ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL PROPERTIES OF WATER SAMPLES ALONG RIVER TARABA, TARABA STATE, NIGERIA

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Abstract

Analysis of water quality using physico-chemical properties of water samples collected from River Taraba was carried out between November 2017 - April 2019. The water samples were collected hygienically from each of the five (5) landing sites (Jamtari, Gayam, Garbabi, Wurbo and Tella) using hygienic cap bottles. All water samples were adequately labelled and transported to laboratory, Modibbo Adama University of Technology Yola for certain physico-chemical parameters like temperature, pH, DO, BOD, Free carbondioxide conductivity, transparency, total phosphorus, total nitrogen and ammonia were measured as described by the instructional manual of the HANNA instruments, JENWAY, EXTECH, GLASWEKWETEIN water analysis kit. Secchi- disc, chemical reagents and spectrophotometer were also used. Physicochemical parameters were analyzed using one way analysis of variance (ANOVA) with the aid of statistical package for social science (SPSS), version 26. The mean assessment of physico-chemical parameters varied between 24.4±1.14^{0}C - 32.6±0.89^{0}C for temperature, pH 7.5±0.53 -10.6±1.03, DO 3.0±0.42mg/l - 9.7±1.11mg/l, BOD 1.4±0.75mg/l - 6.4±1.16mg/l, free carbon dioxide 0.9±0.13mg/l - 1.9±0.81mg/l, conductivity 45.8±6.49 µS/cm - 144±59.93 µS/cm, transparency 6.8±0.98cm - 74.5±20.88cm, total phosphorus 0.293±0.02mg/l - 0.663±0.10 mg/l, total nitrogen 0.198±0.045mg/l - 0.537±0.220mg/l and total ammonia 0.023±0.000mg/l - 0.034±0.006mg/l. The physicochemical parameters are within the satisfactory range except total ammonia (0.029mg/l) which exceeded 0.025mg/l, approved by WHO, (2012). It is advocated that dumping of refuse, defecating and urinating inside the river, grazing of cattle and farming near the river banks should be discouraged as these practices would upsurge the level of ammonia.

Keywords: Water, Quality, Physico-chemical, Properties, River Taraba.

Introduction

Ecological water is not clean, but partially polluted or affected by biological and unnatural circumstances like geological land situations, fountain of aquifers, weather situations and human causes (Narayanan, 2007). The human causes are: agrarian substances carried into waterways via overspill, flaming of biomes as well supplies to the atmospheric accretion of nutrients into freshwater structure, therefore encouraging the creation and development of algae that leash to eutrophication. Mike and Michael, (2004) pinpointed certain elements that ascertained the well-being of a waterways bionetwork such as discharge, the natural system of the path as riparian region, path running as macrophytes etching plus dig up, status of mistreatment (angling) plus the existence of natural obstacles towards connectivity. In a similar way, cities growth, industrial development, acidulous rainfall, makeup of the water bedstead likewise changes the freshwater ecosystem and the water creatures in converting their surrounding makeup, water attribute plus biologic relations (Verkatesharaju *et al*., 2010).

The crave for water attributes could be ascertained by various methods either for sipping, more home utilizations, mechanized, agrarian, irrigation or fish cultivation. Yet, the upkeep of water bionetwork is completely reliant on the physicochemical stuffs and biologic multiplicity (Verkatesharaju *et al*., 2010). The extent of physicochemical limitations of water will ascertained the function with which the water could be greatly utilized for trivial or no usages. Changeability in physicochemical restrictions is liable for the dispersal of creatures among various freshwater environment in harmony with their modification, which permit their survival around a particular environment (Eletta *et al.*, (2005). Main change among freshwater bedstead components plus methods be able to change genus dispersal, efficiency plus steady variation in creation of conservatory vapors (Palmer *et al*, 2005). Consistent plus inconsistent physicochemical attributes are ascertained as an element in riverine pisces bionetwork (Blaber, 2000).

Pisces similar to all creatures rely on its water bionetwork for diet, development, procreation and wellbeing. Physicochemical factors of water are paramount in assessment of a multitude relations among physical and chemical elements that affect the degree of rudimental efficiency, trophic makeup plus complete biomass all through water diet tangle. Furthermore, pisces development relies on water attributes in order to enhance its manufactory and physicochemical factors are recognized to influence the biologic elements of water surroundings in many approaches. In where there is ecological strain, a little dissolved oxygen, high temperature and high ammonia, water creatures are unable to retain their intramural surroundings, this affects the digestion of diet plus procreation of the water creature.

Materials and Methods

Study Area

River Taraba is a tributary of the Benue River. River Taraba is on latitude 8°34'0" N and longitude 10°15'0" E. River Taraba takes its fountain from the elevated altitude of the Alantica hills on the Nigeria-Cameroon boundary in the mid-eastern portion of the State and gushes westwards, overlaying a space of around 265km towards the Benue basin (Akogun, 1992).

River Taraba transcend through Gashaka. Bali and Gassol LGAs before draining into the Benue River (Figure 1). The major economic profession at the river is angling piscaries and agriculture. The popular tribal crowds at the river side are Jukun, Osobo, Wurbo and Tiv. Taraba State is bestowed with bountiful shallow water which includes ponds and rivers. These include River Benue, Taraba and Donga and their tributaries. The State has about 500, 000 hectares of water area and 142 ecological ponds (TSEEDS, 2004).

Sample Collection

Water samples were collected for a period of eighteen (18) months from November 2017-April 2019. The water samples were collected hygienically from each of the five (5) landing sites using antiseptic cap bottles. All water samples were adequately labelled and transported to laboratory, Modibbo Adama University of Technology Yola for physicochemical analysis.

