STRATIGRAPHY AND CORRELATION OF THE NEOPROTEROZOIC SHALER SUPERGROUP, AMUNDSEN BASIN, NORTHWESTERN CANADA

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ABSTRACT

Neoproterozoic strata of the Shaler Supergroup outcrop within a series of inliers on Banks and Victoria Islands and on the adjacent mainland of northwestern Canada. Stratigraphic correlation and sedimentological studies indicate that the inliers were part of a formerly contiguous intracratonic depression within the supercontinent Rodinia known as Amundsen Basin. Paleocurrent and isopach studies suggest that the basin formed an arcuate embayment that was open to the northwest.

Refined lithostratigraphic correlation of the Shaler Supergroup with the Mackenzie Mountains Supergroup in the Mackenzie Mountains suggests that these sedimentary sequences represent segments of the same continuous shallow-marine platform within a much larger depository. The lithostratigraphic correlation is supported by the identification of regionally consistent sequence boundaries and by geochronology of detrital zircons from a regionally persistent quartzarenite unit.

The Shaler Supergroup is similar to the preserved Neoproterozoic successions in several intracratonic basins from central and southern Australia, consistent with recently proposed plate reconstructions for the Neoproterozoic that juxtapose the eastern margin of ancestral Australia against the western margin of Laurentia.

INTRODUCTION

The Neoproterozoic supracrustal succession of northwestern Canada is divisible into three unconformity bounded sequences: A, B, and C (Young et al., 1979). This paper examines Sequence B strata from part of this region in more detail than has been previously reported and introduces refinements to the existing stratigraphic scheme in light of newly acquired information. This information includes descriptions of new occurrences of Sequence B strata along with more detailed lithological information from hitherto documented successions. As well, a wealth of new U-Pb geochronology both from mafic rocks that intrude these successions and from detrital zircons extracted from quartzarenites provides much needed chronostratigraphic refinements.

REGIONAL FRAMEWORK

Stratigraphy

Strata of Sequence B discussed in this paper include the Shaler Supergroup of the Amundsen Basin region and the Mackenzie Mountains Supergroup and Coates Lake Group in the Mackenzie Mountains Fold and Thrust Belt (Figs.1 and 2).

The Shaler Supergroup is considered to be wholly within Sequence B; the lower contact with Sequence A is preserved in the Coppermine area, where it unconformably overlies strata of the Coppermine River Group (Fig.2). The boundary between Sequence B and Sequence C occurs as an erosional unconformity, above the Shaler Supergroup in the Minto Inlier, and above the Mackenzie Mountains Supergroup and Coates Lake Group in the northern Cordillera (Fig.2).

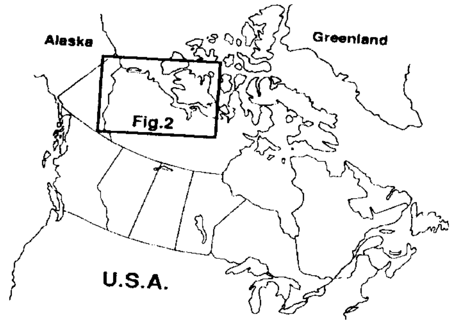

Fig.1. Study area location in north-western Canada.

Age Constraints

The age of Neoproterozoic sedimentary successions in northwestern Canada is partly constrained by U-Pb baddeleyite dating of three major mafic igneous events. The Coppermine basalts, which are truncated by Sequence B strata of the Shaler Supergroup (Rae Group; Fig.2), are part of the regionally extensive Mackenzie igneous event at 1270 Ma (LeCheminant and Heaman, 1989).

Overlying the Shaler Supergroup in Minto Inlier are flood basalts of the Natkusiak Formation, the subaerial expression of the 723 Ma Franklin igneous events (Fig.2; Heaman et al., 1992). Another widespread mafic event is represented by 780 Ma dikes and sills, which intrude the lower part of the Mackenzie Mountains Supergroup (Jefferson and Parrish, 1989).

