Zooplanktonic Dynamics in Ban Ganga Stream, Katra (Jammu)

K. K. Sharma, Nitasha Sawhney and Sarbjeet Kour
Department of Zoology, University of Jammu, Jammu –180006, J&K, India.

ABSTRACT

Ban Ganga, a shallow stream in the historic Trikuta hills of Shivalik range of J&K state is revered much for its sacredness. The present communication is an attempt to make a checklist of the existing species of zooplankton in the stream. In total 15 species were recorded. The zooplankton of Ban Ganga stream was dominated by rotifers. In order to have a comprehensive account of the ecological status of stream, various physico-chemical parameters were also analysed. Several pollution indicator species were also identified.

Keywords: BanGanga, rotifer, zooplankton

INTRODUCTION

Zooplankton constitutes an important ladder of secondary production in aquatic ecosystems. While occupying a key position in aquatic food webs, zooplankton ensures flow of energy from primary producers to higher trophic levels in the food chain. Even fish larvae resort to zooplanktonic food after depletion of the yolk sac. Degradation of water quality arising out of eutrophication and pollution are known to affect the zooplankton community structure. Thus, zooplankters have long been recognized as bioindicators. The most documented information on zooplankton of riverine environments include those of Chacko and Srinivasan (1959), David (1963), Pehwa and Mehrotra (1966), Ray *et al.* (1966), Verma and Dalela (1975), Verma *et al.* (1978), Adholia (1979), Saksena and Kulkarni (1982), Venkateswarlu (1986), Puri (1989), Gocchait (1991), Mishra and Saksena (1998), Baba (2002) and Yousuf *et al*. (2006). Since little or no major work in this direction has been done in Jammu, the present study was undertaken to investigate the zooplanktonic components and their seasonal variation in the Ban Ganga stream at Katra in Jammu.

MATERIAL AND METHODS

Ban Ganga stream, a shallow snow fed stream originating from the Trikuta hills of Shri Mata Vaishno Devi Shrine lying between $32^{o}59^{/}$ and $30^{o}10^{/}$ N and $74^{o}55^{/}$ and $75^{o}50^{/}$ E at an altitude of 1750 m above m.s.l. is revered for the religious taboos attached with it. For the present investigation, three study sites were selected along the longitudinal profile of the stream at a stretch of 2 – 3km, each of which was under the impact of anthropogenic influences.

Data were procured on water temperature (mercury bulb thermometer), depth (graduated meter rod), speed (meter tape and stopwatch), pH (pH meter), DO, free CO_2, CO_3^{2-}, HCO_3^-, Cl^-, Ca^{++} and Mg^{++} as per standard methods enumerated in A.P.H.A, (1985). For zooplankton, 50 l of water sample was filtered through the plankton net of standard bolting silk cloth no. 25. The concentrate was preserved in 5% formalin. Zooplankton was identified following Edmondson and Winberg (1971) and Adoni (1985).

RESULTS AND DISCUSSION

During the present investigation, it has been observed that zooplanktonic community of Ban Ganga stream at Katra comprised of three important groups (Protozoa, Rotifera and Copepoda) which were contributed by 15 species (Table 1). Among the three zooplanktonic group recorded during present studies, rotifers exhibited dominance over other groups both in terms of genera and species and also in population density (Fig. 1) as has also been observed by Singh and Sahai (1978), Sehgal (1980), Sharma (2001), Sharma (2002) and Akhtar (2003). The sequence of dominance of various zooplanktonic groups recorded was as

Rotifera > Protozoa > Copepoda

Table 1: Showing the distribution of zooplankton at different study stations of Ban Ganga stream (Jan., 2003-Dec., 2003)

