

CHAPTER IV

SYSTEMATIC DESCRIPTION

Systematic Description of Ammonoids

Ammonoids discovered in the investigated area at Khao Nong Hoi, Amphoe Pak Chong, Changwat Nakhon Ratchasima can be identified into 7 Superfamilies, 9 Families, 3 Subfamilies, 10 genera and 17 species, as followed:

Order AMMONOIDEA Zittle, 1884

Superfamily GONIATITACEAE Hyatt, 1884

Family AGATHICERATIDAE Artherber, 1911

Genus *Agathiceras* Gemmellaro, 1888

Type Species *Agathiceras suessi* Gemmellaro, 1888

Agathiceras sp.

[Figure 4.1; Plate 1, Figures 1-12; Plate 2, Figures 1-8]

Description.— The conch is thickly subglobular with small umbilicus. Shell diameter ranges between 11.00 – 25.00 mm. Outer surface of some specimen shows finely and longitudinally striation. Suture line represents goniatic type. External suture consists of three lateral saddles and three lateral lobes. At the top part of lateral saddles form rounded shape. Lateral lobes show slightly pointed at bottom. The size of ventral saddle is half of the height of the first lateral saddle. The diagrammatic representation suture line of *Agathiceras* sp. in the study area is illustrated on Figure 4.1.

Material.— 12 specimens of *Agathiceras* sp. 10 complete specimens are KNH 7-1-10, KNH 7-1-11, KNH 7-1-12, and KNH 7-1-13 from rock sample number KNH 7-1-1; KNH 7-10-9, KNH 7-10-11, and KNH 7-10-13 from rock sample number KNH 7-10-1; KNH 10-2-5, KNH 10-2-6, and KNH 10-2-7; 2 from rock sample number KNH 10-2-1. 2 incomplete specimens are KNH 7-1-9 and KNH 7-10-12 from rock sample number KNH 7-1-1 and KNH 7-10-1 respectively.

Remark.— Specimens of this genus could not be identified to the species level because the specimens do not show complete constriction and striation on the surface which are important for identification of species level, and some are fragmental which could not observe the complete suture line and conch shape.

Age.— Moscovian – Wordian (Zhou et al., 1997)

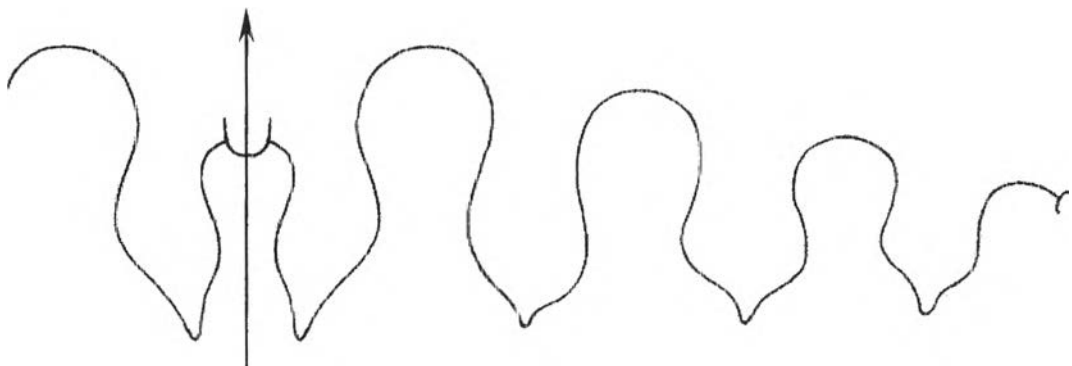


Figure 4.1 Diagrammatic representation of external suture line of *Agathiceras* sp. from specimen number KNH 10-2-5, at a diameter of 12.30 mm, X25, Same specimen as Figures 1-10 on Plate 1.

Agathiceras mediterraneum Toumanskaya, 1949

[Figure 4.2; Plate 2, Figures 9-12; Plate 3, Figure 1-12]

Agathiceras mediterraneum Toumanskaya, 1949, p. 71; pl. 16, Figs. 1-9.

Agathiceras mediterraneum Leonova and Dmitriev, 1989, p. 112; pl. 5, figs. 1a-1b.

Agathiceras mediterraneum Glenister et al., 1990, p. 479.

Description.— *Agathiceras mediterraneum* show subglobular conch, and small umbilicus. Finely and longitudinally striation show at the outer surface. Complete specimens show four constrictions dominantly. Goniatic suture type represent for this species. The external suture is composed of three lateral lobes and three lateral saddles. The top part of each lateral saddle is rounded shape. The pointed tongue shape show at the bottom of each lateral lobe. The height of ventral saddle is nearly equal or about three-quarter of the height

of first lateral saddles. The diagrammatic representation suture line of *Agathiceras mediterraneum* in the study area is illustrated on Figure 4.2.

Material.— 8 specimens; 5 complete specimens: KNH 1-1-8 and KNH 1-1-9 from rock sample number KNH 7-1-1; KNH 7-10-4, KNH 7-10-5, and KNH 7-10-15 from rock sample number KNH 7-10-1; 3 incomplete specimens: KNH 1-1-10 and KNH 7-1-14 from rock sample number KNH 7-1-1; and KNH 7-10-14 from rock sample number KNH 7-10-1.

Age.— Moscovian – Wordian (Zhou et al., 1997)

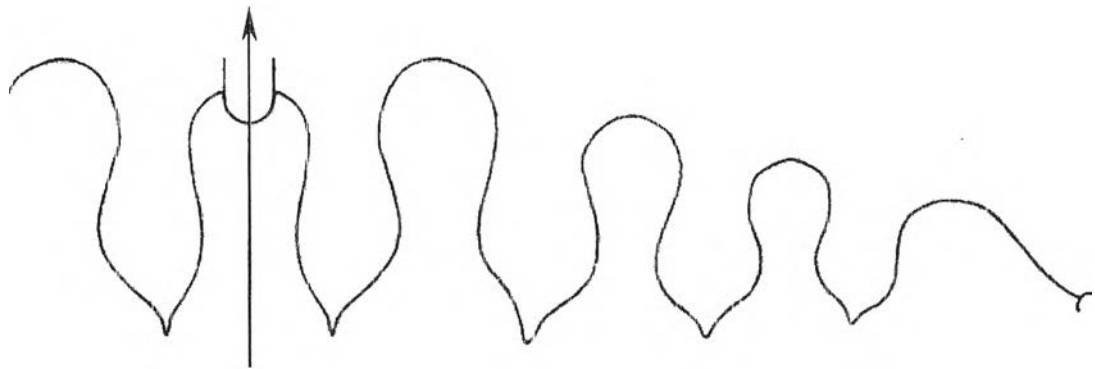


Figure 4.2 Diagrammatic representation of complete external suture line of *Agathiceras mediterraneum*. From complete specimen number KNH 1-1-10, X10, at a diameter of 22.20 mm.

Superfamily ADRIANITACEAE Schindewolf, 1931

Family ADRIANITIDAE Schindewolf, 1931

Subfamily ADRIANITINAE Schindewolf, 1931

Genus *Adrianites* Gemmellaro, 1888

Type Species *Adrianites elegans* Gemmellaro, 1888

Adrianites marathonsensis Bose, 1917

[Figure 4.3; Plate 4, Figures 1-3]

Adrianites marathonsensis Bose, 1917, p 123; pl. 6, figs. 47-56.

Description.— The conch is subglobular. The width of conch is greater than the diameter. Umbilicus is very small. The suture line consists of seven lateral lobes and six lateral saddles. This character is an important feature for distinguishes this species from the others. The ventral saddle is short, around a half of the height of first lateral saddle. The top of each saddle is rounded but slightly pointed shape. The bottom is rather pointed shape than the top part of saddle. The diagrammatic representation suture line of *Adrianites marathonensis* in the study area is illustrated on Figure 4.3.

