Geological Mapping of the Parrsboro Coast, Black Rock to Moose River, Cumberland County

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The geology of late Paleozoic-early Mesozoic rocks on the northern coast of the Minas Basin and south of the Cobequid Fault is shaped by two global events in Earth history: (1) the amalgamation of terranes in the late stages of Pangean assembly (Keppie, 1982; Murphy *et al*., 2011); and (2) the subsequent breakup of the Pangean landmass, as recorded by the basalts of the Central Atlantic Magmatic Province (CAMP) (Marzoli *et al*., 1999). The geology of the map area (Fig. 1) is dominated by the dextral strike-slip Cobequid Fault, which demarcates the southern margin of the Cobequid Highlands, and by subparallel faults to the south (Donohoe and Wallace, 1982), including the Portapique and Clarke Head faults, which were involved in accommodating the late stage of Pangean assembly during the Appalachian orogeny, culminating at the Mississippian-Pennsylvanian unconformity. Reaction of these east-west faults after the early Jurassic resulted in graben formation involving the late Triassic Blomidon Formation, earliest Jurassic North Mountain Formation, and early Jurassic McCoy Brook Formation (Withjack *et al*., 1995). At locations like Clarke Head, both of these events are juxtaposed.

The Clarke Head Fault Zone involves brittly deformed blocks of 10-100 m scale sedimentary Carboniferous strata, 10 m scale subrounded megaclasts, 1-10 m scale exotic igneous and metamorphosed igneous rocks, and a fine matrix of cm scale and finer sedimentary clasts. Mapping indicates that coherent 100 m scale sections of Windsor Group (Gigantoproductid-bearing limestone) and Mabou Group (West Bay

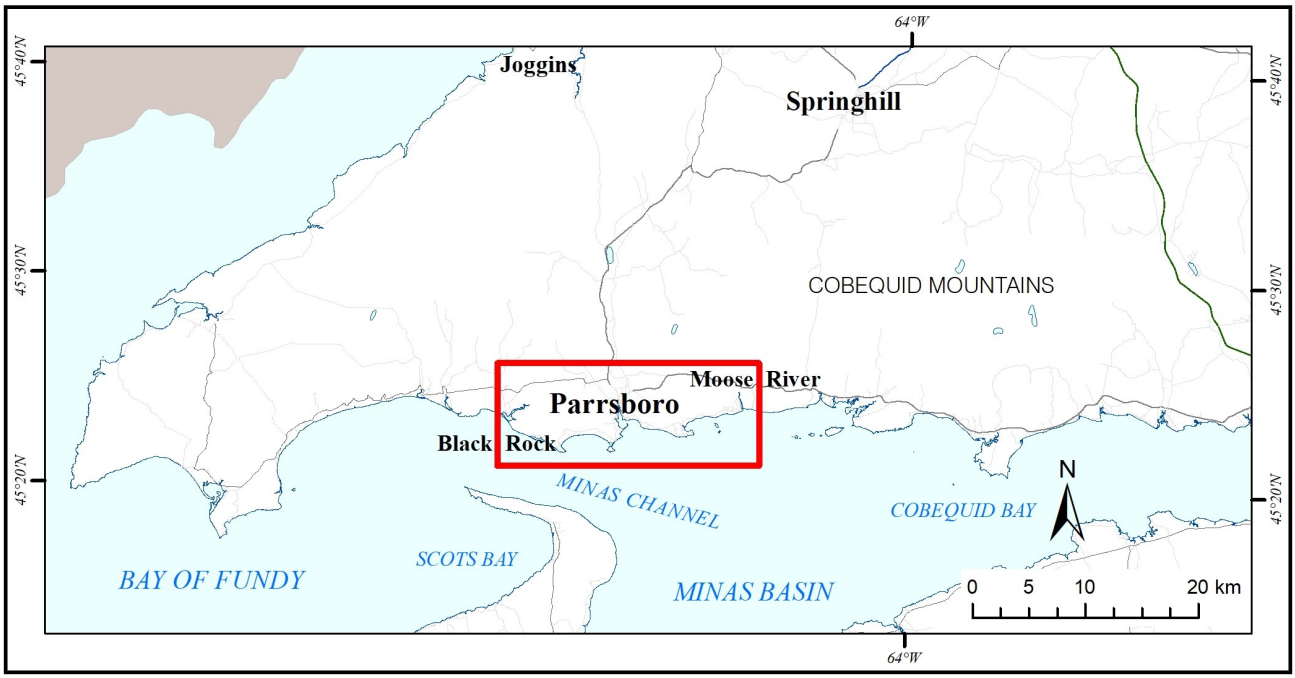

Figure 1. Location of the Parrsboro coast, Cumberland County.

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Formation) 'float' within this matrix and that the entire section south of the bounding fault with the Mesozoic strata can rightly be described as mélange (Bromley, 1987; Calder et al., 2018). Field observations constrain mélange formation to the early Namurian-early Langsettian, with further involvement of the basin-fill subsequent to the early Pennsylvanian. This time interval correlates with the Mississippian-Pennsylvanian unconformity of eastern North America and implicates late stage assembly of Pangea, later deformation being consistent with the timing of salt removal in the Cumberland Basin north of the Cobequids (Waldron et al., 2013). Involvement of mafic clasts within mylonitized gypsum suggests that Windsor evaporites acted as a flux during compression-transpression along a deeply rooted fault system that was re-activated, incorporating garnet-bearing granulite and mafic elements. The large (dm-scale) rounded megaclasts that typify the Clarke Head section are also consistent with movement within an evaporite flux, pointing to a possibly joint tectonic-diapiric cause of mélange formation (Calder et al., 2018).

