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Ruesticyrtiidae (Radiolaria) from the middle Carnian (Late Triassic) of Köseyahya Nappe (Elbistan, eastern Turkey)

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Abstract: Ruesticyrtiidae (Radiolaria) are reported from the Köseyahya stratigraphic section in the Köseyahya Nappe exposed near Elbistan town, western part of Eastern Taurides. The lowermost part of this section is composed of alternating sandstone and marl; overlying beds are represented by alternating clayey/cherty limestone, marl and mudstone. Radiolaria from clayey/cherty limestone beds are very well-preserved, diverse and abundant. The overlying strata in the section consist of ammonoid-bearing nodular limestones with tuff interlayers and subsequently "Hallstatt limestones" with abundant ammonoids. A medium- to thick-bedded, clastic and chert free limestone sequence is situated at the top of the section. A middle Carnian age is assigned to strata from the basal part of the Köseyahya stratigraphic section based on characteristic radiolarian fauna and index form, *Tetraporobrachia haeckeli*. On the basis of abundant and diverse specimens from the family Ruesticyrtiidae, a new genus, *Elbistanium* n. gen. and three new species are described: *Elbistanium gracilum* n. gen., n. sp., *E. productum* n. gen., n. sp. and *Xiphotheca munda* n. sp. Furthermore, emendation of *Xiphotheca karpenissionensis* De Wever is proposed.

Key words: Carnian, eastern Turkey, taxonomy, Radiolaria, Ruesticyrtiidae, *Elbistanium* n. gen.

Introduction

The Ruesticyrtiidae are stratigraphically important guide fossils for the late Anisian to Norian time interval because they evolved quickly during this time span. Previously, Kozur & Mostler (1979, 1981) have erected three different families: Ruesticyrtiidae Kozur et Mostler including four genera (*Ruesticyrtium* Kozur et Mostler, *Nevanellus* Kozur et Mostler, *Pararuesticyrtium* Kozur et Mock, *Wuranella* Kozur et Mostler), Triassocampidae Kozur et Mostler including seven genera (*Triassocampe* Dumitrica, Kozur et Mostler, *Annulotriassocampe* Kozur, *Paratriassocampe* Kozur et Mostler, *Pseudotriassocampe* Kozur et Mostler, *Striatotriassocampe* Kozur et Mostler, *Praeyeharaia* Kozur, *Yeharaia* Nakaseko et Nishimura) and Xiphothecidae Kozur et Mostler comprising two genera (*Xiphotheca* De Wever, *Senelella* Tekin). Recently, De Wever et al. (2001) suggested that Triassocampidae Kozur et Mostler and Xiphothecidae Kozur et Mostler are junior synonyms of the Ruesticyrtiidae Kozur et Mostler as they have the same cephalic structure. Within these genera, taxa belonging to genus *Xiphotheca* De Wever first appear in the early Carnian, then they become dominant in the middle Carnian to early Norian and disappear in the middle Norian (De Wever et al. 1979; Tekin 1999; Tekin et al. 2002). It can be suggested that, two closely related genera, *Elbistanium* n. gen. and *Senelella* Tekin, probably evolved from *Xiphotheca* De Wever in the middle Carnian and early Norian, respectively. Within the circumstances of this study, we will present the characteristics of taxa belonging to *Elbistanium* n. gen.

Previously, middle Carnian radiolarians have been extensively studied mainly in Austria, Japan and Turkey. More particularly, radiolarian fauna of middle Carnian age from the Göstling and Großreifling (Northern Calcareous Alps) localities in Austria have been presented in a series of articles (Kozur & Mostler 1972, 1978, 1979, 1981; Lahm 1984). In Japan, the biostratigraphy of middle Carnian radiolarian faunas have mainly been submitted by Sato et al. (1986), Yoshida (1986) and Sugiyama (1997). Faunas with characteristic index taxa from this time interval have also been encountered in two localities (Huglu Unit in Beysehir-Hoyran Nappes, Central Taurides and Turunç Unit of the Gülbahar Nappe in the Lycien Nappes, Western Taurides) in Turkey (Tekin 1999; Tekin & Goncuoglu 2002).

Highly diverse and abundant representatives of Ruesticyrtiidae of middle Carnian age were extracted from the basal limestone beds of the Köseyahya Nappe outcropping near Elbistan town, eastern Turkey. In this study, new taxa from Ruesticyrtiidae are proposed and the definition of some previously described taxa are emended. Radiolarian taxa from the other families are to be presented in future articles.

Geological setting

The region of Elbistan town is situated in the western part of the Eastern Taurides. It includes many allochthonous sequences with different stratigraphical characteristics (Fig. 1). The lowermost tectonic unit around Elbistan town is "Binboga metamorfics" (Bedi et al. 2005; Fig. 1). This allochthonous unit was first named by Yilmaz et al. (1987) and is mainly composed of metaclastics and metacarbonates deposited from Late Devonian to Late Cretaceous time. Its equivalent in the Central Taurides is the Kütahya-Bolkardag belt proposed by Ozcan et al. (1988).

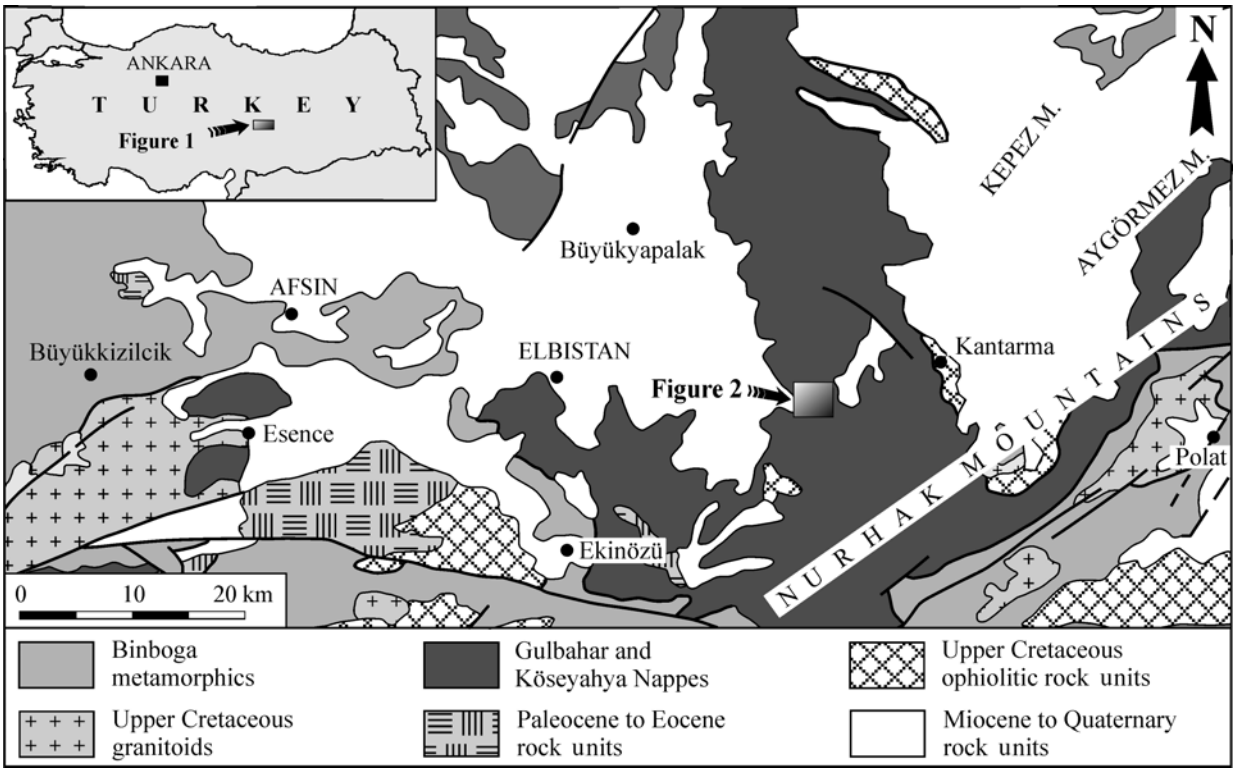

Fig. 1. Geological map showing the distribution of rock units in the western part of the Eastern Taurides around Elbistan town (revised and simplified after Senel 2002).

