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**Research Article**

# Determination of Some Heavy Metals Concentration in Muscle and Bone of Osteoglossidae, Catfish, and Tilapia Fish of River Yobe

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**Abstract:** This paper is aimed at determining the concentration of some heavy metals in catfish, tilapia and osteoglossidae of River Yobe. Analysis of heavy metals was conducted by the use of atomic absorption spectrophotometry method. Result from this study indicate that osteoglossidae contain the higher concentration of Cu, Pb, Fe, Cd and Cr in both muscle and bone with a values of (0.821-0.724mg/kg),(0.312-0.295mg/kg),(0.234-0.194mg/kg),(0.316-0.283mg/kg) and (0.743-0.673mg/kg) follow by Catfish with a value of (0.675-0.583mg/kg), (0.265-0.198mg/kg), (0.193-0.145mg/kg),(0.275-0.214mg/kg) ,and (0.675-0.583mg/kg).Tilapia has the lowest value of (0.659-0.521mg/kg), (0.213-0.178mg/kg),(0.145-0.138mg/kg), (0.243-0.185mg/kg), and (0.652-0.632mg/kg).respectively. The concentration obtained is within the minimum permissible limit set by WHO. On the basis of this findings tilapia fish (tilapia Zilli), catfish (Clarias anguillaris) and Osteoglasidae (Heterotis niloticus) both from River Yobe could be considered safe for consumption but the need for continuous monitoring to prevent bioaccumulation is necessary.

**Keywords:** Osteoglossidae, River, Tilapia, Catfish, Heavy Metals.

## INTRODUCTION

Fish are one of the most widely distributed organisms in the aquatic environment and considered as one of the main protein sources for human (Rashed, 2001) Pollution of different environments is due to human activities in recent years. One of such pollution is marine pollution by heavy metals. The heavy metals are accumulated in the marine environment then transfer to the marine organisms e.g. fishes by different ways. When the concentrations of heavy metals exceed the required levels, they become toxic and cause several health problems (Goldstein, 1990; Lobbana and Harrison,1994; Gledhill *et al.*, 1997; Malik, 2004) . The fishes became sick then die when too much contamination occurs (Gurnham, 1975). Heavy metals enter the aquatic ecosystem from both natural and anthropogenic sources. Entry may be as a result of direct discharges into both fresh and marine ecosystems or through indirect routes such as dry and wet deposition and land run-off (Biney *et al.*, 1994). Important natural sources are volcanic activity, continental weathering and forest fires. The contribution from volcanoes may occur as large but sporadic emissions due to explosive volcanic activity or as other low continuous emissions, including geothermal activity and magma degassing (FAO 1992). The anthropogenic sources include; mining effluents, industrial effluents, domestic effluents and urban storm-water run-off, atmospheric sources e.g. burning of fossil fuels and petroleum industry activities. Contamination with heavy metals is one of the most serious problems in the aquatic environments. In Nigeria, Environmental pollution with heavy metals is one of the biggest problems that face human being. Metals are natural trace components of the aquatic environment, but their levels have been increased due to industrial wastes, geochemical structure, agricultural and mining activities. There are certain heavy metals such as As, Cd, Cu, Pb, Ni and Zn are common pollutants and came from different natural and anthropogenic sources. Metals are partitioned among the various aquatic environmental compartments (water, suspended solids, sediments and biota) and can occur in dissolved, particulates or complex form. Metals have been

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reported to affect cellular organelles and induced toxicity & carcinogenicity.( Yahya *et al., 2018*). Heavy metal contamination in aquatic environments is of critical concern because of their toxicity and accumulation in aquatic organisms. Many dissolved metals entering rivers are adsorbed onto colloid particulates; at high alkalinity and pH, the metals particularly lead and cadmium, precipitate by forming complexes, further influencing the metal toxicity (Dimari *et al.,* 2008). Aquatic organisms such as phytoplankton, zooplankton, fishes and other higher organisms, during feeding may incorporate these heavy metals into their bodies where they may remain for a very long time in sea foods. The metals that accumulate in the tissue of the sea food, concentrate to high amount and are passed on in the food chain. Fishes, being major components of most aquatic habitats have also been recognized as good bio-accumulators of organic and inorganic pollutants (King and Jonathan, 2003). They also act as bio-indicators of heavy metal levels in such environments, and can be used to evaluate the health of such aquatic ecosystems (Farkas *et al.,* 2002; Yousuf and El-Shahawi, 1999).

