CRUISE REPORT

Assessing impacts of phytoplankton community changes in two climate-sensitive arctic ecosystems (PhytoChAOs)

Le Commandant Charcot, Cruise No. 110923 and 051023,

11/09/23 – 12/10/23, Reykjavik (Iceland) – Seattle (USA)

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Picture: Le Commandant Charcot in Aapilattoq (Greenland) with cruise participants Marina Arregui and Elisabeth Rosselli

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Summary

The expedition started on Sunday, September 10, in Reykjavik, with the arrival of the scientists. They started to install their equipment and created a sampling plan with Daniel Cron, the Scientific Coordinator on board. The first station was reached and sampled on September 12 at 19:30 (all times in this report refer to UTC). A total of 26 stations were sampled (***Figure 1***) during this cruise, using phytoplankton and zooplankton nets as well as Niskin Bottles and an on-board peristaltic pump. A CTD (**C**onductivity **t**emperature **d**epth probe) was also deployed to obtain water column profiles of salinity, temperature, density, turbidity and dissolved oxygen. In order to assess if the phytoplankton community was limited by the availability of nitrate, phosphate, silicate or vitamin B_{12}, five nutrient amendment experiments were also performed on board during this cruise.

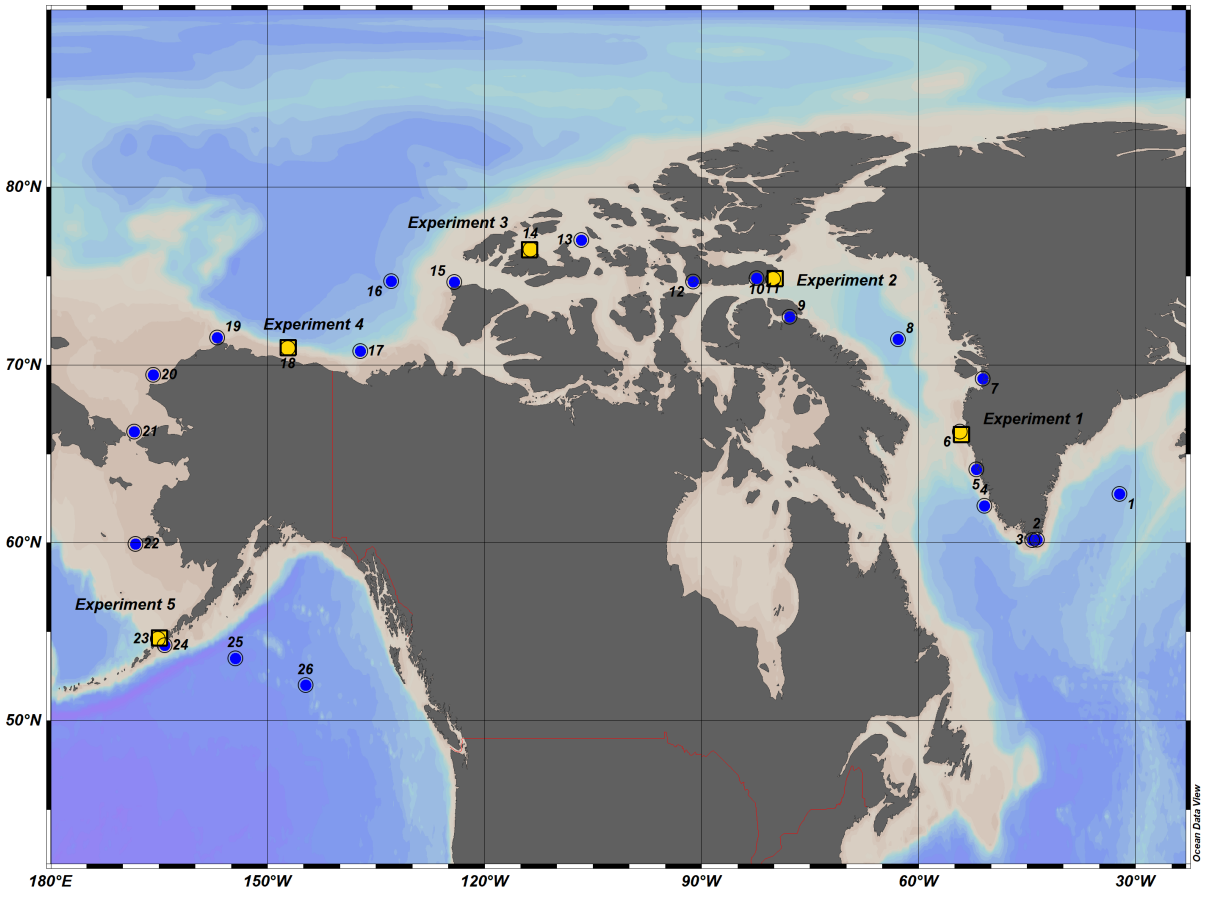

Figure 1. *Map of the 26 stations sampled (blue dots) and the five experiments conducted (yellow squares) from September 11th and October 12th between Reykjavik (Iceland) and Seattle (United States).*

At three stations (5, 22, and 23), phytoplankton sampling with the plankton nets was not possible, and water was only collected from the niskin bottles and the peristaltic pump. Because zooplankton sampling was not permitted in Canadian waters, zooplankton nets were not deployed at stations 9 through 17. All of the nets were deployed from the stern of the 4th deck while the water samples primarily were collected in the wet lab using the peristaltic pump. In addition to the station

work, dissolved toxin sampling was performed within the first seven days of the expedition using three solid phase adsorption toxin tracking (SPATT) bags.

