

Biostratigraphy and Paleoecologic Tolerances of Oligocene through Paleocene Foraminiferal Assemblages of the Gulf Coast Basin

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Extended Abstract

Operationally oriented biostratigraphic and paleoecologic models are developed for Paleocene, Eocene, and Oligocene foraminifera of the Gulf Coast Basin. This paper is a companion to Breard et al. (1993), which describes models of significant paleoecologic and biostratigraphic foraminifera of the Miocene through Pleistocene of this region.

Key benthic paleoenvironmental markers (Figs. 1 and 2) for particular depth zones of the Paleogene are graphically presented with updated biostratigraphic charts (Figs. 3 and 4). Estimates of environment ranges for optimal stratigraphic utility are listed for all marker species on the biostratigraphic charts.

It is important to note that species depth ranges on the two biostratigraphic charts are for their zones of optimum stratigraphic utility. It is possible to find shallower species reworked or ranging into deeper-than-normal zones, where they have little or no correlative value. It is also possible to find deeper water species ranging into shallower zones. This is especially true in the lower bathyal to abyssal zones of the Eocene and Paleocene, where species considered characteristic of these zones range above those environments (van Morkhoven et al., 1986). Because relatively few wells have penetrated such deep environments in the Eocene and Paleocene, we have relied on the literature for Paleogene deep-water sections of Mexico and Trinidad to supplement our list of environmentally important species. The United States Eocene and Paleocene Gulf Coast sections are mostly deposits from nonmarine to outer neritic environments. Published material on foraminifera from deep-water Eocene and Paleocene sections penetrated in oil and gas exploration wells is almost nonexistent. Literature on U.S. Gulf Coast Eocene and Paleogene foraminifera is based mostly on outcrop material.

Several trends are noted when comparing Paleogene to Neogene and younger foraminiferal assemblages. Pre-Oligocene planktic diversity tends to be high, and many planktic species range as high as the inner shelf, which is considerably shallower than most Neogene occurrences. This is probably a result of higher paleotemperatures during the Eocene and Paleocene. Because the Paleogene zonation was derived from both well and outcrop studies, the biostratigraphy of that time can be tied to Gulf Coast lithostratigraphy, whereas the Neogene of the Gulf Coast shelf section is known almost entirely from the subsurface.

Recognition of finer environmental subdivisions is more difficult with increasing geologic time because biostratigraphic and environmental resolution become more broad. Reliance on similar morphotypes replaces the use of living fauna for determining environment tolerances, especially in pre-Oligocene strata.

Comparison of several time slices in the Cenozoic reveals a generally decreasing trend in the number of recognizable biostratigraphic events with increasing time. A 2-million-year period in the Pleistocene between the extinction top/last appearance datum (LAD) of *Globorotalia inflata* and *Globorotalia miocenica* contains more than 20 planktic and benthic foraminiferal events. A 2-million-year interval in the Middle Miocene between LAD of *Textularia W* and *Cibicides opima* has a total of 12 foraminiferal datums. Another 2-million-year period in the Oligocene Anahuac Formation between LAD of *Bolivina perca* and *Marginulina howei* has but seven datable horizons. Similarly, a 2-million-year period in the Eocene Claiborne Group between LAD of *Ceratobulimina eximia* and *Orbulinoides beckmanni* has seven datums. Within a portion of Eocene Wilcox Formation, a 2-million-year period between LAD of *Spiroplectammina wilcoxensis* and *Globorotalia acuta* has but three marker events. Finally, a 2-million-year period in the Paleocene Midway Formation between LAD *Vaginulina longiforma* and *Polymorphina cushmani* has only four faunal datums. This clearly illustrates the decline in biostratigraphic resolution with increased time. This trend suggests greater environmental stability (e.g., higher, less fluctuating paleotemperatures) in the Paleogene, with decreasing Neogene stability resulting in more rapid evolution of Gulf Coast foraminiferal assemblages.

Combination of data from Figures 1 through 4 with Breard et al. (1993) will allow explorationists to estimate environmental tolerances for the entire Gulf Coast Cenozoic biostratigraphic column. This should serve as a predictive tool for foraminiferal studies useful in the exploration and production of oil and gas for the post-Mesozoic strata of the Gulf Coast Basin and beyond.