Material— Small complete specimens number KNH 7-10-17 from rock sample number KNH 7-10-1.

Remark.— Even the specimen number KNH 7-10-17 is very small but the suture line is so clear and represent complete lobes and saddles. Thus this specimen can be identified to the species level.

Age.— Wordian (Zhou et al., 1997)

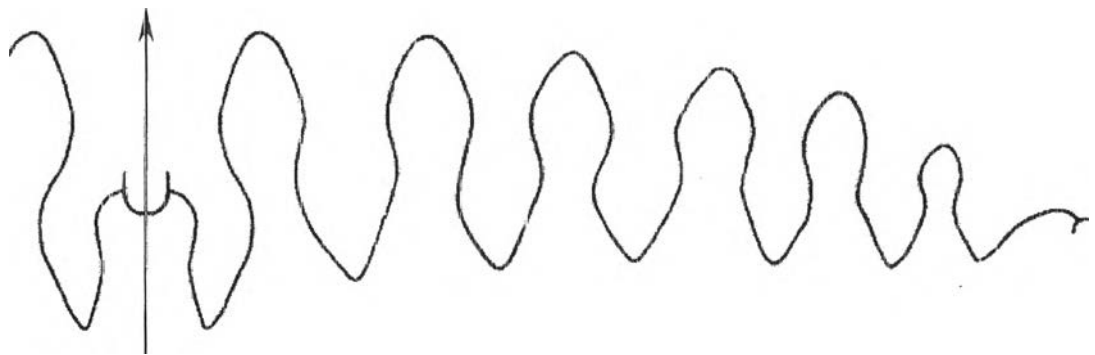


Figure 4.3 Diagrammatic representation of complete external suture line of *Adrianites marathonensis*. From specimen number KNH 7-10-17, X30, at a diameter of 8.60 mm.

Adrianites cancellatum Smith, 1927

[Figure 4.4; Plate 4, Figures 4-7]

Agathiceras cancellatum Haniel, 1915, p 74; pl. 5, figs. 1-3.

Adrianites cancellatum Smith, 1927, p 41.

Description.— The conch of this species is subglobular, tiny proloculus. The width of conch is nearly equal to size of diameter. Suture line represents by goniatitic suture type. The ventral lobe is broad and divide into two parts. The height of ventral saddle is around half of the height of first lateral saddle. The suture line is composed of five lateral lobes and five lateral saddles. Cross striation show at the outer surface. The diagrammatic representation suture line of *Adrianites cancellatum* the study area is illustrated on Figure 4.4.

Material.— Two complete specimens number KNH 10-2-9, and KNH 10-2-10 from rock sample number KNH 10-2-1.

Remark.— Haniel firstly established as the new species of *Agathiceras* sp. in 1915. But in 1927, Smith studied the specimens and disagree with Haniel in 1915 and stated that it should be *Adrianites cancellatum* to be more correct.

Two specimens for this research discovered from Khao Nong Hoi are similar to the specimens of Haniel, C. A. After comparison with, *Agathiceras* sp. and *Adrianites* sp., this two specimens should named *Adrianites cancellatum* Smith, 1927, because *Agathiceras* sp. usually represent three lateral saddles and three lateral lobes. Furthermore, the portion between whorl width and diameter of *Adrianites* sp. usually have a greater number than *Agathiceras* sp.

Age.— Wordian (Zhou et al., 1997)

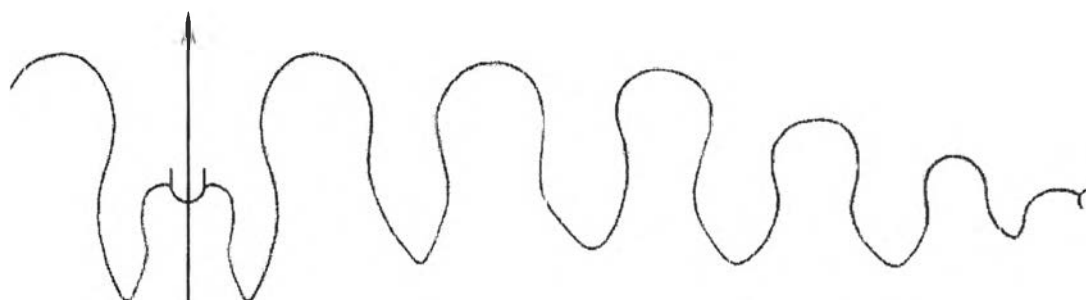


Figure 4.4 Diagrammatic representation of complete external suture line of *Adrianites cancellatum*. From complete specimen number KNH 10-2-10, X25, at a diameter of 12.10 mm.

Superfamily CYCLOLOBACEAE Zittle, 1884

Family VIDRIOCERATIDAE Bose, 1919

Genus *Prostacheoceras* Ruzhencev, 1937

Type Species *Marathonites juresanensis* (Maximova, 1935), Ruzhencev, 1937

Prostacheoceras pamiricus (Bogoslovskaya, 1978)

[Figure 4.5; Plate 4, Figures 10-13]

Tabantalites pamiricus Bogoslovskaya, 1978, p 60; pl. 5, figs. 7-8.

Description.— Conch is subglobular with deep umbilicus. Ceratitic suture type represent for this species. Broad ventral lobe, each side of ventral lobe divides into bifid. First lateral lobe is bifid. Second lateral lobe is trifid. The third of lateral lobe seem to be trifid but incompletely developed. The forth of lateral lobe is undivided. Broad and rounded at first lateral saddle is highest. The second and third lateral saddles area also broad and rounded. Third lateral saddle is abrupt small but fourth lateral saddle is bigger than the third one. The diagrammatic rsuture line of *Prostacheoceras pamiricus* is illustrated on Figure 4.5.

Material.— Complete specimen number KNH 7-10-20 from rock sample number KNH 7-10-1; fragment of specimen number KNH 1-1-3 from rock sample number KNH 7-1-1.

Remark.— At the present time *Tabantalites* sp. is known to be the synonym of *Prostacheoceras* sp. (Moore, 1957, p. L53). That means it is an invalid genus but on studying the suture line of the Bogoslovskaya's specimen and the specimens in the study area, they seem to be the same.

The difference between specimens discovered at Khao Nong Hoi and specimens of Bogoslovskaya is at the third of lateral lobe. The third lateral lobes of specimens collected from Khao Nong Hoi seem to be trifid. But Bogoslovskaya explained that the third lateral lobe of his specimens seem to be bifid. Thus specimens in this thesis can be conferred to his specimens but still have a different point as mentioned.

Age.— Asselian - Wordian (Zhou et al., 1997)

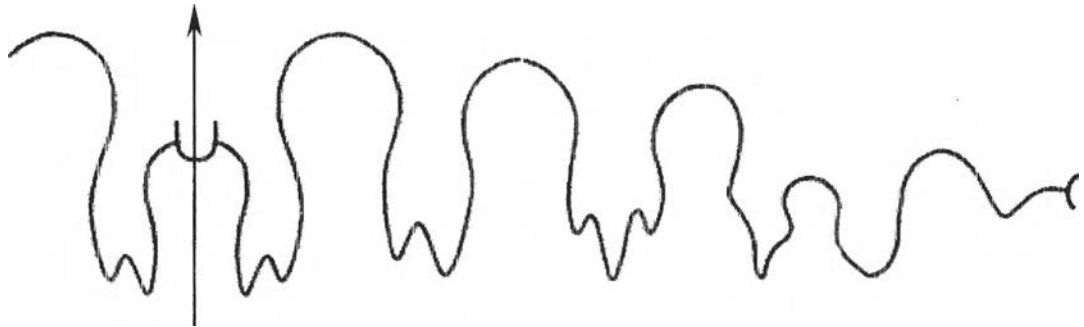


Figure 4.5 Diagrammatic representation of external suture line of *Prostacheoceras pamiricus* at a diameter of 11.20 mm, from specimen number KNH 7-10-20, X25.

