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## **Petroleum Systems of the Tano-Ivorian Basin, Gulf of Guinea**

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The Tano-Ivorian Basin is located offshore Cote d'Ivoire and Ghana. It is bounded to the north by the Lagunes Fault Zone which is likely the onshore extension of the St Paul's fracture zone and to the south by the Romanche fracture zone. The Tano-Ivorian Basin was formed as a pull-apart basin within a zone of transtension between major transform faults, during the Late Cretaceous break up of Gondwana and subsequent development of the Mid Atlantic. During the Aptian Stage, early strike-slip movement resulted in intracontinental siliciclastic sedimentation in fluvial to lacustrine environments similar in some respects to the Neogene infill of the East African Rift System. This period also saw the localised development of an Early Cretaceous lacustrine source interval.

ENE-WSW oriented extension resulted in the development of tilted fault blocks and associated rapid subsidence continued through to the post-rift Albian stage [1]. The 'Albian unconformity' recognised across the margin, developed following uplift and erosion at ~98 Ma. A marine regression resulted in the deposition of limestone facies (Oligostegenid) on the shelf and on the crests of uplifted fault blocks. In the deeper water offshore, the chronostratigraphically equivalent Cenozoic-Albian organic rich black shale was deposited. The Late Albian to Late Santonian saw the development of the deepwater clastic turbidite reservoirs during lowstand periods. Offshore Ghana, these include the Mahogany and Tweneboa fans, which are the Jubilee and TEN field reservoirs, respectively.

Early petroleum exploration in the Tano-Ivorian Basin focused on the Early Cretaceous synrift play, where reservoirs comprise primarily shelfal deposits and hydrocarbons are sourced locally from synrift, lacustrine intervals and/or from, marine Cenozoic-Albian source interval, mature outboard. Traps are predominately structural, tilted fault blocks and seals are provided by Late Cretaceous marine shales. The Espoir Field in Cote d'Ivoire is one example of an Early Cretaceous, structurally trapped oil field. Tullow Oil first entered the region in 1997 when it farmed in to Espoir.

Ranger's Baobab discovery in 2001 and the recognition of the outboard maturity of a younger, marine Cenozoic-Albian source shifted exploration focus to the Late Cretaceous, post rift, deepwater play. Reservoirs range in age from the Cenomanian through to the Maastrichtian with depositional environment dominated by slope to base of slope turbidites. Hydrocarbons are sourced primarily from the Cenozoic-Albian, marine source interval and long range migration is required from the mature, outboard fetch areas. Traps are both structural and stratigraphic and the larger fields, including Jubilee, may require both. Pure stratigraphic traps are rare, and likely restricted to the fields with lower net to gross ratios. Competent seals comprise Late Cretaceous marine shales. In 2007 the Mahogany-1 exploration well, drilled in the Kosmos-operated, West Cape Three Points block, intersected over 90 m of oil pay. The Mahogany discovery was quickly followed by the Tweneboa-Enyenra-Ntomme discoveries in 2009, 2010 and 2011, respectively. In 2013, Tullow had further success when the Paon-1 well, C-103 Block, Cote d'Ivoire, intersected over 30 m of oil pay in Late Cretaceous turbidite reservoirs.

*References:*

- [1] Basile R et al. (2005) Journal of African Geosciences. 43:275-282

