BULLETIN No. 1

**Geological Society of Malaysia**

**February 1968, pp. 17 – 22**

# The Permian System In Malaya

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**Abstract:** Shallow marine limestones, shales and pyroclastics represent a probably complete Permian sequence in Malaya, although individual outcrops show only fragments of it. This sequence is here divided into Lower and Upper Series, the successive faunas of which are related to those of other parts of the Tethyan region. Correlation is effected mainly by the fusulinacean foraminifera.

## GENERAL CHARACTER OF THE PERMIAN SYSTEM IN MALAYA

Rocks belonging to the Permian System are widespread in Malaya and have been recorded from all states except Selangor, Negri Sembilan and Malacca. However the known outcrops are all relatively small in size and are isolated from each other by areas poorly known stratigraphically (fig. 1).

The Permian rocks are typically limestones, shales, tuffaceous shales, and acid to intermediate pyroclastics. The largest limestone formation is the Chuping Limestone, which is about 4,000 ft thick in the Langkawi Islands but thins to about 2,000 ft in central Perlis and, when traced southward into Kedah, lenses out and is replaced by sandstones and shales (Jones, in manuscript). Pyroclastic deposits appear to be absent in the west of Malaya but are widespread within a belt running along the axis of the Malay Peninsula. Coarse clastic sediments form thick beds in the Lower Permian of Perlis but are elsewhere uncommon and usually restricted to thin beds intercalated with shale and limestone. Marine fossils are common in areas where the sediments have escaped metamorphism. They belong to the Tethyan fauna and closely resemble fossils from the Permian of the Salt Range, Sumatra, Indochina, south China and Japan. The rock types and their faunas suggest that, in Permian times, Malaya was occupied by a warm sea which had volcanic islands but was some distance from any large land area. The limestones frequently abound in calcareous algae, indicating extensive shoal areas probably less than 250 ft deep.

Granites of approximately Upper Permian age have been dated from Langkawi, the Kinta Valley, Kemaman and Sungei Lembing in Pahang (Anon. 1966), and also from south Johore and Singapore (Geological Survey of West Malaysia, unpublished communication). Thus towards the end of the Permian some parts of the area may have been uplifted and subjected to earth movements related to these granite intrusions.

