



Water Quality Studies on Otamiri River in Egbu, Imo State, Nigeria.

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Abstract

Otamiri River is a first order river with its source at Egbu in Owerri North Local Government Area (LGA), Imo State. It is joined at Nekede by Nworie River on which several studies have been previously conducted. These studies showed that Nworie was polluted. Since Nworie empties into Otamiri, it is of interest to find out if this river is also polluted like its tributary. So the purpose of this study was to determine if Otamiri River is polluted like Nworie. It was also to find out if it met the water quality criteria of Mississippi (MSWQC) or Environmental Protection Agency (EPA) standard. During the month of January 2017, three water samples were collected about 50 meters apart from Otamiri River in Egbu area, Imo State with sterile plastic bottles and taken to the Alcorn State University Laboratory in Mississippi, U.S.A. The samples were tested according to the methods indicated in the LaMotte water pollution detection kits. Ten chemical parameters were tested. The average readings were recorded and the results analyzed and compared with the MSWQC /EPA standard. The biological profile was carried out by using Nutrient agar and MacConkey agar and confirmed by Lauryl Tryptose Broth Fermentation test. Results of the chemical analysis showed that the Otamiri River met the MSWQC with the exception of alkalinity, carbon dioxide, and phosphate. The test for coliform bacteria (biological test) was negative and confirmed by the Lauryl Tryptose Broth Fermentation test. A comparison between the water quality of Otamiri River and Nworie River showed that Otamiri was generally better. But sand mining on the Otamiri is decried and ill advised.

Keywords: Water quality, Otamiri River, Egbu, Imo State, Nigeria.

1.0 Introduction

Water is one of our most valuable resources. It is vital for the sustenance of human life and the maintenance of healthy environment. In a place like Imo state where pipe-borne water provided by government has or is becoming a thing of the past especially in suburban areas, people are more and more depending on ground water - boreholes. Even so, maintenance of unpolluted or good quality lotic bodies of water in the state is imperative. Sustaining the quality of water not only protects public health, but provides ecosystem habitats and plays major roles in farming, fishing, recreation and tourism (Sullivan *et al.*, 2000).

Water quality studies are important as there is much public apprehension about the effects of water pollution (Reen 2001). Otamiri River is a river with its source at Egbu in Owerri North Local Government

Area (LGA), Imo State. At Nekede, it is joined by Nworie River which traverses Owerri, the Imo State Capital and on which several studies have been previously conducted (Okorie and Acholonu (2008); Duru and Nwanekwu (2012); Acholonu (2015); Okorie and Acholonu (2018)). These studies showed that Nworie was polluted. Since Nworie empties into Otamiri, there was a need to find out if this river is also polluted like its tributary. The purpose of this study was to determine if Otamiri River is polluted like Nworie, its tributary and to find out if it met the water quality criteria of Mississippi (MSWQC) or Environmental Protection Agency (EPA) standard. It was also to add to the pollution studies on rivers in Imo State. Those already carried out include: Okorie and Acholonu (2008), Nworie River; Okorie and Acholonu (2012) Okitankwo River; Acholonu (2015, 2016) Nworie River; and Okorie and Acholonu (2018) Nworie River. Ground studies have also been done (Okorie *et al.* 2013).



Figure 1: Map of Nigeria showing Imo State.



Figure 2: Map of Imo State showing Egbu, the source of the Otamiri River.



Figure 3: Basil Acholonu, a relation, helping to collect water from the Otamiri River.



Figure 4: Demonstrates collection of water samples at the Otamiri River.



Figure 5: A closer picture of the Otamiri River, hardly moving (flowing).

2.0 Materials and Methods

During the month of January 2017, three water samples were collected about 50 meters apart from the Otamiri River in Egbu area (near its source), Imo State, with sterile plastic bottles filled to the brim. They were taken to the United States and to Alcorn State University Laboratory in Mississippi for study. The water samples were tested chemically according to the methods indicated in the LaMotte water pollution detection kits ordered from Carolina Biological Supply Company. Ten chemical parameters were tested. The average readings were recorded, and the results analyzed and compared with the MSWQC/EPA standard and the Nworie River (Acholonu, 2015). The biological profile was carried out by using the nutrient agar and MacConkey agar. They were conducted as indicated by Carolina bacteria pollution of water kits. The results were confirmed by using the Lauryl Tryptose Broth Fermentation test ordered from Carolina Biological Supply Company, and as indicated by the manufacturers. The results were recorded and analyzed.



Figure 6: Sand mining location on the Otamiri River; adverse environmental pollution frenzy.



Figure 7: Acholonu points at sand mining operation going on.



Figure 8: Machine being used for sand mining.

