

Middle Triassic rhynchonellids from the Balaton Highland (Transdanubian Central Range, Hungary)

by J. PÁLFY, Budapest

J. PÁLFY: Middle Triassic rhynchonellids from the Balaton Highland (Transdanubian Central Range, Hungary). — *Annl. hist.-nat. Mus. natn. hung.* 1988 80: 25-46.

Abstract — Nine rhynchonellid species are described from the Middle Triassic (Anisian) of the Balaton Highland. The material was obtained by recent collection. Emphasis is laid on the discussion of the taxonomic problems in the light of the internal characters studied by serial transverse sections, confronted to the recent investigations of other authors. With 15 figures and 3 plates.

INTRODUCTION

Rhynchonellid brachiopods were discovered as early as 1856 in the Balaton Highland. SUESS (in ZEPHAROVICH 1856) described seven brachiopod species including rhynchonellids as well. In the early 1870s J. BÖCKH carried out geological mapping in the region, devoting special attention to fossils of Triassic age. He described two new rhynchonellid species, including *Caucasorhynchia altaplecta* (BÖCKH, 1872) from the most important fossiliferous locality, the Forrás Hill near Felsőörs. J. BÖCKH sent another part of his collection to A. BITTNER for further investigation. In the fundamental monograph of BITTNER (1890) nine species are treated (five of them are new) which were found in the localities of the Balaton Highland. As regard of these species (*Norella refractifrons*, *Volirhynchia vivida*, *Trigonirhynchella attilina*, *Piarorhynchella trinodosi* and *Holcorhynchella delicatula*) the area and the localities can be considered as toptopic.

During the project "Scientific Study of the Balaton", a remarkable effort was made to investigate the fossils of the Balaton Highland by the most prominent paleontologists of that period. BITTNER (1912) and FRECH (1912) also contributed to the paleontological volume of this project. BITTNER provided a list of brachiopods of Anisian age containing nine rhynchonellid species. FRECH described a new species and a new variety in his work.

Recently DETRE (1970) compiled a list of the brachiopod assemblage of the Balaton Highland containing 12 rhynchonellids.

In the present paper the most common nine species are redescribed in detail. The further results of the systematic study as well as the palaeoecological, biogeographical, stratigraphical and evolutionary significance of this brachiopod fauna are planned to be published in the near future.

LOCALITIES

Three localities yielded the rich brachiopod assemblages which formed the basis of the present work (Fig. 1). Two of them, Felsőörs and Köveskál have been known for over a century, and there the author collected additional material. At Aszófő a new excavation

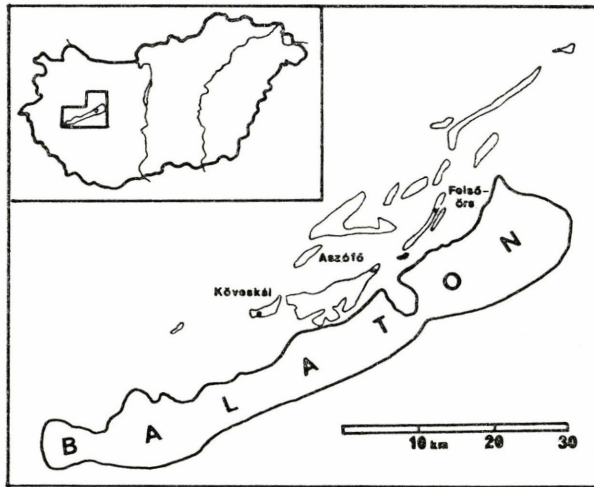


Fig. 1. Sketch map showing the Balaton Highland area located north of Lake Balaton, the three localities and the surface distribution of the Anisian formations.

and collection was carried out by the Hungarian Geological Survey, providing one and a half thousand brachiopod specimens. In all the three localities the Anisian "Recoaro-type" limestone yielded the brachiopod fauna.

On the slope of the *H o r o g* H i l l near the village of Köveskál loose blocks of lumashella-like crinoidal-brachiopodal limestone contained very densely packed usually fragmentary shells.

On the *F a r k ó k ő* H i l l near the village of Aszófő the recently excavated section clearly shows the crinoidal-brachiopodal limestone overlying the Lower Anisian Megyehegy Dolomite. Here this "Recoaro-type" limestone is dark-brown, bituminous, slightly silicified, containing intraclasts, and its thickness does not exceed 3.5 m. In the fossil assemblage the brachiopods are accompanied by bivalves and cephalopods. The occurrence of the index ammonite *Balatonites balatonicus* marks the stratigraphic position (Balatonicus Zone). The brachiopodal-crinoidal limestone is overlain by the thin-bedded "Reifling-type" limestone very rich in cephalopods (see VÖRÖS 1987).

In the *F o r r á s* H i l l near the village of Felsőörs the crinoidal-brachiopodal limestone is about 4 m thick. In the sequence it overlies a cherty, bituminous limestone resting directly upon the Megyehegy Dolomite. Higher up, the brownish, marly "Reifling-type" limestone represents the Illyrian (see SZABÓ et al. 1980). In the crinoidal-brachiopodal "Recoaro-type" limestone no index ammonite has been found, however, its stratigraphic position must be near to the Pelsonian/Illyrian boundary.

SYSTEMATIC PALAEOLOGY

Order RHYNCHONELLIDA KUHN, 1949
 Family Praecyclothyrididae MAKRIDIN, 1964
 Subfamily Tetrarhynchiinae AGER, 1965

Genus *Decurtella* GAETANI, 1966*Decurtella decurtata* (GIRARD, 1843)

(Plate 2: fig. 4; Fig. 2)

- 1871 *Terebratula decurtata* GIR. — QUENSTEDT: p. 183, pl. 41: fig. 111.
 1890 *Rhynchonella decurtata* GIR. sp. — BITTNER: p. 9., pl. 32: figs 1-7.
 1902 *Rhynchonella decurtata* GIR. sp. — BITTNER: p. 518, 524 pl. 21: fig. 16.
 1906 *Rhynchonella decurtata* GIR. — ARTHABER: pl. 35: fig. 3.
 1937 *Rhynchonella decurtata* GIRARD — ASSMANN: p. 31., pl. 7: fig. 16.
 1966 *Decurtella decurtata* (GIRARD) — GAETANI: p. 347., pl. 16, figs 1-7., figs 1-3.
 1967 *Decurtella decurtata* (GIRARD) — SPECIALE: p. 1084, pl. 79: fig. 1.
 1971 *Decurtella decurtata* (GIRARD) — SIBLIK: p. 167, pl. 19.; figs 2-4, figs 1-2.
 1972 *Decurtella decurtata* (GIR.) — SCHOLZ: pl. 8.; fig. 7.
 1974 *Decurtella decurtata* (Girard) — DAGYS: pl. 30.; fig. 3.

Material: 13 specimens from the Forrás Hill near Felsőörs, 18 from Aszófő, and 14 from Köveskál. Altogether 23 of those are well-preserved shells.

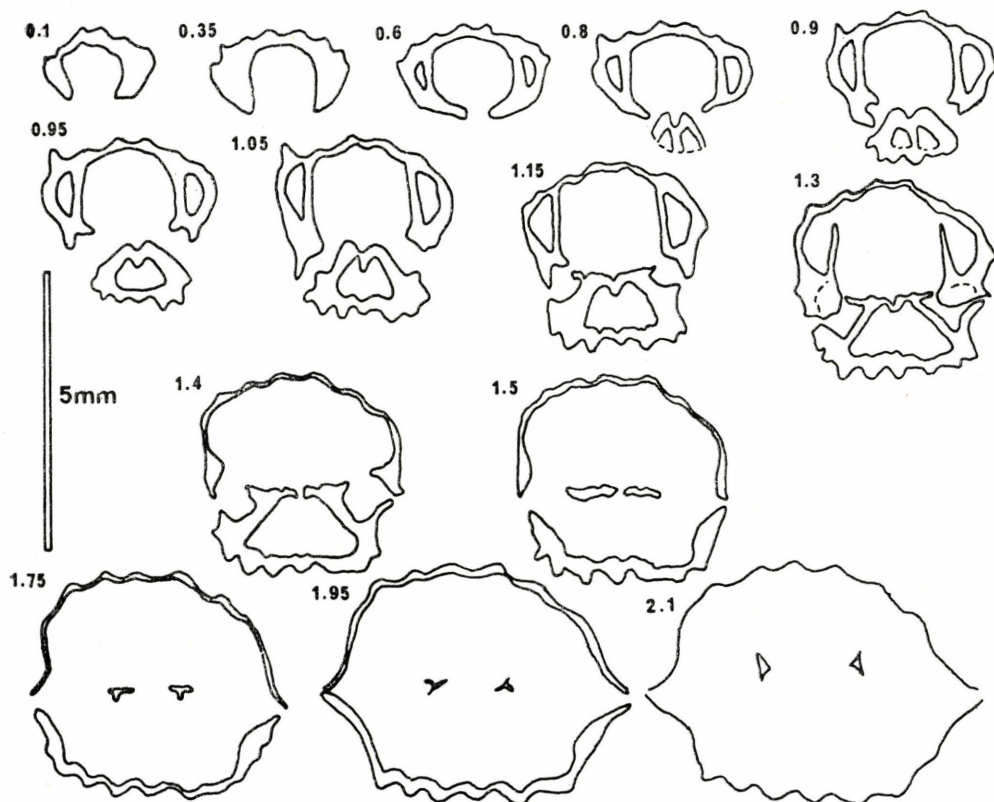


Fig. 2. *Decurtella decurtata* (GIRARD, 1843): a series of 13 transverse sections through the posterior part of a specimen from Aszófő. Original length 8.6 mm. The crura persisted to 2.4 mm from the end of the shell.

Dimensions: The following table presents the data of six characteristic specimens:

	1	2	3	4	5	6
Length	8.8	10.2	9.4	10.0	9.6	10.6
Width	9.9	10.7	10.1	11.2	11.1	12.5
Thickness	5.2	8.4	6.8	9.3	5.0	5.4

(Localities: 1 = Forrás Hill near Felsőörs; 2, 3, 4 = Aszófő; 5, 6 = Köveskál)

Description — External characters: Small to medium-sized shell, characteristically triangular in outline. The angle between lateral margins is 70–80°, the anterior margin is slightly rounded in dorsal view. The shell is planato-convex to biconvex in lateral view, the brachial valve is slightly more convex, while the pedicle one is rather flat. The shell reaches its maximum width near the anterior end, the maximum thickness is placed at mid-length. The lateral commissure divides into two equal parts a flat, oval planarea. There is often a marked flattening at the anterior end of the shell. Sometimes the anterior commissure has a low uniplication. All the surface of the shell is costate. The sharp costation starts from the beak, 7 to 9 costae on each valve run straight to the anterior end without bifurcation, 2 or 3 of them are situated in the central fold. Their profile is trigonal in cross-section. The beak is high and erect. The pedicle opening is triangular in shape and hypothyridid.

