OPEN ACCESS

Haya: The Saudi Journal of Life Sciences
Abbreviated Key Title: Haya Saudi J Life Sci
ISSN 2415-623X (Print) | ISSN 2415-6221 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Seasonal Abundance of Phytoplankton Populations in Gosthani River Estuary near Bhimili, Andhra Pradesh, India

K. Prasanna Lakshmi[1], Reshmi Chatterjee[2], G. M. Narasimha Rao[3*]

[1]Department Botany, M. R. College (A), Vizianagaram-535002, Andhra Pradesh, India
[2]Department of Botany, MDM College, Kolkata, Wet Bengal, India
[3]Formerly Associated with Department of Botany, Andhra University, Visakhapatnam-530003, India

DOI: https://doi.org/10.36348/sjls.2024.v09i09.001 | **Received:** 24.07.2024 | **Accepted:** 30.08.2024 | **Published:** 02.09.2024

***Corresponding author:** G. M. Narasimha Rao
Formerly Associated with Department of Botany, Andhra University, Visakhapatnam-530003, India

Abstract

The present paper deals with the seasonal abundance and distribution of micro algae in the estuarine habitats of the Gosthani River near Bhimili, Andhra Pradesh, India. Water samples were collected for a period of one year from January 2023 to December 2023. A total of 44 species belongs to four major groups such as Chlorophyceae (12), Cyanophyceae (7), Euglenophyceae (5) and Bacillariophyceae (20) were reported from the estuarine regions of Gosthani River. The density of phytoplankton populations in Gosthani estuary varied seasonally with maximum number of cells per liter (5186) was observed in the month of March and minimum number of cells (789) was recorded in the month of August.

Keywords: Bhimili Coast; East Coast of India; Gosthani Estuary; Phytoplankton Populations and Seasonal Abundance.

INTRODUCTION

The river Gosthani is one of the rivers along the East Coast of India. It rises in the Ananthagiri Hills of the Eastern Ghats and flows through the Borra Caves, even though it is the small but it is the largest river flowing through Visakhapatnam District. It flows for 120 km before merging the Bay of Bengal near Bhimili which forms an estuary. Estuaries are in general highly productive zones which offer shelter and food for various biological organisms and phytoplankton plays a crucial role to make estuaries more productive (Ananthan *et al.*, 2004; Tiwari and Chauhan, 2006). Fluctuations in salinity, temperature, dissolved oxygen and organic matters in estuarine habitats promote the rich growth of phytoplankton in river mouths. Estuaries support higher levels biomass of secondary consumers and provide economic opportunities in terms of fishery yields. Studies on distribution of phytoplankton in Mangrove and estuarine habitats of east coast of India was studied by Mani (1992), Raj Kumar *et al.*, (2009), Mohamed *et al.*, (2009), Narasimha Rao and Murty (2010) and Madhava Rao *et al.*, (2015). Few authors (Satya Rao *et al.*, 2011; Narasimha Rao *et al.*, 2012) studied the ecological studies on marine algae of Bhimili coast. In this present investigation an attempt was made to study the composition and seasonal abundance of phytoplankton in the estuarine regions of Gosthani River at Bhimili for a period of one year.

MATERIALS AND METHODS

The river Gosthani merges with Bay of Bengal at Bhimili, a coastal town on East Coast of India and 22 kms away from Visakhapatnam City, Andhra Pradesh. It lies between the latitudes 17º 45'N and the longitudes 83º 16' and 83º 21' E. Most of the coast line is sandy with rock boulders of various sizes. The tidal communication of the sea waters was recorded up to 5 kms. Initially pilot experiments were conducted to observe differences in distribution of Phytoplankton among different parts of the estuary. But there was no significance difference was observed after checking the phytoplankton in water samples collected. Water samples were collected randomly from the estuary for a period of one year, from January 2023 to December 2023 for phytoplankton studies. Each month three to four water samples which consisting two liters bottles collected for this investigation. These samples were immediately fixed with 5% formalin and transported to the laboratory then centrifuged at 3000 rpm for 15 minutes. The Phytoplankton counting was made in duplicate on sedge wick rafter counting chamber. The species of the phytoplankton was identified by the following keys (Prescott, 1951; Subrahmanyam, 1946).

