DIVERSITY/EQUITABILITY ANALYSIS AS A PALEOECOLOGIC TOOL

E. Ann Butler[1] & H. M. Simpson[1]
Dallas, Texas

ABSTRACT

Diversity/equitability analysis of microfaunal and palynologic data as used by Beerbower and Jordan (1969) shows promise of being a rapid and useful technique for mapping paleoenvironmental gradients. In some instances, it may even provide a more satisfactory definition of environmental boundaries than biofacies analysis based on taxonomic composition.

Faunal and microfloral diversity is calculated as Shannon's information theory average uncertainty measure:

$$H = -\sum_{i=1}^{n} P_i \ln P_i$$

where

P_i = the individual fractions for each species, and

n = the number of species in the sample

Using this diversity measure, a few equally common taxa can yield as high a diversity index as many unequally common taxa. Lloyd and Ghelardi's (1964) equitability index, $E = \frac{eH}{n}$, may be used to separate these two diversity components and refine such seemingly homogeneous data.

Recent microfaunal data from Barnstable Harbor, Massachusetts, and the northern Gulf of Mexico have been subjected to diversity/equitability analysis. In the case of Barnstable Harbor, contours based on the equitability index can be rather clearly related to tidal action within the harbor (G. P. Lohmann, personal communication, 1968). A diversity/equitability plot of published Recent Gulf of Mexico data reveals that some environments may be characterized by a unique D/E range. Plotting spore and pollen diversity in vertical succession depicts gradients that appears to be related to transgressive and regressive cycles of sedimentation. While these results must presently be considered preliminary, an analysis of portions of the Lower Miocene sequence (Block 24 field, High Island area, Offshore Texas) and of the Oligocene (southeast Texas), shows that the technique merits further consideration and is potentially a very useful tool for both identifying and mapping ancient environments.

REFERENCES CITED

Beerbower, J. R., and Jordan, Dianne, 1969, Application of information theory to paleontologic problems: taxonomic diversity: Jour. Paleo., v. 43, No. 5, P. 1184-1198.

Lloyd, M., and Ghelardi, R. J., 1964, A table for calculating the "equitability" component of species diversity: Jour. Anim. Ecol., v. 33, P. 217-225.

[1] Atlantic Richfield Co., Dallas, Texas