

## CHAPTER IV

### SYSTEMATIC DESCRIPTION

#### 4.1 Systematic Description of Radiolaria

Radiolarian discovered from the study area in Mae Sot-Phop Phra District, Tak Province belongs to 18 Families and 26 Genera. Most of Radiolarian in the study area was not well preserved. The identified radiolarians in this study have been described as follows:

Subclass RADIOLARIA Müller, 1858

Order POLYCYSTINA Ehrenberg, 1838 Emend. Riedel, 1967

Suborder SPUMELLARIA Ehrenberg, 1875

4.2.1 Family Stylosphaeridae Haeckel, 1862 emend. Kozur and Mostler, 1979

Genus *Dumitricasphaera* Kozur and Mostler, 1979 emend. Lahm, 1984

*Dumitricasphaera* sp.

(Pl. 5, Figs. 13-14)

**Material:** Sections from MGH3, 9

**Range:** Middle to Late Triassic (Ladinian to Carnian)

**Remarks:** The illustrated specimens have short polar spines with two slightly curvous branches towards the central shell. The outline of the polar spine is similar to that of *Dumitricasphaera planustyla*.

**Occurrence:** Northwest Thailand

Genus *Vinassaspongius* Kozur and Mostler, 1979

*Vinassaspongius* sp.

(Pl. 8, Figs. 12-15)

**Material:** Sections from MGH1,2,4,5,6,7,9,10,11,12

**Range:** Middle to Late Triassic (late Ladinian to early Carnian)

**Remarks:** The illustrated specimens have three tightly twisted spines. The shape of main spines, proximally straight then strong twisted and straight distally instead of continuous twisted spine. These features are identical to the diagnostic characters of genus *Vinassaspongius*.

**Occurrence:** Northwest Thailand

Genus *Zhamojdasphaera* Kozur and Mostler, 1979

*Zhamojdasphaera latispinosa* Kozur&Mostler, 1979

(Pl. 7, Figs. 6)

*Zhamojdasphaera latispinosa* Kozur&Mostler

Kozur&Mostler, 1979, p.67, pl.7, figs7-9; pl.12, fig.5

Tekin, 1999, p.68, pl.2, fig.13

**Material:** Section from MGH6

**Range:** Middle to Late Triassic (late Ladinian to middle Carnian)

**Remarks:** The illustrated specimens have a spherical spongy shell and three polar spines, which the feature of polar spine can be compared with those of *Zhamojdasphaera latispinosa* Kozur&Mostler, 1979.

**Occurrence:** Austria, Turkey, Northwest Thailand

#### 4.2.2 Family Capnuchosphaeridae De Wever, in De Wever et al., 1979

Genus *Capnuchosphaera* De Wever, 1979

*Capnuchosphaera triassica* De Wever, 1979

(Pl. 7, Figs. 7)

*Capnuchosphaera triassica* De Wever

De Wever, 1979, p.84, pl.3, figs.14-19

Nakaseko&Nishimura, 1979, p.76, pl.7, figs.5,6

Tekin, 1999, p.72, pl.4, figs.4-5

**Material:** Section from MGH9

**Range:** Late Triassic (early Carnian to early Norian)

**Remarks:** This specie is characterized by cortical shell with three radially arranged primary spines (tumidaspinae with type genus). Spherical shape with 3 tubes of which the distal part is twisted. The specimens can be compared with *Capnuchosphaera triassica* De Wever, 1979 on the basis of the shape of its main spines and shell.

**Occurrence:** Austria, Central Japan, Turkey, Phillipine, Northwest Thailand

*Capnuchosphaera deweveri* Kozur&Mostler, 1979

(Pl. 7, Figs. 10)

*Capnuchosphaera deweveri* Kozur&Mostler

Kozur&Mostler, 1979, pp.75-76, pl.10, figs.4-7, pl.12, fig.1

*Capnuchosphaera triassica* De Wever

Yao, 1982, pl.2, fig.22

**Material:** Section from MGH5

**Range:** Late Triassic (early Carnian to ? late Norian)

**Remarks:** This species having tumidaspinae with porous spinal tunnels and by having well-developed spinal tumors. This feature is similar to that of *Capnuchosphaera deweveri*.

