CHAPTER II

GEOLOGY

2.1 Physiography

The Gulf of Thailand is bordered on the east by the Indochina peninsular, and on the west by Thai-Malay peninsular (Fig. 2.1 a).The Gulf is a large continental shelf and is among one of the world' s widest (Emery and Niino,1963). The most northern part of the Gulf extends from the Central Plain, and spreading about 800 kilometres toward the southeast direction. From the southern part that gradually extends to the east , a width of 400 kilometres or more of the Gulf extends through South China and Java sea (Shepard, 1973). The head of the Gulf or the Bay of Bangkok covers approximately 10,000 square kilometres (Fig.2.1.a). The Hua Hin basin rests on the head of the Gulf of Thailand. The bathymetric features and sea floor configurations of the Gulf, are a shallow and flat basin (Achalabhuti, 1980). The upper Gulf is very shallow, and the average depth is about 15 metres (Fig.2.1.b). Along the northern side of the Upper Gulf, there are four rivers, namely, Meklong, Tha Chin, Chao Phraya and Bang Pakong debouch into the Gulf. The eastern and western sides are shallow and flat, and then sloping toward a large depression area in central part of the Gulf. The central part of the Gulf is a broad depression, with maximum depth of 86 metres below the mean sea level. Some parts of the eastern and western marginal areas of the Upper Gulf are occasionally interrupted by ridges, that many rise above the sea level as island namely, Ko Chang, Ko Sichang,

Figure 2.1 a The Gulf of Thailand and adjacent areas.

(after Achalabhuti, 1980)

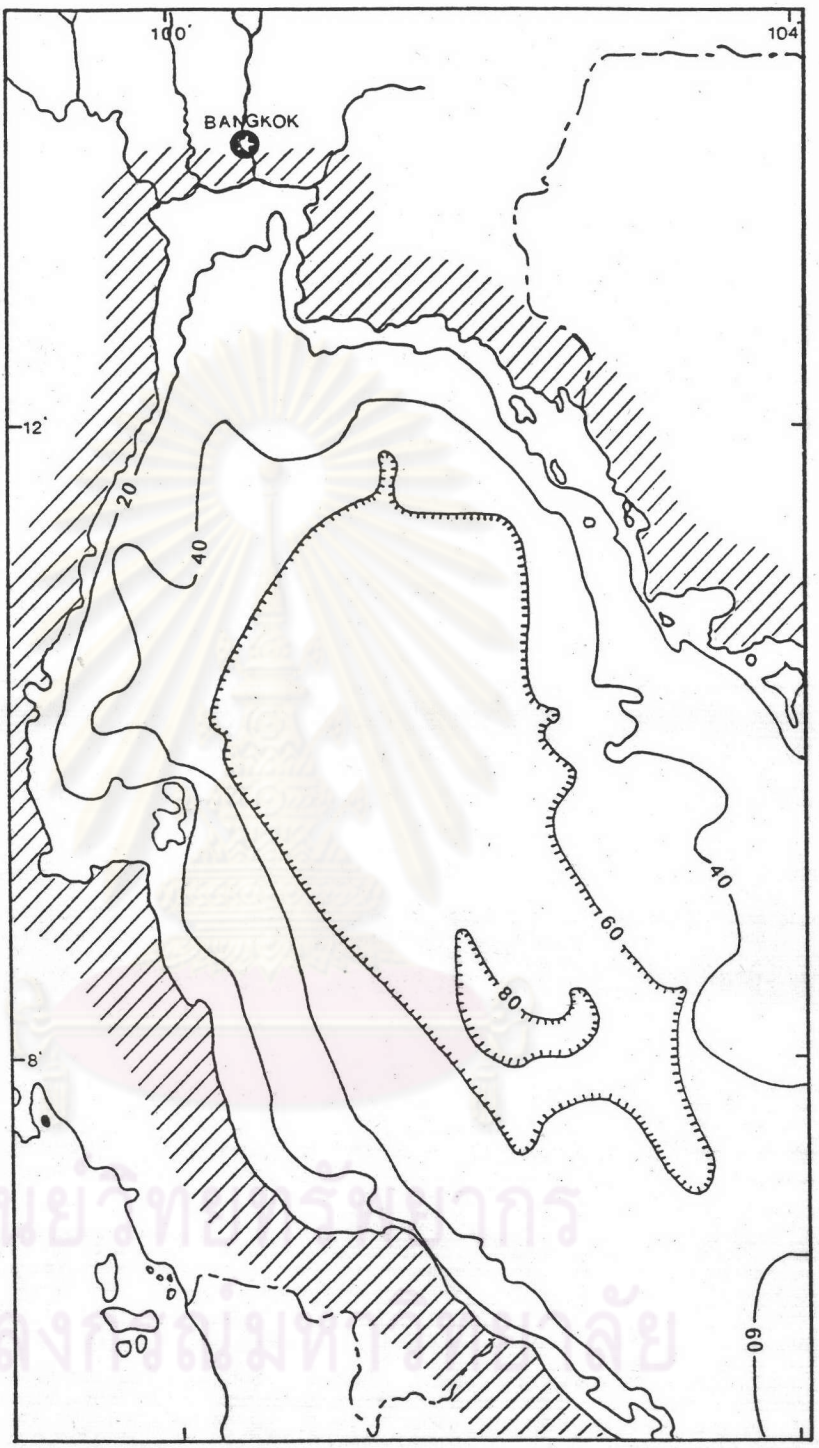

Figure 2.1 b Bathymetric chart of the Gulf of Thailand.
(after Emery and Niino, 1963)

Ko Phai, Ko Khram Yai, Ko Samee San and Ko Samet.

There are few geological studies on bottom sediments dispersal patterns in the Gulf of Thailand, namely, Emery and Niino (1963) ,Dharmvanij (1988)and etc. Generally, sediments in the Gulf are dominated by mud, whereas the shelf is dominated by sand. Although the inner Gulf is mostly covered by mud, with some irregular patches of sand and mud, but sand, gravel and rocks are present near the marginal area or on slight topographic high (Fig.2.1.c). The sediments on the floor and adjacent continental shelf are classified genetically into 6 types; organic, authigenic, residual, relict and modern detrital (Emery and Niino,1963). The percentage of organic type is less than 15 %, and sediments of authigenic, volcanic origins and residual origin are minor not more than 0.3 % of the total. Most of sediments, about 85-87 %, are relict and modern detrital that have different general ages of deposition. The modern detrital sediments are allotted in the Gulf and along the continental shelf, as indicated by the fresh occurrence and seaward gradation in median diameter. The source of modern detrital sediments must be the rivers that drain from the adjacent land areas. The relict sediment is found only 5 % in the Gulf, but occurs about 60% at atop of continental shelf. It is generally characterized as coarse grained, slightly iron-contained, and rounded. Its sources may be relict beach sand left from a Pleistocene time of glacially lower sea level. Most sediments in the upper Gulf of Thailand are the modern detrital, that is dominated by mud and sand at east coastal area (Fig.2.1.d).

