

NSF funded project on zooplankton feeding ecology. Collaborative research between Wim Kimmerer and Sarah Cohen labs at RTC, SFSU. Funding for 2 graduate students, beginning Fall 2010 (or potentially, summer 2010)

Feeding and food limitation in copepod nauplii, the neglected life stage

Copepod nauplii are important both in their diverse trophic roles in ocean foodwebs and in the population dynamics of copepods. Nauplii have a completely different feeding apparatus from later stages, and the first feeding stage can be very sensitive to starvation, making these life stages critical to population dynamics. Yet extant copepod population models treat nauplii as miniature adults. This work will provide valuable input to the growing efforts at modeling ocean ecosystems. This project will also support two Master's theses at San Francisco State University, a minority-serving institution. The project will provide continuing opportunities for training undergraduates, including URM students, in genetics and field ecology at the Romberg Tiburon Center for Environmental studies, an NSF FSML-supported field station on San Francisco Bay.

This project will investigate feeding by copepod nauplius larvae, the most abundant metazoans in the sea. It will answer three questions: 1) How does food selection by adults and nauplii differ when they are fed multiple prey species in the laboratory? 2) How does food selection by adults and nauplii differ when they are feeding on natural prey assemblages? and, 3) How do growth, development, and survival differ between copepodites and nauplii when their growth is food limited? Comparative experiments and field-based measurements will contrast the food consumed, and the effects of food limitation, between nauplii and later life stages. This contrast will include attributes of food such as size, taxon, and motility, and will include experiments with cultured prey offered singly or in a mixture, and natural prey, and apply genetic techniques to determine prey consumption by a predatory copepod. Copepods will be collected from the San Francisco Estuary, with four species selected for experiments to span taxonomic groups, sizes, salinity ranges, and general feeding behavior. A variety of techniques will be applied to account for the inevitable biases and limitations of each; all but one have previously been applied in our laboratories. These will include laboratory feeding experiments using cultured prey individually and in mixtures, and experiments using natural prey. Consumption of prey in experimental bottles will be measured as chlorophyll concentration and through particle counts by microscopy and flow cytometry. Radioactively labeled prey will be used in short incubations to determine feeding on particular prey types. Samples from the field will be examined for gut fluorescence. Separate experiments will determine how nauplii and copepodites survive and grow at different concentrations of food. Investigations of feeding by a predatory copepod (*Tortanus dextrilobatus*) will use molecular techniques to identify mitochondrial and nuclear DNA from diverse suspected prey species. Specific primers will be developed for common zooplankton species consumed by *T. dextrilobatus* in the laboratory. General primers and screening protocols developed here will be useful for identifying food web interactions in other estuarine communities.