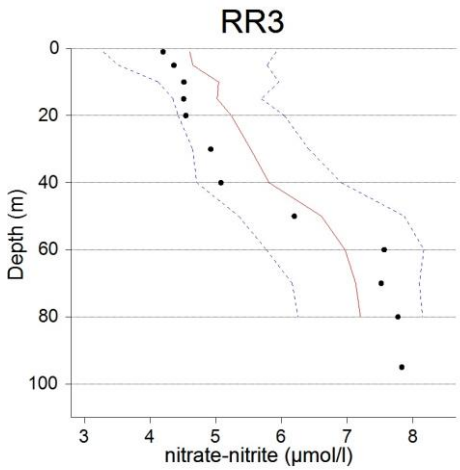

US5B
Depth (m)
20
50
80
110
140
170
200
0
2
4
6
8
nitrate-nitrite (µmol/l)

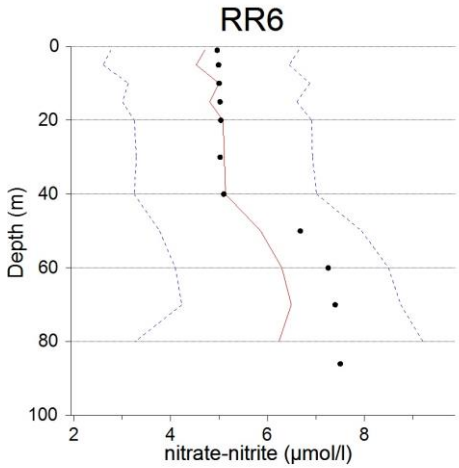

F18
Depth (m)
0
20
40
60
80
100
0
2
4
6
nitrate-nitrite (µmol/l)

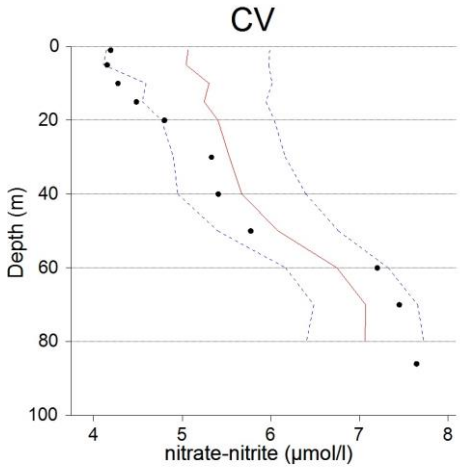

F16
Depth (m)
0
10
20
30
40
50
60
0
1
2
3
4
nitrate-nitrite (µmol/l)

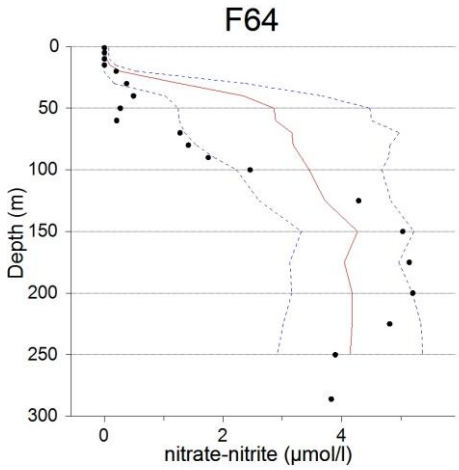

F15
Depth (m)
0
10
20
30
40
50
60
1
2
3
4
5
nitrate-nitrite (µmol/l)

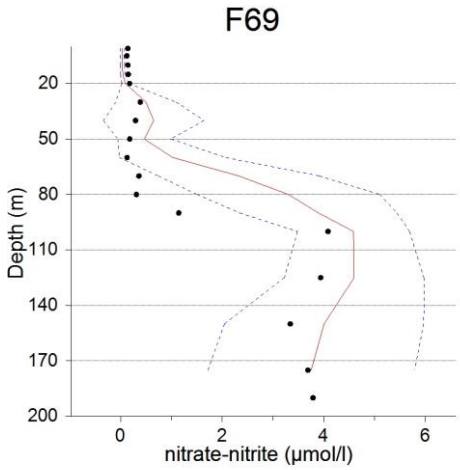

BO3
Depth (m)
0
20
40
60
80
100
4
5
6
7
nitrate-nitrite (µmol/l)

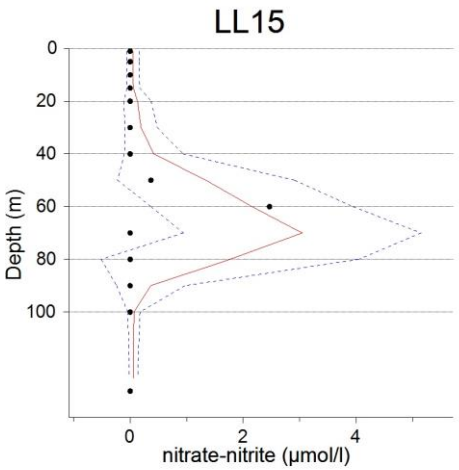

RR3
Depth (m)
0
20
40
60
80
100
3
4
5
6
7
8
nitrate-nitrite (µmol/l)

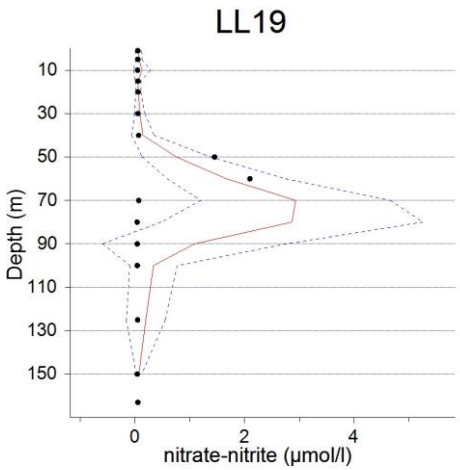

RR6
Depth (m)
0
20
40
60
80
100
2
4
6
8
nitrate-nitrite (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
4
5
6
7
8
nitrate-nitrite (µmol/l)

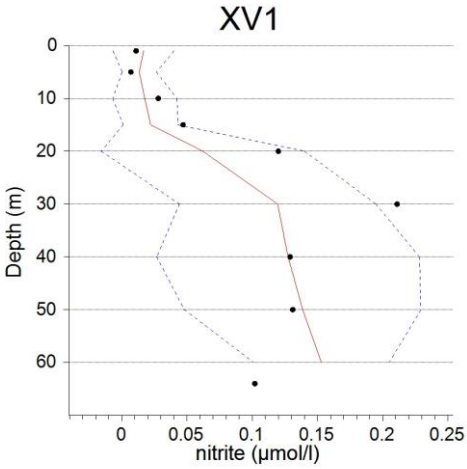

F64
Depth (m)
0
50
100
150
200
250
300
0
2
4
nitrate-nitrite (µmol/l)

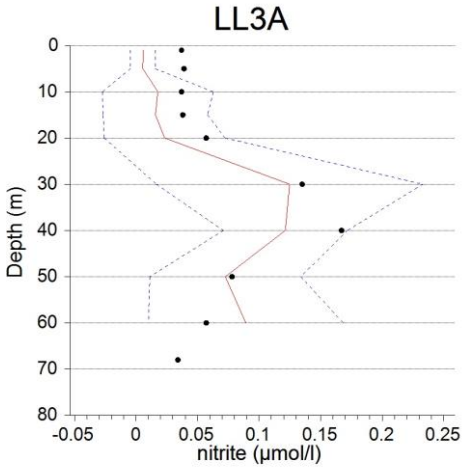

F69
Depth (m)
20
50
80
110
140
170
200
0
2
4
6
nitrate-nitrite (µmol/l)

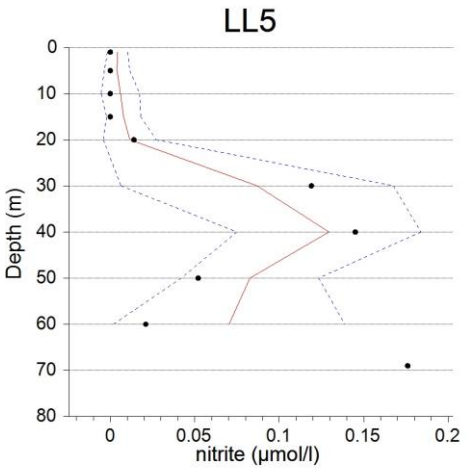

LL15
Depth (m)
0
20
40
60
80
100
0
2
4
nitrate-nitrite (µmol/l)

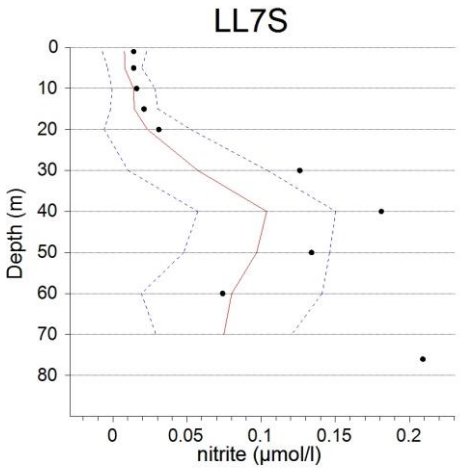

LL19
Depth (m)
10
30
50
70
90
110
130
150
0
2
4
nitrate-nitrite (µmol/l)

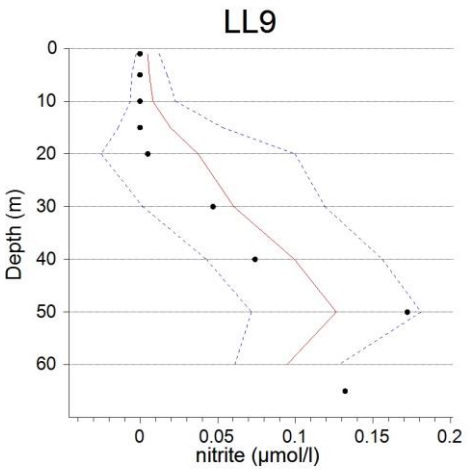
Nitrite:

