

## Some Radiolarians from the bedded chert of the Kubang Pasu Formation

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**Abstract:** An assemblage of radiolarians were discovered from a chert sequence exposed at Bukit Binjal, Kedah. Eight taxa were recognized; *Entactinia variospina* (Won), *Entactinia? inaequoporosa* Won, *Callela hexatinia* Won, *Callela cf. parvispinosa* Won, *Treanosphaera hebes* Won, *Cubaxonium? octaedrospingosum* Won, *Duplexia? foremanae* (Ormiston & Lane) and *Duplexia parviperforata* Won. This assemblage indicates an age of late Tournaisian, Early Carboniferous. The chert was deposited on the outer continental shelf of a passive margin during the period of high siliceous productivity.

**Abstrak:** Satu himpunan radiolaria ditemui pada jujukan rijang yang tersingkap di Bukit Binjal, Kedah. Lapan taksa dikenalpasti; *Entactinia variospina* (Won), *Entactinia? inaequoporosa* Won, *Callela hexatinia* Won, *Callela cf. parvispinosa* Won, *Treanosphaera hebes* Won, *Cubaxonium? octaedrospingosum* Won, *Duplexia? foremanae* (Ormiston & Lane) dan *Duplexia arviperforata* Won. Himpunan ini menunjukkan usia Tournaisian akhir, Karbon Awal. Rijang ini telah diendapkan pada sekitaran pentas benua luar suatu pinggir pasif semasa produktiviti silika tinggi.

### INTRODUCTION

The Kubang Pasu Formation crops out in north and central Perlis and extends further south to the north and central Kedah. The formation was deposited in various environments. In Perlis, the Kubang Pasu Formation was deposited in a shallow marine continental shelf (Yap, 1991). The depositional environment was deeper towards Kedah (Basir Jasin, 1995, 1999). In Kedah, minor chert has been recognised at the lower part of the Kubang Pasu Formation.

Occurrence of chert in the Kubang Pasu Formation, has been reported by Jones (1981) and Basir Jasin (1995, 1999). The research on the chert has been carried out and Basir Jasin (1995) has reported the occurrence of two taxa of Early Carboniferous radiolarians from the bedded chert of the Kubang Pasu Formation. Recently, more samples of chert were collected from several chert outcrops exposed in Kedah and Perlis. Most of the cherts are crystallized and the radiolarians are destroyed.

### GEOLOGICAL SETTING

The Kubang Pasu Formation is well-exposed in northwest Kedah and Perlis. The base of the formation is exposed in Utan Aji and Wang Tangga in Perlis. The lower part consists of mudstone interbedded with thin sandstone. The top part comprises sandstone interbedded with mudstone which is exposed at the base of Bukit Temiang-Bukit Wang Pisang limestone ridge. The Kubang Pasu Formation is conformably overlain by the Chuping Limestone. In Kedah, the Kubang Pasu Formation consists of three rock sequences i.e. bedded chert, interbedded sandstone and mudstone, and thickly massive sandstone.

The Kubang Pasu Formation conformably overlies the Mahang Formation (Hutchison, 1989). It is conformably overlain by the Semanggol Formation. In the Pokok Sena area, the contact between Kubang Pasu and Mahang is a fault contact. In some places, the Kubang Pasu Formation is overtrusted by the Mahang Formation (Zaiton Harun and Basir Jasin, 1999, 2000).

### OCCURRENCE OF RADIOLARIAN CHERT

Radiolarian chert is exposed in several earth quarries at Guar Kepayang, Bukit Telaga Jatoh, Bukit Kamelong, Kampung Belukar, Ladang Cheong Chong Kaw, Kampung Panchor, Bukit Pinang, Bukit Inas, and Bukit Binjal, in north Kedah and Pauh in Perlis (Fig. 1). The chert sequence is composed of rhythmically alternating layers of chert and siliceous mudstone (Fig. 2). The chert is known as ribbon chert. The thickness of the chert sequence varies from 3 m to 11 m. The thickness of individual chert layer varies from 1 cm to 10 cm. The chert is hard and the colour of chert varies from light grey to dark grey but in some places it is black and contains minute pyrite crystals. It is stratigraphically located at the base of the Kubang Pasu Formation (Basir Jasin, 1995, 1999).

