*Poster 8*

# Facies analysis and paleogeographic implication of the Jelai Formation (Middle-Upper Triassic), Central basin of Peninsular Malaysia

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The axial Malayan province comprises four major formations that include: the Jelai formation, Jurong formation, Kerdau formation, Gunong Rabong formation and the Semanggol formation.

Over the years, a detailed sedimentologic study of the Jelai formation is still missing except for some work



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on paleontology and superficial lithologic description previously provided.

The present sedimentological study of the Jelai formation in the central basin of Peninsular Malaysia indicated that deposition took place in shallow water conditions. A non-marine environment represented by the Benta conglomerate indicates a distinct alluvial environment not belonging to the Jelai formation. Paleontologic data revealed the presence of Costatoria sp (myophoria facies) which is a bivalve of shallow water marine zone. Trace fossils such as cruziana has been found in mudstones in the following areas: Kuala Lipis, Temerloh and Segamat. In addition, plant fossils have been found in tuffaceous sandstone and mudstone both in the Temerloh area. As a result, cruziana and plant fossils are both clues of shallow water environment. Scanning electron microscopy of clay samples indicated that quartz ($SiO_2$), orthoclase ($KAlSi_3O_8$) and zircon ($ZrSiO_4$) are major components associated with the clay minerals. Fluorine, titanium, carbon are accessory chemical elements. Iron oxides are also present.

X-ray diffraction (XRD) revealed the following main clay minerals: illite, montmorillonite and kaolinite whereas gypsum, pyrite are also present. High proportion of quartz in clay samples has been noticed both by grain size analysis and XRD. This indicates a shoreline proximity of the Jelai formation. Petrographic study of arenite (sandstone) showed six distinct facies:

1. Medium to coarse-grained sandstone, ferruginous, poorly sorted with abundant rock fragments, containing quartz, trace of mica, plagioclase grains which are mostly altered, and trace of orthoclase. Grain size varying from 0.25 to 1 mm.
2. Fine to medium-grained sandstone, argillaceous, moderately to well sorted, containing quartz, muscovite, trace of orthoclase, little amount of plagioclase and biotite, iron oxides, and rock fragments. Grain size varying from 0.12 to 0.5 mm.
3. Coarse-grained sandstone, argillaceous, strongly bioturbated, containing quartz grains and convolute lamination.
4. Medium-grained sandstone, tuffaceous, moderately to poorly sorted. This facies contains quartz grains, feldspar and fragments of quartzite and glass.
5. Fine-grained sandstone, poorly to moderately sorted, containing quartz grains, feldspar, muscovite, clay minerals and coal fragments.
6. Quartzite, containing quartz, feldspar and trace of iron oxides.

Petrographic study of rudite (conglomerate and breccia) indicated five distinct facies:

1. Sheared sedimentary breccia (olistostrome), containing fragments cemented by iron oxides. Mineralogy showed the presence of quartz, feldspar, altered mica, and abundant rock fragments.
2. Conglomerate, containing quartz, altered muscovite, rock fragments cemented by iron oxides.
3. Conglomerate, containing quartz clasts, abundant rock fragments, roots, wood fragments and sand lenses.
4. Vein breccia, containing quartz and fragments of quartzite embedded in an iron groundmass.
5. Breccia, containing subangular quartz grains, quartzite fragments and volcanic pieces of rock.

Petrographic study of lutite led to four distinct facies:

1. Pebbly mudstone
2. Laminated claystone
3. Black shale
4. Massive to bedded mudstone

The volcanic facies in the Jelai formation is mostly represented by tuffs found in Benta and Temerloh.

Facies distribution shows that sandstone facies occurs in the central and northeastern part of Kuala Lipis. This facies becomes bioturbated and tuffaceous in Temerloh. Quartzite appears in Segamat only.

Conglomerate appears in the northeastern part whereas olistostrome is seen in the southwestern part of Kuala Lipis. Pebbly mudstone is found in Kuala Lipis town and the northern side. Black shale outcrops in Kuala Lipis and Temerloh. Breccia is seen in Segamat whereas tuffs occur in Benta and Temerloh. The tectonic behaviour of the study area showed proof of landslides producing olistostrome. Flexure folding, microfaulting, thrust faulting and compressional stresses have been noticed. Shearing mechanism is obvious in Segamat, Kuala Lipis and Malacca and their suroundings. Volcanic activity has affected the Triassic sediments (Jelai formation).