

Monitoring Water Quality of Nandur Madhmeshwar Wetland, Nasik, Maharashtra (India)

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Abstract

Signs of wetland water quality degradation have been known from decades, especially in those wetlands which are situated in the vicinity of human habitations and used for irrigation. Study on water quality monitoring of Nandur Madhmeshwar wetland have been undertaken to assess the water quality with reference to its suitability to aquatic and wild life. The result shows mean pH 6.91 (\pm 0.52), electrical conductivity 418.02 (\pm 50.13) μ S cm^{-1} and temperature 21.8 (\pm 2.95) $^{\circ}$ C. The turbidity shows sharp increase in the summer season, having mean 3.44 (\pm 2.35) NTU. The mean of alkalinity is 136.25 (\pm 43.14) mg l^{-1} , chloride 43.52 (\pm 23.27) mg l^{-1} and total hardness as CaCO_3 250.37 (\pm 136.92) mg l^{-1} . The mean of free CO_2 is 41.32 (\pm 23.18). The dissolved oxygen did not vary much and having mean 6.07 (\pm 0.78) mg l^{-1} . The BOD is also within the range having mean 5.37 (\pm 1.50) mg l^{-1} . The water quality of the wetland was found to be suitable to aquatic and wildlife.

Key words: monitoring water quality, nandur madhmeshwar wetland.

Introduction:

Wetlands form the major category of aquatic ecosystem (Jain *et. al.* 2008). Wetlands perform various functions such as flood control, aquifer recharge, nutrient absorption, sediment retention, erosion control etc. (Balachandra & Rahamani 2005). However, Wetlands are under immense pressure due to pollution, dumping of wastes and urbanization. Several pollutants, ranging from oxygen demanding organic pollutants, nutrients, heavy metals and siltation play a major role in the degradation of wetland (Chandra *et.al.* 2009).

Water quality in wetland is important aspect for conservation and development, because it determines spatiotemporal dynamics of aquatic organism (Mwaura 2006). The broad aspect of water quality can be visualized in terms of physical and chemical properties. Wetlands water quality is undergoing rapid degradation especially in those wetlands which are situated in the vicinity of human habitations and used for irrigation.

The Nandur Madhmeshwar wetland (19 $^{\circ}$ 15'36" N latitude, 74 $^{\circ}$ 01'51" E longitude) is located in Niphad tahsil of Nasik district (Map 1). The wetland is situated on the confluence of Godavari and Kadva River and covers an area of 800.96 hectares. The wetland is surrounded by agricultural land, villages and roads. The wetland is one of the important waterfowl habitat (IBA site code IN-MH-11) identified by the International Union of Conservation of Nature (IUCN) & aptly called as Maharashtra's Bharatpur. Hence an attempt has been made to monitor water quality of Nandur Madhmeshwar wetland, as it is a source of livelihood to several thousand families of fishermen and farmers, support irrigation, flora, fauna and offer a winter habitat to several species of migratory birds.

Material & Methods:

The surface water samples were collected from four sampling stations of wetland, once every month from October 2010 to September 2011. Two & half liter plastic cans were used for collection of water sample from a depth of approximately 20 cm during morning hours between 7.30 to 9.30 AM. The physical parameter like pH, electrical conductivity (EC, μ S cm^{-1}) and temperature were measured in the field, while other parameters like turbidity (NTU), alkalinity (mg l^{-1}), chloride (mg l^{-1}), total hardness as CaCO_3 (mg l^{-1}), free carbon dioxide (free CO_2 , mg l^{-1}) dissolved oxygen (DO, mg l^{-1}) and biochemical oxygen demand (BOD, mg l^{-1}) were measured as per Standard Method by APHA (2005) in the laboratory of Department of Environmental Science, New Arts, Commerce and Science College, Ahmednagar. pH and EC were measured using pH meter (Model - Rocker - pH 5011 A) and EC meter (Model - Rocker - COND 5022). The turbidity was measured by using Nephelometer (Make – Systronics-132). Alkalinity was determined by titrating sample with standard solution of mineral acid using pH indicators, like phenolphthalein and methyl orange. Chloride was determined following argentometric method while total hardness by EDTA titrimetric method. Free carbon dioxide was determined by titrating sample with standard solution of sodium carbonate using pH phenolphthalein as indicator. The Winklers titrimetric method was used for the determination of DO. BOD₅ was measured by incubating the samples for 5 days at 20 $^{\circ}$ C (Make – Metalb - MSI 9)

Results & Discussion:

The results of the various water quality parameters determined in Nandur Madhmeshwar wetland with range of variation and annual mean along with standard deviation are presented in Table 1. The results showed mean pH 6.91(± 0.52), electrical conductivity 418.02 (± 50.13) $\mu\text{S cm}^{-1}$, temperature 21.8 (± 2.95) °C and turbidity 3.44 (± 2.35) NTU. The mean of alkalinity is 136.25 (± 43.14) mg l^{-1} , chloride 43.52 (± 23.27) mg l^{-1} and total hardness (as CaCO_3) 250.37 (± 136.92) mg l^{-1} . The mean of free CO_2 is 41.32 (± 23.18), DO 6.07 (± 0.78) mg l^{-1} and BOD is 5.37 (± 1.50) mg l^{-1} .

The overall water pH indicate similar trend in the all sampling station of the wetland. The heights pH was reached at the end of January to May, probably due to the strong influence of evaporative concentration and low inflow from two rivers, Godavari and Kadva. Electrical conductance of water depends on ions present in it. In dry season, the total volume of water decreases, as a result the conductivity increases. Water temperature play a very important role, it influence the chemical, biochemical and biological characteristics of water. The present study indicates higher value in summer and lower in monsoon. It could be owing to sedimentation during summer season and turbulence arising out of flood like situation observed during rainy season.

Higher values of alkalinity registered during summer might be due to presence of excess of free carbon dioxide produce as a result of decomposition process. The value for chloride is below the permissible limits of WHO (1997). Higher value of hardness during summer can be attributed to low water level, high rate of evaporation and addition of calcium and magnesium salts. The maximum DO in wetland was recorded during winter, thereafter it started declining gradually and in summer it reached the lowest concentration. This can be attributed to consequent biodegradation, decay of vegetation and higher temperature. High BOD in monsoon were due to high concentration of dissolved and suspended solids in water.

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Table 1. Range of variation, Mean and Standard deviation of water quality parameter of Nandur Madhmeshwar Wetland from October 2010 to September 2011

Parameter	Range of Variation		Mean SD
	Min.	Max.	
pH	6.1	7.9	6.91± 0.52
Electrical Conductivity ($\mu\text{S cm}^{-1}$)	315	496	418.02 ± 50.13
Temperature (°C)	14	28	21.8 ± 2.95
Turbidity (NTU)	8.7	0.5	3.44 ± 2.35
Alkalinity (mg l^{-1})	47	223	136.25 ± 43.14
Chloride (mg l^{-1})	8.3	92	43.52 ± 23.27
Total Hardness as CaCO_3 (mg l^{-1})	73.7	492	250.37 ± 136.92
Free Carbon Dioxide (mg l^{-1})	8.8	80.6	41.32 ± 23.18
Dissolved Oxygen (mg l^{-1})	3.9	8.2	6.07 ± 0.78
Biochemical Oxygen Demand (mg l^{-1})	2.8	8.9	5.37 ± 1.50

Map 1 Location Map of The Nandur Madhmeshwar wetland

