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Diversity and Distribution of Phytoplankton in the River Hiran

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ABSTRACT

Present work was carried out to investigate the diversity and distribution of phytoplankton in the River Hiran. Samples were collected from five sampling stations, namely Kimdeshwar, Khitoula, Ghat Simariya, Khinni and Hirapur for two consective years. A total of 66 species of phytoplanktons were collected from the Hiran river. The greatest phytoplankton density from 830.4 to 4549.9 org/l was found at site S-1, while the least phytoplanktonic density 138.4 to 588.2 org/1 was reported at stations S-5. The phytoplankton represented in greatest number of Cyanophyceae and the least density of Dinophyceae. The phytoplankton represented in the order of Cyanophyceae > Bacillariophyceae > Chlorophyceae > Dinophyceae.

KEYWORDS : River Hiran, Phytoplankton, Distribution , Diversity and Density.

INTRODUCTION:

Fresh water environments are highly diversified and marked by a wide range of physico-chemical conditions, which greatly influence the life in water. Fluctuations is physico-chemical condition adversely affect the organisms limiting their production and interfering in the physiological processes, which reduce their ability to complete with other population within the environment phyto and zooplanktons are the two basic components of the aquatic ecosystem. So, drinking water quality and fishery are intimately connected with the quality and quantity of these two components of the aquatic ecosystem.

Planktons especially Zooplanktons plays several important role in the aquatic community. Direct correlation has been established between the planktonic crop and fish production, because planktonic biomass directly related to the fish production. Among the planktonic communities, the Zooplanktons are the main primary microconsumers of phytoplanktons and are found to be dominated by Protozoa, Rotifera, Copepoda and Cladocera. The phytoplanktons forms a very important component of the aquatic vegetation, occurring in all kinds of water bodies and consequently enjoying a worldwide distribution. Therefore, particularly in the recent past, numerous researchers from all parts of the globe, have paid considerable attention to the study of the planktonic autotorophs. The survey of available literature reveals that the existence of plankton in aquatic systems was unknown, until the middle of the last Century. In fact, the usage of the term " Plankton" has come down over the Century since the time of Hensen, an oceanographer, who first coined this term in 1887. Plankton may be defined as the heterogeneous assemblages of minute organisms, that occur in the water, floating at the mercy of the waves and other water movements (Welch, 1952).

MATERIALS AND METHODS:

Five sampling stations were selected from origin and joining places with the Narmada River. These station are Kimdeshwar, Khitoula, Ghat Simariya, Khinni and Hirapur.

Kundeshwar: This station is one km from Kundam, which has old tample of God Shankar. The HiranRiver originates from a kund located at "Cow Mukh". Here Hiran River is very thin stream and extends forward, it becomes three feet wide. No Fish Fauna were located. Only in rainy season few small fishes can be seen depth of water and are also very less.

Khitoula: This Sampling station is located two km from Sihora. Here water is used for drinking purpose, beside this there is a bathing ghat. Here the river Hiran becomes 160 feet wide and depth is 12 feet/7000 gallons water are supplied to Sihora and 5000 gallons to Khitoula.

Ghat Simariya: This station is 5 km from Simariya, which is a Sandy area. Small stream like river Banne joins to River Hiran.

Khinni: This station is 10 kms from Gosalpur, which is also a sandy area. Total width is 110 feet and depth is 11 feet. Water is utilized for drinking, Pisculture, Agriculture, Bathing and also for the use for Cattles.

Hirapur: This sampling station is last station no.-5, which is 5 km from Belkheda located at Jabalpur – BhopalNational Highway, Route No.-12. Hirapur is located at interior, where Hiranriver Joins the Narmada river at Sankal Dhar.

Collection of Planktons (Phytoplankton): Phytoplankton were collected in 500 ml narrow mouth polythene bottle through plankton net from different sampling sites and preserved in 4% formalin and analyzed in the laboratory with the help of Sedjwich - Rafter counting cell (Wetzel, 1983) under the microscope.

RESULTS AND DISSUSION:

The present investigation has shown a gradual increase in total plankton from October to March. A maximum plankton density from 830.4 to 4549.9 org/1 was recorded from site S-1, while comparatively least plankton density was recorded at site S-4 with a range of 830.4 to 3079.0 org/1. The other stations show intermediate ranges. According to Bayrs (1960) no relationship could be deduced between the chemical conditions and plankton. Davis (1954) suggested action of a combination of physico-chemical factors on plankton. Dad (1981) reported influence of physico-chemical factors on plankton fluctuations. He reported plankton maxima in Summer (June). Griffith (1955) observed no pronounced relationship between temperature and plankton production. Low plankton was reported in Mansoon and Winter months by Chakraborthy *et al.* (1959). According to Welch (1952), Roy (1955), Chakraborthy *et al*. (1959), Pahwa and Mehrotra (1966) and Ray *et al.* (1966), the blankating effect of suspended materials interferes the plankton production and check photosynthetic activity. The present observations agree with the trends suggested as above.