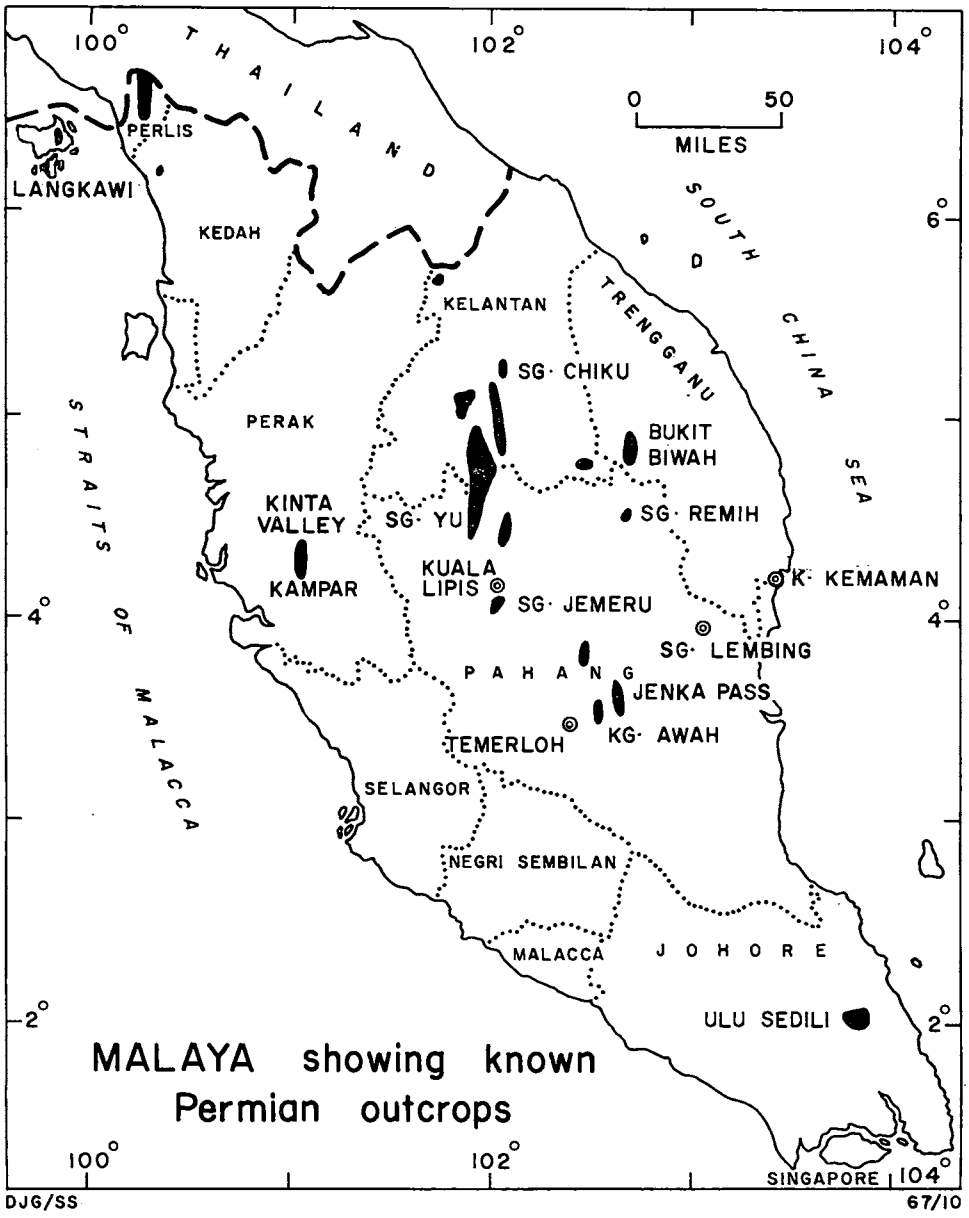


Fig. 1. Map of Malaya showing known Permian outcrops.

## BIOSTRATIGRAPHIC SUBDIVISION OF THE PERMIAN SYSTEM

To compare the Permian rocks of Malaya with better known Permian sequences in other parts of the world it is necessary to use standard biostratigraphic units (fig. 2). The most useful fossils on which to base this biostratigraphy are the fusulinacean foraminifera and the ammonoids. Other fossil groups may be used locally but are less reliable for regional correlation. In the Malayan Permian, fusulines are abundant in many formations, although they have not been discovered in the lowest or the highest beds; ammonoids are uncommon. The biostratigraphic subdivisions of the Permian may be grouped into a Lower and an Upper Series (Likarev, 1961). This precludes the use of the 'Middle Permian' which, although often useful, has controversial upper and lower boundaries.

### The Lower Permian of Malaya

The base of the Permian System is now generally defined by the occurrence of the fusulinid genus *Pseudoschwagerina*. The Pseudoschwagerina zone may be considered as the lower part of the Lower Permian, equivalent to the Wolfcampian in North America and the Sakmarian in the U.S.S.R. *Pseudoschwagerina* is known from Sumatra and the Rat Buri Limestone of Thailand, but has not been found in Malaya. However, west of Kampar in the Kinta Valley, a limestone sequence ranging from pre-Middle Devonian to Permian has been recently discovered (Suntharalingam, 1968). Here the Nam Loong beds contain a rich brachiopod and polyzoan fauna which has not yet been fully appraised but includes several productid and spiriferid genera typical of the 'Permo-Carboniferous' or Sakmarian of European Russia. The Sakmarian is also probably represented in Langkawi and Perlis by the upper part of a sequence of poorly fossiliferous sandstones, siltstones and shales conformably underlying the Chuping Limestone.

