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PHYTOPLANKTON DISTRIBUTION AND ABUNDANCE IN GODAVARI RIVER AT NIRMAL DISTRICT

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ABSTRACT

Over the course of a year (July 2019 to June 2020), daily fluctuations in physico-chemical and nutritional properties were examined to determine the impact of the Godavari river on plankton during a monsoon-driven period. The results of this study indicate that nitrate availability may have a major impact on the physiology and community makeup of natural phytoplankton communities in this area. However, additional seasons with greater physicochemical diversity were used for this experiment. Therefore, more research is required. Due to extreme light deprivation brought on by high turbidity, despite the considerable amount of nutrients delivered by river discharge, it did not result in a phytoplankton bloom. Increased phytoplankton biomass and abundance were linked to water column stratification during a time of moderate discharge, indicating that water column stability is more crucial for promoting phytoplankton blooms than nutrients. According to the link between phytoplankton abundance and nutrients, high N:P ratios support algae growth whereas low N:P ratios favor phytoplankton growth. According to this study, nutrients altered the makeup of the phytoplankton.

Keywords: Phytoplankton diversity, Nutrients, Daily fluctuations.

INTRODUCTION

Water is the most crucial and fundamental resource for mankind. Water resource management has now become a major issue for all emerging countries (Kharake A, Pathare J, Deshmukh P (2021). A severe threat to the river system is posed by the recurrent activities that take place beside rivers and the rapid population growth in those areas. The state of the water, both quality and quantity are consistently under pressure from a variety of human activities, including the clearance of vegetation, industrial activity, encroachment, household, and religious activities.

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The water quality decreased as a result of all these actions. Most of these problems are seen in and around urban areas. This perspective has been taken into account in a thorough investigation of the Godavari River in Basara. The site was used to collect water samples in the first week of Sep 2019 of three sites, Site-I Basara village, Site-II Kowta village and Site-III Ashta village, Nirmal district where Godavari river runs.

Algae are Eukaryotic, primordial aquatic plants that have Chlorophyll as their major pigment for photosynthetic activity. Because of this ability to produce their own food through photosynthesis, algae are regarded as autotrophs. These provide food for a variety of tiny aquatic invertebrates, which in turn provide food for aquatic animals. The Godavari river region at Basara is key site and important natural resource. The wetlands of Godavari are bodies of fresh water. Godavari River is located in Basara Which is 2 km from Basara Bus Station and 1 km from Basara Temple. The Godavari river merges with the Manjeera river close to Basara, where the water flow increases. Before going to the main temple, many pilgrims bathe at the ghats. Samples gathered over the course of a year, from July 2019 to June 2020. Previous works by Chattopadyaya, C., et al., (2009); Chakraborty, S., et al., (2012); Ghosh, S., Barinova, S., & Keshri, J. P. (2012); Jain, S. K., et al., (2007) study on the phytoplanktons of Indian states is still much more to be discovered.

MATERIALS AND METHODS

COLLECTION, PRESERVATION AND IDENTIFICATION

The planktonic algal species were sampled from the Basara bathing ghat every month. The terrestrial members were collected with a knife early in the morning, whereas benthic algae were retrieved with forceps. For collection, between July 2019 to June 2020. Samples are stored in a 4% formaldehyde aqueous solution in the lab for research. The morphological examinations were carried out on fresh material using a light microscope, Fritsch (1961), Prescott (1962), Philipose (1967), Tiwari A, A Rana, and S V S Chauhan (2003), Misra, T. N et al., (1992), and Desikachary (1959) were used to identify the taxa. The Simpson Index is calculated as $D= \Sigma n(n-1)/N(N-1)$ and Simpson Reciprocal Index=1-D

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RESULT AND DISCUSSION

Table 1: Phytoplankton species documentation in Site-I Basara village, Site-II Kowta village and Site-III Ashta village, Nirmal district, Godavari river.

