National Oceanography Centre

RESEARCH EXPEDITION REPORT

NOC ARCTIC CARBON

2025 MY Akula: Greenland fjords

15th to 29th August 2025

Chief Scientist: Dr Elena García-Martín

NOC Report No. 87

Authors: E. Elena Garcia-Martin, Nathan Hubot

Institution: National Oceanography Centre

Submitted Date: 23.10.2025

Financial Support: this research project and access to MY Akula was funded by Augmentum (https://www.augmentum.ch/).

Photos: Elena García-Martín, Nathan Hubot

A pdf of this report is available for download at: https://nora.nerc.ac.uk/id/eprint/540434/

(This page is left blank on purpose)

Contents

Overview

The purpose of the Greenland research cruise on board MY Akula was to investigate the interactions between DOC concentration and composition and the phytoplankton and bacterioplankton communities in Greenland fjords and coastal seas. The MY Akula cruise departed from Kulusuk-Tasilaq on the 15th August 2025 and arrived at Qaqortoq on 27th August 2025 when the science finished. Onboard there were two research scientists from the National Oceanography Centre, two members of Augmentum, and 14 crew members.

The cruise consisted of the sampling of one fjord on the East coast of Greenland (Sermilik fjord) and two fjords on the Southwest coast of Greenland (Iterdlak and Tunulluarfjik fjords). Each station comprised a series of observations of water column properties (temperature, salinity, photosynthetic active radiation, fluorescence and coloured organic matter), nutrients, dissolved organic carbon and its fluorescence, chlorophyll biomass as an indicator of phytoplankton abundance, phytoplankton imaging and eDNA samples for eukaryote and prokaryote plankton composition.

Acknowledgement

We would like to thank all the crew of the MY Akula for their invaluable support and help during this cruise, often at very inconvenient hours, and for making this voyage as enjoyable as it was. Special thanks go to Louis Elston for his invaluable skills skirting icebergs and surfing big waves, keeping us safe on the tender and for his good selection of music which kept our moods up while filtering. Particular thanks are owed to Captain Jonathan Sullivan, Chief Officer Sam Greer, Second Officer Yusuf Etem and Polar Captain Olaf Hartmann for keeping us in the right direction and away from icebergs. In particular we would like to thank Augmentum for its crucial financial support, in particular Enrico and Stefania Braglia for their generosity, constant interest in the science and our wellbeing, and for making all our wishes for this research expedition possible.

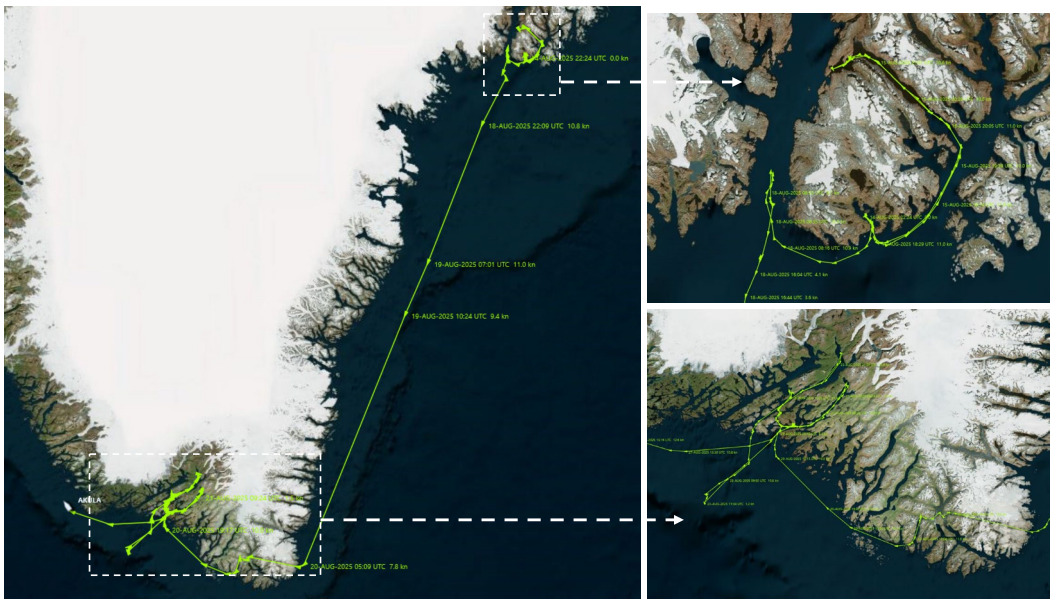
Personnel on Board

Name	Rank
Jonathan Sullivan	Captain
Samual Greer	Chief Officer
Yusuf Etem	2nd Officer
Olaf Hartmann	Polar Captain
Richard White	Expedition leader
Alexander L. Jones Huckle	Bosun
Lauren Wreck	Deckhand
Louis Elston	Deckhand
Cavill Lowish	Chief Engineer
Philip Henry Bradley	2nd Engineer
Alessandro Marrasco	Chef
Irene Ambrosone	Chief Stewardess
Lua Ferruzi	2nd Stewardess
Larysa Shelest	Stewardess
Enrico Braglia	Augmentum
Stefania Braglia	Augmentum
Elena García-Martín	Chief scientist
Nathan Hubot	Research scientist

