The depositional regime of Early Triassic sedimentation in the Bjorne Formation on the eastern margin of the Sverdrup Basin, Ellesmere Island, Nunavut, Canada

DERRICK W. MIDWINTER
Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 4R2

The Bjorne Formation of the Canadian Arctic is a poorly understood, dominantly sandstone unit that occurs in the Sverdrup sedimentary basin in the northern part of the Arctic Islands. The aim of researching this formation is to unravel an important part of Sverdrup Basin evolution. The thickness of the Bjorne Formation nears 2000 m in the depocentres and 1000 m along the margins. The outcrop on Ellesmere Island was deposited on the eastern margin of the basin during three phases in the Early Triassic. Three sandstone members are separated by mudstone members. These mudstones are tongues of the stratigraphically equivalent Blind Fiord Formation in the deep basin that represent basin-wide transgression. The sediment was derived from the east and south of the basin and was sourced mainly from Devonian siliciclastic strata that flanked the basin and extended over the craton. Lithological and sedimentological features were observed and correlated to create facies associations for the lower member. Facies associations help create a depositional model for the entirety of the Bjorne Formation. This enables the understanding of the shifting basinal environment and dominant depositional regime during rapid sedimentation during the Early Triassic.

In the lower member, there are hundreds of metres of stacked sandstones with red siltstone interbeds with planar stratification and primary current lineation. Shallow scours and mud rip-up clasts are present with potential antidune deposits. The red siltstone beds have climbing ripples, desiccation cracks, and slight bioturbation. These associations of sedimentary features give an indication of episodic and rapid sedimentation similar to a fluvial environment within the spectrum of braided rivers. There is also a marine association with interbedded sandstone and siltstone with hummocky cross stratification and intensive bioturbation.

Deposition took place immediately following the Permian-Triassic boundary. Extinction of many vegetational taxa at that boundary could have influenced fluvial styles because vegetation helps stabilize banks. The lack of meandering river deposits in the marine/non-marine transitional zone of the Bjorne Formation in the early Triassic could be in part the result of the extinction event.

Petrographic information will be used to formulate a model for burial history by looking at compaction, cementation and

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alteration. Potential reservoirs, source rocks, seals and traps will be analyzed to interpret the hydrocarbon potential within this unit. Sandstone reservoirs are relatively continuous with limited low permeability barriers. Shale above and within the Bjorne Formation provides a seal, and potential source rocks in the Carboniferous and Permian have a high level of thermal maturity in this area.