Assessment of Physical Parameters of Water of the Dhaleshwari River in Bangladesh before setting up Tanneries

Sarmin Akter
Department of Zoology, Jahangirnagar University, Savar, Dhaka, Bangladesh

Md. Kamrujjaman
Department of Zoology, Jahangirnagar University, Savar, Dhaka, Bangladesh

***Md. Rashed-Ul-Islam**
*Corresponding Author
Institute of Leather Engineering & Technology, University of Dhaka, Dhaka-1209

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1. Introduction

The rivers of Bangladesh mark both the physiography of the nation and the life of the people (Monirul Qader Mirza et al., 2003; Smith et al., 1998). These rivers generally flow south and they serve as the main source of water for cultivation and as the principal arteries of commercial transportation. Rivers also provide fish, an important source of protein. Flooding of the rivers during the monsoon season causes enormous hardship and hinders development, but fresh deposits of rich silt replenish the fertile but overworked soil (Bhuiyan and Dutta, 2012; et al., 2015). The rivers also drain excess monsoon rainfall into the Bay of Bengal. Thus, the great river system is at the same time the country's principal resource and its greatest hazard.

The prominent striking reason of river water pollution is the rapid and unplanned urbanization and the development of surrounding industries like chemical industries, dyeing industries, tanneries textiles etc. (Chen, 2017; Reza and Singh, 2010; Singh et al., 2005). According to the Environment Conservation Act, 1995 (Amendment 2010), tanneries, dyeing factories are 'red category' industries and are bound to install and run an ETP.

Savar is one of the largest industrial belts near Dhaka in Bangladesh. Dhaka Export Processing Zone (DEPZ) is an industrial area located at Savar in which about 86 industries already exist (*BEPZA, 2006*). These industries generate a large amount of effluent every day and discharge into the adjacent irrigation channels and wetlands which finally pass into the adjacent river.

The process of relocating tanneries from the city's Hazaribagh area has been completed in the year 2017. Establishment of infrastructure at the 200 acre tannery estate has been completed. About 72 factories have already started working at the Savar tannery estate, the rest of the factories are under construction and they will be able to start their factories within a short time. In

2001, the High Court had directed the government to shift the tanneries from Hazaribagh to Savar in view of the critical condition of the Buriganga, caused by dumping of untreated chemical waste of the tanneries into the river. In April 2017, the government shut 220 tannery industrial units at Hazaribagh and forced them to relocate to Savar. The number of the tanneries of Hazaribagh was about 220 and they discharged some 21,600 cubic meters of liquid waste and 88 tons of solid waste per day, posing a serious threat to the livelihood of some 1,00,000 people and prompting observer us it to be on the brink of environmental digesters (*DOE, BD*) (Bhuiyan et al., 2011; Paul et al., 2013). So it doesn't take much more effort to imagine that what would be future of the Hemeyetpur and the river Dhleswari. From the very beginning, the relocated tanners found themselves hamstrung by scores of infrastructure deficiencies (Karn and Harada, 2001; McArthur et al., 2001; Talukder et al., 2016). The much-hyped central effluent plant (CETP) remained a virtual pipe dream in the initial phase. It was finally declared operative, but tanners discovered it to be not to be fully functional. With such a major effluent treatment plant not working properly, the nearly Dhaleswari river is feared to become vulnerable to pollution (Chowdhury, 2010; Saha and Hossain, 2011). Earlier, non-treated and toxic waste materials released from Hazaribagh tanneries into the nearby canals, finally flowing into the Buriganga river, played havoc with a densely populated, sprawling area. A recurrence of the practice is set to spawn a terrible nightmare for the rural neighbourhood adjacent to the Savar Estate.

Industrial pollutants such as chromium, lead, cadmium, iron, copper and organic wastes discharged from the industries can accumulate in rivers. Referred as bioaccumulation, this process can ruthlessly affect water quality and species survival (Al-Salem et al., 2017; Schwarzenbach et al., 2010; Yadav, 2015).. More importantly, bioaccumulation of metals in fish, crabs and other edible aquatic species, may cause health problems to enter the food chain. Also this can destroy the water aeration system, the self-purifying process of rivers. Furthermore, eutrophication, a process of absorbing excessive nutrients (especially N and P) beyond their buffering capacity of water bodies lead to the loss of species diversity through increased species mortality, changes in species collection and loss of aquatic flora and fauna diversity.

