

Facies distribution and depositional systems of the modern Baram delta

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The modern Baram delta has long been regarded as an analogue for the highly prolific petroleum reservoirs in northwest Borneo and has been interpreted as a wave dominated delta. However, the depositional system of the delta has not been studied in detail. This study focuses on the sedimentological characteristics of the modern Baram delta with a view towards determining its depositional systems.

The mouth bar of the modern Baram delta has a semi circular shape that consists of river marginal bars and transverse bar both parallel and perpendicular to the river mouth.

Seven lithofacies have been identified, which are sand facies, sand with organic matter and mud facies, sandy heterolithic facies, muddy heterolithic facies, mud with subordinate organic matter facies, mud facies and highly-bioturbated muddy heterolithic facies.

Sand facies is common on the seaward side of the transverse bar. It consists of relatively clean with parallel lamination, small-scale crossbedding, thinly organic layer and occasionally dispersed mud. Sand with organic matter and mud facies consists of interbedded sand with relatively thick organic layers 1–3 cm), thin layers of mud (1 cm), asymmetrical ripples and burrows. Sandy heterolithic facies consists of 60–80% very fine to fine sand grains, scattered mud and thin layers of organic material. Muddy heterolithic facies conversely characterized by mud of 70–90%, commonly laminated with subordinate thin laminae of organic

matters and scattered sand. Mud with subordinate organic matter facies which tend to occur in the lower deltaic plain consists of >90% soft to consolidated mud, mud pellets, mud laminations and subordinate organic matter. Mud facies is the type of facies, which is common in the prodelta area. It is characterized by homogenous, smooth to consolidated mud and vertical to horizontal burrows. Finally, highly bioturbated muddy heterolithic facies consists of predominantly reworked mud with subordinate very fine sand or silt and organic matter.

Different combinations of depositional processes dominate different part of the delta. Tidal processes dominate on the lower delta plain, inward of the delta front and on the river marginal bars. On the seaward side of the transverse bar and to some extent on both flanks of the delta, waves and tidal processes are important. Waves processes exclusively dominate in the nearshore areas.

Suspension sedimentation is most common in the transition to prodelta areas. They are occasionally affected by storm activity or high energy current. In some areas there are influenced by locally generated currents such as longshore current.

A stratigraphic succession of the modern Baram delta was predicted based on observed facies, assuming the relative sea level continue to rise and sediment supply remains constant. The sands are mostly wave influenced at the base, and gradually replaced by tidal sand. The uppermost sediments are the muddy tidal flat and beach sediments. In this succession, 59% of the sediment is tidal and 41% is wave-generated sand.

In this succession tide generated sediments are much more common than the wave generated sediments. Consequently, the modern Baram delta is not a wave-dominated delta but it should be view as a tide-dominated, wave-influenced delta.