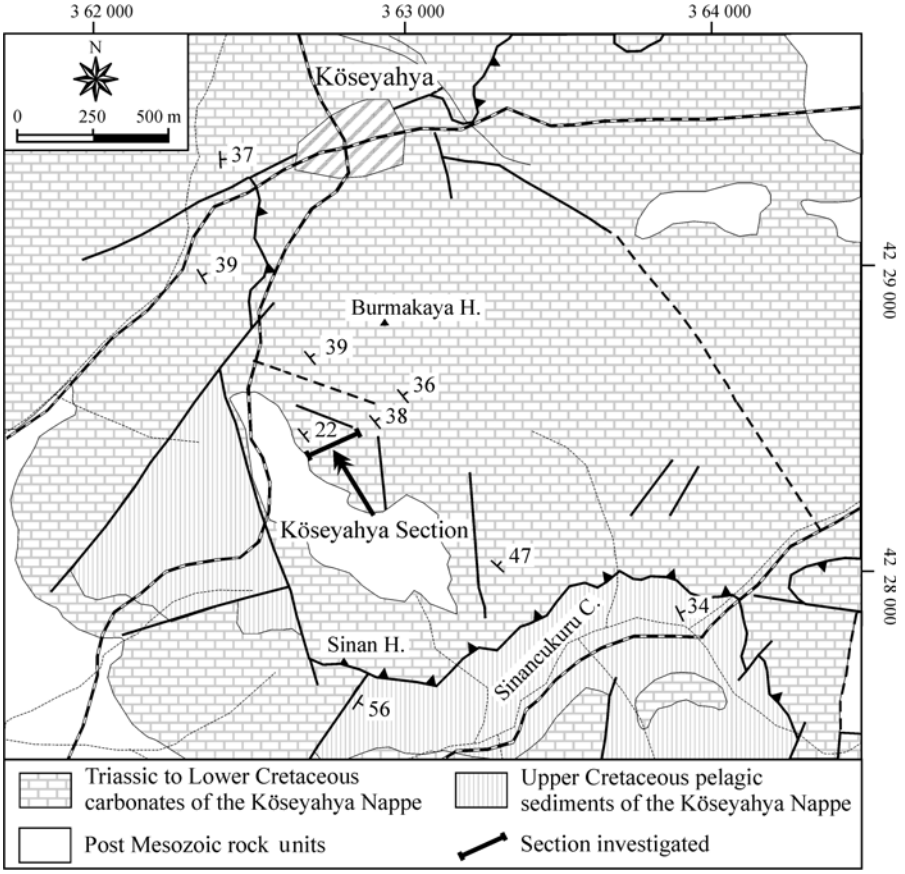

Fig. 2. Geological map of the Köseyahya stratigraphic section and its vicinity (simplified and revised after Bedi 2004).

In the study area, the "Gülbahar nappe" is overthrusted on the Binboga metamorfics (Bedi et al. 2005). This nappe style was first named and described as the "Gülbahar unit" by Poisson (1977) in the Western Taurides and subsequently Senel et al. (1989) defined it as the "Gülbahar nappe" in the same region. In the Western Taurides, it consists mainly of cherty pelagic limestones, clastics and volcanics of Triassic age at the base and Jurassic-Early Cretaceous pelagic cherty limestones, cherts and mudstones in overlying layers. The unit terminates in flyschoidal rock units with blocks of different sizes. A similar tectonic unit was named the "Huglu unit of Beyşehir-Hoyran nappes" by Brunn et al. (1971) and Monod (1977) in the Central Taurides. Ozgul (1976, 1984) later suggested the name "Huglu group of Bozkir unit" for this nappe in the Central Taurides. The term "Gülbahar nappe" is adopted in this study as the lithological character of this unit in the study area is very similar to the original definition of the Gülbahar Nappe by Poisson (1977) and subsequently by Senel et al. (1989).

Several nomenclatures for this nappe have been proposed for the Eastern Taurides namely the "Binboga formation" (Perincek & Kozlu 1981, 1984; Yilmaz et al. 1992, 1993), the "Sogucak formation" (Pehlivan et al. 1991). According to Yilmaz et al. (1992, 1993), the "Binboga formation" (Perincek & Kozlu 1981, 1984) and the "Andirin limestone" (Ayaslioglu 1970) of Middle Triassic–Late Cretaceous age, of different lithology belong to the same unit. A similar suggestion was also claimed by Pehlivan et al. (1991). According to these authors, the Sogucak Formation of Middle-Late Triassic age constitutes the basal part of the Andirin limestone. However, a recent study by Bedi et al. (2005) suggested that the Binboga Formation (Perincek & Kozlu 1981, 1984; Yilmaz et al. 1992, 1993) and the Andirin limestone (Ayaslioglu 1970) are two different nappes and respective equivalent to the Gülbahar Nappe (Poisson 1977; Senel et al. 1989) defined in the Western Taurides and the Köseyahya Nappe (Bedi et al. 2005) described in the Eastern Taurides.

The Köseyahya Nappe proposed by Bedi et al. (2005) tectonically overlies the Gülbahar Nappe around the Elbistan region (Fig. 2). The "Domuzdag nappe" by Poisson (1977); the "Boyalitepe group and the Gencek limestones of the Bozkir unit" proposed by Ozgul (1976, 1984) in the Central Taurides are partly equivalents of this nappe. In the study area, the basal part of the Köseyahya Nappe includes clastic sediments overlain by radiolarian rich clayey, cherty limestones, marl and mudstone alternation. This part is overlain by ammonoid-bearing nodular limestones with tuff interlayers and subsequently by "Hallstatt limestones" with abundant ammonoids (Fig. 3). In the higher upper part of the Köseyahya Nappe, middle Upper Triassic–Lower Cretaceous neritic carbonates and calciturbidites are observed. The upper part of this nappe is composed of Upper Cretaceous pelagic cherty limestones (Bedi et al. 2005). Köseyahya section was measured from middle Carnian to Norian sequences from this nappe style and middle Carnian radiolarian fauna were obtained from clayey and cherty limestones. Detail of lithostratigraphic properties of this section and characteristics of the middle Carnian radiolarian fauna are going to be submitted in the next chapters.

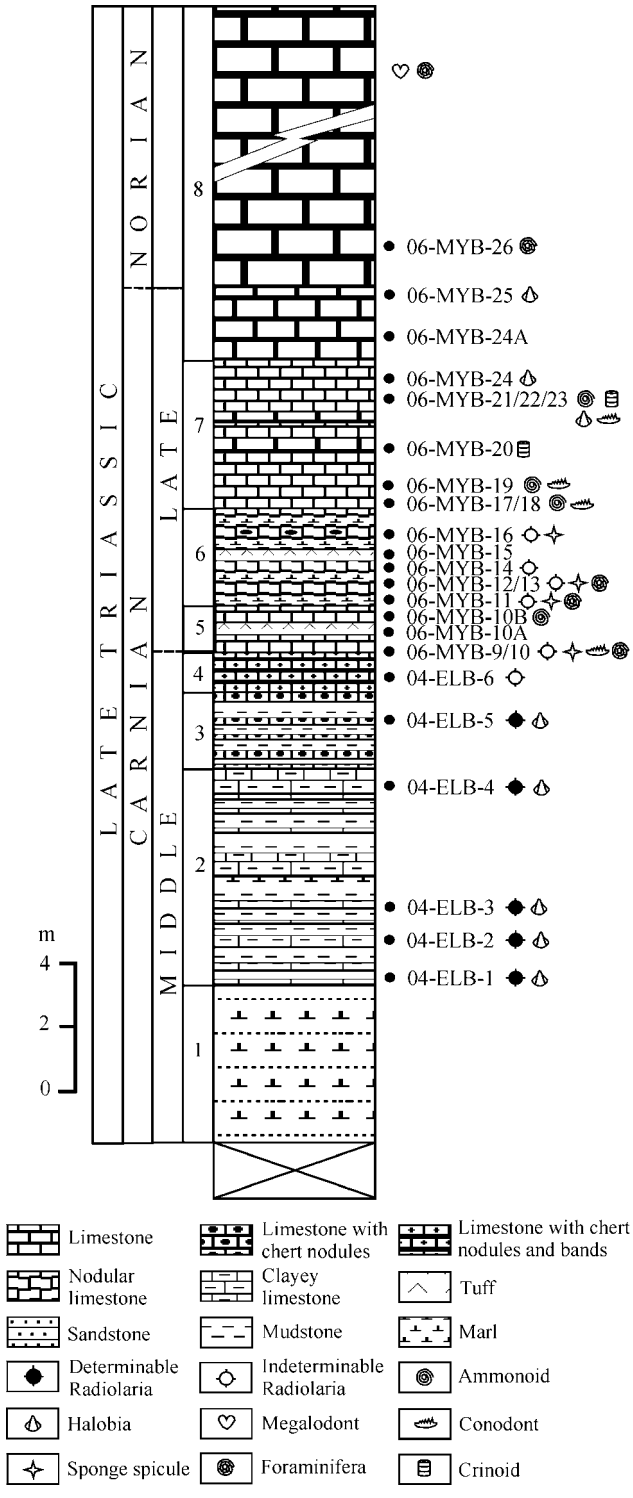

Fig. 3. The Köseyahya stratigraphic section and samples.

Ophiolitic rock units of Late Cretaceous age constitute the uppermost structural units around the Elbistan region (Bedi et al. 2005).

