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# Concentration of Three Heavy Metals in Five Tissues of Fish Barbus sharpeyi, Aspius vorax, Silurus triostegus and Mystus pelusius Collected from Euphrates River Thi Qar, Iraq

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**Abstract**
The present study was conducted to investigate some heavy metals : Cd , Cu , and Zn in the tissue of fishes : *Barbus sharpeyi* Heckel *, Aspius vorax* Heckel *, Silurus triostegus* Heckel and *Mystus pelusius* Solander from the Euphrates River in the area between the town of Batha and the city of Nasiriyah . Samples were collected in July 2015. Where elements showed concentrations in the tissues of varying the four species of fish and *Barbus sharpeyi* as well as high concentrations of cadmium from the rest of the fish careless and that the highest rate of cadmium record in the gills totaled 18.191ppm . As , it turns out that the *Barbus sharpeyi* fish showed significantly more than the accumulation of copper amounted to 58.7760 ppm and recorded the lowest concentrations in *Mystus pelusius* amounted to 13.550 ppm and the highest rate recorded in the liver was 77.951ppm . And, recording zinc big increase in the thickness of running totaled 146.4250 ppm followed *Aspius vorax* reached 66.7960 ppm and the highest rate recorded in gills totaled 114.022 ppm and less focus record in the muscles 52.599 ppm .The results showed significant differences between the fish and the tissue. The findings current indicate high concentrations exceed determinants International approved by the FAO points out the diversity of sources of pollution with heavy and makes life good fish guides to study pollution recommend the establishment of an environmental monitoring system continuously.
**Keywords**: Cadmium, Copper and Zinc

## INTRODUCTION

Pollution of different environments is due to human activities in recent years, one of such pollution is a river pollution by heavy metals has become a hazard due to discharge of industrial effluents (Vineeta *et. al.,* 2007) . Metal accumulation in fish depends on pollution and may differ for various fish species living in the same water body (Jezierska and Witeska,*et. al*., 2001) . Of the various heavy Cd , Cu , and Zn are widely distributed and important as regard to their deleterious effects (Vineeta *et. al.,* 2007) . Elevated levels of heavy metals in aquatic ecosystems have raised serious public concerns around the word due to their high potential to enter and accumulate in food chains and the correlation between heavy metals exposure and cancer in human (Wenfeng Zhang, *et. al.*, 2012) . A study in Suhendal, *et. al.* 2010 show in six heavy metals study in seven species of fish in Ataturk Dam lake .It was concluded that the fish are not heavily burdened with metals ,Weher , 2003 show that the Cd , Cu and Zn concentration in three species of fish were within acceptable limits by FAO standards, in Al-Arab dam in north of Jordan's Valley. As well as, Adehamy,2007 shows that the study of heavy metals concentration in fish shows that the healthily aquatic systems especially , fish located in the top of the food chain , indeed , it have a tendency accumulation of heavy metal from water , so it can prepare input to the pollution of water bodies , Thus knowledge of the biological effects of high concentrations of them . Salman ,*et. al,*. 2007 studied the concentration of nine heavy metals in four species of fish muscle and uses it as an evidence vital to the river pollution . Al-Sarraj, *et. al,*. 2014 studied bioaccumulation for both Pb and Cd tissue and members three species collected fish in Tigris River , indeed it confirmed the existence of a diversity of sources of pollution with heavy metal and makes the fish a vital evidence well to study this pollution . Fahad, 2016 pointed to increased concentration of three elements rates Cd , Cu and Zn , in the tissue of four species of Euphrates river fish .To display the Euphrates River in southern Iraq for different pollutants, including heavy metals, which tend to accumulate in the bodies of living has chosen four types of fish that resides in Iraqi waters for the purpose of examining the three important elements Cd concentration, Cu, and Zn in the tissues of fish in different tissues gills, skin, liver, bones and muscles and used as evidence vital to pollution .

## Materials and Methods

Description of study Area

Euphrates River is one of the important sources of water for human consumption and industrial purposes Figure (1).

