



### Short Communication

## Physicochemical analysis of pond water in Purba Bardhaman, West Bengal, India

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Available online at: [www.isca.in](http://www.isca.in), [www.isca.me](http://www.isca.me)

Received 23<sup>rd</sup> December 2017, revised 13<sup>th</sup> February 2018, accepted 21<sup>st</sup> February 2018

### Abstract

*Physico-chemical analysis of Mondal pond, Bardhaman town, Purba Bardhaman, West Bengal, India, carried out from March 2015 to February 2016. During the analysis, the limnological factors such as temperature, pH, DO (dissolved oxygen), free CO<sub>2</sub>, chloride, alkalinity, PO<sub>4</sub> (phosphate) were taken for consideration and the data were recorded and analysed. In this study, the air temperature ranges from 19°C to 34°C where as water temperature ranges from 16°C to 31.8°C. pH ranges from 8.2 (September) to 9.5 (August). Lowest value of DO was observed in April (4.1mg/l) and highest value was observed in December (13.1mg/l). Free carbon di oxide varies from 2.4mg/l to 10.2mg/l. Chloride content ranges from 70mg/l to 165mg/l. Alkalinity level ranges from 82mg/l to 165.5mg/l where as phosphate level was in between 0.40 mg/l and 0.86mg/l. According to above result, the selected pond is suitable for fish culture but continuous monitoring of all the parameters is necessary.*

**Keywords:** Mondal pond, physicochemical analysis, limnological parameters, fish culture.

### Introduction

An important part of ground water study is the water quality analysis i.e. the study of physicochemical analysis to determine or assess the water whether it is suitable for fish culture, irrigation or any other domestic purposes. Water quality is determined by different factors which may be categorised as physical, chemical, biological etc. All these factors affect water quality as well as the distribution, reproduction of different aquatic organisms like fish etc<sup>1</sup>. Because, all living organisms can tolerate certain range of these parameters. Major deviations from these ranges can affect seriously on body functions of aquatic organisms<sup>2</sup>. For this, my objective focuses on the study of limnological characteristics of fresh water pond required for fish culture.

### Materials and Methods

Description of the site: Name of the pond: Mondal pukur, Ichhlabad, Bardhaman. Colour of water: Green. Average depth: 8-9 ft. Type of water body: Perennial pond. Source of water: Rainfall, domestic and surface run off. Purpose of use: washing/cleaning, bathing. Management practices: Moderately clean, Fish culture noticed. Vegetation types: Water hyacinth; Coconut tree, mango tree at the bank of the pond.

**Study period:** Samples were collected once in a month from the pond between 8.30a.m. and 10 a.m. on and from March 2015 to February 2016.

**Collection of the sample:** Water samples were collected from the above mentioned pond in two plastic bottles, each of two litre size. The containers were properly washed with diluted hydrochloric acid and then rinsed with normal water followed by distilled water followed by sample water.

**Analysis of the sample:** Monthly samples were collected to analyse physico chemical parameters of the selected pond. At the site, a thermometer and a digital pH meter (HANNA) were used to record the temperature and the pH of the pond water respectively. For rest of the analysis, water samples were carried to the laboratory. In the laboratory, DO was measured by following Winkler's method. Titrimetric method was followed to measure free CO<sub>2</sub>.

### Results and discussion

**Temperature:** One of the most important factors is temperature. In case of limnological study, it is very much essential to study as the growth and distribution of plants and animals is influenced by this factor<sup>3</sup>. Dissolved oxygen level is also influenced by this factor<sup>4,5</sup>. In this study, the air temperature was found to be highest in June (34°C) and lowest in January (19°C). Water temperature was found to be highest in June (31.8°C) and lowest in January (16°C). Due to the smaller size of the pond, quick reaction to atmospheric temperature changes was noticed<sup>6</sup>. Similar works with similar findings were found in the study of Saha et al<sup>7</sup> and Mishra et al<sup>8</sup>.

**Water pH:** The negative logarithmic value of hydrogen ions in the water is pH which is an indicator of acidity or alkalinity. In this study, the pH values varied from 7.8 to 9.5. From these values, it may be interpreted that the pond water is alkaline. The minimum pH was recorded in summer and maximum pH was recorded in winter. This study is in close conformity with the study of Adebisi<sup>9</sup> and Tara *et al*<sup>10</sup>.

