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Study on heavy metals levels and its risk assessment in edible fish (*Himantura imbricate*) from Persian Gulf

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***Abstract*—** *Heavy metals are contaminants of great environmental concern due to their multiple origins (natural and anthropogenic), the ability to accumulate in organs and tissues, and the deleterious effects they can cause in organisms. Studies on the accumulation of metals in seafood, such as fish, have increased in importance due to the risk for human health when consuming fish contaminated by metals. The present work was aimed at verifying the concentrations of cadmium (Cd), Nickel (Ni) and lead (Pb) in the muscular tissue of Himantura imbricate (from the Persian Gulf in Hormozgan province, Iran. Samples were analyzed by Atomic Absorption Spectroscopy. There were significant variations among heavy metal accumulation levels of the species and their regions. The heavy metal concentrations found in regions varied for Cd: 0.14, Ni: 0.33, Pb: 0.02 in Qeshm and Cd: 0.25, Ni: 0.48, Pb: 0.03, µg/g in Suoroo. The heavy metal concentrations of fish in Qeshm were lower than those of fish from Suoroo regions. This research showed that heavy metal concentrations in muscle of investigated specie were also lower than the maximum levels set by law.*

Keywords*— *Himantura imbricate, risk assessment, Atomic Absorption Spectroscopy and Persian Gulf.

I. INTRODUCTION

In the recent years, world consumption of fish has increased simultaneously with the growing concern of their nutritional and therapeutic benefits. In addition to its important source of protein, fish typically have rich contents of essential minerals, vitamins and unsaturated fatty acids [1]. Among the pollutants, non-degradable pollutants (persistent pollutants) such as heavy metals in sediments and mud and sludge concentrated as potential marine pollution and at the same time accumulate in aquatic and body tissue and concentrated And fish consumption may be toxic to humans and severe adverse effects such as disorders of the nervous system, renal, genetic mutations, and so on to be created, It is of utmost importance. Among the heavy metals Pb, Ni, and Cd indices, oil pollution and pollution from industrial activities in the marine ecosystem, the capacity of ecosystems to accept the changes in the environment and although, by its nature has the ability to cope with change But today it is clear that destruction has been the speed of natural regeneration. And the process for irreversible environmental degradation is growing, so measures to protect the environment should ponder [2]. In addition, today one of the major concerns in the discharge of heavy metals into the marine environment is all over the world. And is well established that heavy metals cause toxicity and accumulation of ecological significance are many, these elements have devastating effects on the marine ecosystem and species diversity [3]. Lead one of four metals that have the most damaging effects on human health. Bio-synthesis of hemoglobin disorders and anemia, high blood pressure, kidney damage, miscarriage and preterm birth, nervous system disorders, brain damage, infertility in men, decreased learning ability and behavioral disorders and hyperactivity in children from the negative effects of increasing the concentration of lead in body[4]. Nickel toxicity varies widely and is affected by salinity and the presence of other ions is placed. Industrial and commercial use of nickel-containing stainless steel, plating, painting and ceramics are. Nickel also from anthropogenic sources enters the water system. Small amounts of nickel in people who are allergic to this heavy metal can cause severe inflammation of the skin [4]. Cadmium is one of the natural elements in building the body's cells and many enzymes and hormones involved. The metal body with many vital macromolecules are irreversibly linked and

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threatened to disrupt the biological activity of cells. Cadmium also causes gastrointestinal disturbances such as nausea, vomiting, dry mouth, fever, headache and neurological disorders and respiratory diseases are also on the human body in high concentrations in the prostate, bone, muscle and liver accumulates [5]. The most important control methods, choice of different fish species widely to the physiological effects of heavy metals can be used [6]. Thus, the concentration of heavy metals in the tissues of aquatic can be a prelude to detect the level of aquatic pollution [7]. Such as indicator species to measure the amount of pollution can be traced to the Fish table Himantura imbricate.

