Vol 7, Issue 8, 2024 **Impact Factor: 7.355** DOI: https://doi.org/10.31426/ijamsr.2024.7.8.7622

IJAMSR

International Journal of Advanced Multidisciplinary Scientific Research (IJAMSR) ISSN:2581-4281

Comparative Study of Ponds Parameter in Egra Municipality Areas of West Bengal, India

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ABSTRACT

Water is essential to life as we know it, villages have long used ponds as a source of drinking water since ancient times. The current study evaluates the pond water quality in West Bengal's Egra municipality. The quality of water body is identified by its physico-chemical properties. The current study examined and graphically depicted physiochemical properties and climatic change. The ranges for parameters that were obtained were as follows: Water temperature: 35–25 degrees Celsius; soil pH: 5.6–6.5; dissolve CO2: 5–10 mg/L; dissolve O2: 9–14 mg/L. Physiochemical parameters exhibit fluctuations during the monsoon season. As a result, in order to eradicate water pollution, water bodies require greater conservation in terms of quality control.

INTRODUCTION

Since we all know that smaller things have greater significance in our lives, it is inaccurate to characterize small bodies of water as trivial and insignificant. Still, it is evident that small aquatic ecosystems are disregarded in almost all internationally significant perspectives and activities, including carbon processing and transportation, and are viewed as unrelated to global issues. The biosphere and the worldwide network of metabolically active sites are inherently accompanied by small bodies of water (Downing *et al*.,2009). These small aquatic habitats exhibit abnormally high levels of activity for many biological processes and cycles. Knowledge of the nutrient pattern in pond water bodies, as well as additional issues like metal distributions, fluxes, and conversions of significant gases (like N_2O and NHx), enhances knowledge of the roles that small bodies of water perform in world economy with regard to nutrient, gas, and toxin levels. Because of this changing aspect, which is distinctive to pond limnology, knowledge of their operation, succession, and origins is essential. Ponds have significant environmental and spatial significance despite being modest wetland habitats. At the landscape level, ponds are a vital freshwater habitat that contributes significantly to biodiversity preservation. But they are also susceptible to deterioration (Keeble *et al*.,). Ponds can have significant positive effects on nature, pollution reduction, flood prevention, and global warming mitigation with careful planning. On a small scale, they are incredibly inexpensive and simple to create, maintain, and safeguard. Additionally, the environment of the pond has a direct relationship with the local population. Ponds have become a more endangered form of freshwater

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environment, preserving cultural and economic benefits (EPCN 2008). In addition to providing water for enjoyment, agriculture, and cattle watering, effective management of pond water can also decrease floods, restore the aquifer, collect high rainfall events, and lessen the effects of warming temperatures. Inorganic elements of water bodies include the supply of energy required to sustain any living thing, the physical elements (rain, temperature, and weather) that affect it, and the availability of molecules (carbon, oxygen, etc.) needed for its survival.

In order to clarify the current situation of ponds in India, we have attempted to gather the disparate findings on ponds parameters through this article. The purpose of this study is to determine the parameters of the ponds in the municipality of Egra, West Bengal during the monsoon season.

REVIEW OF LITERATURE

- **International**

Water quality evaluation of the impacts of aeration on deep and shallow wet detention ponds in southwest Florida. - (July 2023 Tim J. Denison1, Michael L. Lohr1, David W. Ceilley2 and Edwin M. Evernham III2)

Ventilated and non-ventilated wet retention ponds of different depths were used in this study to evaluate oxygen concentrations and other quality of water data. Out of a number of wet detention ponds at Bonita Springs, Florida's The Brooks home complex, four ponds were chosen. With transportable multi-parameter meters, submerged data sondes, and conventional sampling methods for laboratory examination, a range of information on water quality was gathered from the ponds in autumn of 2004.

