Ephemeral sedimentation in the Early Triassic Bjorne Formation of the Sverdup Basin Nunavut, Canada

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The Bjorne Formation of the Canadian Arctic is a poorly understood, dominantly sandstone unit that occurs

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in the Sverdrup sedimentary basin in the northern part of the Arctic islands. Thickness of the Bjorne Formation nears 2000 m in the depocentres and 1000 m along the margins; this formation was deposited entirely in the Early Triassic during three pulses of sedimentation, each of which constitutes a member. Two sandstone-dominant members are separated by a mudstone-dominant member, which is stratigraphically equivalent to the Blind Fiord Formation in the deep basin. Lithological and sedimentological features were observed in outcrops on Ellesmere Island (eastern margin of the basin) and correlated in order to create a depositional model for the three members. This enables the understanding of the shifting basinal environment and dominant depositional regime during the Early Triassic.

Each sandstone member comprises several hundreds of metres of stacked sandstones with some members having red siltstone interbeds. The red siltstone beds have climbing ripples, synaeresis cracks, and slight bioturbation. Shallow scours and mud rip-up clasts are also present along with planar stratification and primary current lineation. These associations of sedimentary features give an indication of episodic and rapid sedimentation, primarily in the upper flow regime of braided rivers. While the three members are part of an ephemeral sedimentation system, there are marked differences between them as the lower member has a marine association with intensive bioturbation in part.

This study will explore whether the Permo/Triassic extinction event affected the subsequent depositional regime of the Bjorne Formation, because vegetation helps stabilize banks and many vegetational taxa were wiped out by this event. Further research will include petrographic analysis, which provides a diagenetic history by looking at compaction, cementation, and alteration. Potential reservoirs, source rocks, seals, and traps will be analyzed to interpret the hydrocarbon potential within this unit. Shale occurs above and within the Bjorne Formation to provide a seal; potential source rocks exist in the underlying Carboniferous and Permian strata and they have a high level of thermal maturity in this area.