The Late Quaternary Depositional History of the Baram Delta and its Adjacent Brunei Shelf

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The Baram Delta, located in the NW Borneo (Figure. 1), has long been recognized as a prolific oil producing province in this region. The Stratigraphic history of the Baram Delta has recently become a topic of many studies. The present day Baram Delta depositional processes have been widely used as an analogue to interpret the ancient depositional framework of sedimentary successions in this area. As an aid to the reconstruction of the modern depositional model of the Baram system, this research project is initiated with two main goals.

The primary objective of this research is to describe the distribution pattern and acoustic character of the Late Quaternary fluvial-deltaic-estuarine deposits preserved on the western Brunei Shelf (Figure. 1). The approach adopted involves the use of high-resolution (Minigun, 3.5 kHz) seismic reflection data to map stratigraphic boundaries and to characterize seismic facies units bounded by these surfaces. Correlation of seismic horizons, mapping of faults and seismic units, and the generation of isochron and paleogeographic maps help to interpret the depositional processes and shelf evolution through the last eustatic cycle. Figure 2 shows an example of the seismic section used in this study, showing some seismic facies interpretations.

The secondary objective of this research includes the study and evaluation of the evolution of the paleo-Baram coastline during the last highstand, with respect to the present rate of sediment discharge from the Baram River. The result so derived may assist us to better understand the depositional environment of the most recent Baram Delta sequences.

The modern Baram Delta formed its present geometry since 5,000 years BP. The depositional history of this spectacular development was not well understood, especially, its evolution during, and since the last glacio-eustatic lowstand. This study utilizes outcrop-scale seismic data collected on the western Brunei Shelf to unravel its sediment depositional

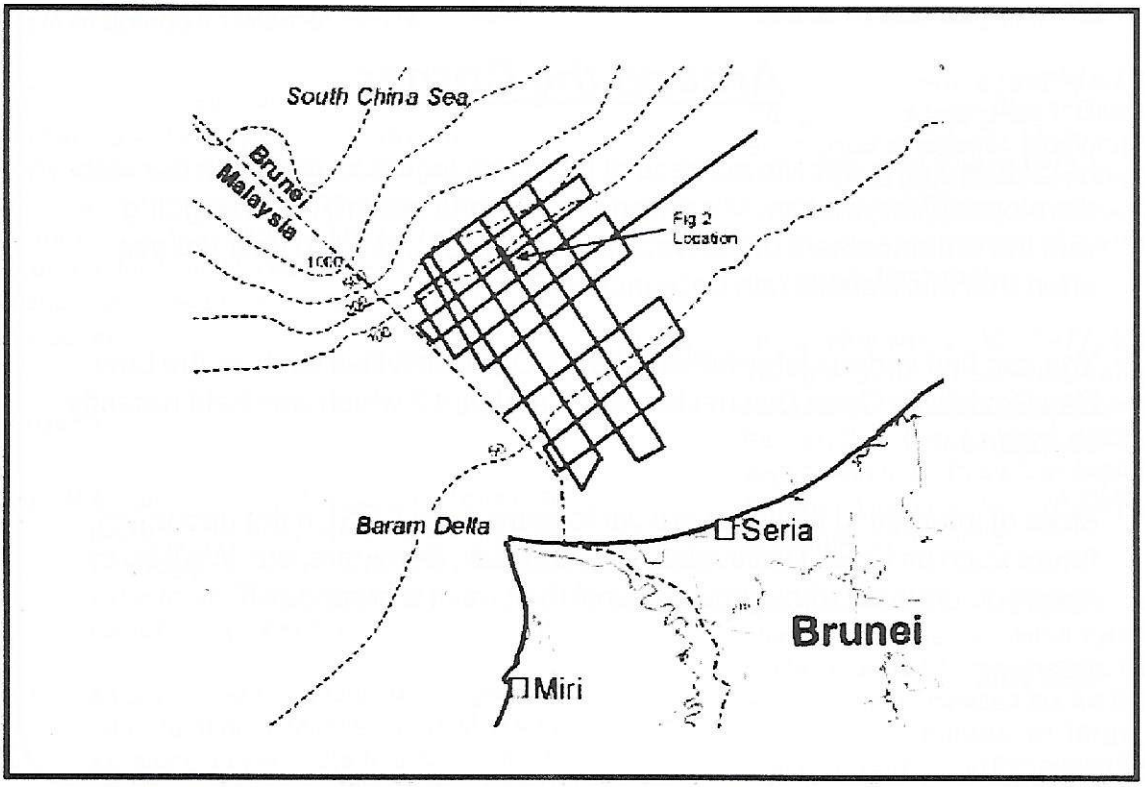


Figure. 1 Location map of the study area, also showing the seismic lines and the location of Figure 2.

