Assessment of Mercury Contamination and Bioaccumulation in Sarasota Bay

Yongseok Hong[1,2], *Erik Rifkin*[2], *Randall S. Wells*[3,4], *Peter Hull*[4] and *Edward J. Bouwer*[1]
[1]Department of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, MD, USA
[2]National Aquarium Conservation Center, National Aquarium in Baltimore, Baltimore, MD, USA
[3]Chicago Zoological Society, Brookfield, IL, USA
[4]Mote Marine Laboratory, Sarasota, FL, USA

Mercury (Hg) is a highly toxic metal that is present in almost all aquatic environments as a result of atmospheric transport and deposition. The metal is readily bioconcentrated and biomagnified, hence elevated Hg concentrations are often observed in fish raising a significant health concern for piscivorous animals, such as small cetaceans. To better understand Hg distribution in environments and Hg bioaccumulation in biota, a field experiment was conducted in the Sarasota Bay, FL. Diffusive gradient in thin film probes were deployed to determine methylmercury (CH_3Hg^+) and inorganic mercury (Hg^{2+}) concentrations in the overlying water and in sediment porewater. Environmental samples, including water, sediment, clams (*Pinna nobilis, Mercenaria mercenaria, Venus affinis)*, plankton, and seagrass (*Thalassia testudinum*), were collected from several locations in the area and analyzed for total Hg and/or CH_3Hg^+. Total Hg levels in fish and Sarasota Bay resident bottlenose dolphins were obtained from previously published work. The Hg concentrations in water and sediment were consistent with reported background levels of Hg in uncontaminated coastal areas (less than 1.0 ng/L in water and 1.0 ng/g in wet sediment). However, Hg was bioconcentrated in the lower trophic level biota, such as plankton and seagrass and biomagnified through trophic transfer. The relative order of Hg concentrations in the samples was: overlying water < sediment porewater < sediment ≈ seagrass blade and roots < zooplankton < benthic organisms (clams, snails) < fish (Pin fish, Stripped mullet) < blood and skin of resident Bottlenose dolphins. The differences of Hg levels in the samples varied from a couple of factors to several orders of magnitude. The results strongly confirm that biomagnification of Hg is occurring in the food web of Sarasota Bay. Furthermore, the present study suggests that top predators in aquatic ecosystems may encounter potential health risks associated with dietary Hg exposure even in a relatively uncontaminated coastal area.

Contact Information: Yongseok Hong, Department of Geography and Environmental Engineering, 3400 N. Charles St. Ames Hall 313, Baltimore, MD, 21218, Phone: 512-786-2747, Fax: 410-516-8996, E-mail: yshong@jhu.edu