

THE PELSONIAN BRACHIOPOD FAUNA OF THE BALATON HIGHLAND

JÓZSEF PÁLFY

INTRODUCTION

Brachiopods are among the most common and diverse fossils in the Pelsonian Substage of the Balaton Highland. The pioneering studies in the second half of the 19th century recognized the “Alpine Muschelkalk” or “Recoaro” limestone based on its distinctive brachiopod faunas, which also permitted correlation with similar facies in the Alps. A detailed history of geological and palaeontological research of Pelsonian strata is given elsewhere (VÖRÖS this volume). The history of brachiopod studies from the Balaton Highland was summarized earlier (PÁLFY 1988).

From the mid-1980's, the author started a revision of the Anisian brachiopod faunas of the Balaton Highland, which included new collecting effort from measured key sections at the localities of Aszófő and Felsőörs, and collection from the poorly exposed locality of Horog-hegy at Köveskál (Figure Br-1). The results were first summarized in Hungarian (PÁLFY 1986), followed by papers on palaeoecological, biostratigraphical and palaeobiogeographical aspects of the Anisian brachiopod faunas (PÁLFY 1991, 1992, 1994). Systematic palaeontological treatment was so far limited to the rhynchonellids (PÁLFY 1988). In the course of geological mapping of the Balaton Highland (BUDAI *et al.* 1999) and ammonoid biostratigraphic studies (VÖRÖS 1998), supplementary collections were obtained from a few other measured sections (Cser-tető at Mentshely and Vörösberény, Figure Br-1). The brachiopod fauna from these localities is of lesser importance. The classic locality of Köveskál was recently revisited and a new excavation was made, resulting in significant new collections from a lower brachiopod-bearing level (referred to as “lower Recoaro” bed) with poor natural outcrops (VÖRÖS & PÁLFY 2002).

Interest in the stratigraphy of the Pelsonian Substage at its type area on the Balaton Highland has renewed in recent years. A collaborative research project led by A. Vörös provided an opportunity to complete publication of brachiopod faunal data gathered over the past nearly 20 years. Within this volume dedicated to the Pelsonian and its fauna, it is fitting to briefly summarize the available information on brachiopods. Besides, the main aim of this contribution is to provide a systematic description of the athyridid, spiriferid and terebratulid taxa, to complement the previously published treatment of rhynchonellids (PÁLFY 1988).

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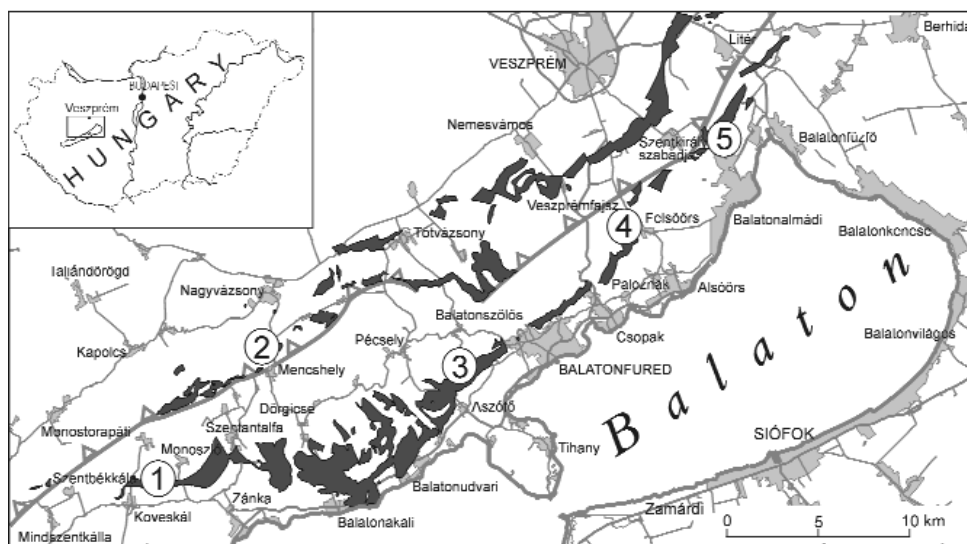


Figure Br-1. The studied Pelsonian brachiopod localities of the Balaton Highland. The distribution of Pelsonian formations is shown dark shaded (barbed line marks the Litér overthrust)

1 — Köveskál, Horog-hegy; 2 — Mentshely, Cser-tető, Section III; 3 — Aszófő, Farkó-kő; 4 — Felsőörs, Forrás-hegy; 5 — Vörösberény, road cut

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LOCALITIES

The faunas described herein were collected from measured stratigraphic sections at five localities, listed from west to east: Köveskál (Horog-hegy), Mecseshely (Cser-tető III), Aszófő II, Felsőörs (Forrás-hegy), and Vörösberény (road cut) (Figure Br-1). Detailed stratigraphic logs of the measured sections are provided elsewhere in this volume (Figures S-3, S-5, and S-9 in VÖRÖS *et al.*, this volume).

THE FAUNA

Brachiopods occur in great abundance at certain levels of the Felsőörs Formation (Figure Br-2). In the course of this study 34 species were distinguished. *Thecocyrtella horogensis* is described herein as new. The occurrence of the identified taxa at the studied localities is summarized in Table Br-1. Detailed information on their stratigraphic distribution (collection levels) and abundance (specimen numbers) in the three main localities (Köveskál, Aszófő and Felsőörs) is listed in the Appendix Br-1.

SYSTEMATIC PALAEOLOGY (EXCLUDING RHYNCHONELLIDA)

The most recent classification of the phylum Brachiopoda was developed during the preparation of the revised edition of relevant volumes of Treatise on Invertebrate Palaeontology. Herein we follow the supraordinal classification of brachiopods as outlined by WILLIAMS *et al.* (1996). The classification of athyridids is adopted from ALVAREZ *et al.*



Figure Br-2. Fossiliferous slab of Pelsonian crinoidal-brachiopodal limestone from the “upper Recoaro bed” of Horog-hegy at Köveskál, with several specimens of *Mentzelia mentzeli* and *Tetractinella trigonella*. Width of slab is 15.5 cm (Hungarian Natural History Museum inventory number M.92.391)

Table Br-1. Summary of occurrences of Pelsonian brachiopod taxa at the studied localities of the Balaton Highland

Taxa	Localities:				
	Köveskál	Aszófő	Felsőörs	Mecseshely	Vörösberény
<i>Discinisca</i> sp.	+				
<i>Lingula</i> cf. <i>tenuissima</i> BRONN, 1837	+				
<i>Norella</i> ? sp.	+			+	
<i>Costirhynchopsis mentzeli</i> (BUCH, 1843)	+	+			
<i>Decurtella decurtata</i> (GIRARD, 1843)	+	+	+		+
<i>Decurtella</i> cf. <i>illyrica</i> (BITTNER, 1903)		+			
<i>Piarorhynchella trinodosi</i> (BITTNER, 1890)	+	+	+	+	
<i>Volirhynchia vivida</i> (BITTNER, 1890)	+		+		+
<i>Volirhynchia projectifrons</i> (BITTNER, 1890)		+	+		
<i>Volirhynchia productifrons</i> (BITTNER, 1890)		+			
<i>Volirhynchia tommasi</i> (BITTNER, 1890)	+	+			
<i>Caucasorhynchia</i> cf. <i>altaplecta</i> (BÖCKH, 1872)	+		+		
<i>Trigonirhynchella atilina</i> (BITTNER, 1890)		+	+		
<i>Homoeorhynchia</i> ? sp.		+			
<i>Holcorhynchella delicatula</i> (BITTNER, 1890)		+		+	
<i>Tetractinella trigonella</i> (SCHLOTHEIM, 1820)	+	+	+		
<i>Schwagerispira</i> cf. <i>mojsisovicsi</i> (BÖCKH, 1872)	+	+	+		
<i>Schwagerispira schwageri</i> (BITTNER, 1890)	+	+	+		+
<i>Costispiriferina manca</i> (BITTNER, 1890)	+				
<i>Dinarispira avarica</i> (BITTNER, 1890)	+				
<i>Dinarispira</i> cf. <i>dinarica</i> (BITTNER, 1890)	+				
<i>Simucosta pectinata</i> (BITTNER, 1890)	+				
<i>Punctospirella fragilis</i> (SCHLOTHEIM, 1814)	+	+			
<i>Mentzelia mentzeli</i> (DUNKER, 1851)	+	+	+	+	
<i>Mentzelia balatonica</i> (BITTNER, 1890)			+		
<i>Koeveskallina koeveskalyensis</i> (STUR, 1865)	+	+	+		
<i>Koeveskallina paleotypus</i> (LORETTZ, 1875)		+			
<i>Thecocyrtella horogensis</i> n. sp.	+				
<i>Coenothyris vulgaris</i> (SCHLOTHEIM, 1820)	+	+	+		
<i>Coenothyris</i> cf. <i>cuccensis</i> BITTNER, 1890		+			
<i>Coenothyris</i> cf. <i>krafftii</i> BITTNER, 1890		+			
<i>Coenothyris</i> ? aff. <i>krafftii</i> BITTNER, 1890		+			
<i>Sulcatinella incrassata</i> (BITTNER, 1890)		+			
<i>Angustothyris</i> ? <i>angustaeformis</i> (BÖCKH, 1872)	+	+	+		
<i>Angustothyris</i> ? sp.					+

(1998), also developed for the Treatise volume (WILLIAMS *et al.* 2002). As the parts of the Treatise that cover spiriferids and terebratulids have not been published yet, the low-level (subordinal) classification of these groups follows the seminal monograph of DAGYS (1974).

The studied material is deposited in the collection of Geological and Palaeontological Department of the Hungarian Natural History Museum (Budapest). The inventory numbers of figured specimens are given in the plate explanation.

