

Evaluating the Stress Factors on Animal-Substrate Interactions from a Pleistocene Shelf-Edge Delta, Mayaro Formation of Trinidad

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Abstract

Late Pliocene Mayaro Formation outcrops along the southeast Trinidad coastline represent a strike-parallel sliver of the paleo-Orinoco shelf-edge delta along the shoulder of one of the series of basin-bounding growth faults defining successive shelf-breaks. The outcrops consist mostly of sediments deposited at the delta-front. In addition, there are a few outcrops of sediments deposited as prodelta and as muddy gravity flow deposits on the upper slope setting within the incised canyon(s) crosscutting the delta front. Although sand-dominated, the delta-front deposits represent a stacked sequence of recurrent, grossly tabular, intermittently coarsening and/or thickening-upward mouth bar splays, their internal architectural and ichnological heterogeneities suggest very complex lateral variabilities – not only within every individual splay, but also among splays. Depositional and paleobiological complexities make Mayaro Formation as an example of a unique type of shelf-edge delta, where the dominant delivery mechanisms being sustained underflows and oceanic waves. Uniqueness of the system includes: (a) the indications of sustained gravity flows and its suppression by wave remobilization, (b) enhanced and common gigantic sizes of bedforms and syndimentary deformation structures, (c) near nonpreservation of fossils of marine biota, (d) rapid diastrophic creation of accommodation and resultant aggradation, (e) localized and asymmetric preservation of channelized splays and oversized guttercasts only within a few older splays, (f) impoverished ichnologic record signifying extreme and fluctuating stress factors vis-à-vis depositional sub-environments, and (g) irregular ichnofossil distribution suggesting that the stress factors gradually wane from southern older splays to northern younger splays with progressively increasing trace-fossil diversity and abundance. Unlike wave-dominated and/or hyperpycnally fed river mouth environments on the inner shelf, the sedimentary facies asymmetries of Mayaro Formation reflect the radial and lateral autogenic variations within individual splays with possible influences by the direction of oceanic swells and currents along the shelf-break. On the other hand, the asymmetries in terms of ichnodiversity, trace-fossil abundances, ichnofabric types, and relative abundances of the channel-like erosional features and slumps suggest the extent of lateral proximity from the feeder system across the splays within the delta-front. The canyon-filling deposits represent a more complex sequence of prodelta and upper slope settings, where types and combinations of gravity flows and the architectural elements reflect different allocyclic phases of the canyon-filling sub-environments, where the stress factors and taphonomic filters appear not to be conducive for benthic colonization and/or trace-fossil preservation.