

Trilobite biofacies along an Ordovician (Sandbian) carbonate buildup to basin gradient, southwestern Virginia

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Keywords: trilobite paleoecology, carbonate bioherm, foreland basin, diversity, ordination

ABSTRACT

The Upper Ordovician Effna, Botetourt, and Liberty Hall limestones of Virginia record deposition in several paleoenvironments along a carbonate ramp during the early history of the Taconic Foreland Basin. Four distinct lithofacies are present, i.e., biohermal mudstone and wackestone, biostromal grainstone, nodular deep-flank limestone and shale, and basinal mudstones and shale, and each of these is associated with different trilobite biofacies. Cluster analysis and ordination define biofacies, and characterize gradients and patterns within the trilobite relative abundance data. Biofacies are clearly delineated along a depth gradient, with gradational compositional changes between associations. The moderate-diversity bioherm biofacies is dominated by illaenids (*Illaenus*, *Bumastoides*) and cheirurids (*Sphaerexochus*). The high-diversity biostromal biofacies is also an illaenid-cheirurid association, but is proportionally enriched in cheirurids, and includes off-bank elements not common in the bioherm. The high-diversity deep-flank facies is associated with an *Ampyx-Isotelus-Nileus* assemblage that gradationally replaces the biostromal biofacies. The deep flank gives way to a low-diversity *Isotelus-Calyptaulax-Raymondaspis* association of cosmopolitan trilobites in the outer slope and basin environment. These biofacies characterize local environments in the Taconic Foreland Basin just prior to, and in the initial phases of tectonically driven oceanographic change that led to regional extirpation of the buildup fauna and the reorganization of deep-water trilobite biofacies. New associations of taxa not found elsewhere in Laurentia are common within the foreland basin, suggesting that the archetypal biofacies described here are reorganized with the onset of regional environmental change.