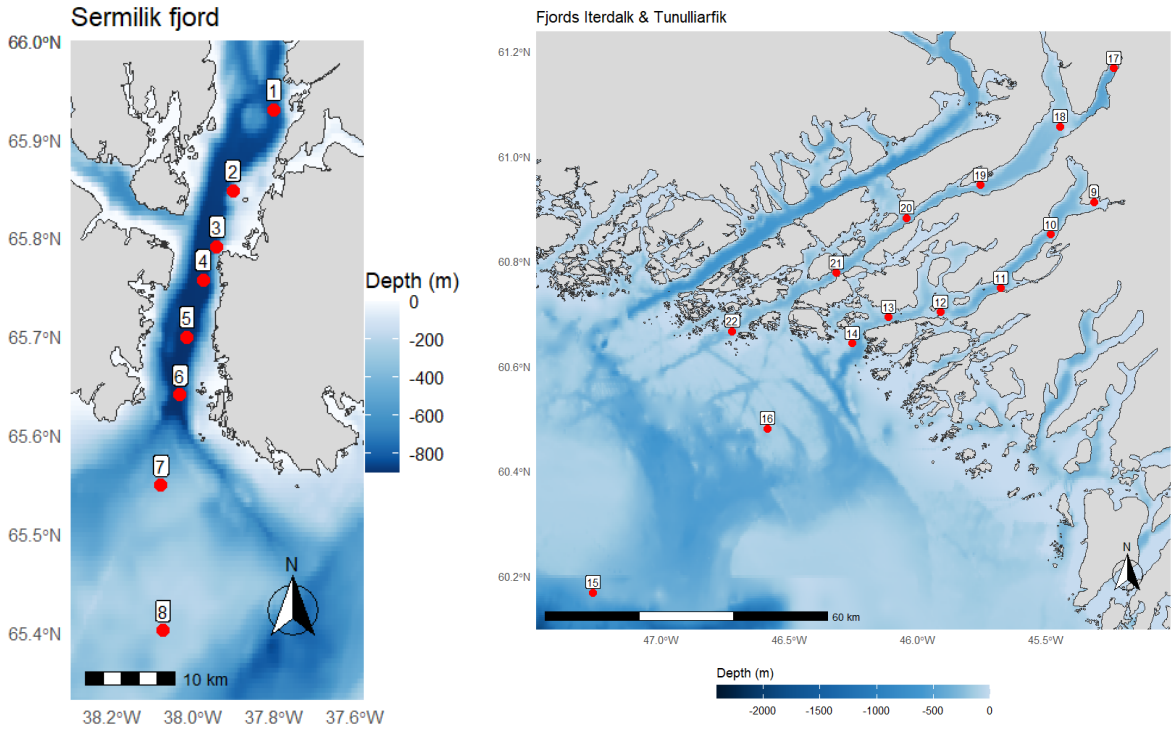
Back row from left to right: Enrico Bragia, Alessando Marrasco, Richard White, Cavill Lowish, Phil Bradley, Louis Elston, Yos Etem, Larysa Shelest, Jon Sullivan, Alex Huckle. From row left to right: Lua Ferruzi, Lauren Wreck, Stefania Braglia, Nathan Hubot, Elena García-Martín, Irene Ambrosone

Itinerary

Eight stations were completed in Sermilik fjord during the first four days, followed by two days of transit from the east coast to the southwest coast where 14 stations were completed in Iterdlak and Tunulluarfik fjords. Details of the position of the stations can be found in the event log section (see below).



Map of the MY Akula cruise track on the left and zoom-in of the different areas on the right



Zoom-in of the three fjords sampled including the sampling stations position (red dots).

Narrative

Thursday 14th August

Two enthusiastic researchers arrived to Kulusuk airport late evening and joined the TT Akula tender to be transferred to the MY Akula yacht which was anchored in front of Tasilaq. Immediately after joining, we, the researchers, were greeted by Augmentum and the crew members and received a short familiarisation of the yacht.

Friday 15th August

Day taken up by mobilization and setting up the lab and we did some tests of the instruments while still anchored in Tasilaq. Several discussions about what rope to use to deploy the CTD and Niskin. We had several rounds of tests with the hand winch to deploy the Niskin bottle. We found several problems (ie. unsuitable rope (too thin), not straight deployment which hampered the fire of the Niskin, Niskin damaged) which were solved with help from the crew. We tested the hand winch on the tender and deployed the CTD only to subsurface waters (~7 m), to familiarize with the procedure. No recordings made. At 5 pm we set sail to Sermililk fjord, and we anchored in Iggaajaddivar Fjord. We had 30 min of science talk to present what we would like to do in these next two weeks. The crew and guests were really interested, although it was probably a little science-heavy!

