Bull. Soc. vaud. Sc. nat. 90.4: 197-215 ISSN 0037-9603

Further new Nassellaria of the lower Tuvalian (Upper Triassic) *Spongotortilispinus moixi* Zone of the Huğlu Unit in the Mersin Mélange

by

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Abstract.–KOZUR H.W., MOIX P. and OZSVÁRT P., 2007. Further new Nassellaria of the lower Tuvalian (Upper Triassic) *Spongotortilispinus moixi* Zone of the Huğlu Unit in the Mersin Mélange. *Bull. Soc. vaud. Sc. nat. 90.4*: 197-215.
Two new families, Spinomersinellidae and Stampfliellidae, two new genera, *Spinomersinella* and *Stampfliella*, 16 new species and two new subspecies (all Nassellaria, Radiolaria) are described from the lower Tuvalian (Upper Triassic) *Spongotortilispinus moixi* Zone of the Huğlu Unit in the Mersin Mélange, southeastern Turkey. Additionally, a new lower Norian genus *Triarcopoulpus* with the new species *T. norica* is established.

Keywords: Nassellaria (radiolarians), lower Tuvalian, Huğlu Unit, Mersin Mélange.

Résumé.–KOZUR H.W., MOIX P. et OZSVÁRT P., 2007. Autres nouveaux Nassellaires de la Zone à *Spongotortilispinus moixi* du Tuvalien inférieur (Trias supérieur) de l'unité de Huğlu appartenant au mélange de Mersin (SE de la Turquie)**.** *Bull. Soc. Vaud. Sc. nat. 90.4*: 197-215.
Deux nouvelles familles, les Spinomersinellidae n. fam. et Stampfliellidae n. fam., deux nouveaux genres, *Spinomersinella* et *Stampfliella*, 16 nouvelles espèces et deux nouvelles sous-espèces (Nassellaires, Radiolaires) appartenant à la zone à *Spongotortilispinus moixi* du Tuvalien inférieur (Trias supérieur) de l`unité de Huğlu du mélange de Mersin (SE de la Turquie) sont décrits. De plus, le genre *Triarcopoulpus* n. gen. ainsi que la nouvelle espèce *T. norica* n. gen. n. sp. du Norien inférieur ont été établis.

Mots clés: Nassellaires (radiolaires), Tuvalien inférieur, Unité de Huğlu, Mélange de Mersin

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CODEN: BSVAA6

Introduction

The best-preserved and most diverse radiolarian fauna of the lower Tuvalian *Spongotortilispinus moixi* Zone (Moix *et al.* 2007) has been derived from the Huğlu Unit of the Tavusçayırı Block (Masset and Moix 2004) in the Mersin Mélange, southeastern Turkey. The richest fauna was found in sample G11, a limestone intercalation within thick tuffs. This is the type stratum of all new radiolarian taxa described in the present paper unless otherwise indicated. The geological setting is discussed by Moix *et al.* (2007). The locality map and the position of sample G11 are presented also in Kozur et al. (this volume), and are therefore not repeated in the present paper, in which further Nassellaria (new species of *Alatipicapora* Tekin 1999, *Podobursa* Wisniowski 1889, *Syringocapsa* Neviani 1900, *Spinomersinella* n. gen., *Stampfliella* n. gen. and *Spinoprotunuma* n. gen.) are described that are characteristic for the *S. moixi* Zone. The illustrated material is deposited in the Hungarian Natural History Museum.

Order Nassellaria Ehrenberg, 1875

Remarks: Families are listed in alphabetic order.
Abbreviations: Mb = median bar, A = apical spine, D = dorsal spine, V = ventral spine, 2 L = two primary lateral spines, 2 l = two secondary lateral spines.

Family Muellericyrtiidae Kozur & Mostler, 1981 emend. Kozur & Mostler, 2006

Genus *Alatipicapora* Tekin, 1999
Type species: *Alatipicapora gediki* Tekin, 1999

Alatipicapora tetrapedis n. sp.

(Plate 1, Figure 16)

Derivatio nominis: In allusion to the presence of four feet.
Holotype: The specimen on Plate 1, Figure 16 (rep.-no. 23-9-04/V-202).
Material: 3 specimens.
Diagnosis: Cephalis moderately large, subglobular, with minute pores, which are almost all closed by a layer of microgranular silica. Apical horn very large, broad, tricarinate. Ridges high, narrow, separated by three wide furrows. Ventral horn large and tricarinate. Three vertical ridges are present on the cephalis that are situated in continuation of the outer ridge of the thorax feet. No collar stricture is visible on the shell. Thorax large, inflated, narrows distally. The pores are very small and often closed by a layer of microgranular silica.

Aperture large. Four thorax feet are present, three tricarinate and situated in prolongation of D and 2 L. The outer ridge of these feet runs up to the cephalis. On the thorax, it changes into a rounded wing with a large, relatively narrow lobe that has a rounded end and bears a few pores. The other two ridges are not elevated. All ridges are narrow with wide inter-ridge furrows. The fourth thorax foot is smaller, distally needle-like but proximally somewhat wider. The spicular system has the spines A, V, 2 L, D, 2 l.
Occurrence: Lower Tuvalian Huğlu Unit of the Mersin Mélange.

Remarks: The apical horn of *Alatipicapora gediki* Tekin, 1999 is smaller than in the new species, the wings have at least on one side several lobes that are smaller than the one lobe in *A. tetrapedis* n. sp., and only 3 thorax feet are present. In *Alatipicapora spinosa* n. sp. the wings end in a spine on their outer side. *Alatipicapora latoalata* n. sp. has broader, bigger wings.