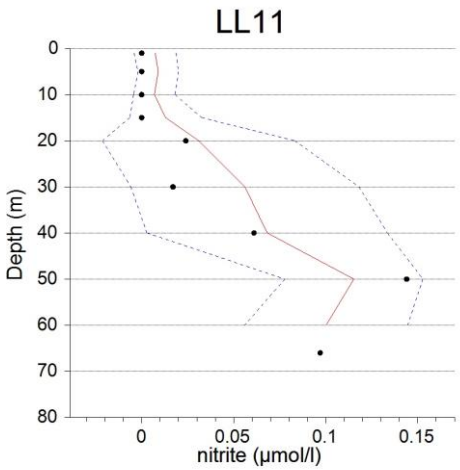

XV1
Depth (m)
0
10
20
30
40
50
60
0
0.05
0.1
0.15
0.2
0.25
nitrite (µmol/l)

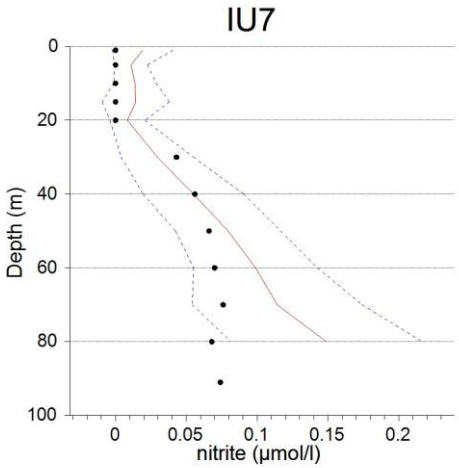

LL3A
Depth (m)
0
10
20
30
40
50
60
70
80
-0.05
0
0.05
0.1
0.15
0.2
0.25
nitrite (µmol/l)

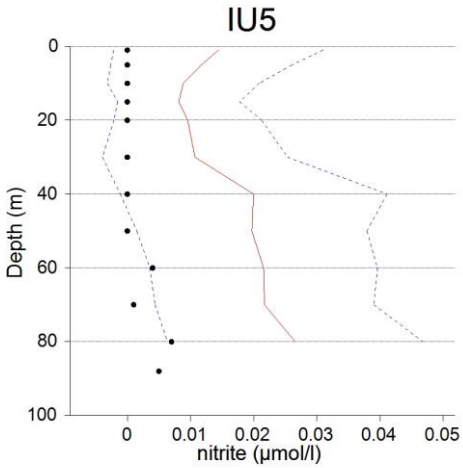

LL5
Depth (m)
0
10
20
30
40
50
60
70
80
0
0.05
0.1
0.15
0.2
nitrite (µmol/l)

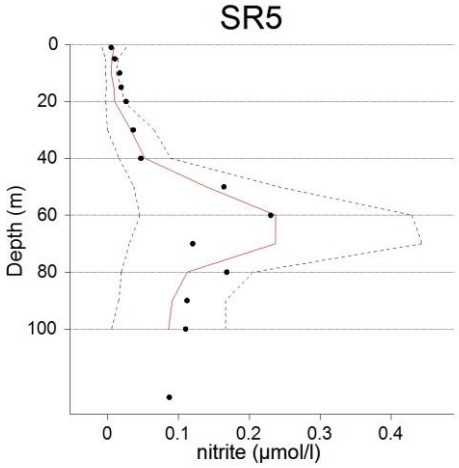

LL7S
Depth (m)
0
10
20
30
40
50
60
70
80
0
0.05
0.1
0.15
0.2
nitrite (µmol/l)

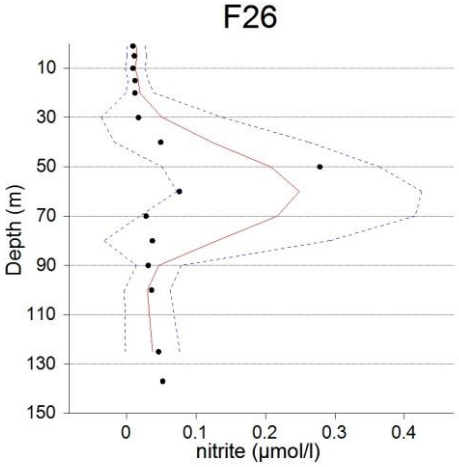

LL9
Depth (m)
0
10
20
30
40
50
60
0
0.05
0.1
0.15
0.2
nitrite (µmol/l)

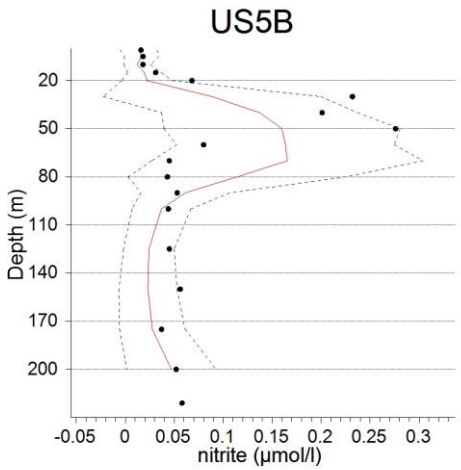

LL11
Depth (m)
0
10
20
30
40
50
60
70
80
0
0.05
0.1
0.15
nitrite (µmol/l)

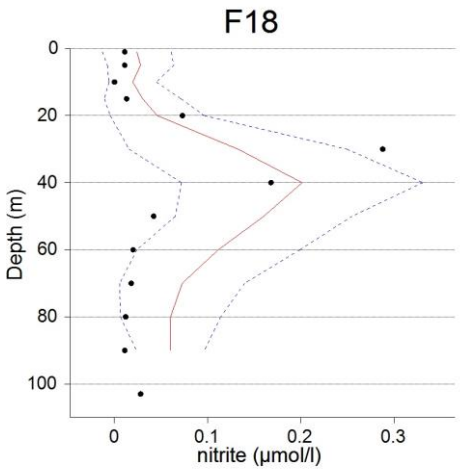

IU7
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
0.2
nitrite (µmol/l)

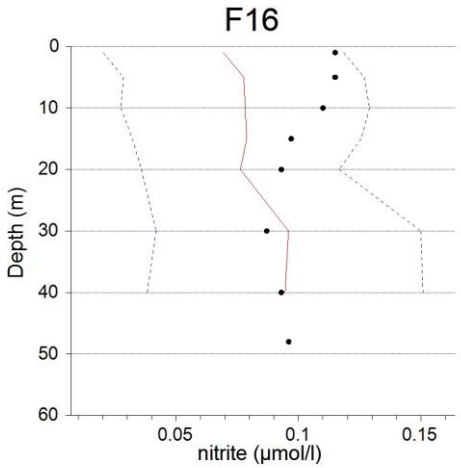

IU5
Depth (m)
0
20
40
60
80
100
0
0.01
0.02
0.03
0.04
0.05
nitrite (µmol/l)

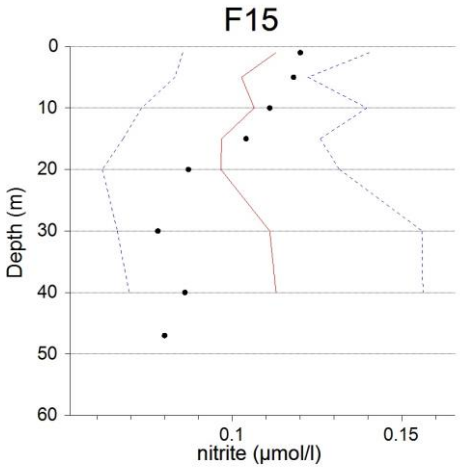

SR5
Depth (m)
0
20
40
60
80
100
0
0.1
0.2
0.3
0.4
nitrite (µmol/l)

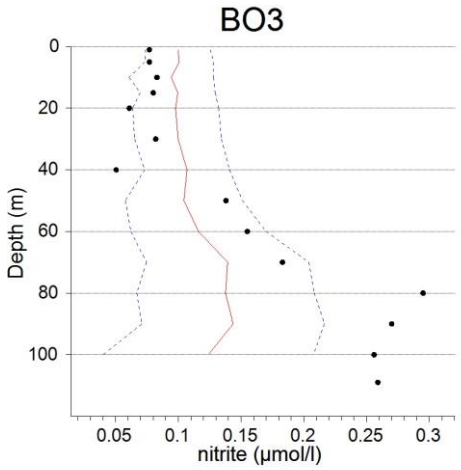

F26
Depth (m)
10
30
50
70
90
110
130
150
0
0.1
0.2
0.3
0.4
nitrite (µmol/l)

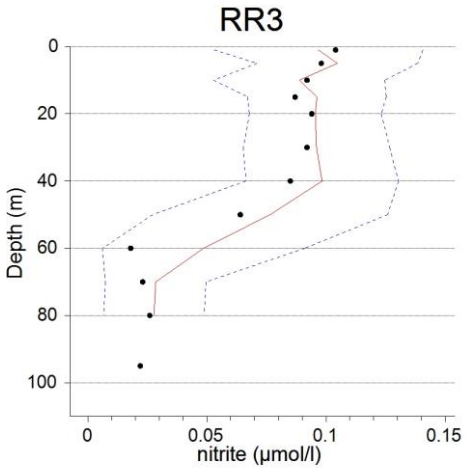

US5B
Depth (m)
20
50
80
110
140
170
200
-0.05 0 0.05 0.1 0.15 0.2 0.25 0.3
nitrite (µmol/l)