Genus *Stacheoceras* Ruzhencev, 1937

Type Species *Stacheoceras mediterraneum* Gemmallaro, 1888

Stacheoceras bransonorum Miller and Cline, 1934

[Figure 4.6; Plate 4, Figures 8-9]

Stacheoceras bransonorum Miller and Cline, 1934, p 293; pl. 39, figs. 23-24.

Description.— The conch is subglobular with small umbilicus. Shell shows slightly constriction. Ceratitic suture type represent in this species. The single specimen number KNH 7-10-10 is consisted of seven lateral saddles and six lateral lobes. Ventral saddle is half of the height of first lateral saddle. The ventral lobe is bifid. The first, second, third, and fourth lateral lobes are trifid. The fifth and sixth lateral lobe are undivided. All external lateral saddles are rounded, undivided and they are rather moderately broad. The diagrammatic representation suture of *Stacheoceras bransonorum* in the study area is illustrated on Figure 4.6.

Material— Single specimen number KNH 7-10-10 from rock sample number KNH 7-10-10.

Age.— Artinskian - Changhsingian (Zhou et al., 1997)

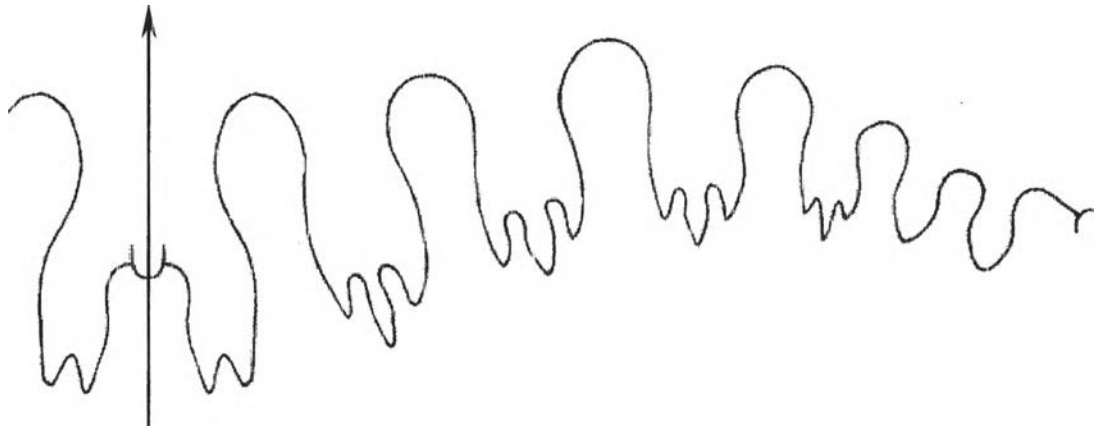


Figure 4.6 Diagrammatic representation of external suture line *Stacheoceras bransonorum* at a diameter of 14.40 mm, X25, from specimen number KNH 7-10-10.

Stacheoceras rothi Miller and Furnish, 1940

[Figure 4.7; Plate 5, Figures 1-2]

Stacheoceras rothi Miller and Furnish, 1940, p. 132; pl. 30, figs. 10-12.

Description.— Conch is subglobular, small umbilicus. Suture line is ceratitic suture type. Suture line composed of eight lateral saddles and seven lateral lobes. Height of ventral saddle is a half of the first lateral saddle. Each of ventral lobes divided into bifid. The first lateral lobe is bifid. The second, third, fourth and fifth lateral lobes are trifid. But at the fifth lateral lobe is not completely developed to be trifid. The sixth and seventh lateral lobes are not divided. Lateral saddles are slightly narrow and undivided. The diagrammatic representation suture of *Stacheoceras rothi* in the study area is illustrated on Figure 4.7.

Material.— Complete single specimen number KNH 7-10-19 from rock sample number KNH 7-10-1.

Age.— Artinskian - Changhsingian (Zhou et al., 1997)

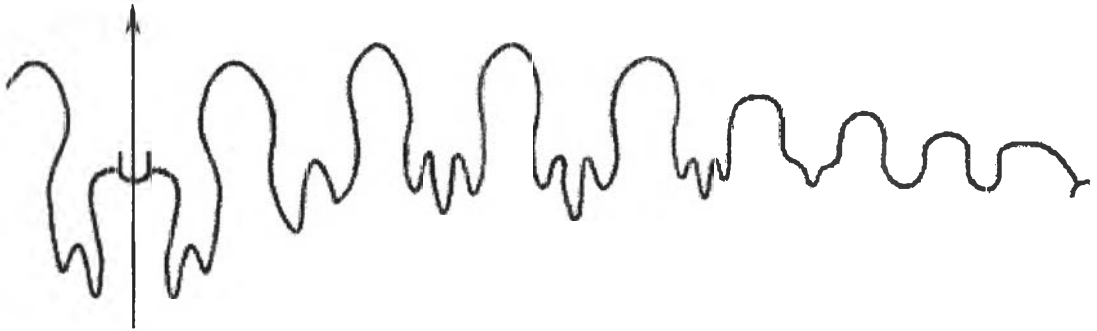


Figure 4.7 Diagrammatic representation of external suture line *Stacheoceras rothi* at a diameter of 19.30 mm, X20, from specimen number KNH 7-10-19.

Stacheoceras mediterraneum Gemmellaro, 1888

[Figure 4.8; Plate 5, Figures 10-13]

Stacheoceras mediterraneum Gemmellaro, 1888, p. 27, 28; pl. 4, figs. 2-6; pl. 7, figs. 11-13.

Stacheoceras mediterraneum Bose, 1919, p. 134.

Stacheoceras mediterraneum Diener, 1921, p. 23.

Stacheoceras mediterraneum De Gregorio, 1930, p. 12.

Stacheoceras mediterraneum Toumansky, 1931, p. 86-91.

Stacheoceras mediterraneum Greco, 1935, p. 162, 163; pl. 14, figs. 7-8.

Stacheoceras mediterraneum Plumer and Scott, 1937, p. 152-153.

Stacheoceras mediterraneum Miller and Furnish, 1940, p. 129, 131-132.

Stacheoceras mediterraneum Miller, 1944, p. 104-105.

Stacheoceras mediterraneum Ruzhencev, 1950, p. 184.

Stacheoceras mediterraneum Miller and Furnish, 1957, p. 708-709; pl. 83, figs. 11-12.

Stacheoceras mediterraneum Ruzhencev, 1962, pl. 28, figs. 10.

Stacheoceras mediterraneum Hayasaka, 1965, p. 22.

Stacheoceras mediterraneum Davis, 1972, p. 78-81; pl. 19, figs. 1-2.

Stacheoceras mediterraneum Termier, et al., 1972, p. 113; pl. 17, figs. 2-4.

Description.— The conch is subglobular with small and moderately deep umbilicus. The complete specimen show slight constriction. The diameter of conch is 37.90 mm. Ceratitic suture type represent in this species. Each side of ventral lobe is bifid. The first lateral lobe is trifid but there is a mark made it resemble to be quadrid. The second, third,

fourth, fifth, sixth, and seventh lateral lobe are trifid. The eighth lateral lobe is undivided. The top of all lateral saddles are rounded shape and undivided. The diagrammatic suture line of *Stacheoceras mediterraneum* in the study area is illustrated on Figure 4.8.

Material.— Complete specimen number KNH 10-2-1 from rock sample number KNH 10-2-1.