Alatipicapora spinosa n. sp.
(Figure 1A, B)

Derivatio nominis: In allusion to the spine on the lobe of the wings.
Holotypus: The specimen on Figure 1B (rep.-no. 23-9-04/II-75). Material: 12 specimens.
Diagnosis: Cephalis moderately large, rounded-conical, not separated from the thorax. Surface with several ribs. Three of them are very high and situated in continuation of the wings. At least two of them join the ridges of the very large apical horn. Shorter ridges originate as radial ridges from the vertical horn. The pores of the cephalis are very small with some closed by a layer of microgranular silica. Apical horn very large, tricarinate, with narrow high ridges and broad furrows between them. The ridges may bear a few obliquely upward directed spines. Vertical horn large, proximally tricarinate, distally needle-like. Thorax large, frustum-like. Pores very small, partly closed by a layer of microgranular silica. Marginal parts of the aperture or the entire aperture closed by a latticed layer. The three thorax feet in continuation of D and 2 L are large, straight, downwardly and somewhat outwardly directed. They are tricarinate with high narrow ridges and broad, deep furrows between them. The outer ridge is especially high and continues on the thorax, where it changes into a high wing with a large lobe that ends in a triangular spine on its outer margin. On the cephalis the continuation of the wings changes again into a very high narrow ridge that ultimately connects with the ridges on the apical horn. The wings have scattered small to medium-sized pores.
Occurrence: Lower Tuvalian Huğlu Unit of the Mersin Mélange.

Remarks: The wings do not end in a spine in any other *Alatipicapora* species.

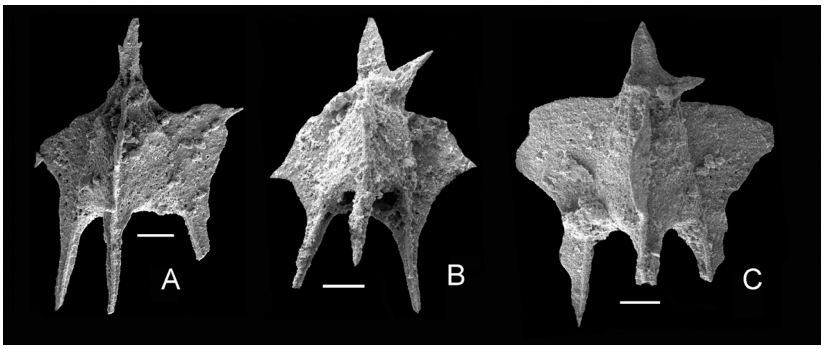

Figure 1.–A, B: *Alatipicapora spinosa* n. sp.; A: vertical horn broken away, rep.-no. 23-9-04/VI-139; B: holotype, rep.-no. 23-9-04/II-75.
C: *Alatipicapora latoalata* n. sp., holotype, rep.-no. 23-9-04/III-95.
Scale = 50 μm

Alatipicapora latoalata n. sp.
(Figure 1C)

Derivatio nominis: In allusion to the very broad wings.
Holotypus: The specimen on Figure 1C (rep.-no. 23-9-04/III-95). Material: 2 specimens.
Diagnosis: Cephalis large, broadly rounded-conical to subglobular, not separated from the thorax. Its surface has several vertical ribs. Three of them are very high and represent the proximal end of the wings and its proximal continuation into a very high, very narrow rib that is connected by an oblique rib with the high ridge of the apical horn. The other vertical ribs are narrow and rather indistinct. Most of the minute pores are closed by a layer of microgranular silica. Apical horn very large, broad, tricarinate with high, narrow ridge and broad, deep furrows. Vertical horn large, tricarinate, with broad, high ridges and deep furrows. Thorax large, long, frustum-like. Pores very small, mostly closed by a layer of microgranular silica. Aperture narrowed or closed by a latticed layer. The three large thorax feet are directed downward and very slightly outward; they have three high narrow ridges separated by deep and wide furrows. The outer ridge is highest and immediately begins to change into the narrow end of the wings. On the thorax the wings are very high, broadly rounded or with one or two broadly rounded lobes. They are widest in the proximal part of the thorax and become rapidly lower in the cephalis. The wings are thin and have a few, widely scattered very small pores. They are mostly closed by a layer of microgranular silica.
Occurrence: Lower Tuvalian Huğlu Unit of the Mersin Mélange.

Remarks: In *Alatipicapora spinosa* n. sp. the lobes of the wings end in a triangular spine.

Family Spinomersinellidae n. fam.

Diagnosis: Large, multicyrtid conical Nassellaria. Cephalis large, subglobular to rounded and frustum-like, with a long, needle-like or very small, tricarinate horn. Segments separated by narrow rings that are partly visible on the shell surface, but sometimes covered by the shell. The wall has irregularly shaped small and large pores. The surface has few to numerous large, tricarinate spines. Large vertical horn always present. Further large horns in prolongation of D and 2 L may be present. Spicular system with Mb, A, V, 2 L, D, 2 l.
Assigned genus: *Spinomersinella* n. gen.
Occurrence: Rare in the lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: Multicyrtid Nassellaria with numerous large spines are very rare. Similar strongly spiny forms occur among some Unumidae Kozur, 1984, but this family is characterised by strong vertical ribs with or without spines. It is obviously not closely related to the Spinomersinellidae n. fam.
In the Eucyrtidiidae Ehrenberg, 1847 some strongly spiny forms with distinct narrow rings also occur, such as *Arthophormis* Haeckel, 1882 and *Cyrtophormis* Haeckel, 1887 (including *Cyrtophormiscus* Haeckel, 1887). They have no vertical horn or horns in prolongation of other spines of the inner spicular system, but they often have a cylindrical distal tube, as in the strongly spiny *Cyrtophormis* Haeckel, 1887, which has a smaller cephalis and a distal tube. We assume that the Spinomersinellidae belong to the Eucyrtidiacea Ehrenberg, 1847. They may be forerunners of the Eucyrtidiidae Ehrenberg, which are mainly distinguished by the small cephalis with a different spicular system and the generally closed or strongly narrowed distal aperture.

