ASSESSMENT OF WATER QUALITY PARAMETERS IN RELATION TO FISHERIES RESOURCES IN OSUN RIVER CATCHMENT, NIGERIA.

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Abstract
Osun River Catchment (ORC) is fed by various tributaries with differential water composition and varying human activities therefore periodic assessment of its water quality parameters is essential for sustenance of fisheries resources in the catchment. Triplicate bi-monthly sampling was done from seven sampling points (A – G) randomly selected based on the information from soil type, drainage, land usage and geographical formation of ORC from November, 2017 to March, 2018. Parameters measured were Temperature, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Ammonia and pH. Apart from DO and BOD which had an inverse relationship, the mean water quality parameters measured from the entire ORC were within the range for sustenance of fisheries resources. The overall high mean BOD (24.1 ± 0.28 mg/l) indicated the presence of pollution which resulted to slight decrease in DO (4.6 ± 0.31 mg/l) below the recommended levels. Significant differences ($P<0.05$) were observed across some months for Temperature, DO, BOD and pH except for Ammonia which showed no significant difference ($P>0.05$) within the months. Maintenance of our aquatic system is therefore essential for sustenance of fisheries resources.

Keywords: Water quality, Osun River Catchment, Sustainability, Fisheries resources

Introduction

The quality of water which governs the life processes, abundance and distribution of organisms in an aquatic system (Boyd and Linchtkoppler, 1979) are mostly altered by pollutants which can be either from point or non-point sources (Iyiola, 2015). Generally, waste generation have been on the increase as a result of the sharp rate of urbanization and consumption of various resources but with dearth of waste disposal systems and drainage systems, all empties into our water bodies and makes making it unfit for animals and humans. These have greatly affected the fisheries production potential of the river leading to decreased catches and migration of some fish species when conditions are not favourable. Apart from land usage, other factors such as the type of soil over which the river flows (Jenyo-Oni and Oladele, 2016), the nature of drainage (slope) (Ayoade *et al.*, 2006) and composition of basement rocks of the area can affect the quality of water over which it flows. Based on these factors, ORC was investigated to provide information on its current status.

Materials and Method

ORC flows through the south-western part of Nigeria between the latitude and longitude coordinates of 6° 33' 35" (6.5597°) North and 4° 3' 46.8" (4.063°) East (Murrell, 2009). It is fed by two major tributaries; the Erinle and Oba Rivers and flows through several communities like Base, Olowa, Balogun, Ori-Ita, Take, Ikoyi etc up to Asejire and westwards to Lagos lagoon. The basement of ORC catchment is made of pre-cambrian rocks (OSCHC, 1991). The major cause of

pollution on the catchment is the various anthropogenic activities such as farming, washing, dumping of refuse and sewage from surrounding communities. The sampling area was between Ipetumodu and Asejire axis and seven sampling points (A-G) were randomly selected based on information about drainage, slope, land usage and geological formation of the ORC. Water samples were collected bimonthly from each sampling points for a period of five months (November 2017 to March, 2018) which coincided with dry season. Temperature was measured *insitu* by immersing a mercury-in-glass thermometer into the sample at a depth of 10mm for duration of two minutes (Onyema, 2008), Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) using Winklers method (APHA, AWWA, WEF 2012), Nitrates, Nitrites, Ammonia and pH using appropriate water quality kits.

Result and Discussion

The mean monthly values of parameters measured from each sampling sites (Table 1) showed variations across the months with exception of DO and BOD which was inversely related. DO is essential for sustenance of aquatic life and levels below 5mg/l are not tolerable to fish (Obot *et al.*, 2016). The overall mean value measured from ORC (4.6 ± 0.31 mg/l) was below the recommended level (WHO, 1994) although mean values from November (5.3 ± 0.11 mg/l), January (5.9± 0.32 mg/l) and February (5.9± 0.11 mg/l) were within the recommended levels as a result of aeration by aquatic plants and flow of water (Iyiola, 2015). The reduction in overall mean DO concentration (4.6 ± 0.31 mg/l) can be attributed to human factors (Ipinmoroti *et al.*, 2018) which increased the mean concentration of BOD (24.1 ± 0.28 mg/l) above the recommended limit of 8.5 – 9.0 (WHO, 1994). The high mean BOD concentration indicated the presence of pollution at some period therefore high amount of oxygen was needed to oxidize the microbes in the samples (Chukwu, 2008). Temperature recorded had a mean value of 20.9 ± 0.28 ^{o}C the highest value in January (24 ± 0.32 ^{o}C) and least in February (19.1 ± 0.23 ^{o}C). pH measured the highest in January and lowest values in February and March with 7.4 ± 0.12, 7 ± 0.11 and 7 ± 0.28 respectively. Ammonia was highest in December (0.1 ± 0.13mg/l), February (0.1 ± 0.42 mg/l) and March (0.1 ± 0.15 mg/l) and lowest in November (0 ± 00) and January (0 ± 00). Temperature (20.9 ± 0.28 ^{o}C), pH (7.2 ± 0.15) and Ammonia (0.1± 0.14 mg/l) were within the required range for sustenance of fisheries resources in an aquatic system (WHO, 1994; Ayoade *et al.*, 2006; Omitoyin *et al.*, 2006, Onyema *et al.*, 2009).

Table 1: Mean monthly values of water quality parameters across the sampling points

	November	December	January	February	March	Mean	WHO (1994)
Temperature (^{o}C)	22.6 ± 0.18 ^{b}	19.3 ± 0.21^{a}	24 ± 0.32 ^{b}	19.1 ± 0.23 ^{a}	19.3 ± 0.44 ^{a}	20.9 ± 0.28	21- 30
DO (mg/l)	5.3 ± 0.11^{b}	4.6 ± 0.50 ^{a}	5.9± 0.32^{b}	5.9 ± 0.11^{b}	4.6 ± 0.51^{a}	4.6 ± 0.31	5 – 8
BOD (mg/l)	18.4 ± 0.12 ^{a}	25.8 ± 0.18^{c}	21.4 ± 0.53^{b}	26 ± 0.41^{c}	28.9 ± 0.16^{c}	24.1 ± 0.28	8.5 – 9.0

Ammonia (mg/l)	0 ± 00	0.1 ± 0.13[a]	0 ± 00	0.1 ± 0.42[a]	0.1 ± 0.15[a]	0.1± 0.14	0.6
pH	7.3 ± 0.12[a]	7.3 ± 0.23[a]	7.4 ± 0.12[a]	7 ± 0.11[a]	7 ± 0.28[a]	7.2 ± 0.15	6.6 – 8.5

Superscript with different characters are significantly different (P<0.05)

Conclusion

Although, most of the water quality parameters (pH, Ammonia and Temperature) measured was within the recommended ranges for fisheries resources, signs of pollution were present which was evident by the concentration of DO and BOD. Therefore, management of water ways is essential and strict adherence to waste disposal and farming practices for sustenance of the environment.

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