The measurements are given in millimetres, conventional abbreviations are used as follows: L = length, W = width, T = thickness.

Internal characters are described where the available material (preservation and number of specimens) permitted the use of serial sectioning.

Phylum Brachiopoda DUMÉRIL, 1806

Subphylum Rhynchonelliformea WILLIAMS *et al.*, 1996

Class Rhynchonellata WILLIAMS *et al.*, 1996

Order Athyridida BOUCOT, JOHNSON & STATON, 1964

Suborder Athyrididina BOUCOT, JOHNSON & STATON, 1964

Superfamily Athyridoidea DAVIDSON, 1881

Family Diplospirellidae SCHUCHERT, 1894

Subfamily Tetractinellinae GRUNT, 1986

Genus **Tetractinella** BITTNER, 1890

Tetractinella trigonella (SCHLOTHEIM, 1820)

(Plate Br-I, 1)

1871 *Terebratula (Spirigera) trigonelloides* SCHLOTH. — QUENSTEDT, p. 255, pl. 45, figs. 13–21.

1890 *Spirigera trigonella* SCHLOTH. — BITTNER, p. 17, pl. 36, figs. 8–31.

1902 *Spirigera (Tetractinella) trigonella* SCHLOTH. — BITTNER, p. 507, 532, 567, pl. 23, figs. 23–26.

1906 *Spirigera trigonella* SCHLOTH. — ARTHABER, pl. 35, fig. 7.

1937 *Spirigera (Tetractinella) trigonella* v. SCHLOTH. — ASSMANN, p. 31, pl. 6, fig. 12.

1949 *Spirigera trigonella* SCHLOTH. — BEŠIĆ, p. 114, pl. 1, figs. 16–20.

1967 *Tetractinella trigonella* (SCHLOTHEIM) — SPECIALE, p. 1087, pl. 79, fig. 4.

1967 *Tetractinella trigonella* (SCHLOTHEIM) — CASATI & GNACCOLINI, p. 123, pl. 9, fig. 10.

1972 *Tetractinella trigonella* (SCHLOTHEIM) — SIBLÍK, p. 189, pl. 61, figs. 1, 6–8. text-figs. 4–15.

1972 *Tetractinella trigonella* (SCHLOTHEIM) — SCHOLZ, pl. 8, fig. 1.

1974 *Tetractinella trigonella* (SCHLOTHEIM) — DAGYS, pl. 45, fig. 3.

1988 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — SIBLÍK, p. 85.

1990 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — USNARSKA-TALERZAK, p. 686, pl. 2, fig. 1, fig. 7.

1991 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — SIBLÍK, p. 168, pl. 1, fig. 6.

1992 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — UROŠEVIĆ, RADULOVIĆ & PESIĆ, p. 475, pl. 1, fig. 8.

1993 *Tetractinella trigonella* (SCHLOTHEIM) — IORDAN, pl. 1, fig. 4.

1993 *Tetractinella trigonella* (SCHLOTHEIM) — TÖRÖK, p. 165, pl. 2, fig. 7.

1993 *Tetractinella trigonella* VON SCHLOTHEIM, 1820 — ANGIOLINI, p. 287, pl. 1, figs. 3–4.

1997 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — KAIM, fig. 17.

1997 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — TORTI & ANGIOLINI, p. 158, pl. 1, fig. 14.

1999 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — SULSER, p. 116, 1 fig.

2001 *Tetractinella trigonella* (SCHLOTHEIM, 1820) — SIBLÍK, p. 26.

2002 *Tetractinella trigonella* (SCHLOTHEIM 1820) — MANTOVANI, p. 38, text-figs. 1–12, pl. 1, figs. 1–6, 9–12, pl. 2, figs. 1–6.

Material: This species occurs at all the three major localities studied. Sixty mostly shelly and articulated specimens were collected from Aszófő. At Köveskál, the “upper Recoaro bed” yielded 139 specimens, mostly disarticulated valves and only 10 articulated shells. On the contrary, most of the 262 specimens recovered from the “lower Recoaro bed” are well-preserved, articulated shells. From Felsőörs, 142 of a total of 148 specimens are articulated, albeit commonly secondarily deformed shells.

Dimensions: The length, width, and thickness measurements of 23 specimens from the “upper Recoaro” and 15 specimens from the “lower Recoaro” at Köveskál, 10 specimens from Felsőörs, and 12 specimens from Aszófő are plotted on Figures Br-3 and Br-4.

Description: Medium sized, pentagonal in outline. Greatest width attained at anterior third, where lateral costae reach the antero-lateral margin. Greatest thickness attained at half length. Apical angle highly variable between 45° and 85°. Beak small, suberect. Pedicular foramen epithyridid. Ornamentation dominated by four prominent costae that run from umbo to anterior margin. Costae form opposing pairs on ventral and dorsal valve; mostly straight, or slightly laterally curved; their profile narrow, acute, highly raised from surface of valves. Angles between ribs equal, or angle of central

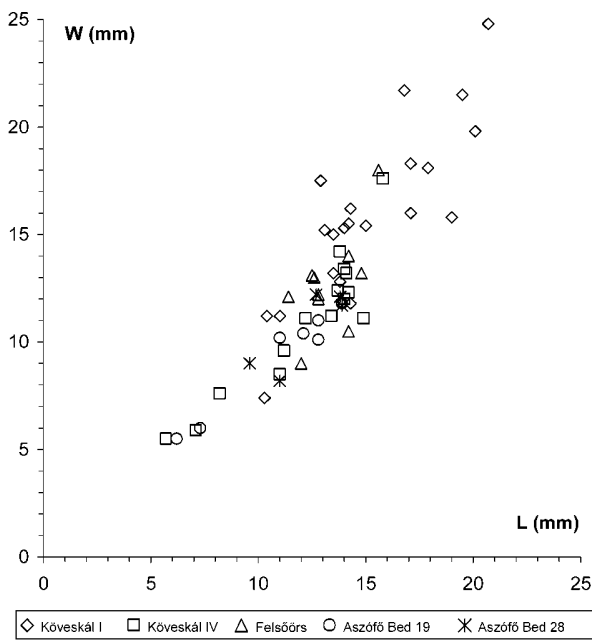


Figure Br-3. Cross plot of length vs. width of 60 measured specimens of *Tetractinella trigonella* from Köveskál (I — “upper Recoaro” IV — “lower Recoaro”), Felsőörs, and Aszófő

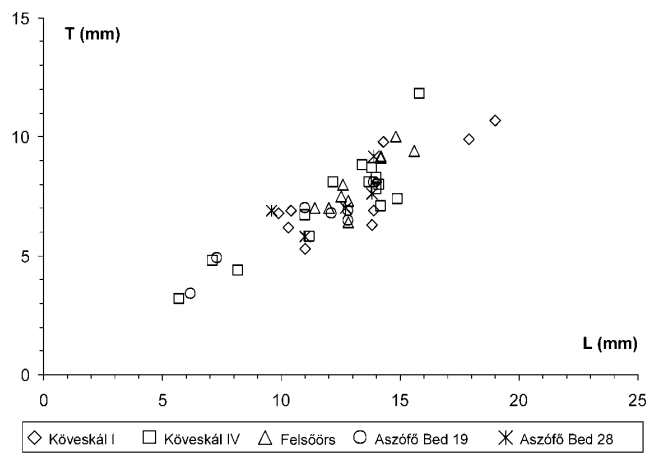


Figure Br-4. Cross plot of length vs. thickness of 60 measured specimens of *Tetractinella trigonella* from Köveskál (I — “upper Recoaro”, IV — “lower Recoaro”), Felsőörs, and Aszófő

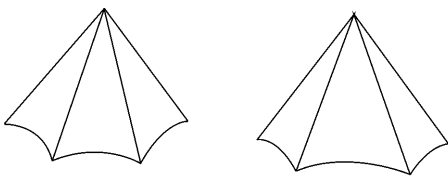


Figure Br-5. Two common morphotypes of *Tetractinella trigonella*, one with even sector angles, the other with larger angle between the middle two ribs



Figure Br-6. Anterior view of two common morphotypes of *Tetractinella trigonella*, one with straight margin, the other with gently uniplicate margin

sector larger than that of two lateral sectors (Figure Br-5). Few specimens from Aszófő possess a smaller secondary costa developed beside one of the inner ribs. Interspaces wide and flat. Anterior margin most commonly rectimarginate (metacarinata), rarely slightly uniplicate (Figure Br-6). Planareas well-developed around lateral margins, bound by lateral valve edges. Planarea flat or slightly convex, divided into two equal halves by lateral commissure. Additional ornamentation consists of fine growth lines, most characteristically on specimens from Felsőörs.

Variability: Characteristic features leave little doubt about conspecificity of all specimens, despite significant intraspecific variability. Convexity (thickness to length ratio) and length to width ratio are relatively constant, as also documented recently by MANTOVANI (2002). The apical angle, angles between ribs, and anterior commissure, however, display significant variability (Figures Br-5 and Br-6). Development of a fifth, secondary rib is also noted on some specimens. This is a rare phenomenon, nevertheless it is also reported by SIBLÍK (1972). Within the diagnostic pentagonal outline the ratio of side lengths and their angles also show some variability.

Remarks: The variability of the studied material support the conclusions of DETRE (1971) and SIBLÍK (1972). However, the bicostate form described by the latter author is considered here to belong to *Tetractinella cornutula*.

