HEAVY METALS DISTRIBUTION IN WATER, SEDIMENT AND AQUATIC SPECIES FROM MATANG MANGROVE FOREST RESERVE, PERAK, MALAYSIA.

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ABSTRACT

The concentration of five heavy metals, namely copper (Cu), cadmium (Cd), zinc (Zn), lead (Pb) and chromium (Cr) were determined in water, sediment, fish, cockles and shrimp collected from eight selected sites in Larut River and Sangga Besar River which are located in the state of Perak. Water quality parameters such as pH, DO, temperature and salinity were monitored. The results were then compared to the recommended Marine Water Quality Standards for Malaysia (MWQS) and DOE Water Quality Criteria for Malaysia. The Atomic Absorption Spectrometry (AAS) and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) techniques were used to determine concentrations of heavy metals in the samples. The Standard Reference Materials SRM 1646 Estuarine Sediment, SRM-BCR Fluka-estuarine water and SRM - DORM-3-Fish protein from the National Research Council Canada, were used to check the accuracy and precision. Data showed a good agreement witqh the certified values for the elements with more than 80 % recovery. The results of the heavy metals in sediment were assessed against the Dutch Criteria for Assessment of Soil Pollutants. The values found in this study were significantly lower than the standard values. The tissue analysis in fish revealed that liver accumulated the highest levels of Heavy Metals. Analysis in cockles indicates that the accumulation of heavy metals are in the order of Zn>Cu>Cr>Pb>Cd. In prawns species of *Penaeus merguiensis*, the results showed that zinc has the highest concentrations followed by copper, chromium, lead and cadmium. The accumulation of copper and zinc in prawn's head of *Penaeus merguiensis* were found high compared to shell and muscle. However the concentration level of the elements reported in this study does not constitute a risk factor for human health and appear to be below the permissible limits issued by FAO.

ABSTRAK

Analisis kepekatan kandungan lima logam berat iaitu Kadmium, Kuprum, Zink, Plumbum dan Kromium telah dijalankan di dalam sampel air, tanah, ikan, kerang dan udang yang diperolehi daripada lapan kawasan di Sg Larut dan Sg Sangga Besar yang terletak di negeri Perak. Kualiti parameter air seperti pH, kandungan oksigen terlarut, suhu dan kemasinan telah diperiksa. Kemudian hasil kajian telah dibandingkan dengan piawaian kualiti air laut Malaysia yang dibenarkan. Teknik AAS dan ICP-MS telah digunakan untuk menentukan kandungan logam berat di dalam sampel. Bahan rujukan piawai SRM 1646 Estuarine sediment, SRM-BCR Fluka Estuarine water dan SRM-DORM 3 Fish protein daripada National Research Council Canada telah digunakan untuk mmastikan ketepatan dan kepersisan keputusan. Data menunjukkan perolehan semula lebih daripada 80% . Kandungan logam adalah lebih tinggi dalam sedimen di bahagian atas permukaan berbanding bahagian bawah permukaan. Keputusan yang diperolehi dibandingkan dengan Dutch Standard Criterion. Nilai yang diperolehi adalah sangat rendah dibandingkan dengan nilai yang ditetapkan. Kepekatan logam berat (Cu, Zn, Cd, Cr dan Pb) dalam tisu (kulit, hati, daging, insang) ikan dan udang (daging, kulit, kepala) serta kerang turut dijalankan. Organ hati menunjukkan kandungan logam berat yang tinggi dalam tisu ikan. Analisis dalam kerang mendapati pengumpulan logam berat adalah dalam turutan Zn>Cu>Cr>Pb>Cd. Dalam tisu udang spesis *Penaeus merguiensis* analisa menunjukkan zink mempunyai kandungan yang lebih tinggi diikuti Kuprum, Kromium, Plumbum dan Kadmium. Akumulasi Kuprum dan Zink dalam kepala udang spesis *Penaeus Merguiensis* adalah lebih tinggi berbanding dalam kulit dan isi udang. Namun kandungan adalah dibawah had yang ditetapkan oleh *FAO*.

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MWQS	Marine Water Quality Standards
SRM	Standard Reference Material
FAO	Food and Agriculture Organization
CRM	Certified Reference Material
DOE	Department of Environment
µg/g	Microgram per gram
µg/l	Microgram per litre
MMFR	Matang Mangrove Forest Reserve
AAS	Atomic Absorption Spectrometer
ICP-MS	Inductive Coupled Plasma-Mass Spectrometer
DO	Dissolved oxygen
mg/l	Milligram per litre
Cu	Copper
Zn	Zinc
Cd	Cadmium
Cr	Chromium
Pb	Lead
SQG	Sediment Quality Guidelines
ANOVA	Analysis of Variance
w.w	Wet weight
d.w	Dry weight
BCF	Bioconcentration factor
LDPE	Low density polyethylene