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SHORT COMMUNICATION

Secondary Productivity of Zooplanktons in Lotic Water of River Saryu and Ganga at Saran District, Bihar, India

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ABSTRACT

The role of Zooplankton in the aquatic food chain is very important as is it a member of trophic level two because it is secondary producer as well as primary consumer. The productivity of zooplankton will reflect the status of the aquatic ecosystem. Scanty reports are available on the secondary productivity of river Ganga. The present study was conducted in stretch of river Saryu and Ganga in Saran district, Bihar that was unexplored earlier. Secondary productivity of zooplankton was estimated following method suggested by Dalai & Parulekar (1986) based on displacement volume and Mangas and Garcia (1991). Zooplankton secondary productivity was in higher range 70.12-227.89 µg during winter followed by summer and monsoon in both the rivers. Zooplankton group wise individual biomass was as follows: (cladocerans > copepods > rotifers). However average biomass indicated that rotifers were dominating zoo plankton in the biomass contribution causing secondary production of zooplankton. The study identifies secondary productivity as a more integrative tool for the assessment of the ecosystem function.

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***Keywords*:** lotic water, Saryu river, Ganga river, secondary productivity, trophic level, zooplankton

1. INTRODUCTION

The role of Zooplankton in the aquatic food chain is very important as is it a member of trophic level two because it is secondary producer as well as primary consumer. The productivity of zooplankton will reflect the status of the aquatic ecosystem. Several works are available on the biomass and secondary productivity of zoo plankton in lagoons, sea (Al-Najjar & El Sherbiny, 2008; Boysen et. al, 1991; Heranndez-Leon, et. al 2000) fresh water, ponds, lakes reservoirs and wet land (Cardozo et. al, 2007, Mangas & Garcia, 1991; Patnaik, 1973; Raman et. al, 1975; Nayar et. al, 1999; Gonazalez et. al, 2011; Sinha 2014). Scanty reports are available on the secondary productivity of river Ganga (Bilgrami & Munshi, 1985).

Present investigation deals with the secondary productivity of zoo plankton of river Saryu and Ganga in Chapra district of Bihar, India that have been unexplored earlier.

2. MATERIALS AND METHODS

2. 1. Study area

Physico-chemical analysis of lotic water of river Saryu (Site A) and Ganga (Site B) at Saran, Bihar, India was done for a period of 12 months from January to December 2010 including winter, summer and rainy seasons. Four sampling stations were selected and established, two each in river Saryu and Ganga respectively. For study, stretch of river Saryu and Ganga were undertaken which were quite virgin as well as almost unaffected by urbanization and anthropogenic activities to see the seasonal variation in the physico-chemical properties of water

2. 2. Collection of Zooplankton

It was collected through a continuous Zooplankton and Phytoplankton separator made out of nylon bolting silk. (Nayar *et. al*., 1999).

Secondary production: It was estimated following method suggested by Dalai & Parulekar (1986) based on displacement volume and Mangas and Garcia (1991).

Map showing the course of river Saryu and Ganga in Saran district has been mentioned in Figure 1. Sampling Site A and B are shown in Figure 2 and 3 respectively.

Figure 1. Map of District Saran showing Course of River Saryu and Ganga

Figure 2. Site A of Saryu River

Figure 3. Site B of Ganga River

3. RESULTS AND DISCUSSION

Zooplankton secondary productivity was in higher range 70.12-227.89 µg during winter followed by summer 122.71-175.30 µg and monsoon 35.06-52.59 µg in river Saryu. Almost similar trend was recorded in river Ganga as it ranged between 87.65 and 248.93 µg during winter, between 115.69 µg and 206.85 µg during summer and between 31.55 µg and 59.60 µg during monsoon (Table 1). As far as zooplankton group wise individual biomass was concerned (cladocerans > copepods > rotifers) cladocerans had highest contribution than copepods and rotifers, however average biomass indicated that rotifers were dominating zooplankton in the biomass contribution causing secondary production of zooplankton. Maximum biomass production of 227.89 µg zooplankton was recorded in the month of January where major contributor was rotifers (192.83 µg) followed by copepods (14.02 µg) and cladocerans (10.52 µg) while during monsoon month of July minimum 21.0 µg biomass was recorded where copepods was the major contributor of 14.02 µg followed by cladocerans of only 7.01 µg in Saryu river.

