Lexicon of Stratigraphic Names of Thailand

Department of Mineral Resources

THAILAND

2013

Lexicon of

Stratigraphic Names of Thailand

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PREFACE

The Royal Thai Department of Mineral Resources (DMR) is the main governmental geoscience organisation serving the country. In all geological studies, precise and accurate definitions of rock units are required, especially for geological mapping, stratigraphic correlation, resource evaluation and the study of geological history. The Working Group on the Stratigraphic Nomenclature of Thailand was therefore established to set up a national stratigraphic names reference volume. All existing lithostratigraphic names prior to 1990 were compiled in the first "Lexicon of Stratigraphic Names of Thailand" published in 1992.

In the last 20 years, numerous technical reports and research papers have been written on the geology of Thailand, geological knowledge has grown rapidly, and many new geological formations and members have been proposed and old units amended. There is thus a need for an updated lexicon in order to keep geosciences professionals informed as to these changes and as to the current status of stratigraphic names. This volume presents a revised list of lithostratigraphic names of Thailand based on a compilation and update of documented units that were published between 1989 and 2012. The present lexicon contains 603 stratigraphic names, of which 290 names are new entry.

The Department appreciates governmental organizations and researchers for their cooperation in providing information. We hope that the new "Lexicon of Stratigraphic Names of Thailand" in 2013 will be a convenient geological reference and will benefit all generations of geologists, students, researchers and all those interested in the geology of Thailand.

Pranuet Roibang

(Mr. Praneet Roibang)
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INTRODUCTION

The Department of Mineral Resources first published the Lexicon of Stratigraphic Names of Thailand in 1992, as a means of keeping the geologic profession informed on the status of geologic units in Thailand. The lexicon terminologies and procedures were in accordance with the International Stratigraphic Guide. The original lexicon contained 313 stratigraphic names including lithostratigraphic names classified into formal and informal names, and chronostratigraphic names all classified as informal names, that came from stratigraphic papers published before 1989. The credit for this endeavor has to be given to the Working Group led by Chairman Thawat Japakasetr, Secretary Phisit Dheeradilok and Assistant Secretary Somchai Nakapadungrat who took several years to accomplish this task.

In this updated lexicon, all stratigraphic names and annotations in the 1992 lexicon are retained, except some units are supplemented with new information and revised where applicable. An attempt has been made to gather all new lithostratigraphic names introduced between 1989 and 2012. However, some pre-1989 names which were not listed in the 1992 lexicon are also included in this volume. The International Stratigraphic Guide (Hedberg, 1976; Murphy and Salvador, 1999) and the international standard (Luttrell and others, 1981; Gwendolyn and others, 1991), state that the proper establishment of a formal lithostratigraphic name requires a statement of intent to introduce the new name that includes publication in a recognized scientific medium; designation of rank; derivation of name; specification of stratotype or type locality; description of unit; geologic age; correlation and genesis (where applicable). Stratigraphic names in abstracts, unpublished theses, open-file releases, and guidebooks that have limited distribution are here considered as informal names and units. Subsurface names are included if these have been defined as part of formal stratigraphy.

The formal name is represented by capitalized initial letters such as Lampang Group, Khao Muang Khrut Sandstone; whereas the unit-term and the lithologic-term in an informal name have lower case initial letters such as Tak group and Chedi conglomerate.

Ages of the units are given following the International Guide and therefore, the designation of "early" or "late", as used by an author with the age of rock units, is changed herein to "lower" or "upper". It should be mentioned, though, that, in recent years, many stratigraphers (e.g. Zalasiewicz and others, 2004) have suggested, controversially, that the

distinction between chronostratigraphic (time-rock units e.g. Devonian System, using Lower and Upper) and geochronological units (time units e.g. Devonian Period, using Early and Late) is both confusing and unnecessary and have suggested that only the terms Early and Late be used.

It should also be noted that all recent standard global correlation charts have dropped the long-used term 'Tertiary'. 'Tertiary' is still widely used, however, and we have continued its use in this volume (generally to include Paleogene plus Neogene) in order to retain the authors' original meanings. Cenozoic is used to include Paleogene plus Neogene and Quaternary.

It is noted that in this book, some geographic names were used in many stratigraphic names (e.g. Li formation, Li granite; Huai Hin Fon limestone, Huai Hin Fon shale; Pong Nam Ron Formation, Pong Nam Ron basalt, Pong Nam Ron quartzite), although they are different in unit terms or lithologic terms. These can be a confusion. Therefore, it is advised that before create new stratigraphic name either formal or informal, researchers should investigate existing names first, and follow the International Stratigraphic Guide.

Each unit name has been annotated using an outline format that has 11 categories i.e. age, distribution, references, lithology, thickness, genesis, parent unit, subdivisions, correlation, type section, and remarks.

Lexicon Explanation

This lexicon follows the format used in the 1992 lexicon and consists of 11 headings, but uses heading names instead of numbers, as follows:

Heading	*Description*
Unit name:	Lithostratigraphic name, chronostratigraphic name, followed by unit name in Thai within a parenthesis.
Age:	As assigned in the naming paper and designated by Period (System), Epoch and Age such as "Lower Permian", "Miocene" or "Carnian".
Distribution:	Areal distribution: province, district, or tectonic provincial names etc.
References:	Refers to naming paper that proposed or revised the stratigraphic name.

Lithology: Principal rock types found in the unit.

Thickness: In meters at the type section and reference section(s).

Genesis: General depositional environment.

Parent unit: Affiliated units of higher rank.

Subdivisions: Subunits in ascending order.

Correlation: Synonymy name(s).

Type section/Type locality/Type area: Following definitions in the International Stratigraphic Guide.

Remarks: Additional information, suggestions and comment.

Local Names

Words	*Meaning*
Mae Nam	river
Huai	creek
Khlong	stream, canal
Khao	mountain, hill
Doi	mountain, hill (Northern Region)
Phu	mountain, hill (the Khorat Plateau, and Loei-Phetchabun Range)
Ko	island
Laem	cape, headland
Ao	bay
Ban	village

LEXICON OF STRATIGRAPHIC NAMES

Ai Ba Lo formation (หมวดหินไอบาลอ)

Age: Permo-Triassic
Distribution: Lower Peninsula: Chanae district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: White to smoky white, sharp, even, very thin banded (1-2 cm) cherts with recrystallised radiolarians intercalated with thin-bedded carbonaceous shales with rare volcaniclastic sediments
Genesis: Deep marine deposits
Correlation: Telong formation in Malaysia
Type locality: Road cuts on the Ai Ba Lo road in the Ku Mung-Ai Ba Lo area, Chanae district, Narathiwat province

Ai Ka Po formation (หมวดหินไอกาเปาะ)

Age: Carboniferous-Permian
Distribution: Lower Peninsula: Sungai Kolok district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Greenish grey, light grey, thin-to thick-bedded, medium-grained, tuffaceous and quartzitic sandstones and fine-grained clast and matrix-supported conglomerates, locally metamorphosed especially at the contact and in shear zones to quartzite and metaconglomerates
Genesis: Low grade metamorphism
Correlation: Ka Lu Bi formation, and Buke Ta formation; Mangga formation and Taku schist in Malaysia
Type locality: Road-cuts and streams as a narrow N-S trending strip on a sharp ridge hill near the Ka Lu Bi-Laem Thong village and the N-S trending sharp ridge from the north of Licho mountain range to Ai Ka Bu village. Named after Ai Ka Po village.

Andaman formation (หมวดหินอันดามัน)

Age: Tertiary (Oligocene)
Distribution: The Andaman Sea
Reference: Nakanart and Mantajit (1983)

Lithology: Grey sandstone, partly interbedded with siltstone in lower part, interbedded with shale in uppermost part
Thickness: 1,000 m
Genesis: Shallow marine to brackish; shallow to middle bathyal
Correlation: Parapat Formation, Bamation Formation
Type locality: Wildcat wells in the Andaman Sea

Ba La granite (หินแกรนิตบาลา)

Age: Cretaceous
Distribution: Lower Peninsula: The Batu Melintang-Sungai Kolok Transect areas
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Biotite granite, foliated, dark grey, equigranular to porphyritic texture; leucogranite; granodiorite dike; pegmatite and aplite dikes
Genesis: I-type granite
Correlation: Kenerong Granite in Malaysia

Ban Hong granite (หินแกรนิตบ้านโฮ้ง)

Age: Triassic (236.4±4.6 Ma, Rb/Sr whole rock isochron)
Distribution: Northern Region: Lamphun province
References: Von Braun and others (1976), Besang and others (1975)
Lithology: Porphyritic biotite granite, medium-grained
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.72475± 81
Type locality: East of Li River, Ban Hong district, Lamphun province
Remarks: The age of the granite was recalculated by Beckinsale and others (1976) to be 243±9 Ma with an initial $(^{87}Sr/^{86}Sr)_0$ ratio of 0.7235 ±15

Ban Huai Khu formation (หมวดหินบ้านห้วยคู)

Age: Triassic
Distribution: Lower Peninsula
Reference: Tansuwan and others (1982)
Lithology: Sandstone, red to reddish-brown and purplish-red, medium- to coarse-grained, siliceous cemented; shale, reddish-brown; and conglomerate
Type locality: Huai Khu village, Sadao district, Songkhla province

Ban Huai Plu formation (หมวดหินบ้านห้วยพลู)

Age:	Cambro-Ordovician
Distribution:	Western Region: Ban Rai district, Uthai Thani province
Reference:	Imsamut and others (1993)
Lithology:	The lower part, 100-200 m thick, consists of micaceous quartzite and quartz-schist; upper part, 200-600 m thick, phyllite, quartz-mica schist and mica schist
Thickness:	300-800 m
Genesis:	Fluviatile to shallow marine environments
Correlation:	Tarutao Group
Type area:	Ban Rai district, Uthai Thani province

Ban Luang formation (หมวดหินบ้านหลวง)

Age:	Carboniferous
Distribution:	Northern Region: Fang and Wiang Hang district of Chiang Mai province
Reference:	Imsamut and Krawchan (2005)
Lithology:	Interbedded of sandstone, siltstone, shale and chert, sharp and parallel bed with lamination sandstone, arkosic and lithic, pale grey, pale greenish grey and greyish-brown, fine-grained, thin to medium bedded; siltstone, mudstone and shale, grey, greenish-grey, whitish-grey, and yellowish-grey, thin bedded; siltstone and mudstone, purplish red and reddish brown, micaceous, thin to medium bedded; chert and siliceous shale, white, smoky white and light brown, ribbon, strongly folded, with radiolarian.
Thickness:	100 m
Genesis:	Shallow marine environment
Parent unit:	Mae Tha Group
Type locality:	Named after Bo Luang village of Mae Ngon sub district, south of Ang Khang Peak, Fang district of Chiang Mai province

Ban Na Yo formation (หมวดหินบ้านนายอ)

Age:	Lower Cretaceous
Distribution:	The Khorat Plateau
References:	Iwai and others (1966, 1968, 1975)
Lithology:	Sandstone, siltstone and shale, interbedded; calcareous conglomeratic sandstone; sandy limestone and calcareous siltstone
Thickness:	420 m

Genesis: Non-marine
Correlation: Khok Kruat Formation
Type locality: Ban Na Yo, Mukdahan province

Ban Nong Hin member (หมู่หินบ้านหนองหิน)

Age: Upper Carboniferous to Lower Permian?
Distribution: Loei-Phetchabun Range
Reference: Assavapatchara (1998)
Lithology: Thin- to thick-bedded, dark grey to black, skeletal limestone and dolomite with nodular and thin-bedded black chert
Thickness: 200-250 m
Genesis: Intertidal and subtidal regimes under influence of low- to high-energy shallow shelf sea of tropical shelf environment
Parent unit: Nam Maholan Formation
Type locality: Good exposures are at Wat Phu Tham Maholan and the Tham Suae Mop areas as well as at southeastern part of the Phu Tham Nam areas.

Ban Nong Nam Khun basalt (หินบะซอลต์บ้านหนองน้ำขุ่น)

Age: Upper Cenozoic (?)
Distribution: The Khorat Plateau
Reference: Jungyusuk and Sirinawin (1983)
Lithology: The rock is dark grey and consists of microphenocrysts of olivine and titanaugite in an intergranular groundmass of lath plagioclase, clinopyroxene, magnetite and sphene
Type locality: Nong Nam Khun village, south of Ubon Ratchathani province

Ban Pa Kha formation (หมวดหินบ้านป่าคา)

Age: Oligocene to Lower Miocene
Distribution: Northern Region: Li basin, Lamphun province
Reference: Ratanasthien (1990)
Lithology: Conglomerate, sandstone, shale, oil shale and coal seams
Thickness: 250 m (Jitapunkul, 1992)
Genesis: Fluvial, lacustrine, swamp deposits
Parent unit: Li group
Correlation: Li formation
Type locality: Pa Kha coal mine, Li district, Lamphun province

Ban Pa Yang suite (หินอัคนีชุดบ้านป่ายาง)

Age:	Triassic
Distribution:	Northern Region: Mae Fa Luang district of Chiang Rai province
Reference:	Putthapiban and Ya-anan (1988)
Lithology:	Porphyritic biotite granite, medium- to coarse- grained; leucogranite, fine- to medium-grained, with aplite and pegmatite
Type area:	Pa Yang village, west of Mai Fa Luang district of Chiang Rai province
Remarks:	The use of term "suite" in the lithostratigraphic unit is inadvisable (Murphy and Salvador, 1999)

Ban Rai formation (หมวดหินบ้านไร่)

Age:	Tertiary
Distribution:	Lower Peninsula
Reference:	Tansuwan and others (1982)
Lithology:	Sandstone, siltstone, claystone and coal
Thickness:	270 m
Type area:	Sadao district, Songkhla province

Ban Rang Khe formation (หมวดหินบ้านรางเข้)

Age:	Cambrian (?)
Distribution:	Western Region
Reference:	Dheeradilok and others (1985a)
Lithology:	Quartzite, yellowish- brown, highly fracturing and quartz-schist, brown to yellowish-brown
Correlation:	Tarutao Group (?)
Type locality:	Rang Khe village, southwest of Tha Maka district, Kanchanaburi province

Ban Sa formation (หมวดหินบ้านสะ)

Age:	Silurian-Devonian
Distribution:	Lower Peninsula: Narathiwat province
Reference:	The Malaysian and Thai Working Groups (2006)
Lithology:	Thin- to thick-banded, light grey, biotite-augen gneiss (40-90%) intercalated with grey banded schistose biotite gneiss (10-60%); well-developed cleavages.
Correlation:	Tiang schist and Kroh formation in Malaysia

Type locality: Stream-cut outcrops along the Mae Nam Kolok near Sa village and the road-cut outcrops at Ba La village the southern part of Waeng district, Narathiwat province

Ban Sai Yoi formation (หมวดหินบ้านไทรย้อย)

Age: Middle Permian
Distribution: Northern Region: Phrae province
Reference: Maneenai and others (1987)
Lithology: Sandstone interbedded with tuff, quartz-schist, quartzite, shale, light grey to dark grey, very thin to thick bedded
Thickness: 50 m
Type locality: At Sai Yoi village, Den Chai district of Phrae province

Ban Tham formation (หมวดหินบ้านถ้ำ)

Age: Permian
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Limestone, light-grey, dark-grey, pink, bedded; calcareous shale, reddish brown and conglomerate in the lower part of the formation
Thickness: 300 m
Genesis: Shallow marine
Type locality: A small mountain at Tham village (Ban Tham), Phayao province

Ban To formation (หมวดหินบ้านโต)

Age: Silurian-Devonian (?)
Distribution: Lower Peninsula
Reference: Muenlek and others (1985)
Lithology: Mica-schist, phyllite, quartzite and alternating sequence of phyllite, argillite, quartzitic sandstone and limestone lens.
Correlation: Thung Saliam Group
Type section: Along the highway No. 410 (Yala-Betong) near To village, Tarn To district, Yala province
Remarks: This formation was previously mapped as part of the Tanaosri group (Muenlek and others, 1985)

Bang Ka Chai formation (หมวดหินบางกะไชย)

Age:	Carboniferous
Distribution:	Eastern Region: Chanthaburi province
Reference:	Raksaskulwong and Prakorbchat (1990)
Lithology:	Slaty shale, black, well developed cleavage, common with pyrite crystals and quartz veinlets; overlying tuffaceous siltstone and sandstone
Thickness:	220 m
Genesis:	Deep sea deposits
Type locality:	Named after Bang Ka Chai village of Tha Mai district

Bang Pu Dum formation (หมวดหินบางปูดำ)

Age:	Tertiary
Distribution:	Lower Peninsula: Krabi province
References:	Electricity Generating Authority of Thailand (1990)
Lithology:	Brown to grey claystone, siltstone and sandstone in the lower part; change upward to claystone, sandstone, limestone and carbonaceous claystone with coal seams.
Thickness:	150 m
Parent unit:	Krabi group
Type locality:	Krabi Lignite Mine, Nuea Khlong district, Krabi province

Bangkok Clay (หมวดหินดินเคลย์กรุงเทพฯ)

Age:	Holocene
Distribution:	The Central Plain: Bangkok
References:	Muktapan cited by Piancharoen and Chuamthaisong (1976), Rao and Nutalaya (1983), Dheeradilok and others (1984)
Lithology:	Weathered clay and soft olive grey or medium to dark grey clay with shell fragments over stiff mottled clay, molluscan fossils and peat. Soft marine clay, i.e., 10-20 m thick occurs in the Bangkok area
Thickness:	20-30 m
Genesis:	Marine, subtidal, intertidal, estuarine
Type area:	Bangkok

Betong formation (หมวดหินเบตง)

Age:	Silurian-Devonian
Distribution:	Lower Peninsula
Reference:	Muenlek and others (1985), Malaysian-Thai Working Groups (2006)
Lithology:	Shale and sandstone with fossils of *Tentaculites* and limestone lens
Thickness:	More than 100 m (Imsamut, 2003)
Genesis:	Deep marine environment (Imsamut, 2003)
Correlation:	The lower part and upper part can be correlated with the Pa Samed and Turulut formations, respectively; Kroh Formation in Malaysia
Type locality:	Along the highway No. 410 from Kamo Sip village to Thai-Malay border
Remarks:	This formation was previously mapped as part of the Tanaosri group (Muenlek and others, 1985)

Bo Kluea formation (หมวดหินบ่อเกลือ)

Age:	Lower Upper Cretaceous
Distribution:	Northern Region: Bo Kluea district of Nan province
Reference:	Imsamut and Chuadee (2006)
Lithology:	Siltstone interbedded mudstone, red to brownish red, thick to very thick bedded, with evaporite disseminated or thin horizon; sandstone, arkosic, brick red, medium-grained, thin to medium bedded, with festoon cross lamination and lamination in the bottom part, ripple marks and mud cracks, mainly coarsening and thickening upward
Thickness:	200-300 m
Genesis:	Flood plain and playa lake environment
Correlation:	Lower Part of Khao Ya Puk formation; Kham Ta Kla and Na Wa Member of Phu Thok Formation
Type locality:	Bo Kluea district of Nan province

Bo Ngam formation (หมวดหินบ่องาม)

Age:	Middle Ordovician
Distribution:	Western Region
Reference:	Siribhakdi (1985)
Lithology:	Limestone, dark grey, commonly with cephalopods, and interbedded phyllitic shale
Parent unit:	Song Tho group
Type locality:	Bo Ngam village, Thong Pha Phum district, Kanchanaburi province

Bo Phloi basalt (หินบะซอลต์บ่อพลอย)

Age:	Tertiary (3.14±0.17Ma, K/Ar whole rock dating)
Distribution:	Western Region: Kanchanaburi province
References:	Barr and Macdonald (1981), Yaemniyom (1982)
Lithology:	The rock is dark grey, dense and has a porphyritic texture. Numbers of spinel lherzolite nodules, megacrysts of clinopyroxene, spinel, sanidine and olivine are distinguishing features
Type locality:	Bo Phloi village, Bo Phloi district, Kanchanaburi province
Remarks:	Nomenclature-nepheline hawaiite

Bo Phloi formation (หมวดหินบ่อพลอย)

Age:	Silurian-Devonian (?)
Distribution:	Western Region
Reference:	Bunopas and Bunjitradulya (1975)
Lithology:	Quartzite, shale, chert, tuff, phyllite and thin crystalline limestone
Thickness:	350 m
Genesis:	It is thought to be derived from a volcanic arc, probably a short distance to the east
Type locality:	Khao Ka and Khao Yai, two isolated hills 10 km southeast of Bo Phloi district, Kanchanaburi province
Remarks:	Not to be confused with Bo Phloi basalt

Bo Sali formation (หมวดหินบ่อสลี)

Age:	Precambrian
Distribution:	Northern Region: Hot district of Chiang Mai province
References:	Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology:	Diopside, calc-silicate and mica schist, augen gneiss
Type locality:	South of Bo Sali village, Hot district of Chiang Mai province

Bong Ti formation (หมวดหินบ้องตี้)

Age:	Triassic
Distribution:	Western Region
Reference:	Siribhakdi (1985)
Lithology:	Limestone, limestone conglomerate and shale, grey to dark grey, and red, well-bedded
Parent unit:	Um Phang group

Type locality: Bong Ti village, Sangkhla Buri district, Kanchanaburi province

Bu Do granite (หินแกรนิตบูโด)

Age: Triassic (207 Ma, Rb/Sr isochron age) (Cobbing and others, 1992)
Distribution: Lower Peninsula: Pattani, Yala and Narathiwat provinces, north of the Malaysia-Thailand border
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Tourmaline biotite-muscovite granite, leucogranite, light grey, equigranular to sparse porphyritic texture; intruded by large quartz, pegmatite and aplite dikes.
Genesis: Ilmenite series with S-type affinity granitoids
Correlation: Merah granite in Malaysia
Type locality: Near Ai So Falls, southwest of the Ku Mung village in Chanae district, Narathiwat provinces

Bu Yong formation (หมวดหินบูยง)

Age: Triassic
Distribution: Lower Peninsula: Chanae district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Massive to thick-bedded conglomerate, conglomeratic sandstone, with both matrix- and clast-supported. Clasts are made up of subangular to rounded, pale brown sandstones, white to smoky quartz, white to grey cherts, brownish grey to bluish grey phyllite and volcanic rocks. Matrix of the rock is reddish brown, fine-to medium-grained, dirty sandstone
Genesis: Submarine fan deposits, proximal part.
Type locality: The Bu Yong road-cut at the Em Se village and stream outcrops in the Ku Mung-Bu Yong area, Chanae district, Narathiwat province

Buke pluton (บุคีพลูตอน)

Age: Cretaceous (?)
Distribution: Lower Peninsula
References: Ishihara and others (1979, 1980)
Lithology: Coarse-grained porphyritic biotite granite and fine- to medium-grained hornblende biotite granite
Type area: Sungai Padi district, Narathiwat province

Remarks: K/Ar biotite age=124±4 Ma. It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Buke Ta formation (หมวดหินบูเก๊ะตา)

Age: Carboniferous-Permian
Distribution: Lower Peninsula: Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Thin banded, dark grey to black, amphibolites schist interbedded with pale grey quartz-amphibolite schist
Correlation: Ai Ka Po formation, and Ka Lu Bi formation; Mangga formation and Taku schist in Malaysia
Type locality: Stream outcrop at Buke Ta village, near Thailand-Malaysia border.

Buntha formation (หมวดหินบุณฑา)

Age: Silurian-Devonian
Distribution: Western Region
Reference: Sukto and others (1985)
Lithology: Black shale; slaty shale; fine-grained sandstone and white quartzitic phyllite
Type area: East of Mae Sot district, Tak province

Carboniferous metavolcanics ? (คาร์บอนิเฟอรัส เมตาโวลคานิคส์ ?)

Age: Lower Carboniferous
Distribution: Northern Region: Lampang and Phrae provinces
References: Piyasin (1972, 1975), Bunopas (1981)
Lithology: Agglomerate and volcanic conglomerate with some associated tuff, tuffaceous sandstone and shale
Genesis: Arc volcanism
Correlation: Correlated with Mae Tha Group, lower parts of the Phrae Group

Cave Temple Member (หมู่หินวัดถ้ำ)

Age: Middle Triassic
Distribution: Northern Region: Lampang province
Reference: Chaodumrong and Burrett (1997)
Lithology: Mainly massive, light grey limestone

Thickness: 216 m at Doi Pha Kan
Genesis: Shallow marine, ramp carbonate platform
Parent unit: Pha Kan Formation
Type section: At Doi Pha Kan north of Ban Tha Si, Doi Chang of Mae Moh district, Lampang
Remarks: Named after Neramit Cave temple east of Mae Moh district of Lampang province

Cenozoic volcanic rocks (?) (ซีโนโซอิคโวลคานิคส์ร็อกซ์ ?)

Age: Cenozoic (?)
Distribution: The Central Plain: Nakhon Sawan and Lop Buri provinces
Reference: Jungyusuk (1987)
Lithology: Pyroclastic flows, ash flow tuffs, rhyodacite, vitric tuff
Type locality: Lamnarai village, Chai Badan district, Lop Buri province

Chaiburi Formation (หมวดหินชัยบุรี)

Age: Lower to Upper Triassic (Dienerian to Middle Norian)
Distribution: Lower Peninsula: Phatthalung province
Reference: Ampornmaha (1995)
Lithology: Thin- to thick-bedded and massive dolomite, laminated limestone, and bioclastic limestone
Thickness: 400-500 m
Subdivisions: Consists of 3 members: Phukhaothong Dolomite, Chiak Limestone, and Phanomwang Limestone Members
Correlation: Part of Ratburi Group in Phatthalung area; part of Chuping and Kodiang Formations in Malaysia
Type area: Named after the largest carbonate mountain in Phatthalung
Remarks: This formation was also named “Chaiburi limestone” by Sardsud and Saengsrichan (2002)

Chaliang Lab formation (หมวดหินเฉลียงลับ)

Age: Tertiary
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference: Chonglakmani and Sattayarak (1984)
Lithology: Shale, yellowish- grey, calcareous; mudstone, white, calcareous, well-bedded

Type locality: Chaliang Lab village, Phetchabun province

Cham Bon formation (หมวดหินจำบอน)

Age: Jurassic
Distribution: Northern Region: Chiang Kham district of Phayao province
Reference: Tansuwan and Chitmanee (1989)
Lithology: Quartzitic sandstone, white to yellowish brown; sandstone interbedded with shale, brown to reddish brown
Genesis: Continental deposit
Correlation: Phra Wihan Formation
Type locality: South of Cham Bon village, Chiang Kham district of Phayao province

Chang Garb Member (หมู่หินช้างกาบ)

Age: Middle Triassic
Distribution: Northern Region: Lampang province
Reference: Chaodumrong and Burrett (1997)
Lithology: Alternating beds of sandstone, siltstone and mudstone with minor limestone beds
Thickness: 147 m at Phra That Muang Kham temple, 233 m at Doi Chang
Genesis: Shallow marine
Parent unit: Pha Kan Formation
Type section: At Doi Chang of Mae Moh district, and Phra That Muang Kham temple of Mueang Lampang district, Lampang province
Remarks: Named after Huai Chang Garb at Doi Chang

Chantaburi basalt (หินบะซอลต์จันทบุรี)

Age: Quaternary (0.44±0.11 Ma, K/Ar whole rock dating)
Distribution: Eastern Region
References: Barr and Macdonald (1978, 1981), Jungyusuk and Sirinawin (1983)
Lithology: The rock is very dark and contains small olivine phenocrysts, ultramafic nodules and various megacrysts
Type locality: Khao Phloi Waen, Chanthaburi province
Remarks: Nomenclature – nephelinite to basanite

Chantaburi granitoids (หินแกรนิตจันทบุรี)

Age:	Upper Triassic-Lower Jurassic (195-209 Ma, $^{40}Ar/^{39}Ar$ dates, emplacement age)
Distribution:	Eastern Region: Chanthaburi province
Reference:	Charusiri and others (1992)
Lithology:	Medium- to coarse-grained, porphyritic- to equigranular, mesocratic, hornblende-biotite granite to quartz diorite, and was cut across by fine- to medium grained, equigranular biotite-hornblende granite
Genesis:	I-type affinity
Parent unit:	Eastern Granite belt
Type area:	At the Plieu and Khlong Narai waterfalls, Chanthaburi province

Chanthaburi group (กลุ่มหินจันทบุรี)

Age:	upper Middle to lower Upper Permian to Middle Triassic (Bunopas, 1994)
Distribution:	Eastern Region: Chanthaburi province
References:	Bunopas (1981, 1992)
Lithology:	Chert, black slaty shale, tuffaceous sandstone and siltstone, quartzite
Subdivisions:	Consists of 3 informal formations: Sra Kaeo, Khao Chakan and Laem Ngob formations (Bunopas, 1994)
Type locality:	Khao Chakan, Sa Kaeo province, Laem Ngob, Trat province

Chao Nen group (กลุ่มหินเจ้าเณร)

Age:	Upper Cambrian to Ordovician
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Sandstone, quartzite, limestone and calcareous mudstone
Thickness:	1,050 m
Subdivisions:	Two informal formations: Chao Nen quartzite and Tha Manao limestone
Type locality:	Srinakarin (Chao Nen) Dam and Khao Tha Manao, Kanchanaburi province

Chao Nen quartzite (หมวดหินควอร์ตไซต์เจ้าเณร)

Age:	Cambrian to Early Ordovician
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Well bedded whitish brown, whitish grey and greenish grey, fine-to medium-grained sandstone and quartzite, grade to interbedded shale

and phyllite and rare limestone bed and then finally to graded beds of sandstone and impure limestone containing shell fragment, with sharply defined base

Thickness: Exceeding 600 m

Parent unit: Chao Nen group

Type locality: Srinakarin (Chao Nen) Dam, Kanchanaburi province

Remarks: The age was given on evidence of trilobites, cephalopods and gastropods.

Chaturat formation (หมวดหินจตุรัส)

Age: Upper Cretaceous

Distribution: Khorat Plateau

Reference: Ratanajaruraks (1990)

Lithology: Predominantly evaporitic rocks, mainly halite, anhydrite and potash; interbedded with terrigenous clastic clay and claystone

Thickness: 50-700 m

Genesis: Marine deposits with access way to the southwest

Parent unit: Maha Sarakham group (Chaturat formation and Phu Thok formation)

Correlation: Maha Sarakham Formation

Type section: Potash exploration drill-hole no K-56, Chatturat town hall, Chaiyaphum province

Chedi conglomerate (หมวดหินกรวดมนเจดีย์)

Age: Middle to Upper Triassic (Malaysian-Thai Working Groups, 2006a), but originally proposed the Triassic (?)

Distribution: Lower Peninsula

Reference: Grant-Mackie and others (1980)

Lithology: Massive, poorly sorted, light grey to medium grey and brown conglomerate with clasts varying sizes from granule to pebble and sand matrix

Thickness: 250 m

Parent unit: Lampang Group (Malaysian-Thai Working Groups, 2006a)

Correlation: Semanggol Formation in Malaysia

Type locality: Road cutting on the northern edge of Khuan Chedi, Sabayoi district, Songkhla province

Remarks: This formation was named Khuan Chedi formation by Malaysian-Thai Working Groups (2006a)

Chiak Limestone Member (หมู่หินปูนเจียก)

Age:	Lower to Middle Triassic (Spathian to Anisian)
Distribution:	Lower Peninsula: Phatthalung province
Reference:	Ampornmaha (1995)
Lithology:	Thin- to thick-bedded limestones intercalated with nodular and thin bedded cherts
Thickness:	300 m
Parent unit:	Chaiburi Formation
Type section:	Quarry at the southern side of Khao Chiak, 6 km west of Phatthalung city

Chiang Kham group (กลุ่มหินเชียงคำ)

Age:	Permian-Carboniferous
Distribution:	Northern Region: Chiang Rai and Phayao provinces
Reference:	Tansuwan and Chitmanee (1989)
Lithology:	Schist, phyllite, meta-volcanic rocks, slate, quartzite, meta-sandstone and meta-shale
Subdivisions:	Into 3 formations: Doi Mun, Huai Nam Bong, and Huai Khrai formations
Correlation:	Phu Rang Ka formation

Chiang Rai basalt (หินบะซอลต์เชียงราย)

Age:	Quaternary (1.69± 1.25 Ma, K/Ar whole rock dating)
Distribution:	Northern Region
References:	Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology:	The rock is light grey to black and vesicular with microphenocrysts of olivine, clinopyroxene and labradorite which are in an intergranular groundmass of lath plagioclase, granular clinopyroxene, magnetite, olivine and chlorite
Type locality:	Chang Khian village, Thoeng district, Chiang Rai province
Remarks:	Nomenclature-tholeiite

Chiang Saen granite-granodiorite (หินแกรนิต-แกรโนไดออไรต์เชียงแสน)

Age:	Triassic
Distribution:	Northern Region: Chiang Saen district of Chiang Rai province
Reference:	Sukvattananunt and Assavapatchara (1989)
Lithology:	Muscovite granite, biotite-hornblende granite, biotite granite, porphyritic granite-granodiorite and diorite

Type area: Chiang Saen district of Chiang Rai province.

Chon Buri group (กลุ่มหินชลบุรี)

Age: Carboniferous
Distribution: Eastern Region: Chon Buri province
Reference: Tansuwan (1999)
Subdivisions: Subdivided into 3 formations: Sri Racha, Plutaluang, and Thammarat Nai formations

Chong Khap formation (หมวดหินช่องแคบ)

Age: Middle Triassic
Distribution: Western Region: Kanchanaburi province
Reference: Bunopas (1981)
Lithology: Interbedded siltstone and shale; siltstone, shale, and thin sandstone, locally with thin limestone; poorly bedded, fine-grained sandstone; bedded limestone with abundant chert nodules
Thickness: 275 m
Genesis: Middle to outer shelf, marine environment
Type locality: 1 km upstream from Ban Chong Khap, 40 km west of Kanchanaburi province, grid ref. 174870, L7017, Sheet DG9

Chong Lot formation (หมวดหินช่องลด)

Age: Ordovician
Distribution: Lower Peninsula: Nakhon Si Thammarat province
Reference: Bamroongsong and Chaodumrong (2001)
Lithology: Limestone, mainly lime mudstone and wackestone, argillaceous, dark grey, thin to medium bedded; marble, light grey, grey
Thickness: Over 300 m
Parent unit: Thung Song Group
Type locality: Khao Chong Lot, Khanom district, Nakhon Si Thammarat province

Chumphon red beds (หมวดหินสีแดงชุมพร)

Age: Lower Jurassic
Distribution: Upper Peninsula
Reference: Raksaskulwong (1994)

Lithology: Red sandstone interbedded with siltstone and shale, few bivalves and plant remains
Thickness: 350 m
Parent unit: Trang Group
Type area: Chumphon province

Dan Lan Hoi Group (กลุ่มหินด่านลานหอย)

Age: Carboniferous
Distribution: Northern Region: Phrae, Uttaradit, and Sukhothai provinces
Reference: Bunopas (1981), Department of Mineral Resources (2001, 2007)
Lithology: Red agglomerate, tuff and tuffaceous sandstone, grey and red sandstone, siltstone and shale, green agglomerate and tuff
Thickness: 1,600 m
Genesis: Deposited in the back-arc, adjacent to the arc
Subdivisions: Three formal formations: Khao Khi Ma Pyroclastics, Lan Hoi Formation and Khao Luang Pyroclastics
Correlation: Mae Tha Group
Type area: Dan Lan Hoi district, west of Sukhothai province

Dan Sai shale (หมวดหินดินดานด่านซ้าย)

Age: Lower to Upper Permian (Kungurian to Kazanian)
Distribution: Northwest of the Khorat Plateau
Reference: Bunopas (1981)
Lithology: Micaceous sandstone, siltstone, shale and carbonaceous shale. Sandstone bed is fine-grained, micaceous orthoquartzite, varying thickness from 20 cm to 2 m. Siltstone is rare and invariably alternated with sandstone and shale in intervals up to 15 meters thick. Shale is interbedded with sandstone and siltstone as above. Black carbonaceous shale frequently occurs as individual beds.
Thickness: 600 m
Genesis: Shallow marine and partial emergence of the depositional surface
Parent unit: Saraburi Group
Type locality: Between km 4 and km 20 along the road between Loei-Dan Sai

Dat Fa Member (หมู่หินตาดฟ้า)

Age:	Upper Triassic
Distribution:	The Khorat Plateau
Reference:	Chonglakmani and Sattayarak (1978)
Lithology:	Grey to black, carbon-rich, calcareous, well bedded shale; argillaceous limestone thin beds
Thickness:	390 m
Genesis:	Lacustrine deposits
Parent unit:	Huai Hin Lat Formation
Type section:	Along Dat Fa village - Kok Kabok village - Huai Pakrai section, Chum Phae district, Khon Kaen province; take its name from Dat Fa village.

Den Matum complex (เด่นมะตูมคอมเพล็กซ์)

Age:	Silurian-Devonian (?)
Distribution:	Northern Region: Tak province
Reference:	Bunopas (1981)
Lithology:	Repeated rhythms of well-bedded to indistinctly bedded, white to brownish grey quartzite, green-grey quartz schist and quartz-mica schist
Thickness:	Over 600 m
Genesis:	Meta-volcanic and meta-pelitic sediments (green schist facies)
Correlation:	Khao Khieo tuff
Type locality:	Few small streams arising in a group of low hills, collectively named Khao Den Matum, 5 km in width, 7 km in length and reaching about 500 m above sea level (South of Tak)

Denchai basalt (หินบะซอลต์เด่นชัย)

Age:	Tertiary (5.64± 0.23 Ma, K/Ar whole rock dating)
Distribution:	Northern Region: Phrae province
Reference:	Barr and Macdonald (1979)
Lithology:	Three flows: the lowest, the oldest, is tholeiitic and transitional to alkalic. It is overlain respectively by the middle and top flows which are hawaiite and basanite.
Type locality:	Bo Keow village and Bo Soon village, south of Denchai district, Phrae province

Diso limestone (หมวดหินปูนดิโส)

Age: Jurassic (Middle Lias to Middle Dogger)
Distribution: Western Region
Reference: Bunopas (1981)
Lithology: Limestone, light brown, red and grey
Thickness: Exceeding 300 m
Genesis: Shallow neritic, marine environment
Correlation: Correlated with upper part of the Sri Sawat limestone and the Mae Moei Group
Type section: Between Huai Diso and Huai Thong Pha Phum, West to Khwae Yai and south of Thong Pha Phum district, Kanchanaburi (grid ref. 310640, Sheet DG 10)

Doi Busra Kam formation (หมวดหินดอยบุษราคัม)

Age: Lower-Middle Permian
Distribution: Northern Region: Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Phyllite interbedded with phyllitic sandstone and phyllitic shale
Thickness: 800-1,000 m
Type locality: At Doi Busra Kam, 15 km west of Phayao downtown

Doi Chang Formation (หมวดหินดอยช้าง)

Age: Middle Triassic
Distribution: Northern Region: Lampang, Phrae, Nan and Uttaradit provinces
References: Proposed by Piyasin (1971, 1972), revised by Chonglakmani (1972, 1981)
Lithology: Grey limestone with minor grey to green shale and sandstone
Thickness: 80-500 m
Genesis: Shallow marine
Parent unit: Lampang Group
Correlation: Pha Kap formation, Pha Kan Formation
Type locality: Doi Chang, Mae Moh district, Lampang province
Remarks: Chaodumrong (1992) suggested, following the International Stratigraphic Guide, that this formation be abandoned due to the use of an inappropriate name

Doi Chang Mup suite (หินอัคนีชุดดอยช้างมูบ)

Age: Permian-Triassic
Distribution: Northern Region: Mae Sai and Mae Fa Luang district of Chiang Rai province
Reference: Putthapiban and Ya-anan (1988)
Lithology: Medium- to coarse-grained tonalite and diorite; fine- to coarse-grained gabbro or gabbroic diorite
Correlation: Doi Sango basic rock
Type area: Doi Chang Mup, west of Mae Sai district of Chiang Rai province
Remarks: The use of term "suite" for a lithostratigraphic unit is inadvisable (Murphy and Salvador, 1999)

Doi Chiang Dao Limestone (หมวดหินปูนดอยเชียงดาว)

Age: Upper Carboniferous to Lower Triassic (Pennsylvanian to Dienerian)
Distribution: Northern Region: Chiang Mai and Mae Hong Son provinces
Reference: Ueno and others (2008)
Lithology: Pale-grey massive limestone but partly more dark-coloured and moderately bedded particularly in its lower part, with frequent dolomitic levels, and free from siliciclastic materials throughout the thick succession.
Thickness: More than 1000 m
Genesis: Mid-oceanic carbonates formed upon seamounts, open shallow-marine origin
Type locality: Named after Doi Chiang Dao where the type locality is located, Chiang Dao district, Chiang Mai province

Doi Huai Nam Sala formation (หมวดหินดอยห้วยน้ำศาลา)

Age: Lower Jurassic
Distribution: Northern Region: Wiang Chiang Rung district of Chiang Rai province
Reference: Sukvattananunt and Assavapatchara (1989)
Lithology: Sandstone, siltstone, shale and volcanic conglomerate
Thickness: 330 m
Type locality: Doi Huai Nam Sala, Wiang Chiang Rung district of Chiang Rai province

Doi Ko formation (หมวดหินดอยก้อ)

Age:	Cambrian-Lower Ordovician
Distribution:	Northern Region: Li district of Lamphun province
Reference:	Chaodumrong and Jiemton (1986)
Lithology:	Sandstone, quartzitic sandstone, grey to brownish-red, thin to thick bedded, shale and phyllite
Thickness:	> 200 m
Correlation:	Pha Bong quartzite
Type locality:	At Doi Ko, Li district of Lamphun province

Doi Kong Mu formation (หมวดหินดอยกองมู)

Age:	Upper Carboniferous
Distribution:	Northern Region: Mae Hong Son province
Reference:	Bunopas (1981)
Lithology:	Well- bedded conglomerate, red and purplish red sandstone and shale. Conglomerate is poorly- to moderately-sorted, with clasts of subrounded to angular pebbles of quartz, chert, quartzite and brown sandstone.
Thickness:	300 m
Genesis:	Paralic deposits (Pertaining to marginal marine environments)
Correlation:	Fang red-beds, Mae Tha Group
Type locality:	Doi Kong Mu, west of Mae Hong Son Town.

Doi Long Formation (หมวดหินดอยลอง)

Age:	Upper Triassic (Carnian)
Distribution:	Northern Region: Lampang province
References:	Proposed by Piyasin (1971), Chonglakmani (1981), revised by Chaodumrong (1992a), Chaodumrong and Burrett (1997)
Lithology:	Grey to light grey, finely crystalline limestone, predominantly massive, but gradually becomes bedded near the base and the top
Thickness:	230 m
Genesis:	Shallow marine; ramp carbonate platform
Parent unit:	Lampang Group
Type locality:	Doi Huai Long, east of Tha Si village, Lampang province
Remarks:	Information above from Chaodumrong and Burrett (1997)

Doi Mun formation (หมวดหินดอยมุน)

Age:	Permian-Carboniferous
Distribution:	Northern Region: Chiang Rai and Phayao provinces
Reference:	Tansuwan and Chitmanee (1989)
Lithology:	Schist, phyllite and meta-volcanic rocks
Parent unit:	Chiang Kham group
Correlation:	Phu Rang Ka formation

Doi Musur Group (กลุ่มหินดอยมูเซอร์)

Age:	Silurian-Devonian
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Sedimentary sequence of quartzite, shale, siltstone, sandstone and banded limestone with chert nodules toward the top
Subdivisions:	Two informal formations: Mae Ya-U siltstone and Doi Musur phyllite
Type area:	Western mountains between Tak city and Mae Sot district

Doi Musur phyllite (หินฟิลไลต์ดอยมูเซอร์)

Age:	Silurian-Devonian
Distribution:	Western Region: Tak province
References:	Bunopas (1981, 1983)
Lithology:	White to light brown quartzitic phyllite
Thickness:	600 m
Parent unit:	Doi Musur Group
Type section:	Km 28.5-km 33, Tak-Mae Sot highway

Doi Pha Khan formation (หมวดหินดอยผาคัน)

Age:	Lower Triassic
Distribution:	Northern Region: Thoen district of Lampang province
Reference:	Sukvattananunt and Paksamut (1986)
Lithology:	Basal conglomerate, clasts of quartz, rhyolite, rhyolitic tuff, andesite, andesitic tuff, quartzite, sandstone and granite, interbedded with sandstone, siltstone and shale; reddish purple, reddish brown
Thickness:	500 m
Correlation:	Phra That Formation
Type locality:	At Doi Pha Khan, Thoen district of Lampang province

Doi Phra Chao formation (หมวดหินดอยพระเจ้า)

Age:	Upper Triassic
Distribution:	Western Region: Mae Sot and Mae Ramat districts of Tak province
Reference:	Tantiwanit and Raksaskulwong (1986)
Lithology:	Limestone, light grey to dark grey, massive in the lower part and well bedded in the upper part; dolomite and recrystallised; shale, interbedded with sandstone and siltstone, dark grey to greenish grey, well bedded with fossil of bivalve
Genesis:	Marine environment
Correlation:	Mae Sariang group
Type Locality:	At Doi Phra Chao, Mae Sot district, Tak province
Remarks:	Fossil of *Halobia* sp.