Age.— Artinskian - Changhsingian (Zhou et al., 1997)

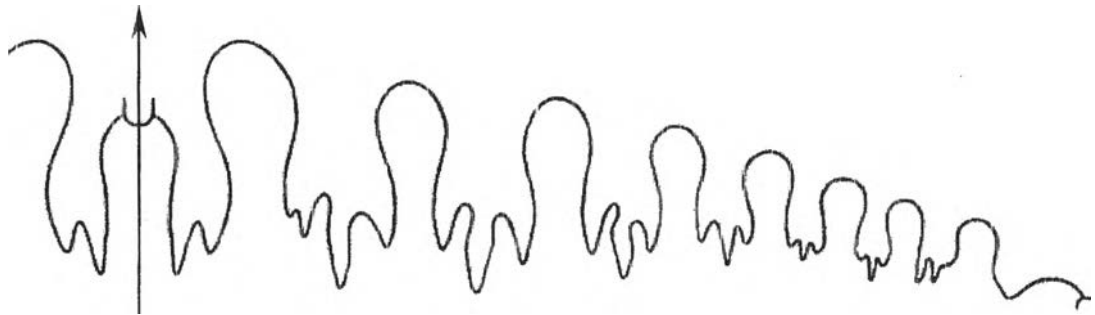


Figure 4.8 Diagrammatic representation of external suture line *Stacheoceras mediterraneum* at a diameter of 37.90 mm, X5, from specimen number KNH 10-2-1.

Superfamily SHUMARDITACEAE Plummer and Scott, 1937

Family PERRINITIDAE Miller and Furnish, 1940

Genus *Perrinites* Bose, 1917

Type Species *Waagenoceras hilli* Smith, 1903

Perrinites sp.

[Plate 5, Figures 4-9; Plate 6, Figure 1-9]

Description.— Specimens of this genus are subglobular conch with small umbilicus. Many specimens are fragment. Ammonitic suture type is the dominantly character for this genus. Ventral lobe is broad and divided into two parts by long ventral saddle. Each side of ventral saddle is digitate and divides into 2-4 secondary saddle (notch). Ventral saddle and all lateral saddle form V-shape and digitate, developed 3-6 notch on each side of lateral saddle.

Material.— 10 specimens for this genus consist of 2 complete specimens number KNH 7-1-20 from rock sample number KNH 7-1-1; KNH 10-2-4 from rock sample number KNH 10-2-1 and 8 fragments of specimen number KNH 1-1-5, KNH 1-1-6, KNH 1-1-7, and KNH 7-1-19 from rock sample number KNH 7-1-1; KNH 7-10-2 from rock sample number KNH 7-10-1; KNH 10-2-2, KNH 10-2-3, and KNH 10-2-8 from rock sample number KNH 10-2-1.

Remark.— According to poorly preserved specimens and some were broken during sample preparation, this 10 specimens could not be identified to the species level.

Age.— Artinskian - Roadian (Zhou et al., 1997)

Perrinites tardus (Miller and Furnish, 1940), Tharalson, 1984

[Figure 4.9; Plate 7, Figures 1-10]

Perrinites hilli tardus Miller and Furnish, 1940, p. 154; pl. 34, figs. 3-6; pl. 35, figs. 6-7.

Perrinites tardus (Miller and Furnish, 1940), Tharalson, 1984, p. 828.

Description.— Conch is subglobular with small umbilicus. The diameter of conch range between 20.00 and 35.10 mm. Ammonitic suture type represent for *Perrinites tardus* Miller and Furnish, 1940. Ventral lobe is broad and divided into two parts by long ventral saddle. Each side of ventral saddle forms two secondary saddles (two notches). Ventral lobe and all lateral lobes form V-shape and suture line strongly digitate. Each side of first lateral saddle divided into three and four notches respectively. Couples of secondary lobe close to top of saddle are bifid. Each side of second lateral saddles divide into three and four notches respectively. Couples of secondary lobes close to top are bifid. And each side of the third lateral saddle divided into four notches. The diagrammatic representation suture line of *Perrinites tardus* in the study area is demonstrated on Figure 4.9.

Material.— 5 specimens are composed of 1 complete specimen number KNH 7-10-17 from rock sample number KNH 7-10-1; 4 fragments of specimen number KNH 1-1-4, KNH 7-1-18 from rock sample number KNH 7-1-1; KNH 7-10-7, and KNH 7-10-16 from rock sample number KNH 7-10-1.

Remark.— In 1940, Miller, A. K. and Furnish, W. M. identified the specimens collected from west Texas and name their specimens, *Perrinites hilli tardus*, as a new subspecies of *Perrinites hilli*. After investigated of *Perrinites hilli*, the author prefers to name the specimens discovered from Khao Nong Hoi as *Perrinites tardus*. Because there are many different points between *Perrinites hilli* and *Perrinites tardus* such as the number of notches on each side of ventral saddle, lateral saddle. Thus, *Perrinites tardus* should be a species not only a subspecies.

Age.— Artinskian - Roadian (Zhou et al., 1997)

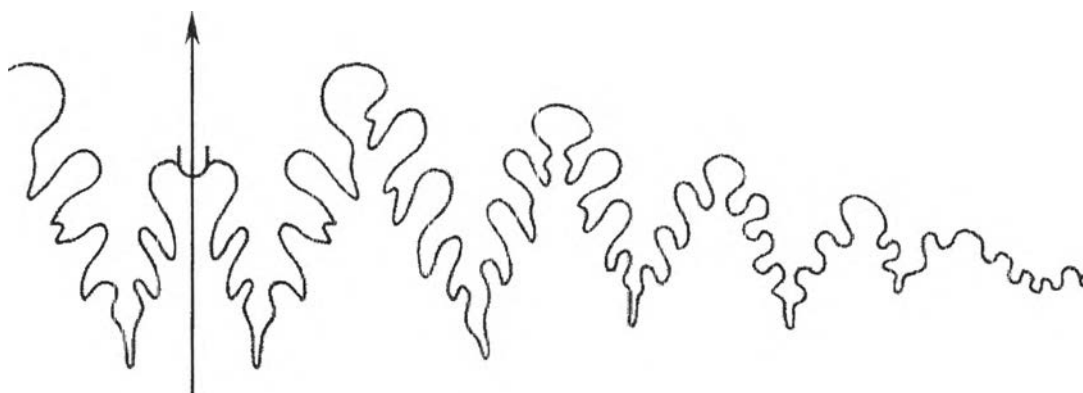


Figure 4.9 Diagrammatic representation of external suture line *Perrinites tardus* at a diameter approximately 27.00 mm, X5, from specimen number KNH 1-1-4.

Perrinites cf. *hilli* (Smith, 1903), Miller and Furnish, 1940

[Figure 4.10; Plate 8, Figures 1-3, 6-7]

Waagenoceras hilli Smith, 1903, p. 140: pl. 27, figs. 1-3.

Waagenoceras hilli Haniel, 1915, p. 114.

Perrinites hilli Bose, 1919, p. 164.

Perrinites hilli Elias, 1938, p. 103.

Perrinites hilli Plummer and Scott, 1940, p. 319-320; pl. 27, figs. 1-4.

Perrinites hilli Miller and Furnish, 1940, p. 149.

Perrinites hilli Ruzhencev, 1940, p. 109

Perrinites hilli Millerried, Miller, and Furnish, 1941, p. 403; pl. 1, figs. 1-6.

Perrinites hilli Tharalson, 1982, p. 818.

Perrinites hilli Glenister et al, 1990, p. 79-480.

Description.— The conch is subglobular with small umbilicus. There are not any complete specimens, some is slightly broken. The suture line is ammonitic suture type. Ventral lobe is broad and divided into two parts, form V-shape by ventral saddle. Each side of ventral saddle consists of three notches. Each side of first lateral saddle consists of four notches. The secondary lobe on each side of lateral saddle usually form bifid, especially last three secondary lobes on top. The second lateral saddle form four notches of secondary saddle. The last couple secondary lobes are bifid. All lateral lobes form V-shape. The diagrammatic representation suture of *Perrinites cf. hilli* in the study area is demonstrated on Figure 4.10.