Superfamily Retzioidea WAAGEN, 1883
Family Neoretziidae DAGYS, 1972
Subfamily Hustediinae GRUNT, 1986

Genus **Schwagerispira** DAGYS, 1972
Schwagerispira mojsisovicsi (BÖCKH, 1872)
(Pl. Br-1, 4)

1872 *Retzia Mojsisovicsi* n. sp. — BÖCKH, p. 165, pl. 11, fig. 30.
1890 *Retzia Mojsisovicsi* BOECKH — BITTNER, p. 20.
1890 *Retzia speciosa* n. sp. — BITTNER, p. 43, pl. 33, figs. 14–15.

- 1892 *Retzia speciosa* BITTNER — BITTNER, p. 4, pl. 1, fig. 17.
 1895 *Retzia mojsisovicsi* BOECKH — SALOMON, p. 96, pl. 3, figs. 8–12.
 1912 *Retzia Mojsisovicsi* BÖCKH var. *speciosa* BITTNER — FRECH, p. 25, text-fig. 36.
 1912 *Retzia Mojsisovicsi* BOECKH — DE TONI, p. 337.
 1972 „*Retzia*” *mojsisovicsi* BOECKH — SIBLÍK, p. 185.
 1988 *Schwagerispira mojsisovicsi* (BÖCKH, 1872) — SIBLÍK, p. 90.

Material: Mostly well preserved, articulated specimens, 2 from Aszófő, 6 from Köveskál, and 16 from Felsőörs.

Dimensions: The table contains measurements (in mm) of six specimens and the holotype.

	Felsőörs					Köveskál	Holotype
L	8.9	8.6	8.8	8.1	9.1	9.2	8
W	6.9	6.8	7.2	6.6	7.2	7.7	7
T	5.8	5.5	3.2	5.1	5.5	5.9	5

Description: Small or medium sized, elongate form of pentagonal outline. Biconvex, valves of equal convexity. Greatest width and thickness attained at mid-length. Beak suberect, pointed, relatively high. Interarea small, bound by edges. Lateral and anterior margins straight, commissure zigzagged. Surface of valves densely and evenly costate. Costae straight, simple with no bifurcation, of rounded, semicircular profile. Interspaces narrower than rib bases. Number of costae 13 to 15 on each valve. Median area flat, occupied by four or five costae.

Remarks: Felsőörs is the type locality of the species. The thorough description of BÖCKH (1872) leaves little doubt that the newly obtained material is safely assigned to this species. BITTNER (1890) described *Retzia speciosa* from Schreyeralp, noting its close affinity to “*R.*” *mojsisovicsi*. Later collections from the Southern Alps led VINASSA DE REGNY (1903) and DE TONI (1912) to interpret “*R.*” *speciosa* as a junior synonym of “*R.*” *mojsisovicsi*. *Schwagerispira mojsisovicsi* bears resemblance to *S. schwageri* (BITTNER, 1890). The latter species also occurs in the Balaton Highland (see Plate Br-I, 3). It is distinguished by its less dense costation (7 to 9 ribs) and more convex, spherical shell shape.

***Schwagerispira schwageri* (BITTNER, 1890)**

(Plate Br-I, 3)

- 1890 *Retzia Schwageri* nov. spec. — BITTNER, p. 21, pl. 36, figs. 1–4.
 1974 *Schwagerispira schwageri* — DAGYS, p. 168, text-fig. 113, pl. 42, fig. 8.

Material: Well preserved, articulated specimens, 2 from Aszófő, 1 from Köveskál, and 1 from Felsőörs.

Dimensions: The figured specimen has the following measurements (in mm): L = 7.1, W = 6.0, T = 5.2.

Description: Small form of subpentagonal outline. Biconvex, dorsal valve more convex than ventral one. Greatest width and thickness attained at mid-length. Beak suberect, pointed, relatively high. Lateral and anterior margins straight, commissure zigzagged. Surface of valves coarsely and evenly costate. Costae straight, simple with no bifurcation, of subtriangular profile. Interspaces narrower than rib bases. Number of costae 7 to 9 on each valve.

Remarks: Three of the four original specimens of Bittner was collected from Köveskál. *Schwagerispira schwageri* is similar to *S. mojsisovicsi* (BÖCKH, 1872), differing from the latter by its less dense costation and more convex, almost spherical shell shape.

Order Spiriferinida IVANOVA, 1972
 Superfamily Spiriferinoidea DAVIDSON, 1884
 Family Spiriferinidae DAVIDSON, 1884
 Subfamily Spiriferininae DAVIDSON, 1884

Genus ***Costispiriferina*** DAGYS, 1974 ***Costispiriferina manca* (BITTNER, 1890)** (Plate Br-I, 5–8)

- 1890 *Spiriferina manca* n. sp. — BITTNER, p. 30, pl. 35, figs. 12–16.
 1912 *Spiriferina manca* BITTNER — DE TONI, p. 333, pl. 1, fig. 4.
 1972 *Spiriferina manca* BITTNER — SCHOLZ, pl. 7, figs. 11–13.
 1988 *Costispiriferina manca* (BITTNER, 1890) — SIBLÍK, p. 63.

Material: This species was collected only from Köveskál, where it occurs in abundance in the “upper Recoaro” bed. All of the 63 specimens are disarticulated valves. The majority is dorsal valves, only 8 of them are ventral valves.

Dimensions: Size variability is confined to a narrow range. Typical dimensions (in mm) are as follows: L = 6.0, W = 10.0, T (ventral valve) = 6.0, T (dorsal valve) = 2.0.

Description: Small sized shells, semicircular in outline. Valves highly unequal, dorsal valve only slightly, ventral one strongly convex. Beak small, ventral interarea high and catacline (normal to plane of commissure). Delthyrium narrow, approximately one fifth of total width. Dorsal umbo low. Maximum width and thickness reached at hinge line. Anterior margin semicircular, zigzagged, forming single, narrow, crescent-shaped plication. Both valves costate, albeit their ribbing pattern differs. Dorsal valve bears a wide median costa, opposite to an interspace bordered by pronounced costae on ventral valve. Number of lateral costae varies between 3 to 5, costae start from umbonal area, lack bifurcation, straight or gently arched laterally nearing anterior margin of dorsal valve. Rib cross section blunt triangular, except for dorsal median costa of semicircular profile.

Remarks: Köveskál is the type locality of the species. The specimen figured by DE TONI (1912) is a more densely costate ventral valve. The ribbing style of dorsal valves is similar to that of *Punctospirella fragilis*; distinguishing of these species is easier by a comparison of ventral valves.

Stratigraphic and geographic distribution: Apart from its type locality, the species is known from Pelsonian strata of the Southern Alps, Tirol, and the Aggtelek Mts.

Genus **Dinarispira** DAGYS, 1974
***Dinarispira avarica* (BITTNER, 1890)**
(Plate Br-I, 9–10)

1890 *Spiriferina avarica* nov. spec. — BITTNER, p. 35, pl. 35, figs. 6–7.

1902 *Spiriferina avarica* BITTNER — BITTNER, p. 513, 576, pl. 26, figs. 5–10.

1912 *Spiriferina avarica* BITTNER — DE TONI, p. 332.

1972 *Spiriferina avarica* BITTNER — SCHOLZ, pl. 7, figs. 7, 10.

Material: Two specimens from Bed 28 at Aszófő, 43 specimens from the upper, and 9 from the “lower Recoaro” bed of Köveskál. All are disarticulated valves, dorsal and ventral valves are equally represented.

Dimensions: Typical measurements (in mm) fall in the following ranges: L = 10–14, W = 13–18, T (ventral valve) = 5–8, T (dorsal valve) = 3–5.

Description: Oval or rounded shells of medium size. Anterior margin elliptical in outline. Maximum width attained immediately below hinge line, maximum thickness below umbo. Biconvex form, ventral valve markedly more convex than dorsal one. Beak straight, elongate, projecting above hinge. Ventral interarea apsacline, normal to plane of commissure at hinge then deflected towards the beak. Anterior commissure straight or slightly uniplicate, zigzagged. Valves costate, rib profile rounded. Two main costae flank a wide interspace which may be divided by two costellae. Lateral wings have additional two or three costae, slightly arched and diverging away from center of valve. Specimens from Köveskál commonly bear growth lines near anterior margin. Shell commonly thick, displaying well developed punctate structure.

Remarks: This species bears resemblance to several closely related spiriferids. It is distinguished from *Punctospirella fragilis* by its higher beak, from *Dinarispira pia* or *D. dinarica* (Plate I, 11–12) by its less dense costation.

Stratigraphic and geographic distribution: Apart from its type area, the species has been recorded from the Anisian of the Southern Alps and Dinarids.

***Dinarispira cf. dinarica* (BITTNER, 1890)**
(Plate Br-I, 11–12)

1890 *Spiriferina pia* nov. spec. var. *dinarica* nov. — BITTNER, p. 35, pl. 35, fig. 23.

1997 *Dinarispira cf. dinarica* (BITTNER, 1890) — TORTI & ANGIOLINI, p. 163, pl. 1, figs. 23–24; pl. 2, fig. 4.

Material: Seven specimens, all single valves, were collected from Köveskál.

Dimensions: Measurements of the two figured specimens are as follows (in mm): L = 9.0, 12.0; W = 13.0, 19.0.

Description: Shells of medium size and semicircular outline. Maximum width attained immediately below hinge line, maximum thickness below umbo. Anterior commissure straight, zigzagged. Valves costate, rib profile rounded. Number of costae between 8 and 10. Two main costae flank a median interspace which is only slightly wider than the others.

Remarks: This species is distinguished from the closely related species *D. avarica* by its somewhat more dense costation.

Genus **Sinuocosta** DAGYS, 1963
Sinuocosta pectinata (BITTNER, 1890)

1890 *Spiriferina pectinata* nov. spec. — BITTNER, p. 31, pl. 35, figs. 24–25.

Material: Seven specimens, all single valves and more or less fragmentary, from Köveskál.