Internal characters (Fig. 2): Pedicle valve: Subparallel, dorsally slightly divergent and ventrally shorter, widely set dental plates separate the subquadrate delthyrial cavity from the semicircular umbonal cavities. The hinge teeth are strong, but not deeply projected into the sockets, the blunt denticula are almost as well-developed as the hinge teeth themselves.

Brachial valve: The hinge plates are almost horizontal. The socket is large and deep with pronounced socket ridges, of which the outer one is even markedly developed. The septalium is narrow and shallow, supported by a short dorsal median septum. The crura are simple, first laterally, later dorso-ventrally elongated, trigonal shaped in cross-section. They are of radulifer type.

Remarks — Earlier several subspecies were distinguished within *Decurtella decurtata*. According to SIBLIK (1971a) the variety *dalmatina* and *vivida* are synonymous and must be considered as independent species. Their costation (blunt costae evolving during a later stage of growth) suggests their belonging to the genus *Volirhynchia* as DAGYS (1974) recognized it. The *oxypterus* variety of FRECH (1912) was based on a single brachial valve, so it is doubtful and still not justified by more recent data. BITTNER's other variety, *devota* was thought by GAETANI (1969) to be another independent species, which has a diagnostically globose appearance and smaller, less curved beak. Such a form has not yet been recorded from the Balaton Highland. Another one of BITTNER's variety, the *mediana* (BITTNER 1902) is thought by SIBLIK (1971a) to be a possible subspecies, since the smaller morphological differences does not allow one to create a new species for this form.

Distribution: *Decurtella decurtata* is widely known from the Anisian, both from the Alpine and the German type facies and faunas. In Hungary it has been recorded from the Balaton Highland, the Aggtelek Mountains, and the Mecsek Mountains. The species seems to be confined to the Pelsonian.

Genus *Volirhynchia* DAGYS, 1974

Volirhynchia vivida (BITTNER, 1890) (Plate 2: fig. 2; Figs 3–4)

1872 *Rhynchonella altaplecta* sp. n. (partim) — BÖCKH: p. 163, pl. 11: fig. 29.

1890 *Rhynchonella decurtata* var. *vivida* sp. n. — BITTNER: p. 10, pl. 32: figs 11–12.

1890 *Rhynchonella decurtata* var. *vivida excavata* — BITTNER: p. 10, pl. 31: fig. 27.

1933 *Rhynchonella decurtata* var. *divida* (sic!) BITTNER — MILOSAVLJEVIĆ: p. 212, pl. 1: fig. 6.

1935 *Rhynchonella decurtata* var. *vivida* BITT. — MILOSAVLJEVIĆ: p. 270, pl. 1: fig. 1.

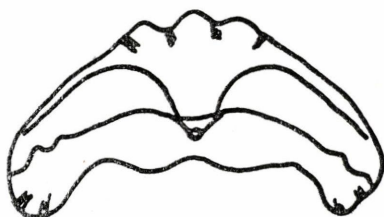
1949 *Rhynchonella vivida* BITTNER — BEŠIĆ: p. 111, pl. 1: fig. 6.

1971 *Decurtella vivida* (BITTNER) — SIBLIK: p. 168, pl. 19: figs. 5–6, pl. 20: fig. 4, Figs. 3–4.

1975 *Decurtella* aff. *vivida* (BITTNER) — KOCHANOVÁ, MELLO et SIBLIK: pl. 7: fig. 5.

Material: 6 well-preserved specimens from the Forrás Hill near Felsőörs and 2 incomplete specimens from Köveskál.

Fig. 3. Drawing of a specimen of *Volirhynchia vivida* from Felsőörs. The posterior view is to show the well-developed lateral wings.



Dimensions: the following table presents the data of the four best preserved specimens from Felsőörs (2-5), while column No. 1 those of the specimen figured by Böckh (1873).

	1	2	3	4	5
Length	10.0	11.5	9.2	9.5	10.4
Width	10.5	11.1	10.6	9.8	10.2
Thickness	6.0	7.4	6.0	5.1	6.8

Description — External characters: Medium-sized shell, pentagonal in outline. After an early biconvex stage the brachial valve remains strongly convex, while on the pedicle valve develops a pronounced sinus. The maximum width and thickness are situated at 3/4 of the length, at the rounded antero-lateral corner. The lateral commissure is ventrally arched running through a faint planarea. The anterior commissure is uniplicate, dominated by a high, wide, almost rectangular fold. The posterior part of the shell is smooth, but from about the one third of the length low, blunt costae evolve. Three costae occupy the central fold, while single ones or pairs run ventrally curved on the lateral flanks toward the antero-lateral corner, forming two very pronounced ventrally projecting

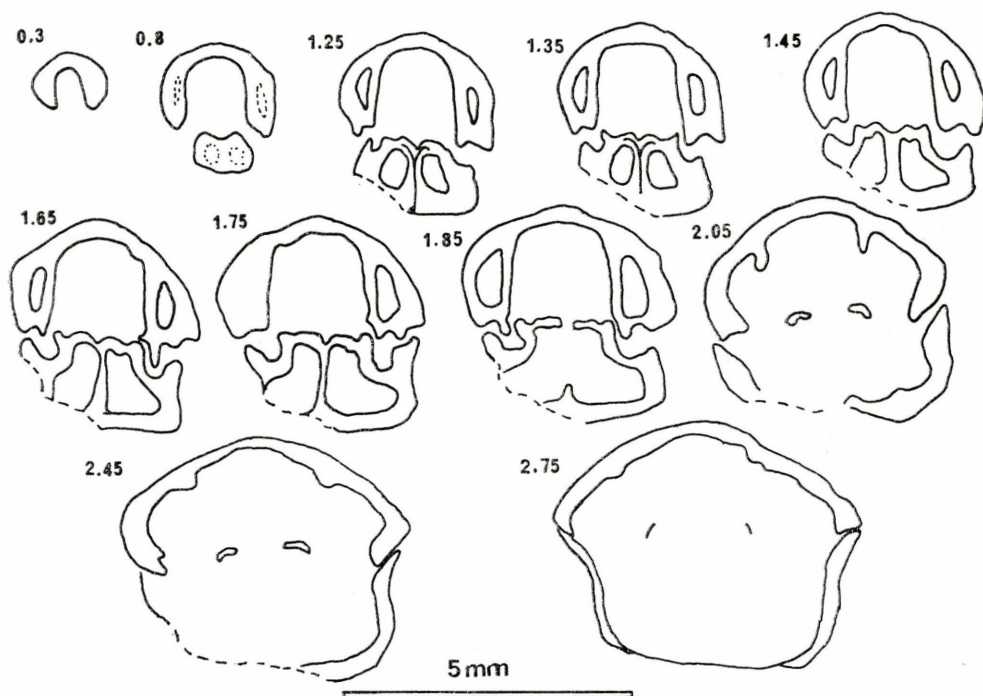


Fig. 4. *Volirhynchia vivida* (BITTNER, 1890): a series of 11 transverse sections through the posterior part of a specimen from Köveskál. Original length 9.5 mm. The crura persisted to 3.0 mm from the posterior end of the shell.

lateral wings (Fig. 3). The beak is moderate in size, straight. The pedicle opening is submesothryridid, with well-developed delthydial plates.

Internal characters (Fig. 4): Pedicle valve: Widely set, subparallel, slightly dorsally divergent and shorter dental plates divide the subquadrate delthyrial cavity and the narrow umbonal cavities. No pedicle collar has been observed. The hinge teeth are strong and deeply inserted in the sockets. Moderate, blunt denticula were ascertained.

Brachial valve: The hinge plates are horizontal, demarkated from the inner socket ridge by a groove. The sockets are deep, the outer socket ridges are markedly high and straight. The shallow V-shaped septalium is supported by a relatively long dorsal median septum, which persists almost to the plane of articulation. The crura are of radulifer type.

Remarks: While describing "*Rhynchonella altaplecta*", the so common species of the fauna of Felsőörs, BÖCKH (1873) held in his hands a specimen representing another species, *vivida*. Furthermore, one of his figured specimens belongs to this one. BÖCKH himself noted and mentioned the differences, e.g. in the character of the beak. BITTNER (1890) pointed out that the species described by BÖCKH consists of two forms. He named the newly segregated one as *vivida*, and treated it as the variety of "*Rhynchonella decurtata*". He also figured a specimen from Köveskál (which shows great resemblance to the one figured in the present paper) and named it as *vivida excavata*. The diagnostic features which allow one to distinguish it from *Caucasorhynchia altaplecta* are the straight beak, the ventrally curved lateral commissure and the ventrally projected wings.

GAETANI (1966) provisionally attributed this species to his newly defined genus *Decurtella*. SIBLIK (1971a) also considered this species to belong to *Decurtella*, but later DAGYS (1974) included it in his new genus *Volirhynchia*. SIBLIK accepted it in his paper of 1983. The internal characters of *vivida* shows great resemblance to those of the genus *Volirhynchia* diagnosed by DAGYS. The serial sections are closely similar to that of *Volirhynchia volitans*, the type species of the genus (DAGYS, op. cit. p. 105.)

Distribution: The species seems to be confined to the Anisian. Its occurrences were reported from various localities in the Southern Alps, Eastern Alps, West Carpathians and the Dinarids.

Volirhynchia tommasi (BITTNER, 1890)

(Plate 1: figs 1–2; Fig. 5)

1890 *Rhynchonella Tommasii* sp. n. — BITTNER: p. 53, fig.

1890 *Rhynchonella decurtata* GIR. var *vivida tumescens* — BITTNER: p. 11, pl. 37: fig. 16.

1902 *Rhynchonella Tommasii* BITTN. — BITTNER: p. 531, pl. 21: fig. 14.

Material: 66 specimens for Aszófő, where this species is a very characteristic element of the fauna of the "Recoaro-type" limestone. Most of them are incomplete or disarticulated valves, others are recrystallized with sparry calcite. Only four of them are well-preserved and complete specimens. Two specimens were found at Köveskál.

Dimension: The following list shows the measured data of six characteristic specimens. No. 1 originated from Köveskál, Nos 2–6 are from Aszófő.