The aim of this work is to determine and compare the concentration of heavy metals (Cu. Cd, Pb, Fe and Cr) In Osteoglasidae (Heterotis niloticus), tilapia(Zillii), and catfish(Clarias anguillaris) in River Yobe, Yobe State, Nigeria . Using atomic absorption spectrometer. When the concentrations of heavy metal exceed the required levels, they become toxic and cause several health problems So, this work will create awareness on the harmful effect of heavy metals consumption and establish a baseline data on the current pollution status of River Yobe.

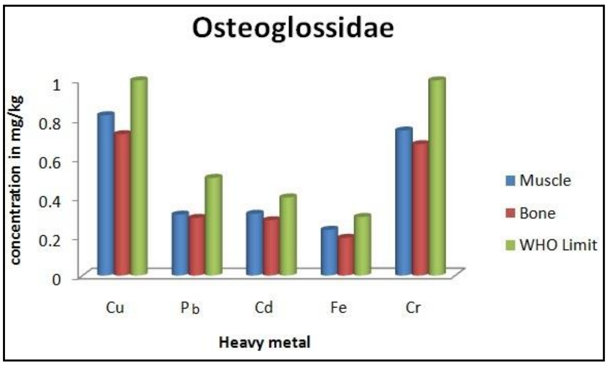
## MATERIALS AND METHODS

Sampling was carried out during dry season from Febuary, 2018 to May, 2018.Sampling method was conducted a ccording to the method described by(Adeniyi *et al.,* 2007). The nitric acid was purchased from Sigma Aldrich and used without further purification .The Atomic absorption spectrometer with model 210 VGP was used to determine the concentration of heavy metal in the fish. The fish samples were collected from three different location. Total of 18 samples of fish were collected (6 Tilapia, 6 Catfish, 6 Osteoglosidae) b and 18 during by local fishermen lebelled and transported in an ice box to the laboratory . The fish samples were identified to species on standard taxonomic keys (Mohsin and Ambak, 1991; Kottelate *et al.,* 1993). The fish samples was properly cleaned, then washed with distilled water to remove planktons and other external adherent it was dried weighed, and frozen at -10$^{o}$C prior to analysis.

For analysis the fish samples were defrosted for two hours . The Muscles and bones were removed using plastic knife and were dried at room temperature for two weeks. The dried muscle and bones were digested as follows: 1.0 g of each was dissolved in 1M nitric acid (10 ml), boiled to complete the dissolution and filtered. The obtained precipitate was washed with nitric acid (1M) and transferred to 25 ml volumetric flask and fill up to the mark with de-ionized water.

## RESULTS AND DISCUSSION

The levels of chromium(Cr), cadmium(Cd), lead (Pb), copper (Cu) and iron (Fe) in Osteoglossidae, Catfish and Tilapia fish from River Yobe were determined using atomic absorption spectrometer and the result are presented in figure 1, 2 and 3



