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Progress Report: April-June 2008

Environmental Projects Benefiting San Diego Bay

Project title:

Maintaining Healthy Eelgrass Beds: Fishes, Trophic Diversity, and Ecosystem Function

Introduction:

As the human population continues to expand, we are witnessing rapid changes in the environment due to anthropogenic impacts. One of these marked effects has been the global degradation and loss of seagrass habitats (Short and Wyllie-Echeverria 1996, Orth et al. 2006), including those within San Diego Bay (Browning and Speth 1973). It has been suggested that the wide-spread overexploitation of top predators (e.g. piscivorous fishes) in aquatic ecosystems could be indirectly contributing to the loss of seagrass habitats (Williams and Heck 2001). Eelgrass *(Zostera marina*), common to San Diego Bay, has been the most widely studied seagrass species throughout the world; however, relatively few studies have examined how small predators (such as fishes) influence the functioning of eelgrass ecosystems (Duffy et al. 2005), and to my knowledge, none have been conducted in a field setting. While eelgrass restoration and conservation are of great interest within San Diego Bay, the long-term success or failure of these efforts may be strongly influenced by trophic interactions such as grazing and predation.

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In March 2008, I began a field experiment to explore top-down effects of fishes on eelgrass ecosystems (see progress report for January-March 2008). The field component of this experiment continued from April 1 through June 9. During this time, research vessels and scuba equipment were used to maintain and monitor the Spring 2008 field experiment thrice-weekly. During maintenance outings, researcher divers made all necessary repairs, cleaned cages of fouling material, and evaluated the integrity of all treatments. Periodic beach seines were conducted to collect fishes for replacing those lost due to damaged cages or mortality. The experiment was completed during the first week of June:

May 19-21: 150 shoots of seagrass were hole-punched and tagged for growth analyses.
June 2-4: 150 seagrass shoots were collected, growth measured, and epiphytes removed.
June 5-7: 24 bags of seagrass were collected, all invertebrates stripped, sieved, and preserved.
June 8-9: 24 plots were surveyed for benthic fauna & all structures removed from field.

Monthly beach seines were conducted to evaluate natural densities and community composition of fishes in nearby seagrass habitat. In addition to fish surveys, six plots adjacent to the experimental array were also sampled monthly for the following:

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- Eelgrass height
- Eelgrass density
- Epiphyte mass
- Epiphyte chlorophyll
- Invertebrate abundance
- Water column nutrients

During June 2008, a species atlas (key) was developed to facilitate the identification and quantification of preserved invertebrate samples (e.g. Amphipoda, Tanaidacea, Caridea, Brachyura, Annelida, Gastropoda, Cnidaria, Turbellaria, etc.). A library of voucher samples was also created to allow validation of invertebrate identifications derived from various texts (e.g. Light's Manual by Smith and Carlton). Invertebrate samples were subsequently analyzed for abundance, biomass, and community composition of important taxa.

Epiphyte samples were prepared for extraction in 95% ethanol and analyzed spectrophotometrically for chlorophyll concentration. These data were standardized to the total mass of the respective epiphyte samples as a measure of the relative algal content of the epiphytic material. Analysis of eelgrass growth data, epiphyte biomass and chlorophyll content and invertebrate metrics are on-going and will continue throughout Summer 2008.

The funded research project is 50% complete as of June 30, 2008. During the next reporting period (July 1 – September 30, 2008), all lab analyses (chl extraction, invertebrate quantification, eelgrass growth, etc.) will be completed and statistical analyses will commence. By October 1 the funded research project is projected to be 75% complete; on schedule to be 100% complete by December 2008.