Table 1: Chemical Profile of Otamiri River

LaMotte Test Kits	Otamiri River	MSWQC/EPA Standard
Alkalinity *	37.5ppm	3.08/.02
Ammonia-Nitrogen	0.1ppm	10
Carbon Dioxide *	11.5ppm	10
Chlorine	0.0ppm	19/11
Dissolved Oxygen	8.4ppm	4-5
Hardness	0.0ppm	50
Iron (Test Strip)	0.0ppm	10
Nitrate	4.5ppm	10
pH	6.5ppm	7.83
Phosphate *	1.00ppm	0.1
Coliform Bacteria Test	Negative	

3.0 Results

Results of the chemical analysis showed that the Otamiri River met the MSWQC with the exception of alkalinity (35/3.08), carbon dioxide (11.5/10), and phosphate (1.0/0.1) (see Table 1). The test for coliform bacteria using nutrient agar and MacConkey agar was negative. The Lauryl Tryptose Broth Fermentation test confirmed this result.

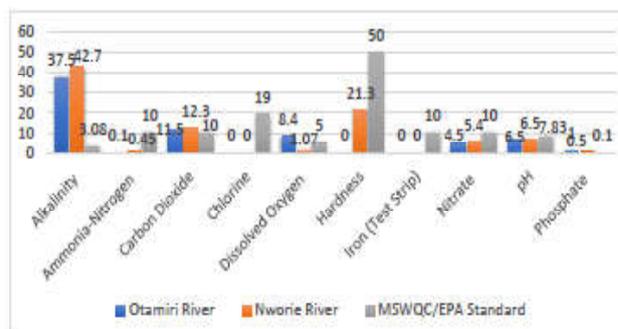


Figure 9: Comparison of Otamiri River with Nworie River.

4.0 Discussion

Based on the chemical parameters analysis, the Otamiri River met the MSWQC with the exception of alkalinity, carbon dioxide and phosphate only. This is encouraging; Based on the microbial test results, the river was not polluted. A comparison between the chemical test results of the Otamiri River and those of River Nworie (Acholonu 2015, 2016) shows that both Nworie and Otamiri Rivers met

Table 2: Comparison of Otamiri River with Nworie River (Acholonu 2015)

LaMotte Test Kits	Otamiri River	Nworie River	MSWQC/EPA Standard
Alkalinity	37.5ppm*	42.7ppm*	3.08/.02
Ammonia-Nitrogen	0.1ppm	0.45ppm	10
Carbon dioxide	11.5ppm*	12.3ppm*	10
Chlorine	0.0ppm	0.0ppm	19/11
Coliform Bacteria Test	negative	present	
Dissolved Oxygen	8.4ppm	1.07ppm*	4-5
Hardness	0.0ppm	21.3ppm	50
Iron (Test Strip)	0.0ppm	0.0ppm	10
Nitrate	4.5ppm	5.4ppm	10
pH	6.5ppm	6.5ppm	7.83
Phosphate	1.0ppm*	0.5ppm*	0.1

most of the MSWQC/ EPA standards. With Nworie River, the following exceeded the MSWQC, alkalinity (42.7/3.08), carbon dioxide (12.3/10), oxygen (1.07/4-5) (low) and phosphate (0.5/0.1). With respect to Otamiri River, the following exceed the MSWQC, alkalinity (37.5/3.08), carbon dioxide (11.5/ 10) and phosphate (1.0/0.1). Alkalinity was higher in Nworie than in Otamiri. Carbon dioxide exceeded the threshold for both rivers, but with Nworie being a little more (11.5/12.5). Also, the dissolved Oxygen content was low in Nworie River (1.07ppm) and high in the Otamiri River (8.4ppm) and phosphate was higher in both, but it was a little higher in the Otamiri River (1.0/0.5). In general, the Otamiri River had better water quality than the Nworie River. Nworie River was positive for coliform bacteria while the Otamiri was negative. But, it is surprising in the sense that the river had high turbidity being brownish in color (not transparent) and with sand mining going on there (see Figures 6 – 8). This could be attributed to the fact that water samples were collected far away from the sand mining area. This loathsome sand mining and anti-environmental action needs to be stopped. Okorie and Acholonu (2018) reported on the effect of commercial Sand Mining on water quality parameters of Nworie River. They recommended an immediate stop to the sand mining followed by a professionally supervised dredging to restore the physical and biological characteristics of the river. With respect to this present study, this recommendation is being repeated and with more emphasis.

A general observation was made on the physical condition of the Otamiri River. The river appeared to have three different looks or physical characteristics. The first was the area where sand mining was going on. The water appeared brownish and very turbid. Another is an area away from where the sand mining was going on and where water samples for this study was collected. The third was a crystal clear area. The water seemed to be flowing directly from the ground and near the river bank. It is recommended that subsequent investigators collect water from these three areas and conduct a differential study on them.

The watershed of Otamiri River is being affected close to its source at Egbu where the sand mining is

going on and the ecosystem is changing with urban development activities also in progress. If the Egbu community and those in government do not do something about it soon, what happened to Awaka, where its source was in antiquity, may happen to Egbu. The water source may move away from Egbu and go to another location (see Acholonu 2017). The river left a track or landmark at Awaka, which is still visible. The Awaka people call the area “Otula Ogwugwu”. Literally, it means bottom pit or bottom valley.

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