The present work would be the reference work when the river would be severely polluted after fully launching the new tanneries. Moreover, now the status of physic-chemical status of water of the dhaleswari river is scanty or very few. So, considering all sorts of things the present study was carried out to assess the water quality of the dhaleswari river with the following aim and objectives:

1. To determine the concentration of physico-chemical properties in surface water in order to determine the extent of pollution level at two points (upstream & downstream) of Dhaleswari river.
2. To assess the monthly variation of those parameters

2. Sample collections

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During this study, water sample was collected from Dhalashwari river in 500 ml plastic bottles and to assess the physicochemical parameters like water colour, depth, temperature, transparency, velocity, TDS and turbidity. Prior to collection plastic bottles were cleaned.

3. Results and Discussions

During the study period, seven selected physical factors were investigated throughout the study period. The collected data on these physical factors are briefly presented below.

3.1 Water Colour

Colour variation in water of Dhaleshwari river observed during the study period tend to show variation with season. The darkish colour was found during dry season and light green during wet season.

The water colour at spot-1 was picth black from December to March and blackish colour was found in April. During the month of May and June the water colour of spot-1 was ash. The light green colour of water found only in July & August.

At spot-2 water colour was greenish in July & August. It was ash From September to November just before starting of dry season and April to May just ending of dry season.

Light black colour of water was found from December to March at spot-2 and greenish colour was found only in July and August.

3.2. Water Depth

During the study period the water depths of Dhaleshwari river were found as highest 1680cm and lowest 430cm.The highest value was recorded in August at sampling point 2 and the lowest value in February at spot-1.

The water depths of the river were found to gradually decrease from November to February and increased slowly in March and rapidly from April to August.

The average depth of the river at spot-1 was 786.67±39.72 cm and at spot-2 997.50±75.74. The data is presented in the following graph.

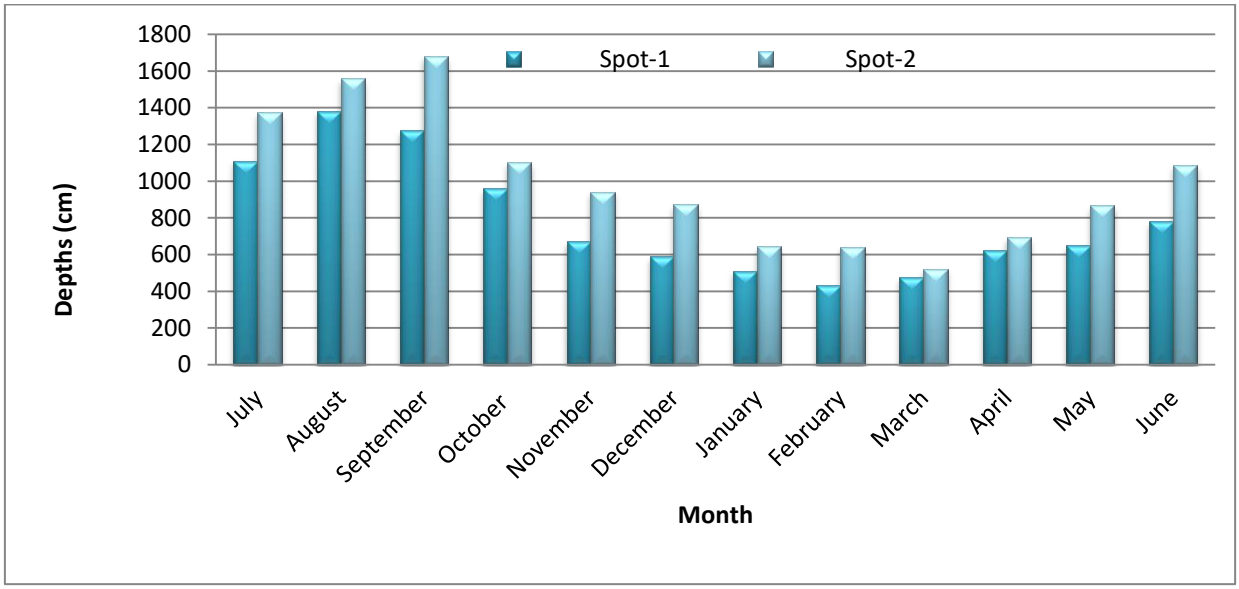

Figure 1. Monthly variation in water depths of Dhaleshwari river at two spots

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3.3. Water Temperature

The temperature of water of the study area at different points and at different times of year ranged from 28.5ºC(maximum) to 17.8ºC(minimum) (Figure 2.) .The temperature of water was high from April to June and found to increase up to August.