Lithostratigraphy of the Köseyahya stratigraphic section

The studied area is located 22 km east of Elbistan town (Fig. 1). The Köseyahya stratigraphic section is situated on the southwest slope of the Burmakaya Hill (at L38 C2 quadrangle sheet, between 42.28.360 N/3.62.755 E and 42.28.484 N/3.62.872 E UTM coordinates; Fig. 2) which is one kilometer away from Köseyahya village of Elbistan town. In this area, slices of the Köseyahya Nappe are thrusted over each other (Fig. 2). The section is approximately 118 meters thick with the basal part covered by slope debris (Figs. 3 and 4A). The top of the section is disturbed by a fault. The section is subdivided into the following eight units, from bottom to top:

Unit 1, Sandstone–marl alternation: The lowermost part of the section is five meters thick, comprised of alternating thin- to medium-bedded, green to yellowish-green sandstone and marl. No samples were taken from this unit.

Unit 2, Clayey limestone–marl–mudstone alternation: This unit is seven meters thick, composed of medium- to thick-bedded, grey to beige clayey limestone rich in iron minerals and laminated green to yellowish-green marl and mudstone alternation (Fig. 4B). The limestone beds contain rich Bivalvia and Radiolaria faunas. Four samples (04-ELB-1, 04-ELB-2, 04-ELB-3 and 04-ELB-4) were taken from these limestone beds for radiolarian analyses.

Unit 3, Clayey limestone with chert nodules–marl–mudstone alternation: This is represented by an alternation of iron rich, thin- to medium-bedded, grey to beige clayey limestone with grey to beige chert nodules, green to yellowish-green laminated marl and mudstone (Fig. 5A). The limestone beds contain very abundant Radiolaria and Bivalvia. Total thickness of this unit is 2.3 meters; sample 04-ELB-5 was obtained from this unit.

Unit 4, Clastic free limestone with chert bands and nodules: This unit includes iron rich, thin- to medium-bedded, grey to beige limestone with grey, beige and black chert bands and nodules (Fig. 5B). The total thickness of this unit is 1.2 meters. Chert bands and nodules are beige and grey at the base of this unit, but are black

Fig. 4. A — Location of the Köseyahya stratigraphic section and its vicinity. Abbreviations: K.N. — The Köseyahya Nappe, S.D. — Slope debris, K.S. — The Köseyahya stratigraphic section. **B** — Detailed photograph of the alternation of iron rich, clayey limestone, marl and mudstone in unit two.

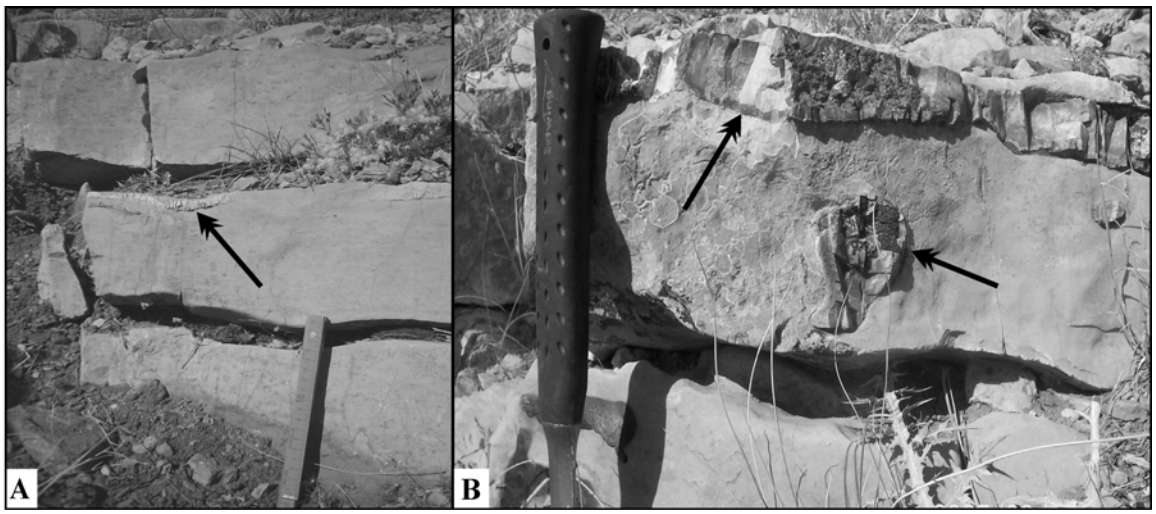

Fig. 5. A — Clayey limestone with chert nodules from unit three, arrow indicates position of chert nodule. **B** — View of chert nodule and chert band in unit four.

towards the top (Fig. 5B). One sample (04-ELB-6) collected from the limestone beds of this unit contained only poorly preserved radiolarians.

Unit 5, Nodular limestone with tuff intercalation: It is composed of 1.15 meters thick, chert free, rare ammonoids bearing very thin- to thin-bedded, grey to beige, nodular limestone with yellow to white tuff interbed. Three samples were derived from this unit for radiolarian and ammonoid analyses (06-MYB-9, 06-MYB-10, 06-MYB-10B) in addition to one sample (06-MYB-10A) from the tuff layer for radiometric dating.

Unit 6, Nodular limestone, marl alternation with tuff intercalation: The lower part of this unit includes reddish grey to red, thin- to medium-bedded, nodular limestone with remains of indeterminable ammonoids and red, very thin-bedded, laminated marl. As ammonoid material is very badly-preserved, we obtained four samples (06-MYB-11, 06-MYB-12, 06-MYB-13, 06-MYB-14) from the lower part of this unit for radiolarian analyses. At the central part of this unit, there is white tuff interbed and one sample (06-MYB-15) was derived from this layer for radiometric dating. The upper part of this unit is very similar in lithologies to those observed from the basal part of this unit, but limestone includes some chert nodules at this part and sample 06-MYB-16 was taken from this part for radiolarian analyses. Total thickness of this unit is about 2.90 meters.

Unit 7, Hallstatt limestone: This unit is characterized by total 4.60 meters thick, reddish grey to red, thin- to medium-bedded, chert and clastic free limestone with abundant ammonoids. Towards the upper part of this unit, crinoids and bivalves (*Halobia*) become abundant. For ammonoid, foraminiferal, conodont and bivalvia analyses, a total of eight samples (from samples 06-MYB-17 to 06-MYB-24) were derived from this unit.

Unit 8, Chert and clastic free limestone: Medium- to thick-bedded, sometimes massive, grey to beige limestone is the main characteristic of this unit. While the lower part of this unit includes an accumulation of bivalves (*Halobia*), the central to upper of it is very rich in bivalves (*Megalodont*) and benthic foraminifers. Total thickness of this unit is approximately 94 m.

Material and method

A well-preserved and abundant radiolarian fauna was obtained from limestone samples 04-ELB-2, 04-ELB-3, 04-ELB-4, and 04-ELB-5 in the Köseyahya section. Sample 04-ELB-1 has a sparse radiolarian fauna, but all specimens are well-preserved (Fig. 6). Although, some specimens (04-ELB-6, 06-MYB-9, 06-MYB-10, 06-MYB-11, 06-MYB-12, 06-MYB-13, 06-MYB-14, 06-MYB-16) contain remains of Radiolaria, these are not well-preserved for determinations (Fig. 3). All samples from the Köseyahya section were processed with hydrochloric acid (10 %) based on the method suggested by De Wever et al. (2001). SEM photographs were taken at METU, Department of Metalogeny Engineering, Ankara.

Systematic Paleontology

The following abbreviations are utilized for the measurements; HT — Holotype, Min. — Minimum, Max. — Maximum and Av. — Average. All holotypes and paratypes are kept at the collection of the Paleontological Laboratory of Geological Engineering Department, Hacettepe University, Ankara (Turkey).

Subclass: **Radiolaria** Müller, 1858
Suborder: **Nasselariina** Ehrenberg, 1875
Family: **Ruesticyrtiidae** Kozur et Mostler, 1979

1981 Triassocampidae Kozur et Mostler, pp. 97–98
1981 Xiphothecidae Kozur et Mostler, p. 113

Type genus: *Ruesticyrtium* Kozur et Mostler, 1979.

Radiolarian Taxa	04-Elb-1	04-Elb-2	04-Elb-3	04-Elb-4	04-Elb-5
Elbistanium gracilum Tekin n. gen., n. sp.	X	X	X	X	X
Elbistanium productum Tekin n. gen., n. sp.		X	X	X	X
Elbistanium sp. A		X	?	X	X
Nevanellus conicus Kozur et Mostler		X	?	X	
Pararuesticyrtium densiporatum Kozur et Mock		X	?	X	X
P. aff. *densiporatum* Kozur et Mock			X		
Pararuesticyrtium rariporatum Kozur et Mostler		X	?	X	X
Pararuesticyrtium sp. A		X			
Pararuesticyrtium sp. B		X			
Ruesticyrtium goczani Kozur et Mostler		X	?	X	X
Xiphotheca karpenissionensis De Wever	X	X	X	X	X
Xiphotheca longa Kozur et Mock	X	X	X	X	X
Xiphotheca munda Tekin n. sp.		X	?	X	X
Spinotriassocampe carnica Kozur et Mostler		X	?	?	X
Tetraporobrachia haeckeli Kozur et Mostler	X	X	X	X	X
Weverella tetrabrachiata Kozur et Mostler		X	?	X	X

Fig. 6. Occurrence chart of the middle Carnian radiolarians in the Köseyahya stratigraphic section.

