

Comparative diversity of freshwater phytoplankton in Mysore and Mandya districts Wet lands of Karnataka

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ABSTRACT

A comparative account of the diversity of freshwater phytoplankton from two districts of Karnataka (Mysuru-T. Narasipura; and Mandya-Srirangapatna Talukas) was carried out. Twenty one species appeared in T. Narasipura taluka and 15 species appeared in Srirangapatna Taluka. Anabaena macrospora and Chroococcus turgidus were abundant while Stauroneis phoenicenteron and Merismopedia tenuissima appeared at all sites of collections Shannon index showed variation to a certain extent while the other indices were not well marked. Blue green algae dominated in all the study sites. According to most limnologists species poor communities indicate adverse effects of pollution which in turn reduce the diversity of the habitat.

Key words: Plankton, Diversity, Shannaon, Simpson, Dominance, Evenness

INTRODUCTION

Phytoplankton has played an important role in the ecology of fresh water ecosystems. Anthropogenic activities in water bodies exert pressure on the diverse biota. Sometimes formation of algal blooms cause nuisance to people living around wetlands⁴ states that richness of species can be used to detect disturbances in wetlands. A large number of wetland diversity studies have been conducted. Some of them include^{1,3,5}. During an extensive study on the distribution of phytoplankton from different districts a large number of phytoplankton were recorded. This paper is an attempt to understand the biodiversity of phytoplankton in two districts of Karnataka. Species richness, species dominance and species evenness have been stressed. Srirangapatna taluka of Mandya district and T. Narasipura of Mysore district were chosen for the present study. Twelve sites in each of the talukas were sampled during the year 2014-2015 and their diversity discussed. A comparative account of the distribution of phytoplankton in the two districts has been discussed.

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MATERIALS AND METHODS

Study area



Map 1: Mysuru District



Map 2. Mandya District

Water samples for plankton analysis were collected from 12 sites of Mandya District (Srirangapatna taluka). It is the southern part of Karnataka State it lies between 76°19' and 77°22' East Longitude and 12°13' and 13°4' North Latitude. The district is between 2500 through 3000 feet above MSL. It has large number of small and high water reservoirs in addition to the perennial river, Kavari that flows through the district.

Water samples for plankton analysis were collected from 12 sites of Mysore district (T. Narasipura taluk) lying in the Southern part of the state. The total area of the district is 5715 sq. Km. It is located between 11°30' and 12°50' North latitude and 75°45' and 77°45' East Longitude at a height of 250ft above MSL. The rivers Kapila and Kabani, Tributaries of the Cauvery flow through this district with a large number of channels creating many wetlands. (Map2)

Sampling and enumeration: Water samples for the enumeration of phytoplankton were collected from 12 sites in each of the talukas of the districts during 2014-15. Random sampling was done. The collection, preservation, identification and enumeration was done as per the methods described by Hosmani⁶ and Bharathi and Lackey⁸, Suksena¹⁵. Identification was done by consulting monographs of algae^{2,11,12,13,14}. Diversity indices were calculated by subjecting the data to PAST Software Program⁴.

RESULTS AND DISCUSSION

The results of the distribution of plankton for Srirangapatana Taluka are presented in Table 1 and that for T. Narasipura taluka in Table 2. About 15 species appeared in water samples of Srirangapatna. Only one site showed the appearance of all 15 species. The number of sites having meagre number of plankton was high. *Anabaena macrospora*, *Chroococcus turgidus* were the most abundant, while *Stauroenies phoenicenteron* appeared in all the 12 sites (Table 1). The number of species that appeared in T. Narasipura samples was 21 with two sites having a fairly higher number of species. *Merismopedia tenuissim* appeared in all the 12 sites of collection (Table 2). The maximum count of phytoplankton in both the areas was as high as 28000 organisms/litre.

