

CHAPTER I

INTRODUCTION



Most of the Earth's materials occur through the geological time from the time of their formation to present. They have, however, undergone invariably change through time. Therefore, the full understanding of them requires the ability to reconstruct both the genetic environment and processes affected them through time.

The Permian carbonate rocks in central Thailand, especially in Changwat Saraburi, are an economically important source of industrial raw materials. They are the major raw materials currently being used for Portland cement and crushed stone industries of the country. Among those Permian carbonates, the Khao Khad Formation is the most suitable rocks and has been exploited extensively for the Portland cement industry. Minor amounts have also been used for the production of quick lime and dimension stones. Besides, the Permian carbonates were also anticipated and recently have been proved as a potential oil and gas reservoir (Kozar et al., 1992; Heward et al., 2000). Therefore, they have become one of the main targets of extensive geological studies for the last several decades because of not only their economic importance, but also their wealth of geologic information, for examples, Lee (1923), Toriyama and Sugi (1959), Borax and Stewart (1966), Hinthong et al. (1985), Tittirananda (1976), Winkel et al. (1983), Wielchowsky and Young (1985), Phothong (1986), Dawson and Racey (1993), Chutakositkanon (1996), Assavapatchara (1998) and Thambunya (1999). Even though a large number of study have been carried out on the carbonate rocks in this area. Most of those studies are, however, concern mainly on the general geology, paleontology, and broad stratigraphy of the Permian carbonate rocks. There are still lacking of detailed studies on the carbonate sedimentology, especially on the detailed petrography, petrology and diagenesis. In

this research, therefore an attempt has been made to delineate the aerial distribution of the sedimentary sequences, to analyze the sedimentary facies and to define the lithostratigraphy of the Khao Khad Formation. The detailed petrographic study of the carbonate rocks of the Khao Khad Formation to decipher the diagenetic history will also help relinquish the diagenetic effect and bring out the original features of carbonate sediments which are essential for the reconstruction of the depositional environment.

Approximately 40 % of the total area of Changwat Saraburi (approximately 1,436 square kms) is underlain by sedimentary sequences of Permian age. This area is a portion of the best exposures of formerly named 'the Ratburi limestone' (Brown et al., 1951), and 'the Ratburi Group' (Javanaphet, 1969). In 1981, Bunopas proposed the type section for the Ratburi Group at Sai Yok district, Changwat Kanchanaburi, which consisted of three formations, namely, Tha Madua Sandstone Formation, Ratburi Limestone Formation, and Khao Muang Krut Sandstone Formation, respectively, in descending order. Besides, he also proposed the Saraburi Group for a succession consisting dominantly of very thick-bedded and bedded limestone, some shale and sandstone which further divided into three formations, namely, Pha Dua or Dan Sai Shale Formation, Saraburi Limestone Formation, and Tham Nam Maholan Formation, respectively, in descending order. Later, Hinthong et al. (1985) proposed six formal formations of the Saraburi Group with type sections mostly located in Saraburi area. They are Phu Phe Formation, Khao Khwang Formation, Nong Pong Formation, Pang Asok Formation, Khao Khad Formation, and Sab Bon Formation, respectively, in ascending order.

The Khao Khad Formation consists of very dark grey to black limestone, argillaceous limestone, dolomite, nodular and bedded cherts intercalated with shale and sandstone. The Khao Khad Formation is designated to be Lower Permian

(Artinskian-Kungurian) and is distributed in the area of Phetchabun range and northwest of the Khorat plateau. The type section is at Khao Khad, Amphoe Phra Phuttabat, Changwat Saraburi with total thickness of 1,812 metres (Hinthong et al., 1985).

1.1 Study Area

The study area consists of three stratigraphic sections which are situated at (1) road cut section along the highway No.21 at the Khao Khieo, Ban Nong Yai, Amphoe Phra Phutthabat, Changwat Saraburi (later called as “Khao Khad area”); (2) quarry at Khao Chan, Ban Saphanhin, Amphoe Muak-Lek, Changwat Saraburi; and (3) along the Thanarat road, from Amphoe Pak Chong to Khao Yai national park (Figure 1.1).

The study stratigraphic sections can be conveniently accessed from Bangkok to Changwat Saraburi along the Highway No.1, the Phaholyothin road. For the stratigraphic section no. 1, take the Highway No.1 to Ban Pu Kae, then turn to the Highway No.21 to Khao Khieo, the study section is located along the highway between Km.6 to Km.12. The total distance from Bangkok to the study section no. 1 is approximately 130 kms. For the study section no. 2, take the Highway No.2 to Amphoe Muak-Lek, the study section is located northwards of the Highway No.2 between Km.28 to Km.33. The total distance from Bangkok to the study section no. 2 is approximately 136 kms. For the study section no. 3, take the Highway No.2 to Amphoe Pak Chong then took the Highway No.2090, the Thanarat road, to Khao Yai national park, the study area is located westwards of the highway between Km.5 to Km.16. The total distance from Bangkok to the study section no. 3 is approximately 180 kms (Figure 1.2).