S.No	Algal species	Class	Site-I	Site-II	Site-III
1	*Chara glabra*	Chlorophyceae	**	**	**
2	*Chara vulgaris*	Chlorophyceae	**	**	**
3	*Chladophora glomerata*	Chlorophyceae	**	**	*
4	*Chlamydomonas gliobosa*	Chlorophyceae	**	**	*
5	*Chlorella ellipsoidea*	Chlorophyceae	*	**	*
6	*Chlorella vulgaris*	Chlorophyceae	*	**	*
7	*Closterium acerosum*	Chlorophyceae	*	**	*
8	*Clostrium tumidum*	Chlorophyceae	*	-	*
9	*Cosmarium auriculatum*	Chlorophyceae	*	*	-
10	*Cosmarium botrytis*	Chlorophyceae	*	*	-
11	*Euastrum spinulosum*	Chlorophyceae	*	-	**
12	*Euastrum verrucosum*	Chlorophyceae	*	*	-
13	*Euastrum quadriculatum*	Chlorophyceae	*	*	-
14	*Oedogonium grande*	Chlorophyceae	**	**	*
15	*Oedogonium patulum*	Chlorophyceae	**	*	*
16	*Pediastrum meyen*	Chlorophyceae	**	**	*
17	*Pediastum duplex*	Chlorophyceae	-	-	**
18	*Scenedesmus denticulatus*	Chlorophyceae	*	*	*
19	*Scenedesmus obiquus*	Chlorophyceae	**	**	*
20	*Scenedesmus quadricauda*	Chlorophyceae	*	*	*
21	*Spirogyra acanthospora*	Chlorophyceae	*	**	*
22	*Spirogyra discoidea*	Chlorophyceae	**	*	**
23	*Spirogyra varians*	Chlorophyceae	**	*	**
24	*Tetraedron quadratum*	Chlorophyceae	*	*	*
25	*Tetraedron regulare*	Chlorophyceae	*	*	*

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26	*Zygnema pectinatum*	Chlorophyceae	*	**	*
27	*Closterium moniliferum*	Chlorophyceae	**	**	**
28	*Cosmarium granatum*	Chlorophyceae	**	*	**
29	*Pediastrum subgranulatum*	Chlorophyceae	-	**	*
30	*Scenedesmus dimorphus*	Chlorophyceae	**	**	*
31	*Scenedesmus major*	Chlorophyceae	*	**	*
32	*Scenedesmus oahuensis*	Chlorophyceae	*	**	*
33	*Oocystis gigas*	Chlorophyceae	*	**	*
34	*Cosmarium nymannianum*	Chlorophyceae	*	-	*
35	*Cosmarium puntatulum*	Chlorophyceae	*	*	-
36	*Pediastrum duplex*	Chlorophyceae	*	*	-
37	*Pediastrum simplex*	Chlorophyceae	*	*	-
38	*Cymbella cymbiformis*	Bacillariophyceae	*	*	*
39	*Cymbella parva*	Bacillariophyceae	**	*	*
40	*Gomphonema acuminatum*	Bacillariophyceae	*	*	*
41	*Gomphonema gracile*	Bacillariophyceae	**	-	*
42	*Navicula radiosa*	Bacillariophyceae	**	*	**
43	*Pinnularia gibba*	Bacillariophyceae	*	*	*
44	*Navicula cryptocephala*	Bacillariophyceae	*	*	*
45	*Navicula transitans*	Bacillariophyceae	**	*	*
46	*Pinnularia viridis*	Bacillariophyceae	*	*	*
47	*Cymbella tumida*	Bacillariophyceae	**	-	*
48	*Gomphonema intricate*	Bacillariophyceae	**	*	**
49	*Navicula amphirynchus*	Bacillariophyceae	*	*	*
50	*Navicula lanceolata*	Bacillariophyceae	*	*	*
51	*Anabaena Constricta*	Cyanophyceae	**	**	*
52	*Anabaenopsis sp.*	Cyanophyceae	*	**	*
53	*Chroococcus minutus*	Cyanophyceae	*	*	*
54	*Gloeocapsa atrata*	Cyanophyceae	*	**	*
55	*Gloeotrichia natans*	Cyanophyceae	*	**	-

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56	*Hydrococcus sps.*	Cyanophyceae	*	*	*
57	*Lyngbya ceylanica*	Cyanophyceae	*	*	*
58	*Nostoc sphaerium*	Cyanophyceae	**	*	**
59	*Oscillatoria Formosa*	Cyanophyceae	*	**	*
60	*Oscillatoria rubescens*	Cyanophyceae	*	-	*
61	*Oscillatoria tenuis*	Cyanophyceae	*	**	*
62	*Phormidium luridum*	Cyanophyceae	*	**	*
63	*Phormidium molle*	Cyanophyceae	*	**	-
64	*Spirulina major*	Cyanophyceae	*	-	-
65	*Synechocystis aqualis*	Cyanophyceae	**	*	*
66	*Osillataria farmosa*	Cyanophyceae	*	**	-
67	*Oscillatoria limosa*	Cyanophyceae	*	*	*
68	*Gleotrichia rasiborskii*	Cyanophyceae	*	**	-
69	*Euglena caudata*	Euglenophyceae	*	*	-
70	*Phacus longicaudata*	Euglenophyceae	*	**	-
71	*Trachelomonas hispida*	Euglenophyceae	*	*	*
72	*Phacus acuminatus*	Euglenophyceae	*	**	-

*Present, ** Abundance, - Absent

Site-I Basara village, Site-II Kowta village and Site-III Ashta village, Nirmal district

Table 2: Species percentage composition, Site-I Basara village, Site-II Kowta village and Site-III Ashta village, Nirmal district, Godavari river.

