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# An assessment of plankton population of Cauvery river with reference to pollution

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***Abstract:*** *Studies on plankton of river Cauvery water, Mettur, Salem District, Tamil Nadu was made to assess the pollution of water from January 2003 to December 2003. The qualitative and quantitative evaluation of the variation in river water showed high quantity of phytoplankton and zooplankton population throughout the study period and rotifers formed dominated group over other groups of organisms. The present study revealed that the water of river Cauvery is highly polluted by direct contamination of sewage and other industrial effluents.*

***Key words****: River, Cauvery, Phytoplankton, Zooplankton, Pollution*

## Introduction

Planktons are very sensitive to the environment they live in any alteration in the environment leads to the change in the plankton communities in terms of tolerance, abundance, diversity and dominance in the habitat. Therefore, plankton population observation may be used as a reliable tool for biomonitoring studies to assess the pollution status of aquatic bodies (Mathivanan and Jayakumar, 1995). The study of plankton as an index of water quality with respect to industrial, municipal and domestic pollution has been reported earlier (Acharjee *et al*., 1995 ; Jha *et al.*, 1997).

The present investigation was carried out on the surface plankton population in the aquatic ecosystem of Cauvery river water. The industrial effluents from various industries in and around Mettur contain numerous toxic substances once entered into the river Cauvery affecting the water quality. As a consequence, the plankton populations of the Cauvery river has been affected in terms of abundance and diversity. The present study is aimed at evaluating the plankton index as the water quality criteria with reference to freshwater bodies polluted by various industries at Mettur.

**Study area:** The river Cauvery originates from Guddagumalai and flows through Karnataka and Tamil Nadu. In Tamil Nadu, it runs through Mettur, Bhavani, Komarapalayam, Trichy and Thanjavur and then into the Bay of Bengal at Kaveripoompattinam. Hence, the present study has been undertaken to examine the effect of pollutants and to assess the planktonic population in Cauvery river at Station I (Pannavadi, unpolluted) and Station II (Sankalimuniappan Koil area, polluted).

## Materials and Methods

Plankton samples were collected by standard methods (APHA, 1989) from predetermined sampling sites from the point of effluent outfall along with the downstream water stretch, arbitrarily designed two stations from January 2003 to December 2003. The collected samples were fixed in 3-4% formalin and brought to the laboratory for plankton analysis. Counting and identification were done as per APHA (1989). Species diversity index was obtained by following Shannon Weaver methodology (Nath, 1997).

## Results and Discussion

**Phytoplankton:** Phytoplankton were collected from the river water during the study period from Stations I and II.

**Station I (Pannavadi):** The qualitative and quantitative monthly occurrence of phytoplanktons species at Station I are given in the Table 1 and Fig.1. The mean number of species of phytoplanktons encounted from station 1 of which, 15 species belonged to chlorophyceae, 8 species to bacillariophyceae, 21 species to myxophyceae and 7 species to euglinae. Total phytoplankton population density ranged from 31 in December to 76 in June. A gradual increase in the total density of phytoplankton population was observed from January to May 2003. The annual mean percentage composition of different groups of phytoplnktons revealed to contribute nearly 29% of chlorophyceae, 16% of bacillariophyceae, 41% of myxophyceae and 14% of euglennineae (Fig. 3).

**Station II (Sankalimuniappan Koil area):** A total number of 44 species of phytoplankton belonging to chlorophyceae, bacillariophyceae, myxophyceae and euglenineae were identified and are presented in Table 2 and Fig. 2. The changes in the total population density of different phytoplankton groups and their monthwise percentage composition were also depicted. The maximum density of 66 cells/ml was observed during June, 2003 where as the minimum of 27 cells/ml was observed during January, 2003. The annual mean percentage composition of different groups of phytoplnktons revealed to contribute nearly 23% of chlorophyceae, 21% of bacillariophyceae, 33% of myxophyceae and 23% of euglennineae (Fig. 4).

**Zooplanktron:** Four types of zooplankton were identified and are given in Table 3 and 4 for station I and II respectively.

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**Table - 1:** Population composition and monthly fluctuation of phytoplankton at Station - I (organisms/ml) from January 2003 to December 2003

| Month | Chlorophyceae | Bacillariophyceae | Euglinae | Myxophyceae | Total phytoplankton |
|---|---|---|---|---|---|
| January | 10 | 8 | 6 | 11 | 35 |
| February | 13 | 9 | 6 | 14 | 42 |
| March | 15 | 8 | 5 | 21 | 49 |
| April | 16 | 7 | 6 | 28 | 57 |
| May | 22 | 5 | 6 | 40 | 73 |
| June | 20 | 11 | 4 | 41 | 76 |
| July | 16 | 6 | 5 | 25 | 52 |
| August | 18 | 7 | 9 | 15 | 49 |
| September | 14 | 9 | 5 | 16 | 44 |
| October | 16 | 11 | 4 | 10 | 41 |
| November | 8 | 7 | 8 | 13 | 36 |
| December | 12 | 4 | 5 | 10 | 31 |
| **Mean** | **15** | **8** | **7** | **21** | **49** |

