



CALFed Progress Questionnaire
California Sea Grant College Program

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ProjectNo_2C R/SF-5

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Project Information

ProjectNo_2C R/SF-5 StartDate_3a 8/1/03 EndDate_3b 7/31/06
ProjectTitle_4 Protistan Microzooplankton in the Suisun Bay Food Web: Source or Sink?

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Additional Research Mentors and Community Mentors

Additional Research Mentors_8

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Additional Community Mentors_9

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Project Objectives: Please type your responses, and answer the questions in a style appropriate for laymen.

ProjectObjectives_10

My primary goals are to quantify the role of protistan microzooplankton in the planktonic food web of Suisun Bay and to provide insight into the structure, function and limits on productivity of the lower planktonic food web. While recognition of the importance of microzooplankton in pelagic food webs is increasing within the scientific community, this component of the planktonic system is still largely uninvestigated in many estuarine environments, including San Francisco Bay.

My objectives for achieving these goals are to examine the distribution, abundance, taxonomic composition, grazing rates and contribution to copepod diet of the protistan microzooplankton in Suisun Bay. These parameters will be compared across a spatial gradient, from deep channel and unprotected shoal waters, to a shallow protected location, in order to capture differences in turbidity which may affect grazing efficiency of micro- and mesozooplankton. Examination of temporal variation will include inter-annual, seasonal (wet vs. dry), and monthly (during historically critical fish recruitment periods) sampling. I will also analyze historical data from the USGS Water Quality of San Francisco Bay Program. I will compare trends in chlorophyll and suspended particulate matter concentration over time, in conjunction with the field measurements, to predict the periods when microzooplankton could have a greater or lesser influence on both phytoplankton biomass and planktonic food web efficiency.

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

I spent the first half of Year 1 of this project assessing potential sampling locations, field-testing experimental protocols and performing preliminary analysis of the micro- and mesozooplankton community composition to determine which taxa to include in my feeding incubation studies. My overall field sampling and experimental program is designed to allow for inter-annual (year 1 vs. year 2), seasonal (wet vs. dry), and monthly comparisons of microzooplankton as consumers and prey resource in the Suisun Bay food web. During the second half of Year 1 I completed the first year's wet season experiments and sample collection, and am in the process of analyzing the samples and experimental results. I collected microzooplankton samples twice per month between February and May (typically an important fish recruitment period) from two locations, one in the Suisun Bay channel and one in the shoals region of Grizzly Bay. Once these samples are analyzed, I will be able to assess how the abundance and community composition vary over time and between the channel and shoals area during this period.

In addition to sampling microzooplankton distribution, once per month between March and May 2004 I conducted microzooplankton grazing (dilution) experiments in coordination with mesozooplankton (copepods, rotifers, cladocerans) feeding incubation experiments using natural seawater and live plankton from the Suisun Bay channel location. Preliminary results of the dilution experiments show that microzooplankton grazing impact on chlorophyll was highest during the April phytoplankton bloom period. Samples from the mesozooplankton feeding incubations are still being analyzed, however initial results from the March and April incubations suggest both copepods (*Limnithona* and *Acartia*) and cladocerans (*Daphnia*) consumed both algae and microzooplankton (ciliates). These early results indicate that during the wet season microzooplankton (ciliates) are likely an important component of a range of mesozooplankton consumers' diets, and that during bloom periods in Suisun Bay microzooplankton may also be important grazers of phytoplankton.

PROJECT MODIFICATIONS: Please explain any substantial modifications in research plans, including new directions pursued. Describe major problems encountered, especially problems with experimental protocols and

how they were resolved. Describe any ancillary research topics developed.

Modifications_12

I experienced some initial problems with the microzooplankton grazing (dilution) experimental protocols as applied to Suisun Bay. Specifically, the amount and very small size ($<1 \mu\text{m}$) of suspended particulate material made filtering experimental water for dilution extremely difficult. However, after several attempts using a range of filter types (in-line cartridges, cellulose filters, glass fiber filters) and pore size (pre-filters between 20- and $1\text{-}\mu\text{m}$) I did arrive at an effective method to filter water that balances sufficiently small pore size with moderate time requirements and cost. I now have run three separate sets of dilution experiments with good success.

I also modified the copepod feeding incubation experiments to increase the number of replicates per treatment over a 12-hour incubation period, as well as expanded the predator taxa to include cladocerans and rotifers. Initial assessment of the mesozooplankton consumer communities present before each experiment showed that these taxa were often dominant in terms of abundance, in addition to copepods. The increased replicates also improve the statistical analyses of the experimental results.

BENEFITS AND APPLICATIONS: Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see <http://science.calwater.ca.gov/pdf/soemgmtcues.pdf>).

BenefitsApplic_13

The research at this point is still preliminary. However, based on the results I have obtained to date, I believe that microzooplankton may be an important link in the planktonic food web during bloom periods in Suisun Bay. Common mesozooplankton taxa included heterotrophic prey (i.e. microzooplankton, primarily ciliates) in their diet, even when algae were blooming. In addition, microzooplankton grazing rates on chlorophyll were low, but significant, at this time. Further analyses will help to reveal whether consumption of microzooplankton by the dominant mesozooplankton served to reduce or enhance the overall trophic efficiency of the system. This will be important information for the development and/or modification of food web models that attempt to predict productivity available for higher trophic levels such as fish.

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COOPERATING ORGANIZATIONS: List those agencies and/or persons who provided financial, technical or other assistance to your project since inception. Describe the nature of their collaboration.

CoopOrganiz_15

Romberg Tiburon Center for Environmental Studies, San Francisco State University: provided a Research Scientist position with office and access to laboratory facilities with Dr. Steve Bollens. They also provided the research vessel for the field collections and experiments, for a fee.

AWARDS: List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

Awards_16

I have been selected to participate in the upcoming DIALOG VI Symposium, to be held at Dauphin Island Labs from Oct 31-Nov 5, 2004. The symposium is designed for recent PhD's in aquatic science, and selection is competitive.

KEYWORDS: List keywords that will be useful in indexing your project.

Keywords_17

microzooplankton, dilution experiments, Suisun Bay, mesozooplankton, grazing, feeding experiments

PATENTS: List any patents associated with your project.

Patents_18

No patents have been developed or applied for as a result of this project.

Additions: Additional information can be added here. Please begin the text with the number of the question you are adding to.

Additions_19

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