

Foraminifera and Nannofossils in Basin Analysis: A Valuable Asset

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The Canadian Western Sedimentary Basin documents a complex paleoenvironmental Mesozoic history linked to tectonism, global and relative sea-level changes. Cretaceous strata record the history of the Western Interior Sea, a marine basin under variable paleoceanographic restriction. In unraveling its depositional history a multidisciplinary approach has been proven as most successful, in which foraminiferal and nannofossil studies play integral parts.

Agglutinated foraminifera dominated benthic environments when the basin was enclosed, connected to the northern Boreal Sea. During times of sea-level highstand anoxic bottom-water conditions were created and southerly derived planktic foraminifera and nannofossils become important biostratigraphic markers. Large mudstone and shale-dominated sequences, indicating deposition in distal settings, appear undividable based on lithology. Faunal assemblages, however, respond to subtle basin processes and their changes can be correlated with regional log markers. Disconformities, hidden within shale sequences, can only be detected by missing faunal and floral zones. Therefore micro- and nannofossils are a vital part of sequence stratigraphic analyses as they distinguish flooding from maximum flooding surfaces and determine unconformities. Tracefossils have become a reliable component of sequence stratigraphic analysis in Western Canada. In once soft, muddy offshore sediments with little lithological contrasts to enhance ichnofossils, the additional use of foraminifera supports paleoecological interpretations. In shallow marine settings, lagoonal sediments can resemble finer-grained, low-energy, fully marine shoreface settings in lithology and log signature. In these complex environments micropaleontology has been successful in paleoenvironmental analysis by showing distinct biofacies. Use of fossils in connection with isotopic and biomarker studies becomes an essential element in paleoceanography.