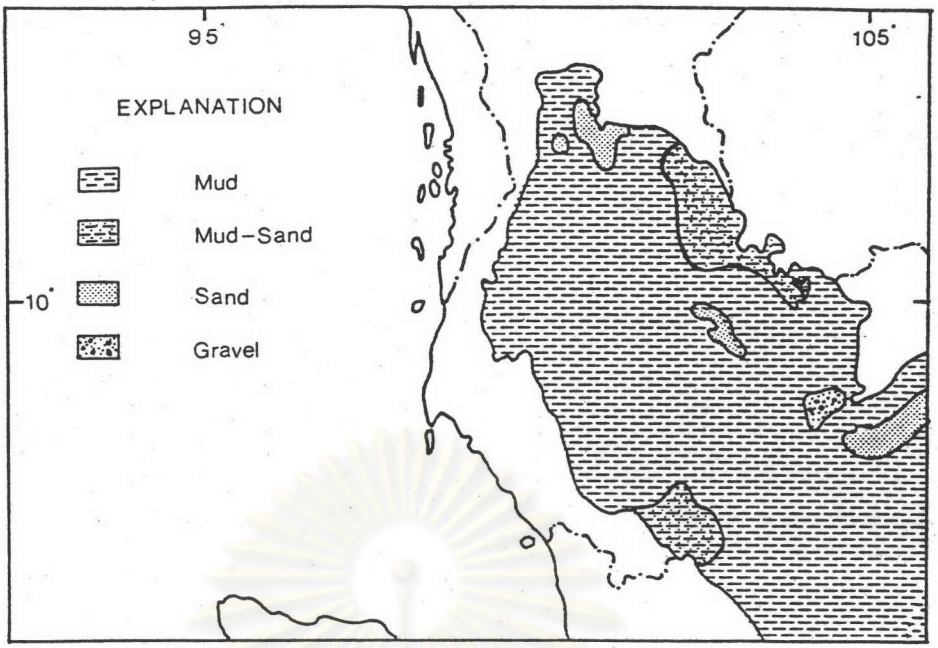

Figure 2.1 c General surficial sediments of the Gulf of Thailand. (after Shepard, Emery and Gould,1949)

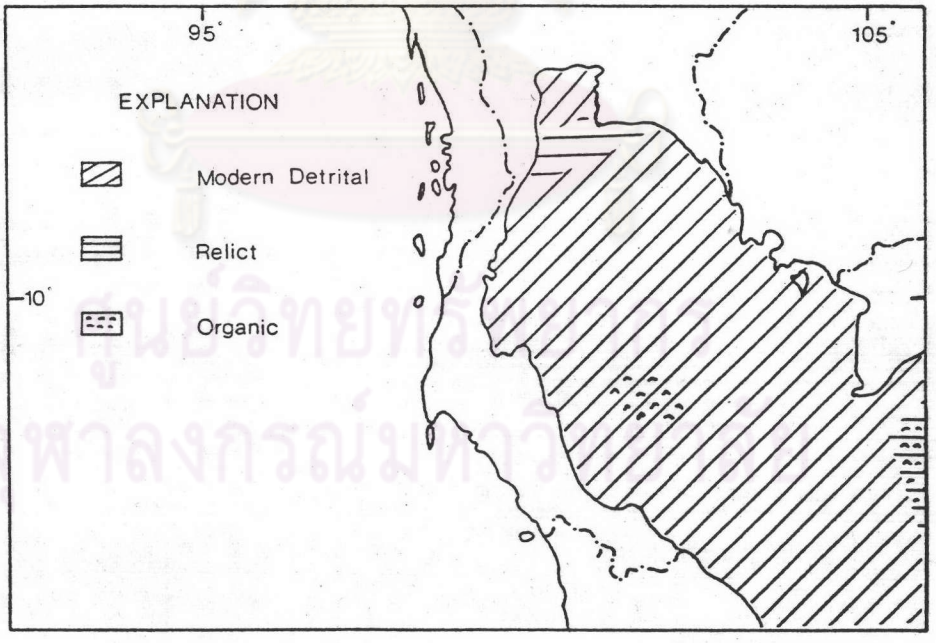

Figure 2.1 d The types of origin of surficial sediments in the Gulf of Thailand. (after Emery and Niino, 1963)

2.2 Geological Setting

The Gulf of Thailand is a intracratonic basin, which is believed to be formed during Late Cretaceous to Early Tertiary (Achalabhuti,1980; Bunopas and Vella,1983b; Barber,1985). The Upper Gulf is bordered on the south and west by a Paleozoic geosyncline which had undergone orogeny during the Mesozoic time. The north to northwestern part of the Gulf is bordered by the rocks of the Shan-Thai Craton, and framed east to southeast by the rocks of Sukhothai fold belt, and the Loei fold belt and Indochina Craton. Its southern part is contacted by the rocks of peninsular Thailand (Fig.2.2.a).

In 1974, Burton subdivided the geology of peninsular Thailand into four major zones (Fig.2.2.b). The internal positive zone is the Paleozoic rocks intruded by granite; the eugeosynclinal zone is a Paleozoic/Mesozoic series with volcanics which have been strongly folded and overlain by later Mesozoic rocks; the miogeanticlinal zone which is mildly metamorphosed Paleozoic geosynclinal rocks only; and the miogeosynclinal zone, fronting the Indian Ocean, is Paleozoic rocks overlain by thin Mesozoic rocks. Bunopas (1982), subdivided the geology of peninsular Thailand into two parts, namely, middle and southern peninsular(Fig.2.2.c). The middle peninsular area is defined by the Prachuap Kiri Khan, Chumphon, Surat Thani, Krabi and Ranong provinces. The southern peninsular extend southward from Krabi and Surat Thani provinces to the south of Songkhla and Narathiwat provinces.

Many rock formations ranging in age from Late Paleozoic to Cenozoic are distributed surrouding the Gulf of Thailand and adjacent