Genus *Spinomersinella* n. gen.

Derivatio nominis: In reference to the occurrence in the Mersin Mélange and in allusion to the strongly spiny shell.
Type species: *Spinomersinella goricanae* n. gen. n. sp.
Diagnosis, occurrence and remarks: As for the family.
Assigned species: *Spinomersinella goricanae* n. gen. n. sp.; *S. multispinosa* n. sp.

Spinomersinella goricanae n. sp.
(Plate 1, Figure 14)

Derivatio nominis: In honour of Prof. Dr. Špela Goričan, Ljubljana, for her excellent work on Mesozoic radiolarians.
Holotypus: The specimen on Plate 1, Figure 14 (rep.-no. 23-9-04/I-64).

Material 7 specimens.
Diagnosis: With the characteristics of the genus. Cephalis large, subglobular to rounded, frustum-like, with a very small tricarinate apical horn. Surface of cephalis rough and with indistinct, short, very thin, irregular vertical ribs in the lower part of the cephalis. The small pores are mainly closed by a layer of microgranular silica. The narrow ring between the cephalis and thorax is readily visible on the surface, but somewhat overgrown by the wall. Thorax trapezoidal, lower than cephalis. The surface is rough and has some very narrow, indistinct irregular vertical ribs that partly cross the ring to the cephalis. The small to minute pores are in part closed by a layer of microgranular silica. A very strong vertical horn is present that is tricarinate with deep furrows between the ridges. In its proximal part the furrows are overgrown by the shell and this part bears large pores. The narrow ring against the subtrapezoidal abdomen is in some areas clearly visible on the surface, but in other areas totally overgrown by the shell. The pores of the abdomen are small to medium-sized. The narrow ring, located between the abdomen and the low but wide subtrapezoidal to subcylindrical first post-abdominal segment, is readily visible on the outer side of the wall. The narrow ring between the first post-abdominal segment and the distinctly higher, cylindrical second post-abdominal segment, is generally readily visible on the outer side. This segment is the widest segment. The third post-abdominal segment is narrower, but also high. All post-abdominal segments have large and medium-sized, subcircular, oval and irregularly shaped pores. The aperture is large. Some scattered large tricarinate spines with narrow, high ridges and deep furrows between them are present on the post-abdominal wall. In their proximal part the spines are overgrown by the shell which bears in this part large pores.
Occurrence: Lower Tuvalian Huğlu Unit of the Mersin Mélange.

Remarks: *Spinomersinella multispinosa* n. gen. n. sp. has a greater number of large spines on the wall. Deep furrows are present only on the proximal part of the spines; the distal part has a triangular cross section or is needle-like. A large, needle-like apical horn and large horns in prolongation of V, 2 L, D, and 2 l are present.

Spinomersinella multispinosa n. sp.
(Plate 1, Figure 15)

Derivatio nominis: In allusion to the numerous spines on the test.
Holotypus: The specimen on Plate 1, Figure 15 (rep.-no. 23-9-04/II-84).
Material: 4 specimens.
Diagnosis: With the characteristics of the genus. Narrow rings between the segments mostly not visible on the outer side of the wall. Cephalis subglobular, with rough surface and a large, needle-like apical horn. Minute

pores mostly closed by a layer of microgranular silica. Thorax frustum-like with medium-sized to large pores and several big horns in prolongation of V, 2 L, D, 2 l. These horns, like all other large spines on the surface of the wall, are tricarinate with deep furrows between the ridges. Their proximal part is overgrown by shell material with large pores. In their distal part the furrows become shallower and finally disappear. Abdomen trapezoidal, with big pores and very large, tricarinate spines that are proximally overgrown by shell material with big pores. The furrows are proximally deep and disappear in the triangular to needle-like distal part. First and second post-abdominal segment cylindrical, second post-abdominal segment somewhat narrower than the first. Pores in both segments large. Narrow ring between the abdominal and first post-abdominal and between the two post-abdominal segments partly visible. Several big spines are present on the abdomen and the post-abdominal segments. They are tricarinate, proximally with deep furrows and there overgrown by shell material with big pores. Distally the furrows become shallow and ultimately disappear, while the spines become needle-like. Several long, needle-like spines are present at the margin of the large aperture.
Occurrences: Lower Tuvalian Huğlu Unit of the Mersin Mélange.

Remarks: For differences from *Spinomersinella goricanae* n. gen. n. sp. see remarks under that species.

Family Stampfliellidae n. fam.

Diagnosis: Monocyrtid Nassellaria with subglobular, large, poreless cephalis, with or without velum, with or without large apical horn. The three very large feet in prolongation of D and 2 L are tricarinate, strongly curved and join at their distal ends forming a cage-like structure with three large windows. Aperture wide, in forms with a velum somewhat narrowed, in forms without a velum surrounded by a ring structure. Internal spicular system with A, V, 2 L, D, 2 l.
Occurrence: Upper Carnian and Lower Norian of Tethys.
Assigned genera: *Stampfliella* n. gen.; *Triarcopoulpus* n. gen.

