CRUISE REPORT

ECOTIP

Le Commandant Charcot, Cruise No. O100522,

10 May – 22 May 2022, Reykjavik (Iceland) – Reykjavik (Iceland)

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Wiedmann, Ingrid UiT The Arctic University of Norway, Tromsø, Norway

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Summary

Arctic ecosystems are currently changing at a rapid rate and drastic sea ice loss may cause a tipping cascade resulting in a strengthening of the water column stratification, an altered plankton community, a modified pelagic-benthic coupling and a reduced transport of biomass to bottom living fish. This may cause major challenges for the halibut oriented Greenlandic fisheries. The EU project ECOTIP investigates these changed and during the cruise with the ice breaker Le Commandant Charcot, ECOTIP researcher Ingrid Wiedmann, accompanied by master student Stian K. Karlsen, collected field data from an area. The ecosystem at the East Greenland coast has so far been little investigated during spring due to heavy sea ice in the area. During the present cruise, the researchers could collect hydrography data at 5 stations as well as water samples for eDNA, phytoplankton, chlorophyll a, chlorophyll a > 10 µm, particulate organic carbon, and samples for the HPLC analysis of pigments) at three stations. These data will be combined in a publication with data from the ECOTIP cruise with the R/V M.S.Merian to the same region in August 2022 and thus allow a better understanding of the East Greenland system during spring and summer.

1. Research Programme/Objectives

At present, the Arctic ecosystems are fundamentally changing as a consequence of the pronounced climate warming in this area. Among the most drastic changes are the gradual sea ice loss, the strengthening of the water column stratification due to more meltwater, and an altered biodiversity due to species invasion. ECOTIP (EU Horizon 2020, #869383) focusses on one pressing question associated with these changes and estimates the dynamics of ecological tipping cascades in (among others) the Greenland Sea. This is crucially needed, because passing a tipping point presumably causes a cascade of changes in the ecosystem and results in a marine system that provides considerably different ecosystem services (e.g., in terms of carbon sequestration and fisheries).

ECOTIP uses different approaches to achieve its goal and relies in subtasks heavily on field data, but field data from this region are hard to obtain, especially during spring, when a dense sea ice is present in the area. To gather observational data (hydrography, water samples for eDNA, phytoplankton, chlorophyll a, chlorophyll a > 10 µm, particulate organic carbon, and samples for the HPLC analysis of pigments) researcher Ingrid Wiedmann, accompanied by master student Stian K. Karlsen participated in the expedition cruise with Le Commandant Charcot to east Greenland.

The main objective with these data was to compare the situation in the water column during spring (LCC cruise) with data from a reasearch curise conducted in August 2022 in the same area, and to understand more of the seasonal changes along the East Greenland coast.

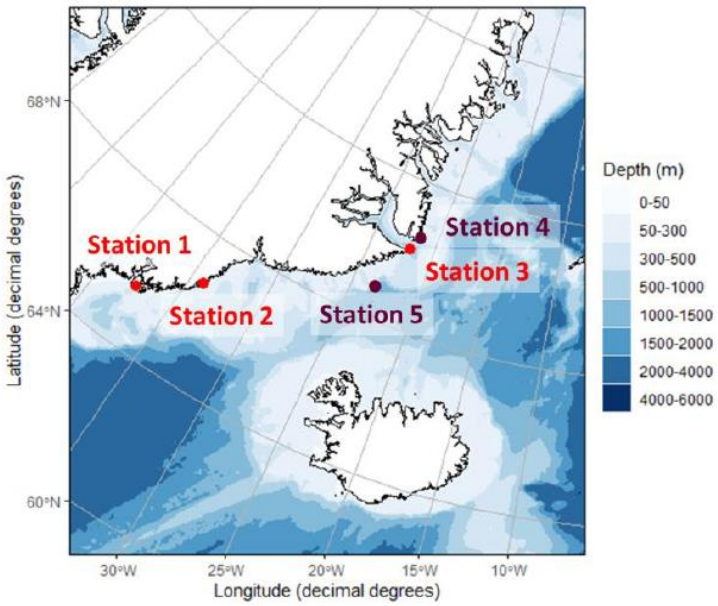

Fig. 1.1 Study area in east Greenland. At station 1, 2, and 3 (red) both hydrographical data with a SBE19 CTD and water samples were collected. At station 4 and 5 (darkred) only a CTD profile with a RBR CTD was taken.

