

HEAVY METALS (CADMIUM (Cd), LEAD (Pb), COPPER (Cu), ZINC (Zn) AND
MANGANESE (Mn)) IN ROCKY SHORE ORGANISMS FROM THE COAST OF
TERENGGANU

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TERENGGANU**

By

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LIST OF ABBREVIATIONS

SYMBOL	MEANING
mg	miligram
µg	microgram
mL	mililiter
ppm	part per million
ppb	part per billion
°C	degree Celsius
B.C	before century
%	percentage
v/v	volume per volume
Pb	Lead
Cd	Cadmium
Cu	Copper
Mn	Manganese
Zn	Zinc
HNO ₃	Nitric acid
NaOH	Sodium hydroxide
MIBK	Metyl isobutyl ketone
APDC	Ammonium pyrolidine dithiocarbamate
ANOVA	Analysis of variance

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ABSTRACT

Four types of bioindicators sample obtained from seven stations of rocky shore areas along east coast in the Terengganu State of Malaysia were used to review the status of aquatic environment with respect to heavy metals. The objectives of this study were to determine the distribution and level of heavy metals in the soft tissues of rocky shore organisms, to study the relationship between size of organisms and metals content, and to study the relationship between sampling stations and metals content. The soft tissues of rock oysters (*Saccostrea* sp.), *Thais* sp., limpets, and barnacles were analyzed for the content of cadmium (Cd), lead (Pb), copper (Cu), zinc (Zn), and manganese (Mn) using inductive coupled plasma mass spectrometer (ICP-MS). For size and metals content relationship, bioindicators except rock oysters were selected and vice versa for determining relationship between location of organisms and metals content. Zn was accumulated the most in all bioindicators and barnacles dominated the highest Zn concentration ($1200.78 \pm 25.11 \mu\text{g/g}$). Significant different ($p < 0.05$) using ANOVA one-way for size and metals relationship occurred in all three bioindicators with Zn in *Thais* sp., Cd in limpets, and all metals in barnacles. Relationship between sampling stations and metals content produced no significant different ($p < 0.05$). Metals content in rock oysters were below permissible limit while Cd, Pb, and Zn in *Thais* sp. and barnacles exceeding the permissible limit established by Malaysian Food Act 1983.

ABSTRAK

Sampel-sampel bagi empat jenis penunjuk biologi telah diperolehi dari tujuh stesen kajian di kawasan pantai berbatu sepanjang bahagian Semenanjung Timur di Negeri Terengganu, Malaysia bertujuan untuk memaparkan status persekitaran akuatik kesan dari pencemaran logam berat. Objektif kajian ini adalah untuk menentukan taburan dan kandungan logam berat di dalam tisu organisma pantai berbatu, untuk mengkaji hubungan di antara saiz organisma yang dipilih dan lokasi persampelan dengan nilai kandungan logam berat. Tisu-tisu dari tiram (rock oyster), siput haliah (*Thais* sp.), remis (limpet) dan teritip (barnacle) telah di analisa menggunakan mesin inductive coupled plasma mass spectrometer (ICP-MS) untuk mengesan nilai kadmium (Cd), plumbum (Pb), kuprum (Cu), zink (Zn), dan mangan (Mn). Penunjuk biologi selain tiram telah digunakan untuk mengkaji perhubungan di antara saiz dan nilai logam berat, dan tiram digunakan untuk mengkaji perhubungan di antara lokasi dengan kandungan logam berat. Zn merupakan logam berat yang paling banyak di ambil oleh semua penunjuk biologi dan teritip menunjukkan nilai kandungan Zn yang paling tinggi ($1200.78 \pm 25.11 \mu\text{g/g}$). Terdapat perbezaan yang ketara ($p < 0.05$) di antara saiz dan kandungan logam berat menggunakan teknik analisa ANOVA satu hala bagi Zn di dalam siput haliah, Cd di dalam remis dan semua logam di dalam teritip. Perhubungan di antara lokasi persampelan dengan nilai logam berat menunjukkan tiada perbezaan ketara ($p > 0.05$). Kandungan logam berat di dalam tiram adalah di bawah nilai yang dibenarkan manakala bagi kandungan Cd, Pb, dan Zn di dalam siput haliah dan teritip adalah melebihi nilai yang dibenarkan dalam Akta Makanan Malaysia 1983.