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RESEARCH PAPER

Studies on water quality parameters in river Gautami-Godavari, Andhra Pradesh

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Abstract : The physico-chemical parameters play a imperative role in growth and sustainability of biological diversity in river ecosystem. The present work was carried out for comparative assessment of physico-chemical parameters of Godavari River at the places Kotipalli and Bhairavapalem for a period of two years starting from March-2015 to February-2017. Samples were collected in monthly intervals during this study duration. Analysis of physico-chemical parametersand nutrients was done. We found Salinity and silicate values have more variations in both selected stations (Kotipalli and Bhairavapalem). Salinity showed highest values (35.01 ppt) at Bhairavapalem (April, 2016) and lowest salinity observed in Kotipalli July 2015. Silicates were noticed low at Bhairavapalem and increased at Kotipalli. The values of silicate were ranged between 0.82mg/L (April 2016) to 16.43mg/L (November 2016) at Kotipalli and we noticed 0.23mg/L (April 2016) to 10.21mg/L silicate values at Bhairavapalem. The study revealed that quality of Godavari river water is highly affected negatively due to industrial, agricultural and human activities.

Key Words : Gautami Godavari River, Hydro graphical parameters and Nutrients

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INTRODUCTION

Water is referred as elixir of life. Life flourished in, on and around the water. Of all the natural resources, water is determinately the most essential. It is the precious gift of nature to mankind and millions of other species living on the earth. Among all the surface water sources, rivers are considered as one of the greatest boons to the human beings. It originates from Brahmagiri Mountain (at 19.5600 0N, 73.2000 0E) having 920 m elevation located at Triambakeswar in the Nashik district of Maharashtra. Freshwater habitats account for some of the richest diversity in the world, and rivers are a fundamental, exciting ecosystem for many species. River ecosystems are flowing waters that drain the landscape, and include the biotic (living) and abiotic (non-living) components interactions. The field observations reveal that water quality is declining due to many human activities mainly industrial, domestic and religious waste (Ashali Chandrakant Kharake *et al.*, 2021).

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MATERIAL AND METHODS

The Godavari estuarine system is located at ~16º 41' 45" N Nand 82º 19' 09" E and covers an area of 15 km^2 (Fig.1). Surface water samples were collected at monthly intervals from March 2015 to February2017 .During navigation, GPS (Global Positioning System), GARMIN was used. The sampling stations are at a distance of 0 to 31.6 km from Kotipalli to Bhairavapalem. The Water samples were collected from surface with the help of Niskin water samplers. The DO was estimated by the modified Winkler's method (Grasshoff *et al.,*1999). Filtered water, soon after collection, was used for the assessment of nutrients.For chlorophyll evaluation, GF/F (47 mm) (Parsons *et al*.,1984) filters containing particulate matter of 1 L water of each sample, preserved at -20 ^{0}C extracted with 90% acetone overnight at 4^{0}C, and the absorption spectrum of the clear supernatant measured using Shimadzu 1800 double beam UV Visible spectrophotometer. The concentration of chlorophyll-*a* was calculated using the Jeffrey equations (Jeffery and Humphrey, 1975).

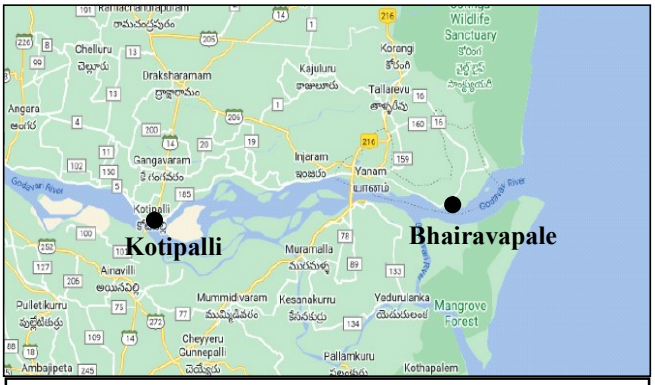

Fig. A: Study area (Stations: Kotipalli and Bhairavapalem)

RESULTS AND DISCUSSION

The hydrographical conditions showed wide variations in the study area depending on the water quality parameters, mainly Temperature and Salinity showed highest values (35.01 ppt) at Bhairavapalem (April, 2016) and lowest salinity observed at Kotipalli in July 2015 (Table 1) (Fig. 1). The significant decrease in salinity values during October/November is not only contributed

Table 1 : Variations of hydrographical parameters at Kotipalli and Bhairavapalem (2015 –2017)