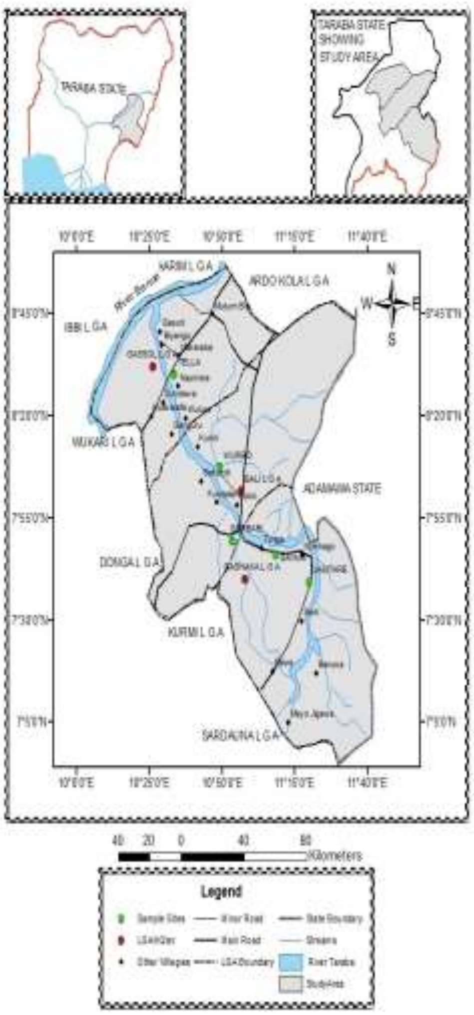

Figure 1: Map of River Taraba Showing Study Sites
Source; Department of Geography, Modibbo Adama University of Technology, Yola

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Determination of Physicochemical Properties

Determination of Temperature

Temperature was ascertained in situ at the sampling sites using a mercury bulb thermometer (Glaswekwertein model). The bulb was placed in water at the depth of 5cm and allowed for two minutes for readings to stabilize before readings was recorded. Temperature readings were measured in triplicates and the mean temperature reading was expressed in Degree Centigrades as described by Boyd, (1979).

Determination of Hydrogen Ion Concentration (pH)

The pH of water body was established in situ at the sampling sites using pH meter (Hanna instrument pHeb pocket sized pH meter-77700P). The electrode of the meter was first standardized using buffer solution which had the same temperature as water. After calibrating the electrode in the buffer solution, it was washed with distilled water before placing deep into the water for two minutes for equilibration. The reading was always standardized with buffer solution before measurement was established (Boyd, 1979). The pH readings were measured in triplicates and the mean pH was recorded.

Determination of Dissolve Oxygen (DO)

It was determined in situ at the sampling sites using Dissolved Oxygen Meter (Extech instrument dissolve oxygen meter-407510A) in which the probe was dipped below the surface water. The DO readings were measured in triplicates and the mean DO reading was expressed in milligram per litre and recorded as described by APHA, (1998).

Determination of Biochemical Oxygen Demand (BOD)

Two equal volumes of water were obtained and diluted with a known volume of distilled water that was thoroughly shaken to ensure oxygen saturation. An oxygen meter was used to determine the concentration of oxygen within one of the vials. The remaining vial was then sealed and placed in darkness for five days in the laboratory after which BOD was measured by subtracting the second meter reading from the first. The readings were measured in triplicates and the mean BOD reading was expressed in milligram per litre (APHA, 1998).

Determination of Free Carbondioxide

Free Carbon dioxide was determined in situ using the method described by Saxena, (1990). 50ml of water sample was poured into a flask and three drops of phenolphthalein indicator (reagent) was added. If the colour turns pink free CO_2 was absent in the sample. If the sample remains colourless, it was titrated against sodium hydroxide solution until pink color appears (End point). The CO_2 readings were measured in triplicates and the mean free CO_2 reading was expressed as milligram per litre.

$$\text{Free } CO_2 \text{ (mg/l)} = \frac{Vt \times 1000}{Vs}$$

Where Vt =Volume of titrate (ml).
Vs = Volume of sample (ml).

Determination of Conductivity

Conductivity was established in situ at the sampling site using conductivity meter (Model: large display conductivity pen – 850037). Electrolyte conductivity of the water body was established as described by (APHA, 1998). The electrode of the conductivity meter was dipped below the water surface and the result was displayed on the screen. The conductivity readings were measured in triplicates and the mean conductivity reading was expressed in uS/cm.

Determination of Transparency

Secchi disc depth was used in situ at the sampling sites to determine turbidity of water as described by Stirling, (1985). Measurement was taken around 09.00hours-12.00hours for best results. The disc was slowly lowered into the water while backing the sun and keeping the line vertical, the depth is recorded at the point where the disc disappeared (d_1). The disc was raised and the depth was recorded where it reappears (d_2). The secchi disc depth were taken as the mean of the two readings ($d_1 + d_2$)/2. The readings were taken while viewing the disc from above. The transparency readings were measured in triplicates and the mean transparency reading was expressed in centimeter.

Determination of Total Phosphorus

Total phosphorus was ascertained in the laboratory as described by AOAC, (1990). 5ml of the sample was measured into a test tube. 1ml ammonium molybdate solution was added and allowed to stand for 20 seconds. 1ml of hydroquinone solution was added, and the flask rotated to mix and 1ml of Na_2SO_4 solution was added. 2ml of distilled water was added. The test tube was stopped by thumb and was shaken to mix thoroughly. The mixture was allowed to stand for 30 minutes and then measured with spectrophotometer set at 650nm, alongside blank. A calibration curve was prepared using standard phosphorus concentration. The total phosphorus readings were measured in triplicates and the mean total phosphorus reading was expressed in milligram per litre.

Determination of Total Nitrogen

Total nitrogen was determined in the laboratory as described by Stirling, (1985). Water sample collected was immediately filtered through pre-rinsed Whatman GF/C filter paper. 25ml of sample was measured in a 150ml conical flask and 1ml of concentrated H_2SO_4 and a dozen anti-bumping granules were added. The same procedure was carried out on standards and distilled water as blank. The sample was boiled on hot plate until the white fumes of sulphurtrioxide appeared, then the flask was removed from hot plate, 1g of potassium persulphate was added to the flask. The mixture was strongly heated at fuming temperature for exactly 10 minutes. Sufficient time was allowed for cooling, and 15ml distilled water was added and transferred to a 50ml volumetric flask. The mixture was gently heated to dissolve the digest in the water. The conical flask was rinsed three times with fresh distilled water to ensure that the sample was completely transferred. 1 drop of methyl red solution and 10M sodium hydroxide were added until the solution turns clear. The solution was back titrated by adding 4M H_2SO_4 drop by drop until the solution turn red. The sample was made up to 50ml with distilled water. 1.0ml of phenol nitroprusside and 1.5ml of alkaline hypochlorite were added to the sample and blank. Samples were allowed to stand for 24 hours before absorbance of standards and sample were taken against a reagent blank using spectrophotometer at 635nm. A calibration curve was prepared using standard nitrogen concentration. The total nitrogen readings were measured in triplicates and the mean total nitrogen reading was expressed in milligram per litre.

