Assessment Cu, Ni and Zn pollution in the surface sediments in the Southern Peninsular Malaysia using cluster analysis, ratios of geochemical nonresistant to resistant fractions, and geochemical indices.

Abstract

The intertidal sediment samples collected in May 2007 from 12 sampling sites in the southern part of Peninsular Malaysia, were determined for the total concentrations of Cu, Ni and Zn and their four geochemical fractions. The total concentrations (µg/g dry weight) of Cu, Ni and Zn ranged from 9.48 to 115.82, 12.95 to 36.18 and 45.35 to 136.56, respectively. The ratios of nonresistant to resistant fractions based on geochemical analysis revealed that the Pantai Lido and Senibong had > 1.0, indicating > 50% of the total concentrations of Cu, Ni and Cu were contributed by anthropogenic sources. This is well complemented by the cluster analysis in which Pantai Lido and Senibong are clustered together based on the three metals clustering pattern. By using Fe as a normalizing element, Cu found at Pantai Lido and Senibong showed > 1.5 for the enrichment factor (EF), which indicated that the Cu was delivered from non-crustal materials or anthropogenic origins while all sampling sites showed Ni and Zn may be entirely from crustal materials. Based on the geoaccumulation index (Igeo) (Müller, 1981), similar pattern was also found for Pantai Lido and Senibong in which again only Cu concentrations ranged from 1-2, indicating 'moderate pollution' (Igeo 1 < 2; Class 2).while other sites can be considered as 'unpolluted' (Igeo < 0; Class 0) by Cu, Ni and Zn. Ratios of NR/R exhibited better in the assessment of polluted sites while EF and Igeo should be revised according to Malaysian sedimentary characteristics. This study should prompt more biochemical and molecular studies on the intertidal molluscs from the Straits of Johore since the identified two sites are located in the Straits of Johore, especially the commercial mussel Perna viridis.