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RESEARCH ARTICLE

STUDY OF ZOOPLANKTONS AT PRAVARA SANGAM IN GODAVARI RIVER (M.S.) INDIA

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ABSTRACT

Plankton occupies a significant position in the food web of lentic ecosystem. They play a central role in cycling organic matter in aquatic ecosystem. The abundance of plankton depends on the various hydrological variables. Evaluation of Godavari River Aurangabad District Maharashtra was made assess the quality of water from September-2011 to August- 2012 the qualitative and quantitative evaluation of the variation in river water showed high quality of zooplankton population throughout the study period. Rotifers formed dominated group over other group of organism. The present study revealed that the water of River Godavari is contaminated of sewage and other industrial effluents at some stations. The present work reports the zooplankton diversity has been studied in the Godavari River for a period of one year from September-2011 to august-2012. The total number of zooplanktons and monthly average of zooplanktons per liter were recorded. It was noted that the total number of zooplanktons varied from 71 to 190 per lit. At station ´ A` and 36 to 192 per Lit. At station´ B `and 68 to 183 per Lit. At station ´C`.

INTRODUCTION

The River Godavari is the second largest river in the Indian Union. Starting from a trickle from the lips of a cow at Triambak, the width of the river grows till it is nearly 6.5 km wide at Dowlaiswaram. It is always spoken of as the Southern Ganga and Vriddha Ganga. Zooplankton has short life span and they respond more quickly to environment leads to change in plankton communication in terms of tolerance, abundance, diversity and dominance in the habitat. Therefore zooplankton communities of numerous reservoirs, lakes and shallow water bodies have been used as indicators for the status of the lake (Christoferson *et al.*, 1993; Jeppensen *et al.*, 1999; Ramchandra *et al.*, 2002). The variability observed in the distribution of zooplankton is due to abiotic parameters (Roff *et al.*, 1988; Christou 1998; Escribano and Hidalgo, 2000; Beyst *et al.*, 2001).

The planktonic photosynthesis plays an important role in conditioning the microclimate zone around an ecosystem. Zooplanktons are playing integral role in transferring energy to the consumers. The ecology of zooplankton communities in rivers has been the focus of an increasing number of studies in recent decades, and considerable progress has been made in understanding the major mechanisms involved in regulating their abundance, diversity and spatiotemporal patterns (Lair, 2006). Nevertheless, the vast majority of such investigations have addressed the influence of abiotic constraints, while a comparatively smaller amount of research has dealt with biotic interactions, which are generally thought to play a minor role in the main channel of rivers (Pace *et al.*, 1992; Basu and Pick, 1996; Reckendorfer *et al.*, 1999; Baranyi *et al.*, 2002). This was actually found to be the case in many large rivers, where abiotic factors such as water temperature, hydrological regime and current velocity (Saunders and Lewis, 1988; Thorp *et al.*, 1994; van Dijk and van Zanten, 1995; Dickerson *et al.*,2010), presence of discontinuities along the river course (Welker and Walz, 1999; Havel *et al.*, 2009), availability of inshore retention zones (Reckendorfer *et al.*, 1999; Schiemer *et al.*, 2001; Casper and Thorp, 2007) and connectivity with the adjacent floodplain (Aoyagui and Bonecker, 2004; Wahl *et al.*, 2008) were shown to be key drivers of zooplankton dynamics. Most of these surveys, though, rely on fortnightly or monthly sampling frequencies, which are too low to detect the outcome of potential interactions among organisms with high growth rates, such as rotifers, that usually represent the dominant component of metazoan plankton in rivers, both in terms of density and biomass (Lair, 2006; Vadadi-Fu¨ lo¨p *et al.*, 2010). In many of these field investigations, the analysis of biological interactions is thus limited to relations between zooplankton and phytoplankton/ protozooplankton abundance and composition over time (Lair and Reyes-Marchant, 1997;

