AN ASSESSMENT OF WATER QUALITY PARAMETERS OF RIVER CHANCHAGA, MINNA, NIGER STATE

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ABSTRACT

Assessment of physico-chemical parameters of River Chanchaga in Minna, Niger State was carried out from June to December, 2015. The physico-chemical Parameters were determined biweekly from four sampling points (Kasobo, Tunga-Waya, Numukpan and Chanchaga Village) using standard methods. The parameters determined include P^H, dissolved oxygen, electrical conductivity, total alkalinity, temperature, BOD and ammoma. High mean range of physico-chemical parameters were observed at some points. It was concluded that Agricultural activities like fertilizer application and other activities like bathing, washing and defecation into the water might be responsible for the high physico-chemical parameters recorded at some points.

Keywords: Assessment, Physico-Chemical Parameters, River Chanchaga, Water Qualities and Minna.

INTRODUCTION

The physical and chemical parameters of water immensely influence its uses, the distribution and richness of the biota (Unanam and Akpan, 2006). Several of these physico-chemical parameters have been studied on large man-made lakes in Northern Nigeria (Adeniji, 1981). Other works on physico-chemical parameters include that of Balarabe (1989), on Makwaye Lake, Zaria, Oniye, *et al.,* (2007), On Zaria Dam and Kolo and Oladimeji (2004), on water quality and some nutrient levels in Shiroro Lake, Niger State. Water pollution is of grave consequence because both terrestrial and aquatic life may be affected; it may cause disease due to the presence of some hazardous substances, which may distort the water quality, add odours and significantly hinder economic activities (Asonye, *et al.* 2007). In Nigeria like any other developing country of the world, the level of several metal pollution of freshwater bodies is no longer safe for human consumption (Omorregie *et al.*, 2002). Earlier base line studies have identified elevated levels of certain trace metals in Local Freshwater systems (Asonye, *et al*, 2007) arising mainly from agricultural and industrial processes (Adakole, 2007).

MATERIALS AND METHODS

Study Area

River Chanchaga lies between latitude $9^{o}30^{1}$ N and longitude $6^{0}32^{1}$E. It is found in Bosso Local Government Area, Minna, Niger State (Figure 1). River Chanchaga flows through Kasobo, Numu Kpan, Tunga-Waya, Isafi-Wambai Gurusa and a Village (Chanchaga) named after river Chanchaga.

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The people of the area are predominantly farmers and a lot of farming activities are done on daily basis. Domestic wastes are dumped in the river and activities such as bathing, washing and defecation are done on the banks of the river.

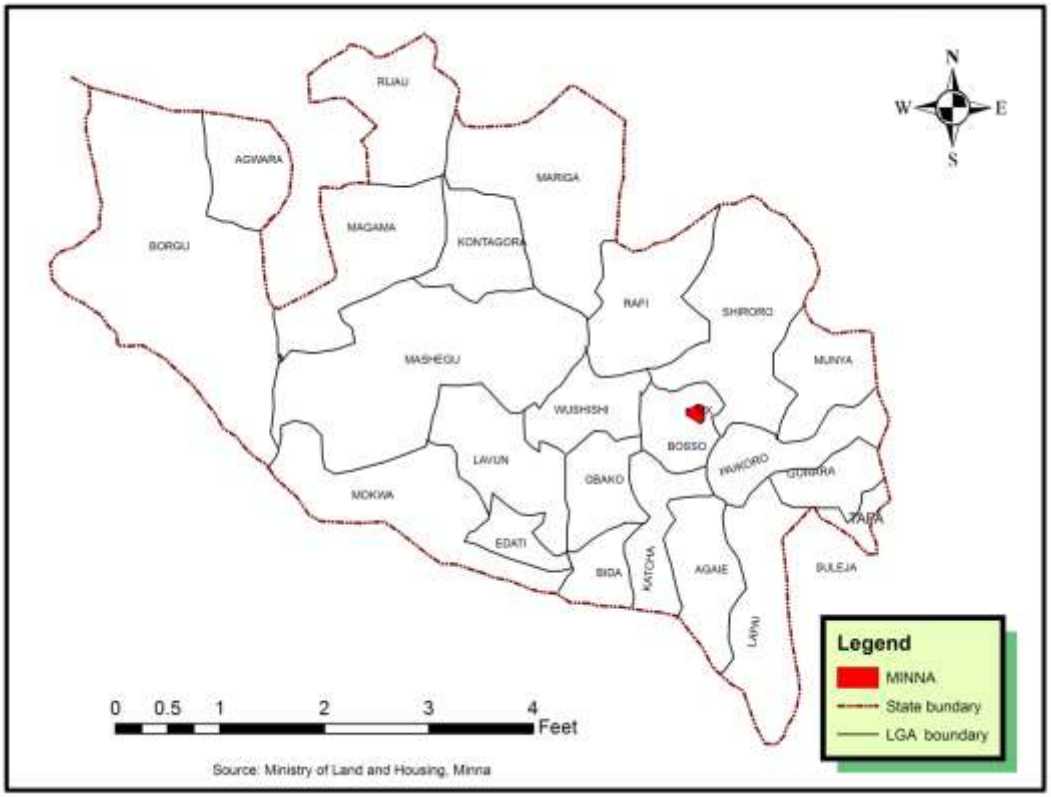

Fig.1: Map of Niger State showing Minna
Source: Ministry of Land and Housing, Minna

Sampling Points

Water Samples were collected from four sampling points (Kasobo, Tunga – Waya, Numu Kpan and Chanchaga) biweekly from June to December, 2015 with corked specimen bottles.