**Occurrence:** Turkey, Austria, Central Japan, East Central-Oregon, Northwest Thailand

*Capnuchosphaera* sp.

(Pl. 7, Figs. 11-14)

**Material:** Sections from MGH4,5,6,7,8,9,10,11,12

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** This species having three tumidaspinae are broken off, the shapes of tumidaspinae and cortical shell compare well with genus *Capnuchosphaera* Kozur&Mostler.

**Occurrence:** Northwest Thailand

4.2.3 Family Patulibracchiidae Pessagno, 1971 emend. Baumgartner, 1980

Genus *Paronaella* Pessagno, 1971

*Paronaella* sp.

(Pl. 5, Figs. 9-12)

**Material:** Sections from MGH4,5,6,7,8,9,10,11

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** The specimens figure here can be compared with genus *Paronaella* by the outline of arms, size, and shape of pore, which having large pores.

**Occurrence:** Northwest Thailand

4.2.4 Family Parasaturnalidae Kozur and Mostler, 1972 emend. Kozur and Mostler

1883

Subfamily Parasaturnalidae Kozur and Mostler, 1972

Genus *Paleososaturnalis* Donofrio & Mostler 1878 emend. Kozur & Mostler, 1981

*Paleososaturnalis* sp.

(Pl. 5, Figs. 1-4)

**Material:** Sections from MGH4,5,6,9

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** Illustrated specimens having test with ring flat, short polar spine and triangle in shape. The shape of this unidentified species is identical to the diagnostic character of genus *Paleososaturnalis* Donofrio & Mostler 1878.

**Occurrence:** Northwest Thailand

4.2.5 Family Orbiculiformidae Pessagno, 1973

Genus *Orbiculiforma* Pessagno, 1973

*Orbiculiforma* sp.

(Pl. 5, Figs. 7-8)

**Material:** Sections from MGH6,12

**Range:** Middle to Late Triassic (last Ladinian to middle Carnian)

**Remarks:** The illustrated specimens have test large, roughly circular in outline. These features are identical to the diagnostic characters of the *Orbiculiforma karnica* (Kozur&Mostler, 1978).

**Occurrence:** Northwest Thailand

#### 4.2.6 Family Hagiastriidae Riedel, 1967, emend. Pessagno, 1971, 1977a

Genus *Hagiastrum* Haeckel, 1881

*Hagiastrum augustum* Pessagno, 1979

(Pl. 5, Figs. 5-6)

*Hagiastrum augustum* Pessagno

Pessagno, 1979, p.165, pl.3, figs.3-5,16

**Material:** Section from MGH12

**Range:** Late Triassic (Carnian? to Norian)

**Remarks:** The illustrated specimens have test with short, broad rays about half as wide as long. Ray tip with 4 or more short spine of variable length. These features are identical to the diagnostic characters of the *Hagiastrum augustum* Pessagno, 1979.

**Occurrence:** Baja California, Northwest Thailand

#### 4.2.7 Family Actinommididae Haeckel, 1862 emend. Kozur&Mostler, 1979

Genus *Triassospongosphaera* Kozur and Mostler, 1981

*Triassospongosphaera* sp.

(Pl. 2, Figs. 15-16)

**Material:** Section from BKHL.B.

**Range:** Middle Triassic (Ladinian)

**Remarks:** The illustrated specimens have spongy shell with several straight and rod-like spines. This feature is similar to that of *Triassospongosphaera multispiosa* (Kozur and Mostler).

**Occurrence:** Northwest Thailand

Genus *Kahlerosphaera* Kozur and Mostler, 1979

*Kahlerosphaera* sp.