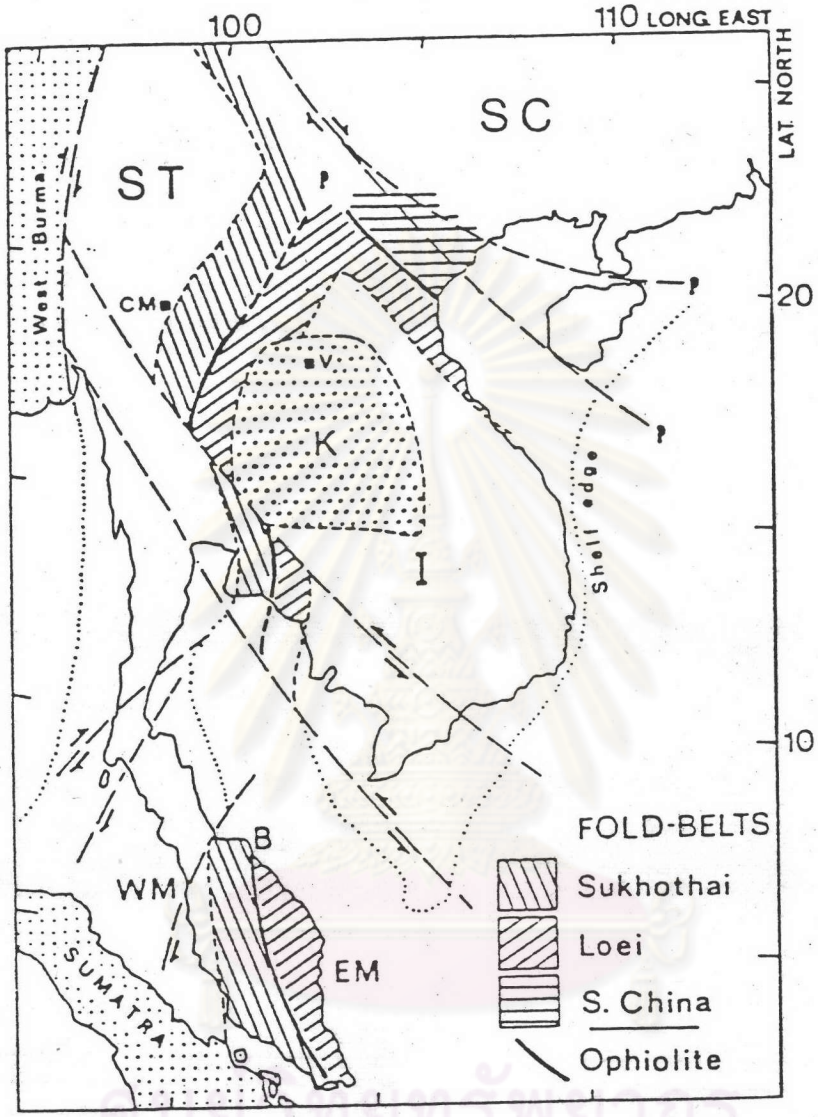

Figure 2.2 a Ancient cratonic areas; I, Indochina (including eastern Thailand); SC, South China and ST, Shan-Thai (eastern Burma, western Thailand and Northwestern Malay Peninsula). Adjacent fold-belts are formed of thick mainly marine Paleozoic to Triassic sediments and tholeitic volcanic rocks that accumulated along the margins of the cratons. Ophiolites lie between contiguous fold belts. Sinistral faulting and oroclinal bending occurred mainly during the Jurassic and Cretaceous. K, Khorat Basin; CM, Chiangmai; V, Vientiane; WM, West Malay Peninsula; EM, East Malay Peninsula; B, Bentong ophiolite line. (after Bunopas, 1981)

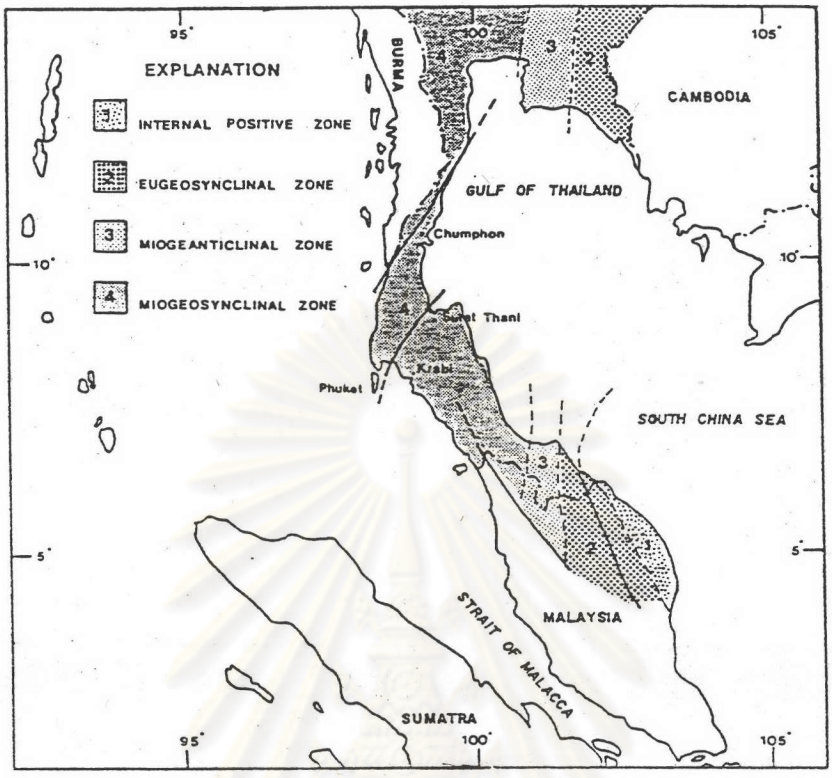

Figure 2.2 b The map of four zones of Peninsular Thailand.

(after Burton,1974)

Age	Middle Peninsula	South Peninsular Thailand		
		West	Middle	East
CENOZOIC	Coastal and alluvium Krabi lignite	Coastal and alluvium Sadao lignite	Coastal and alluvium not known	Coastal and alluvium not known
Cretaceous	—	—	—	—
Jurassic	Chumphon Red-beds	White quartz sandst. and red shale near Thung Song	Chian Yai Red-beds	—
Triassic	—	—	Na Thawi shale	—
Permian	Ratburi Limestone	Ratburi Limestone	Ratburi Limestone	—
Carboniferous	Phuket Group ? ? ? ? ?	Sandstone & shale at Trang	Ko Yo shale and chert	Mayo Red-beds
Devonian-Silurian		Khuan Din So and Thung Wa shale, chert and limestone	Satun shale	Yala, Narathiwat phyllite, metatuff
Ordovician	—	Thung Song Limestone Tarutao Formation	—	—
PRECAMBRIAN	—	Khanom gneiss	—	—

Figure 2.2 c Lithostratigraphic units of Peninsular Thailand.

(after Bunopas, 1982)

areas. The Gulf is believed to be mainly covered by Quaternary deposits, which is extending from the Lower Central Plain to the south, with only few localities where the Late Paleozoic rocks are exposed as islands. The eastern part of the Gulf is bounded mainly by Quarternary deposits and large volume of granite, granodiorite and diorite of probably Carboniferous to Cretaceous age. Precambrian rocks are exposed in the eastern part of granite which are characterized by metamorphic complex of amphibolite facies, biotite-microcline gneiss, quartz-feldspathic gniess, biotite schist, banded quartzite, calc-silicate rocks and marble with augen layered, laminated and well bedded. The Carboniferous-Permain rocks are mainly present in the western part of the Gulf. The Carboniferous-Permain rocks are characterized by sandstone, shale, chert, pebbly shale, pebbly sandstone of gray to darkish gray, greenish gray, brown, laminated to thick bedded, conglomerate and tuff (Fig.2.2.d).