II. MATERIALS AND METHODS

Heavy metals are hazardous pollutants that waste and sewage into the sea. Aquaculture can act as a measure of pollution in aquatic ecosystems. Therefore, measurement and evaluation of a number of toxic elements and heavy metals (lead, nickel, iron, zinc and copper) in the muscle tissue of blue Fish table Himantura imbricate stations (Qeshm and Souroo) in the Persian Gulf was the basis for this study . After determining the three stations, in every season of every station, 30 type of Himantura imbricates were sampled, so that were collected randomly in every season of collect 90 type and total two season 180 sample. After the biometrics, autopsy was performed and was isolated muscle tissue.so that for dry crap muscle tissues put in the freeze dryer (VaCo5 model) at 40 - ° C for 8 to 10 hours.so after running out the time and ensure complete dry of muscle tissue, the samples are removed balloons and in the petri dishes were placed numbered [8]. In order to digest the samples were ground with a porcelain mortar laboratory. the First, was measured (0.5gr) amount of dried samples tissue by" Sartorius scales"-made in Germany- with accuracy equivalent 0.001grams.The sample is poured shed into a microwave vial (ETHOS1, model) and after the addition of 7 ml of concentrated nitric acid 65% (after the using porcelain mortar any time, washed with nitric acid 5% and was completely rinse with distilled water) so 1 ml hydrogen peroxide (30%), closed the door's vials and those are placed in a special chamber, next transferred to the microwave and according to the order digest the sample. After digestion and cooling time, the samples were removed from the device and were pure through Whitman filter paper number 42. The content of the filter was washed with distilled water. So samples liquid ready discharged into the beakers and were dried in the laboratory's temperature. After dried, samples mixed through distilled water and samples deliver to the volume 50 with pure distilled water.So sample kept in polyethylene containers and stored at 4 ° C (to avoid any reduction in the volume). Obviously storage time should not be long and after digestion of the samples, they injected the atomic absorption and their actual chemical concentrations were calculated. The chemical digestion is based on accepted MOOPAM [8]. Data analysis was performed using SPSS 21 software and analysis of means to help T- test were compared with the presence or absence of a significant difference at 95% (P- value <0.05) was determined. As well as charts and tables Excel2007 software was used.

III. RESULTS

Analysis of variance showed that the concentrations of lead, nickel and cadmium in muscle tissue of Fish table Himantura imbricate between regions Qeshm and Souroo there is a significant difference (P-value< 0.05). As the studied concentration in the muscle of fish table Himantura imbricate Souroo higher than from Qeshm and the difference was statistically significant (P-value<0.05). (Table1 and Figures 1).

Table.1: compares the results of the average of the elements nickel, lead and cadmium in muscle tissue of Fish table Himantura imbricate in Qeshm and Souroo (mean ± SD), (n = 30)..

Index / Area	Qeshm	Souroo
Nickel (micrograms per gram)	0.02±0.33	0/03±0.48
Lead (micrograms per gram)	0/002±0.024	0/003±0.035
Cadmium (micrograms per gram)	0.01±0.25	0.02±0.34

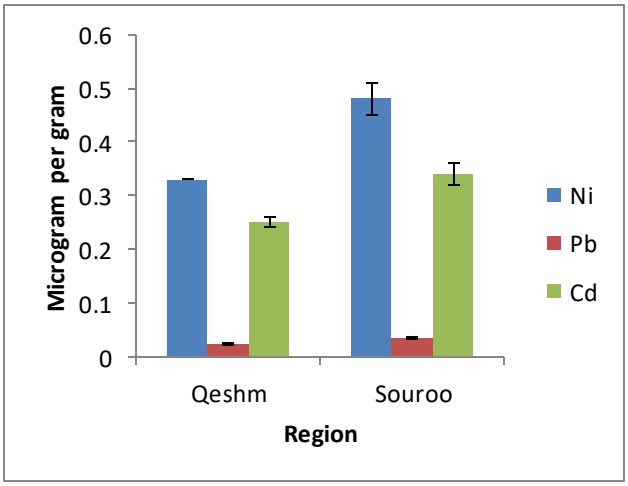

Fig.1: Comparison of nickel, lead and cadmium in muscle tissue of Fish table Himantura imbricate muscle in Qeshm and

