Species

ANALYSIS

ISSN 2319 – 5746 EISSN 2319 – 5754

Urban biodiversity a tool to assess aquatic health

Padmanabha B

Post Graduate Dept. of Applied Zoology, Maharani's Science college for women, Mysore – 570 005, India; Email: padmanabhabb@gmail.com

Publication History
Received: 05 December 2014
Accepted: 11 January 2015
Published: 28 January 2015

Citation
Padmanabha B. Urban biodiversity a tool to assess aquatic health. *Species*, 2015, 12(35), 97-100

ABSTRACT

The objective of this paper is to monitor the aquatic health of urban lentic ecosystems by using biodiversity as a tool. The sediment and soil samples collected from three lakes to analyse macrobenthos. The collected macrobenthos are assorted on an enamel tray on which several parallel lines are made. Then these specimens are sequentially arranged to compute Sequential Comparison Index (SCI). According to the results, highest SCI recorded in the Kamana lake (5.84) followed by Mandakally lake (5.17) and lowest in the Dalavai lake (2.98). Healthy aquatic body normally has a SCI value greater than 12 (up to 24), where as polluted streams are generally less than 8. So the SCI of these three lakes less than 8 which indicated that the water of these lakes are being polluted. A non biologist can also use SCI as a tool to assess the pollution of the aquatic system.

Key Words: Aquatic health, Macrobenthos, Sequntial Comparison Index, Kamana lake, Mandakally lake, Dalavai lake.

1. INTRODUCTION

Water is essential for the survival of any forms of life. Aquatic health deterioration in a growing city is always in the rising trend, it's effects on the environment must be studied. Water quality can be assessed either monitoring the hydrographical parameters of water or by analyzing inhabiting biota. Biota comprises mainly plankton, macrobenthos and other aquatic animals. In pollution stressed aquatic environments, change in the community structure is reflected in the diversity patterns. Water pollution indices are commonly used for the detection and evaluation of water pollution. The indices are broadly characterized in to two parts: the physico-chemical indices and the biological indices. The physico-chemical indices are based on the values of varous physico-chemical parameters in water sample, while the biological indices are derived from the biological information. These changes can be quantified numerically as diversity indices, which are useful in water quality monitoring. Biological diversity refers to variety and variability among living organisms. Various indices are now extensively used to measure aquatic pollution (Chaurasia and Agarwal, 2004; Sharma *et al.,* 2005; Padmanabha and Belagali, 2007, Padmanabha, 2009).

2. MATERIALS AND METHODS

Three lakes in Mysore city namely – Kamana, Mandakally and Dalavai lakes are selected for this study in the Mysore city. The soil and sediment samples collected and analyse to collect macrobenthos. This study is carried out from January 2012 to December 2012. Macrobenthos are collected, preserved and sequentially arranged on an enamel tray to compute Sequential Comparison Index (SCI).

Sequential Comparison Index: Most biological indices require some taxonomical background of the investigator. The sequential Comparison Index, proposed by *Cairns et al*, 1968. A simplified method for non-biologists to estimate relative difference in biological diversity in stream pollution studies. This requires no knowledge of biology. The index can be used by professional biologists for quick surveys and by the nonbiologists for getting an idea of the biological effects of pollution during an otherwise physico-chemical investigation.

Data collection: The processed and preserved macrobenthos are placed on an enamel tray on which several parallel lines are made by a glass pencil or a black tape. Put the organisms in this tray without any bias, the organisms at this stage are dispersed throughout the tray without a linear arrangement (Fig 1). Now arrange them linearly by moving them linearly by moving each organism up and down to the closest line and maintain left to right sequence of the organisms (Fig 2). \

Now examine the organisms individually (Fig. 3). Start examining from left corner of the first line and record the scoring as runs. The 1st organism is marked as 'X'. Proceed to the 2nd organism, if it is same as the 1st one, mark 'X', if is different mark 'O'. Now compare the 3rd organism with the 2nd. If it is same as the 1st or 2nd, put the same mark as for the 1st or 2nd as 'X' or 'O', if it is different, the mark is changed. The comparison is continued till the last organism is compared with the last but one. Count the number of runs by counting the groups of 'X's and 'O's. Each run begins with an 'X' or 'O' and continues till the code remains same. A different run begins if the code (animal) is changed. Total runs=16. No. Of organisms is the total number of organisms on all the lines (22). The equivalent no. of species is determined by closely examining the organisms no. Os sps is 3. Sequential Comparison Index (SCI) was computed by Cairns *et al*., 1968; Trivedy and Goel, 1986, Srivastava & Srivastava, 2006.

