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EFFECTS OF SOME ENVIRONMENTAL FACTORS ON TEMPORAL DISTRIBUTION OF ZOOPLANKTON IN LAPAI-GWARI STREAM, NIGER STATE, NIGERIA

Mohammed, A. Z*., Musa, M., Arimoro, F. O., **Auta, Y. I,** Samuel, P. O, & Adama, B.S.
Department of Animal Biology, Federal University of Technology, Minna

Email: adamumzkolo@futminna.edu.ng

Abstract:

The impact of some environmental factors on the distribution of zooplankton in the Lapai-Gwari stream was investigated for a period of six months using standard techniques to understand the ecosystem dynamics, species interactions, and overall ecosystem health. Results revealed that all the physical and chemical parameters studied were significantly different monthly with a high total dissolved solids value observed in the month of April which was above the National Environmental Standards and regulation enforcement agency for surface waters. A total of 902 individuals of zooplankton were observed which was made up of 51% rotifers, 20% copepods, and 29% Cladocerans. The rotifers were also found to be more in the rainy months with Filinia terminalis dominating in the month of March. Among the copepods, Macrocyclops fuscus was found to dominate in May. Whereas among the *cladocera, Alonella exigua,* dominates in August. The eigenvalues from the canonical correspondence analysis accounted for 29.37% of all the environmental parameters that were observed from Axis 1 and the permutation test revealed no significant difference. *Brachionus baylyi, Brachionus palas, Asplanchna multiceps, Brachionus sesssilis, Euchlanis mentameyers,and Asplanchna* intermedia, appeared to be strongly associated with alkalinity and the months of June and July. From the physico-chemical parameters and zooplankton the stream appeared slightly perturbed with the presences of polluting indicator organisms like Asplanchna Species and the Brachionus, probably due to the various anthropogenic activities around the stream and resulting inlow faunal diversity of zooplankton.

Keywords: Physico-chemical parameters, zooplankton diversity and abundance, Lapai-Gwari Stream, perturbed, anthropogenic activities.

Introduction

Headwaters, streams, and wetlands are important watersheds that are critical for maintaining biodiversity, ecosystem functions, natural resource-based economies, human society, and culture (Susan et al., 2019). Though most expected output in water bodies is fish, power supply, and recreation, the actual converters of the energy, phytoplankton to zooplankton to higher trophic levels are neglected. Fresh water is an important component in the aquatic ecosystem whose main function is to facilitate the links in the food chain (Agnes et al., 2021; Bonjoru et al., 2020).

Zooplankton graze on primary producers and organic debris in the water column and thereby play an important role in the integration of the energy budget of the ecosystem (Anene et al, 2003), transferring primary productivity to fish and other consumers (Dejen et al, 2004) and purifying the water column (Okogwu, 2010). Zooplankton is of great importance in the bio-monitoring of pollution (Davies et al 2009). The nature of species occurring, diversity, biomass, and season of maximum abundance of zooplanktonic organisms differs in water bodies (FAO, 2006; Ravera,1996). The community structure and diversity are sensitive to changes in environmental conditions (Thias and Elvio, 2013), nutrient changes, and also to different levels of pollution (Arimoro and Oganna 2010). Their standing crop and species composition are most likely to indicate the quality of the water body in question (Pinto-Coeluo, et al. 2005; Pramila et al. 2008; Arimoro and Oganna 2010; Hashemzadeh and Ventkataramana, 2012). The zooplankton community includes copepods, cladocerans, rotifers, chaetognaths, amphipods, holoplankton, and larva stages of meroplankton. Associated with plankton studies is the analysis of physico-chemical parameters which reflects the abiotic status of the ecosystem (Mulani et al, 2009). Therefore, the zooplankton population in a community is related to the physico-chemical property of the water body. Lapai-gwari stream is a water body that receives effluent from Mosgola-fishing community. The stream originates from around Bosso in Minna the capital of Niger State and flows down to be recharged from effluents of about one hundred fish ponds. The stream did not receive attention

MACROINVERTEBRATE DIVERSITY AND WATER QUALITY PATTERNS OF A MUNICIPAL STREAM IN DOKO DISTRICT, NIGER STATE, NIGERIA

*Umar B.L., Arimoro F.O., Adama S.B., Mohammed Y.M., Mohammed A.Z. & **Auta Y.I.**

Applied Hydrobiology Unit, Department of Animal Biology, Federal University of Technology Minna, Niger State, Nigeria.

*Corresponding author; umarliman90@gmail.com.

Abstract

The macroinvertebrate community of Emikpata stream, Doko district, Niger State, Nigeria were studied for a period of eight months using the modified kick sampling techniques. Four well marked stations were selected along the course of the stream designated as station 1, 2, 3,4.Physicochemical parameters examined and readings were: Water temperature (23.0-27.0°C),Depth (20.96-24.10cm), Flow velocity (0.29-0.30m/s), Dissolved oxygen (5.97-6.35mg/l),Biochemical oxygen demand (3.25-3.87mg/l), pH (6.0-6.32, Conductivity (49.1-110.0µS/cm),Total hardness (12.3-18.0mg/l), Total alkalinity (13.0-20.5mg/l), Chlorine (10.71-32.79mg/l),Nitrate (1.83-3.69mg/l), Phosphate (0.60-1.12mg/L), Sodiumn (7.24-9.02mg/l), Potassium (1.74-1.92mg/l). A total of 625 individuals from 28 species and 19 families of invertebrate were recorded. Significantly higher($P<0.005$) macroinvertebrate abundance was recorded during the dry season as compares to the wet season. The Canonical Correspondence Analysis (CCA)result showed strong relationship between species abundance and measured environmental variables. Higher population of pollution tolerant

macroinvertebrates groups and the poor water quality observed during the sampling period were indications of pollution stress occasioned by anthropogenic activities, decomposing domestic wastes and inorganic fertilizer washed into the stream from various nearby farms.

Keywords: Macroinvertebrate, Community, Emikpata Stream, Doko, anthropogenic activities, domestic wastes, fertilizer

Introduction

Macroinvertebrate organisms form significant part of an aquatic ecosystem;they are of ecological and economic importance because they maintain various levels of interaction within aquatic environment (Dobson et al. 2002). Biomonitoring of these organisms may help to conserve and proffer appropriate management decisions in an aquatic ecosystem. Macroinvertebrates have limited mobility and can stay in an area for some time without moving away easily. The type of macroinvertebrates species obtained may be used as indicator of the status of the water quality of that environment at that location in a particular time (Arimoro and Keke, 2017). Macroinvertebrates have high variability and are significant to predict the effect of short-term environmental variation which are used to distinguish some characteristics of rivers and streams across the globe (Barbour et al 1999). Substrate is perhaps one of the most important factors affecting the distribution of macroinvertebrates, although alterations in physicochemical parameters such as temperature, salinity and food availability also play vital role in determining the extent of distribution and abundance of benthic macroinvertebrates species in aquatic ecosystem. Also, they constitute a major link in the aquatic food chain (Olomukoro et al 2013; Uwem and Edet 2016). Fresh-water