 

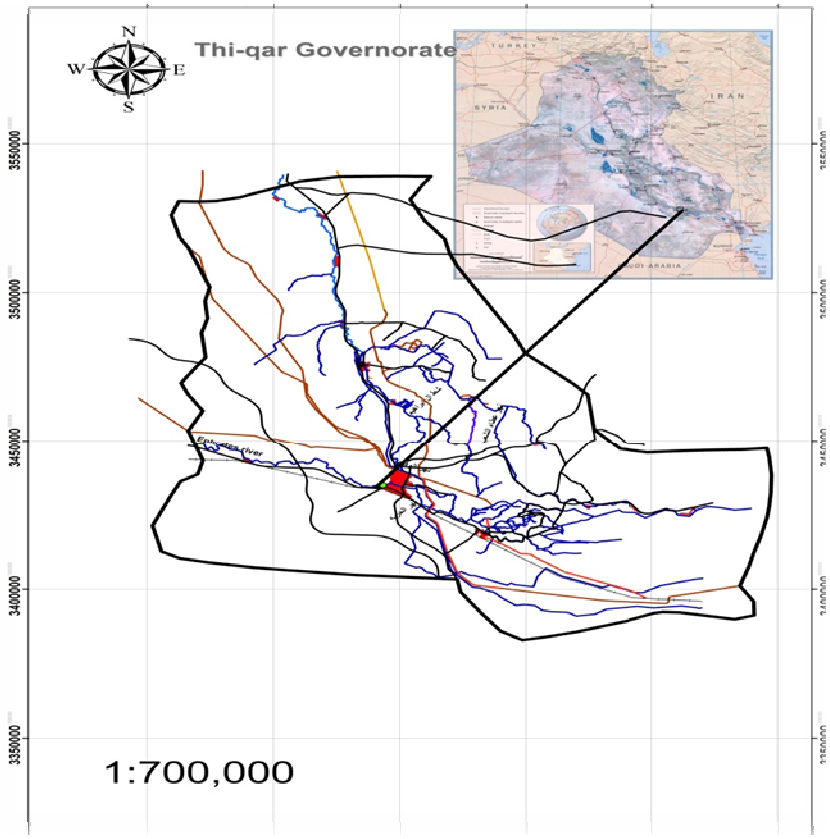


Figure 1: Map Showing the Sampling Location in the Euphrates River at Thi-Qar Province

The quality of the Euphrates River is deteriorated when it comes out of Shinafiyah area in the city of Diwaniya after passing Samawah that causes the springs of subsurface areas the salinity to rise to 6.4 g / liter (Hussein,*et. al.,* 2006). The Euphrates River Penetrates geographical area of the city of Nasiriya from the North West Frontier Badhae city at kilometer 911.5 of the Euphrates River, the beginning of the study area to the electricity station of Nasiriya city (Long 31.042393° ,Lat 46.216016°) , River width is between (25-84 m) fishing operations are in those area located on the banks of the river, use electric fishing for collecting fish specimens that are put immediately in a small container of crushed ice to continue Fish processing in the laboratory. Samples of four species of fish spread in Euphrates in the area from Badhae region to the city of Nasiriya are gathered in July 2015 to study the bioaccumulation of heavy metals i.e. Cadmium , Copper and Zinc in the tissues of fish, which are used as a good reference for contamination of the environment with heavy elements (Salman *et. al.,* 2007) . Investigating species have specific features , length between 15-20 cm and O-group age . Fish were collected with plastic container which have crashed ice gill , skin, liver, bones and muscles of each type of fish have been isolated by specific method (Lucky, 1977) in the anatomy of the fish . Tissue of fish are separated , cut into small pieces , mixed well and then dried at a temperature of 105 C for 24 hours and then milled and digested according to Canli and kalay (1998) and measured by atomic absorption apparatus (FAO,1983) ,expressed it ( mg / kg dry weight ) and used the random tests in assessing global C.R.D. Transactions 3 × 5 × 4 for four different fish and five different tissues and three replicates and analyzed by SPSS to show ANOVA (schedule of analysis of variance AL-Rawi (1992) .

## RESULTS AND DISCUSSIONS

Cadmium

Table (1) the rate of the presence of cadmium in four types of freshwater fish, *Barbus sharpeyi, Aspius vorax,, Silurus triostegus* and *Mystus pelusius*. The results showed that the rate of cadmium for fish above amounted to 34.628, 24.276, 1.590, 6.017 ppm, respectively. Figure (2) It excelled treatment *Barbus sharpeyi* morally when p <0.05 for all other fish transactions followed *Aspius vorax* treatment with the lowest recorded cadmium transactions are treated running has the difference is due to the accumulation of heavy metals in the bodies of fish to various factors such as pH and water hardness and the level of pollution in the ocean water in addition to age and physiological condition of the thickness (Vanden Broke *et. al.,* 2002) and other factors such as salinity and temperature (Kalay,1998). The presence of cadmium in the tissues of fish has reached the gill and skin, liver,

