

Groundhog Day Two: The Geology of the Devonian Bent Horn Oil Field, Cameron Island, Canadian Arctic Islands

Jack Wendte*

Geological Survey of Canada, Calgary, Alberta, Canada

jwendte@NRcan.gc.ca

and

Keith Dewing

Geological Survey of Canada, Calgary, Alberta, Canada

Oil in the Bent Horn Oil Field occurs in limestones of the Lower and Middle Devonian Blue Fiord Formation. These limestones make up the upper part of an isolated, reef-rimmed carbonate bank, up to an estimated thickness of 1200-1500 m, of Late Silurian to Middle Devonian Age. Oil was discovered in 1974 and a total of three oil wells were drilled near the southern coast of Cameron Island, from 1974 to 1976. Of these wells, only one was capable of sustained production, with a cumulative production between 1985 and 1993 of 321,470 m³, but was shut in in 1995. In addition, several other wells were drilled on Cameron Island from the mid-1970's to the early 1980's in an unsuccessful effort to extend the field.

The present study is based on the detailed examination of cores from 12 wells. Of these wells, 10 are located near the southern margin of the isolated bank, near the southern coast of Cameron Island, and two further north near the eastern margin of the isolated bank. Despite the numerous penetrations, only foreslope facies were encountered in the cores. From a depositional standpoint, it seemed as if every day of core examination was a repeat of previous ones, evoking a sequel to the well-known movie, *Groundhog Day*.

Sustained oil production is attributed to be from partially open fractures in the portion of the Blue Fiord Formation that occurs in repeated thrust-fault slices along the southern margin of the isolated bank. Unfortunately, matrix porosities are close to zero. Despite favourable foreslope depositional facies, practically all the primary pores were infilled by calcite cements during burial in later Devonian and Carboniferous times. Extensive micro-pores of dissolution origin formed from still later fluids that flowed up through the thrust-fault zones during Carboniferous or younger times. However, these pores were subsequently infilled by bitumen, which apparently formed from the over-cooking of oils in the pores.