Table 1. Secondary Production of Zooplankton Biomass of River Saryu (Jan-Dec, 2010)

Month	Zooplankton Biomass*			
	Total (µg)	**Rotifera (µg)**	**Copepoda (µg)**	**Caldocera (µg)**
January	227.89	192.83	14.02	10.52
February	87.65	42.07	28.05	17.53
March	157.77	84.14	18.34	45.58
April	122.71	56.09	31.55	35.06
May	175.3	98.17	45.58	24.54
June	150.76	84.14	42.07	24.54
July	21.04	0	14.02	7.01
August	28.05	7.01	10.52	10.52
September	35.06	10.52	14.02	10.52
October	52.59	14.02	21.04	17.53
November	70.12	28.05	21.04	21.04
December	105.18	70.12	14.02	21.04
Note: * Biomass of Protozoa has been Discarded.				

Almost similar trends of zooplankton production were recorded in river Ganga. Maximum production of 248.93 µg was observed out of which highest biomass was of rotifers 210.36 µg followed by cladocerans 43.07 µg and copepods 7.01 µg in the winter season (January). Minimum production was observed during monsoon in July of 31.55 µg in which cladocerans dominated 42.07 µg followed by copepods 7.01 µg. No rotifers were recorded during July in river Ganga (Table 2).

Bimodal peak of zooplankton production have also been recorded in river Ganga one in winter and another in summer by Bilgrami & Munshi, 1985. Similar observations have also been recorded in the present investigation. Higher level of zooplankton production during summer and winter can be attributed to higher nutritional level and higher photosynthetic rate. During the rainy season, low production of zooplankton was obviously due to fast current, heavy siltation and turbidity. Month wise secondary productivity is shown in Figure 4 & 5.

Table 2. Secondary Production of Zooplankton Biomass of River Ganga (Jan-Dec, 2010)

Month	**Zooplankton Biomass***			
	Total (µg)	**Rotifera (µg)**	**Copepoda (µg)**	**Caldocera (µg)**
January	248.93	210.36	7.01	24.54
February	112.19	56.09	31.55	24.54
March	206.85	73.63	126.22	7.01
April	157.77	70.12	63.12	24.54
May	115.69	42.07	24.54	35.06
June	105.18	42.07	45.58	17.53
July	31.55	-	7.01	24.54
August	49.08	7.01	17.53	24.54
September	52.59	7.01	31.55	14.02
October	59.60	7.01	45.58	7.01
November	87.65	42.07	38.57	7.01
December	98.17	84.14	7.01	7.01
NOTE: Biomass of protozoa has been discarded.				

