

Ecological Factors' Effect on Migratory Birds at Manaktheri pond and Dablikhurd pond in Hanumangarh Area During 2021, 2022, and 2023

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Abstract

The study reveals that the physio-chemical quality of water in wetlands, particularly in Hanumangarh, affects the number of migratory birds. The study found that annual temperature changes, which are closely linked to pH changes, lead to a decrease in migratory birds. The highest pH was found in Manaktheri pond, while the lowest was in Dablikhurd pond. Total dissolved solids (TDS) levels also impacted migrating birds, with Manakthri pond having the highest TDS and Dablikhurd pond have the lowest. Increased pollution led to a decrease in phytoplankton, the primary food source for migratory birds. The salinity of water also affected migrating birds. Factors contributing to the decline include environmental modifications, litter, water pollution, deforestation, trash removal, hazardous chemicals, human disturbance, pesticide spread, agrochemical contamination, global warming etc .

Introduction

In order to avoid the cold, birds fly towards the equator during the winter. Birds begin to arrive in different parts of Rajasthan as winter approaches. For migratory birds, freshwater ponds and marshes are ideal locations. Birds use information from the sun, stars, and Earth's magnetic field for navigation and orientation.

The climate in Rajasthan is favourable for birds to winter and build their nests. Birds on migration travel to all tropical nations with warmer winters. Rajasthan's villages are well renowned for using their vast territory for crop cultivation, which requires wetlands, either natural or man-made. Migratory birds find these freshwater ponds and wetlands to be desirable locations.

Abiotic and biotic variables directly affecting the population of migratory birds.

Therefore, it is necessary to evaluate the physico-chemical parameters of the water quality.

Water quality parameters such as BOD, clarity, salinity or hardness, pH, temperature, and phytoplankton and zooplankton were analysed in the lab.

II. METHODS

Sample gathering and examination:

Sample gathering:

Water samples were taken from Manaktheri Pond and the Dabli Khurd Pond. The samples were gathered in plastic containers so that the water quality could be examined. Samples were taken monthly for three years of the study in 2020–2021– 2022. The containers were well cleaned and rinsed before to sampling, and they were meticulously labelled with the appropriate identification afterward.

During the study period, the number of migratory birds and their species in these wetlands were also counted, and the characteristics of the water quality were measured.