The highest average temperature of water found during the month of August and the lowest temperature of water was recorded in January. The water temperature was found to decrease gradually from November to February.

The average temperature at spot-1 during the study period was 23.54±4.23ºC and at spot-2 it was 24.12±4.48ºC. The data is given in Fig. 2.

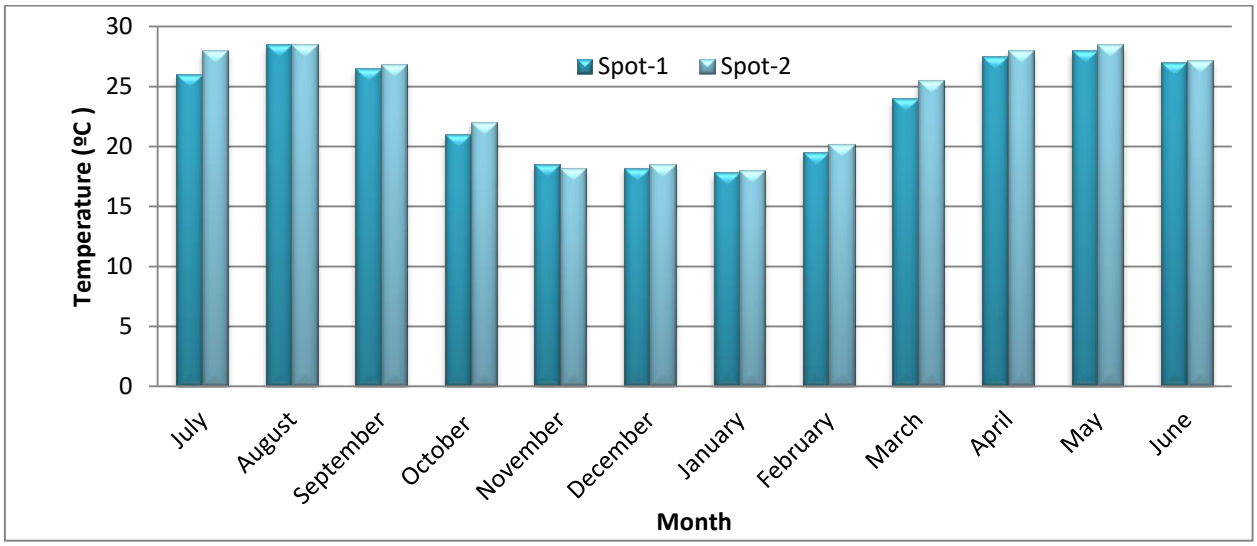

Figure 2. Monthly variation in water Temperature of Dhaleshwaririver at two spots

3.4. Transparency

Throughout the study period the monthly value of water transparency were within the range of 18cm/sec (as minimum value) to 58.8 cm/sec (maximum value). The highest value was recorded in July at spot-1 and the lowest value from spot-2 in February.

The fllactuation of values started from September then continues up to February then the values started to increase from March and highest in July. (Figure. 3)

