Summer 2024

WWU Marine Chemistry Lab and Field Assistant

Elsa (Christopher Adam) Lindenmeyr
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COLLEGE OF THE ENVIRONMENT

Internship Title: Lab and Field Assistant

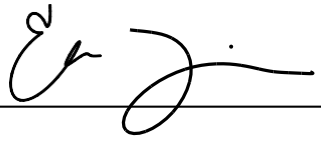
Organization Worked For: Western Washington University College of the Env.

Student Name: Elsa Lindenmeyr

Internship Dates: 6/18/24 7/25/24

Faculty Advisor Name Manuel Montaño

Department ESCI

STUDENT SIGNATURE 

DATE 8/15/24

Laboratory and Field-Work Internship

WWU Marine Chemistry – David Shull, Jessica Scotten

June 18th, 2024, to July 25th, 2024

Elsa Lindenmeyr

The research project I assisted on was the 2D analysis of nitrite/nitrate and ammonia reactions within Bellingham Bay and Padilla Bay and the genetic analysis of nitrogen fixating bacteria within sediment. This study was led by Jessica Scotten and David Shull, through Western Washington University's Marine Chemistry laboratory.

During this internship, I gained both laboratory and field experience through numerous things. I first learned how to assemble mold for the gels that would be used for the experiment. This was done by sandwiching a rubber tube and spacers between two pieces of glass and then pouring the liquid gels with a pipette. The pouring of the gels took preciseness to pour quickly enough that it doesn't set half-way through and create stripes, and not pour so quickly that you get bubbles.
I learned to make agarose and acrylamide solutions and how long and the conditions they need to set. I would make gels for a couple weeks independently.

To prepare for field deployments, I also learned how to mix reagents and solvents for the nitrate/nitrite and ammonia reactions, and problem solved when things went array with our Greiss reagent and other dyes. I performed calibrations by submersing gels in reagents and fixing a calibration tool to gels. I then would place the calibration gels and reagent gels after they had reacted into a box and did imaging of the gels with a hyperspectral camera.

The field work I did was the boat work in Bellingham Bay. We would board one of Western's research vessels and go into the southern Bellingham Bay. Once we reached predetermined coordinates, we dropped a Haps Corer and a CTD. These devices took sediment

cores and water samples that would be used the next day and later in the study. The Haps Corer took a sediment core that we then put on ice and took back to the lab. The CTD took readings of dissolved oxygen, salinity, the amount of light at the bottom, and water samples that we also took back to the lab.

Once back in the lab, the sediment cores had the mounted agarose and acrylamide gels put into them and then Argon gas was used to vacuum the air out of the core canisters, all within a laboratory cold room. The cores and gels were left for 24 hours to come to equilibrium with the Argon gas controlling their environment.

The following day, we ran calibrations and then split open the cores. Mud samples were taken from the cores using a grid system and straws. Those mud-filled straws were then frozen to be analyzed at a later date. The gels were taken out of the core and reacted with the reagent gels; acrylamide gels - which measured nitrate/nitrite reactions - were reacted with Greiss reagent and ___. The agarose gels – which measured ammonia reactions – were reacted with ____.
The gels and the reagent gels, which all got stacked with the sample gel in the middle to react, where then processed accordingly and then imaged with the hyperspectral camera. My last day was in the Shannon Point Marine Institute's laboratory reacting and imaging the sample gels.

The CTD being prepared to be lowered into the water at Site 1 (upper left). Water samples being taken from the CTD at Site 1 with canisters labeled Site 1 and 2 (upper middle). Canisters that will be filled with water from the CTD, a sediment core tube, and caps for the sediment cores (upper right). The Haps Corer being lifted back onto the boat after taking a sediment core; see the dark tube in the middle of the device filled with mud from Site 2 (lower left). The sediment core being unloaded from the Haps Corer at Site 2 (lower middle). The sediment cores sitting in ice baths to maintain sea bottom temperatures for the journey back to the lab (lower right).

This internship taught me a lot about laboratory expectations, how to problem solve experimental issues, and what collaborating on a research project is like. Some of the learning objectives I had at the beginning of the internship were that I would gain experience with field work that is unpredictable (will be dictated by low tide times). I also had set out to experience laboratory work, specifically the development, testing, and deployment of chemical sensors for dissolved nitrogen. I also wanted hands on experience in the field and in lab outside of a classroom and gives me a sense of what working on a research project as a graduate student or employee will be like. This internship met all the learning objectives I had intended to meet.

A lot of the planning and scheduling of how many gels we needed by when, and when we would deploy and retrieve the sampling gels was very up in the air until the last minute. This was because of the tides, working in a shared space at Shannon Point Marine Institute, and working with dye reagents that none of us had a ton of experience with. There were lots of whiteboard discussions and brainstorming of how many gels we needed to make that week, where we wanted our sites to be, how many sites, and how we would schedule the actual deployment. There were lots of kinks that had to be worked out in order to get usable results, and there was a lot of trial and error throughout the hole process. I learned how to roll with changes in a plan, and how to come up with solutions on the spot.

I truly got the laboratory and field experience that I had been expecting. The laboratory work at first was a little slow, as you can imagine pouring gels for days might be. But once we got prep done and started taking samples, it was more engaging, and I learned a lot. I feel a lot more confident in a laboratory space and in the field, as the field day I was on was also packed with lots of things to do. I really got a feel for what a research project looks like outside of a classroom. This had a lot more problem solving than I was expecting, but the amount of experience of my teammates had made it easier to solve issues. It was also inspiring to see very experienced

professionals getting frustrated with some of the issues that I too was stumped with.

This internship has prepared me for the field in numerous ways, and in ways that my previous classroom experiences have not. My coursework have given me the background information to understand what the study was trying to accomplish, but a lot of the laboratory practices, especially the on-the-fly problem solving, helped shape my understanding of experimental work. I've done a few term projects that included planning and conducting an experiment, but none of them have come close to this internship. The term projects were much more structured and weren't new information in the field. It was exciting to be doing work that was new, rather than coursework.

I am incredibly grateful for the opportunity given to me by Jessica Scotten and David Shull. This internship has made me excited for working in the field and continuing to do research related to nitrogen fixation in the Salish Sea.