Cyanobacteria and Citizens in the Eel River

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EPA Region 9 HABs | April 26, 2017
The Eel River

Drainage Area (km\(^2\))

- 1 - 200
- 201 - 1000
- 1001 - 2000
- 2001 - 5000
- 5001 - 9534

![Map of Eel R. Watershed](image)

![Image of Eel River](image)
Algae fuels aquatic summer food webs

Algae kill dogs in the Eel river

Power, Bouma-Gregson, et al. 2015, *Copeia*
What is the temporal and spatial distribution of cyanobacteria in the Eel River?

Monitoring sites:
- Collected algal samples
- Measured cyanotoxin concentrations (SPATT)
Eel River Recovery Project

www.eelriverrecovery.org

Data Collection

Water Day

Streamside Workshops

Algal Foray 2013 & 2015
Eel River Recovery Project

Toxic Algae Factsheet
Eel River Recovery Project

Cyanoacteria or Blue-green algae can cause Eel River toxicity
- Cyanobacteria or blue-green algae are photosynthetic bacteria that are found in aquatic environments. They are a very diverse group of organisms that are distributed throughout the world.
- Individual cyanobacteria cells can only be seen under a microscope, but cyanobacteria can form colonies that are visible to the naked eye.
- Cyanobacteria are usually present in freshwater systems, and under certain environmental conditions cyanobacteria form "blooms" (or rapidly reproduce) and become the dominant organism in an area. Cyanobacterial blooms have negative ecological and public health effects.
- Blooms of cyanobacteria that produce hepatotoxins were not documented in the Eel River prior to 2001.

How to identify Cyanobacteria in the Eel River
- Cyanobacteria are dark green or brown/orange algae that grow on the bottom of the river.
- They often grow on top of other types of filamentous algae, creating dark green patches on the other algae and form "transes" or finger-like shapes (Figure 1).
- Cyanobacteria can also form from the bottom and float on the surface as dark green gelatinous balls, which can then accumulate at the edge of the river (Figure 2).

2015 and 2016 cyanotoxin monitoring by ERRP and Round Valley Tribes

http://www.eelriverrecovery.org/algae.html
Cyanobacteria in the Eel

Benthic mats, not planktonic soups
Observed common cyano. taxa

*Anabaena* spp.: slow water, fragile, on algae
Observed common cyano. taxa

*Phormidium* spp.: fast water, robust, on rocks
Floating Cyanobacteria
**SPATT Samplers**

**Solid Phase Adsorption Toxin Tracking (SPATT)**

- Time integrative
- Multiple toxins detected (anatoxin-a and microcystins)
- Low limit of detection
- Easy to deploy and analyze
- HP20 DIAION resin not expensive
- Difficult to compare to regulatory limits

Dr. Raphael Kudela UCSC, oceandatacenter.ucsc.edu

SPATT Samplers
SPATT Results

Higher anatoxin-a (ATX) levels than microcystin (MCY)
SPATT 2015 Map
SPATT 2015: Presence/Absence

N = 47

ATX: 77% positive

MCY: 87% positive
Cyano. Mat Cyanotoxins

Higher ATX concentrations than MCY concentrations
More frequent ATX detections
2015 H₂O Samples

Unfiltered H₂O samples

![Graph showing unfiltered H₂O samples for different river forks (ATX and MCY). The x-axis represents different river forks (CR, LE, MF, MS, NF, SF), and the y-axis represents concentration in µg L⁻¹. The data points are scattered across the graph, indicating variability in the samples.]
Lessons Learned: Monitoring

- Main public safety threat is ingestion of actual cells, rather than river water.
- Anatoxin-a more of a threat than microcystins.
- SPATT sampling can be conducted by citizen groups.
- Different regulatory metrics and sampling methods for rivers & streams with benthic cyanobacteria, versus lakes and open water with planktonic cyanobacteria.
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Questions?

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