

SEASONAL CHANGES IN WATER QUALITY PARAMETERS OF MALIDEVI ESTUARY (NELLORE) EAST COAST OF ANDHRA PRADESH, INDIA**Sobha Rani, S.**

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Abstract: From January 2016 to December 2016 the investigation was conducted in Malidevi estuary. Transparency values ranged from 0.58 ± 0.21 to 0.97 ± 0.21 . Mean values of pH was varied from 7.2 ± 0.20 to 9.2 ± 0.32 . Atmospheric temperature varied from 25.8 ± 1.17 °C to 32.9 ± 1.07 °C. Surface water values ranged from 24.7 ± 2.01 °C to 31.9 ± 0.92 °C. Salinity of Malidevi estuary varied from 19.33 ± 0.76 to 34.68 ± 1.00 (‰). Dissolved oxygen was ranged from 3.31 ± 0.26 to 7.92 ± 0.54 mg/l. The rainfall was varied between 0.21 ± 0.01 to 194.4 ± 0.86 mm.

Keywords: pH, Salinity, temperature and dissolved oxygen.

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Introduction

Rapid industrialization and fast-growing aquaculture sector leads to variations in the physico-chemical parameters of estuarine water body. Industries which are located nearby water stream released their wastes (effluents) without treatment or partial treatment, this eventually enter into the estuarine water. Hence continuous monitoring is required to assess the quality of estuarine water body.

Several workers reported water quality parameters of estuarine environment in different parts the India (Gadhia *et al.*, 2012; Pravat Ranjan Dixit *et al.*, 2013; Uma Maheswara Rao *et al.*, 2015; Sreenivasulu *et al.*, 2015; Vijaya Pratap and Ramesh Babu, 2015; Sobha Rani, 2016).

The aim of the present investigation is to provide basic data on physic-chemical parameters in Malidevi estuary which is located at Nellore.

Methodology

Sampling was practiced for twelve months (January to December 2016) in Malidevi estuary to identify the water quality parameters. Water was collected in 3 litres polythene containers and transported to the laboratory of Department of Chemistry, Govt. Degree College, Paderu Visakhapatnam for further analysis. Dissolved oxygen (DO) and salinity were estimated as per standard procedures mentioned in Strickland and Parsons (1972). Calibrated pH meter was used for pH analysis (digital) (DH-2, Atago Company Pvt. Ltd, Japan). Water temperature was estimated by using thermometer (Testo, 104 IR).

Results

Transparency, pH, salinity, temperature (atmospheric as well as surface water), Dissolved oxygen and Rainfall content of estuarine water was studied from January 2016 to December-2016.

Transparency

The water transparency values ranged from 0.58 ± 0.21 to 0.97 ± 0.21 . Our observations showed that, transparency in the month of May was maximum whereas lower transparency was recorded in September. Transparency showed positive relation with atmospheric ($r=0.3326$) and water temperatures ($r=0.5328$). (Table 1, 2).

pH

pH of water fluctuated between 7.2 ± 0.20 and 9.2 ± 0.32 . Maximum and minimum pH values were noticed during June and November months respectively (Table 1, 2). Positive correlation was observed with temperature of water ($r=0.8824$), salinity ($r=0.5443$). Indirect relationship with Dissolved oxygen was noticed ($r= -0.3784$). (Table 1, 2).

Atmospheric and surface temperatures

Atmospheric temperature varied from 25.8 ± 1.17 °C to 32.9 ± 1.07 °C. In November and December months the observed atmospheric temperature was minimum whereas maximum temperature was recorded in the month of May. It exhibited positive relation with surface water temperature ($r= 0.92012$) (Table 1, 2). In perspective of surface water, it ranged from 24.7 ± 2.01 °C to 31.9 ± 0.92 °C. The higher and lower temperatures were noticed in the month of December and June respectively. It exhibited a positive relation for salinity ($r=0.5991$), pH ($r=0.8824$) and an indirect relation was seen in case of dissolved oxygen ($r= -0.4201$). (Table 1, 2).

Salinity

Salinity of Malidevi estuary varied from 19.33 ± 0.76 to 34.68 ± 1.00 (‰). The observed salinity was lower during August (19.33 ± 0.76), October (19.45 ± 0.94). Whereas maximum was noticed in the month of May (34.68 ‰). Salinity exhibited a positive relation with temperature ($r=0.5991$), pH ($r=0.5443$) whereas it exhibited an indirect relation for dissolved oxygen ($r= -0.4201$) (Table 1, 2).

Dissolved oxygen

Dissolved oxygen was varied between 3.31 ± 0.26 to 7.92 ± 0.54 . In May (3.31) lower DO was observed whereas maximum (7.92) was observed in the month of September. Dissolved oxygen exhibited an indirect correlation (negative) ($r= -0.4201$), ($r= -0.7291$), ($r= -0.3784$) with water temperature, salinity and pH respectively (Table 1, 2)

Rainfall

The rainfall was varied between 0.21 ± 0.01 to 194.4 ± 0.86 mm. The higher and lower rainfall data was observed during the months of September (194.4) and January (0.21 mm) respectively. Rainfall exhibited a direct relation (positive correlation) with Dissolved oxygen ($r=0.5379$). (Table 1, 2).

