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A review of Lower and Middle Palaeozoic biostratigraphy in west peninsular Malaysia and southern Thailand in its context within the Sibumasu Terrane

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Abstract

Fossils from the Cambrian to Devonian rocks of southern Thailand, the Langkawi Islands, mainland Kedah, Perlis, north Perak and central West Peninsular Malaysia are listed and reviewed, and their stratigraphy and correlation reassessed. The hitherto anomalous record of the trilobite *Dalmanitina* from Malaysia is reviewed and found to be of latest Ordovician (Hirnantian) age, rather than Lower Silurian age as previously reported, and is considered a probable synonym of the widespread *Mucronaspis mucronata*. A new stratigraphical nomenclature is erected for part of the Langkawi, mainland Kedah and Perlis area successions, in which the term Setul Limestone (which stretched from the Ordovician to the Devonian) is abandoned and replaced by the Middle Ordovician Kaki Bukit Limestone, the late Ordovician and early Silurian Tanjong Dendang Formation, the Silurian Mempelam Limestone, and the early Devonian Timah Tasoh Formation, all underlying the paraconformity with the late Devonian Langgun Red Beds. There was a single depositional basin in the generally shallow-water and cratonic areas of southern Thailand, Langkawi, and mainland Kedah and Perlis, in contrast to the deeper-water basin of north Perak. Only Silurian rocks are dated with certainty within another basin in central West Malaysia, near Kuala Lumpur, which were also cratonic and shallow-water, although to the east in west Pahang there are basal Devonian deeper-water sediments with graptolites. The area is reviewed in its position within the Sibumasu Terrane, which, in the Palaeozoic, also included central and northern Thailand, Burma (Myanmar) and southwest China (part of Yunnan Province).

Keywords: Lower Palaeozoic; Devonian; Malaysia; Thailand; Sibumasu; Brachiopods; Trilobites

1. Introduction

During the Lower Palaeozoic, world geography was dominated by the vast palaeocontinent of Gondwana. Around this lay a collage of much smaller, but nevertheless substantial peri-Gondwanan terranes (Cocks and Fortey, 1988; Cocks and Torsvik, 2002; Fortey and Cocks, 2003), which varied greatly both in their physical and faunal links with the main continent and with each other at various times. One of these was the Sibumasu (sometimes termed Shan-Thai) Terrane (Fig. 1), which extended from Burma (Myanmar) and south-west China in the north to Sumatra in the south. Sibumasu is bounded to the east by the Uttaradit-Nan to Raub-Bentong suture, which separates Sibumasu from the adjacent Annamia (or Indochina) Terrane, whose Lower and Middle Palaeozoic faunas and stratigraphy are quite different. To the west, Sibumasu is mostly bounded today by the Andaman Sea, apart from the suture which lies to the west of the Shan States in Burma. In the centre of the terrane lay southern Thailand and western Peninsular Malaysia, and from these areas a large variety of rocks and fossils have been found and described during the past century. However, several of these findings have been published in ways that are not easy to integrate with

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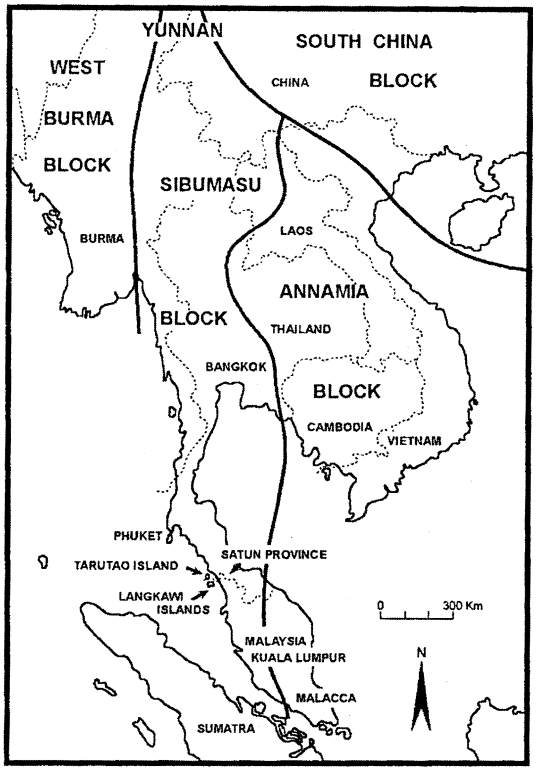