Class	**No. of orders**	**No. of species**	**Percentage**
Chlorophyceae	16	37	51.38
Bacillariophyceae	11	13	18.07
Cyanophyceae	4	18	25.00
Euglenophyceae	1	4	05.55
Total	32	72	100

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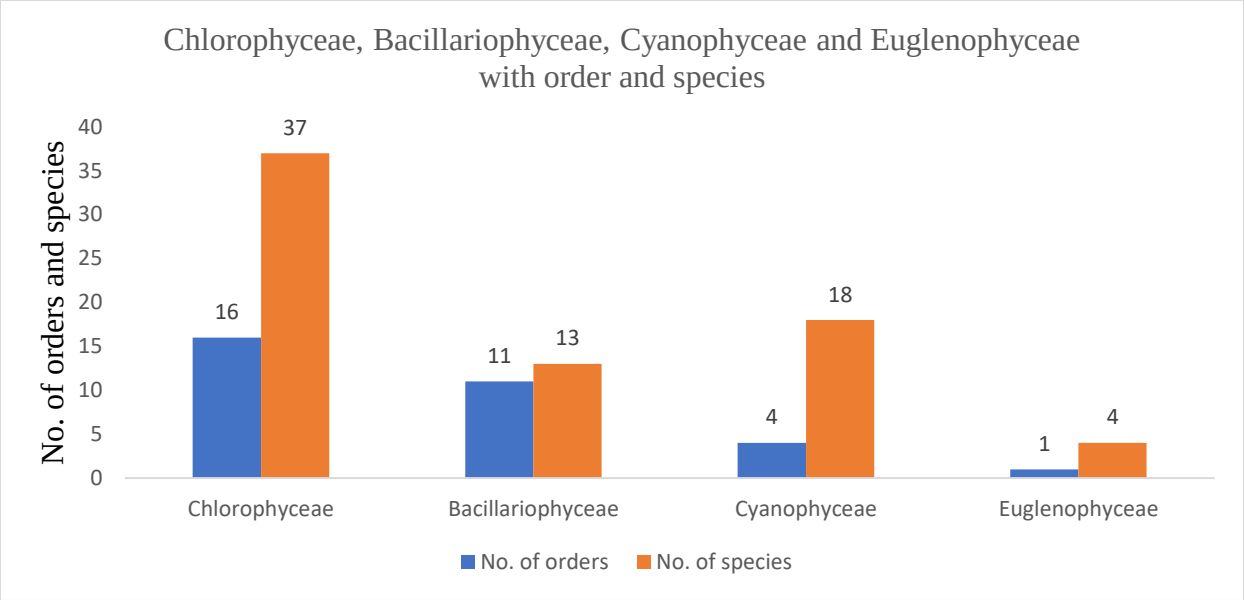

Figure 1: Graph representing Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae with order and species in Nirmal district, Godavari river.

Table 3: Calculation of Simpson Index and Simpson Reciprocal Index Nirmal district, Godavari river.

S.No	Class	No. of species	n(n-1)
1	Chlorophyceae	37	1332
2	Bacillariophyceae	13	156
3	Cyanophyceae	18	306
4	Euglenophyceae	4	12
Total		**N=72**	Σ n(n-1)=1806

The results of Phytoplankton species Documentation in Godavari river, the 72 species of algal members included 37 species from the Chlorophyceae, 13 species from the Bacillariophyceae, 18 species from the Cyanophyceae, and 4 species from the Euglenophyceae. similar findings were identified by Desikachary . T.V. 1959; Tiwari A,A Rana and SVS Chauhan 2003 (Table 1)**.** According to Table 2, has a composition of 51.38% Chlorophyceae, 18.07% Bacillariophyceae, 25.00% Cyanophyceae, and 05.55% Euglenophyceae in Figure 1, was in sink with Dr.J.W.Prakash (2016). The Chlorophyceae family has the greatest variety of species, with 37 different kinds, while the Euglenophyceae family had the fewest, with only four different kinds.

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The Godavari River possesses the greatest variety of phytoplankton, which is consistent with the findings of Chinnaiah B. Ramesh babu M. and Digamber Rao, B. 2011; Odelu. G. 2015; Kumara swamy B. et al., 2013**.** According to Pradhan et al. (2014), the upper Godavari of today is distinguished by low suspended sediment load and very high phytoplankton productivity. The Simpson Index was calculated as, D=1806/5112=0.35 and Simpson Reciprocal Index=1-0.35=0.65 shown in Table 3.

CONCLUSION

River Godavari showed variation with sampling sites, the river constitutes high nutrient concentration due to human activities which resulted in proliferated growth of algae, that had direct impact on flora and fauna lived in water bodies. The collection from the study sites showed rich algae belonging to various classes, such as Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae.

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