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Early Cretaceous palynomorphs from Kampung Tanah Runtuh, Kluang, Johor

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Abstract: Some fairly well-preserved Early Cretaceous palynomorphs were identified in a rock sequence at Kampung Tanah Runtuh, Kluang Johor. The rock sequence consists predominantly of mudstone, siltstone and cross-laminated fine- to medium-grained sandstone of various in thicknesses, and interpreted to be deposited in a fluvial environment. The observed palynomorphs are assigned to twelve genera which include the most commonly observed genera namely *Cicatricosisporites*, *Araucariacites* and *Concavissimisporites*. The identified palynomorph assemblage shows a close resemblance with the *Stylosus* Assemblage of Early Cretaceous age.

Abstrak: Beberapa palinomorf berusia Kapur Awal yang terawet baik telah dikenal pasti dari jujukan batuan di Kampung Tanah Runtuh, Kluang. Jujukan batuan didominasi oleh batu lumpur, batu lodak dan batu pasir berlaminasi silang berbutiran halus hingga sederhana dalam pelbagai ketebalan, dan ditafsir telah terendap di sekitaran fluvial. Palinomorf yang ditemui dikelaskan kepada dua belas genera yang merangkumi genera yang biasa ditemui iaitu *Cicatricosisporites*, *Araucariacites* dan *Concavissimisporites*. Himpunan palinomorf yang dikenal pasti mempunyai persamaan yang rapat dengan Himpunan *Stylosus* yang berusia Kapur Awal.

INTRODUCTION

The sedimentary rocks which are exposed at several localities in the vicinity of Kluang as part of the Bukit Semberong ridge were previously mapped and interpreted to be Jurassic-Cretaceous in age. In general, these rocks that are predominantly of mudstone, siltstone and sandstone are partly tuffaceous and generally dip at approximately 30° to the northeast. Similar to other Jurassic-Cretaceous rocks exposed in several parts of the Malay Peninsula, the rock sequence in Kluang area is interpreted as continental deposits. However, a more precise age of the rock sequences was not determinable apart from assigning it a general Early Cretaceous age. This age interpretation is commonly applied to other Jurassic-Cretaceous rocks throughout Peninsular Malaysia as a result of the limited data of well-preserved macrofossils found, and therefore, palynological data is vital for a most precise determination of age of the rock, as it has been proven in some previous palynological studies (for example, Uyop Said and Che Aziz Ali, 2000). The main objective of the present study is to interpret the age of the rock sequence by utilising the available palynological evidence acquired.

Several studies on some geological aspects of the Kluang area were conducted by several previous workers. General geology and mining industries of Johor was reported by Willbourn (1928) and the more recent works dealt with mapping and sedimentological aspects were conducted by Juhari Mat Akhir (1979), Loh (1980), Rosli Chik (1989) and Zaitul Zahira Ghazali (1999). They interpreted the sedimentary rocks which were exposed in the Kluang to be part of Tebak Formation of Late Jurassic-Early Cretaceous age. The evidence of it's age was based on the fact that the rock sequence in the Kluang area is correlatable to the rock sequence bearing *Gleichenoides gagauensis* at Kahang which is located to the north of this study area (Loh, 1980). Furthermore, the occurrence of Late Mesozoic plant fossils was reported from the study area by Basir Jasin *et al.* (1989). They were able to identify some Early Cretaceous plant fossils namely *Podozamites pahangensis*, *Otozamites gagauensis*, *O. malayana*, *Zamites* cf. *buchianus* and *Gleichenoides* cf. *pantiensis*. These plant fossils were also previously reported from several parts of Peninsular Malaysia (Kon'no, 1967, 1968; Kon'no and Asama 1975).

