

Uptake of Mercury and Relationship to Food Habits of Selected Fish Species in the Shenandoah River Basin, Virginia

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ABSTRACT

Mercury poses significant challenges to human health and fisheries management. Historical industrial practices in Waynesboro, Virginia left portions of the Shenandoah River basin contaminated with mercury and stringent health advisories for fish consumption. I investigated processes affecting the bioaccumulation of mercury in *Catostomus commersoni*, *Ictalurus punctatus*, *Lepomis auritus*, and *Micropterus dolomieu* by studying food habits, total mercury and methylmercury in common prey items, and bioaccumulation dynamics of methylmercury in the mercury contaminated South River and South Fork of the Shenandoah River and uncontaminated North River. Additionally, I evaluated sexual and seasonal variations of total mercury in *M. dolomieu* in the South Fork of the Shenandoah River.

Algae, aquatic insects, crayfish, detritus, and fish accounted for 75-97% of the diet. Total mercury in aquatic invertebrates and forage fish in contaminated rivers ranged from 66.7-398.3 and 198.0-594.9 ng/g wet weight, while total mercury in aquatic invertebrates and forage fish in the reference river were 4.4 and 29.3 ng/g. Model simulations indicated that dietary pathways accounted for 87% of methylmercury uptake by fish in contaminated rivers, but only 57% in the reference river. Total mercury in *M. dolomieu* was 19-20% higher in females than males and 14-21% higher during spring than summer and fall. Results of this study indicate that bioenergetics-based bioaccumulation models are valuable tools for evaluating field data, identifying processes critical to contaminant accumulation, and comparing outcomes of alternative management options associated with pollution control, ecosystem management, and/or restoration activities for management guidance prior to costly expenditures.