Genus: *Elbistanium* Tekin n. gen.

Etymology: From the Elbistan town from eastern Turkey.

Type species: *Elbistanium gracilum* n. gen., n. sp.

Diagnosis: Long, slender test with slight increase in width in proximal part (until third/fifth post-abdominal segments) followed by different segments shapes and terminating with a short tube.

Description: Test long to very long, slender and multicyrtid. Cephalothorax hemispherical to dome-shaped with rare pores at thorax without horns. Proximal part of test (cephalothorax to third/fifth post-abdominal segment) increasing in width gradually. Abdomen to third/fifth post-abdominal segments hoop-shaped with elevated, polygonal (tetragonal to hexagonal) pore frames with nodes at pore frame vertices. Following part of the test having different segment shapes (globular, subcylindrical to hoop-like), pore frames and pore shapes. Test terminates with short and tapering tube.

Remarks: *Elbistanium* n. gen. differs from *Xiphotheca* De Wever (in De Wever et al. 1979: p. 93) by having a test gradually increasing in width till third/fifth post-abdominal segment instead of test increasing in width till first post-abdominal segment and hoop-like, narrower first post-abdominal segment instead of very bulbous, globular first post-abdominal segment. It can be differentiated from *Senelella* Tekin (1999, p. 172) by possessing a not globular, hoop-like, less wider and shorter first and second post-abdominal segments without spines.

Included taxa: *Elbistanium gracilum* Tekin n. gen., n. sp., *Elbistanium productum* Tekin n. gen., n. sp., *Elbistanium* sp. A.

Elbistanium gracilum Tekin n. gen., n. sp.
Fig. 7.1–8

Etymology: Latin, *gracilum*: slender.

Holotype: Sample 04-ELB-2 (Fig. 7.1).

Paratypes: Seven specimens from samples 04-ELB-1, 04-ELB-2, 04-ELB-3, 04-ELB-4 and 04-ELB-5 (Fig. 7.2–8).

Type locality and horizon: Köseyahya stratigraphic section, 1 km south of Köseyahya village, Elbistan town, eastern Turkey; cherty limestones in Köseyahya Nappe of middle Carnian (Late Triassic) age (see locality description).

Diagnosis: Slender test multicyrtid gradually increasing in width until third/fourth post-abdominal segment. Following four/five segments subcylindrical and last three segments subspherical to hoop-shaped. Test terminated with short, slightly tapering, porous tube. Aperture at the end of tube small and subcircular.

Description: Test slender, very long with eleven to twelve post-abdominal segments. Cephalothorax hemispherical to dome-shaped with rare circular pores on thorax without spines. While collar stricture indistinct without pores, lumbar stricture prominent and marked by a deep depression. Abdomen to third or fourth post-abdominal segments hoop-shaped with slightly elevated, polygonal pore frames and subcircular to subellipsoidal small pores. Fourth or fifth post-abdominal segment subcylindrical to hemispherical with similar pore frames as previous segments. Test slightly increasing in width until fourth or fifth post-abdominal segment. Next four segments slender, subcylindrical with scattered small, subcircular to subellipsoidal pores and strictures between these segments shallow, gentle and wide. Subsequent two segments subspherical to subcylindrical with slightly elevated net-like pore frames and small to medium-sized, subcircular pores. Last segment hoop-shaped with similar pore frames than previous two segments. Strictures between last three segments gentle, shallow and wide. Tube at the end of the test short, slightly tapering distally, circular to subcircular in axial section and with slightly elevated pore frames and small, subcircular pores. Aperture at terminate of tube small and subcircular.

Measurements: Based on eight specimens, only three are complete (in μm):

	HT	Min.	Max.	Av.
Length of the test	753	680	753	705
Maximum width of the test	82	64	85	72

Remarks: *Elbistanium gracilum* n. gen., n. sp. differs from *Elbistanium productum* n. gen., n. sp. by having a slightly longer test but fewer segments, widest fourth or fifth post-abdominal segment instead of widest third post-abdominal segment, different shape of segments in medial and distal parts instead of regular, globular segments in these parts. It can be differentiated from *Elbistanium* sp. A by possessing a longer test, widest fourth or fifth post-abdominal segment instead of widest third post-abdominal segment, prominent subcylindrical, subspherical to hoop-shaped segments in medial and distal parts instead of subcylindrical segments in medial and distal parts.

Elbistanium productum Tekin n. gen., n. sp.
Fig. 7.12–20

Etymology: Latin, *productum*: lengthened, long.

Holotype: Sample 04-ELB-2 (Fig. 7.12).

Paratypes: Eight specimens from samples 04-ELB-2, 04-ELB-3, 04-ELB-4 and 04-ELB-5 (Fig. 7.13–20).

Type locality and horizon: Köseyahya stratigraphic section, 1 km south of Köseyahya village, Elbistan town, eastern Turkey; cherty limestones in Köseyahya Nappe of middle Carnian (Late Triassic) age (see locality description).

Diagnosis: Test multicyrtid, very long, increase in width until third post-abdominal segment. Second to last post-abdominal segments uniform and globular in shape. Test terminated with short, tapering tube. Aperture small and subcircular.

Description: Test very long, slender with twelve to fourteen post-abdominal segments. Cephalothorax hemispherical to dome-shaped without horns. While cephalis mainly poreless, thorax with scattered, irregular and rare pores. Collar stricture indistinct and poreless. Abdomen to third post-abdominal segments hoop-shaped with highly elevated, polygonal (tetragonal to hexagonal) pore frames

