

Carnian spire-bearing brachiopods from the Slovak Karst (SE Slovakia)

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Abstract: Koninckinacean, spiriferid and athyridid brachiopods are dealt with in this paper, which is the last contribution to the taxonomic study of the Carnian brachiopod fauna of the Slovak Karst. Based on internal characteristics, the generic affiliation of "*halobiarum*" BITTNER to *Spiriferina* has been changed and the species is referred now to *Mentzelia* QUENSTEDT: *Laballa dagysi* is described here as a new species, and *Mentzelia halobiarum versata* as a new subspecies. The latter is a further taxon characteristic of the upper brachiopod assemblage in the local Carnian.

Key words: Western Carpathians, Slovak Karst, Triassic, brachiopods

Introduction

This paper focuses on spire-bearing brachiopods = *Koninckinidae*, *Spiriferida* and *Athyridida* = groups that formerly were all classified in *Spiriferida*. It is the final part of my detailed study of the Carnian brachiopod fauna from the Slovak Karst. The study was based on large collections made during the last 4 decades, in the beginning by J. Bystrický and his collaborators, and later sampled also by myself. The general geological situation was referred to in my previous papers on the brachiopod fauna (e.g. Siblík, 1986), the exact location of the fossil localities is well documented from the sketches in papers by Kochanová and Kollárová-Andrusovová (1983) for Silická Brezová and its environs, and by Kochanová (1987) for the Ostré vršky area. A small brachiopod collection was made in a recently excavated trench SSE of the old quarries near Silická Brezová.

Acknowledgements:

This research was made possible thanks to the grant from the Grant Agency of the Academy of Sciences of the Czech Republic (grant no. A 3013606). Short visits to Vienna enabling study of comparative material were financially supported in 1996 and 1997 by the Austrian Academy of Sciences. Dr. Fr. Stojaspal (Geologische Bundesanstalt, Wien), Dr. H. Summesberger (Naturhistorisches Museum, Wien), and Prof. Dr. L. Krystyn (Institut für Paläontologie, Univ. Wien) kindly provided access to collections and loaned comparative material. I am also indebted to Ing. M. Rozložník (Manager of the Protected Landscape Region - the Biospheric Reserve Slovak Karst, Brzotín) for his kind assistance and permission to continue sampling. I owe thanks also to Prof. A. Dagys (Vilnius) who examined my material of *Laballa* and encouraged me to establish the new species.

Systematic description

Order: *Strophomenida* ÖPIK 1934

Superfamily: *Koninckinacea* DAVIDSON, 1853

Family: *Koninckinidae* DAVIDSON, 1853

The koninckinids are very common in the light-coloured coquina "Tisovec" Limestone in the environs of Silická Brezová. Their preservation is commonly unsatisfactory, however. Except for 2 complete specimens, only pedicle valves (in most cases their internal moulds) have been found. Many of them are fragmentary or damaged in their posterior parts. In the absence of information on internal details, one must consider general shape and some external characters only. Recognition of species is, thus, made rather difficult and a considerable part of koninckinid material could not be well identified specifically. The comparative material in Vienna is not numerous and its preservation rather mediocre. In his recent paper, Dagys (1996) established a new suborder *Koninckinidina* and included it in *Athyridida*.

Koninckina SUESS in DAVIDSON, 1853

***Koninckina* cf. *alata* BITTNER, 1890**
(Pl. 1, Fig. 1)

cf. 1890 *Koninckina alata* nov. spec. - BITTNER, p. 236, Pl. 16, Fig. 17.

Material: One slightly damaged pedicle valve measuring 9.6x 10.4 mm.

Remarks: The specimen is similar to *Koninckina alata* as figured by BITTNER (1890) though the "ears" cannot be

adequately compared since they have been damaged in my specimen. It differs from Bittner's type in its greater convexity. Similarly, a more convex valve determined as *Koninckina alata* was figured by JIN & FANG (1977, Plate 4, Fig. 4).

Occurrence: Silická Brezová - lower part of Balogh's locality. *Koninckina alata* was described from the Dinarids (Norian).

***Koninckina* cf. *strophomenoides* BITTNER, 1890**

cf. 1890 *Koninckina strophomenoides* ZUGMAYER (in coll.) nov. spec. - BITTNER, p. 235, Pl. 16, Fig. 16.

Material: 1 fragmentary pedicle valve without anterior and anterolateral margins (inv. no. SNM Z 21995).

Remarks: The fragment resembles Norian *Koninckina strophomenoides* BITTNER by its dimensions, flat character, slight beak and very long, straight hinge line. A poorly developed concentric ornament is visible near lateral margin of valve. The definite specific determination is made difficult owing to poor preservation.

Occurrence: Silická Brezová - lower part of Balogh's locality.

Carinokoninckina JIN & FANG, 1977

***Carinokoninckina telleri* (BITTNER, 1890)**

(Pl. 1, Figs. 4-5)

1886 *Koninckina Telleri* n. sp. - BITTNER, p. 5 (nomen nudum).

1890 *Koninckina Telleri* BITTNER. nov. spec. - BITTNER, p. 129, 131, 134, Pl. 30, Figs. 1-10 (incl. var. *ornata* and *dilatata*).

1963 *Koninckina telleri* BITTNER - DAGYS, p. 134, Pl. 21, Figs. 3-4.

1974 *Koninckina telleri* BITTNER - DAGYS, Pl. 26, Fig. 2.

1988 *Koninckina telleri* BITTNER - SIBLÍK, p. 24.

Lectotype (selected by Siblík, 1988): BITTNER, 1890, Pl. 30, Fig. 5. It is deposited in the Geologische Bundesanstalt, Wien (no. 1890/2/150).

Locus typicus: Oberseeland (Zgornje Jezersko), Slovenia.
Stratum typicum: Carnian (according to DIENER, 1920, p. 77).

Material: 66 mostly fragmentary internal moulds of pedicle valves. The dimensions of figured specimens: 10.3 x 13.0 mm (Pl. 1, Fig. 4) and 9.5 x 10.6 mm (Pl. 1, Fig. 5).

Remarks: Most specimens show a considerable resemblance to those figured by BITTNER (1890) on Pl. 30, Figs. 4, 6 but differ from them in lesser thickness and lesser convexity of pedicle valves. However, some other Bittner's specimens of "*telleri*" deposited in the collections of the Geologische Bundesanstalt in Vienna have pedicle valves of lesser thickness, and these are comparable to my specimens. Larger, sulcated specimens similar to that figured by BITTNER on Pl. 30, Fig. 10 (as var. *dilatata*) are found only exceptionally in my material. *Koninckina telleri* was quoted from the Slovak Karst already by BYSTRICKÝ (1964). This determination was called partially in question by SIBLÍK (1997), but afterwards it was confirmed during the study of comparative material of "*telleri*" and *Koninckina leopoldiaustriae* in

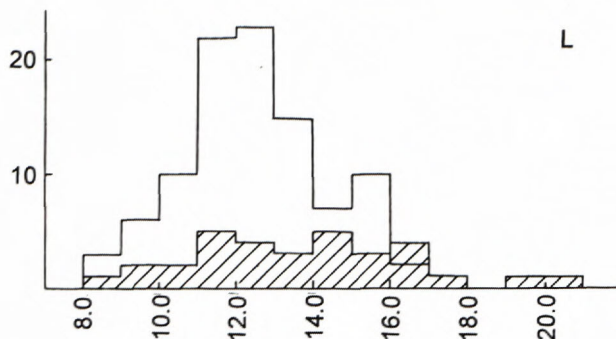


Fig. 1 Length frequency histogram for 99 specimens of *Mentzelia halobiarum halobiarum* (BITTNER) (Ostré vršky Hill. loc. B₂A) and 32 specimens of *Mentzelia halobiarum versata* ssp.n. - hatched (Silická Brezová - upper part of Balogh's locality), in mm. Vertically number of specimens.

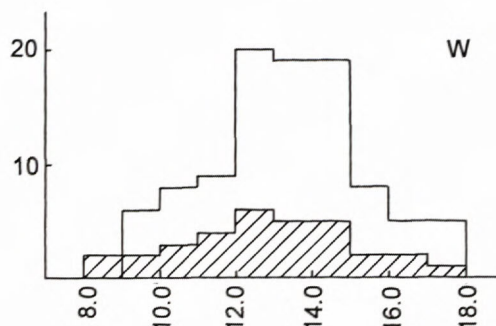


Fig. 2 Width frequency histogram (for explanation see Fig. 1).

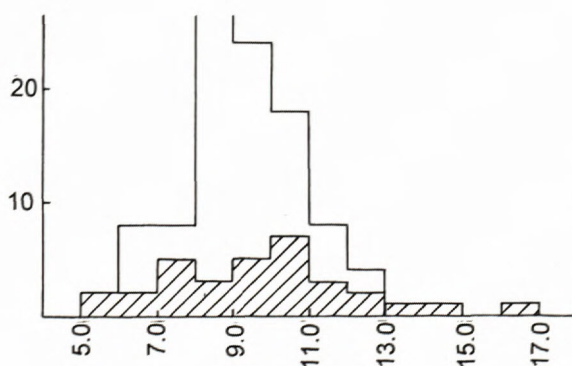


Fig. 3 Thickness frequency histogram (for explanation see Fig. 1).

the Geologische Bundesanstalt in Vienna. *Koninckina telleri* became the type species of *Carinokoninckina* JIN & FANG, 1977.

Occurrence: Silická Brezová - lower part of Balogh's locality (38 specimens), upper part of Balogh's locality (3 specimens), M-45 (2 specimens), 60 m ESE of M-49 (3 specimens), loc. Šimák near the elevation point 419.3 (11 specimens), Ostré vršky - loc. B₂A (8 specimens, 3 of them var. *dilatata* BITTNER), loc. O₂ (1 specimen).

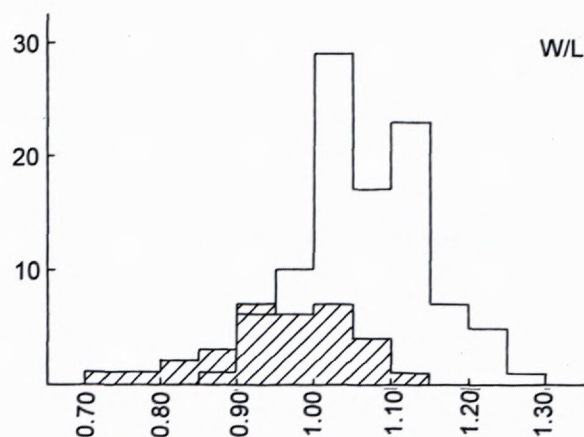


Fig. 4 Width/length frequency histogram for 99 specimens of *Mentzelia halobiarum halobiarum* (BITTN.) (Ostré vršky Hill, locB₂A) and 32 specimens of *Mentzelia halobiarum versata* ssp.n.- hatched (Silická Brezová - upper part of BALOGH's locality), in mm. Vertically number of specimens.