MATERIAL AND METHOD

This study focuses on the occurrence of palynomorphs which were recovered from a rock sequence exposed at Kampung Tanah Runtuh earth quarry, approximately 2 km off the Kluang-Mersing trunk road, or approximately 7 km to the northeast of Kluang town (Fig. 1). The rock sequence was measured and at the same time sampling was also carried out throughout the rock sequence. The most suitable samples for palynological study are siltstone and fine-grained sandstone which are rich in carbonaceous materials. A total of 35 samples were collected and processed for palynological study. The samples were oxidised by Schulze solution and the oxidation times vary from one sample to another. Generally, most of the samples were oxidised for

between 30-45 minutes. Slides were prepared by using Canada Balsam as the mounting medium and subsequently were examined under transmitted light microscope

RESULT AND DISCUSSION

The rock sequence

The rock sequence of approximately 60 m thick consists predominantly of mudstone, siltstone and cross-laminated fine- to medium-grained sandstone which vary in thickness (Fig. 2). The rock sequence is interpreted to be deposited in a fluvial environment which including flood plain and abandoned channel (Rasanubari Asmah Rahmah Abdul Hamid, *in prep.*). The thickness of the layers varies from a few centimeters to a several centimeters. Most of the mudstone and siltstone that are rich in organic materials are light grey to dark grey in colour. In comparison, organic materials occur as laminations in fine- to medium-grained sandstone and they are found to be rich in palynomorphs. Sedimentary structures such as parallel and cross laminations and ripple marks are common in the sandstone layers.

Palynomorph assemblage

Fairly-well preserved palynomorphs were observed in eleven samples in various abundances in every slide prepared. Other samples were found contain unidentified poorly-preserved palynomorphs or plant debris. Most of the palynomorphs are light to dark brown in colour after oxidation, and some of the palynomorphs remained indistinguishable due their opacity. The presence of every identifiable palynomorph was categorised either as common (more than ten specimens observed in one slide), less common (5-10 specimens) or infrequent (less than 5 specimens). Based on the ornamentation on the exine, the identified palynomorphs generally consist of laevigate to echinate spores and pollen varying in size from several microns to a couple of tenths of a micron. The identified palynomorphs genera are *Cyathidites* Couper 1953, *Stereisporites* Pflug 1953, *Biretisporites* Delcourt, Dettmann and Hughes 1963, *Dictyophyllidites* (Couper) Dettmann 1963, *Leptolepidites* Couper 1953, *Concavissimisporites* Delcourt, Dettmann and Hughes 1963, *Pilosisporites* Delcourt and Sprumont 1955, *Dictyotosporites* Cookson and Dettmann 1958, *Cicatricosisporites* Potonié and Gelletich 1933, *Rouseisporites* Pocock 1962, *Araucariacites* Cookson ex Couper 1953 and *Tenellisporites* Potonié 1956. Some selected palynomorphs are illustrated in Figure 3.

The present palynomorph assemblage is described a whole from one locality instead of separately for every sample due to the state of preservation which generally yielded unidentified poorly-preserved specimens and very low counts of palynomorphs in many samples. The identified palynomorph assemblage from the studied rock sequence is characterised by the common species of