The lower Central Plain or well-known as the Chao Phraya basin as defined herein extends from the vicinity of Nakhon Sawan in the North to the Upper Gulf of Thailand in the south. The Chao Phraya basin rests between Phitsanulock basin in the north and Hua Hin basin in the south. The Chao Phraya basin is composed of small basins which are scattered in the western, eastern and southern parts of the main basin. The small basins in the Choa Phraya basin are oriented in the N to S direction and each one covers an area ranging from approximately 100 to 1,000 square kilometres (Fig.2.2.e). The thickness of sedimentary sequences in these small basins are more than 4,000 meters. O'Leary and Hill (1989) suggested ,the basins were developed in the Oligocene to Miocene between Mae Ping and Three

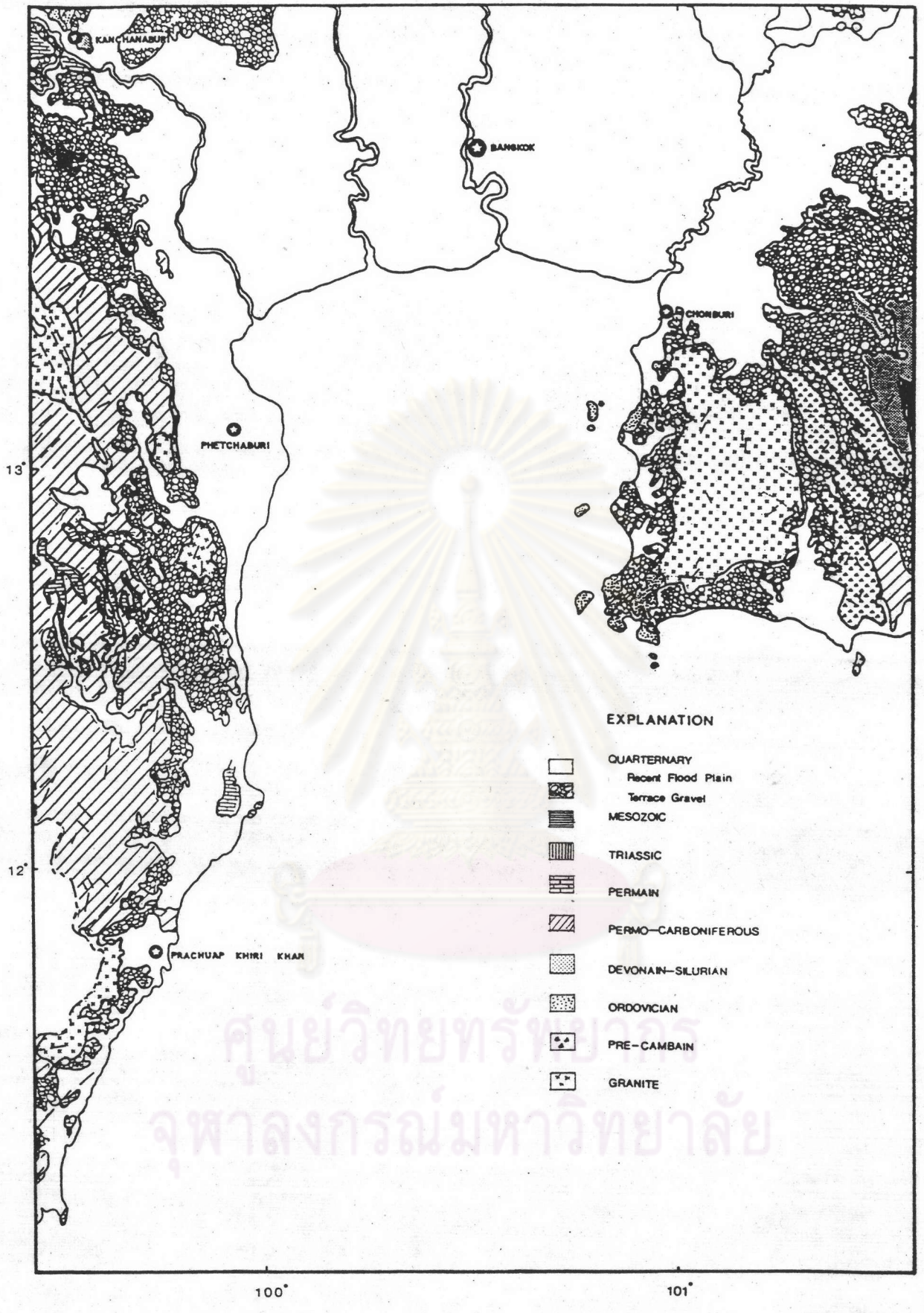

Figure 2.2 d The distribution of many rock units around the Upper Gulf of Thailand. (after DMR, 1985)

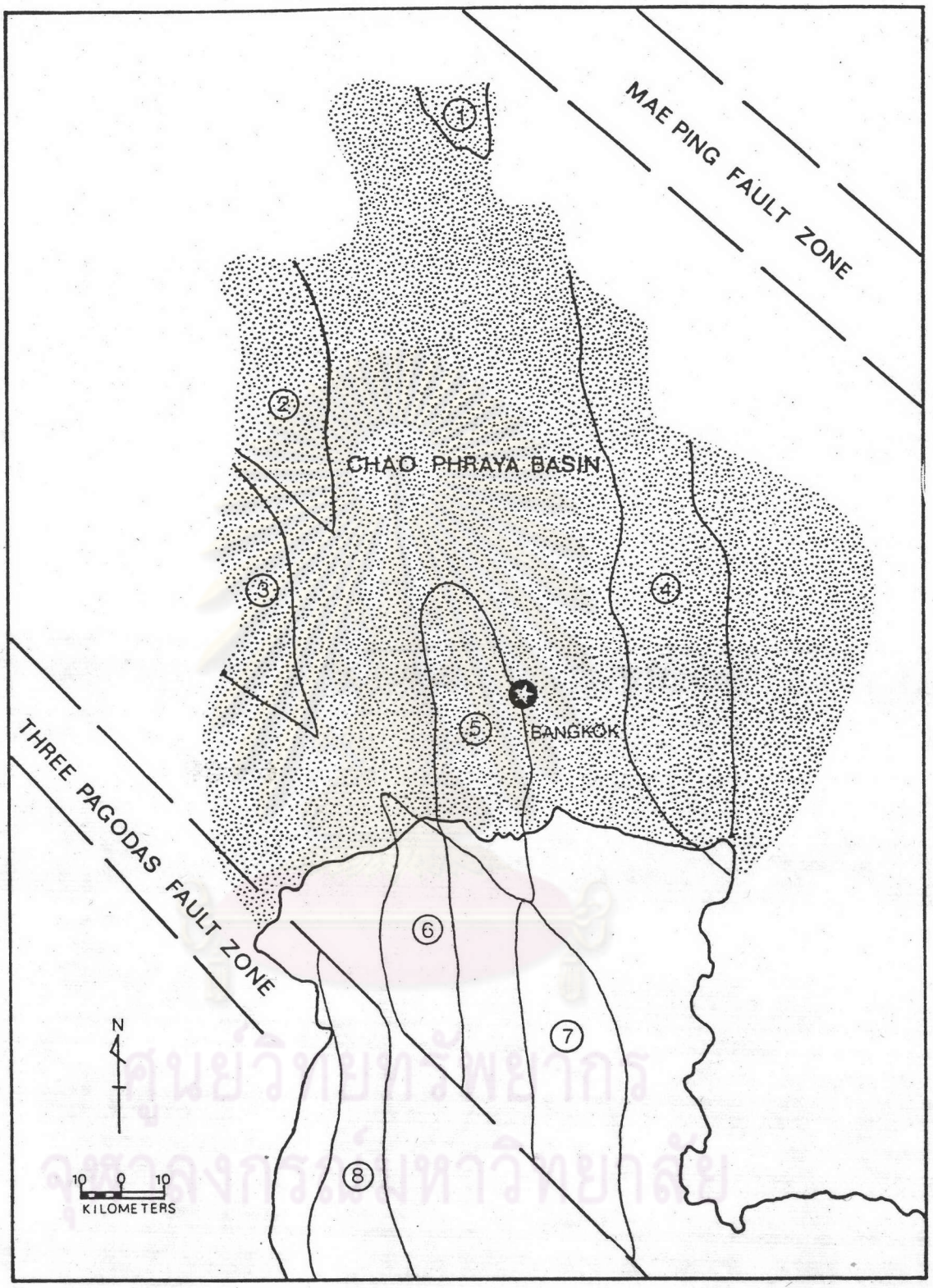

Figure 2.2 e Map of the Choa Phraya basin showing small Tertiary basins distribution, and the major tectonic lineaments. 1 Sing buri; 2 Suphan buri; 3 Kamphaeng saen; 4 Ayuthaya; 5 Thon buri; 6 Sakhon; 7 Paknam; 8 Hua Hin (after Nutalaya and Rau, 1981; Palachan and Sattayarak,1989 and O'leary, 1989)

