RESEARCH ARTICLE

SUMMING UP WATER CHARACTERISTICS WITH SOFTWARE-ANALYSED TROPHIC INTERRELATIONS IN A POND.

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Manuscript Info	*Abstract*
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All the living creatures in the world and their health depend on the availability of quality water for drinking and other purposes. This report is based on the studies which aimed to evaluate the water quality of a model pond in Bodh Gaya (Bihar), India that has been used by the population for different uses apart from aquaculture since long. Investigation of pond water samples from the body at varying seasons was taken up regarding parameters such as P^H, temperature, conductivity, dissolved oxygen, B.O.D., Turbidity, T.D.S, Transparency, Total hardness, Calcium, Magnesium, Phosphate, Nitrate and Chlorine contents to generate data for EwE (*Ecopath with Ecosim*) based analysis of the ecosystem network, growth of components, fish growth potentiality and population dynamics.

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Introduction:-

Water plays an important role in the development of healthy society. Ecological network analysis is a system based methodology to analyze within the system and its interacting components used to identify holistic properties that are otherwise not evident from the direct observations. Like any analytical technique, the accuracy of the results is as good as the data available but the additional challenge is that the data need to characterize an entire ecosystem's flows and storages (Fath *et al*, 2007).

While 70% surface of the earth is covered by water, majority of water available on the earth is saline and only 3% of the total only exists as fresh water. Fresh water has become a scare commodity due to over exploitation and pollution (Ghosh and Bose 1968 : Gupta and Shukla 2006, Patil and Tijare 2001, Singh and Mathur, 2005). Since the International Biological programs (IBP) emphasis on ecosystem research around 1970s, the focus of many ecological studies has been on describing flows in the ecosystems and a number of methodologies were developed for measuring trophic interactions between groups of organisms in different types of ecosystem (Ed mondson and Winberg, 1971, Holme and Mclntgre, 1971, Bagenal, 1978; Fashan, 1984; Christensen and Pauly, 1992). A highly useful software Ecopath II was deveplped by Christensen and Pauly (1992) for balancing steady state ecosystem model and calculating network characteristics. It was further refined year after year for application in various ecosystems especially for aquatic ecosytems as Ecopath with Ecosim (EwE) (Zhang et al; 2011).

Before we go for EwE application for network analysis, it is imperative to assess and analyze water characteristics to correlate the pressure dynamics with the network interrelations.

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Materials And Method:-
Sample collection – Water samples were collected from the *Dibrahi* Pond in plastic bottles in winter, summer and rainy seasons. Samples were taken during 07:00 to 08:00 am in the morning from the depth of 30 cm below the surface, bought to the laboratory and stored at 4^0 c for further analysis.
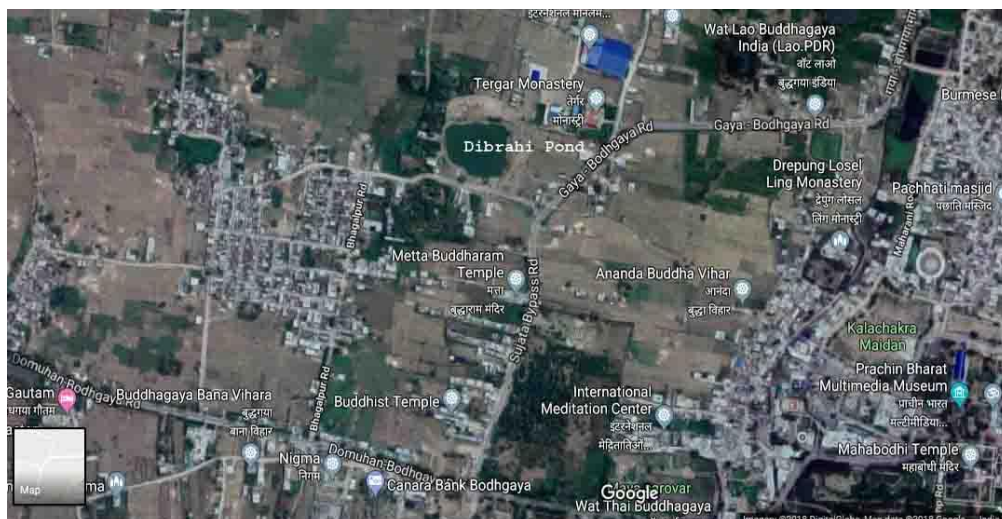
Google Map Location of the pond (24°42'08.5"N 84°58'49.2"E)

Result And Discussion:-
P^H measurement – The P^H was measured by P^H meter. The P^H values varied from 7 to 8 in all the three season i.e winter, summer and rainy season.