Remarks: The Sanfilippoellidae Kozur & Mostler, 1979 (= Poulpidae DeWever, 1981) have unfused feet. In the transitional genus *Veghia* Kozur & Mostler, 1981 the three feet are inward-curved, but do not touch each other. Tekin (1999) questioned whether the distal ends of the feet in *Veghia* were fused or not, because too little material was known at that time. However, the Julian type species of *Veghia* is rather common and it can be easily recognised by the unique development of the distal ends of the feet, whether the distal end is preserved or not. None of these forms has fused distal ends of the feet.

Stampfliella n. gen.

Type species: *Stampfliella tuvalica* n. gen. n. sp.
Derivatio nominis: In honour of Prof. Dr. G. Stampfli, Lausanne for his outstanding work on Tethyan palaeogeography.
Diagnosis: With the characteristics of the family. A distinct velum and a strong tricarinate apical horn are present.
Assigned species: *Stampfliella tuvalica* n. gen. n. sp.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: The lower Norian *Triarcopoulpus* n. gen. has a ring structure around the aperture and lacks an apical horn and a velum.

Stampfliella tuvalica n. gen. n. sp.
(Plate 1, Figure 13)

Derivatio nominis: In reference to its occurrence in the lower Tuvalian.
Holotypus: The specimen on Plate 1, Figure 13 (rep.-no. 23-9-04/III-166).
Material: 3 specimens.
Diagnosis: Cephalis large, subglobular, with distinct velum. Wall with minute, scattered pores, often closed by a layer of microgranular silica. Apical horn large, wide, slightly eccentric, with deep, broad furrows between the high ridges. The proximal part of the apical horn has a constant, rather large width; the shorter distal part is conical. The velum is short, frustum-like, with a rough surface and without pores. The aperture of the velum is slightly narrowed. Three feet are present in continuation of D and 2 L. They are tricarinate with wide furrows between the ridges, curved, and their distal ends join to form a cage-like structure with three large windows. This cage-like structure is somewhat shorter, but broader than the remaining test. Cephalic spicular system with Mb, A, V, 2 L, D, 2 l.
Occurrence: Lower Tuvalian of the Huğlu Unit of Mersin.

Remarks: *Stampfliella tuvalica* n. gen. n. sp. and the genus *Stampfliella* probably developed from *Sanfilippoella* Kozur & Mostler, 1979.

Genus *Triarcopoulpus* n. gen.

Type species: *Triarcopoulpus norica* n. gen. n. sp.
Derivatio nominis: In allusion of the fusion of the feet into a cage-like structure consisting of three arcs, and to the general similarity of the genus to *Poulpus* De Wever.
Diagnosis: With the characteristics of the family. The poreless large, subglobular cephalis has no apical horn. Distally a distinct ring structure is present around the large aperture.

Occurrence: Lower Norian of Turkey.

Remarks: *Triarcopoulpus* n. gen. has developed from *Veghia* Kozur & Mostler, 1981 by fusion of the three feet into a cage-like structure.

Triarcopoulpus norica n. sp.

1999 *Veghia* sp. aff. *Veghia sulovensis* Kozur & Mock, 1981 – Tekin, p. 162, Plate 38, Figure 10.

Derivatio nominis: In reference to its occurrence in the Norian.

Holotypus: The specimen, illustrated by Tekin (1999, Plate 3, Figure 10).

Material: One specimen.

Locus typicus: Yalakuzdere section of the Alakircay Nappe (Antalya nappes), see Tekin (1999).

Stratum typicum: Pelagic limestones of early Norian age (for details see Tekin, 1999).

Diagnosis: The large, poreless, subglobular cephalis has no apical horn. Its large aperture is surrounded by a ring-like structure. The three, long, tricarinate feet are curved and join distally to form a large, cage-like structure with three large windows. This cage-like structure is longer and broader than the cephalis. The three high, narrow ridges are separated by broad furrows.

Occurrence: Lower Norian of Alakircay Nappe (Antalya Nappes, Turkey).

Family Syringocapsidae Foreman, 1973 emend. Pessagno, 1977

Genus *Podobursa* Wisniowski, 1889 emend. Foreman, 1973

Type species: *Podobursa dunikowskii* Wisniowski, 1889

Podobursa claviformis n. sp.

(Plate 1, Figure 1)

Derivatio nominis: In allusion to its club-shaped test.

Holotypus: The specimen on Plate 1, Fig. 1 (rep.-no. 23-9-04/I-134). Material: 23 specimens.

Diagnosis: The test has four segments. Cephalis small, rounded-conical to semisphaerical, sometimes with a minute eccentric apical spine. It has minute pores, mostly closed by a layer of microgranular silica. Thorax somewhat wider but not higher than cephalis, hoop-like with minute pores, mostly closed by a layer of microgranular silica. Collar and lumbar strictures indistinct. Abdomen hoop-like, wider than thorax, with numerous small pores. The strongly inflated post-abdominal segment is subglobular, somewhat wider than high. It has small to large circular, oval or polygonal pores with slightly elevated pore frames. It bears sparsely arranged, needle-like spines, irregularly

distributed on the entire surface. The distal tube is moderately long and tapers slightly toward the terminal end, which bears 9-12 short, needle-like outwardly to downwardly directed spines. Aperture constricted.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: The lower Norian *Podobursa akayi* Tekin, 1999 has a longer distal tube that bears fewer terminal spines, and the spines on the first post-abdominal segment are only present on the equatorial belt. *Podobursa sceptrumides* n. sp. has a longer distal tube with fewer but larger terminal needle-like spines.