Doi Pong Nok formation (หมวดหินดอยโป่งนก)

Age:	Upper Triassic
Distribution:	Northern Region: Chiang Rai and Phayao provinces
Reference:	Tansuwan and Chitmanee (1989)
Lithology:	Shale, sandstone, siltstone and conglomerate, reddish-brown, reddish-purple.
Thickness:	200 m
Correlation:	Mae Phong formation

Doi Re Wa formation (หมวดหินดอยเรวา)

Age:	Middle to Upper Jurassic
Distribution:	Western Region: Mae Ramat district of Tak province
Reference:	Tantiwanit and Raksaskulwong (1986)
Lithology:	Limestone, dark grey, well bedded in the lower part and thick-bedded or massive in the upper part, with fossils of ammonite; shale, grey, light grey, greenish grey, silty and calcareous, with fossils of ammonite and bivalve; sandstone and basal conglomerate
Genesis:	marine environment
Correlation:	Huai Fai Group
Type Locality:	At Doi Re Wa, 10 km northwest of Kha Ne Chue village, Mae Ramat district of Tak province
Remarks:	Fossil of *Parvamussium* sp.

Doi Saket-Wiang Pa Pao granites (หินแกรนิตดอยสะเก็ด-เวียงป่าเป้า)

Age:	Triassic (215±3 Ma, Rb/Sr whole rock isochron)
Distribution:	Northern Region: Chiang Mai province
References:	Beckinsale and Nakapadungrat (1981) Nakapadungrat and others (1985)
Lithology:	Porphyritic biotite granite, medium- to coarse-grained and equigranular, fine to medium-grained biotite granite
Genesis:	Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.7295±7
Type area:	Along the Doi Saket-Wiang Pa Pao highway
Remarks:	No age determination was made on the fine-to medium-grained biotite granite

Doi Sango basic rock (หินอัคนีชนิดเบสดอยสะโง๊ะ)

Age:	Permian-Triassic
Distribution:	Northern Region: Chiang Saen district of Chiang Rai province
Reference:	Sukvattananunt and Assavapatchara (1989)
Lithology:	Gabbro, gabbroic diorite and diorite, grey to black, fine to medium grained
Correlation:	Doi Chang Mup suite
Type locality:	At Doi Sango, Chiang Saen district of Chiang Rai province

Doi Tham formation (หมวดหินดอยถ้ำ)

Age:	Permian
Distribution:	Northern Region: Mae Phrik district of Lampang province
Reference:	Chaodumrong and Jiemton (1986)
Lithology:	Biomicrite, light grey, coarse-grained, medium to very thick-bedded, with fusulinids, crinoids, corals and algae
Type locality:	Named after Doi Tham, west of Huai Khi Nok village, Mae Phrik district of Lampang province

Doi Thon formation (หมวดหินดอยโทน)

Age:	Middle-Upper Permian
Distribution:	Northern Region: Mueang district of Phayao province
Reference:	Tiyapirach and Mahapoom (1990)
Lithology:	Limestone and argillaceous limestone, grey, greyish-brown, thick bedded to massive
Thickness:	500-600 m

Genesis: Near shore shallow marine deposit
Correlation: Pha Huat Formation
Type locality: At Doi Thon, 1 km southeast of Phayao downtown

Doi Yao formation (หมวดหินดอยยาว)

Age: Upper Tertiary
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Conglomerate, reddish brown; intercalated with conglomeratic sandstone, sandstone, semi-consolidated, pale yellow to yellowish brown
Thickness: 50-100 m
Type locality: Doi Yao, Lan Sang National Park, between grid reference 010-030 E and 560-580 N of Map sheet Changwat Tak (4842 IV), Indian 1975

Doi Yot Formation (หมวดหินดอยหยด)

Age: upper Lower to lower Middle Jurassic (Upper Toarcian to Lower Aalenian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Mudstone interbedded with limestones and limestone lenses; mudstones dominate in the middle part
Thickness: 370 m
Genesis: Shallow marine
Parent unit: Hua Fai Group
Type section: Named after Doi Yot, 2 km south of the Huai Mae Sot power station; type section follow the power station's canal about 2 km west of Doi Yot

Dok Du formation (หมวดหินดอกดู่)

Age: Lower to Middle Carboniferous
Distribution: Northwest of the Khorat Plateau
Reference: Chonglakmani and Sattayarak (1984)
Lithology: Chert, black, red, milky with pink massive limestone; sandstone and shale
Correlation: Nong Dok Bua formation (Department of Mineral Resources, 2007)

Type locality: Phu Dok Du, Sri Bun Rueang district, Nong Bua Lam Phu province

Donchai Group (กลุ่มหินดอนชัย)

Age: Silurian-Devonian
Distribution: Northern Region: Chiang Mai, Chiang Rai and Lamphun provinces
Reference: Piyasin (1972)
Lithology: The rocks consist of repeated bed of quartzite, quartzo-feldspathic schist, phyllite, chloritic phyllite, calc-silicate, and chert.
Thickness: Over 1500 m
Correlation: Pha Som group
Type locality: Nam Mae Bon stream near Don Chai village, Mae Tha district, east of Lamphun, sheet DC 14

Dong Luang formation (หมวดหินดงหลวง)

Age: Cambro-Ordovician ?
Distribution: Northern Region: Mae Sariang district, Mae Hong Son province
References: Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology: Argillaceous, grey limestone, thin to medium beds; marble
Thickness: 150 m
Type area: Mae Kanai village, Dong Noi village, Mae Sariang district, Mae Hong Son province

Eastern pluton (อิสเทอร์นพลูตอน)

Age: Triassic (?)
Distribution: Northern Region: Tak province
Reference: Mahawat (1982)
Lithology: The rock consists of tonalite, granodiorite and monzogranite
Parent unit: Tak batholith
Type area: East of Tak province
Remarks: It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

E-Lert Formation (หมวดหินอีเลิศ)

Age: Permian
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau

Reference: Charoenprawat and others (1984), Department of Mineral Resources (2007)

Lithology: Brown and grey shale, yellowish brown sandstone, thin- bedded dark grey limestone and chert

Type locality: Huai E-Lert, Loei province

Erawan formation (หมวดหินเอราวัณ)

Age: Middle Permian?

Distribution: Loei-Phetchabun Range

Reference: Chaodumrong and others (1998)

Lithology: Thick- to massive- bedded, grey to light-grey limestone; beds grade to massive upwards; local occurring of crinoid fragments, fusulinids and bivalves

Parent unit: Saraburi Group

Type section: Phu Tham Erawan, Loei province

Fang Chert (หมวดหินเชิร์ตฝาง)

Age: Lower Devonian to Middle Triassic (Sashida and others, 2000; Wonganan and Caridroit, 2005). It was originally assigned to the Devonian (Bunopas, 1981)

Distribution: Northern Region: Chiang Mai and Lamphun provinces

Reference: Bunopas (1981), Department of Mineral Resources (2001, 2007)

Lithology: From bottom to top, it consists of over 200 m interbedded grey shale and sandstone often crushed along fault; 100 m well- bedded chert, green, grey and brown in colour, with very thin feldspathic shale bands; 70 m black argillite, black carbonaceous shale, rare siltstone band; 200 m medium-grained, well-bedded sandstone, mudstone and silicified shale, green, greyish- red and brown in colour

Thickness: 570 m (Bunopas, 1981), no thicker than 200 m (Wonganan and Caridroit, 2005)

Genesis: Pelagic sediment in deep ocean

Type locality: Km 100-110, Chiang Mai-Fang highway, 42 km south of Fang district, Chiang Mai province. Type section is at km 105.6-106.1.

Fang Daeng formation (หมวดหินฝั่งแดง)

Age: Tertiary (?)
Distribution: Upper Peninsula
Reference: Silpalit and others (1985)
Lithology: Red, fine- to medium-grained sandstone, with cross-bedding, mud cracks, ripple marks, interbedded with thin layer of semi-consolidated conglomerate
Type locality: Fang Daeng, Prachuab Khiri Khan province

Fang red-beds (หมวดหินเรดเบดฝาง)

Age: Upper Carboniferous
Distribution: Northern Region: Chiang Mai province
Reference: Bunopas (1981)
Lithology: Thick conglomerate and interbedded conglomeratic sandstone grading to sandstone and shale. The conglomerate is well-sorted consisting of rounded to subrounded pebbles of chert, quartzite, slate and some limestone
Thickness: 200 m
Correlation: Doi Kong Mu Formation
Type locality: 40 km south of Fang district, on the Chiang Mai-Fang road
Remarks: Ueno and Charoentitirat (2011) suggested the formation's age should be younger, because the chert clasts were derived from the Devonian-Triassic Fang Chert.

Fang-Mae Suai granites (หินแกรนิตฝาง-แม่สรวย)

Age: Triassic (232 ± 31 Ma, Rb/Sr whole rock isochron)
Distribution: Northern Region: Chiang Mai province
References: Von Braun and others (1976), Besang and others (1975)
Lithology: Medium- to coarse-grained porphyritic biotite granite
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0 = 0.7280 \pm 33$
Type area: Mountain range between Fang district of Chiang Mai province, and Mae Suai district of Chiang Rai province
Remarks: The age of this granite was recalculated by Beckinsale and others (1979) as 240 ± 64 Ma with an initial $(^{87}Sr/^{86}Sr)_0$ ratio of 0.7280 ± 66

Haad Som Pan granites (หินแกรนิตหาดส้มแป้น)

Age: Cretaceous (?)
Distribution: Upper Peninsula: Ranong province
Reference: Aranyakanon (1961)
Lithology: Porphyritic biotite granite, coarse-grained tourmaline granite and medium-grained granite of uppermost zone
Type locality: Area around Haad Som Pan village, 8 km east of Ranong province

Hod formation (หมวดหินฮอด)

-see Hod limestone

Hod limestone (หมวดหินปูนฮอด)

Age: Upper (?) Ordovician
Distribution: Northern Region: Mae Hong Son, Chiang Mai, Lamphun and Tak provinces
Reference: Bunopas (1981)
Lithology: The lower 300 m of the formation consists of thinly bedded argillaceous limestone; the middle 100 m consists of slaty shale and sandstone with bands of limestone; the upper 400 m consists of massive to the thickly bedded, grey to dark grey limestone with stylolites and a few argillaceous bands. Metamorphosed in part.
Thickness: 800 m
Type area: West of Hod, south of Chiang Mai province, along the track, 8 km from Mae Pae village through the limestone terrain on the northern side of the valley of Nam Mae Pae
Remarks: Raksaskulwong and Tantiwanit (1984) proposed “Hod formation” to replace the Hod limestone, but this name should be retained with respect to the International Stratigraphic Guide, as it has priority. Contains no reliably identified fossils.

Hong Hoi Formation (หมวดหินฮ่องหอย)

Age: Lower to lower Upper Triassic (Griesbachian-Carnian)
Distribution: Northern Region: Lampang province
References: Proposed by Pitakpaivan (1955) and Piyasin (1971, 1972), revised by Chonglakmani (1972, 1981, 2011) and Chaodumrong and Burrett (1997)

Lithology: Greenish-grey shale, mudstone, sandstone, siltstone, conglomerate and minor interbedded argillaceous limestone; Bouma sequence is common

Thickness: 1,900 m; 700 m at type section at Huai Mae Dum to Huai Muang (Chaodumrong and Burrett, 1997)

Genesis: Submarine fan environment

Parent unit: Lampang Group

Subdivisions: Chaodumrong and Burrett (1997) subdivide it into 3 members: Tha Si, Mae Dum Sandstone, Huai Muang Members

Type section: Huai Mae Dum to Huai Muang, east of Tha Si village, Mueang Lampang district; Huai Hong Hoi, Dong village, Mae Moh district, Lampang province

Remarks: Detrital zircons date this formation as 238±3 and 239±3 Ma, (Ladinian-Carnian boundary) (Burrett and others, in press).

Hua Fai Group (กลุ่มหินหัวฝาย)

Age: upper Lower to lower Middle Jurassic (Lower Toarcian to Lower Bajocian)

Distribution: Northern Region: Mae Hong Son, Tak province

References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)

Lithology: Sequences of limestones and interbedded mudstones

Thickness: 900 m

Genesis: Shallow marine

Subdivisions: Consists of 3 formations in ascending order: Khun Huai, Doi Yot and Pha De Formations

Correlation: Huai Pong Group, Umphang Group, lower part of Mae Moei Group

Type section: Section along the road between Khun Huai village to Huai Mae Sot power station; follow the power station's canal about 2 km west of Doi Yot

Hua Na Kham Formation (หมวดหินหัวนาคำ)

Age: Middle Permian (Chonglakmani and Sattayarak, 1984), Middle to Upper Permian (Booth and Sattayarak, 2011)

Distribution: Loei-Phetchabun Ranges

Reference: Chonglakmani and Sattayarak (1984), Department of Mineral Resources (2007)

Lithology: Grey shale, yellowish brown sandstone; grey limestone, bedded and lenticular

Thickness: 1425 m in Non Sung-1 well (Booth and Sattayarak, 2011)

Genesis: Shallow water shelf environment, upward to deltaic and coastal marsh environments (Booth and Sattayarak, 2011)
Correlation: Pha Dua Formation (Ueno and Charoentitirat, 2011)
Type locality: Hua Na Kham village, Chaiyaphum province

Huai Bo Khong Formation (หมวดหินห้วยบ่อโขง)

Age: Triassic
Distribution: Northern Region: Nan and Uttaradit provinces
Reference: Bunopas (1981), Department of Mineral Resources (2001, 2007)
Lithology: Intercalations of green-grey greywacke, grey shale, sandstone, siltstone; Bouma sequence; alternating beds of green-grey and red conglomerate
Thickness: 900 m
Genesis: Marine
Parent unit: Nam Pat Group
Type locality: Huai Bo Khong, Nam Pat district, Uttaradit province

Huai Chan Member (หมู่หินห้วยจันทร์)

Age: Upper Triassic
Distribution: Northern Region: Phrae and Lampang provinces
Reference: Chaodumrong and Burrett (1997)
Lithology: Alternating beds of grey to dark grey limestone, mudstone and shale with minor sandstone and chert beds. Bouma sequence is common.
Thickness: 110 m
Genesis: Deep sea, submarine fan deposits
Parent unit: Wang Chin Formation
Type section: Huai Chan of Song district, Phrae province

Huai Fak formation (หมวดหินห้วยแฝก)

Age: Middle-Upper Triassic
Distribution: Northern Region: Chiang Rai and Phayao provinces
Reference: Tansuwan and Chitmanee (1989)
Lithology: Mudstone and shale, greenish-grey; interbedded with sandstone; with *Posidonia* sp., *Halobia* sp., and *Pteria* sp.
Genesis: Shallow marine deposits
Correlation: Huai Sarian formation

Huai Hin Fon limestone (หมวดหินปูนห้วยหินฝน)

Age:	Jurassic
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Well bedded muddy limestone (at quarry) and calcareous siltstone, alternating shale, limestone and marl
Thickness:	680 m
Genesis:	Marine
Parent unit:	Mae Moei Group
Type section:	Km 67.5-73, Tak-Mae Sot highway

Huai Hin Fon shale (หมวดหินดินดานห้วยหินฝน)

Age:	Jurassic
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Green-grey siltstone, shale, sandstone; dark grey siltstone and alternating limestone containing *Posidonia* sp.; dark grey shale containing ammonites
Thickness:	770 m
Genesis:	Marine
Parent unit:	Mae Moei Group
Type section:	Km 67.5-73, Tak-Mae Sot highway

Huai Hin Lat Formation (หมวดหินห้วยหินลาด)

Age:	Upper Triassic (Carnian-Norian)
Distribution:	The Khorat Plateau
References:	Iwai and others (1964, 1966), Chonglakmani and Sattayarak (1984)
Lithology:	Conglomerate, limestone conglomerate, grey to dark grey sandstone; siltstone; black shale and marl containing plant fossils, *Neocalamites* sp., *Clathropteris* sp.
Thickness:	140 m at its type section, 1,300 m at Kok Kabok village (Chonglakmani and Sattayarak, 1978)
Genesis:	Fluvio-lacustrine
Parent unit:	Khorat Group
Subdivisions:	Into 5 members: Pho Hai, Sam Khaen Conglomerate, Dat Fa, Phu Hi, and I Mo Members (Chonglakmani and Sattayarak, 1978)

Type section: Along Huai Hin Lat of Chum Phae district, around Km 108 on Khon Kaen-Loei highway, about 18 km southwest of Pha Nok Khao village; reference sections proposed by Chonglakmani and Sattayarak (1978) along Ban Dat Fa-Ban Kok Kabok-Huai Pakrai section, and Ban Lui Lai- Nam Phrom Dam section

Huai Kaeo formation (หมวดหินห้วยแก้ว)

Age: Triassic
Distribution: Northern Region: Mueang district of Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Shale, brown, grey and greenish grey, thin bedded, interbedded with greywacke; carbonaceous shale
Genesis: Marine deposit
Correlation: Hong Hoi Formation
Type locality: At Huai Kaeo reservoir, North of Huai Kaeo Luang village, 20 km northeast of Phayao province

Huai Khi Nok formation (หมวดหินห้วยขี้นก)

Age: Silurian-Devonian
Distribution: Northern Region: Mae Phrik district of Lampang province and Li district of Lamphun province
Reference: Chaodumrong and Jiemton (1986)
Lithology: Quartzite, sandstone, quartz-schist, light grey to light brown; shale; slate; phyllite and quartz-mica-schist, grey to dark grey
Thickness: > 100 m
Correlation: Lateral facies change with Nam Tok Ko formation
Type locality: At Huai Khi Nok, southeast of Huai Khi Nok village, Mae Phrik district of Lampang province

Huai Khrai formation (หมวดหินห้วยไคร้)

Age: Permian-Carboniferous (?)
Distribution: Northern Region: Chiang Rai and Phayao provinces
Reference: Tansuwan and Chitmanee (1989)
Lithology: Meta-sandstone and interbedded meta-shale, brown, greyish brown
Parent unit: Chiang Kham group
Correlation: Phu Rang Ka formation

Type locality: Named after Huai Khrai

Huai Khram formation (หมวดหินห้วยคราม)

Age: Tertiary
Distribution: Lower Peninsula: Krabi province
References: Electricity Generating Authority of Thailand (1990)
Lithology: Brown to grey clay and claystone with minor sandstone and conglomerate
Thickness: 150 m
Parent unit: Krabi group
Type locality: Krabi Lignite Mine, Nuea Khlong district, Krabi province

Huai King Formation (หมวดหินห้วยคิง)

Age: Lower Miocene (Watanasak, 1989)
Distribution: Northern Region: Mae Moh basin, Lampang province
References: Chaodumrong (1985), Evans and Jitapunkul (1990)
Lithology: Fining upward sequences of sandstone and conglomerate to mudstone. Fine-grained clastics increase in proportion in the upper part.
Thickness: 15-320 m (Sompong and others, 1996)
Genesis: Fluvial, alluvial fan and lake (Chaodumrong, 1985; Uttamo and others, 2003)
Parent unit: Mae Moh Group
Subdivisions: Chaodumrong (1985) informally subdivided it into 2 members: A-1 member consisting of coarser clastic rocks, and A-2 member of finer clastic rocks.
Type locality: Boreholes in Mae Moh basin, Mae Moh district, Lampang province

Huai Kon formation (หมวดหินห้วยโก๋น)

Age: Miocene
Distribution: Northern Region: Chaloem Phra Kiat district of Nan province
Reference: Imsamut and Chuadee (2006)
Lithology: Cycles of semi-consolidated sequence, mainly fining, thinning upward, conglomerate, sandstone, siltstone and mudstone; conglomerate, greyish-yellow to pale yellow, medium to thick bedded, angular to rounded pebbles (2-10 cm in diameter) of yellow shale, sandstone, quartz and greenish grey quartzite; sandstone, greyish-yellow, fine-to

medium-grained, thin to medium bedded with cross lamination and lamination; siltstone and mudstone, greyish-yellow to pale yellow, medium bedded.

Thickness: 60 m

Genesis: River and lake environment

Type locality: At Huai Kon reservoir, Huai Kon village, Chaloem Phra Kiat district of Nan province

Huai Lat Formation (หมวดหินห้วยลาด)

Age: Lower Triassic

Distribution: Northern Region: Nan and Uttaradit provinces

Reference: Bunopas (1981), Department of Mineral Resources (2001, 2007)

Lithology: Brownish-red to greyish-green, very coarse-grained agglomerate, volcanic conglomerate and thin tuffaceous sandstone beds

Thickness: 500 m

Genesis: Marine

Parent unit: Nam Pat Group

Type section: Huai Lat, 6 km north of Nam Pat town, Uttaradit province (grid ref. 6750, 19660, Sheet EB 18)

Huai Luang Formation (หมวดหินห้วยหลวง)

Age: Miocene-Pliocene

Distribution: Northern Region: Mae Moh basin, Lampang province

References: Chaodumrong (1985), Evans and Jitapunkul (1990)

Lithology: Red-brown and grey mudstone, claystone and siltstone with some sandstone and conglomerate; common with colour mottling, calcrete

Thickness: Up to 560 m (Chaodumrong, 1985), up to 400 m (Uttamo and others, 2003)

Genesis: Fluvial, over bank deposits, alluvial fan (Chaodumrong, 1985; Uttamo and others, 2003)

Parent unit: Mae Moh Group

Subdivisions: Chaodumrong (1985) informally subdivided into 3 members: C-1, C-2, and C-3 members

Type locality: Boreholes in Mae Moh basin, Mae Moh district, Lampang province

Huai Mae Tam formation (หมวดหินห้วยแม่ต๋ำ)

Age: Upper Triassic - Lower Jurassic
Distribution: Northern Region: Mueang district of Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Arkosic sandstone, red, brownish red, fine to medium grained, some micaceous; interbedded with red shale, thick bedded
Thickness: 1,000 m
Genesis: Shore line deposit
Correlation: Hong Hoi Formation
Type locality: At Mae Tam earth dam, 20 km south of Phayao downtown

Huai Mae Tho gneiss (หินไนส์ห้วยแม่ท้อ)

Age: Precambrian (?)
Distribution: Western Region
Reference: Bunopas (1976)
Lithology: Quartz-feldspathic gneiss, calc-silicate, schist and some igneous rock that was deformed and resulted in lens shape of feldspar
Type locality: Huai Mae Tho, west of Tak province

Huai Mae Toen formation (หมวดหินห้วยแม่เติน)

Age: Lower Permian
Distribution: Northern Region: Mae Phrik district of Lampang province
Reference: Chaodumrong and Jiemton (1986)
Lithology: Sandstone, grey, fine-grained, laminated to medium-bedded , with small-scale cross bedding; interbedded with grey shale and locally with limestone, grey, thin-bedded
Type locality: Named after Huai Mae Toen, Mae Phrik district of Lampang province

Huai Muang Member (หมู่หินห้วยม่วง)

Age: lower Upper Triassic?
Distribution: Northern Region: Lampang province
Reference: Chaodumrong and Burrett (1997)
Lithology: Mainly grey to greenish grey mudstone and shale with intercalation of limestone in the upper part
Thickness: 160 m
Genesis: Submarine fan deposits

Parent unit: Hong Hoi Formation

Type section: Named after Huai Muang, east of Tha Si village, Mueang Lampang district, Lampang, where the type section is located

Huai Na Poi formation (หมวดหินห้วยนาปอย)

Age: Lower to Middle Permian

Distribution: Northern Region: west and southwest of Mueang district of Phayao province

Reference: Tiyapirach and Mahapoom (1990)

Lithology: Tuffaceous shale interbedded with tuffaceous sandstone, tuff and conglomerate

Thickness: 2,000-2,500 m

Genesis: Marine deposit with volcanic activity

Correlation: Kiu Lom Formation

Type locality: At Huai Na Poi, Mo Kaeng Tong village, Mueang district of Phayao province (17 Km southwest of Phayao)

Huai Nam Bong formation (หมวดหินห้วยน้ำบง)

Age: Permian-Carboniferous

Distribution: Northern Region: Chiang Rai and Phayao provinces

Reference: Tansuwan and Chitmanee (1989)

Lithology: Slate, quartzite, phyllite, grey to greyish black, brown; limestone lens, recrystallised.

Thickness: 200 m

Parent unit: Chiang Kham group

Correlation: Phu Rang Ka formation

Huai Phu Noi Formation (หมวดหินห้วยพุน้อย)

Age: Originally proposed as Upper Devonian, but Lower Permian by Chaodumrong and others (2004)

Distribution: Upper Peninsula

Reference: Piyasin (1975), Department of Mineral Resources (2007)

Lithology: Shale, grey to black, well- bedded; shale, grey, massive, developed slip cleavage, with scattered pebbles of granite and quartzite

Thickness: 480 m

Genesis: Marine, deep water

Parent unit: Kaeng Krachan Group
Correlation: Laem Mai Phai Formation (Chaodumrong, 2010)
Type locality: Small creek west of Khao Phra, Phetchaburi province

Huai Pla Lot formation (หมวดหินห้วยปลาหลด)

Age: Ordovician
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Purplish red to purplish-brown phyllitic shale; whitish-grey slate; met siltstone and silicified shale; brown metasandstone and siltstone; brown phyllite and less quartzite; intercalated limestone and marble
Thickness: Approximately 1,100-1,200 m
Type locality: Huai Pla Lot, between grid reference 870-910 E and 530-560 N of Map sheet Ban Pang San (4742 I), L7017

Huai Pong Group (กลุ่มหินห้วยโป่ง)

Age: upper Lower to lower Middle Jurassic (Toarcian-Aalenian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Shale and sandstone in the lower part; limestone and siltstone in the middle part; and sandstone in the upper part
Thickness: 200 m
Genesis: Shallow marine, neritic zone
Subdivisions: Consists of 3 formations in ascending order: Pa Lan, Mai Hung, and Kong Mu Formations
Correlation: Hua Fai Group, Umphang Group
Type section: Named after Huai Pong village, Mueang Mae Hong Son district; type section at Km 8-9 along road from Pa Lan village and Klang village to Mae Sariang-Mae Hong Son highway

Huai Prik formation (หมวดหินห้วยปริก)

Age: Silurian-Devonian
Distribution: Lower Peninsula: Ban Na San and Wiang Sa district of Surat Thani province and Nakhon Si Thammarat province
Reference: Sripongpun and Sinpool-anant (1989)
Lithology: Sandstone, micaceous sandstone and shale

Thickness: >100 m
Type locality: Huai Prik village, Nakhon Si Thammarat province
Remarks: fossil of *Styliolina* sp.

Huai Sai formation (หมวดหินห้วยทราย)

Age: Carboniferous
Distribution: Loei-Phetchabun Range: Mueang and Wichian Buri district of Phetchabun
Reference: Jungyusuk and Sinsakul (1989)
Lithology: Sandstone, reddish brown to brown, cross-bedded; pebbly sandstone with pebbles of quartz, quartzite, chert, red siltstone and sandstone, limestone and volcanic rock.
Genesis: Continental environment
Correlation: Huai Hin Lat Formation
Type locality: Named after Ban Huai Sai village, Mueang district of Phetchabun province

Huai Sam Mun Luang limestone (หมวดหินปูนห้วยสามหมื่นหลวง)

Age: Ordovician
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Grey to dark grey, well bedded to massive argillaceous limestone
Thickness: Approximately 700-750 m
Type locality: Huai Sam Mun Luang, between grid reference 730-760E and 700-740 N of Map sheet Ban Pang San (4742 I), Indian 1975

Huai San formation (หมวดหินห้วยส้าน)

Age: Triassic or younger
Distribution: Northern Region: Mae Hong Son province
Reference: Raksaskulwong and Tantiwanit (1984)
Lithology: Sandstone, reddish brown, greyish green, fine- to medium grained, medium- to thick bedded; siltstone, reddish brown, calcareous; limestone, light grey, medium- to thick bedded; conglomerate, reddish brown.
Type locality: Huai San, 2 km north of Mae Suya village, Mae Hong Son province

Huai Sarian formation (หมวดหินห้วยสะเรียน)

Age: Upper Triassic (Carnian-Norian)
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Shale, mudstone, dark grey, greyish green; intercalated with thin bedded sandstone; minor conglomerate
Genesis: Shallow marine deposits
Type area: Chun and Pong districts, Phayao province

Huai Sieo formation (หมวดหินห้วยเสียว)

Age: Middle Miocene
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Sandstone, conglomerate, mudstone, siltstone, semi-consolidated,
Thickness: 500 m
Type area: Pong district, Phayao province

Huai Som formation (หมวดหินห้วยส้ม)

Age: Upper Carboniferous
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat plateau
Reference: Chonglakmani and Sattayarak (1984)
Lithology: Shale, grey sandstone; conglomerate, grey, white, reddish- brown; limestone, grey, lenses and banded; chert, black, nodular and bedded
Type locality: Huai Som, Phu Kradung district, Loei province

Huai Thak Formation (หมวดหินห้วยทาก)

Age: Upper Permian (Kungurian-Kazanian)
Distribution: Northern Region: Chiang Mai, Lampang and Phrae provinces
References: Piyasin (1972), Bunopas (1981)
Lithology: Dark grey to greyish- brown sandstone and shale, conglomerate, limestone, fossiliferous shale and thin-bedded, calcareous sandstone
Thickness: 1,316 m at type section (Piyasin, 1972), 750-1500 m (Bunopas, 1981)
Genesis: Shallow marine, neritic zone
Parent unit: Ngao Group

Type section: Small creek next to mountain called Pha Phlung and Pha Huat, Ngao district, Lampang province; named after a small creek called "Huai Thak"

Remarks: This formation was previously mapped as part of the Ratburi Group (Piyasin, 1972)

Huai Wai quartzite (หินควอร์ตไซต์ห้วยหวาย)

Age: Cambrian (?)

Distribution: Western Region: Uthai Thani province

Reference: Bunopas (1976)

Lithology: Quartzite, phyllite and quartz-biotite schist

Type locality: Huai Wai, west of Lang Khao village, Ban Rai district, Uthai Thani province

Hub Kapong granites (หินแกรนิตหุบกระพง)

Age: Triassic (210.2 ± 3.9 Ma, Rb/Sr whole rock isochron)

Distribution: Upper Peninsula

References: Putthapiban and Suensilpong (1978), Beckinsale and others (1979)

Lithology: Biotite granite, porphyritic and foliated.

Genesis: Crustal origin - $(^{87}Sr/^{86}Sr)_0 = 0.7237 \pm 6$

Subdivisions: Three unnamed units: The very coarse-grained porphyritic biotite gneissic granite (a_1), medium-grained equigranular to coarse-grained granite gneiss (a_2) with big feldspar, and non-foliated granite (b_1)

Type area: Area around Hub Kapong, Cha-am district, Phetchaburi to Hua Hin district, Prachuab Khiri Khan province

Remarks: K/Ar biotite age = 63.6 ± 4 Ma

I Mo Member (หมู่หินอีหม้อ)

Age: Upper Triassic

Distribution: The Khorat Plateau

Reference: Chonglakmani and Sattayarak (1978)

Lithology: Shale, sandstone, limestone, grey diorite, tuff and agglomerate

Thickness: 300 m

Parent unit: Huai Hin Lat Formation

Type section: At Khao I Mo, a small mountain 5 km east of Huai I Chin village, Lom Kao district, Phetchabun province

Ka Lu Bi formation (หมวดหินกาลูบี)

Age: Carboniferous-Permian

Distribution: Lower Peninsula: Sungai Kolok district, Narathiwat province

Reference: The Malaysian and Thai Working Groups (2006)

Lithology: Cycles of thin- to medium-bedded, shales, sandstones and conglomerates with quartz veins and dykes. Local deformation and low-grade metamorphism took place within the shear and contact zones resulting in metamorphism of the original rocks to slate, phyllite, phyllitic shale and spotted slate.

Genesis: Low grade metamorphism

Correlation: Ai Ka Po formation, and Buke Ta formation; Mangga formation and Taku schist in Malaysia

Type locality: Along road-cuts and stream in low relief terrains of the Sukhirin, Ka Lu Bi, To Mo-Phu Khao Thong, Ku Mung-Ka To, Ka To-Nam Hom, Khao Soon Patthana, Ai Ba Lo-Change Perk and So Wo village areas. Named after Ka Lu Bi village.

Kaeng Krachan formation (หมวดหินแก่งกระจาน)

-see Kaeng Krachan Group

Kaeng Krachan Group (กลุ่มหินแก่งกระจาน)

Age: Lower Permian: Asselian to Kungurian (Chaodumrong, 2010); but previously assigned to the Upper Devonian to Carboniferous (Piyasin, 1975)

Distribution: Western Region and Peninsula.

References: Proposed by Piyasin (1975), revised by Chaodumrong and others (2004, 2007) and Chaodumrong (2010), Department of Mineral Resources (2007)

Lithology: Sequence of thin- to medium-bedded sandstone and mudstone, pebbly rocks, mudstone and quartz-rich sandstone

Thickness: 1,760 m

Genesis: Glacially influenced shallow marine to outer shelf environments

Subdivisions: Piyasin (1975) proposed 3 formal formations: Huai Phu Noi, Khao Phra and Khao Chao Formations;

Raksaskulwong and Wongwanich (1993) revised the group to comprise 4 formations: Khao Wang Kradat, Spillway, Ko He and Khao Phra Formations;

Chaodumrong and others (2007) revised the group to consist of 5 formal formations: Laem Mai Phai, Spillway, Ko He, Khao Phra and Khao Chao Formations, and the formations have been used in recent geological maps of the Department of Mineral Resources

Correlation: Phuket group, Mergui Series of Myanmar, Singa Formation of Malaysia

Type area: Kaeng Krachan Dam, 36 km west of Thayang district; Khao Phra, Phetchaburi province; and in Eastern side of Phuket province

Remarks: The Kaeng Krachan formation (Javanaphet, 1969) was proposed as the upper part of the Tanaosri Group. Piyasin (1975) raised the Kaeng Krachan formation to group status. The Phuket group (Mitchell and others, 1970) is equivalent of the Kaeng Krachan Group; however, the given age (Cambrian-Lower Permian) is now known to be erroneous.

Kaeng Raboet formation (หมวดหินแก่งระเบิด)

Age: Lower Jurassic

Distribution: Western Region

References: Bunopas (1980a, 1981)

Lithology: Red shale and intercalated red, cross-bedded sandstone grading downward to alternating red, cross-bedded sandstone and graded beds of conglomerate with limestone clasts, grading down to conglomerate with angular to subrounded limestone, clasts up to 1 m and some red coarse-grained sandstone lenses.

Thickness: 240 m

Genesis: Alluvial fan deposit.

Type locality: 2 km southwest of Kaeng Raboet village, Kanchanaburi province

Remarks: Formerly used as the Kaeng Raboet sandstone by Bunopas (1980a)

Kaeng Raboet sandstone (หมวดหินทรายแก่งระเบิด)

-see Kaeng Raboet formation.

Kam Takla Member (หมู่หินคำตากล้า)

Age: Upper Cretaceous – Lower Tertiary

Distribution: The Khorat Plateau: Nakhon Phanom, Udon Thani and Sakon Nakhon provinces

Reference: Thiamwong and Lertnok (2005)

Lithology: Wavy laminated, reddish brown siltstone; intercalated with fine-grained, calcareous, brick red sandstone
Parent unit: Phu Thok Formation (Nawa, Kam Ta Kla, Phu Thok Noi Members)
Type section: Named after Kham Ta Kla district, at water pit in child care centre (UTM Grid 369325E, 1975510N, Map Sheet 5744 I), Kham Ta Kla district, Sakon Nakhon province

Kamawkala limestone (หมวดหินปูนกะมอกกะลา)

Age: Jurassic
Distribution: Western Region
Reference: Bunopas (1981)
Lithology: Grey, thin-bedded, recrystallised limestone with some fossil debris; grey, thick-bedded, recrystallised limestone, thick-bedded at the lower part.
Thickness: 1,100 m
Genesis: Marine
Parent unit: Mae Moei group
Type locality: Kamawkala Gorge, 25 km northwest of Mae Ramat district, Tak province

Kanchanaburi formation (หมวดหินกาญจนบุรี)

Age: Devonian-Carboniferous
Distribution: The whole country
Reference: Javanaphet (1969)
Lithology: Slate, phyllite, quartzite
Parent unit: Tanaosri group

Kanchanaburi series (หินสมัยกาญจนบุรี)

-see Tanaosri group

Kang Pla Formation (หมวดหินก้างปลา)

Age: Upper Triassic (Middle Carnian to Lower Norian)
Distribution: Northern Region: Phrae province
References: Proposed by Chonglakmani and Tiyapun (1985), revised by Chaodumrong and Burrett (1997) and Chonglakmani (2011)
Lithology: Mainly thin- to massive- bedded limestones with minor intercalated clastics

Thickness: 500 m; 76 m at reference section at Km 45.5 on the Rong Kwang - Ngao highway (Chaodumrong and Burrett, 1997)
Genesis: Ramp carbonate platform
Parent unit: Lampang Group
Correlation: Pha Kan Formation (only east of Phayao, Ngao and Long areas) of Piyasin (1972, 1975) and Chonglakmani (1972, 1981), Khun Huai Ri formation (Chonglakmani and Tiyapun, 1985)
Type section: Took its name from Doi Kang Pla, north of Song district, Phrae province
Remarks: Chonglakmani (2011) mapped this formation under the new group, Song Group.

Kantang Formation (หมวดหินกันตัง)

Age: Lower Miocene
Distribution: Andaman Sea: Mergui Basin
References: Nakanart and Mantajit (1983), Polachan (1988), Polachan and Racey (1994)
Lithology: Mainly grey glauconitic shales containing abundant foraminifera. Proportion of thin siltstones, sandstone and limestones increase upward
Thickness: 1404 m
Genesis: Neritic shelf to upper bathyal environments
Parent unit: Mergui Group
Correlation: Belumai Formation of North Sumatra Basin
Type section: At the interval from 5,180 feet to 9,860 feet in the Mergui well
Remarks: The name proposed by Nakanart and Mantajit (1983), but information described above from Polachan (1988)

Kata Beach suite (กะตะบีชสูท)

Age : Cretaceous (98±7 Ma, Rb/Sr whole rock isochron)
Distribution: Upper Peninsula
Reference: Putthapiban and Gray (1983)
Lithology: Coarse-to very coarse-grained porphyritic biotite granite, with allanite and sphene as accessories
Genesis: Crustal origin (?) – $(^{87}Sr/^{86}Sr)_0$ = 0.7193±12
Parent unit: Phuket granites
Type locality: Kata Beach, Phuket province

Khai Luang formation (หมวดหินคายหลวง)

Age: Devonian-Carboniferous
Distribution: Northern Region: Mae Hong Son province
Reference: Raksaskulwong and Tantiwanit (1984)
Lithology: Sandstone, grey, brown, fine- to medium grained, medium- to thick bedded
Thickness: 350 m
Parent unit: Mae Hong Son group

Kham Sakae Saeng formation (หมวดหินขามสะแกแสง)

Age: Lower Pleistocene of Plio-Pleistocene
Distribution: The Khorat Plateau
Reference: Wongsomsak (1985)
Lithology: Upper clay, iron concretion cap, carbonate-rich zone, lower sand
Thickness: 2.1-2.5 m
Type section: 350 m southwest of Don Phangat village, Kham Sakae Saeng district, Nakhon Ratchasima province

Khanom gneissic complex (หินไนสิกคอมเพล็กขนอม)

Age: Inferred Precambrian
Distribution: Lower Peninsula: Khanom district, Nakhon Si Thammarat province
References: Kosuwan and Charusiri (1997)
Lithology: Gneiss, schist, calcsilicate, quartzite and marble
Subdivisions: 5 informal units: Haad Nai Phlao gneiss, Khao Yoi schist, Laem Thong Yang gneiss, Khao Dat Fa granite, and Khao Pret granite.
Type area: Khanom district, Nakhon Si Thammarat province

Khanu Chert (หมวดหินเชิร์ตขาณุ)

Age: Lower Permian (Sashida and Nakornsri, 1997); previously regarded as Silurian-Devonian (?)
Distribution: Northern Highland: Sukhothai province
Reference: Bunopas (1976), Department of Mineral Resources (2007)
Lithology: Thin-bedded, white, black, grey, brown, blue and green chert with laminae of feldspathic and tuffaceous materials between chert beds.
Thickness: 800 m
Parent unit: Sukhothai Group (Wongwanich and Boucot, 2011)

Correlation: Khao Gob chert, Nakhon Sawan province

Type locality: Small hills between Sawankhalok district and Thung Saliam district, Sukhothai province

Khao Ban Na Thung Chuak formation (หมวดหินเขาบ้านนาทุ่งเชือก)

Age: Silurian - Devonian

Distribution: Western Region: Ban Rai district, Uthai Thani province

Reference: Imsamut and others (1993)

Lithology: Feldspathic sandstone, greywacke and siltstone in the lower part; mainly mudstone, greywacke and limestone lens in the upper part

Thickness: 400 m

Type area: Ban Rai district, Uthai Thani province

Khao Chakan formation (หมวดหินเขาฉกรรจ์)

Age: Middle to Upper Permian

Distribution: Eastern Region: Sa Kaeo, Prachin Buri, Chanthaburi provinces

References: Bunopas (1981), Tansuwan and Boonkanpai (1999)

Lithology: Limestone, massive and bedded, grey to black, with fusulinids and corals

Genesis: Shallow marine deposits

Parent unit: Chanthaburi group

Correlation: Khao Taa Ngog Formation

Type section: Khao Chakan, Sa Kaeo province

Khao Chao Formation (หมวดหินเขาเจ้า)

Age: Lower Permian (Chaodumrong, 2010); but originally assigned to the Upper Carboniferous (Piyasin, 1975)

Distribution: Western Region and Peninsula

References: Proposed by Piyasin (1975), revised by Chaodumrong and others (2004, 2007) and Chaodumrong (2010), Department of Mineral Resources (2007)

Lithology: Sequence of quartz-rich sandstone, shale, siltstone and mudstone. Beds of tuff, limestone, thin shells and crinoid stems are observable in the upper part of the formation.