The last station was sampled on October 9. The ship entered the harbour in Seattle, USA on the morning of October 12, and the scientists disembarked the same day.

1. Research Objectives

The main objectives of PhytoChAOs were:

1) To measure core oceanographic parameters such as plankton biomass (particulate organic carbon, nitrogen, chlorophyll a, and particulate vitamin), dissolved nutrients (nitrate, phosphate, silicate, vitamins) and dissolved organic carbon.

2) To characterize the phytoplankton communities in coastal areas impacted by sea ice and glacial melt or permafrost thawing, with an emphasis on potentially toxic species.

3) To measure and identify dissolved and particulate phycotoxins.

4) To collect and characterize zooplankton in order to assess the trophic transfer and potential transformation of phycotoxins.

5) To conduct bottle incubation experiments looking at the impact of macronutrients and vitamin B_{12} on the phytoplankton community composition.

6) To isolate and characterize key phytoplankton species for laboratory experiments.

2. Narrative of the Cruise

PhytoChAOs was conceptualized by four scientists with different expertese. While four berths were available to us for this cruise, one of the participants (Simon Tulatz) fell ill the week before the expedition and could not join. The three remaining scientists landed in Reykjavik on September 10 and embarked on Le Commandant Charcot. The equipment was carried on board and stored in the wet lab until the following day. The scientists had a quick tour of the scientific areas with Scientific Officer Daniel Cron. They ate in the crew area before retiring to their cabins for the night.
The next morning, one of the scientists (Fuat Dursun) had to disembark unexpectedly because of a family emergency. This now left only two scientist to conduct the work proposed and planed for four and presented a logistical problem. The two scientists left on board spent their day (September 11) unpacking and setting up the equipment in the wet and dry labs. The initial sampling plan which had consisted of two stations per day, had to be reduced to one station per day, and some work, such as the planed cell isolations had to be cut cut due to lack of expertise. A safety instruction followed later on the same day with the passengers.

Figure 2. *Phyto- and zooplankton sampling from the 4th deck's stern.*

On September 12, the organization of the working space continued, as well as the distribution of tasks and a review of the sampling protocols. In the morning, a meeting with Captain Patrick Marchesseau, Staff Captain Lucas Estorges, and Chief Engineer Marc Lasilier was organised together with the Scientific Officer Daniel Cron and the other scientific team on board. The purpose of the meeting was to discuss the sampling plan, adapting it to the ship's route and the passengers' activities. The first station was reached at 19:30. Two nets were deployed (twice each): a phytoplankton net (20 µm mesh size) and a zooplankton net (150 µm mesh size) (***Figure 2***) from a depth of 30m, were performed aft, from the 4th deck using the mooring winch. After the plankton was collected, the nets were rinsed with fresh water and left to dry at the ship's stern. The water sampling, through the peristaltic pump, followed quickly after and on station. Ten litres of seawater were collected from a depth of 10 m. The samples were left in the wet lab fridge until they were processed. All the stations where nets, CTD or Niskin bottles were deployed required the ship to stop and was able to happen only because of good communication between Captain Patrick Marchesseau and the on board Scientific Officer, Daniel Cron.

Station 2 was in Prince Christian Sound on September 13 near a glacier, and samples were collected following the same procedures described above. In addition to the nets, a CTD cast was performed to 30m. The parameters obtained for each CTD cast include temperature, salinity, density anomaly, dissolved oxygen and turbidity.

On September 14, the ship reached Aappilattoq (Greenland), where station 3 was sampled, deploying two phytoplankton and zooplankton net tows and the CTD to 30m. Water samples from 10 m were also collected using the peristaltic pump. After processing the samples, the cruise participants had the opportunity to go on land and visit the village with the passengers. Station 4 was reached on September 15 and sampled as previously described.

On September 16, the ship arrived in Nuuk (Greenland), where it stayed in the harbour for the day. Following the suggestion of the Scientific Officer, no samples were collected in order to avoid dirtying the sampling equipment. The peristaltic pump was turned off during the night because of a loud banging noise in the pipes leading through the crew area. The peristaltic pump was briefly used later that day (20:00) to collect water once the ship had left Nuuk (station 5). As the banging had subsided, the pump stayed on for the continuous toxin sampling using a SPATT-Bag. The cruise participants used this day to set up the lights needed for the incubation experiment planned for the

next day in the wet lab fridge. This work included setting up three LED lights at regular distances from each other and to perform light intensity measurements.