	1	2	3	4	5	6
Length	11.7	11.9	16.2	13.5	13.0	11.2
Width	16.5	14.9	20.8	15.9	15.1	13.8
Thickness	8.7	9.1	12.1	7.2	9.0	7.7

Description — External characters: Medium to large shell, triangular in outline, slightly rounded at the antero-lateral corner. Biconvex at an early stage of growth, but later the pedicle valve becomes rather flat and a sinus develops on it. The maximum width and thickness are at the anterior third of the length. The angle between the lateral margins is about 110°. The anterior commissure is uniplicate, the dorsal fold occupies the central third of the anterior front. The fold is usually as high as wide. The ventral sinus is V-shaped. The posterior part of the shell is smooth, but anteriorly from about the posterior third costae develop. The originally blunt costae become higher, sharper and trigonal in cross-section toward the anterior margin. Usually there are 3 costae in the dorsal fold, 2 in the central sinus and 2 to 5 on the lateral flanks. The beak is moderate in size, triangular and erect, with a hypothryridid pedicle opening on it.

Internal characters (Fig. 5): Pedicle valve: The dorso-ventrally elongated, rounded subquadrate delthyrial cavity is located between the subparallel, ventrally shorter dental plates. The umbonal

cavities are rather narrow, trigonal in cross-section. No pedicle collar has been observed. The hinge teeth are short, anteriorly and dorsally expanded. Short, blunt denticula were also ascertained.

Brachial valve: Dorsally arched hinge plates with pronounced crural bases are characteristic. The septalium is shallow and widely V-shaped, supported by a long dorsal median septum, which persists well beyond the plane of articulation. The wide and shallow sockets are situated between the blunt and nearly equal inner and outer socket ridges. No additional sockets are developed. The crura are of radulifer type, originating from the distal ends of the hinge plates. The cross-section of the crura is trigonal, then rather elongated, blade-like toward the front of the shell.

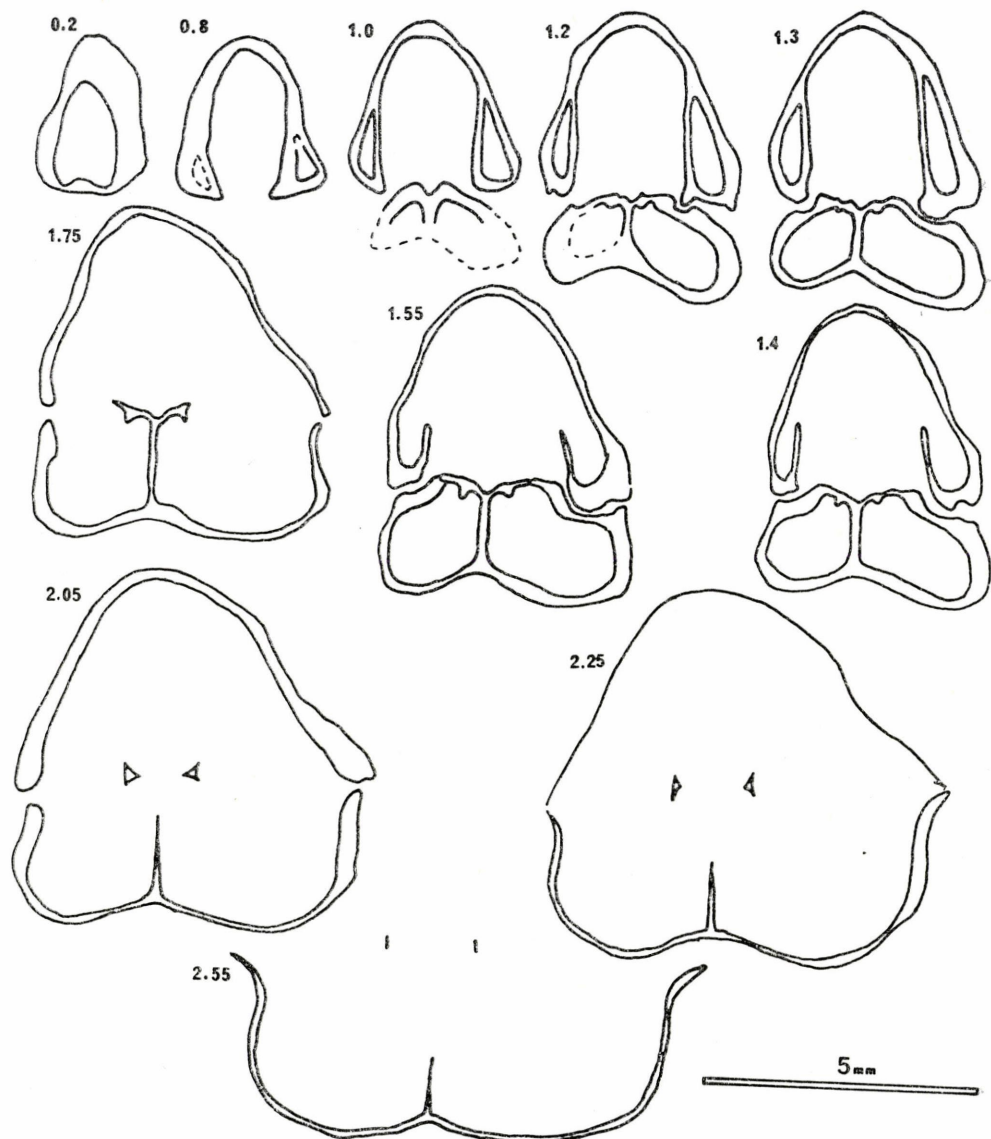


Fig. 5. *Volirhynchia tommasi* (BITTNER, 1890): a series of 11 transverse sections through the posterior part of a specimen from Aszófő. Original length 11.5 mm. The crura persisted to 3.0 mm from the posterior end of the shell.

Remarks — “*Rhynchonella Tommasii*” was first described by BITTNER (1890) from the Southern Alps, but in the same volume he also described and figured a specimen from Köveskál and named it as “*Rhynchonella decurtata* var. *vivida tumescens*”. In both description he mentioned the apparently great similarity of these two forms to each other and suggested the possibility of their belonging to the same species. DIENER (1920) already treated these forms together, keeping the specific name *tommasii*. This form really shows great resemblance to *vivida*. Diagnostic features for distinction are the less sharp lateral margin and the lack of the ventrally projected wings.

GAETANI (1966) attributed this species to his new genus *Decurtella*, together with the already treated *vivida*. As it was seen, DAGYS (1974) moved *vivida* into his newly described genus *Volirhynchia*, but he did not mention *tommasii* in his fundamental work; neither did SIBLIK (1983) give a generic attribution of this species. Despite some open questions the present author thinks that the external and internal characters of *tommasii* are convincing enough to prove its belonging to the genus *Volirhynchia*. We have seen its great external similarity to *vivida* which is a certain representative of the genus *Volirhynchia*. Their internal features also fit more or less to each other. DAGYS determined their crura in the generic diagnosis as that of canalifer type, but it can be considered to be rather one of radulifer type. The figure of serial transverse sections of the type species *Volirhynchia volitans* seems not to contradict this judgement. Nevertheless, there are minor differences in the inner structure of *Volirhynchia tommasi* and *V. vivida*, as the former has a longer median septum and arched plates beside the dissimilarity of the dental plates.

Distribution: So far *Volirhynchia tommasi* has been known from the Balaton Highland and the Southern Alps only, and seems to be confined to the Anisian.

***Volirhynchia projectifrons* (BITTNER, 1890)**
(Plate 1: figs 3–7, Fig. 6)

1890 *Rhynchonella projectifrons* sp. n. — BITTNER: p. 41, pl. 31: figs 16–17.

1890 *Rhynchonella protractifrons* sp. n. — BITTNER: p. 41, pl. 31: figs 19–22.

1895 *Rhynchonella protractifrons* BITTN. (partim) — SALOMON: p. 100, pl. 3: figs 19, 21–22 (non figs 16, 17, 18, 20, 23 and 24)

Material: Altogether 5 well-preserved specimens, one from the Forrás Hill near Felsőörs, and 4 from the lower part of the Aszófő sequence.

Dimensions: The following table shows the data measured on each specimens No. 1 originated from Felsőörs, Nos 2–5 are from Aszófő

	1	2	3	4	5
Length	11.0	14.1	9.1	9.2	8.3
Width	11.0	16.8	9.1	10.0	8.8
Thickness	6.5	9.2	4.9	6.6	6.2

Description — External characters: Medium-sized to large shell in adult stage, oval in outline. Maximum width is at about the anterior third, maximum thickness is at about the half length in the juvenile stage, later shifting toward the anterior end. Biconvex form with a differently developed fold and sulcus on the adult specimens. In the very early stage of ontogeny a narrow sulcus developed on the brachial valve, of which a groove appears in the centre, probably representing a dorsal median septum. The lateral commissure arches gently ventrally to the point where it meets the uniplicate anterior commissure. The whole commissure is sharp and prominent. The height of fold grows during ontogeny. The fold is up to twice as wide as high. The anterior view of the fold varies from semicircular to almost rectangular (Fig. 6) The whole surface of both valves is smooth.

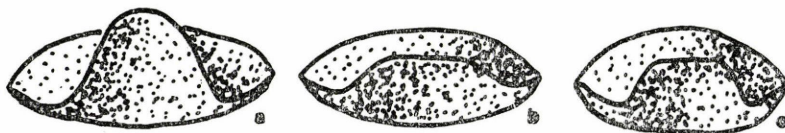


Fig. 6. Drawing from the anterior view of three specimens of *Volirhynchia projectifrons* (BITTNER, 1890) from Aszófő, to show the variation in anterior commissure; a = adult form, gently arched high fold ($\times 2.5$), b = juvenile form, gently arched low fold ($\times 3$) and c = juvenile form, moderately angular fold ($\times 3$)

The beak is medium-sized, suberect. It swells from the posterior part of the pedicle valve, but anteriorly gradually disappears, since the dorsal sulcus grows.

Internal characters: There were no adequate specimen available for serial sectioning due to the recrystallization and the paucity of the material.

Remarks — The identification of this species remains uncertain due to the scarcity of figured descriptions known by the author. BITTNER (1890) presented two specimens slightly different in outlook, what may be explained by the different stages of growth. This is also the main cause of the differences in the form of the specimens treated here. DAGYS (1974) attributed this species to the genus *Volirhynchia* which was questioned by SIBLIK (1983). Being no other generic attribution suggested, here I preserve DAGYS' point of view. Nevertheless it is doubtful, since *projectifrons* has smooth valves, whereas all the other species of *Volirhynchia* have costate anterior part. Serial sectioning can help to resolve this problem, if subsequent collectings provide more available material. SIBLIK (1983) assumed that *projectifrons* and "*Rhynchonella*" *protractifrons* (BITTNER, 1890) are synonymous. This is highly probable, since our specimens from Felsőörs shows greater resemblance to the latter one of BITTNER's species, while common features suggest it is conspecific with the specimens from Aszófő. It would be advisable to preserve the name *projectifrons*, because the original figures of *protractifrons* hint a rather juvenile form. In the sense of SALOMON (1895), *Rhynchonella ottomana* (BITTNER, 1890) and *Rhynchonella generosa* (BITTNER, 1890) also belong to "*Rhynchonella protractifrons*". This seems to be an obvious mistake.

