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Facies variability from an Early Ordovician mud-rich deltaic deposit: Redmans Formation, Bell Island Group, Newfoundland, Canada

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Marginal marine mudstone systems are poorly known from the Palaeozoic. It is important to have a better understanding of these systems to more accurately assess the interplay of marginal marine environments, at the facies level, on geochemical signatures that are used for stratigraphic correlation. The interaction of bioturbation, sedimentation style, and organic carbon are directly linked to geochemical signatures and represent the control marginal marine environments have on these signatures.

We present a combined sedimentological-ichnological facies model for mud-dominated shoreface and shelf facies members in the Early Ordovician (477.7 Ma) Redmans Formation (Bell Island Group, Newfoundland). Over seventy metres of core from the Bell Island Group, Redmans Formation, have been described at centimetre-resolution. Twelve sedimentological facies have been recognized, comprising proximal, central, and distal distributary mouth bars, prodelta, bay fills, and possible channel deposits. The Redmans Formation is composed of thick quartz arenites interbedded (up to 3.25 m thick) with intervals of intensely bioturbated mudstone (up to 1 m thick). Sandstone ichnofabrics are dominated by *Diplocraterion* isp. and *Planolites* isp., whereas mudstone traces are more diverse and include *Cruziana* isp., *Planolites* isp., *Trichophycus* isp., *Diplocraterion* isp., other unidentifiable vertical and subvertical traces that range in size from 30 µm to 20 cm.

An array of ichnological and physical sedimentological textural information was used at a range of scales from outcrop to thin section to characterize facies. Sedimentological descriptions allow consideration of the relationship between organic matter abundance, distribution, and biogeochemistry with respect to palaeoenvironment in the Early Ordovician Redmans Formation. In addition the relationship between bioturbation and preserved organic matter quality is assessed.