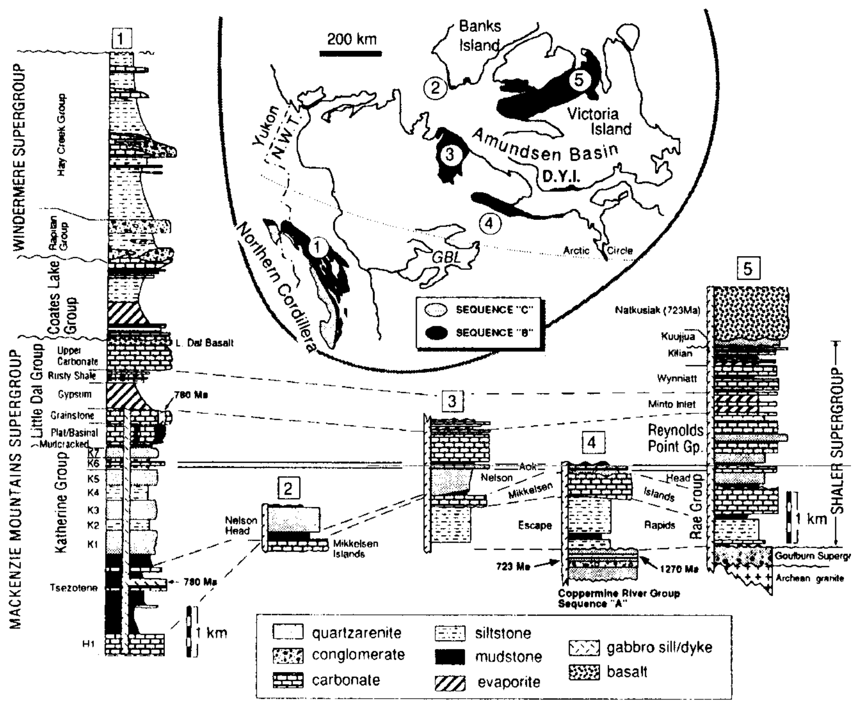

Fig.2. Regional correlation of Neoproterozoic Sequence B strata from northwestern Canada (after Jefferson and Young, 1989). DYI, Duke of York Inlier; GBL, Great Bear Lake; 1, Mackenzie Mountains Fold and Thrust Belt; 2, Cape Lambton Inlier; 3, Brock Inlier; 4, Coppermine area; 5, Minto Inlier.

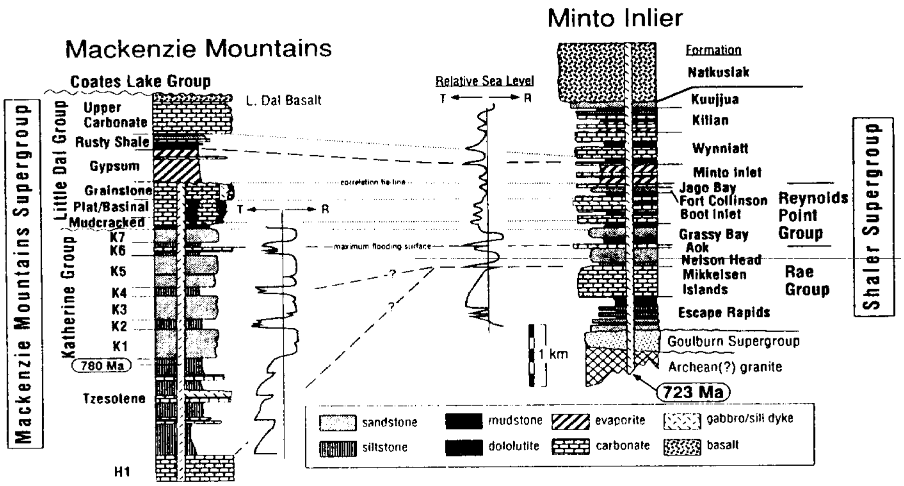

Fig.3. Detailed stratigraphic correlation between the Mackenzie Mountains Supergroup of the Mackenzie Mountains Fold and Thrust Belt and the Shaler Supergroup of Amundsen Basin. Sea-level curve for the Tsezotene formation and Katherine Group is unpublished data of D. Long.

The lower age limit of Sequence B is further constrained by ca. 1.08 Ga (U-Pb) detrital zircons obtained from quartzarenite specimens of both the Nelson Head Formation of the Shaler Supergroup and map unit K-7 of the Mackenzie Mountains Supergroup (Fig.3; Rainbird et al., 1994b).

