Lower Triassic (Smithian) conodonts from northwest Pahang Peninsular Malaysia

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ABSTRACT
Lower Triassic conodonts are reported from limestones, interpreted as a possible submarine slump, exposed along the new Kuala Lipis - Gua Musang highway, northwest Pahang, Peninsular Malaysia. The co-occurrence of Neospathodus triangularis (Bender), Platysvillosus costatus (Staesch), Neospathodus dieneri Sweet and Platyvillosus hamadai Koike in the fauna indicates a Scythian (late Smithian) age. Platyvillosus hamadai is unknown from the Peri-Gondwana province and its occurrence in the fauna supports a pre-Early Triassic rifting of the Malay Peninsula from Gondwana. J. Micropalaeont. 11 (1): 13-19, June 1992.

INTRODUCTION
The Triassic sedimentary rocks of Peninsular Malaysia are distributed in three sedimentary regions that are characterised by distinctive sedimentary facies (Fig. 1). In the western part of the Peninsula, on the Sibumasu terrane, two regions are recognised, an early to late Triassic carbonate platform in the northwest (Chuping and Kodiang Limestones), which extends into Thailand and Sumatra, and a deep-water basin margin which also extends into central Sumatra (Metcalfe 1989a, 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). East of the Bentong-Raub suture, these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1981). The Triassic sedimentary rocks of Peninsular Malaysia are distributed into distinctive sedimentary facies (Fig. 1). In the western part of the Peninsula, on the Sibumasu terrane, two regions are recognised, an early to late Triassic carbonate platform in the northwest (Chuping and Kodiang Limestones), which extends into Thailand and Sumatra, and a deep-water basin margin which also extends into central Sumatra (Metcalfe 1989a, 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). East of the Bentong-Raub suture, these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a). Both of these Triassic sequences are essentially devoid of volcanic components (Metcalfe 1990a).
Fig. 1. Map showing the distribution of the three Triassic sedimentary regions in Peninsular Malaysia, the location of the study area and place names mentioned in the text. Inset map shows the principal tectonic blocks of the region: 1, South China; 2, Indochina; 3, East Malaya; 4, Sibumasu; 5, Mount Victoria Land; 6, S.W. Borneo; 7, Semitau; 8, Hainanese terranes.
Malaysian Triassic conodonts

Fig. 2. Sketch map showing the location of the conodont locality A. For general location see figure 1.

and Russia (Buyri, 1979) but it has also been reported from the Dienerian of the Himalayas (Goel, 1977) and China (Tian et al., 1983) and from the Smithian of Kedah, Peninsular Malaysia (Koike, 1982) and Japan (Koike, 1988). This species therefore ranges from Dienerian to early Spathian. *Platyvillosus hamadai* was first described from the Smithian in Kedah, Malaysia (Koike, 1982) and has since been reported from the Smithian of Japan (Koike, 1988). Specimens described as *Platyvillosus latigatus* by Tian et al. (1983) were considered to belong to *Platyvillosus hamadai* by Koike (1988) and occur in Dienerian strata. *Platyvillosus hamadai* therefore ranges from Dienerian to Smithian. From the above discussion, the co-occurrence of *N. triangularis*, *N. dieneri*, *P. costatus*, and *P. hamadai* would indicate a late Smithian age for the limestones at locality A.

**SYSTEMATIC NOTES**

*Neospathodus dieneri* Sweet, 1970

(Pl. 1, figs 1-5)

For synonymy and description see Sweet (1970), Ziegler (1973) & Matsuda (1982)

**Remarks.** The specimens reported in this paper conform well to descriptions given by Sweet (1970) and Matsuda (1982).

*Neospathodus triangularis* (Bender, 1967)

(Pl. 1, figs 6, 7)

For synonymy and description see Bender (1967), Ziegler (1973), Matsuda (1983) and Perri (1985)

**Remarks.** This species is characterised by having a short, high blade and a triangular or heart-shaped basal cavity. The species differs from the similar *N. homeri* (Bender) by the broader basal cavity and shorter blade of *N. triangularis*.

*Platyvillosus costatus* (Staesche, 1964)

(Pl. 1, fig. 8)

For synonymy and description see Staesche (1964), Goel (1977) and Koike (1988)

**Remarks.** The specimens reported here represent the morphotype (Form M) of Koike (1988) with only

Table 1. Conodont elements recorded from locality A
(All samples were 2kg in weight)

| SPECIES | 1013 | 1014 | 1015 | 1016 |
|---------|------|------|------|------|
| *Cypridodella magnidentata* (Tatge), Sb. | 1    |      |      |      |
| *Cypridodella muelleri* (Tatge), Sb. | 1    | 1    |      |      |
| *Cypridodella sp.*, Sa. | 1    |      |      |      |
| *Cypridodella sp.*, Sb. | 1    | 1    | 1    |      |
| *Cypridodella sp.*, Sc. | 1    |      |      |      |
| *Cypridodella sp.*, Pb. | 1    | 1    | 1    |      |
| *Ellisonia bogschi* (Kozur & Mostler), Pa. | 1    |      |      |      |
| *Ellisonia nevoadensis* (Muller), Pa. | 1    | 1    |      |      |
| *Ellisonia triassica* (Muller), M. | 1    |      |      |      |
| *Ellisonia sp.*, M. | 1    |      |      |      |
| *Furnishius sp.*, Sb? | 1    |      |      |      |
| *Neospathodus dieneri* Sweet, Pa. | 23   | 10   | 53   |      |
| *Neospathodus triangularis* (Bender), Pa. | 1    | 4    | 23   | 1    |
| *Neospathodus sp.*, Pa. | 6    | 1    | 2    |      |
| *Platyvillosus costatus* (Staesch), Pa. | 2    |      |      |      |
| *Platyvillosus hamadai* Koike, Pa. | 1    |      |      |      |
| *Xaniognathus saginatus* (Huckriede), Pa. | 1    | 1    | 2    |      |
| *Xaniognathus sp.*, Pa. | 2    |      |      |      |
| Unidentifiable elements | 5    | 1    | 9    | 4    |
| TOTAL | 11   | 50   | 45   | 78   |