Station 6 was reached in the early morning hours of September 17. In addition to the previously described equipment, two Niskin bottles were deployed, one at 30 m depth and the other at the sea surface (***Figure 3***). In addition to the regular sampling activities, 15 L of water was also collected for the nutrient amendment experiment.

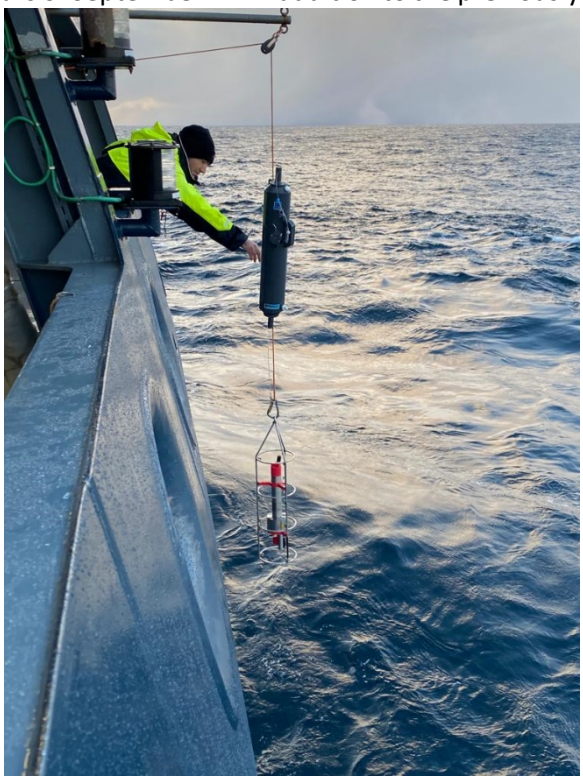

Figure 3. *CTD cast and water sampling with a NISKIN bottle at 30m depth below sea surface.*

On September 18, the ship reached Ilulissat. At station 7, net sampling, a CTD cast, and water sampling through the peristaltic pump were conducted. After processing the samples, the scientists had the opportunity to take a closer look at the fjord and the Jakobshavn Glacier by going on land.

On September 19, the ship reached station 8 within the Baffin Bay. Two phytoplankton and two zooplankton nets were deployed successively; a CTD cast and two Niskin bottles were deployed at the surface and at 30 m depth. Water samples from 10 m depth were also collected. In addition, the toxin sampling through SPATT bags had to be interrupted because the banging due to the peristaltic pump had started again. As no solution could be found, no more SPATT bags were deployed for the rest of the expedition.

For Stations 9-12, the sampling process remained unchanged with the except that, in accordance with the agreement reached with the Canadian authorities, no zooplankton nets were deployed in Canadian waters. At station 10, the second experiment was launched, when the ship reached the Prince Patrick Islands on September 21. The navigation on ice at that stage of the cruise had already started. At station 13 the Ferry box on board Le Commandant Charcot was switched off and only one phytoplankton net could be deployed because of the thickness of the sea ice. The scientists and the Scientific Officer ended this station prematurely to avoid damage to the net or other equipment. Water samples from 10 m could be taken from the peristaltic pump, previously flushed by the Scientific Officer.

Navigation through the ice continued on September 26; however, a complete sampling was conducted at station 14, including two phytoplankton nets, a CTD cast and two Niskin bottles, one at the surface and one at 30 m depth. The peristaltic pump was again flushed and used to sample the regular 10 L of seawater and the 15 L necessary to launch the third experiment.

Stations 15 to 17 (September 27 to 29) were taken at sea on the way to Herschel Island. They included the same sampling parameters as the previously described station.

No sampling was performed on September 30 because a Search and Rescue Exercise (SAREX) was performed in collaboration with US and Canadian Coast Guards on Herschel Island, involving most

of the crew, including Scientific Officer Daniel Cron. The expedition participants used this day to transfer data from their lab books to a computerized version to be sent to their colleagues ashore.

The ship entered US waters on October 1. Zooplankton nets were again included in the regular sampling plan. At station 18, two zooplankton nets, two phytoplankton nets and the CTD were deployed to 30m depth. Water from the surface and 30m was collected using the Niskin bottles. Water for filtration and for the setup of the fourth experiment was collected with the peristaltic pump (25 L total). The same sampling procedure was carried out for stations 19 to 21.

On October 5, the ship had reached Nome and all the passengers and part of the crew disembarked. No samples were taken that day. The cruise participants used that day for computer work and lab cleaning.

