Investigation into the presence of cyanobacteria in the Quinnipiac River

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Introduction

The area surrounding the Quinnipiac River is known to have an assortment of point and nonpoint pollution sources that have led to increased levels of nutrients and bacterial pollution (QRWA 2013). Elevated levels of nutrients can result in an excess growth of a single type of algae, known as an algal bloom. Urban development can cause a rise in nutrients, and therefore can impact the frequency and extent of these blooms (Huisman et al. 2018). Blooms of toxin producing cyanobacteria species can cause particularly serious health complications in aquatic and land organisms, including humans (Codd et al. 1999). Toxic cyanobacteria have been identified throughout the state of Connecticut (CT DEEP 2011); however, little research has been done on the Quinnipiac River to determine the presence and potential toxicity of cyanobacterial species. This study aims to identify the presence of cyanobacteria in the Quinnipiac River, as well as nutrients and water qualities that might correlate with the distribution of these species. Through collection and isolation of individual cyanobacterial species we intend to identify cyanobacterial communities and their potential for toxicity within the river. Furthermore, information gathered in this study will improve understanding of bacterial and pollutant levels throughout the Quinnipiac River, and provide useful knowledge to improve water quality.

Study Objectives

- Determine the presence and identification of cyanobacteria in the Quinnipiac River.
- Identify patterns of nutrient distribution and potential correlations between nutrients and the presence of cyanobacteria.

Materials and Methods

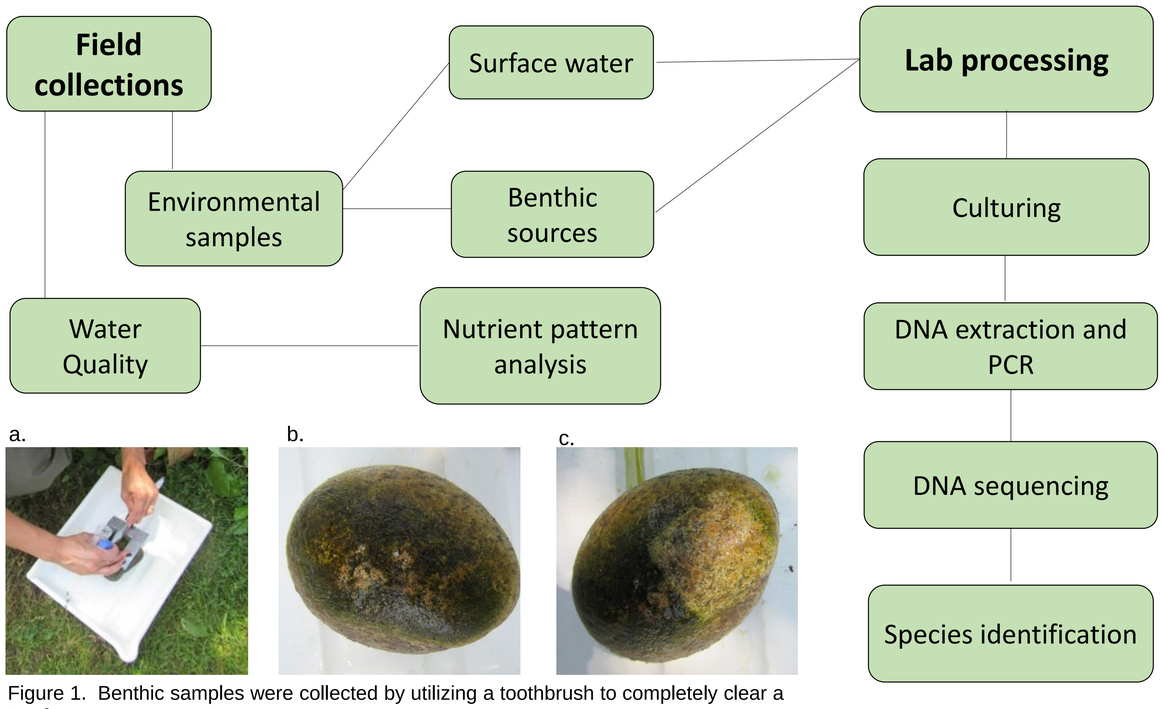

Figure 1. Benthic samples were collected by utilizing a toothbrush to completely clear a 4cm^2 plot into pure distilled water.

