Hydrocarbon Potential in Coated-Grain Banks of the Mississippian Frobisher Beds, Southeastern Saskatchewan

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Abstract
Coated-grain banks of the Mississippian Frobisher Beds in southeastern Saskatchewan are major oil producers where hydrocarbons are trapped subjacent to the sub-Mesozoic unconformity surface. Local production also occurs sporadically away from the subcrop trend, often in areas overlying northeast-southwest trending anticlinal structures. Core analyses and geophysical well-log correlations in the Steelman-Pinto oilfields indicate that hydrocarbon trapping in the upper Frobisher carbonate-evaporite succession is partly related to lateral facies transitions. Oolite reservoirs (Figure 1A) thin landward and grade into nonporous intershoal (Figure 1B and 1C), lagoonal, and evaporite facies. Stratigraphic cross section A-A' (Figure 2) shows some of the important facies changes in the Pinto Field. Shoals are commonly capped by impermeable mudstones and anhydrite-plugged wackestones and packstones. Drilling has traditionally targeted structural "highs", however further potential may exist along paleoshoreline trends where trapping is primarily related to facies changes.

In the Steelman Field, syndepositonal reactivation of basement faults caused local subsidence during Frobisher times resulting in abrupt thickness and facies anomalies. The upper flanks of these structures were sites of oolite accumulations. The lower trough areas are filled with nonporous mudstones and skeletal wackestones. These muddy argillaceous facies typically persist upwards through successive Frobisher cycles and can be identified by their high gamma-ray response on well logs. Several local producing areas are related to these linear faults where production occurs on the up-dip and down-dip sides of the structure. Localized down-dropped areas are characterized by an unusually thicker section of overlying Mississippian strata (Ratcliff-Poplar) preserved below the sub-Mesozoic unconformity surface. Isopach maps of these strata may help delineate Frobisher shoal and lineament trends.

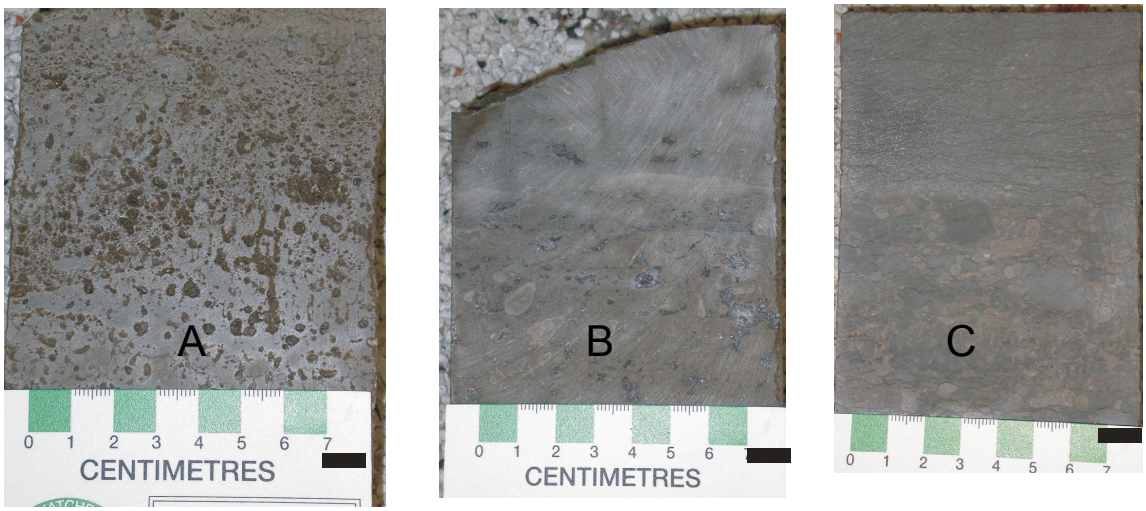

Figure 1. A) Oolite shoal reservoir rock with intergranular vuggy porosity (2-11-2-4W2, 5196 ft). B) Poorly-sorted muddy oolitic/peloidal back-barrier facies with abundant anhydrite cement (8-11-2-4W2, 5204 ft). C) Intraclastic packstone deposited as washover debris (8-11-2-4W2, 5219 ft).

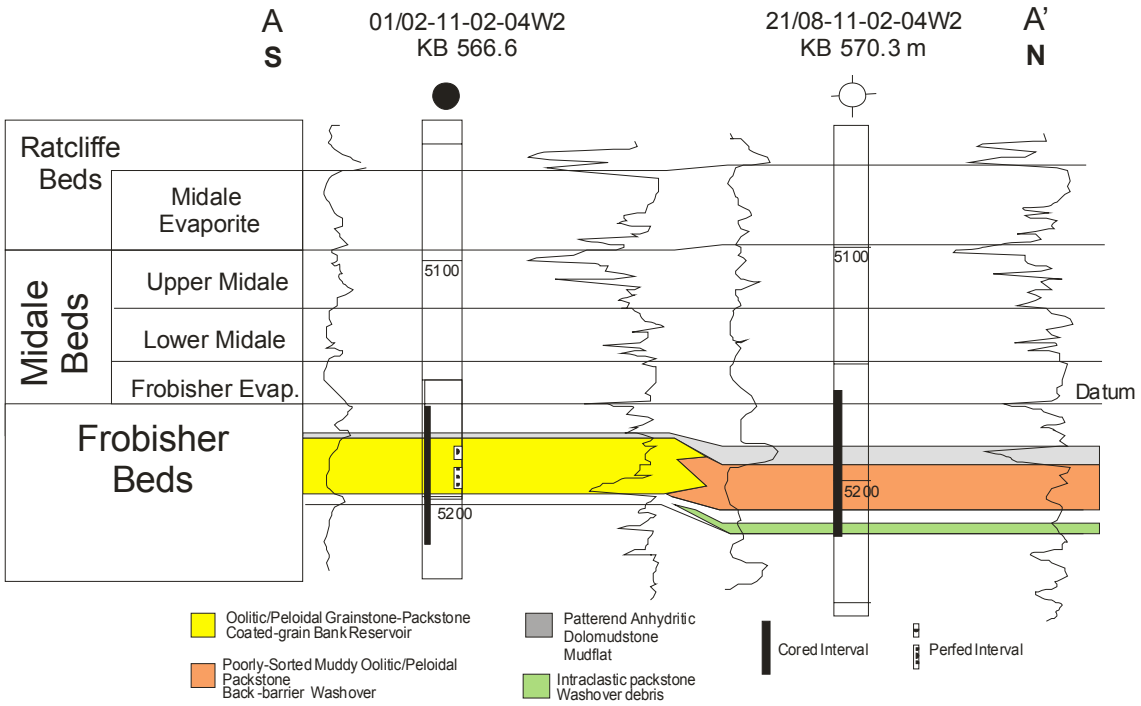

Figure 2. Stratigraphic cross section A-A' in the Pinto Field showing lateral facies relationships in the coated grain shoal setting. Note lateral transition from shoal reservoir rock to anhydrite-plugged muddy back-barrier facies. Photos of various facies are shown in Figure 1.