2. Narrative of the Cruise

Despite the great opportunity to collect data in a rather little inverstigated area, the cruise with LCC started with several hinders. When the scientists came onboard, no Niskin bottles available for sampling. Thanks to ECOTIP cooperation partners in Reykjavik an old-fashioned Nansen water collector could be organized and used to take water samples. Also, the cruise track of LCC was changed on short notice and thus a new Greenlandic sampling permit had to be organized in the first days of the cruise. However, after these hinders were overcome, the reserachers could start sampling.

Sampling 13.5.

CTD data (Seabird 911) and water (using the Nansen water collector) was samples through a hole in the sea ice (close to LCC) outside Tassilaq. Since the sea ice was rather thin (ca. 40 cm), both CTD and water samples could be collected through a hole in the ice. Several passenengers came by and the scientists could communicate the “why” and “how” of their scientific sampling to interested persons.

Subsequent to the sampling on the ice, the collected water samples (1, 15, 35 m) were filtered (Chl a and organic carbon and nitrogen, POC & PON) in the wet lab and for eDNA in the dry lab.

Sampling 14.5.

Also outside Poulsenfjorden, a CTD profile and water samples could be collected through a hole in the land fast ice (ca. 350 m to open water, ca. 3 km to land; ice thickness ca. 60 cm). The collected water (collected 1, 15, 35, 90 m) was brought back to the vessel in carboys and filtered for Chl a and POC & PON in the wet lab and for eDNA in the dry lab.

Sampling 17.5.

After one day of poor weather and one day with a polar bear (and cancelled sampling), a CTD profile and water samples were collected in a small open water area (polynya?) outside Scoresby Sound. Water samples at 1 m, 15 m, and 35 m were collected from the "marina" where the tourists went on the dinghys. Th communication with the bridge was here slightly difficult, and thus the water sampler was twice dragged under the vessel, because the ship suddently started to turn). This results in rather poor sampling, because it is not clear at which depth the sample was actually collected. The last water sample (90 m) and the CTD profile were then collected from a dinghy, ca. 300 m from LCC. The sampling from the dinghy went well.

As described before, the water samples were filtered in the wet lab (Chl a and POC & PON) and the dry lab (eDNA) after sampling.

Sampling 18.5.

On this day, LCC was "parked" in very thick, deformed sea ice close to the coast. The guides made a ca. 400 m walking path for the passengers, and we were allowed to try to sample close to the ship. The ice had a thickness of 2.7 m, but with the help of some passengers a small hold was drilled through the ice and a CTD cast was possible. However, due to time constraints, it was not possible to take any water samples.

Sampling 20.5.

Due to rather poor visibility, polar bears and poor sea ice conditions, no sampling was possible on 19.5.2023. On 20.5., the passengers of LCC were allowed to take a walk on a big ice floe. We drilled a hole in the sea ice (ca. 70 cm thick) and took a CTD cast down to ca. 220 m. Due to potential polar bear sights and worsening visibility we were not able to take water samples that day.