Acknowledgments

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Results

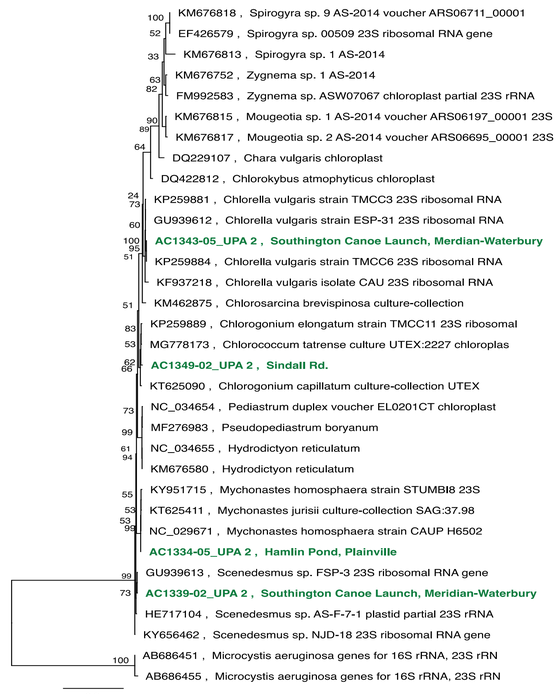

Figure 2. Phylogenic classification and identification of isolate cultures

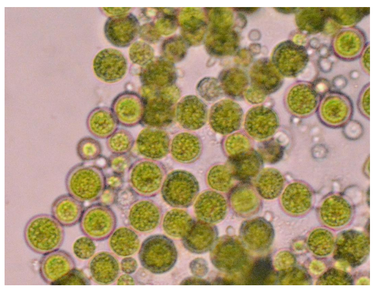

Figure 3. Image of AC1349-05, identified as *Chlorella vulgaris*, at 400x magnification.

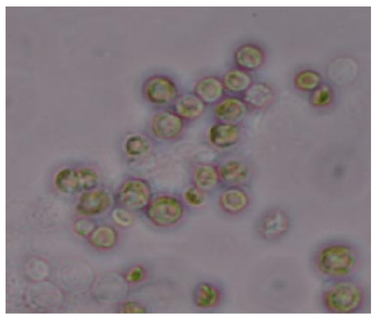

Figure 4. Image of AC1334-05, identified as *Mychonastes homosphaera*., at 400x magnification.

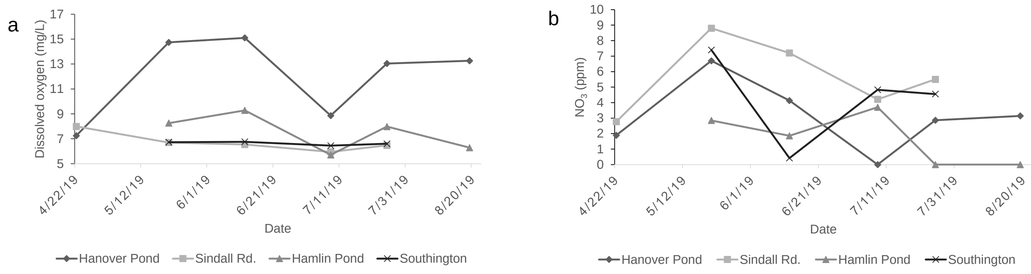

Figure 5. Levels of dissolved oxygen measured with a YSI dissolved oxygen meter (a), and NO_3 measured with an eXact Echo-Check kit (b) present at each field site from May to August 2019.

Discussion

We have identified a broad range of algal species present in the Quinnipiac River, but no cyanobacterial species have been isolated in cultures to date. This could be due to the latency of cyanobacterial development, requiring additional time to accommodate culturing and growth. Alternatively, the absence of cyanobacteria isolates could be the result of significantly low levels present in the river. Confirmation of cyanobacteria in similar waterways throughout the state of Connecticut (CT DEEP 2011) indicates that additional research, with an emphasis on identifying potential toxin producing species, is needed.

Further investigation of the samples collected during the May-August collection period is necessary to identify all species, including cyanobacteria, present. Examination of these samples will continue as mixed and single species cultures mature to provide a thorough community assessment. Additionally, water quality and nutrient patterns will be compared to fluctuations in the type and amount of species present in the river to determine any correlations. Current and future results will provide an understanding of the environmental community as a whole, as well as contribute to a broad range of reference sequences to support an overarching study of environmental sequences of the Quinnipiac River.

References

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