Water quality parameters assessment of Ras El-Ain natural ponds, Tyr, Lebanon. (2023, Milad Khatib, Mohamad Daoud, Wahib Arairo, Marianne Saba and Hussein Mortada)

The primary factor influencing human wellness, vegetation, and wildlife is the quality of water. However, exposure to either ecological (like soil erosion and change in the climate) or artificial (like unregulated waste from industry and sewage discharges) elements and actions frequently results in changes to the quality of water (Barbieri *et al*. 2021). The amount as well as the quality of surface water and groundwater will vary as a result of all these factors. Changes in the amount and quality of freshwater (snow, surface waters, and groundwater) provide essential data for assessing regional resource shortages (Andrew *et al*. 2017). These findings suggest that in order to ensure exceptional water quality, a chemical analysis of the primary ions and minerals for each of the five impacted areas is necessary. To lessen some of the pollutants in the freshwater ponds, it is also suggested that an in-depth investigation be carried out that links each trait and pollutant to its origin. The administration of Lebanon's water resources is impacted by the study. To improve the quality of the water, the authors suggest treating sewage at the source. It is recommended that locals become more knowledgeable and aware of water pollution. It is also necessary to establish surveillance systems and implement purification devices. Additionally, overuse of fertilizer would be prevented, and landfill building sites should be located far from water sources.

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Water quality parameters retrieval of coastal mariculture pond based on uav multispectral remote sensing. (2023, Yumeng Zhang, Wenlong Jing, Yingbin Deng, Wenneng Zhou)

1) The findings of the developed model demonstrated that the obtaining models for SS, COD, NO_3-N, and chl-a were more accurate than those for other factors. 2) The best forecasting framework was developed by applying the model to the testing set data, which produced a coefficient of correlation of 0.93 between the observed and expected SS values and an overall mean error of prediction of 4.65 mg L−1.In contrast to the other models, which have corrosion coefficients of 0.87, 0.86, and 0.81, respectively, the findings of the validation set show that the corrosion coefficients of chl-a, COD, and NO3-N are all more than 0.8. This study offers a guide for satellite-based assessment of water quality in rainy and overcast regions for fish farming. In 2020, the aquaculture and fishing sectors combined to produce a record 214 million tons worldwide, comprising 36 million tons of algae and 178 million tons of aquatic organisms.

- **National**

Multivariate analysis to assess the physico-chemical parameters and phytoplankton blooms in a eutrophic pond. (2023, Raju Potharaju and M. Aruna)

Between March 2022 and February 2023, the water biochemistry of an annual mud pond and the characteristics of phytoplankton generation in a chosen pond were examined. The present study concentrated on the physical, chemical factors like temperature, transparency, pH, electrical conductivity (EC), dissolved oxygen (DO), biochemical oxygen demand (BOD), ammonia, total phosphorus (TP), dissolved iron, and chlorophyll a—that influence the expansion of phytoplankton in the pond.

The biomass of phytoplankton was calculated using chlorophyll a. The pond hosted submerged phytoplankton growth of *Chlorella vulgaris, Aphanothece sp., Leptosira sp., Lepocinclis globulus*, and *Lepocinclis fusiformis*. Distinct scums of *Euglena proxima* and *Lepocinclis globulus* were also observed in March 2023. A major component assessment was conducted. The present study revealed the degree of natural pollution in the experiment's pond that led to the growth of Euglenozoa.

Nitrogen is released as ammonia when leaf litter decomposes organically. It was shown that the presence of iron that dissolved increased the dominance of *Euglena proxima* and *Lepocinclis globulus*. It was found that biological decay and natural eutrophication were the main causes of the pond's algae bloom generation. The new study highlights the need for annual pond maintenance and silt removal in order to maintain and preserve these important regional sources of fresh water.

Water Quality Assessment of Chandubi Lake with special reference to Nutrients and Productivity at Primary Level. (June 2023, Aminur Rahaman)

The goal of the current study was to gain a primary understanding of the changing nature of the physiological indicators and general productivity of Chandubi Lake. The average water temperature is 26.74 ± 3.84 °C, with a range of 33 °C to 21 °C. Chandubi Lake experiences summer temperatures

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between 24°C and 31°C and winter temperatures between 15°C and 22°C. Summer time scorching heat can cause eutrophication by lowering the level of oxygen and promoting the emergence of algae. However, aquatic species may experience a drop in development and reproduction as a result of lower rates of metabolism brought on by cold temperatures. A further important factor influencing the aquatic life in the lake is pH. Chandubi Lake has a pH between 7.5 and 8.5. Both aquatic flora and fauna are thought to flourish well in this range. A departure from this range, however, may put aquatic life under stress and have a negative impact on its development and ability to reproduce. The condition of the lake is also determined by dissolved oxygen (DO), another crucial factor. According to reports, Chandubi Lake's DO levels fluctuate between 5.7 to 11.2 mg/L. As it is required for respiration, DO is vital to aquatic creatures' existence. Fishes as well as other aquatic beings require high DO levels to develop, whereas decreased DO levels can result in stress due to oxygen and, in severe situations, even death.

