

Trace Fossils and Palaeoenvironment in Shelf-Margin Clinofolds: An Example from the Central Basin of Spitsbergen

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Lower Eocene shelf-margin clinofolds in the Central Basin, Spitsbergen, have been well studied, but not previously from an ichnological point of view. Forty six ichnotaxa have been recognized in the coastal plain – shoreline/shelf – slope segments of clinofolds, but only ten of them are common. Coastal-plain channel sandstones contain a few root structures, whereas supra-channel facies have the low diverse ichnoassemblage. Helminthoidichnites, Steinichnus and roots are common. Cochlichnus and bird footprints are rare. This ichnoassemblage belongs to the impoverished Scoyenia ichnofacies with contributions from the Mermia ichnofacies (Cochlichnus, Helminthoidichnites), typical of lakes. The coastal plain was probably inundated, swampy and vegetated, explaining the general lack of mammal footprints.

Tidal-flat sediments are poorly bioturbated, but rippled surfaces display Haplotichnus and Kouphichnium, rarely Undichna, Archaeonassa and Limulicubichnus. The assemblage is less diverse than in similar settings of older age, probably because these tidal flats were stressed by predator and scavenger activity, such as birds.

In the shallower parts of wave-dominated deltaic parasequences Ophiomorpha nodosa, Arcusichnus, and rare Macaronichnus occur. They belong to the Skolithos ichnofacies. The Cruziana ichnofacies is represented by Thalassinoides, Asteriacites and Stelloglyphus. Prodelta mudstones and fine-grained sandstones are dominated by Phycosiphon incertum, which strongly bioturbate the sediments. Bioturbation decreases gradually up the parasequences.

Turbidites in slope channels and basin-floor fans are not colonized at all or contain abundant Arenituba storvolensis. In places it co-occurs with Phycosiphon and Polykladichnus. This trace fossil assemblage is dissimilar to the deepwater Nereites ichnofacies, possibly because the Spitsbergen turbidites were generated by hyperpycnal flows.