AMUNDSEN BASIN

Neoproterozoic strata of the Shaler Supergroup have been recognized in the Minto and Duke of York Inliers on Victoria Island, in the Cape Lambton Inlier on southern Banks Island, and in the Brock Inlier and Coppermine area on the northern coastal mainland between the Brock River and Coronation Gulf (Fig.2). Regional correlation of these inliers was first suggested by O'Neill (1924), who recognized lithologic and stratigraphic similarities between rocks in the Brock Inlier and the Coppermine area. Christie et al. (1972) concurred with this observation and were the first to suggest that these rocks might be part of the same contiguous depositional basin that was named after the Amundsen Gulf region. Young (1974) pointed out that the "basin" might be more like an embayment; open to the northwest, as indicated by consistent paleocurrents in that direction and by the fact that there appear to be no physical barriers (basement promontories) such as those that occur to the south and east. The basin is inferred to have been formed in an intracratonic tectonic environment as its strata are characterized by interconnected, regionally correlative sequences.

The sedimentary succession of the Amundsen Basin is entirely within Sequence B and is termed the Shaler Supergroup (Rainbird et al., 1994a). The Shaler Supergroup was recently proposed as a consequence of the elevation to formation status of several informal members of the former Shaler Group (Thorsteinsson and Tozer, 1962). The Shaler Group was originally defined from investigations in the Minto Inlier, where the most regionally extensive and stratigraphically complete exposures are preserved (see also Young, 1981; Rainbird, 1991).

SHALER SUPERGROUP

Minto Inlier

In the Minto Inlier, the Shaler Supergroup comprises a 4- to 5-km-thick succession of platformal marine carbonate, evaporite, and subordinate siliciclastic rocks overlain and underlain by fluvial and fluvio-deltaic siliciclastic rocks. It includes, in ascending stratigraphic order: Rae Group, Reynolds Point Group, Minto Inlet Formation, Wynniatt Formation, Kilian Formation, and Kuujjua Formation (Fig.2; Thorsteinsson and Tozer, 1962; Young, 1981; Jefferson et al., 1985; Rainbird, 1991; Rainbird et al., 1994a). The Shaler Supergroup is overlain by the Natkusiak Formation, an up to 1,100 m-thick accumulation of flood basalt flows and minor volcaniclastic rocks that have been dated at 723 Ma.

In the northeast Minto Inlier, the Rae Group is subdivided into four formations, which attain a combined thickness of at least 1,200 m (Rainbird et al., 1992a; Rainbird et al., 1994a). The Escape Rapids Formation consists of very poorly exposed quiet-water mudstone/siltstone and rare turbiditic sandstone intercalations. It is overlain by shallow-water limestone and cherty stromatolitic dolostone of the Mikkelsen Islands Formation. A sporadic karstic topography underlies the Nelson Head Formation, a coarsening-upward succession of mudrocks and sandstone interpreted as a prograding fluvio-deltaic complex. Marine inundation reworked the uppermost quartzarenites and deposited the Aok Formation, a distinctive orange-weathering stromatolite biostrome that caps the formation (Jefferson and Young, 1989).

The overlying Reynolds Point Group is 650 to 900 m thick and has been subdivided lithostratigraphically into four formations (Rainbird et al., 1994a; Fig.2), following the original member subdivisions of Young and Long (1977). The Grassy Bay Formation is a mudstone-to-quartzarenite succession representing a prograde river-fed delta reworked by storms. The Boot Inlet Formation comprises rhythmitic, stromatolitic, and oolitic dolostone facies recording mid- to outer-shelf, mid-shelf, and inner-shelf deposition on a cyclically prograding, storm-dominated carbonate ramp (Morin and Rainbird, 1993). The Fort Collinson Formation is composed of cross-bedded quartzarenite and sandstone-carbonate rhythmite representing sand-shoal to barrier-beach and back-barrier-lagoon environments. The overlying Jago Bay Formation comprises stromatolitic and thin-laminated dolostone deposited in a lagoon that evolved to a subaerial setting.