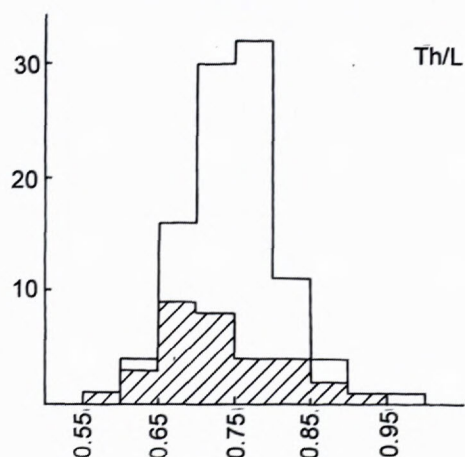


Fig. 5 Thickness/length frequency histogram (for explanation see Fig. 4).

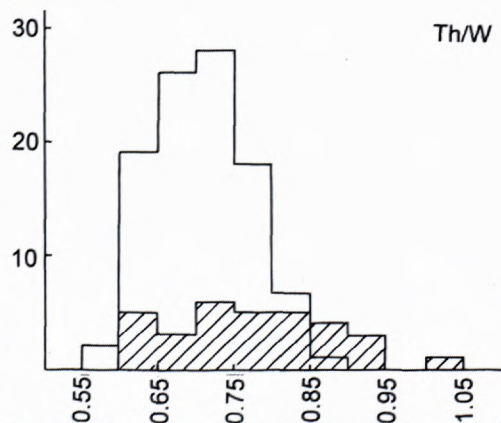


Fig. 6 Thickness/width frequency histogram (for explanation see Fig. 4).

***Carinokoninckina* aff. *expansa* (BITTNER, 1890)**
(Pl. 1, Fig. 2)

aff. 1890 *Koninckina expansa* nov. spec. - BITTNER, p. 132, 134, Pl. 30, Figs. 11 - 12.

Material: 45 fragmentary specimens. The figured one has dimensions 10.0 x 13.0 mm.

Remarks: There is a series of pedicle valves with weakly developed umbonal parts bearing certain resemblances to Carnian *Carinokoninckina expansa* figured by BITTNER (1890) on Pl. 30, Fig. 12. They are in average smaller and many are thicker, more convex, and have longer hinge lines. Owing to the limited number of well-preserved specimens of this variable material, it was not possible to determine it precisely. Bittner's variety *crassitesta* (1890, Pl. 30, Fig. 11) was distinguished by Bittner from "*expansa*" by its much thicker shell material and by longer hinge line.

Occurrence: Silická Brezová - lower part of Balogh's locality (23 specimens), upper part of Balogh's locality (2 specimens), M-45 (2 specimens), 60 m ESE of M-49 (18 specimens).

Order: *Spiriferinida* IVANOVA, 1972

Suborder: *Spiriferinidina* IVANOVA 1972

Superfamily: *Mentzelioidae* DAGYS, 1974

Family: *Mentzeliidae* DAGYS, 1974

Subfamily: *Mentzeliinae* DAGYS, 1974

Mentzelia QUENSTEDT, 1870

***Mentzelia halobiarum* (BITTNER, 1890)**

(Pl. 1, Fig. 6, Pl. 2, Figs. 1-5, Pl. 3, Fig. 2, Pl. 4, Fig. 5, Text-Figs. 1-8, 10B)

1890 *Spiriferina halobiarum* nov.spec.- BITTNER, p. 248, Pl. 14, Figs. 6-15 (incl. var. *linguata*).

?1890 *Spiriferina halobiarum* var. *amblyrhyncha* - BITTNER, p. 248, Pl. 14, Fig. 16.

1972 *Spiriferina halobiarum* BITTNER - ENTCEVA, p. 23, Pl. 6, Figs. 7-8.

1988 "*Spiriferina*" *halobiarum* BITTNER - SIBLÍK, p. 70 (cum syn).

? 1993 "*Spiriferina*" cf. *halobiarum* BITTNER - GYALOG et al., p. 183, Pl. 2, Fig. 3.

Lectotype (selected by SIBLÍK, 1988): BITTNER, 1890, Pl. 14, Fig. 7, deposited in the Geologische Bundesanstalt in Vienna (no. 1890/2/329).

Locus typicus: Bergstein near Landl/Enns, Styria.

Stratum typicum: Hallstatt Lms., Carnian.

Material: 192 complete specimens, 19 brachial and 99 pedicle valves. Specimens have been observed up to about 17.5 mm in length, 18.0 mm in width and 13.0 mm in thickness. The figured specimens measure: 9.1 x 9.6 x 6.8 mm (Pl. 1, Fig. 6), 16.3 x 18.4 x 11.3 mm (Pl. 2, Fig. 1), 17.2 x 17.9 x 12.7 mm (Pl. 2, Fig. 2), 13.8 x 14.9 x 9.6 mm (Pl. 2, Fig. 3), 12.5 x 13.2 x 9.0 mm (Pl. 2, Fig. 4), 13.8 x 13.8 x 10.3 mm (Pl. 2, Fig. 5), 16.1 x 14.9 x 11.5 mm (Pl. 3, Fig. 2), 13.8 x 15.4 x 10.2 mm (Pl. 4, Fig. 5).

Internal characters: Interior of the pedicle valve has striate cardinal process and median septum of variable length. Median septum fused with low dental flanges to form spondylium-like structure which makes generic affiliation of "*halobiarum*" to *Mentzelia* evident. Septum not continuing into spondylial cavity in some sectioned spe-

cimens. In rare cases, short ventral adminicula partly separated from median septum were ascertained near to umbo. Analogous development could be stated also in some specimens of *Mentzelia halobiarum versata* ssp.n. (see Fig. 10 C-D). Similar observations were described and figured in some mentzeliids (*Mentzelia mentzelii*, *Mentzelia sinuata*, *Koiveskallina koiveskalliensis*) by DAGYS (1974, p. 28, Fig. 7). At the same time, he associated "*halobiarum*", with some hesitation, to his new genus *Mentzelioides* (DAGYS, 1974, p. 131). The separation of adminicula from septum could formerly be - when observed on the outer shell surface - the cause of illusory "tripartite" character of "*halobiarum*" reported in his original description by BITTNER (1890).

Except for massive teeth and subparallel hinge plates, the infilling of crystalline calcite made it impossible to trace other internal structures in sectioned specimens.

Remarks: The great external variability of the species was previously emphasized by BITTNER in his original description (1890). Width of area belongs, according to him, to the most variable characters of "*halobiarum*". Most of specimens from the Slovak Karst differ from the Austrian ones in having a shorter hinge line, and thus, in more rounded outline of the shell. There are, however, Austrian specimens that also develop a short hinge line (e.g. BITTNER, 1890, Pl.14, Fig.12, or the specimen from Balbersteine/Miesenbach figured herein on Pl. 3, Fig. 5). Only a few of my specimens show faint, poorly ascertainable ribbing close to the outer parts of valves; the majority of individuals remain completely smooth. Most specimens in the upper part of Balogh's locality near Silická Brezová, is represented by larger single valves without any ribbing and without stronger sulcation or folding. They are classified without any hesitation with the species under consi-

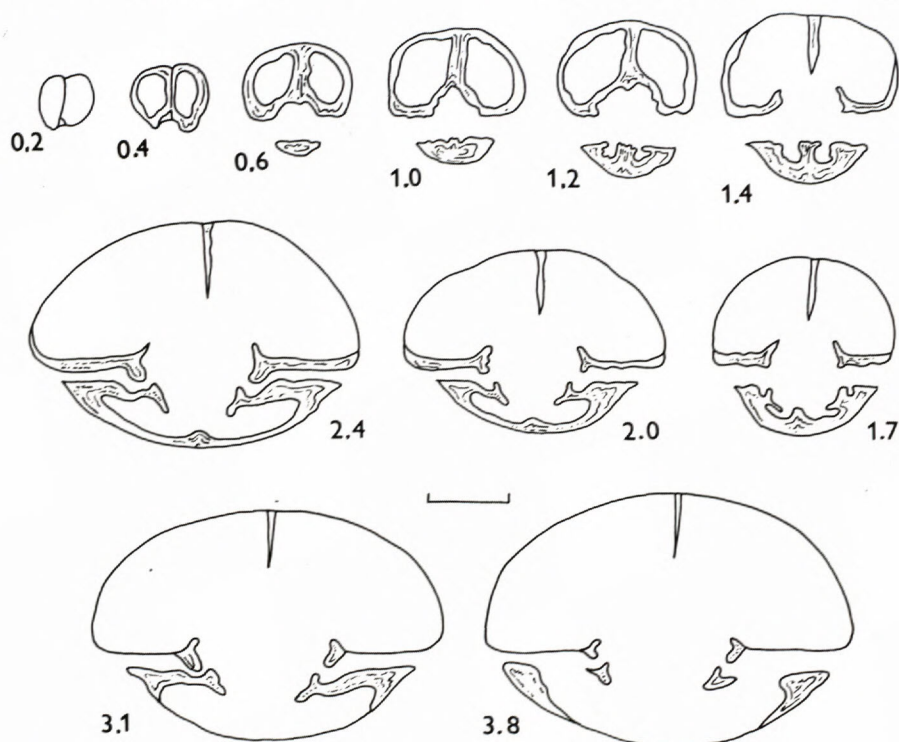


Fig. 7 *Mentzelia halobiarum* (BITTNER). Ostré vršky Hill, loc. B₂A. Serial sections through the posterior part of shell. Original length 13.8 mm. Sections taken perpendicular to maximum length. Enlarged, scale bar equals 3 mm.

