

Neocomian palynomorph assemblage from Central Pahang, Malaysia

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Abstract: The rock successions exposed at several road-cuts along the road connecting Triang and Paloh Hinai in the central part of Pahang yield a distinct palynomorph assemblage, which is dominated by fairly-well preserved significant palynomorph species namely *Cicatricosisporites australiensis*, *C. ludbrookiae*, *Biretisporites eneabbaensis* and *Baculatisporites comaumensis*. Based on the occurrence of the total palynomorphs, the identified assemblage shows some similarities with that of *Stylosus* Assemblage and the succeeding *Speciosus* Assemblage of Lower Cretaceous age. The presence of certain stratigraphically significant palynomorph permits the assignment of chronostratigraphic age of this assemblage to the lowest *Speciosus* Assemblage of Valanginian- Hauterivian (Neocomian).

Abstrak: Jujukan batuan yang tersingkap di beberapa potongan jalan yang menghubungkan Triang dan Paloh Hinai di bahagian tengah Pahang mengandungi himpunan palinomorff yang didominasi oleh *Cicatricosisporites australiensis*, *C. ludbrookiae*, *Biretisporites eneabbaensis* dan *Baculatisporites comaumensis* yang terawet hampir sempurna. Berdasarkan kepada kehadiran keseluruhan palinomorff, himpunan yang dikenal pasti menunjukkan persamaan dengan Himpunan *Stylosus* dan Himpunan *Speciosus* yang menindih di bahagian atasnya berusia Kapur Awal. Kehadiran palinomorff yang khusus pada pada usia stratigrafi tertentu telah membolehkan usia himpunan ini diletakkan di bahagian terbawah Himpunan *Speciosus* yang berusia Valanginian- Hauterivian (Neocomian).

INTRODUCTION

Several road cuts along the newly built Triang-Paloh Hinai rural road, in the central part of Pahang expose some rock successions, which was previously mapped and dated as Jurassic-Cretaceous age. This road was built to connect several villages located along the south bank of the Pahang River. Samples for palynological study were systematically collected from several localities situated approximately 20 km to the east of Chenor and 10 km to the south of Maran (Figure 1-A). In general, based on field observations, the rock successions along this road are predominantly of reddish brown of fine to coarse-grained sandstone and conglomerate. Suitable samples for palynological study of siltstone and fine-grained sandstone were collected from several localities and it was found that some of them yielded the most varied palynomorphs in a fairly-well state of preservation.

The studied rock successions closely resemble that of the rock successions in the Tekai River area which was reported by Sharifah Shahira Wafa Syed Khairulminir Wafa *et al.* (2005) as part of the Mangkin Sandstone Formation of the Tembeling Group. Various geological aspects of the Tembeling Group, especially in the Tekai River and Tembeling River areas (approximately 70 km to the north of Jerantut) were reported by previous workers. Geological studies were carried out on these rocks in the early 1900s, by Scrivenor (1907, 1911 and 1931) who proposed the name of Tembeling Series. However, based

on the newly acquired evidences by several succeeding workers such as Koopmans (1966 and 1968), Khoo (1974, 1977 and 1983) and Harbury *et al.* (1990), the status of the earlier proposed name was reviewed and subsequently several new names were proposed. In general, the well-accepted Tembeling Group of Jurassic-Cretaceous age comprises three formations in ascending order, namely the Lanis Conglomerate Formation, Mangkin Sandstone Formation and Termus Shale Formation and it was interpreted as continental deposits of mainly conglomerate, sandstone and shale of various thicknesses. Due to the scarcity of well-preserved macrofossils, which is not an uncommon phenomena for the most of the Jurassic-Cretaceous sedimentary rocks in Peninsular Malaysia, the age of these rocks was often only interpreted by comparing lithology, structural styles and sedimentary structures of these rock successions with those in other established areas. Based on recent discoveries of palynomorphs from rock successions in the Tekai River area, a more specific age of Lower Cretaceous was proposed by Saiful Azman Abd Lah (2003), Sharifah Shahira Wafa Syed Khairulminir Wafa *et al.* (2005) and Ainul Rubizah Ariffin *et al.* (2005). Other Upper Mesozoic palynomorph assemblages were also reported from the southeastern part of Pahang (Uyop Said, 2002) and in Johor (Uyop Said and Che Aziz Ali, 2000, Uyop Said and Syahrul Salehudin, 2001 and Uyop Said *et al.*, 2003). The main objective of this study is to continue the effort to acquire and publish the palynological data discovered from the Jurassic-Cretaceous sedimentary

rocks of Peninsular Malaysia and established a more precise age for this rock succession.