Conformably overlying the Reynolds Point Group is the Minto Inlet Formation, a 300- to 450-m-thick succession of cyclically alternating peritidal sulfate evaporites and carbonates (Phaneuf, 1993). The upper part of the Shaler Supergroup, which includes the Wynniatt, Kilian, and Kuujjua formations (see Thorsteinsson and Tozer, 1962; Young, 1981; and Rainbird, 1991), is exposed only in the Minto Inlier and does not appear to correlate with strata elsewhere in the Amundsen Basin.

Cape Lambton Inlier

Outcrops of Shaler Supergroup strata were first recognized on the southern tip of Banks Island at Nelson Head and Cape Lambton by Thorsteinsson and Tozer (1962). These constitute about 500 m of strata (Young and Jefferson, 1975; Miall, 1976), which are lithologically comparable to the Mikkelsen Islands Formation and the Nelson Head Formation in Minto Inlier (Fig.2.; Rainbird et al., 1994a). Neither the base of the Mikkelsen Islands Formation nor the top of the Nelson Head Formation is preserved in the Cape Lambton section, although Young and Jefferson (1975) proposed that a 60-m-thick shale unit above the quartzarenite at the top of the section could be part of the Reynolds Point Group. If the shale is considered to be Grassy Bay Formation (basal Reynolds Point Group), then the Aok Formation is missing and perhaps shaled out. This is consistent with isopach and paleocurrent data that indicate that the Amundsen Basin deepened toward the northwest (see below and Rainbird et al. 1992a).

Brock Inlier

Brock Inlier, situated on the southern coast of the Amundsen Gulf (Fig.2), was first recognized by Mackay (1957); bedrock geology was mapped by Balkwill and Yorath (1971) and Cook and Aitken (1969), who considered it to include rocks that are correlative with the Shaler Supergroup in the Minto and Cape Lambton Inliers. About 2,500 m of Shaler Supergroup strata are preserved in Brock Inlier, encompassing a stratigraphic section from about the middle of the Escape Rapids Formation to approximately the middle of the Minto Inlet Formation (Fig.2.; Jones et al., 1992; Rainbird et al., 1994a) . The lower Shaler Supergroup in the Brock Inlier was subdivided into three mappable units, P1-P3 (Cook and Aitken, 1969), that correspond to the Escape Rapids, Mikkelsen Islands, and Nelson Head formations (Fig.2). Thicknesses are comparable to those measured in Minto Inlier. Jones et al. (1992) divided the conformably overlying stromatolitic and oolitic dolostone succession (P4) into four members (a to d), which are now called the Aok (Rae Group), Grassy Bay, Boot Inlet, and Fort Collinson-Jago Bay formations (Reynolds Point Group; Rainbird et al., 1994a). The uppermost Shaler Supergroup in Brock Inlier is a mixed sequence of varicoloured dolostone and gypsum and minor quartzarenite estimated to be about 150 m thick (unit P5 of Cook and Aitken [1969] now called Minto Inlet Formation). Cook and Aitken (1969) noted the unconformable contact between the Jago Bay and Minto Inlet formations in the southwest part of the Brock Inlier, but elsewhere it appears to be conformable. Details of the internal stratigraphy of the Minto Inlet Formation have been described by Young (1981) and Phaneuf (1993). It is exposed only in Minto and Brock Inliers.

Coppermine Area

The Neoproterozoic sedimentary succession of the Coppermine area is capped by a sequence of mainly siliciclastic rocks belonging to the Rae Group of the Shaler Supergroup, which is about 1,300 m thick and unconformably overlies multiple folded and thrusted Sequence A strata of the Coppermine River Group (Figs.2 and 3; Hildebrand and Baragar, 1992). The Coppermine area is the type area of the Rae Group (Baragar and Donaldson, 1973) and is the only place in the Amundsen Basin where the Rae Group is completely preserved. It comprises, in ascending stratigraphic order, the Escape Rapids, Mikkelsen Islands, Nelson Head, and Aok formations (Fig.2). The stratotype of the Escape Rapids Formation begins along the cutbank of the Coppermine River above Escape Rapids and comprises about 1,000 m of thinly cross-bedded to ripple cross-laminated fine sandstone and drab to red and green variegated siltstone/shale (Rainbird et al., 1994a). It was subdivided into map units 19, 20, and 21 by Baragar and Donaldson (1973), which are now referred to as the Hihotok, Nipartoktuak, and Bloody Fall members (Rainbird et al., 1994a). The Escape Rapids Formation is conformably overlain by about 260 m of cherty, stromatolitic dolostone of the Mikkelsen Islands Formation that is in turn unconformably overlain about 90 m of massive to faintly cross-bedded dull pink to light brown quartzarenite of the Nelson Head Formation (Rainbird et al., 1994a).