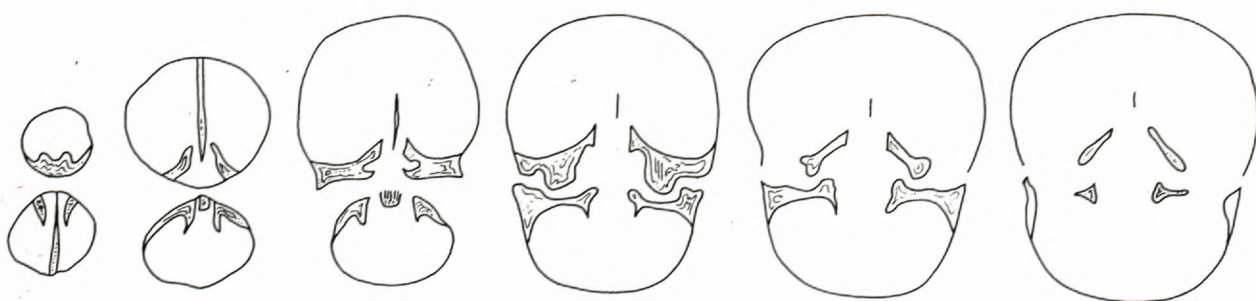


Fig. 8 *Mentzelia halobiarum* (BITTNER). Ostré vršky Hill, loc. B₂A. Transverse sections through another specimen showing massive teeth and extremely short ventral septum. Original length 16.0 mm. Enlarged.

deration. *Mentzelia halobiarum* shows considerable affinity to "*Spiriferina*" *ptychitiphyla* BITTNER from the Anisian Schreyeralms Limestone except that this latter species has a better defined and laterally limited fold and deep sulcus. Already PEARSON (1977, p. 19) proved that "*ptychiphyla*" is a true mentzeliid, and it was confirmed also by my study of a specimen from Schiechlinghöhe near Hallstatt which revealed a well-developed spondylium and bilobate cardinal process.

The affirmation of the Norian occurrence of the species could be based on the material coming from the Hallstatt Limestone and deposited in two Vienna institutions: two specimens in the possession of the Palaeontological Institute of the University (coll. Gruber) originate from Balbersteine/Miesenbach (Lower Austria) - Lacián 1. The first a globose specimen with subangular anterior plication is figured herein on Pl. 3, Fig. 5, and the other is a smooth one (width 34.0 mm) closely resembling Bittner's specimen (1890, Pl. 14, Fig. 9) in outline and in well-developed sulcation of the pedicle valve. Also of Norian age, are 2 smooth specimens with shallow sulcation from Steinbergkogel near Hallstatt, deposited in the collections of the Naturhistorisches Museum (no. 1926. II. 213, coll. Heinrich).

Occurrence: Carnian - Norian of the Northern Calcareous Alps. The species was reported also from the Tisovec Lms. at the Spalenisko locality near Dobšinská ľadová jaskyňa in the Stratenská hornatina Mts. (Pevný in Bystrický et al., 1982). My material comes from the following localities: Silická Brezová - lower part of the Balogh's loca-

lity: 19 specimens (1 complete specimen, 1 brachial valve and 17 pedicle valves), upper part of the Balogh's locality: 37 specimens (15, 5, 17), locality S-7: 1 specimen (0, 0, 1), loc. M-43: 2 specimens (0, 0, 2), M-46: 8 specimens (0, 0, 8), M-47: 2 specimens (0, 0, 2), loc. Šimák near the elevation point 419.3: 2 specimens (0, 0, 2), loc. A 1-77: 8 specimens (3, 1, 4), new trench - red nos. 12-13: 5 specimens (0, 0, 5), nos. 16-18: 22 specimens (0, 2, 20), nos. 24-25: 1 specimen (0, 0, 1), Ostré vršky Hill-loc. B₂A: 202 specimens (173, 10, 19) and loc. O₂: 1 pedicle valve.

***Mentzelia halobiarum versata* ssp. n.**

(Pl. 1, Fig. 7, Pl. 3, Figs. 1, 3-6, Text-Figs. 1-6, 9-10 B,C)

Holotype: Specimen figured on Pl. 3, Fig. 4 and deposited in the collections of the Slovak National Museum in Bratislava under registered number SNM Z 21986.

Stratum typicum et locus typicus: Greyish and flesh-colored micrites, Tuvalian (*Subbulatus*-? *Anatropites* Zones) Silická Brezová, upper part of Balogh's locality.

Derivatio nominis: Lat. *versare*, -atum = to reverse.

Material: 72 complete specimens up to 21.0 mm long, 18.0 mm wide and 16.5 mm thick, 17 brachial and 9 pedicle valves. The dimensions of the figured specimens: 9.3 x 10.0 x 6.0 mm (Pl. 1, Fig. 7), 10.6 x 10.2 x 7.8 mm (Pl. 3, Fig. 1), 16.5 x 16.0 x 13.5 mm (Pl. 3, Fig. 3), 16.4 x 16.2 x 10.9 mm (Pl. 3, Fig. 4 -holotype), 11.2 x 10.4 x 7.9 mm (Pl. 3, Fig. 5), 11.9 x 9.2 x 8.8 mm (Pl. 3, Fig. 6).

Internal characters: The sections could be misrepresen-

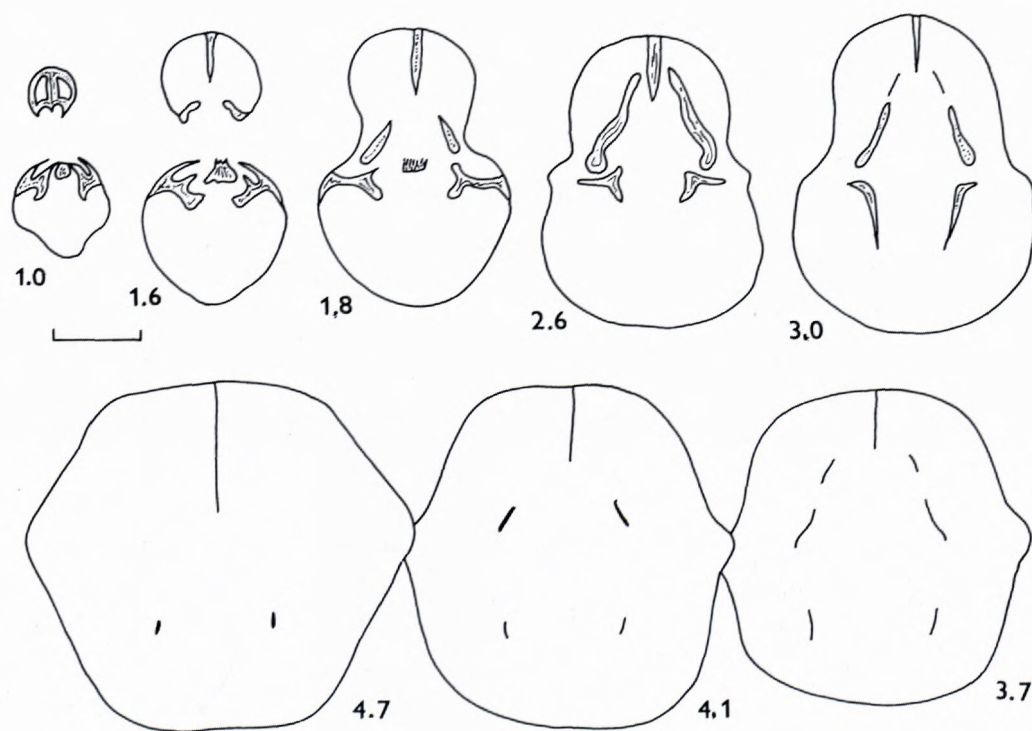


Fig. 9 *Mentzelia halobiarum versata* ssp. n. Silická Brezová, upper part of Balogh's locality. Length of specimen = length of brachial valve 16.1 mm. Enlarged, scale bar equals 3 mm.



ted due to unusual, reverse position of valves. Sections are not substantially distinct from those of previously described *Mentzelia halobiarum halobiarum*. The spondylium-like structure is well developed, with median septum usually continuing into spondylial cavity (Figs. 10 C, D). The septum is longer in average than in *Mentzelia halobiarum halobiarum*, extending to more than 1/3 the length of pedicle valve. Poor preservation precluded further serial sectioning of studied specimens.

Definition and remarks: New subspecies was distinguished from *Mentzelia halobiarum halobiarum* by relatively narrower shells, very short hinge line, usually narrower and higher uniplication, much thicker brachial valve in comparison with pedicle valve, and specially by large, swollen dorsal beak incurved over hinge line. The reverse condition is best seen on shell profile: the beak of brachial valve overpasses that of pedicle one (extreme condition is perspicuous on specimen figured on Plate 4, Fig. 6). There may be up to 6 poorly developed ribs present on the lateral slopes of valves bordering the sulcus and fold of adult individuals of the new subspecies.

Occurrence: Silická Brezová - upper part of Balogh's locality: 88 specimens (64 complete specimens, 15 brachial and 9 pedicle valves), lower part of Balogh's locality: 7 specimens (7, 0, 0), loc. Šimák near the elevation point 419.3: 2 specimens (1, 1, 0), and locality A 1-77: 1 brachial valve.

Superfamily *Spiriferinoidea* DAVIDSON, 1884

Family *Spiriferinidae* DAVIDSON, 1884

Subfamily *Spiriferininae* DAVIDSON, 1884

Mentzelioides DAGYS, 1974

***Mentzelioides* (?) sp. n.**

(Pl.1, Fig. 3)

Material: One slightly deformed specimen with dimensions 19.5 x ?18.5 x 13.0 mm.

