The Relationship Between Metal Concentration and Mean Grain Size in New Haven and Branford Harbors

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Abstract

The presence of metal contaminants in marine sediments can have significant impacts on bottom-dwelling marine organisms. Breslin and others have conducted high-resolution sampling of sediments in Connecticut's harbors, including Norwalk, Bridgeport, and New Haven and have found metal contamination to be elevated. The spatial distribution of metal concentrations depends on sediment properties as well as sources and fluxes of contaminants. A pattern of decreasing metal concentration and increasing average grain size, moving from inner harbor to outer, was found and presents an interpretive problem. Do sediment contaminant concentrations decrease seaward because one is getting farther from river and local industrial sources, or is concentration decreasing because sediment grain size is increasing? Smaller grain sizes have more surface area for metal to adhere to per unit volume, have more clay minerals with electrostatic charges, and tend to have more organic material. All of these tend to increase metal concentrations. This research seeks to isolate the role of sediment characteristics in metal concentration in Connecticut's harbors so that the contribution of proximity to sources and magnitude of flux can be more clearly interpreted.

Early results suggest that mean grain size correlates inversely with Zn, Cu, and Fe concentrations. The variability of concentration with respect to grain size remains substantial and may possibly be accounted for by the presence of organic material in the sediments, by differences in sediment composition (e.g., type and percentage of clay minerals), or simply by the limited number of data. De-trended data (actual concentration minus predicted concentration based on grain size effects) indicate that some of the variability may be due to proximity to local sources of contamination.