S. No.	Organisms	Station		
		I	II	III
1.	*Centropyxis aculeate*	+	+	+
2.	*Vorticella sps.*	+	+	+
3.	*Brachionus bidentata*	-	-	+
4.	*Philodina sps.*	+	+	+
5.	*Lepadella ovalis*	+	+	+
6.	*Colurella obtuse*	-	+	-
7.	*C. uncinata*	+	+	+
8.	*Filinia longiseta*	-	+	-
9.	*Dicranophorus epicharis*	-	+	-
10.	*Cephalodella gibba*	-	-	+
11.	*Lecane bulla*	+	+	+
12.	*L. clososterca*	+	+	+
13.	*L. ludwigii*	-	+	-
14.	*L. luna*	-	+	-
15.	*Mesocyclops leuckartii*	+	+	+
16.	*Nauplius larvae*	+	-	+

Minima in total protozoan count (Table 2) during winter months may be attributed to low temperature and short supply of food (Kumar, 1990 and Sharma, 2002). The maxima attained by protozoan population during summer season may be attributed to increased temperature and subsequent increment in the production of organic matter (as an outcome of increased temperature) on which protozoan are known to feed (Sorokin and Paveljeva, 1972 and Kumar, 1990). Increment in protozoan population may also be linked with increase in temperature, DO and calcium concentration. Vasisht and Jindal (1980) and Gochhait (1991) also advocated that numerically low number in protozoan count is attributed to reduced detritus and relatively increased water flow.

Table 2: Seasonal variation in the Protozoan population (n/l) along the three study stations of Ban Ganga stream (Jan., 2003 – Dec., 2003)

Months/Stations	Station I	Station II	Station III	Mean
January	50	100	Ab	0±40.8
February	150	200	200	183±23.5
March	300	450	100	283.3±143.3
April	300	100	250	216.6±84.9
May	1100	4700	1950	2583.3±1536.4
June	200	100	450	250.0±147.1
July	Ab	50	200	83.3±84.9
August	50	200	50	100.0±70.7
September	100	250	150	166.6±62.3
October	3300	200	150	1216.6±1473.2
November	1650	1750	1600	166.6±62.3
December	400	Ab	100	166.6±169.9

The early winter maxima (Table 3) observed in rotifer population during the present investigation may be due to the influence of some important ecological factors like DO concentration, absence of free CO_2, and alkalinity (Ricci and Balsamo, 2000) (Table 6). Rotifers recorded their maxima at S-II which may be attributed to the lentic like conditions due to embankment created at this station which results in slow speed of water and thereby increased depth of the station. It is thus, emphasized that although rotifers are present in all types of water bodies, the diversity is best flourished in lentic conditions with less speed (Ricci and Balsamo, 2000). *Lepadella ovalis* and *Lecane bulla* are the two species which can tolerate low levels of DO (Prabhavathy and Srinivasan, 1977).

Table 3: Seasonal variation in the rotifer population (n/l) along the three study stations of Ban Ganga stream (Jan., 2003 – Dec., 2003)

Months/Stations	Station I	Station II	Station III	Mean
January	350	350	500	400±70.7
February	50	100	150	100±40.8
March	100	300	150	183.3±84.9
April	Ab	550	50	200±248.3
May	50	550	450	350±216.0
June	200	5000	1000	206.6±2099.9
July	100	100	250	150±70.7
August	Ab	300	800	366.6±329.9
September	650	700	200	516.6±224.8
October	Ab	2550	750	1100±1070.0
November	4100	1400	1850	2450±1181.1
December	300	350	Ab	216.0±154.5

Table 4: Seasonal variation in the protozoan population (n/l) along the three study stations of Ban Ganga stream (Jan., 2003 – Dec., 2003)

Months/Stations	Station I	Station II	Station III	Mean
January	Ab	Ab	Ab	
February	Ab	Ab	Ab	
March	50	Ab	50	33.3±23.5
April	Ab	Ab	Ab	
May	Ab	Ab	Ab	
June	Ab	Ab	Ab	
July	Ab	Ab	Ab	
August	Ab	Ab	50	16.6±23.5
September	Ab	Ab	Ab	
October	1450	Ab	150	533.3±651.0
November	2250	Ab	Ab	750.0±1060.0
December	300	50	Ab	1166.6±131.2

Minima in population of Copepoda during rainy season may be attributed to some unfavourable conditions of physico-chemical parameters (higher water currents and higher depth levels) prevailing in Ban Ganga stream. (Table 4 and 6). The winter maxima recorded for Copepoda may be related to maximum grazing intensity (Gochhait, 1991 and Sharma, 2001).