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Souroo

IV. DISCUSSION

Exploration, extraction and transportation of oil in the Persian Gulf, in addition to direct contamination, due to large amounts of heavy metals, chemical pollution of the Gulf marine and aquatic life is [9]. Fabris and colleagues (2006) showed that the concentration of heavy metals such as arsenic, cadmium, iron, zinc and mercury in fish and lobster J. Edwardsis P. bassenis ground now and abalone H. rubra to the location where the fish live in it. Depends on the concentration of the species in different parts of the coastal waters of Victoria in Australia there is a significant difference, but a pattern and there was no consistent trend across regions at a concentration of heavy metals. There are significant differences between the concentrations of heavy metals in different areas can be discussed and not because of different management application, environmental conditions, evacuation of wastewater, the presence of industrial plants and aquaculture activities in the areas [10]. Chen (2002), showed significant differences in the concentrations of lead, cadmium, mercury, silver, copper and iron Chi-Ku Lagoon was found in samples from different regions. He also said that in areas where the origin of pollutants from sewage or fresh water input. Cadmium, mercury and copper were present in the environment, while the entrance to the remote areas of the mouth and go wetland reduced concentrations of these elements [11]. Dural and colleagues (2007), with several experiments showed that the concentration of heavy metals in aquatic organisms in different regions (the Persian Gulf, Gulf Egypt, the Gulf Askndryvn, in the South Atlantic salt marshes and wetlands Spain California) due to different environmental conditions such as: temperature, salinity, pH and light industrial activities .... and there is a significant difference[12]. Turkmen and colleagues (2005) reported that concentrations of heavy metals in fish muscle, according to the area where the fish is caught. And according to the species of fish can be very diverse and vary, also showed. Although not different between the concentrations of heavy metals in different parts of sampling fish there are significant differences [13]. Meador et al. (2005), the concentration of three cadmium, mercury and lead in sediments and fish in several areas in Alaska and California have measured the results showed concentrations of lead and cadmium in sediments rural areas of California due to human activity is the because gasoline is increasing [14]. A significant impact on aquatic habitats so that the concentration of heavy metals, heavy metals in organisms that live in the Gulf are less than the amount of heavy metals in the body of organisms in coastal waters and estuaries, bays and inlets are present [15]. Unfortunately, in the discharge of sewage and solid waste and industrial development and dredging operations off the coast and ports, unloading of agricultural pesticides and fertilizers, as well as Persian Gulf oil extraction operations are heavily polluted with heavy metals and hydrocarbons is [16]. More pollutants into aquatic systems are eventually are deposited in the sediment. Sediments, aquatic environments are a critical component for performance and nutrition provide habitat for many organisms and in many cases the accumulation of metals in sediments than in the water [15]. And semi-benthic benthic species vulnerable to contaminants in sediments and contaminants are water-soluble, this species also play a constructive role in this environment and therefore their demographic shifts affect all societies and threaten the balance of ecosystems [17].

Generally, the most important reasons for the high concentration of lead, nickel and cadmium in muscle tissue in Himantura imbricate in Souroo compared to Qeshm in various industries along the coast, discharge of industrial effluents and urban coastal waters is that their wastewater in a variety of heavy metals, and this increases the concentration of these metals. On the other hand there dhow building yards along the waterfront of the island and the use of color and anti-corrosion material (which contains zinc chromate and lead oxides area and finally moved to the coastal waters and adjacent areas and water pollution in this area are), too Boat traffic (tourism and fishing activities) and the presence of lead and nickel in gasoline and publish it in the air, then lead and nickel from combustion and quickly deposited on the soil, The nickel-containing sediments by rivers to the Persian Gulf could also be other reasons for this increase. The most important part is edible muscle tissue of fish that can directly impact on human health. Based on concentrations measured in terms of weight compared with existing standards (Table 2), was lower than the limit concentration, and muscle consumption of lobster in three regions of the Hormozgan province (Qeshm and Souroo) will not be a threat to the these metals.

Table2. World standards for permitted levels of nickel, lead and cadmium (micrograms per gram) in fish muscle tissue

Reference	Metal					International standard
	Cu	Fe	Zn	Ni	Pb	
FAO/WHO, 2010	10	-	30	-	2.14	FAO/WHO
Pourang et	10	-	35	-	1.5	NHMRC

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al., 2004						
Pourang et al., 2004	-	100	35	1	5	FDA

In the first study to estimate the amount of entry and the risk of heavy metals nickel, lead, zinc, iron and copper were the crab. Results showed that all estimates of daily log metals is no danger in taking this species of fish found not consumers. It should be noted that in Crab various other metals such as mercury and organic pollutants such as polyaromatic hydrocarbons, and accumulate. It is therefore essential that health authorities such as the Ministry of Health and other organizations in comprehensive background check estimate the amount of risk in different groups of consumers such as children and pregnant women do, and the accumulation of heavy metals in fish consumed annually carcinogenic and non-commercial and examine..

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