The Eel River

Power, Bouma-Gregson, et al. 2015, *Copeia*
Algae fuels aquatic summer food webs

Algae kill dogs in the Eel river

Power, Bouma-Gregson, et al. 2015, Copeia
Cyanotoxins in wadeable streams

Fetscher et al. 2015, *Harmful Algae*, Fig. 3
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

Streamside Workshops

Data Collection

Water Day

Algal Foray 2013 & 2015
Cyanobacteria or blue green algae can cause Eel River toxicity

Cyanobacteria 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 "bloom" or rapidly reproduce and become the dominant organism in an area. Cyanobacterial blooms have negative ecological and public health effects.

Blue-green algae that produce cyanotoxins were not documented in the Eel River before 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 “spires” or finger-like shapes (Figure 1).
- Cyanobacteria can detach 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).

Figure 1. Cyanobacteria (dark green) growing on other algae and forming distinctive "spires." (Images: K. Bouma-Gregson)

Figure 2. Cyanobacteria (dark green) floating on the surface and forming gelatinous balls. (Images: K. Bouma-Gregson)

2015 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 cyanobacteria taxa

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

*Phormidium* spp.: fast water, robust, on rocks
Cyanobacteria in the Eel
**SPATT Samplers**

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

- Captures temporal and spatial variability
- Multiple toxins detected
- Low limit of detection
- Easy to deploy and analyze
- Difficult to compare to regulatory limits

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SPATT Results

Higher ATX levels than MCY levels

ng toxin / mg resin / day

MCY

ATX

year

- 2013
- 2014

Jun-22
Jul-06
Jul-20
Aug-03
Aug-17
Aug-31
Sep-14
Sep-28

2013
2014
SPATT 2015: Presence/Absence

N = 47

ATX: 77% positive

MCY: 87% positive
Mat Cyanotoxins

More frequent ATX production than MCY production 2014

[Bar chart showing the distribution of ATX, MCY, and No Toxins production by Anabaena and Phormidium with sample sizes N=84 and N=18 respectively.]

[Image of underwater algae]
2015 Mat and H$_2$O Samples

Cyanobacterial Mats

H$_2$O Samples
Excessive erosion:
creates wide shallow channels

Water withdrawals: decrease summer base flows

Higher temperatures

High green algal biomass

Cyanobacteria Growth

Excessive erosion: creates wide shallow channels
Lessons Learned: Ecology

- Widespread occurrence of cyanobacterial mats, however less abundant in the Lower Eel.
- Different habitats for *Anabaena* versus *Phormidium*
- Growth probably driven by warmer temperatures.
- Anatoxin-a more common than microcystin.
Lessons Learned: Monitoring

• Main public safety threat is ingestion of actual cells, rather than only water.
• SPATT sampling can be conducted by citizen groups.
• Digital micro-photographs are helpful for sharing information.
• Regulatory metrics and sampling methods will be different for rivers & streams, versus lakes and open water.
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Questions?

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