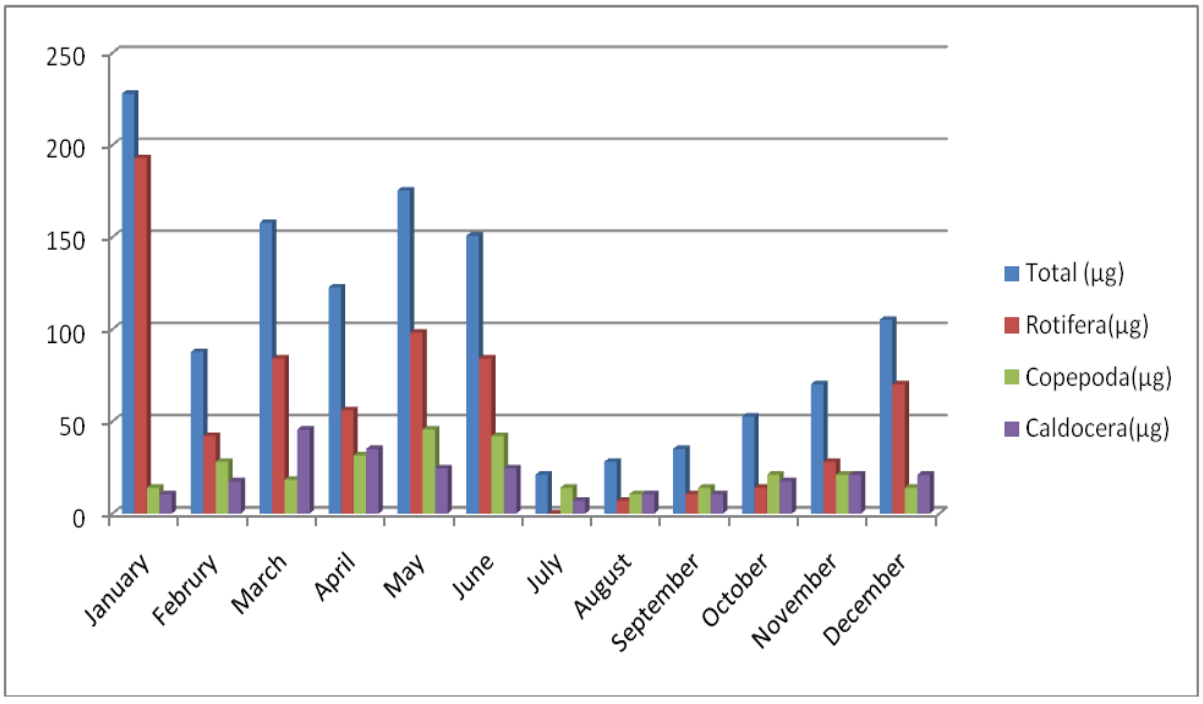

Fig. 4. Zooplankton Secondary Productivity (µg) at Site A (Saryu river) during Jan- Dec 2010

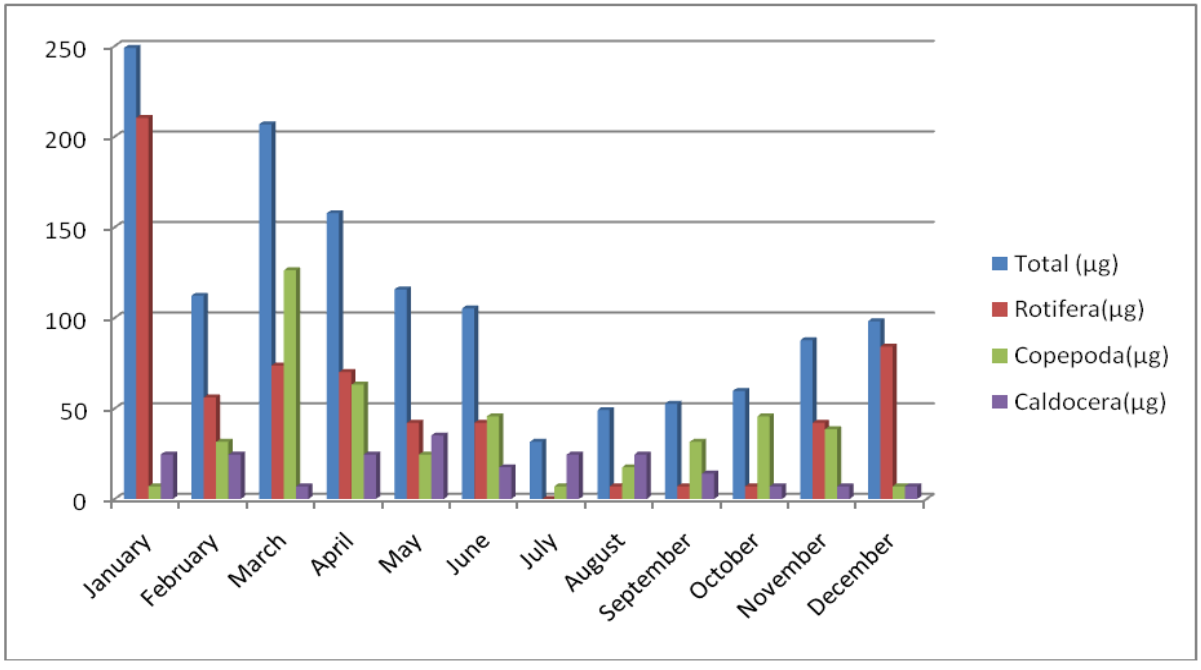

Fig. 5. Zooplankton Secondary Productivity (µg) at Site B (Ganga river) during Jan-Dec 2010

4. CONCLUSION

Zooplankton secondary productivity was in higher range 70.12-227.89 µg during winter followed by summer and monsoon in both the rivers. Zooplankton group wise individual biomass was as follows: (cladocerans > copepods > rotifers). However average biomass indicated that rotifers were dominating zoo plankton in the biomass contribution causing secondary production of zooplankton. The study identifies secondary productivity as a more integrative tool for the assessment of the ecosystem function.

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