



Comparison Between The Water Quality Of Otamiri River In Imo State, Nigeria And Mud Island Creek In Natchez, Mississippi, USA.

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Abstract

Water quality deals with the physical, chemical, and biological characteristics of water. Water is the driver of nature. The purpose of this study is to determine the water quality of the Otamiri River, the Mud Island Creek and compare the two. It was also to find out if the two met the Mississippi Water Quality Criteria (MSWQC). During March 2017, water samples were collected from three sites along the Otamiri River about 50 meters apart and were transported to the USA and taken to the Alcorn State University Laboratory in Mississippi. They were tested chemically as indicted in the LaMotte water quality detection kits., Water samples were also collected from three sites along the Mud Island Creek about 50 meters apart in March 2018. They were brought to Alcorn State University Laboratory and tested chemically according to the methods indicated in the LaMotte water pollution detection kits just as was done for the Otamiri River. The two data obtained were recorded, tabulated and compared. Ten parameters were tested. The biological profile for both was carried out by using Nutrient agar and MacConkey agar and confirmed by the Lauryl Tryptose Broth Fermentation test. For the Otamiri River, alkalinity, carbon dioxide, hardness and phosphate exceeded the MSWQC. For the Mud Island Creek, alkalinity, carbon dioxide, hardness, and phosphate exceeded the MSWQC. The biological profile for the Otamiri River showed that coliform bacteria were absent. For the Mud Island Creek, it was positive indicating that it was polluted. In general, the quality of Otamiri River was better than that of the Mud Island Creek.

Keywords: Comparison, Water Quality, Otamiri River, Nigeria, Mud Island Creek, Mississippi, USA.

1.0 Introduction

Water quality deals with physical, chemical, and biological characteristics of water usually with respect to its suitability for use. Water is a colorless, transparent, odorless liquid that forms the seas, lakes, rivers and rain and is the basis of the fluids of living organisms. It is the driver of nature; the *summum bonum* of life. But good quality water is essential for good health (Acholonu, 2016). Otamiri River is a first order river with its source at Egbu, in Owerri North Local Government Area(LGA), Imo State until it is joined at Nekede by River Nworie on which several studies have been previously conducted (Okorie and Acholonu, 2008; Duru and Nwanekwu, 2012; Okorie and Acholonu, 2018). Previous water quality studies have been conducted on the Otamiri River (Acholonu 2019; Acholonu et al. 2019). Mud Island Creek is a freshwater body, a small river, rivulet or stream, located on Natchez Trace Parkway, Natchez, in Jefferson County, Mississippi.

The purpose of the present study was to determine the water quality of the Otamiri River, Mud Island Creek and compare the two. It was also to find out if they met the Mississippi Water Quality Criteria (MSWQC/EPA Standards).

2.0 Materials and Methods

During March 2017, water samples were collected from three sites, about 50 meters apart along the Otamiri River in Egbu, Owerri North LGA Imo State, Nigeria (Figures 1–3) transported to the USA and taken to Alcorn State University Laboratory in Mississippi and tested chemically according to the methods indicated in the LaMotte water pollution detection kits.

During March 2018, water samples were collected from three sites about 50 meters apart along the Mud Island Creek (Figures 4 and 5). They were brought to Alcorn State University Laboratory and tested



Figure 1: A panoramic view of Otamiri River



Figure 2: Another view of Otamiri River.

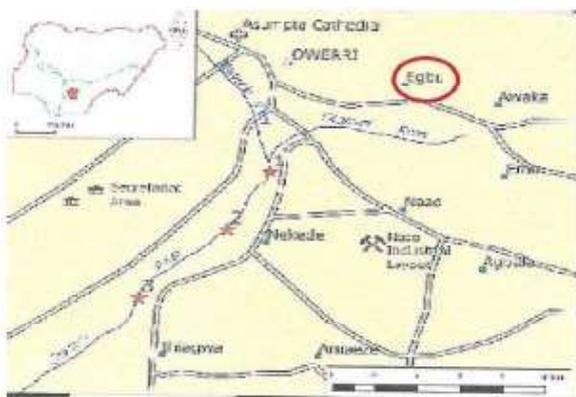


Figure 3: Map of Nigeria showing Egbu, the source of the Otamiri River.



Figure 4: Picture shows signboard indicating the area of the Mud Island Creek where water samples were collected.



Figure 5: Picture shows the Mud Island Creek where water samples were collected.

chemically as was done with the Otamiri River samples. The two data obtained were recorded, tabulated and compared. Ten parameters were tested for each collection.

The biological profile for both was also carried out by using Nutrient agar and MacConkey agar as indicated by Carolina bacterial pollution of water kits. The results were confirmed by using the Lauryl Tryptose Broth Fermentation tests ordered from Carolina Biological Supply Company and as indicated by the manufacturers. The results were recorded, tabulated and analyzed.

3.0 Results

The results showed that the Otamiri River met the (Mississippi Water Quality Criteria (MSWQC/EPA Standards) except for alkalinity (28/3.08), carbon dioxide (16/10) hardness (68/50) and phosphate (1.0/0.1). (See Table 1).

The Mud Island Creek also met the MSWQC/EPA Standards except for alkalinity (15/3.08), carbon dioxide (13/10), hardness (160/50) and phosphate (1.3/0.1) (See Table 1). The biological profile for the Otamiri River showed that coliform bacteria used as an indicator of water pollution were negative. For the Mud Island Creek, it was positive. These were confirmed by the Lauryl Tryptose Broth Fermentation tests.