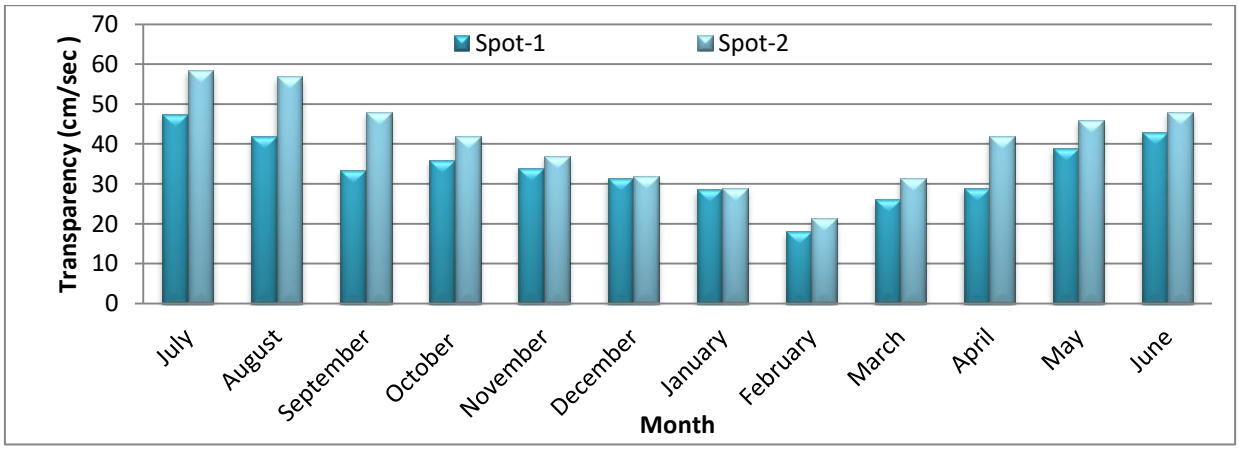

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Figure 3. Monthly variation in water Transparency of Dhaleshwari river at two spots

3.5. Velocity

The velocity of surface water of Dhaleshwari river was tend to increase from May to September and the highest value was found in July at Spot-1.

Then the values started to decrease slightly from September to November and the value decreases rapidly in December to March (Figure 4).

The lowest value was found in March at spot-1. The recorded highest value was 51.7cm and the lowest value was 3.20cm. The full result is given in Figure. 4.

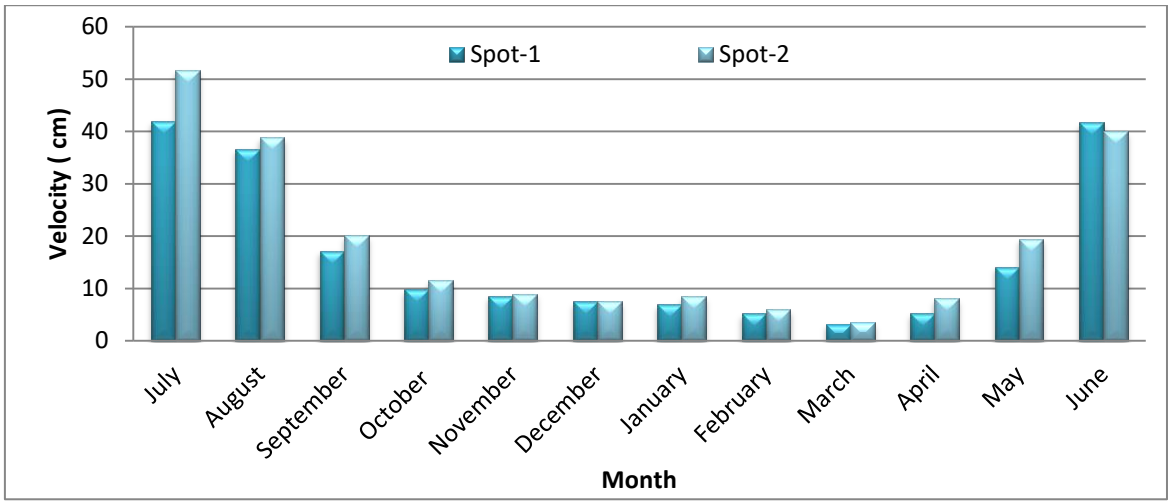

Figure 4. Monthly variation in Velocity of Dhaleshwari river at two different spots

3.6 Total Dissolve Solids (TDS)

Concentration of water dissolve solids collected at different points and at different times of year ranged from 3.36 mg/l (minimum value) to 1049 mg/l (Maximum value).

The TDS of water was considerably high during dry season from December to April and the highest TDS value of water samples found during the month of April (TDS = 1044 mg/l) at spot-1.

The TDS was relatively low during wet season from May to October and the lowest average TDS value found during the month of December (TDS = 3.36 mg/l) at spot-2. The result of TDS is presented in Figure-5.