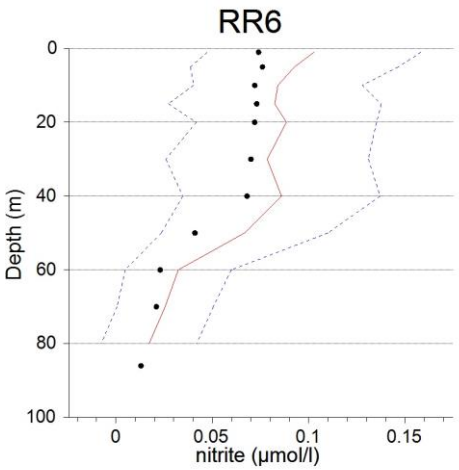

F18
Depth (m)
0
20
40
60
80
100
0 0.1 0.2 0.3
nitrite (µmol/l)

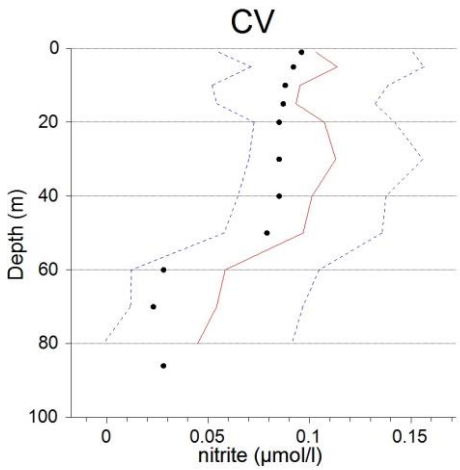

F16
Depth (m)
0
10
20
30
40
50
60
0.05 0.1 0.15
nitrite (µmol/l)

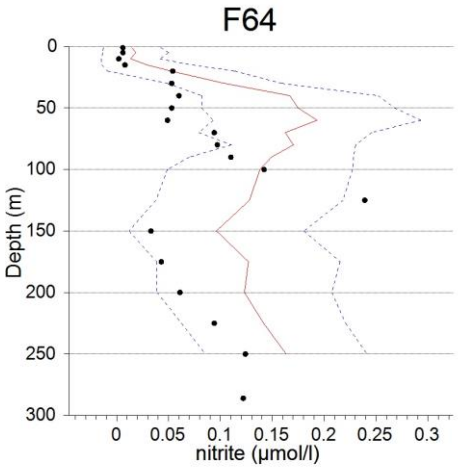

F15
Depth (m)
0
10
20
30
40
50
60
0.1 0.15
nitrite (µmol/l)

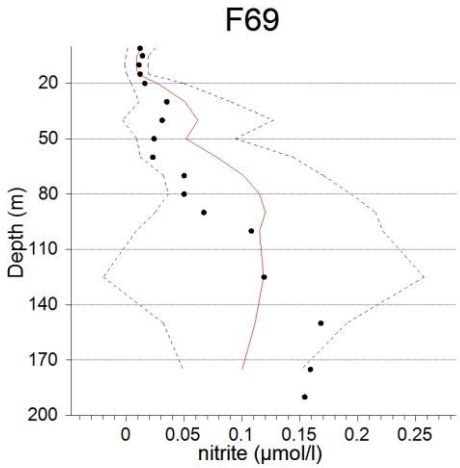

BO3
Depth (m)
0
20
40
60
80
100
0.05 0.1 0.15 0.2 0.25 0.3
nitrite (µmol/l)

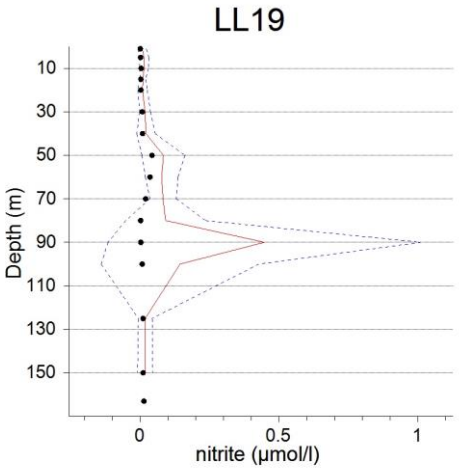

RR3
Depth (m)
0
20
40
60
80
100
0 0.05 0.1 0.15
nitrite (µmol/l)

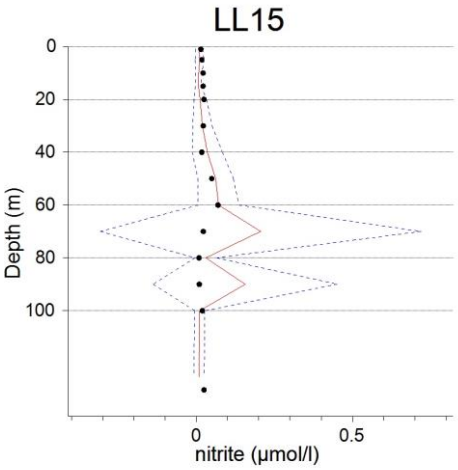

RR6
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
nitrite (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
nitrite (µmol/l)

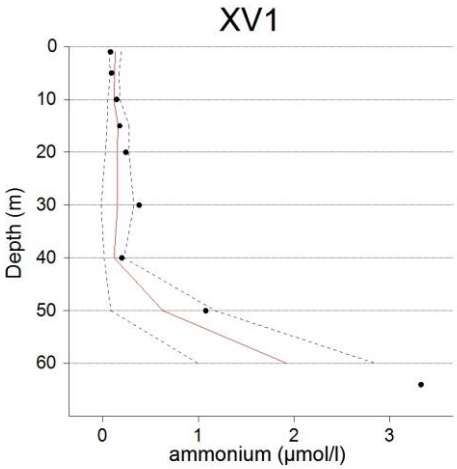

F64
Depth (m)
0
50
100
150
200
250
300
0
0.05
0.1
0.15
0.2
0.25
0.3
nitrite (µmol/l)

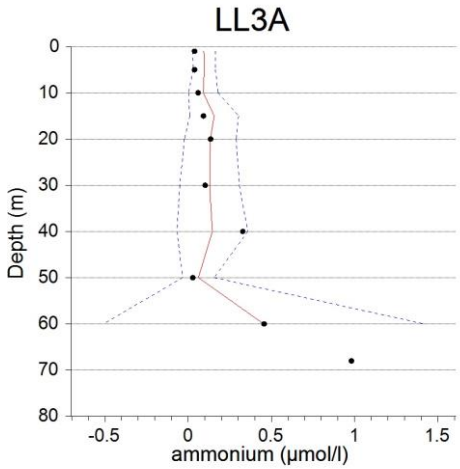

F69
Depth (m)
20
50
80
110
140
170
200
0
0.05
0.1
0.15
0.2
0.25
nitrite (µmol/l)

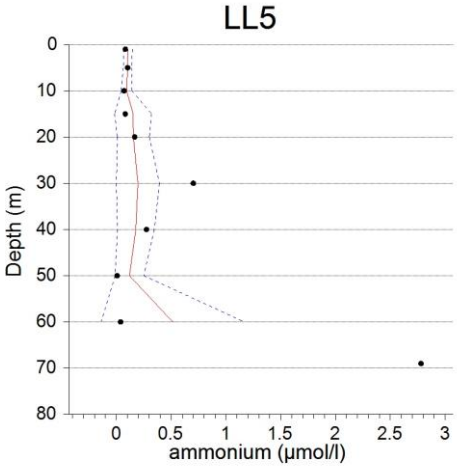

LL19
Depth (m)
10
30
50
70
90
110
130
150
0
0.5
1
nitrite (µmol/l)

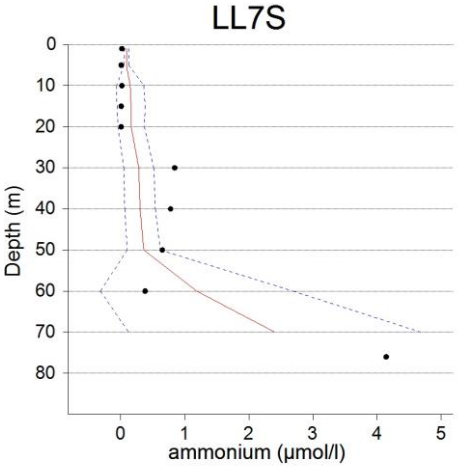

LL15
Depth (m)
0
20
40
60
80
100
0
0.5
nitrite (µmol/l)

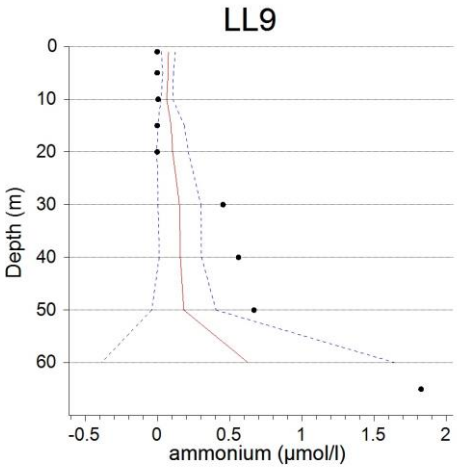
Ammonium:

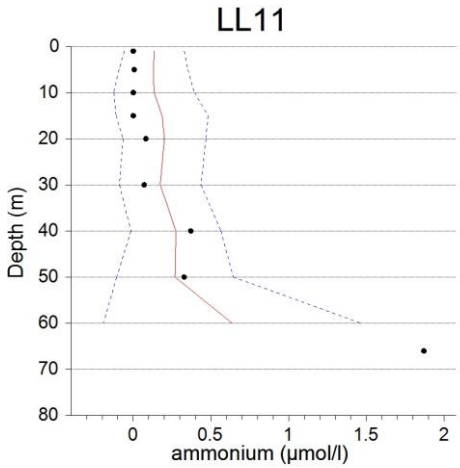

XV1
Depth (m)
ammonium (µmol/l)