In the evening of the same day, the ship embarked for the transit to Seattle. As the current was quite strong on October 6, the ship could not stabilize enough to deploy the nets, Niskin bottles and CTD at station 22. Therefore, only water samples intended for filtration was taken that day.

The Aleutian Islands were reached on October 7. Shortly before the islands, water was collected from the peristaltic pump (station 23) for core oceanographic parameters and for the last nutrient amendment experiment. The Gulf of Alaska is a region where trace metals are low and often limit phytoplankton productivity. Due to the fact that the infrastructure for trace metal clean sampling and sample processing is currently lacking on the Le Commandant Charcot, experiments could not be caried out after the Aleutian Island since contamination could not be ruled out. Station 24 was sampled later on October 7th. One phytoplankton net and one zooplankton net were deployed to 30m. The peristaltic pump was used to collect water from 10m depth.

The two last stations (25 and 26) took place on October 8 and 9, respectively. Phytoplankton, zooplankton, and water samples were taken using the nets, the Niskin bottles and the peristaltic pump. The CTD was also deployed on both days.

From the 10th to 12th of October, the last experiment was ended, the last samples were processed, the equipment was packed and the inventory of the equipment left on board for the upcoming Antarctic cruise (CC080124) was prepared. Due to the space limit in the shipping box, part of the samples had to be left on board in the -80°C freezer. Samples preserved with Lugols/ Formaline were stored and left on board in one of the equipment boxes.

During the cruise, some laboratory visits were organized by Scientific Officer Daniel Cron for French-speaking and English-speaking passengers. On those visits and during the water collection, the scientists could interact with the passengers and explain their work. Also, the scientists had the opportunity to give two presentations: The first one to introduce themselves and the aim of their research on Le Commandant Charcot, and the second one on the way to Nome (Alaska, US), to present the work performed and to explained the preliminary results and observations made during the expedition.

3. Protocols

The goal for PhytoChAOs was to obtain unique spatial coverage of plankton diversity, phycotoxins and macro- and micro nutrient in one of the worlds most undesampled regions. To this end, the water and the net tows each were sub-samples for different parameters such as chlorophyll a, particulate organic carbon and nitrogen (POC/PON), particulate and dissolved vitamins, dissolved inorganic nutrients and different toxins. Some DNA extractions, sample fixation and cell isolations were also performed on board.

Water Samples

In order to get good spatial coverage of core oceanographic parameters, water was collected from 10m via the ship's peristaltic pump. In additon interregrated samples for Azaspiracid (AZA) and DNA analyses were obtained by mixing water from the surface and 30m (obtained via Niskin bottles) with the water collected with the peristaltic pump.

Chlorophyll a, POC/PON and particulate B-vitamins

At every station, 10 L of seawater was collected from the peristaltic pump in 2 L plastic amber bottles and stored in the fridge of the wet lab until further processing.

For Chlorophyll a, water was filtered over triplicate glass fibre filters (GFF, 0.7-µm pore size) and polycarbonate filters (PC, 5-µm pore size) with a gentle vacuum of <200 mbar (***Figure 6***). The filters were then collected and frozen at -20°C for post-cruise analysis. Similarly, samples for POC/PON and particulate vitamins were collected by filtering water onto pre combusted and non-combusted GFF filters respectively for subsequent analysis back at the AWI. The volume of water filtered depended on the station. Some were richer in organic matter than others. However, it never exceeded 750 mL per filter.

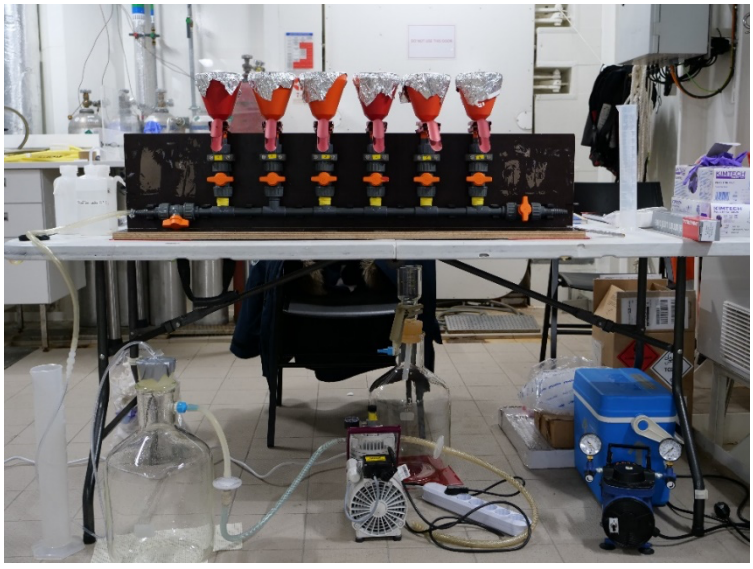

Figure 6. *Filtration rack deployed in the wet lab. A tube connects the filtration rack to the water recovery bottle and to the pump responsible for the system's vacuum suction.*

Flowcytometric analysis of the nano and picoplankton community

Two samples, of 4.75 mL whole sea water were collected in 5mL cryovials preserved with 250µL formalin and stored at -20°C for later analysis at the AWI.