Thickness: 760 m (Piyasin, 1975), 57 m at Khao Ta Mong Lai, over 100 m at Spillway of the Kaeng Krachan Dam

Genesis: Shallow marine

Parent unit: Kaeng Krachan Group

Type section: Khao Kling, 3 km west of km 131.8, Phet Kasem highway; reference section at Khao Ta Mong Lai, Prachuap Khiri Khan province

Khao Chi Chan member (หมู่หินเขาชีจรรย์)

Age: Carboniferous-Permian
Distribution: Eastern Region: Sattahip district of Chon Buri province
Reference: Boonkanpai and Pudtarauksa (2009)
Lithology: Argillaceous limestone, recrystallised limestone, marble and calc-silicate
Thickness: 20 m
Parent unit: Plu Ta Luang formation
Type Locality: At Khao Chi Chan, Sattahip district of Chon Buri province

Khao Chon Kan formation (หมวดหินเขาชนกัน)

Age: Jurassic (?)
Distribution: The Central Plain: west of Nakhon Sawan province
Reference: Bunopas (1980)
Lithology: Conglomerate, sandstone, shale
Correlation: Lower Khorat Group
Type locality: Khao Chon Kan, west of Nakhon Sawan province

Khao Daen granites (หินแกรนิตเขาแดน)

Age: Upper Cretaceous (93±4 Ma, Rb/Sr whole rock isochron)
Distribution: Upper Peninsula: Thai-Burmese border
References: Beckinsale and others (1979), Nakapadungrat and others (1985)
Lithology: Porphyritic biotite granite with allanite accessory, equigranular medium- to coarse-grained, biotite-muscovite granite and fine- to medium- grained muscovite-tourmaline granite
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.7338±7
Type area: Area around Charin Tin Mine, Kanchanaburi province
Remarks: K/Ar biotite age = 71.1±2.2 Ma
K/Ar muscovite age = 73.9± 1.5 Ma

Khao Daeng formation (หมวดหินเขาแดง)

Age: Lower Jurassic
Distribution: Western Region
References: Bunopas (1976, 1981)

Lithology: Red shale and interbedded red, medium-grained sandstone with locally thin reddish white limestone; brown, reddish-brown, medium- to coarse-grained sandstone; red shale and intercalation of red sandstone; poorly bedded conglomerate; unstratified and very poorly sorted volcanic conglomerate grade down to agglomerate
Thickness: 795 m
Genesis: Non-marine
Correlation: Nam Phong Formation and Phu Kradung Formation
Type locality: Small hill near Ban Tha Mai Daeng, Tak province

Khao Din formation (หมวดหินเขาดิน)

Age: Silurian-Devonian-Carboniferous
Distribution: Lower Peninsula: Nopphitam, Sichon and Tha Sala district of Nakhon Si Thammarat province, Kanchanadit district of Surat Thani province
Reference: Kosuwan and Nakapadungrat (1992)
Lithology: Shale, brown to reddish brown, interbedded with tuffaceous sandstone; arkosic sandstone interbedded with mudstone and greywacke
Genesis: Marine environment
Correlation: Khuan Klang Formation?
Type locality: At Khao Din Temple. Khao Din village of Tha Sala district of Nakhon Si Thammarat province
Remarks: Fossil of *Posidonomya* sp., *Thaiaspis sethaputi* and a spiriferid.

Khao Kachong pluton (เขากระช่องพลูตอน)

Age: Jurassic (?)
Distribution: Lower Peninsula
References: Ishihara and others (1979), Pitakpaivan (1969)
Lithology: Medium- to coarse-grained porphyritic biotite granite
Type area: Mountain range between Trang and Phatthalung provinces
Remarks: K/Ar biotite age = 180±5 Ma

Khao Kata Khwam granites (หินแกรนิตเขากะทะคว่ำ)

Age: Cretaceous ?
Distribution: Upper Peninsula: Phangnga province
References: Garson and others (1975), Nakapadungrat and others (1984)
Lithology: Biotite granite and biotite-muscovite granite

Subdivisions: Five unnamed units: coarse-grained porphyritic biotite granite, fine-to medium-grained porphyritic biotite granite, fine-grained biotite granite, tourmaline-muscovite granite and leucocratic granite (Nakapadungrat and others, 1984)

Type locality: Khao Kata Khwam, east of Kapong district, Phangnga province

Khao Khad Formation (หมวดหินเขาขาด)

Age: Lower Permian (Artinskian-Kungurian) by Hinthong and others (1985), Lower-Middle Permian (Asselian to Capitanian) by Thambunya (2005)

Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau

Reference: Hinthong and others (1985)

Lithology: Very dark grey to black limestone, recrystallised and argillaceous limestone and dolomite, nodular and bedded chert intercalated with shale and sandstone, locally marble and calcsilicate rocks

Thickness: 1,812 m

Genesis: Shallow marine environment

Parent unit: Saraburi Group

Type section: Khao Khad, Phra Phuttabat district, Saraburi province

Remarks: This Formation was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Khao Khamoi granite (หินแกรนิตเขาขโมย)

Age: Triassic

Distribution: Western Region: Ban Rai district of Uthai Thani province

Reference: Nakapadungrat and Chaisen (1986)

Lithology: Porphyritic biotite-muscovite granite

Type Locality: Khao Khamoi, Ban Rai district of Uthai Thani province

Khao Khi Ma Pyroclastic (หมวดหินไพโรคลาสติกเขาขี้ม้า)

Age: Carboniferous

Distribution: Northern Region: Sukhothai province

References: Bunopas (1976, 1981), Department of Mineral Resources (2001, 2007)

Lithology: Tuffaceous, coarse-grained sandstone, shale and infrequent layers of graded-bedded, fine-grained agglomerate; agglomerate, mostly andesitic, with medium-sized clasts, with frequent intercalations of green tuff; poorly bedded, green agglomerate, with large clasts

Thickness: 250 m
Genesis: Assumed to be marine
Parent unit: Dan Lan Hoi Group
Correlation: Lower part of the Mae Tha Group, the Mae Sai Formation; Khao Ki Ma Formation (Ueno and Charoentitirat, 2011)
Type section: North-south trending ridge, south of Ban Dan Lan Hoi district, Sukhothai province
Remarks: Ueno and Charoentitirat (2011) introduced the Khao Ki Ma Formation to replace the Khao Khi Ma Pyroclastic, with respect to nomenclatural guidelines (Salvador, 1999, p. 40)

Khao Khieo tuff (หมวดหินทัฟฟ์เขาเขียว)

Age: Silurian-Devonian (?)
Distribution: Northern Region: Sukhothai province
Reference: Bunopas (1976)
Lithology: A monotonous sequence of poorly differentiated interbedded greywacke, argillites, sandy slate, tuffaceous phyllite, quartzo-feldspathic tuff, andesitic tuff, lithic and crystal tuffs, and some well cleaved agglomerate. The rocks are green to grey in colour when fresh and are brown to yellow in colour when weathered. The tuff, mainly quartzo-feldspathic, increase in proportion to the top of the sequence
Thickness: 1,800 m
Parent unit: Thung Saliam Group (Sukhothai Group)
Correlation: Probably correlated with thin tuffaceous strata between Rayong and Chanthaburi provinces; and some tuffaceous strata between Yala and Pattani provinces
Type section: Extends across the mountain from west to east near Pran Kratai district from grid ref. 553-1855

Khao Khwang Formation (หมวดหินเขาขวาง)

Age: Lower Permian (Sakmarian) by Hinthong and others (1985), Upper Pennsylvanian to Middle Permian by Ueno and Charoentitirat (2011)
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference: Hinthong and others (1985)
Lithology: Black, dark to light grey limestone with chert nodules, locally dolomitic, intercalated with pinkish brown and greenish grey shale, sandstone, tuffaceous sandstone and volcanic rocks

Thickness: 490 m
Genesis: Shallow marine environment
Parent unit: Saraburi Group
Type section: Khao Khwang, Saraburi province
Remarks: This formation was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Khao Ki Ma Formation (หมวดหินเขาขี้ม้า)

-see Khao Khi Ma Pyroclastic

Khao Krachai granite (หินแกรนิตเขากระชาย)

Age: Triassic
Distribution: Western Region: Ban Rai district of Uthai Thani province and Dan Chang district of Suphan Buri province
Reference: Nakapadungrat and Chaisen (1986)
Lithology: Porphyritic biotite granite
Type Locality: Khao Krachai, Ban Rai district of Uthai Thani province

Khao Kradong basalt (หินบะซอลต์เขากระโดง)

Age: Quaternary (0.92±0.30 Ma, K/Ar whole rock dating)
Distribution: The Khorat Plateau: Buri Ram province
References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology: It is grey to greyish-black, vesicular, scoriaceous and bombs, intergranular texture with abundant olivine phenocrysts
Type locality: Khao Kradong, 7 km south of Buri Ram province
Remarks: Nomenclature-hawaiite

Khao Kralok formation (หมวดหินเขากระโหลก)

Age: Ordovician
Distribution: Upper Peninsula
Reference: Dheeradilok and others (1985b)
Lithology: Dolomitic limestone, light grey to dark grey; marble, grey and white, minor drag fold partly intercalation with dolomitic limestone bed
Type section: Khao Kralok, Pranburi district, Prachuab Khiri Khan province

Khao Lak Formation (หมวดหินเขาหลัก)

Age:	Middle Jurassic (Lower Bajocian)
Distribution:	Upper Peninsula: Chumphon and Prachuap Khiri Khan provinces
References:	Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology:	Mainly mudstone and sandstone; bivalves and ammonites are common
Thickness:	190 m
Genesis:	Shallow marine
Correlation:	Hua Fai Group, Khlong Min Formation
Type section:	A small creek on the southern flank of Khao Lak, on the provincial boundary of Chumphon and Prachuap Khiri Khan provinces

Khao Ling Tang Formation (หมวดหินเขาลิงต่าง)

Age:	Permian
Distribution:	Lower Peninsula
Reference:	Nakinbodee and others (1985)
Lithology:	Limestone, light grey to dark grey, massive to bedded, coarse- to fine-recrystallised, locally with chert nodules and layers interbedded with sandstone and shale, with fusulinids, brachiopods, corals, ammonoids, pelecypods and crinoids
Type locality:	Khao Ling Tang, Kanchanadit district, Surat Thani province

Khao Lon conglomerate (หมวดหินกรวดมนเขาโล้น)

Age:	Tertiary
Distribution:	Northern Region: Tak province
Reference:	Hinthong and others (1986)
Lithology:	Conglomerate, reddish brown, semi-consolidated,
Type locality:	Khao Lon, Tak province, between grid reference 090-100 E and 660-680 N of Map sheet Changwat Tak (4842 IV), L7017

Khao Luak Formation (หมวดหินเขาลวก)

Age:	Lower Permian
Distribution:	Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References:	Nakornsri (1977), Bunopas (1981), Department of Mineral Resources (2007)
Lithology:	Well-bedded, green and grey sandstone, brownish-grey shale and thin limestone bands

Thickness: 1,500 m
Genesis: Marine shelf environment
Parent unit: Saraburi Group
Type locality: Khao Luak
Remarks: This formation was previously mapped as part of the Ratburi Group (Nakornsri, 1977)

Khao Luang Pluton (เขาหลวงพลูตอน)

Age: Jurassic (?)
Distribution: Lower Peninsula
References: Ishihara and others (1979, 1980)
Lithology: Essentially coarse-grained porphyritic biotite granite, equigranular medium-grained muscovite-biotite granite and leucocratic granite
Type locality: west of Nakhon Si Thammarat province
Remarks: K/Ar muscovite age= 187±6 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Khao Luang Pyroclastic (หมวดหินไพโรคลาสติกเขาหลวง)

Age: Carboniferous
Distribution: Northern Region: Sukhothai province
References: Bunopas (1976, 1981), Department of Mineral Resources (2001, 2007)
Lithology: Mainly agglomerate and volcanic conglomerate with moderately rounded boulders, cobbles and pebbles. The predominant colours are red, purple, reddish-brown and reddish-green, imparted mainly by a matrix of silt and/or clay. Thin red sandstone and fine-grained tuff beds are intercalated with the coarse-grained beds. Bedding varies from indistinct to moderately well-defined and its thickness ranges from a few centimetres up to 1 metre
Thickness: 550 m
Genesis: Submarine slides, in moderately deep sea, a volcanic arc
Parent unit: Dan Lan Hoi Group
Correlation: Mae Sai Formation
Type section: Khao Luang, west of Sukhothai province

Khao Mai Ruak formation (หมวดหินเขาไม้รวก)

Age:	Upper Ordovician
Distribution:	Western Region: Ban Rai district, Uthai Thani province
Reference:	Imsamut and others (1993)
Lithology:	Mainly calcareous shale and calcareous sandstone, locally intercalated with argillaceous limestone
Thickness:	200 m
Parent unit:	Khao Tam Yae group
Type area:	Ban Rai district, Uthai Thani province

Khao Mon member (หมู่หินเขาหมอน)

Age:	Carboniferous-Permian
Distribution:	Eastern Region: Sattahip district of Chon Buri province
Reference:	Boonkanpai and Pudtarauksa (2009)
Lithology:	Spotted mudstone, spotted shale, quartzite, hornfels, meta chert and meta argillaceous limestone
Thickness:	10-15 m
Parent unit:	Plu Ta Luang formation
Type Locality:	At Khao Mon, Sattahip district of Chon Buri province

Khao Muang Khrut Sandstone (หมวดหินทรายเขาเมืองครุฑ)

Age:	Originally assigned to Lower Permian, but Middle Permian by Chaodumrong and others (2004, 2007)
Distribution:	Western Region
References:	Proposed by Bunopas (1980a, 1981), revised by Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)
Lithology:	Thin- to thick-bedded, coarse-grained, grey to brownish-grey sandstone; quartz-rich sandstone; common with cross stratification; interbedded with shale, mudstone, limestone and dolomite
Thickness:	Exceeding 400 m, 50 m at Khao Kaeo Noi
Genesis:	Shallow marine shelf
Parent unit:	Ratburi Group
Correlation:	Bryozoa bed (Mitchell and others, 1970)
Type section:	Khao Muang Khrut, 15 km west of Kanchanaburi province; Chaodumrong and others (2004, 2007) proposed reference section at Khao Kaeo Noi, 2 km east of Khao Muang Khrut village

Remarks: This formation was previously mapped as part of the Sai Yok group (Bunopas, 1980a)

Khao Nam Yot formation (หมวดหินเขาน้ำหยด)

Age: Upper Triassic
Distribution: Central Region: Wichian Buri district of Phetchabun province
Reference: Jungyusuk (1988)
Lithology: Limestone conglomerate, 80-90% clasts of limestone, interbedded with red sandstone
Thickness: 100 m
Correlation: Huai Hin Lat Formation
Type locality: At Khao Nam Yot, Wichian Buri district of Phetchabun province

Khao Noen Nam Sap formation (หมวดหินเขาเนินน้ำซับ)

Age: Permian
Distribution: Upper central plain: Noen Maprang district of Phitsanulok province
Reference: Leevongcharoen and others (2008)
Lithology: Sandstone, greenish grey, very fine-grained, well sorted, composed of quartz, feldspar, rock fragment, lamination, thick bedded, locally quartzite; hornfels; sandstone interbedded mudstone, dark and pale grey, thin bedded; limestone, medium grey, thin to very thick bedded with fossil brachiopod, coral
Genesis: Marine environment
Type Locality: At Khao Noen Nan Sap, Noen Maprang district of Phitsanulok province

Khao Nui formation (หมวดหินเขานุ้ย)

Age: Middle Permian
Distribution: Lower Peninsula
Reference: Tansuwan and others (1982)
Lithology: Limestone, grey to bluish-grey and greyish-black, massive to thin-bedded, with fusulinids, brachiopods, and crinoid stems
Type locality: Khao Nui, Hat Yai district, Songkhla province

Khao Pathawi limestone (หมวดหินปูนเขาปัทวี)

Age: Upper Triassic (Norian-Rhaetian)
Distribution: Central Plain: Nakhon Sawan, Uthai Thani

References: Ueno and others (2012)
Lithology: Limestone, grey, pure, massive, and displaying karst tower. Main microfacies are bioclastic grainstone, bioclastic- peloidal grainstone/ packstone, and bioclastic wackestone/ packstone
Thickness: Estimate at least several hundred metres
Genesis: Platform carbonate
Correlation: Lampang Group (Kang Pla Formation)
Type Locality: Named after Khao Pathawi. It consists of seven limestone monadnocks: Khao Phra, Khao Kachi, Khao Kwang Thong, Khao Thonglang, Khao Chong Lom, Khao Hin Thoen, and Khao Pathawi, west of Thap Than and Sawang Arom districts of Uthai Thani province

Khao Phanom Bencha adamellite (หินอะดาเมลไลต์เขาพนมเบ็ญจา)

Age: Cretaceous (?)
Distribution: Lower Peninsula
Reference: Garson and others (1975)
Lithology: Medium-to coarse-grained porphyritic hornblende adamellite
Type locality: Khao Phanom Bancha, north of Krabi province
Remarks: The term “granite” should used instead of adamellite (Streckeisen, 1976)

Khao Phanom Rung basalt (หินบะซอลต์เขาพนมรุ้ง)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau: Buri Ram province
References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology: The rock is grey to dark grey, vesicular, intergranular texture with abundant olivine phenocryst
Type locality: Khao Phanom Rung, Buri Ram province
Remarks: Nomenclature-hawaiite

Khao Phra Formation (หมวดหินเขาพระ)

Age: Lower Permian (Chaodumrong, 2010); but originally assigned to the Carboniferous (Piyasin, 1975)
Distribution: Western Region and Peninsula
References: Proposed by Piyasin (1975), revised by Chaodumrong and others (2004, 2007) and Chaodumrong (2010), Department of Mineral Resources (2007)

Lithology: Mudstone, laminated mudstone, siltstone and sandstone; fossils occur abundantly: brachiopods and bryozoans
Thickness: 55 m at Khao Phra
Genesis: Shallow marine
Parent unit: Kaeng Krachan Group
Type section: Khao Phra, 8 km west of Don Sai village, Phetchaburi province
Remarks: The Khao Phra of Piyasin (1975) includes sequences of pebbly rocks, but Raksaskulwong and Wongwanich (1993) and Chaodumrong and others (2004, 2007) exclude the pebbly rocks from this formation, and assign them to the Ko He Formation

Khao Phu Nam Sai formation (หมวดหินเขาภูน้ำใส)

Age: Cambro-Ordovician
Distribution: Western Region: Ban Rai district, Uthai Thani province
Reference: Imsamut and others (1993)
Lithology: Quartzite, brownish white, lamination to massive
Thickness: 200 m
Correlation: Tarutao Group
Type area: Ban Rai district, Uthai Thani province

Khao Phueng formation (หมวดหินเขาพลึง)

Age: Middle Triassic
Distribution: Northern Region: Uttaradit, Phrae and Sukhothai provinces
Reference: Saengsrichan and others (2007)
Lithology: Laminated, grey shale or mudstone, and interbedded sandstone; mudstone and interbedded chert. It displays lateral facies change with the Khao Phueng formation
Thickness: 200-350 m
Genesis: Submarine fan environment in continental slope area
Correlation: Undifferentiated unit of Piyasin (1972)
Type locality: Huai Ha, Uttaradit province; on Khao Phueng-Mae Phuak village road, Den Chai district, Phrae province

Khao Prai Bat basalt (หินบะซอลต์เขาไปรบัท)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau

References: Barr and Macdonald (1978), Jungyusuk and Sirinawin (1983)
Lithology: It is greyish-black and commonly shows a vesicular texture. It consists of granular olivine, clinopyroxene, plagioclase and magnetite.
Type locality: Khao Prai Bat, 2 km south of Khao Phanom Rung, Buri Ram province
Remarks: Nomenclature-hawaiite

Khao Prathiu suite (เขาประทิวสูท)

Age: Cretaceous (82±4 Ma, Rb/Sr whole rock isochron)
Distribution: Upper Peninsula: Phuket Island
Reference: Putthapiban and Grey (1983)
Lithology: Equigranular to slightly porphyritic biotite-hornblende adamellite
Genesis: Mantle origin $(^{87}Sr/^{86}Sr)_0 = 0.71435\pm23$
Parent unit: Phuket granites
Type locality: Khao Prathiu, Phuket province
Remarks: The term “granite” should be used instead of adamellite (Streckeisen, 1976)

Khao Ruak formation (หมวดหินเขารวก)

Age: Ordovician
Distribution: Upper Peninsula: Ratchaburi province
Reference: Dheeradilok and others (1985a)
Lithology: Limestone, thinly laminated, grey to dark grey, recrystallised, intercalated with argillite and fairly well-developed minor drag fold on thin layers, and marble
Type locality: Khao Ruak, Ratchaburi province

Khao Sam Sen formation (หมวดหินเขาสามเสน)

Age: Upper-Middle Permian
Distribution: Northern Region: Uttaradit province
Reference: Sukvattananunt and Prasittikarnkul (1984)
Lithology: Shale, brown to grey interbedded with sandstone and tuffaceous sandstone; limestone
Thickness: 200 m
Type locality: At Khao Sam Sen, Tha Pla district of Uttaradit province
Remarks: Fossil of *Verbeekina* sp. and *Pseudodoliolina* sp.

Khao Sawoei Rat formation (หมวดหินเขาเสวยราช)

Age:	Silurian-Devonian
Distribution:	Upper Peninsula
Reference:	Dheeradilok and others (1985b)
Lithology:	Quartzite, brown to yellowish-brown shale or siltstone
Type locality:	Khao Sawoei Rat, Hua Hin district, Prachuab Khiri Khan province

Khao Si In formation (หมวดหินเขาสีอิน)

Age:	Silurian-Devonian
Distribution:	Lower Peninsula: Nakhon Si Thammarat province
Reference:	Kosuwan (1996)
Lithology:	Black shale interbedded sandstone, gypsum, anhydrite beds, quartzitic sandstone interbedded shale, mudstone, siltstone with limestone lenses.
Thickness:	350 m
Correlation:	Conformably overlying the Thung Song Limestone
Type locality:	Khao Si In, 1 km to the east of Khanom district.

Khao Taa Ngog Formation (หมวดหินเขาตาง๊อก)

Age:	Middle to Upper Permian
Distribution:	Eastern Region: Sa Kaeo and Chanthaburi provinces
Reference:	Chaodumrong (1992b), Ueno and Charoentitirat (2011)
Lithology:	Limestone, grey, medium to thick bedded and massive, common to abundant bioclast fragments; intercalated with shale
Genesis:	Shallow marine deposits
Correlation:	Part of Saraburi Group
Type locality:	Khao Taa Ngog, next to Thailand-Cambodia, Khlong Hat district, Sa Kaeo province

Khao Tam Yae formation (หมวดหินเขาตำแย)

Age:	Middle-Upper Ordovician
Distribution:	Western Region: Ban Rai district, Uthai Thani province
Reference:	Imsamut and others (1993)
Lithology:	Mainly carbonate rocks
Thickness:	400-800 m
Parent unit:	Khao Tam Yae group

Type area: Ban Rai district, Uthai Thani province
Remarks: Duplication of geographic names, Khao Tam Yae, in group and formation ranks is contrary to the recommendation of the International Stratigraphic Guide (Murphy and Salvador, 1999); therefore, these names are obsolete

Khao Tam Yae group (กลุ่มหินเขาตำแย)

Age: Upper-Middle Ordovician
Distribution: Western Region: Ban Rai district, Uthai Thani province
Reference: Imsamut and others (1993)
Lithology: Carbonate rocks in the lower part; mainly calcareous shale and sandstone with minor limestone in the upper part
Thickness: 600-1000 m
Subdivisions: Consists of 2 formations: Khao Tam Yae and Khao Mai Ruak formations
Type area: Ban Rai district, Uthai Thani province
Remarks: Duplication of geographic names, Khao Tam Yae, in group and formation ranks is contrary to the recommendation of the International Stratigraphic Guide (Murphy and Salvador, 1999); therefore, these names are obsolete

Khao Tao formation (หมวดหินเขาเต่า)

Age: Precambrian (?), but Upper Triassic by Sinclair (1997)
Distribution: Upper Peninsula
Reference: Dheeradilok and others (1985b)
Lithology: Orthogneiss and augen gneiss with ptygmatic folding of anatexite
Genesis: Orthogneiss, igneous origin
Parent unit: Hua Hin group by Sinclair (1997)
Type area: Khao Tao, Prachuab Khiri Khan province
Remarks: This gneissic granite has been suggested to be Triassic (Beckinsale and others, 1979; Putthapiban and Suensilpong, 1978)

Khao Taphan Formation (หมวดหินเขาตาพั้น)

Age: Cambrian-Ordovician (?)
Distribution: Western Region: south of Kanchanaburi province
Reference: Dheeradilok and others (1985a)

Lithology: Sillimanite-mica schist, paragneiss, calc-silicate, granite gneiss and leucogranite gneiss
Type area: Khao Taphan, Kanchanaburi province

Khao Taptim formation (หมวดหินเขาทับทิม)

Age: Cambrian-Ordovician (?)
Distribution: Upper Peninsula
Reference: Dheeradilok and others (1985b)
Lithology: Quartzite, yellowish-brown, highly fractured; mica-schist and spotted schist
Type locality: Khao Taptim, Pranburi district, Prachuab Khiri Khan province

Khao Tha Phon limestone (หมวดหินปูนเขาท่าพล)

Age: Lower Carboniferous (Visean-Serpukhovian)
Distribution: Upper central plain: Noen Maprang district of Phitsanulok province
Reference: Leevongcharoen and others (2008)
Lithology: Limestone, pale to dark grey, thin to very thick bedded, greyish black chert nodule, locally recrystalline, with coral, foraminifera, algae, brachiopods, crinoids, bivalves, ostracods, bryozoa and echinoderms
Thickness: 150 m
Genesis: Marine environment (small patch reef)
Type Locality: At Khao Tha Phon, Noen Maprang district of Phitsanulok province

Khao Thalai red-beds (หมวดหินเรดเบดเขาทะลาย)

Age: Lower Triassic or older
Distribution: Eastern Region: Chanthaburi and Rayong provinces
References: Bunopas (1981), Ridd (2008)
Lithology: Red-beds; fine- to coarse-grained, red sandstone with planar cross-bedding, conglomerate, and red, brown silty mudstone.
Genesis: Alluvial fan deposits
Type locality: Khao Thalai and Laem Thai Ran Dok Mai, Chanthaburi province
Remarks: Bunopas (1981) introduced a name Khao Thalai red-beds, but it was subsequently ignored. Ridd (2008) reintroduced the name as described above.

Khao Tosae suite (เขาโต๊ะแซะสูท)

Age: Cretaceous: 84±1 Ma, Rb/Sr whole rock isochron (Putthapiban and Gray, 1983), 74±4 Ma, Rb/Sr whole rock isochron (Beckinsale and Nakapadungrat, 1981)
Distribution: Upper Peninsula: Phuket Island
References: Putthapiban and Gray (1983), Beckinsale and Nakapadungrat (1981)
Lithology: Fine- to medium-grained biotite-muscovite-tourmaline granite
Genesis: Crustal origin: $(^{87}Sr/^{86}Sr)_0$ = 0.7406±7 (Putthapiban and Gray, 1983), $(^{87}Sr/^{86}Sr)_0$ = 0.7453±6 (Beckinsale & Nakapadungrat, 1981)
Parent unit: Phuket granites
Type locality: Khao Tosae, Phuket Island

Khao Um Yom formation (หมวดหินเขาอุมยอม)

Age: Cambrian (?)
Distribution: Western Region
Reference: Sukto and others (1985)
Lithology: Bedded and massive quartzite with phyllite and quartz schist interbedded
Type locality: Tak-Mae Sot highway, Tak province

Khao Wang Chick formation (หมวดหินเขาวังจิก)

Age: Permian-Triassic
Distribution: Eastern Region: Rayong province
Reference: Tansuwan and Prasertsong (2002)
Lithology: Shale and mudstone, pale grey and brown, interbedded with chert, grey and greyish black, very well bedded, and tuffaceous sandstone, sandstone and siltstone
Thickness: 30 m
Type locality: At Khao Wang Chick, 8 km north of Klaeng downtown, Rayong province

Khao Wang Kradat Formation (หมวดหินเขาวังกระดาด)

Age: Carboniferous
Distribution: Upper Peninsula: Prachuap Khiri Khan and Phetchaburi provinces
References: Raksaskulwong and Wongwanich (1993), Department of Mineral Resources (2007)

Lithology: Arkosic and quartzitic sandstones interbedded with mudstone in the lower part; Bouma sequence is present; mudstone and shale with some interbedded siltstone dominate in the upper part
Thickness: 104 m
Parent unit: Kaeng Krachan Group
Type section: Khao Wang Kradat, km 4 on the road no 3459, Bang Saphan district, Prachuap Khiri Khan province

Khao Wong formation (หมวดหินเขาวง)

Age: Lower Triassic
Distribution: Eastern Region: Rayong and Chanthaburi provinces
Reference: Tansuwan and Boonkanpai (1999)
Lithology: Limestone, massive to bedded, grey to greyish black, with oncoids, and interbedded shale
Genesis: Shallow marine
Correlation: Sukpaiwan formation
Type section: Khao Wong, Tha Mai district, Chanthaburi province

Khao Ya Puk formation (หมวดหินเขาย่าปุก)

Age: Upper Cretaceous
Distribution: Northern Region: Phitsanulok province
Reference: Kosuwan (1990)
Lithology: Sandstone, brick-red, coarse- to medium grained, poor sorted, thick bedded with large scale cross-bedding and graded bedding; fine-grained sandstone and interbedded siltstone, brown, with ripple marks and mud cracks
Thickness: 200 m
Genesis: Arid, shallow regressing sea, braided stream
Correlation: Phu Tok formation
Type area: Khao Ya Puk, Nakhon Thai district, Phitsanulok province

Khara Khiri pluton (คาราคีรีพลูตอน)

Age: Triassic (?)
Distribution: Lower Peninsula
Reference: Ishihara and others (1979)

Lithology: Medium- to coarse-grained porphyritic biotite granite with tourmaline spots, alkali feldspar is about 2-6 cm

Type locality: Khao Khara Khiri, Pattani province; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Khlong Khlung gneiss (หินไนส์คลองขลุง)

Age: Precambrian (?)

Distribution: Western Region

Reference: Bunopas (1976)

Lithology: Quartzo-feldspathic gneiss, banded gneiss, calc-silicate and mica-schist with limestone at the top

Type locality: Khlong Khlung district, Kamphaeng Phet province

Khlong Kon limestone (หมวดหินปูนคลองโกน)

Age: Middle Triassic (?) (Grant-Mackie and others, 1980), Middle to Upper Triassic (Sashida and others, 1999)

Distribution: Lower Peninsula

Reference: Grant-Mackie and others (1980)

Lithology: Light to medium grey, fine-grained massive limestone

Thickness: 600 m

Genesis: Marine (Grant-Mackie and others, 1980), lagoon or back-reef environment (Sashida and others, 1999)

Correlation: Pha Kan Formation, Doi Chang Formation

Type locality: Khao Khlong Kon, west of Saba Yoi district, Songkhla province

Khlong Min Formation (หมวดหินคลองมีน)

Age: lower Middle Jurassic, Middle-Upper Jurassic (Raksaskulwong, 2002)

Distribution: Lower Peninsula: Krabi, Trang, Nakhon Si Thammarat provinces

References: Teerarungsigul and others (1999), Raksaskulwong (2002)

Lithology: Mudstone interbedded with fossiliferous limestone in the lower part; change upward to siltstone and fossiliferous limestone, to sandstone, and fossiliferous limestone in the upper part

Thickness: 58-116 m

Genesis: Brackish water in lagoon up to non-marine lacustrine deposits

Parent unit: Thung Yai Group (Trang Group)
Type section: At Khlong Min, NE of Khao Sam Chom; reference section at Laem Pleo of Bo Muang village, Khlong Thom district, Krabi province

Khlong Sait formation (หมวดหินคลองเสียด)

Age: Tertiary
Distribution: Lower Peninsula: Krabi province
References: Electricity Generating Authority of Thailand (1990)
Lithology: Grey claystone, fine-grained sandstone, fossiliferous limestone
Thickness: 100 m
Parent unit: Krabi group
Type locality: Krabi Lignite Mine, Nuea Khlong district, Krabi province

Khlong Suan Mark gneiss (หินไนส์คลองสวนหมาก)

Age: Precambrian (?)
Distribution: Western Highland
Reference: Bunopas (1976)
Lithology: Banded gneiss, augen, biotite gneiss and calc-silicate
Genesis: Meta-sedimentary rocks
Type locality: Khlong Suan Mark, west of Pong Nam Ron village, Kamphaeng Phet province

Khlong Wang Chao gneiss (หินไนส์คลองวังเจ้า)

Age: Precambrian (?)
Distribution: Western Region
Reference: Bunopas (1976)
Lithology: Banded gneiss, biotite schist and calc-silicate
Genesis: Meta-sedimentary rocks
Type locality: Khlong Wang Chao, Mueang Tak district, Tak province

Khlong Wang Chao group (กลุ่มหินคลองวังเจ้า)

Age: Cambrian to Ordovician
Distribution: Northern and Western Regions: Lamphun, Lampang, and Tak provinces
Reference: Bunopas (1981)
Lithology: Quartzite, quartz-schist and argillaceous limestone
Thickness: Over 1,327 m

Subdivisions: Two informal formations: Suan Mark limestone and Pong Nam Ron quartzite

Type locality: Khlong Suan Mark, 4 km west of Pong Nam Ron village and Huai Khrai, a western tributary of Mae Ping between Tak and Wang Chao, Tak province

Khlung basalt (หินบะซอลต์ขลุง)

Age: Late Cenozoic (?)

Distribution: Eastern Region

References: Vichit and others (1978), Sirinawin (1981)

Lithology: The rock is holocrystalline, porphyritic texture containing abundant olivine crystals and minor brown clinopyroxene in a groundmass of clinopyroxene, lath feldspar, opaques, olivine and brown glass

Type locality: In villages of We Lu, Aug Et, I Ram, Saphan Hin and Khlong I Tok, Khlung district, Trat province

Remarks: Nomenclature-basanitoid

Khok Kruat Formation (หมวดหินโคกกรวด)

Age: Upper Cretaceous; but Lower Cretaceous (Aptian-Albian) by Department of Mineral Resources (2007)

Distribution: The Khorat Plateau

Reference: Ward and Bunnag (1964)

Lithology: Soft siltstone and moderately resistant sandstone and caliche-siltstone, pebbles of calcareous conglomerate

Thickness: 709 m

Genesis: Fluviatile

Parent unit: Khorat Group

Type section: Km 207 and km 209, Friendship highway (highway no 2), named after Khok Kruat village, Nakhon Ratchasima province.

Khop Dong formation (หมวดหินขอบด้ง)

Age: Carboniferous

Distribution: Northern Region: Fang and Wiang Hang district of Chiang Mai province

Reference: Imsamut and Krawchan (2005)

Lithology: Sandstone, lithic, arkosic and quartzitic, interbedded with mudstone; lithic sandstone, greyish white, brownish grey and greenish grey, fine-to

medium-grained, with oolitic clasts of chert, mica and quartz; arkosic sandstone, brownish red and pale brown, fine-to medium-grained; quartzitic sandstone, grey, light grey, medium-grained, medium to very thick bedded (>5 m) with cross bedding and lamination; siltstone and mudstone, pale greenish grey, dirty, with leaf and tree fragments, thin to very thick bedded, lamination; mudstone, grey, smooth and homogeneous, thin to thick bedded, pencil-like fracture.

Thickness: 600-800 m

Genesis: Shallow marine environment

Parent unit: Mae Tha Group

Type locality: Named after Khop Dong village, near Thai-Myanmar boundary, Fang district of Chiang Mai province

Khorat Group (กลุ่มหินโคราช)

Age: Upper Triassic to Cretaceous

Distribution: The Khorat Plateau

References: Ward and Bunnag (1964), Iwai and others (1966), Gardner and others (1967), Department of Mineral Resources (2007)

Lithology: Red clastic sedimentary rocks, sandstone, siltstone, claystone, shale and conglomerate

Thickness: 5,000 m

Genesis: Continental deposits

Subdivisions: Consists of 9 formations: Huai Hin Lat, Nam Phong, Phu Kradung, Phra Wihan, Sao Khua, Phu Phan, Khok Kruat, Maha Sarakham and Phu Thok Formations (DMR, 2007; Jin-Geng and Meesook, 2013)

Consists of 6 formations: Upper Nam Phong, Phu Kradung, Phra Wihan, Sao Khua, Phu Phan, Khok Kruat (Sattayarak and others, 1989; Booth and Sattayarak, 2011; Racey, 2011), based mainly on unconformities from seismic evidence.

Type area: Khorat Plateau

Remarks: This Group was formerly named as the Khorat series (Brown and others, 1951, 1953). Mouret (1994) raised the Khorat Group to Khorat supergroup, but this name is informal, according to the International Stratigraphic Guide.

The International Stratigraphic Guide states that "local or minor hiatuses, disconformities or unconformities within a sequence of similar lithologic composition should not be considered reason for recognition of more than one lithostratigraphic unit" (Murphy and Salvador, 1999).

Khorat series (หินสมัยโคราช)

-see Khorat Group

Khu Muang formation (หมวดหินคูเมือง)

Age: Upper Pleistocene, Lower Holocene
Distribution: The Khorat Plateau
Reference: Wongsomsak (1985)
Lithology: Upper sand horizon, gravel lens, lower sand horizon, major gravel horizon
Thickness: 5.5 m
Type section: 1 km south of Khu Muang district, Buri Ram province (grid ref. 8642, 8695, Map sheet no, 5639 IV)

Khuan Chedi formation (หมวดหินควนเจดีย์)

-see Chedi conglomerate

Khuan Khuha formation (หมวดหินควนคูหา)

Age: Tertiary (?)
Distribution: Lower Peninsula
Reference: Muenlek and others (1985)
Lithology: Conglomerate, sandstone, siltstone, semi-consolidated; grave bed with good cement in some parts including sand lenses and plant remains.
Type locality: Khuan Khuha, Nongchik district, Pattani province

Khuan Klang Formation (หมวดหินควนกลาง)

Age: Lower Carboniferous (Tournaisian-Visean)
Distribution: Lower Peninsula
References: Tansuwan and others (1982), Department of Mineral Resources (2007), Ueno and Charoentitirat (2011)
Lithology: Shale, reddish-brown and grey with bivalves, brachiopods and fragment of trilobite; interbedded sandstone, siltstone and chert beds
Thickness: 120 m
Genesis: Marine environment
Type section: Named after a small hill, Khuan Klang where type section located, 5 km west of Satun city

Remarks: This formation was also misspelled as “Kuan Klang Formation” (Wongwanich and Boucot, 2011)

Khuan Muang formation (หมวดหินควนม่วง)

Age: Tertiary
Distribution: Lower Peninsula: Krabi province
References: Electricity Generating Authority of Thailand (1990)
Lithology: Grey to greenish grey, fossiliferous claystone; minor sandstone interbeds
Thickness: 100 m
Parent unit: Krabi group
Type locality: Krabi Lignite Mine, Nuea Khlong district, Krabi province

Khun Huai Formation (หมวดหินขุนห้วย)

Age: upper Lower Jurassic (Lower Toarcian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Mainly limestone-marl-dominated sequences with interbedded mudstones
Thickness: 140 m
Genesis: Shallow marine, restricted basin
Parent unit: Hua Fai Group
Type section: Named after Khun Huai village, Mae Sot district, Tak; type section along the road between Khun Huai village to Huai Mae Sot power station

Khun Mae Kanai formation (หมวดหินขุนแม่กะใน)

Age: Silurian – Devonian?
Distribution: Northern Region: Mae Sariang district, Mae Hong Son province
References: Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology: Whitish brown sandstone, greyish green mudstone, grey shale
Thickness: 400-600 m
Type area: Near Mae Hoa Pa Kae village, Pha Daeng village

Khun Nam Rin formation (หมวดหินขุนน้ำริน)

Age: Cambrian
Distribution: Northern Region: Mae Hong Son province
Reference: Raksaskulwong and Tantiwanit (1984)

Lithology: Quartzite, brown, thick bedded, cross bedded,
Genesis: Near shore environment
Parent unit: Pha Bong Group
Type locality: Pha Bong Dam, Mae Hong Son province

Khuntan batholith (ขุนตาลบาโธลิธ)

Age: Triassic (212±12Ma, Rb/Sr whole rock isochron)
Distribution: Northern Region: Chiang Mai, Lampang province
Reference: Teggin (1975), Suensilpong and others (1977), Beckinsale and others (1979)
Lithology: Porphyritic biotite granite, biotite-muscovite granite and tourmaline-muscovite granite
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0$ =0.7224±20
Type area: Khuntan mountain range, northwest of Lampang and southeast of Chiang Mai province
Remarks: K/Ar biotite age=200 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Khwaeng Phao formation (หมวดหินแขวงเภา)

Age: Ordovician
Distribution: Lower Peninsula
Reference: Nakinbodee and others (1985)
Lithology: Limestone, light grey to dark grey, bluish-grey, brownish- grey, massive to thin bedded, recrystallised, and argillaceous layer, with nautiloids, sponges, gastropods, and brachiopods
Type locality: Ban Khwaeng Phao, Khanom district, Nakhon Si Thammarat province

Kio Chan formation (หมวดหินกิ่วจันทร์)

Age: Jurassic-Cretaceous
Distribution: Northern Region: Chaloem Phra Kiat district of Nan province
Reference: Imsamut and Chuadee (2006)
Lithology: Sandstone, quartzitic, pale brown, light grey and greenish grey, medium- to very coarse-grained, well sorted, thin to thick bedded; sandstone, arkosic, light grey, fine-to medium-grained, medium bedded; siltstone to mudstone, grey and greenish-grey, thin bedded; conglomerate,

sandstone and tuffaceous siltstone with volcanic pebbles, brownish red in the lowest part; interbedded with conglomerate, sandstone and pale brown and light grey, with pebbles (1-3 cm in diameter) of quartz, chert and flint, medium to thick bedded; interbedded with arkosic siltstone thick to very thick bedded in the upper part, cross lamination, lamination, graded bedded and ripple marks

Thickness: 200 m

Genesis: Braided stream

Subdivisions: Quartzitic sandstone member and pebbly sandstone member (from bottom to top)

Type locality: Kio Chan village, Chaloem Phra Kiat district of Nan province

Kiu Lom Formation (หมวดหินกิ่วลม)

Age: Lower Permian (Stephanian-Sakmarian)

Distribution: Northern Region: Chiang Mai, Lampang, Phrae provinces

References: Piyasin (1972), Bunopas (1981, 1982)

Lithology: Andesite, rhyolite, tuff, agglomerate, tuffaceous sandstone and shale, sandstone; shale intercalated with calcareous shale and thin bedded limestone. Basal volcanics overlie sandstone and shale of the Mae Tha Formation (Piyasin, 1972). Sandstone, shale calcareous shale, thin-bedded limestone with fusulinids (Bunopas, 1981)

Thickness: 500-600 m (Piyasin, 1972; Bunopas, 1981)

Genesis: Open marine environment (Bunopas, 1981, 1983)

Parent unit: Ngao Group

Correlation: Nam Mahoran formation (Piyasin, 1972)

Type section: Kiu Lom Damsite, Lampang province

Remarks: This formation was previously mapped as part of the Ratburi Group (Piyasin, 1972)

Klaeng schist and phyllite (หินชีสต์และฟิลไลต์แกลง)

Age: Silurian-Devonian (?)

Distribution: Eastern Region: Rayong and Chanthaburi provinces

Reference: Bunopas (1981)

Lithology: The lower part of the sequence consists of interbedded quartz mica schist, tuffaceous quartzite and brown tuffaceous phyllite. Overlying the schist are intercalations of grey slate, slaty shale, chert, phyllite and rare thin limestone bands.

Correlation: This formation is probably comparable with the Bo Phloi Formation
Type locality: Lower terrain adjacent to the side of and sub-parallel to the Precambrian gneiss hills, east of Klaeng district, Rayong province

Kled Kaew member (หมู่หินเกล็ดแก้ว)

Age: Carboniferous-Permian
Distribution: Eastern Region: Sattahip district of Chon Buri province
Reference: Boonkanpai and Pudtarauksa (2009)
Lithology: Quartzitic sandstone, arkosic sandstone, mudstone, shale and chert
Thickness: 35 m
Parent unit: Plu Ta Luang formation
Type Locality: At Kled Kaew bay, Sattahip district of Chon Buri province

Klo Tho Formation (หมวดหินกล้อทอ)

Age: upper Lower Jurassic (Lower Toarcian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: thin bedded, dark grey mudstones and interbedded sandstones with fining upward sequences
Thickness: 60 m
Genesis: Shallow marine
Parent unit: Umphang Group
Type section: Named after Klo Tho village of Umphang district, Tak; type section along a track 3 km north of Klo Tho village of Umphang district to Pu Khloe Khi village in Myanmar

Ko He Formation (หมวดหินเกาะเฮ)

Age: Lower Permian
Distribution: Peninsula
References: Proposed by Raksaskulwong and Wongwanich (1993), revised by Chaodumrong and others (2004, 2007), Department of Mineral Resources (2007)
Lithology: Mainly pebbly rocks or diamictite with subordinate, intercalated mudstone and sandstone. It is poorly sorted, with clasts generally less than 10%, and a matrix consisting of silty mud to muddy sand. Clasts are generally smaller than 2 cm

Thickness: 120 m
Genesis: Submarine fan deposits
Parent unit: Kaeng Krachan Group
Type section: Named after "He island" of Phuket province, where the type section is located.