Remarks: In the lack of complete, well preserved specimens, no complete description can be given. Our largest specimen is >15 mm in width and <10 mm in length, characterized by a wide hinge line and semicircular anterior margin. This is the most densely costate form among the studied spiriferids, bearing more than 20 costae on its dorsal valve. A relatively narrow and low median sulcus does not interrupt the costation pattern, bearing 3–4 costae. The dense ribbing distinguishes this form from otherwise similar species, e.g. *Punctospirella fragilis*. Another closely resembling species is *Hirsutella hirsuta*, which tends to have a greater W/L ratio, somewhat more pronounced median fold, and a much thicker ventral valve.

Subfamily Punctospirellinae DAVIDSON, 1884

Genus **Punctospirella** DAGYS, 1974
Punctospirella fragilis (SCHLOTHEIM, 1814)
 (Plate Br-I, 13–14)

- 1871 *Spiriferina fragilis* SCHLOTH. — QUENSTEDT, p. 500, pl. 53, figs. 39–41.
 1890 *Spiriferina fragilis* SCHLOTH. — BITTNER, p. 29, pl. 35, figs. 2–4.
 1895 *Spiriferina fragilis* v. SCHLOTH. — SALOMON, p. 82, 140, pl. 2, figs. 18–19.
 1906 *Spiriferina fragilis* SCHLOTH. — ARTHABER, pl. 35, fig. 9.
 1914 *Spiriferina fragilis* SCHLOTH. — ARTHABER, p. 193, pl. 18, fig. 9.
 1937 *Spiriferina fragilis* v. SCHLOTH. — ASSMANN, p. 29, pl. 6, fig. 7.
 1967 *Spiriferina fragilis* (SCHLOTHEIM) — SPECIALE, p. 1088, pl. 79, fig. 5.
 1967 *Spiriferina fragilis* (SCHLOTHEIM) — CASATI & GNACCOLINI, p. 124, 138, pl. 11, figs. 9–10.
 1972 *Spiriferina fragilis* SCHLOTHEIM — SIBLÍK, p. 181, pl. 61, fig. 2.
 1974 *Punctospirella fragilis* (SCHLOTHEIM) — DAGYS, pl. 39, figs. 2–3.
 1988 *Punctospirella fragilis* (SCHLOTHEIM, 1813) — SIBLÍK, p. 67.
 1990 *Punctospirella fragilis* (SCHLOTHEIM, 1814) — USNARSKA-TALERZAK, p. 688, pl. 2, fig. 2.
 1992 *Punctospirella fragilis* (SCHLOTHEIM, 1814) — UROŠEVIĆ, RADULOVIĆ & PESIĆ, p. 473, pl. 1, figs. 4–6.
 1993 *Punctospirella fragilis* (SCHLOTHEIM) — URLICHS, p. 211, figs. 2a–c.
 1993 *Punctospirella fragilis* (SCHLOTHEIM) — IORDAN, pl. 1, fig. 9.
 1993 *Punctospirella fragilis* (SCHLOTHEIM) — TÖRÖK, p. 165, pl. 2, fig. 4.
 1997 *Punctospirella fragilis* (SCHLOTHEIM, 1814) — KAIM, fig. 19b.
 1999 *Punctospirella fragilis* (SCHLOTHEIM, 1813) — SULSER, p. 128, 1 fig.
 2001 *Punctospirella fragilis* (SCHLOTHEIM, 1813) — SIBLÍK, p. 21.

Material: The Aszófő section yielded 29 specimens, another 15 specimens were collected at Köveskál. All are disarticulated valves, mostly fragmentary, only a few complete and well-preserved specimens are available.

Dimensions: Average measurements are as follows (in mm): L = 10, W = 15, T (dorsal valve) = 4, T (ventral valve) = 5.

Description: Shells of medium size. Hinge line broad, anterior margin with elliptical outline. Greatest width attained at hinge line, greatest thickness below umbo. Biconvex, both valves equally and moderately convex. Beak slightly erect, of medium size. Interarea wide and low. Delthyrium cannot be studied on available specimens. Umbo of dorsal valve small. Anterior margin straight but zigzagged. Valves entirely costate; ribs strong, straight, divergent anteriorly. Costae and interspaces evenly distributed, of rounded cross section. Ribbing style of two valves slightly different, ventral valve dominated by median interspace and two flanking main ribs. Main median rib of opposing dorsal valve broader than 4–5 lateral ribs.

Remarks: This is historically the first described Middle Triassic brachiopod species, therefore it is abundantly recorded in the literature. The median rib and corresponding interspace appears less prominent in Muschelkalk faunas of the Germanic Basin. This feature shows the largest variability, e.g. specimens figured by SALOMON (1895) display stronger median rib than the Balaton material, which is best comparable with that described by SPECIALE (1967).

Stratigraphic and geographic distribution: This species is known from both the Alpine and Germanic areas, from Anisian and Ladinian strata of Germany, Silesia, the Southern Alps, Dinarides, and Western Carpathians.

Subfamily Mentzeliinae DAVIDSON, 1884

Genus *Mentzelia* QUENSTEDT, 1871
Mentzelia mentzeli (DUNKER, 1851)
 (Plate Br-I, 15)

- 1890 *Spiriferina* (*Mentzelia*) *Mentzelii* DUNKER — BITTNER, p. 22, pl. 34, figs. 1–19.
 1906 *Spiriferina* (*Mentzelia*) *Mentzelii* DUNK. — ARTHABER, pl. 35, fig. 13.
 1912 *Spiriferina* *Mentzeli* DUNK. — DE TONI, p. 328, pl. 1, fig. 5.
 1937 *Spiriferina* (*Mentzelia*) *mentzelii* DUNKER — ASSMANN, p. 30, pl. 6, figs. 10–11.
 1967 *Mentzelia mentzelii* (DUNKER) — CASATI & GNACCOLINI, p. 124, pl. 9, figs. 4, 9.
 1969 *Mentzelia mentzeli mentzeli* (DUNKER) — GAETANI, p. 507, pl. 34, figs. 8–10, text-fig. 8.
 1972 *Mentzelia mentzeli mentzeli* (DUNKER) — SIBLÍK, p. 183, pl. 42, fig. 1.
 1974 *Mentzelia mentzeli* (DUNKER) — DAGYS, pl. 40, fig. 1.
 1988 *Mentzelia mentzeli* (DUNKER, 1851) — SIBLÍK, p. 66.
 1992 *Mentzelia mentzeli* (DUNKER, 1851) — UROŠEVIĆ, RADULOVIĆ & PESIĆ, p. 475, pl. 1, fig. 7.
 1993 *Mentzelia mentzeli* (DUNKER, 1851) — ANGIOLINI, p. 295, pl. 6, figs. 6–8.
 1993 *Mentzelia mentzeli* (DUNKER) — IORDAN, pl. 1, fig. 14.
 1997 *Mentzelia mentzeli* (DUNKER, 1851) — TORTI & ANGIOLINI, p. 161, pl. 1, figs. 20–21, pl. 3, figs. 17–19.
 1999 *Mentzelia mentzeli* (DUNKER 1851) — SULSER, p. 127, 1 fig.
 2001 *Mentzelia mentzeli* (DUNKER, 1851) — SIBLÍK, p. 20.

Material: Abundant collections were made at Aszófő (402 specimens) and Köveskál (266), with additional material from Felsőörs (5). All are disarticulated valves, except for two articulated specimens from Aszófő. At Köveskál ventral valves are more common than dorsal valves in the “upper Recoaro” bed, whereas their number is approximately equal at Aszófő.

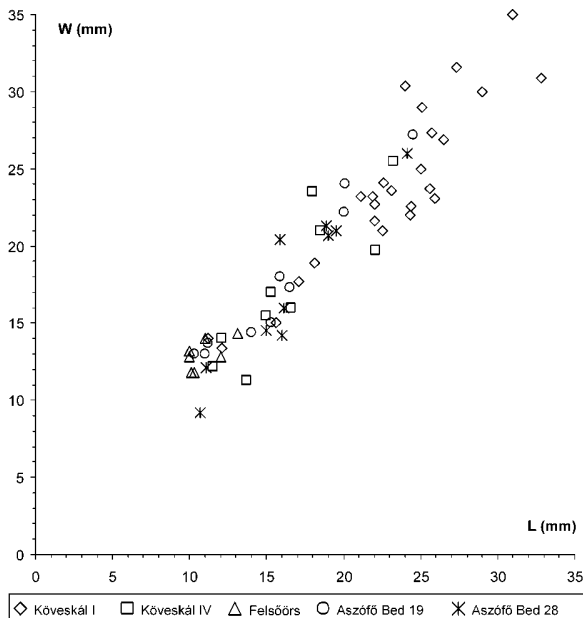


Figure Br-7. Cross plot of length vs. width of 65 measured specimens of *Mentzelia mentzeli* from Köveskál (I — “upper Recoaro”, IV — “lower Recoaro”), Felsőörs, and Aszófő

flanking the sulcus on the ventral valve. *M. balatonica* (Plate Br-I, 16), whose type locality is Felsőörs, is distinguished by its prominent, narrow uniplication of semicircular profile, and its fine ribbing developed near the lateral and anterior margins.

Stratigraphic and geographic distribution: The species is widely distributed and common in both the Germanic and the western Tethyan basins. It reaches peak abundance in the Anisian but also ranges into the Ladinian.

Mentzelia balatonica (BITTNER, 1890)
 (Plate Br-I, 16)

1890 *Spiriferina balatonica* nov. spec. — BITTNER, p. 28, pl. 35, fig. 1.

Material: Two well preserved, articulated specimens from Felsőörs.