 

bones and muscles 18.191 ppm cadmium rates, 18.191,15.919, 15.582, 15.611, 17.835 ppm Figure (3) respectively were different tissues of fish among them mentally at the level of p <0.05 and reached the highest rate of cadmium in the gills may be due to the gills are important to the site to enter the heavy elements that cause the effects of injurious that destructive (Bols, *et. al.,* 2001). The accordance with a study (Al-Dehami, 2010) The overlap between the types of fish tissue careless reached the highest amount of cadmium levels in *Barbus sharpeyi* fish gills and in the treatment amounted to 39.110 ppm and moral superiority when p <0.05 for all interactions. The lowest value of the rates of cadmium has appeared in gill running and amounted to 1.554 ppm may be due to the diversity of patterns of nutrition at Fish played a major role in increasing the concentration of elements in the muscles and other body parts (Forstner, *et. al.,* 1981).

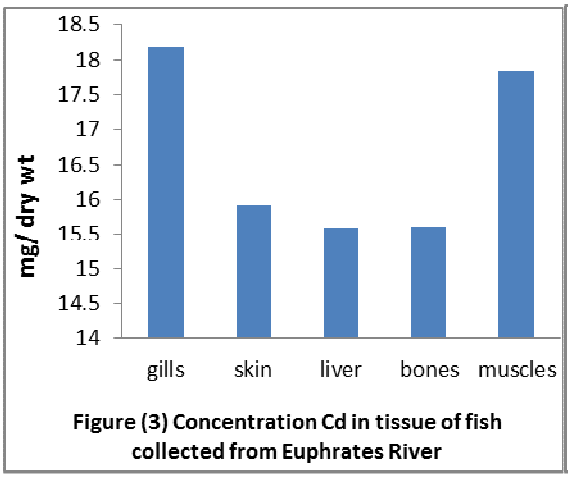


**Figure (3) Concentration Cd in tissue of fish collected from Euphrates River**

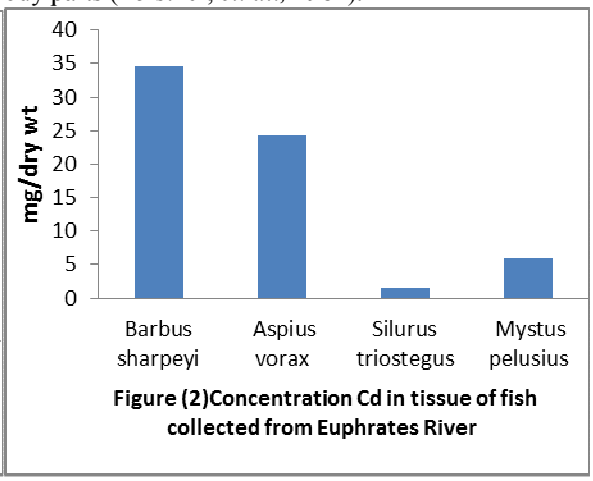


**Figure (2)Concentration Cd in tissue of fish collected from Euphrates River**

Copper

Table (2) the rate of the presence of copper in four types of freshwater fish, *Barbus sharpeyi, Aspius vorax,, Silurus triostegus* and *Mystus pelusius*. The results showed that the copper rate of the fish above stood at 58.7760, 41.2280, 47.0917, 13.5500 ppm respectively excelled treatment Biny on all other fish transactions at the level of p <0.05,figure (4) followed by treatment of *Silurus triostegus* and *Aspius vorax* The lowest coefficients for copper is *Mystus pelusius*.The treatment has been largely due to . Various species of fish from the same water body that may accumulate different amounts of metals. Interspecies differences in metal accumulation may be related to living and feeding habits . Kidwell *et al.,* (1995) . Copper Seen weave Fish has copper gill, skin, liver, bone and muscle rate is reached 40.397, 22.443, 77.951, 33.524, 25.953 ppm , respectively ,figure(5) have varied weave fish including the moral level of p <0.05 and was the highest rate of copper in the liver and the least in the skin and is due . The liver is the main organ for metal regulation in fish . Exposure to metals results in induction of metallothioneins production and subsequent binding of metals to the protein . (Vineeta, et. al.,2007).The overlap between the fish species and tissues studied the market reached the highest amount of the rates of copper is in the *Barbus sharpeyi* fish in a transaction liver reached 140.3500 ppm and the superiority of moral when p <0.05 between the size of overlaps either the lowest value of the rates of copper appeared in the bones of *Mystus pelusius* amounted to zero due to agree with study (Mount and Stephan, 1967) as between the accumulation of elements in the liver refers to the exposure of fish to pollution in prior periods.