Baragar and Donaldson (1973) and Campbell (1983) described a conformable contact between the Mikkelsen Islands and Nelson Head formations with a thin intervening zone of carbonaceous mudstone and grey siltstone, the carbonaceous mudstone first appearing as thin interlayers in the uppermost carbonate. At a section near the mouth of the Rae River; however, the quartzarenite directly overlies carbonate, with features indicating subaerial exposure and karstification (Rainbird et al., 1992a). This suggests that the Coppermine area occupied a position as close to the basin margin as the northeast Minto Inlier, where a paleokarsted contact also was observed. In contrast, the same contact is conformable in the Brock and Cape Lambton Inliers. This is consistent with northwestward
and is composed of about 400 m of pale grey, cherty, thickening of the overlying fine-grained interval, in the direction of the inferred basin depocentre (cf. Cape Lambton Inlier).

Overlying strata, originally interpreted by Baragar and Donaldson (1973) as being part of the Rae Group, including an orange-weathering stromatolitic dolostone unit, had been reinterpreted as being Cambrian (Saline River Formation) on the basis of burrows, trilobite tracks, and inarticulate brachiopods in strata that apparently underlie the orange-weathering dolostone (Dixon 1979; Campbell 1983). Jefferson and Young (1989) accepted the evidence of the fossils but considered the orange stromatolite to be Proterozoic (Aok Formation; Rainbird et al., 1994a), forming paleotopographic highs draped by Paleozoic strata. Recent field studies (e.g., Jones et al., 1992; Rainbird et al., 1994a) have confirmed Jefferson and Young (1989), most decisively because the Aok is intruded in places by the 723 Ma Franklin gabbro.

Duke of York Inlier

The Duke of York Inlier, first described by Thorsteinsson and Tozer (1962), includes outcrops of Franklin diabase, quartzarenite, and dolostone located on southernmost Victoria Island and in the Duke of York archipelago and Richardson Islands in the Coronation Gulf (Fig.2). It is well established that these rocks lie along an east to east-northeast arcuate structural trend, along strike with Shaler Supergroup strata in the Coppermine area (Young and Jefferson, 1975; Dixon, 1979; Campbell, 1983). Shaler Supergroup strata in the Duke of York Inlier belong to the Rae Group, including about 190 m of dolosiltite and dololutite of the Mikkelsen Islands Formation, conformably overlain by about 230 m of cross-bedded buff to white quartzarenite of the Nelson Head Formation (Dixon, 1979; Rainbird et al., 1994a). There is no reported occurrence of karst or unconformity at the carbonate-quartzarenite contact such as is observed in the Minto Inlier and the Coppermine area (Rainbird et al., 1992a). The quartzarenites are similar to other occurrences of the Nelson Head Formation, being relatively pure and free of siltstone interbeds and having consistent north-northwesterly paleocurrent indicators (Campbell, 1983). An isolated outcrop of Aok Formation outcrops about 2 km west of the west end of Johansen Bay (Rainbird et al., 1994a).

REGIONAL CORRELATION OF THE SHALER SUPERGROUP

Aitken et al. (1973) noted the similarity between Neoproterozoic rocks of the Coppermine area and the Mackenzie Mountains Fold and Thrust Belt. Young (1977), Aitken et al. (1978), and Young et al. (1979) proposed the first regional correlation between rocks of the Mackenzie Mountains Supergroup and the Shaler Supergroup in the Amundsen Basin. Refinements to this scheme were suggested by Young (1979) and Jefferson and Young (1989). Young (1977) and Jefferson (1985) compared evaporitic rocks of the Coates Lake Group of the Mackenzie Mountains with the Kilian Formation of the Shaler Supergroup; however, the former appear to have been deposited within an isolated fault-bound basin that may not have had any connection to the Amundsen Basin.