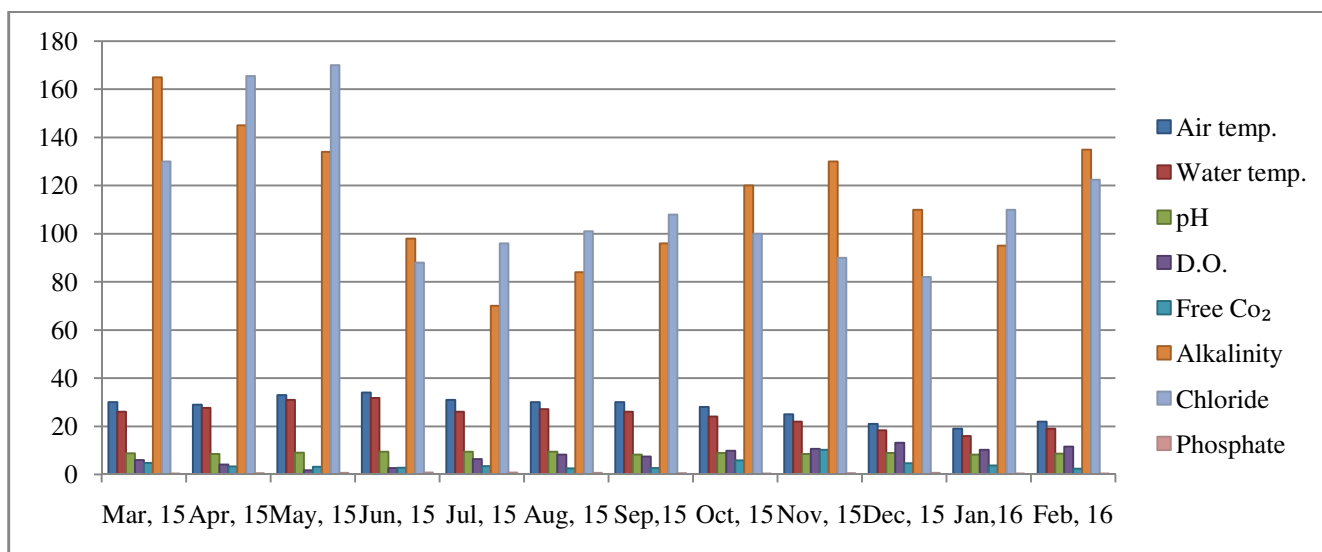
**DO (Dissolved oxygen):** The DO is a vital factor. It was high in winter and low during monsoon. This is due to low atmospheric temperature in winter (high level of dissolved oxygen) and high metabolic rate of organisms<sup>11</sup>. In this study, it is found to be highest in December (11.1mg/l) and lowest in May (2.7mg/l). These findings were supported by the findings of Pathak and Mankodi<sup>12</sup>, Edmondson<sup>13</sup>, Manawar<sup>14</sup>. In low dissolved oxygen level, organic matters started decomposing<sup>15</sup>.

**Free Carbon Di Oxide:** Free carbon di oxide in the pond is due to the seeping of inflowing ground water, respiration of aquatic organisms, decomposition of aquatic organic matter etc<sup>3</sup>. Free CO<sub>2</sub> value was lowest in June (2.8mg/l) i.e. in the summer season and the value was highest in November (10.2mg/l) i.e. in the winter season. Similar observations were found in the work of Tara *et al*<sup>10</sup>, Jain and Senapati<sup>16</sup>, Qadri and Shah<sup>17</sup>. They also noticed high summer value of free carbon di oxide.