Dimensions: Measurements of the figured specimen are as follows (in mm): L = 11.8, W = 14.6, T = 10.1.

Dimensions: Figure Br-7 shows measurements made on 65 specimens.

Description: Round or oval shells of medium to large size. Biconvex, ventral valve is more convex than dorsal one. Largest width attained at posterior third, largest thickness at half length. Anterior margin semicircular. Width of hinge line variable, usually approximately half of total width. Beak medium-sized, curved. Interarea of moderate height, apsacline. Delthyrium open, occupying medium third of interarea. Ventral interarea bordered by beak ridges. Anterior commissure straight, some adult specimens display uniplication, with low and gently arched fold. Shell surface most commonly smooth, or capillate on some specimens. Well developed growth folds near the anterior margin occur commonly on specimens from Köveskál.

Remarks: *Mentzelia mentzeli* is a long-established and widely distributed species. BITTNER (1890) distinguished numerous subspecies within it (*acrorhyncha*, *baconica*, *brevisrostris*, *illyrica*, *judicarica*, *media*). He also described two new, closely allied species as *Spiriferina balatonica* and *S. pannonica*. Although the infraspecific systematics of *M. mentzeli* is in need of revision, the Balaton Highland specimens agree well with the nominate subspecies.

Two related species, *M. ampla* and “*Spiriferina ptychitiphila*” are distinguished by their blunt, straight and diverging edges

Description: Shell of medium size, outline subhexagonal, width slightly exceeding length. Biconvex, ventral valve slightly more convex than dorsal one. Largest width and thickness attained at posterior third. Width of hinge line approximately 3/4 of total width. Beak medium-sized, curved. Interarea of moderate height, apsacline. Delthyrium open, occupying a quarter of interarea. Anterior commissure bears well-developed uniplication. Fold narrow, nearly semicircular. Shell surface mostly smooth, except broad and low incipient costae developing towards anterior margin.

Remarks: Felsőörs is the type locality of this species. *M. balatonica* is distinguished from the much more common *M. mentzeli* by its angular, subhexagonal outline and distinctive, semicircular fold.

Stratigraphic and geographic distribution: So far this species is only known from its type locality, the Pelsonian of Felsőörs.

Genus **Koeveskallina** DAGYS, 1965
***Koeveskallina koeveskalyensis* (STUR, 1865)**
(Plate Br-I, 17–21)

1856 *Spiriferina* n. sp. — SUESS in ZEPHAROVICH, p. 369.

1865 *Spiriferina Koeveskalyensis* SUESS — STUR, p. 245.

1872 *Spiriferina Koeveskalliensis* SUESS — BÖCKH, p. 162, pl. 11, figs. 22–23.

1890 *Spiriferina (Mentzelia) Koeveskalliensis* (SUESS) BÖCKH — BITTNER, p. 26, pl. 34, figs. 29–34.

1890 *Spiriferina Koeveskalliensis* SUESS var. — BITTNER, p. 44, pl. 33, fig. 16.

1895 *Spiriferina* cf. *Spitiensis* STOLICZKA — SALOMON, p. 87, pl. 2, figs. 7–15.

1899 *Spiriferina Spitiensis* STOLICZKA — BITTNER, p. 21, pl. 4, figs. 15–16.

1902 *Spiriferina (Mentzelia) Koeveskallinesis* BOECKH var. *validirostris* nov. — BITTNER, p. 583, pl. 25, figs. 23–25.

1906 *Spiriferina (Mentzelia) Koeveskalliensis* SUESS — ARTHABER, pl. 35, fig. 11.

1967 *Koeveskallina koeveskalliensis* (SUESS) — CASATI & GNACCOLINI, p. 125, pl. 9, fig. 7.

1972 *Koeveskallina koeveskalyensis* (STUR) — SIBLÍK, p. 184, pl. 61, fig. 4, pl. 63, fig. 2.

1974 *Koeveskallina koeveskalliensis* BOECKH — DAGYS, pl. 40, figs. 3–4.

1988 *Koeveskallina koeveskalyensis* (STUR, 1865) — SIBLÍK, p. 64.

1993 *Koeveskallina koeveskalyensis* (STUR) — IORDAN, pl. 1, figs. 7–8.

2001 *Koeveskallina koeveskalyensis* (STUR, 1865) — SIBLÍK, p. 19.

Material: Thirty-five internal moulds with shell remains from Köveskál, 14 shelly specimens from Felsőörs, 19 from Aszófő. All are disarticulated valves, ventral and dorsal valves nearly equal in numbers.

Dimensions: The measurements (in mm) of representative specimens of ventral and dorsal valves (5 of each) are tabulated below.

Dorsal valves	Aszófő	Aszófő	Felsőörs	Köveskál	Köveskál
L	15.0	11.9	9.8	14.2	14.5
W	17.2	14.9	10.2	15.6	18.4
T	4.1	2.8	3.1	6.7	5.2
Ventral valves	Felsőörs	Felsőörs	Aszófő	Köveskál	Köveskál
L	10.1	10.1	10.4	17.5	13.3
W	8.5	8.9	12.1	16.9	14.1
T	6.8	6.9	5.8	9.4	7.1

Description: Medium sized, oval or subcircular in outline. Valves unequal, ventral valve more strongly convex than dorsal valve. Both valves attain greatest width at mid-length, greatest thickness measured at posterior third. Beak large and erect. Well-developed interarea of equilateral triangular shape. Width of hinge line is 2/3 of total width. Delthyrium wide; deltidial plates and foramen cannot be observed on available specimens. Lateral and anterior margin straight. Surface of both valves ornamented by dense ribbing. Rib profile rounded and blunt, ribs extend from umbo to anterior margin, without bifurcation. Concentric growth lines, perpendicular to ribs, characterize specimens from Felsőörs. Coarse rugae common on specimens from Aszófő.

Remarks: The type locality of the species is Köveskál. It is of historic interest that the first record dates back to 1856, when Suess mentioned the species in a single sentence (in ZEPHAROVICH 1856). STUR (1865) established the name of the species, as it was clarified by SIBLÍK (1970) who discussed the authorship and nomenclature of the species. The first illustration was provided by BÖCKH (1872). Subsequent works introduced some confusion as Suess, Stur and Böckh were variably referred to as authors of the taxon, a controversy that was cleared by SIBLÍK (1970). A Himalayan species, *Spirifer spitiensis* STOLICZKA, 1865 is regarded synonymous with *K. koeveskalyensis*, following DIENER (1920).

Stratigraphic and geographic distribution: The species has been recorded from Pelsonian and Illyrian strata of the Northern Calcareous Alps, Southern Alps, Western Carpathians, Dinarids, and the Himalayas.

***Koeveskallina paleotypus* (LORETZ, 1875)**

(Plate Br-I, 22)

1875 *Spiriferina paleotypus* n. sp. — LORETZ, p. 802, pl. 21, fig. 1.1890 *Spiriferina paleotypus* LORETZ — BITTNER, p. 28, pl. 35, figs. 9–11.1912 *Spiriferina paleotypus* LOR. — DE TONI, p. 329, pl. 1, fig. 7.?1967 *Koeveskallina* cf. *paleotypus* (LORETZ) — CASATI & GNACCOLINI, p. 127, pl. 9, fig. 2.1988 *Koeveskallina paleotypus* (LORETZ, 1875) — SIBLÍK, p. 64.2001 *Koeveskallina paleotypus* (LORETZ, 1875) — SIBLÍK, p. 19.*Material:* 26 well preserved but disarticulated valves from Aszófő.*Dimensions:* The length of entire valves ranges from 17 to 25 mm, width ranges from 21 to 30 mm.*Description:* Large sized shell, rhomboidal in outline with semicircular anterior margin and high umbo. Biconvex, ventral valve more convex than dorsal one. Greatest width attained anteriorly from hinge, greatest thickness below umbo. Beak large, curved, projected high above hinge. Interarea wide but not high, bounded by edges. Umbo of dorsal valve stout. Anterior margin uniplicate, width of fold is $\frac{1}{4}$ of total width. Fold gently arched, forming no angles on the anterior margin, best developed on adult specimens. Surface of both valves evenly and densely costate. Costae fine, of rounded profile, their width slightly exceeds that of interspaces. Strength of costae increases from umbo towards anterior margin. Radial ornamentation consists of prominent, irregularly spaced rugae.*Remarks:* Diagnostic features of the species include its dense costation and the uniplication. Together with its larger size, they distinguish *K. paleotypus* from *K. koeveskalyensis*. The species differs from similarly large specimens of *Mentzelia mentzeli* by its costation: *M. mentzeli* is typically smooth, only some subspecies develop costellation (e.g. *M. mentzeli judicaria*). The specimens from Aszófő agree well with the original description of the species, as well as the figured specimens of BITTNER (1890) and DE TONI (1912). The illustrated specimen of CASATI & GNACCOLINI (1967) appears smaller, its beak is lower, and the ribbing style is different. With no anterior view available, its identity is questionable.*Stratigraphic and geographic distribution:* The species is known from several Anisian localities of the Southern Alps, Dinarids, and Caucasus.