Remarks: A specimen externally similar to the Liassic spiriferinids ex gr. *alpina* OPPEL, 1861: medium sized, smooth impunctate (?) shell with length exceeding width, brachial valve less convex than the pedicle one, strong

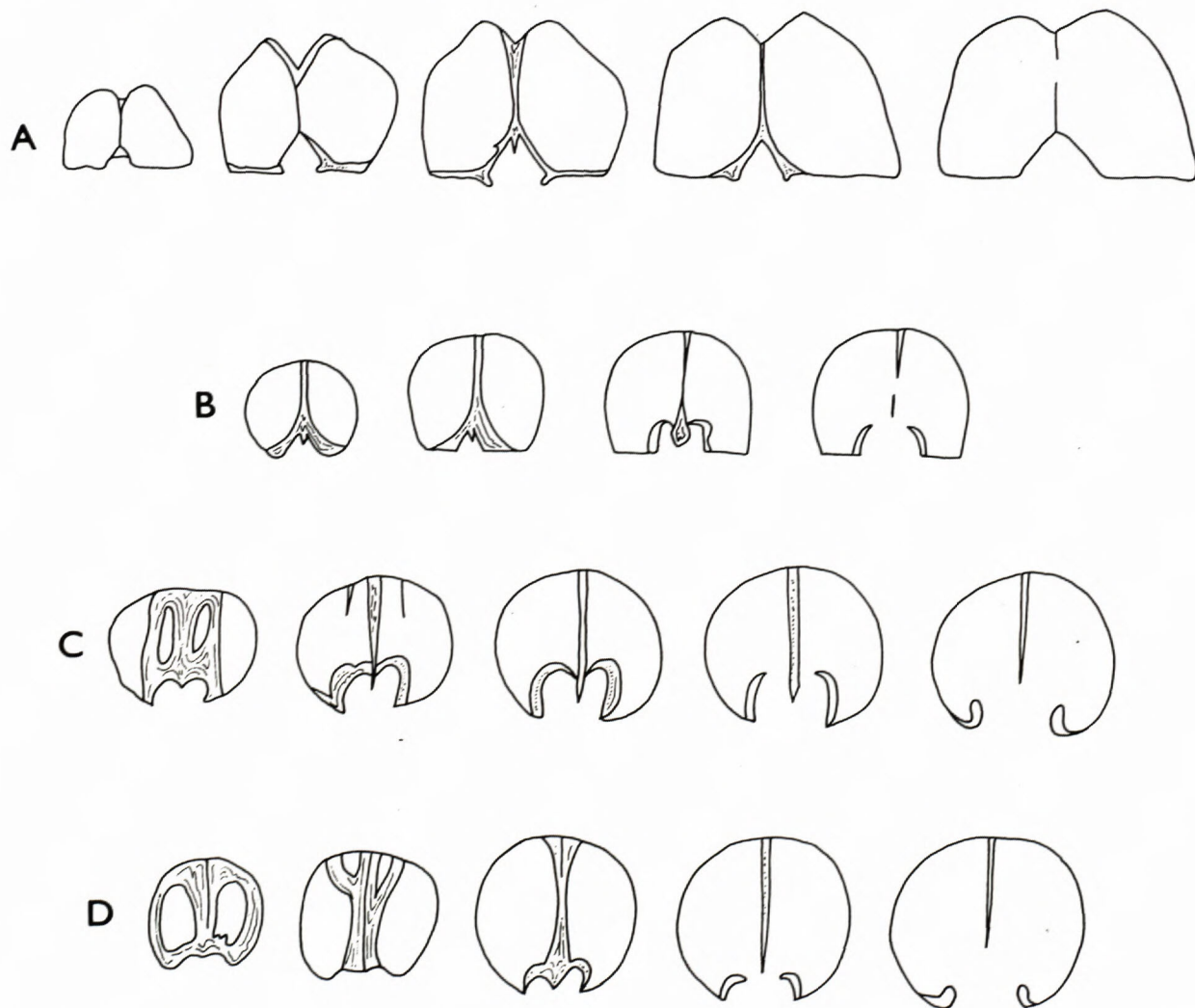


Fig. 10 Transverse sections through the posterior part of pedicle valve. A - *Laballa dagysi* sp.n. Silická Brezová, lower part of Balogh's locality. B - *Mentzelia halobiarum* (BITTN.). Silická Brezová, upper part of Balogh's locality. C and D - *Mentzelia halobiarum versata* ssp. n. Silická Brezová, upper part of Balogh's locality. All enlarged.

relatively wide umbo present on the pedicle valve, straight hinge line sharply delimited on both sides, only slight uniplication anteriorly. Short dental lamellae ascertainable externally on the pedicle umbo.

As I do not find any parallel among Upper Triassic species, further comparisons are presently made difficult owing to the insufficient material.

Occurrence: Silická Brezová - lower part of Balogh's locality.

Suborder *Cyrtinidina* CARTER & JOHNSON, 1994

superfamily *Suessioidea* WAAGEN, 1883

Family *Laballidae* DAGYS, 1962

Subfamily *Laballinae* DAGYS, 1962

Laballa MOISSEIEV in DAGYS, 1962

Laballa dagysi sp. n.

(Pl. 4, Figs. 1-4, 6, Text-Figs. 10 A, 11-20)

1940 *Cyrtina Suessii* WINKL. - BALOGH, p. 172, 195, Pl. 1, Fig. 1.

?1940 *Cyrtina* ? *ambigua* n. sp. - BALOGH, p. 173, 196, Pl. 1, Fig. 2.

Holotype: Specimen figured on Pl. 4, Fig. 3 and deposited in the collections of the Slovak National Museum in Bratislava under registered number SNM Z 21991.

Stratum typicum et locus typicus: Light-coloured coquina limestone, Tuvalian (*Subbulatus* Zone), Silická Brezová - lower part of Balogh's locality.

Derivatio nominis: After Prof. A. DAGYS (Vilnius), eminent specialist on Mesozoic brachiopods.

Material: 102 complete specimens, 58 brachial and 227 pedicle valves. Specimens have been seen up to 24.0 mm long, 30.0 mm wide and 16.0 mm thick. Figured specimens measure: ?17.3 x 18.7 x 10.9 mm (Pl. 4, Fig. 1), 10.6 x 14.5 x 8.6 mm (Pl. 4, Fig. 2), ca.18.0 x 22.2 x 13.0 (Pl. 4, Fig. 3 - holotype), 18.6 x 20.2 x 11.5 mm (Pl. 4, Fig. 4), and ? x 30.0 x ca.15.0 mm (Pl. 4, Fig. 6).

Description: Medium sized smooth spiriferid with the shell outline slightly wider than long; transversally elongated to semicircular brachial valve shallow, pedicle one subpyramidal with a pointed beak, only minimally recurved at the apex (Pl. 4, Fig. 4). Hinge line slightly shorter than maximum width. Interarea catacline, large, triangular and flat, wider than high, sharply delimited by angular ridges; in young specimens may be either procline. Sulcus and fold large, strongly developed and well delimited. Linguiform plication of the anterior commissure high and rounded.

Internal characters: Only a few specimens in my large collection appeared to be suitably preserved for sectioning. Variable length of the pedicle septum is characteristic of them. The transverse sections show the essential features of *Laballa* as they were described or figured in the type species *Laballa suessi* by DAGYS (1963, p. 88, Figs. 39-40 or 1965, Fig. 42), PEARSON (1977, p. 21, Fig. 2), and in this paper (Text-Fig. 21). Sections of my specimens are

very similar to those obtained from the mentioned Alpine specimens of "*suessi*". A satisfactory reconstruction of jugum and spiralia is still missing, however.

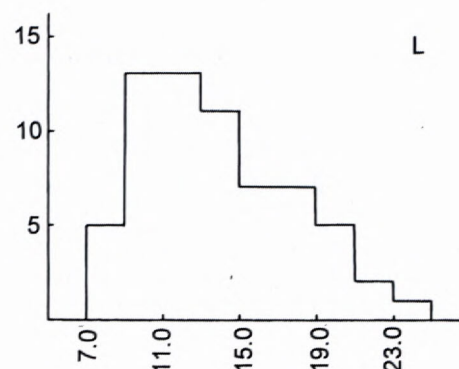


Fig. 11 Length frequency histogram for 64 complete specimens of *Laballa dagysi* sp.n., in mm. Vertically number of specimens. Silická Brezová, lower part of Balogh's locality.

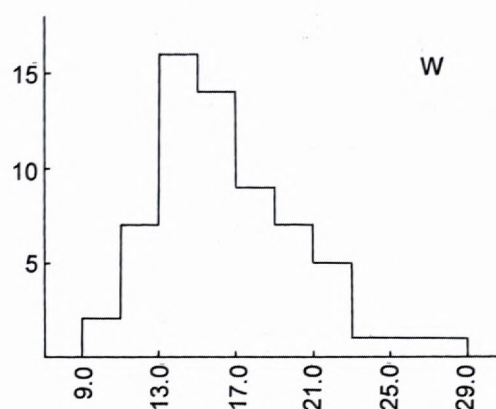


Fig. 12 Width frequency histogram (for explanation see Fig. 11).

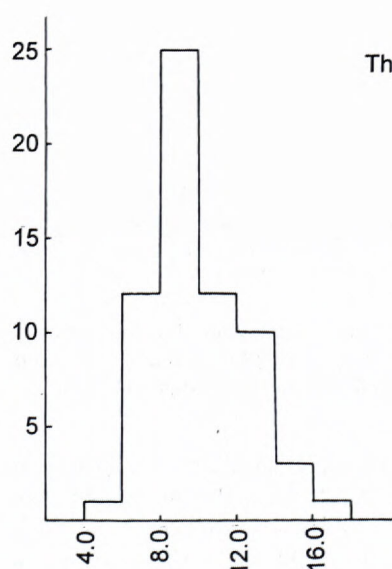


Fig. 13 Thickness frequency histogram (for explanation see Fig. 11).

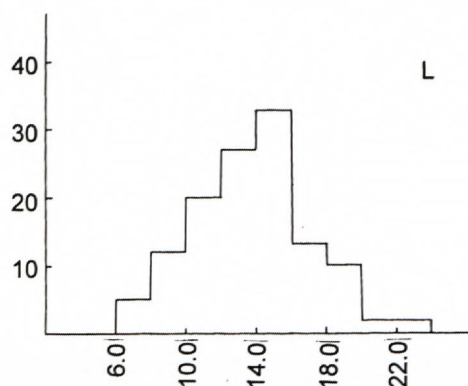


Fig. 14 Length frequency histogram for 134 isolated pedicle valves of *Laballa dagysi* sp.n., in mm. Vertically number of specimens. Silická Brezová, lower part of Balogh's locality.

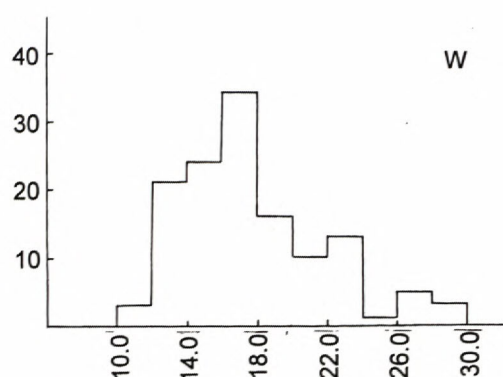


Fig. 15 Width frequency histogram (for explanation see Fig. 14).

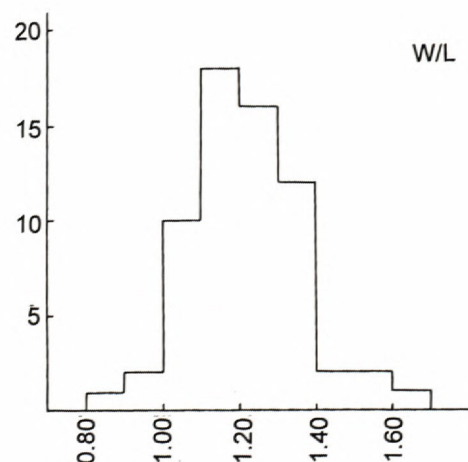


Fig. 16 Width/length frequency histogram for 64 complete specimens of *Laballa dagysi* sp.n., in mm. Vertically number of specimens. Silická Brezová, lower part of Balogh's locality.