Pagodas Fault Zones which the E to W dip extension of basins were controlled by the N to S trending of Indosinian fabric. The N to S fabrics are the direct result of Indosinian orogeny in the Early Triassic with the final collision of Shan-Thai and Indochina plates. The later NW to SE trending sinistral fault, Three Pagodas and Mae Ping Faults Zones, were active during Mesozoic (Bunopas, 1981). In the Late to Early Oligocene , major dextral movement on Mae Ping and Three Pagodas Fault Zones resulted from large-scale dextral shear stress in the major block between them, which probably caused by clockwise rotation of the western margin of Indochina with the continued collision of India and Asia (O'Leary and Hill,1989). This shear stress may be expected to the cause of extensional basins which are controlled by transcurrent faults. The stratigraphy of the lower Central Plain is subdivided into 3 major units. Unit I, the lower part is deposited during Late Oligocene to Mid Miocene. The sediments are fluvialtile sequences with an intervening fluvio-lacustrine sequence. Unit II, the Mid Miocene to Late Miocene, are sediments of lacustrine origin in the lower part and fluvialtile origin in the upper part. Unit III, the fluvialtile sediments are dominantly deposited in the basin from Late Miocene to the present (Pradidtan and Tongtaow,1984).

Many geologists such as ; Park.et. al., (1971) and Achalabhuti (1974,1980), attempted to explain the complex structural framework of the Gulf for a long time ago. At present, the parallel series of N to S trend horsts and grabens are well known and efficiently divide the overall Gulf of Thailand complicated basins into a number of small troughs and ridges. Three major ridges are

recognized, notably, Narathiwat ridge , Ko Kra ridge, and the Samui Shelf. The Ko Kra ridge and Narathiwat ridge divide the Gulf into western and eastern sectors. The western sector of the Gulf is composed of minor shallow basins , such as, Kra basin which lies in the N-S direction parallel to the Ko Kra ridge. Chumphon basin which is an only deep basin bounded by the Ranong and Khlong Marui faults. The eastern part of the Gulf is composed of few major deep basins, namely, the Pattani trough and Malay basin. The Pattani trough is an elongate basin of 300 kilometres long and 30-50 Kilometres wide oriented in the N to S direction. The Malay basin is located on the eastern side of the Narathiwat Ridge oriented in the N to NW direction (Fig.2.2.f). In the northern part of the Gulf, the Three Pagodas fault of NW to SE trending may extend along the N to NE shore of the Gulf, similar to the Red River fault in China. The Ranong and Khlong Marui faults are oriented in the NE to SW direction resting on the western part of the Gulf. Besides, the local structural features are secondary to the major N to S trend consisting of splay faults, faulted anticline, drape structure and the others.

Many authors attempt to explain the sedimentation and sedimentary facies in the Gulf. In the western part of the Gulf, the sediments can be divided to 3 cycles from the periods of transgression and regression (Woollands and Haw,1976; Bois,1980; Pradidtan,1987). In the eastern part, Lian and Bradley (1986) divided the Tertiary sediments into 4 units representing the periods of transgression and regression while Woolland and Haw (1976) has divided into 3 cycles similar to the western part (Fig.2.2.g). However , the eastern part of the Gulf is deeper than the western

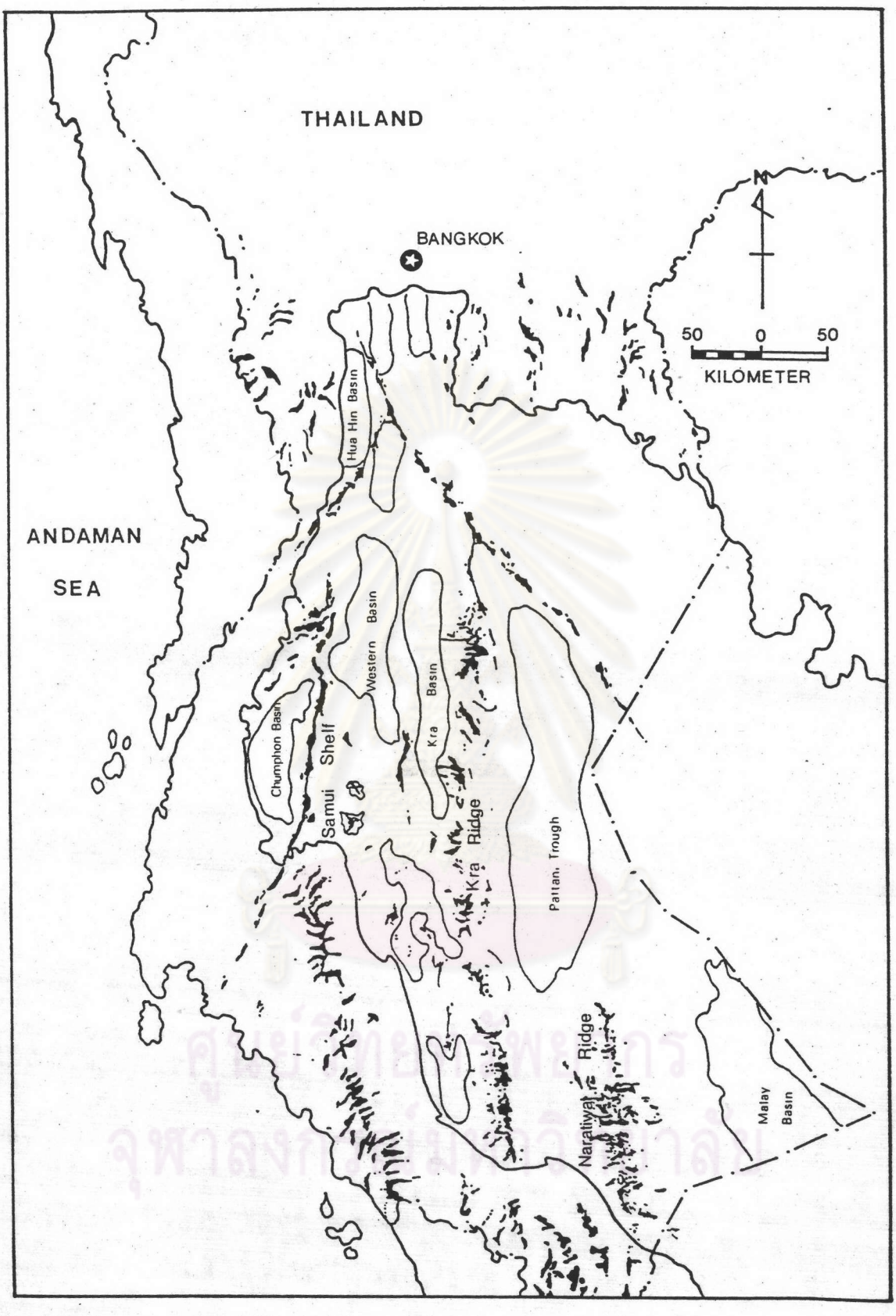

Figure 2.2 f The pre-Tertiary basement structure of the Gulf of Thailand. (after Achalabhuti, 1980)