Months	pH	Salinity ppt	Temperature ^{0}C	DO ppm	pH	Salinity ppt	Temperature ^{0}C	DO ppm
	Kotipalli				Bhairavapalem			
2015_March	8.8	17.00	29.00	3.7	8	29.10	29.00	2.3
April	8	13.87	32.00	3.2	7.99	27.01	32.00	2.4
May	8.48	18.20	29.20	2.5	7.79	30.30	31.20	3.2
June	8.5	2.30	33.0	2.4	8.31	18.50	31.8	2.2
July	7.94	0.00	29.20	3.9	7.82	13.81	29.10	3.8
August	7.45	0.74	33.70	4.1	8.05	8.15	31.50	3.6
Sept.	7.89	1.50	29.20	3.7	7.88	2.00	29.50	3.4
Oct.	7.91	0.03	32.00	4.4	8.1	4.19	31.00	4.1
2016_January	7.92	4.48	24.70	3.7	8.04	22.08	25.00	3.7
Feb.	8.12	12.68	30.10	4.9	8.09	30.16	30.00	3.7
March	8.12	14.70	30.00	3.7	8.04	31.51	32.00	3.2
April	8.18	17.50	29.80	3.1	8.05	35.01	30.10	3.2
May	8.48	0.94	30.40	3.7	8.01	28.76	29.80	3.6
June	8.45	3.40	30.10	3.2	8.20	22.80	30.20	3.6
July	7.28	0.28	29.30	3.3	7.82	1.98	28.20	3.2
August	7.64	0.37	28.20	3.6	7.62	0.57	27.70	3.5
Oct.	8.02	0.94	29.80	3.6	7.63	1.32	28.90	3.5
Nov.	8.04	0.38	30.20	4.1	8.15	6.02	28.70	3.8
Dec.	8.50	0.88	25.60	5.0	7.98	19.10	25.40	3.7
2017_January	8.45	1.95	28.80	4.8	8.05	24.93	28.00	3.4
Feb.	8.19	7.96	29.00	4.0	8.09	29.18	28.00	3.9

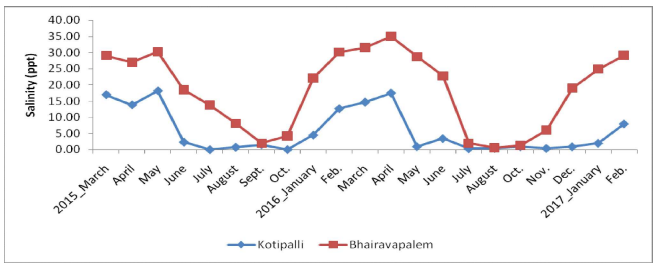

Fig. 1: Monthly variations of Salinity at Kotipalli and Bhairavapalem

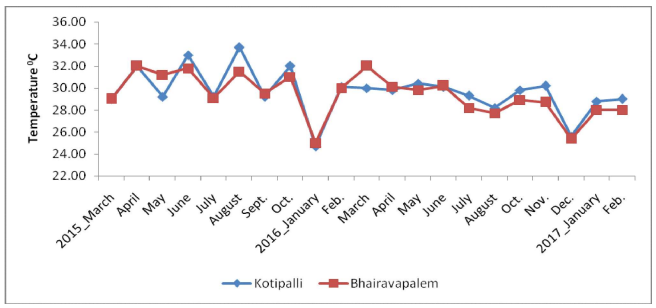

Fig. 2: Monthly variations of temperature at Kotipalli and Bhairavapalem

by the local precipitation during NE monsoon but also coupled with the low saline water which comes from the northern part of the BOB during this period. Achary *et al.,* 2010, reported similar typeof seasonal variation at Kalpakkam coastal waters. The lowest dissolved oxygen levels (2.20 ppm) was observed at Bhairavapalem where the salt water influence is more and the highest dissolved oxygen level 5.0 ppm was at Kotipalli where there is fresh water. Saltwater holds low dissolvedoxygen than freshwater, so oceanic dissolved oxygen concentrations tend to be lower than those of freshwater. As salinity increases, dissolved oxygen exponentially decreases**.** In aquatic systems, dissolved oxygen is the result of an imbalance between the processes of photosynthesis, dreadful conditions of organic matter, re-aeration (Granier *et al.*, 2000)

The values of silicate were ranged between 0.82mg/L (April 2016) to 16.43mg/L (November 2016) at Kotipalli and we noticed 0.23mg/L (April 2016) to 10.21mg/L (Fig. 3 and 4) at Bhairavapalem. Decrease of silicate level was observed from Kotipalli to Bhairavapalem. Silicate showed strong negative correlation with salinity in both the transects and strong positive correlation with dissolved oxygen (Munir *et al.,* 2020) (Table 2).

Table 2: Variations of nutrients at Kotipalli and Bhairavapalem (2015 to 2017)

