Haynesville Sandstone Reservoirs in the Updip Jurassic Trend of Alabama

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Since the 1986 drilling of the 1 Carolyn McCollough Unit 1-13 well, which initiated production from the Frisco City sandstone of the Haynesville Formation in Monroe County, Alabama, seven Haynesville fields have been established in Covington, Escambia, and Monroe Counties. Initial flow rates of several hundred BOPD are typical in wells in these fields, and maximum rates exceed 2,000 BOPD in North Frisco City field. As of August 1993, these fields had produced more than 3,400,000 bbl of oil and 4,000,000 Mcf of gas from depths of 12,000 to 13,000 ft. Haynesville sandstone reservoirs are concentrated in two distinct areas: (1) an eastern area (Hickory Branch, North Rome, and West Falco fields; API oil gravity = 40°) in the Conecuh embayment and (2) a western area (Frisco City, North Frisco City, southeast Frisco City, and Megargel fields; API oil gravity = 58–59°) on the Conecuh ridge complex. Eastern fields are productive from Haynesville sandstone, which is not continuous with the two distinct, productive sandstone bodies in western fields, the Frisco City sandstone and the Megargel sandstone. Hydrocarbon traps are structural or combination traps associated with basement paleohighs. Reservoir bodies generally consist of conglomerate (igneous clasts in western fields; limestone clasts in eastern fields), sandstone (subarkose-arkose), and shale (some of which is red) in stacked upward-fining sequences. Shale at the tops of these sequences is bioturbated. These marine strata were deposited in shoal-water braid-delta fronts. Petrophysical properties differ between the two areas. Maximum and average permeability in western fields (k_{max} = 2,000 md; k_{ave} = 850–1,800 md) is an order of magnitude higher than that in eastern fields. The distribution of diagenetic components, including a variety of carbonate minerals, evaporite minerals (anhydrite and halite in western fields), and carbonate-replaced pseudomatrix, commonly is related to depositional architecture.

Comprehensive, Quantitative Micropaleontological Analysis as a Tool for Paleoenvironmental Interpretation and Sequence Stratigraphy, with an Example from the Yegua Formation, Southeast Texas

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Traditional industrial approaches to biostratigraphy and paleoenvironmental analysis largely use only a small portion of the available microfossil assemblage, concentrating on various marker taxa ("tops" of index fossils and paleoenvironmental guide fossils). Sequence stratigraphic approaches may place more emphasis on the entire assemblage, but efficient analytical strategies still need to be developed to extract maximum information from micropaleontological data. Microfossil assemblages are produced by three types of processes: (1) *in situ* accumulation of taxa living at the sample site; (2) post-mortem transport of specimens into and out of the sample site ("downslope transport"), and (3) taphonomic/diagenetic processes such as dissolution, which can alter taxon proportions. Recognizing and evaluating the effects of these processes on the microfossil assemblage can lead to a better geological interpretation. We propose an analytical strategy to address these issues, consisting of (1) bulk faunal descriptors (faunal abundance, preservation, diversity, planktic microfossil abundance) combined with lithologic information (e.g., abundance of glauconite) to identify broad paleoenvironmental patterns; (2) biofacies definition based on cluster analysis and factor analysis of the entire microfossil data set to refine these patterns; (3) interpretation and modeling of biofacies trends using detrended reciprocal averaging, and (4) analysis of faunal mixing patterns using polytopic vector analysis. We apply this analytical strategy to foraminiferal data from the middle Eocene Yegua Formation of southeast Texas. Seven biofacies are recognized along a short, three-well dip transect, representing paleoenvironments ranging from marginal marine delta plain to outer neritic muddy shelf. The detailed "paleoenvironmental fabric" defined by these biofacies helps to delineate genetic sequence boundaries, higher frequency cyclicity, and aspects of depositional systems and paleoenvironments that are not apparent from analysis of well logs and marker fossils alone.