

SILURIAN ACRITARCHS AND ASSOCIATED FRESHWATER AND MARINE MICROFLORAS FROM SAUDI ARABIA: COMPREHENSIVE REVIEW AND NEW INSIGHTS

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Acritarchs and prasinophyte algae, associated with more enigmatic freshwater and marine organic-walled microfossils, are a major component of the Silurian palynofloras of the Arabian Peninsula. Significant advances in the knowledge of the palynological associations and their distribution have been made since the initial phase of the joint Saudi Aramco-CIMP project in the 90's, revealing their indispensable role in refining the Paleozoic palynostratigraphy of the Arabian Plate. Organic-walled microfossils can also be applied as paleoenvironmental and paleoclimatic indicators, although their full potential in this respect has yet to be achieved.

The Silurian System of Saudi Arabia is composed of the Qusaiba and Sharawra members of the Qalibah Formation, of Llandovery-Wenlock age, and the lower part of the Tawil Formation, which includes the Ludlow-Pridoli. The Qalibah Formation is a coarsening-upward progradational marine sequence. The Qusaiba Member is composed mostly of claystone and organic-rich shale with interbeds of siltstone and sandstone. Depositionally, the Qusaiba Member is interpreted to represent the delta-toe clays, whereas the Sharawra Member was deposited as pro-delta siltstones and sandstones of an immense fluviodeltaic system. The sand-dominated Tawil Formation mostly accumulated in marginal marine environment and fluvial settings. The contact between the Sharawra Member and the Tawil Formation is marked by a sharp unconformity, which represents a mid-Silurian regional hiatus due to a severe period of uplift and erosion in Arabia, probably related to the Caledonian movement.

Globally, well preserved acritarch assemblages were recovered from core and cuttings samples investigated in 15 wells in central and northwestern Saudi Arabia. More than 200 species have been recovered in the entire Silurian, including several new species in association with well-known species. Some of the latter are documented for the first time in Saudi Arabia.

The proposed biozonation is based on acritarchs and associated microfloras according to First Appearance Datums (FADs) of selected index taxa, and concurrent associations of species; it is correlated with the regional Silurian chitinozoan zonation published by Al-Hajri and Paris (1998), Paris et al. (1995), and Paris et al. (2015).

Notable taxonomic similarities exist among Silurian acritarch assemblages of Western Gondwana (e.g. Argentina, Brazil, Bolivia and Paraguay), Northern Gondwana (Algeria, Ghana, Libya, Tunisia), and Saudi Arabia, showing that there was no significant paleolatitudinal bio-provincialism within the group during Silurian times. Interesting relationships are also discussed between Aeronian and Telychian Saudi Arabian and Baltic assemblages.