

**A COMPARATIVE STUDY ON THE SELECTED PARAMETERS OF
WATER QUALITY OF DHANMONDI, RAMNA AND
HATIRJHEEL LAKES IN DHAKA CITY**

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Water is a unique resource because it is essential for all life and it constantly cycles between the land and the atmosphere. Water resources are of great environmental issues and studied by a wide range of specialists including hydrologists, engineers, ecologists, geologists and geo morphologists (Kumar and Dua 2009). It has become an important issue for them as it affects not only human uses but also plant and animal life. Lakes are one of the most potential water resources that can meet the increasing demand of water throughout the Dhaka city in dry seasons. Humans frequently depend on lakes for a great many services such as drinking water, waste removal, fisheries, agricultural irrigation, industrial activity and recreation. For the reason lakes have become important ecosystems (Hameed M. *et al.* 2010). Water quality is deteriorated day by day due to numerous biological, physical and chemical variables causing water toxicity. When concentration of any element or compound exceeds the tolerance limit for organisms that element is treated as pollutants. Research work has been carried out to determine some vital water quality parameters those abate the water quality and find out the most vulnerable location of Dhanmondi, Ramna and Hatirjheel lake.

In the recent years environmental scientists of the country are interested to study the limnological status of surface water bodies to assess the water quality and biodiversity for conservation planning of the wetlands (Mohuya *et al.* 2010; Hossain *et al.* 2010; Khondker *et al.* 2012, Islam and Chowdhury 2013 etc.). Contamination of Dhanmondi and Gulshan lake waters was studied by Hossain *et al.* (2010).

Water of Dhanmondi, Ramna and Hatirjheel lakes was considered to assess their quality. Ten samples of each lakes were collected during the month of April and May from different locations of the lakes under investigation. Different physico-chemical properties such as temperature, conductivity, visibility, turbidity, pH, DO, BOD₅, TDS of the samples were studied in detail. The study area is comprised of three famous lakes of Dhaka City. They are different in location and vary in environmental aspects. Fig. 1 exhibits the study area with sampling points. Water samples were collected from the

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sampling points of the study area. Ten water samples were collected from different locations of each lake. Water sample was collected during spring season (April-May 2017). Samples were collected in 1.5 liter polypropylene bottles. Prior to sample collection, sampling bottles were prepared and labeled as standard procedures. Standard procedures were used to analyze the physico-chemical parameters of the water samples.

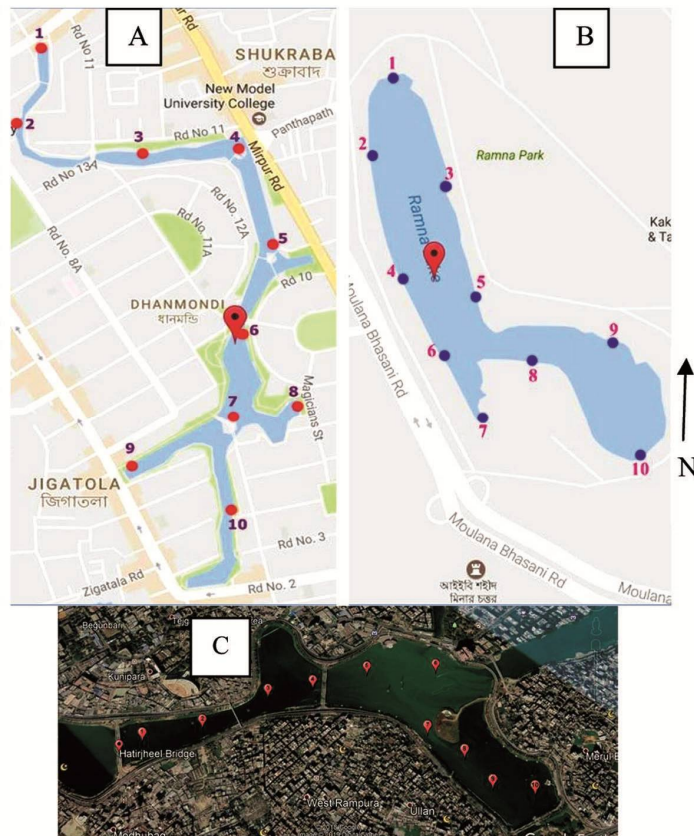


Fig. 1. Map of areas under study Dhanmondi (A), Ramna (B) and Hatirjheel lake (C).

