

**LEAD, COPPER AND ZINC CONTENTS OF *Neritina sp.*(GASTROPODA) IN
THE TERENGGANU RIVER ESTUARY**

**By
NUR SHUHADA BT. MUHAMAD TAJUDIN
UK10154**

**Research Report submitted in partial fulfillment of the requirement for the degree
of Bachelor of Science (Marine Science)**

**Department of Marine Science
Faculty of Maritime and Marine Science
UNIVERSITY MALAYSIA TERENGGANU
2007**

1100054369



**JABATAN SAINS MARIN
FAKULTI PENGAJIAN MARITIM DAN SAINS MARIN
UNIVERSITI MALAYSIA TERENGGANU**

**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini dimaklumkan dan disahkan bahawa laporan penyelidikan bertajuk: Lead, Copper and Zinc Contents of Estuarine *Neritina* sp. (Gastropoda) in The Terengganu River Estuary oleh Nur Shuhada Bt. Muhamad Tajudin, No. Matrik: UK 10154 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Samudera sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda (Sains Samudera), Fakulti Pengajian Maritim dan Sains Marin, Universiti Malaysia Terengganu.

Disahkan oleh:

.....

Penyelia Utama

Nama: Prof. Dr. Noor Azhar b. Shazili

Cop Rasmi:

PROF. DR. NOOR AZHAR MOHAMED SHAZILI
Director
Institute of Oceanography,
Universiti Malaysia Terengganu (UMT)
21030 Kuala Terengganu, Terengganu
MALAYSIA

Tarikh: 25/4/07

.....
Ketua Jabatan Sains Marin

Nama: Dr. Razak Bin Zakaria

Cop Rasmi:

DR. RAZAK ZAKARIYA
Ketua Jabatan Sains Marin
Fakulti Pengajian Maritim dan Sains Marin
Universiti Malaysia Terengganu
(UMT)

Tarikh: 2/1/08

ACKNOWLEDGEMENT

First of all, I would like to thank God for the guidance and blessing through out the project. I would also like to thank my supervisor, Prof. Dr. Noor Azhar for his precious guidance, advice and continuous support through out the completion of this project. I really appreciate him for giving me the chance to do this great research.

My gratitude also goes to my beloved mother, Pn. Noor Leila and my father, Mr. Muhamad Tajudin. They continuously giving me support and help. Thanks also to my little sister, Nur Afifah. My appreciation also goes to my beloved Ahmad Fithri who continuously giving me advises and supports. Thanks to him for being a good listener and be beside me although you are far. Not forgetting, Vikrant who always give me the guidance and support too.

Thanks also to my fellow course mate especially Fathimah, Nadia Fatin, Fadil and Masrul for their help. I also would like to thanks my room mate, Siti Waznah who helps me during the samplings and the lab work, until the completion of this thesis. I would also express my gratitude to my beloved housemate, Muna, Ah, Aimi, Erin. Thank you for the sharing and caring, it was a great memory to know you and have you guys.

Last but not least, the appreciation also goes to the lab assistant of Oceanography Laborotary, for allowing me to use the apparatus and instruments during my lab work.

This project will not be able to complete without the help of any above.

THANK YOU VERY MUCH

TABLE OF CONTENT

CONTENTS	PAGES
ACKNOWLEDGEMENT	ii
TABLE OF CONTENT	iii
LIST OF FIGURES	iv
LIST OF TABLE	v
LIST OF ABBREVIATION	vi
LIST OF APPENDICES	
1.0 INTRODUCTION	1
1.1 OBJECTIVES	4
2.0 LITERATURE REVIEW	
2.1 Heavy metals and its pollution	5
2.2 Individual nature of heavy metals	9
2.3 Bioindicator	11
2.4 Criteria for selecting good monitoring species	15
2.5 The use of marine mollusc as monitors	14
2.6 Concentration of heavy metals in the aquatic organisms	15
2.7 Concentrations in marine mollusc	17

3.0	METHODOLOGY	
3.1	Study area	19
3.2	Preparation of polyethylene bottles	19
3.3	Sampling method	20
3.4	Storage samples	22
3.5	Measuring size and weight	22
3.6	Extraction of tissues	22
3.7	Digestion	23
3.8	Blank correction factor	23
3.9	Recovery test	24
3.10	Statistic Analyzation	24
4.0	RESULTS	26
5.0	DISCUSSION	
5.1	<i>Neritina sp.</i> able to be applied as a bioindicator	50
5.2	Concentration of each heavy metal	
5.2.1	Concentrations of Zinc	52
5.2.2	Concentrations of Copper	54
5.3.3	Concentrations of Lead	55

6.0	CONCLUSION	57
	REFERENCES	59
	APPENDIXES	62

LIST OF FIGURES

FIGURE	2.1:	Recycle of heavy metals in marine ecosystem	8
FIGURE	2.2:	Classification of bioindicator	11
FIGURE	2.3:	Relationship between organisms and metals contamination	13
FIGURE	3.1:	Map of Study area, Terengganu Estuaries	21
FIGURE	3.2:	Flow chart of Methodology	25
FIGURE	4.1:	Min graph Concentration of Heavy Metals in <i>Neritina sp.</i> vs. all 10 stations	32
FIGURE	4.2:	Graph Concentration of Copper vs. size in 10 different stations	34
FIGURE	4.3:	Graph Concentration of Zinc vs. size in 10 different stations	38
FIGURE	4.4:	Graph concentration of Plumbum vs. size in 10 different stations	42
FIGURE	4.5:	Graph Concentrations of Heavy Metals in <i>Neritina sp.</i> vs. Size of <i>Neritina sp.</i> in 10 different Stations.	46

