Petroleum Geology Conference and Exhibition 2008
14th – 15th January 2008 • Kuala Lumpur Convention Center, Kuala Lumpur, Malaysia

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ICHNOFOSSILS FROM THE TERTIARY SEDIMENTS OF THE WEST CROCKER FORMATION IN KOTA KINABALU AREA, SABAH

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Detailed facies analysis on several well-exposed successions belonging to the West Crocker Formation reveals well-preserved trace fossils, which has not previously described. The ichnofossil assemblage in this area is associated with turbidite deposits, which indicates benthic or deep marine environments. They can be grouped into two different ichnofacies namely Zoophycos and Nereites.

Traces of Zoophycos ichnofacies include Chondrites, Cosmorhaphe, Phycosiphon, Planolites Protopaleodictyon,, Thalassinoides and Zoophycos. Zoophycos ichnofacies appears in all the various types of facies associations. They are common within heterolithic beds of predominantly shale, with minor fine-grained and thin bedded sandstones, and siltstones. These beds are interpreted to be deposited in the levee-interchannel areas that indicate quiet water settings (Nizam et.al 2006, 2007). Some Zoophycos ichnofacies such as Chondrites and Protopaleodictyon are common within the thin muddy sandstone that formed depositional lobes association (Figure 1). Their distribution suggests that there is no specific environmental constraint for Zoophycos ichnofacies.

Due to the broad paleobathymetric range of Zoophycos ichnofacies (Pemberton, 1992) facies-crossing elements by Cosmorhaphe, Thalassinoides, and Zoophycos with Nereites ichnofacies are portrayed in the study area. The widespread distribution of these ichnofossils may be due to the variable food resources, numerous substrate types, and different energy and oxygen levels (Pemberton, 1992; Paolo Monaco, 1995).

Nereites ichnofacies are sub-divided into pre-turbidite and post-turbidite suite. Pre-turbidite ichnofossils includes Helminthoida, Lorenzinia, Nereites, Paleodictyon, Spirodesmos, Spirophycus, Spirohaphe (Figure 2), Urohelminthoida, and Megagrapton. They are also found within heterolithic beds of shale and sandstone/siltstone that formed levee-interchannel association. They represent the quiet environments where the substrate is free from turbidity currents influence (Pemberton, 1992; Paolo Monaco, 1995). Post-turbidites ichnofossils includes Ophiomorpha, Skolitos, and Diplocraterion. They are found within the laminated sandstones in the fining-upward sequences of channel fill association (Figure 3). These ichnofossils represents less stable community and very much influenced by turbidity activities. They may also be derived from shallower environments (Pemberton, 1992; Tchoumatchenco, 2001).

These traces are preserved as complex horizontal grazing traces and patterned feeding/dwelling structures, numerous crawling and/or grazing traces and sinuous faecal casting. These structures are produced by deposit feeders and scavengers, and possible structures associated with trapping or farming microbes within essentially permanent open domiciles. These traces are later filled-in by sediments transported by the low density turbidity currents.

Figure 1: Characteristics trace fossils of Chondrites-Protopaleodictyon assemblage. (a) Chondrites isp.; resembles meandering and branching style. (b) Protopaleodictyon isp.; less meander, shows branching from the apex of the meander. They are found on bedding plane of thin muddy sandstone in Taman Maju, Sepanggar.

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Warta Geologi (Newsletter of the Geological Society of Malaysia), Vol. 34, No. 1, January-February 2008

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Figure 2: Pre-turbidite Spirohaphe ichnofossil of Nereites ichnofacies. This spiral-shaped ichnofossil represents crawling or grazing trace is found on bedding planes of heterolothic beds in Taman Warisan, Inanam..

Figure 3: Post-turbidite Ophiomorpha ichnofossil occurs in laminated sandstone of channel-fill succession. It represents vertical burrowing traces in a less stable environment. This spectacular 3-dimensional trace exhibits in Bantayan outcrop, Inanam.