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Palaeoclimate reconstructions of the last 4000 years in the Southern Northwest territories using ostracods, and implications for the long-term viability of the Tibbitt to Contwoyto Winter Road

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Analysis of ostracod assemblages from cored lacustrine sediments will provide proxy data as a contribution to the project: Palaeoclimatological Assessment of the southern Northwest Territories and implications for the long-term viability of the Tibbitt to Contwoyto Winter Road.

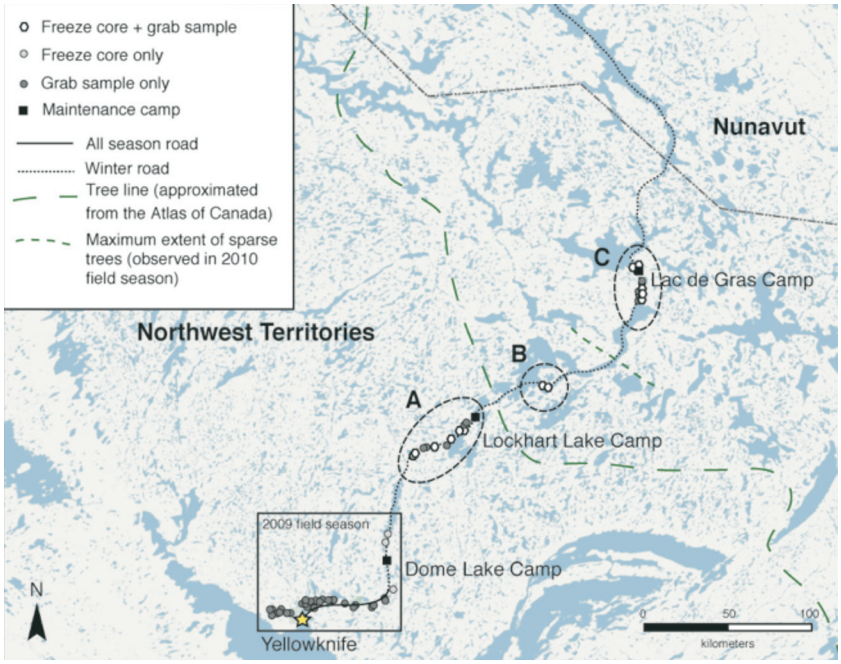

Fig. 1: Location map of the TCWR in Northern Canada showing the TCWR and sample locations. Source: Macumber et al. (in prep.).

Funded by the Natural Sciences and Research Council of Canada (NSERC), the multi-proxy project is aimed at providing data from biological and chemical analysis of lake sediment cores and tree rings to track climate change over the last 4000 years in the southern Northwest Territories. With the region predicted to warm at a rate twice as fast as the rest of the world (IPCC 2001, 2007), there are concerns over maintaining the Tibbitt to Contwoyto Winter Road (87 % of which runs over frozen lakes; Fig. 1), where projected future warming trends of 2–3 °C over the next 50 years (Schlesinger & Mitchell 1987; ACIA 2004) are likely to decrease the annual ice cover by 100 to 130 days. If this predicted warming occurs, changes in ice cover and stability will have drastic implications for the feasibility of mining operations, so there is a crucial need for planners, developers and policy makers to understand the likely impact of future climate variability on the Tibbit to Contwoyto Winter Road (TCWR).

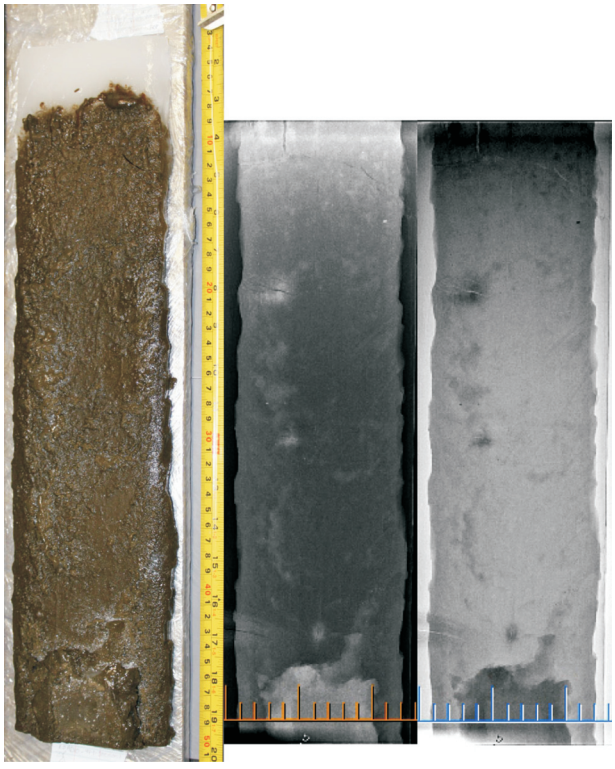

Fig. 2: Freeze core ROAD10-47-1, face 1 of 1, section 1 of 2: (left) light photograph; (middle) positive X-ray; (right) negative X-ray. The larger bars on the X-ray scale are separated by 5 cm and the smaller bars are separated by 1 cm. Photograph from Macumber et al. (in prep.).

Systematic temperature records for the region are available only from the 1940s, and so there is a need for more detailed long-term palaeoclimate information to help understand current short-term climate oscillations in context of the Holocene climate. Three lakes were freeze-cored (Fig. 2) for samples in 2009.

Analysis of ostracod assemblages from the lake core sediments will provide additional palaeoenvironmental and palaeotemperature information for the multi-proxy project (to include diatoms, chironomids, thecamoebians, pollen and dendrochronology), thus helping to develop a more complete understanding of how medium and long-term climate oscillations are correlated to short-term variations.

The project will employ the Mutual Ostracod Temperature Range method (Horne 2007) to reconstruct palaeotemperatures for the region. Current mean daily January and July temperature ranges are from -17.5°C to -27.5°C and +7.5°C to +17.5°C respectively. Preliminary results and analysis from core material will be presented and discussed.

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