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Allostratigraphic and Sedimentologic Applications of Trace Fossils to the Study of Incised Estuarine Valleys: An Example from the Virgilian Tonganoxie Sandstone Member of Eastern Kansas

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ABSTRACT

The Tonganoxie Sandstone Member (Stranger Formation) records part of the infill of an estuarine valley system that was incised during a late Missourian (Late Carboniferous) drop in sea level and subsequently infilled during a transgressive episode later in the Virgilian (Late Carboniferous). At Buildex Quarry, in an eastern valley-margin position, this unit is represented by planar-bedded-and-laminated siltstone beds (tidal rhythmites) overlying a coplanar surface of lowstand erosion and subsequent transgression. These tidal rhythmites contain a relatively diverse ichnofauna dominated by arthropod trackways, surface grazing trails, fish traces, and tetrapod tracks, including the ichnogenera *Circulichnis* Vyalov, *Dendroidichnites* Demathieu, Gand, and Toutin-Morin, *Diplichnites* Dawson, *Diplopodichnus* Brady, *Gordia* Emmons, *Helminthoidichnites* Fitch, *Helminthopsis* Heer, *Kouphichnium* Nopcsa, *Mirandaichnium* Aceñolaza, *Stiaria* Smith, *Stiallia* Smith, *Tonganoxichnus* Mángano, Buatois, Maples, and Lanier, *Treptichnus* Miller, and *Undichna* Anderson. The Buildex ichnofauna represents a mixture of the nonmarine *Scoyenia* and *Mermia* ichnofacies and records the activity of a terrestrial and freshwater biota. Ichnologic evidence, coupled with sedimentologic data, suggests that the Buildex succession was deposited on tidal flats in the most proximal zone of the inner estuary, between the landward limit of tidal currents and the salinity limit further towards the sea. This type of trace-fossil assemblage seems to characterize the lower part of transgressive system tracts, immediately overlying the coplanar surface during the late Paleozoic. As transgression proceeded, tide-influenced freshwater facies tended to be replaced by retrogradational brackish-water parasequences, and the mixed *Scoyenia* and *Mermia* ichnofacies was replaced by a *Skolithos*-impoverished *Cruziana* ichnofacies. The coplanar surface (flooding surface and sequence boundary) that marks the base of the Tonganoxie sequence at Buildex lacks the substrate-controlled, marine *Glossifungites* ichnofacies. The coals and paleosols with upright plant remains that typify the coplanar surface at Buildex represent erosional truncation and subsequent omission close to the interfluves and may be regarded as the landward equivalent of the *Glossifungites* ichnofacies. Buildex-type ichnofaunas probably are widespread in Pennsylvanian tidal rhythmites of the U.S. Midcontinent and may be used to identify freshwater inner estuarine facies, to delineate fluvio-estuarine transitions in incised valley systems, and to refine models based exclusively on lithofacies evidence.

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