STRATIGRAPHY, SEDIMENTOLOGY AND PALEOGEOGRAPHY OF THE MACHINCHANG GROUP (CAMBRIAN), PULAU LANGKAWI, MALAYSIA

M.Z. FASHORI, KAMAL ROSLAN MOHAMED & MOHD SHAFEEA LEMAN
Department of Geology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor

The Machinchang Group (Cambrian) comprises several units deposited in association with a broad, shallow standing body of water in northern Pulau Langkawi. The standing body of water, a large lake with limited connections to the sea, developed in response to marine transgression. The Machinchang Group is subdivided informally on lithologic and sedimentologic grounds into four distinct formations (Fig. 1). In ascending order, they are:

4. Jemuruk Formation
3. Tanjung Buta Sandstone
2. Anak Datai Sandstone
1. Tanjung Hulur Formation

Tanjung Hulur Formation

The entire formation is dominantly argillaceous and shows soft sediment deformation, microfaults, convolute bedding, wave ripples and parallel laminations. There is also a gradual increase in energy, as indicated by the presence of parallel laminations grading upwards into cross bedded rippled sandstone. The sediments of this formation are interpreted to have been deposited in a very low energy, lacustrine environment.

Three major lithological successions are identified in the Tanjung Hulur Formation in the study area. These are Member "A", a weakly cemented light green to light grey mudstone/shale interbedded siltstone and fine sandstone. Member "B", a cyclic pattern of sedimentation of shale, siltstone and fine sandstone, is apparent throughout the member. Each cycle consists of argillaceous dark grey/black shale at the base and grades upward into finely laminated siltstone overlain by fine to medium grained argillaceous sandstone. Coarsening upward cycles reflect progressive shallowing of the basin. Member "C", light green medium to coarse grained, well sorted sheet sandstone representing shoreline deposits. The lowering of sea levels resulted in the seaward progradation of the coastline and the development of deep incised river valleys.

Anak Datai Sandstone

Anak Datai Sandstone is a predominantly light-grey, coarse-grained to conglomeratic, poor to moderately sorted, crossbedded litharenite. The sandstone contains fining upward sequences and reveals a distinct fluvial sandbody geometry. A paleovalley 2-3 km wide was formed in the northern Langkawi area by the Anak Datai channel system.

The sheet character of its regional distribution, the presence of numerous erosional surfaces associated with mudclasts, the dominance of trough and horizontal bedding and the small amount of over bank facies all suggest that the system was braided.

The regressing shorelines of the Cambrian sea at the end of Tanjung Hulur Formation caused the Anak Datai fluvial channels to migrate basinward, incising down into the underlying sediments.

Tanjung Buta Sandstone

Immediately after regression, the Cambrian sea transgressed into the Anak Datai paleovalley. With continued sea level rise the paleovalley was transformed into an estuary with quartzose sand filling the paleovalley. A mesotidal estuarine setting was interpreted for Tanjung Buta lithofacies, based on the

Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 20, No. 3, May-June 1994

presence of tidal couplets, mud drapes, reactivation surfaces, flaser and herringbone beds. This formation displays numerous tidal features analogous to the Holocene depositional setting of Oosterschelde, in the Netherlands.

This sandstone is white to light grey, fine to medium grained, very well sorted quartzarenite, with a slightly fining upward successions. Cross beds show a regular alteration of thick to thin sandy foresets separated by thin mud drapes.

Jemuruk Formation

The Jemuruk Formation comprises a coarsening upward marine sequence, which coarsens upward from bioturbated black shale to well sorted, medium grained cross bedded and massive light grey sandstones, deposited on the upper shoreface of a prograding wave dominated shoreline.

Major fluctuations in relative sea level are generally interpreted as the result of eustatic sea level fluctuations. However, the provenance of the sediments, and the geometry of the basin changed dramatically during deposition of each of the four successions in the Machinchang Group. These observations are cited as evidence that tectonic uplift and/or subsidence was at least partly responsible for initiating base-level fluctuations in the basin.