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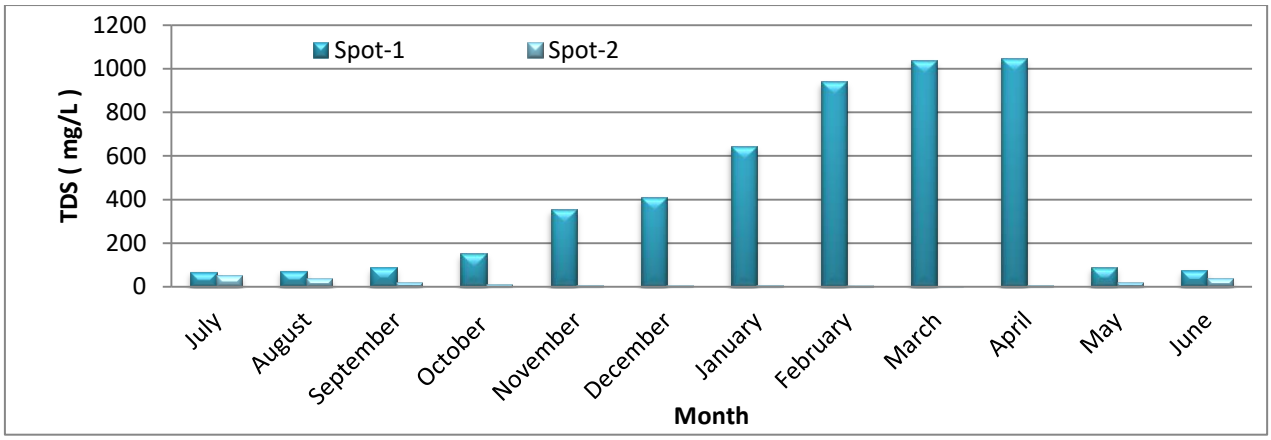

Figure 5. Monthly variation in TDS of Dhaleshwari river at two different spots

3.7 Turbidity

The turbidity was found higher during July the value is 131 NTU and the value tend to increase from April to September where the value increased rapidly from June to August.

The value of turbidity tends to decrease from October to February and a rapid change occurs from October to December. The lowest value was 2.38 NTU in November.

The highest value observed in July at Spot-1 is 131 NTU and the lowest in November at Spot-2 is 2.38 NTU. Figure 6 depicts the result of turbidity.

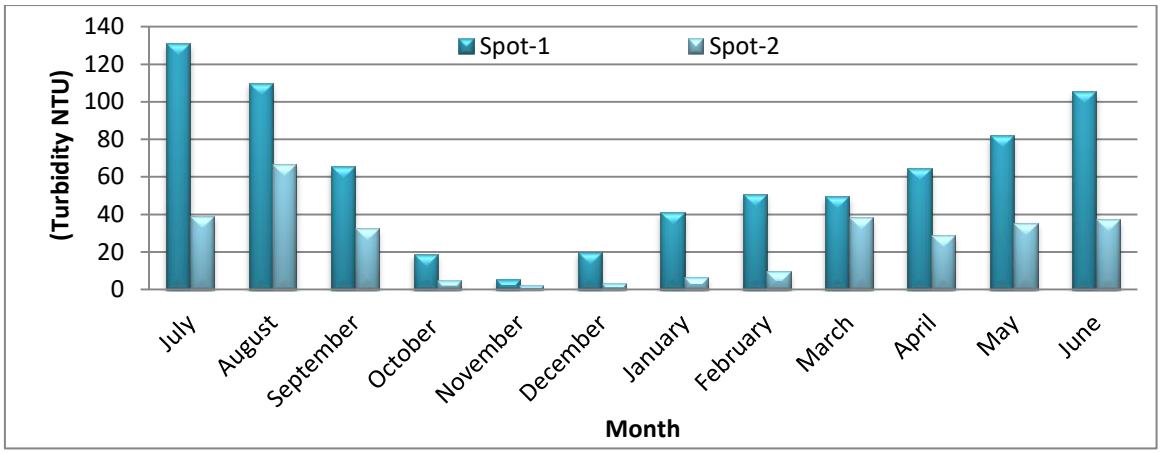

Figure 6. Monthly variation in Turbidity of Dhaleshwari river at two different spots

4. Conclusion:

The present study revealed that the quality of river water is already been polluted and in some extent became worst during the dry periods. Samples were collected monthly from the main stream of the river from those spots from July 2013 to June 2014. Physico-chemical parameters like colour, depth, temperature, total dissolved solid (TDS), turbidity were determined by standard method. Present study revealed that the river water is blackish during dry season and light green in wet season. The study showed that the average depth of the river at spot-1 was 786.67±39.72 cm and at spot-2 997.50±75.74. The average temperature at spot-1

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during the study period was 23.54±4.23ºC and at spot-2 it was 24.12±4.48ºC. The monthly values of water transparency were within the range of 18cm/sec (as minimum value) to 58.8 cm/sec (maximum value). Concentration of water dissolve solids collected at different points and at different times of year ranged from 3.36 mg/l (minimum value) to 1049 mg/l (maximum value). The highest value of turbidity observed in July at Spot-1 is 131 NTU and the lowest in November at Spot-2 is 2.38 NTU.

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