Table No.1 Phytoplankton population in Srirangapatna Tq. (2014-2015) (Organisms/liter)

Species	SRS1	SRS2	SRS3	SRS 4	SRS5	SRS 6	SRS 7	SRS 8	SRS9	SRS10	SRS 11	SRS12
<i>Anabaena macrospora</i>	0	14000	11200	5600	2800	12600	4200	5600	12600	14000	5600	1400
<i>Chroococcusturgidus</i>	4200	2800	2800	0	1400	2800	12600	8400	28000	4200	1400	0
<i>Merismopediaglauca</i>	0	9800	11200	0	0	7000	7000	1400	5600	4200	0	2800
<i>Microcystiscrassa</i>	2800	11200	8400	4200	7000	25200	28000	0	0	14000	5600	4200
<i>Spirulinanordestedtii</i>	0	1400	1400	0	0	2800	1680	0	0	1400	01600	1400
<i>Dictyosperiumindicum</i>	0	0	0	4200	2800	0	4200	5600	5600	2800	1400	0
<i>Tetrastrumstaurogeniforme</i>	0	0	0	1400	2800	1400	1400	1400	1400	0	1400	1400
<i>Closteriumlunula</i>	0	0	0	2800	1400	1400	1400	0	0	0	2800	1400
<i>Pediastrum simplex</i>	0	0	1400	4200	2800	0	2800	0	1400	2800	4200	1400
<i>Scenedesmusquadracauda</i> <i>var. westei</i>	2800	4200	5600	5600	5600	0	4200	2800	1400	2800	0	4200
<i>S. dimorphous</i>	4200	0	4200	4200	4200	0	4200	4200	0	0	1400	0
<i>Coelastrummicroporum</i>	0	4200	0	12600	5600	0	1400	4200	5600	2800	1400	2800
<i>Cyclotellaantiqua</i>	0	0	0	1400	0	0	2800	8400	7000	7000	1400	4200
<i>Melosiragranulata</i>	4200	1400	0	2800	0	1400	7000	9800	9800	7000	2800	2800
<i>Stauroneisamphicephala</i>	12600	4200	2800	5600	12600	16800	16800	14000	15400	2800	14000	12600

Table No.2 phytoplankton Population in sites of T. Narsipura tq (2014-2015) (Organisms/liter)

Species	TNS1	TNS2	TNS3	TNS4	TNS 5	TNS6	TNS 7	TNS 8	TNS 9	TNS 10	TNS 11	TNS 12
<i>Chroococcusdispersus</i>	0	0	1400	0	2800	0	16800	2800	5600	12600	11200	7800
<i>C. turgidus</i>	0	2800	1400	0	8400	0	12600	11200	11200	14000	12600	12600
<i>Merismopediatermissims</i>	8400	8400	2800	7000	9800	5600	21000	16800	14000	15400	7000	2800
<i>M. glauca</i>	1400	0	1400	0	0	0	28000	23800	28000	28000	25200	28000
<i>Oscillatoriaacutissima</i>	0	0	0	0	0	1400	7000	1400	2800	1400	2800	2800
<i>Microcystiscrassa</i>	1400	0	1400	2800	4200	0	2800	5600	7000	7000	2800	2800
<i>M. wesenbergii</i>	0	0	1400	1400	2800	1400	1400	1400	0	0	0	0
<i>Spirulinanordestedtii</i>	0	0	0	0	0	0	1400	0	1400	1400	1400	1400
<i>Tetrastrumstaurogeniaeforme</i>	0	0	0	1400	2800	0	1400	1400	1400	2800	1400	1400
<i>Cosmariumobtusatum</i>	8400	2800	0	2800	1400	0	5600	0	0	0	0	0
<i>C. ocellatum</i>	8400	2800	0	2800	1400	5600	0	0	0	0	0	0
<i>P. simplex</i>	0	0	0	1400	1400	0	5600	0	5600	1400	2800	2800
<i>P. tetras</i>	0	0	0	0	0	1400	4200	2800	1400	2800	2800	1400
<i>Scenedesmusquadracauda</i> <i>var. westei</i>	8400	9800	0	5600	5600	0	4200	1400	2800	5600	2800	2800
<i>S. dimorphus</i>	1400	2800	0	0	0	0	1400	1400	0	2800	2800	1400
<i>Coelastrummicroporum</i>	1400	1400	0	7000	0	4200	1400	1400	1400	2800	1400	1400
<i>Nitzschiaamphibia</i>	0	0	0	0	0	0	1400	0	2800	2800	2800	2800
<i>Cyclotellaantiqua</i>	0	0	0	0	1400	1400	0	1400	1400	1400	1400	2800
<i>Synedraacus</i>	11200	0	2800	4200	0	0	4200	1400	2800	2800	5600	1400
<i>Stauroneisamphicephala</i>	4200	0	4200	0	0	1400	0	4200	2800	1400	2800	1400
<i>Amphora ovalis</i>	1400	0	0	0	0	0	1400	2800	1400	2800	1400	0