Podobursa fusiformis n. sp.
(Plate 1, Figures 2 and 3)

Derivatio nominis: In allusion to its regular, spindle-shaped test.
Holotypus: The specimen on Plate 1, Figure 2 (rep.-no. 23-9-04/II-97). Material: More than 100 specimens.
Diagnosis: Test spindle-shaped in lateral outline, with four segments. Cephalis small, rounded-conical with rough surface, poreless. Apical horn small, needle-like eccentric. Thorax hoop-like, poreless. Collar stricture is indistinct. Lumbar stricture with medium-sized, oval pores. Abdomen frustum-like to hoop-like, with small to medium-sized circular and oval pores. The large first post-abdominal segment is frustum-like in its upper half and inverse frustum-like in its lower half. The medium-sized to large pores are roundish to polygonal and have slightly elevated polygonal pore frames. 15 needle-like, radially arranged spines of similar length are present at the equator of the first post-abdominal segment. The distal tube is broad, cyclindrical and tapers rapidly in its distal part. It ends in a short, needle-like distal spine. The distal tube has small to medium-sized roundish pores.
Occurrence: Lower Tuvalian of the Tethys.

Remarks: The lower Norian *Podobursa galeata* Tekin, 1999 has a more slender distal tube that does not end in a terminal spine.

Podobursa longiceras n. sp.
(Plate 1, Figures 8 and 9)

Derivatio nominis: In allusion to its long apical horn.
Holotypus: The specimen on Pl. 1, Fig. 8 (rep.-no. 23-9-04/IV-208). Material: More than 50 specimens.
Diagnosis: Cephalothorax small, cylindrical, in the cephalic part conical, with very long, needle-like, somewhat oblique apical horn. Cephalis and thorax cannot be separated on the outer wall. The minute pores of the cephalis are mostly closed by a layer of microgranular silica. The very small to small pores of the thorax are mostly open. The much larger pore frames are elevated and

produce a rough surface. Partly irregular, narrow low longitudinal ribs are present on the thorax and may also reach onto the cephalis. Abdomen strongly inflated, globular, two-layered. The outer layer has large pore frames that are slightly to strongly elevated. Numerous short, needle-like, at their base carinate spines are present. Short, radial ribs branch off from the base of one of these spines. The distal tube is very long and very slender, and terminates in three or four short spines. Its surface has irregular, low, short, longitudinal ribs or a very faint reticulation. Sparse, widely scattered small pores are present.
Occurrence: Lower Tuvalian of the Tethys.

Remarks: Two subspecies can be separated within this species.

Podobursa longiceras longiceras n. subsp.
(Plate 1, Figure 8)

Holotypus: As for the species. Material: More than 50 specimens.
Diagnosis: With the characteristics of the species. Cephalothorax has faint longitudinal ribs. Pore frames of the outer layer on the abdomen are only slightly elevated. Distal tube has irregular, short, longitudinal ribs and three short terminal spines.

Remarks: *Podobursa longiceras tetraspinosa* n. subsp. has a rough surface on the cephalothorax, but no longitudinal ribs, the pore frames of the outer layer of the abdomen are strongly elevated, and the distal tube has no longitudinal ribs and terminates in four short spines.

Podobursa longiceras tetraspinosa n. subsp.
(Plate 1, Figure 9)

Derivatio nominis: In allusion to its four terminal spines on the distal tube.
Holotypus: The specimen on Plate 1, Figure 9 (rep.-no. 23-9-04/V-140). Material: 8 specimens.
Diagnosis: With the characteristics of the species. Cephalothorax with rough surface but without longitudinal ribs. Large pore frames on the outer layer of the abdomen strongly elevated. Distal tube without longitudinal ribs but with four terminal spines.

Remarks: For differences from *Podobursa longiceras longiceras* n. subsp., see under that subspecies.

Podobursa mersinensis n. sp.
(Plate 1, Figure 6)

Derivatio nominis: In reference to the occurrence in the Mersin Mélange.
Holotypus: The specimen on Plate 1, Figure 6 (rep.-no. 23-9-04/II-90).

Material: More than 50 specimens.
Diagnosis: Test with four segments, spindle-shaped in lateral outline. Cephalis to abdomen form the conical proximal part of the test, which ends in a short, needle-like apical horn. On the wall surface, these three segments can be barely separated. Cephalis and thorax have minute pores that are mostly closed by a layer of microgranular silica. Collar and lumbar strictures indistinct. The abdomen has a rough surface with small pores. Abdomen and first post-abdominal segment are separated from each other by a ring of pores. The first post-abdominal segment is large, strongly inflated, frustum-like in its upper part, and inversely frustum-like in its lower part. It has small to medium-sized pores with elevated pore frames. 12-14 needle-like, radial spines of equal size are present in the equatorial area. The distal tube is moderately long and wide. It has partly longitudinal, small to medium-sized, circular pores. The distal tube ends terminally with a ring of 6-8 spines around the aperture.
Occurrence: Lower Tuvalian of the Tethys.

Remarks: *Podobursa galeata* Tekin, 1999 is distinguished by a larger abdomen and slightly tapering terminal tube. *Podobursa* sp. A Tekin, 1999 has a conical distal tube.

