Vita

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Universities Attended:

University of New Brunswick (2022)
Bachelors of Science

University of New Brunswick (2025)
Masters of Science
Biology

Conference Presentations:

Changes in gene expression associated with submersion and exposure of benthic cyanobacterial mats. Oral presentation at the Society of Canadian Aquatic Sciences (SCAS) Annual Meeting. Fredericton, New Brunswick, Canada, 2024

Impact of environmental changes on benthic microbial mats in the Wolastoq. Oral Presentation at the Conference of Biological Sciences. Fredericton, New Brunswick, Canada, 2024

Effects of rapid environmental fluctuations on benthic microbial mats in the Wolastoq. Poster Presentation at the Conference of Biological Sciences. Fredericton, New Brunswick, Canada, 2025

The Effect of Rapid Environmental Fluctuations on Benthic Microbial Mats in the Wolastoq

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Hannah J. G. Nyvlt

in the Department of Biology

U.N.B., Fredericton, N.B.

Tuesday, October 7th, 2025
9:00 a.m.

Bailey Hall, Room 102

Examining Committee

Dr. Janice Lawrence	co-Supervisor
Dr. Adrian Reyes-Prieto	co-Supervisor
Dr. Alexa Alexander-Trusiak	Internal Examiner
Dr. Sara Eisler	External Examiner
Dr. Shawn MacLellan	Chair of Oral Examination

Abstract

Benthic microbial mats are found attached to the bottom substrate of lakes and rivers and are home to a multitude of organisms. In the Wolastoq, benthic mats containing *Microcoleus* capable of producing anatoxin-a, a potent neurotoxin, were identified following the death of 4 dogs in 2018 and 2019. These toxic benthic mats proliferate in the region below the Mactaquac hydrogeneration station. The Mactaquac dam causes rapid, drastic changes in water flow and fluctuations in water levels (circa 1.5m). This presumably causes stress to benthic communities due to rapid changes in environmental conditions such as temperature, moisture, and light as the mats alternates from being submerged under the water to exposed to air. To understand the impact of the submersion/exposure cycles on Wolastoq benthic mat communities, we investigated overall changes in gene expression levels to infer modulation/regulation of the prevalent microbial metabolic routes in the mats. Benthic mats were sampled in triplicate while submerged under the water and again after one hour of exposure to air in direct sunlight during the afternoon. Nucleic acids were extracted, and mRNA sequenced with Illumina technology. The *SqueezeMeta* pipeline was used to assemble and analyze the recovered transcripts. Then the primary functions in the community were examined. The bacterial community showed evidence of oxidative and UV stress resulting in decreased metabolic activity in the mats sampled. In the cyanobacteria *Microcoleus*, there was decreased activity in *Photosynthesis*, *Nitrogen metabolism* and *Carbon Fixation pathways*, and increased activity in *DNA Replication and Repair pathways*, indicating that their response to this stress was to decrease metabolic activity while trying to maintain cell integrity. These findings allow us to better understand how the smallest organisms in the Wolastoq respond to environment fluctuation, something that has been lacking from previous analyses.