ABSTRACT

An integrated well log and core study of the Upper Jurassic Smackover Formation and associated Jurassic lithofacies in the Conecuh Embayment, onshore northeastern Gulf of Mexico, has shown that the depositional environments for these updip lithofacies differ from the setting for other updip Upper Jurassic lithofacies in the onshore northeastern Gulf of Mexico. In the Conecuh Embayment, Jurassic Louann Salt is absent, Smackover beds directly overlie Upper Jurassic Norphlet deposits, and there is no overlying thick section of Buckner anhydrites as observed in other areas. The transgression of the Smackover sea was over a surface of Norphlet alluvial and fluvial deposits of variable thickness rather than a surface controlled by Norphlet eolian and Louann salt deposition and post-depositional salt movement. Lithofacies in this area consist of progradational subtidal peloidal and ooid grainstone and packstone sand bars deposited in a nearshore moderate-energy carbonate setting as compared to the typical inner ramp lithofacies of high-energy grainstone and packstone shoal and shoreface deposits. Subtidal microbial (thrombolite) buildups discovered in this embayment did not develop on pre-Jurassic high-relief basement structural features and are not overlain by high-energy shoal and shoreface grainstone and packstone lithofacies like the microbial buildups to the west and south of the Conecuh Embayment. These subtidal microbial buildups extended landward beyond the depositional limit of the carbonate sand bar complex and are postulated to have developed in a protected, low-energy bay or lagoonal environment within an embayed shoreline. The critical fac-
tor for microbial growth was the presence of a hard substrate, and microbial
development was mainly controlled by available accommodation space
created primarily by a rise in sea level. Black shale beds containing terres-
trial-derived herbaceous organic material, including ferns, mosses and coni-
fers, characteristic of a warm humid climate occur in the Conecuh Embay-
ment. The presence of a more humid climate relative to areas to the west
resulted in an influx of freshwater into the embayment. The introduction of
freshwater affected depositional and post-depositional conditions, such
that porosity in the reservoir facies is dominated by depositional, primary
solution-enlarged, and secondary vuggy pores in the embayment rather
than diagenetic intercrystalline dolomite and moldic pores characteristic of
reservoirs in the Mississippi Interior Salt Basin. A revised Smackover depo-
sitional model that incorporates the implications of these findings on poten-
tial petroleum reservoir, source, and seal facies in the Conecuh Embayment
provides additional petroleum exploration targets for the onshore north-
eastern Gulf of Mexico.

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