

## **Applied Multidisciplinary biofacies analysis of the Khafji and Safaniya Member of the Wasia Formation (Cretaceous) of Saudi Arabia**

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Integral to a sequence stratigraphic study of the late Aptian to Albian Khafji and Safaniya members of the Wasia Formation is a multidisciplinary definition of biofacies. Palynological and nannofossil datums provide a broadly spaced conventional biostratigraphy within the deltaic successions of Khafji and Safaniya but higher resolution correlations can only be achieved through the use of multidisciplinary biofacies that contribute to the recognition of higher order flooding events associated with the siliciclastic successions of the world's largest offshore oil field reservoirs.

The intervals between biostratigraphic datums based on the appearances of elaterate palynomorphs (late Albian), pollen, dinoflagellate cysts and selected nannofossils control (late Aptian and Albian) are characterized by diversity/abundance peaks of dinoflagellate cysts, fresh-water algae, foraminifers and coccolith and ascidian spicule nannofossils.

Recent agglutinating foraminifera assemblages from the Sedili River, Malaysia, which were calibrated to ebb and flood salinities from the South China Sea to a distance 32 km upstream, provided the uniformitarian template for estuarine biofacies. These data are the basis for understanding ecological significance of Cretaceous foram genera such as Trochammina, Ammobaculites and Orbitolina, all morphotypes present in the Khafji and Safaniya members.

Dinoflagellate cysts also show similar trends to those of the foraminifera responding to salinity, of which Subtilisphaera dominates brackish water environments with assemblages diversifying with increasing salinity. Pteridophyte spores dominate the terrestrial successions. The integrated biofacies developed from the palynology and micropaleontology display isolated but distinct evidence of marine flooding events of variable extent within a depositionally complex, thick succession of Khafji and Safaniya deltaic sediments. Integration with sedimentology is an ongoing part of this project.