

Integrated Ichnology and Sedimentology of Anomalously Thick Sandstone Bodies, Triassic Doig Formation, West-Central Alberta

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Summary

Prolific hydrocarbon reservoirs in the Triassic Doig Formation of the Wembley/Valhalla region of west-central Alberta, are associated with Anomalously Thick Sandstone Bodies (ATSB), that have been previously interpreted by various authors, as incised valley fills, lowstand shorefaces, growth-faulted graben fills, and turbidite filled shelf/slope slumps. An integrated ichnological and sedimentological evaluation has revealed that the Doig ATSBs, and their laterally adjoining facies, were actually deposited in a range of shallow, restricted marine depositional environments.

Sedimentary successions within the Doig Formation are generally characterized by very low levels of bioturbation, low diversity trace fossil suites and reduced size of ichnogenera (as compared to fully marine counterparts), reflecting persistent paleoenvironmental stress. In addition, primary sedimentary features show evidence of episodic rapid deposition, subsequent reworking by waves and storms, fluctuations in salinity, oxygenation, substrate consistency, and depositional energy. Such conditions are characteristic of deposition in wave influenced deltaic settings where the depositional environment is dominated by fresh water riverine influx and subsequent reworking by waves and storms.

Sequence stratigraphic and thickness relationships suggest that this delta complex accumulated on a gently sloping inner shelf ramp. As such it conforms to the shoal-water type delta classification, rather than the shelf-edge type, which has received considerable recent attention in the literature. The recognition of restricted, shoal water deltaic processes within the Doig succession provides the context for a more refined understanding of the potential origin of these prolific, yet enigmatic hydrocarbon reservoirs.