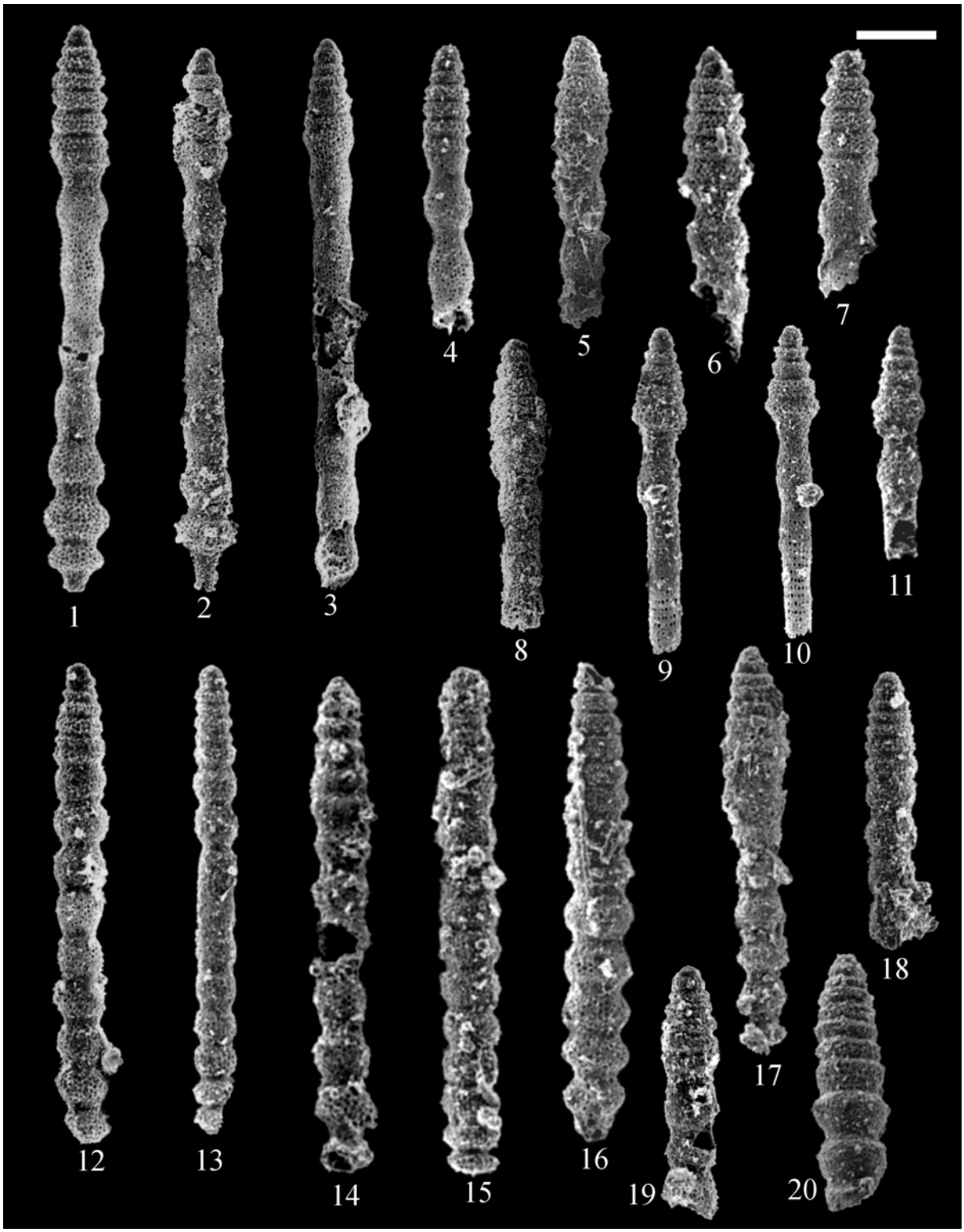

Fig. 7. Scanning electron micrographs of the middle Carnian radiolarian fauna from the Köseyahya stratigraphic section. **1–8** — *Elbistanium gracilum* Tekin n. gen., n. sp.; 1 — Holotype, sample no. 04-ELB-2. Scale bar = 100 μm; 2–8 — Paratypes: 2 — Sample no. 04-ELB-5, 3 — Sample no. 04-ELB-1, 4 — Sample no. 04-ELB-2, 5 — Sample no. 04-ELB-1, 6 — Sample no. 04-ELB-3, 7 — Sample no. 04-ELB-4, 8 — Sample no. 04-ELB-5. Scale bar for all specimens = 100 μm. **9–11** — *Elbistanium* sp. A; 9 — Sample no. 04-ELB-4, 10 — Sample no. 04-ELB-2, 11 — Sample no. 04-ELB-5. Scale bar for all specimens = 100 μm. **12–20** — *Elbistanium productum* Tekin n. gen., n. sp.; 12 — Holotype, sample no. 04-ELB-2; Scale bar = 100 μm. 13–20 — Paratypes: 13 — Sample no. 04-ELB-4, 14 — Sample no. 04-ELB-5, 15 — Sample no. 04-ELB-2, 16 — Sample no. 04-ELB-4, 17 — Sample no. 04-ELB-4, 18 — Sample no. 04-ELB-3, 19 — Sample no. 04-ELB-4, 20 — Sample no. 04-ELB-5; Scale bar for all specimens = 100 μm.

with nodes at pore frame vertices and small subcircular to subelliptical pores. Test increasing in width until third post-abdominal segment. Lumbar stricture and strictures between first to third post-abdominal segments distinct and marked by deep depressions without pores. Following post-abdominal segments globular, spherical to subspherical, uniform, approximately in same width and length with slightly elevated, net-like polygonal (mainly pentagonal to hexagonal) pore frames and small, mainly subcircular pores. Strictures between these segments prominent marked by shallow but wide depressions. Tube (Fig. 7.16) at the end of test tapering distally with scattered irregular pores. Aperture small and subcircular.

Measurements: Based on ten specimens, only six are complete (in μm):

	HT	Min.	Max.	Av.
Length of the test	565	563	680	615
Maximum width of the test	65	55	88	75

Remarks: *Elbistanium productum* n. gen., n. sp. differs from *Elbistanium* sp. A in this study in having globular, uniform segments in medial and distal parts instead of slender, subcylindrical segments in medial and distal parts. It has been compared to *Elbistanium gracilum* n. gen., n. sp. under the latter species.

Elbistanium sp. A
Fig. 7.9–11

Description: Test long with at least six post-abdominal segments. Cephalothorax hemispherical to dome-shaped without horns. While cephalothorax mainly poreless in one specimen (Fig. 7.9), in the other specimen (Fig. 7.10), it includes net-like polygonal pore frames and small, circular pores. Collar stricture indistinct and poreless. Abdomen to third post-abdominal segments hoop-shaped, slightly increasing both in width and height distally and with highly elevated, polygonal (mainly hexagonal) pore frames and small, subcircular pores. Lumbar stricture and strictures between first to third post-abdominal segments distinct and mainly poreless. Last three post-abdominal segments slender, subcylindrical, uniform with aligned, small, subelliptical pores, eight of them visible at one side of the test. Stricture between third and fourth post-abdominal segments very wide and shallow.

Remarks: *Elbistanium* sp. A differs both from *Elbistanium gracilum* n. gen., n. sp. and *Elbistanium productum* n. gen., n. sp. by having a shorter test and subcylindrical segments in medial and distal parts.

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Köseyahya stratigraphic section, Köseyahya village, Elbistan, Turkey.

Nevanellus Kozur et Mostler, 1981

Type species: *Nevanellus conicus* Kozur et Mostler, 1981.

Nevanellus conicus Kozur et Mostler, 1981
Fig. 8.1–2

1981 *Nevanellus conicus* n. sp. Kozur et Mostler, p. 93, pl. 18, fig. 1

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Göstling, Austria; limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Pararuesticyrtium Kozur et Mock
in Kozur & Mostler, 1981

Type species: *Pararuesticyrtium densiporatum* Kozur et Mock in Kozur & Mostler, 1981.

Pararuesticyrtium densiporatum
Kozur et Mock in Kozur & Mostler, 1981
Fig. 8.3

1981 *Pararuesticyrtium densiporatum* n. sp. Kozur et Mock in Kozur & Mostler, p. 94, pl. 16, fig. 1

Stratigraphic range: Late Triassic; early Carnian–middle Carnian.
Occurrence: Western Carpathians; limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Pararuesticyrtium sp. aff. *P. densiporatum*
Kozur et Mock in Kozur & Mostler, 1981
Fig. 8.4

Remarks: This specimen differs from the *Pararuesticyrtium densiporatum* Kozur et Mock by having a shorter test with fewer segments, wider medial part of test and absence of the triangular projections at the distal end.

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Fig. 8. Scanning electron micrographs of the middle Carnian radiolarian fauna from Köseyahya stratigraphic section. **1–2** — *Nevanellus conicus* Kozur et Mostler; 1 — Sample 04-ELB-2, 2 — Sample 04-ELB-2. Scale bar for two specimens = 130 μm. **3** — *Pararuesticyrtium densiporatum* Kozur et Mock; Sample 04-ELB-5; Scale bar = 110 μm. **4** — *Pararuesticyrtium* sp. aff. *P. densiporatum* Kozur et Mock; Sample 04-ELB-3; Scale bar = 120 μm. **5** — *Pararuesticyrtium rariporatum* Kozur et Mostler; Sample 04-ELB-2; Scale bar = 90 μm. **6** — *Pararuesticyrtium* sp. A; Sample 04-ELB-2; Scale bar = 150 μm. **7** — *Pararuesticyrtium* sp. B; Sample 04-ELB-2; Scale bar = 110 μm. **8** — *Ruesticyrtium goczani* Kozur et Mostler; Sample 04-ELB-5; Scale bar = 100 μm. **9–16** — *Xiphotheca karpenissionensis* De Wever; 9 — Sample no. 04-ELB-4, 10 — Sample no. 04-ELB-4, 11 — Sample no. 04-ELB-3, 12 — Sample no. 04-ELB-2; *Continued on the next page.*