Fig. 1: Srirangapatna

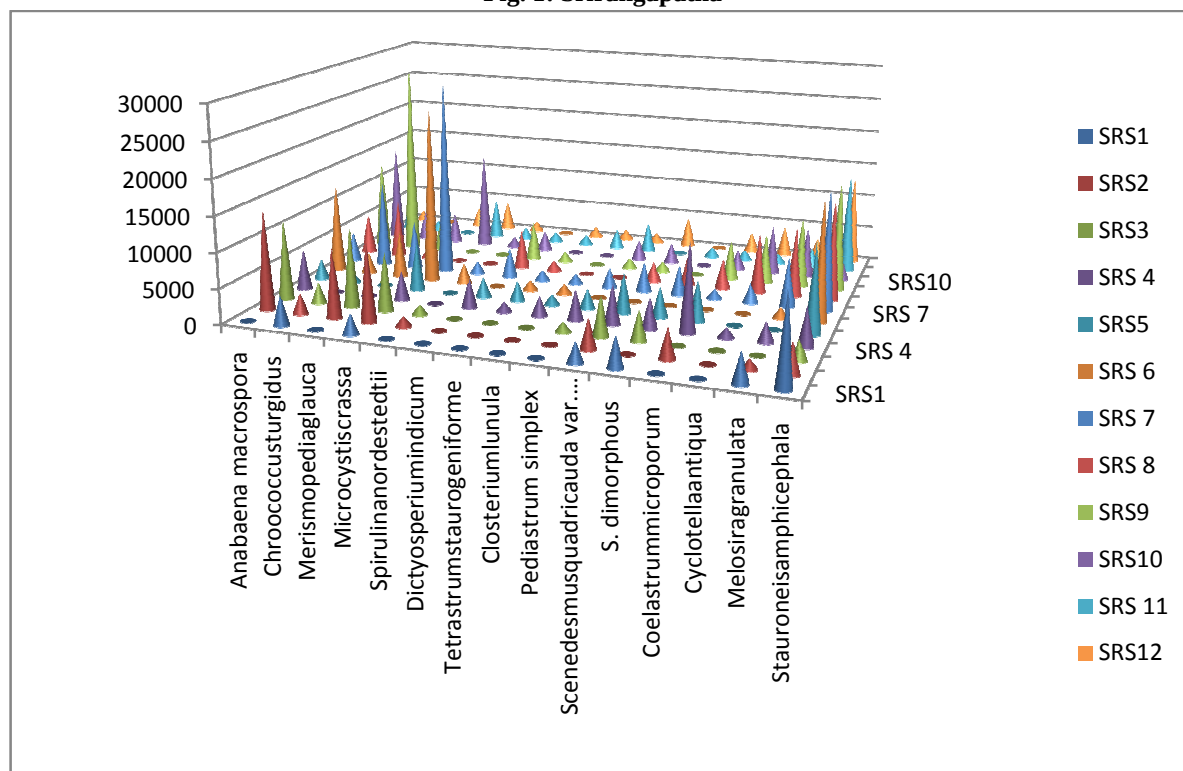


Fig. 2: T Narsipur

