Impact of Nutrient Loading and Eurasian Watermilfoil on Phytoplankton Communities Among Channels of the Les Cheneaux Islands, Lake Huron

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OBJECTIVES

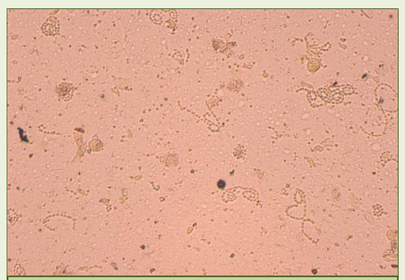
- Provide a basis for understanding primary producer responses to nutrient loading and Eurasian watermilfoil (*Myriophyllum spicatum*) management efforts in the waterways of the Les Cheneaux Islands.
- Understand how impacting stressors change densities of undesirable algae including cyanobacteria.

BACKGROUND

- Water quality is a concern in channels of the Les Cheneaux Islands but little is known about phytoplankton communities, which form the base of the pelagic food web.

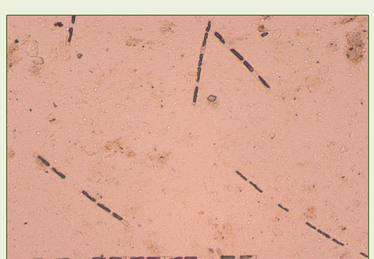
Myriophyllum spicatum in the Les Cheneaux Islands

- Phytoplankton communities may be affected by interacting stressors, including invasion by the aquatic weed *Myriophyllum spicatum* and nutrient loading from coastal towns.



High density Anabaena spp. at TS4

- Cyanobacteria (above) can pose a threat to healthy ecosystems because they are a poor food source for grazing zooplankton and can release toxins harmful to humans and aquatic organisms.

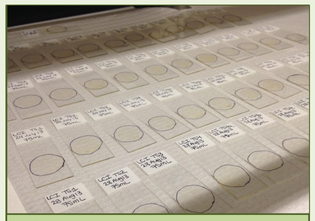


Chains of Melosira spp. at TS5

METHODS

- Phytoplankton communities were sampled at 12 stations in association with regular water quality monitoring from May-October 2013.

Summer 2013 Sampling Stations



Semi-permanent slide mounts

- Estimates of phytoplankton abundance and biovolume were quantified from semi-permanent slide mounts prepared for each water sample.

RESULTS - Total Species Biomass

- Cyanobacteria (CY) comprised a larger percentage of total biovolume at sites with degraded water quality (TS4, TS4a, TS4b, TS4c, and TS5) while diatoms (BAC) dominated sites located in more open water areas with lower nutrient concentrations.
- Stations with high relative abundance of cyanobacteria tend to have lower total biovolumes than those dominated by diatom species.

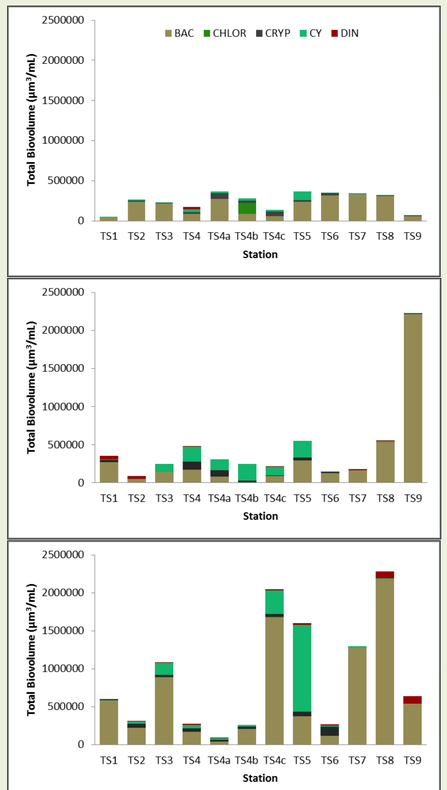


Figure 1: Total biovolume composition of five main groups of phytoplankton during May, June, and July (top to bottom).

RESULTS - CY Responses to P

- In each month, there appeared to be a positive trend between total phosphorus (P) and total cyanobacteria biomass.
- June data indicates that nutrient loading favors species composition towards higher concentrations of cyanobacteria, including *Anabaena*, *Aphanocapsa*, and *Merismopedia* spp.

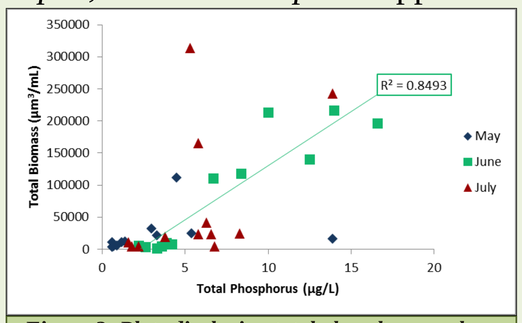


Figure 2: Plots displaying total phosphorus values against total cyanobacteria biovolumes at 12 stations in May, June, and July. June was the only month which showed a significant regression.

CONCLUSIONS

- High nutrient concentrations in the Les Cheneaux Islands appear favorable for cyanobacteria, including taxa capable of nitrogen-fixation.
- Shallow sites with high nutrient loading should be monitored for unwanted taxa more frequently than open-water sites with lower nutrient concentrations.
- High density *M. spicatum* growth, which was observed at stations TS4b and TS5, may be positively related to presence of cyanobacteria – this interaction will be explored more thoroughly in summer 2014 through field observations and mesocosm experiments.

ACKNOWLEDGEMENTS

Funding: Les Cheneaux Watershed Council, Great Lakes Research Center
Assistance: Les Cheneaux Watershed Council sampling team, Jennifer Croskrey, Michael Gretz, Erin Cafferty