(Pl. 8, Figs. 1-3)

**Material:** Sections from MGH4,6

**Range:** Late Triassic (middle Carnian to early Norian)

**Remarks:** The illustrated specimens have cortical shell, primary spines consists of short shaft, straight three wings, which are diagnostic characters of genus *Kahlerosphaera*.

**Occurrence:** Northwest Thailand

#### 4.2.8 Family Stylosphaeridae Haeckel, 1882

Genus *Staurolonche* Haeckel, 1882

*Staurolonche trispinosa* (Kozur and Mostler, 1979)

(Pl. 8, Figs. 10)

*Staurolsphaera trispinosa* Kozur and Mostler

Kozur and Mostler, 1979, p.58, pl.21, fig.3

*Staurolsphaera trilobo* Nakaseko and Nishimura

Nakaseko and Nishimura, 1979, p.72, pl.5, figs.1, 2

*Stauracontium ? Triaspinosum ladinicum* Dumitrica, Kozur and Mostler

Dumitrica, Kozur and Mostler, 1980, p.17, pl.1, fig.5, pl.2, fig.4, pl.3, fig.6, 7, pl.5, fig.4, pl.14, fig.5

*Staurolonche trispinosa* (Kozur and Mostler, 1979)

Sashida et al., 1999, p.771, fig.8.18

**Material:** Section from MGH9

**Range:** Middle to Late Triassic

**Remarks:** The specimens are characterized by spherical shell with four spines which are perpendicular to each other in the same plane. The four spines are three-bladed with wide and deep furrow, untwisted. These features are identical to the diagnostic characters of the *Staurolonche trispinosa* (Kozur and Mostler, 1979).

**Occurrence:** European Tethys, Japan, Timor Island, Northwest Thailand

#### 4.2.9 Family Relindellidae Kozur&Mostler, 1980

Genus *Pentaspongodiscus* Kozur&Mostler, 1979 emend.

Dumitrica, Kozur&Mostler, 1980

*Pentaspongodiscus* sp.

(Pl. 8, Figs. 4-6)

**Material:** Sections from MGH6,9

**Range:** Middle to Late Triassic (last Anisian to Rhaetian)

**Remarks:** The specimens have five long three-bladed spines are stout in the equatorial plane. This specimen tentatively included this form in the genus *Pentaspongodiscus* because of these features.

**Occurrence:** Northwest Thailand

#### 4.2.10 Family Ferresidae Carter, 1993

Genus *Ferresium* Blome, 1984 emend. Carter, 1993

*Ferresium* sp.

(Pl. 7, Figs. 15-16)

**Material:** Sections from MGH1,4

**Range:** Late Triassic (late Norian to Rhaetian)

**Remarks:** The specimens are similar to *Ferresium philippinense* Yeh and Cheng (1996) by the shape of their primary spines, but differ from the latter in having a spherical cortical shell.

**Occurrence:** Queen Charlotte Islands, Northwest Thailand

#### 4.2.11 Family Oertlispongidae Dumitrica et al., 1980

Genus *Oertlispongus* Dumitrica et al., 1980

*Oertlispongus* sp.

(Pl. 1, Figs. 3-8)

**Material:** Sections from BKHL.B,1,2,3,4

**Range:** Middle Triassic (Ladinian)

**Remarks:** The poorly preserved specimens which show the first polar spine without a spongy shell. The shape of the main polar spine is very long or longer than the diameter of shell, strongly curved and stout. The specimens (fig. 3-5) are quite similar to that of *Oertlispongia inaequispinosus* describe by Dumitrica et al., 1980.

