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Relation Among Temperature, Salinity, pH and DO of Seawater Quality

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Abstract. Worldwide coastal and marine resources provide a wide range of essential ecological, economic and social benefits. Temp (OC), pH, Salinity (ppt) and DO (mg/L) measured monthly at sampling point of seawater for twelve months monitoring period in the Bay of Bengal to monitor the variation of selected parameters at six selected locations near Moheshkhali Upazila of Cox's Bazar District. Water samples collected from a depth of 0.5m. Temperature, pH, Salinity and DO levels and variation of respective monitoring location found consistent for a twelve months monitoring period. While temperature decreased, salinity increased at all sampling locations. It was also observed that, DO decreased, while temperature increased for twelve months monitoring period. Temperature of seawater of the Bay of Bengal found in a rage of 20OC to 30OC, pH found in a range of 7.6 to 8.3, Salinity measured in a range of 13ppt to 32ppt and DO measured in a range of 6.0mg/l to 7.9mg/l.
Keywords. Seawater; Temperature; pH; Salinity; Dissolved Oxygen.

1. Introduction

Worldwide coastal and marine resources provide a wide range of essential ecological, economic and social benefits. Marine water is direct and indirect sources of income for millions of people, provide food, serve as sinks for materials from land-based sources, maintain environmental cycles, regulate climatic conditions, and maintain the complex ecological balance of the array of marine and estuarine ecosystems that characterize the region.

Water from a sea or ocean is called seawater. On average, 35 g/l of dissolved salts found in seawater in the world's oceans that means average salinity is about 3.5%. Reference to U.S. Office of Naval Research Ocean, Water: Temperature (2007), at typical salinity, it freezes at about −2 °C (28 °F). In 2012, Tim, et.al stated that, seawater pH is typically limited to a range between 7.5 and 8.4. But J.J. Morgan in 1981 stated that there is no universally accepted reference pH-scale for seawater and the difference between measurements based on different reference scales may be up to 0.14 units.

According to EPA Notification (GSR 7, dated Dec. 22, 1998), In a coastal segment marine water is subjected to several types of uses therefore according to the types of uses and activities, water quality criteria have been specified to determine its suitability for a particular purpose.

Dixon W and Chiswell B in 1996 expressed that the water quality plays very important role in well- being of human, animals and plants inhabiting the area. Surface water quality within a region is influenced by both natural processes and anthropogenic activities stated by Pejman A H et al. (2009).

Rajwa et al. in 2014 expressed that, DO is primarily dependent upon water temperature; he further expressed it dependence undergoes alterations due to changing hydrometeorological conditions and the intensity of biological processes such as photosynthesis, respiration and decomposition of organic matter. Moore et al. in 2005, Moehansyah et al. in 2002 and Cooke et al. in 2011 described that, most anthropogenic activities generally raise the temperature of receiving waters, cause sedimentation and eutrophication which leads to the turbid environment and depletion of DO content in water column.

2. Objective of The Study

The core focus of the study, more specifically, is based on the measurement of selected physical parameters of seawater in the Bay of Bengal. In this regard, objective of this research are-

- To observe the variation of selected parameters.
- To recommend seawater quality standard for some selected parameters.
- To summarize present knowledge, knowledge gaps and directions for future research.

The study can lead towards a new era of seawater quality of Bangladesh to set standard for seawater considering industrialization at coastal area in Bangladesh.

3. Materials and Methods

Seawater collected from selected location in the Bay of Bengal. Study are was near Matarbari and Dhalghata union under Moheshkhali Upazila of Cox's Bazar District. Literature was reviewed in order to compile reliable information on seawater quality. The analyses were done using several test methods such as electrochemical and optical. Sea surface water samples collected from six locations for a period of 12 months, from November 2018 to October 2019 at 0.5m depth. Water sampling locations are mentioned in below table 1. Sampling location shown in below figure 2.

