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A preliminary checklist of zooplanktons and macroinvertebrates of river Kashimbila, Taraba state, Nigeria

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Abstract
A preliminary study was conducted to determine the composition and abundance of zooplankton and macroinvertebrates of Kashimbila River, Takum LGA, Taraba State, Nigeria. Zooplankton samples were collected monthly from the River from August 2016 to March 2017 using plankton net of 55µm mesh size. The plankton was preserved using 4% formalin and three drops of Lugol's solution and stored in plastic containers and taken to laboratory for further analysis. Zooplankton identification and counting were done by use of a binocular light microscope. Twenty one (21) species belonging to twelve (12) taxonomic groups were recorded. Macroinvertebrates were the dominant taxon with 38% followed by ciliophora with 14% while Cnidaria, Rotifera, Arthropoda, Nematoda, Amoebozoa, Copepoda, Diptera, Heterichida, Cladocera and Coleoptera with 4.76% each had one species. The findings indicate the unpolluted nature of the Kashimbila River and also provide useful information on the checklists and ecology of the zooplankton's species which could be potentially used as bio-indicators for assessing and monitoring the River.

Keywords: Zooplanktons, macroinvertebrates, checklists, river kashimbila, composition

1. Introduction
Apart from aquatic macrophytes, plankton serves as the basis of productivity in several rivers [1]. Plankton's of an aquatic ecosystem is central to the normal functioning of the aquatic environment [2]. Planktons constitute the starting point of energy transfer; they are highly sensitive to allochthonously imposed changes in the environment [3]. Plankton are the basis of food production for fish in the capture fisheries [4]. Zooplankton is an important component in aquatic ecosystem whose main function is to act as primary and secondary links in the food chain. They are important link in the transfer of energy from producers to carnivores [5]. Zooplankton due to their large density, drifting nature, shorter life span, high group or special diversity and different tolerance are used as indicator agent for the physical, chemical and biological process in the aquatic ecosystem [6]. Zooplanktons and macroinvertebrates occupy a strategic trophic level in aquatic ecosystem. Apart from their ability to exert a tremendous influence on phytoplankton abundance and succession by means of selective grazing, they form an important source of food for carnivorous and omnivorous fish [7].
Zooplankton communities often respond quickly to environmental changes because most species have short generation time (usually days to week in length) [8]. Zooplankton responds to a wide variety of disturbances including nutrient load, sediment input, contaminant densities and acidification. Jude *et al.*, [9] stressed that the specie assemblages of the zooplankton are indications of environmental quality and ecological changes. To this end, the checklists of zooplanktons and macroinvertebrates will give an insight about the characteristics and quality of the water [10]. It is therefore necessary to study the zooplankton community of Kashimbila River, to ascertain the healthy status of the water body and its potential to support fisheries resources.

2. Materials and Methods
Study Area
The Kashimbila River/Dam is located in Kashimbilla district, 50km south-west of Takum town in Taraba State, Nigeria.

The river/dam took its source from the Bamenda highlands in northwestern Cameroon. The River is located on Latitude 6^0 52′N and Longitude 9^0 45′E (Fig 1).