Distribution: Beside the Balaton Highland this species is known from the Anisian formations of the Southern Alps and Eastern Alps (Schreyeralm).

Genus *Costirhynchopsis* (DAGYS, 1974)

Costirhynchopsis mentzeli (BUCH, 1843)

(Plate 2: fig. 1; Fig. 7)

- 1890 *Rhynchonella Mentzelii* BUCH spec. — BITTNER: p. 12, pl. 32: figs 14–16.
 1902 *Rhynchonella Mentzelii* BUCH spec. — BITTNER: p. 502, 503, pl. 21: figs 8–12.
 1935 *Rhynchonella Mentzelii* BUCH — MILOSAVLJEVIĆ: p. 271, pl. 1: fig. 2.
 1912 *Rhynchonella Mentzelii* BUCH — DE TONI: p. 339, pl. 1: fig. 11.
 1937 *Rhynchonella Mentzelii* v. BUCH sp. — ASSMANN: p. 31, pl. 7: fig. 12.
 1949 *Rhynchonella Mentzelii* BUCH — BESICH: p. 111, pl. 1: fig. 8.
 1971 "*Rhynchonella*" *mentzeli* (Buch) — SIBLIK: p. 176, pl. 19: fig. 1, pl. 20: fig. 9, fig. 12.

Material: 63 specimens from Aszófő and 2 specimens from Köveskál, the bulk of which consists of incomplete or disarticulated shells.

Dimensions: The following table shows the data measured on five specimens from Aszófő representing the average.

	1	2	3	4	5
Length	8.0	7.9	7.7	8.1	8.8
Width	8.7	9.1	9.4	9.3	10.7
Thickness	4.1	4.6	5.4	6.5	3.9

Description — External characters: Usually small, sometimes medium-sized shell. The brachial valve is oval, the pedicle one is subtriangular in outline. Both valves are equally convex. The flat biconvex character is more common, but in some cases the lateral view has a rather globose appearance. The maximum width can be measured at the anterior third, the maximum thickness is at half length. The anterior commissure is more often uniplicate than rectimarginate. A low, wide, gently arched fold may develop only in the later stage of growth. Both valves are fully covered by the sharp, dense costation. The number of costae is 14–15, 4–6 of which are placed in the central fold. The straight costae start from the beak and run slightly divergently to the anterior end without bifurca-

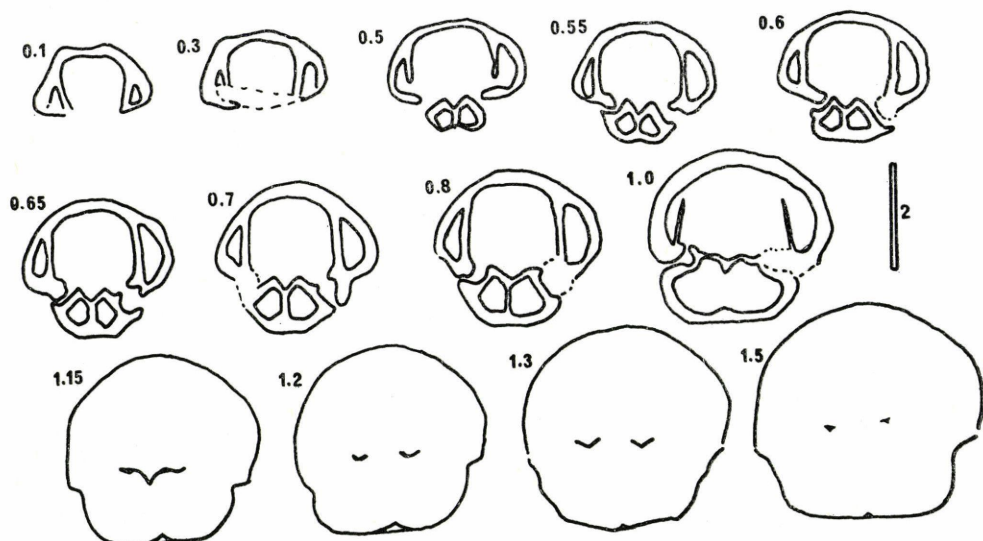


Fig. 7. *Costirhynchopsis mentzeli* (BUCH, 1843): a series of 13 transverse sections through the posterior part of a specimen from Aszófő. Original length 7.9 mm. The crura persisted to 1.7 mm. from the posterior end of the shell.

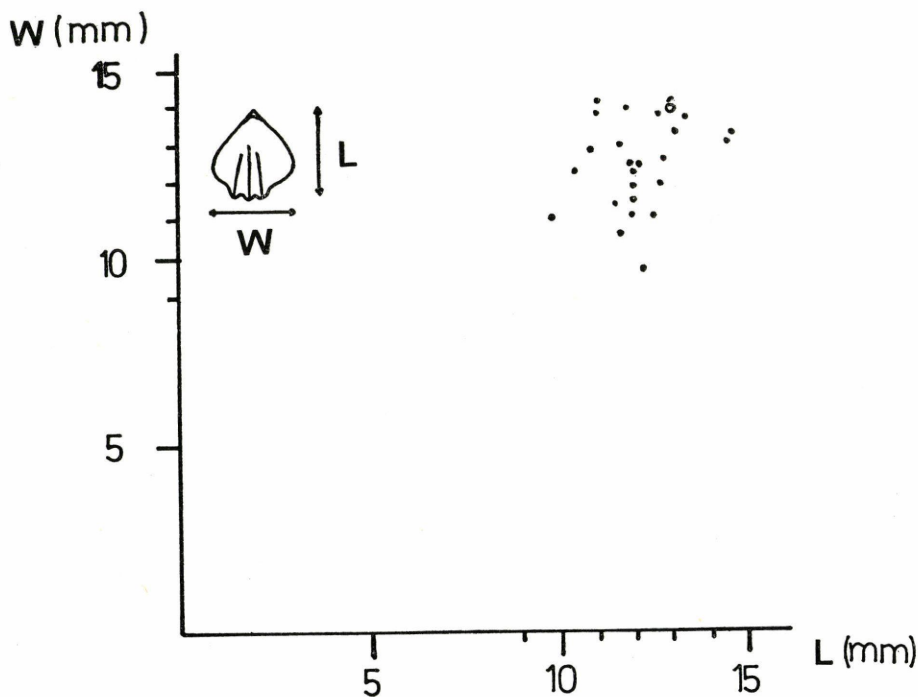


Fig. 8. Scatter-diagram of relationship of width to length in *Caucatorhynchia altaplecta* (BÖCKH, 1872), based on measurements of 25 specimens from Felsőörs. "o" marks the holotype.

tion. Their profile is trigonal in cross-section. The beak is relatively high, suberect to erect. The pedicle opening is hypothyriddid.

Internal characters (Fig. 7): Pedicle valve: The delthyrial cavity is subquadrate. The dental plates are widely set, and after a subparallel stage become slightly dorsally divergent and ventrally shorter. The umbonal cavities are semioval. A pedicle collar has not been observed. The hinge teeth as well as the denticula are well-developed, not expanded dorsally.

Brachial valve: The ventrally arched hinge plates become flatter beyond the plane of articulation. The inner and the outer socket ridges are well-developed, the sockets are wide and shallow. The moderate septalium is V-shaped. The septalial plates are connected with the dorsal median septum, which anteriorly suddenly decreases and disappears through a short ridge-like phase. The crura are of prefalcifer type, originating from the the median part of the hinge plates, ventrally arched and V-shaped in cross-section.

Remarks — The studied specimen agreed well with those known from previous descriptions and figures. The diagnostic features are clear enough for a certain identification. As regards generic attribution, DAGYS' view is accepted here (DAGYS 1974, 1977).

Distribution: *Costirhynchopsis mentzeli* is known from both the Alpine and the German-type Middle Triassic, from the Pelsonian and the Illyrian. First it was described from the German Muschelkalk, but beside the Balaton Highland it was also found in the Southern Alps, the Dinarids and the West Carpathians.

Subfamily *Praecyclothyridinae* MAKRIDIN, 1964

Genus *Caucasorhynchia* DAGYS, 1963

Caucasorhynchia altaplecta (BÖCKH, 1872)
(Plate 3: figs 1-4; Figs 8-11)

1872 *Rhynchonella altaplecta* sp. n. — BÖCKH: p. 163, t. 11: fig. 28 (non fig. 29 = *Volirhynchia vivida*)

1890 *Rhynchonella alteplecta* BOECKH — BITTNER: p. 11, pl. 37: figs 9-15.

1906 *Rhynchonella altaplecta* BKH. — ARTHABER: pl. 35: fig. 10.

?1914 *Rhynchonella alteplecta* BÖCKH — SMITH: p. 146, pl. 94: figs 15-16.

1971 *Caucasorhynchia altaplecta* (BOECKH) — SIBLIK: p. 180, pl. 20: fig. 5.

1978 *Caucasorhynchia* aff. *altaplecta* (BÖCKH) — LEIN et SIBLIK: p. 217, pl. 31: fig. 6, Fig. 6.

Material: 284 specimens from the Forrás Hill near Felsőörs and 1 specimen from Köveskál. Mostly well preserved but silicified shells.

Dimensions: The scatter diagrams of the figures 8 and 9 show the dimensions of 25 measured specimens and that of the holotype in addition.

Description — External characters: Medium-sized shell, subtrigonal or subpentagonal in outline. Maximum width is located near the anterior third, maximum thickness at half length. Both valves are equally convex. The angle between the lateral margins may vary between 75° and 105°, but most often it is about 90°. The posterior part of the lateral margin is straight, but becomes curved ventrally toward the antero-lateral corner. Around its posterior part a marked, wide, flat or deepened planarea is developed. The anterior margin is uniplicate. The fold is wide and its height greatly varies. The development of the sulcus on the pedicle valve starts from its posterior third.

The posterior part of the shell is smooth as well as the lateral flanks except for a blunt edge which runs from the beak toward the antero-lateral corner on the brachial valve. There is a similar one bordering the sinus on the pedicle valve. There are costae on the fold which have a rounded trigonal profile. They evolve from the posterior third of the shell. The number of costae is 2 to 6, rarely bifurcation were also ascertained. The beak is small, hardly exceeding over the brachial umbo, and suberect. The pedicle opening is submesothyridid.

Internal characters (Fig. 10): Pedicle valve: The delthyrial cavity is subquadrate. The dental plates are moderately widely placed, parallel to subparallel, and ventrally shorter. The umbonal cavities are narrow. The hinge teeth are straight and stout.