3. Station List

Station No.	Date	Time	Latitude	Longitude	Water Depth	Gear	Remarks/Recovery
	2022	[local time]	[°N]	[°W]	[m]		
Station 1	13.5.	Ca. 11:00	65.62533	37.63896	45	CTD (Seabird)/ Nansen Water collecter	CTD to 40 m depth; Water collected at 1, 15, and 35 m
Station 2	14.5.	Ca. 13:00	66.71363	34.07562	130	CTD (Seabird)/ Nansen Water collecter	CTD to ca. 100 m depth; Water collected at 1, 15, 35, 90 m
Station 3	17.5.	Ca. 10:30	70.14198	21.93736	130	CTD (Seabird)/ Nansen Water collecter	CTD to ca. 100 m depth; Water collected at 1, 15, 35, 90 m
Station 4	18.5.	Ca. 13:15	70.55395	21.42783	Ca. 100	CTD (RBR)	CTD to ca. 90 m depth
Station 5	20.5.	Ca. 11:00	Drifting from 68.87894 to 68.85648	Drifting from 23.36357 to 23.40582	400-1000	CTD (RBR)	CTD to ca. 220 m depth

4. Preliminary Results

4.1 Water and Plankton Sampling with CTD/Rosette

4.1.1 CTD Measurements

CTD measurements were collected at each of the five stations. A preliminary compliation was presented to the passengers at the end of the cruise.

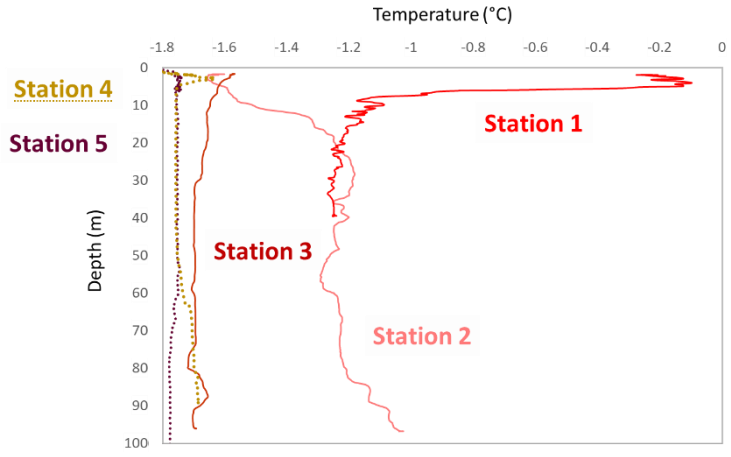

Fig. 4.1 Temperature plots from the CTD casts at all five stations.

4.1.2 Water samples

The water samples have been analyzed for different purposes.

The Chl a and POC/PON data will be included in a manuscript Ingrid Wiedmann and Camilla Svensen will work on autumn 2023. The manuscript work has been a bit deplayed, because the data from the LCC will be seen in context of data collected in August 2023 (Research vessel Maria M. Merian) and analyses of all samples has not been finalized yet.

Additional algae pigment samples were collected for ECOTIP collaborators, working at IOPAN Poland. They will use the samples to combine the ability of satellites to recognize these pigments with the field observations by filtering water samples.

Finally, the eDNA data are used by ECOTIP PhD student Paulina Urban. Due to maternal leave, her work is however slightly delayed.

Data and Sample Storage / Availability

The CTD data have been submitted to NIRD (Norwegian Research Data Archive, https://archive.sigma2.no/). The data set has the title "CTD Profiles (Temperature, Conductivity, Salinity, Fluorescence, PAR) at 5 stations in East Greenland (65.6-70.5 N, 21.4-37.6 W), ECOTIP cruise with the ice breaker Le Commandant Charcot, 10-22 May 2022" and will be available very soon.

For the biological data, metadata are available on the ECOTip Geonetwork and can be found here https://ecotip-geo.iopan.pl/geonetwork/srv/eng/catalog.search#/metadata/eba5dd2f-229b-413a-8c1a-d608ce876632.

5. Participants

No.	Name	Early career (Y/N)	Gender	Affiliation	On-board tasks
1	Ingrid Wiedmann, Researcher	N	F	UiT	CTD work, Collecting water samples, Filtration of Chl a/ POC/ PON
2	Stian Kleiven Karlsen, Master Student	Y	M	UiT	CTD work, Collecting water samples, Filtration of eDNA

UiT UiT The Arctic University of Norway, Tromsø, Norway

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