Saturday 16th August

Sunny day. We left to sample the first station in Sermilik fjord (Station 1) at 8 am on the tender TT Akula. The views were stunning, with small, medium and large icebergs everywhere. Although the intention was to go further north, the ice conditions and our first experience navigating between icebergs made us stop a little bit further north from Tiilerilaaq town, close to a huge iceberg. Maximum depth 55 m (although we suspect it was under ice formation or change in the water temperature, as the acoustic sonar from the tender was changing from 55 to 130 m in 1m distance). CTD profile to 50 m and sampled 1 m, 15 m and 45 m. Researchers returned to MY Akula after the sampling.

In the afternoon, we departed with the tender to sample the second station (Station 2) south from Iggaajaddivar Fjord. The station was chosen in the middle of Sermilik fjord, so we could explore a deeper water column and influence of several water masses. It was very sunny with a light breeze, and there were medium-strong superficial currents that made the tender drift with the icebergs around us. The station was quite close (<1 km) to a tiny island with many birds on it. CTD profile to 90 m, and samples collected at 1 m, 15 m and 45 m. Researchers returned to MY Akula after the sampling. Process of the samples in the late afternoon-evening.

Sunday 17th August

Blue skies in the morning and calm weather. Sermilik fjord was less packed with icebergs although there were still some large ones. We sampled two stations in the morning (Station3 and Station 4) from the tender. Station3 was opposite the mouth of St Petersen fjord, which meant that we were surrounded by large and small icebergs. One feature that we noticed is that the echo sounder of the tender changed from 400 m to 15 m in less than 1 m, which we suspected again was due to the proximity of ice sheets. The maximum water depth at station3 was 440 m, although the echo sounder was very variable. CTD deployment to 80 m and collection of water samples at three depths. The water was quite clear, and there was no sign of lots of organisms. When we finished sampling, we sailed further south and completed Station4 (maximum depth indicated 145 m, but in the surrounding areas indicated 500 m). There were high mountains around us, but we could not see any water input from land. Processing of samples in the afternoon.

At 5 pm, the MY Akula set sail to Tasiliaq where we anchored for the night (65° 53.93'N, 037° 45.679'W).

Monday 18th August

MY Akula set sail at 5:55 am from Tasiliaq to Station5 (65° 41.97' N, 38° 00.91' W). It was a foggy morning. Once at the station we tested the deployment of the CTD from the MY Akula, but we were having problems keeping the CTD vertical to perform the profiles. After a couple of tries, we aborted and decided to sample from the tender. The tender left at 9 am, and by 10 am, the air was clear of fog in the centre of the fjord with fog on both sides. The water was clear of icebergs and only had small ice patches. From Station5 we sailed to Station6 (further out in the fjord, 65° 38.49'N, 38° 01.93' W) where we performed another profile at midday and collected water. There were some surface currents that made the tender wave a little bit. We had whales greeting us, which stayed for a short time close to our tender and MY Akula. The captain recorded amazing footage! By this time the sky was clear and sunny. Returned to MY Akula for lunch and processed some samples while we sailed to Station7 (65° 32.93'N, 38° 04.76'W), where we performed another CTD profile and sampling of the water column. The water was clear of ice, and there were icebergs far in the distance (>2 km away). We moved to the most open water station (Station8, 65° 24.10'N, 38° 04.44'W) where the waters had a deep blue colour. After finishing with the sampling, we returned to MY Akula (~6 pm) to process the samples. The process of the plankton imaging was left to the next morning, as we needed to rest.

The forecast indicated strong winds and bad weather conditions approaching during the following two days, so the MY Akula started sailing to the South of Greenland to avoid it and have an easier journey. This meant that we did not have time to sample the land-terminating fjord in this area as initially programmed.

Tuesday 19th August

Sailing day along the southeast coast of Greenland. Misty morning followed by sunny spells and low clouds. Calm seas, and some whales spotted. Day to process samples, and work on the data collected. We sailed into Prins Christianssund fjord to avoid the strong winds around the south of Greenland. Beautiful area!

Wednesday 20th August

Continued the passage in the morning and we anchored at 60° 08'53''N and 44° 16'22.1''W position to shelter from the wind. Warm weather (13 °C), but very windy. Researchers went to shore for a short walk with Augmentum members. It was nice to step on land (and water, as our feet got damp when we got down from the tender into a tiny rocky beach). Green patches of land with small flowers and wild blueberry plants. There was a walking trail which appeared and disappeared in the mountainous area. After one hour, we returned to the MY Akula, which continued its journey to Qaqortoq where we anchored at ~8 pm (60° 42'41.25''N and 46° 01'59.39''W). It felt warm, and it was, as the air temperature was 17 °C.

