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ANALYSIS OF DIVERSITY INDEX OF RIVER GANGA NEAR BARAUNI(BIHAR)

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ABSTRACT

In the present investigation, the water of river Ganga near Barauni (Bihar) was studied at two different sites for two consecutive years with reference to diversity index of phytoplankton to its Species diversity, Species richness, Species evenness. The average mean value of Species diversity were found varying from bits/Individual, Species richness from 5.41- 5.48 and Species evenness from 0.93- 0.91 at site-I and site-II. From the above finding the present investigation indicates that the river water is moderately polluted at both sites near Barauni.

(Key Word: River Ganga, Species diversity, Species richness, Species evenness)

INTRODUCTION

The river Ganga near Barauni (Bihar) receives the effluents and toxic substances discharged from different factories like thermal power plant, oil refinery and fertilizer factory. In addition, the river water also receives the effluents of Bata shoe factory and McDowell wine factory situated at Mokama adjacent to Barauni. In addition to these effluents and toxic substances, the river water also receives town sewage near Barauni. Simariaghat witnesses hundreds of dead bodies being burnt daily and sacred practices of depositing human remains in the river water also causes pollution. Cattle bathing, clothes washing, dumping of garbage, boating, fish catching etc. also add to the pollution of water. Thakur and Despandey (1968) stated that heavy discharge of oil bearing wastes from the oil refinery factory of Barauni caused noticeable pollution in this river upto Munger. Thakur and Despandey (1968) stated that heavy discharge of oil bearing wastes from the oil refinery factory of Barauni caused noticeable pollution in this river upto Munger.

Growth of algae is very common in all types of habitat. Different habitats however witness different combination of alga. This is probably because different physico-chemical condition prevails in different habitats accordingly. Algal populations thus recorded vary in these habitats on account of their variable nutritional requirement. A natural algal community is characterized by presence of few species with many individuals or vice-versa. An unfavorable limiting factor such as pollution results in a detectable change in community structure. Hence natural assemblage of algal population can be used as indicator of trophic status of water body. One of the simplest and most promising methods of such

information is the analysis of diversity index. Diversity index is the mathematical expression of the ratio between number of species and importance value (number, biomass, productivity, and so on) of individual (Verma and Munshi 1987). Margalef (1957) for the first time recommended the species diversity index as a powerful tool for assessing the algal community structure. It is supposed to be maximum when each individual belong to different species and minimum when all individual belong to same species.

MATERIALS AND METHODS

The river Ganga flowing near Barauni (Bihar) was selected for the present ecological studies. Within a stretch of 10kms.2 different spots were selected. From each spot, water from upstream and downstream side were collected in plastic Jug. All the water were mixed thoroughly and were taken to the laboratory and Species diversity was calculated on the basis of formula given by Shannon and Weaver (1964), Species richness on the basis Odum et al. (1960) and Species evenness was on the basis of Pielon(1966, 1969) and Sheldon (1969).

RESULT AND DISCUSSION

Biological analysis of river water were made with reference to algal Species diversity, Species richness, Species evenness at both sites and result has been presented in Table – 1 and 2 respectively.

In the present investigation the average annual mean value of phytoplankton diversity was ascertained as 1.21 ± 0.03 bits/individual with a minimum value of 1.02 bits/individual in the months of August to a maximum 1.40 bits/individual in the months of January at site- I and at site- II, the annual mean average value was computed as 1.12 ± 0.02 bits/individual with a minimum value of 1.03 bits/individual in September to a maximum value of 1.22 bits/individual in June (Table-.1& 2). Several researches have demonstrated that effluent from catchment areas produce striking change in the biotic community structure and thus ultimately in the indices of species diversity in a given water body. Wilhm and Dorris (1968) studied the condition of stream receiving organic compounds with the help of community structure of macro invertebrate population. The effect of various kinds of pollutants on the diversity of species reported by different workers clearly indicates that there are apparent reduction in the diversity values near the effluents outfall irrespective of the nature of pollutant but it increases gradually at the downstream. Woodwell(1970) has also reported that the diversity increases with distance from toxic pollution. Thus it may be concluded that increase in pollution results in decrease in diversity values.

