

HEAVY METAL CONCENTRATION IN MULLET (*MUGIL CEPHALUS*) FROM MINI-NDAI CREEK, RUMUOLUMENI, PORT HARCOURT.

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Abstract

Heavy metals are elements that occur naturally but are also released into the environment from industries, and other anthropogenic activities to levels that can cause pollution. High concentrations of heavy metals in the aquatic organisms may pose a health risk to consumers of these organisms. The aim of this study was to ascertain the levels of heavy metals in Mullet fish (*Mugilcephalus*) in Mini-Ndai creek, Rumuolumeni. Heavy metals were determined using Atomic Absorption Spectrophotometer (AAS). Samples were collected in January, March and May. Data were analysed using mean and standard deviation represented in bar graph. The heavy metals analysed are Ni, Fe and Cr. The results indicated high concentrations of Fe and Ni (8.18 µg/g and 1.36 µg/g) respectively with low concentrations of Cr (0.03 µg/g). The trend of heavy metals concentration can be represented as Fe > Ni > Cr. Fe and Cr was within the safe limits while Ni was seen to be above the safe limits for human consumption. It is recommended that further studies of heavy metals should be carried out to determine the physicochemical parameters and the heavy metal content of the creek.

Keywords: Concentration, heavy metals, Mini-Ndai creek, Mullet

Introduction

Heavy metals pollution in the aquatic environment as a result of anthropogenic activities is increasing at an alarming rate and has since become a worldwide issue (Abdel-Baki *et al.*, 2011). Heavy metals level in the aquatic ecosystem has been on the increase in recent times due to the release of domestic, industrial and also agricultural wastes (Kaoud, 2015). Due to the toxicity of the heavy metals, when released to the water bodies causes a geological change. They are long-lasting and have the ability to accumulate in the organisms that inhabit the marine environment. (Ogbuagu *et al.*, 2011).

Heavy metals pollution of water and aquatic organisms as a result of urbanization and industrialization provides potential risks to their drinking and consumption and thus has a global issue (Hammed *et al.*, 2023).

Fishes are aquatic organisms and are one of the main sources of protein to humans. They are great indicators of heavy metal contamination in the aquatic environment as they occupy levels in the food chain (Karadede-Akin & Unlu, 2007). The channels through which heavy metals get accumulated in the fish are the food chain and water. These heavy metals get through the bodies of fishes through their digestive tract, gills or body surface (Wang, 2015). After these

metals have been effectively absorbed in the fish, they are transported through the bloodstream to the organs where they get accumulated (Fazio et al., 2014).

This fish is been consumed on a daily basis, hence the need for the evaluation for heavy metal contents in it to monitor potential hazards and provide possible early warnings.

Heavy metals are non-biodegradable and persists in the environment for a very long time (Javed & Usmani, 2017). Toxic heavy metals are greatly dangerous as elements or when in the combined state, such as Arsenic (As), Chromium (Cr), Cadmium (Cd), lead (Pb). Mercury (Hg), Nickel (Ni), Zinc (Zn) have varying levels of toxicity and health effects (Kinuthia et al., 2020).

Heavy metals are “often referred to as any metallic element that has relatively high density and are toxic at low concentrations. E.g Hg, Pb, As, Cr and Cd. Trace elements like Copper (Cu), Iron (Fe), Zinc (Zn) are important for maintaining the body metabolism of humans but can lead to poisoning when they are at high concentrations (Igwemmar et al., 2013).

Heavy metals concentrations at different levels present in the tissues of fishes show the level of exposure in time past, either through water or food and can indicate to a great extent the existing state of the animals before toxicity as it affects the interrelationship of the populations within the aquatic environment (Birungi et al., 2007).

The concentration of metals varies with different species as it relates to their feeding habits and ability to bioaccumulate (Akoto et al., 2014). There is a direct impact on the concentration of heavy metals in the various tissues and organs of fishes as a result of the aquatic environment’s contamination, uptake, regulation and elimination inside the fish (Effiong et al., 2019)

High level concentration of metals are said to have lethal and chronic effects evident on the fishes (Jaishankar et al., 2014). Hence, fishes are used for evaluating the environmental state in the aquatic environment in recent times (Akan et al., 2012). The consumption of fishes has recently been on the increase because of their nutritional and therapeutic effects. Fishes contain some vital vitamins, unsaturated fatty acids and minerals (Medeiros et al., 2012). Fishes are one of the most abundant in the aquatic environments. About 1 billion people globally depend solely on fishes as their primary source of animal protein (FAO). The metal concentration varies with species that relates to the feeding habits and bioaccumulation capacity (Akoto et al., 2014).

This study is of great importance because it tends to ascertain the concentration of heavy metals in Mullet fish (*Mugilcephalus*) found in the Mini-Ndai creek located at Rumuolumeni, Port Harcourt.