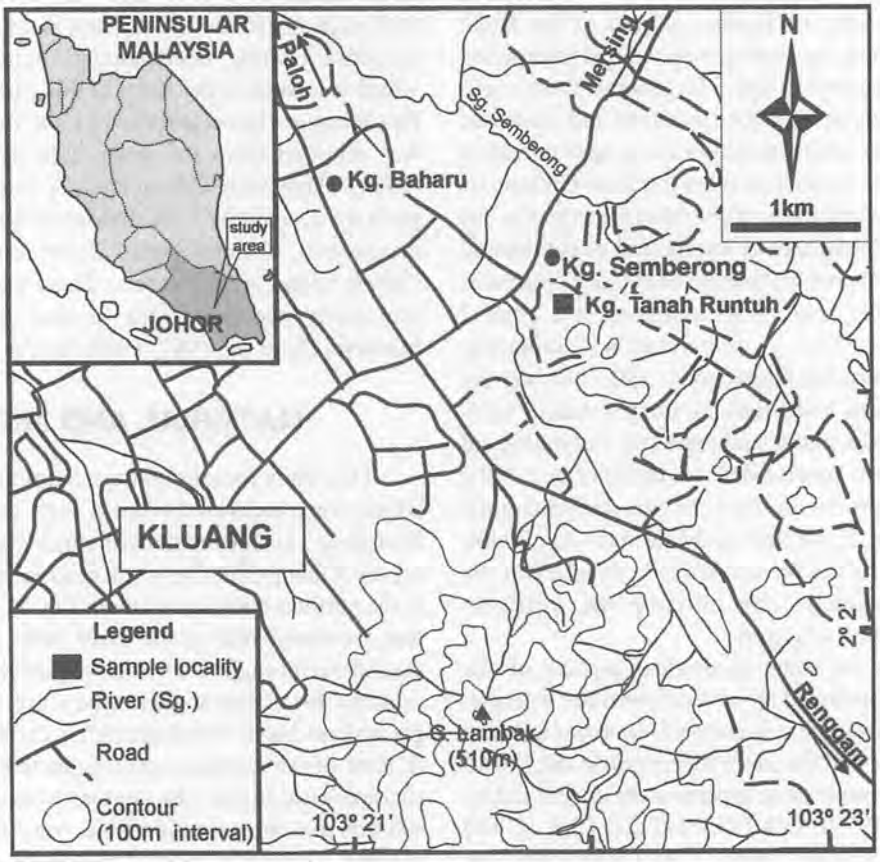

Figure 1. Map showing sample locality.

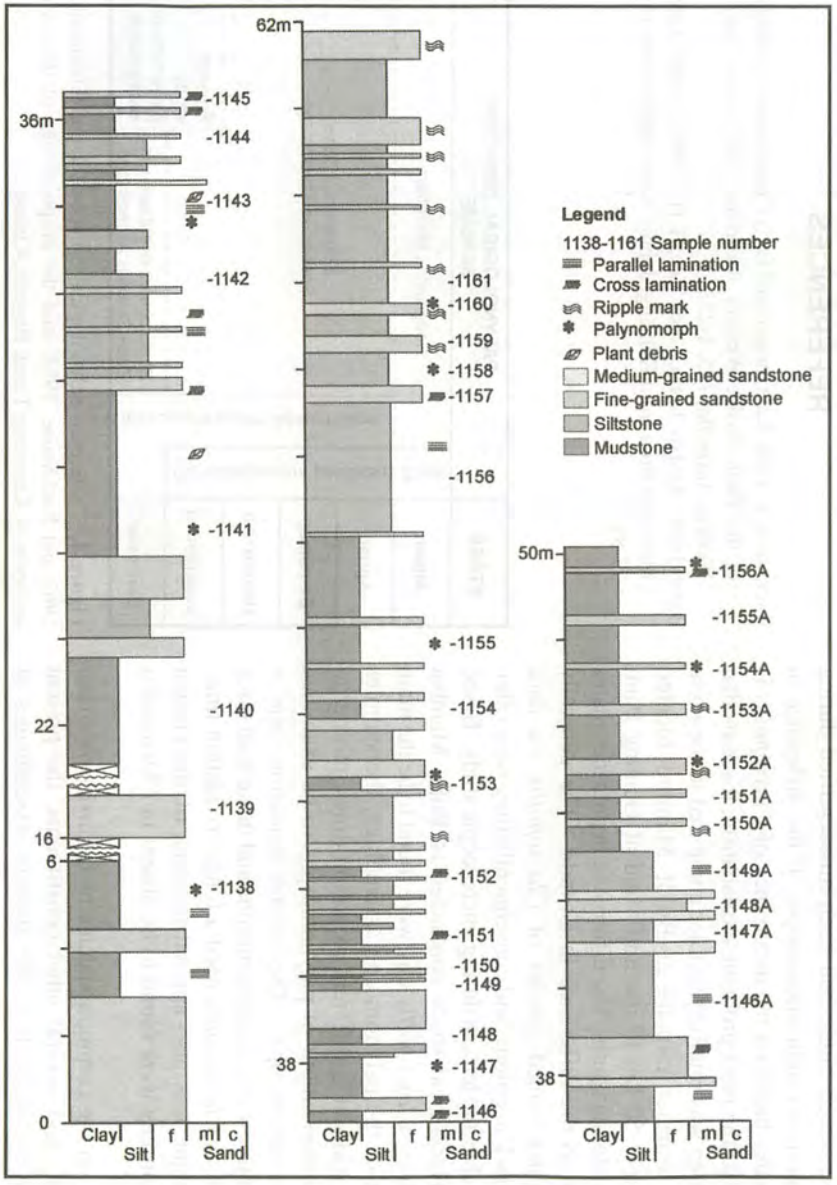

Figure 2. Generalised lithologic log of the section studied showing the sample horizon (measured by Rasanubari Asmah Rahmah Abdul Hamid and Mohd Musryzal Mohamed Ariffin).