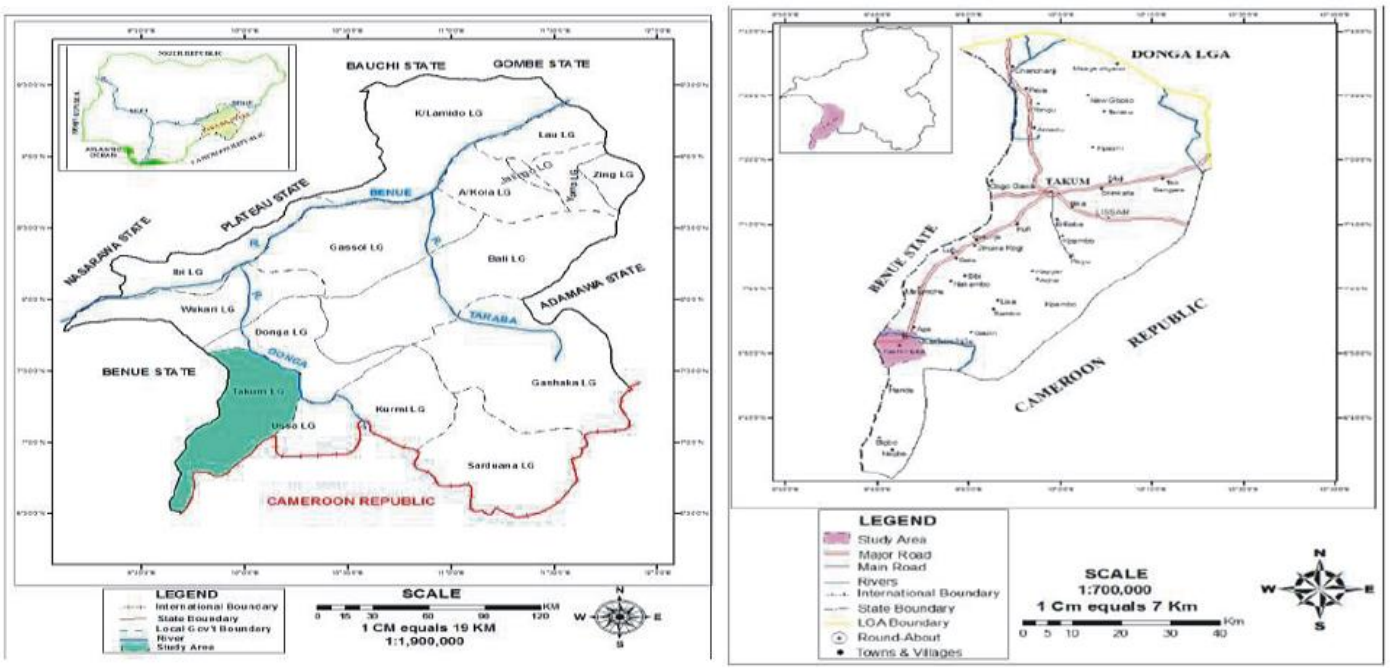

Fig 1: Location Map of the Study area

Sample stations

The study was carried out for an 8 months period (August 2016 to March 2017). The study area was categorized into three stations: Station A, B and C. Station A (before the dam where fishing activities, farming, bathing and washing of clothes occur). Station B (where the dam is built) while Station C (downstream of the dam where irrigation, farming and cattle rearing occur)

Method of data collection

A plankton net of 55µm mesh size was used for sampling the stations by hauling horizontally, a distance of five meters across each station according to the method of Anene [11]. The resultant concentrated plankton samples were transferred into a plastic container and were preserved using 4% formalin and three drops of Lugol's solution. The samples were then transported in a cooler packed with ice blocks (to stop further biological activities) for analysis. Identification and counting of Zooplankton species were done by use of a binocular light microscope at a magnification of 100x (oil emersion). Slides for qualitative and quantitative analyses were prepared (in triplicate) and whole count method was employed, using Sedgwick rafter Counting Chamber to determine their density [12]. Identification of the zooplankton species was according to [13, 14, 15, 16].

3. Results

The percentage composition of the zooplankton and macroinvertebrates of River Kashimbila is presented in Figure 2. Twenty one (21) species belonging to twelve (12) taxonomic groups were recorded. Macroinvertebrates were the dominant taxon with 38% followed by ciliophora with 14% while Cnidaria, Rotifera, Arthropoda, Nematoda, Amoebozoa, Copepoda, Diptera, Heterichida, Cladocera and Coleoptera with 4.76% each had one specie.

