



Host-parasite-sediment partitioning of metals in *Octolasmis*-infested *Scylla* mud crabs from Sarawak mangrove rivers, Malaysian Borneo

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ABSTRACT

Mud crabs (*Scylla* spp.) can accumulate metals due to their benthic and deposit feeding nature. *Octolasmis* spp. are pedunculate barnacles commonly found in the gill chambers of mud crabs and traditionally regarded as ectocommensals. However, high infestations can obstruct airflow, trap organic waste, impair respiration, cause oxidative stress, tissue inflammation, and reduced immune responses in hosts, thus, supporting their consideration as ectoparasites. *Octolasmis* may also accumulate higher metal concentrations than their hosts, potentially revealing contaminant exposure in aquatic environments. We hypothesized that *Octolasmis* would accumulate higher metal concentrations than host tissues, supporting its potential as a bioindicator. This study aimed to evaluate Cd, Pb, Cr, Cu, Mn, and Fe partitioning among mud crab tissues (i.e. hepatopancreas and gills), *Octolasmis*, and sediments from four mangrove rivers in Sarawak during dry and wet seasons (2024–2025). Results showed that *Octolasmis* accumulated significantly higher metal concentrations (notably Fe, Cr, and Pb) compared to the hepatopancreas and gills of mud crabs ($p < 0.001$) in all sites. Mud crabs tissue-to-sediment bioaccumulation factors (BAF_{ss}) indicated Cu and Pb enrichment in both tissues (hepatopancreas and gills), and Cr enrichment in the hepatopancreas at Kuap River (BAF_{ss} = 35.5). Parasite-to-host gill ratios (BAF_{gh} > 1) confirmed efficient metal accumulation for the *Octolasmis*. Hazard indices (HI > 1) at all sites indicated potential non-carcinogenic risk. These findings establish *Octolasmis* as a robust bioindicator for monitoring metal contamination within mud crabs and estuarine systems.

1. Introduction

Mangrove and estuarine river sediments retain metal contaminants through binding, burial, and subsequent redistribution facilitated by fine particles, organic matter, sulfides, and Fe–Mn oxides (Abeywardhana et al., 2022). These sediments accumulate suspended materials from river discharge and coastal deposition, acting as both sinks and secondary sources of metals (Harbison, 1986; Tam and Wong, 2000). Metal pollution from coastal industrial activities increasingly threatens ecological integrity, human health and seafood safety (Alavi et al., 2025). Nur et al. (2021) demonstrated that *Octolasmis* spp. have potential as a bioindicator of mercury pollution. However, studies investigating the accumulation of multiple metals in *Octolasmis* spp.

remain limited, leaving its broader potential as a bioindicator poorly understood. Benthic organisms encounter persistent contaminants like Cd, Pb, Cr, Cu, Mn, and Fe through contact with sediments, feeding, burrowing, and respiration (Deng et al., 2019). Detrital pathways in mangrove food webs sustain macroinvertebrates and commercially harvested species, linking sediment contamination to ecological risk and seafood safety (Kristensen et al., 2008; zu Ermgassen et al., 2025). Although sediment chemistry can indicate environmental contamination, biological accumulation provides a more direct measure of contaminant exposure and ecological uptake.

Mud crabs (*Scylla* spp.) are suitable biomonitoring organisms as their benthic and deposit feeding lifestyles provide multiple pathways for metal exposure (Shelley and Lovatelli, 2011). Accurate species

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