$$SCI = \frac{No.of\,`runs}{No.of\,`Organisms} X No.of\,`Equivalent`Species \quad SCI = \frac{16}{22} X\, 3 = 2.18$$

3. RESULTS AND DISCUSSION

According to table 1, highest Sequential Comparison Index recorded in the Kamana lake ( ), followed by Mandakally lake and Dalavai lake. These results suggest that the water of all these three lakes are being polluted because recorded SCI is less than 8. Out of these three lakes Dalavai lake is highly polluted followed by mandakally lake and Kamana lake (Graph1).

For accurate estimation of the SCI, the index of the same sample should be taken 2-3 times by collecting the organisms after one reading and respreading them. Since the pollution usually causes a reduction in the no. of species and increase in the number of individuals of the remaining species. The SCI usually decreases with increasing pollution. In a particular case, if the SCI values at a baseline site are 9.2 and 9.4, decline to 5.1, 5.0,5.2, 5.3 at various polluted sites and then again become 8.9 and 9.0 ar a far away downstream site, an inference can be drawn that the system is damaged biotically at the polluted sites and the recovery takes place at the downstream sites. This index can be used to detect pollution in several areas at the cost of very little time and money. This index can also be used to, support the chemical data, wherever necessary. Cairns state that a healthy stream normally has a SCI value greater than 12 (up to 24), where as polluted streams are generally less than 8.Sequential Comparison Index can be a ready made tool to assess water quality. Even non-biologist can also compute Sequential Comparison Index to evaluate aquatic health.

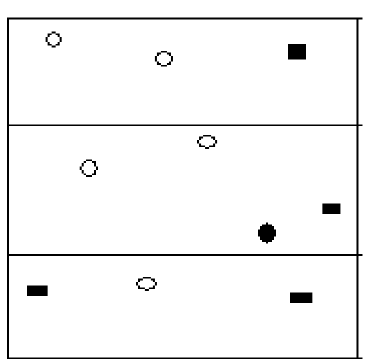


Fig 1: Organisms assorted in the enamel tray

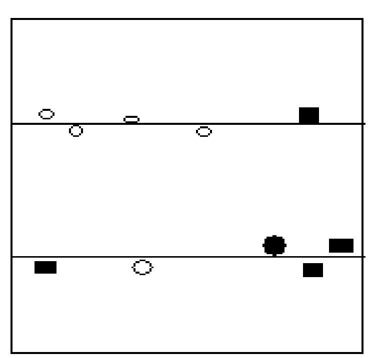


Fig 2: Organisms after the linear arrangement

Padmanabha,
Urban biodiversity a tool to assess aquatic health,
Species, 2015, 12(35), 97-100,

