Progress Report

Title of the project: Magnitude and extension of copper pollution effects on benthic faunal communities in San Diego Bay

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Progress report on activity August 6, 2009 – Nov 05, 2009

Summary of the whole activity

Main results

Work this period has been focused on (1) literature review, (2) finishing measurements of copper complexation capacity in selected samples collected in Harbor Island (West and East) and in American's Cup Basin, (3) sorting of meiofauna (4) generate a matrix of data in excel for further analysis and graphic presentation, and (5) production, submission and publication of a manuscript on copper distribution in Shelter Island Yacht Basin. This paper describes the overall effect of the boats distribution (number of boats and distance to boats) on the Cu levels in the water column and sediments, along with their spatial variability within Shelter Island Yacht Basin (Neira et al. 2009). This paper is "in press" in the journal Chemistry & Ecology and will be published officially in December 2009 in the Vol. 25 (6): 417-433. A pdf of this paper (proof) is attached in a separate file. Detailed knowledge of the actual Cu species distribution, and the Cu complexation capacity (a measure of the self-detoxification capacity of the system), now applied to Harbor Island (E & W) and American's Cup will contribute to a better assessment of biological effects and understanding of the benthic faunal communities.

In this regard, we plotted the average concentration of free Cu^{++} measured in three vertical zones (surface water, bottom water, and sediment porewater) of four marinas (Fig. 1). We observed that free Cu^{++} is much higher in surface water than in porewater, which suggests that sediments might be releasing ligands to bind Cu. The gradient of reduced Cu^{++} concentration towards the inner marinas can be attributed to several factors, primarily, exposure, water flushing, and Cu complexation capacity.

From the additional sediment samples collected at selected sites in May 2009, we measured Cu content in several invertebrate species from Harbor Island (W & E) and American's Cup Basin. Preliminary results revealed a wide range of Cu concentrations in tissues of differing species. This variation may be related to life styles, feeding modes, and/or degree of tolerance to the metal. Preliminary data show that the highest average concentration in tissue was found in inner American's Cup sites, where the highest concentrations of sediment Cu occur. At sites near the "mouth" where Cu in sediments is lower, the average Cu content in tissues drops 3 times. Concentrations of bioavailable Cu in sediment measured in selected sites were consistent with those measured in 2008. Titrations using increasing CuSO4 concentrations were conducted to determine the Cu complexation capacity in surface and bottom water from American's Cup and both Harbor Island marinas.

For each task:
Activity carried out:

Laboratory: analysis of bioavailable Cu content in sediment is done. One replicate set of meiofauna was sorted and animals counted. Macrofauna sorting and counting done.

Desk: Literature research to obtain historical records of Cu pollution in the bay. Available data are being analyzed and integrated. Manuscript on Cu spatial distribution at Shelter Island Yacht Basin is currently "in press" in Chemistry & Ecology and will be published officially in the Vol. 25 No 6 of December 2009. The final proof of this paper is included in this report attached in a separate file.

Table of activity - percentage carried out

Task	Field	Laboratory	Desk
	Previous/this period	Previous/this period	Previous/this period
Focused sampling	%100 / 100%	%80 / 70%	%70 / 50%

Task in progress:

- field: Currently no field work; preparing logistics to carry out field experiments of toxicity in SIYB
- laboratory: Meiofauna sorting, Macrofauna biomass measurement.
- desk : research and revision of literature, data analysis. Preparing a manuscript on bottom community response to Cu in SIYB.

Deliverables
Report produced

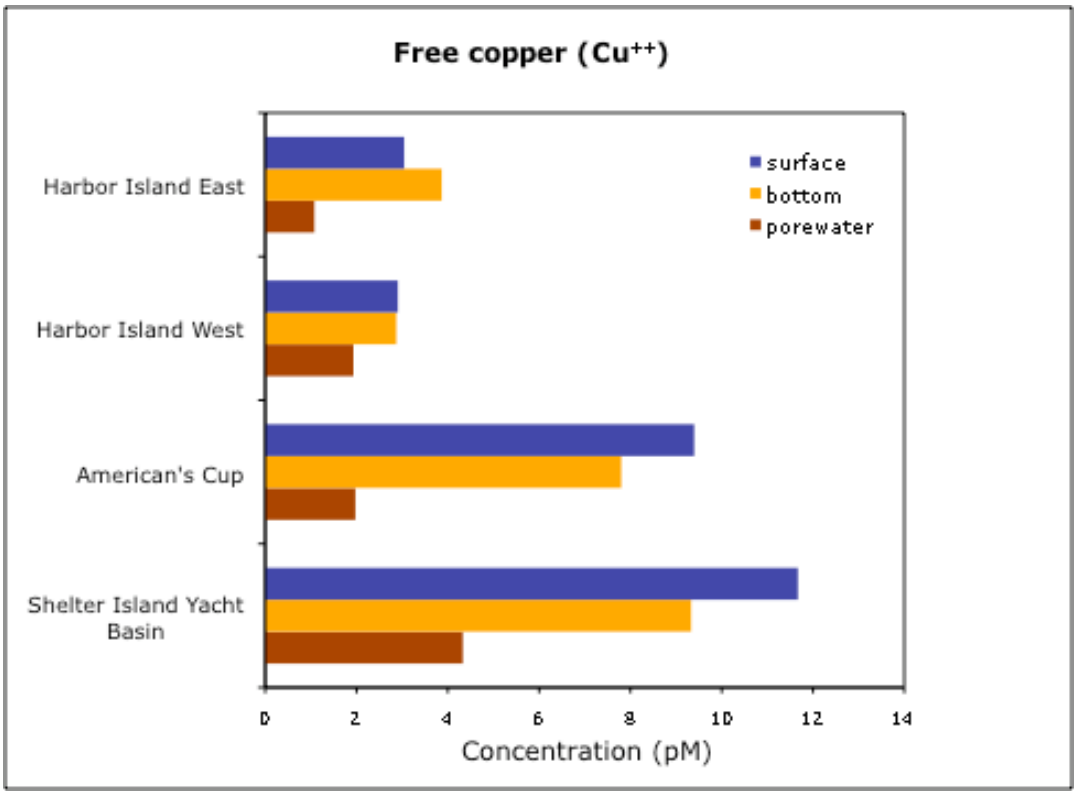

Fig. 1. Comparison of free Cu^{++} concentrations within marinas in three vertical zones (surface water, bottom water, and sediment porewater), and among marinas. Free Cu was measured with an Orion 94-29 Cu-Ion Selective Electrode in unfiltered water samples.

Fig. 2. Mini-gravity core to collect sediment samples