Observations on the Ichnology of the Avalon and Ben Nevis Formations, White Rose Field, Newfoundland

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Analysis of core from nine studied wells within the Cretaceous Avalon (Barremian-Aptian) and Ben Nevis (Aptian-Albian) formations from the Whiterose Field, Jeanne D'Arc Basin, offshore Newfoundland reveals a diverse trace assemblage principally formed within a soft sediment substrate and associated with the *Skolithos* ichnofacies (indicating relatively high energy depositional conditions and a shifting sand substrate) and proximal *Cruziana* ichnofacies (reflecting shelfal deposition between the fair weather and storm wavebase). The strata are mostly siliciclastic, being dominated by sandstones that interbed with and grade into siltstone. In addition, coquinas and shell lags are also frequently encountered. As well as the softground ichnofauna, there are examples of both microboring affecting the abundant invertebrate fauna and macroboring present in a hardground surface. This gives rise to an isolated occurrence of the *Trypanites* ichnofacies (with bivalve generated borings emplaced in a laterally continuous hard substrate that is indicative of a period of non-deposition or erosion).

A thin section petrographic study, examining samples from each of the studied wells, reveals examples of biogenically produced textural alteration that include cryptic bioturbation, sediment mixing within strata initially deposited as heterolithic sand and silt beds and partitioned burrow fills that are characterized by contrasting grain size and texture between the burrow fill and surrounding matrix.

A complex diagenetic history is also apparent, with a dramatic and sharply bounded local variation displayed between samples that are most heavily influenced by compaction and dissolution processes and those dominated by cementation. Mechanical compaction is observed with fracturing and deformation of bioclasts, in addition to extensive chemical compaction, with pressure solution indicated by concavo-convex and sutured grain contacts as well as stylolites, some of which display a volume loss as great as 40%. These zones are in marked contrast to areas that have been largely unaffected by compaction but in which frequently abruptly bounded and intensive calcite cementation is apparent, locally obliterating the initially high primary depositional porosity. Isopachous fringing, blocky and poikilotopic calcite cements are all apparent, reflecting precipitation in a full range of settings from the marine phreatic zone through shallow and deep burial environments. Previous authors have invoked dissolution of skeletal aragonite as the major carbonate source for calcite cementation, however the large volumes encountered suggest a considerable proportion must also have been derived from pressure dissolution of underlying strata.