



International Workshop on Arctic Ocean Observation:
Future Collaboration by Research Vessels and Icebreakers
November 17-18, 2023 @ IINO CONFERENCE CENTER, Tokyo, Japan.



Early Career Scientist Session

Perspectives from an early career polar scientist

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Abstract

Research interests

I am fascinated by the Arctic Ocean not just because of its unique ecosystem functioning, but also how changes in this region propagate across dimensions: from local speciation to global climate regulation, and even geopolitics. During my years in Arctic research, it has become clearer to me how we often lack knowledge on whether we are measuring actual change or whether our measurement methods have simply improved. For instance, in my current research on microbially-mediated biogeochemical cycling of nitrogen in the Arctic Ocean¹, our predictive abilities are hampered by not knowing whether the rather newly discovered process of nitrogen fixation in the Arctic Ocean historically is an Arctic feature or a mere result of changing conditions during the Anthropocene. This is an example of why I believe inter-disciplinary and collaborative research is crucial for how we as a scientific community predict future Arctic ecosystem functioning in a time of global change. Here, Arctic observations have a key role.

My research motivation especially surrounds the bi-directionality of interactions between organisms and climate. Commonly posed questions like “How will this ecosystem respond to sea ice disappearance” I find often lack the perspective of “How may the function of this ecosystem impact sea ice disappearance”. This often requires the addition of more interdisciplinary thinking around biological, physical-chemical, and geological system interactions – something I believe generates a better understanding and more accurate long-term predictions of ecosystem function under change.

My current research focuses on better deciphering the role of nitrogen fixation in pelagic, sympagic and benthic Arctic ecosystems. My PhD research was conducted with the Eurasian Arctic Ocean in focus (Atlantic-influenced shelf seas and the central Eurasian Basin). This was with an opportunity to join RV Mirai 2023 expanded to also cover the Pacific inflow shelves and the Canada basin during my postdoc. Overall the aim is to investigate underlying diazotroph communities, their environmental regulation and the degree of nitrogen fixation taking place at various spatiotemporal scales. A specific focus is on the role of dissolved organic matter in the regulation of a group called non-cyanobacterial diazotrophs. Ultimately, quantitative data on nitrogen fixation needs to be incorporated into biogeochemical models to facilitate the prediction of primary production development in the changing Arctic Ocean.



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Insights into Arctic Ocean observation

Since 2016 I have been participating in five Arctic Ocean expeditions with RV Lance (Norway), IB Oden (Sweden), RV Polarstern (Germany) and RV Mirai (Japan). My responsibilities have gradually increased from “just” being a student participant to being coordinator for biological sea ice work on RV Polarstern 2022 and principal investigator of a project onboard RV Mirai 2023. This has allowed me to get insight into all steps from original idea and concretization, funding application, planning and packing, logistics and shipping, onboard performance of various types of sampling (ranging from sediment to sea ice and coastal to offshore), and finally reporting and post-cruise communication and optimization of data usage. Being onboard ships of different nationalities has enabled me insight into different ship cultures and logistical systems. In 2021, I was part of a Synoptic Arctic Survey expedition (Sweden’s contribution with IB Oden). There, a big effort was put into educating us early career researchers in collaborative work in big teams with a common aim, sea ice work and overall expedition planning.

Thoughts and aspirations regarding new research icebreakers

I believe there are three points of major importance regarding the participation of ECS in Arctic seagoing expeditions. 1) **The education of the next generation of polar scientists** requires training in planning, practical sampling, data handling and reporting. Hand-over of knowledge is equally important between generations of scientists. Opportunities could be supported by a specific training program where for instance students can join as helpers in various projects and/or routine sampling. 2) **Ensuring the well-being and confidence of the ECS participants.** Life at sea is very different and can be under heavy pressure from the PI at home, challenging social conditions onboard, language barriers, and many more hours of work than normal. It is important there is support for beginners at sea on how to deal with these conditions. A pre-cruise document containing all information regarding the expedition as such, participants, life onboard and expectations from participants is helpful. Once onboard, having a meeting dedicated to the people being first time onboard can create a safer space to ask questions. A person of trust (a person who is not the chief scientist but another experienced more senior person to whom potential problems can be communicated is important. A general introduction meeting for everyone new to the ship would also be useful for an introduction to the particular ship's culture and unwritten rules. A sheet with a few important phrases in the ship’s language would also make sure a good environment between international scientists and crew. 3) **New perspectives and collaborations.** Facilitating a communicative environment onboard will allow not only the growth of the participants but also new ideas and collaborations. This can be encouraged through pre-cruise meetings with presentations and discussions, presentations and updates during the cruise, and post-cruise workshops. A living document with ideas, samples and plans could be a helpful interactive tool to achieve this.

References

von Friesen and Riemann, 2020. Nitrogen Fixation in a Changing Arctic Ocean: An Overlooked Source of Nitrogen? *Frontiers in Microbiology*. 11:596426. doi: 10.3389/fmicb.2020.596426