Remarks: The new species shows considerable similarity to Rhaetian *Laballa suessi* (ZUGM.), and despite the great age difference between the Carnian and Rhaetian, the specimens from the Carnian of the Slovak Karst have been a long time identified as "*suessi*" (for example by BALOGH, 1940, BYSTRICKÝ, 1964, SIBLÍK, 1986, 1997). Also PEARSON's (1977, p. 22) presumption was that the separa-

tion of material from Silická Brezová from ZUGMAYER's "*suessi*" is not practicable. Great external variability of both species may lead to single specimens which are impossible to be easily distinguished. In the case that larger material is available, the average characteristics make the differentiation of the two species possible. *Laballa dagysi* sp. n. may be distinguished from *Laballa suessi* (ZUGM.) by a relatively longer hinge line, narrower delthyrium, higher, rounded linguiform extension rising sharply from the anterior commissure, and a slight apical recurving of the pedicle valve. Ledges bordering the delthyrium in "*suessi*" are only poorly developed in "*dagysi*". Certain irregularities in the shell symmetry are characteristic of the new species, and are caused most probably by the nature of the former substrate. A great age difference between the two species is also an important factor.

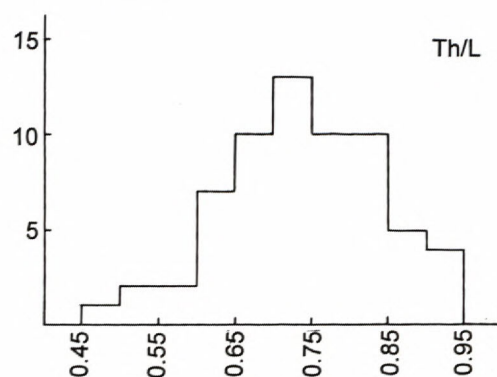


Fig. 17 Thickness/length frequency histogram (for explanation see Fig. 16).

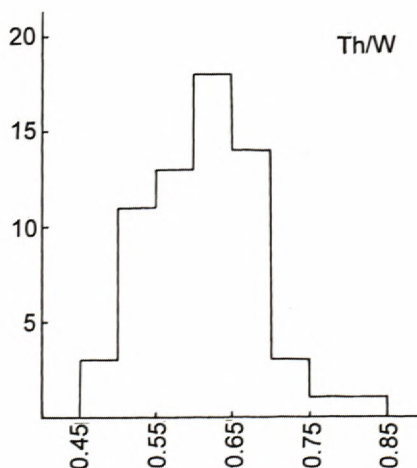


Fig. 18 Thickness/width frequency histogram (for explanation see Fig. 16).

A new species *Cyrtina* ? *ambigua* based on 2 specimens (1 type specimen and 1 fragment), was described from Silická Brezová by Balogh in 1940. Judging from Balogh's illustration, there was every reason to believe in the apsacline character of area in the type specimen and it was at the same time the main difference from "*suessi*" (with its catacline area). However, my personal study of

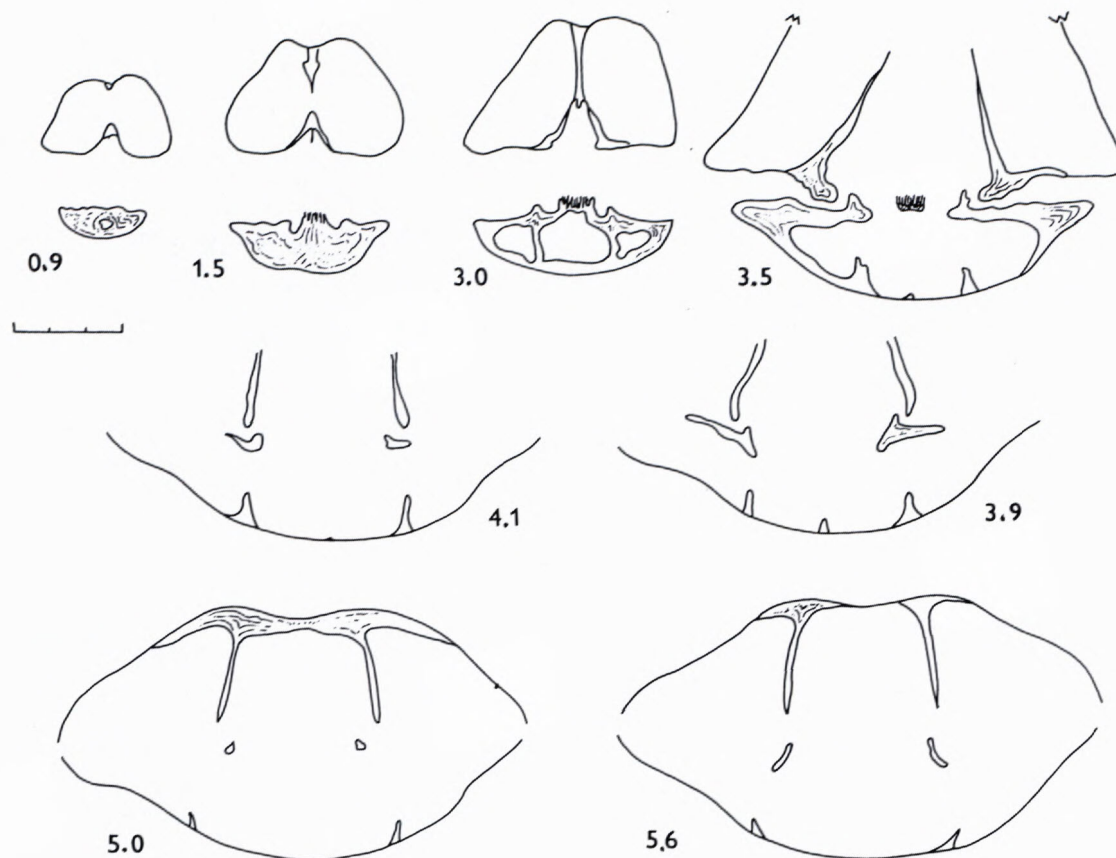


Fig. 19 *Laballa dagysi* sp.n. Original length 19.0 mm. Silická Brezová, lower part of Balogh's locality. Enlarged, scale bar equals 3 mm.

Balogh's collection deposited in the Geological Survey in Budapest formerly showed that reported orientation of pedicle valve is illusory. Balogh's type specimen of "*ambigua*" is strongly damaged in the terminal part of its pedicle valve whereas the lower part of area clearly reveals a catacline orientation, usual in "*suessi*". In my and Bystrický's large, very variable material from the Slovak

Karst, there have not been found additional specimens similar to Balogh's "*ambigua*". For reasons of stability, this name is not used for material from Silická Brezová. It is even not certain if Balogh's specimen of "*ambigua*" is a deformed, fragmentary variant of *Laballa* because its internal structures are not known. In addition, Balogh was not quite sure about generic identity, having described the

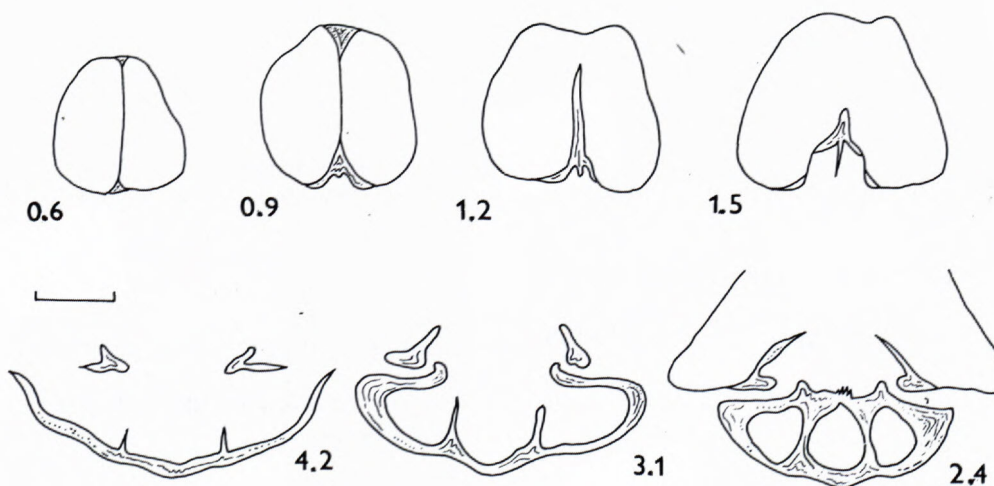


Fig. 20 *Laballa dagysi* sp.n. Original length of specimen 16.6 mm. Silická Brezová, lower part of Balogh's locality. Enlarged, scale bar equals 3 mm.

