

## Abstract

The study is focus on Cadmium and total Polycyclinc aromatic hydrocarbons (PAHs) contamination on feral fish and farmed green mussels along the East Of Thailand; Ang Sila coast, Chonburi province and Mapthaputh Industrial Estate, Rayong province in 2012 to 2014. In addition, biomarker (Cytochrome P450, CYP1A) and Metallothionein (MT) assessment proved exposure to above mentioned chemicals based on on one time sampling collected in 2013. Pragnant and student's behaviour in marine food consumption and their perceived risks related to consuming marine food was studied based on interviews relating to their knowledge and understanding about danger in consuming marine food contaminated with chemicals.

In 2014, results showed cadmium in fish liver caught from Ang Sila averaged  $0.2960 \pm 0.1793$  ug/g wet wt. (n=30), which is higher value 6 time than the liver in fish caught from Mapthaputh that averaged  $0.1859 \pm 0.1329$  ug/g wet wt. (n=30). It is statistically significant with ANOVA ( $p < 0.01$ ). As compare to the fish meat, the Cadmium level is in both areas where Ang Sila and Mapthaputh averaged  $0.0016 \pm 0.0022$  ug/g wet wt. (n=30) and  $0.0033 \pm 0.0024$  ug/g wet wt (n=30). Six fish species were caught from Angsila with high Cadmium quantity in the liver ( $>0.2 \sim 1.0$  ug/g wet wt.). As for Mapthaputh, the level of Cadmium quantity in the liver is high only in Mackerel (averaged  $0.3081 \pm 0.0607$  ug/g wet wt.) as for the total of 7 fish species caught.

In 2014, the Cadmium quantities in green mussels found is lower than that fish liver. Around Ang Sila, the Cadmium concentration in small green mussels averaged  $0.0644 \pm 0.0071$  ug/g wet wt.(n=20), and large green mussels that averaged  $0.0764 \pm 0.0064$  ug/g wet wt.(n=20). On the contrary, around Mapthaputh area, Cadmium concentration from large (averaged  $0.0103 \pm 0.0019$  ug/g wet wt. (n=20) and small green mussels (averaged  $0.0123 \pm 0.0031$  ug/g wet wt.). And, Cadmium concentration in green mussels of both large and small around Ang Sila is higher than that Mapthaputh with statistical significance ( $p < 0.01$ ). Farmed-mussel (as control) collected form Trat Province found cadmium concentration (n=10) with average  $0.1171 \pm 0.0098$  ug/g wet wt.

In 2014, the concentration of PAHs in fish liver from Ang Sila averaged  $0.1041 \pm 0.1026$  ug/g dry wt. (n=30), which is 4 times higher in fish meat that averaged  $0.0270 \pm 0.0519$  ug/g dry wt. (n=30). This is significant statistically with ANOVA ( $p < 0.01$ ). As for Mapthaputh area, the concentration of PAHs in fish liver averaged  $0.0546 \pm 0.0547$  ug/g dry wt. (n=30), which is 2.7 times higher than fish meat that averaged  $0.0201 \pm 0.0278$  ug/g dry wt. (n=30), significant statistically with ANOVA ( $p < 0.01$ ). The concentration of PAHs in fish liver from Ang Sila is 2 times higher than that from Mapthaputh.

In 2014, the concentration of total PAHs from large green mussels in Ang Sila averaged  $0.0500 \pm 0.0194$  ug/g dry wt. (n=30), which is 2 times higher than small green mussels that averaged  $0.1834 \pm 0.0567$  ug/g dry wt. (n=30), with statistical significance with ANOVA ( $p < 0.01$ ). As for Mapthaputh, the concentration of PAHs in large green mussels averaged  $0.1834 \pm 0.0567$  ug/g dry wt. (n=30), which is 13 times higher than small green mussels that averaged  $0.0142 \pm 0.1004$  ug/g dry wt. (n=30). It is different with statistical significance ( $p < 0.01$ ). The total concentration of PAHs of large size of green mussels from Ang Sila is 3.6 times higher than that from Mapthaputh with statistical significance ( $p < 0.01$ ). Farmed-mussel (as control) collected from Trat Province found no PAHs concentration (n=10).