RESULTS AND DISCUSSION

Table-1 show that a total of 44 micro algal forms were identified from the water samples collected in Gosthani estuary at Bhimili, east coast of India. Out of the 44 species, 12 species belongs to Chlorophyceae, 7 species belongs to Cyanophyceae, 5 species belongs to Euglenophyceae and remaining 20 species belongs to Bacillariophyceae (Table-1). Based on the composition of Phytoplankton in Gosthani estuary it is evident that class Bacillariophyceae was more abundant than remaining other groups in algae. Presence of low number of species belongs to Cyanophyceae and Euglenophyceae classes reveals that estuarine water is less polluted and presence of moderate organic matter. Dominant group observed in phytoplankton of Gosthani estuary agrees with the results of Gouda and Panigrahy (1996) and Sawant and Madhupratap (1996). Both of these investigators reported that the diatoms were dominant class in their study.

The phytoplankton abundance in Gosthani estuary increases slowly form the October month onwards and attains its peak level in the month of March. From March month onwards the abundance of phytoplankton decreases and minimum density was recorded in the month of August (Fig-1). The abundance of phytoplankton in Gosthani estuary varied seasonally (Fig-1) with maximum number of cells per liter (5186) was observed in the month of March where good transparency, moderate saline conditions and temperature may favor for good growth Phytoplankton while minimum number of cells (789) was recorded in the month of August when heavy rains, low transparency and minimum salinity levels in estuarine waters due floods and rains may not promote the growth of micro algae in this estuary (Satya Rao *et al.*, 2011; Narasimha Rao *et al.*, 2012). Distribution and abundance of phytoplankton varied due to changes in hydrographical conditions and light requirement of the species as reported by Marshall, 1996.

Table-1: Distribution of Phytoplankton in Gosthani estuary

	Chlorophyceae
1	*Ankistrodesmus convolutus*
2	*Ankistrodesmus falcatus*
3	*Chlorogonium euchlorum*
4	*Chlamydomonas sps*
5	*Closterium acerosum*
6	*Coelanastrum indicum*
7	*Monoraphadium indicum*
8	*Pediastrum duplex*
9	*Pediastrum tetras*
10	*Scenedesmus obliquns*
11	*Scenedesmus dimorphus*
12	*Spirogyra sps*
	Cyanophyceae
13	*Anabaena*
14	*Oscillatoria limosa*
15	*Spirulina platensis*
16	*Merismopedia sps*
17	*Aphanotheca gigantean*
18	*Microcystis sps*
19	*Phormidium sps*
	Euglenophyceae
20	*Euglena viridis*
21	*Euglena acus*
22	*Phacus orbiscularis*
23	*Phacus triqueter*
24	*Strombomonas australis*
	Bacillariophyceae
25	*Amphiprora paludosa*
26	*Amphiprora gigantean*
27	*Asterionella japonica*
28	*Coscinodiscus sublineatus*
29	*Cocconeis pediculus*
30	*Cyclotella meneghiniana*
31	*Cymbella cistula*
32	*Melosira moliniformis*

33	*Melosia dubia*
34	*Navicula gregaria*
35	*Nitzschia logissima*
36	*Pinnularia viridis*
37	*Pleurosigma balticum*
38	*Rhizosolenia stolterfothii*
39	*Rhizosolenia crassispina*
40	*Skeletonema costatum*
41	*Synedra rumpens*
42	*Thalassiosira decipienns*
43	*Thalassiothrix frauenfeldii*
44	*Raphoneis amphiceros*