Northern part of the Gulf of Thailand

Cycle	Major Lithology	Environment	Age
III	sand, clay and coal	Inner Neritic, Coastal swamp	Quaternary
II	sand, clay, calcareous clay, mudstone and limestone	Fluvial to Deltaic/ Coastal swamp	Pliocene to Miocene
I	Sandstone and Conglomerate	Alluvial Fan	Early Tertiary

Southern part of the Gulf of Thailand

Cycle	Major Lithology	Environment	Age
III	clay with sand	Inner Neritic	Quaternary
	clay/mudstone interbedded with coal and sandstone	Coastal mangrove swamp	Pliocene to Mid-Miocene
II	Sandstone interbedded with shale and coal beds	Fluvial and Deltaic plain	Early-Mid Miocene
	abundant coal, shale and thin bedded sandstone	Coastal swamp and Tidal influence	
I	Sandstone, Siltstone and Shale/Mudstone	Channel and Flood-plain	Early Tertiary

Figure 2.2 g Stratigraphic succession of the Gulf of Thailand. (after Woollands and Haw, 1976)

part and opening broad toward the South China sea in the south of the Gulf of Thailand. Therefore, the eastern sector has more marine influence than in the western sector. Considering from the different subdivisions of sedimentary sequences in the eastern and western parts of the Gulf, the Unit 2 of Lian and Bradley (1986) shows the marine transgression similar to lower part of Cycle II of Woolland and Haw(1976). This may be a short transgressive phase which became widespreadly in the main basin areas at the end of regression in Cycle I. Therefore, the sedimentation and sedimentary facies in the Gulf of Thailand can be divided into 3 cycles. In summary, the Tertiary sediments in the Gulf are practically divided into 3 cycles representing the periods of transgression and regression during the time of deposition (Fig.2.2.h). Cycle I is the lower part of the sequence deposited in the topography of horsts and grabens, with N to S normal faults controlled. This cycle is confined in the deeper part of grabens. Besides,this cycle may be locally deposited in the uplifted Mesozoic terrains. The sediments are represented by alluvial fan, fluviatile and lacustrine facies. In the deeper part of grabens the lacustrine facies are always present, whereas elsewhere the facies may be ranging from alluvial fan to fluviatile. This cycle is Oligocene to Early Miocene in age. Cycle II is the regressive sequence, although there is a short time marine transgression in the lower part of cycle. The topography of deposition in the lower part of this cycle is still horsts and grabens then the sediments are lacustrine, fluvio- marine, coastal plain and coal swamp deposits. The sediments are dark shale interbedded with sandstone. This cycle is Early miocene to Middle Miocene in age. Due to the lacking of the topography of horsts and grabens in the upper part, therefore

Unit	Major Lithology	Environment	Age
IV	Uncompacted clay with sandstone beds, thin coal beds, minor dolomite	Mangrove swamp and marine	Quaternary to Late-Mid-Miocene
III	Varies color claystone and sandstone with thin coal beds	Delta Front	Late-Mid-Miocene
II	Organic rich shale, thin coal beds, and thin sandstone beds	Brackish lagoona and distal delta	Mid-Early-Miocene
I	Varies color shale interbedded with sandstone	Fluvial and lacustrine	Early-Miocene to Late-Oligocene

Figure 2.2 h The stratigraphic succession of the Pattani basin, the southern part of the Gulf of Thailand. (after Lian and Bradley, 1986)

sediments in the upper sequence of this cycle are widespread deposited by fluviatile and delta facies. The sediments are shale interbedded with sandstone and coal, the sandstone thick is ranging from few to over ten meters. The boundary of Cycle II and Cycle III is the Mid Miocene Unconformity which is the climax of rifting in this region (Rodolfo,1969). Cycle III is the marine transgression. and the sediments are deposited under the widespread marine condition until the present day. The sediments are clay, silt, sand and interbedded with coal along section especially in the lower part of third unit. The age of this cycle is Middle Miocene to Quaternary.

In 1989, Chinbunchorn, Pradidtan and Sattayarak reported the stratigraphic sequences of the Tertiary basins in Thailand, including the Gulf of Thailand in the new style. They suggested that the Gulf is rift basins and divided the Tertiary sediments into 2 sequences, syn-rift and post-rift sequences. Besides, they concluded that the age of a regional unconformity in this area, which have been identified as Late Middle Miocene or Middle Miocene, should be Late Miocene from clearly identifiable seismic sections and the basaltic lava dating (10 Ma.). Syn-Rift sequence is a sequence deposited during active rifting period which is Oligocene to Late Miocene. This sequence can be subdivided into 3 units, lower, middle and upper. The lower unit is the fluvial system containing some interbedded redbeds and deposits during Late Oligocene to Early Miocene. The middle unit, Early Miocene to Middle Miocene, contains thick lacustrine sediments and consists of high organic claystone/shale with minor thin bedded sandstone. The upper unit generally composes of fluvial deposits with some lacustrine sediments and deposited from Middle Miocene to Late

Miocene. The second is the Post-Rift sequence, unconformably overlying the Syn-Rift sequence, which deposited from Late Miocene to Quaternary. This sequence consists of high energy fluvialtile coarse sand and gravel with some interbedded varicolored clay.

In 1990, Pradidtan et. al., analyzed the sedimentary sequences of the Western, Chumphon, Pattani and Malay basins and described the stratigraphy in more detail. They suggested , the sequences above the Late Miocene Unconformity is named as Chao Phraya Group. Then the sequences below the Unconformity in each basins is defined as a group and the basin name is suggested as the group name (Fig.2.2 i).

Due to the fact that, the Tertiary sediments in the Gulf of Thailand are the generally nonmarine and marginal marine deposits, therefore the foraminifera in this sediments are very limited. The palynology is used in biostratigraphy, although it serves only for outline dating and board correlation, which are used to establish, or support, the stratigraphic columns in the Gulf of Thailand. Achalabhuti (1974), reported the results of micropaleontological and palynological analyses of the Gulf of Thailand. Four and five floral zones are always determined from well section and reveal that the deeper wells penetrated sedimentary sequences ranging in age from Holocene to Oligocene. The well data were correlated, and the generalized stratigraphic section of the Gulf was shown with the major lithological units, palynological zones, depositional environments and geological ages (Fig.2.2 j). Paul and Lian,(1975) reported the palynological zones in the central Gulf area from fossil data of Union-Seapec 13-1 well that ranging in and from Quarternary

