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ATTILA VÖRÖS

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BUDAPEST, 2018

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On the front cover:
Epikellnerites vaszolyensis n. sp. - holotype in lateral and ventral views (Vászoly, Trench P-11/c, Reitzi Zone)

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Contents

Introduction

One of the most important peaks of diversity in the history of the Triassic ammonoids is recorded in the Late Anisian (TOZER 1981, BRAYARD et al. 2009) and this diversity bloom is especially remarkable in the Alpine–Mediterranean region (VÖRÖS 2014). It was obviously not by pure chance that the Anisian/Ladinian boundary was aimed to be drawn within this stratigraphical interval of the extremely rich ammonoid faunas, and that it was attempted powerfully from the time of MOJSISOVICS (1882) and BITTNER (1892) to the recent (BRACK et al. 2003, MIETTO et al. 2003a, VÖRÖS et al. 2003b).

The continuous international attention forced us to increase our efforts to collect more and more ammonoids from measured sections of the Balaton Highland what has been a key region of Middle Triassic ammonoid stratigraphy since the time of BÖCKH (1872, 1873a, 1874) and MOJSISOVICS (1882). The first extensive excavations and voluminous collections, conducted by our late colleague Imre SZABÓ in the 1960's, resulted in a mass of ammonoids but without strict stratigraphical dating. From the 1980's the Geological Institute of Hungary performed a detailed geological mapping of the Balaton Highland (BUDAI et al. 1999) and some adjoining parts of the Southern and Eastern Bakony Mts (BUDAI et al. 2001a, b). This activity was accompanied by systematic, bed-by-bed collection of fossils all over this wider area.

In the last decades of the last century, dozens of artificial trenches were excavated on the vegetation- and soil-covered hillsides and plateaus of that area, and bed-by-bed collection of fossils was made by well-trained teams, involving palaeontologists. Great amount of new stratigraphical data from the Balaton Highland appeared in important contributions on the Lower Triassic (BROGLIO LORIGA et al. 1990) and in a monograph with re-definition of the Pelsonian Substage (VÖRÖS et al. 2003a). As the result of geological mapping and detailed stratigraphic logs in sections we outlined the Triassic palaeogeography and evolution of the Balaton Highland (BUDAI & VÖRÖS 1992, 1993, 2007; BUDAI & HAAS 1997; HAAS & BUDAI 1995; VÖRÖS et al. 1997). The palaeoecological, and palaeobiogeographical aspects of the diverse ammonoid fauna were also published (VÖRÖS 1992, 1996, 2001, 2002) and some general aspects of extinctions and diversity changes of the Triassic Ammonoidea were also discussed (VÖRÖS 2010b, 2014), always with regard to the Balaton Highland fauna.

However, the centre of attention remained at the ammonoids of the Upper Anisian formations, including the "*Trachyceras Reitzi* horizon" whose stratigraphical importance and curious ammonoids have been famous since the magnificent pioneering works by BÖCKH (1873a) and MOJSISOVICS (1882). The last decades saw the "Quest for the Golden Spike", intended to designate the GSSP (Global Stratotype Section and Point) of the Ladinian Stage. Due to the traditions and the excellent new results at the Balaton Highland, we believed our region (namely the Felsőörs section) as a strong candidate for the Ladinian GSSP. In spite of our best efforts (SZABÓ et al. 1980; VÖRÖS & PÁLFY 1989; KOVÁCS et al. 1990; VÖRÖS 1993, 1995; VÖRÖS et al. 1996, 2003b; MÁRTON et al. 1998; PÁLFY et al. 2003), after repeated international ballots, the GSSP of the Ladinian Stage was defined elsewhere. Nevertheless, the two decades resurgence in the fieldwork and in the labs resulted in thousands of ammonoid specimens collected from well-dated Triassic sections of the Balaton Highland. The especially diverse Anisian and Ladinian ammonoid faunas were illustrated in a comprehensive volume (VÖRÖS 1998) published in Hungarian language. The detailed and illustrated monographic description of the Middle Anisian (Pelsonian) fauna was published soon after (VÖRÖS 2003). Due to its very high diversity, classical reputation and prime importance in stratigraphy, the Upper Anisian ammonoid fauna of the Balaton Highland, with the focus on faunas of the "*Trachyceras Reitzi* horizon", was considered a highly valuable subject which deserves a full palaeontological documentation. The present volume is dedicated to the systematic description of this extremely diverse fauna. The systematic description is accompanied with an introduction to the Middle Triassic stratigraphy of the area, and short discussions and evaluations of diverse aspects of the ammonoid fauna.

Acknowledgements

First of all, I want to express my deepest and most sincere thanks to Prof. Tamás BUDAI who was my relentless companion in the fieldworks at the Balaton Highland and abroad, supported me in collecting fossils, in improving the Triassic stratigraphy of the region and in writing co-authored papers. This monograph would not be born without him.

Thanks are due to Prof. Géza CSÁSZÁR, former department leader of the Geological Institute of Hungary, who, in the early 1980's, insistently encouraged and helped me to undertake the task of Triassic ammonoid research on the Balaton Highland. He supported the voluminous collecting work in the artificial trenches of the area, and the study of the ammonoids providing the basis of the present monograph.

I am thankful to Profs. T. TOZER (†), H. RIEBER, P. BRACK, F. TATZREITER, M. BALINI, P. MIETTO, and S. MANFRIN for the valuable discussions on Triassic ammonoid taxonomy and stratigraphy. The useful field-trips to some important Alpine Triassic ammonoid localities, led by W. SCHATZ, F. TATZREITER, M. BALINI, V. DE ZANCHE (†) and P. GIANOLLA are also sincerely acknowledged.

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The ammonoid photographs have been taken by E. HANKÓ, M. BOSNAKOFF and A. VIRÁG, and additionally by Z. LANTOS and I. SZENTE; their efforts are deeply acknowledged. Part of the computer graphic work was done by P. KŐBÁNYAI.

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Essential technical help was given by the Mining and Geological Survey of Hungary whose kind permission for publishing this monograph as a volume of the Geologica Hungarica series Palaeontologica is much appreciated. Special thanks are due to O. PIROS for the careful editing.

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Previous research

The first, doubtful report on probably Late Anisian ammonoids from the Balaton Highland is due to the Hungarian Benedictine monk, F. RÓMER (1860), in his book devoted to the archaeological finds of the Bakony region. When travelling from Vásony (= Nagyvázsony) to Mencsel (= Mencshely), he collected "numerous, mainly small, intact ammonites from the boulders of the Cserjés-hegy" (RÓMER 1860, p. 180). ["Cserjés-hegy", in present usage corresponds to the place Cser Hill near Mencshely, what is one of our most important localities of Late Anisian ammonoids.]

The next, also doubtful, report on an Upper Anisian ammonoid is connected to HAUER (1861) who noted that J. KOVÁTS collected "*Ceratites binodosus* Hau." near Nagyvázsony. This specimen was not found in the old collections in Budapest, and the species was not listed later by LÓCZY (1916, p. 116) from KOVÁTS' locality (Alsócsepel-Kiserdőhegy, near Barnag). [New collections at the locality (nowadays called Vöröstó, Akol Hill) restricted the age of the exposed strata to the upper part of the Trinodosus Zone; the alleged "*Ceratites binodosus*" specimen would probably correspond to *Lardaroceras barrandei*.]

Ten years later, the detailed geological mapping of the Southern Bakony (including the Balaton Highland) by J. BÖCKH, brought about the superb ammonoids which could be regarded as definitely Upper Anisian, according to our present usage. In 1870, near Felsőörs, J. BÖCKH discovered the "yellow, siliceous limestones of Forráshegy" with a plenty of peculiar ammonoids. The fossils, as loose siliceous nodules, were weathered out from a tuffaceous rock on the grassy hillside. On the request of J. BÖCKH, in order to reveal the bedding sequence, L. ROTH carried out excavations and systematically collected ammonoids in 1871. In the same year he gave the first meaningful palaeontological descriptions of two new ammonoid species: "*Ceratites*" *boeckhi* and "*C.*" *mojsisovicsi*, regrettably only in Hungarian, and without illustration (ROTH 1871). Most of the newly collected ammonoids, besides some brachiopods, were soon described and illustrated in the volumes of the substantial monograph by BÖCKH (1872, 1873a, 1874). The new nominal ammonoid species, recorded from the "Kalk mit *Ceratites Reitzi*", were the following:

"*Ceratites*" *zalaensis* (="*C.*" *mojsisovicsi* ROTH, 1871)
"*Ceratites*" *reitzi*
"*Arcestes*" *angustoumbilicatus*
"*Arcestes*" *batyolcus*
"*Ammonites (Sageceras)*" *zsigmondyi*

(The above listed species were found in the course of the recent collections, except "*Arcestes*" *batyolcus.* The original specimen was examined in the collections of the Mining and Geological Survey of Hungary and, according to the rock matrix, it does not belong to the "Reitzi beds" [=Vászoly Formation] but must came from the overlying "Nemesvámos Limestone" [Buchenstein Formation] of Ladinian age.)

Further digging and bed-by bed collections at Felsőörs were done by J. STÜRZENBAUM in 1874, who described an additional new ammonoid species, namely "*Ceratites*" *felsoeoersensis* (STÜRZENBAUM 1875). (It turned out so early, that at the vegetation- and soil-covered plateaus of the Balaton Highland, significant biostratigraphical results can not be achieved without excavation of artificial trenches.)

The peculiar ammonoids of Felsőörs roused the interest of the international scientific community, and the whole fauna was revised and included to the magnificent monograph of MOJSISOVICS (1882) who defined his "Zone des *Trachyceras Reitzi*" partly by the ammonite finds at Felsőörs. MOJSISOVICS (1882) described and re-figured all ammonoids introduced previously by ROTH (1871), BÖCKH (1872, 1873a, 1874) and STÜRZENBAUM (1875) from Felsőörs, and considerably complemented the fauna of the "Reitzi beds" with the following, newly collected elements:

"*Ceratites*" *hungaricus*
"*Arpadites (Ceratites)*" *liepoldti*
"*Ceratites*" *hantkeni*
"*Ceratites*" *zezianus* (~ "*Trachyceras*" *chiesense* MOJSISOVICS, 1882)
Hungarites costosus
Joannites trilabiatus

(These species were found also in the course of the recent collections, except *Joannites trilabiatus.* The original specimen was examined in the collections of the Mining and Geological Survey of Hungary and, according to the rock matrix, it does not belong to the "Reitzi beds" [=Vászoly Formation] but must came from the overlying "Nemesvámos Limestone" [Buchenstein Formation] of Ladinian age.)

Furthermore, MOJSISOVICS (1882) described several ammonoid species from Felsőörs, from the deeper part of the section, belonging to the Trinodosus Zone: "*Ceratites*" *rothi,* "*C.*" *cordevolicus,* "*C.*" *aviticus,* moreover "*C.*" *trinodosus,* "*C.*" *subnodosus* and "*C.*" *barrandei* from other, only partly defined localities of the Balaton Highland.

Up to the end of the 19th century, the knowledge of the Upper Anisian ammonoids of the Balaton Highland was restricted principally to Felsőörs.

New fossil collections were carried out in the course of the ambitious international project entitled "Wissenschaftliche Erforschung des Balatonsees" (Scientific Research of the Lake Balaton) led and supervised by L. LÓCZY at the turn of the twentieth century. The Scholae Piae monk and teacher D. LACZKÓ, who was one of the most talented field geologists and productive fossil hunters of those times, gave an important stratigraphical contribution as well (LACZKÓ 1911). Ammonoids were collected by him from diverse, mainly Upper Anisian, localities along the Balaton Highland, and the collected ammonoids were identified and described by outstanding European specialists.

DIENER (1899, 1900) listed and partly described dozens of Upper Anisian ammonoids from Köveskál, Mencshely, Vöröstó, Barnag, Nemesvámos, Balatonfüred, Felsőörs and Hajmáskér. This fauna was complemented and taxonomically revised by ARTHABER (1903). The localities of Mencshely and especially of Hajmáskér yielded the most important new elements for the Upper Anisian ammonoid fauna of the Balaton Highland. The complete list, considering ARTHABER's revision is the following:

"*Norites*" *dieneri* ARTHABER
"*Hungarites*" *arthaberi* DIENER
"*Hungarites*" *emiliae* MOJSISOVICS
"*Hungarites*" *bocsarensis* ARTHABER
"*Ceratites*" *perauritus* DIENER
"*Ceratites*" *conspicuus* DIENER
"*Ceratites*" *ecarinatus* HAUER
"*Ceratites*" *loczyi* ARTHABER
"*Dinarites*" *laczkoi* ARTHABER

The contribution by FRECH (1903) was restricted to Felsőörs, from where he recorded "*Ptychites*" *acutus* Mojsisovics and "*Hungarites arietiformis*" Hauer, and described and figured the following new species:

"*Ptychites (Beyrichites)*" *loczyi* (~ *Hungarites* sp.)
"*Balatonites*" *margaritatus*
"*Trachyceras*" *cholnokyi*
Lecanites sibyllinus (~ *Lecanites misanii* [MOJSISOVICS, 1882])

(The above mentioned species were found also in the course of the recent collections, except "*Balatonites*" *margaritatus*. The original specimen was examined in the collections of the Mining and Geological Survey of Hungary and, according to the rock matrix, "*Balatonites*" *margaritatus* might not come from the "Reitzi beds" [=Vászoly Formation]. It is a true *Balatonites* (close to the "*egregius* group") and it seems that it was derived from a quite another locality, from the deeper part of the Felsőörs Limestone of Pelsonian age.)

In the closing volume of the "Balaton Monograph", LÓCZY (1913, 1916) summarized the palaeontological results and gave lists of the ammonoid taxa determined by the above mentioned authors. Most of the listed Upper Anisian ammonoids (including MOJSISOVICS' originals) have been kept in the collections of the Geological Institute of Hungary (now Mining and Geological Survey of Hungary, Budapest).

After several decades, important excavations have been established at the Balaton Highland. The new geological mapping project by the Geological Institute of Hungary resulted in significant improvements in the knowledge of Middle Triassic ammonoids of the Balaton Highland. In the early 1980's, field work done by I. SZABÓ and T. BUDAI (and many others) stimulated new, systematic collections of fossils. The excavation and bed-by-bed collection of several key sections were carried out under the supervision of the present author and yielded several thousand ammonoid specimens. The international quest for the Ladinian GSSP invoked the modern re-evaluation of the Middle Triassic ammonoid biostratigraphy of the Balaton Highland (SZABÓ et al. 1980; VÖRÖS & PÁLFY 1989; KOVÁCS et al. 1990; VÖRÖS 1993, 1995). The region (namely the

Felsőörs section) was a strong candidate for the Ladinian GSSP, supported not only by biostratigraphy but also by magnetostratigraphy and geochronology (Vörös et al. 1996, 2003b; Márton et al. 1998; Pálfy et al. 2003). The especially diverse Anisian and Ladinian ammonoid faunas of the Balaton Highland were illustrated in a comprehensive volume (Vörös 1998). The re-evaluation of the Felsőörs section and the short description of some new ammonoid finds were published by Vörös et al. (2009, 2015). All the Upper Anisian ammonoids, collected in the last decades from the Balaton Highland, are aimed to be taxonomically revised and describe and illustrated in the present monograph.

Upper Anisian stratigraphy of the Balaton Highland

The geographical scope of this study goes beyond the Balaton Highland and covers some adjoining parts of the Southern and Eastern Bakony Mts. (Figure 1). However, the focus remains at the Balaton Highland, therefore, in the present monograph, this geographical term will be used for the whole above-mentioned, wider area of investigation.

From stratigraphical point of view the subject matter is restricted to the Upper Anisian (Illyrian) Substage, including the Trinodosus, Reitzi and Secedensis zones, as they were used by VÖRÖS (2014) (Table 1).

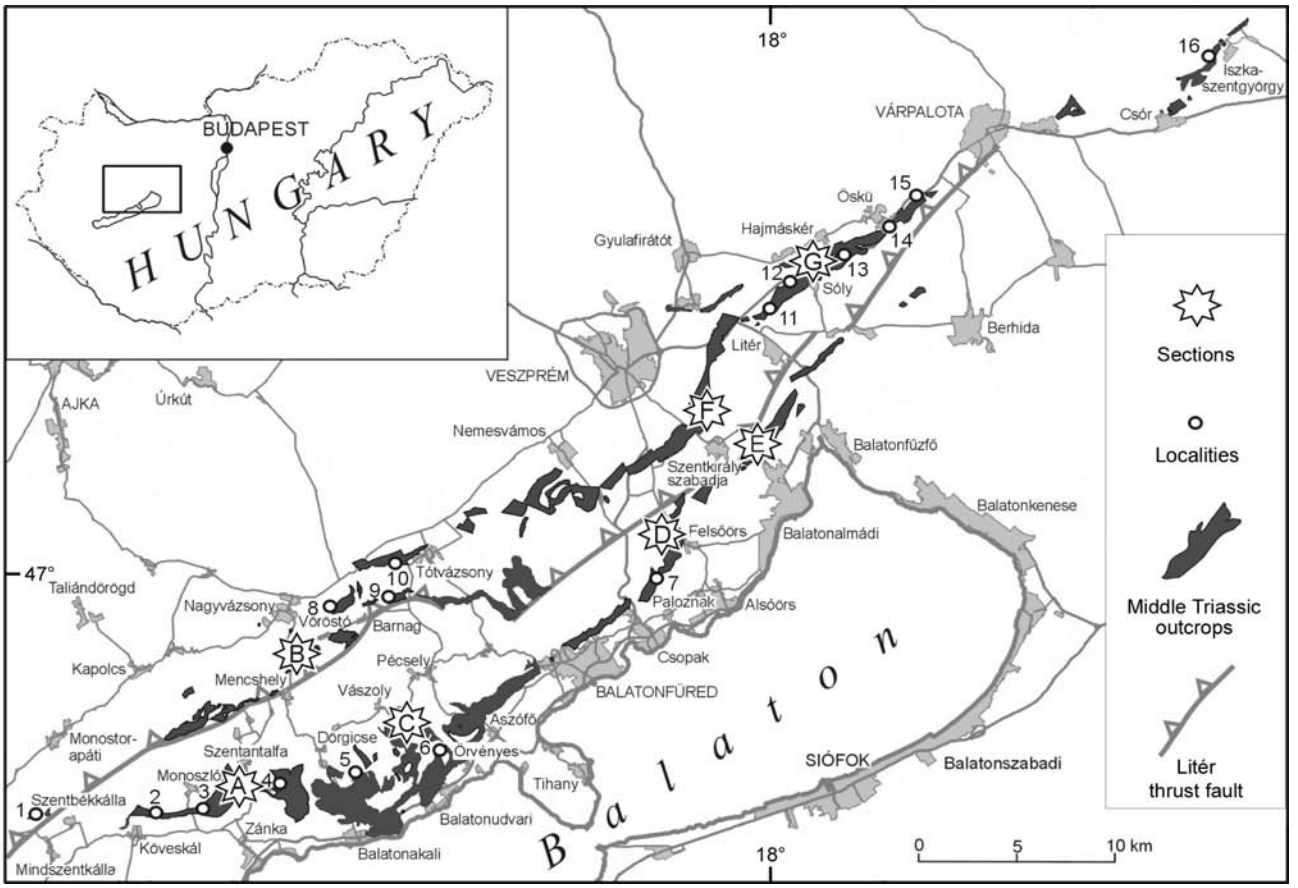


Figure 1. Situation map showing the most important measured and bed-by-bed collected sections and other localities of the Balaton Highland and the Eastern Bakony Mountains yielding Upper Anisian ammonoids (compiled from VÖRÖS et al. 2003a and BUDAI & VÖRÖS 2007)
Sections: A = Szentantalfa, B = Mencshely I, II and diverse localities, C = Vászoly, Öreg Hill, P–1a, P–2 and diverse localities, D = Felsőörs, E = Vörösberény, F = Szentkirályszabadja section and quarry, G = Sóly, Őr Hill. *Localities:* 1 – Szentbékkálla, 2 – Köveskál, Horog Hill, 3 – Monoszló, Hegyes-tű, 4 – Balatoncsicsó, ruins of St Balázs church, 5 – Dörgicse, Drt–1 core, 6 – Örvényes, Szakadás Valley, 7 – Paloznak, Pzt–1 core, 8 – Vöröstó, Akol Hill, 9 – Barnag, 10 – Tótvázsony, 11 – Litér, quarry, 12 – Hajmáskér, Hmt–3 core, 13 – Sóly, road-cut, 14 – Öskü, road-cut, 15 – Öskü, quarry, 16 – Iszkaszentgyörgy, Piramita Hill

The subzonal system and the lower boundary of the Upper Anisian were differently defined and used in a series of previous works. This concerns mainly the rank and position of the "Binodosus Zone/Subzone". The historical contradictions about the definition of this ammonoid taxon and its stratigraphical importance were not settled despite the efforts by ASSERETO (1971) and the new results of BALINI (1993), TATZREITER & BALINI (1993) and MIETTO & MANFRIN (1995). When defining the Pelsonian Substage, VÖRÖS et al. (2003a, p. 32) regarded the Binodosus Subzone as the uppermost subzone of the Pelsonian, and this was applied also by BUDAI & VÖRÖS (2007). On the other hand, the comprehensive study by MONNET et al. (2008) convincingly proved that the upper boundary of the Middle Anisian (Pelsonian) should be drawn above the zone with *Bulogites* (*zoldianus/mojsvari*) and, consequently, the zone with *Schreyerites binodosus* was transferred to the base of the Upper Anisian. This view was included to the recent summaries by BALINI et al. (2010) and JENKS et al. (2015) and was accepted also by VÖRÖS (2014). The subzonal scheme in Table 1 corresponds to this revised opinion.

Table 1. The ammonoid zonal and subzonal scheme used at the Balaton Highland. The scope of the present monograph is restricted to the Upper Anisian units marked as boldface

Stage	Substage	Zone	Subzone
Ladinian	*Fassanian*	*Eoprotrachyceras curionii*	*Eoprotrachyceras curionii*
Anisian	Illyrian	**Nevadites secedensis**	**Nevadites secedensis**
			Ticinites crassus
		Reitziites reitzi	**Aplococeras avisianum**
			Reitziites reitzi
			Hyparpadites liepoldti
			Kellnerites felsoeoersensis
		Paraceratites trinodosus	**Lardaroceras pseudohungaricum**
			Asseretoceras camunum
			Paraceratites trinodosus
			Schreyerites ? binodosus
	Pelsonian	*Balatonites balatonicus*	*Bulogites zoldianus*

The fauna of the Binodosus Subzone at the Balaton Highland is rather poor, and it was properly described by VÖRÖS (2003). Moreover its connection to the successive Trinodosus Subzone is not known in our area. Therefore the ammonoids of the Binodosus Subzone are left out from the scope of this study and the present monograph comprises the data only from the higher subzones of the Trinodosus Zone and the whole Reitzi and Secedensis Zones of the Upper Anisian.

The chronostratigraphical scheme of the Middle Triassic of the Balaton Highland, surveyed in the present work (Figure 2), shows the major lithostratigraphic units as defined by BUDAI et al. (1999) and HAAS & BUDAI (1999).

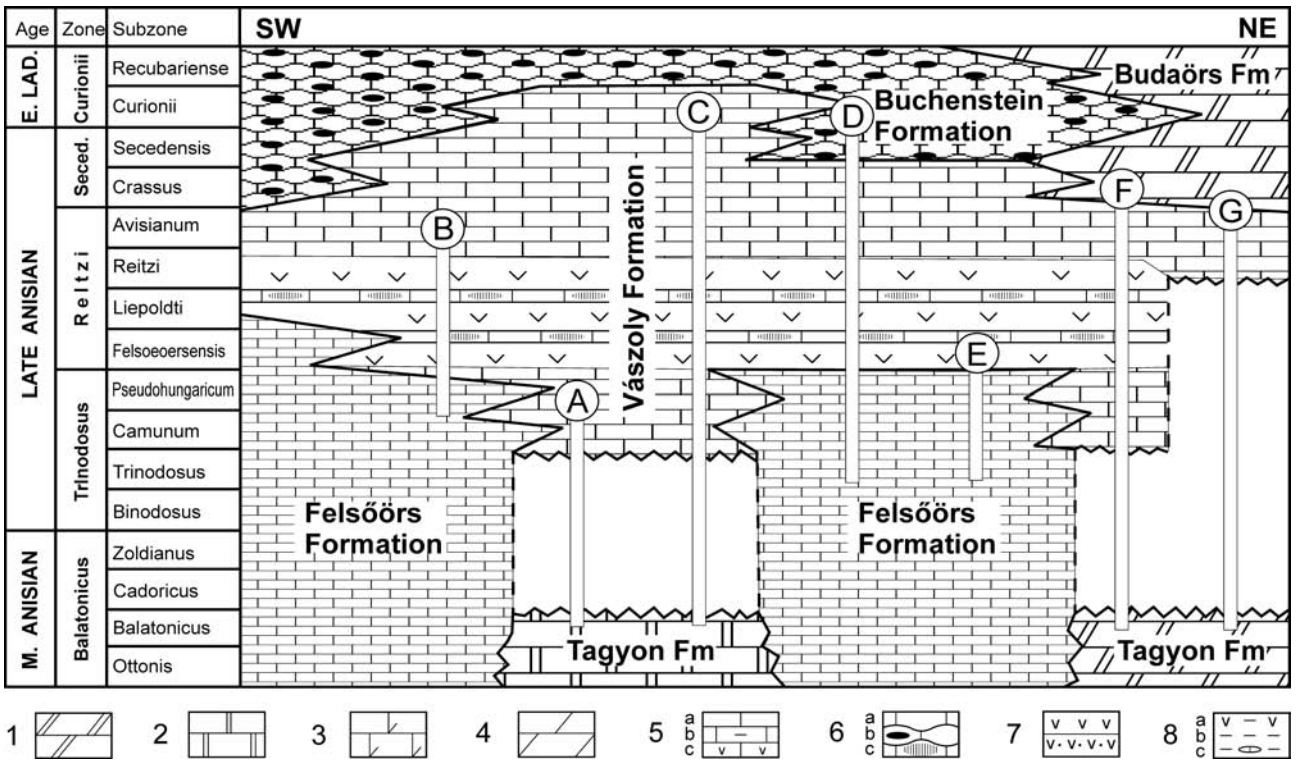


Figure 2. Chrono- and lithostratigraphic scheme of the Middle Triassic of the Balaton Highland, showing the facies relationships of the major formations, with the indication of the stratigraphic intervals recorded in the measured sections. (Only the Upper Anisian part of the formations was surveyed in the present work.)

A = Szentantalfa, B = Mencshely, C = Vászoly, D = Felsőörs, E = Vörösberény, F = Szentkirályszabadja, G = Sóly. 1 – platform dolomite, 2 – platform limestone, 3 – dolomitic limestone, 4 – dolomite, 5a – limestone, 5b – siliceous limestone, 5c – tuffaceous limestone, 6a – nodular limestone, 6b – nodular limestone with chert nodules, 6c – silicified limestone, 7 – fine and coarse grained tuff, 8a – tuffaceous clay, 8b – clay, 8c – clay with calcareous lenses or nodules. Blank represents stratigraphic gaps. M = Middle, E = Early, LAD = Ladinian, Fm = Formation

Lithostratigraphic units

Tagyon Formation. This formation belongs to the Middle Anisian (Pelsonian) Substage, but because it forms the direct underlying of the Upper Anisian layers in some sections, it will shortly be accounted. The Tagyon Formation is a massive carbonate rock, similar to the Alpine Steinalm Limestone, and in our interpretation it developed on isolated carbonate platforms (BUDAI & VÖRÖS 2007). The usually white, bedded limestone alternates with yellowish laminitic carbonates. The shallow subtidal fossiliferous limestone beds contain rich dasycladalean assemblages of Pelsonian age (BUDAI et al. 1993, VÖRÖS et al. 2003a). The typical (non-dolomitized) Tagyon Limestone is restricted to the middle part of the Balaton Highland where its thickness varies between 50–100 m. On the northeast lying carbonate platform, the formation is completely dolomitized secondarily (HAAS et al. 2014, 2016). The higher layers of this formation yielded a few specimens of *Balatonites balatonicus* proving the Pelsonian age (VÖRÖS 2003).

Felsőörs Formation. The lower, Pelsonian part of this formation accumulated in the intervening basins between the isolated platforms of the Tagyon Formation. The Upper Anisian (Illyrian) members of the Felsőörs Formation, representing the Trinodosus Zone, consist of various limestones of basin facies. The most widespread rock type is grey, bedded, nodular limestone with dark grey chert nodules and lenses. Flaser bedding and marl intercalations are frequent. Dark grey, well bedded, laminated, bituminous limestones, with numerous ammonites and thin-shelled, flat bivalves, are also common. Argillaceous and marly intercalations regularly occur; the topmost limestone beds are interlayered by tuffaceous clays. A definite asymmetric pattern was recorded in the thickness of the Felsőörs Formation, with a decreasing trend toward the NE (BUDAI & VÖRÖS 1993, 2007). Along the marginal zones of the basins, the topmost beds of the Felsőörs Formation (corresponding to the Camunum and Pseudohungaricum subzones) probably intercalates with the basal, limestone layers of the Vászoly Formation, but this was not seen in any outcrops. The upper boundary of the Felsőörs Formation is sharp almost everywhere: the first massive and widespread tuff layers of the Vászoly Formation (Felsoeoersensis Subzone) form a seal on the top of the dark limestone series.

Vászoly Formation. This extremely complex and heterogeneous formation includes the most part of the Upper Anisian (Illyrian) sedimentary rocks and it yielded the richest ammonoid faunas. The lower boundary of the Vászoly Formation is heterochronous. In many places on the territory of the former (Pelsonian) isolated platforms, its fossiliferous, ammonitic, crinoidal basal limestone beds (corresponding to the Camunum Subzone) rest unconformably on the eroded surface of the Tagyon Formation. This implies a hiatus between the Middle Anisian Balatonicus Subzone and the Upper Anisian Camunum Subzone.

The next, fundamental member of the Vászoly Formation starts with the first widespread and thick tuff layers corresponding to the Felsoeoersensis Subzone (the "reitzi tuff"; "pietra verde" auctt.). Then, up to the level of the Avisianum Subzone, the tuff layers of various thicknesses, interbedded with usually siliceous limestone layers determine the aspect of the sedimentary facies. A considerable lateral heterogeneity can be recorded in this middle member of the Vászoly Formation. The proportion of tuffaceous material is much higher in the basinal settings than in the sedimentary complexes of the areas of submarine highs (the former isolated carbonate platforms). Concurrently, in the latter areas the colours of the limestone layers tend to be reddish (pink to dark violet), in contrast to the yellow or grey limestone intercalations in the basinal settings. In the northeast, the tuffaceous material is very subordinate and the carbonate layers are rather dolomitic.

The uppermost member, the "Vászoly limestone", appears everywhere nearly synchronously in the Avisianum Subzone. It is a white or beige to purplish, almost pure, well bedded limestone in the areas of submarine highs and tends to be nodular and clayey in the basinal settings; it yielded a very diverse ammonoid fauna. In the north-eastern area (Sóly, Hajmáskér), it rests unconformably, with a great hiatus on the dolomitic Tagyon Formation (Pelsonian). In the Vászoly area (a submarine high) it persists up to the Ladinian Curionii Zone, elsewhere it does not surpass the Secedensis Zone and interfingers with the subsequent Buchenstein Formation.

Buchenstein Formation. The most common facies of this formation is a red or grey, nodular or thick bedded siliceous and cherty limestone ("Nemesvámos Limestone"). Its deposition started in the Secedensis Zone in most places; the major part of the formation belongs to the Ladinian.

Budaörs Dolomite Formation. In the north-eastern part of the study area (Veszprém Plateau, Eastern Bakony), the progradation of the easterly lying Budaörs platform can be recognized. The massive dolomitic rocks of the first prograding tongues of the Budaörs Formation were recorded just above the ammonite-bearing limestones of the Avisianum Subzone.

The facies relationships between the Upper Anisian formations of the Balaton Highland and their palaeogeography were discussed by BUDAI & VÖRÖS (1992, 1993), VÖRÖS et al. (1997), BUDAI & HAAS (1997), VÖRÖS (2002) and BUDAI & VÖRÖS (2007). Only the essential points of the palaeogeographic model are summarized here and illustrated in Figure 3. The more or less uniform Early Anisian carbonate ramp was segmented and partly drowned, and isolated carbonate platforms (Tagyon Formation) developed in the Middle Anisian (Pelsonian). Hemipelagic limestones and marls (Felsőörs Formation) accumulated in the intervening, partly halfgraben-type basins. Relative sea-level rise resulted in drowning of the isolated platforms which became pelagic plateaus (submarine highs) in the Late Anisian (Trinodosus Chron, Camunum Subchrone). Widespread volcanism started in the Reitzi Chron producing rather thick tuffaceous deposits in the basins and thinner inter-

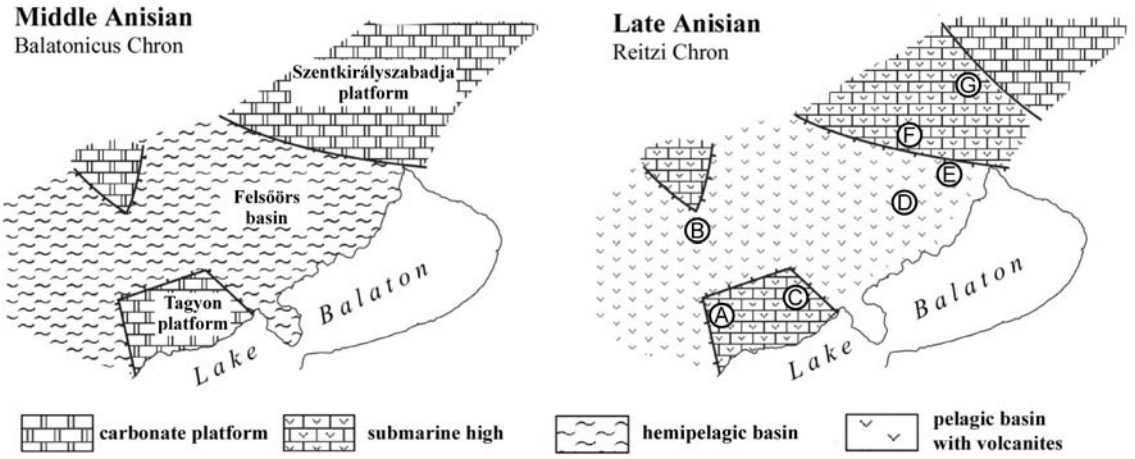


Figure 3. *Middle* Triassic palaeogeographic sketch maps illustrating the major basins and platforms/submarine highs of the Balaton Highland, and the significant change from the Middle to Late Anisian, showing the approximate positions of the key sections (modified from BUDAI & VÖRÖS 2006)
A = Szentantalfa, B = Mencshely, C = Vászoly, D = Felsőörs, E = Vörösberény, F = Szentkirályszabadja, G = Sóly

calations in the limestone layers on the submarine highs. Carbonate sedimentation prevailed again from the Avisianum Subchron onwards, both in the basins and on the highs, and a north-eastern carbonate platform (Budaörs Formation) started to prograde to the eastern part of the Balaton Highland in the Secedensis Chron.

Fossiliferous localities

Numerous fossil-bearing localities were sampled in the course of our field work in the last decades. From among them, only those, yielding valuable ammonoid material will be reported in the following. Their geographical locations are shown in Figure 1.

Measured sections

In this part, the Upper Anisian sections, where we made bed-by-bed collection of ammonoids, will shortly be described.

SZENTANTALFA

The 5 m long artificial trench lies at the southern outskirts of the village Szentantalfa, near the road to Tagyon (coordinates: x=46° 54'21", y=17°40'34"). At the southern end of the exposure the white, massive Tagyon Formation was seen, which was overlain, by a poorly bedded, brownish-grey ammonitic limestone of one metre thickness with a sharp, truncated contact (Vászoly Formation). The next, 50 cm thick bed is a brownish-red limestone full of ammonites, dipping 30° to the N. The uppermost exposed layer is a grey to violet coloured tuffaceous clay ("pietra verde"). The field sampling was carried out by T. BUDAI, L. DOSZTÁLY and V. HERMANN; the preparation of the ammonoids was done in laboratory by A. VÖRÖS. Preliminary description of the section and its biostratigraphy were published by BUDAI & VÖRÖS (1991), GAETANI (ed.)(1993) and VÖRÖS (1993, 1998); the taxonomical and biostratigraphical data presented in these papers needed a minor revision. The stratigraphic column of the Szentantalfa section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 4. The basal part of the section belongs to the Pelsonian; after a large stratigraphical gap, the ammonoid bearing layers represent the Camunum and Pseudohungaricum subzones of the Trinodosus Zone.

The ammonoid fauna is diverse and abundant; the uppermost level (Bed 1) is a kind of ammonite coquina. The preservation of the fossils is rather poor. The host rock usually splits along the sparry calcite substituting the ammonite shells, thus the outer surface of the

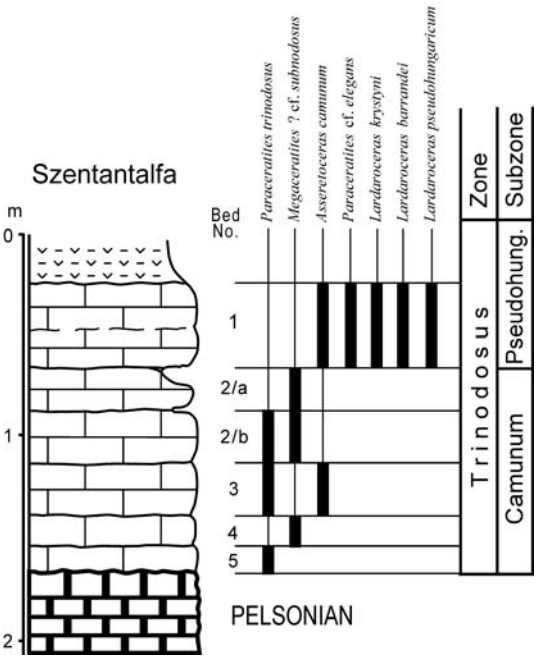


Figure 4. The stratigraphic column of the Szentantalfa section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS 1998)
Legend as in Figure 2. Pseudohung. = Pseudohungaricum

Table 2. List of the ammonoid taxa collected from the Szentantalfa section and their number of specimens per beds

	1	2/A	2/B	3	4	5	sum
Norites cf. *gondola*	1						1
Beyrichites cf. *reuttensis*	4						4
Lardaroceras krystyni	6						6
Lardaroceras barrandei	4						4
Lardaroceras pseudohungaricum	8						8
Paraceratites trinodosus			6	2		9	17
Paraceratites cf. *elegans*	4						4
Semiornites ? cf. *aviticus*	24	1	1	1			27
Semiornites cf. *cordevolicus*		4	5	2	1	1	13
Asseretoceras camunum	10			1			11
Megaceratites ? cf. *subnodosus*		8	3		3		14
Longobardites zsigmondyi	1						1
Longobardites breguzzanus	1						1
Flexoptychites angustoumbilicatus	1		2				3
Flexoptychites cf. *acutus*	2	9	2				13
Flexoptychites flexuosus	6			2			8
sum	72	22	19	8	4	10	135

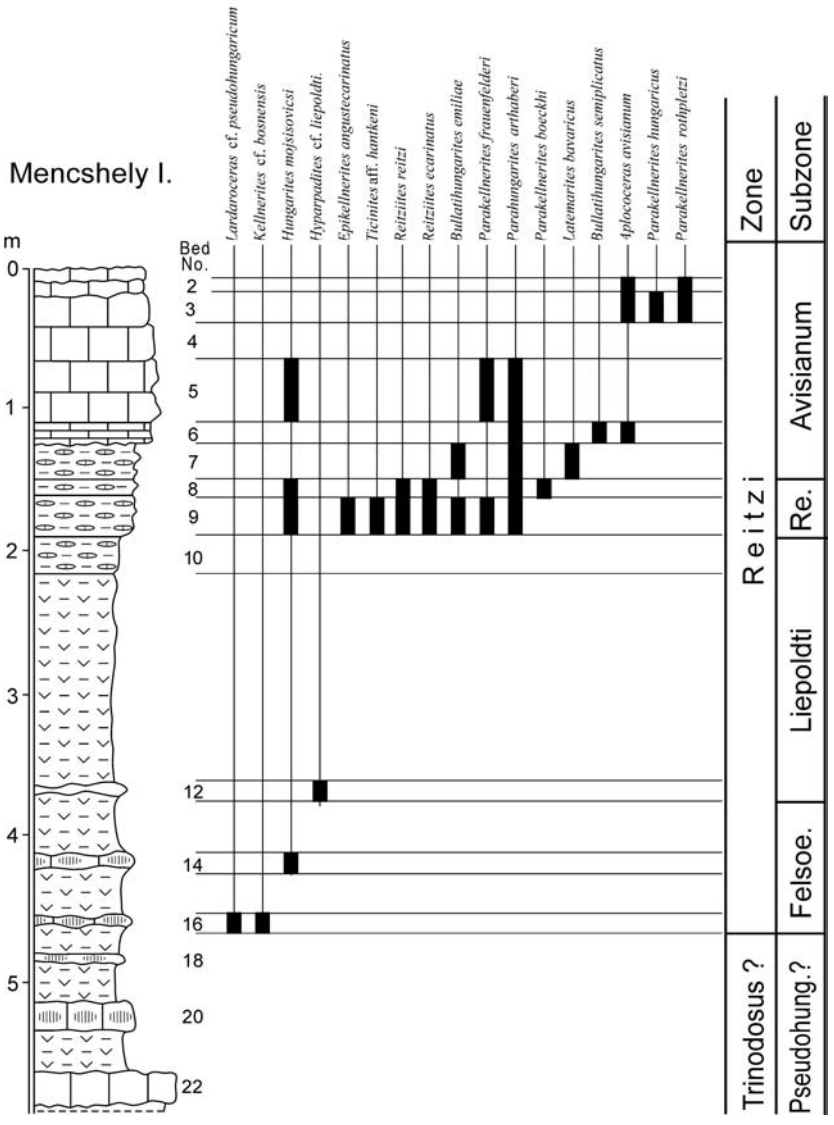


Figure 5. The stratigraphic column of the Mencshely I section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/ subzonal subdivision (modified from VÖRÖS 1998)
Legend as in Figure 2. Pseudohung. = Pseudohun gari cum, Felsoe. = Felsoeoersensis, Re. = Reitzi

ammonites are seldom visible. In most cases only the body chambers were filled by micritic limestone, and the spar-filled phragmocones regularly were crushed into pieces during hammering. Very frequently, the ammonites were primarily fossilized as fragments of body chambers. From the nearly 900 collected specimens, 135 were identified at least on species level; the number of identified taxa is 16. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 2.

MENCSHELY, CSER HILL

The Cser Hill, 2 km to the north of the village Mencshely, is one of the classical sites at the Balaton Highland, yielding Upper Anisian ammonoids. In the 1850's, J. KOVÁTS and F. RÓMER collected here "numerous, mainly small, intact ammonites" (RÓMER 1860, p. 180).

Due to the samplings by D. LACZKÓ at the end of the 19th century, the stratigraphical importance of this locality was stressed in the "Balaton monograph" of LÓCZY (1913, 1916), and the collected ammonoids were described by DIENER (1899, 1900) and ARTHABER (1903).

In the course of the detailed geological mapping, in the 1980's, two artificial trenches were excavated on the Cser Hill.

The **Mencshely I** section lies 200 m to the east from the top of the Cser Hill (coordinates: x=46°57'32", y=17°42'32"). The trench was around 23 m long, 1 m wide and its depth varied between 0.2 and 2 m. The first bed-by-bed collection of ammonoids was made by T. BUDAI, G. CSILLAG, L. DOSZTÁLY, V. HERMANN and A. VÖRÖS in 1990.

The lowermost member of the section is an ochre-yellow clay, overlain by a 25 cm thick, grey, flaser-bedded limestone bank (Bed 22, Felsőörs Formation). This unfossiliferous limestone layer is followed by two metres thick tuffaceous clay, intercalated with greyish-yellow, siliceous limestone layers of 5 to 20 cm thickness (Beds 12–21, Vászoly Formation). Some of these limestone layers yielded a few poorly preserved ammonoids. The next member is a more than 150 cm thick, light yellow, tuffaceous clay, followed by a violet to greenish-yellow clay with scarce ammonoids (Bed 10). The next, 30 cm thick layer, a more consolidated, reddish-brown clay with tuff lenses, is the most fossiliferous part of the section with diverse ammonoid fauna (Bed 9). The next layers of similar lithology (Beds 7 and 8) vary only in colour, from yellow to brownish-red. The

Table 3. List of the ammonoid taxa collected from the Mencshely I section and their number of specimens per beds

Bed	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	sum
Norites gondola					1			1	1								3
Lardaroceras cf. *pseudohungaricum*																1	1
Kellnerites cf. *bosnensis*																2	2
Epikellnerites angustecarinatus									1								1
Epikellnerites vaszolyensis								1	3								4
Epikellnerites spinatus									1								1
Epikellnerites pseudocholnokyi									1								1
Hyparpadites cf. *liepoldti.*												3					3
Hyparpadites cf. *szaboi*														1			1
Parakellnerites frauenfelderi					1				4								5
Parakellnerites boeckhi								1									1
Parakellnerites stuerzenbaumi			9	1													10
Parakellnerites aff. *hungaricus*			1														1
Parakellnerites hungaricus			1														1
Parakellnerites rothpletzi		3	1														4
Parahungarites arthaberi					6	1	13	2	8								30
Reitziites reitzi								1	14								15
Reitziites reitzi morphotype *cholnokyi*									6								6
Reitziites ecarinatus								5	18								23
Latemarites bavaricus							1										1
Stoppaniceras cf. *hermanni*			1														1
Stoppaniceras cf. *budaii*						1											1
Ticinites ? aff. *hantkeni*									2								2
Hungarites mojsisovicsi					7			1	4					1			13
Bullatihungarites emiliae							2		5								7
Bullatihungarites semiplicatus						1											1
Hungarites sinuosus						1											1
Aplococeras avisianum		2	3			2											13
Lecanites misanii					6												
Celtites sp. A							1										1
Longobardites zsigmondyi								1									1
Discoptychites cf. *megalodiscus*						9		1									10
Gymnites sp.	1																1
Epigymnites ecki		1	1														2
Flexoptychites cf. *angustoumbilicatus*			1		1				19	2		1		2			26
Flexoptychites cf. *acutus*		3						2	5	6				1			17
Flexoptychites cf. *flexuosus*		5	1		6	2	12	8	13					1			48
Parasturia cf. *emmrichi*			2														2
Proarcestes sp.		2	9	7	9			1	1								29
sum	1	16	30	8	37	17	29	25	106	8		4		6		3	290

clayey succession of the section is sharply terminated by a dark red, platy, crinoidal limestone of 15 cm thickness (Bed 6). The overlying, more than one metre thick calcareous succession (Beds 1 to 5) consists of thick beds of light grey, violet- and green-spotted limestones. The lower and thicker beds contain accumulations of crinoids and ammonoids; the upper, thinner layers are flaser-bedded with fewer amounts of fossils.

In an auxiliary excavation, a similar succession with similar fossil content was revealed, more or less corresponding to the Beds 1 to 8 of the main (Mencshely I) section.

Preliminary description of the section and its biostratigraphy were published by BUDAI et al. (1991) GAETANI (ed.)(1993) and VÖRÖS (1993, 1998); the taxonomical and biostratigraphical data needed a minor revision. The stratigraphic column of the Mencshely I section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 5. The four subzones of the Reitzi Zone are well demonstrated. The presence of the Trinodosus Zone and its uppermost unit, the Pseudohungaricum Subzone is only inferred.

The ammonoid fauna of the 17 fossiliferous beds of the section is mostly very abundant and diverse. The state of preservation is widely variable, according to the lithology of the host rock. The ammonoids of Beds 6 to 9 are usually well-preserved. From the more than 1200 collected specimens, 290 were identified at least on species level; the number of identified taxa is 39. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 3.

The **Mencshely II** section was exposed in a ten metres long artificial trench, near the top of the Cser Hill, about 200 m west of the site Mencshely I (coordinates: x=46°57'33", y=17°42'17"). The bed-by-bed collection of ammonoids was made by L. DOSZTÁLY, I. FŐZY, P. VINCZE and A. VÖRÖS in 1991.

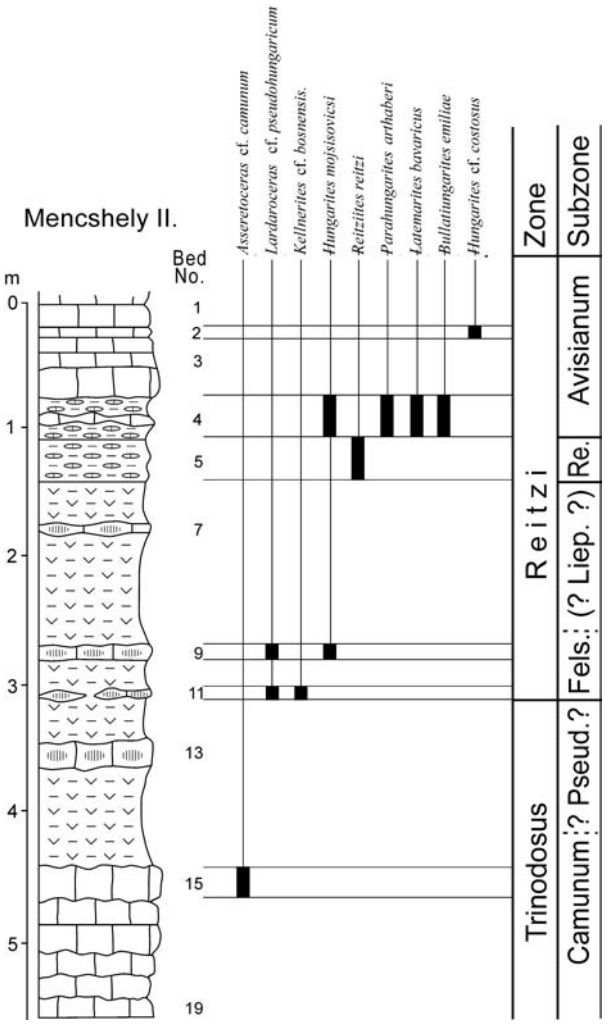


Figure 6. The stratigraphic column of the Mencshely II section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS 1998) Legend as in Figure 2. Pseud. = Pseudohungaricum, Fels. = Felsoeoersensis, Liep. = Liepoldti, Re. = Reitzi

The lowermost, more than one metre thick member of the section consists of 15 to 40 cm thick layers of grey, nodular limestone (Beds 15–19, Felsőörs Formation). The overlying, light-grey to ochre-yellow tuffaceous clay of 70 cm thickness (Bed 14, Vászoly Formation) is covered by a 20 cm thick, grey to yellow, siliceous limestone (Bed 13). The next member, a variegated (light-grey, yellow, light-green, pale-violet) tuffaceous clay of two metres thickness, includes thin (less than 10 cm) light-grey, siliceous limestone layers (Beds 7, 9, 11). Higher in the tuffaceous clay, ammonite-bearing calcareous nodules appear (Bed 5), upwards the colour of the clay changes to reddish-brown and includes a coquina-like, friable crinoidal limestone (Bed 4). The tuffaceous complex is overlain, with a sharp contact, by pure, light-violet, green-spotted, solid limestone layers (Beds 1–3).

Preliminary description of the section and its biostratigraphy were published by VÖRÖS (1998); the taxonomical and biostratigraphical data needed a minor revision. The stratigraphic column of the Mencshely II section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 6. It has to be noted that in this section, probably because of the limited number of diagnostic ammonoids, only the Camunum, Reitzi and Avisianum subzones can be proved definitely. The presence of the Pseudohungaricum and Felsoeoersensis subzones is obvious but their delimitation from the neighbouring subzones is not possible. The Liepoldti Subzone is not proved at all.

The ammonoid fauna of the nine fossiliferous beds of the section is moderately abundant and diverse. The state of preservation is usually rather poor; well-preserved ammonoids were collected only from Beds 4 and 5. From more than 400 collected specimens, 105 were identified at least on species level; the number of identified taxa is 17. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 4.

Table 4. List of the ammonoid taxa collected from the Mencshely II section and their number of specimens per beds

Bed	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	sum
Lardaroceras cf. *pseudohungaricum*									2		1					3
Semiornites ? *falcifer*									1							1
Asseretoceras cf. *camunum*															1	1
Kellnerites cf. *bosnensis*											2					2
Epikellnerites cf. *vaszolyensis*									2							2
Parahungarites arthaberi				49												49
Reitziites reitzi					2											2
Reitziites reitzi morphotype *cholnokyi*					2											2
Latemarites bavaricus				1												1
Hungarites mojsisovicsi				3					2							5
Bullatiungarites emiliae				2												2
Flexohungarites cf. *costosus*		1														1
Longobardites zsigmondyi				2	1											3
Flexoptychites cf. *angustoumbilicatus*				4					4							8
Flexoptychites cf. *acutus*				4	2											6
Flexoptychites cf. *flexuosus*	3	5		4	1				3							16
Proarcestes sp.		1														1
sum	3	7	0	69	8		0		14		3				1	105

VÁSZOLY, ÖREG HILL

The Öreg Hill, between the villages Vászoly, Pécsely and Örvényes, is one of the most important fossil sites of the Balaton Highland yielding perhaps the richest Upper Anisian ammonoid assemblage. Strangely, this wealthy locality escaped the attention of the classical, pioneering geologists, and was revealed only in the 1950's by Imre SZABÓ.

At that time, uranium-ore exploration was performed on the Balaton Highland and an unexpected uranium enrichment was found connecting to phosphorite horizons in the Middle Triassic succession (=Vászoly Formation) at the Öreg Hill. For detailed studies of the sequence, led by I. SZABÓ, trenches and shafts were excavated and boreholes were drilled on the hill and surroundings. Based on these studies the outlines of the Middle Triassic sequence of the area was outlined by SZABÓ (1972). It was demonstrated that the tuff-bearing successions and the phosphorite horizons, connected to pelagic limestones (Vászoly Formation), are full of ammonoids. (The current sedimentological and palaeo-environmental evaluation of this phosphorite enrichment in terms of monsoon-driven upwellig is given in BUDAI et al. 2017).

In the course of the uranium-ore explorations hundreds of ammonoids were collected. The extensive, but unfortunately not bed-by-bed, collections of ammonoids, made by I. SZABÓ and the detailed stratigraphy of the Middle Triassic formations remained mostly unpublished. Many data can be found in interim and mostly confidential reports prepared by I. SZABÓ for the uranium ore company. The only exception was the publication by KOVÁCS et al. (1990), where the geological map and section of the Öreg Hill, furthermore stratigraphic columns of two trenches and two shafts were figured and photographs of two conodont and four ammonoid specimens were given. However, valuable information on the ammonoid biostratigraphy was not presented.

In the eighties of the last century a geological mapping project was carried out on the Balaton Highland (BUDAI 1992, BUDAI et al. 1999). The new observations raised doubts on the structural geology and stratigraphy of the Öreg Hill (BUDAI & DOSZTÁLY 1990), therefore two abandoned trenches (P–11a and P–2) were excavated again by the team of the Geological Institute of Hungary.

The revised geological map (based on field observations by T. BUDAI) and the sites of the most important ammonite-bearing localities of the Öreg Hill (based on manuscript map by I. SZABÓ) are shown in Figure 7. The signs of the localities are prefixed by "P", because the area of the Öreg Hill (now Vászoly), at the time of the uranium-ore explorations was regarded as belonging to the district of the village Pécsely.

The **Vászoly P–11a section** 3 metres wide and 10 metres long trench, directed to SW–NE direction, was excavated in more than two metres depth, near the top of the Öreg Hill, in a grassy belt between two wooded areas (coordinates: x=46°55'45", y=17° 47'05"). The more than 6 metre thick sequence of beds has the dip of 30 to 40° towards the SW. The bed-by-bed collection of ammonoids was made in the frame of the Laczkó Dezső Fossil Hunting Camp with the participation of J. PÁLFY, A. VÖRÖS, L. DOSZTÁLY, A. DULAI, A. GALÁCZ, M. KÁZMÉR, I. SZENTE and P. VINCZE in 1988. Subsequently, occasional collections were made by T. BUDAI, V. HERMANN and L. KERCSMÁR.

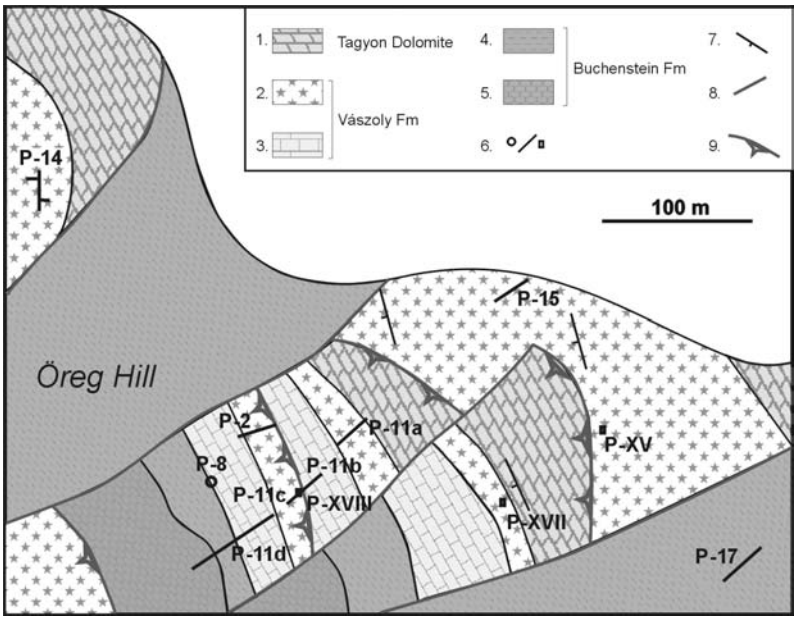


Figure 7. Geological map of the Öreg Hill, Vászoly, showing the artificial exposures yielding Upper Anisian ammonoids (modified from BUDAI et al. 2017)
Middle Anisian (Pelsonian): 1 – thick-bedded dolomite, *Upper Anisian (Upper Illyrian):* 2 – tuff, limestone, dolomitic limestone, *Ladinian:* 3 – light grey, bedded limestone, 4 – laminated, siliceous tuff, radiolarite, 5 – nodular cherty limestone, 6 – borehole, trench, shaft, 7 – dip, 8 – fault, 9 – thrust fault

The lowermost exposed member of the section, the Tagyon Dolomite, is overlain by a 15 cm thick, brown crinoidal limestone with scarce fossils. The next layer, a light yellow tufaceous and calcareous sandstone (Bed 2/A), is followed again by brownish crinoidal limestone with poor fossil content. The overlying 30–35 cm thick calcareous, tuffaceous sandstone (Bed 3/A) yielded a rather rich ammonoid and brachiopod fauna. The next two layers of partly siliceous, dolomitic limestones (Beds 3 and 4) contain a few poorly preserved ammonoids and brachiopods and thin horizons of *Daonella* coquinas. Above a thin calcareous coarse grained tuff sandstone interlayer, a 25 cm thick, massive, biodetrital, phosphatized limestone bank (Bed 5) follows, with abundant fossils. The lower part of the next layer (Bed 6) is a few cm thick calcareous coarse grained tuff; the upper part is a thicker brownish-grey limestone bank. The Bed 7 consists of greenish-grey calcareous marl with compressed ammonoids. From the 80 cm thick Bed 8 upwards, the tuffaceous lithology prevails in the section. The Bed 9, of 50 cm thickness, is dominated by tuffaceous sandstone and clayey interbeds, and contains calcareous concretions and compressed ammonoids. The 10–15 cm

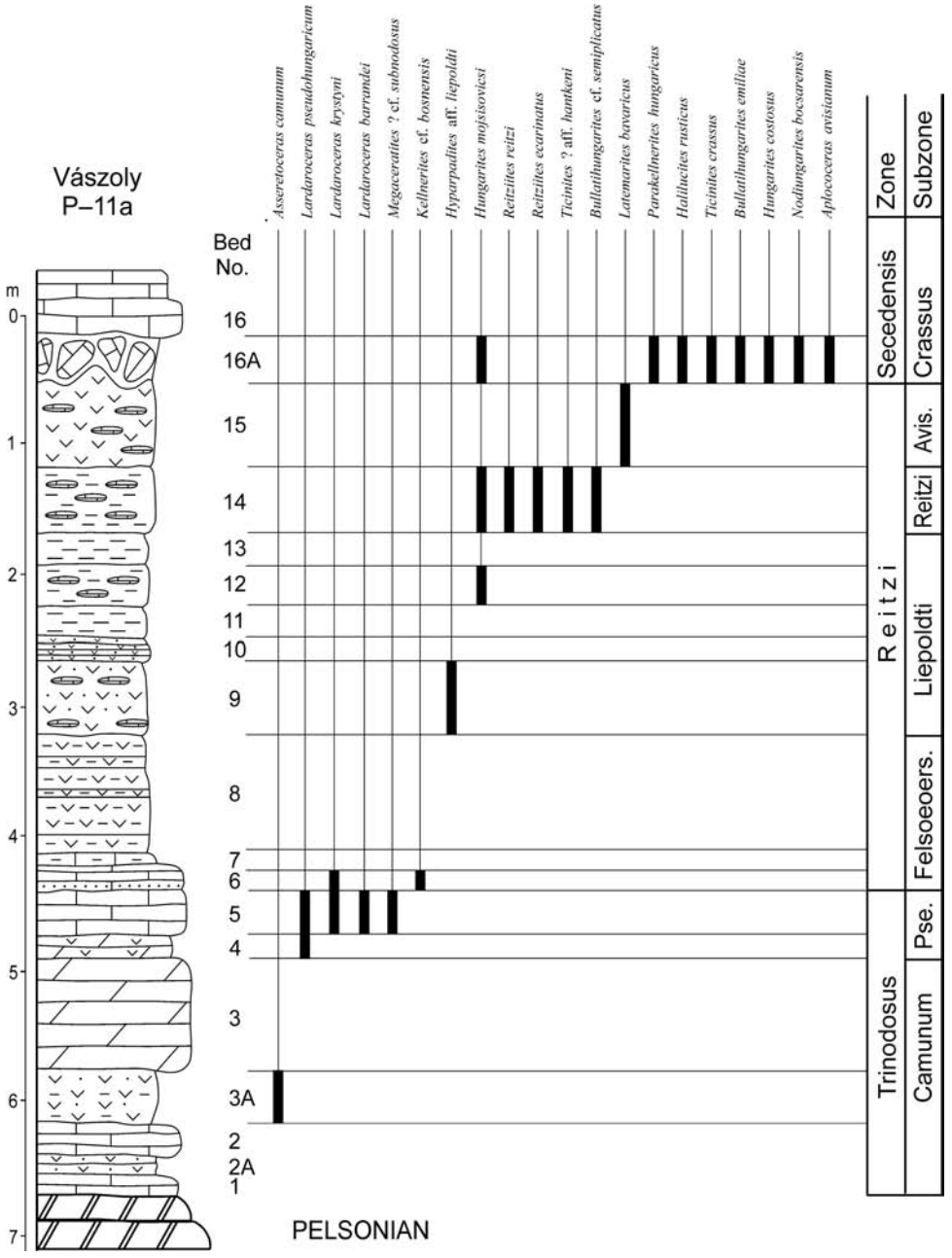


Figure 8. The stratigraphic column of the Vászoly P–11a section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS & PÁLFY 1989) Legend as in Figure 2. Pse. = Pseudohungaricum, Felsoeoers. = Felsoeoersensis, Avis. = Avisianum

thick Bed 10 is a well-bedded, red, tuffaceous sandstone, and the overlying, 20 cm thick loose, greyish-violet tuffaceous clay (Bed 11) are devoid of fossils. The next layer (Bed 12), a yellow clay of around 30 cm thickness, contains calcareous lenses and surprisingly rich fauna. Above an unfossiliferous, greyish-brown, soft, tuffaceous sandy clay (Bed 13) follows around 50 cm thick, yellow clay with calcareous nodules (Bed 14) which yielded a diverse ammonoid fauna, although in a fragmentary state of preservation. The lithology and fossil content of the next layer (Bed 15) is similar but it differs by its olive-green brown-spotted colour.