Thursday 21st August

MY Akula set sailed at 5:45 am to the inner part of the fjord. Our first day of science in this fjord was greeted by warm temperatures (14 °C), and strong winds (26 knots) in the morning. The water was choppy and we completed the last four miles on the tender to Station9, a shallow (~33 m) station close to two rivers, therefore ensuring we captured water input from a land terminating fjord. The wind gusted up to 30 kts while we approached the inner part of the fjord. The tender was up and down in the waves, and it was very difficult to maintain the position. We deployed the CTD, in non-ideal conditions, and the deployment of the equipment felt risky. Although we did not fear for our lives, the conditions were not safe, so we decided to collect only surface water (as the land-terminating end member), and then cancelled the

station. As soon as we finished sampling, and the waves allowed it, we moved to Station10, and by this time the wind picked up to gusts of 35 knots. There were sporadic large waves (~2 m), with several splashes into the tender and on us. Deployed the CTD with the rough weather, and we collected samples at three depths. It was hard and challenging, and despite not being so cloudy, the visibility of the water was minimal (1-2 m). The wet researchers and our courageous crew member, Louis, came back to the MY Akula for lunch, and left to Station11 at 1:45 pm. The water was still choppy and very windy. Water samples collected at three depths. Back to Qaqortoq port where the MY Akula docked. Easy evening and some relief in the local pub with live Greenlandic music. A good time to integrate with the crew and have some relaxing time.

Friday 22nd August

Early start (7:30 am) on a grey, rainy morning. Researchers embarked on the tender to Station12, a station in the middle of the fjord, sheltered by small islands. Although the day was grey and drizzling/raining, the water was calm which helped the deployment of the CTD and the Niskin bottle. We felt relief after the previous day. Water column sampled at the three depths. Then, we moved further south to Station13, which was in the middle of the fjord, further south from Qaqortoq, and with icebergs present in the far distance close to land. There were several boats and cruises passing towards Qaqortoq port. We successfully deployed the CTD and Niskin bottle. The water was turbid, and the visibility decreased a lot in the first meters.

Back to MY Akula for lunch and by this time the rain stopped, and it was cloudy with some spells of sun. We set off to Station14 in the afternoon on the tender. Sun came out while on station and the air temperature was ~14 °C. Calm waters and good conditions for the deployment of the CTD and Niskin bottle. MY Akula set sailed at 1.30 pm to anchor at the mouth of the fjord (60° 44.1116'N and 46° 14.32'W) with beautiful surroundings. Sunny afternoon spent inside the lab processing the samples.

Saturday 23rd August

MY Akula set off before 6.00 am to our station on the slope of the shelf (Station15), arriving close to the first one at ~10.00 am. Although it was sunny during the sunrise, we went through a couple of fog patches during our sailing. We sailed the last 4 nm on the tender and by then it was cloudy with some sunny spells. There were some swells, although the sea was barely flat. It felt that all the members of the tender were tired, and we had several misfires with the Niskin bottles, which contributed to the low morning mood. We had several interested birds during the sampling, which were waiting to see if we managed to get some fresh fish and take advantage of it. But no fish, only water! Once the station was completed, we sailed back ~8 nm to meet the MY Akula and then kept sailing towards the shelf. At 2 pm we arrived at our shelf station (Station16) and deployed the tender for sampling. The sun was out, although it was still cold. The spirit of the members on the tender was a little bit lifted which helped performing the station without any problem. There was a patch of broken macroalgae (*Fucus sp*.) and some jellyfish in the water when we deployed the first Niskin bottle. Not sure where they were coming from but may have an influence on our fDOM results. In this station we also had a bird audience, waiting for a bite. Back to the MY Akula once finished, which set sail heading towards Narsarsuaq dock. During the transit, there were a couple of patches full of icebergs, which added some tension to the journey. But the journey was beautiful with green land on both sides of the fjord. Finally, some proper green! We passed several houses and settlements towards Narsarsuaq dock where we docked in the late evening with a beautiful sunset.

Sunday 24th August

Early start for the tender members as we wanted to get as close as possible to the marine terminating glacier (Station17). It was a misty cold mysterious morning with low visibility (30-40 m). We passed many icebergs, some of them beautifully carved. We managed to get pretty close to the glacier (400-500 m), which was stunning. The fog started to rise a couple of meters above our head, leaving the water a turquoise colour. We successfully deployed the CTD and the Niskin bottle and collected all the samples with no issues. By the time we finished, the glacier was covered by a foggy curtain, and it felt as if it was not there, and we had simply dreamed of it. We sailed to the next station (Station18) where we were surrounded by icebergs. Despite being cold, the calm waters and the beautiful scenery helped us to complete the station without problem. We came back to MY Akula with all our samples and started processing them until the afternoon when we sailed again to the last station of the day (Station19). We sailed ~14 miles down the fjord, through blue light icebergs, passing several waterfalls. Although it was foggy up the fjord, there was a sunny patch in our station. The water was very clear and calm, and as in the morning we did not have any problem during sampling.

Monday 25th August

A foggy start for our journey down the fjord. Last day of collecting water. MY Akula set sail at 7 am, to take us to the first station of the morning (Station20). The water had some icebergs spread here and there, but overall, it was not a difficult passage. At 9:30 am, we left on the tender to perform the sampling of the station while the MY Akula went to find a good place to anchor. Station20 was in front of Narsaq, where the Narsarsuaaraq fjord opens to this fjord. In Narsaq village there were a couple of oil deposits, although these should not influence our station as we were quite far away. No problems were encountered, so we continued to Station21. The whole journey was mesmerising: light blue icebergs, impressive, some of them with the shape of a sphinx, and when we went round it, a huge blue hole which made our jaws drop. Nature is beautiful! After several pictures we continued to our Station21. It was still foggy and cold, but the good calm waters helped us to complete the station without any problem. Once we had all the samples we came back to MY Akula for lunch and a tiny break.

