

Petroleum Resource Assessment of the Fundy Basin: A Literature Review

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Summary

The Bay of Fundy is world famous for its high tide environment and unique geological setting. The Fundy Basin, located beneath the Bay of Fundy, is a failed Mesozoic rift basin that formed as Pangea broke up in the Triassic-Jurassic. The basin has had limited exploration success to date with only two offshore wells drilled in the 1970s and 1980s.

As part of performing a national assessment of Canada's offshore areas, the Geological Survey of Canada is undertaking a regional hydrocarbon assessment of the Fundy Basin. Seismic and well data (Figure 1) will be reviewed and incorporated with historical and modern scientific research to perform petroleum systems analyses that will inform a qualitative resource assessment. A literature review will be presented.

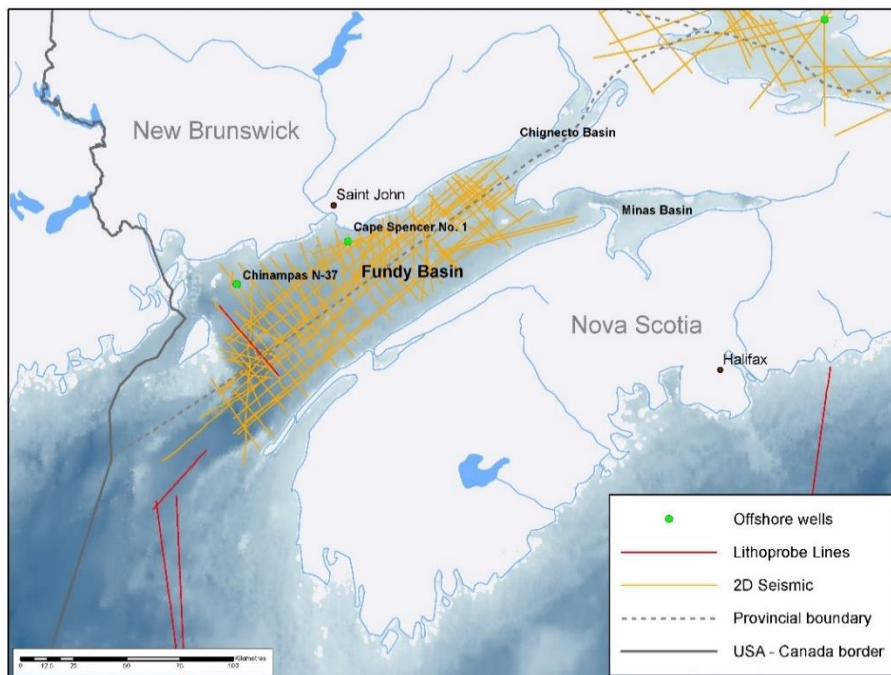


Figure 1. Map showing Fundy Basin and Chignecto and Minas sub-basins, offshore exploration wells, and 2D seismic data.

Geologic Setting and Lithology

During Pangea breakup, the Fundy Basin was an incised valley located near the paleo-equator and subject to semi-arid conditions with seasonal heavy rains, creating fluvial and eolian reservoirs with the central parts of the basin likely having saline lakes leading to salt and gypsum deposits within thinly-bedded lake deposits (Wade et al., 1996; Fensome & Williams, 2022). As

rifting occurred, there was an increase in volcanic activity that created the widespread North Mountain Basalt formation (Figure 2). Sediment deposition continued into the middle Jurassic until there was little accommodation space left and rifting ended (Fensome & Williams, 2022).

The main lithologic units in the Fundy Basin are the Triassic Wolfville and Blomidon formations, and the Jurassic North Mountain Basalt and Scots Bay (equiv. McCoy Brook) (Figure 2).

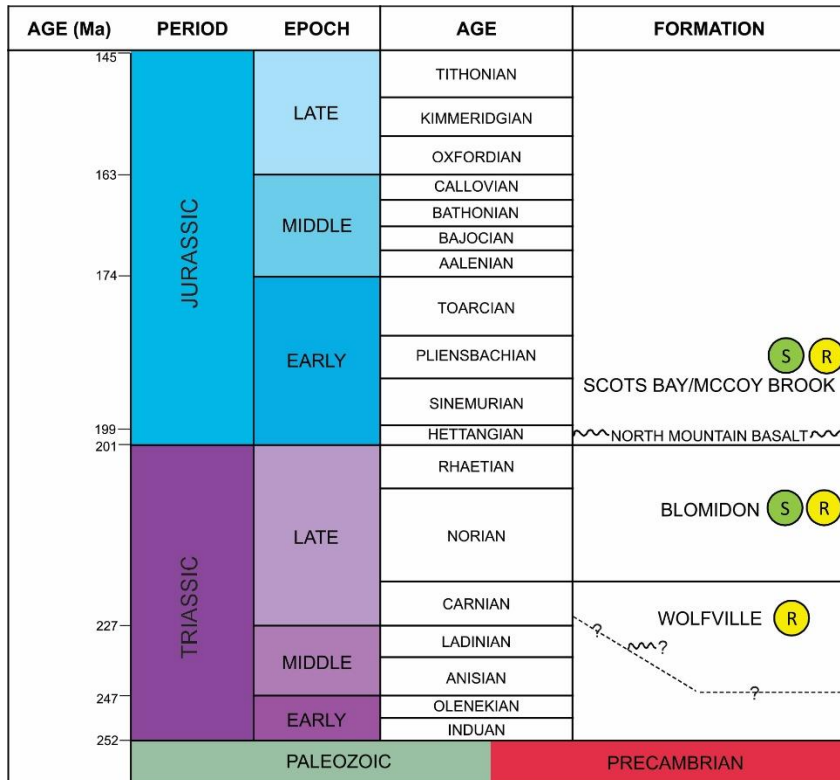


Figure 2. Fundy Basin Mesozoic stratigraphic chart (modified after Wade et al., 1996). R: reservoir, S: source rock.

Petroleum System Analysis

The source rock is most likely the Blomidon sediments that were been deposited in the deeper water areas of the Fundy and Chignecto basins (Wade et al, 1996). Scots Bay could also be a source.

Traps and seals include rollover anticlines, faults and structures that were in-place by the time of Blomidon and lower Scots Bay maturation, as well as unconformities and facies-type stratigraphic traps (mostly in Chignecto sub-basin) (Wade et al., 1996).

Two exploration wells have been drilled and abandoned in the basin: Chinampas N-37 in 1975 that drilled the flank of a structure targeting fluvial and lacustrine sandstones (Mobil Oil Canada Ltd., 1975), and Cape Spencer #1 in 1983 that drilled a proximal alluvial fan far from a source rock (Wade et al., 1996). Cutting samples were contaminated due to drilling fluids, however showed low vitrinite reflectance values (GeoFuel Research Inc., 1988). Neither well had any hydrocarbon shows (Irving Chevron et al., 1988; Mobil, 1975).

Studies suggest that hydrocarbons are migrating in the area, however have weak anomalies (InterOcean Systems Inc, 1987). Thermal gradients are 2.24-2.44°C/100 m with thermal alteration indices of 2.5 at water bottom to 3.25 at 3,662 m (Wade et al., 1996) suggesting liquid petroleum generation potential.

Results

Exploration risks include overmature source rocks, especially to the south near Grand Manan Island (Figure 1), limited source rock deposition and maturation, trap timing, and seal integrity.

Future work will include seismic and potential field data interpretation and review of additional scientific publications prior to a resource assessment being completed. Core was also collected for both exploration wells and could provide better vitrinite reflectance and geochemical information.

References

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Footnote

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