Determination of Total Ammonia

Total ammonia was determined in the laboratory as described by Philips, (1985). Sample collected was immediately filtered through pre-rinsed Whatman GF/C filter paper. The phenol-hypochlorite method was adopted for freshwater samples. 1.0ml of phenol-nitroprusside reagent was added to 25ml of sample. It was mix and 1.5ml of alkaline hypochlorite reagent was added. The flask was covered and the mixtures left to stand in the dark for 1 hour at room temperature. The absorbance of standards of ammonia stock was serially diluted with the same procedure used for sample and reagent and calibration curve was prepared and measured at 430nm spectrophotometer. The total ammonia readings were measured in triplicates and the mean total ammonia reading was expressed in milligram per litre.

Statistical Analysis

Physicochemical properties were analyzed using one way analysis of variance (ANOVA) with the aid of statistical package for social science (SPSS), version 26.

Results

Temperature

The monthly rates of temperature is shown in figure 2. The monthly temperature rates fluctuated among 23^0C in the month of December, 2018 at site C to 34^0C in the month of April, 2018 at site C. The monthly mean temperature fluctuated among 24.4±1.14^{0}C in the month of December, 2018 and 32.6±0.89^{0}C in the month of April, 2019. The mean rate of temperature for the period of study was 28.1±1.32^{0}C. The mean temperature rates show significant difference across months ($p<0.05$). But there was no significant difference across sites for the period of the study ($p>0.05$).

pH

The monthly rates of pH is shown in figure 3. The monthly rates of pH fluctuated among 6.8 in February 2018 at site D to 12.1 in the month of July 2018 at site A. The monthly mean pH fluctuated among 7.5±0.53 in December 2018 and 10.6±1.03 in July 2018. The mean rate of pH for the period of study was 8.2±0.64. The rates showed significant difference between the months ($p<0.05$). There was no significant difference across the sites ($p>0.05$) for the period of the study.

Dissolved Oxygen

Dissolved Oxygen monthly rates is presented in figure 4. Dissolved Oxygen monthly rates fluctuated among 2.5mg/l in June 2018 at site D to 13.5mg/l in January 2019 at site C. Dissolved Oxygen monthly mean fluctuated among 3.0±0.42mg/l in June 2018 to 9.7±1.11mg/l in January 2018. The mean rate of Dissolved Oxygen for the period of study was 7.0±1.48mg/l. There was a significant difference among the months ($p<0.05$) but there was no significant difference within sites ($p>0.05$) for the period of the study.

Biochemical Oxygen Demand

The Biochemical Oxygen Demand monthly rates is shown in figure 5. The Biochemical Oxygen Demand rates fluctuated among 0.6mg/l in the month of April 2018 at site C to 9.3mg/l in January 2019 at site C. The monthly mean Biochemical Oxygen Demand fluctuated among 1.4±0.75mg/l in May 2018 to 6.4±1.16mg/l in February 2018. The mean rate of Biochemical Oxygen Demand for the period of study was 4.1±1.22mg/l. There was a significant difference among the months ($p<0.05$) but there was no significant difference within the sites ($p>0.05$) for the period of the study.

Free Carbon Dioxide

The free Carbon Dioxide monthly rates is presented in figure 6. Carbon dioxide rates fluctuated among 0.3mg/l in May 2018 at site C to 2.7mg/l in April 2018 at site C. The monthly mean carbon dioxide fluctuated among 0.9±0.13mg/l in the months of November 2017 to 1.9±0.81mg/l in April 2018. The mean rate of free carbon dioxide for the period of study was 1.0±0.35mg/l. There was significant difference among the months ($p<0.05$) but there was no significant difference within sites ($p>0.05$) for the period of the study.

Conductivity

Conductivity monthly rates is shown in figure 7. Conductivity rates fluctuated among 40 µS/cm in August 2018 at site C to 266 µS/cm in December 2018 at site D. The monthly conductivity mean fluctuated among 45.8±6.49 µS/cm in August 2018 to 144±59.93 µS/cm in January 2019. The mean rate of conductivity for the period of study was 98.6±38.36 µS/cm. There was no significant difference within the months ($p>0.05$) but there was significant difference across the sites ($p<0.05$) for the period of the study.

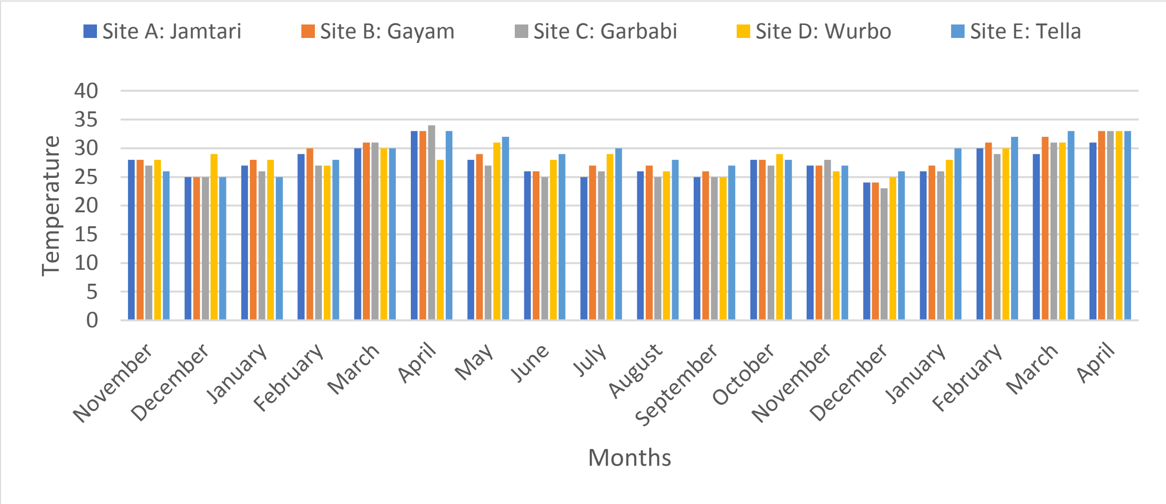

Figure 2: Monthly mean Temperature of River Taraba from November, 2017 – April, 2019