One of the limiting factors in Chandubi Lake is the amount of free CO_2present. According to reports, Chandubi Lake's levels of nutrients fall below the Central Pollution Control Board's (CPCB) permitted levels.

Study of physico-chemical parameters on a fresh water pond of Orai, U.P, India. (2023, Rashmi Singh, Shreyasi Niranjan band Sasya Nagar)

Ponds are under the category of lentic wetlands, which are negatively impacted by human activity. Mahil Pond is a freshwater pond located in the center of the city (Orai), and the goal of the present research is to evaluate the physico-chemical characteristics of its water. The current study was carried out between January 2022 and December 2022, which is a period of twelve months. Monthly information was collected and then categorized by year, along with its respective standard deviation.

Water pH, temperature, oxygen concentration, BOD, alkalinity, hardness, nitrate-nitrogen, and phosphates were among the characteristics that were examined in this study. The results of this investigation showed that the pond water's alkalinity level is higher than the World Health Organization's permitted levels. Many of the factors being evaluated, however, some are above the acceptable limit, while some are inside the acceptable range. The current investigation makes it clear that the water in the Mahil Pond is situated just below the contamination limit, making it unfit for human consumption as well as for the survival of local creatures. Improving pond water standards can be accomplished by reducing human activity and implementing municipal sanitation as soon as possible.

- **West Bengal**

Physicochemical analysis of some water ponds in and around Santiniketan, West Bengal, India. (2023, Aniruddha Nag, Hema Gupta Joshi).

Some biophysical properties of the surface water of a few ponds located within and around Santiniketan are reported in this research. Surface water's purity was assessed by measuring physical (pH, electrical conductivity, and alkalinity) and chemical (sodium, potassium, chlorinity, salinity, free CO2, and COD) characteristics.

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Significant differences in the physico-chemical characteristics of the water in several ponds were found by the investigation. The parameters' values included alkalinity 39.4 to 391.2 Ppm bicarbonates, Na+1.7 to 8.6 ppm, K+ 0.29 to 16.5 ppm, chlorides 55.44 to 443.11 ppm, free Co 24.75 to 26.14 ppm, COD 2.7 to 52.3 ppm, electrical conductivity 1.174 to 712.5 µmhos cm-1, and pH 5.8 to 8.5. The results of the correlation study showed a significant negative link ($P<0.05$) and a high significant relationship ($P<0.001$, $P<0.01$) between the parameters. Amongst all the ponds, Churamani was extremely contaminated. With the exception of COD, electric conductivity, and alkalinity, the most of the metrics were under the permissible range. Churamani was the most toxic of all the ponds under study, with the highest COD, pH, salinity, and chlorinity readings. The locals' overuse of the pond and the dumping of their household trash into it were the causes.

Trend analysis of Sundarban shrimp pond parameters. (2023, Suvadeep Samanta, Prosenjit Pramanick, Sufia Zaman, Abhijit Mitra)

For ten years (2010–2019), the growth rate of *Penaeus monodon* was observed in two shrimp production ponds at Chemaguri, which is situated on Sagar Island in the Indian Sundarbans. Because of differences in nitrate, phosphate, and dissolved oxygen, the two ponds showed notable differences in the surviving frequency of the cultivated species.

Variations in the population size of the species grown (10 PL20/m2 in pond 1 and 25 PL20/m2 in pond 2) are the primary source of this discrepancy. These variations led to the production minerals (apart from silicate) and changes in dissolved oxygen (DO). The current state in the Sundarban region's shrimp farming sector may be restored and environmentally balanced with the addition of a biotreatment pond and improvement of stocking density. Substantial R2 values for nitrate and phosphate are found in both ponds' statistical analysis of the water parameters, suggesting a continuous rise in the elements produced by the feces and leftover food of the cultivated species.