Aim and Objectives of the study

The aim of the study was to evaluate the state of heavy metal contamination of the Mini-Ndai creek. The objectives of this study was to determine the relative concentrations of Nickel (Ni), Iron (Fe) and Chromium (Cr) in Mullet fish (*Mugilcephalus*).

Materials and Methods

Study Area

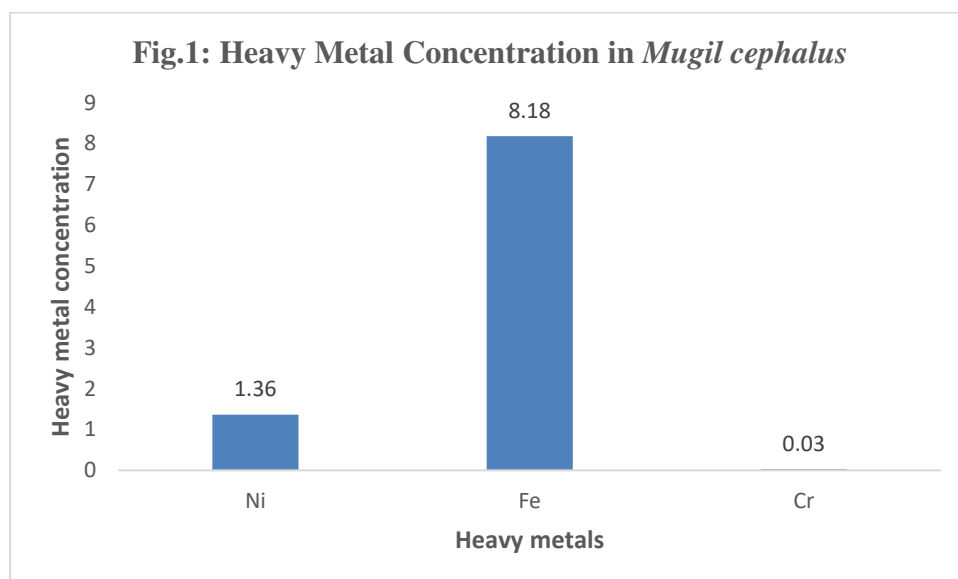
The study was carried out at the Mini-Ndai creek situated at Rumuolumeni, Port Harcourt, Rivers State. Water enters the creek at high tide from the New Calabar River and drains from the surrounding mangrove swamp into the river as the tide ebbs.

Fish Sample: Fish samples were purchased from the local fishermen and fish sellers of the creek. They were immediately transferred into plastic containers containing ice and stored in a freezer prior to analysis.

Sample Preparation: On the day of analysis, the fish samples were taken out of the freezer and thawed at room temperature. They were oven dried and pulverized into powdered form. They were digested with nitric acid and then analysed for Nickel (Ni), Iron (Fe) and Chromium (Cr) using an Atomic Absorption Spectrophotometer (AAS).

Statistical Analysis: Statistical analysis was carried out and the results gotten using arithmetic mean and standard deviation.

Results: The mean concentration of heavy metals in *Mugilcephalus* are presented in Fig. 1. The mean concentrations of Ni, Fe and Cr in the *Mugilcephalus* were $1.36 \pm 0.45 \mu\text{g/g}$, $8.18 \pm 0.98 \mu\text{g/g}$ and $0.03 \pm 0.01 \mu\text{g/g}$ respectively. Fe had the highest concentration in the *Mugilcephalus* among other heavy metals studied. The order of heavy metal concentration in the *Mugilcephalus* was $\text{Fe} > \text{Ni} > \text{Cr}$.



Discussion

The study showed that the heavy metals analyzed in the fish sample (*Mugilcephalus*) were within the safe limits except for Nickel that was seen to be above the safe limits.

The order of heavy metal concentrations in the *Mugilcephalus* are $\text{Fe} > \text{Ni} > \text{Cr}$ which contrasts slightly with the trend $\text{Fe} > \text{Cd} > \text{Ni} > \text{Hg} > \text{Cr}$ as reported by Umunnakwe and Aharanwa (2014). This indicates that Fe had the highest concentration in the fish species with Cr having the least concentration in *Mugilcephalus*.

Conclusion

Heavy metals are known to affect aquatic lives. When these heavy metals accumulate over a long period, it exerts direct consequences to aquatic biota and in turn man and other organisms within the biosphere. The heavy metals except Ni and Cr were within the safe limits for consumption.

Continuous consumption of these fishes could have adverse effects on human health as regards the adverse nature of these heavy metals (Ni and Fe).

Based on the research carried out in the study area, the following measures need to be noted.

3. The abattoir effluents discharge into the creek should be discouraged.
4. Further studies should be carried out on the creek to determine the physicochemical parameters and the heavy metal content of the creek.

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