SFCWA State and Federal Contractors Water Agency

FACT SHEET

Effects of nutrients and light on phytoplankton of Suisun Bay (13-34)	
Deliverables: Rates of growth and primary production for six phytoplankton species isolated into culture from Suisun Bay, exposed to various forms and levels of nitrogen at three different light intensities.	
Status: Collected and isolated phytoplankton cells into culture; nitrogen and light level experiments not yet performed.	
Primary Investigator: Mine Berg	**Recipient Organization:** Applied Marine Sciences
Project Cost: $92,749	**SFCWA Funding:** $92,749
Partners: None	

Introduction

A large body of research has demonstrated that growth of phytoplankton in San Francisco Estuary is light limited due to high levels of turbidity (Cole and Cloern 1984, 1987, Alpine and Cloern 1988, Cloern 1999, Jassby and Cloern 2002). Under these conditions, accumulation of phytoplankton biomass only occurs during narrow windows of time, when the water column stabilizes enough to reduce sediment resuspension and turbidity, allowing light to penetrate (Cloern and Nichols 1985, Cloern 1991).

According to a recent paradigm proposed by Dugdale et al. (2007) and Parker et al. (2012a,b), growth of phytoplankton is limited by the presence of ammonium rather than irradiance. Central to this paradigm is that phytoplankton grow slower when using ammonium compared to nitrate as the sole source of nitrogen for growth, and that phytoplankton use one source of nitrogen at a time. Because ammonium is the preferred source of nitrogen for growth by phytoplankton, the nitrate pool cannot be accessed as long as ammonium is present in the water column at 4 µmol L-1 or above. As such, phytoplankton are arrested in slow growth mode until ammonium is drawn down below 4 µmol L-1 (Dugdale 2007).

The present project will compare the impact of differences in irradiance versus the impact of differences in nutrients on rates of growth of phytoplankton recently isolated from Suisun Bay. Different levels of irradiance and nutrient source will be tested in unialgal cultures under controlled conditions to minimize influence of confounding factors such changes in temperature, light, grazing, and competition among different algal species during the experimental period.

Objective

These experiments will serve to identify 1) concentrations of ammonium that are inhibitory to growth of phytoplankton, specifically diatoms, and 2) whether current concentrations of ammonium in San Francisco Bay are at levels that may inhibit phytoplankton growth, 3) whether growth rates of resident phytoplankton species differ when they grow on nitrate versus ammonium, and 4) to quantify how changing irradiance compares with changing nitrogen source and concentration, on growth rates of phytoplankton.

Results

Unavailable as yet.

Conclusions

Awaiting results.

Relevance

To identify thresholds of ammonium that are inhibitory to growth of individual phytoplankton species in Suisun Bay, and in the Sacramento River, and to quantify the effect of changing irradiance versus changing nutrient source on growth of phytoplankton. Once the effects of these competing environmental parameters are quantified, they can be applied to explain levels of low primary productivity in Suisun Bay.

Next Steps

Preparation of report on findings.