

MUHAMMAD IZZAT BIN KAMARUZAMAN

MASTER OF SCIENCE

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**ACCUMULATION OF METALLIC
ELEMENTS IN COMMERCIAL FISH SPECIES
OF SETIU COASTAL WATERS, TERENGGANU
AS POLLUTION BIOINDICATOR**

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**Thesis Submitted in Fulfillment of the
Requirement for the Degree Master of Science in the
School of Marine and Environmental Sciences
Universiti Malaysia Terengganu**

2018

DEDICATION

يُطْلِبُهُ نَهَارًا وَاللَّيْلُ يُغْشِي الْعَرْشَ عَلَى أَسْتَوَىٰ ثُمَّ أَيَّامٍ سِتَّةَ فِي الْأَرْضِ وَالسَّمَوَاتِ خَلَقَ الَّذِي اللَّهُ رَبُّكُمْ إِنَّ
الْعَلَمِينَ رَبُّ اللَّهِ تَبَارَكَ ۖ الْأَمْرُ وَالْخَلْقُ لَهُ أَلَا ۖ بِأَمْرِهِ مُسَخَّرَتِ النُّجُومَ وَالْقَمَرَ وَالشَّمْسَ وَحَثِينًا

Indeed, your Lord is Allah, who created the heavens and earth in six days and then established Himself above the Throne. He covers the night with the day, [another night] chasing it rapidly; and [He created] the sun, the moon, and the stars, subjected by His command. Unquestionably, His is the creation and the command; blessed is Allah, Lord of the worlds (Al-'A`raf, 7: 54). To my beloved parents, Makalsom binti Kadir and Kamaruzaman bin Hamzah. Both of you are my precious pearl in my life. I hope that I have made you proud.

ABSTRACT

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu
In fulfillment of the requirement for the degree of Master of Science

**ACCUMULATION OF METALLIC ELEMENTS IN COMMERCIAL
FISH SPECIES OF SETIU COASTAL WATERS, TERENGGANU AS
POLLUTION BIOINDICATOR****MUHAMMAD IZZAT BIN KAMARUZAMAN****March 2018****Main supervisor : Ong Meng Chuan, Ph. D.****Co-Supervisor : Nurulnadia Mohd Yusoff, Ph. D.****School : School of Marine and Environmental Sciences**

The pollution from Metallic Elements (MEs) becoming one of the major concern in assessing potential human risk on food consumption. Wild commercial fish exposed to the natural environment are the main source of exposure to human. Thus, this study was conducted to determine the concentration of MEs in selected commercial fish of Setiu coastal water and to study the correlation of the metals with the fish sizes. Ten types of MEs including chromium (Cr), manganese (Mn), copper (Cu), zinc (Zn), iron (Fe), nickel (Ni), cadmium (Cd), arsenic (As), lead (Pb) and mercury (Hg) were detected in both the liver and muscle of five commercial species collected namely *Auxis* sp., *Megalaspis cordyla*, *Rastrelliger* sp, *Selaroides* sp. and *Nemipterus* sp. Fishes were dissected for muscle and liver and digested using Teflon Bomb digestion method. The concentration of MEs in the organ were detected using the Inductive Coupled Plasma – Mass Spectrophometer. The data obtained show selected MEs were higher in the liver than the muscle except for Cr for all fish species collected. Overall concentration of all fish species shows that the concentration of Fe>Zn>As>Cu>Cd>Mn>Cr>Hg>Ni>Pb in the liver and the concentration of Fe>As>Zn>Cr>Cu>Mn>Ni>Hg>Pb>Cd in the muscle. The size of fish and the trophic level does not influence the MEs concentration in the fish. The concentration of MEs in the liver can safely say that does not affect the concentration of MEs in the muscle means that the fish diet is not the main source of metal content for muscle.

