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Horizontal Distribution of Micro Algae in Vasishta Godavari Estuary, Andhra Pradesh, India

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Abstract **Original Research Article**

River Vasishta Godavari is one of the branches of Godavari River. Horizontal distribution of micro algae and estuarine algae was studied for a period of one year from May 2023 to April 2024. A total of 65 micro algae and 5 species of estuarine algae were identified in the three selected study sites of the Vashista estuary. Out of these 65 micro algae, 17 belongs to Chlorophyceae, 28 belongs to Bacillariophyceae, 12 belongs to Cyanophyceae, 6 Euglenophyceae and remaining two species belongs to Dinophyceae. At the mouth of estuary more Bacillariophyceae members were observed than the away from the river mouth region. Abundance of phytoplankton cells per one liter was more in April and November months during the period of investigation in all stations of the Vasishta Godavari estuary.

Keywords: Micro Algae, Estuarine Algae, Distribution and Composition, Vasishta Godavari Estuary, AP, India.

INTRODUCTION

Estuaries are highly productive ecosystem than other ecosystems on the earth and offer a healthy environment for the growth and development of aquatic organisms. The meeting place of the river with sea is the most productive region due to presence of organic matter and other nutrients which is a source of abundant phytoplankton populations in the concerned places. Phytoplankton play a vital role to make estuarine system more productive and directly or indirectly promote the growth of the fish production in aquatic habitats. (Saifullah *et al*., 2014). Phytoplankton are the primary producers of the food web and this energy transferred to higher levels of the food chain (Ananthan *et al*., 2004, Tiwari and Chauhan, 2006). Estuarine habitats promote the growth of primary producers which in turn produce the secondary consumers in the aquatic habitats, a source of financial support to the local people. Several authors (Mani, 1992; Narasimha Rao, 1995; Gouda and Panigrahy,1996; Narasimha Rao and Venkanna,1996; Sawant and Madhu Pratap, 1996; Mohamed *et al*., 2009, Raj Kumar *et al*., 2009, Narasimha Rao and Murty, 2010; Madhava Rao *et al*., 2015; Narasimha Rao,2024 and Prasanna Lakshmi *et al*., 2024) explored the distribution and composition of micro algae and estuarine algae in some estuarine and mangrove habitats of East and West coasts of India. Vasishta is one of the branches of Godavari River and merges into Bay of Bengal at Antarvedi. In this present investigation, a study was made on the horizontal distribution and composition of micro algae and estuarine algae from Chinchinada to Antarvedi point where river mouth of the Vasishta estuary.

MATERIALS AND METHODS

Godavari bifurcated into two branches namely Gouthami and Vasishta, River Vasishta moves towards west and divided near Gannavaram which gives another branch named Vainateyam meets Bay Bengal at Karawaka near Gogannamatam. Godavari branch of Vasishta moves towards west through Razole, Chinchinada, Sakhinetipalli and merges with Bay of Bengal at Antarvedi. Three study sites were selected along the estuary, Station 1 at Chinchinada (Latitude 16^0. 45' N longitude 81^0.77' E) and station 2 was at Sakhinetipalli (Latitude 16^0. 42' N longitude 81^0.71' E) and third station at Antarvedi (Latitude 16^0. 33' N longitude 81^0.73' E) near mouth of the estuary. For micro algal distribution and composition, water samples were collected from these three study sites from the month of May 2023 to April 2024. Estuarine algal samples were collected and fixed with 5% formalin for further observation. Two-liter water samples (at each station) were collected randomly in three study sites at monthly intervals. And these samples were fixed with 4% formalin to avoid decay of the phytoplankton in water samples. These samples transported to the laboratory and centrifuged at 3000 rpm for fifteen

minutes. Phytoplankton counting was made in replicate on sedge wick rafter cell. Species of the phytoplankton species were identified by the keys (Subramanyam, 1946; Desikachary, 1959).