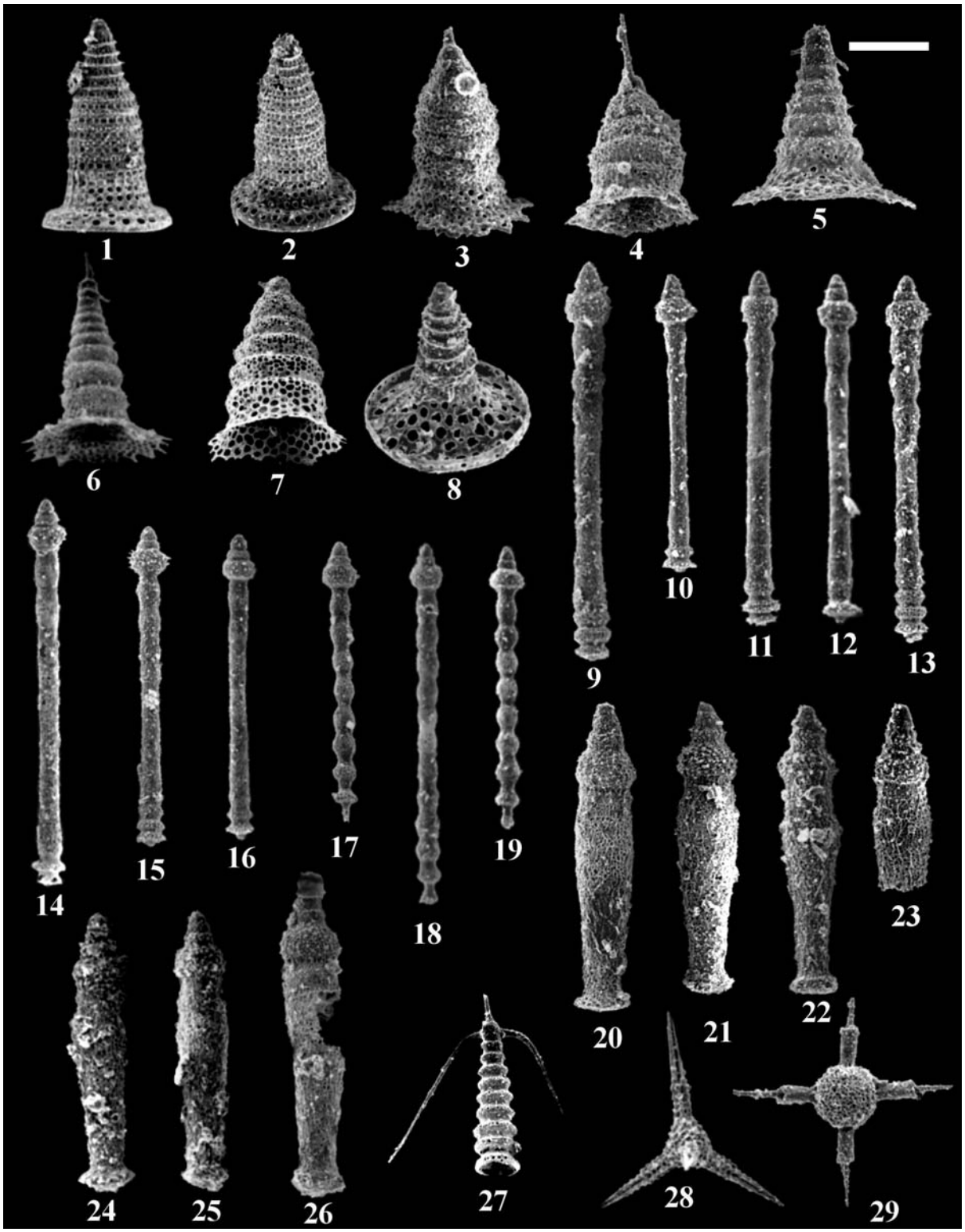

Fig. 8. *Continued from the previous page.* 13 — Sample no. 04-ELB-4, 14 — Sample no. 04-ELB-2, 15 — Sample no. 04-ELB-4, 16 — Sample no. 04-ELB-2; Scale bar for all specimens = 150 μm. **17–19** — *Xiphotheca longa* Kozur et Mock; 17 — Sample no. 04-ELB-4, 18 — Sample no. 04-ELB-4, 19 — Sample no. 04-ELB-2; Scale bar for all specimens = 150 μm. **20–26** — *Xiphotheca munda* Tekin n. sp.; 20 — Holotype, Sample no. 04-ELB-2; Scale bar = 120 μm. 21–26 — Paratypes: 21 — Sample no. 04-ELB-5, 22 — Sample no. 04-ELB-2, 23 — Sample no. 04- ELB-4, 24 — Sample no. 04-ELB-4, 25 — Sample no. 04-ELB-5, 26 — Sample no. 04-ELB-2; Scale bar for all specimens = 120 μm. Some stratigraphically important middle Carnian radiolarian taxa from different families. **27** — *Spinotriassocampe carnica* Kozur et Mostler; Sample no. 04-ELB-2; Scale bar = 118 μm. **28** — *Tetraporobrachia haeckeli* Kozur et Mostler; Sample no. 04-ELB-2; Scale bar = 175 μm. **29** — *Weverella tetrabrachiata* Kozur et Mostler; Sample no. 04-ELB-2; Scale bar = 180 μm.

Pararuesticyrtium rariporatum Kozur et Mostler, 1981
Fig. 8.5

1981 *Pararuesticyrtium rariporatum* n. sp. Kozur et Mostler, pp. 94–95, pl. 16, fig. 2; pl. 17, fig. 2; pl. 18, fig. 3

Stratigraphic range: Late Triassic; middle Carnian.

Occurrence: Göstling, Austria; limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Pararuesticyrtium sp. A
Fig. 8.6

Brief definition: Test long, slender, slightly increasing in width distally with seven post-abdominal segments and wide skirt. Cephalis poreless, hemispherical with long needle-like apical horn and moderately long lateral spine. All strictures deep and narrow. Thorax to last segment hoop-like, gradually increasing in width distally. Post-abdominal segments with polygonal pore frames with mainly subcircular and small pores. Skirt at the end of test abruptly widened distally with same pore frames as post-abdominal segment. Triangular projections and needle-like spines present at the periphery of skirt.

Remarks: This form differs from *Pararuesticyrtium densiporatum* Kozur et Mostler by possessing a slender test with more segments, longer horn and skirt with needle-like spines and triangular projections. It can be also differentiated from *Pararuesticyrtium* sp. B by having a longer, slender test with more and more slender segments, prominent apical horn, well-developed, wider skirt with triangular projections and needle-like spines.

Stratigraphic range: Late Triassic; middle Carnian.

Occurrence: Limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Pararuesticyrtium sp. B
Fig. 8.7

Brief definition: Test with three post-abdominal segment and short skirt at the end of test. Test increasing in width distally. Cephalis small, poreless with small, needle-like lateral spine and probably rudimentary apical horn. Thorax to last segment hoop-like with polygonal pore frames and large, subcircular pores. Skirt short with same pore frames as post-abdominal segments and short, needle-like spines at the periphery.

Remarks: This form differs from *Pararuesticyrtium rariporatum* Kozur et Mostler by possessing a slightly shorter test with fewer and wider segments, larger pores on thorax to last post-abdominal segment and shorter skirt. It is compared to *Pararuesticyrtium* sp. A under the latter taxon.

Range: Late Triassic; middle Carnian.

Occurrence: Limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Ruesticyrtium Kozur et Mostler, 1979

Type species: *Ruesticyrtium rieberi* Kozur et Mostler, 1979.

Ruesticyrtium goczani Kozur et Mostler, 1981
Fig. 8.8

1981 *Ruesticyrtium goczani* n. sp. Kozur et Mostler, p. 95, pl. 17, fig. 1; pl. 18, fig. 2

Range: Late Triassic; middle Carnian.

Occurrence: Göstling, Austria; limestone beds at the basal part of the Köseyahya stratigraphic section, Köseyahya Nappe, Elbistan, Turkey.

Genus: *Xiphotheca* De Wever in De Wever et al., 1979

Type species: *Xiphotheca karpenissionensis* De Wever in De Wever et al., 1979.

Xiphotheca karpenissionensis De Wever in De Wever et al., 1979 emend. herein
Fig. 8.9–16

pars 1979 *Xiphotheca karpenissionensis* n. sp. De Wever in De Wever, Sanflippo, Riedel & Gruber, p. 93, pl. 7, figs. 1, 2 **non** 3, 4, 5
pars 1982 *Xiphotheca karpenissionensis* De Wever — De Wever, pp. 318–319, pl. 47, figs. 2, 3, 5 **non** 4
1995 *Xiphotheca karpenissionensis* De Wever — Halamic & Gorican, pl. 1, fig. 25
1999 *Xiphotheca* sp. cf. *X. karpenissionensis* De Wever — Tekin, p. 174, pl. 42, fig. 12
2002 *Xiphotheca karpenissionensis* De Wever — Wang, Wang & Pei, p. 331, pl. 2, figs. 20, ?21
2002 *Xiphotheca karpenissionensis* De Wever — Tekin, Goncuo□lu & Turhan, p. 132, figs. 5–11, 12

Emended definition: Test very long with presumably ten to twelve (mainly eleven) post-abdominal segments. Cephalothorax small, dome-shaped to hemispherical, poreless without horns. Abdomen wider than cephalothorax, disc-shaped to subtrapezoidal, mainly poreless locally with small scattered pores. Collar stricture not prominent, lumbar stricture distinct and marked by relatively deep and narrow depression. First post-abdominal segment bulbous, globular, mainly irregular, sometimes net-like, elevated, polygonal (trigonal to hexagonal) pore frames with nodes at pore frame vertices and small to medium-sized, circular to subelliptical pores. Following segments decreasing in width drastically after first post-abdominal segment. Second and third post-abdominal segments subcylindrical to elongated barrel-shaped. Following possibly five to six post-abdominal segments uniform, overall cylindrical in outline without strictures. In some cases (Fig. 7.9,13), the fourth post-abdominal segment resembles to second and third post-abdominal segments, subcylindrical to elongate barrel-shaped. From second to eighth or ninth post-abdominal segments, test includes irregular, slightly elevated, polygonal pore frames with very small nodes at pore frame vertices and small, sub-

circular to subelliptical pores. Mainly last three (Fig. 7.9,11,13,15), in some cases last two (Fig. 7.8,14,16) or last (Fig. 7.12) segments/segment wider than the cylindrical part, hoop-like with polygonal (mainly hexagonal) pore frames with large, subcircular pores. Very short, rudimentary, slightly tapering tube present at the end of tube (Fig. 7.10,12,15,16). Aperture very small and subcircular.

Remarks: Abundant, very well-preserved and complete specimens (more than thirty) of *Xiphotheca karpenissionensis* De Wever were obtained from the Köseyahya stratigraphic section. As the type material of this species erected by De Wever et al. (1979) was not complete, a new definition of this species was carried out by using this material. New material clearly reveals that the fourth post-abdominal segment of the form could be subcylindrical as second and third post-abdominal segments. This part is followed by long, overall cylindrical part possibly corresponding to five/six segments. Distal part of test shows variations; last three/two segments or only last segment can be hoop-like and the tube at distal end is very short.