MATERIAL AND METHOD

A field survey was carried out in March and April, 2005, during which the rock successions were measured and systematic sampling was conducted. Out of 64 samples collected for several aspects of geological studies, 41 samples were identified to be suitable for palynological study. Only palynological samples collected at several horizons from locality 15, 17, 19 and 25 are discussed in this paper (Figure 1-B). Most of the samples containing carbonaceous materials are grey to dark grey shale, siltstone and fine to medium-grained sandstones. The selected samples were processed according to the standard palynological processing technique of dissolving in hydrofluoric acid to remove the silica prior the oxidation process by using Schulze solution for a duration of times varying from 30 to 45 minutes. Palynological slides were prepared by using Canada Balsam as mounting medium and every slide was thoroughly studied under transmitted light microscope. The observed palynomorphs in the samples were then identified by comparing them with the previously reported palynomorphs from other areas. Some selected specimens representing the identified palynomorph species are illustrated in Figures 2 and 3.

RESULT AND DISCUSSION

A detailed description of the rock succession from the study area is described by Marahizal Malihan (2006) and Zainey Konjing (2006). In general, the rock succession is dominated by siltstone, fine to medium-grained sandstones and conglomerate of varying in thickness from a few centimeters to a couple of meters. Based on the lithology, it can be divided into several facies such as predominantly conglomerate facies, predominantly fine-grained sandstone facies and interbedded fine-grained sandstone and siltstone facies. However, the palynological samples of mostly fine-grained sandstone and siltstone were only collected from the interbedded fine-grained sandstone and siltstone facies (Figure 1-B). The commonly observed sedimentary structures are cross lamination and cross bed in siltstone and sandstone respectively. The presence of these sedimentary structures together with channelised beds of sandstone and conglomerate, which is also common in this area, can be interpreted to be associated with the meandering and braided river systems.

Out of 41 samples collected and processed for palynological study, only 13 samples yielded relatively well-preserved palynomorphs. Other samples were found to be barren or yielded badly-preserved and unidentifiable palynomorphs. It was found that samples 1377 and 1386 yielded the most of the identified palynomorphs in the