Table 5: Seasonal variation in the protozoan population (n/l) along the three study stations of Ban Ganga stream (Jan., 2003 – Dec., 2003)

Months/Stations	Station I	Station II	Station III1	Mean
January	400	450	500	450±40.82
February	200	300	350	283.3±62.36
March	450	750	300	500±187.08
April	300	650	300	416.6±164.99
May	3350	750	600	1566.6±1262.49
June	400	5100	1450	2316.6±2014.25
July	650	750	400	600±147.19
August	100	550	1000	550±367.42
September	150	300	300	250±70.71
October	3350	7250	2700	4433.3±2009.28
November	7200	3150	3600	4650±1812.45
December	1000	400	100	500±374.16

The group Cladocera remained absent throughout the investigation period. The recorded absence may be attributed to:

1. Inadequate food supply.
2. Migration of organisms from higher reaches of the river to lower reaches as has been observed by Wetzel (2001) that micro crustaceans tend to move from the prevailing habitats of back water area to downstream during the periods when water flow exceeds 2.5 cm/s.

During the present investigations several pollution indicator species viz. *Brachionus bidentatus, Mesocyclops leuckartii, Centropyxis aculeata* were identified as has also been suggested by Pennak (1968), Patalas (1972) and Pandit (1980). In conclusion, presence or absence of a certain species of zooplankton in a water body are not only indicative of trophic status of water body but also acts as agent of energy transfer from one trophic level to other trophic level and provides information about the various linkages in the food chains and food web.

Table 6: Seasonal variations in Physico-chemical parameters of Ban Ganga stream (Jan., 2003 – Dec., 2003)

Months	Weather	Atmos-pheric Temp. (°C)	Water Temp. (°C)	Depth (cm)	Speed (m/s)	pH	DO (mg/l)	FCO_2 (mg/l)	CO_3^{--} (mg/l)	HCO_3^{--} (mg/l)	Cl^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)
January	PC	19	16	20	0.04	8.1	6.4	A	27.0	223.8	22.5	41.3	29.0
February	S	15	16.3	19.3	0.04	8.3	7.4	A	33.0	221.0	17.9	37.3	28.9
March	S	24	19.3	19	0.04	8.8	7.7	A	34.0	242.9	20.5	36.5	26.4
April	S	26	17.8	21.3	0.04	8.7	7.4	A	41.0	185.9	21.9	33.0	29.3
May	S	12.1	27.3	18	0.04	8.1	7.6	A	35.5	187.0	27.2	37.6	28.4
June	P C	30.6	28	18.6	0.03	8.5	7.5	A	35.0	209.4	23.9	32.0	22.6
July	R	30.3	27	23.6	0.05	8.6	8.0	A	29.0	162.6	21.2	26.6	20.2
August	P C	28.8	24.3	30.3	0.09	8.2	8.4	A	25.0	112.8	22.5	36.2	24.2
September	P C	27.6	24	30.6	0.09	8.2	7.8	A	40.0	67.0	15.2	37.6	27.6
October	S	24.3	22	21	0.06	8.5	7.4	A	23.0	82.3	20.5	34.9	25.0
November	S	22	19.1	18.3	0.04	8.5	7.6	A	23.0	57.9	57.9	32.0	22.1
December	S	18	16.8	18.6	0.04	8.1	7.0	A	25.0	65.0	64.0	38.4	22.6
Range		15 - 32.1	16 - 28	18 - 30.6	0.03 - 0.09	9.1 - 8.8	6.4 - 8.4	A	23.0 - 41.0	57.9 - 242.9	15.2 - 27.2	26.6 - 41.3	20.2 - 29.3

A = Absent; S = Sunny; R = Rainy; P C = Partially cloudy

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