KESAN SAIZ PARTIKEL KEATAS TABURAN LOGAM DALAM SEDIMEN DARI PERAIRAN PERSISIRAN PANTAI PAHANG PADA PRA MONSUN DAN PASCA MONSUN

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Tesis Dihantar bagi Memenuhi Keperluan untuk Ijazah Sarjana Sains di Institut Oseanografi dan Sekitaran
Universiti Malaysia Terengganu

JANUARI 2012

To My Beloved Father & Mother,

Late Bidai Anak Dingun

Nemia Zabala Abina

To My Beloved Brother and Sisters,

James Anak Bidai

Josephine Anak Bidai

Jessica Anak Bidai

Thank You for all the supports

Cheers..

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk Ijazah Master Sains.

KESAN SAIZ PARTIKEL KEATAS TABURAN LOGAM DALAM SEDIMEN DI PERAIRAN PERSISIRAN PANTAI PAHANG PADA PRA MONSUN DAN PASCA MONSUN

JOSEPH ANAK BIDAI

OKTOBER 2011

Pengerusi : **Prof. Noor Azhar bin Mohamed Shazili, PhD.**

Ahli : **Prof. Kamaruzzaman bin Yunus, PhD.**

Ahli : **Prof. Madya. Rosnan bin Yacoob, PhD.**

Institut : **Institut Oseanografi dan Sekitaran**

Sedimen dari kawasan perairan pantai Pahang telah dikaji kepekatan dan taburan logam bagi menentukan peranan saiz partikel sedimen dalam taburan logam. Kesan monsun timur laut keatas taburan logam juga telah ditentukan melalui analisis sedimen yang diperolehi pra- dan pasca-monsun.

Analisa saiz partikel menunjukkan butiran sedimen di kawasan kajian menjurus kepada sederhana sempurna (purata 0.94±0.22) bagi sampel pra monsun dan tidak sempurna (purata 1.01±0.21) bagi sampel pasca monsun. Penyisihan butiran sedimen ini

disebabkan oleh kelajuan dan perubahan arus serta kemasukan sedimen dari air sungai ke laut. Kawasan kajian didapati banyak dipengaruhi oleh sungai-sungai yang ada di negeri Pahang yang mempunyai dua sungai utama iaitu Sungai Pahang dan Sungai Kuantan. Ujian kepencongan membuktikan sedimen di kawasan kajian adalah jenis berpasir halus. Sampel pra monsun menunjukkan nilai kepencongan -0.46±0.83 manakala sampel pasca monsun dengan nilai kepencongan -0.60±0.71. Sedimen pasca monsun didapati mempunyai saiz partikel sedimen yang lebih halus daripada sampel pra monsun. Kemasukan sedimen baru mempengaruhi saiz sedimen pasca monsun dengan lebih banyak air disebabkan oleh lebih banyak hujan di negeri Pahang dan seterusnya mengalir ke laut dan membawa partikel-partikel sedimen.

Perhubungan logam dengan kandungan karbon organik adalah lemah bagi purata keseluruhan sampel pra dan pasca monsun kecuali Ba ($p<0.05$) bagi sedimen pasca monsun dan Pb ($p<0.05$) bagi sedimen pra monsun.

Kepekatan logam di pengaruhi oleh saiz partikel sedimen dengan menunjukkan nilai kepekatan semakin berkurangan apabila saiz partikel sampel semakin besar. Nilai-nilai kepekatan yang tinggi kebanyakkannya diperolehi daripada saiz sedimen 40μm, 63μm dan 90μm manakala kebanyakkan kepekatan yang rendah diperolehi daripada saiz sedimen 125μm, 250μm dan 500μm. Walaubagaimanapun terdapat beberapa nilai kepekatan tinggi logam Mg yang tidak mengikuti corak ini dengan nilai 2.04 % Mg dikaitkan dengan saiz partikel 250 um bagi sampel pra monsun. Kepekatan logam keseluruhannya adalah lebih tinggi dalam sedimen pra monsun berbanding sedimen

pasca monsun. Ini menunjukkan monsun memberikan impak yang ketara kepada taburan logam di perairan Pahang.

