

ENVIRONMENTS OF DEPOSITION AND DIAGENESIS OF THE STUART CITY FORMATION (CRETACEOUS), SPEARY GAS FIELD, KARNES COUNTY, TEXAS

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ABSTRACT

Carbonate rocks of the Stuart City Formation accumulated at the Lower Cretaceous shelf margin from late Trinitian through middle Washitan. Paleobathymetry controlled facies patterns in and around reef buildups. Following uplift of the San Marcos arch during middle Washitan and consequent exposure of some reefs, fresh-water diagenesis produced secondary porosity and permeability in part of the upper Stuart City.

Facies present in cores from the Speary gas field reflect deposition in backreef lagoon and open shelf-margin environments of the Comanche platform. Miliolid wackestones accumulated in protected areas behind the rudist reefs which were fringed by wave-and tide-washed grainstones of rudist debris. *Stromatoporoid* boundstones reflect patch-reef deposition close behind the main reef complex. Adjacent shoal areas were characterized by packstones of rudist and associated reef debris coated with abundant algal encrustations. Mollusc wackestones were deposited as a transitional facies between the shelf-margin facies and the lagoonal facies. As Stuart City deposition ended, shelf-margin facies were overlapped by shelf-lagoon facies.

Early marine phreatic diagenesis lithified much sediment but did relatively little to alter the original rock texture. Micritized grain rims and bladed calcite, after acicular aragonite rim cement, are ubiquitous and characteristic of marine diagenesis.

Dissolution of aragonitic skeletal grains followed, and was in turn followed by bladed or blocky cement infilling of the grain molds. During a later stage of cementation, coarse calcite mosaic was precipitated in remaining interparticle pore spaces and grain molds. Interparticle porosity was rarely preserved. The preserved intraparticle porosity is, however, present in all facies and notably in body cavities of large rudist fragments. Moldic porosity occurs only in grainstones and only in those cores in which the Stuart City was deposited on a bathymetric high. The widespread distribution of the coarse, calcite mosaic indicates that fresh-water diagenesis affected all of the rocks. However, diagenesis was more extreme on bathymetric prominences as indicated by the isolated occurrences of moldic porosity. Grainstones containing moldic porosity have the highest porosity and permeability-16 percent and 14 millidarcies, respectively.

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