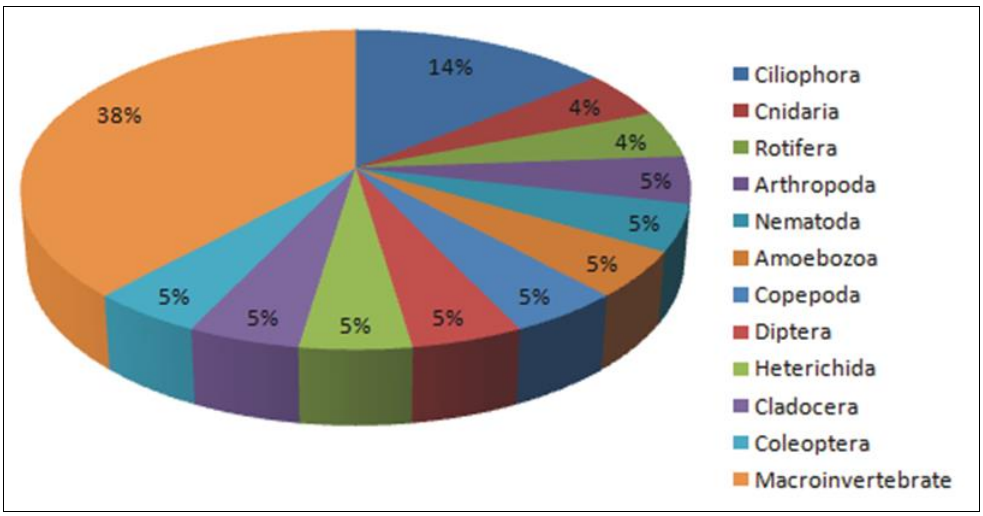

Fig 2: Percentage composition of Zooplankton and Macroinvertebrates in Kashimbila River

Table 1: Status of Species and Distribution of Zooplankton in River Kashimbila

Taxa	Specie(s)	Station A	Station B	Station C
Ciliophora	*Paramecium*	+	+	-
	Stylonychia	+	+	-
	Vorticella	+	+	+
Cnidaria	*Hydra*	-	-	+
Rotifera	*Brachionus*	+	+	+
Arthropoda	*Water mite*	+	-	+
Nematoda (Roundworm)	*Ascaris lumbricoides*	+	+	-
Amoebozoa	*Amoeba*	+	-	-
Copepoda	*Diaptomus*	+	+	+
Diptera	*Polypedilum*	+	+	+
Heterichida	*Stentor*	+	+	+
Cladocera	*Daphnia*	+	+	+
Coleoptera	Water beetle	+	+	+
Macroinvertebrate	Mayfly nymph	+	+	+
	Mosquito larva	+	+	+
	Damselfly nymph	+	+	+
	Blackfly	+	-	-
	Dragonfly nymph	+	-	+
	Alderfly nymph	+	-	-
	Stonefly nymph	+	-	+
	Water beetle	-	-	+

Key:
+ Present
- Absent

4. Discussion

Twenty one (21) species from 12 taxons of Zooplanktons and Macroinvertebrates were observed in the selected study stations (Fig 2; Table 1). The study was dominated by macroinvertebrates with 38% and Ciliophorans with 3 species consisting of 14%. The productivity of the study area is higher than other similar ecosystems. This result is higher than the study conducted by Yakubu *et al.,* [17] who reported 10 species of zooplankton from Num River, 12 species reported by Ansa, Kingdom & Seikorowei [1] in Forcados River, Niger Delta, Nigeria and lower than the 24 species reported by Zabbey *et al*., [18] from Imo River.

Moreso, this study compared favourably with the study of Emmanuel and Onyema [19] and Nkwoji *et al*., [20] who reported 18 and 20 species in Lagos Lagoon respectively. The result of this study further varies considerably from other similar studies conducted in Nigeria. Davies *et al*., [4] reported 32 species from Elechi Creek and Okogwu [21] reported 67 species from Eboma Lake in the middle Cross River flood plain. The difference in the number of zooplankton species in this study and other studies may be attributed to the natural conditions of water bodies and time of sampling [22]. FAO [23] had earlier reported that distributions of zooplankton vary from place to place and year to year due to the dynamic nature of aquatic systems. Carney [24] also reported that most zooplankton migrate upward from deeper strata as darkness approaches and return to the deeper areas at dawn. Furthermore, Welcomme [25] and Wetzel [26] attributed zooplankton abundance to differences in flow, turbidity, dissolved oxygen concentration and conductivity.

5. Conclusion

The preliminary study on zooplankton and macroinvertebrates of Kashimbila River, Taraba state revealed the presence of Twenty one (21) species belonging to twelve (12) taxonomic groups. Macroinvertebrates were the dominant taxon with 38% followed by ciliophora with 14% while Cnidaria, Rotifera, Arthropoda, Nematoda, Amoebozoa, Copepoda, Diptera, Heterichida, Cladocera and Coleoptera with 4.76% each had one species. The findings indicate the unpolluted nature of the Kashimbila River and also provide useful information on the checklists and ecology of the zooplankton's species which could be potentially used as bio-indicators for assessing and monitoring the River.

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