

# Nannofossil abundance and diversity changes – a reaction to changing paleoenvironments in the late Tithonian of the Flemish Pass Basin, offshore Newfoundland

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The Flemish Pass is a Mesozoic extensional basin located 500 km offshore of Newfoundland that contains multiple oil discovery areas operated by Equinor Canada Ltd. Reservoirs are of late Tithonian through early Berriasian age and are represented by a series of incised valleys that consist of fluvio-deltaic sandstones and intervening marine shales. Nannofossil analyses from cores and cuttings have been conducted to supplement sedimentological core observations, interpretations, and uncertainties. Here, we present an integrated sedimentological and nannofossil review from a core that details a unique set of lithofacies and nannofossil variations that demonstrate paleoenvironmental changes and the flooding of a late Tithonian delta system.

Three facies associations are interpreted across the Bay de Verde F-67Z cored interval between 3043 and 3053 m. The basal facies association 1 (FA1) is represented by rhythmic, finely laminated, dark gray organic mudstone, light gray siltstone, red-brown organic mudstone, and calcareous laminae, which lack bioturbation. It is gradationally overlain by facies association 2 (FA2) with variably crypto-bioturbated lithofacies, consisting of black organic mudstone, light gray calcareous to silty mudstone, and very fine-grained sandstone laminae. The youngest sediments are dominated by facies association 3 (FA3), which is predominantly comprised of calcareous mudstone and marl beds that are intensely bioturbated and contain a diverse ichnofabric.

The nannofossil assemblages are characteristic of the North Atlantic Tethyan Province with *Acadialithus valentinei*, *Nannoconus magnadiscus*, and *Polycostella senaria* prevalent. FA1 yields high-abundance, opportunistic nannofossil bloom assemblages that can be attributed to upwelling conditions and are located at the base of the prodelta slope. The calcareous laminae were found to yield prolific coccospheres. Benthic foraminiferal assemblages are absent, but there are isolated radiolarian influxes. FA2 contains increased nannoflora diversity. Anoxic through hypoxic bottom waters are prevalent with continued deposition of black, organic mudstone, but agglutinated foraminifera are present that indicate increased oxygenation in the substrate. FA3 yields highly bioturbated marls, which yield a diverse calcareous benthic foraminiferal assemblage in association with a high abundance and diversity of nannoflora that is typical of a fully oxygenated marine shelf.