A total of 66 species of phytoplankton were collected from the Hiran river. The greatest phytoplankton density from 640.1 to 2716.1 org/1 was found at site S-1, while the least phytoplanktonic density 640.1 to 1885.7 org/1 was reported at stations S-5.

The phytoplankton represented in greatest number of Cyanophyceae and the least density of Dinophyceae. The phytoplankton represented in the order as:

Cyanophyceae > Bacillariophyceae > Chlorophyceae > Dinophyceae.

The Bacillariophyceae in this study ranged between 346.0 to 1245.6 org/1 at station S-2. These dominated at all the stations throughout the study period. The percentage composition range from 33.88 to 65.78%. Most dominant Bacillariophyceae were reported from river Kagna, river Godavari and river Krishna by Venkateswarlu (1986). Khare and Unni (1986) reported most dominant Bacillariophyceae from Kolarriver ranging upto 70 to 100%. In this regard the present observations agree with the above authors. *Synedraulna*, *Fragilaria* species were most dominant species of orderBacillariophyceae.

The present investigation has recorded Chlorophyceae domination next to the Bacillariophyceae, ranging from 207.6 to 882.2 org/1 at S-2 and 138.4 to 588.2 org/1 at S-5, which represent the least density. Patra and Nayak (1982) and Adholia (1988) reported most dominant population

of Chlorophyceae from river Betwa. In this regard the present finding differs from the above, where Chlorophyceae was next to Bacillariophyceae. During this study maximum Chlorophyceae was recorded in the month of December and minimum in January. The percentage composition of Chlorophyceae ranging from 21.6 to 41.50%. The present study has shown that *Zygnemapectinatum*, *Spiogyro*sps.,*Pediastrum simplex* and *Chlorella*sps. were most dominant. Similar observations were made by Patra and Nayak (1982) from the Hiranriver.

Amongst the Cyanophyceae the present the present study has reported the dominant population of *Microcystis aeruginosa*. Similar reports were made by Patra and Nayak (1982). *Ceratium hirundnella* represented the Dinophyceae population.

Plankton population on which the whole aquatic life depends, directly or indirectly is governed by the interaction of a number of physical, chemical and biological conditions of the water body and the tolerance to one or more of these conditions (Reid and Wood, 1976). No individual factor abiotic or biotic is singly responsible for the fluctuation of plankton periodicity. A number of physical, chemical, biological and environmental factors acting simultaneously must be taken into consideration to understand the fluctuations of plankton population (Davis, 1954).

During present study phytoplankton exhibitsbimodal oscillations. One pulse of the phytoplankton was observed in the month of April, this was termed as summer peak and the second peak was observed in the months of November and December known as winter peak, which was comparatively of a lower magnitude. Such a bimodal fluctuation have also been noted by Singh (1968), Das and Shrivastava (1956) and George (1966).

During this investigation the maximum of phytoplankton were recorded in late spring and post monsoon months and the minimum were recorded is summer and monsoon months. Smith (1924) emphasized on light, temperature and free carbon dioxide as the controlling factors of growth of algae. Allen (1920) and Prashad (1956) were of the opinion, that the temperature is the determining factor in the seasonal distribution of organisms. Holden and Green (1960) observed that temperature, when compared with certain other factors was less significant in influencing the abundance of Plankton. Welch (1952), Roy (1955), Chakraborty *et al*. (1959), Pahwa and Mehrotra (1966) and Ray *et al*. (1966) observed the "blanketing effect" of suspended material interfering with the production of plankton by retarding photosyntheticactivity. Allen (1920) observed that water currents above a very moderate speed were distinctly inimical to plankton development. Verma and Shukla (1970) pointed out that no individual factor physical or chemical singularly responsible for the seasonal fluctuations of phytoplankton.

Here during this observation it was noted that the total number of phytoplankton was low in summer and monsoon months. This may be attributed to the reason that during summer high water temperature, turbidity, fluctuating water level and low nutrient concentration along with consumption of phytoplankton by zooplankton and fishes, resulted in their education of phytoplankton population. Low plankton production during monsoon period seems to be due to wavy action of currents, an increase in turbidity and influx of rain water, which act as limiting factor for plankton population. Reports of Vijayaraghavan (1971) and Chakraborty *et al*. (1959) support the above contention.

Fig. 01: Diversity of phytoplanktons in different sites (2006-07).

Fig. 02: Diversity of phytoplanktons in different sites (2007-08).

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