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MIDDLE TRIASSIC SPIRIFEROID MENTZELIIDS (BRACHIOPODA) FROM ALPINE AND MEDITERRANEAN AREAS

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Abstract. Ten species of mentzelioid spiriferids from several Middle Triassic localities of Alpine and Mediterranean areas are analysed both for external and internal characters. The genera *Mentzelia, Paramentzelia, Koeveskallina,* and the new genus *Dagyssia* are referred to the subfamily Mentzeliinae, whilst *Tethyspira* and the new genus *Ptychomentzelia* are referred to the subfamily Tethyspirinae. In addition, a new species (*Ptychomentzelia ritensis*) is described. The superfamily Mentzelioidea Dagys, 1974 is retained as a viable container of the whole group here discussed, previously split in the second edition of the Treatise in two different superfamilies.

Introduction

The milestone steps of our knowledge on Triassic brachiopods are the works of Alexander Bittner at the end of 19th century and Algirdas Dagys in the second part of the 20th century. They built their systematics on the external morphology and on a few internal characters (Bittner 1890, 1892, 1899, 1903) or on a combined use of external and internal characters (Dagys 1963, 1965, 1974, 1996). Amongst these brachiopods, there is the group of mentzelioids, spanning the Middle to Late Triassic interval.

In the present paper, we add new information on several species of this group, describing previously mostly unknown internal characters.

We studied the following taxa, here cited with the last published binominal combination, before this study: *Mentzelia mentzeli mentzeli* (Dunker, 1851), *Mentzelia mentzeli judicarica* (Bittner, 1890), *Mentzelia ampla* (Bittner, 1890), *Mentzelia fraasi* (Bittner, 1890), *Koeveskallina koeveskalyensis* (Stur, 1865), *Koeveskallina pannonica* (Bittner, 1890), *Spiriferina palaeotypus* (Loretz, 1875), *Mentzelia propontica* (Toula, 1896), *Mentzelia ptychitiphila* (Bittner, 1890), *Tethyspira* sp. ind.

The studied material was collected by one of us (MG) from the Middle Triassic rocks in the Alps and in others circum-Mediterranean areas, by Andrea Tintori from the Anisian of Grigna Mountains, by Elio Dellantonio from the Predazzo area (Southern Alps), by the late Riccardo Assereto in Turkey and by the late Dan Patrulius from Rumania. N. Mantovani studied most of this material in her Ph.D. thesis (Mantovani 2001). A part of the thesis material was already published (Mantovani 2002). However, a sister note on mentzelioids never issued. M. Gaetani resumed the material and prepared the present paper.

The sampling localities are plotted on the lower Ladinian palaeogeographical map (Gaetani et al. 2000) (Fig. 1).

Most of the material is housed in the Museum of Palaeontology of the Milano University (MPUM). Additional material is housed in the Museo Civico di Predazzo (Trento) (MCP) and in the Museo di Scienze Naturali dell'Alto Adige/Naturmuseum Südtirol (PZO). Original specimens of Bittner (1890, 1903) and Toula (1896) are stored in Vienna (Siblik 1988, 2010 a, b), and in Munich. Specimens from the Karchowice Formation (Lower Muschelkalk) of Upper Silesia (South Poland), Strzelce Opolskie (former Großstrehlitz) are stored in Muschelkalkmuseum Hagdorn Ingelfingen (MHI, courtesy of H. Hagdorn).

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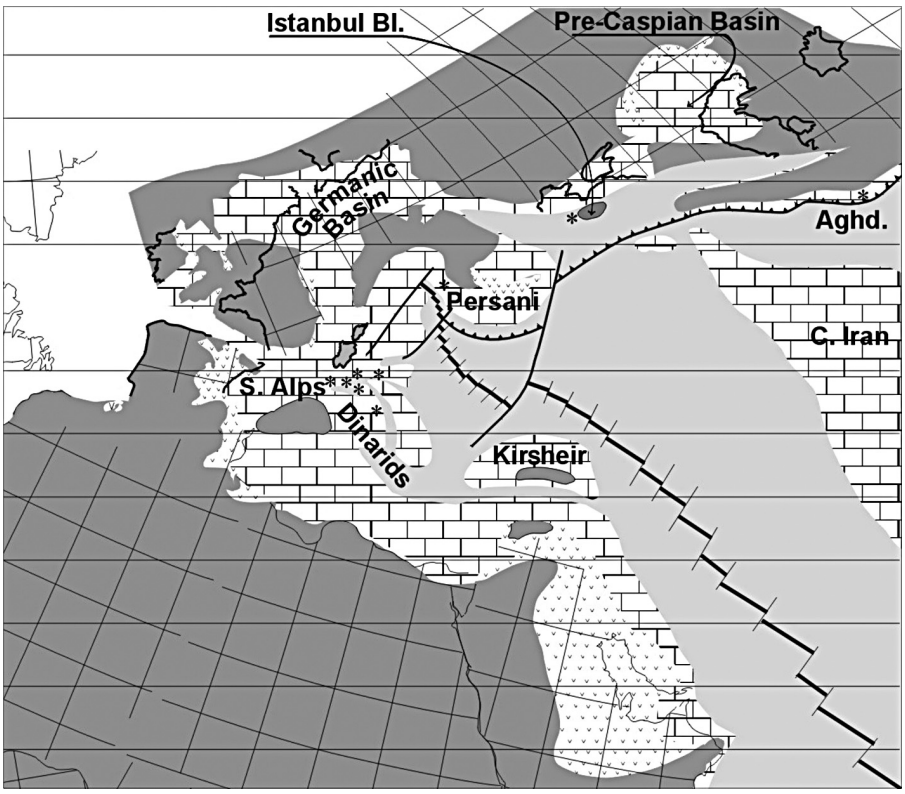


Fig. 1 - Localities where the studied material was collected. Most belong to the western shores of the Tethys. (From Gaetani et al. 2000, modified).

List of localities and biometric data are listed in the Appendices # 1 and 2.

Systematic palaeontology

Remarks on the suprageneric classification

Order **Spiriferinida** Ivanova, 1972

Suborder **Spiriferinidina** Ivanova, 1972

Two suprageneric classification schemes have been proposed, in which the species here discussed may be placed. Carter et al. (1994, 2006) proposed a new classification of the impunctate and punctate spiriferid brachiopods, for the revised edition of the Treatise on Invertebrate Paleontology (Part H, Brachiopoda). In this classification, considerable emphasis was placed on the shell structure (for orders), growth form (for suborders or superfamilies), internal structures (for families or subfamilies) and micro-ornament (at the family levels). Most of the species examined in this paper were placed in the superfamily Spiriferinoidea, family Spiriferinidae with several subfamilies amongst which there are the subfamilies Mentzeliinae and Tethyspirinae, of interest here. However, other genera like *Koeveskallina* were inserted in the Balatonispiridae, superfamily Pennospiriferinoidea.

Dagys (1996) re-examined the classification of Carter et al. (1994), questioning its applicability to the Mesozoic punctate Spiriferids. He reaffirmed the validity of the superfamily Mentzelioidea Dagys, 1974, considered it a monophyletic group, and placed all the genera here examined in the family Mentzeliidae.

We consider the group of mentzelioids, typical for the Triassic, to be sufficiently homogeneous to be kept in the superfamily Mentzeliodea Dagys, 1974 as Dagys (1996) suggested. Carter et al. (1994) referred most of the mentzeliids to the superfamily Spiriferinoidea Davidson, 1884. However, the general morphology of the Spiriferinoidea is significantly different from many mentzeliids.

The classification adopted in the present paper is as follows.

Superfamily Mentzelioidea Dagys, 1974
(*nom. transl.* Sun and Ye, 1982)

Biconvex shells, small to medium sized, rarely large. Radial ornamentation absent, or weakly to well developed. Sulcus and fold weakly to well developed. High median ventral septum. Dental flanges joined to the median septum forming a false spondylium. Dental adminicula present in some stock, forming dental plates; these are eventually joined to the median septum forming a spondylium. Spondylial chamber variable in shape and dimensions. The median ventral septum protrudes into the spondylial chamber in variable degree.

Tab. 1 - Distinctive characters of the described genera of Mentzeliinae and Tethyspirinae.

Subfamily Mentzeliinae Adminicula absent False spondylium	*Mentzelia*	Sulcus and fold weak
		Usually smooth
		Low interarea
	Paramentzelia	Sulcus and fold weak
		Surface smooth
		Dorsal apical platform
	Koeveskallina	Sulcus and fold weak
		Surface ribbed
		Dental flanges short
	Dagyssia gen. nov.	Sulcus and fold well developed
		Surface ribbed
		Dental flanges long
Subfamily Tethyspirinae Adminicula present Spondylium	*Tethyspira*	Sulcus and fold strong
		Surface smooth
		Ventral septum high and long
	Ptychomentzelia gen. nov.	Sulcus well developed, fold weak or absent
		Surface ribbed
		Septum thin and short

At the family and subfamily levels, two characters appear critical: the dental plates and the ribbing.

Dental plates. They are formed by blades of secondary shell underlying hinge teeth in the ventral valve. They are composed by two elements: adminicula and dental flanges. The adminicula are paired sub-vertical plates situated umbonally in both valve and extending from the valve floor to the dental flanges. The presence of ventral adminicula is critical in the classification of mentzelioids.

The dental plates are secreted independently from the median septum and in variable position as regards to ventral valve floor (i.e. in gen. n. *Ptychomentzelia*). Interpretation problems may arise when fibers of secondary shell are growing from the edges of the dental flanges towards the median septum, simulating the dental plate (i.e. *Mentzelia mentzeli*). The ventral adminicula may be adjoined to the median septum, whereas the dental flanges converge towards it (i.e. *Tethyspira*).

Figure 2 provides a synthesis of the apical structure of the studied species.

Ornaments. The mentzeliods may be smooth or ribbed, on the flanks only or on the whole shell. They never have large plicae in contrast to the genus *Spiriferina*. We used the combination of ribbing and of presence/absence of dental plates as a taxonomic criterion.

Family Mentzeliidae Dagys, 1974
(*nom. transl.* Sun and Ye, 1982)

Small to medium, rarely large sized shell. Radial ornamentation absent or consisting of costae developed on the whole shell or only anteriorly. Dental plates present or absent.

Subfamily Mentzeliinae Dagys, 1974

Sulcus and fold weak to well developed. Ornamentation absent or consisting of costae developed the whole shell or only anteriorly. Dental adminicula absent. (Tab. 1)

Genera: *Mentzelia* Quenstedt, 1871; *Koeveskallina* Dagys, 1964; *Paramentzelia* Xu, 1978; *Dagyssia* gen. nov.; ?*Tylospiriferina* Xu, 1972; ?*Madoia* Sun & Ye, 1982. This last genus is accepted in the Treatise (Carter et al. 1994), but its only distinctive character seems to be the growing laminae at its margins, possibly not sufficient to validate the genus.

Subfamily Tethyspirinae Carter in Carter et al., 1994

Sulcus extended anteriorly as a sulcal tongue. Radial ornamentation lacking or present on the anterior half of the shell. Dental plates attached to the median ventral septum in their ventral part. Adminicula short; dental flanges longer and converging. Deep V-shaped spondylium. (Tab. 1)

Genera: *Tethyspira* Siblik, 1991; *Spondylospiriferina* Dagys, 1972. *Ptychomentzelia* gen. n.

Description of the studied material

Subfamily Mentzeliinae Dagys, 1974

Genus *Mentzelia* Quenstedt, 1871

Type species: *Spirifer Mentzeli* Dunker, 1851 (= *Spirifer medianus* Quenstedt, 1852)

Emended diagnosis: Subequally biconvex shell, sub-pentagonal to transversally oval in outline. Narrow cardinal margin with rounded cardinal extremities. Low ventral interarea; sulcus and fold weak, sometimes lacking. Usually smooth, rarely very faint ribbing. Dental flanges converging and merged to the median septum. Therefore, *Mentzelia*

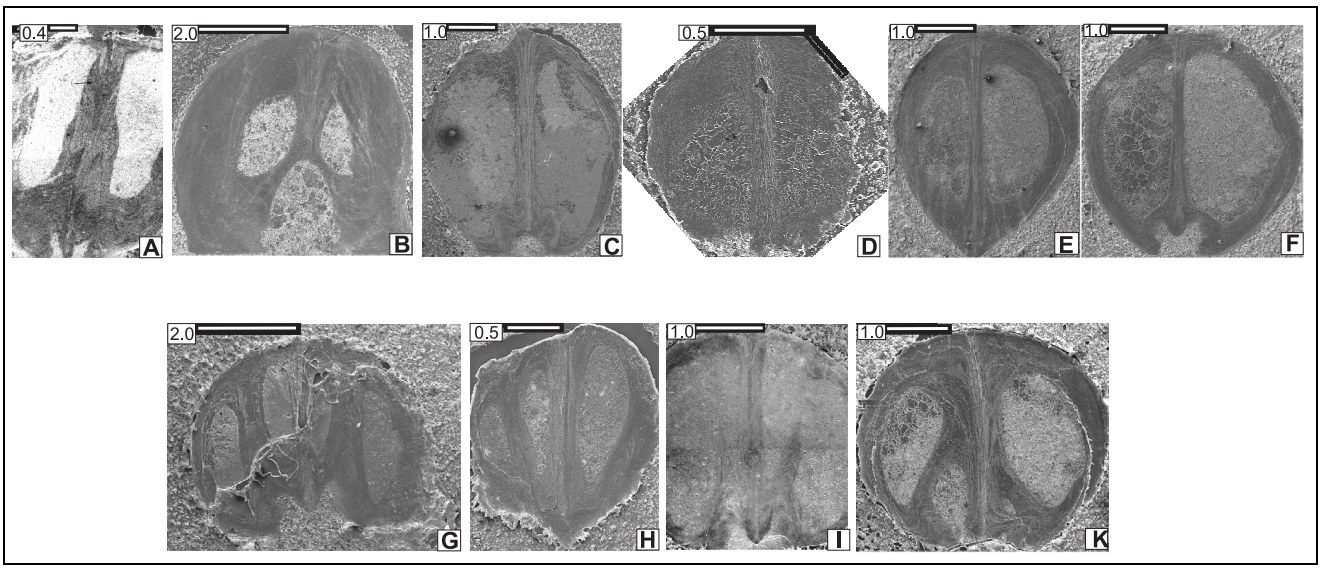


Fig. 2 - Apical internal characters of the studied species; all measures are in mm.
Top row: Mentzeliinae.
A) *Mentzelia mentzeli* (Dunker). Specimen MPUM 8635 (G351/35). The black arrows point the discontinuities of the secondary fibres 1.3 mm from the umbo. B) *Mentzelia judicarica* (Bittner). Specimen MPUM 8628 (G45/6). At 4.6 mm from the umbo, the dental flanges are joined to the median ventral septum, which is strong and sub-triangular, forming a well developed false spondylium. C) *Mentzelia ampla* (Bittner). Specimen MPUM 8660 (TB1/3). At 1.4 mm from the umbo, very low dental flanges fused to the long median septum. D) *Koeveskallina koeveskalyensis* (Stur). Specimen MPUM 8708 (N/57). At 1.0 from the umbo, the very low dental flanges are linked to the septum. E) *Dagyssia palaeotypus* (Loretz). Specimen MPUM 11369 (G351/8). At 0.9 mm from the umbo, adminicula are clearly absent. F) *Dagyssia palaeotypus* (Loretz) Specimen MPUM 11369 (G351/8). At 1.3 mm from the umbo, the dental flanges are low and convergent to the median septum.
Low row: Tethyspirinae.
G) *Ptychomentzelia propontica* (Toula). Specimen MPUM 8615 (T40/4). At 0.7 mm from the umbo, the dental plates are joined to the median septum, which protrudes only apically in the spondylial cavity. H) *Ptychomentzelia ptychitiphila* (Bittner). Specimen MPUM 8643 (Y67/6). The dental plates are divergent from the floor of the valve. I) *Ptychomentzelia ritensis* n. sp. Specimen MPUM 8666 (G223/41). Distinct,straight dental plates. K) *Tethyspira* sp. ind. Specimen MPUM 8621 (L/1). At 1.1 mm from the umbo, the dental plates are attached to the strong median septum which deeply protrudes into the V-shaped spondylium.

multicostata and *Mentzelia paucicostata*, erected by Yang & Xu (1966), do not fit in this diagnosis because of their coarse ribbing.

Stratigraphical range: Middle and Upper Triassic of the Alps, Carpathians, Dinarids, Caucasus, Pamirs, Himalaya, Vietnam, South China (Dagys 1974; Siblík 1988).

Mentzelia mentzeli (Dunker, 1851)

Figs 2A, 3; Pl. 1, figs 1-8; App. 2, tab. 1

1851 *Spirifer Mentzeli* sp. n. Dunker: 287, pl. 34, figs 17-19.

PLATE 1

Mentzelia mentzeli (Dunker, 1851). Scale bar = 1 cm.

Fig. 1-3 - Specimens from the Karchowice Formation (Lower Muschelkalk) of Upper Silesia (South Poland). Strzelce Opolskie (former Großstrehlitz) (courtesy of H. Hagdorn). 1) Specimen MHI 1721: a- ventral, b- posterior and c- lateral views; 2) Specimen MHI 1829/1, ventral view; 3) Specimen MHI 1828/1, interior view of a ventral valve.

Fig. 4 - Specimen PZO 5713 (Cima dei Colli Alti/Hochalpenkopf, Pelsonian); a- ventral, b- dorsal, c- frontal, d- posterior and e- lateral views.

Fig. 5 - Specimen PZO 5739 (Cima dei Colli Alti/Hochalpenkopf, Pelsonian); a- ventral, b- dorsal, c- frontal, d- posterior and e- lateral views.

Fig. 6 - Specimen MPUM 8649 (Prà della Vacca/ Kuhwiesenkopf, Pelsonian); a- ventral, b- dorsal, c- frontal, d- posterior and e- lateral views.

Fig. 7 - Specimen MPUM 8720 (debris Prà della Vacca - Kuhwiesenkopf) spiralium. Fig. 8 - Specimen MPUM 8631 (G126) (Foppa della Lanca, basal Illyrian); a- ventral, b- dorsal, c- frontal and d- posterior views.

Mentzelia judicarica (Bittner, 1890).

Fig. 9 - Specimen MPUM 5030/4 (G45/4) (Peschiera 1, Pelsonian) showing the radial fine ribbing present on the whole shell; a- ventral, b- dorsal, c- lateral and d- frontal views.