Ko Kha formation (หมวดหินเกาะคา)

Age: Tertiary (Miocene-Holocene)
Distribution: Northern Highland: Lampang province
References: Piyasin and others (1977, 1978), Sripongpun (1985)
Lithology: Interbedded of diatomaceous clay and diatomite
Thickness: 15.35 m
Genesis: Lacustrine, fresh-water, cool clear water
Type locality: Drill hole in Lampang basin. Ko Kha district, Lampang province

Ko Kut basalt (หินบะซอลต์เกาะกูด)

Age: Tertiary (8.5±1.0 Ma, K/Ar whole rock dating)
Distribution: Eastern Region: Trat province
References: Bignell and Snelling (1977), Jungyusuk and Sirinawin (1983)
Lithology: The basalt is greyish-black, vesicular, and microporphyritic texture; abundant olivine and minor clinopyroxene microphenocrysts in the intergranular groundmass of plagioclase, clinopyroxene, olivine and opaques
Type locality: Ko Kut, Trat province

Ko Lan quartzite (หินควอร์ตไซต์เกาะล้าน)

Age: Cambrian (?)
Distribution: Eastern Region: Chon Buri province
Reference: Bunopas (1981)
Lithology: Well- to poorly-bedded, brown quartzite; brownish-grey shaly slate and black to brown slate, which is reddish when weathered, all showing mesoscopic folds
Thickness: 500 m
Type locality: Ko Lan, Chon Buri province
Remarks: A Cambrian age is inferred on stratigraphic position since similar rocks underlie the probable Ordovician limestone of Ko Si Chang

Ko Samui pluton (เกาะสมุยพลูตอน)

Age: Triassic (?)
Distribution: Lower Peninsula
Reference: Ishihara and others (1979, 1980)
Lithology: Coarse-grained porphyritic biotite granite, medium-grained porphyritic biotite granite and fine- to medium-grained biotite-muscovite granite
Type locality: Around Ko Samui district, Surat Thani province
Remarks: K/Ar muscovite age= 202 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Ko Sichang limestone (หมวดหินปูนเกาะสีชัง)

Age: Ordovician (?)
Distribution: East Thailand
Reference: Ridd (2011)
Lithology: Blue-grey, rather uniform-textured marble
Correlation: Si Chang limestone (Buravas, 1957)
Type area: Ko Si Chang, and Khao Chae Chan, Chon Buri province
Remarks: Marble was probably caused by contact metamorphism as suggested by the granite intrusion at the south end of the island.

Ko Yao Noi formation (หมวดหินเกาะยาวน้อย)

Age: Lower Permian (Sakmarian)
Distribution: Lower Peninsula: Phangnga province
Reference: Pitakpaivan and Mantajit (1981)
Lithology: Lower part: alternating sequence of dark grey laminated mudstone and medium grained sandstone with argillaceous limestone lenses. Middle part: pebbly mudstones, laminated mudstone and sandstone interbedded. Upper part: tuffaceous sandstone alternating with thin volcanic tuff, passing upward into bedded chert
Thickness: 400 m
Genesis: Diamictite
Correlation: Originally proposed to correlate with the Khao Chao Formation of Piyasin (1975), but it is likely to be Ko He and Khao Phra Formations (Chaodumrong and others, 2004)

Type Locality: At Pa Sai east of Ko Yao Noi, Laem Sai southeast end of Ko Yao Noi, and at Laem Son Ngam eastern part of Ko Yao Noi and north of Laem Sai, Phangnga province

Kong La formation (หมวดหินกองลา)

Age: Cambrian-Ordovician ?
Distribution: Northern Region: Mae Sariang district, Mae Hong Son province
References: Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology: Calc-silicate, quartzite, schist
Type area: Along Km post 5 of road no 1270, to Kong La village

Kong Mu Formation (หมวดหินกองมู)

Age: lower Middle Jurassic (Aalenian) or younger
Distribution: Northern Region: Mae Hong Son, Tak province
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Mainly fine- to medium-grained arkosic sandstone with slightly calcareous cement in the lower part
Thickness: 65 m
Genesis: Shallow marine, neritic zone
Parent unit: Huai Pong Group
Type section: Named after Doi Kong Mu, Mueang Mae Hong Son district where the type section is located.

Krabi group (กลุ่มหินกระบี่)

Age: Tertiary
Distribution: Lower Peninsula
References: Javanaphet (1969), Sae Leow (1985)
Lithology: Semi-consolidated, reddish-brown to grey sandstone, siltstone, claystone, limestone with coal lenses.
Thickness: 1,400 m
Genesis: Fluviatile, lacustrine, coal swamp, delta front
Subdivisions: Sae Leow (1985) has divided it into 5 formations : A, B, C, D and E; Electricity Generating Authority of Thailand (1990) subdivided it into 6 informal formations, in ascending, Bang Pu Dum, Pakasai, Khlong Sait, Khuan Muang, Tha Nun, and Huai Khram
Type area: Krabi basin, Krabi province

Remarks: The Krabi series (Brown and others, 1951) has been used for Tertiary basins in southern Thailand and the Krabi group (Javanaphet, 1969) has been used for all Tertiary basins in Thailand

Krabi series (หินสมัยกระบี่)

-see Krabi group

Kraburi formation (หมวดหินกระบุรี)

Age: Silurian-Devonian (?)
Distribution: Upper Peninsula
Reference: Mahawat and others (1985)
Lithology: Thick sequences of massive to bedded greywacke, pebbly sand, pebbly shale, mudstone intercalated in part with turbidites
Type area: Kraburi district, Ranong province

Kroeng Krawia formation (หมวดหินเกริงกระเวีย)

Age: Upper Ordovician
Distribution: Western Region
Reference: Siribhakdi (1985)
Lithology: Limestone with argillaceous layers, dark grey; pinkish-brown, massive
Type locality: Kroeng Krawia village, Thong Pha Phum district, Kanchanaburi province

Ku Mung igneous complex (หินอัคนีคอมเพล็กคูเมือง)

Age: Permo-Triassic
Distribution: Lower Peninsula: The Batu Melintang-Sungai Kolok Transect areas, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Pillow lava, basal, green, light green and greenish white serpentinite, relicts of ultramafic and mafic rocks with podiform chromite deposits
Correlation: Ai Ba Lo formation
Type locality: The road-cut from Ai Su Re-Bu Yong and in the Ai Ba Lo areas

Kuan Tung Formation (หมวดหินควนทัง)

Age: Upper Silurian to Lower Devonian (Wongwanich and Boucot, 2011)
Distribution: Lower Peninsula

References: Wongwanich and others (1990), Wongwanich (1990)
Lithology: Limestone, grey, massive to thick bedded in the lower part, change to thin bedded, red limestone, 44 m thick, in the middle part, and red limestone, 46 m thick, with algal polygons of small stromatolites in the upper part (Wongwanich and Boucot, 2011).
Thickness: 105 m
Genesis: Shallow to deep-pelagic deposit
Parent unit: As part of Thong Pha Phum Group (Wongwanich, 1990), but Ridd (2011) assigned it as part of the Satun Group.
Correlation: Upper Setul Limestone on Langkawi island
Type section: Named after a small limestone hill's name, between Km post 7-10 Langu- Thung Wa road

Kuchinarai group (กลุ่มหินกุฉินารายณ์)

Age: Upper Triassic
Distribution: The Khorat Plateau: subsurface
Reference: Mouret (1994)
Lithology: Sandstones and conglomerates, upward to varicoloured sandstones, siltstones and mudstones
Thickness: 750 m (Booth and Sattayarak, 2011)
Genesis: Alluvial, fluvial and lacustrine deposits
Subdivisions: Phu Noi and Phu Phra formations
Correlation: Huai Hin Lat Formation
Remarks: Booth and Sattayarak (2011) concluded that there is no proper type section.

Kulong pluton (กือลองพลูตอน)

Age: Triassic (?)
Distribution: Lower Peninsula
References: Ishihara and others (1980), Pitakpaivan (1969)
Lithology: Coarse-grained porphyritic muscovite-biotite granite, and porphyritic biotite granite, both are foliated
Type area: 10 km south of Yala province
Remarks: K/Ar muscovite age=52.9±1.6Ma (Ishihara and others, 1980) K/Ar biotite age= 34±1Ma (Pitakpaivan, 1969); It is recommended in the International Stratigraphic Guide that lithogenetic terms such as "pluton", "batholith", "flysch" should not be considered stratigraphic terms.

La Nga Formation (หมวดหินลาง่า)

Age:	Lower Ordovician (Lower Arenig)
Distribution:	Lower Peninsula: Tarutao island, Satun province
References:	Wongwanich (1990), Department of Mineral Resources (2007)
Lithology:	Thick to massive cross bedded and channeled, grey dolosiltite and calcarenite in the lower part; thick to massive bedded calcarenite with occasional planar cross-bedding, burrow, mud crack in the upper part
Thickness:	75-130 m
Genesis:	Peritidal environment on a homoclinal ramp
Parent unit:	Thung Song Group
Type section:	Takes its name after Ao La Nga, west of Tarutao island, where type section located.

Lae Tong Formation (หมวดหินแลตอง)

Age:	Lower Ordovician (Middle Arenig)
Distribution:	Lower Peninsula: Tarutao Island, Satun province
References:	Wongwanich (1990), Department of Mineral Resources (2007)
Lithology:	Thin bedded (1-3 cm), grey argillaceous limestone and shale in the lower part, and thin bedded (1-3 cm), grey nodular limestone and red, grey shale in the upper part.
Thickness:	112-120 m
Genesis:	Peritidal environment on a homoclinal ramp
Parent unit:	Thung Song Group
Type section:	Named after Lae Tong island, south of Tarutao island, where the type section is located on the west coast of the island.

Laem Mai Phai Formation (หมวดหินแหลมไม้ไผ่)

Age:	Lower Permian
Distribution:	Peninsula
References:	Proposed by Hills (1989), revised by Chaodumrong and others (2004, 2007) and Chaodumrong (2010), Department of Mineral Resources (2007)
Lithology:	Sequences of thin-bedded turbiditic sandstone and interbedded mudstone in the lower part; and changing upwards to laminated mudstone in the upper part; slump beds, Bouma sequence, bioturbation and drop stones are present.
Thickness:	120 m
Genesis:	Submarine fan and glaciomarine deposits, shelf to deep sea

Parent unit: Kaeng Krachan Group
Correlation: Huai Phu Noi formation of Piyasin (1975), lower part of the Laem Mai Phai formation of Hills (1989)
Type section: Along the beach between Laem Mai Phai village and Puem Suk village; reference sections at Laem Phan Wa, Phan Wa bay, Laem Phap Pha, and Laem Tukkae, Phuket province

Laem Ngob formation (หมวดหินแหลมงอบ)

Age: Middle Triassic
Distribution: Eastern Region: Trat province
References: Bunopas (1994)
Lithology: Radiolarian and quartzitic chert, and intercalated with tuff and thin volcanic flow
Genesis: Deep marine deposits
Parent unit: Chanthaburi group
Type Locality: Laem Ngob district, Trat province

Laem Sak red beds (หมวดหินชั้นหินแดงแหลมสัก)

Age: Lower Cretaceous
Distribution: Lower Peninsula: Ao Luek district of Krabi province
Reference: Assavapatchara and Yamansabedean (2006)
Lithology: Conglomerate, sandstone, siltstone and mudstone, reddish purple to brown
Thickness: 20 m
Genesis: Meandering river environment
Parent unit: Lamthap Formation
Type Locality: Named after Laem Sak cape, Ao Luek district of Krabi province
Remark: Fossil of *Unio* sp.

Laem Sing formation (หมวดหินแหลมสิงห์)

Age: Jurassic
Distribution: Eastern Region: Chanthaburi and Rayong provinces
Reference: Raksaskulwong and Prakorbchat (1990)
Lithology: Conglomerate and sandstone, reddish brown, common cross bedded; interbedded with mudstone, reddish brown in the upper part.

Chaodumrong (1992b) reported several fining upward cycles at the type section

Thickness: Over 250 m

Genesis: Tidal flat, shallow sea deposits

Correlation: Khao Thalai Red-beds

Type section: Named after Laem Sing mountain to the west of Laem Sing district, Chanthaburi province.

Laem Tap formation (หมวดหินแหลมทาบ)

Age: Silurian-Devonian-Carboniferous

Distribution: Lower Peninsula

Reference: Nakinbodee and others (1985)

Lithology: Sandstone, pebbly sandstone, shale, mudstone, pebbly mudstone, cherts and limestone, greenish-grey, brown light grey to dark, well bedded, laminated, cross-laminated with brachiopods, corals, ammonoids, bryozoans, bivalves and crinoids.

Type locality: Laem Tap, Don Sak district, Surat Thani province

Lam Long sandstone (หมวดหินทรายลำลอง)

Age: Triassic (?)

Distribution: Lower Peninsula

Reference: Grant-Mackie and others (1980)

Lithology: Light grey to brown, thin-bedded (5-20 mm) fine-grained sandstone with 1 mm limonite spotting distributed commonly throughout.

Thickness: Around 3,700 m

Type locality: West of Lam Long village, Na Thawi district, Songkhla province

Lam Narai basalt (หินบะซอลต์ลำนารายณ์)

Age: Tertiary (11.29±0.04 Ma, K/Ar whole rock dating)

Distribution: The Central Plain

References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)

Lithology: The younger basalt is dark grey to black and comprises phenocrysts of olivine and labradorite which are in the groundmass of oriented laths of plagioclase clinopyroxene, olivine and magnetite. The older basalt is underlain by rhyodacite lavas and pyroclastic flows of the acid volcanic sequence

Type locality: Lam Narai village, Lop Buri province

Lam Thap Formation (หมวดหินลำทับ)

Age: lower Lower Cretaceous
Distribution: Lower Peninsula: Nakhon Si Thammarat, Krabi, and Trang provinces
References: Proposed by Raksaskulwong and others (1990), revised by Teerarungsigul and others (1999), Raksaskulwong (2002)
Lithology: Thick bedded arkosic sandstone, and siltstone interbedded with shale. Raksaskulwong (2002) reported several fining upward cycles
Thickness: 30 m at Laem Pleo, 197 m at Khao Tao,
Genesis: Fluviatile (meandering river)
Parent unit: Thung Yai Group (Trang Group)
Correlation: Chumphon red beds formation (Raksaskulwong, 1994); Sao Khua Formation
Type section: At Khao Tao between Km 22 and Km 25 of road no 4110 (Thung Yai to Thung Song), Nakhon Si Thammarat; Named after Lam Thap district of Nakhon Si Thammarat; reference section at Laem Pleo of Bo Muang village, Krabi province

Lampang Group (กลุ่มหินลำปาง)

Age: Lower to Upper Triassic (Scythian to Norian)
Distribution: Northern Region: Lampang and Phrae provinces
References: Piyasin (1971), Liangsakul (1979), Chonglakmani (1981, 2011), Chaodumrong and Burrett (1997)
Lithology: Consists of 2 megasequences of mainly fine-grained clastics, from red beds up to platform limestones and turbiditic sandstone and mudstone.
Thickness: 3,000 m
Genesis: Shallow to deep marine environments
Subdivisions: Chaodumrong and Burrett (1997) subdivided it into 7 formal formations: Phra That, Pha Kan, Hong Hoi, Doi Long, Pha Daeng, Kang Pla, and Wang Chin Formations.
Chonglakmani (2011) proposed that this group consists of 4 formal formations: Phra That, Pha Kan, Hong Hoi, and Doi Long Formations; and assigned the Pha Daeng, Kang Pla, and Wang Chin Formations to his new Song Group.
Correlation: Semanggol Formation in Malaysia
Type area: Lampang and Phrae provinces

Remarks: The Doi Long Formation at the type section at Doi Pha Daeng is overlain conformably by clastic rocks of the Pha Daeng Formation. With regard to the International Stratigraphic Guide (Murphy and Salvador, 1999) the Pha Daeng should be in the Lampang Group.

Lan Hoi Formation (หมวดหินลานหอย)

Age: Carboniferous
Distribution: Northern Region: Sukhothai province
References: Bunopas (1976, 1981), Department of Mineral Resources (2001, 2007)
Lithology: Red-brown sandstone and shale, interbedded; red-brown to maroon shale passing up to brown spotted shale, then shale interbedded with red-brown siltstone; white quartz sandstone, thick-bedded, with intercalation of brownish-grey shale; red shale and red calcareous siltstone; red brown arkosic sandstone, red shale and intraformational conglomerate; green-grey tuffaceous sandstone with weakly defined graded bedding interbedded with brownish green shale and siltstone
Thickness: 850 m
Parent unit: Dan Lan Hoi Group
Correlation: Takhli and Chainat sandstone
Type section: Small stream on the flank to Khao Prathak, 10 km northwest of Khao Luang, Sukhothai province

Lan Krabu Formation (หมวดหินลานกระบือ)

Age: Tertiary (Oligocene-Miocene)
Distribution: The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference: Knox and Wakefield (1983)
Lithology: Grey, occasionally gastropod-bearing silty claystone with rare siltstone, very fine-grained sandstone streak. This unit is predominant in the formation. Thin bedded, regularly alternating fine- to medium-grained sandstone, siltstone, claystone; massive bituminous to coaly claystone with rare siltstone, very fine-grained sandstone streak
Thickness: 2,100 m
Genesis: Lacustrine, fluvio-Lacustrine
Parent unit: Phitsanulok Group
Type locality: Petroleum wells in Phitsanulok basin, Sukhothai and Kamphaeng Phet provinces

Lan Sang gneissic complex (หินไนส์ลานสางคอมเพล็ก)

-see Lansang gneiss complex

Lansang gneiss (หินไนส์ลานสาง)

Age: Precambrian (?)
Distribution: Western Region
Reference: Bunopas (1976)
Lithology: Banded gneiss, biotite schist and few calc-silicate and marble
Type locality: Lansang Water Fall, Tak province

Lansang gneiss complex (หินไนส์ลานสางคอมเพล็กซ์)

Age: Precambrian (?)
Distribution: Western Region: Tak province
Reference: Campbell (1973)
Lithology: Different grain sizes of feldspar-porphyroblastic gneiss, laminated calc-silicate, quartzitic rocks, migmatite and pegmatite. There are imbrications on the western side and cataclasis on the eastern side.
Thickness: Approximately 3,500 m
Genesis: It is andesine-epidote subfacies of amphibolite facies. It was deformed and partially recrystallised at the level of green-schist facies during the post-Paleozoic period
Type locality: Lansang Water Fall, Mueang Tak district, Tak province
Remarks: This unit is also spelled Lan Sang gneissic complex (Hinthong and others, 1986)

Lansang gravels (หมวดหินชั้นกรวดลานสาง)

Age: Tertiary (Neogene)
Distribution: Western Region: west of Tak province
Reference: Bunopas (1976)
Lithology: Moderately consolidated conglomerate, poorly-bedded sandstone, mudstone with Neogene leave fossils
Type locality: North of Lansang village, Tak province

Lap Lae formation (หมวดหินลับแล)

Age: Upper-Middle Permian

Distribution: Northern Region: Uttaradit province; Si Satchanalai district, Sukhothai province

Reference: Saengsrichan and others (2007)

Lithology: Fine-grained, greenish grey greywacke and interbedded shale or mudstone; intercalated with basaltic andesite 1-1.5 m thick in the middle and upper parts; conglomerate, thin bedded limestone and bedded chert in the lower part.

Thickness: 100-150 m

Genesis: Continental shelf; shallow to deep sea

Correlation: Undifferentiated unit of Piyasin (1972)

Type locality: At Mon Din Daeng and Doi Mon Ngeing of Mon Din Daeng village, Lap Lae district, Uttaradit province; at Mae Toen Tai village, Si Satchanalai district, Sukhothai province

Li formation (หมวดหินลี้)

Age: Tertiary (Oligocene)

Distribution: Northern Region: Lamphun province

References: Javanaphet (1969), Chaodumrong and others (1982)

Lithology: Mudstone, shale, greenish-grey to greyish-brown; coal; oil shale; conglomerate and sandstone, white to light grey

Genesis: Lacustrine, fluviatile

Correlation: Ban Pa Kha formation and Mae Long formation of Ratanasthien (1990)

Type locality: Pa Kha, Ban Pu sub-basins, Li district, Lamphun province

Li granite (หินแกรนิตลี้)

Age: Triassic (236 ± 14 Ma, Rb/Sr whole rock isochron)

Distribution: Northern Region: Lamphun province

References: Von Braun and others (1976), Besang and others (1975)

Lithology: Biotite granite

Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0 = 0.7220 \pm 22$

Type area: East of Li district, Lamphun province

Remarks: The age of the granite was recalculated by Beckinsale and others, 1979 to be 244 ± 28 Ma with an initial $(^{87}Sr/^{86}Sr)_0$ ratio of 0.7220 ± 44

Li-Thoen formation (หมวดหินลี้-เถิน)

-see Li-Thoen Red Beds

Li-Thoen Red Beds (หมวดหินชั้นหินแดงลี้-เถิน)

Age:	Carboniferous?
Distribution:	Northern Region: Thoen district of Lampang province and Li district of Lamphun province
Reference:	Wongwanich and Maranate (1984)
Lithology:	Sandstone, red, fine to coarse grained; conglomerate, fine grained, with graded bedding and cross-bedding; siltstone, mudstone and shale
Thickness:	2,000 m
Genesis:	Alluvial fan deposit
Type locality:	Between Km 17-26 of Li-Thoen road (highway no. 106), Thoen district of Lampang province and Li district of Lamphun province

Loei group (กลุ่มหินเลย)

Age:	Pennsylvanian - Permian
Distribution:	Loei-Phetchabun Range
References:	Ueno and Charoentitirat (2011)
Lithology:	Succession of carbonates and siliciclastic strata occurring on the Pha Nok Khao Platform
Subdivisions:	Assavapatchara and others (2006) subdivided it into 3 formations (ascending): Nam Mahoran, E-Lert, and Pha Dua formations; Ueno and Charoentitirat (2011) subdivided it into 4 Formations: Wang Saphung, Nam Mahoran, E-Lert, and Pha Dua Formations, but in the southern area, the group consists of 3 formations: Huai Som, Pha Nok Khao, and Hua Na Kham.
Correlation:	Saraburi Group
Type area:	On the Pha Nok Khao Platform
Remarks:	The name Loei group is confused with that of Mouret (1994) who first introduced the “Loei group” for Upper Silurian to Lower Carboniferous sections in NE Thailand, and is used widely by oil companies for sedimentary sections below the Mid-Carboniferous Unconformity (Booth and Sattayarak, 2011).

Lom Sak formation (หมวดหินหล่มสัก)

Age:	Upper Cretaceous (Middle Mesozoic)
Distribution:	Loei-Phetchabun Ranges
References:	Iwai and others (1966), Endo and Fujiyama (1966), Maranate (1986)
Lithology:	Red-grey tuff, breccia tuff and green tuff interbedded with yellowish to pale green, fine-grained sandstone, dark grey shale and calcareous shale
Type locality:	Km 105-122.5 Phitsanulok-Lomsak highway, Phetchabun province

Lopburi formation (หมวดหินลพบุรี)

Age:	Upper Pleistocene
Distribution:	The Central Plain
Reference:	Dheeradilok and others (1985c)
Lithology:	Marl deposits, with black clay, silty clay and stiff clay with iron concretion
Thickness:	15-20 m or more
Genesis:	Lacustrine/Fluviatile
Subdivisions:	Three informal members : Phra Phutthabat member, Ban Mo member and Nong Done member
Type locality:	Nong Dong Done district, Lop Buri province

Lower Kamawkala shale (หมวดหินดินดานกะมอกกะลาตอนล่าง)

Age:	Triassic (Upper Ladinian-Carnian)
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Green-grey, silty, sandy shale, consistently interbedded with fine-grained sandstone; proportion of sandstone increases downwards, *Halobia* sp., and *Posidonia* sp., occur at higher part
Thickness:	900 m
Genesis:	Marine
Parent unit:	Mae Moei Group
Type locality:	Kamawkala Gorge, 25 km northwest of Mae Ramat district, Tak province
Remarks:	The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Lower Nam Phong formation (หมวดหินน้ำพองตอนล่าง)

Age:	Rhaetian
Distribution:	The Khorat Plataeu
Reference:	Mouret and others (1993)
Lithology:	Fining upwards; conglomeratic to fine-grained sandstones, and dark grey brown clay in the lower part, and red claystone in the upper part; well defined on seismic;
Thickness:	170 m
Genesis:	Meandering rivers with associated flood-plain and overbank deposits
Parent unit:	Khorat Group
Type section:	At Phu Phra 1 well
Remarks:	The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Lower Permian tuff (?) (หมวดหินโลเวอร์เพอร์เมียนทัฟ ?)

Age:	Lower Permian
Distribution:	Northern Region: Lampang and Phrae provinces
References:	Piyasin (1972), Bunopas (1981)
Lithology:	Tuffaceous sandstone, tuffaceous shale, andesite, rhyolite, tuff and agglomerate
Correlation:	Correlated with lower part of the Ngao Group (Kiu Lom Formation)
Type locality:	Doi Tone, Phra That Muang Kham, east of Lampang province
Remarks:	The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Lower Phu Kradung formation (หมวดหินภูกระดึงตอนล่าง)

Age:	Lower Jurassic (Liassic)
Distribution:	The Khorat Plateau
Reference:	Mouret and others (1993)
Lithology:	Medium to dark red, silty-sandy claystone with minor fine-grained sandstone; almost transparent on seismic
Genesis:	Alluvial flood-plain with some overbank deposits
Parent unit:	Khorat Group
Type section:	At Phu Phra 1 well

Remarks: The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Lu Kloc Tu Formation (หมวดหินหลู่โค้กตู)

Age: lower Middle Jurassic (Upper Aalenian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Thin to thick bedded, fine- to coarse-grained arkosic sandstone
Thickness: 200 m
Genesis: Shallow marine
Parent unit: Umphang Group
Type section: Named after Lu Kloc Tu Mountain on the Thailand-Myanmar border where the type section located.

Mae Bong formation (หมวดหินแม่บง)

Age: Permian-Triassic
Distribution: Northern Region: Doi Luang and Wiang Chiang Rung district of Chiang Rai province
Reference: Sukvattananunt and Assavapatchara (1989)
Lithology: Sandstone, siltstone, shale are interbedded, thick-massive; conglomerate and mudstone are intercalated
Thickness: 1,000 m
Type locality: Mae Bong village, Doi Luang district of Chiang Rai province

Mae Chaen formation (หมวดหินแม่แจน)

Age: Middle Triassic
Distribution: Northern Region: Phrae and Lampang province
Reference: Maneenai and others (1987)
Lithology: Limestone, thin to thick bedded, interbedded with shale, siltstone, agglomerate
Thickness: 100-200 m
Correlation: Pha Kan Formation
Type locality: Named after Huai Mae Jan, Long district of Phrae province

Mae Chan formation (หมวดหินแม่จัน)

Age:	Tertiary
Distribution:	Western Region
Reference:	Siribhakdi (1985)
Lithology:	Siltstone, shale, and sandstone, light brown and dark grey, semi-consolidated to consolidated, well bedded, locally coal beds and gypsum, with gastropods and bivalves
Type locality:	Mae Chan village, Um Phang district, Tak province

Mae Choey formation (หมวดหินแม่เฉย)

Age:	Upper Triassic
Distribution:	Northern Region: Tha Pla district and Mueang Uttaradit district, Uttaradit
Reference:	Saengsrichan and others (2007)
Lithology:	Breccias, grey sandstone and lens of conglomerate in the lower part; reddish brown sandstone, conglomerate and siltstone with carbonate nodules.
Thickness:	100 m
Genesis:	Alluvial fan and fluvial deposits
Correlation:	Huai Hin Lat Formation, Nam Phong Formation
Type locality:	at Pha Lat village, at Mae Choey waterfall, Tha Pla district and Mueang Uttaradit district, Uttaradit province

Mae Dum Sandstone Member (หมู่หินทรายแม่ดำ)

Age:	Middle - lower Upper Triassic?
Distribution:	Northern Region: Lampang province
Reference:	Chaodumrong and Burrett (1997)
Lithology:	Thin- to massive, turbiditic, grey sandstone, and minor conglomerate and mudstone
Thickness:	400 m
Genesis:	Submarine fan deposits
Parent unit:	Hong Hoi Formation
Type section:	Named after Huai Mae Dum, east of Tha Si village, Mueang Lampang district, Lampang, where type section located

Mae Fang Formation (หมวดหินแม่ฝาง)

Age:	Upper Miocene - Pliocene (Morley and Racey, 2011), originally assigned to Pleistocene
Distribution:	Northern and Western Regions: Chiang Mai and Tak provinces
References:	Buravas (1973), Chaodumrong and others (1983)
Lithology:	Coarse arkosic sandstone with minor interbedded shale
Thickness:	Over 700 m
Genesis:	Alluvial fans, braided rivers
Correlation:	Huai Luang Formation
Type Locality:	Fang Basin, Chiang Mai province

Mae Hong Son Formation (หมวดหินแม่ฮ่องสอน)

Age:	Upper Silurian to Carboniferous
Distribution:	Northern Region: Mae Hong Son province
Reference:	Bunopas (1981)
Lithology:	Well bedded, brown and black chert, with some interbedded sandstone and grey shale, sandstone, shale, subgreywacke and chert with occasional limestone bands
Thickness:	500 m
Genesis:	Shallow marine shelf deposits
Correlation:	Doi Musur Group, Thong Pha Phum Group
Type locality:	8 km south of Mae Hong Son province and 7 km upstream from Pha Bong Dam
Remarks:	Raksaskulwong and Tantiwanit (1984) raised the Mae Hong Son Formation to Mae Hong Son group, which consists of 3 informal formations: Nam Khat, Khai Luang, and Mae Suya formations

Mae Hong Son group (กลุ่มหินแม่ฮ่องสอน)

-see Mae Hong Son Formation

Mae Jua formation (หมวดหินแม่จั๊ว)

Age:	Middle Triassic
Distribution:	Northern Region: Den Chai district, Phrae province
Reference:	Saengsrichan and others (2007)
Lithology:	Laminated, grey shale or mudstone and interbedded, thin bedded limestone in the lower part; greywacke and interbedded mudstone in

place, pencil-like fracture; thin bedded mudstone in the upper part. Thickness: 100 m

Genesis: Lower submarine fan

Correlation: Hong Hoi Formation (Piyasin, 1972)

Type locality: Mae Jua reservoir and Tai Yoi village of Den Chai district, Phrae province

Remarks: This formation can correlate with the Wang Chin Formation of Chaodumrong and Burrett (1997)

Mae Ko complex (หินแม่ก๊อคอมเพล็กซ์)

Age: Silurian-Devonian (?)

Distribution: Northern Region: Chiang Rai province

Reference: Bunopas (1981)

Lithology: Sillimanite schist, andalusite schist and amphibolites schist, usually grey or greenish-grey to black

Type area: Wiang Pa Pao district, Chiang Rai province

Mae Lama basalt (หินบะซอลต์แม่ลามา)

Age: Late Cenozoic (?)

Distribution: Northern Region: Mae Hong Son province

References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)

Lithology: The basalt is amygdaloidal and massive and consists phenocrysts of olivine, zoned plagioclase and microphenocryst of plagioclase in an intergranular groundmass of andesine, clinopyroxene and opaques

Type area: South of Mae Sariang district, Mae Hong Son province

Remarks: Nomenclature-Tholeiite

Mae Lama granites (หินแกรนิตแม่ลามา)

Age: Lower Cretaceous (130±4 Ma, Rb/Sr whole rock isochron)

Distribution: Northern Region: south of Mae Hong Son province

References: Beckinsale and others (1979), Nakapadungrat and others (1985)

Lithology: The granites show a gradual change from porphyritic biotite granite to coarse-grained biotite-muscovite granite and to fine- to medium-grained, tourmaline-muscovite granite

Genesis: Mantle origin $(^{87}Sr/^{86}Sr)_0 = 0.7086\pm7$

Type area: Mae Lama Mining district, Mae Hong Son province

Remarks: K/Ar biotite age = 53.4±1.4 Ma, K/Ar muscovite age = 70.1±3.8 Ma, K/Ar muscovite (from the wolframite vein) = 72.2±2.5 Ma

Mae Lamao formation (หมวดหินแม่ละเมา)

Age: Tertiary
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Shale, dark grey, bedded with lignite seam; claystone and sandstone; conglomerate in the upper part
Thickness: 42 m
Type locality: Huai Mae Lamao, Mae Lamao village, Tak province

Mae Long formation (หมวดหินแม่ลอง)

Age: Middle- Upper Miocene
Distribution: Northern Region: Li basin, Lamphun province
Reference: Ratanasthien (1990)
Lithology: Laminated shale, mudstone and coal seams
Genesis: Lacustrine, swamp deposits
Parent unit: Li group
Correlation: Li formation
Type locality: Mae Long reservoir and Na Sai coal mine

Mae Lu Sandstone Member (หมู่หินทรายแม่ลู)

Age: Upper Triassic
Distribution: Northern Region: Phrae and Lampang provinces
Reference: Chaodumrong and Burrett (1997)
Lithology: Mainly thin to medium bedded, grey to light brown sandstone, with subordinate mudstone.
Thickness: 230 m
Genesis: Deep sea, submarine fan deposits
Parent unit: Wang Chin Formation
Type section: Km post 55.2 to 55.9 and 66.4 to 66.5 along Lampang – Denchai highway. This member takes its name from Mae Lu village.

Mae Moei Group (กลุ่มหินแม่เมย)

Age:	Triassic to Jurassic
Distribution:	Western Region
References:	Von Braun and Jordan (1976), Bunopas (1981)
Lithology:	Green, grey to dark grey siltstone, shale, sandstone, well bedded muddy limestone and calcareous siltstone, bluish-grey to dark grey limestone.
Thickness:	2,300 m
Genesis:	Continental facies and shallow marine environment
Subdivisions:	Two informal formations: Upper Mae Moei group and lower Mae Moei group (Von Braun and Jordan, 1976); Seven informal formations: Pang Manora sandstone, Mae Pa Luang shale, Huai Hin Fon shale, Huai Hin Fon limestone, Lower Kamawkala shale, Kamawkala limestone, and Upper Kamawkala shale (Bunopas, 1981)
Type locality:	Km post 67.5 – 73, Mae Sot-Tak highway and Kamawkala Gorge, 25 km northwest of Mae Ramat district, Tak province

Mae Moh (also spelled Mae Mo) Group (กลุ่มหินแม่เมาะ)

Age:	Lower Miocene-Pliocene
Distribution:	Northern Region: Lampang province
References:	Piyasin (1972), Chaodumrong (1985), Evans and Jitapunkul (1990)
Lithology:	Semi-consolidated, red to brownish-red, claystone, siltstone; lignite, calcareous claystone, mudstone; claystone, mudstone highly calcareous; fine- to coarse-grained clastic rocks
Thickness:	1,100 m
Genesis:	Fluviatile, lacustrine, swamp deposits
Subdivisions:	Three formal formations, in ascending: Huai King Formation, Na Khaem Formation and Huai Luang Formation (Evans and Jitapunkul, 1990)
Type locality:	Mae Moh basin, Lampang province
Remarks:	Mae Sot series (Brown and others, 1951) has been used for strata in Tertiary basins in northern Thailand. It was first named the Mae Mo Formation (Gardner and others, 1967), and was later used for the stratigraphic sequence in the Mae Mo basin and adjacent areas. Piyasin (1972) raised the Mae Mo Formation to group status, and later it was renamed the Mae Moh Group (Chaodumrong, 1985).

Mae Ngao basalts (หินบะซอลต์แม่งาว)

Age:	Upper Cenozoic
Distribution:	Northern Region: Tak province
Reference:	Limtrakun and others (2007)
Lithology:	Alkali basalt, greyish-black, fine-grained, with megacrysts of plagioclase, olivine and clinopyroxene.
Genesis:	Continental within plate environment
Correlation:	Mae Lama basalt
Type area:	Tha Song Yang district, Tak province

Mae Pa formation (หมวดหินแม่ปะ)

Age:	Tertiary (Miocene to Paleocene)
Distribution:	Western Region: Mae Sot district, Tak province
Reference:	Thanomsap (1985)
Lithology:	Marlstone, mudstone, calcareous shale, oil shale; dominant chemical precipitated in the upper part and barrier, channel, beach sands in the lower part.
Thickness:	1,325 m
Genesis:	Marginal lacustrine
Parent unit:	Mae Sot Group
Type locality:	Mae Sot basin, Tak province

Mae Pa Luang shale (หมวดหินดินดานแม่ปะหลวง)

Age:	Upper Triassic to Jurassic
Distribution:	Western Region
Reference:	Bunopas (1981)
Lithology:	Bluish grey impure limestone and alternating limestone and shale: thicker shale beds in the lower part; alternating dark grey limestone and marl; blue, grey sandy shale, with occasional thin muddy limestone band, well bedded, dark grey argillaceous limestone.
Thickness:	470 m
Genesis:	Marine
Parent unit:	Mae Moei Group
Correlation:	Kamawkala limestone
Type section:	Km post 67.5 – 73, Mae Sot-Tak highway

Mae Phae Luang formation (หมวดหินแม่แพหลวง)

Age:	Cambrian ?
Distribution:	Northern Region: Mae Sariang district, Mae Hong Son province
References:	Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology:	Quartzite, quartz-mica schist, and quartz-feldspar schist, meta sandstone
Thickness:	20 m
Correlation:	Pha Bong quartzite (Bunopas, 1981)
Type area:	Mae Phae Luang village, Mae Phae Noi village

Mae Phong formation (หมวดหินแม่ผง)

Age:	Upper Triassic (Norian-Rhaetian)
Distribution:	Northern Region: Phayao and Nan provinces
Reference:	Tansuwan and Kosuwan (1988)
Lithology:	Red beds; sandstone, shale, siltstone, and conglomerate, red, reddish brown, thin- to thick bedded, often cross bedded
Thickness:	Over 310 m
Genesis:	Continental to shallow marine deposits
Type area:	Chun district, Mae Phong dam, Phayao province

Mae Phrik formation (หมวดหินแม่พริก)

Age:	Carboniferous
Distribution:	Northern Region: Mae Phrik district of Lampang province
Reference:	Chaodumrong and Jiemton (1986)
Lithology:	Sandstone, composition varies from arenites to wackes, medium to coarse grained; shale, greenish grey
Correlation:	Mae Tha Group
Type locality:	Named after Mae Phrik-Huai Khi Nok village, Mae Phrik district of Lampang province

Mae Ping Formation (หมวดหินแม่ปิง)

Age:	Lower Silurian - Middle Devonian
Distribution:	Northern Region: Lamphun province
Reference:	Burrett and others (1986)
Lithology:	Thin bedded, grey limestone and argillaceous bed, 60 m thick, in the lower part; thick to massive limestone, 160 m thick, in the upper part.

This formation overlies conformably black tentaculitid shale with syneresis cracks on the top of beds.

Thickness: 220 m

Correlation: Thong Pha Phum Group, Lower Devonian Zebingyi Formation in Shan State of Myanmar

Type section: At Tat Sador and Ko Luang Waterfall in the Mae Ping National Park, Li district, Lamphun province

Mae Plung shale (หมวดหินดินดานแม่พลึง)

Age: Upper Carboniferous

Distribution: Western Region: Kanchanaburi province

Reference: Bunopas (1981)

Lithology: Greenish-grey shale, interbedded with green-grey tuffaceous sandstone: with infrequent well sorted, subrounded pebble conglomerates and rare argillaceous limestone bands. Clasts of the conglomerate include shale, quartz, limestone and chert

Thickness: 300 m

Genesis: Near shore marine environment.

Correlation: Khao Muang Khrut Formation, Doi Musur Group

Type locality: Huai Mae Plung, 30 km north–northwest of Bo Phloi district, Kanchanaburi province

Mae Pum formation (หมวดหินแม่ปึม)

Age: Lower Jurassic

Distribution: Northern Region: Mae Jai district of Phayao province

Reference: Tiyapirach and Mahapoom (1990)

Lithology: Arkosic sandstone, red, reddish brown, medium to coarse grained; interbedded with shale and siltstone, red, reddish purple

Thickness: 1,000-1,500 m

Genesis: Continental river deposits

Correlation: Phu Kradung Formation

Type locality: At Mae Pum dam, 6 km of Mae Jai downtown

Mae Ramat formation (หมวดหินแม่ระมาด)

Age: Paleogene

Distribution: Western Region: Tak province

References: Thanomsap (1985), Thanomsap and Sitahirun (1992)
Lithology: Fining and coarsening upward sequences: conglomerate, sandstone, siltstone, coal and claystone
Thickness: 600 m
Genesis: Alluvial fan, alluvial plain
Parent unit: Mae Sot Group
Type locality: Mae Sot basin, Mae Sot district, Tak province

Mae Ramphung formation (หมวดหินแม่รำพึง)

Age: Triassic (?)
Distribution: Upper Peninsula
Reference: Silpalit and others (1985)
Lithology: Arkosic sandstone, red and yellowish-brown, well-bedded, very hard, intercalated partly with conglomerate consisting predominantly of white, sandstone pebbles; limestone conglomerate, well sorted and well rounded, intercalated with red, medium-grained sandstone at the base
Type locality: Khao Mae Ramphung, Bang Saphan district, Prachuab Khiri Khan province

Mae Rim formation (หมวดหินแม่ริม)

Age: Oligocene- Early Miocene (Rhodes and others, 2003)
Distribution: Northern Region: Mae Rim district, Chiang Mai province
Reference: Rhodes and others (1997)
Lithology: Moderately lithified conglomerate, sandstone and minor shale
Genesis: Alluvial fan, with localized lacustrine environments
Type locality: West and north of Mae Rim district, Chiang Mai province

Mae Sai Formation (หมวดหินแม่สาย)

Age: Carboniferous (?)
Distribution: Northern Region: Nan, Phrae and Sukhothai provinces
Reference: Bunopas (1981)
Lithology: Red chert, massive: the upper part becomes progressively more brecciate and contains frequent volcanic clasts, grades upwards into red conglomerate, agglomerate with very angular clasts at the base, the less angular to subangular boulders and cobbles consisting mainly of chert, but including also andesite, diorite and argillite; continuing upwards, the clasts become progressively better sorted and better rounded. The

formation passes up to sandy shale with frequent conglomerate beds thick-bedded shales, coarse-grained sandstone and conglomerate

Thickness: 1,500 m

Genesis: Deposit within the arc-trench gap, probably not from the arc.

Parent unit: Phrae Group

Correlation: Lower part of Mae Tha Group

Type section: Huai Mae Sai and Huai Mae Pung, Ban Mae Sai, 15 km north of Rong Kwang district, Phrae province

Mae Salit pluton (แม่สลิตพลูตอน)

Age: Triassic (?)

Distribution: Northern Region: Tak province

Reference: Mahawat (1982)

Lithology: Pink hornblende-biotite monzogranite

Parent unit: Tak batholith

Type locality: Mae Salit village, north of Tak province; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Mae Sariang Formation (หมวดหินแม่สะเรียง)

Age: Middle to Upper Triassic

Distribution: Northern Region: Mae Hong Son province

References: Bunopas (1981), Chonglakmani (2011)

Lithology: Basal red conglomerate, grey shale with chert and limestone band, interbedded siltstone, and fine-grained sandstone

Thickness: 850 m

Genesis: Shallow to deep sea

Type section: Km post 5 to 10 on the highway from Mae Sariang to Mae Hong Son

Remarks: Information above from Bunopas (1981) who first proposed this unit as group rank. Later, Chonglakmani (2011) changed to formation rank.
Srinak and others (2007) subdivided the Mae Sariang Group into 3 units, in ascending order: Kong Som, Pratru Muang, and Mae Laeb units.

