CONTENT OF HEAVY METAL IN MULLET FISH SAMPLES FROM NAKHON SI THAMMARAT MUNICIPAL AREA

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Abstract: The analysis of heavy metal such as Iron Copper Lead Cadmium and Chromium in mullet fish samples from Nakhon Si Thammarat in the South of Thailand was studied. Mullet fish samples were collected from Khlong Thasak, Khlong Pakpoon, Khlong Pakpaya and Khlong Paknakhon between April 2014 and September 2014. The content of 8.45 to 66.31, 0.37 to 3.49 , 0.50 to 1.98, 0.17 to 1.28 and 0.07 to 0.09 mg/L for Iron, Copper, Lead, Cadmium and Chromium, in mullet samples, respectively by using Atomic Absorption spectrophotometry. This research could be used as database for food safety.

1. Introduction

Fish is one of the important sources of protein with Omega-3 polyunsaturated fatty acids, which are renowned globally for greatly reducing cholesterol levels and maintaining healthy human hearts, brains, joints and immune system. Fish demand is increasing rapidly around the world. [1] [3]

Nevertheless, fish is influenced by various types of contaminants such as heavy metals, and subsequently could be changed into a main source of contaminant uptake for human being. Industries, agriculture activities and transportation are potential sources of toxic contaminants in the marine environment. [2]

Heavy metals are natural trace components of the aquatic environment, but their levels have increased due to industrial, agricultural. As a result, aquatic animals are exposed to elevated levels of heavy metals. [1-4]

The levels of metals in upper members of the food web like fish can reach values many times higher than those found in aquatic environment or in sediments. Thus contamination in the region is an important issue regarding the health of the aquatic animals and in turn, health of the seafood consumers. [4]

Iron is a vital element in life. The major scientific and medical interest in iron is as an essential metal, but toxicological considerations are important in terms of accidental acute exposures and chronic iron overload. [5]

Iron poisoning is a leading cause of poisoning deaths in children. Symptoms begin with acute gastroenteritis, followed by a quiescent period, then shock and liver failure. [5]

Copper toxicity is a much overlooked contributor to many health problems; including anorexia, fatigue, premenstrual syndrome, depression, anxiety, migraine headaches, allergies, childhood hyperactivity and learning disorders. [6]

The toxic effects of lead, on people exposed to lead in the course of their work. Short-term exposure to high levels of lead can cause brain damage, paralysis (lead palsy), anaemia and gastrointestinal symptoms. Longer-term exposure can cause damage to the kidneys, reproductive and immune systems in addition to effects on the nervous system. The most critical effect of low-level lead exposure is on intellectual development in young children and, like mercury, lead crosses the placental barrier and accumulates in the fetus. Infants and young children are more vulnerable than adults to the toxic effects of lead, and they also absorb lead more readily. Even short-tem, low-level exposures of young children to lead is considered to have an effect on neurobehavioral development. Consumption of food containing lead is the major source of exposure for the general population. [7-9].

The principal toxic effect of cadmium is its toxicity to the kidney, although it has also been associated with lung damage (including induction of lung tumors) and skeletal changes in occupationally exposed populations. Cadmium is relatively poorly absorbed into the body, but once absorbed is slowly excreted, like other metals, and accumulates in the kidney causing renal damage. The kidney of food animals is a major source of cadmium in the diet although lower levels are found in many foods. [7].

Chromium plays a dual role in human biochemistry as in trace amounts it is an essential nutrient, while large amounts are toxic and carcinogenic. Health effects related to hexavalent chromium exposure include diarrhea, stomach and intestinal bleedings, cramps, and liver and kidney damage. Chromium salts are used extensively in industrial processes and may enter the water supply through the discharge of wastes. [10].

This study was undertaken to investigate the current heavy metal such as Iron, Copper, Lead, Cadmium and Chromium contamination in tissue of mullet from four stations differing in locations such as Khlong Thasak, Khlong Pakpoon, Khlong Pakpaya and Khlong Paknakhon between April 2014 and September 2014.

2. Materials and Methods

Sample preparation

Fresh fishes were collected from Khlong Thasak, Khlong Pakpoon, Khlong Pakpaya and Khlong Paknakhon**,** in Nakhon Si Thammarat Municipal Area**.** Specimen**s** of similar body weight and length were selected from all samples. The samples were set from April 2014 and September 2014 for all six times.

Heavy metals content analysis

All the plastic and glassware were cleaned by soaking in 2 M HNO_3 for 48 h, and rinsed with distilled water, and deionized water. Stock standard solutions of Fe, Cu, Pb, Cd and Cr from Merck were used.

Fish tissues were dissected and washed with MQ water. To access the total metal contents, microwave assisted acid digestion procedure was carried out. The digestion system was used at 200 °C in 90 min. All sample solutions were determined by atomic absorption spectrometry. [11]

3. Results and Discussion

Table 1: The content of iron in mullet fish samples from Nakhon Si Thammarat, Thailand, between April 2014 and September 2014.