Superfamily Suessioidea WAAGEN, 1883

Family Cyrtinidae FREDERIKS, 1912

Subfamily Thecocyrtellinae DAGYS, 1965

Genus **Thecocyrtella** BITTNER, 1892***Thecocyrtella horogensis* new species**

(Plate Br-I, 23, 34)

Diagnosis: Small, smooth cyrtinid shell of semicircular outline. Both valves symmetrical; dorsal valve nearly flat, ventral valve strongly convex, hemipyramidal; ventral interarea triangular, beak pointed.*Type material:* Holotype M.92.492, a well-preserved, articulated specimen with shell remains, with the following dimensions (in mm): L = 6.8, W = 6.7, T = 5.3. Paratype M.2002.866, a well-preserved ventral valve with shell remains with the following dimensions (in mm): L = 5.8, W = 7.5, T = 5.6.*Type locality and stratigraphic horizon:* Horog-hegy near Köveskál, Balaton Highland, Hungary; “lower Recoaro” bed of the Pelsonian Substage, Anisian Stage, Middle Triassic.*Etymology:* Named after its type locality, Horog-hegy (= Horog Hill) near Köveskál.*Description:* Small sized shell, semicircular in outline. Dorsal valve nearly flat, ventral valve strongly convex, hemipyramidal. Greatest width same as width of hinge line, greatest thickness same as height of interarea. Beak straight and pointed. Ventral interarea triangular in outline, height greater than its width. Delthyrium covered, symphytium observed on paratype. Umbo of dorsal valve small and pointed. Lateral and anterior margins straight. Shell surface smooth, except for faint growth lines developed on ventral valve. Some parts of shell remains appears to display punctate structure.*Remarks:* Although only two specimens are available for study, their characteristic features cannot be identified with previously described forms and warrant the erection of a new species. The internal characters remain unknown as serial sectioning was precluded by the uniqueness of the articulated specimen. The peculiar “cyrtinid” shell shape allows the assignment to superfamily Suessioidea with confidence (following the classification adopted by WILLIAMS *et al.* 2002). The superfamily consists of two families, of which Suessiidae is distinguished on the basis of its internal characters and comprises a single genus of Jurassic age. Therefore our specimen is best accommodated in the family Cyrtinidae. Its generic composition and the distinction of genera is somewhat controversial. When erecting the family, BITTNER (1890) originally included two Triassic genera, *Cyrtotheca* and *Cyrtina*. Subsequently he also distin-

guished *Thecocyrtella* (BITTNER 1892), later HALL & CLARKE (1894) established *Bittnerula* and designated *Cyrtina zitteli* as its type species.

DAGYS (1974) included *Cyrtotheca* and *Bittnerula* as synonyms within *Thecocyrtella* (sensu BITTNER 1892) and designated *Cyrtotheca ampezzana* as type species. Undoubtedly this Carnian species shows the greatest resemblance to our form, in possessing symmetrical ventral valve (a feature not typical to most other Cyrtinidae), as well as in its small size and lack of ornamentation. It, however, differs from the new species by its greater length to width ratio. The only other cyrtinid brachiopod known from the Anisian is *Cyrtina katzeri* BITTNER, 1902 (p. 600, pl. 26, fig. 4). Its asymmetric and ribbed shell suggests that it is not closely related to our form. In summary, the assignment of the herein described specimen to *Thecocyrtella* is justified using either the systematics of DAGYS (1974) or WILLIAMS *et al.* (2002).

Order Terebratulida WAAGEN, 1883

Suborder Terebratulidina WAAGEN, 1883

Superfamily Dielasmatoidea SCHUCHERT, 1913

Family Dielasmatidae SCHUCHERT, 1913

Subfamily Dielasmatinae SCHUCHERT, 1913

Genus **Coenothyris** DOUVILLÉ, 1879
***Coenothyris vulgaris* (SCHLOTHEIM, 1820)**
 (Plate Br-I, 24–26)

1871 *Terebratula vulgaris* SCHLOTH. — QUENSTEDT, p. 420, pl. 50, figs. 70–101.

1890 *Terebratula (Coenothyris) vulgaris* SCHLOTH. — BITTNER, p. 5, text-fig.

1899 *Terebratula (Coenothyris) vulgaris* SCHLOTH. — BITTNER, p. 28, pl. 5, fig. 14.

1906 *Terebratula (Coenothyris) vulgaris* SCHLOTH. — ARTHABER, pl. 35, figs. 4–6.

1937 *Coenothyris vulgaris* SCHLOTH. — ASSMANN, p. 26, pl. 7, fig. 15.

1967 *Coenothyris vulgaris* (SCHLOTHEIM) — SPECIALE, p. 1089, pl. 79, figs. 6–8, pl. 80, figs. 1–7, text-figs. 9–14.

1971 *Coenothyris vulgaris* (SCHLOTHEIM) — DETRE, p. 107, pl. 5, figs. 2–5, pl. 6, figs. 1–4, pl. 7, figs. 1–6, text-figs. 43–51.

1974 *Coenothyris vulgaris* SCHLOTHEIM — DAGYS, pl. 46, fig. 2.

1988 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — SIBLÍK, p. 92.

1988 *Coenothyris vulgaris* (SCHLOTHEIM) — USNARSKA-TALERZAK, p. 173, figs. 2–26, 31.

1989 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — POPIEL-BARCZYK & SENKOWICZOWA, p. 98, pl. 1, 3–4, figs. 3–7.

1990 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — USNARSKA-TALERZAK, p. 680, pl. 1, fig. 1.

1992 *Coenothyris vulgaris* (SCHLOTHEIM 1820) — UROŠEVIĆ, RADULOVIĆ & PESIĆ, p. 475, pl. 1, figs. 9–11, fig. 4.

1992 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — DETRE in DETRE, LANTOS & Ó. KOVÁCS, pl. 1–3, figs. 1–3.

1993 *Coenothyris vulgaris* (SCHLOTHEIM), 1820 — SENKOWICZOWA & POPIEL-BARCZYK, p. 582, pl. 1, fig. 3.

1993 *Coenothyris vulgaris* (SCHLOTHEIM) — IORDAN, pl. 1, fig. 16.

1993 *Coenothyris vulgaris* (SCHLOTHEIM) — TÖRÖK, pl. 2, figs. 3, 5, text-fig. 9.

1996 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — SENKOWICZOWA & POPIEL-BARCZYK, p. 457, pl. 1, fig. 7, figs. 7, 7a–c.

1996 *Coenothyris vulgaris* (VON SCHLOTHEIM) — TRAMMER, KAIM & MALKOWSKI, fig. 5.

1999 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — SULSER, p. 129, 1 fig.

2001 *Coenothyris vulgaris* (SCHLOTHEIM, 1820) — SIBLÍK, p. 28.

Material: Abundant material is available from the three main localities: 22 specimens from Felsőörs, 34 from Köveskál, and 77 from Aszófő.

Description: Medium to large sized, circular or oval in outline. Isometric, greatest width and thickness attained at mid-length. Biconvex, both valves are moderately convex. Beak erect and stout, lacking beak ridges. Foramen permesothyrinid. Lateral and anterior margins straight. Shell surface smooth, fine growth lines only occasionally developed.

Internal features (Figure Br-8):

The less than ideal preservation of the serially sectioned specimens hindered the observation of all characters. Delthyrial cavity rounded. Pedicle collar well developed. Short, diverging dental plates developed close to the wall of ventral valve. Hinge plate narrow, septalium deep. A long median septum persists at least to mid-length. Loop

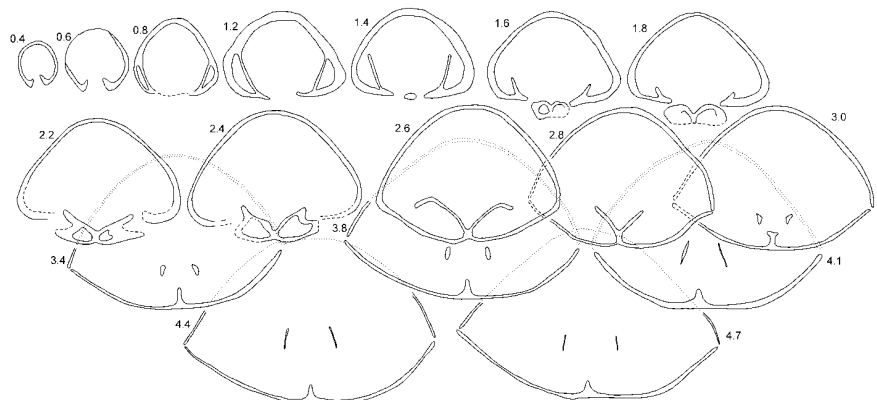


Figure Br-8. Transverse serial sections of a specimen of *Coenothyris vulgaris* from Aszófő. Distance from posterior end of shell given in mm. Length of specimen is 17.5 mm

incomplete in observed specimens, ascending part not preserved. Descending branch long, narrow, subparallel, ribbon-like, nearly perpendicular to plane of commissure.

Remarks: The external morphology of the species is remarkably simple and poor in features. A morphometric characterization was attempted by DETRE (1971), DETRE *et al.* (1984). Until recently, no detailed description of the internal morphology was available. Among the few published sources for comparison of the internal characters were the serial sections and descriptions given by MUIR-WOOD (in MOORE 1965), DETRE (1971), DETRE *et al.* (1984), and DAGYS (1974). Specimens from the Meesek Mts. were sectioned by Török and discussed in PÁLFY & TÖRÖK (1992). The possibility of polyspecific nature of *C. vulgaris* is suggested by the presence of divergent and short dental plates, deep septalium, long loop and median septum, which are in conflict with earlier observations. Concurrently with our study, USNARSKA-TALERZAK (1988) provided a detailed description of the internal morphology of *C. vulgaris*.

The external morphology is said to be variable. Previous descriptions included both rectimarginate and uniplicate forms. In Aszófő, these morphologies fall into two distinct populations that include adult specimens from within the same bed (*e.g.* Bed 19). Thus the uniplicate form is herein regarded as a separate species and identified as *C. cf. krafftii* (see Plate Br-I, 27–28), even though its internal features remain unknown. Another closely allied, but perhaps separate form is *C. cf. succensis* (Plate Br-I, 29), distinguished by its narrower and higher uniplication.

Stratigraphic and geographic distribution: *C. vulgaris* is one of the most common and abundant species in the Anisian of both the Germanic Basin and Tethyan localities.