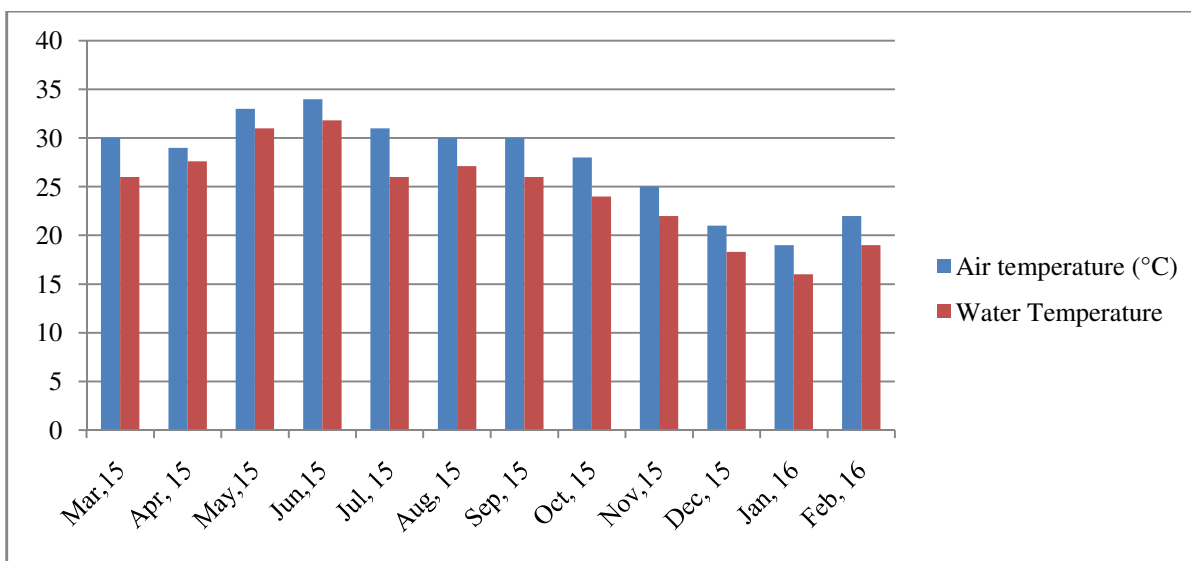
**Chloride content:** One of the most vital inorganic ions in water is chloride. This is found in almost all water bodies as it is highly soluble. It is also regarded as an indicator of sewage pollution<sup>5</sup>. In my study, chloride is recorded to be highest in March i.e. in summer season and lowest in July i.e. in the monsoon season. Chaturbhuj *et al*<sup>18</sup>, Jana<sup>19</sup>, Arya *et al*<sup>20</sup> also recorded such type of finding.

**Table-1:** Monthly variation in Physicochemical factors of Modol Pond.

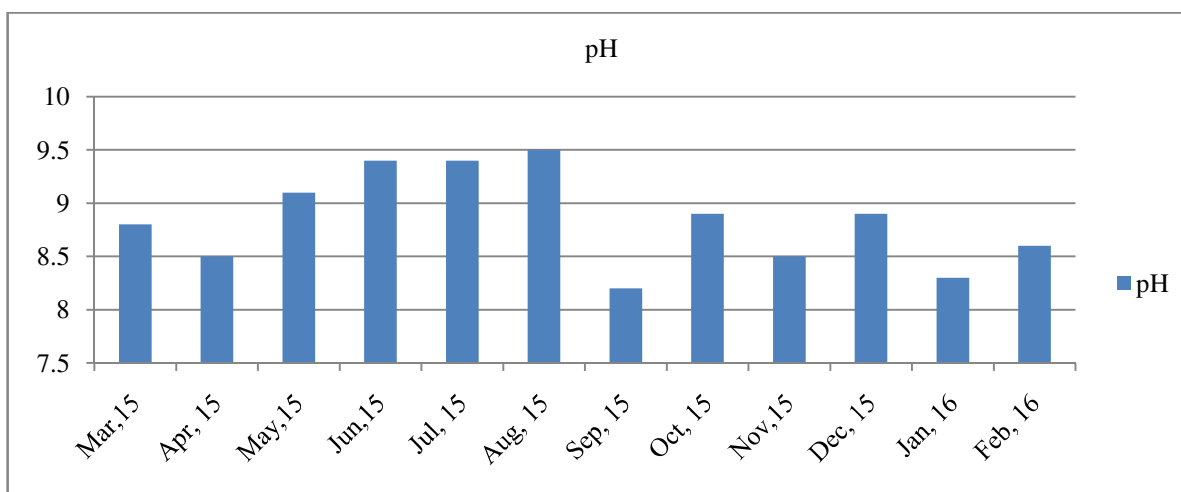
Parameters	Mar, 2015	Apr, 2015	May, 2015	Jun, 2015	Jul, 2015	Aug, 2015	Sep, 2015	Oct, 2015	Nov, 2015	Dec, 2015	Jan, 2016	Feb, 2016
Air temperature (°C)	30	29	33	34	31	30	30	28	25	21	19	22
Water Temperature (°C)	26	27.6	31	31.8	26	27.1	26	24	22	18.3	16	19
pH	8.8	8.5	9.1	9.4	9.4	9.5	8.2	8.9	8.5	8.9	8.3	8.6
Dissolved Oxygen (mg/l)	6.0	4.1	1.7	2.6	6.4	8.2	7.5	9.8	10.6	13.1	10.2	11.6
Free Carbon di oxide (mg/l)	4.8	3.3	3.2	2.8	3.5	2.5	2.6	5.8	10.2	4.6	3.7	2.4
Alkalinity (mg/l)	165	145	134	98	70	84	96	120	130	110	95	135
Chloride (mg/l)	130.0	165.5	170	88	96	101	108	100	90	82	110.0	122.5
PO <sub>4</sub> (Phosphate) (mg/l)	0.46	0.58	0.62	0.86	0.75	0.68	0.54	0.42	0.54	0.60	0.40	0.45