Mackenzie Mountains Supergroup

Neoproterozoic sedimentary strata outcrop in the Mackenzie Mountains of the Northwest Territories at the northernmost end of the Canadian Cordillera (Fig.2). These strata occur in the Mackenzie Mountains Fold and Thrust Belt (also known as the Mackenzie Arc): a northwest-striking arcuate belt of stacked thrust panels and isolated blocks that were juxtaposed with Cambrian to Devonian passive continental margin successions during Laramide deformation.

The oldest rocks exposed belong to Sequence B strata of the Mackenzie Mountains Supergroup (Fig.2; Young et al., 1979). Map unit H1 represents the lowermost unit of the Mackenzie Mountains Supergroup and is composed of about 400 m of pale grey, cherty, stromatolitic dolostone (Aitken et al., 1973). The base has not been observed. This is conformably overlain by the Tsezotene Formation, a predominantly argillaceous and recessive sequence, up to 1,500 m thick, representing a prograding muddy carbonate ramp deposit (Long, 1991).

The Tsezotene is conformably overlain by the Katherine Group, an up to 2,000-m-thick succession comprising seven informal members defined by alternating units of siltstone/mudstone and quartzarenite (Figs.2 and 3; Aitken et al., 1973). These can be grouped into three coarsening upward cycles that resemble the fluvio-deltaic cycles described from the Nelson Head Formation (Rainbird et al., 1992a) and from the Grassy Bay Formation (Young and Long, 1977; Morin and Rainbird, 1993). Marine influence is recorded in the uppermost cycle with a distinctive orange-weathering stromatolite unit (K6), and an overlying quartzarenite unit (K7), which exhibits polymodal paleocurrents from crossbedding (D. Long, pers. commun., 1993).

The Little Dal Group paraconformably overlies the Katherine Group and consists of six formations with an aggregate thickness of about 2,800 m (Figs.2 and 3; Aitken, 1981). The basal Mudcracked formation consists of about 60 m of interbedded fine quartzarenite, dolomitic sandstone and siltstone with large- and small-scale hummocky cross-stratification, interference ripples and desiccation cracks.

The Mudcracked formation grades upward into the Basinal/Platformal "assemblage," which is characterized by shaly dolostone rhythmite (Basinal unit) overlain by both tabular and patch reefs composed of digitate stromatolites with intervening oolitic grainstone (Platformal unit). The Basinal unit varies in thickness from 250 to 400 m, and the Platformal unit exceeds 500 m in some sections (Aitken, 1981).

The gradationally overlying Grainstone Formation has a maximum thickness of 425 m and is composed of five units of alternating parallel- to lenticular-bedded dolostone rhythmite and cross-bedded to planar-laminated oolitic dolostone (Aitken, 1981). Jefferson (1983) remarked that calcareous quartzarenite and sandy argillaceous dololutite are common near the top of the Grainstone Formation.

The Grainstone Formation is conformably overlain by the Gypsum Formation, which has a maximum thickness of 530 m and is composed of plane-laminated white to varicoloured gypsite and anhydrite with subordinate gypsiferous siltstone and dolosiltite. Nodular texture and enterolithic folding are common in some sections (Aitken, 1981).

The overlying Rusty Shale formation has a maximum thickness of 230 m and consists of recessive, desiccation-cracked, ripple-marked, rusty weathering, black to grey shaly mudstone and siltstone and very fine-grained dolomitic quartzarenite. Aitken (1981) recognized five members that are correlated throughout the Mackenzie Mountains Inlier: first carbonate member, first shale member, middle sandstone member, second shale member, and second carbonate member.

The Upper Carbonate formation occurs at the top of the Little Dal Group and has been informally subdivided into 13 informal members mainly on the basis of differing stromatolite forms (for detailed description, see Jefferson, 1983; Jefferson and Parrish, 1989). The basal 6 members (UC1-6) comprise a relatively uniform carbonate platform succession, 350 to 450 m thick, composed of grey and tan stromatolitic to oolitic dolostone and limestone. The upper 6 members (UC 7-12) are discontinuous with an average aggregate thickness of about 60 m and consist of stromatolitic carbonate units separated by widely spaced beds of grey to brown mudstone. The uppermost member of the Upper Carbonate formation is a sporadically developed sequence of basalt flows (up to 100 m thick) of unknown age, referred to as the Little Dal basalt.

