Correlation between the Western Laurentia Mesoproterozoic sediments of the Athabasca, Thelon and Hornby Bay regions, N.W.T. and Nunavut

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Summary

Work in both the Athabasca and Hornby Bay basins over the last 5 years has improved understanding of the stratigraphy of these basins to the extent that correlation between them can be made in some detail. The Thelon Basin is much less well known, especially its interior and deeper sections making detailed correlations to other basins speculative.

Main Points and Conclusions

All three basins are partially underlain by early, more or less coeval (circa 1830-1780 Ma) redbeds (Bigbear?, Baker Lake, Martin, upper Wollaston groups) in remnants of formerly larger basins that had a proximal and lithologically immature sediment source. In the Athabasca and Thelon basin areas they contain interbedded volcanics.

The strata referred in the past to the Hornby Bay, Dismal Lakes, Athabasca, Wharton and Barrenlands groups may be divided into three major sequences, with the possible exception of the Barrenlands Group.

The lower sequence in each area was deposited circa 1760-1720? Ma. The Athabasca and Hornby Bay area basal units (Fair Point and Bigbear sequences) are not precisely dated and may prove to be part of the previous or next grouping or form sequences that to date have not been recognized in the Thelon area.
Hornby Bay area: Bigbear sequence?
Thelon area: Wharton Group.
Athabasca area: Fair Point sequence?

The next sequence was deposited from about 1720 to circa 1640 Ma. If the Bigbear and Fair Point sequences prove to fall in this interval, then in the Hornby Bay and Athabasca areas this period includes two major depositional sequences.
Hornby Bay area: Mountain Lake Group (Lady Nye, East River, Kaertok formations).
Thelon area: Lower Barrenlands Group (Thelon Fm sequences 1, 2, 3 and posibly lower and higher units.
Athabasca area: Sequence 2 (Read, Manitou Falls, Lazenby Lake, Wolverine Point formations).

The upper sequence was emplaced from about 1550 to about 1200 Ma.

Hornby Bay area: Dismal Lakes Group (Leroux, Fort Confidence, Dease Lake, Kendall River, Sulky, Greenhorn Lakes fms).
Thelon area: Upper Barrenlands unit(s), possibly Upper Thelon Fm, Kuungi Fm.
Athabasca area: Sequence 3 (Locker Lake, Otherside, Douglas, Carswell fms).

The redbed sequences and the lower sequence were deposited in local basins, had a proximal source area, and are unlikely to have been directly connected.

The middle sequence in the Hornby Bay area was deposited at the margin of a major epicontinental sea that can be traced in the subsurface to the craton margin. Its connection to the Athabasca and Thelon basins remains to be proven. If the upper parts of the sequences prove to be marine rather than lacustrine these basins at their upper levels may have been gulfs along the same shoreline, separated by highlands left by the earlier orogenies and intrusive episodes. Paleocurrent data suggest that the basins were separated by highlands at the level of the fluvial units of this sequence.

The upper sequence of the Athabasca Basin closely resembles the Dismal Lakes Group of the Great Bear Lake and Coppermine River area (NWT and Nunavut) in lithology, lithofacies, thicknesses, and time of deposition. It is its close correlative, suggesting that their deposition was controlled by continent scale tectonic forces.

Dismal Lakes region				Athabasca region			
Group	Formation	Main generalized lithofacies	Thickness (m)	Group	Formation	Main generalized lithofacies	Thickness (m)
Conformable contact with overlying Coppermine River Group basalts				Major unconformity below overlying Paleozoic clastics and carbonates			
Dismal Lakes Group	Greenhorn Lakes	Laminated carbonates, minor stromatolite bioherms, carbonate mudstone	190	McFarlane Group (Proposed)	Carswell	Laminated, stromatolitic, oolitic dolostone	> 500 ?
	Sulky	Stromatolitic carbonates, reefal in some areas	90-300		basal Carswell	Interbedded clastics and carbonates, gypsum casts	
	Kendall River	Interbedded oolitic and stromatolitic carbonate, mudstone, and fine sandstone	120		Douglas	Thinly bedded black mudstone, interbedded fine sandstone, marine	200 ?
	Dease Lake	Fine sandstones and mudstones, evaporitic, with salt and gypsum casts	150		Otherside	Quartz-rich sandstone, paralic to marine	> 180
	Fort Confidence	Thinly bedded black mudstone, interbedded fine sandstone, marine	150		Locker Lake	Qtz-rich pebbly sandstone, thin conglomerates, fluvial to paralic	200-287
	Leroux	Quartz-rich marine sandstone	20-300				
		Marine qtz-rich sandstone, minor paralic basal pebbly sandstone, lags, mudstone	0-20				
Major unconformity overlying tuffaceous marine to paralic clastics circa 1660 Ma							