Mae Sariang Group (กลุ่มหินแม่สะเรียง)

-see Mae Sariang Formation

Mae Sariang pluton (แม่สะเรียงพลูตอน)

Age: Triassic (K/Ar mica age and paleontological evidence)
Distribution: Northern Region: Chiang Mai province
References: Teggin (1975), Von Braun and others (1976)
Lithology: Medium-grained porphyritic biotite granite with amphibole accessory
Genesis: Crustal origin ?
Type locality: Along Hot-Mae Sariang highway (Km post 86.3-97.6)
Remarks: K/Ar biotite age = 200 Ma and 205 Ma, K/Ar muscovite age = 225 Ma, K/Ar feldspar age = 142-168 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Mae Sat formation (หมวดหินแม่สาด)

Age: Carboniferous
Distribution: Northern Region: Mueang, Mae Suai, Mae Lao district of Chiang Rai province and Mae Ai district of Chiang Mai province
Reference: Sukvattananunt and Kenwiset (1988)
Lithology: Interbedded of sandstone, siltstone, shale and chert, sharp and parallel bed with lamination in the lower part : sandstone, arkosic and lithic, pale grey to greenish-grey, fine-grained, thin to medium bedded; siltstone, mudstone and shale, greenish-grey to yellowish-grey, thin bedded; siltstone and mudstone, purplish red and reddish-brown, micaceous, thin- to medium-bedded; chert and siliceous shale, white to light brown, ribbon, strongly folded; greywacke, greenish-grey, fine- to coarse-grained, poorly-sorted, medium-bedded.
Thickness: 400-600 m
Parent unit: Mae Tha Group
Type locality: Named after Huai Mae Sat, east of Suan Dok village, Mueang district of Chiang Rai

Mae Sot (also spelled Mae Sod) Formation (หมวดหินแม่สอด)

Age: Oligocene - Lower Miocene (Pradidtan, 1989), originally assigned to Oligocene - Pliocene
Distribution: Northern and Western Regions: Chiang Mai and Tak provinces
References: Buravas (1973), Chaodumrong and others (1983), Thanomsap (1985)

Lithology: Red sandstone and siltstone in the lower part; mudstone, coal seams, and oil shale in the middle part; and grey mudstone and sandstone in the upper part
Thickness: Over 500 m
Genesis: Fluvio-lacustrine deposits
Parent unit: Mae Sot Group (Thanomsap, 1985)
Correlation: Mae Moh Group
Type Locality: Drilled hole in Fang Basin, Chiang Mai province
Remarks: The name “Mae Sot” might be confused with the Mae Sot Group

Mae Sot Group (กลุ่มหินแม่สอด)

Age: Tertiary (Paleogene-Pliocene)
Distribution: Western Region: Mae Sot district, Tak province
References: Von Braun and Jordan (1976), Thanomsap (1985), Thanomsap and Sitahirun (1992)
Lithology: Shale, interbedded with mudstone and oil shale; marlstone, mudstone, oil shale and sandstone; conglomerate, sandstone, siltstone and coal
Thickness: 3,000 m
Genesis: Lacustrine, fluviatile, alluvial fan
Subdivisions: Three informal formations: Mae Ramat, Mae Pa, and Mae Sot formations
Type locality: Mae Sot basin, Mae Sot district, Tak
Remarks: The Mae Sot series (Brown and others, 1951) has been used for Tertiary basin in northern Thailand. The Mae Sot formation has been used in Fang and Chiang Mai basins. The Mae Sot formation (Piyasin and others, 1977, 1978) has been used in Lampang basin.
It is stated in the International Stratigraphic Guide that the geographic name of the original unit (for example “Mae Sot”) should not be employed for any of its subdivisions.

Mae Sot series (หินสมัยแม่สอด)

-see Mae Sot Group

Mae Suai schist (หินชีสต์แม่สรวย)

Age: Silurian-Devonian
Distribution: Northern Region: Mae Suai, Mueang, Mae Lao district of Chiang Rai province and Mai Ai district of Chiang Mai province

Reference: Sukvattananunt and Kenwiset (1988)
Lithology: Low grade metamorphic rock; mica schist, actinolite-tremolite schist, quartz schist, phyllite, quartzite, recrystallised limestone lens, and some schist interbedded with volcanic rock
Thickness: 500-1,300 m
Parent unit: Don Chai Group
Type locality: Mae Suai District of Chiang Rai province

Mae Suya formation (หมวดหินแม่สุยะ)

Age: Carboniferous-Permian
Distribution: Northern Region: Mae Hong Son province
Reference: Raksaskulwong and Tantiwanit (1984)
Lithology: Shale, greyish-green; sandstone, greenish-grey, fine- to medium grained, calcareous; conglomerate, brownish grey
Thickness: 400 m
Parent unit: Mae Hong Son group
Type locality: Huai Mae Suya, Mae Hong Son province

Mae Taeng group (กลุ่มหินแม่แตง)

Age: Pleistocene
Distribution: Northern Region: Chiang Mai province
Reference: Piyasin (1972)
Lithology: Sand, gravel, cobbles and boulders
Genesis: Alluvial
Type area: Mae Taeng district, Chiang Mai province

Mae Tha Basalt (หินบะซอลต์แม่ทะ)

Age: Quaternary: 0.69 or 0.95 Ma (Fission track dating), 0.8 ±0.3-0.6±0.2 Ma (K/Ar whole rock dating)
Distribution: Northern Region: Lampang province
References: Barr and others (1976), Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983), Sasada and others (1987)
Lithology: Dark grey to black and vesicular with abundant of olivine microphenocrysts. The intergranular groundmass consists of lath labradorite, clinopyroxene and magnetite
Thickness: 1-12 m (Boonsoong and Panjasawatwong (2003)

Genesis: Continental rift basalt (Boonsoong and Panjasawatwong (2003)
Type locality: Pha Lad village, Mae Tha district, Lampang province
Remarks: Nomenclature-basanite

Mae Tha Group (กลุ่มหินแม่ทา)

Age: Carboniferous
Distribution: Northern Region: Chiang Mai and Lamphun provinces
Reference: Piyasin (1972)
Lithology: Quartzite, siliceous shale, quartzitic sandstone, feldspathic sandstone, kaolinitic shale; andesite, rhyolite, tuff, breccias, pyroclastic chert and green shale, agglomerate, conglomerate, sandstone, slate and light grey to pinkish-grey, massive to well bedded, recrystallised limestone
Genesis: Shallow shelf
Type area: Mae Tha district, Lamphun province

Mae Tham formation (หมวดหินแม่ต๋ำ)

Age: Middle-Upper Jurassic
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Siltstone, fine-grained sandstone, red, reddish brown; shale, dark red, thin bedded
Correlation: Sao Khua Formation
Type area: Chun and Pong districts, Phayao province

Mae Tho Formation (หมวดหินแม่ท้อ)

Age: Lower to Middle Permian
Distribution: Northern Region
Reference: Bunopas (1976)
Lithology: Grey shale, bedded limestone, tuff, massive limestone, tuffaceous shale and sandstone: The base contact with Precambrian (?) gneiss and the top overlain unconformably with the Triassic Um Yom formation
Thickness: ~ 300 m
Correlation: Kiu Lom Formation
Type section: Huai Mae Tho, east of Lansang National Park, Tak province

Mae Wang Chang formation (หมวดหินแม่วังช้าง)

Age: Ladinian-Carnian
Distribution: Northern Region: Sukhothai, Lampang and Phrae province
Reference: Sukvattananunt and Paksamut (1986)
Lithology: Shale and sandstone, grey to greenish grey; siltstone and mudstone
Thickness: 500-700 m
Correlation: Hong Hoi Formation
Type locality: At Doi Mae Wang Chang, Si Satchanalai district of Sukhothai province

Mae Ya-U siltstone (หมวดหินทรายแป้งแม่ยะอุ)

Age: Silurian-Devonian
Distribution: Western Region
Reference: Bunopas (1981)
Lithology: The upper part of the sequence consists of grey-green siltstone, shale and massive, dark grey shale; and 1,200 m alternations of brown-grey shale, siltstone, sandstone and limestone with chert nodules containing bryozoa and fusulinid near the top.
Thickness: 2,800 m
Parent unit: Doi Musur Group
Type section: Type section is designated at Tak-Mae Sot highway between km 32 and km 62.3 (except km 32 to km 49 which is covered by Cenozoic gravel bed)

Maha Sarakham Formation (หมวดหินมหาสารคาม)

Age: Upper Cretaceous Gardner and others (1967); but middle Cretaceous (Albian-Cenomanian) by Racey and others (1994); 93 Ma (K/Ar, K/Ca and $^{87}Sr/^{86}Sr$ –composition) or Cenomanian by Hansen and others (2002)
Distribution: The Khorat Plateau
References: Gardner and others (1967), Department of Mineral Resources (2007)
Lithology: Salt-bearing claystone, mudstone, siltstone and sandstone
Thickness: 1,000 m
Parent unit: Khorat Group
Type section: Drilled well no F-34 at Ban Chiang Hian, 6 miles east of the town of Maha Sarakham, Mueang Maha Sarakham district, Maha Sarakham province
Remarks: This formation has been excluded from the Khorat Group by recent oil companies' papers, but a local unconformable contact as mentioned by

Racey and others (1994) is not sufficient to remove this formation from the group (see: International Stratigraphic Guide (Hedberg, 1976; Murphy and Salvador, 1999)).
This formation was also miswritten “Mahasarakham Formation”.
Ratanajaruraks (1990) named this formation the Chaturat formation. However, the Maha Sarakham has priority.

Mai Hung Formation (หมวดหินไม้ฮุง)

Age:	lower Middle Jurassic (Aalenian)
Distribution:	Northern Region: Mae Hong Son and Tak provinces
References:	Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology:	Well-bedded sandy limestone with oncolites in the lower part; massive bedded in the middle part; and sandy limestone in the upper part
Thickness:	40-70 m
Genesis:	Shallow marine, neritic zone
Parent unit:	Huai Pong Group
Type section:	Named after Mai Hung village, Mueang Mae Hong Son district; type section is at a limestone cave, SSE of Mai Hung village

Malaka Formation (หมวดหินมะละกา)

Age:	Lower Ordovician (Upper Tremadoc)
Distribution:	Lower Peninsula: Tarutao Island, Satun province
References:	Wongwanich (1990), Department of Mineral Resources (2007)
Lithology:	Thinly bedded, grey argillaceous and dolomitic limestone with wavy continuous and partly discontinuous lenticular bedding 10-100 mm thick; a tuff layer at the lower part.
Thickness:	30 m at Malaka Creek; 410 m at Ao Talo Wao
Genesis:	Peritidal environment on a homoclinal ramp
Parent unit:	Thung Song Group
Type section:	Takes its name from Malaka Creek, Tarutao Island. Type section is situated on the north bank of Malaka Creek.

Matsi formation (หมวดหินมัทรี)

Age:	Permian (?)
Distribution:	Upper Peninsula: Chumphon province
Reference:	Burton (1978)

Lithology: Medium- to coarse-grained, rather mature arenite white to red in colour and showing laminated bedding, frequently disposed in sets of cross-beds 5 to 70 cm thick
Thickness: 24.81 m
Genesis: Deltaic environment
Type section: Khao Matsi, Pak Nam Chumphon, Chumphon province
Remarks: The given age was erroneous, Jurassic is more likely.

Mayo formation (หมวดหินมายอ)

Age: Lower Carboniferous (?)
Distribution: Lower Peninsula
Reference: Muenlek and others (1985)
Lithology: Sandstone, reddish-brown; slaty shale; tuffaceous shale, brown to brownish red; and conglomeratic sandstone with cross-bedding
Type locality: 1.5 km northeast of Mayo district, Pattani province

Mergui Group (กลุ่มหินเมอร์กุย)

Age: Upper Oligocene to Plio-Pleistocene
Distribution: Andaman Sea: Mergui Basin
References: Polachan (1988), Polachan and Racey (1994)
Lithology: Sandstones, conglomerates, siltstones, mudstones, limestones
Genesis: Non-marine depositional environment to deep marine shale and submarine fan turbidites
Subdivisions: Consists of 9 formations: Ranong, Yala, Payang, Tai, Kantang, Surin, Trang, Thalang and Takua Pa Formations
Correlation: Formations in North Sumatra
Type area: Mergui Basin, Andaman Sea

Mi Kiat conglomerate (หมวดหินกรวดมนมีเกียรติ)

Age: Triassic (?)
Distribution: Lower Peninsula
Reference: Grant-Mackie and others (1980)
Lithology: Quartzite conglomerate, poorly sorted, subrounded, low sphericity
Thickness: 500 m
Type locality: South of km 7, Khlong Ngae-Na Thawi highway (No. 42)

Mo Din Daeng formation (หมวดหินมอดินแดง)

Age:	Tertiary
Distribution:	The Khorat Plateau
Reference:	Boonsener and Sonpirom (1997)
Lithology:	Shale with indurated silt and local sandstone interbedded
Thickness:	37 m
Correlation:	Borabu formation
Type section:	Named after Mo Din Daeng in Khon Kaen university campus where the type section was revealed during construction of the plastic reservoir, and from boreholes

Mon Hin Lai red beds (หมวดหินชั้นหินแดงม่อนหินไหล)

Age:	Jurassic
Distribution:	Northern Region: Phrao district of Chiang Mai province
Reference:	Assavapatchara and others (2005)
Lithology:	Arkosic sandstone intercalated with siltstone and shale
Thickness:	40-60 m
Genesis:	Continental deposit
Type locality:	Mon Hin Lai village, Phrao district of Chiang Mai province

Muang Kham Member (หมู่หินม่วงคำ)

Age:	Middle Triassic
Distribution:	Northern Region: Lampang province
Reference:	Chaodumrong and Burrett (1997)
Lithology:	Alternating beds of thin- to thick-bedded, grey oncolitic to bioclastic limestone (packstone to lime mudstone)
Thickness:	323 m at Phra That Muang Kham temple
Genesis:	Shallow marine, ramp carbonate platform
Parent unit:	Pha Kan Formation
Type section:	At Doi Chang of Mae Moh district and Phra That Muang Kham temple of Mueang Lampang district, Lampang province
Remarks:	Named after Huai Muang Kham, eastern side of Phra That Muang Kham temple

Muang Khum formation (หมวดหินม่วงคำ)

Age:	Lower-Middle Permian
Distribution:	Northern Region: Lampang and Phrae provinces
Reference:	Sukvattananunt and Paksamut (1986)
Lithology:	Limestone, thin to thick bedded
Thickness:	50-150 m
Correlation:	Pha Huat Formation
Type locality:	West of Muang Kham village, Thoen district of Lampang province

Muno volcanics (หินภูเขาไฟมูโน๊ะ)

Age:	Permo-Triassic
Distribution:	Lower Peninsula: The Batu Melintang-Sungai Kolok Transect areas, Narathiwat province
Reference:	The Malaysian and Thai Working Groups (2006)
Lithology:	Strongly sheared, highly altered andesite, andesitic tuff and agglomerate
Correlation:	Tanah Merah in Malaysia
Type locality:	The small hill at Muno village, adjacent to Mae Nam Kolok

Na Khaem Formation (หมวดหินนาแขม)

Age:	Miocene
Distribution:	Northern Region: Mae Moh basin, Lampang province
References:	Chaodumrong (1985), Evans and Jitapunkul (1990)
Lithology:	Calcareous claystone and mudstone with major coal seams mainly lignite in the middle part of the formation; fossils of gastropods, fish, and other vertebrates occur locally.
Thickness:	180 - 470 m
Genesis:	Calcium-rich water lacustrine and swamp
Parent unit:	Mae Moh Group
Subdivisions:	Chaodumrong (1985) informally subdivided into 6 members: B-1, B-2, B-3, B-4, B-5, and B-6 members
Type locality:	Boreholes in Mae Moh basin, Mae Moh district, Lampang province

Na Ngan formation (หมวดหินนางัน)

Age:	Lower Jurassic
Distribution:	Northern Region: Phayao and Nan provinces
Reference:	Tansuwan and Kosuwan (1988)

Lithology: Shale, red, reddish brown, feldspathic; intercalated with sandstone, red
Thickness: 200 m
Genesis: Alluvial deposits
Type area: Huai Na Ngan, Chun district, Phayao province

Na Sai formation (หมวดหินนาทราย)

Age: Tertiary (Neogene)
Distribution: Northern Region: Li district, Lamphun province
Reference: Boriphatkoson (1986)
Lithology: Marlstone, claystone, lignite, semi-consolidated; sandstone, conglomeratic sandstone, conglomerate, siltstone with abundant gastropod *Viviparus* sp., plant and fish fossils
Genesis: Lacustrine, fluvial
Type locality: Na Sai Mine, Li district, Lamphun province

Na Thawi formation (หมวดหินนาทวี)

Age: Upper Triassic
Distribution: Lower Peninsula
References: Grant-Mackie and others (1980), Malaysian-Thai Working Groups (2012)
Lithology: Interbedded siltstone and siliceous sandstone
Thickness: 3,000 m (?), 100-250 m (Malaysian-Thai Working Groups, 2012)
Genesis: Marine, outer submarine fan
Type section: Along highway No. 42, between Km post 14-16, Songkhla province

Nachuak formation (หมวดหินนาเชือก)

Age: Quaternary
Distribution: The Khorat Plateau: Maha Sarakham and Roi Et provinces
Reference: Suwanich (1995)
Lithology: Mainly calcareous sand and clay, limestone or travertine in white, white grey
Thickness: 178 m at drilled hole no K-67; 196 m in NC-4 borehole
Genesis: Shallow fresh water lake, derived from sediments of the underlying Phu Tok formation
Type locality: 5 drilled holes at Na Chuak district, Maha Sarakham province

Nai Tak formation (หมวดหินนายตาก)

Age: Ordovician
Distribution: Lower Peninsula
Reference: Burton (1974)
Lithology: Alternating sequence of calcareous argillite, calcareous quartzite and impure limestone. The formation is overlain by the Thung Song limestone.
Thickness: 571 m
Parent unit: Satun group
Type section: It is well exposed in the road and railway cutting between Thung Song and Ron Phibun. Along the railway from a point 80 m east of km post 772. This lies between lat. 8° 8' 34"N; long. 99° 48' 23" E in the map sheet 47-15, DA 4
Remarks: This formation seems to be a facies change and occurs locally.

Nai Thon Beach suite (ไนทอนบีชสูท)

Age: Cretaceous (94 ± 12 Ma, Rb/Sr whole rock isochron)
Distribution: Phuket province
Reference: Putthapiban and Gray (1983)
Lithology: Coarse-grained porphyritic biotite-muscovite granite
Genesis: Crustal origin - $(^{87}Sr/^{86}Sr)_0 = 0.7277 \pm 10$
Parent unit: Phuket granites
Type locality: Nai Thon Beach, Phuket province

Nakhon Ratchasima basalt (หินบะซอลต์นครราชสีมา)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau
Reference: Jungyusuk and Sirinawin (1983)
Lithology: It is greyish black, vesicular and microporphyritic texture. Abundant olivine microphenocrysts are in an intergranular groundmass of oriented lath plagioclase, granular aggregated clinopyroxene and opaques
Type locality: Khon Buri district, Nakhon Ratchasima province
Remarks: Nomenclature-hawaiite

Nam Cho basalt (หินบะซอลต์น้ำโจ้)

Age:	Late Pliocene
Distribution:	Northern Region: Lampang province
Reference:	Sutthirat (1995)
Lithology:	Basalt
Genesis:	Magma crystallization, continental basalt related to extension rifting
Type locality:	Nam Cho subdistrict, Mae Tha district , Lampang province

Nam Duat formation (หมวดหินน้ำเดือด)

Age:	Tertiary
Distribution:	Loei-Phetchabun Range: Wichian Buri district of Phetchabun province
Reference:	Jungyusuk and Sinsakul (1989)
Lithology:	Sandstone interbedded with shale; mudstone, carbonaceous bed and lignite with fossiliferous bed of *viviparus*
Genesis:	Continental environment (lake)
Type locality:	East of Nam Duat village, Wichian Buri district of Phetchabun province

Nam Duk Formation (หมวดหินน้ำดุก)

Age:	Middle Permian
Distribution:	Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References:	Chonglakmani and Sattayarak (1984), Ueno and Charoentitirat (2011)
Lithology:	Grey to black shale, yellowish-brown sandstone, and grey to dark grey, thin bedded limestone
Type locality:	Nam Duk village, Km post 16-24, Lomsak-Chumphae highway

Nam Dung formation (หมวดหินน้ำดัง)

Age:	Middle Permian
Distribution:	Northern Region: Mae Lao and Pan districts of Chiang Rai province
Reference:	Sukvattananunt and Kenwiset (1988)
Lithology:	Shale, phyllitic shale, sandstone, tuffaceous shale; shale interbedded with sandstone
Thickness:	450 m
Type Locality:	Near Huai Nam Dung village, Pan district of Chiang Rai province

Nam Khat formation (หมวดหินน้ำกัด)

Age:	Silurian-Devonian
Distribution:	Northern Region: Mae Hong Son province
Reference:	Raksaskulwong and Tantiwanit (1984)
Lithology:	Shale, black, dark grey; sandstone, light brown to grey, fine- to medium grained intercalated with argillaceous limestone, thin- to medium bedded; ammonoids, graptolites
Thickness:	250 m
Parent unit:	Mae Hong Son group
Type locality:	Huai Nam Khat, Mae Hong Son province

Nam Mae Jang (basaltic) formation (หินบะซอลต์น้ำแม่จาง)

Age:	0.69 to 0.95 Ma (Barr and Macdonald, 1979)
Distribution:	Northern Region, eastern Region and southern margin of the Khorat Plateau
Reference:	Dheeradilok (1992)
Lithology:	Alkaline basalt with and without corundum
Correlation:	Mae Tha Basalt (Jungyusuk and Sirinawin, 1983)
Type section:	Nam Mae Jang bridge along Lampang-Denchai road

Nam Maholan Formation (หมวดหินน้ำมโหฬาร)

Age:	Lower Permian?; Upper Carboniferous to upper Middle Permian (Gzhelian to Murghabian) (Assavapatchara, 1998)
Distribution:	Loei-Phetchabun Range
References:	Chaodumrong and others (1998), Assavapatchara (1998), Department of Mineral Resources (2007)
Lithology:	Thin- to thick- bedded, grey limestone and interbedded shale with chert as nodule and lens scattering parallel bedding plane; shale and sandstone predominate in the lower part; local occurrence of crinoid fragments, fusulinid, coral and bivalves
Parent unit:	Saraburi Group
Subdivisions:	Assavapatchara (1998) subdivided the formation into 3 members: Tham Suae Mop, Ban Nong Hin, and Phu Pha Khao members
Type section:	Phu Tham Maholan, Loei province

Nam Mahoran Formation (หมวดหินน้ำมโหหาร)

Age: Permian
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Charoenprawat and others (1984), Department of Mineral Resources (2007)
Lithology: Grey to black shale, yellowish brown sandstone, and grey to dark grey, thin bedded limestone
Correlation: Chaodumrong and others (1998) remapped carbonate sequences of the Pha Nok Khao and Nam Mahoran formations to be 4 informal formations, in ascending: Pha Phung, Nam Maholan, Erawan, and Pha Sana formations
Type locality: Nam Mahoran Cave, Wang Saphung district, Loei province

Nam Pat Group (กลุ่มหินน้ำปาด)

Age: Triassic
Distribution: Northern Region: Nan and Phrae provinces
References: Bunopas (1981), Department of Mineral Resources (2001, 2007)
Lithology: Brownish-red to grey, green, very coarse-grained agglomerate, volcanic conglomerate, thin tuffaceous sandstone; intercalations of green, grey and red conglomerate
Thickness: 1,400 m
Genesis: Marine
Subdivisions: Consists of 2 formations, in ascending order: Huai Lat and Huai Bo Khong Formations
Type area: East of Sirikit Dam, Uttaradit province

Nam Pha formation (หมวดหินน้ำผา)

Age: Upper Triassic (Rhaetian)
Distribution: The Khorat Plateau
Reference: Bunopas (1971)
Lithology: Grey and brown calcareous siltstone, sandstone, interbedded with grey to dark grey, bedded argillaceous limestone in the lower part, and grey and red calcareous siltstone, mudstone, shale and red argillaceous limestone in the upper part
Thickness: 550 m
Correlation: Huai Hin Lat Formation
Type area: Nam Phrom Dam, Khon Kaen province

Nam Phong Formation (หมวดหินน้ำพอง)

Age: Upper Triassic (Rhaetian); Uppermost Norian to Rhaetian (Racey and others, 1994)
Distribution: The Khorat Plateau
Reference: Ward and Bunnag (1964)
Lithology: Red beds: siltstone, sandstone and mudstone in the lower and upper parts; sandstone and conglomerate in the middle part.
Thickness: 1,465 m at the type section
Genesis: Fluvio-lacustrine
Parent unit: Khorat Group
Type area: Nam Phong, Phu Kradung district, Loei province
Remarks: The Nam Phong Formation is divided by the Indosinian II Unconformity into 2 formations: Lower Nam Phong and Upper Nam Phong formations (Booth and Sattayarak, 2011). However, Murphy and Salvador (1999) states that the term “lower”, “middle” and “upper” should not be used for formal subdivisions of lithostratigraphic units.

Nam Phung formation (หมวดหินน้ำพุง)

Age: Lower Cretaceous
Distribution: The Khorat Plateau
Reference: Iwai and others (1975)
Lithology: Conglomerate, sandstone and shale with intercalations of bivalve bearing calcareous siltstone
Genesis: Non-marine
Correlation: Khok Kruat Formation
Type area: Nam Phung Dam site, Sakon Nakhon province

Nam Ri formation (หมวดหินน้ำรี)

Age: Jurassic
Distribution: Northern Region: Chaloem Phra Kiat and Bo Kluea districts of Nan province
Reference: Imsamut and Chuadee (2006)
Lithology: Cycle of arkosic and quartzitic sandstone, fine-grained, siltstone and mudstone, reddish-brown, greyish-red, greenish red, light grey and greenish-grey, calcareous and micaceous, thin- to medium-bedded with cross-lamination, lamination and ripple mark, fining and thinning upward; conglomerate to conglomeratic sandstone, reddish-brown to greyish-

brown, with pebbles (0.5-5 cm in diameter) of quartz, chert, sandstone, red mudstone, and light grey limestone, medium-bedded; with caliche, light yellow, thin horizon or nodule in mudstone, thick-bedded

Thickness: 400 m

Genesis: Alluvial fan and fluvial deposit

Subdivisions: Lower mudstone, Middle sandstone and Upper mudstone member (from bottom to top)

Type locality: Nam Ri village, Chaloem Phra Kiat district of Nan province

Nam Tok Ko formation (หมวดหินน้ำตกก้อ)

Age: Silurian-Devonian

Distribution: Northern Region: Li district of Lamphun province

Reference: Chaodumrong and Jiemton (1986)

Lithology: Limestone, grey greenish grey, thin-bedded and massive to thick-bedded; black shale at the lowermost sequence; fine-grained sandstone; siltstone; shale at the uppermost sequence

Thickness: 217 m

Type locality: At Ko waterfall, Li district of Lamphun province

Remarks: Fossil of *Tentaculites elegans*, *Styliolina* sp.

Nam Yun basalt (หินบะซอลต์น้ำยืน)

Age: Late Cenozoic (?)

Distribution: The Khorat Plateau

Reference: Jungyusuk and Sirinawin (1983)

Lithology: The rock is grey to black and contains microphenocrysts of olivine and minor clinopyroxene in an intergranular groundmass of plagioclase, clinopyroxene, opaque and zeolite

Type locality: Khao Noi Khiribanpot, Nam Yun district, Ubon Ratchathani province

Narathiwat phyllite (หินฟิลไลต์นราธิวาส)

Age: Silurian-Devonian (?)

Distribution: Lower Peninsula: Narathiwat province

Reference: Bunopas (1981)

Lithology: Phyllite, fine-grained tuff, interbedded with chert

Type locality: The excavation for the Banglang Dam, Yala and Narathiwat provinces, north of Thai-Malay border

Narathiwat ultramafics (หินอัลตราเมฟิกนราธิวาส)

Age:	Middle Paleozoic
Distribution:	Lower Peninsula: Narathiwat province
Reference:	Bunopas (1981)
Lithology:	Gabbro and peridotite
Genesis:	Ophiolite
Correlation:	Sra Kaeo ultramafics

Nawa Member (หมู่หินนาหว้า)

Age:	Upper Cretaceous – Lower Tertiary
Distribution:	The Khorat Plateau: Nakhon Phanom, Udon Thani and Sakon Nakhon provinces
Reference:	Thiamwong and Lertnok (2005)
Lithology:	Mudstone and claystone, reddish brown, orange; siltstone, orange, brown
Thickness:	More than 8 m, 30-300 m (Assavapatchara, 2012)
Genesis:	Fluvial, lake and flood deposits (Assavapatchara, 2012)
Parent unit:	Phu Thok Formation (Nawa, Kam Ta Kla, Phu Thok Noi Members)
Type section:	Named after Na Wa district; Huai Oun bridge (0405941E, 1934163N), Nong Bua subdistrict, Na Wa district, Nakhon Phanom province; Reservoir pit (0396537E 1914646N) Mueang Sakon Nakhon district

Nearn Sawan formation (หมวดหินเนินสวรรค์)

Age:	Lower Ordovician
Distribution:	Western Region
Reference:	Siribhakdi (1985)
Lithology:	Sandstone, and quartzite, brown to reddish-brown, calcareous
Parent unit:	Song Tho group
Type area:	Nearn Sawan village, Thong Pha Phum district, Kanchanaburi province

Ngao Group (กลุ่มหินงาว)

Age:	Permian
Distribution:	Northern Region: Lampang and Phrae provinces
References:	Bunopas (1981, 1982)
Lithology:	Sandstone, shale, calcareous shale and thin-bedded limestone with fusulinids; massive to well bedded, recrystallised limestone; fossiliferous

shale and thin-intercalations of sandstone, limestone and intraformational conglomerate

Thickness: 1,960 m (600 + 600 + 760)

Genesis: Carbonate shelf, shallow marine shelf

Subdivisions: Three formations, in ascending order (Piyasin, 1972): Kiu Lom Formation, Pha Huat Formation, Huai Thak Formation

Correlation: Ratburi Group (?)

Type area: Ngao district, Lampang province

Remarks: This group formerly mapped as Ratburi Group by Piyasin (1972), and later changed the name to Ngao Group by Bunopas (1981)

Noen Phu Yai Yua Formation (หมวดหินเนินผู้ใหญ่เยื่อ)

Age: Triassic

Distribution: Eastern Region: Chanthaburi province

References: Raksaskulwong and Prakorbchat (1990), Department of Mineral Resources (2007)

Lithology: Shale, dark grey to black, well bedded, thin to medium bedded; interbedded with sandstone and siltstone, grey,

Thickness: 250 m

Genesis: Outer submarine fan deposits (Chaodumrong, 1992b)

Type locality: Named after the priest- campsite Noen Phu Yai Yua (now called priest-campsite Pha Sing), about 6 km west of Chanthaburi town; rock succession is well exposed in excavated pit.

Remarks: It was originally spelt Noen Poo Yai Yue (Raksaskulwong and Prakorbchat, 1990), but informal name.

Noen Po formation (หมวดหินเนินโพธิ์)

Age: Permo-Carboniferous (Raksaskulwong and Prakorbchat, 1990), but Permo-Triassic (Chaodumrong, 1992b)

Distribution: Eastern Region: Chanthaburi province

References: Raksaskulwong and Prakorbchat (1990), Chaodumrong (1992b)

Lithology: Shale and sandstone, varicoloured, greenish grey, black, reddish brown; claystone, light grey and intercalated chert in the upper part

Thickness: 48 m at Noen Po

Genesis: Forearc basin (Chaodumrong, 1992b)

Type locality: Named after a small hill, Noen Po about 10 km south of Chanthaburi city where the type section is located

Nong Bua Formation (หมวดหินหนองบัว)

Age: Tertiary (Paleogene)
Distribution: The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference: Knox and Wakefield (1983)
Lithology: Red-brown claystone with minor coarse- to fine-grained lithic sandstone; medium-to coarse-grained calcareous lithic sandstone, grey to varicoloured claystone occurred at the top and as rare intercalations within the formation
Thickness: 1,000 m
Genesis: Low energy alluvial plain; fluvio-lacustrine
Parent unit: Phitsanulok Group
Type section: Petroleum wells in Phitsanulok basin, Kamphaeng Phet province

Nong Dok Bua formation (หมวดหินหนองดอกบัว)

Age: Upper Devonian to Carboniferous
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference: Charoenprawat and others (1984)
Lithology: Thin-bedded chert, siltstone, shale, quartzite, tuff, sandstone and limestone
Correlation: Pak Chom chert, Dok Du formation (Department of Mineral Resources, 2007)
Type locality: Small creak of Phu Chumpa, northwest of Nong Dok Bua village, Loei province

Nong Pak Dong formation (หมวดหินหนองปากดง)

Age: Lower Carboniferous
Distribution: Upper Peninsula; Suan Phueng district of Ratchaburi province
Reference: Leevongcharoen and Yathakum (2009)
Lithology: Mudstone, greyish white, lamination, locally intercalated with sand layer
Thickness: 50-100 m
Correlation: Khuan Klang Formation
Type Locality: Named after Nong Pak Dong village, Suan Phueng district of Ratchaburi province
Remarks: Fossil of *Posidonomya* sp.

Nong Pong Formation (หมวดหินหนองโป่ง)

Age:	Lower Permian (Artinskian-Kungurian)
Distribution:	Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References:	Hinthong and others (1985), Bunopas (1981)
Lithology:	Grey to greenish-grey, banded limestone, dark grey to greyish-brown shale, grey to very dark grey, thin- to thick-bedded limestone, interbedded with brownish-grey shale; in middle part, grey to brown shale interbedded with grey to dark grey limestone grading upward to well bedded, grey limestone and in upper part, grey to brownish-grey shale intercalated grey to dark grey limestone lens
Thickness:	673 m
Parent unit:	Saraburi Group
Type section:	East of Khao Khwang, grid ref. 560 to 600 E and 440 to 470 N sheet 47P/FG 22, Series L 7017
Remarks:	This formation was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Orb Luang gneiss (หินไนส์ออบหลวง)

Age:	Precambrian
Distribution:	Northern Region: Chiang Mai and Mae Hong Son provinces
Reference:	Bunopas (1981)
Lithology:	High grade metasediments, biotite microcline gneiss, calcsilicates, biotite marble, and biotite schist
Thickness:	Over 3,400 m
Genesis:	Sedimentary origin
Type locality:	At Orb Luang Gorge, Hot district, Chiang Mai province

Pa Kae Formation (หมวดหินป่าแก่)

Age:	Upper Ordovician (Caradoc to Lower Ashgill)
Distribution:	Lower Peninsula: Satun province
References:	Wongwanich and others (1990), Wongwanich (1990)
Lithology:	The lower part, 34 m thick, limestone, red, poorly laminated to very thin bedded; with darker red argillaceous partings, and abundant crinoids debris, stromatolitic polygons. The upper part, 32 m thick, dominated by nodular limestone' and overlain conformably by Wang Tong Formation
Thickness:	66 m at the type section, 126 m thick at Petra National Park
Genesis:	Pelagic deeper water of homoclinal ramp.

Parent unit: Topmost unit of the Thung Song Group (Wongwanich and others, 1990), but Ridd (2011) also assigned it to the Satun Group.

Type section: Named after Pa Kae village where type section located, to the north of Langu district, Satun province

Pa Lae formation (หมวดหินผาแล)

Age: Upper Triassic

Distribution: Northern Region: Chiang Rai and Phayao provinces

Reference: Tansuwan and Chitmanee (1989)

Lithology: Limestone, grey, greyish black, thin- to thick bedded; oncoids and skeletal fragments

Genesis: Shallow marine deposits

Correlation: Pha Chik formation

Pa Lan Formation (หมวดหินป่าลาน)

Age: upper Lower Jurassic (Toarcian)

Distribution: Northern Region: Mae Hong Son and Tak provinces

References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)

Lithology: Alternating of grey mudstone and subordinate thin bedded sandstone

Thickness: 90 m

Genesis: Shallow marine, neritic zone

Parent unit: Huai Pong Group

Type section: Named after Pa Lan village, Mueang Mae Hong Son district; type locality at Km post 8-9 along the road from Pa Lan village and Klang village to Mae Sariang-Mae Hong Son highway

Pa Nan Formation (หมวดหินปาหนัน)

Age: Lower Ordovician (Lower Arenig)

Distribution: Lower Peninsula: Tarutao island, Satun province

References: Wongwanich (1990), Department of Mineral Resources (2007)

Lithology: Dolomitic calcisiltite and dark grey micrite, and stromatolite

Thickness: 50-210 m

Genesis: Peritidal environment on a homoclinal ramp

Parent unit: Thung Song Group

Type section: Named after Pa Nan island, south of Tarutao island, where the type section is located.

Pa Samed Formation (หมวดหินป่าเสม็ด)

Age:	Lower Devonian to Lower Carboniferous (Namurian) (Agematsu and others, 2006; Wongwanich and others, 2002), originally assigned as Devonian-Carboniferous (Tansuwan and others, 1982)
Distribution:	Lower Peninsula
References:	Tansuwan and others (1982), Wongwanich and Boucot, 2011)
Lithology:	Black tentaculite shale in the lower part, upward to sandstone, shale and limestone intercalation in the middle part, and sandstone with grey, red shale in the upper part.
Thickness:	167 - 567 m (Wongwanich and Boucot, 2011)
Genesis:	Deep sea
Parent unit:	As part of Thong Pha Phum Group (Wongwanich and others, 1990), but Ridd (2011) assigned it as part of the Devonian-Carboniferous Nga Chang Supergroup.
Type section:	At Km post 9.7-9.8 Langu- Thung Wa road.
Remarks:	The formation was originally written the Pa Sa Med (Tansuwan and others, 1982), named after Pa Samed village, about 9 km north of Langu district, Satun province

Pai formation (หมวดหินปาย)

Age:	Middle-Upper Permian
Distribution:	Northern Region: Mae Hong Son province
References:	Bunopas (1976), Raksaskulwong and Tantiwanit (1984)
Lithology:	Limestone, thin- to medium bedded in lower part, massive in upper; minor sandstone and shale interbedded
Thickness:	500 m
Remarks:	The formation's name proposed by Bunopas (1976), but information above from Raksaskulwong and Tantiwanit (1984)

Pak Chom chert (หมวดหินเชิร์ตปากชม)

Age:	Silurian-Devonian (?); Upper Devonian (Sashida and others, 1993)
Distribution:	Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference:	Bunopas (1981)
Lithology:	Shale and chert
Type area:	Pak Chom district, Loei
Remarks:	Bunopas (1992) adopted the Pak Chom formation that consisted of Ban Nong shale member, and the overlying Pak Chom chert member.

Pak Chom formation (หมวดหินปากชม)

-see Pak Chom chert

Pakasai formation (หมวดหินปกาสัย)

Age:	Tertiary
Distribution:	Lower Peninsula: Krabi province
Reference:	Electricity Generating Authority of Thailand (1990)
Lithology:	Grey to greenish grey claystone, limestone and shale; sandstone and siltstone occur as interbeds in the western part of the Krabi basin
Thickness:	50-450 m
Parent unit:	Krabi group
Type locality:	Krabi Lignite Mine, Nuea Khlong district, Krabi province

Panare pluton (ปะนาเระพลูตอน)

Age:	Triassic (?)
Distribution:	Lower Peninsula
Reference:	Ishihara and others (1979)
Lithology:	Coarse-grained porphyritic biotite granite and fine-grained porphyritic biotite-muscovite granite
Type locality:	Panare district, Pattani province; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Pang A formation (หมวดหินปางอ้า)

Age:	Cambrian
Distribution:	Northern Region: Tak province
Reference:	Hinthong and others (1986)
Lithology:	Interlayered quartz-schist, quartzite, quartz-mica schist, and phyllite, white and pale yellow
Thickness:	Approximately 350-1,000 m
Correlation:	Khao Um Yom formation
Type locality:	Along Km post 21.5 to 24.6 Tak-Mae Sot highway, between grid reference 880-930 E and 550-590 N of Map Sheet Ban Pang San (4742 I), L7017

Pang Asok Formation (หมวดหินปางอโศก)

Age: Lower Permian (Artinskian-Kungurian)
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Hinthong and others (1985), Bunopas (1981)
Lithology: Lower part: greenish-grey to pale reddish-brown sandstone, intercalated with shale, pale reddish-brown shale, interbedded with light greenish grey arkosic sandstone, pale reddish-brown shale, intercalated with brownish-grey limestone; middle part : mostly grey to greyish-brown shale; upper part; brown to dark grey slate, slaty shale, intercalated with greenish-grey lenticular arkosic sandstone
Thickness: 366 m
Parent unit: Saraburi Group
Type section: Pang Asok village, nearby Pang Asok railway station, grid ref. 550 to 560 E and 220 to 226 N
Remarks: This formation was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Pang Manora sandstone (หมวดหินทรายปางมโนรา)

Age: Early Triassic
Distribution: Western Region
Reference: Bunopas (1981)
Lithology: Reddish and yellowish shale and shaly sandstone with thick sandstone at the base; grey argillaceous, micaceous sandstone with fossil wood; alternations of grey and red sandstone and shale; well bedded, red sandstone and siltstone; brecciated conglomerate, poorly sorted to non-sorted, consisting mainly of highly angular limestone clasts
Thickness: 390 m
Genesis: Alluvial flood-plain deposit
Parent unit: Mae Moei Group
Type locality: Km post 67.5-73, Mae Sot-Tak highway

Payang Formation (หมวดหินป่ายาง)

Age: Lower Miocene
Distribution: Andaman Sea: Mergui Basin
References: Nakanart and Mantajit (1983), Polachan (1988), Polachan and Racey (1994)

Lithology: White to light grey, medium to coarse-grained, calcareous glauconitic sandstones interbedded with grey shale; abundant benthic foraminifera and shell fragments
Thickness: 603 m at the Payang well
Genesis: Shallow marine environment which progressively deepens upwards to top
Parent unit: Mergui Group
Correlation: Belumai Formation of North Sumatra Basin, Keutapang Formation
Type section: At the Payang well between the depths of 4,430-2,420 feet.
Remark: The Payang formation was first named by Nakanart and Mantajit (1983) for an Upper Miocene sediments.

Pha Bong group (กลุ่มหินผาบ่อง)

-see Pha Bong quartzite

Pha Bong quartzite (หินควอร์ตไซต์ผาบ่อง)

Age: Cambrian (?)
Distribution: Northern Region: Mae Hong Son and Chiang Mai provinces
Reference: Bunopas (1981)
Lithology: Orthoquartzite, pinkish to whitish brown, thick-bedded, medium-grained with scattered well rounded pebbles of quartz and black chert. The upper most part contains interbedded grey slaty shale, increasing in frequency and thickness towards the top. The top few metres contain thin limestone bands
Thickness: 1,500 m
Correlation: Chao Nen quartzite, Pong Nam Ron quartzite, Ko Lan quartzite and Tarutao formation
Type section: Pha Bong Dam, 15 km south of Mae Hong Son province
Remarks: Raksaskulwong and Tantiwanit (1984) proposed the “Pha Bong group” to replace the Pha Bong quartzite

Pha Buang formation (หมวดหินผาบ่วง)

Age: Middle Permian
Distribution: Northern Region: Mae Charim district of Nan province
Reference: Wunapeera and Kosuwan (1987)

Lithology: Shale interbedded with sandstone; intercalated with limestone in the upper part
Type Locality: Doi Pha Buang, Mae Charim district of Nan province
Remark: Fossil of *Neoschwagerina* sp., and *Schwagerina* sp.

Pha Chik formation (หมวดหินผาจิก)

Age: Upper Triassic
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Limestone, light grey to dark grey, bedded to massive, common fossiliferous fragments
Genesis: Shallow marine deposits
Type locality: Doi Pha Chik, Phayao province

Pha Daeng Formation (หมวดหินผาแดง)

Age: Upper Triassic (Carnian)
Distribution: Northern Region: Lampang province
References: Kiriwat and Suensilpong (1964), Piyasin (1971), revised by Chaodumrong and Burrett (1997) and Chonglakmani (1981, 2011)
Lithology: Predominantly red shale, sandstone and conglomerate. Limestone-clast conglomerate occurs at the lower part of the formation and changes upward to red beds.
Thickness: 600 m (Chonglakmani, 1981), 700 m at Doi Pha Daeng-Huai Ting Tue section (Chaodumrong, 1992)
Genesis: Fan delta deposits (Chaodumrong, 1992), continental deposits (Piyasin, 1971; Chonglakmani, 2011)
Parent unit: Lampang Group
Type section: Doi Pha Daeng-Huai Ting Tue, 4 km east of Tha Si village, Lampang province
Remarks: This formation was previously mapped as the uppermost unit of the Lampang Group (Piyasin, 1971). Chonglakmani (1981, 2011) regarded it as separate formation under the Song Group. However, the Pha Daeng lies conformably on the Doi Long Formation. With respect to the international stratigraphic guide's, priority rule, the Pha Daeng belongs to the Lampang Group. Detrital zircons give ages of 226±3, 227±4 and 229±3 Ma (Burrett and others, in press).

