
A microbial mat and associated trace fossil assemblage at Coal Mine Point, Nova Scotia: paleoenvironmental significance and evidence of a previously unrecorded transgression

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The Coal Mine Point (CMP) headland, within the UNESCO World Heritage Site at Joggins, contains a prominent Poorly Drained Floodplain lithofacies (PDF). New ichnological and sedimentological evidence has shed new light on the paleoenvironmental interpretation at CMP. The presence of aquatic trace fossils and an associated microbial mat suggests a previously unrecognized transgression event with a possible marine connection.

In 2009, two associated sandstone blocks were liberated from the upper part of the fluvial-channel body at CMP by erosion. One of the blocks has since been turned over and both are otherwise somewhat obscured by debris, and are survived only by photographs. The sandstone blocks preserve wrinkle structures consistent with a fossilized microbial mat, in addition to several tetrapod (*Pseudobradypus* (?), *Dromillopus*) and terrestrial invertebrate trackways (*Diplichnites cuithensis*, *Diplichnites gouldi*). Substrate stabilization and increased cohesiveness is evidenced by the interaction between the microbial mat and large arthropleurids which traverse the wrinkled surface exhibited by the large *Diplichnites* trackways. Trackways are not underprints and trackway emplacement was post-mat growth, as the imprints are sharp and show no sign of extramorphological distortion.

In combination, these terrestrial trace fossils are indicative of the known PDF assemblages at Joggins. However, preserved with the sandstone beds are paired mud drapes, which are interpreted as possible tidal rhythmites, and aquatic ichnofossils (*Cochlichnus*, *Skolithos*, *Arenicolites*, *Rhizocorallium*, and *Protichnites*). Collectively, the microbial mat and overlying ichnofossil assemblage, suggest a transgressive event and marine influence preserved in the upper Coal Mine Point sandstones. Deposition of fluvial sands was followed by channel abandonment and the formation of microbial mats, after which a minor transgressive event established brackish conditions in the uppermost part of the channel fill. Microbial mats are uncommon in the Phanerozoic record,

and the CMP occurrence is one of very few examples from a fluvial or tidal channel body.