

“STUDY ON LIMNOLOGY OF NAGESHWAR POND OF CHAPRA DISTRICT WITH SPECIAL REFERENCCES TO FISHES”

*Dr. Arjun Pratap Singh**Dr. Raj Kumar

* Rajendra college Dept. of Zoology, J.P University, Chapra, Bihar, India

**Associate Professor and H.O.D. of Zoology, Rajendra College, Chapra

ABSTRACT

Nageshwar pond is a small pond located in Chapra (saran) district Bihar. Study on limnology of Nageshwar pond carried out during January 2008 to December 2009. The present study deal with physico-chemical parameters such as temperature, P^H alkalinity, chloride, conductivity, TDS, Dissolve oxygen, calcium, magnesium, sodium, carbonate, bicarbonate, transparency and silicate. The total eighty one type of phytoplankton is recorded by four classes. A total seventeen type of benthic fauna is recorded in different season.

Introduction

Limnological studies on water bodies are aimed to know the existing ecological factors of the pond to assess the ecological relationship between abiotic and biotic parameters and to suggest the method for the improvement of productivity. Several studies have been made on the limnology of fresh water bodies in India.

Ganpathi, (1940), Alikuhni et al. 1948, Harsey et al. 1982, Rao & Mahmood 1995, Alfred and Thapa 1996, Naganandini and Hosmani 1980, Patel and Sinha 1998, Pandey et al. 2003, Raj Narayan K.K. Ssaxena and Shalini Chauhan 2007.

Materials and Methods

Nageshwar pond is situated of Chapra district (saran) State- Bihar. The fresh water pond is more than 20 year old. This pond is about 4 acre in area and with an average depth of about more than 4 to 5 meters (13-15 feet). The water of this pond is used by fish production. The pond is also use for washing dirty cloth bathing of domestic animal and used by animal for drinking purpose. Sample of the water to physiochemical characteristics is analyses according to standard method of APHA (2005).

Water is collected in large plastic container, immediately a mercury centigrade thermometer with an accuracy of 0.1⁰ c was dipped and kept steady for about a minute. Now the thermometer was read and noted in field diary. Water sample collected during morning hours 10.30AMa.m. to 11AM. Some of the results are recorded in the laboratory. The parameter observed with colour p^H paper, total dissolved oxygen, carbon-dioxide, calcium, sodium, phosphate, TDS, Silicate, Chloride, conductivity, carbonate, bicarbonate, alkalinity, and transparency. Hydrogen ion concentration was determined with the help of BDH paper indicator was used. Total suspended Solid was measured by dry and weight

method. Dissolve oxygen was measure by winkler's Iodometric method. Abiotic parameters of pond water were analysed as per standard methods given by APHA (1975), Galterman 1968, and Trivedi and Goel (1994).

Transparency was measured by sacchi disc which is made of circular metal plate 20cm in a diameter. This disc was lowered in the water with the help of a string and the depth (d_1) at which it disappeared was noted. Now the disc was lifted up slowly and the depth (d_2) at which the disc reappeared was noted. Transparency was calculated as follow: -

$$\text{Transparency} = d_1 + d_2 / 2.$$

Biological analysis – Fishes and planktons

Fish – Fish were collected at regular interval with the help of local fisherman at different site of the pond They applied drag Net, Caste Net, Scoop Net. The identification was made with the help of Day's fish fauna of **BRITISH INDIA** and the classification of the fished Present and extinct of leo's Berg.

Phytoplankton analysis – The water sample collected in 200 ml Plastic bottles were Preserved by adding 8 ml of 6% formalin Phytoplanktons were counted by lackey's drop method Number of Sub samples without any addition of unencumbered species when compared to the already examined sub samples in the same sample (APHA, 1985)

Zooplankton were counted by **sedgwick rofter** plankton counting cell and identified as described in the literature Muruganet al. (1998), Altaff (2003) Fd monsoon (1959), Battish (1992), Dhanpathi (2000).

Result and discussion

The result obtained by Seasonal Variation in the Physico-Chemical Character of water of the Pond-2009 Physico-chemical analysis of sample are given in table No. 1 and water temperature, Air temperature, Rain fall and Transparency are given in table No. 2. Temperature of water is one of the most important factors in an aquatic environment. It was found negatively correlated with DO. During the experimental period observed 17.6 to 32.9⁰ water temp and 19 to 43⁰ c air temp. The highest. temp. was recorded in the month of June and lowest in the Month of January 2009. Dissolved oxygen (DO) in water is of great importance to all aquatic organisms and is considered to be the factor which reflects physical and biological process taking place in a water body. It is important in the production and support of life water body receives the supply of oxygen mainly from two sources directly from atmosphere and during the process of photosynthetic, activity, of chlorophyll bearing plants.