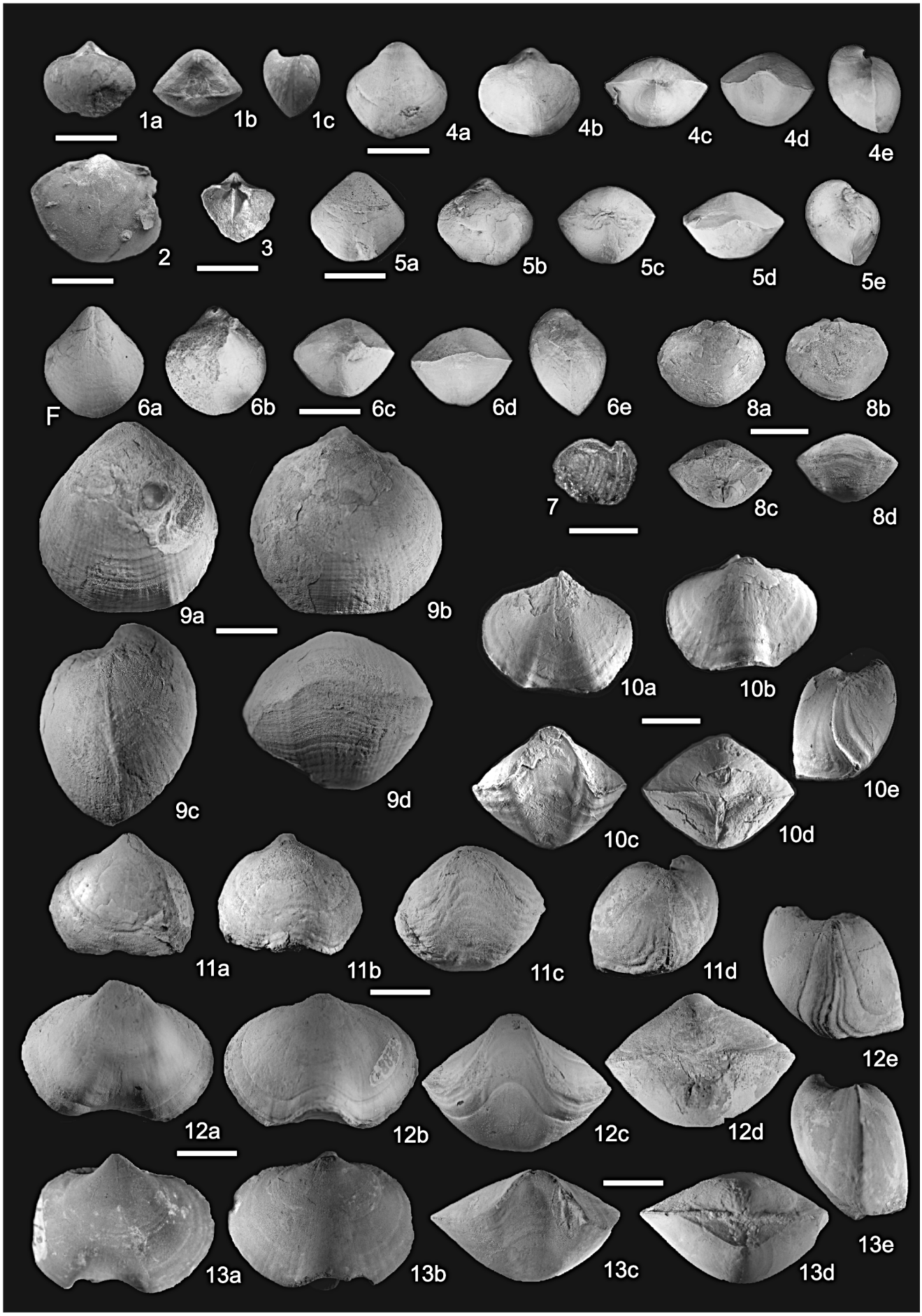
Mentzelia ampla (Bittner, 1890)

Fig. 10 - Lectotype (Bayerische Staatsammlung 1890.VIII.37); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 11 - Specimen MPUM 8664 (TB1/10) (Val Meria, Illyrian); a- ventral, b- dorsal, c- anterior and d- lateral views.

Fig. 12 - Specimen MPUM 8663 (G883/2) (Soingrat at Wendelstein, Ladinian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 13 - Specimen MPUM 8662 (N/2) (Val Meria, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.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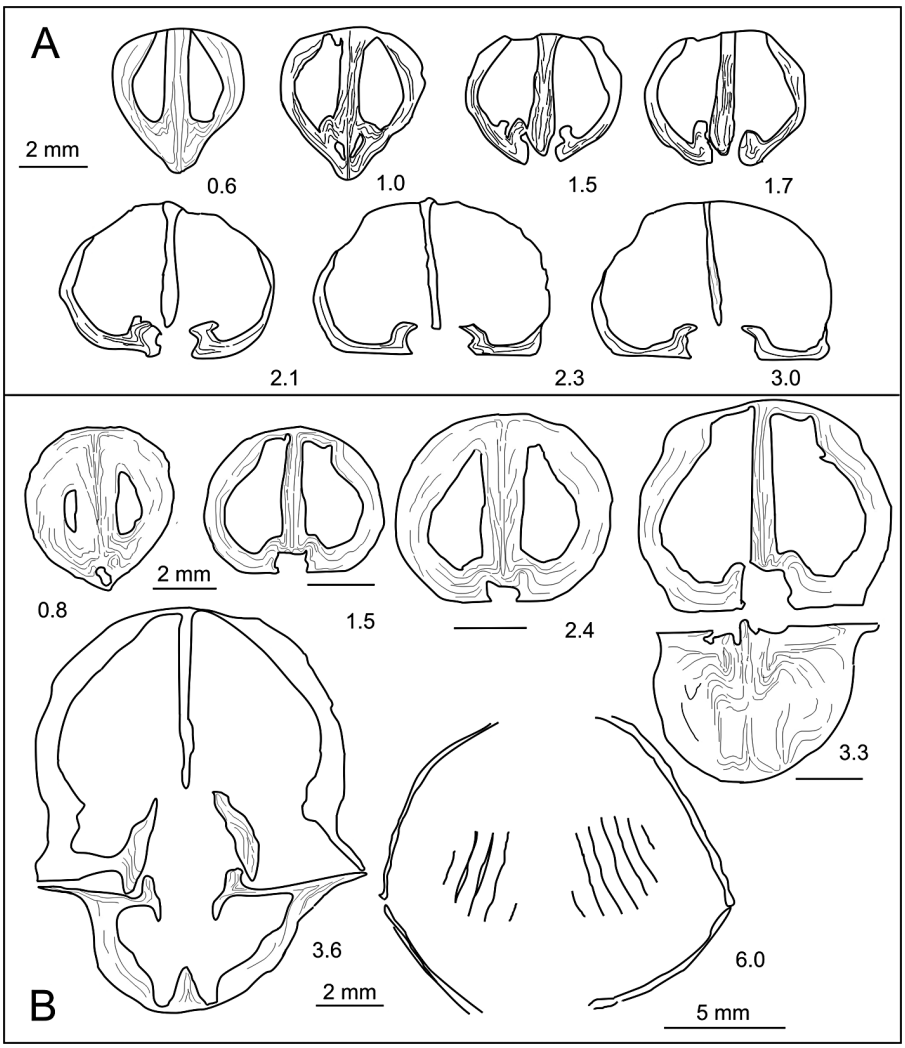


Fig. 3 - *Mentzelia mentzeli* (Dunker, 1851). Serial sections of the specimens A) MPUM 8636 (G50) (Frugone, top Pelsonian) and B) MPUM 8635 (G351/35) (Prà della Vacca, Kuhwiesenkopf), Pelsonian. Distance from the umbo are in mm.

1875 *Spiriferina paleotypus* var. *acrorhyncha* var. nov. Loretz: 802, pl. 21, fig. 2.

1875 *Spiriferina paleotypus* var. *media* var. nov. Loretz: 802, pl. 21, fig. 3.

1890 *Spiriferina* (*Mentzelia*) *Mentzelii* - Bittner: 22, pl. 34, figs 1-17.

1890 *Spiriferina (Mentzelia) Mentzelii* var. *acrorhyncha* - Bittner: 23, pl. 34, figs 20-21

1890 *Spiriferina (Mentzelia) Mentzelii* var. *media* - Bittner: 24, pl. 34, fig. 22

1890 *Spiriferina (Mentzelia) Mentzelii* var. *angusta* var. nov. Bittner: 24, pl. 34, fig. 23

1890 *Spiriferina (Mentzelia) Mentzelii* var. *baconica* var. nov. Bittner: 24, pl. 34, fig. 27

1890 *Spiriferina (Mentzelia) Mentzelii* var. *illyrica* var. nov. Bittner: 24, pl. 34, fig. 28

1906 *Spiriferina* (*Mentzelia*) *Mentzelii* - Arthaber, pl. 35, fig. 13.

?1912 *Spiriferina Mentzeli* - De Toni: 328, pl. 1, fig. 5.

1920 *Spiriferina (Mentzelia) mentzeli* - Diener: 54.

1937 *Spiriferina* (*Mentzelia*) *mentzelii* - Assmann: 30, pl. 6, figs. 10-11.

1967 *Mentzelia mentzelii* - Casati & Gnaccolini: 124, pl. 9, figs 4, 9.

1969 *Mentzelia mentzeli mentzeli* - Gaetani: 507, pl. 34, figs 8-10, text-fig. 8.

1972 *Mentzelia mentzeli mentzeli* - Siblik: 183, pl. 42, fig. 1.

1974 *Mentzelia mentzeli* - Dagys, pl. 40, fig. 1.

1988 *Mentzelia mentzeli* - Siblìk: 66.

1993 *Mentzelia mentzeli* - Iordan, pl. 1, fig. 14.

1997 *Mentzelia mentzeli* - Torti & Angiolini: 161, pl. 1, figs 20-21, pl. 3, figs 17-19.

2001 *Mentzelia mentzeli* - Siblìk: 20.

2003 *Mentzelia mentzeli* - Palfy: 146, pl. 1, fig. 15.

Type locality: Dunker (1851) erected the species based on five specimens, partially silicified, coming from the lower Illyrian of the locality of Tarnowitz (Tarnowskie Góry) in the Upper Silesia (Poland) (Dr. H. Hagdorn, pers. comm.).

Material: More than 250 specimens in various state of preservation. They come from the following localities: Prà della Vacca/Kuhwiesenkopf PZO 5648-5669, PZO 5739, PZO 5753, PZO 5757, PZO 5758, PZO 5760, PZO 5761, MPUM 8635 (G351/35; peels), MPUM 8649, MPUM 8720; Cima dei Colli Alti/Hochalpenkopf PZO 5713-5727; Col Vallaccia MPUM 8719; Dosso della Croce MPUM 8632; Peschiera 2 MPUM 8633; Frugone MPUM 8636; Foppa della Lanca MPUM 8631 (G126). Dr. H. Hagdorn kindly provided the pictures for Plate 1, figs 1-3, for specimens from the Karchowice Formation (Specimen MHI 1721, 1829/1, 1828/1). It is the same horizon of the type-locality, which is no longer available.

Description

External characters. Small to medium sized shell, biconvex in shape, sub-pentagonal to transversally sub-

oval in outline. Width slightly greater than length, rarely does length exceed width. Maximum width at about 1/2 of the maximum length. Hinge narrow. Cardinal extremities rounded. Gently uniplicate, variably developed commissure with a gently convex fold. Ventral valve more convex than the dorsal valve. Ventral umbo prominent, overhanging the hinge. Ventral interarea weak. Ventral median sulcus, usually shallow. Sulcus starts anteriorly of the umbo. Dorsal valve with small umbo. Fold weak to absent. Very fine radial costellae on the anterior part of flanks. The concentric ornamentation consists of several lamellae in both valves, which increase in density near the anterior margin.

Internal characters. (Fig. 3). Ventral valve with strong, long and high median septum with apical callosity. Dental flanges apically fused to the median septum, developing a small pseudospondylium. Pseudospondylial chamber posteriorly very small, becoming larger and sub-squared at about 1.8 mm from the umbo. The median septum extends dorsally into the pseudospondylial chamber. The dental flanges loose contact with the median septum between 2 and 4 mm, disappearing at a distance from the umbo of about 5 mm. Articulation between the valves formed by strong teeth and deep sockets. The spiralium may have up to 8 spires (Calzada & Gaetani 1977, fig. 3).

Intraspecific variability. Mentzelia mentzeli shows a high morphologic variability, also in the juvenile stages.

Bittner (1890) distinguished 7 varieties on the basis of the variability of the interarea (relatively short in the *M. mentzeli brevirostris* and *M. mentzeli media*, longer in the *M. mentzeli illyrica*, *M. mentzeli baconica*, *M. mentzeli angusta* and *M. mentzeli acrorhyncha*) and of the umbo (very long, terminally pointed and overhanging the hinge in the *M. mentzeli acrorhyncha*, *M. mentzeli angusta*, *M. mentzeli illyrica*, and *M. mentzeli baconica*, narrow and more strongly overhanging the hinge in *M. mentzeli brevirostris*).

In this paper, the varieties *M. mentzeli acrorhyncha* Loretz, 1875, *M. mentzeli media* Loretz, 1875, *M. mentzeli angusta* Bittner, 1890, *M. mentzeli baconica* Bittner, 1890, *M. mentzeli illyrica* Bittner, 1890, and *M. mentzeli dinarica* Bittner, 1903 are considered as morphotypes of the species. The variety *M. mentzeli judicarica* Bittner, 1890 is raised to the rank of species.

Remarks. The identification of *M. mentzeli* may present problems, because of partial homoeomorphism with *Ptychomentzelia ritensis* sp. nov. *M. mentzeli* is usually smaller, with a less defined sulcus and no fold. However, definitive recognition is obtained through the internal characters, as in *M. mentzeli* the dental flanges are convergent towards the median septum, whilst in *P. ritensis* the convergence of dental flanges and adminicula forms dental plates that diverge towards the valve floor and are neatly distinct from the median septum. The different position of the dental flanges or plates affects the shape of the false spondylium chamber, low in *M. mentzeli* and larger in *P. ritensis*.

Occurrence and stratigraphical range. *M. mentzeli* is a common species in the Anisian (mostly Pelsonian and Illyrian) of Western Tethys and of the eastern part of the Middle European Basin. Widespread in the Southern and Northern Calcareous Alps, in the Dinarids and in the Albanian Alps, as well as in the Hungary (Balaton Highland), Carpathians and Balkans, Iberia, Turkey, Crimea and NW Caucasus. Occasional findings in the lower Ladinian are also reported (Iordan 1993; Torti & Angiolini 1997). This species seems to prefer to dwell on carbonate muddy bottoms.

Mentzelia judicarica (Bittner, 1890)

Figs 2B, 4; Pl. 1, fig. 9; App. 2, tab. 2

1890 *Spiriferina (Mentzelia) Mentzelii* var. *judicarica* var. nov. Bittner: 24, pl. 34, fig. 26.

?1890 *Spiriferina (Mentzelia) Mentzelii* var. *brevirostris* var. nov. Bittner: 24, pl. 34, fig. 25.

?1933 *Spiriferina Mentzeli* cf. var. *brevirostris* - Milosavljevic: 209, pl. 1, fig. 3.

1969 *Mentzelia mentzeli judicarica* - Gaetani: 509, pl. 34, figs 11-13; pl. 35, figs 1- 5.

Holotype: The holotype by monotypy (Bittner, 1890, pl. 34, fig. 26) is housed in the Geologische Bundesanstalt of Wien, under the number GBA 1890/002/0018/26.

Type locality: Peschiera near Roncone (TN). Top of the Angolo Limestone, upper Pelsonian (Gaetani 1969).

Material: Eighty-two complete specimens, and about 100 isolated valves. Almost all the material was already considered in Gaetani (1969; specimens MPUM 5030, 5031, 5032). Additional material from the locality of Peschiera 3, MPUM 8626, 8627, 8628, and from Valle Agordina, MPUM 8629.

Description

External characters. Medium to large-sized biconvex shell. Width usually exceeds length, rarely the opposite. Hinge narrow with rounded cardinal extremities. Anterior commissure gently uniplicate.

Ventral valve more convex than dorsal valve, in particular in the juvenile specimens. Small, short ventral umbo, only weakly pointed and curved over the hinge. Straight and low ventral interarea. Usually, the ventral median sulcus is absent or gently deep. Very reduced dorsal umbo. Fold absent.

The species may have a very faint radial ornamentation, consisting of numerous fine costae, occurring on the anterior half of both valves and in the sulcus. Very fine growth lamellae in the anterior half of the shell, becoming denser near the anterior margin. The microornamentation consists of drop-shaped base of spines (Gaetani 1969, pl. 35, figs 4, 5).

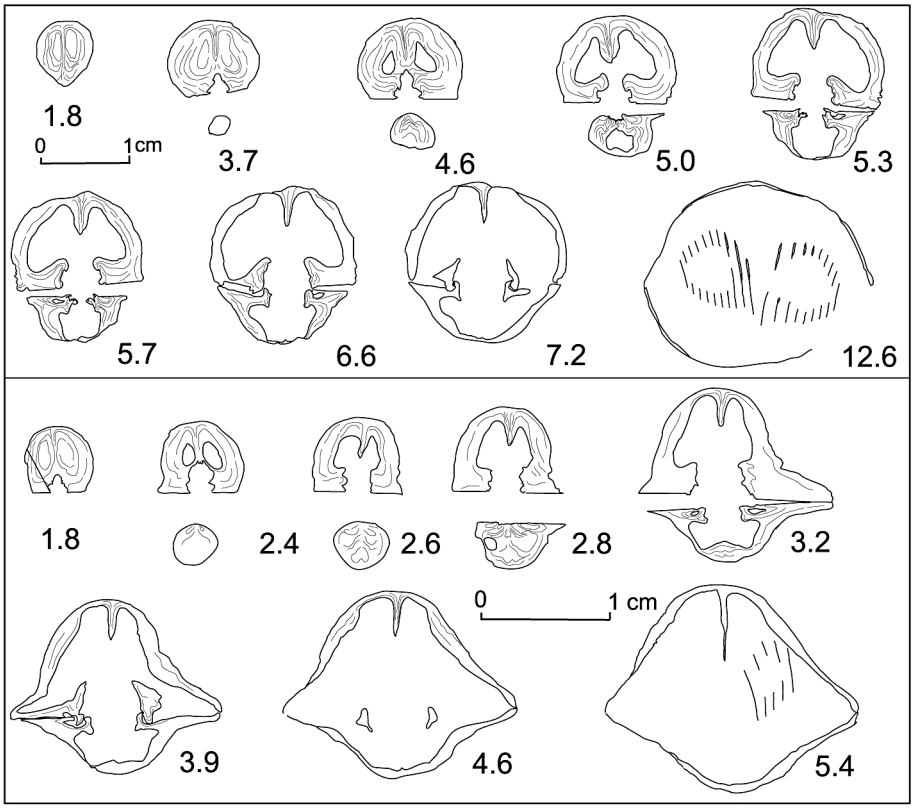


Fig. 4 - *Mentzelia judicarica* (Bittner, 1890). Serial sections of the specimens A) MPUM 5030/12 (G45/12) and B) MPUM 8628 (G45/6); Peschiera 1, Pelsonian. Distance from the umbo are in mm.

Internal characters. (Fig. 4). *M. judicarica* is characterized by the occurrence of a stout, sub-triangular shaped, low and long median ventral septum. Dental plates are lacking; however, dental flanges are present and joined to the median septum, forming a U-shaped false spondylium. The median septum does not project into the spondylial chamber. Very strong teeth and deep sockets make the articulation. The cardinal process is in the form of posteriorly concave ctenophoridium.