Examining the extent of seawater intrusion from groundwater quality analysis at Purba Medinipur coast of India, April 2020. (2020, Souvik Chakrabortya,b , Bernadette Johna, Subhasish Das and Prabir Kumar Maity)

Invasion of seawater has a significant impact on these areas due to the contamination of groundwater. Astichawk, Bhajachowlee, and the other locations listed earlier are situated close to the seaside on Purba Medinipur's west side. Seawater intrusion therefore has a significant impact on these areas. The permissible range for total hardness, as stated in (IS)10500:2012, is 40–80 ppm. The total hardness of Purba Medinipur is too high to be used as water for drinking. Acceptable range for the total hardness is 30 ppm, following IS 4251:1967. For the purpose of irrigation, a total hardness of 100 to 150 mg/L is thought to be optimal for growing plants. It is clear that flooding from seawater affects primarily Purba Medinipur's coastal areas, particularly the south and west sections that are close to the Bay of Bengal, Pichabani. From the perspective of overall hardness, water from the sea may have a significant impact on several locations in the coming years. (IS) 10500:2012 states that 600 ppm of sodium chloride is an acceptable level. From the perspective of magnesium carbonate, invasion of seawater has no effect on the magnesium carbonate level of any shoreline area in Purba

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Medinipur. Purba Medinipur's Astichwak, Kumirda and Badalpur, iron levels are within the safe range for water to be drunk. Seawater intrusion has a significant impact on the remaining locations. Infiltration of seawater has been observed to have a significant impact on Purba Medinipur, leading to an increase in the values of ground-water quality parameters. There won't be any clean water accessible in Purba Medinipur if such careless use of groundwater persists with no limitations, and the lithological character, water in the ground, and surface water will all be completely saturated with salty water that has invaded from the sea.

OBJECTIVES

1. Collect and study the properties of water and soil fromponds in Egra.
2. Study the area around the pond.
3. Identification of animal and plant species near the pond.

MATERIALS AND METHOD

- Mainly survey based and observation-based method has been used.
- Water and soil sample has been collected from the site.

Study Site

Below the mentioned 2 study sites are selected (Fig 1,2,3) –

(i) Hattanagar Shib Mandir (SS 1)

Latitude – 21.9022^0 N

Longitude - 87.5384° E

Fig - 1: Site 1

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(ii) Road Safety Park (SS 2)

Latitude - 21.8998^0 N

Longitude – 87.5359^0 E

Fig - 2: Site 2

SS1 **SS2**

Fig 3: **Study Area SS1: Hattanagar Shib Mandir, SS2: Road Safety Park**

Sample Collection

Soil: Soil sample was collected from the ghat of the pond and top layer of the soil was collected by hand. Soil sample was kept in an open container. (Fig - 4)

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Fig - 4: Soil Sample Collection

Water: water sample was collected from ghat 20cm under water surface. Sample was collected in an 1L water bottle. (Fig - 5,6)

Fig - 5: SS1: Temple Ghat

Fig - 6: SS2: Park Ghat

Identification of Species Around the Site

1. Hattanagar Shib Mandir (SS1): - Here are some regular animal species found in thesurrounding pond on initial naked eye observation.

(i) ***Pila Globusa* –**

Fig - 7: *Pila* sp.

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(ii) ***Sympetrum Fonscolombii*** **–**

Fig - 8: ***Sympetrum*** **sp.**

(iii) ***Cornu Aspersum*** **–**

Fig - 9: ***Cornu sp***

(iv) ***Harpaphe Haydeniana*** **–**

Fig - 10: ***Harpaphe*** **sp.**

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2. Road Safety Park (SS2)

(i) ***Lasius Niger* –**

Fig - 11: *Lasius* sp.

(ii) ***Khaki Campbell* –**

Fig - 12: *Khaki* sp.

(iii) ***Cornu Aspersum* –**

Fig - 13: *Cornu* sp.

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(iv) ***Omocestus Viridulus*** **–**

Fig - 14: ***Omocestus*** **sp.**

(v) ***Hoplobatrachus Tigerinus*** **–**

Fig - 15: ***Hoplobatrachus*** **sp.**

Water Properties

- **Dissolve O_2 measure in water sample –** Dissolve O_2 in fresh water pond was estimated by Winkler Iodometric Method.
- **Dissolve CO_2 measure in water sample –** 4 drops of Phenolphthalein indicator is added in sample and titrated against NaOH solution (0.0227N).

