

**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 with 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 merguensis*, 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 merguensis* 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 memastikan 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 merguensis* analisa menunjukkan zink mempunyai kandungan yang lebih tinggi diikuti Kuprum, Kromium, Plumbum dan Kadmium. Akumulasi Kuprum dan Zink dalam kepala udang spesis *Penaeus Merguensis* adalah lebih tinggi berbanding dalam kulit dan isi udang. Namun kandungan adalah dibawah had yang ditetapkan oleh *FAO*.

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TABLE OF CONTENTS

ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	viii
LIST OF TABLES	x
LIST OF ABBREVIATIONS	xii
CHAPTER 1: INTRODUCTION	
1.0 Mangrove	2
1.1 Matang Mangrove Forest Reserve	3
1.2 Importance of Mangrove to Prawns	5
1.3 Cockles Production in Matang Mangrove Forest	6
1.4 Heavy Metals	7
1.5 Metals speciation and Toxicity	9
1.5.1 Copper (Cu)	9
1.5.2 Zinc (Zn)	10
1.5.3 Cadmium (Cd)	11
1.5.4 Chromium (Cr)	12
1.5.5 Lead (Pb)	14
1.6 Reasearch Objectives	15

CHAPTER 2: LITERATURE REVIEW

2.1	Heavy metals in water	17
2.2	Heavy metals in sediments	19
2.3	Heavy metals in aquatic organisms	23
2.4	Distribution pattern of heavy metals in tissues and organs	25
2.5	Distribution pattern of heavy metals in difference depth of sediment cores	27

CHAPTER 3: MATERIALS AND METHODS

3.0	Introduction	31
3.1	Study area	31
3.2	Sampling methodology	33
3.2.1	Water collection	34
3.2.2	Sediment collection	34
3.2.3	Aquatic organisms collection	35
3.3	Chemicals and Reagent	37
3.4	Glasswares	37
3.5	Standard Reference Material	38
3.6	Preparation of calibration standard	38
3.7	Sample Preparation	39
3.7.1	Water samples	39
3.7.2	Sediment samples	39
3.7.3	Tissue samples	40
3.8	Apparatus	41
3.8.1	Atomic Absorption Spectrometry	41
3.8.2	Inductive Coupled Plasma Mass Spectrometry	42
3.8.3	Microwave Digestion System	44

CHAPTER 4: RESULTS AND DISCUSSION	
4.0	Introduction 46
4.1	Physico-chemical Parameter Analysis 47
4.1.1	pH 48
4.1.2	Temperature 49
4.1.3	Dissolved Oxygen (DO) 51
4.1.4	Salinity 52
4.2	Analysis of Standard Reference Materials 53
4.3	Concentrations of Heavy Metals 56
4.3.1	Heavy metals in water 57
4.3.2	Heavy metals distribution in surface sediments 66
4.3.3	Heavy metals distribution in typical sediment profiles 73
4.3.4	Correlation coefficient analysis in sediment 81
4.4	Metals concentrations in different aquatic species 82
4.4.1	Heavy metals contents in various parts of prawns 84
4.4.2	Heavy metals content in cockles (<i>Anadara granosa</i>) species 87
4.4.3	Heavy metals contents in various organs of fishes 90
4.4.5	Correlation coefficient analysis in tissues of fish 95
CHAPTER 5: CONCLUSION	97
REFERENCES	99
LIST OF PUBLICATIONS	108
APPENDIX	109

LIST OF FIGURES

Figure 1.1	Matang Forest Reserve at the river-mouth of Sepetang River	5
Figure 3.1	Sampling Location P1-P8 in Matang Mangrove	33
Figure 3.2	Estuarine organisms caught in the Matang Mangrove Forest	35
Figure 3.3	Skin tissue of fish (<i>Scaptophagus argus</i>)	41
Figure 3.4	Dissection of fish (<i>Scaptophagus argus</i>)	41
Figure 3.5	Atomic Absorption Spectrometry image	42
Figure 3.6	Agilent ICP-MS Model 7500ce	43
Figure 3.7	CEM-MarsX digestion system	44
Figure 4.1	pH value from Larut River	49
Figure 4.2	pH value from Sangga Besar River	49
Figure 4.3	Surface water temperature from Larut River	50
Figure 4.4	Surface water temperature from Sangga Besar River	50
Figure 4.5	Dissolved oxygen level in Larut River	51
Figure 4.6	Dissolved oxygen level in Sangga Besar River	52
Figure 4.7	Salinity level in Larut River	53
Figure 4.8	Salinity level in Sangga Besar River	53
Figure 4.9	Heavy metal concentrations in water from Larut river	58
Figure 4.10	Heavy metal concentrations in water from Sangga Besar river	58
Figure 4.11	Concnetrations of Zn in water	61
Figure 4.12	Concentration of Cu in water	62
Figure 4.13	Concentration of Pb in water	63
Figure 4.14	Concentration of Cr in water	64