Material.— 3 specimens are 1 slightly broken specimen number KNH 7-10-3 from rock sample number KNH 7-10-1; 2 fragment of specimen number KNH 7-1-16 from rock sample number KNH 7-1-1, and KNH 7-10-8 from rock sample number KNH 7-10-1.

Remark.— Three specimens discovered from the study area are not perfect specimens. They could not be observed complete suture line system and conch shape. For this reason, the author prefers to use cf. for the specimens from Khao Nong Hoi. They could be compared with *Perrinites hilli* (Smith, 1903) that Miller and Furnish edited and proposed on 1940 because they had a perfect description and presented clear suture line. Furthermore, the other authors didn't present complete description and nice suture line before them.

Age.— Artinskian - Roadian (Zhou et al., 1997)

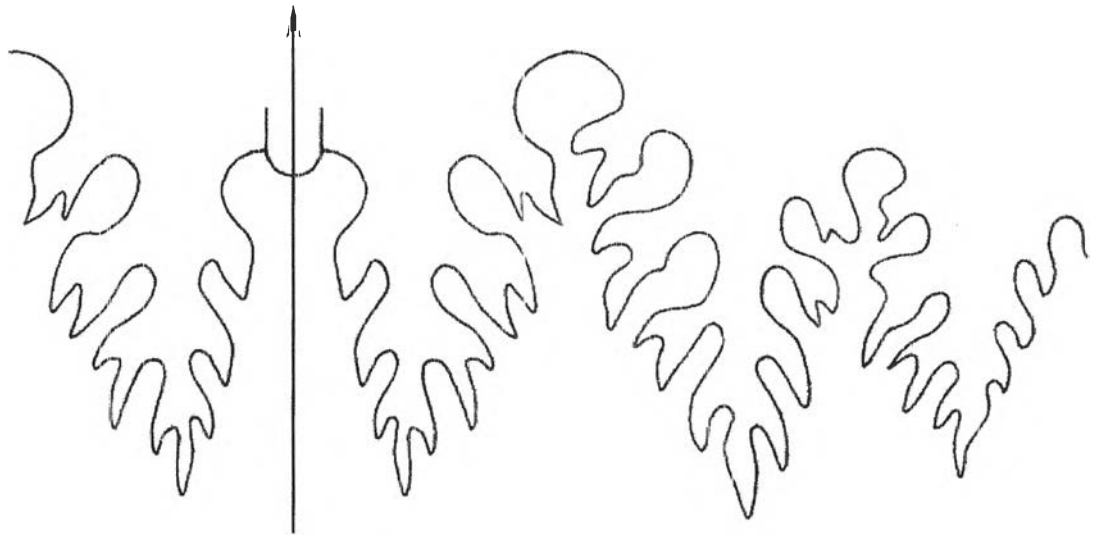


Figure 4.10 Diagrammatic representation of external suture line *Perrinites* cf. *hilli* at a diameter of 42.40 mm, X10, from specimen number KNH 7-10-3.

Superfamily POPANOCERATACEAE Hyatt, 1900

Family POPANOCERATIDAE Hyatt, 1900

Genus *Popanoceras* Hyatt, 1884

Type Species *Popanoceras nensis* Maximova, 1935

Popanoceras sp.

[Figure 4.11; Plate 8, Figures 4-5]

Description.— The size of conch is big up to 38.10 mm. Conch is flattened, at the venter side is narrowly rounded. The umbilicus is small. Suture line represents by ceratitic suture type. Ventral lobe is broad and divided by ventral saddle. Each side of ventral lobe is tetrafid. The first lateral lobe is trifid. The second lateral lobe divided form seven secondary lobes. The third lateral lobe is trifid. The fourth lateral lobe digitated and form six secondary lobe. All lateral saddle is very broad and rounded. The diagrammatic representation suture line of *Popanoceras* sp. is showed on Figure 4.11.

Material.— Complete specimen number KNH 7-10-1 from rock sample number KNH 7-10-1.

Remark.— The specimen number KNH 7-10-1 could be identified only on genus level because it could not be compared with any species of *Popanoceras* sp. in any available references. The author would like to compare with another references that it does not exist in Thailand. On the other hand, it is possibly to be a new species but still need more references before making decision.

Age.— Artinskian - Roadian (Zhou et al., 1997)

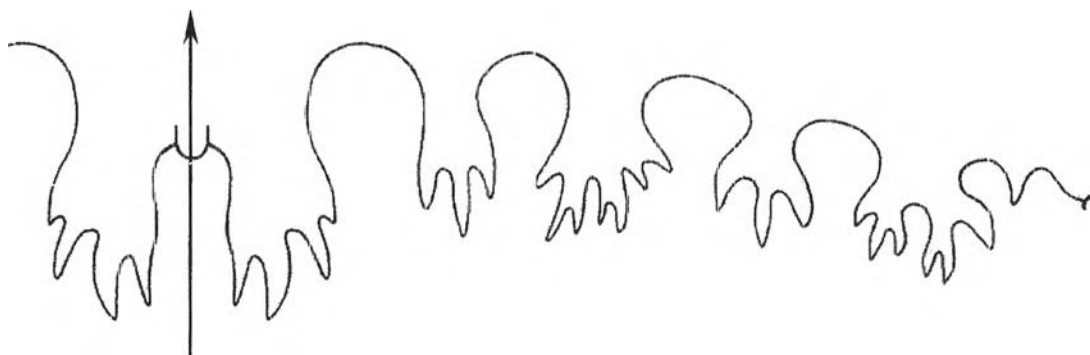


Figure 4.11 Diagrammatic representation of external suture line of *Popanoceras* sp. from specimen number KNH 7-10-1, at a diameter of 38.10 mm, X10.

Family THALASSOCERATIDAE Hyatt, 1900

Genus *Thalassoceras* Gemmellaro, 1888

Type Species *Thalassoceras phillipsi* Gemmellaro, 1888

Thalassoceras welleri (Bose, 1917), Miller and Furnish, 1940

[Figure 4.12; Plate 9, Figures 1-3]

Prothalassoceras welleri Bose, 1917, p. 104; pl. 5, figs. 14-18.

Thalassoceras welleri Miller and Furnish, 1940, p. 107.

Description.— Conch is subglobular slightly flattened, rounded at ventral side. The umbilicus is very small. Ceratitic suture is represent. Each side of ventral lobe is digitate and developed seven secondary lobes. The second lateral lobe consists of six secondary lobes. The first lateral saddle is broad and rounded in U-shape. The diagrammatic representation suture line of *Thalassoceras welleri* in the study area is showed on Figure 4.12.

Material.— Complete specimen number KNH 7-10-18 from rock sample number KNH 7-10-1.

Remark.— Although the specimen is small (12.00 mm.) but it was preserved with perfect suture line. Thus this specimen could be compared with *Thalassoceras welleri* (Bose, 1917), Miller and Furnish, 1940

In 1917, Bose identified the specimens and established a new species name *Prothalassoceras welleri* without clear suture drawing. After that in 1940, Miller and Furnish revised the specimens of Bose and presented the suture line. Furthermore, they named those specimens as a new genus, *Thalassoceras welleri*. For the reason above, the author would like to identify the specimen number KNH 7-10-18 as *Thalassoceras welleri*. Moreover, *Prothalassoceras welleri* still be a synonym of *Thalassoceras welleri* at the present time (Moore, 1957).

