Preliminary Report

Application Title/Cruise Name: "F2025-004 - Svalbard: In Search of Iconic Arctic Wildlife (BEAR)"

Project Title: Arctic Pulses - measuring primary productivity potential of polar microbial communities around the Svalbard archipelago

Project PI/Chief Scientist: Allison A. Fong, Ph.D.

Platform Coordinator: Ashley Knight

Summary

Samples were collected from a total of 8 stations around the Svalbard archipelago between June 12-23, 2025 as part of the F2025-004 – Svalbard: In Search of Iconic Arctic Wildlife (BEAR) cruise. The field sampling was exceptionally successful, with samples collected at multiple locations across Svalbard, and repeat sampling at 3 locations over the course of the 2-week period. Weather conditions were conducive to sampling every day at sea and coordinated by the ship's leadership and expedition team. As proposed, the main sampling approach included sampling of surface seawater utilizing simple bottle collections from a Zodiak.

The main objective of the project was to evaluate the changes in microbially-driven oxygen dynamics across surface waters of Svalbard. We collected a small suite of parameters to relate changes in oxygen concentration to microbial biodiversity, microbial cell abundances, and the amount of photosynthetic biomass. Our observations and measurements of relative oxygen concentration changes are a proxy for primary productivity. Together these measurements allow us to take snapshots of productivity in the waters around Svalbard and relate them to local environmental conditions to better understand how ecosystem-level processes are changing across Svalbard.

Sample and Measurement Log

<u>Photosynthetic Biomass – chlorophyll concentration in seawater</u>

- 63 chlorophyll samples; 20 derived from field stations and 43 derived from oxygen incubation bottles. Chlorophyll field collections were subsampled into 2 size fractions onboard – 0.7 micron and >10 micron
- To be analyzed using fluorometric measurements of chlorophyll content per filter at onshore laboratory facilities.

Microbial Cell Abundances – cell counts by flow cytometry

- 30 unique samples; 10 unique samples from field stations and 20 unique samples from oxygen incubation samples. All samples are collected in triplicate, resulting in 90 sample vials.
- To be analyzed at onshore facilities using flow cytometric techniques, which provide cell abundances based on cell size and cell fluorescent characteristics

Microbial Biodiversity – DNA sequencing of microbial marker gene 16S rRNA

- 10 DNA samples collected; all derived from field stations and filtered onboard onto 0.2 micron Sterivex cartridges.
- Based on chlorophyll concentrations and cell abundances, DNA sequencing will be prioritized to optimize comparisons across stations with strong differences in these microbial properties.

Oxygen Dynamics Measurements – field-collected seawater incubated in gas-tight bottles under artificial light and temperature conditions in the ship-based laboratory space

- Measurements conducted at 8 stations, with sample water incubated in light (10-20 umols m^{-2} s^{-1}) and dark conditions between temperatures of +2 to +3.5 CC.
- Compared to *in situ* water temperatures and light conditions, laboratory settings were within +/- 1°C, but light conditions were significantly less intense than field conditions.

Sample Locations

Date	Station Number	Location
12 June 2025	1	76° 57.2442 N, 15° 47.9680 E
13 June 2025	2	77° 56’ 26.861 N, 21° 18’ 26.369 E
14 June 2025	3	78° 5’ 854 N, 20° 46’ 2.217 E
15 June 2025	4	79° 33’n6.115 N, 17° 40’ 12.38 E
16 June 2025	5	81° 56.89 N, 20° 26.6 E
17 June 2025	6	79° 38’ 51.281 N, 15° 41’ 58.498 E
20 June 2025	7	76° 56’ 41.071 N, 15° 48’ 50.14 E
21 June 2025	8	77° 56’ 26.491 N, 21° 18’ 24.091 E
22 June 2025	9	79° 34’ 34.445 N, 18° 36’ 32.963 E
23 June 2025	10	81° 25’ 26.144 N, 19° 11’ 54.877 E