Dissolved B-vitamins and macronutrients

Figure 7. *Dissolved B-vitamins concentration over C18 SPE columns.*

One 2 L plastic amber bottle was collected at each station for dissolved B-vitamin. The water was first filtered using a Masterflex peristaltic pump and a 0.2/0.4µm prose size AcroPak™ filtration cartridge. Once filtered, the exact volume of water was measured before being acidified to a pH of 6.2-6.8 using HCl (3.2N). An internal standard, N^{15} -B_{12}, was also added in order to calculate % recovery.

The 2 L water where then slowly concentrated onto a previously methanol-conditioned SPE column (***Figure 7)***. The laminar flow speed through the SPE column was fixed at 1 ml/min, using a micro-peristaltic pump. After the whole volume of water had passed through the column, they were rinsed with MQ water and dried with a syringe before being parafilmed on both sides and dried in the -20°C freezer, waiting for further analysis back in the laboratory at AWI. Two 10 mL water samples were collected from the filtered water from the filtration rack at every station to quantify dissolved nutrients in the seawater using standard colorimetric techniques

AZA and DNA samples

3 L of water collected from 0, 10 and 30 m were mixed together, before being filtered over a 200-µm mesh to measure AZAs. 100 mL was fixed with Lugols solution, whereas the other part (between 3 to 5 L) was collected on 5-µm polycarbonate filters using vacuum filtration. The filter was rinsed with 1000 µL of 100 % methanol and the methanol was transferred into a 0.45 µm spin-filter and centrifuged for 5 minutes at maximum speed and stored at -20°C until further analysis.

For DNA, 2 to 4 L of water were filtered following the same procedure as for AZA. The filter was then rinsed with 500 µL of SL1-Buffer (part of the DNA extraction kit), transferred to a bead tube and stored at -20 °C until analysis back at the AWI in Bremerhaven.

Net tows

Both, phytoplankton and zooplankton nets, were deployed twice to a depth of 30 m.

Phytoplankton net

A mesh-size 20 µm net was used. The content of the net was collected and its volume adjusted to 2 L, with 0.2µm filtered seawater (FSW). 18 mL of water was preserved with 2 mL of formaldehyde (1%, V/V). A 50 mL aliquot of this net tow was placed in the fridge, for subsequent cell isolation. The remaining volume was filtered over a filter tower consisting of 200, 50 and 20 µm pore sized mesh. Each mesh was then rinsed with FSW, the content of each fraction was transferred into 50 ml centrifugation tubes, and the volumes

adjusted to 45 ml using FSW. The samples were centrifuged at maximum speed for 10 minutes, and the supernatants were discarded. Each subsample was transferred to a cryovial with about 1.5 mL of FSW and centrifuged again for 10 minutes at maximum speed. After that, the supernatant was discarded and the pellets of the samples were stored at -20 °C for subsequent toxin analysis back at the AWI.

Zooplankton net

Figure 4. *Zooplankton net tow at Station 24 observed through the stereomicroscope.*

Similarly, a 150 µm mesh sized net was deployed for collecting zooplankton. 160 mL of the obtained sample was preserved with 40 mL of 20% formaldehyde (final 4% V:V). The inspection of the content of the sample and species identification was conducted visually as well with the help of a stereomicroscope (***Figure 4***). Individuals of each species were stored in 5 ml Eppendorf tubes and frozen at -20°C for the post-cruise extraction and analysis of toxins in the laboratories of the Alfred Wegener Institute in Bremerhaven. The remaining sample was filtered over a 1000, 500, 250 and 100 µm filter tower. Each fraction was transferred and adjusted into a 15 mL centrifugation tube using FSW. The samples were centrifuged at maximum speed for 10 minutes, and the supernatants were discarded. The pellet was resuspended in 4ml FSW, and divided into two aliquots of 2 ml. The cryovials were centrifuged and the pellets stored frozen until toxin analysis back at the AWI in Bremerhaven.

Cell isolation

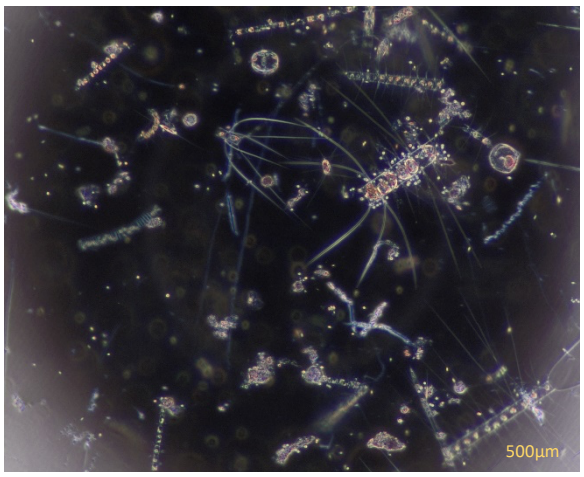

Figure 5. *Phytoplankton net tow at station 11, observed through the microscope before cell isolation. The picture was taken thanks to the OLYMPUS cellSens software linked to Ponant's microscope.*

At some stations, phytoplankton cell isolation from the net tows was performed. It should be mentioned that the two team members with experience in cell isolation were not on board. Nevertheless, some cells were successfully isolated by the cruise participants following the protocol and the advice from colleagues on land.