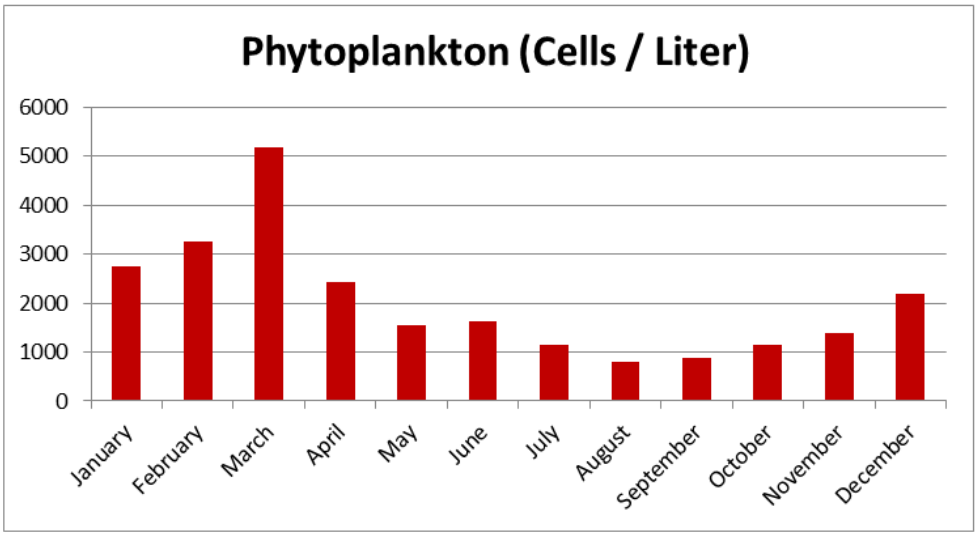

Figure-1: Seasonal Changes in the Abundance of Phytoplankton in Gosthani Estuary

CONCLUSION

Algal diversities are natural events and can occur systematically depending on the climate and water conditions of the river. Extreme occurrence of phytoplankton is harmful to the water body and the organisms that depend on it. Excessive algal growth and pollution can turn the holy river into dead water. Also, there are some algae that secrete toxins that are deadly to other organisms. It also spoils the aesthetic value of the water body. Because these toxic substances do not degrade, they are persistent in the environment and have the potential to bioaccumulation in the food chain, posing potential hazards in the long run. If all the necessary measures, government and non-government, are taken simultaneously and seriously, it can go a long way in reducing and mitigating further degradation of the two rivers with a view to restoring its natural unpolluted and healthy ecosystem.

Acknowledgements: Grateful thanks to local people in connection with collection of water samples.

REFERENCES

- Ananthan, G., Sampathkumar, P., Soundarapandian, P., & Kannan, L. (2004). Observations on Environmental Characteristics of Ariyankuppam Estuary and Verampattinam Coast of Pondicherry. *J Aqua Biol*, 19, 67-72.
- Gouda, R., & Panigrahy, R. C. (1996). Ecology of Phytoplankton in Coastal Waters of Gopalpur, East Coast of India. *Indian J Mar. Sci*, 25, 81-84.
- Madhava Rao D. S., Jyothi, K., & Narasimha Rao, G. M. (2015). Micro Algal Population in Mangrove Habitats of the Visakhapatnam, East Coast of India. *J Algal Bio Utln*, *6*(2), 5-10.
- Mani, P. (1992). Natural Phytoplankton Communities in Pichavaram Mangroves. *Indian J Mar Sci*, 21(4), 72-77.
- Marshall, H. G. (1996). Observations on the Vertical Distribution of Coccolithophores in North Western Sargassa Sea. *Limnol Ocenogr*, 11, 432-435.
- Mohamed, A. A., Sithik, G., Thirumaran, K., Arumugan, R., Ragupathi Raja Kannan, R., & Anantharaman, P. (2009). Studies of Phytoplankton Diversity from Agnitheertham and Kothandaramar Koil Coastal waters, Southeast Coast of India. *Global J Env Res*, *3*(2), 118-125.
- Narasimha Rao G. M., & Prayaga M. P. (2010). Seasonal Abundance of Micro Algae in Pandi Back waters of Godavari Estuary, Andhra Pradesh, India. *Not Sci Biol*, *2*(3), 26-29.

- Narasimha Rao, G. M. Pragaya Murty, P., & Subba Rangaiah, G. (2012). Seasonal Growth and Spore Shedding in *Rosenvingea nhatrangensis* Dawson from Bhimili, East Coast of India. *Seaweed Res Utiln*, *34*(1&2), 22-26.
- Rajkumar, M., P., Perumal, A. V., Prabu, N. V. Perumal., & Rajeskar, K. T. (2009). Phytoplankton diversity in Pichavaram mangrove waters from South-east coast of India. *J Environ Biol*, 30, pp. 489-498.
- Satya Rao, K., Prayaga Murty, P., & Narasimha Rao, G. M. (2011). Seasonal studies on marine algae of the Bhimili Coast. *J Algal Biomass Utln*, 2(2), 69-82.
- Sawant, S., & Madhupratap, M. (1996). Seasonality and Composition of Phytoplankton's in the Arabian Sea. *Curr Sci*, 71, pp. 869-873.
- Subrahmanyam, K. (1946). The Diatoms of the Madras Coast. *Proc Indian Acad Sci*, 24, 85-197.
- Tiwari, A., & Chauhan, S. V. S. (2006). Seasonal Phytoplanktonic Diversity of Kithamlake, Agra. *J Environ Biol*, 27, pp. 35-3.