Item 10.3.1

Cyanobacteria in HRM lakes — 3 years of monitoring

Dave Redden, Clarke Brown, and Graham Gagnon

DALHOUSIE UNIVERSITY

waterstudies.
CENTRE FOR WATER RESOURCES STUDIES | DALHOUSIE UNIVERSITY

Faculty of Engineering
Dalhousie University
Halifax, NS Canada

Monitoring Our Lakes for Safe Recreation

Supporting safe access to a cherished resource

Lakes are central to life in HRM and are a source of civic pride

Our team works with HRM to monitor lakes and provide information needed to support public health and safety

Challenge – lake access in HRM

Lifeguards provided at select beaches during July and August

Beaches are frequently closed due to visible cyanobacteria

When visible blooms occur, beaches remain closed while awaiting laboratory results

- By the time results are obtained they no longer reflect current conditions
- Some beaches have been closed for most of the 2-month beach monitoring season

What are cyanobacteria?

Naturally occurring photosynthetic bacteria

- Growth impacted by **nutrients** and **temperature**

Cyanobacteria can form blooms

- Discolored water or surface scums

Some cyanobacteria produce harmful toxins

- Toxins are not visible and not always present

Health Canada guidelines

Health Canada provides guidelines for the toxin, not the cyanobacteria

Health Canada provides guidelines for total microcystins:

- 10 µg L^{-1} for recreational water

Microcystin-LR (MC-LR) is commonly used for monitoring

There are other cyanotoxins, but Health Canada does not have guidelines for them

Our monitoring program

Exploring new ways to monitor cyanotoxins

Monitored 8 recreational lakes

- Sampled weekly from May to November for 3 years (2022 to 2024)

Analysis included:

- Water chemistry
- Toxins - MC-LR, anatoxin-A, cylindrospermopsin, saxitoxin
- qPCR – genes required for producing toxins

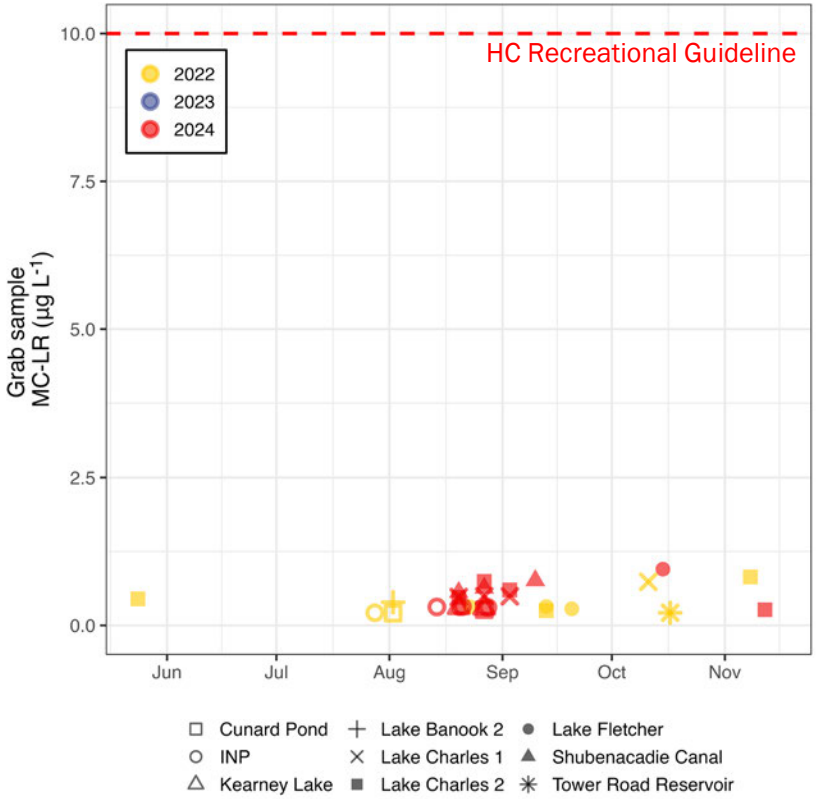
Results

Results – MC-LR concentrations are below recreational guidelines

MC-LR detected at 7 lakes

MC-LR detected in some samples despite no visual signs of cyanobacteria

All concentrations well below recreational guideline of 10 µg L^{-1} (never exceeded 1 µg L^{-1})