**Occurrence:** Worldwide

Genus *Baumgartneria* Dumitrica, 1982

*Baumgartneria bifurcata* Dumitrica, 1982

(Pl. 1, Figs. 1-2)

*Baumgartneria bifurcata* Dumitrica

Kozur&Mostler, 1994, p.64, pl.13, figs.3, 5, 6,10

Sashida et al., 1999, p.772, fig.10.28, 10.29

**Material:** Section from BKH5

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The specimens lack spongy shell due to the washing produce. In specimen, the stem is generally longer than axial spine. Kozur and Mostler (1994) recognized two morphotypes based on the shape of lateral branches. These specimens have straight branches which are perpendicular to the stem.

**Occurrence:** European Tethys, Japan, Timor Island, Northwest Thailand

Genus *Falcispongia* Dumitrica, 1980

*Falcispongia falciformis* Dumitrica, 1982

(Pl. 2, Figs. 7)

*Falcispongia falciformis* Dumitrica

Kozur&Mostler, 1994, p.65, pl.14, figs. 2, 6, 12

**Material:** Section from BKH5

**Range:** Middle Triassic (middle Ladinian)

**Remarks:** Several poorly preserved specimens were examined. This species is distinguished by the presence of a narrow inner flattened wing on the main polar spine



and by the shorter stem. The appearance of the main spines is quite similar to *Falcispongia falciformis*.

**Occurrence:** Italy, Romania, Northwest Thailand

*Falcispongia* sp.

(Pl. 2, Figs. 8)

**Material:** Section from BKH5

**Range:** Middle Triassic (middle Ladinian)

**Remarks:** Poorly preserved main spines without spongy shell were obtained. The specimens are characterized by lateral wings on the main polar spine. These specimens assigned to the genus *Falcispongia*.

**Occurrence:** Northwest Thailand

#### 4.2.12 Family Hindaesphaeridae Kozur&Mostler, 1981

Genus *Pseudostylosphaera* Kozur&Mostler, 1981

*Pseudostylosphaera japonica* (Nakaseko and Nishimura, 1979)

(Pl. 2, Figs. 9-10)

*Archeospongoreunum japonica* Nakaseko and Nishimura

Nakaseko and Nishimura, 1979, p.67, pl.1, figs.2,4,9

*Pseudostylosphaera japonica* (Nakaseko and Nishimura, 1979)

Kamata et al., 2002, p.500, fig.5F

**Material:** Section from BKHL.B

**Range:** Middle Triassic (Anisian to Ladinian)

**Description:** Shell globular, surface of shell rough which form a slightly spongy meshwork; its pores very small, and irregular in shape. Polar spines are two straight and three bladed polar spines are equal in length of the main axis of the shell and breadth, moderately long, massive triradial in axial section having three longitudinally arranged ridges alternating with three longitudinally arranged deep grooves; width of spines increases slightly toward a distal direction and decreases near the terminus.

**Remarks:** This species is distinguished from other species of the genus *Pseudostylosphaera* by having the strong polar spine.

**Occurrence:** Worldwide

*Pseudostylosphaera spinulosa* (Nakaseko and Nishimura, 1979)

(Pl. 2, Figs. 12-13)

*Archeospongoreunum spinulosa* Nakaseko and Nishimura

Nakaseko and Nishimura, 1979, p.69, pl.2, figs. 3, 4, 6

*Pseudostylosphaera spinulosa* (Nakaseko and Nishimura, 1979)

Sashida et al., 1999, p.770, figs.8.1-8.2

Kamata et al., 2002, p.500, fig.5-G

**Material:** Section from BKH1

**Range:** Middle Triassic (Anisian to Ladinian)

**Description:** Shell ellipsoidal with rough surface; spongy meshwork; polar spines unequal in length; the major stout, its length as long as the height of the shell, triradiate in axial section with three longitudinally arranged grooves interspersed between three longitudinally arranged ridge; the minor very short, conical.

**Remarks:** This species is distinguished from other species of the genus by having very sturdy three-bladed polar spines which have differences in their length.

