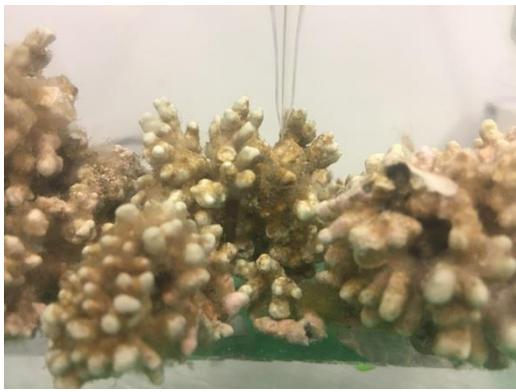


Exchange SAGES Postdoctoral and Early Career Researcher Exchange (PECRE) Fellowship
Final Report by Dr. Kathryn Shoenrock

Host: Dr. Laurie Hoffman
Max Planck Institute for Marine Microbiology

The role of epibacterial communities in nitrogen uptake and availability in Arctic coralline algae *Lithothamnion glaciale*: implications for the ecology and physiology of this polar species.



Background

This project's goal is to define the physiochemical characteristics of biofilms found on the Arctic coralline alga, *Lithothamnion glaciale*, and role they play in essential nutrient uptake. *L. glaciale* is free-living coralline alga known to provide habitat and refuge for many marine species in the Atlantic. This species has a limited distribution along the southwestern coastline of Greenland and because biofilms play a role in the ecological functioning of corallines, we are curious to understand how they may function in species distribution and ecophysiology. *L. glaciale* was collected from the Godthåbsfjord region of Greenland and kept in ambient and axenic cultures at the University of Glasgow.

As part of a larger project where *L. glaciale* is used as a paleoclimate proxies (especially for the Arctic), we attempt to understand the physiology of model organisms and their interaction with the environment. Coralline algae are important ecosystem modifiers and can provide a paleoclimate record through sclerochronology in their ecosystems. Physiology and

nutrient acquisition are directly tied to growth and calcification of these algal species which is the framework for sclerochronology.

The SAGES funded PECRE exchange provided the logistical framework to begin answering these questions through travel support for K. Schoenrock from U. Glasgow to collect specimens in Greenland and do lab work at the Max Planck Institute for Marine Microbiology (MPIMM) in Bremen, Germany. The metabolic role of the biofilm was evaluated with Dr. Hofmann by 1) quantifying the availability of basic resources throughout the diffusive boundary layer and 2) evaluating *L. glaciale* nitrogen uptake in ambient and axenic conditions using microsensor technologies. At the MPIMM microsensors (NO_x and O₂) were used to create concentration profiles from the maerl surface through the biofilm. By targeting NO_x and O₂ we investigate nutrient resources and primary productivity in the biofilms of the Arctic maerl.

Successes:

- Dr. Schoenrock attempted to create axenic cultures of the macroalgae, *L. glaciale*. This was not 100% successful (few strains of fungus and bacteria remained in culture), but future work can build off these attempts.
- Microsensor work with the maerl species was incredibly difficult as the metabolic rates of Arctic corallines are very low. The methodology for measuring nutrient uptake and primary productivity in these unique specimens was fine-tuned during the research exchange, and Dr Hofmann continues to work with *L. glaciale* from Greenland and Spitsbergen.

Interaction with SAGES Community

During the research exchange, SAGES member K. Schoenrock was able to communicate her research with many researchers at the MPIMM, Leibniz Center for Tropical Marine Research (ZMT) and University of Bremen. This research has been communicated to members of Dr Nicholas Kamenos' lab (SAGES members) and will be/has been presented at many international conferences by both K. Schoenrock and L. Hofmann.

Knowledge exchange:

Students

K. Schoenrock hosted Marion Bacquet, Erasmus exchange student from University Quimper on a research project investigating the microbiome, physiology, and environmental tolerance of the polar maerl species *Lithothamnion glaciale*.

Presentations

Gordon Research Seminar (GRS) 'Unifying Ecology Across Scales' 2016 "Epibacterial Community Function in the Physiology of Polar Coralline Algae" Kathryn Schoenrock, Kenan Matterson, and Laurie Hofmann

EGU 2017 "Phenology of *Lithothamnion glaciale* in mixed fjord conditions: mesocosm experiments provide insight to maerl physiology and distribution in southwestern Greenland." Kathryn Schoenrock, Marion Bacquet, and Nicholas Kamenos

BPS 2017- "A pan-Arctic assessment of biodiversity and ecosystems services provided by coralline algae reefs" Kathryn Schoenrock and Arley Muth

"The hidden communities of maerl beds and kelp forests" Galway Science & Technology Festival

Pint of Science, "Bi-polar seaweeds"

Glasgow Science Festival, LevelUpHuman Science Comedy podcast

Greenland Institute of Natural Resources- Preserved maerl and biodiversity samples provided with a poster for public outreach events.

It is hoped that collaboration between Drs Schoenrock and Hofmann will continue for many years to come. It is anticipated that the results of this SAGES PECRE collaboration will generate a larger collaborative network for future work.