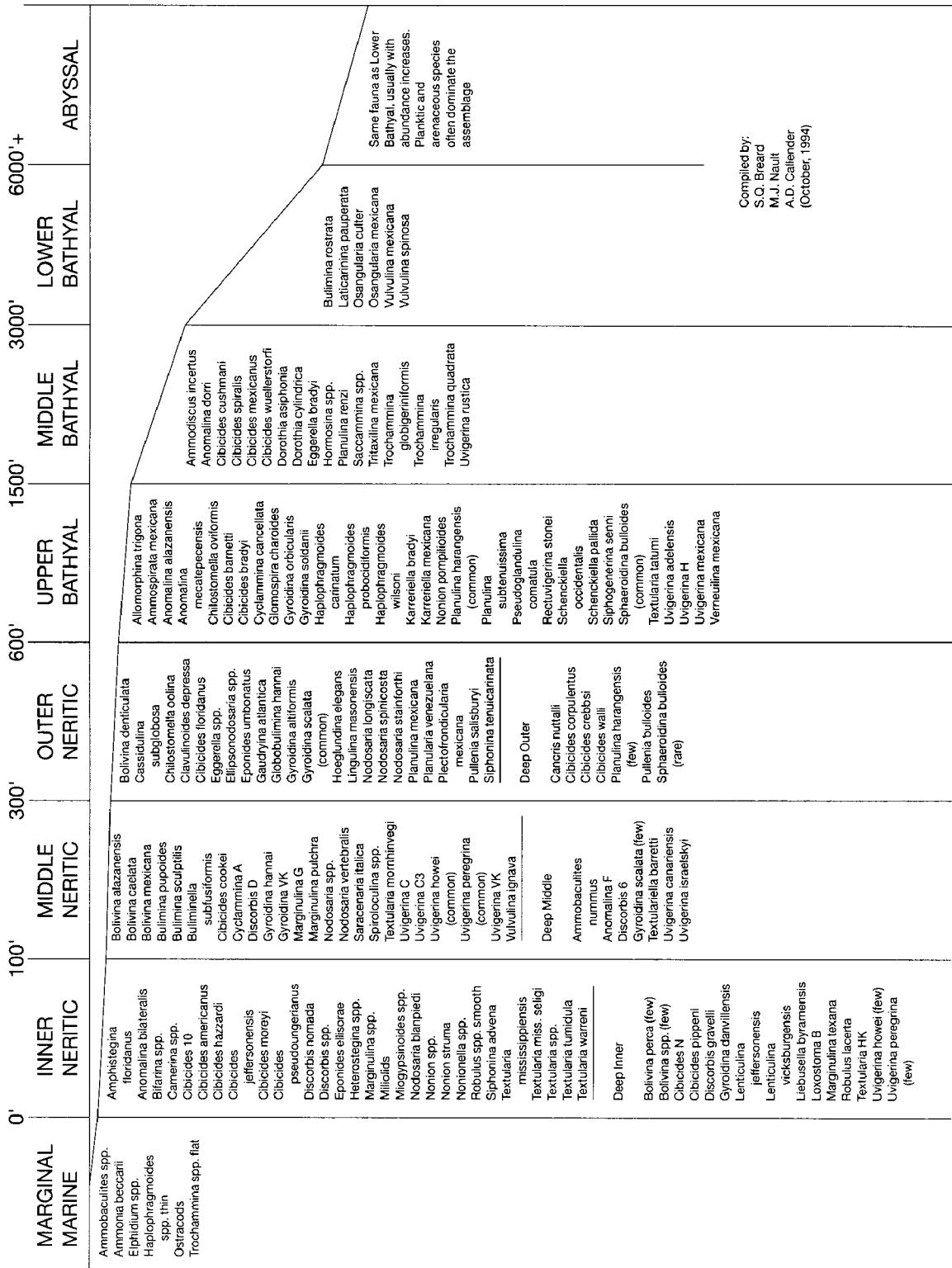


Figure 1. Selected foraminiferal paleoenvironmental indicators for the Oligocene of the Gulf Coast Basin.