The boundary between the uppermost clayey-tuffaceous layer and the overlying thick-bedded Vászoly Limestone Member (Bed 16) is heavily disturbed. In the SW wall of the trench it was visible that the thickness of the uppermost tuffaceous clay (Bed 15) varies between 40 and 80 cm. This is caused by the huge blocks and banks of the overlying limestone which sunk into the rather soft, plastic clay and, by overburdening, produced diaper-like deformation. At the same time, the lowermost limestone beds were separated into tilted banks and isolated blocks. Despite of this disturbance, the Bed 16 can be traced in regular deposition in the surroundings of the trench, and the same lithology (light-grey to white, massive micritic limestone) is observed in the higher overlying beds. On the other hand, in the disturbed boundary level, we found several big blocks of a light-yellow, partly nodular and crinoidal limestone with extremely rich ammonoid fauna. This rock type was inferred as representing the disintegrated fragments of the lowermost layer of the overlying massive limestone complex and was labelled as the Bed 16/A.

Previous descriptions of the section and its biostratigraphy were published by VÖRÖS & PÁLFY (1989), SZABÓ & VÖRÖS (1990), KOVÁCS et al. (1990), VÖRÖS (1993, 1998), GAETANI (ed) (1993) and VÖRÖS et al. (1996). It is important to note that the ammonoid taxonomy and the biostratigraphy given in the above papers needed a major revision. The stratigraphic column of the Vászoly P–11a section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 8. This is one of the most complete Upper Anisian sections of the Balaton Highland, from biostratigraphical point of view. The topmost two subzones of the Trinodosus Zone and all four subzones of the Reitzi Zone are proved and, although in the form of a single, probably condensed layer (16/A), the Crassus Subzone of the Secedensis Zone is also present.

The ammonoid fauna of the nine fossiliferous beds of the section is very variable in abundance and diversity. The state of preservation is also variable, according to the lithology of the host rock. The ammonoids of Beds 5 and 16/A are usually well-preserved. From the more than 800 collected specimens, 194 were identified at least on species level; the number of identified taxa is 32. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 5.

Table 5. List of the ammonoid taxa collected from the Vászoly P–11a section and their number of specimens per beds

Bed	16A	15	14	12	9	6	5	4	3A	sum
Norites gondola						1	2			3
Lardaroceras krystyni						2	21			23
Lardaroceras barrandei							8			8
Lardaroceras pseudohungaricum							13	1		14
Asseretoceras camunum									26	26
Megaceratites ? cf. *subnodosus*							5			5
Kellnerites cf. *bosnensis*						1				1
Hyparpadites aff. *liepoldti*					6					6
Hyparpadites szaboi					2					2
Parakellnerites stuerzenbaumi	2									2
Parakellnerites hungaricus	1									1
Reitziites reitzi			1							1
Reitziites ecarinatus			1							1
Reitziites morphotype *cholnokyi*		1	3							4
Latemarites bavaricus		1								1
Halilucites rusticus	1									1
Stoppaniceras hermanni	1									1
Stoppaniceras budaii	1									1
Ticinites ? aff. *hantkeni*			1							1
Ticinites crassus	2									2
Hungarites mojsisovicsi	5		1	3						9
Bullatihungarites emiliae	1									1
Bullatihungarites cf. *semiplicatus*			1							1
Hungarites costosus	1									1
Nodihungarites bocsarensis	1									1
Nodihungarites vinczei	1									1
Aplococeras avisianum	1									1
Longobardites zsigmondyi							1	1	1	3
Flexoptychites angustoumbilicatus	2		5			2	6			15
Flexoptychites cf. *acutus*	1	2	8	3						14
Flexoptychites flexuosus	13			4		3	18	2		40
Proarcestes sp.	3									3
sum	37	4	21	10	8	10	74	4	27	194

The **Vászoly P–2** section was excavated in a trench around 80 m to the west from the section P–11a (coordinates: x=46°55'45", y=17°47'02"). The bed-by-bed collection of ammonoids was made in the frame of the Laczkó Dezső Fossil Hunting Camp with the participation of J. PÁLFY, A. VÖRÖS, M. KÁZMÉR, I. SZENTE and P. VINCZE in 1988.

The SW–NE directed, 10 m long and 1–2 m deep trench exposed the tuffaceous rocks of the Vászoly Formation and, in both ends, terminated in the thick-bedded Vászoly Limestone Member. At the eastern end of the trench, the contact surface between the tuffaceous complex and the Vászoly Limestone is nearly vertical; therefore this contact is probably tectonic and may be interpreted as a thrust fault.

At the western end of the trench the topmost layers of the tuffaceous complex and the overlying, thick-bedded Vászoly Limestone was clearly seen. Here the deepest (unnumbered) layer was an ochre-yellow, tuffaceous clay. The first fossiliferous layer (Bed 4) was a 50 cm thick, reddish-violet clayey tuff with calcareous nodules and lenses and many ammonoids of fragmentary state of preservation. The next two layers (Beds 3 and 2) of 50 cm and 30 cm thickness, respectively, consisted of grey to violet coloured tuffaceous clays and did not yield any valuable ammonoids. The lowermost, 50 cm thick bank of the Vászoly Limestone Member (Bed 1) was a light-grey to beige, massive micritic limestone, with very few, poorly preserved ammonoids. It has to be mentioned that in the section P–2 we did not find any piece of the very fossiliferous, yellow limestone what we traced along the boundary between the tuffaceous complex and the Vászoly Limestone (Bed 16/A), in the section P–11a.

Preliminary descriptions of the section P–2 and its biostratigraphy were published by KOVÁCS et al. (1990), VÖRÖS (1993, 1998) and GAETANI (ed.)(1993). The ammonoid taxonomy and the biostratigraphy given in these papers needed a major revision. The stratigraphic column of the Vászoly P–2 section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 9. In this auxiliary section the Reitzi Zone, with the Reitzi Subzone was well documented. The presence of the Avisianum Subzone is only inferred, and there was not any proof of the Secedensis Zone. The Ladinian Curonii Zone was indicated by a single specimen of an *Eoprotrachyceras* sp. in the overlying, massive Vászoly Limestone.

The ammonoid fauna of the section is rather poor in abundance and diversity: only the Bed 4 yielded valuable ammonoids and a fragment of an *Eoprotrachyceras* sp. was found in Bed 1. The state of preservation is also poor. From the

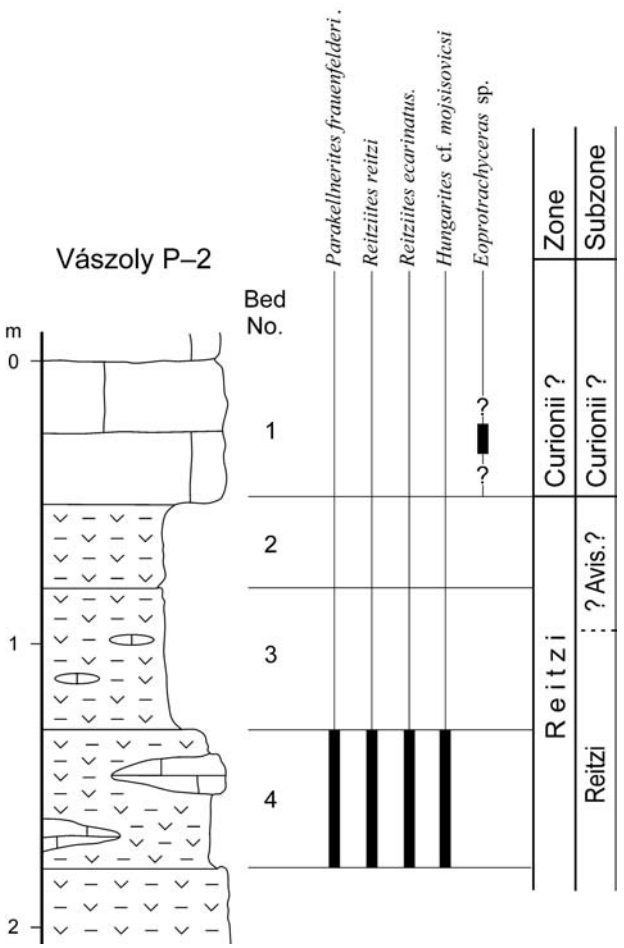


Figure 9. The stratigraphic column of the Vászoly P–2 section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS 1998) Legend as in Figure 2. Avis. = Avisianum

Table 6. List of the ammonoid taxa collected from the Vászoly P–2 section and their number of specimens per beds

	Bed4	
Norites gondola	1	1
Parakellnerites frauenfelderi	1	1
Reitziites reitzi	1	1
Reitziites reitzi morphotype *cholnokyi*	1	1
Reitziites ecarinatus	3	3
Hungarites cf. *mojsisovicsi*	2	2
Flexoptychites cf. *studeri*	1	1
Flexoptychites angustoumbilicatus	8	8
Flexoptychites flexuosus	2	2
sum	20	20

more than 70 collected specimens, 20 were identified at least on species level; the number of the identified Upper Anisian ammonoid taxa is 9 (excluding the Ladinian *Eoprotrachyceras* sp.). The revised list of the Upper Anisian ammonoid taxa and the specimen number data by beds are shown in Table 6.

FELSŐÖRS

The Middle Triassic section at Felsőörs is one of the most famous geological localities of Hungary, known since the historical times by the descriptions of ROTH (1971), BÖCKH (1872, 1873, 1874) STÜRZENBAUM (1875) and MOJSISOVICS (1882). Owing to its outstanding scientific value, and a possible interest for the public, the section was recently re-excavated and preserved from erosion, and was partly covered by shelters. Now it is a protected geological conservation site and an educational nature walk. The lower, Pelsonian part of the section consists of natural outcrops on the hillside (also known as Forrás-hegy or Malom-völgy); whereas the higher, more fossiliferous strata were exposed by artificial trenches. The latter part of the section represents the Upper Anisian Trinodosus, Reitzi and Secedensis Zones and ends with the base of the Ladinian Curionii Zone. Only this latter part is described in details in the present monograph (coordinates: x=47°01'04", y=17°56'34").

The recent, bed-by-bed collection of ammonoids was made during several campaigns by I. SZABÓ and A. VÖRÖS in 1989; in the frame of the Laczkó Dezső Fossil Hunting Camp with the participation of J. PÁLFY, A. VÖRÖS, M. GASPARIK and P. VINCZE in 1992; by T. BUDAI, L. DOSZTÁLY, I. SZABÓ and A. VÖRÖS in 1995; and by T. BUDAI, I. SZABÓ and A. VÖRÖS in 2005.

The lower part of the trench/cut exposes the grey, flaser-bedded, marly limestones of the Felsőörs Limestone (Beds 84/F to 87) with poorly preserved ammonoids, including a 1 m thick whitish tuffaceous clay horizon just below Bed 87. The overlying well-bedded sequence (Beds 88 to 99/C) consists of 8–20 cm thick, grey limestone layers, with 5–30 cm thick, yellow clay interlayers. Ammonoids are frequent, but hard to extract from the limestones or preserved in compressed state in the clayey interlayers. The Felsőörs Limestone abruptly terminates with a thick limestone bank (Bed 99/C), showing undulated top surface.

The overlying tuffaceous succession of the Vászoly Formation starts at the top of the exposed bedding surface of Bed 99/C. The lower (around 18 m thick) part of this sequence consists of greenish-white, sometimes brownish-yellow potassium-trachyte tuffs ("pietra verde", "reitzi-tuff"). Limestone appears only in thin cherty interlayers or rows of lenses of ochre-yellow colour. The first limestone interlayer (Bed 100/E) yielded important ammonoids; further, significant ammonoids were collected from Beds 102 and 105. In the higher part of the Vászoly Formation, the carbonate sedimentation returns in the form of pinkish-grey, nodular limestones; tuffaceous clay becomes subordinate. These beds (from Bed 110 to 111/K) were previously interpreted as debris flow (KOVÁCS 1993, VÖRÖS et al. 1996), however, the new excavations and repeated sampling proved that this is a continuous pelagic flaser-bedded basinal limestone containing an ordinary succession of ammonoid assemblages. Starting with the next, massive, cherty limestone bed (Bed 112), the tuffaceous material becomes subordinate and appears only in altered form, as clayey interlayers.

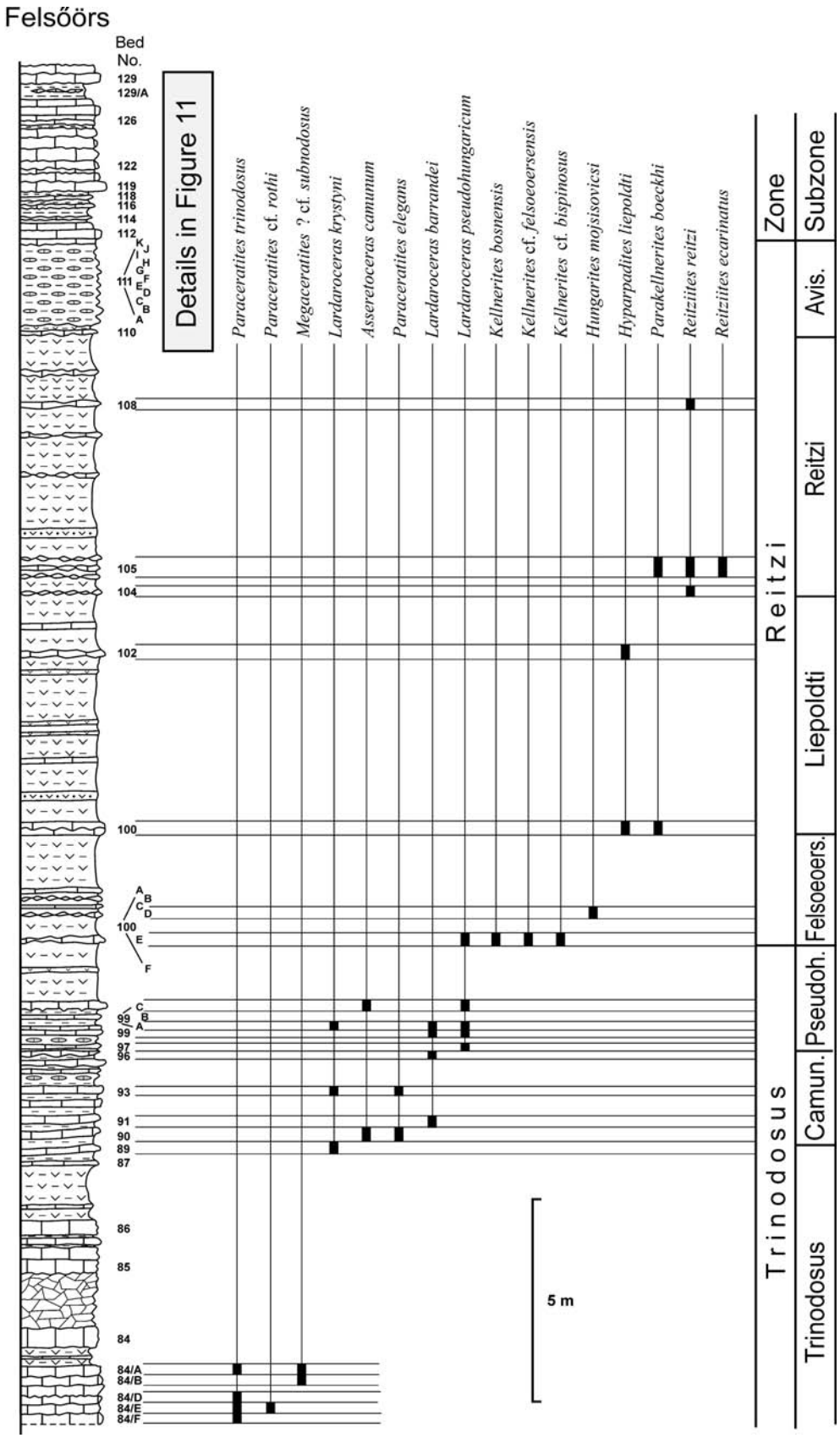


Figure 10. The stratigraphic column of the Felsőörs section with the zonal/subzonal subdivision and the ranges of the stratigraphically significant ammonoid taxa in the interval of the Trinodosus to Reitzi subzones (modified from VÖRÖS 1998). The ammonoid ranges of the *higher* part is shown in Figure 11
Legend as in Figure 2. Camun. = Camunum, Pseudoh. = Pseudohungaricum, Felsoeoers. = Felsoeoersensis, Avis. = Avisianum

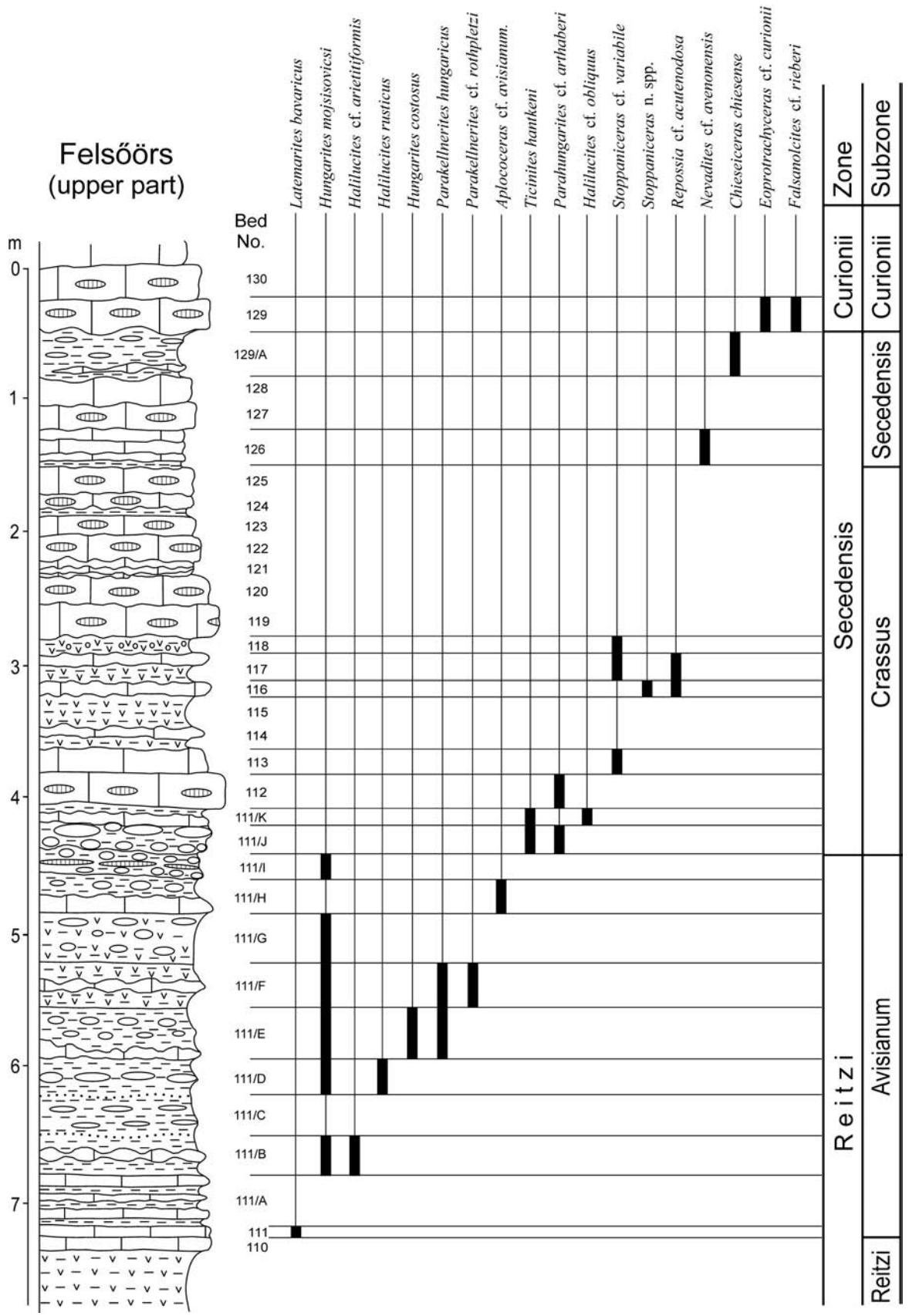


Figure 11. The stratigraphic column of the upper part of Felsőörs section with the zonal/subzonal subdivision and the ranges of the stratigraphically significant ammonoid taxa in the interval of the Avisianum to Curionii subzones (modified from VÖRÖS et al. 2009)

(The occurrences of *Eoprotrachyceras* and *Falsanolcites* species are shown only as proving the base of the Curionii Zone; they are not described in the systematic part of the monograph.) Legend as in Figure 2

From Bed 119 upward, the dominant lithology is cherty limestone forming 10 to 40 cm-thick beds with rare clayey interlayers of variable thickness (Buchenstein Formation). The limestone beds, gently (20 to 30°) dipping to the NW, contain reddish or light-grey chert nodules, or even large lenses; the bedding surfaces are uneven or nodular. This interval (Beds 119–129) proved to be extremely poor in fossils. The recent excavations exposed the section up to a massive cherty limestone bank (Bed 129). Just below this bank, the Bed 129/A, a 40 cm thick clay bed with limestone nodules yielded valuable ammonoids proving the topmost horizon of the Anisian.

Previous descriptions of the Felsőörs section, or certain parts of it, were published by SZABÓ et al. (1980), KOVÁCS et al. (1990), KOVÁCS (1994), VÖRÖS (1993, 1998), VÖRÖS et al. (1996, 2003b, 2009). Magnetostratigraphic results and the integrated stratigraphy of the Felsőörs section were described by MÁRTON et al. (1998). Sampling of several tuff layers for zircon crystals was made from the "reitzi-tuff" and U-Pb radiometric data were published by PÁLFY et al. (2003). The ammonoid data and the biostratigraphy given in these papers needed a moderate revision.

The stratigraphic column of the Felsőörs section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown (for technical reasons) in two separate figures (Figures 10 and 11). Due to its biostratigraphic significance, this is the most important Middle Triassic section of the Balaton Highland. All Upper Anisian ammonoid zones (Trinodosus, Reitzi, Secedensis) and subzones (from the Trinodosus to the Secedensis) were well documented, moreover, the lowermost part of the Ladinian (with the Curionii Subzone) was also proved (VÖRÖS et al. 2009).

Table 7. List of the ammonoid taxa collected from the lower part (Trinodosus to Reitzi Subzone) of the Felsőörs section and their number of specimens per beds

	108	105	104	102	100	100/A	100/C	100/D	100/E	99/C	99/A	99	97	96	93	92	91	90	89	88	84/A	84/B	84/D	84/E	84/F	sum
Norites gondola												1														1
Beyrichites ? sp.																							1			1
Lardaroceras krystyni											1				1				2							4
Lardaroceras barrandei											1	1		2			4									8
Lardaroceras pseudohungaricum									15	13	2	4	1													35
Paraceratites trinodosus																					1		5	8	2	16
Paraceratites elegans															4			1								5
Paraceratites cf. *rothi*																								2		2
Semiornites aviticus															10	1	4	2								17
Asseretoceras camunum										12								2								14
Megaceratites ? cf. *subnodosus*																					2	2				4
Kellnerites bosnensis									2																	2
Kellnerites cf. *felsoeoersensis*									1																	1
Kellnerites cf. *bispinosus*									1																	1
Epikellnerites ? sp.							1																			1
Hyparpadites liepoldti				2	1																					3
Parakellnerites boeckhi		2			1																					3
Reitziites reitzi	1	1	1																							3
Reitziites ecarinatus		1																								1
Hungarites mojsisovicsi								1																		1
Longobardites zsigmondyi														1	1											2
Longobardites breguzzanus											2	1														3
Japonites sp.		1																								1
Discoptychites cf. *megalodiscus*																									2	2
Ptychites oppeli																		17						1		18
Flexoptychites angustoumbilicatus		8					1	3	2			4	1	3				4		1						27
Flexoptychites flexuosus		3				1								5				7								16
sum	1	16	1	2	2	1	2	4	21	25	6	11	2	11	16	1	8	33	2	1	3	2	6	11	4	192

The ammonoid fauna of the 44 fossiliferous beds of the Felsőörs section is partly very abundant and diverse. The state of preservation is widely variable, according to the lithology of the host rock. From the more than 1000 collected specimens, 332 were identified at least on species level; the number of identified taxa is 49 (excluding the Ladinian *Eoprotrachyceras* and *Falsanolcites* species). The revised list of the Upper Anisian ammonoid taxa and the specimen number data by beds are shown in two separate tables (Tables 7 and 8).

Table 8. List of the ammonoid taxa collected from the upper part (Avisianum to Secedensis Subzone) of the Felsőörs section and their number of specimens per beds

	129/A	126	118	117	116	114	113	112	111/K	111/J	111/I	111/H	111/G	111/F	111/E	111/D	111/B	111/A	111	sum
Parakellnerites stuerzenbaumi										2	1	1	6	2	2					14
Parakellnerites aff. *hungaricus*											1									1
Parakellnerites hungaricus														1	1					2
Parakellnerites cf. *rothpletzi*														1						1
Parahungarites cf. *arthaberi*								2		1										3
Latemarites bavaricus																			3	3
Halilucites rusticus																1				1
Halilucites cf. *arietitiformis*																	1			1
Halilucites cf. *obliquus*									1											1
Stoppaniceras cf. *variabile*			1	1			1													3
Stoppaniceras rieberi					2			2			1									5
Stoppaniceras aff. *rieberi*					1															1
Repossia cf. *acutenodosa*				9	1															10
Ticinites hantkeni									7	5										12
Nevadites cf. *avenonensis*		4																		4
Chieseiceras chiesense	7																			7
Chieseiceras sp.	2	1			1															4
Hungarites mojsisovicsi											4		1	1	9	4	2			21
Hungarites costosus															1					1
Aplococeras cf. *avisianum*												1								1
Celtites ? sp. A						1														1
Gymnites sp.												1								1
Flexoptychites angustoumbilicatus				2					2			1	5	7	7	1		1		26
Flexoptychites flexuosus													3							3
Proarcestes sp.	3	3				3			2		1			1						13
sum	12	8	1	12	5	4	1	4	12	8	8	4	15	13	20	6	3	1	3	140

VÖRÖSBERÉNY

This section is a road-cut between Vörösberény (part of Balatonalmádi) and Szentkirályszabadja, in the slope of the Megye Hill (coordinates: x=47°03'25", y=17°59'32"). Here the uppermost part of the Felsőörs Formation (limestone beds with clay seams) and the lower part of the tuffaceous Vászoly Formation is exposed in about 10 m thickness. Bed-by-bed bulk samples have been collected by the workers of the Geological Institute of Hungary in 1987, the detailed preparation of the ammonites was done in the laboratory. The rich ammonoid fauna concentrated in the lower, yellowish, flaser-bedded layers (Beds 26 to 29) of the Felsőörs Limestone. Higher up (Beds 7 to 25) the collecting of ammonoids from the hard limestone was very difficult. The Vászoly Formation (Beds 1 to 6) was almost barren, except a few ammonoids.

Preliminary descriptions of the section and its biostratigraphy were published by BUDAI & VÖRÖS (1989), VÖRÖS (1993, 1998) and GAETANI (ed.)(1993). The ammonoid taxonomy and the biostratigraphy given in these papers needed a major revision. The stratigraphic column of the Vörösberény section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 12. Only the Trinodosus Subzone of the Trinodosus Zone is well documented in this section. The two higher subzones (Camunum and Pseudohungaricum) are present but, due to the scarce fossil content, they can not be delimited. From the Reitzi Zone, only the lowermost, Felsoeoersensis Subzone is proved. It should be noted that a loose specimen of *Latemarites bavaricus* was found, higher up in the non-measured part of the section, which points to the presence of the Avisianum Subzone.

The ammonoid fauna of the 15 fossiliferous beds of the Vörösberény section is variable in abundance and diversity. The state of preservation is generally rather poor. From the more than 1000 collected specimens (most of them from the Trinodosus Zone), 148 were identified at least on species level; the number of identified taxa is 19. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 9.

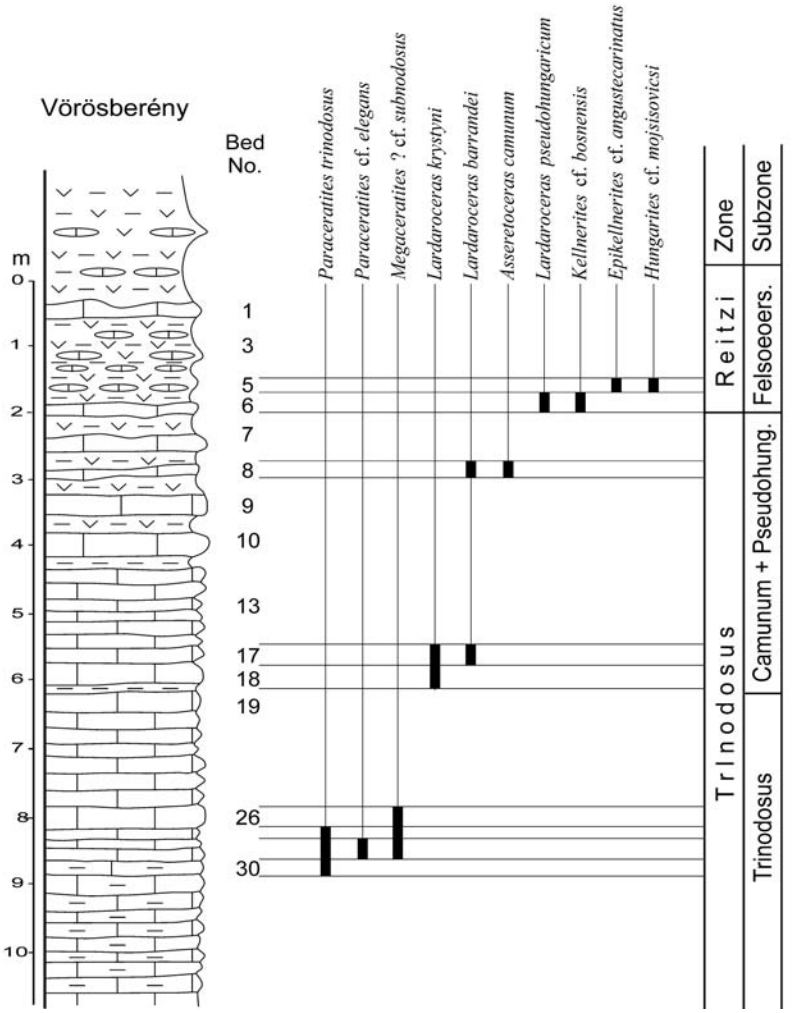


Figure 12. The stratigraphic column of the Vörösberény section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS 1998)
Legend as in Figure 2. Felsoeoers. = Felsoeoersensis

Table 9. List of the ammonoid taxa collected from the Vörösberény section and their number of specimens per beds

Bed	1	3	5	6	8	12	17	18	19	22	26	27	28	29	30	sum
Norites cf. *gondola*							1									1
Beyrichites ? sp.											1	1				2
Lardaroceras barrandei					6		4									10
Lardaroceras krystyni							1	1								2
Lardaroceras pseudohungaricum				1												1
Paraceratites trinodosus												3	1	9	2	15
Paraceratites cf. *elegans*													2	1		3
Semiornites cf. *cordevolicus*												9	13			22
Asseretoceras camunum					2											2
Megaceratites ? cf. *subnodosus*											1	3	30	6		40
Kellnerites cf. *bosnensis*				1												1
Epikellnerites cf. *angustecarinatus*			1													1
Epikellnerites cf. *vaszolyensis*			1													1
Hungarites cf. *mojsisovicsi*			2													2
Discoptychites cf. *megalodiscus*													2	8		10
Ptychites cf. *oppeli*		1														1
Flexoptychites angustoumbilicatus						2										2
Flexoptychites cf. *acutus*				2	1							2	5	1		11
Flexoptychites flexuosus	2		3		2	2	1		3	1				7		21
sum	2	1	7	4	11	4	7	1	3	1	2	18	53	32	2	148

SZENTKIRÁLYSZABADJA

The fossiliferous beds of the section, representing an unusual, partly dolomitic facies of the Vászoly Formation, are exposed in a pit, excavated and used formerly for military purposes, about one hundred metres to the west of a large abandoned quarry (coordinates: x=47°04'24", y=17°57'18"). The pit was extended to dip-direction by a narrow trench. The bed-by-bed collection of ammonoids was made by L. DOSZTÁLY, P. VINCZE and A. VÖRÖS in 1991.

The lower part of the section (Beds 22 to 25) consists of thick dolomite beds alternating with yellow clays. Higher up the dolomite becomes thin-bedded and crumbly and contains volcanoclastic admixture; here we collected the first ammonoids. Then (Beds 11 to 18) the dolomite alternates with limestone, but the crumbly and tuffaceous character remains constant throughout the sequence. Bed 14 is an ochre-yellow to brown, crinoidal limestone with extremely rich ammonoid fauna. Higher up the tuff content increases gradually, and in Bed 9, a characteristic, coarse grained tuff layer appears. Above some further tuffaceous, dolomitic layers, the uppermost beds are again massive dolomites (Beds 1 and 2) but since they contain a few ammonite "ghosts", these layers are interpreted as pelagic limestones dolomitized secondarily. Recent excavations revealed further two, partly dolomitic, fossiliferous layers (Beds –1 to –2) (VÖRÖS et al. 2015). (The ammonoids of these beds are in the private collection of K. TAMÁS and G. FÖLDVÁRI, and are not taken into account in the present monograph.)

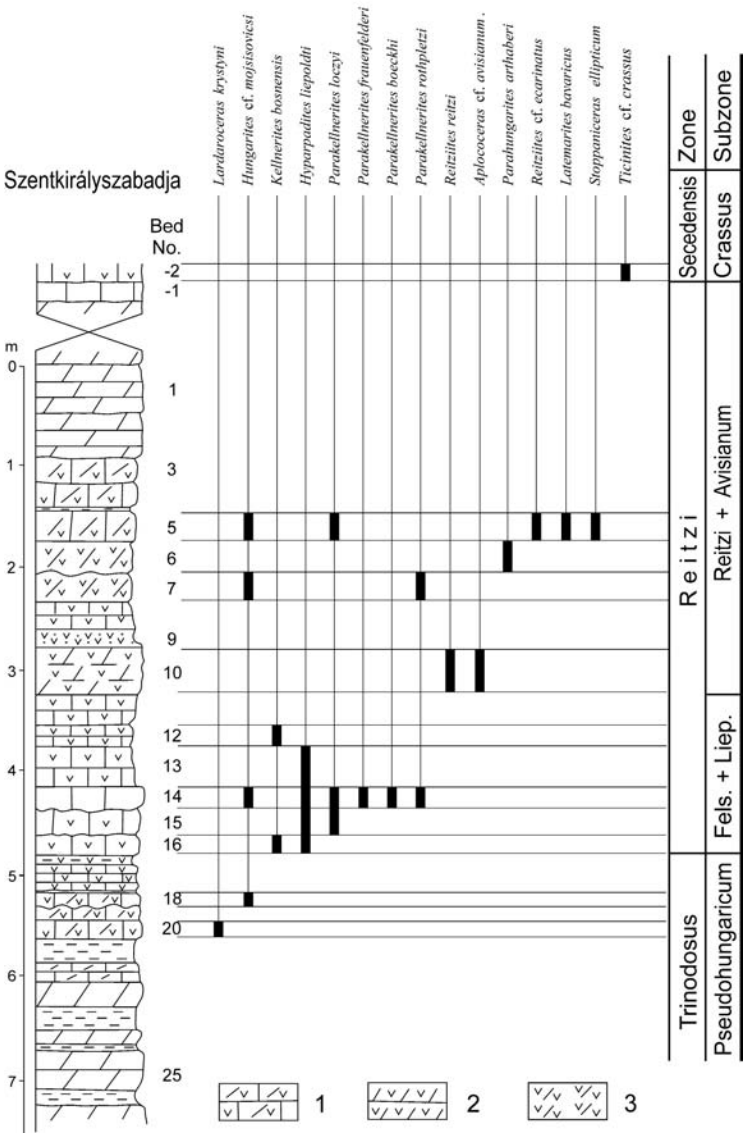


Figure 13. The stratigraphic column of the Szentkirályszabadja section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision. (The occurrence of *Ticinites* cf. *crassus* is shown only as proving the Crassus Subzone; the specimen, illustrated in VÖRÖS et al. 2015, is in private property and is not described in the systematic part of the monograph.) (modified from VÖRÖS et al. 2015)
1 – dolomitic limestone with tuff, 2 – tuffaceous dolomite, 3 – dolomitic tuffite. Further legend as in Figure 2. Fels. = Felsoeoersensis, Liep. = Liepoldti

Preliminary descriptions of the section and its biostratigraphy were published by VÖRÖS (1993, 1998) GAETANI (ed.) (1993) and BUDAI et al. (2001a). The ammonoid taxonomy and the biostratigraphy given in these papers needed a moderate revision. A recent description of the complemented section was given by VÖRÖS et al. (2015). The stratigraphic column of the Szentkirályszabadja section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 13. This section provided good documentation of the Reitzi Zone, and somewhat less reliable proof of the base of the Secedensis Zone. On the other hand, regrettably, the subzonal subdivision within the Reitzi Zone was only partly possible. The subzonal index taxa of the Felsoeoersensis and the Liepoldti subzones appeared simultaneously in Bed 16, and their ranges seemed to overlap. Similarly, the first appearances of the index species of the Reitzi and the Avisianum subzones (*Reitziites reitzi* and *Aplococeras avisianum*) were both recorded in Bed 10. This is the single section at the Balaton Highland, where the subzones of the Reitzi Zone were not well differentiated. The explanation may be sought in the special palaeogeographical position (carbonate platform rim) and sedimentary regime (pelagic incursions to dolomitic sedimentation) of this locality; intermittent reworking and condensation might occur here.

The ammonoid fauna of the 13 fossiliferous beds of the Szentkirályszabadja section is variable in abundance and diversity. The state of preservation is variable, according to the lithology of the host rock. From the nearly 800 collected specimens, 166 were identified at least on species level; the number of identified taxa is 23. The revised list of ammonoid taxa and the specimen number data by beds (excluding the ammonoids in the private collection of K. TAMÁS and G. FÖLDVÁRI) are shown in Table 10.

Table 10. List of the ammonoid taxa collected from the Szentkirályszabadja section and their number of specimens per beds

Bed	5	6	7	8	10	12	13	14	15	16	17	18	20	sum
Lardaroceras krystyni													2	2
Semiornites cf. *aviticus*													1	1
Kellnerites bosnensis						1				2				3
Hyparpadites liepoldti							3	3	2	13				21
Hyparpadites szaboi											1	1		2
Parakellnerites frauenfelderi								6						6
Parakellnerites boeckhi								1						1
Parakellnerites cf. *stuerzenbaumi*	1													1
Parakellnerites rothpletzi			4					1						5
Parakellnerites loczyi	1							2	1					4
Parahungarites arthaberi		3												3
Parahungarites aff. *arthaberi*		1												1
Reitziites cf. *ecarinatus*	3													3
Reitziites reitzi					2									2
Latemarites bavaricus	6													6
Stoppaniceras ellipticum	1													1
Hungarites cf. *mojsisovicsi*	4		2					3				1		10
Hungarites szentei	1	1												2
Aplococeras cf. *avisianum.*					1									1
Discoptychites cf. *megalodiscus*			1					1						2
Flexoptychites angustoumbilicatus		2		1			6	27			2	1	2	41
Flexoptychites cf. *acutus*									1					1
Flexoptychites flexuosus	1	2	5		5			23	5	6				47
sum	18	9	12	1	8	1	9	67	9	21	3	3	5	166

SÓLY, ŐR HILL

The hilly area between the villages Sóly and Hajmáskér, called Berek Hill, or Berekalja in the "Balaton Monograph" by LÓCZY (1913, 1916), belongs to the classical Middle Triassic ammonoid localities of the Balaton area. The yellow to pinkish, tuffaceous and crinoidal, very fossiliferous limestones were discovered in the last years of the 19th century and were reported later by LACZKÓ (1911). The exposures of this area yielded the rich fauna described by DIENER (1899, 1900) and ARTHABER (1903). This "Hajmáskér fauna" received importance in the synthesising paper on the "Zona ad Avisianus" by ASSERETO (1969).

Our section was excavated on the SW slope of the Őr Hill, north of the village Sóly and 200 m to the south of the main road No. 8 (coordinates: x=47°08'18", y=18°02'03"). The bed-by-bed collection of ammonoids was made by T. BUDAI, G. CSILLAG, L. DOSZTÁLY, I. SZABÓ and A VÖRÖS in 1995 and 1996.

The eight metres thick, variable, tuffaceous, clayey, fossiliferous limestone series lies between two dolomite bodies. The underlying, fragmented dolomite probably belongs to the Middle Anisian Tagyon Formation, while the overlying cellular dolomite is considered a prograding tongue of the Late Anisian – Ladinian carbonate platform (Budaörs Formation).

Previous descriptions of the section and its biostratigraphy were published by VÖRÖS (1998) and BUDAI et al. (2001a). The ammonoid taxonomy and the biostratigraphy given in these papers needed a minor revision. The stratigraphic column of the Sóly section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision are shown in Figure 14. Only the higher part of the Reitzi Zone is represented in this section. The Avisianum Subzone is especially well documented by a diverse ammonoid assemblage corresponding to the classical "Hajmáskér fauna".

The ammonoid fauna of the 15 fossiliferous beds of the Sóly section is rather abundant and diverse. The state of preservation is variable. From the almost 900 collected specimens, 312 were identified at least on species level; the number of identified taxa is 22. The revised list of ammonoid taxa and the specimen number data by beds are shown in Table 11.

Other localities

KÖVESKÁL, HOROG HILL

The Horog Hill, two km ENE of the village of Köveskál, is perhaps the oldest known Middle Triassic localities of the Balaton Highland, from the time of ZEPHAROVICH (1856) and BÖCKH (1872, 1873). The Pelsonian ammonoid fauna and stratigraphy of the poorly exposed area was described by VÖRÖS & PÁLFY (2002) and VÖRÖS (2003). Upper Anisian ammonoids were also collected here, at several occasions, by T. BUDAI, L. DOSZTÁLY, J. PÁLFY, I. SZENTE and A. VÖRÖS from

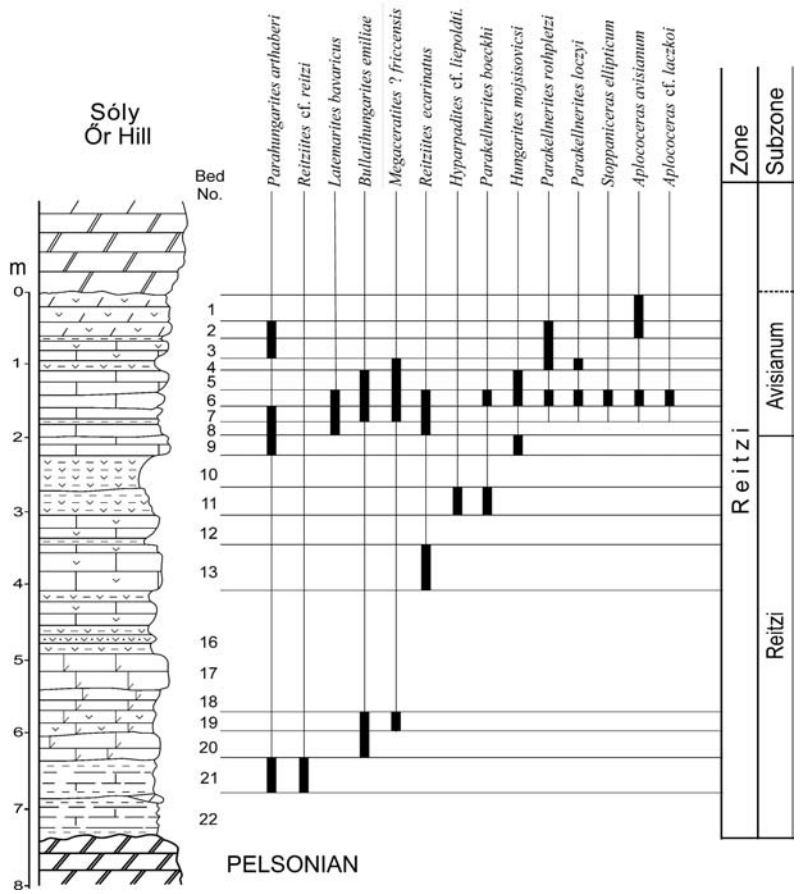


Figure 14. The stratigraphic column of the Sóly section with the ranges of the stratigraphically significant ammonoid taxa and the zonal/subzonal subdivision (modified from VÖRÖS 1998)
Legend as in Figure 2 and 13

Table 11. List of the ammonoid taxa collected from the Sóly section and their number of specimens per beds

Bed	1	2	3	4	5	6	7	8	9	11	13	18	19	20	21	sum
Norites gondola						1										1
Megaceratites ? friccensis				2	1	4	7						1			15
Hyparpadites cf. *liepoldti*										6						6
Parakellnerites boeckhi						4				2						6
Parakellnerites stuerzenbaumi															1	1
Parakellnerites rothpletzi		10	5	1		4										20
Parakellnerites loczyi				2		6										8
Parahungarites arthaberi		5	4				4	5	51						1	70
Parahungarites solyensis					1	6			1							8
Reitziites cf. *reitzi*															2	2
Reitziites ecarinatus						1	12	1			2					16
Latemarites bavaricus						3	31	15								49
Detoniceras ? sp.							1									1
Stoppaniceras ellipticum						1										1
Hungarites mojsisovicsi					3	4			1							8
Bullatihungarites emiliae					3	8	2						7	2		22
Aplococeras avisianum	2	1				3										6
Aplococeras cf. *laczkoi*						1										1
Longobardites zsigmondyi						18	6		6	5			1			36
Longobardites breguzzanus			1		3	12						2				18
Flexoptychites angustoumbilicatus						2										2
Flexoptychites flexuosus							12									12
sum	2	16	10	5	11	78	75	21	59	13	2	2	11	2	5	312

the detritus of the grey Felsőörs Limestone (coordinates: x=46°53'29", y=17°37'44"). The ammonoids prove the presence of the Trinodosus and Pseudohungaricum subzones. The list of ammonoid taxa and the specimen number data are shown in Table 12.

MONOSZLÓ, HEGYES-TŰ N

A few ammonoids were collected by T. BUDAI, G. CSÁSZÁR, L. KOLOSZÁR, J. PÁLFY and A. VÖRÖS in the 1980's, from loose pieces of limestone on a bushy plateau (coordinates: x=46°53'43", y=17°39'16"). The host rock was the greyish-beige Felsőörs Limestone, which, according to the ammonoids, represents the Trinodosus Subzone. The locality and its ammonoids were shortly reported by VÖRÖS (1998); the ammonoid taxonomy and the biostratigraphy given in that paper needed some revision. The revised list of ammonoid taxa and the specimen number data are shown in Table 12.

BALATONCSICSÓ, RUINS OF ST. BALÁZS CHURCH

Ammonoids were collected by T. BUDAI, V. HERMANN and A. VÖRÖS, partly from an abandoned trench, partly from the scree in a vineyard nearby (coordinates: x=46°54'43", y=17°41'50"). The host rock, a brownish-violet, finely crinoidal limestone belongs to the Vászoly Formation. The ammonoids represent a narrow stratigraphical interval of the Reitzi Zone, namely the Avisianum Subzone. The locality and its ammonoids were shortly reported by VÖRÖS (1998); the ammonoid taxonomy and the biostratigraphy given in that paper needed some revision. The list of ammonoid taxa and the specimen number data are shown in Table 12.

DÖRGICSE, DRT–1 CORE (73.4–75.2 m)

The drill-core (coordinates: x=46°55'31", y=17°43' 45") revealed an ochre-yellow, fine-grained crinoidal, biodetrital limestone, very similar to the lithology known from the Szentantalfa section, and represents the lower member of the Vászoly Formation (for details of the lithostratigraphy and sedimentology of the drilled core see BUDAI et al. 1999). The ammonoids, collected by T. BUDAI and A. VÖRÖS, point to the Camunum and/or the Pseudohungaricum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

VÁSZOLY, ÖREG HILL (DIVERSE LOCALITIES)

As it was mentioned in the detailed description of this area (p. 19), in the course of the uranium-ore explorations dozens of trenches and shafts were excavated on the Öreg Hill. Many of these outcrops yielded valuable, taxonomically very important ammonoids, although mainly collected as loose pieces in the scree around the shafts by I. SZABÓ and his co-workers in the 1960's. Subsequently, a few further loose ammonoids were found by E. VÉGH-NEUBRANDT, T. BUDAI, ZS. KERCSMÁR, I. SZENTE and A. VÖRÖS. The ammonoid bearing localities are shown in Figure 7. It is impossible to give detailed descriptions of their stratigraphy, because all of the trenches and shafts were filled up and buried completely still in the 1960's. Only KOVÁCS et al. (1990), on the basis of manuscript data by I. SZABÓ, illustrated the lithological logs of two shafts (XVII and XVIII) but without valuable information on the ammonoid biostratigraphy. From Shaft XVIII the ammonoid taxa *Parakellnerites* sp., "*reitzi*-group", and *Hungarites bocsarensis* were mentioned. As a summary, we may state that the rock material of the ammononoids, described in the present monograph from diverse localities of Vászoly, Öreg Hill, represents variable lithological types of the Vászoly Formation. The ammonoids coming from these diverse localities prove the presence of the Felsoeoersensis, Liepoldti, Reitzi, Avisianum and the Crassus subzones in the area. The list of ammonoid taxa and the specimen number data are shown in Table 13.

ÖRVÉNYES, SZAKADÁS VALLEY (coordinates: X=46°55'13", Y=17°48'39")

A few pieces of ammonoids were collected by I. SZABÓ in 1966, from the light-grey tuffaceous layers of the Vászoly Formation; they point to the presence of the Liepoldti and/or the Reitzi Subzone. Later T. BUDAI found a *Flexoptychites* specimen in a red limestone exposed in an artificial trench. The list of ammonoid taxa and the specimen number data are shown in Table 12.

PALOZNAK, PZT–1 CORE (105.0 m) (coordinates: X=46°59'53", Y=17°55'34")

A single specimen of *Megaceratites* cf. *subnodosus* (MOJSISOVICS, 1882) was collected by T. BUDAI, from the Felsőörs Formation (dark-grey, marly limestone). The ammonoid proves the presence of the upper part of the Trinodosus Zone.

FELSŐÖRS, 111/A–K BEDS

A single specimen of *Stoppaniceras budaii* n. sp. was found by I. SZABÓ, in the scree of the Felsőörs section (coordinates: x=47°01'04", y=17°56'34"). The rock-type infilling the body chamber of the ammonoid hints to the upper part of the Vászoly Formation, i.e. the nodular layers between Beds 111/A to 111/K (Avisianum to Crassus subzones).

VÖRÖSBERÉNY, ROAD-CUT (coordinates: X=47°03'25", Y=17°59'32")

In addition to the detailed bed-by-bed collection, the scree along the road-cut between Vörösberény (Balatonalmádi) and Szentkirályszabadja, yielded some further ammonoids. T. BUDAI and J. PÁLFY collected a few specimens from the Felsőörs

Table 12. List of the ammonoid taxa collected from diverse localities of the Balaton Highland and their number of specimens per localities

	Köveskál, Horog Hill (2001, 2012)	Monoszló, Hegyes-tű N	Balatoncsicsó, ruins of St. Balázs church	Dörgicse, Drt-1 core (73.4-75.2 m)	Örvényes, Szakadás Valley	Paloznak, Pat-1 core (105.0 m)	Vörösberény, road-cut (loose)	Szentbékkálla, vineyards (loose)	Mencshely, Cser-tető (1990, loose)	Mencshely, Cser-tető (2011, 2013, reitzi beds)	Vörstó, Akol Hill	Barnag E (loose)	Tótvázsony W (loose)	Felsőörs, 111 beds (loose)	Szentkirályszabadja, quarry N	Litér, Murva-quarry E	Hajmáskér, Hmt-3 core (113.4-115.8 m)	Sóly, road-cut S	Öskü, road-cut	Öskü, Murva-quarry E	Iszkaszentgyörgy, Piramita Hill
Norites gondola									1	2			1								
Lardaroceras krystyni	1							5			1		1		4						1
Lardaroceras pseudohungaricum	1							1	1						2						8
Paraceratites trinodosus	8	5					2					2									
Paraceratites elegans		2					2														
Semiornites aviticus				1																	
Asseretoceras camunum											1				2						1
Megaceratites ? cf. *subnodosus*	5			1		1	2	1	2			2									
Epikellnerites angustecarinatus										4											
Epikellnerites tamasi								1													
Epikellnerites vaszolyensis					2			1	1	1											
Epikellnerites pseudocholnokyi										9											
Parakellnerites boeckhi			2							2											
Parakellnerites hungaricus			1																		
Parakellnerites aff. *hungaricus*									2												
Parakellnerites cf. *rothpletzi*			1													1					
Parahungarites arthaberi			10						4	19							2	15		2	
Parahungarites cf. solyensis																		1			
Reitziites reitzi									1	18											
Reitziites reitzi morphotype *cholnokyi*									2	12											
Reitziites ecarinatus								1	2	16							2		1		
Latemarites bavaricus							1			3							1	2			
Stoppaniceras budaii														1							
Stoppaniceras ellipticum																		1	1		
Ticinites ticinensis												1									
Ticinites aff. *hantkeni*										1											
Hungarites mojsisovicsi												1					2		2		
Bullatihungarites cf. *semiplicatus*										1											
Hungarites cf. *costosus*			1																		
Hungarites szentei										2								1			
Aplococeras avisianum			4																		
Lecanites misanii									2												
Celtites ? sp.			1																		
Longobardites zsigmondyi		1								1											3
Longobardites breguzzanus																	1			1	
Ptychites oppeli								16													
Flexoptychites angustoumbilicatus			3					1	2												
Flexoptychites cf. *acutus*			1		2			1			2						1				1
Flexoptychites flexuosus			13					3	3		1										6
Proarcestes sp.			2																		
sum	15	8	39	2	4	1	7	31	23	91	5	6	2	1	8	1	9	20	4	3	20

Formation, and A. VÖRÖS found a single, loose specimen in the higher part of the tuffaceous Vászoly Formation. The list of ammonoid taxa and the specimen number data are shown in Table 12.

SZENTBÉKKÁLLA, VINEYARDS

The poor exposures and the scree in the Szentbékkálla vineyards seem to represent a continuous series of Anisian to Ladinian formations of basin facies (between coordinates x=46°53'28", y=17°33'01" and x=46°53'33", y=17°33'06"). The loose blocks and pieces of mostly siliceous limestones lying around the vineyards came from the Felsőörs Formation and the Vászoly Formation. Numerous ammonoids were collected here, at several occasions, by T. BUDAI, ZS. KERCSMÁR, J. PÁLFY, K. TAMÁS and A. VÖRÖS. A few specimens were shortly described and illustrated by VÖRÖS et al.

(2015). The list of ammonoid taxa, incorporated in the present monograph, and their specimen number data are shown in Table 12.

MENCSHELY, CSER HILL (PRELIMINARY COLLECTIONS)

In 1990, before starting the detailed bed-by-bed collections in the Mencshely I section (coordinates: x=46° 57'32", y=17°42'32"), numerous ammonoids were collected from the detritus coming from variable rock-types of the Felsőörs Formation and the Vászoly Formation, by T. BUDAI, G. CSILLAG, L. DOSZTÁLY and A. VÖRÖS. The ammonoid species point to the presence of several upper Anisian horizons, from the Pseudohungaricum Subzone to the Avisianum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

MENCSHELY, CSER HILL (SUPPLEMENTARY COLLECTIONS)

In 2011 and 2013, well after the detailed bed-by-bed collections in the Mencshely I section (coordinates: x=46°57'32", y= 17°42' 32"), T. BUDAI, I. SZENTE, P. VINCZE and A. VÖRÖS collected supplementary ammonoid material from the red, tuffaceous limestones of the Vászoly Formation, in order to increase the taxonomical knowledge on the fauna of the Reitzi Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

Table 13. List of the ammonoid taxa collected from diverse localities of the Öreg Hill (Vászoly) and their number of specimens per localities

	Trench P-11/a (loose)	Trench P-11/b (loose)	Trench P-11/c (loose)	Trench P-11/d (loose)	Trench 14 (loose)	Trench 15 (loose)	Trench 17 (loose)	Shaft XIII.	Shaft XV.	Shaft XVII.	Shaft XVIII.	Vászoly, loose	sum
Lardaroceras krystyni										1		1	2
Lardaroceras barrandei												1	1
Kellnerites felsoeoersensis									1				1
Epikellnerites angustecarinatus							1			1		1	3
Epikellnerites tamasi			1										1
Epikellnerites vaszolyensis			3								2	1	6
Hyparpadites liepoldti	1		1			2					1		5
Hyparpadites szaboi										2			2
Parakellnerites frauenfelderi			1							1			2
Parakellnerites boeckhi	1		5				1						7
Parakellnerites stuerzenbaumi					1								1
Parakellnerites aff. *rothpletzi*			1										1
Parakellnerites loczyi											1		1
Parakellnerites cf. *zoniaensis*					1								1
Parahungarites arthaberi			1										1
Parahungarites solyensis							1						1
Reitziites reitzi			4	3			6	1		1	2	1	18
Reitziites reitzi morphotype *cholnokyi*							1						1
Reitziites ecarinatus							1						1
Stoppaniceras hermanni							1						1
Hungarites mojsisovicsi	1		1		1								2
Bullatihungarites emiliae										1			1
Bullatihungarites semiplicatus			1										1
Hungarites costosus												1	1
Hungarites szentei					2								2
Hungarites sinuosus			1									2	3
Nodihungarites bocsarensis	2												2
Nodihungarites vinczei	1												1
Aplococeras laczkoi	1												1
Flexoptychites angustoumbilicatus		2	8		3		3			1	5	2	24
Flexoptychites acutus			1		2		1			1	1		6
Flexoptychites flexuosus	1	2	6	2								2	13
sum	8	4	35	5	10	2	16	1	1	9	12	12	115

VÖRÖSTÓ, AKOL HILL

This locality probably corresponds to one of the classical fossiliferous sites near Nagyvázsony, mentioned by HAUER (1861) and LÓCZY (1913, 1916). A small artificial trench, excavated in the early 1980's, exposed a few layers of reddish-yellow limestone (Vászoly Formation) resting on the Tagyon Formation (stratigraphic column of the section is in the manuscript of BUDAI 2006) (coordinates: x=46°57'57", y=17°43'01"). Ammonoids, collected by T. BUDAI, G. CSILLAG, V. HERMANN and A. VÖRÖS, prove the presence of the Camunum and/or the Pseudohungaricum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

BARNAG EAST

On the meadows to the east of the village Barnag (coordinates: x=46°58'57", y=17°45'11"), loose ammonoids were collected by G. CSILLAG and A. VÖRÖS from grey siliceous limestones (Felsőörs Formation) and, at another place, from red limestones (Vászoly Formation). The ammonoids point to the Trinodosus and the Avisianum (or perhaps the Secedensis) subzones, respectively. The list of ammonoid taxa and the specimen number data are shown in Table 12.

TÓTVÁZSONY WEST

West of the village Tótvázsony, along the roads (coordinates: x=47°00'19", y=17°46'32"), loose ammonoids were collected by G. CSILLAG and A. VÖRÖS from greyish-beige siliceous limestones (Felsőörs Formation). The ammonoids point to the higher part of the Trinodosus Zone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

SZENTKIRÁLYSZABADJA, QUARRY N

Dolomitized algal limestones of the Tagyon Formation were quarried in several large pits two kilometres north of the village Szentkirályszabadja (coordinates: x=47°04'25", y=17°57'26"). This shallow marine carbonate platform of Pelsonian age is unconformably overlain by brownish-yellow to grey limestones of the Vászoly Formation (BUDAI et al. 1993, 1999, 2001a; GAETANI [ed.] 1993). In the northernmost part of the quarry, from the lowermost beds of the Vászoly Formation, T. BUDAI, L. DOSZTÁLY and A. VÖRÖS collected some poorly preserved ammonoids which prove the presence of the Camunum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

LITÉR, QUARRY E

In the eastern rim of the quarry (coordinates: x=47°06'56", y=17°59'19"), poorly exposed layers of brownish-yellow, tuffaceous, crinoidal limestone (Vászoly Formation) were found between Middle Anisian and Upper Anisian – Ladinian dolomite bodies (for more details of the lithostratigraphy and sedimentology of the studied section see BUDAI et al. 2001a). A. VÖRÖS collected here a few ammonoids, e.g. *Parakellnerites* cf. *rothpletzi* (SALOMON, 1895), which points to the Avisianum Subzone.

HAJMÁSKÉR, HMT–3 CORE (113.4–115.8 m)

The drill-core (assigned by GY. RAINCSÁK) (coordinates: x=47°08'10", y=18°01'09") revealed a brownish-yellow to pink, fine-grained, tuffaceous crinoidal limestone, very similar to the lithology known from the Sóly section, and represents the upper member of the Vászoly Formation. A simplified lithological column of the core was figured by VÖRÖS (1993) and a more detailed one by BUDAI (2006). In spite of the small diameter of the cores, numerous ammonoids were collected in 1980 by GY. RAINCSÁK and A. VÖRÖS. The fauna is comparable to the classical "Hajmáskér fauna" (DIENER 1899, 1900; ARTHABER 1903) and proves the presence of the Avisianum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

SÓLY, ROAD-CUT S

In the road-cut along the southern side of the main road No. 8, at the Őr Hill (coordinates: x=47°08'20", y=18°02'03"), brownish-yellow, tuffaceous, crinoidal limestones were exposed in a few metres thickness, between the underlying Pelsonian and the overlying Upper Anisian – Ladinian massive dolomite complexes (description and lithologic column of the section were published by BUDAI et al. 2001a). These layers represent a reduced lateral continuation of the beds sampled in the Sóly section about 100 m southward. The ammonoids, collected by L. DOSZTÁLY and A. VÖRÖS, are also very similar to those known from the Sóly section, and prove the presence of the Avisianum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

ÖSKÜ, ROAD-CUT N

Very close to the village Öskü, the road-cut along the northern side of the main road No. 8 (coordinates: x=47°08'17", y=18°04'36"), exposed the yellowish-red, tuffaceous, crinoidal-brachiopodal limestone of the Vászoly Formation, resting unconformably on Middle Triassic dolomites (Tagyon Formation). The section was described and figured by KOVÁCS et al. (1990, p. 180). According to the usage of that time, they qualified the dolomite as Megyehegy Dolomite and the fossiliferous layers as Buchenstein Formation. They made extended collecting work and listed (without illustrations) more than a dozen of ammonoid species, mostly known also from the classical "Hajmáskér fauna" (DIENER 1899, 1900; ARTHABER 1903). The ammonoids, collected by I. SZABÓ, were presumably deposited in the collections of the Mining and Geological Survey of Hungary, where we attempted to find the material. As a partial success, we found specimens collected by I. SZABÓ from Öskü from the reddish, crinoidal limestone, but regrettably, we were not able to verify the mentioned long list of ammonoid species. We could identify only four ammonoid taxa from that collection by I. SZABÓ. The list of ammonoid taxa and the specimen number data, resulted from our recent investigation, are shown in Table 12.