Fig. 1. Map of south-eastern Asia, showing the modern boundaries of Sibumasu and neighbouring Palaeozoic terranes.

the larger picture, and are often available only in disparate and sometimes difficult-to-locate publications, and it is the purpose of this paper to place the various published geological dates and faunas accurately in relation to each other. The other chief objective is to revise the stratigraphy and correlation within both southern Thailand and northern Malaysia, and to reassess the area's position within the wider context of the whole of the Sibumasu Terrane.

All the rocks described in this paper are underlain by, faulted against, or often metamorphosed by, the so-called Main Range Batholith, a series of granites which have been radiometrically dated at 198–220 Ma (Late Triassic to Early Jurassic) ages (Hutchison, 1996), and which form the spine of the modern Thai-West Malaysian peninsula (Fig. 2). These subsequent geological events have distorted the Lower Palaeozoic rocks in such a way that it is not possible to see the contemporary geography, or what shape the basin or basins in which the rocks were deposited would have been. All that can be stated with certainty is that the Lower Palaeozoic rocks now lying in the northwestern part of the area are shallow-water cratonic sediments, mainly limestones, in contrast to the rocks to their southeast, which were deposited in deeper-water basins, which therefore probably lay on the margins of the old terrane in Palaeozoic times. South of these areas, near the federal capital of Kuala Lumpur, there are further massive limestones, but only of Silurian age, which were probably deposited in a separate basin.

2. Stratigraphy

Because the rocks described in this account lie today in two different countries, Malaysia and Thailand, there has been some tendency to treat them separately; for example, the substantial and impressive memoir by Jones (1981) deals only with northern West Peninsular Malaysia. However, Hamada et al. (1975) published a summary up to that time of the formations and fossils of both Thailand and Malaya (as the country was previously termed). Correlation of the Ordovician was published by Wongwanich et al. (1983) and the Silurian by Berry and Boucot (1972), and two of us have also published a preliminary review of the Sibumasu Terrane in the Ordovician (Fortey and Cocks, 1998), but since then the three authors have together undertaken field work in the area, which has enabled further parts of the jigsaw to fall into place over a wider stratigraphical interval, from the Cambrian to Devonian, within western Peninsular Malaysia and southern Thailand.

The region can be divided into five areas (Figs. 1 and 2): (1) southern Thailand; (2) the Langkawi Islands of Kedah State (Fig. 3); (3) mainland Kedah and Perlis; (4) north Perak; and (5) the central West Malaysian area around Kuala Lumpur, and these will be considered in turn. The late Cambrian to early Carboniferous stratigraphical sequences for each of the areas is shown in Fig. 4. In addition, Fig. 4 shows the stratigraphical positions of some of the many faunas which have been described, and these are numbered (e.g. Locality 1) in the running text below and the geographical positions of most of them are shown on Figs. 2, 3. Although a few summaries have been published for some fossil groups, such as the trilobites (Kobayashi and Hamada, 1984) and brachiopods (Hamada, 1984), none have proved to be comprehensive since the early review of Malaysian fossils by Jones et al. (1966). The opportunity is taken here to figure or refigure (Figs. 5, 6) a few key fossils from some of the beds.

3. Southern Thailand (Fig. 4, Column 1)

The Lower Palaeozoic rocks considered here all lie within Satun Province (Fig. 2) and were summarised some time ago by Wongwanich and Burrett (1983). On the mainland the Cambrian is poorly exposed, but on Tarutao Island, which is near the west coast of Thailand and within sight of the Langkawi Islands of Malaysia, there is a substantial series of Cambrian rocks (Lee, 1983). There the local base rises from the sea, and above it the Tarutao Formation is divided into three members, the lower (more than 450 m thick) of thinly bedded micaceous mudstones, with minor siltstones and cross-bedded sandstones, the middle (1950 m thick) of quartzites and sandstones with several beds of acid tuffs and tuffaceous mudstones, and the upper (575 m thick) of fine sandstones and clays with