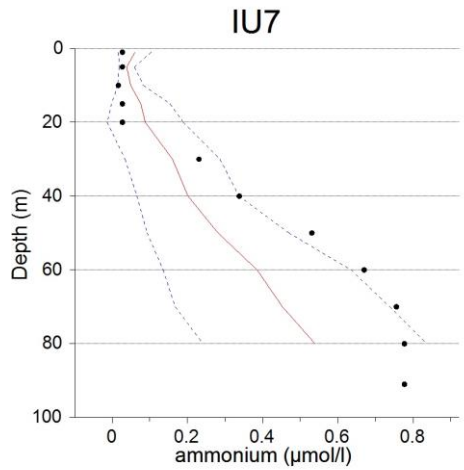

LL3A
Depth (m)
ammonium (µmol/l)

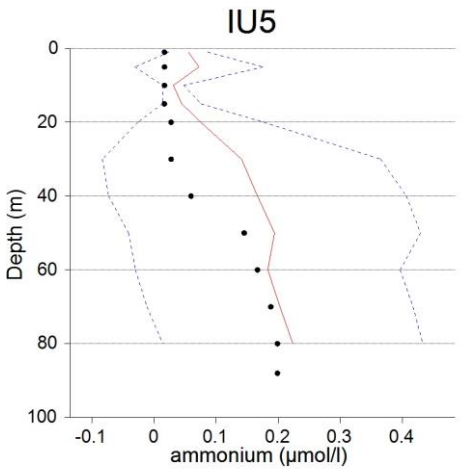

LL5
Depth (m)
ammonium (µmol/l)

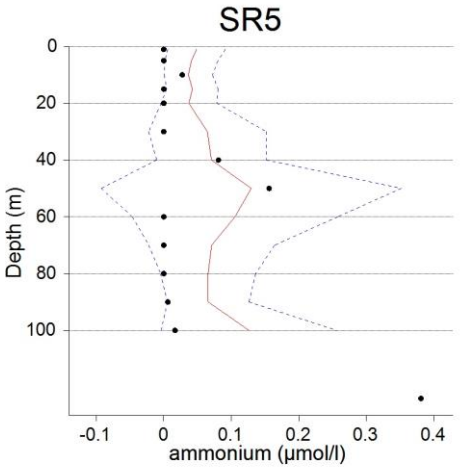

LL7S
Depth (m)
ammonium (µmol/l)

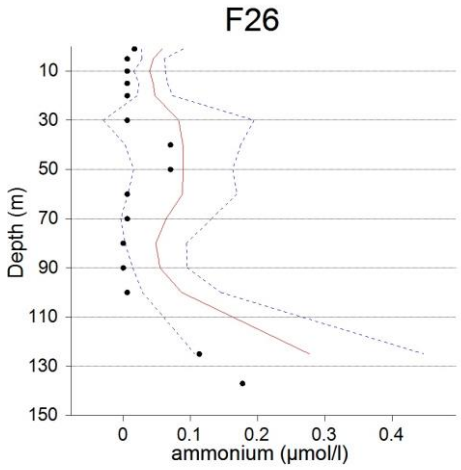

LL9
Depth (m)
ammonium (µmol/l)

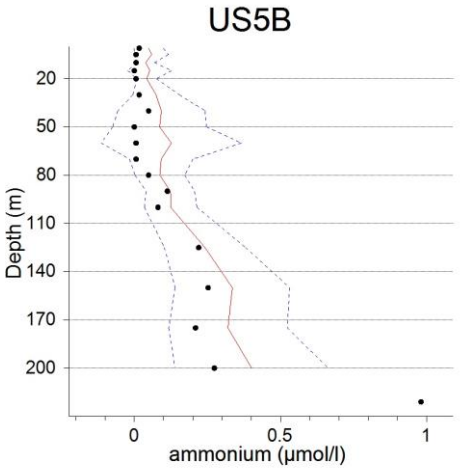

LL11
Depth (m)
ammonium (µmol/l)

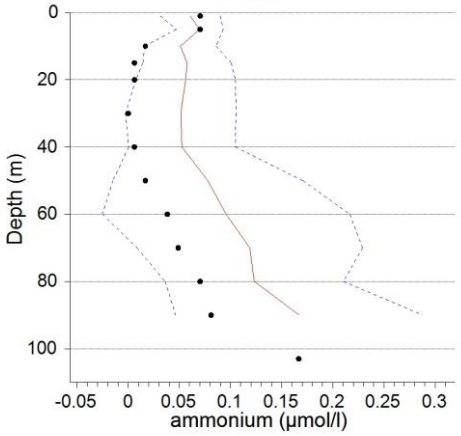

IU7
Depth (m)
0
20
40
60
80
100
0
0.2
0.4
0.6
0.8
ammonium (µmol/l)

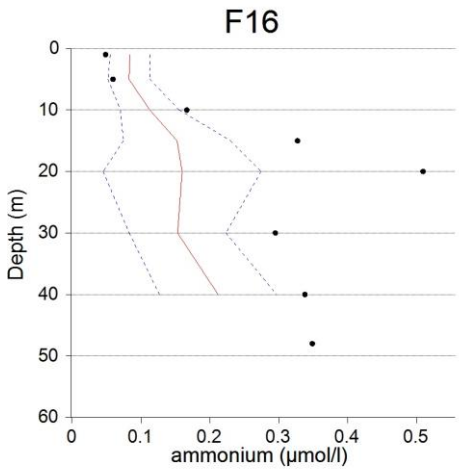

IU5
Depth (m)
0
20
40
60
80
100
-0.1
0
0.1
0.2
0.3
0.4
ammonium (µmol/l)

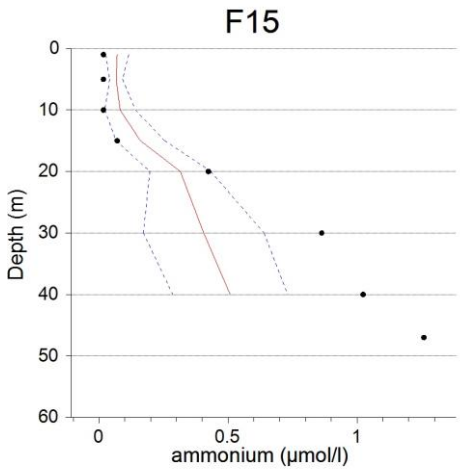

SR5
Depth (m)
0
20
40
60
80
100
-0.1
0
0.1
0.2
0.3
0.4
ammonium (µmol/l)

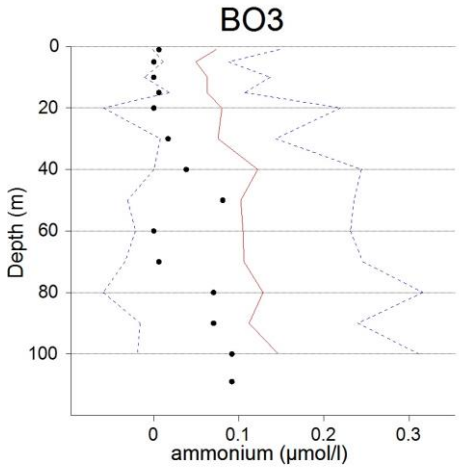

F26
Depth (m)
10
30
50
70
90
110
130
150
0
0.1
0.2
0.3
0.4
ammonium (µmol/l)

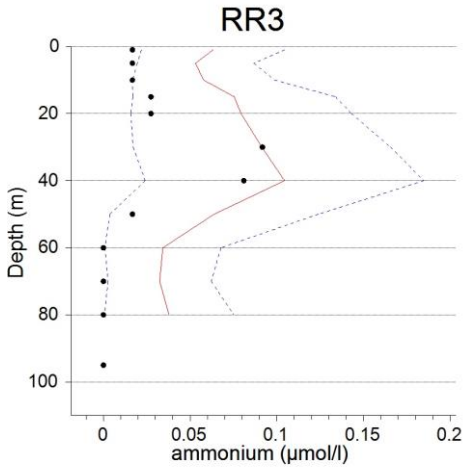

US5B
Depth (m)
20
50
80
110
140
170
200
0
0.5
1
ammonium (µmol/l)

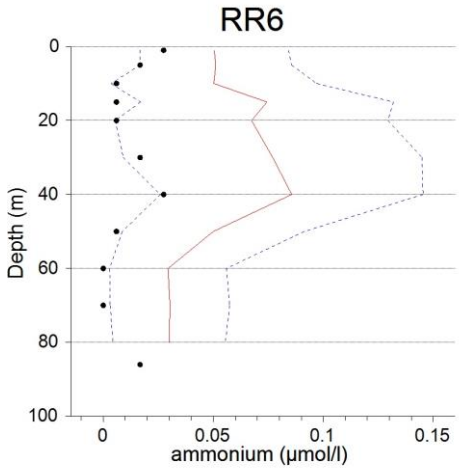

F18
Depth (m)
0
20
40
60
80
100
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
ammonium (µmol/l)

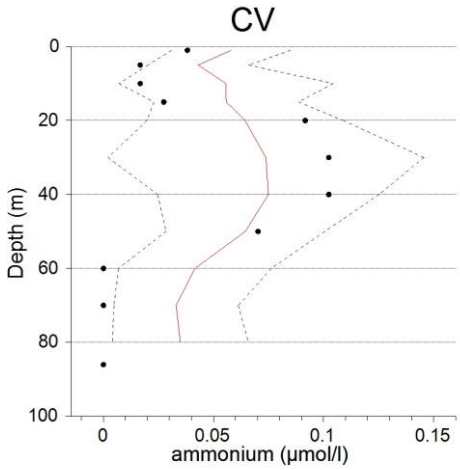

F16
Depth (m)
0
10
20
30
40
50
60
0
0.1
0.2
0.3
0.4
0.5
ammonium (µmol/l)

