



Cyclicity of Carbonate Shoaling Sequences of the Lower Cretaceous Pettet Formation, Rusk County, East Texas

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ABSTRACT

The Lower Cretaceous Pettet (Sligo) Formation of East Texas has been a target for hydrocarbon production for over 85 yr. The formation preserves a record of a long-lived carbonate platform with an extensive 125+ mi (200+ km) wide platform interior containing a complex mosaic of ooid-skeletal grainstones, argillaceous skeletal-green algal packstones, siliciclastic-rich molluscan packstones, and siliciclastic mudstones. The shoals are ubiquitous across East Texas and are the reservoir facies for dozens of fields in the region. However, they commonly interfinger with other facies at a meter scale, and well-to-well connectivity is sometimes unexpectedly poor, raising questions of lateral continuity and extent of shoal bodies. To address these problems, this study presents a comprehensive analysis of the facies, sequence stratigraphy, and stratal architecture of the Pettet Formation in Rusk County, East Texas, and identifies the geographic and stratigraphic distribution of shoal intervals within four defined subunits. Facies analysis reveals that shoal packages follow a consistent upsection progression from skeletal to ooid grainstones within each subunit. Porosity and permeability measurements demonstrate that basal skeletal grainstones have the greatest reservoir quality, while capping ooid grainstones and off-shoal facies are tight. Maps of grainstone distribution within each subunit reveal trends in shoal positioning that indicate eustatically-controlled changes in accommodation and reflect depositional diachroneity across the study area. The delineation of two third-order composite sequences, which are correlative to two of four third-order sequences (Barremian-30 and Aptian-10) described in the Sligo Formation of Central Texas, suggests that carbonate deposition in the East Texas region initiated later than in Central Texas, likely related to East Texas's proximity to a siliciclastic source. This

study's insight into the timing of Pettet Formation deposition, in addition to the contribution of the region's first detailed sequence stratigraphic framework, provides a solid foundation for new work assessing future play development.

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