CHAPTER 1
INTRODUCTION

This research is an application of palynology to reconstruction of paleovegetation and determination of the precise stratigraphic position of the sedimentary sequences. Fossil pollen, spores, and microscopic algae preserved in the sedimentary sequences were recovered from Tertiary basins in northern Thailand. The concept used in this research follows the principle of uniformitarianism that "*the present is the key to understanding the past.*" On the basis of this principle, the ecological tolerances of recent species are used to describe the ecological tolerances of the fossils where fossils and recent species are fairly identical in morphology. The fossil pollen assemblages are then used to infer compositions of source vegetation and to estimate their paleophytogeographies.

This chapter was written to arrange concisely the succession of the whole content of the research starting with background and problems, why palynology has to be used, and objectives of the study.

1.1 BACKGROUND AND PROBLEMS

Tertiary basins in northern Thailand have been studied for more than 50 years. The basins contain fuel minerals including crude oil, coal, and oil shale. Earlier periods of the investigations put emphases on the research for minerals. During that period, Thailand had few geoscientists to investigate the basins with academic purposes. The first publication on geological exploration of Thailand was conducted by a joint collaboration between the pioneering Thai geologists and American geologists in which Tertiary basins were documented (Brown and others, 1951). At that time, the Tertiary sediments were classified into two series, the Mae Sot Series

and Krabi Series on the basis of their geographical setting. Some fossil occurrences were also reported. Investigations increased and became more academic oriented with time as the stratigraphic framework of the region became better understood. The basins contain sediments and stratigraphic successions that are somewhat similar characteristics (Gibling and Ratanasthien, 1980), and make it impossible to use as a basis for the stratigraphic correlation across the basins.

Fossil material is important in reconstructing not only the depositional environment but also the stratigraphic framework of the region. The first significant paleontological work was carried out by a Japanese paleobotanist who reported warm temperate macrofloral fossils from the Li basin (Endo, 1963) and subsequently (Endo, 1964, 1966). Endo was the first scientist who pointed out that northern Thailand used to have a warm temperate climate around the Paleogene. Thereafter, warm temperate pollen was successively reported from the Li basin, Nong Ya Plong basin, and Na Hong basin by other workers, as well as tropical pollen from different stratigraphic positions (Ratanasthien, 1984; Meesuk, 1986; Watanasak, 1988; Songtham and others, 2000, 2001, 2003). Numerous tropical Miocene vertebrate remains were reported by the Thai-French cooperation project under the auspices of the Department of Mineral Resources. These tropical faunal remains were recovered from tropical pollen-bearing formations consistent with having tropical animals in the tropical forests during some parts of Miocene time. On the other hand, no indicative vertebrate remains have been recovered from the warm temperate pollen-bearing formations.

The results from previous paleontological research reveal that there was, at least, a climate change from a warm temperate to a tropical condition during Oligocene to Miocene time. However, some questions still remain including:

1. Whereabouts in northern Thailand are the warm temperate and tropical formations and how many cycles of warm temperate and tropical climates have there been throughout the period of deposition?

2. What is the real picture of the Tertiary stratigraphic framework of northern Thailand?

1.2 PALYNOLOGY

Palynology used herein also includes paleopalynologic study of the forms of microfossils obtained from rocks and sediments through an acid maceration process. The microfossils include several kinds of plants and animals but herein include just the pollen, spores, and microscopic algae and the term "sporomorph" may be applied. Some species of pollen, in particular, are very important as they are distributed all over the region by wind dispersal. When they settle down on the ground surface in suitable localities they may be preserved as fossil pollen with morphology still identifiable to the pollen of the parent trees. Especially Cenozoic fossil pollen is likely identifiable to the family, genus, or sometimes species level. Therefore, fossil sporomorphs have sufficient reliability to be used as a key to understanding earth history coupled with stratigraphic correlation solutions.

From previous palynological investigations, two main palynological assemblages are recognized, including warm temperate and tropical assemblages. To understand the real nature of Tertiary stratigraphic architecture, temperate and tropical elements need to be recovered from the sediments. Accordingly, it is hoped that warm temperate and tropical sporomorphs would be recovered from almost every layer of the coal and carbonaceous fine-grained sediments. Meanwhile, indicative vertebrate remains are very rare in the warm temperate pollen-bearing formation and has never

been reported before. Therefore, the palynology is considered to play a significant role in this research. However, many other fields, including vertebrate paleontology, geochemistry, isotope geology, paleomagnetism, and so forth, are needed to combine to solve the problems.

1.3 OBJECTIVES

The main aim of this research is to compare the fossil assemblages with known standard stratigraphic levels and to correlate the stratigraphic frameworks of the Tertiary sedimentary successions in northern Thailand. However, at the end of the research, some results may also be obtained including:

1. Description and identification of the sporomorphs by putting them into precise taxonomic position and then comparing them with extant species, as well as establishing a standard database of fossil sporomorphs and extant pollen and spores for future reference.

2. Understanding the plant communities of the past and reconstructing paleophytogeographic histories during periods of sedimentation.

3. Evaluating the palynological assemblages corresponding with the fossil fuels in both quantitative and qualitative aspects.

4. Elucidating the cause of change in the vegetational patterns through time across the period of deposition.