ÖSKÜ, QUARRY

The quarry (also known as Kikeri Quarry) (coordinates: x=47°09'57", y=18°05'26"), is mined for crumbly and pulverized dolomites belonging to the Middle Anisian Tagyon Formation. Brownish-red, tuffaceous, crinoidal limestones (Vászoly Formation) are deposited on the uneven, eroded surface of the dolomites in the south-western end of the quarry (description and lithologic column of the section were published by BUDAI et al. 2001a). A detailed description of the geolo-

gy and the tectonic interpretation of the Kikeri Quarry were published recently by CSICSEK & FODOR (2016). Ammonoids were collected from here by T. BUDAI, G. CSILLAG, L. DOSZTÁLY, I. SZABÓ and A. VÖRÖS in the 1990's. The lithology of the fossiliferous layers and the ammonoid taxa are akin to those known from the upper part of the Sóly section, i.e. point to the Avisianum Subzone. The list of ammonoid taxa and the specimen number data are shown in Table 12.

ISZKASZENTGYÖRGY, PIRAMITA HILL

Upper Anisian ammonoids were collected by T. BUDAI, L. DOSZTÁLY and A. VÖRÖS from the poor exposures of the Felsőörs Limestone (coordinates: x=47°14'08", y=18°17'05"), apparently forming a bed complex between two massive, platform carbonate formations. A short description and a drawing of the section were published by BUDAI et al. (2001b). The ammonoids prove the presence of the Camunum and Pseudohungaricum subzones. The list of ammonoid taxa and the specimen number data are shown in Table 12.

The Ammonoid Fauna

The monographic description is supposed to incorporate all pieces of Upper Anisian ammonoids known from the Balaton Highland; in the present case this intention remains admittedly an approximation to an obviously impossible task.

The overwhelming majority of the Upper Anisian ammonoids described in this monograph, collected recently and systematically by the author and his colleagues, is deposited in the collection of the Department of Paleontology and Geology of the Hungarian Natural History Museum (Budapest).

Another, very important collection of Upper Anisian ammonoids from the Balaton Highland is found in the Museum of the Mining and Geological Survey of Hungary (Budapest). The originals of the classical papers and monographs by ROTH (1871), BÖCKH (1872, 1973, 1974), STÜRZENBAUM (1875), MOJSISOVICS (1882), DIENER (1899, 1900), ARTHABER (1903) and FRECH (1903) are kept here. A considerable part of the ammonoid fauna collected by Imre SZABÓ from Vászoly in the 1960's was also deposited in this museum. The comprehensive nature of the present monograph necessitated and justified to include the photographs taken from certain type specimens described in the classical publications and from some other diagnostic specimens of this collection.

Additionally, a few private collections reached the scope of the present study. The largest and most important of these is in the property of Károly TAMÁS and Gabriella FÖLDVÁRI, in Kővágóörs. Following the source data in VÖRÖS (1998), they developed enormously large ammonoid collections from some Anisian localities at the Balaton Highland. A few of their specimens are also illustrated in this monograph. The private collection of László VARGA (Úny) received a few ammonoids collected by Imre SZABÓ from Vászoly, whose photographs were appropriate to be included to the present work.

Several thousand Upper Anisian ammonoid fossils were encountered in the course of preparing this monograph. From among them, 2104 specimens were identified at least on species level. The 85 taxa represent 37 genera. Four of the genera and 14 of the species are described here as new taxa. Further five species are considered to be new, but in the lack of sufficient material, they are described under open nomenclature prefixed by "aff.". In eight cases, the generic attribution was certain but the identification of the taxa are indicated only as "sp." The taxa are listed in Table 14, with the indication of the specimen number data.

Table 14. List of the Upper Anisian ammonoid taxa of the Balaton Highland, with their species numbers

Norites gondola (Mojsisovics, 1869)	15	*Kellnerites felsoeoersensis* (Stürzenbaum, 1875)	2
Beyrichites cf. *reuttensis* (Beyrich, 1867)	4	*Kellnerites* cf. *bispinosus* (Hauer, 1896)	1
Lardaroceras krystyni Balini, 1992	50	*Epikellnerites angustecarinatus* (Hauer, 1896)	9
Lardaroceras barrandei (Mojsisovics, 1882)	28	*Epikellnerites tamasi* n. sp.	2
Lardaroceras pseudohungaricum Balini, 1992	75	*Epikellnerites* aff. *tamasi* n. sp.*	1*
Paraceratites trinodosus (Mojsisovics, 1882)	65	*Epikellnerites vaszolyensis* n. sp.	18
Paraceratites cf. *elegans* (Mojsisovics, 1882)	16	*Epikellnerites pseudocholnokyi* n. sp.	10
Paraceratites cf. *rothi* (Mojsisovics, 1882)	2	*Epikellnerites spinatus* n. sp.	2
Semiornites cf. *cordevolicus* (Mojsisovics, 1882)	35	*Reitziites reitzi* (Böckh, 1872)	63
Semiornites cf. *aviticus* (Mojsisovics, 1882)	46	*Reitziites reitzi* (Böckh, 1872) morphotype *cholnokyi*	28
Semiornites ? cf. *falcifer* (Hauer, 1896)	1	*Reitziites ecarinatus* (Hauer, 1896)	70
Asseretoceras camunum (Assereto, 1963)	58	*Latemarites bavaricus* (Reis, 1901)	68
Megaceratites cf. *subnodosus* (Mojsisovics, 1882)	77	*Detoniceras ?* sp.	1
Megaceratites ? cf. *friccensis* (Arthaber, 1916)	15	*Hyparpadites liepoldti* (Mojsisovics, 1882)	38
Kellnerites bosnensis (Hauer, 1887)	11		

Hyparpadites aff. *liepoldti* (Mojsisovics, 1882)	6
Hyparpadites szaboi n. sp.	7
Parakellnerites frauenfelderi Rieber, 1973	14
Parakellnerites boeckhi (Roth, 1871)	22
Parakellnerites hungaricus (Mojsisovics, 1882)	4
Parakellnerites stuerzenbaumi n. sp.	30
Parakellnerites aff. *hungaricus* (Mojsisovics, 1882)	4
Parakellnerites cf. *rothpletzi* (Salomon, 1895)	32
Parakellnerites aff. *rothpletzi* (Salomon, 1895)	1
Parakellnerites loczyi (Arthaber, 1903)	13
Parakellnerites cf. *zoniaensis* Brack & Rieber, 1993	1
Parahungarites arthaberi (Diener, 1899)	209
Parahungarites solyensis n. sp.	10
Halilucites rusticus (Hauer, 1896)	2
Halilucites cf. *arietitiformis* (Hauer, 1896)	1
Halilucites cf. *obliquus* (Hauer, 1896)	1
Stoppaniceras cf. *variabile* Rieber, 1973	3
Stoppaniceras rieberi n. sp.	5
Stoppaniceras aff. *rieberi* n. sp.	1
Stoppaniceras cf. *ellipticum* (Hauer, 1887)	4
Stoppaniceras hermanni n. sp.	3
Stoppaniceras budaii n. sp.	3
Repossia cf. *acutenodosa* Rieber, 1973	10
Ticinites cf. *ticinensis* Rieber, 1973	1
Ticinites hantkeni (Mojsisovics, 1882)	12
Ticinites ? aff. *hantkeni* (Mojsisovics, 1882)	4
Ticinites crassus (Hauer, 1896)	2
Nevadites cf. *avenonensis* Brack & Rieber, 1993	4
Chieseiceras chiesense (Mojsisovics, 1882)	7
Chieseiceras sp. A	1
Hungarites mojsisovicsi (Roth. 1871)	79
Hungarites costosus Mojsisovics, 1882	5
Hungarites sinuosus n. sp.	6
Hungarites szentei n. sp.	4
Bullatihungarites emiliae (Mojsisovics, 1882)	33
Bullatihungarites semiplicatus (Hauer, 1896)	4
Nodihungarites bocsarensis (Arthaber, 1903)	3
Nodihungarites vinczei n. sp.	2
Celtites ? sp. A	2
Celtites ? sp. B	1
Aplococeras avisianum (Mojsisovics, 1882)	20
Aplococeras laczkoi (Arthaber, 1903)	2
Lecanites misanii (Mojsisovics, 1882)	8
Longobardites zsigmondyi (Böckh, 1874)	51
Longobardites breguzzanus Mojsisovics, 1882	24
Japonites ? sp.	1
Discoptychites cf. *megalodiscus* (Beyrich, 1867)	24
Gymnites sp.	2
Tropigymnites sp. **	1**
Epigymnites ecki (Mojsisovics, 1882)	2
Ptychites cf. *oppeli* Mojsisovics, 1882	35
Flexoptychites cf. *studeri* (Hauer, 1857)	1
Flexoptychites angustoumbilicatus (Böckh, 1872)	188
Flexoptychites flexuosus (Mojsisovics, 1882)	252
Flexoptychites cf. *acutus* (Mojsisovics, 1882)	76
Parasturia cf. *emmrichi* (Mojsisovics, 1882)	2
Proarcestes sp.	48
	2104

* MFGI collection (Budapest).
** K. Tamás collection (Kővágóörs).

The **state of preservation** of the ammonoid fossils was very variable, according to the lithology of the host rock. In the pure limestones, the originally aragonitic ammonoid shells were substituted by sparry calcite, or appeared only as imprints on the moulds of the shells. In these cases the host rock usually split along the sparry calcite substituting the ammonite shells, thus the outer surface of the ammonites were rarely visible. In many cases only the body chambers were filled by micritic limestone, and secondary calcite precipitated in the open spaces of the phragmocones. Very frequently, the ammonites were primarily fossilized as fragments of body chambers. In the clayey interlayers, and in some thin-bedded tuffaceous layers, the ammonoids were preserved in compressed state. In the siliceous limestones, the ammonoid shells were substituted by silica, but usually the fossils unbreakably coalesced with chert nodules. In all cases, the ammonoid fossils were extremely hard to extract from the host rock, and frequently were crushed into pieces during hammering. Consequently, entire remains of ammonoid specimens were extremely seldom found. More or less complete body chambers with imprints of seemingly intact aperture were recorded on a few specimens (Plate XL: 1; Plate XLIII: 1).

Diverse aspects of the Upper Anisian ammonoid fauna of the Balaton Highland were evaluated and published in the last decades.

The **biostratigraphical** results will be presented in a separate chapter.

The **palaeoenvironmental distribution** of the Late Anisian ammonoids was analysed and evaluated previously in two papers.

VÖRÖS (1996) compared the distribution of two special morphogroups of ammonoids and pointed out that the proportion of „coronates" (strongly ornamented ceratitids) was consistently lower in the basins than in the pelagic plateaus, whereas „sphaerocones" (Ptychitidae + Arcestidae) showed inverse relationship. During the studied interval, the proportion of "coronates" decreased, whereas the proportion of "sphaerocones" increased in time in the whole territory of the Balaton Highland (both in the basins and on the pelagic plateaus). This relationship was used to estimate water depth and changes in bathymetry. The depth of the pelagic plateaus and the basins was estimated as around 100 m and 200 m, respectively, for the Camunum Subchron. The depth difference slightly increased during the Late Anisian: the plateaux subsided to about 220 m, while the basins almost reached the 400 m depth for the Avisianum Subchron.

VÖRÖS (2002) studied the environmental distribution of ammonoid genera in the higher part of the Reitzi Zone (considered Ladinian at those times). Several genera showed definitive patterns of distribution according to palaeoenvironments.

Remarkably, in most cases the shell morphology of the ammonoids did not show direct correlation with the palaeoenvironment. It turned out that these results need to be revised.

The new analysis, presented here, used an improved data base, taking into account the newly available ammonoid finds and the new results of the taxonomical revision. The material is restricted to a narrower stratigraphical interval (Reitzi + Avisianum subzones) and to the ammonoid fauna of four representative localities/sections: Vászoly (including the sections P–11a and P–2, and diverse localities at the Öreg Hill), Felsőörs, Szentkirályszabadja and Sóly. The Mencshely sections were left out from the comparison because here the fauna of the Reitzi Zone is definitely mixed from palaeoecological point of view. The mentioned four localities and their ammonoid faunas are thought to represent different palaeoenvironments, as shown in Figure 15.

The percentage of *Flexoptychites*, as compared to the whole ammonoid assemblages of the respective localities, shows gradual increase towards the open sea, i.e. moving away from the shallow water carbonate platform. Remarkably, the percentage of *Flexoptychites* reaches a maximum at the submarine high and not in the deeper basin.

Five ammonoid genera (*Reitziites, Hungarites, Parakellnerites, Latemarites and Parahungarites*) were selected to demonstrate their distinctive palaeoenvironmental distribution. The criteria of selection were the relatively high specimen

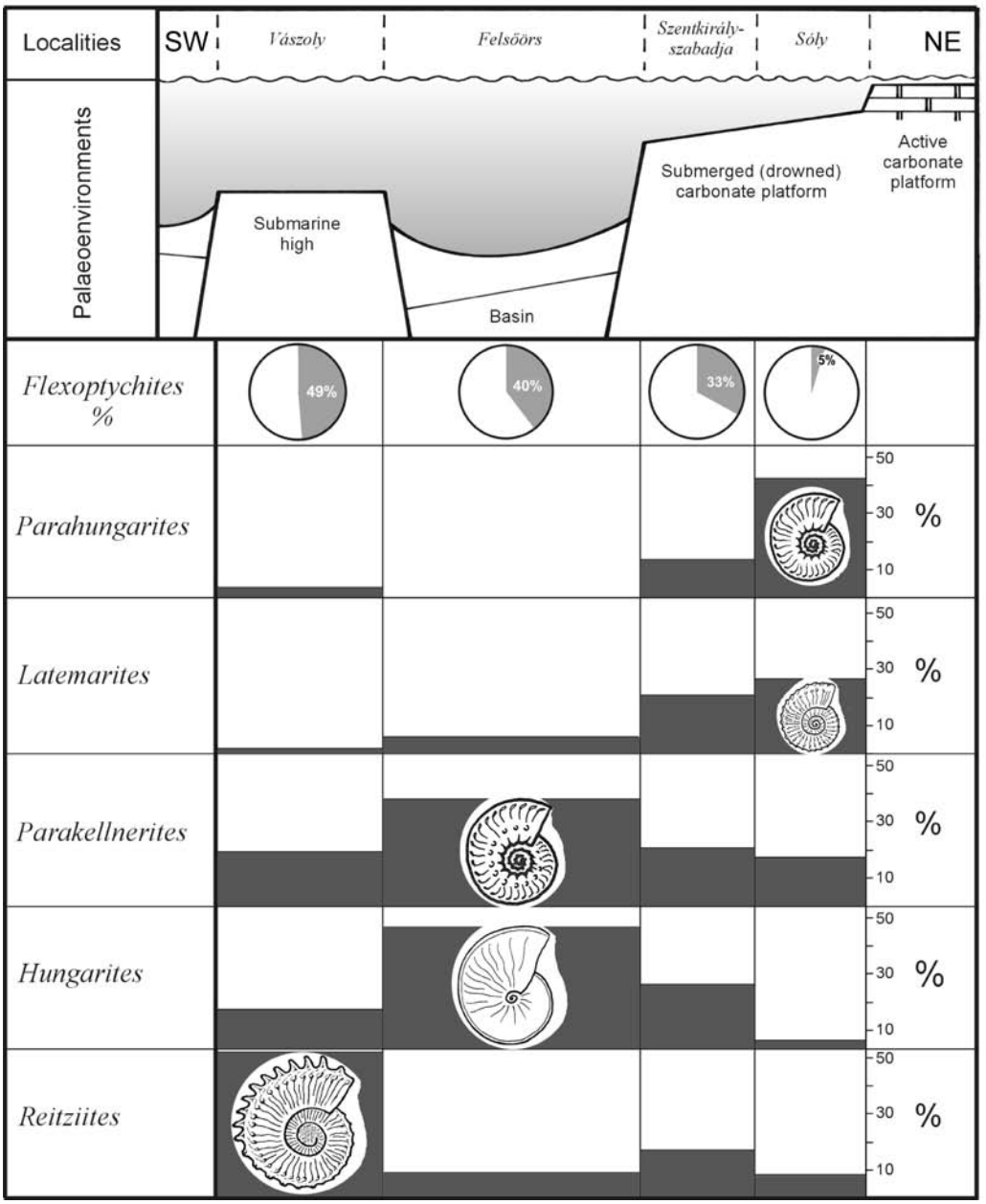


Figure 15. Late Anisian palaeoenvironmental model along the strike of the Balaton Highland (Reitzi + Avisianum Subchron), showing the variation of the percentages of *Flexoptychites* in the whole fauna, and the mutual proportions of selected ceratitid genera within the respective locality

numbers and the wide occurrence in different settings. The mutual percentages of the distinctive genera were counted for each locality, i.e. the base of percentage counting (the total) was not the whole local ammonoid fauna but the sum of the specimens of the five genera occurred on the respective locality.

The new results only partly endorse those of the previous study (VÖRÖS 2002): the genus *Latemarites* is definitely abundant in the peri-platform areas. The new genus *Parahungarites* (which was previously included in *Hungarites*) shows similar palaeoenvironmental preference. On the other hand, and on the contrary to the previous analysis (VÖRÖS 2002), *Parakellnerites* and *Hungarites* (s.s.) seem to characterize the deeper basinal setting, and *Reitziites* is definitely dominant at the submarine high. It is worth mentioning that the smooth oxycone *Longobardites* seemed to be positively linked to the peri-platform area, but it was not included to the present numerical comparison because (in the studied interval) it occurred exclusively in the Sóly locality.

The **diversity trends and dynamics** of the Anisian ammonoids, with emphasis on the Late Anisian fauna of the Balaton Highland, were analysed recently by VÖRÖS (2010b, 2014). Two pulses of diversification were outlined: one in the Middle Anisian (Pelsonian) and another, near the end of the Late Anisian (Late Illyrian). In the western Tethys, and especially in the Balaton Highland, the Late Illyrian diversity peak was very prominent: the ammonoid generic richness, the turnover rate and the proportion of originations were very high. This explosive peak was interpreted in terms of major changes of two regional environmental factors: the coeval volcanic activity and the control of nearby carbonate platforms. The Late Illyrian volcanic ash falls provoked a dramatic increase of ammonoid generic richness by fertilization i.e. supplying nutrients and iron, thus increasing the primary productivity in the ocean. Carbonate platform margins offered diverse habitats with new, empty niches; the microbial mats supplied suspended organic matter for the higher trophic levels and eventually the ammonoids. A co-evolution of the regional carbonate platforms and the ammonoids was suggested.

The **palaeobiogeography** of the Anisian ammonoids of the Balaton Highland was investigated by VÖRÖS (1992) by plotting the distribution of "distinctive taxa" on present day tectonic map. The Late Illyrian palaeobiogeographical pattern showed marked faunal belts: the "German" fauna was strongly endemic; in the deeper, pelagic outer shelf areas of the Tethyan region the extremely rich "Schreyeralm–Dinaric" fauna appeared; the shallower shelf regions were characterized by the "South-Alpine" fauna (including the plots of the Balaton Highland). It was suggested that the Illyrian sea-level fall resulted in increasing endemism between the "German" and the Alpine–Tethyan faunas.

The results of the present study were not attempted to be analysed by advanced numerical methods either, instead, the occurrences of the Late Anisian ammonoid taxa of the Balaton Highland in certain, well-documented coeval faunas of the neighbouring western Tethyan (Alpine and Dinaric) regions were counted (Table 15). In this comparison the new taxa and the taxa with open nomenclature (sp., aff.) were left out from the Balaton Highland fauna, what eventually resulted in 54 items. The relationship seems the strongest with western Lombardy and the Giudicarie region (28 shared taxa, each) and

Table 15. Number of late Anisian ammonoid species shared between the Balaton Highland and certain coeval faunas of the neighbouring Alpine and Dinaric regions

Balaton Highland	North Tirol	Salzkammergut	West Lombardy	Giudicarie	Dolomites	Dinarides
54	12	8	28	28	25	24

with the Dolomites (25) and rather weak with the Northern Calcareous Alps (Tirol and Salzkammergut: 14 altogether). The apparent similarity with the Dinaridic faunas (24 shared taxa) is somewhat surprising and seems to contradict partly to the previous assumptions (VÖRÖS 1992). If we add up the occurrences of the three South Alpine faunal regions, the merged list of species counts 52, indicating an almost complete identity between the species composition of the Late Anisian ammonoid faunas of the Balaton Highland and the Southern Alps.

Biostratigraphy

Comprehensive historical reviews of the development of the Triassic biostratigraphic scheme and the ammonoid-based biostratigraphic scale were given recently by BALINI et al. (2010) and JENKS et al. (2015). As far as the Middle Triassic scales are concerned, we may state proudly that the results from the Balaton Highland have been in the foreground from the beginning, by the contributions of BÖCKH (1872, 1873, 1874), MOJSISOVICS (1882), DIENER (1899, 1900), ARTHABER (1903) and FRECH (1903). Owing to the historical priority and the high-level, up to date biostratigraphical results achieved in the last decades, the Balaton area, and especially the Felsőörs section, seemed to fulfil the severe requirements of the Ladinian GSSP. Our efforts to receive the "golden spike" failed, but the painstaking work was not useless: the detailed ammonoid collections from dozens of well-dated sections resulted in a refined local ammonoid scale for the Middle Anisian (Pelsonian: VÖRÖS et al. 2003a) and for the Late Anisian (VÖRÖS et al. 1996, 2003b; VÖRÖS 1998). These scales were successfully correlated with those established in other European regions (VÖRÖS et al. 2003a, b, 2014; VÖRÖS et al. 2009).

The recent collections and the results of the taxonomical revision of the Upper Anisian ammonoid fauna of the Balaton Highland give good reason for supplementing and re-defining subzonal schemes proposed in the above mentioned papers.

The stratigraphical distribution of the Upper Anisian ammonoid taxa of the Balaton Highland in the successive subzones of the Trinodosus, Reitzi and Secedensis zones is shown in Table 16. On the basis of the ammonoid data sets recorded in the measured sections, nine successive subzones can be recognized and correlated within the studied stratigraphic interval of the Balaton Highland. The elements of the proposed subzonal scheme, from bottom to top (Figure 16): Trinodosus Subzone, Camunum Subzone, Pseudohungaricum Subzone (parts of the Trinodosus Zone), Felsoeoersensis Subzone, Liepoldti Subzone, Reitzi Subzone, Avisianum Subzone (parts of the Reitzi Zone), Crassus Subzone, Secedensis Subzone (parts of the Secedensis Zone). The subzones can be best recognized and are most completely represented in the Felsőörs section.

The base of the **Trinodosus Subzone** was nowhere recorded at the Balaton Highland, therefore its delimitation from the subjacent Binodosus Subzone remains unknown. The Trinodosus Subzone is well documented in the Felsőörs and the Vörösberény sections by at least five metres thick bed complexes, below Bed 90, and Bed 18, respectively. Its fauna consists of, besides the subzonal index species, *Paraceratites rothi, P. elegans, Semiornites cordevolicus, Megaceratites subnodosus* and abundant specimens of *Ptychites* and *Flexoptychites* species. It can be more or less correlated with the SF97A to SF105A interval of the Stabol Fresco section in Giudicarie (Figure 17).

The **Camunum Subzone** is rather widespread in the Balaton Highland: it is well documented in the Felsőörs section (between Beds 90 to 96), the Vászoly P–11a section (below Bed 4) and the Szentantalfa section (Beds 2/a to 5). It is surely present in the Vörösberény and Szentkirályszabadja sections, though with doubtful delimitations. Besides the subzonal index species, its fauna is characterized by the appearance of *Lardaroceras krystyni, L. barrandei, Norites gondola* and *Semiornites aviticus*. It corresponds to the "*Lardaroceras* beds" in Giudicarie (e.g. between the beds SF105A and SF111A in Stabol Fresco: BALINI 1992a, and the beds above 51 m in Bagolino [Pertica] section [Figure 17]: BRACK et al. 2005).

The **Pseudohungaricum Subzone** is best documented in Felsőörs (between beds 97 and 99C) and is well known in the sections Mencshely I (below Bed 16), Vászoly P–11a (Beds 4 and 5), Szentantalfa (Bed 1) and in Szentkirályszabadja (below Bed 16). It is present also in Vörösberény, but its delimitation from the Camunum Subzone is uncertain here. Besides the first appearance of the subzonal index species, the fauna comprises *Longobardites breguzzanus, Beyrichites reuttensis*; some elements of the subjacent subzones (*Norites, Megaceratites* and even *Asseretoceras camunum*) appear again here. Correlation is evident with the Giudicarie sections (Figure 17): above Bed SF111A in Stabol Fresco (BALINI 1992a) and beds around 52 m at Bagolino (BRACK et al. 2005).

The **Felsoeoersensis Subzone** is well documented in Felsőörs (between Beds 100E and 100), Vászoly P–11a (Beds 6 to

Table 16. The stratigraphical distribution of the late Anisian ammonoid taxa of the Balaton Highland in the successive zones and subzones

	Trinodosus	Camunum	Pseudohungaricum	Felsoeoersensis	Liepoldti	Reitzi	Avisianum	Crassus	Secedensis
	Trinodosus			Reitzi				Secedensis	
Paraceratites cf. *rothi* (Mojsisovics, 1882)	▪▪▪▪▪								
Paraceratites trinodosus (Mojsisovics, 1882)	▪▪▪▪▪	▪▪							
Semiornites cf. *cordevolicus* (Mojsisovics, 1882)	▪▪▪▪▪	▪▪▪▪▪							
Paraceratites cf. *elegans* (Mojsisovics, 1882)	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪						
Megaceratites cf. *subnodosus* (Mojsisovics, 1882)	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪						
Ptychites cf. *oppeli* Mojsisovics, 1882	▪▪▪▪▪	▪▪▪▪▪	———	▪▪▪▪▪					
Discoptychites cf. *megalodiscus* (Beyrich, 1867)	▪▪▪▪▪	———	———	———	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪		
Flexoptychites cf. *acutus* (Mojsisovics, 1882)	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	
Flexoptychites flexuosus (Mojsisovics, 1882)	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	
Semiornites cf. *aviticus* (Mojsisovics, 1882)		▪▪▪▪▪	▪▪▪▪▪						
Asseretoceras camunum (Assereto, 1963)		▪▪▪▪▪	▪▪▪▪▪						
Lardaroceras krystyni Balini, 1992		▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪					
Lardaroceras barrandei(Mojsisovics, 1882)		▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪					
Norites gondola (Mojsisovics, 1869)		▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	———	▪▪▪▪▪	▪▪▪▪▪		
Longobardites zsigmondyi (Böckh, 1874)		▪▪▪▪▪	▪▪▪▪▪	———	———	▪▪▪▪▪	▪▪▪▪▪		
Flexoptychites angustoumbilicatus (Böckh, 1872)		▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	
Beyrichites cf. *reuttensis* (Beyrich, 1867)			▪▪▪▪▪						
Lardaroceras pseudohungaricum Balini, 1992			▪▪▪▪▪	▪▪▪▪▪					
Longobardites breguzzanus Mojsisovics, 1882			▪▪▪▪▪	———	———	———	▪▪▪▪▪		
Kellnerites felsoeoersensis (Stürzenbaum, 1875)				▪▪▪▪▪					
Kellnerites cf. *bispinosus* (Hauer, 1896)				▪▪▪▪▪					
Kellnerites bosnensis (Hauer, 1887)				▪▪▪▪▪	?				
Epikellnerites tamasi n. sp.				?	?	?			
Hungarites mojsisovicsi (Roth, 1871)				▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	
Tropigymnites sp.				?	?	?	?		
Hyparpadites liepoldti (Mojsisovics, 1882)				?	▪▪▪▪▪	———	?		
Hyparpadites szaboi n. sp.				?	▪▪▪▪▪				
Semiornites ? cf. *falcifer* (Hauer, 1896)					▪▪▪▪▪				
Epikellnerites aff. *tamasi* n. sp.					▪▪▪▪▪				
Hyparpadites aff. *liepoldti* (Mojsisovics, 1882)					▪▪▪▪▪				
Epikellnerites vaszolyensis n. sp.					▪▪▪▪▪	▪▪▪▪▪			
Epikellnerites angustecarinatus (Hauer, 1896)					▪▪▪▪▪	▪▪▪▪▪			
Parakellnerites frauenfelderi Rieber, 1973					▪▪▪▪▪	▪▪▪▪▪	▪▪		
Parakellnerites boeckhi (Roth, 1871)					▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪		
Parakellnerites cf. *rothpletzi* (Salomon, 1895)					▪▪	▪▪▪▪▪	▪▪▪▪▪		
Parakellnerites loczyi (Arthaber, 1903)					▪▪	▪▪▪▪▪	▪▪▪▪▪		
Epikellnerites pseudocholnokyi n. sp.						▪▪▪▪▪			
Epikellnerites spinatus n. sp.						▪▪▪▪▪			
Reitziites reitzi (Böckh, 1872)						▪▪▪▪▪			
Ticinites ? aff. *hantkeni* (Mojsisovics, 1882)						▪▪▪▪▪			
Japonites ? sp.						▪▪▪▪▪			
Flexoptychites cf. *studeri* (Hauer, 1857)						▪▪▪▪▪			
Reitziites reitzi (Böckh, 1872) morphotype *cholnokyi*						▪▪▪▪▪	▪▪		
Reitziites ecarinatus (Hauer, 1896)						▪▪▪▪▪	▪▪		
Bullatihungarites semiplicatus (Hauer, 1896)						▪▪▪▪▪	▪▪▪▪▪		

Table 16. Continuation

	Trinodosus	Camunum	Pseudohungaricum	Felsoeoersensis	Liepoldti	Reitzi	Avisianum	Crassus	Secedensis
	Trinodosus			Reitzi				Secedensis	
Parakellnerites stuerzenbaumi n. sp.						▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	
Proarcestes sp.						▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪	▪▪▪▪▪
Latemarites bavaricus (Reis, 1901)							▪▪▪▪▪		
Parakellnerites hungaricus (Mojsisovics, 1882)							▪▪▪▪▪	▪▪▪▪▪	
Megaceratites ? cf. *friccensis* (Arthaber, 1916)							▪▪▪▪▪		
Parahungarites solyensis n. sp.							▪▪▪▪▪		
Detoniceras ? sp.							▪▪▪▪▪		
Halilucites cf. *arietitiformis* (Hauer, 1896)							▪▪▪▪▪		
Stoppaniceras cf. *ellipticum* (Hauer, 1887)							▪▪▪▪▪		
Aplococeras laczkoi (Arthaber, 1903)							▪▪▪▪▪		
Celtites ? sp. B							▪▪▪▪▪		
Gymnites sp.							▪▪▪▪▪		
Epigymnites ecki (Mojsisovics, 1882)							▪▪▪▪▪		
Parasturia ? sp.							▪▪▪▪▪		
Aplococeras avisianum (Mojsisovics, 1882)							▪▪▪▪▪	?	
Parakellnerites aff. *hungaricus* (Mojsisovics, 1882)							▪▪▪▪▪		
Hungarites sinuosus n. sp.							▪▪▪▪▪	▪▪▪▪▪	
Halilucites rusticus (Hauer, 1896)							▪▪▪▪▪	▪▪▪▪▪	
Stoppaniceras hermanni n. sp.							▪▪▪▪▪	▪▪▪▪▪	
Stoppaniceras budaii n. sp.							▪▪▪▪▪	▪▪▪▪▪	
Hungarites costosus Mojsisovics, 1882							▪▪▪▪▪	▪▪▪▪▪	
Stoppaniceras rieberi n. sp.							▪▪▪▪▪	▪▪▪▪▪	
Celtites ? sp. A							▪▪▪▪▪	▪▪▪▪▪	
Parakellnerites aff. *rothpletzi* (Salomon, 1895)								▪▪▪▪▪	
Parakellnerites cf. *zoniaensis* Brack & Rieber, 1993								▪▪▪▪▪	
Ticinites crassus (Hauer, 1896)								▪▪▪▪▪	
Nodihungarites bocsarensis (Arthaber, 1903)							?	▪▪▪▪▪	
Nodihungarites vinczei n. sp.								▪▪▪▪▪	
Halilucites cf. *obliquus* (Hauer, 1896)								▪▪▪▪▪	
Stoppaniceras cf. *variabile* Rieber, 1973								▪▪▪▪▪	
Stoppaniceras aff. *rieberi* n. sp.								▪▪▪▪▪	
Repossia cf. *acutenodosa* Rieber, 1973								▪▪▪▪▪	
Ticinites cf. *ticinensis* Rieber, 1973								▪▪▪▪▪	
Ticinites hantkeni (Mojsisovics, 1882)								▪▪▪▪▪	
Chieseiceras sp.								▪▪▪▪▪	
Nevadites cf. *avenonensis* Brack & Rieber, 1993									▪▪▪▪▪
Chieseiceras chiesense (Mojsisovics, 1882)									▪▪▪▪▪

8) and Mencshely I (Beds 14 to 16). It is definitely present in Vörösberény and Szentkirályszabadja, but in these sections its upper limit can not be drawn. Besides the subzonal index, other *Kellnerites* species (*K. bosnensis, K. bispinosus*) are the distinctive elements of this subzone. *Lardaroceras* species appear again here. The correlation is good with the Bagolino section (Figure 17) on the basis of the appearance of *Kellnerites* species at 53 m (Brack et al. 2005, Vörös et al. 2009).

The **Liepoldti Subzone** is well defined in Felsőörs (between Beds 100 and 102), Vászoly P–11a (above Bed 9) and Mencshely I (above Bed 12). It is present in the Szentkirályszabadja section, but here its lower limit is not proved, because the ranges of the subzonal index species *K. felsoeoersensis* and *Hyparpadites liepoldti* overlap. The characteristic faunal element of this subzone are the *Hyparpadites* species, furthermore the first appearances of the genera *Epikellnerites* and

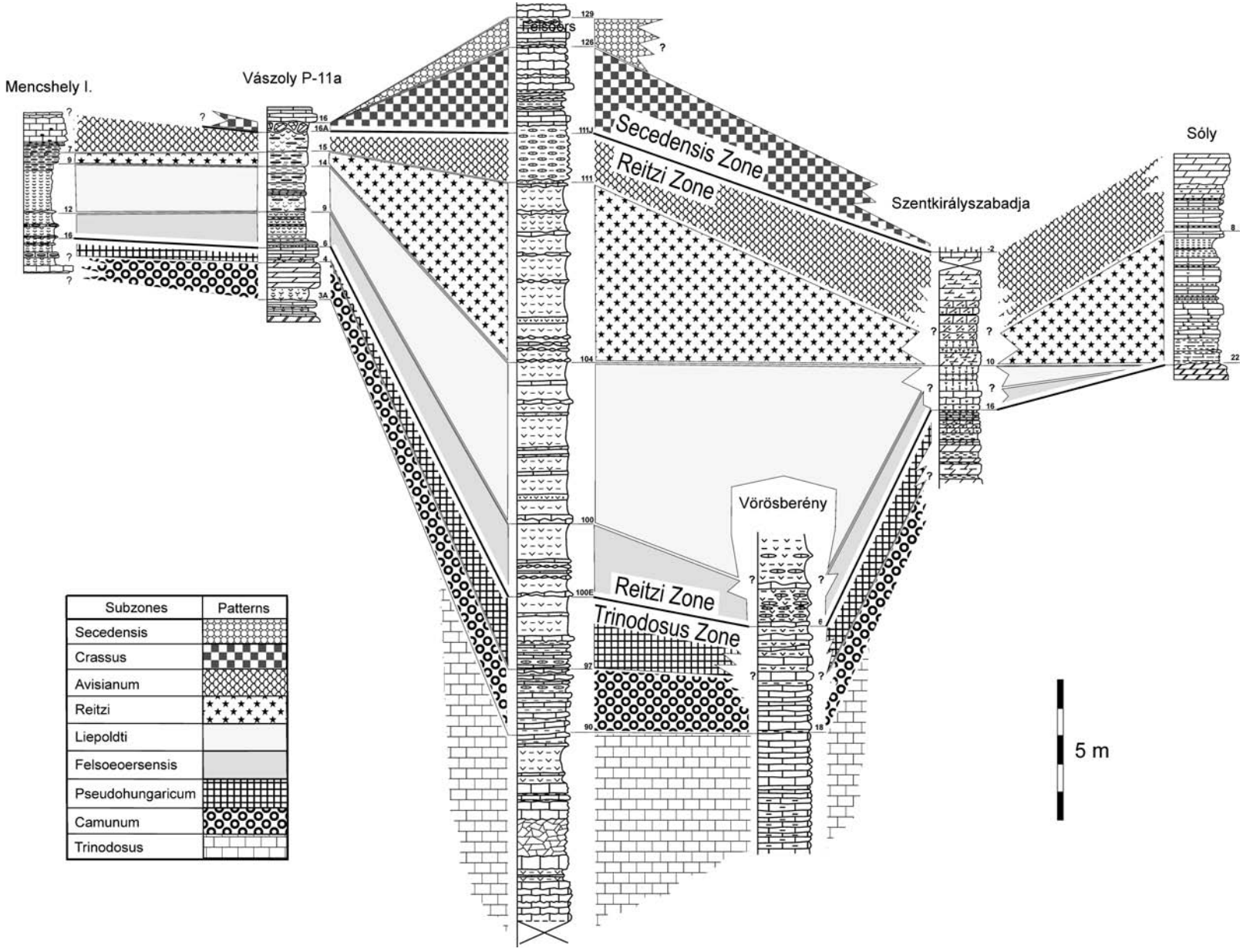


Figure 16. The Upper Anisian ammonoid subzones and zones recognized in the Balaton Highland and their correlation between the measured sections of the area

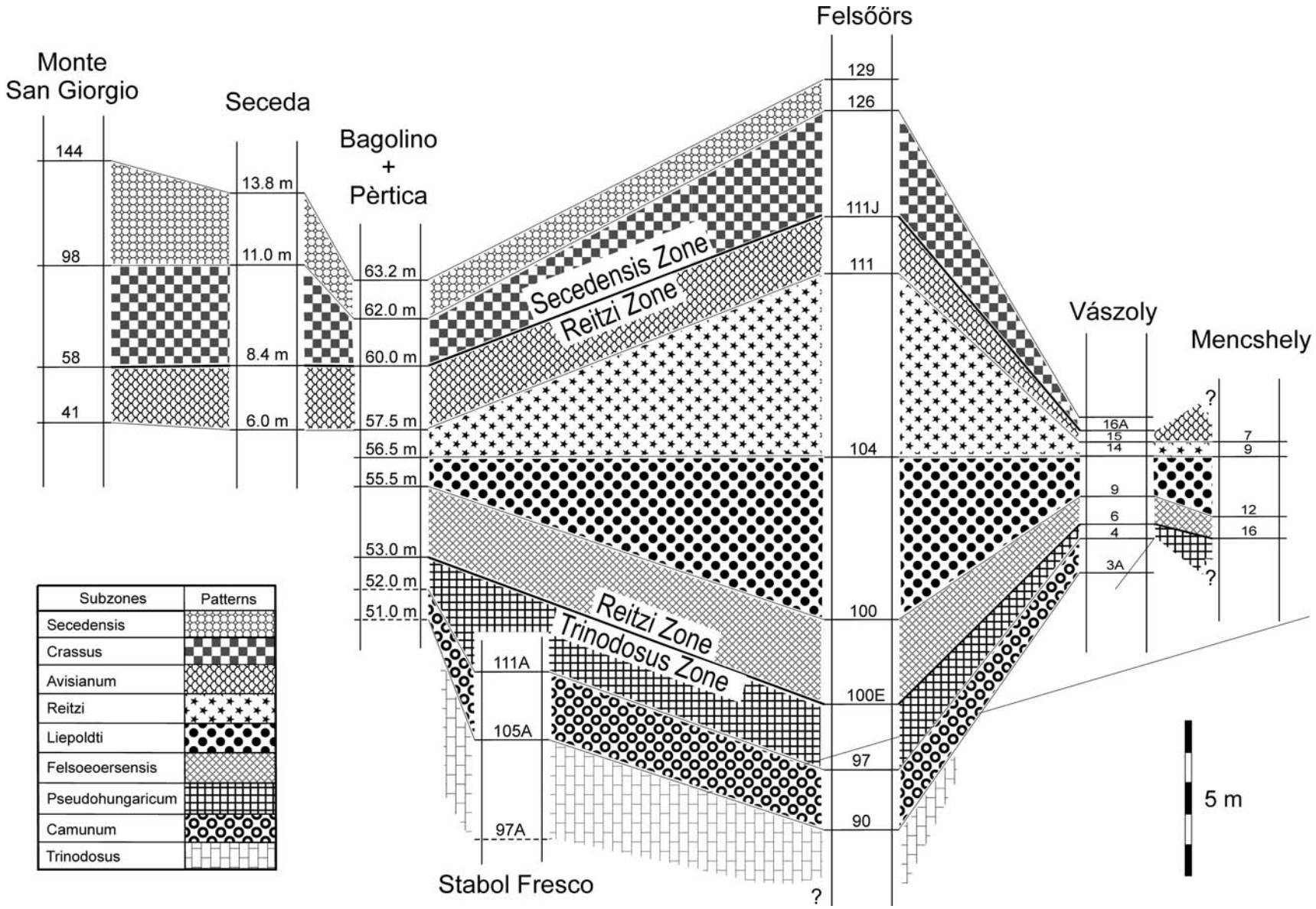


Figure 17. The Upper Anisian ammonoid subzones and zones and their correlation between selected sections of the Balaton Highland and the Southern Alps. Southern Alpine data from RIEBER (1973), BRACK & RIEBER (1993), BRACK et al. (2003, 2005), BALINI (1992a), MIETTO et al. (2003) and MANFRIN et al. (2005)

Parakellnerites were recorded here. This subzone can well be recognized in the interval 55.5 to 56.5 m in the Bagolino section (Figure 17).

The **Reitzi Subzone** is classically recognized and recently proved again in Felsőörs (between Beds 104 and 108), well documented in Vászoly P–11a (Bed 14), Vászoly P–2 (Bed 4), Mencshely I (Beds 8 and 9) and Sóly (Bed 21). It is definitely present in the Szentkirályszabadja section (in Bed 10), but here it appears together with *Aplococeras avisianum*, the index of the next subzone. The fauna of the Reitzi Subzone is diverse: besides the *Reitziites* species, the representatives of the genera *Epikellnerites, Parakellnerites, Parahungarites, Hungarites* and *Bullatihungarites* frequently occur. The correlation is good with the interval 56.5 to 57.5 m of the Bagolino section (Figure 17).

The **Avisianum Subzone** is the most widespread subzone of the Reitzi Zone in the Balaton Highland and perhaps also in the Southern Alps. It is perfectly documented in Felsőörs (Beds 111 to 111/I) Mencshely (Beds 1 to 7) and Sóly (Beds 1 to 8), and it is present in Vászoly P–11a (Bed 15) and Szentkirályszabadja, although here it overlaps the subjacent subzone. The ammonoid fauna is extremely diverse; besides the subzonal index *Aplococeras avisianum* and *A. laczkoi*, *Latemarites bavaricus*, *Megaceratites* ? cf. *friccensis* and several species of *Hungarites*, *Halilucites* and *Parakellnerites* are abundant here. The correlation is excellent with Bagolino (57.6 to 60 m interval) and Monte S. Giorgio (Beds 41 to 57) and even with sections in the Dolomites (Figure 17): Seceda (6 to 8.5 m interval) and Latemar (Beds LB 3 to LB 4, according to MANFRIN et al. 2005).

The **Crassus Subzone** is well documented in the Felsőörs section (between Beds 111J and 118), proved by a rich fauna in a single, condensed bed of the Vászoly P–11a section (Bed 16A) and in the topmost exposed bed of the Szentkirályszabadja section (Bed –2). The fauna is rather diverse, with the dominance of *Ticinites hantkeni*; besides *Nodihungarites bocsarensis,* some species of the genera *Parakellnerites, Halilucites, Stoppaniceras* and *Repossia* are frequent. The correlation (Figure 17) is good with Bagolino (60 to 62 m interval), Monte S. Giorgio (Beds 58 to 87) and with Seceda (8.4 to 11 m interval) and Latemar (Beds L 2 to LA 83: MANFRIN et al. 2005).

The **Secedensis Subzone** is equivalent to the Serpianensis and Chiesense subzones, as defined previously by MIETTO & MANFRIN (1995). Recently MANFRIN et al. (2005, p. 487) used the name Secedensis Subzone, containing a higher, tentatively divided Chiesense Subzone. In fact, the "Chiesense Subzone" in most places (Bagolino, Seceda, Felsőörs) is restricted to a few beds or a single bed ("chiesense groove"), therefore it does not seem to be reasonable to define this horizon as a separate subzone. At the Balaton Highland, the Secedensis Subzone was proved only in the Felsőörs section (between Beds 126 and 129A). Here its fauna is extremely poor: only a few specimens of *Nevadites* cf. *avenonensis* and *Chieseiceras chiesense* were collected. The correlation (Figure 17) is good with Bagolino (62 to 63.2 m interval), Monte S. Giorgio (Beds 98 to 144) and with Seceda (11 to 13.8 m interval) and Latemar (Beds LA 101A to LA 0: MANFRIN et al. 2005).

The recently revised Upper Anisian scale, the ammonoid zones and subzones defined at the Balaton Highland, are demonstrated in Figure 16. The possible correlation of the subzones recognized at the Balaton Highland with selected, well documented sections of the Southern Alps is shown in Figure 17. The good correlation with the Latemar succession is not shown for graphical reasons, because the Latemar stratigraphic column is extraordinarily large, more than twenty times thicker than any other compared sections. The correlation between Felsőörs and Bagolino is almost perfect. The lower part (Trinodosus and Camunum subzones) of the Felsőörs section is well correlated with the basinal sections (Stabol Fresco) of Lombardy (Giudicarie). Starting from the Avisianum Subzone, the other South Alpine sections (Monte San Giorgio, Seceda) show also good correlation with the more condensed sections of the Balaton Highland (Vászoly, Mencshely).

Systematic descriptions

In the following descriptions the systematics developed by TOZER (1981) is used, with a few exceptions. The genera *Lardaroceras*, *Asseretoceras* and *Megaceratites*, introduced afterwards, are systematically arranged according to the opinion of their author BALINI (1992a, b). *Hyparpadites*, due to its fastigate venter, is here removed from Arpaditidae to Paraceratitinae. Moreover, following the opinion of MANFRIN et al. (2005), *Ticinites* is removed from Danubitidae to Bulogitinae, *Parasturia* is removed from Sturiidae to Ptychitidae and, following MONNET & BUCHER (2005), *Tropigymnites* is removed from Japonitidae to Gymnitidae.

The signs of open nomenclature were used according to BENGTSON (1988), except regarding the uncertainty of the generic attributions; here the opinions of RICHTER (1943) and MATTHEWS (1973) were followed, i.e. question marks "?" after the name, instead of "aff." in front of the name, were used. The signs attached to the synonymy lists were applied from RICHTER (1943, p. 40–42) and MATTHEWS (1973).

The majority of the material is deposited in the Department of Palaeontology and Geology of the Hungarian Natural History Museum (HNHM) under the inventory numbers prefixed by M., INV, or PAL, and in the palaeontological collection of the Mining and Geological Survey of Hungary (MGSH) under the inventory numbers prefixed by T. A few figured specimens are kept in the private collections of K. TAMÁS (Kővágóörs) and L. VARGA (Úny), without inventory numbers.

The author made comparative studies on ammonoid specimens deposited in several museums abroad; the names of the collections and their acronyms (used in the present monograph) are the following: Geologische Bundesanstalt, Wien (GBAW), Naturhistorisches Museum, Wien (NHMW), Bayerische Staatssammlung, München (BSM), Paläontologisches Institut und Museum, Universität Zürich (PIMUZ), Natural History Museum, London (NHML).

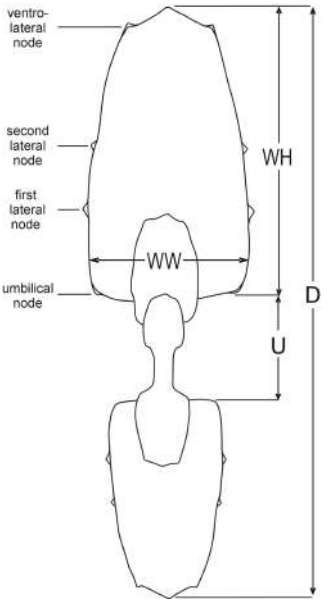


Figure 18. The axes of measurements (D = diameter, WH = whorl-height, WW = whorl-width, U = diameter of umbilicus), and the terminology of nodes, used in the present monograph

The dimensions of the measured ammonoid specimens (D = diameter, WH = whorl-height, WW = whorl-width, U = diameter of umbilicus) are given in millimetres (Figure 18).

Order Ceratitida HYATT, 1884
Superfamily Noritoidea KARPINSKY, 1889
Family Noritidae KARPINSKY, 1889
Genus ***Norites*** MOJSISOVICS, 1878
Type species: *Norites gondola* (MOJSISOVICS, 1869)

Norites gondola (MOJSISOVICS, 1869)
Plate I: 1–5.

* 1869 *Ammonites Gondola* MOJS. nov. sp. — MOJSISOVICS, Cephalopoden-Fauna des alpinen Muschelkalkes, p. 584, pl. XV, fig. 3a–b.

v 1900 *[Ceratites] cordevolicus* MOJS. — DIENER, Muschelkalk–Cephalopoden südl. Bakony, p. 25, pl. II, fig. 3.
v 1901 *Norites gondola* MOJS. var. nov. — REIS, Fauna des Wettersteinkalkes I., p. 90, pl. IV, figs 24, 25.
v 1903 *Norites Dieneri* ARTH. — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 26, pl. I, fig. 9.
? 1915 *Norites gondola* MOJS. — ARTHABER, Die Trias von Bithynien, p. 144, pl. XVII, fig. 3.
v 1934 *Norites gondola* (MOJSISOVICS) — SPATH, Ammonoidea of the Trias, p. 281, fig. 98.
v 1973 *Norites dieneri* ARTHABER, 1903 — RIEBER, Grenzbitumenzone, p. 71, pl. 17, figs 17, 18, 20.
v 1989 *Norites dieneri* ARTHABER, 1903 ? — VÖRÖS & PÁLFY, Vászoly, p. 19.
1996 *Norites dieneri* ARTHABER, 1903 — FANTINI SESTINI, Calcare di Esino 2, p. 216, pl. 1, fig. 10.
v 1998 *Norites dieneri* ARTHABER, 1903 — VÖRÖS, Balaton-felvidék, p. 26, 35, 38, 42.
v 2003 *Norites gondola* (MOJSISOVICS, 1869) — VÖRÖS, Pelsonian, p. 79, pl. A–I, figs 5–7, text-fig. A–9. (cum syn.)
2008 *Norites gondola* (MOJSISOVICS 1869) — MONNET et al., Giudicarie, p. 69, text-figs 6, 7.

Material

15 specimens of various state of preservation, from Felsőörs (1), Vörösberény (1), Szentantalfa (1), Vászoly (4), Mencshely (6), Sóly (1) and Tótvázsony (1).

Measurements

	D	WH	WW	U
INV 2017.139.1.	34.8	~17.9	~10.1	~3.7
INV 2017.140.1.	33.4	17.5	?	~3.2
INV 2017.136.1.	28.1	13.8	7.5	~2.8
INV 2017.138.1.	~28.1	~13.1	?	~2.8
INV 2017.137.1.	26.3	14.1	7.6	~2.8

Description

The specimens are rather small for the genus. The coiling is very involute; the whorl-section is high and narrow trapezoidal. The umbilicus is narrow and deep. The umbilical wall is steep and forms a rather sharp shoulder with the flanks. The flanks are gently and evenly convex and meet the flat venter with a marked ventrolateral shoulder, carrying a definite, faint keel. The ornamentation is very weak.

The details of the suture were not studied; a weathered specimen (Plate I: 5) shows a ceratitic suture with at least five lateral lobes at 27 mm diameter.

Remarks

N. gondola is the type species of the genus *Norites*. Its middle Anisian (Pelsonian) occurrences and the relationships to other Pelsonian forms of *Norites* were discussed in detail by VÖRÖS (2003).

N. dieneri ARTHABER, 1903 was taken as an independent species by some authors, including VÖRÖS (1998) mainly on the basis of its larger size and its occurrence in the higher Anisian beds (Avisianum Subzone), in contrast to *N. gondola* which was recorded prevalently from the Pelsonian. However the new collections at the Balaton Highland revealed *N. gondola* in some transitional horizons (Camunum, Pseudohungaricum and Felsoeoersensis subzones). The extremely large size of ARTHABER's type specimen of *N. dieneri* is not considered enough to distinguish it as a separate species.

The specimen figured as *N. gondola* by ARTHABER (1915, l. c.) seems to be poorly preserved and its ventrolateral shoulder is rather rounded, without "keel"; therefore this item is included to the synonymy only with query.

Several specimens of *N. gondola* listed by SPATH (1934) were examined in the collection NHML (London) and most of them (C. 5458, C. 13896, C. 21037–9, C. 23063, C. 37191 and C. 37206) are here regarded as proper representatives of that species.

Distribution

N. gondola was described from the Anisian Schreyeralm Limestone of the Northern Calcareous Alps. It was found also in Anisian localities of the Northern Calcareous Alps, the Southern Alps and the Dinarides (Han Bulog Limestone). At the Balaton Highland it ranges from the Pelsonian Balatonicus Subzone to the Illyrian Avisianum Subzone.

Superfamily Ceratitoidea MOJSISOVICS, 1879
Family Ceratitidae MOJSISOVICS, 1879
Subfamily Beyrichitinae SPATH, 1934
Genus **Beyrichites** WAAGEN, 1895
Type species: *Beyrichites reuttensis* (BEYRICH, 1867)

Beyrichites cf. *reuttensis* (BEYRICH, 1867)
Plate I: 6.

* 1867 *Ammonites Reuttensis*. — BEYRICH, Über einige Cephalopoden, p. 113, pl. I, fig. 4a–c.
v 1998 *Beyrichites* cf. *reuttensis* (BEYRICH, 1867) — VÖRÖS, Balaton-felvidék, p. 26, 59.
v 2003 *Beyrichites* cf. *reuttensis* (BEYRICH, 1867) — VÖRÖS, Pelsonian, p. 95, pl. A–VII, fig.10 (cum syn.).

Material
Four fragmentary specimens from Szentantalfa.

Measurements

	D	WH	WW	U
INV 2017.141.1.	48.5	?	?	?

Description
The specimens are medium-sized for the genus. Compressed shells with rather involute coiling. The whorl-section is high oval. The umbilical shoulder is rounded. The flank is gently convex and passes gradually into the highly arched, narrow venter. The ornamentation is weak; it consists of widely spaced, sinuous to falcoid ribs fading out near the venter. In the outer part of the flank, very weak secondary ribs are inserted between the primaries.
Suture lines were not seen.

Remarks
The middle Anisian (Pelsonian) occurrences of *B. reuttensis* and the relationships to other species of *Beyrichites* were discussed in detail by VÖRÖS (2003). The figures published by VENZO & PELOSIO (1968, l. c.) are regarded as the most perfect and reliable illustrations of *B. reuttensis*.

Distribution
B. reuttensis was described from the Anisian of the Southern Alps. It is also known from the Northern Calcareous Alps (Wetterstein Limestone), the Dinarides and the Caucasus. At the Balaton Highland it ranges from the Illyrian Binodosus Subzone to the Pseudohungaricum Subzone.

Genus **Lardaroceras** BALINI, 1992
Type species: *Lardaroceras krystyni* BALINI, 1992

Lardaroceras krystyni BALINI, 1992
Plate I: 9.

* 1992 *Lardaroceras krystyni* sp. n. — BALINI, Lardaroceras, p. 12, text-figs 4A, 5A–E, pl. 1, figs 1–5.
1993 *Lardaroceras krystyni* BALINI, 1992 — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 64, pl. 3, fig. 1.
v 1998 *Lardaroceras krystyni* BALINI, 1992 — VÖRÖS, Balaton-felvidék, p. 20, 22, 59 (partim), (non pl. I, fig. 7).
v 2010 *Lardaroceras krystyni* BALINI, 1992 — VÖRÖS, North Hungary, p. 6, pl. I, figs 4, 5.

Material
50 specimens of various state of preservation, from Felsőörs (4), Vörösberény (10), Szentantalfa (6), Szentkirályszabadja (2), Vászoly (23), Szentbékkálla (4), and Iszkaszentgyörgy (1).

Measurements

	D	WH	WW	U
INV 2017.144.1.	59.1	26.9	?	?

Description
Small to large *Lardaroceras* with moderately involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall and the umbilical margin are poorly seen. The flanks are gently convex, almost flat and meet the arched venter at a blunt ventrolateral margin. The venter bears a definite rounded keel separated from the ventrolateral

shoulders. The ornamentation consists of weak, mostly sinuous radial ribs and nodes. The prominent umbilical nodes elevate from the umbilical margin. There are no lateral nodes. The ventrolateral nodes (around 20 on a half whorl) are of medium strength; on the body chamber they appear as somewhat adorally elongated clavi.

Suture lines are not visible.

Remarks

This is the type species of the genus *Lardaroceras* and, according to the detailed description of BALINI (1992b, l. c.), it differs from the other species of that genus by the absence of lateral nodes. Previously this feature was not considered by the present author (VÖRÖS 1998, l. c.) and some forms with lateral row of nodes were wrongly attributed to *L. krystyni*. In the present monograph these forms are described as *L. barrandei* (MOJSISOVICS, 1882).

Distribution

L. krystyni was described from the Illyrian (Middle Triassic) of the Southern Alps (Lombardy). At the Balaton Highland it ranges from the Illyrian Camunum Subzone to the Felsoeoersensis Subzone.

Lardaroceras barrandei (MOJSISOVICS, 1882)
Plate I: 7, 8, 10, 11.

v * 1882 *Ceratites Barrande*i E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 25, pl. XII, fig. 8.
v 1989 *Parakellnerites* cf. *meriani* RIEBER, 1973 — VÖRÖS & PÁLFY, Vászoly, p. 19. (partim)
v 1993 *Parakellnerites* sp., aff. *merianii* B — VÖRÖS, Reitzi Zone, p. 27, pl. I, figs 8, 9.
v 1993 *Parakellnerites* sp., aff. *merianii* B — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 3.
v 1998 *Lardaroceras krystyni* BALINI, 1992 — VÖRÖS, Balaton-felvidék, p. 20, 22, 59 (partim), pl. I, fig. 7.
v 1998 *Lardaroceras* sp., aff. *krystyni* BALINI, 1992 — VÖRÖS, Balaton-felvidék, p. 22, 59 (partim), pl. I, fig. 8.
v 2002 *Lardaroceras* sp. — VÖRÖS & PÁLFY, Köveskál, p. 55, pl. I, fig. 9.

Material

28 specimens of various state of preservation, from Felsőörs (8), Vörösberény (2), Szentantalfa (4), Szentkirályszabadja (1), Vászoly (9), Köveskál (1), Szentbékkálla (2) and Vöröstó (1).

Measurements

	D	WH	WW	U
M.98.4	78.8	35.4	22.9	?
M.98.5	78.1	38.4	~21.1	~14.1
INV 2017.142.1.	38.1	19.1	?	~7.5
INV 2017.143.1.	36.8	18.5	?	~7.1

Description

Small to large *Lardaroceras* with moderately involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall and the umbilical margin are poorly seen. The flanks are gently convex, almost flat and meet the arched venter at a blunt ventrolateral margin. The venter bears a definite rounded keel separated from the ventrolateral shoulders. The ornamentation consists of weak, mostly sinuous radial ribs and nodes. The prominent umbilical nodes elevate from the umbilical margin. The weak lateral nodes are somewhat nearer to the umbilical than to the ventrolateral margin and fade gradually on the body chamber; their number is around 12 on a half whorl. The ventrolateral nodes (20 to 22 on a half whorl) are strong, mostly pointed; on the body chamber they appear as somewhat projected clavi.

Suture lines are not visible.

Remarks

The holotype of *L. barrandei*, by monotypy, is deposited in the collection of the MGSH (Budapest), under the inventory number T.123. This specimen was inspected in the collection of the MGSH and the identification of our specimens from the Balaton Highland was confirmed.

This species, although properly defined and illustrated by MOJSISOVICS (1882), was almost forgotten; only AIRAGHI (1912, p. 13) gave a short description of a specimen from the Anisian of Tre Fontane (Monte San Giorgio). This record was not verified by later authors because AIRAGHI's material was lost during the war (see RIEBER 1973, p. 7). Previously, *L. barrandei* was overlooked by the present author (VÖRÖS 1993, 1998, l. c.) and was taken as a variant of *L. krystyni* BALINI, 1992.

However, it can easily be differentiated by its definite lateral row of nodes, missing in *L. krystyni*. The closely related *L. pseudohungaricum* BALINI, 1992 shows much coarser ornamentation both in the ribbing and in the nodosity.

Distribution

L. barrandei was described from the Balaton Highland, where its occurrence is now verified at numerous sites. Its record from the Southern Alps is ambiguous. At the Balaton Highland it ranges from the Illyrian Camunum Subzone to the Felsoeoersensis Subzone.

Lardaroceras pseudohungaricum BALINI, 1992
Plate I: 12; Plate II: 1–7; Figure 19.

v 1882 *Ceratites hungaricus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 35 (partim), pl. XXX, fig. 19 (only).
v 1989 *Parakellnerites* cf. *frauenfelderi* RIEBER, 1973 — VÖRÖS & PÁLFY, Vászoly, p. 19. (partim).
v * 1992 *Lardaroceras pseudohungaricum* sp. n. — BALINI, Lardaroceras, p. 17, text-figs 4B–D, 6A–B, pl. 2, figs 1, 2, pl. 3, figs 1, 2.
v 1993 *Lardaroceras* aff. *pseudohungaricum* BALINI, 1992 — BRACK & RIEBER, Anisian/Ladinian boundary, p. 468 (partim), pl. 5, figs 11, 12, 15 (non fig. 3).
v 1993 *Parakellnerites* sp., aff. *hungaricus* A — VÖRÖS, Reitzi Zone, p. 27, pl. I, figs 6, 7.
1993 *Lardaroceras pseudohungaricum* BALINI, 1992 — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 64, pl. 3, fig. 2.
v 1993 *Parakellnerites* sp., aff. *hungaricus* A — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, figs 6, 7.
v 1998 *Lardaroceras pseudohungaricum* BALINI, 1992 — VÖRÖS, Balaton-felvidék, p. 20, 59, pl. II, figs 1, 2.
v 1998 *Lardaroceras* ? sp. aff. *pseudohungaricum* BALINI, 1992 — VÖRÖS, Balaton-felvidék, p. 22, 59.
1998 *Lardaroceras pseudohungaricum* BALINI, 1992 — PETEK, Hrastenica, p. 131 and 139, pl. 3, fig. 5.
v 2010 *Lardaroceras pseudohungaricum* BALINI, 1992 –VÖRÖS, North Hungary, p. 5, pl. I, figs 1, 3.

Material

75 specimens of various state of preservation, from Felsőörs (35), Vörösberény (1), Szentantalfa (8), Vászoly (14), Mencshely (5), Köveskál (1), Szentbékkálla (1), Szentkirályszabadja (2) and Iszkaszentgyörgy (8).

Measurements

	D	WH	WW	U
T.1666.	49.8	19.8	17.4	15.2
M.98.18	94.5	37.5	?	?
INV 2017.145.1.	90.7	?	?	?
M.98.168A	72.3	30.1	19.4	17.1
INV 2017.146.1.	64.4	27.2	17.6	~15.1
M.98.19	62.7	28.1	~17.1	~15.1
INV 2017.147.1.	56.5	37.5	17.7	~21.1
M 2001.26	49.7	22.4	?	17.1

Description

It is a large *Lardaroceras*, with moderately evolute coiling. The whorl-section is moderately compressed, high oval to subpentagonal. The umbilical margin is subrounded, steep. The flanks are slightly convex and form well marked ventrolateral shoulders with the gently arched venter. A rounded keel is present, well separated from the ventrolateral shoulders. The flanks are ornamented with strong ribs and nodes. The almost radial, slightly projected primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is 12 to 14 on a half-whorl of the body chamber. Instead of bifurcation, secondary ribs appear by insertion in the outer half of the flank. There are three rows of nodes. Each primary rib starts with strong, mostly sharp nodes at the umbilical margin, bears a prominent, pointed node at about the inner two-fifth of the flank and ends with strong, adorally projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 15 to 18 on a half-whorl of the body chamber. The ornamentation is stronger on the body chamber than on the phragmocone.