Figure 1 showing DabliKhurd pond



Figur 2 : Showing Satrlite View of DabliKhurd Pond

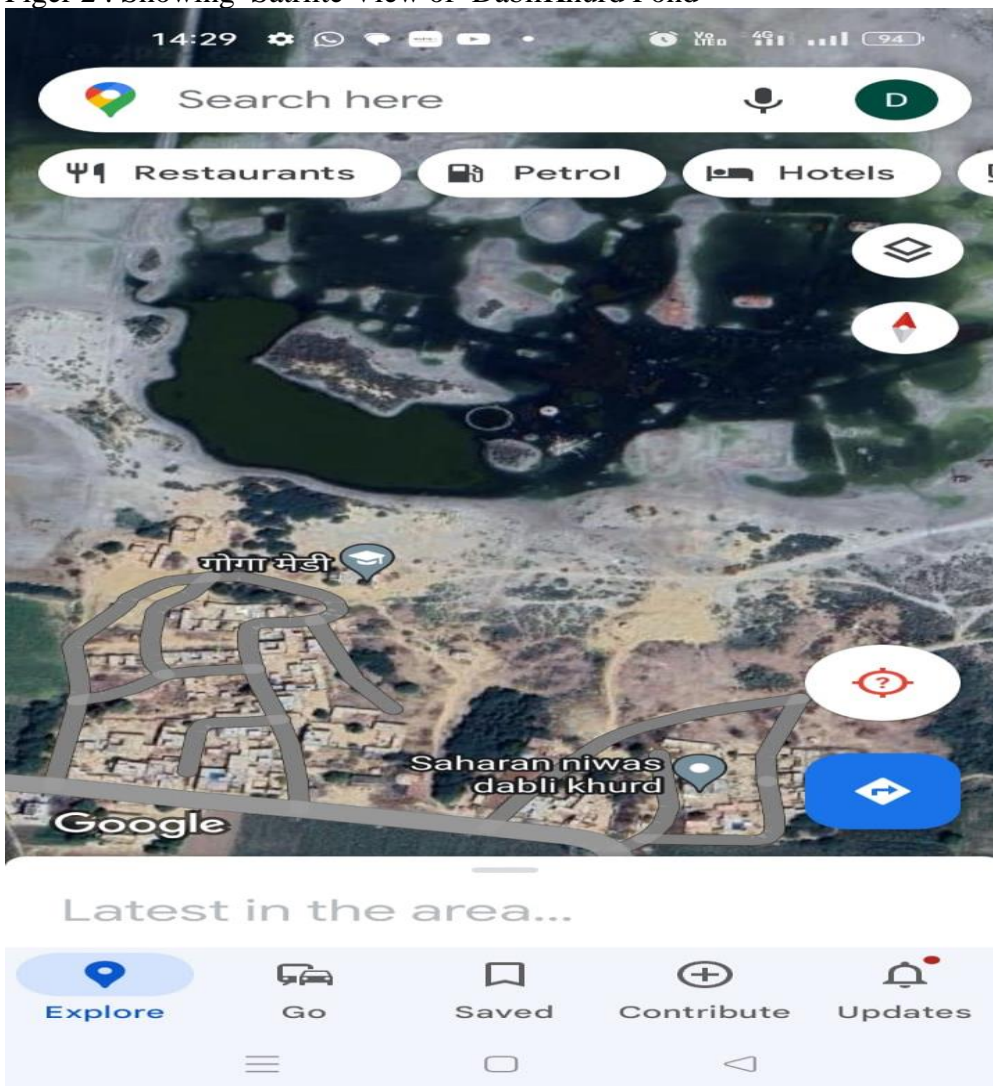




Figure 2 : showing Manaktheri Pond Hanumangarh



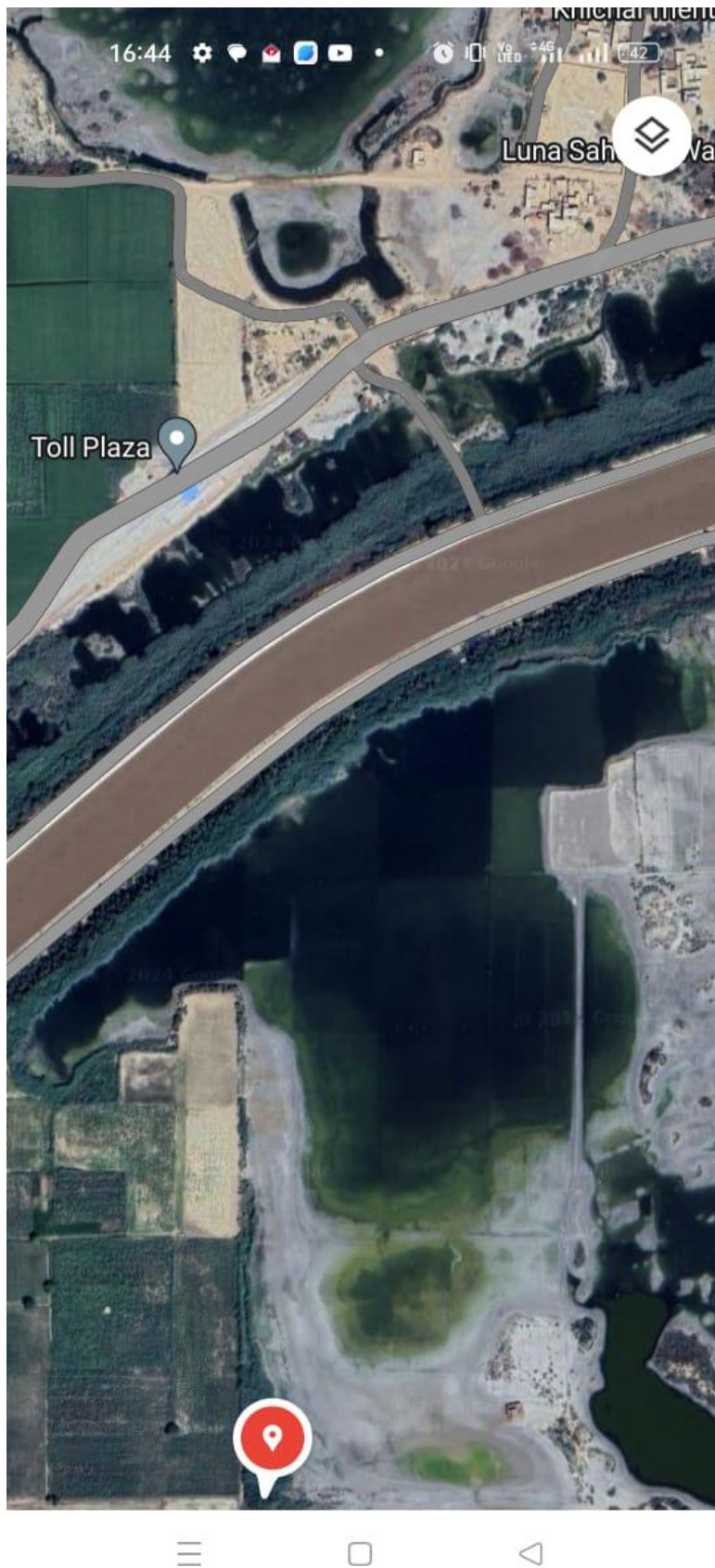


Figure 3 and 4 showing satellite view of manaktheri pond

III . Results-

The most exquisite creatures in nature are birds. Over the course of three years, the pond's water was examined as part of the migrating bird study.

1 pH of Pond

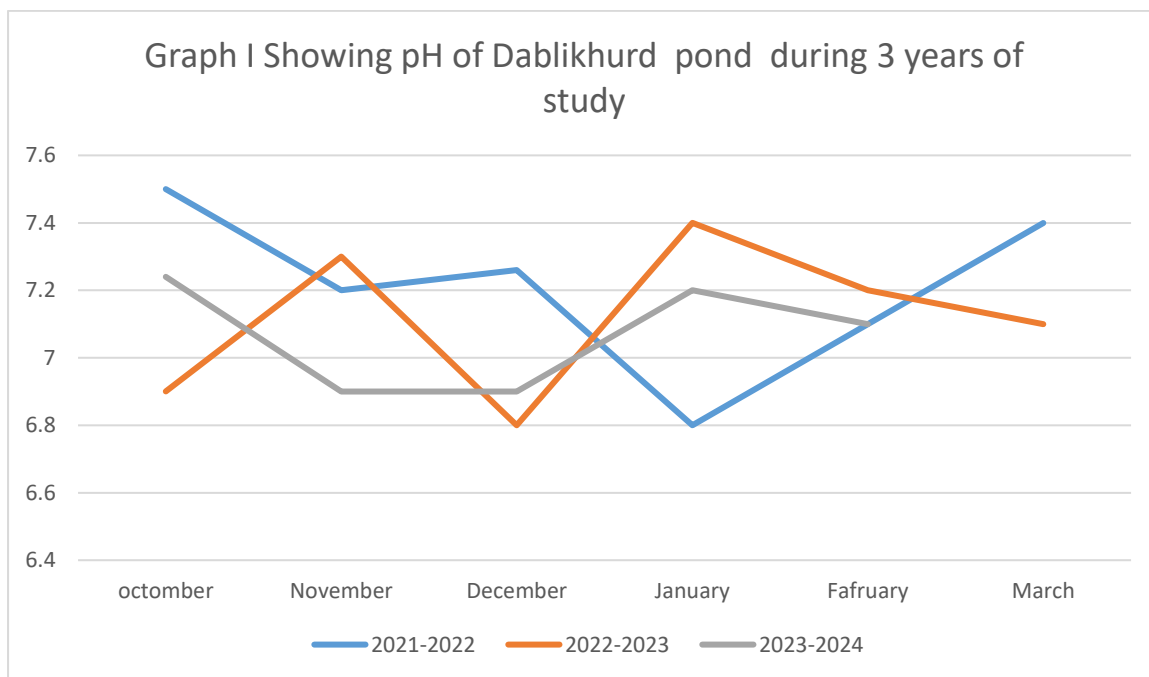
A solution's hydrogen ion activity is measured by its pH (Potentia Hydrogen), which may be calculated using the reciprocal of the hydrogen ion activity logarithm at a particular temperature.

Based on the aforementioned experiment, it was found that the pH of the two ponds where water analysis was done was 6.8–7.26 for Dablikhurd and 6.7–7.2 for Manaktheri Pond.

(a) The pH of Dablikhurd Pond

Table 1 showing pH of Dablikhud pond during three years of study.

