Ichnological Expressions of Low Oxygen Settings: An Integrated Ichnological and Sedimentological Analyses of the Canol Formation, Northwest Territories, Canada

SK Biddle[a*], MT LaGrange Rao[a], B Harris[a], KM Fiess[b], V Terlaky[b], and MK Gingras[a]

[a] Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Canada
[b] Northwest Territories Geological Survey, Yellowknife, NT

The Canol formation, part of the broader Horn River Group in the Central Mackenzie Valley of the Northwest Territories, consists of primarily black shales deposited during the late Givetian to early Frasnian Period of the Late Devonian. The Canol formation is considered to represent distal-basin-fill accumulating in an anoxic to euxinic depositional setting, owing to the shale's organic rich character, pyrite content, and lack of obvious biogenic reworking. The sediment transport processes resulting in the deposition of the these shales have yet to be identified. This study aims to identify paleo-redox fluctuations and depositional processes within the Canol formation deposits via comprehensive integrated ichnological and sedimentological analyses compared with geochemical paleo-redox proxies (e.g. molybdenum enrichment for identification of euxinic deposition).

Detailed ichnological and sedimentological petrographic analyses is being carried out on thin sections taken from five cored Canol formation intervals and five outcrop localities. Microscopic biogenic horizontal and vertical structures have been documented, having a range of morphologies. Identified traces are grouped into a morphological classification scheme based on the most obvious characteristics. Characteristics such as orientation, structure fill and fill organization, and burrow linings are used when identifying and differentiating biogenic structures. Sedimentological aspects being evaluated include, but are not limited to, evidence of small scale primary sedimentary features such as bedding and laminae, fossiliferous zones and intrabasinal rip-up clasts, and diagenetic features such as pyrite abundance and habit. The data collected from this study will result in the identification of small-scale physio-chemical fluctuations within the basin during deposition of the Canol shales. This will ultimately lead to a deeper understanding of the large-scale geochemical and sequence stratigraphic trends occurring throughout the formation.

Corresponding Author: biddle@ualberta.ca