E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2019; 7(4): 385-387

www.fisheriesjournal.com
Received: xx-05-2019
Accepted: xx-06-2019

Elinge CM
Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

Obaroh IO
Department of Animal and Environmental Biology, Kebbi State University of Science and Technology, Aliero, Nigeria

Muhammad A
Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

Yanah YM
Department of Biochemistry, Kebbi State University of Science and Technology Aliero, Nigeria

Abdullahi LY
Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

Correspondence
Elinge CM
Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Nigeria

Determination of some heavy metals in three selected Fish species from river Zamare, Nigeria

Elinge CM, Obaroh IO, Muhammad A, Yanah YM and Abdullahi LY

Abstract
Human activities had been the major cause of pollution in water globally. The concentrations of heavy metals being a major pollutant could be assessed using aquatic vertebrate. Thus this study was carried out to evaluate the concentrations of some heavy metal (Zn, Mn, Fe, Cu, Cd, Cr, Ni, and Pb) both in gills and muscle of *Synodontis schall* and *Synodontis membranaceus* in River Zamare. Analyses were carried out using Atomic Absorption Spectrophotometer (AAS). The results showed that, gills of the two fish species had highest concentration of heavy metals than the muscles. Nickel observed in these studies was considerably higher than the recommended limit for heavy metals with the gills of *Synodontis schall* having the highest concentration of 1.90±0.39mg/L. Lead was not detected in both gills and muscles of the two fish species, Chromium was also not detected in the gills of the two fish species. There was no significance difference (P>0.05) in the concentration of heavy metal in both muscles and gills. This study shows that, there is a need for proper monitoring of the river.

Keywords: Concentration, heavy metals, gills, muscle, analyze, concentration and pollution

1. Introduction
Pollution of rivers by heavy metal has become an issue of great concern over the last few decades. Not only does it pose a threat public water supplies, but also to aquatic fauna and flora a fisheries resources often consume by human. Heavy metal is defined as sub-set of element that exhibit metallic properties with high density and high toxicity. They include lanthanide, actinide, transition metals and metalloid. They occur naturally as they are component of lithosphere and can also be released into environment through vulcanization, soil erosion, withering of rock and dissolution of water soluble salt [1]. The bioaccumulation of heavy metal in tissue of aquatic organism have been reported to be an indirect measure of the abundance and availability of metals in the aquatic environment [2].
Dumping waste into rivers contribute to the large problem of the river pollution, which can seriously damage the aquatic environment and cause health hazard to people [3]. Runoff is another sources of chemical deposition into water courses, particularly, various hydrocarbon and metals[4]. Insecticide apply to water in order to control mosquitoes larvae, some fisherman and poachers uses poison to harvest fish illegally thus causing harm to the water body. Pesticides and their empty container are carelessly dumped into rivers by farmer. Often the river also get contaminated from abattoir waste. Increase in the amount of heavy metals usually cause disruption in the ecological balance of a river.
High concentration of heavy metals in water could be toxic to the aquatic organism as a result this could decline the fish population in the water body [5]. Their accumulation in aquatic food web is also a potential threat to public health. Heavy metals are of high priority pollutants because of their relatively high toxic effects and accumulation in the environment. The pollution of aquatic environment by heavy metals and successive uptake in the aquatic food chain poses hazard to human population. Aquatic environment has been reported to be grossly affected by increase in human activities [6]. Fish is considered as one of the most significant indicators of heavy metal pollution in aquatic environment[7]. Fish can take in and absorbed element and heavy metals from their surrounding water. When fish is exposed to heavy metal either in their food or water, they tend to takes these metals up which may accumulate in different tissue in significant amount thus leading to toxicological effect on the organism [8]. Some fish species that are consumed have been widely investigated for hazardous heavy metal

That could affect human health when consumed.
Synodontis schall and *Synodontis membranaceus* are among the most captured fish in River Zamare, thus the need to investigate their gills and muscles for possible heavy metal contamination.

2. Materials and Method

2.1 Study area

This study was conducted on Zamare River in Yauri local government area of Kebbi state, Nigeria. Zamare River is one of the major rivers in Kebbi state. The river is connected to some villages like Gumbi, Yauri and kainji dam. Zamare River serve as a sources of drinking water for both inhabitant of the community and their domestics animal. Several activities such as fishing, washing of household material, trucks, cars and bathing are carried out near the river.

2.2 Collection of fish samples

The two different species of fish namely *Synodontis schall* and *Synodontis membranaceus* were bought from fishermen, fishing along the river. Samples were collected in ice chest filled with ice cubes and were immediately transported to the laboratory where the gills and muscles section were removed and dried in an oven.

