

## Sequence-stratigraphic and depositional framework of wave-influenced deltaic systems in the lower and middle Frio Formation, Redfish Bay, Corpus Christi, Texas

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Over 1,800 feet of continuous core, combined with log and 3-D seismic data, illustrate a stratigraphic succession of high-frequency progradational episodes composed of wave-modified deltaic and shoreface deposits within an overall second-order lowstand systems tract in the lower and middle Frio Formation in Redfish Bay, Texas. This second-order succession can be divided into 11 higher order (4th or 5th) sequences. Upward-coarsening parasequences display a transition of depositional environments from offshore to lower and middle shoreface. The typical facies succession within a parasequence consists of gray, massive mudstone interbedded with thin (0.1- to 0.2-ft), very fine grained, rippled sandstone with *Zoophycus* at the base followed by alternating fair-weather and storm-dominated deposits. The fair-weather suite is characterized by highly bioturbated, very fine to fine grained sandstone, with *Cruziana* ichnofacies including *Planolites*, *Thalassionides*, *Asterosoma*, *Palaeophycus*, *Chondrites* and *Rosselia*. Remnant wavy laminations or ripples are also preserved. The coarser and cleaner sandstones of storm origin are massive and weakly bioturbated with *Ophiomorpha*. Parallel and low-angle laminations with possible hummocky cross-stratification and ripples are present. The lower part of the ARCO #470-4 core (10,335 to 11,460 ft), parasequences 1st – 7th is composed predominantly of low-energy deposits in a distal setting, indicated by the dominance of the deposit-feeding infauna over the suspension-feeding infauna. Soft-sediment deformation occurs below shoreface sandstones, implying an unstable substrate and rapid deposition in middle- to outer-shelf environments. The upper part of the cored interval (9,651 to 10,335 ft), parasequences 8th – 11th, has more opportunistic trace fossils with vertical to subvertical structures (*Ophiomorpha* and *Diplocraterion*) and records proximal shoreface successions. The uppermost 285 feet core consists of alternating, fine- to medium-grained, sparsely and pervasively bioturbated sandstone with stressed *Cruziana* and *Skolithos* Ichnofacies including *Palaeophycus*, *Thalassionides* and *Ophiomorpha*. The coarser grain size, the stressed ichnofacies, integrated with the presence of shell layers and mud chips indicate a proximal-shoreline setting. In any single parasequence, cleaner storm beds with coarser grain size and less bioturbation have better reservoir quality (porosity and permeability) than highly bioturbated fair-weather beds.

**Keywords:** sequence stratigraphy, parasequence, wave-influence delta, shoreface, Frio Formation