3.1 Similarities of Water Samples from Otamiri River in Nigeria and from Mud Island Creek in the USA.

An examination of the test results from the Otamiri River and the Mud Island Creek showed that both were 0.1 for ammonia-nitrogen, 0.00 for copper, and 0.00 for iron.

3.2 Differences of Water Samples from Otamiri River in Nigeria and from Mud Island Creek in the USA

Otamiri River had higher carbon dioxide than Mud Island Creek (16/15). Mud Island Creek had higher alkalinity (115/28), dissolved oxygen (10.7/9.1), hardness (160/68), pH (7.3/7.0), phosphate (1.3/1.0) and salinity (1.5/0.00) than Otamiri River.

3.3 Comparison of Otamiri River and Mud Island Creek Water Samples with the MSWQC/EPA Standards.

Otamiri River met the MSWQC/EPA Standards except for alkalinity (28/3.08), carbon dioxide (16/10), hardness (68/50) and phosphate (1.0/0.1). Mud Island Creek met the MSWQC/EPA Standards except for alkalinity (115/3.08), carbon dioxide (15/10), hardness (160/50) and phosphate (1.3/0.1).

3.4 Comparison of the biological profile of the Otamiri River in Nigeria and Mud Island Creek in the USA

Otamiri River was negative with coliform bacteria while Mud Island Creek was positive and therefore polluted.



Figure 6: Picture shows the biological test result with MacConkey Agar. It shows the growth of bacterial colonies for Mud Island Creek water.

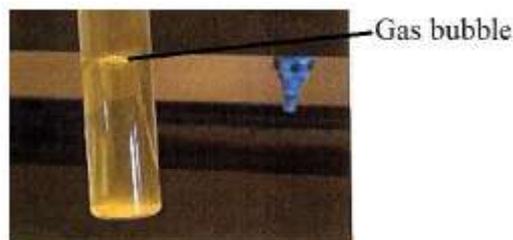


Figure 7: Picture shows the Lauryl Tryptose Broth Fermentation test result. Note gas bubble present in the inverted bottom of the tube confirming that coliform bacteria are present in the Mud Island Creek water.

4.0 Discussion

The alkalinity concentration in the Otamiri River (28/3.08) and the Mud Island Creek (115/3.08) were different. But both exceeded the MSWQC/EPA Standards with that of the Mud Island Creek being much higher. The dissolved oxygen concentration of the Otamiri River and Mud Island Creek were above the threshold for MSWQC/EPA Standard (9.4/5 and 10.7/5 respectively). Otamiri River had a higher concentration of carbon dioxide (16/10) than the Mud Island Creek (15/10). Of all the differences, the most outstanding was the Mud Island Creek’s very high water hardness (160/50) and the Otamiri River’s distant lower concentration of water hardness (68/50). It must be observed that in the study by Acholonu et al. 2019, Otamiri River’s hardness was 0.00. The biological test results of the Otamiri River and Mud Island Creek showed that the water from the first one was not polluted while the latter, was polluted. That is, coliform bacteria test result was negative for the first but positive for the latter.

Table 1: Chemical Analysis of water samples in parts per million (ppm) from Mud Island Creek and Otamiri River

Parameters	Average Results for Mud Island Creek	Average Results for Otamiri River	MSWQC/EPA Standards
Alkalinity	115*	28*	3.08
Ammonia-Nitrogen	0.1	0.1	10
Carbon Dioxide	15*	16*	10
Copper	0.00	0.00	8.85/6.25
Dissolved Oxygen	10.7	9.4	5.0
Hardness (Test Kit)	160*	68*	50
Iron	0.00	0.00	0.2
pH	7.3	7.0	6.0/9.0
Phosphate	1.3*	1.0	0.1
Salinity	1.5	0.00	80

Figure 6: Picture shows the biological test result with MacConkey Agar. It shows the growth of bacte-

A general review of the results showed that the differences between the two water bodies are more than the similarities and that more parameters from the Mud Island Creek exceeded the threshold for MSWQC/EPA Standards than the Otamiri River. So, an overall assessment shows that the water quality of the Otamiri River appears to be better than that of the Mud Island Creek. This kind of result was obtained in the previous study by Acholonu et al. (2019) between Otamiri River and the Lower Mississippi River. They explained this by saying: “It is possible that the driving forces are the uses made of the two rivers which are more in the United States than in Nigeria. This includes use for agriculture, urban and industrial development, transportation and recreation” (loc. cit.).

The results got from the Otamiri River, differ from those of the previous study on the Otamiri River (Acholonu, 2019). The reason for this was brought out from the statement of Acholonu et al. 2019: “It must be remembered that the water quality of any lotic body of water changes from time to time depending on the surrounding environment and the use made of it. This is why it is needful to monitor the quality of any river by conducting water quality studies periodically”. This comment is hereby re-emphasized.

5.0 Conclusion

This study shows that the Otamiri River in Nigeria has less pollutants than the Mud Island Creek in the USA especially as it concerns water hardness which was 68ppm while the Mud Island Creek was 160ppm.

Acholonu *et al.* (2019) recommended that this kind of comparative study be conducted by subsequent investigators. This their recommendation is an additional reason why this present study was conducted.

Based on the findings from this study, it appears that the quality of Otamiri River from Egbu, Imo State, Nigeria was better than that of the Mud Island Creek from Natchez, Mississippi, USA. It is important to note that the same conclusion was reached in the comparison between the Otamiri River and the Lower Mississippi River (loc. cit).

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