UNIVERSITI PUTRA MALAYSIA

# MACROBENTHOS AND WATER QUALITY OF LANGAT RIVER SYSTEM,MALAYSIA

AZRINA BINTI MOHAMED ZAWAWI

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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 Fulfillment of the Requirement for the Master of Science**

**2002**

*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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**AZRINA BINTI MOHAMED ZAWAWI**

**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/$m^2$ (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

**AZRINA BINTI MOHAMED ZAWAWI**

**November 2002**

**Pengerusi:** **Dr. Abdul Rahim Ismail**

**Fakulti:** **Sains dan Pengajian Alam sekitar**

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 terebut. 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, amnonia 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 25th 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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This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

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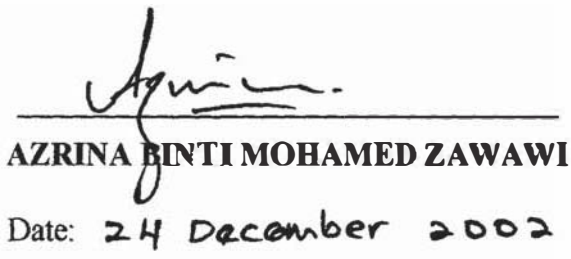
## DECLARATION

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.



**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

$H_2SO_4$ = Acid Sulphuric

HCL = Acid Hydrochloric

$HClO_4$ = Acid Perchloric

$HgI_2$ = Mercuric Iodide

$HgSO_4$ = Mercuric Sulphate

$HNO_3$ = Acid Nitric

$K_2Cr_2O_7$ = Potassium Dichromate

KI = Potassium Iodide

NaOH = Natrium Hydroxide

$NH_4OH$ = Ammonium Hydroxide

$NO_2$-N = Nitrite-Nitrogen

$NO_3$-N = Nitrate-Nitrogen

Org = Organic Matter

Pb(s) = Lead (Sediment)

$PO_4$-P = Orthophosphate

SE = Standard Error

St. = Station

TDS = Total Dissolved Solids

TSS = Total Suspended Solids

Zn (s) = Zinc (Sediment)

Zn(w) = Zinc (Water)