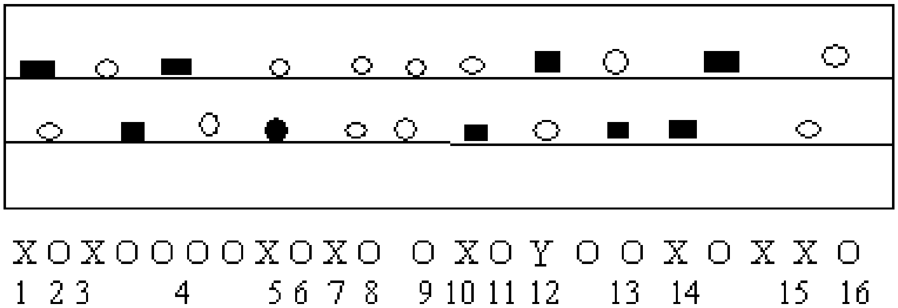
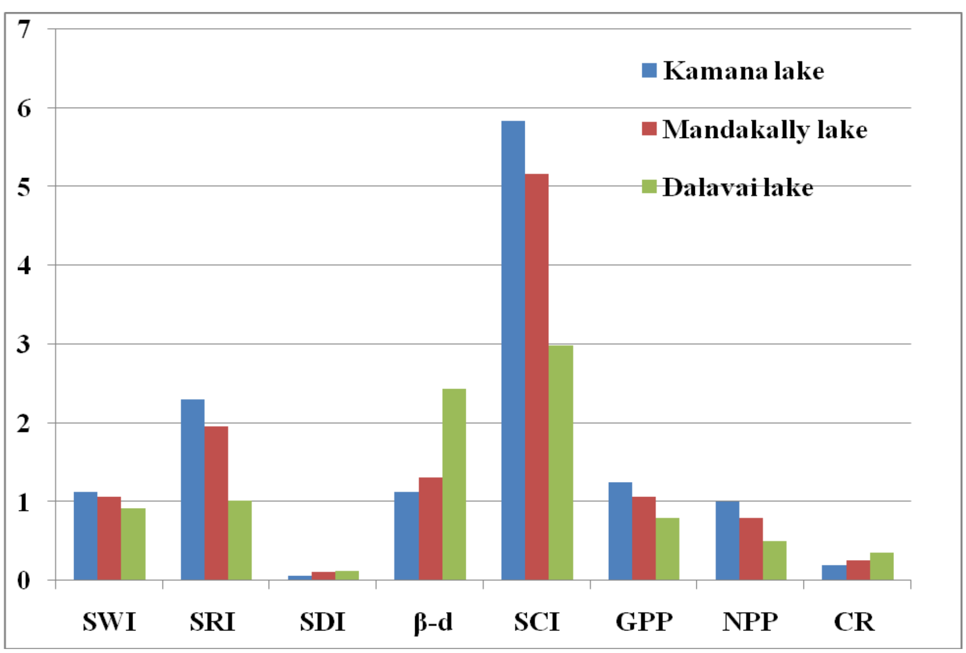


Fig 3: Computation of sequential runs in the enamel

Table 1

Population parameters of macrobenthos in the lakes of Mysore city

	Kamana lake	Mandakally lake	Dalavai lake
Shannon-Weaver index (SWI)	1.12	1.06	0.92
Species richness index (D)	2.30	1.96	0.99
Simpson dominance index (SDI)	0.06	0.11	0.12
β – diversity index (β-d)	1.13	1.31	2.43
Sequential Comparison Index (SCI)	**5.84**	**5.17**	**2.98**
Gross Primary Productivity (GPP) (gC/m^3/hr)	1.20	1.06	0.85
Net primary Productivity (NPP) (gC/m^3/hr)	1.0	0.8	0.5
Community Respiration (CR) (gC/m^3/hr)	0.20	0.26	0.35
Goodnight and Whitley Index (GWI)	82	76	67



Graph 1

Relationship between different biotic components

Padmanabha,
Urban biodiversity a tool to assess aquatic health,
Species, 2015, 12(35), 97-100,

REFERENCES

1. Cairns J Jr, Albaugh DW, Busey F and Chanay MD. 1968. The sequential comparison index. A simplified method for non-biologists to estimate relative difference in biological diversity in stream pollution studies. *J. Water Pollut. Control Fed.,* 40(9), 1607-1613.
2. Chaurasia S. and Agarwal G.D. 2004. Biodiversity based indices of water quality. *IJEP*, 24(10), 762-765.
3. Padmanabha B. and Belagali S.L. 2007. Diversity indices of rotifers for the assessment of pollution in the lakes of Mysore city, India. *Poll. Res*., 26(1), 65-68.
4. Padmanabha B. 2009. Diversity of macrobenthos a tool to assess aquatic pollution. In: National conference on "Conservation of Biodiversity in protected areas – Opportunities and Challenges". 23& 24th January, 2009, Christ Univerity, Bangalore. Proceedings Pp.16-20.
5. Sharma K., Bharadwaj S.M., Chaturvedi R.K. and Sharma K.P. 2005. Applicability of diversity indices for a comparative assessment of degree of pollution in lentic and lotic ecosystems and describing vegetation characteristics. *Nat. Env & Poll. Tech*., 4(1), 101-106.
6. Srivastava R K and Seema Srivastava, 2006. Diversity indices for water pollution monitoring. *J. Ecobiol*., 18(1), 1-9.
7. Trivedy R.K and Goel P.K. 1986. Chemical and Biological methods for water pollution studies. Environmental Publications, Karad (India), Pp. 1-250.