

Analytical Research On Water Quality Of The River Naf For Fisheries Activity

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Abstract: Water quality analysis is an essential aspect of aquatic environment studies to assess the pollution level and identify the suitable environment for fishery activities like fishing and cultivation. In this investigation, sample waters were obtained from five different sampling sites to evaluate the water quality status of the Naf river from March 2021 to September 2021. Throughout the research, seven physio-chemical parameters were analyzed, which were water temperature, transparency, turbidity, pH, DO, salinity, alkalinity and ranges from 27-34°C; 19-54 cm; 18-138 NTU; 7.2-8.2; 7-13 mg/L; 25-30 ppt and 86-336 ppm respectively. During the analysis among all sampling locations, no considerable variations were observed for any parameters, but significant differences were seen in the monthly data assessment, especially in April and July. The study revealed that the water of the Naf River is in good environmental condition for fisheries activity such as fishing and fisheries cultivation, comparing with the standard value of different water quality parameters.

Keywords— Water quality analysis; Physio-chemical parameters; Naf River; Environmental Health; Fisheries

1. INTRODUCTION (Hea

Water is an elixir of life and a precious natural resource essential for human survival. It has found an abundant amount on the earth [1]. Out of the total water reserves of the world, about 97% is salty water (marine), and only 3% is freshwater. Even this small fraction of freshwater is not available to us as most of it is locked up in polar ice caps, and just 0.003% is readily available to us in the form of groundwater and surface water [2]. Due to its unique properties, water is the multiple uses of all living organisms. Water is essential for life. Most of the life processes take place in the water contained in the body. Civilizations depend on water in every advancement activity [3]. Water is utilized for drinking, watering, shipping, laundry, and garbage dumping for manufacturers and is employed as a coolant for thermal energy production. Water shapes the earth's surface and regulates our climate [4]. With the growing human community and agile advancement, the requirements for water withdrawal have risen countless folds, and a massive proportion of withdrawal is contaminated due to land-based activities [5].

Rivers are the most crucial water sources. It has long been used for fisheries activity [6]. Unfortunately, the aquatic environment of the river might face adverse impacts by different anthropogenic activities, which affect its physio-chemical quality and systematically destroys the community disrupting the delicate food web [7–9].

This research intends to investigate the quality of the Naf River water. Naf River is a significant water body that is considered an estuary rich with fisheries resources and supports the livelihood of nearby fisheries communities. Feasibility analysis of the water of the Naf River will be beneficial for the surrounding livelihood for their irrigation, fishing, and cultivation activity.

2. MATERIAL AND METHODS

This research work was conducted at Naf River, positioned in the southeast portion of Bangladesh. It is an international river that flows into Cox's Bazar district of Bangladesh and the Rakhine State of Myanmar. Five stations were randomly selected from downstream to upstream of the Naf river area (Figure 1). The approximate geographical location of those stations were, station-1 (22°18'59" N and 91°51'15" E); station-2 (22°18'31" N and 91°52'20" E), station-3 (22°18'6" N and 91°51'53" E), station-4 (22°17'49" N and 91°51'30" E), station-5 (22°17'2" N and 91°51'15" E).

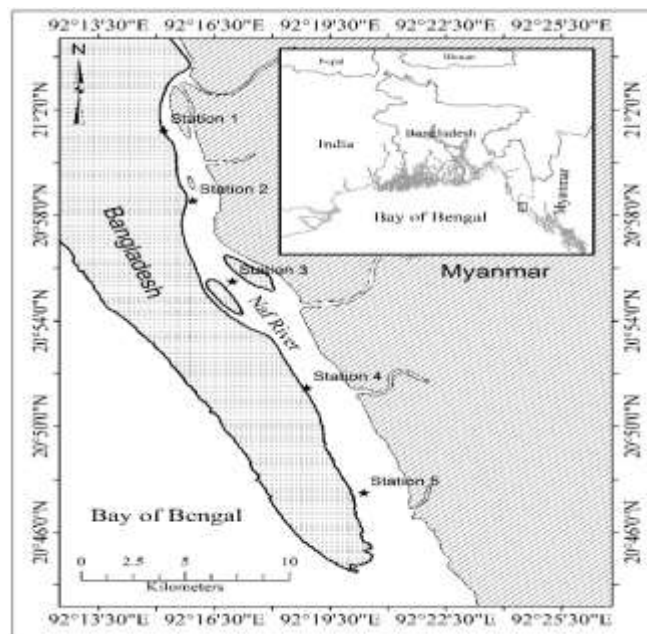


Figure 1. Sampling location in Naf River.

