New Nouveau Brunswick

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## PUBLICATION RELEASE:

## Memoir 4 (online)

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The Middle Paleozoic Rocks of Northern and Western New Brunswick, Canada

**R.A. Wilson (xlsx, and pdf formats). To purchase this report on CD-ROM refer to page 4 of this notice.**

The post-Taconic, Middle Paleozoic Matapédia Cover Sequence (MCS) of northern and western New Brunswick oversteps deformed Early Paleozoic inliers to the northwest (Popelogan) and southeast (Miramichi and Elmtree). The Popelogan Inlier represents part of a volcanic arc built on the leading edge of the peri-Gondwanan Ganderian microcontinent during Early to Middle Ordovician southeasterly directed subduction. At the same time, extension behind the Popelogan Arc led to the opening of the Tetagouche Backarc Basin, dividing Ganderia into an active (northwestern in present coordinates) leading segment, and a passive trailing segment (the Gander margin). Collision of the Popelogan Arc with the Laurentian continental margin following closure of the main tract of the Iapetus Ocean in the Late Ordovician is recorded by a Taconic disconformity throughout the northern Appalachian Orogen. Further convergence of Ganderia was achieved by a switch to northwesterly directed subduction of Tetagouche backarc lithosphere beneath the composite Laurentian margin. A northwest-facing accretionary wedge (Brunswick Subduction Complex) developed during Late Ordovician to Early Silurian thrust-related imbrication of oceanic crust and microcontinental blocks (now represented by the Fournier and Bathurst supergroups) of the Tetagouche Backarc Basin. At this time, deep-marine, clastic and carbonate sedimentary rocks composing the Grog Brook and Matapedia groups of the MCS were deposited in the Matapédia Forearc Basin situated between the Laurentian margin and the accretionary wedge. Concurrent with development of thrust nappes in the subduction complex, syn-accretionary clastic turbidites were deposited above the Sormany Group (Fournier Supergroup) and the California Lake and Tetagouche groups (Bathurst Supergroup).

Silurian deformation and exhumation of the accretionary wedge along the eastern margin of the Matapédia Forearc Basin is recorded by the regional Salinic A unconformity located between Lower Paleozoic rocks of the Fournier and Bathurst supergroups in the Miramichi and Elmtree inliers, and the base of the overlying Lower to lower Middle Silurian basin-fill succession of the Quinn Point Group. The fluvial to subtidal to shallow marine clastic and carbonate facies of the Quinn Point Group passes basinward to the west into a thin-bedded, turbiditic slope facies that gradationally overlies deep-marine carbonates of the Matapédia Group, and the Salinic A unconformity is absent. Calcareous sandstone, slate, and ferro-manganiferous shale of the Lower to Upper Silurian Perham Group conformably overlie the Matapédia Group in the southwestern and northwestern parts of the MCS.

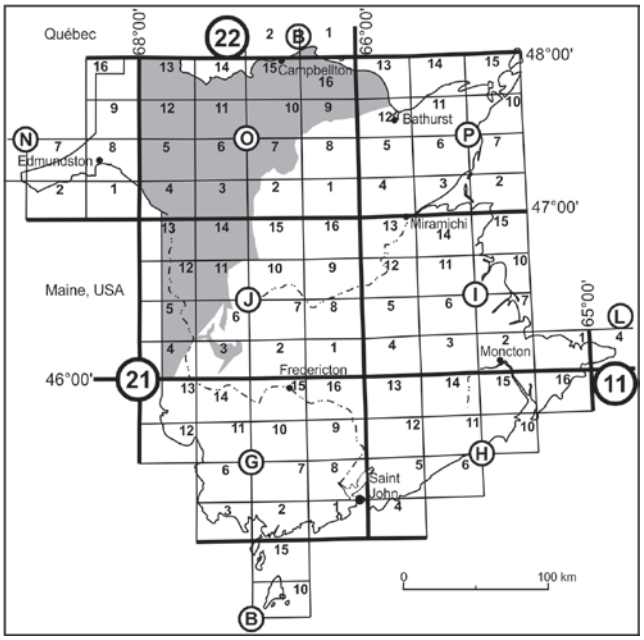
Collision of Ganderia's trailing passive margin with composite Laurentia closed the Tetagouche Backarc Basin by the early Late Silurian. Uplift associated with this collision is recorded in the northeastern part of the MCS by the regional Late Silurian Salinic B unconformity above the Quinn Point Group. Post-collisional successions include 1. Upper Silurian clastic and reefal carbonate strata of the Petit Rocher Group deposited along the northern margin of the Miramichi Inlier and southern margin of the Elmtree Inlier; 2. Upper Silurian subaerial volcanic rocks and associated terrestrial sedimentary rocks of the Dickie Cove Group deposited along the northern and western margins of the Elmtree Inlier; and 3. Upper Silurian to Lower Devonian reefal carbonates and calcareous siliciclastic rocks of the Chaleurs Group deposited to the north of the Popelogan Inlier. The regional Salinic B depositional break also occurs in the southwestern part of the MCS, where it separates Lower to Upper Silurian strata of the Perham Group from Upper Silurian to Lower Devonian