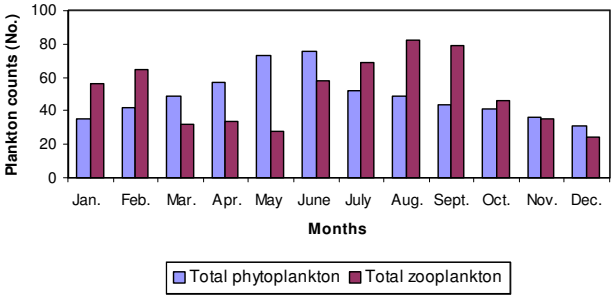


**Fig. 1:** Total plankton population in river Cauvery, Mettur during Jan. 2003 - Dec. 2003 unpolluted area (Station I)

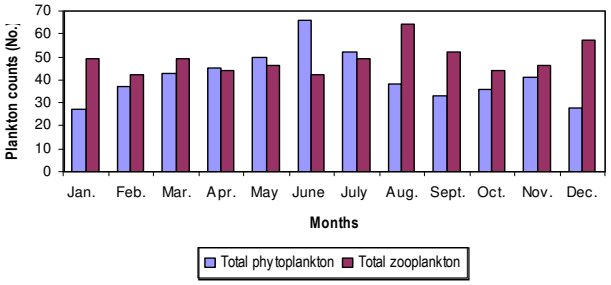


**Fig. 2:** Total plankton population in river Cauvery, Mettur during Jan. 2003 - Dec. 2003 polluted area (Station II)

**Table - 2:** Population composition and monthly fluctuation of phytoplankton at Station II (organisms/ml) from January 2003 to December 2003

| Month | Chlorophyceae | Bacillariophyceae | Euglinae | Myxophyceae | Total phytoplankton |
|---|---|---|---|---|---|
| January | 6 | 4 | 7 | 10 | 27 |
| February | 7 | 6 | 9 | 9 | 37 |
| March | 8 | 10 | 8 | 17 | 43 |
| April | 11 | 9 | 10 | 6 | 45 |
| May | 14 | 8 | 7 | 21 | 50 |
| June | 18 | 11 | 10 | 27 | 66 |
| July | 16 | 11 | 6 | 19 | 52 |
| August | 11 | 9 | 5 | 13 | 38 |
| September | 10 | 5 | 6 | 12 | 33 |
| October | 11 | 5 | 6 | 14 | 36 |
| November | 12 | 6 | 7 | 16 | 41 |
| December | 5 | 8 | 4 | 11 | 28 |
| **Mean** | **13** | **12** | **13** | **18** | **44** |

**Station I (Pannavadi):** The zooplankton species encountered at Station I and their monthwise distribution are presented in Table 3 and Fig. 5. A total of 49 species were recorded from this station, of which, 18 species belonged to cladocera, 13 species to rotifera, 11 species to copepoda and 10 species to protozoa. The maximum population density (82) was observed in August and minimum (24) in December. The annual mean percentage composition of different groups of zooplankton showed that rotfera contributed 24%, cladocera 34%, copepoda 22% and protoza 20% (Fig. 5).

**Station II (Sankalimuniappan area):** A total of 13 species of zooplankton were identified from this station of which, 5 species belonged to cladocera, 3 to rotifera, 3 to copepoda and 2 to protoza. The monthly occurrence of various zooplankton species during the present study are shown in Table 4 and Fig. 2. The total zooplankton population density varied from 42, during February to 64, in August. The annual mean percentage composition of zooplankton groups showed that rotifera contributed 25%, cladocera 24%, copepoda 27% and protozoa 24% (Fig. 6).

**Table - 3:** Population composition and monthly fluctuation of zooplankton at Station - I (organisms/ml) from January 2003 to December 2003

| Month | Cladocera | Copepoda | Rotifera | Protozoa | Total zooplankton |
|---|---|---|---|---|---|
| January | 18 | 12 | 10 | 16 | 56 |
| February | 20 | 22 | 14 | 9 | 65 |
| March | 9 | 8 | 7 | 8 | 32 |
| April | 8 | 9 | 11 | 6 | 34 |
| May | 7 | 6 | 7 | 8 | 28 |
| June | 14 | 8 | 15 | 21 | 58 |
| July | 22 | 13 | 24 | 10 | 69 |
| August | 30 | 22 | 24 | 6 | 82 |
| September | 27 | 21 | 23 | 8 | 79 |
| October | 21 | 9 | 5 | 11 | 46 |
| November | 10 | 4 | 10 | 11 | 35 |
| December | 8 | 6 | 5 | 5 | 24 |
| **Mean** | **18** | **11** | **13** | **10** | **51** |