Measurements: Based on the twenty-six type specimens (in μm):

	Min.	Max.	Av.
Length of the test	470	716	627
Maximum width of the test	67	95	79

Stratigraphic range: Late Triassic; middle Carnian–late Carnian–?middle Norian.

Occurrence: Karpenission, Greece; northwestern Croatia; Bozkir, Konya, Igdecik village, Central Sakarya and Köseyahya stratigraphic section, Köseyahya village, Elbistan, Turkey; ?Tibet, China.

Xiphotheca longa Kozur et Mock in
Kozur & Mostler, 1981 emend. Tekin, 1999
Fig. 8.17–19

1979 *Xiphotheca* sp. — Pessagno, Finch & Abbott, pl. 5, fig. 5
1981 *Xiphotheca longa* n. sp. Kozur et Mock in Kozur & Mostler, pp. 113–114, pl. 41, fig. 2
1986 *Xiphotheca karpenissionensis* De Wever — Sato, Murata & Yoshida, fig. 16.14
1989 *Xiphotheca longa* Kozur et Mock — Yeh, p. 71, pl. 8, fig. 1
1992 *Xiphotheca karpenissionensis* De Wever — Otsuka, Kajima & Hori, pl. 3, figs. 17–18
1992 *Xiphotheca* cf. *longa* Kozur et Mock — Otsuka, Kajima & Hori, pl. 3, fig. 19
emend. 1999 *Xiphotheca longa* Kozur et Mock — Tekin, p. 174, pl. 42, figs. 13–14
1999 *Xiphotheca longa* Kozur et Mock — Bragin & Krylov, 567, figs. 13E–G
2002 *Xiphotheca longa* Kozur et Mock — Wang, Wang & Pei, p. 331, pl. 2, figs. 20, ?21
2003 *Xiphotheca longa* Kozur et Mock — Tekin & Yurtsever, p. 158, pl. 2, fig. 14
2005 *Xiphotheca longa* Kozur et Mock — Bertinelli, Chiari & Marcucci, figs. 4–19, 20
2005 *Xiphotheca longa* Kozur et Mock — Bertinelli, Ciarapica & Passeri, fig. 15–1

Stratigraphic range: Late Triassic; middle Carnian–early middle Norian–?late middle Norian.

Occurrence: Baja California, Mexico; Western Carpathians; Oman; East-Central Oregon, USA; Kyushu, Japan; Yaylakuzdere and Gökcam sections, Antalya and Köseyahya stratigraphic section, Elbistan, Turkey; Tibet, China; Central Apennines, Italy.

Xiphotheca munda Tekin n. sp.
Fig. 8.20–26

Etymology: Latin, *munda*: clean, neat, elegant.

Holotype: Sample 04-ELB-2 (Fig. 8.20).

Paratypes: Six specimens from samples 04-ELB-2, 04-ELB-4 and 04-ELB-5 (Fig. 8.21–26).

Type locality and horizon: Köseyahya stratigraphic section, 1 km south of Köseyahya village, Elbistan town, eastern Turkey; cherty limestones in the Köseyahya Nappe of middle Carnian (Late Triassic) age (see locality description).

Diagnosis: Test multicyrtid, increasing in width until first post-abdominal segment. First post-abdominal segment bulbous and overall shape of the second post-abdominal to last segment cylindrical. Distal end of the test widened and aperture large.

Description: Test moderately long with presumably eight post-abdominal segments. Cephalis dome-shaped and poreless without horns. Thorax and abdomen hoop-shaped, gradually increasing in width distally. They have irregular, elevated, polygonal (trigonal to hexagonal) pore frames with small nodes at pore frame vertices and subcircular to subelliptical pores in different size. Collar and lumbar strictures indistinct and marked only by shallow depressions with pores. First post-abdominal segment bulbous, subglobular with same pore frames as thorax and abdomen. Second to possible eight post-abdominal segments overall subcylindrical in outline. No stricture visible between these segments but in some cases, row of pores indicate the segment division (Fig. 8.26). These post-abdominal segments include irregular, polygonal (trigonal to hexagonal) pore frames with nodes at pore frame vertices and subcircular to subelliptical pores in different size. Distal end of the test widened and brimmed. Aperture large and subcircular.

Measurements: Based on seven type specimens, six are complete (in μm):

	HT	Min.	Max.	Av.
Length of the test	461	400	472	443
Maximum width of the test	92	78	92	88

Remarks: *Xiphotheca munda* Tekin n. sp. differs from *Xiphotheca longa* Kozur et Mock by possessing a shorter test, fewer segments, wider and longer proximal part (cephalothorax to first post-abdominal segment), wider, overall subcylindrical medial to distal parts (second to eight post-abdominal segments) instead of globular, uniform segments in medial and distal part and wider aperture at the end of the test.

Family: **Planispinocyrtiidae** Kozur et Mostler, 1981

Genus: *Spinotriassocampe* Kozur, 1984

Type species: *Spinotriassocampe hungarica* Kozur, 1984.

Spinotriassocampe carnica Kozur et Mostler, 1994
Fig. 8.27

1994 *Spinotriassocampe carnica* n. sp. Kozur et Mostler, p. 105, pl. 26, fig. 7
non 1997 *Spinotriassocampe carnica* Kozur et Mostler Group — Sugiyama, p. 187, fig. 49–3 (?=*S. longobardica* Kozur et Mostler)
1999 *Spinotriassocampe carnica* Kozur et Mostler — Tekin, p. 151, pl. 34, fig. 4

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Sicily, Italy; Haciyunuslar stratigraphic section, Bozkir, Konya, and Köseyahya stratigraphic section, Elbistan, Turkey.

Suborder: **Spumellariina** Ehrenberg, 1838
Superfamily: **Pyloniacea** Haeckel, 1881 emend. Dumitrica in De Wever et al., 2001
Family: **Hagiastridae** Riedel, 1967

Genus: *Tetraporobrachia* Kozur et Mostler, 1979

Type species: *Tetraporobrachia haeckeli* Kozur et Mostler, 1979.

Tetraporobrachia haeckeli Kozur et Mostler, 1979
Fig. 8.28

1979 *Tetraporobrachia haeckeli* n. sp. Kozur et Mostler, p. 79, pl. 4, fig. 6; pl. 5, fig. 1
1984 *Tetraporobrachia haeckeli* Kozur et Mostler — Lahm, pp. 26–27, pl. 3, fig. 4
1999 *Tetraporobrachia haeckeli* Kozur et Mostler — Tekin, p. 127, pl. 25, fig. 2
2002 *Tetraporobrachia haeckeli* Kozur et Mostler — Wang, Wang & Pei, p. 330, pl.1, figs. 22–23
2005 *Tetraporobrachia haeckeli* Kozur et Mostler — Feng, Malila, Wonganan, Chonglakmani, Helmcke, Ingavat-Helmcke & Caidroit, p. 249, pl. 2, fig. 22

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Göstling and Grossreifling, Austria; Haciyunuslar stratigraphic section, Bozkir, Konya and Köseyahya stratigraphic section, Elbistan, Turkey; Tibet, China; Northwest Thailand.

Suborder: **Entactinaria** Kozur et Mostler, 1982
?Family: **Capnuchosphaeridae** De Wever in De Wever et al., 1979 emend. Pessagno in Pessagno et al., 1979 emend. Blome, 1983

Genus: *Weverella* Kozur et Mostler, 1979

Type species: *Weverella tetrabrachiata* Kozur et Mostler, 1979.

Weverella tetrabrachiata Kozur et Mostler, 1979
Fig. 8.29

1979 *Weverella tetrabrachiata* n. sp. Kozur et Mostler, pp. 76–77, pl. 14, fig. 8
1981 *Weverella tetrabrachiata aspinosa* Kozur et Mostler n. subsp., p. 77, pl. 63, fig. 3
1999 *Weverella tetrabrachiata aspinosa* Kozur et Mostler — Tekin, p. 85, pl. 7, fig. 13

Stratigraphic range: Late Triassic; middle Carnian.
Occurrence: Göstling and Grossreifling, Austria; Haciyunuslar stratigraphic section, Bozkir, Konya and Köseyahya stratigraphic section, Elbistan, Turkey.

