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ORIGINAL ARTICLE

Studies on Phytoplankton and Zooplankton in Chambal River at Dholpur District

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ABSTRACT

Planktons are microscopic organisms which are floating passively on suface of open water ecosystems. These are present in both fresh water and marine habitats, drifting with current. They are of two types-phytoplankton and zooplankton. Both have ecological significance to establish water quality. Presence of harmful phytoplankton and zooplankton in Chambal River indicate organic pollution in River at dholpur district. Present study helps in measuring extent of pollution on the basis of identification of zooplankton and phytoplankton.

***Key words**: Phytoplankton, Zooplankton, Chambal River, Dholpur River.*

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INTRODUCTION

Planktons are diverse in nature, broadly divided in zooplankton and phytoplankton. Autotrophic components are phytoplanktons and heterotrophic components are zooplanktons, but detrivorous planktonic organisms are also present. Larvae of nonplanktonic organisms could also initially live as planktons. Though planktons are microscopic in size but they play very important role in aquatic food chains. Phytoplanktons are only producers in open oceans. Planktons are short lived but their rate of reproduction is very high. Zooplankton is a categorization spanning a range of organism sizes including small protozoans and large metazoans. It includes holoplanktonic organisms whose complete life cycle lies within the plankton, as well as meroplanktonic organisms that spend part of their lives in the plankton before graduating to either the nekton or a sessile, benthic existence. Although zooplanktons are primarily transported by ambient water currents, many have locomotion, used to avoid predators (as in diel vertical migration) or to increase prey encounter rate. Ecologically important protozoan zooplankton groups include the foraminiferans, radiolarians and dinoflagellates (the last of these are often mixotrophic). Important metazoan zooplankton include cnidarians such as jellyfish and the Portuguese Man o' War; crustaceans such as copepods, ostracods, isopods, amphipods, mysids and krill; chaetognaths (arrow worms); molluscs such as pteropods; and chordates such as salps and juvenile fish. This wide phylogenetic range includes a similarly wide range in feeding behavior: filter feeding, predation and symbiosis with autotrophic phytoplankton as seen in corals. Zooplankton feed on bacterioplankton, phytoplankton, other zooplankton (sometimes cannibalistically), detritus (or marine snow) and even nektonic organisms. As a result, zooplankton are primarily found in surface waters where food resources (phytoplankton or other zooplankton) are abundant.

MATERIALS AND METHODS

Water sample collected at mid stream 0.5-1 metre below the surface). For collection of sample net plankton is collected for determine the diversity of species and density of planktons. The most of convenient and widely used plankton net made is up of bolting silk no. 25. Plankton sample have collected from different cross sections of the Chambal River between 8 A.M. to 10 A.M., plankton net comprises are metal ring of 15 cm diameter attached to a wooden/metal handle of 1 meter length, bolting silk cloth is tightly stitched around the metal ring in a manner to shape it like a conc. At tapering end of the conc. A specimen tube with rim at the top is strongly tight during the time of collection the net dipped in the water, as the rim is completely emerged below the water surface. In this manner two to six successive having should be made. The contents of specimen tube are subsequently transferred to other specimen tube, having 5% formaline. The plankton density is determined by micro transect method (Lackey 1938) and subsequently modified Edmondson (1974). The details of the process are as follow-

The concentrate of Zooplankton mixed, then one drop of its put on the clean slide by a micropipette and covered with glass cover slip. These countings of organism should be made in five strips along the length or breath of the glass cover slip under the microscope (plate) and such five drops are examined. The width of microscopic field is measured with the help of micrometer. The number of plankton per drop can be calculated as follows:

$$\text{Total number per day} = \frac{\text{Area of cover slip X average number of plankton per transect or focus}}{\text{Area of transect}}$$

The number of Zooplankton per litre may be calculated by following formula-

$$\text{Number of zooplanktonper litre} = \frac{a \text{ X } V'}{V''}$$

Where,

a = number of plankton per ml

V' = volume of concentrate

V'' = volume of water filtered through the net

The volume of water filtered through the net can be calculated by following formula-

$$V = iirl$$

Where,

V = volume of water filtered

R = radius of plankton net ring

l = column of water filtered

Sample of only the horizontal profile of River usually do not give a correct picture of the plankton density and diversity because same of the plankton undertake vertical movement which is determined by diel cycle. It is therefore essential that few samples are taken from different depths of water. Which will present a vertical profile highly of the plankton since the depth of River varies at different points, therefore it will be appropriate if, besides the surface water, the plankton are collected according to the depth of water. For collection of sample from vertical column the samples are sketched in figure-The further details are as follows-A wide method glass bottle of 1-3 litres capacity (according to need) is taken and placed in a larger container made up of galvanized iron sheet or Zink sheets. The gap between the container and the bottle is packed up with raw dust for proper insulation only the neck and mouth of the glass bottle protrudes outside and the remaining part is inside the insulated container. A rubber stopper is fixed at the mouth of the bottle which has three holes for insertion of thermometer (A) and inlet tube

(B) and an outlet (C) glass tube. In the outlet tube (C) a transparent plastic tube of desired length is filtered. The metallic container should be provided with two hooks (D) at the top (for suspending it by a nylon cord) since the current is usually fast and the samples may not go down in a totally perpendicular manner, the entire samples may be placed in a nylon bag. At the bottom of net some weight (stones etc) may be put to overcome the current effect. At the time of operation the nylon rope may be marked at every one metre length. The unattached end of the plastic tube should be elipped (E) and the sample should be gradually dipped in to the water. After the samples has reacted the desired depth, the clip of the plastic tube should be removed. So what the air is expelled out. The moment, air is replaced by water column in the plastic tube, the end of the tube should again be clipped and the samples should be gradually lifted and taken out. The temperature should be immediately recorded. After recording the temperature the rubber stopper should be removed and the water sample should be filtered for determining the plankton density and diversity.

