

Recent mapping and interpretation of the enigmatic Clarke Head area, northern Nova Scotia, Canada

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The Clarke Head coastal section is an oft-visited, visually stunning, and challenging geological site. Mapping of this complex section was facilitated by aerial drone photography that provided detailed rectified photomosaics of the intertidal zone in map view and of the higher, largely inaccessible cliff face. We use the term Clarke Head fault zone (CHFZ) to refer to a nominally 500 m-wide section of deformed Carboniferous sedimentary strata and older igneous rocks that occur south of a narrow but regionally persistent graben involving the late Triassic Blomidon Formation, earliest Jurassic North Mountain Formation, and early Jurassic McCoy Brook Formation. The CHFZ involves coherent but brittlely 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 centimetre-scale and finer sedimentary clasts. Mapping indicates that coherent 100 m-scale sections of Windsor Group (Gigantoproductid-bearing limestone) and Mabou Group (West Bay 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*. Although we are still at the stage of characterizing the geometry of the fault zone, our mapping indicate that *mélange* clasts involve strata older than the West Bay formation of the Mabou Group’ (late Viséan– early Namurian). Parrsboro Formation (Langsettian) of Cumberland Group affinity is highly involved at fault margins of the *mélange* proper. These preliminary 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 timing of salt removal in the Cumberland Basin north of the Cobequids. Involvement of mafic clasts within mylonitized gypsum suggests that Windsor evaporites acted as a flux during transpression along a deeply rooted fault system that was reactivated, incorporating garnet-bearing granulite and mafic elements. The large (decametre-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.