**Occurrence:** Japan, Philippines, Russian Far East, Italy, European Tethys, Timor Island, Northwest Thailand

*Pseudostylosphaera timorensis* Sashida & Kamata, 1999

(Pl. 2, Figs. 14)

*Pseudostylosphaera timorensis* Sashida & Kamata

Sashida et al., 1999, p.770, figs.8.3-8.6

**Material:** Section from BKH5

**Range:** Middle Triassic (Ladinian)

**Description:** The globular shell is large for the genus and has many circle pores on its surface. The vertices of the pore frames bear nodes. One polar spine is long; approximately the same length as that of the shell diameter, the other is half as long. Polar spines are three-bladed and have needle-like distal ends. The furrows between the ridges are broad and deep.

**Remarks:** This species is distinguished from *Pseudostylosphaera tenuis* (Nakaseko and Nishimura, 1979) by having thicker and shorter polar spine.

**Occurrence:** Timor Island, Northwest Thailand

*Pseudostylosphaera* sp.

(Pl. 1, Figs. 9-20)

**Material:** Sections from BKH1,2,3,4,5

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The illustrated specimen is poorly preserved. The specimens have cortical shell, pore frames of the outer layer and bearing two opposite polar spine which is diagnostic character of genus *Pseudostylosphaera*.

**Occurrence:** Northwest Thailand

4.2.13 Family Muellertortidae Kozur, 1988a

Genus *Muellertortis* Kozur, 1988a

*Muellertortis cochleata cochleata* (Nakaseko and Nishimura)

(Pl. 2, Figs. 18)

*Muellertortis cochleata cochleata* (Nakaseko and Nishimura)

Kozur, 1988a, p.53, pl.1, figs.1-8, pl.2, figs.1,2, pl.3, fig.1

Kamata et al., 2002, p.501, fig.6-D

**Material:** Section from BKHL.B

**Range:** Middle to Late Triassic (middle Ladinian to early Carnian)

**Remarks:** This specimen have a spherical to subspherical shell and four main spines. Three spines are twisted tightly and have deep grooves and ridges. An untwisted is

slightly longer than the other spines. These are the identical characters of *Muellertortis cochleata cochleata* (Nakaseko and Nishimura) by Kozur (1988a)

**Occurrence:** European Tethys, Russian Far East, Japan, Northwest Thailand

Spumellaria gen. et sp. Indet

(Pl. 4, Figs. 1-16)

**Material:** Sections from BKHL.B,1,2,3,4,5,6,7,8, MGH4,6,8,9

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** These unnamed specimens are characterized by having a spongy shell and spines on outer margin of the shell. The appearance of this species rather resembles that of the suborder spumellaria by Ehrenberg (1875).

**Occurrence:** Northwest Thailand

Suborder NASSELLARIA Ehrenberg, 1875

4.2.14 Family Eptingiidae Dumitrica, 1978a

Genus *Eptingiidae* Dumitrica, 1978a

*Eptingium manfridi manfridi*, Dumitrica, 1978a

(Pl. 3, Figs. 5-11)

*Tripocyclia japonica* Nakaseko&Nishimura

Nakaseko&Nishimura, 1979, p.73, pl.4, figs.11,12

*Eptingium manfridi manfridi*, Dumitrica

Dumitrica, Kozur and Mostler, 1980, p.19, pl.3, figs.1-3, pl.6, figs.5-7

Kozur and Mostler, 1994, p.42, pl.1, fig.3

Sashida et al., 1999, p.773, figs.6.16, 6.17

**Material:** Sections from BKHL.B,1,5

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The specimens have a shell with three, broad-bladed spines which have unequal angles between the spines and do not have any spine torsion. End of spine are rounded. This spines is identified to *Eptingium manfridi* by having wide three main spine.

**Occurrence:** European Tethys, Japan, Timor Island, Northwest Thailand

*Eptingium* sp.