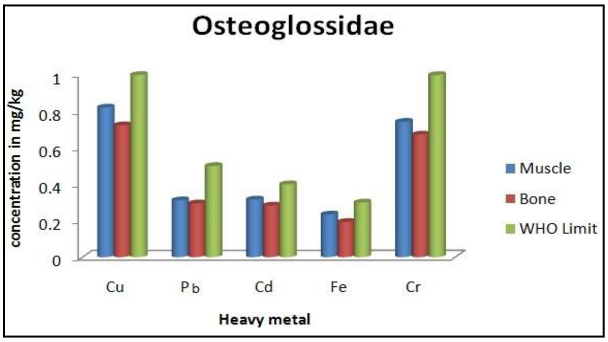




**Figure1**.

The result of the analysis indicated that osteoglossidae from Yobe river contained high concentration of Copper, and Chromium with the value of (0.821-0.724mg/kg) and (0.743-0.673mg/kg) muscle to bone respectively. The concentration of Cadnium in muscle is higher than that of lead with (0.316mg/kg) and (0.312mg/kg) while the concentration of lead is higher in bone compared to that of Cadmium with the value of (0.295mg/kg) and (0.283mg/kg) Lead poisoning is a type of metal poisoning caused by lead in the body (WHO, 2016). Symptoms may include: abnormal pain, constipation, headaches, irritability, memory problem, inability to have children and tingling in the hands and feet (LIW, 2013). It causes about 10 % of intellectual disability of otherwise unknown causes and can result in behavioural problems (WHO, 2016). Some of the effects are permanent (WHO, 2016). In severe cases anaemia, seizure, coma or death may occur (LIW, 2013; WHO 2016) causes includes exposure of lead via contaminated air, water, dust, food, consumer products (WHO, 2016). Therefore, it's not advisable to eat the bone of osteoglossidae of River Yobe. this finding is similar with that of (sani 2011) which stated that The bone recorded the highest concentration of lead in the mean and standard deviation value of 7.60±2.33mg/kg. Iron has the lowest concentration of (0.234-0.194mg/kg) muscle to bone respectively.

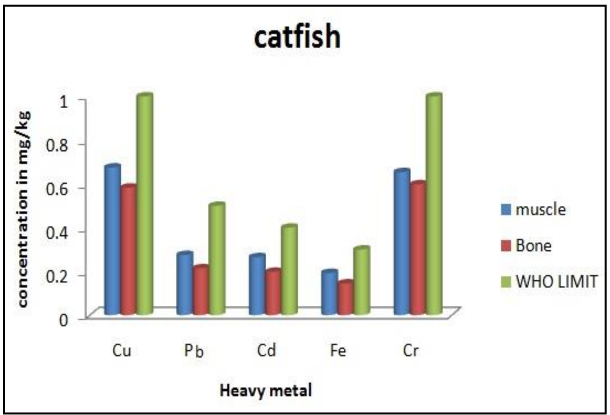



**Figure 2**

The result of the analysis indicated that catfish from Yobe river contained high concentration of Copper and Chromium with the value of (0.675-0.583mg/kg) and (0.654-0.598mg/kg) the concentration of copper is high in muscle than Chromium while that of Chromium is high in bone than copper. Similar finding were reported by Dimari *et al.*, (2008). It was found that the concentrations of chromium in the different organs of three fish species caught from Alau Dam varied from one organ to another. Ibrahim *et al.*,(2018) reported that Cr was found to be above the permissible limits set by WHO (1985) in which the bones has chromium concentration of 0.84 kg/mg, gills 0.86 mg/kg and muscles 0.84 kg/mg during the wet seasons, so also it concentration in the dry seasons were above the set permissible limits. Therefore, due to the health effect of chromium to human as result of it accumulation it is recommended not to eat the bones, muscles and the gills of the catfish caught from Lake Njiwa Adamawa state. The concentration of chromium in this study is within permissible limit and catfish caught from River Yobe is safe for consumption. The concentration of Cadmium and lead were found to be (0.275-0.214mg/kg) and (0.265-0.198mg/kg) muscle to bone this finding disagree with the report of (Sani 2011) which reported that the study reveals that, the bone of cat-fish recorded the highest lead level concentration (7.60±2.33mg/L equivalent to 0.338±0.21m g/g wet weight). Iron has the lowest concentration of (0.193-0.145ssmg/kg) muscle to bone respctively.