RESULTS AND DISCUSSION

In this present study a total of 65 micro algal species (Table 1) were identified from the collected water samples from Vasishta Godavari estuary, Andhra Pradesh. Out of these 65 micro algal forms, 17 species belong to Chlorophyceae, 28 species related to Bacillariophyceae, 12 species belong to Cyanophyceae, 6 species belong to Euglenophyceae, and 26 species related to Bacillariophyceae and remaining 2 species belong to Dinophyceae (Table 1). As a whole, on the basis of the obtained results on composition of micro algae in Vashsita Godavari estuary, class Bacillariophyceae is dominant group followed by Chlorophyceae as reported by Gouda and Panigrahy (1996); Sawant and Madhu Pratap (1996); Narasimha Rao and Murty, (2010); Madhava Rao *et al*., (2015); Narasimha Rao (2024) and Prasanna Lakshimi *et al*., (2024). Presence of micro algae in different stations of the estuary revels some interesting observations. More Chlorophyceae and Cyanophyceae members were observed in station 1 than in station 2 and station 3 (Table 1), similarly less Bacillariophyceae members were observed in station 1 and station 2 than in station 3 (Table 1). Gradual reduction of Chlorophyceae and Cyanophyceae members from station 1 to station 3 like wise gradual increase of Bacillariophyceae members from station 1 to station 3 was reported in this study. Present study agrees with the earlier works on Sarada and Varaha estuarine complex (Narasimha Rao, 2024) and Gosthani estuary (Prasanna Lakshmi,2024) where a greater number of Bacillariophyceae members were reported in estuarine habitats than other members of algae. Table 2 shows the presence of estuarine algae in different stations of the Vasishta estuary, a total of 5 estuarine algae were reported, out of these 3 belong to Rhodophyceae and 2 belong to Chlorophyceae. Presence of macro algae in estuaries was reported earlier by Narasimha Rao (1995), Narasimha Rao and Venkanna (1996) and Narasimha Rao and Murty, (2011) in different estuarine habitats of Andhra Pradesh. In the present investigation the number of estuarine algae was increased from station 1 to station 3, this is due to salinity of surface waters as well as influx of fresh water in the estuary. Table 3 shows the seasonal changes in the abundance of total phytoplankton (cells/lit.) in different stations of Vashista River estuary. In this study, two growth peaks were reported as observed by Narasimha Rao and Murty (2010) on micro algae of Godavari estuary. One growth peak was observed in April month and another growth peak were observed in the month of October. Higher number of phytoplankton cells per one liter (5420 cels/lit.) was reported in station 1 and lower number of phytoplankton (824 cells/lit.) was observed in station 2 (Table 3).

Table 1: Composition of micro algae in different stations of Vashista Godavari, Andhra Pradesh, India

Sl. No	Name of the alga	class	Station 1	Station 2	Station 3
1	*Ankistrodsmus convolutes*	Chlorophyceae	+	+	-
2	*Chalmydomonas globosa*	Chlorophyceae	+	-	-
3	*Chlorella vulgaris*	Chlorophyceae	+	+	+
4	*Closterium ehrenbergii*	Chlorophyceae	+	+	-
5	*Closerium moniliferum*	Chlorophyceae	+	-	-
6	*Cosmarium contractum*	Chlorophyceae	+	-	-
7	*Cladophora glomerata*	Chlorophyceae	+	+	-
8	*Chaetophora elegans*	Chlorophyceae	+	-	+
9	*Eudorina pectnalis*	Chlorophyceae	+	+	-
10	*Hydrodictyon reticulam*	Chlorophyceae	-	+	+
11	*Oedogonium globosum*	Chlorophyceae	+	+	-
12	*Pediastrum simplex*	Chlorophyceae	+	-	-
13	*Scenedesmus dimophus*	Chlorophyceae	+	+	-
14	*Scenedesmus denticulatus*	Chlorophyceae	+	-	-
15	*Spirogyra communis*	Chlorophyceae	+	-	-
16	*Zygnema sterile*	Chlorophyceae	+	+	-
17	*Zygnema pectinatum*	Chlorophyceae	+	-	-
18	*Asterionella japonica*	Bacillariophyceae	+	-	+
19	*Amphiprora paludosa*	Bacillariophyceae	-	+	+
20	*Amphiprora gigantean*	Bacillariophyceae	-	-	+
21	*Amphiprora gigantean*	Bacillariophyceae	-	+	+
22	*Coscinodiscus sublineatus*	Bacillariophyceae	+	-	+
23	*Cocconeis pediculus*	Bacillariophyceae	-	-	+
24	*Cyclotella meneghiniana*	Bacillariophyceae	-	+	+
25	*Cymbella cistula*	Bacillariophyceae	+	-	+
26	*Cymbella austriaca*	Bacillariophyceae	+	-	+