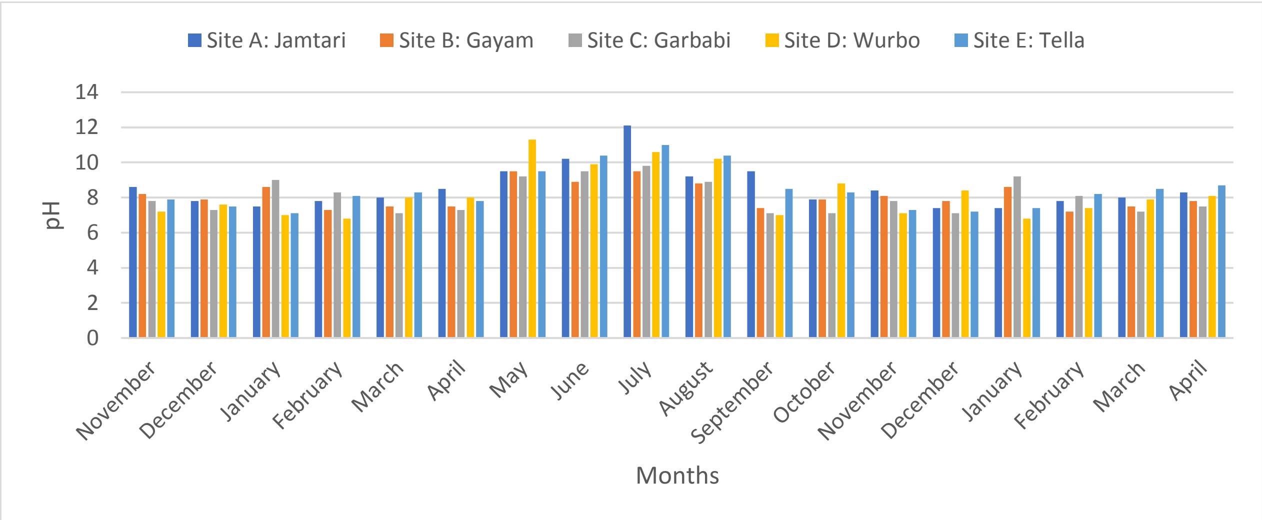

Figure 3: Monthly mean pH of River Taraba from November, 2017 – April, 2019

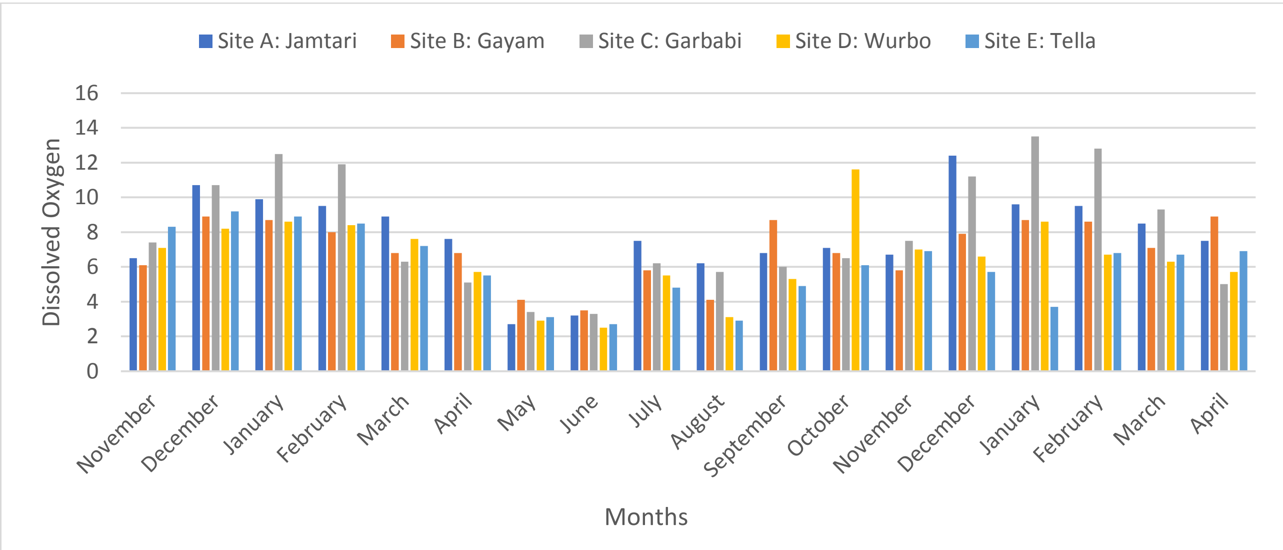

Figure 4: Monthly mean Dissolved Oxygen of River Taraba from November, 2017 – April, 2019

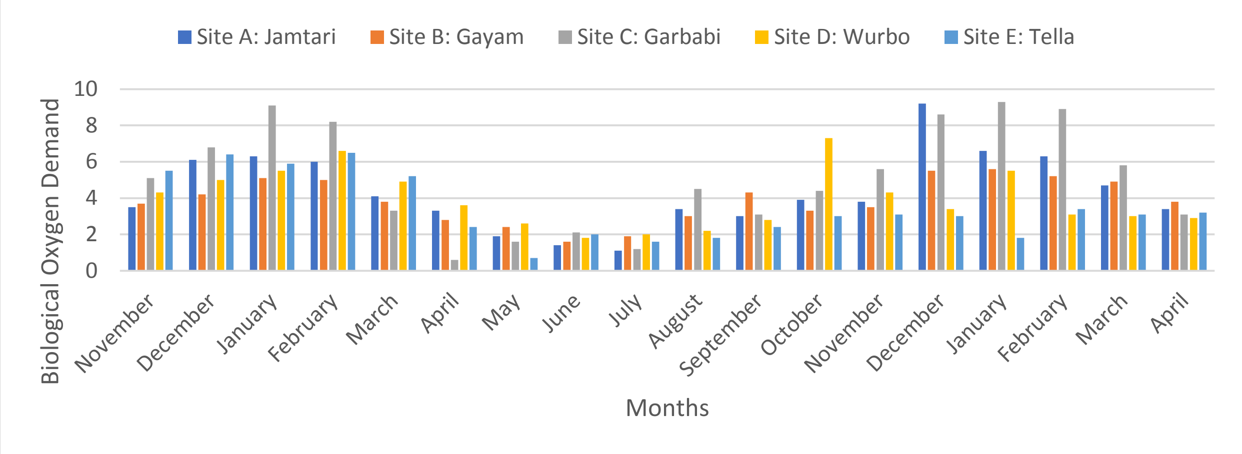

Figure 5: Monthly mean Biological Oxygen Demand of River Taraba from November, 2017 – April, 2019