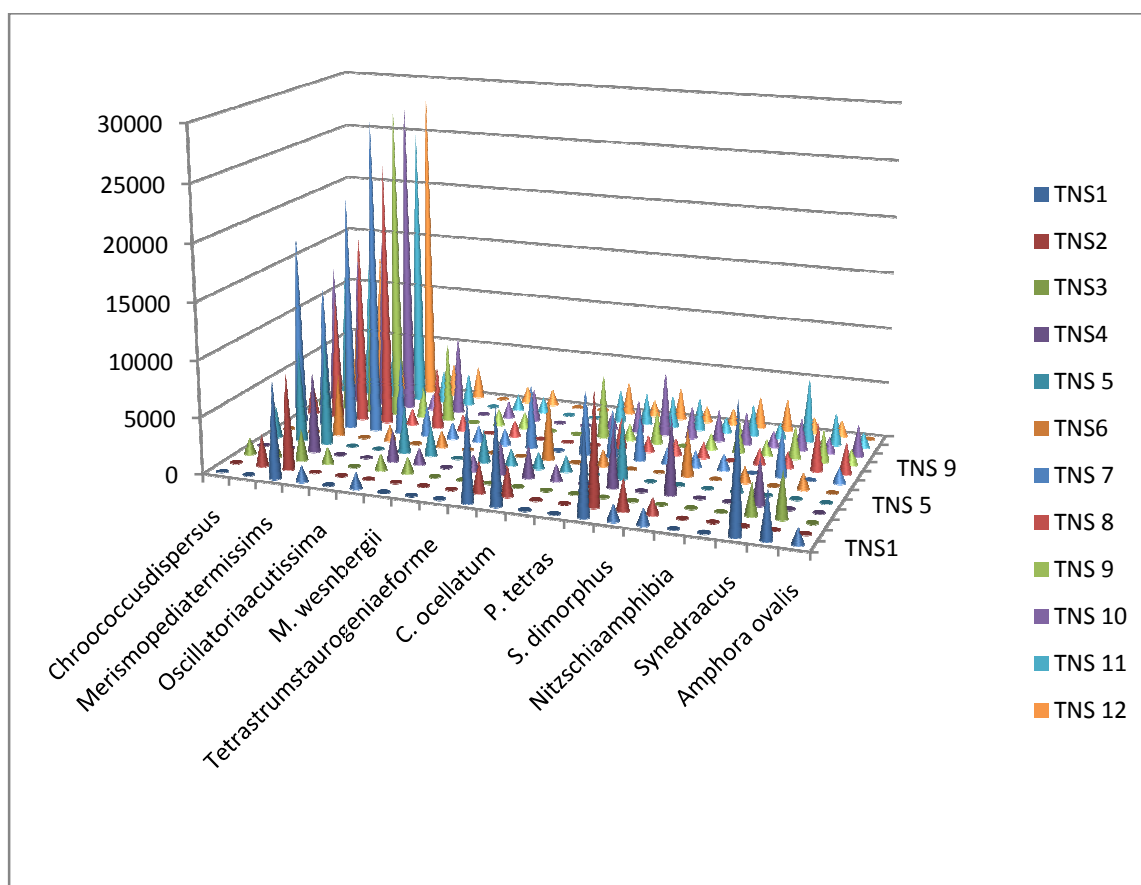
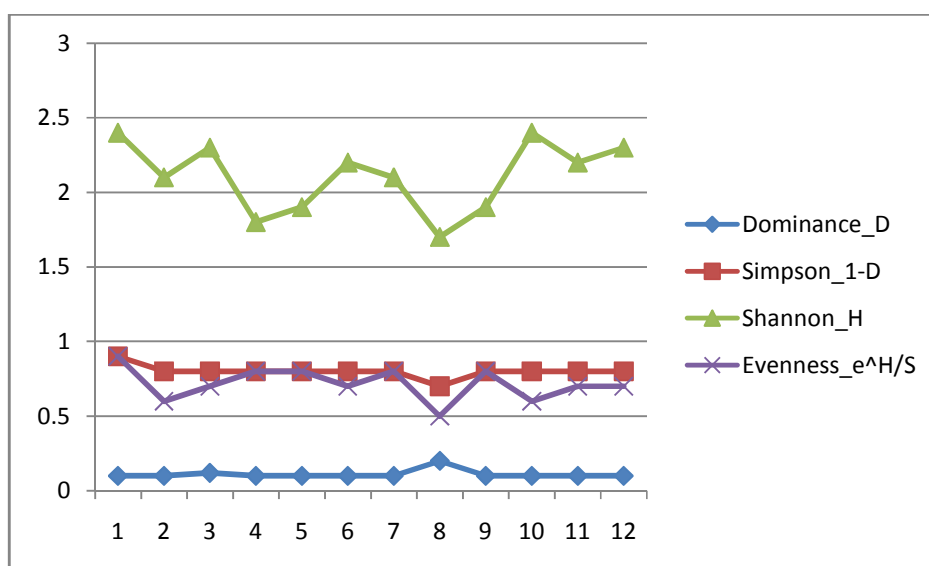