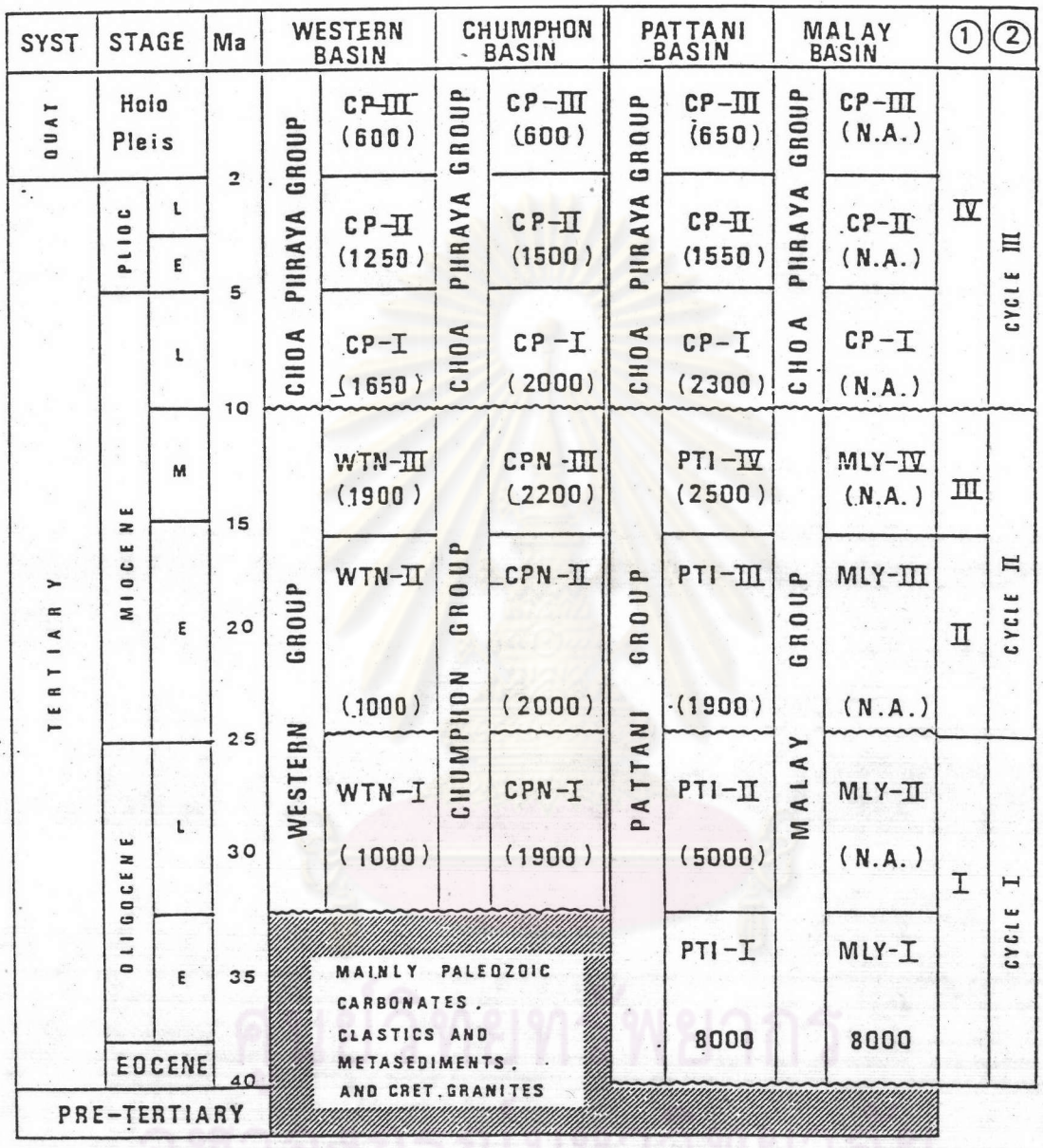

Figure 2.2 i The Stratigraphic of the Tertiary basins in the Gulf of Thailand. (1):Lian &Breadley, 1986 ; (2):Woolands &Haw, 1976. (after Pradidtan,et.al.1990)

MAJOR LITHOLOGIC UNITS	FLORAL ZONES	ENVIRONMENTAL PHASES			AGE	
LIGHT GRAY TO GRAY-BROWN CLAYS, SILTY WITH LIGNITE INTERBEDS	PODOCARPUS	INNER SUBLITTORAL			QUATERNARY	
LIGHT GRAY CLAYS WITH SANDS AND LIGNITE INTERBEDS	DACRYDIUM	COASTAL SWAMP	LITTORAL	SUBLITTORAL	PLIOCENE	
GRAY CLAYSTONES AND SHALES WITH SANDSTONE, LIGNITE, AND COAL INTERBEDS	FLORSCHUETZIA MERIDIONALIS	COASTAL SWAMP	LAGOONAL	COASTAL PLAIN	LATE MIDDLE MIOCENE	
VARIGATED SHALES WITH SANDSTONE AND COAL INTERBEDS	FLORSCHUETZIA LEVIPOLI	FLOODPLAIN	COASTAL PLAIN	LAGOONAL	MIDDLE MIOCENE	TERTIARY
	ALNIPOLLENITES VERUS	COASTAL PLAIN	LITTORAL	INNER - SUBLITTORAL	EARLY MIOCENE	
DARK GRAY SHALE WITH SANDSTONE INTERBEDS	FLORSCHUETZIA TRILOBATA	LITTORAL	INNER SUBLITTORAL		OLIGOCENE	

Figure 2.2 j The general stratigraphic section of the Gulf of Thailand. (after Achalabhuti, 1985)

to Oligocene? (Fig.2.2 k). This well penetrated with about 3,368 meters and the unconformity is at 1,380 meters subsea within the upper part of the Middle Miocene section. The sedimentary sequences of well section are consisting of interbedded sandstone, siltstone and shale. Lek-u thai, Sangsuwan and Thogpentai (1984), reported the palynological evidence from 9-466/1x well of Chumporn basin (Fig.2.2 1). They proposed four palynological zones ranging in age from Holocene to Oligocene, and the deposition environment varies from nonmarine fluvial to coastal plain. Finally, the four to five palynological zones ranging in age from Holocene to Oligocene, are always used to establish or correlate the stratigraphic section in this area to the present day.

2.3 Geological Evolution of the Gulf of Thailand

Thailand is located along southern margin of SE Asia and its composed of the least two microcontinents, namely, Shan-Thai and Indochina cratons (Bunopas.et.al.,1978; Mitchell,1981). The Shan Thai craton is exposed to the western part of Thailand and eastern part of Burma. The basement of this terrain consists of Precambrian granitoids, gneisses, and schists which are overlain by a complex fold belt of Paleozoic and Mesozoic rocks that crop out continuously from northern Thailand through Malaysia. The Indochina craton terrain is composed of Mesozoic continental sedimentary sequences of the Khorat Group, Permain carbonate and deep water facies (Bunopas,1981). The Mesozoic Khorat sediments are believed to overlain the Kontum massif which lies eastward into Loas, Cambodia and Vietnam. Shan-Thai and Indochina were cratonic fragments of Gondwana Australia in the Southern Hemisphere during the Precambrian to lower Paleozoic. After

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ZONE	AGE RANGE
Pocarpas	Quarternary
Dacyrdium	Pliocene
Florschuetzia meridionalis	U-M Miocene
Florschuetzia levipoli	M-L Miocene
Florschuetzia trilobata	Oligocene