***Coenothyris cf. succensis* BITTNER, 1902**

(Plate Br-I, 29)

1902 *Terebratula (Coenothyris) Succensis* nov. spec. — BITTNER, p. 528, pl. 18, fig. 33.

Material: A single specimen from Aszófő.

Dimensions (in mm): L = 18.0, W = 16.5, T = 9.5.

Remarks: This form is evidently closely allied with *Coenothyris vulgaris*, separated only on the basis of its narrow and high uniplication. Apart from this feature, other characteristics agree well with those of *C. vulgaris*. The identification remains somewhat doubtful as it is based on a single specimen and this species has not been reported in the literature except for its original description.

Stratigraphic and geographic distribution: Beside the Aszófő specimen, only the type material is illustrated from the Venetian Alps, although BITTNER (1902) also mentioned similar forms from the Sarajevo area.

***Coenothyris cf. krafftii* BITTNER, 1902**

(Plate Br-I, 27–28)

1902 *Terebratula (Coenothyris) Krafftii* nov. spec. — BITTNER, p. 527, pl. 18, figs. 30–32.

Material: 32 specimens from Aszófő.

Dimensions: Measurements of the two figured specimens (that represent typical adult individuals) are as follows (in mm): L = 25.4, 28.0; W = 21.8, 22.0; T = 15.2, 13.9.

Description: Large shell of suboval to subpentagonal outline. Greatest width and thickness attained at mid-length. Biconvex, ventral valve significantly more convex than dorsal one. Beak erect, no beak ridges present. Foramen perme-sothyridid. Anterior margin uniplicate, showing a tendency towards incipient biplication. Fold wide, taking up half of total width, its development starts only on anterior third of adult shell. Shell surface generally smooth, only in few cases bears extremely faint costellae and/or growth lines. Median septum and well developed adductor muscle scars observed through the dorsal valve of some specimens.

Remarks: This form is clearly separated from the rectimarginate population of *Coenothyris vulgaris* in several beds of the Aszófő section. Its diagnostic feature is the uniplication. It is best compared to *C. krafftii*, noting that the type of that species becomes more clearly biplicate at larger size.

Stratigraphic and geographic distribution: Beside the Aszófő specimens, only the type material is illustrated from the Venetian Alps.

***Coenothyris ? aff. krafftii* BITTNER, 1902**

(Plate Br-I, 2)

aff. 1902 *Terebratula (Coenothyris) Krafftii* nov. spec. — BITTNER, p. 527, pl. 18, figs. 30–32.

Material: 68 specimens from Aszófő and 2 from the “lower Recoaro” bed of Köveskál.

Dimensions: Measurements of the figured specimen (that represents a typical adult individual) are as follows (in mm): L = 20.2, W = 16.5, T = 11.9.

Description: Moderately large shell of subpentagonal outline. Ventral valve slightly more convex than dorsal one. Maximum width attained at 3/5 of length. Beak erect, foramen small. Anterior margin uniplicate, bearing a wide, perfectly flat fold with angular corners. Fold develops directly from dorsal umbo, demarcated by straight edges. Shell surface smooth.

Remarks: In earlier reports (PÁLFY 1986, VÖRÖS & PÁLFY 2002) this species was referred to “*Pexidella*” aff. *sturi* (BÖCKH, 1872). Its punctate shell structure, however, clearly suggests that it is properly allocated to terebratulids, further supported by the lack of spiral brachidium in several specimens observed with broken umbo. Based on its external morphology, this form is close to *Coenothyris kraffii*. The main distinguishing feature is the early ontogenetic development of the uniplication and the presence of characteristic edges bordering the fold. This character is likely to justify its allocation to a separate species and perhaps even to a different genus, a question that remains to be solved using serial sectioning.

Genus ***Sulcatinella*** DAGYS, 1974
Sulcatinella incrassata (BITTNER, 1890)
(Plate Br-I, 30–31)

1890 *Waldheimia (Aulacothyris) angusta* v. SCHLOTH. var. *incrassata* — BITTNER, p. 8, pl. 41, figs. 23–26.

Material: Fifty-four, mostly well-preserved, articulated specimens from Aszófő and a single specimen from the “lower Recoaro” bed of Köveskál.

Dimensions: The measurements (in mm) of the two figured specimens are as follows. Plate Br-I, 30: L = 15.3, W = 13.5, T = 12.8; Plate Br-I, 31: L = 14.7, W = 11.5, T = 10.1.

Description: Small to medium sized, rounded pentagonal in outline. Ventral valve inflated, strongly convex, dorsal valve much less convex to nearly flat. Greatest width and thickness attained at mid-length. Beak straight, pointed, with straight beak ridges. Foramen mesothyridid. Posterior and lateral margins straight, thickened. Anterior margin sulcate, bearing a wide, nearly flat face and wide but shallow sulcus. Shell surface ornamented with fine, closely spaced growth lines.

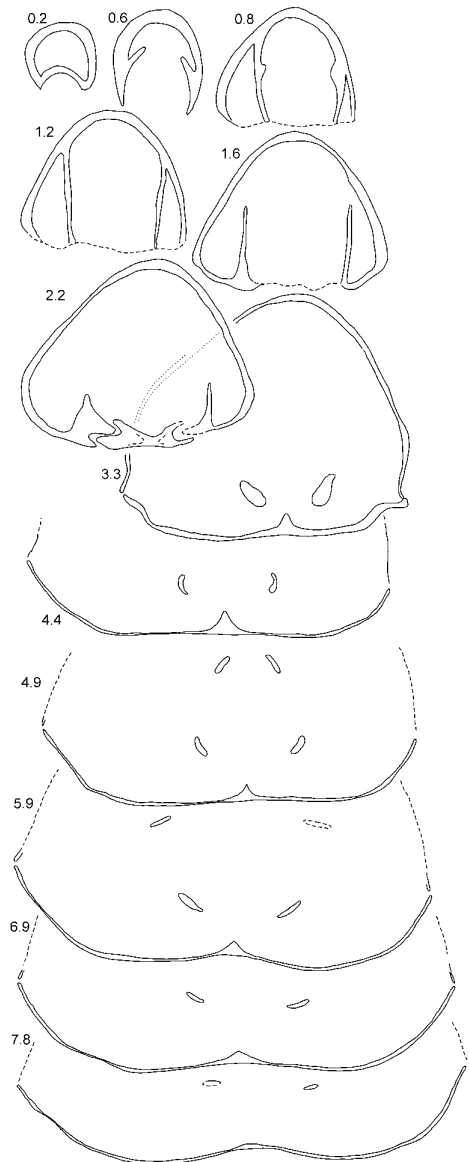
Internal features (Figure Br-9): Ring-like pedicle collar surrounds inner margin of foramen. Dental plates long and parallel. Width of delthyrial cavity equals the combined width of umbonal cavities. Septalium deep, hinge plate at low position. Tooth sided by small denticle. Length of median septum reaches half of entire length, brachidium also at least of same length. Descending ribbon of loop first runs parallel to median septum, then turns parallel to plane of dorsal valve.

Remarks: The inflated shape and sulcate anterior margin agree well with the original description. The only difference is the straight beak of the Aszófő specimens as opposed to the erect beak of the holotype. The peculiar external morphology provides a basis to raise the rank of this taxon from variety (= subspecies), as proposed originally by BITTNER (1890), to species. It is further supported by the investigation of internal morphology, which also allows a confident assignment to the genus *Sulcatinella*. Both the external and internal features of this species show good agreement with the diagnosis and description of DAGYS (1974).

Externally the inflated shape, internally the presence of dental plates allow distinction from other sulcate terebratulids, such as *Angustothyris angustaeformis* and *Silesiathyris angusta*.

Stratigraphic and geographic distribution: Apart from the Balaton Highland, the species is known from the Anisian of the Northern Calcareous Alps.

Figure Br-9. Transverse serial sections of a specimen of *Sulcatinella incrassata* from Aszófő. Distance from posterior end of shell given in mm. Length of specimen is 14.2 mm



Family Angustothyrididae DAGYS, 1972

Genus *Angustothyris* DAGYS, 1972
Angustothyris ? *angustaeformis* (BÖCKH, 1872)
 (Plate Br-I, 32–33)

1856 *Waldheimia* n. sp. — SUESS in ZEPHAROVICH, p. 369.1872 *Waldheimia angustaeformis* BKH. n. sp. — BÖCKH, p. 160, pl. 21, fig. 20.1890 *Waldheimia angustaeformis* BOECKH — BITTNER, p. 8, 52, pl. 36, figs. 37–40.1895 *Waldheimia angustaeformis* BOECKH — SALOMON, p. 104, pl. 3, figs. 29–31.1906 *Waldheimia angustaeformis* BKH. — ARTHABER, pl. 35, fig. 12.1914 *Waldheimia angustaeformis* BKH. — ARTHABER, pl. 18, fig. 10.1972 “*Zeilleria*” *angustaeformis* (BÖCKH) — SIBLIK, p. 195, pl. 62, fig. 5.? 1974 *Angustothyris angustaeformis* BOECKH — DAGYS, pl. 48, fig. 1.1988 *Angustothyris angustaeformis* (BÖCKH, 1872) — SIBLIK, p. 101.1990 *Angustothyris angustaeformis* (BOECKH, 1872) — USNARSKA-TALERZAK, 681, fig. 3.1997 *Angustothyris angustaeformis* (BÖCKH, 1872) — TORTI & ANGIOLINI, p. 168, pl. 1, figs. 35–36, pl. 2, fig. 5.2001 *Angustothyris angustaeformis* (BÖCKH, 1872) — SIBLIK, p. 32.