Suture lines were not studied in detail; certain specimens showed four lateral saddles and a well denticulated first lateral lobe.

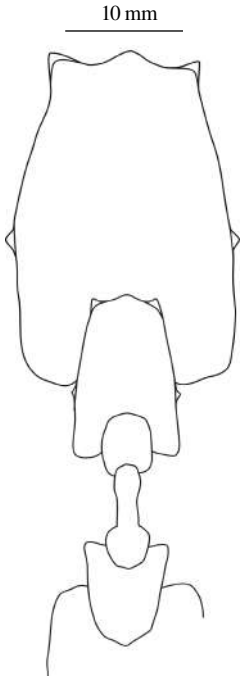


Figure 19. Cross section of *Lardaroceras pseudohungaricum* BALINI, 1992 (M.98.168), Vászoly, P–11a, Bed 5, Trinodosus Zone, Pseudohungaricum Subzone

Remarks

When introducing the species name *pseudohungaricum*, BALINI (1992b, p. 19) referred to the close similarity of his new species to "*Ceratites hungaricus*" MOJSISOVICS, 1882. He also stated that *L. pseudohungaricum* corresponded only partly to the specimens figured under the name *hungaricus* by MOJSISOVICS and that the four specimens figured by MOJSISOVICS (1882, pl. XXX, figs 17, 18, 19, 21) represented a heterogeneous series. The original specimens figured by MOJSISOVICS (housed in the collection MGSH under the inventory numbers T.698., T.699., T.828. and T.1666.) were studied by the present author, and the morphological heterogeneity of the type series was confirmed. The largest specimen (T.828., pl. XXX, fig. 21 in MOJSISOVICS 1882) was designated by RIEBER (1973, p. 33) as the lectotype of the species *hungaricus* (now *Parakellnerites hungaricus*, see later in this monograph). Other two specimens (T.699., T.698., pl. XXX, figs 17 and 18 in MOJSISOVICS 1882) will be described as different, partly new species of *Parakellnerites* (later in this monograph). The fourth specimen (T.1666., pl. XXX, fig. 19 in MOJSISOVICS 1882) is here regarded as a proper representative of *L. pseudohungaricum*.

L. pseudohungaricum BALINI, 1992 differs from other species of *Lardaroceras* by its much coarser ornamentation, both in ribbing and in nodosity.

In some previous works (VÖRÖS & PÁLFY 1989, l. c., VÖRÖS 1993, l. c.), we tried to identify our specimens of *L. pseudohungaricum* with different species of *Parakellnerites*.

The specimens figured as *Lardaroceras* aff. *pseudohungaricum* by BRACK & RIEBER (1993, l. c.) were inspected at the collection PIMUZ, Zürich and, in the author's opinion, most of them may correspond to *L. pseudohungaricum*, except the specimen on pl. 5, fig. 3 of BRACK & RIEBER (1993), which seems to stand closer to *L. krystyni*.

Distribution

L. pseudohungaricum was recorded from late Anisian localities of the Southern Alps, the Julian Alps and the Rudabánya Mts (North Hungary). At the Balaton Highland its range is restricted to the Illyrian Pseudohungaricum and Felsoeoersensis Subzones.

Subfamily Paraceratitinae SILBERLING, 1962

Genus **Paraceratites** Hyatt, 1900

Type species: *Paraceratites elegans* (MOJSISOVICS, 1882)

Paraceratites trinodosus (MOJSISOVICS, 1882)

Plate II: 9–12; Plate III: 1–3; Figures 20, 21.

v * 1882 *Ceratites trinodosus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 29 (partim), pl. VIII, figs 6, 9, pl. XXXVII, figs 6, 7. (non pl. VIII, figs 5, 7).

non 1906 *Ceratites trinodosus* MOJS. — RENZ, Argolis (1), p. 385, unnumbered text-fig. on p. 386.

? 1907 *Ceratites trinodosus* v. MOJSISOVICS — DIENER, Himalayan Muschelkalk, p. 48, pl. III, fig. 5.

non 1910 *Ceratites trinodosus* MOJSISOVICS — RENZ, Argolis (2), p. 19, pl. I, fig. 7.

v non 1915 *Ceratites trinodosus* MOJS. Var. — ARTHABER, Die Trias von Bithynien, p. 123, pl. XII, fig. 3.

v 1934 *Paraceratites trinodosus* (MOJSISOVICS) — SPATH, Ammonoidea of the Trias, p. 436 (partim), (non fig. 146).

1936 *Ceratites trinodosus* MOJS. — STEFANOFF, Golo-Bărdo, p. 156 (partim), pl. III, figs 3, 6, 9. (non pl. III, fig. 8).

? 1955 *Ceratites trinodosus* MOJS. — ŽLEBNIK, Peca, p. 216, figs 1, 2.

? 1958 *Ceratites (Paraceratites) trinodosus* MOJSISOVICS — SACCHI VIALLI & VAI, Fauna triassica bresciana, p. 70, pl. IV, fig. 33.

? 1963 *Paraceratites trinodosus* (MOJSISOVICS) 1882 — ASSERETO, Val Camonica, p. 35, pl. II, figs 3, 4, text-fig. 10.

non 1964 *Paraceratites* cf. *trinodosus* MOJSISOVICS — BANDO, Japan, p. 113, pl. 5, fig. 5, text-fig. 34/4.

1967 *Paraceratites trinodosus* (MOJSISOVICS, 1882) — CASATI & GNACCOLINI, Alpi Orobie, p. 135, pl. 10, fig. 8.

1968 *Paraceratites trinodosus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 100, pl. IX, figs 1–10, pl. X, figs 1, 2, pl. XII, fig. 1, 4.

1969 *Paraceratites trinodosus* (MOJSISOVICS) — GAETANI, Giudicarie, p. 484, pl. 37, figs 9, 10.

1980 *Paraceratites trinodosus* (MOJSISOVICS) — GU et al., Tibet, p. 347, pl. I, figs 9–11, text-fig. 4c.

1995 *Paraceratites trinodosus* (MOJSISOVICS, 1882) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 549, pl. II, figs 2, 3.

1993 *Paraceratites* aff. *trinodosus* (MOJSISOVICS, 1882) — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 64, pl. 1, fig. 5.

v 1998 *Paraceratites trinodosus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 22, 59, pl. I, figs 4, 5.

Material

65 specimens of various state of preservation, from Felsőörs (16), Vörösberény (17), Szentantalfa (17), Köveskál (8), Monoszló (5), Barnag (2).

Measurements

	D	WH	WW	U
M.87.033	53.8	24.1	18.1	11.8
M.98.8	49.5	24.1	16.4	11.2
INV 2017.153.1.	46.1	20.5	16.1	11.3
INV 2017.152.1.	44.1	21.1	13.5	?
INV 2017.150.1.	37.8	17.8	?	8.1
INV 2017.151.1.	36.1	16.4	11.3	?
INV 2017.149.1.	25.1	11.1	10.5	?

Description

Medium to large *Paraceratites* with moderately involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is steep to overhanging; the umbilical margin is rather well marked. The flanks are gently convex and meet the arched venter at a blunt ventrolateral margin. The venter is gently roof-shaped but not fastigate. The ornamentation consists of rather strong, slightly prorsiradiate, almost straight ribs and nodes. The number of the ribs (eight on a half whorl) increases by irregular insertion of secondary ribs; bifurcation is rare. There are three rows of nodes. Each primary rib starts with strong nodes at the umbilical margin, bears a prominent node at about the inner two-fifth of the flank and ends with strong, adorally projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 13 to 15 on a half-whorl of the body chamber. The ornamentation is somewhat stronger on the body chamber than on the phragmocone.

The suture line (Figure 21) is ceratitic with three simple lateral saddles; only the ventrolateral saddle shows a minute incision. The first lateral lobe is deeply denticulated.

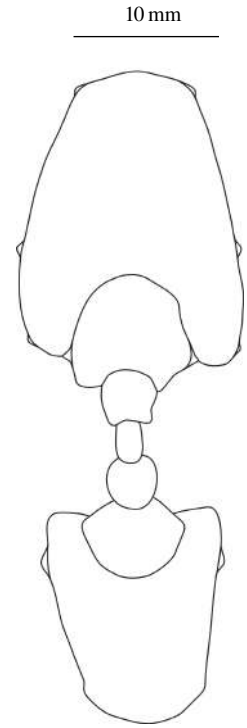


Figure 20. Cross section of *Paraceratites trinodosus* (MOJSISOVICS, 1882) (INV 2017.153.1.), Vörösberény, Bed 29, Trinodosus Zone, Trinodosus Subzone

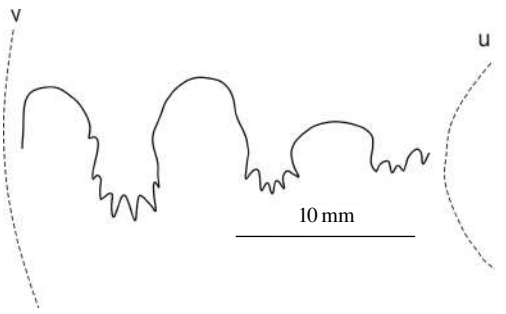


Figure 21. Suture line of *Paraceratites trinodosus* (MOJSISOVICS, 1882) (M.98.8), at 22 mm whorl-height, Vörösberény, Bed 29, Trinodosus Zone, Trinodosus Subzone; u: umbilical margin, v: ventrolateral margin

Remarks

P. trinodosus was frequently recorded and profusely illustrated by numerous authors, nevertheless its exact morphological interpretation is still indefinite. Even the original description and illustrations given by MOJSISOVICS (1882) portrayed rather different forms under the name *trinodosus*. SPATH (1934, p. 436) designated a lectotype (specimen figured by MOJSISOVICS on pl. VIII, fig. 9), deposited in the BSM (München). This specimen (from Reutte, Nordtirol) slightly differs from the others figured by MOJSISOVICS by its almost rectiradiate ribbing. The other members of the type series, inspected by the present author in the collections GBAW (Wien) and the MGSH (Budapest), represent a wider range of variation. Only one specimen, figured by MOJSISOVICS (1882, pl. VIII, fig. 5), should be excluded by its fairly different ornamentation, and another (l. c. fig. 7) by its minute size. This wider concept or interpretation of *P. trinodosus* corresponds to and is supported by the copious illustration of this species by VENZO & PELOSIO (1968, l. c.).

P. trinodosus differs from *P. elegans* (MOJSISOVICS, 1882) by its more robust construction, by gently prorsiradiate ribbing and by the lateral nodes closer to the umbilicus; from *P. rothi* (MOJSISOVICS, 1882) by its arched venter and stronger ornamentation.

The specimens figured as *P. trinodosus* by RENZ (1906, l. c. and 1910, l. c.) probably belong to some other species showing quite different ornamentation, with weak nodes and sinuous, almost falcoid ribbing. More or less the same holds true for the poorly preserved specimen figured by BANDO (1964, l. c.).

ARTHABER's specimen of *P. trinodosus* from Turkey (ARTHABER, 1915, l. c.) may also be attributed to another species. According to the observations by the present author in the collections GBAW (Wien) this specimen has highly arched venter and its ornamentation, especially the nodes differ considerably from those of *P. trinodosus*.

STEFANOFF (1936, l. c.) figured four specimens of *P. trinodosus*. As far as the very poor photographs permit an evaluation, one of them (pl. II, fig. 8) surely does not belong here, because it has strongly projected ventrolateral nodes.

The specimen figured by GAETANI (ed.) (1993, l. c.) under the name *Paraceratites* aff. *trinodosus* from the Prezzo Limestone of Adanà (Giudicarie, Southern Alps) is here regarded as belonging to *P. trinodosus* in a broad sense.

Several specimens of *P. trinodosus*, listed by SPATH (1934) were examined in the collection NHML (London) and some of them (C. 14053, C. 14054, from Turkey) are here regarded as proper representatives of that species. Other specimens from Hallstatt (Northern Calcareous Alps) and Bosnia may tentatively attributed to *P. trinodosus*. The North American specimen figured as *P. trinodosus* by SPATH (1934, fig. 146) was later included to *P. vogdesi* (SMITH, 1914) by SILBERLING & NICHOLS (1982) and the latter species was eventually ranged into their new genus *Brackites* by MONNET & BUCHER (2005).

Distribution

P. trinodosus is widespread in the upper Anisian of the Northern Calcareous Alps, the Southern Alps, the Balkan Mountains and occurred in Tibet. The records from the Dinarides, Turkey and the Himalayas are doubtful. At the Balaton Highland its range is restricted to the Illyrian Trinodosus and Camunum Subzones.

Paraceratites cf. *elegans* (MOJSISOVICS, 1882)

Plate II: 8.

* 1882 *Ceratites elegans* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 31, pl. IX, figs 5, 6, pl. XXVIII, fig. 9.
? 1904 *Ceratites* confr. *elegans* MOJSISOVICS 1882. — MARTELLI, Boljevici, p. 86, pl. V, fig. 3.
? 1936 *Ceratites* cfr. *elegans* MOJS. — STEFANOFF, Golo-Bărdo, p. 158, pl. IV, figs 7, 8.
? 1963 *Paraceratites* cf. *elegans* (MOJSISOVICS) 1882. — ASSERETO, Val Camonica, p. 35, pl. II, fig 5.
1968 *Paraceratites elegans* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 99, pl. VIII, figs 15–17.
1980 *Paraceratites elegans* (MOJSISOVICS) — GU et al., Tibet, p. 346, pl. I, figs 12, 13, text-fig. 4b.
1995 *Paraceratites elegans* (MOJSISOVICS, 1882) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 549, pl. II, fig. 1.
v 1998 *Paraceratites* cf. *elegans* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 22, 59.

Material

16 specimens of various state of preservation, from Felsőörs (5), Vörösberény (5), Szentantalfa (4), Monoszló (2).

Measurements

	D	WH	WW	U
INV 2017.148.1.	33.3	15.5	?	8.2

Description

Medium sized *Paraceratites* with moderately involute, compressed conch. The whorl-section is high oval. The characters of the umbilical wall and the umbilical margin are poorly seen. The flanks are gently convex, almost flat and meet the highly arched venter at a blunt ventrolateral margin. The venter is roof-shaped but not fastigate. The ornamentation consists of rather strong, nearly straight ribs and nodes. The number of the primary ribs (seven on a half whorl) increases by irregular, sometimes double, insertion of secondary ribs; bifurcation is rare. There are three rows of nodes. Each primary rib starts with strong node at the umbilical margin, bears a prominent lateral node and ends with strong, adorally projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 12 on a quarter of the phragmocone.

The suture line was not seen.

Remarks

P. elegans, the type species of the genus *Paraceratites*, differs from *P. trinodosus* by its more compressed conch, more elevated, subcarinate venter and nearly rectiradiate ribbing. The type specimens, deposited in Berlin, were not inspected by the present author, but the good figures given by MOJSISOVICS (1882, l. c.) and the fine illustrations published by VENZO & PELOSIO (1968, l. c.) offered a realistic morphological information on *P. elegans*.

The items by MARTELLI (1904, l. c.), STEFANOFF (1936, l. c.) and ASSERETO (1963, l. c.) are only tentatively included to the present synonymy because of the poor quality of the published photographs.

Distribution

P. elegans was described from Anisian of the Northern Calcareous Alps, the Southern Alps and Tibet; its records from the Dinarides and the Balkan Mountains are doubtful. At the Balaton Highland its range is restricted to the Illyrian Trinodosus, Camunum and Pseudohungaricum Subzones.

Paraceratites cf. *rothi* (MOJSISOVICS, 1882)
Plate III: 4, 5.

v * 1882 *Ceratites rothi* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 25, pl. IX, fig. 7.
1968 *Paraceratites rothi* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 107, pl. XI, figs 9–19, pl. XII, fig. 3.
v 1998 *Paraceratites* cf. *rothi* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 20, 59.

Material

Two specimens of poor state of preservation from Felsőörs.

Measurements

	D	WH	WW	U
Holotype T.838.	47.3	20.5	16.7	11.2
INV 2017.154.1.	54.5	~19.5	?	?

Description

Medium sized with moderately evolute conch. The whorl-section is low subtrapezoidal. The umbilical wall and the umbilical margin are poorly seen. The flanks are almost flat and meet the venter at a marked ventrolateral margin. The venter is very low, almost tabulate. The ornamentation consists of ribs of various strength, and nodes. There are 10 to 12 ribs on a half whorl; secondary ribs and bifurcation are rare. The umbilical nodes are poorly seen. The lateral nodes lie near the middle of the lateral flank and are massive but rather low. The ventrolateral nodes (12 to 14 on a half whorl) are strong and somewhat adorally projected.

The suture line was not seen.

Remarks

The original specimen of *P. rothi* was investigated by the present author in the collection of the MGSH (Budapest). It is a single specimen, kept under the inventory number T.838., and is re-figured here (Plate III: 5) as the holotype by monotypy. Both the specimen and the description and figure by MOJSISOVICS (1882, l. c.) show the tabulate venter, crossed by fine, adorally arched growth lines. This is the most important morphological feature distinguishing *P. rothi* from other species of *Paraceratites*. The ample illustration given by VENZO & PELOSIO (1968, l. c.) endorse the independent specific status of *P. rothi*.

Distribution

P. rothi was described from the upper Anisian from Felsőörs (Hungary) and from the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Trinodosus Subzone.

Genus **Semiornites** ARTHABER, 1912
Type species: *Semiornites cordevolicus* (MOJSISOVICS, 1882)

Semiornites cf. *cordevolicus* (MOJSISOVICS, 1882)
Plate III: 7, 9.

v * 1882 *Ceratites cordevolicus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 26, pl. XII, figs 5–7.
1934 *Semiornites cordevolicus* (MOJSISOVICS) — SPATH, Ammonoidea of the Trias, p. 455, figs 149, 150a.
? 1935 *Ceratites cordevolicus* MOJS. — BERNDT, Ostbalkan, p. 13, pl. I, fig. 3.
? 1963 *Semiornites cordevolicus* (MOJSISOVICS) 1882 — ASSERETO, Val Camonica, p. 40, pl. III, fig 3.

1967 *Semiornites cordevolicus* (MOJSISOVICS, 1882) — CASATI & GNACCOLINI, Alpi Orobie, p. 135, pl. 10, fig. 4.
1968 *Semiornites cordevolicus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 110, pl. XII, figs 8–10, 12, 13.
v 1998 *Semiornites* cf. *cordevolicus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 22, 59.

Material

35 specimens of various state of preservation, from Vörösberény (22), Szentanatalfa (13).

Measurements

	D	WH	WW	U
INV 2017.156.1.	36.1	17.5	10.5	6.8
INV 2017.158.1.	23.5	~12.5	~5.1	~5.1

Description

Small *Semiornites* with involute, compressed conch. The whorl-section is high subtrapezoidal. The umbilical margin is well marked; the umbilical wall is gently inclined. The flanks are almost flat and meet the tabulate venter at a rather sharp ventrolateral margin. The ornamentation consists of weak, mostly sinuous radial rugae and growth lines. There are no umblical and lateral nodes. The ventrolateral margin bears weak nodes (around 20 on a half whorl); on the body chamber they appear as adorally elongated clavi.

Suture lines are not visible.

Remarks

The original specimens of *cordevolicus*, figured by MOJSISOVICS (1882, l. c.), were checked in the collections GBAW (Wien) and the MGSH (Budapest, T.827.). The specimen, figured by MOJSISOVICS (1882, pl. XII, fig. 5), was re-figured and designated as lectotype by SPATH (1934, l. c.). These figures and the splendid illustrations published by VENZO & PELOSIO (1968, l. c.) unanimously show that *S. cordevolicus* is the most weakly ornamented species of the genus *Semiornites*.

In a previous work (VÖRÖS 1998, p. 22, 59) a few specimens of this species were wrongly attributed to the more strongly ornamented *S. lennanus* (MOJSISOVICS, 1882).

The record from the Balkan Mountains by BERNDT (1935, l. c.) is fairly doubtful because the published poor figure shows keel-like crest along the ventrolateral shoulder of the specimen which suggests that it may belong to the genus *Norites*.

Distribution

S. cordevolicus was repeatedly recorded from the Southern Alps.

At the Balaton Highland its range is restricted to the Illyrian Trinodosus and Camunum Subzones.

Semiornites cf. *aviticus* (MOJSISOVICS, 1882)
Plate III: 6.

v * 1882 *Ceratites aviticus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 24, pl. XII, figs 2–4.
? 1963 *Semiornites aviticus* (MOJSISOVICS) 1882 — ASSERETO, Val Camonica, p. 37, pl. III, fig 1, text-figs 11, 12.
? 1967 *Semiornites aviticus* (MOJSISOVICS, 1882) — CASATI & GNACCOLINI, Alpi Orobie, p. 135, pl. 10, figs 3, 9.
1968 *Semiornites aviticus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 114, pl. XIII, figs 4, 10, 14–16.
1993 *Semiornites aviticus* (MOJSISOVICS, 1882) — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 64, pl. 1, fig. 4.
v 1993 *Semiornites aviticus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 5.
v 1993 *Semiornites aviticus* — VÖRÖS, Reitzi Zone, p. 27, pl. I, figs 3, 4.
v 1998 *Semiornites* ? cf. *aviticus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 20, 59.

Material

46 specimens of various state of preservation, from Felsőörs (17), Szentantalfa (27), Szentkirályszabadja (1), Dörgicse (1).

Measurements

	D	WH	WW	U
INV 2017.155.1.	82.5	39.5	23	19.7

Description

Large *Semiornites* with involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical margin is well marked; the umbilical wall is gently inclined. The flanks are gently convex and meet the venter at a rather sharp ventrolateral margin. The venter is rather highly arched, roof-shaped but still not fastigate. The ornamentation consists of weak, mostly sinuous primary ribs and intercalated secondary riblets. The umblical and lateral nodes are weak and fade out on the body chamber. The ventrolateral margin bears numerous weak nodes (around 20 on a half whorl) persisting also on the body chamber.

Suture lines are not visible.

Remarks

The original specimens of *aviticus*, figured by MOJSISOVICS (1882, l. c.), were checked in the collections of the MGSH, and the largest specimen (inventory number: T.697., figured by MOJSISOVICS 1882, pl. XII, fig. 4) is designated here as lectotype. On the basis of the comparisons, the identification of our specimens seems warranted.

S. aviticus differs from *S. cordevolicus* (MOJSISOVICS, 1882) by its somewhat stronger ornamentation and from other species of *Semiornites* by its roof-shaped, almost fastigate venter.

VENZO & PELOSIO (1968, l. c.) illustrated various specimens of *S. aviticus*; from among these, the largest one (l. c., pl. XIII, fig. 17) is the most similar to our specimens.

The items by ASSERETO (1963, l. c.) and CASATI & GNACCOLINI (1967, l. c.) are only tentatively included to the present synonymy because the figured specimens bear very strong ornamentation.

Distribution

S. aviticus was described from the Balaton Highland and from many localities of the Southern Alps. At the Balaton Highland it ranges from the Illyrian Binodosus Subzone to the Pseudohungaricum Subzone.

Semiornites ? cf. *falcifer* (HAUER, 1896)
Plate III: 8.

v * 1896 *Ceratites falcifer* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 258, pl. VIII, figs 5, 6.
1904 *Ceratites falcifer* HAUER 1896 — MARTELLI, Boljevici, p. 84, pl. V, fig. 4.
non 1916 *Ceratites (Semiornites) falcifer* HAU. — ARTHABER, Trient, p. 257, pl. V, figs 3, 4.
? 1949 *Ceratites falcifer* HAU. — RIEDEL, Alpi meridionali, p. 5, pl. I, fig. 8.
1994 *"Ceratites"* aff. *falcifer* HAUER,1896 — BALINI, Hydra, p. 359, pl. 2, fig. 3.
2003 *"Semiornites" falcifer* (HAUER, 1896) — MIETTO et al., Bagolino, p. 459, pl. 1, fig. 5, pl. 2, fig. 8.

Material

One poorly preserved, fragmentary specimen from Mencshely.

Measurements

	D	WH	WW	U
INV 2017.157.1.	34.5	25.4	?	?

Description

Small half-whorl showing involute, compressed conch. The whorl-section is high subtrapezoidal. The umbilical margin is well marked; the umbilical wall is gently inclined. The flanks are almost flat and meet the arched venter at a rather sharp ventrolateral margin. A low, rounded keel is present on the venter, well separated from the ventrolateral shoulders. The flanks are ornamented with moderately strong, prorsiradiate falcoid primary ribs (around eight on a quarter of the whorl) and a few intercalated secondary riblets. The umblical nodes are rather prominent. Lateral nodes are absent. The ventrolateral margin bears well developed, adorally projected nodes (around 13 on a quarter of the whorl).

Suture lines are not visible.

Remarks

The original specimen of *falcifer*, figured by HAUER (1896, l. c.), was checked in the collections NHMW (Wien). Our specimen from the Balaton Highland fits rather well the figured monotype in the characters of the ornamentation. Only its venter seems to be narrower, but this may be due to the preservation (partial compaction) of our specimen.

The specimen figured by ARTHABER (1916, l. c.) as "*Ceratites* (*Semiornites*) *falcifer*" does not seem to belong to this species because it shows a definitely fastigate venter, less falcoid ribs, and much more robust ventrolateral nodes.

The item by RIEDEL (1949, l. c.) is only tentatively included to the present synonymy because, although the ornamentation is somewhat similar to *falcifer*, the accompanying *Bulogites* fauna suggests a Pelsonian age.

"*Ceratites* sp. ind. aff. *falcifer* HAUER", figured by DIENER (1913, p. 53, pl. VII, fig. 1) is rather similar to HAUER's original figure of *falcifer*, but on the basis of its cross section it seems to belong to the genus *Bulogites*.

SALOPEK (1913, p. 10, fig. 1) figured only a suture line, therefore this record of *falcifer* is also questionable.

MIETTO et al. (2003, l. c.) published only lateral views of a somewhat compressed forms attributed to *falcifer*; moreover, their specimens came from the upper part of the Reitzi Zone.

The generic position of the species "*Ceratites falcifer"* (HAUER, 1896) is queried. BALINI (1994, l. c.) maintained the wide uncertainty in the generic attribution, while using the name "*Ceratites*". KUTASSY (1932, p. 473) used the name combination "*Ceratites* (*Semiornites*) *falcifer*". SPATH (1934, p. 456) definitely put this species into the genus *Semiornites* and directly compared it to *S. aviticus* (MOJSISOVICS, 1882) and *S. cordevolicus* (MOJSISOVICS, 1882). MIETTO et al. (2003, l. c.) also used this generic attribution but used inverted commas for the generic name. In fact, the falcoid ribbing is more widespread among the Hungaritidae, whereas the venter of "*Ceratites*" *falcifer* points to relationship to Paraceratitinae. After considering the opinions of SPATH (1934, p. 456) and P. MIETTO (pers. comm.) the combination of names *Semiornites* ? *falcifer* is used here tentatively. It has to be mentioned that this species was regarded as member of the genus *Stoppaniceras* by RIEBER (1973, p. 36, 41); this is not accepted here, but further emphasizes the uncertainty around the proper generic attribution of the species *falcifer*.

Distribution

S. ? *falcifer* was described from the upper Anisian from the Dinarides, Island Hydra (Greece) and the Southern Alps. At the Balaton Highland it was found in the Illyrian Liepoldti Subzone.

Genus **Asseretoceras** BALINI, 1992

Type species: *Asseretoceras camunum* (ASSERETO, 1963)

Asseretoceras camunum (ASSERETO, 1963)

Plate III: 10–12; Plate IV: 1–4.

* 1963 *Bulogites camunus* n. sp. — ASSERETO, Val Camonica, p. 46, pl. IV, figs 4, 5, text-figs 15, 16.
v 1989 *Stoppaniceras* cf. *variabilis* RIEBER, 1973 — VÖRÖS & PÁLFY, Vászoly, p. 21, pl. I, figs 1, 2.
v 1992 *Asseretoceras camunum* (ASSERETO, 1963) — BALINI, New genera, p. 181, figs 2, 3.
v 1993 *Asseretoceras camunum* — VÖRÖS, Reitzi Zone, p. 28, pl. I, figs 1, 2.
1993 *Asseretoceras camunum* (ASSERETO, 1963) — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 64, pl. 2, figs 2, 3.
v 1993 *Asseretoceras camunum* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, figs 1, 2.
1994 *Asseretoceras camunum* (ASSERETO, 1963) — BALINI, Hydra, p. 354, pl. 1, fig. 1.
v 1998 *Asseretoceras camunum* (ASSERETO, 1963) — VÖRÖS, Balaton-felvidék, p. 20, 59.
v 2010 *Asseretoceras camunum* (ASSERETO, 1963) —VÖRÖS, North Hungary, p. 8, pl. II, figs 1, 2.
v 2015 *Asseretoceras camunum* (ASSERETO, 1963) — VÖRÖS et al., New data, p. 319, pl. I, fig. 1.

Material

58 specimens of various state of preservation, from Felsőörs (14), Vörösberény (2), Szentantalfa (11), Vászoly (26), Mencshely (1), Vöröstó (1), Szentkirályszabadja (2), Iszkaszentgyörgy (1).

Measurements

	D	WH	WW	U
INV 2017.160.1.	~60.1	20.4	?	?
INV 2017.161.1.	57.5	18.5	?	?
INV 2017.159.1.	52.1	19.2	?	19.8
INV 2017.162.1.	52.1	17.1	?	?
M.89.52	28.5	12.4	8.3	8.2
M.89.187A	26.5	12.8	10.1	?
M.89.187B	24.7	9.5	8.2	?

Description

Medium-sized *Asseretoceras* with moderately involute conch. The whorl-section is somewhat trapezoidal, subquadrate. The umbilical wall and the umbilical margin are poorly observed, they seem to be subrounded. The flanks are gently convex. The ventrolateral margin is well-marked. The venter is evenly and moderately arched. The ornamentation consists of strong ribs bearing nodes. The ribs are slightly prorsiradiate and gently concave. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is 8 to 10 on a half-whorl of the body chamber. The secondary ribs are usually intercalated in the interspace of the primaries; bifurcation is rare. There are three rows of nodes on the flanks. The umbilical nodes are rather bulla-like on each primary ribs. The moderately strong lateral nodes appear irregularly on some primary ribs in the inner one-fourth of the flank. The ventrolateral nodes (14 to 18 on a half-whorl) uniformly appear both at the primary and on the secondary ribs. They are adorally projected and develop as spines on the body chamber.

Suture lines are not visible.

Remarks

A. camunum was introduced by ASSERETO (1963, l. c.) as a species of *Bulogites*, then it became the type species of *Asseretoceras* erected by BALINI (1992a). Subsequent illustrations by GAETANI (ed.) (1993, l. c.) and (BALINI 1994, l. c.) supported the identification of our specimens with *A. camunum*.

A few specimens from Vászoly (Balaton Highland) were erroneously identified as *Stoppaniceras* cf. *variabilis* RIEBER, 1973 by VÖRÖS & PÁLFY (1989, l. c.); in fact they represent *A. camunum*.

Distribution

A. camunum was described from the upper Anisian of the Southern Alps, Island Hydra (Greece) and the Rudabánya Mts (North Hungary). At the Balaton Highland its range is restricted to the Illyrian Camunum and Pseudohungaricum Subzones.

Genus **Megaceratites** BALINI, 1992

Type species: *Megaceratites fallax* BALINI, 1992

When erecting his new genus, BALINI (1992a, p. 183) based it excusively to the type species *fallax* and excluded many, partly similar, ceratitid species. On the other hand, the present author (VÖRÖS, 1998, 2010a) had the opinion, that the close morphological similarity between the type species and "*Ceratites*" *subnodosus* MOJSISOVICS, 1882, and their almost coeval occurrence, justified the attribution of the latter species to *Megaceratites*. The morphological and stratigraphical ranges of *Megaceratites* were further expanded when DE ZANCHE et al (1995, p. 138) and MIETTO et al. (2003b, p. 454) tentatively attributed the higher Anisian species *friccensis* (ARTHABER, 1916) to *Megaceratites*. This broader interpretation of the genus *Megaceratites* is preferred here.

Megaceratites cf. *subnodosus* (MOJSISOVICS, 1882)
Plate IV: 5–8; Plate V: 1.

v * 1882 *Ceratites subnodosus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 33, pl. X, figs 9–11.
v ? 1882 *Ceratites* nov. f. ind. — MOJSISOVICS, Mediterr. Triasprovinz, p. 36, pl. XIII, fig. 2.
v ? 1896 *Ceratites* cf. *subnodosus* MOJS. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 254, pl. VII, fig. 4.
? 1912 *Ceratites subnodosus* MOJS. — AIRAGHI, Besano, p. 19, pl. III, fig. 3. (no ventral view)
1914 *Ceratites subnodosus* MOJS. — HORN, Knollenkalkstufe, p. 18, pl. I, fig. 1.
1916 *Ceratites subnodosus* MOJS. — ARTHABER, Trient, p. 250, text-fig. 3a, pl. III, figs 1–4.
v 1934 *Paraceratites subnodosus* (MOJSISOVICS). — SPATH, Ammonoidea of the Trias, p. 438 (partim).
1968 *Paraceratites subnodosus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 108, pl. XII, figs 6, 7.
non 1980 *Paraceratites subnodosus* (MOJSISOVICS) — GU et al., Tibet, p. 347, pl. I, figs 17–19, text-fig. 4a.
v 1989 *Paraceratites* ? *subnodosus* (MOJSISOVICS, 1882) — VÖRÖS & PÁLFY, Vászoly, p. 19, pl. I, fig. 3.
v 1993 *Paraceratites* ? *subnodosus* — VÖRÖS, Reitzi Zone, p. 27, pl. I, fig. 5.
v 1993 *Paraceratites* ? *subnodosus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 4.
v 1998 *Megaceratites* ? cf. *subnodosus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 20, 59, pl. I, fig. 6.
v 2010 *Megaceratites subnodosus* (MOJSISOVICS, 1882) — VÖRÖS, North Hungary, p. 8, pl. II, fig. 3.
v 2015 *Megaceratites* ? *subnodosus* (MOJSISOVICS, 1882) — VÖRÖS et al., New data, p. 319, pl. I, fig. 2.

Material

77 specimens of various state of preservation, from Felsőörs (4), Vörösberény (42), Szentantalfa (14), Vászoly (5), Mencshely (2), Köveskál (5), Dörgicse (1), Paloznak (1), Szentbékkálla (1), Barnag (2).

Measurements

	D	WH	WW	U
M.98.9	82.1	38.5	25.5	?
INV 2017.164.1.	82.1	31.5	25.8	29.5
INV 2017.163.1.	78.1	31.1	23.4	?
INV 2017.165.1.	67.5	27.1	?	?
M.89.168A	65.1	26.4	20.6	21

Description

Medium to large *Megaceratites*, with moderately evolute conch. The whorls are rather compressed, stout; the cross-section is subquadratic. The umbilical edge is subrounded. The flanks are flat to gently convex and form a well marked ventrolateral shoulder with the flat, gently arched venter. The flanks are ornamented with very strong ribs with irregularly developed nodes. The prorsiradiate ribs (8 to 10) are somewhat projected on the body chamber. Secondary ribs irregularly inserted by intercalation at the inner half of the mid-flank. There are no umbilical nodes. The lateral nodes appear on the inner thirds of the primary ribs. The ventrolateral nodes are very prominent, clavus-like; they appear on both the primary and the secondary ribs. Their number is 12 to 14 on a half-whorl of the body chamber. The venter is usually flat, or slightly roof-shaped. The phragmocone and the inner whorls are much weakly ornamented than the body chamber and their venters are more arched.

Suture lines are poorly visible; definitely ceratitic.

Remarks

This species was previously placed into the genus *Paraceratites* by several authors. The stout whorls and the character of the ornamentation fit very well with those of *Megaceratites* erected recently by BALINI (1992b); this assignment is used in the present paper, despite that BALINI definitely did not include the species *subnodosus* into his new genus.

MOJSISOVICS (1882, l. c.) in the original description illustrated three specimens which well demonstrated the range of variation of *subnodosus*. The lectotype designated by SPATH (1934, l. c.), figured by MOJSISOVICS (1882) on pl. X, fig. 10, portrays a variant with rather regular and strong lateral nodes and low ventral keel on the phragmocone. The other two specimens (pl. X, figs 9, 11, in MOJSISOVICS 1882) have few or none lateral nodes and possess flat venter. Most of our specimens from the Balaton Highland correspond rather to these latter two types. The broader interpretation of *subnodosus* is supported also by the illustrations published by VENZO & PELOSIO (1968, l. c.).

The specimen described by MOJSISOVICS (1882, p. 36, pl. XIII, fig. 2) as "*Ceratites* nov. f. ind." may tentatively be included to *subnodosus* as a very rarely ribbed, marginal variant.

The record by HAUER (1896, l. c.) is included into the synonym list only tentatively, because only the suture line was figured, and the specimen is very poorly preserved (as it was confirmed in the collection NHMW, Wien).

The specimen figured by GU et al. 1980, l. c.) from Tibet has fastigate venter and its ventrolateral nodes are weaker than the lateral ones, therefore it is definitely excluded from *M. subnodosus*.

Several specimens of *M. subnodosus*, listed by SPATH (1934.) were examined in the collection NHML (London) and two of them (C. 23073, C. 5423, from Albania and Hallstatt) are here regarded as proper representatives of this species. Other two specimens (C. 20485, C. 30981, from Bosnia and Montenegro) seem to stand closer to *M.* ? *friccensis* (ARTHABER).

Distribution

M. subnodosus was described from Anisian of the Northern Calcareous Alps, the Southern Alps, the Dinarides and the Rudabánya Mts (North Hungary). At the Balaton Highland its range is restricted to the Illyrian Trinodosus, Camunum and Pseudohungaricum Subzones.

Megaceratites ? cf. *friccensis* (ARTHABER, 1916)
Plate V: 2; Figure 22.

* 1916 *Ceratites friccensis* ARTH. — ARTHABER, Trient, p. 254, pl. IV, figs 2–4.
1995 *"Megaceratites" friccensis* (ARTHABER, 1916) — DE ZANCHE et al., Dolomites, p. 138, pl. II, fig. 8.
v 1998 *Megaceratites* ? *friccensis* (ARTHABER, 1916) — VÖRÖS, Balaton-felvidék, p. 42, 59, (partim) pl. IV, fig. 13 (only).
2003 *"Megaceratites" friccensis* (ARTHABER, 1916) — MIETTO et al., Bagolino, p. 454, pl. 2, figs 7, 9.

Material

15 specimens of various state of preservation, from Sóly.

Measurements

	D	WH	WW	U
M.98.87	94.5	41.1	35.1	?

Description

Large *Megaceratites*, with moderately evolute conch. The whorls are stout; the cross-section is subquadratic. The umbilical edge is poorly seen. The flanks are gently convex and pass gradually into the gently arched venter. The flanks are ornamented with robust ribs with strong nodes. The number of the nearly rectiradiate ribs is eight on the body chamber. A few secondary ribs irregularly appear by intercalation. There are no umbilical nodes. The lateral nodes develop on the inner thirds of the primary ribs. The ventrolateral nodes are exceptionally prominent; in some cases they appear as laterally oriented, long spines, gently curving ventrally. Their number is eight on a half-whorl of the body chamber. The phragmocone and the inner whorls are less strongly ornamented than the body chamber and higher oval in cross-section (Figure 22).

Suture lines are not seen.

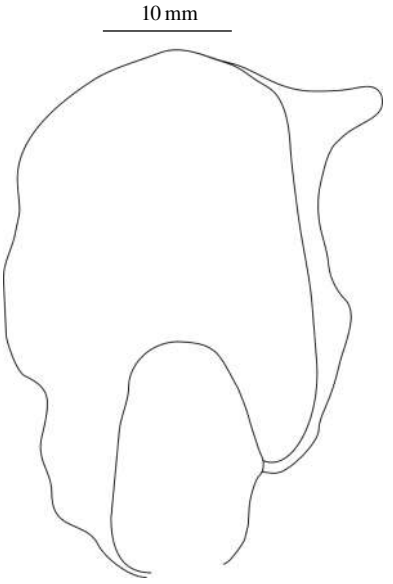


Figure 22. Cross section of *Megaceratites* ? cf. *friccensis* (ARTHABER, 1916) (M.98.87), Sóly, Bed 6, Reitzi Zone, Avisianum Subzone

Remarks

On the basis of the rather good figures of *friccensis* by ARTHABER (1916, l. c.), DE ZANCHE et al. 1995, l. c.) and MIETTO et al. (2003, l. c.), the identification of our specimens from the Balaton Highland seems to be warranted. The tentative attribution of the species *friccensis* to the genus *Megaceratites*, also suggested by DE ZANCHE et al. 1995, l. c.) and MIETTO et al. (2003, l. c.), is expressed here by the use of question mark. It has to be noted that *friccensis* was regarded as member of the genus *Stoppaniceras* by RIEBER (1973, p. 36, 41); this underscores the uncertainty around the proper generic attribution of this species.

In a previous work of the present author (VÖRÖS, 1998, pl. IV, figs 11, 12) a few ammonoids were figured as *M.* ? *friccensis*; now they are regarded as belonging to *Stoppaniceras* cf. *ellipticum* (HAUER, 1887).

Some specimens, listed by SPATH (1934, p. 439) under the name *Paraceratites subnodosus* (MOJSISOVICS, 1882), were examined in the collection NHML (London) and two of them (C. 20485, C. 30981, from Bosnia and Montenegro) were thought to be standing close to *M.* ? *friccensis* (ARTHABER).

Distribution

M. friccensis was described from the upper Anisian Reitzi Zone of the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Avisianum Subzone.

Genus **Kellnerites** ARTHABER, 1912

Type species: *Kellnerites bosnensis* (HAUER, 1887)

The generic name *Kellnerites* was introduced by ARTHABER (1912, p. 342) as a subgenus of *Ceratites*, with the type species "*C.*" *bosnensis* HAUER, 1887. SALOPEK (1914) erected a new genus *Popinites* on the same type species; this was a junior objective synonym and was included to *Kellnerites* by the same author (SALOPEK 1936b, p. 176). In the first part of his catalogue SPATH (1934, p. 458) used the generic name *Popinites* but in the second part of the catalogue (SPATH 1951, p. 10) and in the "Treatise" (ARKELL et al. 1957, p. L152), the right use of the senior name *Kellnerites* was established. The generic name *Bosnites*, used for this taxon by FRECH & RENZ (1908) and RENZ (1913), was preoccupied by a noritid genus *Bosnites* HAUER, 1896.

The correct interpretation of the type species needs further discussion. In the first definition of *Kellnerites* ARTHABER (1912, p. 342) referred to the illustrations of both specimens figured as *bosnensis* by HAUER (1887, pl. VI, figs 1, 2). SPATH (1934, p. 458–459, fig. 151) made a restriction: he selected one (the larger) of HAUER's specimens as lectotype and reproduced the figure pl. VI, fig. 1 of HAUER. The other figure by HAUER (1887, pl. VI, fig. 2) was taken as different and cited with question mark by SPATH (l. c.). This was followed in the "Treatise" (ARKELL et al. 1957) where the same figure of HAUER (1887) was reproduced as typical in the description of *Kellnerites*. The reason of this restriction might be that HAUER (1896, p. 255) erected a new species "*C.*" *halilucensis* for the smaller specimen what he figured previously as *bosnensis* (HAUER 1887, pl. VI. fig. 2). This restricted morphological interpretation of *Kellnerites*, typified by the specimen *K. bosnensis* figured by HAUER (1887, pl. VI, fig. 1) is used here.

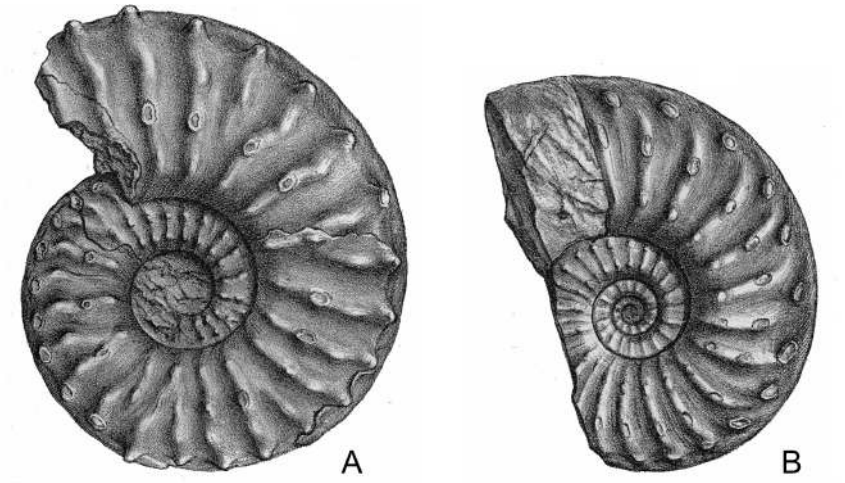


Figure 23. Comparison of two type specimens figured as *"Ceratites" bosnensis* by HAUER. A: the holotype of *"C." bosnensis* from Han Bulog (Geologische Bundesanstalt, Wien, inv. no. 1887/01/33), described and figured by HAUER (1887, p. 24, pl. VI, Figure 1); B: the second "type" of *"bosnensis"* from Haliluci (Naturhistorisches Museum, Wien, inv. no.: NHMW 1998z0063/0037), designated by HAUER (1896, p. 254, pl. VII, figs. 13, 14), which is regarded as belonging to *Epikellnerites tamasi* n. sp. in the present monograph (×0.8)

The interpretation of the type species of *Kellnerites* became further confused when HAUER (1896, p. 254, pl. VII, figs 13, 14) described a specimen, attributed to "*C.*" *bosnensis* and categorically identified with the original type (HAUER 1887, pl. VI, fig. 1). However, this specimen (as confirmed by the present author in the collection NHMW, Wien) is very much different from the original type. It has definitely prorsiradiate, projected ribs, bearing four nodes, in contrast to the rectiradiate ribbing and three rows of nodes of the original type specimen (Figure 23). It is here regarded as a species of a different, new genus described later in this monograph.

After all, in a restricted interpretation, used in the present monograph, the genus *Kellnerites* comprises the following nominal species:

Kellnerites bosnensis (HAUER, 1887, p. 24, pl. VI, fig. 1)
Kellnerites felsoeoersensis (STÜRZENBAUM, 1875, p. 256, pl. V, fig. 1)
Kellnerites bispinosus (HAUER, 1896, p. 256, pl. VII, figs 5–9)
? *Kellnerites halilucensis* (HAUER, 1896, p. 255).

Their common diagnostic features are the rectiradiate ribbing and three rows of nodes.

Kellnerites bosnensis (HAUER, 1887)
Plate V: 3–5.

v * 1887 *Ceratites Bosnensis* n. sp. — HAUER, Han Bulog, p. 24 (partim), pl. VI, fig. 1 (only) (non fig. 2 = halilucensis).
v non 1896 *Ceratites Bosnensis* HAU. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 254, pl. VII, figs 13–14.
non 1908 *Ceratites (Bosnites) bosnensis* HAUER. (FRECH) — FRECH & RENZ, Hydra, p. 455, pl. XVI, fig. 2.
non 1913 *Ceratites (Bosnites) bosnensis* HAUER — RENZ, Griechenland, p. 571, text-fig. 9.
? 1914 *Popinites bosnensis* HAU. sp. — SALOPEK, Kunovac-vrela, p. 11 (partim), pl. III, fig. 2a. (only) (non pl. III, fig. 2b, c and pl. VII, fig. 1).
v 1934 *Popinites bosnensis* (HAUER) — SPATH, Ammonoidea of the Trias, p. 459 (partim), figs 150c, 151.
non 1964 *Kellnerites* cf. *bosnensis* HAUER — BANDO, Japan, p. 110, pl. 5, fig. 6, text-fig. 33/1.
v 1993 *Kellnerites bosnensis* — VÖRÖS, Reitzi Zone, p. 27, pl. II, fig. 3.
v 1993 *Kellnerites felsoeoersensis* — VÖRÖS, Reitzi Zone, p. 27, pl. II, figs 1, 2.
v 1993 *Kellnerites bosnensis* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 8.
v 1993 *Kellnerites felsoeoersensis*. — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 9, pl. 12, fig. 1.
v non 1993 *Kellnerites bosnensis* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), pl. 5, figs 10, 11.
v ? 1993 *Kellnerites bosnensis* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), pl. 5, figs 7–9, 13, 14, (non pl. 5, figs 10, 11).
v non 1993 *Kellnerites bosnensis* (HAUER, 1896) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 65, pl. 4, figs 4, 5.
v ? 1993 *Kellnerites bosnensis* (HAUER, 1896) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 65 (partim), pl. 4, figs 6, 10, 11.
v 1998 *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — VÖRÖS, Balaton-felvidék, p. 20, 59, (partim), pl. II, fig. 4 (only).

v 1998 *Kellnerites* cf. *bosnensis* (HAUER, 1887) — VÖRÖS, Balaton-felvidék, p. 38, 59.
non 1998 *Kellnerites* cf. *bosnensis* (HAUER, 1887) — PETEK, Hrastenica, p. 131, 138, pl. 3, figs 1–3.
v non 2015 *Kellnerites* cf. *bosnensis* (HAUER, 1887) — VÖRÖS et al., New data, p. 319, pl. I, fig. 3.
v non 2016 *Kellnerites bosnensis* (HAUER 1888) — TONGTHERM et al., Thailand, p. 162, figs 4j–l.

Material

11 specimens of various state of preservation, from Felsőörs (2), Vörösberény (1), Szentkirályszabadja (3), Vászoly (1), Mencshely (4).

Measurements

	D	WH	WW	U
M.98.6	89.5	38.1	23.1	25.5
INV 2017.167.1.	71.2	32.3	23.6	22.1
INV 2017.166.1.	49.1	22.3	13.5	?

Description

Medium to large *Kellnerites* with moderately involute conch. The whorl-section is high oval to subquadratic. The umbilical wall is subvertical. The flanks are gently convex and passes gradually to the highly arched venter bearing a distinct, rounded keel. The ventrolateral margin is marked by a row of prominent nodes. The flanks are ornamented with massive, rectiradiate, slightly projected primary ribs (10 on a half whorl) and nodes. Some primary ribs are thickened at the outer third of the flank in the form of low swellings but not true nodes. Rare intercalated secondary ribs appear irregularly at around mid-flank. There are three rows of nodes. The umbilical nodes are well-developed. The row of the high and pointed lateral nodes runs near the inner third of the flank. The very strong, spinose ventrolateral nodes (15 on a half whorl) appear at the ends of both the primary and the secondary ribs; they are elevated laterally and slightly curved ventrally.

Suture lines are not visible.

Remarks

K. bosnensis is the type species of the genus *Kellnerites*, yet its correct interpretation needs discussion. In the first definition of *bosnensis* HAUER (1887, pl. VI, figs 1, 2) illustrated two, somewhat different specimens. Later HAUER (1896, p. 255) introduced a new name "*Ceratites Halilucensis*" for the smaller specimen (figured in HAUER 1887, pl. VI, fig. 2). In the same monograph HAUER (1896, p. 254, pl. VII, figs 13, 14) described a specimen which he attributed to "*C.*" *bosnensis* and categorically identified with the original type, i. e. the larger specimen figured in HAUER (1887, pl. VI, fig. 1). However, these two specimens are very much different, as confirmed by the present author in the collections NHMW, and the GBAW, Wien, respectively (Figure 23). The original type of *bosnensis* (HAUER 1887, pl. VI, fig. 1), deposited in the GBAW (inventory number: 1887/01/33), has rectiradiate ribbing with three definite rows of nodes, whereas the second specimen of "*bosnensis*" (HAUER 1896, pl. VII, figs 13, 14), kept in the NHMW (inventory number: NHMW 1998z0063/0037), portrays prorsiradiate, projected ribs and four rows of nodes.

The present author regards the former specimen (HAUER 1887, pl. VI, fig. 1) as the typical *bosnensis*, and in doing this, shares the opinions of SPATH (1934, p. 458–459, fig. 151) who designated it as the lectotype, and (ARKELL et al. 1957, p. L152) who re-figured this specimen as the type of *Kellnerites bosnensis*.

On the other hand, the subsequently described specimen, with four rows of nodes (HAUER 1896, p. 254, pl. VII, figs 13, 14), was apparently regarded by many authors, e. g. FRECH & RENZ (1908, l. c.), RENZ (1913, l. c.), SALOPEK (1914, pl. III, fig. 2b, c; pl. VII, fig. 1), BANDO (1964, l. c.), BRACK & RIEBER (1993, l. c.) and PETEK (1998, l. c.) as the typical *Kellnerites bosnensis*. In the opinion of the present author, the subsequently described specimen of HAUER (1896), with four rows of nodes, and the majority of the above cited records belong to some probably different species of another, new genus, to be described later in this monograph.

Other species of *Kellnerites* can be well differentiated from *K. bosnensis*. In *K. felsoeoersensis* (STÜRZENBAUM, 1875) and *K. halilucensis* (HAUER, 1896) the lateral row of nodes is near the middle of the flank, while in *K. bosnensis* the lateral nodes are much closer to the umbilicus, in the inner third of the lateral side. *K. bispinosus* (HAUER, 1896) differs from *K. bosnensis* by its more evolute conch with stout whorls with low quadratic cross-section.

One of the specimens figured as "*Popinites bosnensis*" by SALOPEK (1914, pl. III, fig. 2a) may tentatively be regarded as *K. bosnensis*; the others (l. c., pl. III, fig. 2b, c and pl. VII, fig. 1) seem to be representatives of the above mentioned new genus.

The specimens listed by SPATH (1934) under the name *Popinites bosnensis*, were examined in the collection NHML (London) and two of them (C. 20328, C. 20482, from Volujak, Bosnia) are here regarded as proper representatives of that species. The figure (SPATH, l. c., fig. 151) is a reproduction of the original figure of the type specimen of "*Ceratites*" *bosnensis* by HAUER (1887, pl. VI, fig. 1).

In some previous work VÖRÖS (1993, l. c., 1998, l. c.) also in GAETANI (ed.) (1993, l. c.) wrongly attributed a few specimens of *K. bosnensis* to *K. felsoeoersensis* (STÜRZENBAUM, 1875). On the other hand, the specimen figured mistakenly as *K. bosnensis* by VÖRÖS et al. (2015, l. c.) should be attributed to *K. felsoeoersensis*, on the basis of its lateral nodes located at the middle of the flank.

The specimen figured by TONGTHERM et al. (2016, l. c.) was inspected personally in 2014 on loan from K. TONGTHERM; this tricarinate juvenile ammonite may belong rather to the genus *Halilucites*.

Distribution

K. bosnensis was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland it occurs in the Illyrian Felsoeoersensis Subzone and probably in the Liepoldti Subzone.

Kellnerites felsoeoersensis (STÜRZENBAUM, 1875)
Plate VI: 1–3; Figure 24

v * 1875 *Ceratites Felső Örsensis* n. sp. — STÜRZENBAUM, Ceratites Reitzi-szint, p. 256, pl. V, fig. 1.
v 1882 *Ceratites Felsö-Örsensis* STÜRZENBAUM. — MOJSISOVICS, Mediterr. Triasprovinz, p. 36, pl. XIII, fig. 1.
v 1896 *Ceratites fissicostatus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 255, pl. VII, figs 1–3.
v ? 1993 *Kellnerites bosnensis* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), pl. 5, fig. 10 (only).
v ? 1993 *Kellnerites fissicostatus* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470, pl. 7, figs 2, 3.
v non 1993 *Kellnerites felsoeoersensis* — VÖRÖS, Reitzi Zone, p. 27, pl. II, figs 1, 2.
v non 1993 *Kellnerites felsoeoersensis* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 11, fig. 9, pl. 12, fig. 1.
v non 1998 *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — VÖRÖS, Balaton-felvidék, p. 20, 59, (partim), pl. II, fig. 4 (= *bosnensis*).
v 1998 *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — VÖRÖS, Balaton-felvidék, p. 20, 59, (partim), pl. II, fig. 3 (only).
v 2015 *Kellnerites* cf. *bosnensis* (HAUER, 1887) — VÖRÖS et al., New data, p. 319, pl. I, fig. 3.

Material

Two specimens of medium state of preservation, from Felsőörs (1), and Vászoly (1).

Measurements

	D	WH	WW	U
Holotype T.694.	74.8	26.6	24.2	25.1
M.98.11	85.1	35.3	26.1	28.4
INV 2017.169.1.	72.1	32.3	24.5	?

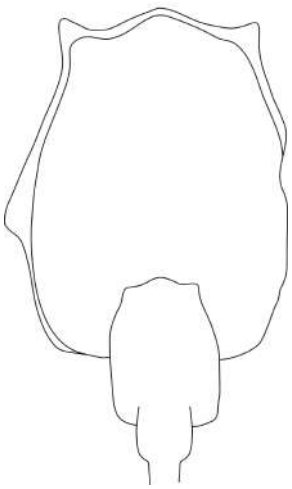


Figure 24. Cross section of *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) (M.98.11), Szentkirályszabadja, loose, Reitzi Zone, Felsoeoersensis Subzone (?)

Description

Large *Kellnerites* with moderately involute conch. The whorl-section is high oval to subquadratic (Figure 24). The umbilical wall is subrounded. The flanks are gently convex and passes gradually to the arched venter bearing a very high, blunt keel. The ventrolateral margin is marked by a row of prominent nodes. The flanks are ornamented with very strong, rectiradiate, slightly projected primary ribs (10 on a half whorl) and nodes. Secondary ribs appear rarely and irregularly at around the mid-flank. There are three rows of nodes. The umbilical nodes are moderately developed. The row of the high and pointed lateral nodes runs near the middle of the flank. The strong, spinose ventrolateral nodes (12 to 14 on a half whorl) appear at the ends of both the primary and the secondary ribs; they are elevated ventrolaterally and gently curved ventrally.

Suture lines are poorly visible; ceratitic, with at least two lateral saddles.

Remarks

The holotype (by monotypy) of *K. felsoeoersensis*, is kept in the collection of the MGSH under the inventory number T.694. It was inspected by the present author and re-figured here (Plate VI: 1). The original figure by STÜRZENBAUM (1875, l. c.) is very correct, whereas the figures portraying the same type specimen by MOJSISOVICS (1882, l. c.) are somewhat exaggerated. Nevertheless the most important distinctive character of *K. felsoeoersensis*, i.e. the position of the lateral row of nodes at the mid-flank, is well demostrated, and in this way the identification of our specimens is warranted.

Other species of *Kellnerites* can be well differentiated from *K. felsoeoersensis*. In *K. bosnensis* (HAUER, 1896) and *K. bispinosus* (HAUER, 1896) the lateral nodes are much closer to the umbilicus, in the inner third of the lateral side. Moreover, *K. bispinosus* (HAUER, 1896) differs from *K. felsoeoersensis* by its more evolute conch with stout whorls with low quadratic cross-section. *K. halilucensis* (HAUER, 1896) stands very close to *felsoeoersensis* by its radial ribbing and single lateral row of nodes at the mid-whorl; the only small difference is that its keel is apparently much weaker.

The type specimen of *K. fissicostatus* (HAUER, 1896, l. c.) was investigated in the collection NHMW (Wien), and in the opinion of the present author it should belong to *K. felsoeoersensis* by the strong similarity of its all morphological features. For the same reason, the rather worn specimen, figured as *K. fissicostatus* by BRACK & RIEBER (1993, l. c.) is here tentatively included to *K. felsoeoersensis*.

One of the specimens figured under the name *K. bosnensis* by BRACK & RIEBER (1993, pl. 5, fig. 10) has its lateral row of nodes at the mid-flank; it may belong to *K. felsoeoersensis* or to *K. halilucensis*.

In some previous work VÖRÖS (1993, l. c., GAETANI [ed.] 1993, l. c.) and partly in VÖRÖS (1998, l. c.) wrongly attributed a few specimens of *K. bosnensis* to *K. felsoeoersensis* (STÜRZENBAUM, 1875). On the other hand, the specimen figured mistakenly as *K. bosnensis* by VÖRÖS et al. (2015, l. c.) should be attributed to *K. felsoeoersensis*, on the basis of its lateral nodes located at the middle of the flank.

Distribution

K. felsoeoersensis is recorded from the upper Anisian of the Balaton Highland, the Dinarides and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Felsoeoersensis Subzone.

Kellnerites cf. *bispinosus* (HAUER, 1896)
Plate V: 6.

v * 1896 *Ceratites bispinosus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 256, pl. VII, figs 5–9.
? 1914 *Popinites bispinosus* HAU. var *licanus*. — SALOPEK, Kunovac-vrela, p. 11, pl. III, fig. 1.
v 1993 *Kellnerites bispinosus* — VÖRÖS, Reitzi Zone, p. 27.
v 1998 *Kellnerites* cf. *bispinosus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, p. 20, 59.
v ? 2010 *Kellnerites* cf. *bispinosus* (HAUER, 1896) — VÖRÖS, North Hungary, p. 6, pl. I, fig. 6.

Material

One poorly preserved specimen from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.168.1.	34.1	14.8	15.4	?

Description

Small *Kellnerites* with rather evolute conch. The whorl-section is low trapezoidal, subquadratic; the width of the whorl exceeds the height. The umbilical wall is subrounded. The flanks are rather convex. The venter is arched and bears a low, indistinct, rounded keel. The ventrolateral margin is marked by a row of prominent nodes rising above the venter. The flanks are ornamented with massive, rectiradiate, slightly projected primary ribs and nodes. Rare intercalated secondary ribs appear irregularly at around the mid-flank. There are three rows of nodes. The umbilical nodes are well-developed. The row of the high and pointed lateral nodes runs near the inner third of the flank. The very strong, spinose ventrolateral nodes appear at the ends of both the primary and the secondary ribs.

Suture lines are not visible.

Remarks

The original specimens of *K. bispinosus* were checked by the present author in the collection NHMW (Wien) and they correspond properly to the figures given by HAUER (1896, l. c.). From among them, the specimen, figured on pl. VII, figs 7, 8, can be qualified as the holotype, since HAUER (l. c., p. 256) declared that he considered this specimen the "eigentliche Typus". On the basis of its stout, quadratic whorl, blunt keel, and the lateral nodes near the inner third of the lateral part, the specimen from Felsőörs fits well the variation range of *K. bispinosus*.

Other species of the genus differ from *K. bispinosus* first of all by their more involute conch and higher ventral keel. Moreover, in *K. felsoeoersensis* (STÜRZENBAUM, 1875) and *K. halilucensis* (HAUER, 1896) the lateral nodes are around the mid-flank, while in *K. bispinosus* they are at the inner one-third of the flank.

The specimen figured by SALOPEK (1914, l. c.) as *Popinites bispinosus* HAU. var *licanus* probably does not belong here, because it has a very high keel and its ribbing is strongly projected.

VÖRÖS (2010a) tentatively attributed a specimen from North Hungary to *K.* cf. *bispinosus*. The ornamentation and the evolute conch of this poorly preserved specimen is similar to that species, on the other hand, it seems to have a rather high, blunt keel what contradicts to this attribution.

Distribution

K. bispinosus was described from the upper Anisian of the Dinarides and doubtfully from North Hungary. At the Balaton Highland its range is restricted to the Illyrian Felsoeoersensis Subzone.

Genus ***Epikellnerites*** n. gen.

Type species: Epikellnerites angustecarinatus (HAUER, 1896).

Diagnosis: Small to large ceratitids with moderately involute conch. Whorl section subquadratic to high oval; umbilical margin subrounded to steep. Venter arched to fastigate; keel present. Prorsiradiate, projected ribs of various strength. Primaries and secondaries occasionally form fibulate ribbing. Four rows of nodes: umbilical nodes, two rows of lateral nodes at various parts of the flank, and projected clavi on the ventrolateral margin. Suture ceratitic, three lateral saddles, first lateral lobe deep with various degree of denticulation.

Derivatio nominis: Epikellnerites seems to appear stratigraphically above *Kellnerites* (epi- <greek> = above).