Months	No2	No3	NH4	PO4	SiO4	No2	No3	NH4	PO4	SiO4
	mg/Lit									
	Kotipalli					Bhairavapalem				
2015_March	0.03	0.11	0.03	0.01	3.55	0.01	0.07	0.04	0.01	0.23
April	0.02	0.08	0.16	0.08	1.17	0.04	0.13	0.24	0.03	1.13
May	0.01	0.17	0.04	0.03	7.19	0.01	0.12	0.03	0.01	0.39
June	0.02	0.07	0.05	0.02	7.74	0.04	0.19	0.08	0.02	1.02
July	0.02	1.96	0.14	0.05	3.52	0.01	1.91	0.19	0.05	3.86
August	0.01	1.07	0.35	0.06	4.77	0.01	1.34	0.09	0.06	1.47
Sept.	0.02	1.02	0.31	0.08	4.69	0.01	1.37	0.09	0.07	1.55
Oct.	0.01	0.23	0.13	0.07	8.06	0.05	0.16	0.15	0.07	6.29
2016_January	0.01	0.18	0.15	0.02	3.18	0.02	0.13	0.12	0.01	0.74
Feb.	0.01	0.11	0.07	0.01	1.72	0.02	0.17	0.10	0.01	0.39
March	0.01	0.16	0.12	0.01	2.71	0.03	0.12	0.26	0.00	0.32
April	0.01	0.26	0.13	0.02	0.82	0.03	0.66	0.09	0.01	0.45
May	0.00	0.02	0.08	0.02	1.93	0.08	0.22	0.11	0.04	1.33
June	0.02	1.01	0.05	0.03	6.54	0.04	1.34	0.09	0.04	1.42
July	0.03	1.71	0.05	0.03	7.13	0.03	1.71	0.03	0.04	1.94
August	0.00	0.38	0.13	0.03	1.87	0.01	0.32	0.14	0.03	1.70
Oct.	0.01	0.05	0.23	0.03	8.96	0.03	0.07	0.23	0.02	8.18
Nov.	0.01	0.60	0.20	0.02	16.43	0.01	0.43	0.28	0.02	10.21
Dec.	0.01	0.28	0.11	0.02	9.03	0.02	0.37	0.02	0.02	3.78
2017_January	0.02	0.26	0.10	0.01	10.62	0.02	0.12	0.14	0.01	1.37
Feb.	0.00	0.39	0.24	0.02	3.67	0.00	0.20	1.06	0.01	0.55

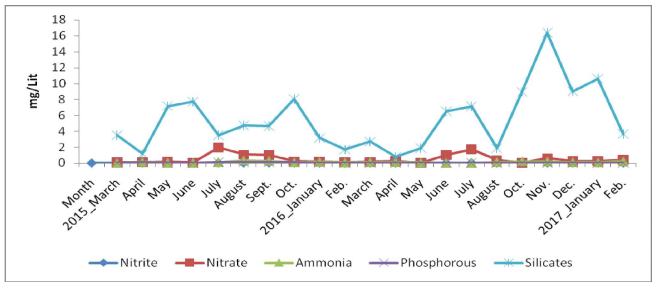

Fig. 3: Monthly variations of nutrients at Kotipalli

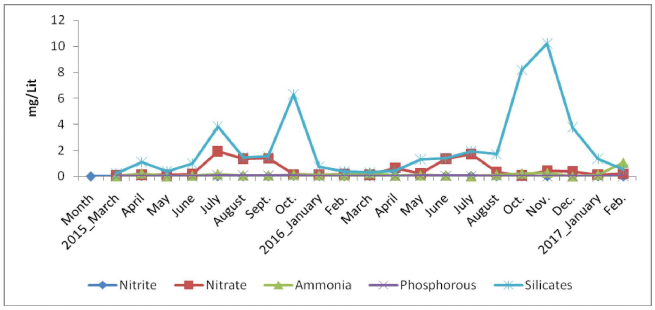

Fig. 4: Monthly variations of nutrients at Bhairavapalem

The spatio-temporal variation of silicate in coastal water is influenced by several factors, more importantly the proportional physical mixing of seawater with fresh water (Purushothaman and Venugopalan, 1972), adsorption of reactive silicate into suspended sedimentary particles (Lal, 1978), chemical interaction with clay minerals (Aston, 1980; Gouda and Panigrahy, 1992), co-precipitation with humic compounds and iron (Stephns and Oppenheime, 1972) and biological removal by phytoplankton, especially by diatoms and silicoflagellates (Aston, 1980 and Liss and Spencer, 1970).

The present study indicates that the surface water off Godavari is PO_4-limited on nitrogen fixation even during the peak discharge period. A sequential decrease in the levels of PO_4 in the Godavari estuary was recently reported by Bharathi *et al*. (2018) and was attributed to the estuarine processes and utilization by phytoplankton (Fig. 3 and 4). In addition, Sarma *et al*. (2020c) found that the central BoB is severely PO_4-limited to support nitrogen fixation. This could potentially exert a significant effect on the biogeochemical cycling of nutrients in this region, which can influence the growth, proliferation and composition of the phyto plankton assemblages.

Conclusion :

In Gautami Godavari river when water flow was high during monsoon, while its number increases during winter and hit the highest point was observed during pre-monsoon. It might be due to many nutrients got available for their growth in addition to bright sunlight and much quantity of carbon dioxide. Based on the present investigation it is observed that the water is suitable for the paddy and aquaculture as all the quality parameters are within the prescribed norms and the water can be used for fresh and brackish water aquaculture. Hence the study area have high potential for brackish water shrimp culture development based on values obtained which were in conformity with recommended values for shrimp culture at Bhairavapalem surroundings.

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