Pha De Formation (หมวดหินพะเด๊ะ)

Age:	Middle Jurassic (Upper Aalenian to Lower Bajocian)
Distribution:	Northern Region: Mae Hong Son and Tak provinces
References:	Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology:	Mainly of limestone-marl-dominated sequences with minor mudstones; common stylolitic and oncolitic bands.
Thickness:	390 m
Genesis:	Shallow marine
Parent unit:	Hua Fai Group
Type section:	Named after Pha De village, Mae Sot district, Tak; type section along the road from Hua Fai village to the Huai Mae Sot power station

Pha Dua Formation (หมวดหินผาเดื่อ)

Age:	Permian
Distribution:	Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference:	Charoenprawat and others (1984)
Lithology:	Brown to brownish grey, micaceous sandstone, siltstone and shale with plant fossil
Type locality:	Pha Dua, Loei province

Pha Huat Formation (หมวดหินผาหวด)

Age:	Middle Permian (Sakmarian-Artinskian)
Distribution:	Northern Region: Lampang and Phrae provinces
References:	Piyasin (1972), Bunopas (1981, 1982)
Lithology:	Massive to well bedded, recrystallised limestone, locally fossiliferous
Thickness:	400-500 m (Piyasin, 1972), 600 m (Bunopas, 1981)
Genesis:	Shallow marine, neritic zone
Parent unit:	Ngao Group
Type locality:	Pha Huat, Ngao district, Lampang province
Remarks:	This formation was previously mapped as part of the Ratburi Group (Piyasin, 1972)

Pha Kan Formation (หมวดหินผาก้าน)

Age:	Lower to Middle Triassic (Uppermost Dienerian – Anisian)
Distribution:	Northern Region: Lampang province

References: Proposed by Piyasin (1971, 1972), revised by Chonglakmani (1981, 2011) and Chaodumrong and Burrett (1997)
Lithology: Thin- to thick-bedded, massive, grey to dark grey limestones with minor grey to green shale and sandstone
Thickness: 80-550 m
Genesis: Shallow marine, ramp carbonate platform
Parent unit: Lampang Group
Subdivisions: Chaodumrong and Burrett (1997) subdivided into 4 members: Wiang Sawan, Chang Garb, Cave Temple, and Muang Kham Members
Type section: Doi Pha Kan, Tha Si village, Lampang province; reference sections at Phra That Muang Kham temple of Mueang Lampang district and at Doi Chang of Mae Moh district, Lampang province

Pha Kap formation (หมวดหินผาแคบ)

Age: Middle Triassic
Distribution: Northern Highland: Lampang, Phrae, Nan and Uttaradit provinces
Reference: Pitakpaivan (1955)
Lithology: Limestone, dull brownish-grey with patches and spots of brownish material, finely crystalline
Thickness: 100 m
Genesis: Marine
Type locality: Pha Kap, Moh Luang village, Mae Moh district, Lampang province
Remarks: This formation has been included in the Doi Chang Formation (Chonglakmani, 1981)

Pha Nok Khao Formation (หมวดหินผานกเค้า)

Age: Lower to Middle Permian
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Chonglakmani and Sattayarak (1984), Department of Mineral Resources (2007)
Lithology: Massive- to thick-bedded, grey limestone; black, nodular or thin-bedded chert, intercalation with thin-bedded grey shale
Genesis: Carbonate platform, subtidal condition (Booth and Sattayarak, 2011)
Parent unit: Saraburi Group (Bunopas, 1981)
Correlation: Nam Mahoran Formation; Chaodumrong and others (1998) remapped carbonate sequences of the Pha Nok Khao and Nam Mahoran

formations to be 4 informal formations, in ascending: Pha Phung, Nam Maholan, Erawan, and Pha Sana formations

Type locality: Pha Nok Khao, Loei province

Remarks: The term Pha Nok Khao Formation has been used widely by oil companies for subsurface Permian carbonates beneath the Khorat Plateau (Booth and Sattayarak, 2011)

Pha Phung formation (หมวดหินผาผึ้ง)

Age: Lower Permian?

Distribution: Loei-Phetchabun Range: Loei province

Reference: Chaodumrong and others (1998)

Lithology: Thick- to massive- bedded, grey to light-grey limestone; common in crinoid fragments and fusulinid.

Parent unit: Saraburi Group

Type area: Phu Pha Phung, Loei province

Pha Sana formation (หมวดหินผาสะนา)

Age: Middle Permian?

Distribution: Loei-Phetchabun Range: Loei province

Reference: Chaodumrong and others (1998)

Lithology: Thin- to medium- bedded, dark grey limestone and interbedded shale; good lateral continuity of bed; common in crinoid fragments, fusulinid, coral; shale predominates in the lower part of the sequence; locally cut by volcanic dikes

Parent unit: Saraburi Group

Type section: Phu Pha Sana, Loei province

Pha Som group (กลุ่มหินผาซ่อม)

Age: Silurian-Devonian

Distribution: Northern Region: Uttaradit and Phrae provinces

References: Bunopas (1969, 1981)

Lithology: Sedimentary sequence usually metamorphosed to green-schist facies: banded quartzite, quartzitic phyllite, phyllite, mica-hornblende schist,

chlorite schist, actinolite-quartz schist, epidote-quartz schist, muscovite-quartz schist; well develop cleavage

Genesis: Inner trench slope deposits

Correlation: Lateral facies change with the Thung Saliam group

Type locality: At the excavations prepared for the dam abutments of the Sirikit Dam (formally Pha Som dam)

Pha Som ultramafics (หินอัลตราเมฟิกผาซ่อม)

Age: Middle Permian (269±12 Ma) (Barr and Macdonald, 1987)

Distribution: Northern Region: Nan and Uttaradit provinces

References: Bunopas (1981), Singharajwarapan (1994)

Lithology: Gabbro, peridotite, serpentinite and dunite with minor mafic dike and pillow lavas

Genesis: Ophiolite, suture

Type area: East and southeast of Nan province along the Nan river; north and west of Sirikit (Pha Som) Dam, Tha Pla district, Uttaradit province

Pha Woh limestone (หมวดหินปูนพะวอ)

Age: Middle to Upper Permian

Distribution: Northern Region: Tak province

Reference: Bunopas (1981)

Lithology: Dolomitic limestone with rare intercalation of quartzose sandstone are present in the lower part; 150 m thick of the upper part consists of dolomitic limestone and chert

Thickness: 650 m

Genesis: Continental margin deposits

Type section: At Pha Woh, km 62.3 to km 66 on the Tak-Mae Sot highway

Remarks: This unit is equivalent to the Phra Who Limestone of Heim and Hirschi (1939) and Bunopas (1981)

Phangnga formation (หมวดหินพังงา)

Age: Tertiary (Late Miocene)

Distribution: The Andaman Sea

Reference: Nakanart and Mantajit (1983)

Lithology: Grey limestone with minor shale
Genesis: Shallow to middle Bathyal
Type area: Wildcat wells in the Andaman

Phanom Sarakham schist (หินชีสต์พนมสารคาม)

Age: Precambrian (?)
Distribution: Eastern Region: Chachoengsao province
Reference: Buravas (1957)
Lithology: Schist: muscovite, garnet, topaz and kyanite
Type area: Phanom Sarakham district, Chachoengsao province

Phanom Wang Formation (หมวดหินพนมวัง)

Age: Middle Permian
Distribution: Western Region and Peninsula
References: Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)
Lithology: Medium- to thick- bedded, grey limestone (mainly wackestone to packstone) and intercalated chert nodules and lenses; partly dolomitized, and replaced by chert lenses
Thickness: 80 m
Genesis: Shallow marine deposits, epeiric carbonate platform
Parent unit: Ratburi Group
Type section: Named after Phanom Wang temple where type section located, Kanchanadit district, Surat Thani province

Phanomwang Limestone Member (หมู่หินปูนพนมวังก์)

Age: Upper Triassic (Lower to Middle Norian) (Ampornmaha, 1996)
Distribution: Lower Peninsula: Phatthalung province
Reference: Ampornmaha (1995)
Lithology: Thick- to massive limestones
Thickness: 100 m
Parent unit: Chaiburi Formation
Type section: At the quarry of Khao Phanomwang, 10 km NW of Phatthalung city

Phap Pha Formation (หมวดหินพับผ้า)

Age:	Middle Permian (Murghabian)
Distribution:	Western Region and Peninsula
References:	Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)
Lithology:	Thin- to medium-bedded, grey to dark grey limestones and thinly intercalated shale; partly dolomitized, and replaced by chert lenses and nodules.
Thickness:	200 m
Genesis:	Shallow marine deposits, epeiric carbonate platform
Parent unit:	Ratburi Group
Type section:	Named after Khao Phap Pha where type section located, Kanchanadit district, Surat Thani province

Pharaka formation (หมวดหินผาละกา)

Age:	Carboniferous-Permian
Distribution:	Western Region
Reference:	Sukto and others (1985)
Lithology:	Banded limestone with chert nodules; grey shale; sandstone; and carbonaceous shale
Type area:	East of Mae Sot district, Tak province

Phitsanulok Group (กลุ่มหินพิษณุโลก)

Age:	Oligocene to Recent
Distribution:	The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference:	Knox and Wakefield (1983)
Lithology:	Conglomerate, sandstone in the lower part; mudstone, siltstone and coal in the middle part; change to sandstone, mudstone, conglomerate in the upper part
Thickness:	8,000 m
Genesis:	Alluvial fan, fan delta, fluvio-lacustrine depositional environments
Subdivisions:	Subdivided into 8 formations (ascending order) Sarabop, Nong Bua, Khom, Lan Krabu, Chum Saeng, Pratu Tao, Yom and Ping Formations
Type section:	Petroleum wells in Phitsanulok basin, Kamphaeng Phet province

Pho Hai Member (หมู่หินโพไฮ)

Age:	Upper Triassic
Distribution:	Loei-Phetchabun Range: Loei and Phetchabun provinces
Reference:	Chonglakmani and Sattayarak (1978)
Lithology:	Volcanic rocks: tuff, agglomerate, rhyolite, and andesite including some intercalation of sandstone and conglomerate
Thickness:	210 m
Parent unit:	Huai Hin Lat Formation
Type section:	Along Lom Sak – Chum Phae highway between km 42 to km 44.5; named after Huai Pho Hai, about 0.5 km west of the type locality.

Phra That Formation (หมวดหินพระธาตุ)

Age:	Lower to Middle Triassic (Upper Griesbachian to Lower Anisian)
Distribution:	Northern Region: Lampang and Sukhothai provinces
References:	Proposed by Piyasin (1971), Chonglakmani (1981); revised by Chaodumrong and Burrett (1997)
Lithology:	Red beds in the lower part, often upward to grey beds of mudstone, siltstone, sandstone with occasional intercalated limestone
Thickness:	100-840 m, 90 m at the type section
Genesis:	Near shore to continental deposits
Parent unit:	Lampang Group
Type section:	Phra That Muang Kham, 11 km southeast of Lampang province

Phra Wihan Formation (หมวดหินพระวิหาร)

Age:	Middle Jurassic; but Lower Cretaceous (Berriasian-Barremian) by Racey and others (1994)
Distribution:	The Khorat Plateau
References:	La Moreaux and others (1959), Ward and Bunnag (1964), Iwai and others (1968)
Lithology:	White quartz sandstone and thin laminations of red siltstone
Thickness:	56-136 m
Genesis:	Fluvio-lacustrine; at present believe to be braided river system
Parent unit:	Khorat Group
Type area:	Southern slope of Khao Phra Wihan
Remarks:	Phra Vihan Formation was previously used (La Moreaux and others, 1959; Ward and Bunnag, 1964)

Phra Woh Limestone (หมวดหินปูนพระวอ)

Age:	Middle to Upper Permian
Distribution:	Western Region: Mae Sot district, Tak province
References:	Heim and Hirschi (1939), Bunopas (1981)
Lithology:	The lower part of the section consists of coarse-grained and massive dolomitic limestone with rare intercalated quartzitic sandstone, while the upper 150 m consists of dolomitic limestone and chert
Thickness:	650 m
Genesis:	Carbonate shelf facies deposited on continental margin
Correlation:	Kamawkala Limestone in Myanmar (Stokes, 1988)
Type section:	Km post 62.3-66, Mae Sot-Tak highway
Remarks:	This formation was originally proposed as “Pawa limestone” by Heim and Hirschi (1939), and also renamed as “Phawa Limestone” by Stokes (1988), and Pha Woh limestone by Bunopas (1981)

Phrae formation (หมวดหินแพร่)

Age:	Tertiary (not older than Middle Miocene)
Distribution:	Northern Region: Phrae province
Reference:	Muraoka and others (1997)
Lithology:	Gritty mudstone with intercalated thin conglomerate, sandstone, mudstone, and lignite beds
Genesis:	Fan and lacustrine deposits
Type section:	Phrae Basin, Phrae province
Remarks:	The word “Phrae” will be confused with the Phrae Group

Phrae Group (กลุ่มหินแพร่)

Age:	Carboniferous to Permian
Distribution:	Northern Region: Nan, Phrae, Uttaradit and Sukhothai provinces
Reference:	Bunopas (1981)
Lithology:	Agglomerate, conglomerate, greywacke, argillite and limestone
Thickness:	4,000 m
Subdivisions:	Two formations, in ascending order: Mae Sai Formation and Rong Kwang Formation
Correlation:	Mae Tha Group
Type area:	North of Rong Kwang district, Phrae province

Remarks: Based on Late Triassic fossils found in limestones formerly mapped as the Rong Kwang Formation, Chonglakmani (2011) rearranged this to be part of the Kang Pla Formation, under a new group, the Song Group.

Phu Fai diabase (หินไดอะเบสภูฝ้าย)

Age: Tertiary (3.28±0.48 Ma, K/Ar whole rock dating)
Distribution: The Khorat Plateau: Si Sa Ket province
References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology: The rock is pale grey, diabasic texture and consists of granular clinopyroxene, olivine, magnetite and plagioclase
Type area: Phu Fai, 90 km east of Khunhan district, Si Sa Ket province
Remarks: Nomenclature-nepheline mugearite

Phu Hi Member (หมู่หินภูฮี)

Age: Upper Triassic
Distribution: The Khorat Plateau
Reference: Chonglakmani and Sattayarak (1978)
Lithology: Grey sandstone, shale and argillaceous limestone with some intercalation of conglomerate bed in the lower half of the member
Thickness: 650-850 m
Genesis: Deltaic-fluvial deposits
Parent unit: Huai Hin Lat Formation
Type section: Along Ban Dat Fa-Ban Kok Kabok-Huai Pakrai section, Chum Phae district, Khon Kaen province; named after a Phu Hi stream

Phu Kha formation (หมวดหินภูคา)

Age: Lower Jurassic
Distribution: Northern Region: Chaloem Phra Kiat and Bo Kluea districts of Nan province
Reference: Imsamut and Chuadee (2006)
Lithology: Conglomerate, reddish-brown, light grey and pale greenish-grey, medium- to thick-bedded, with pebbles of limestone and marble, light grey to dark grey, rounded, arkosic sandstone (more than 5-25 cm in diameter), reddish-brown, angular; interbedded with arkosic lamination and ripple mark; calcarenite, pale greenish-grey and light grey, smooth, thin to medium bedded; argillaceous limestone, grey sandstone,

siltstone and mudstone, purplish-red, greyish-red, greenish-red, calcareous, thin- to medium-bedded, with cross bedding, to dark grey, thin bedded with laminations

Thickness: 200-500 m

Genesis: Alluvial fan and braided stream deposit

Subdivisions: Conglomerate and Red-grey clastic member (from bottom to top)

Type locality: Phu Kha mountain, Bo Kluea district of Nan province

Phu Kham formation (หมวดหินภูคำ)

Age: Middle Jurassic

Distribution: Northern Region: Phayao and Nan provinces

Reference: Tansuwan and Kosuwan (1988)

Lithology: Sandstone, dense, white, brown, medium to fine-grained, well sorted; minor arkosic sandstone and shale, reddish brown

Genesis: Channel deposits

Correlation: Phra Wihan Formation

Type area: Chun district, Phayao province

Phu Khamint basalt (หินบะซอลต์ภูขมิ้น)

Age: Late Cenozoic (?)

Distribution: The Khorat Plateau: Si Sa Ket

Reference: Jungyusuk and Sirinawin (1983)

Lithology: The rock is dark grey, with microphenocrysts of abundant olivine, minor titanaugite and plagioclase in the intergranular groundmass of plagioclase, clinopyroxene, olivine and magnetite

Type area: Phu Khamint, Kanthralak district, Si Sa Ket province

Phu Khat formation (หมวดหินภูขัด)

Age: Upper Cretaceous (?)

Distribution: Northern Region: Phitsanulok province

Reference: Kosuwan (1990)

Lithology: Sandstone, reddish-brown, fine- to medium grained, well sorted; interbedded with siltstone, brown; intercalated with conglomeratic sandstone and conglomerate

Genesis: Arid, pond, alluvial fan?

Type area: Phu Khat, Nakhon Thai district, Phitsanulok province

Phu khwang formation (หมวดหินภูขวาง)

Age: Lower Triassic
Distribution: Northern Region: Mueang district of Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Arkosic and quartzitic sandstone, red, reddish brown, medium-to-coarse grained; interbedded with shale and conglomerate
Thickness: 800-1,500 m
Correlation: Phra That Formation
Type locality: At Phra That Phu Khwang (Phu Khwang temple) San Pa Sak village, Mae Na Ruea sub district, Mueang district, Phayao province (18 km southwest of Phayao)

Phu Kom basalt (หินบะซอลต์ภูก้อม)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau: Si Sa Ket province
Reference: Jungyusuk and Sirinawin (1983)
Lithology: The rock is greyish-black, vesicular and microporphyritic
Type area: Phu Kom, southwest of Kantharalak district, Si Sa Ket province

Phu Kradung Formation (หมวดหินภูกระดึง)

Age: Lower Jurassic; Lower Jurassic to Lower Cretaceous (Racey and others, 1994); Middle to Upper Jurassic (Department of Mineral Resources, 2007)
Distribution: The Khorat Plateau
References: La Moreaux and others (1959), Ward and Bunnag (1964), Iwai and others (1968), Hayami (1968)
Lithology: Soft siltstone and non-resistant sandstone with greenish-grey calcareous conglomerate. Bone fragments and teeth are present.
Thickness: 1,001 m at the type section
Genesis: Fluvio-lacustrine
Parent unit: Khorat Group
Type section: Phu Kradung, Phu Kradung district, Loei province

Phu Lop group (กลุ่มหินภูลพ)

Age: Upper Norian
Distribution: The Khorat Plateau: subsurface
Reference: Mouret (1994)

Lithology: Red beds, mostly siltstone and shale
Thickness: 85 m
Genesis: Alluvial deposits
Parent unit: Kuchinarai group
Type section: TOTAL Phu Lop-IX well
Remark: A primary unit of lithostratigraphy is a rank of formation rather than group, as mentioned in the International Stratigraphic Guide (Murphy and Salvador, 1999).

Phu Ngaen basalt (หินบะซอลต์ภูเงิน)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau: Si Sa Ket province
References: Barr and Macdonald (1978), Jungyusuk Sirinawin (1983)
Lithology: The rock is dark grey and contains microphenocrysts of abundant olivine, minor clinopyroxene and rare orthopyroxene. The groundmass consist of clinopyroxene, plagioclase and opaque
Type area: Phu Ngaen, Kantharalak district, Si Sa Ket province
Remarks: Nomenclature-hawaiite

Phu Ngeon formation (หมวดหินภูเงิน)

Age: Upper Jurassic -Cretaceous
Distribution: Northern Region: Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Shale, purple, red, some calcareous; interbedded with sandstone and siltstone, brown, red, micaceous
Thickness: 100-150 m.
Genesis: Fresh water lake
Correlation: Sao Khua Formation
Type locality: At Phu Ngeon village, Mae Pum sub district, Mueang district of Phayao province

Phu Noi formation (หมวดหินภูน้อย)

Age: Carnian or Lower Norian
Distribution: The Khorat Plateau: subsurface
Reference: Mouret (1994)
Lithology: Mainly sandstone; almost transparent on seismic

Genesis: Braided stream, alluvial fan
Parent unit: Kuchinarai group

Phu Pha Khao member (หมู่หินภูผาขาว)

Age: Upper Carboniferous to Lower Permian?
Distribution: Loei-Phetchabun Range
Reference: Assavapatchara (1998)
Lithology: Thin- to very thick-bedded, white to light grey skeletal limestone, algal lamination, crystalline limestone and dolomite
Thickness: 250-300 m
Genesis: Intertidal and subtidal regimes under influence of low- to high-energy shallow shelf sea of tropical shelf environment
Parent unit: Nam Maholan Formation
Type section: At Phu Pha Khao, western part of Dong Noi village, Pha Khao district of Loei province

Phu Phan Formation (หมวดหินภูพาน)

Age: Lower Cretaceous; Lower Cretaceous (? Barremian-Aptian) by Racey and others (1994)
Distribution: The Khorat Plateau
References: La Moreaux and others (1959); Ward and Bunnag (1964); Iwai and others (1968)
Lithology: Thick-bedded and cross-bedded conglomeratic sandstone and conglomerate
Thickness: 183 m
Genesis: Fluviatile; at present it is believed to have been a braided river system
Parent unit: Khorat Group
Type section: Phu Pha Phung, Phu Phan Range, Kalasin province

Phu Phe Formation (หมวดหินภูเพ)

Age: Lower Permian (Sakmarian)
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference: Hinthong and others (1985)
Lithology: Pinkish-grey to very dark grey limestone with chert in tabular nodules parallel with bedding and partially intercalated with slaty shale: base upthrusted on the Sab Bon Formation (metasedimentary rocks)

Thickness: 593 m
Parent unit: Saraburi Group
Type section: Khao Phu Phe, east of Km post 131-132, Friendship highway grid ref. between 250 to 280 E and 150 to 180 N, sheet 47 P/FG 13, series L7017
Remarks: This formation, was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Phu Phra Angkhan basalt (หินบะซอลต์ภูพระอังคาร)

Age: Late Cenozoic (?)
Distribution: The Khorat Plateau: Buri Rum province
References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology: The rock is greyish-black, vesicular and generally exhibits columnar jointing at the lower part nears the vent. It is intergranular texture with abundant olivine phenocrysts
Type area: Phu Phra Angkhan, Nang Rong district, Buri Ram province
Remarks: Nomenclature-hawaiite

Phu Phra formation (หมวดหินภูพระ)

Age: Norian
Distribution: The Khorat Plateau: subsurface
Reference: Mouret (1994)
Lithology: Dark-grey organic shale and minor sandstone and rare anhydrite
Genesis: Lacustrine deposits
Parent unit: Kuchinarai group

Phu Po volcanic formation (หมวดหินภูเขาไฟภูปอ)

Age: Triassic
Distribution: Phu Kamyao and Mae Jai district of Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Tuff, grey, purple, green and red, dense and porphyritic; andesite, rhyolite and agglomerate
Type locality: At Phra That Phu Po Temple, Dongjan sub district of Phu Kamyao district, Phayao province

Phu Rang Ka formation (หมวดหินภูรังกา)

Age: Carboniferous-Permian?
Distribution: Northern Region: Phayao and Nan provinces
Reference: Tansuwan and Kosuwan (1988)
Lithology: Quartzite intercalated with dark grey phyllitic shale, and carbonaceous shale in the lower part; conglomerate, quartzitic sandstone, and reddish brown shale in the upper part
Type area: Chiang Kham and Pong districts, Phayao province

Phu Tap Member (หมู่หินปูตั๊บ)

Age: Upper Triassic
Distribution: Northern Region: Phrae, Lampang
Reference: Chaodumrong and Burrett (1997)
Lithology: Mainly grey to greenish grey mudstone with minor sandstone and siltstone
Thickness: 220 m
Genesis: Deep sea, submarine fan deposits
Parent unit: Wang Chin Formation
Type section: Km post 54.9 to 55.2 and 66.5 to 66.7 along Lampang –Denchai highway. takes its name from the Phra That Phu Tap temple

Phu Thok Formation (หมวดหินภูทอก)

-see Phu Tok Formation

Phu Tok Formation (หมวดหินภูทอก)

Age: Tertiary (?) (Sattayarak, 1985), Cretaceous-Lower Tertiary (Department of Mineral Resources, 2007)
Distribution: The Khorat Plateau
Reference: Sattayarak (1985), Department of Mineral Resources (2001, 2007)
Lithology: Sandstone, brick-red, fine- to medium-grained, thick-bedded to massive, very large scale cross-bedding and small scale wavy bed
Thickness: 100 m
Genesis: Wind with minor fluvial
Subdivisions: Consists of 3 members: Nawa, Kham Ta Kla, and Phu Thok Noi Members (Thiamwong and Lertnok, 2005)
Type section: Phu Tok, Bung Kan district, Bung Kan province

Remarks: This formation is also written as “Phu Thok Formation” (Department of Mineral Resources, 2007; Meesook, 2011)

Phubon marbles (หินอ่อนพุบอน)

Age: Cambrian-Ordovician (?)
Distribution: Western Region: Uthai Thani province
Reference: Bunopas (1980a)
Lithology: Mica-schist, contorted marble and minor calc-silicate rocks
Type locality: Phubon village, Ban Rai district, Uthai Thani province

Phuket Granites (หินแกรนิตภูเก็ต)

Age: Cretaceous
Distribution: Upper Peninsula: Phuket Island
References: Garson and others (1975), Beckinsale and Nakapadungrat (1981), Putthapiban and Gray (1983)
Lithology: Biotite granite, biotite-muscovite granite, hornblende biotite-muscovite granite, hornblende biotite adamellite
Subdivisions: Four informal names: Khao Prathiu suite, Kata Beach suite, Nai Thon Beach suite and Khao Tosae suite (Putthapiban and Gray, 1983)
Type area: Phuket island, Phuket province
Remarks: The term “granite” should be used instead of adamellite (Streckeisen, 1976)

Phuket group (กลุ่มหินภูเก็ต)

-see Kaeng Krachan Group

Phuket series (หินสมัยภูเก็ต)

-see Tarutao group

Phukhaothong Dolomite Member (หมู่หินโดโลไมต์ภูเขาทอง)

Age: Lower to Middle Triassic (Dienerian to Spathian)
Distribution: Lower Peninsula: Phatthalung province
Reference: Ampornmaha (1995)
Lithology: Massive and bedded dolomites
Thickness: 65 m

Parent unit: Chaiburi Formation
Type section: At old quarry in the Phukhaothong temple, Khuan Khanun district, Phatthalung province

Phun Phin Formation (หมวดหินพุนพิน)

Age: Upper Cretaceous
Distribution: Lower Peninsula: Nakhon Si Thammarat, Surat Thani, Krabi, and Trang provinces
References: Teerarungsigul and others (1999), Raksaskulwong (2002)
Lithology: Predominantly of red to reddish-brown, fine-grained sandstone, siltstone, and conglomerate/breccias with both clast-supported and matrix supported
Thickness: 102-770 m to over 1,000 m
Genesis: Debris flows and Fluviatile (braided)
Parent unit: Thung Yai Group (Trang Group)
Type section: At Km 10 of road no 4038 from Lam Thap to Khlong Thom
Remarks: The Phun Phin unconformably overlies the Sam Chom Formation (Teerarungsigul and others, 1999)

Ping Formation (หมวดหินปิง)

Age: Middle-lower Upper Pleistocene
Distribution: The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference: Knox and Wakefield (1983)
Lithology: Coarse-grained sand, gravel and clay
Thickness: 1,250 m
Genesis: Fluviatile, coarse-grained clastic (high energy) deposits
Parent unit: Phitsanulok Group
Type section: Petroleum wells, Phitsanulok basin, Sukhothai and Kamphaeng Phet provinces

Pinyo Pluton (ปินเยาะพลูตอน)

Age: Triassic (?)
Distribution: Lower Peninsula: Yala province
References: Ishihara and others (1979), Pitakpaivan (1969)
Lithology: Coarse-grained porphyritic granite
Type area: West of Bannang Sata district, Yala province

Remarks: K/Ar biotite age = 229±7 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered stratigraphic terms.

Plu Ta Luang formation (หมวดหินพลูตาหลวง)

Age: Carboniferous
Distribution: Eastern Region: Chon Buri and Rayong provinces
Reference: Tansuwan (1999)
Lithology: Bedded chert with radiolarian, sandstone siltstone and carbonaceous shale, locally with red siltstone and spotted slate, spotted shale, meta chert, limestone lens.
Thickness: 800 m
Parent unit: Chon Buri group
Type locality: Khao Plu Ta Luang, Sattahip district, Chon Buri province

Pong Klua formation (หมวดหินโป่งเกลือ)

Age: Upper Jurassic
Distribution: Northern Region: Phayao province
Reference: Tiyapirach and Mahapoom (1990)
Lithology: Quartzitic sandstone, white, pink coarse grained, thick bedded; intercalated with conglomeratic sandstone
Thickness: 80-100 m
Genesis: Continental river deposits
Correlation: Phra Wihan Formation
Type locality: At Phra That Pong Klua Temple, 16 km north of Phayao downtown

Pong Nam Ron basalt (หินบะซอลต์โป่งน้ำร้อน)

Age: Late Cenozoic (?)
Distribution: Eastern Region: Chanthaburi province
References: Barr and Macdonald (1978), Jungyusuk and Sirinawin (1983)
Lithology: The rock is porphyritic texture with abundant olivine phenocrysts and minor clinopyroxene in an intergranular groundmass of lath plagioclases, granular to prismatic clinopyroxene, opaque minerals and glass
Type area: 20 km east and southeast of Pong Nam Ron district, Chanthaburi province
Remarks: Nomenclature-basanite

Pong Nam Ron Formation (หมวดหินโป่งน้ำร้อน)

Age: Triassic
Distribution: Eastern Region
References: Sivaborvorn and others (1976), Tansathien and others (1985), Raksaskulwong and Prakorbchat (1990), Department of Mineral Resources (2007)
Lithology: Greywacke, greenish grey, dark grey, fine- to medium grained, poorly to moderately sorted, thin to massive, graded bedded, small scale cross-bedded; interbedded shale and locally thin bedded limestone
Thickness: over 200 m
Genesis: Inner submarine fan deposits (Chaodumrong, 1992b)
Type area: Eastern parts of Chanthaburi, Trat and Sa Kaeo provinces

Pong Nam Ron quartzite (หินควอร์ตไซต์โป่งน้ำร้อน)

Age: Cambrian to Lower Ordovician (?)
Distribution: Western Region: west of Tak, Kamphaeng Phet provinces
Reference: Bunopas (1981)
Lithology: Quartzite, monotonous well bedded, with minor beds of quartz-schist and quartz-pelitic schist
Thickness: 500 m
Parent unit: Khlong Wang Chao group
Correlation: Chao Nen quartzite and Pha Bong quartzite
Type section: The section is upstream from the bend of the creek under the limestone range near the fault contact with the Precambrian rocks (NE47-15 grid 1842-509)
Remarks: The age is controlled by very poorly preserved supposedly Ordovician fossils in the overlying formation, suggesting that the rocks are possibly of earliest Ordovician or Cambrian age.

Pong Sawae Formation (หมวดหินโป่งสะแว)

Age: Silurian-Devonian
Distribution: Western Region: Kanchanaburi province
Reference: Siribhakdi (1985)
Lithology: Shale, dark brown to black, well bedded, with *Tentaculites* sp. and graptolites.
Type section: Pong Sawae village, Sangkhla Buri district, Kanchanaburi province

Pra Bat formation (หมวดหินพระบาท)

Age:	Upper Triassic to Jurassic
Distribution:	Upper Peninsula: Chumphon province
Reference:	Grant-Mackie and others (1980)
Lithology:	Interbedding of massive, fine grained sandstone, mudstone, and siltstone
Thickness:	65 m
Genesis:	Shallow marine, near shore
Type section:	Named after Khao Pra Bat, a small hill, Hua Sai district, Nakhon Si Thammarat province

Pra Tong formation (หมวดหินประตง)

Age:	Permian
Distribution:	Eastern Region: Chanthaburi and Sa Kaeo provinces
Reference:	Tansuwan and Boonkanpai (1990)
Lithology:	Chert, thick and thin bedded, well bedded, reddish brown, brown, intercalated with limestone and volcanic rocks
Genesis:	Transitional area between shallow to deep marine environment
Type Locality:	Near Pa Tong village, Soi Dao district of Chanthaburi province

Pranburi formation (หมวดหินปราณบุรี)

Age:	Precambrian (?), but inferred Paleozoic by Sinclair (1997)
Distribution:	Upper Peninsula: Prachuap Khiri Khan province
Reference:	Dheeradilok and others (1985b)
Lithology:	Sillimanite-mica schist, marble, laminated calc-silicate, quartzite and quartz-mica schist
Genesis:	Paragneiss, sedimentary origin
Parent unit:	Hua Hin group by Sinclair (1997)
Type area:	Pranburi district, Prachuap Khiri Khan province
Remarks:	Putthapiban and Suensilpong (1978) suggested post-Triassic age but Pongsapich and others (1980) argued that the age is pre-Carboniferous-Permian

Pranburi-Hua Hin metamorphic complex (ปราณบุรี-หัวหิน เมตามอร์ฟิคคอมเพล็กซ์)

Age:	Precambrian (?) ; Pre-Carboniferous-Permian (?)
Distribution:	Upper Peninsula: Prachuab Khiri Khan province
Reference:	Pongsapich and others (1980)

Lithology: Marble, quartzite, calc-silicate, quartzofeldspathic, metapelite (including schist and Hua Hin gneiss)
Genesis: Igneous origin (Pranburi gneiss)
Type area: Pranburi district, Hua Hin district, Prachuab Khiri Khan province

Pratu Tao Formation (หมวดหินประดู่เฒ่า)

Age: Tertiary (Lower-Middle Miocene)
Distribution: The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference: Knox and Wakefield (1983), Department of Mineral Resources (2007)
Lithology: Upper alluvial plain facies; fluviatile fine- to coarse-grained sand, ephemeral lacustrine, alluvial plain red-brown to varicoloured clay
Thickness: 1,400 m
Genesis: Alluvial plain, meandering river, ephemeral lacustrine
Parent unit: Phitsanulok Group
Type section: Petroleum wells in Phitsanulok basin, Sukhothai and Kamphaeng Phet provinces

Pru Chaba formation (หมวดหินพรุชบา)

Age: Carboniferous
Distribution: Lower Peninsula: Songkhla province
Reference: Tansuwan and others (1982)
Lithology: Sandstone, dark grey with scattered pebbles of quartzite, quartz, sandstone, shale; mudstone, with load casts and slump structures; intercalation of mudstone, sandstone, dark grey
Type locality: Named after Pru Chaba village where the type locality located, Hat Yai district, Songkhla province

Pu Chui formation (หมวดหินปุจุ้ย)

Age: Lower Permian
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Interbedded mudstone, greenish grey, and sandstone, fine-grained; orthoquartzite, white and pale, medium- to coarse-grained, well sorted; intercalated calcareous lens; limestone, grey to light-grey, bedded; occasionally limestone conglomerate with *Monodiexodina* sp.
Thickness: Approximately 500 m

Type locality: Huai Pu Chui, Tak province, between grid reference 920-940 E and 680-700 N of Map sheet Ban Pang San (4742 I), L 7017

Pu Khloe Khi Formation (หมวดหินปู่เคลอะคี)

Age: lower Middle Jurassic (Lower Aalenian)
Distribution: Northern Region: Mae Hong Son, Tak and Kanchanaburi provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Thick bedded to massive, dark-grey limestone with abundant oncolitic and stylolitic layers
Thickness: 60 m
Genesis: Shallow marine
Parent unit: Umphang Group
Type section: Named after Pu Khloe Khi village in Myanmar; type section along a tract from Klo Tho village of Umphang district to Pu Khloe Khi village in Myanmar

Ranong Formation (หมวดหินระนอง)

Age: Upper Oligocene to Lower Miocene
Distribution: Andaman Sea: Mergui Basin
References: Nakanart and Mantajit (1983), Polachan (1988), Polachan and Racey (1994)
Lithology: Massive or thick bedded, variable colour sandstones and conglomerate in the lower part of the formation; grey sandstone, siltstone and shale with occasional thin coals in the middle part; and predominantly fine-grained, calcareous greenish grey massive/ thick bedded sandstones in the upper part.
Thickness: 1,104 m at type locality to 230 m at the Payang well
Genesis: Fluviatile environment in its lower part, followed by a shallow marine environments in the middle and upper parts.
Parent unit: Mergui Group
Correlation: Bruksah Formation of North Sumatra Basin
Type section: Named after Ranong fault which cuts obliquely across the Thai-Malay Peninsula. Type section at B-1 well from the interval 8,030-11,710 feet
Remarks: Polachan (1988) revised the "Ranong formation" of Nakanart and Mantajit (1983) into 2 formations: Ranong formation consists mainly of sandstone, and Yala formation comprises mostly of shale with minor sandstone.

Ratburi Group (กลุ่มหินราชบุรี)

Age: Middle-Upper Permian (Chaodumrong and others, 2004, 2007), originally mapped as Carboniferous-Permian (Javanaphet, 1969; Bunopas, 1981)

Distribution: Western Region and Peninsula

References: Proposed by Javanaphet (1969), Bunopas (1981); revised by Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)

Lithology: In most areas, sequences of thin- to medium-bedded limestones are overlain by massive limestones. In a complete sequence, thick-bedded limestone and clastic sequence occur in the lower part of the group. Followed by sequences of thin- to medium-bedded limestones, upward to medium- to thick-bedded limestones, and topped by thick sequence of massive limestone. Dolomite, marble, and replacement chert are present.

Thickness: 1,450 m

Genesis: Shallow marine deposits, epeiric carbonate platform

Subdivisions: Bunopas (1981) subdivided (then called Sai Yok group) into 3 formations: Khao Muang Khrut Sandstone, Sai Yok Limestone and Tha Madua Sandstone

Chaodumrong and others (2004, 2007) subdivided into 5 formations: Thung Nang Ling, Khao Muang Khrut Sandstone, Phap Pha, Phanom Wang, and Um Luk Formations.

Correlation: Sai Yok group

Type area: At Khao Thung Nang Ling, Khao Phap Pha, Khao Phanom Wang, and Khao Um Luk of Surat Thani province; Khao Muang Khrut of Kanchanaburi province

Remarks: The Ratburi limestone (Brown and others, 1951) and the Ratburi group (Javanphet, 1969) have been used throughout Thailand for limestones and associated clastic sediments of Permian age; the Sai Yok group (Bunopas, 1981) was used in the Three Pagoda Fault Zone between Kwae Noi and Kwae Yai

Ratburi limestone (หมวดหินปูนราชบุรี)

-see Ratburi Group

Rayong-Bang Lamung granites (หินแกรนิตระยอง-บางละมุง)

Age: Middle Triassic (221±11 Ma, Rb/Sr whole rock isochron)
Distribution: Eastern Region: Chon Buri, Rayong
References: Beckinsale and Nakapadungrat (1981), Nakapadungrat and others (1985)
Lithology: Coarse-grained porphyritic biotite granite, fine- to medium-grained porphyritic biotite granite and equigranular, fine- to medium-grained biotite-muscovite granite
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0 = 0.7263\pm6$
Type area: Area around Rayong-Bang Lamung highway

Rong Kwang Formation (หมวดหินร้องกวาง)

Age: Lower Carboniferous to Permian
Distribution: Northern Region: Phrae, Nan, Uttaradit and Sukhothai provinces
Reference: Bunopas (1981)
Lithology: Green to grey tuffaceous sandstone and slate, fine- to medium-grained sandstone, siltstone and green grey slaty shale; massive to thick-bedded, crystalline limestone, some indistinctly bedded crystalline limestone
Thickness: 2,350 m
Genesis: Arc-trench gap
Parent unit: Phrae Group
Type area: Cutting along Phrae-Nan Road, 4 km northeast of Rong Kwang district, Phrae province
Remarks: Based on Late Triassic fossils found in limestones formerly mapped as the Rong Kwang Formation, Chonglakmani (2011) rearranged to be part of the Kang Pla Formation, under a new group, the Song Group.

Rung Nok Formation (หมวดหินรังนก)

Age: Lower Ordovician (Middle-Upper Arenig)
Distribution: Lower Peninsula: Tarutao Island, Satun province
References: Wongwanich (1990), Department of Mineral Resources (2007)
Lithology: Limestone, dolomitic limestone, and dolomite; thinly beds (1-3 cm) in the lower part, and thick to massive beds in the upper part
Thickness: 368 m
Genesis: Peritidal environment on a homoclinal ramp
Parent unit: Thung Song Group
Type section: Takes its name after Rung Nok cave on Lae Tong island, south of Tarutao island, where the type section is located on the south side of the island

Ruso pluton (รือเสาะพลูตอน)

Age:	Jurassic (?)
Distribution:	Lower peninsula: Narathiwat
References:	Ishihara and others (1979, 1980)
Lithology:	Coarse-grained biotite granite, slightly porphyritic and medium-grained porphyritic biotite granite
Type area:	Khao Budo, Narathiwat province
Remarks:	K/Ar biotite age = 145±5 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered as stratigraphic terms.

Sadao formation (หมวดหินสะเดา)

Age:	Tertiary (Early Miocene)
Distribution:	The Andaman Sea
Reference:	Nakanart and Mantajit (1983)
Lithology:	Interbedded sandstone and siltstone
Genesis:	Lower Bathyal
Type locality:	Wildcat wells in the Andaman Sea

Sai Bon formation (หมวดหินไสบอน)

Age:	Upper Triassic
Distribution:	Lower Peninsula
Reference:	Raksaskulwong and others (1990)
Lithology:	Red sandstone interbedded with argillaceous limestone, dolomitic limestone lenses, abundant bivalves, corals, gastropods and ammonites
Thickness:	110 m
Genesis:	Shallow marine deposits
Type Locality:	Nakhon Si Thammarat province

Sai Yok group (กลุ่มหินไทรโยค)

-see Ratburi Group

Sai Yok Limestone (หมวดหินปูนไทรโยค)

Age:	Lower-Middle Permian
Distribution:	Western Region: Kanchanaburi province

References: Bunopas (1890a, 1981)
Lithology: Massive limestone, argillaceous to dolomitic, thick-bedded
Thickness: 400-900 m
Genesis: Broad continental shelf
Parent unit: Ratburi Group
Type section: Northeast of Kanchanaburi-Sai Yok Road, 6 km south of the Sai Yok waterfall, Kanchanaburi province
Remarks: This formation was previously mapped as part of the Sai Yok group (Bunopas, 1981). Ueno and Charoentitirat (2011) changed the formation's name to Sai Yok Formation, but it should be named as Sai Yok Limestone, with respect to priority according to the International Stratigraphic Guide.