Physico-Chemical Analysis

Water temperatures were measured at each sampling points using mercury in glass thermometers in ^{0}C. Pye Unicam model 292 metre (after standardization with buffer solution at p^{H} 4.0, 7.0 and 9.O.) was used for P^{H} and electrical conductivity determination. The modified Winkler – Azide method (Lind, 1979; APHA, 1985,) was used to determine the dissolved oxygen. Total alkalinity was determined using standard method described by Boyd (1979) and APHA (1992). Ammia and biochemical oxygen demand (BOD) were determined using Burette titration.

Statistical Analysis

Data collected were analyzed with one – way analysis of variance (ANOVA) procedure using Statistical Package for Social Sciences (SPSS version 16.0) for window. Statistical significance of difference among means was compared using Turkey (HSD) test.

RESULTS

The mean biweekly values of physico-chemical parameters of the four locations for the six months are presented in Table 1.

Table 1: Mean of the Physco-Chemical Parameters of the Four Sampling Points

PARAMETERS	POINTS			
	Kasobo	Tunga- Waya	Numu Kpan	Chanchaga
PH	7.2 ±0.03[a]	12.3±0.43 [b]	9.3±0.14 [c]	11.2±0.01 [e]
Temperature (^{o}c)	23.6±0.11 [e]	27.4±0.00[b]	24.1±0.02[a]	27.3±0.06 [b]
Dissolved Oxygen (mg/L)	7.5±0.16 [b]	10.2±0.06[a]	2.3±0.15 [c]	1.7±0.04 [d]
Conducting (Mg/L)	81.4±1.02 [a]	92.3±0.95[b]	86±0.55[c]	70±0.66[d]
BOD (Mg/L)	43±0.46[b]	47.3±*0.55*[c]	118±*0.75*[d]	130±*0.57*[e]
Ammonia (Mg/L)	0.33±*0.12*[a]	0.9±*0.16*[b]	2.9±*0.00*[c]	6.8±*0.54* [d]
Total alkalinity $CaCo_3$ /L	78.4±*0.03*[b]	130±*0.03*[c]	133±*0.02*[a]	80±*0.52*[e]

Mean of parameters with the same superscript along the vows are not significantly different at P> 0.05.

DISCUSSION

There were marked variations in the physico-chemical parameters of the four sampling points (Kasobo, Tunga-Waya, Numu Kpan and Chanchaga village).The mean P^H values of the four sampling points ranged from 7.2 (Kasobo) to 12.3 (Tunga-Waya). Numu Kpan had 9.3 while Chanchaga village had 11.2. FEPA standard is 6.0 to 9.0. The P^H of Kasobo (7.2) and Numu Kpan (9.03) falls within the FEPA standard. The high P^H values of Tunga – Waya (12.3) and Chanchaga Village (11.2) might be due to intensive algal growth associated with organic pollution. Boyd and Lichtkopper (1979) reported P^H range of 6.0 – 8.5 as being ideal for supporting aquatic life including fish. Thus, the P^H range obtained in Kasobo is within the acceptable level of 6.0 to 8.5 for culturing tropical fish species (Huett, 1977) and for drinking water (WHO, 1984). Federal Environmental protection Agency (FEPA) recommended P^H of 6.5 to 8.0 for drinking water and 6.0-9.0 for aquatic life.

Temperature increased from Kasobo (23.0) to 27.4 in (Tunga-Waya) and 27.3 (Chanchaga Village) While Numu Kpan had 24.1. The temperature range falls within FEPA standard of 20^0C. Dupree and Hunner (1984) observed that warm water fish grow best at temperature between 25^0C to 32^0C. Alabaster and Lloyd (1980) stated that the normal range to which fish is adapted in the tropics is between 8^0C and 30^0C. Dissolved oxygen fluctuated between Kasobo (7.6mg/L) and Tunga – Waya (10.2). Numu Kpan had 2.3mg/L while Chanchaga Village had 1.7mg/L. Dissolved oxygen of Kosobo falls within the FEPA standard of 7.5mg/L. Low dissolved oxygen observed in Numu Kpan and Chanchaga Village might be due to discharge of sewage effluents. The high dissolved oxygen recorded at Tunga-Waya might also be due to discharge of sewage effluent. The variation in mean conductivity with the highest value of 92.3mg/L (Tunga-Waya) while Kasobo had 81.4mg/L, Numu Kpan had 86.0mg/L and Chanchaga village had 70.0mg/L respectively.

The mean BOD of the river ranged from 43.0mg/L (Kasobo) to 130.0mg/L (Chanchage village), Tunga – Waya had 47.3mg/L while Numukpan had 118.0mg/L. The high mean value of BOD is indication of pollution pressure (Fagade, *et al*, 1992).

