Peninsular Malaysia

Ooi Jin-Bee

Professor of Geography, University of Singapore

New edition of

Land, People and Economy in Malaya

Longman
London and New York
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PART ONE

The land
Frontispiece Political Divisions, 1974 (see note on Malay spelling, p. xv).
1 Geological evolution, relief and drainage

The geological evolution of the Malay Peninsula

In early Palaeozoic times an extensive landmass lay between present-day Asia and Australia. This ancient landmass was composed of crystalline rocks such as schists, gneisses and plutonites. Van Bemmelen (1949) calls it the Indonesian Primeval Continent. During the course of the Palaeozoic era parts of this Continent, including the part now occupied by the Malay Peninsula, began to subside, creating geosynclinal conditions. A long period of quiet subsidence and sedimentation was followed in the course of time by a very long and involved cycle of mountain building. The geological history of the Malay Peninsula forms part of the story of this orogenesis, which is still continuing in some areas of present-day Indonesia.

The geosynclinal areas were covered by seas, but their limits are uncertain. It is probable that most of the Indo-Chinese Peninsula, the Malay Peninsula, parts of western Borneo, south-eastern Sumatra and most of Java were covered by such geosynclinal seas, though not all at the same time.

In the part now occupied by the Malay Peninsula, evidence of sedimentation in Upper Cambrian times has been found in the northwest. The sediments included cement-bedded sands, muds, silts and pebbles laid down in shallow waters, on the northwest coast of the Langkawi Islands as well as on a Thai island north of the Langkawis (Procter, 1966). Subsidence continued to Silurian times and geosynclinal conditions appeared to have been created as far south as present-day Selangor. Thick layers of limestone and shales were laid down in the geosyncline—the limestones of this age have been estimated to be 7 500 ft (2 286 m) thick in the Langkawi Islands (Jones, 1961) and 6 000 ft (1 829 m) thick in the Kuala Lumpur area (Gobbett, 1964). Similar fossil-bearing Ordovician—Silurian sedimentary rocks comprising limestone, shale and chert have been discovered in west Perlis, south Kedah, the Kanthan, Grik and Kroh areas of Perak, and the south Bentong area of Pahang (Fig. 1).
Fig. 1.1 Geology of the Malay Peninsula.
The first of the many phases of orogenesis (mountain-building) affecting the Malay Peninsula occurred in Upper Silurian—Lower Devonian times. This was probably preceded by volcanic activity. Although the orogeny was a minor one, it had the important effect of creating two long narrow geosynclinal basins due to the rise of a geanticlinal ridge occupying the site where the Main Range now stands. The geosynclinal basin west of this ridge was a miogeosyncline in which volcanic activities were absent. In contrast, evidence of subsequent volcanic activity has been found in the eastern geosyncline, which consequently has been termed an eugeosyncline (Chung, 1970).

Sedimentation in the miogeosyncline took place without a break in the shallow seas which covered the area during the Upper Palaeozoic era. The sediments deposited during the Devonian and Carboniferous periods consisted of a succession of limestones at the southern part of the miogeosyncline and of fine-grained non-calcareous materials at the northern end. Limestone rocks of Devonian age have been proved to occur in the Kanthan limestone hill and in southwest Kampar, Perak, where they are about 4 000 ft (1 219 m) thick. Carboniferous fossils and rocks have been found in Perlis, Kedah and Perak.

The sedimentation record in the eugeosyncline appeared to have been different in detail from that in the west. Sediments of Devonian age in west-central Pahang consisted of conglomerates, quartzites, graptolitic shales and cherts, which have been intruded by basic rocks. These rocks were previously known as the Foothills Formation and the 'Older Arenaceous Series'. Carboniferous rocks are widespread along the east coast where they were probably laid down in a shallow water marine environment. In the Kuantan area they consisted of carbonaceous shales, phyllites, quartzites and limestone bands. In central Pahang they were made up of thick successions of limestone. In southern Kelantan the Carboniferous sediments discovered were calcareous mudstones intercalated with pyroclastics (Chung, 1970).

In Upper Carboniferous—Lower Permian times another period of orogenesis was accompanied by the emplacement of granite in many parts of Peninsular Malaysia. Radiometric datings have established these granites, the oldest known to date, to be 280 to 300 million years old (Snelling et al., 1968).

According to van Bemmelen (1949) a period of orogenesis in Carbo—Permian times affected the area where the present Anambas Island is located (east of the present east coast of Peninsular Malaysia). A geanticline was pushed up in this zone, with compensatory subsidence of the adjacent regions. The border deep north of the geanticline was situated in the area where Natuna Island now stands. The wide and shallow southern border deep extended from the eastern half of present-day Peninsular Malaysia (with the Kelantan—Trengganu Border Range and the Tahan Range as central axis) to the island of Karimata and the
southern part of West Borneo (Fig. 1.2). Both deeps were centres of volcanic activity. The products of vulcanism in the southern deep were the clastic ejectamenta formerly classified as the Pahang Volcanic Series (a term no longer in use; the rocks are now known to be more widespread in distribution and cover a wider range of time—Carboniferous to Triassic—than was once thought).

The next phase in the evolution of the Malay Peninsula occurred at the end of the Palaeozoic era when the geosynclinal strip along eastern Peninsular Malaysia, Karimata and the southern part of West Borneo was uplifted by orogenic forces. The geanticlinal ridges so formed were intruded by granitic magma. The uplift of a geanticline along eastern Peninsular Malaysia brought about compensatory subsidence along