Seasonal Changes of Biogenic Silica Concentration in the Bedford Basin

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Background

- Biogenic Silica (bSi) is a core nutrient element in aquatic systems and is heavily involved with biogeochemical cycling and microbial life (2, 3)
- Diatoms are responsible for the majority of silica cycling in aquatic environments (2)
- Research on bSi has been focused within open ocean systems to characterize biogeochemical cycling globally, somewhat neglecting estuary systems

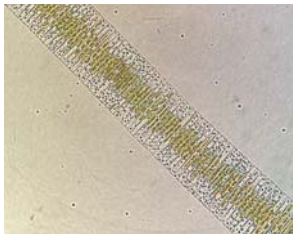

Figure 1. Diatom chain from the Bedford Basin (Photo by Mykola Prus)

Objective

This study aims to help characterize the seasonal changes of biogenic silica in the Bedford Basin in 2023

Methods

- Samples were collected at 44.691°N, 63.641°W (Figure 2) at 5m depth
- Sample collection began on January 1st, 2023 and concluded on February 1st, 2024
- All samples were collected in triplicate and fractioned into two size classes: >3 µm and >0.4 µm
- bSi samples were processed and measured according to the methods outlined by Hu et al. (2024) (1)
- Particulate nitrogen (PN) samples were analyzed using Elemental Analysis

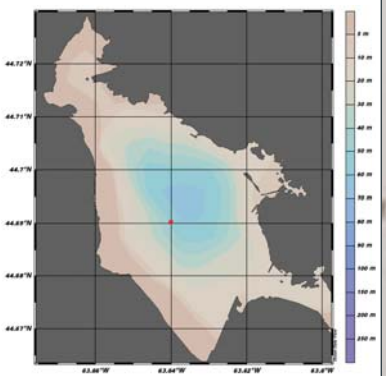

Figure 2. Bathymetry map of the Bedford Basin. Red square indicating sample collection location.

Results

- The ratio of bSi to PN shows two distinct peaks, one in March/April and another in August (Figure 3)
- Samples larger than 3 µm showed a significant bSi:PN peak in March, with values more than double those observed in the >0.4 µm size fraction (Figure 3)
- Between the spring and late summer bloom, PN-normalized bSi decreased over the days of the year. A linear correlation was observed between bSi/PN and days ($y = -0.0035x + 0.7832$, $r^2 = 0.65$) (Figure 3)

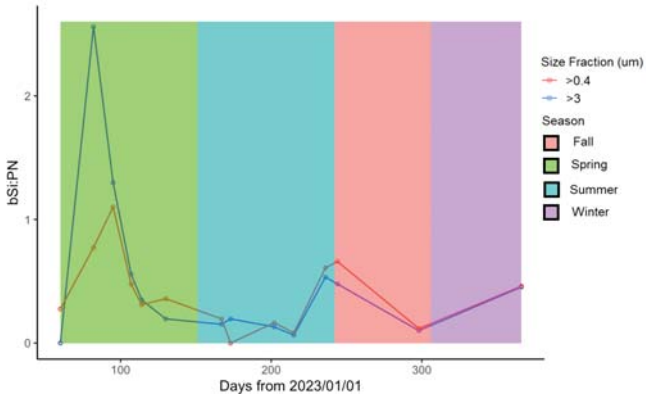

Figure 3. bSi to PN ratio values in the Bedford Basin over the course of a year.

Conclusions

1. The two peaks in bSi:PN are likely the result of the Spring and later Summer blooms.

2. Large spike in bSi:PN during the spring bloom in the >3 um size fraction suggests that diatoms are the primary contributors to the bloom. In contrast, the lower-than-one bSi:PN ratio observed during the late-Summer bloom may indicate a mixture of siliceous and non-siliceous plankton.

3. Although further observations and more data is needed, the results herein suggest that bSi concentration in the basin is driven by blooms, with bSi likely being purged in the absence of blooms.

Acknowledgments

I would like to give a special thanks to: Dr. Ying-Yu Hu, Dr. Zoe Finkel, Dr. Joerg Behnke, Nuwanthi Samarasinghe, The Bedford Basin Monitoring Program, Magdalena Waclawik, and Tamara Wilson.

This work was supported by the Simons Collaboration on Computational Biogeochemical Modeling of Marine Ecosystems (CBIOMES, grant 549937 to Z. V. Finkel), Simons Collaboration on Ocean Processes and Ecology-Gradients (SCOPE-Gradients, grant 723789 to Z. V. Finkel), the Canada Research Chairs program, and NSERC.

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