Table 1: Water Sampling Locations

SN	Sampling Locations ID	GPS Coordinates of Sampling Locations	
1	SW 1	21°43'15.75"N	91°51'46.25"E
2	SW 2	21°41'49.44"N	91°51'36.50"E
3	SW 3	21°40'48.88"N	91°50'42.39"E
4	SW 4	21°39'6.37"N	91°50'3.33"E
5	SW 5	21°37'22.52"N	91°49'28.16"E
6	SW 6	21°35'1.30"N	91°48'55.28"E

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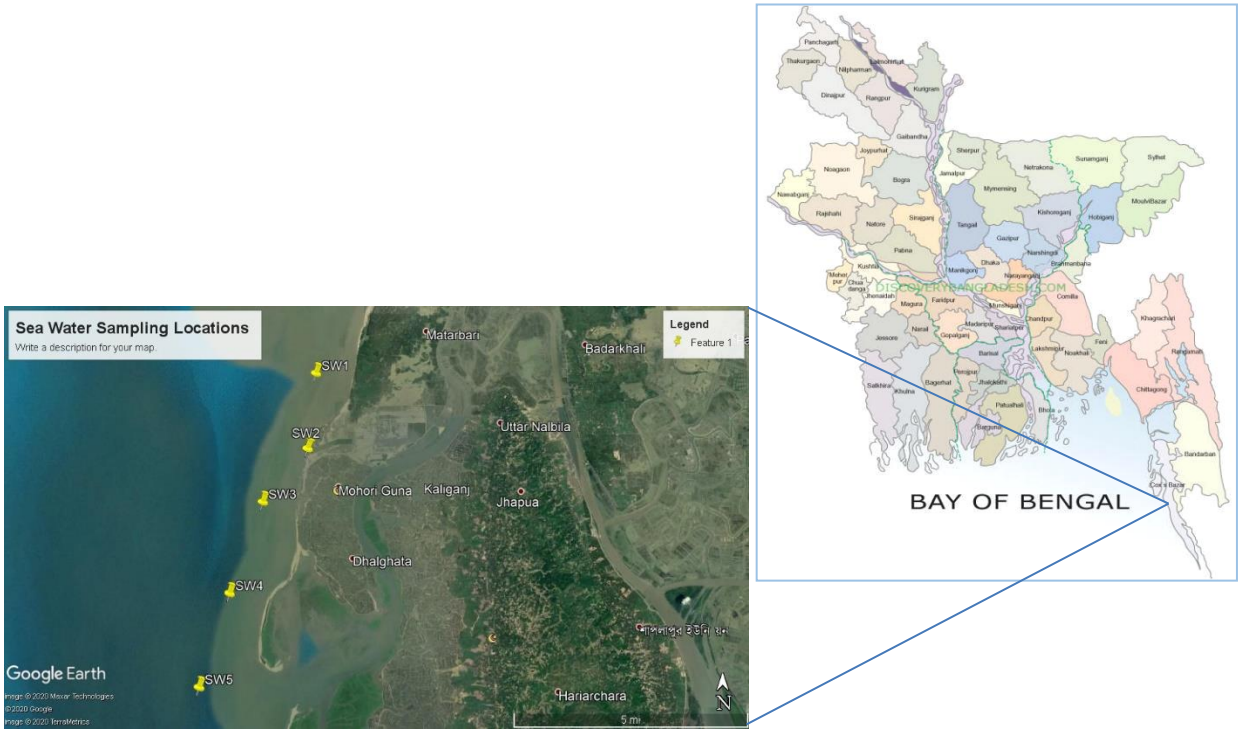

Figure 1: Seawater Sampling Locations.

Temp (OC), pH, Salinity (ppt) and DO (mg/L) measured monthly at sampling point of seawater for twelve months monitoring period from November 2018 to October 2019.

4. Results and Discussions

During 12 month monitoring period, temperature at location SW1 found in a range of 20^{O}C – 30^{O}C, pH found in a range of 7.8 – 8.2, Salinity found between 22ppt and 30ppt and DO found in a range of 6.1mg/l to 7.8mg/l. Analysis result shown in Figure 2.