RESULTS AND DISCUSSION

(A) CHLOROPHYCEAE:

Table 1: Sitewise arrangement of Phytoplanktonic genara

Chlorophyceae	Site A	Site B	Site C
Ulothrix zonata	D	D	D
Euglenopsis varex	D	F	A
Spirogyra sp.	A	D	R
Euglena acus	A	F	D
Volvox sp.	-	F	D
Polytoma. uvella	R	R	-
Paranema tricophorum	-	R	-
Microspora amoena	A	-	-
Oedogonium tripterus	-	F	-
Lemanea annulata	R	R	R
Closteriopsis leibleini	A	F	R
Chalamydomonas curvata	F	R	-
Tetraspora cylindrica	R	D	F
Centritractus sp.	-	R	R
Gloeomonas sp.	R	F	-
Lutherella sp.	-	A	-
Actinastrum sp.	-	R	-
Ascoglena vaginicola	R	F	-
Hormidium subtile	D	-	R
Hydrurus foetidus	R	-	-

D – Dominant, A – Abundant, F – Fluent, R – Rare

(B) BACILLARIOPHYCEAE:

Bacillariophyceae	Site A	Site B	Site C
Bacillaria	D	D	R
Frustulia	R	R	R
Synendra	D	D	A
Gyrosigina	A	A	R
Tabellaria	F	D	D
Asterionella	-	-	D
Navicula	A	R	D
Amphipleura	R	-	-

Actinella	-	-	R
Fragelaria	R	-	-
Cylindrotheca	F	A	F
Diatomella	R	R	R
Brebisonia	D	-	A
Anoneomeris	A	R	D
Mastogloea	D	A	F

D – Dominant, A – Abundant, F – Fluent, R – Rare

(C) MYXOPHYCEAE:

Table 2: Sitewise arrangement of Zooplanktonic genera

Myxophyceae	Site A	Site B	Site C
Nostoc	A	A	A
Oscillatoria	D	D	D
Nodularia	R	-	R
Hydrocoryna	R	R	-
Spirulina	D	D	F
Anacystis	R	F	F
Raphidiopsis	-	R	-
Symploca	R	R	R
Gloetrichia	R	-	R

(A) CLADOCERA:

Cladocera	Site A	Site B	Site C
Daphnia	D	D	D
Bosmina	-	F	R
Macrothrix	R	R	R
Alonella	R	-	R
Dadaya	A	F	A
Moina	R	-	-
Monospilus	-	-	R
Pleuroxus	R	R	-
Lathonura	-	R	F
Camtocerus	R	R	-

(B) COPEPODA

Copepoda	Site A	Site B	Site C
Cyclops	D	A	D
Eucyclops	R	F	-
Halicyclops	A	R	-
Bryocamptus	R	R	R
Argulus	R	R	R
Diaptomus	R	F	F

(C) RHIZOPODA:

Rhizopoda	Site A	Site B	Site C
Amoeba	D	D	D
Nabella	D	R	A
Arcella	-	-	R
Difflugia	D	A	A
Choas	-	R	-

Pelomyxa	R	A	F
Euglypha	-	-	R
Enteroplea	-	R	-
Centropyxis	F	R	A
Cochleopodium	-	-	R

(D) ROTIFERA:

Rotifera	Site A	Site B	Site C
Platyias	F	A	R
Keratella	D	F	A
Notholeca	-	F	-
Brachionus	D	D	R
Filinia	R	-	-
Monostyla	F	R	F
Notommata	F	R	-
Trichotria	-	R	F
Lomnias	-	-	R
Euchlanis	R	-	-
Lepodella	R	-	R
Colurella	R	R	-
Lecane	-	-	R
Rotaria	-	R	-
Monomalta	F	-	R

The presence of coliform does not mean that pathogens are present, it simply means that their might be present are high coliform & faecal coliform count suspicious and the water should not be consume. Presence of phytoplanktons recorded positive correlation with free CO_2, temperature and chloride whereas negative correlation exhibited in D.O., Phosphate, pH and total alkalinity. Zooplanktons correlated positively with chloride and D.O. while show negative correlation with PH and total alkalinity. in significantly increase which indicate-Those phytoplanktons which were confined to sewage discharge and mixing points only can be treated as pollution tolrent forms. Another group of algae which are more sensitive to toxic pollutant and were found in clean water. Such algae which are indicator of organic pollutions they are monitoring for coliform and faecal coliform which are responsible for organic pollution in water. Zooplankton density continuously increases at all collecting stations which indicate that there is continuously discharge of town sewage. Zooplankton and phytoplankton was recorded maximum during summer in each sites upstream and down stream and minimum population was recorded during winter at all the sites of upstream and down stream. Algae of Rhodophycae group, blue green algae clearly indicate that in Chambol River organic pollution is going to increase. In the month of July 2005 when temperature is more than 30oC and pH more than 7, there is presence of abundant Protozoans. Besides presence of Protozoans, zooplanktons the rotifires also indicator of organic pollution in Chambol River of Dholpur region.

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