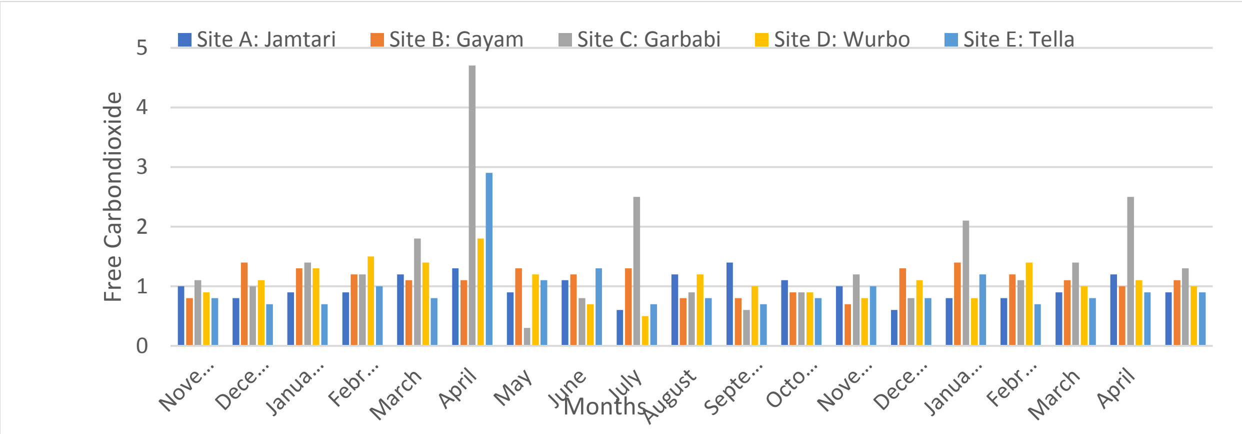

Figure 6: Monthly mean Free Carbon dioxide of River Taraba from November, 2017 – April, 2019

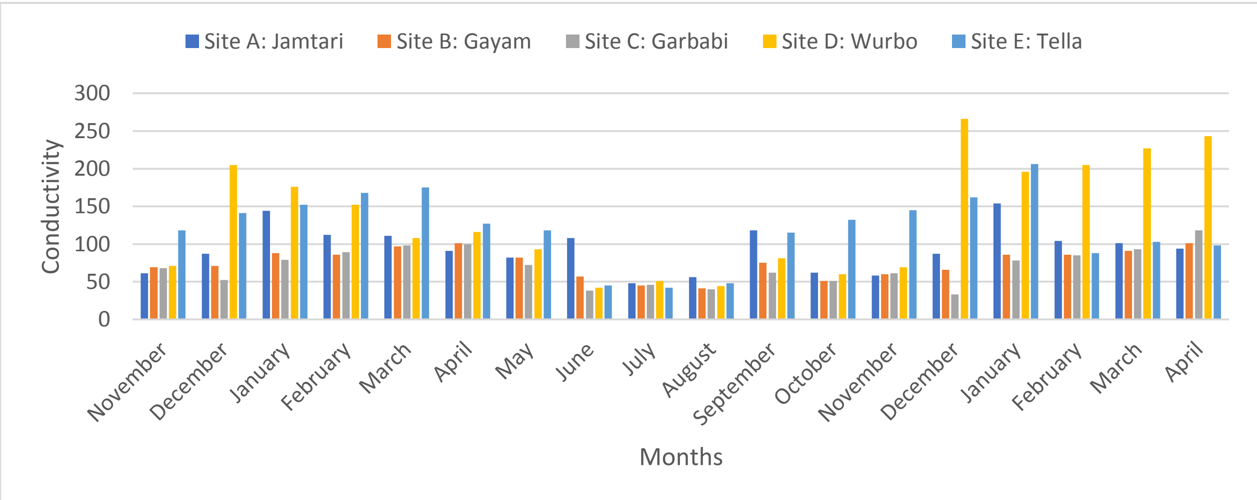

Figure 7: Monthly mean Conductivity of River Taraba from November, 2017 – April, 2019

Transparency

The monthly rates for transparency is shown in figure 8. The monthly rates fluctuated among 3.5cm in August 2018 at site B to 162.5cm in April 2018 at site A. The mean monthly rates fluctuated among 6.8±0.98cm in September 2018 to 74.5±20.88cm in December 2017. The mean rate of transparency for the period of study was 46.0±25.8cm. There was a significant difference both within months and sites ($p<0.05$) for the period of the study.

Total Phosphorus

The monthly rates of total phosphorus is presented in figure 9. The monthly rates of phosphorus fluctuated among 0.038mg/l in May 2018 at site D to 0.987mg/l in April 2018 at site D. The monthly mean rates fluctuated amid 0.293±0.02mg/l in the month of September 2018 to 0.663±0.10 mg/l in April 2019. The mean rate of total phosphorus for the period of study was 0.482±0.126mg/l. There was a significant difference among months ($p<0.05$) but there was no significant difference among sites ($p>0.05$) for the period of the study.

Total Nitrogen

The monthly rates of total nitrogen is shown in figure 10. The monthly rates fluctuated among 0.033mg/l in March 2019 at site E to 0.946mg/l in August 2018 at site E. The mean monthly rates fluctuated among 0.198±0.045mg/l in January 2018 to 0.537±0.220mg/l in July 2018. The mean rate of total nitrogen for the period of study was 0.327±0.174mg/l. There was no significant difference within the months ($p<0.05$) but there was significant difference between sites ($p>0.05$) for the period of the study.

Total Ammonia

The monthly rates of ammonia is presented in figure 11. The monthly rates fluctuated among 0.020mg/l in September 2018 at site C to 0.039mg/l in the month of May 2018 site D. The monthly mean rates fluctuated among 0.023±0.000mg/l in August 2018 to 0.034±0.006mg/l in March 2018 and 0.034±0.006mg/l in April 2019. The mean rate of total ammonia for the period of study was 0.029±0.005mg/l. There was significant difference among the months ($p<0.05$) but there was no significant difference among sites ($p>0.05$) for the period of the study.