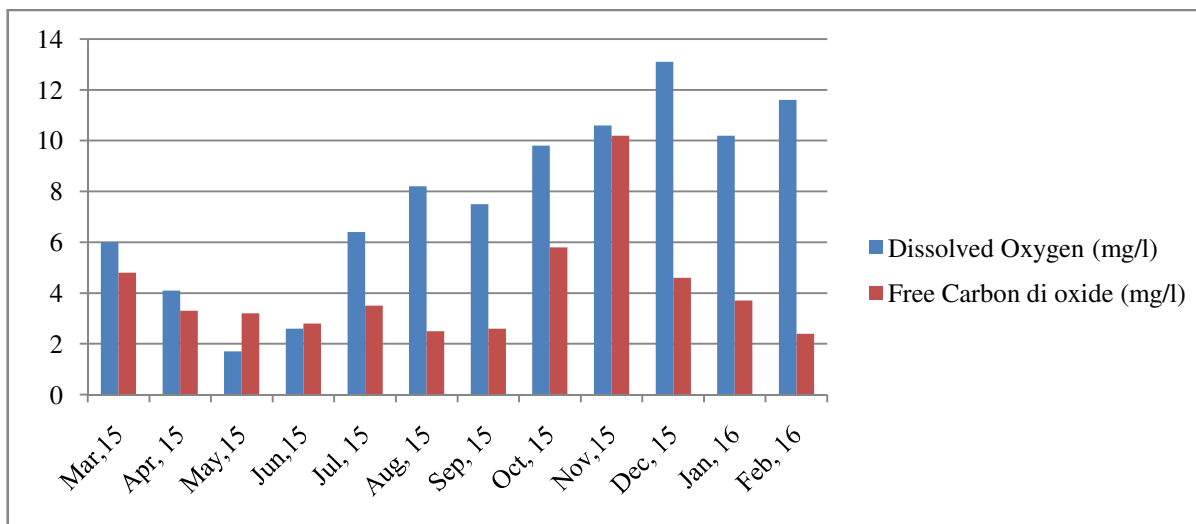
**Figure-1:** Monthly variation of different limnological factors.



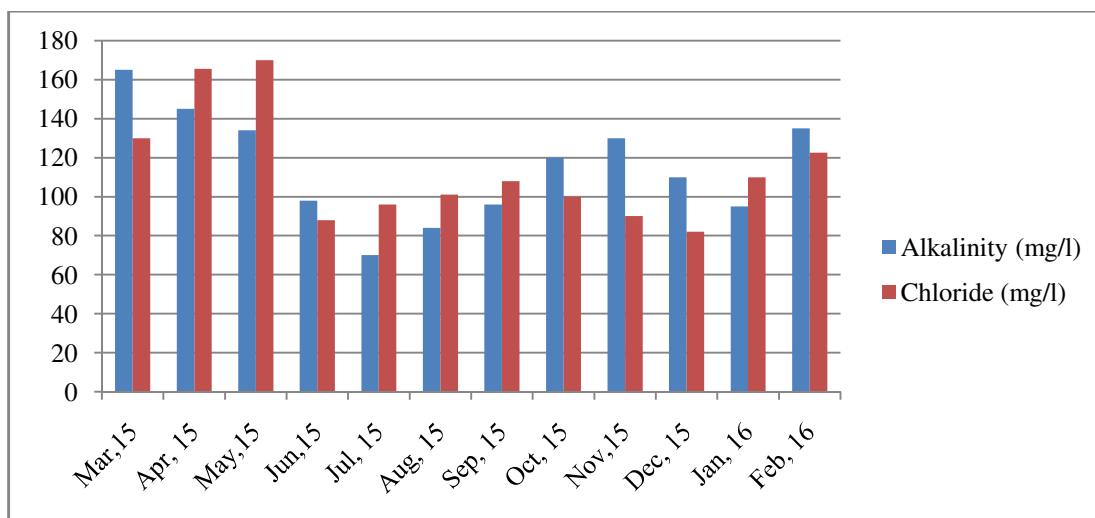
**Figure-2:** Variation of temperature of Mondal Pond.