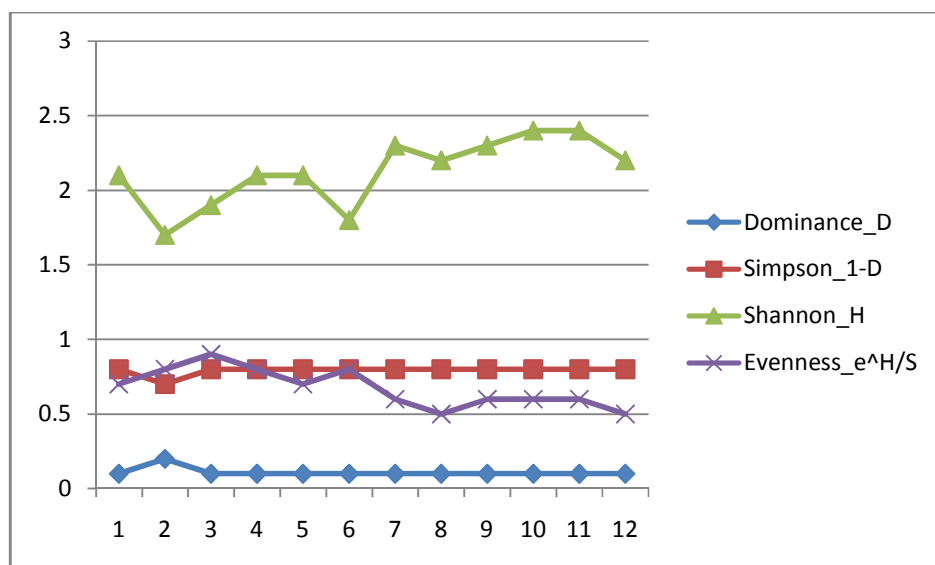
Table No 3. Diversity indices in the phytoplankton population of Srirangapatna tq taluk

	Srs1	Srs2	Srs3	Srs4	Srs51	Srs6	Srs7	Srs8	Srs9	Srs10	Srs11	Srs12
Taxa_S	12	13	14	7	8	14	10	11	8	17	13	14
Individuals	21 ³	93 ²	10 ⁴	29 ³	29 ³	81 ³	63 ³	58 ³	57 ³	11 ⁴	88 ³	77 ³
Dominance_D	0.1	0.1	0.12	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
Simpson_1-D	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8
Shannon_H	2.4	2.1	2.3	1.8	1.9	2.2	2.1	1.7	1.9	2.4	2.2	2.3
Evenness_e^H/S	0.9	0.6	0.7	0.8	0.8	0.7	0.8	0.5	0.8	0.6	0.7	0.7
Brillouin	2.3	2.1	2.3	1.8	1.9	2.2	2.1	1.7	1.9	2.4	2.2	2.3
Menhinick	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Margalef	1.1	1.0	1.1	0.5	0.6	1.1	0.8	0.9	0.6	1.3	1.0	1.1
Equitability_J	0.9	0.8	0.8	0.9	0.9	0.8	0.9	0.7	0.9	0.8	0.8	0.8
Fisher_alpha	1.2	1.1	1.2	0.6	0.7	1.2	0.9	1.0	0.7	1.5	1.1	1.2
Berger-Parker	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.4	0.1	0.2	0.1	0.2

