J.Aqua.Biol., Vol. 21(1), 2006 : 29 – 31.

CLUSTER ANALYSIS OF ZOOPLANKTON FROM THANE LAKES (MAHARASHTRA)

Raut, Nayana S., Milan Gholba and Madhuri Pejaver,
Department of Zoology, B.N.Bandodkar College of Science,
Chendani, Thane – 400 601, Maharashtra.

Key words : Lakes, Zooplankton, Cluster Analysis, Dendrogram

Abstract :

In the study of four lakes namely Ambeghosale, Rewale, Upavan and Makhamali from Thane city the zooplankton samples were collected. During the course of statistical analysis the zooplankton was subjected, first time to cluster analysis. Different clusters are represented with the help of tree diagram of variables (dendrogram).Maximum six clusters were seen in lake Ambeghosale, while minimum three clusters were evident in the lake Rewale.

Introduction :

Planktonic organisms in temperate lakes commonly show distinct seasonal dynamics that have been attributed mainly to changes in ambient physico-chemical parameters (light, temperature and nutrients) which in turn govern phytoplankton primary production and autotrophy-herbivore interactions (Hessen *et.al.*, 2005). During the present study apart from the simple graphical comparison, statistical methods are used to interpret the data. The use of statistics in biology is known as biostatistics or biometry (Suresh Kumar and Satya Nerri 2002).

Cluster analysis is used to classify the variables into groups. Cluster analysis appears to be handy tool in determining important factors that control activity in polluted waters. The cluster analysis is represented by dendrogram. A dendrogram is a tree diagram, which represents the amalgamation (grouping) of variable into clusters.

Here we have used correlation coefficient as a similarity measure. In the 1st step two variables, which are closest are joined. In the next step either a third variable joins the first two or two other variables are joined together in 2nd cluster. This procedure continues until all variables are clustered and all clusters are joined into one single cluster.

Cluster analysis was also reported by Bruno *et. al.*, (2002). They have Shown cluster analysis of averages of physical and chemical variables at the sampling stations in Everglades National Park. Knag Jung-Hoom *et. al.*, (2004), used this tool to show zooplankton abundance in the East Sea. Further, Hamilton *et.al.* (2005) have employed cluster analysis to show the way clusters and groups of planktonic invertebrates are based on density across 105 ponds. Rana and Bhat (2005) have also represented cluster analysis with dendrogram to show relationships among cotton cultivators belonging to four cultivated species of cotton.

Materials and Methods :

Monthly water samples from four lakes Viz. Ambeghosale, Rewale, Upavan and Makhamali in Thane district of Maharashtra were collected. The physicochemical analysis of water samples was carried as per the procedures described in the Standard Methods (APHA, 1981; Trivedi and Goel, 1984). Monthly samples of zooplankton

were collected and preserved in 4% Lugol's Iodine for further analysis.

The one year data of the physico-chemical parameters were subjected to statistical analysis for which the software - Mintab 14 was used. With this programme cluster analysis of zooplankton of the four lakes was carried out and the results are represented in the form of dendrograms.

Result and Discussion :

Cluster analysis appears to be handy tool in determining important factor that control zooplankton diversity in polluted water. For the cluster analysis of zooplankton. 75% similarity level was taken into consideration as it depicts better picture.

For various lakes, cluster analysis of zooplankton was carried out and dendrograms were obtained.

Ambeghosale :

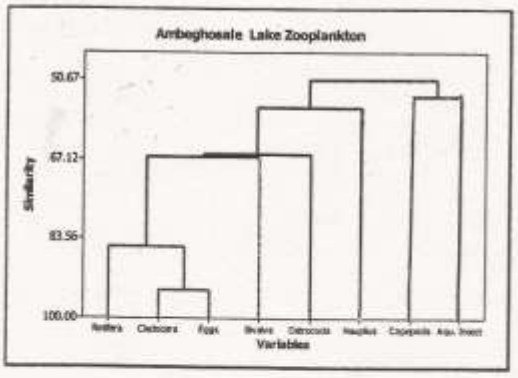

Fig. 1. Dendrogram of Zooplankton in the lake Ambeghosale.

Cluster 1 : Rotifera, Cladocera, Eggs
Cluster 2 : Copepoda
Cluster 3 : Ostrocoda
Cluster 4 : Nauplius
Cluster 5 : Bivalve
Cluster 6 : Aquatc Insects.

In zooplankton cluster analysis (Fig. 1) in total 6 clusters were noted, out of which 1st cluster was large with 3 species and remaining clusters have only one class each.

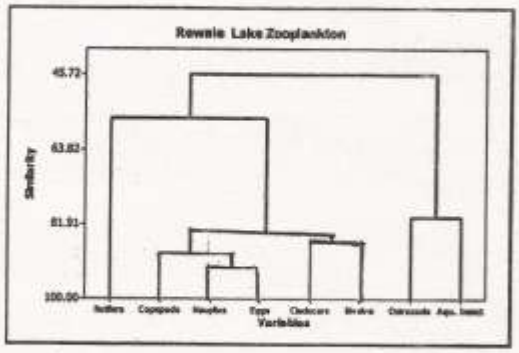

Fig. 2. Dendrogram of Zooplankton in lake Rewale.