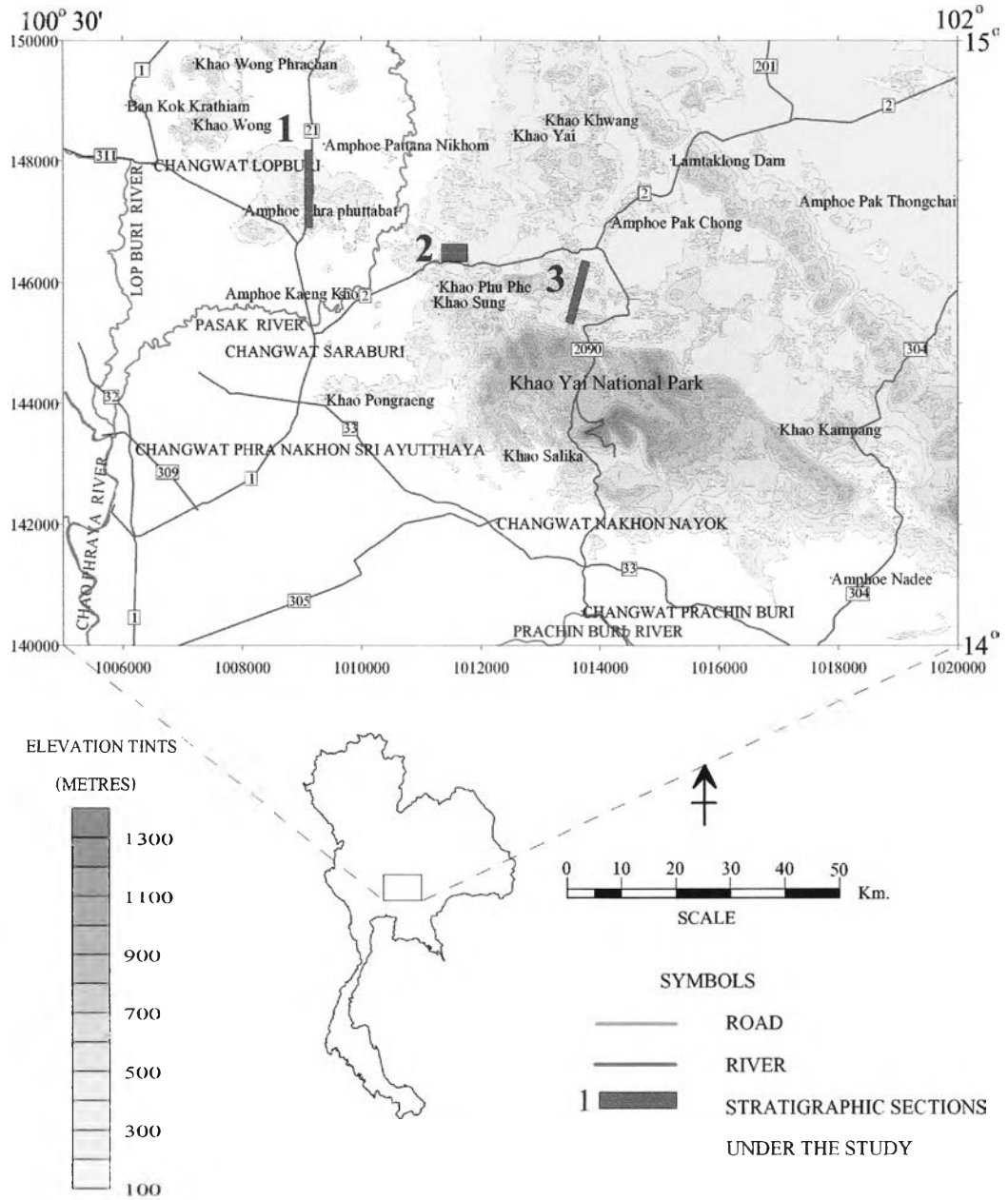


Figure 1.1 Hypsographic map with three stratigraphic sections used for this study.

