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Limnological evaluation of fish culture pond of Madhubani

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Abstract

Limnology in the modern source of term is the science of inland waters concerned with all the factors that influence living populations within the water. These factors mostly create water pollution, which is the most serious problem to humankind. It is an established fact that water quality is closely related to the surrounding environment and prevalent land use (APHA, 1992). Madhubani town is known for a network of pond and rivers. It is also a true fact that the flood has effected these water reservoirs badly and is fully responsible for serious problem for these reservoirs as well as mankind. Pond under study is situated in sapta of district Madhubani.

The quality of water depends on its temperature, Clarity, colour, which in any aquatic habitat at a given time is the sum total of the effect of various physical chemical and biological factors. The undesirable impurities are termed as pollutants, which are expressed with the help of various physico-chemical characteristics such as BOD (Biological Oxygen Demand) pH, alkalinity etc.

The knowledge of the physico-chemical structure and the biotic community structure of the pond under study would help in evolving the steps to be taken towards the scientific and systematic maintenance and management of pond for fish culture operation and its mortality in order to achieve a target productivity. It will boost up to formulate and enhance knowledge on the water environment issues and its impact on life. Besides these the present work will be focused on:

- Seasonal variations in community structure and population density of Zooplanktons and macrovertebrates.
- Seasonal variations in community structure and density of marcophytes and phytoplanktons.
- Seasonal variations in various physico-chemical profile of soil and water.
- Diurnal variations in certain physico-chemical parameters.
- Investigations of loss of fishes or fish death if any.

Keywords: Limnological evaluation, physical-chemical biological parameters, fish culture, Madhubani ponds

Introduction

The present study deals with the analysis of certain physico-chemical characteristics of pond of Madhubani situated in sapta under the campus of R.K. College, Madhubani. The analysis was made during the period from June 2013 to May 2014. The parameters like temperature, PH, transparency, conductivity, total solids, total alkalinity total hardness, dissolved oxygen, BOD, Free CO₂, chloride and phosphate have been investigated. The PH. was found to be highest in January ranged from 7.5 to 8.00 Temperature of pond water followed by the same course of that of air temperature. Total hardness, Co, Mg was also found to be highest in January. The population of fish was highest in July and August depends on rainfall and minimum in September to January. The systematic study of fish has shown that the water bodies were rich in population. Approx 18 species of fishes were collected which belong up to 10 families. Effects of variation on different parameters were studied on different fish fauna are known for fish culture.

The ecological status and fish production potential with reference to its physic-chemical properties during three season have been observed. The Ponds of Madhubani have varieties of fishes of different orders v² cypriniformes, Perciformes, ophiocephaliformes, Mugiliformes, Mastacembeleformes etc. have been found in preliminary studies. It reflects that fish productive potential of these ponds is optimum proper management in light of integrated fish farming have been investigated which may enhance fish productive potential of these ponds.

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In present investigation, different physiochemical factors of water such as water level, temperature, turbidity, PH, CO₂, DO, total hardness etc. along with biodiversity have been analysed this water has been used for culturing of fish without any scientific maintenance. Due to increased population from domestic and other human activities fish production of these ponds are affected. It is also a fact that this region is flood affected time to time and we are facing heavy price in terms of depletion of natural resources and environmental degradation causing shrinkage of fish habitat by way of water pollution from various sources. The distribution of aquatic biota also affect the fish productivity Normally water is never pure in chemical sense and there are natural impurities derived from at wasp hare catchments areas and the soil further human sewage, lots of cattle dungs, lots of dryin vegetations from surrounding get added to these ponds and changed the water quality. The effect of fishing on habitats components community structure and ecosystem processes, for a diversity of habitats and fishing gear types are also affected commonalities of all included immediate effects on species composition and diversity and a reduction in habitat comeffect were found to be a good predictor of chronic effects. Recovery after fishing was more variable, depending on habitat type, life history strategy of component species, and the natural disturbance regime.