Year	october	November	December	January	February	March
2020-2021	7.5	7.2	7.26	6.8	7.1	7.4
2021-2022	6.9	7.3	6.8	7.4	7.2	7.1
2022-2023	7.1	6.9	6.9	7.2	7.1	6.8



During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October pH was 7.5, in the month of November it was 7.2, December 7.2, January 6.8, February 7.1 and in march it was 7.4

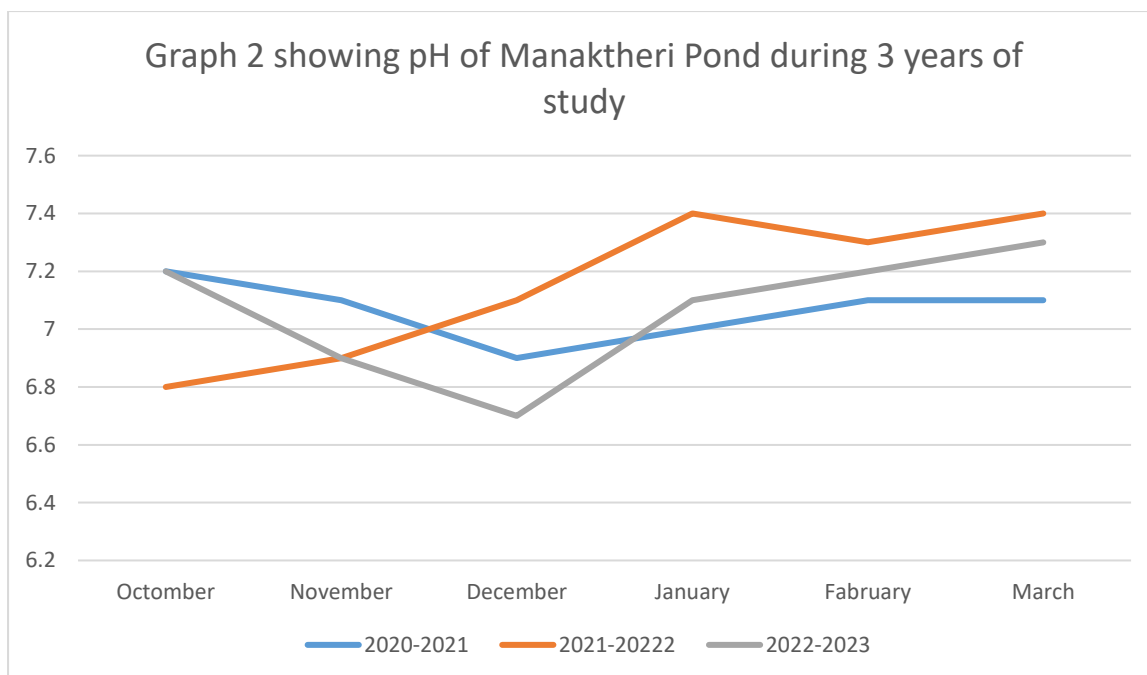
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October pH was 6.9, in the month of November it was 7.3, December 6.8, January 7.4, February 7.2 and in march it was 7.1

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October pH was 7.1 in the month of November it was 6.9, December 6.9, January 7.2, February 7.1 and in march it was 6.8

(b) The pH of Manaktheri Pond

Table 2 : showing pH of Manaktheri pond during three years of study.

Year	october	November	December	January	February	March
2020-2021	7.2	7.1	6.9	7	7.1	7.1
2021-2022	6.8	6.9	7.1	7.4	7.3	7.4
2022-2023	7.3	6.9	6.7	7.1	7.2	7.3



During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October pH was 7.2, in the month of November it was 7.1, December 6.9, January 7.4, February 7.2 and in March it was 7.3

During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October pH was 6.8, in the month of November it was 6.9, December 7.1, January 7.4, February 7.3 and in March it was 7.4

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October pH was 7.3 in the month of November it was 6.9, December 6.7, January 7.2, February 7.2 and in March it was 6.3

2. TDS, or total dissolved solids,

It primarily indicates the different types of minerals that are found in water and the overall concentration of substances that dissolve in it. TDS was between 300 and 900 ppm. It has been noted that the TDS of Manakthri Pond ranges from 556 to 717, and the TDS of Dablikhurd Pond ranges from 586-794.

(a) TDS of Dablikhurd pond

During this study biochemical analysis of Dablikhurd water body 2020-2021 it was observed that in the month of October TDS was 595, in the month of November it was 643, December 667, January 752, February 769 and in March it was 794.

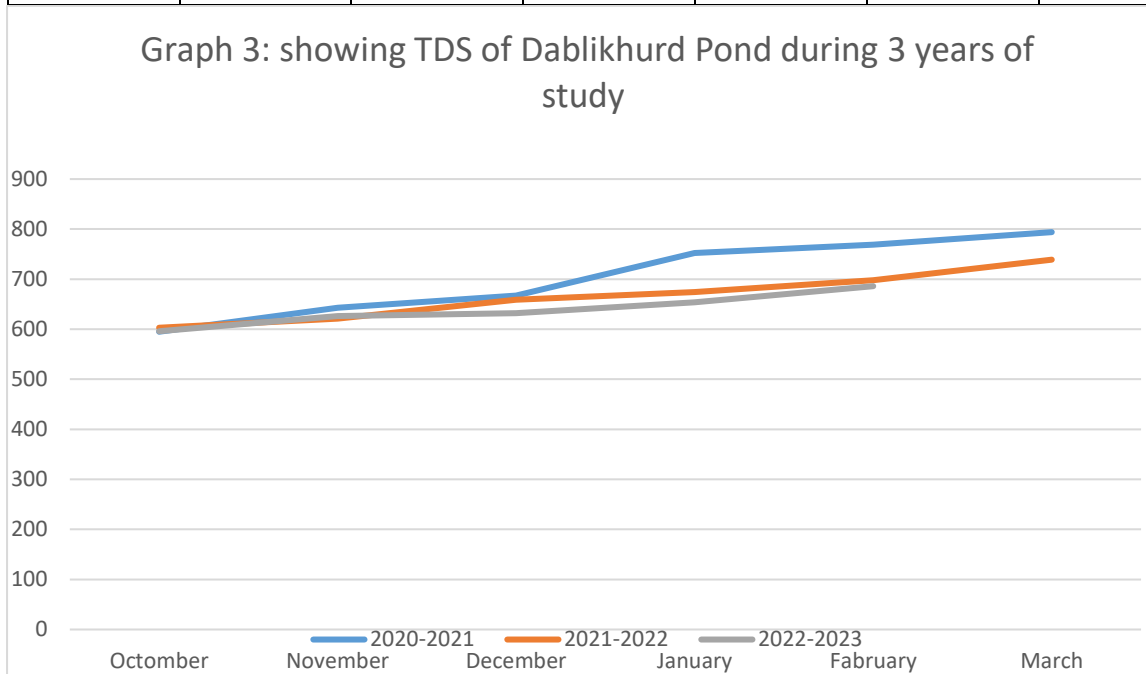
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October TDS was 659, in the month of November it was 674, December 659, January 674, February 698 and in March it was 739.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October TDS was 586, in the month of November it was 626, December 632, January, February 654 and in March it was 757.