Month (2014)	Khlong			
	Pakpoon	Paknakhon	Pakpaya	Thasak
April	13.60	12.41	16.64	13.1
May	14.01	18.34	29.99	22.65
June	16.61	13.85	8.45	8.51
July	37.76	20.77	66.31	39.51
August	14.51	18.80	27.19	19.54
september	18.71	9.67	27.19	9.48
% recovery	80-101	80-100	82-102	82-102

The content of iron in mullet fish samples from Khlong Pakpoon, Khlong Paknakhon, Khlong Pakpaya and Khlong Thasak was found in the range of 13.60 to 37.76, 9.67 to 20.77, 8.45 to 66.31 and 8.51 to 39.51 mg/L respectively. (Table 1)

Table 2: The content of copper in mullet fish samples from Nakhon Si Thammarat, Thailand, between April 2014 and September 2014.

Month (2014)	Khlong			
	Pakpoon (mg/L)	Paknakhon (mg/L)	Pakpaya (mg/L)	Thasak (mg/L)
April	0.80	0.73	0.83	0.79
May	0.99	1.02	1.19	1.08
June	0.49	0.49	0.37	0.51
July	0.68	0.75	0.79	0.80
August	0.86	0.67	0.99	0.73
september	3.27	3.29	3.46	3.49
% recovery	82-100	80-100	85-100	89-100

The content of copper in mullet fish samples from Khlong Pakpoon, Khlong Paknakhon, Khlong Pakpaya and Khlong Thasak was found in the range of 0.49 to 3.27, 0.49 to 3.29, 0.37 to 3.46 and 0.51 to 3.49 mg/L respectively. (Table 2)

Table 3: The content of lead in mullet fish samples from Nakhon Si Thammarat, Thailand, between April 2014 and September 2014.

Month (2014)	Khlong			
	Pakpoon (mg/L)	Paknakhon (mg/L)	Pakpaya (mg/L)	Thasak (mg/L)
April	N.D.	N.D.	N.D.	N.D.
May	N.D.	N.D.	N.D.	N.D.
June	1.73	1.51	1.42	1.54
July	0.85	0.54	0.55	1.35
August	0.86	1.42	1.69	1.35
september	0.70	0.54	0.74	0.50
% recovery	80-103	82-100	80-98	80-99

The content of lead in mullet fish samples from Khlong Pakpoon, Khlong Paknakhon, Khlong Pakpaya and Khlong Thasak was found in the range of 0.70 to 1.73, 0.54 to 1.51, 0.55 to 1.69 and 0.50 to 1.54 mg/L respectively. No contamination by lead was found in mullet fish samples between April 2014 to May 2014. (Table 3)

Table 4: The content of cadmium in mullet fish samples from Nakhon Si Thammarat, Thailand, between April 2014 and September 2014.

Month (2014)	Khlong			
	Pakpoon (mg/L)	Paknakhon (mg/L)	Pakpaya (mg/L)	Thasak (mg/L)
April	0.64	0.73	0.83	0.73
May	0.95	1.00	0.95	1.09
June	0.10	0.55	0.10	0.10
July	0.34	0.33	0.60	0.30
August	0.24	0.17	0.32	0.29
september	0.87	0.88	0.77	0.76
% recovery	80-102	82-102	85-100	81-100

The content of cadmium in mullet fish samples from Khlong Pakpoon, Khlong Paknakhon, Khlong Pakpaya and Khlong Thasak was found in the range of 0.10 to 0.95, 0.17 to 1.00, 0.10 to 0.95 and 0.10 to 1.09 mg/L respectively. (Table 4)

Table 5: The content of chromium in mullet fish samples from Nakhon Si Thammarat, Thailand, between April 2014 and September 2014.

Month (2014)	Khlong			
	Pakpoon (mg/L)	Paknakhon (mg/L)	Pakpaya (mg/L)	Thasak (mg/L)
April	N.D.	N.D.	N.D.	N.D.
May	N.D.	N.D.	N.D.	N.D.
June	N.D.	N.D.	N.D.	N.D.
July	N.D.	N.D.	N.D.	N.D.
August	N.D.	N.D.	N.D.	N.D.
september	0.09	0.07	0.07	N.D.
% recovery	81-100	80-100	80-98	80-100

N.D. = Non detectable

The content of cadmium in mullet fish samples from Khlong Pakpoon, Khlong Paknakhon and Khlong Pakpaya was found at 0.09, 0.07 and 0.07 mg/L respectively. No contamination by chromium was found in mullet fish samples between April 2014 to August 2014 of Khlong Pakpoon, Khlong Paknakhon and Khlong Pakpaya, Khlong Thasak in any sample (Table 5)

4. Conclusions

This study aims to analyze heavy metals such as iron copper lead cadmium and chromium that contaminated in mullet fish samples of Nakhon Si Thammarat municipal area, the southern part of Thailand.Mullet fish samples were collected from Khlong Thasak, Khlong Pakpoon, Khlong Pakpaya and Khlong Paknakhon between April 2014 to September 2014. The content of 8.45 to 66.31, 0.37 to 3.49 , 0.50 to 1.98, 0.17 to 1.28 and 0.07 to 0.09 mg/L for Iron, Copper, Lead, Cadmium and Chromium, in mullet samples, respectively

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