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Studies of the biological relation for entomo-fauna and lchthyo fauna

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Abstract
The present investigation was studied at different ponds of the Chapra District This pond passes with many effluents. Its annual average depth is 6-8 metres. It receives effluents from sugar factory, town sewage and Jute mill. It also receives pollutants from remains of dead and burnt bodies. Agrochemicals are also coming into the stream of river from adjoining areas. River is also being polluted by different human activities such as boating, extensive fishing, human and animal bathing, cloths washings. To study the effect of se age on the limnology of pond, four sites have been selected.

Keywords: Lchthyo fauna, Chapra, entomo-fauna

Introductions
Bihar is very rich in inland water bodies like rivers (lotic system) lakes aid ponds (lentic system). Ganga is one of the main rivers of North Bihar. The people in and around the Chapra zone used the water of for river for various purposes of life, such a irrigation, bathing, washing and drinking. Apart from the human activities cleaning of utensils, washing of clothes, bathing of human and animals, burning of dead bodies, discharge of industrial effluents as well as influx of domestic sewage into this river has further deteriorated the quality of water and perhaps utilization of water directly from the river might he closing the health hazards to the local people.

The people of this area, that is the zone of Chapra, are still residing in the lap of nature in one hand and on the other they are prone to diseases. Municipals sewage and industrial effluents are two major causes pf pollution of ponds. Therefore study of water quality of ponds become important part of environmental science. In last decade limnological work in India became most common among the scientist. In addition to that many international worker come into the field. Several investigators both from India and abroad (Cairn and Dickers 1972, Sreenivasan and Duthie 1973, Vass *et al*. 1977, Rai 1978, Ramarao *et al*. 1978, Govindan and Sundersan 1979. Zingde *et al*. 1981; Badola and Singh 1981, Ersani and Gonulol 2011) [1-9] have studied various aspects of water ecosystem and pollution factors.

In Bihar too, several researches studied on limnologici. However, these works stated above are fragmentary and needs more attention towards limnologial work-specially pollution control of rivers caused by sewage effluents. The present work is an approach to fulfill the above demand. The Jathi ponds, Rajendra Sarovar & Gobardhan Das pond at Chapra is chosen for the study.

In the present work, attempted has been made to assess the Physicochemical parameters taken for the study were transparency, temperature, pH, dissolved oxygen, free CO_2, carbonate, alkalinity, total hardness, calcium and magnesium.

Effects of this parameter on the biological spectrum have been seen with reference to algal communities important classes viz., green algae, blue-green algae, diatoms.

Material & Method
Site-I: The site Jathipond was selected as the first station and the cause of selection was to study the presence of pollutants before entering into the city. This is about six kilometers before the mixing of city sewage.

Site-II: (Rajendra Sarovar pond) this site is centrally located in the city. This site is more important because the sewage of the city mixes here. The selection of site-II was made to study the presence of pollutants immediately after the mixing. The site was just few meters away the mixing.

Site-III: (Govardhan Das pond) Site III was selected about 3 KM away from the sewage mixing point. Presence of pollutants coming from effluent and it is supposed to be decreased in the concentration of effluents. This site is also important as the human-population of the area is becoming thinner.

Site-IV: (Banwarilal pond) This is the site where it is assumed that the content of water will carry the pollutants of Chapra city throughout is flow. This site is about 9 K.M away from the sewage mixing point. Population of human being is very thin and hence human activity is very meager.

Collection of sample

Collection of river water was made for the study of phyco-chemical parameters from the surface at a distance of 4.5 from the bank every month between 9-11AM for one i.e. from February 2002 to January 2003. For study of Biological parameters, study was made only in three months i.e. May, August, and January, considering the impact of session only. The collected water samples were taken to laboratory for

(A) Physico-chemical analyses
(B) Biological Study
(C) Phytoplankton Community Structure.
(D) Zooplankton Community Structure.
(E) Productivity.

