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Determination of Heavy Metals in *Metapenaeus dobsoni* and *Penaeus indicus* Shrimp Species Captured from Negombo and Puttalam Lagoons, Sri Lanka

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Abstract

The presence of heavy metals in aquatic ecosystems has become a growing concern worldwide due to their potential impact on human health and environmental well-being. Shrimp consumption has also been increasing over the years in Sri Lanka, underscoring the need to analyze shrimp to ensure that contaminant heavy metal levels meet international food safety standards. This study was carried out to determine the levels of Cu, Zn, Pb, Cr, and Cd in muscle tissue of commercially important *Metapenaeus dobsoni* (*Kadal Issa*) and the levels of Cu, Zn, and Cr in *Penaeus indicus* (*Kiri Issa*) shrimp species from Negombo and Puttalam lagoons in Sri Lanka. The study aimed to compare heavy metal levels in shrimp species between two lagoons and evaluate potential risks to human health associated with shrimp consumption. Shrimp samples were collected monthly from October 2022 to March 2023. Dry ash preparation was carried out as the digestion technique for the samples and quantified for Cu and Zn using Flame-Atomic Absorption Spectroscopy (FAAS), while Cr using Graphite Furnace Atomic Absorption Spectroscopy (GFAAS). Inductively Coupled Plasma Mass Spectroscopy (ICP-MS) was used to determine Pb and Cd. The mean heavy metal levels in µg/g wet weight in the *Metapenaeus dobsoni* captured from Negombo lagoon were found in order of Cu(4.1±1.7)>Zn(4.0±3.3)>Pb(0.126±0.066)>Cd(0.088±0.013)>Cr(0.061±0.031), while captured from Puttalam lagoon were found in order of Zn(6.6±4.3)>Cu(6.6±1.404)>Pb(0.172±0.193)> Cd(0.145±0.066)>Cr(0.076±0.005). The mean metal levels in µg/g wet weight found in *Penaeus indicus* were as follows, Cu(4.4±1.8)>Zn(2.7±1.3)>Cr(0.048±0.019) in Negombo lagoon and Cu(5.9±0.8)>Zn(4.4±2.3)>Cr(0.073±0.030) in Puttalam lagoon. The findings show that in general, the heavy metals levels detected in shrimp samples were higher in Puttalam Lagoon than in Negombo Lagoon. In addition, the results demonstrated that shrimp from both lagoons and species were safe for human consumption during the study period since none of the heavy metal levels in the shrimp samples exceeded the maximum permissible level (MPL) allowed for shrimp consumption according to FAO/WHO. Furthermore, the Estimated Daily Intake (EDI) and Target Hazard Quotient (THQ) values indicated that there was no non-carcinogenic risk of the determined metals via the consumption of *Metapenaeus dobsoni* and *Penaeus indicus* shrimp species captured from Negombo and Puttalam lagoons.

***Keywords**:* Heavy metals, Shrimp consumption, Negombo lagoon, Puttalam lagoon, Potential risks