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Kobayashi *et al*., 1998; Kim and Joo, 2000; Lair, 2005; Bergfeld *et al*., 2009). On the other hand, among the relatively fewer works specifically focusing on the role of biotic factors in structuring riverine zooplankton, most of the research has dealt with the impact of planktivorous fish and benthic bivalves on plankton assemblages, or with zooplankton grazing potential. These studies were carried out both by means of field surveys (Basu and Pick, 1997; Welker and Walz, 1998; Chang *et al*., 2008; Pace *et al*., 2010) and ex situ or in situ experiments (Gosselain *et al*., 1998a,b; Ietswaart *et al*., 1999; Jack and Thorp, 2000, 2002; Kim *et al*., 2000; Thorp and Casper, 2003; Joaquim-Justo *et al*., 2006; Ning *et al*.,2010; Davis and Gobler, 2011). On the contrary, few studies have investigated the significance of biotic interactions within the zooplankton community itself (De Leo and Ferrari, 1993; Lair *et al*., 1999; Guelda *et al*., 2005).

This lack of knowledge on the role of biotic interactions within lotic zooplankton traditionally led to considering it as an assemblage of taxa subjected to downstream transport and driven by external abiotic forces, therefore lacking internal, self-regulating properties of a true community in its strict sense, contrary to what has been acknowledged in lentic systems (Agustı`*et al*., 1990; Pahl-Wostl, 2004; Roy, 2009). As a result, the actual influence of biological control on community dynamics might be underestimated, ultimately leading to an incomplete understanding of the functioning of lotic systems.

Wetlands are regarded as a sensitive ecosystem with immense importance. It is a confined ecosystem and comprises with water, bottom mud and surface film (Keddy, 2010). Whereas it's biological parts comprises plankton, fishes, aquatic plants and the birds (Clegg, 1986). In all kinds of aquatic system plankton has been regarded as a very good bio-indicator for the quality of water. Phytoplankton community serves as a bio-indicator for assessing the health of an aquatic ecosystem (Tiwari and Chauhan, 2006; Hoch *et al*., 2008). Anitha Devi *et al*., 2013 also described that phytoplanktons are the primary producers of aquatic ecology and controls the dynamic of productivity. Zooplankton acts as bio-indicator of water quality as well as quantification of primary energy transfer from producer to primary consumer (Dulic *et al*., 2006). Kolhe *et al*., 2013 also observed the zooplankton communities respond more quickly to environment variations. Diversity and population of phytoplankton are influenced by a number of factors like nutrients, physico-chemical parameters, carbon exchange and biological interactions (Bhuiyan and Gupta, 2007; Rajagopal *et al*., 2010). Interactions between phytoplankton and zooplankton maintain the hydrological regimes for aquatic biodiversity (Bunn and Arthington, 2002). Hence the present investigation was carried out on the surface zooplankton population in the aquatic ecosystem of Godavari. The industrial effluents from various industries in and around the Kaigaon downstream and sewage discharge affecting the water quality as a consequence; the zooplankton population of Godawari River has been affected in terms of abundance and diversity.

Table 1 Monthly variation of Zooplanktons in No/lit. of Godavari River at station ″A".

Sr.No	Zooplanktons	Total	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug
1	Copepoda	314	29	26	34	26	26	23	30	24	20	32	26	18
2	Rotifera	664	13	16	29	125	21	68	94	18	37	76	29	38
3	Cladocera	205	14	21	10	18	14	27	14	16	12	21	22	16
4	Ostracoda	258	15	18	22	21	25	22	28	20	17	27	25	18
	Total		71	81	95	190	86	120	166	78	86	156	102	90

Table 2 Monthly variations of Zooplanktons in No/lit. of Godavari River at station ″B".

Sr.No.	Zooplanktons	Total	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug
1	Copepoda	179	30	26	22	06	13	04	24	09	10	13	9	13
2	Rotifera	735	32	45	47	160	80	101	118	40	22	46	32	12
3	Cladocera	134	13	05	11	10	7	13	28	17	11	10	5	4
4	Ostracoda	158	25	17	16	8	11	9	22	15	9	11	8	7
	Total		100	93	96	184	101	127	192	81	53	80	54	36

Table 3 Monthly variations of Zooplanktons in No/lit. of Godavari River at station ″C".

