



## Physico-chemical characteristics of estuarine water bodies from Sindhudurg district of Maharashtra

### KEYWORDS

physico-chemical analysis, pigments, estuaries.

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**ABSTRACT** Analysis of the physico-chemical parameters of five estuaries from Sindhudurg district was carried out during the post monsoon season (December, 2012), with respect to temperature, EC, pH, DO, alkalinity, hardness, salinity, TDS, nitrate and phosphate content. During the study period dissolved oxygen and nutrients content was high at different estuaries. Pigment concentration did not exhibit much variation among selected water bodies. Physico-chemical status of the coastal waters under investigation was found normal. DO varied with salinity, alkalinity and hardness at different sites. EC and pH of different estuarine water bodies also possessed a significant correlation.

### Introduction

The quality of water in any ecosystem provides a significant information about the available resources for supporting life in that ecosystem (Thirupathiah et al. 2012). All known life forms on earth depend on water and hence hydrological studies are essential to understand the relationship between its trophic levels and webs (Govindasamy et al. 2012).

The health of an aquatic ecosystem depends on the physico-chemical and biological characteristics and may help in their conservation and management, (Venkasharaju et al. 2010). Estuarine and coastal areas are complex and dynamic aquatic environments (Morris et al. 1995). Very little information is available about the physico-chemical characteristics and nutrients present in estuaries of Sindhudurg district of Maharashtra. In the present study analysis of estuarine water from different sites in Sindhudurg district is carried out during the post monsoon season (December, 2013).

### Materials and Methods

The estuaries selected from Sindhudurg coastal region along with co-ordinates are given below.

Site	'N' Latitude	'E' Longitude
Mithbav	16°17.422'	073°26.341'
Achara	16°12.019'	073°26.620'
Adbandar	16°13.795'	073°28.021'
Dongarewadi	16°13.018'	073°27.257'
Kunakeshwar	16°20.032'	073°23.448'

### Sampling

Water samples from different estuaries were collected in plastic cans and brought to the laboratory for physico-chemical analysis. Dissolved Oxygen content of water was determined by Winkler's method (1888). EC, Temperature, pH and Total Dissolved Solids of water were recorded using digital equipments. Alkalinity, Hardness, Salinity, Dissolved Oxygen and nutrients (Nitrate and Phosphate) of water samples were analyzed by the standard methods described by Trivedy and Goel (1986). Correlation between the parameters was determined using statistical method.

### Pigment Analysis

For pigment analysis ten liters of water were filtered through the plankton net having 25 mesh size to get 10 ml concentrated sample which was passed through a GF/C filter paper having 1µm porosity. The filtered sample was gently ground with a homogenizer in 90% acetone to dissolve the filter and was stored in a refrigerator for 20-24 hours after addition of 1 ml of 1% MgCO<sub>3</sub>. Next day it was centrifuged for 20 min at 5000 rpm and the supernatant was saved for measuring optical density to determine the chlorophyll content using tricromatic equation by spectrophotometric method (Jeffrey and Humphrey, 1975).

### Results and Discussion

Physico-chemical characteristics of estuarine water samples reported in the present study are given in Table-1.

**Table: 1. Physico-chemical properties of some estuaries from Sindhudurg district**

Parameters	Mithbav	Achara	Aadbandar	Dongarewadi	Kunakeshwar
Air temp. °C	30.9	35	33	31	30.3
Water temp. °C	30.5	32.1	33.1	30	29.7
EC mS/cm	18.44	17.65	18.05	13.85	19.05
pH	8	7.4	7.9	6.7	8.3
Alkalinity mg/L	210	100	130	160	235

Parameters Sites	Mithbav	Achara	Aadbandar	Dongarewadi	Kunakeshwar
Hardness mg/L	172	148	156	160	196
DO mg/L	8.5	6.8	6.5	7.7	9.3
Salinity ‰	25.02	19.9	18.66	23.74	26.94
TDS mg/L	5190	5330	5280	4560	5540
Nitrate mg/L	0.282	0.228	0.362	0.328	0.293
Phosphate mg/L	0.34	0.19	0.452	0.3	0.09

Temperature at different estuarine regions varied from 29.7°C to 33.1°C. DO ranged between 6.5 to 9.3 mg/L at different sites. EC values shifted from 13.85 to 19.05 mS/cm and pH from 6.7 to 8.3 in different water samples. Alkalinity showed a significant variation and ranged from 100 to 235 mg/L, being maximum at Kunakeshwar and minimum at Achara while hardness changed from 148 to 196 mg/L at different sites. Salinity varied from 18.66 to 26.94 ‰ at different sites. TDS ranged from 4560 to 5540 mg/L at different sites maximum being at Achara site (Table 1). Correlation between hardness, salinity, alkalinity, DO, EC etc. was analyzed and is presented in Table 2.