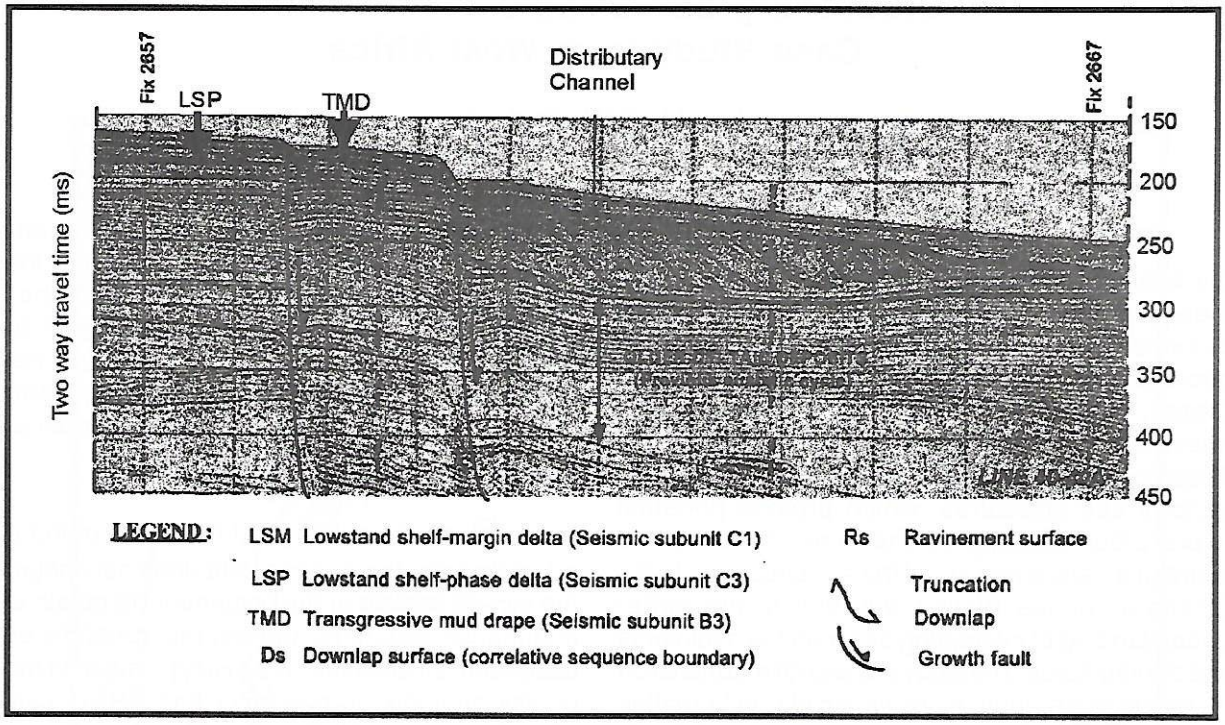


Figure. 2 An example of a seismic line with its descending foreset bedding.

environments since the last glacioeustatic sea-level fall.

Seismic analysis study allows distinction of 3 seismic units that form the youngest depositional sequence. They are:

1. Lowstand System Tract (Unit C) includes the Baram Incised Valley and "cut-and-fill" fluvial channels, shelf-phase deltas and shelf-margin deltas. This unit is the lowermost deposits of the youngest sequence, bounded by the downlap surface or its correlative surface at the baSe and an erosional surface at the top
2. Transgressive Systems Tract (Unit B) consists of the fluvial channel backfill deposits, "valley-fill deltas" and muddy drapes. It is bounded at the top by a conformable surface and at the base by an erosional surface
3. Highstand Systems Tract (Unit A) of which only the prodelta portion of the modern Baram Delta is observed on the seismic data. This unit is the youngest and bounded at the base by the maximum flooding surface.

The current study shows that:

1. The lowstand period has created a prominent incised valley on the western Brunei Shelf and formed prograding sand bodies at the shelf margin.
2. There are two shelf-margin deltas recognized as active in the study area during the lowstand.
3. There are at least four types of incised channels and –valley fill deposits preserved on the western Brunei Shelf since the last lowstand
4. The current sediment discharge rate of the Baram River is insufficient to fill the Baram estuary as proposed by Caline and Huong (1992) within a period of 5,400 years.

Editorial Note:

This extended abstract is taken from Francis Ho's MSc thesis in the University of Brunei Darussalam (1998). It is a good piece of study as high-resolution shallow seismic study on modern system is relatively rare, especially in the region. The full research is published by Hiscott (2001).

Reference:

Caline, B and J. Huong, 1992, New insight into the recent evolution of the Baram Delta from satellite imagery: Geol. Soc. Malaysia Bulletin, v. 32, p. 1-13.

Hiscott, R. N., 2001, Depositional sequences controlled by high rates of sediment supply, sea-level variations, and growth faulting: the Quaternary Baram Delta of northwestern Borneo, Marine Geology 175, p. 67-102.