

A Segment of the Hercynian Thrust Belt Between Saint John and Cape Spencer, Southern New Brunswick

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The segment of the Hercynian thrust belt which is exposed along the Bay of Fundy, southeast from Saint John to Cape Spencer, consists of poly-deformed sedimentary sequences which in places host gold occurrences. Aside from a small Triassic graben, the coast exposes three distinct sedimentary packages, two of Carboniferous age and one of Carboniferous or older age. The Carboniferous or older sediments, including those referred to as the West Beach formation by Nance (1985), occur mainly along the coast to the southeast of Mispec Beach. The Carboniferous Balls Lake Formation occurs mainly to the northwest of Mispec Beach and the conformably overlying Lancaster Formation outcrops mostly inland.

The Carboniferous or older sedimentary rocks are thrust over the Balls Lake and Lancaster formations and consist mainly of fine-grained purple and greyish purple siltstone, slate, and sandstone with occasional thin limestone beds. Arkose and polymictic granite pebble conglomerate are locally abundant. The Balls Lake Formation consists of purple and red quartzose sandstone, siltstone, shale and quartz pebble conglomerate of probable fluvial origin. Local coarse polymictic paraconglomerates at Mispec Point appear to be debris flows. The conformably overlying Lancaster Formation consists dominantly of grey and brownish grey medium- and coarse-grained sandstone locally containing fossil tree trunks, discontinuous pebble conglomerates and minor thin grey shales. A finer-grained, possibly paralic sequence of Lancaster Formation is exposed near Saint John city.

At least three phases of deformation have affected these sequences. D₁ deformation produced a penetrative S₁

cleavage which is parallel or sub-parallel to bedding. No F₁ folds were discovered. It is possible that the S₁ cleavage formed by shearing (mainly bedding parallel) resulting from arching or bending during collision of the Avalon and Meguma terranes as suggested by Ruitenberg (1973) and Ruitenberg and McCutcheon (1982).

The D₂ phase deformation produced both southeast and northwest directed thrusting along with large northeast trending, thrust-related folds having either northwest or southeast dipping axial surface cleavages (S₂). A northwest dipping spaced S₂ cleavage is well developed in shaly units of the Balls Lake Formation. Gold mineralization clearly occurred along thrust-related folds of this deformation phase. A minor D₃ phase of deformation produced sporadic steeply dipping kink bands.

The D₂ thrusts are extremely important because they juxtapose the major rock sequences and they control the emplacement of gold deposits. The thrusts tend to follow the least competent units (shales, limestones). Many of the thrust surfaces contain thrust-parallel, layered quartz-chlorite veins a few centimeters thick but massive quartz veining up to two meters thick is found locally near gold occurrences. Extension veins of quartz ± calcite ± chlorite are often abundant in competent units near the thrusts. Folds commonly occur immediately above and/or below thrust surfaces. Alteration effects related to D₂ thrusting include reduction (green) of the original red beds adjacent to many thrusts and more intense buff alteration with pyrite and gold occurring in some thrust-related fold crests and below some thrust surfaces.