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Monitoring Hg and Cd Contamination Using Red Swamp Crayfish (*Procambarus clarkii*): Implications for Wetland Food Chain Contamination

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Abstract Environmental pollution is one of the most serious causes of degradation of Mediterranean wetlands. Mercury (Hg) and cadmium (Cd) are of particular concern due to biomagnification. Here, we used red swamp crayfish (*Procambarus clarkii*) to monitor the spatial and temporal patterns of these two metals in a Portuguese rice field system. We sampled the crayfish in three different sites and three different time periods in the Sado River Basin (Portugal). We measured temperature, pH, total dissolved solids and conductivity in the water. Hg and Cd were measured in the crayfish abdominal muscle tissue and exoskeleton. In muscle, a spatial pattern was found for the accumulation of Cd while for Hg, only a temporal pattern emerged. The spatial pattern for Cd seemed to reflect the mining history of the sites, whereas the temporal pattern for Hg seemed related to the flooding of rice fields. We suggest that this flooding process increases Hg bioavailability.

Keywords Ecological indicator · Bioaccumulation · Toxicity · Trace elements

PC Tavares passed away during the preparation of this study.

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1 Introduction

Metals are one of the major concerns worldwide, being released into aquatic environments from natural and anthropogenic sources. Mercury (Hg) is a persistent contaminant which can affect neurological functions in both human (Clarkson and Magos, 2006) and wildlife species (Mason et al. 2000). In water and sediments, inorganic Hg can be converted by bacteria into methylmercury, much more toxic than inorganic Hg (Mason et al. 2000).

Cadmium (Cd) at high levels of exposure has been associated to *itai-itai* disease (Mochizuki et al. 2002). This metal is known to accumulate more quickly in soils and sediments than in the biota (Burger 2008) and abiotic parameters such as temperature and pH seem to affect bioaccumulation rates of these two metals. Low pH, low salinity and the presence of decomposable matter in reducing environments appear to enhance production of methylmercury which is more efficiently bioaccumulated. These factors can also influence the effects of Cd in the biota as increasing pH seems to