Age.— Sakmarian - Wordian (Zhou et al., 1997)

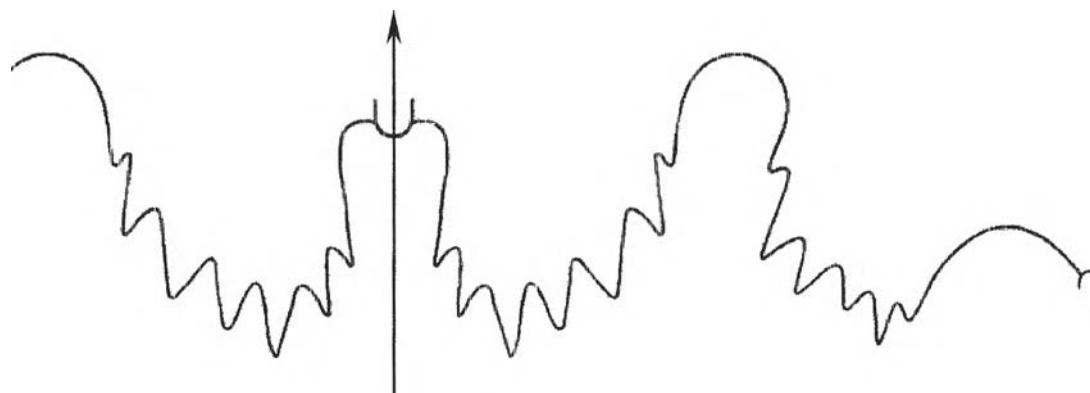


Figure 4.12 Diagrammatic representation of external suture line of *Thalassoceras welleri* from specimen number KNH 7-10-18, at a diameter of 12.00 mm, X20.

Superfamily PROLECANITACEAE Hyatt, 1884

Family DARAELITIDAE Tschernow, 1907

Genus *Daraelites* Gemmellaro, 1907

Type Species *Daraelites meeki* Gemmellaro, 1888

Daraelites sp.

[Figure 4.13; Plate 9, Figures 4-5]

Description.— The conch is narrow flattened with large proloculus. Suture line does not clear because the specimen was recrystallized. The suture line is composed of five lobes and six saddles. The ventral lobe is not divided. The first lateral saddle is highest. The ventral saddle is at the shoulder of conch and the height is equal to second lateral saddle. The third and fourth lateral saddle is narrowly rounded and decreases in size respectively. The arrangement and shape of lobes and saddles shows the characteristic of the genus *Daraelites* sp. The diagrammatic representation suture line of *Daraelites* sp. is illustrated on Figure 4.13.

Material.— Fragment of specimen number KNH 1-1-2 from rock sample number KNH 7-1-1.

Remark.— The specimens number KNH 1-1-2 is too much weathered at the surface. Even the suture line is not clear but the form of suture line and the conch shape are still useful for identification. According to the form of suture line, conch shape, and proloculus, this specimen can be identified as *Daraelites* sp.

Age.— Asselian - Wordian (Zhou et al., 1997)

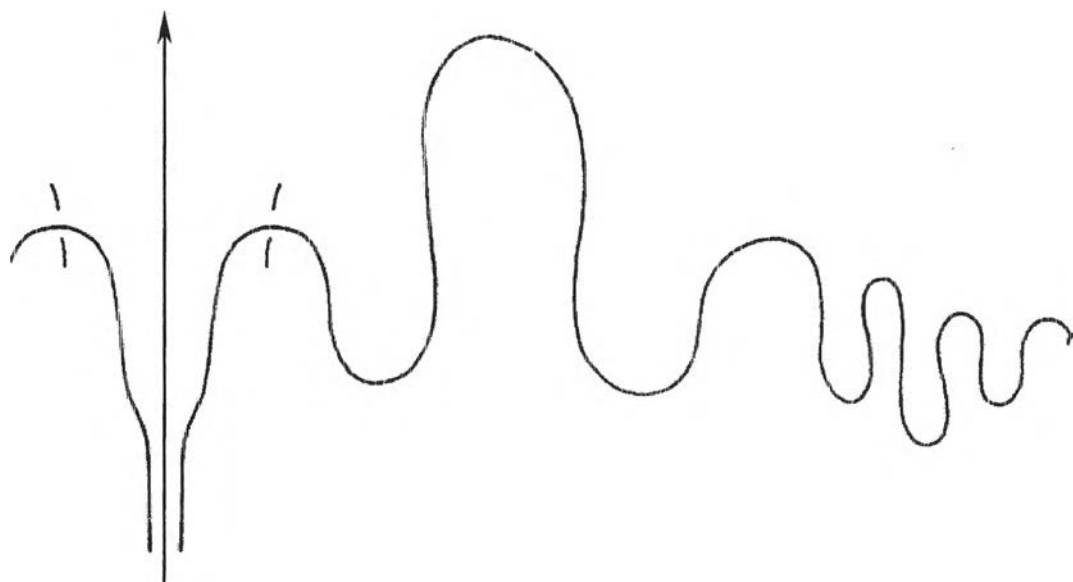


Figure 4.13 Diagrammatic representation of external suture line of *Daraelites* sp. from specimen number KNH 1-1-2, at a diameter of 32.00 mm, X10.

Superfamily MEDLICOTTIACEAE Karpinsky, 1889
Family PRONORITIDAE Frech, 1901
Subfamily NEOPRONORITINAE Ruzhencev, 1936
Genus *Parapronorites* Gemmellaro, 1907
Type Species *Parapronorites meeki* Gemmellaro, 1888

Parapronorites sp.

[Figure 4.14; Plate 9, Figure 6]

Description.— The conch is flattened shape with moderately umbilicus. Ventral lobe divided and has a small secondary ventral saddle on each side, make it resemble to be trifold. The first lateral lobe is very broad and consists of four secondary lobes. The second, the third and the fourth lateral lobe is bifid. The fifth and sixth lateral lobes are not divided. All saddle is rounded and forms oval shape at the top part. The first lateral saddle is highest. From first to sixth lateral saddles, the height of the saddle is decreases in ascending order. The diagrammatic representation suture line of *Parapronorites* sp. is showed on Figure 4.14.

Material.— Specimen number KNH 7-10-6 from rock sample number KNH 7-10-1.

Remark.— The specimen number KNH 7-10-6 discovered from Khao Nong Hoi could be identified to the genus level. After compared with many references, there are not any species matched with this specimen. This specimen is probably belonged to a new species of *Parapronorites* sp., if the references are enough available.

Age.— Artinskian - Wordian (Zhou et al., 1997)

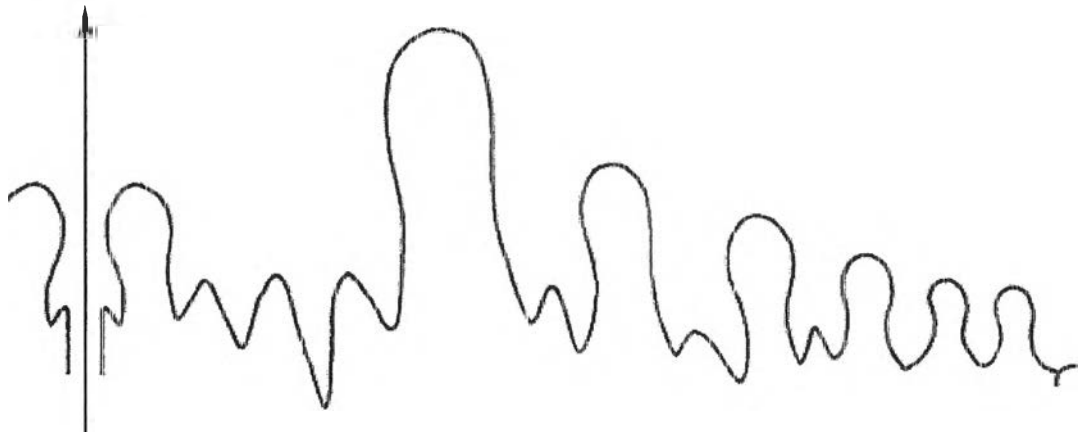


Figure 4.14 Diagrammatic representation of the suture line of *Parapronorites* sp. from specimen number KNH 7-10-6, at a diameter of 19.00 mm, X20.