Temperature:-
Temperature varies in the range of between 19^0 C to 32^0 C in all the three season i.e winter, summer and rainy season. The temperature of water directly influence some chemical reactions in aquatic ecosystem the significant corresponding . Temperature is basically an important factor for its effects on chemical and biological reactions in water. Taken temp record on the spot, immediately by dipping the thermometer for about one minute.

Table 1:-presents the quality parameters of the pond

Sl. No.	Water quality parameter	Season		
		Winter	Summer	Rainy
1.	Temp (^{0}C)	19^0C	32^0C	26^0C
2.	P^H	7	8	8
3.	Conductivity (mohs/cm)	0.5	0.7	0.9
4.	D.O	3.0	3.5	5.8
5.	B.O.D. (mg/l)	7.0	7.5	5.4
6.	Transparency (cm)	33.5	42.3	29.6
7.	Turbidity (NTU)	44	35	52
8.	Total hardness (mg/l)	420	490	350
9.	Calcium (mg/l)	100.2	140.5	65.4
10.	Magnesium (mg/l)	221	146.4	140
11.	Phosphate (mg/l)	1	0	1
12.	Nitrate (mg/l)	1	1	1
13.	T.D.S (mg/l)	275	233	320
14.	Chlorine (mg/l)	68	76	42.4

Conductivity:-
Conductivity is the measure of the capacity of a substance or solution to conduct electric current. Conductivity is reciprocal of the resistance conductivity if measured of a cub with each side of 1 cm at 25^0 C is called specific conductance. The conductivity varies in the range of 0.5 to 2.1 in season wise.

Dissolved Oxygen:-
Dissolved oxygen is one of the most important parameters in water quality assessment and coordinate the physical and biological processes prevailing in the water. The obtained range of D.O was found 3 – 5.8. It was highest in the rainy season and lowest in winter season. Higher D.O could be increased due to the solubility of oxygen at the lower temperatures.

B.O.D:-
The amount of oxygen consumed during microbial utilization of organics is called the Biochemical oxygen deman (Howard S. Peavy). B.O.D is a measure of the dissolved oxygen consumed by micro organisms during the oxidation of reduced substances in water. An inverse relationship was found between the dissolve oxygen concentrations and B.O.D value (coscun .I 1989). The obtained range of B.O.D was found 5.4 – 7.5. Highest range was found in summer and lowest in rainy season.

Transparency:-
Transparency is a measure of the depth of light penetration into the water. It depends on the amount of particles in water. Hence, it directly and visually indicates the pollution level. The obtained range was found 29 – 42.3, highest in summer and lowest in rainy season.

Turbidity:-
Suspension of particles of water interfering with the passage of light is turbidity (Hemlata Mahobe, 2013). The range of turbidity varied between 35 to 52. NTU. The highest range was observed in rainy and lowest during summer.

Total Hardness:-
Total hardness is a measure of the calcium and magnesium concentrations in water. Its range was found in the range of 350 to 490. The maximum range was found in summer and the minimum range in rainy season respectively. Upadhyaya, 2013 was reported total hardness was high during summer similar result were observed in the present study.

Calcium:-
It is very important for the vertebrates of the pond likes fishes, crabs etc. The obtained range was 65 to 140.5. The lowest range was found in rainy and the highest range was found in summer.

Magnesium:-
Plants may loose colour due to lack of magnesium. It was found in the range of 140 to 221 lowest in rainy and highest in winter.

Phosphate:-
It is essential for plant life but too much addition of phosphate can speed up eutrophication. The maximum value was 1 and minimum value was 0.

Nitrate:-
Nitrate value was 1 in all winter, summer and rainy seasons.TDS is an aggregate indication of the presence of a broad array of chemical contaminants. Its range was highest in rainy season *i.e.* 320 and lowest in winter *i.e.* 275 respectively.

Chlorine Content:-
Chloride is one of the most vital inorganic ions in water as it is highly soluble. Its range was 42 – 76 found lowest during rainy and highest in summer season.

Conclusion:-

A healthy society can developed by the use of water. Pond water is very essential part since there is lack of water on earth. Range of all water quality parameters I suitable for the survival of aquatic plants and animal. Chlorine content may affect the life under pond but P^H and temperature favours them. Hence, the water supports a healthy environment for this ecosystem.

Acknowledgement:-

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