Ichnology and sedimentology of Cretaceous and Paleogene strata on Bylot Island, Nunavut, Canada: development of a rift-basin succession in Baffin Bay

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The Labrador-Baffin Seaway formed during rifting and separation of Greenland from the North American plate. Rifting began in the Early Cretaceous, with seafloor spreading starting in the Maastrichtian and ending in late Eocene. As a result, Early Cretaceous syn-rift strata accumulated in grabens, followed by late rift and post-rift deposition. Bylot Island, at the northwestern end of Baffin Bay, preserves a record of this rift history, providing a vital analogue for understanding the adjacent offshore succession. Cretaceous and Paleocene strata are preserved today on north Bylot Island at Maud Bight (North Bylot Trough) and on southwest Bylot Island and nearby areas of Baffin Island (Eclipse Trough). Our detailed analysis of the ichnology and sedimentology of 14 measured stratigraphic sections from these areas provides new insights into the depositional paleoenvironments of these strata. Lower Cretaceous synrift strata of Eclipse Trough are well preserved along Salmon River on Baffin Island. Basal deposits reflect alternating aquatic conditions and subaerial exposure, including wave, interference, and adhesion ripples, mud crack casts, and plane-bed lineations. Surface trails, arthropod trackways, and *Diplocraterion* comprise a *Scoyenia* Ichnofacies and with the sedimentology suggest deposition within a lake-margin or floodplain setting. The uppermost of these strata are fluvial, with shallow channels, coals, and overbank mudstones. Overlying these beds in both Eclipse and North Bylot Troughs, an Upper Cretaceous transgressive shale is characteristically dominated by *Phycosiphon*, forming an assemblage of the *Zoophycos* Ichnofacies and interpreted as representing outer shelf (or more distal) deposits. Higher Upper Cretaceous sandstones in Eclipse Trough record progradational cycles of storm-dominated, inner shelf through foreshore deposits, with cross-stratified beds alternating with bioturbated fair-weather beds containing diverse and abundant archetypal *Cruziana* Ichnofacies suites. At Maud Bight, probable Upper Cretaceous sandstones also reflect storm-dominated, lower shoreface to upper shoreface, hummocky to tabular cross-stratified beds alternating with fair-weather beds, characteristically bioturbated by *Macaronichnus*. Similar storm-dominated shoreface strata are seen in Paleocene sandstones from Eclipse Trough; however, more thickly bedded sandstones there show evidence of high sedimentation rates, suggesting deltaic deposition. In Maud Bight, probable Paleocene sandstones and conglomerates reflect delta-front deposition, in addition to fine-grained, grey, *Macaronichnus*-dominated shoreface to foreshore sandstones. Overlying the Paleocene sandstones in Maud Bight, interbedded shales, siltstones, and sandstones reflect shallow, brackish deposition within an estuarine or prodeltaic setting. The overall succession is predominantly

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marine with common storm-dominance and similar depositional paleoenvironments seen between the two structurally isolated areas of Bylot Island.

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