Material: Mostly slightly silicified, articulated specimens, 53 from Aszófő, 85 from Köveskál, and 9 from Felsőörs.

Dimensions: Measurements (in mm) of the holotype are as follows: L = 15.7, W = 14.2, T = 8.0. The measurements of the two figured specimens are as follows: Pl. 1, fig. 32: L = 18.4, W = 15.3, T = 9.8; Pl. 1, fig. 33: L = 21.7, W = 17.9, T = 12.2.

Description: Medium to large sized, pentagonal to rounded subpentagonal in outline. Biconvex, ventral valve more convex than dorsal one. Greatest width attained at posterior third, greatest thickness at mid-length. Beak strong, high, erect. Foramen circular, mesothyridid. Prominent, gently arched beak ridges reach lateral margin. Greatest convexity at middle of ventral valve, forming blunt ridge, whereas lateral wings flatten out. Anterior margin sharp and sulcate. Sulcus deep and wide, developing from middle of dorsal valve. Shell surface smooth.

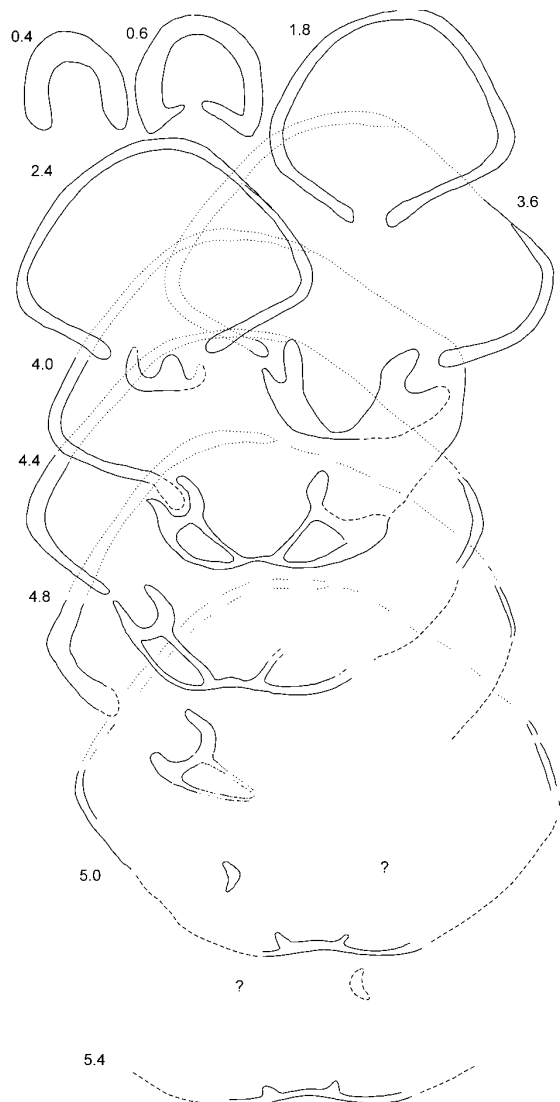
Internal features (Figure Br-10): Pedicle collar well developed. Dental plates absent. Hinge plates not fused. Median septum lacking. Septalium deep. Sockets wide and deep. Teeth straight, undivided, with no denticle. Brachidium not preserved in the studied specimen.

Remarks: The type locality of the species is Köveskál. BÖCKH (1872) notes in the original description that distinction from the similar “*Waldheimia*” *angusta* (now assigned to *Silesiathyris*) is based on their differing size. Similar external morphology of these two species makes their distinction a persistent problem. The more pentagonal outline, the blunt “ridge” and flanking “wings” of *A. angustaeformis* may serve as diagnostic features.

DAGYS (1972, 1974) designated *angustaeformis* as the type species of his newly established genus *Angustothyris*. The diagnosis of the internal morphology was given on the basis of investigation of specimens from the Caucasus. His figured specimen displays a less developed sulcus and the described internal features also show characteristic differences from the Köveskál specimens, casting doubts about the identification of the Caucasian specimens. Further research is needed to confirm or disprove their synonymy.

Stratigraphic and geographic distribution: This species is known from Pelsonian and Illyrian strata of the Southern Alps, Western Carpathians, Anatolia, and the Caucasus. POPIELBARCZYK & SENKOWICZOWA (1983) recorded the species from Silesia, this is the first record from the Germanic Basin.

Figure Br-10. Transverse serial sections of a specimen of *Angustothyris* ? *angustaeformis* from Köveskál. Distance from posterior end of shell given in mm. Length of specimen is 18.1 mm



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Plate Br-I.

Pelsonian brachiopods from the Balaton Highland. Figures are natural size unless otherwise indicated. Specimens were coated with ammonium-chloride before photography. Specimens are deposited in the collection of Geological and Palaeontological Department, Hungarian Natural History Museum, under the inventory numbers prefixed by M.

1. *Tetractinella trigonella* (SCHLOTHEIM, 1820); M.92.423; Felsőörs; a = dorsal view, b = lateral view, c = anterior view.
2. *Coenothyris* ? aff. *krafftii* BITTNER, 1902; M.92.435; Aszófő II, Bed 19; a = dorsal view, b = lateral view, c = anterior view.
3. *Schwagerispira schwageri* (BITTNER, 1890); M.92.424; Felsőörs; a = dorsal view, b = lateral view, c = anterior view, 2×.
4. *Schwagerispira mojsisovicsi* (BÖCKH, 1872); M.92.425; Felsőörs; a = dorsal view, b = lateral view, c = anterior view, 2×.
5. *Costispiriferina manca* (BITTNER, 1890); M.92.414; Köveskál; dorsal valve.
6. *Costispiriferina manca* (BITTNER, 1890); M.92.415; Köveskál; dorsal valve.
7. *Costispiriferina manca* (BITTNER, 1890); M.92.416; Köveskál; ventral valve; a = ventral view, b = posterior view.
8. *Costispiriferina manca* (BITTNER, 1890); M.92.417; Köveskál; ventral valve.
9. *Dinarispira avarica* (BITTNER, 1890); M.92.418; Köveskál; ventral valve.
10. *Dinarispira avarica* (BITTNER, 1890); M.92.419; Köveskál; ventral valve.
11. *Dinarispira* cf. *dinarica* (BITTNER, 1890); M.92.342; Köveskál; dorsal valve.
12. *Dinarispira* cf. *dinarica* (BITTNER, 1890); M.92.342; Köveskál; dorsal valve.
13. *Punctospirella fragilis* (SCHLOTHEIM, 1814); M.92.420; Köveskál; ventral valve.
14. *Punctospirella fragilis* (SCHLOTHEIM, 1814); M.92.421; Köveskál; dorsal valve.
15. *Mentzelia mentzeli* (DUNKER, 1851); M.92.422; Aszófő II, Bed 28; a = dorsal view, b = lateral view, c = anterior view.
16. *Mentzelia balatonica* (BITTNER, 1890); M.92.491; Felsőörs; a = dorsal view, b = lateral view, c = anterior view.
17. *Koeveskallina koeveskalyensis* (STUR, 1865); M.92.408; Aszófő II, Bed 19; dorsal valve.
18. *Koeveskallina koeveskalyensis* (STUR, 1865); M.92.409; Köveskál; dorsal valve.
19. *Koeveskallina koeveskalyensis* (STUR, 1865); M.92.410; Felsőörs; ventral valve.
20. *Koeveskallina koeveskalyensis* (STUR, 1865); M.92.411; Köveskál; ventral valve.
21. *Koeveskallina koeveskalyensis* (STUR, 1865); M.92.412; Felsőörs; ventral valve.
22. *Koeveskallina paleotypus* (LORETZ, 1875); M.92.413; Aszófő II, Bed 19; ventral valve.
23. *Thecocyrtella horogensis* n. sp.; Holotype, M.92.492; Köveskál; a = dorsal view, b = ventral view, c = anterior view, d = posterior view, e = lateral view, 2×.
24. *Coenothyris vulgaris* (SCHLOTHEIM, 1820); M.92.426; Felsőörs; a = dorsal view, b = lateral view, c = anterior view.
25. *Coenothyris vulgaris* (SCHLOTHEIM, 1820); M.92.427; Aszófő II, Bed 18; a = dorsal view, b = lateral view, c = anterior view.
26. *Coenothyris vulgaris* (SCHLOTHEIM, 1820); M.92.436; Aszófő; ventral valve.
27. *Coenothyris* cf. *krafftii* BITTNER, 1902; M.92.429; Aszófő II, Bed 18; a = dorsal view, b = lateral view, c = anterior view.
28. *Coenothyris* cf. *krafftii* BITTNER, 1902; M.92.428; Aszófő II, Bed 22; a = dorsal view, b = lateral view, c = anterior view.
29. *Coenothyris* cf. *cuccensis* BITTNER, 1902; M.92.430; Aszófő II, Bed 28; a = dorsal view, b = lateral view, c = anterior view.
30. *Sulcatinella incrassata* (BITTNER, 1890); M.92.431; Aszófő II, Bed 19; a = dorsal view, b = lateral view, c = anterior view.
31. *Sulcatinella incrassata* (BITTNER, 1890); M.92.432; Aszófő II, Bed 19; a = dorsal view, b = lateral view, c = anterior view.
32. *Angustothyris* ? *angustaeformis* (BÖCKH, 1872); M.92.434; Köveskál; a = dorsal view, b = lateral view, c = anterior view.
33. *Angustothyris* ? *angustaeformis* (BÖCKH, 1872); M.92.433; Aszófő II, Bed 28; a = dorsal view, b = lateral view, c = anterior view.
34. *Thecocyrtella horogensis* n. sp.; Paratype, M.2002.866; Köveskál; posterior view of ventral valve, 2×.

