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Productivity, benthos and fishes

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Abstract
In ecology, Productivity or production refers to the rate of generation of biomass in an ecosystem Productivity of autotrophs such as plants is called primary productivity while that of heterophs such as animals in called secondary productivity.

Keywords: Benthos and Fishes

Introduction
Limnological studies without the study of productivity does not make sense. Phytoplanktons constitute major segment of the primary production in the fresh water ecosystems acquire special significance. The phytoplankton population density directly influences primary productivity of the ecosystem. Community respiration which is governed by all living organisms in the water ecosystem in one of the important parameter for productivity study. Effluents from different sources affect primary productivity in general. In the present study Gross Primary Productivity (GPP), Net Primary Productivity (NPP), Community Respiration (CR) and ration of Net and Gross Primary Production were observed. Methods to study these parameters have been described in the Chapter Material Methods.
Considerable work has been done on the phytoplanktonic primary production of the ponds and lakes: Goldman (1960), Ganapati and sreenivasan (1970), Khan and Siddiqui (1990) [13], Vijayaraaghavan (1971), Hickman (1973 and 1979), Nasar and Munshi (1975), Srivastava and Sahai (1976) and Kaul (1977). However there is a paucity of literature on the phytoplanktonic primary production of the riverine ecosystems. Some significant contributions in this field are those of Erti and Juris (1967), Kowatczewski and Lack (1971), Bilgrami *et al.,* (1979 and 1985), Descy *et al*., (1987 and Saha and Pandit (1990).

Observation
The Productivity of the river Baya was studied in three seasons of 2008 and 2009. Net Primary Productivity and Gross Primary Productivity was observed as per the method given in the chapter Material and methods. Ration of Net productivity and Gross productivity was also computed. The results have been presented in the Table 6.1 to 6.3 and figures VI.1 to VI.3. Details of the observations have been explained under the flowing category. Average values of two years for each ghat have been calculated and used for data presentation.

Net primary productivity (NPP)
Average net Productivity of river Baya was observed 0.108$\pm$ 0.07gm/m^3 /hr considering all three observed ghats during 2008-09 (Table 6.4). Maximum NPP was observed 0.199 gm/m^3 /hr at BakhobaGhat in summers (Table 6.1) and minimum NPP was minimum during rains at all three observed ghats and maximum during summers. It is also evident from the same Figure and Table that there is no significant variations among different ghats.

Gross primary productivity (GPP)
Average community Respiration of river Baya was observd 0.137$\pm$ 0.08gm/m^3 /hr considering all three observed ghats during 2008-09maximum GPP was observed 0.267 gm/m^3 /hr at Bakhoba Ghat in summers (Table 6.1)and minimum GPP was observed 0.038 gm/m^3 /hr in rain at Telia Ghat. Figure VI.1.2 clearly reveals that GPP was minimum during rains at all three observed ghats and maximum during summers. It is also evident from the same Figure and Table that there is no significant variations among different ghats.

Community Respiration

Average Community Respiration of river Baya was observed 0.030± 0.02gm/m^3 /hr considering all three observed ghats during 2008-09. Maximum CR was obsereved 0.072 gm/m^3 /hr at Bakhoba Ghat in summers and minimum GPP was observed 0.008 gm/m^3 /hr in rian at Teliaghat. Figure VI. 1.2 clearly reveals that GPP was minimum during rains at all three observed ghats and maximum during winter except at Bakhoba where it was maximum during summer.

Fishes and Benthos

Baya is a perennial river. Fish farming is not a common activity of this regions. But fishermen of local area used to capture fishes regularly. There is no standard method of farming/culture of fishes. Fishes observed during the period is given in Table 6.6. The data is collected from local market and from personal interview with local fishermen. Benthos of the river was examined regularly in three seasons. Np abnormalities and uncommon fauna and flora observed during the period. This is in accordance with the observation made by Kumar (1998).

