

Metals and arsenic in sediment and fish from Cau Hai lagoon in Vietnam: ecological and human health risks

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ABSTRACT

Concentrations of Al, As, Bi, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, U and Zn were analysed in surface sediments collected from 13 different sampling sites from Cau Hai lagoon in Central Vietnam, and in 8 wild and farmed-fishes involving both pelagic and benthic species. Multivariate analysis has shown that these trace elements are mainly associated with lithogenic matter, and are most likely the result of alteration and erosion processes in the lagoon. Enrichment factors and geo-accumulation indices reveal substantial sediment enrichments in both As and Bi with respect to the averaged composition in the upper continental crust. The As enrichment in sediment is reflected by a high concentration of As in the edible portion of fish tissue with values up to 10 times higher than the allowed limits set up by Health Canada. Target hazard quotient and target carcinogenic risk for As were assessed through fish diet and were much higher than 1 and 10^{-4} , respectively indicating potential health risks for regular fish consumers in Cau Hai lagoon.

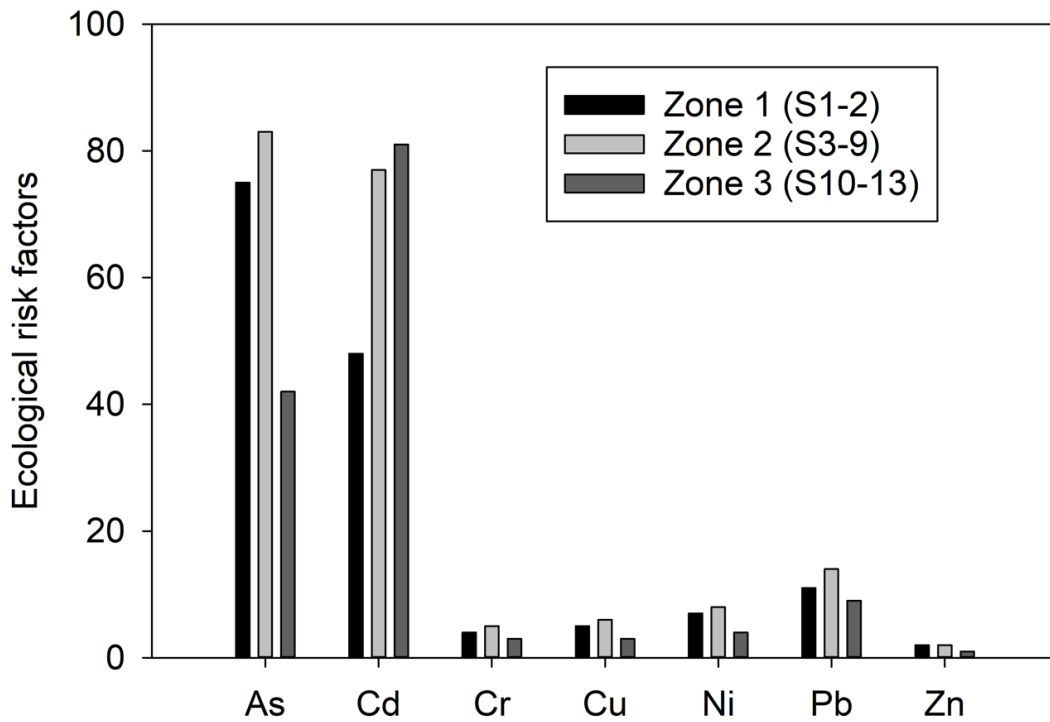


Figure 1. Ecological risk factors ($ER_i = TEF_i \cdot CF_i$) for As, Cd, Cr, Cu, Ni, Pb and Zn. Zones 1 to 3 were determined according to AHC results.

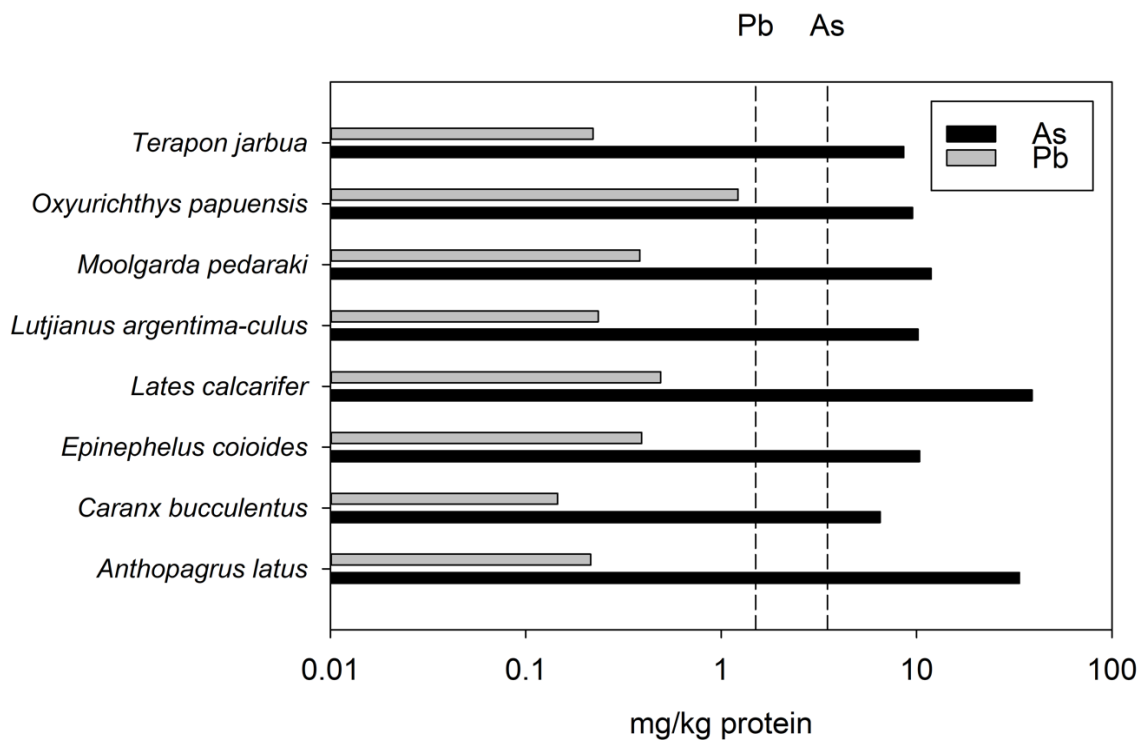


Figure 2: As and Pb levels in edible fish tissues (mg/kg protein). Dot lines represent the maximum edible fish levels established by Health Canada (2017).