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A Study on Water Quality Conditions of Vimtim (Gramta) Stream in Mubi, Adamawa State

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Abstract: Gramta stream being the largest and the only river in a village called Vimtim located in Mubi north Local Government area of Adamawa State, whereas humans and animals used, was studied to ascertain the suitability of the water for fish and other related uses. Three study points; inlet (A), middle (B) and outlet (c) were adopted for monitoring the temperature, pH values, ammonia values and transparency values. The mean temperature values of stations are; A (25.83°C), B (25.88°C) and C (26.83°C) while monthly mean temperature are; June (26.33°C), July (26.16°C) and August (26.00°C). Average pH values of stations are; A (8.10), B (8.13) and C (7.87) while monthly pH average values are; June (7.53), July (8.21) and August (8.37). Average station values of dissolved oxygen are; A (6.0), B (6.0) and C (6.33) while monthly mean are; June (6.67), July (6.00) and August (5.67). Average station conductivity values are; A (73.90 μ cm s^{-1}), B (74.00 μ cm s^{-1}) and C (76.13 μ cm s^{-1}) while monthly average conductivity values are; June (85.67 μ cm s^{-1}), July (64.57 μ cm s^{-1}) and August (73.80 μ cm s^{-1}). Stations mean value of ammonia are; A (0.5), B (0.5) and C (0.5) while monthly mean values are; June (0.5), July (0.5) and August (0.5). Mean station transparency values are; A (21.10cm), B (21.40cm) and C (21.40cm) while monthly mean transparency value are; June (20.33cm), July (21.67cm) and August (21.78cm). In conclusion Gramta river, despite the fact that it serves many purposes it is still suitable for fresh water fishes and other related uses.

Key words: Water Quality · Condition Factor · Vimtim Stream

INTRODUCTION

One of the major environmental issues of our time is the growing demand of water quality conditions suitable for use by humans as well as aquatic organisms (fish) [1]. Rivers, lakes and dams are valuable ecological resources that serve many human needs and therefore enhance life by providing a lot of opportunities. A large number of Nigerian populations live near small water bodies such as lakes, reservoirs, swamps and coastal lagoons. Many of them heavily depend on the resources of such water bodies as their main sources of food and family income. Usually such small systems are subjected to several inherent environmental factors as well as more intensive human usage impacts than most large systems [2]. It is a well known fact that water quality conditions are constantly being threatened by pollution from large quantities of waste influenced by urbanization, industrialization and agriculture. The increasing level of using chemical herbicides, pesticides and improper domestic and sewage disposal has created a growing awareness of national management of aquatic resources and control of waste discharged from the environment [3]. Water quality conditions according to Boyd and Lichotkoper [4] include all the physical, chemical and biological factors that influence the beneficial use of that water. The stream of Gramta (Vimtim) serve many purposes which include irrigation (dry season farming), fishing, as well as a source of domestic water used by the community and as a source of drinking water for cattle. A number of miscellaneous water users also participate in this value chain. The great commercial and food value of this stream has brought impact to the human life of this community. So far no data/information on water quality conditions of this stream has been documented. Against this background, this study was designed to investigate the physiochemical parameters of this stream so as to ascertain the suitability of this water for fish and other related uses.

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MATERIALS AND METHODS

Gramta stream is located in a village called Vimtim in Mubi North Local Government of Adamawa State-Nigeria. The name Gramta (in Fali tribe) means a very big traditional pot that contains large volume of water which never dries up. The stream has its source from two main mountains called "Tsundanba" and "Makaraha" located in the southern and eastern part of the community respectively. The stream serve for many purposes such as fishing, irrigation (dry season), as well as a source of drinking water for both animal and human beings.

Three sampling stations were selected along the stream for this study. The stations include: the inlet of the stream as station A, middle of the stream as station B and the outlet of the stream as station C. The study was conducted for a period of three months from June to August, 2009. Water samples were collected inside a cleaned dry 1 litre wide mouthed transparent glass bottle. The sample of each station was collected at a depth of 30cm and was transported to the laboratory testing immediately. Temperature was determined at the site using mercury bulb thermometer, transparency was determined using a Secchi disc. Dissolved oxygen (DO) was also directly determined using Jenway DO meter Model 9500, which measures DO from 0.2 mg l^{-1} to 20 mg l^{-1}. Ammonia was determined using the ammonia testing kits, conductivity was determined in the laboratory with the aid of Hatch Conductivity meter Model EC500. Hydrogen ion concentration (pH) of the water was determined using the combined pH and conductivity metre Jenway Model 3540.

STATISTICAL ANALYSIS

All data obtained were subjected to Analysis of Variance (ANOVA) to test the level of significance among stations and monthly means. Mean separation was by standard deviation SD as described by Steel and Torie [5].

RESULTS

Water Quality Conditions: The monthly and station values of the water temperature, pH, dissolved oxygen, conductivity, ammonia and transparency are shown in the Tables 1-6.