Sr.No.	Zooplanktons	Total	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug
1	Copepoda	264	28	24	28	17	27	15	28	17	18	28	15	19
2	Rotifera	660	25	40	37	135	50	80	101	42	35	52	31	32
3	Cladocera	178	12	15	13	15	12	19	24	15	13	18	10	12
4	Ostracoda	197	15	16	18	16	19	16	20	16	15	19	12	15
	Total		80	95	96	183	108	130	173	90	81	117	68	78

MATERIALS AND METHODS

Godavari is the largest river in south India and ranks 3rd among the Indian rivers, flows 1465Km and empties into the Bay of Bengal. It rises in the Sahayadri hills, in Maharastra state and it reaches Andhra Pradesh receiving water from the Manjra, the Pranahita (which itself is itself formed by the confluence of the three rivers viz., the Wardha, the Painganga and the Wainganga); the Mannair, the Indravathi and the Sabari. Water samples were collected once in every month from the three different stations A, B and C from Kaigaon to Pravara sangam from the surface waters of the River. Water

Samples were collected monthly from three different stations in between 8 to 10 am at regular intervals and filtered by using 644 plankton net. The samples were preserved in 4% formalin. The samples were observed for their identification using APHA.

RESULTS AND DISCUSSION

Zooplanktons recorded from three different stations of Godavari river belongs to four major groups Rotifera, Cladocera, Ostracoda and Copepoda. Zooplankton population rises steadily with time to a pick level conceding with the

maximum release of nutrients with least DO And Highest BOD at safe level. [3]. Ningule and Gayke noted that the total number of zooplanktons varied from 28 to 45 number per lit.at station' A' and 28 to 47 per lit.in station' B'in Sarni-Sangvi reservoir, Kumar *et al* recorded zooplanktons at Munger 17 to 137 per lit. in Ganga river in Bihar. Baburao *et al* found the domination of zooplankton over phytoplankton in Himayatnagar lake Hyderabad. Pawar and Madlapure recorded 29 genera of zooplanktons from Sirur dam water in Mukhed in Naded District. Sirsat and Ambore studied the zooplankton community from a fresh water pond at Dharmapuri in Beed Maharashtra, Jaybhay and Madlapure were recorded zooplanktons number varied from 23 to 43 per lit.at station' A` 18 to 33 per lit. At station B and 19 to 41 per lit.at station C During the year Feb.2003 to Jan.2004 in Parola dam Hingoli.

In the present investigation, group rotifer is dominant over the remaining three groups at each station. It was noted that the total number of zooplanktons varied from 71 to 190 per lit. at station ' A' and 36 to 192 per Lit. at station' B `and 68 to 183 per Lit. at station 'C`. The monthly fluctuation of zooplanktons shown in table-1, table-2 and table-3.The zooplankton fluctuates monthly and its productivity was according to Rajshekhar *et al.*, (2010), the composition and relative abundance of species in the aquatic communities is influenced by the variation in tropic state and seasonal changes of physicochemical variables of water body. Dirican *et al.*, (2009) permanent dominancy of rotifer species such as Brachionus and Keratella are indicative of eutrophic condition of lake. They studied Camligoze dam lake, Turkey and stated that rotifer are more abundant than other zooplankton groups and account for major portion of food chain. Chattopadhyay and Barik (2009) studied composition and diversity of net zooplankton from Krishnasayar lake and recorded high scores of species diversity and low scores of species richness amongst net zooplankton. They also recorded maximum relative abundance for rotifer and minimum for Decapoda.

Ferdous and Muktadir (2009) reviewed the potentiality of zooplankton as bio-indicator. They concluded that potentiality of zooplankton as bio-indicator is very high. Ramchandra *et al*., (2006) emphasized role of plankton in aquatic food chain and discussed zooplankton as bio-indicators. They carried hydrobiological investigation in selected Bangalore lakes. Preety Singh (2013) in Gomati river (U.P.) Zooplanktons were reported to be highest (168-220 in/l) during winter and lowest (114-155 in/l) during summer season.

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