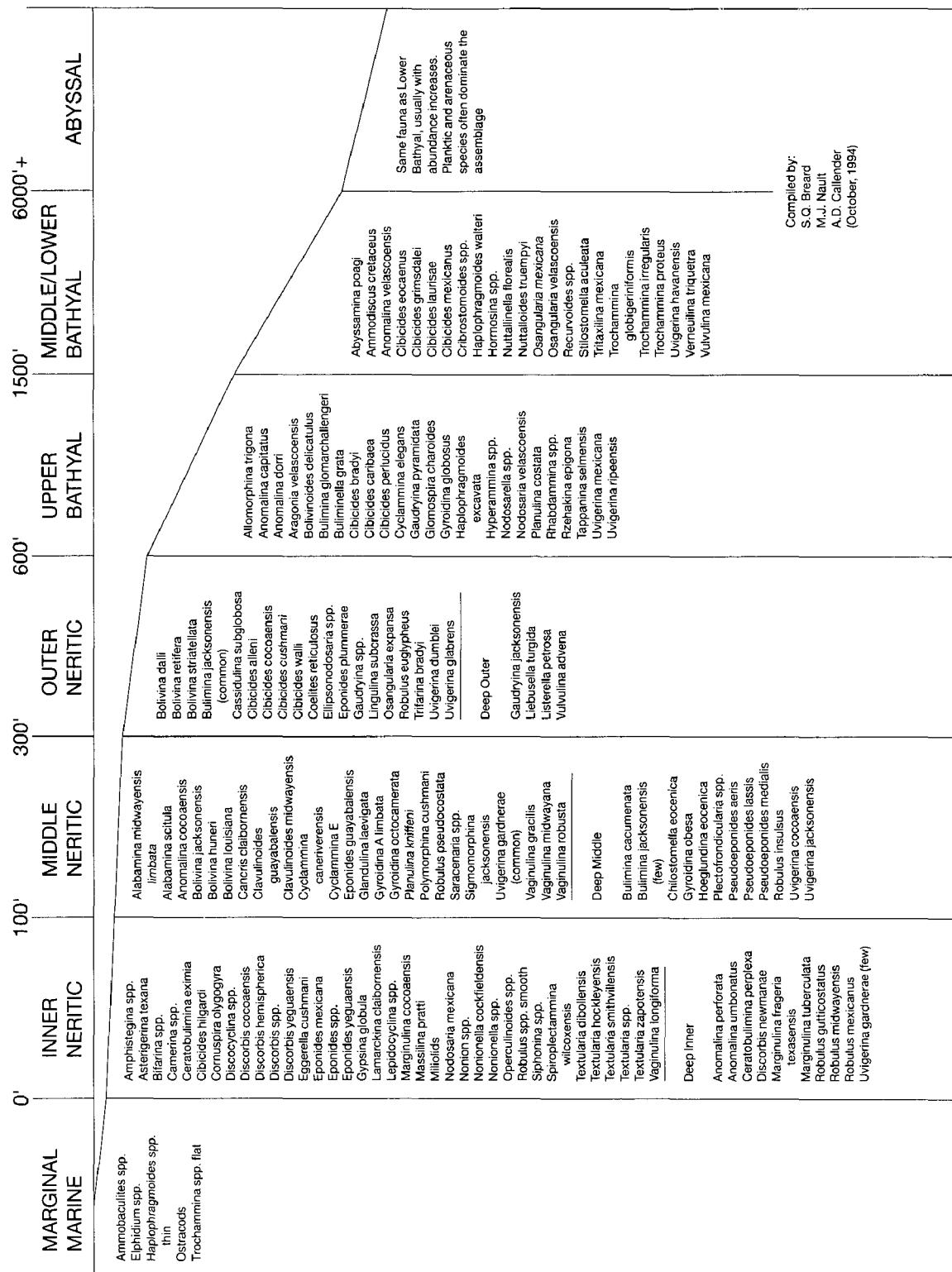


Figure 2. Selected foraminiferal paleoenvironmental indicators for the Eocene and Paleocene of the Gulf Coast Basin.

