Regional overview of the middle to upper Jurassic, Scotian shelf

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The Scotian shelf has been subject to hydrocarbon exploration by several oil companies from the late sixties to the present, with the bulk of exploration done in the seventies. Despite this exploration effort, no significant hydrocarbons have been discovered from the middle to upper Jurassic Abenaki Formation. Most of the hydrocarbons recovered from the Scotian shelf are found within the Cretaceous fluvial-deltaics of the Mic-Mac, Mississauga, and Logan Canyon formations. This presentation re-examines the hydrocarbon potential of the middle to upper Jurassic Scotian shelf, with emphasis on the Abenaki Formation carbonates.

The Abenaki Formation contains four members in ascending order: (1) Scatarie Member, (2) Misaine Member, (3) Baccaro Member, and (4) Artimon Member. The lower Callovian Scatarie Member is a deepening upward, cyclic carbonate ramp that was transgressed by the upper Callovian Misaine Member shales. The Baccaro Member consists of two southwest-northeast trending carbonate platforms separated, near Sable Island, by the prograding fluvial-deltaics of the coeval Mic-Mac Formation. The Baccaro Member is the thickest member of the Abenaki Formation, with a maximum thickness exceeding 1300 m. It is also overlain by several different units, depending on the distance from the Sable Island delta. Approximately 150 km southwest of Sable Island, the Baccaro Member is covered by shallow water reefal sponges of the local Artimon Member. About 200 km further southwest, the informal Roseway Canyon Member carbonate platform carbonates overlies the Baccaro Member. Typically it is overlain in the southwest by the Verrill Canyon Formation shales and to the northeast by the Mic-Mac Formation deltaics.

From the examination of Canstrat logs, well history reports' well logs, production tests, core and ditch cutting descriptions from over 20 wells, the Baccaro Member shows the most potential for hydrocarbons. For the most part, the Baccaro Member contains tight oolitic mudstone and grainstones cemented with micrite and/or sparry calcite. However, porosity streaks of 5 to 15 m with a mean visual porosity range of 6 to 10% can be found in most wells. Maximum porosities of 15 to 20+% were found in dolomites and dolomitic oolitic packstone and grainstones of the Demascota G-32 well. Paleogeographic facies reconstructions based on lithology and biostratigraphy (i.e., palynology and micropaleontology) interpret the majority of the porous zones to be associated with the edge of the carbonate platform.

Oil staining in core samples, gas cut mud (i.e., presence of gas bubbles within the drilling mud after a drill stem test) and gas to surface from well history report drill stem tests and repeat formation tests found in a few wells indicate the presence of hydrocarbons within the Jurassic. Most of the hydrocarbon potential is not found in the Baccaro Member carbonate platform, but rather in the Mic-Mac sandstones within the Baccaro Member. These sandstones are informally referred to as intra Mic-Mac units and are found in overpressurized gas traps to the Uniacke G-72 (i.e., 20.5 MMCF gas to surface daily) and Arcadia J-16 wells, southeast of Sable Island. Other possible traps are along the carbonate platform edge and talus slope of the platform edge where transgressive Verrill Canyon Formation shales provides a seal and source. According to the paleogeography, no hydrocarbons were found in these traps because no well was drilled close enough to the platform edge. Hydrocarbon potential within the middle to upper Jurassic Scotian shelf is therefore restricted to the intra Mic-Mac units and Baccaro Member carbonate platform facies.

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