Remarks. *Mentzelia mentzeli* var. *judicarica* was erected by Bittner (1890, pl. 34, fig. 26) on a single incomplete specimen collected from F^{te}. Danzelino (a fortress near the former boundary of the Austro-Hungarian Empire). Our specimens are topotypic. Here we raise *M. mentzeli judicarica* to the rank of species, because *M. judicarica* differs from *M. mentzeli* by its greater dimensions and convexity of both valves with length exceeding width. The ventral umbo is less developed and the ventral interarea is lower and straighter with narrower hinge; sulcus usually absent or less developed, and fold absent. The radial ornamentation is very faint. The dental flanges are shorter and strongly convergent to the ventral valve floor; the false spondylium higher and U-shaped; the median septum does project into the spondylial chamber. *M. mentzeli* and *M. judicarica* occupied a different environment (Gaetani 1969).

The references of var. *brevirostris* Bittner (1890, pl. 34, fig. 25) and of the Milosavljevic specimen (1933, pl.1, fig. 3) to *M. judicarica* are doubtful.

Occurrence and stratigraphical range. *M. judicarica* has been reported so far from the Anisian of Giudicarie Valleys and from Valle Agordina in Eastern Dolomites. Apparently restricted to mud-free bottoms.

Mentzelia ampla (Bittner, 1890)

Figs 2C, 5A; Pl. 1, figs 10-13; App. 2, tab. 3

1890 *Spiriferina (Mentzelia) ampla* sp. nov. Bittner: 165, pl. 41, figs 10-11.
1894 *Spiriferina (Mentzelia) ampla* - Bittner: p. 584.
1895 *Spiriferina (Mentzelia) ampla* - Philippi: 720, figs 1-3.
1895 *Spiriferina ampla* var. *bathycolpos* var. nov. Salomon: 85, pl. 1, figs 59, 60.
1895 *Spiriferina ampla* var. *radiata* var. nov. Salomon: 86, pl. 1, fig. 61.
1895 *Spiriferina ampla* - Salomon: 86, pl. 1, fig. 62.
?1896 *Spiriferina (Mentzelia) ampla* - De Lorenzo: 123.
?1958 *Mentzelia ampla* - Pantic: 63, pl. 1, fig. 4.
?1963 *Spiferina ampla* - Sucic-Protic, pl. 1, fig. 1.
1988 *Mentzelia* sp. aff. *ampla* - Vörös & Pálfy, pl. 4, fig. 7a-c.
?1994 *Mentzelia ampla* - Siblìk: 369.
1997 *Mentzelia ampla* - Torti & Angiolini: 162, pl. 1, fig. 22, pl. 2, figs 1-2.

Lectotype: The specimen of Bittner, 1890, pl. 41, fig. 10; here selected and refigured. Bittner's specimens are housed in the Bayerische Staatssammlung für Palaeontologie und historische Geologie of Münich (Germany).

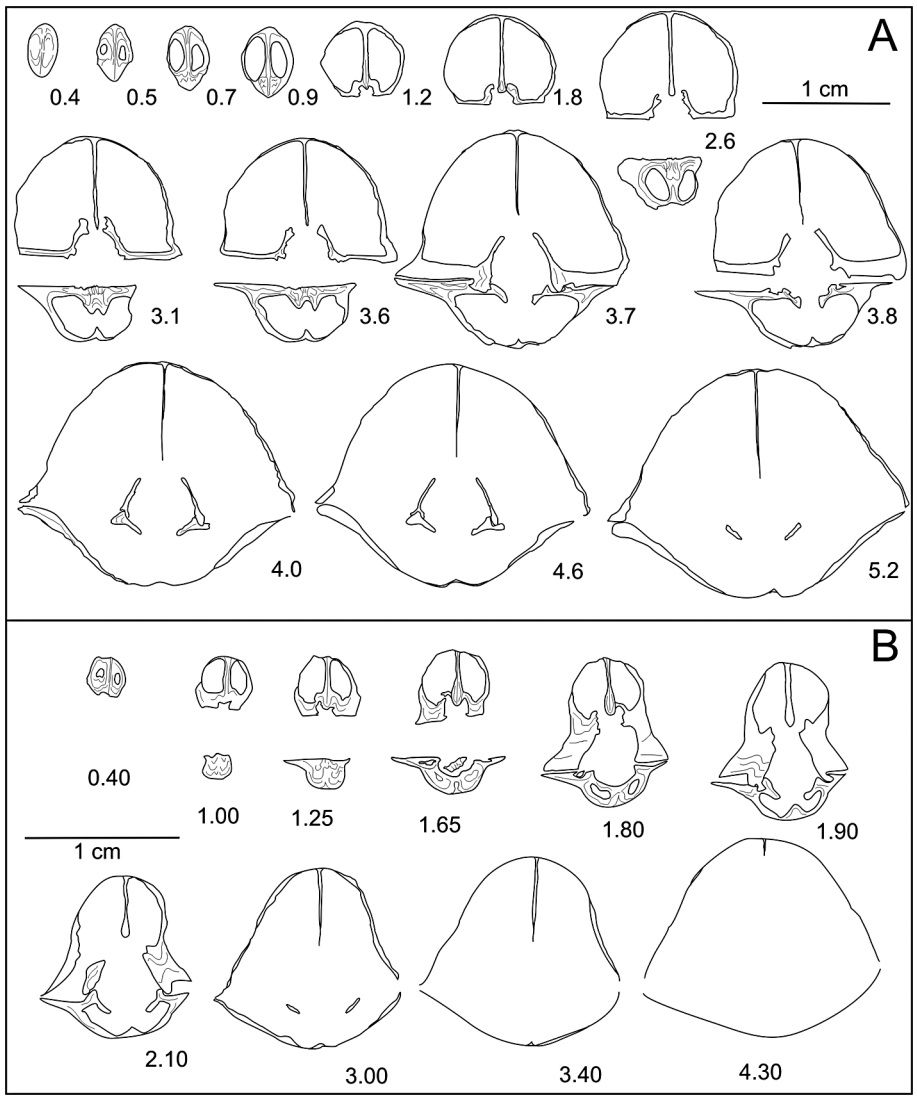


Fig. 5 - A) *Mentzelia ampla* (Bittner, 1890) – Serial sections of the specimen MPUM 8660 (TB1/3); Val Meria, Illyrian. Distance from the umbo are in mm. B) *Paramentzelia fraasi* (Bittner, 1890). Serial sections of the specimen MPUM 8729 (G883/2), Wendelstein, Ladinian. Distance from the umbo are in mm.

Type locality: Wendelstein area – Partnach Schichten, Bavaria, Germany. Ladinian.

Material: Thirty-seven decorticated specimens collected in the following localities: Val Meria, MPUM 8660, MPUM 8661, MPUM 8662, MPUM 8664; Soingrat (Wendelstein area, Bavaria, MPUM 8656, MPUM 8663, MPUM 8728). We had also at our disposal the specimens of Torti & Angiolini (1997, specimens 1010D/3 and 754/128) and also considered several specimens stored in the Predazzo Museum. The search for the locality Val di Rosalia of Salomon (1895) was unsuccessful.

Description

External characters. Medium sized biconvex shell with a sub-rhomboidal outline. Width slightly exceeding length, with maximum width at about 1/2 of the maximum length. Short and straight cardinal margin with rounded extremities, rarely angular (obtuse angle) and gently winged. Uniplicate anterior commissure with high and U-shaped fold. Ventral valve with medium sized umbo, pointed and weakly curved on the hinge. Median sulcus extending to form an anterior tongue. The sulcus, U-shaped in cross-section, begins near the umbo, becoming larger and deeper at about 1/3 of the maximum length of the shell. Concave and apsacline ventral interarea, height 1/3 of its length. Wide delthyrium delimited by peri-deltidial areas. Dorsal valve with umbo not pointed and only weakly curved on the hinge. Well developed, rounded fold.

Faint radial ornamentation usually starting at midlength and occurring on the sulcus and fold. In the decorticated specimens, ribs are commonly not visible. Growth lamellae are in number of 2-3 in 5 mm near the anterior margin. Micro-ornament not observed.

Internal characters (Fig. 5A). Thin and long median ventral septum. It disappears between 6 and 7 mm from the umbo (MPUM 8660). Dental plates absent. Long and low dental flanges, convergent to the median septum. The secondary fibres of the dental flanges show a weakly convex flow towards the ventral valve floor and they are in continuity with those of the median septum, forming an apical false spondylium. The median septum protrudes into spondylial chamber only apically.

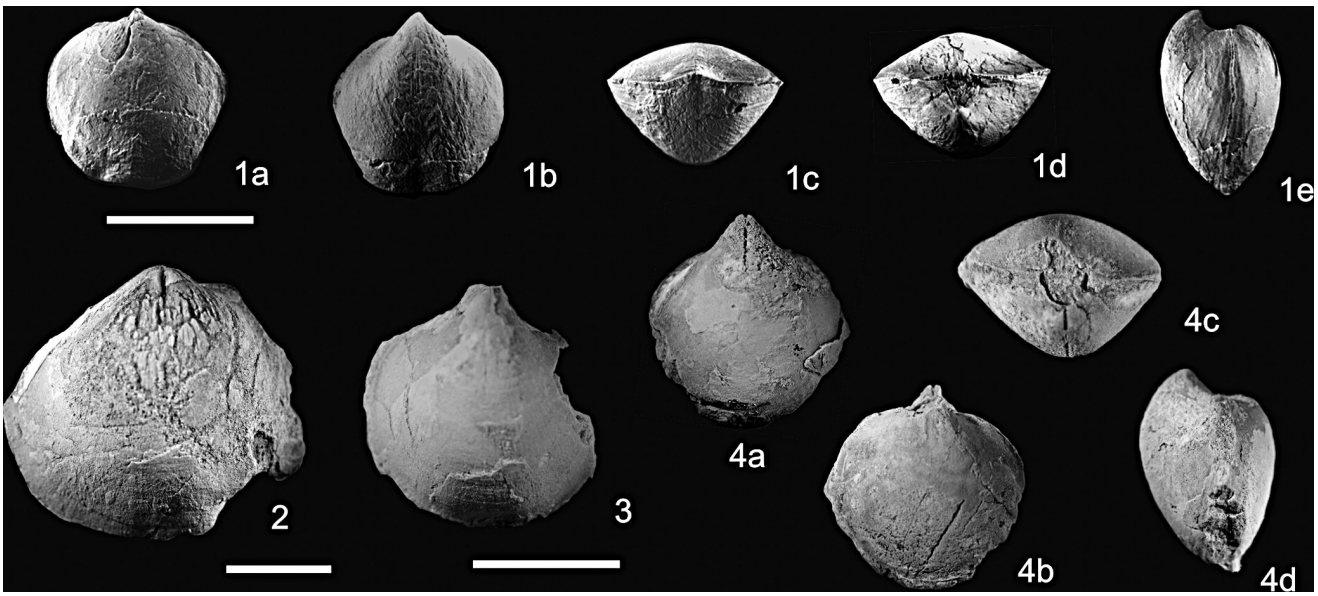


Fig. 6 - *Paramentzelia fraasi* (Bittner, 1890). Pictures: scale bar 1 cm.
1) Lectotype, specimen from Wendelstein; a- dorsal, b- ventral, c- anterior, d- posterior and e- lateral views. 2) Specimen MPUM 8715/1 (G882), Wendelstein, Ladinian; ventral view. 3) Specimen MPUM 8715/2 (G882), Wendelstein, Ladinian; ventral view. 4) Specimen MPUM 8715/3 (G882), Wendelstein, Ladinian; a- ventral, b- dorsal, c- posterior, and d- lateral views.

Remarks. Salomon (1895) introduced *bathycolpos* and *radiata* as varieties (pl. 1, figs 59-60 and 61). We consider *bathycolpos* as a gerontic specimen with radial ornamentation near the anterior margin; *radiata* was erected because of radial ornamentation supposedly lacking in the nominative subspecies. However, a gentle radial ornamentation is present in the lectotype (Pl. 1, fig. 10a-e) and in other specimens at our disposal. In the present paper, *bathycolpos* and *radiata* Salomon, 1895, are included in the nominative subspecies. The specimens described by De Lorenzo (1896) and collected from the Middle Triassic of Lagonegro (Italy) have not been illustrated. *Mentzelia scabrula* Ching, Sun & Ye was described by Sun (1981, p. 207, text-fig. 17, pl. 7, figs 23-30) from the Tibet region. The Authors emphasize its affinity with *M. ampla*, from which *M. scabrula* differs by its smaller dimensions and much reduced plica. The internal characters are similar.

Siblìk (1991) included with doubt the species *Mentzelia ampla* (Bittner, 1890) and the varieties *radiata* and *bathycolpos* (Salomon, 1895) in the genus *Tethyspira*, on the basis of external morphology, the internal characters of *ampla* not being known at the time. Torti & Angiolini (1997) excluded this species from *Tethyspira*, based on serial sections, an opinion shared here.

Occurrence and stratigraphical range. *Mentzelia ampla* is a rare species with a wide range, from the basal Illyrian (Val Meria) through the Anisian/Ladinian boundary interval (Dörgicse Fm. = Buchenstein Beds) in the Balaton Highland, Hungary (Vörös & Palfy 1988). The species occurs mostly in the Ladinian, in the Northern Calcareous Alps (Partnach Schichten of Wendelstein and Wettersteinkalk of Raxalpe) and the Southern Alps (Esino Limestone, Marmolada Limestone). It seems to prefer carbonate sand bottoms.

Genus *Paramentzelia* Xu, 1978

Type species: *Paramentzelia ovata* Xu, 1978

Paramentzelia fraasi (Bittner, 1890)

Figs 5B, 6

1890 *Spiriferina Fraasi* Bittner: 165, pl. 40, fig. 34; pl. 41, fig. 15.
1988 *Mentzelia fraasi* - Siblìk: 65.

Lectotype: Selected by Siblìk (1988). Bayerische Staatsammlung 1890.VIII.37. Here figured.

Type locality: Wendelstein area – Partnach Schichten, Bavaria, Germany. ?Ladinian/Carnian.

Material: MPUM 8715: six complete specimens and nine ventral valves; MPUM 8729: 1 complete specimen, all from Soingrat (Wendelstein area, Bavaria).

Description

External characters. Smooth biconvex shell, subpentagonal in outline, with maximum width posteriorly, near the hinge. Apsacline interarea, with small, recurved beak. Faint sulcus developed only in the anterior half of the length. Commissure gently uniplicate.

Dorsal valve with fold almost absent.

Internal characters (Fig. 5B). Ventral valve with stout median septum rounded at its end, ending at about 4.5 mm from the umbo. Dental flanges joined to the septum to form a small false spondylium. Small teeth. Dorsal valve with thick lamellar ctenophoridium. Crural bases supported by a callus to form an apical plat-

form. The ventral septum disappears at about 5 mm from the umbo.

Remarks. The presence of an apical platform in the dorsal valve suggests the attribution to the genus *Paramentzelia* Xu, 1978.

Occurrence. Our material originates fom the type-area. Apparently the species is known only from there.

Genus *Koeveskallina* Dagys, 1965

Type species: *Spiriferina Köveskályensis* Stur, 1865

Diagnosis: The genus *Koeveskallina* comprises species with small biconvex shells, sub-oval in outline. Narrow and straight cardinal margin, with rounded cardinal extremities. Sinus and fold lacking or weakly developed. Radial ornamentation with numerous and fine ribs on the entire surface of the shell. Dental plates absent. Median ventral septum thin and long. Dental flanges transversally fused to the septum, forming a false spondylium. The median septum enters the spondylial chamber only apically. Wide crural plates connected with the floor of the shell by secondary layer. Spiralium up to ten whorls, jugum subdivided.

Remarks. The genus was erected by Dagys (1965) and referred by the same author (1974) to the subfamily Mentzeliinae Dagys, 1974. Dagys included in the genus *Koeveskallina* all the species with small shells, oval shape, short umbo, sinus and fold usually lacking or developed only in the anterior part, and numerous fine ribs on the overall surface.

The genus *Koeveskallina* differs from the genus *Mentzelia* Quenstedt, 1871 by the occurrence of fine dense ribs, which cover the entire surface of the shell. The internal characters are similar.

Sun & Ye (1982) introduced the new species *K. epichara* and *K. media,* referred to the genus *Koeveskallina.* However, they bear a coarser ribbing, the dorsal valve is flat, and the dental sockets are supported by blades that do not exists in *Koeveskallina*.

Occurrence and stratigraphical range. From the Anisian to the Carnian of the Alps, Dinarids, Carpathians, Crimea, Caucasus, and Himalayas (Dagys, 1974).

Koeveskallina koeveskalyensis (Stur, 1865)

Figs 2D, 7A-B; Pl. 2, figs 4-11; App. 2, tab. 4

1865 *Spiriferina Köveskályensis* sp. nov. Stur: 245.

1873 *Spiriferina Köveskálliensis* - Boeckh: 175, pl. 11: figs 22, 23.

1890 *Spiriferina (Mentzelia) Köveskalliensis* - Bittner: 26, pl. 34, figs 29-32, 35.

1890 *Spiriferina (Mentzelia) Köveskalliensis* var. *microrhyncha* var. nov.; Bittner: 27, pl. 34, figs 33-34.

?1890 *Spiriferina Köveskalliensis* var. *subsinuosa* var. nov. Bittner: 44, pl. 33, fig. 16.

?1892 *Spiriferina (Mentzelia)* aff. *Köveskalliensis* - Bittner: 5, pl. 1, fig. 7.

?1894 *Spiriferina (Mentzelia) koeveskalliensis* - Tommasi: 67.

1895 *Spiriferina* cfr. *Spitiensis* Stoliczka; Salomon: 87, pl. 2, fig. 14.

1899 *Spiriferina Spitiensis* Stoliczka; Bittner: 21, pl. 4, figs 15-16.

1901 *Spiriferina (Mentzelia) Koeveskalliensis* var. *microrhyncha* - Bittner: 21, pl. 4, fig. 15.

1903 *Spiriferina (Mentzelia) Köveskalliensis* var. *validirostris* - Bittner: 583, pl. 25, figs 23-25.

1906 *Spiriferina* (*Mentzelia*) *Köveskalliensis* Suess; Arthaber, pl. 35, fig. 11.

1967 *Koeveskallina koeveskalliensis* - Casati & Gnaccolini: 125, pl. 9, fig. 7.

1972 *Koeveskallina koeveskalyensis* - Siblík, pl. 61, fig. 4; pl. 63, fig. 2 (*cum syn.*).

1974 *Koeveskallina koeveskalyensis* - Dagys: 172, pl. 40, figs 3, 4.

?1993 *Koeveskallina koeveskalyensis* - Iordan: pl. 1, figs 7, 8.

2001 *Koeveskallina koeveskalyensis* - Siblik: 19.

2003 *Koeveskallina koeveskalyensis* - Pálfy: 147, pl. 1, figs 17-21.

Holotype: Not selected (Siblik 1988).