Fig - 16: Dissolve O_2 Measure in Lab

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- **Measurement of water temperature –** Water temperature was measured with a regular thermometer throughout the monthsin various weather conditions.

Fig - 17: Thermometer

Soil PH (with PH Meter)

This method gives direct reading andbecause of its accuracy and rapidity it is considered the best.

Take 10 gm of soil in a 50 ml breaker and add 25 ml of glass distilled water (soil: water ratio as 1:2.5). the suspension is stirred at regular interval for 20 minutes. PH meter is set, electrodes are immersed intothe sample and PH is measured.

6.5 to 7.5 PH value neutral, over 7.5 is considered alkaline, less than 6.5 is acidic. The sample ponds are acidic in nature.

Winkler Iodometric Method

1 ml of manganous sulphate and 1 ml of alkaline iodide reagent added into sample, then a precipitation is formed. 1 ml of conc. H2SO4 is added. 0.025N sodium thiosulphate isadded till color turned into pale yellow and 1% starch solution is added to give a blue color and the titration is terminated by turning the solution into color less one.

0	4.0	6.5	9.5	12
All fishes aredead	Very few fishcan live	Most big fish can live, but small fish can't	All fish can live	

The dissolve oxygen in the sample ponds are suitable for fishes to live.

Free Co_2

100 ml water sample is taken and 4 drop of phenolphthalein indicator added. Sample remain colourless and free CO_2 is present. Titration with 0.0227N NaOH solution and a faint pink colour appeared. The titration was repeated three times and mean value was taken. The dissolve C02 in the sample ponds are good for pisciculture.

Water Temperature

It was measured with thermometer. The water bodies were 3^0 to 4^0 higher than environmental temperature. SS1 site was little cooler than SS2 site.

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RESULTS AND DISCUSSION

Table 1: (Soil ph)

Study Area	Month				
	June	July	August	September	October
SS1	5.6	5.8	5.4	6.0	5.5
SS2	6.0	5.6	5.9	6.2	5.7

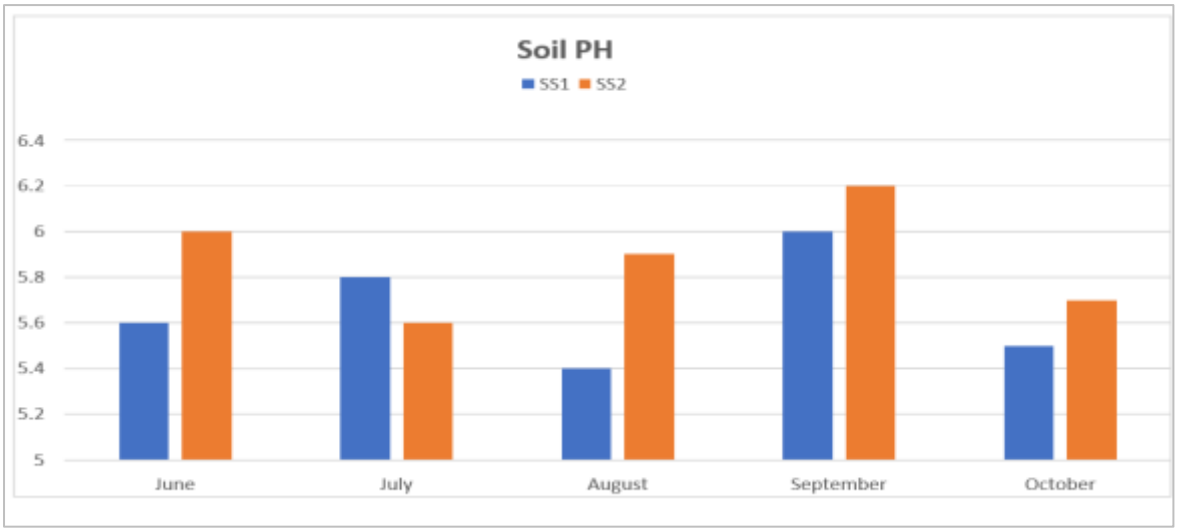

Fig - 18: Soil ph of both sites from the month of June to October

Table 2: (Dissolve o_2 in Water)