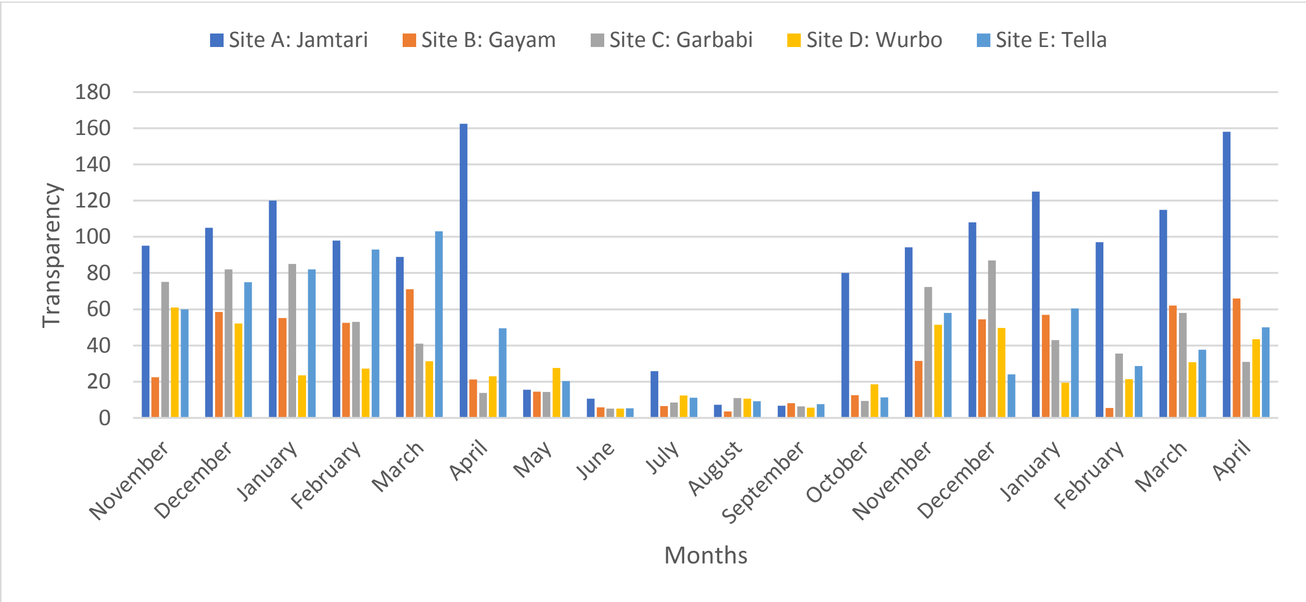

Figure 8: Monthly mean Transparency of River Taraba from November, 2017 – April, 2019

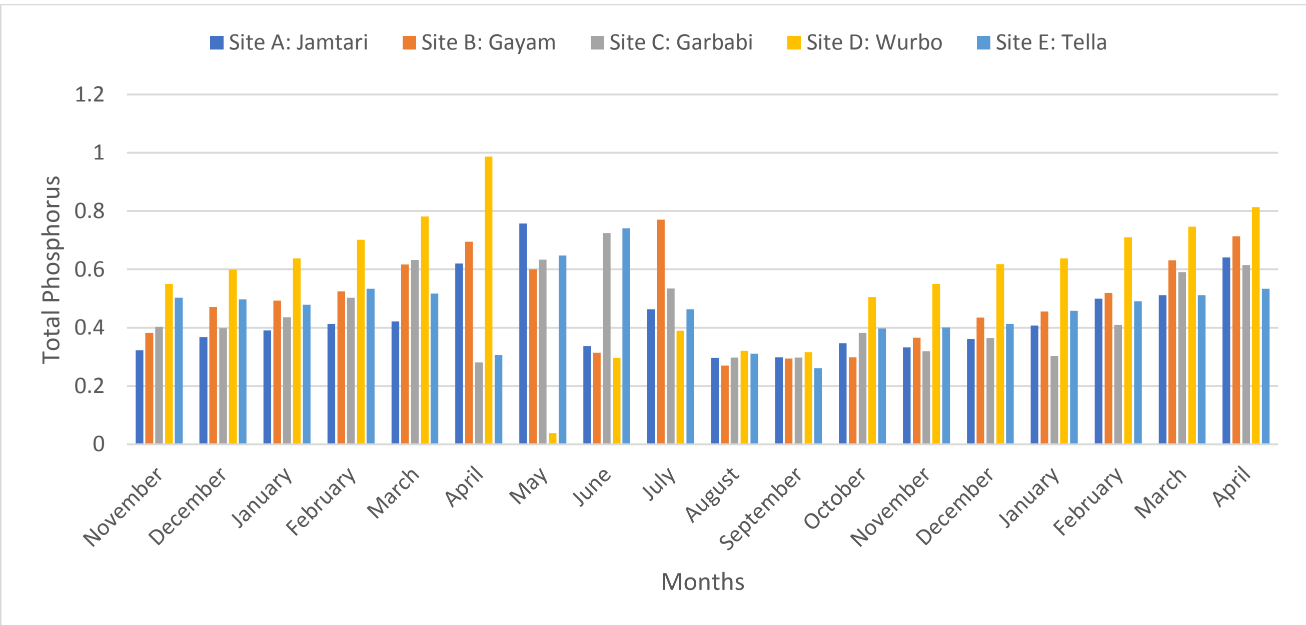

Figure 9: Monthly mean Phosphorus of River Taraba from November, 2017 – April, 2019