During the experimented period show a gradual decrease in DO from winter to summer. It is negatively correlation with water temp. The seasonal Variation of Do depend upon the temperature of the water body which influences the oxygen solubility in water. It is the measure of the concentration of hydrogen ions. It provides the measure of the acidity or alkalinity of a solution. It regulates most of the biological Process and bio-chemical reaction. In the experimental period of Nageshwar pond found to be alkaline in most of the months. The low pH Value was 6.1 found to be during the month of august 2009, Due to influence of fresh water in flux, dilution of pond water, low temperature and organic matter decomposition. This finding is in accordance with that of singer et al. (1987)

Table No.1-Physico- Chemical Analysis of Nageshwar Pond 2009.

Seasonal Variation in the Physico-Chemical Character of water of the Pond-2009						
	Winter (Jan-Feb, Nov-Dec)		Summer(March-June)		Rainy(July-Oct)	
	Avg.	Range	Avg.	Range	Avg.	Range
pH	7.1	6.3-8.0	7.50	6.8-7.8	6.3	6.1-6.5
Conductivity	646.5	635-662	691.25	640-720	592.5	580-615
DO ₂	12.35	12-12.6	10.85	10.2-11.9	11.15	10.4-11.6
CO ₂	1.35	1.1-1.6	2.2	1.7-2.8	1.85	1.2-2.6
CO ₃	2.48	2.2-2.8	2.98	2.6-3.2	2	1.8-2.2
HCO ₃	117	112-122	112	108-116	105.5	100-114
Ca	15	18-Dec	10.7	7.2-12.4	11.75	7.6-14.2
Mg	9.45	6.6-12.8	8.85	6.4-12	3.95	3.4-5.2
Silicate	15.45	12.4-20.8	12.55	11.2-13.8	25.25	24.4-26.8
PO ₄	0.05	0.04-0.07	0.1	0.08-0.12	0.08	0.07-0.10
TDS	382.5	350-430	367.5	330-465	521.4	370-600
Cl	11.37	11-11.5	12.4	12-12.8	10.55	10.4-10.7
Alkalinity	119.75	110-130	150.25	136-163	108.75	98-125