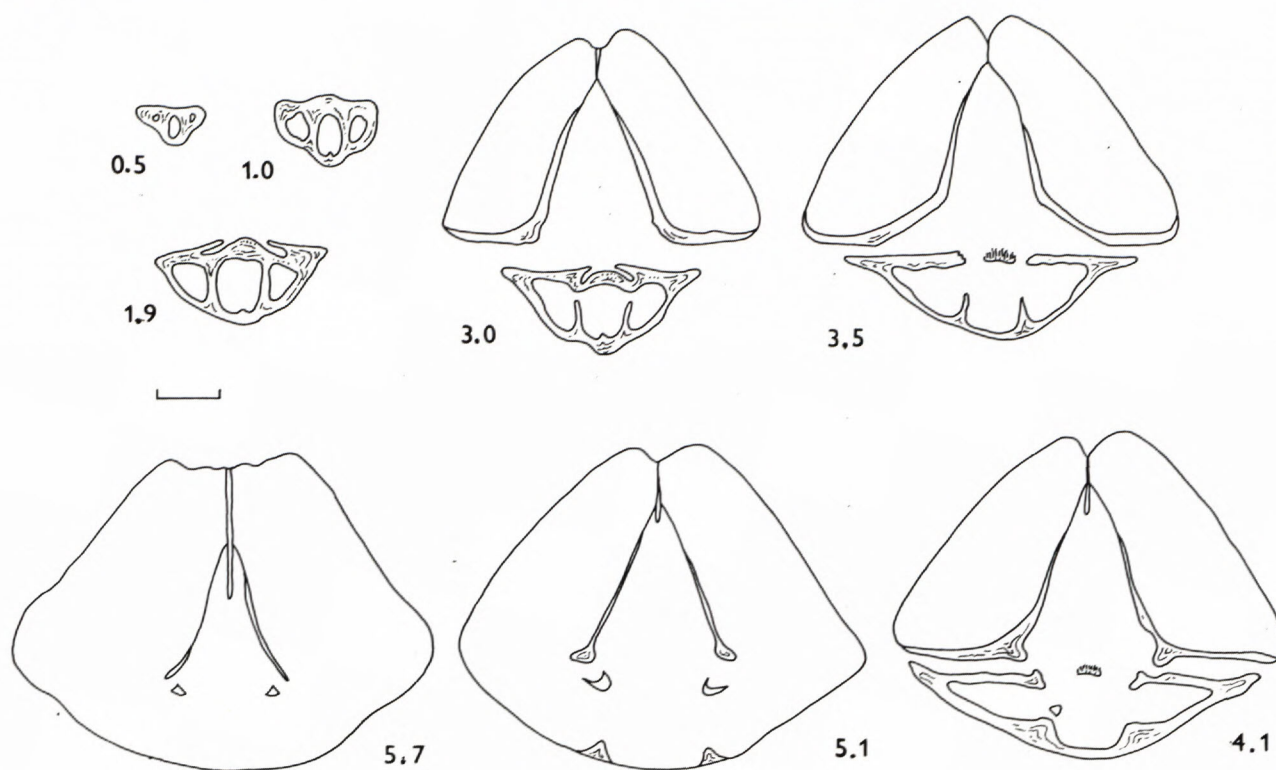


Fig. 21 *Laballa suessi* (ZUGM.). Original length of specimen ca. 30.0 mm. Kössen Beds, Kitzberg by Neusiedl, Lower Austria (coll. Palaeont.Inst.Univ.Vienna). Enlarged, scale bar equals 5 mm.

species as *Cyrtina*? Moreover, during my visit to Budapest in 1996, the original specimen could not be traced. *Cyrtina* ? *ambigua* is placed here then with doubts into synonymy with *Laballa dagysi* sp.n.

Occurrence: Silická Brezová - lower part of Balogh's locality: 299 specimens (86 complete specimens, 38 brachial and 175 pedicle valves), upper part of Balogh's locality: 4 specimens (1, 0, 3), Šimák near the elevation point 492.2: 13 specimens (1, 2, 10), loc. A 1-77: 1 specimen (1, 0, 0), loc. M-46: 3 specimens (2, 1, 0), loc. M-47: 2 specimens (2, 0, 0), loc. M-48, 49: 2 specimens (0, 2, 0), 60 m ESE of M-49: 9 specimens (0, 4, 5), new trench - red nos. 16-18: 10 specimens (5, 2, 3), Ostré vršky Hill -loc. B₂A: 35 specimens (3, 6, 26), locality "Gemerské lúky" N of Ostré vršky Hill: 3 specimens (0, 1, 2).

Subfamily *Thecocyrtellinae* DAGYS, 1965
Thecocyrtella BITTNER, 1892

***Thecocyrtella ampezzana* (BITTNER, 1892)**
(Pl. 1, Fig. 10)

- 1890 *Cyrtotheca Ampezzana* nov.gen.nov.spec. - BITTNER, p. 116, Pl. 38, Fig. 19.
- 1900 *Thecocyrtella Ampezzoana* BITT. - BITTNER, p. 26, Pl. 3, Fig. 24.
- 1918 *Thecocyrtella ampezzoana* BITT. - GALLENSTEIN, p. 53.
- 1920 *Thecocyrtella Ampezzana* BITTNER - DIENER, p. 59.
- 1930 *Thecocyrtella Ampezzoana* BITTNER - GUGENBERGER, p. 72.
- 1974 *Thecocyrtella ampezzana* (BITTNER) - DAGYS, p. 149.
- 1988 *Thecocyrtella ampezzana* (BITTNER) - SIBLÍK, p. 74.

Holotype by monotypy: the specimen lost (see BITTNER, 1890).

Locus typicus: Falzarego road, W of Cortina d'Ampezzo.

Stratum typicum: ? Carnian.

Material: One specimen with dimensions 5.3 x 3.7 x 4.0 mm.

Remarks: A diminutive specimen corresponds well to the Bittner's original figure and detailed description of the type specimen, and shows the only difference - a pointed beak of brachial valve only slightly recurved apically. It is the first find of this "southern" element in the West Carpathians.

Occurrence: Silická Brezová - lower part of Balogh's locality.

Order *Athyridida* BOUCOT, JOHSON & STATON, 1964
Suborder *Athyrididina* BOUCOT, JOHSON & STATON 1964
Superfamily *Athyridoidea* DAVIDSON, 1881
Family *Spirigerellidae* GRUNT, 1965
Subfamily *Spirigerellinae* GRUNT, 1965

Dioristella BITTNER, 1890

***Dioristella indistincta* (BEYRICH, 1863)**
(Pl. 1, Figs. 8-9)

- 1863 *Terebratula indistincta* BEYRICH, p. 34.
- 1866 *Terebratula indistincta* BEYRICH - LAUBE, p. 6, Pl. 11, Figs. 4-6 only.
- 1890 *Spirigera indistincta* BEYR. spec. - BITTNER, p. 59, 86, 147, 164, Pl. 29, Figs. 28-31.

- 1900 *Spirigera (Dioristella) indistincta* BEYR. spec. - BITNER, P. 32, pl. 3, Figs. 1-6.
 1904 *Spirigera indistincta* BEYR. sp. - WAAGEN, p. 450.
 1904 *Spirigera indistincta* BEYR. - BROILI, p. 159, Pl. 18, Fig. 1.
 1910 *Spirigera (Dioristella) indistincta* BEYR. sp. - SCALIA, p. 19, Pl. 2, Figs. 2-7.
 1927 *Spirigera indistincta* BEYRICH - OGILVIE-GORDON, Pl. 12, Fig. 31.
 1974 *Dioristella indistincta* (BEYRICH, 1862) - DAGYS, p.155, Text-Fig.104, Pl. 43, Fig. 3.
 1975 *Dioristella indistincta* (BEYRICH, 1862) - BUJNOVSKÝ KOCHANOVÁ & PEVNÝ, p. 39, Pl.3, Figs. 2-3, Pl. 4, Fig. 1.
 1988 *Dioristella indistincta* (BEYRICH) - SIBLÍK, p. 77 (cum syn.).

Lectotype: not selected.

Locus typicus: Füssen, Bavaria.

Stratum typicum: Carnian (according to DIENER, 1920, p. 65).

Material: 95 specimens up to 7.8 mm in length, 6.0 mm in width and 5.5 mm in thickness. The figured specimens measure: 7.7 x 6.0 x 4.8 mm (Pl.1, Fig. 8) and 7.5 x 5.7 x 5.0 mm (Pl.1, Fig. 9).

Remarks: Our specimens are characterized by ovate to pear-shaped outline and variable thickness, most of them are slightly uniplicate. Three specimens develop high, incurved lateral and anterior flanges (similar to those of specimen figured by Bittner, 1890 on Pl. 29, Fig. 31). The interiors show nearly complete recrystallization, but simple spiralia are ascertainable.

Occurrence: Carnian. One specimen comes from the Ostré vřšky Hill (loc. B₂A), the others were collected formerly by Bystrický near the Ostré vřšky Hill ("Gemerské lúky, above *Teutloporella* limestone"). Other localities: Liptovská Osada and Ludrová near Ružomberok, Predhorie in the Strážovská hornatina Mts. (Pevný in Bujnovský, Kochanová & Pevný, 1975), Dudlavá skala in the Horehronské podolie valley (Biely & Papšová, 1983). Some similarities to the species under consideration were found in the material coming from Jablonov in the Slovak Karst (Wetterstein Limestone) and were described as *Dioristella* aff. *indistincta* by Siblík (1981)

Suborder *Retziidina* BOUCOT, JOHNSON & STATON, 1964
 Superfamily *Retzioidea* WAAGEN, 1883
 Family *Neoretziidae* DAGYS, 1972
 Subfamily *Hustediinae* GRUNT, 1985
Schwagerispira DAGYS, 1972

Schwagerispira bystrickyi SIBLÍK, 1990

- 1990 *Schwagerispira bystrickyi* sp.n. - SIBLÍK, p.104, Pl. 42, Figs. 1-3, Pl. 43, Fig. 1, Text-Figs. 1-2.

Holotype: Figured by Siblík, 1990 on Pl. 42, Fig. 2. It is deposited in the collections of the Slovak National Museum (no. SNM Z 20023).

Locus typicus: Silická Brezová, upper part of Balogh's locality.

Stratum typicum: Tuvanian, *Subbulatus* and *Anatropites* (?) Zones.

Material: 42 specimens. The holotype measures 10.4 x 8.6 x 8.0 mm.

Remarks: Nothing is to be added to the description given in 1990. The species has been found at additional localities, it belongs to the relatively rare finds, however.

Occurrence: Silická Brezová - lower and upper parts of Balogh's locality, locality K-2, loc. M-46 and 47, loc. 60 m ESE of M-491, and bed 16 (red numbers) of the new trench.

Complete list of Carnian brachiopods found in the Slovak Karst

Former Balogh's locality I. (1940) SW of the village of Silická Brezová is the best locality for the Carnian brachiopod fauna of the Slovak Karst. There has been possible to distinguish 2 levels with different brachiopod assemblages (Siblík, 1986). The lower part is represented by the light-coloured coquina "Tisovec" Limestone that corresponds to the Tuvanian *Subbulatus* Zone; the upper part is flesh-coloured or greyish micrite limestone that probably corresponds to the Uppermost Tuvanian *Anatropites* Zone (see Kochanová & Kollárová-Andrusovová, 1983, p. 554-555). There may be both stratigraphical and environmental significance in this variation of brachiopod content. According to the brachiopod assemblages, most of the other Carnian localities on the Silica and Plešivec Plateaus are considered here to be more or less contemporaneous with the lower part of Balogh's locality. Only a few localities near Silická Brezová are compared to the upper part of BALOGH's locality, as they contain corresponding "upper" brachiopod assemblages (locality A 1-77, M-42 and beds of red nos.24-25 in the new trench).

Taxa found in the lower assemblage:

Austriellula gomorensis (BAL.)
Rimihynchopsis aff. *rimulata* (BITTN.)
Volirhynchia dux SIBL.
Caucasorhynchia elegans elegans SIBL.
Gemerithyris hungarica hungarica (BAL.)
Aulacothyris compressa BITTN.
Aulacothyris sinuosa BAL.
Rhaetina concinna SIBL.
Koninckina cf. *alata* BITTN.
Koninckina cf. *strophomenoides* BITTN.
Mentzelioides (?) sp. n.
Thecocyrtella ampezzana (BITTN.)