In the procedure, the lid of a 48-well plate was used for isolating the cells. A drop of the aliquot taken out of the phytoplankton net tows was placed in one of the delimited circles (***Figure 5***). Some medium drops were placed in the next well. Under the microscope the targeted cell was isolated using a 0.5-10µL pipette. The cell was carefully deposited in a 96-well plate and 250 µL of K-medium was added. The plate was then stored under ambient light and kept at 4°C and brought back to the AWI at the end of the expedition.

SPATT bag sampling

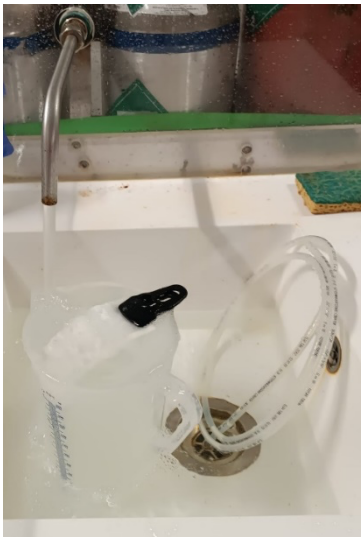

Figure 8. *SPATT-bag. Continuous lipophilic sampling in the wet-labs's sink*

SPATT bags were deployed in the wet lab (***Figure 8***). Those were submitted to a constant flow (~0.8L/min) of water from the peristaltic pump to absorb dissolved toxins. After 48 hours they were removed from the water and stored at 4°C. The extraction and measurement of the toxins will be performed in the laboratories of the Alfred Wegener Institute in Bremerhaven.

Nutrient amendment experiments

15 L of water were collected from 10m depth using the ship's peristaltic pump. The water volume was divided between 15 bottles of 1 L each. The experiment consisted of five treatments, in triplicate, as presented in ***Figure 9***.

The incubations were carried out in a fridge equipped with a LED lights set up, mimicking ambient conditions. Every incubation lasted approximately 2.5 days and was terminated by collecting samples from each bottle. Per bottle, one GFF and one PC filter for chlorophyll analysis and one sample for flow cytometry analysis were collected. The samples were then stored at -20 °C until the end of the expedition. Phytoplankton samples consisting of a 90mL pool of 30mL per replicate within one treatment were also collected, and Lugol's solution was added reaching a final concentration of 1% (V/V). The samples were stored in a dark box for the rest of the expedition.

All the samples from the five experiments at Stations 6, 10, 14, 18 and 23, were left on board.

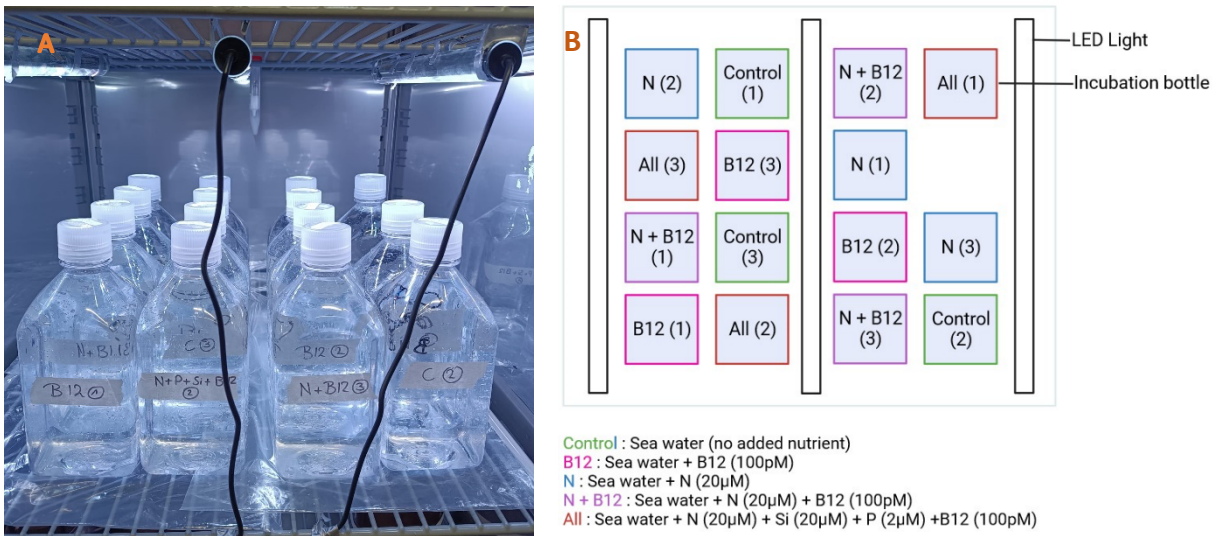

Figure 9. *Experiment Setup in the wet-laboratory fridge (A), and schematic of the different treatments used (B).*