Table 3: showing TDS of Dablikhurd Pond during the course of three years of research.

Year	October	November	December	January	February	March
2020-2021	595 ppm	643 ppm	667 ppm	752 ppm	769 ppm	794 ppm

2021-2022	603 ppm	621 ppt	659 ppm	674 ppm	698 ppm	739 ppm
2022-2023	586 ppm	626 ppm	632 ppm	654 ppm	686 ppm	757 ppm



(b) TDS of Manaktheri Pond

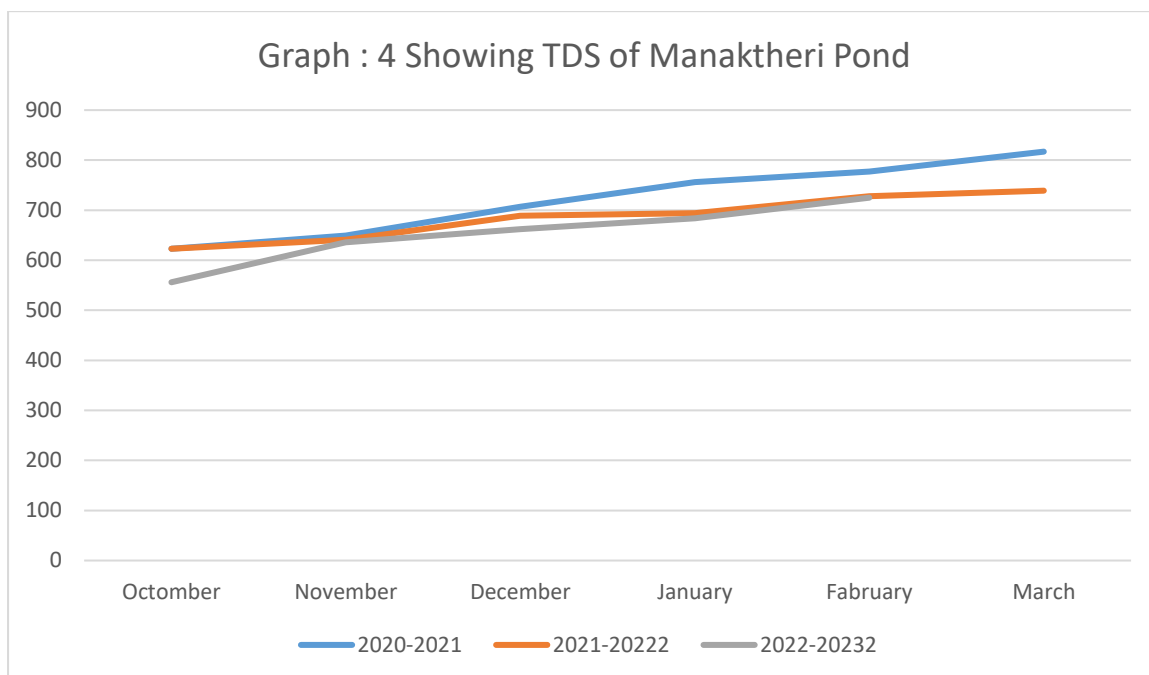
During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October TDS was 623, in the month of November it was 649, December 707, January 756, February 777 and in march it was 817.

During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October TDS was 623, in the month of November it was 641, December 689, January 694, February 728 and in march it was 739.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October TDS was 556, in the month of November it was 636, December 662, January 684, February 725 and in march it was 757.

Table 4 : Showing TDS of Manaktheri Pond over the course of the three-year research.

Year	October	November	December	January	February	March
2020-2021	623 ppm	649 ppm	707 ppm	756 ppm	777 ppm	817 ppm
2021-2022	623 ppm	641 ppt	689 ppm	694 ppm	728 ppm	739 ppm
2022-2023	556 ppm	636 ppm	662 ppm	684 ppm	725ppm	757 ppm



3. Temperature

Any material's heat can be measured using its temperature. It has an impact on the chemical and physical characteristics of water as well as the aquatic life, plants, and animals as well as their biological processes. Temperatures throughout this investigation varied from degree C.

(a) Temperature of Dablikhurd Pond

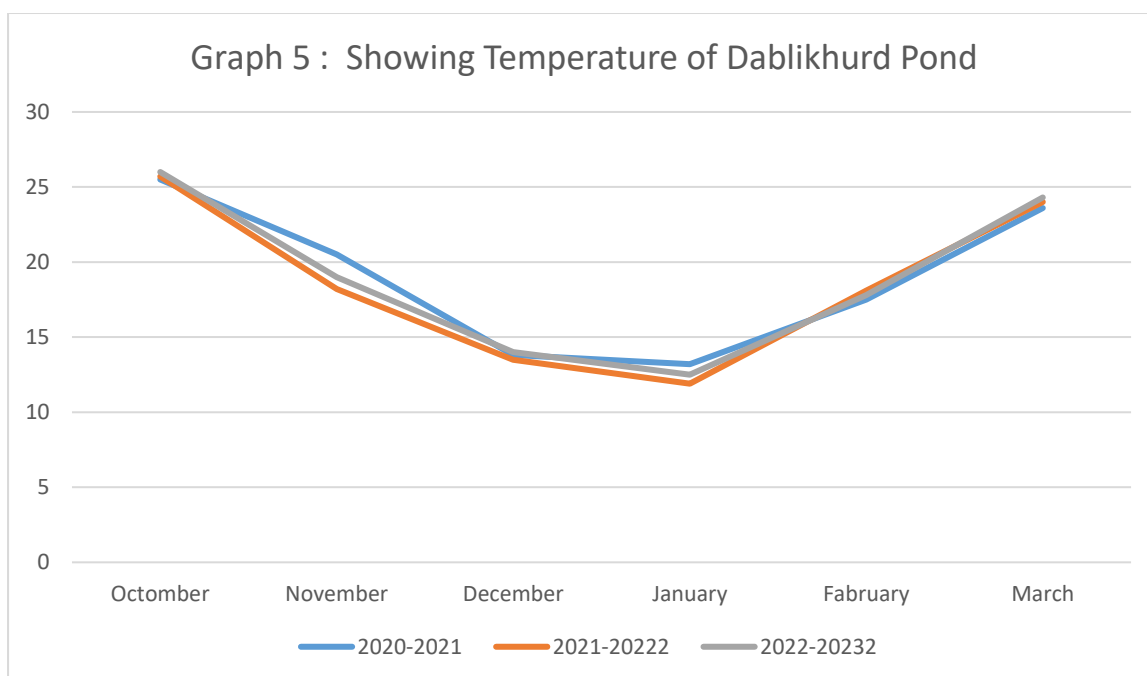
During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October temperature of Dablikhurd pond was 25.5, in the month of November it was 20.5, December 13.81, January 13.2, February 17.5 and in march it was 23.3.