In the afternoon, we departed for our last and final station at the mouth of the fjord (Station22). Our spirits were high, even knowing that we were not going to see icebergs. As soon as we approached Simiutaq, the water changed from calm conditions to choppy. Neptune did not want us to finish easily and put some challenges ahead. The choppy waters caused some misfires of the Niskin bottle at 45 m, but with the good team effort to keep the tender in position, so the line of the Niskin was vertical, we succeeded. We noticed some break up macroalgae (*Fucus sp*) on the surface waters. All samples collected, which meant the end of the sampling. Mix of feelings: happiness for having completed a successful mission versus the sadness for ending our expedition in this fantastic, special and magical place. Despite the mixed feelings, we had a fantastic ending, as we spotted a flock of birds feeding intensively in the water. We were not sure what was happening, but there was definitely something in the water. They turned out to be seals!!! This was the “cherry on top” that we needed to put an end to our scientific sampling days.

Afternoon-evening processing samples. We were told that the sky had good conditions for northern lights, and they made their appearance, which rewarded the crew who worked late.

Tuesday 26th August

Late start for the MY Akula, with most of the science done. What we expected to be an easy morning cleaning and packing, turned out to be altered by a storm approaching our way, so

the captain requested to go back to Qaqortoq to drop off our equipment ASAP. So, the easy morning turned into a frantic morning packing, playing Tetris with our equipment, labelling and emailing our warehouse in Qaqortoq to arrange an early collection. After several emails, and phone calls we arranged the drop of the equipment for mid-afternoon, so last minute printing labels, checking that we were not forgetting anything and bye-bye, ten of our boxes were collected and will be stored until the freight line arrives in a couple of days/weeks.
With all the science done, equipment gone, we, the researchers, decided to go for a walk in Qaqortoq and its hills. We enjoyed the sun and conversation while sitting behind the church admiring the stunning views on a sunny afternoon. The day ended up in the Qaqortoq hotel where we socialised and enjoyed a cold drink in a nice environment.
The change of plans implied that instead of saying farewell to this adventure in Qaqortoq on the 29th August as initially planned, we stayed on board and got a lift to Nuuk, from where we would fly back home.

Wednesday 27th August
Left Qaqortoq in the morning to make our journey to Nuuk. Day to write reports, work on the data and a presentation of the science done.

Thursday 28th August
Arrival to Nuuk in the afternoon where we anchored in front of the port. Day to catch up with emails and office work.

Friday 29th August
Short trip around Nuuk fjord to enjoy the beautiful landscape. All the science is done, time to go back home.

Saturday 30th August
A very windy wet day greeted us on our last day on board. After lunch we said goodbye to this magnificent yacht and the helpful crew and got a lift to Nuuk. We travelled light except for the two huge cool Yeti boxes containing all our samples.
When will we come back? Not sure, but hopefully soon.

Event Log

Station	Date	Deployment			Recovery			Maximum depth (m)	Notes
		Time (local)	Latitude (N)	Longitude (W)	Time (local)	Latitude (N)	Longitude (W)		
1	16/08/2025	08:52	65°55.80	37°48.155	08:59	65°55.78	37°48.140	55	Niskin deployed to 1, 15, 45 m
2	16/08/2025	14:35	65°50.87	37°54.16	14:45	65°50.85	37°54.16	255	Niskin deployed to 1, 15, 45 m
3	17/08/2025	08:34	65°47.47	37°56.49	08:43	65°47.47	37°56.49	432	Niskin deployed to 1, 15, 45 m
4	17/08/2025	09:57	65°45.42	37°58.57	10:05	65°45.41	37°58.49	102	Niskin deployed to 1, 15, 45 m
5	18/08/2025	09:21	65°41.97	38°00.91	09:26	65°42.02	38°00.89	>500	Niskin deployed to 1, 15, 45 m
6	18/08/2025	10:48	65°38.45	38°01.93	10:56	65°38.51	38°01.81	>500	Niskin deployed to 1, 15, 45 m
7	18/08/2025	14:42	65°32.93	38°04.76	14:49	65°32.96	38°05.01	321	Niskin deployed to 1, 15, 45 m
8	18/08/2025	16:37	65°24.10	38°04.44	16:47	65°24.10	38°04.67	168	Niskin deployed to 1, 15, 45 m
9	21/08/2025	08:54	60°54.77	45°18.73	08:55	60°54.77	45°18.73	32	Niskin deployed to 1 m
10	21/08/2025	09:48	60°51.069	45°28.818	09:53	60°50.90	45°29.26	394	Niskin deployed to 1, 15, 45 m
11	21/08/2025	13:38	60°44.93	45°40.53	13:45	60°44.96	45°40.68	387	Niskin deployed to 1, 15, 45 m
12	22/08/2025	07:53	60°42.19	45°54.64	07:59	60°42.20	45°54.63	305	Niskin deployed to 1, 15, 45 m
13	22/08/2025	09:11	60°41.64	46°06.74	09:17	60°41.64	46°06.83	249	Niskin deployed to 1, 15, 45 m
14	22/08/2025	13:21	60°38.63	46°15.31	13:27	60°38.61	46°15.31	265	Niskin deployed to 1, 15, 45 m
15	23/08/2025	10:33	60°10.119	47°15.909	10:40	60°10.060	47°16.054	242	Niskin deployed to 1, 15, 45 m
16	23/08/2025	14:34	60°28.87	46°35.15	14:41	60°28.89	46°35.26	127	Niskin deployed to 1, 15, 45 m
17	24/08/2025	08:06	61°10.092	45°14.080	08:13	61°10.087	45°14.080	394	Niskin deployed to 1, 15, 45 m
18	24/08/2025	09:37	61°03.419	45°26.625	09:44	61°03.421	45°26.608	174	Niskin deployed to 1, 15, 45 m
19	24/08/2025	13:46	60°56.71	45°45.26	13:53	60°56.72	45°45.24	300	Niskin deployed to 1, 15, 45 m
20	25/08/2025	09:53	60°52.94	46°02.51	09:59	60°52.93	46°02.54	300	Niskin deployed to 1, 15, 45 m
21	25/08/2025	11:20	60°46.68	46°19.05	11:27	60°46.66	46°19.12	396	Niskin deployed to 1, 15, 45 m
22	25/08/2025	14:43	60°40.01	46°43.34	14:50	60°39.98	46°43.35	320	Niskin deployed to 1, 15, 45 m

