



Trophic transfer of metals along freshwater food webs: Evidence of cadmium biomagnification in nature

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ABSTRACT: We conducted a study with cadmium (Cd) and copper (Cu) in the delta of San Francisco Bay, using nitrogen and carbon stable isotopes to identify trophic position and food web structure. Cadmium is progressively enriched among trophic levels in discrete epiphyte-based food webs composed of macrophyte-dwelling invertebrates (the first link being epiphytic algae) and fishes (the first link being gobies). Cadmium concentrations were biomagnified 15 times within the scope of two trophic links in both food webs. Trophic enrichment in invertebrates was twice that of fishes. No tendency toward trophic-level enrichment was observed for Cu, regardless of whether organisms were sorted by food web or treated on a taxonomic basis within discrete food webs. The greatest toxic effects of Cd are likely to occur with increasing trophic positions, where animals are ingesting Cd-rich prey (or food). In Franks Tract this occurs within discrete food chains composed of macrophyte-dwelling invertebrates or fishes inhabiting submerged aquatic vegetation. Unraveling ecosystem complexity is necessary before species most exposed and at risk can be identified.

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