CHAPTER II

GENERAL GEOLOGY

2.1 General Geologic Setting

Geologic map of the Lam Narai volcanic field and vicinity shown in Figure 2.1 was primarily compiled by Nikorn Nakornsri (1981) and later modified in detail by Nikom Jungyusuk and Panya Suriyachai (1987). Generally, rocks distributed in this area comprise the sequences of sedimentary rocks ranging in ages from Permian to Jurassic, and the successions of igneous rocks that took place during the late Tertiary to early Quaternary (Nikom Jungyusuk and Panya Suriyachai, 1987). The Quaternary sediments are developed in Pa Sak flood plain and in the western part of area.

The Permian rocks are characterized by brown shale, gray to dark slaty shale, well bedded to massive limestones, limestone breccias and recrystalline limestones. These rocks have been firstly grouped into the Ratburi Group by Nikorn Nakornsri (1981) and later have been grouped into the Saraburi Group by The Stratigraphic Nomenclature (Nikom Jungyusuk and Panya Suriyachai,1987).

Shale and slaty shale occur as small hills at the northeast of the area. These hills are part of the Khao Luak Formation which orientates parallel to the western flank of the Khorat Plateau (Nikom Jungyusuk and Panya Suriyachai,1987). These rocks are found

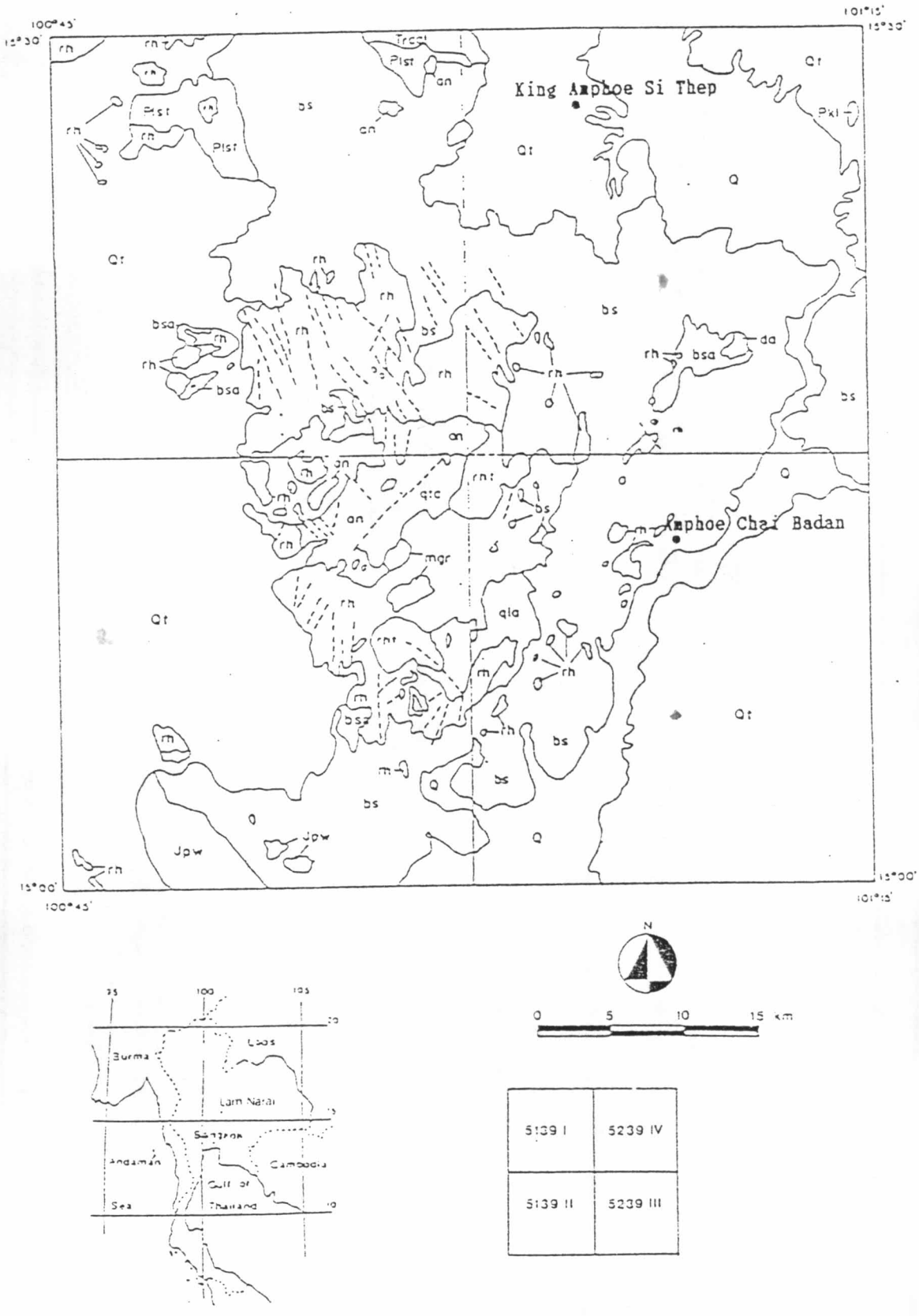

Figure 2.1 Geological map of the Lam Narai volcanic field and vicinity (after Nikom Jungyusuk and Panya Suriyachai, 1987).

CORRELATION OF MAP UNITS AGE

Q

Alluvium sediments Quarternary

Qt

Terrace sediments

bs

Basalt

da rh rht mgr

Dacite Rhyolite Rhyolitic tuff Microgranite

ban an qlt Quarternary-

Basaltic andesite Andesite Quartz latite Tertiary

qtc

Quartz trachyte

UNCONFORMITY

Jpw Jurassic

Sandstone (Phra Wihan Formation)

UNCONFORMITY

Trcol Triassic

Limestone conglomerate

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Plst

Limestone Permian

Pkl

Shale and interbedded limestone

SYMBOLS

———— Geologic boundary

-------- Fault

○ Amphoe

to be overlain by basaltic lavas in Huai Ple at the north of Ban Rang Yoi.

At Khao Amon Rat and Khao Khi Khang Khao in the north of the area, and Ban Wang Manora which is surrounded by the Lam Narai volcanic field, the rocks are well bedded to massive limestones, limestone breccias and recrystalline limestones. Nikom Jungyusuk and Panya Suriyachai (1987) reported that these rocks are parts of the Tak Fa Formation. These rocks always possess fossils of fusulinids, corals, and brachiopods. They are permeated and overlain by andesitic and basaltic lavas, at which the contact zone the limestones are metamorphosed and transmuted into marble.

