



First Discovery of Early Silurian Foraminiferal Assemblages from the Upper Qusaiba and Lower Sharawra members, Qasim Region, Saudi Arabia, and their paleoenvironmental implications

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The Lower Silurian Qusaiba rock record in Saudi Arabia plays an essential role in the petroleum system as a prolific source rock as well as for studies of the paleoclimate, paleoenvironment, and paleoecological reconstruction of Gondwana owing to its deposition after the Hirnantian glaciation. Paleontological studies of graptolites and palynomorphs have been extensively conducted on the Lower Silurian of Saudi Arabia, providing a good chronostratigraphic framework based on the standard biozones.

Abundant foraminiferal assemblages consisting of twenty genera; *Ammobaculites*, *Ammovertella*, *Amphitremoida*, *Bathysiphon*, *Blastamina*, *Ceratamina*, *Hemmisphaerammina*, *Hyperammina*, *Lagenammina*, *Psammosphaera*, *Rhizammina*, *Rhabdammina*, *Saccamina*, *Sorosphaera*, *Stacheia*, *Turritellevella*, *Tolypammina*, *Thurammina*, *Thuramminoides*, and a total of forty-seven species have been recovered from the clastic shale to silty shale of the upper Qusaiba and lowermost Sharawra members from the Qusaiba type section in Old Qusaiba Town, Qasim District, Saudi Arabia. The foraminiferal assemblages exhibit low abundance in the lower part of the succession, and a maximum in the middle and uppermost part. The low abundance of recoverable foraminifera in the lower part of the section associated with abundant framboidal pyrite may indicate suboxic paleoenvironmental conditions. Gradually, increased faunal abundance in the middle part of the studied section where the foraminifera have mostly smooth shells represents more well-oxygenated conditions in the offshore. In addition, the coarse shell wall of *Amphitremoida* is associated with alternating shale, silt, and fine to medium grained sandstone in the uppermost part, indicating higher energy of the lower shoreface environment of the lowermost Sharawra member. Our investigation of this succession represents the first discovery of diverse agglutinated foraminiferal assemblages in the Silurian of Gondwana.