Knoll Reef facies and diagenesis of the LaPlante Formation (Late Silurian), northern New Brunswick

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The LaPlante Formation outcrops in a narrow belt from near Petit Rocher southwest to Upsalquitch Lake and consists of numerous scattered small carbonate build-ups and associated strata. Field and laboratory studies indicate that these small carbonate build-ups have the following common features: (1) in morphology, they occur as isolated mounds that range in thickness from 5 to 20 m thick and laterally from 20 to 100 m across; (2) there are three distinct units and five different lithologic facies related to each individual build-up. The core unit consists of a laminar and massive stromatoporoid facies representing the organic production and frame construction. The flank unit is composed of crinoidal packstone and talus breccia facies consisting of large lithoclasts and bioclasts derived from the core unit within a grey shale matrix. The cap unit commonly is a thin layer (0.5-2 m) of grey shale with some bioclasts, representing the final phase of organic accumulation; (3) in core units, the framework builders are mainly stromatoporoids, algae and tabulate corals, and growth cavities are common, especially in the laminar stromatoporoid facies. Core units commonly contain a relatively high content of lime mud and terrigenous clay and silt, suggesting a relatively low-energy environment; (4) from base to top, the abundance of massive stromatoporoids increases and that of laminar stromatoporoids decreases; and (5) no grainstone facies nor lagoonal deposits were found, suggesting lack of strong influence of waves and probably no wave-resistant barriers.

The above features suggest that the small scattered carbonate build-ups in the LaPlante Formation are not fringing reefs, like the reefs in the West Point Formation of Gaspé, but are stromatoporoid-dominated knoll reefs. They formed on the upper slope at the margin of the Bathurst Basin in a relatively low-energy environment.

The LaPlante reefs show five phases of calcite cements formed in different diagenetic environments from marine to shallow burial through meteoric phreatic phase to a final deeper burial phase. Dolomite occurs as an anhedral open-space-filling cement phase and scattered euhedral or saddle form cement phase in cavities and fractures. Anhedral dolomite cement post-dates the latest calcite phase and may be burial dolomite. At least four generations of fractures are recognized and are related to the carbonate cement phases. The several generations of fracturing were formed by early diagenetic processes, brecciation, and tectonic activity. The last diagenetic phase in cavity fillings is authigenic quartz with fine-to-coarse, anhedral-to-euhedral crystal forms. It post-dates all calcite and dolomite.