Ostré vřšky only:

Austriellula angulifrons (BITTN.)
Austriellula halophila (BITTN.)
Caucasorhynchia elegans consobrina SIBL..
Aulacothyris sandlingensis BITTN.
Cruratula (?) sp.
Propygope (?) sp.
Dioristella indistincta (BEYR.)

Taxa found in the upper assemblage:

Norella obesa SIBL.
Apertirhynchella triplex SIBL.
Amoenirhynchia seydeli (BITTN.)
Costirhynchopsis variata glabra SIBL.

Gemerithyris copiosa inflata SIBL.
Gemerithyris hungarica globosa SIBL.
Austriellula undosa SIBL. (also Ostré vršky Hill)
Pseudorugitella pulchella (BITTN.) (also Ostré vršky Hill)

Taxa found both in the lower and upper assemblages:

Costirhynchopsis variata variata SIBL.
Gemerithyris copiosa copiosa SIBL.
Sulcatothyris rotunda SIBL.
Carinokoninckina telleri (BITTN.)
Carinokoninckina aff. expansa (BITTN.)
Mentzelia halobiarum halobiarum (BITTN.)
Mentzelia halobiarum versata ssp. n.
Laballa dagysi sp. n.
Schwagerispira bystrickyi SIBL.

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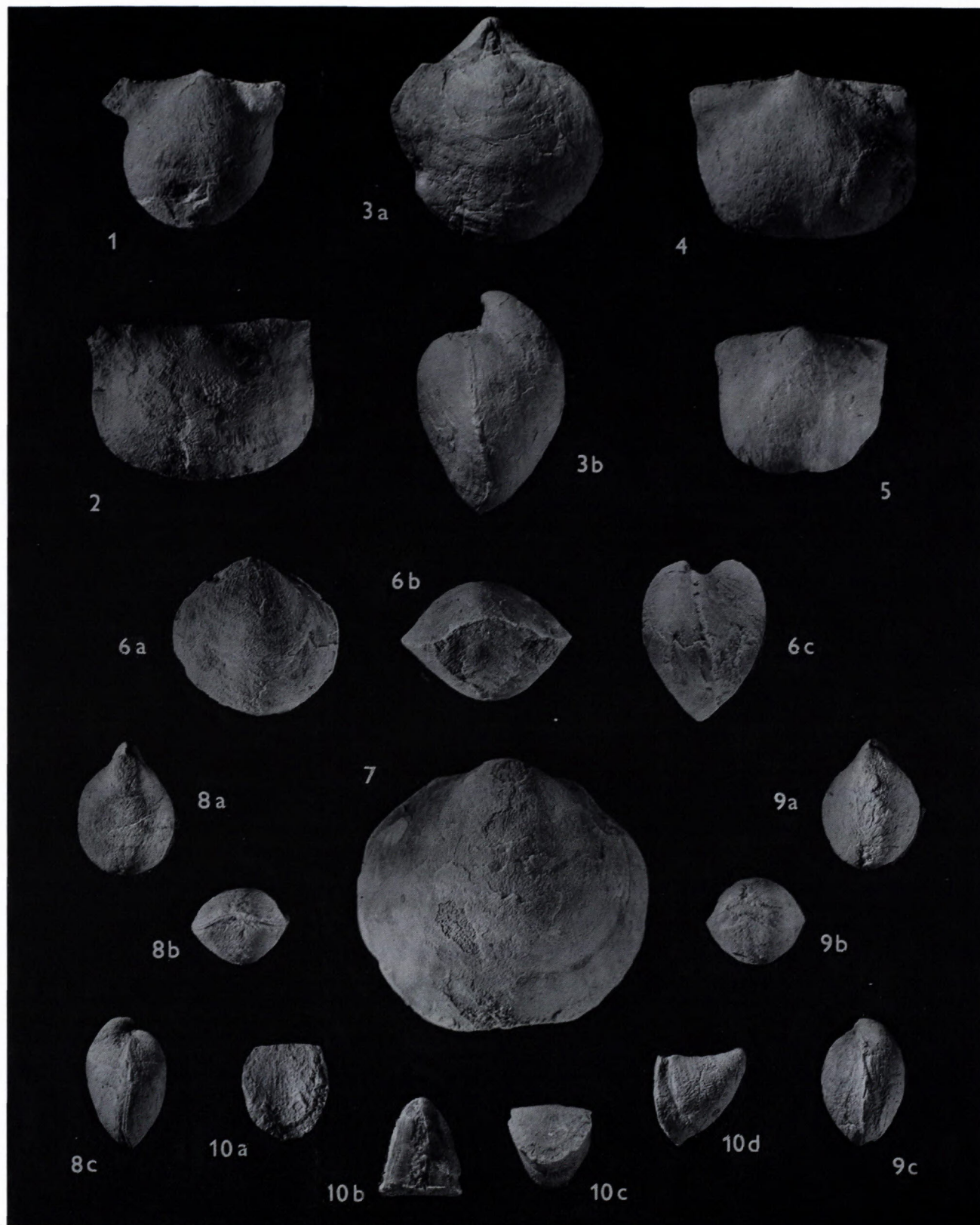


Plate 1

Fig. 1 *Koninckina* cf. *alata* BITTNER; Silická Brezová, lower part of Balogh 's locality, SNM Z 21971 (x 3); **Fig. 2** *Carinokoninckina* aff. *expansa* (BITTNER); Silická Brezová, lower part of Balogh 's locality, SNM Z 21972 (x 3); **Fig. 3** *Mentzelioides* sp. n.; Silická Brezová, lower part of Balogh 's locality, SNM Z 21973 (x 2); **Fig. 4** *Carinokoninckina telleri* (BITTNER); Silická Brezová, loc. Šimák near the elevation point 419.3. Coll. by Bystrický SNM Z 21974 (x 3); **Fig. 5** *Karinokoninckina telleri* (BITTNER); Silická Brezová, lower part of Balogh 's locality, SNM Z 21975 (x 3); **Fig. 6** *Mentzelia halobiarum* (BITTNER) - young specimen Ostré víšky Hill, loc. B₂A SNM Z 21976 (x 3); **Fig. 7** *Mentzelia halobiarum versata* ssp.n. -juvenile specimen; Silická Brezová, upper part of Balogh 's locality, SNM Z 21977 (x 5); **Figs. 8-9** *Dioristella indistincta* (BEYRICH) N of Ostré víšky Hill. Collected by Bystrický, SNM Z 21978-9 (x 3); **Fig. 10** *Thecocyrtella ampezzana* (BITTNER); Silická Brezová, lower part of Balogh 's locality, SNM Z 21980 (x 4)

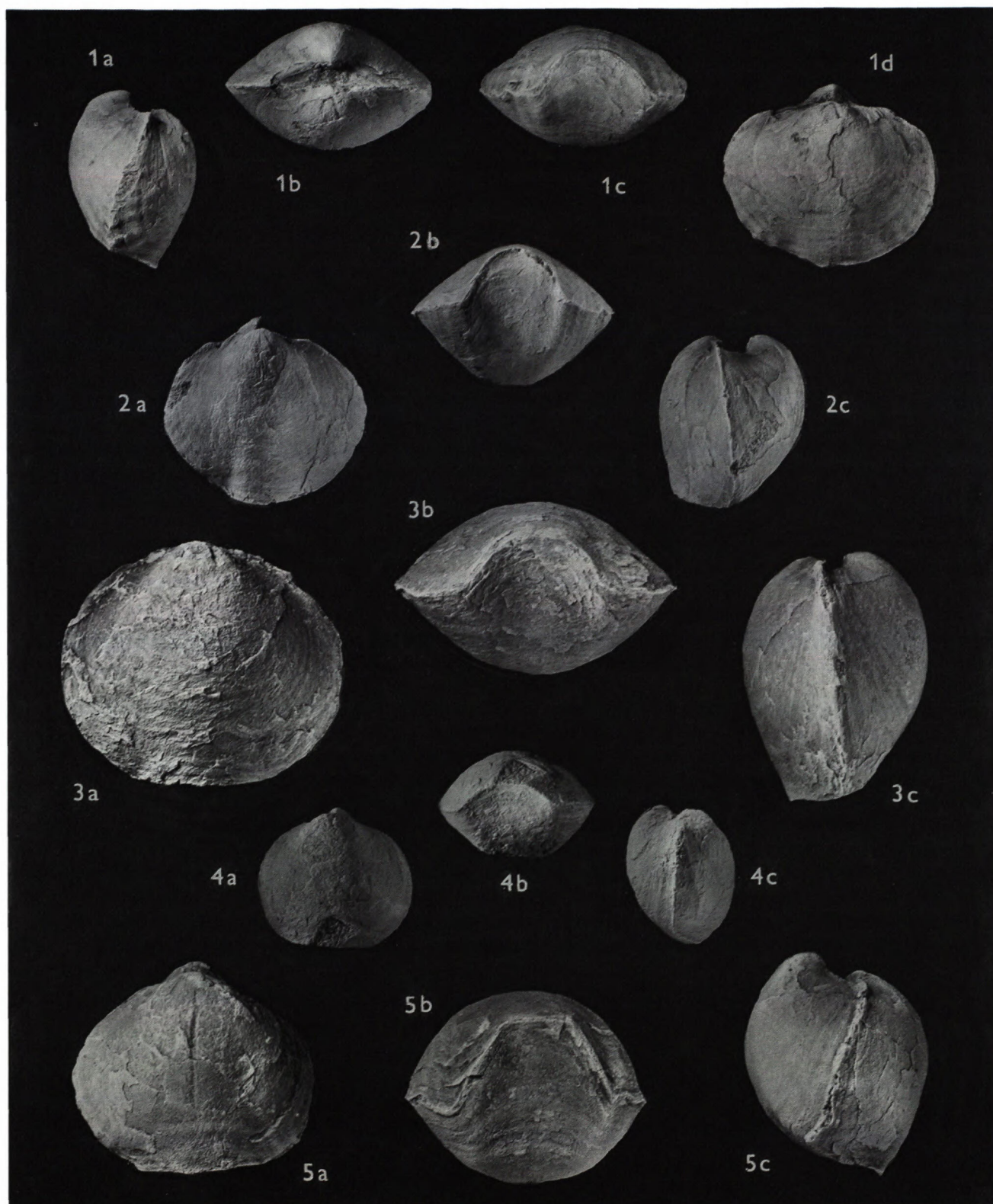


Plate 2

Fig. 1 *Mentzelia halobiarum* (BITTNER); Lectotype. Locality Bergstein near Landl a.d. Enns, Styria. Carnian. Collections of the Geologische Bundesanstalt in Vienna, inv. no. 1890/2/329 (x 2); **Fig. 2** *Mentzelia halobiarum* (BITTNER); Locality as Fig. 1. Collections of the Geologische Bundesanstalt in Vienna. Specimen figured by Bittner, 1890 on Pl. 14, Fig. 13 (x 2); **Fig. 3** *Mentzelia halobiarum* (BITTNER); Both terminations of the hinge line broken. Ostré vršky Hill, loc. B₂A, SNM Z 21981 (x 3); **Fig. 4** *Mentzelia halobiarum* (BITTNER); Ostré vršky Hill, loc. B₂A SNM Z 21982 (x 2); **Fig. 5** *Mentzelia halobiarum* (BITTNER); Balbersteine/Miesenbach, Lower Austria. Lowermost Norian. Collections of the Palaeontological Institute of the University Vienna (coll. Gruber) (x 3)

