DISTRIBUTION OF HEAVY METALS CONCENTRATION IN SURFICIAL SEDIMENTS OF MUAR RIVER, JOHOR, MALAYSIA

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SCHOOL OF MARINE AND ENVIRONMENTAL SCIENCES
UNIVERSITI MALAYSIA TERENGGANU

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Lihat Sebelah

DISTRIBUTION OF HEAVY METALS CONCENTRATION IN SURFICIAL SEDIMENTS OF MUAR RIVER, JOHOR, MALAYSIA

By

Margaret A/P William Thomes

Research Report submitted in partial fulfilment of

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A5: Declaration and Verification Report

SCHOOL OF MARINE AND ENVIRONMENTAL SCIENCES

UNIVERSITI MALAYSIA TERENGGANU

DECLARATION AND VERIFICATION REPORT

FINALYEAR RESEARCH PROJECT

It is hereby declared and verified that this research report entitled Distribution of Heavy Metals Concentration in Surficial Sediments of Muar River, Johor, Malaysia by Margaret a/p William Thomes, Matric No. UK28194 have been examined and all errors identified have been corrected. This report is submitted to the School of Marine and Environmental Sciences as partial fulfilment towards obtaining the Degree of Bachelor of Science (Marine Science), School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

µg/g	-	Microgram per gram
®C	-	Degree of Temperature
Ø	-	Phi
%	-	Percentage
>	-	More than
<	-	Less than
Al	-	Aluminium
As	-	Arsenic
Cd	-	Cadmium
Cu	-	Copper
Cr	-	Chromium
CF	-	Contamination Factor
dw	-	Dry Weight
E	-	East
EF	-	Enrichment Factor
EPA	-	United States Environmental Protection Agency
g	-	Gram
GIS	-	Geographical Information System
GPS	-	Global Positioning System
HCl	-	Hydochloric Acid
HF	-	Hydrophobic Acid
HNO_3	-	Nitric Acid
Hg	-	Mercury
ICP-MS	-	Inductively Coupled Plasma Mass Spectrometry
I-geo	-	Index of Geo-accumulation
km	-	Kilometre
Li	-	Lithium
M	-	Metal
m	-	Metre

mL	-	Millilitre
N	-	North
NOAA	-	National Oceanic and Atmospheric Administration
NIST	-	National Institute of Standards and Technology
OM	-	Organic Matter
Pb	-	Lead
PSA	-	Particle Size Analyser
PLI	-	Pollution Load Index
r	-	Correlation coefficient
S	-	South
Sc	-	Scandium
SQGs	-	Sediment Quality Guidelines
SRM	-	Standard Reference Material
TEC	-	Threshold Effect Concentration
UCC	-	Upper Continental Crust
WWF	-	World Wildlife Fund
Zn	-	Zinc

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ABSTRACT

In the aquatic system, surficial sediments act as a vital indicator of heavy metal effluence. This study purposes (1) to determine and illustrate the degree of heavy metals (chromium (Cr), copper (Cu), zinc (Zn), lead (Pb), cadmium (Cd) and arsenic (As)) contamination in the surficial sediments collected at Muar River due to the surrounded development of anthropogenic activities such as fishing activities, boating, industrials and municipal output, agricultural and aquaculture at Muar River which have a high tendency to emit heavy metal pollutants to the river and estuary; (2) to evaluate the relationship between the sediment grain size and heavy metal concentrations in surficial sediments of Muar River. Hence, the distribution, correlation and pollution status of heavy metals in 40 surficial sediments collected by Ponar grab were analysed using ICP-MS after Teflon bomb digestion and the results were visualized using ArcGis 10.0 software. The average concentrations was 71.9 μg/g *dw* (Cr), 20 μg/g *dw* (Cu), 238.83 μg/g *dw* (Zn), 289.57 μg/g *dw* (Pb), 5.47 μg/g *dw* (Cd) and 30.86 μg/g *dw* (As), respectively where all of the average concentrations are higher than the Upper Continental Crust (UCC) values. Besides, the calculation of pollution status using Enrichment factor (EF), Geo-accumulation index (I-geo) and Pollution load index (PLI) concludes that Muar River are contaminated with heavy metals especially with Cd. Muar River exhibits fine silt surficial sediments which have a negative correlation with heavy metals proving that the heavy metals does not occur naturally but by anthropogenic sources. Overall, it can be concluded that Muar River was more influenced by anthropogenic sources than natural inputs.

PENGAGIHAN KEPEKATAN LOGAM BERAT DALAM SEDIMEN PERMUKAAN SUNGAI MUAR, JOHOR MALAYSIA

ABSTRAK

Sedimen permukaan merupakan petunjuk penting dalam menilai kadar pencemaran logam berat dalam system akuatik. Kajian ini bertujuan (1) menentukan dan menggambarkan kadar pencemaran logam berat (kromium (Cr), tembaga (Cu), zink (Zn), Plumbum (Pb), kadmium (Cd) and arsenik (As)) dalam sedimen permukaan dari Sungai Muar. Ini adalah kerana, Sungai Muar dikelilingi dengan pembangunan activiti anthropogenik seperti activiti memancing, perindustrian, pertanian dan akuakultur yang mempunyai kecendurungan tinggi untuk mengalirkan logam berat ke dalam sungai dan muara sungai; (2) menilai hubungan antara saiz butiran sedimen dan kepekatan logam berat dalam sedimen permukaan Sungai Muar. Oleh itu, pengagihan, korelasi dan status pencemaran logam berat dalam 40 sampel sedimen permukaan yang diambil menggunakan grab Ponar dianalisa menggunakan ICP-MS selepas dihadamkan menggunakan kaedah bom telfon. Keputusan yang diperolehi digambarkan dengan perisian ArcGis 10.0. Purata kepekatan yang diperolehi masing-masing adalah 71.9 μg/g *dw* (Cr), 20 μg/g *dw* (Cu), 238.83 μg/g *dw* (Zn), 289.57 μg/g *dw* (Pb), 5.47 μg/g *dw* (Cd) dan 30.86 μg/g *dw* (As) dimana kesemua purata kepekatan adalah lebih tinggi daripada nilai Kerak Benua Teratas (UCC). Selain itu, status pencemaran yang dikira menggunakan 'Enrichment factor (EF), Geo-accumulation index (I-geo) and Pollution load index (PLI)' menyimpulkan bahawa Sungai Muar tercemar dengan logam berat terutamanya logam berat cadmium (Cd). Sungai Muar mempamerkan sedimen berlumpur halus yang mempunyai hubungan negatif dengan kepekatan logam berat membuktikan bahawa logam berat tidak berlaku secara semula jadi tapi kerana factor

anthopogenik. Secara kesimpulannya, Sungai Muar lebih dipengaruhi oleh factor antropogenik dari kemasukkan semula jadi.