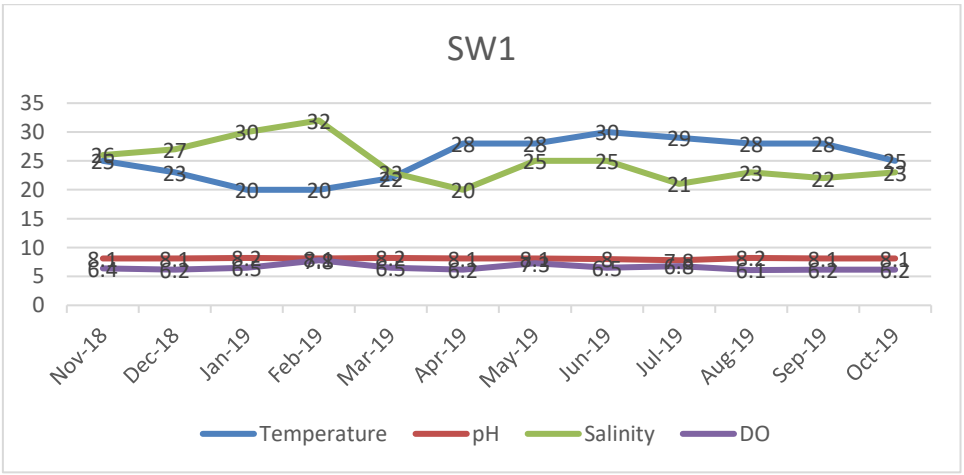

Figure 2: Analysis Result of Location SW1.

Surface seawater temperature at location SW2 found within 20^{O}C – 30^{O}C, pH found in a range of 7.9 – 8.3, Salinity found between 20ppt and 32ppt and DO found in a range of 6.0mg/l to 7.8mg/l for 12 months monitoring period. Analysis result shown in Figure 3.

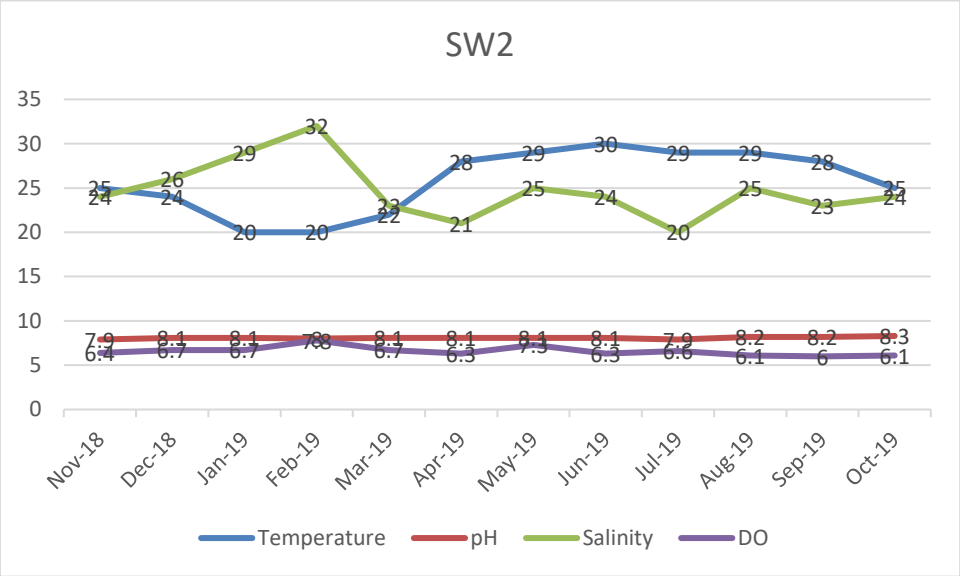

Figure 3: Analysis Result of Location SW2.

At location SW3 for 12 month monitoring period, temperature at location SW3 found in a range of 20^{O}C – 30^{O}C, pH found between 7.9 and 8.2, Salinity found between 20ppt and 32ppt and DO found in a range of 6.1mg/l to 7.8mg/l. Analysis result shown in Figure 4.

