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Macro Invertebrate Fauna of Kodon Stream, a Tropical Fresh Water in Gombe- Nigeria

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ABSTRACT

The dynamics of Macroinvertebrates distribution and abundance in relation to Physico-chemical characteristics i.e. water temperature, air temperature, pH, transparency/turbidity, current velocity, water discharge, channel morphometry of the stream were observed. All the characteristics were monitored fortnightly over a period of three months (January – March, 2010). Physico-chemical characteristics showed little variation throughout the sampling occasion as a result of the persistent dry hot season. A total of 119 Macroinvertebrates were collected and 2 phyla identified, (Arthropoda and Mollusca). Phylum Arthropoda consisted of only one class, Insecta had 3 individuals i.e, *Dystiscus, Aeshnidae* and *Neoperla*. Phylum Mollusca- had one class, Gastropoda, had three species, (*Melanoides, Lymnaea species* and *Planorbid*). Phylum Mollusca were the most abundant with 113 individuals.

INTRODUCTION

Macroinvertebrates are bottom dwelling organisms which include micro fauna and macro fauna. The macro fauna whose habitat is basically two dimensional are virtually restricted to the bottom surface for feeding and respiration. The micro fauna on the other hand, live in the mud with three dimensional habitats. The macro invertebrates include Mollusca and some Crustaceans while the micro fauna include Hirudina, Nematodes and some Dipterans larvae such as chironomid, cheoborus larvae (Taiwo, 1989). Macroinvertebrates are usually above 500mili microns and can be seen with the naked eyes.

Macroinvertebrates play a vital role in the circulation and recirculation of nutrients in the aquatic environment. They constitute the link between the unavailable nutrient in the detritus and useful proteins in fish (Oke, 1990).

Macroinvertebrates also contribute to the productivity of the aquatic ecosystem. Benthos acts as a biological indicator of their environment. The diversity of the benthos as regards to quality and quantity is a reflection of the water and its sediments (Brinkhurst, 1974). Aquatic Macroinvertebrates are used most often in the environmental assessment of surface water; that is to say, Macroinvertebrates are good indicators of water quality (Brinkhurst, 1974).

Macroinvertebrates play a role in the ecology of the aquatic habitat and this has resulted into individuals as well as combined research studies.

Brinkhurst (1974) researched on the species diversity in the macroinvertebrates of the Bay of quintet, lake Ontario, Canada. His research showed that the diversity of the community increases with decreasing fertility in summer bottom water temperature.

Hynes in 1970 reported that the alteration of substrate composition associated with various types of organic pollution is believed to have a major impact on the benthic community.

Peter (1970) in a similar work at the Black Volta River in Ghana recorded seven Macroinvertebrates. They were; Oligochaetea, Odonata, Chironomidae, Hirudine, Bivalvia, Crustaceans and Mollusca.

Bidwell and Clarke (1977) made the first check list of the benthic fauna of Lake Kainji. This list contains representative from six invertebrates phyla viz; Protozoa, Porifera, Annelida, Arthropoda, Mollusca and Ectoprocta.

Kodon stream is a major source of drinking water to many parts of Gombe State, a research has not been carried out to determine its purity.

The objectives of this work are to assess the Macroinvertebrates of Kodon Stream, to monitor the health of the environment using a biotic index and provide useful information for further research.

MATERIALS AND METHOD

Determination of Biological characteristics

Samples of Macroinvertebrates were collected from each sampling station using a benthic scoop net and the five minute kicking technique was employed. These samples were collected fortnightly for the period of three months and an average was taken. Samples were preserved in 70% ethanol and taken to the laboratory and were preserved in 10% formalin.

In the laboratory, the samples were poured on a white tray and sorted by hands. The different groups of organisms were counted and preserved in 70% ethanol for further identification using hand lens and taxonomic keys. (Umar, 1989)

Determination of water quality characteristics

i. Air temperature: This was read using thermometer.
ii. Water temperature: Was determined by lowering the thermometer in water.
iii. Channel morphometry: The width of the Stream was determined using a measuring tape graduated in meters. The depth was measured by means of steel meter rule, also graduated in meters.
iv. Transparency/ Turbidity: This was measured using a secchi disc. The disc was lowered in the water until it disappeared from view and the depth recorded. A transparent ruler was used to measure the depth.
v. Current velocity: This was determined by dropping a floating object (wooden substance) and allowed to float. The distance travelled by the object and the time taken was observed and average readings were recorded.
vi. Water discharge: Water discharge was determined by multiplying the mean values of the channel width, depth and the current velocity.

