Assessment of Seasonal Variations In Physico-Chemical Properties of Barda Bandharan Wetland : A Limnological Study

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Abstract-Limnology refers to systematic study of plankton and their biodiversity found in aquatic eco-system and their role in maintaining the aqueous ecosystem. Plankton refers to plants and animals that drift with the ocean currents and fresh river water. They are the habitants in the open waters (Limnetic water) of the sea and fresh river water. Phytoplanktons always live near the surface of the sea and fresh water as they require light for photosynthesis, they play important role in transformation of water and carbon dioxide into short chain sugars. The plants in the pelagic zone are exceptionally small, microscopic, and single-celled, buoyantly supported by the density of the surrounding water. Physicochemical parameters are very important factors that play a significant role in wetland plankton diversity and fluctuation in the same. In the present research, we evaluated impact of several abiotics factors on plankton diversity during pre, middle and post winter seasons at of Barada Bandharan wetland, Kodinar, India.

Keywords: Plankton Diversity, Abiotic Factor, Limnology, Pelagic zone, Phytoplanktons,

I. INTRODUCTION

Planktons are the organisms that live suspended in the water of seas, lakes, ponds, and rivers, and not able to swim against the currents of water. This latter feature distinguishes plankton from nekton, community of actively swimming organisms like fish, larger cephalopods and aquatic mammals. There are two major groups of phytoplankton: (l) non motile, fast-growing diatoms (2) motile flagellates and dinoflagellates, which can migrate vertically in the water column in response to light. Each group exhibits a tremendous variety of cell shapes, many with intricate designs and ornamentations. The diatoms are further divided into two groups based on cell shape: (1) Pennate diatoms, which evolved first during the Late Cretaceous, are long and (2) centric diatoms, which evolved later than the pennates, are shaped like pallboxes and may have elaborate arrays of spines projecting from their cell walls. Phytoplankton has varied in physical and chemical requirements for population growth. Diatoms differ significantly with respect to motility, cell-wall composition and ornamentation, and nutritional and reproductive strategies. Diatoms have cell walls, called frustules, made of silica (the same material in glass and opal). In contrast, Dino-flagellates can have a rigid cell-wall, called a theca, made of cellulose plates, or they can have a non-rigid cell membrane (no theca). these two forms of Dino-flagellate's structures gave rise to the terms "armored" and "unarmored" (or "naked") Dino-flagellates. Diatoms and Dino-flagellates can be highly ornamented, which aids in species identification. Cell-surface design on some diatoms may help focus light on chloroplast, allowing survival at greater depths where light intensity is very low. Long spines, cell shape, and the formation of chains and colonies make diatoms more difficult for predators to grasp or bite and also assist in flotation. Some Dino-flagellates form chains, whereas others have protuberances that look like wings, crowns, or horns, for similar reasons. Both groups commonly reproduce by simple cell division. Some species of diatoms and Dino-flagellates are known to produce resting stages. Resting spores in diatoms, and cysts in Dino-flagellates, allow species to survive in unfavorable condition. Dino-flagellate's species have feeding veils that are extruded around such food items as diatoms. Both groups are able to absorb nutrients and vitamins into the cell and have distinct preferences for the forms of some of those nutrients.

II. MATERIALS AND METHODS

A. Sample collection Points:

Three sample points selected at Barda Bandharan (Sampling Points) with specific GPS location and suitable depth and surface. Sample Collected in plastic bottle (non metallic, free-flushing sample recommended for general purpose of water sampling)

5 liter samples Collected for physicochemical analysis approximately less than 2 feet of river water. Time and temperature measured and transferred all sample as soon as possible to laboratory for study further testing. Temperature range between 18 to 21 ^{0}C of samples (Winter Period)

Sr. No.	Barda Bandharan Site Location
1	N 2046 59.4 ,E 070 39 21.1
2	N 2046 59.7 ,E 070 39 27.6
3	N 2046 00.3 ,E 070 39 27.6

Fig.1 : Satellite view of Barda Bandharan Wet land

B. Bacteriological Analysis:

Bacteria found in water belong by definition to plankton but because of special techniques required for sampling and identification are considered separately. These organisms are important in the transformation of dead organic materials to inorganic plant nutrients. Some of these marine and freshwater microorganisms (including blue-green algae) fix molecular nitrogen from water containing dissolved air, forming ammonia or related nutrients important for phytoplankton growth .Although little is known about the extent of nitrogen fixation bacteria always are found in water samples. Biological interactions in the ocean are not between populations or between tropic levels, as many box-model representations of pelagic food webs might lead us to think. This allows us to build models and to extrapolate observations beyond the system in which the observations were made. Traditionally, scientists who go on cruises and examine distribution patterns of both biota and environmental properties using sampling are considered biological oceanographers and those who explore the functioning of individuals, for example by conducting laboratory experiments with organisms are considered marine biologists. We need to combine the two approaches to understand the ecology of the oceans.