A controlled value of pH is desired in water supplies, sewerage treatment and chemical processing plants. The pH plays an important role in coagulation, disinfection, water softening and controlling of corrosion. The pH also plays a significant role in biological treatment of waste water. According to ECR-1997, inland water pH values for recreational purpose and fisheries are 6.5-8.5 whereas pH level of water of Dhanmondi, Ramna and Hatirjheel lakes were 9.3 - 10, 7.2 - 8.8 and 8.7 - 9.5, respectively. Therefore, fish cultivation as well as the growth of different microorganisms are difficult. Table 1 also shows that water pH of Dhanmoni Lake was higher than that of other lakes.

Total dissolved solid (TDS) is the portion of total solids that passes through the filter. In potable water, most of the solids remain in dissolved form and consists of inorganic salts, small amount of organic matter, and dissolved gases. Table 1 shows that TDS of water samples of three lakes were in acceptable limit according to the WHO and Bangladesh standard for potable water. Hatirjheel showed maximum TDS among the studied lakes.

Table 1. pH, TDS and EC of water of the sampling sites of the study area.

Sam- ple ID	pH			TDS (ppm)			Conductivity ($\mu\text{S}/\text{cm}$)		
	Dhanmondi lake	Ramna lake	Hatirjheel lake	Dhanmondi lake	Ramna lake	Hatirjheel lake	Dhanmondi lake	Ramna lake	Hatirjheel lake
S ₁	9.5	8.5	8.9	137	110	462	395	230	660
S ₂	9.4	8.0	9.1	143	114	292	401	230	417
S ₃	9.2	8.8	8.6	138	119	354	353	235	505
S ₄	9.7	7.4	8.4	137	120	572	378	260	817
S ₅	9.3	7.6	8.5	139	112	452	384	240	645
S ₆	9.3	8.5	8.7	137	116	672	344	230	960
S ₇	10.0	8.0	8.9	127	113	598	337	240	854
S ₈	9.5	7.2	9.3	141	121	512	367	250	731
S ₉	9.9	7.6	9.5	124	110	354	345	240	505
S ₁₀	9.7	8.2	9.0	157	119	372	486	260	531

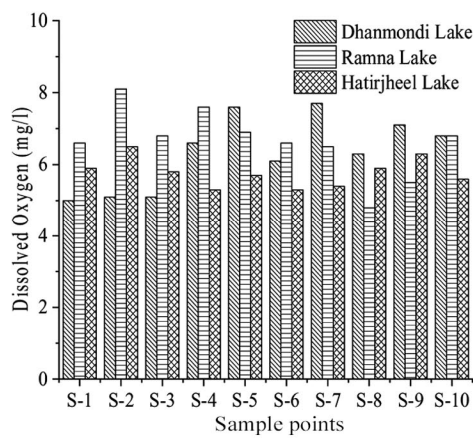


Fig. 2. DO of water of Dhanmondi, Ramna and Hatirjheel lakes.

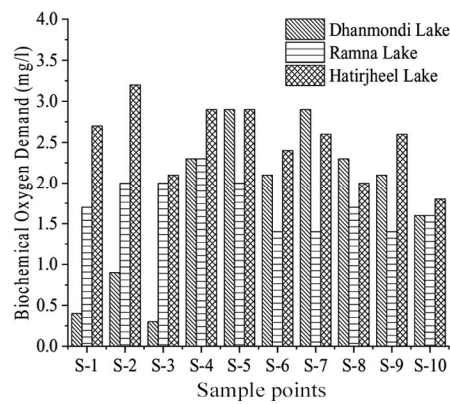


Fig. 3. BOD₅ of water of Dhanmondi, Ramna and Hatirjheel lakes.

Conductivity is a measure of how well water can conduct an electrical current. Conductivity increases with increasing amount and mobility of ions. From Table 1 it is found that electrical conductivity value for Hatirjheel lake was higher than others and exceeded the acceptable limit in four sampling location according to ECR (1997) standard for TDS. But condition of TDS in Dhanmondi and Ramna lakes was better in acceptable range.

Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution. Fig. 2 illustrated that field test result of dissolve oxygen of different sampling location in Dhanmondi, Ramna and Hatirjheel Lake. Standard value of dissolve oxygen for inland surface water is 5 or more (ECR-1997). Study found that maximum DO was 7.7 mg/l in Dhanmondi Lake, 8.1 mg/l in Ramna Lake and 6.3 in Hatirjheel Lake. Study also found that quantity of DO in the water of the lakes studied is within the permissible limit or little higher.

