Ichnology and Stratigraphic Significance of the "Coal-Bearing Unit" of the McMurray Formation; Northeast Athabasca, Alberta

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ABSTRACT

In northeast Athabasca it has become a rule-of thumb for the petroleum industry to place the stratigraphic break between lower McMurray fluvial deposits and middle McMurray estuarine (typically brackish) deposits at an extensive and regionally correlateable coal-bearing interval. The coals are typically of low quality with variable sand content. This dominantly muddy suite of facies includes paleosols and organic mud, but coarse-grained sand lenses and channels are also commonly observed within this unit. Ichnological and sedimentological investigation provide considerable evidence indicating that this and the immediately underlying unit are probably not part of the lower McMurray as traditionally defined, but rather are genetic units of the middle McMurray.

Lateral accretion deposits underlying the coal-bearing unit incorporate a brackish ichnological signature. The same holds true for the muddy facies of the coal-bearing unit itself, indicating the unit was in close proximity to an estuarine shoreline. Sand and shale lenses within the coal-bearing unit are interpreted as brackish splays. In outcrop, as well as in the subsurface (from log interpretations), major coarse-grained channels are observed to incise through the coal-bearing unit at several levels into the underlying lateral accretion deposits.

The stratigraphic arrangement of depositional systems within the lower portion of the McMurray Fm. is complex. Although the coal-bearing unit is an important stratigraphic marker, and no doubt has sequence stratigraphic significance, its employment as a simple marker for the separation of continental and marginal marine deposits is apparently incorrect. The ‘true’ lower to middle McMurray contact occurs below this coal-bearing unit.