The range of the mean concentration of ammonia contents of the river are from 0.33mg/L (Kasobo) to 6.8mg/L (Chanchaga village). Tunga-Waya had 0.9mg/L while Numukpan had 2.9mg/L. Fagade *et al.*, (1972) stated that water with 2.7mg/L of ammonia content are grossly polluted. This implies that Numukpan and Chanchaga Village are grossly polluted; aquatic resources will be negatively affected. The alkalinity of the river ranged between 78.4mg/L (Kasobo) to 133.0mg/L (Numukpan), Chachaga village had 80.0mg/L while Tunga – Waya had 130.0mg/L. These values signified that the river had a good buffering characteristics and will not fluctuate with change in P^H values which may occurs as a result of algal bloom caused by dumping of untreated sewage into river as well as other organic pollutants. Because of high biochemical oxygen demand of 118.0mg/L (Numukpan) and 130.0mg/L in Chanchaga village cum high nammonia content of 2.9mg/L (Numukpan) and 6.8mg/L (Chanchaga village). The two sampling points are under Pollution Street. The sources of pollution stress are most likely due to the presence of sewage refuse and other agricultural wastes dumped into the river.

CONCLUSION

Activities such as fertilizer application, bathing, washing and defecation into the river might have contributed to the high physico-chemical parameters recorded at some points in river Chanchaga.

REFERENCES

Adakole, J.A. (2000): The Effects of Domestic, Agricultural and Industrial Effluent on the Water Quality and Biota of Bindare Stream, Zaria – Nigeria PhD. Thesis, Department of Biological Science, Ahmadu Bello University, Zaria. 256 PP.

Adeniji, H.O. (1981): The Development of Limnology in Nigeria, In: Proceedings of the First Workshop for the Promotion of Limnology in Developing Countries: 15-17

Alabaster, J.S. and Lloyd, R. (1980): Water Quality Criteria for Fresh Water Fish. 2nd Edition Pp. 325.

APHA (1985): American Public Health Association. Standard Methods for the Examination of Water and Waste Water 15th Edition. Pp. 476.

APHA (1992): America Public Health Association. Standard Methods for the Examination of Water and Waste Water. 19 Edition, PP. 472.

Asonye, C.C., Okolie, N.P, Okenwa, E.E, and Iwuanyawu, U.G. (2007): Some Physico-Chemical Characteristic and Heavy Metal Profiles of Nigerian Rivers, Streams and Waterways. *African Journal of Biotechnology,* 6 (s): 617-624.

Balarabe, M.L. (1989): Limnology and Zooplakton Distribution of Makwaye, (Ahmadu Bello University, Farm Lake, Samaru, Zaria. Unpublished M.Sc Thesis. Ahmadu Bello University, Zaria PP143.

Boyd, C.E. (1979); Water Quality in Warm Water Fish Ponds. 1st Edition, Agricultural Experimental Station Auburu University, Crafts Master Publication, Company, Alabama, U.S.A 341P.

Boyd, C.E. and lichtkopper, F.R (1979): Water Quality Management in Pond Fish Culture Research and Development Series 22-30.

Fagade, S.O. Adebisi, A.A., Kolo, R.J. Elemi B.F. Adeosun, A.A. and Ja'afarun, (1992): Urbanization and Degradation of Aquatic Resources. The Ibadan Experience. University of Ibadan, Nigeria.

FEPA (1991): Guidelines and Standards for Environmental Pollution Control in Nigeria. Federal Environmental Protection Agency, Nigeria.

Huett, M. (1977): Textbook of Fish Culture, Breeding and Cultivation of Fish. 2nd Edition, *New Book Publication.* University Press, Cambridge, PP 438.

Kolo, R.J. and Oladimeji, A.A (2004): Water Quality and Some Nutrient Levels in Shiroro Lake, Niger State. Nigeria. *Journals of Aquatic Sciences*. 19 (2); 99

Lind, O.T. (1979): A Handbook of Common Methods of Water Analysis for Limnology. *C.V. Moshy Publishers,* St Liius, U.S.A 69 PP.

Omoregic, E., Okoronkwo, M.O. Eziashi A.C and Zoakah, A.I (2002): Metal Concentrations in Water Column Benthic Macro Invertebrates and Tilapia from Delimit River, Nigeria. *Journal of Aquatic Sciences*. 17 (1); 55-59.

Oniye, S.L., Ega, R.A Ajanusi, O.J. and Agbede, R.I.S (2002): Some Aspect of the Physico-Chemical Parameters of Zaria Dam, Nigeria. *Agric and Environment. II* (2); 367-379

Unanam, A.E. and Akpan, A.W (2006): Analysis of Physico-Chemical Parameters of some Freshwater Bodies in Essien Udim Local Government Area of Akwa-Ibom State, Nigeria. In; *Proceeding of the 21st Annual Conference of the Fisheries Society of Nigeria* (FISON) Calabar, 13th – 17th November, 2006.

WHO, (1984): Guidelines for Drinking Water. World Health Organization, Geneva, PP 211.

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