THESIS TITLE : THE DETERMINATION OF CADMIUM, CHROMIUM, COPPER, IRON, LEAD, MANGANESE, MERCURY, SELENIUM AND ZINC IN DIFFERENT MARINE ANIMALS FROM THE GULF OF THAILAND BY ATOMIC ABSORPTION SPECTROPHOTOMETRY

AUTHOR : MISS CHUTIMA WONGSOOKSIN

THESIS ADVISORY COMMITTEE :

Chutima Kukusamud .....Chairman

(Assistant Professor Chutima Kukusamude)

Tipawan Khummheng .....Member

(Associate Professor Tipawan Khummheng)

ABSTRACT

Thirty-seven species of marine animals including shrimp, fish, cuttle fish, crabs, clams and oysters were collected from Khao Sammuk and Aung Sila fishing ports (Chonburi province) and Paknum market (Samutprakarn province). The collected specimens were digested with concentrated nitric acid in Teflon bombs in a microwave digester and analysed for nine metals by atomic absorption spectrophotometry. The results revealed that the content of the metals, at the 90% confidence level, in ppm wet weight were as follow :

The cadmium concentration in shrimp, varied from 0.162 ± 0.037 to 0.252 ± 0.057; in fish, not detected to 0.451 ± 0.003; in cuttle fish, 0.049 ± 0.003 to 0.350 ± 0.038; in crabs, 0.302 ± 0.032 to 1.156 ± 0.020; in clams and oysters, 0.029 ± 0.008 to 0.355 ± 0.059.

The chromium concentration in shrimp, varied from 0.007 ± 0.002 to 0.554 ± 0.049; in fish, not detected to 2.201 ± 0.055; in cuttle fish, not detected to 0.541 ± 0.069; in crabs, 0.078 ± 0.020 to 0.102 ± 0.016; in clams and oysters, 0.019 ± 0.001 to 0.289 ± 0.035.

The copper concentration in shrimp, varied from 2.822 ± 0.006 to 3.491 ± 0.015; in fish, not detected to 2.943 ± 0.076; in cuttle fish, 0.474 ± 0.045 to 1.249 ± 0.067; in crabs, 1.376 ± 0.022 to 6.952 ± 0.125; in clams and oysters, 0.058 ± 0.017 to 1.651 ± 0.054.

The iron concentration in shrimp, varied from 0.447 ± 0.219 to 45.721 ± 5.647; in fish, not detected to 27.041 ± 0.538; in cuttle fish, 1.909 ± 0.142 to 2.598 ± 0.193; in crabs, not detected to 0.012 ± 0.000; in clams and oysters, 20.775 ± 0.407 to 105.169 ± 4.768.

The lead concentration in shrimp, varied from 0.147 ± 0.008 to 1.340 ± 0.038; in fish, not detected to 4.609 ± 0.137; in cuttle fish, 0.106 ± 0.017 to 0.630 ± 0.036; in crabs, 0.044 ± 0.018 to 2.408 ± 0.074; in clams and oysters, 0.045 ± 0.019 to 2.252 ± 0.182.

The manganese concentration in shrimp, varied from not detected to 3.203 ± 0.281; in fish, not detected to 2.285 ± 0.190; in cuttle fish, not detected to 0.392 ± 0.129; in crabs, 0.527 ± 0.037 to 0.696 ± 0.164; in clams and oysters, 4.025 ± 0.061 to 9.751 ± 0.872.

The mercury concentration in shrimp, varied from 0.019 ± 0.002 to 0.050 ± 0.003; in fish, 0.006 ± 0.001 to 0.176 ± 0.006; in cuttle fish, 0.015 ± 0.001 to 0.019 ± 0.004; in crabs, 0.029 ± 0.001 to 0.124 ± 0.007; in clams and oysters, 0.014 ± 0.010 to 0.033 ± 0.001.

The selenium concentration in shrimp, varied from not detected to 0.001 ± 0.000; in fish, not detected to 2.207 ± 0.401; in cuttle fish, 0.003 ± 0.001 to 0.004 ± 0.000; in crabs, not detected; in clams and oysters, 2.166 ± 0.070 to 2.839 ± 0.216.

The zinc concentration in shrimp, varied from 10.408 ± 2.402 to 16.344 ± 0.853; in fish, not detected to 11.194 ± 0.845; in cuttle fish, 9.517 ± 0.019 to 11.216 ± 0.386; in crabs, 9.866 ± 0.017 to 19.848 ± 0.450; in clams and oysters, 5.797 ± 0.109 to 17.940 ± 0.849

The mean relative standard deviation for the determination of cadmium, chromium, copper, iron, lead, manganese, mercury, selenium and zinc were found to be 4.9%, 4.3%, 4.2%, 3.7%, 4.2%, 4.2%, 3.3%, 7.1%, and 2.8% respectively. The recoveries of methods for the same metals were 86.1-98.5%, 86.2-97.7%, 88.4-98.0%, 86.2-96.0%, 87.2-98.4%, 87.2-91.9%, 86.6-99.8%, 85.2-88.5%, and 85.7-95.9% respectively.

Nine of the samples had chromium levels in excess of permitted amounts but the level of other metals was lower. All of the marine species tested are probably safe to consume with respect to the metal content except to chromium.

Comparing the metal content among the marine species tested, fish had the highest levels of lead, cuttle fish had the highest levels of chromium, crabs had the highest levels of zinc, copper, cadmium and mercury, while clams and oysters had the highest levels of iron, manganese and selenium. Among the nine metals, iron levels were highest in all marines species while, the second highest was zinc. Mercury was present at lowest level.

Comparison of these results with ealier studies showed an increase in cadmium, copper and mercury accumulation.