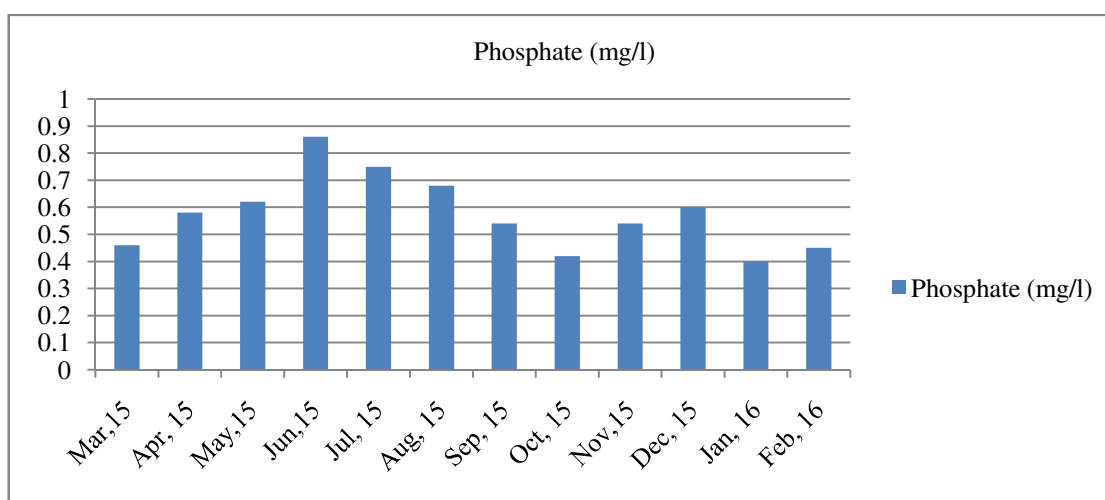
**Figure-3:** Monthly variation of pH of Mondal Pond.



**Figure-4:** Monthly variation of Dissolved Oxygen and Free Carbon Dioxide of Mondal Pond.



**Figure-5:** Monthly variation of Alkalinity and Chloride content of Mondal Pond.



**Figure-6:** Monthly variation of Phosphate content of Mondal Pond.

**Alkalinity:** The ability to resist changes in pH is alkalinity which is due to the presence of carbonates, bicarbonates hydroxides, phosphates and other compounds in water<sup>21</sup>. Evaporation and decomposition of organic matter, photosynthesis, denitrification etc are the main factors for increasing alkalinity whereas nitrification, respiration etc are the main factors for decreasing alkalinity<sup>22</sup>. It is highest in May and lowest in December in my study.

**Phosphate:** The phosphate content was lowest in January, 2016 (0.40mg/l) and highest in June, 2015 (0.86mg/l) with highest value in June i.e. in monsoon season and lowest value in January i.e. in winter season. Similar findings were recorded in the works of Mishra et al<sup>8</sup>, Kannan and Job<sup>23</sup>.

## Conclusion

According to National Agriculture Extension Research<sup>24</sup>, light green or green colour of water is suitable for fish culture. 28-

32°C temperature is suitable for major carps<sup>25</sup> where as 24-30°C temperature is suitable for carp culture. The average blood pH level of fish is 7.4<sup>21</sup>. Between 7.0 and 8.5, pH value is very good for fish life and biological productivity<sup>21</sup>. Santosh and Singh<sup>26</sup> in their study depict the pH range of 6.7 to 9.5 is required for fish culture. More than 5ppm DO is desired for good fish production<sup>27,28</sup>. Snatosh and Singh<sup>26</sup> stated that cat fishes and other fishes with accessory respiratory organ can sustain low DO level of 4mg/l. Long time exposure of fish to very low oxygen level of 0.3 mg/l can cause death of fish<sup>29</sup>. Fish can tolerate higher carbon di oxide level if DO level is high<sup>30</sup>. The optimum level of carbon di oxide for fish pond is less than 10 mg/l<sup>29</sup>. The ideal range of alkalinity is 75 to 200mg/l<sup>31</sup> while it is 50 to 150mg/l as desirable range<sup>32</sup>. The desired phosphate level for fish culture is 0.06mg/l<sup>32</sup> while Bhatnagar<sup>25</sup> claimed the optimum range of phosphate level is 0.05 to 0.07ppm. Not only that they also suggested that 1.0ppm is optimum for production of plankton. Minimum level of chloride concentration is 60

mg/l<sup>21</sup>. Higher chloride levels than 100mg/l can burn the edges of the gills.

Depending on the limnological parameters selected, it may be concluded that the Mondal pond is suitable for fish culture. But the results depict that more monitoring of all the parameters is necessary.

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