4. Station List

Table 1. Stations sampled for PhytoChAOs onboard the 'Le Commandant Charcot'. PP-net = phytoplankton net, ZP-net = zooplankton net, CTD = Conductivity, Temperature and Density

Station No.	Date	Time	Latitude	Longitude	Gear	Remarks/Recovery
	2023	[UTC]	[°N]	[°W]		
1	12.09	19:30	62°44'29,01''	32°12'45,01''	2 PP + 2 ZP-nets + peristaltic pump	
2	13.09	19:42	60°10'24,10''	43°37'37,53''	2 PP + 2 ZP-nets + peristaltic pump + CTD	
3	14.09	11:25	60°8'43,10''	44°16'29,19''	2 PP + 2 ZP-nets + peristaltic pump + CTD	
4	15.09	22:05	62°5'36,51''	50°52'54,66''	2 PP + 2 ZP-nets + peristaltic pump + CTD	
5	16.09	20:00	64°7'29,46''	52°0'44,32''	Peristaltic pump water sampling only	
6	17.09	10:30	66°14'51,73''	54°19'2,88''	2 PP + 2 ZP-nets + peristaltic pump + Niskin bottles + CTD	2 Niskin bottles at 0 and 30 m respectively Launch experiment 1
7	18.09	12:15	69°13'45,37''	51°6'55,46''	2 PP + 2 ZP-nets + peristaltic pump + CTD	
8	19.09	13:15	71°27'0,86''	62°50'14,36''	2 PP + 2 ZP-nets + peristaltic pump + CTD	
9	20.09	13:25	72°42'22,84''	77°50'18,10''	2 PP-nets + peristaltic pump + CTD	Entry in canadian territory (ZP sampling not allowed)
10	21.09	13:55	74°49'37,84''	80°6'26,52''	2 PP-nets + flow through + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively Launch experiment 2
11	22.09	13:35	74,84°	0,80219°	2 PP-nets + peristaltic pump + CTD	
12	23.09	15:45	74°41'32,79''	91°10'27,12''	2 PP-nets + flow through+Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
13	24.09	07:00	77°1'40,99''	106°36'56,16''	1 PP-net + peristaltic pump	Sampling interrupted to avoid damage of the equipment due to strong currents and the presence of ice

14	26.09	23:05	76°30’0,16’’	113°39’1,32’’	2 PP + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively Launch experiment 3
15	27.09	17:25	74°39’22,72’’	124°10’59,38’’	2 PP + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
16	28.09	21:30	74°42’6,80’’	132°56’25,54’’	2 PP + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
17	29.09	18:30	70°46’21,18’’	137°12’31,95’’	2 PP + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
18	01.10	21:15	70°56’31,56’’	147°13’20,40’’	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively Launch experiment 4
19	02.10	17:58	71°32'19,11"	156°57’41,73’’	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
20	03.10	19:54	69°26’5,30’’	165°47'31,88"	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	1 Niskin bottle at 0 m (surface) only
21	04.10	19:15	66°14’35,41’’	168°26’56,08’’	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
22	06.10	19:45	59°55’53,86’’	168°15'42,90"	Peristaltic pump water sampling only	
23	07.10	16:36	54°35'55,10"	165°9'45,02"	Peristaltic pump water sampling only	Launch experiment 5
24	07.10	19:45	54°14'47,62"	164°11'51,53"	1 PP + 1 ZP-net + peristaltic pump	Lack of time to sample all nets and CTD+ NIskin bottles
25	08.10	18:20	53°30'18,73"	154°27'19,37"	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively
26	09.10	18:20	51°59'27,81"	144°43'22,27"	2 PP + 2 ZP net + peristaltic pump + Niskin + CTD	2 Niskin bottles at 0 and 30 m respectively

5. Sample List

Table 2. Samples taken at each station during PhytoChAOs. POC = particulate organic carbon; Part vit = particulate vitamin; Chl = chlorophyll; Diss nut = dissolved nutrients; Diss vit = dissolved vitamins; Expt = nutrient amendment experiment ; PP = phytoplankton tow and analysis; ZP = zooplankton tow and analysis; AZA = azaspiracids