CTD deployment and Niskin bottle sampling

Elena García-Martín, Nathan Hubot and Emma Worthington (National Oceanography Centre)

For each station, we deployed an RBRmaestro³ CTD from surface to 80-90 m weather depending. We only had one station that was shallower (40 m) in which the deployment was done to 30 m.

The CTD deployed was an RBRmaestro³ CTD modified with specific configuration: an RBRcoda^3 T.ODO optical dissolved oxygen sensor, an RBRcoda^3 PAR radiometer, and a 3-channel RBRtridente with backscatter, Chlorophyll-a, and fluorescence and colorimetric (fDOM/cDOM) optics. Maximum pressure rate of 550 dbar. The main characteristics provided by the manufacturer are:

- Family: Standard Instrument 'L3'
- Material: POM
- Feature: Fast 8Hz sampling '|fast8'
- Multiple sensor integration: POM
- SEC: RBRmaestro³ POM
- BEC: Blank battery end-cap
- Option: Wi-Fi [2000dbar max]
- Combined CT kit: Inductive marine with fast response temperature [750dbar max]
- Pressure kit: Piezo resistive gauge [multiple ranges available]
- Dissolved oxygen kit: T.ODO|fast [cabled, 0.6m, 6000dbar max]
- PAR kit: cosine [cabled, 0.6m, 2000dbar max]
- Tridente kit: bb.chl-a.fDOM [cabled, 0.6m, 6000dbar max]

The CTD was slightly modified by the addition of a bracket to be able to deploy it. The deployment was done by hand using a rope with the assistance of a hand winch. A safe line was added to minimise the potential loss of the CTD in bad weather conditions.

Sensors were manufacturer calibrated, and they were neither calibrated before the cruise with seawater samples due to lack of time, nor calibrated on the cruise due to lack of resources on board. Sensors will be calibrated once back at the National Oceanography Centre.

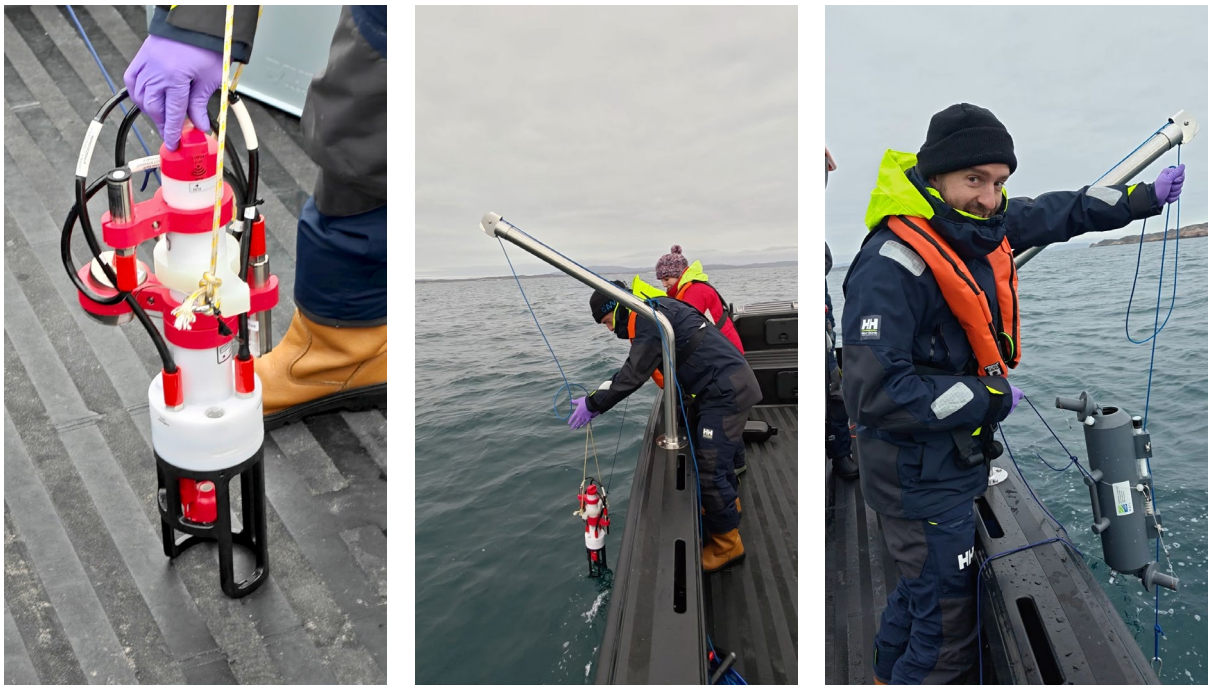
Casts were numbered with the name of the station. 22 full casts were recorded. No problems were encountered during the deployment, and extra weight was added on those stations with bad weather conditions.

