

Ichnological and Sedimentological Comparisons of Brackish-Water Bay-Head Deltas and Fully Marine Open-Coast Deltas, Lower Cretaceous Grand Rapids Formation, Alberta

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Summary

The Lower Cretaceous Grand Rapids Formation of central Alberta provides an opportunity to evaluate two delta types lying along-strike from one another: brackish-water bay-head deltas, and fully marine open-coast deltas. Brackish-water embayment-bound bay-head delta successions are characterized by coarsening-upward markedly heterolithic intervals with abundant fluid mud drapes, rare syneresis cracks, thin-bedded (<10cm) sandstones with micro-HCS, oscillation and current ripples, and normally graded, locally laminated-to-burrowed sandstone and siltstone beds. Bioturbation intensities range from BI 1-6. Trace fossil suites of bay-head delta successions are broadly consistent with existing brackish-water ichnological models: suites are of low diversity, contain diminutive ichnogenera, form depauperate marine ichnocoenoses, show sporadic distributions, and are dominated by facies-crossing forms. Common ichnogenera include *Gyrolithes*, *Cylindrichnus*, *Lingulichnus*, *Skolithos*, *Planolites*, *Palaeophycus*, rare *Chondrites*, *Lockeia*, navichnia (sediment-swimming structures), and fugichnia.

Deltaic systems interpreted to have prograded into fully marine basins also comprise coarsening-upward successions with claystone drapes of fluid mud origin. Units show, however, more abundant syneresis cracks and oscillation ripples, thicker HCS beds with only rare current ripples, trough cross-beds, normally graded sandstone to siltstone beds, and carbonaceous laminae. Ichnogenera are more robust than in brackish-water counterparts and display increased diversity, *although dominated by deposit-feeding structures*. Bioturbation intensities range from BI 0-5. Common ichnogenera include *Cylindrichnus*, *Skolithos*, *Planolites*, *Thalassinoides*, *Chondrites*, *Lockeia*, *Teichichnus*, *Asterosoma*, *Rosselia*, *Taenidium*, rare *Zoophycos*, *Gyrolithes*, *Phycosiphon*, *Rhizocorallium*, navichnia, and fugichnia. Notable is the sporadic presence of elements that are interpreted to record the activity of organisms deemed intolerant of physico-chemical stress (e.g., *Zoophycos*, *Phycosiphon*, *Asterosoma* and *Rhizocorallium*).