Study Area	Month				
	June	July	August	September	October
SS1	11	10	12	9	14
SS2	10	9.0	11	8	12

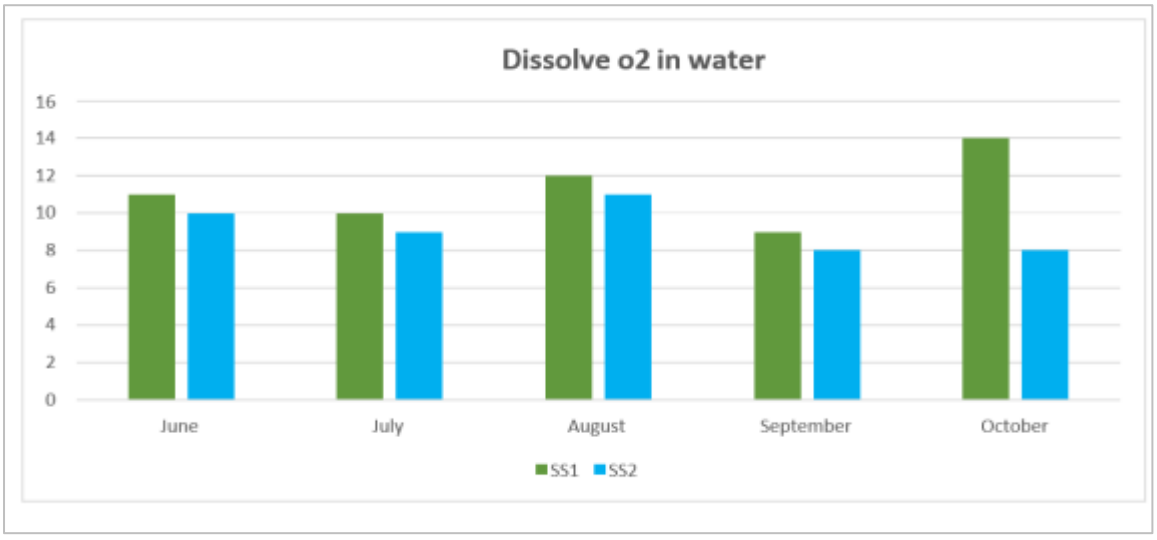

Fig - 19: DO in both site water from June to October

Vol 7, Issue 8, 2024 **Impact Factor: 7.355** DOI: https://doi.org/10.31426/ijamsr.2024.7.8.7622

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Table 3: (Dissolve co_2 in Water)