During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October temperature was 25.7, in the month of November it was 18.2, December 18.5, January 11.5, February 18.1 and in march it was 24.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October temperature was 26, in the month of November it was 19, December 14, January 684, February 12.5 and in march it was 24.3.

Table: 5 : Showing the average monthly temperature of Dablikhurd Pond during the research period

Year	October	November	December	January	February	March
2020-2021	25.5	20.5	13.81	13.2	17.5	23.6
2021-2022	25.7	18.2	13.5	11.9	18.1	24
2022-2023	26	19	14	12.5	17.8	24.3



(b)Temperature of Manaktheri Pond

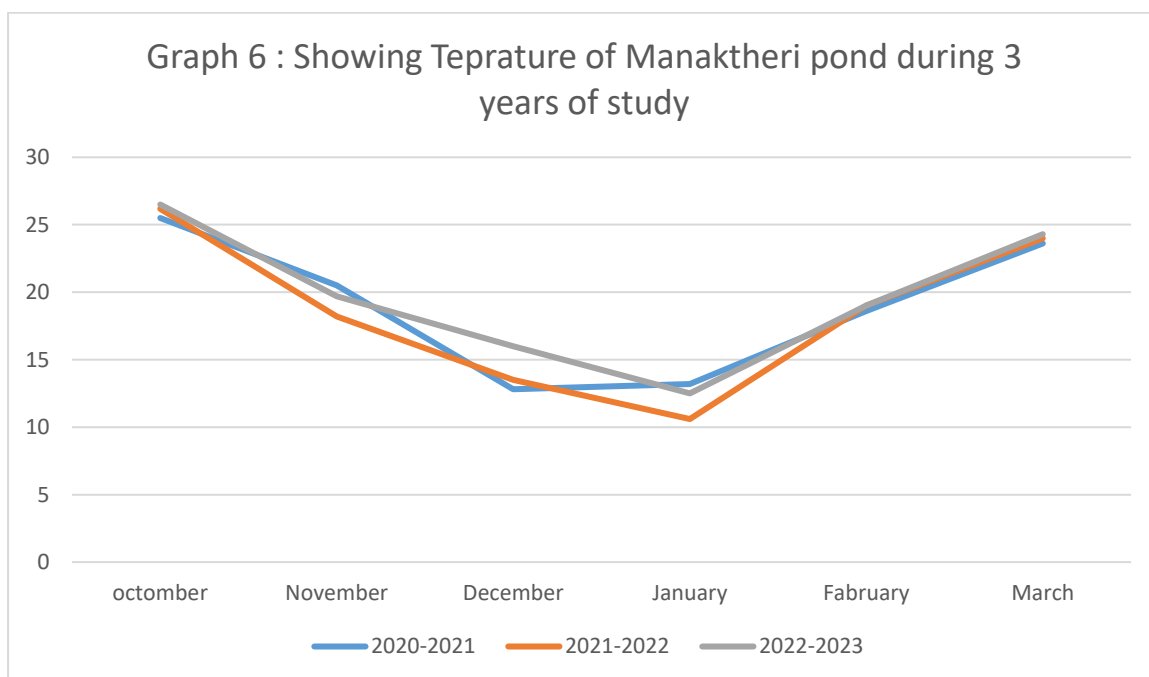
During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October temperature of pond was 25.5, in the month of November it was 20.5 , December 12.81 , January 13.2, February 18.6 and in march it was 23.3.

During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October temperature was 26, in the month of November it was 18.2 , December 13.5 , January 10.5 , February 19 and in march it was 24.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October temperature was 26.5, in the month of November it was 19.7 , December 16 , January 12.5 , February 19 and in march it was 24.3.

Table: 6; Showing the average monthly temperature of Manaktheri Pond during 3 years of study

Year	October	November	December	January	February	March
2020-2021	25.5	20.5	12.81	13.2	18.6	23.6
2021-2022	26	18.2	13.5	10.6	19	24
2022-2023	26.5	19.7	16	12.5	19	24.3



Salinity:

The amount of dissolved salt or saltiness in a body of water is known as salinity. The aforementioned experimentation revealed that the manaktheri pond's salinity ranged between 5.5 and 6.9 ppt, whereas the dablikhurd pond's salinity ranged from 5.2 to 6.9 ppt.

(a) Salinity of Dablikhurd Pond

During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October salinity of Dablikhud pond was 5.5, in the month of November it was 5.2, December 5.6, January 6.2, February 5.9 and in march it was 6.4.

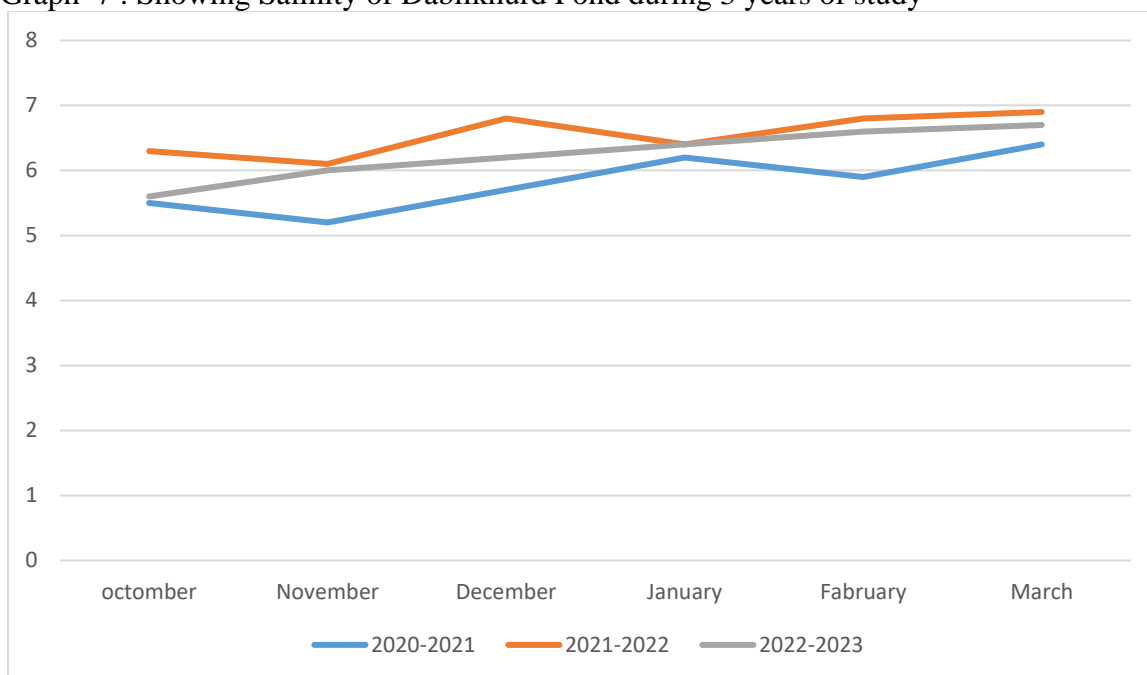
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October salinity was 6.3, in the month of November it was 6.1, December 6.8, January 6.4, February 6.8 and in march it was 6.9.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October salinity was 5.6, in the month of November it was 6, December 6.2, January 6.4, February 6.6 and in march it was 6.7.