sedimentary and volcanic rocks of the Tobique Group. Disconformities at the base of the Chaleur and Tobique groups are younger (Pridolian) than those at the base of the Petit Rocher and Dickie Cove groups (Ludlovian), suggesting that Salinic B uplift related to closure of the Tetagouche Backarc Basin and Ganderia – Laurentia collision was diachronous, occurring somewhat later at locations closer to the Laurentian margin. Radiometric dating indicates that a local post-Salinic B disconformity, located between the Upper Silurian volcanic rocks of Dickie Cove Group and overlying Lower Devonian volcanic rocks of the Dalhousie Group, represents a hiatus of approximately two million years. This disconformity coincides with a regional sea-level lowstand manifested in widespread deposition of earliest Lochkovian redbeds.

Upper Silurian (Pridolian) to Lower Devonian (Lochkovian), commonly turbiditic sedimentary and associated volcanic rocks are assigned to the Dalhousie Group and Tobique Group in the eastern part of the MCS, and the Fortin Group in the western part. These rocks were deposited in a retroarc foredeep whose depocentre migrated to the northwest in advance of the Acadian deformation front. Dalhousie Group stratigraphy varies between the two areas of its exposure in the Jacquet River and Restigouche synclines, as well as within the Jacquet River Syncline, on the east and west sides of the Black Point – Arleau Brook Fault. In the Tobique Group, a Pridolian to earliest Lochkovian, dominantly volcanic lower part correlates with the Dickie Cove Group, and a Lochkovian, dominantly sedimentary upper part with the Dalhousie Group. Correlative deep-water clastic sedimentary rocks of the Lower Devonian Fortin Group were deposited in the northwestern part of the MCS, west of the Restigouche Fault. These rocks range in age into the early Emsian, supporting regional diachrony associated with northwesterly foredeep migration. Upper Silurian to Lower Devonian volcanic rocks in the MCS were generated in a complex tectonic setting, as emplacement occurred on the upper (Laurentian) plate with respect to the subducted Tetagouche backarc slab and Ganderia's trailing passive margin, which in turn formed the upper plate with respect to the subducting Acadian Seaway slab and the Avalonian microcontinent. It is proposed that Late Silurian volcanic rocks preserved in the Dickie Cove Group and lower part of the Tobique Group were generated in response to break-off of the Tetagouche backarc slab, whereas volcanic rocks of the Dalhousie Group and upper part of the Tobique Group were related to postulated dehydration of a shallowly-dipping Acadian slab beneath northern New Brunswick in the Early Devonian. All volcanic rocks have within-plate geochemical signatures and were generated by partial melting of the same subcontinental lithospheric mantle source. However, andesitic compositions are abundant in Lower Devonian volcanic rocks in the upper part of the Tobique Group and especially in the Dalhousie Group; genesis of these volcanic rocks may have involved contributions of both the dehydrating Acadian slab and remnant hot asthenospheric mantle inherited from Salinic slab break-off, producing partial melts with mixed arc and within-plate signatures.

Acadian deformation of the MCS in northern New Brunswick is estimated to have occurred in the Early Devonian between 415 and 395 Ma, and was accompanied in its later stages by dextral strike-slip faulting on the Rocky Brook – Millstream, Restigouche – Grand Pabos, and Catamaran Brook faults, and numerous related satellite faults. Rapid post-Acadian uplift throughout the northern Appalachians led to the deposition of upper Lower to lower Middle Devonian terrestrial sedimentary rocks of the Gaspé Sandstones Group unconformably above of the Dalhousie and Tobique groups. Late Acadian or Neo-Acadian adjustments resulted in moderate tilting of these beds, which are the youngest rocks preserved in the New Brunswick segment of the MCS.

Mineral occurrences in the MCS include volcanic-hosted base-metal deposits in the Tobique and Dalhousie groups; porphyry-type, skarn-type, and vein-type base-metal (+/- silver and gold) deposits associated with intrusive rocks and major faults; gold-bearing quartz veins hosted by sedimentary rocks of the Grog Brook Group and carbonate-altered sedimentary rocks of the Petit Rocher Group; and stratiform iron and manganese deposits in sedimentary rocks of the Perham Group.




grey shading on map denotes study area

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