The upper part of the Lower Permian, characterized in Southeast Asia by the fusulinacean genera *Pseudofusulina, Parafusulina,* and *Misellina,* occurs widely in Malaya and is considered equivalent to the Leonardian of North America and to the Artinskian and Kungurian of the U.S.S.R. It is represented in Langkawi and Perlis by the lower part of the Chuping Limestone. In Perlis the basal calcareous sandstone member of this formation contains *Pseudofusulina* (Newton, 1926). The corals *Sinopora dendroidea* (Yoh) and *Caninia cf. liangshanensis* Huang are common in the Chuping Limestone and are known also from the Chihsia Limestone of south China. The polyzoa from Pulau Jong, Langkawi, described by Sakagami (1963) are related to those from the Middle Productus Limestone of the Salt Range and from the Chihsia Limestone. A fuller account of the fauna is given in Jones, *et al.* (1966)

In the Kinta Valley, the H.S. Lee beds overlying the Sakmarian Nam Loong beds may be correlated with the Chuping Limestone. They contain *Pseudofusulina Kraffti* (Schellwien), *Misellina claudiae* (Deprat), waagenophyllid corals, and a rich molluscan fauna dominated by gastropods and including the goniatites *Adrianites* and *Stacheoceras*. Other limestones of approximately the same age are known from Bukit Biwah in Trengganu and Ulu Sedili in Johore. These are metamorphosed and the fauna is less well presedved. *Parafusulina* and waagenophyllid corals are recorded from Bukit Biwah and suggest a correlation with the Chihsia Limestone (Jones, *et al.*, 1966).