Type locality: Piazza Brembana (Prezzo Lmst., Illyrian, Lombardy, Italy).

Material: 280 specimens, mostly decorticated, from the following localities: Canalone Porta MPUM 8700 (G133), Val Tesa MPUM 8704, MPUM 8706, MPUM 8708, 8709,8710, 8711, 8712 (N); Val Suella MPUM 8705, MPUM 8713; Val Meria MPUM 8703 (T1,2); Foppa della Lanca MUPM 8688, 8699 (G130); Valle dell'Acqua Fredda MPUM 8707; Rugialdbach MPUM 8691, MPUM 8702 (G67); Monte Rite MPUM 8701 (G54), MPUM 8695, MPUM 8698, MPUM 8735 (G223); MPUM 8690, 8692, 8693, 8737 (G460); Nadosolui valley, Persani Mts. MPUM 8694, MPUM 8696. Gebze MPUM 8689 (T282).

Description

External characters. Small and biconvex shell, from sub-circular to sub-elliptical in outline. The width often exceeds the length; otherwise, width and length are similar. The maximum width occurs at about 1/2 of the maximum length. Hinge line narrow; cardinal extremities from rounded to weakly obtuse angle. Anterior commissure weakly uniplicate.

Ventral valve more convex than dorsal valve. Medium sized umbo, fairly long, pointed and weakly curved on the hinge line. The ventral interarea is apsacline, variable in height; wide and open delthyrium. Ventral valve with a very shallow median sulcus, sometimes absent. Dorsal valve with short and not pointed umbo. Fold absent.

The ornamentation consists of numerous simple ribs beginning at the umbo and reaching the anterior margin. The ribs, 40 to 46 in number over all the surface of the shell, are not in corresponding position on the two valves. Two to five growth lamellae on the anterior half.

Internal characters (Fig. 7). Ventral valve characterized by a simple and high median septum extending more than 1/2 of the maximum length. Short and low dental flanges converging to the top of the median septum, forming a small pseudospondylial cavity. Myofragm extending to about 1/3-1/4 of the maximum length. Spiralium with up to seven spires.

Remarks. Some variability in the outline, thickness, anterior commissure, orientation and height of the ventral interarea may be observed. The anterior commissure is from weakly uniplicate to rectimarginate when the sulcus and the fold are absent. In some specimens, the ventral interarea is apsacline, orthocline in others and few specimens show a ventral interarea from apsacline to orthocline.

Based on the development of the umbo, Bittner distinguished four varieties of *K. koeveskalyensis*, namely *K. koeveskalyensis microrhyncha* (Bittner, 1890), *K. koeveskalyensis leptorhyncha* (Bittner, 1892), *K. koeveskalyensis validirostris* (Bittner, 1903) and *K. koeveskalyensis subsinuosa* (Bittner, 1890).

We considered for a long time whether to keep *K. koeveskalyensis validirostris* as an independent species, because it is older and occurs in a different environment in the Southern Alps. It was found in a context of carbonate sands, probably requiring a more effective pedicle attachment, while *K. koeveskaliensis* is found in quieter, muddier environment. However, we doubt it may be a sufficient character to separate it as a self-standing species. *K. koeveskalyensis microrhyncha* and *K. koeveskalyensis leptorhyncha* are considered as morphotypes of *K. koeveskalyensis.* The *K. koeveskalyensis subsinuosa* variety is tentatively considered as morphotype of the species, because of its deeper sulcus.

The specimens of Iordan (1993, pl. 1, figs 7-8) are doubtful because the ventral valve shows an ornamentation consisting of 12-13 ribs on each flank, against 16-18 in our specimens. Siblík (1970) discussed the right spelling of the species *Koeveskallina koeveskalyensis* (Stúr, 1865) which is here adopted.

Occurrence and stratigraphical range. *Koeveskallina koeveskalyensis* is a common species in the Anisian of the Southern and Northern Alps, Hungary and Caucasus. Our specimens from the Grigna Mountains originate from the same lithological unit as in the type locality. The species seems to be adapted also to muddy bottoms.

Koeveskallina pannonica (Bittner, 1890)

Fig. 7B; Pl. 2, figs 1-3; App. 2, tab. 5

1890 *Spiriferina (Mentzelia) pannonica* Bittner, p. 26, pl. 34, fig. 36.

?1904 *Spiriferina (Mentzelia) pannonica* - Martelli, p. 338-339.

?1989 *Koeveskallina? pannonica* - Vörös and Pálfy, pl. 4, fig. 4a-c.

Holotype: The specimen described and illustrated by Bittner (1890, pl. 34, fig. 36) is housed at the Geol. Survey of Budapest (Hungary) (Siblík, pers. comm. 2002).

Type locality: Aszófő (Balaton Highland, Hungary).

Material: Four specimens from the locality of Monte Rite MPUM 8684 (G223/302); MPUM 8685 (G460/26), MPUM 8686 (G460/79), MPUM 8738 (G460/130).

Description

External characters. Small to medium sized and biconvex shell, from sub-oval to sub-triangular in outline. Width exceeds length and the maximum width occurs at about 1/2 of the length. Narrow hinge line. Anterior commissure weakly uniplicate. Ventral valve much more convex than the dorsal. Strong ventral umbo, pointed and weakly curved on the hinge line. Apsacline ventral interarea; delthyrium wide and open. Its base is 1/3 of the interarea width. Median sulcus, narrow and deep, and starting from the umbo. Dorsal valve with a short and not pointed umbo. Fold absent.

The ornamentation consists of dense and very fine ribs, covering the whole shell, more than 20 on each flanks. The two ribs in the middle of the sulcus appear larger. Ribs not in corresponding positions on the two valves. Rather strong growth lamellae on the anterior half of the valves.

Internal characters. Only the presence of a median ventral septum extending for 1/3-1/4 of the maxi-

PLATE 2

Genus *Koeveskallina*. Scale bar = 1 cm.

Koeveskallina pannonica (Bittner, 1890) from the Bithynian/Pelsonian of Monte Rite (Cadore, Italy).

Fig. 1 - Specimen MPUM 8686 (G460/79); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 2 - Specimen MPUM 8684 (G223/5); a- ventral, b- lateral and c- posterior views.

Fig. 3 - Specimen MPUM 8685 (G460/26), ventral view.

Koeveskallina koeveskalyensis (Stur, 1865).

Fig. 4 - Specimen MPUM 8712 (N 96) (Val Tesa, Grigna Group, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 5 - Specimen MPUM 8699 (G130/18) (Foppa della Lanca, Grigna Group, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 6 - Specimen MPUM 8700 (G133/9). (Canalone Porta, Grigna Group, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

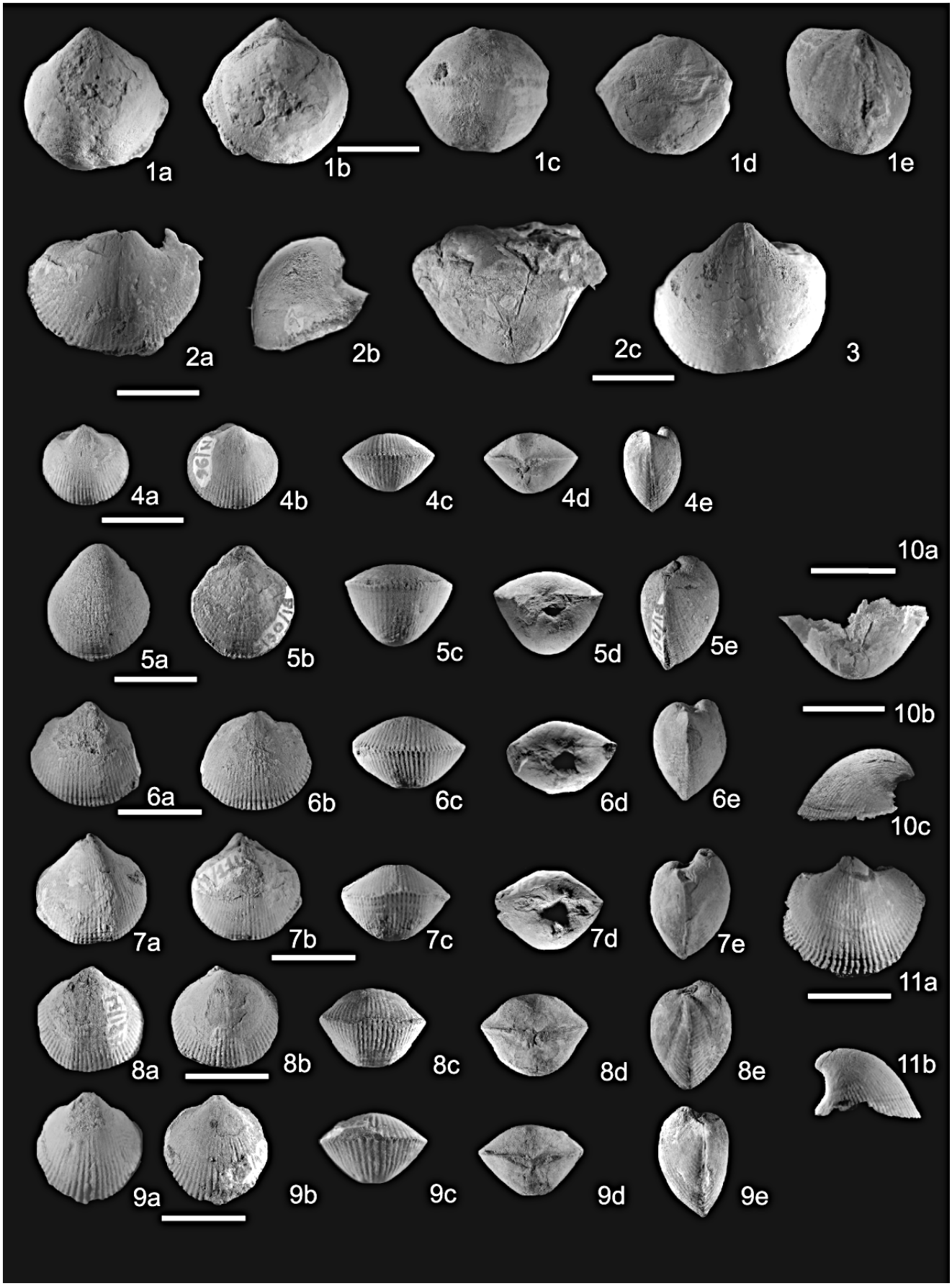
Fig. 7 - Specimen MPUM 8713 (N114) (Val Suella, Introbio, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 8 - Specimen MPUM 8713 (N114) (Val Suella, Introbio, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 9 - Specimen MPUM 8700 (G133/11) (Canalone Porta, Grigna Group, Illyrian); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 10 - Specimen MPUM 8698 (G223/110) (Monte Rite, Bithynian or Pelsonian); a- ventral, b- posterior and c- lateral views. Ecotype with strong beak, named *Koeveskallina validirostris* by Bittner (1903).

Fig. 11 - Specimen MPUM 8691 (G67/1) (Rugialdbach, Pelsonian); a- ventral and b- lateral views. Ecotype with strong beak, named *Koeveskallina validirostris* by Bittner (1903).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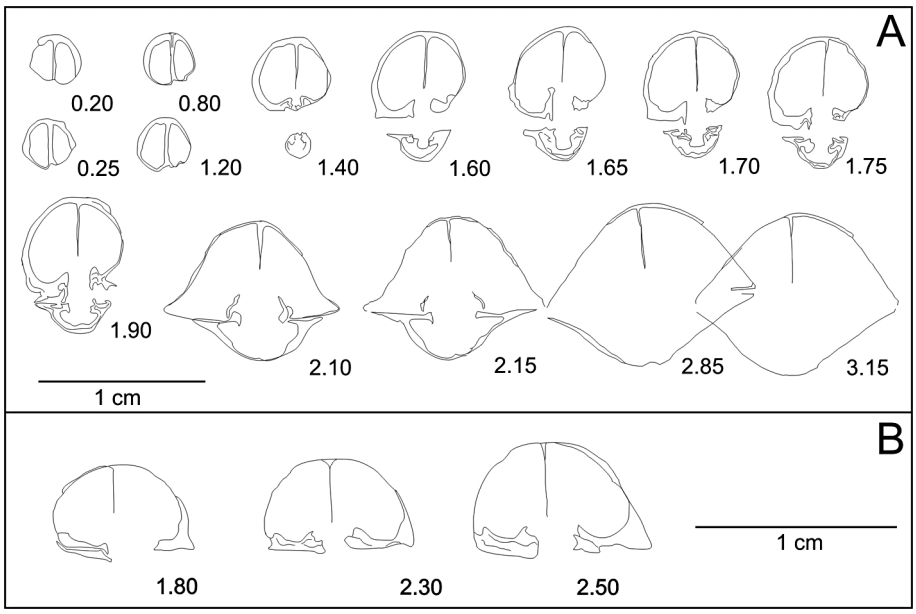


Fig. 7 - *Koeveskallina koeveskalyensis* (Stur, 1865). Serial sections of the specimen A) MPUM 8704 (N/85) and B) MPUM 8706 (N200). Val Tesa, latest Pelsonian/Illyrian. C) *Koeveskallina pannonica* (Bittner, 1890), specimen MPUM 8684 (G223/302). M. Rite Bithynian or Pelsonian. Distance from the umbo are in mm.

mum length of the valve may be observed. No other data.

Remarks. In 1890 Bittner described (pl. 34, fig. 36) the new species *Spiriferina (Mentzelia) pannonica*, which differs from *K. koeveskalyensis* (Stur, 1865) by the straight and deep ventral median sulcus, often absent in *K. koeveskalyensis,* by a stronger convexity of both the valves, and in having coarser ribs. Later, the species was only rarely recognized. Martelli (1904) described two specimens of *pannonica* from the Anisian of the Buceri (Montenegro) stressing their similarity to the specimens from Marmolada (Italy) (Salomon 1895), which were compared by Salomon to *Spiriferina spitiensis* Stoliczka. However, *K. pannonica* differs from the Salomon's specimens (pl. 2, figs 7-15) in the straighter ventral umbo and deeper ventral sulcus. De Toni (1912) considered *Spiriferina (Mentzelia) pannonica* as variety of *K. koeveskalyensis*, characterized by a well developed median ventral sulcus.

Vörös and Pálfy (1989) figured a complete specimen. However, the illustration does not allow to verify the presence of the typical straight and deep median ventral sulcus.

Occurrence and stratigraphical range. *K. pannonica* is a rare species occurring in the Pelsonian of Aszófő (Hungary) and in the Southern Alps at the top of a carbonate platform, possibly Bithynian in age. Its occurrence at the base of the *Reitzi* Zone (uppermost Anisian) in the Vászoly section (Vörös & Pálfy 1989) is doubtful.

Genus *Dagyssia* gen. nov.

Type species*: Spiriferina paläo-typus* var. *lineolata* Loretz, 1875

Derivation of name: Dedicated to Algirdas Dagys for his outstanding contribution to the knowledge of Triassic brachiopods.

Diagnosis: Medium sized biconvex shell with well-developed sulcus and fold. Radial ornamentation consisting of numerous ribs on the anterior half of the shell or on the whole surface. Micro-ornamentation consisting of numerous spines usually arranged in quincunx. Simple median ventral septum. Long dental flanges whose distal ends are convergent to the ventral valve floor and sub-orthogonal to the median ventral septum. Dental plates absent. Small false spondylium. The spondylial cavity is low and the septum enters only apically.

Composition of the genus: *Spiriferina paläo-typus* var. *lineolata* Loretz, 1875; *Mentzelia multicostata* Yang & Xu, 1966.

Comparisons. The type species *Dagyssia palaeotypus* was previously included in the genus *Koeveskallina* by Siblík (1988) and Pálfy (2003) because of its ribbing on the whole shell. However, *Koeveskallina* has a more globose shape and lacking or less pronounced sulcus and fold. *K. koeveskalyensis*, *K. acrorhyncha* and *K. pannonica* form a rather homogeneous group, whilst the general shape of *D. palaeotypus* is transverse and does not fit in the *Koeveskallina* shape. The internal characters are instead common to the other genera of the subfamily Mentzeliinae.

Mentzelia multicostata Yang & Xu, from the Anisian of Guizhou, China, has a similar ribbing, even if coarser, and similar internal characters. We tentatively refer this species to the new genus.

Occurrence and stratigraphical range: At present known only from the Middle Triassic of the margin of Adria promontory, and possibly from the South China Block.

Dagyssia palaeotypus (Loretz, 1875)

Figs 2E, 8A-B; Pl. 3, figs 1-6; App. 2, tab. 6

1875 *Spiriferina paläo-typus* var. *lineolata* var. nov. Loretz: 802, pl. 21, fig. 1.

non 1875 *Spiriferina paläo-typus* var. *acrorhyncha* var. nov. Loretz: 803, pl. 21, fig. 2.

non 1875 *Spiriferina paläo-typus* var. *media* var. nov. Loretz: 803, pl. 21, fig. 3.

1890 *Spiriferina (Mentzelia) palaeotypus* - Bittner: 28, pl. 35, figs 9-11.

1903 *Spiriferina (Mentzelia)* cfr. *palaeotypus* - Bittner, pl. 25, fig. 22.

?1903 *Spiriferina ptychitiphila* Bittner; Kittl: 701, pl. 23, fig. 3.

1912 *Spiriferina palaeotypus* - De Toni: 239, pl. 1, fig. 7a-c.

non 1935 *Spiriferina (Mentzelia) paleotipus (sic)* - Milosavljevic: 272, pl. 1, fig. 7.

non 1958 *Mentzelia palaeotypus* - Pantic: 66, pl. 2, fig. 2.

1967 *Spiriferina palaeotypus* - Leonardi, pl. 24, fig. 5.

non 1967 *Koeveskallina* cfr. *palao-typus* - Casati & Gnaccolini: 127, pl. 9, fig. 2.

1988 *Koeveskallina paleotypus* - Siblík: 64.

2001 *Koeveskallina palaeotypus* - Siblík: 19.

2003 *Koeveskallina palaeotypus* - Pálfy: 148, pl. Br-I, fig. 22.

Lectotype: The specimen figured by Loretz (1875, pl. 21, fig. 1) is housed in the Bayerische Staatssammlung für Palaontologie und historische Geologie in Munich (Germany).

Type locality: The locality description by Loretz is rather vague, but it is reasonable to consider as type-locality the north-western slope of the ridge between Monte Prà della Vacca and the ridge 2279 m, at an altitude of 2160 m, in the upper part of the Dont Formation, Braies, Bolzano. Therefore, most of our specimens may be considered as topotypic.

Material: 153 specimens from the following localities: Prà della Vacca/Kuhwiesenkopf PZO 5671-5712 (G351, G465), PZO 5754 (level 1 of Bechstaedt. & Brandner 1970); MPUM 11369 (G351/8), MPUM 11370 (G482/24); debris (MPUM 8716, 8727); Cima dei Colli Alti PZO 5728-5752 (G481); Monte Rite MPUM 8714 (G223), MPUM 8739 (G460); Cernera MPUM 8718 (P54).