Sl. No	Name of the alga	class	Station 1	Station 2	Station 3
27	*Fragilaria intermedia*	Bacillariophyceae	-	-	+
28	*Hemiaulus sp.*	Bacillariophyceae	-	+	-
29	*Leptocylindrus minimus*	Bacillariophyceae	+	+	+
30	*Melosira moliniformis*	Bacillariophyceae	-	-	+
31	*Navicula major*	Bacillariophyceae	+	-	+
32	*Melosira varians*	Bacillariophyceae	-	+	+
33	*Navicula bacilloides*	Bacillariophyceae	+	-	+
34	*Nitzschia paradoxical*	Bacillariophyceae	-	-	+
35	*Nitzschia panduriformis*	Bacillariophyceae	-	+	+
36	*Pinnularia viridis*	Bacillariophyceae	-	-	+
37	*Pleurosigma balticum*	Bacillariophyceae	+	+	+
38	*Rhizosolenia stolterfothii*	Bacillariophyceae	-	+	+
39	*Rhizosolenia crassispina*	Bacillariophyceae	+	+	+
40	*Skeletonema costatum*	Bacillariophyceae	-	+	+
41	*Synedra rumpens*	Bacillariophyceae	+	+	+
42	*Thalassiosira decipienns*	Bacillariophyceae	-	+	+
43	*Thalassiothrix frauenfeldii*	Bacillariophyceae	+	+	+
44	*Raphoneis amphiceros*	Bacillariophyceae	-	-	+
45	*Synedra affinis*	Bacillariophyceae	+	-	-
46	*Anabaena constricta*	Cyanophyceae	+	-	-
47	*Chroococcus varians*	Cyanophyceae	+	-	-
48	*Calothrix fusca*	Cyanophyceae	+	-	-
49	*Gleotheca rupestris*	Cyanophyceae	-	-	+
50	*Lyngbya nigra*	Cyanophyceae	+	+	-
51	*Microcystis elegans*	Cyanophyceae	+	+	-
52	*Microcystis aeruginosa*	Cyanophyceae	+	-	+
53	*Nostoc commune*	Cyanophyceae	+	+	-
54	*Oscillatoria cortiana*	Cyanophyceae	+	+	-
55	*Phormodium fragile*	Cyanophyceae	+	-	+
56	*Rivularia curvata*	Cyanophyceae	+	-	-
57	*Spirulina patensis*	Cyanophyceae	-	+	+
58	*Euglena fusca*	Euglenophyceae	+	-	+
59	*Euglena viridis*	Euglenophyceae	+	+	-
60	*Euglena caudate*	Euglenophyceae	+	+	-
61	*Phacus longicauda*	Euglenophyceae	+	+	-
62	*Phacus horridus*	Euglenophyceae	-	-	+
63	*Trachelomonas armata*	Euglenophyceae	+	-	+
64	*Ceratium sp*	Dinophyceae	+	+	+
65	*Diplopsalis sp.*	Dinophyceae	-	+	+

Table 2: Presence of estuarine algae in different stations of Vashista River estuary

S.No	Name of the alga	Class	Station 1	Station 2	Station 3
1	*Chara baltica*	Chlorophyceae	+	+	+
2	*Enteromorpha compressa*	Chlorophyceae	-	+	+
3	*Bostrychia tenella*	Rhodophyceae	-	-	+
4	*Caloglossa leprieurii*	Rhodophyceae	+	+	+
5	*Catenella impudica*	Rhodophyceae	-	-	+

Table 3: Seasonal changes in the abundance of total phytoplankton in different stations of Vashista River estuary

Month	Phytoplankton (Cells / lit.)		
	Station 1	Station 2	Station 3
May 2023	3820	3296	3424
June	1586	1464	1526
July	948	856	928
August	876	824	842
September	1240	1192	1226
October	2432	2162	2292

Month	Phytoplankton (Cells / lit.)		
	Station 1	Station 2	Station 3
November	2854	2548	2678
December2023	1964	1846	1932
January2024	1250	1126	1224
February	2146	1978	2084
March	3584	3476	3276
April 2024	5420	4632	4892

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