Table 1. Physico-chemical characteristics of Malidevi estuary

Months	Transparenc y (m)	pH	Temperature		Salinity (‰)	D.O (Mg/l)	Rain fall (mm)
			Atmospher e (°C)	Water (°C)			
January	0.67±0.07	8.1±0.43	28.4±0.99	25.6±0.87	26.32±0.49	5.74±0.11	0.21±0.01
February	0.75±0.01	7.9±0.27	29.8±1.23	26.8±1.07	29.84±0.12	5.96±0.38	1.37±0.02
March	0.77±0.02	8.5±0.56	30.8±1.01	29.4±1.21	30.12±0.58	4.17±0.27	30.87±1.27
April	0.84±0.13	8.7±0.37	32.4±1.32	30.1±1.34	32.87±1.09	3.95±0.58	46.24±2.68
May	0.97±0.21	8.9±0.61	32.9±1.07	31.7±0.89	34.68±1.00	3.31±0.26	54.32±1.97
June	0.82±0.01	9.2±0.32	31.9±1.05	31.9±0.92	32.35±1.27	7.12±0.05	62.71±1.74
July	0.73±0.27	8.7±0.41	30.6±1.12	28.4±0.87	21.43±0.94	6.24±0.10	74.47±2.15
August	0.61±0.16	8.5±0.53	30.1±1.05	27.9±1.03	19.33±0.76	7.15±0.27	92.15±0.78
September	0.58±0.21	7.9±0.35	29.9±1.34	26.3±0.91	21.72±1.09	6.91±0.13	126.5±2.12
October	0.62±0.12	7.4±0.41	28.7±1.07	26.8±1.08	19.45±0.94	7.92±0.54	194.4±0.86
November	0.71±0.21	7.2±0.20	27.5±1.13	25.4±1.22	21.29±0.48	6.14±0.37	149.4±1.87
December	0.87±0.01	7.6±0.57	25.8±1.17	24.7±2.01	28.64±0.75	5.89±0.41	9.3±0.93

Table 2. Correlation co-efficient matrix (r) for physico-chemical parameters of Malidevi estuary.

	Transparency	pH	Atmospheric temperature	Water temperature	Salinity	Dissolved oxygen	Rainfall
Transparency	1						
pH	0.439582	1					
Atmospheric temperature	0.332632	0.841952	1				
Water temperature	0.530848	0.882436	0.920123	1			
Salinity	0.855434	0.544331	0.490374	0.599154	1		
Dissolved oxygen	-0.72438	-0.37841	-0.43749	-0.42012	-0.7292	1	
Rainfall	-0.51881	-0.38954	-0.09226	-0.11844	-0.67523	0.537969	1

Discussion

Turbidity of water prevents the proper penetration of light into water body and this leads to minimize the growth of plants and oxygen production. Suspended particles in estuarine water body leads to enhance the water temperature as they have capacity to absorb heat (Voluntary estuary monitoring manual chapter 15).

Higher pH values were recorded in summer season where as the low pH values were recorded during monsoon. The observations of the current work correlate with the findings of previous reports Thangaraj, 1984; Hemalatha, 1996; Sreenivasan, 1998; Santhanam and Perumal 2003; Palpandi (2011) from the Vellar estuarine system. Ravaniah *et al.*, 2010 from pennar estuary Nellore. The reported pH values in the current study following the trends of results reported by Ragothaman and Patil (1995) and Upadhyaya (1998).

Temperature is a universal factor which may influence the physic-chemical parameters of an aquatic ecosystem and also on the distribution of organisms. Higher temperature in summer months was due to the meteorological characteristics, shallowness of the estuary and its proximity to land, which resulting in rapid changes in temperature with reference to changes in atmospheric temperature (Karunagaran, 1990). The observations of the present study results were in agreement with previous reports (Thangaraj, 1984, 1985; Gothandaraman, 1993; Sreenivasan, 1998; Senthilnathan, 1990; Mani, 1981; Vasantha, 1989; Kaliyaperumal, 1992; Karuppusamy 1997; Saraswati, 1993; Ravaniah *et al.*, 2010; Palpandi, 2011).

Salinity is key abiotic factor which control the distribution of the living organisms (Chandramohan and Srinivasa, 1998). The findings of present study following the trends in salinity values from different estuarine environment (Singbal, 1973, 1976; Chandran and Ramamoorthi, 1984; Murugan and Ayyakannu, 1991; Palpandi, 2011; Budharatna Bhaware *et al.*, 2013).

DO concentration in any water body due to rate of photosynthesis process and respiration of plants as well as animals (Soundarapandian *et al.*, 2009). Temperature, photosynthesis, salinity, respiration process will influence the DO levels in the water body of any environment (Budharatna Bhaware *et al.*, 2013). In Malidevi estuary the dissolved oxygen values were reported high during monsoon months. This process is aided due to the freshwater influx and rainfall (Saravankuamr *et al.*, 2008).

Recorded high rainfall data in the present study was attributed due to Northeast monsoon. The minimum rainfall was notice during post monsoon and summer months. The rainfall data obtained in the present investigation following similar trends of previous reports from different estuaries, Vellar estuary (Nedumaran *et al.*, 2001); Parangipettai coast (Santhanam and Perumal, 2003; Sundaramanickam *et al.*, 2008); Muttukadu backwaters (Prema and Subramaniam, 2003)

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