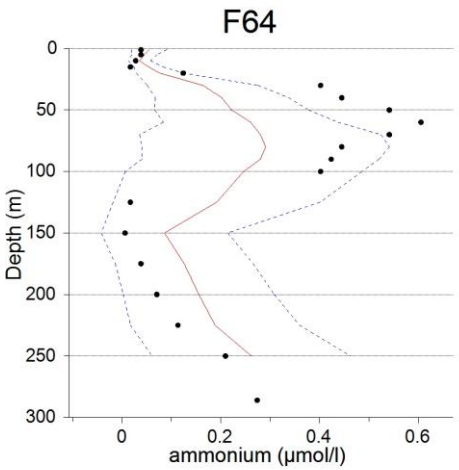

F15
Depth (m)
0
10
20
30
40
50
60
0
0.5
1
ammonium (µmol/l)

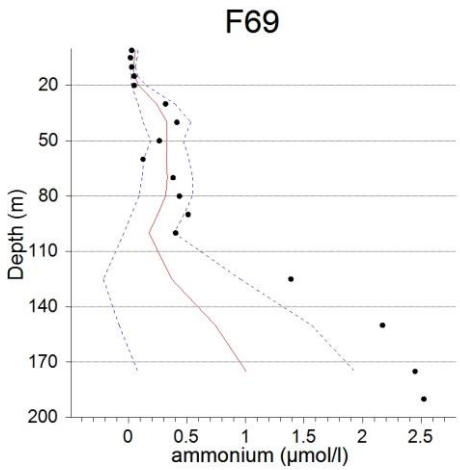

BO3
Depth (m)
0
20
40
60
80
100
0
0.1
0.2
0.3
ammonium (µmol/l)

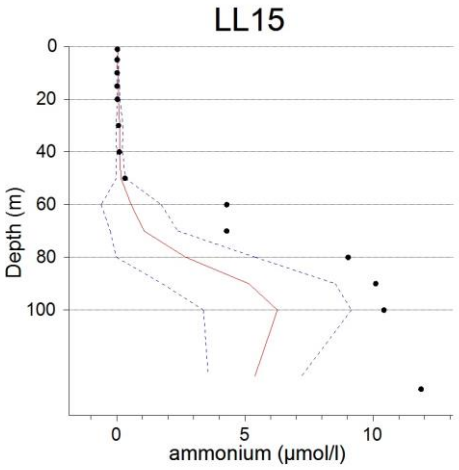

RR3
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
0.2
ammonium (µmol/l)

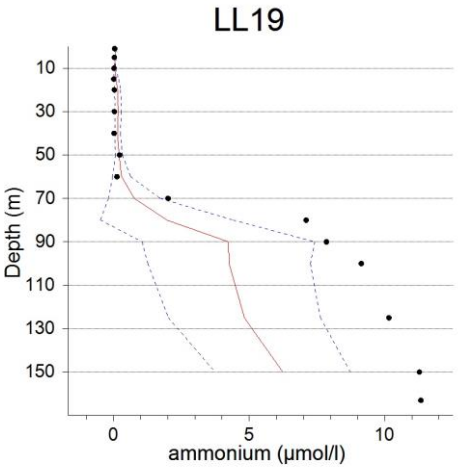

RR6
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
ammonium (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
ammonium (µmol/l)

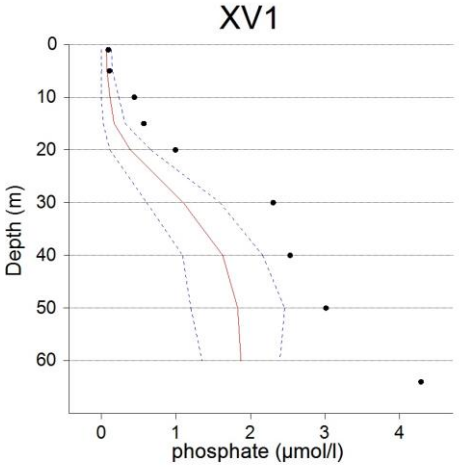

F64
Depth (m)
0
50
100
150
200
250
300
0
0.2
0.4
0.6
ammonium (µmol/l)

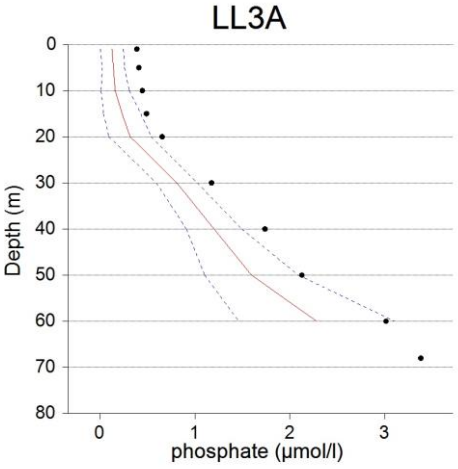

F69
Depth (m)
20
50
80
110
140
170
200
0
0.5
1
1.5
2
2.5
ammonium (µmol/l)

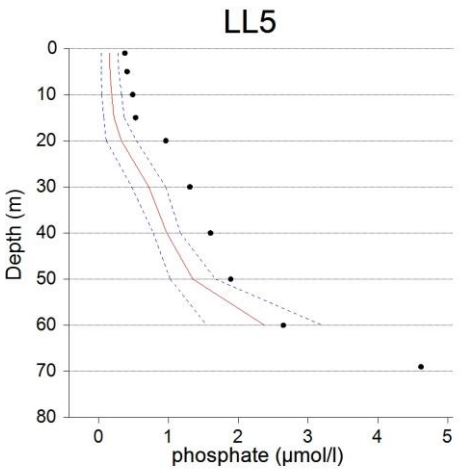

LL15
Depth (m)
0
20
40
60
80
100
0
5
10
ammonium (µmol/l)

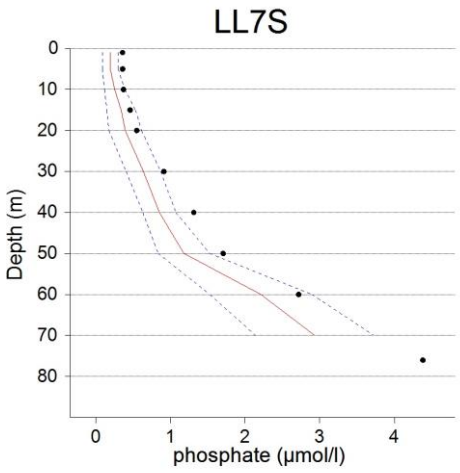

LL19
Depth (m)
10
30
50
70
90
110
130
150
0
5
10
ammonium (µmol/l)

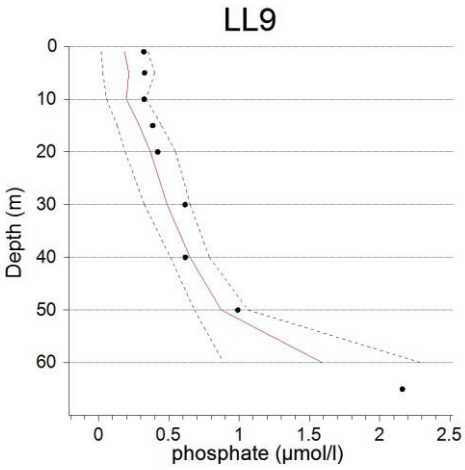
Phosphate:

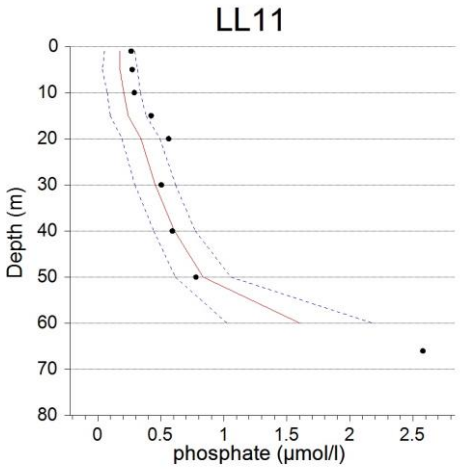

XV1
Depth (m)
0
10
20
30
40
50
60
0
1
2
3
4
phosphate (µmol/l)

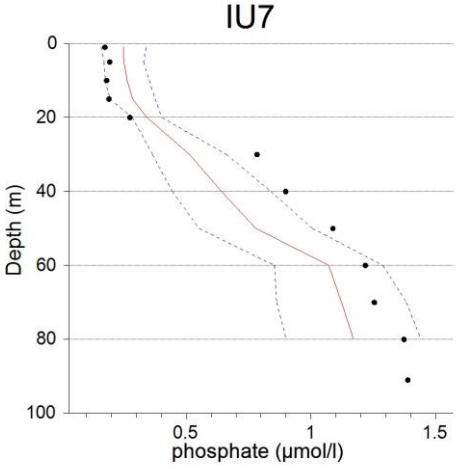

LL3A
Depth (m)
0
10
20
30
40
50
60
70
80
0
1
2
3
phosphate (µmol/l)

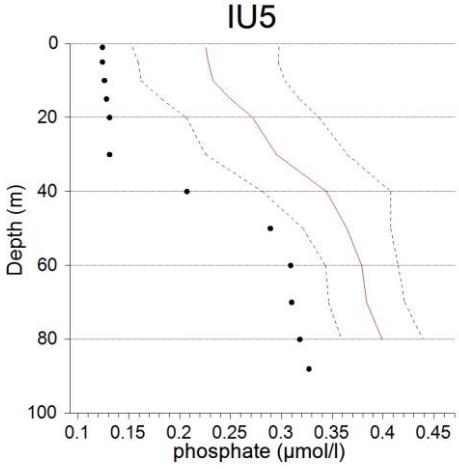

LL5
Depth (m)
phosphate (µmol/l)