Podobursa sceptrumides n. sp.
(Plate 1, Figure 5)

Derivatio nominis: In allusion to its test resembling a sceptre.
Holotypus: The specimen on Plate 1, Figure 5 (rep.-no. 27-11-04/I-17).
Material: 36 specimens.
Diagnosis: Test with four segments, sceptre-shaped. Cephalothorax rounded-subconical, surface rough or with minute nodes; semisphaerical cephalic and hoop-like thoracic part barely distinguished from each other. Collar and lumbar strictures indistinct. Abdomen hoop-like, surface rough and covered with minute nodes. Cephalothorax and abdomen have minute pores that are mostly closed by a layer of microgranular silica. First post-abdominal segment globular, strongly inflated, with small pores and polygonal elevated pore frames that bear numerous moderately long (30-40 μm) needle-like spines. The distal tube is long, moderately wide, and bears numerous irregularly arranged medium-sized pores. The circular aperture is surrounded by five (or six) outward-directed, relatively long, needle-shaped spines and four or five downwardly directed, short spines.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: For differences from *Podobursa tuvalica* n. sp. see under that species.

Podobursa tuvalica n. sp.
(Plate 1, Figure 4)

Derivatio nominis: In reference to its occurrence in the lower Tuvalian.
Holotypus: The specimen on Plate 1, Figure 4 (rep.-no. 27-11-04/I-8). Material: 9 specimens.
Diagnosis: The test has four segments. Cephalothorax conical, cephalis and thorax barely distinguishable on the outer surface. Short needle-like apical horn slightly eccentric. Abdomen hoop-like. Collar and lumbar stricture indistinct. Cephalis, thorax and abdomen have minute pores that are mostly closed by a layer of microgranular silica. The strongly inflated first post-abdominal segment is subglobular, slightly compressed in the vertical direction. It has small to medium-sized roundish, oval, rarely polygonal pores and polygonal elevated pore frames, and randomly arranged short, needle-like radial spines. The distal tube is slender and tapers slightly toward the distal end. It has medium-sized roundish pores, partly arranged in longitudinal rows and bears terminally three small spines directed downward and somewhat outward.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: In *P. claviformis* n. sp. the proximal part (cephalis to abdomen) is shorter and the distal tube is wider and has numerous terminal spines. *P. sceptrumides* n. sp. is distinguished by longer spines on the first post-abdominal inflated segment, and a longer, wider distal tube with larger and more numerous terminal spines.

Genus *Syringocapsa* Neviani, 1900
Type species: *Theosyringium robustum* Vinassa, 1901

Syringocapsa glabra n. sp.
(Plate 1, Figure 7)

Derivatio nominis: In allusion to the smooth surface of its test.
Holotypus: The specimen on Plate 1, Figure 7 (rep.-no. 23-9-04/VII-3). Material: 21 specimens.
Diagnosis: Tricyrtid. Cephalis conical, with a long (30-35 μm) needle-like, apical horn. Thorax short, cylindrical, shorter and somewhat broader than cephalis. Cephalis and thorax have a rough surface and scattered minute pores that are mostly closed by a layer of microgranular silica. Collar stricture is marked by a ring of small pores. Abdomen short, frustum-like, with minute pores (partly closed by a layer of microgranular silica) having elevated pore frames. Lumbar stricture is marked by a ring of medium-sized pores. First post-abdominal segment globular and inflated, separated from abdomen by a ring of medium-sized oval pores with a vertical long axis. It has a smooth

surface with minute, irregularly arranged, widely scattered circular pores. Distal tube very long, very slender, terminating in a small round aperture. It bears very few widely scattered small pores.
Remarks: The early Norian *Syringocapsa extansa* Tekin, 1999 has a much shorter distal tube and the thorax is not separated by a pore ring from the cephalis and abdomen.

Family Unumidae Kozur, 1984
Genus *Spinoprotunuma* n. gen.

Type species: *Spinoprotunuma triassica* n. sp.
Derivatio nominis: In allusion to its similarity to the genus *Protunuma* Ichikawa and Yao, 1976, and to the distinct apical and distal spines.
Diagnosis: Test with five to six segments, spindle-shaped with a distinct spine on both the proximal and distal ends. Cephalothorax conical, with a distinct short apical horn. Cephalis and thorax on the outer wall barely distinguishable. The few minute pores on the cephalis and thorax are all or nearly all closed by a layer of microgranular silica. Surface of the cephalothorax rough to nearly smooth, on the thoracic part sometimes covered by the proximal part of the longitudinal ribs. Other segments on the wall surface invisible, or visible when they are separated from each other by relatively distinct strictures. They possess numerous small to medium-sized circular to polygonal pores, and are covered by distinct continuous, discontinuous or irregular ribs. Distally an inverse conical prolongation is present that has sparse, widely scattered, small pores except near its distal end where they are large.
Occurrence: Lower Tuvalian of the Tethys.
Assigned species: *Spinoprotunuma triassica* n. sp.; *S. constricta* n. sp.; *S. furcatostriata* n. sp.

Remarks: Tekin (1999) established the lower Norian genus *Praeprotunuma* Tekin with one species, *P. antiqua* Tekin. He emphasized several morphological features that he thought distinguished *Praeprotunuma* from *Protunuma* Ichikawa & Yao, 1976, but all of these features are also present in some of the typical Jurassic *Protunuma*. There are also *Protunuma* species that have a small, insignificant, apical horn mentioned even in the original diagnosis of the genus ("Apical horn not present or, if present, insignificant"). This apical horn may be even somewhat larger than in *P. antiqua*, e.g. in *Protunuma paulsmithi* Carter in the specimen illustrated by Goričan *et al.* (2006, pl. PRU01, Figure 2). The cephalis of Jurassic *Protunuma* also has no pores at the wall surface. The thorax, rarely also the cephalis have also costae in Triassic forms. Discontinuous ribs also occur in some Jurassic *Protunuma,* e. g. *Protunuma turbo* Matsuoka, 1983 and *P. paulsmithi* Carter, 1988 (in Carter *et al.* 1988). Thus, either *Praeprotunuma* should be regarded as a junior synonym

of *Protunuma* or Jurassic *Protunuma* with an apical spine and/or discontinuous ribs must be separated form *Protunuma* and assigned to *Praeprotunuma*.