Description

External characters. Medium sized and biconvex shell, from sub-pentagonal to elliptical in outline. Width exceeding length and maximum width at about 1/2 of the maximum length. Hinge narrow; cardinal extremities rounded, rarely angular (obtuse angle) and weakly winged. Anterior commissure uniplicate with a sub-squared fold.

Ventral valve more convex than the dorsal valve. Rather strong umbo, long, terminally pointed and curved on the hinge. Ventral interarea concave and apsacline, width double of the height. Widh of the delthyrium about 1/3 of the interarea. Median sulcus, flat and sub-squared in section, starting at the umbo. Dorsal valve sub-oval in outline. Fold starting at the umbo, wide but not very high, rounded in transverse section, sub-rectangular near the anterior commissure.

Shell ornamented by numerous, simple and dense ribs, starting at the umbo, 14-18 on the each flank, not in corresponding position on the two valves, and 6-10 in the sulcus and fold. Micro-ornament consisting of elongate and solid spines, arranged in quincunx. Growth lamellae, denser anteriorly, 3 to 9 over 5 mm of length, near the anterior margin.

Internal characters. (Fig. 8). *Dagyssia palaeotypus* is characterized by its median septum, simple in shape and high. The median septum disappears anteriorly to 5 mm distance from the umbo. Dental adminicula lacking. Dental flanges very low and of average length, formed by secondary fibres strongly convergent to the median septum and fused to it. Small and low false spondylium. The septum enters only apically the spondylial chamber. Dental flanges lose contact with the septum at a distance of 2 mm from the umbo; then they disappear at a distance of about 4.5-5 mm from the umbo. Articulation with medium sized teeths and shallow inner socket ridges. Crura disappear at a distance of 6 mm from the umbo.

Remarks. Loretz (1875) distinguished the new species *Spiriferina paläo-typus* with three varieties: *lineolata*, *acrorhyncha* and *media* (pl. 21, figs 1-3). Following Bittner (1890) we consider only *D. palaeotypus* var. *lineolata* as belonging to *D. palaeotypus*, while *acrorhyncha* and *media* are lacking ornaments and are thus referred to *Mentzelia mentzeli*. The specimen of *Sp. ptychitiphila* from Haliluci (Kittl 1903) is tentatively assigned to *D. palaeotypus*. However, it lacks significant ribbing in the sulcus and on the fold. The specimen described by Milosavljevic (1935, pl. 1, fig. 7) lacks fine ribbing and a deep sulcus as does the single ventral valve of Pantic (1958). These specimens are not referred to *D. palaeotypus*. The specimen described by Casati and Gnaccolini (1967, pl. 9, fig. 2a-b) has a more convex dorsal valve and coarser ribs only on the flanks. It is thus referred to *Ptychomentzelia ptychitiphila.*

Occurrence and stratigraphical range. *Dagyssia palaeotypus* is recorded in the middle Anisian of Italy, Hungary (Pálfy 1986, 2003), and Dalmatia. It seems to dwell on a substratum characterized by a certain amount of micrite or fine mud.

Subfamily Tethyspirinae Carter in Carter et al., 1994

Genus *Tethyspira* Siblík, 1991

Type species: *Tethyspira persis* Siblík, 1991

Remarks. Siblík (1991) placed the genus in the Mentzeliinae with doubts, as being close both to Mentzeliinae Dagys, 1974 and to Laballinae Dagys, 1962. However, the genus differs from Mentzeliinae because the dental plates are joined to the median septum entering into a spondylial-like structure and from Laballinae in the absence of a semi-pyramidal ventral valve and of plates supporting descending lamellae of spiralia.

Carter et al. (1994) referred the genera *Tethyspira* and *Spondylospiriferina* Dagys, 1972 to the new subfamily Tethyspirinae characterized by the occurrence of the spondylium. We follow Carter et al. (1994).

Occurrence and stratigraphical range. Middle Triassic of Iran and Italy.

Tethyspira sp. ind.

Fig. 9; Pl. 4, figs 1-3

Material: Six specimens from Val Meria, MPUM 8621, MPUM 8622, MPUM 8623, MPUM 8624.

Description

External characters. Medium to large sized, biconvex shell with sub-elliptical outline, very elongated transversally. Ventral valve width exceeding length. Maximum width occurring at about 1/2 of the maximum length. Narrow hinge with rounded cardinal extremities. Uniplicate anterior commissure with high U-shaped fold. Ventral valve sub-elliptical in outline, less convex than the dorsal valve. Medium sized umbo, long, not pointed and curved on the hinge. Ventral interarea concave and apsacline. The height of the interarea is 1/2 of its length. Delthyrium delimited by peridelthydial areas with a basal width of about 1/2 – 1/3 of the width of interarea. Ventral valve with rounded median sulcus. The width of sulcus rapidly increases at about 1/3 of the maximum length, becoming wider and deeper; then it expands anteriorly, forming a well-developed sulcal tongue.

Dorsal valve sub-elliptical in outline, with not pointed umbo. Fold strong and rounded in section, starting at the umbo and becoming very high near the anterior commissure.

The concentric ornamentation consists of very prominent growth lamellae up to 6 to 8 in number. Micro-ornamentation not observed.

Internal characters (Fig. 9). A single ventral valve (MPUM 8621) was sectioned, showing a stout, high and long median ventral septum; well developed dental plates with dental flanges joined to the septum, forming a small spondylium. Adminicula parallel and adjacent to the median septum. Articulation poorly observed, apparently not tight.

Remarks. The meagre material at disposal prevents a more detailed analysis and species attribution. Externally there is some similarity with *Mentzelia ampla* (Bittner, 1890). However, *T. persis* differs from *M. ampla* by its greater size, more transversally elongate shell, lower convexity of both valves (more specifically of the dorsal valve), absence of costae on the anterior part of valves, stronger median septum, presence of dental plates, and spondylial cavity divided in two lateral spondylial chambers by the median septum.

Occurrence and stratigraphical range. The genus *Tethyspira* is known only from the type species *T. persis,* which is reported from the Ladinian of northeast Iran. Our finding in the basal Illyrian of the Val Meria indicates that the genus appeared earlier in the Middle Triassic.

Genus *Ptychomentzelia* gen. nov.

Type species. *Spiriferina (Mentzelia) Mentzelii* var. *propontica* Toula, 1896: 159, pl. 18, fig. 7 a-e.

Etymology: Mentzeliid with ribs (Greek *ptychos*).

Diagnosis: Small to medium sized and biconvex shells, with well-developed sulcus. Fold weak to absent. Costae may be present on the anterior half of the shell. Thin median ventral septum. Dental plates slightly divergent to the ventral valve floor. High and long dental flanges. Spondylium present and spondylial chamber wider than high, sub-quadrate in shape. The median septum protrudes in-to the spondylial cavity only apically.

Species assigned to the genus: *Spiriferina (M.) propontica* Toula, 1896; *Spiriferina ptychitiphila* Bittner, 1890; *Ptychomentzelia ritensis* sp. nov.

Occurrence and stratigraphical range: Middle Triassic, mostly Anisian (Bithynian of Turkey, Pelsonian and Illyrian of Hungary, Rumania, Bosnia and Italy). Ladinian of Western Dolomites, Italy.

Ptychomentzelia propontica (Toula, 1896)

Figs 2G, 10; Pl. 4, figs 4-8; App. 2, tab. 7

1896 *Spiriferina (Mentzelia) Mentzelii* var. *propontica* var. nov. Toula: 159, pl. 18, fig. 7a-e.

1914 *Spiriferina (Mentzelia) Mentzelii* var. *propontica* - Arthaber: 193, pl. 18, figs 7a-d, 8a-d.

1969 *Mentzelia propontica* - Gaetani: pl. 35, figs 6, 7.

2010b *Mentzelia propontica* - Siblík: pl. 2, figs. 1abc.

Holotype: By monotypy, the specimen is housed in the Geologische Bundesanstalt Wien, catalogue number 1896/002/0004.

PLATE 3

Dagyssia palaeotypus (Loretz, 1875). Scale bar 1 cm.

Fig. 1 - Specimen PZO 5671, Pra' della Vacca/Kuh Wiesenkopf, Pelsonian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

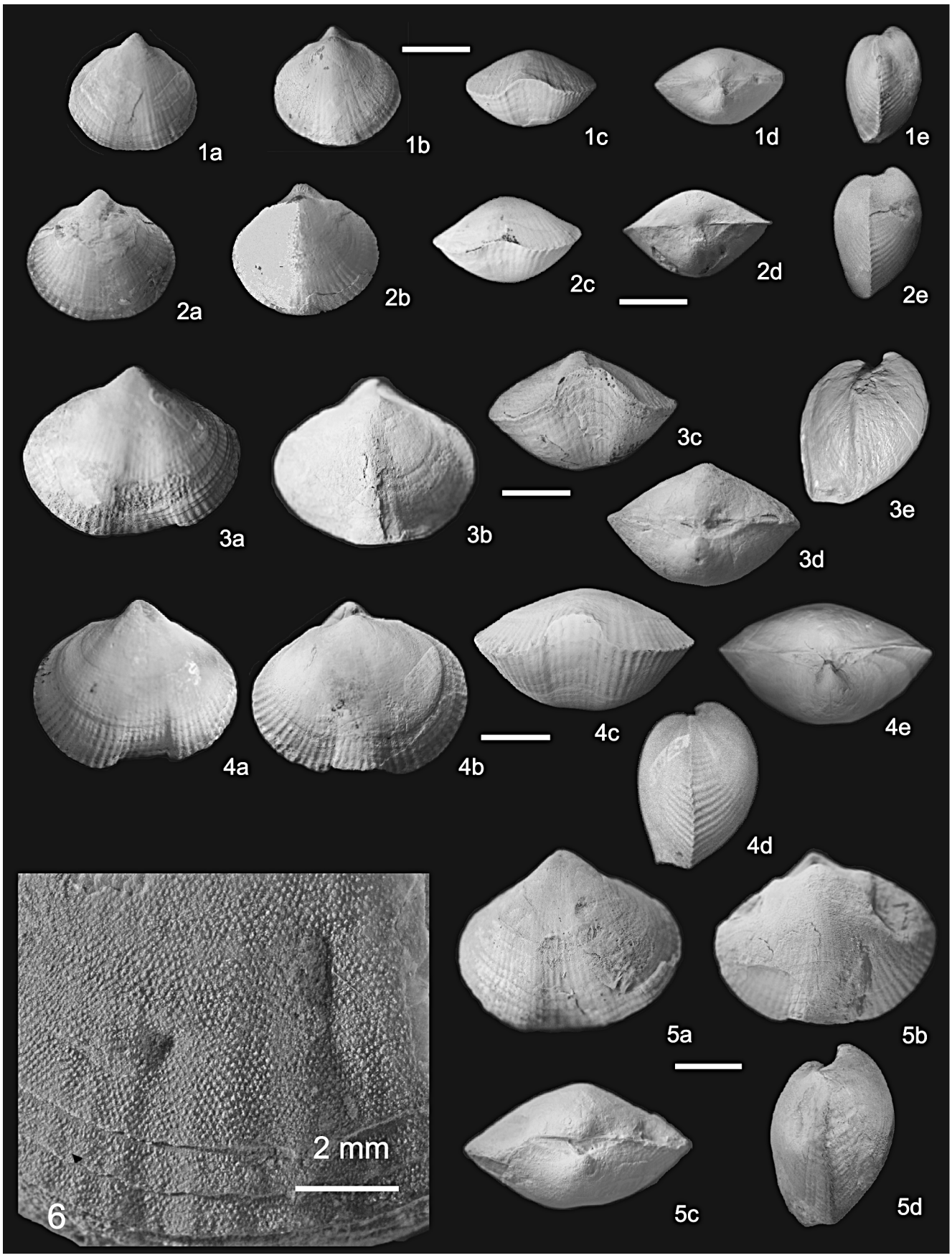
Fig. 2 - Specimen PZO 5673, Pra' della Vacca/Kuh Wiesenkopf, Pelsonian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 3 - Specimen PZO 5731, Cima dei Colli Alti/Hochalpenkopf, Pelsonian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 4 - Specimen PZO 5730, Cima dei Colli Alti/Hochalpenkopf, Pelsonian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 5 - Specimen PZO 5672, Pra' della Vacca/Kuh Wiesenkopf, Pelsonian; a- ventral, b- dorsal, c- anterior and d- lateral views.

Fig. 6 - Specimen MPUM 8716 (G465), Pra' della Vacca/Kuh Wiesenkopf, Pelsonian; detail of the spiny surface.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2 mm

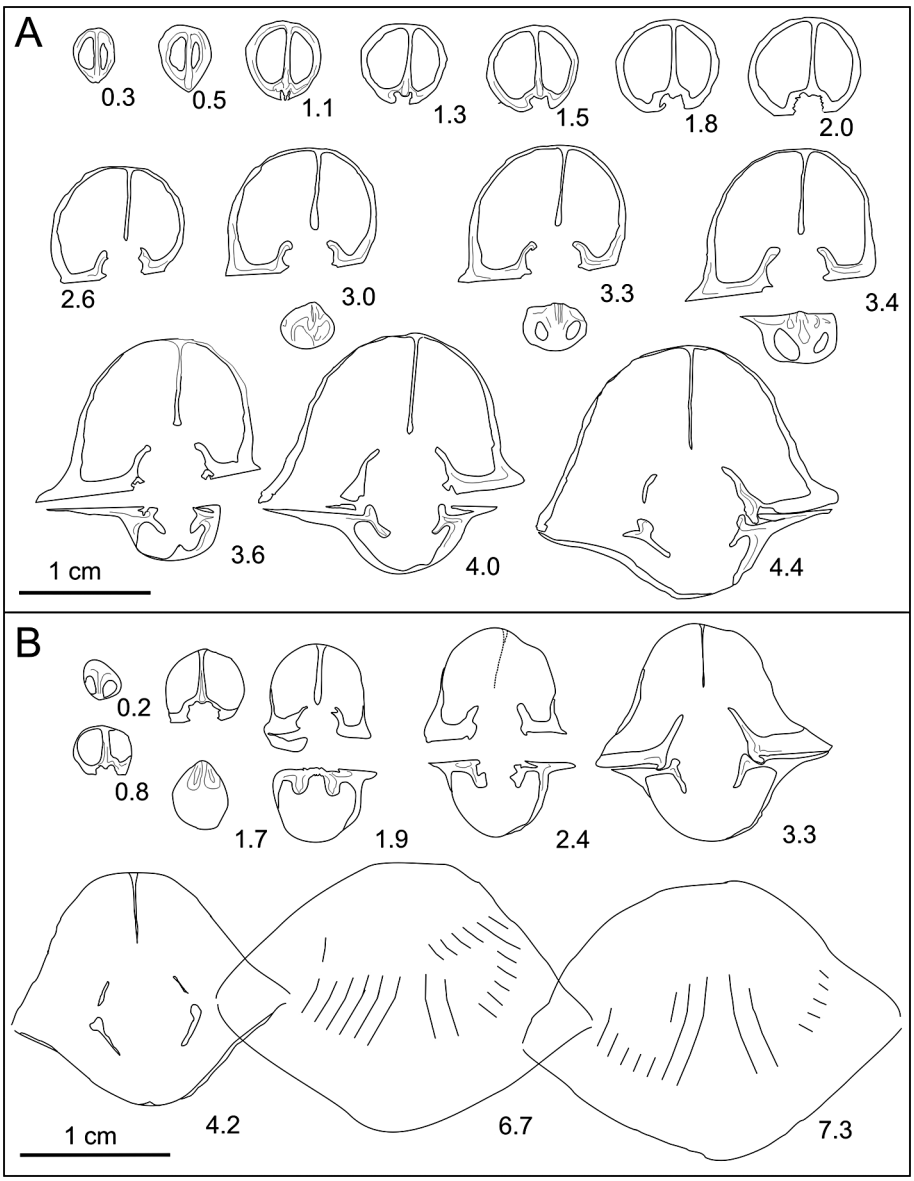


Fig. 8 - *Dagyssia palaeotypus* (Loretz, 1875). Internal structures of specimens A) MPUM 11369 (G351/8) and B) MPUM 11370 (G482/24). Prà della Vacca/ Kuhwiesenkopf, Pelsonian or earliest Illyrian. Distances are in mm from the umbo.

Other material: The specimens described by Arthaber (1914) are in the Naturaliensammlung of Stuttgart (Gaetani 1969). Several topotypes from Dil-Iskilessi section are housed in the Natural History Museum London (Endriss Collection, B40475).

Type locality: Gebze area, stratotype of the Bithynian substage, Anisian (Kokaeli Peninsula, Turkey) (Assereto 1972, 1974; Nicora 1977; Fantini Sestini 1988).

Material: Seventy-four specimens (MPUM 8615-8620 and MPUM 8625) collected by R. Assereto in 1969 and 1971. Field numbers: see Appendix 1. The material is well preserved. Our specimens may be considered as topotypic and come from the Toula's locality of Dil-Iskilessi = Gebze section, Nodular Limestone. (Assereto 1972, 1974; Nicora 1977; Fantini Sestini 1988).

Description

External characters. Small to medium sized ventribiconvex shell, sub-elliptical in outline. Width slightly exceeding length and maximum width occurring at about 1/2 of the length. Hinge narrow, with cardinal extremities forming an obtuse angle, sometimes

PLATE 4

Tethyspira sp. ind. (Val Meria, lowermost Illyrian). Scale bar 1 cm.

Fig. 1 - Specimen MPUM 8622 (NA/8); a- ventral and b- lateral views.

Fig. 2 - Plaster replica of the specimen MPUM 8621 (L/1); a- ventral and b- lateral views.

Fig. 3 - Specimen MPUM 8623 (MA/10), dorsal valve.

Ptychomentzelia propontica (Toula, 1896). All specimens from the type locality of Gebze (Turkey), Bithynian stratotype.