We might provide a suggestions for the improvement of water quality along with the adjustment of biodiversity The

water resources of these areas demands a comprehensive plan, area-wise and region wise with minutely worked out management programme emphasizing conservation of biodiversity. The community depending on there resources may be trained in modern scientific approaches for discriminate vtilization. It is necessary to focus on guide for conservation, sustainable fishery and livelihood resources.

There should be assessment of fisheries potential and the coefficient of co-relation with other abiotic variables.

Methods & Materials

For the purpose to study and evaluate the pond water and soil, I collected propeline water samples from various aspects of pond. I also collected planktons and soil samples water samples were collected from the R.K. college compus pond sites during March 2010 to feb 2012. The effect was calculated in the laboratory by using standard tool and techniques. Some of the experiments were done at the spot while other were done in the laboratory after fixing the samples.

The temperature of air and pond water was recorded by mercury celsive thermometer at sampling sites and transparency by pin method in terms of depth (centimeter) that directly co-related with the degree of light penetration.

The chemical analysis of pond water was made as per standard methods given in APHA (20th Edition, 2005) The soil samples analysis were done by using standard methods of al (1998), Santhanum *et al.* (1989), and APHA (2005)

Table 1: Physico-chemical Profiles of studied pond (March 2010 to February 2011)

| Pera meters | Summer season | | | Monsoon season | | | | Winter season | | | | |
|------------------------|---------------|-------|------|----------------|------|--------|-----------|---------------|----------|----------|---------|----------|
| | March | April | May | June | July | August | September | October | November | December | January | February |
| AT(C) | 24.0 | 28.2 | 32.8 | 33.6 | 27.2 | 26.3 | 25.2 | 23.2 | 21.0 | 18.1 | 17.0 | 21.5 |
| WT(C) | 22.8 | 26.5 | 28.5 | 28.9 | 25.0 | 24.2 | 23.1 | 21.6 | 19.6 | 17.2 | 16.8 | 18.6 |
| TR | 27.0 | 30.5 | 35.2 | 32.6 | 27.0 | 22.5 | 16.2 | 17.2 | 19.8 | 17.8 | 18.0 | 20.2 |
| PH | 8.2 | 8.2 | 8.6 | 8.7 | 8.1 | 7.2 | 7.1 | 7.4 | 7.5 | 7.8 | 8.0 | 8.5 |
| TDS (PPM) | 460 | 590 | 620 | 785 | 880 | 910 | 710 | 650 | 415 | 400 | 580 | 590 |
| DO ₂ (ppm) | 8.8 | 5.8 | 3.9 | 6.1 | 7.0 | 7.8 | 8.0 | 9.2 | 10.0 | 12.2 | 14.0 | 11.9 |
| FCO ₂ (PPM) | 5.60 | 4.29 | 4.12 | 4.16 | 6.17 | 6.15 | 4.6 | 3.75 | 4.15 | 2.86 | 6.0 | 7.05 |
| CA (PPM) | 35.0 | 40.0 | 46.2 | 45.3 | 42.2 | 13.1 | 25.5 | 25.8 | 24.6 | 28.0 | 32.1 | 35.0 |
| MG (PPM) | 14.5 | 20.6 | 20.2 | 24.2 | 17.5 | 6.5 | 3.6 | 7.4 | 9.0 | 10.5 | 10.2 | 12.5 |
| CL (PPM) | 15.0 | 62.8 | 65.5 | 70.0 | 72.2 | 75.4 | 60.1 | 54.2 | 50.2 | 45.1 | 43.0 | 12.0 |

AT- Atmospheric temperature, WT- Water temperature, TR – Transparency, TDS – Total dissolve solid, DO₂- Dissolve Oxygen, CA- Calcium, MG – Magnisium, CL – Chloride,