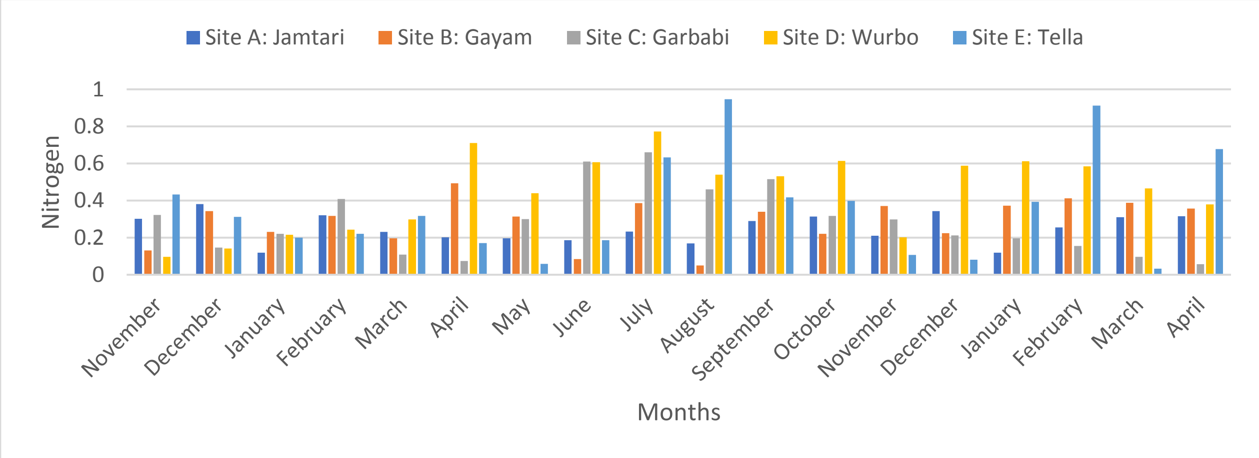

Figure 10: Monthly mean Nitrogen of River Taraba from November, 2017 – April, 2019

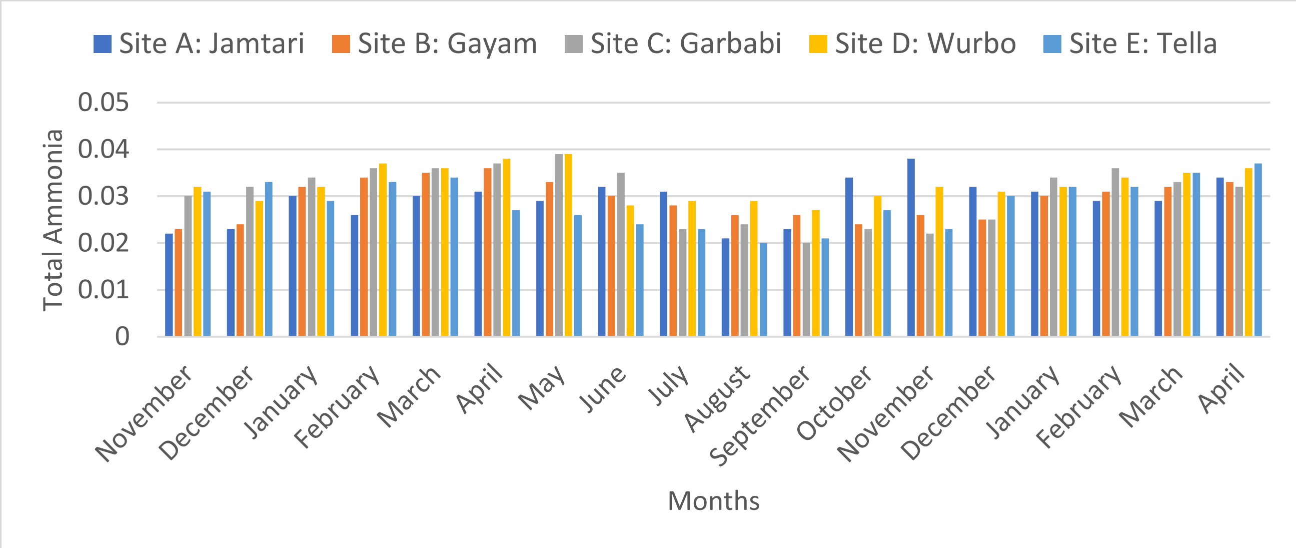

Figure 11: Monthly mean Ammonia of River Taraba from November, 2017 – April, 2019

Discussion

The water temperature of River Taraba fluctuates among months during the period of the study. The lowdown water temperature noted in December, may possibly be due to the distinctive cool dry North-East trade wind recognized as Harmattan among November and February while the greater water temperature in April was owed to distinctive warm climate from the North East (Abowei, 2010). This trend of temperature disparity was likewise narrated about River Benue at Makurdi by Akaahan *et al*., (2015). The valuation of temperature investigated are around standard array advocated by Federal Ministry of Environment, (2001) for warm Pisces, hence sustaining Pisces procreation, their existence, digestion and bodily processes of water creatures in River Taraba.

pH rates varied amid months. The noted pH mean rate is within the EU authorized array for piscaries and water beings (Akindele *et al.,* 2013) and WHO, (2012). pH standard for gulping water and cultivation of warm Pisces. The pH rate gotten in this work is connected to values noticed by Yakubu *et al.,* (2007) in Nun River, Nigeria. USEPA, (1991) commented that severe pH rates out of the array strained the natural structure of majority of water creatures and decrease procreation. It indicated that Pisces were strained in July 2018 since the pH rate exceeded standard. Greater mean rate detected in July 2018 might be due to joined impacts of shallow run-off from agrarian areas (with great intensity of lime) and photosynthetic action of macrophytes. Mustapha, (2008) opined an upsurge in pH with photosynthesis. The lowermost pH noted in December might be due to small or lack of shallow run-off. By and large, the mean pH rate for the period of the study is within the standard threshold of WHO, (2012), this has sustained the procreation, development, existence and a large number of water creatures in River Taraba.

The mean difference of the DO varied between months. The great dissolved oxygen rate documented in January matches with the harmattan time of lowermost turbidity and temperature. The cool harmattan wind which intensifies wave activity, and reduced surface water temperature could have influenced the dissolved oxygen intensity throughout the dehydrated months of the year, while the torrential rainwater generated upsurge turbidness and reduced dissolved oxygen intensity throughout the hydrated months of the year. The variability of DO throughout the period of research might be due to putrefaction of biological substances causing the utilization of oxygen. Though, Palmer *et al*., (2005) opined that DO intensity are anticipated to be at the saturation point 6mg/l DO at 25^{O}C. Abubakar (2006) noticed that apart from photosynthetic actions which increased the upholding of great dissolved oxygen points, the cool wind may initiate the water to unify thus, the occurrence of bottom-up and top-bottom is increased. Lowermost dissolved oxygen intensity causes reduced breathing and nourishing behaviors which similarly have adverse impact on the development and infectious manifestation in water creatures. The DO mean rate during the period of the study is within the desirable threshold by WHO, (2012). This indicate that the water is good for the wellbeing of water creatures in River Taraba.

