Depositional Model for Lithofacies of the Upper Jurassic Smackover Formation in the Conecuh Embayment, Northeastern Gulf of Mexico: Implications for Petroleum Exploration

Ernest A. Mancini[1], D. Joe Benson[1], Berry H. Tew[1, 2], Ibrahim Cemen[1], and Alexander E. Owen[1]

[1]Center for Sedimentary Basin Studies, Department of Geological Sciences, University of Alabama, Tuscaloosa, Alabama 35487, U.S.A.

[2]Geological Survey of Alabama and State Oil And Gas Board of Alabama, Tuscaloosa, Alabama 35486, U.S.A.

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-

Mancini, E. A., D. J. Benson, B. H. Tew, I. Cemen, and A. E. Owen, 2019, Depositional model for lithofacies of the Upper Jurassic Smackover Formation in the Conecuh Embayment, northeastern Gulf of Mexico: Implications for petroleum exploration: GeoGulf Transactions, v. 69, p. 557–558.

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 terrestrial-derived herbaceous organic material, including ferns, mosses and conifers, characteristic of a warm humid climate occur in the Conecuh Embayment. 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 depositional model that incorporates the implications of these findings on potential petroleum reservoir, source, and seal facies in the Conecuh Embayment provides additional petroleum exploration targets for the onshore northeastern Gulf of Mexico.

Ed. Note: This abstract was extracted from a full paper published in the 2019 volume of the *GCAGS Journal*. The *Journal* papers are currently available in open-access format online at www.gcags.org.