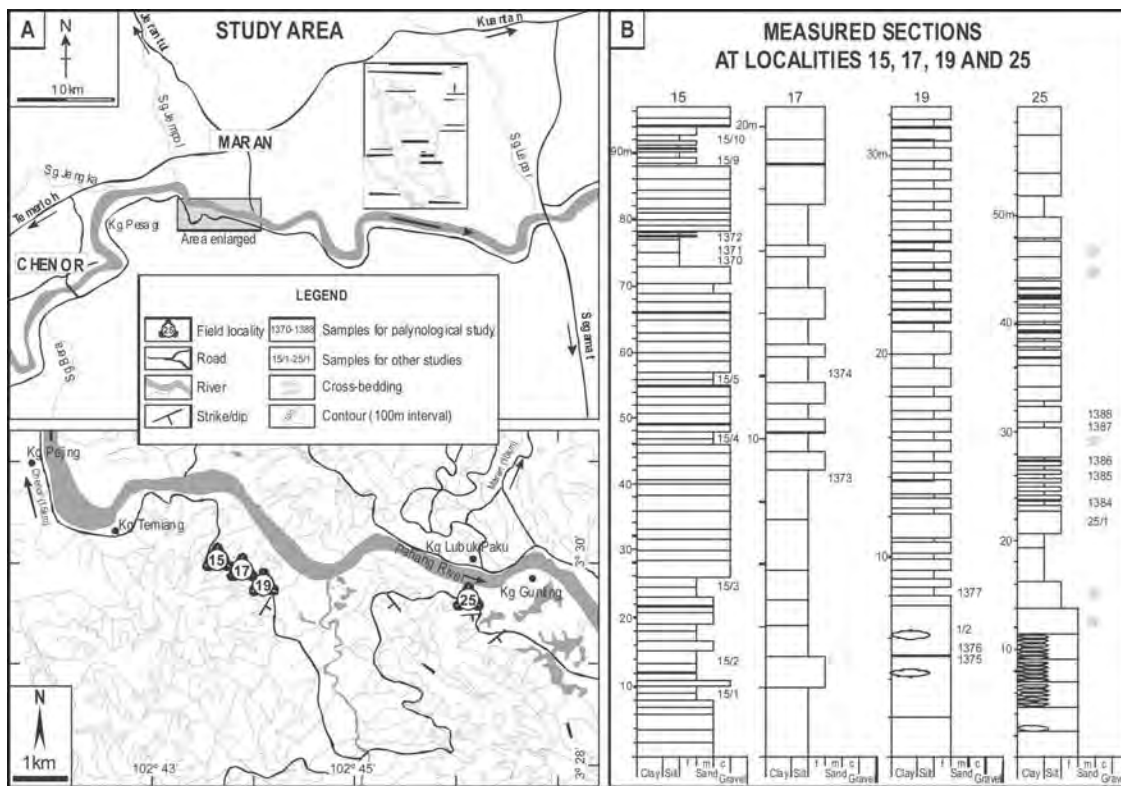


Figure 1: Location of the study area in central Pahang illustrating the localities of four measured sections (A) and generalised lithologic columns together with sample horizons for the palynological study (B) - sections measured by Marahizal Malihan and Zainey Konjing.

present study. A total of 16 taxa from 12 palynomorph genera of Upper Mesozoic spore and pollen were able to be identified from the samples. They are *Biretisporites eneabbaensis* Backhouse 1978, *B. spectabilis* Dettmann 1963, *Cyathidites australis* Couper 1953, *C. minor* Couper 1953, *Cycadopites* sp., *Tricolpites microminus* (Groot and Penny) Singh 1971, *Cicatricosisporites intersectus* Rouse 1962, *C. australiensis* (Cookson) Potonié 1956, *C. ludbrookiae* Dettmann 1963, *Trilobosporites trioreticulosus* Cookson and Dettmann 1958, *Echinatisporis* sp., *Ischyosporites variegatus* (Couper) Schulze 1967, *Baculatisporites comaumensis* (Cookson) Potonié 1956, *?Neoraistrickia* sp., *Araucariacites australis* Cookson 1947 and *Ephedripites jansonii* (Pocock) Muller 1968. Most of the identified palynomorphs were encountered in samples 1377 and 1388. In general, the samples studied show a low palynomorph count, and therefore, a comprehensive statistical study was not conducted. Each palynomorph was stated as common or dominant based on its occurrence above five counts in each slide out of an average of 40 to 50 total palynomorph counts.

The most common species are *Biretisporites eneabbaensis*, *B. spectabilis*, *Cyathidites australis*, *Cicatricosisporites australiensis*, *C. intersectus* and *Araucariacites australis* which were observed in most of the studied samples. The less common taxa are *Cicatricosisporites ludbrookiae*, *Baculatisporites comaumensis* and *Echinatisporis* sp.. Selected palynomorph specimens representing each identified taxon are illustrated in Figures 2 and 3.

Due to the stratigraphically long-ranged ages for most of the Upper Mesozoic palynomorphs, it was not possible to establish the index palynomorphs to indicate precise age limits. However, it is common to describe the identified palynomorphs as assemblages in order to establish the age of the rock successions studied after comparing them with the established assemblages from other areas of comparable age. The identified palynomorph assemblage is characterised by apiculate spores of having various types of ornamentation ranging from fine scabrae to elongated projections on the exine. This assemblage was compared with the established Upper Mesozoic palynostratigraphic zonations, which were reported by previous workers. Based on the identified palynomorphs, the present palynomorph assemblage shows a very close resemblance to some of the established palynomorph assemblages in the Early Cretaceous.

