

PLANKTONIC FORAMINIFERA OFF BOMBAY—AN APPRAISAL USING MULTIVARIATE ANALYSIS

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ABSTRACT

Relative abundance of twenty-two planktonic species of foraminifera has been studied in relation to temperature, salinity, water depth and calcium carbonate in the bottom water using cluster analysis. This analysis allowed the differentiation of all the species into two main groups in relation to physico-chemical features. The objectively determined communities closely agreed with those classified earlier using traditional methods.

The distribution of planktonic foraminifera and some of the possible factors influencing their occurrence in the shelf sediments have been a subject of study for some time. Foraminifera form an important group in the sea for determining the age of the sediments.

In this paper an attempt has been made to re-evaluate the data published by Rao (1972) from the eastern Arabian Sea, using cluster analysis for objectively indentifying the planktonic foraminifera communities associated with physico-chemical parameters. All calculations of cluster analysis were carried out on microsystem DCM 1101.

In the literature there are numerous coefficients of associations which measure similarity. Many of these coefficients include counts of the number of species common to assemblages. The counts can be adjusted to the total number of species present in each assemblage. Since a particular type of fauna has a definite direction and magnitude, it is possible to use the cluster analysis technique to study the planktonic foraminifera.

Cluster analysis is a multivariate technique complimentary to that of factor analysis. This analysis puts together all those variables which have a high mutual similarity into groups or clusters and determines a hierarchial classification of these clusters in order of decreasing similarity. The resulting classification is graphically represented as a tree diagram. The details of techniques are given by Sokal and Sneath (1963). The weighted pair group method of clustering was used in the present analysis. The clustering is represented diagrammatically with the variables represented at the tips of two or more branches emerging from any furcation point (Fig. 1) and the level at which the groups of the variables join at higher level of each branch. Any variable occupying positions intermediate between the two 'natural' clusters will be affected because of overlapping of the clusters. This is not permitted by the method and hence such variables are forced to be kept into one or the other group. Here an attempt has been made to represent essentially a multidimensional relationship on a two-dimensional diagram and hence a little distortion becomes inevitable.

Fig. 1 shows the results of the cluster analysis of the species based on all parameters. The species A,B,C,D,E,F,H,I,J,K,Q form one cluster while the species G,L,M,O,P,R,

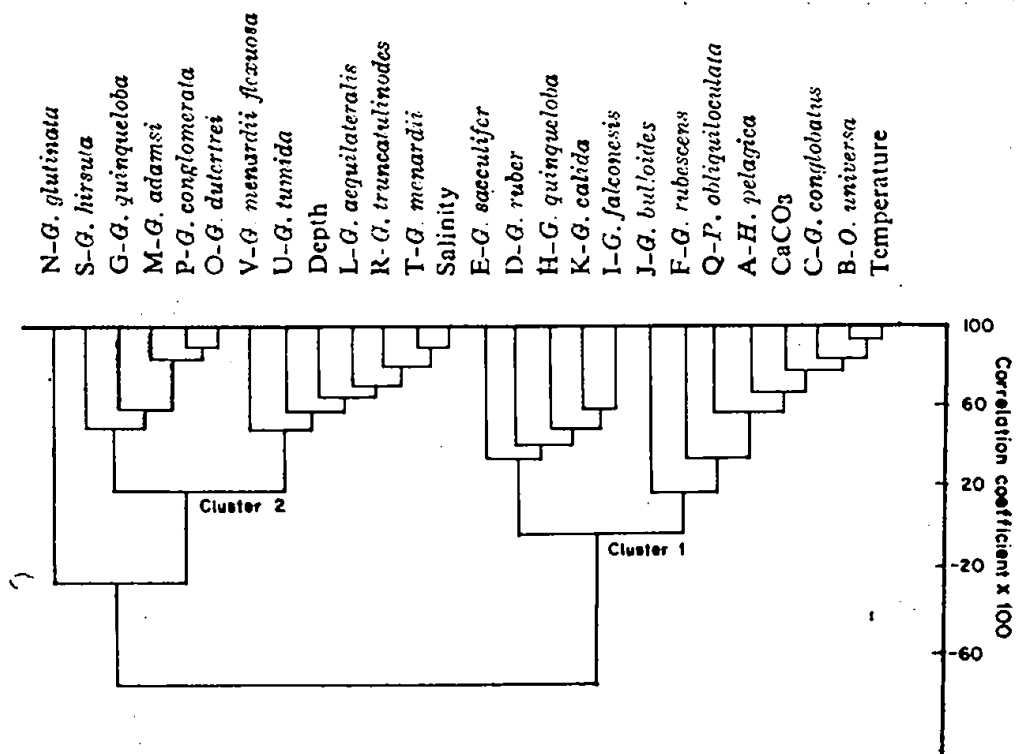


Fig. 1. Weighted pair group clustering of all the species in relation to physico-chemical features based on correlation coefficients.

S, T, U, Y form the other cluster. Rao (1972) has observed two families namely *Globigerinidae* and *Globorotaliidae*. These two families when compared with the two clusters derived by the present analysis technique showed similar results.

The technique of multivariate (cluster) analysis appears to be a very useful aid for the study of faunal distribution in the environment and the use of such a technique would be a time-saving device in ecological studies where a large volume of numerical data is to be dealt with.

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