Figure 2.2 k Palynological zones of the Gulf of Thailand.
(after Paul and Lian, 1975)

ZONE	AGE RANGE
Podocarpas - Dacyrdium	Holocene - Pliocene
Florschuetzia meridionalis	U - M Miocene
Florschuetzia levipoli	M - L Miocene
Florschuetzia trilobata	Oligocene

Figure 2.2 l Palynological zones of the Gulf of Thailand.
(after Lek-u-thai,Sangsuwan and Thogpenyai,1984)

that they were rifted, drifted and moved upward to a low latitude Northern Hemisphere position, which rotating about 180 degrees in the horizontal plane from Early Carboniferous to Early Triassic. At that time, the oceanic crust between the Shan- Thai and Indochina microcontinents is subsided beneath these microcontinental plates and the result in the Triassic granite belt along the western part of Thailand (Fig. 2.3). During Late Triassic to Middle Jurassic, Shan-Thai is collided with Indochina, and two-microcontinents rapidly swung clockwide to collide with South China in the same time. The collision of these microcontinents is the cause of the development of the central belt granite in Thailand. Finally, the Shan-Thai block is collided by the Western Burma Block during Early Cretaceous to Early Tertiary that result in the western belt granite in Thailand. Major strike-slip faults in Jurassic to Cretaceous are Mae Ping and Three Pagodas faults which are subparallel to the Red River strike-slip fault. The Mae Ping and Three Pagodas faults stopped moving in Late Cretaceous or Early Tertiary (Bunopas and Vella,1983b). Red River fault separated SE Asia from South China, which formed in the same time, and stills active to the present (Bunopas,1981). The tin-bearing Cretaceous granites forming a belt as a result of subduction along the eastern margin of the present Bay of Bengal. It is not clear when subduction occurs but it probably was when peninsula of India rapidly moved north to close the Mesozoic Tethys and opened the Indian Ocean. There are three main ideas about the development of the Tertiary basin of the Gulf of Thailand. First idea, the plate motions in Southeast Asia from Late Cretaceous to Tertiary is the major cause of the development of Tertiary basins in this region including the forming of Tertiary basins of the Gulf of Thailand. In addition to,

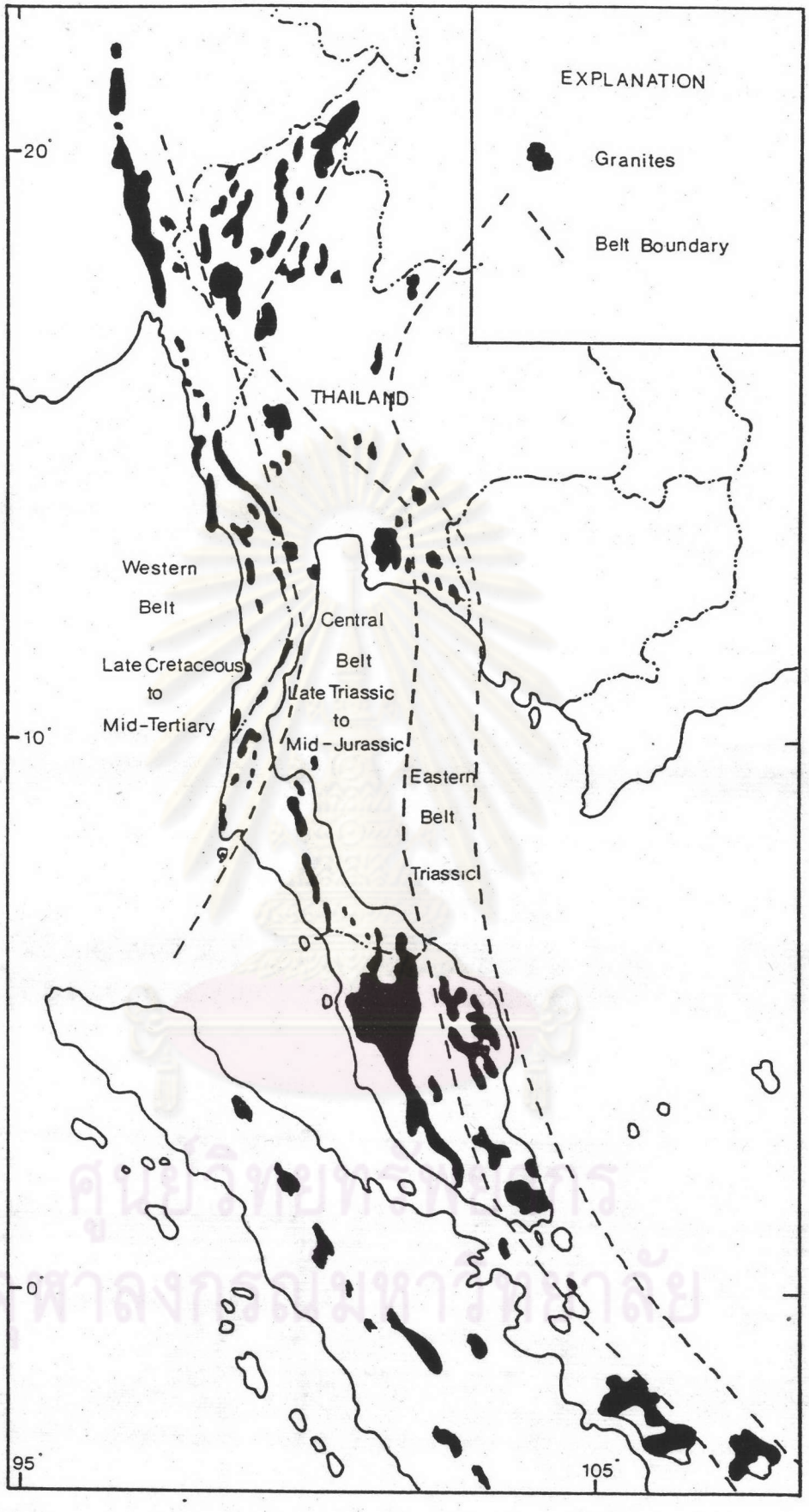

Figure 2.3 Regional distribution and ages of granite belts in Thailand. (after Charusiri et. al, 1989)

the plate motions are combined with the ocean floor spreading, rifting, collision of India with Asia and emplacement of granite in this region. These basins are classified to the rift and back-arc basins. Many geologists support this idea, such as, Achalabhuti (1974,1980), Paul and Lian (1975), Bunopas (1980), Gatinsky (1986) and Pradidtan (1987). Second idea, the Gulf of Thailand is formed by interaction between Ranong Khlong Marui wrench faults in the Thai-Malay peninsula and Three Pagodas wrench fault on the western edge of the Gulf (Hutchison, 1986; Lian and Bradley, 1986; Polachan, 1988). These basins are considered to be the continental wrench basin or the transtensional basin. Third idea consist of the first and second ideas, the development of Tertiary basin in Thailand is the result of the plate motions in Southeast Asia during Late Mesozoic to Early Cenozoic combine with movement of wrench faults in this region (Daly, Hooper and Smith, 1987; Palachan and Sattayarak, 1989; Chinbunchorn, Pradidtan and Sattayarak, 1989). The rift/pull apart basin is the Tertiary basin model in this idea.