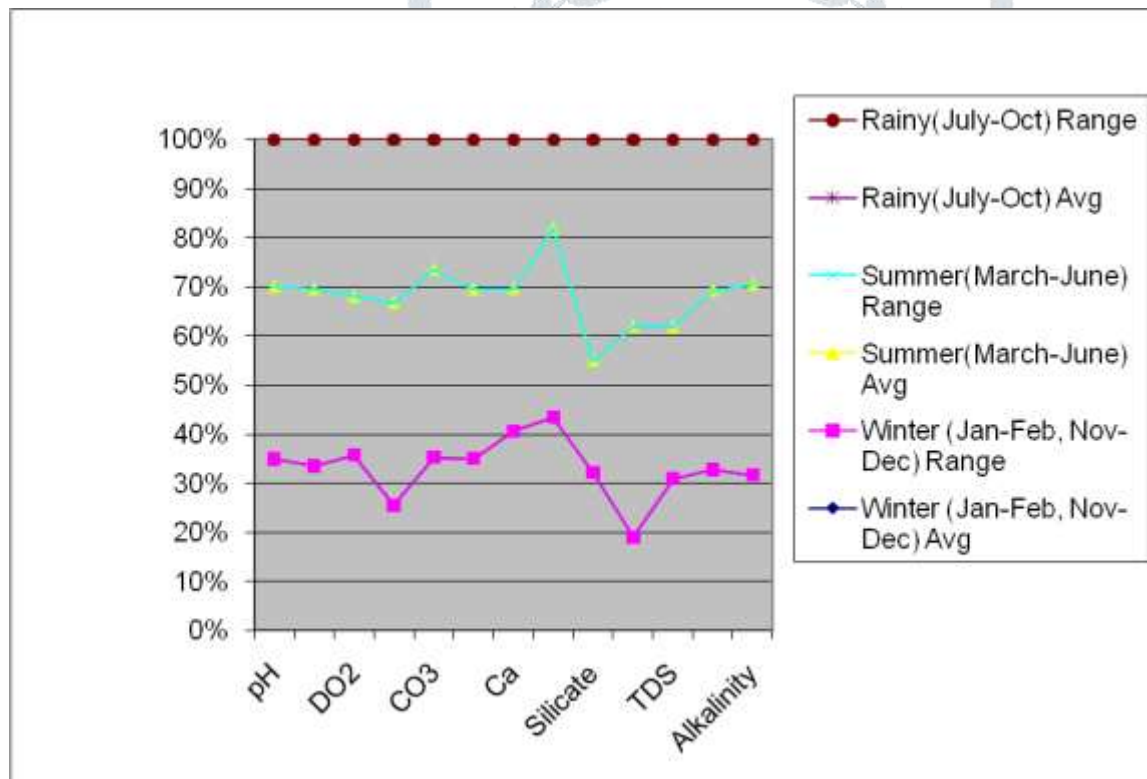
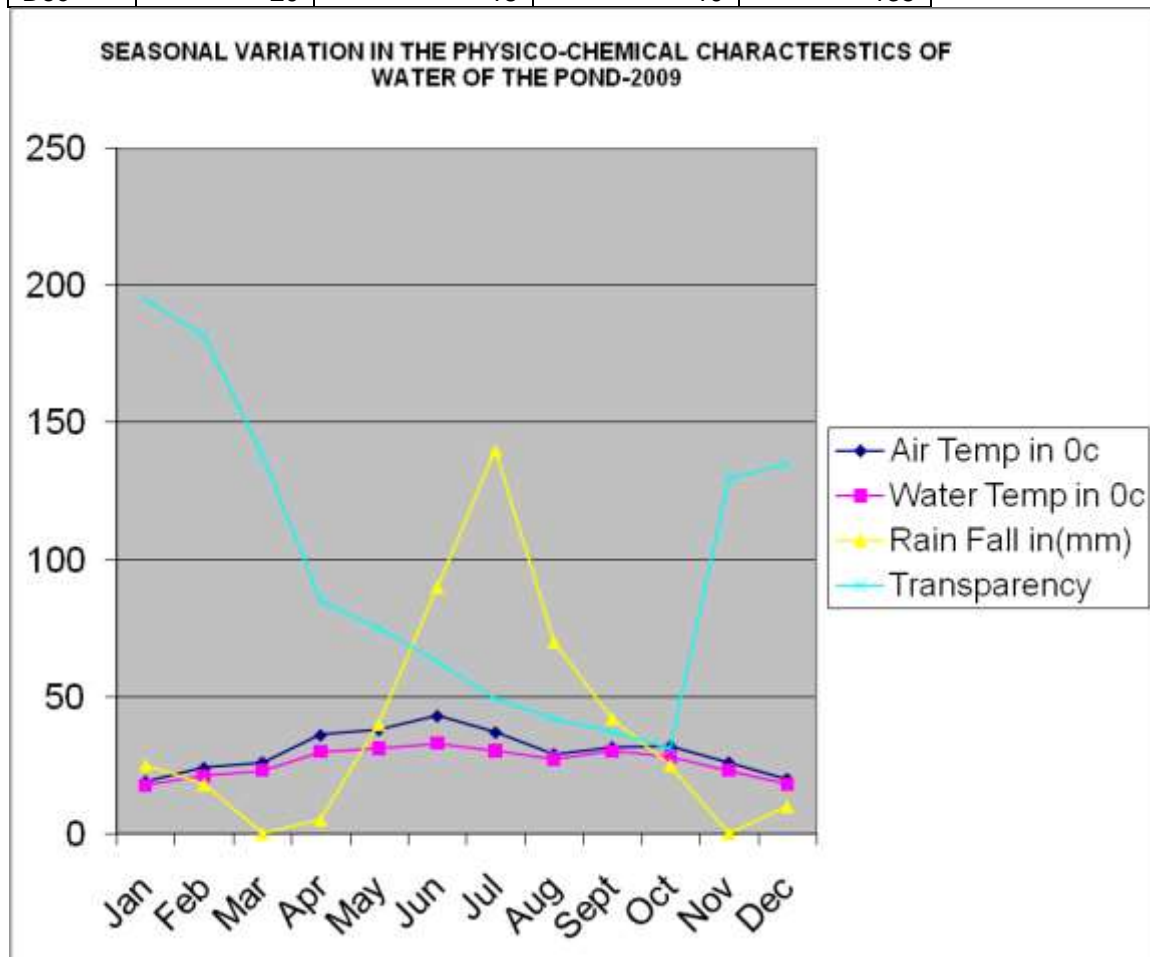


Table No.2 Analysis of water temperature, Air temperature, Rain fall and Transparency of Nageshwar Pond 2009.

