HOLOTHURIA SPECIES AS INDICATORS OF HEAVY METALS POLLUTION IN PULAU BIDONG, TERENGGANU

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By

Chan Shue Fen

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FINAL YEAR PROJECT REPORT VERIFICATION

PENGAKUAN DAN PENGESAHAN LAPORAN

It is hereby declared and verified that this project report titled **HOLOTHURIA SPECIES AS INDICATORS OF HEAVY METALS POLLUTION IN PULAU BIDONG, TERENGGANU** by **CHAN SHUE FEN, UK 30706** have been examined and all errors identified have been corrected. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **Bachelor of Science (Marine Science** from School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

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DECLARATION

It is hereby declared and verified that this project report titled **HOLOTHURIA SPECIES AS INDICATORS OF HEAVY METALS POLLUTION IN PULAU BIDONG, TERENGGANU** by **CHAN SHUE FEN, UK 30706** have been examined and all errors identified have been corrected. This report is submitted to the School of Marine and Environmental Sciences as partial fulfillment towards obtaining the **Bachelor of Science (Marine Science)** from School of Marine and Environmental Sciences, Universiti Malaysia Terengganu.

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LIST OF ABBREVIATIONS

nm	-	nautical miles
°C	-	degree Celcius
g	-	gram
mL	-	mililitre
HNO_3	-	nitric acid
HCl	-	hydrochloric acid
HF	-	hydrofluoric acid
ICP-OES	-	Inductively-coupled Plasma Optical Emission Spectrometer
ICP-MS	-	Inductively-coupled Plasma Mass Spectrometer
BAF	-	Bioaccumulation factor
µg/g	-	microgram per gram
Zn	-	zinc
Fe	-	iron
K	-	potassium
Mg	-	magnesium
Pb	-	lead
Cd	-	Cadmium
Co	-	Cobalt
Al	-	Aluminium
Std Dev	-	standard deviation

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ABSTRACT

This study aims at determining the heavy metals concentration and bioaccumulation factor (BAF) in *Holothuria* species in Pulau Bidong, Terengganu. Concentration of selected heavy metals (Zn, Fe, K, Mg, Pb, Cd, Co and Al) were analyzed in body wall, longitudinal muscle, respiratory tree, and digestive tract of *Holothuria* species in Pulau Bidong by using ICP-OES after the samples were digested with Microwave Digestion machine with 1.5 mL of nitric acid. The heavy metals concentration are significantly different ($p < 0.05$) between body parts of *Holothuria*. K and Mg were the two highest metals with the concentration level of K was 5097.57 µg/g in body wall, 4333.04 µg/g in longitudinal muscle, 329.76 µg/g in respiratory tree and 5672.95 µg/g in digestive tract while concentration of Mg was 7858.32 µg/g in body wall, 6248.71 µg/g in longitudinal muscle, 7012.86 µg/g in respiratory tree and 9256.27 µg/g in digestive tract. Concentration of Pb was five times higher than the permissible levels of Malaysian Food Regulation while Cd was 2.4 times higher than permissible levels in world scale. Bioaccumulation factor of *Holothuria* species indicated *Holothuria* species is macroconcentrator with the values of bioaccumulation factor is higher than 2 in all four body parts. This indicates *Holothuria* species is suitable for biomonitoring of its environment. K and Mg are essential elements that require for daily biological processes of *Holothuria* which explains the high concentration of both elements in *Holothuria* species.

SPESIS *HOLOTHURIA* SEBAGAI BIOINDIKATOR KEPADA POLUSI LOGAM BERAT DI PULAU BIDONG, TERENGGANU

ABSTRAK

Kajian ini bertujuan untuk menentukan kepekatan logam berat dan faktor bioakumulasi (BAF) dalam spesis *Holothuria* di Pulau Bidong, Terengganu. Kepekatan logam berat yang dipilih (Zn, Fe, K, Mg, Pb, Cd, Co dan Al) yang terdapat dalam dinding badan, otot membujur, pokok pernafasan dan saluran penghadaman spesis *Holothuria* yang didapati di Pulau Bidong telah dianalis menggunakan ICP-OES setelah dihadam dengan 1.5 mL asid nitric di mesin Microwave Digestion. Kepekatan logam berat menunjukkan perbezaan yg ketara ($p < 0.05$) antara keempat-empat bahagian badan *Holothuria*. Kepekatan K dan Mg merupakan kepekatan yang tertinggi yang dijumpai dalam keempat-empat bahagian badan *Holothuria* di mana kepekatan K dalam dinding badan ialah 5097.57 μg/g, dalam otot membujur ialah 4333.04 μg/g, dalam pokok pernafasan ialah 329.76 μg/g dan dalam saluran penghadaman ialah 5672.95 μg/g manakala kepekatan Mg dalam keempat-empat organ dalaman ialah 7858.32 μg/g dalam dinding badan, 6248.71 μg/ dalam otot membujur, 7012.86 μg/g dalam pokok pernafasan and 9256.27 μg/g dalam saluran penghadaman. Kepekatan Pb merupakan lima kali ganda lagi tinggi dari tahap yang dibenarkan di Malaysia manakala kepekatan Cd ialah 2.4 kali ganda tinggi dari tahap yang dibenarkan mengikut piawaian antarabangsa. Nilai BAF spesis *Holothutria* yang tinggi dari nilai 2 dalam semua bahagian badan menunjukkan *Holothuria* ialah makrokonsentrator yang sesuai digunakan untuk pemantauan biologi persekitaran. K dan Mg ialah elemen-elemen penting yang diperlukan dalam proses biologi harian *Holothuria*. Kepentingan K dan Mg dalam proses biologi menjelaskan sebab kepekatan K dan Mg yang ditemui di dalam spesis *Holothuria*.