LIST OF TABLE

TABLE	3.1:	Coordinate for each sampling stations in the area of Terengganu Estuaries	20
TABLE	4.1:	Taxonomy of Mollusc <i>Neritina Sp.</i>	26
TABLE	4.2:	Concentrations of Lead, Copper and Zinc in <i>Neritina sp.</i> in 10 Station around Terengganu Estuaries	27
TABLE	4.3:	Recovery Test from Dogfish Liver Certificate Reference Material for Trace Metal (DOLT 2)	30
TABLE	4.4:	Water parameter of 10 Sampling Stations	47

LIST OF ABBREVIATION

Cd	Cadmium
Pb	Lead
Zn	Zinc
Cu	Copper
Mn	Manganese
Co	Cobalt
Cr	Chromium
Ni	Nickel
Al	Aluminium
g	gram
$\mu\text{g/g}$	microgram per gram
ppm	Parts per Million
AAS	Spectrophotometric Atomic Absorption
H_2O_2	Hydrogen Peroxide
HNO_3	Nitric Acid

LIST OF APPENDICES

Appendix	1	Kruskal Wallis Test for each heavy metals in each station.	70
Appendix	2	Regression Analysis for Lead	71
Appendix	3	Regression Analysis for Zinc	75
Appendix	4	Regression Analyses copper	79

ABSTRACT

By using gastropods as indicator, we can indicate level of lead, copper and zinc in their body tissues and determine the contamination of the heavy metals in the area of Terengganu Estuaries. The objectives of this work were to identify copper, zinc and lead accumulated in the tissue of organisms collected, to see the relation between sizes of mollusk with the concentrations of the heavy metals in the mollusk tissue and to make a comparison between concentrations of heavy metals in a mollusk tissue in each different station. There are ten different sampling locations around Kuala Terengganu Estuaries. Gastropods of *Neritina sp.* were randomly collected for this purpose. Concentration of lead, copper and zinc were analyzed by using flame atomic absorption spectrophotometer (AAS) model Varian 220 FS. *Neritina sp.* accumulates zinc the most in their tissues compared to other heavy metals. The concentration are around 97.8 $\mu\text{g/g}$ – 179.0 $\mu\text{g/g}$. the highest concentrations of zinc is in Station 9 which is around 179.0 $\mu\text{g/g}$. The second highest concentration of heavy metals is Copper. The concentration is around 20.2 $\mu\text{g/g}$ - 94.3 $\mu\text{g/g}$. The highest concentration is identified in Station 2. Station 2 is around Pasar Payang area which is 94.3 $\mu\text{g/g}$. The lowest concentration of copper is in Station 10 which is around 20.2 $\mu\text{g/g}$. Lead also had been analyzed in the tissues of the gastropods collected. The concentrations are around 17.9 $\mu\text{g/g}$ – 42.2 $\mu\text{g/g}$. The highest concentration is in Station 5, near maritime boat area. From Kruskal-Wallis Test, there are significance ($p < 0.05$) between stations for lead, copper and zinc. These show that there is pollution and contamination occurs. There are also differences of concentration in different size of organism. Positive regression shows in lead explain the concentration increasing with sizes while for copper and zinc is in the other way.

ABSTRAK

Gastropod boleh digunakan sebagai penunjuk biologi untuk menentukan kandungan Plumbum, Zink dan Kuprum yang mencemarkan kawasan Muara Sungai Terengganu. Objektif kajian ini dilakukan adalah untuk mengkaji tahap kandungan Plumbum, Kuprum dan Zinc yang terkandung di dalam tisu gastropod, untuk mengkaji hubungan saiz dan kepekatan logam berat dalam tisu gastropods dan membuat perbandingan tahap kepekatan logam berat di setiap stesen kajian. Terdapat sepuluh stesen kajian di sepanjang Muara Sungai Terengganu. Gastropods dari jenis *Neritina sp.* di kutip bagi tujuan ini. Kandungan logam berat ini ditentukan dengan menggunakan Atomic Absorption Spectrophotometer (AAS) model Varian 220 FS. daripada kajian yang dilakukan *Neritina sp.* mengakumulasikan logam Zink pada tahap yang paling tinggi berbanding logam-logam yang lain. Kandungannya adalah 97.8 μ g/g – 179.0 μ g/g. Kandungan Zink tertinggi adalah di Stesen 9. Kandungan logam berat yang kedua tertinggi adalah Kuprum. Kandungannya, sekitar 20.2 μ g/g - 94.3 μ g/g. Kandungan Kuprum tertinggi adalah di Stesen 2 dan yang terendah adalah di Stesen 10. Analisa logam Plumbum juga dijalankan dan menunjukkan ianya mempunyai kepekatan yang lebih rendah berbanding logam lain iaitu sekitar 17.9 μ g/g – 42.2 μ g/g. Kepekatan yang tertinggi dicatatkan di Stesen 5. Daripada ujian Kruskal Wallis, terdapat perbezaan beerti ($p < 0.05$) di antara kesemua stesen dan kesemua logam berat. Ini menunjukkan, berlaku pencemaran dan kontaminasi di sekitar Muara Sungai Terengganu. Terdapat juga pebezaan di antara kepekatan logam berat dengan saiz daripada kajian yang telah dijalankan. Hubungan regresi yang positif ditunjukkan di dalam akumulasi logam Plumbum manakala hubungan regresi yang negative ditunjukkan di dalam akumulasi bagi logam Zink dan Kuprum.