Standard plate count method used for enumeration of bacteria/.biochemical Analysis used for identification of bacterial isolated from water Samples (APHA 2012)

C. Sample processing for chlorophyll and carotenoids estimation:

Samples for the chlorophyll estimation were preserved in ice box onboard in darkness to avoid degradation in opaque container covered with aluminum foil. Immediately after reaching the shore ,all samples Put in icebox than transfer all samples as soon as to laboratory for Analysis, 1 liter of collected water sample was filtrate through GF/F filters (pore size 0.45 um) by using vacuum filtration assembly. After vacuum filtration the glass tissue grinder with glass grinding tube. Glass fiber filter paper will assist breaking the cell during gridding and chlorophyll content was extracted with 10 ml of 90% acetone under cold condition along with saturated magnesium carbonate solution in class screw cap tubes. After an extraction period of 24 hrs, the sample ware transferred to calibrate centrifuge tubes and adjusted the volume to original volume with 90% Acetone .the extract was clarified by using centrifuge in close tubes. The clarified extract was then decanted in clean cuvette and optical density was observed at wavelength according to Chlo. A, B, C and Total chlorophyll with carotenoids. The calculation carryout according to APHA 2012

D. Sample collection for plankton Analysis

Collected 1 liter river water sample from three collection site with Plankton net (0.20 microne). After collection of river water samples it's transferred as soon as possible to laboratory for Analysis. Add 4% formalin solution and stay it for 48 hrs, after incubation time period drop count Method used for identified plankton diversity.

E. Physicochemical Analysis:

Primary Examination has done Base on Physical examination of water sample by Color, odor and turbidity. pH and Conductivity measured by pH meter and Conductivity meter.

F. Estimation of Total solid (T.S.)

Porcelain dish is used for this method; Heat it for 103 to 105 C for 1 hrs. Store and cool dish in desiccators until needed weight immediately before use. (Pre weight)Shake the water sample very well and add 100ml of it in to evaporating Petri dish. Put evaporating dish in to oven at 103 to 105 C for overnight. Next day take out it from oven and cool it in desiccators dish would be having dried residues in it. Measure the weight of evaporating dish. (Post weight)Put the data or pre weight and post weight of the dish in following equation and calculate the amount of total solid present in the sample.

Calculation: mg total solids/L= (A-B).1000/Sample volume (ml)

Where,

A=post weight of dish (weight of dried residues +dish mg)

B= Pre weight (weight of dish mg.)

G. Estimation of Total dissolved solid (T.D.S.)

Porcelain dish is used for this method; Heat it for 103 to 105 C for 1 hrs. Store and cool dish in desiccators until

needed weight immediately before use. (Pre weight)Shake the water sample very well and add 100 ml of it in to filtration device that is having glass fiber on it. Apply vacuum and filter out 100ml of sample. Collect the filtrate in to evaporating dish. Put evaporating Petri dish in to oven at 103 to 105 C for overnight. Next day take out it from oven and cool it in desiccators dish would be having dried residues in it. Measure the weight of evaporating dish. (Post weight) Put the data of pre weight and post weight of the dish in following equation and calculate the amount of total solid present in the sample.

Calculation: mg total dissolved solid/L= (A-B).1000/sample volume (ml)

Where,

A=Post weight of dish

(weight of dried resIdues+dish, mg)

B=pre weight (weight of dish, mg)

H. Estimation of chloride in water sample

Sample preparation: Take 100ml of sample in 250ml conical flask. If chlorine is higher in the sample, dilute the sample and then take 100ml of diluted sample. If the sample is highly colored add3ml Al $(OH)_3$ suspension, mix, settle and filter.

Titration: Set the pH of the sample in the range of 7-10 with the help of H_2SO_4 /NAOH.

Add 1ml K_2CrO4 indicator solution. Titrate it with standard AgNO3 Titrate to a pinkish yellow end point. Be consistent in end point recognition.

Calculation: [1] mg Cl/L= (A-B).N.35450/ml of sample (100ml)

Where, A=ml titration for sample, B=ml titration for blank, C=normality of $AgNO_3$ (0.0141N)

[2] mg NaCl /L=(mg Cl/L).1.65

I. Total water hardness:

Take 1ml of water samples than added few drops of the ammonium bisulphate solution add to black-T as indicator. We observed that water sample color is occurrence pink. Then added EDTA slowly drops by drop and water color is blue.

Calculation: Formula: 1000.1ml of used in EDTA/ml of water sample.

J. Estimation of dissolved oxygen (D.O) and biological oxygen demand (B.O.D)

300 ml of B.O.D. bottle was used for water sample Analysis. In this bottle add 1ml MnSo4 solution followed by addition of 1ml alkali iodide acid reagent. Stopper the bottle carefully to exclude and mix by inverting bottle a few times. Add 1ml concentrated H_2So_4. Res topper the bottle and mix it thoroughly too completely dissolve the precipitates. Take 200ml of this mixture from bottle to flask.