In 2014, fish (liver and muscle) from both stations and from Ang Sila (small and large size of green mussel) found 3 types of low molecular weight PAH namely Phenanthrene (PHE), Pyrene (PYR), Fluoranthene (FLA). For Mapthaputh, Chrysene (CHR) found additional type beside 3 types of PAHs in small size of green mussel while large size found additional type of Acenaphthylene (ACY) and Chrysene (CHR).

In 2014, fish liver from both stations found 4 types of low molecular weight namely Phenanthrene (PHE), Pyrene (PYR), Fluoranthene (FLA), and Chrysene (CHR) and 1 more type (Benz[a]anthracene, BaA) found from Angsil. From the same fish sample, fish muscle is no longer CHR accumulated. In other word, large mussel from both stations found the same 3 types namely PHE, FLA and PYR, while 3 more types (Acenaphthylene, ACY; Acenaphthene, ACE and CHR) found from Mapthaputh. Results from small mussel, 2 types (PHE and FLA) were found from Angsil, while Mapthaputh has detected 3 types (FLA, PYR and CHR). According to the International Agency for

Research on Cancer, BaA and CHR are considered classify as possibly carcinogenic to human.

In 2014, the expression of CYP1A (molecular mass at 76/54 kDa, Wester Blot detection) in marine fish from Ang Sila using antibody technique shows 60% positive results from 60 samples (12 fish species) as for Mapthaputh area, there are 100% positive results from 60 samples (7 fish species). Metallothionein (MT) expression (size 10 kDa) from Ang Sila was found 33.3% positive results from 60 samples as for Mapthaputh, 73.3 positive results out from 60 samples. Fish species as categorized by its consumption behaviour (carnivore, omnivore and herbivore) has no significance statistically in relation to expression of CYP1A and MT.

In 2014, the expression of CYP1A (56 kDa) with antibody technique was found in green mussels for both Ang Sila and Mapthaputh. However, the concentration of the bioindicator band can verify different concentrations of samples. Both small and large green mussels from Ang Sila were verified by antibody and antigen with thin concentration (+) and average concentration (++) only. As for Mapthaputh, small and large green mussels have average (++) and high concentration (+++) only. Farmed-mussel (as control) collected from Trat Province found CYP1A from all samples (n=10)

Seafood consumption and knowledge about risks associated with seafood consumption of consumers were investigated. For the first two years of investigation (2012-2013), pregnant women are the most vulnerable group as compared to children and general public living around Mapthaputh area because they have the lowest knowledge about chemical contamination in seafood and their seafood consumption behavior is at risk. In 2014, a design was performed to identify the effects of an initiative to promote safe seafood consumption among pregnant women living around Mapthaputh area, Rayong Province were investigated. Pregnant women were enrolled in a conducted program that promotes health and well-being, which was adopted from Pender's principles for health promotion. Two types of activities were conducted in the program: participatory activities involving communication materials (manuals and videos) and active promotion that include sending information through phone SMS. Pregnant women (average age is 26) have education at the junior high school level and currently work as laborers. Most of

them frequently prefer to consume seafood such as mackerel, squids, shrimps, crabs, and green mussels respectively. They are patients of a hospital in Mapthaphut, Rayong Province. Based on the consumption behavior before and after women enrolled in health promotion program for safe seafood consumption, it was found that there was an improved knowledge on the risks associated with seafood consumption and the ability for pregnant women to consuming seafood with statistically significant difference at ( $p < 0.01$ ). As for the knowledge about the emotion related to seafood consumption, it was found that there was no significant difference between before and after the experiment at  $P = 0.069$ . Overall results of 3 years research, it can be concluded that pregnant women consumption behavior had changed in general when compared between before and after their enrollment in the health promotion for safe seafood consumption with statistically significant difference at  $p < 0.01$ . After the experiment, the average equaled 52.80 and the average before the experiment was 46.97.

**Key words:** Cadmium, Polycyclinc aromatic hydrocarbons, Cytochrome CYP1A, Metallothionein, marine fish, Green mussel, seafood, pregnant women