

HEAVY METAL ACCUMULATION (Cu AND Pb) FROM
ARTIFICIALLY CONTAMINATED SEDIMENT BY A MARINE
BIVALVE *GELOINA* sp.

NARESH KUMAR S/O APPADURAI

FACULTY OF APPLIED SCIENCE AND TECHNOLOGY
UNIVERSITI PUTRA MALAYSIA TERENGGANU
TERENGGANU

1998

01:12

L 9

1100024080 PERPUSTAKAAN UNIVERSITI PUTRA MALAYSIA TERENGGANU

LP 23 FSGT 1 1998



1100024080

Heavy metal accumulation (Cu and Pb) fromn artificially contaminated sediment by a Marine / Naresh Kumar s/o Appadurai.

PERP

PERPUSTAKAAN
KOLEJ UNIVERSITI SAINS & TEKNOLOGI MALAYSIA
21030 KUALA TERENGGANU

1100024080

1100024080		

Lihat sebelah

HAK MILIK
PERPUSTAKAAN KUSTEM

LP
23
FSGT
1
1998

HEAVY METAL ACCUMULATION (Cu AND Pb) FROM
ARTIFICIALLY CONTAMINATED SEDIMENT BY A MARINE
BIVALVE *GELOINA* sp.

BY

NARESH KUMAR S/O APPADURAI

This project report is submitted in partial fulfillment of
the requirements for the Degree of
Bachelor of Fisheries Science

Faculty of Applied Science and Technology
UNIVERSITI PUTRA MALAYSIA TERENGGANU

1998

1100024089

ACKNOWLEDGEMENT

First and foremost, I would like to extend my greatest appreciation to my supervisor, Assoc. Prof. Dr. Noor Azhar Mohd. Shazili for his untiring assistance, invaluable guidance and endless support throughout my final year project.

I would like to extend my deepest gratitude and love to my mom, dad and sis who have shared my joys and sorrows, sacrificed their undying efforts and moral support over the years.

Last but not forgotten , I sincerely thank my friends Khushwant, Hafiz and the rest of the wonderful souls who have contributed in one way or another to the completion of my project and also who made my exploits in University Putra Malaysia a pleasant one which I will cherish the rest of my life.

Naresh Kumar s/o Appadurai

37935

B.Fisheries Sc.

Universiti Putra Malaysia Terengganu

"CONSISTENCY IS VICTORY"

Abstract

In this experiment, the bivalve clams *Geloina* sp. were subjected to the standard 28 day bioaccumulation and 14 day depuration study in artificially contaminated sediment. The clams were put into tanks with copper and lead contaminated sediments with initial concentration series of 0.5 $\mu\text{g/g}$ Cu : below detection limit (Pb); 14.50 $\mu\text{g/g}$ Cu : 6.50 $\mu\text{g/g}$ Pb; 16.00 $\mu\text{g/g}$ Cu : 19.00 $\mu\text{g/g}$ Pb; 16.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb; 22.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb and 168.50 $\mu\text{g/g}$ Cu : 172.00 $\mu\text{g/g}$ Pb. The range of Cu and Pb levels in sediment were 0.5 $\mu\text{g/g}$ - 243.00 $\mu\text{g/g}$ dry weight Cu and below detection - 172 $\mu\text{g/g}$ dry weight Pb respectively. Water quality and other physical parameters were maintained during the study. Copper and lead content in the overlying water, in the sediment and in the clam tissue were determined weekly. Percentage of organic carbon and grain size was determined. Specific Growth Rate (SGR) was determined simultaneously with the metal accumulation in clams to determine effects of metals accumulated to growth. Percentage of organic carbon in the sediment was $2.60\% \pm 0.05$. The results show that mortalities did not exceed 25% while Cu and Pb content in overlying water ranged from below detection limit - 0.7mg/L; below detection limit - 0.04 mg/L respectively. Cu concentration in clam tissue ranged from below detection limit to 246.587 $\mu\text{g/g}$ Cu dry weight while lead content in clam tissue ranged from 0.305 $\mu\text{g/g}$ to 15.394 $\mu\text{g/g}$ Pb dry weight. Generally average SGR values showed positive results up to the 16.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb exposure tank but the values were negative in the 22.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb and 168.50 $\mu\text{g/g}$ Cu : 172.00 $\mu\text{g/g}$ Pb exposure tanks. This study also shows that Cu is readily accumulated in *Geloina* sp. from artificially Cu-enriched sediment but the same cannot be said about lead and also it shows that growth was

affected in initial sediment metal concentrations of 22.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb and 168.50 $\mu\text{g/g}$ Cu : 172.00 $\mu\text{g/g}$ Pb.