The monthly mean dissimilarity of Biochemical Oxygen Demand was observed. The results found is within the appropriate array for usual behaviors of pisces (Bhanagar and Devi, 2013). The results also concurs with Edward, (2017) who stated similar values in upper Benue River. The pattern of periodic BOD trailed with that of DO intensity with great rates and fluctuations throughout the hot season than in the drizzling season The explanation for the lofty biological oxygen demand observed in February could be due to great putrefaction of biologic substances by microbes while the lowermost BOD observed in the month of May could be due to little putrefaction of biologic substances by microbes. The general mean BOD rate throughout the time of the study is within the applauded confines, this showed that pollution was not a critical impediment thus, not detrimental for pisces existence in River Taraba.

The monthly mean discrepancy of free CO_2 varied during the period of the study. The lowermost rate of free CO_2 detected in the month of October can be ascribed to little luminosity infiltrating the unblemished water preceding to lower photosynthesis while the greater CO_2 detected in April may be as a consequence of uppermost temperature of the water body, lowermost DO, and hot season of the year undertakings around the river which bathed living and nonliving compounds into the river. The results is greater than what was informed by Nnamona *et al.,* (2018) of River Ebenyi in Eha-Amufu and Environs, Southeast, Nigeria. The rate of CO_2 in this study is within the permissible limit defined by WHO, (2012). The mean rate of free CO_2 through the period of the study sustained nourishment, stability and alignment of water creatures in River Taraba.

Monthly mean conductivity rate fluctuates. The result is in accordance with (WHO, 2012) that electrical conductivity of most fresh water fluctuates. The result is fewer than why was observed by Raji *et al*., (2015) of River Sokoto Northwestern, Nigeria. The fluctuation in the conductivity rate detected might be due to the fluctuation of monthly mean rate of pH around the neutral point of 7 noted in the river. Acidic water ($pH < 4.5$) or alkalinity ($pH > 10$) escalate uppermost conductivity rates. The results backs Carr and Neary, (2006) report that ions were small in the drizzling season of the year than in the hot season of the year since conductivity drops in the drizzling season of the year as intensity of salts turn out to be further diluted. Consequently, seepages can alter the conductivity of a watercourse because of their composition. Seepages could raise the conductivity of water because of the existence of chloride, phosphorus and nitrate (USEPA, 1991). Conductivity is incredibly steady than temperature, dissolve oxygen and pH and it is only dependent to fast variations when there are new inputs such as storm water inflow or as hot period progresses or increased effects of ground water. The greater conductivity rates recorded throughout hot months of the year was affected by intensified water vaporization. The mean conductivity rate during the period of the study is within the approved standard for water creatures hence their flourishment in River Taraba.

The monthly mean rate of transparency of River Taraba varied.The lowermost monthly mean rate detected in September might be as a result of drizzling months of the year which match with uppermost turbidity ascribed to upsurge in wreckage burden. The uppermost transparency mean rate recorded in December is within the recommended threshold of (Bhatnagar and Devi, 2013). Related remark was made by Ehigiator and Obi, (2015) on the associations amid physical components of Ovia River. The uppermost transparency could be due to shallow run-offs and settling impact of floating substances throughout hot months of the year. Uppermost turbidity upsurges water temperature due to floating atoms attracting more heats; this in turn decreases the intensity of dissolved oxygen because it decreases the quantity of luminosity infiltrating the water, which cutbacks photosynthesis. The mean transparency rate all through the period of the study is within the needed threshold of WHO, (2012), this indicate that, there are no dissolved solids that can upset the digestion and functioning of pisces and other water creatures in River Taraba. It also depicts that there were no particles that can overlay watercourse floor and suffocate pisces eggs and other benthonic micro invertebrates or choke fish lamellae.

The monthly mean variation of total phosphorus alternated. ACTFR, (2002) asserts that synthetic origin of phosphorus comprises composts, cleansers, waste water, industrial discharge and animal eliminations amongst others. The lowermost rate of Phosphorus in the month of September may well be inflow of water into the watercourse while the uppermost rate noted down in the month of April might be as an effect of shrunken capacity of water and agrochemicals operated round the watercourse in the hot season of the year. The result is fewer than what was investigated by Raji *et al*., (2015) of River Sokoto Northwestern, Nigeria. The mean total phosphorus rate during the period of the study is within good threshold of (USEPA, 1991) and as endorsed by Bhatnagar and Devi, (2013), the result pointed out that there was no algal bloom that will lessened the quantity of oxygen, the mean dissolve phosphorus might have fueled the richness of pisces in River Taraba.

The monthly mean total nitrogen varied. The greater nitrogen noticed in July might be due to shallow run-offs as well as putrefaction of carbon-based substance during the drizzling months of the year. Ibrahim *et al*., (2009) opined that greater nitrate intensities is connected to inputs from cultivated grounds. The lowermost total nitrogen in January might be due to the greater intensities of dissolved oxygen and lessened or lack of shallow run-offs. The mean rate of total nitrogen found in River Taraba were fewer than the peril threshold stated by Abubakar, (2006) that surplus nitrogen at greater intensities can initiate little amount of Dissolved Oxygen and noxious to warm-blooded faunas in some circumstances. The mean total nitrogen rate found during the period of the study is within the suggested limit (USEPA, 1991). It proved that there will be no Oxygen diminution, thus breathing and nourishing behaviors of pisces sustained their general wellbeing in River Taraba.

The monthly mean total ammonia varied. The mean rate of total ammonia for the study area is greater than what was recommended by Bhatnagar and Devi, (2013). The result is in conformity with Edward, (2017) who testified a greater total ammonia in upper Benue River during hot and wet season of the year. The greater total ammonia found through the period of the study might be due to putrefaction of carbon-based substances as well as eliminatory wastes of water creatures in the watercourse. The mean rate of total ammonia for the period of the study is marginally out of the argued threshold for water creatures, hence it could lower their development, confrontation to infections and osmoregulatory disproportion.

Conclusion

The water quality is good for the development, existence and procreation of pisces and other water creatures as indicated by most evaluation of the physicochemical properties except for total ammonia which exceeded the threshold and could pose threat if not curbed.

Conflict Of Interest

The authors declared no conflict of interest exist.

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