Table 7 : Displaying Dablikhud Pond's salinity during the course of three years of research.

Year	october	November	December	January	February	March
2020-2021	5.5 ppt	5.2 ppt	5.7 ppt	6.2 ppt	5.9 ppt	6.4 ppt
2021-2022	6.3 ppt	6.1 ppt	6.8 ppt	6.4 ppt	6.8 ppt	6.9 ppt
2022-2023	5.6 ppt	6 ppt	6.2 ppt	6.4 ppt	6.6 ppt	6.7 ppt

Graph 7 : Showing Salinity of Dablikhud Pond during 3 years of study



(b) Salinity of Manaktheri pond

During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October salinity of Dablikhurd pond was 5.5, in the month of November it was 5.5 , December 5.9 , January 6.2, February 6.8 and in march it was 6.4.

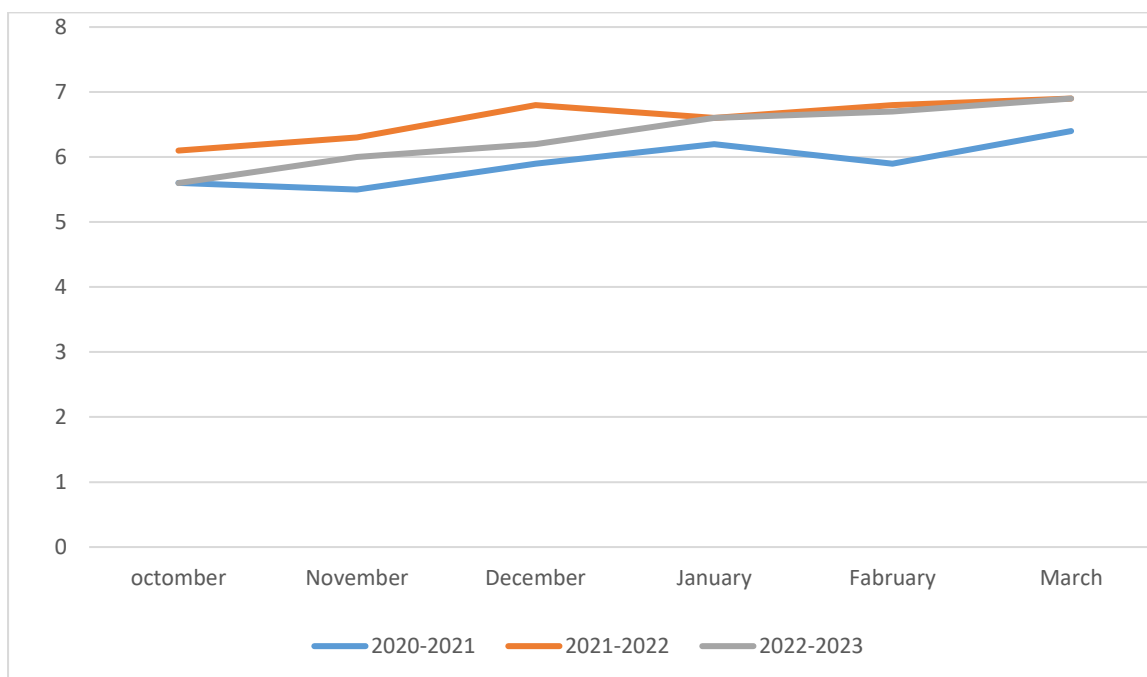
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October salinity was 6.1, in the month of November it was 6.3 , December 6.8 , January 6.6, February 6.7 and in march it was 6.9.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October salinity was 5.8, in the month of November it was 6.2 , December 6.4 , January 6.3 , February 6.6 and in march it was 6.7.

Table 8 showing salinity of Manaktheri pond during three years of study.

Year	october	November	December	January	February	March
2020-2021	5.6 ppt	5.5 ppt	5.9 ppt	6.2 ppt	6.8 ppt	6.4 ppt
2021-2022	6.1 ppt	6.3 ppt	6.8 ppt	6.6 ppt	6.7 ppt	6.9 ppt
2022-2023	5.8 ppt	6.2 ppt	6.4 ppt	6.3 ppt	6.7 ppt	6.7 ppt

Graph 8 : Showing Salinity of Manaktheri Pond during 3 years of study



5 . Dissolved oxygen

Dissolved oxygen, or DO, is a necessary component for all aquatic life forms to break down contaminants that are created by humans. In order to preserve higher kinds of biological life and to maintain the right balance of different pollutants, dissolved oxygen must be present in the water. This keeps the water bodies healthy. An important test for controlling waste treatment and water contamination is the estimation of dissolved oxygen. The dissolved oxygen content of Dablikhurd Pond varied between 8.72 and 12.93 parts per million (mg/l) in the current study.

(a) Dissolve Oxygen of Dablikhurd Pond

During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October DO of Dablikhurd pond was 8.2, in the month of November it was 9.2 , December 9.7 , January 10.2, February 10.9 and in march it was 11.4.

