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Department of Fisheries, Faculty of Agriculture, University of Maiduguri, Nigeria
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Some Aquatic Macrophytes and Water Quality Parameters of River Guma, Benue, Nigeria

*Okayi, R.G., Daku, V., and Mbata, F.U.
Department of Fisheries and Aquaculture, University of Agriculture, P.M.B. 2373, Makurdi, Nigeria.

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ABSTRACT

The study was conducted between July-August 2012 to identify some aquatic macrophytes of River Guma in Guma Local Government Area of Benue State taking from four sites (A ,B ,C, and D) as a case study. The identification was done by visually observing and assessing the aquatic macrophyte growth on the sites. In addition some physico-chemical parameters associated with their distribution in river Guma was studied and analyzed.The four sites studied had some macrophytes in common, namely, Cyperus alopcuroides, Thalia genuculata, Corypha umbraculifera, Ludwigia leptocarea, Ludwigia erecta while Azolla africana were found in site A, Ceratophyllum dermersun and Eichornia crassipies were found in site B and C. The result of the physico-chemical parameters taken revealed that there was a significant difference ($p < 0.05$) in all the parameters taken with free carbon dioxide ranging from 3.38±0.13- 4.03±0.03,biochemical oxygen demand (BOD) values ranged from 2.47±0.09 - 3.53 ± 0.03, DO_2 ranged from 4.63±0.08-4.00±0.10 between July and August. pH ranged from 7.03±0.03 - 7.38±0.13, turbidity ranged from 23.25±0.25 - 24.25±0.25, temperature ranged from 25.25±0.25 - 25.59±0.09 while total alkalinity ranged from 21.03±1.03 - 22.03±0.98 between July and August

Keywords: Keywords: Aquatic macrophytes, Water quality parameters, River Guma

INTRODUCTION

River Guma consists of rich Fadama areas and is endowed with some macrophytes. The Fadama area provides good fertile land for subsistence vegetable production and livestock grazing. Local fishing activities are also carried out. Fish growth depends on water quality in order to boost its production. Water physico – chemical parameters are known to affect the biotic component of an aquatic environment in various ways (Ugwumba, 1993). The important characteristics of River Guma to its riparian owners can never be over emphasized and also the damage done to its quality by man and other animals calls for more attention to study, protect and preserve the stream and its valuable resources e.g, fishes, shrimps, crabs, phytoplankton, zooplankton and macrophytes. The interest in aquatic macrophytes generally began in the tropics in the beginning of second half of the 20th century and this interest arose from possible advantages and threat the macrophytes may pose to man and water body utilization (Adigun, 2005).

According to Birnin-Yauri (2010), aquatic vegetation is green plants which

* Corresponding Author email: rgokayi@yahoo.com Tel:+234 (0) 8068078099

undergo photosynthetic activities either completely or partially in water. Aquatic macrophytes are very important in the food chain of fishes as it also serve as source of food and a significant role in the oxygen balance and nutrient cycle of many water courses. Studies on aquatic macrophytes, and especially their ecology, were few in number before the 1960s (Thomaz *et al.,* 2008). Kio and Ola-Adams (1987) reported the presence and spread of aquatic macrophytes on Nigerian water bodies that had aroused considerable national interest and concern especially in the Lagos lagoon and Okitipupa water ways. Okayi,*et al*. (2011) reported eutrophication of some selected sites on River Benue due to the application of inorganic fertilizer during the dry season farming and the flow of blood and animal waste matter from abattoirs into the River.

Despite the threats aquatic macrophytes may pose on water bodies, they can also be useful as lakes and ponds bordered by swamps and marginal vegetations are vividly exploited for municipals, industrial and agricultural waste water treatment. They may also be used for the removal of agricultural effluents (Lin 2001; Brickers, 2003; Ferreira*,* 2007). The objective of this study is to investigate the aquatic macrophytes and physico – chemical parameters of River Guma.

MATERIALS AND METHODS

Study area

The study was conducted in "River Guma" in the Guma local government area of Benue State. The River has its starting point from Aduduguru in Bukankutu in Obi Local Government Area of Nasarawa State. It passes through Keana and Gbajimba. It empties itself into River Benue at Tse-Adee village in Makurdi Local Government Area, Benue State. The study was carried out for a period of two months. The river was divided into four locations (sites) A, B, C and D. On the four sites chosen (A, B, C, D), the growth of the aquatic macrophytes were visually observed and assessed. The plants on the water surface were collected by raking, while aquatic macrophytes were collected with the aid of a shovel and hand pulling. The macrophytes collected were identified with the aid of an identification key.

