

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5708 SOUTH ELLIS AVENUE
CHICAGO, ILLINOIS 60637

RESEARCH ASSISTANT

APPLY TO: DR. J. K. STILLE
DEPARTMENT OF CHEMISTRY
5708 SOUTH ELLIS AVENUE
CHICAGO, ILLINOIS 60637



LP 9 FST 4 2006



1100042316

A spatial distribution of heavy metals during Pre-Monsoon season in Johor Coastal Waters, South China Sea / Malini d/o Balasubramaniam.

PERPUSTAKAAN
KOLEJ UNIVERSITI SAINS & TEKNOLOGI MALAYSIA
21030 KUALA TERENGGANU

1100042316		

Lihat sebelah

HAK MILIK
PERPUSTAKAAN KUSTEM

**A SPATIAL DISTRIBUTION OF HEAVY METALS DURING PRE –
MONSOON SEASON IN JOHOR COASTAL WATERS, SOUTH CHINA SEA.**

By

Malini D/O Balasubramaniam

**Research report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Science (Marine Sciences)**

**Department of Marine Sciences
Faculty of Science and Technology
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2005 / 2006**

1100042316

This project report should be cited as:

Malini, B. 2006. A Spatial Distribution of Heavy Metals During Pre – Monsoon Season in Coastal Johor Waters, South China Sea. Undergraduate Thesis, Bachelor of Science (Marine Science), Faculty of Science and Technology, Kolej Universiti Sains dan Teknologi Malaysia, Terengganu.104p.

No part of this project may be reproduced by any mechanical, photographic or electronic process, or in the form of photographic recording, nor may it be stored in a retrieval system, transmitted or otherwise copied for public or private use, without written permission from the author and the supervisor of the project.

ACKNOWLEDGEMENT

Firstly, I would like to thank God for enabling me to finish this thesis successfully without any complications. There are also many people who provided invaluable help to me in writing this report. I am especially indebted to Associate Prof. Dr. Kamaruzzaman Bin Yunus for his useful guidance and suggestions through out this whole project. Not forgetting Dr. Nor Antonina Abdullah for her advice and encouragement which has helped me a lot to fulfill my task.

I also would like to take this opportunity to convey my greatest gratitude to my parents and sisters for their full support. At the same time, my utmost thanks goes to all the research assistants including Hizam, Willison, Jamil, Ong and Karthik who did not hesitate to spend some of their precious time for me at any time. Without their support and help, I would not have reach to this extend.

My greatest thanks goes to all my course mates especially Elly, Hada, Sumitha, Ambika, Rani and Radha for lending a big hand in this project completion. Last but not least, my deepest appreciation goes to my housemates who had given their moral support and willingly helped me in finishing this thesis effectively.

ABSTRAK

Kajian ini telah dijalankan di kawasan perairan Johor sebelum musim monsun bermula. Kawasan kajian adalah seluas 7009 km². Ia melibatkan 48 stesen dari kawasan Pulau Pemanggil sehingga ke Tanjung Punggai. Pengumpulan sampel telah dilakukan dari tarikh 6 Oktober 2004 hingga ke 12 Oktober 2004. Tujuan kajian ini adalah untuk mengetahui ciri - ciri sedimen, kandungan karbon dan logam berat. Kemudian kaitan antara ketiga – tiga elemen ini ditentukan.

Secara keseluruhannya, ia menunjukkan sedimen di kawasan kajian kebanyakannya terdiri daripada butir – butir pasir yang halus dengan nilai sisihan piawai yang lemah. Kebanyakan stesen juga mempunyai nilai kepencongan positif yang menunjukkan kehadiran butir – butir halus yang lebih banyak. Kehadiran sedimen – sedimen halus mungkin boleh disebabkan oleh kemasukan sedimen dari sungai berhampiran atau tindakan semula jadi.

Julat kandungan karbon adalah di antara 0.29 % dan 2.65 %. Analisis logam berat pula dilakukan dengan menggunakan ICP-MS di mana kekekatannya adalah seperti 0.14 hingga 77.88 µg/g berat kering (Pb), 1.83 hingga 53.33 µg/g berat kering (Co), 0.85 hingga 91.87 µg/g berat kering (Cu), 1.27 hingga 5.12 µg/g berat kering (Fe), 158.08 hingga 966.33 µg/g berat kering (Mn) dan 4.83 hingga 205.21 µg/g berat kering (Zn).

