Effective Petroleum Systems And Crude Oil Compositions In Bowser Basin

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ABSTRACT

Crude oils extracted from Bowser Basin rocks indicate that at least three petroleum systems have been effective in generating crude oil, which is preserved as stains and fluid inclusions. The three petroleum systems are distinguished by a molecular biomarkers that are controlled by biological evolution in marine environments. Through Phanerozoic time marine organisms have progressively selected to use a shorter cholesterol-like molecule in preference to the longer cholesterol-like homologues, except in lacustrine environments. As a result the ratio of the C28/C29 steranes in crude oils is observed to increase progressively through Phanerozoic time, from much less than one in the Paleozoic, to about unity at the Late-Early Cretaceous boundary, to more than one in the Present. This variation serves as a molecular clock that dates when the source rock of a given crude oil was deposited, regardless of where it has migrated to. In the Bowser Basin some oils have low C28/C29 sterane ratios, indicating that they were derived from the rocks of Stikinia, while other oils have high a C28/C29 sterane ratio indicating that they were derived from either the Hazelton or Bowser Lake groups. A third group of oils have sterane compositions, C27:C28:C29, that indicate a lacustrine source rock. The presence, in Bowser Lake Group reservoirs, of oils derived from the Stikine Assemblage is consistent with, and provides additional evidence for, previously inferred large lateral variations in the thermal maturity of the Bowser Basin. This also suggests that potential reservoirs in the Hazelton Group might contain petroleum -- a concept not considered previously. Therefore, the molecular composition of crude oils from Bowser Basin rocks both confirms and extends the petroleum prospectivity of the region by indicating the presence and function of at least three effective petroleum systems with petroleum source rocks at different stratigraphic levels.