Nominal species belonging to Epikellnerites:

Epikellnerites angustecarinatus (HAUER, 1896, p. 256, pl. VII, figs 15–17)
Epikellnerites bagolinensis (BRACK & RIEBER, 1993, p. 470, pl. 6, figs 1, 2)
Epikellnerites tamasi n. sp.
Epikelnerites aff. *tamasi* n. sp.
Epikellnerites vaszolyensis n. sp.
Epikellnerites pseudocholnokyi n. sp.
Epikellnerites spinatus n. sp.

Discussion: Epikellnerites, from morphological point of view, stands between *Kellnerites* and *Reitziites*. It shares the general shape of the conch with *Kellnerites*, including the nearly fastigate venter with definite keel, but differs in having four lateral rows of nodes in contrast to the three rows of nodes in *Kellnerites*. On the other hand, the ornamentation of the flanks in *Epikellnerites*, especially in the species *E. vaszolyensis* and *E. pseudocholnokyi*, shows many similarities to that of *Reitziites*; however, the latter genus has flat or concave venter, in contrast to the arched and keeled venter of the *Epikellnerites* species.According to the sparse data, *Epikellnerites* occurs stratigraphically above *Kellnerites* and below *Reitziites* and this suggests that it may represent a phyletic connecting link between them.

Distribution: Late Anisian; Dinarides, Southern Alps, Balaton Highland, doubtfully Island Hydra (Greece). At the Balaton Highland *Epikellnerites* ranges from the Illyrian Liepoldti to Reitzi Subzones.

Epikellnerites angustecarinatus (HAUER, 1896)
Plate VI: 4–6; Plate VII: 1, 2; Figure 25.

v * 1896 *Ceratites angustecarinatus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 256, pl. VII, figs 15–17.
? 1908 *Ceratites (Bosnites) bosnensis* HAUER. (FRECH) — FRECH & RENZ, Hydra, p. 455, pl. XVI, fig. 2.
v 1990 *"Protrachyceras" reitzi* (BÖCKH) — KOVÁCS et al., Balaton Upland, p. 194, pl. 3, fig. 4.
v 1993 *Kellnerites angustaecarinatus* — VÖRÖS, Reitzi Zone, p. 27, pl. II, fig. 4.
v ? 1993 *Kellnerites angustecarinatus* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470, pl. 6, fig. 4.
v 1998 *Kellnerites angustecarinatus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, p. 38, 59.

Material

Nine specimens of various state of preservation, from Vörösberény (1), Vászoly (3) and Mencshely (5).

Measurements

	D	WH	WW	U
INV 2017.173.1.	74.8	31.2	21.2	22.5
INV 2017.171.1.	70.6	28.0	21.1	23.8
INV 2017.170.1.	68.2	27.1	18.1	21.5
INV 2017.172.1.	48.2	18.5	17.1	?
INV 2017.174.1.	36.5	15.1	13.1	12.2

Description

Large *Epikellnerites* with moderately involute conch. The whorl-section is high oval to subquadratic. The umbilical wall is subvertical. The flanks are gently convex and pass gradually to the highly arched venter bearing a distinct, blunt keel. The ventrolateral margin bears a row of prominent nodes. The flanks are ornamented with massive, slightly prorsiradiate, almost straight primary ribs (10 to 12 on a half whorl) and nodes. Rare intercalated secondary ribs appear irregularly in the inner third of the flank; bifurcation is rare. Both the primary and the secondary ribs weaken or almost fade out near the ventrolateral margin. There are four rows of nodes. The umbilical nodes are well-developed. The first row of the pointed lateral nodes runs near the inner quarter of the flank. The second row of the strong, sometimes spinose lateral nodes (16 to 18 in number) runs in the outer quarter of the flank; they appear at the end of the ribs, also on the secondaries. The ventrolateral nodes appear as a separate row of projected clavi on the ventrolateral margin; they are elevated above the ventral keel; they are less in number (14 on a half whorl) than the third lateral nodes.

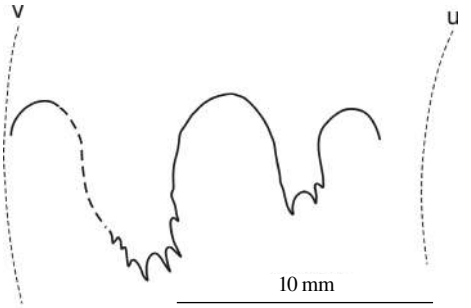


Figure 25. Suture line of *Epikellnerites angustecarinatus* (HAUER, 1896) (INV 2017.172.1.), at 16 mm whorl-height, Vászoly, loose, Reitzi Zone Liepoldti or Reitzi Subzone; u: umbilical margin, v: ventrolateral margin

Suture lines are poorly seen; ceratitic, with three entire lateral saddles and deeply denticulated first lateral lobe (Figure 25).

Remarks

The holotype (by monotypy) of *E. angustecarinatus* was inspected by the present author in the collection NHMW (Wien, inventory number: NHMW 1998z0063/0006) and it corresponds properly to the figures given by HAUER (1896, l. c.). On the basis of their morphology, especially the blunt keel, and the four rows of nodes, the identification of the specimens from the Balaton Highland with *E. angustecarinatus* was confirmed.

E. angustecarinatus is a valid and well-defined taxon; it is the type species of the genus *Epikellnerites*. It differs from the other species of the genus first of all by its coarser ornamentation, in terms of both the ribbing and the nodes. *E. bagolinensis* (BRACK & RIEBER, 1993) is more involute and its lateral nodes significantly prevail over the ribs. *E. tamasi* n. sp. has higher whorls with fastigate venter and its nodes prevail in strength over the ribs. In *E. vaszolyensis* n. sp. the ribbing prevails over the nodes which are differently located. In *E. spinatus* n. sp. the nodes are regularly pointed. *Epikellnerites pseudocholnokyi* n. sp. has fine ribbing almost without nodes.

The specimen figured as "*Ceratites* (*Bosnites*) *bosnensis* HAUER" by FRECH & RENZ (1908, l. c.), probably belongs to *E. angustecarinatus* on the basis of its four rows of lateral nodes, although the figure shows definitely rectiradiate ribbing.

KOVÁCS et al. (1990, l. c.) illustrated a specimen from Vászoly as *"Protrachyceras" reitzi* (BÖCKH). This ammonite was kept in the private collection of the late I. SZABÓ and was transferred to the collection of the Hungarian Natural History Museum. According to the label, the locality was Vászoly, Shaft XVII, in contrast to the statement in KOVÁCS et al. (1990, l. c.) referring to Vászoly, Shaft XVIII. This specimen was so embedded in the rock matrix, that only its lateral part was seen. On the basis of the lateral ornamentation the authors (KOVÁCS et al. 1990, l. c.) misidentified this ammonite. Subsequent preparation of the specimen by the present author revealed the ventral side with definite keel and now it is identified as *E. angustecarinatus*

The "*Kellnerites angustecarinatus*" specimen illustrated by BRACK & RIEBER (1993, l. c.) was checked in the collection PIMUZ, Zürich; the very poor preservation of the specimen does not permit to decide if the identification is correct or not.

Distribution

E. angustecarinatus was described from the upper Anisian of the Dinarides; its records from the Island Hydra (Greece) and the Southern Alps are doubtful. At the Balaton Highland it ranges from the Illyrian Liepoldti to Reitzi Subzones.

Epikellnerites tamasi n. sp.
Plate VII: 3, 4; Figures 26, 27.

v 1896 *Ceratites Bosnensis* HAU. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 254, pl. VII, figs 13–14.
? 1904 *Ceratites trinodosus* MOJSISOVICS 1882 — MARTELLI, Boljevici, p. 80, pl. V, fig. 1.
? 1914 *Popinites bosnensis* HAU. sp. — SALOPEK, Kunovac-vrela, p. 11 (partim), pl. III, figs 2b, c, pl. VII, fig. 1 (only), (non pl. III, fig. 2a).
v 1993 *Kellnerites bosnensis* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), pl. 5, figs 10, 11 (only).
v 1993 *Kellnerites bosnensis* (HAUER, 1896) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 65, pl. 4, figs 4, 5 (only).
? 1994 *"Kellnerites"* sp. ind. — BALINI, Hydra, p. 356, pl. 1, fig. 2.
? 1998 *Kellnerites* cf. *bosnensis* (HAUER, 1887) — PETEK, Hrastenica, p. 131, 138 (partim), pl. 3, fig. 3 (only).
v 2015 N. gen. aff. *Kellnerites bagolinensis* BRACK & RIEBER, 1993 — VÖRÖS et al., New data, p. 319, pl. I, fig. 4.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.10.1.

Locus typicus: Szentbékkálla, vineyards; grab sample

Stratum typicum: ochre-yellow, siliceous limestone (Vászoly Formation ?); upper Illyrian, Reitzi Zone, Liepoldti Subzone (?).

Derivatio nominis: After the name of Károly TAMÁS who collected the holotype.

Diagnosis: Medium-sized, moderately involute *Epikellnerites* with high oval whorls and subrounded umbilical wall. Venter narrow, fastigate; keel sharp. Ribs prorsiradiate, projected. Four rows of prominent nodes. Lateral nodes at the inner and the outer third of the flank, respectively, forming spiral chains. Ventrolateral projected clavi separated from ribs. Suture ceratitic; lateral lobes shallow, denticulation dense.

Material

Two incomplete specimens from Vászoly (1) and Szentbékkálla (1).

Measurements

	D	WH	WW	U
Holotype PAL 2017.10.1.	75.1	30.8	21.4	20.9
Paratype PAL 2017.11.1.	44.1	?	14.2	14.1

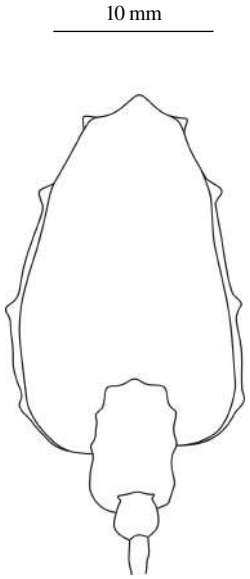


Figure 26. Cross section of *Epikellnerites tamasi* n. sp., Holotype, PAL 2017.10.1., Szentbékkálla, loose, Reitzi Zone, Felsoeoersensis or Liepoldti Subzone (?)

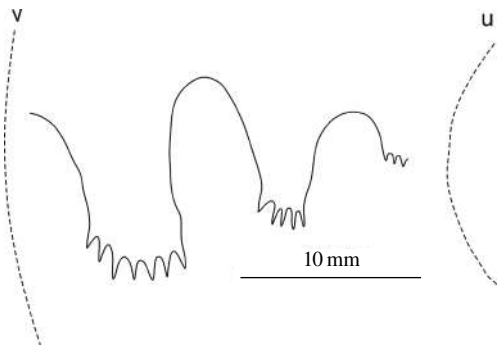


Figure 27. Suture line of *Epikellnerites tamasi* n. sp., Holotype, PAL 2017.10.1., at 23 mm whorl-height, Szentbékkálla, loose, Reitzi Zone, Felsoeoersensis or Liepoldti Subzone (?), u: umbilical margin, v: ventrolateral margin

Description

Medium-sized *Epikellnerites* with moderately involute conch. The whorl-section is high oval. The umbilical wall is subrounded. The flanks are gently convex and pass gradually to the high and narrow, almost fastigate venter bearing a distinct, rather sharp keel. The ventrolateral margin bears a row of prominent nodes. The flanks are ornamented with prorsiradiate, partly sinuous, projected primary ribs (14 to 16 on a half whorl) and nodes. Rare intercalated secondary ribs appear irregularly near the umbilicus; bifurcation is rare. Both the primary and the secondary ribs weaken or almost fade out near the ventrolateral margin. The nodes are more prominent than the ribs. There are four rows of nodes. The umbilical nodes are well-developed. The first row of the lateral nodes runs near the inner third of the flank. The second row of the strong lateral nodes runs in the outer third of the flank; they seem to form a nearly continuous spiral chain on the phragmocone, while they became isolated on the body chamber. The ventrolateral nodes appear as separate rows of projected clavi on the ventrolateral margins; their number is around 16 on a half whorl.

Suture lines are ceratitic, with at least three, entire lateral saddles. The second lateral saddle is rather narrow and high. The lateral lobes have shallow depression with dense denticulation (Figure 27).

Remarks

This new species was established on a type specimen collected by K. TAMÁS at Szentbékkálla, from the debris of siliceous limestone (probably Vászoly Formation, Reitzi Zone; see VÖRÖS et al. 2015). *E. tamasi* was described previously under different names. The oldest record of this taxon is due to HAUER (1896, pl. VII, figs 13, 14), who described a specimen with four rows of nodes and prorsiradiate, projected ribs, very similar to *E. tamasi*. HAUER (1896, l. c.) attributed this specimen to "*C.*" *bosnensis* HAUER, 1887 and categorically identified it with the original type of *bosnensis*, i. e. the larger specimen figured under this name in HAUER (1887, pl. VI, fig. 1). However, this must be qualified as a mistake, because these two specimens are very much different, as confirmed by the comparative studies of the present author in the collections of the NHMW, and the GBAW, Wien, respectively (Figure 23). The original type specimen (HAUER 1887, pl. VI, fig. 1), having rectiradiate ribbing with three definite rows of nodes, was taken as the type of *Kellnerites bosnensis* by SPATH (1934, p. 458–459, fig. 151) and (ARKELL et al. 1957, p. L152).

The "second *bosnensis*" (HAUER 1896, pl. VII, figs 13, 14), with pro-

jected ribs and four rows of nodes, was apparently regarded by some authors, e. g. SALOPEK (1914, l. c.), BRACK & RIEBER (1993, l. c.), also in GAETANI (ed.) (1993, l. c.); specimen checked in the collection PIMUZ (Zürich) and PETEK (1998, l. c.) as the typical *Kellnerites bosnensis*. On the other hand, by the opinion of the present author, the subsequently described specimen of HAUER (1896, l. c.), with four rows of nodes, and the above cited records probably belong to *Epikellnerites tamasi* n. sp.

The specimens figured as "*Ceratites trinodosus* MOJSISOVICS" by MARTELLI (1904, l. c.) and as "*Kellnerites*" sp. ind. by BALINI (1994, l. c.) show apparent similarity to *E. tamasi.*

The type specimen of this new species was recently described and illustrated with the tentative open nomenclature as "N. gen. aff. *Kellnerites bagolinensis* BRACK & RIEBER, 1993" by VÖRÖS et al. (2015, l. c.).

A remarkable ammonoid, desribed and illustrated by MOJSISOVICS (1882, p. 36, pl. XXXIV, fig. 1) as "*Ceratites* nov. forma indet aff. *hungarico*", is deposited in the collection of the MGSH under the inventory number T.863. The specimen was collected by B. ZSIGMONDY in 1871 from Felsőörs, from the siliceous limestone of the Reitzi Zone (judging from the rock matrix, probably from around Bed 100, according to the present numbering; i. e.: probably from the Liepoldti Subzone). It shows many similarities to *E. tamasi* in whorl characters and ornamentation, with the difference that the lateral rows of nodes lay in the inner half of the flank. This large fragment of a body chamber (with a maximum diameter of 93.5 mm) is re-figured here (Plate VII: 5) and named as *Epikellnerites* aff. *tamasi.* It is not described in detail in this monograph because it is represented only with a single specimen in the collection of the MGSH, and no further specimens were found in our recent collecting works.

Distribution

E. tamasi was recorded from the upper Anisian of the Dinarides, the Southern Alps and doubtfully from the Island Hydra (Greece). At the Balaton Highland it occurs probably in the Illyrian Liepoldti Subzone.

Epikellnerites vaszolyensis n. sp.

Plate VII: 6; Plate VIII: 1–8; Plate IX: 1, 2; Figures 28–30

v 1990 *Parakellnerites* sp. nov. 1. — KOVÁCS et al., Balaton Upland, p. 194, pl. 3, fig. 1.
v 1993 *Reitziites reitzi* — VÖRÖS, Reitzi Zone, p. 27 (partim), pl. III, fig. 3 (non figs 2, 4).
v 1993 *Reitziites reitzi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117 (partim), pl. 12, fig. 5. (non figs 4, 6).
v 1998 *Hyparpadites* ? sp., aff. *liepoldti* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 50, pl. II, fig. 6. (Erroneously named as "*Hyparpadites* sp. aff. *bagolinensis* BRACK & RIEBER" in the plate explanation.)
v 1998 *Hyparpadites* cf. *bagolinensis* (BRACK & RIEBER, 1993) — VÖRÖS, Balaton-felvidék, p. 50, pl. II, fig. 7.
v 1998 *Kellnerites* sp., aff. *angustecarinatus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, p. 38, 59, pl. III, fig. 1.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.12.1.

Locus typicus: Vászoly, Trench P–11/c.

Stratum typicum: Purplish-red to greenish-yellow limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Liepoldti or Reitzi Subzone.

Derivatio nominis: After the name of the type locality, Vászoly.

Diagnosis: Medium-sized, moderately involute *Epikellnerites* with high oval whorls and subrounded to steep umbilical wall. Venter fastigate; keel blunt. Ribs prorsiradiate, sinuous, projected. Primaries and secondaries weaken near the ventrolateral margin and tend to form fibulate ribbing. Ribbing prevails over nodosity. Four rows of nodes. Lateral nodes at the inner and the outer quarter of the flank, respectively. Ventrolateral projected clavi separated from ribs. Suture ceratitic; lateral lobes deep, denticulation strong.

Material

18 specimens of various state of preservation, from Vörösberény (1), Vászoly (6), Mencshely (8), Örvényes (2) and Szentbékkálla (1).

Measurements

	D	WH	WW	U
Holotype PAL 2017.12.1.	72.1	30.1	29.3	22.1
Paratype PAL 2017.14.1.	77.7	34.2	19.7	22.1
Paratype PAL 2017.13.1.	71.1	30.1	20.3	?
Paratype PAL 2017.15.1.	70.8	31.6	21.9	18.3
Paratype M.98.14.	68.1	27.5	17.6	18.5
Paratype PAL 2017.18.1.	66.5	26.9	20.2	20.5

	D	WH	WW	U
Paratype M.98.74	49.5	20.1	13.5	?
Paratype M.87.006	47.1	~18.1	11.1	?
Paratype PAL 2017.17.1.	40.1	17.5	12.1	10.3
Paratype PAL 2017.19.1.	38.1	21.1	16.2	?
Paratype PAL 2017.16.1.	30.1	13.6	9.3	8.3

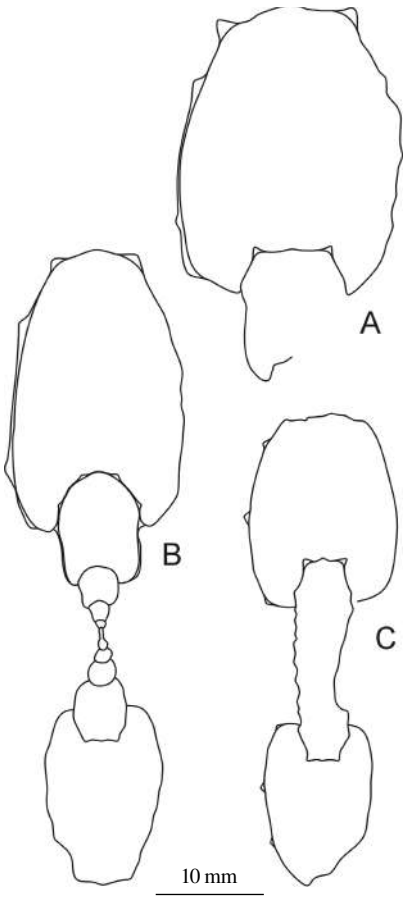


Figure 28. Cross sections of *Epikellnerites vaszolyensis* n. sp. A: Paratype, PAL 2017.47.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); B: Paratype, PAL 2017.13.1., Vászoly, P–11c, loose, Reitzi Zone, Reitzi Subzone (?); C: Paratype, M.98.74, Mencshely, loose, Reitzi Zone, Reitzi Subzone (?)

Description

Medium-sized *Epikellnerites* with moderately involute conch. The whorl-section is high oval. The umbilical wall is subrounded to steep. The flanks are gently convex and pass into the almost fastigate venter bearing a distinct, blunt keel. The ventrolateral margin is accentuated by a row of prominent nodes. The flanks are ornamented with slightly prorsiradiate, sinuous, projected primary ribs (12 to 14 on a half whorl) and nodes. Secondary ribs intercalate irregularly at around the inner fifth of the flank; bifurcation is rare. Both the primary and the secondary ribs weaken or almost fade out near the ventrolateral margin. The ribbing seems more prominent than the nodes. There are four rows of nodes. The umbilical nodes are well-developed. The first row of the medium strong lateral nodes runs near the inner quarter of the flank. The second row of the stronger lateral nodes runs in the outer quarter of the flank. The ventrolateral nodes form separate rows of projected clavi on the ventrolateral margins; their number is around 15 on a half whorl. The ribs became slightly convex between the two rows of the lateral nodes; some ribs seem to fuse near the ventrolateral clavi, in the form of a kind of fibulate ribbing. In some cases the ornamentation becomes stronger on the body chamber than on the phragmocone.

Suture lines are ceratitic, with at least three, entire lateral saddles. The lateral lobes are deep with strong denticulation (Figures 29, 30).

Remarks

E. vaszolyensis differs from other species of the genus by its lateral ornamentation, where the ribbing prevails over the nodes and the widely spaced two lateral rows of nodes lying in the inner and the outer quarter of the flank. *E. angustecarinatus* (Hauer, 1896) is more coarsely ornamented in all respects. *E. bagolinensis* (Brack & Rieber, 1993) is more involute and its lateral nodes, evenly distributed on the flanks, significantly prevail over the ribs. *E. tamasi* n. sp. has higher whorls with fastigate venter and its nodes prevail in strength over the ribs. In *E. spinatus* n. sp. the nodes are regularly pointed. *Epikellnerites pseudocholnokyi* n. sp. has fine ribbing almost without nodes.

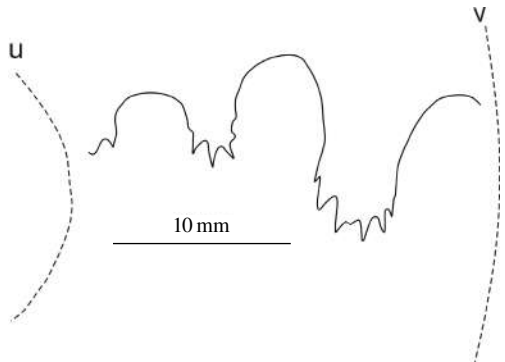


Figure 29. Suture line of *Epikellnerites vaszolyensis* n. sp., Paratype, PAL 2017.14.1., at 21 mm whorl-height, Vászoly, P11c, loose, Reitzi Zone, Liepoldti or Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

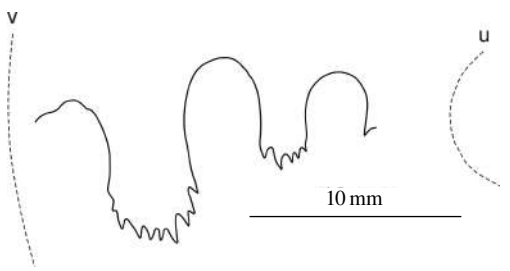


Figure 30. Suture line of *Epikellnerites vaszolyensis* n. sp., Paratype, M.87.006, at 15 mm whorl-height, Szentbékkálla, loose, Reitzi Zone, Liepoldti or Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

Many specimens of this new species were tentatively identified with completely different taxa by previous authors.

The specimen, illustrated by KOVÁCS et al. (1990, pl. 3, fig. 1) as a new species of *Parakellnerites*, is re-figured here (Plate VIII: 7); it represents an extremely finely ribbed variant of *Epikellnerites vaszolyensis.*

On the basis of ribbing characters, an ammonite were wrongly identified with *Reitziites reitzi* (BÖCKH) by the present author (VÖRÖS 1993, l. c., and in GAETANI 1993, l. c.). In fact this specimen, re-figured here (Plate IX: 2) bears a ventral keel and this, together with the charcteristic ornamentation, render it to *E. vaszolyensis.*

Some other specimens of *E. vaszolyensis* from the Balaton Highland were also wrongly identified with different *Hyparpadites* species by the present author (VÖRÖS 1998, l. c.) misled by the curious nature and position of their lateral rows of nodes. These specimens are re-figured here (Plate VIII: 2, 5).

A little worn half-whorl, illustrated prevously as *Kellnerites* sp., aff. *angustecarinatus* (HAUER, 1896) by VÖRÖS (1998, l. c.), is re-figured here (Plate VIII: 4) and on the basis of its partly fibulate ribbing, subordinate nodes and definite keel, now it is regarded as *E. vaszolyensis*, different from the much coarsely ornamented *E. angustecarinatus.*

Distribution

E. vaszolyensis was until now reported only from the Balaton Highland, where it ranges from the Illyrian Liepoldti Subzone to the Reitzi Subzone.

Epikellnerites pseudocholnokyi n. sp.

Plate IX: 3–5; Figures 31, 32

v 1993 *Reitziites cholnokyi* — VÖRÖS, Reitzi Zone, p. 27 (partim), pl. III, fig. 5 (non fig. 6).
v 1993 *Reitziites cholnokyi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117 (partim), pl. 12, fig. 7. (non fig. 8).

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.20.1.

Locus typicus: Mencshely I, Bed 9.

Stratum typicum: Red to greyish-yellow, clayey limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Reitzi Subzone.

Derivatio nominis: Reference to the apparent similarity to *Reitziites* morphotype *cholnokyi* (FRECH, 1903).

Diagnosis: Small, moderately involute *Epikellnerites* with high oval whorls and steep umbilical wall. Venter arched; keel blunt. Ribs prorsiradiate, sinuous, strongly projected. Primaries and secondaries weaken near the ventrolateral margin. Four rows of nodes. Nodosity subordinate to ribbing. Lateral nodes/swellings at the inner and the outer third of the flank, respectively. Ventrolateral projected clavi, separated from ribs. Suture ceratitic; lateral lobes deep, denticulation strong.

Material

10 specimens of various state of preservation, from Mencshely.

Measurements

	D	WH	WW	U
Holotype PAL 2017.20.1.	26.5	10.5	8.5	10.1
Paratype PAL 2017.21.1.	31.4	12.3	9.4	10.1
Paratype PAL 2017.22.1.	27.1	?	9.6	?

Description

Small *Epikellnerites* with moderately involute conch. The whorl-section is high oval. The umbilical wall is rather steep. The flanks are gently convex and pass into the narrow, arched venter bearing an indistinct, blunt keel. The ventrolateral margin is accentuated by a row of projected clavi. The flanks are ornamented with slightly prorsiradiate, sinuous, strongly projected primary ribs (14 to 16 on a half whorl) and weak nodes. Numerous secondary ribs intercalate irregularly at around the inner third of the flank; bifurcation is rare. Some primary and secondary ribs weaken or almost fade out near the ventrolateral margin. The secondary ribs occasionally fuse near the ventrolateral margin, in the form of a kind of fibulate ribbing. On the flanks the ribbing strongly prevails over the nodes which develop only as rather irregular swellings on the ribs. There are four rows of nodes. The umbilical nodes are regularly developed. The first row of the weak lateral nodes or swellings runs near the inner third of the flank. The second row of the somewhat stronger lateral nodes/swellings runs in the outer third of the flank. The ventrolateral nodes form separate rows of projected clavi on the ventrolateral margins; their number is around 16 to 18 on a half whorl.

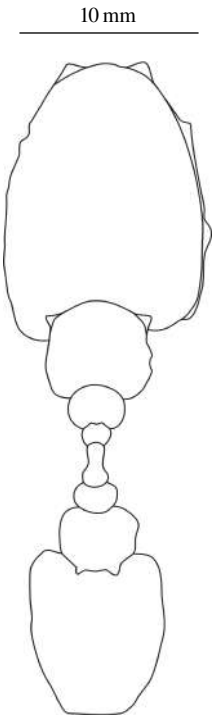


Figure 31. Cross section of *Epikellnerites pseudocholnokyi* n. sp., Paratype, PAL 2017.48.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?)

Suture lines are ceratitic, with at least three, entire lateral saddles. The lateral lobes are deep with rather strong denticulation (Figure 32).

Remarks

E. pseudocholnokyi is extraordinarily similar to *Reitziites cholnokyi* (FRECH, 1903) which is described in the present monography as *R. reitzi* morphotype *cholnokyi.* The details of the ornamentation fit almost perfectly, and even the suture lines do not show significant deviation. The diagnostic difference is in the ventral part. The venter of "morphotype *cholnokyi"* is very narrow, slightly grooved and the ventrolateral clavi appear alternately, while in *E. pseudocholnokyi* the venter is wider, arched or slightly keeled, and the ventrolateral clavi stand in opposite order.

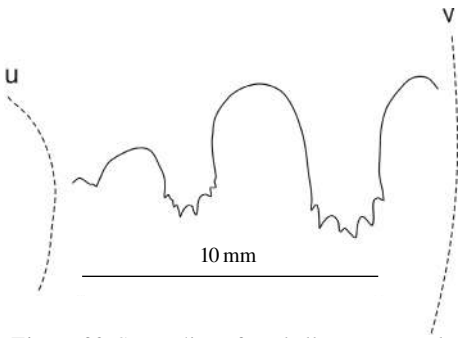


Figure 32. Suture line of *Epikellnerites pseudocholnokyi* n. sp., Paratype, PAL 2017.48.1., at 13 mm whorl-height, Mencshely, loose, Reitzi Zone, Reitzi Subzone (?), u: umbilical margin, v: ventrolateral margin

The above demonstrated deceptive similarity misled the present author (VÖRÖS 1993, l. c., and in GAETANI 1993, l. c.) who figured a specimen of *E. pseudocholnokyi* under the name *Reitziites cholnokyi*.

E. pseudocholnokyi differs from other species of the genus *Epikellnerites* by its more compressed whorls and its lateral ornamentation: fine and dense ribbing with very weak nodes or rather swellings.

Distribution

E. pseudocholnokyi is known only from the Balaton Highland, where its range is restricted to the Illyrian Reitzi Subzone.

Epikellnerites spinatus n. sp.
Plate IX: 6, 7; Figure 33

v 1993 *Reitziites reitzi* — VÖRÖS, Reitzi Zone, p. 27 (partim), pl. III, fig. 4 (non figs 2, 3).

Holotype: Hungarian Natural History Museum (Budapest), inventory numbers: PAL 2017.23.1.

Locus typicus: Mencshely I, Bed 9.

Stratum typicum: Red to greyish-yellow, clayey limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Reitzi Subzone.

Derivatio nominis: Reference to the extremely pointed nodes of this species.

Diagnosis: Small to medium-sized, moderately involute *Epikellnerites* with oval whorls and subrounded umbilical wall. Venter fastigate; keel blunt. Ribs prorsiradiate, slightly projected. Primaries and sparse secondaries weaken near the ventrolateral margin. Ribbing and nodosity equal in strength. Four rows of nodes. Pointed lateral nodes/spines at the inner and the outer third of the flank, respectively. Ventrolateral row of pointed nodes, separated from ribs. Suture ceratitic; first lateral lobe deep, finely denticulated.

Material

Two incomplete specimens from Mencshely.

Measurements

	D	WH	WW	U
Holotype PAL 2017.23.1.	52.1	19.1	15.8	16.5
Paratype PAL 2017.24.1	38.1	15.2	13.2	?

Description

Small to medium-sized *Epikellnerites* with moderately involute conch. The whorl-section is oval. The umbilical wall is

subrounded. The flanks are moderately convex and pass into the almost fastigate venter bearing a definite blunt keel. The flanks are ornamented with prorsiradiate, slightly projected primary ribs (10 to 12 on a half whorl) and nodes. Secondary ribs intercalate irregularly at around the middle of the flank; bifurcation was not observed. The ribs weaken near the ventrolateral margin. The ribbing and the nodosity are equally prominent elements of the ornamentation. There are four rows of nodes. The umbilical nodes are regularly developed. The first row of the strong and pointed lateral nodes runs near the inner third of the flank. The second row of the pointed lateral nodes runs in the outer third of the flank. The ventrolateral nodes form separate rows of slightly projected tubercles on the ventrolateral margins; their number is around 14 on a half whorl. Most of the lateral and the ventrolateral nodes show a definite spinose character.

Suture lines are poorly seen; ceratitic, with rather deep and finely denticulated first lateral lobe.

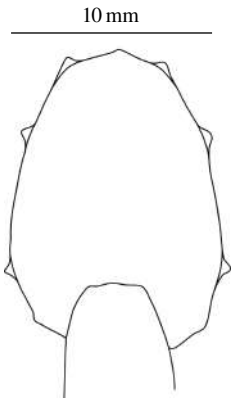


Figure 33. Cross section of *Epikellnerites spinatus* n. sp., Holotype, PAL 2017.23.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone

Remarks

E. spinatus differs from other species of the genus *Epikellnerites* by its characteristic ornamentation, where the ribbing and the nodosity are equally prominent elements, and the spinose character of its nodes.

In a previous work (VÖRÖS 1993, l. c.) the here designated type specimen of *E. spinatus* was wrongly attributed to *Reitziites reitzi* (BÖCKH, 1872).

Distribution

E. spinatus is known only from the Balaton Highland, where its range is restricted to the Illyrian Reitzi Subzone.

Genus **Reitziites** BRACK & RIEBER, 1993
Type species: *Reitziites reitzi* (BÖCKH, 1872)

When they introduced the genus *Reitziites*, BRACK & RIEBER (1993, p. 471) gave a comprehensive and correct morphological definition. They also suggested that *Reitziites* is a descendant of *Kellnerites* and the ancestor of *Nevadites*. This opinion is accepted here with the complementing remark that *Epikellnerites* n. gen. is the possible link between *Kellnerites* and *Reitziites*; and that the direct descendant of *Reitziites* may be *Latemarites*.

Nominal species attributed to *Reitziites*:

Reitziites reitzi (BÖCKH, 1872, p. 147, pl. VII, fig. 3a, pl. VIII, figs 3b, 4, 5)

Ceratites perauritus DIENER, 1900 (p. 26, pl. II, fig. 1) = *Reitziites reitzi*

Trachyceras Cholnokyi FRECH, 1903 (p. 8, pl. II, fig. 5) = *Reitziites reitzi* morphotype *cholnokyi*

Reitziites ecarinatus (HAUER, 1896, p. 257, pl. VIII, figs 7–10)

Balatonites conspicuus DIENER, 1900 (p. 28, pl. II, fig. 5) = *Reitziites ecarinatus*

By the inclusion of the species *ecarinatus* (HAUER, 1896) to *Reitziites*, the scope of the genus became wider than the original definition of BRACK & RIEBER (1993). Further discussion at the species descriptions.

Reitziites reitzi (BÖCKH, 1872)
Plate XIX: 1–8; Plate XX: 1–6, 8; Plate XXI: 1–7; Plate XXII: 1–3; Figures 34–36

v * 1872 *Ceratites Reitzi* n. sp. — BÖCKH, Bakony déli részének, p. 147, pl. VII, fig. 3a, pl. VIII, figs 3b, 4, 5.
v 1873 *Ceratites Reitzi* n. sp. — BÖCKH, Südlichen Theiles des Bakony, p. 157, pl. VII, fig. 3a, pl. VIII, figs 3b, 4, 5.
v 1875 *Ceratites Reitzi* BÖCKH — STÜRZENBAUM, Ceratites Reitzi-szint, p. 256, pl. V, fig. 2.
v 1882 *Trachyceras Reitzi* (BOECKH) E. v. M. — MOJSISOVICS, Mediterr. Triasprovinz, p. 113, pl. VII, figs 2–5.
v 1900 *Ceratites perauritus* nov. sp. — DIENER, Muschelkalk–Cephalopoden südl. Bakony, p. 26, pl. II, fig. 1.
v 1903 *Trachyceras Reitzi* BÖCKH — FRECH, Neue Cephalopoden, p. 8, pl. II, fig. 6.
? 1936 *Kellnerites samoborensis* n. sp. — SALOPEK, Gregurić-brijeg, p. 212, pl. I, fig. 1.
1964 *Protrachyceras reitz*i (BOECKH) — BANDO, Japan, p. 106, pl. 10, figs 1–5, text-figs 31, 32.
v non 1986 Group of *Nevadites reitzi* (BÖCKH 1872) — BRACK & RIEBER, Lower Buchenstein beds, p. 200, pl. 2, fig. 2, pl. 4, fig. 4.
v 1989 *Xenoprotrachyceras reitzi* (BÖCKH, 1872) — VÖRÖS & PÁLFY, Vászoly, p. 21., pl. III, fig. 5.
v non 1990 "*Protrachyceras*" *reitzi* (BÖCKH) — KOVÁCS et al., Balaton Upland, p. 194, pl. 3, fig. 4.
v 1993 *Reitziites reitzi* (BÖCKH, 1872) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 472 (partim), pl. 7, figs 1, 4, 5, pl. 8, figs 1, 2, 7–10, 12, pl. 11, figs 1, 2, text-figs 15s, 17e, f. (only).
v 1993 *Reitziites reitzi* (BÖCKH, 1872) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 65, pl. 15, figs 2–4, 7, 8.
v 1993 *Reitziites reitzi* — VÖRÖS, Reitzi Zone, p. 27 (partim), pl. III, fig. 2 (non figs 3, 4).

v 1993 *Reitziites reitzi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117 (partim), pl. 12, figs 4, 6. (non fig. 5).
? 1995 *Reitziites reitzi* (BÖCKH, 1872) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 549, pl. II, fig. 7.
? 1995 *Reitziites reitzi* (BÖCKH, 1872) — DE ZANCHE et al., Dolomites, p. 152, pl. II, fig. 4.
v 1998 *Reitziites reitzi* (BÖCKH, 1872) — VÖRÖS, Balaton-felvidék, p. 21, 31, 38, 59, pl. III, figs 2, 3.
? 2003 *Reitziites reitzi* (BÖCKH, 1872) — MIETTO et al., Bagolino, p. 451, pl. 1, figs 4, 12.
v 2015 *Reitziites reitzi* (BÖCKH, 1872) — VÖRÖS et al., New data, p. 319, pl. I, fig. 5.

Material

63 specimens of various state of preservation, from Felsőörs (3), Szentkirályszabadja (2), Vászoly (20), Mencshely (36) and Sóly (2).

Measurements

	D	WH	WW	U
Lectotype T.696.	79.8	26.9	?	31.5
T.3212.	90.6	29.9	?	?
T.3103.	52.6	18.5	?	21.2
T 2017.10.1.	101.5	36.1	26.4	?
T 2017.9.1.	92.9	34.5	22.1	?
T 2017.11.1.	73.6	28.3	20.8	23.2
INV 2017.212.1.	94.8	38.4	28.6	?
INV 2017.207.1.	90.1	39.5	27.4	?
M.98.21	82.1	42.1	?	?
INV 2017.215.1.	80.4	34.4	21.2	22.2
INV 2017.216.1.	76.2	~23.0	?	~25.0
INV 2017.213.1.	73.5	27	20	28.8
INV 2017.210.1.	64.5	24.8	?	26.5
INV 2017.208.1.	63.2	27.1	19.8	?
M.98.15	58.8	23.2	19.5	22.8
M 2001.27	54.1	21.1	?	19.5
INV 2017.209.1.	48.8	26.5	21.5	?
INV 2017.206.1.	42.5	19.1	16.5	?
M.89.108	41.5	14.4	11.1	?
INV 2017.205.1.	40.1	13.5	?	16.3
INV 2017.214.1.	39.6	13.7	13.1	14.0
INV 2017.204.1.	25.1	13.8	12.5	?
M.89.110	15.4	5.1	6.1	6.2
INV 2017.211.1.	14.5	?	5.9	?
L. Varga collection, Úny	76.5	30.3	?	27.5
L. Varga collection, Úny	42.8	14.8	?	14.3

Description

Medium to large *Reitziites* with moderately evolute conch. The whorl-section is oval. The umbilical wall is subrounded to steep. The flanks are gently convex and pass gradually into the flat or gently sulcate venter. The ventrolateral margin is accentuated by a row of prominent spines. The flanks are ornamented with nearly prorsiradiate, sinuous, projected primary ribs (14 to 18 on a half whorl) and nodes. Secondary ribs intercalate irregularly at around the inner third of the flank or even nearer to the umbilicus; bifurcation is rare and occurs only near the umbilicus. In many cases the primary and the secondary ribs fuse as approaching the ventrolateral margin and form of a kind of fibulate ribbing. Farther close to the ventrolateral

margin, both the primary and the secondary ribs weaken or almost fade out. On the flanks, the ribbing always prevails over the nodes; in some cases lateral nodosity seems to be absent (e.g. Plate XIX: 1, 7). Usually there are four rows of nodes. The umbilical nodes are regularly developed. The first row of the lateral nodes runs near the inner quarter of the flank; in most cases these nodes are only swellings on the ribs, but occasionally they tend to form spines (e.g. Plate XIX: 5). The second row of the very strong lateral nodes or spines runs in the outer quarter of the flank, at the fibulate meeting point or the end of the ribs. The ventrolateral nodes are in fact very high, almost vertical spines (around 16 on a half whorl); they form separate, usually alternating rows. These hollow spines, as a rule, break away, but if preserved, they show peculiar shape reminding pricked-up dog's ears; they neatly bend out from the vertical position and their lateral sides are somewhat excavated (e.g. Plate XIX: 5, and good illustration by STÜRZENBAUM 1875, pl. V, fig. 2). There is an almost smooth, narrow belt between the rows of the third lateral nodes and ventrolateral spines; this belt, and the narrow, flat venter is rarely crossed by weak growth lines. The style and strength of ornamentation change considerably during growth. In some cases the ornamentation becomes stronger on the body chamber than on the phragmocone (e.g. Plate XX: 5; Plate XXI: 7; Plate XXII: 1), or vice versa (e.g. Plate XX: 1; Plate XXI: 4).

Suture lines are ceratitic, with three, entire lateral saddles. The first lateral lobe is deep and wide, with strong denticulation; the second lateral lobe is much reduced in all respects (Figures 35, 36).

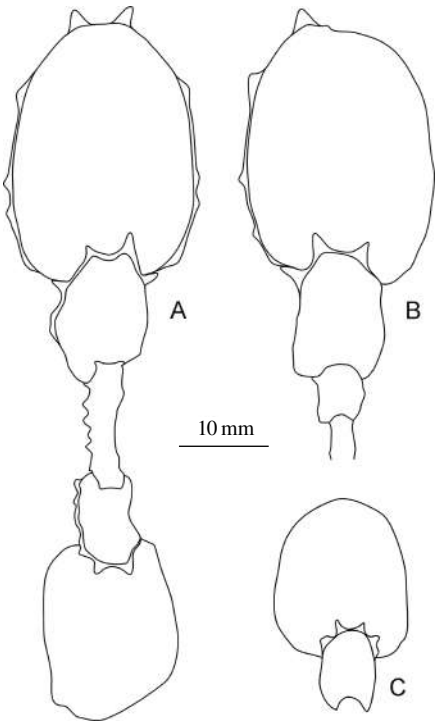


Figure 34. Cross sections of *Reitziites reitzi* (BÖCKH, 1872), A: INV 2017.213.1., Vászoly, P–17, loose, Reitzi Zone, Reitzi Subzone; B: T 2017.9.1., Vászoly, P–11c, loose, Reitzi Zone, Reitzi Subzone; C: INV 2017.208.1., Mencshely II, loose, Reitzi Zone, Reitzi Subzone (?)

Remarks

R. reitzi is one of the first described and emblematical ammonoid species of the late Illyrian; for a long time, though mainly by Hungarian experts, it was regarded as the index fossil marking the base of the Ladinian (MOJSISOVICS 1882, SZABÓ et al. 1980, VÖRÖS et al. 2003b). In fact, it would have been an excellent guide fossil as well, because of its almost unmistakable morphology, quite unique among Triassic ammonoids.

From the point of view of lateral ornamentation, *R. reitzi* has some similarity to certain species of *Epikellnerites,* especially to *E. vaszolyensis* n. sp. but strongly differs by the flat or concave venter with vertical, very high ventrolateral spines in contrast to the fastigate venter and lower ventrolateral clavi of *E. vaszolyensis*.

Within the genus, *R. ecarinatus* (HAUER, 1896) differs from *R. reitzi* by its more evolute conch, broader, subhexagonal whorl-section and coarser ornamentation, dominated by nodes.

The lectotype (BÖCKH 1872, pl. VII, fig. 3a and pl. VIII, fig. 3b), designated by BRACK & RIEBER (1993, p. 472), is kept in the collection of the MGSH under the inventory number T.696. The lectotype is refigured here (Plate XIX: 1a, 1b) to show that the lateral views of this specimen given by BÖCKH (1872) and later by MOJSISOVICS (1882, pl. VII, fig. 2) are correct. On the other hand, the ventral views given by the cited authors are too much artistic and imaginative, because the other side of the specimen is embedded to host rock and the other row of the ventrolateral spines is hardly seen.

R. reitzi has a rather wide range of variation, therefore some species, described earlier under different names may be

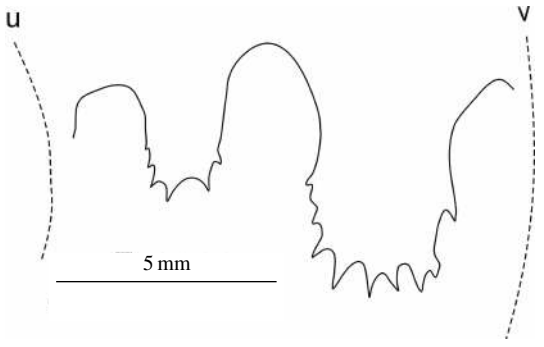


Figure 35. Suture line of *Reitziites reitzi* (BÖCKH, 1872), INV 2017.205.1., at 12 mm whorl-height, Felsőörs, loose, near Bed 108, Reitzi Zone, Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

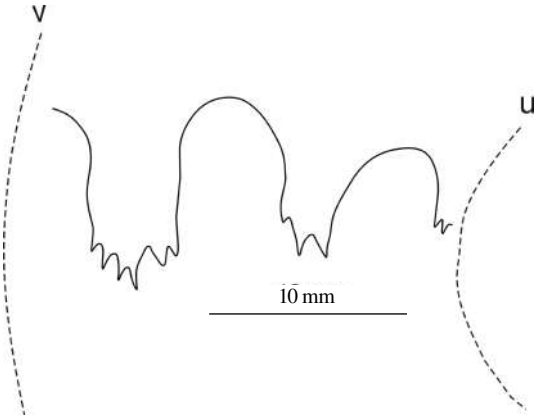


Figure 36. Suture line of *Reitziites reitzi* (BÖCKH, 1872), INV 2017.215.1., at 21 mm whorl-height, Vászoly, P–11c, loose, Reitzi Zone, Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

regarded as synonyms, ("*Ceratites perauritus*" DIENER 1900, l. c.), or included here as morphotypes of *R. reitzi* ("*Trachyceras Cholnokyi*" FRECH, 1903, p. 8, pl. II, fig. 5). The specimens of *cholnokyi* are connected by continuous morphological transitions with the typical *reitzi*. This relationship is illustrated here on Plate XXII; the specimens of "typical" *cholnokyi* differ from *reitzi* mainly by their narrower venter. In spite of this connection, the morphotype *cholnokyi* (within the species *R. reitzi*) is described separately in the present monograph.

The specimen figured as "*Kellnerites samoborensis* n. sp." by SALOPEK (1936a, l. c.) shows lateral ornamentation very similar to *R. reitzi* and, as it is written in the German version of the paper (SALOPEK 1936b, p. 176), the venter bears neither keel, nor sulcus. Therefore this record is taken tentatively into the present synonymy.

BRACK & RIEBER (1986, l. c.) described a few specimens as belonging to the "group of *Nevadites reitzi*", but later the same authors (BRACK & RIEBER 1993), synonymised these with their new species *Nevadites avenonensis* BRACK &RIEBER, 1993.

KOVÁCS et al. 1990, l. c.) figured a specimen under the name "*Protrachyceras*" *reitzi* (BÖCKH). The lateral ornamentation showed some similarity to *R. reitzi*, but the specimen was so embedded to the host rock that the ventral side was not seen. The careful preparation by the present author revealed the keeled venter; consequently the specimen was identified as *Epikellnerites angustecarinatus* (HAUER, 1896).

BRACK & RIEBER (1993) collected a series of specimens of *R. reitzi* from Bagolino, which were examined by the present author in the collection PIMUZ, Zürich. Most of them were considered typical representatives of this species. The specimens figured on pl. 7, figs 6, 7; pl. 8, figs 3–6, 13, 14 and pl. 11, fig. 3, were seen as standing close to *R. reitzi* morphotype *cholnokyi,* which, in fact, belongs to the species *reitzi* in wider sense. The single specimen which does not fit *R. reitzi* was figured by BRACK & RIEBER (1993, pl. 8, fig. 11) and, by its coarse ribbing and nodes, probably belongs to *R. ecarinatus* (HAUER, 1896).

Some of the specimens illustrated previously by the present author as *R. reitzi,* turned out to be representatives of different species of *Epikellnerites*; e.g. *E. vaszolyensis* (VÖRÖS 1993, pl. III, fig. 3; and also in GAETANI 1993, pl. 12, fig. 5), and *E. spinatus* (VÖRÖS 1993, pl. III, fig. 4.).

The specimens figured as *R. reitzi* by MIETTO & MANFRIN (1995), DE ZANCHE et al. 1995), and MIETTO et al. (2003) are rather poorly preserved and do not show the ventral part. On the basis of their lateral ornamentation they may belong to *R. reitzi.*

Distribution

R. reitzi was described from the upper Anisian of the Balaton Highland, the Southern Alps, Japan and probably from the Dinarides. At the Balaton Highland its range is restricted to the Illyrian Reitzi Subzone.

Reitziites reitzi (BÖCKH, 1872)
morphotype *cholnokyi*
Plate XXII: 4–7; Figure 37.

v * 1903 *Trachyceras Cholnokyi* n. sp. (Protrachyceras) — FRECH, Neue Cephalopoden, p. 8, pl. II, fig. 5.
1913 *Protrachyceras Cholnokyi* FRECH — RENZ, Griechenland, p. 547, text-fig. 2.
v 1989 *Xenoprotrachyceras cholnokyi* (FRECH, 1903) — VÖRÖS & PÁLFY, Vászoly, p. 21., pl. III, figs 3, 4.
v 1993 *Reitziites reitzi* (BÖCKH, 1872) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 472 (partim), pl. 7, figs 6, 7, pl. 8, figs 3–6, 13, 14, pl. 11, fig. 3, text-fig. 15r (only).
v 1993 *Reitziites cholnokyi* — VÖRÖS, Reitzi Zone, p. 27 (partim), pl. III, fig. 6 (only), (non fig. 5).
v 1993 *Reitziites reitzi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117 (partim), pl. 12, fig. 8 (only), (non fig. 7).
v 1998 *Reitziites cholnokyi* (FRECH, 1903) — VÖRÖS, Balaton-felvidék, p. 31, 38, 59.
v 2015 *Reitziites cholnokyi* (FRECH, 1903) — VÖRÖS et al., New data, p. 319, pl. I, fig. 6.

Material

28 specimens of various state of preservation, from Vászoly (6) and Mencshely (22).

Measurements

	D	WH	WW	U
M.89.129A	58.1	24.4	15	20.1
INV 2017.217.1.	52.4	21.1	13.4	13.3
INV 2017.218.1.	42.7	16.1	11.7	14.3
M.89.129B	28.3	11.8	7.8	8.2

Description

Small to medium-sized *Reitziites* with moderately involute conch. The whorl-section is high oval. The umbilical wall is subrounded to steep. The flanks are gently convex and pass into the narrow, tabulate venter. The ventrolateral margin is

accentuated by a row of projected clavi. The flanks are ornamented with slightly prorsiradiate, sinuous, strongly projected primary ribs (18 to 20 on a half whorl) and indistinct nodes. Numerous secondary ribs intercalate irregularly near the umbilicus or at around the inner third of the flank; bifurcation is rare. Some of the primary and the secondary ribs weaken near the ventrolateral margin. The secondary ribs occasionally fuse with the primaries near the ventrolateral margin, in the form of a kind of fibulate ribbing. On the flanks the ribbing strongly prevails over the nodes which develop only as rather irregular swellings on the ribs. There are four rows of nodes. The umbilical nodes are regularly developed. The first row of the weak lateral nodes runs near the inner third of the flank. The second row of the somewhat weaker lateral nodes or swellings runs in the outer third of the flank. The ventrolateral nodes form separate rows of projected clavi on the ventrolateral margins; their number is around 14 to 16 on a half whorl. The venter is narrow and the two rows of closely set ventrolateral clavi are in alternating position.

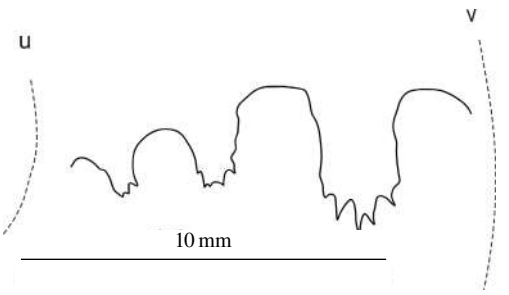


Figure 37. Suture line of *Reitziites reitzi* (BÖCKH, 1872) morphotype *cholnokyi*, INV 2017.296.1., at 12 mm whorl-height, Mencshely, loose, Reitzi Zone, Reitzi Subzone (?), u: umbilical margin, v: ventrolateral margin

Suture lines are ceratitic, with at least three, entire lateral saddles. The first lateral lobe is deep with strong denticulation; the second and third lateral lobes are gradually reduced both in depth and in denticulation (Figure 37).

Remarks

This taxon, described originally as *Trachyceras Cholnokyi* by FRECH (1903, l. c.) was regarded for a long time (from RENZ 1913, l. c. to VÖRÖS et al. 2015, l. c.) as a valid, distinct species. BRACK & RIEBER (1993, l. c., p. 473) synonymised *R. cholnokyi* with the morphologically close *R. reitzi* (BÖCKH, 1872).

The detailed studies made on a large material in the course of the preparation of the present monograph convinced the author that, from morphological point of view, the typical *cholnokyi* is connected by continuous transitions with the typical *reitzi*. This relationship is illustrated here on Plate XXII: 1–3; these specimens of *R, reitzi* are very close to the typical *cholnokyi* and differ mainly by their wider venter. Nevertheless, it was felt reasonable to distinguish and describe this group of peculiar ammonoids as a morphotype *cholnokyi* within the species *R. reitzi*.

Some of the specimens figured as *R. reitzi* by BRACK & RIEBER (1993, pl. 7, figs 6, 7, pl. 8, figs 3–6, 13, 14, pl. 11, fig. 3), morphologically correspond to the morphotype *cholnokyi.*

The species *Epikellnerites pseudocholnokyi* introduced in the present monograph, is very similar to *R. reitzi* morphotype *cholnoky* in its lateral ornamentation and differs only by its wider and arched venter. This deceptive similarity led the present author (VÖRÖS 1993, l. c. and in GAETANI 1993, l. c.) to the wrong identification of a part of the respective specimens.

Distribution

This morphotype was recorded in the upper Anisian of the southern Alps and Greece. At the Balaton Highland its range is restricted to the Illyrian Reitzi and Avisianum Subzones.

Reitziites ecarinatus (HAUER, 1896)
Plate XX: 7; Plate XXIII: 1–11; Figure 38.

v * 1896 *Ceratites ecarinatus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 257, pl. VIII, figs 7–10.
v 1900 *Balatonites conspicuus* nov. sp. — DIENER, Muschelkalk–Cephalopoden südl. Bakony, p. 28, pl. II, fig. 5.
v 1900 *Protrachyceras* sp. ind. — DIENER, Muschelkalk–Cephalopoden südl. Bakony, p. 31, pl. II, fig. 2.
v 1903 *Ceratites conspicuus* DIEN. sp. — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 22, pl. I, figs 5, 6.
v 1903 *Ceratites ecarinatus* HAUER — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 23, pl. I, fig. 4.
v ? 1973 *Protrachyceras* cf. *conspicuus* (DIENER, 1900) — RIEBER, Grenzbitumenzone, p. 69, pl. 16, fig. 7.
v 1989 *Nevadites* cf. *ecarinatus* (HAUER, 1896) — VÖRÖS & PÁLFY, Vászoly, p. 21., pl. III, fig. 1.
v 1993 *Reitziites reitzi* (BÖCKH, 1872) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 472 (partim), pl. 8, fig. 11 (only).
v ? 1993 *Kellnerites* cf. *ecarinatus* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470, pl. 6, figs 5, 6.
v 1993 *Reitziites ecarinatus* — VÖRÖS, Reitzi Zone, p. 27, pl. III, fig. 7.
v 1993 *Reitziites ecarinatus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 12, fig. 9.
? 1995 *"Kellnerites" ecarinatus* (HAUER, 1896) — DE ZANCHE et al., Dolomites, p. 152, pl. II, fig. 3.
v 1998 *Nevadites* ? *symmetricus* (SALOMON, 1895) — VÖRÖS, Balaton-felvidék, p. 31, 60.
v 1998 *Nevadites* cf. *ecarinatus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, p. 50, pl. VI, fig. 16.

Material

70 specimens of various state of preservation, from Felsőörs (1), Szentkirályszabadja (3), Vászoly (5), Mencshely (41), Sóly (16), Szentbékkálla (1), Hajmáskér (2) and Öskü (1).

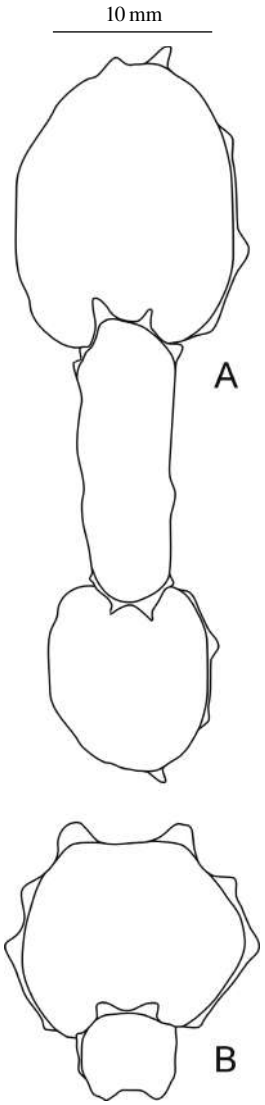
Measurements

	D	WH	WW	U
M.87.009	55.9	22.5	18.2	22.2
INV 2017.224.1.	40.2	15.8	?	11.2
INV 2017.226.1.	41.1	15.3	13.1	?
INV 2017.227.1.	40.0	15.0	15.0	?
INV 2017.225.1.	36.1	12.8	14.1	16.2
INV 2017.220.1.	33.8	12.8	11.1	13.1
M.98.218	32.8	17.1	15.0	?
INV 2017.222.1.	29.5	10.8	12.8	11.5
INV 2017.223.1.	29.2	9.8	11.1	12.2
INV 2017.228.1.	20.8	7.1	8.2	8.7
INV 2017.221.1.	24.4	9.8	9.4	8.4

Description

Small to medium-sized *Reitziites*, with moderately evolute conch. The whorls are compressed, stout; the cross-section is oval to subhexagonal. The umbilical edge is subrounded. The flanks are strongly convex and pass gradually into the flat to gently sulcate venter. The flanks are ornamented with very strong ribs and nodes. The widely spaced ribs are rectiradiate to slightly prorsiradiate; their number is 8 to 10 on a half whorl. Very rarely, secondary ribs are irregularly inserted by intercalation. There are four rows of nodes. The umbilical nodes appear only as swellings of the ribs. The first row of lateral nodes develops on the inner thirds of the primary ribs; these nodes occasionally appear as spines. The second row of lateral nodes emerges at the outer quarter of the ribs; some of the ribs terminate at these very prominent tubercles. The ventrolateral nodes are the most prominent; they form more or less separate, usually alternating rows of spines. Some of the strong ribs reach the ventrolateral spines, others weaken between the third row of lateral nodes and the ventrolateral spines. Some spines stand alone, without connection to any ribs, in the interspaces of spine-bearing ribs. The very high, almost vertical ventrolateral spines (10 to 12 on a half whorl) are hollow spines; if preserved, they show peculiar pointed ear shape (e.g. Plate XXIII: 2), reminding the spines of *R. reitzi*.

Suture lines are poorly visible; ceratitic, with two or three lateral saddles.



Remarks

HAUER (1896, l. c.) described and figured two specimens of *ecarinatus*. These were inspected by the present author in the collection NHMW (Wien); from among them the larger one, figured by HAUER (1896, pl. VIII, figs 9, 10; inventory number: NHMW 1998z0063/0017), is designated here as lectotype. The identification of our specimens from the Balaton Highland with the typical *R. ecarinatus* is ascertained.

R. ecarinatus differs from other species of *Reitziites* first af all by its evolute conch with stout, almost hexagonal whorls, and by the widely spaced, very strong ribs and nodes. The copious material recently collected from diverse localities of the Balaton Highland allowed us to somewhat broaden the morphological range of variation of this species.

As a marginal member of the genus, *R. ecarinatus* bears striking resemblance to some *Nevadites* species introduced by BRACK & RIEBER (1993), as revealed by the comparative studies of the present author in the collection PIMUZ, Zürich. Especially, the holotype of *N. secedensis* BRACK & RIEBER (1993, pl. 11, fig. 8; PIMUZ 7116) can well be compared to our specimen of *R. ecarinatus* figured here (Plate XXIII: 1). Similarly, the smaller specimens of *N. secedensis* and *N. avenonensis* BRACK & RIEBER, 1993, figured by BRACK & RIEBER (1993, pl. 11, figs 4, 5 and figs 9, 10, respectively) are remarkably similar in all respects to our smaller specimens of *R. ecarinatus* from the Balaton Highland. In spite of the high degree of apparent similarity, the two groups of forms remain separate stratigraphically, because *R. ecarina-*

Figure 38. Cross sections of *Reitziites ecarinatus* (HAUER, 1896), A: INV 2017.226.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; B: INV 2017.297.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?)

tus is restricted to the upper part of the Reitzi Zone, whereas *N. secedensis* and *N. avenonensis* are known only from the higher Secedensis Zone.

The type specimen of "*Balatonites conspicuus* nov. sp.", described and figured by DIENER (1900, l. c.) was examined in the collection of the MGSH, where it is kept under the inventory number T.1641. It is surely not a *Balatonites*, because, instead of a nodose keel, it has a concave venter. This poorly preserved ammonite from Hajmáskér is rather deformed, crushed laterally, as it is also shown in the cross section figure by DIENER (1900, pl. II, fig. 5d). Considering the effect of compression, on the basis of the lateral ornamentation, the attribution of the specimen to *R. ecarinatus* is justified. The similarity is especially striking to our specimen from Szentbékkálla, figured here on Plate XXIII: 1.

Another fragmentary specimen from Hajmáskér, described by DIENER (1900, l. c.) as "*Protrachyceras* sp. ind.", and deposited in the collection of the MGSH, under the inventory number T.1266., is regarded here as a typical representative of *R. ecarinatus*.

Both above mentioned items by DIENER were revised and attributed to "*Ceratites conspicuus* DIEN. sp." by ARTHABER (1903, p. 22); in the sense of the present interpretation, they belong to *R. ecarinatus*.

In the same work, ARTHABER (1903, p. 23, pl. I, fig. 4) described and figured a small ammonite from Hajmáskér as *Ceratites ecarinatus* HAUER. The examination of this specimen (inventory number T.1254.) in the collection of the MGSH endorsed the identification of ARTHABER.

The specimen figured as *Protrachyceras* cf. *conspicuus* by RIEBER (1973, l. c.) is listed with query in the synonymy, because it may belong to some species of *Nevadites* of higher stratigraphical position. According to H. RIEBER (pers. comm.) this specimen was collected near Besano, where only the higher part of the Grenzbitumenzone was exposed, corresponding to the Beds 80 to 120 interval in Monte San Giorgio (Secedensis Zone).