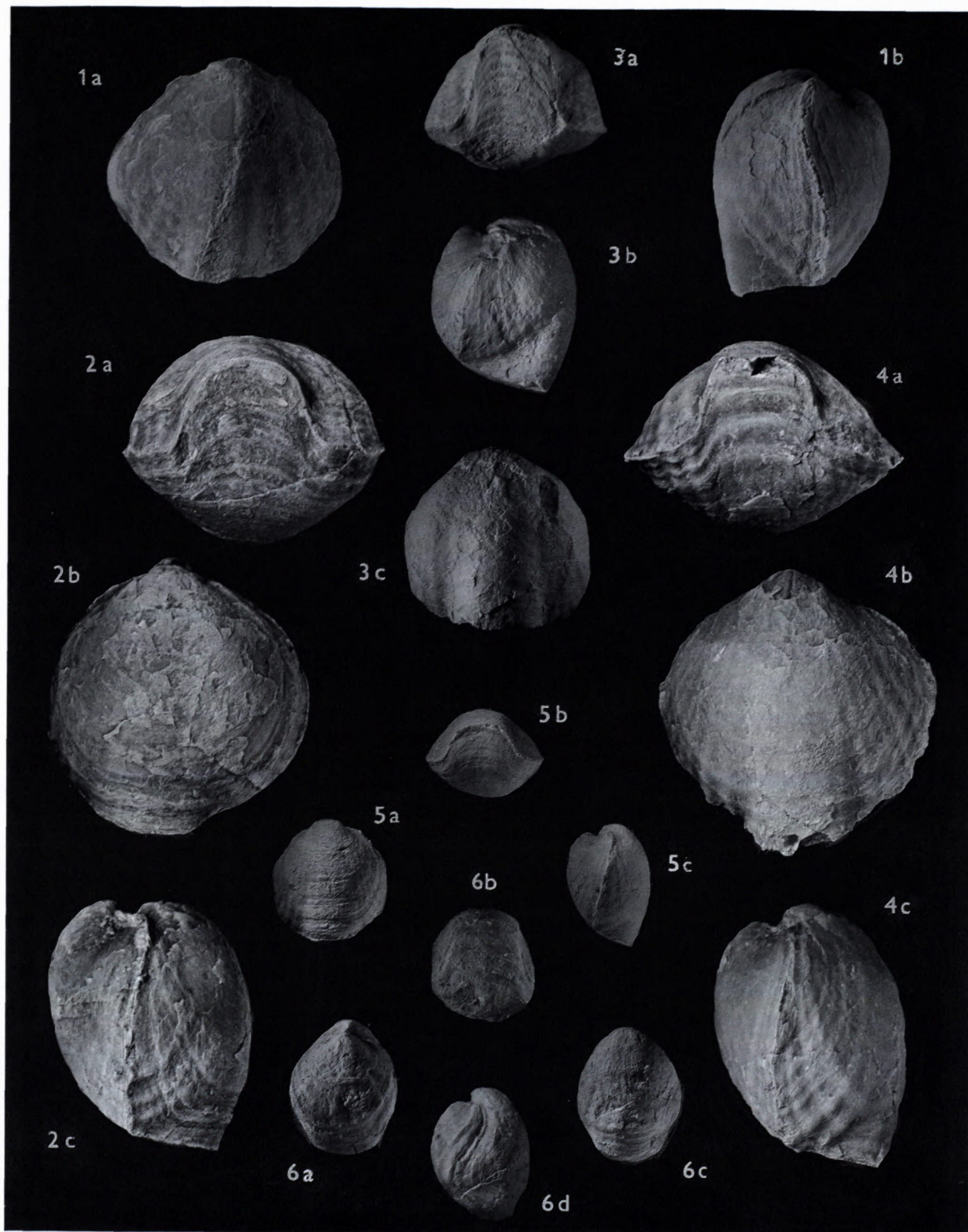


Plate 3

Fig. 1 *Mentzelia halobiarum versata* ssp. n.; Silická Brezová, upper part of Balogh 's locality, SNM Z 21983 (x 4); **Fig. 2** *Mentzelia halobiarum* (BITTNER), Ostré vřšky Hill, loc. B₂A, SNM Z 21984 (x 3); **Fig. 3** *Mentzelia halobiarum versata* ssp. n.; Silická Brezová, upper part of Balogh 's locality, SNM Z 21985 (x 2); **Fig. 4** *Mentzelia halobiarum versata* ssp. n. Holotype. Silická Brezová, upper part of Balogh 's locality, SNM Z 21986 (x 3); **Fig. 5** *Mentzelia halobiarum versata* ssp.n.; Silická Brezová, upper part of Balogh 's locality, SNM Z 21987 (x 2); **Fig. 6** *Mentzelia halobiarum versata* ssp. n.; Silická Brezová, upper part of Balogh 's locality. Variant with extreme reversal of valves. 6a-ventral view, 6b-anterior view, 6c-dorsal view, 6d-lateral view with pedicle valve left, SNM Z 21988 (x 2)

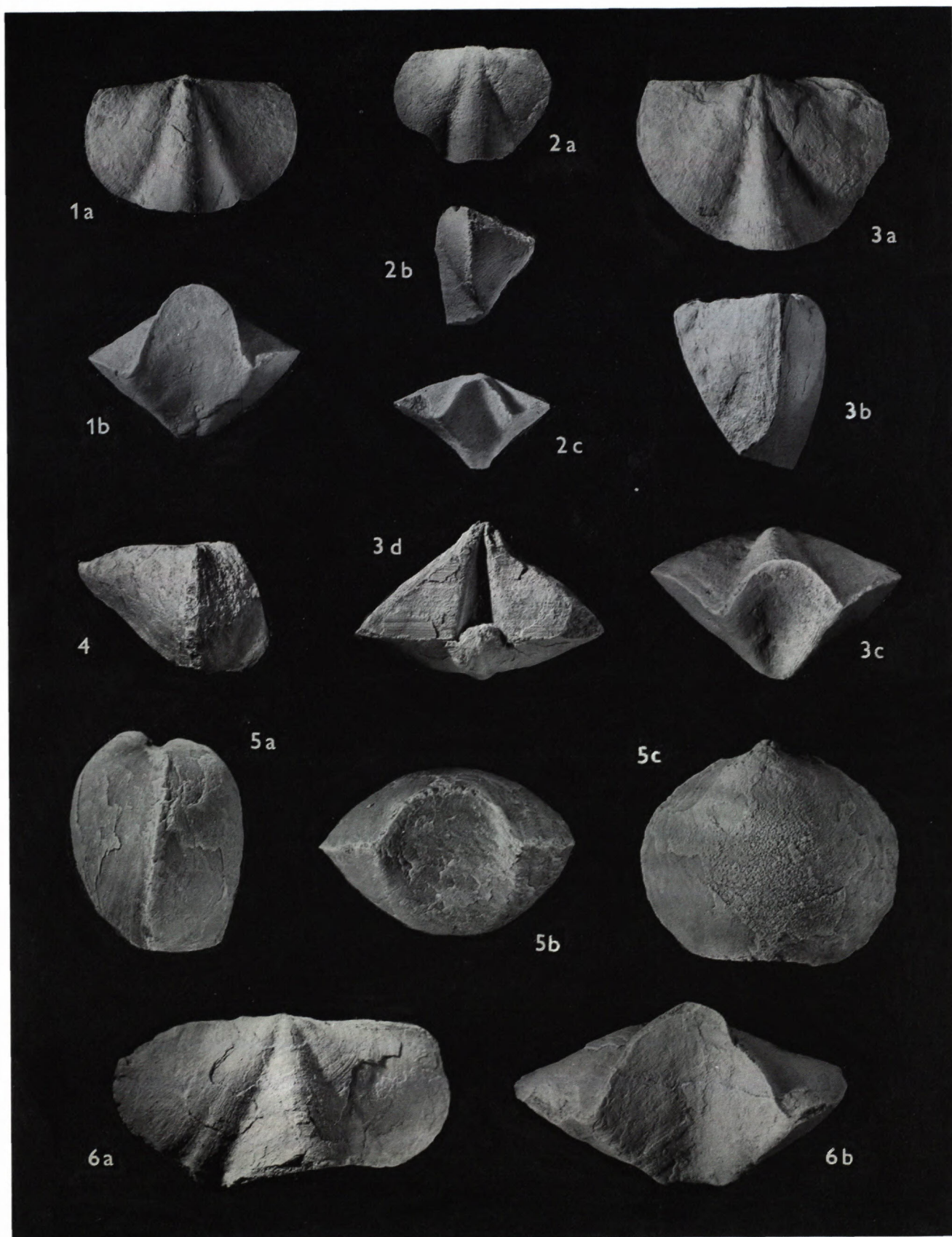


Plate 4

Figs. 1-4 *Laballa dagysi* sp. n.; Silická Brezová, lower part of Balogh's locality. Specimen on Fig. 2b shows a procline pedicle area. Fig. 3-holotype SNM Z 21989-21992 (x 2); **Fig. 5** *Mentzelia halobiarum* (BITTNER); Ostré vřšky Hill, loc. B₂A, SNM Z 21993 (x 3); **Fig. 6** *Laballa dagysi* sp.n.; Silická Brezová, W of the elevation point 492.2, SNM Z 21994 (x 2)

All figured specimens were coated with ammonium chloride before photographing. The specimens from the Slovak Karst are housed in the collections of the Slovak National Museum in Bratislava (SNM). Photographs by Mr. J. Brožek, Prague.