Sam Chom Formation (หมวดหินสามจอม)

Age: Cretaceous
Distribution: Lower Peninsula: Nakhon Si Thammarat, Surat Thani, Krabi, and Trang provinces
References: Raksaskulwong (1994), Teerarungsigul and others (1999), Raksaskulwong (2002)
Lithology: Mainly matrix-supported conglomerate, conglomeratic sandstone, and thin- to medium-bedded sandstone; clasts are quartz, chert, red sandstone and volcanics
Thickness: 100 m (Teerarungsigul and others, 1999), 140 m (Raksaskulwong, 1994)
Genesis: Alluvial fan
Parent unit: Thung Yai Group (Trang Group)
Type section: Khao Nam Daeng and Khao Sam Chom, Nakhon Si Thammarat
Remarks: The Sam Chom has unconformable contacts with both overlying Phun Phin Formation and underlying Lam Thap Formation (Teerarungsigul and others, 1999)

Sam Khaen Conglomerate Member (หมู่หินกรวดมนซำแคน)

Age: Upper Triassic
Distribution: The Khorat Plateau
Reference: Chonglakmani and Sattayarak (1978)
Lithology: Limestone conglomerate intercalated with limestone beds, conglomerate often polymictic and red in colour, and intercalated with red sandstone and shale

Thickness: 100-550 m
Genesis: Basal conglomerate
Parent unit: Huai Hin Lat Formation
Type section: Along Huai Hin Lat, about 1 km south of Sam Khaen village

Sam Nak O formation (หมวดหินสำนักเอาะ)

Age: Cretaceous
Distribution: Lower Peninsula: Songkhla province
Reference: Malaysian-Thai Working Groups (2006a)
Lithology: Red clast-supported fanglomerate and cycles of fining upwards sequences of orthoconglomerate grading into paraconglomerate and then grading further into conglomeratic sandstone
Thickness: 600 m
Genesis: Alluvial fan
Correlation: Phun Phin Formation, Saiong beds in Malaysia,
Type Locality: Named after Sam Nak O village, Saba Yoi district, Songkhla province
Remarks: Correlation to the Phun Phin Formation is not consistent with its lithology

Samae San member (หมู่หินแสมสาร)

Age: Carboniferous-Permian
Distribution: Eastern Region: Sattahip district of Chon Buri province
Reference: Boonkanpai and Pudtarauksa (2009)
Lithology: Chert, Grey to dark grey, brown, thinly bedded, well bedded, shale parting and limestone lenses
Thickness: 10-15 m
Parent unit: Plu Ta Luang formation
Type Locality: At Chong Samae San village, Sattahip district of Chon Buri province
Remark: Fossil of radiolarian: *Folicucullus* sp., *Albaillela* sp., and *Latentibifistula* sp.

Samoeng pluton (สะเมิงพลูตอน)

Age: Triassic 195±5 Ma, Rb/Sr whole rock isochron-(Teggin, 1975), 200±19 Ma, Rb/Sr whole rock isochron (Punyaprasiddhi, 1980)
Distribution: Northern Region: Chiang Mai province
References: Teggin (1975), Punyaprasiddhi (1980)

Lithology: Biotite granites

Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.7337±8 (Teggin, 1975), $(^{87}Sr/^{86}Sr)_0$ = 0.7330±25 (Punyaprasiddhi, 1980)

Subdivisions: Three unnamed units: porphyritic biotite granite, leucocratic granite and medium-grained biotite granite

Type area: Samoeng Mine, Samoeng district, Chiang Mai province

Remarks: Teggin (1975) postulated that the leucocratic granite is Tertiary in age but Punyaprasiddhi (1980) demonstrated that it is Triassic. It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered as stratigraphic terms.

Sani formation (หมวดหินสะนี)

Age: Triassic (?)

Distribution: Lower Peninsula

Reference: Grant-Mackie and others (1980)

Lithology: Alternating sandstone and argillite overlain by quartzitic sandstone, conglomerate and bedded chert

Thickness: 4,300 m

Type locality: Sani village, Saba Yoi district, Songkhla province

Sao Khua Formation (หมวดหินเสาขัว)

Age: Lower Cretaceous (? Barremian-Aptian) by Racey and others (1994); originally assigned as Upper Jurassic (Ward and Bunnag, 1964)

Distribution: The Khorat Plateau

Reference: Ward and Bunnag (1964)

Lithology: Siltstone, greyish-red to reddish-brown, mottled, calcareous and non-resistant; sandstone, red, yellowish-grey to yellowish-brown, medium- to fine-grained; minor conglomeratic sandstone. Imsamut (2003a) mentioned the occurrence of calcrete in the formation.

Thickness: 404-720 m

Genesis: Continental deposits

Parent unit: Khorat Group

Type section: At km post 35.2-41.5, Udon Thani-Nong Bua Lamphu Road; Imsamut (2003a) proposed reference sections at Khao Chamuk Khaek section, Lum Ngoen village of Nakhon Ratchasima province (821900E, 1614900N, 5338 II, L7018), at Phu Wiang Investigation Site 1 within Phu Wiang

National Park, Khon Kaen province (204800E, 1846400N, 5442 III, L7018), at Phu khum Khao section of Sahat Sakhan district, Kalasin province (343300E, 1546000N, 5742 II, L7018).

Sap Bon Formation (หมวดหินซับบอน)

Age: Lower-Middle Permian (Kungurian-Kazanian)
Distribution: Phetchabun Ranges and northwest of the Khorat Plateau
References: Hinthong and others (1985), Bunopas (1981)
Lithology: Grey to brown tuff sandstone, siltstone, shale and chert intercalated with grey limestone; upper part, light grey to dark grey, thin-bedded, recrystallised limestone interbedded with light brown to rusty brown shale and siltstone
Thickness: 1,103 m
Parent unit: Saraburi Group
Type section: Sap Bon Teak Plantation, Bon Sok Luk and Huai Sap Tai, Muak Lek district, Saraburi province (grid ref. 400 to 420 E and 100 to130 N, sheet 47 P/FG 13, Series L-7017)
Remarks: This formation was previously mapped as part of the Ratburi Group (Hinthong and others, 1985)

Sap Maidaeng formation (หมวดหินซับไม้แดง)

Age: Lower Jurassic
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
Reference: Nakornsri (1981)
Lithology: Medium- to coarse-grained, poorly cemented, pebbly sandstone
Correlation: Phu Kradung Formation
Type locality: Sap Maidaeng village, Nong Phai district, Phetchabun province

Sapan formation (หมวดหินสะปัน)

Age: Upper Cretaceous
Distribution: Northern Region: Bo Kluea district of Nan province
Reference: Imsamut and Chuadee (2006)
Lithology: Sandstone, arkosic, brick red, friable, fine-to medium-grained, thick bedded, with large scale cross bedding; intercalated with siltstone and mudstone, red, brownish red, thin to medium bedded, lamination, ripple mark and mud crack.

Thickness: 300-400 m
Genesis: River and lake environment
Subdivisions: Upper mudstone member, Thick bedded sandstone member and Lower mudstone member (from top to bottom)
Correlation: Upper part of Khao Ya Puk formation; Phu Thok Noi and Kham Ta Kla Member of Phu Thok Formation
Type locality: At Sapan waterfall, Sapan village, Bo Kluea district of Nan province

Saraburi Group (กลุ่มหินสระบุรี)

Age: Permian
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Bunopas (1981), Hinthong and others (1985)
Lithology: Interbedded shale, sandstone and thin-bedded limestone; massive to well bedded limestone, fossiliferous and reefal; shale and thin-bedded sandstone
Thickness: 4,486 m
Genesis: Marine shelf environment, near-reef environment
Subdivisions: Six formal formations (Hinthong and others, 1985): Phu Phe, Khao Khwang, Nong Pong, Pang Asok, Khao Khad and Sap Bon Formations;
Two formations by Nakornsri (1977): Khao Luak and Tak Fa Formations;
Three formations by Chonglakmani and Sattayarak (1984): Pha Nok Khao, Nam Duk and Hua Na Kham Formation;
Three formations by Charoenprawat and others (1984): Nam Mahoran, E-Lert, and Pha Dua Formations
Type area: Saraburi province
Remarks: The Ratburi Group was previously used by Javanaphet, 1969

Saraburi limestone (หมวดหินปูนสระบุรี)

Age: Lower-Middle Permian (Wolfcampian to Gaudalupian or Sakmarian to Kungurian)
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Kobayashi (1966), Bunopas (1981)
Lithology: Brown to grey, light-dark grey to black limestone well bedded to poorly bedded limestone, with chert nodules on layers containing fusulinids and crinoids; dark grey to black slate
Thickness: 2,386 m

Genesis: Near-reef environment, basin slope, marine shelf, intertidal to supratidal environment
Parent unit: Saraburi Group
Type section: Friendship highway, 7 km west of Muak Lek district, Saraburi province

Sattahip formation (หมวดหินสัตหีบ)

Age: Silurian
Distribution: Eastern Region: Chon Buri province
Reference: Ridd (2011)
Lithology: Predominantly quartzite with minor argillite, and mainly argillite with subordinate quartzite. The argillite is somewhat thin bedded chert and interbedded shale (author opinion)
Type Locality: Along the coast near Si Racha and Sattahip districts, Chon Buri province, and on a nearby islands

Sattahip shale (หมวดหินดินดานสัตหีบ)

Age: Silurian-Devonian (?)
Distribution: Eastern Region: Chon Buri province
References: Bunopas (1981, 1983)
Lithology: A sequence of interbedded slaty shale, fine-grained argillaceous sandstone and a few thin limestone bands. The rocks are well cleaved and mesoscopically folded
Correlation: It is comparable with the Thong Pha Phum Group
Type locality: Sattahip Naval Base, south of Pattaya, Chon Buri province

Satun Group (กลุ่มหินสตูล)

Age: Lower Ordovician-Lower Devonian (Ridd, 2011); Ordovician to Devonian (?)(Burton, 1974)
Distribution: Lower Peninsula
References: Burton (1974), Ridd (2011)
Lithology: Mainly dark-grey argillaceous limestone
Thickness: 2,239 m (Burton, 1974)
Genesis: Middle to outer shelf (Ridd, 2011)
Correlation: Thung Song Group
Subdivisions: In ascending order; Burton (1974) subdivided into 2 informal formations: Nai Tak formation and Thung Song limestone;

Ridd (2011) subdivided into 4 formations: Thung Song Limestone, Pa Kae, Wang Tong, and Kuan Tung Formations.

Type area: Named after Satun Province with type area in Satun, and Thung Song district, Nakhon Si Thammarat province

Remarks: Satun group was first proposed by Burton (1974), and revised by Ridd (2011). Essentially synonymous with the Thung Song Group and overlying formations of Wongwanich and others (1990).

Sea-O basalt (หินบะซอลต์แซออ)

Age: Late Cenozoic (?).

Distribution: Eastern Region: Sa Kaeo province

Reference: Jungyusuk and Sirinawin (1983)

Lithology: The rock is dark grey, vesicular amygdaloidal which commonly filled by opal (hyalite). It comprises phenocrysts of olivine that are commonly altered to iddingsite. Groundmass consists of plagioclase (labradorite), granule aggregated clinopyroxene and skeletal opaque.

Type area: Sae-O village, Aranyaprathet district, Sa Kaeo province

Si Chang limestone (หมวดหินปูนสีชัง)

Age: Ordovician (?)

Distribution: Eastern Region: Chon Buri province

Reference: Buravas (1957)

Lithology: The lower part of the sequence consists of interbedded quartzite and quartz-schist where as the main part consists of dark grey argillaceous limestone, well bedded to massive, with very rare Ordovician (?) nautiloids

Thickness: 400 m

Type locality: Ko Si Chang, 11 km west of Si Racha district, Chon Buri province

Remarks: Most of limestone was recrystallised to marble

Si That formation (หมวดหินสีธาตุ)

Age: lowermost Upper Carboniferous (Bashkirian) to Lower Permian

Distribution: The Khorat Plateau: subsurface

References: Proposed by Booth (1998), Booth and Sattayarak (2011)

Lithology: The formation consists of 5 units: unit 1, the lowermost, is grey shale; unit 2, is white to grey limestone with black carbonaceous shale grades

into Dolomitic limestone; followed by light-grey to brown calcareous shale and sandstone of unit 3; carbonaceous shale and limestone of unit 4, and topped by carbonaceous shale with coal seams

Thickness: 376 m

Genesis: Shallow marine, lagoon and terrestrial environments

Parent unit: Saraburi Group

Correlation: Wang Saphung Formation, Clastics formation

Type section: In well Si That-2 from interval 2400 to 2776 m

Remarks: Saraburi Group of Booth and Sattayarak (2011) consists of, in ascending, Si That, Pha Nok Khao, Nam Duk, and Hua Na Kham Formations

Silurian-Devonian metavolcanics ? (หมวดหินไซลูเรียน-ดีโวเนียน เมทาโวลคานิค ?)

Age: Silurian-Devonian

Distribution: Northern Region: Chiang Rai, Tak; Western Region: Suphan Buri province

References: Piyasin (1972), Bunopas (1981)

Lithology: Volcaniclastic sediments with sporadic pyroclastics and lava

Genesis: Volcanic arc

Correlation: Correlated with Don Chai Group

Soi Woi intrusives (หินอัคนีเขาสอยวอย)

Age: Triassic (?)

Distribution: Loei-Phetchabun Ranges: north of Nakhon Nayok

Reference: Hinthong and others (1985)

Lithology: Undifferentiated granodiorite, hornblende granite, biotite granite, quartz monzonite, quartz diorite and syenodiorite

Type area: South of Lam Phra Phloeng Dam, Nakhon Ratchasima province

Song Group (กลุ่มหินสอง)

Age: Upper Triassic (Upper Carnian to Norian)

Distribution: Northern Region: Phrae province

Reference: Chonglakmani (2011)

Lithology: Sequences of red beds, grey beds, limestones, and mudstones interbedded with turbiditic sandstones

Thickness: Up to 2,100 m

Genesis: Intermontane basin, marine and partly non-marine

Subdivisions: Subdivided into 3 formations: Pha Daeng, Kang Pla, and Wang Chin Formations
Correlation: Upper part of Lampang Group of Chaodumrong (1992), Rong Kwang Formation of Bunopas (1981)
Type area: Song, Rong Kwang and Wang Chin districts, Phrae province

Song Phi Nong formation (หมวดหินสองพี่น้อง)

Age: Silurian-Devonian
Distribution: Northern Region: Tak province
References: Bunopas (1976), Hinthong and others (1986)
Lithology: Interlayered tuffaceous shale, phyllitic, reddish brown and pale green; limestone, very thinly bedded; subordinate phyllite, slate and mica-schist, grey to greenish grey; occasionally banded limestone and marble on top
Thickness: Approximately 900 m
Type locality: Doi Song Phi Nong, Tak province, between grid reference 040-046 E and 610-630 N of Map sheet Changwat Tak (4842 IV), L7017
Remarks: Description above from Hinthong and others (1986)

Song Tho group (กลุ่มหินสองท่อ)

Age: Lower-Upper Ordovician
Distribution: Western Region
Reference: Siribhakdi (1985)
Lithology: Limestone with argillaceous bands, dark grey; shale, pinkish-brown massive; sandstone and quartzite, brown to reddish-brown, calcareous
Thickness: 4,486 m
Genesis: Marine shelf environment, near-reef environment
Subdivisions: Three informal formations: Nearn Sawan formation, Bo Ngam formation, Kroeng Krawia formation
Type area: Thong Pha Phum district, Kanchanaburi province

Songkhla pluton (สงขลาพลูตอน)

Age: Triassic (207 ± 6 Ma, Rb/Sr whole rock isochron)
Distribution: Lower Peninsula
References: Ishihara and others (1979), Pitakpaivan (1969), Darbyshire (1988)

Lithology: Coarse-grained, porphyritic biotite granite; medium-grained porphyritic biotite-muscovite granite and fine-grained biotite granite
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.7262± 0.0021
Type area: Low land area between Songkhla and Hat Yai district.
Remarks: K/Ar biotite age = 181 ± 6 Ma and 171 ± 6 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as "pluton", "batholith", "flysch" should not be considered stratigraphic terms.

Sookpriwun formation (หมวดหินสุขไพรวัน)

-see Sukpaiwan formation

Sop Prap basalt (หินบะซอลต์สบปราบ)

Age: Late Cenozoic (?)
Distribution: Northern Region: Lampang province
References: Barr and Macdonald (1981), Jungyusuk and Sirinawin (1983)
Lithology: Vesicular basalt and pyroclastic debris
Type area: 33.3 km southwest of Lampang, along the Lampang-Sop Prap highway
Remarks: Nomenclature-hawaiite

Spillway Formation (หมวดหินสปิลเวย์)

Age: Lower Permian (Chaodumrong and others, 2004, 2007), but originally mapped as Upper Carboniferous to Lower Permian (Raksaskulwong and Wongwanich, 1993)
Distribution: Upper Peninsula: Phetchaburi province
References: Proposed by Raksaskulwong and Wongwanich (1993), revised by Chaodumrong and others (2004, 2007), Department of Mineral Resources (2007)
Lithology: Sequence of laminated mudstone and thin to medium bedded sandstone; ripple mark, load cast, slump structure and hummocky cross-stratification are present.
Thickness: 120 m
Genesis: Stormy shelf deposits
Parent unit: Kaeng Krachan Group
Type section: Named after the spillway of Kaeng Krachan Dam, Phetchaburi province, where the type section is located.

Sra Kaeo ultramafics (หินอัลตราเมฟิกสระแก้ว)

Distribution: Eastern Region: Sra Kaeo, Chanthaburi and Rayong provinces
Reference: Bunopas (1981)
Lithology: Serpentinite and hornblendite
Genesis: Ophiolite
Type area: Sra Kaeo-Chanthaburi highway i.e. near Tha Kham village; Ragam village, Pong Nam Ron district, Chanthaburi province

Sra Kaew formation (หมวดหินสระแก้ว)

Age: upper Middle Permian (Kungurian)
Distribution: Eastern Region: Sa Kaeo, Prachin Buri, Chanthaburi provinces
References: Bunopas (1992), Tansuwan and Boonkanpai (1999)
Lithology: Thin- to medium bedded chert with radiolarians; bedded pelagic claystone; limestone; pillow basalt, and ultramafic rocks
Genesis: Melange zone
Parent unit: Chanthaburi group
Correlation: Wung Nam Yen formation (Chaodumrong, 1992b)
Type area: Sa Kaeo province
Remarks: This formation is also spelled “Sra Kaeo formation” of Chanthaburi group (Bunopas, 1994)

Sri Paen formation (หมวดหินสีแป้น)

Age: Carboniferous-Permian
Distribution: Lower Peninsula: Yala province
Reference: Imsamut (2003)
Lithology: Shale, mudstone and phyllitic shale, grey to dark grey, thin- to medium bedded, intercalated with sandstone, yellowish-brown to greenish grey, fine grained, medium bedded; radiolarian chert, thin bedded; argillaceous limestone, dark grey, thin- to medium bedded, and intercalated shale, dark grey to black
Thickness: 500 m
Genesis: Intertidal to subtidal environments
Type section: Named after Sri Paen village, Than To district where good exposure prevailed; reference section along road-cut outcrops from Ta Phayao – Ban To village, Than To-Sri Paen village, and Na Kaset village

Sri Racha formation (หมวดหินศรีราชา)

Age:	Carboniferous
Distribution:	Eastern Region: Chon Buri province
Reference:	Tansuwan (1999)
Lithology:	Quartzite, interbedded schist, quartz schist, phyllite, marble, metacarbonate, sandstone, red siltstone, limestone in the upper part
Thickness:	1,000 m
Parent unit:	Chon Buri group
Type locality:	Sri Racha district , Chon Buri province

Sri Sawat gravel bed (หมวดหินชั้นกรวดศรีสวัสดิ์)

Age:	Tertiary (Neogene)
Distribution:	Western Region
Reference:	Bunopas (1890a)
Lithology:	Moderately consolidated gravel in lower part, sandstone and tuff
Thickness:	100 m
Type locality:	Pak Tha village, Sri Sawat district, Kanchanaburi province

Sri Sawat limestone (หมวดหินปูนศรีสวัสดิ์)

Age:	Middle Triassic to Upper Jurassic
Distribution:	Western Region
References:	Bunopas (1981, 1983)
Lithology:	Light grey to dark grey limestone; red sandstone, shale, marl and limestone in the middle part
Thickness:	400-600 m
Genesis:	Shallow marine with non-marine influence at the end of Triassic
Correlation:	The upper part can be correlated with the Diso limestone; the middle with the Kaeng Reboet formation and the lower with the Chong Khap formation
Type locality:	Along Huai Chongkhrong, 6 km west of Si Sawat district, Kanchanaburi province

Suan Cham formation (หมวดหินสวนชาม)

Age:	Triassic
Distribution:	Lower Peninsula
Reference:	Grant-Mackie and others (1980)

Lithology: Light to medium grey, graded, fine-grained sandstone and turbidite mudstone
Thickness: 1,700 m
Type locality: Suan Cham village, Saba Yoi district, Songkhla province (grid 991, 208 sheet 5122 II, Series L-7017)

Suan Mark limestone (หมวดหินปูนสวนหมาก)

Age: Ordovician
Distribution: Western Region and Northern Region: Chiang Mai
References: Bunopas (1976, 1981)
Lithology: Argillaceous limestone, well banded with alternating horizons of grey slate and quartzite
Thickness: Over 827 m
Parent unit: Khlong Wang Chao group
Type locality: Khlong Suan Mark, 4 km west of Pong Nam Ron village, about 70 km west of Kamphaeng Phet province
Remarks: It was previously mapped as part of the Thung Song Group by Bunopas (1976)

Suan Sak formation (หมวดหินสวนสัก)

Age: Upper Permian
Distribution: Northern Region: Phrae province
Reference: Maneenai and others (1987)
Lithology: Black shale interbedded with grey limestone, dark grey mudstone, grey limestone, some chert nodules
Thickness: 100 m
Genesis: Shallow marine environment
Type locality: At Suan Sak village, Long district of Phrae province
Remark: Fossil of *Paleofusulina sinensis* (Sheng) and *Calaniella* cf. *lepida* (Wang)

Sukhirin granite (หินแกรนิตสุคีริน)

Age: Triassic
Distribution: Lower Peninsula: Waeng district, Sukhirin district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Porphyritic biotite granite
Genesis: I-type granite

Correlation: Kemahang Granite in Malaysia

Type locality: The road-cut from Ba La village (Waeng district) to Phu Khao Thong village (Sukhirin district) via the Hara-Ba La wild life sanctuary.

Sukhothai Group (กลุ่มหินสุโขทัย)

-see Thung Saliam Group

Sukpaiwan formation (หมวดหินสุขไพรวัน)

Age: Lower Triassic

Distribution: Easter Region: Rayong province

Reference: Chaodumrong (1992b)

Lithology: Limestone, grey, medium to thick bedded and massive, common with ooids, peloids and bioclasts; intercalated with shale

Genesis: Shallow marine deposits

Type locality: At Khao Suk Phraiwan of Klang district, Rayong province

Remarks: This formation is also spelled "Sookpriwun" (Department of Mineral Resources, 2007)

Sungai Kolok formation (หมวดหินสุไหงโกลก)

Age: Holocene to the present day

Distribution: Lower Peninsula: the western part of Sungai Kolok district and Sungai Padi district, Narathiwat province

Reference: The Malaysian and Thai Working Groups (2006)

Lithology: Sandy clay, clay and sand with minor gravel

Genesis: Fluviatile environment: flood plain, natural levee, abandoned channel

Subdivisions: Subdivided into 4 members: Pengkalan member, Floodplain member, Natural levee member, and Abandoned Channel member.

Correlation: Beruas Formation in Malaysia

Surin basalt (หินบะซอลต์สุรินทร์)

Age: Late Cenozoic (?)

Distribution: The Khorat Plateau: Surin province

References: Barr and Macdonald (1978), Jungyusuk and Sirinawin (1983)

Lithology: The rock is greyish black, vesicular, with microphenocrysts of abundant olivine and minor clinopyroxene. The groundmass consists of oriented laths of plagioclase, granular clinopyroxene, olivine and opaque

Type area: Khao Pha Non Sawai, Surin province
Remarks: Nomenclature-mugearite

Surin Formation (หมวดหินสุรินทร์)

Age: Middle Miocene
Distribution: Andaman Sea: Mergui Basin
References: Polachan (1988), Polachan and Racey (1994)
Lithology: Mainly sandstones interbedded with shale and limestones; abundant foraminifera, gastropod and bivalve fragments
Thickness: 198 m
Genesis: Shallow marine environment
Parent unit: Mergui Group
Correlation: Baong Formation of North Sumatra Basin
Type section: At the interval from 1,760 feet to 2,420 feet in the Payang well; named after Surin island

Ta Ruang formation (หมวดหินตาเรือง)

Age: Triassic
Distribution: Eastern Region: Chanthaburi and Sa Kaeo provinces
Reference: Tansuwan and Boonkanpai (1990)
Lithology: Mudstone/ shale interbedded with thin- to thick bedded sandstone, greenish grey and brown; locally conglomerate at the base. The formation is overlain by the Pong Nam Ron formation.
Genesis: Trench deposits?
Type locality: At Ta Ruang village, and to the west of Chanthaburi-Sa Kaeo highway between km post 69-80
Remarks: Lithologically, this formation and the Noen Phu Yai Yua formation can be correlated, but they have different stratigraphy. The former underlies the Pong Nam Ron formation, while the latter overlies.

Ta Sue Kho Formation (หมวดหินตะซูโค๊ะ)

Age: upper Lower Jurassic (Upper Toarcian)
Distribution: Northern Region: Mae Hong Son and Tak provinces
References: Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)
Lithology: Thick bedded, medium- to coarse-grained arkosic sandstone with plant remain

Thickness: 105 m
Genesis: Shallow marine
Parent unit: Umphang Group
Type section: Named after mountain on the Thailand-Myanmar border; type section along a tract 3 km north of Klo Tho village of Umphang district to Pu Khloe Khi village in Myanmar

Tai Formation (หมวดหินใต้)

Age: Lower Miocene
Distribution: The Andaman Sea: Mergui basin
References: Polachan (1988), Polachan and Racey (1993, 1994)
Lithology: A basal unit of interbedded anhydrite, dolomite, shale and sandstone; a middle unit of reef limestone; and upper unit of calcarenites interbedded with silty shales and sandstones.
Thickness: 585 m at the type locality well, the Tai well, to 768 m in the D-1 well
Genesis: Transgressive sequence from delta front in the basal unit to shallow marine carbonate build-up, and fore-reef environment in the upper unit
Parent unit: Mergui Group
Subdivisions: Subdivided into 3 informal units: basal unit, middle unit, and upper unit
Correlation: Peutu Formation of the North Sumatra basin; Tai limestone of Nakanart and Mantajit (1983)
Type locality: In the Tai Well, the central High, Andaman Sea
Remarks: Tai limestone was proposed by Nakanart and Mantajit (1983), and was replaced by Tai Formation by Polachan (1988)

Tai limestone (หมวดหินปูนใต้)

-see Tai Formation

Tak Bai formation (หมวดหินตากใบ)

Age: Holocene
Distribution: Lower Peninsula: Sungai Kolok district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Clay, silty clay, peaty clay and sand
Genesis: Shallow marine deposits

Subdivisions: Subdivided into 5 members: Bagan Datoh/Shallow marine member, Teluk Intan/Tidal flat member, Peat swamp member, Matang Gelugor/Old beach member and recent beach member
Correlation: Gula Formation in Malaysia

Tak batholith (ตากบาโธลิธ)

Age: Triassic
Distribution: Northern Region: Tak province
References: Mahawat (1982), Teggin (1975)
Lithology: Composite plutons of granite, granodiorite, diorite
Subdivisions: Four plutons namely: Eastern pluton, Western Main Range pluton, Mae Salit pluton and Tak pluton
Type area: East and north of Tak
Remarks: Tak granites have been named by Bunopas, 1976. They consist of hornblende granite, biotite-muscovite granite and leucogranite Tak granites, according to Pongsapich and Mahawat, 1977, they comprise granite, quartz monzonite, granodiorite, and quartz diorite; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered as stratigraphic terms.

Tak Fa Formation (หมวดหินตากฟ้า)

Age: Lower-Middle Permian (Antinskian-Kungurian)
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Nakornsri (1977, 1981), Department of Mineral Resources (2007)
Lithology: Massive to well bedded limestone, grey to bluish-grey limestone; sandstone and shale
Parent unit: Saraburi Group
Correlation: Pha Huat Formation (?)
Type locality: Tak Fa district, Nakhon Sawan province

Tak granites (หินแกรนิตตาก)

- see Tak batholiths

Tak group (กลุ่มหินตาก)

Age:	Triassic
Distribution:	Western Region: west of Tak province
References:	Bunopas (1976, 1981)
Lithology:	Thin-bedded limestone with argillaceous laminae; grey shale and interbedded greenish-grey siltstone, lithic sandstone, grey to purplish-grey shale; red polymictic conglomerate, thin-bedded limestone, reddish-brown sandstone, minor shale
Thickness:	525 m
Genesis:	Shallow marine
Subdivisions:	Three informal formations: Tha Chang Tai limestone, The Chang Tai formation, and Um Yom formation
Correlation:	Lampang Group
Type area:	Small tributary of Huai Um Yom, small hill grid ref. 006, 589 sheet 47P/CA 24, Series L-708 and quarry limestone west of Tha Chang Tai village.

Tak pluton (ตากพลูตอน)

Age:	Triassic by Rb/Sr whole rock isochron; 208±4 Ma from White granite and 212±4 Ma from Pink granite
Distribution:	Northern Region: Tak province
References:	Mahawat (I982), Teggin (1975)
Lithology:	Pink hornblende biotite monzogranite, syenogranite, microgranite and granite porphyry
Genesis:	Mantle origin; $(^{87}Sr/^{86}Sr)_0$ for white granite is 0.7162±6 Ma, and $(^{87}Sr/^{86}Sr)_0$ for pink granite is 0.7110±7 Ma
Parent unit:	Tak batholith
Type area:	East of Tak province
Remarks:	White and pink granites were named and dated by Teggin (1975). These ages were recalculated by Beckinsale and others (1979) to be 213±13 Ma with $(^{87}Sr/^{86}Sr)_0$ = 0.7158 and 219 ±13 Ma with $(^{87}Sr/^{86}Sr)_0$ = 0.7194 for white and pink granites, respectively; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered as stratigraphic terms.

Takhli red beds (หมวดหินเรดเบดตาคลี)

Age:	Triassic
Distribution:	The Central Plain: Takhli district, Nakhon Sawan province
Reference:	Assavapatchara (2003)
Lithology:	Reddish brown, greywacke, arkosic and sub-arkosic siltstone, shale and mudstone
Thickness:	500 m
Type locality:	Takhli mountain, Takhli district Grid Ref.437867, L7017

Takua Pa Formation (หมวดหินตะกั่วป่า)

Age:	Pliocene – Pleistocene to recent
Distribution:	Andaman Sea: Mergui Basin
References:	Nakanart and Mantajit (1983), Polachan (1988)
Lithology:	Grey, calcareous, glauconitic shales containing abundant foraminifera, and occasional siltstones
Thickness:	320 m
Genesis:	Lower bathyal, basin plain deposits
Parent unit:	Mergui Group
Correlation:	Seurula and Julu Rayeu Formations of North Sumatra Basin
Type section:	At the A-1 well between interval <2,250-3,320 feet; named after Takua Pa Town of Phuket province.
Remarks:	The Takua Pa formation was first named by Nakanart and Mantajit (1983) for Pliocene-Pleistocene sediments.

Takua Pa-Phangnga granites (หินแกรนิตตะกั่วป่า-พังงา)

Age:	Upper Cretaceous (78±2 Ma, Rb/Sr whole rock isochron)
Distribution:	Upper Peninsula
References:	Garson and others (1975), Nakapadungrat and others (1985)
Lithology:	Fine-to medium-grained biotite granite and coarse-grained porphyritic biotite granite
Genesis:	Crustal origin $(^{87}Sr/^{86}Sr)_0$ = 0.7346±6
Type area:	Around Khao Lak, along Takua Pa-Phangnga highway

Talo Dang Formation (หมวดหินตะโล๊ะดัง)

Age:	Lower Ordovician (Upper Tremadoc)
Distribution:	Lower Peninsula: Tarutao Island, Satun province

References: Wongwanich (1990), Department of Mineral Resources (2007)
Lithology: Thinly bedded (10-50 mm), grey to pink nodular limestone and interbedded greyish green and red calcareous shale
Thickness: 130 m at Ao Talo Dang; 80 m at Ao Bin La
Genesis: Peritidal environment on a homoclinal ramp
Parent unit: Thung Song Group
Type section: Takes its name after Talo Dang bay, Tarutao Island where the type section is located

Tan Yong granite (หินแกรนิตตันหยง)

Age: Triassic (228±5 Ma, Rb/Sr isochron age) (Cobbing and others, 1992)
Distribution: Lower Peninsula: Sungai Padi district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Medium- to coarse-grained, leucocratic porphyritic biotite granite.
Genesis: Mixture of I- and S-types granites
Type area: Sungai Padi district, Narathiwat province
Remarks: Tan Yong granite and Tanyong pluton could be correlated.

Tanaosri group (กลุ่มหินตะนาวศรี)

Age: Devonian-Carboniferous
Distribution: The whole country
Reference: Javanaphet (1969)
Lithology: Greywacke, siltstone, mudstone and pebbly mudstone
Subdivisions: Two Informal formations: Kaeng Krachan formation and Kanchanaburi formation
Remarks: It is equivalent to Kanchanaburi series (Brown and others, 1951)

Tanyong pluton (ตันหยงพลูตอน)

Age: Triassic (?)
Distribution: Lower Peninsula: Narathiwat province
References: Ishihara and others (1979, 1980)
Lithology: Coarse-grained biotite granite, slightly porphyritic and fine-grained porphyritic biotite granite
Type area: Khao Tanyong, east of Narathiwat province
Remarks: K/Ar muscovite age = 206 ± 6 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as

"pluton", "batholith", "flysch" should not be considered stratigraphic terms. Tan Yong granite and Tanyong pluton could be correlated.

Tarn To formation (หมวดหินธารโต)

Age: Permian (?)
Distribution: Lower Peninsula
Reference: Muenlek and others (1985)
Lithology: Recrystallised limestone, light grey to white, massive and well bedded; and marble
Type area: Tan To district, Yala province

Tarutao formation (หมวดหินตะรุเตา)

- see Tarutao Group

Tarutao Group (กลุ่มหินตะรุเตา)

Age: Upper Cambrian-Lower Ordovician (Bunopas, 1981; Teraoka and others, 1982; Shergold and others, 1988)
Distribution: Lower Peninsula
References: Javanaphet (1969), Bunopas (1981), Tansuwan and others (1982)
Lithology: Quartzose and variegated sandstone, thinly to thickly bedded, poorly developed tabular cross beds
Thickness: 1,000 m (Bunopas, 1981); 850 m (Tansuwan and others, 1982)
Genesis: Shallow marine, barrier beach complex.
Correlation: Phuket series (Brown and others, 1951), Machinchang Formation in Malaysia
Type section: At Ao Talo Topo, extending, from Laem Hin Ngam (grid.360 682) to the limestone point (grid 375 709) in the L 7017 series, map no 4922 III
Remarks: The Tarutao Group was first mentioned by Javanaphet, 1969. This description was taken from the Tarutao formation (Bunopas, 1981). The Tarutao formation is obsolete. Constituent formations need to be published for this group.

Tarutao quartzite (หินควอร์ตไซต์ตะรุเตา)

Age: Cambrian
Distribution: Lower Peninsula
Reference: Burton (1974)

Lithology: Quartzite and phyllite
Correlation: Tarutao Group
Type area: Tarutao Island, Satun province
Remarks: This name is obsolete (see Tarutao Group)

Terrace I (The Central Plain) formation (หมวดหินเทอเรซวัน)

Age: Holocene
Distribution: The Central Plain
Reference: Alekseev and Takaya (1967)
Lithology: Clay and loamy sand: 7.5 YR 5/3, few cobbles and boulders
Genesis: Alluvial
Type locality: Mae Nam Chao Phraya, 8 km north of Sing Buri province

Terrace II (The Central Plain) formation (หมวดหินเทอเรซทู)

Age: Upper Pleistocene
Distribution: The Central Plain
Reference: Alekseev and Takaya (1967)
Lithology: Gravel, cobble and boulder with silty and pisolitic concretions
Genesis: Alluvial
Type locality: Mae Nam Chao Phraya, 8 km north of Sing Buri province

Terrace III (The Central Plain) formation (หมวดหินเทอเรซทรี)

Age: Middle Pleistocene
Distribution: The Central Plain
Reference: Alekseev and Takaya (1967)
Lithology: Sandy clay with pisolites and iron concretions
Genesis: Alluvial
Type locality: Mae Nam Chao Phraya, 8 km north of Sing Buri province

Terrace IV (The Central Plain) formation (หมวดหินเทอเรซโฟ)

Age: Middle Pleistocene
Distribution: The Central Plain
Reference: Alekseev and Takaya (1967)
Lithology: Hard pan laterite with clayey sand
Genesis: Alluvial
Type locality: Si Satchanalai district, Sukhothai province

Tha Chang Tai formation (หมวดหินท่าช้างตาย)

Age:	upper Middle Triassic to lower Upper Triassic
Distribution:	Western Region: west of Tak province
References:	Bunopas (1976, 1981)
Lithology:	Grey shale and interbedded greenish-grey siltstone, gradually change to interbedded greenish-grey lithic sandstone grey to purplish-grey shale with a few silicified shale or chert beds
Thickness:	140 m
Genesis:	Shallow marine
Parent unit:	Tak group
Correlation:	Correlated with Hong Hoi Formation
Type locality:	Small hill under the limestone cliff on the eastern bank of Huai Mae Tho, Tak (grid ref.006589, sheet 47P/C 24, Series L-708)

Tha Chang Tai limestone (หมวดหินปูนท่าช้างตาย)

Age:	lower Upper Triassic (Norian ?)
Distribution:	Western Region
References:	Bunopas (1976, 1981)
Lithology:	Limestone, thinly bedded: between the limestone beds thin argillaceous laminae are distinct
Thickness:	159 m
Genesis:	Shallow marine
Parent unit:	Tak group
Correlation:	Correlated to the Doi Chang Formation
Type locality:	Limestone quarry immediately west of Tha Chang Tai village, Tak province

Tha Kanun formation (หมวดหินท่าขนุน)

Age:	Jurassic
Distribution:	Western Region
Reference:	Siribhakdi (1985)
Lithology:	Dolomitic limestone, arenaceous and brecciated; sandstone; and shale, grey and red, thick-bedded to massive
Parent unit:	Um Phang group
Type locality:	Tha Kanun village, Thong Pha Phum district, Kanchanaburi province

Tha Madua Sandstone (หมวดหินทรายท่ามะเดื่อ)

Age: Upper Permian
Distribution: Western Region: Kanchanaburi province
References: Bunopas (1890a, 1981)
Lithology: Sandstone, fine- to coarse-grained brown to pale brown, and interbedded shale
Thickness: ~ 150 m
Genesis: Partly continental environment near a shoreline
Parent unit: Ratburi Group
Type section: At the top of Khao Thon, 6 km west of Tha Madua village, Kanchanaburi province
Remarks: This formation was previously mapped as part of the Sai Yok group (Bunopas, 1981)

Tha Manao limestone (หมวดหินปูนท่ามะนาว)

Age: Ordovician
Distribution: Western Region: Kanchanaburi province
Reference: Bunopas (1981)
Lithology: Limestone, calcareous mudstone. The lower part of the limestone which is thickly bedded, contains abundant chert nodules and occasional Ordovician, nautiloids; The upper part is thinly bedded, grey recrystallised limestone with interbedded thin sandstone, grading upwards from the thick bedded limestone. The limestone subsequently grades upward to interbedded quartzite and phyllite. The highest part of formation consists of dark, light grey and brownish-grey thinly bedded dolomitized limestone conformably underlying white shale of the Silurian-Devonian Bo Phoi Formation
Thickness: 450 m
Genesis: Peritidal
Parent unit: Chao Nen group
Type locality: Along a ridge of low to moderate relief, Khao Tha Manao east of Tha Manao village on the road to Chao Nen Dam, Kanchanaburi province. A section at Khao Tam yields abundant receptaculitids (*Fisherites*) and the Middle Ordovician nautiloids *Georgina, Wutinoceras* and *Armenoceras* (Stait and Burrett, 1984).

Tha Nun formation (หมวดหินท่านุ่น)

Age:	Tertiary
Distribution:	Lower Peninsula: Krabi province
References:	Electricity Generating Authority of Thailand (1990)
Lithology:	Grey to brownish grey claystone, sandstone and siltstone with coal seam in the northern part of the basin, and grey to reddish brown claystone and sandstone in the southern part.
Thickness:	100-150 m
Parent unit:	Krabi group
Type locality:	Krabi Lignite Mine, Nuea Khlong district, Krabi province
Remark:	Named after Ban Tha Nun, Krabi province

Tha Si Member (หมู่หินท่าสี)

Age:	Lower-Middle Triassic?
Distribution:	Northern Region: Lampang province
Reference:	Chaodumrong and Burrett (1997)
Lithology:	Mainly mudstone and minor intercalated sandstone, conglomerate and limestone
Thickness:	140 m
Genesis:	Submarine fan deposits
Parent unit:	Hong Hoi Formation
Type locality:	Along Lampang - Ngao (Phaholyothin) highway; named after Tha Si village, Mueang Lampang district, Lampang province

Tha Takhroa formation (หมวดหินท่าตะคร้อ)

Age:	Pleistocene
Distribution:	Upper Peninsula: Phetchaburi province
Reference:	Dheeradilok and others (1985a)
Lithology:	Older terrace: gravel bed consists of boulders and pebbles of quartzite, quartz, chert, slate, sandstone and granite; lateritic soil is generally on the top or in higher elevation in some places
Type locality:	Tha Takhroa village, Nong Ya Plong district, Phetchaburi province

Thabsila gneiss (หินไนส์ทับศิลา)

Age:	Precambrian (?)
Distribution:	Western Region: west of Kanchanaburi province

Reference: Bunopas (1890a)
Lithology: Metamorphic complex, augen gneiss, granite gneiss, biotite-microcline gneiss, quartz-feldspathic gneiss, biotite schist, banded quartzite, calc-silicate and marble
Genesis: Original rock: subarkose or subgreywacke, calcareous sandstone, shale with limestone at the top
Type area: NW Thabsila village, Kanchanaburi province

Thalang Formation (หมวดหินถลาง)

Age: Upper Miocene
Distribution: Andaman Sea: Mergui Basin
References: Polachan (1988), Polachan and Racey (1994)
Lithology: Glauconitic shales with abundant foraminifera, shell fragments and carbonaceous detritus interbedded with siltstones and fine-grained glauconitic sandstones
Thickness: 174 m
Genesis: Deep lower bathyal environment
Parent unit: Mergui Group
Correlation: Keutapang Formation of North Sumatra Basin
Type section: At the A-1 well between interval 3,320-3,900 feet; named after Thalang town of Phuket province

Tham Krachaeng formation (หมวดหินถ้ำกระแชง)

Age: Lower Permian
Distribution: Lower Peninsula: Yala province
Reference: Imsamut (2003)
Lithology: Limestone, light grey to dark grey, thick- to very thick bedded with chert nodule; marble; intercalated shale, dark grey, very thin bedded; dolomite
Genesis: Shallow marine environment
Correlation: Ratburi Group
Type locality: Along Rong Mo Hin village to Than To district – Ka Sod-Ku Nang Pa Yong mountain. Named after Tham Krachaeng cave, Than To district, Yala province.

Tham Suae Mop member (หมู่หินถ้ำเสือหมอบ)

Age: Upper Carboniferous to Lower Permian?
Distribution: Loei-Phetchabun Range
Reference: Assavapatchara (1998)
Lithology: Thin- to thick-bedded, light to dark grey limestone interbedded with thin bedded greenish grey shale and siltstone
Thickness: Over 50 m
Genesis: Intertidal and subtidal regimes under influence of low- to high-energy shallow shelf sea of tropical shelf environment
Parent unit: Nam Maholan Formation
Type section: At Tham Suae Mop, Khok Pak Whan village, Pha Khao district, Loei province

Thamdin formation (หมวดหินถ้ำดิน)

Age: Lower Permian
Distribution: Northern Region: Uttaradit province
Reference: Sukvattananunt and Prasittikarnkul (1984)
Lithology: Limestone, light grey to black, well bedded to massive; crystalline limestone, light grey to pinkish grey; with calcareous shale; chert, black to green and thinly bed
Thickness: 500 m
Correlation: Pha Huat Formation?
Type locality: Named after Thamdin village, Tron district of Uttaradit province
Remarks: Fossil of *Pseudoschwagerina of muongthensis*, *Pseudofusulina* cf. *gruparensis*, *Schwagerina* sp., *Agathammina* sp., *Paleotextuluiaria* sp., and *Climacammina* sp.