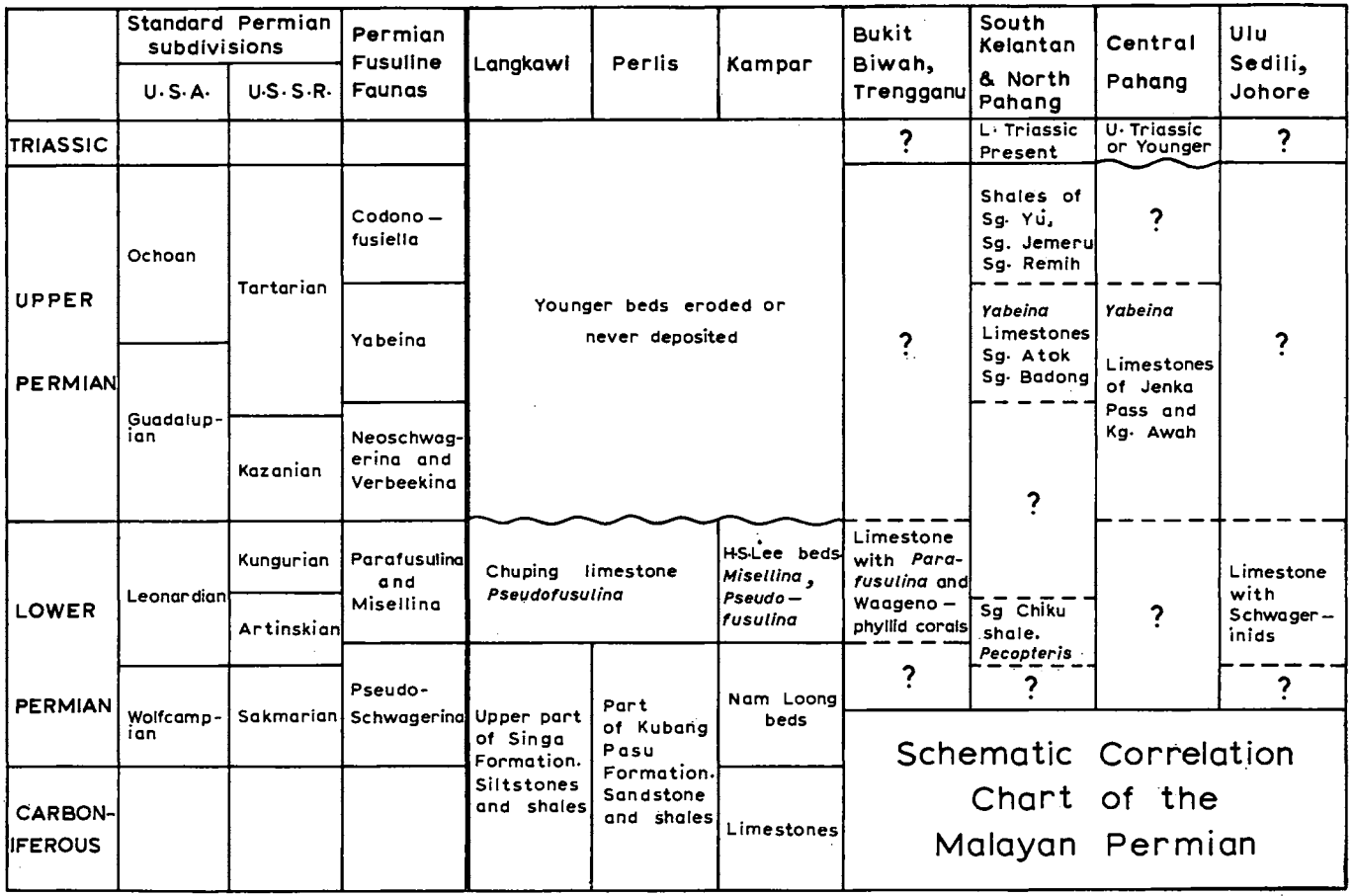


Fig. 2. Schematic correlation chart of the Malayan Permian.

A fern-like frond from shale exposed in the Sungei Chiku, Kelantan, was described by Edwards (1926) as *Pecopteris* cf. *cyathea* (Schlotheim) and compared to an 'Upper Carboniferous' flora described previously from Sumatra. The Sumatran flora is now known to lie above beds containing *Pseudoschwagerina* and thus to be Artinskian or younger. It shows affinity with the European Permian flora rather than that of Gondwanaland. This flora probably covered volcanic islands in the Malayan Permian sea.

## The Upper Permian of Malaya

The Upper Permian of Southeast Asia is characterized by a succession of fusulinacean genera belonging to the family Verbeekinidae. *Verbeekina* and *Neoschwagerina* are typical of the lower part of the Upper Permian and are accompanied in higher beds by the morphologically more complex *Yabeina*. Late in the Permian these stocks appear to have become extinct and other unrelated fusulinaceans (*e.g. Codonofusiella*) characterize the uppermost beds.

The known Upper Permian deposits of Malaya are restricted to south Kelantan and central and north Pahang, areas where the Lower Permian is poorly known. They are composed of shales, pyroclastics and thin limestones. Thick limestone formations are absent. Many of the limestones abound in calcareous algae and species of *Verbeekina, Neoschwagerina* and *Yabeina* which allow correlation with the Akasakan Stage in Japan. Waagenophyllid corals, productids and other brachiopods including the abberrant *Leptodus* are also present. Volcanic ash beds are found closely associated with these limestones and at Kampong Awah, Pahang, fossiliferous limestone blocks lie in an andesitic agglomerate of Upper Permian or Triassic age.

The uppermost Permian *Codonofusiella* fauna is not known in Malaya but tuffaceous shales from the Sungei Jemeru in north Pahang, and the Sungei Yu and Sungei Remih in south Kelantan contain brachiopods, including *Leptodus, Uncinunellina,* and *Spiriferellina,* and also lamellibranchs suggesting a late Permian age (Jones, *et al.*, 1966). These shales appear to pass up conformably into Lower Triassic strata in Kelantan (Yin, 1965).

In Kedah the Upper Permian may be represented by sandstones and shales of the upper part of the Kubang Pasu Formation which here underlies a conodont-bearing limestone of Middle and Upper Triassic age (Ishil and Nogami, 1966).

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DISCUSSION: Asked about the Permian-Triassic boundary, the speaker said that the transition appeared to be present in the sequence in South Kelantan, but that elsewhere the uppermost Permian was generally absent.

J. H. Leow pointed out that evaporites were known at the top of the Permian in Thailand. Was there any evidence of such deposits in Malaya? The speaker replied that there was nothing to suggest the presence of evaporites anywhere in Malaya.