Lower Jurassic stratigraphy and hydrocarbon source rock intervals: will the real Poker Chip Shale please stand up?

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ABSTRACT

The Lower to Upper Toarcian Poker Chip Shale is present at outcrop in the central and southern Alberta foothills, and comprises organic-rich (total organic carbon (TOC) values of 1 to 7 wt. %), marine calcareous shales and thin limestones. The outcrops are presently overmature with respect to hydrocarbon generation, and hence their initial generative potential is difficult to assess. Previously presumed equivalent strata in the subsurface of the Plains region was studied in an attempt to document the generative potential of the Poker Chip Shale at the early to mid-mature stages of thermal maturity. The results of this study are integrated with other stratigraphic and paleontological studies to support revised correlations of Lower Jurassic strata from the outcrop belt to the subsurface of west-central Alberta, and to assess the hydrocarbon source rock potential of the various Lower Jurassic units.

Organic-rich (TOC values up to 18.5 wt %) oil source rocks previously assigned to the upper unit of the subsurface “Nordegg Member” are of Early to Late Toarcian age, based on new ammonite identifications. These strata are considered equivalent to the Poker Chip Shale as identified at its type section. Strata commonly identified as the Poker Chip Shale in subsurface databases are younger (Late Toarcian to Aalenian), organic-poor (TOC < 1 wt %) medium- to dark-grey, or greenish-grey, non-calcareous, pyritic, friable and variably bentonitic shales. These subsurface strata are considered equivalent to lithologically similar, but imprecisely dated strata in the lower Rock Creek Member of the Fernie Formation at outcrop in the western Alberta Foothills.