Korelasi antara kandungan karbon dan saiz sedimen menunjukkan kaitan yang boleh diabaikan dengan nilai r 0.15. Di samping itu, korelasi di antara logam berat dan saiz

sedimen menunjukkan julat nilai r di antara 0.01 dan 0.22. Semua logam berat menunjukkan kaitan yang boleh diabaikan kecuali Pb yang menunjukkan kaitan yang lemah. Julat nilai r bagi korelasi di antara logam berat dan kandungan karbon adalah 0.02 hingga 0.23. Ia menunjukkan semua logam berat mempunyai kaitan yang boleh diabaikan kecuali Fe yang mempunyai kaitan yang lemah.

Faktor pengkayaan menunjukkan kesemua logam berat di kawasan kajian mempunyai pengaruh aktiviti manusia kecuali Cu. Zn menunjukkan nilai faktor pengkayaan yang tertinggi yang bermaksud pengkayaan sederhana. Bacaan indeks geoakumulasi pula membuktikan Fe berpunca secara semula jadi manakala Zn adalah logam berat yang boleh diklasifikasikan sebagai bahan pencemar utama. Ini mungkin disebabkan oleh aktiviti manusia seperti pengorekan pasir, pembuangan bahan buangan ke dalam laut atau daripada kawasan perindustrian.

Secara kesimpulannya, taburan logam berat di kawasan perairan Johor adalah dalam tahap terkawal kecuali bagi Zn. Namun begitu, tanpa tindakan tegas, situasi ini boleh bertambah buruk. Oleh itu, pemerhatian secara berterusan harus dilakukan terutamanya bagi Zn di kawasan Laut China Selatan.

ABSTRACT

A geochemical study was carried out in Johor coastal waters during the pre monsoon season. The study area consists of 48 stations altogether from the area of Pulau Pemanggil to Tanjung Punggai. The surface area of the research stations is 7009 km². Samples had been collected from 6th October 2004 to 12th October 2004. The purpose of the study is to determine the sediment characteristics, organic carbon content and heavy metal distribution. Later the correlation between these three elements is found out.

In summarize, it concludes that the sediments in Johor waters are dominated by fine sand with poor sorting. Most of the stations have very positively skewed sediments which prove there is an excess of finer grains. It showed most stations with extremely leptokurtic sediments. Finer sediments can be found in most of the stations. This might be due to sediment inputs from the nearby rivers or nature forces.

The range of organic carbon content is between 0.29 % and 2.65 %. Meanwhile the heavy metals ranged from 0.14 to 77.88 µg/g dry weights (Pb), 1.83 to 53.33 µg/g dry weights (Co), 0.85 to 91.87 µg/g dry weights (Cu), 1.27 to 5.12 µg/g dry weights (Fe), 158.08 to 966.33 µg/g dry weights (Mn) and 4.83 to 205.21 µg/g dry weights (Zn).

The correlation between organic carbon and particle size showed almost negligible relationship with the 0.15 r value. In the meantime, the correlation between heavy metals and particle size showed the range of r value is from 0.01 to 0.22. All the heavy metals have almost negligible relationship while only Pb has low correlation.

The range of r value is from 0.02 to 0.23 for correlation between heavy metals and organic carbon content. All the heavy metals have almost negligible relationship except Fe which showed low correlation.

The enrichment factor (EF) indicated that all the heavy metals have anthropogenic sources except for Cu while Zn has the highest EF value compared to other metals which showed moderate enrichment. Meanwhile, geoaccumulation index (I_{geo}) states that Fe has natural origin while Zn can be considered as the main pollutant. This might originate from human activities like sand mining, sea dumping or from the industrial wastes.

In conclusion, the heavy metals distribution in Johor coastal waters is in the secure stage except for Zn. Although the other metals do not show very high concentration, this situation will deteriorate if stern actions are not taken. As we can see, an annual monitoring should be done especially to monitor Zn distribution in the South China Sea.