Harmful Algal Blooms

Hamzah D. Ansari

Oakland University

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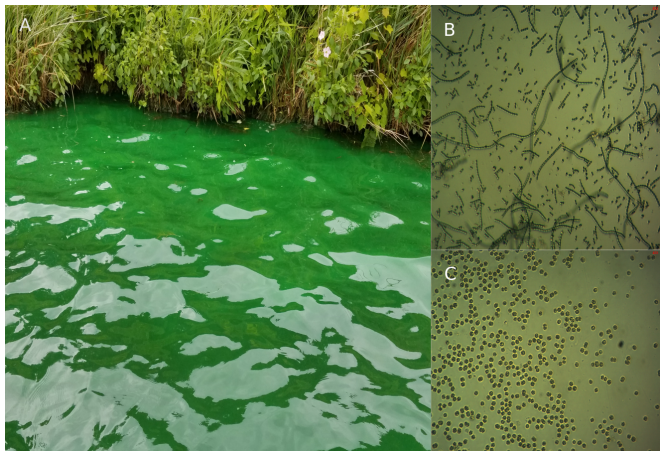
Outline

Harmful Algal Blooms

- Increase in primary productivity and growth of microspopic algae and cyanobacteria
- Toxin-producing genera
- Decrease biodiversity
- Anoxic environment



Harm

- Irritant
  - Lipolysacharides
- Toxins
  - Microcystin and nodularin
  - Cylindrospermopsin
  - Anatoxin[1]
  - Saxitoxin[2]

[1] Meyer et al., "Prerequisites of Isopeptide Bond Formation in Microcystin Biosynthesis".

[2] Fontanillo et al., "Synthesis of Highly Selective Submicromolar Microcystin-Based Inhibitors of Protein Phosphatase (PP)2A over PP1".

Law and Regulation

- Safe Drinking Water Act[3]
- Maximum Contaminant Level[4]
  - Regulated and enforced
- Contaminant Candidate List
  - "More like guidelines"

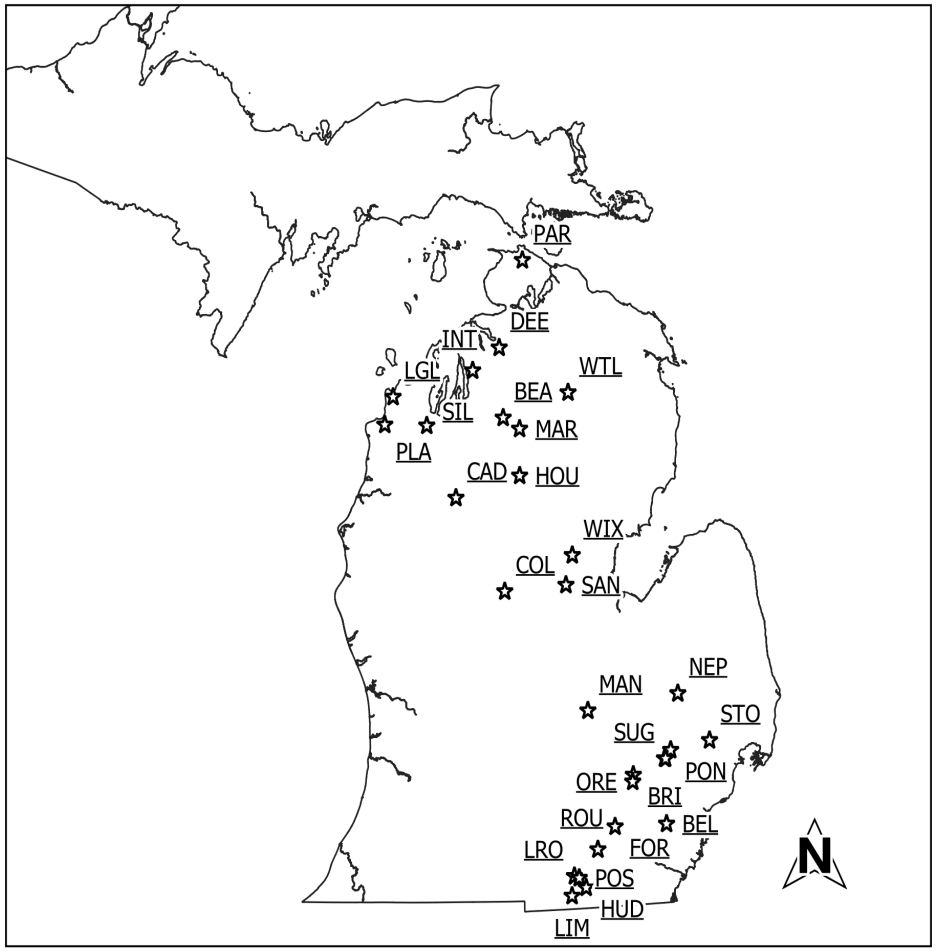
[3] Davis et al., "Phylogenies of Microcystin-Producing Cyanobacteria in the Lower Laurentian Great Lakes Suggest Extensive Genetic Connectivity".

[4] Janda and Abbott, "16S rRNA Gene Sequencing for Bacterial Identification in the Diagnostic Laboratory".

Objectives

- a
- b

Surveyed Lakes



Methods

Water Sampling

- Sampled each lake once a month
- Collected water
- Quickly transported back
- Analyzed ASAP

Nutrient Analysis

- Coloremetric
- jflsd

LC-MS/MS

- a

ELISA

- a

Geospatial Analysis

- a

Results

- a

Could we predict HABs?

- a
- a

Acknowledgment

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References I

Davis, Timothy W. et al. "Phylogenies of Microcystin-Producing Cyanobacteria in the Lower Laurentian Great Lakes Suggest Extensive Genetic Connectivity". en. In: *PLoS ONE* 9.9 (Sept. 2014), e106093. ISSN: 1932-6203. DOI: 10.1371/journal.pone.0106093. URL: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0106093 (visited on 06/26/2018).

Fontanillo, M. et al. "Synthesis of Highly Selective Submicromolar Microcystin-Based Inhibitors of Protein Phosphatase (PP)2A over PP1". In: *Angew Chem Int Ed Engl* 55 (Nov. 2016), pp. 13985–13989. ISSN: 1521-3773 (Electronic) 1433-7851 (Linking). DOI: 10.1002/anie.201606449.

References II

Janda, J. Michael and Sharon L. Abbott. "16S rRNA Gene Sequencing for Bacterial Identification in the Diagnostic Laboratory: Pluses, Perils, and Pitfalls". In: *Journal of Clinical Microbiology* 45.9 (Sept. 2007), pp. 2761–2764. ISSN: 0095-1137. DOI: 10.1128/JCM.01228-07. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2045242/ (visited on 10/09/2018).

Meyer, S. et al. "Prerequisites of Isopeptide Bond Formation in Microcystin Biosynthesis". English. In: *Chembiochem* 18 (Dec. 2017), pp. 2376–2379. ISSN: 1439-7633 (Electronic) 1439-4227 (Linking). DOI: 10.1002/cbic.201700389.