Station No.	Type of sampling											
	CTD	POC	Part vit	Chl	Diss nut	Diss vit	Expt	PP	ZP	AZA	DNA	Cell isolation
1		x	x	x	x	x		x	x			
2	x	x	x	x	x	x		x	x	x	x	
3	x	x	x	x	x	x		x	x			
4	x	x	x	x	x	x		x	x			
5	x	x	x	x	x	x						
6	x	x	x	x	x	x	x	x	x	x	x	
7	x	x	x	x	x	x		x	x	x	x	
8	x	x	x	x	x	x		x	x	x	x	
9	x	x	x	x	x	x		x		x	x	x
10	x	x	x	x	x	x	x	x		x	x	x
11	x	x	x	x	x	x		x		x	x	x
12	x	x	x	x	x	x		x		x	x	x
13		x	x	x	x	x		x				x
14	x	x	x	x	x	x	x	x		x	x	
15	x	x	x	x	x	x		x		x	x	x
16	x	x	x	x	x	x		x		x	x	x
17	x	x	x	x	x	x		x		x	x	x
18	x	x	x	x	x	x	x	x	x	x	x	
19	x	x	x	x	x	x		x	x	x	x	x
20	x	x	x	x	x	x		x	x			x
21	x	x	x	x	x	x		x	x	x	x	
22		x	x	x	x	x						x
23		x	x	x	x	x	x					
24		x	x	x	x	x		x	x			x
25	x	x	x	x	x	x		x	x	x	x	
26	x	x	x	x	x	x		x	x	x	x	x

Some SPATT bags allowed the sampling of toxins from September 12 to 17. Three of those bags were used. Further integrative sampling of toxins could not take place because of the malfunction of the peristaltic pump.

6. Preliminary Results

CTD data

The full results of the CTD-cast can be found in the appendix. The results for temperature, salinity and oxygen saturation of the CTD-cast at Station 3 from 0 to 45 m are shown in ***Figure 10*** and show a fairly homogeneous upper mixed layer.

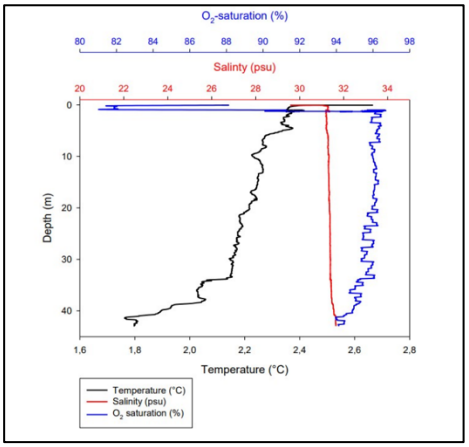

Figure 10. *Results for temperature, salinity and O_2 of the CTD-cast to 45 m at Station 3.*

Zooplankton

Target arctic zooplankton were successfully identified onboard using the stereomicroscope and were stored independently for toxin analysis. Some species identified include the amphipod *Themisto libelulla*, euphausiids like *Thysanoessa longicaudata*, or calanoid copepods like *Calanus glacialis (**Figure 11**)*.

Figure 11. *Species present in the zooplankton samples seen under the stereomicroscope. A) Adult female of the copepod Calanus hyperboreus, and B) the amphipod Themisto libellula stereomicroscope*

Phytoplankton cell isolates

Once goal was the the establishment of laboratory cultures of select harmful algal bloom species. While it is still to early to tell, an initial examination of the cell isolates revealed some growth of the targeted diatom *Pseudonitzschia* sp..

7. Participants

No.	Name	Early career (Y/N)	Gender	Affiliation	Assigned onboard tasks
1	Marina Arregui	Y	F	AWI	Zoo- and Phytoplankton Analysis
2	Elisabeth Rosselli	Y	F	AWI	Water analysis and experiments
3	Fuat Dursun	N	M	UIST	Cell isolation and Phytoplankton analysis

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UIST Institute of Marine Sciences and Management, Istanbul University

8. Acknowledgments

We thank ARICE for giving us the opportunity to conduct this unique research and Ponant for providing us with the needed shiptime to carry it out. A special thank goes to Vladislav Sidorenkov-Duprez and Marion Fourquez for organisational and logistical support. We are grateful to Captain Patrick Marchesseau, his officers and the rest of the crew of the Le Comandant Charcot for organising daily stops of the ship so that sampling could occur. Their curiousity and support for our work was exemplary. A special thank goes to Scientific Officer Daniel Cron, who provided technical and organisational support, and was quick to adapt to the everchanging and sometimes incongruous requests by the scientists. Additionally, we would like to thank members of the Ecological Chemistry Section and the Logistics Department at the AWI for providing logistical and financial support. Thanks also to Chris Gobler and Jennifer Goleski from Stony Brook University as well as Kathi Lefebvre and Emily Bowers from NOAA for providing the means of shipping our samples back to Germany.

Appendix

Excel file containing the full CTD-Data called CTDdata_PhytoChAOS_LCC_2023.