### RADIOLARIANS AND GEOLOGICAL AGE

Basir Jasin (1995) identified only two taxa from the chert sequence exposed at Kampung Kamelong. Other chert samples did not yield well-preserved radiolarians. Recently, more chert samples were collected from Guar Kepayang, Bukit Inas and Bukit Binjal, Kedah. Chert from Guar

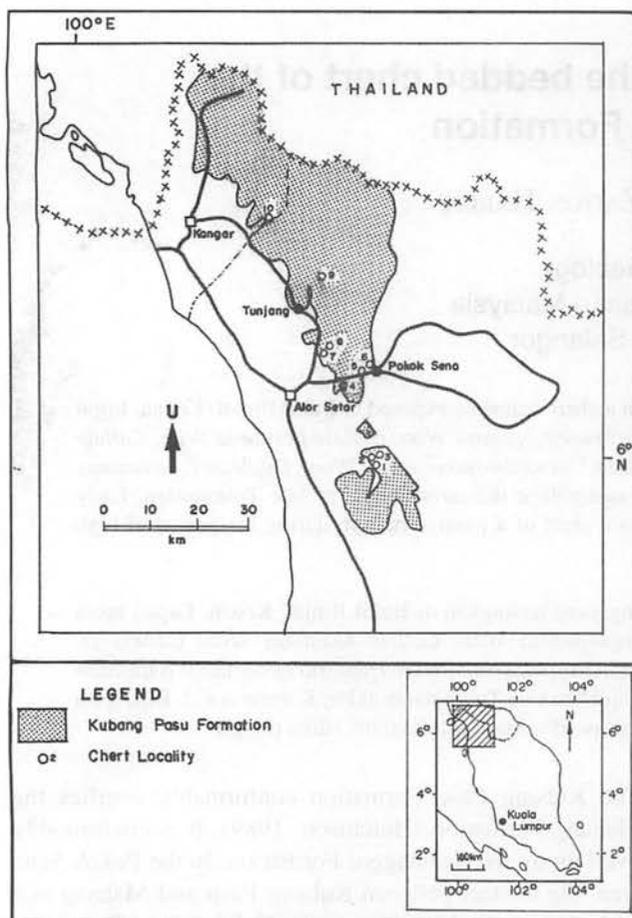


Figure 1. Distribution of radiolarian chert in Kedah and Perlis. 1: Guar Kepayang; 2: Bukit Telaga Jatoh; 3: Bukit Kamelung; 4: Kampung Belukar; 5: Ladang Cheong Chong Kaw; 6: Kampung Panchor; 7: Bukit Pinang; 8: Bukit Inas; 9: Bukit Binjal and 10: Pauh.

Kepayang yielded some *Entactinia variospina*. Some fairly well-preserved radiolarians were retrieved from several chert samples exposed at Bukit Binjal. All taxa belong to spumellarian type. Nine radiolarian species were identified (Plates 1 and 2):

- Entactinia variospina* (Won)
- Entactinia unispina* Won
- Entactinia? inaequoporosa* Won
- Callela hexatinia* Won
- Callela cf. parvispinosa* Won
- Treanosphaera hebes* Won
- Cubaxonium? octaedrospingosum* Won
- Duplexia? foremanae* (Ormiston & Lane)
- Duplexia parviporata* Won

The most common species is *Entactinia variospina* which is represented by the forms that have variable number of spines; two, three, four, and five spines (Plate 1). These forms were found in the *Albaillella pseudoparadoxa* Zone, Tournaisian, in Europe (Won, 1998). The occurrence of stratigraphically short ranging species *Cubaxonium? octaedrospingosum*, *Callela hexatinia*,

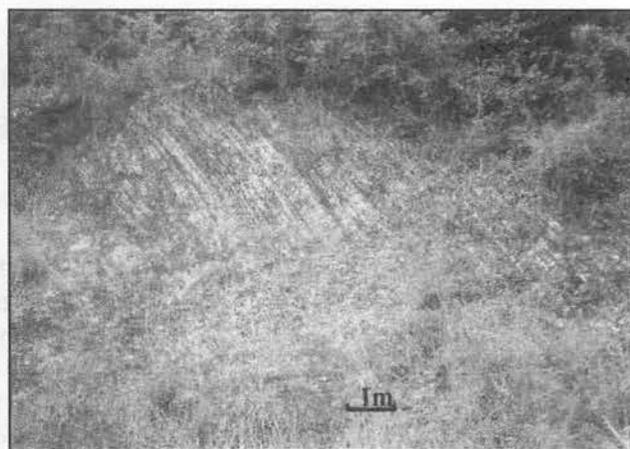


Figure 2. Outcrop of Bukit Binjal showing nature of the bedded chert.

*Entactinia inaequoporosa*, and *Duplexia parviporata* indicates that the assemblage belongs to *Albaillella indensis-rotata* Zone of Won (1998). This assemblage indicates an age of late Tournaisian, Early Carboniferous (Fig. 3). The zonal markers *Albaillella indensis* and *Eostylodicta rota* are absent in the present material.