A high-energy shallow-marine platform is the depositional setting inferred from sedimentology of most of the Little Dal Group (Aitken, 1981). Episodes of marine transgression are represented by thicker shale units (e.g., Basinal unit), and platform barrier-related "lagoonal" conditions were suggested for deposition of evaporites of the Gypsum Formation (ibid).

Younger Neoproterozoic Strata

In the Mackenzie Mountains Fold and Thrust Belt, the Mackenzie Mountains Supergroup is separated from the overlying Windermere Supergroup by the Coates Lake Group, which also is considered to be part of Sequence B on the basis of lithologic similarity with the Mackenzie Mountains Supergroup (Fig.2.; Young et al., 1979; Jefferson, 1983; Jefferson and Parrish, 1989). Others consider the Coates Lake Group, along with the Rapitan Group, to be the initial rift deposits of the Windermere Supergroup and thus would include both with Sequence C (Ross, 1991; Aitken, pers. commun., 1991) The Coates Lake Group is restricted to a 300- km southeast-northwest trending belt in the area of the Plateau Thrust system (Jefferson, 1983). It is separated from the underlying Little Dal Group by a regional, low-angle, erosional unconformity. Detailed stratigraphy of the Coates Lake Group has been described by Jefferson (1983) and Jefferson and Ruelle (1986).

The Windermere Supergroup (Sequence C) overlies the Coates Lake Group in several areas and unconformably overlaps the lower parts of the Mackenzie Mountains Supergroup beyond the outcrop extent of the Coates Lake Group. Detailed stratigraphy of the Windermere Supergroup in the Mackenzie Mountains is given by Eisbacher (1981), Yeo (1981), and Aitken (1989, 1991).

Sequence Stratigraphic Correlation

Correlation between the Mackenzie Mountains Supergroup and the Shaler Supergroup of Amundsen Basin is largely based on the obvious lithostratigraphic similarities between the two sequences (for details, see Fig.3 and references cited above). Correlation based strictly on lithostratigraphy is sufficient for regional mapping purposes but not for basin analysis because a single lithostratigraphic unit can encompass genetically dissimilar strata (e.g., fluvial quartzarenite overlain by marine quartzarenite, separated by a sequence boundary, would be considered as one lithostratigraphic unit). Sequence stratigraphic studies in the Shaler Supergroup (Morin and Rainbird, 1993; Rainbird and Jefferson, 1993) have identified several sequence boundaries and maximum flooding surfaces (*sensu* Embry, 1993). Comparison with stratigraphic sections from the Mackenzie Mountains Supergroup (Aitken, 1981; D. Long, pers. commun., 1993), reveals that some of these boundaries can be traced between the two areas. An example is the contact separating the Mikkelsen Islands Formation from the overlying Nelson Head Formation in the Shaler Supergroup, which is an erosional (karstic) sequence boundary directly overlain by a maximum flooding surface (a combined sequence boundary and a maximum flooding surface is called a merged surface). This surface correlates either with the H1-Tsezotene boundary or with the Katherine Group unit K3-K4 boundary in the Mackenzie Mountains (Fig.3). In the latter case, the Tsezotene to K3 succession would be equivalent to a hiatus represented by the sub-Nelson Head merged surface. Another example is a sporadic erosional sequence boundary that occurs between fluvial and marine quartzarenites of the Grassy Bay Formation (Morin and Rainbird, 1993). This boundary matches closely the boundary between Katherine Group unit K-7 and the overlying Mudcracked Formation in Mackenzie Mountains (Fig.3). The boundary appears to be gradational in most sections, but in section 77-12 (Fig.3.7 in

Aitken 1981), it is clearly an unconformity, which is interpreted as the same sequence boundary identified in the Amundsen Basin.

