

**AAPG Annual Convention
Salt Lake City, Utah
May 11-14, 2003**

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Modeling Gulf of Mexico Microfossil Paleoecology

Microorganisms are widely used to study modern seafloor processes and monitor coastal pollution. To differentiate eustatic changes having a widespread effect from local water depth fluctuations that are significant for only a small area, microfossil counterparts are routinely employed to evaluate these processes in the past. Paleoecology of forms lacking living representatives is often subjectively judged by the association. The Gulf of Mexico is an ideal location to design a better method of ecological modelling because the surface sediments are well-studied and the subsurface is a prime focus of hydrocarbon exploration.

A relational database has been constructed for the published literature of the Gulf of Mexico, containing tables of species names, location information, and faunal abundances. Sample analyses from 40 papers with nearly 4000 surface locations reveal the biogeographic distribution of 1500 known species. Many taxa have depth restrictions related to water mass layering, while others are facies controlled. A four-digit ecozone code is given to each species, based on the method first described in Robinson and Kohl (1978). The first and last digits of the code represent the shallowest and deepest zones known for the species, and for dominant taxa, the two middle digits represent the zones where the onset and decrease of dominance.

Results of the databasing help design a "better" paleoecological procedure, "better" implying more accurate, reproducible, and free of operator bias. Obstacles to be overcome include taxonomic problems (unrecognized synonyms), geographic problems (weak coverage), and analytical problems (inconsistent sample information).