Table 2: Seasonal variation in water physico-chemical parameters of R.K college campus pond of Madhubani district. Bihar

| S. No | Parameters | F-Value | Significance | 1% Level |
|-------|--------------------|------------|--------------|----------|
| 1. | Temperature | 24.56073 | 5.05 | 10.97 |
| 2. | Transparency | 50.8417 | 5.05 | 10.97 |
| 3. | pH | 0.2981 | 5.05 | 10.97 |
| 4. | DO ₂ | 3.1215 | 5.05 | 10.97 |
| 5. | FCO ₂ | 57.2005 | 5.05 | 10.97 |
| 6. | Co ₃ | 93.9355 | 5.05 | 10.97 |
| 7. | Hco ₃ | 23260.7280 | 5.05 | 10.97 |
| 8. | Total alkalinity | 21477.1640 | 5.05 | 10.97 |
| 9. | Chloride | 186.8924 | 5.05 | 10.97 |
| 10. | Calcium (C++) | 73.7536 | 5.05 | 10.97 |
| 11. | Magnesium | 32.1877 | 5.05 | 10.97 |
| 12. | Calcium hardness | 1450.0274 | 5.05 | 10.97 |
| 13. | Magnesium hardness | 373.5320 | 5.05 | 10.97 |
| 14. | Total hardness | 1994.4973 | 5.05 | 10.97 |
| 15. | All Parameter | 7452.5305 | 5.05 | 10.97 |

Table 3: Seasonal variation in soil physico-chemical parameters of R.K Collage campus pond of Madhubani district, Bihar.

| S. No | Parameters | F-Value | Significance | |
|-------|-----------------|-----------|--------------|---------|
| | | | 5% Level | 1%Level |
| 1. | Air.T | 16.09292 | 5.05 | 10.97 |
| 2. | Soil.T | 16.93397 | 5.05 | 10.97 |
| 3. | pH | 371.335 | 5.05 | 10.97 |
| 4. | Organic carbon | 10.42787 | 5.05 | 10.97 |
| 5. | Organic Mastter | 148.0616 | 5.05 | 10.97 |
| 6. | Phosphate | 0.240421 | 5.05 | 10.97 |
| 7. | Nitrate | 148.0616 | 5.05 | 10.97 |
| 8. | ALL PARAMETER | 7052.5305 | 5.05 | 10.97 |

Table 4: Population density of planktos of studied pond (2010-2011)

| S. No | Phytoplanktos | class | Zooplanktos | Phylum |
|-------|--------------------|-------------------|----------------------|------------|
| 1. | Oscillatoria | cyanophyceae | Monostaila sp. | Arthropoda |
| 2. | Rivularia aquatica | cyanophyceae | Vorticella camponula | Arthropoda |
| 3. | Nostoc | cyanophyceae | Cyclops sp. | Arthropoda |
| 4. | Pinnularia sp. | bacillariophyceae | Moina sp | Arthropoda |
| 5. | Gomphonema sp. | bacillariophyceae | Nauplius larvae | Arthropoda |
| 6. | Chlorella sp. | chlorophyceae | Euglena sp. Ameba | Protozoa |
| 7. | Spirogyra sp. | chlorophyceae | Brachionus sp. | Rotifera |
| 8. | Eudorina sp. | chlorophyceae | Paramecium aurelia | Protozoa |
| 9. | Closterium sp. | chlorophyceae | Lichen sp. | Rotifera |
| 10. | Pediastrum sp. | chlorophyceae | | Protozoa |

Recommendations

- Though the pond has been notified as protected area. The Municipal department should take care of it.
- Illegal Fishing and hunting of fish should immediately be checked by enforcing the laws.
- Eutrophication should be checked by gradual removal of weeds to keep the pond alive.
- A proper inlet and outlet are required to flush out the pond water.
- Indiscriminate use of fishing boat and uncontrolled fishing should be avoided.
- Regular survey of the pond area by the guards or local police is urgently to save the flora and fauna of the pond.
- Physico-chemical test of water and soil should be conducted at regular intervals.
- To create awareness among the villagers. Fisherman and local people towards the conservation of local fishes may be most effective tool towards the context.
- Few sign boards with appropriate slogans may be fixed at certain places around the pond to aware the local people.
- Few workshop and training programmes should be implemented by the government or fisheries department for the proper improvement of the pond as I noticed.
- At the last, a proper management plan to maintain its identity is another request to save the ecosystem of the pond.

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