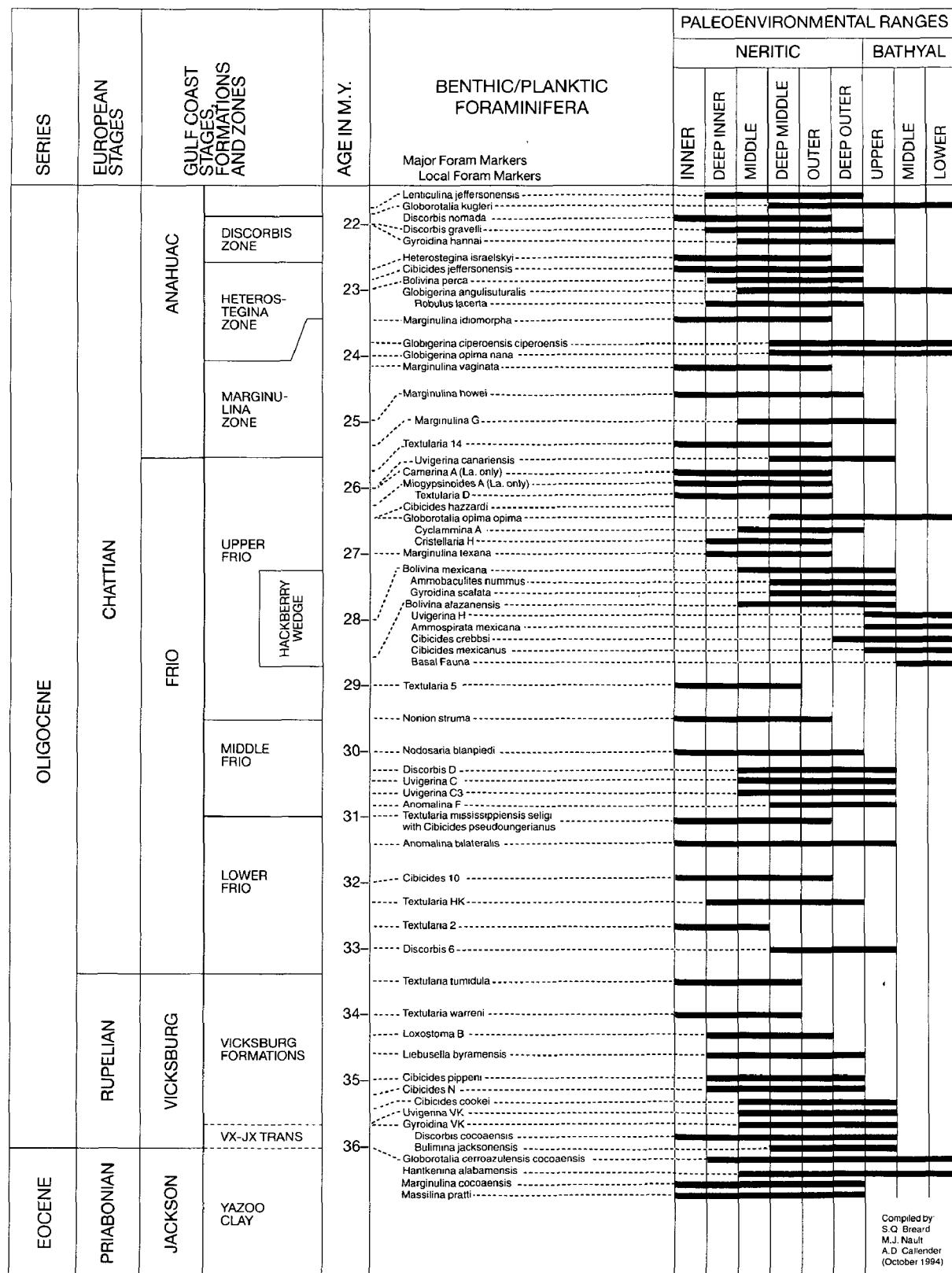


Figure 3. Foraminiferal biostratigraphy and useful paleoenvironmental ranges of marker foraminifera of Oligocene strata of the Gulf Coast Basin.