Transparency was determined on the field using the seechi disc; temperature was determined using mercury in glass thermometer. Water sample were collected to the laboratory for analyzing the remaining physico-chemical parameter using Larmotte water pollution kit (Model AM – 22, code 5917 – 01). This involves immersing 1 litre bottle inside the water body and gradually filling it with water in order to prevent air bubbles and then corked under the water surface before taking it to the laboratory.

RESULTS

Identification of Aquatic Macrophytes

During the study period (July and August, 2012), the aquatic macrophytes in table 1 were observed and identified from all the sites (A,B,C,D) of River Guma. Some were found only in sites A and B while some were found in all the sites as shown in table 1. The macrophytes identified were classified as submerged, submerged with floating leaves, and floating and emergent macrophytes.

The floating macrophytes identified included *Pistia stratiotes* (water lettuce), *Ipomea aquatica* (water spinach), *Azolla africana* (water fern) and *Lemna pacicastata* (Duck weed). Emergent macrophytes were observed in all the Sites (A, B, C, and D). These includes; *Cyperus alopercuroides* (Umbrella palm), *Thalia geniculata* (Hardly water Canna),

Ludwigia erecta (water Premose), *Borassus aethiopum* (Barasus), *Corypha umbraculifera* (Talipot palm),*Costus afer* (Costus), Afranomum melegulata (Aframomum). Their leaves were above the water while their roots were attached to the soil where nutrient is derived. The submerged macrophytes with floating leaves identified in River Guma were; water lily and water hyacinth while the only submerged macrophyte is hornwort.

Physico – chemical Parameters

Table 2 shows physico-chemical parameters of River Guma between July to August, 2012. The results of the total alkalinity of River Guma ranged from 21.03±1.03 to 22.03±0.98. The lower value was recorded in July in sites A and B, while the highest value for total alkalinity was recorded in August in sites C and D. The results of the statistical analysis showed that there was a significant difference ($p \leq 0.05$) between the two months of study period (July and August).

Table 1: Some Aquatic Macrophytes of River Guma

S/No.	Family	Scientific Name	Common Name	Sites
1	Araceae	*Pistia stratiotes*	Water lettuce	A
2	Convolvulaceae	*Ipomea aquatic*	Water spinach	A
3	Cyperaceae	*Cyperus alopecuroides*	Umbrella palm	A,B, C, D
4	Nymphaeaceae	*Nymphae lotus*	Water lily	A, B
5	Nymphaeaceae	*Nymphae odorata*	Water lily	A, B
6	Lemnaeceae	*Lemna pacicastata*	Duck weed	A
7	Poaceae	*Echinochloa colona*	Echinocolona link	A,B
8	Poaceae	*Rhytachnetri aristata*	N/A	A, B, C
9	Azollaceae	*Azolla africana*	Water fern	A
10	Ceratophyllaceae	*Ceratophyllum demersum*	Horn wort	B, C
11	Marantaceae	*Thalia geniculata*	Hardy water canna	A, B, C, D
12	Onagraceae	*Ludwigia decurrens*	Water premise	A, B, C, D
13	Onagraceae	*Ludwigia erecta*	Water premise	A, B, C, D
14	Borasseae	*Borassu saethiopum*	Barasus	A, B, C, D
15	Borasseae	*Corypha umbraculifera*	Talipot palm	A, B, C, D
16	Zingiberaceae	*Costus afer*	Costus	A, B, C, D
17	Zingiberaceae	*Aframomum melegulata*	Aframomum	A, B, C, D
18	Pandanaceae	*Sararnga sinuosa*	N/A	A, B, C, D
19	Poaceae	*Eichornia crassipes*	Water hyacinth	B, C
20	Onagraceae	*Ludwigia leptocarea*	Water premise	A,B, C, D

The water temperature obtained for the sites ranged between 25.25±0.25 and 25.59±0.09. The lower temperature was recorded in July on sites A and B. The result of the statistical analysis shows that there was significant different ($p \leq 0.05$) between the sites in July and August. The results of turbidity obtained for the sites ranged from 23.25±0.25 – 24.25±0.25 with the lowest and highest turbidity value were recorded in July and August, respectively. There was significant difference ($p \leq 0.05$) between July and August of the turbidity range. The pH values obtained from the sites ranged from 7.03±0.03 – 7.38±0.13. July recorded the lowest pH value while August recorded the highest. The dissolved oxygen of the sites ranged from 4.68±0.08 – 4.90±0.10 between

July and August respectively. The results of the statistical analysis show that there was a significant difference ($p \leq 0.05$) between July and August. In August, sites C and D. Free carbon dioxide of the sites on the river ranged from 3.38±0.13 to 4.03±0.03 with the lower value recorded in July while the highest value was recorded in August. The results of the BOD ranged from 2.47±0.09 to 3.53±0.03. The lowest value was recorded in August while the highest value was recorded in July. The statistical analysis shows that there was significant difference ($p < 0.05$) between August and July.