Superfamily MEDLICOTTIACEAE Karpinsky, 1889

Family MEDLICOTTIDAE Karpinsky, 1889

Subfamily PROPINACOCERATINAE Gemmellaro, 1888

Genus *Propinacoceras* Gemmellaro, 1888

Type Species *Propinacoceras beyrichi* Gemmellaro, 1888

Propinacoceras beyrichi Gemmellaro, 1888

[Figure 4.15; Plate 9, Figures 9-10]

Propinacoceras beyrichi Gemmellaro, 1883, p. 54-55; pl. 5, figs. 12-15; pl. 7, figs. 29-30.

Propinacoceras beyrichi Diener, 1921, p. 13

Propinacoceras beyrichi Tournansky, 1931, p. 53

Propinacoceras beyrichi Miller and Warren, 1933, p. 296-298.

Propinacoceras beyrichi Crockford and Warren, 1935, p. 161.

Propinacoceras beyrichi Miller and Crockford, 1936, p. 24.

Propinacoceras beyrichi Plummer and Scott, 1937, p. 91.

Propinacoceras beyrichi Miller and Furnish, 1940, p. 40-46.

Propinacoceras beyrichi Ruzhencev, 1949, p. 114-119; pl. 6, figs. 9-10.

Propinacoceras beyrichi Termier and Termier, 1970, p. 94.

Propinacoceras beyrichi Termier et al., 1972, p. 109; pl. 14, figs. 1-2.

Propinacoceras beyrichi Furnish, 1973, p. 538

Propinacoceras beyrichi Nassichuk, 1988, p. 564, pl. 1, figs. 1-3.

Description.— Conch is flatted shape. Flatted at the ventral side perpendicular to the lateral side and marks by longitudinal groove. On flatted ventral side, it is marked by a double row of dominantly short transverse ribs, which extend from middle of ventral side to shoulder of conch. The suture line represents ceratitic suture type. Ventral lobe is long and divide resembles to be trifid. The first lateral lobe is intermediate size, bifid. The second lateral lobe is longest and shows bifid. The third and fourth lateral lobes become small and show bifid. On the ventral saddle consist of three equally secondary saddle (differ from *Propinacoceras americanum* Miller and Warren, 1933). The diagrammatic representation suture line of *Propinacoceras beyrichi* from the study area is demonstrated on Figure 4.15.

Material.— Fragment of specimen number KNH 7-1-15 from rock sample number KNH 7-1-1.

Age.— Artinskian - Wordian (Zhou et al., 1997)

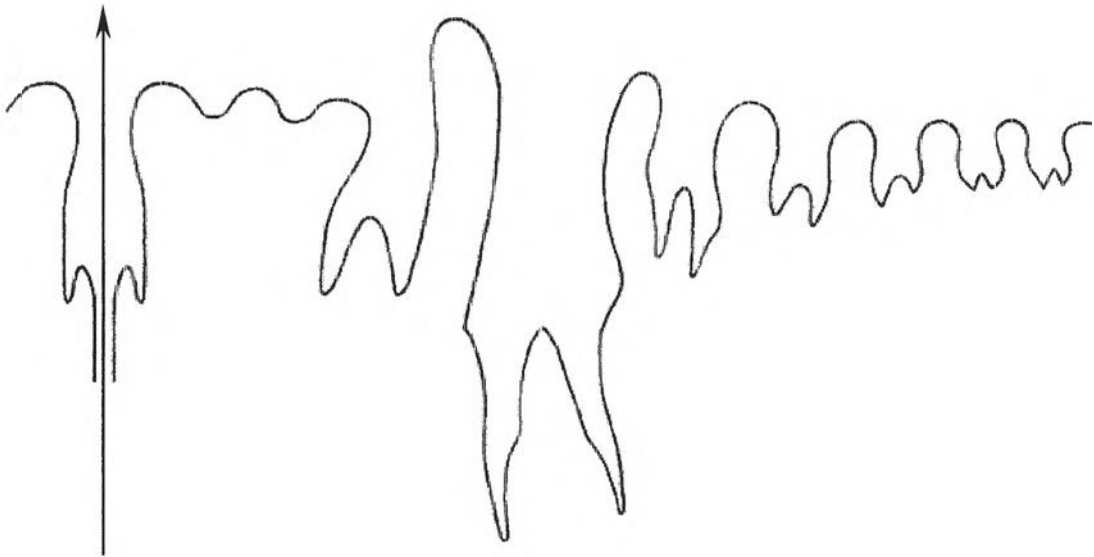


Figure 4.15 Diagrammatic representation suture line of *Propinacoceras beyrichi* from specimen number KNH 7-1-15, at a diameter approximately 49.60 mm, X10.

Propinacoceras americanum Miller and Warren, 1933

[Figure 4.16; Plate 9, Figures 7-8]

Propinacoceras americanum Miller and Warren, 1933, p. 297-299, pl.

Propinacoceras americanum Crockford and Warren, 1935, p. 160-161.

Propinacoceras americanum Miller and Crockford, 1935, p. 23-24.

Propinacoceras americanum Miller and Furnish, 1940, p. 23.

Propinacoceras americanum Ruzhencev, 1949, p. 118.

Propinacoceras americanum Miller, Furnish and Clark, 1957, p. 1060.

Description.— The conch is flat shape. The ventral side is rather flat and marks by longitudinal groove. A ventral side is perpendicular to the lateral side. The flattened ventral side is marked by a double row of dominantly short transverse ribs, which extend from middle of ventral side to shoulder of conch. Suture line is ceratitic suture type. Ventral lobe is long and divide resembles to be trifid. The first lateral lobe is intermediate size, bifid. The second lateral lobe is longest and shows bifid. The third and fourth lateral lobes become small and show bifid. Ventral saddle is composed of three secondary saddles. The first secondary saddle is highest among three secondary saddle of ventral saddle. The second and the third secondary saddle are a half of the height of first secondary saddle. All of lateral saddles are

long and rounded. The diagrammatic representation suture line of *Propinacoceras americanum* from the study area is illustrated on Figure 4.16.

Material.— Fragment of specimen number KNH 1-1-1 from rock sample number KNH 7-1-1.

Age.— Artinskian - Wordian (Zhou et al., 1997)



Figure 4.16 Diagrammatic representation suture line of *Propinacoceras americanum* from specimen number KNH 1-1-1, X10, at a diameter approximately 35.00 mm.

Systematic Description of Fusulinids

Fusulinids discovered in the study area at Khao Nong Hoi, Amphoe Pak Chong, Changwat Nakhon Ratchasima belong to 5 Families, 5 Subfamilies, and 7 genera. Almost of fusulinids in the study area seem to be recrystallised. The internal structure and wall of some specimens were destroyed. However, the trace of wall structure and internal structure still exist and useful for study. Identification of fusulinids in the study locality are described as followed:

Order FORAMINIFERIDA Eichwald, 1830
Suborder ALLOGROMINA Loeblich and Tappan, 1961
Family SCHWAGERINIDAE Dunbar and Henbest, 1930
Subfamily PSEUDOSHWAGERINIDAE Chang, 1963
Genus *Robustoschwagerina* Miklukho-Maklay, 1959
Type Species *Pseudoschwagerina tumida* Likharev, 1939

Robustoschwagerina sp.