Radiolarian assemblage and biostratigraphy

As was explained in a previous chapter, the radiolarian fauna from the basal part of the Köseyahya stratigraphic section is very abundant and diverse in taxa belonging to the Ruesticyrtiidae. Radiolarian taxa from the other families are also very diverse. They include: *Vinassaspongus subsphaericus* Kozur et Mostler, *Zhamojdasphaera latispinosa* Kozur et Mostler, *Capnuchosphaera deweveri* Kozur et Mostler, *C. lea* De Wever, *C. triassica* De Wever, *Dumitricasphaera simplex* Tekin, *Divatella spinosa* Kozur et Mostler, *Weverella tetrabrachiata* Kozur et Mostler, *Palaeosaturnalis hugluensis* Tekin, *Triassocrucella baloghi* (Kozur et Mostler), *Spongostylus carnicus* Kozur et Mostler, *S. tortilis* Kozur et Mostler, *Tetraporobrachia haeckeli* Kozur et Mostler, *Hindeosphaera bispinosa* Kozur et Mostler, *Pseudostylosphaera hellenica* (De Wever), *Bulbocyrtium reticulatum* Kozur et Mostler, *Deflandrecyrtium curvatum* (Kozur et Mostler), *Nevanellus conicus* Kozur et Mostler, *Annulopoulpus reticulatus* Kozur et Mostler, *Picapora robusta* Kozur et Mostler, *Pseudosaturniforma carnica* Kozur et Mostler, *Spinotriassocampe carnica* Kozur et Mostler.

Some taxa are stratigraphically important and were previously found only in middle Carnian strata of Austria and Turkey. They includes: *Dumitricasphaera simplex* Tekin, *Divatella spinosa* Kozur et Mostler, *Weverella tetrabrachiata* Kozur et Mostler (Fig. 8.29), *Palaeosaturnalis hugluensis* Tekin, *Triassocrucella baloghi* (Kozur et Mostler), *Tetraporobrachia haeckeli* Kozur et Mostler (Fig. 8.28), *Nevanellus conicus* Kozur et Mostler (Fig. 8.1–2), *Picapora robusta* Kozur et Mostler and *Spinotriassocampe carnica* Kozur et Mostler (Fig. 8.27).

The radiolarian fauna from the basal part of the Koseyahya stratigraphic section is well-correlated to the "*Tetraporobrachia haeckeli*" Radiolarian Zone suggested by Kozur et Mostler (1994) for middle Carnian (Fig. 9). It is also correlated with the *Capnuchosphaera* Lowest-occurrence Zone suggested by Sugiyama (1997) due to co-occurrence of *Capnuchosphaera deweveri* Kozur et Mostler, *C. triassica* De Wever, *Annulotriassocampe baldii* Kozur etc. According to Sugiyama (1997), the characteristic fauna of overlying *Poulpus carcharus* Lowest-occurrence Zone is represented by *Poulpus carcharus* Sugiyama, *Enoplocampe yehae* Sugiyama,

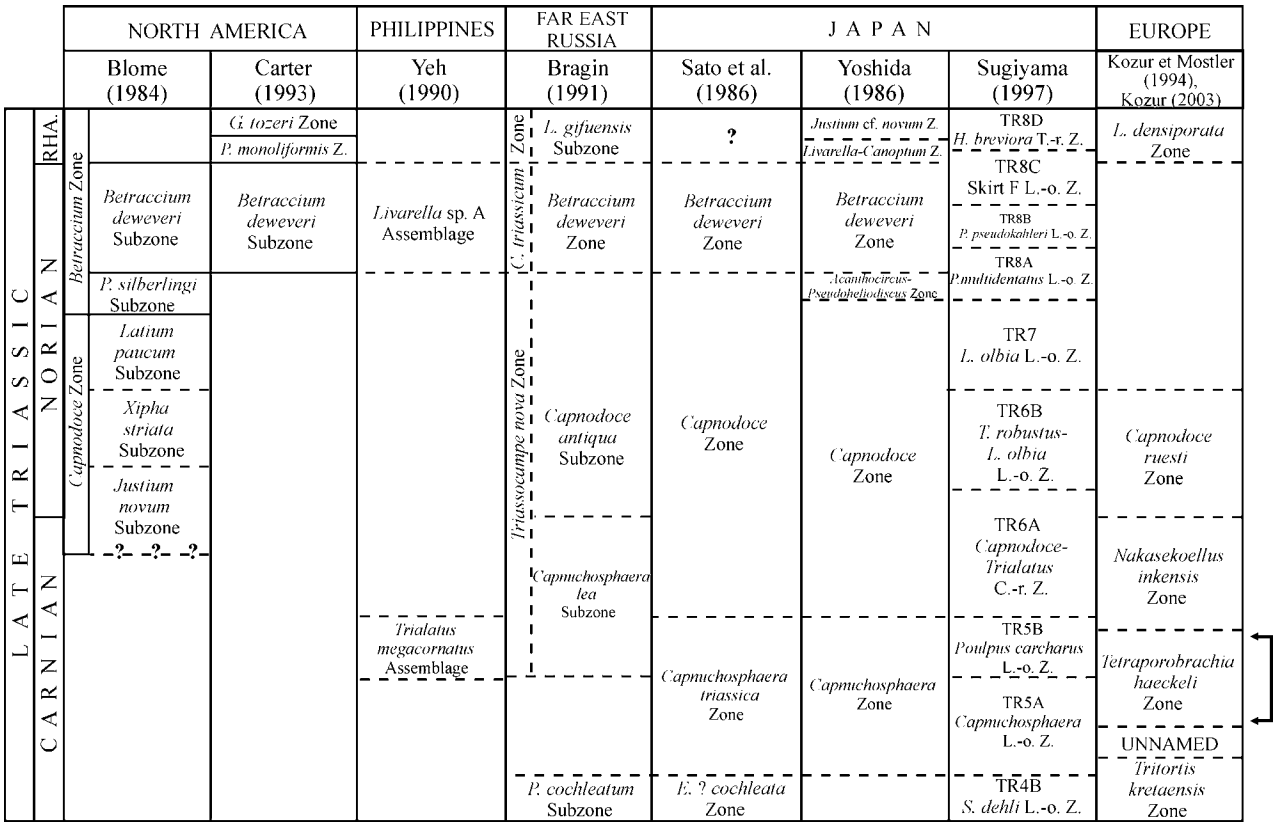

Fig. 9. Late Triassic radiolarian zonations and assemblages of Blome (1984), Sato et al. (1986), Yoshida (1986), Yeh (1990), Bragin (1991), Carter (1993), Kozur et Mostler (1994) Sugiyama (1997) and Kozur (2003). Bracket indicates the stratigraphic position of radiolarian fauna from the Köseyahya stratigraphic section within the Köseyahya Nappe.

Japonocampe nova (Yao), *Kahlerosphaera norica* Kozur et Mostler, *Capnuchosphaera lea* De Wever, *C. theloides* De Wever, *C. tricornis* De Wever. Although fauna from the basal part of the Koseyahya stratigraphic section does not contain *Poulpus carcharus* Sugiyama, *Enoplocampe yehae* Sugiyama, *Japonocampe nova* (Yao), *Kahlerosphaera norica* Kozur et Mostler characterizing this zone, some of the characteristic taxa such as *Capnuchosphaera lea* De Wever from this zone are present in the fauna. Based on this assemblage, radiolarian fauna from the basal part of the Köseyahya stratigraphic section is also partly correlated to the *Poulpus carcharus* Lowest-occurrence Zone.

The age of the obtained fauna could not be latest Carnian corresponding to *Capnodoce-Trialatus* Concurrent-range Zone by Sugiyama (1997), as it does not have *Capnodoce* and associated characteristic fauna of this zone. The fauna from the basal part of the Köseyahya stratigraphic section is also presumably correlated with the *Capnuchosphaera triassica* Zone proposed by Sato et al. (1986) and *Capnuchosphaera* Zone by Yoshida (1986) (Fig. 9).

Sample (06-MYB-10B) derived from the strata over Radiolaria-bearing samples (Fig. 3) in the section includes characteristic ammonite taxa such as *Tropites* cf. *subbulatus* (determined by Leopold Krystyn, Vienna, Austria) indicating middle late Carnian age. This evidence also confirms the middle Carnian age for the underlying Radiolaria-bearing strata. On the basis of the presence of the index form and associated radiolarian fauna, the age of the basal part of the Köseyahya stratigraphic section from the Köseyahya Nappe is assigned to the middle Carnian.

Conclusions

On the basis of the radiolarian fauna obtained from Köseyahya stratigraphic section from Köseyahya Nappe near to Elbistan town, Eastern Taurides, a new genus of Ruesticyrtiidae, *Elbistanium* Tekin n. gen., two new species of this genus, (*Elbistanium gracilum* Tekin n. gen., n. sp. and *Elbistanium productum* Tekin n. gen., n. sp.) are described. In addition to this, *Xiphotheca munda* Tekin n. sp. is defined as a new species. This material also allowed us to emend the definitions of *Xiphotheca karpenissionensis* De Wever.

The radiolarian fauna from the basal part of this section is very similar to the faunas previously obtained from Huglu Unit in Beysehir-Hoyran Nappes, Central Taurides and Turunç Unit of the Gülbahar Nappe in Lycien Nappes, Western Taurides. In comparison to previously well-defined middle Carnian radiolarian faunas from Austria, Japan and Turkey, it can be concluded that the age of

radiolarian fauna from the basal part of the Köseyahya stratigraphic section is middle Carnian.

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