From among the many specimens figured as *R. reitzi* by BRACK & RIEBER (1993), only one (l. c., pl. 8, fig. 11) does not seem to belong to that species but should be regarded as a *R. ecarinatus* by its widely spaced, coarse ribs and strong nodes.

The specimen figured as "*Kellnerites*" *ecarinatus* by DE ZANCHE et al. 1995, l. c.) is a poorly preserved, compressed form; its venter is not seen at all. Therefore it is only tentatively included to the present synonymy.

In a previous work (VÖRÖS 1998, l. c.) the taxon *Nevadites* ? *symmetricus* (SALOMON, 1895) was itemised from Vászoly (Balaton Highland). This single specimen was the same as figured by VÖRÖS & PÁLFY (1989, pl. III, fig. 1) under the name "*Nevadites* cf. *ecarinatus*". Here it is regarded as a juvenile specimen of *R. ecarinatus* and re-figured on Plate XX: 7. The type specimen of "*Trachyceras symmetricus*" SALOMON, 1895 was checked in the BSM (München) and it turned to be different from *R. ecarinatus*, and appeared as belonging to *Nevadites*.

The specimen figured under the name *Nevadites* cf. *ecarinatus* by VÖRÖS (1998, l. c.) is re-figured here on Plate XXIII: 1, as *R. ecarinatus*. In this case, just as in the previous item, the explanation of the mistake in the generic attribution can be given by the above discussed deceptive similarity between some forms of *Nevadites* and *R. ecarinatus*.

Distribution

R. ecarinatus was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Reitzi and Avisianum Subzones.

Genus **Latemarites** BRACK & RIEBER, 1993

Type species: *Latemarites latemarensis* BRACK & RIEBER, 1993, now regarded as a junior synonym of *Latemarites bavaricus* (REIS, 1901).

When the genus *Latemarites* was introduced by BRACK & RIEBER (1993, p. 475), the name-bearing species *Latemarites latemarensis* n. sp. was designated as the type species. *L. latemarensis* was correctly described and illustrated by plentiful material and was demonstrated as a widely variable species (BRACK & RIEBER 1993, p. 478).

MANFRIN et al. (2005, p. 496, figs 11/1–15) pointed out that *L. latemarensis* was the junior synonym of *Latemarites bavaricus* (REIS, 1901), and they convincingly proved the morphological identity of the two species by comparative studies of the type specimens of REIS, kept in the BSM (München).

The approval of this subjective synonymy logically would mean that the type species, *L. latemarensis* should be substituted by the senior synonym *L. bavaricus*. However, according to the Article 67.1.2. of the ICZN (1999, p. 57): "The name of a type species remains unchanged even when it is a junior synonym or homonym, or a suppressed name." Moreover, we may accept the "Recommendation 67B." of the ICZN, and apply it to our case:

The designated type species of *Latemarites*: *Latemarites latemarensis* BRACK & RIEBER, 1993 is currently synonymised with *Latemarites bavaricus* (REIS, 1901), but the latter is not the type species of *Latemarites* and should not be cited as such. If mention of the type species is required it should be made in some such manner as "Type species *Latemarites latemarensis* BRACK & RIEBER, 1993, a junior synonym of *Latemarites bavaricus* (REIS, 1901)"; or "Type species *Latemarites latemarensis* BRACK & RIEBER, 1993, now regarded as a synonym of *Latemarites bavaricus* (REIS, 1901)".

Consequently, we regard *Latemarites latemarensis* BRACK & RIEBER, 1993 as the type species of the genus, but we shall use the senior synonym, *Latemarites bavaricus* (REIS, 1901) in the following systematic descriptions.

In accordance with the opinion of MANFRIN et al. (2005, p. 496) *Latemarites* is regarded as a descendant of *Reitziites*.

Latemarites bavaricus (REIS, 1901)
Plate XXIII: 12–18; Plate XXIV: 1–9.

v * 1901 *Ceratites bavaricus* nov. spec. — REIS, Fauna des Wettersteinkalkes I., p. 78, pl. II, figs 19–23, pl. VII, figs 4, 5.
v 1907 *Ceratites bavaricus* REIS — REIS, Fauna des Wettersteinkalkes II., p. 131, Text-figs 4, 5.
v 1993 *Latemarites latemarensis* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 478, pl. 10, figs 1–24, text-figs 15i, 17b.
v 1998 *Latemarites latemarensis* BRACK & RIEBER, 1993 — VÖRÖS, Balaton-felvidék, p. 29, 38, 42, 59, pl. VI, figs 6–15.
v 1998 *Latemarites conspicuus* (DIENER, 1900) — VÖRÖS, Balaton-felvidék, p. 42, 59, pl. VI, figs 2–5.
v 2002 *Latemarites latemarensis* BRACK & RIEBER — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, figs 8–17.
2005 *Latemarites bavaricus* (REIS, 1900) — MANFRIN et al., Latemar, p. 496, figs 11/1–15.
v 2015 *Latemarites latemarensis* BRACK & RIEBER, 1993 — VÖRÖS et al., New data, p. 319, pl. I, fig. 7.

Material

68 specimens of various state of preservation, from Felsőörs (3), Szentkirályszabadja (6), Vászoly (1), Mencshely (5), Sóly (51), Vörösberény (1) and Hajmáskér (1).

Measurements

	D	WH	WW	U
M.98.33	61.1	20.1	14.8	25.4
M.98.81	43.5	15.2	10.8	20.1
M.89.135	41.5	15.8	?	19.5
M.98.57	40.0	14.8	10.8	15.8
M.98.80	38.1	14.8	12.1	12.8
M.98.66	38.0	16.8	12.4	?
M.98.84	33.4	12.2	9.8	13.1
INV 2017.229.1.	29.1	10.6	9.2	10.5
M.98.29	28.1	9.1	?	11.3
INV 2017.232.1.	28.1	?	5.4	?
M.98.86	26.1	8.5	7.1	11.7
M 2001.28	25.5	9.8	8.1	8.5
M.98.70	23.1	8.5	6.2	8.6
INV 2017.231.1.	22.5	6.8	5.5	?
INV 2017.230.1.	16.1	5.6	4.3	6.9
K. Tamás collection, Kővágóörs	65.1	24.8	?	24.1

Description

Small to medium-sized *Latemarites* with moderately evolute conch. The whorl-section is high oval. The umbilical wall is subrounded to steep. The flanks are gently convex and pass gradually to the tabulate venter. The ventrolateral margin is accentuated by a row of prominent spines. The flanks are ornamented with slightly prorsiradiate, straight to sinuous, projected primary ribs (around 12 on a half whorl) and nodes. Secondary ribs intercalate irregularly at around the inner third of the flank or even nearer to the umbilicus; bifurcation is rare. On the inner half of the flanks and in the specimens of less than 30 mm diameter, the ribbing prevails over the nodes. Usually there are four rows of nodes. The umbilical nodes are only swellings on the ribs. The first row of the lateral nodes runs near the inner quarter of the flank; in most cases these nodes are weak or only of medium strength. The second row of the very strong lateral nodes or spines runs in the outer quarter of the flank; the ribs usually terminate or weaken at these nodes. The ventrolateral nodes are rather high spines (18 to 24 on a half whorl); they form separate, usually opposite rows. These spines, as a rule, break away, but if preserved, they are elevated ventrolaterally and gently curved ventrally.

The style and strength of ornamentation may change considerably during growth. In some cases the ornamentation becomes stronger on the body chamber than on the phragmocone (e.g. Plate XXIII: 18), or vice versa (e.g. Plate XXIV: 4).

Suture lines are poorly seen: ceratitic, with three lateral saddles and a deeply denticulated first lateral lobe (Plate XXIV: 3).

Remarks

The lectotype of *L. bavaricus,* figured by REIS (1901, pl. II, fig. 19) was designated by MANFRIN et al. (2005, p. 496) on the basis of direct investigations of those authors in the BSM (München). They re-figured the lectotype and a few other paralectotype specimens from the collection of REIS (MANFRIN et al. 2005, figs 11/8–10, 14, 15). Finally they concluded that *L. bavaricus* is conspecific with its junior synonym *L. latemarensis* BRACK & RIEBER, 1993.

The present author had the possibility to check the original specimens of REIS (1901, 1907) in München and, previously, the originals of *L. latemarensis* in the PIMUZ, Zürich, as well. It can be stated definitely, that the latter material is far more numerous and diverse, and it is better illustrated than that of REIS, considering even the illustrations by MANFRIN et al. (2005). Moreover, the present author has some doubt if *L. bavaricus* and *L. latemarensis* are really conspecific, because the few specimens of *L. bavaricus* in the REIS collection from the Wetterstein Mts are all simply ribbed, without definite nodes, whereas strongly nodose specimens prevail in the *L. latemarensis* populations from the Southern Alps (see illustrations in BRACK & RIEBER, 1993, pl. 10, figs 1–24 and in MANFRIN et al. 2005, figs 11/1–7). At the same time, it is demonstrated that simple ribbing is also frequent in the South Alpine poulations of *L. latemarensis*. After all, the present author accepted the opinion of MANFRIN et al. (2005) and the *Latemarites* specimens from the Balaton Highland are described here under the name *L. bavaricus*.

The species name *bavaricus* is cited by MANFRIN et al. (2005) with the date of 1900. REIS' work, appeared in the thirtieth volume of Geognostische Jahreshefte, München, for the year 1900, but the volume was published in 1901. Therefore the proper date of the authorship is 1901.

In a previous work VÖRÖS (1998, l. c., pl. VI, figs 2–5) some specimens were wrongly identified as "*Latemarites conspicuus* (DIENER, 1900)". Now these are included to the wide variation range of *L. bavaricus*.

Distribution

L. bavaricus was described from the upper Anisian of the Northern Calcareous Alps and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Reitzi and Avisianum Subzones.

Genus **Detoniceras** MANFRIN & MIETTO, 1991

Type species: *Detoniceras rex* MANFRIN & MIETTO, 1991

Detoniceras ? sp.

Plate XXIV: 10.

v 1998 *Detoniceras* ? sp. — VÖRÖS, Balaton-felvidék, p. 42.

Material

One fragment from Sóly.

Measurements

	D	WH	WW	U
M.98.233	16.5	8.8	8.1	?

Description

Small fragment of a *Detoniceras*. The conch seems rater evolute; the whorl section is high oval. The unbilical wall is rounded. The flanks are gently convex; the venter is deeply sulcate. The flanks are ornamented with coarse ribs and strong nodes. No umbilcal nodes are seen. Two lateral rows of nodes at the inner and outer third of the flank. The elevated ventrolateral nodes or spines stand opposite arrangement along the deep ventral groove.

Remarks

On the basis of its rather deep and sharp ventral groove, our specimen seems most similar to *Detoniceras*? *dezanchei* MANFRIN & MIETTO, 1991 which species was only tentatively assigned to the genus *Detoniceras* in a subsequent work by MANFRIN et al. (2005, p. 498).

Most of the species of the genus *Detoniceras* occur in the Ladinian, but *Detoniceras* ? *dezanchei* was recorded also in the upper Anisian Secedensis Zone.

Distribution

The specimen from the Balaton Highland was collected from the late Illyrian Avisianum Subzone.

Genus **Hyparpadites** SPATH, 1951
Type species: *Hyparpadites liepoldti* (MOJSISOVICS, 1882)

The generic name *Hyparpadites* was introduced by SPATH (1951, p. 57) based on the species "*Arpadites* (*Ceratites*) *Liepoldti*" described and figured by MOJSISOVICS (1882, p. 53, pl. VIII, fig. 1, pl. IX, fig. 9). SPATH (l. c.) and subsequently the "Treatise" (ARKELL et al. 1957, p. L162) regarded *Hyparpadites* as a fore-runner of the typical *Arpadites*, and included it to the family Arpaditidae. However this attribution, based on the false morphological interpretation of the type species, was essentially wrong.

Even MOJSISOVICS (1882, p. 53), in the original description of *liepoldti,* used the generic name "*Ceratites*" in parentheses and compared this species to "*Ceratites*" *elegans* MOJSISOVICS, 1882, both in general shape and in the ceratitic suture. Besides the presence of a second lateral row of nodes, the chief diagnostic character was the bicarinate venter. The apparently bicarinate venter led MOJSISOVICS (l. c.) SPATH (l. c.) and ARKELL et al. (l. c.) to misplace *liepoldti* (and consequently *Hyparpadites*) to the Arpaditidae, instead of the Ceratitidae. It has to be mentioned that HAUG (1894, p. 401) recognized the mistake, and stated that *liepoldti* is a true ceratitid ("est un véritable *Ceratites*...").

The apparent contradiction in the proper systematic position of *Hyparpadites* was recognized by the late T. TOZER in the course of the preparation of the planned "new Treatise" and he asked the present author (letter in 1994) to check the figured type specimen of *H. liepoldti* kept in the collection of the Geological Institute of Hungary (now Mining and Geological Survey of Hungary). Careful examination of the specimen revealed that it has nothing to do with the Arpaditidae, because the apparent "ventral furrow" (as seen on the specimen) is a little oblique, two centimetres long scratch, made probably by a chisel during preparation. The ventral view given by MOJSISOVICS (1882, pl. VIII, fig. 1) is highly exaggerated and misleading. Continuous ventral furrow can not be seen on the specimen, only in the innermost part, next to the body chamber, where it is an artefact. Everywhere else, only the fastigate, carinate venter can be seen.

It is worth mentioning also that MOJSISOVICS (1882, p. 53) shortly described another specimen of *liepoldti*, a whorl-fragment with keel on its venter.

In conclusion, the genus *Hyparpadites* must be removed from the family Arpaditidae and included to Ceratitidae. Its basic characters are the compressed, involute conch, fastigate venter, and flanks ornamented with weak ribs and four definite rows of nodes.

The genus *Hyparpadites* comprises the following nominal species:
Hyparpadites liepoldti (MOJSISOVICS, 1882, p. 53, pl. VIII, fig. 1, pl. IX, fig. 9)
Hyparpadites aff. *liepoldti* (MOJSISOVICS, 1882)
Hyparpadites szaboi n. sp.

In some previous works (VÖRÖS 1998, VÖRÖS et al. 2009) the present author suggested to include also *Kellnerites bagolinensis* BRACK & RIEBER, 1993 to *Hyparpadites*. In this monograph this species is regarded as belonging to the new genus *Epikellnerites*.

Hyparpadites liepoldti (MOJSISOVICS, 1882)
Plate IX: 8–10; Plate X: 1–6; Plate XI: 1, 2; Figures 39–41

v * 1882 *Arpadites (Ceratites) Liepoldti* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 53, pl. VIII, fig. 1, pl. IX, fig. 9.
v 1993 *Hyparpadites liepoldti* — VÖRÖS, Reitzi Zone, p. 27, pl. II, fig. 5.
v 1993 *Hyparpadites liepoldti* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 12, fig. 3.
v 1993 *Hyparpadites* sp., aff. *liepoldti* — VÖRÖS, Reitzi Zone, p. 31, pl. III, fig. 1.
v 1993 *Hyparpadites* sp. aff. *liepoldti* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 12, fig. 2.
v 1993 *Kellnerites bagolinensis* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), specimen PIMUZ 7064 only (not figured).
v 1998 *Hyparpadites* sp., aff. *liepoldti* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 21, pl. II, fig. 5.

Material

38 specimens of various state of preservation, from Felsőörs (3), Szentkirályszabadja (21), Vászoly (5), Mencshely (3) and Sóly (6).

Measurements

	D	WH	WW	U
Lectotype T.689.	58.5	29.2	?	11.2
M.98.22	89.8	40.1	?	23.1
INV 2017.178.1.	88.4	42.1	17.8	15.1

	D	WH	WW	U
INV 2017.176.1.	>65	?	?	19.0
INV 2017.177.1.	62.5	29.5	16.1	14.4
INV 2017.175.1.	53.5	26.1	15.4	11.8
INV 2017.180.1.	53.1	25.2	14.5	12.1
INV 2017.179.1.	38.1	20.9	?	?
L. Varga collection, Úny	89.0	31.8	21.2	20.8
K. Tamás collection, Kővágóörs	65.1		?	13.1
K. Tamás collection, Kővágóörs	56.1	14.1	?	11.1

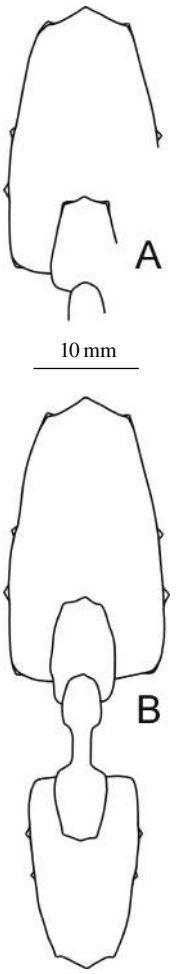


Figure 39. Cross sections of *Hyparpadites liepoldti* (MOJSISOVICS, 1882), A: INV 2017. 290.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis or Liepoldti Subzone; B: INV 2017.291.1., Szentkirályszabadja, Bed 16, Reitzi Zone, Felsoeoersensis or Liepoldti Subzone

Description

Medium to large-sized *Hyparpadites* with compressed, involute conch. The whorl-section is high oval. The umbilical margin is steep to subvertical. The flanks are very gently convex and meet at a well-marked ventrolateral shoulder with the fastigate venter bearing a high keel. The flanks are ornamented with weak to moderately strong ribs and nodes. The almost radial, slightly projected and partly sinuous primary ribs are usually stronger in the inner half of the flank. Their number is 12 to 14 on a half-whorl. Bifurcation and insertion of secondary ribs occur irregularly. There are four rows of nodes. Each primary rib starts with well-developed nodes at the umbilical margin. The first row of lateral nodes is near the umbilical margin, in the inner quarter of the flank. The second row of lateral nodes runs at around the mid-flank. The ventrolateral margin bears prominent, pointed, somewhat projected nodes; their number is 26 to 30 on a half-whorl.

Suture lines are ceratitic, showing at least three lateral saddles with very weak denticles on the lower part of their sides. The lateral lobes are deep and wide, with rather strong denticulation (Figures 40, 41).

Remarks

The lectotype of "*Arpadites* (*Ceratites*) *Liepoldti* MOJSISOVICS, 1882", was examined by the present author in the collection of the MGSH (inventory number: T.689.) and is re-figured here (Plate IX: 8). It was ascertained that this specimen does not belong to the Arpaditidae, because it is very involute and fastigate, and the ventral furrow, emphasized by MOJSISOVICS (1882, l. c.), is an artefact. It is a somewhat oblique, short scratch, made probably by a chisel during preparation. The ventral view portrayed by MOJSISOVICS (1882, pl. VIII, fig. 1) is highly exaggerated and misleading, because the specimen is, in fact, fastigate, throughout. MOJSISOVICS (1882, l. c.) himself was somewhat hesitant as far as the generic attribution of *liepoldti*, because he used the generic name "*Ceratites*" in parentheses and compared this species to "*Ceratites*" *elegans* MOJSISOVICS, 1882, both in general shape and in the ceratitic suture. Moreover, he mentioned another specimen of *liepoldti*, a whorl-fragment with keel on its venter. Consequently, the attribution of the species

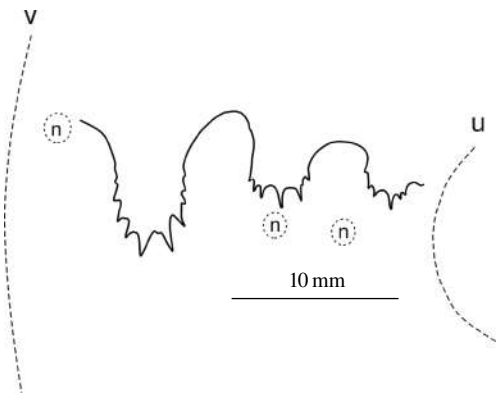


Figure 40. Suture line of *Hyparpadites liepoldti* (MOJSISOVICS, 1882), (Lectotype, T.689.), at 24 mm whorl-height, Felsőörs, loose, Reitzi Zone, Liepoldti Subzone (?), u: umbilical margin, v: ventrolateral margin, n: position of nodes

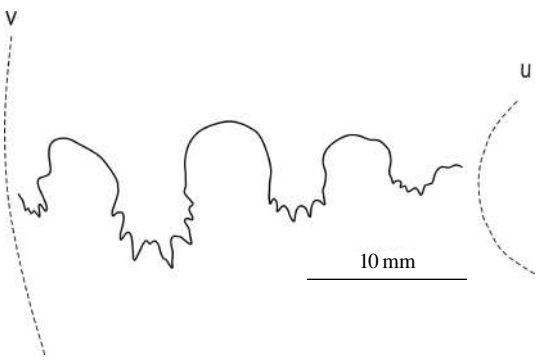


Figure 41. Suture line of *Hyparpadites liepoldti* (MOJSISOVICS, 1882), INV 2017.176.1., at 27 mm whorl-height, Vászoly, P–XVIII, loose, Reitzi Zone, Liepoldti Subzone (?), u: umbilical margin, v: ventrolateral margin

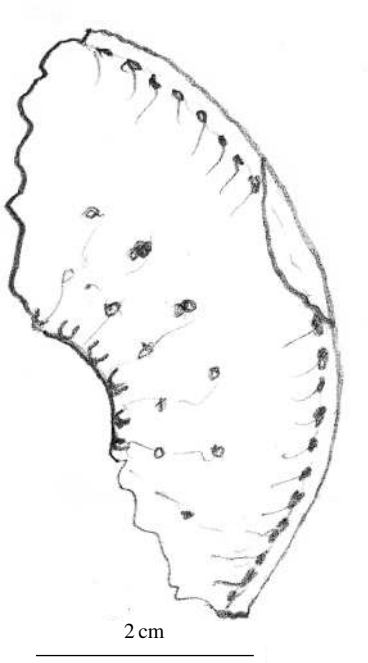


Figure 42. Hand-drawing from a specimen of *Hyparpadites liepoldti* (MOJSISOVICS, 1882), kept in the Paläontologisches Institut und Museum, Universität Zürich (inv. no.: PIMUZ 7064) under the name *Kellnerites bagolinensis* BRACK & RIEBER (1993)

liepoldti to the genus *Hyparpadites* SPATH, 1951 is justified. As it is written above, in the discussion of the genus, *Hyparpadites* should be removed from the Arpaditidae to the Ceratitidae.

STÜRZENBAUM (1875, p. 258), under the name "*Ceratites Böckhi* ROTH", described a well-preserved specimen with four rows of nodes, bearing a weak row of nodes between the umbilical and the lateral nodes; this corresponds well to the diagnostic feature of *H. liepoldti*. This is very probably the same specimen what was figured as the type of *H. liepoldti* by MOJSISOVICS (1882, l. c.) because, according to the museum's label, the type specimen was collected by J. STÜRZENBAUM in 1874.

BRACK & RIEBER (1993, p. 471, in the description of *Kellnerites bagolinensis* n. sp.) mentioned a specimen (inventory number: PIMUZ 7064) where even the spiral of the outer lateral nodes was situated in the inner half of the whorl height. This fragmentary specimen was not figured in their paper, but the present author (in 1998, Zürich, by courtesy of H. RIEBER) had the possibility to see and make a drawing (Figure 42) from that specimen which is here regarded as a typical representative of *H. liepoldti*.

In a few previous publications (VÖRÖS 1993, 1998) this species was described with open nomenclature as *Hyparpadites* sp., aff. *liepoldti.*

The specimen, illustrated here on Plate X: 6 (Sóly, Avisianum Subzone), was at first believed to be close to *P. arthaberi* (DIENER, 1899), but the two lateral rows of nodes in the inner half of the flank proves that it belongs to *H. liepoldti*, in spite of its high stratigraphical occurrence.

Distribution

H. liepoldti is known from the upper Anisian of the Southern Alps and the Balaton Highland, where it ranges from the Illyrian Felsoeoersensis to the Liepoldti (and probably to the Avisianum) Subzones.

Hyparpadites aff. *liepoldti* (MOJSISOVICS, 1882)
Plate X: 7.

v 1989 *Hungarites* cf. *boeckhi* (HAUER, 1896) — VÖRÖS & PÁLFY, Vászoly, p. 19, pl. I, fig. 5.

Material

Six specimens of various state of preservation, from Vászoly.

Measurements

	D	WH	WW	U
M.89.136	67.1	30.1	12.7	12.8

Description

Large *Hyparpadites* with strongly compressed, involute conch. The whorl-section is very high oval. The umbilical margin is poorly seen; subrounded to steep. The flanks are nearly flat and meet at a well-marked ventrolateral shoulder with the highly fastigate venter bearing a keel. The flanks are ornamented with numerous weak ribs and indistinct nodes. The almost rectiradiate, slightly projected and partly sinuous ribs of equal strength usually run through the flank. Their number is around 15 on a half-whorl. Bifurcation and insertion of secondary ribs occur irregularly. Each primary rib starts with well-developed nodes at the umbilical margin. The indistinct lateral nodes, or rather swellings, are seated on the ribs; they seem to form at least two spiral rows. The ventrolateral margin bears distinct, somewhat projected nodes; their number is around 30 on a half-whorl.

Suture lines are not seen.

Remarks

This species is represented by poorly preserved specimens in our material, but on the basis of the general shape, ornamentation and especially the characters of the venter, its attribution to *Hyparpadites* seems to be assured. On the other hand, it is only tentatively allied to *H. liepoldti*.

In our previous work (VÖRÖS & PÁLFY 1989) the specimen figured here (Plate X: 7) was wrongly attributed to

"*Hungarites* cf. *boeckhi* (HAUER, 1896)". As SPATH (1951, p. 10) pointed out, the species name *Ceratites Boeckhi,* given by HAUER (1896, p. 264) was preoccupied by the valid name introduced by ROTH (1871, p. 213) as emended by MOJSISOVICS (1882, p. 37). Therefore SPATH (l. c.) proposed the new name *Hungarites discus* SPATH, 1951 for HAUER's species. However this species, according to the observations by the present author in the collection NHMW, (Wien), has no lateral and ventrolateral nodes and its fine ribs run up to the high keel. Consequently our previous identification was erroneous also from morphological point of view.

Distribution

At the Balaton Highland the range of *H.* aff. *liepoldti* is restricted to the Illyrian Liepoldti Subzone.

Hyparpadites szaboi n. sp.
Plate XI: 3, 4, 6; Figure 43.

v 1990 *Parakellnerites* sp. nov. 2. — KOVÁCS et al., Balaton Upland, p. 194, pl. 3, fig. 2.
v ? 1993 *Kellnerites bagolinensis* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 470 (partim), pl. 6, figs 3, 9 (only) (non pl. 6, figs 1, 2, text-fig. 15o, 16e.

Holotype: Hungarian Natural History Museum (Budapest), inventory numbers: PAL 2017.25.1.
Locus typicus: Vászoly, Shaft P–XVII, loose.
Stratum typicum: Dark-red to yellow limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Liepoldti Subzone (?).
Derivatio nominis: After the name of Imre SZABÓ, who collected the type specimens.
Diagnosis: Small to medium-sized, moderately involute *Hyparpadites* with high oval whorls and steep umbilical wall. Venter fastigate; keel moderately high. Ribs slightly prorsiradiate, projected. Primaries and secondaries of uniform strength through the flank. Four rows of nodes. Pointed lateral nodes at the inner and the outer third of the flank, respectively. Ventrolateral row of prominent nodes, at the ends of ribs. Suture ceratitic; first lateral lobe very deep, strongly denticulated; third lateral lobe flat with weak denticles.

Material

Seven specimens of various state of preservation, from Szentkirályszabadja (2), Vászoly (4) and Mencshely (1).

Measurements

	D	WH	WW	U
Holotype PAL 2017.25.1.	59	28.3	17.5	12
Paratype PAL 2017.26.1.	37.8	17	12	10
Paratype PAL 2017.27.1.	32.1	~15.1	?	?

Description

Small to medium-sized *Hyparpadites* with compressed, rather involute conch. The whorl-section is high oval. The umbilical margin is steep. The flanks are very gently convex and meet at a well-developed ventrolateral shoulder with the fastigate venter bearing a moderately high keel. The flanks are ornamented with rather weak ribs and nodes. The slightly prorsiradiate and projected primary ribs are of equal strength through the flank. Their number is around 12 on a half-whorl. Bifurcation and insertion of secondary ribs occur irregularly. There are four rows of nodes. Each primary rib starts with well-developed nodes at the umbilical margin. The first row of lateral nodes is in the inner third of the flank. The second row of lateral nodes runs at around the outer third of the flank. The ventrolateral margin is marked by prominent, somewhat projected nodes developing at the ends of the ribs; their number is 18 to 24 on a half-whorl. The ornamentation seems to become coarser on the body chamber than on the phragmocone.

Suture lines are ceratitic, showing at least three, entire lateral saddles. The first lateral lobe is extremely deep, with rather strong denticulation; the third lateral lobe shows flat bottom with weak denticles (Figure 43).

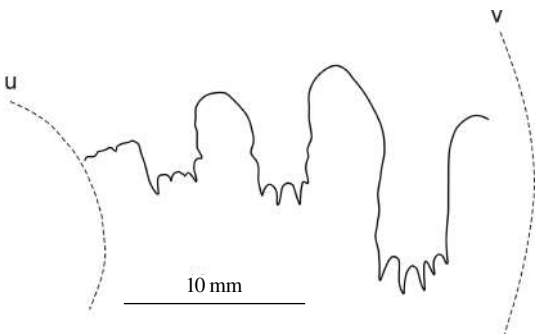


Figure 43. Suture line of *Hyparpadites szaboi* n. sp., Holotype, PAL 2017.25.1., at 27 mm whorl-height, Vászoly, P–XVII, loose, Reitzi Zone, Liepoldti Subzone (?), u: umbilical margin, v: ventrolateral margin

Remarks

H. szaboi stands very close to *H. liepoldti*; it differs from the type species first of all by the position of the lateral rows of nodes. In *H. szaboi* they are at the inner and outer third of the flank, whereas in *H. liepoldti* both rows are close to the umbilicus, in the inner half of the flank. In addition, *H. szaboi* has a lower keel and its suture is different.

The type specimen of *H. szaboi* was illustrated previously by KOVÁCS et al. (1990, pl. 3, fig. 2.) under the name *Parakellnerites* sp. nov. 2.

The author had the opportunity to study the specimens labelled as "*Kellnerites bagolinensis*" in the PIMUZ, Zürich, described by BRACK & RIEBER (1993, p. 470, pl. 6, figs 1–3, 9). The type series is believed heterogeneous: only the holotype (l. c., pl. 6, figs 1, 2) may be considered the true *bagolinensis* (included to *Epikellnerites* n. gen. in the present monograph). Other two specimens (l. c., pl. 6, figs 3, 9) show prorsiradiate, partly sinuous ribbing and less distinct nodosity; features definitely different from the typical *bagolinensis* and very similar to *H. szaboi*. They are listed with question mark in the present synonymy. A further specimen (inventory number: PIMUZ 7064), labelled also as *bagolinensis* by BRACK & RIEBER, is in fact a typical *H. liepoldti*, discussed and figured above (Figure 42).

Distribution

H. szaboi is known only from the Balaton Highland, where it ranges from the Illyrian Felsoeoersensis Subzone to the Liepoldti Subzone.

Genus **Parakellnerites** RIEBER, 1973

Type species: *Parakellnerites frauenfelderi* RIEBER, 1973

Parakellnerites frauenfelderi RIEBER, 1973

Plate XI: 5, 7–12; Figures 44, 45.

v * 1973 *Parakellnerites frauenfelderi frauenfelderi* ssp. n. — RIEBER, Grenzbitumenzone, p. 20, pl. 1, figs 1–13, Text-figs 6a–g.

v 1998 *"Stoppaniceras"* ex gr. *ellipticum* (HAUER, 1887) — VÖRÖS, Balaton-felvidék, p. 35, 38 (partim).

Material

14 specimens of various state of preservation, from Szentkirályszabadja (6), Vászoly (3) and Mencshely (5).

Measurements

	D	WH	WW	U
T 2017.2.1.	68.4	32.2	20.2	17.1
T 2017.1.1.	21.6	9.2	7.8	7.1
INV 2017.181.1.	44.5	17.8	14.4	13.1
INV 2017.183.1.	38.1	19.1	14.5	?
INV 2017.184.1.	35.5	13.5	9.7	?
INV 2017.185.1.	~29.8	?	?	?
INV 2017.182.1.	27.8	11.2	9.5	8.5

Description

Small to medium-sized *Parakellnerites* with moderately involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is subrounded to oblique. The flanks are gently convex and meet the arched venter at a blunt ventrolateral margin. The venter is roof-shaped with a definite keel. The ornamentation consists of rather strong, slightly prorsiradiate, almost straight ribs and nodes. The number of the ribs (8 to 12 on a half whorl) increases by insertion of secondary ribs at around the half of the flank; bifurcation is rare. There are three rows of nodes. Each primary rib starts with strong nodes at the umbilical margin, bears a prominent node at about the inner two-fifth of the flank and ends with a strong, adorally projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 16 to 18 on a half-whorl. The ornamentation is somewhat coarser and shows more widely spaced ribs on the body chamber than on the phragmocone.

The suture line (Figure 45) is ceratitic with three narrow and high lateral saddles with minute incision at their base. The first lateral lobe is very deep and strongly denticulated; the second and third lateral lobes are gradually reduced in all respects.

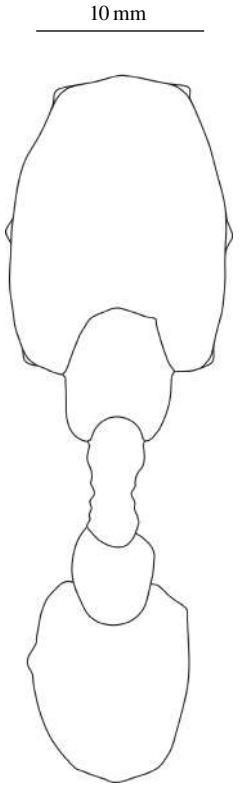


Figure 44. Cross section of *Parakellnerites frauenfelderi* RIEBER, 1973, INV 2017.292.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis or Liepoldti Subzone

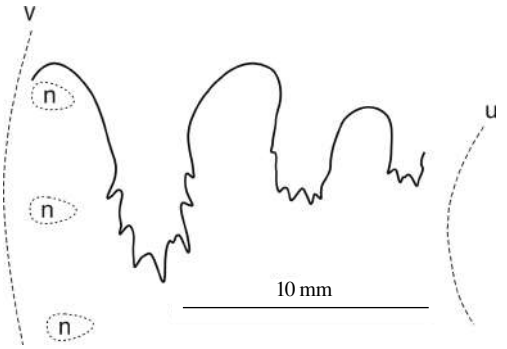


Figure 45. Suture line of *Parakellnerites frauenfelderi* RIEBER, 1973, INV 2017.183.1., at 17 mm whorl-height, Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, u: umbilical margin, v: ventrolateral margin, n: position of nodes

Remarks

When introduced the genus *Parakellnerites*, RIEBER (1973, p. 17) designated *P. frauenfelderi* as the type species and the nominate subspecies *P. frauenfelderi frauenfelderi* as the type subspecies. From among the five subspecies of *P. frauenfelderi*, introduced by RIEBER (1973), *P. f. frauenfelderi* was based on the holotype of the species. The holotype was checked by the present author in the collection PIMUZ, Zürich, and it was confirmed that the respective specimens from the Balaton Highland show the greatest similarity to this subspecies of *P. frauenfelderi.*

P. frauenfelderi seems to be different from other species of *Parakellnerites* by its rather coarse ornamentation both in ribbing and in nodosity, somewhat reminding the ornamentation of *Paraceratites*. From this point of view, *Parakellnerites meriani* RIEBER, 1973 is similar, but it has narrower and definitely carinate whorls. Moreover, in typical cases, the umbilical wall of *P. frauenfelderi* is oblique.

In a previous work (VÖRÖS 1998, l. c.) some specimens, which are now regarded as *P. frauenfelderi*, were cited tentatively under the name *"Stoppaniceras"* ex gr. *ellipticum* (HAUER, 1887).

Distribution

P. frauenfelderi was described from the Southern Alps, from the lower part of the "Grenzbitumenzone", corresponding to the Avisianum Subzone. At the Balaton Highland it ranges from the Illyrian Liepoldti Subzone to the Avisianum Subzone.

Parakellnerites boeckhi (ROTH, 1871)

Plate XII: 1–6; Plate XIII: 1–3; Figures 46–48.

v * 1871 *"Ceratites Böckhi"* n. sp. — ROTH, Forráshegy, p. 213.
v 1874 *Ceratites Böckhi* ROTH — BÖCKH, Südlichen Theiles des Bakony II, p. 175, pl. IV, fig. 13.
v 1882 *Ceratites Boeckhi* ROTH — MOJSISOVICS, Mediterr. Triasprovinz, p. 37, pl. IX, fig. 8.
v ? 1986 *"Ceratites" Böckhi* ROTH 1871 — BRACK & RIEBER, Lower Buchenstein beds, p. 203, pl. 4, fig. 5.
v 1989 *Parakellnerites* cf. *boeckhi* (ROTH, 1871) — VÖRÖS & PÁLFY, Vászoly, p. 21.
? 1995 *Parakellnerites boeckhi* (ROTH, 1871) — DE ZANCHE et al., Dolomites, p. 146, pl. III, fig. 6.
v 1998 *Parakellnerites boeckhi* (ROTH, 1871) — VÖRÖS, Balaton-felvidék, p. 20, 59, pl. III, fig. 4, pl. V, fig. 4.
v 2002 *Parakellnerites boeckhi* (ROTH) — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, fig. 5

Material

22 specimens of various state of preservation, from Felsőörs (3), Szentkirályszabadja (1), Vászoly (7) Mencshely (3), Sóly (6) and Balatoncsicsó (2).

Measurements

	D	WH	WW	U
Holotype T.681.	57.7	23.8	?	11.9
T 2017.4.1.	90.2	42.7	26.6	18.1
T 2017.5.1.	88.2	40.6	25.4	18.8
T 2017.6.1.	83.5	40.5	21.8	18.9
T 2017.3.1.	79.9	40.1	22.9	15.7

	D	WH	WW	U
M.98.28	77.1	35.8	21.7	14.1
INV 2017.186.1.	70.8	31.1	18.8	11.8
M.98.31A	43.4	19.6	~10.1	11.6
M.98.31B	38.5	18.5	?	9.3

Description

Medium to large-sized *Parakellnerites* with moderately involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The flanks are gently convex and meet the arched venter at a blunt ventrolateral margin. The venter is roof-shaped with a rather high keel. The ornamentation consists of rather strong, prorsiradiate, slightly sinuous ribs and nodes. The ribs are stronger and prorsiradiate in the inner half of the whorl, then become weaker and nearly rectiradiate towards the venter. The number of the ribs (8 to 10 on a half whorl) increases by insertion of secondary ribs at around the outer third of the flank; vague bifurcations appear also. There are three rows of nodes. Each primary rib starts with strong and projected nodes at the umbilical margin, bears a prominent node at about the inner third of the flank and ends with a strong, adorally projected, pointed node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 18 to 20 on a half-whorl. The ornamentation becomes weaker on the body chamber.

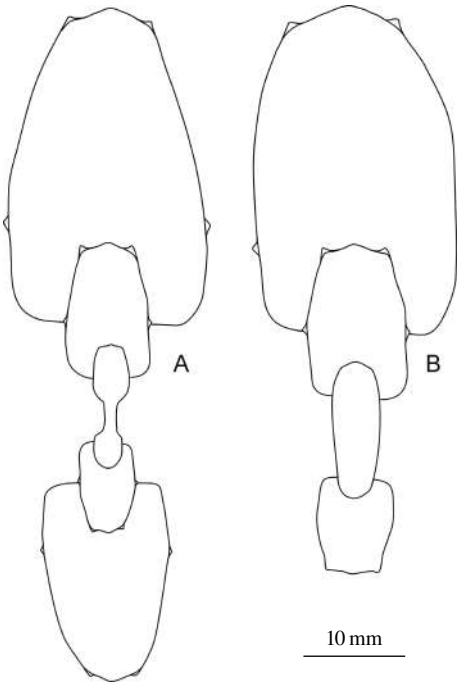


Figure 46. Cross sections of *Parakellnerites boeckhi* (Roth, 1871), A: T 2017.6.1., Vászoly, P–11c, loose, Reitzi Zone, Reitzi Subzone (?); B: INV 2017.293.1., Mencshely I, Bed 8 (?), Reitzi Zone, Reitzi Subzone (?)

The suture line of the holotype (Figure 47) is ceratitic, tending to be subammonitic, with four rather high lateral saddles with incisions at their sides. The first lateral lobe is very deep and strongly denticulated; the second and third lateral lobes are gradually reduced in all respects. Another specimen (Figure 48) shows a typical ceratitic (penultimate) suture with three entire lateral saddles; the first lateral lobe is deeply denticulated, the third lateral lobe is noticeably bifid.

Remarks

Roth (1871, l. c.) gave a proper description of *P. boeckhi*, regrettably only in Hungarian, notwithstanding, species name remained available. After Böckh (1874, l. c.) who gave a rather artistic but misleading figure; the first, more or less correct illustration of *P. boeckhi* was given by Mojsisovics (1882, pl. IX, fig. 8.). The species was based on a single specimen, now kept in the collection of the MGSH (inventory number: T.689.) which is the holotype by monotypy and re-figured here (Plate XII: 1).

The copious new material from the Balaton Highland helps to portray a

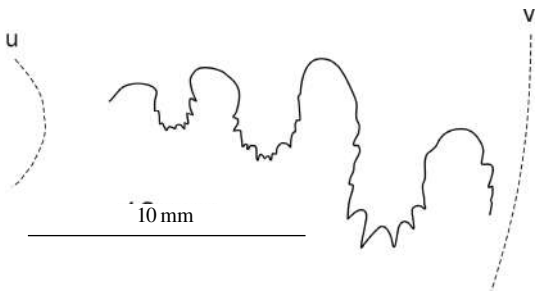


Figure 47. Suture line of *Parakellnerites boeckhi* (Roth, 1871), (Holotype, T.681.), at 18 mm whorl-height, Felsőörs, loose, Reitzi Zone, Reitzi Subzone (?), u: umbilical margin, v: ventrolateral margin

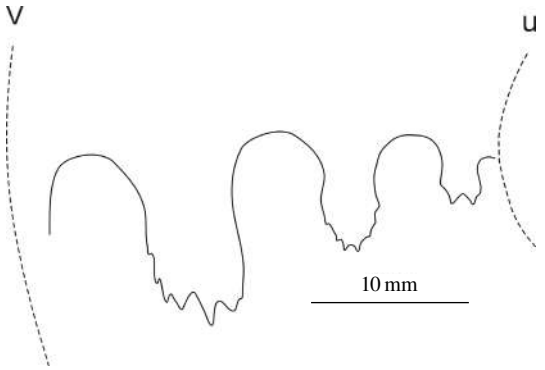


Figure 48. Suture line of *Parakellnerites boeckhi* (Roth, 1871), INV 2017.293.1., at 29 mm whorl-height, Mencshely I, Bed 8 (?), Reitzi Zone, Reitzi Subzone (?), u: umbilical margin, v: ventrolateral margin

reliable picture of the species. *P. boeckhi* differs from other species of *Parakellnerites* by its characteristic lateral ornamentation, with initially prorsiradiate ribs turning rectiradiate in the outer half of the flank.

The specimen figured as *"Ceratites" Böckhi* ROTH 1871 by BRACK & RIEBER (1986, pl. 4, fig. 5.) was checked in the collection PIMUZ, Zürich; this rather incomplete specimen seems to belong here. DE ZANCHE et al. 1995, pl. III, fig. 6.) figured a very similar specimen under the name *P. boeckhi*; it is also a probable representative of this species.

Distribution

P. boeckhi was described, besides the Balaton Highland, from the upper Anisian of the Southern Alps. At the Balaton Highland it ranges from the Illyrian Liepoldti Subzone to the Avisianum Subzone.

Parakellnerites hungaricus (MOJSISOVICS, 1882)
Plate XIV: 5–8; Plate XV: 1; Figure 49.

v 1882 *Ceratites hungaricus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 35 (partim), pl. XXX, fig. 21 (only).
? 1912 *Ceratites hungaricus* MOJS. — AIRAGHI, Besano, p. 21, pl. III, fig. 4.
v 1993 *Parakellnerites* ? *hungaricus* — VÖRÖS, Reitzi Zone, p. 25 (partim), pl. VI, fig. 1. (non fig. 2).
v 1993 *Parakellnerites* ? *hungaricus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 118 (partim), pl. 13, fig. 9 (non fig. 10).
v 1998 *Parakellnerites* sp., aff. *hungaricus* (MOJSISOVICS, 1880) — VÖRÖS, Balaton-felvidék, p. 20, 29, 59.

Material

Four specimens of various state of preservation, from Felsőörs (2), Vászoly (1) and Mencshely (1).

Measurements

	D	WH	WW	U
Lectotype T.828.	71.1	25.1	?	21.9
INV 2017.289.1.	67.8	30.7	18.7	16.5
M.89.75	57.6	23.6	?	19.1
INV 2017.288.1.	32.3	14.1	9.2	?
INV 2017.287.1.	30.1	14.5	10.6	7.8

Description

Small to medium-sized *Parakellnerites* with moderately involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The flanks are gently convex and meet the venter at a distinct ventrolateral margin. The venter is fastigate. The ornamentation consists of nearly rectiradiate, somewhat projected ribs and nodes. The number of the ribs (around 10 on a half whorl) increases by insertion of secondary ribs at around the middle of the flank; bifurcations were not observed. The ribs become wider and lower towards the venter. There are three rows of nodes. Each primary rib starts with strong nodes at the umbilical margin, bears a prominent, mostly pointed node at about the inner third of the flank and ends with a strong, somewhat projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is 16 to 20 on a half-whorl. The ornamentation tends to be coarser on the body chamber.

The suture line (Figure 49) is ceratitic, with entire lateral saddles; The first lateral lobe is very deep and strongly denticulated; the second and third lateral lobes are gradually reduced in all respects.

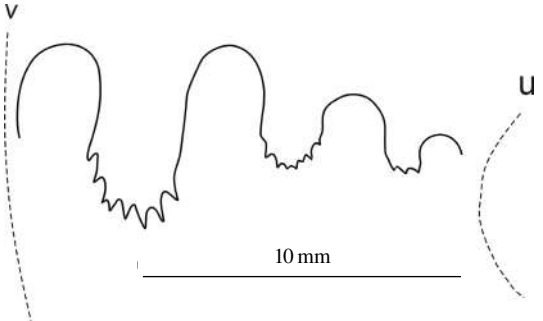


Figure 49. Suture line of *Parakellnerites hungaricus* (MOJSISOVICS, 1882), INV 2017.188.1., at 14 mm whorl-height, Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

Remarks

The name and concept of the species "*Ceratites hungaricus*" MOJSISOVICS, 1882 posed a complex nomenclatorial and taxonomic problem. It was recognised that the four specimens figured under the name *hungaricus* by MOJSISOVICS (1882, pl. XXX, figs 17, 18, 19, 21) represented a heterogeneous series (RIEBER 1973, BALINI 1992b). The original specimens figured by MOJSISOVICS (housed in the collection of the MGSH under the inventory numbers T.698., T.699., T.828. and T.1666.) were studied by the present author, and the morphological heterogeneity of the type series was confirmed. The largest and most complete specimen (T.828., pl. XXX, fig. 21 in MOJSISOVICS 1882)

was designated by RIEBER (1973, p. 33, in the discussion of *P. meriani*) as the lectotype of the species *hungaricus* (now *Parakellnerites hungaricus*). Other two specimens (T.699., T.698., pl. XXX, figs 17 and 18, respectively, in MOJSISOVICS 1882) will be described as two other, partly new, species of *Parakellnerites* (later in this monograph). The fourth specimen (T.1666., pl. XXX, fig. 19 in MOJSISOVICS 1882) belongs to the genus *Lardaroceras* and is regarded as a proper representative of *L. pseudohungaricum* BALINI, 1992.

The specimen, figured as "*Ceratites hungaricus*" by AIRAGHI (1912, l. c.) may tentatively attributed to this species, although its ornamentation is much coarser.

In previous works (VÖRÖS 1993, 1998, l. c.) the species *P. hungaricus* was interpreted in a wider sense, including some forms which are now, in the present monograph, attributed to *P. stuerzenbaumi* n. sp.

The species name *hungaricus* appeared first in MOJSISOVICS (1880, p. 699), but only in faunal list therefore it remained *nomen nudum* until MOJSISOVICS (1882) gave the valid description.

Distribution

Up to now, *P. hungaricus* was recorded only from the Balaton Highland, where it occurs in the Illyrian Reitzi and Avisianum Subzones and probably in the Crassus Subzone.

Parakellnerites stuerzenbaumi n. sp.
Plate XIII: 4–6; Plate XIV: 1–4

v * 1882 *Ceratites hungaricus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 35 (partim), pl. XXX, figs 17 (only).
? 1963 *Semiornites hungaricus* (MOJSISOVICS) 1882 — ASSERETO, Val Camonica, p. 41, pl. II, figs 6, 7.
v 1989 *Parakellnerites* cf. *meriani* RIEBER, 1973 — VÖRÖS & PÁLFY, Vászoly, p. 19, pl. II, fig. 3.
v 1989 *Parakellnerites* cf. *hungaricus* (MOJSISOVICS, 1882) — VÖRÖS & PÁLFY, Vászoly, p. 21.
v 1993 *Parakellnerites* ? *hungaricus* — VÖRÖS, Reitzi Zone, p. 25, pl. VI, fig. 2. (non fig. 1).
v 1993 *Parakellnerites* ? *hungaricus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 118, pl. 13, fig. 10.
v 1998 *Parakellnerites hungaricus* (MOJSISOVICS, 1880) — VÖRÖS, Balaton-felvidék, p. 20, 31, 42, 59.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.30.1.

Locus typicus: Vászoly, Trench P–14, loose.

Stratum typicum: Yellow limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of József STÜRZENBAUM, renowned Hungarian geologist of the 19th century, who collected one of the paratypes.

Diagnosis: Medium to large, rather involute *Parakellnerites* with high oval whorls and nearly flat umbilical wall. Venter narrow, sharply fastigate. Ribs indistinct, rectiradiate. Three rows of prominent nodes. Distinct, pointed lateral nodes at the middle of the flank, forming spiral chain. Ventrolateral nodes pointed. Suture ceratitic; four lateral saddles, first lateral lobe deep.

Material

30 specimens of various state of preservation, from Felsőörs (14), Szentkirályszabadja (1), Vászoly (3), Mencshely (10), Sóly (1) and Balatoncsicsó (1).

Measurements

	D	WH	WW	U
Holotype PAL 2017.30.1.	96.9	42.5	22.4	20.3
Paratype T.699.	59.3	31.6	16.5	?
Paratype M.89.83	62.8	31.7	16.5	11.6
Paratype M.89.86	93.5	39.3	?	~18.3
Paratype PAL 2017.29.1.	~75.8	38.1	18.2	?
Paratype PAL 2017.31.1.	75.4	29.8	?	?
Paratype PAL 2017.28.1.	~70.1	40.4	20.8	?

Description

Medium to large *Parakellnerites* with rather involute, compressed conch. The whorl-section is high oval. The umbilical wall is oblique to vertical. The flanks are gently convex, almost flat and meet the venter at a distinct ventrolateral margin.

The venter is sharply fastigate. The ornamentation consists of very weak, indistinct, rectiradiate, ribs and nodes. The ribs are better visible in the inner half of the whorl, then usually fade out towards the venter. The number of the ribs (around 10 on a half whorl) seems to increase by vague insertion of secondary ribs. There are three rows of nodes. Each primary rib starts with weak nodes at the umbilical margin and ends with a strong, pointed node at the ventrolateral margin. There are similar, strong nodes (around 20 on a half-whorl) on the ventrolateral ends of the secondary ribs. The fastigate venter shows fine, projected growth rugae approaching diagonally to the keel from both sides. The lateral row of prominent, pointed nodes runs at about middle of the flank and does not seem to be strictly connected to the ribs. Their number varies between 8 to 12 on a half whorl.

The suture line is poorly seen; ceratitic, with four lateral saddles and a deep, denticulated first lateral lobe.

Remarks

One of the paratypes of *P. stuerzenbaumi* was included to the description of "*Ceratites hungaricus*" by MOJSISOVICS (1882, l. c.). This specimen is kept in the collection of the MGSH under the inventory number T.699. and is re-figured here (Plate XIII: 4). The original specimens, figured by MOJSISOVICS as "*Ceratites hungaricus*", were studied by the present author, and the morphological heterogeneity of the type series was confirmed. The largest and most complete specimen (T.828., pl. XXX, fig. 21 in MOJSISOVICS 1882) was previously designated by RIEBER (1973, p. 33) as the lectotype of the species *P. hungaricus*. One specimen (T.1666., pl. XXX, fig. 19 in MOJSISOVICS 1882) belongs to *Lardaroceras* and is regarded here as a proper representative of *L. pseudohungaricum* BALINI, 1992. Other two specimens, figured by MOJSISOVICS (1882) represent two other species of *Parakellnerites,* and one of these (T.699., pl. XXX, figs 17 in MOJSISOVICS 1882) is here selected as one of the paratypes of *P. stuerzenbaumi*.

P. stuerzenbaumi differs from other species of *Parakellnerites* first of all by its very weak, almost invisible ribbing and the distinct row of pointed lateral nodes at the mid-flank.

The specimens figured as "*Semiornites hungaricus*" from Contrada Gobbia by ASSERETO (1963, l. c.) belong probably to *P. stuerzenbaumi*; as it can be judged from the rather poor photographs, they are especially similar to our variants with smaller number of lateral nodes (e.g. Plate XIII: 5 and Plate XIV: 3).

In our earlier work (VÖRÖS & PÁLFY 1989, p. 19, pl. II, fig. 3) one specimen of *P. stuerzenbaumi* was wrongly identified as *Parakellnerites* cf. *meriani*.

In some other previous papers (VÖRÖS & PÁLFY 1989, p. 21, VÖRÖS 1993, 1998, l. c.) the species *P. hungaricus* was interpreted in a wider sense, including some forms which are now, in the present monograph, attributed to *P. stuerzenbaumi* n. sp.

Distribution

P. stuerzenbaumi was described from the upper Anisian of the Balaton Highland and probably the Southern Alps. At the Balaton Highland it ranges from the Illyrian Reitzi Subzone to the Crassus Subzone.

Parakellnerites aff. *hungaricus* (MOJSISOVICS, 1882)

Plate XV: 2–4

v 1882 *Ceratites hungaricus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 35 (partim), pl. XXX, fig. 18 (only).
v 1998 *Parakellnerites* ? *hungaricus* (MOJSISOVICS, 1880) — VÖRÖS, Balaton-felvidék, p. 38.

Material

Four specimens of various state of preservation, from Felsőörs (1) and Mencshely (3).

Measurements

	D	WH	WW	U
T.698.	66.1	26.9	?	?
INV 2017.191.1.	~76.1	~27.5	?	21.5
INV 2017.190.1.	53.8	25.1	13.1	10.9

Description

Small to medium-sized *Parakellnerites* with rather involute, compressed conch. The whorl-section is high oval. The umbilical wall is oblique to vertical. The flanks are gently convex and meet the venter at a distinct ventrolateral margin. The venter is fastigate with a definite keel. The ornamentation consists of nearly rectiradiate, somewhat projected ribs of various strength, and nodes. The number of the ribs (8 to 10 on a half whorl) increases by insertion of secondary ribs at around the

middle of the flank; bifurcations were not observed. There are three rows of nodes. Each primary rib starts with very strong nodes at the umbilical margin, bears a prominent, mostly pointed node at about the middle of the flank and ends with an extremely strong, pointed and projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is around 16 on a half-whorl. The ornamentation tends to be coarser on the body chamber.

The suture line is poorly seen; ceratitic to subammonitic, with partially denticulated first lateral saddle and very deep first lateral lobe.

Remarks

One specimen of this taxon was included into the description of "*Ceratites hungaricus*" by MOJSISOVICS (1882, l. c., pl. XXX, fig. 18). This specimen is kept in the collection of the MGSH under the inventory number T.698. and is re-figured here (Plate XV: 2). This specimen, together with the newly collected ones from the Balaton Highland, belongs to a distinct morphological group standing between *P. hungaricus* (MOJSISOVICS, 1882) and *P. stuerzenbaumi* n. sp. The position of the lateral row of nodes at the mid-flank reminds the latter species, whereas the style of ribbing is akin to *P. hungaricus*, therefore the name *P.* aff. *hungaricus* is applied to it in the present monograph. It is different from the related species of *Parakellnerites* by the very strong, pointed and widely spaced ventrolateral nodes.

In a previous paper of the present author (VÖRÖS 1998) the species *P. hungaricus* was interpreted in a wider sense, including some forms which are here attributed to *P.* aff. *hungaricus.*

Distribution

Up to now this taxon is known only from the Balaton Highland, where it occurs in the Illyrian Avisianum Subzone.

Parakellnerites cf. *rothpletzi* (SALOMON, 1895)
Plate XV: 5–8; Figures 50, 51.

v * 1895 *Balatonites rothpletzi* nov. sp. — SALOMON, Marmolata, p. 199, pl. VI, fig. 12.
1921 *Hungarites Waageni* MOJSISOVICS sensu lato — BUBNOFF, Forno, p. 456 (partim), pl. XII, fig. 7 (only).
v ? 1973 *Parakellnerites* ? sp. indet. b — RIEBER, Grenzbitumenzone, p. 34, pl. 5, figs 9, 10, Text-fig. 10d.
v 1993 *Parakellnerites rothpletzi* (SALOMON, 1895) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 466, pl. 4, figs 1–17, text-fig. 15h.
v 1993 *Parakellnerites rothpletzi* (SALOMON, 1895) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 66, pl. 6, fig. 10.
v 1998 *Parakellnerites rothpletzi* (SALOMON, 1895) — VÖRÖS, Balaton-felvidék, p. 37, 50.
v non 1998 *Parakellnerites rothpletzi* (SALOMON, 1895) — VÖRÖS, Balaton-felvidék, p. 42, pl. V, figs 1–3.
2005 *Parakellnerites rothpletzi* (SALOMON, 1895) — MANFRIN et al., Latemar, p. 495, figs 9/29–34.

Material

32 specimens of various state of preservation, from Felsőörs (1), Szentkirályszabadja (5), Mencshely (4), Sóly (20), Litér (1) and Balatoncsicsó (1).

Measurements

	D	WH	WW	U
INV 2017.195.1.	66.5	~32.5	16.1	?
INV 2017.193.1.	~63.1	~29.0	15.1	~11.0
INV 2017.194.1.	44.8	22.2	12.1	8.2
INV 2017.192.1.	~37.1	19.3	9.2	?

Description

Small to medium-sized *Parakellnerites* with rather involute, compressed conch. The whorl-section is high oval. The umbilical wall is oblique to vertical. The flanks are gently convex, almost flat and meet the venter at a distinct ventrolateral margin. The venter is fastigate. The ornamentation consists of very weak, prorsiradiate and projected ribs and weak nodes. The number of the ribs (12 to 14 on a half whorl) seems to increase by vague insertion of secondary ribs. There are three rows of nodes. Each primary rib starts with a definite node at the umbilical margin, bears indistinct node or swelling at the inner third of the flank, and ends with a rather strong, projected node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of ventrolateral nodes varies between 20 and 30 on a half-whorl, altogether. The projected part of the ventrolateral nodes runs up to the fastigate ven-

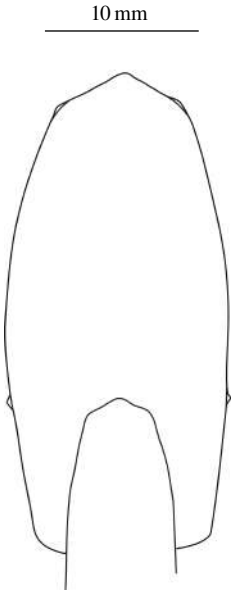


Figure 50. Cross section of *Parakellnerites* cf. r*othpletzi* (SALOMON, 1895), INV 2017.195.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone

ter in the form of fine, diagonal growth rugae. This description of the ornamentation fits only to the phragmocone; on the body chamber the ornamentation gradually fades out, except the projected ventrolateral nodes.

The suture line (Figure 51) is ceratitic, tending to be subammonitic, with three rather high lateral saddles with incisions at their sides. The first lateral lobe is very deep and strongly denticulated; the second and third lateral lobes are gradually reduced in all respects. On another, larger specimen (Plate XV: 7) a more typical ceratitic (penultimate) suture is partially seen, with four entire lateral saddles; from among these the third is very wide.

Remarks

The original specimen of *P. rothpletzi*, designated here as lectotype, was inspected by the present author in the BSM (München); the figure given by SALOMON (1895, pl. VI, fig. 12.) corresponds almost perfectly to the type specimen. A plaster cast of the lectotype is figured here (Figure 52). It shows a fastigate venter with projected nodes, the weak ornamentation of the flanks, diagnostically fading out on the body chamber. The latter feature is especially decisive in distinguishing *P. rothpletzi* from other species of *Parakellnerites*. On the basis of the above mentioned fundamental characters, the identification of our moderately preserved specimens from the Balaton Highland seems to be ascertained.

BUBNOFF (1921, pl. XII, fig. 6, 7) figured two specimens under the name "*Hungarites Waageni*". One of these (l. c. pl. XII, fig. 7) seems rather close to *P. rothpletzi* [in the explanation to plate XII (p. 620) this specimen was named "*Hungarites Waageni* MOJS. var. form. *rothpletzi* SALOMON"]. The other specimen (l. c. pl. XII, fig. 6) does not belong to *rothpletzi* and appears to be very similar to *Parakellnerites variecostatus* (REIS, 1901).

The specimens figured as "*Parakellnerites* ? sp. indet. b" by RIEBER (1973, l. c.) are probably belong to *P. rothpletzi*; one of the specimens figured by RIEBER (1973, pl. 5, fig. 10) is especially similar to one of ours shown here on Plate XV: 8.

BRACK & RIEBER (1993, l. c., and also in GAETANI 1993, l. c.) described and illustrated numerous specimens of *P. rothpletzi*. This copious material, collected from one locality at the Latemar Mountain, portrays the range of variation of the species. They were inspected by the present author in the collection PIMUZ, Zürich, and the homogeneity of the assemblage was ascertained. Yet, it is remarkable, that the majority of the Latemar specimens has much stronger ornamentation, even on the body chamber, than the lectotype of *P. rothpletzi* figured by SALOMON (1895).

In a previous work of the present author (VÖRÖS 1998, l. c.) the species *P. rothpletzi* was interpreted in a wider sense, including some forms (VÖRÖS 1998, pl. V, figs 1, 2) which are here attributed to *P. loczyi* (ARTHABER, 1903).

Distribution

P. rothpletzi was described from the upper Anisian of the Southern Alps and the Balaton Highland, where it ranges from the Illyrian Liepoldti Subzone to the Avisianum Subzone.

Parakellnerites aff. *rothpletzi* (SALOMON, 1895)
Plate XV: 9

v 1993 *Parakellnerites* aff. *rothpletzi* (SALOMON, 1895) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 467, pl. 4, fig. 18.

