Fluvial-Deltaic sedimentation affected by the P-T extinction in the Early Triassic Bjorne Formation of the Eastern Sverdrup Basin, Nunavut, Canada

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The Bjorne Formation is a predominantly sandstone unit in the Sverdrup Basin in the northern part of the Canadian Arctic Islands. The Early Triassic succession of the Bjorne Formation and coeval Blind Fiord Formation nears 2000 m thickness in two depocentres in the basin, and 1000 m along the margins, a significant portion of the 13,000 m of Carboniferous to Tertiary basin fill. The Early Triassic represents a period of active subsidence and infilling of the Sverdrup Basin. The study location was on Fosheim Peninsula, Ellesmere Island with the outcrop representing the eastern margin of the basin during three pulses of Early Triassic sedimentation. The sandstone members, Cape Butler, Pell Point and Cape O'Brien, are separated by thin marine shale units, which represent basin-wide transgression. Lithological and sedimentological features were observed and correlated in order to create a depositional model for the three members.

The lower member, the Cape Butler Member, is composed primarily of upper flow regime plane beds that display rapid transition to lower flow regime bedforms, mainly ripples. Trough cross-beds formed by dunes are scarce and thin red siltstones cap some waning-flow successions. The middle Pell Point Member is dominated by trough cross-stratification, with some parallel lamination. The upper member, Cape O'Brien, is similar to Pell Point, with a large occurrence of trough cross-bedding. Additional structures include bedforms in the upper/lower regime transition, antidune bedding, one possible chute-and-pool structure, and many erosional surfaces, many of which are lagged with mudstone intraclasts. In their architecture, sandstone units are laterally extensive, multistory, and stacked in units a few metres thick, with relatively little indication of major channel forms. Plant fragments are very rare. The Bjorne Formation was an ephemeral depositional system subject to repeated intense floods that laid down sufficient sand and waned sufficiently rapidly to preserve high flow-strength bedforms. There is evidence of sub-aqueous conditions with the presence of synaeresis cracks and trace fossils, mostly in the Cape Butler Member, such as *Skolithos, Diplocraterion, Thalassinoides, Palaeophycus,* and *Arenicolites*, but while they are non-diagnostic of a specific environment, their presence suggests marine influence at some levels. The braided fluvial system passed basinward into a marine-influenced environment.

Deposition took place immediately following the Permo/Triassic boundary with its major extinction event. The reduction in diversity of vegetation and likely reduction of vegetation cover may have enhanced sediment loading and the absence of channel bank stability may have promoted the development of broad bedload channels. With the bulk of the mud that passed through the system

deposited in the Blind Fiord Formation, the low amount of mud in the Bjorne Formation and the decrease of channel bank stability, sediment dynamics within both braided ephemeral and tidal/ subtidal channels of a braid-delta can be similar, promoting the formation of extensive sandstone sheets.

Petrographic analysis identifies the Bjorne Formation as a quartzarenite to sublitharenite with ubiquitous carbonate cement, comprised of early, pore-filling calcite, and late, grain-replacive dolomite-ankerite rhombohedra. The provenance of the sediment is determined as from the craton interior and recycled orogen. This is congruent with previous studies showing that the Canadian Shield was covered in Devonian siliciclastics sourced from the Caledonian/Ellesmerian orogeny, and from the Precambrian Greenland Shield. There was ample sediment blanketing the source areas to the south and east of the Sverdrup Basin to supply the Early Triassic strata. Based on vitrinite reflectance data from cores elsewhere, much of the Bjorne Formation appears to lie within the oil window, but