

A palynomorph assemblage from Bukit Mambai, Labis, Johor

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A well-exposed rock sequence at Bukit Mambai in the north of Labis was previously mapped as Jurassic-Cretaceous in age. The rock sequence dips in the north-west direction, and it comprises predominantly of fine to medium-grained sandstone, siltstone and shale. Several layers of the rock sequence are very rich in organic materials of dark grey to black in colour, and some of them can be found as parallel laminations in fine-grained sandstone layers. It is interpreted that, the rock sequence was deposited in a fluvial environment as indicated by the presence of commonly associated sedimentary structures of cross-bedding and ripple marks.

Out of twenty-eight samples which were systematically collected and processed for palynological study, seven samples yield some identifiable of fairly well-preserved palynomorphs. The remaining samples, however, are very rich in palynodebris and contain poorly-preserved palynomorphs of either badly corroded or are unable to be identified due to their opacity. After a considerable effort has been given during the sample preparation by applying several different oxidation times and or using different oxidising agents in order to yield correctly oxidised palynomorphs to be studied under a light microscope, most of the poorly-preserved specimens are ignored. Despite a majority of the samples examined contain poorly-preserved palynomorphs, this study is able to identify a palynomorph assemblage which can be utilised in interpreting the age of the rock sequence and the most probable climatic condition during which the sediments were deposited.

The present palynomorph assemblage comprises of *Classopollis* spp. and *Ephedripites* sp. as the most dominant constituents together with the less dominant ones such as *Cycadopites* sp., *Cyathidites* sp., *Todisporites minor* Couper, *Balmeisporites holodictyus* Cookson and Dettmann, *Klukisporites scaberis* Cookson and Dettmann, *Cicatricosisporites* sp. and *Dictyophyllidites* sp. Based on their size range and the nature of the tetrad mark, the commonly observed genus of *Classopollis* is assignable to three different species, namely *C. cf. classoides* (Pflug) Dettmann, *C. torosus* (Reissinger) Balme and *C. cf. vignollensis* Reyre, Kieser and Pujol. For example, *C. cf. classoides* can be distinguished from *C. torosus* by being larger in size and having a typical triangular shape of aperture, whilst the latter is normally smaller in size as well as its aperture with a distinct trilete-like structure in the middle. The genus of *Ephedripites* is also commonly found in the present samples and it can be recognised by its elliptical outline with a distinct spirally-arranged ridge-like ornamentation on the exine. Due to their scarcity, the other genera of *Cycadopites*, *Cyathidites*, *Cicatricosisporites* and *Dictyophyllidites* are not assigned to their respective species, but nevertheless, they show a close resemblance to the previously recorded genera from other areas. Some species can be recognised with certainty based on their typical ornamentation. *Balmeisporites holodictyus* is recognised by its reticulate pattern of ornamentation with some elevated muri at the equator. In comparison, this species shows some similarities to *Klukisporites scaberis*. However, the latter is ornamented by verrucae which do not exceed its equatorial outline. Only a single specimen of *Cicatricosisporites* sp. is observed in the present samples, and therefore, at this stage, it is not assigned to any particular species of this genus until more specimens acquired.

Based on the dominance of *Classopollis* spp. and *Ephedripites* sp., the rock sequence at Bukit Mambai is interpreted to be late Early Cretaceous in age. Although the former genus is also a common constituent in the older palynomorph assemblage, but the presence of the latter genus which is confined to the late Early Cretaceous supports the proposed age of the studied rock sequence. The abundance of *C. cf. classoides* in the present palynomorph assemblage is also recorded in Neocomian's assemblage but the younger assemblage is distinguished by the absence of other common species such as *Cicatricosisporites australis* and *Alisporites grandis*. Furthermore, the proposed age is also supported by the presence of *Balmeisporites holodictyus* which appeared for the first time in Aptian. The dominance of *Classopollis* spp. in the present samples indicates that the climate during which the sediments were deposited was warm and dry. As a result of the present palynological study, it enables a more specific age to be proposed for the rock sequence which was previously mapped as only Jurassic-Cretaceous in age.