2.1 Laboratory methods

Sampling was collected from the five selected stations monthly for seven months, from March 2021 to September 2021. Samples were collected in an acid wash (1-liter) plastic container and brought to the laboratory for further analysis. The sampling was done from 8 a.m. to 4 pm. Samples were obtained from the upper water surface to measure Physio-chemical parameters like water temperature, salinity, pH, water transparency, dissolved oxygen, alkalinity, and turbidity. Water temperature, transparency, pH, dissolved oxygen, salinity, and alkalinity were measured in the field.

Turbidity was tested in the lab within 24 hours of collection. The quality of the water was analyzed by standard methods [10].

3. RESULT AND DISCUSSION

The water quality parameters for the selected five stations were recorded over the seven months. These physio-chemical parameters were recorded: temperature, Salinity, pH, Dissolved oxygen, Transparency, Turbidity, and alkalinity. The range of monthly and station-wise water parameters of Naf River was summarized in Table 1 and Table 2.

Table 1. The results of water quality parameters for different sampling Stations

Parameters	Station 1	Station 2	Station 3	Station 4	Station 5
Temperature (°C)	28.96	29.54	29.67	29.23	29.73
Transparency (cm)	36	38.9	39.48	40.29	40.57
Turbidity (NTU)	55.01	51.9	50.27	47.59	51.4
pH	7.83	7.9	7.9	7.9	7.9
DO(mg/l)	8.95	10.27	10.24	9.9	10.11
Salinity(ppt)	26.43	26.43	26.29	26.00	25.57
Alkalinity (mg/l)	219.4	224.1	212.5	213.1	223.6

Table 2. The results of water quality parameters from March to September

Parameter	Mar	Apr	May	Jun	Jul	Aug	Sep
Temperature(°C)	28.8	33.05	27.98	30.28	27.76	29.2	28.8
Transparency(cm)	53.07	30.93	38.67	44.27	19.80	43.0	43.6
Turbidity(NTU)	18.46	18.74	49.44	42.56	137.4	67.92	24.14
pH	7.8	7.6	7.34	8.28	8.4	7.82	8.08
DO(mg/l)	9.44	7.01	9.6	10.2	10.8	12.08	10.14
Salinity (ppt)	30	30	25.4	30	8	29.6	30
Alkalinity	291.6	316.4	335.8	144.13	86.8	148.4	206.8

3.1 TEMPERATURE

Temperature is one of the most crucial water parameters as it affects the ecosystem's biotic and abiotic components [11,12]. The temperature of the water sample varied from 27-34° C in different months. No notable fluctuation was seen among the sampling stations (Table 1). However, a highly significant difference was observed in the month-wise analysis, where the temperature in April was significantly higher than in other months of the study period (Table 2). The inconstancy in river water temperature typically depends on the season, geospatial diversity, sampling period, and effluents entering the river [13]. The standard temperature range of river

water for the aquatic environment is 20 to 30°C, both in the dry and wet seasons [14]. According to the observed values, the average temperature in the Naf River water was fit within the range of the Department of Environment, Bangladesh standard limit.

3.2 TRANSPARENCY

Transparency is essential because it can depict suspended, organic, inorganic matters and primary production in water. The value of transparency fluctuated from 19-54 cm. No strong contrast was witnessed in station-wise evaluation (Table 1), but a profoundly notable variation in transparency was seen in the month-wise analysis, significantly higher in

March and lower in July (Table 2). The transparency of the freshwater from 35 to 45 cm is suitable for the aquatic habitat [15]. So, the average transparency of Naf River water was close to the acceptable range except in April because of dry seasons, when transparency was high, and in July, transparency was the lowest because of high hill heavy runoff.

