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Bioaccumulation of heavy metals in Bass fish (Morone Saxatilis) at Rodoni Cape, in Adriatik sea, Albania.

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Abstract: - The present study was carried out to determine the level of bioaccumulation of some heavy metals in fish which comes from the discharge of Ishmi river which has a length of 79 km from Tirana and flows into the Cape of Rodon in the Adriatic Sea. Three heavy metals, namely merkury (Hg), lead (Pb), and cadmium (Cd) were selected for this study. The concentrations of heavy metals (Hg, Pb, Cd) were measured in muscles at about thirty fish species collected from five main landing areas in the Adriatik Sea. The levels of heavy metals varied significantly among fish species and organs. As expected, muscles always possessed the lowest concentrations of all metals. The concentration of metals in the present fish muscles were accepted by the international legislation limits and are safe for human consumption. Metal concentrations were determined by Flame Atomic Absorption Spectrophotometer after nitric acid digestion of samples. Based on the results observe that all the fish samples were negative, they are very low in comparison with the permitted values.

Keywords: - *Adriatik sea, Bioaccumulation, Heavy metals, fish, pollution,*

I. INTRODUCTION

This study aim is to estimate the level of heavy metals in the fish at Adriatik sea. Ishmi River flows in central Albania; three main contributors to Ishmi River are Tirana, Terkuza and Zeza streams (Saraçi R.,2002). Assessment of heavy metals in sediments and phragmites australis in Tirana river, proved a strong positive correlation between the concentrations of metals in the sediment and all common reed (Kucaj E., 2015). Based on the analysis conducted it showed that samples taken of water, sediment and reeds resulted contaminated with heavy metals in the river Tirana. (Kucaj E.; Abazi.U., 2015).

Fish are relatively situated at the top of the aquatic food chain; therefore, they normally can accumulate heavy metals from food, water and sediments (Yilmaz F., 2007; Zhao S.,2012). The amount of the toxic elements in fish is dependent on the concentration levels of these elements in the food and the habitats of fish, and the detoxification rate of metals (Urena., 2007). In addition to its important source of protein, fish typically have rich contents of essential minerals, vitamins and unsaturated fatty acids (Medeiros RJ., 2012). Fishes have been found to be good indicators of the heavy metal contamination levels in aquatic systems because they occupy different atrophic levels (Burger., 2002; Karadede-Akinand and Ünlü, 2007). Therefore, many international monitoring programs have been established in order to assess the quality of fish for human consumption and to monitor the health of the aquatic ecosystem (Meche A., 2010). Most of these studies concentrated mainly on the heavy metals in the edible part (fish muscles). However, other studies reported the distribution of metals in different organs like the liver, kidneys, heart, gonads, bone, digestive tract and brain. The water quality of the river Tirana, comes down from the source of the river at the end as a result of the increased pollution. Results found classify waters of the river Tirana in class IV-V, poor condition (Kucaj E., 2015).

According to the literatures, metal bioaccumulation by fish and subsequent distribution in organs is greatly inter-specific. Fishes represent the peak of consumers in water system. Fishes have ability to collect these metals in concentrations higher than water and sediments due to feed on organic materials in aquatic environment (Olaifa, 2004).

Ishmi River has a geographic extension very interesting, passes in the middle of the country, traversing residential areas, industrial areas and agricultural areas. All activities in areas closely related to the use of natural water resources and at the same time have a direct impact on aquatic ecosystems and water quality. Farmers who use natural water resources for irrigation of agricultural lands, need for safety and better asset quality natural use, otherwise it is a danger to them, agricultural product and consumers.

On the other side flows into the Adriatic Sea tourist area, so water quality affects the health of tourists, mentioning the children of the surrounding villages that make bathroom in Ishmi River, which is more

vulnerable from organic pollution. Also metals content in muscles were compared against the recommended maximum permissible limit (MPL) to assess the quality of fish for human consumption.

II. MATERIALS AND METHODS

About thirty commercial fish species were purchased from local fishermen at five main fish landing areas on the Adriatik Sea (Fig. 1) during June 2015 at Kepi Rodonit. The collected species were Bass (Morone saxatilis). These fish species were put in sterile polythene bags and taken in icebox to the laboratory where they were washed with running tap water to remove dirt, were classified, weighed, measured (Fig.2).

Fish samples were identified taxonomically using standard reference sources (www.fishbase.org). For each sample were take about 1 kg bass fish which contain 5-6 fish. All the fish samples were separately stored inside the deep freezer at about -100C and were allowed to thaw; Scales were removed and washed with running water before dissected with sterile scissors to remove muscles from ather organs. These were transferred into sterile sample bottles, labelled and kept for digestion and analysis of heavy metals. For metal analysis, frozen fish were partially thawed, and each fish was dissected using stainless steel instruments. Muscles were taken out; composite samples 1 g ± 0.2 were used for subsequent analysis.

The samples were digested with ultra pure nitric acid HNO_3 (Scharlau 69.5%) and 1 ml H_2O_2 (Sgma-Aldrich 30%) and placed in the microwave oven type BERGHOF at 100 °C. The solution was made up to known volume with deionized distilled water and analyzed for Hg, Pb, Cd, using the Atomic Absorption Spectrophotometer (AAS Thermo Solaar).