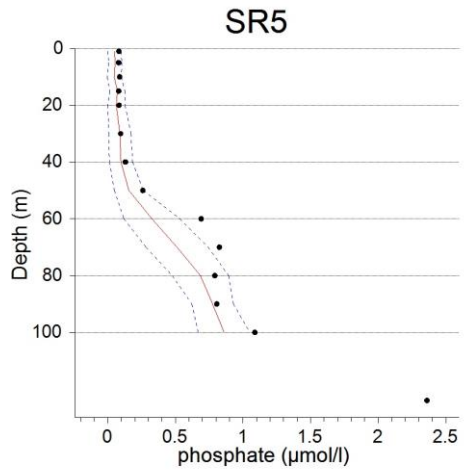

LL7S
Depth (m)
phosphate (µmol/l)

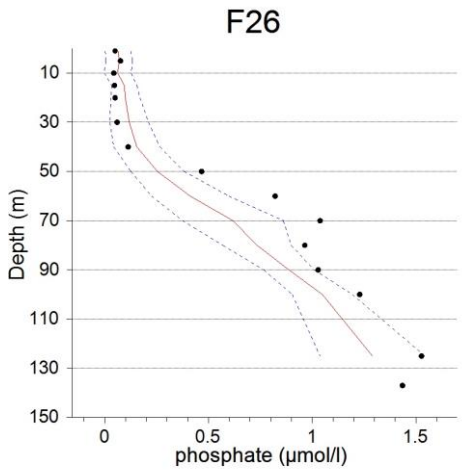

LL9
Depth (m)
phosphate (µmol/l)

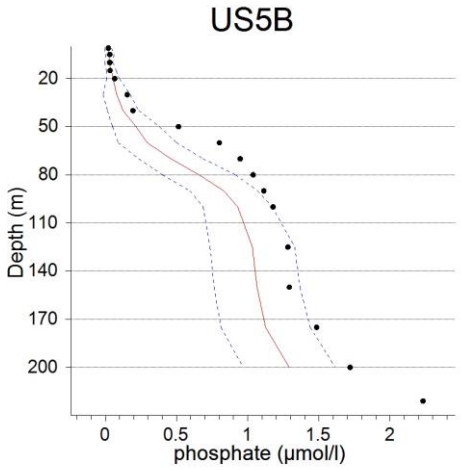

LL11
Depth (m)
phosphate (µmol/l)

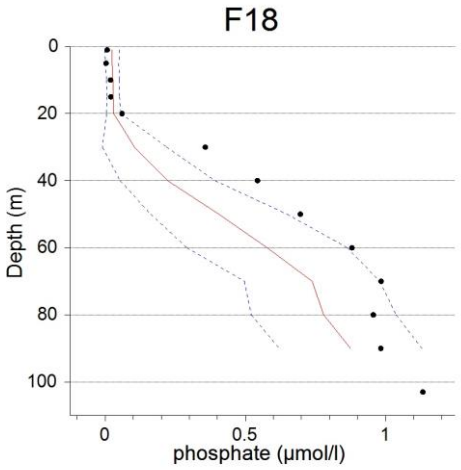

IU7
Depth (m)
phosphate (µmol/l)

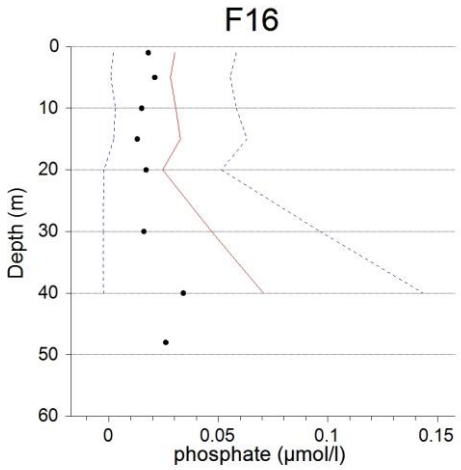

IU5
Depth (m)
phosphate (µmol/l)

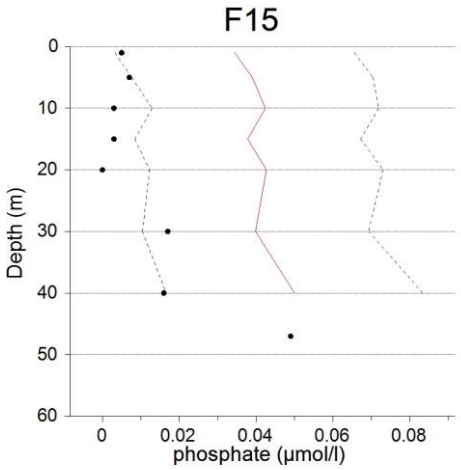

SR5
Depth (m)
0
20
40
60
80
100
0
0.5
1
1.5
2
2.5
phosphate (µmol/l)

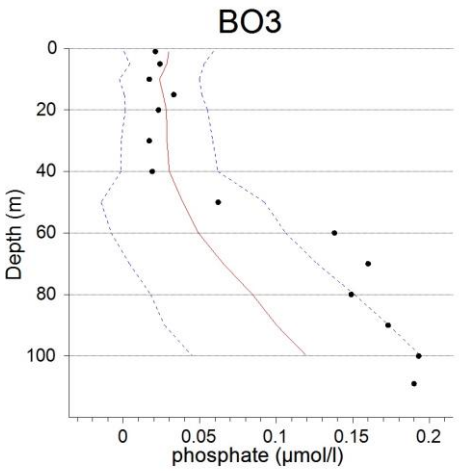

F26
Depth (m)
10
30
50
70
90
110
130
150
0
0.5
1
1.5
phosphate (µmol/l)

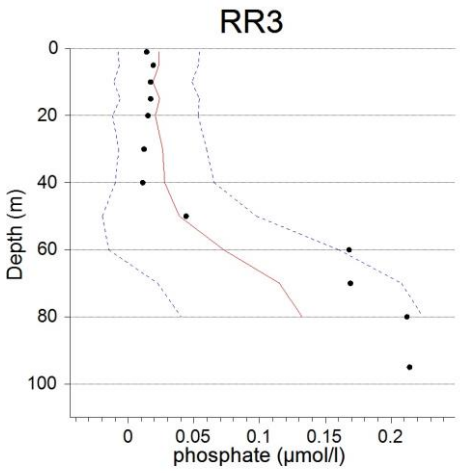

US5B
Depth (m)
20
50
80
110
140
170
200
0
0.5
1
1.5
2
phosphate (µmol/l)

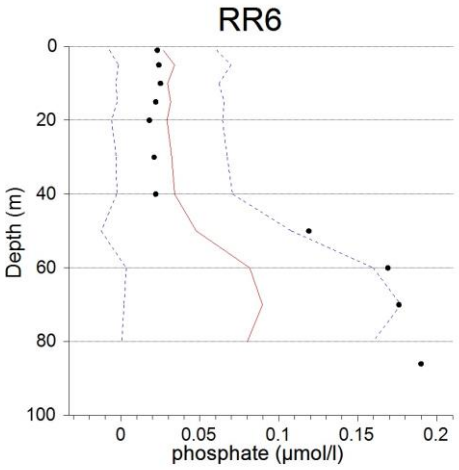

F18
Depth (m)
0
20
40
60
80
100
0
0.5
1
phosphate (µmol/l)

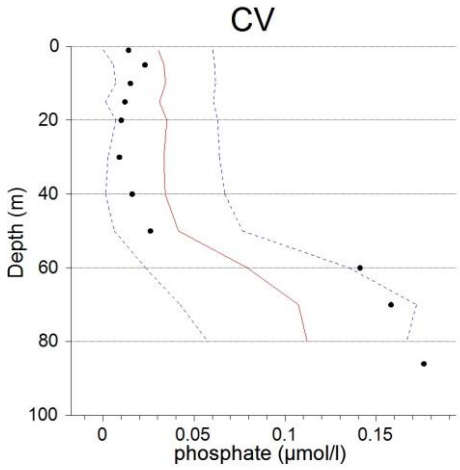

F16
Depth (m)
0
10
20
30
40
50
60
0
0.05
0.1
0.15
phosphate (µmol/l)

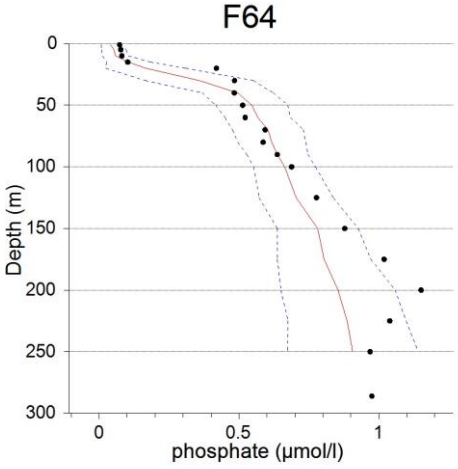

F15
Depth (m)
0
10
20
30
40
50
60
0
0.02
0.04
0.06
0.08
phosphate (µmol/l)

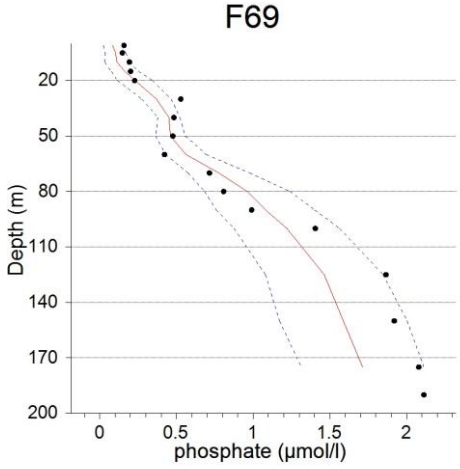

BO3
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
0.2
phosphate (µmol/l)

