

Assessment of Elemental Pollution in Marine Sediment from Talang-Satang and Bako National Park of Sarawak, Malaysia

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Abstract

The assessments of elemental pollution in sediment collected from national park of Sarawak were done based on their distribution pattern, geoaccumulation index and enrichment factor. The enrichment factors (EF) were determined by the elemental rationing method, whilst the geoaccumulation index (I_{geo}) by comparing of current concentration to background concentration of metals. The elements were analyzed by using Instrumental Neutron Activation Analysis (INAA). The results of enrichment factor show that Talang-Satang and Bako National Park have significant contaminated by toxic elements such as As, Cr, Sb, Ti and U. Base on the classification system proposed for sediment quality with referring to I_{geo} , the sediment quality of the Talang-Satang and Bako National Park for Arsenic (As) contamination can be categorized as moderate to extremely contaminated. Contamination of element such as Cr, Sb and Ti can be categorized as uncontaminated to moderate contaminated, and U can be categorized as uncontaminated to moderate and strong contaminated. The average concentration of As in sediment of Bako shown surpassed sediment quality guideline (probable effect concentration - PEC) value, whilst Cr concentration in sediment of Talang-Satang shown above midpoint effect concentration (MEC). This indicating, the sediment of Bako and Talang-Satang could have a potential for producing chronic effect to the marine biota or benthic organism.

Keywords: geoaccumulation, enrichment factor, sediment, Sarawak national park.

INTRODUCTION

Domestic and industrial waste, land reclamation, seabed dragging, agriculture-base, recreation, mining, fish culture, oil drilling, shipping accident, oil spill and atmospheric runoff are main sources of pollution. Sediment can be used as one of indicator to identify the sources, distribution and accumulation of elemental pollution. Accumulation of elemental pollution in sediment can give an adverse affect to the benthic organism especially to the micro-invertebrate species and other organisms (e.g., egg and larval stage of fish) that spend all or part of their life cycle associated either within (infaunal) or on (epibentic) the bottom sediment. Most of micro-invertebrate becomes part of diet to the other aquatic animals. Knowledge about the level of elemental pollution in sediment could give an adverse effect to the organism are still limited. However, a few guideline had been publish by Wisconsin Department of Natural Resources, USA can be used as a guidance to identify permissible limit of elemental pollution in sediment.

Talang-Satang National Park is the first national park in Sarawak to consist primarily of a marine area. It has been created for the primary purpose of marine turtle conservation. This national park includes four islands namely Satang Besar and Satang Kecil island (9,894 ha), Talang-Talang Besar and Talang-Talang Kecil island (9,520 ha). Bako National Park is Sarawak's oldest national park, covering an area of 2,727 hectares at the tip of the Muara Tebas peninsula. Bako National Park was gazetted as a protected area on 1 May 1957.

Talang-Satang National Park receive inputs of contaminant by discharge of plumes from three rivers (Sampadi, Rayu, Sibul) and Bako National Park received sediment contamination from Tabo, Buntal and Sarawak rivers. Metals are mainly associated with particulate and colloidal matter, which precipitate and deposit once they reach the marine environments. Metal accumulation in marine sediment may reflect a diversity of