III. RESULTS AND DISCUSSION

Cadmium (Cd), Mercury (Hg), Lead (Pb) were analysed and the levels of the heavy metals concentration were measured in each of the fish samples at muscle using Atomic Absorption Spectrophotometer. The results of the analysis are presented in Table 2. **(**mg/kg wet weight**)**. As shown in table 2, all the sample fish contained the lowest concentrations of metals in muscles. It is well known that muscles are not an active site for metal biotransformation and accumulation (Elnabris KJ., 2013). In table 1. presents the average values of length and weight of fish. But in polluted aquatic habitats the concentration of metals in fish muscles may exceed the permissible limits for human consumption and imply severe health threats it seems from the figure 3.

Table 1. Number of fish for each sample, mean length (cm) and weight (gr)

Nr	Nr.samples	Number of fish	Mean Length (cm)	Weight (g)
1	Sample 1	5	24.5	172.2
2	Sample 2	4	26.2	179.3
3	Sample 3	6	19.4	130.2
4	Sample 4	5	23.1	157.3
5	Sample 5	6	18.3	116.9

Table 2. Concentrations of lead, cadmium and mercury in muscle of in Adriatik sea (in mg/kg or ppm)

Nr	Kampioni	Pb (mg/kg)	Cd (mg/kg)	Hg (mg/kg)
1	Sample 1	0.010	0.018	0.061
2	Sample 2	0.021	0.022	0.012
3	Sample 3	0.003	0.026	0.053
4	Sample 4	0.006	0.024	0.022
5	Sample 5	0.002	0.025	0.013

Table 3. Maximum Permissible Limit (MPL) of heavy metals in fish muscles (mg/g wet wt.) according to international standards.

	Metals							Reference
	Cu	Zn	Pb	Cd	Fe	Mn	Hg	
FAO (1983)	30	30	0.5	0.05				FAO
FAO/WHO limit	30	40	0.5	0.5				FAO/WHO
WHO 1989	30	100	2	1	100	1		Mokhtar
European community			0.3	0.05			0.5	EC 1881/2006

Figure 1. Sampling site in Cape of Rodon in the Adriatic Sea

The metal concentrations in the examined fish species from the Adriatik Sea fall below the Maximum Permissible Limit for human consumption recommended by FAO, WHO and EC. Regarding the geographical variation of metals, there was no consistent increase of metals in all fish species from one site. Furthermore, some fish from the same species collected from different sites also significantly accumulated different concentrations of metals.

Figure 2. Sample fish, Bass *(Morone saxatilis)*, laboratory procedures.

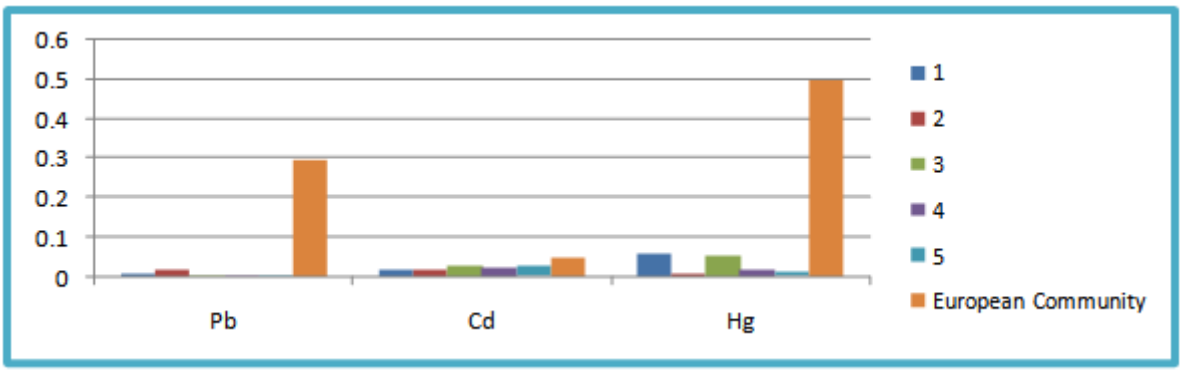

Figure 3. Distribution of cadmium (Cd), lead (Pb) and mercury (Hg) in the muscle compare with the European Community limitit

IV. CONCLUSION

Metal concentrations in the five studied locations were within the same range. Health risk analysis of heavy metals in the edible parts of the fish indicated safe levels for human consumption and concentrations in the muscles are generally accepted by the international legislation limits.

In view of the importance of fish to diet of man, it is necessary that biological monitoring of the water and fish meant for consumption should be done regularly to ensure continuous safety of the seafood. Safe disposal of domestic sewage and industrial effluents should be practiced and where possible, recycled to avoid these metals and other contaminants from going into the environment. However, the levels of metals in Bass fish should be continuously monitored in potential polluted areas since pelagic fish showed a tendency to accumulate cadmium in muscles from polluted water. In addition, many factors can influence metal uptake like sex, age, size, reproductive cycle, swimming patterns, feeding behavior and living environment (i.e., geographical location) (Zhao S.,2012; Meche A., 2010).

Although fish are mostly migratory and seldom settle in one place, metal accumulation in fish organs provides evidences of exposure to contaminated aquatic environment (Qadir A., Malik RN., 2011) and could be used to assess the health condition of the area from which they were collected.

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