Title
AQU 1: Characterization of the Phytoplankton Community in Lake Fulmor, CA, Using Embedded Sensor Networks

Permalink
https://escholarship.org/uc/item/3538q0g0

Authors
Beth Stauffer
Stefanie Moorthi
Bin Zhang
et al.

Publication Date
2006
Introduction: Phytoplankton communities in aquatic & marine ecosystems

Highly variable phytoplankton communities

- Chemical & physical forcing of phytoplankton communities
  Phytoplankton populations can be limited by chemical nutrients such as nitrate, phosphate, and silicate. They are also strongly impacted by changes in physical parameters, including wind speed & direction (which directly affects mixing depth & water column stratification), light regime, & water flow
- Harmful algal & cyanobacterial blooms in aquatic environments
  Previous & current NAMOS work has focused on the Brown Tide organism, *Aureococcus anophagefferens*, & a Red Tide dinoflagellate, *Lingulodinium polyedrum*. In addition, some cyanobacteria produce hepatotoxins & neurotoxins that can have deleterious effects on animal & human health

Study Site: Lake Fulmor, San Jacinto Mountains, CA

- Altitude: ~ 5000 feet
- Maximum depth: 6m
- Low flow but relatively strong discrete wind events
- Observed surface scum formation during wind events

Proposed Solution: Phytoplankton community in Lake Fulmor, CA

Networked Aquatic Microbial Observing System (NAMOS)

Network of 10 buoys provides chlorophyll & temperature data from several locations with high temporal resolution

Robotic boat fills in gaps spatially & can collect samples for further analysis

NAMOS deployments in 2005 & 2006

Seasonal changes in water column stratification & chlorophyll concentration

- Relative chlorophyll in LF increased from a daily mean of 12 to 158 µg/L from May to October, 2005 (Figure 1a).
- Water column temperature stratification in LF decreased over the year
  - Increasing the accessibility of nutrients to phytoplankton?
  - Also increasing the amount of time spent outside of the euphotic zone (and thus promoting vertical migration)?

Diel variations in chlorophyll concentration at single stations in lake (vertical migration)

- Maximum fluorescence measurements were observed at 1m depth from dusk → dawn (18:00-06:00) on a diel cycle.
- Additional sensing & sampling is underway in 2006 season to investigate the constituency & dynamics of migration

Phytoplankton community composition

- LF was heavily dominated by cyanobacteria in July 2005, including species in the genera *Microcystis* (3b), *Anabaena* (3c,d), & *Spirulina* (3e). The dinoflagellate *Ceratium* was also abundant (3a).
- In October 2005 *Anabaena* (3i,j) was dominant in the surface scum, while the cyanobacterium *Aphanizomenon* (3g,h) was abundant in water collected from 0.5m depth. Diatoms of the genus *Amphipleura* (3f) were also present in the surface sample.
- Preliminary analyses of samples from the May 2006 deployment show dominance by diatoms (likely *Asterionella*) & cladocerans (mainly Daphnids).