Result and Discussion

(A) Peiysico-Chemicalanalysis

The Physico-chemical analyses were made with reference to Transparency, Temperature, pH, Dissolved Oxygen, Free CO_2 Carbonated alkalinity, Total Hardness, Calcium and Magnesium.

Of the parameters noted above determination of Transparency, Temperature and pH were made on the collection spot and the remaining in the laboratory. Standard methods of A.P.HA. (1975) were followed for the analysis of each parameter noted above except organic matter for which specific methods were adopted (Jhingaran *et al.* 1969). Chemicals and reagents used for the analyses were of BDHI Merk. AR grade details of the methods adopted for the parameters under consideration may be seen under respective heads as follows:

1. Transparency (cm): It was measured by using Sacchi disc (20cm diameter). It was dipped into water until it disappeared and was uplifted with the help of string tied to it. The point of disappearance reappearance of the disc was note and the transparency was calculated as follows.

$$\text{Transparency} = \frac{d_1 + d_2}{2}$$

Where
d_1 = depth at which Sacchi disc disappeared.
d_2 = depth at which Sacchi disc reappeared.

2. Temperature (°C): The water temperature was recorded by using a centigrade mercury thermometer (Century type No CP 901).

3. pH: pH of the river water was measured with the help of systronics pH meter (model 324)

4. Dissolved Oxygen (mg1^{-1}): It was estimated through Winkler's method (A.P.H.A., 1975) Reagent used

1. Sodiumthiosulphate (0.025N)
2. Alkaline Potassium iodide Solution
   (100 g KON + 50 g KI +200 ml. distilled water)
3. $MnC1_2$ (40%)
4. Starch indicator
   (1g Starch + 100 ml. warm distilled water + few drops of formaldehyde solution)
5. HCL, (Cone.)

Procedure: 250 ml. of the water sample was taken in a reagent bottle. lml. of $MnC1_2$ and lml. of alkali iodide solution were added using separate pipettes. The solution was left for sometimes to settle down the precipitates. 2m1. of cone. HC1 was added to it.

100 ml. of the treated sample was taken in a 150m1conical ask. 2 or 3 drops of starch indicator was added to it and the solution was crated with sodiumthiosulphate until the solution turned colorless. The mount of dissolved oxygen was calculated through the following equation.

$$\text{Dissolved Oxygen (mg1}^{-1}) = \frac{(M \times N)\, of \;\; transtion \;\; \times 8 \times 1000}{V_2\left(\frac{V_1 - V}{V_1}\right)}$$

V_1 = Volume of Sample.
V_2 = Volume to the part of the contents titrated.
V = Volume of $MnSO_4$+ alkali iodide used.

5. Free carbon dioxide (mg1^{-1}): It was estimated by titrating the sample with a strong alkali using phenolphthalein as indicator.

Reagent used

1. Phenolphthalein indicator 1% (0.5g phenolphthalein +50 ml. of 95% ethanol+50 ml, distilled water)
2. Sodium hydroxide (NaOH) – 0.05N

Procedure

50 ml. of the sample was taken in a concial flask and few drops of phenolphthalein indicator was added. If pink colour appeared then it means CO_2 was absent. It the colour of the sample remained uncharged. It was titrated with 0.05 N NaQH until the colour of the solution turned to link. Free CO_2 was calculated as follows.

Free CO_2 (ppm) =

Phenolphthalein alkalinity (mg1^{-1})

Reagent used

1. Phenolphthalein indicator 1 %
2. HCL 0.1N

Procedure

50 ml of the sample was taken in a conical flask and few drops of phenolphthalein indicator was added. The colour of the solution turned pink and titrated with 0.1 NHCl until the colour disappeared.

Phenolphthalein alkalinity (P.A.) Was calculated as per the equation below.

$$\text{P.A. as } CaCO_3 = \frac{(ppm)\,(A \times N)\, of \;\; HCL \;\; \times 1000 \;\; \times 50}{ml \;\; of \;\; Sample}$$

Where
A. = ml. of HCL used.

