

Ichnofacies evaluation as an inventive approach in reservoir analysis for delineating stratigraphic sequences and interpreting depositional history: An example from shoreface and wave-influenced delta deposits in Sarawak basin, Malaysia

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Abstract: The B-A core from Field B in Sarawak Basin is studied for delineating stratigraphic sequences and interpreting depositional history. The core is unfortunately quite weathered and several intervals are broken up so a continuous depositional history is not possible. An overall picture of the depositional settings is however able to be determined from the sections that are clean enough to display bed boundaries, lithologies, sedimentary structures, bioturbation distributions and trace fossil assemblages. The succession begins with a number of shallowing upwards offshore to shoreface parasequences from the base upwards to 7932.4 feet with no evidence of deltaic influence. This part of the core generally shows relatively pervasive bioturbation, especially in the more distal facies which tend to be thoroughly bioturbated. A thin deltaic interval is observed between 7932.4 feet and 7883.9 feet where bioturbation is sporadically distributed. Deltaic influence is obvious but not pronounced suggesting the unit represents a wave- dominated delta. The base of this interval is marked by a mudclast and gastropod lags, whereas the overlying proximal lower shoreface deposits contain locally occurring clay drapes and phytodetritus suggesting deltaic deposition. A strong shift to deltaic deposition is clearly marked at the interval between 7907.7 feet and 7860.6 feet, where unburrowed clay drapes and phytodetritus are common, and bioturbation is very sporadically distributed ranging from Bioturbation Index (BI) 0-4. This parasequence is interpreted as sparsely bioturbated prodelta upwards to very sparsely burrowed mouthbar deposits. Between 7860.0 feet and 7810.3 feet, the succession consists of stacked fine- to medium-grained sandstone units with abundant carbonaceous detritus. The succession from 7806.4 feet up to 7431.8 feet contains seven parasequences of heavily bioturbated upper offshore upwards to heavily bioturbated to sporadically bioturbated lower shoreface deposits. Evidence of minor deltaic influence is present throughout suggesting part of this succession may represent a wave-dominated delta. Most of the deposits display strong levels of bioturbation and minimal evidence of storm deposition. A very pervasively bioturbated transgressive deposit that contains very large and complex *Roselia* rotates is described between 7382 feet and 7380.8 feet, indicating very slow sedimentation rates in a lower offshore setting during transgression. Abundant overprinting of individual trace fossils also proposes very slow deposition rates and the continuous reworking of the substrate over a long period of time. The last interval of the core described covering core depth between 7292.5 feet and 7258.4 feet consists of two shallowing upwards, storm-dominated shoreface parasequences. The succession starts with a pervasively bioturbated upper offshore deposit between 7292.5 feet and 7267.6 feet and later it can be seen that the units shallow upwards through moderately bioturbated to sparsely bioturbated storm-dominated lower shoreface and finally to middle shoreface example for shoreface and wave-influenced delta facies understanding as it records a depositional gradient from lower offshore environments in an open marine setting through shoreface environments (locally affected by proximity to a contemporaneous delta system), to more coastal environments that are mouthbar with brackish water assemblages.

Keywords: Delineating stratigraphic sequences, depositional history