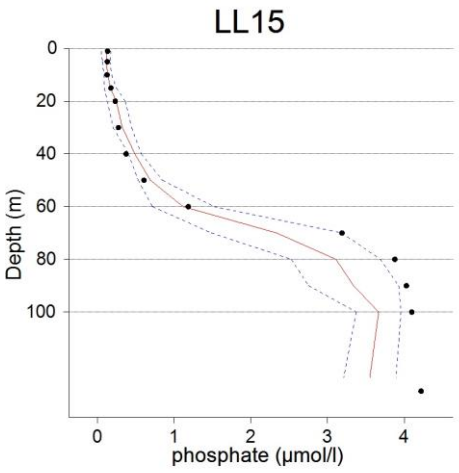

RR3
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
0.2
phosphate (µmol/l)

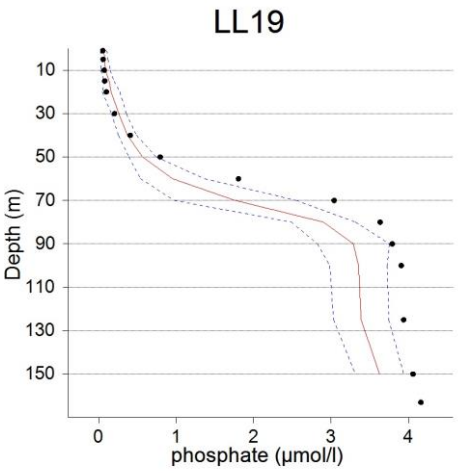

RR6
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
0.2
phosphate (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
0
0.05
0.1
0.15
phosphate (µmol/l)

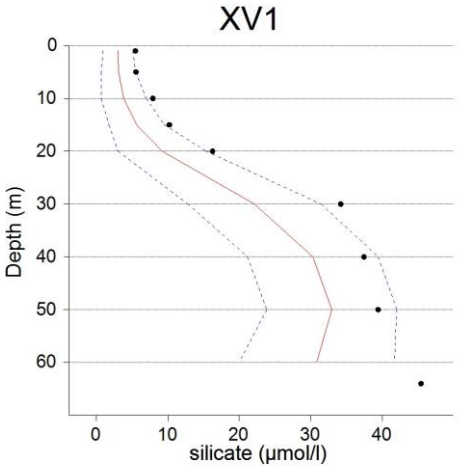

F64
Depth (m)
0
50
100
150
200
250
300
0
0.5
1
phosphate (µmol/l)

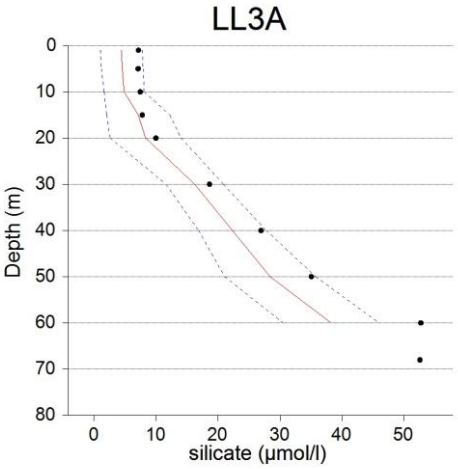

F69
Depth (m)
20
50
80
110
140
170
200
0
0.5
1
1.5
2
phosphate (µmol/l)

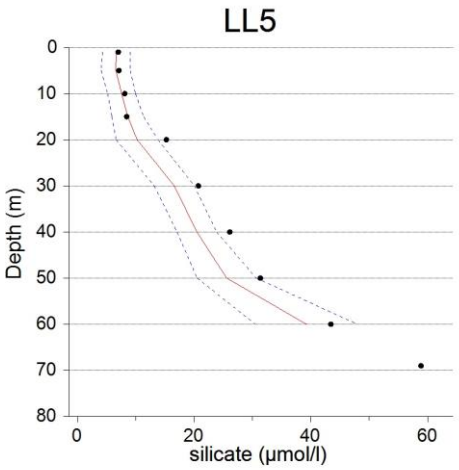

LL15
Depth (m)
0
20
40
60
80
100
0
1
2
3
4
phosphate (µmol/l)

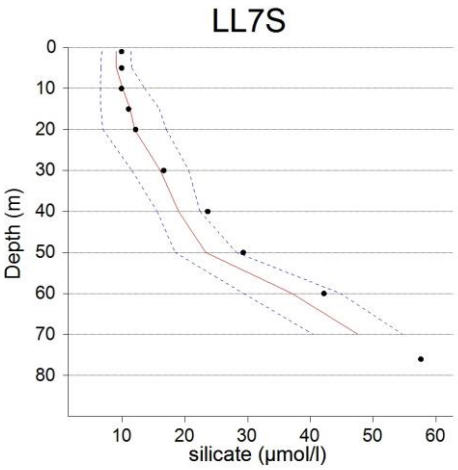

LL19
Depth (m)
10
30
50
70
90
110
130
150
0
1
2
3
4
phosphate (µmol/l)

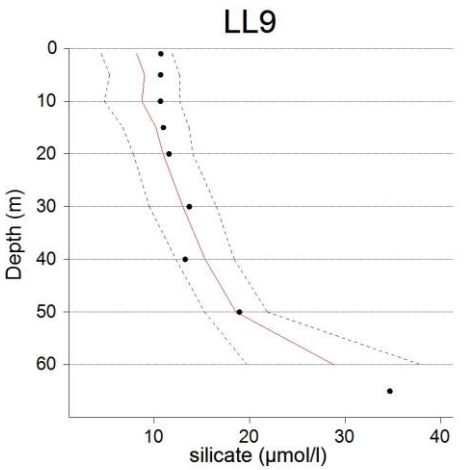
Silicate:

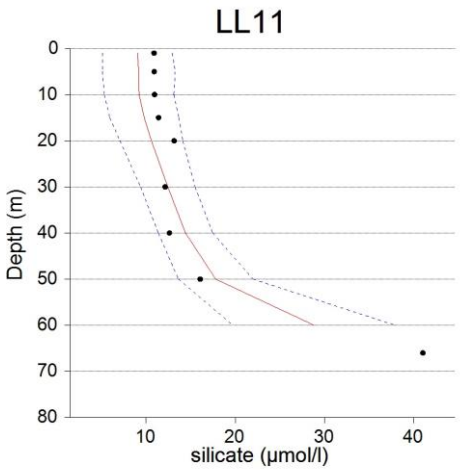

XV1
Depth (m)
0
10
20
30
40
50
60
0
10
20
30
40
silicate (µmol/l)

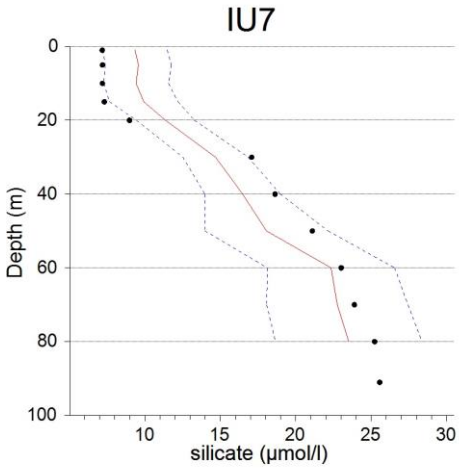

LL3A
Depth (m)
0
10
20
30
40
50
60
70
80
0
10
20
30
40
50
silicate (µmol/l)

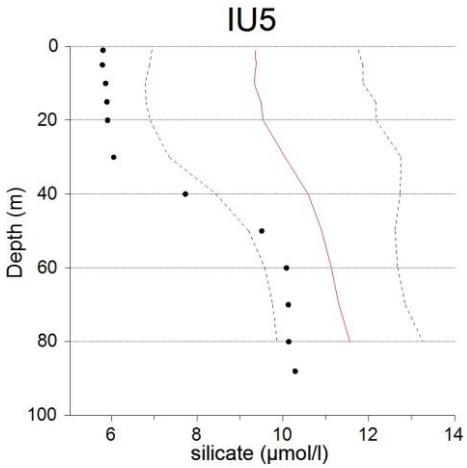

LL5
Depth (m)
0
10
20
30
40
50
60
70
80
0
20
40
60
silicate (µmol/l)

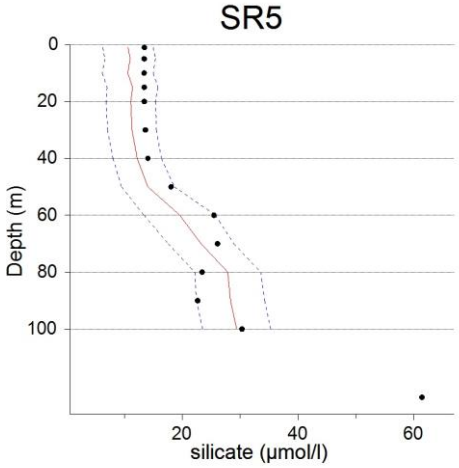

LL7S
Depth (m)
0
10
20
30
40
50
60
70
80
10
20
30
40
50
60
silicate (µmol/l)

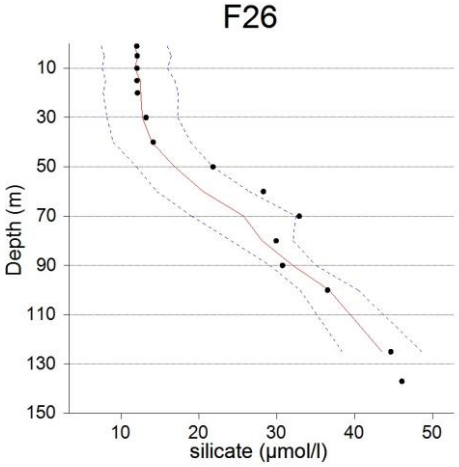

LL9
Depth (m)
silicate (µmol/l)

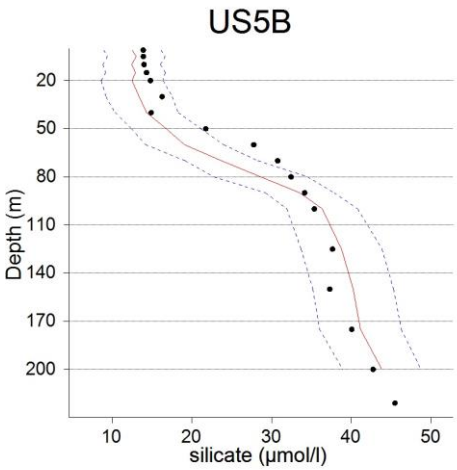

LL11
Depth (m)
silicate (µmol/l)

