

AN ASSESSMENT OF METALS CONTAMINATION IN KEMAMAN MANGROVE
SEDIMENT DURING PRE AND POST-MONSOON
SEASONS

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SEDIMENT DURING PRE AND POST-MONSOON
SEASONS

By

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LIST OF ABBREVIATIONS

Al	Aluminium
Fe	Iron
Cr	Chromium
Mn	Manganese
Cu	Copper
Cd	Cadmium
ppt	part per thousand
HNO ₃	Nitric acid
HCl	Hydrochloric acid
HF	Hydrofluoric acid
H ₂ SO ₄	Sulfuric acid
NBS	National Bureau of Standard
ml	milligram
μg ⁻¹	microgram per gram
°C	degree Celsius
Ø	phi
PSA	Particle Size Analyzer
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry

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ABSTRACT

An assessment of metals contamination in Kemaman mangrove sediment during pre and post-monsoon seasons were conducted. The surface sediments were collected from 10 sampling point from Chukai mangrove forest during pre-monsoon and post-monsoon seasons and were analyzed for Al, Fe, Cr, Mn, Cu, Cd, Pb and grain size. During pre-monsoon, the average concentration of Al, Fe, Cr, Mn, Cu, Cd and Pb were $2.02 \pm 0.8\%$, $0.79 \pm 0.43\%$, $263.89 \pm 306.08 \mu\text{gg}^{-1}$ dry weight, $31.82 \pm 17.82 \mu\text{gg}^{-1}$ dry weight, $4.88 \pm 2.98 \mu\text{gg}^{-1}$ dry weight, $0.02 \pm 0.01 \mu\text{gg}^{-1}$ dry weight and $6.26 \pm 2.8 \mu\text{gg}^{-1}$ dry weight, respectively. During post monsoon, the average concentration of Al, Fe, Cr, Mn, Cu, Cd and Pb were $2.54 \pm 1.1\%$, $0.84 \pm 0.38\%$, $37.12 \pm 12.26 \mu\text{gg}^{-1}$ dry weight, $26.05 \pm 6.16 \mu\text{gg}^{-1}$ dry weight, $3.85 \pm 1.57 \mu\text{gg}^{-1}$ dry weight, $0.02 \pm 0.01 \mu\text{gg}^{-1}$ dry weight and $7.44 \pm 3.42 \mu\text{gg}^{-1}$ dry weight, respectively. Enrichment factor and normalization was used to point out the level of pollution. During pre-monsoon, the enrichment factor (EF) and normalization indicated that only Fe, Cd and Pb were from natural resources, while all metals except for Cr originated naturally during post-monsoon. Comparison with background level indicates that the heavy metal concentrations on the study area are lower, except for Cr during both seasons. The statistical analysis of Pearson correlation matrix proved that there is a significant relationship between metal concentration and particle size. The concentrations of metals decrease with the decrease of particle mean size, suggesting their association with fine fraction of the sediment. All the metals except for Cr do not show any significant differences with seasonal changes ($p > 0.05$).

Kajian Penilaian Terhadap Pencemaran Logam Berat di Kawasan Bakau Kemaman pada
Sebelum dan Selepas Monsun

ABSTRAK

Penilaian terhadap pencemaran logam berat di kawasan bakau Kemaman pada sebelum dan selepas monsoon telah dijalankan. Sedimen permukaan telah diambil dari 10 poin penyampelan dari paya bakau di Chukai pada sebelum dan selepas monsun dan telah dianalisa untuk menentukan kandungan Al, Fe, Cr, Mn, Cu, Cd, Pb and saiz partikel.. Pada sebelum monsun, purata kepekatan Al, Fe, Cr, Mn, Cu, Cd dan Pb adalah masing-masing $2.02 \pm 0.8\%$, $0.79 \pm 0.43\%$, $263.89 \pm 306.08\mu\text{gg}^{-1}$, $31.82 \pm 17.82\mu\text{gg}^{-1}$, $4.88 \pm 2.98\mu\text{gg}^{-1}$, $0.02 \pm 0.01\mu\text{gg}^{-1}$ and $6.26 \pm 2.8\mu\text{gg}^{-1}$ Pada selepas monsun, purata kepekatan Al, Fe, Cr, Mn, Cu, Cd dan Pb adalah masing-masing $2.54 \pm 1.1\%$, $0.84 \pm 0.38\%$, $37.12 \pm 12.26\mu\text{gg}^{-1}$, $26.05 \pm 6.16\mu\text{gg}^{-1}$, $3.85 \pm 1.57\mu\text{gg}^{-1}$, $0.02 \pm 0.01\mu\text{gg}^{-1}$ and $7.44 \pm 3.42\mu\text{gg}^{-1}$. Faktor kekayaan dan normalisasi di gunakan untuk mengkaji tahap pencemaran. Pada sebelum monsun, faktor kekayaan dan normalisasi menunjukkan hanya Fe, Cd and Pb sahaja datang dari sumber semulajadi, manakala selepas monsun, semua logam berat kecuali Cr datangnya dari sumber semulajadi. Perbandingan dengan tahap letar belakang menunjukkan bahawa kepekatan logam berat di kawasan penyampelan adalah lebih rendah kecuali bagi Cr untuk kedua-dua musim. Ujian statistik korelasi matrik Pearson menunjukkan adanya hubungan antara logam dan saiz partikel. Kepakatan logam menurun dengan penurunan saiz particle, menunjukkan adanya particle halus dalam sedimen. Semua logam kecuali Cr tidak menunjukkan hubungan positif dengan perubahan musim ($p > 0.05$).