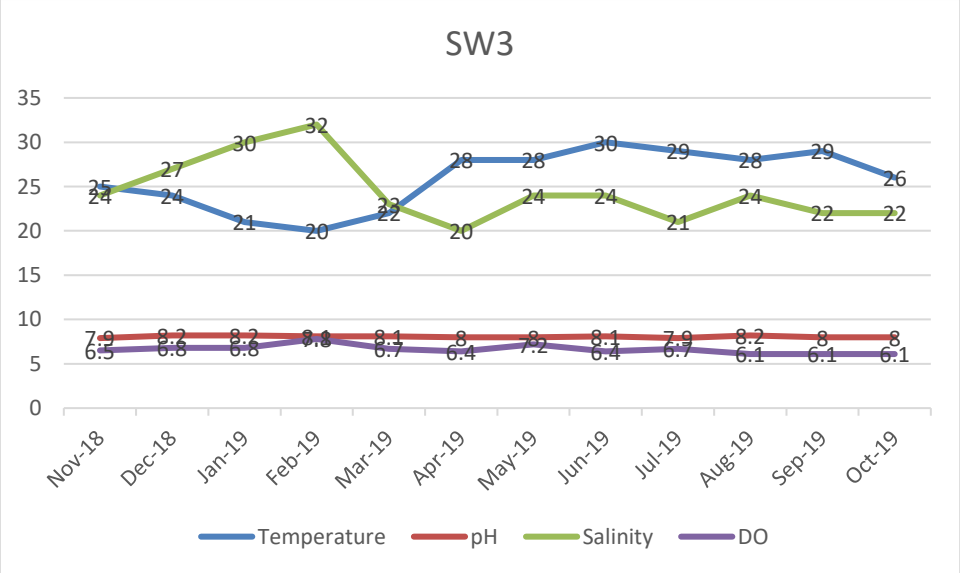

Figure 4: Analysis Result of Location SW3.

Surface seawater temperature at location SW4 found between 20^{O}C – 29^{O}C, pH found within 7.7 – 8.2, Salinity found in a rage of 19ppt - 32ppt and DO found in a range of 6.1mg/l to 7.8mg/l for 12 months monitoring period. Analysis result shown in Figure 5.

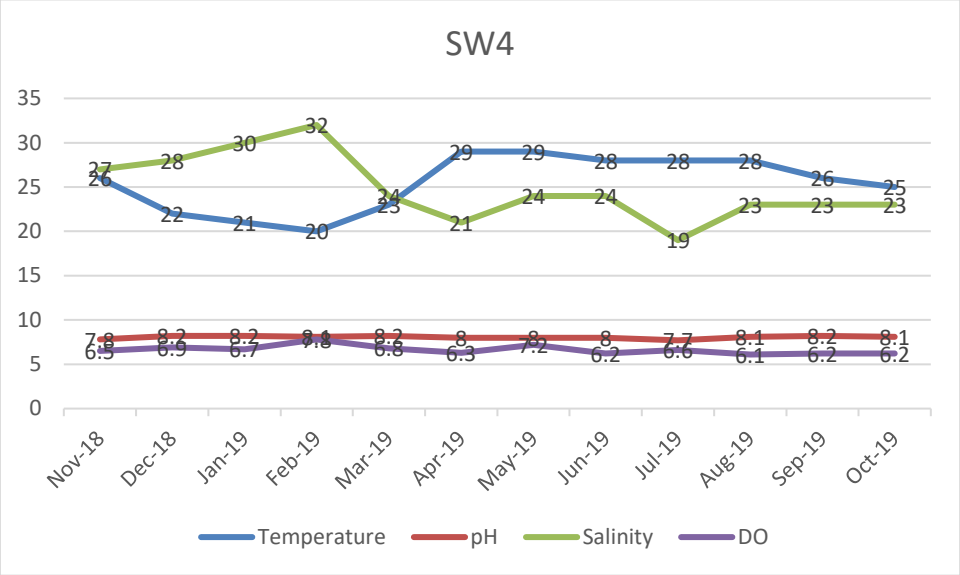

Figure 5: Analysis Result of Location SW4.

During 12 month monitoring period, temperature at location SW5 found in a range of 20^{O}C – 29^{O}C, pH found in a range of 7.7 – 8.2, Salinity found between 17ppt and 32ppt and DO found in a range of 6.0mg/l to 7.8mg/l. Analysis result shown in Figure 6.