Figure 4.15	Concentration of Cd in water	65
Figure 4.16	Heavy metal concentration in surface sediments from Larut river	72
Figure 4.17	Heavy metal concentration in surface sediments from Sangga Besar river	72
Figure 4.18	Heavy Metals profiles at P1	74
Figure 4.19	Heavy Metals profiles at P2	74
Figure 4.20	Heavy Metals profiles at P3	76
Figure 4.21	Heavy Metals profiles at P4	76
Figure 4.22	Heavy Metals profiles at P5	79
Figure 4.23	Heavy Metals profiles at P6	79
Figure 4.24	Heavy Metals profiles at P7	80
Figure 4.25	Heavy Metals profiles at P8	80
Figure 4.26	Content of heavy metals in aquatic organisms from Larut river	83
Figure 4.27	Content of heavy metals in aquatic organisms from Sangga Besar river	83
Figure 4.28	The content of heavy metals in the prawn harvested from Larut river	86
Figure 4.29	The content of heavy metals in the prawn harvested from Sangga Besar River	86
Figure 4.30	Heavy metals content in various organs of fish (<i>Scaptophagus Argus</i>)	94

LIST OF TABLES

Table 3.1	Sampling locations in Matang Mangrove Forest	36
Table 3.2	Date of sampling carried out	37
Table 3.3	Flame atomic absorption spectrophotometer operating conditions	42
Table 3.4	ICP-MS operating conditions	43
Table 4.1	Results of <i>in-situ</i> water parameters	47
Table 4.2	Observed and certified values of elemental concentrations in standard reference material NIST- Estuarine sediment	55
Table 4.3	Observed and certified values of elemental concentrations in standard reference material NIST- tissue	55
Table 4.4	Observed and certified values of elemental concentrations in standard reference material BCR-Fluka- estuarine water	56
Table 4.5	Average concentrations of Heavy Metals in water ($\mu\text{g/l}$)	59
Table 4.6	Analysis of variance (ANOVA) of Cu, Zn, Cd, Cr and Pb concentrations in water in different sampling points	66
Table 4.7	Heavy Metal concentrations in surface sediments (mg kg^{-1})	68
Table 4.8	Heavy metal concentrations mg kg^{-1} dry weight in surface sediments reported in this and other studies.	71
Table 4.9	Concentrations of heavy metal in sediment profile from Larut River	75
Table 4.10	Concentrations of Heavy Metals in sediment Profiles from Sangga Besar River	78
Table 4.11	Pearson correlation coefficient matrix between heavy metals in	81

	sediment of Sepetang river at sites P1-P4	
Table 4.12	Pearson correlation coefficient matrix between heavy metals in sediment of Sangga Besar river at sites P5-P8	81
Table 4.13	Average content of Heavy Metals in tissue of prawns and cockles (mg kg ⁻¹ d.w)	83
Table 4.14	Mean concentrations and standard deviation in the muscle, shell and heads of prawn (mg kg ⁻¹ dw)	85
Table 4.15	Mean heavy metal concentrations in cockles from Matang Mangrove comparison with literature data	89
Table 4.16	Average content of heavy metals in fish (<i>Scaptophagus Argus</i>) obtained from Matang mangrove with comparison to the Malaysian Food Act 1983 and Food Regulations 1985 Fourteen Schedule in mg/kg wet weight	94
Table 4.17	Linear correlation coefficient for heavy metals in skin	95
Table 4.18	Linear correlation coefficient for heavy metals in muscle	96
Table 4.19	Linear correlation coefficient for heavy metals in gills	96
Table 4.20	Linear correlation coefficient for heavy metals in liver	96

LIST OF ABBREVIATIONS

MWQS	Marine Water Quality Standards
SRM	Standard Reference Material
FAO	Food and Agriculture Organization
CRM	Certified Reference Material
DOE	Department of Environment
$\mu\text{g/g}$	Microgram per gram
$\mu\text{g/l}$	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