7. Total alkalinity (mgl^{-1})

Reagent used

1. HCLO. 1N
2. Methyl orange indicator 0.05 %

Two or three drops of methyl orange indicator was added to the above solution and it was titrated against 0.1N HCL until the yellow colour changed to pink. The total alkalinity (T.A.) was calculated through the following equation.

$$\text{P.A. as } CaCO_3 = \frac{(B \times N)\ of\ \ HCL\ \ \times 1000\ \ \times 50}{ml\ .of\ \ Sample}$$

Where

B = ml. of total HCI used

Concentration of carbonate and bicarbonate was calculated rom the table given below.

Table 1: Calculation of the values of carbonate and bicarbonate alkalinity from the P(–1) and T (–2).

Result of Titration	Co_3 alkalinity on as $CaCo_3$	HCo_3 alkalinity as $CaCo_3$
P=0	0	T
P<1/2T	2P	0
P=1/2T	2P	0
P>1/2T	2(T-P)	0

8. Total Hardness ($mg1^{-1}$)

Hardness of water generally caused by the presence of calcium and magnesium ions. It was estimated by EDTA titrimetfic method using Eriochrome black T as indicator.

Reagent used

1. EDTA Solution - 0.0 IM (3.723 disodium salt + 1 liter distilled water)
2. EDTA buffer Solution – (16.9gc NH_4C1+143m1. NH_4OH+1.179g disodium salt+0.780g $MgSO_4$. $7H_2O$+50 ml. distilled water and diluted with 250 ml. distilled water.
3. Erichrome Black T indicator. (mixture of 040g Eriochrome Black T + 100 g NaCl)

Procedure

50 ml of sample was taken in a conical flask. 1ml. of EDTA suffer solution and 20-30 mg of Eriochrome Black T indicator were added to it. The solution turned wine red. It was then titrated against EDTA solution until colour turned to blue. Total hardness was calculated as Per following equation.

$$\text{Total hardness a } mg1^{-1}CaCo_3m1\ \frac{EDTA\ \ used\ \ \times 1000}{ml\ .of\ \ sample}$$

9. Calcium ($mg1^{-1}$): It was estunated by EDTA titrimetric method.

Reagents used

1. EDTA Solution –0.01 M
2. Sodium hydroxide (NaOH) –1N (40 g NaOH + 1 liter distilled water)
3. Murexide indicator (mixture of 0.2g of ammonium purpurate with 100g of NaC1)

Procedure

50 ml. of the sample was taken in a conical flask and 2 ml of NaOH was added to it. 100 to 200 mg. of murex ide indicator was added the solution turned Pink. The content was titrated against EDTA solution until the pink Colour changed to purple. The calcium content was calculated as follows.

$$\text{Calcium } (mg1^{-1})\ \frac{X\ \times 400\ \ g}{ml\ .of\ \ sample}$$

Were,

X = Volume of EDTA used.

10. Magnesium ($mg1^{-1}$)

The quantity of magnesium was calculated on the basis of the formula given below.

Mg ($mg1^{-1}$) = Total hardness (as ppm $CaCO_3$)

Calcium hardness (as ppm $CaCO_3$) × 0.244

(B) Biological Analysis

The details of materials & methods followed for biologic analyses are given below.

Collection & Preservation

Phytoplankton samples were collected by hauling 150 liters of water through a planklonnet (bloting silk no. 22) with the help of a water sample of known volume. The samples thus collected were preserved by adding Lugol's solution. Periphytic algae were collected by scraping submerged stones, sticks, pilings, macrophytes and other available substrates. These were also preserved by adding Lugol's solution was added to 100 ml, sample and the preserved samples were kept in the dark. The material from the study of the diatoms was, however, treated differently. The diatoms were cleaned according to Braun's method. The material was first treated with an equal amount of concentrated HCl for on 1 hour and then thoroughly washed with distilled water. Then the material was treated with equal amount of concentrated H2SO4 with a few crytals of potassium dichromate added to it. It was allowed to stand for 2 to 4 hours. The material was then thoroughly washed with the distilled water and the cleaned diatoms thus obtained were preserved in 4% formalin added with glycerin. For the taicroseopic examination of diatoms, a drop of alcohol containing the leaned diatoms was placed on a cover slip and the cover slip was heated from below so that the alcohol took fire and was allowed to burn out. A drop Canada balsam was then placed on up–slide down over it.