Study Area	June	July	August	September	October
SS1	8	5	9	7	7.5
SS2	7	6	7	5	6.5

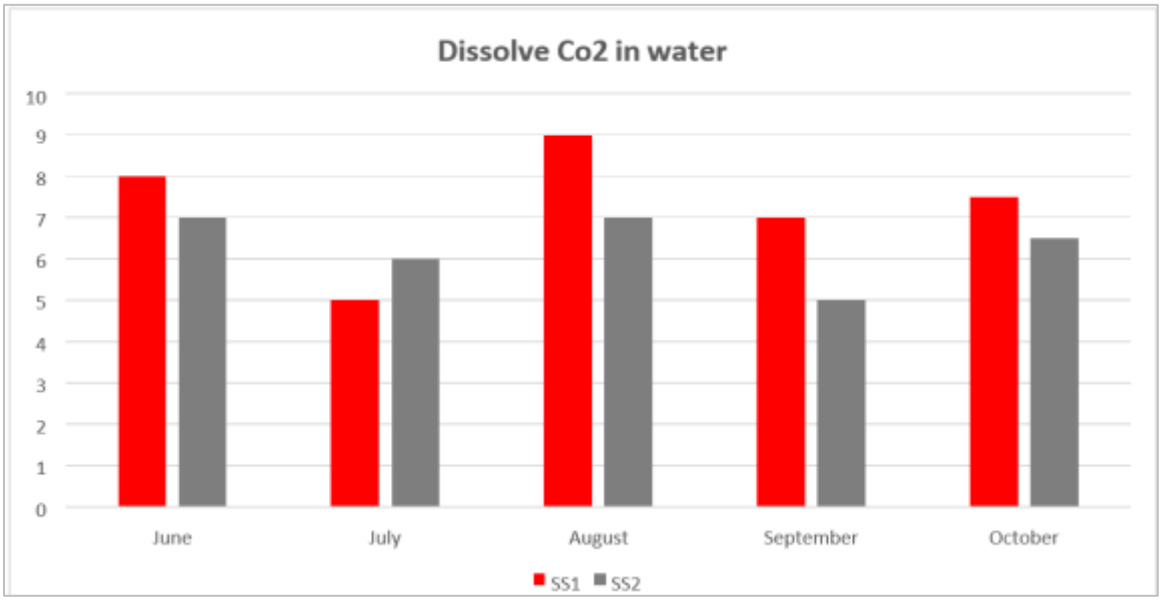

Fig - 20: CO_2 in both site water from June to October

Table 4: (Water Temperature)

Study Area	Month				
	June	July	August	September	October
SS1	28	25	26	27	32
SS2	30	30	27	29	35

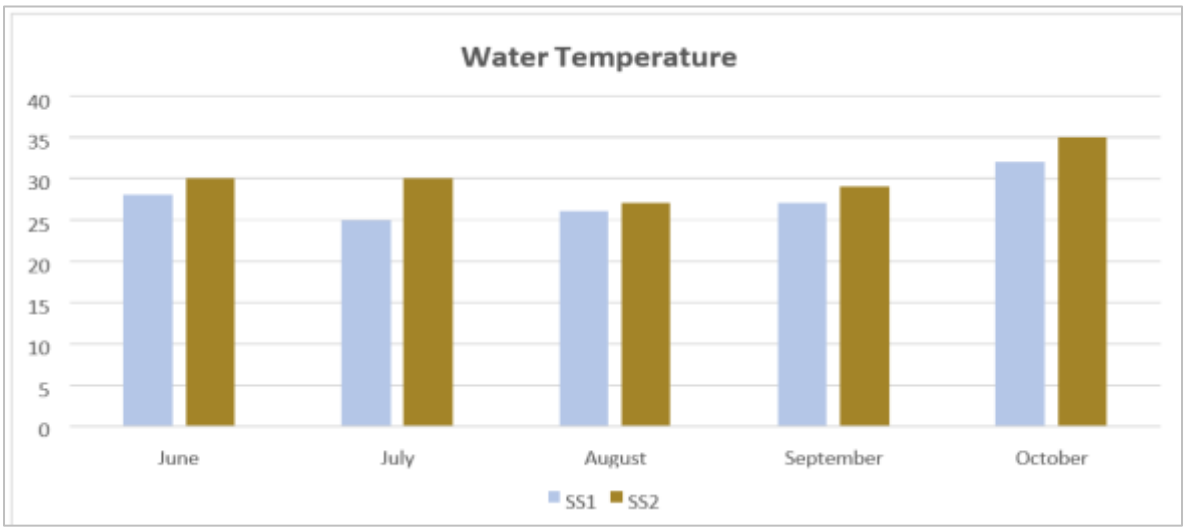

Fig - 21: Water temperature of both sites from June to October

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Comparison Between Sites

The growth of millipedes are much higher than the other species inSS1. The growth of ants and order Hymenoptera are much higher than other species in SS2. From the following data SS1 pond water is colder than SS2 pond. SS1 pond need more restoration than SS2. SS1 pond is used as a devotion place, on the other hand SS2 pond falls under the park and school usage. SS1 pond is darker in colour because dexcessive garbage and plastic, but SS2 ponds water is clearer.

The determination of soil pH is important for plant and animal life. Soil can be acidic, neutral, alkaline in nature. Slightly acidic soil (5.6 – 6.0) found in SS1 and SS2. Most plants grow with in a pH range of 4.0 – 9.5.

These data are similar to previous works that has been done in Purba Medinipur District.

CONCLUSION

This article is about the study of physico - chemical parameters like dissolve co2, dissolve o2, soil pH, water temperature of two fresh water ponds SS1 (Hattanagar Shib Mandir) and SS2 (Road Safety Park).

Although the data are limited, the current study clearly showclose relatedness between two sites. To conclude, these two ponds have ideal condition for plant and animal habitation and fish culture. It is important to conserve and restore theseareas from excess plastic garbage for the overall wellbeing of the fresh water ecosystem.

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