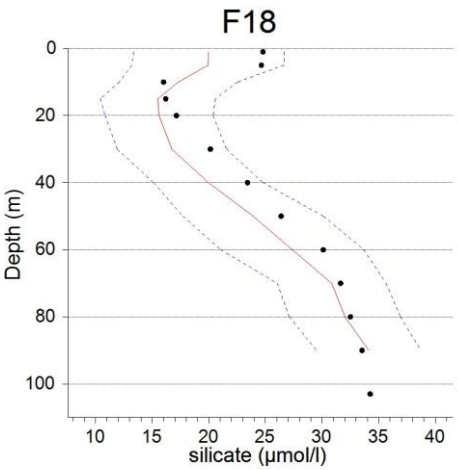

IU7
Depth (m)
silicate (µmol/l)

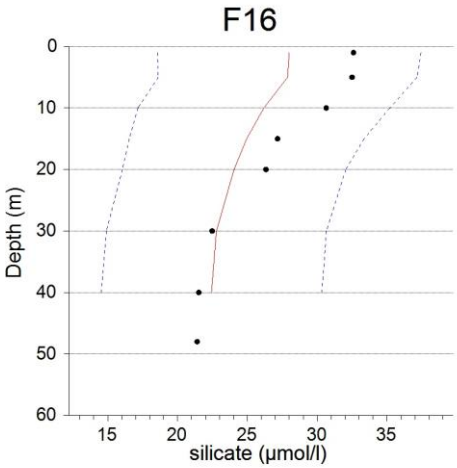

IU5
Depth (m)
silicate (µmol/l)

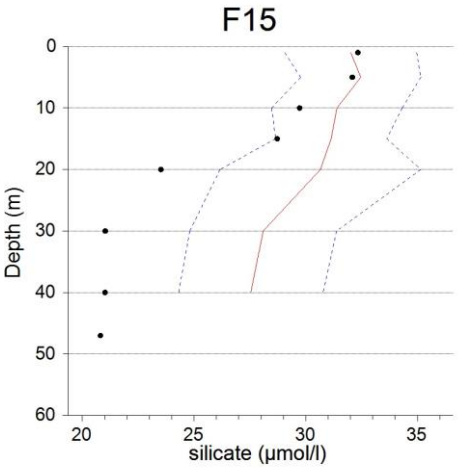

SR5
Depth (m)
silicate (µmol/l)

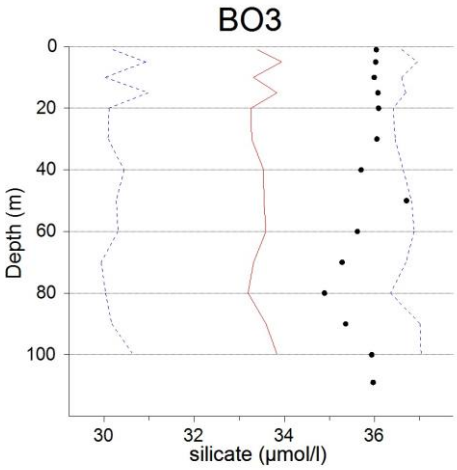

F26
Depth (m)
silicate (µmol/l)

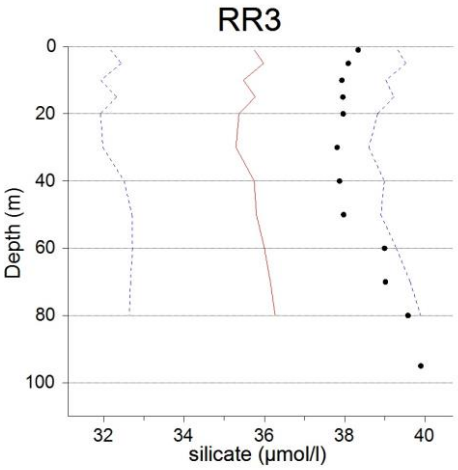

US5B
Depth (m)
20
50
80
110
140
170
200
10
20
30
40
50
silicate (µmol/l)

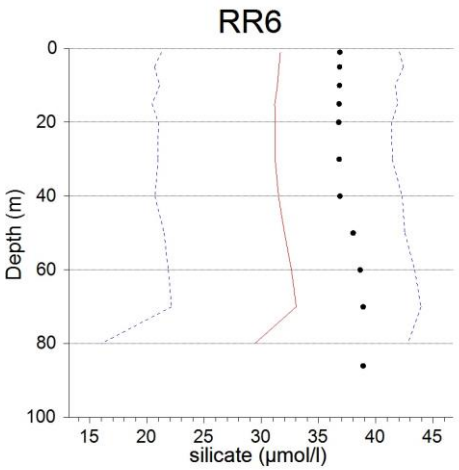

F18
Depth (m)
0
20
40
60
80
100
10
15
20
25
30
35
40
silicate (µmol/l)

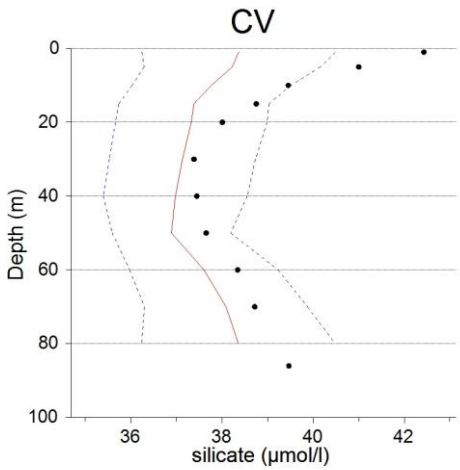

F16
Depth (m)
0
10
20
30
40
50
60
15
20
25
30
35
silicate (µmol/l)

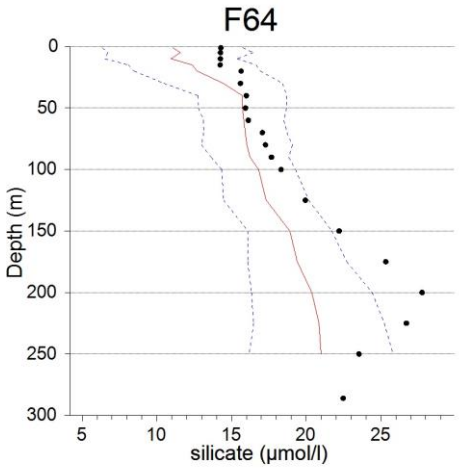

F15
Depth (m)
0
10
20
30
40
50
60
20
25
30
35
silicate (µmol/l)

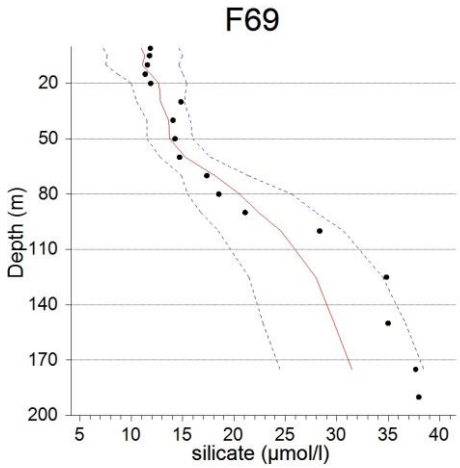

BO3
Depth (m)
0
20
40
60
80
100
30
32
34
36
silicate (µmol/l)

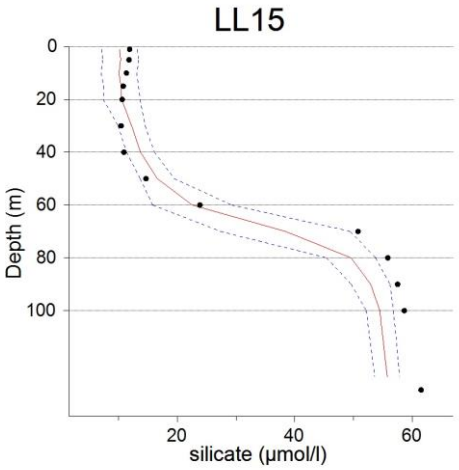

RR3
Depth (m)
0
20
40
60
80
100
32
34
36
38
40
silicate (µmol/l)

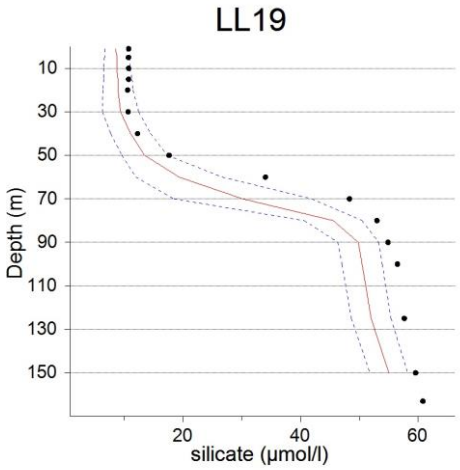

RR6
Depth (m)
0
20
40
60
80
100
15
20
25
30
35
40
45
silicate (µmol/l)


CV
Depth (m)
0
20
40
60
80
100
36
38
40
42
silicate (µmol/l)


F64
Depth (m)
0
50
100
150
200
250
300
5
10
15
20
25
silicate (µmol/l)


F69
Depth (m)
20
50
80
110
140
170
200
5
10
15
20
25
30
35
40
silicate (µmol/l)


LL15
Depth (m)
0
20
40
60
80
100
20
40
60
silicate (µmol/l)


LL19
Depth (m)
10
30
50
70
90
110
130
150
20
40
60
silicate (µmol/l)