Wilhm and Dorris(1968) have classified the water bodies into three categories on the basis of diversity. Water bodies having diversity less than 1 (one) as heavily polluted, between 1-3 as moderately polluted and exceeding 3 as the clear or clean water. Adhering to these classification both sites come under the categories of moderately polluted and site-II is comparatively more polluted than site-I.

From the table-1 and 2 it is evident that the annual trend of variation in diversity index showed its minimum value (1.02 bits/individual) in August to maximum(1.40 bits/individual) in January at site-I and minimum (1.03 bits/individual) during September-October and maximum(1.22 bits/individual) in June at site-II.

From the table (1 and 2) it is also evident that the value of diversity index varied from 1.00 to 1.5 during different months of the year at both sites. From this it may be concluded that river water is polluted as a whole. Lower values during monsoon months indicates slightly higher pollution due to flow of sewage and garbages from adjacent areas.

According to Margalef(1958) and Mayer and Mc.Cormic (1971), the large range in the diversity of species is an indicator of seasonal variations in the flora of any aquatic system. In the present investigation, the fluctuation has been computed as from 1.02-1.40 bits/individual at site-I and 1.03-1.22 bits/individual at site-II, suggesting no significant fluctuation in the planktonic flora at both sites.

Species diversity as conceived from Shannon's formula has two closely interrelated components- the Species richness and Species evenness. According to Llyod and Gehelardi (1964), while the first denotes a simple ratio between total species/ total number of individuals, the second express the distribution of individuals among the species. Thus more the richness and more the evenness, higher will be diversity.

The annual mean average of species richness was found 5.41 ± 0.38 with seasonal fluctuation varying from 3.67 - 7.34 at site-I (Table-1). At site-II, the annual mean average value was found 5.48 ± 0.23 with variation from 4.27 - 6.93 (Table-2). Similarly the annual mean value of species evenness was ascertained as 0.93 ± 0.01 varying from 0.89 - 0.97 at site-I (table-1) and at site-II, the mean value was ascertained as 0.91 ± 0.01 with annual variations from 0.83-0.97 (table-2).

The range of fluctuation in the species richness is more than the fluctuation in species evenness at both the sites in the river water, suggesting the impact of seasonal variation is more.

TABLE – 1
Monthwise Variations in the Indices of Community Structure (Sp. Div.bits/Individual)
(Site- I)

	Species Diversity	Species Richness	Species Evenness
Jan	1.40	7.34	0.97
Feb	1.30	6.13	0.95
Mar	1.21	5.35	0.95
Apr	1.17	4.71	0.96
May	1.32	6.95	0.92
Jun	1.29	7.14	0.90
Jul	1.23	5.43	0.93
Aug	1.02	3.82	0.89
Sep	1.05	3.77	0.92
Oct	1.07	3.67	0.93
Nov	1.19	4.73	0.95
Dec	1.27	5.83	0.95
M.V	1.21	5.41	0.93
S.E(±)	0.03	0.38	0.01

TABLE – 2

Monthwise Variations in the Indices of Community Structure (Sp. Div.bits/Individual)
(Site- II)

	Species Diversity	Species Richness	Species Evenness
Jan	1.21	6.33	0.94
Feb	1.20	5.74	0.93
Mar	1.10	5.53	0.85
Apr	1.10	6.36	0.83
May	1.21	5.93	0.89
Jun	1.22	6.68	0.84
Jul	1.14	5.37	0.91
Aug	1.04	4.40	0.93
Sep	1.03	4.54	0.92
Oct	1.03	4.27	0.96
Nov	1.14	5.42	0.97
Dec	1.12	5.20	0.93
M.V	1.12	5.48	0.91
S.E(±)	0.02	0.23	0.01

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