Zinc

Table (3) the rate of the presence of zinc in four types of freshwater fish, *Barbus sharpeyi, Aspius vorax,, Silurus triostegus* and *Mystus pelusius*. The results showed that the rate of zinc fish above amounted to 112.9407, 66.7960, 146.4250, 74.3832 ppm respectively excelled treatment *Silurus triostegus* all other fish transactions at the level of p <0.05 and followed by *Barbus sharpeyi* treated either lesser treatment recorded it figure (6) for chalk and results show high levels of zinc in the tissues of fish agrees with the study (Hussein and fahad, 2012) in his study on the concentration of heavy metals in the muscles *Liza abu* in Gharraf River, where the study showed a substantial increase of zinc on cadmium and Copper

 

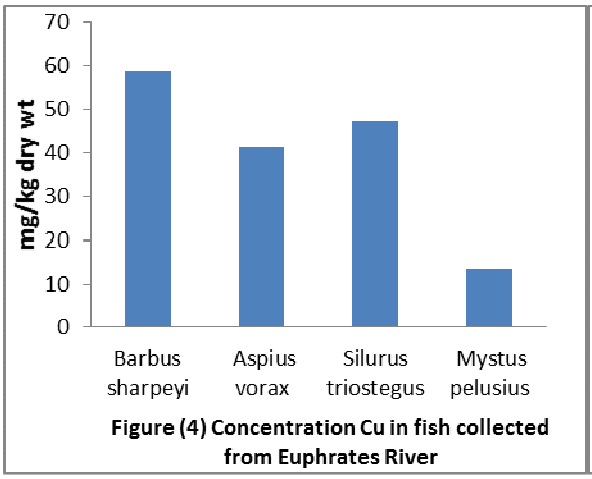


**Figure (4) Concentration Cu in fish collected from Euphrates River**

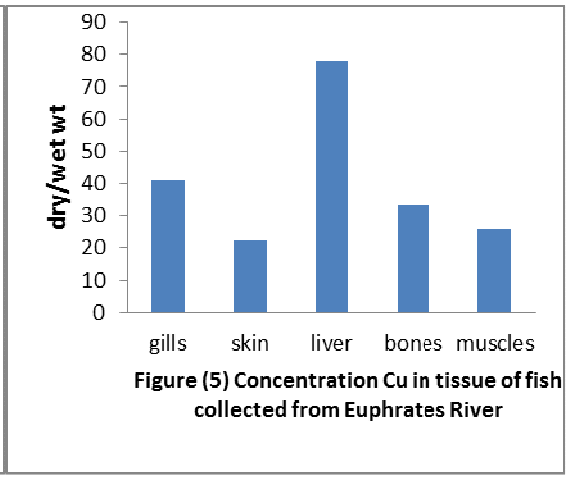


**Figure (5) Concentration Cu in tissue of fish collected from Euphrates River**

. rates zinc presence in the tissues of fish gills and skin, liver, bones and muscles is 128.551, 108.778, 114.022, 96.731, 52.599 ppm respectively were different tissues of fish among them moral level of $p < 0.05$ figure (7) and reached the highest rate of zinc in the tissue of gills and least in the muscles and the reason that high zinc levels in the tissue of gills because of what belongs to the tissue of the nature and functionality enables of ionic regulation and osmosis giving cell tissue absorption of soluble elements consistent with the ability of the study (Akbar and Al-Khazali, 2012).Also returning to Maximum accumulation of metals was recorded in gills as they were in direct contact with ambient medium and are the main site of water movement , while minimum accumulation was recorded in muscles. (Vineeta, *et. al.,* 2007) .