Water Discharge, $Q = w \times d \times v$.

Where; Q= discharge, d= width, v= current velocity

vii. Hydrogen ion concentration pH : pH was determined using a portable pH meter.

RESULT

Table 1: Taxa abundance for the four Sampling Sites

Phylum	Class	Family	Species	Site A	Site B	Site C	Site D	Total
Arthropoda	Insecta	Coleoptera	Dystiscus	1				1
		Plecoptera	*Neoperla*	1				1
		Odonata	*Aeshnidae*	2	2			4
Mollusca	Gastropoda	Thiaridae	*Melanoides*	56	3	10	3	72
		Lymnaedae	*Lymnaea species*	15	9	3	2	29
		Planorbidae	*Planorbid*	12				12
			Total	87	14	13	5	119

Table 2: Physico-chemical parameters of the four Sampling Sites

S/N	Physico-chemical parameters	Site A	Site B	Site C	Site D	Average
1	Air temperature (^{0}C)	30.5	29.6	31.7	35.6	31.7
2	Water temperature(^{0}C)	30.9	32.2	33.3	31.3	31.3
3	Transparency/Turbidity (NTU)	26	30	40	40	40
4	pH	6.8	7.7	7.2	7.2	7.2
5	Current velocity (m/s^{-1})	67.5	150	36	8.9	67.5
6	Channel depth (m)	10	12	3.4	15	15
7	Channel width (m)	3	2.9	3.4	2.8	3.4
8	Water discharge (m/s^{-1})	2025	5220	1836	373.8	5220

DISCUSSION

Studies of Macroinvertebrates of Kodon Stream reveals a total of 119 organisms were collected; out of which members of the phylum Arthropoda had the least occurrence (6). Phylum Mollusca occurred most frequently with 113 individuals. This is similar to a studies carried out by Benthic Restoration Goal Index, conducted at the Delware River Philadelphia, (Richard, 2009). Records of high pollution and those with little or no pollution were discovered.

Alteration of substrate composition along the Stream Sites such as washing, bathing is believed to add toxicity to the water and cause pollution to the benthic community. This goes with a work reported by Hynes, (1970), who reported that the alteration of substrate composition associated with various types of organic pollution have major impact on the benthic community.

Generally, the stream invertebrates are used as indicators of the amount of oxygen in the water. This is affected by organic matter, fertilizers, detergents and heat. The more oxygen loving animals you find, the better the water quality; the more you find animals that can live with little oxygen, the poorer the water quality, (Ofojekwu *et.al*, 1996). Thus, snails (Mollusca) are animals that can live in dirty water (Richard, 2009). Presence of abundant snails in Kodon Stream might be an indication that the water is polluted.

Traditionally, people have used an observation of animal behavior to indicate water quality. This involves noting the kinds of animals that rise to breath at the water surface. For snails (Mollusca), if a lots of snails rise to breath to the surface of water, the water is polluted. (Umar, 1989)

Gastropods are the most abundant samples of Macroinvertebrates in Kodon Stream, their abundance could be attributed to their ability to tolerate some level of pollution. (Umar *et. al*, 2014)

Oxygen depletion occurs with increase in population of aquatic invertebrates. The more you find animals that can live with little oxygen, the poorer the water quality (Umar *et. al*, 2014). From the result, the most tolerant species among the Macroinvertebrates identified was *Melanoides*. It was found in all the four (4) Sampling Sites. *Dystiscus* and *Neoperla* had the least tolerance level. They occurred in only one station with distribution of one each.

Physico-chemical characteristics of water provide a good idea in investigating the kind of living things in the water and to determine stream water quality. The higher the temperature of the water, the less oxygen will dissolve in it. The relatively high temperature in the stream (31.3^{0} C) also resulted in the less number of Macroinvertebrates. This is similar to the result found by Brinkhurst (1974), who researched on the species diversity of Macroinvertebrates of Bay of Quintel, Lake Ontario, Canada. His result showed that the diversity of the community increases with decreasing fertility in summer bottom water temperature. Aquatic animals thus, often preferred shaded areas where water is cooler, when hot, oxygen decreases.

CONCLUSION

Aquatic Macroinvertebrates are used very often in environmental assessment of surface water. That is to say, Macroinvertebrates are good indicators of water quality. Low diversity index of benthic organisms is an index of high degree of pollution.

Factors such as physical occurrences which include stream alteration, reduced flow, as well as human activities such as washing, fishing, logging, toxicity of water, all has a big influence on the benthic population.

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