

Bioavailability of polycyclic aromatic hydrocarbons (PAHs) to short-neck clam (*Paphia undulata*) from sediment matrices in mudflat ecosystem of the west coast of Peninsular Malaysia

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Abstract The bioaccumulation and bioavailability of polycyclic aromatic hydrocarbons (PAHs) were characterized in sediment and *Paphia undulata* (short-neck clam) from six mudflat areas in the west coasts of Peninsular Malaysia. The concentrations of total PAHs varied from 357.1 to 6257.1 and 179.9 ± 7.6 to 1657.5 ± 53.9 ng g⁻¹ dry weight in sediment and short-neck clam samples, respectively. PAHs can be classified as moderate to very high level of pollution in sediments and moderate to high level of pollution in short-neck clams. The diagnostic ratios of individual PAHs and principal component analysis indicate both petrogenic and pyrogenic sources with significant dominance of pyrogenic source. The first PAHs biota-sediment accumulation factors and relative biota-sediment accumulation factors data for short-neck clam were obtained in this study, indicating a preferential accumulation of lower molecular weight PAHs.

Evaluation of PAH levels in sediments and short-neck clams indicates that short-neck clam could be introduced as a good biomonitor in mudflats. The results also demonstrated that under environmental conditions, the sedimentary load of hydrocarbons appears to be one of the factors controlling their bioavailability to biota.

Keywords Polycyclic aromatic hydrocarbons (PAHs) · Mudflat ecosystem · *Paphia undulata* (short-neck clam) · Bioavailability · Biomonitor · Peninsular Malaysia

Introduction

The Straits of Malacca Estuary is one of the most important international navigation waterways from both an economic and a strategic perspective. More than 60,000 ships pass through the Malacca Straits per year, which 80 % of them carries oil to Northeast Asia in 2008 (Gilmartin 2008) and has increased tremendously to more than 90,000 ships in 2013 (Malaysian Marine Department 2014). During the last few decades, industrialization, urbanization and population growth have significantly increased the demand for energy in East Asia. Consequently, there is a drastic increase of contaminants of a great concern such as polycyclic aromatic hydrocarbons (PAHs), linear alkylbenzenes (LABs), etc. in the region's ecosystem (Keshavarzifard et al. 2015; Alkhadher et al. 2015, 2016; Magam et al. 2015).

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