Abstrak

Kajian bioakumulasi dan depurasi telah dijalankan kepada lokan bivalvia *Geloina* sp. dalam sedimen yang dicemarkan secara buatan dengan logam kuprum dan logam plumbum. Lokan-lokan tersebut diletakkan dalam 6 tangki berkepekatan awal 0.5 µg/g Cu : dibawah had kesan (Pb); 14.50 µg/g Cu : 6.50 µg/g Pb; 16.00 µg/g Cu : 19.00 µg/g Pb; 16.00 µg/g Cu : 16.00 µg/g Pb; 22.00 µg/g Cu : 16.00 µg/g Pb and 168.50 µg/g Cu : 172.00 µg/g Pb masing-masing. Kepekatan logam Cu dan Pb dalam sedimen adalah berjulat 0.5 µg/g - 243.00 µg/g berat kering Cu dan dibawah had kesan - 172 µg/g berat kering Pb masing-masing. Kualiti air dan parameter fizikal yang lain dikekalkan sepanjang kajian. Kandungan Cu dan Pb dalam air, sedimen dan tisu lokan ditentukan setiap minggu. Peratus kandungan karbon organik dan saiz partikel juga ditentukan. Specific Growth Rate (SGR) ditentukan pada masa yang sama dengan kajian bioakumulasi logam untuk mengkaji kesan akumulasi logam terhadap tumbesaran lokan. Peratus karbon organik dalam sedimen adalah berjulat 2.60% ± 0.05. Keputusan menunjukkan kadar kematian tidak melebihi 25 % sementara kandungan Cu dan Pb dalam air pula berjulat dari bawah had kesan - 0.7 mg/l; bawah had kesan - 0.04 mg/l masing-masing. Kandungan logam Cu dalam tisu lokan pula berjulat dari bawah had kesan sehingga 246.587 µg/g Cu berat kering sementara julat logam Pb dalam tisu lokan adalah 0.305 µg/g hingga 15.394 µg/g Pb berat kering. Secara keseluruhan nilai purata SGR menunjukkan nilai positif sehingga tangki pendedahan 16.00 µg/g Cu : 16.00 µg/g Pb tetapi dalam 2 tangki seterusnya iaitu tangki berkepekatan awal 22.00 µg/g Cu : 16.00 µg/g Pb dan 168.50 µg/g Cu : 172.00 µg/g Pb nilai purata SGR menunjukkan nilai negatif. Kajian ini juga menunjukkan bahawa logam Cu sedia diakumulasi oleh *Geloina* sp. dalam sedimen buatan yang kaya dengan logam Cu tetapi perkara yang sama tidak berlaku

kepada logam Pb. Kajian ini juga menunjukkan terdapat kesan terhadap tumbesaran dalam sedimen berkepekatan awal 22.00 $\mu\text{g/g}$ Cu : 16.00 $\mu\text{g/g}$ Pb dan 168.50 $\mu\text{g/g}$ Cu : 172.00 $\mu\text{g/g}$ Pb.

CONTENTS

ABSTRACT

PREFACE

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

LIST OF SYMBOLS

CHAPTER I INTRODUCTION

1.1 Background

CHAPTER II LITERATURE REVIEW

2.1 ANALYTICAL APPROACH

2.2 Location of study

2.3 Sampling

2.4 Preparation of equipment

2.5 Pre-experimental activities

2.6.1 Acidification of metals, sediments and water samples

2.6.2 Spilling of sediments

2.7 Experimental methods and equipment

2.8.1 Dissolved metal assay

2.8.2 Ground and metal filter assay

2.9 Chemical analysis

2.9.1 Graphical analysis

2.9.2 Tabular data method

2.9.3 Ground Pb concentration analysis by gravimetry