2.3 Sample preparation

Fish samples were weighed and decapitated, the gills and muscle were separated. The muscle was cut into smaller pieces using knife and then dried in an oven for 48hours at 60^0C. The dried gills and muscle were ground and milled with a mortar and pestle into powdered. The ground gills and muscle were put in a dry polythene bag and stored until when needed.

2.4 Digestion of the Fish Samples

Four gram (4g) of the ground muscle and gills were digested with 10 ml of nitric acid (HNO_3) and 4ml of Perchloric acid, the mixture was heated on the hot plate for 30minites at 85^0C. After completing the digestion process, the residue was allowed to cool and was filtered into 50 ml volumetric flask. Distilled water was added to it to fill up to the mark. The filtrate was transferred into pre - cleaned sample bottle and stored under room temperature, for further atomic absorption spectrophotometer (AAS), analysis [9].

3. Results and Discussion

At the end of this study, it was observed that the gills of the two fish accumulated higher concentration of heavy metals than the muscle, this could be because the gills of the fish function as excretory organs for some heavy metals and it is in direct contact with the water body. Similar observable was reported by Guerrin *et al.* [10]. And Saeed and Sakar [11].
The concentration of nickel observed in the gills and muscles of the two fish in this study were observed to be higher than WHO [12] maximum permissible limit (0.5-0.6ppm).
The concentration of nickel observed in the gills of *Synodontis schall* (Table 1) was higher than the concentration of nickel observed in the gill of *Synodontis membranaceus* (1.90±0.39 and 1.39±0.95ppm) but *Synodontis membranaceus* (Table 2) had higher concentration of nickel in the muscle than the muscle of *Synodontis schall* (1.44±0.32 and 1.27±0.53ppm). The high concentration of nickel observed in this study could be due to the presence of nickel in the detergent used in washing cloth and automobile in the river. Lead was not detected in the gills and muscle of the two fish sample while chromium was detected only in the muscle of the two fish samples. Higher concentration of manganese was observed in gills and muscle of *Synodontis schall* (0.83±0.49 and 0.39±0.25ppm), while the lower concentration was in gills and muscle of *Synodontis membranaceus* (0.47±0.14 and 0.36±0.18ppm). The presence of manganese in both species could be as a result of black smith and mechanic work close to the river.
As seen in Table 1 *Synodontis schall* had high concentration of iron in the gills (1.17±0.43ppm) than the gills of *Synodontis membrane*, however high concentration of iron was also observed in the muscle of *Synodontis membranaceus* (0.74±0.39 and 0.65±0.46ppm respectively). Earlier study reported by obaroh *et al.* [6]. On river Jega, they reported high concentration of iron from three sampling stations. This higher concentration could also be attributed to the fact that iron are naturally abundant in soil in Nigeria since the sources of iron depositories are the aquatic system [13]. The concentration of copper in the gills and muscle of *Synodontis membranaceus* (0.50+0.12 and 0.68+0.42ppm) were higher than the gills and muscle of *Synodontis schall* (0.28±0.09 and 0.27±0.03 ppm). The concentration of copper observed in the gills and the flesh of two fish species were below WHO permissible limit of 1-3ppm [10].
High concentration of cadmium was observed in the gills and the muscle of *Synodontis membranaceus* (0.07±0.05and 0.18±0.15 ppm), high concentration of zinc was also observed in the muscle of *Synodontis membranaceus* (0.28±0.07 ppm) than the muscle of *Synodontis schall* (0.15±0.02 ppm), *Synodontis membranaceus* had high concentration of zinc in the gills then *Synodontis schall* (0.15±0.02 ppm). Similar observation was made by Lawson [14]. The variations observed in both gills and muscle of the two species of fish could be as a result of varied activity or metabolism process and the ability of each species to detoxify the heavy metals in their system. Toxic metals are not biodegradable instead they bioaccumulation in tissue of living organism. A report made by Bubb and Laster [15] opined that heavy metal pollution in aquatic environment and its subsequent uptake in the food chain cause adverse health effect to human. Hence it could result in morphological abnormalities, neurophysiological disturbance and genetics alteration of cells. They have also been reported to affect enzymatic and hormonal activities as well as growth rate.