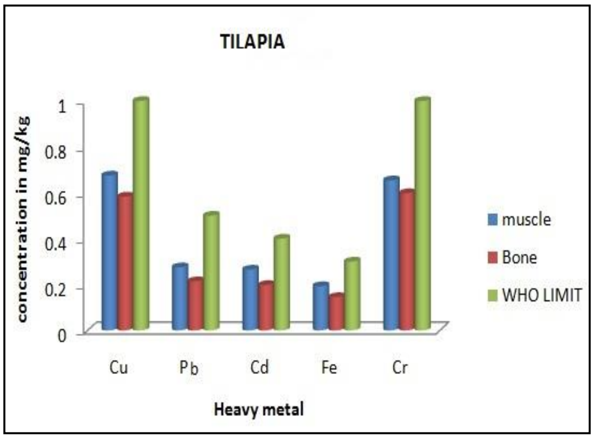



**Figure3**.

The result of the analysis indicated that Tilapia fish from Yobe River contained high concentration of Chromium (0.652-0.632mg/kg) and copper (0.659-0.521mg/kg), the concentrations of chromium in the bones and muscles of Tilapia fish were not detected in both the seasons (Ibrahim *et al.*, 2018 ). Based on this study it indicate that Tilapia fish from River Yobe contained significant amount of chromium and copper in both bone and muscle as compared to Tilapia fish caught from Lake Njiwa Adamawa state. Cadmium is a nonessential trace metal that is potentially toxic to most fish and wildlife, particularly freshwater organisms (Dimari *et al.*, 2008). The concentration of cadnium is higher than that of lead with the value (0.243-0.185mg/kg). and (0.213-0.178mg/kg) muscle to bone respectively. Ejike and Liman (2017) reported the high concentration of Pb and Cd (2.40 mg/kg and 1.30 mg/kg) in the muscle part of Tilapia. Iron has the lowest concentration of (0.145 mg/kg -0.138mg/kg )muscle to bone respctively.

## CONCLUSION

The levels of heavy metals in fish vary in various species and different aquatic environment (Sani, 2011). The result of this study indicated that the concentration of copper and chromium is high in the three different fish species. Different fish species may support the view that there is a variation in ability of different fish organs to accumulate heavy metals (Joy 2013). the concentration of Cu, Pb, Fe, Cd and Cr is high in the muscle than in bone of all the fish samples. Result from this study indicate that osteoglossidae contain the higher concentration of Cu, Pb, Fe, Cd and Cr in both muscle and bone with a values of (0.821-0.724mg/kg),(0.3120.295mg/kg),(0.2340.194mg/kg),(0. 3160.283mg/kg),and(0.7430.673mg/kg) follow by Catfish with a value of (0.675-0.583mg/kg),(0.265-0.198mg/kg),(0.1930.145ssmg/kg), (0.275-0.214mg/kg) ,and (0.675-0.583mg/kg). Tilapia has the lowest value of(0.6590.521mg/kg),(0.2130.178mg/kg),(0.1450.138m g/kg),(0.2430.185mg/kg)and(0.6520.632mg/kg).respect ively.Therateof bioaccumulation of heavy metals in aquatic organisms depends on the ability of the organisms to digest the metals and the concentration of such metal in the water body. Also, it has to do with the concentration of the heavy metal in the surrounding soil sediments as well as the feeding habits of the organism (Eneji *et al.,* 2011). Osteoglossidae recorded the highest concentration of lead (0.295mg/kg). The concentration obtained is within the minimum permissible limit set by WHO. This findingis similar with that of (Olaifa *et al.*, 2004) which stated that Generally, lower concentrations of heavy metals occurred in gills and bones than in the intestines and muscles

On the basis of this findings tilapia fish (tilapia Zilli),catfish(Clariasanguillaris)andOsteoglasidae(Heterotis niloticus) both from River Yobe could be considered safe for consumption but the need for continuous monitoring to prevent bioaccumulation is necessary It also reveals that River Yobe has low level of metal pollution as compared to Lake Njuwa in Adamawa and Epe lagoon in lagos (IBRAHIM, 2018; OLOWU *et al.,* 2010 ) . Adquate monitoring and legistilative provision should be monted in other to protect and enhanced the better quality and resource of River Yobe .

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