Cluster 1 : Rotifera,
Cluster 2 :Copepoda, Cladocera, Nauplius, Bivalve, Eggs
Cluster 3 : Ostrocoda, Aquatic Insect

In this lake only 3 clusters were seen out of which 1st cluster was represented by only Rotifera. The 2nd cluster is large with 5 classes and the 3rd has only 2 classes.

Makhamali

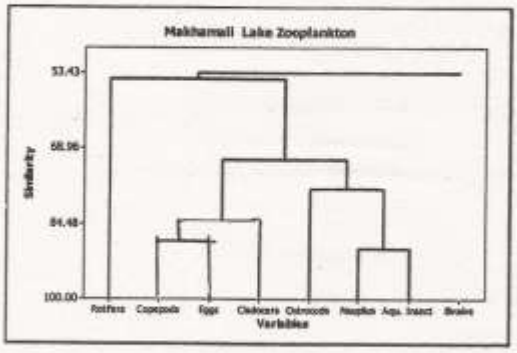

Fig. 3. Dendrogram of Zooplankton in the lake Makhamali.

Cluster 1 : Rotifera,
Cluster 2 : Copepoda, Cladocera, Eggs

Cluster 3 : Ostracoda, Nauplius, Aquatic Insect
Cluster 4 : Bivalve

In the lake Makhamali 4 clusters were seen. The 1st cluster was represented by rotifers only while 2nd and 3rd with cluster 3 classes and last cluster has only one class.

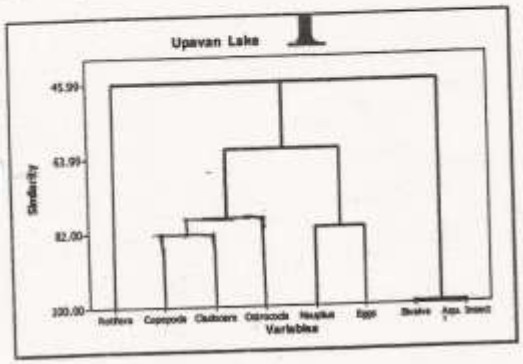

Fig. 4. Dendrogram of Zooplankton in lake Upavan.

Cluster 1 : Rotifera,
Cluster 2 : Copepoda, Ostracoda, Cladocera
Cluster 3 : Nauplius, Eggs.
Cluster 4 : Bivalve, Aquatic Insect

In this lake maximum 4 clusters were seen similar to lake Makhamali. The 1st cluster is denoted with rotifers only, 2nd cluster with 3 classes, while 3rd and 4th clusters have 2 classes each.

Conclusion :

During the present study in cluster analysis of zooplankton, maximum 6 clusters were seen in lake Ambeghosale, while minimum 3 clusters were reported in the lake Rewale. Further, in lake Makhamali and Upavan four clusters were evident.

Acknowledgements :

The authors are thankful to TMC authorities to allow the collection of zooplankton samples. Authors also wish to express their thanks to Staff and Research Scholars of Department of Zoology, B. N. Bandodkar College of Science for their constant encouragement.

References :

APHA (1980) Standard methods for the examination of water and wastewater, 15th edition. New York, USA.

Bruno M.C., G. Sagnotii & S. A. Perry (2002) Planktonic copepods from temporary marshes in Everglades National Park (Florida USA) *Hydrobiologia* 485 : 1 – 18.

Hamilton A. J., Wayne Robinson, Iain, Taylor & Ben P. Wilson (2005) The ecology of sewage treatment gradients in relation to their use by waterbirds. *Hydrobiologia* 534 : 91-108.

Hessen D. O., Ellen Van Donk[2] and Ramesh Gulati[2] (2005) Seasonal seston stoichimoetry : effects on zooplankton in cyanobacteria-dominated lakes. *Journal of plankton research*. Vol. 27, No. 5, Pages 449-460.

Kang Jung-Hoon, Woong-Seo Kim[1], Kyung-IL Chang and Jae-Hoon NOH (2004) Distribution of plankton related to the mesoscale physical structure within the surface mixed layer in the southwestern East Sea, Korea. *Journal of Plankton Research* Vol. 26 No. 12. Oxford University Press.

Rana, M.K. and K.V.Bhat (2005) RAPD markers for genetic diversity study among Indian cotton cultivators. *Curreent Science*, 88 : 1956 – 1961.

Suresh Kumar and Satya Nerri (2002) Basic Biostatistics. Campus books international publication. Pg. 195.

Trivedi R. K. and P. K. Goel (1984) Chemical and biological methods for water pollution studies. Environmental Publ., Karad, India - 122pp.