The amount of oxygen required by microorganisms to oxidize organic wastes aerobically is called biochemical oxygen demand (BOD). BOD is a measure of the strength of a water or wastewater, the greater the concentration of degradable organic carbon, the higher the BOD. Standard value of biological oxygen demand for inland surface water is 3 or less (ECR-1997). According to Fig. 3 highest BOD₅ of Dhanmondi Lake was 2.9 mg/L in Sample 5 and 7. In addition highest BOD of Ramna Lake was 2.3 mg/l in Sample 4 and that of Hatirjheel lake was 3.2 in sample 2. Comparatively BOD was higher in Hatirjheel lake and exceeded the permissible limit (ECR, 1997). BOD of Dhanmondi and Ramna Lake were within standard value.

Turbidity refers to how clear the water is. It is an important indicator of the amount of suspended sediment in water, which can have many negative effects on aquatic life. The suspended sediments that cause turbidity can block light to aquatic plants, smother aquatic organisms, and carry contaminants and pathogens, such as lead, mercury, and bacteria. Fig. 4 clarified that turbidity of different sampling point in Dhanmondi, Ramna and Hatirjheel lake. Study found that turbidity value is very much high in only one point of three Lakes, which is more crowdie and polluted area of the Lake. On the other hand, Bangladesh Standard of Turbidity value is 10 NTU, whereas the average tested result is lower than the BD standard.

The standard measurement for underwater visibility is the distance at which a Secchi disc can be seen. Factors affecting visibility include: particles in the water (turbidity), salinity gradients (haloclines), temperature gradients (thermoclines) and dissolved organic matter. Fig. 5 shows visibilities of Dhanmondi and Ramna lakes are higher than that of Hatirjheel lake. Visibility of 6-16 inch is good for fish culture (Boyd 1982). Thus, in most of the sampling points of Dhanmondi and Ramna lakes visibilities were not within the recommended level for fish culture.

The experimental data revealed that water of Hatirjheel lake was worse than that of Ramna and Dhanmondi lakes. The pHs of water samples of Dhanmondi lake ranged from 9.2 - 10.0 and that of Ramna and Hatirjheel were 7.2 - 8.8 and 8.4 - 9.5, respectively which are above the standard level as recommended by the environment

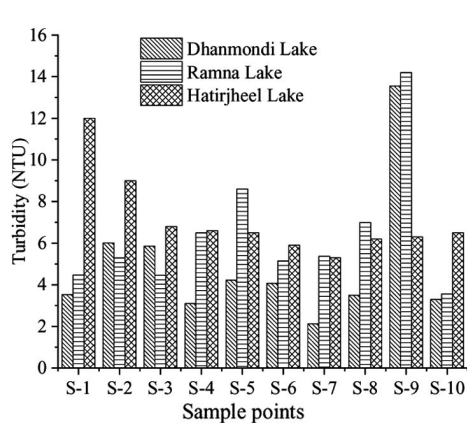


Fig. 4. Turbidity of water of Dhanmondi, Ramna and Hatirjheel lakes

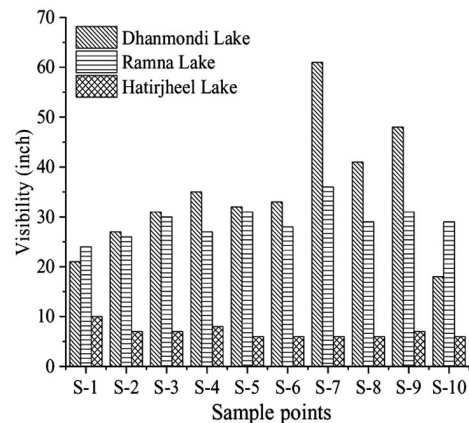


Fig. 5. Visibility of water of Dhanmondi, Ramna and Hatirjheel lakes.

conservation rules (ECR 1997). The other parameters of water samples, namely BOD₅, DO, turbidity, EC, TDS of the lakes were investigated and were found to be within the acceptable limit recommended by ECR 1997. From the above discussion it can be concluded that water of Hatirjheel lake is more polluted compared to other studied lakes.

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