Feeding habit is the main factor affecting the level in the liver and the condition of habitat play an important role distributing the MEs in the muscle. The level of MEs in muscle are safe for human consumption based on elements studied. The value of Hazard Quotient for selected fish was less than one (< 1) meaning there are at risk of human consumption in this study. Based on the Pollution Load Index (PLI) a pollution indicator, shows the values of less than 50 (< 50) meaning there is no need for drastic action needed to be done in the study area and the study area was not polluted by the selected elements. This study provides information about provisional tolerance weekly intake (PTWI) necessary for minimizing potential health risks resulting from human consumption.

ABSTRAK

Abstrak tesis dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Sarjana Sains

AKUMULASI ELEMEN LOGAM DI DALAM SPESIS IKAN KOMERSIAL SEBAGAI PENUNJUK BIOLOGI DI PERAIRAN SETIU, TERENGGANU

MUHAMMAD IZZAT BIN KAMARUZAMAN

Mac 2018

Penyelia Utama : Ong Meng Chuan, Ph. D.
Penyelia Bersama : Nurulnadia Mohd Yusoff, Ph. D.
Pusat Pengajian : Pusat Pengajian Sains Marin dan Sekitaran

Pencemaran daripada elemen logam menjadi perhatian umum bagi mentafsir kemungkinan risiko pemakanan terhadap manusia. Ikan berkomersial tinggi terhadap manusia telah terdedah dengan persekitaran adalah punca utama manusia terdedah kepada logam surih. Kajian ini dijalankan untuk menentukan kepekatan elemen logam didalam ikan terpilih di sekitar perairan Setiu dan mengkaji hubungan antara saiz ikan dan tahap kepekatan elemen logam. Sepuluh elemen telah dipilih termasuklah kromium (Cr), manganese (Mn), kuprum (Cu), zink (Zn), ferum (Fe), nikel (Ni), kadmium (Cd), arsenik (As), plumbum (Pb) dan merkuri (Hg) telah dinilai di dalam hati dan otot lima ikan yang telah dipilih seperti *Auxis* sp., *Megalaspis cordyla*, *Rastrelliger* sp, *Selaroides* sp. dan *Nemipterus* sp. Sampel ikan dibelah bagi mengambil otot dan hati untuk dicernakan bersama 69% asid nitrik menggunakan kaedah Bom Teflon. Kepekatan elemen logam ditentukan menggunakan *Inductive Coupled Plasma – Mass Spectrophometer (ICP-MS)* dan keputusan menunjukkan kepekatan elemen logam yang telah dipilih di dalam hati lebih tinggi berbanding di dalam otot kecuali logam Cr. Semua ikan menunjukkan Fe>Zn>As>Cu>Cd>Mn>Cr>Hg>Ni>Pb di dalam hati dan Fe>As>Zn>Cr>Cu>Mn>Ni>Hg>Pb>Cd didalam otot. Saiz ikan dan tahap rantaian makanan menunjukkan tiada perkaitan dengan kepekatan elemen logam. Logam didalam hati juga menunjukkan tiada hubungan dengan kepekatan elemen logam di

dalam otot. Ini bermakna boleh dikatakan corak pemakanan ikan dan kondisi habitat memainkan peranan penting dalam mempengaruhi nilai elemen logam didalam hati dan otot. Kepekatan elemen logam yang terkandung didalam ikan adalah selamat kepada manusia. Nilai penentuan tahap bahaya (HQ) untuk ikan terpilih adalah dibawah nilai satu bermaksud ikan tersebut selamat dan tidak berbahaya kepada manusia. Indeks Pencemaran (PLI) juga menunjukkan dibawah nilai 50 dan menunjukkan kawasan kajian tidak tercemar dengan elemen logam yang telah dipilih. Kajian ini juga memberi maklumat berkenaan dengan pengambilan makanan yang dibenarkan (PTWI) yang perlu diikuti bagi mengurangkan kemungkinan berlaku sebarang risiko terhadap manusia akibat pemakanan.