3.3 TURBIDITY

Turbidity is the expression of the visual attribute, where the light is dispersed by the particles existing in the water. Clay, silt, organic element, phytoplankton, and other diminutive organisms induce turbidity in water [16,17]. Turbidity measured in this analysis was between 18-138 NTU. No vital inconstancy was detected among the Stations (Table 1). However, a notable contrast was detected in the month-wise assessment (Table 2), where turbidity in July was significantly more eminent than in other months because of hill landslides and high drainage.

3.4 PH

The pH of the water is crucial because it alters the solubility and availability of nutrients and how aquatic organisms can utilize them. Besides, it is a crucial constituent that works as an indicator of the water body. In this investigation, the pH level fluctuated from 7.2-8.7; a notable fluctuation in pH was found among different months (Table 2). In July, it was detected significantly higher than in other months. However, no sharp exception was detected among the sampling stations (Table 1). According to the FAO and Environment Conservation Rule of Bangladesh, the adequate pH limit is 6.5 to 8.5 for irrigation water [17–20], and for fisheries and livestock is 5.5 to 9.0 [18]. The study found that the pH values of all sampling sites were somewhat higher than the conventional limit because of the geographic position where natural tidal movement transports seawater into the river.

3.5 DISSOLVED OXYGEN

The variation in dissolved oxygen (DO) mainly occurred for the solubility of the oxygen risen with the drop of water temperature. Besides, it occurs by the aerobic bacteria existing in the sample and excrete CO₂ due to decomposition [21]. The readings of DO obtained by the sampling were varied from 7-13 mg/L. No notable change was seen among different Stations (Table 1). However, a profoundly significant variation was observed among different months (Table 2), wherein in August, the DO was more eminent than in other months. The standard range of DO in natural water is 4-6 ppm, and for aquatic survival and aquaculture is >5 ppm [22–26]. Based on the measured findings of DO from all water samples taken from Naf River exceeded the acceptable range, which means the ecosystem and the water body's health were excellent and suitable for aquatic organisms and fisheries.

3.6 SALINITY

The concentration of salinity varied from 25-30 ppt. No notable contrast was seen amongst the Stations (Table 1).

Though, the fluctuation was seen in monthly assessments (Table 2). In July, salinity decreased significantly. In this month, the range of salinity in all Stations was similar. However, all stations experienced comparatively similar temporal salinity variation except in July due to high rainfall, and hill runoff causes low salinity by freshwater dilution [27].

3.7 ALKALINITY

Total alkalinity is generated by bicarbonates, carbonates, OH ions, borates, silicates, and phosphates [28,29]. Alkalinity is a measure of the buffering function of water and is requisite for aquatic communities in a freshwater system because it equilibrates the pH fluctuations that typically happen due to the photosynthesis of phytoplankton [30]. The range of alkalinity was obtained from 86-336 ppm. Station-wise measurement exhibited no significant variation (Table 1). However, this fluctuation was observed in monthly variation (Table 2). In July, alkalinity declined significantly. The standard state of alkalinity is >100 ppm [31]. Based on standard scale of alkalinity, most of the water samples were comparable to the standard limit.

4. CONCLUSION

The investigation exhibited that the Naf river's water quality was natural; municipal stress and anthropogenic effects not yet impose any vital threat to the aquatic habitat and environmental quality. Besides following the calculated data and comparative analysis with the standard interpretation, it was demonstrated that the water body was quite prolific for fisheries activities. Although no vital distinction was observed for the spatial allocation of the sampling stations, monthly variation was quite substantial, representing the monsoonal influences on the river's water. Consequently, the study will benefit future researches to outline the convenient zonation of fishing and fish culture activity through the data of the water quality parameter of the river Naf.

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6. REFERENCES

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