(Pl. 3, Figs. 13-15)

**Material:** Sections from BKH1,2,4,5

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The specimens have three main spines with shell which have almost equal angle between the spines. This specimen can be assigned to the genus *Eptingiidae*.

**Occurrence:** Northwest Thailand

Genus *Spongostephanidium* Dumitrica, 1978a

*Spongostephanidium japonicum* (Nakaseko and Nishimura, 1979)

(Pl. 3, Figs. 1-3)

*Trilonche japonica* Nakaseko and Nishimura

Nakaseko and Nishimura, 1979, p.72, pl.4, figs.8, 10

*Spongostephanidium japonicum* (Nakaseko and Nishimura, 1979)

Sashida et al., 1999, p.775, figs. 6.1, 6.2, 6.6-6.8, 6.10

**Material:** Sections from BKH1,2

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The specimens are characterized by having a shell with rather thick three spines and strong, high nodes on the vertices of the pore frames. This species is quite similar to *Spongostephanidium japonicum* (Nakaseko and Nishimura, 1979) by having diagnostic features.

**Occurrence:** European Tethys, Japan, Timor Island, Philippine, Northwest Thailand

*Spongostephanidium* sp.

(Pl. 3, Figs. 4)

**Material:** Sections from BKH1,4

**Range:** Middle Triassic (Anisian to Ladinian)

**Remarks:** The specimens have high nodes on the pore frames of shell with three rod-like spines. This specimen is similar to genus *Spongostephanidium* Dumitrica by having diagnostic shell feature.

**Occurrence:** Northwest Thailand

#### 4.2.15 Family Triassocampidae Kozur and Mostler, 1981

Genus *Triassocampe* Dumitrica et al., 1980

*Triassocampe* cf. *deweveri* (Nakaseko and Nishimura, 1979)

(Pl. 2, Figs. 1-2)

*Triassocampe deweveri* (Nakaseko and Nishimura, 1979)

Yao, 1982, p.55, pl.1, figs.1-3

*Dictyomitrella deweveri* Nakaseko and Nishimura

Nakaseko and Nishimura, 1979, p.77, pl.10, figs.8,9

**Material:** Section from BKH1

**Range:** The specimens have a conical test of which upper part of the cephalis conical, lower part cylindrical with small and hoop-like thorax. All following segments are inversely trapezoidal in the abdomen this feature is not very distinct. The proximal ring of nodes is in all post-thoracic segments distinctly separated from the segments. These shell features are quite similar to those of *Triassocampe deweveri* (Nakaseko and Nishimura, 1979)

**Remarks:** Middle Triassic

**Occurrence:** Central Japan, Northwest Thailand

*Triassocampe* sp.

(Pl. 2, Figs. 3-6, Pl. 7, Figs. 1)

**Material:** Sections from BKH1,2,3,4,5, MGH12

**Range:** Middle to Late Triassic

**Remarks:** The specimen is characterized by having slender and sub-cylindrical test without apical horn, with proximal ring of nodes or smooth ring. This specimen can be assign to genus *Triassocampe* Dumitrica by having dianogtic shell features.

**Occurrence:** Northwest Thailand

Genus *Annulotriassocampe* Kozur, 1994

*Annulotriassocampe sulovens* (Kozur and Mock, 1981)

(Pl. 6, Figs. 19-20)

*Annulotriassocampe sulovens* (Kozur and Mock, 1981)

Tekin, 1999, p.170, pl. 41, fig. 8

*Triassocampe sulovens* Kozur and Mock, Kozur and Mostler, 1981, p. 99, pl. 13, fig. 3

**Material:** Sections from MGH5,6

**Range:** Middle to Late Triassic (late Ladinian to early Carnian)

**Remarks:** The specimens are characterized by having only one row of pore on every segment. These specimens have well-developed circumferencial ridge and a horizontal pore on the ridges, which are diagnostic characters of *Annulotriassocampe sulovens*.