Niskin deployment and sampling

A 5 L OSIL Niskin was used during the whole expedition. 5 kg weight was added to the line to keep the Niskin bottle vertically during the deployments. The deployment was by hand with the same rope and hand winch used with the CTD.

For each station we deployed the Niskin at three depths (1, 15 and 45 m) to collect water for the different samples collected.

We directly filtered water from the Niskin for dissolved organic carbon, fluorescence dissolved organic matter and nutrients. In addition, water samples were collected in 1L bottles for chlorophyll-a concentration, pico-, nano- and microplankton abundance, and seawater was collected in 2L bottles for eDNA (see below).



RBR Maestro CTD, and the hand deployment of the CTD and Niskin bottle

Dissolved organic carbon (DOC) and fluorescence dissolved organic matter (fDOM)

(Elena García-Martín, NOC)

Water was filtered through an in-line GF/F filter holder containing a pre-combusted (450 °C, 5 hours) GF/F filter into pre-acid cleaned 50 mL HDPE bottles. The filter housing was sterilized in a 10 % HCl acid bath for >4 hours, and rinsed with Milli-Q before being assembled with a new GF/F filter in between sampling days. Glass DOC bottles were rinsed three times with filtered water before being filled to the shoulder to allow headroom for freezing. Samples were acidified with 50 µL of 12M hydrochloric acid (37%). Samples were stored inside cool bags with Techni-ice in, to keep the cold conditions until returning to the MY Akula, where they were stored in the 4 °C fridge.

After the collection of the DOC samples, the same filter holder with the pre-combusted GF/F filter was used to collect filtered seawater into 30 mL pre-acid cleaned amber glass bottles for fDOM. The glass bottles were rinsed three times with filtered water before being filled to the shoulder to allow headroom for freezing. Samples were stored inside cool bags with Techni-ice in, to keep the cold conditions until returning to the MY Akula, where they were stored in the -20 °C freezer.

Dissolved inorganic nutrients

(Elena García-Martín, NOC)

Water was filtered directly from the Niskin bottle using a 25 mL pre-acid washed syringe with an in-line cellulose acetate ovni filter (0.8/0.45 µm) attached to it. A 30 ml pre-acid cleaned Nalgene bottle was rinsed three times with filtered seawater, then filled to the shoulder to allow for expansion on freezing. Samples were stored inside cool bags with Techni-ice in, to keep the cold conditions until returning to the MY Akula, where they were stored in the -20 °C freezer.

Filtration system for the DOC, fDOM and nutrients

Chlorophyll-a and phytoplankton composition

(Elena García-Martín and Nathan Hubot NOC)

Samples for chlorophyll-a and phytoplankton composition and imaging were collected into brown 1 litre HDPE bottles. The bottles were rinsed three times with seawater and filled to the shoulder. Samples were stored inside cool bags with Techni-ice in, to keep the cold conditions until returning to the MY Akula, where they were subsampled for the different variables.

Chlorophyll-a

250 ml of sea water was filtered onto a 47 mm GF/F filter. Filter was collected and stored inside Eppendorf tubes and stored in the -20 °C freezer.

Bacterio-, pico- and nanoplankton.