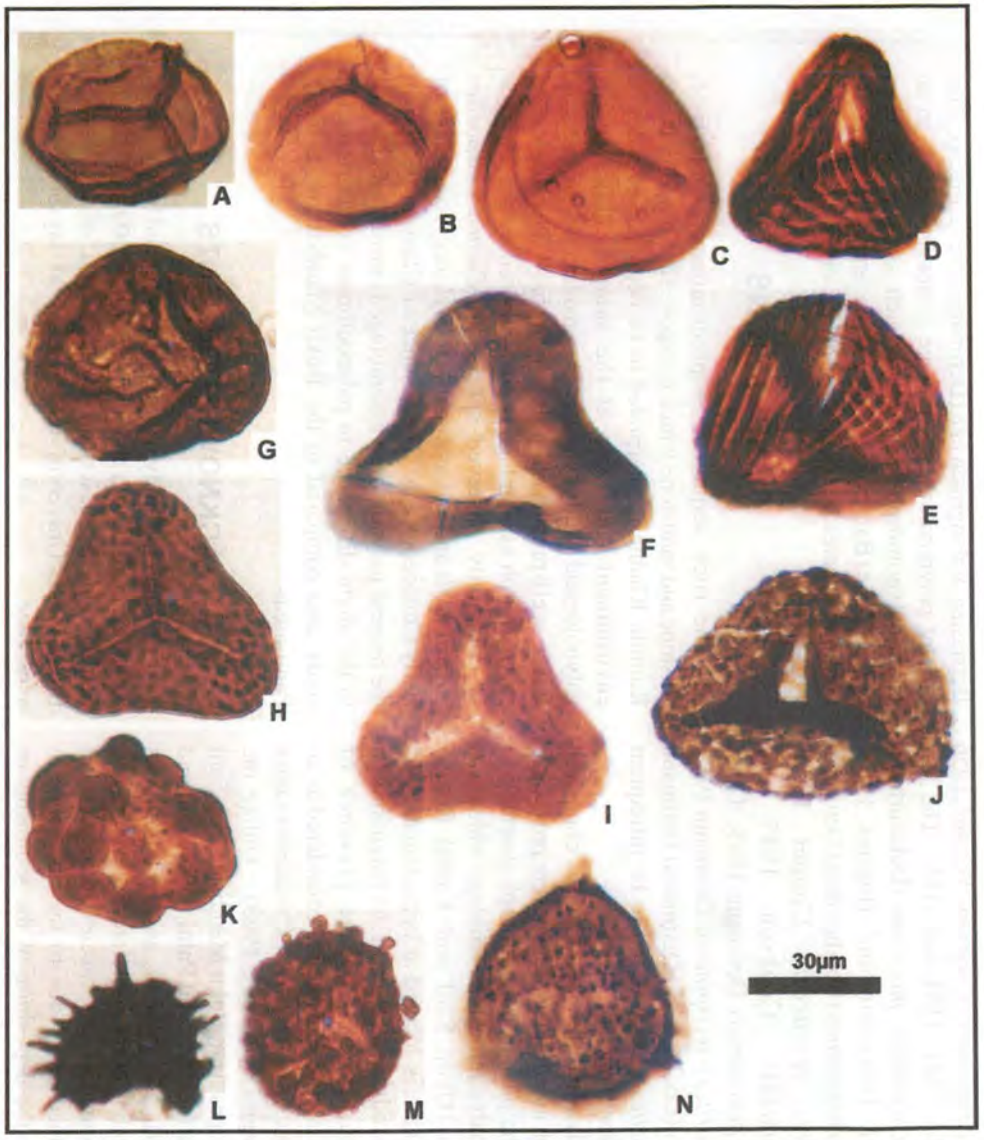

Figure 3. Selected palynomorphs from Kampung Tanah Runtuh, Kluang, Johor. Sample/slide number and England's finder or grid reference position are given in bracket. A & B — *Stereisporites antiquasporites* (Wilson and Webster) Dettmann 1963 (A:1139/3-142.9/46.8, B:1139/3-139.4/43.4) , C — *Dictyophyllidites pectinataeformis* (Bolkhovitina) Dettmann 1963 (1143/3-132.3/39.3), D & E — *Cicatricosisporites australiensis* (Cookson) Potonié 1956 (D:1143/3-141.6/43.2, E:1143/3-138.2/47.9), F — *Cyathidites australis* Couper 1953 (1156A/3-127.9/49.9), G — *Araucariacites australis* Cookson 1947 (1155A/1-P45/4), H & I — *Concavissimisporites crassatus* (Delcourt and Sprumont) Delcourt *et al.* 1963 (H:1154A/1-M42/4, I:1139/3-140.1/43.7), J — *Leptolepidites bossus* (Couper) Schulz 1967 (1141/3-139.6/29.8), K — *Leptolepidites major* Couper 1958 (1161/3-O30), L — *Tenellisporites* sp. (1139/1-C34/4), M — *Neoraistrickia* sp. (1156A-U33/2) and N — *Dictyotosporites filosus* Dettmann 1963 (1155/3-134.5/34.1).

Cicatricosisporites australiensis (Cookson) Potonié 1956 as observed in samples 1141, 1143 and 1155. The less common species are *Cyathidites punctatus* (Delcourt and Sprumont) Delcourt, Dettmann and Hughes 1963, *Dictyophyllidites pectinataeformis* (Bolkhovitina) Dettmann 1963, *Leptolepidites verrucatus* Couper 1953, *Araucariacites australis* Cookson 1947 and *Concavissimisporites penolaensis* Dettmann 1963. Other species such as *Pilosporites parvispinosus* Dettmann 1963, *Rouseisporites simplex* (Cookson and Dettmann) Dettmann 1963 and *Tennellisporites* sp. are found to be infrequent constituents in the assemblage.

The identified palynomorph assemblage is compared with other palynomorph assemblages which were previously recorded in Johor. The present palynomorph assemblage is comparable to the palynomorph assemblage which was reported from Paloh (Uyop Said and Kamal Roslan Mohammed, 1993) which is located at approximately 15 km to the north of the study area. Both of the palynomorph assemblages are characterised by the presence of *Cicatricosisporites australiensis* which is considered as an index palynomorph species of the Lower Cretaceous rather than Upper Jurassic age (Dettmann, 1963). Unlike the palynomorph assemblages from Bukit Mambai (Uyop Said and Shahfuddin Mustaffa, 1999) and Panti (Uyop Said and Che Aziz Ali, 2000), the present assemblage lacks *Classopolliss* spp. which is normally related to a warm and dry climate. The absence of this species in the present study could be explained either due