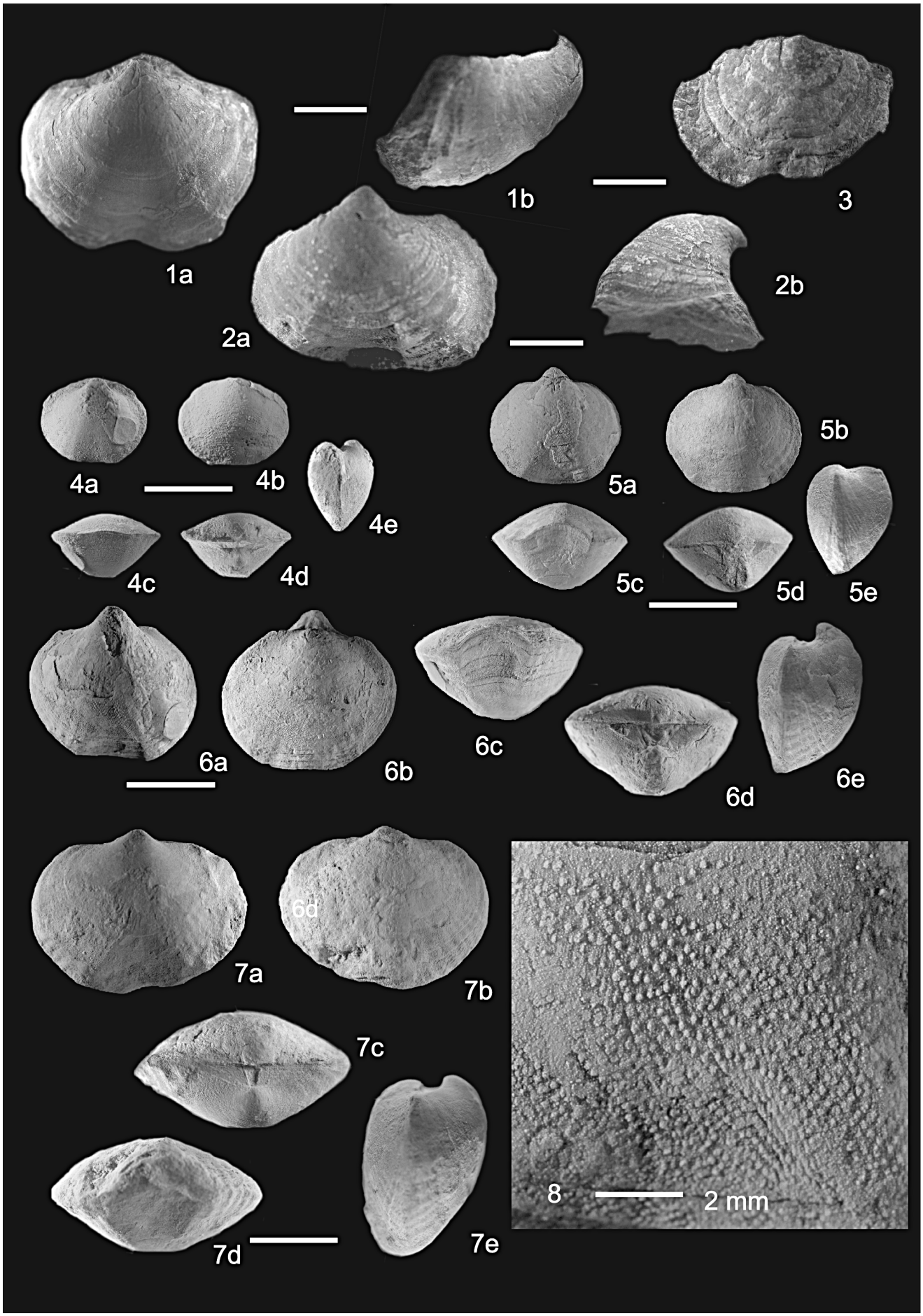
Fig. 4 - Specimen MPUM 8619 (T23/13); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 5 - Specimen MPUM 8620/1 (T76); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 6 - Specimen MPUM 8618 (T125); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 7 - Specimen MPUM 8620/2 (T76); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 8 - Specimen MPUM 8618 (T125), detail of the spiny micro-ornaments.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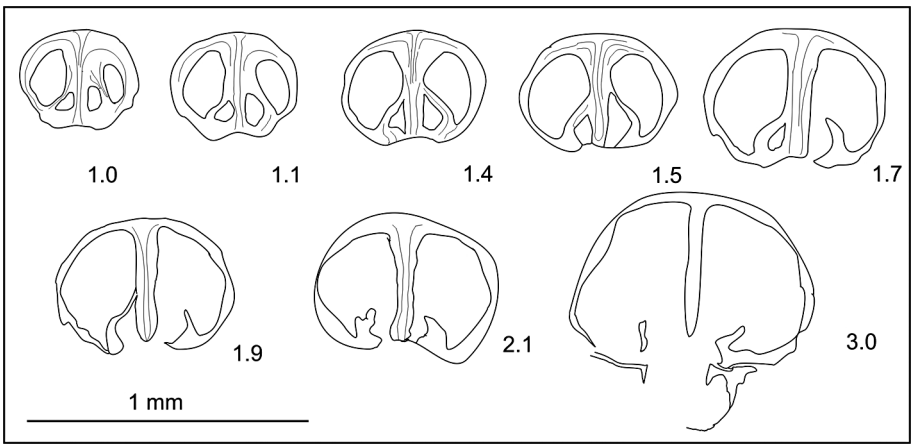

Fig. 9 - *Tethyspira* sp. ind. Serial sections of the specimen MPUM 8621 (T/1) Val Meria, Illyrian. Distances are in mm from the umbo.

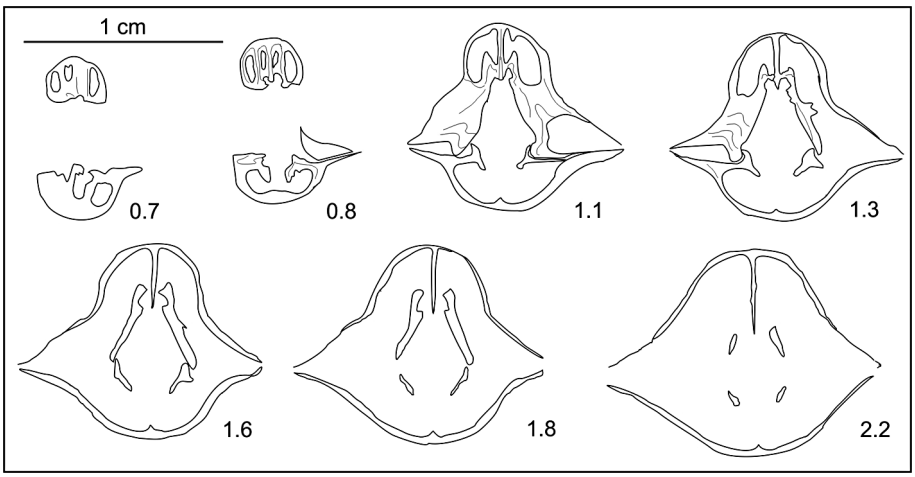

Fig. 10 - *Ptychomentzelia propontica* (Toula, 1896). Serial sections of the specimen MPUM 8615 (T40/4), Gebze, Bithynian. Distances are in mm from the umbo.

winged. Anterior commissure uniplicate, with semicircular profile of the fold.

Ventral valve from sub-elliptical to sub-pentagonal in outline. Medium sized umbo, fairly long, pointed and curved on the hinge at variable angle. Ventral interarea concave, from apsacline to orthocline with height about 1/3 of its length; open delthyrium. Ventral sulcus semi-circular in section, starting at the umbo.

Dorsal valve sub-elliptical in profile. Dorsal umbo rounded and straight on the hinge. A faint fold occurs at the anterior commissure.

Radial ornamentation of 8-10 large costae occurring in the anterior half of each flank. Costae very weak or absent in the sulcus. Growth lamellae on both valves, denser near the anterior margin. Micro-ornamentation consisting of long and prostrate spines, arranged in quincunx, occurring on the entire surface of the shell, absent from ventral and dorsal interareas (Pl. 4, fig. 8).

Internal characters. (Fig. 10). Ventral valve with a simple, rather short median ventral septum, extending to about 1/2 of the length of the shell. Well developed dental plates divergent towards the ventral valve floor and formed by the union of adminicula and dental flanges. The adminicula disappear at about 1 mm from the umbo. High and long dental flanges, slightly convergent towards the ventral valve floor. The median septum apically fuses to the dental plates forming an apical spondylium, which is sub-rectangular in shape. Dental plates loosing contact with the septum at a distance of about 1.5 mm from the umbo. Dental flanges disappear at a distance of about 2 mm from the umbo. Median septum protruding into the spondylial chamber only apically. Dorsal valve with low and short myophragm. Weak articulation. Spiralium with at least 3-4 whorls.

Remarks. This very distinctive species, with peculiar micro-ornamentation, differs from *P. ptychitiphila* (Bittner, 1890) by its less transverse outline, less convex dorsal valve, angular and winged cardinal extremities, sulcus delimited by an acute angle fold, shorter adminicula and dental flanges.

Occurrence and stratigraphical range. *P. propontica* is recorded only from the Gebze area, Istanbul Block. About 50% of them come from level 5 (Osmani Zone), another 45 % from levels 6 and 7 (Ismidicus Zone), which form the reference section of the Bithynian substage. A few originates from the Lower Member, who delivered also early Anisian conodonts (Nicora 1977) or from the Upper Member, referred to the

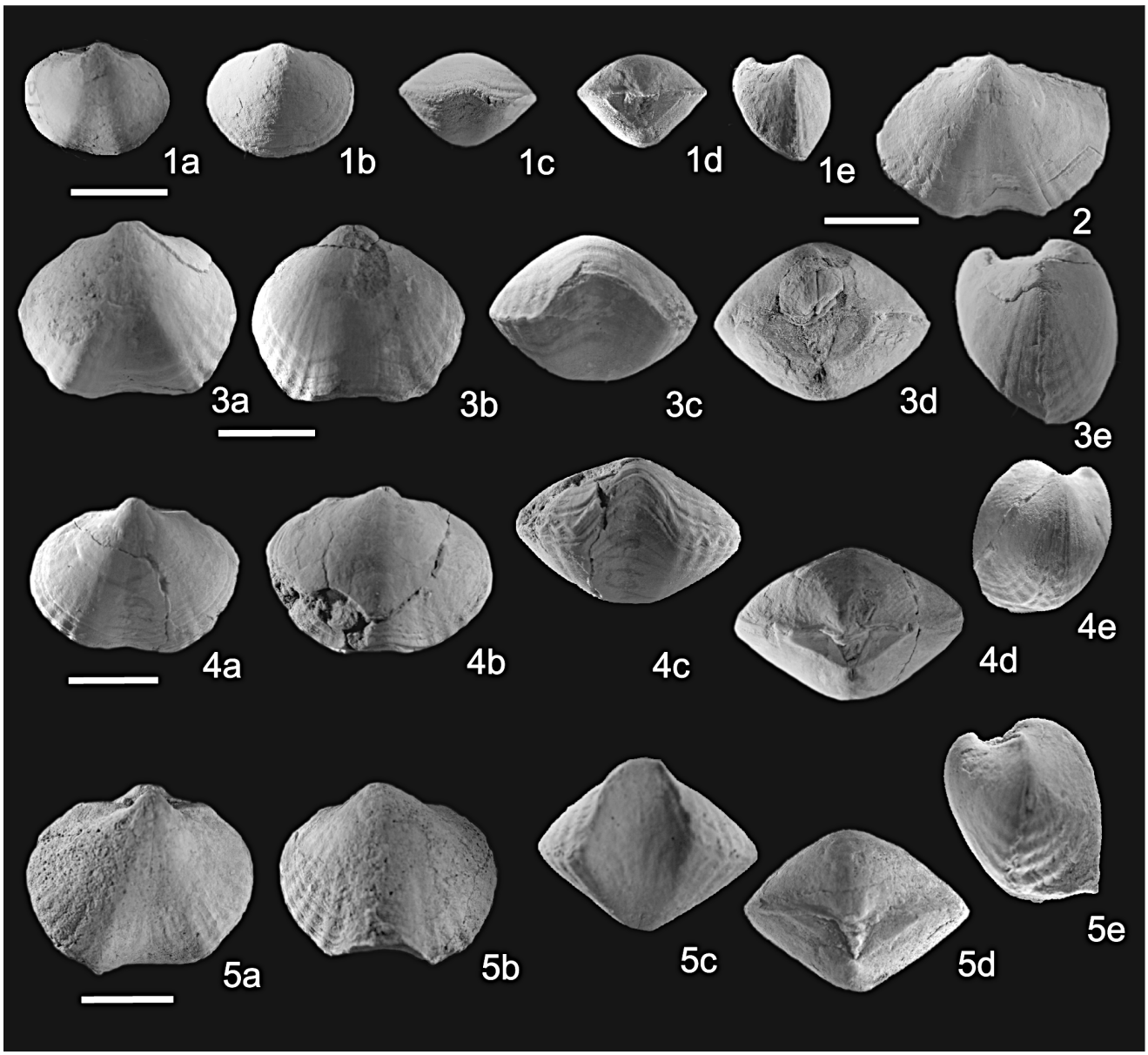

PLATE 5

Ptychomentzelia ptychitiphila (Bittner, 1890). Scale bar 1 cm.

Fig. 1 - Specimen MPUM 8642 (P/2) Valenzana di Pegherolo, Illyrian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 2 - Specimen MPUM 8646 (Y67/3) Blizanac near Sarajevo, Bosnia, Illyrian. Ventral view.

Fig. 3 - Specimen MPUM 8647 (VN2) Valley Nadasolui, Romania, Anisian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 4 - Specimen MPUM 8645 (Y67/1) Blizanac near Sarajevo, Bosnia, Illyrian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Fig. 5 - Specimen MPUM 8658 (G444) Latemar, Ladinian; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.

Pelsonian (Fantini Sestini 1988). It was apparently dwelling in somewhat muddy bottoms.

Ptychomentzelia ptychitiphila (Bittner, 1890)

Figs 2H, 11; Pl. 5, figs 1-4; App. 2, tab. 8

1890 *Spiriferina ptychitiphila* sp. nov. Bittner: 44, pl. 33, figs 17-18.

1890 *Spiriferina ptychitiphila* var. *amblyrhyncha* var. nov. Bittner: 45, pl. 33, fig. 19.

1890 *Spiriferina ptychitiphila* var. *angusta* var. nov. Bittner: 45, pl. 33, fig. 20.

1892 *Spiriferina ptychitiphila* - Bittner: 5, pl. 1, figs 8, 9.

1903 *Spiriferina ptychitiphila* - Bittner: 578.

non 1903 *Spiriferina ptychitiphila* - Kittl: 701, pl. 23, fig. 3.

1903 *Spiriferina ptychitiphila* var. *globulosa* var. nov. Kittl: 701, pl. 23, fig. 4.

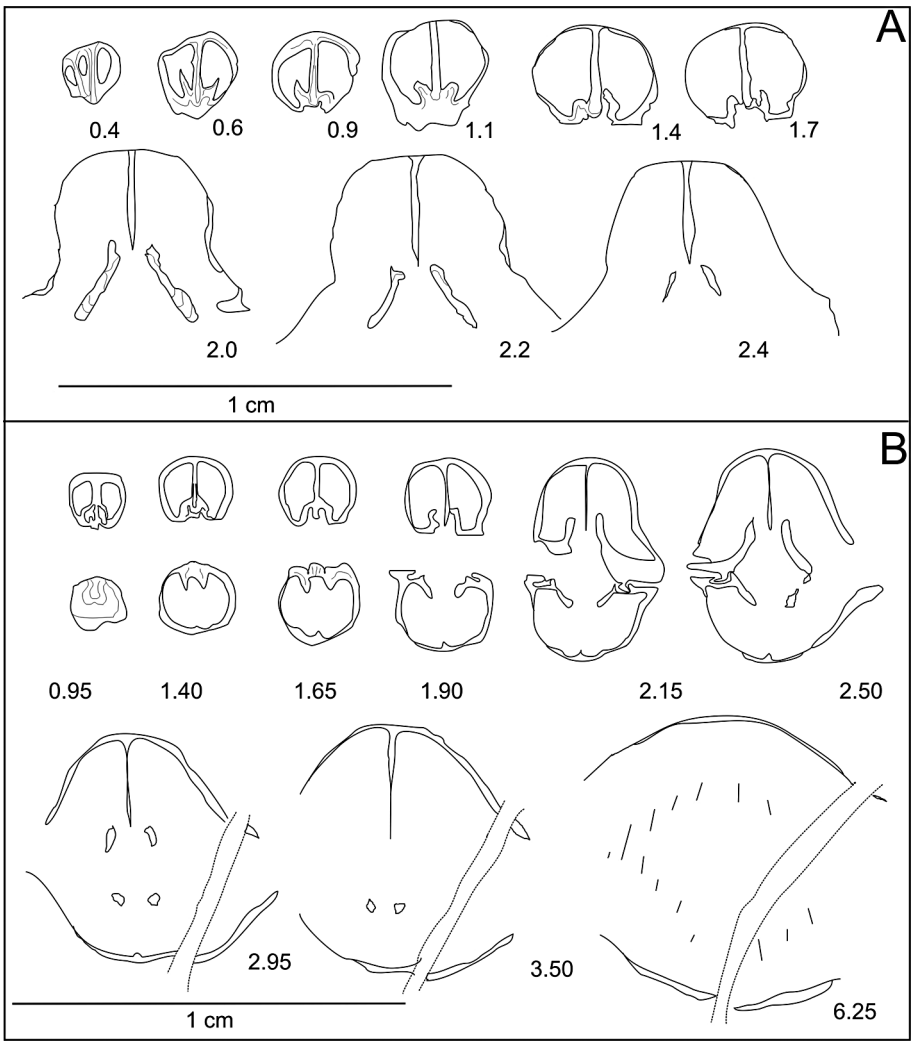

Fig. 11 - *Ptychomentzelia ptychitiphila* (Bittner, 1890). Serial sections of the specimens A) MPUM 8643 (Y67/6) and B) MPUM 8641 (Y67/2). Blizanac, Illyrian. Distances are in mm from the umbo.

non 1933 *Spiriferina ptychitiphila* var. *angusta* - Milosavljevic: 207-208, pl.1, fig. 1.

1967 *Koeveskallina* cfr. *palaeotypus* - Casati & Gnaccolini: 127, pl. 9, fig. 2.

1993 *Mentzelia ptychitiphila* - Iordan: pl. 1, fig. 10a-d.

Lectotype*:* Lectotype (Bittner 1890, pl. 33, fig. 18) selected by Siblík (1988); housed in the Naturhistorisches Museum (Wien), NHM-Nr.1885.D.3312.

Type locality: Schreyeralm, near Hallstatt (Austria).

Material: Sixty-eight specimens, mostly decorticated from the following localities: Valenzana MPUM 8642; Viezzena (Trento): MCP/1207-1355-1436-1642-1572-1805-1807-1869 -2064-2065-2066-2067-2068-2084-2094-2196-2197-2198-2276-2500-4853-5083-5084-5086-5087-5094-5095-5097/1-5101/5; Latemar MPUM 8657, MPUM 8658 (G444). Blizanac MPUM 8641, MPUM 8643, MPUM 8645MPUM 8646, MPUM8732 (Y67); Studenkovic 1, MPUM 8730, Studenkovic 2 MPUM 8731 Studenkovic 3 MPUM 8733; Nadosului Valley (Persani Mountains, Rumania) MPUM 8640, 8647.

Description

External characters. Medium sized and biconvex shell, from sub-pentagonal to sub-elliptical in outline. Width exceeding length and maximum width occurring at about 1/2 of the maximum length. Hinge narrow, with rounded cardinal extremities, rarely forming an obtuse angle. Uniplicate anterior commissure, with rounded fold.

Ventral valve with medium sized umbo, fairly long, pointed and weakly curved on the hinge. Concave and apsacline interarea, with width about 1/4-1/5 of its length; delthyrium open and high. Ventral sulcus semi-circular in profile, starting near the umbo, larger and deeper at the commissure.

Dorsal valve with fold, poorly elevated and rounded in section. It may originate at the umbo, but it is well developed only near the anterior margin.