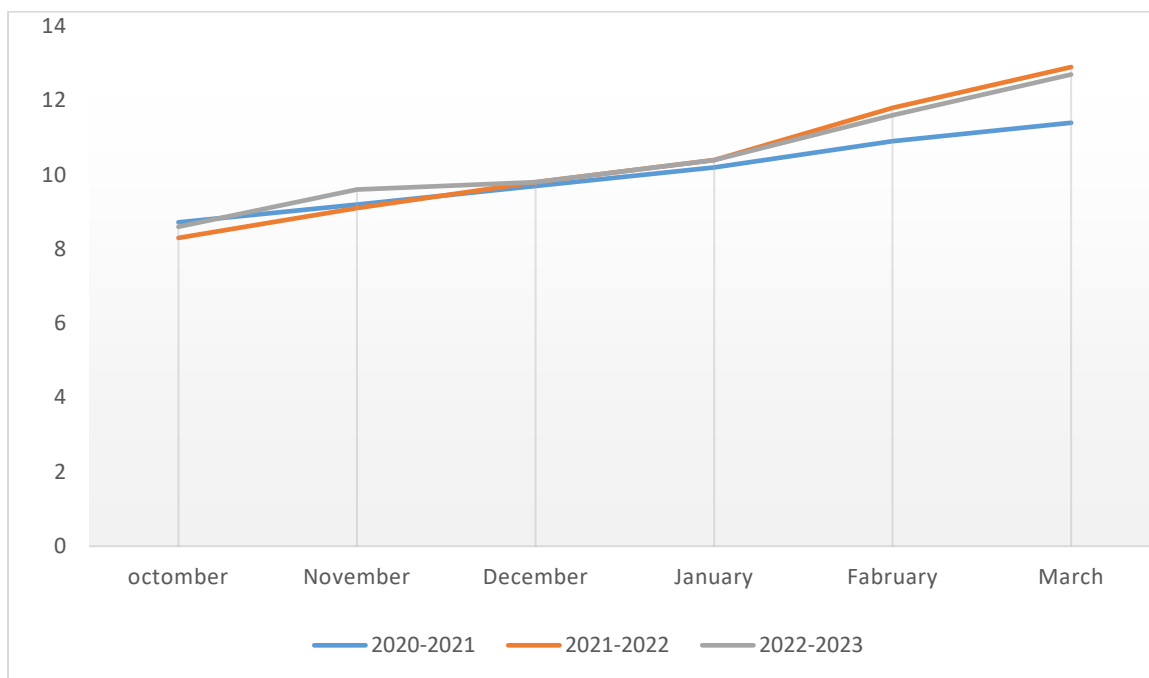
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October salinity was 8.3, in the month of November it was 9.1 , December 9.8 , January 10.4, February 11.8 and in march it was 12.9.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October salinity was 8.6, in the month of November it was 9.6 , December 9.82 , January 10.4, February 11.6 and in march it was 12.7.

Table 9 : Displaying the Dablikhud Pond's dissolve oxygen during the course of three years of research.

Year	october	November	December	January	February	March
2020-2021	8.72 ppm	9.2 ppm	9.7 ppm	10.2 ppm	10.9 ppm	11.4 ppm
2021-2022	8.3 ppm	9.1 ppm	9.8 ppm	10.4 ppm	11.8 ppm	12.9 ppt
2022-2023	8.6 ppm	9.6 ppm	9.82 ppm	10.4 ppm	11.6 ppm	12.07 ppt

Graph 9 : Displaying the Dablikhud Pond's dissolve oxygen during the course of three years of research.



(b) Dissolve Oxygen of Manaktheri Pond

During this study biochemical analysis of water body 2020-2021 it was observed that in the month of October DO of Manaktheri pond was 8.52, in the month of November it was 9.2 , December 9.9 , January 10.2, February 11.7 and in march it was 12.8.

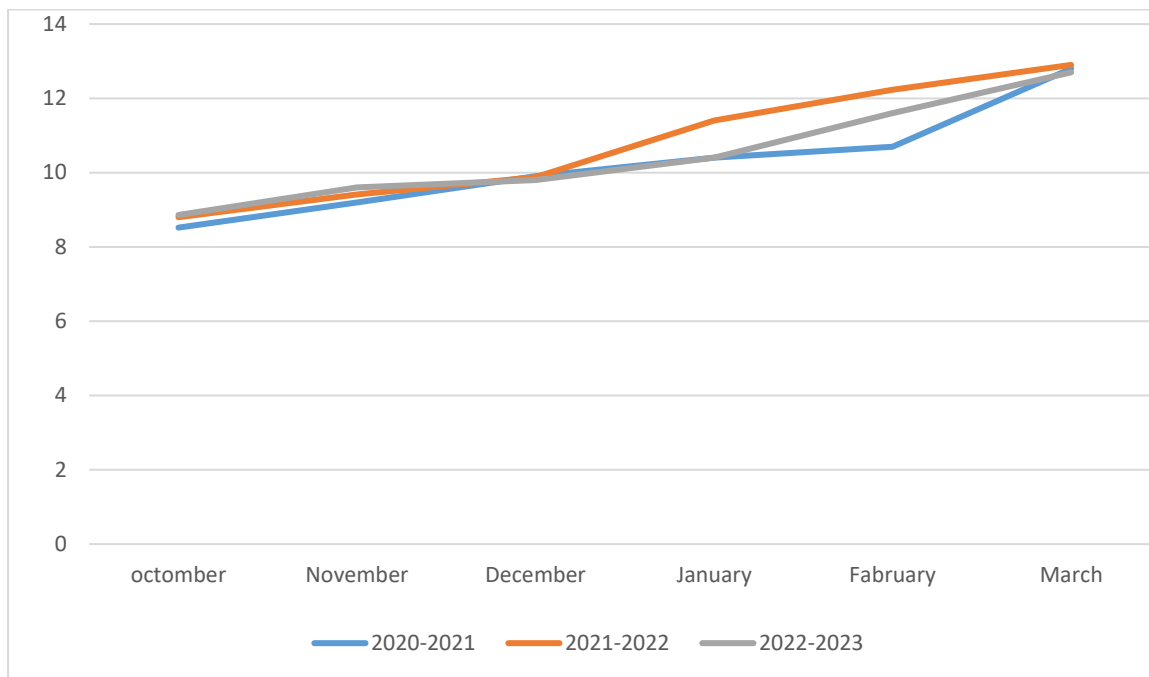
During this study biochemical analysis of water body 2021-2022 it was observed that in the month of October DO was 8.8, in the month of November it was 9.41 , December 9.8 , January 10.4, February 11.8 and in march it was 12.5.

During this study biochemical analysis of water body 2022-2023 it was observed that in the month of October DO was 8.8, in the month of November it was 9.3 , December 9.82 , January 10.8, February 11.6 and in march it was 12.5.

Table displaying the Manaktheri Pond's dissolve oxygen during the course of three years of research.