Table 1: Heavy Metals Concentration (Ppm) in Gills and Flesh of *Synodontis schall*

Sample	Fe	Cu	Pb	Ni	Cr	Cd	Mn	Zn
Gills	1.17 ± 0.43^b	0.28 ± 0.09^a	N.D	1.90 ± 0.39^c	N.D	0.06 ± 0.03^a	0.83 ± 0.49^a	0.60 ± 0.42^a
Muscle	0.65 ± 0.46^a	0.27 ± 0.03^a	N.D	1.27 ± 0.53^a	0.13 ± 0.09^a	0.12 ± 0.08^a	0.39 ± 0.25^a	0.15 ± 0.0^a
WHO (2003)	1-3	1-3	0.1-0.2	0.5-0.6	0.05-0.15	2.00-5.00	0.5-0.6	0.10-0.75

Mean Standard Deviation of Triplicate Result; N.D- Not detected

Table 2: Heavy Metals Concentration (Ppm) in Gills and Flesh of *Synodontis membranaceus*

Sample	Fe	Cu	Pb	Ni	Cr	Cd	Mn	Zn
Gills 0.29±0.06 [a]	0.87±0.68[a]	0.50±0.12[a]	N.D	1.39±0.95[a]	N.D	0.07±0.05[a]	0.47±0.14[a]	
Muscle [a]	0.74±0.39[a]	0.68±0.4[a]	N.D	1.44±0.32[a]	0.16±0.03[a]	0.18±0.15[a]	0.36±0.18[a]	0.28±0.0
WHO (2003) 0.75	1-3	1-3	0.1-0.2	0.5-0.6	0.05-0.15	2.00-5.00	0.5-0.6	0.10-

Mean Standard Deviation of Triplicate Result; N.D- Not detected

4. Conclusion

Some heavy metal are essential element, metal like zinc, chromium, copper, manganese and iron they are needed in trace as they play important role in the process of life. However at high concentration these metals are toxic to human and animal life by affecting the respiration, feeding and other physiological functions. Reduction of anthropogenic activities in riverine area to the average standard has become a necessity; furthermore, with efficient monitoring it is hope that human activity along the river bank will be reduced to the best minimal.

5. References

1. Fergussion M. Determination of heavy metals in fish water and sediment of Ausar Dam Lake in Turkey Iran. J Environ Health Science. 1990; 6(2):73-80.
2. Kucuksezgin F, Condos O, Altay E, Uluturhan ED. Assessment of marine pollution in lzmur. 2006; 5:35-40.
3. Botkin D, Keller EA. Environmental science; Earth as a living planet 2nd Edition. Canada John Wiley and Sons, Inc, 2006.
4. Maltby l, Farrow DM, Boxall ABA, Callow P. Betton C1. The effect of motorway run-off on freshwater ecosystem. Field study. Environment Toxicological Chemicals. 1995; 14:1077-1092.
5. Ezeronye OU, Ubalua AO. Studies on the effect of abattior and industrial effluents on the heavy metals and microbial quality of Aba River in Nigeria. African Journal Biotechnology. 2005; 4:266-272.
6. Obaroh IO, Elinge CM, Nwankwo C. Assessment of some heavy metals and physico-chemical parameters of Jega River, North Western Nigeria. International Journal of Natural and Applied Science. 2012. 8:78-81.
7. Rashed, MN. Monitoring of environmental heavy metal in fish from Nasser lake Environmental International Journal. 2001. 27:27-33.
8. Seymore, T. Bioaccumulation of metal in *Barbus marequesic* from the Olifant River, Kruger National Park, and lethal level of Mn to juvenile *Oreochromic mossambicus*. M. Sc thesis, Rand Afrikaans University, South Africa, 1994.
9. Kambole, MS. Managing the water quality of the Kafue River. *In*: water demand management for sustainable development 3 water net warfsa symposium, Daressalaam. 2002, 1-6.
10. Guerrin F, Burgal-sacaze V, Saqui-samesp L. Level of heavy metal and organochlorine pesticides of cyprinid fish reared four years in waste water treatment pond. Bulletin of Environmental Contaminant and Toxicology. 1990, 44:461-467.
11. Saeed SM, Sakar SF. Impact of cage-fish culture in the river Nile on physiochemical characteristic of water, metal accumulation, histological and some biochemical parameter in fish. Abbassa International Journal of Aquatic, 2008, 179-202.
12. WHO. Malathion in cadmium in grey mullet, *Mugil cephalus* (l), from harbour waters of Visakhapatnam, drinking water. Background document for preparation of WHO guidelines for drinking water quality, 2003.
13. Adeyemi D, Anyakora C, Ungunada, A. Organochlorine pesticides residue in fish sample from Lagos lagoon, Nigeria. American Journal of Environmental Science. 2008; 4(6):649-653.
14. Lawson EO. Physico-chemical parameter and heavy metal content of water from the mangrove swamp of Lagos lagoon, Lagos, Nigeria. Advance in Biological Research. 2001; 5(1):08-21.
15. Bobb JM. Lester JN. The impact of heavy metal in low land river, and implications for man and the environment, science. Total Environment. 1991; 100:207-203.