Identification

The preserved phytopiankton samples were concentrated prior to counting. These samples were centrifuged at 1500 rpm for 20 minutes. The supernatant was removed by decanting and the phytoplankton samples were collected in 10 ml. final volume. The counting of phytoplankton was done with the help of a haemacytometer. The haemacytometer was charged with vigorously shaken concentrated sample. The phytoplankton were allowed to settle for 5 minutes and then counted in the central chamber of the haemacytometer. 10 replicates were taken for each sample and the density of the phytoplankton was calculated as follows:

$$\text{Phytoplankton, units/1} = \frac{\text{No of Phytoplankton in the central chamber} \times 104}{\text{Concertaion factor}} \times 1000$$

$$\text{Concentration factor} = \frac{\text{volume of water concentrated}}{\text{Volume of water made after concentration.}}$$

(C) Zooplankton community structure

The preserved zooplankton samples were concentrated prior to counting. These samples were centrifuged at 1500 rpm for 20 minutes. The supernatant was removed by decanting and the zooplankton Samples were collected in 10 ml. final volume. The Counting of zooplankton was done with the help of a haemacytometer. The haemacytometer was charged with vigorously shaken concentrated sample. The zooplanktons were allowed to settle for 5 minutes and then counted in the central chamber of the haemacytometer. 10 replicates were taken for each sample and the density of the zooplankton was calculated as follows:

$$\text{Zooplanklons, units/1} = \frac{\text{No of Phytoplankton in the central chamber}}{\text{Concertation factor}} \times 1000$$

Where

$$\text{Concentration factor} = \frac{\text{volume of water concentrated}}{\text{Volume of water made after concentration.}}$$

(D) Productivity

It was calculated on the collection spot through light and dark bottle method as described by Gardner and Gran (1927).

Reagent Used

A per estimation of dissolved oxygen.

Procedure

First of all initial oxygen concentration was estimated, Then water sample in two bottles (one covered with black paper and other with our it) were suspended in the water from where the samples were collected. The above bottles were exposed for one hour and then the oxygen concentration was estimated from both the bottle, The Net Primary productivity, Gross Primary Productivity and Community Respiration were calculated on the basis of the formula given below:

$$\text{Net Primary Productivity } (O_2 \text{ mg/1hr}) \frac{dl - DL}{h}$$

$$\text{Gross Primary Productivity } (O_2 \text{ mg/1 hi}) \frac{dl - Dd}{h}$$

$$\text{Community Respiration } (O_2\text{mg/1hr}) = \frac{DL - Dd}{h}$$

Where,

Dl = Dissolved oxygen in initial bottle in mg/1

DL = Dissolved oxygen in light bottle in mg/1

Dd = Dissolved oxygen in dark bottle in mg/l

H = Duration of exposure in hour

Conclusion

The collection of organisms both attached to or resting on the bottom sediments and burrowed into the sediments are benthos. In terms of size, benthos are generally divided into three categories: meiohenthos, the organisms that pass through a 0.5 millimeter sieve; macrobenthos, those that are caught by grabs or dredges but retained on the 0.5 millimeter sieve, and bibenthos, those organisms than live on rather than in the seabed. Benthos freshwater and marine ecosystems, the collection of organisms both teacher to and resting on the bottom sediments and burrowed into the dements.

The macrophytobenthos and macrozoobenthos were studied at three months. Material cofleceted on the spot were analysed and identified with the help of standard literature in the laboratory.

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