**Occurrence:** East-Central Oregon, Turkey, Philippine, Northwest Thailand

#### 4.2.16 Family Sanfilippoellidae Kozur&Mostler, 1979

Genus *Poulpus* De Wever, 1979

*Poulpus* sp.

(Pl. 8, Figs. 7-9)

**Material:** Sections from MGH4,6,7,8,10,11

**Range:** Middle to Late Triassic

**Remarks:** The specimens are characterized by having a shell which is composed of a hemiglobular cephalis with three conical feet. The surface of cephalis is general smooth but has a few pores near the base of the feet. This unidentified species is quite similar to those of genus *Poulpus* De Wever, 1979 by having through out three-bladed feet and feature pore near the base of the feet.

Occurrence: Worldwide

#### 4.2.17 Family Canoptidae Pessagno, 1979

Genus *Canoptum* Pessagno, 1979

*Canoptum rhaeticum* Kozur & Mostler, 1981

(Pl. 6, Figs. 1-2)

*Canoptum rhaeticum* Kozur & Mostler

Kozur & Mostler, 1981, pp.103-104, pl.20, fig.1-4

Sugiyama, 1997, p.175, fig.50-5

*Canoptum triassicum* Yao

Yao, 1982, p.60, pl.3, fig.3-4

**Material:** Sections from MGH4,6,7,8,9

**Range:** Upper Triassic (late Norian to Rhaetian)

**Remarks:** These specimens are characterized by shell conical, with 8-12 segments. Cephalis dome-shaped without apical horn. Cephalis and thorax poreless with smooth surface. Post-thoracic segments trapezoidal in outline. Post-cephalic segments increase gradually in width and in height. This feature is distinguishable from *Canoptum rhaeticum* Kozur & Mostler, 1981.

**Occurrence:** Austria, Central Japan, Northwest Thailand

*Canoptum laxum* Blome, 1984

(Pl. 6, Figs. 3-4)

*Canoptum laxum* Blome

Blome, 1984, p.47, pl.11, figs.9,14

**Material:** Sections from MGH4,9

**Range:** Upper Triassic (upper Carnian ? to middle Norian)

**Description:** This specimen are characterized by test conical, test consists of cephalis, thorax abdomen and post-abdomen chambers. Cephalis dome-shaped without apical horn. Thorax, abdomen and post abdomen chamber subcylindrical. Four post-



abdominal chamber, distally increasing slightly in height and more rapidly in width. Pore on final post-abdominal chambers not observed on type material, buried by an outer layer of microgranular silica. This feature is distinguishable from *Canoptum laxum* Blome, 1984.

**Occurrence:** East-Central Oregon, Northwest Thailand

*Canoptum cf. levis* Tekin, 1999

(Pl. 6, Figs. 5-6)

*Canoptum levis* Tekin

Tekin, 1999, p.137, pl. 28, figs. 13-15

**Material:** Sections from MGH4,6

**Range:** Middle Triassic (late Ladinian to early Carnian)

**Remarks:** Test roughly spindle-shaped with mainly four post-abdominal segments and completely covered by microgranular silica. Cephalis small and dome-shaped, collar stricture indistinct. Test slowly widening at thorax, trapezoidal in outline, abdomen and first post-abdominal segments slightly wider than thorax, hoop-like in outline. These features of specimens are similar to those of *Canoptum levis* Tekin, 1999.

**Occurrence:** Turkey, Northwest Thailand

*Canoptum* sp.