The Triassic rocks are predominantly limestone conglomerate and red sandstone beds. They are exposed at Khao Amon Rat and adjacent areas in the northern part. Limestone conglomerate rests unconformably on the Permian limestone. The clasts, subrounded and bad sorting, are composed mainly of limestone clasts and minor red sandstone clasts. Each bed of limestone conglomerate is about 1 m thick which is conformed and interbedded with red sandstone beds.

The Jurassic rock exposes in the sounthern part of the area at Khao Paniat. It is characterized by quartz sandstone with pale brown to white in color. This Jurassic sandstone has been grouped into the Phra Wihan Formation. It is also overlain by basaltic lavas at the eastern side of Khao Paniat.

The Quaternary terraces and alluvial sediments are developed surrounding the high mountain ranges, and further

developed in flood plains including Pa Sak flood plain at the eastern side and along with the western side of the area extending from north to south. At the southern part of Khao Leam, the terrace sediments are passed through by basaltic dykes and subsequently cevered by basaltic lavas.

Regarding igneous rocks, they have been found to be present throughout the study area and vicinity. They are composed mainly of volcanic and related volcaniclastic rocks and minor small bodies of shallow intrusive rocks. The volcanic and related volcaniclastic rocks are range in composition from felsic to mafic. In general, they occur as outpouring lava flows surrounding their source vent areas and/or overlying the other older sedimentary rocks, and also occur as explosive eruptions of rhyolite-dominant tephra, producing a great variety of stratigraphic depositional facies. In addition, some volcanic rocks also expose as dykes intruding the older sediments of Permian and Jurassic as well as the sediments as young as Quaternary. The shallow intrusive rocks are characterized by small stocks of microgranite that are again surrounded by volcanic rocks. However, field relation between the volcanic rocks of the study area and the other sedimentary rocks of the adjacent area are rather rare.