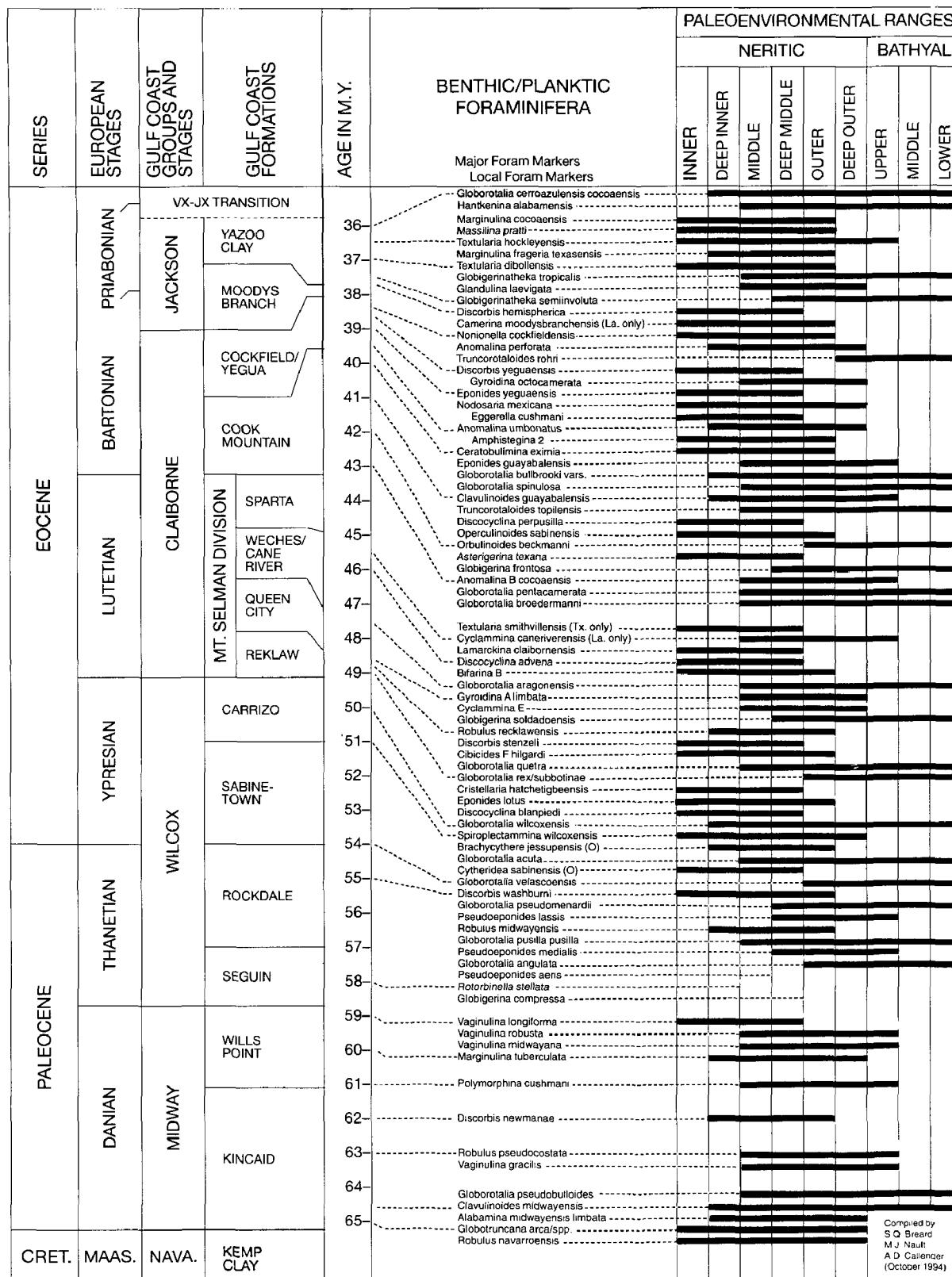


Figure 4. Foraminiferal biostratigraphy and useful paleoenvironmental ranges of marker foraminifera of Eocene and Paleocene strata of the Gulf Coast Basin.

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