to the difference in palaeoclimates during the deposition of the sediments or secondly because of the opacity of the specimens of *Classopollis* which might had been misidentified during examination under light microscope. If the difference in palaeoclimates based on the occurrence of *Classopollis* is considered as the most probable explanation, it seems that the study area was relatively cooler compared to the more drier and warmer climate at Bukit Mambai located approximately 50 km to the north and at Gunung Panti some 80 km to the south. The difference in palaeoclimates is also due to the difference in altitude. The generally rounded, thick-exined species of *Classopollis* are dark brown to black in colour, and consequently they were often not identifiable and left out during microscopic study. Based on the palynological study conducted at Bukit Mambai from which the *Classopollis* spp. were found to be the main constituent of the palynomorph assemblage, the samples had to be oxidised in different oxidation times in order to get an optimum colour of palynomorphs to be examined under light microscope. The shorter oxidation time is suitable for thin-exined palynomorphs and those with thick exines such as *Classopollis* need a longer oxidation time. This technique was also applied to some of the present samples, but they were found to be absent in *Classopollis* specimens.

Based on the common species of *Cicatricosisporites australiensis* and several other constituents, the present assemblage is assignable to the *Stylosus* Assemblages of Berriasian-Valanginian age (Dettmann, 1963) (Fig. 4). This present palynomorph assemblage is not assignable to an older palynomorph assemblage such as *Aequitriradites acusus* Zone (Backhouse, 1988) as the later is devoid of the common species of *Cicatricosporites australiensis*.

CONCLUSIONS

The rock sequence of predominantly mudstone, siltstone and sandstone which is exposed at Kampung Tanah Runtuh, Kluang is interpreted to be deposited in a fluvial environment and some of the samples collected for palynological study yielded a considerable numbers of fairly well-preserved palynomorphs. The identified palynomorph assemblage is characterised by the presence of commonly observed species of *Cicatricosisporites australiensis* and it is assignable to *Stylosus* Assemblage of Early Cretaceous age. The absence of *Classopollis* spp. in the present palynomorph assemblage is most probably due to the slight difference in palaeoclimate condition in the study area compared to the Bukit Mambai and Gunung Panti areas.