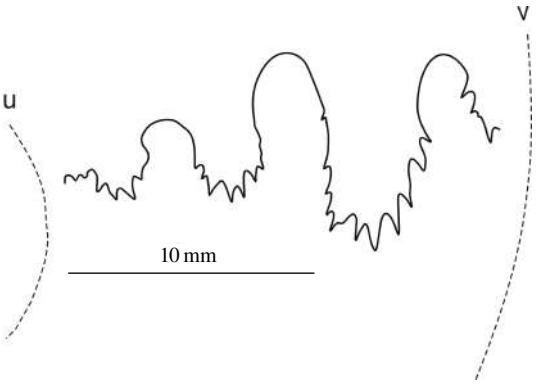


Figure 51. Suture line of *Parakellnerites* cf. *rothpletzi* (SALOMON, 1895), INV 2017.192.1., at 18 mm whorl-height, Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

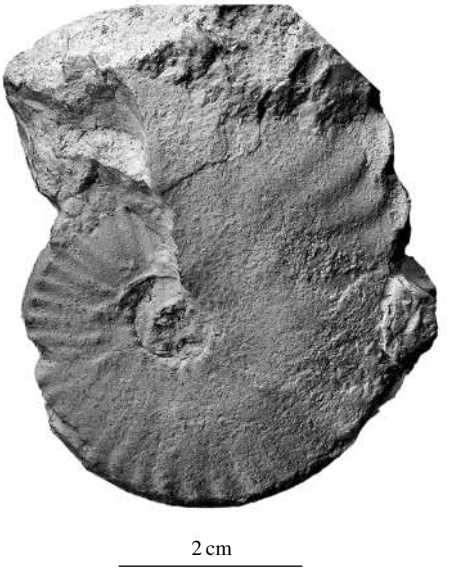


Figure 52. *Parakellnerites rothpletzi* (SALOMON, 1895), cast of the lectotype kept in the Bayerische Staatssammlung, München, figured by SALOMON (1895, pl. VI, Figure 12). By courtesy of Dr. A. NÜTZEL (München)

Material

One specimen from Vászoly.

Measurements

	D	WH	WW	U
T 2017.7.1.	60.3	28.3	15.9	18.1

Description

Medium-sized *Parakellnerites* with compressed, moderately involute conch. The whorl-section is high oval. The umbilical margin is steep to overhanging. The flanks are gently convex and meet at a well marked ventrolateral shoulder with the fastigate venter. The flanks are ornamented with moderately strong ribs and nodes. The slightly prorsiradiate, partly projected and sinuous primary ribs are usually stronger in the inner half of the flank. Their number is around 10 on a half-whorl. Bifurcation and insertion of secondary ribs occur irregularly. There are three rows of nodes. Each primary rib starts with well-developed nodes at the umbilical margin, bears a lateral node or swelling at the inner third of the flank and terminates with a projected, clavus-like node at the ventrolateral margin. The number of the ventrolateral nodes is around 18 on a half-whorl.

Suture lines are poorly seen, ceratitic.

Remarks

The single specimen from Vászoly has no proper counterpart in our material. It can only be compared to the specimen described and figured as *Parakellnerites* aff. *rothpletzi* by BRACK & RIEBER (1993, l. c.). This specimen from Seceda was checked by the present author in the collection PIMUZ, Zürich, and on the basis of the apparent similarity, the above mentioned name with open nomenclature was applied to our specimen from the Balaton Highland.

It has to be emphasised that the ornamentation of the specimens of this taxon is much stronger than that of *P. rothpletzi* (SALOMON, 1895).

Distribution

This taxon was described from the upper Anisian of the Southern Alps. At the Balaton Highland it was found in the Illyrian Crassus Subzone.

Parakellnerites loczyi (ARTHABER, 1903)
Plate XVI: 1–9

v * 1903 *Ceratites Lóczyi* ARTH. — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 21, pl. I, figs 7, 8.
v 1990 *Parakellnerites* sp. nov. 3. aff. *frauenfelderi* RIEBER — KOVÁCS et al., Balaton Upland, p. 194, pl. 3, fig. 3.
v 1998 *Parakellnerites rothpletzi* (SALOMON, 1895) — VÖRÖS, Balaton-felvidék, p. 42, pl. V, figs 1–3.
v 1998 *Parakellnerites loczyi* (ARTHABER, 1903) — VÖRÖS, Balaton-felvidék, p. 42, pl. V, figs 5–7.
v 2002 *Parakellnerites loczyi* (ARTHABER) — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, fig. 6.
v 2002 *Parakellnerites rothpletzi* (SALOMON) — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, fig. 7.

Material

13 specimens of various state of preservation, from Szentkirályszabadja (4), Vászoly (1) and Sóly (8).

Measurements

	D	WH	WW	U
Lectotype T.1259.	47.5	21.2	?	13.1
INV 2017.196.1.	69.5	31.5	17.4	14
M.98.46	56.8	27.1	13.7	12.1
M.98.42	53.1	23.5	13.1	13.1
M.98.43A	52.8	23.6	11.8	13.8
INV 2017.197.1.	51.1	23.1	14.3	11.4
M.98.88	41.1	17.2	10.1	10.8

	D	WH	WW	U
M.98.48	39.5	16.1	~9.5	~11.0
M.98.47A	28.7	11.3	~7.5	9.4

Description

Small to medium-sized *Parakellnerites* with moderately involute, strongly compressed conch. The whorl-section is very high oval. The umbilical wall is subrounded to slightly overhanging. The flanks are very gently convex and meet the venter at a definite ventrolateral margin. The venter bears a definite keel on the phragmocone and on the smaller specimens then becomes simply fastigate on the body chamber. The ornamentation consists of slightly prorsiradiate, straight ribs and nodes. The number of the ribs (8 to 10 on a half whorl) increases by irregular insertion of secondary ribs, sometimes near the umbilicus; bifurcation was not observed. The ribs are rather strong near the unbilicus and characteristically expand towards the venter, i.e. they become gradually lower and wider. Each primary rib starts with a definite node at the umbilical margin. At the ventrolateral margin the low and expanded ribs (both the primaries and the secondaries) end with strong, longitudinal clavi which, in some cases, coalesce to almost continuous chains. At the flanks, the strength of the ribbing and the nodosity increase during growth. The inner whorls of the phragmocone are ornamented only by weak ribs; nodes are usually absent. Nodes gradually appear on the phragmocone and become stronger on the body chamber; they are situated at the inner third of the flank.

The suture line is not well known; ceratitic with at least three lateral saddles and a deeply denticulated first lateral lobe, as shown by one of our specimens (Plate XVI: 9) and by the figure drawn from the lectotype by ARTHABER (1903, pl. 1, fig. 8c).

Remarks

This species was regarded as belonging to the genus *Parakellnerites* also by RIEBER (1973, p. 18). The type specimens of ARTHABER (1903, pl. I, figs 7, 8), from Hajmáskér, are kept in the collection of the MGSH under the inventory numbers T.1259. (lectotype) and T.1647 (paralectotype). The first of them, figured as "*Ceratites Lóczyi*" by ARTHABER (1903, l. c., pl. I, fig. 8), is here designated as the lectotype, and re-figured on Plate XVI: 1. The newly collected specimens from the Balaton Highland correspond properly to the type specimens but portray a somewhat wider morphological range. The most particular features of *P. loczyi*, distinguishing it from other *Parakellnerites* species, are the straight ribs expanding and lowering towards the venter and the absence of nodes in the earlier growth stages.

KOVÁCS et al. (1990, pl. 3, fig. 3) illustrated a specimen from Vászoly as "*Parakellnerites* sp. nov. 3. aff. *frauenfelderi* RIEBER". This ammonite was kept in the private collection of the late I. SZABÓ and was transferred to the collection of the Hungarian Natural History Museum and re-figured here (Plate XVI: 2) as *P. loczyi*.

Some specimens of *P. loczyi* were wrongly attributed to *P. rothpletzi* in a previous publication by the present author (VÖRÖS 1998, pl. V, figs 1–3).

Distribution

P. loczyi was up to now recorded only from the Balaton Highland, where it ranges from the Illyrian Liepoldti Subzone to the Avisianum Subzone.

Parakellnerites cf. *zoniaensis* BRACK & RIEBER, 1993

Plate XVI: 10.

v 1993 *Parakellnerites zoniaensis* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 465, pl. 3, figs 1–10, text-figs 15d–g, 16d.

Material

One specimen from Vászoly.

Measurements

	D	WH	WW	U
T 2017.8.1.	85.7	36.5	20.8	18.2

Description

Large *Parakellnerites* with moderately involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The flanks are gently convex and meet the arched venter at a definite ventrolateral margin. The

venter is roof-shaped with a rather high keel. The ornamentation consists of rather weak, prorsiradiate, slightly straight ribs and nodes. The ribs are rather strong in the inner third of the flank, then weaken, but become stronger again towards the venter. The number of the ribs (about 8 on a half whorl) increases by insertion of secondary ribs at around the middle of the flank. There are three rows of nodes. Each primary rib starts with strong nodes at the umbilical margin, bears a weak node at about the middle of the flank and ends with a strong, somewhat projected and pointed node at the ventrolateral margin. There are similar, strong nodes on the ventrolateral ends of the secondary ribs. The number of the ventrolateral nodes is around 20 on a half-whorl. The row of the weak lateral nodes seems to disappear on the body chamber. Fine, projected growth rugae, approaching diagonally to the keel, are seen on the fastigate venter.

The suture lines were not seen.

Remarks

The original specimens of *P. zoniaensis,* described by BRACK & RIEBER (1993), were examined by the present author in the collection PIMUZ, Zürich, and thus the identification of the specimen from the Balaton Highland seems approved. It shares many features of the ornamentation with the larger specimens of the Punta di Zonia assemblage, first of all the fading of the ribs on the mid-flank, and the character of the venter.

BRACK & RIEBER (1993, p. 466) properly discussed the differences between *P. zoniaensis* and two closely related species: *P. hungaricus* (MOJSISOVICS, 1882) and *P. rothpletzi* (SALOMON, 1895). A further, even more similar species, *P. stuerzenbaumi* n. sp., differs from *P. zoniaensis* by its almost completely smooth umbilical margin and by the almost total absence of lateral ribbing.

Distribution

P. zoniaensis was described from the upper Anisian of the Southern Alps. At the Balaton Highland it was found in the Illyrian Crassus Subzone.

Genus ***Parahungarites*** n. gen.

Type species: *Parahungarites arthaberi* (DIENER, 1899).

Diagnosis: Small to medium-sized ceratitids with rather involute conch. Whorl section high oval; umbilical margin vertical to overhanging. Venter fastigate; keel present. Rectiradiate, sinuous, projected ribs. Irregularly inserted secondaries. Typically only ventrolateral nodes; umbilical nodes may be present. Projected ventrolateral clavi are oriented diagonally but may coalesce along the ventrolateral margin. Suture ceratitic, tending to subammonitic; three lateral saddles, first lateral lobe deep with strong denticulation.

Derivatio nominis: Combined from the generic names *Parakellnerites* and *Hungarites*, indicating that the new genus morphologically stands between the two.

Nominal species belonging to *Parahungarites*:

Parahungarites arthaberi (DIENER, 1899, p. 9, pl. I, figs 1–3)

Parahungarites solyensis n. sp.

Discussion: This new genus, as its name implies, morphologically stands between the genera *Parakellnerites* and *Hungarites* (s. l.), and is believed to form a phyletic link between them. The type species, *P. arthaberi* was attributed for a long time to the genus *Hungarites*, and in fact, the fastigate/keeled venter, and the very weak lateral ornamentation supported this idea. Later, BRACK & RIEBER (1993, p. 465) pointed out that the presence of the definite ventrolateral row of nodes excludes *arthaberi* from *Hungarites* and they included this species to *Parakellnerites*. It is true that *Parahungarites arthaberi* and *solyensis* share many features of *Parakellnerites* but the absence of the lateral (and in most cases also the umbilical) nodosity opposes this attribution. On the other hand, transitional forms can be found among the *Parakellnerites* species as well. For example, *P. rothpletzi* (SALOMON, 1895) may be regarded as some kind of "connecting link", because, in typical cases, it shows the gradual diminishing of the umbilical and lateral nodosity, reaching the stage of only faint ribbing on the body chamber. BRACK & RIEBER (1993, p. 461) also recognized that *Parakellnerites* "is no monophyletic unit" and that "The morphological gap between several representatives of *Parakellnerites* sensu lato and *Hungarites* is very small." At the same time they called the attention to the heterogeneity of *Hungarites* and the family Hungaritidae, which can not be regarded as phylogenetic units. TOZER (1981, p. 93) included several strongly nodose genera (e.g. *Iberites* HYATT, 1900, *Gevanites* PARNES, 1975) to Hungaritidae, what also points to the heterogeneity of the family. Even earlier SPATH (1951, p. 9, 10) declared that *Hungarites* "must be polyphyletic" and represents "an assemblage of Ceratitid offshoots...", and that "The separation of Hungaritidae from the Ceratitidae will thus always be more or less arbitrary." SPATH (l. c.) also stated that the "Ladinian genotype of *Hungarites*, i.e. *H. mojsisovicsi* ROTH, is an endform" and "could not have given rise to a form like *H. yatesi* Hyatt & Smith, which was smooth already in the earliest Anisian. [Regrettably, this observation was not taken into account in the "Treatise" (ARKELL et al. 1957, p. L156) and the description of *Hungarites* was illustrated by a drawing of *H. yatesi*, maintaining the uncertainty.] Our hungaritid material from the Balaton Highland supports the ideas cited above, and

suggests that *Parakellnerites* (s. l.) and *Hungarites* (s. l.) are connected with transitional forms. Therefore, in the opinion of the present author, the hungaritids, at least the late Anisian hungaritids, would be better removed from the Hungaritidae and inserted to the Paraceratitidae, close to *Parakellnerites*. However, this kind of rearrangement of the systematic order is beyond the scope of this monograph.

Distribution: Late Anisian; Southern Alps, Dinarides, Balaton Highland. At the Balaton Highland *Parahungarites* ranges from the Illyrian Reitzi to Crassus Subzones.

Parahungarites arthaberi (DIENER, 1899)

Plate XVII: 1–10; Figures 53–56.

v * 1899 *Hungarites Arthaberi* nov. sp. — DIENER, Cephalopodensuiten südl. Bakony, p. 9, pl. I, figs 1–3.
v 1993 *Parakellnerites arthaberi* (DIENER, 1899) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 465, pl. 2, figs 10, 11, pl. 12, figs 7, 10, text-fig. 16f.
v 1993 *Parakellnerites arthaberi* (DIENER, 1899) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 65, pl. 6, fig. 10.
v 1993 *Hungarites arthaberi* — VÖRÖS, Reitzi Zone, p. 27, pl. IV, fig. 3.
v 1993 *Hungarites arthaberi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 12, fig. 10.
v 1998 *Hungarites ? arthaberi* DIENER, 1899 — VÖRÖS, Balaton-felvidék, p. 21, 38, 42, 50, pl. III, figs 5–7, pl. IV, figs 1, 2.

Material

209 specimens of various state of preservation, from Felsőörs (3), Szentkirályszabadja (4), Vászoly (1), Mencshely (102), Sóly (85), Balatoncsicsó (10), Hajmáskér (2) and Öskü (2).

Measurements

	D	WH	WW	U
Lectotype T.310.	57.8	29.2	15.9	7.9
INV 2017.200.1.	77.1	?	18.8	?
INV 2017.203.1.	75.2	35.1	19.4	~10.5
M.87.021	73.4	31.4	18.2	12.1
M.98.227	54.7	25.6	~15.5	8.7
M.98.146	53.5	27.2	13.6	8.1
INV 2017.201.1.	52.5	28.4	13.6	8.7
M.98.68	51.1	25.4	12.1	6.4
INV 2017.198.1.	50.1	24.1	15.1	7.1
M.98.69	46.8	23.5	12.8	5.7
M.98.223A	42.1	?	~10.0	?
INV 2017.199.1.	41.1	19.6	?	7.2
M.98.147	38.1	19.5	11.1	6.8
INV 2017.202.1.	36.5	17.8	10.4	6.8

Description

Small to medium-sized *Parahungarites* with very involute, compressed conch. The whorl-section is high oval. The umbilical wall is vertical to slightly overhanging. The flanks are gently convex, almost flat and meet the venter at a blunt ventrolateral margin. The venter is fastigate, occasionally keeled. The ornamentation consists of weak, rectiradiate and sinuous ribs and weak nodes. The number of the ribs (around 10 on a half whorl) increases by inserted secondary ribs; the place of insertion varies from the periumbilical region to the outer third of the flank. Both the primaries and the secondaries are strongly projected near the ventrolateral margin. There are no umbilical and lateral nodes. The ventrolateral nodes have the form of strongly projected clavi, developed as diagonally oriented swellings on the ends of the primary and secondary ribs. The number of ventrolateral clavi varies between 20 and 24 on a half-whorl. In some cases, the ornamentation of the body chamber becomes weaker and the ribs develop into irregularly spaced, sinuous growth rugae.

The suture line (Figures 54–56) is ceratitic, tending to be subammonitic, with three high lateral saddles with occasional incisions at their sides. The first lateral lobe is very deep and strongly denticulated; the second (and the indistinct third) lateral lobe are reduced

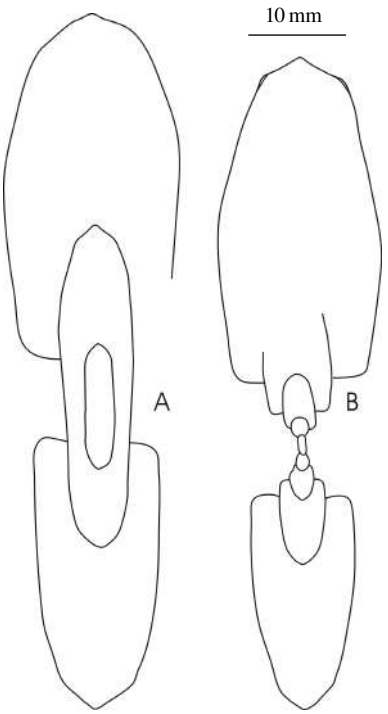


Figure 53. Cross sections of *Parahungarites arthaberi* (Diener, 1899), A: M.87.021, Balatoncsicsó, St. Balázs church ruins, loose, Reitzi Zone, Avisianum Subzone (?); B: INV 2017.294.1., Mencshely II, Bed 4, Reitzi Zone, Avisianum Subzone

in all respects. Vague suspensive lobes are seen near the umbilical margin.

Remarks

P. arthaberi is the far most common ceratitid ammonoid found at the Balaton Highland. The original type series figured by DIENER (1899, pl. I, figs 1–3), housed in the collection of the MGSH were examined by the present author. The specimen, figured by DIENER (l. c.) on pl. I, fig. 1 (inventory number T.310.) is here designated as the lectotype of *P. arthaberi*, and the specimen figured only for its suture line by DIENER (l. c., pl. I, fig. 3; inventory number T.314.) stands close to the lectotype and is considered the paralectotype. On the other hand, the smallest specimen, figured by DIENER on pl. I, fig. 2 (inventory number T.311.) should be excluded from *P. arthaberi* and attributed to the genus *Parakellnerites* (perhaps to *P. rothpletzi*) because it has three definite rows of nodes.

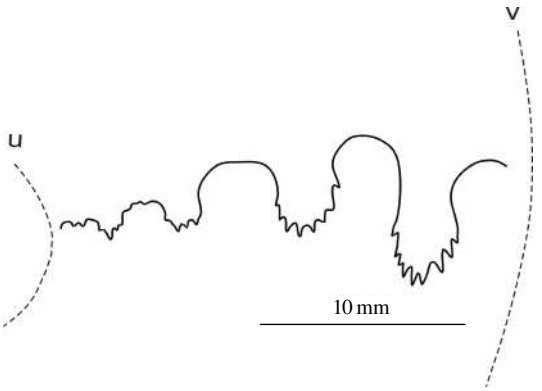


Figure 54. Suture line of *Parahungarites arthaberi* (DIENER, 1899), M.98.146, at 22 mm whorl-height, Balatoncsicsó, St. Balázs church ruins, loose, Reitzi Zone, Avisianum Subzone (?), u: umbilical margin, v: ventrolateral margin

P. arthaberi has typically neither umbilical, nor lateral nodes and its venter is simply fastigate without definite keel. *solyensis* n. sp. differs from *P. arthaberi* by the presence of strong nodes at the umbilical margin.

The specimens figured as "*Parakellnerites arthaberi*" by BRACK & RIEBER (1993, and also in GAETANI 1993) were checked by the present author in the collection PIMUZ, Zürich. One of them (BRACK & RIEBER 1993, pl. 12, fig. 10) corresponds properly to *Parahungarites arthaberi.* The other items (BRACK & RIEBER 1993, pl. 2, figs 10, 11, pl.12, fig. 7) do not show the characteristic sinuous ribbing but, considering the wide variation range of this species, they may also belong here.

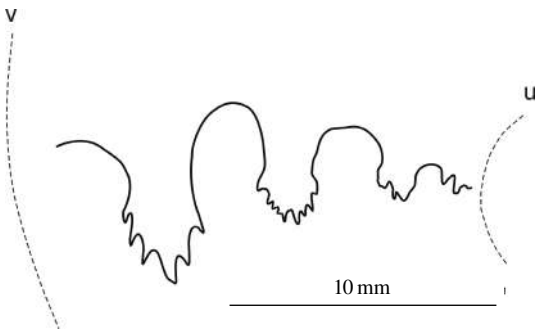


Figure 55. Suture line of *Parahungarites arthaberi* (DIENER, 1899), M.98.227, at 18 mm whorl-height, Sóly, Bed 8, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

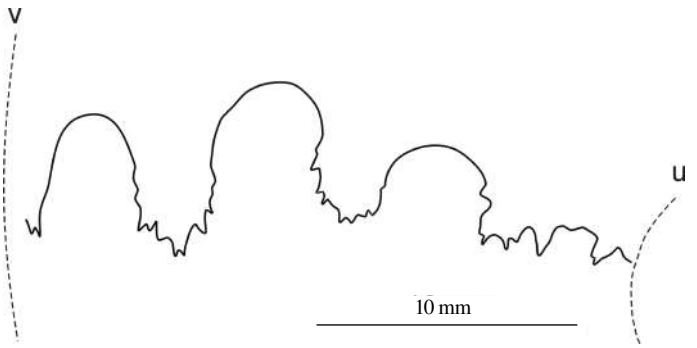


Figure 56. Suture line of *Parahungarites arthaberi* (DIENER, 1899), INV 2017.295.1., at 23 mm whorl-height, Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

Distribution

P. arthaberi was described from the upper Anisian of the Balaton Highland and the Southern Alps. According to the new data, at the Balaton Highland it ranges from the Illyrian Reitzi Subzone to the Crassus Subzone.

Parahungarites solyensis n. sp.
Plate XVIII: 5–9; Figure 57.

v 1896 *Ceratites lenis* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 252 (partim), pl. VI, figs 3, 4 (only). (non figs 1, 2, 7 and 5, 6).

v 1993 *Hungarites lenis* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 463 (partim), pl. 2, figs 6, 7 (only).
v 1993 *Hungarites lenis* (HAUER, 1896) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 64 (partim), pl. 4, figs 1, 2 (only).
v 1998 *Hungarites* ? sp., aff. *arthaberi* DIENER, 1899 — VÖRÖS, Balaton-felvidék, p. 42, pl. IV, fig. 3.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: M.98.53.
Locus typicus: Sóly, Őr Hill, Bed 9.
Stratum typicum: Yellow to pink limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Avisianum Subzone.
Derivatio nominis: After the name of the village Sóly, near to the type locality.
Diagnosis: Small to medium-sized, rather involute *Parahungarites* with high oval whorls and vertical to overhanging umbilical wall. Venter fastigate; keel blunt. Ribs rectiradiate, sinuous, projected. Two rows of nodes. Umbilical nodes prominent. Lateral nodes absent. Ventrolateral projected clavi, tending to coalesce. Suture ceratitic; first lateral lobe deep, expanding, denticulation strong.

Material
10 specimens of various state of preservation, from Vászoly (1) and Sóly (9).

Measurements

	D	WH	WW	U
Holotype M.98.53.	65.3	30.1	14.8	11.7
Paratype M.98.208A	53.1	24.4	13.5	11.3
Paratype M.98.208B	46.5	21.5	11.1	9.3
Paratype M.98.212A	35.8	16.6	8.3	8.7
Paratype PAL 2017.32.1.	32.0	13.0	7.0	10.0

Description
Small to medium-sized *Parahungarites* with rather involute, compressed conch. The whorl-section is high oval. The umbilical wall is vertical to slightly overhanging. The flanks are gently convex, almost flat and meet the venter at a blunt ventrolateral margin. The venter is fastigate, with a blunt keel. The ornamentation consists of weak, rectiradiate and sinuous ribs and weak nodes. The number of the ribs (around 10 on a half whorl) increases by secondary ribs inserted mostly at the middle of the flank. Both the primaries and the secondaries are projected near the ventrolateral margin. The umbilical nodes are well-developed. There are no lateral nodes. The rather weak ventrolateral nodes have the form of projected clavi, developed on the ends of the primary and secondary ribs. The ventrolateral clavi tend to coalesce into an almost continuous rim which endows the venter with tricarinate appearance. In most cases, the ornamentation of the body chamber becomes weaker and the umbilical nodes seem to vanish.

The suture line (Figure 57) is ceratitic, tending to be subammonitic, with three lateral saddles with occasional incisions at their sides. The strongly denticulated first lateral lobe is very deep and expands posteriorly; the second (and the indistinct third) lateral lobe is reduced, the third lobe seems to be bifid.

Remarks
The absence of lateral nodes refer this new species to the genus *Parahungarites*. It differs from *P. arthaberi* (DIENER, 1899) by having umbilical nodes (at least on the phragmocone) and by the less prominent and less projected nature of the ventrolateral clavi.

In the present author's opinion some forms previously figured under the name "*Ceratites lenis*" by HAUER (1896, l. c.) and "*Hungarites lenis*" by BRACK & RIEBER (1993, and also in GAETANI 1993) belong to *P. solyensis* n. sp.

The type material of "*Ceratites lenis*" HAUER, 1896 was examined by the present author in the collections NHMW (Wien). The three specimens figured under the name "*lenis*" seem to represent three different taxa. The largest specimen (figured by HAUER 1896, on pl. VI, figs 1, 2 and 7 for the suture line; inventory number: NHMW 1998z0063/0007) should keep the name "*lenis*"; it was designated as the lectotype of *lenis* by SPATH (1934, p. 457, under the name "*Semiornites lenis*"). One of the other specimens (figured by HAUER 1896, on pl. VI, figs 5, 6) portrays quite different ornamentation, with definite umbilical nodes (which are almost absent in the lectotype) and bears a slightly arched venter,

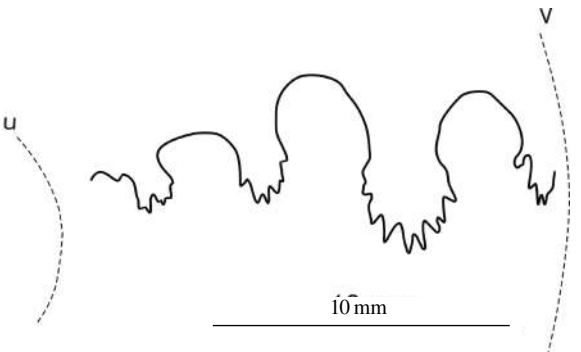


Figure 57. Suture line of *Parahungarites solyensis* n. sp., Paratype, M.98.208B, at 17 mm whorl-height, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

without any keel. The third specimen (figured by HAUER 1896, on pl. VI, figs 3, 4) differs from both the latter and the lectotype. The character of the umbilical and ventrolateral nodes, the absence of lateral nodes, and the roughly tricarinate venter, all fit well to the respective features of *P. solyensis*.

BRACK & RIEBER (1993) apparently interpreted rather widely the species "*Hungarites lenis*". Their figured specimens were examined by the present author in the collection PIMUZ, Zürich. The smaller of the two specimens (BRACK & RIEBER 1993, pl. 2, figs 6, 7; re-figured in GAETANI 1993, pl. 4, figs 1, 2) corresponds properly to the specimen figured by HAUER 1896, on pl. VI, figs 3, 4, consequently it is here regarded as belonging to *P. solyensis*.

In the previous work of the present author (VÖRÖS 1998, l. c.) a specimen (now the holotype of *P. solyensis*) was figured as *Hungarites* ? sp., aff. *arthaberi*.

Distribution

P. solyensis is known from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Avisianum Subzone.

Genus **Halilucites** DIENER, 1905

Type species: *Halilucites rusticus* (HAUER, 1896)

Halilucites rusticus (HAUER, 1896)

Plate XXIV: 13, 14; Plate XXV: 1; Figure 58.

v * 1896 *Ceratites (Hungarites) rusticus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 259, pl. IX, figs 1–4.
? 1913 *Ceratites (Halilucites)* aff. *rusticus* v. HAUER spec. — TOULA, Westbosnien, p. 655, pl. XXIII, fig. 7.
1995 *Halilucites rusticus* (HAUER, 1896) — DE ZANCHE et al., Dolomites, p. 148, pl. III, fig. 4.
v 1998 *Halilucites rusticus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, p. 31, pl. VII, fig. 2.
v 2002 *Halilucites rusticus* (HAUER) — VÖRÖS, Paleoenvironmental distribution, p. 488, pl. 2, fig. 1.
2003 *Halilucites rusticus* (HAUER, 1896) — MIETTO et al., Bagolino, p. 459, pl. 1, fig. 14, pl. 2, fig. 6.
2005 *Halilucites rusticus* (HAUER, 1896) — MANFRIN et al., Latemar, p. 496, figs 11/16, 17, 19, 20.
? 2007 *Halilucites rusticus* (HAUER, 1896) — BRACK et al., Growth and drowning, p. 334, fig. 5/10.

Material

Two specimens from Felsőörs (1) and Vászoly (1).

Measurements

	D	WH	WW	U
M.98.63	110.1	38.1	29.5	43.1
INV 2017.235.1.	39.1	17.4	13.8	?

Description

Medium to large *Halilucites* with rather evolute conch. The whorl-section is subquadrate. The umbilical wall seem to be subrounded to vertical. The flanks are gently convex. The ventrolateral margin is well-marked, carinate. The venter is tricarinate, with a prominent, high keel. The ornamentation consists of coarse ribs bearing indistinct nodes. The ribs are nearly rectiradiate and definitely projected. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is 10 to 12 on a half-whorl of the body chamber. The secondary ribs are usually intercalated in the interspace of the primaries in the inner third of the flank; bifurcation also occurs at around the mid-flank. There are three rows of nodes. The umbilical nodes are well-developed on each primary ribs. The moderately strong lateral nodes appear rarely and irregularly on some primary ribs at the points of bifurcations. The ventrolateral nodes (18 to 20 on a half-whorl) uniformly appear both at the primary and on the secondary ribs. They are adorally projected and develop into fine, projected growth rugae approaching diagonally to the ventrolateral carinae.

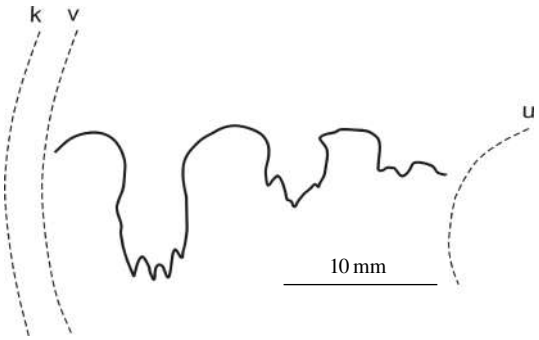


Figure 58. Suture line of *Halilucites rusticus* (HAUER, 1896), M.98.63, at 31 mm whorl-height, Vászoly, P–11a, Bed 16/A, Secedensis Zone, Crassus Subzone, u: umbilical margin, v: ventrolateral margin, k: top of the keel

The suture line is poorly preserved (Figure 58), very simple ceratitic, with at least three lateral saddles; the first lateral lobe is very deep and coarsely denticulated, the other lobes are much reduced.

Remarks

This is the type species of the genus *Halilucites*. The original specimens of *rusticus*, figured by HAUER (1896, l. c.), were examined in the collection NHMW (Wien), and the better preserved specimen (inventory number: NHMW 1998z0063/0029; figured by HAUER 1896, pl. IX, figs 1, 2) is designated here as lectotype. On the basis of the comparisons, the identification of our specimens seems warranted.

H. rusticus is rather easy to identify, nevertheless some items of the above synonymy are queried. The specimen figured as "*Ceratites* (*Halilucites*) aff. *rusticus*" by TOULA (1913, l. c.) may belong here though its lateral nodes are at the one-third of the flank and the crucial ventral view is not shown.

BRACK et al. (2007) figured some *Halilucites* specimens from the Dolomites; one of these (l. c., fig. 5/10), named as *H. rusticus*, probably represent *H. arietitiformis* (HAUER, 1896), on the basis of its strongly projected, simple ribs.

Distribution

H. rusticus was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland it was found in the Illyrian Crassus Subzone.

Halilucites cf. *arietitiformis* (HAUER, 1896)

Plate XXIV: 12.

v * 1896 *Ceratites (Hungarites) arietitiformis* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 260, pl. X, figs 1–3.
v ? 1896 *Ceratites (Hungarites) planilateratus* HAU. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 261, pl. XI, figs 1–3.
1903 *Hungarites arietiformis* HAUER — FRECH, Neue Cephalopoden, p. 13, pl. III, fig. 1.
? 1906 *Hungarites arietiformis* HAUER — RENZ, Argolis (1), p. 388, unnumbered text-fig. on p. 386.
? 1910 *Hungarites arietiformis* HAUER *(Judicarites)* — RENZ, Argolis, p. 34, text-fig. 3.
v ? 1986 *Halilucites* cf. *arietitiformis* (HAUER 1896) — BRACK & RIEBER, Lower Buchenstein beds, p. 204, pl. 2, figs 5, 6.
v 1993 *Halilucites arietitiformis* — VÖRÖS, Reitzi Zone, p. 25, pl. VI, fig. 4.
v 1993 *Halilucites arietiformis* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 118, pl. 13, fig. 6.
v 2002 *Halilucites* cf. *arietitiformis* (HAUER) — VÖRÖS, Paleoenvironmental distribution, p. 488, pl. 2, fig. 2.

Material

One incomplete specimen from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.234.1.	46.9	17.1	11.7	?

Description

Small, incomplete half whorl of a *Halilucites*. The whorl-section is high subquadrate. The umbilical wall seem to be subrounded. The flanks are gently convex. The ventrolateral margin is well-marked, carinate. The venter is tricarinate, with a prominent, high keel. The ornamentation consists of coarse ribs without distinct lateral nodes. The ribs are prorsiradiate, projected, nearly falcoid. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is around 12 on a half-whorl (partly on the body chamber). Secondary ribs were not observed. The ventrolateral nodes (around 12 on a half-whorl) appear as swellings on the primary ribs. They are adorally projected and diagonally coalesce with the ventral carinae.

The suture line is poorly seen (Plate XXIV: 12); ceratitic, with three lateral saddles and a deep first lateral lobe of simple dentition.

Remarks

The original specimen of *H. arietitiformis*, figured by HAUER (1896, pl. X, figs 1–3), was examined in the collection NHMW (Wien). The type is much larger than the specimen from the Balaton Highland, but the essential features, first of all the characteristic style of ribbing, are shared and the identification of our specimen seems warranted.

H. arietitiformis (HAUER, 1896) differs from *H. rusticus* by its simple, not bifurcating, much more projected, almost falcoid ribbing and narrower whorls. *H. obliquus* (HAUER, 1896) is more finely ribbed and has definite periumbilical nodes.

The comparisons made in HAUER's type materal of *Halilucites* species, in the NHMW (Wien), led to the conclusion that some of those species would be better to unite because their morphological differences are very subtle. For example, the species *planilateratus* HAUER, 1896, according to the opinion of the present author, may be tentatively attributed to *H. arietitiformis*. It must be noted that *planilateratus* was regarded as a gerontic variant of *H. rusticus* by MANFRIN et al. (2005, p. 498). This underscores the observation that the differences between HAUER's species of *Halilucites* are indistinct.

FRECH (1903, pl. III, fig. 1) illustrated a very typical specimen of *H. arietitiformis* from Felsőörs (the species name written erroneously as "*arietiformis*").

The specimen figured as "*Hungarites arietiformis*" by RENZ (1906, text-fig. on p. 386) and re-figured in RENZ (1910, text-fig. 3), in the absence of ventral view, was included to the synonymy only with query.

BRACK & RIEBER (1986, pl. 2, figs 5, 6) figured a worn fragment as *Halilucites* cf. *arietitiformis*. This specimen was checked in the collection PIMUZ, Zürich, and tentatively included to the synonymy.

Distribution

H. arietitiformis was described from the upper Anisian of the Dinarides and probably the Southern Alps and the Hellenides. At the Balaton Highland it was collected from the Illyrian Avisianum Subzone.

Halilucites cf. *obliquus* (HAUER, 1896)
Plate XXIV: 11

v * 1896 *Ceratites (Hungarites) obliquus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 262, pl. IX, figs 5–7.
v ? 1896 *Ceratites (Hungarites) intermedius* HAU. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 263, pl. XII, figs 15–17.

Material

One incomplete specimen from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.234.1.	46.9	17.1	11.7	?

Description

Body chamber fragment of a medium-sized *Halilucites*. The whorl-section is high oval. The flanks are gently convex. The venter seems tricarinate; the keel is prominent. The ornamentation consists of coarse ribs bearing indistinct nodes. The ribs are sinuous and projected. Secondary ribs are intercalated in the interspace of the primaries in the inner third of the flank. Umbilical nodes are present on some primary ribs.

The suture line is not seen.

Remarks

The original specimen of *H. obliquus*, figured by HAUER (1896, pl. IX, figs 5–7), was examined in the collection NHMW (Wien). On the basis of the shared essential features, first of all the characteristic style of ribbing, and the umbilical nodosity, the identification of our specimen seems acceptable.

H. obliquus differs from *H. rusticus* (HAUER, 1896) by its weak ribbing and the absence of lateral nodes. *H. arietitiformis* (HAUER, 1896) has coarser and almost falcoid ribbing and has no umbilical nodes.

The species *intermedius* HAUER, 1896, according to the opinion of the present author, may be tentatively synonymised with *H. obliquus*. It must be noted that *intermedius* was interpreted as closely allied to *H. obliquus* also by MIETTO et al. (2003b, p. 459) and MANFRIN et al. (2005, p. 498). This endorses the view that the differences between certain species of *Halilucites* introduced by HAUER (1896) are very weak.

Distribution

H. obliquus was described from the upper Anisian of the Dinarides. At the Balaton Highland it was collected from the Illyrian Crassus Subzone.

Genus **Stoppaniceras** RIEBER, 1973
Type species: *Stoppaniceras variabile* RIEBER, 1973

RIEBER (1973, p. 34) introduced *Stoppaniceras* with three species: *S. variabile* RIEBER, 1973, *S. grandinodus* RIEBER, 1973 and *S. artinii* (AIRAGHI, 1912), but the diagnostic differences of the genus from other genera of Paraceratitinae remained rather indistinct. Later BRACK & RIEBER (1986, 1993) described further specimens and taxa attributed to *Stoppaniceras*, which helped to formulate a more coherent picture of the genus. It is also important to note that BRACK & RIEBER (1986, p. 202, 203) gave a comprehensive description of the "Group of ››*Ceratites*‹‹ *ellipticus* HAUER 1887" and suggested that these forms are closely connected to *Stoppaniceras*, *Repossia* and *Parakellnerites*. It was also mentioned that the group of *ellipticus* would be detailed in a planned monograph. Regrettably, a detailed work of this kind did not appear since then.

The late Anisian ammonoid fauna of the Balaton Highland comprises a few specimens representing *Stoppaniceras* in strict sense, but even more forms apparently belonging to the "group of *ellipticus*". Without elucidating in details the taxonomy of the group, the present author had to reach an arbitrary solution, therefore in a previous work (VÖRÖS 1998) these forms were mentioned and/or illustrated as "*Stoppaniceras*" ex gr. *ellipticum* (HAUER). The close examination of the specimens illustrated as *Stoppaniceras* and "group of *ellipticus*" by RIEBER (1973) and BRACK & RIEBER (1986, 1993) in the collection PIMUZ, Zürich, convinced the present author that all these forms may belong to the genus *Stoppaniceras*. Furthermore, the "group of *ellipticus*" is here suggested to be divided to several distinct, mostly new, species.

In this concept, *Stoppaniceras* comprises (apart from the originally attributed species) various taxa with different lateral ornamentation, from finely to coarsely ribbed and nodose. The most important, shared feature lies in the venter, which is rather wide, almost tabulate, and bears a separate, distinct, blunt keel.

Stoppaniceras cf. *variabile* RIEBER, 1973

Plate XXV: 2.

v * 1973 *Stoppaniceras variabilis* sp. n. — RIEBER, Grenzbitumenzone, p. 36, pl. 9, figs 1–20, pl. 10, figs 1–4, pl. 14, fig. 11, Text-figs 10f–k, 10n–q.
1974 *Stoppaniceras variabilis* RIEBER — RIEBER, Tessiner Kalkalpen, p.171, pl. 2, figs 1–10, text–fig. 2c.
v non 1989 *Stoppaniceras* cf. *variabilis* RIEBER, 1973 — VÖRÖS & PÁLFY, Vászoly, p. 21., pl. I, figs 1, 2.
v 1998 *"Stoppaniceras"* cf. *variabile* RIEBER, 1973 — VÖRÖS, Balaton-felvidék, p. 21, 60.

Material

Two incomplete specimens and one imprint from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.236.1.	55.1	?	?	?

Description

Small-sized, moderately evolute *Stoppaniceras*. The umbilical wall seem to be subrounded. The flanks are gently convex. The ventrolateral margin and the venter are poorly seen. The ornamentation consists of regular ribs and nodes. The ribs are rectiradiate, straight. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is around 10 on a half-whorl. Few secondary ribs are irregularly inserted around the middle of the flank. There are three rows of nodes. The umbilical nodes are regular, distinct. The lateral nodes develop on each primary ribs at around the inner quarter of the flank. The ventrolateral nodes are poorly seen but seem to be pointed.

The suture line is not preserved.

Remarks

The original specimens illustrated as *Stoppaniceras variabile* by RIEBER (1973, pl. 9, figs 1–20, pl. 10, figs 1–4, pl. 14, fig. 11) were examined by the present author in the collection PIMUZ, Zürich. It was judged that the above described, poorly preserved specimens from Felsőörs may belong to *S. variabile* mainly on the basis of their lateral ornamentation.

In our previous paper (VÖRÖS & PÁLFY, 1989, l. c.), some specimens of *Asseretoceras camunum* (ASSERETO, 1963) were wrongly identified as *S. variabile*.

Distribution

S. variabile was described from the upper Anisian of the Southern Alps. At the Balaton Highland it was collected from the Illyrian Crassus Subzone.

Stoppaniceras rieberi n. sp.

Plate XXV: 3–7.

v ? 1986 Group of *"Ceratites" ellipticus* HAUER 1887 — BRACK & RIEBER, Lower Buchenstein beds, p. 202, pl. 4, figs 3, 6, pl. 5, fig. 2.
v ? 1986 *Stoppaniceras* — BRACK & RIEBER, Lower Buchenstein beds, p. 203, pl. 5, fig. 3.
1993 *"Stoppaniceras"* sp. — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 66, pl. 7, fig. 4.
v 1998 "Stoppaniceras" ex gr. *ellipticum* HAUER, 1887 A — VÖRÖS, Balaton-felvidék, p. 21, 60, pl. VIII, fig. 3.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: M.98.26.

Locus typicus: Felsőörs, Bed 116.

Stratum typicum: Grey, siliceous limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of Hans RIEBER, outstanding expert of Triassic ammonoids.

Diagnosis: Medium to large-sized rather evolute *Stoppaniceras* with high oval to subtrapezoidal whorls and subrounded to vertical umbilical wall. Venter gently arched, with distinct blunt keel. Ribs sinuous, projected. Three rows of nodes. Umbilical nodes well-developed. Strong and pointed lateral nodes at the inner quarter of primary ribs. Ventrolateral nodes adorally projected; chevron-like ventral ornamentation. Suture ceratitic.

Material

Five, partly incomplete specimens from Felsőörs.

Measurements

	D	WH	WW	U
Holotype M.98.26	68.1	27.1	17.3	?
Paratype PAL 2017.33.1.	101.6	?	26.7	?
Paratype M.98.27	81.5	29.6	23.5	?
Paratype PAL 2017.34.1.	56.2	?	?	?
Paratype PAL 2017.35.1.	44.9	24.8	?	?

Description

Medium to large *Stoppaniceras* with rather evolute conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is subrounded to vertical. The flanks are gently convex. The ventrolateral margin is well-marked. The venter is gently arched, with a distinct and prominent, but blunt keel. The ornamentation consists of moderately strong ribs and nodes. The ribs are slightly prorsiradiate, sinuous and definitely projected. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is around 12 on a half-whorl of the body chamber. The secondary ribs are usually intercalated in the inner third or the middle of the flank; bifurcation also occurs at around the inner third of the flank. There are three rows of nodes. The umbilical nodes are well-developed on each primary ribs. The rather strong and pointed lateral nodes appear on the inner quarter of some primary ribs, and rarely at the points of bifurcations. The ventrolateral nodes (around 22 on a half-whorl) uniformly appear both at the primary and on the secondary ribs. They are adorally projected and develop into fine, projected growth rugae approaching diagonally to the ventral keel, giving a chevron-like appearance of the venter.

The suture line is poorly visible; ceratitic, with well-denticulated first lateral lobe.

Remarks

The specimens illustrated as "Group of »*Ceratites*« *ellipticus* HAUER" by BRACK & RIEBER (1986, pl. 4, figs 3, 6, pl. 5, fig. 2, and also in GAETANI 1993, pl. 7, fig. 4) were examined by the present author in the collection PIMUZ, Zürich. Their rather weak ornamentation is fairly different from the coarsely ribbed and nodose, typical "*Ceratites ellipticus*", as figured by HAUER (1887, pl. VI, fig. 3) and HAUER (1896, pl.VIII, figs 3, 4). At the same time, they are very similar to our specimens from the Balaton Highland, both in ornamentation and in the character of the venter (not illustrated by BRACK & RIEBER, l. c.). Another specimen, figured with the simple use of name "*Stoppaniceras*" by BRACK & RIEBER (1986, l. c., pl. 5, fig. 3), shows also strong similarity to our specimens and probably belongs to *S. rieberi* n. sp.

By its rather fine ornamentation, *S. rieberi* is very different from *S. ellipticus* (HAUER, 1887). It stands close to *S. variabile*, but differs by the weaker, sinuous and projected ribbing.

In a previous work of the present author (VÖRÖS, 1998, l. c.) some specimens of *S. rieberi* n. sp. were mentioned and illustrated as *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 A.

Distribution

Apart from the Balaton Highland, specimens now included into *S. rieberi* were recorded from the upper Anisian of the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Avisianum and Crassus Subzones.

Stoppaniceras aff. *rieberi* n. sp.
Plate XXVI: 1.

v 1998 *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 B — VÖRÖS, Balaton-felvidék, p. 21, 60, pl. VIII, fig. 2.

Material

One specimen from Felsőörs.

Measurements

	D	WH	WW	U
M.98.25	73.5	29.8	18.5	21.1

Description

Medium-sized *Stoppaniceras* with rather evolute conch. The whorl-section is high subtrapezoidal. The umbilical wall is poorly seen. The flanks are nearly flat. The ventrolateral margin is well-marked. The venter is gently arched, with a prominent, but blunt keel. The ornamentation consists of rather weak ribs and nodes. The ribs are slightly prorsiradiate, sinuous and projected. The number of primary ribs is around 12 on a half-whorl of the body chamber. Secondary ribs intercalate irregularly; bifurcation was not observed. There are three rows of nodes. The umbilical nodes are well-developed on each primary ribs. The weak lateral nodes appear irregularly on the inner third of some primary ribs. The ventrolateral nodes (around 30 on a half-whorl) uniformly appear both on the primary and on the secondary ribs. They are gently projected adorally and develop into fine, projected growth rugae approaching diagonally to the ventral keel, which gives a chevron-like appearance to the venter.

The suture line is poorly visible; ceratitic, with three lateral saddles.

Remarks

The single specimen of this taxon stands very close to *S. rieberi* n. sp., but differs by its significantly denser ribbing and the nearly total absence of lateral nodes. In spite of these important differences, considering the paucity of the material (single specimen), the introduction of a new species did not appear to be reasonable.

In the previous work of the present author (VÖRÖS, 1998, pl. VIII, fig. 2) the above described specimen of *S.* aff. *rieberi* was illustrated as *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 B.

Distribution

Up to now, *S.* aff. *rieberi* is recorded only from the Balaton Highland, where it was collected from the Illyrian Crassus Subzone.

Stoppaniceras cf. *ellipticum* (HAUER, 1887)
Plate XXVI: 2–4; Figure 59.

v * 1887 *Ceratites ellipticus* n. sp. — HAUER, Han Bulog, p. 25, pl. VI, fig. 3.
v 1896 *Ceratites ellipticus* HAU. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 259, pl. VIII, figs 3, 4.
1921 *Ceratites ellipticus* HAUER — BUBNOFF, Forno, p. 453, pl. III, fig. 8.
v 1934 *Paraceratites ellipticus* (HAUER) — SPATH, Ammonoidea of the Trias, p. 436.
v 1998 *Megaceratites ? friccensis* (ARTHABER, 1916) — VÖRÖS, Balaton-felvidék, p. 42, 52, 59 (partim) pl. IV, figs 11, 12 (only).
v 1998 *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 — VÖRÖS, Balaton-felvidék, p. 29.

Material

Four fragmentary specimens from Szentkirályszabadja (1), Sóly (2) and Öskü (1).

Measurements

	D	WH	WW	U
INV 2017.237.1.	77.4	36.1	24.4	19.1
M.98.117	76.5	40.2	23.1	?
M.98.59	62.5	?	?	?

Description

Medium to large-sized *Stoppaniceras* with moderately involute conch. The body chamber shows definite umbilical egression. The whorl-section is high oval to subquadratic. The umbilical wall is subrounded. The flanks are gently convex and passes gradually into the fastigate venter. The ventrolateral margin is marked by a row of prominent nodes. The flanks are ornamented with massive, slightly prorsiradiate primary ribs (8 to 10 on a half whorl) and nodes. Secondary ribs were not observed. On the phragmocone the ribbing is weak and slightly sinuous whereas the body chamber bears very coarse and occasionally fibulate ribs (Plate XXVI:

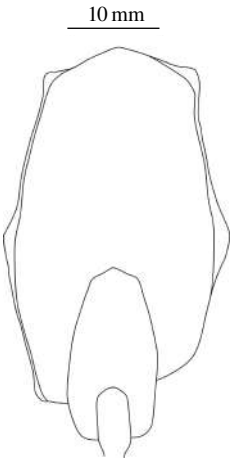


Figure 59. Cross section of *Stoppaniceras* cf. *ellipticum* (HAUER, 1887), M.98. 117, Sóly, road-cut, Reitzi Zone, Avisianum Subzone (?)

3). There are three rows of nodes. The umbilical nodes are weak. The row of the massive lateral nodes runs near the inner third and the middle of the flank. The ventrolateral nodes are of medium strength (around 18 on the half whorl) on the phragmocone and became very strong and less numerous (around 10) on the body chamber. The occasional fibulate ribs coalesce at these laterally expanded spine-like nodes.

Suture lines are not visible.

Remarks

The species "*Ceratites ellipticus*" was based on a single specimen by HAUER (1887, l. c.). This holotype (by monotypy), housed at the collection GBAW Wien (inventory number: 1887/01/34), was examined by the present author and the egression of the body chamber, the presence of occasional fibulate ribbing and the wide and blunt ventral keel were confirmed. Subsequently HAUER (1896, l. c.) described and figured another specimen of "*Ceratites ellipticus*", showing the same basic features. This specimen was also inspected by the present author in the NHMW, Wien (inventory number: NHMW 1998z0063/0011). By these comparisons the identification of the specimens from the Balaton Highland as "*ellipticus*" seems to be warranted.

The generic position of this species was variously suggested by previous authors and is still somewhat dubious. KUTASSY (1932, p. 473) used the name combination "*Ceratites* (*Semiornites*) *ellipticus*". SPATH (1934, p. 439) definitely attributed *ellipticus* to *Paraceratites* and compared it to "*Paraceratites subnodosus* (MOJSISOVICS)" and "*Ceratites evolvens* HAUER". RIEBER (1973, p. 47), though not dealing with *ellipticus*, attributed the closely related species "*Ceratites evolvens* HAUER" to his new genus *Serpianites*. Probably following this idea, MIETTO & MANFRIN (1995, p. 554) wrote about "*Serpianites*" *ellipticus* (HAUER). However, this attribution is not feasible, because *ellipticus* has keeled venter and definite umbilical nodes, whereas the genus *Serpianites* was defined as having flat venter and smooth umbilical margin, devoid of nodes (RIEBER 1973, p. 44). After all, the present author preferred to ascribe *ellipticus* to the genus *Stoppaniceras*, the substantial morphological features of which, at least do not contradict to this attribution.

Stoppaniceras ellipticum differs from the previously described species of the genus (*S. variabile, S. rieberi*) by its extremely coarse ornamentation and the strong egression of the body chamber. The very coarsely ornamented *S. grandinodus* RIEBER, 1973 differs by its considerably more evolute conch and by the flat venter on the body chamber. The also strongly ornamented species, *S. hermanni* n. sp. and *S. budaii* n. sp. have more regular and denser ribbing.

The specimen figured as "*Ceratites ellipticus*" by BUBNOFF (1921, pl. III, fig. 8) corresponts very well to ours from the Balaton Highland, even including the fibulate ribbing.

One specimen listed as "*Paraceratites ellipticus*", by SPATH (1934) was examined in the collection NHML (London, inventory number: C. 30982, from Montenegro) and it is here regarded as a proper representative of *Stoppaniceras ellipticum*.

In the previous work by the present author (VÖRÖS 1998, l. c.) some specimens of *S. ellipticum* were wrongly identified and illustrated as *Megaceratites* ? *friccensis* (ARTHABER, 1916).

Distribution

S. ellipticum was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Avisianum Subzone.

Stoppaniceras hermanni n. sp.
Plate XXVI: 5; Plate XXVII: 1.

v 1993 *"Ceratites"* ex gr. *ellipticus* — VÖRÖS, Reitzi Zone, p. 27, pl. V, fig. 2.
v 1998 *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 — VÖRÖS, Balaton-felvidék, p. 31 (partim).

Holotype: Hungarian Natural History Museum (Budapest), inventory number: M.98.16.

Locus typicus: Vászoly, Trench P–11/a, Bed 16/A.

Stratum typicum: Ochre-yellow limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of Viktor HERMANN, who collected the holotype.

Diagnosis: Large, moderately evolute *Stoppaniceras* with high oval whorls and vertical to overhanging umbilical wall. Venter slightly arched, with distinct blunt keel. Ribs straight, prorsiradiate, of uniform strength on phragmocone and body chamber. Three rows of nodes. Umbilical nodes strong. Lateral nodes at the inner third of ribs. Very strong ventrolateral nodes. Suture ceratitic.

Material

Three specimens from Vászoly (2) and Mencshely (1).

Measurements

	D	WH	WW	U
Holotype M.98.16	100.1	38.5	26.1	29.5
Paratype PAL 2017.36.1.	~69.0	32.0	24.5	?

Description

Large *Stoppaniceras* with moderately evolute conch. The body chamber shows umbilical egression. The whorl-section is high oval to subquadratic. The umbilical wall is vertical to overhanging. The flanks are gently convex and passes gradually into the slightly arched and keeled venter. The blunt keel is definitely elevated from the wide venter. The ventrolateral margin is accentuated by a row of prominent nodes. The flanks are ornamented with coarse and straight, slightly prorsiradiate primary ribs (around 8 on a half whorl) and nodes. Secondary ribs are irregularly intercalated, partly near the umbilicus, partly at the outer third of the flank. The ribbing is of uniform strength throughout the phragmocone and the body chamber. There are three rows of nodes. The umbilical nodes are strong. The row of the moderately strong lateral nodes runs near the inner third of the flank. The very strong ventrolateral nodes (around 20 on a half-whorl) uniformly appear both on the primary and on the secondary ribs.

Suture lines are poorly preserved; ceratitic, with three lateral saddles and a rather wide first lateral lobe.

Remarks

On the basis of its wide venter, with separate, elevated blunt keel and the egression of the body chamber, *S. hermanni* n. sp. is regarded as belonging to the genus *Stoppaniceras*. By the characters of the venter, it stands close to the group of *S. rieberi* n. sp. The uniform, coarse, prorsiradiate ribbing differentiates *S. hermanni* from the other species of the genus.

In previous works of the present author (VÖRÖS 1993, 1998) the holotype of this species was cited and/or illustrated as belonging to the "group of *ellipticus* HAUER".

Distribution

Up to now *S. hermanni* n. sp. is known only from the Balaton Highland, where it was found in the Illyrian Crassus Subzone.

Stoppaniceras budaii n. sp.
Plate XXVII: 2, 3; Figures 60, 61.

v 1998 *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887 — VÖRÖS, Balaton-felvidék, p. 31 (partim), pl. VIII, fig. 1.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: M.87.042.

Locus typicus: Vászoly, Trench P–11/a, Bed 16/A.

Stratum typicum: Ochre-yellow limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of Tamás BUDAI, renowned Hungarian geologist, who collected the holotype.

Diagnosis: Large-sized, moderately evolute *Stoppaniceras* with high oval whorls and subrounded to vertical umbilical wall. Venter fastigate. Ribs gently sinuous, prorsiradiate, uniform strength on phragmocone and on body chamber. Three rows of nodes. Umbilical nodes weak. Moderately strong lateral nodes at the inner third of ribs. Strong, projected ventrolateral nodes. Suture ceratitic, with numerous elements and peculiar, pointed peri-umblical suspensive lobes.

Material

Three specimens from Felsőörs (1), Vászoly (1) and Mencshely (1).

Measurements

	D	WH	WW	U
Holotype M.87.042	99.8	39.8	22.9	31.9
Paratype PAL 2017.37.1.	113.2	?	28.2	?

Description

Large *Stoppaniceras* with moderately evolute conch. The body chamber shows moderate umbilical egression. The whorl-section is high oval to subquadratic. The umbilical wall is subrounded to vertical. The flanks are gently convex and pass gradually into the fastigate venter. The ventrolateral margin is accentuated by a row of prominent nodes. The flanks are ornamented with strong, gently sinuous, somewhat prorsiradiate primary ribs (around 10 on a half whorl) and nodes.

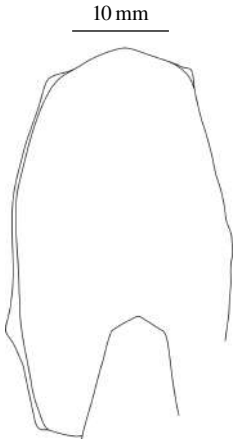


Figure 60. Cross section of *Stoppaniceras budaii* n. sp., Holotype, M.87.042, Vászoly, P–11a, Bed 16/A, Secedensis Zone, Crassus Subzone

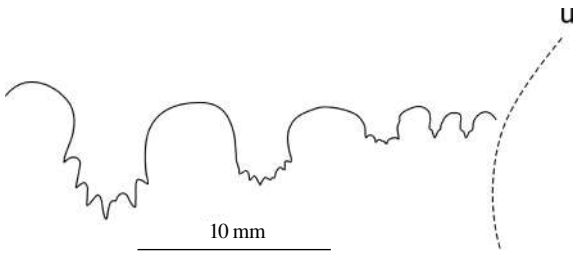


Figure 61. Suture line of *Stoppaniceras budaii* n. sp., Holotype, M.87.042, at 27 mm whorl-height, Vászoly, P–11a, Bed 16/A, Secedensis Zone, Crassus Subzone, u: umbilical margin

Secondary ribs are irregularly intercalated, mostly near the umbilicus. The ribbing is of uniform strength throughout the phragmocone and the body chamber. There are three rows of nodes. The umbilical nodes are weak and disappear on the body chamber. The row of the moderately strong lateral nodes runs near the inner third of the ribs. The strong ventrolateral nodes (around 16 on a half-whorl) uniformly appear both on the primary and on the secondary ribs. The ventrolateral nodes are projected and pass into diagonally oriented, fine growth rugae.

Suture lines are ceratitic (Figure 61), with several, wide and entire lateral saddles; the first lateral lobe is rather deep and strongly denticulated, the second and third lateral lobes are reduced in all respects; the two peri-umbilical suspensive lobes are peculiarly pointed, like spear-heads.

Remarks

On the basis of the general features of the ornamentation and the egression of the body chamber, *S. budaii* n. sp. is regarded as belonging to the genus *Stoppaniceras*. By the fastigate character of the venter, it stands close to the group of *S. ellipticum* (HAUER, 1887), but differs by its denser ribbing, uniformly developed on the phragmocone and on the body chamber, and its less prominent lateral nodes.

In a previous work of the present author (VÖRÖS, 1998, pl. VIII, fig. 1) the holotype of this species was cited and illustrated as *"Stoppaniceras"* ex gr. *ellipticum* HAUER, 1887.

Distribution

Until now *S. budaii* n. sp. is known only from the Balaton Highland, where it was found in the Illyrian Avisianum and Crassus Subzones.

Genus **Repossia** RIEBER, 1973

Type species: *Repossia acutenodosa* RIEBER, 1973

Repossia cf. *acutenodosa* RIEBER, 1973

Plate XXVII: 4, 5.

v * 1973 *Repossia acutenodosa* sp. n. — RIEBER, Grenzbitumenzone, p. 52, pl. 10, fig. 16, pl. 11, figs 1–32, pl. 12, fig. 1, Text-figs 13m–o.
1974 *Repossia acutenodosa* RIEBER — RIEBER, Tessiner Kalkalpen, p.171, pl. 1, figs 4–6, text-fig. 2f.
? 1995 *Repossia acutenodosa* RIEBER, 1973 — DE ZANCHE et al., Dolomites, p. 146, pl. I, fig. 18.
v 1998 *Repossia* ? sp. — VÖRÖS, Balaton-felvidék, p. 21, pl. VII, fig. 3.

Material

Ten fragmentary specimens from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.238.1.	55.7	?	?	?
M.98.23	45.5	20.8	14.9	?

Description

Medium-sized *Repossia* with moderately involute conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is poorly preserved; seems to be subrounded. The flanks are gently convex and pass into the fastigate venter bearing a definite keel. The ventrolateral margin is marked by a row of prominent nodes. The flanks are ornamented with very weak, prorsiradiate, slightly projected primary ribs (8 to 10 on a half whorl) and nodes. Secondary ribs appear rarely and irregularly at around

the mid-flank. The ribbing weakens and almost vanish toward the ventrolateral margin. There are three rows of nodes. The umbilical nodes are well-developed. The row of the high and spinose lateral nodes (around 10 on a half whorl) runs near the inner third of the flank. The strong, spinose ventrolateral nodes (12 to 14 on a half whorl) are projected adorally.

Suture lines are poorly seen; ceratitic, with three lateral saddles.

Remarks

R. acutenodosa is the type species and, at the same time, the only properly defined species of *Repossia*. The original specimens of *R. acutenodosa* were examined by the present author in the collection PIMUZ, Zürich. On the basis of their widely spaced and spinose lateral nodes and the almost total absence of ribbing, our incomplete specimens from the Balaton Highland were identified with this species. The similarity is especially remarkable with the specimens figured by RIEBER (1973, pl. 11, figs 1–3, 13, 14).

The specimen figured as *R. acutenodosa* by DE ZANCHE et al. 1995) is very poorly preserved, therefore this item is included into the synonymy only with question mark.

One of the specimens illustrated here (Plate XXVII: 5) was figured as *Repossia* ? sp. in a previous work by the present author (VÖRÖS 1998). Now, considering the monospecific character of the genus, the attribution to *R. acutenodosa* seems reasonable.

Distribution

R. acutenodosa was described from the upper Anisian of the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Crassus Subzone.

Subfamily Bulogitinae MIETTO & MANFRIN, 2005

Genus **Ticinites** RIEBER, 1973

Type species: *Ticinites ticinensis* RIEBER, 1973

The new subfamily Bulogitinae was introduced by MANFRIN et al. (2005, p. 499) supported by convincing morphological arguments. Besides *Ticinites*, they included to this subfamily the genera *Bulogites* ARTHABER, 1912, *Salterites* DIENER, 1915 and *Reiflingites* ARTHABER, 1896. On the other hand, they synonymised the latter genus with *Asseretoceras* BALINI, 1992, what is not accepted by the present author.