In Peninsular Malaysia, a similar age radiolarian assemblage was reported from the Langkap chert. The Langkap chert yielded 34 radiolarian taxa belonging to *Albaillella deflandrei* Zone which is slightly older than the *Albaillella indensis-rotata* Zone. Some genera such as, *Albaillella*, *Archocyrtium*, *Ceratoikiscum* and *Cystisphaeractinium* which present in the Langkap chert are absent in the chert of the Kubang Pasu Formation. The difference in radiolarian composition reflects the differences in palaeogeography and palaeoenvironment.

During the Carboniferous time, this part of the Peninsular Malaysia was a part of the Sibumasu block which was attached to Gondwanaland. The Kubang Pasu chert was probably deposited on a continental shelf of Gondwanaland and the Langkap chert was deposited in a deeper marine environment.

## TECTONIC SETTING AND DEPOSITIONAL ENVIRONMENT OF THE CHERT

The chert sequence of the Kubang Pasu Formation is associated with mudstone. The chert is dark grey in colour, rhythmically interbeds with mudstone. This rock association is a continental margin chert association (Jones and Murchey, 1986). The chert deposited near a continent is considered as marginal basin deposits (Karl, 1989).

The presence of bedded chert in the Kubang Pasu Formation and the Langkap chert indicates that there was a high productivity of radiolarians during late Tournaisian, Early Carboniferous. The absence of volcanic material in the chert sequence suggests that the sequence was probably

