



**UNIVERSITI PUTRA MALAYSIA**

**MACROBENTHOS AND WATER QUALITY OF  
LANGAT RIVER SYSTEM, MALAYSIA**

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**MACROBENTHOS AND WATER QUALITY OF LANGAT RIVER SYSTEM,  
MALAYSIA**

By

**AZRINA BINTI MOHAMED ZAWAWI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in  
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*Khas buat keluarga tersayang.....*

*Semoga kita semua akan sentiasa dilimpahi  
rahmat oleh ALLAH S.W.T*

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirements for the degree of Master of Science

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**November 2002**

**Chairman: Dr. Abdul Rahim Ismail**

**Faculty: Science and Environmental Studies**

A study on macrobenthos and water quality of Langat River system was conducted at 12 sampling stations in Langat River and its tributaries, Semenyih River, Chongkak River and Lopo River. Samples were collected every month from March 1998 to February 1999 except for September 1998 and December 1998. Ten taxa of macrobenthos with 64 species were identified. Ephemeroptera and Diptera were dominant at the upstream area of Langat River system while Oligochaeta was dominant at the downstream area. Oligochaeta had the highest percentage of mean density (98.89%) followed by Diptera (0.57%) and Ephemeroptera (0.34%). *Limnodrilus hoffmeisteri* from the order of Oligochaeta had recorded the highest mean density about

*hoffmeisteri* from the class of Oligochaeta had recorded the highest mean density about 1899673.34 ind/m<sup>2</sup> (80%) and it was dominant at all the polluted stations in the downstream of Langat River. This species can be used as the bioindicator of the polluted water bodies in Malaysia.

Twenty one physicochemical factors, which influenced the density of macrobenthos were analyzed. According to the analysis, there were some other pollutants beside the climate such as the effluent from industries, poultry farms and the surface run off, which influenced the changes of monthly physicochemical factor value.

Based on the correlation analysis, factors such as the width of the river, temperature, dissolved oxygen, orthophosphate, nitrate, ammonium and total suspended solids showed a strong significant correlation with the distribution and density for macrobenthos. Based on the water quality index analyses for the whole sampling period between March 1998 and February 1999, the water quality index for Langat River System was recorded in a range of 45 to 60 which is classified as very polluted. Water quality analysis for each sampling stations throughout the sampling periods illustrated that Stations 1, 2, 3, 4, 9, 10, 11 and 12 had a water quality index below 60, indicating that they were very polluted while Stations 5, 6, 7 and 8 were slightly polluted with water quality index in a range of 61 to 73.

Abstrak tesis yang dikemukakan kepada senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains.

**MAKROBENTOS DAN KUALITI AIR BAGI SISTEM SUNGAI LANGAT,  
MALAYSIA**

Oleh

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**November 2002**

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Kajian terhadap makrobentos dan kualiti air bagi Sistem Sungai Langat telah dijalankan di 12 buah stesen pensampelan di Sungai Langat dan juga cabang-cabangnya iaitu Sungai Semenyih, Sungai Chongkak dan Sungai Lopo. Pensampelan dijalankan setiap bulan dari bulan Mac 1998 hingga bulan Februari 1999 kecuali pada bulan September 1998 dan Disember 1998. Sebanyak 10 buah taksa bagi makrobentos telah dikenalpasti meliputi 64 bilangan spesies kesemuanya. Order Ephemeroptera dan Diptera mendominasi bahagian hulu Sungai Langat sementara Oligochaeta mendominasi kawasan hilir bagi sungai tersebut. Kepadatan bagi Oligochaeta mencatatkan jumlah tertinggi sebanyak 98.89% diikuti dengan kepadatan Order Diptera sebanyak 0.57%

mendominasi semua stesen yang tercemar di hilir sungai. Spesies ini boleh dijadikan sebagai bioindikator bagi sungai-sungai tercemar di Malaysia.

Secara keseluruhannya, sebanyak 21 parameter fizikokimia telah dianalisis dan didapati mempengaruhi kepadatan makrobentos. Berdasarkan analisis yang dijalankan, terdapat beberapa faktor luaran lain yang mempengaruhi faktor fizikokimia bulanan yang diuji selain dari faktor cuaca iaitu buangan sisa industri, ladang penternakan serta hakisan.

Dari analisis korelasi yang dijalankan, beberapa faktor fizikokimia seperti kelebaran sungai, suhu, konduktiviti, pH, oksigen terlarut, ortofosfat, nitrat, ammonia dan jumlah bahan terampai sangat mempengaruhi taburan dan kepadatan makrobentos. Berdasarkan analisis indeks kualiti air yang dijalankan pada setiap bulan pensampelan dari bulan Mac 1998 hingga bulan Februari 1999, kualiti air bagi Sistem Sungai Langat berada di dalam julat 45 hingga 60 dan diklasifikasikan sebagai sangat tercemar. Analisis indeks kualiti air mengikut stesen pensampelan mendapati Stesen 1, 2, 3, 4, 9, 10, 11 dan 12 berada di bawah 60 dan diklasifikasikan sebagai sangat tercemar sementara indeks kualiti air bagi Stesen 5, 6, 7 dan 8 menunjukkan keadaan sedikit tercemar dengan indeks kualiti air yang berada dalam julat 61 hingga 73.

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I certify that an Examination Committee met on 25<sup>th</sup> November 2002 to conduct the final examination of Azrina Binti Mohamed Zawawi on her Master of science thesis entitled “Macrobenthos and Water Quality of Langat River System, Malaysia“ in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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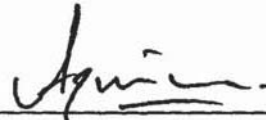
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## DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Putra Malaysia or other institutions.



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AZRINA BINTI MOHAMED ZAWAWI

Date: 24 December 2002

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**LIST OF ABBREVIATIONS**

AAS	= Atomic Absorption Spectrophotometer
APHA	= American Public Health Association
BMWP	= Biological Monitoring Working Party
BOD	= Biochemical Oxygen Demand
COD	= Chemical Oxygen Demand
Cu (s)	= Cuprum (Sediment)
Cu (w)	= Cuprum (Water)
DO	= Dissolved Oxygen
DOE	= Department of Environment
FAS	= Ferrous Ammonium Sulphate
H <sub>2</sub> SO <sub>4</sub>	= Acid Sulphuric
HCL	= Acid Hydrochloric
HClO <sub>4</sub>	= Acid Perchloric
HgI <sub>2</sub>	= Mercuric Iodide
HgSO <sub>4</sub>	= Mercuric Sulphate
HNO <sub>3</sub>	= Acid Nitric
K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	= Potassium Dichromate
KI	= Potassium Iodide
NaOH	= Natrium Hydroxide
NH <sub>4</sub> OH	= Ammonium Hydroxide
NO <sub>2</sub> -N	= Nitrite-Nitrogen
NO <sub>3</sub> -N	= Nitrate-Nitrogen



Org	= Organic Matter
Pb(s)	= Lead (Sediment)
PO <sub>4</sub> -P	= Orthophosphate
SE	= Standard Error
St.	= Station
TDS	= Total Dissolved Solids
TSS	= Total Suspended Solids
Zn (s)	= Zinc (Sediment)
Zn(w)	= Zinc (Water)