
Orphan Basin: an overview of geology and exploration history

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Orphan Basin lies under the deep waters off the continental shelf approximately 500 km northeast of St. John's, Newfoundland. Water depths range from over 500 m to over 2500 m. This region made news in 2004 due to the results of a land sale held by the Canada-Newfoundland and Labrador Offshore Petroleum Board. The team of Chevron, ExxonMobil and Imperial Oil bid over 672 million dollars in work commitments for the right to explore 2 124 630 hectares. During 2004, the partners conducted a 101 382 km (CMP) 3-D seismic survey. This was followed in 2005 with additional 3-D seismic as over 268 545 km (CMP) were recorded using two seismic vessels. Shell subsequently acquired an interest in all the blocks from ExxonMobil. In 2005, ExxonMobil announced that the deepwater, semi-submersible rig, Eirik Raude had been leased for 2006.

No wells have been drilled on the current licences in the basin. Prior to 2003, 9 wells had been drilled on the flanks of the basin. In 1970, the Deep Sea Drilling Project drilled and cored a 249 m well centred on the Orphan Knoll at Sites 111. The hole was terminated in sandstones dated as Middle Jurassic (Bajocian). Of note was the well, Texaco Shell et al. Blue H-28 drilled to 6103 m in 1486m of water. Abandoned in 1979, Blue H-28 drilled through a section of Tertiary, Cretaceous and Carboniferous sediments. Drilled in the adjacent Flemish Pass Basin, Esso PAREX et al. Baccalieu I-78 reached a depth of 5135 m. The well encountered Tertiary, Cretaceous, and Jurassic sediments and was abandoned in 1985.

In 2004, Petro-Canada et al Mizzen L-11 was drilled to a depth of 3823 m. Potential Jurassic reservoir sands were encountered in well but were determined to be water-bearing. Live oil was recovered from sandstone at 3350.8 m using a repeat formation tester. This oil-bearing sandstone may be equivalent to sandstone drilled at Baccalieu I-78, approximately 25 km south of Mizzen L-11 well. Jurassic source rocks have been identified in Baccalieu I-78. An active petroleum system is suggested by the Mizzen L-11 well.

Based on the review of 2-D seismic data, large structures can be mapped in the Orphan Basin. However, trap type, presence of seals, adequate reservoir beds as well potential source associated with advantageous timing are still to be proven in the Orphan Basin. A well could answer these questions.