**Table - 4:** Population composition and monthly fluctuation of zooplankton at Station - II (organisms/ml) from January 2003 to December 2003

| Month | Cladocera | Copepoda | Rotifera | Protozoa | Total zooplankton |
|---|---|---|---|---|---|
| January | 12 | 13 | 11 | 13 | 49 |
| February | 10 | 10 | 12 | 10 | 42 |
| March | 13 | 11 | 15 | 10 | 49 |
| April | 11 | 12 | 10 | 11 | 44 |
| May | 10 | 10 | 14 | 12 | 46 |
| June | 10 | 11 | 10 | 11 | 42 |
| July | 12 | 13 | 12 | 12 | 49 |
| August | 15 | 12 | 18 | 19 | 64 |
| September | 17 | 13 | 10 | 12 | 52 |
| October | 13 | 10 | 11 | 10 | 44 |
| November | 10 | 11 | 14 | 11 | 46 |
| December | 18 | 11 | 16 | 12 | 57 |
| **Mean** | **11** | **14** | **13** | **11** | **49** |

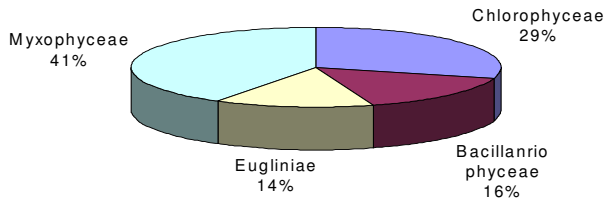


**Fig. 3:** Station I Phytoplankton (unpolluted)

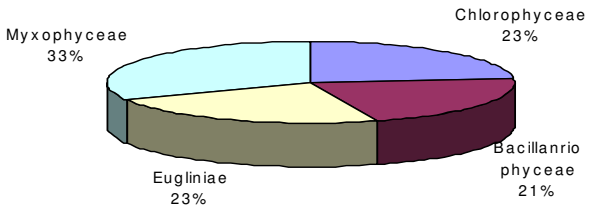


**Fig. 4:** Station II Phytoplankton (polluted)

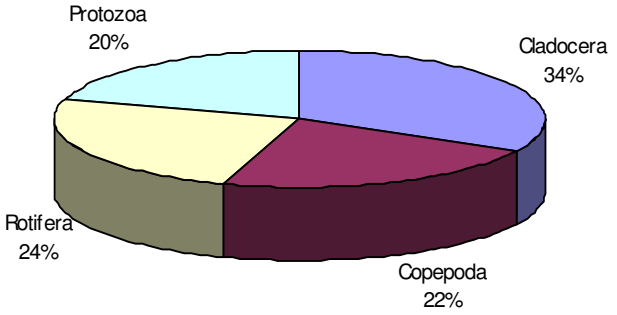


**Fig. 5:** Station I Zooplankton (unpolluted)

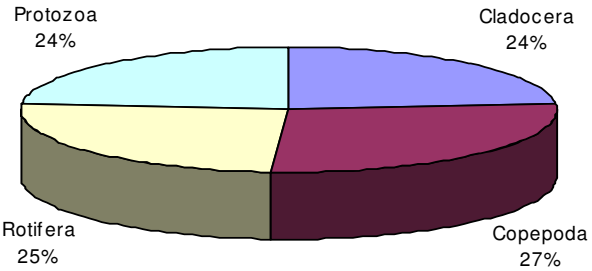


**Fig. 6:** Station II Zooplankton (polluted)

**Fig. 3 to 6:** Annual mean percentage composition of planktons at Station I and II during January to December 2003

The knowledge of plankton species composition and distribution to time and space are of great value especially in any running water system. The present study reveals some aspects of phyto and zooplanktonic dynamics to explain their relations with the physicochemical parameters of river Cauvery.

In the present investigation, the phytoplankton fluctuates monthly and its productivity was high during June and low during December as evidenced earlier by Sadguru *et al*. (2002). The phytoplankton comprises major portion in the river. The basic process of phytoplankton production was dependent upon temperature, turbidity and nutrients as reported by Srinivasan *et al*. (1979) and Sukumaran and Das (2002). In the present study, the low productivity of phytoplankton might be due to the grazing effect by zooplankton and fishes as evidenced earlier by Mathivanan and Jayakumar (1995), Biswas and Konar (2001) and Sadguru *et al*. (2002).

The zooplankton population also fluctuates monthly (Biswas and Konar, 2001), productivity was high during August and low during December 2003 in this study area. The reason might be due to heavy rain as evidenced by Sadguru *et al*., 2002. The predominance of rotifers and copepodes over the other groups of zooplankton observed in the present study has also been reported earlier in various rivers (Davis, 1995; Kumar, 1997; Mukhopadhysay *et al.,* 2000; Prakash and Srivastava, 2001). Thus, the influence of nutrients of water on the zooplankton population has been reduced in Station II as compared to Station I. In the present investigation, this observation clearly revealed that zooplankton represents a sensitive indicator of pollution compared to that of phytoplankton.

It is concluded from this study that the plankton population of river Cauvery at Mettur, Salem district is highly influenced by the discharge from different industrial effluents. The shift in the planktonic community structure and dominance of pollution tolerant forms at discharge zone indicated deterioration of water quality in this stretch of the river.

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