(Modified after Geological Map of Thailand sheet Changwat Phranakhon Si Ayuthaya, ND 47-8, DMR, 1985)

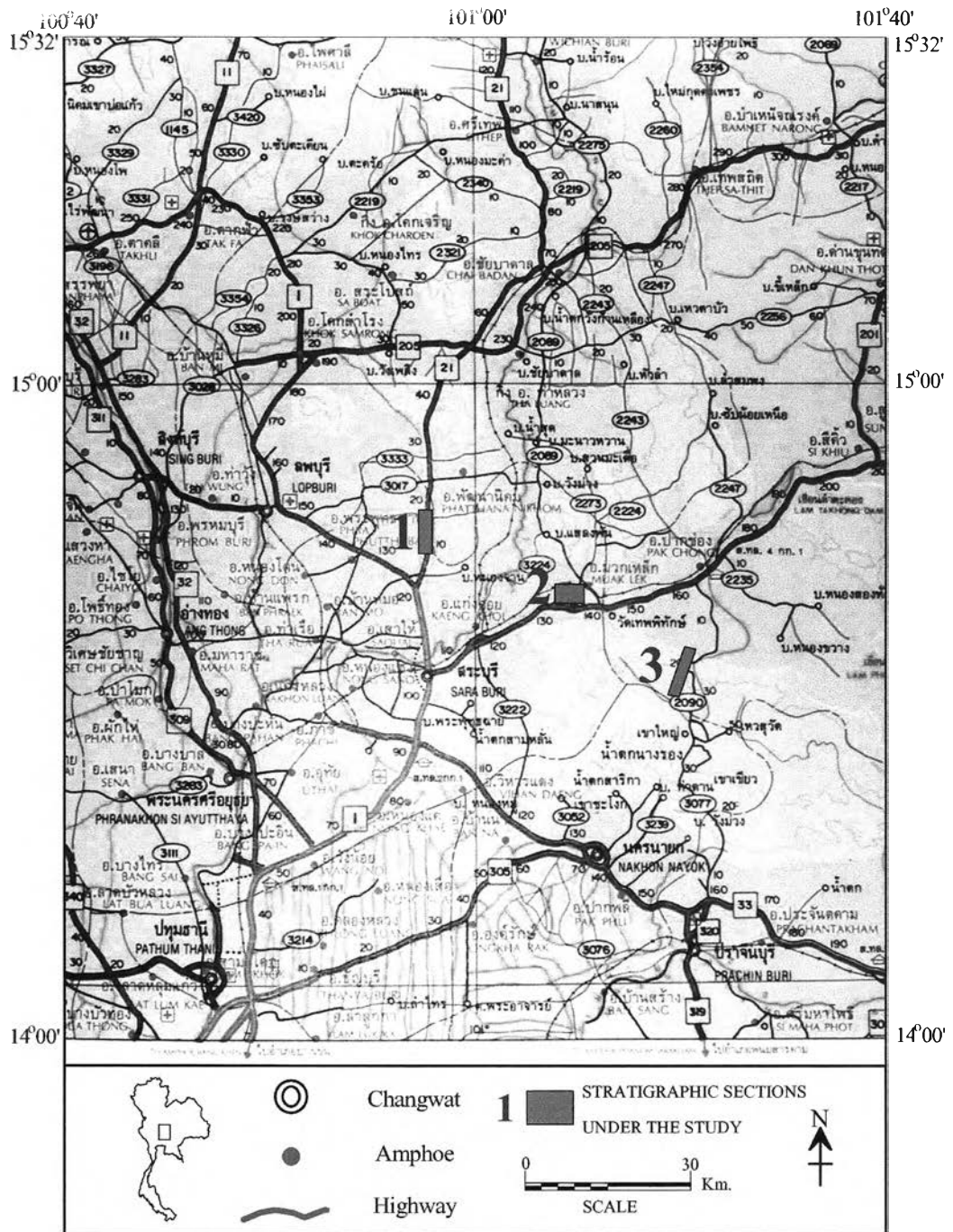


Figure 1.2 Location of the study area and its vicinity illustrating the network of the national and provincial highways (Highway Department, 1996).

1.2 Objective

The objectives of this study are four folds: firstly to define the lithostratigraphic succession and lithofacies of the Khao Khad Formation in relation to the depositional environments; secondly, to determine the lateral facies change of the Khao Khad Formation by comparisons of facies sequences from three measured sections; thirdly, to determine the diagenetic processes affected the Khao Khad Formation since they were deposited and; fourthly, to reconstruct the depositional environment of the Khao Khad Formation in the study area.

1.3 Scope of Works

- 1.3.1 Determination of the lithostratigraphic succession of the Khao Khad Formation exposed in Changwat Saraburi and neighboring area by collecting the geological information from the field and rock samples.
- 1.3.2 Petrographic examination of rocks by using a polarizing microscope to obtain information on mineral composition (with auxiliary staining technique), microstructures or textures and their relationship.
- 1.3.3 Classification of the carbonate rocks based on both field and petrographic methods.
- 1.3.4 Study the trace element content, and carbon and oxygen isotopic composition of various carbonate fabrics.
- 1.3.5 Examination of the fossils and their relative ages with the reference to the previous works (not the main objective of this study).