Discussion

Seasonal variation in the Net Primary Productivity at all three observed ghats was studied. Many workers have observed primary productivity of ponds, lakes and reservoirs (Sreenivasan 1963, 64, 65, 76 Ganpati and Sreenivasan 1970: Khan and Siddiqui 1971 [13], Vijaraghwan 1971. Nasar 1975: Nasar and Munshi 1975: Nasar and Nasar 1976, 1978. Munawar 1974. Hasmani and Bharati 1980; Dutta and Choudhary 1984: Pradeep and Gupta 1986. Yadav *et al.*, 1967 Valccha and Bhatnagar 1989. Saha and Pandit 1990, and Patralekh 1999) But less attention was given on riverine system (Bilgrami *et al.*, 1979. Patra 1985. Prand *et al*., 1988, Saha and Pandit 1990, Jha 1998).

The annual mean average of NPP and GPP was observed 0.108 and 0.137 gm/m^3/h respectively (Table 6.4). Saha and Pandit (1990) found the NPP varying from 0.29mgc/l/d to 1.13 mg/l/d and from 0.30 mg/l/d to 1.32 mg/l/d at the Kappa ghat and Burarighat respectively of river Ganga at Bhagalpur. Prasad *et al*., (1998) estimated the NPP varying from 0.005-0.417gm/m^3/h during 1987 and from 0.018-0.377 gc/m3/brduring 1988 in river Gandak from 0.028 -0.629 gc/m3/hr during 1987 and from0.228-- 0.395 gc/m3/hr during 1988 in river Kurch. In the present investigation the was found to vary from 0.030 gc/m3/hr. With annual mean value 0.192 g/m3/hr which is slightly lower than the value reported by Prasad *et al*., (1998).

The productivity of the river Baya showed bimodal pattern as reported earlier by Goldman and Wetzel (1963), Vijairaghwan (1971). Nasar and Nasar (1978), Saha and Pandit 1990) and Patra (1990). The value of NPP showed its primary peak during summer and a secondary peak of lower magnitude in winter. Similarly, the GPP exhibited its primary peak during summer and secondary in winter. Saha and Pandit (1990) found the primary peak in February at Kuppaghat and in March at Bararighat of river Gangawhile Bilgrami *et al*., (1979) and Singh (1981) have recorded the higher value of productivity during summer in river Ganga Prasad *et al*., (1988) observed the maximum value of NPP and GPP in all the three seasons at different sites of river Gandak and BurhiGandak. In case of stagnant water system, the production was found maximum indifferent months/seasons of the year. Sreenivasan (1964) reported the highest production during December in Ayyangulum tank and during April in Amaravati reservoir. While working on three tropical ponds, Vijayraghawan (1971) reported the high production twice during the annual cycle (April and September) in Othakadai pond but only in April in Yanamalai Pond. Nasar and Nasar (1978) observed the maximum production twice in a sewage fed pond at Bhagalpur one in September and other in February. Singh and Swarup (1981) found highest production in September in Surahalake. Yadav *et al*., (1987) recorded the maximum production during April in DeghaliBeel, Assam. Valecha and Bhatnagar (1989) reported the productivity peak during April In first year and during August in second year of observation in the same eutrophic lake.

The variation in the productivity is a common feature as observed by the various workers and similar the case was also observed in the present investigation. Minimum productivity was observed in the rain. The variation of productivity may be attributed to many other physic-chemical factors.

community respiration ranging from 0.30 to 0.95 mgc/l/d and 0.32 to 1.02 mgc/l/d at Kappaghat and Bararighat respectively in river Ganga. Singh (1983) observed the variation between 0.10 to gc/m2/d in Ganga river. Prasad *et al*., (1988) found community respiration ranging from 0.01 to 0.082 gc/m3/hr during 1987 and 0.014 to 0.035 gc/ m3/hr during 1988 in river Gandak from 0.011 to 0.12gc/m3/hr during 1987 and 0.01 tyo0.042 gc/m3/hr during 1988 in river BurhiGandak.

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