All the conodont elements recovered exhibit a colour alteration index (CAI) of 5 indicating that they have been heated to between 300 and 480 degrees centigrade (Epstein et al., 1977). They do not however show any gross distortions as seen in regionally metamorphosed rocks (Rejebian et al., 1987) and are in general well preserved apart from some surface pitting (plates 1 and 2). This suggests that they have been subject to thermal heating due to burial or proximity to a heat source. It is unlikely that there has ever been sufficient sedimentary cover to produce a CAI of 5 by burial (even with high geothermal gradients) and this is probably the result of contact thermal heating by the nearby Early Jurassic (204 Ma) Bukit Tujoh granite (Fig 2).
weakly developed ridges on the lateral margins of the upper surface.

*Platyvillosus hamadai* Koike, 1982

(Pl. 1, fig. 9)

For synonymy and description see Koike (1982, 1988)

**Remarks.** This species is distinguishable from *P. costatus* and *P. aspenatus* Clark, Sincavage and Stone by its lack of nodes or ridges on the upper surface of the platform.

**DISCUSSION**

Olistostromes of Upper Permian or Lower Triassic age and Lower Triassic limestone conglomerates have been identified in the Raub area (Chakraborty & Metcalfe, 1987; Metcalfe, 1989b). The limestone conglomerates were interpreted as possible fault scarps by Metcalfe (1989b) and the limestone bodies and blocks exposed in the road cutting here described may also be a large slump deposit associated with a steep palaeoslope (fault scarps). The presence of extensive olistostromes and slump deposits along the western margin of the central basin of the Malay Peninsula suggests active tectonics during the early Triassic. The tectonic setting of the Central Basin of the Malay Peninsula is still contentious with various models ranging from an aborted rift (Tan, 1976, 1984) to back-arc basin (Hutchison, 1973) to fore-arc basin (Sengor 1986). The wide ranging tectonic models reflect the paucity of stratigraphical, palaeontological, sedimentological and geochemical data for the basin. Recent work in Thailand suggests that the Triassic basins of north Thailand (mainly half grabens) probably opened as a result of post-orogenic collapse following the late Permian-early Triassic orogeny (Cooper et al., 1989). There was clearly active tectonics taking place in the Malay Peninsula during the Early Triassic which produced olistostromes and limestone conglomerates regarded as fault scarps. The Lower Triassic olistostromes in the Raub-Bentong area have been interpreted as part of the Bentong-Raub Suture by Tjia (1989) and related to eastwards subduction of the palaeotethys beneath East Malaya.

Much recent debate has centred on the timing of the suturing of Sibumasu to Indochina/East Malaya along the Uttarakir-Nan and Bentong-Raub sutures with various suturing ages proposed including Late Triassic, Late Permian and Early Triassic. Some authors (Audley-Charles, 1988; Audley-Charles et al., 1988) have considered that the Malay Peninsula remained part of eastern Gondwana until the Middle Jurassic.

The fauna reported in this paper contains the species *Platyvillosus hamadai* which is restricted to the early Triassic northern hemisphere "Tethys Province" and which does not occur in the contemporaneous southern hemisphere "Peri-Gondwana Province" (Matsuda, 1985). This suggests that the Malay Peninsula probably rifted from Gondwana in the Permian and was in low northern palaeolatitudes by the early Triassic as indicated by the palaeomagnetic data (Metcalfe, 1990c).

The texturally well preserved conodonts from locality A (plates 1 and 2) suggest that they have not been involved in regional metamorphism which would imply that any collisional orogeny that occurred during the suturing of Sibumasu to East Malaya must have been pre-Smithian in age.

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Explanation of Plate 2

Smithian conodonts from Pahang, Peninsular Malaysia.

Fig.1. Cypridodella magnidentata (Tatge), Sb element, lateral view, specimen 1015/4.
Fig.2. Cypridodella muelleri (Tatge), Sb element, lateral view, specimen 1016/4.
Figs.3-6. Cypridodella sp. Posterior views. Fig.3. Pb element, specimen 1016/5. Fig. 4. Sc element, specimen 1013/3. Fig. 5. Sb element, specimen 1013/4. Fig. 6. Sa element, specimen 1014/2.
Fig.7. Ellisionia triassica (Muller), M element, posterior view, specimen 1015/5.
Fig.8. Ellisionia nevadeiisis (Muller), Pa element, lateral view, specimen 1016/6.
Fig.9. Ellisionia bogchi (Kozur & Mostler), Pa element, lateral view, specimen 1015/6.
Fig.10. Ellisionia sp. M element, posterior view, specimen 1016/7.
Fig.11. Furnishiius sp., Sb7 element, lateral view, specimen 1016/8.
Fig.12. Xaniognathus saginatus (Huckriede), Pa element, lateral view, specimen 1015/7.
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