Unlike the palynomorph assemblage of the lowest Cretaceous in Peninsular Malaysia recorded from the Panti Sandstone (Uyop Said and Che Aziz Ali, 2000), the identified assemblage lacks in *Classopollis* spp.. Certain species of the genus *Classopollis* were found to be common constituents and characterise the Jurassic and lower part of Early Cretaceous palynomorph assemblages such as *Stylosus* Assemblage (Dettmann, 1963). The present palynomorph assemblage is not comparable to any Upper

Jurassic palynomorph assemblages because of the absence of common species such as *Aequitriradites acusus* and *Retitriletes watherooensis*. Furthermore, it differs from the *Balmeiopsis limbata* Zone (Backhouse, 1988) of Valanginian-Aptian age because of the absence of significant species *Balmeiopsis limbata* and *B. robusta*. The present assemblage is also not assignable to the younger palynomorph zones or assemblages such as *Captospora paradoxa* Zone and *Phimopollenites pannosus* Zone of Albian age because of the absence of pollen grains of angiosperm origin, which are common components in the later assemblages.

Despite of the absence of *Crybelosporites stylosus*, the presence of the commonly recorded species of *Araucariacites australis*, *Baculatisporites comaumensis* and *Cyathidites australis* together with some other significant species, the present palynomorph assemblage shows some similarities with the *Stylosus* Assemblage of Berriasian-Valanginian age. With the relatively common occurrence of *Cicatricosisporites ludbrookiae* in the present samples, the assemblage resembles the *Speciosus* Assemblage of Valanginian-Aptian age. Dettmann (1963) stated that, the first appearance of *Cicatricosisporites ludbrookiae* was used to distinguish the *Speciosus* Assemblage from the older assemblages. However, the identified assemblage is not exactly matched with the *Speciosus* Assemblage due to the absence of other common components such as *Cicatricosisporites hughesi*, *Pilosporites notensis* and *Crybelosporites striatus*.

After a thorough comparative study based on the occurrence of palynomorph species, it was determined that, the present palynomorph assemblage shows some similarities to both of the assemblages namely, the older *Stylosus* Assemblage and the younger *Speciosus* Assemblage. Therefore, it seems that, the age of this assemblage should be interpreted to be spanning the two assemblages. The occurrence of *Cicatricosisporites ludbrookiae* which characterises the younger assemblage makes it more appropriate to assign it to the lowermost part of the *Speciosus* Assemblage of Valanginian-Hauterivian age (Figure 4). The interpreted age of this assemblage is similar to that of the palynomorph assemblage recorded from Bukit Belah, Batu Pahat, Johor (Uyop Said and Syahrul Salehudin, 2001), but the later assemblage consists of relatively better preserved and varied palynomorph taxa.

CONCLUSION

The palynomorph assemblage of sixteen identified palynomorph taxa is the first palynological data reported from this area. Based on the occurrences of the palynomorphs in the samples studied, the assemblage spans the *Stylosus* and *Speciosus* Assemblages. However, the presence of *Cicatricosisporites ludbrookiae*, which is interpreted to only appear in the *Speciosus* Assemblage places the present palynomorph assemblage into the lowest