Radial ornamentation consisting of 5-6 coarse ribs in the anterior half of both valves. Very faint ribbing may occur in the sulcus and on the fold. Growth lamellae on both valves, denser near the anterior margin. Micro-ornamentation usually not preserved due to decortication.

Internal characters (Fig. 11). Simply shaped and strong median ventral septum. Well developed dental plates formed by the fusion of adminicula and dental flanges. Adminicula disappear at a distance of 0.5 mm.

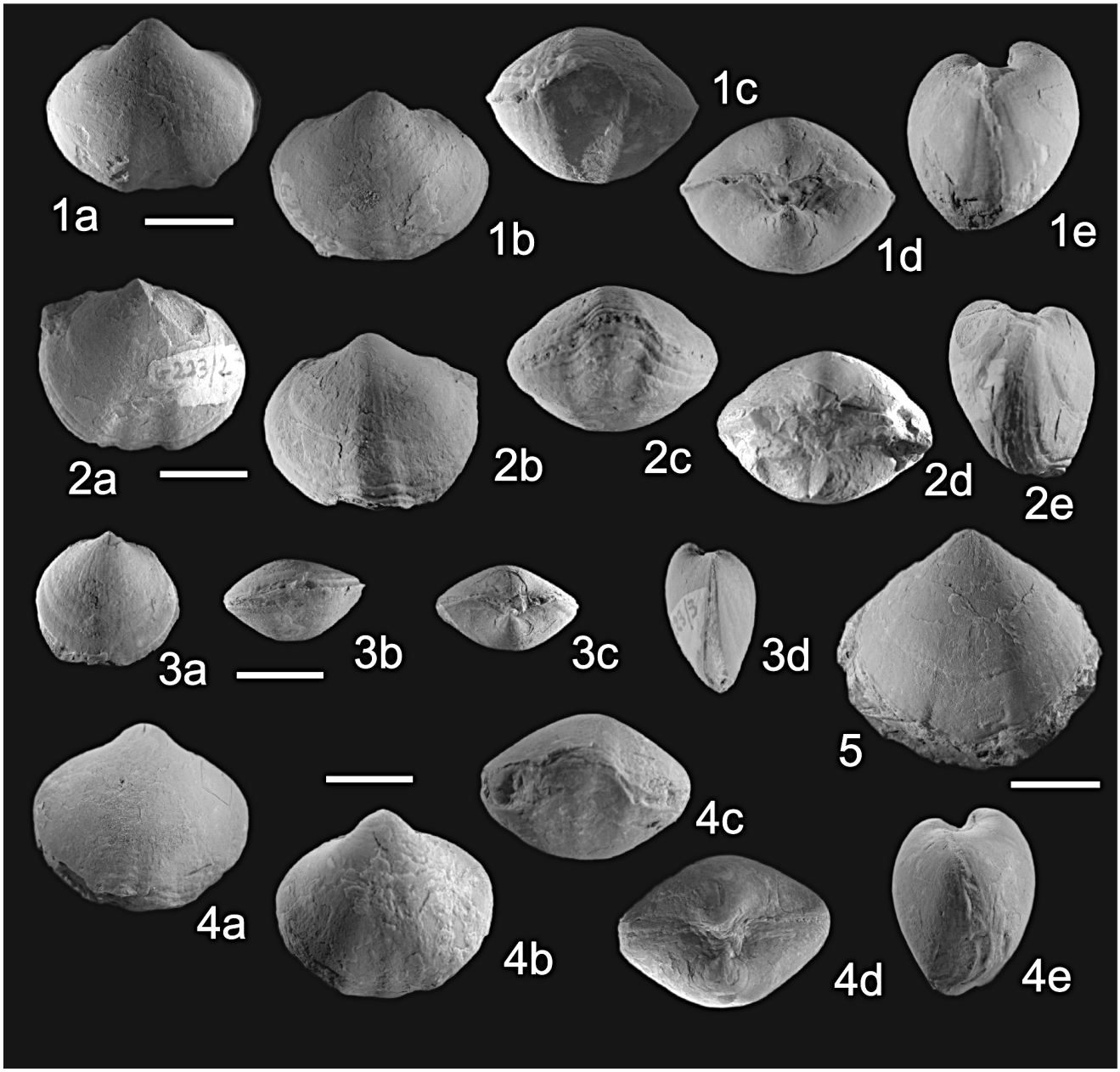

PLATE 6

Ptychomentzelia ritensis n. sp. All specimens from the type area of Monte Rite, Bithynian or Pelsonian. Scale bar = 1 cm.

Fig. 1 - Specimen MPUM 8672 (G223/91), holotype; a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.
Fig. 2 - Specimen MPUM 8675 (G223/2); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.
Fig. 3 - Specimen MPUM 8677 (G223/3); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.
Fig. 4 - Specimen MPUM 8674 (G223/125); a- ventral, b- dorsal, c- anterior, d- posterior and e- lateral views.
Fig. 5 - Specimen MPUM 8681 (G223/121), ventral valve.

Long dental flanges convergent to the ventral valve floor. The secondary fibres of dental flanges are fused to the median septum forming a medium sized spondylium, sub-rectangular in shape. The septum protrudes in the spondylial chamber only apically. Dorsal valve characterized by a short myophragm.

Remarks. Bittner (1890) distinguished the varieties *amblyrhyncha* (pl. 33, fig. 19) and *angusta* (pl. 33, fig. 20). The first one differs from the nominative subspecies in its sub-elliptical outline, deeper median sulcus, straighter ventral umbo and higher ventral interarea. The second one, *angusta,* has a smaller ventral umbo, less curved on the hinge and less deep median sulcus. Both are here considered as morphotypes of the nominative species.

Kittl (1903, pl. 23, fig. 4) introduced the var. *globulosa*, characterized by a length exceeding width,

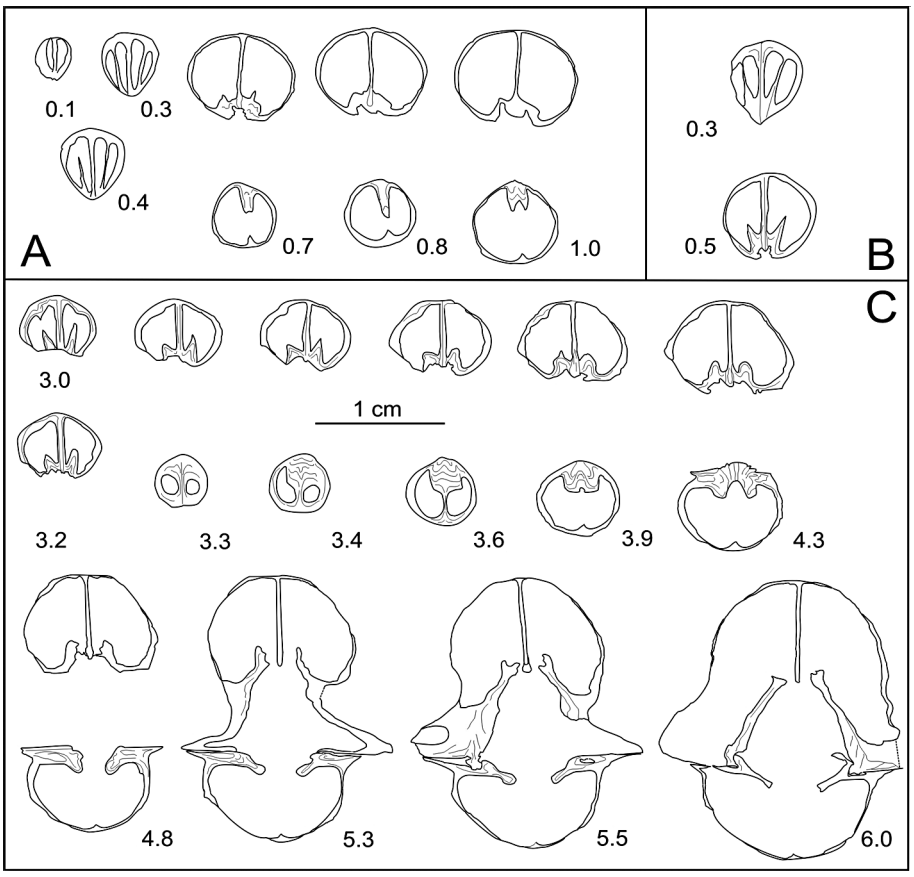

Fig. 12 - *Ptychomentzelia ritensis* n. sp. Serial sections of the specimens A) MPUM8665/1 (G223/1); B) MPUM 8666 (G223/41), and C) MPUM 8667 (G223/119). Distances are in mm from the umbo.

greater thickness than the nominative species, ventral umbo less curved on the hinge, sulcus less developed, fold absent, and 8-9 costae on the anterior half of each flank. Var. *globulosa* seems to be an independent taxon whose rank needs to be established, but we do not have material to decide. The specimen illustrated by Milosavljevic (1933) apparently lack lateral costae.

Occurrence and stratigraphical range. *P. ptychitiphila* is a species found in mud-free sedimentary facies, both in the Han Bulog facies, and in the internal lagoon of the carbonate platforms, in the upper Anisian and Ladinian of Italy, Austria, Bosnia, Hungary, and Rumania.

Ptychomentzelia ritensis sp. nov.

Figs 2I, 12; Pl. 6, figs 1-5; App. 2, tab. 9

Type locality: Monte Rite (Cadore, Italy), locality G223, topmost part of the Monte Rite Fm. ? Bithynian or lowermost Pelsonian (Neri et al. 2007)

Material: 267 mostly decorticated specimens.

Etymology: Named after the main collecting locality, M. Rite.

Holotype: The holotype (MPUM 8672) is housed in the collections of the Museum of the Dipartimento di Scienze della Terra, Università degli Studi of Milan, Italy.

The specimens are collected from Monte Rite (G223) MPUM 8665, MPUM 8666, MPUM 8673, MPUM 8674, MPUM 8675, MPUM 8676, MPUM 8677, MPUM 8678, MPUM 8679, MPUM 8680, MPUM 8681, MPUM 8682, MPUM 8683, MPUM 8667 (peels) and (G460) MPUM 8734. Specimens considered to be *P.* aff. *ritensis* were collected in the level 1 of the Prà della Vacca/Kuhwiesenkopf (PZO 5754).

Diagnosis: Biconvex with transverse outline; fold and sulcus variably developed. Faint radial ornamentation of costae at the anterior margin. High and long dental flanges.

Description

*External characters***.** Medium sized, biconvex shell, with sub-elliptical outline. Width greater than the length; maximum width at about 1/2 of the maximum length. Hinge narrow; cardinal extremities weakly angular (obtuse angle), sometimes winged. Anterior commissure uniplicate with rounded fold. Ventral umbo well developed, pointed and curved on the hinge. Well developed ventral interarea, concave and apsacline. Delthyrium wide about 1/3 of the interarea. Median sulcus variably deep, semicircular in section, beginning at about 1/4-1/5 of the maximum length of the valve; in some specimens it is gently plicate. Dorsal umbo very well developed and rather straight. Fold rounded and variably developed.

Very faint radial ornamentation consisting of costae near the anterior margin; usually they are not preserved due to decortication, except for the holotype (MPUM 8672). Growth lamellae from 5 to 7 in number.

Internal characters. (Fig. 12). Simply shaped median ventral septum. Well developed dental plates formed by the union of adminicula and dental flanges. Adminicula disappear at a distance of 2-3 mm from the umbo.

High and long dental flanges slightly divergent from the valve floor posteriorly. Small sized apical spondylium, sub-rectangular in shape. Septum protruding into the spondylial chamber only apically. Dental flanges loosing contact with the median septum at a distance of 4-5 mm from the umbo, disappearing at about 7 mm.

Dorsal valve with large ctenophoridium, rather loose articulation, and short myophragm.

Intraspecific variability. The intraspecific variability is observed in the anterior commissure, strongly uniplicate in some specimens, very weakly in others and consequently in the height of the fold. The sulcus is more or less deep.

Remarks. *Ptychomentzelia ritensis* is similar to *Mentzelia mentzeli* (Dunker, 1851). The former has a larger size, is more transversally elongated, has higher ventral and dorsal interareas, a deeper sulcus, a better developed fold and a more strongly uniplicate anterior commissure. However, it is not always obvious to distinguish the two species.

The internal characters are instead rather different. *P. ritensis* has dental plates which grow independently from the adminicula and are divergent from the ventral valve floor. The dental flanges are well developed and they are in contact with the median septum forming a larger and higher spondylium. This new species could have affinities with *Spriferina (Mentzelia) Mentzelii* var. *dinarica* Bittner, 1903, based on its general shape and dental plates, as described by Bittner (1903, p. 602, fig. 11).

Occurrence and stratigraphical range. *P. ritensis* occurs in the Bithynian/ Pelsonian of M. Rite in Dolomites. The species seems to prefer mud-free bottoms or even rocky bottoms, because it is frequently found in fissure fillings.

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Appendix 1 - List of the fossil localities

Grigna meridionale

• *Canalone Porta*. On the northern side of the gully, at 1470 m a.s.l., 1.5 m above the first layer very rich in crinoid ossicles (G133). *K. koeveskalyensis*. Age: latest Pelsonian or earliest Illyrian.

• *Val Tesa (= Val Monastero in the Colonghei area).* From the trail to Rif. Rosalba, about 20 m above the trail along the gully at 1210 m a.s.l., a section in the Banco a Brachiopodi is productive in fossils, mostly at 2 m from the base, very rich in crinoid ossicles (specimens N followed by a number): *K. koeveskalyensis.* Age: latest Pelsonian or earliest Illyrian.

• *Val Meria.* Along the creek, on the right hydrographic side at c 600 m a.s.l., a short section in the topmost Banco a Brachiopodi and a marginal facies of the Prezzo Limestone was measured. Brachiopods are very difficult to be extracted. Instead in large boulders of this horizon, some 50 m downslope on the left side of the creek, were collected (samples T, TB, NA): *M. ampla, K. koeveskalyensis, Tethyspira* sp. ind. Age: most probably basal Illyrian.

Grigna settentrionale

• *Valle dell'Acqua Fredda*. In along the old mule-track from Pasturo to Pialeral, on the right side of the Acqua Fredda creek crops out the "Banco a Brachiopodi", topmost part of the Angolo Fm., late Pelsonian in age. A few tens of m above the bridge, in the overlying basal part of the Prezzo Limestone (N/116). *K. koeveskalyensis.* Age: latest Pelsonian or basal Illyrian.

• *Foppa della Lanca.* The trail from Baita Amalia to Baita dello Scudo crosses a trench at c. 1570 m, carved in a detachment niche of a landslide. In the Prezzo Limestone, c. 15 m above the base of the unit, immediately below the trail (G 126, G130): *K. koeveskalyensis.* Age: Illyrian.

• *Val Suella.* To the east of Introbio on the left side of the gulley of Val Suella, at 1010 m a.s.l., in the basal part of the Prezzo Limestone, in a bed rich in crinoid ossicles (specimens N followed by a number): *K. koeveskalyensis.* Age: latest Pelsonian or basal Illyrian.

Valenzana

Prezzo Limestone, Illyrian. The locality was described by Casati and Gnaccolini (1967, p. 72) where the specimen of *P. ptychitiphila* was figured as *K.* cf. *palaeotypus.* Here refigured. Age: Illyrian?

Valli Giudicarie

All the samples were collected in the topmost part of the Angolo Fm. late Pelsonian in age. The levels with *M. judicarica* seems to lie few m below the levels with *M. mentzeli*, which are usually richer in clay and silt.

• *Peschiera 1* (G45) described in Gaetani (1969, p. 526) *M. judicarica*;

• *Peschiera 2* (G48), below the road, 100 m to NE of the previous locality, stratigraphically above the previous sample: *M. mentzeli.*

• *Peschiera 3* (G 49) 10 m below the bridge on the creek Revegler: *M. judicarica*.

• *Frugone* (G50), along the trail Frugone-Praso 200 m to the SSW of the bridge of Frugone: *M. mentzeli.*

• *Dosso della Croce*. At about 900 m to SSE of the Dosso dei Morti top, on the eastern slope of the Dosso della Croce at 1850 m a.s.l., in the transitional beds between Calcare di Dosso dei Morti and Calcare di Prezzo (G83): *M. mentzeli.*

Monte Rite

De Toni (1912) first studied the area. MG made extensive collections in the 70's. A general picture of the stratigraphy is given in Farabegoli and Guasti (1980), where also some brachiopod identifications made by MG are reported. There are two brachiopod assemblages. The first is preserved in fissure fillings and lenses in the topmost part of the Upper Serla Fm. (in the new geological map Foglio Cortina 1:50.000, the new term Fm. di M. Rite is introduced, P. Gianolla, pers. comm., 2002; Neri et al. 2007). They are: fissure filling on the wall on the corner of the west back side of the eastern building just below the summit ridge, light grey encrinitic limestone (G223): *P. ritensis, K. koeveskalyensis, K. pannonica, D. palaeotypus.* A neptunian dike, cutting the previous ones, with yellowish cement (G460) *K. pannonica, D. palaeotypus*. Age: Pelsonian according to Farabegoli & Guasti (1980), Bithynian according to Neri et al. (2007). At the top of the M. Rite Fm., in the transgressive level 30 cm-thick at the base of the Dont Fm., along the flat trail on the ridge (G54) *K. koeveskalyensis*. Age: Pelsonian.

Valle Agordina

Along the gully open above the trail between F.li Vaiombel and Casere Rovinaz, at about 1325 m a.s.l., about 65 m above the base of the Dont Fm., (sample CF 69bis): *M. judicarica*.

Cernera

Section *Rio Stretto*, south face of M. Verdal. Dont Fm., 28 m below the top of the unit, making contact with the Cernera Dolomite (sample P54), *D. palaeotypus.* More details of the stratigraphy in Blendinger et al. (1984). Age: late Pelsonian.

Latemar

Cima orientale del Latemar (Latemar OstGipfel). The locality was studied by Philippi (1904) and Wilkens (1909). 10 m below the top of the mountain northwards, before to cross a volcanic dyke in light brown dolomitic limestone which is the topmost part of the Latemar Limestone, Ladinian, Gredleri Zone (G444) *P. ptychitiphila.*

Viezzena

The area was studied by Philippi (1904). Along the main ridge of the mountain to the north of the top at 2465 m a.s.l., (G450) *D. ampla.* To the north of this point the curator of the Museo Civico di Predazzo, dr. E. Dellantonio collected *P. ptychitiphila* (samples MCP). Age: latest Anisian or early Ladinian.

Val Badia (Abteital)

Along the Rugiald creek on the E side of the M. Croce di Rid, in a horizon of 8.5 m of pink dolomitic marls, below the Contrin Dolomite (G67) *K. koeveskalyensis.* Age: latest Pelsonian or basal Illyrian. More details in Mutschlechner (1932).