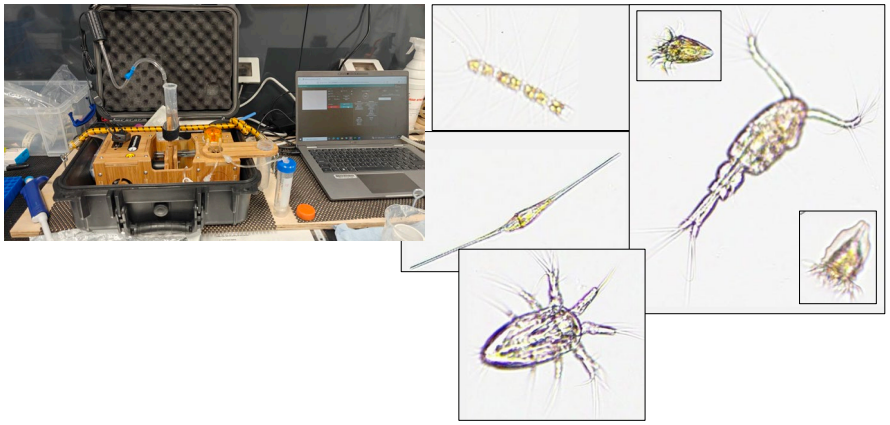
0.95 mL sea water sample was collected into Eppendorf tubes, fixed with 50 µL of 20 % paraformaldehyde (1% final concentration) and left 30 min at 4 °C before storing them in the -20 °C freezer.

Lugol samples

A hundred mL of seawater was collected into ambar glass bottles. One mL of lugols iodine solution was added to each of the samples. The lid was wrapped in parafilm, and samples were shaken to homogenise the chemical. Samples were stored at 4 °C until provided to the warehouse in Qaqortoq for their transport

PlanktoScope Images

Between 500-650 mL of seawater was filtered through an 18 µm mesh filter, and the retained sample was resuspended in 7-14 mL of filtered seawater and collected in an eppendorf.
The sample was then imaged with a PlanktoScope with a 300 µm flow cell. Between 200-300 images were acquire, with a pumped volume of 0.02, and a 0.5 second to stabilize the image. Images were segmented with PlanktoScope software, and the data and objects were uploaded to Ecotaxa.



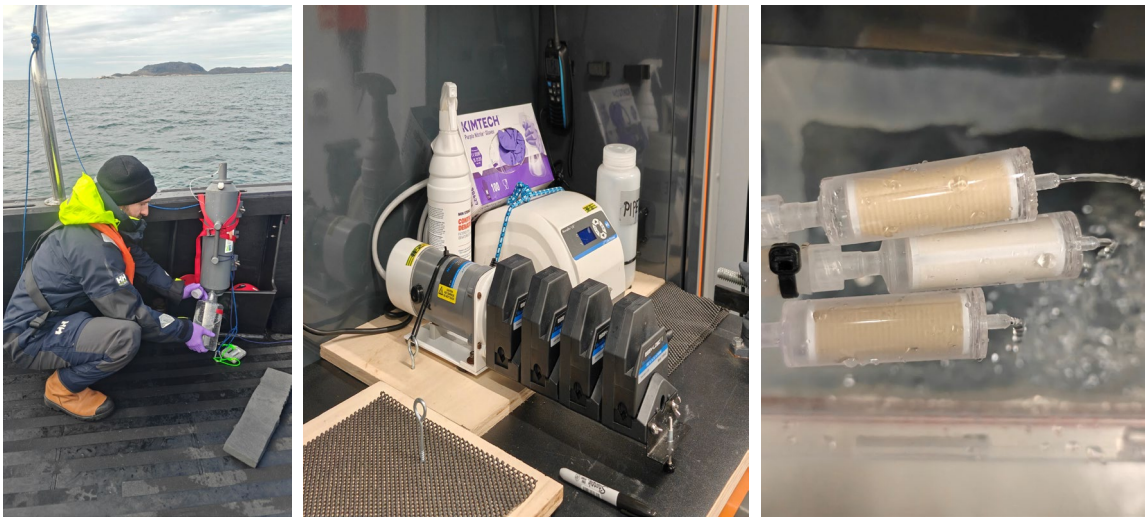
PlanktoScope and some images of phytoplankton and zooplankton from the sampled water

Environmental DNA (eDNA)

(Nathan Hubot NOC)

2 L of seawater were collected directly from the Niskin bottles into bleach-rinsed, clear HDPE bottles. Samples were stored in cool bags with Techni-Ice™ to maintain low temperatures until returning to the MY Akula, where processing was carried out.

In the laboratory, seawater was filtered using a peristaltic pump equipped with three parallel heads, allowing simultaneous filtration of three samples. The pump speed was set to 70 RPM (revolutions per minute). Each 2 L sample was passed through a sterile 0.2 µm Sterivex™ filter cartridge. Following filtration, filters were preserved with 1 mL of RNAlater® and sealed with parafilm. Samples were subsequently stored at –20 °C until further analysis.



Collection of a 2 L eDNA sample from a Niskin bottle (left) and subsequent filtration onto Sterivex™ cartridges (right) with a peristaltic pump (middle).

National Oceanography Centre, European Way, Southampton, SO14 3ZH
United Kingdom +44 (0)300 131 2321

Joseph Proudman Building 6 Brownlow Street, Liverpool, L3 5DA
United Kingdom +44 (0)151 795 4800

National Oceanography Centre is a company limited by guarantee, set up under the law of England and Wales, company number 11444362.

National Oceanography Centre is registered as a charity in England and Wales, charity number 1185265, and in Scotland, charity number SC049896.

NOC.AC.UK