2.2 Structural Geology

The only significant geologic structure in the Lam Narai volcanic field and vicinity is fault. From photolineament map, faults and fractures in the Lam Narai volcanic field align in at least three directions. They are sets of north-south, northeast-

southwest, and northwest-southeast directions (Figure 2.1).

The major fault lying in the north-south directon appears at the southern part of the volcanic field. The Pa Sak River, which is considered to be the fault-controlling stream, is the most distinctive one, lying in this fault direction. The major northeast-southwest fault is clearly found at the central portion of the volcanic field. This fault set is closely associated with the early volcanic rocks of the Lam Narai volcanic field.

The major fault set lying in the northwest-southeast direction is commonly present in rhyolite ranges, especially at the western part of the volcanic field from the north to the south. In addition, basaltic dykes and ranges of late basaltic volcanoes which usually occur at the north of the Lam Narai volcanic field are also lying in this fault direction. Late basaltic lava flows are also observed to overlie the old Pa Sak River, and as a result the Pa Sak River changed its direction of flow to the east. All evidences of this major fault set indicate that the Lam Narai volcanic field is strongly influenced by tectonic movement in the northwest-southeast direction. It is believed that the trend of this major fault set is nearly parallel to the major NW-trending Mae Ping fault which extends from the northwest (Nikom Jungyusuk and Panya Suriyachai, 1987).

2.3 Geological Evolution

The Lam Narai volcanic field is part of the volcanic region (or belt) lying along the western rim of the Khorat Plateau.

Geological and tectonic evolutions of this volcanic region, including the Lam Narai volcanic field, can be equivalently correlated with the geological and tectonic evolution of the Khorat Plateau and as well as of the Indochina craton.

According to Sangad Bunopas (1981), Sangad Bunopas and Vella (1983), the latest Permian to early Lower Triassic igneous and volcanic activities had been distributed along the westernmost margin of the Indochina. These activities are attributed to a brief subduction from west to east of an ocean floor that separated Shan-Thai and Indochina. At this period, the western parts of the Khorat Plateau were uplifted, in concomitance with the intrusions and explosions of andesitic magma along this portion including the Lam Narai volcanic field.

During Middle Triassic the Indochina and the Shan-Thai cratons were collided (Sangad Bunopas, 1981). After the collision mountain arose along the suture and extensive rhyolites extruded on the land surface (Sangad Bunopas, 1981 and Sngad Bunopas and Vella, 1983). Prolonged erosion of the thrust mountains produced mollasse deposits which were fully developed in the Khorat Basin that formed during Jurassic to Cretaceous in the western side of the Indochina. At the Lam Narai volcanic field, during this time, the northern parts were characterized by limestone conglomerate deposits which graded upward to the formation of red sandstone beds. Whereas the southern parts of the area, quartz sandstone of the Phra Wihan Formation was the predominant deposits.

After the latest Cretaceous, the Khorat Basin was uplifted

as a result of rifting of the continent Southern Asia and the beginning of the mountains further west of the Khorat Plateau (Sangad Bunopas, 1981; Sangad Bunopas and Vella, 1983). During Tertiary, a tensional regime had developed and a system of north-south trending faults appeared, together with the development of the Petchabun Basin at the eastern side and the Chao Phraya Basin at the western side of the Lam Narai volcanic field.

Subsequently extension and rifting of the Andaman Sea, the opening of the South China Sea and the progressive clockwise rotation of Thailand yield northeast-southwest trends of basalt flows in the southern part of the Khorat Plateau, in the Eastern Gulf and Kamphucha during late Cenozoic time (Sngad Bunopas and Vella, 1983). But according to Nikom Jungyusuk and Panya Suriyachai (1987), the latest episode of tectonism was the time when the northwest-southeast faults commenced in late Tertiary to early Quaternary with widespread occurrence of volcanic eruptions of both mafic and felsic magmas.

In the thesis of Sangad Bunopas (1981) all volcanic rocks in the volcanic region lying along the western margin of the Khorat Plateau, except late basalt were included in late Permian to early Triassic ages. However, Theerapongs Thanasuthipitak (1978) and Nikom Jungyusuk and Panya Suriyachai (1987) suggest that andesite, rhyolite and tuffs appearing in the Lam Narai volcanic field are formed during late Cenozoic time according to the presence of undevitrified vitric tuffs with well-preserved rhyolitic obsidian of the overlying rhyolitic lavas.