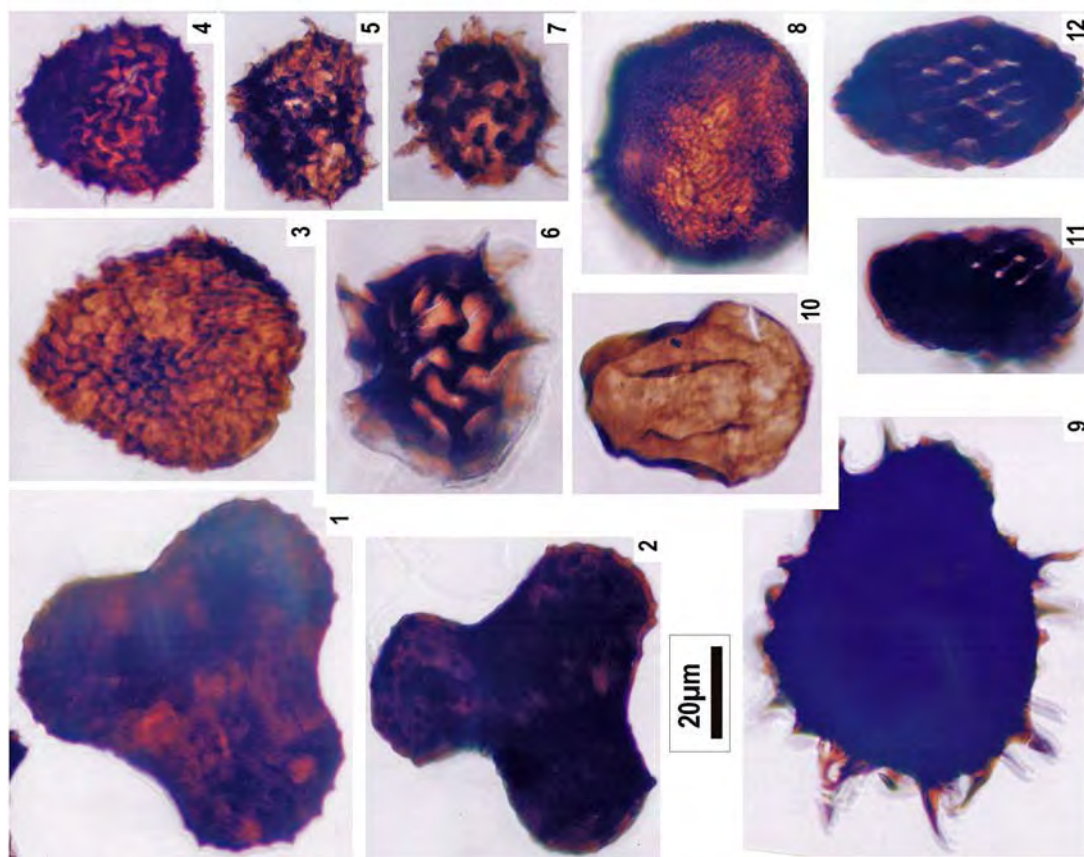


Figure 3: Selected palynomorphs from the study area. All specimens were photographed under transmitted light microscope. Each specimen is denoted in bracket by field locality/sample number/slide number/England finder reference. 1-2. *Trilobosporites trioreticulosus* Cookson and Dettmann 1958 - 1(25/1385/6/W/35-3), 2(25/1386/6/R/37-1); 3-5. *Echinatisporis* sp. - 3(19/1377/6/H/38-4), partly corroded specimen, 4(17/1373/5/Y/36), 5(19/1377/6/O/46); 6-7. *Ischyosporites variegatus* (Couper) Schulze 1967 - 6(19/1377/6/S/32), 7(19/1377/6/G/40-3), partly corroded specimen; 8. *Baculatisporites comaunensis* (Cookson) Potonié 1956 - (25/1386/6/U/46); 9. ?*Neoraisitricia* sp. - (15/1369/6/V/39); 10. *Araucariacites australis* Cookson 1947 - (15/1369/5/J/41-4); 11-12. *Ephedripites jansonii* (Pocock) Muller 1968 - 11(19/1377/6/R/35), 12(17/1374/6/E/33)