(Pl. 6, Figs. 13)

**Material:** Sections from MGH1,2,3,4,5,6,9,11,12

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** Test is spindle-shaped with dome-shaped cephalis and lack a horn. Pore on ridge circular to elliptical in shape, not set in pore frame. Feature of illustrated specimens are similar to those of the genus *Canoptum* Pessagno, 1979

**Occurrence:** Northwest Thailand

#### 4.2.18 Family Xiphothecidae Kozur & Mostler, 1981

Genus *Castrum* Blome, 1984

*Castrum peronatum* Blome, 1984

(Pl. 6, Figs. 14-15)

*Castrum peronatum* Blome

Blome, 1984, p.54, pl.14, figs.4, 9, 12, 14, 18; pl.17, fig.14

Tekin, 1999, p.177, pl.43, figs.13-14

**Material:** Sections from MGH3,4,6,7

**Range:** Middle Triassic to Late Triassic (late Ladinian to middle Norian)

**Description:** The specimens are consisting of multicyrtoid test with conical and more post-abdominal segments. Cephalis is dome shape and lacking a horn. Thorax, abdomen and post-abdominal chambers are separated from each other by strong nodes circumferential ridges with massive, polygonal nodes. Pore frame between circumferential ridges shows larger pore frames triangular to rectangular in outline, and sub-circular to elliptical pores which is smaller pores frame tetragonal in outline. These features of specimens are similar to those of *Castrum peronatum* Blome, 1984.

**Occurrence:** Western North America, East-central Oregon, Turkey, Northwest Thailand

*Castrum* ? sp.

(Pl. 6, Figs. 13)

**Material:** Section from MGH8

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** These unidentified species characteristically has a test multicyrtoid, conical with polygonal frames are separated by nodes circumferential ridge. These features of specimens are similar to those of genus *Castrum* Blome, 1984

**Occurrence:** Northwest Thailand



Genus *Xiphotheca* De Wever, 1979

*Xiphotheca longa* Kozur & Mock, 1981

(Pl. 6, Figs. 16)

*Xiphotheca longa* Kozur & Mock

Tekin, 1999, p.174, pl.42, figs.13-14

**Material:** Sections from MGH4,7

**Range:** Late Triassic (late Carnian to middle Norian)

**Remarks:** This specimen characteristically has test long. Tests gradually increase until first post-abdominal segment. First post-abdominal segment more bulbous than the other segments. This feature is distinguishable from *Xiphotheca longa* Kozur & Mock, 1981.

**Occurrence:** Baja California, Western North America, East-central Oregon, Turkey, Northwest Thailand

*Xiphotheca* sp.

(Pl. 6, Figs. 17)

**Material:** Sections from MGH4,7,8

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** This unidentified species characteristically has test very long, subcylindrical forms. These features of specimens are similar to those of genus *Xiphotheca* De Wever, 1979.

**Occurrence:** Northwest Thailand

Genus *Canesium* Blome, 1984

*Canesium* sp.

(Pl. 6, Figs. 18)

**Material:** Section from MGH4

**Range:** Late Triassic (late Ladinian to middle Norian)

**Remarks:** This specimens having test multicyrtoid, subconical in outline, chamber increase rapidly in both height and width. Cephalis dome-shaped, lacking a horn, thorax and abdomen covered by an outer layer of microgranular silica. This specimen included this form in genus *Canesium* Blome, 1984.

**Occurrence:** Northwest Thailand

Nessellaria gen. et sp. indet

(Pl. 7, Figs. 3-5)

**Material:** Sections from MGH1,3,4,5,7,8,9,10,11

**Range:** Late Triassic (Carnian to Norian)

**Remarks:** The illustrated specimen is poorly preserved. The shell of this unidentified species seems to be composed of globular cephalis, thorax, abdomen and post-abdomen. This species may be included in the suborder nessellaria Ehrenberg, 1875

**Occurrence:** Northwest Thailand

Spine D1

(Pl. 8, Figs. 16-17)

**Material:** Sections from MGH1,2,3,4,5,6,7,8,9,10,11,12

**Range:** Late Triassic (Carnian to early Norian)

**Remarks:** Straight spines with strong dextral torsion. This specimen is distinguished by having a long torsionless portion in the proximal part. These are the identical characters of Spine D1 by Sugiyama, 1997.

**Occurrence:** Northwest Thailand