[Plate 10, Figures 5-11]

Description.— Test is large, the diameter up to 10 mm., subspherical or inflated fusiform with protrude pole. Proloculus is very small. The first four to five volutions represent tightly fusiform. The last three to four volutions are rapidly enlarge height of volution. But the last volution usually decreases the height of it. Septa plane but slightly fluted at the pole. Wall structure is fusulinellid type, consists of tectum and loosely keriotheca.

Material.— The specimens from thin sections number KNH 3-13-1 and KNH 3-13-2 from rock sample number KNH 3-13-1; KNH 3-16-1, and KNH 3-16-2 from rock sample number KNH 3-16-1; KNH 5-12-3, KNH 5-12-4, KNH 5-12-5, and KNH 5-12-6 from rock sample number KNH 5-12-1.

Age.— Asselian - Sakmarian (Loeblich and Tappan, 1988)

Subfamily SCHWAGERININAE Dunbar and Henbest, 1930
Genus *Parafusulina* Dunbar and Skinner, 1931
Type Species *Parafusulina wordensis* Dunbar and Skinner, 1931

Parafusulina sp.

[Plate 12, Figures 5-11; Plate 13, Figures 1-7]

Description.— Test is usually elongated fusiform but some may form subcylindrical. The middle of test shows depression in some specimen. Slightly rounded to bluntly pole. Large proloculus and constantly in height of volution up to seven or eight volutions. Axis of

coiling is straight. Septa are highly and narrowly fluted at base of septa from pole to pole. At the central part of test, septa usually unfluted and heavy fluted at the pole. Neither chomata nor parachomata are present. Axial filling is heavy accumulating along axis of coiling especially at second and third volution. Wall structure represents fusulinellid type. Wall is composed of dense tectum and thick keriotheca.

Material.— The specimens from thin sections number KNH 1-1-1, KNH 1-1-4, KNH 1-1-17, and KNH 1-1-28 from rock sample number KNH 7-1-1; KNH 6-5-5, KNH 6-5-8, and KNH 6-5-10 from rock sample number KNH6-5-1; KNH 6-6-2, KNH 6-6-6, KNH 6-6-13, KNH6-6-16, KNH 6-6-21, KNH 6-6-27, KNH 6-6-28, and KNH 6-6-40 from rock sample number KNH 6-6-1.

Age.— Asselian – Kungurian (Moore, 1964)

Genus *Pseudofusulina* Dunbar and Skinner, 1931

Type Species *Pseudofusulina huecoensis* Dunbar and Skinner, 1931

Pseudofusulina sp.

[Plate 14, Figures 1-13]

Description.— Test is moderately large and long, elongate fusiform with acute pole. The length may reach to 20 mm. Straight axis of coiling. Wall structure represent by fusulinellid type. The wall is composed of tectum and coarsely keriotheca. The volution may up to seven to eight volution and loosely coiled. Septa flute at the base of septa throughout the length. Straight tunnel with short chomata dominantly at first volution and disappear at the later volution. Slightly axial filling appears like a thin layer along the axis of coiling.

Material.— The specimens from thin sections number KNH 1-1-15 from rock sample number KNH 7-1-1; KNH 5-12-1 from rock sample number KNH 5-12-1; KNH 6-5-10 from rock sample number KNH 6-5-1; KNH 6-6-1, KNH6-6-5, KNH 6-6-14, KNH 6-6-17, KNH 6-6-19, KNH 6-6-20, KNH 6-6-22, KNH 6-6-23, KNH 6-6-39, and KNH 6-6-40 from rock sample number KNH 6-6-1.

Age.— Asselian – Artinskian (Loeblich and Tappan, 1988)

Family VERBEEKINIDAE Staff and Wedekind, 1910

Subfamily MISELLININAE Miklukho-Maklay, 1958

Genus *Misellina* Schenck and Thompson, 1940

Type Species *Doliolina ovalis* Deprat, 1915

Misellina sp.

[Plate 10, Figures 1-4]

Description.— The test of *Misellina* sp. is small, ellipsoidal with small proloculus. Axis of coiling is greater than the height of volution. The volution may up to seven volutions. Height of volution rather constantly, some specimens are slowly enlarging in later volution. Wall is represented by fusulinellid type, consist of thick tectum and dense and thick keriotheca. Septa plane unfluted. Foramens exist on the septa throughout the length. Broad and low parachomata occur in every volution.

Material.— The specimens from thin sections number KNH 1-1-3 from rock sample number KNH7-1-1; KNH 5-12-1 from rock sample number KNH 5-12-1; KNH 6-5-3, and KNH 6-5-7 from rock sample number KNH 6-5-1; KNH 6-6-2, and KNH 6-6-3 from rock sample number KNH 6-6-1.

Age.— Sakmarian – Artinskian (Loeblich and Tappan, 1988)

Family STAFFELLIDAE Miklukho-Maklay, 1949

Genus *Pamirina* Leven, 1970

Type Species *Pamirina darvasica* Leven, 1970

Pamirina sp.

[Plate 11, Figures 1-4]

Description.— Test is very small to small size with very small spherical proloculus, depression at the pole. The axis of coiling is shorter than the height of volution. The volution of test may up to seven volutions. The height of volution is rapidly increasing in later volution. Fusulinellid wall type is represent Wall structure is composed of tectum and

keriotheca. Single broad and low tunnel sandwiches by small chomata but disappear at last volution.

Material.— The specimens from thin sections number KNH 1-1-18 from rock sample number KNH 7-1-1; KNH 6-5-1 and KNH 6-5-3 from rock sample number KNH 6-5-1; KNH 6-6-18 and KNH 6-6-20 from rock sample number KNH 6-6-1.

Age.— Sakmarian – Artinskian (Loeblich and Tappan, 1988)

Family NEOSCHWAGERINIDAE Dunbar and Condra, 1927

Subfamily THAILANDININAE Toriyama and Kanmera, 1968

Genus *Thailandina* Toriyama and Kanmera, 1968

Type Species *Thailandina buravasi* Toriyama and Kanmera, 1968

Thailandina sp.

[Plate 11, Figures 5-6]

Description.— Test is small, inflate fusiform. Pole of test is bluntly pointed. The volution may up to ten volutions. Septa plane, unfluted. Wall structure is unclear, blur in all volution like it was destroyed by secondary replacement. Parachomata dominantly well developed throughout the volution.

Material.— The specimens from thin sections number KNH 1-1-11 from rock sample number KNH 7-1-1; KNH 6-5-2 from rock sample number KNH 6-5-1.

Remark.— The blur wall and internal structure may be special character of *Thailandina* sp., because this character disappear in another specimens collected from the same locality even in the same thin section.

Age.— Kungurian – Roadian (Loeblich and Tappan, 1988)

Family FUSULINIDAE Moller, 1878

Subfamily FUSULININAE Moller, 1878

Genus *Quasifusulina* Chen, 1934

Type Species *Fusulina longissima* Moller, 1878

Quasifusulina sp.

[Plate 11, Figures 7-10; Plate 12, Figure 1-4]

Description.— Test is subcylindrical to elongate shape, bluntly and rounded pole. The middle of test (in axial section) shows depression. Proloculus is rather large size. Wall structure is represent by schwagerinid type. Thin wall is composed of tectum and diaphanotheca, some specimens show very thin lower tectorium and some is unclear wall structure. Septa intensely fluted throughout the length of test. The height of volution is increasing at later volution. Tunnel is narrow, large. Heavy axial filling but usually disappear at the last volution.

Material.— The specimens from thin section number KNH 6-5-13 from rock sample number KNH 6-5-1; KNH 6-6-1, KNH 6-6-7, KNH 6-6-29, KNH 6-6-35, and KNH 6-6-37 from rock sample number KNH 6-6-1; KNH 7-1-1 and KNH 7-1-2 from rock sample number KNH 7-1-1.

Age.— Moscovian – Sakmarian (Loeblich and Tappan, 1988)