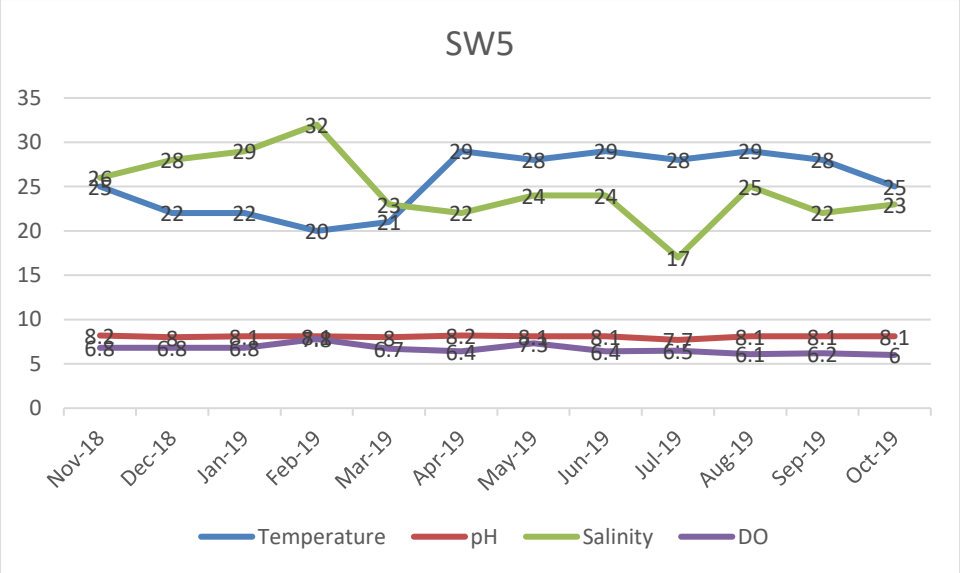

Figure 6: Analysis Result of Location SW5.

At location SW6 for 12 month monitoring period, temperature found in a range of 20^{O}C – 30^{O}C, pH found between 7.6 and 8.2, Salinity found between 13ppt and 32ppt and DO found in a range of 6.1mg/l to 7.9mg/l. Analysis result shown in Figure 7.

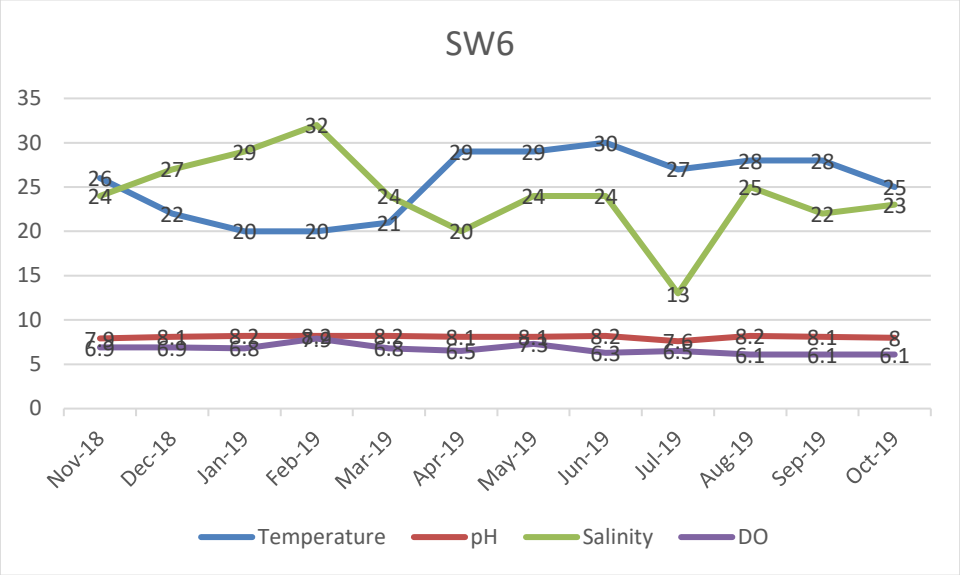

Figure 7: Analysis Result of Location SW6.

Location SW2 was nearest to the land around 50m and location SW6 was around 4,600m from nearest land area. SW1 was around 1,200m, SW3 was around 1,200m, SW4 was around 1,300m and SW5 was around 2,500m from nearest land. Distance between sampling location SW1 and SW6 was around 16,000m. Distance was measured considering GPS coordinate of each sampling locations. Though the sampling locations were from 50m to 4,600m from nearest land but no major deviation of result found during monitoring time considering different distance. Hence, impact of nearest community was not observed on seawater quality.

Temperature, pH, Salinity and DO levels and variation of respective monitoring location found consistent for a twelve months monitoring period. While temperature decreased, salinity increased at all sampling locations except July 2019. It was raining during sampling in July 2019. It was also observed that, DO decreased, while temperature increased for twelve months monitoring period. pH at all sampling location found similar during twelve months monitoring period.

5. Conclusions

Monthly water samples collected from six selected locations in the Bay of Bengal from a depth of 0.5m for twelve months. Temperature, pH, Salinity and DO levels measured and found a relation among those selected parameters round the year. While Temperature decreased, both Salinity and DO increased. Temperature of seawater of the Bay of Bengal found in a rage of 20OC to 30OC, pH found in a range of 7.6 to 8.3, Salinity measured in a range of 13ppt to 32ppt and DO measured in a range of 6.0mg/l to 7.9mg/l. Though it was a monitoring for a short period of twelve months, but it can help Bangladesh government for any development activities near onshore of the Bay of Bengal.

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