Year	October	November	December	January	February	March
2020-2021	8.52 ppm	9.2 ppm	9.9 ppm	10.4 ppm	11.7 ppm	12.8 ppm
2021-2022	8.8 ppm	9.41 ppm	9.88 ppm	11.4 ppm	12.23 ppm	12.9 ppt
2022-2023	8.88 ppm	9.34 ppm	9.82 ppm	10.89 ppm	11.55 ppm	12.55 ppt

Graph 8: Displaying the Manaktheri Pond's dissolve oxygen during the course of three years of research.



Comparative study on physiological features of dablkhurd and manakthery pond

TABLE 1: Dablkhurd Pond's physiological features from October to December in the years 2020–2021, 2021–22, and 2022–2023.

Analysis of Samples	2020-21	2021-22	2022-23
BOD	3.2mg/ lit	3.3mg/ lit	4 mg/ lit
Clarity	52cm	54cm	51 cm
Temperature	25 C	26.6C	28 C
pH	6.26	6.89	7.25
Salinity or Hardness	31 ppt	32 ppt	35 ppt
Dissolve Oxygen	10.42	10.77	

A. Phytoplankton of Dablikhurd pond

TABLE 3: Presence of Phytoplankton in the water of Dabli Khurd Pond from October to December.

Phytoplankton	2019	2020	2021
Chlorophyceae	33.52%	34%	30 %
Cyanophyceae	21%	23%	20 %
Euglenophyceae	2.7%	3%	5 %

B Phytoplankton of Manaktheri Pond

TABLE 3: : Presence of Phytoplankton at Manaktheri Pond from October to December.

Phytoplankton	2019	2020	2021
Chlorophyceae	35%	36%	32 %
Cyanophyceae	22%	23%	21 %
Euglenophyceae	3%	3.5%	4.8 %

V. Discussion

The months of October through December saw the completion of the water analysis. It was determined after three years of thorough research and sample analysis that the physio-chemical quality of water varies annually.

As a result, the number of migratory birds varies annually. One way to summarise this study is as follows:

1 Temperature And pH Impact on Migratory Birds

The temperature of the pond was measured during the course of three years of research, from October to December. It was found to be as follows:

Temperature changes are intimately correlated with pH changes. A study found that wetlands experience an annual rise in temperature, which also causes the pH to drop.

This turns into the cause of the decrease in migratory birds.

According to the aforementioned experiment, water analysis was done on the two ponds, and the results showed that the pH ranged from 6.50 to 9.69. Manaktheri pond had the highest pH, while Dablikhurd pond had the lowest.

2 Total dissolved solids (TDS):

This term mostly refers to the many types of minerals that are found in water. Gas and colloids were absent from TDS. The TDS was 165.5–254.8 ppm. Manaktheri reported the highest TDS, whereas Badopal recorded the lowest.

3 BOD's impact on migrating birds

The amount of BOD increases in response to an increase in pollution. As a result, there is less phytoplankton in the water in wetlands. The main source of food for migratory birds is phytoplanktons.

4 Water's salinity effect on migratory birds

The overall amount of unwanted salts in water is known as salinity; it is expressed as grammes of salt per kilogramme of water (gm/kg) or as a part per thousand. The test mentioned above revealed that the salinity ranged from 5.1 to 6.9 ppt. The pond water of Dabli Khurd had the highest salinity, while the pond water of Manaktheri had the lowest.

Additional variables causing the fall in migrating birds include:

According to the study, the following factors have contributed to the decrease in migrating birds in the wetlands close to Hanumangarh:

1. Modifications to the natural environment, including vegetation uprooting.
2. Litter, water pollution, noise pollution, emissions from motor vehicles, etc.
3. Gradual loss of vegetation due to deforestation in the Rajasthan restricted forest region nearby.
4. Getting rid of trash near the wetland.
5. The fall in migratory birds is caused by dumped rubbish and sewage.
6. Because of hazardous chemicals, human disturbance, and the spread of pesticides on agricultural land.
7. Because to the contamination of wetlands' water by agrochemicals.
8. Global warming and climate change are major factors in the loss of migratory birds.

9. During the Makar Sankranti holiday, migratory birds are killed or injured by Chinese kites in the sky.

VI. Conclusions

Regarding the quality of the water, several physicochemical factors such as turbidity, pH, dissolved oxygen, chemical oxygen demand, and biochemical oxygen requirement For wetlands, analysis was done on demand, conductivity, water temperature, total alkalinity, and nitrate between July 2020 and December 2023. The Bureau of Inequality's class D IS 2296:1982 values for water dissolved oxygen and pH are all within allowable bounds, with the exception of the dian Standard (BIS) for inland surface water used for fish culture and wildlife and IS 13891:1994 for fresh water fish culture. Because wetlands have greater pH and lower dissolved oxygen concentrations, their water quality is unsuitable for fish, aquatic life, and migrating birds.

The presence of muddy water, human waste and excrement in wetlands, higher pH concentrations, pesticides and hazardous chemicals in the water, human activity-induced water contamination, lower concentrations of dissolved oxygen, and improper waste disposal are some other factors that have been noted during the study period for the deteriorating water quality of wetlands. The decline in migratory bird populations due to decomposition of plants and flora, the absence of aquatic animals, and the lack of plankton and fish are the reasons behind Hanumangarh's selected wetlands.

Other factors that contribute to pollution and the decline in migrating bird populations include livestock grazing, traffic disruption, noise pollution, and motor vehicles.

On farmland, boating, deforestation, vegetation deterioration, illicit fishing, hunting, people using Chinese kites, habitat degradation, water pollution, and the dispersal of hazardous chemicals in wetlands are some of the causes. Therefore, appropriate conservation plans for migrating birds are required.

VII. SUGGESTIONS

The following suggestions are given in light of the investigation of water quality parameters and evaluation of migratory birds in several wetlands in Hanumangarh:

- 1) Action needs to be taken to ensure that all of Hanumangarh's wetlands are conserved and developed sustainably.
- 2) Educate the public on the economic and ecological benefits of wetlands.
- 3) All wetlands should be continuously monitored in order to evaluate the water's amount and quality.
- 4) Planning the conservation strategy for these wetlands requires a thorough analysis of the community metabolism.
- 5) It is best to keep wetlands from becoming completely dry because this can result in habitat loss, interference from humans, and loss of wildlife diversity in some wetlands.

The complete prohibition of hunting and poaching in all wetland regions is necessary to stop the continued decline in the migrating bird population.

7) In order to preserve the sustainability and well-being of the wetland environment, the unrestricted use of chemicals and pesticides needs to end.

8) It is important to look into the ecological effects of highways on migratory birds and aquatic life.

9) Limiting the amount of trash and sewage that is disposed of in the wetlands could aid in their preservation.

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