Brachial valve: The horizontal hinge plates are flat and fused. The sockets are relatively deep, bordered by the well developed inner and outer socket ridges. The septalium is very reduced. The

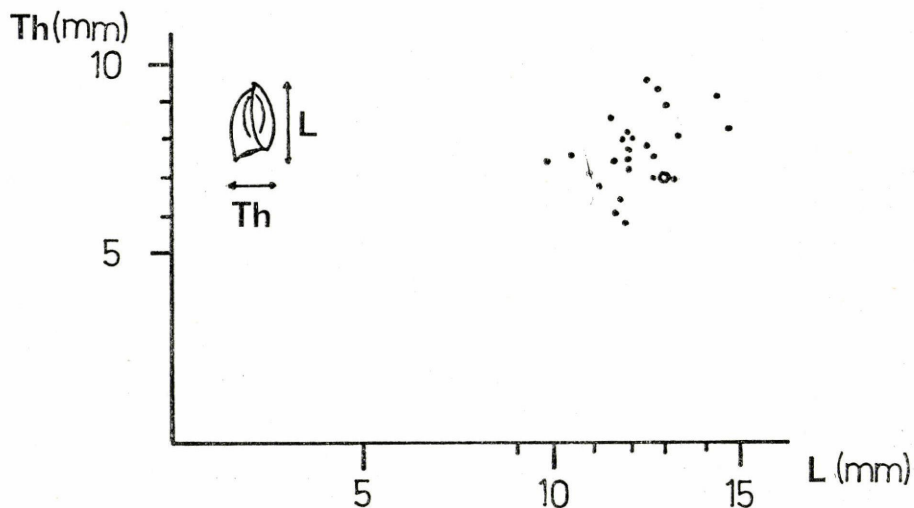


Fig. 9. Scatter-diagram of relationship of thickness to length in *Caucatorhynchia altaplecta* (BÖCKH 1872), based on measurements of 25 specimens from Felsőörs. "o" marks the holotype.

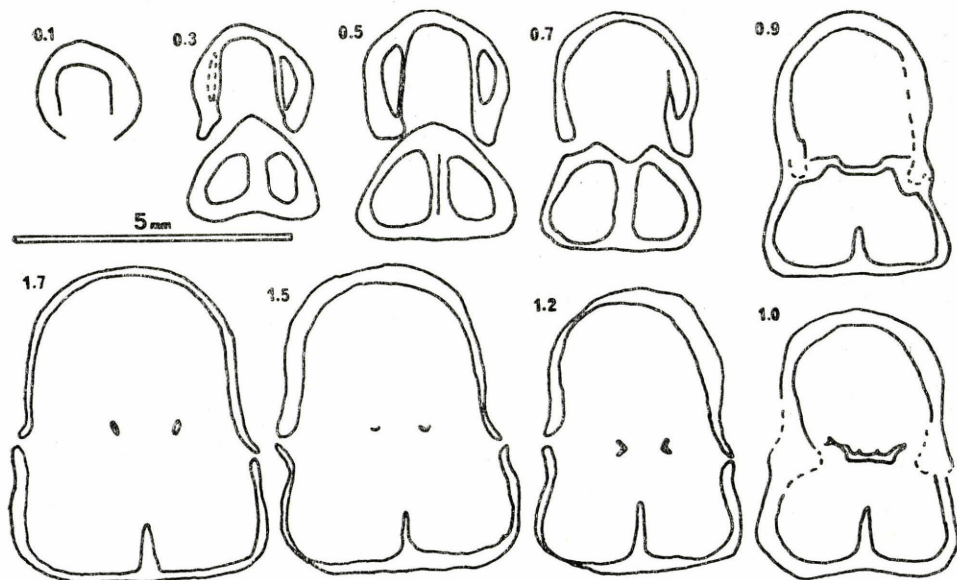


Fig. 10. *Caucatorhynchia altaplecta* (BÖCKH, 1872): a series of 9 transverse sections through the posterior part of a specimen from Felsőörs. Original length 11.8 mm. The crura persisted to 1.7 mm, the dorsal median septum to 2.1 mm from the posterior end of the shell. The slightly ventrally tilted orientation of the specimen differs from the usual position.

median septum is ridge-like and rather short. Pronounced crural bases appear near the distal ends of the hinge plates. The crura are of radulifer type.

Variability — As the scatter diagrams of the length, width and thickness show (Figs 8–9), *Caucasorhynchia altaplecta* has a characteristic morphological variability. (The spots form a cluster rather than fit to a definite line.) Beside this the most important differing features are the costation and the character of the uniplication. Fig. 11. shows the number of costae in 20 specimens. In one-fourth of these specimens studied a branching costa also occurred. The profile of costae ranges from the extremely rounded to the almost sharp.

Remarks — As it was already pointed out concerning *Volirhynchia vivida*, only one of the two figures of the original description of BÖCKH showed this species. BITTNER found the forms with three costae to be the most characteristic, but also mentioned specimens with four or five costae turning up more rarely. SIBLIK (1971b) differentiated a new subspecies, *Caucasorhynchia altaplecta acuticostata* which has diagnostically more numerous, sharper, and more often branching costae. He retained the nominate subspecies for the morphotype known from the Balaton Highland. Based on the present studies this distinction is justified. It should be noted, that in our material only *Caucasorhynchia altaplecta altaplecta* was found.

Distribution: Beside the Balaton Highland this species is known from the Anisian formations of the Eastern Alps, Southern Alps, Dinarids and West Carpathians.

Subfamily *Holcorhynchellinae* DAGYS, 1974

Genus *Holcorhynchella* DAGYS, 1974

Holcorhynchella delicatula (BITTNER, 1890)
(Plate 2: fig. 3; Fig. 12)

1890 *Rhynchonella delicatula* sp. n. — BITTNER: p. 11, pl. 35: figs 28–29.

Material: One well-preserved specimen from Aszófő.

Dimensions: Length 6.8 mm, width 6.2 mm thickness 3.9 mm.

Description — External characters: Small shell, subpentagonal in outline. The pedicle valve is strongly convex, semiglobose, while the brachial valve is flattened after an early biconvex stage of the shell growth. So the appearance in the lateral view is rather planato-convex. Maximum width and maximum thickness are located at about mid-length. The lateral commissure runs straight-forward anteriorly. The brachial valve holds a sulcus along its whole length. This sulcus is narrow, groove-like near the umbo and gradually broadening on the anterior half. Near the anterior end a secondary fold is developed within the sulcus giving an intraplicate appearance to the anterior commissure (Fig. 12). The whole surface of the shell is smooth. The beak is characteristically triangular in dorsal view, medium-sized and suberect. The pedicle foramen is hypothyriddid.

Internal characters: The internal character remains unknown, because only a single specimen of this species was found, so there was no possibility for serial sectioning.

Remarks: This specimen agrees well with those figured by BITTNER (1890), which also originate from the Balaton Highland, from the locality Csicsó. — There are several closely related forms mainly described by BITTNER (1902) from the Dinarids, which can be distinguished by the different plication. According to DAGYS (1974) these forms are very probably congeneric, though no evidence for their internal characters has been found as yet.

Distribution: The *Holcorhynchella delicatula* was found in the Balaton Highland and so far seems to be confined to the Balatonicus Zone (Pelsonian).

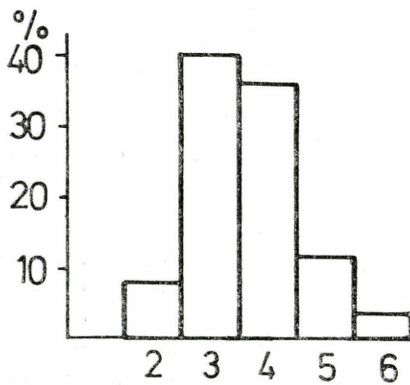


Fig. 11. Distribution of the number of costae on the brachial valve of *Caucatorhynchia altaplecta* (BÖCKH, 1872). (The holotype has three costae.)

Genus *Piarorhynchella* DAGYS, 1974

Piarorhynchella trinodosi (BITTNER, 1890)

(Plate 3: figs 5-6; Figs 13-14)

1890 *Rhynchonella trinodosi* sp. n. — BITTNER: p. 13, pl. 32: figs 17-33.

1899 *Rhynchonella trinodosi* BITTNER. — BITTNER: p. 14, pl. 2: fig. 10.

?1933 *Rhynchonella trinodosi* BITTNER. — MILOSAVLJEVIĆ: p. 211, pl. 1: fig. 5.

1963 "*Rhynchonella*" *trinodosi* BITTNER — ASSERETO: p. 24, pl. 1: fig. 1.

1967 *Piarorhynchia?* *trinodosi* (BITTNER) — CASATI et GNACCOLINI: p. 123, pl. 9: figs 5-6.

1967 *Piarorhynchia?* *trinodosi* (BITTNER) — SPECIALE: p. 1085, pl. 79: figs 2-3.

1969 *Piarorhynchia trinodosi* (BITTNER) — GAETANI: p. 499, pl. 33: figs. 8-9, pl. 34: figs. 1-7. text-figs. 6-7.

1971 *Piarorhynchia trinodosi* (BITTNER) — SIBLIK: p. 173, pl. 20: figs 2-3.

1986 *Piarorhynchella trinodosi* (BITTNER) — KOCHANOVA et MICHALIK: p. 517, figs 5, 7-8.

Material: 28 specimens from the Forrás Hill near Felsőörs, most of them are silicified shells. 4 specimens from Köveskál, 2 of them are complete. 8 specimens from Aszófő, originating from the upper part of the sequence.

Dimensions: The following table presents the data of five characteristic specimens. (The abbreviations stand for the locality. 1 = Köveskál, 2 = Felsőörs.)

	1	1	2	2	2
Length	9.6	8.8	6.5	7.2	10.1
Width	9.7	8.1	5.8	7.1	10.8
Thickness	6.9	5.2	3.9	4.2	6.5

Description — External characters: Small to medium-sized shell, rounded subtrigonal in outline. Both valves are convex, though the pedicle one is slightly flatter. Maximum of width is located at the anterior margin, maximum thickness is at the anterior third. The divergence of the lateral margins forms an angle of 75-80°. The anterior commissure is uniplicate. The fold is wide, its height may vary. The posterior part of the valves is smooth, both the costation and the plication become apparent at half, or at the anterior third of the length. There are 2 or 3 costae in the dorsal fold, 1 or 2 costae in the ventral sinus and 2 or 3 costae on the lateral flanks. The profile of the costae and the intervals are trigonal, rounded at the beginning, but toward the anterior margin it becomes sharper and higher.



Fig. 12. Drawing from the anterior view of a specimen of *Holcorhynchella delicatula* (BITTNER, 1890) from Aszófő. Width 6.2 mm.