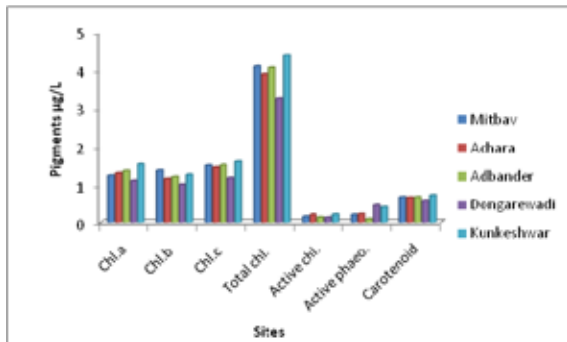
**Table: 2. Correlation between different parameters of water analyzed from estuaries of Sindhudurg.**

	EC mS/cm	pH	Salinity	Alkalinity mg/L	Hardness mg/L	Temp °C	DO mg/L	TDS	Nitrate mg/L	Phosphate mg/L
EC mS/cm	1									
pH	0.952577	1								
Salinity	0.083328	0.259136	1							
Alkalinity mg/L	0.308273	0.52615	0.926565	1						
Hardness mg/L	0.430083	0.625211	0.86651	0.942246	1					
Temp °C	0.210114	0.048069	-0.95092	-0.78264	-0.70554	1				
DO mg/L	0.257297	0.425026	0.983564	0.955953	0.929058	-0.88361	1			
TDS	0.957003	0.878139	0.015695	0.188424	0.393982	0.241775	0.190933	1		
Nitrate mg/L	-0.25885	-0.03068	-0.12832	0.096582	0.05117	0.141424	-0.14794	-0.33066	1	
Phosphate mg/L	-0.20311	-0.15951	-0.55885	-0.34883	-0.53318	0.567133	-0.58476	-0.37138	0.637432	1

Hardness was positively and significantly correlated with salinity (0.866) and alkalinity (0.942) and pH (0.625). Dissolved Oxygen showed a strong correlation with salinity, (0.983), alkalinity (0.956) and Hardness (0.929). Alkalinity exhibited a positive correlation with salinity (0.926). EC and pH were significantly correlated (0.952). Prasanna and Rajan (2010) have reported that DO was positively correlated with temperature and salinity.

Nitrate and phosphate content were very low at Achara site. At Kunakeshwar phosphate content recorded was minimum. The variation of nitrate and phosphate may be due to the processes like adsorption and desorption and buffering action of sediment under varying environmental

condition (Govindasamy and Kannan, 2000). The Indian standard for nitrate in drinking water is 45 mg/L (Alongi et al 1992). In the present investigation nitrate concentration observed was very low at different sites (0.22 to 0.36 mg/L). Phosphate content showed slight variation at different sites. Chlorophyll 'a' ranged from 1.1 to 1.5 µg/L, Chlorophyll 'b' from 1 to 1.37 µg/L and Chlorophyll 'c' from 1.17 to 1.6 µg/L at different sites. The total chlorophyll content varied from 3.27 to 4.39 µg/L. Chlorophyll 'c' was higher than that of chlorophyll 'a' and chlorophyll 'b' at all the stations. Carotenoid content was much similar in all the water bodies, which ranged from 0.58 to 0.72 µg/L (Fig.1).



**Fig 1: Pigment content at the estuaries of Sindhudurg district**

Total pigment content was higher at the Kunkeshwar and lower at Dongarewadi. The active phaeophytin content was more at Dongarewadi estuary.

When the content of chlorophyll 'a' is much higher than that of chlorophyll 'b' and 'c', the Cyanophyceae members are dominant in the water and when the content of chlorophyll 'c' is higher than that of chlorophyll 'b', the diatoms are dominant (Cirenko, 1988).

### Conclusion

The physico-chemical status of the coastal waters of Sindhudurg district was normal. The present investigation baseline information may be used for further ecological assessment and monitoring of marine ecosystem.

### REFERENCE

- Alongi, D. M., Boto, K. G. and Robertson, A. J. 1999. Nitrogen and phosphorus cycles in tropical mangrove ecosystem, Washington DC, American Geophysical Union, 41:251-292. | Bell, P. R.F. 1991. Status of eutrophication in the Great Barrier Reef Lagoon. *Mar. Pollut. Bull.* 23:89-93. | Cirenko, L. A. 1988. The information value of chlorophyll and carotenoid concentration as indicators of algal. *Freshwater Biol.* 17 (2): 237-250. | Govindasamy, C., Arulpriya, M., Ruban, P. and Meenakshi, V. R. 2013. Hydro-chemical Evolution of Palk Strait Region, Bay of Bengal. *J. Trop. Life Sci.* 2 (1): 1-5. | Morris, A. W., Allen, J. I., Howland, R. J. M. and Wood, R. G. 1995. The estuary plume zone; source or sink for land derived nutrient discharges? *Estuarine, coastal and shelf Science* 40: 387-402. | Prasanna, M. B. and Rajan, P. C. 2010. Physico-chemical properties of water collected from Dharma estuary. *Int. J. Environ. Sci.* 1(3): 334-342. | Thirupathiah, M., Samatha, C. and Sammaiah, C. 2012. Analysis of water quality using physico-chemical parameters in lower manair reservoir of Karimnagar district, Andhra Pradesh. *Int. J. Env. Sci.* 3 (1): 172-180. | Trivedy, R. K. and Goel, P. K. 1986. *Chemical and Biological Methods for Water Pollution Studies*. Published by Environmental Publications, Post Box 60, Karad. Oriental printing Press, Madar Gate, Aligarh. 248pp. | Venkatesharaju, K., Ravikumar, P., Somashekhar, R. K. and Prakash, K. L. 2010. Physico-chemical and Bacteriological Investigation on the river Cauvery of Kollegal Stretch in Karnataka. *J. Sci. Engineering and tech.* 6(1): 50-59. | Winkler, L. W. 1888. Die Bestimmung des in Wasser gelosten Sauerstoffes. *Berichte der deutschen chemischen Gesellschaft.* 21: 2843-2855. |