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REFERENCES

BACKHOUSE, J., 1988. Late Jurassic and Early Cretaceous palynology of the Perth Basin, Western Australia. *Bull. Geol. Surv. Western Australia, 135*, 1-233.

BASIR JASIN, AHMAD JANTAN AND TAN, T.H., 1989. Some Late Mesozoic flora from Keluang, Johor. *Sains Malaysiana 18*, 77-85.

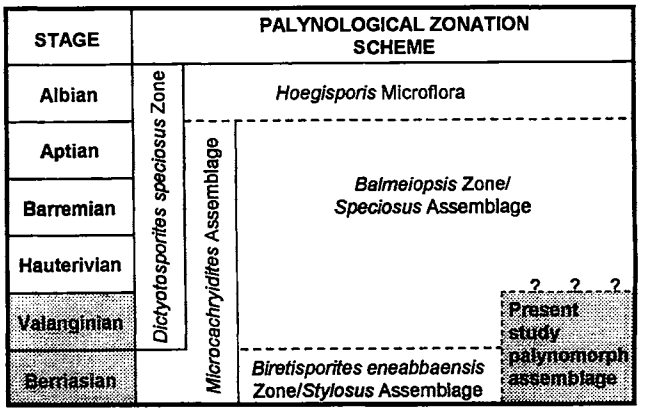

Figure 4. Cretaceous palynological zonation scheme (Dettmann, 1963 and Backhouse, 1988) and the proposed age of the rock sequence at Kampung Tanah Runtuh, Kluang.

DETTMANN, M.E., 1963. Upper Mesozoic microfloras from southeastern Australia. *Proc. Royal Soc. Victoria, 77*, 1-148.

JUHARI MAT AKHIR, 1979. *Geologi kawasan Gunung Lambak, Keluang, Johor.* Unpublished B.Sc. (Hons.) thesis, Department of Geology, Universiti Kebangsaan Malaysia.

KON'NO, E., 1967. Some younger Mesozoic plants from Malaya. *Geol. Palaeon. Southeast Asia 3*, 135-164.

KON'NO, E., 1968. Addition to some younger Mesozoic plants of Malaya. *Geol. Palaeon. Southeast Asia 4*, 139-155.

KON'NO, E. and Asama, K., 1975. Younger Mesozoic plants from Ulu Endau, Pahang, West Malaysia. *Geol. Palaeon. Southeast Asia 16*, 91-102.

LOH, C.K., 1980. *Geology of the Keluang area, sheet 124.* Geol. Surv. Malaysia Rep. for 1979, 142-146.

RASANUBARAI ASMAH RAHMAH ABDUL HAMID (*in prep.*). *Sedimentologi dan paleontologi di beberapa lokaliti terpilih sekitar Paloh dan Kluang, Johor.* Unpublished B.Sc. (Hons.) thesis, Geology Programme, School of Environmental and Natural Resources, Faculty of Science and Technology, Universiti Kebangsaan Malaysia.

ROSLI CHIK, 1989. *Geologi kawasan Keluang, Johor.* Unpublished B.Sc. (Hons.) thesis, Department of Geology, Universiti Kebangsaan Malaysia.

UYOP SAID AND KAMAL ROSLAN MOHAMED, 1993. Cretaceous spores from Paloh, Johor (Abstract). *Warta Geologi, 19(3)*, 115-116.

UYOP SAID AND SHAHFUDDIN MUSTAFA, 1999. A palynomorph assemblage from Bukit Mambai, Labis Johor. *Warta Geologi, 25(3)*, 131.

UYOP SAID AND CHE AZIZ ALI, 2000. On the palynomorph assemblage from the Panti Sandstone, Johor. *Proc. Geol. Soc. Malaysia Ann. Conf.*, 137-141.

WILLBOURN, E.S., 1928. The geology and mining industries of Johore. *J. Malay. Br. Asiat. Soc., 6(4).*

ZAITUL ZAHIRA GHAZALI, 1999. *Geologi dan paleontologi kawasan Paloh-Kluang, Johor Darul Takzim.* Unpublished B.Sc. (Hons.) thesis, Department of Geology, Universiti Kebangsaan Malaysia.

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