The beak is pronounced, erect. The pedicle opening is hypothyriddid, the deltidial plates are well developed.

Internal characters (Fig. 13): The sectioned specimen was too silicified to distinguish clearly all the fine details of the internal structure. However, some valuable observation could be made.

Pedicle valve: The delthyrial cavity is rounded, almost circular. The umbonal cavities were filled with silica, but the placement of the subparallel dental plates can be assumed. The hinge teeth are simple, no denticula were distinguished.

Brachial valve: The hinge plates are narrow, almost horizontal. The septalium is shallow, supported by a moderate dorsal median septum. The sockets are deep, bordered by marked inner and outer socket ridges. The crural bases are located in the middle of the hinge plates. The crura are of calcarifer type.

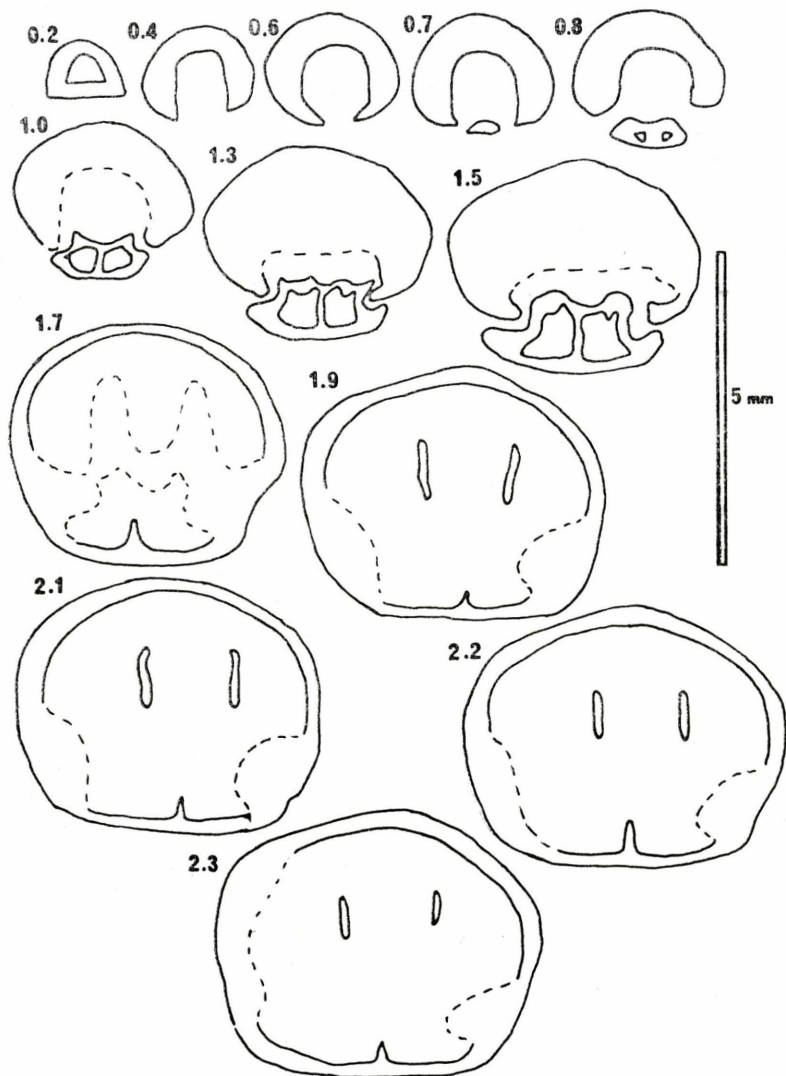


Fig. 13. *Piarorhynchella trinodosi* (BITTNER, 1890): a series of 13 transverse sections through the posterior part of a specimen from Felsöör. Original length 7.6 mm. The crura persisted to 2.6 mm from the posterior end of the shell. The internal part of the shell was partly silicified.



Fig. 14. Drawing of five specimens of *Piarorhynchella trinodosi* (BITTNER, 1890) to show the variation in the anterior commissure.

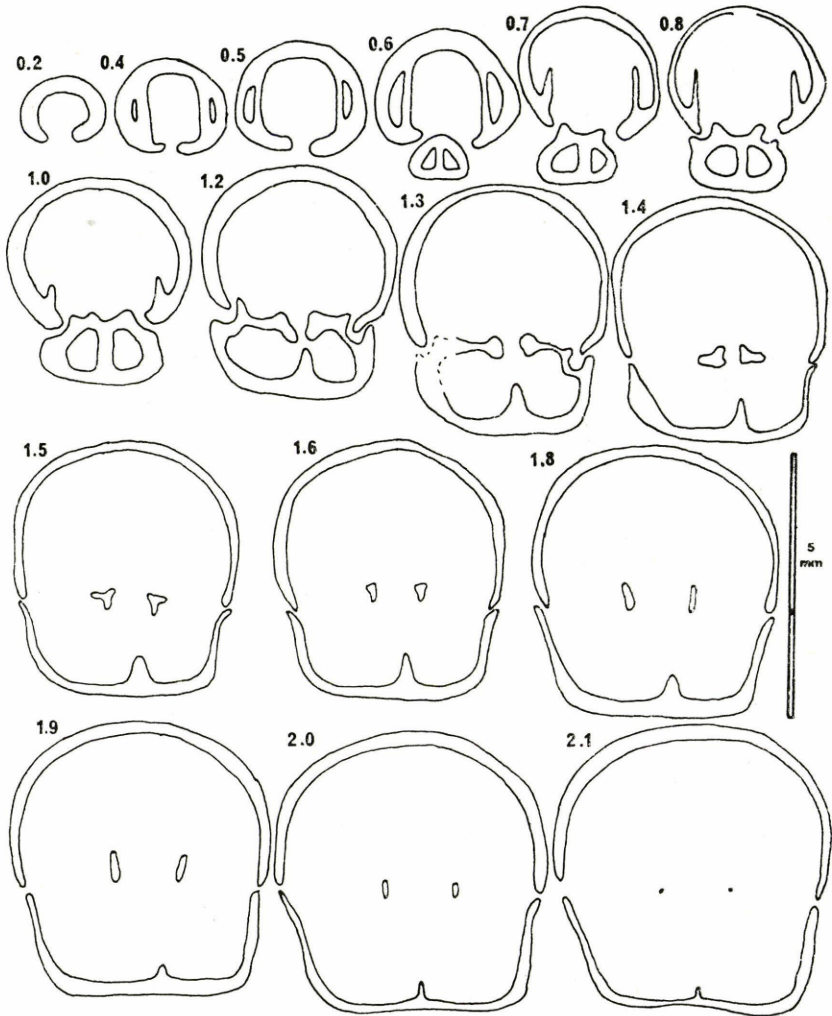


Fig. 15. *Trigonirhynchella attilina* (BITTNER, 1890): a series of 16 transverse sections through the posterior part of a specimen from Felsőörs. Original length 8.1 mm. The crura persisted to 2.2 mm from the posterior end of the shell.

Variability: The size, the costation and the height of the fold vary (Fig. 14). During growth first blunt costae occur which later get sharper along with the fold becoming higher. Due to this ontogenetic development, most of the specimens from Felsőörs are considered to be immature.

Remarks — Among the modern authors GAETANI (1969) provided the most detailed description of the species with rich illustration, including several serial transverse sections. His material from Lombardia also shows great morphological variability. In GAETANI's collection even the extremely folded "cynocephalous" forms occur as well. GAETANI pointed out that ontogeny is the most probable cause for these morphological variations.

Distribution: GAETANI (1969) observed the stratigraphical range of this species to be confined to the Trinodosus Zone. In SIBLIK's (1971a) opinion the species is most abundant in the Illyrian substage, but he mentioned its occurrence in Pelsonian faunas as well. In the Balaton Highland *Piarorhynchella trinodosi* occurs at the higher level of the Balatonicus Zone (in the Aszófő sequence), it is more abundant in Felsőörs in the uppermost part of the Pelsonian and is also recorded from the Illyrian strata. — Geographically the species was also reported from the Southern Alps, Eastern Alps, the West Carpathians and the Himalaya.

Family Wellerellidae LIKHAREW, 1956

Genus *Trigonirhynchella* DAGYS, 1963

Trigonirhynchella attilina (BITTNER, 1890)
(Plate 2: fig. 5, Plate 3: fig. 7; Fig. 15)

- 1890 *Rhynchonella Attilina* sp. n. — BITTNER: p. 16, pl. 37: fig. 1-8.
1933 *Rhynchonella Attilina* BITTN. — MILOSAVLJEVIĆ: p. 210, pl. 1: fig. 9.
1971 "*Rhynchonella*" *attilina* BITTNER — SIBLIK: p. 178, pl. 20: fig. 1, Fig. 13.
1972 "*Rhynchonella*" *attilina* BITTNER — SCHOLZ: pl. 8. fig. 9.

Material: 329 specimens from the Forrás Hill near Felsőörs, mostly well-preserved, but usually silicified shells. Two specimens from Aszófő.

Dimensions: The data measured of the largest specimen are the following: length = 9 mm width = 7 mm, thickness = 6 mm. The average is approximately L = 8, W = 6 and Th = 4,5 in mm. There is very little variation in size.

Description — External characters: Small-sized shell, subtrigonal in outline. The anterior margin is almost semicircular. The postero-lateral margins are straight or slightly convex, they meet each other at an angle of 45-50°. Both valves are equally convex, in some cases the shell has a globose appearance. Maximum width and thickness are reached at the middle of the valves..

The posterior part of the lateral commissure is straight, it divides a faintly developed planarea into two equal parts. The anterior commissure is rectimarginate, no fold or sinus can be observed, but it has zig-zag deflexions due to the costation. The number of costae is 6 to 9. The costae occur at about the mind-length and become stronger toward the anterior margin. Their profile is rounded, the width of the costae and the intervals are equal. The posterior part of the shell is smooth. The beak is small and erect. The pedicle opening is submesothyridid.

Internal characters (Fig. 15): Pedicle valve: the delthyrial cavity is subquadrate between well developed, almost parallel dental plates. The dental plates are widely set and ventrally shorter, than dorsally. The umbonal cavities are narrow and elongated. No pedicle collar has been observed. The teeth are of medium size, deeply inserted in the brachial valve only in the plane of articulation. Denticula have not been perceptible.

Brachial valve: The hinge plates are horizontal. The inner socket ridge as well as the crural bases are strong. The dorsal median septum is short, reduced. The crura are of prefalcifer type.