The lower Norian *Protunuma antiqua* (Tekin) was until now the oldest representative of the Unumidae Kozur, 1984. However, our three new lower Tuvalian species of *Spinoprotunuma* are considered here as the oldest representatives of the Unumidae. They may belong to different genera which all differ from the Jurassic *Protunuma*. The type species of *Spinoprotunuma* is distinguished from *Protunuma* (including *Praeprotunuma*) above all by the presence of a conical distal tube which ends in a spine. The apical spine is more pronounced than in typical *Protunuma* with a small apical spine. In *Spinoprotunuma* ? *constricta* n. sp. the distal part is not preserved. But even if the distal end is not closed and no distal spine is present, this species still would not belong to *Protunuma* because all post-thoracic segments are distinctly separated from each other on the outer side of the wall by distinct strictures (unlike in *Protunuma*). In this case *Spinoprotunuma* ? *constricta* would belong to another new genus. The distal prolongation is not preserved either in any specimen of *Spinoprotunuma furcatostriata* n. sp., but was probably present because in some specimens the proximal part of this prolongation is preserved. The ribs are quite different from the ribs of any *Protunuma* species (including *Praeprotunuma antiqua*).

Spinoprotunuma triassica n. sp.
(Plate 1, Figure 10)

Derivatio nominis: In allusion to its occurrence in rocks of Triassic age.
Holotypus: The specimen on Plate 1, Figure 10 (rep.-no. 23-9-04/V-250).
Material: More than 100 specimens.
Diagnosis: With the characteristics of the genus. Test spindle-shaped, with a needle-like apical and distal spine. The six segments increase gradually in size until well below the middle portion of test, then decrease suddenly in size. Lumbar stricture may be marked by a ring of pores that are partly covered by a layer of microgranular silica. Longitudinal ribs straight, some of them running from the thoracic part of the cephalothorax to somewhat above the distal cone. Others begin only on the abdomen, on the first post-abdominal segment or are only present on the distal segment. Seven to nine ribs are visible in lateral view. Distal prolongation conical, terminating in a short, but distinct, needle-like distal spine.
Occurrence: Lower Tuvalian of the Tethys.

Remarks: *Protunuma antiqua* (Tekin 1999) is distinguished from *Spinoprotunuma triassica* n. sp. by a shorter apical horn and the absence of a distal conical prolongation ending in a distal spine.

Spinoprotunuma ? *constricta* n. sp.
(Plate 1, Figure 11)

Derivatio nominis: In allusion to the distinct constrictions between the post-thoracic segments.
Holotypus: The specimen on Plate 1, Figure 11 (rep.-no. 23-9-04/VII-15).
Material: 29 specimens.
Diagnosis: Test conical, widest near the distal end. Except for the cephalis and thorax, the segments are separated from each other by relatively deep strictures. Longitudinal ribs run from the thoracic part of the cephalothorax to the last post-abdominal segment. On every specimen, some ribs are irregularly curved and others are straight. The distal portion is broken away in all specimens.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: *Spinoprotunuma* ? *constricta* n. sp. differs from all other species of *Spinoprotunuma* in having distinct strictures between the segments, except between cephalis and thorax.

Spinoprotunuma ? *furcatostriata* n. sp.
(Plate 1, Figure 12)

Derivatio nominis: In allusion to the forking ribs on its surface.
Holotypus: The specimen on Plate 1, Figure 12 (rep.-no. 27-11-04/II-143).
Material: 5 specimens.
Diagnosis: Test pear-shaped, with five segments not visible or barely visible on the outer side. Segments increase gradually in size until the beginning of the distal third of the test, then rapidly decrease in size toward the distal end. The minute pores of the cephalothorax and abdomen are mostly closed by a layer of microgranular silica. The small pores of the post-abdominal segments are mostly open. The test, except for the cephalis, is covered by Y-shaped forked ribs that are all connected with each other. The distalmost portion is broken in all specimens, but the proximal part of a distal prolongation with small pores is preserved in several specimens.
Occurrence: Lower Tuvalian of the Huğlu Unit of the Mersin Mélange.

Remarks: *Spinoprotunuma furcatostriata* n. sp. differs from all other species of *Spinoprotunuma* in having forked ribs on surface.

ACKNOWLEDGEMENTS

This work was funded by a grant of the Hungarian Scientific Foundation (OTKA F048341). We thank very much Dr. Robert E. Weems, United States Geological Survey, Reston, Virginia for improving our English. P.M. is very obliged to the Institute of Geology and Paleontology, Lausanne University, Switzerland for laboratory facilities. He is also very grateful to Shell Exploration and Production for financial support.

Especially we wish to thank Prof. Dr. Gérard Stampfli, Lausanne, for his very important help that made our paper possible.

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Manuscript received June 12, 2007

Plate 1

All illustrated specimens are from sample G11, a limestone intercalation within thick tuffs of the Tuvusçayırı Block in the Mersin Mélange, southeastern central Turkey (see Figure 1 of Kozur et al., this volume), lower Tuvalian *Spongotortilispinus moixi* Zone.

