Petroleum Prospectivity of the Triassic-Jurassic Succession of Sverdrup Basin, Canadian Arctic Archipelago

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The Sverdrup Basin of the Canadian Arctic Archipelago is an established petroliferous basin with 17 discovered oil and gas fields. Almost all the hydrocarbons occur in Triassic-Jurassic shallow marine sandstones and were sourced from Middle to Upper Triassic bituminous shales. The discovered fields occur on the culminations of Paleogene structures many of which are cored by Carboniferous salt which contributed to the growth of the structures through the basin development.

Three prospective areas for future discoveries in the Triassic-Jurassic succession have been outlined and these include western Sverdrup, southeastern Sverdrup, and the Fosheim Peninsula area which is located on the east-central flank of the basin. These areas are delineated on the basis of the occurrence of mature Triassic source rocks and the subsurface occurrence of potential reservoir strata in the Triassic-Jurassic succession.

Most of the large structures in these prospective areas were mapped and tested in the initial round of hydrocarbon exploration. However, a number of smaller culminations remain to be tested and more detailed seismic surveys may well reveal the presence of other ones. Overall, the structural play involving Triassic-Jurassic strata still has considerable potential left.

The largest potential plays which have not been tested are those involving a stratigraphic component as part of the hydrocarbon trapping mechanism. Potential reservoir units are developed on the 3rd order sequence scale and 22 such sequences have been delineated in the Triassic-Jurassic succession. Most of them contain a progradational, shallow marine sandstone unit which is in part porous within the prospective areas. These units are often truncated by unconformities on the basin margins and change facies to non-porous strata basinward. The pinchouts of these porous units in proper structural orientations provide good petroleum prospects because they were already present during the maturation and migration of the Triassic-sourced hydrocarbons and are less likely to be associated with fractures which allow hydrocarbons to escape.