

## **Tectonic Evolution and Hydrocarbon Potential of Nogal Rift Basin, Northern Somalia**

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### **ABSTRACT**

Closely-spaced seismic profiles, exploration wells, gravity and magnetic data have been used to determine the tectonic evolution and hydrocarbon potential of the poorly known basin of Nogal rift, northern Somalia. The WNW-ESE striking Nogal rift basin as defined by seismic data is approximately 200 km long and 40 km wide. The basin is a large half-graben formed as a result of mainly Upper Cretaceous and Oligocene-Miocene rifting. Its deepest depocentre with at least 4000 m thick sediments of Mesozoic and Cenozoic in age is located in the west (northeast of Nogal-1 well), near the Shileh Madu Mountain Range. Oligocene-Miocene normal faulting with northerly tilted fault blocks (horst and graben structures) is the common style with possible strike-slip components at the major faults. The tectonic evolution of the Nogal rift basin and associated sub-basins can be summarized by long periods of slow subsidence and uplift which are punctuated by short periods of fast subsidence. Backstrip tectonic subsidence curves and seismic reflection profiles confirm that the basin was affected by two (possibly three) phases of Mesozoic and Cenozoic continental rifting. The first rift phase is not well developed in the area. But it probably occurred during Kimmeridgian-Tithonian and was followed by period of erosion. This pre-Cenomanian erosional event removed almost all the Jurassic and Lower Cretaceous syn-rift and post-rift sediments in a wide area referred as Nogal-Erigavo Arch, which has similar NW-SE orientation of the Upper Jurassic rifting basins of Somalia and Yemen. A second rifting event, that is more pronounced than the first rift, in ?Cenomanian-Maastrichtian followed this erosional event. This rifting event resulted deposition of very thick, well sorted, fluvio-deltaic sandstones (Jesomma and Gumburo Formations) of more than 1700 m. The Jesomma and Gumburo Formations are between two to five-fold thicker in the Nogal Rift Basin compared to wells drilled in the footwalls. The Jesomma and Gumburo Formations provide excellent reservoirs sealed by transgressive mudstones and carbonates. The final rifting event was in the Oligocene-Miocene and is related to the opening of the Gulf of Aden. Reactivation of the Upper Cretaceous faults during the Oligocene-Miocene is known to have modified pre-existing traps throughout the basin.