Table 1: Shows the monthly and station water temperature values for the period of the study. The highest (26.33°C) and lowest (26.00°C) monthly mean temperature were reported in June and August, respectively. The station's highest and lowest means

Table 1: Mean Temperature (°C) values of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	26.50	25.50	27.00	26.33
July	25.50	26.50	26.50	26.17
August	25.50	25.50	27.00	26.00
Station Mean	25.83	25.88	26.83	

Table 2: Mean p^H Values of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	7.60	7.50	7.50	7.53
July	8.22	8.30	8.12	8.21
August	8.50	8.60	8.00	8.37
Station Mean	8.10	8.13	7.87	

Table 3: Mean Dissolved Oxygen (DO mg l^{-1}) Value of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	7.0	6.0	7.0	6.67
July	6.0	6.0	6.0	6.00
August	5.0	6.0	6.0	5.67
Station Mean	6.0	6.0	6.33	

Table 4: Mean Conductivity (μ cm s^{-1}) Values of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	85.00	87.00	85.00	85.67
July	64.00	64.00	65.00	64.57
August	72.00	71.00	78.00	73.80
Station Mean	73.90	74.00	76.13	

Table 5: Mean Ammonia (mgl^{-1} Value of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	0.5	0.5	0.5	0.5
July	0.5	0.5	0.5	0.5
August	0.5	0.5	0.5	0.5
Station Mean	0.5	0.5	0.5	

Table 6: Mean Transparency (cm) Value of Gramta Stream

	Stations			
Months	A	B	C	Monthly Mean
June	20.00	20.20	21.00	20.33
July	22.00	22.00	21.00	21.67
August	21.33	22.00	22.00	21.78
Station Mean	21.10	21.40	21.40	

were 26.83 and 25.83°C reported in station C and A, respectively. There was no significant difference, among the monthly and station mean temperatures.

Table 2 shows the monthly and station pH values of the study area. The highest monthly mean pH (8.37) and the lowest (7.53) were recorded in August and June, respectively, while the highest (8.13) and the lowest (7.87) station pH mean was reported in station B and C, respectively. There were significant difference ($p<0.05$) among the monthly mean and station mean.

Table 3 shows the dissolved oxygen content of the stream. The highest (6.67) and the lowest (5.67) monthly dissolved oxygen mean values were in June and August, respectively, while the highest (6.33) and lowest (6.0) pH station means were in C and A and B, respectively. Significant difference ($p<0.05$) existed among the monthly means of the dissolved oxygen.

Table 4 shows the conductivity values of the water. The highest (85.67) and lowest (64.57) monthly conductivity mean was in June and July, respectively while the highest (76.13) and the lowest (73.9) station mean were reported in station C and A, respectively. Significant difference ($P<0.05$) existed across the months and the stations of the stream under investigation.

Table 5 shows the ammonia values of the stream. The ammonia was the same (0.5mgl) across the months and the stations of the stream under investigation. No significant difference was observed among the treatments means.

Table 6 shows the transparency of the stream. The highest (21.78cm) and the lowest (20.33cm) monthly mean values were recorded in August and June respectively, while the highest (21.40cm) and the lowest (21.10cm) station mean values were recorded in station C and A, respectively. No significant difference existed among the means.

DISCUSSION

The various investigated physicochemical parameters in this study were favourable for fish production and fall within the standards recommended by Boyd and Lickotkoper [4]. The highest and the lowest mean temperature reported in this study correspond to the optimum temperature required by most tropical fresh water fish [6]. The highest and the lowest p^H reported in this study did not exceed the range (6.5 - 8.5) that most fish can tolerate and this was observed in the entire month and station values of the stream under the period of investigation. The range is also in line with the report of Ugwu and Mgbenka [7]. Dissolved oxygen content of the stream was also within the range recommended for fresh water fish. Viveen *et al.* [6] recommended that the dissolved oxygen of water should not be less than 4ppm for fresh water fish and the values obtained in this study was higher than the minimum recommended. Conductivity values of the stream showed some variations both across the months and the stations. This trend is in agreement with other workers such as [8]. Pandy *et al.* [9] reported an increase in trend in the variation of the water conductivity of Kaithkola lake in India. The reason for this can be attributed to the amount of waste and agricultural chemicals discharged into the stream in the peak of the rainy season (August). The mean ammonia values recorded does not show any difference among means and also does not affect the life of fish in this stream. Transparency values indicated that the water was more transparent at the beginning of the rainfall and at the inlet station. Mean transparency value recorded were similar to value (20 - 22cm) recorded and documented by Viveen *et al.* [6]. This shows that the stream water contains adequate nutrients hence it was being fairly turbid.

CONCLUSION

The relationship between fish yield and water parameters showed that no parameter can be singled out in relation to fish growth and health. Gramta river despite the fact it serves many purposes is still suitable for fish and related uses.

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