A challenge within the map area is inferring map relationships across marine areas: recent bathymetric surveys in support of tidal energy research in the vicinity of Black Rock identifies an east-west offshore fault south of Cape Sharp and Partridge Island (G. Fader, personal communication, 2017) that may connect with the Clarke Head Fault. Several formations within the map area have not been formally defined in accordance with the stratigraphic code, including the late Mississippian West Bay formation, early Pennsylvanian Parrsboro formation and early Jurassic McCoy Brook formation; proposed type sections of these formations have been identified within the map area.

The coastal exposures comprise some of the most important paleontological sites in Nova Scotia, including invertebrate and vertebrate body and trace fossil localities. The database that supports the map includes paleontological specimens collected by Eldon George (Fig. 2) during his long and storied career as citizen scientist and owner of Canada's oldest rock and mineral shop on

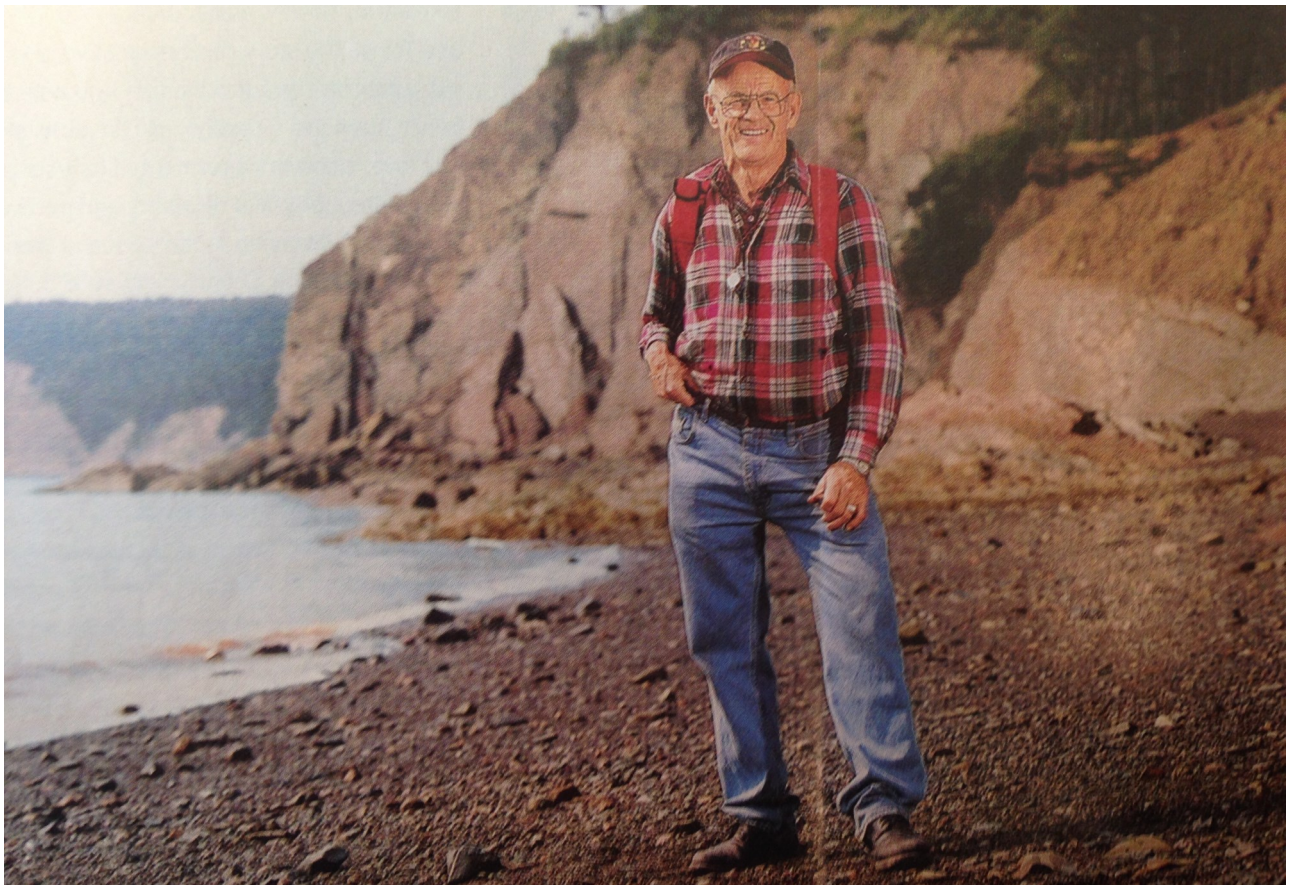

Figure 2. Eldon George, long-time mineral and paleontological 'citizen scientist' of the Parrsboro Shore, at East Bay in 2003.

Whitehall Road, Parrsboro, and curated by the Fundy Geological Museum.

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