The sequence stratigraphic correlation is further strengthened by U-Pb detrital zircon geochronology from unit K-7 in the Mackenzie Mountains Supergroup and from the Nelson Head Formation in the Minto Inlier. Single zircons separated from one quartzarenite sample from each unit indicate almost identical suites of concordant ages (Rainbird et al., 1994b). Both suites are strongly dominated by Mesoproterozoic (~1100-1400 Ma) detrital zircons, supporting the conjecture that the quartzarenites are correlative and part of an extensive fluvial system that may have originated from the foreland of Grenville orogen (Rainbird et al., 1992b).

DISCUSSION

Detailed stratigraphic correlation between Sequence B strata of the Shaler Supergroup and the Mackenzie Mountains Supergroup suggests that the basins in which these strata were deposited were connected and perhaps part of a much larger intracratonic basin. Relative sea-level curves have been derived from stratigraphic and sedimentological studies of the Shaler Supergroup in the Minto Inlier and of the Katherine Group and Tsezotene Formation in the Mackenzie Mountains (Rainbird and Jefferson, 1993; D. Long, pers. commun., 1993). This work indicates that the Mackenzie and Amundsen basins were affected by some of the same transgressive events. These are characterized by erosional sequence boundaries, developed on fluvial quartzarenites or shallow-water, stromatolitic carbonates that are overlain by variable thicknesses of thin-laminated (deep-water) mudstone (Fig.3). The nature and the regional extent of the transgressive events suggests that they are attributable to a regional scale tectonic process (such as intraplate stress; Cloetingh, 1986). The aerial extent, magnitude of the inferred deepening episode, and degree of change of the sedimentary regime across the boundaries is comparable to that observed across second- or perhaps third-order sequence boundaries described from the Phanerozoic; however, available chronostratigraphic and biostratigraphic control does not allow us to establish the precise periodicity of the cycles defined by the boundaries.

Stratigraphic correlation of North American Sequence B and C with stratigraphic successions in several intracratonic basins from central and south Australia has been proposed by Bell and Jefferson (1987). This was used as a foundation for reconstructions of a Neoproterozoic supercontinent (*Rodinia* of McMenamin and McMenamin, 1990), in which the eastern margin of Australia is juxtaposed against the western margin of North America (Dalziel, 1991; Hoffman, 1991; Moores, 1991; Brookfield, 1993). The lithostratigraphic and sequence stratigraphic comparison of Sequence C from the northern Canadian Cordillera and the south Australian Adelaide trough is particularly compelling (Young, 1992). Possible equivalents of Sequence B in Australia are the Burra Group in the Adelaide trough and the Heavitree Quartzite-Bitter Springs Formation in the Amadeus Basin (cf. Preiss and Forbes, 1981).

CONCLUSIONS

Stratigraphic correlation between the Cape Lambton, Brock, Duke of York, and Minto Inliers and Coppermine area indicates that they are part of a once contiguous depository, the Amundsen Basin. The basin is inferred to have been formed in an intracratonic tectonic environment because its strata are characterized by interconnected, regionally correlative sequences. Paleocurrent and isopach studies suggest that the basin formed an arcuate embayment that was open to the northwest.

Refined lithostratigraphic correlation of the Shaler Supergroup in the Amundsen Basin with the Mackenzie Mountains Supergroup in the northern Cordillera suggests that the embayment was likely part of a much larger inland sea or seaway that developed prior to rifting and breakup of the supercontinent Rodinia. The correlation is supported by the identification of regionally consistent sequence boundaries, which imply that basin development was punctuated by several distinctive, perhaps tectonically controlled, basin flooding events. The correlation also is constrained by the geochronology of detrital zircons from a regionally persistent quartzarenite unit, supporting the contention that an extensive fluvial braid-plain blanketed the platform.

The Shaler Supergroup and Mackenzie Mountains Supergroup bear similarity to Neoproterozoic successions preserved in several intracratonic basins in central and southern Australia. This is consistent with proposed plate reconstructions of the Neoproterozoic supercontinent Rodinia that juxtapose the eastern margin of ancestral Australia against the western margin of Laurentia. This hypothesis has implications for predictive metallogeny in both areas and can be tested with paleomagnetic, chemostratigraphic, biostratigraphic, and geochronological comparisons.

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