

ALGAL DIVERSITY INDEX WITH REFERENCE TO BRAHMSAROWAR POND, GAYA

S. M. Shakil Ahmad and Sumayya Sheikh*

Key words : *diversity index, phytoplankton, pollution stress, community diversity*

The algal properties have been expressed in terms of diversity. In the present investigation, the diversity index for different algal classes witnessed in Brahmसारowar pond Gaya, reflects the pollution stress upon the pond ecosystem. The value lies between 0.45 to 1.17 which indicated that Brahmसारowar pond is getting polluted due to misuse and abuse of water, such as the dumping of garbage, regular discharge of human faecal matter and use of its water for laundering purpose by local washermen.

INTRODUCTION

Diversity index is a measure of diversity which takes into account the number of species present as well as the relative abundance of each species. Precisely stated, diversity index is a mathematical measure of species diversity in a community. The Shannon index has been a popular diversity index in the ecological literature. This index is often used by ecologists in aquatic conditions to know the percentage of phytoplanktons and hence the level of pollution. In the present investigation, Shannon diversity index method has been followed to know the algal classes index in a pond of Gaya.

MATERIALS AND METHODS

Water samples for the examination of physico-chemical and biological parameters were collected separately (Trivedi and Goel, 1986; APHA, 1989).

Sampling was done at an interval of one month on the 15th instant of each month. The time for collection of sample was fixed between 8.00 am to 10.00 am.

Surface water grab or integrated samples were collected manually as per requirement. Collection bottles were slowly dipped at a slightly inclined angle beneath the surface about 10 cm to 15 cm deep. (APHA, 1989). These collection bottles were properly tagged and labeled. In the present investigation,

diversity index of algal classes from Brahmसारowar pond was calculated following Shannon's species index method.

SHANNON'S SPECIES DIVERSITY INDEX(H')

It is an expression of correlation with the pollution status of the ecosystem (Wilhm and Dorris, 1966; Washington, 1984) which is based on Shannon's information theory (Shannon and Weaver, 1949; Pielou, 1977; Sugihara, 1980). It has been calculated as:

$$H' = S_{i=1}^s 1 \left(\frac{n_i}{N} \right) \log_2 \left(\frac{n_i}{N} \right)$$

Where

H' = Shannon's index

N_i = No. of individual of each species (Genus here)

N = Total no. of individuals in the sample

Log₂ = 1.443 ln N

1.443 = amplification factor, Hutchinson (1967)

No. of species in the sample (Genus here)

OBSERVATION

Diversity index of algae in the studied pond was calculated in different months of the year 2015 and was compiled in Table-1.

Table-1 Diversity index (H') In Brahmसारowar Pond, Gaya, during the year 2015.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual average
Chlorophyceae	1.12	1.14	1.10	1.09	1.03	1.00	1.15	1.04	1.15	1.12	1.14	1.13	1.10
Cyanophyceae	1.12	1.13	1.08	1.07	1.00	0.46	0.52	1.54	1.15	1.17	1.13	1.14	1.042
Bacillariophyceae	1.10	1.09	0.55	0.62	0.66	0.44	0.64	0.64	1.07	1.06	1.11	1.11	0.845
Euglenophyceae	0.87	0.80	0.76	0.69	0.67	0.54	0.59	0.59	0.62	0.56	0.68	0.89	0.676

RESULT AND DISCUSSION

In chlorophyceae, the lowest value of Shannon's diversity index was 1.00 in June and highest value was recorded as 1.15 in July and Sept. with an annual average of 1.100. On the other hand, in Cyanophycean members lowest index was 0.46 in June and highest was 1.17 in October with an annual average of 1.042. Similarly, in Bacillariophycean members, lowest value was

Faculty Teacher, Environment and Water Management, Gaya College, Gaya.

*Research Scholar, P. G. Department of Botany, Magadh University, Bodh Gaya-824234

0.44 in June and highest in November and December as 1.11 with an annual average of 0.845. In case of Euglenophyceae members lowest value was 0.45 in August and the highest as 0.89 in December with an annual average of 0.676.

Species diversity is statistical abstraction with two components reflecting the number of species richness and the distribution of individuals of all species equitably at a particular site. Communities with a similar richness may differ in diversity, depending upon the distribution of individuals among the species. Wilhm and Dorris (1966) have suggested a relationship between species diversity and pollution status of aquatic ecosystem and classified as following:

- >3 → Clean water
- 1-3 → Moderately polluted
- <1 → Heavily polluted

Staub *et al.* (1970) proposed a different scale of pollution in terms of species diversity index which is a modified one and states a negative correlation between Shannon's index and pollution.

- 3-0-4.5 → Slight
- 2.0-3.0 → Light
- 1.0-2.0 → Moderate
- 0.0-1.0 → Heavy

The present finding of diversity index can be compared with both the lines of Wilhm and Dorris (1966) and Staub *et al.* (1970). It can be well stated that the pond in question, Brahmsarowar pond, Gaya shows greater degree of pollution. Thus the pollution status of the pond can be stated without calculating the losses at the consumer level as well as

decomposer level which may be helpful in biomonitoring aquatic ecosystem.

References

- APHA, 1989. Standard Methods for Examination of Water and Wastewater, 18th Ed. American Public Health Association, Washington D.C.
- Hutchison, G.E. 1967. Phytoplankton Association: A Treatise on Limnology, Vol. 2, John Wiley and Sons Inc. New York : 363.
- Pielou, E. C. 1977. Mathematical Ecology, New York. John Wiley & Sons : 385.
- Shannon, C. E. and Weaver, W. 1949. Mathematical theory of Communication (Urbana Ill : Univ. of Illinois Press) : 117.
- Staub, R., Applying, J.W., Hofmeister, A. M. and Hass. I.J. 1970. The effect of industrial wastes of Memphis and Shelby country on primary plankton producers: *Bioscience* **20**:905-912.
- Sugihara, G. 1980. Minimal Community Structure. An explanation of species abundance, patterns, *Amer. Nat.* 116: 770-787.
- Trivedi, R. K. and Goel, P. K. 1986. Chemical and biological methods for water pollution studies, Environment Publications, Karad, India.
- Washington, H. G. 1984. Diversity, Biotic and Similarity indices. *Water Res.* **18** (6): 653-694.
- Wilhm, J. L. and Dorris, T. C. 1966. Species diversity of benthic macroinvertebrates in a stream receiving domestic and oil refinery effluents. *Amn. Midl. Nat.* **76** : 427-449.