samples. We aim to understand how these organisms survive in low-nutrient environments, explore interactions between toxic and non-toxic cyanobacteria and other bacteria, and analyze benthic community diversity and growth facilitators using metagenomics. Additionally, we aim to understand the influence of various substrate types on benthic mat composition and growth. An LCMS/MS toxin measurement analysis revealed that all the benthic samples contained anatoxin-a (ATX) (377.13 ±18.05 µg/g) and dihydro anatoxin-a (5.15±0.3 µg/g). ATX (0.377 µg/L) was also present in water samples. Low chlorophyll-a levels and microscopy results suggest the toxin in the water comes from benthic sources, not pelagic algae. The initial metagenomic analysis found that cyanobacteria constituted the majority (>60%) of all benthic mat samples, predominantly belonging to the Microcoleus genus, with <5% attributed to eukaryotic algae. Upon resampling in the fall (October), we observed a complete shift in benthic algae composition, with no presence of Microcoleus. Additionally, no ATX was detected in the algal mats or water samples. We are also studying distinct Microcoleus strains isolated in from same location to compare genotype variations between lab-cultured and environmental samples. Our study, the first to focus on Microcoleus in Zion National Park, reveals adaptive phosphorus acquisition strategies in nutrient-poor conditions. This strain is notably more toxic and contains unique thiamine biosynthesis genes absent in other toxic genomes studied in New Zealand. Supported by NSF funding, ongoing work includes genotypic analysis and microbial interaction studies to better understand Microcoleus proliferation and toxin production. Our research team is also collaborating with experts from New Zealand, Switzerland, the United States Geological Survey (USGS), and the U.S. Environmental Protection Agency (USEPA) to advance our understanding of this cyanobacterium.

4.16.P-We402 Temperature and Salinity Affect Growth and Toxin Production of Estuarine Cyanobacterium Microcystis aeruginosa

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Coastal ecosystems, which act as essential connectors between inland waters and ocean systems, are now encountering unparalleled challenges fueled by human activities and climate change. Microcystis aeruginosa is recognized as a harmful cyanobacterial species with its ability to produce microcystins (MCs) and its tendency to bloom in estuarine environments. Although previous research has shown the impact of individual environmental conditions on the growth or toxin production of M. aeruginosa, the possible interactive effects and resulting changes in its toxicity remain uncertain. In this study, we initially conducted an orthogonal growth experiment to evaluate the effects of variations in temperature, salinity, pH, and nutrient conditions. This was followed by a full-factorial growth experiment, with temperature and salinity as primary variables. We measured intracellular and extracellular MCs content, along with phycocyanin levels, during both exponential and stationary growth phases. Toxicity was assessed through mortality and swimming behavior in the harpacticoid copepod Nitokra spinipes and the calanoid copepod Acartia tonsa, both estuarine species. Results indicated that both growth and MCs production were significantly induced by increasing temperatures (15 to 28 °C), but were reduced with elevated salinity levels (8 to 16 ppt). Furthermore, cell density and growth rate showed a strong correlation with both intracellular and extracellular MCs levels. A significant interaction between temperature and salinity was detected, while no correlation was observed between intracellular MCs and phycocyanin levels. Lastly, exposure to M. aeruginosa led to reduced swimming speed, higher inactivity, and increased mortality in A. tonsa compared to the non-toxic Rhodomonas salina, while N. spinipes showed no sensitivity to M. aeruginosa at environmentally relevant concentrations. This study emphasizes the combined effects of temperature and salinity on M. aeruginosa growth and toxin production, shedding light on potential risks associated with future blooms under changing climate conditions.

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4.16.P-We403 Portable and Semi-Automated System for Paralytic Shellfish Toxins' Monitoring

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Seafood aquaculture is heavily impacted by toxic harmful algal blooms (HABs) yearly. Paralytic Shellfish Toxins (PSTs) are among the most dangerous families of toxins and frequently affect seafood aquaculture. In this work, we describe the development of a portable and semi-automated system for detecting PSTs in seawater, allowing tracking of the appearance and progression of PSTs-producing HABs before the