Thammarat Nai formation (หมวดหินธรรมรัตน์ใน)

Age: Carboniferous
Distribution: Eastern Region: Chachoengsao province
Reference: Tansuwan (1999)
Lithology: Siltstone, sandstone, and limestone with bryozoas, foraminiferas, corals. Siliceous siltstone, mudstone, conglomerate, in the upper part there are schist phyllite, conglomeratic phyllite, amphibolites, carbonaceous phyllite, slate
Thickness: 1,500m
Parent unit: Chon Buri group

Type locality: Thammarat Nai village, Sanam Chai Khet district, Chachoengsao province

Thap Song formation (หมวดหินทับสงฆ์)

Age: Permian
Distribution: Eastern Region: Chanthaburi and Sa Kaeo provinces
Reference: Tansuwan and Boonkanpai (1990)
Lithology: Chert, brown, reddish brown, grey, well thin bedded; interbedded with very thin bedded shale
Genesis: Transitional area between shallow to deep marine environment
Type area: Near Thap Song village, about 4 km east of Km post 78 of Chanthaburi-Sa Kaeo highway.

Thong Lang granite complex (ทองหลางแกรนิตคอมเพล็กซ์)

Age: Lower Triassic (237±25 Ma, Rb/Sr whole rock isochron)
Distribution: Western Region: west of Uthai Thani province
References: Nakapadungrat (1982), Nakapadungrat and others (1985)
Lithology: Biotite granite, generally porphyritic
Genesis: Crustal origin $(^{87}Sr/^{86}Sr)_0 = 0.7258\pm21$
Subdivisions: Four unnamed units: allanite-biotite granite, biotite granite, leucocratic granite and aplitic granite
Type area: 8 km west of Thong Lang village, Ban Rai district, Uthai Thani province
Remarks: K/Ar biotite age = 72.5±0.6 Ma, K/Ar age of biotite separated from pegmatite is concordant at 72 Ma

Thong Pha Phum Group (กลุ่มหินทองผาภูมิ)

Age: Ordovician to Carboniferous?
Distribution: Western Region: between Kwae Noi and Kwae Yai, Kanchanaburi province
Reference: Bunopas (1981)
Lithology: Sandy marl is lowest (30 m) and passes up to well cleaved black shale. Black shale grades up to a distinct unit of 30 m thick and consisting of dark grey calcareous siltstone. Above this unit is a thick sequence of thinly bedded, nodular limestone, varying in composition from pure to argillaceous, silty or sandy; and in colour from grey to red, with fossils. The highest unit is olive grey shale
Thickness: Over 1,075 m

Correlation: Correlated with Mibayataung Formation (Myanmar)
Type locality: Huai Thong Pha Phum, north of Thong Pha Phum district, Kanchanaburi province

Thong Tanot formation (หมวดหินท้องโตนด)

Age: Cambrian (?)
Distribution: Lower Peninsula: Nakhon Si Thammarat province
Reference: Nakinbodee and others (1985)
Lithology: Sandstone, brownish grey to yellowish brown; shale, quartzite, phyllite
Type locality: Khao Thong Tanot, Sichon district, Nakhon Si Thammarat province

Thung Kik formation (หมวดหินทุ่งกิ๊ก)

Age: Ordovician-Silurian
Distribution: Northern Region: Li district of Lamphun province
Reference: Chaodumrong and Jiemton (1986)
Lithology: Limestone, grey to dark grey, laminated to thin bedded, interlayered with calcisiltite and calcarenite, locally fossils of nautiloids that indicate middle Ordovician, shale at the upper sequence, white marble, commonly sugary texture. Fossil of *Actinoceras* sp. was observed.
Thickness: > 500 m
Correlation: Hod limestone
Type locality: At Thung Kik ranger station, Mae Ping national park, Li district of Lamphun province

Thung Ma San formation (หมวดหินทุ่งมะส้าน)

Age: Cambrian
Distribution: Northern Region: Mae Hong Son province
Reference: Raksaskulwong and Tantiwanit (1984)
Lithology: Schist, mica schist, calc-silicate, thin bedded quartzite, slate and hornfels
Parent unit: Pha Bong group
Type locality: Ban Thung Ma San, Mae Hong Son province

Thung Nang Ling Formation (หมวดหินทุ่งนางลิง)

Age: Middle Permian (Wordian)
Distribution: Western Region and Peninsula

References: Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)
Lithology: Medium- to thick-bedded limestones with abundant fragments of crinoids stems; intercalated with thin-bedded sandstone and shale; some parts were dolomitized.
Thickness: 80 m at Khao Thung Nang Ling
Genesis: Shallow marine deposits, epeiric carbonate platform
Parent unit: Ratburi Group
Type section: Named after Khao Thung Nang Ling where type section located at the old quarry on its western side, Kanchanadit district, Surat Thani province

Thung Pho Mine stock (ทุ่งโพธิ์ไมน์สต๊อค)

Age: Triassic (?)
Distribution: Lower Peninsula
References: Ishihara and others (1979, 1980)
Lithology: Fine- to medium-grained, biotite-muscovite granite with tourmaline spots
Type area: Thung Pho Mine, Namom district, Songkhla province
Remarks: K/Ar biotite age=191 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “stock” should not be considered stratigraphic terms.

Thung Saliam Group (กลุ่มหินทุ่งเสลี่ยม)

Age: Silurian-Devonian
Distribution: Northern Region: Uttaradit and Sukhothai provinces
References: Bunopas (1981, 1982)
Lithology: A sequence of tuff, limestone, marble and chert
Subdivisions: Three informal formations: Khao Khieo tuff, Thung Saliam limestone and Khanu chert
Type area: West of Thung Saliam district, Sukhothai province
Remarks: This group was changed its name to Sukhothai Group (Geological Survey Division, 1987; Bunopas, 1994; Wongwanich and Boucot, 2011)

Thung Saliam Limestone (หมวดหินปูนทุ่งเสลี่ยม)

Age: Silurian-Devonian (?)
Distribution: Northern Region: Sukhothai; Central Plain: Nakhon Sawan province
Reference: Bunopas (1981)

Lithology: Grey recrystallised limestone, tuffaceous shale and sandstone and white marble
Thickness: 900 m
Parent unit: Thung Saliam Group (Sukhothai Group)
Correlation: Correlated with the Khao Sawang marble and the Khao Manao marble
Type locality: The hill west of Thung Saliam district, north Sukhothai province

Thung Song Formation (หมวดหินทุ่งสง)

-see Thung Song Group

Thung Song Group (กลุ่มหินทุ่งสง)

Age: Ordovician (Middle Tremadoc to Ashgill)
Distribution: Lower Peninsula and Western Region
References: Javanaphet (1969), Bunopas (1981), Wongwanich and others (1990)
Lithology: Upper part: alternating sandy shale and limestone; middle and lower part: dark grey, thick-bedded stylolitic limestone with argillaceous band, 200 m thick; reddish brown calcareous shale and thin limestone lens, frequently distorted, 75 m thick; grey to greenish black limestone, thick bedded, with intercalation of argillaceous bands 150 m thick
Thickness: 900-1,410 m
Genesis: Peritidal to deep water environment on a homoclinal ramp
Subdivisions: Wongwanich and others (1990) subdivided it into 7 formations (ascending): Malaka, Talo Dang, La Nga, Pa Nam, Lae Tong, Rung Nok, and Pa Kae Formations
Correlation: Satun Group of Ridd (2011), Setul Limestone in Malaysia, Thung Song Formation of Bunopas (1981)
Type locality: Eastern end of Talo Udang Bay in the southern part of Tarutao Island and Thung Song district, Nakhon Si Thammarat province
Remarks: Thung Song limestone was first proposed by Brown and others (1951), and was raised to Thung Song Group by Javanaphet (1969). At present, the Thung Song Group is widely used in most literature and maps; therefore the Satun Group is not necessary.

Thung Song Limestone (หมวดหินปูนทุ่งสง)

Age:	Ordovician-Devonian (?)(Burton, 1974); Lower to Upper Ordovician (Ridd, 2011)
Distribution:	Lower Peninsula
References:	Burton (1974), Ridd (2011)
Lithology:	Grey to dark grey, argillaceous limestone, bedded and massive
Thickness:	1,668 m (Burton, 1974)
Parent unit:	Both Burton (1974) and Ridd (2011) assigned it as part of the Satun Group, but constituent formations different.
Correlation:	Thung Song Group (Bunopas, 1981); the formation of Ridd (2011) equivalent to Malaka, Talo Dang, LaNga, Pa Nam, Lae Tong and Rung Nok Formations of Wongwanich and others (1990).
Type section:	Ko Tarutao (Ridd, 2011); and the north face of Khao Tham Talot, situated on the southern side of Thung Song Town, Lat 8° 09′ 28" N Long 99° 40′ 55" E, map DA3, 751017 (Burton, 1974).
Remarks:	The name “Thung Song Limestone” of Brown and others (1951), Burton (1974), and of Ridd (2011) are used with different meanings that can cause confusion.

Thung Yai Group (กลุ่มหินทุ่งใหญ่)

Age:	lower Middle Jurassic- Upper Cretaceous
Distribution:	Lower Peninsula: Nakhon Si Thammarat, Surat Thani, Krabi, and Trang provinces
References:	Raksaskulwong (1994), Teerarungsigul and others (1999), Raksaskulwong (2002)
Lithology:	Reddish brown shale and sandstone, conglomerate
Thickness:	760 m
Genesis:	Non-marine deposits
Subdivisions:	Raksaskulwong (1994) formerly subdivided Trang Group into 4 formations: Chumphon red beds, Khlong Min, Sam Chom, and Phun Phin. Teerarungsigul and others (1999) subdivided it into 4 formations: Khlong Min, Lam Thap, Sam Chom, and Phun Phin Formations.
Type locality:	Laem Pleo, Khlong Thom district, Krabi province; Khao Sam Chom and Khao Nam Daeng east of Khlong Min; km 10 on the road no 4038 from Lam Thap to Khlong Thom.

Remarks: This group was originally named Trang Group (Raksaskulwong, 1994; Teerarungsigul and others, 1999). Raksaskulwong (2002) introduced the Thung Yai Group to replace the Trang Group, as the "Trang Formation" has been used for Neogene sequences.

To Mo granite (หินแกรนิตโต๊ะโม๊ะ)

Age: Cretaceous
Distribution: Lower Peninsula: To Mo area
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Biotite-hornblende granite to granodiorite, light grey, fine-grained, equigranular
Genesis: I-type granite
Correlation: Lawar granite in Malaysia
Type locality: The southern part of Licho-Balu mountain range near To Mo gold mine

Trang Formation (หมวดหินตรัง)

Age: Middle Miocene
Distribution: Andaman Sea: Mergui Basin
References: Nakanart and Mantajit (1983), Polachan (1988), Polachan and Racey (1994)
Lithology: Mainly grey glauconitic shales in the lower part, and turbidites in the upper part
Thickness: 732 m at the type section, 231 m at the E-1 well
Genesis: Bathyal deposits
Parent unit: Mergui Group
Correlation: Baong Formation of North Sumatra Basin
Type section: At the Trang well between interval 2,670-5,110 feet
Remarks: The Trang formation was first named by Nakanart and Mantajit (1983). Information above is taken from Polachan (1988).

Trang Group (กลุ่มหินตรัง)

-see Thung Yai Group

Trat basalt (หินบะซอลต์ตราด)

Age: Quaternary (1.13±0.17Ma, K/Ar whole rock dating)
Distribution: Eastern Region: Trat province

References: Barr and Macdonald (1981), Sirinawin (1981)
Lithology: The rock is dark, porphyritic texture with small olivine and minor clinopyroxene as phenocrysts in the groundmass of clinopyroxene, opaques and nepheline; megacrysts are garnet, clinopyroxene, spinel and ilmenite
Type area: Nong Bon village, Bo Rai district, Trat province
Remarks: Nomenclature-olivine nephelinite

Tu Wi formation (หมวดหินตือวี)

Age: Silurian – Devonian- Carboniferous?
Distribution: Northern Region: Mae Hong Son province
References: Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology: fine-grained, whitish brown sandstone; reddish brown siltstone; conglomerate
Type area: Huai Pu village, Tu Wi village, Mae Sariang district, Mae Hong Son province

Turulut Formation (หมวดหินตุรุลุด)

Age: Devonian-Early Carboniferous
Distribution: Lower Peninsula: Trang province
Reference: Udomrath and Dhamdusdi (1985)
Lithology: Grey to greyish black, calcareous mudstone, calcareous sandstone with limestone lens, sandy shale, yellowish-brown sandstone and maroon siltstone
Correlation: Correlated with the upper part of the Betong formation
Type area: Khao Turulut, Trang province

Um Lap conglomerate (หมวดหินกรวดมนอุมลับ)

Age: Carboniferous
Distribution: Northern Region: Tak province
Reference: Hinthong and others (1986)
Lithology: Conglomerate, purple to pinkish brown; tuffaceous sandstone, reddish brown to purplish brown, medium- to coarse grained interbedded with tuffaceous shale, purple to pale green
Thickness: Approximately 500 m

Type locality: Huai Um Lap, Tak province, between grid reference 970-990 E and 660-680 N of Map sheet Ban Pang San (4742 I), L7017

Um Luk Formation (หมวดหินอุ้มลูก)

Age: Middle to Upper Permian
Distribution: Western Region and Peninsula
References: Chaodumrong and others (2004, 2007), Department of Mineral Resources (2001, 2007)
Lithology: Thick sequence of thickly bedded to massive, grey to light grey limestone (mainly lime mudstone to packstone)
Thickness: 200 m
Genesis: Shallow marine deposits, epeiric carbonate platform
Parent unit: Ratburi Group
Type section: Named after Khao Um Luk where the type section is located, Kanchanadit district, Surat Thani province; reference sections at Khao Phu Liap and Khao Kaeo Noi, Kanchanaburi province

Um Yom formation (หมวดหินอุมยอม)

Age: Lower Triassic
Distribution: Western Region: Tak province
References: Bunopas (1976, 1981), Hinthong and others (1986)
Lithology: Conglomerate, red to reddish brown, intercalated with calcareous sandstone and mudstone; locally limestone conglomerate, reddish brown
Thickness: 235 m (Bunopas, 1976, 1981), approximately 200 m (Hinthong and others, 1986)
Genesis: Marine
Correlation: Correlated with Phra That Formation
Type locality: Huai Um Yom, Tak province, between grid reference 010-030 E and 580-600 N of Map sheet Changwat Tak (4842 IV), L7017

Umphang Group (กลุ่มหินอุ้มผาง)

Age: Lower-Middle Jurassic
Distribution: Western Region: Tak province
References: Siribhakdi (1985), Meesook and Grant-Mackie (1996), Meesook and Saengsrichan (2011)

Lithology: Dolomitic limestone, arenaceous and brecciated; sandstone; and shale, grey and red, thick-bedded to massive; limestone, limestone conglomerate and shale, grey to dark grey and red, well bedded
Thickness: 430 m
Genesis: Shallow marine
Subdivisions: Meesook and Grant-Mackie (1996) subdivided into 4 formations in ascending order: Klo Tho, Ta Sue Kho, Pu Khloe Khi, and Lu Kloc Tu Formations
Correlation: Hua Fai Group, Huai Pong Group
Type locality: Along a track 3 km north of Klo Tho village of Umphang district to Pu Khloe Khi village in Myanmar
Remarks: Meesook and Grant-Mackie (1996) renamed the Umphang Group

Upper Kamawkala Shale (หมวดหินดินดานกะมอกกะละตอนบน)

Age: Jurassic
Distribution: Western Region: west of Tak province
Reference: Bunopas (1981)
Lithology: Greenish grey sand shale with calcareous concretions and occasional intercalation of sandstone containing ammonites
Thickness: 190 m
Genesis: Marine
Type locality: Kamawkala Gorge, 25 km northwest of Mae Ramat district, Tak province

Upper Nam Phong formation (หมวดหินน้ำพองตอนบน)

Age: Rhaetian
Distribution: The Khorat Plataeu
Reference: Mouret and others (1993)
Lithology: Dark red claystone; thin layer, fine-grained sandstone; almost transparent on seismic
Genesis: Meandering rivers with associated flood-plain and overbank deposits
Parent unit: Khorat Group
Type section: At Phu Phra 1 well
Remarks: The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Upper Permian-Lower Triassic volcanics (หินอัปเปอร์ เพอร์เมียน-โลเวอร์ไทรแอสซิก โวลคานิค)

Age: Upper Permian-Lower Triassic
Distribution: Northern Region: Chiang Rai, Lampang, Tak, Loei-Phetchabun Ranges and northwest of the Khorat Plateau and Eastern Region
Reference: Bunopas (1981)
Lithology: Extensive flows, pyroclastic rocks of andesitic and rhyolitic composition and their plutonic equivalents together with volcaniclastic sediments
Genesis: Volcanic arc

Upper Phu Kradung formation (หมวดหินภูกระดึงตอนบน)

Age: Lower Jurassic (Liassic)
Distribution: The Khorat Plataeu
Reference: Mouret and others (1993)
Lithology: Fining upward units; conglomerate, sandstone, claystone; continuous markers on seismic
Thickness: Over 26 m
Genesis: Meandering river channels with associated flood-plain
Parent unit: Khorat Group
Type section: At Phu Phra 1 well
Remark: The term “lower”, “middle”, and “upper” should not be used for formal subdivision of lithostratigraphic units as stated in the International Stratigraphic Guide (Murphy and Salvador, 1999)

Upper Triassic to Lower Jurassic rhyolite (หินไรโอไลท์ยุคไทรแอสซิกตอนบน ถึง จูแรสซิกตอนล่าง)

Age: Upper Triassic-Lower Jurassic
Distribution: Northern Region: Phayao, Phrae, Tak; the Central Plain: Uthai Thani, Nakhon Sawan and Lop Buri provinces
Reference: Bunopas (1981)
Lithology: Alkaline rhyolite flows and associated rock, interlayered with the lower part of the Khorat Group

Uthai Thani Complex (อุทัยธานีคอมเพล็กซ์)

Age: Precambrian (?)
Distribution: Western Region: Uthai Thani province
References: Bunopas (1980a)

Lithology: The rock consists of biotite gneiss, augen gneiss, quartzite, quartzite-schist and quartz-biotite schist at the lower part. There are calc-silicate rocks, interbedded at the upper part and the amount of calc-silicate rocks increase towards the top where they are calc-silicate and marble

Genesis: Original rocks were subarkose or subgreywacke, calcareous sandstone, shale with limestone at the top

Type area: Ban Rai district, Uthai Thani province

Remarks: Calc silicate rock were mapped as metamorphic equivalent to Ordovician limestone by Nakapadungrat (1982), Nakapadungrat and others (1985)

Uthai Thani limestone (หมวดหินปูนอุทัยธานี)

Age: Middle Permian (Ingavat and others, 1975)

Distribution: Central Plain: Nakhon Sawan, Uthai Thani

References: Bunopas (1981), Ueno and others (2012)

Lithology: Limestone, grey to dark grey, generally thick bedded, and usually bioclastic, but sometime muddy.

Thickness: Estimate at least several hundred metres

Genesis: Shallow marine platform

Correlation: Ratburi limestone, Sai Yok Limestone

Type Locality: Khao Chakkachan, Khao No, west of Thap Than and Sawang Arom districts of Uthai Thani province

U-Thong marbles (หินอ่อนอู่ทอง)

Age: Cambrian-Ordovician (?)

Distribution: Western Region: west of Suphan Buri province

Reference: Bunopas (1890a)

Lithology: Banded, white sugary marble, partly dolomitization and quartz- mica schist

Thickness: 200-750 m

Type locality: West of U-Thong district, Suphan Buri province

Uttaradit group (กลุ่มหินอุตรดิตถ์)

Age: Permian

Distribution: Northern Region: Phrae and Sukhothai provinces

Reference: Ueno and Charoentitirat (2011)

Lithology: Limestone, sandstone, siltstone and shale
Genesis: Shallow marine
Subdivisions: Rong Kwang Formation and Thung Saliam Formation
Correlation: Phrae Group, Ngao Group
Type area: In Rong Kwang district of Phrae, and in Thung Saliam district of Sukhothai province

Waeng formation (หมวดหินแว้ง)

Age: Pleistocene
Distribution: Lower Peninsula: Waeng district, Sungai Kolok district, Sungai Padi district, Narathiwat province
Reference: The Malaysian and Thai Working Groups (2006)
Lithology: Light-grey to yellowish-brown clay, sandy with medium to coarse sand, granules and pebbles
Genesis: Colluvium-flood plain
Subdivisions: Subdivided into 2 members: Colluvium/Terrace and Former floodplain. The Colluvium/Terrace member is further subdivided into 3 units in ascending order: gravel beds unit, Lateritic layers unit and Residual sand unit.
Correlation: Simpang Formation in Malaysia

Wang Chin Formation (หมวดหินวังชิ้น)

Age: Upper Triassic (Middle Carnian to Lower Norian)
Distribution: Northern Region: Phrae, Lampang provinces
References: Proposed by Charoenpravat (1968), revised by Chaodumrong and Burrett (1997)
Lithology: Mainly of mudstone with subordinate turbiditic sandstones and allodapic limestones
Thickness: 600 m to more than 1000 m
Genesis: Deep sea, submarine fan deposits
Parent unit: Lampang Group
Subdivisions: Chaodumrong and Burrett (1997) subdivided it into 3 members: Phu Tap, Huai Chan, and Mae Lu Sandstone
Correlation: Hong Hoi Formation (only in Song, Long and Wang Chin areas) of Piyasin (1972, 1975) and Chonglakmani (1972, 1981)
Type section: Km post 54.7 to 55.9, and 66.3 to 66.7 along Lampang – Denchai highway, and at Huai Chan, Phrae province

Remarks: Chonglakmani (2011) placed this formation in his new Song Group.

Wang Pha Pluton (วังพาพลูตอน)

Age: Jurassic (?)
Distribution: Lower Peninsula
References: Ishihara and others (1979, 1980)
Lithology: Coarse-grained porphyritic biotite granite and equigranular fine- to medium-grained muscovite-biotite granite
Type area: 30 km west of Hat Yai district, Songkhla province
Remarks: K/Ar muscovite age= 187±6 Ma; It is recommended in the International Stratigraphic Guide that lithogenetic terms such as "pluton", "batholith", "flysch" should not be considered as stratigraphic terms.

Wang Saphung Formation (หมวดหินวังสะพุง)

Age: Middle to Upper Carboniferous
Distribution: Loei-Phetchabun Ranges and northwest of the Khorat Plateau
References: Charoenprawat and others (1984), Department of Mineral Resources (2007)
Lithology: Clastic rocks and limestone; conglomerate, shale, sandstone
Thickness: 440 m
Type locality: Huai Luang, Huai Bunnag, east of Wang Saphung district, Loei province
Remarks: Ueno and Charoentitirat (2011) revised the formation to include the upper part of the Nong Dok Bua Formation; and Pennsylvanian-Lower Permian is given.

Wang Tong Formation (หมวดหินวังตง)

Age: Upper Ordovician to Lower Silurian (Upper Ashgill to Llandovery)
Distribution: Lower Peninsula
References: Wongwanich and others (1990), Wongwanich (1990)
Lithology: Shale, black with graptolites, in the lower part; passing up to siltstone, dark grey, and shale, black with graptolites, and interbedded chert in the upper part.
Thickness: 50-110 m
Genesis: Deep sea environment
Parent unit: Lowest formation of the Thong Pha Phum Group (Wongwanich, 1990), but Ridd (2011) assigned it to part of the Satun Group.

Type section: Named after Wang Tong village, 12 km to the north of Langu district, Satun province

Wang Yai siltstone (หมวดหินทรายแป้งวังใหญ่)

Age: Triassic (?)
Distribution: Lower Peninsula
Reference: Grant-Mackie and others (1980)
Lithology: Light blue to grey, laminated sandy siltstone
Thickness: 225 m
Type locality: Wang Yai and Lam Long villages, Na Thawi district, Songkhla province (grid ref. 945 415, sheet 5122 II, Series L 7017)

Western Main Range Pluton (หินเวสเทอร์นเมนเรงพลูตอน)

Age: Triassic (?)
Distribution: Northern Region: Tak province
Reference: Mahawat (1982)
Lithology: Pink hornblende-biotite monzogranite associated with aphanitic rock, granite porphyry and leucogranite
Parent unit: Tak batholith
Type area: East of Tak province
Remarks: It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “flysch” should not be considered as stratigraphic terms.

Wiang Sawan Member (หมู่หินเวียงสวรรค์)

Age: Lower Triassic
Distribution: Northern Region: Lampang province
Reference: Chaodumrong and Burrett (1997)
Lithology: Alternating beds of thin- to thick bedded, dark grey to grey bioclastic-oncolitic limestone and minor shale
Thickness: 180 m at Phra That Muang Kham temple; 182 m at Doi Chang
Genesis: Shallow marine, ramp carbonate platform
Parent unit: Pha Kan Formation
Type section: At Phra That Muang Kham temple of Mueang Lampang district, Lampang
Remarks: Named after Wiang Sawan temple in Mae Moh village.

Wichian Buri group (กลุ่มหินวิเชียรบุรี)

Age:	Upper Oligocene to Middle Miocene
Distribution:	The Central Plain: Phetchabun intermontane basin, Phetchabun province
Reference:	Remus and others (1993)
Lithology:	Claystone with minor interbeds of siltstone and sandstone in the lower part; sandstone proportion increases upward, and change to sandstone, claystone, siltstone and tuff in the upper part. Minor lignite occurred locally.
Thickness:	1,352 m
Genesis:	Fluvial- Deltaic- Lacustrine
Subdivisions:	Informally subdivided into 4 units: unit four, unit three, unit two, and unit one
Type section:	Six wells drilled in the Wichian Buri sub-basin

Wichianburi basalt (หินบะซอลต์วิเชียรบุรี)

Age:	Late Cenozoic (?)
Distribution:	Loei-Phetchabun Ranges: south of Phetchabun; northwest of the Khorat Plateau
Reference:	Jungyusuk and Sirinawin (1983)
Lithology:	The rock is black and contain some mafic nodules and black spinels
Type area:	Wichian Buri district, Phetchabun province

Wung Nam Yen formation (หมวดหินวังน้ำเย็น)

Age:	Permian?
Distribution:	Eastern Region: Sa Kaeo and Chanthaburi provinces
Reference:	Chaodumrong (1992b)
Lithology:	Complex unit; chert, red and grey, thin to medium bedded, good lateral continuity; claystone, red, thin bedded, well bedded; limestone, bioclastic fragments; ultramafic rocks, serpentinite and basalt
Genesis:	Melange zone
Type area:	Along Sa Kaeo - Chanthaburi highway

Ya Kut formation (หมวดหินยาคุด)

Age:	Jurassic ?
Distribution:	Northern Region: Mae Sariang district, Mae Hong Son province
References:	Khositanont and others (2004), Prasertsong and Khositanont (2006)
Lithology:	Fine-grained, reddish brown sandstone; quartzite; siltstone; conglomerate
Type area:	Kong Loi village, Ya Kut village, Omkoi district, Chiang Mai province

Yaha Formation (หมวดหินยะหา)

Age:	Carboniferous (?) (Muenlek and others, 1985), Lower-Middle Carboniferous (Amnan and Raksaskulwong, 2002)
Distribution:	Lower Peninsula
References:	Muenlek and others (1985), Amnan and Raksaskulwong (2002), Malaysian-Thai Working Groups (2006)
Lithology:	Shale, greenish grey, well bedded; sandstone, white to brown, medium- to coarse-grained; siliceous shale, chert, shale with cross-bedding; and conglomerate
Thickness:	400-450 m (Amnan and Raksaskulwong, 2002)
Genesis:	Shallow marine, intertidal environment (Amnan and Raksaskulwong, 2002)
Correlation:	Khuan Klang Formation, Kubang Pasu Formation in Malaysia
Type area:	8 km south of Yaha district, Yala province
Remarks:	This formation was previously mapped as part of the Kaeng Krachan Group

Yala Formation (หมวดหินยะลา)

Age:	Upper Oligocene to Lower Miocene
Distribution:	Andaman Sea: Mergui Basin
References:	Polachan (1988), Polachan and Racey (1994)
Lithology:	Mainly grey shales with minor sandstones in the lower part; white to light grey, fine grained, calcareous glauconitic sandstone in the upper part; abundant planktonic foraminifera and shell fragments; facies change with the Ranong and the overlying Trang formation
Thickness:	1,110 m at type locality, 2,085 m at the E-1 well
Genesis:	Deep sea, basin plain, changed upward to turbidite deposits
Parent unit:	Mergui Group
Correlation:	Bampo Formation of North Sumatra Basin

Type section: At the C-1 well in the southern part of the Mergui Basin; Named after the Yala province.

Yod Nam Mine Stock (?) (ยอดน้ำไมน์สต๊อก)

Age: Cretaceous (?)
Distribution: Lower Peninsula: Nakhon Si Thammarat
References: Ishihara and others (1979, 1980)
Lithology: Medium-to coarse-grained, porphyritic biotite granite with pink feldspar, fine-grained porphyritic biotite-muscovite granite and equigranular medium-grained biotite-muscovite granite
Type area: 25 km west to southwest of Sichon district, Nakhon Si Thammarat province
Remarks: It is recommended in the International Stratigraphic Guide that lithogenetic terms such as “pluton”, “batholith”, “stock” should not be considered as stratigraphic terms.

Yom Formation (หมวดหินยม)

Age: Tertiary (Upper Miocene ?)
Distribution: The Central Plain: Sukhothai and Kamphaeng Phet provinces
Reference: Knox and Wakefield (1983)
Lithology: Medium-to coarse-grained sand and varicolored clay
Thickness: 1,000 m
Genesis: Fluvial
Parent unit: Phitsanulok Group
Type section: Petroleum wells in Phitsanulok Basin, Sukhothai and Kamphaeng Phet provinces

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Khao Phanom Hung basalt (Buri Ram)

Khao Prai Bat basalt (Buri Ram)

Khlong Sait formation (Krabi)

Khlung basalt (Trat)

Khu Muang formation (Buri Ram)

Khuan Khuha formation (Pattani)

Khuan Muang formation (Krabi)

Ko Khao formation (Lampang)

Ko Kut basalt (Trat)

Krabi group (Krabi)

Krabi series (Krabi)

Lam Narai basalt (Lop Buri)

Lan Krabu Formation (Kamphaeng Phet)

Lansang gravels (Tak)

Li formation (Lamphun)

Lopburi formation (Lop Buri)

Mae Chan formation (Kanchanaburi)

Mae Lama basalt (Mae Hong Son)

Mae Lamao formation (Tak)

Mae Long formation (Lamphun)

Mae Mo Group (Lampang)

Mae Ngao basalts (Tak)

Mae Pa formation (Tak)

Mae Ramat formation (Tak)

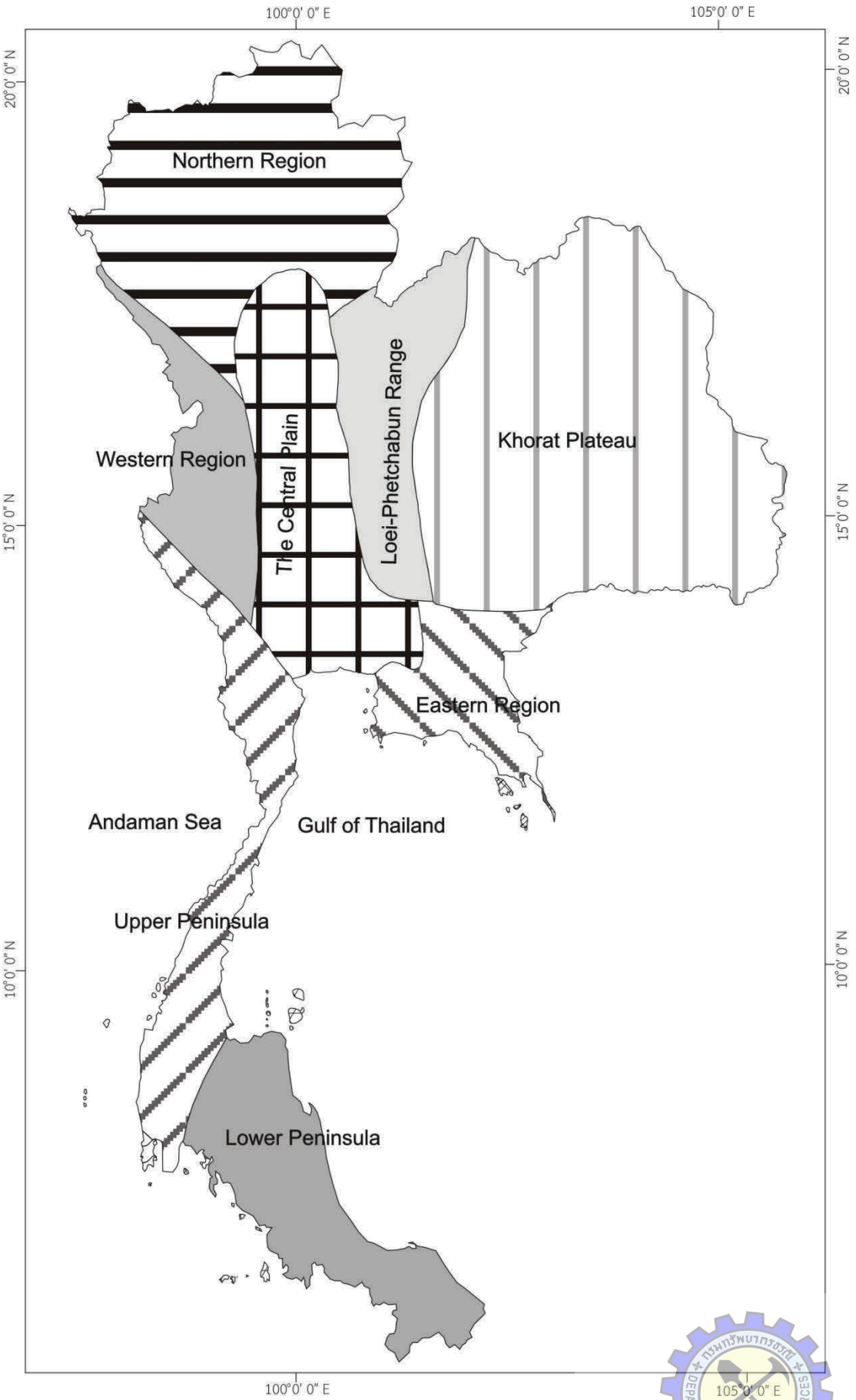
Mae Rim formation (Chiang Mai)

Mae Sot (?) formation (Tak)

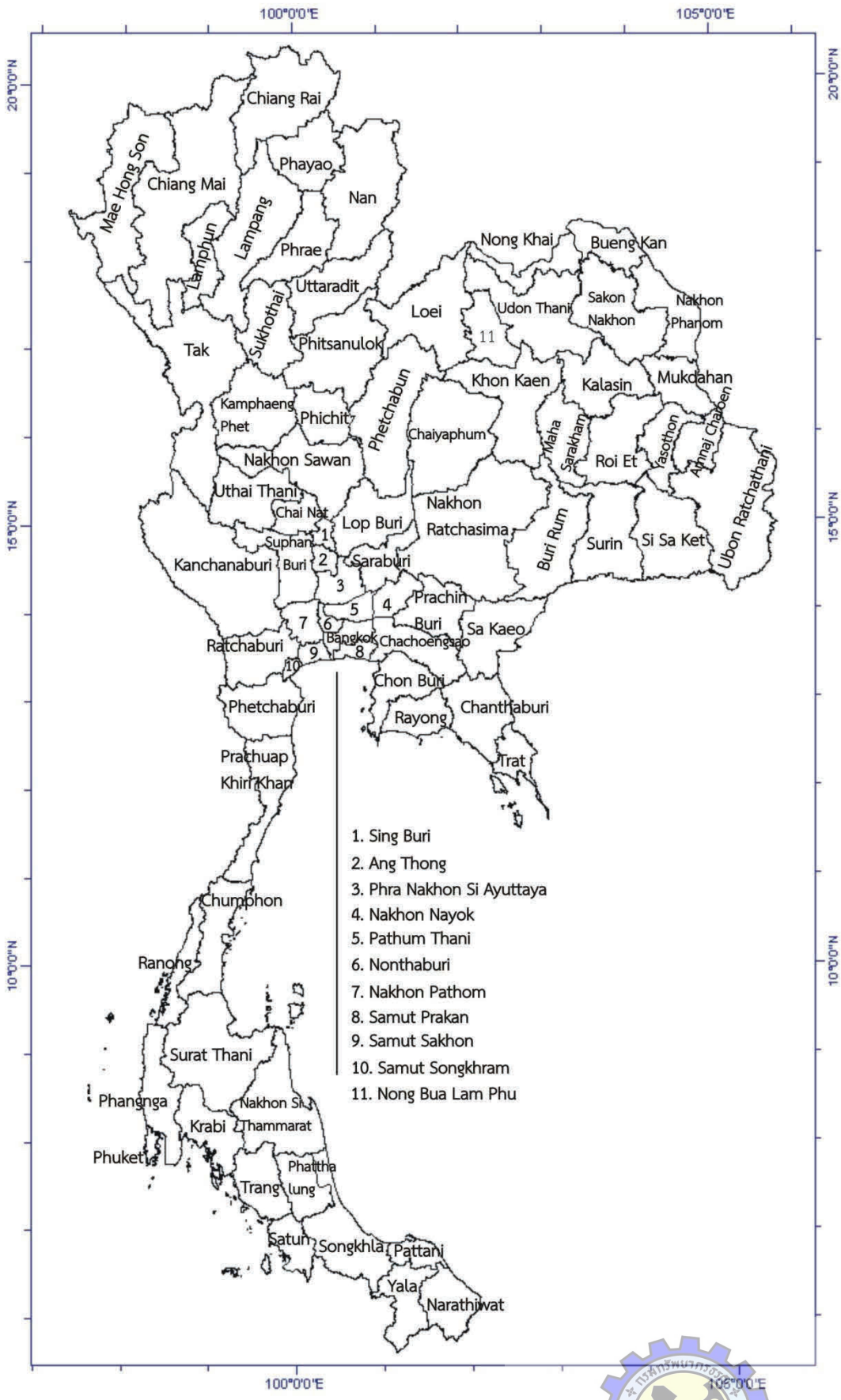
Mae Sot Group (Tak)

Mae Sot series (Tak)
Mae Taeng group (Chiang Mai)
Mae Tha Basalt (Lampang)
Mergui Group (Andaman Sea)
Mo Din Daeng formation (Khorat Plateau)
Na Khaem Formation (Lampang)
Na Sai formation (Lamphun)
Nachuak formation (Maha Sarakham, Roi Et)
Nakhon Ratchasima basalt (Nakhon Ratchasima)
Nam Cho basalt (Lampang)
Nam Duat formation (Phetchabun)
Nam Mae Jang (basaltic) formation (Lampang)
Nam Yun basalt (Ubon Ratchathani)
Nong Bua Formation (Kamphaeng Phet)
Pakasai formation (Krabi)
Payang Formation (Andaman Sea)
Phangnga Formation (Andaman Sea)
Phitsanulok Group (Phitsanulok)
Phrae formation (Phrae)
Phu Fai diabase (Si Sa Ket)
Phu Komb basalt (Si Sa Ket)
Phu Ngoen basalt (Si Sa Ket)
Phu Phra Angkhan basalt (Buri Rum)
Phu Thok Formation (Nong Khai)
Phu Tok Formation (Nong Khai)
Ping Formation (Kamphaeng Phet)
Pong Nam Ron basalt (Chanthaburi)
Pratu Tao Formation (Kamphaeng Phet)
Ranong Formation (Andaman Sea)
Sadao Formation (Andaman Sea)
Sae-O basalt (Prachin Buri)
Sop Prap basalt (Lampang)
Sri Sawat gravel bed (Kanchanaburi)
Sungai Kolok formation (Narathiwat)
Surin basalt (Surin)
Surin formation (Andaman Sea)
Tai Formation (Andaman Sea)
Tai limestone (Andaman Sea)
Tak Bai formation (Narathiwat)

Takua Pa formation (Andaman Sea)
Terrace I (The Central Plain) formation (Sing Buri)
Terrace II (The Central Plain) formation (Sing Buri)
Terrace III (The Central Plain) formation (Sing Buri)
Terrace IV (The Central Plain) formation (Sukhothai)
Tha Nun formation (Krabi)
Tha Takhroa formation (Phetchaburi)
Thalang formation (Andaman Sea)
Trang formation (Andaman Sea)
Trat basalt (Trat)
Waeng formation (Narathiwat)
Wichian Buri group (Phetchabun)
Wichianburi basalt (Phetchabun)
Yala formation (Andaman Sea)
Yom Formation (Kamphaeng Phet)

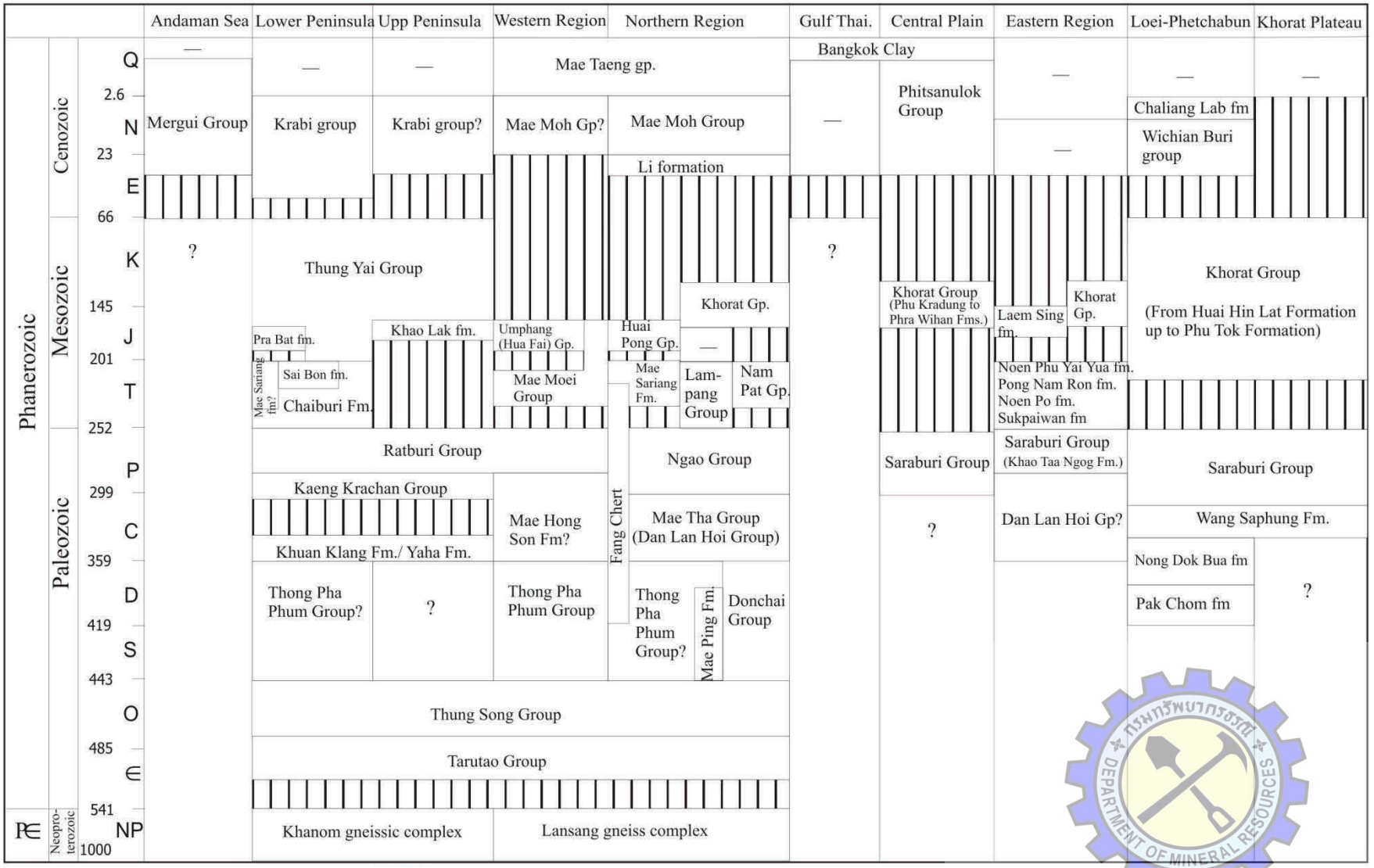


Map showing physiographic regions of Thailand used in this book



Map showing provincial areas of Thailand

Correlation of lithostratigraphic units of Thailand



Note: – = No name ? = Uncertain = Major hiatus