Remarks — The type-locality of this species is Felsőörs, where it is one of the most prevalent members of the brachiopod assemblage. Previously "*Rhynchonella*" *attilina* was not associated with any modern genus. The study of the internal characters by serial

sectioning gave evidences for its belonging to the family *Wellerellidae* (and to the Mesozoic subfamily *Cirpinae* within it, in the sense of AGER 1965), based on the precalcifer type of the crura and the short dorsal median septum. The triangular outline, the smooth posterior half of the shell and the rounded, gradually developing costation on the anterior half are the characteristic external features of the genus *Trigonirhynchella*. Earlier it was recorded only from the Upper Triassic. The present species shows only slight differences compared with the diagnostic internal characters of *Trigonirhynchella*. They are the subparallel dental plates instead of strongly divergent ones of the type species *Trigonirhynchella trigona* (DAGYS, 1961), and a less reduced dorsal median septum. However, a comprehensive study allows us to attribute the *atitlina* to the *Trigonirhynchella* genus.

Distribution: Beside the type-locality, the species was reported from the Dinarids and the West Carpathians. Stratigraphically it occurs in the Pelsonian as well as in the Illyrian.

* * *

Acknowledgement The author is especially indebted to A. VÖRÖS for his continuous encouragement, help and advice. Sincere thanks are due to A. GALÁCZ, who supervised the thesis work which formed the basis of the present paper.

References

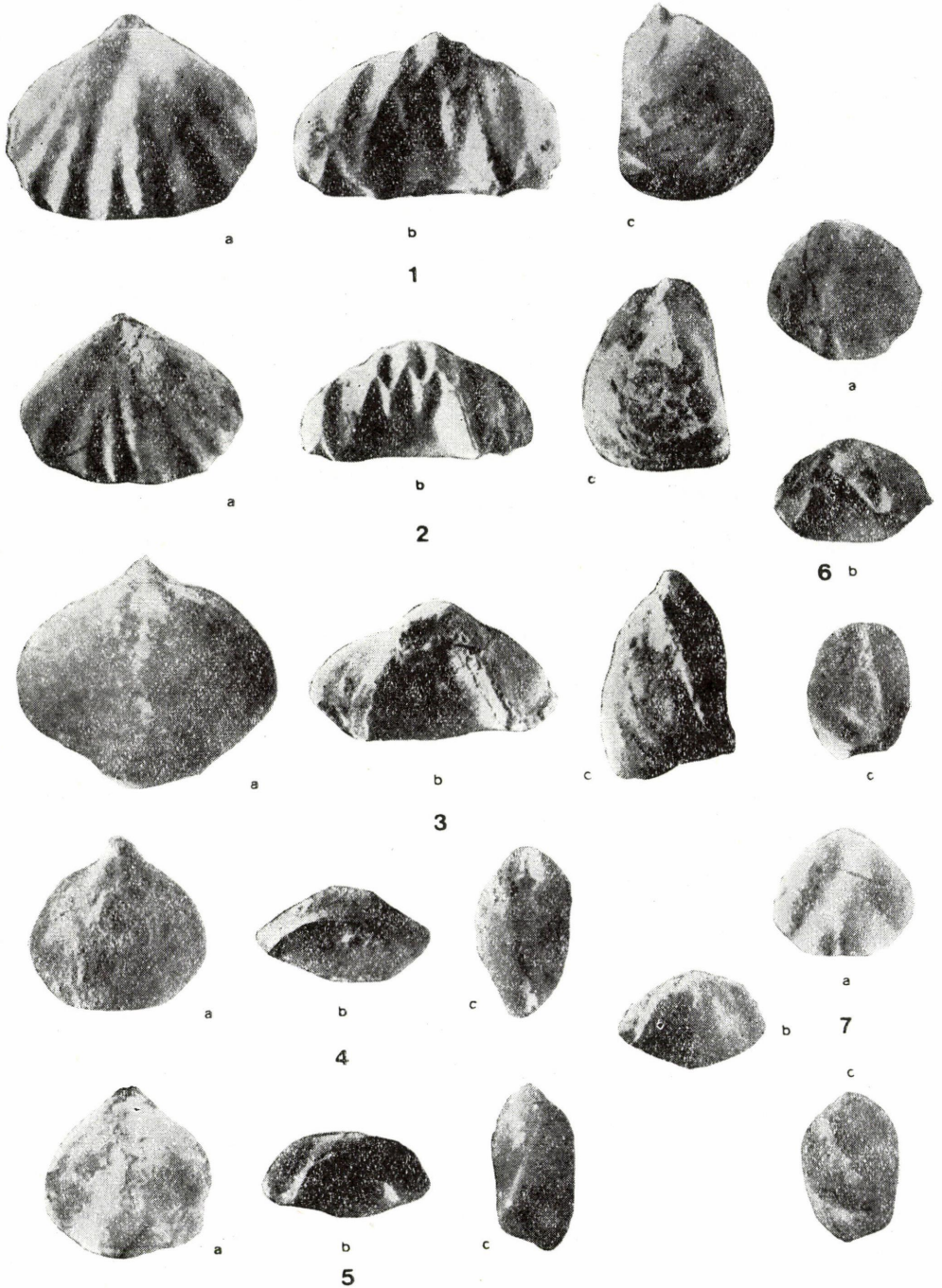
- AGER, D. V. (1965): Mesozoic and Cenozoic Rhynchonellacea. — In: MOORE, R. C. (ed.): Treatise on Invertebrate Paleontology. Part H.: Brachiopoda.: H597–H625.
- ARTHABER, G. (1906): Die alpine Trias des Mediterrangebietes — In FRECH, F. (ed.): Lethaea geognostica. Part 2.: Mesozoicum.: 223–472.
- ASSERETO, R. (1963): Fossili dell'Anisico superiore della Val Camonica. — *Riv. ital. Paleont. Stratigr.* **69**(1): 3–123.
- ASSMANN, P. (1937): Revision der Fauna der Wirbellosen der oberschlesischen Trias. — *Abh. preus. geol. Landesanst.* **170**: 1–134.
- BESIĆ, Z. (1949): La faune a Brachiopodes du Trias aux environs du village Seljani dans la Piva (Montenegro). — *Ann. geol. Penins. Balkan.* **17**: 105–122.
- BITTNER, A. (1890): Brachiopoden der alpinen Trias. — *Abh. geol. Reichsanst.* **14**: 1–325.
- BITTNER, A. (1899): Trias Brachiopoda and Lamellibranchiata in Himalayan Fossils. — *Mem. geol. Surv. India Paleont. indica ser.* **15**. **3**(2): 1–143.
- BITTNER, A. (1902): Brachiopoden und Lamellibranchiaten aus der Trias von Bosnien, Dalmatien und Venetien. — *Jb. geol. Reichsanst.* **52**: 495–643.
- BITTNER, A. (1912): Brachiopoden aus der Trias des Bakonyer Waldes. — *Res. wiss. Erforsch. Balatonsee, Paläontologie* **2**(1): 1–58.
- BÖCKH, J. (1872): A Bakony D-i részének földtani viszonyai. [Geological setting of the Southern part of the Bakony Mts.] — *Jb. ung. geol. Reichanst.* **2**(2): 65–173. (in Hungarian.)
- BÖCKH, J. (1873): Die geologischen Verhältnisse des südlichen Theiles des Bakony. I. Theil. — *Jb. ung. geol. Anst.* **2**(2): 25–182.
- CASATI, P. & GNACCOLINI, M. (1967): Geologie delle Alpi Orobie occidentali. — *Riv. ital. Paleont. Stratigr.* **73**(1): 25–162.
- DAGYS, A. S. (1974): Triassic brachiopods (Morphology, classification, phylogeny, stratigraphical significance and biogeography). — Novosibirsk: 1–385 (In Russian).
- DAGYS, A. S. (1977): New name for a Triassic rhynchonellid genus. — *Paleont. Zh.* **3**: 139 (In Russian).
- DE TONI, A. (1912): Brachiopodi della zona a Certatites trinodosus di Monte Rite in Cadore. — *Mem. Ist. geol. miner. Univ. Padova* **1**: 319–351.
- DETRE, CS. (1970): The distribution of the brachiopods in the Triassic time — *Ősl. Viták* **15**: 47–67 (In Hungarian with English abstract).
- DIENER, C. (1920): Brachiopoda Triadica. — *Fossilium Catalogus I. Animalia* **10**: 1–108.
- FRECH, F. (1912): Neue Zweischaler und Brachiopoden aus Bakonyer Trias. — *Res. wiss. Erforsch. Balatonsee, Paläontologie* **2**(2): 1–140.
- GAETANI, M. (1966): Decurtella, nuovo genere triassico di Rhynchonellida. — *Riv. ital. Paleont. Stratigr.* **72**(2): 343–356.

- GAETANI, M. (1969): Osservazioni paleontologiche e stratigraphiche sull'Anisico delle Guidicarie (Trento). — *Riv. ital. Paleont. Stratigr.* **75**(3): 649–546.
- KOCHANOVA, M., MELLO, J. & SIBLIK, M. (1975): Fossilien aus dem Wettersteinkalke des Slowakische Karstes. — *Geol. Pr. Zprávy* **63**: 55–66 (In Czech with German abstract).
- KOCHANOVA, M. & MICHALIK, J. (1986): Stratigraphy and macrofauna of the Zámotie Limestones (Upper Pelsonian-Lower Illyrian) of the Choc Nappe at the southern slopes of the Nizke Tatry Mts. (West Carpathians). — *Geol. Sb.—Geol. Carpathica* **37**(4): 501–531.
- LEIN, R. & SIBLIK, M. (1978): A brachiopod fauna from the Spielkogel (Muerztaler Alpen, Styria): New data concerning the stratigraphic emplacement of *Tetractinella* (?) *dyactis* (BITTNER). — *Mitt. Ges. Geol. Bergbaustud.* **25**: 205–221.
- MILOSAVLJEVIĆ, M. (1933): Le Trias moyen de la montagne Jadovnik. — *Ann. geol. Penins. Balkan.* **11**(2): 206–213 (In Serbian with French abstract).
- MILOSAVLJEVIĆ, M. (1935): Le Trias moyen du Plateau Zare. — *Ann. geol. Penins. Balkan.*, **12**(2): 270–274 (In Serbian with French abstract).
- PÁLFY, J. (1986): Investigations on Middle Triassic brachiopod faunas from the Balaton Highland (Transdanubian Central Range, Hungary). — *Ósl. Viták* **33**: 3–52. (In Hungarian with English abstract.)
- PANTIĆ, S. (1958): Brachiopodenfauna aus dem Bjelasica-Gebirge (Montenegro). — *Bull. Serv. geol. geophys. serb.* **16**: 57–79 (In Serbian with German abstract).
- QUENSTEDT, F. A. (1871): Petrefaktenkunde Deutschlands. Part. 2.: Die Brachiopoden. — Leipzig: 1–748.
- SALOMON, W. (1895): Geologische und paleontologische Studien über die Marmolata. — *Paleontographica* **42**: 1–210.
- SCHOLZ, G. (1972): An Anisian Wetterstein Limestone reef in North Hungary. — *Acta miner. petrogr. Univ. Szeged* **20**(2): 337–362.
- SIBLIK, M. (1971a): Anisian Rhynchonellids from the Slovak Kars Region. — *Geol. Pr. Zprávy* **56**: 163–184 (In Czech, with English abstract).
- SIBLIK, M. (1971b): New Anisian Rhynchonellid from Slovakia. — *Geol. Sb.—Geol. Carpathica* **22**(1): 159–167.
- SIBLIK, M. (1983): Triassic brachiopods of the Northern Alps and their generic attributions. — *Schriftenr. erdwiss. Komm. österr. Akad. Wiss.* **5**: 277–286.
- SMITH, J. P. (1914): The Middle Triassic marine invertebrate faunas of North America. — *Prof. Pap. U.S. geol. Surv.*, **83**: 1–254.
- SPECIALE, A. (1967): Fossili del Trias medio delle valli Trompia e Sabbia. — *Riv. ital. Paleont. Stratigr.* **73**(4): 1055–1140.
- SZABÓ, I., KOVÁCS, S. LELKES, GY. & ORAVECZ-SCHEFFER, A. (1980): Stratigraphic investigation of a Pelsonian-Fassanian section at Felsőörs (Balaton Highland, Hungary). — *Riv. ital. Paleont. Stratigr.* **85**(3–4): 789–806.
- VÖRÖS, A. (1987): Preliminary results from the Aszófő section (Middle Triassic, Balaton area, Hungary): a proposal for a new Anisian ammonoid subzonal scheme. — *Fragm. miner. paleont.* **13**: 53–64.
- ZEPHAROVICH, R. (1856): Die Halbinsel Tihany in Plattensee und die nächste Umgebung von Füred. — *Sber. Akad. Wiss. Wien* **19**(2): 339–373.