Analisa penormalan terhadap logam menjurus kepada rumusan bahawa sumber logam yang dikaji adalah daripada sumber semulajadi kecuali logam Pb kerana nilai kepekatannya melebihi nilai kepekatan kerak bumi 13 mg/kg. Kepekatan Pb antara 18.23 mg/kg hingga 57.03 mg/kg memberikan nilai indeks geoakumulasi diantara -0.74 hingga 1.12 menunjukkan tahap 'tiada pencemaran' hingga ke 'sedikit tercemar'.

Kajian ini mendapati kepekatan logam berat meningkat semakin kecil saiz partikel sedimen. Pengaruh monsun timur laut adalah ketara didalam mengalirkan sedimen baru dari sungai ke laut serta menyebarkan sedimen didasar kaut. Terdapat perbezaan kandungan logam dalam sedimen yang dikaji diantara kedua- dua musin monsun, tetapi hanya logam Pb didapati sedikit dipengaruhi oleh kemasukan antropogenik.

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfilment of the requirement for the degree of Master of Science.

EFFECT OF PARTICLE SIZE ON METAL DISTRIBUTION IN SEDIMEN FROM PAHANG COASTAL WATERS DURING THE PRE-MONSOON AND POST-MONSOON PERIODS

JOSEPH ANAK BIDAI

OCTOBER 2011

Chairperson : Prof. Noor Azhar bin Mohamed Shazili, PhD.

Member : Prof. Kammaruzzaman bin Yunus, PhD.

Member : Prof. Madya. Rosnan bin Yacoob, PhD.

Institute : Institute of Oceanography and Environment

The concentration and distribution of metals in sediments off the coast of Pahang were studied with the objective of determining the role of sediment particle size in metal distribution. The effects of the northeast monsoon on metal distribution was also determined by analysis of data obtained before and after the monsoon.

Particle size analysis showed that the sediment in the study area on average was moderately sorted (0.94+_0.22) for pre northeast monsoon samples and poorly sorted (1.01+_0.21) for post monsoon samples. Sediment particle sorting values indicated the

important influence of current velocity and its changes on sediment input from rivers to the sea. The average of skewness value for pre- monsoon sediment was -0.46+_0.83 while for the post- monsoon sediment was -0.60+_0.71. Post monsoon sediment consisted of finer particle size compared to post- monsoon samples. The input of fresh sediment via riverine flow during the northeast monsoon is thought to influence the post- monsoon sediment size.

Metal correlations with organic content is weak for pre- and post- monsoon sediments except for Ba ($p<0.05$) for post- monsoon sediment and Pb ($p<0.05$) for pre-monsoon sediment.

Metal concentrations is influenced by sediment particle size with metal concentrations decreasing with increase in particle size. High concentrations were mostly found in sediment particle sizes of 40, 63 and 90 um whereas lower concentrations were associated with sediment sizes of 125, 250 and 500 um. However high concentrations of Mg did not follow this trend with highest concentrations of 2.04% Mg being associated with 250 um particle size in pre- monsoon sediment. Metal concentrations were overall higher in pre-monsoon sediments than in post-monsoon sediments. This shows that the monsoon has a large impact on metal distribution in Pahang waters.

From the normalization analysis of metals it can be concluded that the metals are of natural origin except for Pb where some anthropogenic influence was noted. Enrichment factors were calculated only for Pb as the concentration values were higher

than the earth crust concentration of 13 mg/kg. The concentration of Pb of 18.23 to 57.03 mg/kg gave geoaccumulation index values of -0.74 to 1.12 , indicating " no contamination" to "slight contamination".

This study shows that heavy metal concentrations increases with decreasing sediment particle size. The northeast monsoon has a major influence in input of fresh sediment from rivers to the sea as well as in redistributing the bottom sediment. There was a difference in sediment metal content between the two monsoon seasons but anthropogenic impact was found only for Pb.