Table 2: Some water Quality Parameters of River Guma between July to August, 2012

Sites	Parameters						
	DO (mg/l)	CO_2	Alkalinity	BOD	Temp (^oC)	pH	Turbidity
A							
July	4.68±0.08	3.38±1.03	21.03±0.03	3.53±0.03	25.25±0.25	7.03±0.03	23.25±0.25
August	4.90±0.10	4.03±0.03	22.03±0.98	2.47±0.09	25.59±0.09	7.38±0.13	24.25±0.25
P-Values	0.21^{ns}	0.04*	$0.55n^{s}$	0.01**	$0.33n^{ns}$	0.11^{ns}	0.11^{ns}
B							
July	4.86±0.06	2.36±0.06	23.90±0.10	2.93±0.08	25.03±0.03	6.73±0.23	23.39±0.81
August	4.86±0.06	4.80±0.10	25.03±0.78	2.99±0.10	26.05±0.05	6.13±0.13	24.24±0.98
P-Values	0.66^{ns}	0.03*	029^{ns}	0.67^{ns}	0.003**	0.15^{ns}	0.58^{ns}
C							
July	3.84±0.19	1.78±0.03	24.00±1.00	2.83±0.13	26.54±0.48	7.75±0.25	25.53±0.53
August	4.08±0.18	2.70±0.10	23.00±1.00	3.10±0.15	25.04±0.03	7.90±0.40	25.63±0.63
P-Values	0.46^{ns}	0.01**	0.55^{ns}	0.29^{ns}	0.09^{ns}	0.78^{ns}	0.91^{ns}
D							
July	4.69±0.05	2.05±0.05	20.78±0.28	3.07±0.02	26.10±0.01	7.15±0.15	23.30±0.70
August	4.90±0.05	2.15±0.15	20.32±0.27	3.40±0.15	26.55±0.46	7.13±0.13	24.30±0.70
P-Values	0.12^{ns}	0.59^{ns}	0.35^{ns}	0.16^{ns}	0.43^{ns}	0.91^{ns}	0.42^{ns}

DISCUSSION

The 20 species of aquatic macrophytes were identified during the study period (July – August 2012). These macrophytes were found along River Guma and may be regarded as weed, pasture, forage, medicine, organic manure etc. These plants presence along River Guma may be due to the nature and type of soil which favoured its production and their ability to resist or withstand unfavourable conditions.

These aquatic macrophytes along River Guma may serve as food to fish, offers shelter to fish, serve as spawning ground, provide food and shelter to water fowls, improve aesthetic values, and provide materials for curative therapy as ethnobotanic. They also have a negative value of impeding navigation in the water.

The result of the water quality parameters of River Guma indicated that, all the parameters determined were within the recommended range for the survival, growth and reproduction of fishes of River Guma except for the dissolved oxygen which falls slightly below 5mg/litre which is required for warm water fish (Swingle, 1969). The slight drop in dissolved oxygen(D.O) may be as a result of high deposit of organic matter from agricultural run-off into the river, decomposition of organic matter by micro-organisms, respiration by zooplankton, fish and other benthic organisms (APHA, 1990), and water wave motion and the flow of water

entering River Guma through tributaries. The variation in temperature within the two months of study may probably be due to slight changes in the weather condition between July and August. The temperature range falls within the tolerable range for inland water bodies (Okayi, 2010). The results showed that higher value of turbidity was recorded in August and this may be due to domestic waste discharge, block production along River Guma, farming activities and siltation of the River. Poor water quality parameters in water bodies and ponds could cause serious behavioural reactions in many fish species; which may include low response to feeding, erratic swimming, low growth rate, clogging of fish gills, lower resistance to diseases and smothering of fish eggs and larvae (Pillay, 1992).

CONCLUSION

From the result obtained within the short duration of study (July – August), there is need for intensive water quality assessment and therefore management of River Guma, this will help to prevent pollution of the river.

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