Braies Dolomites

The Braies Fm. is rich in brachiopods in several levels. The Anisian stratigraphy has been studied by Pia (1938), Bechstädt and Brandner (1970), De Zanche et al. (1992). Palynology has been studied by Kunstatcher & Roghi (2006). We collected Mentzelioids from three sections in the unit, which received different names: Pragser Sch. (Pia 1938), Recoaro Fm. (De Zanche et al. 1992) and Dont Fm. (Kunstatcher & Roghi 2006). Age for all the levels: Pelsonian; perhaps the topmost one enters in the Illyrian.

• *Prà della Vacca (Kuhwiesenkopf).* Some 200 m to the west of the top, a deep gully is carved on the northern side of the mountain. On the rounded ridge and along strike in grey amalgamated nodular limestone rich in crinoid ossicles were collected the specimens PZO 5670 to 5712 of *D. palaeotypus* and the specimens PZO 5648 to 5657, plus PZO 5671 of *M. mentzeli,* (G351) (G465). This is most probably the locality where Loretz (1875) collected his fauna. Most probably corresponds to the brachiopod level 4 of Bechstädt and Brandner (1970). In the section downwards, *M. mentzeli* occurs in several levels, at -23 m (G349) (= level 3 of Bechstädt and Brandner 1970) (PZO 5760) and 105 m below (G 346) (PZO 5757, PZO 5758) (= level 2 of Bechstädt and Brandner (1970). In the level 1 of Bechstadt & Brandner (1970) together with *M. mentzeli* (PZO 5753) and *D. palaeotypus* (PZO 5754) also *Ptychomentzelia* aff. *ritensis* was collected (PZO 5755-5756). Other specimens of the two species were collected in the debris (MPUM 8720).

• *Cima dei Colli Alti (Hochalpenkopf).* In the eastern gully on the northern side of the mountain at c 1870 m PZ 5714 to PZO 5727 (G479) *M. mentzeli. D. palaeotypus* PZO 5728 to PZO 5752 (G482) about 30 m above the previous sample, directly correlatable to the level G351-465.

• *Col Vallaccia.* In 1972 R. Assereto collected tens of *M. mentzeli* MPUM 8729, sample (72/33)

Soingrat

The type area of *Mentzelia ampla* and *Paramentzelia fraasi* was sampled by MG in 1975. From the calcareous layer cropping out in near vertical position, within the Partnach Schichten, some 30 m above its base against the Wetterstein Kalk, *D. ampla* and *P. fraasi* were collected in situ (G882), *D. ampla* collected in debris(G883). Ulrichs (1994) more recently reconsidered the area. Age: Ladinian.

Sarajevo area (Trebevic)

On the slope of M. Trebevic towards Sarajevo, with bedding often parallel to the slope, it crops out the Anisian succession with whitish massive limestone below and pink well bedded nodular limestone above (Han Bulog Limestone). In between, it may occur a breccia level, with block up to 1 m of size of whitish limestone and matrix made by red micrite, in which brachiopods may be abundant. From this horizon, MG collected fossils in 1966, in the localities here described.

• *Studenkovic 1* (Y51) immediately above the village: *P. ptychitiphila.*

• *Studenkovic 2* (Y54) to the W of the previous one, stratigraphically 2 m above: *P. ptychitiphila*.

• *Studenkovic 3* (Y55) 1080 m of altitude, above the highest house of the village: *P. ptychitiphila*.

• *Blizanac* (Y67). Above the village of Blizanac, at 1225 m a.s.l. on the W corner of a fenced cultivated field: *P. ptychitiphila*. Brachiopods are preserved in the red matrix of the breccia.

Persani Mountains

In 1971 the late Dan Patrulius gave as gift to MG specimens from the Anisian of the from the Persani mountains, particularly from the area to the east of Cuciulata. From the Nadasolui valley, but without further precisions, originate *K. koeveskaliensis* and *P. ptychitiphila.*

Age: Anisian. Further information on the Mnt. Persani stratigraphy in Patrulius et al. (1996).

Gebze

The section of Gebze (= Dil-Iskilessi) in Turkey near Istanbul, was measured and sampled by the late R. Assereto in 1969 and 1971 and described by Assereto (1972, 1974), Nicora (1977), and Fantini Sestini (1988). It is the type locality of *P. propontica*. Specimens were collected from the *level* 3 T9 1 spec.; T13 1 spec.; *level* 4 T140 (1 spec.); *level 5* :T14 1 spec.; T15 3 spec.; T17 3 spec.; T22 7 spec.; T23 12 spec.; T28 1 spec.; T35 1 spec.; T36 4 spec.; T55 1 spec.; T56 4 spec.; T57 1 spec.; T141 1 spec.; *level 6* : T29 4 spec.; T33 1 spec.; T75 2 spec.; T108 1 spec.; T123 1 spec.; T125 1 spec.; T126 1 spec.; T152 2 spec.; T162 1 spec; T198 1 spec.; *level 7*: T53 1 spec.; T76 2 spec.; T97 2 spec.; T129 1 spec.; T163 3 spec.; *level 8*: T63 1 spec.; T64 1 spec.). Age: Bithynian, with few specimens collected in the basal Pelsonian (T63 and T64). Outside the section: T217, T303, T305 collected from a trench near Ekishehir.In the pink limestone, about 16 m below the transgressive Cretaceous layers, *K. koeveskalyensis* (T282), age Pelsonian/Illyrian.

Appendix 2 - Dimensions

Abbreviations. All measurements are expressed in millimetres (mm): L: maximum length of shell; W: maximum width of shell; Th: thickness of shell; hl: hinge length; sW: sulcus width; fW, fold width; ih: ventral interarea height.

The specimens are identified with the Museum catalogue number: MPUM for Milano University museum, PZO for Bolzano Naturmuseum, MCP for Predazzo Museum and when possible by the field sample number.

Specimen	L	W	Th	hl	sW	ih
PZO 5716 G479/1	12.8	14.3	8.9		5.8	2.6
PZO 5717 G479/2	10.3	12.1	7.5	6.8	4.8	2.3
PZO 5715 G479/3	15.1	15.7	16.4	8.4	6.9	
PZO 5718 G479/4	12.2	15.1	10.6	8.3	7.4	2.3
PZO 5719 G479/5	15.5	16.6	10.5	10.2		3.2
PZO 5663 G479/7	17.4	15.7	11.1	10.4	7.1	
PZO 5665 G479/9	9.6	12.9	7.1	8.1	5.7	2.2
PZO 5723 G479/10	10		7.1		4.8	2.35
PZO 5724G479/11			8.2			
PZO 5726 G479/13	14.4	14.2	13.4			
PZO 5649 G465/7	17.2	16.4	17.4	9.2	7.7	2.9
PZO 5652G465/8	13.5	12.8	8.1			2.3
MPUM 8633 G48/2			12.4			
MPUM 8633 G48/8					7.8	
PZO 5658 G346/1	11.5	12.6	7.7	6.6		2.4
PZO 5650 G346/2	18.1	16.4	12.3		7.2	
PZO 5659 G346/3		16.5	12.1	10.9	6	3.5
PZO 5713 FMA/42	16.1	16.7	10.8		7.6	2.6

Tab. 1 - *Mentzelia mentzeli* (Dunker, 1851).

Specimen	L	W	Th	hl	Ws
MPUM 5030 G45/1	21.25	20.65	14.25		
MPUM 5030 G45/2	25.4	23.3	17.25		
MPUM 5030 G45/3	26.3	25.7	17.15		
MPUM 8628 G45/4	26.5	25.85	17.15		
MPUM 8627 G45/5	29.4	28.15	23.3		
MPUM 5030 G45/6	29.1	28.35	24.15		
MPUM 5030 G45/7	32.65	29			
MPUM 5030 G45/8	31.6	27.65	24.45		
MPUM 5030 G45/1bis	25.5	24.1	17.3		

Tab. 2 - *Mentzelia judicarica* (Bittner, 1890).

Specimen	L	W	Th	hl	fW	ih
MPUM 8656 G883/1		21	14		12	5
MPUM 8663 G883/2		32	20		16	6
MPUM 8660 TB1/3	23.5	29	16.3	17.8	15.7	3.9
MPUM 8664 TB1/10	24.3	24.6	18	12.4	12.1	4.2
MPUM 8661 TB1/18	18.2		11.9			3.2
MPUM 8661 T/1	17.1	16.7	11.2	8.7	6	2.7
MPUM 8661 T/2		27		14.9		4.7

Tab. 3 - *Mentzelia ampla* (Bittner, 1890).

Specimen	L	W	Th	hl	ih
MPUM 8699 G130/17	13	13	9	8	
MPUM 8699 G130/18	14	12.5	9.5		
MPUM 8700 G133/5	13	13	10		
MPUM 8700 G133/6		13	9	7.5	
MPUM 8700 G133/9	12		9		2
MPUM 8700 G133/11	13.5	13	8	8	2
MPUM 8700 G133/12			8	8	3
MPUM 8700 G133/14		12	7		
MPUM 8700 G133/15		12	7	7	2
MPUM 8700 G133/18			6		
MPUM 8701 G54/7	9	10	6		
MPUM 8705 N/31	8	8.5	5		
MPUM 8711 N/35	14.5	14.5	10.5		
MPUM 8705 N/41	10	11.5		7	
MPUM 8705 N/42	9	10	6		
MPUM 8705 N/44		12.5	7		
MPUM 8705 N/47	11	12	6.5	8.5	
MPUM 8705 N/49	10	11	6		
MPUM 8704 N/51	7.5	8	4.5	5	
MPUM 8706 N/54	12	12	8		
MPUM 8708 N/57	13	14	9.5		3
MPUM 8705 N/60		15	10.5		
MPUM 8705 N/73	11	13		8	
MPUM 8705 N/77	12	12.5		8	
MPUM 8705 N/80	11.5	12.5			
MPUM 8705 N/117	15	14	10		
MPUM 8705 N/118	12	12	8		
MPUM 8705 N/121	11.5	11.5	8	7	2
MPUM 8705 N/123	10	12	7	9	2
MPUM 8705 N/124		13	8	8	2
MPUM 8705 N/125			7	7	2
MPUM 8705 N/126	12.5	13	8	9	
MPUM 8713 N/127	13	13	10	7	
MPUM 8706 N/128	14.5	14.5	10		
MPUM 8706 N/86			11		
MPUM 8706 N/91	10.5		7		2
MPUM 8706 N/93	11	12	7	6	
MPUM 8706 N/95		14	8.5	9	2
MPUM 8712 N/96	10	11	7	6	2
MPUM 8706 N/98		9	5.5	6	
MPUM 8706 N/99	11	12	7	6.5	
MPUM 8706 N/101	10	10	6		
MPUM 8706 N/102	11	11.5	6.5	7	2
MPUM 8706 N/103	10.5	11	7	6.5	
MPUM 8706 N/104	10		6.5		
MPUM 8706 N/105	11.5	12	8		
MPUM 8706 N/106	10		6		
MPUM 8705 N/109	13	13	9	8.5	
MPUM 8706 N/111	13	14.5	9	9	2.5
MPUM 8706 N/112	15	15	10	9	3.5
MPUM 8705 N/113	12.5	13	9.5		
MPUM 8713 N/114	13	13	9		3
MPUM 8706 N/115	13.5	14.5	9		2
MPUM 8707 N/116	14		9		2.5
MPUM 8687 N/107	11.5	13	9		4
MPUM 8687 N/110	15	15	11.5		5
MPUM 8737 G460/153	8	10	7	6	3.5
MPUM 8737 G460/56	10.5	11.7	7	6	4

Tab. 4 - *Koeveskallina koeveskalyensis* (Stur, 1865).

Specimens	L	W	Th	hl	sW	ih
MPUM G460/79	17.2	16.4	14.2	11.9	3	4.3
MPUM G460/130				>15	4.7	6.6
MPUM G460/26	>17.6	>20		8.3	4.5	5.2
MPUM G223/223	>14.5	>17.6		>15.1	3.6	5.1

Tab. 5 - *Koeveskallina pannonica* (Bittner, 1890).

Specimen	L	W	Th	hl	sW	ih
PZO 5687 G465/7	17.50	16.50	12.00			
G 465/8	13.50	13.00	8.00			
MPUM 8726 Ferr 1	16.00	17.00	12.00	11.00		2.50
MPUM 8726 Ferr 2	14.00	15.00	8.00	9.00		3.00
MPUM 8726 Ferr 3	13.00	15.00	10.00	9.00		2.50
MPUM 8726 Ferr 4	16.00	17.00	10.00	11.00		4.50
PZO 5671 Ferr 5	18.00	19.00	11.00	9.00	7.00	
MPUM 8726 Ferr 6	16.00	17.00	10.00	8.00		3.00
MPUM 8726 Ferr 7	17.50	19.00	12.00	14.00		3.00
MPUM 8726 Ferr 8	16.00	17.00	10.50	8.50		2.50
MPUM 8726 Ferr 11	21.00	25.50	15.00	14.00		4.00
MPUM 8726 Ferr 12	23.00	26.50	16.00	12.50		3.00
MPUM 8726 Ferr 13	18.00	24.00	13.00	14.00		3.00
MPUM 8726 Ferr 14	14.00	13.50	10.00	10.00		4.00
MPUM 8726 Ferr 15	11.70	13.80	8.10	6.3		2.8
PZO 5673G 351/ 25	20.00	22.00	13.00	11.00		
PZO 5672 G351/32	25.00	30.50	17.00	13.00	8.00	2.50
PZO 5730 G482/ 1	26.50	32.00	17.00	13.50	10.00	3.00
PZO 5728 G482/2	26.00	30.00	17.00	15.00	10.00	3.50
PZO 5732 G482/3	24.00	26.50	18.00		8.00	
PZO 5733 G482/4	20.00	22.50	13.00	12.00	9.00	3.00
PZO 5734 G482/5		27.00	16.00	14.00	9.50	
PZO 5735 G482/6	19.50	22.00	12.00	11.50		3.00
PZO 5737 G482/8	25.50	29.50	17.00	12.50	12.00	4.00
PZO5738 G482/9	20.00	25.00	14.00	12.00	8.00	
PZO 5739 G482/10	25.00	27.50	19.00		8.05	
PZO5741 G482/12	24.00		11.50		11.00	
PZO 5750 G482/22	23.00	27.00	16.00		9.00	
PZO 5752 G482/25	20.00	22.00	12.00	13.00	8.00	3.00

Tab. 6 - *Dagyssia palaeotypus* (Loretz, 1875).

Specimen	L	W	Th	hl	sW	ih
MPUM 8617 T17/11	12	13.5	9			2
MPUM 8617 T14a	13	14	11.5	9		
MPUM 8617 T22/1	11	13	8	8.5		
MPUM 8617 T22/8	8.1	8.1	4.5			
MPUM 8617 T23/1	14	15.5	8	10	8	2.5
MPUM 8617 T23/3	12	13.5	9			2.1
MPUM 8617 T23/5	9	11	7	8		2.5
MPUM 8619 T23/13	11	13.5	8			2.5
MPUM 8617 T28/1	13	15.5	8.5	10		
MPUM 8617 T29/1	8.5	8.9	8	9	7	2
MPUM 8617 T29/2	10.5	11.5	6	7		2
MPUM 8617 T33/10	14	15	9	8	6	
MPUM 8620 T40/4	14	16	9.5	10	9	3
MPUM 8617 T56/1	10.5	11	7	7.1		2
MPUM 8617 T75/2	14	16	10		7	3
MPUM 8620 T76/2	14	15	9.5	9	8	
MPUM 8620 T76/3	20	24	12.5	14.1	12	
MPUM 8617 T93/1	13.5	14.5	9.5	9		3
MPUM 8617 T93/2	13.5	14.5	10	10		
MPUM 8617 T97/1	13	14	9		7.5	2
MPUM 8617 T97/2	15	16	8.9	8	8	2.5
MPUM 8617 T108/7	13	16	8		7.5	
MPUM 8618 T125/1	18	19.5	12	11	9	3
MPUM 8617 T126/6	12	14	9	8		3
MPUM 8617 T152/1	13	14	8	9	7	2
MPUM 8616 T163/1		14.5	10	10.5		3
MPUM 8617 T198/1	9	9.5	5			
MPUM 8617 T305/9	15	17.5	10	12.1	8.5	3

Tab. 7 - *Ptychomentzelia propontica* (Toula, 1896)

Specimen	L	W	Th	hl	Ws	ih
MPUM 8645 Y67/1	18.5	23	14	13.5	11.5	3
MPUM 8647 VN/2	20	23	15.5		13	4.5
MPUM 8640 VN/5					11.9	
MPUM 8640 VN/9	18.9	19.4	14.6	11.3	11.9	3.7
MPUM 8640 VN/16					18	
MCP2083	12.1	13	8		7.2	2.5
MCP2066					11.9	
MCP4853	14.4	16.5	10.9	10.4	8.9	5.1
MCP1355	14.5	16.2	10.5	9.1		3.25
MCP5086			12.9			
MCP5095	16.1	17.5	11.9	9.7	10.8	2.3
MCP2197		16.4	9.5	7.5		2.1
MCP2500	19.1	18.8	14.1	9.2	9.3	3.1
MCP2198	15.9	20	11.4	9.1	10.1	2.3
MCP5084		21.3	12.6	10.7		
MCP5083	17.4	20.8	18.2	10.2	12.4	3.6
MCP2093	17.2	18.4	12.5	10.1	10.1	
MCP2065	14.4	13.9	9.4	5.7	8	2.4
MCP2064	16.7	18.3	10.3	10.1	10.7	
MCP2067	17.1	18.2	11.1	9.7	13.6	3.3
MCP2196	17.5	19.9	11.7	11.9	9.5	3
MCP2068	16.2	17.1	11.8		10.9	2.6
MCP2276	16.1	19.2	11.1	9.4	10.1	3.3

Tab. 8 - *Ptychomentzelia ptychitiphila* (Bittner, 1890).

Specimen	L	W	Th	sW	hl	ih
MPUM 8672 G223/91	20.9	24.4	17.3	10.8	14.3	3.8
MPUM 8673 G223/6		23.9	17.1	10.6	13.7	5.4
MPUM 8674 G223/125	23	24.3	16.9	10.7	13.1	3.4
MPUM 8665 G223/228	21.5	24.5		9.3		5.1
MPUM 8666 G223/180			14.3		11.5	3.6
MPUM 8666 G223/224			16.6	8.8		
MPUM 8666 G223/41	22.3		16.9	8.7	13.8	5.7
MPUM 8666 G223/42	22.2		16.1	8.4		4.7
MPUM 8677 G223/119				9.6		
MPUM 8666 G223/5	19.7	20	14.4	7.8	9.5	3.9
MPUM 8677 G223/3	16	16.3	9.6		7.3	3.1
MPUM 8666 G223/1	15.9	16.1	9.1		10.6	2.7
MPUM 8682 G223/4	13.8	16.1	10.9			
MPUM 8666 G223/300	18.4	23.2	16.3	8.5	7.1	3.6
MPUM 8666 G223/301	19.1	21.9	14.3	7.9	4.7	2.2
MPUM 8666 G223/54				10.1	19.6	5.7
MPUM 8666 G460/97	13.9	14.9	9	6.6		3.4

Tab. 9 - *Ptychomentzelia ritensis* n. sp. MPUM 8672 is selected as holotype.