Fig. 3: Srirangapatna**Table No. 4 Diversity Indices in the phytoplankton population of T Narsipura taluk**

0	TNS1	TNS2	TNS 3	TNS1	TNS1	TNS1	TNS1	TNS1	TNS1	TNS1	TNS1	TNS1
Taxa_S	11	7	8	10	11	8	18	16	17	18	18	17
Individuals	56 ³	30 ³	16 ³	36 ³	42 ³	22 ³	12 ⁴	81 ³	93 ³	10 ⁴	91 ³	77 ³
Dominance_D	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Simpson_1-D	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Shannon_H	2.1	1.7	1.9	2.1	2.1	1.8	2.3	2.2	2.3	2.4	2.4	2.2
Evenness_e^H/S	0.7	0.8	0.9	0.8	0.7	0.8	0.6	0.5	0.6	0.6	0.6	0.5
Brillouin	2.1	1.7	1.9	2.1	2.1	1.8	2.3	2.2	2.3	2.4	2.4	2.2
Menhinick	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Margalef	0.9	0.5	0.7	0.8	0.9	0.7	1.4	1.3	1.4	1.4	1.4	1.4
Equitability_J	0.8	0.8	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7
Fisher_alpha	1.0	0.6	0.8	0.9	1.0	0.7	1.6	1.4	1.5	1.6	1.6	1.5
Berger-Parker	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.3

Fig. 4: T. Narsipura



The diversity indices generated by using the PAST Software for both the study areas are presented in Table 3 and Table 4. The Software generates a total of 9 diversity indices. The importance of these is described by Basavarajappa, Raju, Hosmani and Niranjana¹. However 4 most significant diversity indices are often discussed. They include Dominance Index, Simpsons index, Shannon Index and Evenness Index.

Richness is a measure of the number of different kinds of organisms in a particular area. Species richness is the number of species present. Diversity depends not only on richness but also on evenness. Evenness compares the similarity of the population size of each species present. Evenness is the measure of a relative abundance of the different species making up the richness of the area. The Shannon diversity index (H) is another index that is commonly used to characterize species diversity in a community. Like Simpson's index, Shannon's index accounts for both abundance and evenness of the species present. The diversity indices of the phytoplankton in Srirangapatna taluka are shown in Table 3 and Fig.3. The number of taxa varied from a minimum of 8 to a maximum of 14. Total number of individuals were as high as 93000 o/l at site no 2. The dominance index was very low (0.02). The Simpson index was high in most of the sites whereas the Shannon index varied to a considerable extent reaching a maximum of 2.5 (always ≥ 1.8). Dominance and richness were not well marked.

The diversity indices in T. Narasipura taluka were also not well marked. The maximum number of Taxa recorded were 18 O/L and individuals were also 93000 o/L. (Table 4, Fig. 4). The Shannon index and the Evenness index were almost similar to those in the other lake. The only difference between the two lakes was the total number of individuals and a slight variation in the number of species. The distribution of phytoplankton in the wetlands of Srirangapatna is shown in Fig. 1. *Chroococcus turgidus* and *Merismopedia glauca* were the most dominant species among the 15 species recorded. About 21 species were recorded in T. Narasipura taluka. *Chroococcus disperses*, *Merismopedia tenuissima* and *Oscillatoria acutissima* dominated to a certain extent.

CONCLUSION

It is assumed that species rich communities are better suited than species poor communities and further adverse effects of pollution will be reflected in the reduction of diversity⁷. It is also stated by Patrick⁹ and Rosenberg¹² that enriched ecosystems display reduction in algal diversity. The diversity of the phytoplankton in the present study indicates that it is fairly poor, although 15 to 21 species appeared in each taluka respectively. Only members of the Cyanophyceae appeared to be dominant. Shannon index showed variation in both the localities.

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