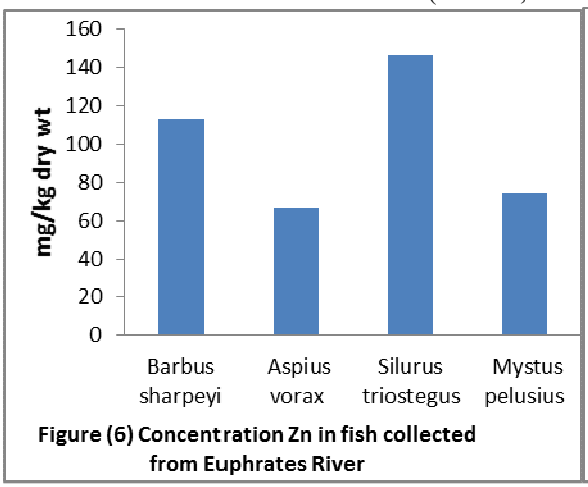


**Figure (6) Concentration Zn in fish collected from Euphrates River**

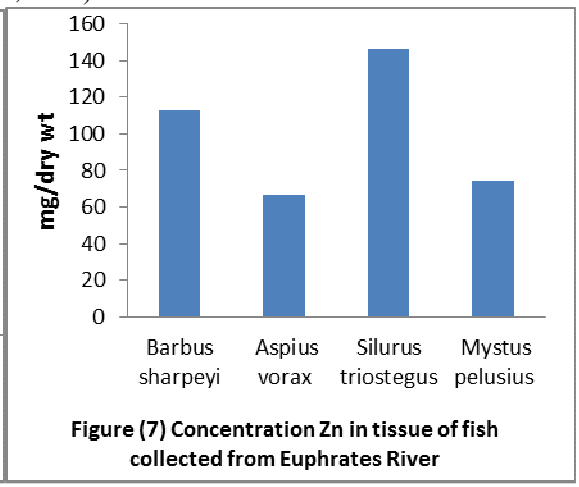


**Figure (7) Concentration Zn in tissue of fish collected from Euphrates River**

The overlap between the types of fish and parts careless reached the highest amount of the rate of zinc is in the thickness of the running and in the treatment of gills reached 190.2500 ppm and the superiority of moral at the level of $p < 0.05$ The lowest value of the rates of zinc was recorded in the muscles of *Mystus pelusius* reached 34.2500 ppm may be largely due to the diversity in the concentrations of heavy metals in the body is the result of the contrast between a member and another, and the ability of any tissue or by the accumulation of an item can be observed from the accumulated amount of the element (Adeyeye, *et. al.,* 1996). And accumulation of muscle refers to the constant exposure to pollutants and periods of time speaking by increasing metabolism in these organs (Schulz and Martins-Junior, 2001) is consistent with a study ( Al-Khafaji, et. al.,2011) On Gharraf River as record concentrations of low zinc in the muscles of fish *Silurus triostegus*.

**Table (1) Cadmium levels (g/ kg) dry wt. of various tissues for four fish species in the Euphrates**

| | gills | skin | liver | bones | muscles | |
|---|---|---|---|---|---|---|
| *Barbus sharpeyi* | 39.110 | 33.490 | 33.490 | 33.560 | 33.490 | 34.628 |
| *Aspius vorax* | 29.280 | 24.310 | 18.680 | 22.260 | 26.850 | 24.276 |
| *Silurus triostegus* | 1.554 | 4.441 | 4.327 | 3.331 | 3.625 | 1.590 |
| *Mystus pelusius* | 4.375 | 5.875 | 5.833 | 6.625 | 7.375 | 6.017 |
| | 18.191 | 15.919 | 15.582 | 15.611 | 17.835 | |

 

**Table (2) Copper levels (g/ kg) dry wt. of various tissues for four fish species in the Euphrates**

| | gills | skin | liver | bones | muscles | |
|---|---|---|---|---|---|---|
| *Barbus sharpeyi* | 30.7200 | 35.0900 | 140.3500 | 35.0900 | 52.6300 | 58.7760 |
| *Aspius vorax* | 26.3200 | 21.9300 | 83.3300 | 52.6300 | 21.9300 | 41.2280 |
| *Silurus triostegus* | 86.0833 | 17.2500 | 65.1250 | 46.3750 | 20.6250 | 47.0917 |
| *Mystus pelusius* | 20.6250 | 15.5000 | 23.0000 | .0000 | 8.6250 | 13.5500 |
| | 40.937 | 22.443 | 77.951 | 33.524 | 25.953 | |

**Table (3) Zinc levels (g/ kg) dry wt. of various tissues for four fish species in the Euphrates**

| | gills | skin | liver | bones | muscles | |
|---|---|---|---|---|---|---|
| *Barbus sharpeyi* | 122.1700 | 140.9500 | 162.2933 | 73.4000 | 65.8900 | 112.9407 |
| *Aspius vorax* | 86.1600 | 93.6600 | 46.3800 | 68.1500 | 39.6300 | 66.7960 |
| *Silurus triostegus* | 190.2500 | 138.5000 | 159.7500 | 173.0000 | 70.6250 | 146.4250 |
| *Mystus pelusius* | 115.6250 | 62.0000 | 87.6660 | 72.3750 | 34.2500 | 74.3832 |
| | 128.551 | 108.778 | 114.022 | 96.731 | 52.599 | |

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