Plate 1

Figure 1: *Podobursa claviformis* n. sp. holotype, rep.-no. 23-9-04/I-134.

Figures 2, 3: *Podobursa fusiformis* n. sp.; Figure 2: holotype, slightly oblique lateral view showing the equatorial spines, rep.-no. 23-9-04/II-97; Figure 3: rep.-no. 23-9-04/II-66.

Figure 4: *Podobursa tuvalica* n. sp. holotype, rep.-no. 27-11-04/I-8.

Figure 5: *Podobursa sceptrumides* n. sp. holotype, rep.-no. 27-11-04/I-17.

Figure 6: *Podobursa mersinensis* n. sp. holotype, rep.-no. 23-9-04/II-90.

Figure 7: *Syringocapsa glabra* n. sp. holotype, rep.-no. 23-9-04/VII-3.

Figure 8: *Podobursa longiceras longiceras* n. subsp. holotype, rep.-no. 23-9-04/IV-208.

Figure 9: *Podobursa longiceras tetraspinosa* n. subsp. holotype, rep.-no. 23-9-04/V-140.

Figure 10: *Spinoprotunuma triassica* n. sp. holotype, rep.-no. 23-9-04/V-250.

Figure 11: *Spinoprotunuma* ? *constricta* n. sp. holotype, rep.-no. 23-9-04/VII-15.

Figure 12: *Spinoprotunuma* ? *furcatostriata* n. sp., holotype, rep.-no. 27-11-04/II-143.

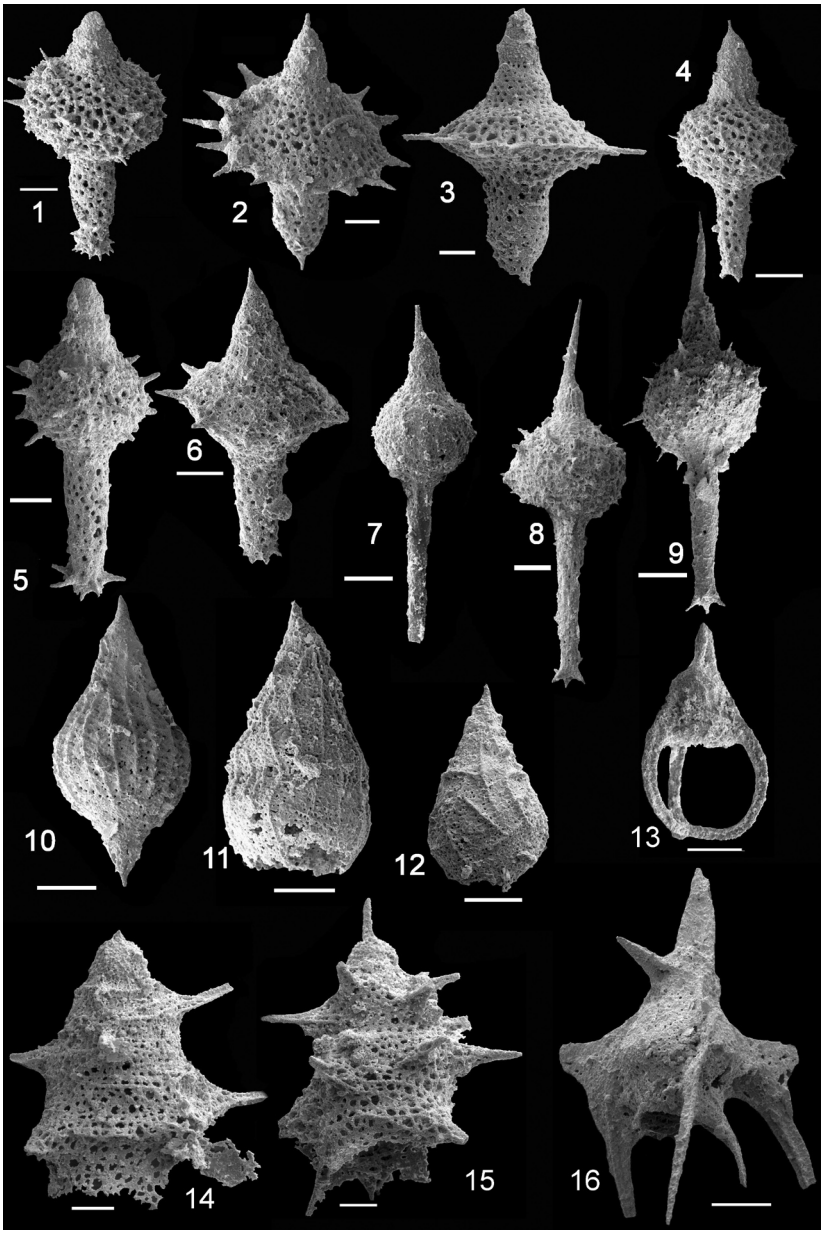
Figure 13: *Stampfliella tuvalica* n. gen. n. sp., holotype, rep.-no. 23-9-04/III-166.

Figure 14: *Spinomersinella goricanae* n. gen. n. sp., holotype, rep.-no. 23-9-04/I-64

Figure 15: *Spinomersinella multispinosa* n. sp., holotype, rep.-no. 23-9-04/II-84.

Figure 16: *Alatipicapora tetrapedis* n. sp., holotype, rep.-no. 23-9-04/V-202.

Plate 1



Scale 50 μm