Month	Air Temp in °c	Water Temp in °c	Rain Fall in(mm)	Transparency
Jan	19	17.6	25	195

Feb	24	21	18	182
Mar	26	23	nil	138
Apr	36	30	5	85
May	38	31	40	75
Jun	43	32.9	90	63
Jul	37	30.2	140	49
Aug	29	27.1	70	42
Sept	31.5	30.1	42	37
Oct	32	28	25	31
Nov	26	23	nil	130
Dec	20	18	10	135



Conductivity :-

Conductivity is a good and rapid method to measure the total dissolved ion and is directly related to the solids. The electrical conductivity of pond under my investigation varied from 580 to 720 cm/mhos in the year 2009

Alkalinity –

Total alkalinity of water refers to the quality and kinds of components present such as bicarbonates, Carbonates and hydroxide. Total alkalinity may be used as a tool for measurement of productivity. During the experimental period it ranged from a minimum of 98 to a maximum of 163 mg/l and higher value was absent in the month of June 2009.

Sodium –

Sodium is mono-valent cation commonly present in water. This ion does not produce hardness to water. It is related with the function of nervous system, membrane system and excretory system. According to WHO

guide line, the maximum admissible limit is 100 mg/l. In the experimental period, the (Sodium) Na⁺ Concentration in surface water ranged from 3.0 to 4.7 mg/l in 2009 and was all the time lower than the maximum admissible limit.

Chlorides

These are important inorganic anions which vary, in concentration in natural waters. High Concentration of chlorides is harmful to aquatic life and considered to be the indicators of pollution due to organic wastes of animal or industrial origin. During the experimental period Chloride concentration oscillated between 10.4 to 12.8 mg/l in 2009. These values are also within the standard desirable limit prescribed by WHO. Calcium and magnesium were also analyzed and were found to be within the permissible levels. Values obtained from the experimental period ranged from 7.2 to 18.0 mg/l and 26.9 mg/l. 3.4 to 12.8 mg/l for Calcium and magnesium. Silicate range from 10.5 to 26.9 mg/l in 2009.

TDS – The Total Dissolved solids were recorded maximum 600 ppm in the month of August and minimum 330 ppm in May 2009.

Phosphate- The lowest values in monsoon may be due to dilution of pond water by rain water. The high value in the summer season may be due to continuous inflow of sewage without any dilution by rain water. The value of phosphate was observed minimum 0.04 ppm in the month of December and maximum up to 0.12 ppm in the month of June. Transparency – During the experimental period maximum transparency was recorded 189 ppm in the month of January and minimum 34 PPM in the month of September 2009. It is essential for the growth of organisms and can limit primary productivity (Wetzel 1984)

Statistical analysis 2009

Pearson Correlation among various parameters such as P^H, Conductivity, DO, CO₂ Carbonate, bicarbonate, Calcium, Magnesium, Sodium, Silicate Phosphate, TDS, Chloride, alkalinity, air temperature, water temperature, and Transparency were developed.

P^H showed positive and highly significant correlation with Conductivity (r=0.871), carbonate, (r=0.744) and chloride (r=0.741) at the 0.01 level and with magnesium (r=0.590), at the 0.05 level

Conductivity

Conductivity was found to be positively and highly significantly correlated with P^H (r=0.871), Carbonate (r=0.736), at the 0.01 level and with Na (r=0.582), alkalinity (r=0.698), at the 0.05 level.

Dissolved oxygen shows significant positive and highly significantly correlated with calcium with Calcium (r=0.582), at the 0.01 level and negatively correlated with temp., CO₂ (r=0.875), Phosphate (r=0.931) at the 0.01 level.

Carbonate showed significant positive correlation with P^H (r=0.744), Conductivity (r=0.874), Sodium (r=0.651), alkalinity (r=0.657) at 0.01 level. Carbonate showed negatively correlated with silicate (r=0.872) at 0.01 level.

Conclusion:-

Thus, from the above mentioned observations, Nageshwar pond is an ideal water body for the culture of fish. For greater production of fishes regular monitoring of fishes must be done. The pond has broken embankments. This gives chance of escaping of fishes during the raining season. Therefore, embankments on all sides of the pond should be raised so that undesired exit or entry of water can be controlled.

Washing of dirty clothes and bathing of domestic animals should be avoided.

Insect attacking fry and fingerlings and small fishes should be removed regularly so that the damage caused by them must be minimized.

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