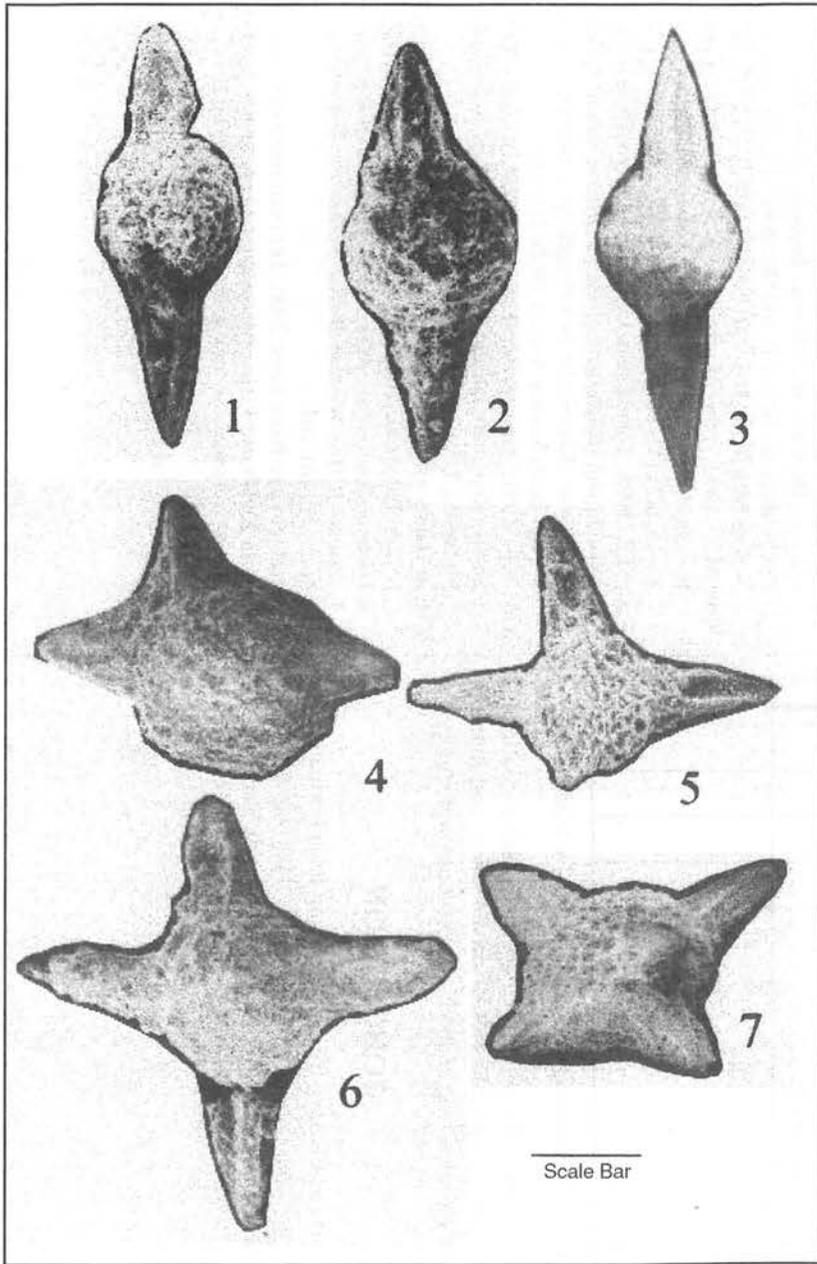


Plate 1. 1, 2, 3, 4, 5, 6, 7, *Entactinia variospina* Won with variable number of spines. 1, 2, 3, *E. variospina* with two polar spines (100 $\mu$ m); 4 & 5. *E. variospina* with 3 spines (100 $\mu$ m); 6. *E. variospina* with 4 spines (80 $\mu$ m); 7. *E. variospina* with 5 spines (100 $\mu$ m). (Scale bar in  $\mu$ m is indicated in the parenthesis)

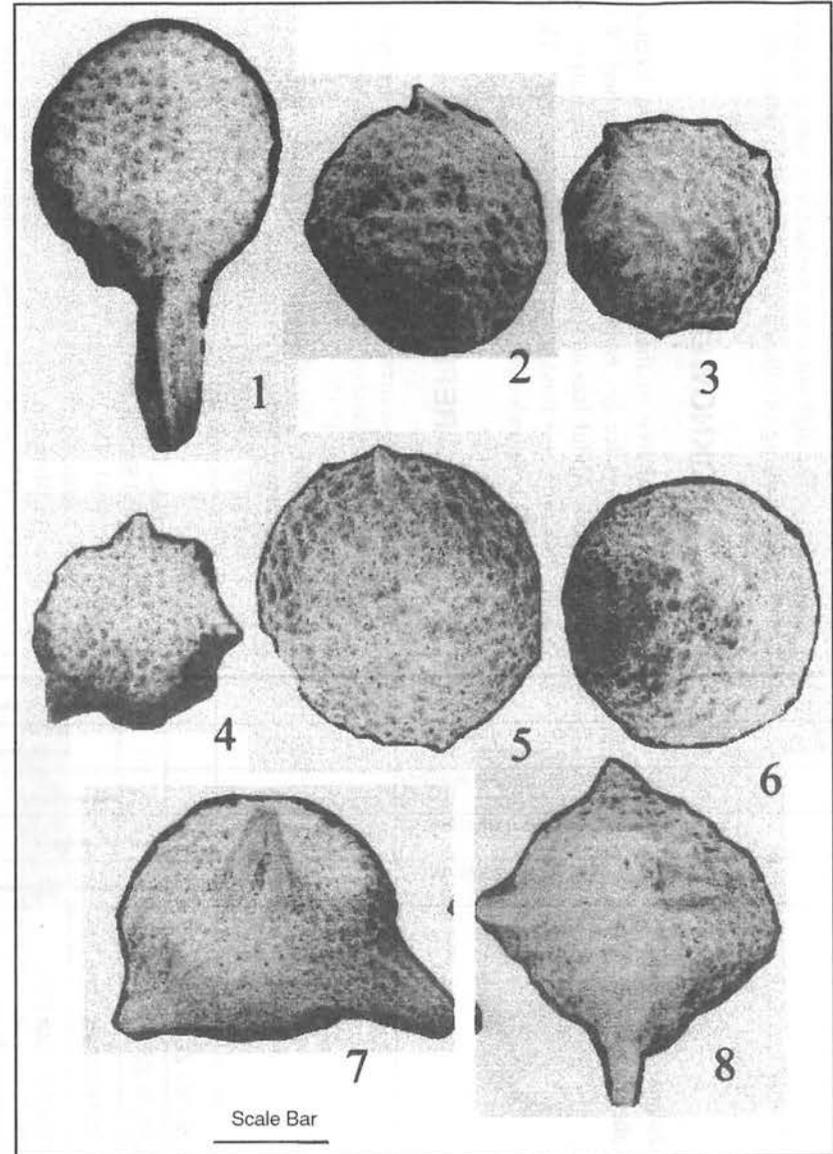


Plate 2. 1. *Entactinia unispina* Won (100 $\mu$ m); 2. *Entactinia? inaequopora* Won (100 $\mu$ m); 3. *Callela hexatina* Won (100 $\mu$ m); 4. *Callela cf. parvispinosa* Won (100 $\mu$ m); 5. *Duplexia? foremanae* (Ormiston & Lane) (80 $\mu$ m); 6. *Duplexia parviporata* Won (80 $\mu$ m); 7. *Treanosphaera hebes* Won (100 $\mu$ m); and 8. *Cubaxonium? octaedrospongiosum* Won (100 $\mu$ m). (Scale bar in  $\mu$ m is indicated in the parenthesis)

