SWAMP
Surface Water
Ambient Monitoring
Program

HARMFUL CYANOBACTERIA BLOOMS AND THEIR TOXINS IN CLEAR LAKE AND THE SACRAMENTO-SAN JOAQUIN DELTA

What is it?

Harmful cyanobacteria and their toxins are increasingly becoming contaminants of concern, however there is limited information on their distribution and the conditions that promote their proliferation and toxin production. This study was designed to identify and characterize the presence of harmful cyanobacteria and their toxins in two California waterbodies known to experience cyanobacteria blooms: Clear Lake and the Sacramento-San Joaquin Delta.

The monitoring objectives for this study included the need to:

- Determine the presence and concentrations of toxins in harmful cyanobacteria blooms.
- Identify and count the algal taxonomy (classified species of algae) found in harmful cyanobacteria blooms.
- Provide a better understanding of the mechanisms underlying the source, occurrence and toxin concentrations of harmful cyanobacteria blooms.

Monitoring was conducted during the 2011 bloom season (June - October) at seven Clear Lake sampling stations and eight Delta sampling stations. Water column samples were analyzed for cyanotoxins, algal taxonomy, chlorophyll a, nutrients, and dissolved organic carbon. Samples were also collected for molecular analysis to confirm the algal taxonomy.

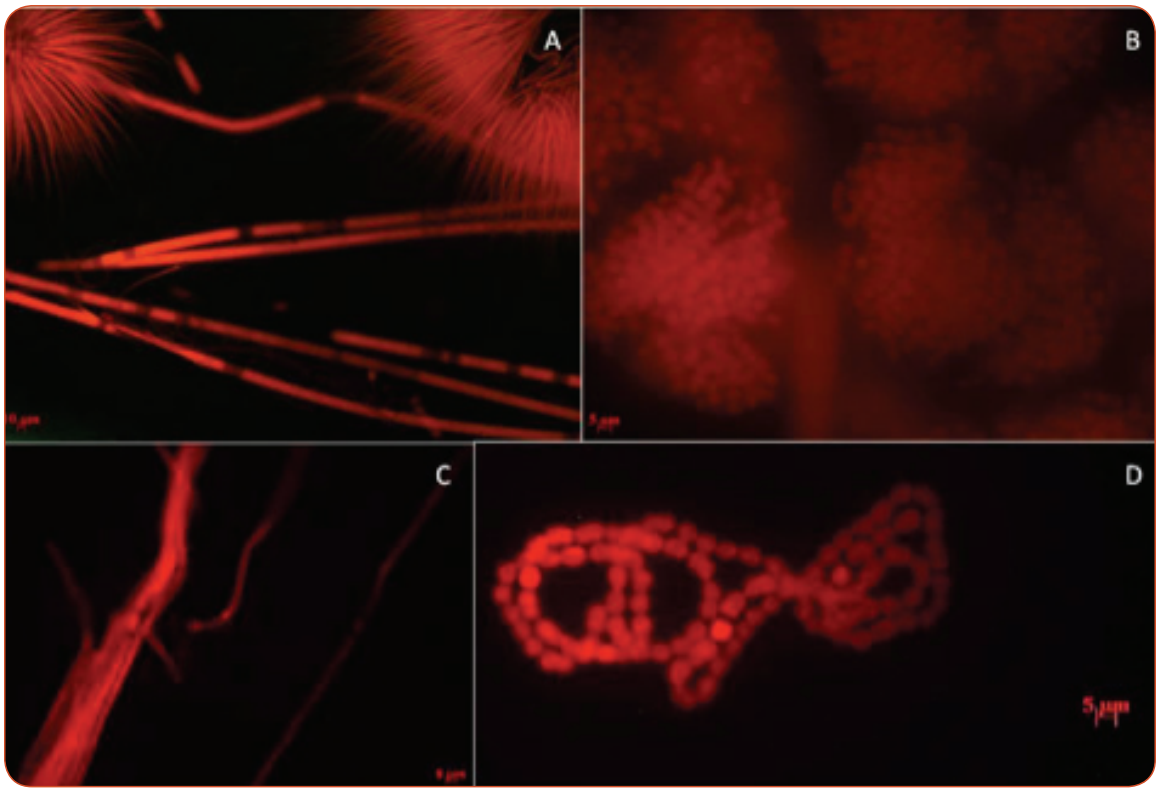
The study was coordinated with other agencies and existing monitoring efforts. Monitoring in the Delta was coordinated with the Environmental Monitoring Program conducted under the Interagency Ecological Program (IEP). In Clear Lake, monitoring was coordinated with the Lake County Water Resources Department.

Photos of a scum forming bloom observed in the upper arm of Clear Lake in July, 2011.

Why is it important?

Harmful cyanobacteria adversely affect water quality and can impact multiple beneficial uses, including aquatic life, drinking water, recreation, and fishing. Cyanobacteria blooms can produce toxins known to be harmful to humans and aquatic species, including the microcystin toxin associated with liver cancer and over twenty sea otter deaths on the Central Coast of California. Blooms can also result in dissolved oxygen sags, taste and odor problems in drinking water, and clogged water filters.

Cyanotoxins have also been proposed as one of the potential factors contributing to the Pelagic Organism Decline (POD) in the Delta. Microcystis was found to coincide with the decline of various pelagic organisms (delta smelt, striped bass, and threadfin shad) and their copepod preys in the freshwater sections of the Delta.



Micrographs of filamentous cyanobacteria observed in Clear Lake samples collected on July 14, 2011: A. Cloeotrichia sp. And Lyngbya cincinnati (x10), B. Microcystis aeruginosa (x40), C. Aphanizomenon sp. (x 40), and D. Anabaena sp. (x40).

A better understanding of the population and dynamics of harmful cyanobacteria and their toxins in California waterbodies is crucial for mitigating future impacts of blooms on water quality and assessing the risks to aquatic ecosystems and public health.

How will this information be used?

This study will provide important information to inform management decisions related to harmful cyanobacteria blooms and their water quality impacts. Findings from this study will be communicated to our SWAMP partners and other interested parties through presentations and a published report.

All monitoring data will be entered into the SWAMP database and will be available to the public through CEDEN.

For more information about this study click here.