

The Assessment of Mangrove Sediment Quality in Mengkabong Lagoon: An Index Analysis Approach

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Abstract: The objectives of this study are to use different types of indexes to assess the current pollution status in Mengkabong lagoon and select the best index to describe the Mengkabong sediment quality. The indexes used in this study were Enrichment Factor (EF), Geo-accumulation Index (Igeo), Pollution Load Index (PLI) and Marine Sediment Pollution Index (MSPI). Different indexes give diverse status of Mengkabong lagoon sediment quality. MSPI has an advantage over the earlier indexes and viewed as a simple summary of the state of the sediment. However, the heavy metal assessment indices are not to be used as the only indicator for sediment quality. Site-specific, biological testing and ecological analysis of existing benthic community related to sediment contamination are needed for final decision making in the case of Mengkabong lagoon.

Key words: Heavy Metals; Indexes; Sediment Quality; Surface Sediment.

INTRODUCTION

Heavy metal cycling is a serious problem addressed in mangrove environment (Marchand et al, 2006; Pekey, 2006). The high concentrations of heavy metals are derived from anthropogenic inputs from industrial activities around the estuary such as discarded automobiles, batteries, tires, waste water disposal etc (Shriadah, 1999; Bloom and Ayling, 1977). For an example, study done by Bloom and Ayling (1977) in Derwent Estuary revealed high concentration of zinc and lead due to a zinc refining company found near the estuary. Moreover, the study by Kehrig et al, (2003) suggests that metal concentrations in sediment samples from Jequia mangrove forest, Brazil, have significantly exceeded the natural concentration of heavy metals. The results indicated a significant anthropogenic input of zinc, lead, chromium, copper and methyl mercury. Sediments act as sinks and sources of contaminants in aquatic systems because of their variable physical and chemical properties (Pekey, 2006; Marchand et al, 2006; Rainey et al, 2003; Evans et al, 2003). Analysis of pollutants in sediments is vital as they were adsorbed by material in suspension and by fine-grained particles (Shriadah, 1999). Pekey (2006) demonstrated the heavy metals tend to be trapped in aquatic environment and accumulate in sediments.

According to Caeiro et al, (2005), the concentration of metal contaminants' can be classified into three types which are (i) contamination indices- which compare the contaminants with the clean or polluted stations measured elsewhere; (ii) background enrichments indices- which compare the results for the contaminants with the baseline or background levels and (iii) ecological risk indices- which compare the results for the contaminants with Sediment Quality Guidelines (SQG). Environmental quality indices are a powerful

tool for development, evaluation and conveying raw environmental information to decision makers, managers, technicians' or for the public. In recent decades, different metal assessment indices applied to estuarine environment have been developed (Caeiro et al, 2005; Spenner and Macleod, 2002). Sediment quality values are a useful to screen the potential for contaminants within sediment to induce biological effects and compare sediment contaminant concentration with the corresponding quality guideline (Spencer and Macleod, 2002). These indexes evaluate the degree to which the sediment-associated chemical status might adversely affect aquatic organisms and are designed to assist sediment assessors and managers responsible for the interpretation of sediment quality (Caeiro et al, 2005). It is also to rank and prioritize the contaminated areas or the chemicals for the further investigation (Farkas et al, 2007).

Aim and Subject of the Research

The subject of this research involves the surface sediments collected at high and low tide. Due to the increasing developments in Mengkabong lagoon, the study aims to (1) use different types of indices to aggregate and assess the heavy metal contamination of Mengkabong mangrove sediment (2) select the best index to describe the Mengkabong lagoon sediment quality.

RESEARCH METHODOLOGIES AND METHODS

Study Area

This study took place in Mengkabong mangrove forest, Tuaran District, West Coast of Sabah which is 40 km away from Kota Kinabalu. The total of study