Add 1ml 2% starch solution as indicator. Titrate it with 0.025 $Na_2S_2O_3$ solutions. Record the end point, when the blue color of starch disappears.

Calculation:V_1.0.1.1000/200 Where, v1=Burette no.

K. Determination of acidity of water

Hydrogen ions present in a sample as a result of dissociation or hydrolysis of solute react with addition of standard alkali thus acidity depends on end point of the indicator used this colour change of phenolphthalein indicator is used to PH 8.3 at 25'c response to stoichemetric utilization of carbonic acid to bicarbonate.

Mineral acidity:

$$\frac{\text{Volume of NAOH (V1)} * \text{N} * 50 * 1000}{\text{Sample taken}}$$

Total acidity

$$\frac{\text{Volume of NAOH (V1)} * \text{N} * 50 * 1000}{\text{Sample taken}}$$

III. RESULTS AND CONCLUSION

Wetland is great ecosystem and its support a great Biodiversity. In present work we investigated interaction between physicochemical parameters with their impact on Microbial biodiversity during pre, middle and post winter time period 2016-2017 of Barda Bandharan wetland (Temporary wetland) Near Barda Village, Kodinar taluka. Microbial biodiversity is the fourth very important factors of ecosystem in water body because its convert complex organic material to simple organic and inorganic compound which utilize by plankton, Water samples collected from wetland of Barda Bandharan around under 2 fit. Included 15 parameters for Analysis like Temperature, pH, Conductivity, T.S, T.D.S., D.O., B.O.D. water Hardness and chloride. Temperature range 19.0^0C to 20.5^0C. pH range of wetland water was 7.96 to 8.9, pH of water samples were normal Range as per standard but higher pH of water noted on

Nove-11 Month. Higher results of pH indicated salts concentration may higher. Conductivity of water were higher in the sample (Dec-21), higher conductivity indicates salts concentration higher in water sample. Dissolved oxygen (D.O) and Biological oxygen demand (B.O.D) data indicated that dissolve oxygen level range 7.9 to 8.9 in water. Higher D.O. value indicates good condition for aquatic life inside the water. T.S. and T.D.S. data of water samples were higher and fluctuate more during time period. T.S.range of sample 1000 mg/L to 1920 mg/L, Higher, TDS of samples range 300 mg/L to 490 mg/L the data of T.S and T.D.S is higher than normal range its indicated water is not directly use for Agriculture and drinking purpose, higher values is also dangerous for normal aquatic life. Water hardness is another parameter which indicated salts quality in water samples like carbonate and many other salts in water sample. Water hardness Ranges were 300 mg/L to 670 mg/lit, salt concentration were increase during sampling time period (Table:01 and Figure:01 to 08)

we investigated hydrology parameter influence the biodiversity and many other biological parameters, microorganisms also play in maintain organic and inorganic compound in water ecosystem, from above research case study we conclude that plankton and microbial interaction play important role in maintain wetland ecosystem.

Biological Parameter included chlorophyll estimation in which Analysis of Chlo A, chlo B and Total Chlorophyll with cartenoids concentration. Chlorophyll play important role in production of organic molecules in water body ecosystem and it's maintaining food web chain in water body ecosystem. Plankton Analysis in which Zooplankton and phytoplankton are very important biotic factor maintain water body ecosystem. Phytoplankton is primary food producer which is consuming by zooplankton and fish with many other water body animals depend on zooplankton concentration in wetland ecosystem.

Chlorophyll estimation of collected wetland water was indicating that total chlo. Concentration increased during data Analysis with Time period, its indicated organic concentration increase during time period and due to that Bacterial concentration may increase.

Concentration of chlorophyll also indicated increase concentration of phytoplankton, phytoplankton are primary producer of food in water ecosystem they play a major role in maintain water ecosystem. We isolated 36 spp. of phytoplankton during Analysis; Ditoms concentration was higher in which *Rhizosolenia setigera* was predominant in water system. Cylindrotheca spp. was also found during water sample analysis and cynobacteria were predominant found in wetland water system they also important role in photosynthesis.

Plankton Analysis in which Zooplankton and phytoplankton are very important biotic factor maintain water body ecosystem. Phytoplankton is primary food producer which is consuming by zooplankton and fish with many other water body animals depend on zooplankton concentration in wetland ecosystem. Concentration of chlorophyll also indicated increase concentration of phytoplankton, phytoplankton are primary producer of food in water ecosystem they play a major role in maintain water ecosystem. Isolated 18 spp. of Zooplankton during Analysis; Acrocalanus longicornis concentration was higher in which copepod n a u p l i us *was* predominant in water system. Cylindrotheca spp. was also found during water sample analysis and cynobacteria were predominant found in wetland water system they also important role in photosynthesis.

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