Author's address: JÓZSEF PÁLFY

Geological and Paleontological Department
Hungarian Natural History Museum
H-1370 Budapest 5, Pf. 330
Hungary

Plate I



Figs 1-2. *Volirhynchia tommasi* (BITTNER): 1 = Aszófő, x1.5, 2 = Köveskál, x1.5 — Figs 3-4. *Volirhynchia projectifrons* (BITTNER): 3 = Aszófő, x1.5, 4 = Felsőörs, x1.5 — Figs 5-7. *Volirhynchia projectifrons* (BITTNER): Aszófő, x1.7, x1.5 and x1.7. — a = dorsal view, b = anterior view (brachial valve uppermost), c = lateral view.

Plate 2

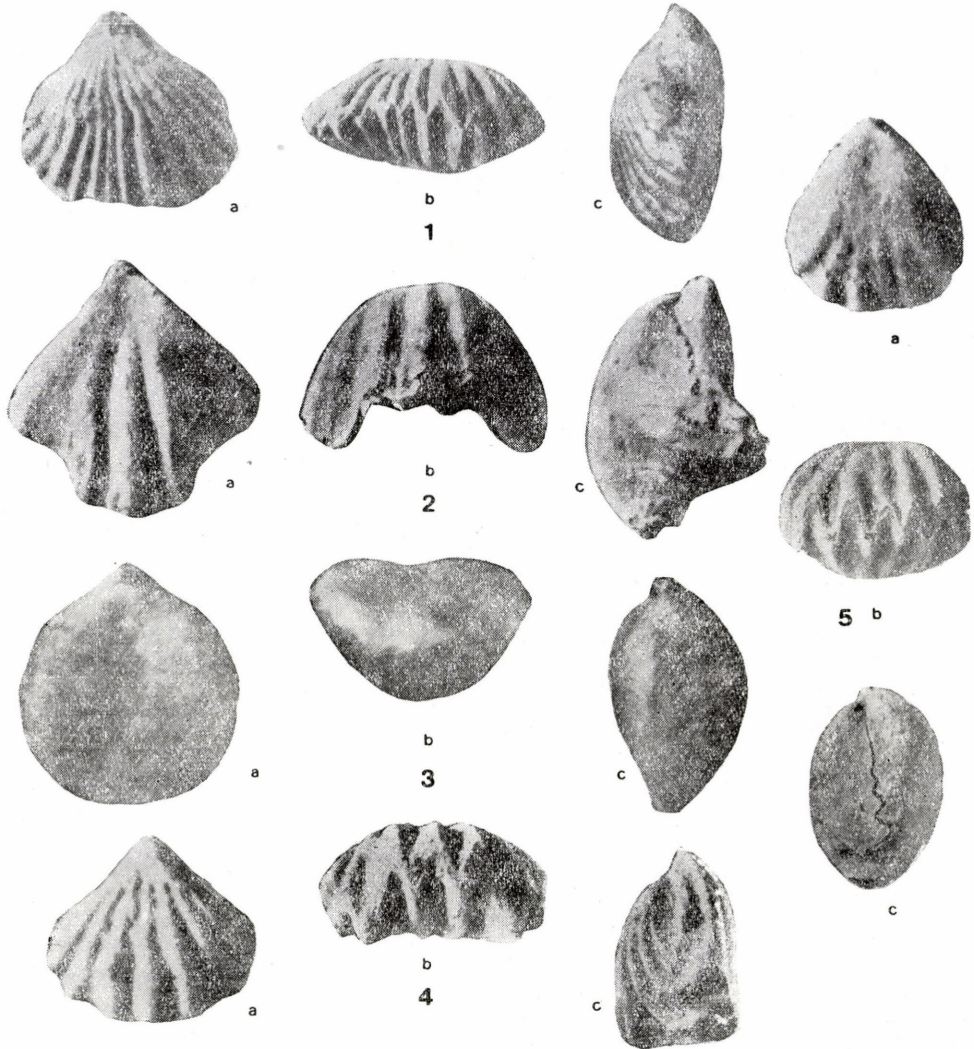
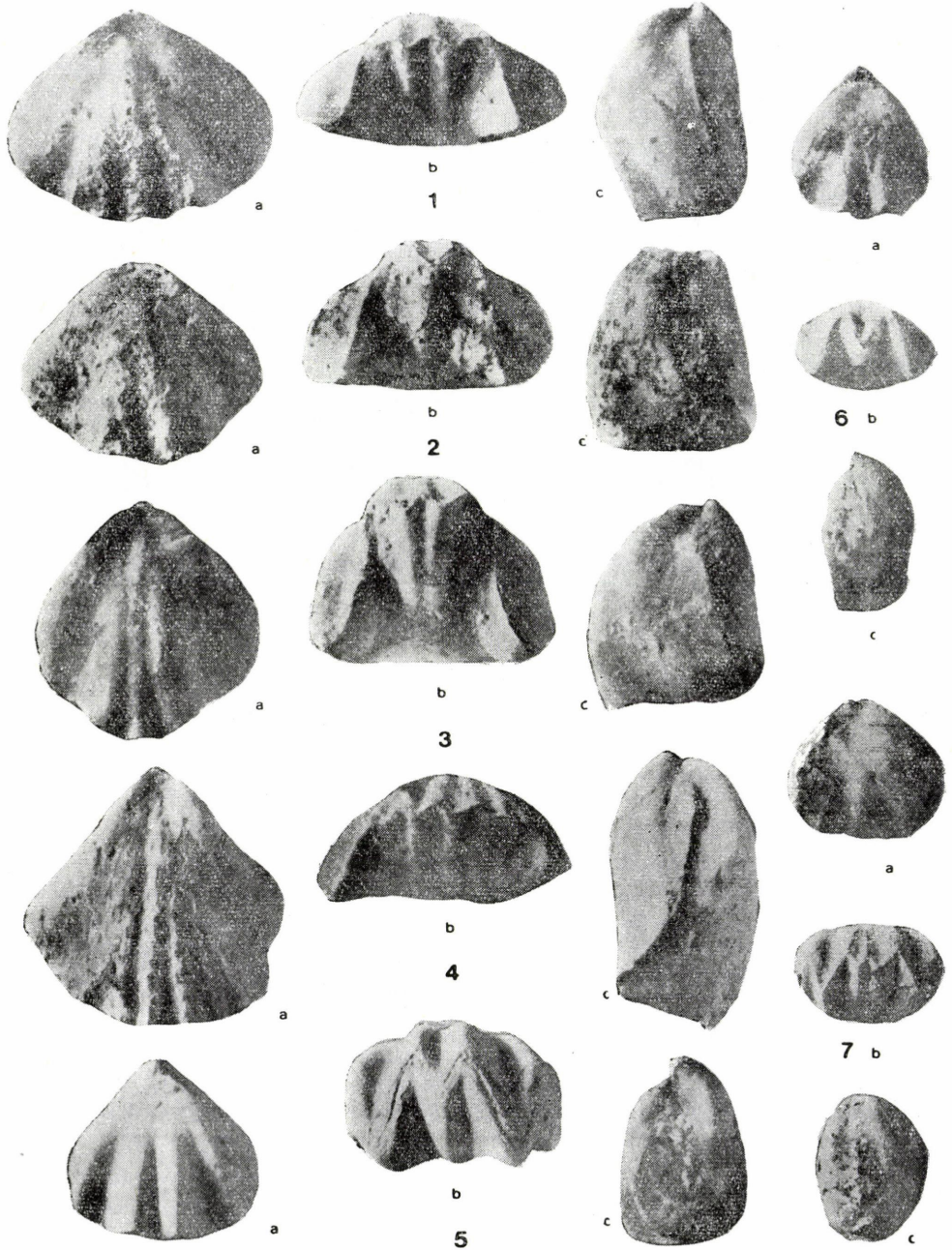


Fig. 1. *Costirhynchopsis mentzeli* (BUCH): Aszófő, x3 — Fig. 2. *Volirhynchia vivida* (BITTNER): Felsőörs, x2 — Fig. 3. *Holcorhynchella delicatula* (BITTNER): Aszófő, x3 — Fig. 4. *Decurtella decurtata* (GIRARD): Felsőörs, x2 — Fig. 5. *Trigonirhynchella attilina* (BITTNER): Felsőörs, x2. — a = dorsal view, b = anterior view (brachial valve uppermost), c = lateral view.

Plate 3



Figs 1-4. *Caucosorhynchia altaplecta* (Böckh): Felsőörs, x2 — Figs 5-6. *Piarorhynchella trinodosi* (BITTNER): 5 = Köveskál, x2, 6 = Felsőörs, x2 — Fig. 7. *Trigonirhynchella atilina* (BITTNER): Aszófő, x2. — a = dorsal view, b = anterior view (brachial valve uppermost), c = lateral view.