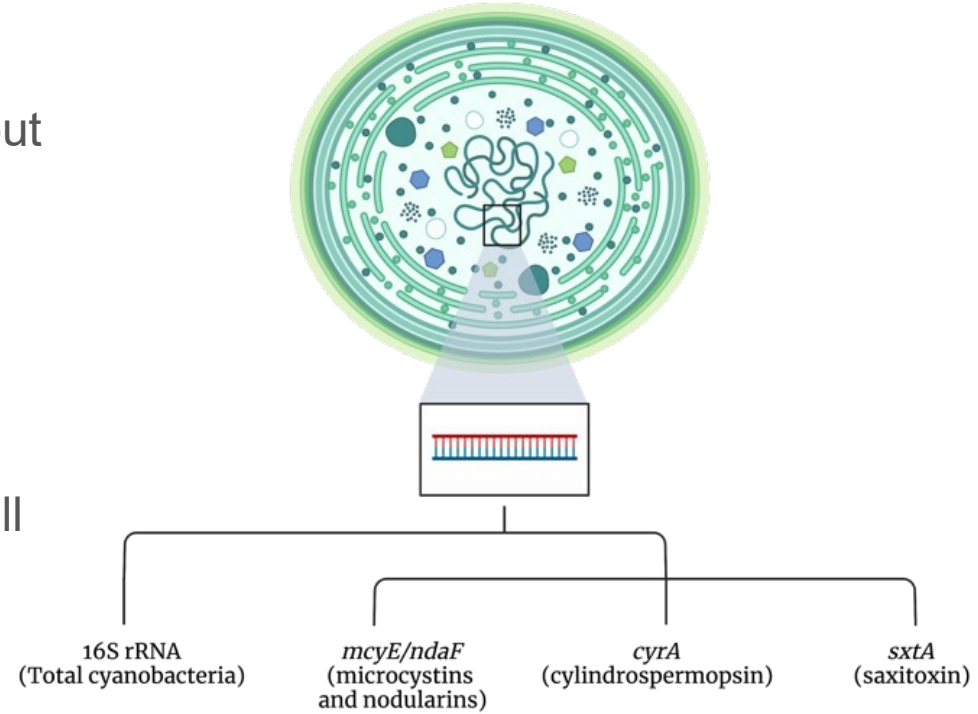


Results – toxin-producing genes present at all lakes

The genes required for producing microcystins were found in all lakes, but concentrations were highly varied

The presence of the genes does not guarantee microcystins are being produced

Microcystin production is possible in all the study lakes



Key takeaways

- The lakes we monitor all have the potential for microcystins, but in 3 years of monitoring, concentrations of MC-LR have never approached the recreational guideline
- Reducing nutrient inputs (phosphorus and nitrogen) to these lakes remains the best strategy for limiting cyanobacterial growth
- Continued monitoring — and improving our ability to monitor — is essential to ensure safe recreation in these lakes

Conclusions

Conclusions

We are thankful for the opportunity to work with HRM to monitor these lakes and provide information in support of public health and safety

Monitoring cyanotoxins is complex and we need innovative approaches that allow rapid decision making

We look forward to continuing to work together to find solutions

The research team acknowledges funding through our NSERC Alliance Partnerships.

The research team acknowledges additional specific support from HRM for their assistance and guidance in this work. Additionally, the team acknowledges the support from all the co-op students and CWRS staff that have been involved on this project.

Questions

Dave Redden

[redacted]

Clarke Brown

[redacted]