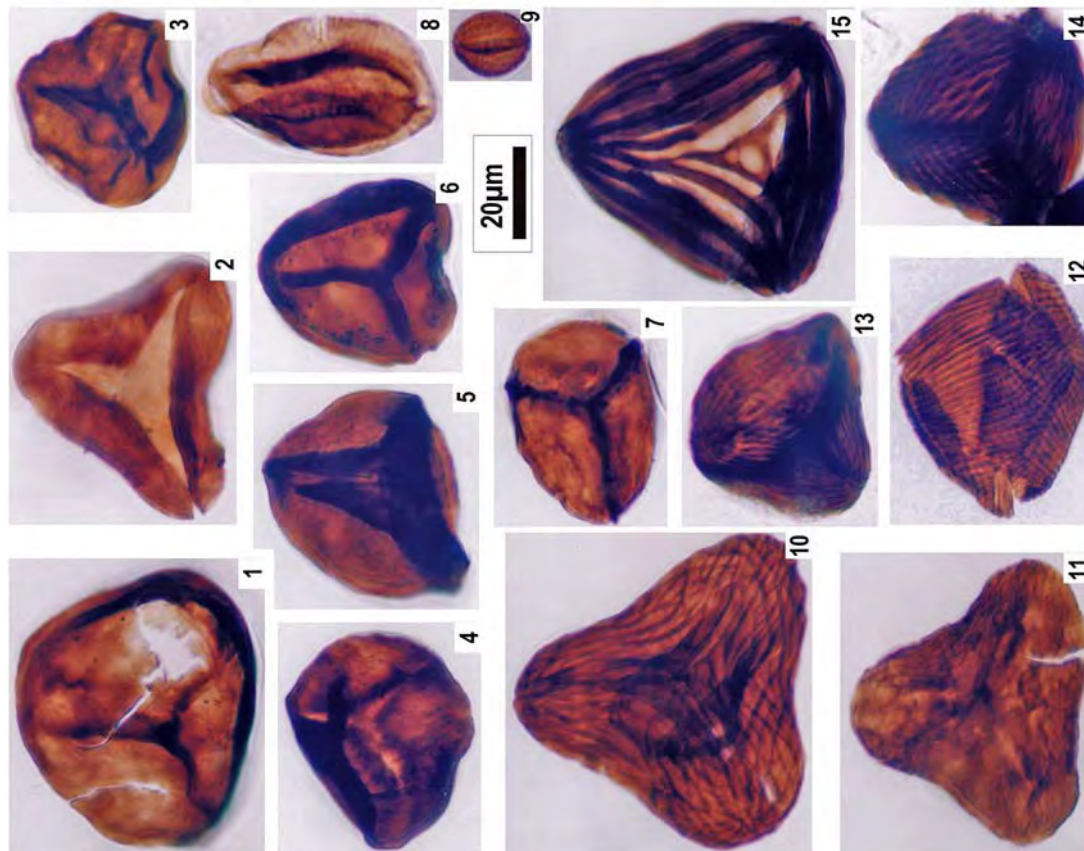


Figure 2: Selected palynomorphs from the study area. All specimens were photographed under transmitted light microscope. Each specimen is denoted in bracket by field locality/sample number/slide number/England finder reference. 1. *Biretisporites eneubbaensis* Backhouse 1978 - (19/1377/6/T/46); 2. *Cyathidites australis* Couper 1953 - (17/1373/5/J/47-2); 3. *C. minor* Couper 1953 - (25/1386/6/U/41); 4-7. *B. spectabilis* Dettmann 1963 - 4(17/1374/5/F/45-4), 5(17/1374/6/M/47-4), 6(17/1373/5/H/43), 7(19/1377/6/H/40); 8. *Cycadopytes* sp. - (17/1374/5/H/46-3); 9. *Tricolpites microminus* (Groot and Penny) Singh 1971 - (15/1369/6/M/48-3); 10-12. *Cicatricosisporites intersectus* Rouse 1962 - 10(19/1377/6/D/49), 11(19/1377/6/S/44-1), 12(19/1377/6/R/39); 13-14. *C. australiensis* (Cookson) Potonié 1956 - 13(25/1386/6/W/31-4), 14(25/1386/6/M/48-4); 15. *C. ludbrookiae* Dettmann 1963 - (15/1369/6/U/49-3)

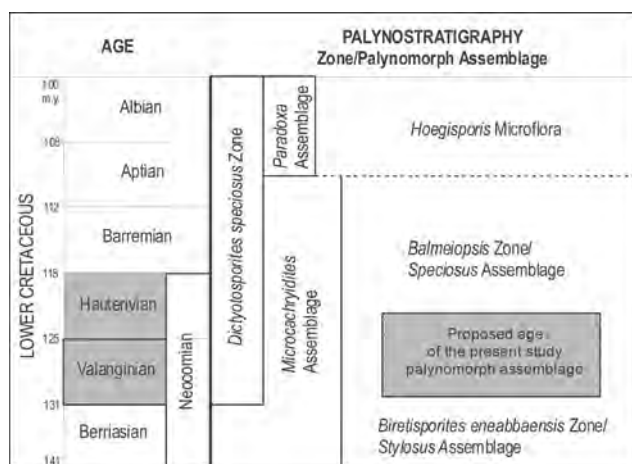


Figure 4: Palynostratigraphy of the Lower Cretaceous with some selected established palynomorph zonation together with the proposed age of the identified palynomorph assemblage in the present study.

Speciosus Assemblage of Valanginian-Hauterivian age. This palynological data contributes to the on going effort to establish a more precise age of the continental rock successions in Peninsular Malaysia as an alternative to other fossils for dating purposes.

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