Ticinites cf. *ticinensis* RIEBER, 1973

Plate XXVIII: 1.; Figure 62.

v * 1973 *Ticinites ticinensis* sp. n. — RIEBER, Grenzbitumenzone, p. 56, pl. 7, figs 1–5, 8–10, pl. 10, fig. 7, Text-figs 17o, 17q–x.

v 1998 *Megaceratites* ? sp. — VÖRÖS, Balaton-felvidék, p. 49.

Material

One incomplete specimen from Barnag.

Measurements

	D	WH	WW	U
INV 2017.239.1.	56.1	27.1	29.1	?

Description

Medium-sized *Ticinites*, with moderately evolute conch. The whorl is stout; the cross-section is subquadratic. The umbilical edge is subrounded. The flanks are gently convex and pass gradually into the somewhat arched, almost flat venter. The flanks are ornamented with robust ribs and extremely strong, spinose nodes. The number of the slightly prorsiradiate ribs is six on the body chamber. A few secondary ribs irregularly appear by intercalation. The umbilical nodes are rather swellings on the ribs. The prominent, spinose lateral nodes develop on the inner thirds of the primary ribs. The ventrolateral nodes are exceptionally prominent; they appear as straight, long spines, elongated in lateral direction. Their number is 10 on a half-whorl of the body chamber. The inner whorls seem to be also strongly ornamented (Figure 62).

Suture lines are not seen.

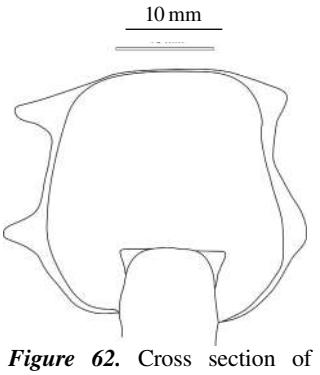


Figure 62. Cross section of *Ticinites* cf. *ticinensis* RIEBER, 1973, INV 2017.239.1., Barnag, loose, Secedensis Zone (?)

Remarks

The original specimens of *T. ticinensis* were examined by the present author in the collection PIMUZ, Zürich. On the basis of its widely spaced and extremely spinose lateral and ventrolateral nodes and the characteristic, stout whorl-section, our incomplete specimen from the Balaton Highland was identified with this species. The similarity is especially remarkable with the specimens of *T. ticinensis* figured by RIEBER (1973, pl. 7, figs 1–4, 10 and pl. 10, fig. 7).

In the previous work of the present author (VÖRÖS 1998, p. 49) the same single specimen was tentatively attributed to the genus *Megaceratites* BALINI, 1992. Subsequent, careful preparation revealed the style of nodosity what allowed the proper identification of the specimen.

Distribution

T. ticinensis was described from the upper Anisian of the Southern Alps. At the Balaton Highland it was collected loose, probably deriving from the Illyrian Crassus Subzone.

Ticinites hantkeni (MOJSISOVICS, 1882)
Plate XXVIII: 2–7.

* 1882 *Ceratites Hantkeni* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 42, pl. XXX, fig. 16.
v 1986 *"Ceratites" hantkeni* MOJS. 1882 — BRACK & RIEBER, Lower Buchenstein beds, p. 203, pl. 5, fig. 1.
v 1993 *Ticinites brescianus* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 473, pl. 9, figs 1–3, 11, text-fig. 15m.
v 1993 *Ticinites dolomiticus* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 474, pl. 9, figs 4, 8, 9, text-figs 15n, 17a.
v non 1993 *Nevadites* ? *hantkeni* — VÖRÖS, Reitzi Zone, p. 27, pl. III, fig. 8, pl. IV, figs 1, 2.
v non 1993 *Nevadites* ? *hantkeni* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 13, figs 1, 2.
v 1998 *Ticinites* ? *hantkeni* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, (partim) p. 21, 60, pl. VI, fig. 17, (non p. 31, 38).
v 2002 *Ticinites* cf. *hantkeni* (MOJSISOVICS) — VÖRÖS, Paleoenvironmental distribution, p. 488, pl. 2, fig. 3.

Material

12 poorly preserved specimens from Felsőörs.

Measurements

	D	WH	WW	U
Topotype T.3088.	62.7	23.8	21.5	?
INV 2017.240.1.	74.9	22.8	20.4	?
INV 2017.243.1.	71.1	20.1	?	33.5
M.98.72	63.9	29.5	26.8	?
INV 2017.241.1.	54.2	16.1	?	24.1
INV 2017.242.1.	40.1	20.2	?	?

Description

Medium to large-sized *Ticinites*, with rather evolute conch. The whorl section is subtrapezoidal to quadratic. The umbilical edge is subrounded. The flanks are gently convex and pass gradually into the flat venter. The venter is crossed by very faint growth lines and, bears an indistinct, very thin, keel-like median elevation. The flanks are ornamented with robust ribs and nodes. The number of the slightly prorsiradiate ribs is 10 to 12 on the body chamber. A few secondary ribs irregularly appear by intercalation. Bifurcation was not observed. The umbilical nodes are rather swellings on the ribs. The prominent lateral nodes develop in the inner part of the primary ribs, very near the umbilicus. The very strong and spinose ventrolateral nodes appear at the ventrolateral ends of both the primary and the secondary ribs. Their number is 12 to 14 on a half-whorl of the body chamber. The inner whorls are also strongly ornamented with bullate lateral nodes.

Suture lines are poorly seen; ceratitic, with three lateral saddles and wide and deep first lateral lobe.

Remarks

The original description of "*Ceratites hantkeni*" by MOJSISOVICS (1882, l. c.) was based on a rather small specimen from the "Zone des *Trachyceras Reitzi*" at Felsőörs and, according to MOJSISOVICS (1882, l. c.) was deposited in the Geological Institute of Hungary. However, this specimen, which should be considered the lectotype of *T. hantkeni*, seems to be lost. It was indicated as a missing type even in the comprehensive catalogue by BODA (1964, p. 149). The present author, helped by

the staff of the Mining and Geological Survey of Hungary, made several unsuccessful efforts in the last three decades to find again this specimen, therefore, at the moment, this type specimen should be regarded as lost. On the other hand, in the last sentence of his original description, MOJSISOVICS (1882, l. c.) shortly described another, larger, incomplete specimen from Felsőörs which he tentatively identified as *hantkeni*. This specimen is kept in the collection of the MGSH under the inventory number T.3088. and is figured here on Plate XXVIII: 2. Its lateral ornamentation more or less corresponds to the lost type, but its ventral side is worn and does not show any morphological details; moreover, it is a body chamber showing no suture lines. Partly because of these differences, and partly because, theoretically, it can not be excluded that the lost original type may turn up again, this topotypical specimen is not designated here as the neotype of *T. hantkeni*.

The most important diagnostic feature of *T. hantkeni* lies in the position of the lateral nodes, very near the umbilical margin. These lateral nodes, as MOJSISOVICS (1882, l. c.) wrote: "by superficial observation may be considered umbilical nodes". The very thin, thread-like keel in the middle of the flat venter, as shown by the figure of the lost type (MOJSISOVICS 1882, pl. XXX, fig. 16b), was also found in one specimen of the new collections from Felsőörs (Plate XXVIII: 3, inventory number: M.98.72.), where the ventral part was well-preserved.

BRACK & RIEBER (1986, p. 203, pl. 5, fig. 1) described a specimen as "*Ceratites*" *hantkeni* MOJS. 1882. Later this specimen was selected by BRACK & RIEBER (1993, p. 473) as the holotype of the new species *Ticinites brescianus* and in the same work (p. 474), the authors introduced a further new species: *Ticinites dolomiticus*. All these specimens were investigated by the present author in the collection PIMUZ, Zürich. The holotype of *brescianus* (described originally as *hantkeni*) seems to stand the farthest from the typical *hantkeni* in the present author's opinion, because it is too much evolute. On the other hand, the other specimens of *brescianus* and also of *dolomiticus* are very close to each other and also to *hantkeni*. The subquadrate whorl-section, the lateral ornamentation with almost peri-umbilical nodes and the faint ventral keel on the flat venter are shared features. The umbilical width, what BRACK & RIEBER (1993, l. c.) considered crucial difference between their new species and *hantkeni*, in fact, does not differ significantly. This value varies between 44–46% in *hantkeni* and 45–51% in *brescianus–dolomiticus*, thus an overlap exists.

BRACK & RIEBER (1993, p. 474) wrote that in their opinion the species *hantkeni* does probably not belong to *Ticinites*, but they did not offer any proof or explanation. After the comparative studies of the *Ticinites* material in Zürich and Budapest, the present author takes the liberty to ignore the above opinion and introduces the idea that *Ticinites hantkeni* (MOJSISOVICS, 1882), *T. brescianus* BRACK & RIEBER, 1993 and *T. dolomiticus* BRACK & RIEBER, 1993 form a single species and, by priority, the valid name of the species is *Ticinites hantkeni*. It may be remarked that the unification of *brescianus* and *dolomiticus* was implicitly suggested by DE ZANCHE et al. 1995, p. 138) and MIETTO & MANFRIN (1995, p. 554), although in the frame of *T. crassus* (HAUER, 1896). This latter part of their opinion can not be endorsed because in *T. crassus* the lateral nodes are near the mid-flank, while in *T. hankeni* (and in *brescianus* and *dolomiticus*) they are very near the umbilicus.

In some previous papers (VÖRÖS 1993) and also in GAETANI (ed.)(1993) the present author interpreted too widely the species *hantkeni* and wrongly attributed some specimens to the genus *Nevadites*. In the present monograph these specimens are described in the taxon *Ticinites* ? aff. *hantkeni*, which differs from *T. hantkeni* by its more numerous, sinuous and sharper ribs; moreover, by its ventrolateral nodes, forming separate rows.

Distribution

T. hantkeni is known from the upper Anisian of the Southern Alps and the Balaton Highland, where its range is restricted to the Illyrian Crassus Subzone.

Ticinites ? aff. *hantkeni* (MOJSISOVICS, 1882)
Plate XXIX: 1–3; Figure 63.

v 1989 *Nevadites* ? cf. *hantkeni* (MOJSISOVICS, 1882) — VÖRÖS & PÁLFY, Vászoly, p. 21., pl. III, fig. 2.
v 1993 *Nevadites* ? *hantkeni* — VÖRÖS, Reitzi Zone, p. 27, pl. III, fig. 8, pl. IV, figs 1, 2.
v 1993 *Nevadites* ? *hantkeni* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 13, figs 1, 2.
v 1998 *Ticinites* ? *hantkeni* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, (partim) 31, 38. (non p. 21, pl. VI, fig. 17).

Material

Four incomplete specimens from Vászoly (1) and Mencshely (3).

Measurements

	D	WH	WW	U
M.89.109	52.1	18.5	15.2	20.1
INV 2017.244.1.	49.2	17.4	14.6	?
INV 2017.245.1.	43.1	15.7	14.8	?

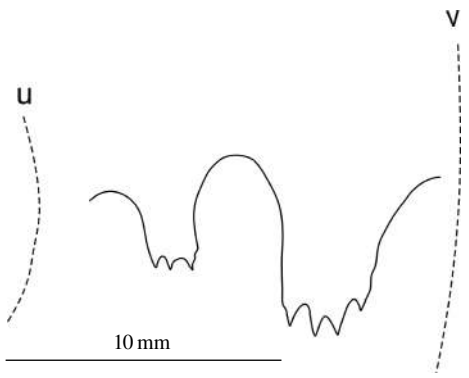


Figure 63. Suture line of *Ticinites* ? aff. *hantkeni* (MOJSISOVICS, 1882), INV 2017.244.1., at 15 mm whorl-height, Mencshely I, loose, Reitzi Zone, Reitzi or Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

Description

Medium-sized *Ticinites*, with moderately evolute conch. The whorl section is subtrapezoidal to quadratic. The umbilical edge is subrounded. The flanks are gently convex and pass gradually into the flat venter. The venter bears an indistinct, keel-like median elevation. The flanks are ornamented with sharp ribs and nodes. The number of the slightly sinuous, projected ribs is 12 to 14 on a half whorl. A few secondary ribs irregularly appear by intercalation near the umbilicus. Bifurcation was not observed. The umbilical nodes form swellings on the ribs. The lateral nodes develop in the inner part of the primary ribs, near the umbilicus. The ventrolateral part of the ribs are weakened and the strong ventrolateral nodes form a separate row at the ends of the primary and secondary ribs. Their number is 16 to 18 on a half-whorl. The inner whorls are also strongly ornamented.

Suture lines are only partly seen (Figure 63); ceratitic, with three lateral saddles and wide and deep first lateral lobe; the ventral saddle is high and bifid, the ventral lobe is deeply incised.

Remarks

In some previous papers (VÖRÖS & PÁLFY 1989, VÖRÖS 1993) and also in GAETANI (ed.)(1993) and partly in VÖRÖS (1998) the present author interpreted too widely the species *T. hantkeni* and included some forms, described here as *T.* ? aff. *hantkeni.* The generic attribution to *Nevadites* was also wrong. The presently used attribution to *Ticinites* is only tentative, because of the differences in the lateral ornamentation.

T. ? aff. *hantkeni* differs from *T. hantkeni* by its more numerous, sinuous and sharper ribs and by its ventrolateral nodes forming separate rows. Moreover it was recorded from a significantly deeper stratigraphic level: *T. hantkeni* from the Crassus Subzone, while *T.* ? aff. *hantkeni* from the Reitzi Subzone.

Distribution

Up to now, *T.* ? aff. *hantkeni* was recorded only from the Balaton Highland, where its range is restricted to the Illyrian Reitzi Subzone.

Ticinites crassus (HAUER, 1896)

Plate XXIX: 4.

v * 1896 *Ceratites crassus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 259, pl. VIII, figs 1, 2.
v ? 1993 *Ticinites* sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 475, pl. 9, fig. 5.
1995 *Ticinites crassus* (HAUER, 1896) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 551, pl. III, fig. 2.
1995 *Ticinites crassus* (HAUER, 1896) — DE ZANCHE et al., Dolomites, p. 148, pl. III, fig. 1.
v 1998 *Ticinites crassus* (HAUER, 1896) — VÖRÖS, Balaton-felvidék, (partim) 31, 60, pl. VI, fig. 1. (non p. 21).
v 2002 *Ticinites crassus* (HAUER) — VÖRÖS, Paleoenvironmental distribution, p. 488, pl. 2, fig. 4.
v 2015 *Ticinites* cf. *crassus* (HAUER, 1896) — VÖRÖS et al., New data, p. 320, pl. II, fig. 1.

Material

One well preserved specimen and one fragment from Vászoly.

Measurements

	D	WH	WW	U
M.98.61	91.8	31.5	33.8	37.6

Description

Large *Ticinites*, with rather evolute conch. The whorl section is subtrapezoidal to quadratic. The umbilical edge is subrounded. The flanks are gently convex. The venter is flat and bears a very low, blunt keel. The flanks are ornamented with robust ribs and nodes. The number of the rectiradiate ribs is nine on a half whorl. A few secondary ribs irregularly appear by intercalation. Bifurcation occurs rarely. The umbilical nodes are only swellings on the ribs. The prominent lateral nodes develop near the middle part of the primary ribs. The very strong, almost spinose ventrolateral nodes appear at the ventrolateral ends of both the primary and the secondary ribs. Their number is 14 on a half-whorl of the body chamber. The inner whorls are also strongly ornamented with strong ribs and lateral nodes.

Suture lines are not seen.

Remarks

The holotype (by monotypy) of *T. crassus* was inspected by the present author in the collection NHMW (Wien). Our specimen from the Balaton Highland is very similar to the holotype in the basic features (evolution, whorl section, style of ribbing) and in the position of the lateral nodes near the mid-flank. The only difference is in the number of ribs, which is higher in the holotype. In spite of this, our specimen may be identified with *T. crassus*. It is worth mentioning that the specimen figured as *T. crassus* by MIETTO & MANFRIN (1995) and DE ZANCHE et al. 1995) has also lower number of ribs, similar to our specimens.

The species "*Ceratites*" *crassus* HAUER, 1896 was first attributed to the genus *Ticinites* by MIETTO & MANFRIN (1995, l. c.) and DE ZANCHE et al. 1995, l. c.); this opinion is accepted here.

The major distinctive feature of *T. crassus* is the position of the lateral nodes near the mid-flank. This separates it from most of the other species of *Ticinites*, notably the group of *T. hantkeni* (MOJSISOVICS, 1882), including the probably synonymous *T. brescianus* BRACK & RIEBER, 1993 and *T. dolomiticus* BRACK & RIEBER, 1993, where the lateral nodes are very near the umbilcal margin. According to this distinction, the specimen figured as *Ticinites* sp. by BRACK & RIEBER (1993, pl. 9, fig. 5) may belong to *T. crassus*.

In a previous work (VÖRÖS 1998) this species was interpreted more widely; now some of those specimens are attributed to *T. hantkeni*.

Distribution

T. crassus was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland it was found in the Illyrian Crassus Subzone.

Subfamily Nevaditinae TOZER, 1994

Genus **Nevadites** SMITH, 1914

Type species: *Nevadites merriami* SMITH, 1914

Nevadites cf. *avenonensis* BRACK & RIEBER, 1993

Plate XXX: 2, 3.

v 1986 Group of *Nevadites reitzi* (BÖCKH 1872) — BRACK & RIEBER, Lower Buchenstein beds, p. 200, pl. 2, fig. 2, pl. 4, fig. 4.
v * 1993 *Nevadites avenonensis* n. sp. — BRACK & RIEBER, Anisian/Ladinian boundary, p. 480, pl. 11, figs 9–12, pl. 12, figs 5, 6.
v 1993 *Nevadites* avenonensis n. sp. — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 66, pl. 7, figs 6, 8.
v 2009 *Nevadites* cf. *avenonensis* BRACK and RIEBER, 1993 — VÖRÖS et al., Curionii Zone in Felsőörs, p. 331, pl. I, figs 1, 3.

Material

Four poorly preserved, incomplete specimens from Felsőörs

Measurements

	D	WH	WW	U
M 2009.343.1.	57.1	?	19.1	?
M 2009.342.1.	28.8	21.6	?	?

Description

Medium-sized *Nevadites* with seemingly moderately evolute conch. The whorl-section seems to be subtrapezoidal. The umbilical margin is poorly observed, seems to be subrounded. The flanks are gently convex. The ventrolateral margin is well-marked. The venter is flat. The ornamentation consists of strong ribs and nodes. The ribs are slightly prorsiradiate and projected. The primary ribs run from the umbilical margin to the ventrolateral shoulder. Their number is around eight on a half-whorl of the body chamber. The secondary ribs are usually intercalated; bifurcation was not observed. There are three rows of nodes. The umbilical nodes are rather bulla-like on each primary ribs. The moderately strong lateral nodes appear irregularly on some primary ribs in the inner third of the flank. The ventrolateral nodes (around 16 on a half-whorl) uniformly appear both at the primary and on the secondary ribs. They are adorally projected and become somewhat spinose.

Suture lines are not visible.

Remarks

The above described specimens were collected from almost the highest part of the Felsőörs section (Bed 126), a little below the horizon with *Chieseiceras chiesense* (MOJSISOVICS, 1882), marking the top of the Secedensis Zone. On the basis

of their stratigraphical position, our very incomplete specimens were tentatively attributed to the genus *Nevadites* (see also in VÖRÖS et al. 2009, l. c.). Their morphological features do not contradict this attribution. The morphologically closest *Nevadites* species is *N. avenonensis* BRACK & RIEBER, 1993.

In their earlier paper BRACK & RIEBER (1986, l. c.) described some ammonoids as belonging to the "group of *Nevadites reitzi* (BÖCKH, 1872)". In their later work (BRACK & RIEBER 1993, l. c.) these, and the newly collected specimens formed the basis of their new species *N. avenonensis*. All these specimens were studied by the present author in the collection PIMUZ, Zürich. The specimens included to the type series by the authors seem to portray a very wide range of morphological variation, where our specimens from the Balaton Highland may well be fitted in.

Distribution

N. avenonensis was described from the upper Anisian of the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Secedensis Subzone.

Genus **Chieseiceras** BRACK & RIEBER, 1986

Type species: *Chieseiceras chiesense* (MOJSISOVICS, 1882)

Chieseiceras chiesense (MOJSISOVICS, 1882)

Plate XXIX: 6; Plate XXX: 1.

v * 1882 *Trachyceras chiesense* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 95, pl. XXXIV, fig. 4.
? 1882 *Ceratites zezianus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 44, pl. XXXVII, figs 3, 4.
? 1962 *Trachyceras (Protrachyceras)* sp. cf. T. (P.) *mascagni* TORNQUIST — PARNES, Israel, p. 46, pl. 8, figs 17–18, text fig. 10a.
v 1986 *Chieseiceras chiesense* (MOJS., 1882) — BRACK & RIEBER, Lower Buchenstein beds, p. 195, pl. 1, figs 1–11, pl. 2, figs 1, 3, 4, 9, pl. 4, fig. 7, text-figs 9a–f.
v ? 1986 *Chieseiceras* cf. *chiesense* (MOJS.) — BRACK & RIEBER, Lower Buchenstein beds, p. 199, pl. 2, figs 7, 8, text-fig. 9m.
1993 *Chieseiceras chiesense* (MOJS.) — GAETANI, (ed.), Anisian/Ladinian boundary field workshop, p. 66, pl. 7, figs 1–3, 5.
1995 *Chieseiceras chiesense* (MOJSISOVICS, 1882) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 551, pl. III, fig. 8, pl. IV, fig 5.
1995 *Chieseiceras chiesense* (MOJSISOVICS, 1882) — DE ZANCHE et al., Dolomites, p. 148, pl. III, figs 2, 3, 7.
v non 1998 *Chieseiceras chiesense* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 21, pl. VIII, fig. 4.
v 2009 *Chieseiceras chiesense* (MOJSISOVICS, 1882) — VÖRÖS et al., Curionii Zone in Felsőörs, p. 329, pl. I, fig. 2, pl. II, figs 2, 3.

Material

Seven incomplete and poorly preserved specimens from Felsőörs.

Measurements

	D	WH	WW	U
M 2009.346.1.	129.5	41.1	?	?
M 2009.341.1.	79.4	37.7	?	?

Description

Medium to large-sized *Chieseiceras*, with seemingly moderately evolute conch. The whorl section is high subtrapezoidal. The umbilical edge is not seen. The flanks are gently convex and join the venter at a marked ventrolateral edge. The venter is rather wide and concave. The flanks are ornamented with prominent ribs and nodes. The rectiradiate primary ribs and the bifurcating secondary ribs are arranged into bundles. There are no definite umbilical and lateral nodes. Prominent nodes develop at the ventrolateral ends of the primary and secondary ribs. Their number is 32 to 44 on a half-whorl of the body chamber. The inner whorls are also strongly ornamented.

Suture lines are not seen.

Remarks

The holotype of *C. chiesense*, designated by BRACK & RIEBER (1986, p. 196), is housed in the collection GBAW (Wien). Both this, and the numerous specimens figured by BRACK & RIEBER (1986, l. c.) and kept in the collection PIMUZ, Zürich, were inspected by the present author. Thus the identification of the specimens from the Balaton Highland seems to be ascertained, despite of their poor state of preservation. This identification is further supported by the fact that they were collected from the highest exposed beds of the Felsőörs section (Bed 129/A) just below the first occurrence of *Eoprotrachyceras* species (VÖRÖS et al. 2009, l. c.).

The species described as "*Ceratites*" *zezianus* by MOJSISOVICS (1882, l. c.) from the Southern Alps and Felsőörs was identified with *Chieseiceras chiesense* by BRACK & RIEBER (1986, l. c.). This suggestion is accepted here, though it should

be remarked that the recent collections at Felsőörs did not yield any forms properly corresponding to "*Ceratites zezianus*".

PARNES (1962, l. c.) described a specimen from the "lower Ladinian" of Israel under the name "*Trachyceras* (*Protrachyceras*) sp. cf. *T.* (*P.*) *mascagni* TORNQUIST". This ammonoid is quite different from the species *mascagni,* as described by TORNQUIST (1898, p. 660, pl. XXI, fig.4), which is more evolute, with narrow and fastigate venter. At the same time, PARNES' specimen is very similar to *C. chiesense* in ribbing and sulcate venter, with the slight difference that its ventral furrow is narrower. Therefore this item is tentatively included in the synonymy of *C. chiesense.*

In the previous work by the present author (VÖRÖS 1998, l. c.) a *Chieseiceras* specimen was illustrated as *C. chiesense*. At present, that specimen, collected from somewhat deeper level in Felsőörs, is attributed to another, undetermined species of *Chieseiceras*.

Distribution

C. chiesense was described from the upper Anisian of the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Secedensis Subzone.

Chieseiceras sp. A
Plate XXIX: 5.

v 1998 *Chieseiceras chiesense* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 21, pl. VIII, fig. 4.

Material

One well preserved body chamber from Felsőörs.

Measurements

	D	WH	WW	U
M.98.24	66.5	26.1	17.1	?

Description

Medium-sized *Chieseiceras*, with moderately evolute conch. The whorl section is high subtrapezoidal. The umbilical edge is subrounded. The flanks are gently convex and join the venter at a marked ventrolateral edge. The venter is wide and concave. The flanks are ornamented with prominent ribs. The primary ribs (around 12 on a half whorl of the body chamber) are rectiradiate and partly sinuous. The secondary ribs are inserted at around mid flank. There are no definite umbilical and lateral nodes. Prominent nodes develop at the ventrolateral ends of both the primary and the secondary ribs. Their number is 24 on a half-whorl of the body chamber.

The suture line is ceratitic, with three entire lateral saddles and moderately indented lateral lobes.

Remarks

This specimen was described by VÖRÖS (1998, l. c.) as *Chieseiceras chiesense* (MOJSISOVICS, 1882), though it was more coarsely ribbed. Discussions with H. RIEBER and P. BRACK convinced the present author, that this *Chieseiceras* may belong to another species occurring in deeper level, significantly below the true *chiesense* horizon (top of the Secedensis Subzone). The mentioned colleagues found this form in the Seceda section (pers. comm.), and also in Bagolino (BRACK et al. 2005, figs 5, 7) about two metres below the "*chiesense* groove". Regrettably, they neither gave a species name to those findings, nor illustrated them. The scarcity of the Felsőörs material does not allow the introduction of a new species name.

Distribution

At the Balaton Highland this taxon was found in the Illyrian Crassus Subzone.

Family Hungaritidae WAAGEN, 1895

Genus **Hungarites** MOJSISOVICS, 1879

Type species: *Hungarites mojsisovicsi* (ROTH, 1871)

SPATH (1951, p. 9, 16, 17) argued that this genus should be restricted to the Ladinian (now late Anisian) forms, most of all to the type species *Hungarites mojsisovicsi* (ROTH, 1871), which had no connection/transition to the morphologically similar early Anisian forms. Nevertheless, in the "Treatise" (ARKELL et al. 1957, p. L155, L156) the early Anisian species "*Hungarites*" *yatesi* HYATT & SMITH, 1905 was selected to illustrate the genus *Hungarites,* and this might led to some misunderstandings. The new classification of the Triassic ammonoids by TOZER (1981, p. 93) gave a clearer view, and *Hungarites* was assembled with other Ladinian genera (from the Sephardic province) into the family Hungaritidae.

The type species, *Hungarites mojsisovicsi* (ROTH, 1871), was designated also by SPATH (1951, p. 16) who indicated the synonymy with "*Ceratites*" *zalaensis* (BÖCKH, 1872) but obviously gave priority to *H. mojsisovicsi.*

In the present monograph, the genus *Hungarites* is restricted to the smooth or variously ribbed forms without any kind of nodosity. The species having umbilical nodes are included to the new genus *Bullatihungarites*, whereas the forms with ventrolateral nodes are assembled into the new genus *Nodihungarites*. In the present interpretation the genus *Hungarites* (s. s.) comprises the following species:

Hungarites mojsisovicsi (ROTH, 1871, p. 213) = *H. zalaensis* (BÖCKH, 1872)
Hungarites costosus (MOJSISOVICS, 1882, p. 223, pl. VIII, fig. 4)
Hungarites lenis (HAUER, 1896, p. 252, pl. VI, figs 1, 2, 7 only)
Hungarites sinuosus n. sp.
Hungarites szentei n. sp.

The above listed species are described in detail in the present monograph, except *H. lenis* (HAUER, 1896), which does not seem to occur in the late Anisian of the Balaton Highland. Nevertheless the interpretation of *H. lenis* needs some comments below.

The specimen figured by HAUER (1896, pl. VI, figs 1, 2) was designated as the lectotype of *lenis* by SPATH (1934, p. 457, although described as *Semiornites lenis*). The lectotype (under the inventory number: NHMW 1998z0063/0007) is kept in the collection NHMW (Wien), besides further two ammonoids, described and figured by HAUER (1896, pl. VI, figs 3–6), who considered them belonging also to "*Ceratites*" *lenis*. The present author carefully examined these three specimens and concluded that they represent three different taxa. The lectotype (HAUER 1896, pl. VI, figs 1, 2) is a true *Hungarites*, with smooth umbilical rim, even in the inner whorls (in contrast to the figure given by HAUER, l. c.); with weak ribbing throughout the lateral sides (even on the body chamber) and fastigate venter. The second specimen figured by HAUER (1896, pl. VI, figs 3, 4) has definite umbilical nodes passing to radial swellings, and well-developed ventrolateral nodes and carinate venter; it may very probably belong to the genus *Parahungarites* n. gen. (introduced herein). The third specimen, figured by HAUER (1896) on pl. VI, figs 3, 4, shows a lateral ornamentation more or less similar to the previous one, but its venter bears a low, blunt keel; it seems rather close to the genus *Lardaroceras*. It can hardly be understood why HAUER (1896) lumped these apparently quite different forms into a single species; but anyhow, it was the source of later misinterpretations of the species *lenis*.

Hungarites mojsisovicsi (ROTH, 1871)

Plate XXX: 4–6; Plate XXXI: 1–5; Plate XXXII: 1–4; Plate XXXIII: 1, 2; Plate XXXIV: 1–3; Figures 64–69.

v * 1871 *Ceratites mojsisovicsi* BÖCKH M. S. — ROTH, Forráshegy, p. 213.
v 1872 *Ceratites Zalaensis* n. sp. — BÖCKH, Bakony déli részének, p. 145, pl. VII, figs 1, 2.
v 1873 *Ceratites Zalaensis* n. sp. — BÖCKH, Südlichen Theiles des Bakony, p. 155, pl. VII, figs 1, 2.
v 1882 *Hungarites mojsisovicsi* (BOECKH) E. v. M. — MOJSISOVICS, Mediterr. Triasprovinz, p. 222, pl. VII, fig. 6, pl. VIII, fig. 3.
non 1903 *Hungarites mojsisovicsi* ROTH sp. — FRECH, Neue Cephalopoden, p. 10, pl. III, figs 2, 3.
non 1910 *Hungarites mojsisovicsi* ROTH *(Judicarites)* — RENZ, Argolis, p. 33, pl. I, fig. 5.
v 1989 *Hungarites mojsisovicsi* (ROTH, 1871) — VÖRÖS & PÁLFY, Vászoly, p. 19., pl. I, fig. 4, pl. II, fig. 2.
v 1989 *Hungarites* cf. *lenis* (HAUER, 1896) — VÖRÖS & PÁLFY, Vászoly, p. 19., pl. I, fig. 6.
v ? 1993 *Hungarites zalaensis* (BÖCKH, 1872) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 461 (partim), pl. 1, figs 3, 7, 8 (only).
v 1993 *Hungarites lenis* — VÖRÖS, Reitzi Zone, p. 27, pl. IV, fig. 4.
v 1993 *Hungarites mojsisovicsi* — VÖRÖS, Reitzi Zone, p. 27, pl. V, fig. 3.
v 1993 *Hungarites mojsisovicsi* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 13, fig. 3.
? 1995 *Hungarites zalaensis* (BÖCKH, 1872) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 551 (partim), pl. III, fig. 6 (only), non fig. 7.
v 1998 *Hungarites mojsisovicsi* (ROTH, 1871) — VÖRÖS, Balaton-felvidék, p. 21, 38, 42, (partim), pl. IV, figs 4, 5 (only) (non fig . 6), pl. VI, fig. 1.
v 2002 *Hungarites mojsisovicsi* (ROTH) — VÖRÖS, Paleoenvironmental distribution, p. 486 (partim), pl. 1, figs 1, 2.
? 2005 *Hungarites zalaensis* (BÖCKH, 1872) — MANFRIN et al., Latemar, p. 481 (partim), figs 9/24–27 (only), non fig. 28.

Material

79 specimens from Felsőörs (22), Vörösberény (2), Szentkirályszabadja (10), Vászoly (14), Mencshely (18), Sóly (8), Barnag (1), Hajmáskér (2) and Öskü (2).

Measurements

	D	WH	WW	U
Lectotype T.1662.	100.3	?	25.2	?
Paralectotype T. 3085.	68.1	36.1	?	12.5

	D	WH	WW	U
T 2017.12.1.	81.6	46.8	25.8	11.5
INV 2017.252.1.	110.5	46.1	25.5	20.7
INV 2017.251.1.	110.1	47.2	24.6	22.4
M.89.101	108.5	46.5	23.3	20.6
INV 2017.301.1.	96.3	45.0	?	17.4
INV 2017.249.1.	92.1	44.4	?	13.1
M.89.90	81.7	37.8	17.5	12.9
INV 2017.247.1.	74.9	33.6	16.3	?
INV 2017.248.1.	74.1	?	19.3	?
M.98.36	71.1	34.1	15.1	9.5
INV 2017.253.1.	70.6	40.8	?	?
INV 2017.246.1.	70.5	34.1	17.1	?
M.98.35	68.5	33.4	15.5	9.1
M.98.152A	64.1	31.1	14.5	9.5
INV 2017.250.1.	61.9	35.1	15.4	7.2

Description

Medium to large-sized *Hungarites* with very involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The umbilical margin is smooth. The flanks are gently convex, almost flat and meet the venter at a definite ventrolateral shoulder. On the phragmocone and on the immature specimens, the venter has a mostly sharp keel, always well separated from the ventrolateral shoulders by flat bands (Figure 64). The keel gradually disappear on the mature body chamber and the venter becomes flat or gently fastigate (Figure 65). The body chamber shows definite umbili-

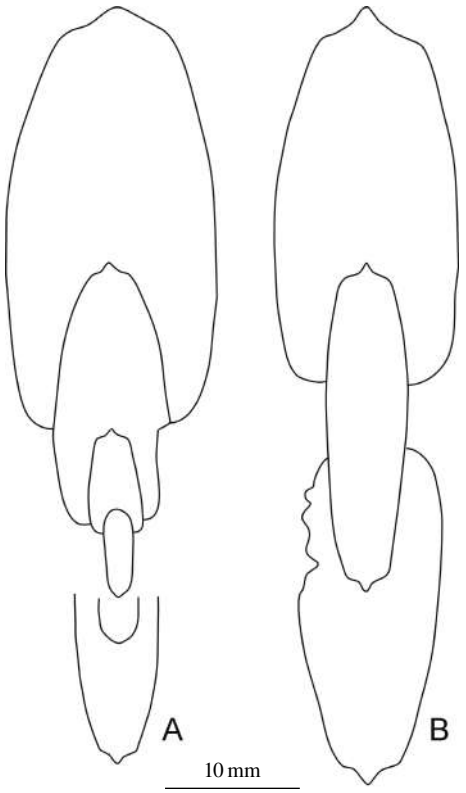


Figure 64. Cross sections of *Hungarites mojsisovicsi* (Roth, 1871), A: M.89.126, Vászoly, P–11a, Bed 12, Reitzi Zone, Liepoldti Subzone; B: M.89.97, Vászoly, P–11a, Bed 16/A, Secedensis Zone, Crassus Subzone

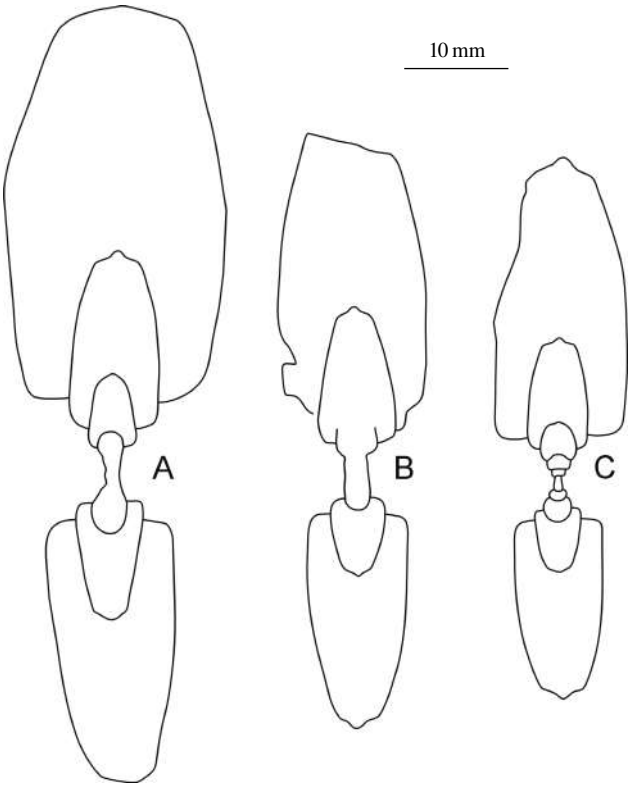


Figure 65. Cross sections of *Hungarites mojsisovicsi* (Roth, 1871), A: T 2017.12.1., Vászoly, P–11c, loose, Reitzi Zone, Reitzi Subzone (?); B: M.98.152A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; C: INV 2017.298.1., Vászoly, P–2, Bed 4, Reitzi Zone, Reitzi Subzone

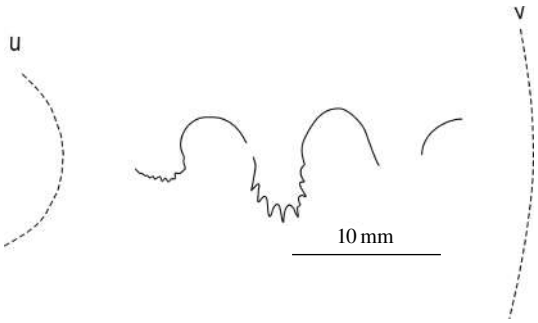


Figure 66. Suture line of *Hungarites mojsisovicsi* (Roth, 1871), Paralectotype, T.3085., at 30 mm whorl-height, Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?), u: umbilical margin, v: ventrolateral margin

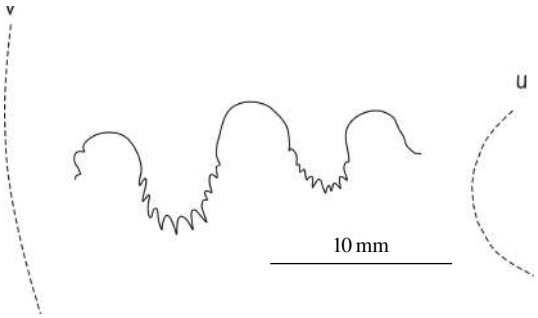


Figure 67. Suture line of *Hungarites mojsisovicsi* (Roth, 1871), INV 2017.246.1., at 26 mm whorl-height, Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

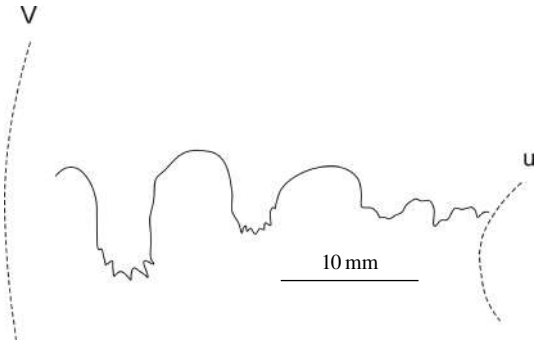


Figure 68. Suture line of *Hungarites mojsisovicsi* (Roth, 1871), INV 2017.252.1., at 32 mm whorl-height, Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

Figure 69. Suture line of *Hungarites mojsisovicsi* (Roth, 1871), INV 2017.298.1., at 29 mm whorl-height, Vászoly, P–2, Bed 4, Reitzi Zone, Reitzi Subzone, u: umbilical margin, v: ventrolateral margin

cal egression. The ornamentation is very weak or absent. Most specimens show irregularly spaced, very gentle, sinuous and projected ribs, or rather radial folds. These radial folds are the strongest at around the mid-flank and gradually disappear ventrally; rarely, secondary folds are inserted near the venter. In many cases, the ornamentation of the body chamber becomes weaker and the folds develop into irregularly spaced bundles. Nodes are totally absent.

The suture line (Figures 66–69) is ceratitic, tending to be subammonitic, with at least three lateral saddles with occasional incisions at their sides. The first lateral lobe is very deep and strongly denticulated; the second (and the indistinct third) lateral lobe are reduced in all respects. Vague suspensive lobes are seen near the umbilical margin.

Remarks

The larger specimen figured by Böckh (1872, pl. VI, fig. 1) as "*Ceratites*" *zalaensis*, and subsequently by Mojsisovics (1882, p. 222, pl. VII, fig. 6) as *Hungarites mojsisovicsi*, was designated as the lectotype of *mojsisovicsi* by Spath (1951, p. 16). The smaller (better preserved) specimen, figured by Böckh (1872, pl. VI, fig. 2) and later by Mojsisovics (1882, pl. VIII, fig. 3) became the paralectotype of *H. mojsisovicsi* (Roth, 1871). Both specimens are kept in the collection of the MGSH, under the inventory numbers T.1662. (lectotype) and T.3085. (paralectotype), respectively. They are re-figured here on Plate XXXI: 1 and Plate XXX: 4.

Many authors (see the synonymy) preferred to denote this species as *zalaensis* (Böckh) instead of *mojsisovicsi* (Roth). This nomenclatural contradiction will be discussed and cleared up in the following.

The first, regrettably laconic, but valid description of this species (as "*Ceratites mojsisovicsi* Böckh M. S.") was published by Roth (1871, p. 213), in Hungarian:

„Ezen alak [*Ceratites Böckhi* n. sp.] mely hármas gömbsora, úgymint részint lobaszerkezete által *Cerat. binodosus*ra emlékeztet, ettől jól kifejlődött taraja által már lényegesen különbözik. Ez utóbbi (a taraj) *Cerat. mojsisovicsi* Böckh M. S.-val hozza kapcsolatba, ettől pedig gömbékesítése, valamint nem szűkülő első oldallobusa által van elkülönítve."

That is, in English translation:

"This form [„*Ceratites Böckhi* n. sp."] by its three rows of nodes and partly by the structure of its suture line reminds to *Cerat. binodosus* but from this it differs substantially by its well developed crest. This latter (the crest) brings it into connection with *Cerat. mojsisovicsi* Böckh M. S., from which it is separated by its nodose ornament and its not narrowing first lateral lobe."

It is a very simple differential diagnosis, with the definite statements that the species "*Ceratites mojsisovicsi*" is similar to "*Ceratites Böckhi*" in having a "crest" (i.e. fastigate or keeled venter) but it is different from "*C. Böckhi*" because it does not have nodose ornament (i.e. smooth) and its first lateral lobe is narrowing. This diagnosis meets the requirements of availability according to the Article 12.1. of the ICZN (ICZN 1999, p. 23) which says: "To be available, every new name published before 1931 must ... be accompanied by a description or a definition of the taxon that it denotes." Therefore, the species name „*mojsisovicsi*" is available and has to be maintained. The name "*Cer. mojsisovicsi*" was mentioned again by Böckh (1872, p. 140 and 1873a, p. 150, in footnote) as reference to „*Cer. Zalaensis*" what he intended to introduce as a substitute name for "*Cer. mojsisovicsi*". It is remarkable that Roth (1871, p. 213), when first mentioning this species name, attributed the authorship to Böckh: "*Ceratites mojsisovicsi* Böckh M. S." implying that this name was originally given by Böckh. The reason why Böckh wanted

to change this name is hardly comprehensible. After all, BÖCKH's "*C. Zalaensis*" is here taken as a junior objective synonym of "*C. mojsisovicsi* ROTH". Regrettably, the diagnosis of "*C. mojsisovicsi*" was published only in Hungarian, but this does not change its status in the zoological nomenclature. The Recommendation 13B of the ICZN (ICZN 1999, p. 24: "Authors should publish diagnoses of new taxa in languages widely used internationally in zoology.") applies only to names published after 1931.

As far as the authorship is concerned, not BÖCKH, but ROTH has to be regarded as the author of the species *mojsisovicsi*, because the latter author gave the first definiton of this taxon (ROTH 1871, p. 213). Therefore the present author does not accept the action of MOJSISOVICS (1882, p. 222) who cited BÖCKH as the author of this species and agrees with the usage by SPATH (1951, p. 16) and in the "Treatise" (ARKELL et al. 1957, p. L156) where the authorship of "*Hungarites mojsisovicsi*" is given to ROTH, 1871.

The lectotype and paralectotype of *H. mojsisovicsi* are available in the collection of the MGSH, moreover our recent collecting works yielded a great amount of *H. mojsisovicsi* specimens. On this basis, the wide morphological variation and the diagnostic features of this species were properly defined. Other species of *Hungarites* differ from the type species mostly in their stronger ornamentation. *H. costosus* MOJSISOVICS, 1882 has stronger ribbing and much higher and sharper keel, even on the body chamber. *H. lenis* (HAUER, 1896) stands very close to *H. mojsisovicsi*, but its ribbing is more regular, rectiradiate and runs through the flanks, from the umbilical to the ventrolateral margin. In *H. sinuosus* n. sp., the sinuous radial folds are more distinct, prorsiradiate and become stronger towards the venter. In *H. szentei* n. sp. the strong radial folds increase in width and strength ventrally and bear projected swellings at their ventral ends.

Two specimens illustrated as *H. mojsisovicsi* by FRECH (1903) show definite umbilical nodosity what renders them close to the new genus *Bullatihungarites*.

The specimen figured as *H. mojsisovicsi* by RENZ (1910, pl. I, fig. 5) has very distinct and strong ribbing, therefore it definitely does not belong to this species.

In some previous works the present author (VÖRÖS & PÁLFY 1989, VÖRÖS 1993), in lack of direct knowledge on the lectotype of *H. lenis* (HAUER, 1896), certain specimens of *H. mojsisovicsi* were wrongly attributed to *lenis*. Moreover, one of the specimens, figured as *H. mojsisovicsi* by VÖRÖS (1998, pl. IV, fig. 6), according to the present revision, is believed to belong to *Bullatihungarites* aff. *emiliae* (MOJSISOVICS, 1882).

BRACK & RIEBER (1993, l. c.), and also in GAETANI (ed.) (1993, l. c.), too widely and partly wrongly interpreted *H. mojsisovicsi* (what they mentioned and described under the invalid name *H. zalaensis*). Their specimens were examined by the present author in the collection PIMUZ, Zürich, and only a few of them (figured by BRACK & RIEBER 1993 on pl. 1, figs 3, 7, 8) may perhaps belong to *H. mojsisovicsi*. The majority of their figured specimens has definite nodes (or bullae) on the umbilical margin (BRACK & RIEBER 1993, pl. 1, figs 1, 2, 4–6). In the author's opinion these are attributed to *Bullatihungarites emiliae* (MOJSISOVICS, 1882).

Some of the specimens figured by MIETTO & MANFRIN (1995, l. c.) and MANFRIN et al. (2005, l. c.) (who also used the invalid name *H. zalaensis*) may belong to *H. mojsisovicsi*, although, as far as the photographs show, the umbilical margin seems somewhat nodose. Some others of their figured specimens (MIETTO & MANFRIN 1995, pl. III, fig. 7) and (MANFRIN et al. 2005, fig. 9/28) probably represent different species of *Bullatihungarites*.

Distribution

H. mojsisovicsi was described from the upper Anisian of the Balaton Highland and the Southern Alps. At the Balaton Highland it ranges from the Illyrian Felsoeoersensis Subzone to the Crassus Subzone.

Hungarites costosus MOJSISOVICS, 1882
Plate XXXV: 4, 5.

v 1872 *Ceratites* n. sp. indet. — BÖCKH, Bakony déli részének, p. 149, pl. VIII, fig. 6.
v 1873 *Ceratites* n. sp. indet. — BÖCKH, Südlichen Theiles des Bakony, p. 159, pl. VIII, fig. 6. 2.
v * 1882 *Hungarites costosus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 223, pl. VIII, fig. 4.
? 1903 *Hungarites costosus* MOJS. em. FRECH — FRECH, Neue Cephalopoden, p. 12, pl. III, fig. 4.
v 1993 *Halilucites costosus* — VÖRÖS, Reitzi Zone, p. 25, pl. V, fig. 5, pl. VI, fig. 3.
v 1993 *Halilucites costosus* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 118, pl. 13, fig. 8.

Material

Five specimens from Felsőörs (1), Vászoly (2), Mencshely (1) and Balatoncsicsó (1).

Measurements

	D	WH	WW	U
Holotype T.693.	77.8	32.2	21.1	?
INV 2017.254.1.	35.4	?	?	?

Description

The new collections yielded only poor fragments, therefore this description is partly based on the holotype of *H. costosus*, available in the collection of the MGSH (inventory number: T.693.), and re-figured here (Plate XXXV: 4).

Medium to large-sized *Hungarites* with involute, moderately compressed conch. The whorl-section is oval to subquadrate. The umbilical wall is poorly seen. The umbilical margin is smooth. The flanks are gently convex, and meet the venter at a definite ventrolateral shoulder. The venter has a very sharp and high keel, well separated from the ventrolateral shoulders by flat, almost concave belts. These give a tricarinate appearance to the actually unicarinate venter. The ornamentation consists of somewhat irregular, sinuous and projected ribs, starting in the inner third of the flank and becoming gradually stronger ventrally. At the ventrolateral margin the ribs become strongly projected, then fade out in the form of weak, diagonal folds.

The suture lines are poorly seen; ceratitic, with three lateral saddles and moderately denticulated first and second lateral lobes.

Remarks

The type specimen of *H. costosus* was first illustrated by BÖCKH (1872, 1873, l. c.) as "*Ceratites* n. sp. indet." , but the first binominal description of this species was given by MOJSISOVICS (1882, l. c.). It may be mentioned that the figures published by BÖCKH (l. c.) is much more realistic than those of MOJSISOVICS (l. c.).

FRECH (1903, l. c.) illustrated two specimens of *H. costosus* from the type locality; they may, in all probability, belong to this species.

In a previous paper (VÖRÖS 1993, l. c.) and also in GAETANI (ed. 1993, l. c.) the present author attributed this species to the genus *Halilucites*. MIETTO et al. (2003, p. 459) and MANFRIN et al. (2005, p. 498) rightly criticized this attribution and suggested that the species *costosus* may belong to a new genus. Their criticism is accepted, but, instead of creation of a new genus, the species *costosus* is now attributed to *Hungarites* in the concept of the present revision of this genus.

Distribution

Up to now, *H. costosus* is known only from the Balaton Highland, where it occurs in the Illyrian Avisianum Subzone and probably in the Crassus Subzone.

Hungarites sinuosus n. sp.
Plate XXXIV: 4, 5; Plate XXXV: 1–3; Figures 70, 71.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.38.1.

Locus typicus: Mencshely I, Bed 6.

Stratum typicum: Red, green-spotted crinoidal limestone (Vászoly Formation); upper Illyrian, Reitzi Zone, Avisianum Subzone.

Derivatio nominis: Referring to the ornamentation, the sinuous ribbing on the flanks.

Diagnosis: Medium to large-sized, very involute *Hungarites* with high oval whorls and vertical umbilical wall. Umbilical margin smooth. Venter arched to fastigate, with distinct low keel. Ribs prorsiradiate, sinuous, projected, strength increasing ventrally. Ornament stronger on body chamber. Nodes absent. Suture subammonitic.

Material

Six specimens from Felsőörs (1), Vászoly (2) and Mencshely (3).

Measurements

	D	WH	WW	U
Holotype PAL 2017.38.1.	88.5	40.8	19.1	13.5
Paratype PAL 2017.39.1.	103.1	?	29.1	?
Paratype M.89.100	97.3	39.6	23.7	20.7
Paratype PAL 2017.40.1.	78.7	33.3	21.9	17.3
Paratype PAL 2017.41.1.	70.5	38.1	20.4	?

Description

Medium to large-sized *Hungarites* with very involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The umbilical margin is smooth. The flanks are gently convex, almost flat and meet the venter at an indistinct ventrolateral shoulder. On the phragmocone and on the immature specimens, the venter has a narrow but

low and rounded keel, moderately separated from the ventrolateral shoulders. The mature body chamber has a gently fastigate venter and shows definite umbilical egression. The ornamentation consists of rather regularly spaced, prorsiradiate, sinuous and projected ribs, or folds. The ribs start near the umbilical margin and become stronger ventrally; rarely, secondary folds are inserted near the venter. In most cases, the strength of the ornamentation increases on the body chamber. Nodes are totally absent.

The suture line (Figure 71) is subammonitic, with four lateral saddles showing incisions at their sides. The first lateral lobe is very deep and strongly denticulated; the second and the third lateral lobes are reduced in all respects. Several suspensive lobes are seen near the umbilical margin.

Remarks

The most important distinctive feature of *H. sinuosus* is the moderately strong, prorsiradiate, sinuous ribbing, increasing in strength towards the ventrolateral margin. The ornamentation of *H. mojsisovicsi* (ROTH, 1871) is much weaker or absent, and it has higher and sharper keel. *H. costosus* MOJSISOVICS, 1882 has stronger ribbing and much higher and sharper keel, even on the body chamber. From some aspects *H. lenis* (HAUER, 1896) stands between *H. sinuosus* and *H. mojsisovicsi*, but its ribbing is more regular, rectiradiate and runs through the flanks in uniform strength, from the umbilical to the ventrolateral margin. In *H. szentei* n. sp. the ribs are straight and increase in width and strength ventrally and bear projected swellings at their ventral ends.

Distribution

Up to now *H. sinuosus* n. sp. is known only from the Balaton Highland, where it ranges from the Illyrian Avisianum Subzone to the Crassus Subzone.

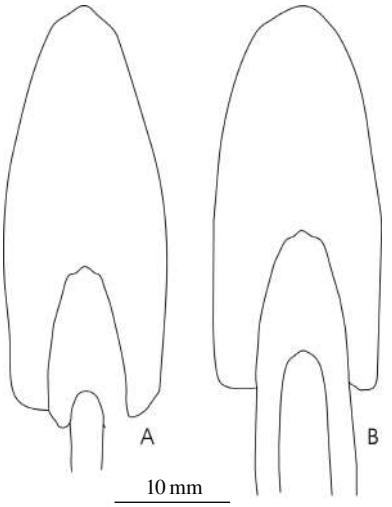


Figure 70. Cross sections of *Hungarites sinuosus* n. sp., A: Holotype, PAL 2017.38.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone; B: Paratype, M.89.100, Vászoly, P–11a, Bed 16/A, Secedensis Zone, Crassus Subzone

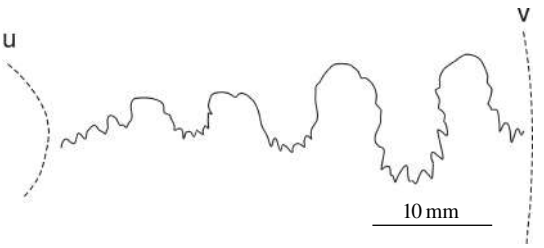


Figure 71. Suture line of *Hungarites sinuosus* n. sp., Holotype, PAL 2017.38.1., at 41 mm whorl-height, Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventrolateral margin

Hungarites szentei n. sp.
Plate XXXVI: 1–4; Figure 72.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2017.42.1.

Locus typicus: Vászoly, Trench P–14 (loose).

Stratum typicum: Ochre-yellow limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of István SZENTE, renowned Hungarian palaeontologist.

Diagnosis: Medium to large-sized, involute *Hungarites* with high oval whorls and vertical umbilical wall. Umbilical margin smooth. Venter with low keel in the phragmocone; fastigate in body chamber. Ribs prorsiradiate, straight, strength increasing ventrally, projected swellings on ventrolateral ends of ribs. Ornament stronger on body chamber. Suture ceratitic to subammonitic.

Material

Four specimens from Szentkirályszabadja (2) and Vászoly (3).

Measurements

	D	WH	WW	U
Holotype PAL 2017.42.1.	98.6	40.8	23.3	26.7
Paratype PAL 2017.45.1.	82.5	34.2	?	20.8
Paratype PAL 2017.44.1.	81.5	30.6	18.1	15.8
Paratype PAL 2017.43.1.	76.6	32.5	18.5	14.4

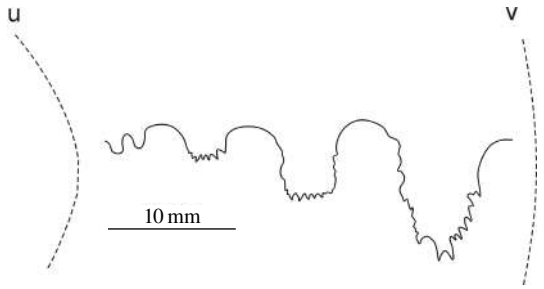


Figure72.Suture line of *Hungarites szentei* n. sp., Holotype, PAL 2017.42.1., at 35 mm whorl-height, Vászoly, P–14, loose, Secedensis Zone (?), Crassus Subzone (?), u: umbilical margin, v: ventrolateral margin

Description

Medium to large-sized *Hungarites* with involute, moderately compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The umbilical margin is smooth. The flanks are gently convex, almost flat and meet the venter at a distinct ventrolateral shoulder. On the phragmocone the venter has a narrow but low and rounded keel, moderately separated from the ventrolateral shoulders. The mature body chamber has fastigate venter and shows definite umbilical egression. The ornamentation consists of regularly spaced, prorsiradiate, straight ribs. The ribs start not far from the umbilical margin and become very strong ventrally; rarely and irregularly, secondary riblets are inserted near the venter. At the ventrolateral margin the ribs end with prominent, projected swellings. The strength of the ornamentation increases on the body chamber.

The suture line (Figure 72) is ceratitic, tending to subammonitic, with four lateral saddles partially showing incisions at their sides. The very deep first lateral lobe is strongly and irregularly denticulated; the second and the third lateral lobes are weakly denticulated. Suspensive lobes appear near the umbilical margin.

Remarks

H. szentei differs from other species of *Hungarites* by its straight and very strong ribbing. *H. costosus* MOJSISOVICS, 1882 is similarly or even more strongly ribbed, but it has very high and sharp keel on the body chamber, which is simply fastigate in *H. szentei*.

Distribution

Up to now *H. szentei* n. sp. is known only from the Balaton Highland, where it ranges from the Illyrian Reitzi Subzone to the Crassus Subzone.

Genus ***Bullatihungarites*** n. gen.

Type species: *Bullatihungarites emiliae* (MOJSISOVICS, 1882).

Diagnosis: Small to medium-sized hungaritids with very involute conch. Whorl section high oval; umbilical wall vertical to oblique. Venter with sharp ventrolateral shoulder and high keel. Prorsiradiate to rectiradiate, partly sinuous radial folds, widening and fading out ventrally. Bullate umbilical nodes present; lateral or ventrolateral nodes absent. Suture ceratitic, tending to subammonitic; three to four, narrow and high lateral saddles, first lateral lobe deep with strong denticulation.

Derivatio nominis: Referring to the bullate ornament along the umbilical margin.

Nominal species belonging to *Bullatihungarites*:

Bullatihungarites emiliae (MOJSISOVICS, 1882, p. 223, pl. VIII, fig. 8.)
Bullatihungarites semiplicatus (HAUER, 1896, p. 265, pl. XI, figs 4–6.)

Discussion: Until recently, the late Anisian hungaritids of the Tethyan province (except the Sephardic ones) were assembled into one genus, namely the *Hungarites*, with the type genus *H. mojsisovicsi* (ROTH, 1871), according to the designation by SPATH (1951, p. 16). In the conception of the present monograph, considering the essential morphological characters of the type species, *Hungarites* includes only weakly ornamented species, without any nodes. Therefore, a new genus *Bullatihungarites* was necessary to be introduced for the forms with umbilical nodosity. In typical case these bullate umbilical nodes pass into radial swellings gradually widening and fading in ventral direction.

Distribution: Late Anisian; Southern Alps, Dinarides, Balaton Highland. At the Balaton Highland *Bullatihungarites* ranges from the Illyrian Reitzi to Crassus Subzones.

Bullatihungarites emiliae (MOJSISOVICS, 1882)
Plate XXXVII: 1–8; Plate XXXVIII: 1; Figures 73–75.

v * 1882 *Hungarites Emiliae* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 223, pl. VIII, fig. 8.
v ? 1896 *Ceratites (Hungarites) plicatus* HAU. n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 266, pl. IX, figs 8–10.
v 1900 *Hungarites Emiliae* MOJS. — DIENER, Muschelkalk–Cephalopoden südl. Bakony, p. 27, pl. II, fig. 4.
v ? 1993 *Hungarites zalaensis* (BÖCKH, 1872) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 461 (partim), pl. 1, figs 1, 2, 4, 5, 6, textfigs 15a, b (only). (non figs 3, 7, 8).

v ? 1993 *Hungarites zalaensis* (BÖCKH, 1872) — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 66, pl. 6, fig. 9.
v ? 1993 *Hungarites* cf. *plicatus* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 462 (partim), pl. 2, figs 1–3, (only), (non figs 4, 8, 9).
v 1998 *Hungarites emiliae* MOJSISOVICS, 1882 — VÖRÖS, Balaton-felvidék, p. 42, pl. V, fig. 8.
v 1998 *Hungarites mojsisovicsi* (ROTH, 1871) — VÖRÖS, Balaton-felvidék, p. 42, (partim), pl. IV, fig. 6.
v 2002 *Hungarites mojsisovicsi* (ROTH) — VÖRÖS, Paleoenvironmental distribution, p. 486 (partim), pl. 1, fig. 3.
? 2005 *Hungarites zalaensis* (BÖCKH, 1872) — MANFRIN et al., Latemar, p. 481 (partim), figs 9/24–27 (only), non fig. 9/28.

Material

32 specimens from Vászoly (2), Mencshely (8) and Sóly (22).

Measurements

	D	WH	WW	U
INV 2017.258.1.	92.7	41.5	20.3	14.5
M.98.229A	66.1	31.5	17.5	12.8
M.98.37	56.1	28.8	12.4	5.8
M.98.208A	56.0	29.6	14.4	10.5
INV 2017.256.1.	53.1	?	14.5	9.1
M.98.40	52.1	26.2	11.5	7.8
M.98.239A	31.3	15.4	7.3	5.7
INV 2017.255.1.	31.1	14.6	7.2	5.1
INV 2017.257.1.	31.1	?	?	?

Description

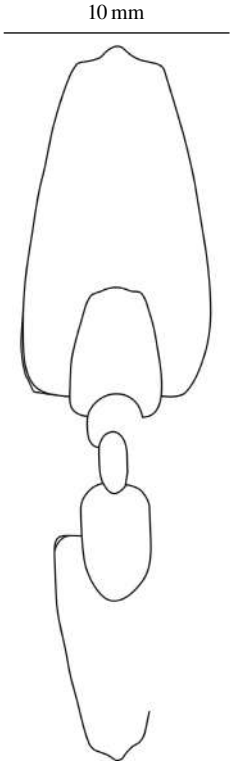


Figure 73. Cross section of *Bullatihungarites emiliae* (MOJSISOVICS, 1882), INV 2017.299.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone

Small to medium-sized *Bullatihungarites* with very involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to vertical. The flanks are gently convex, almost flat and meet the venter at a sharp and smooth ventrolateral shoulder. The venter has a rather high, subrounded keel, separated from the ventrolateral shoulders by narrow, concave belts. The ornamentation consists of prorsiradiate, partly sinuous ribs, or rather folds. The ribs start with definite umbilical nodes or bulges (7 to 8 on a half whorl) at the umbilical margin; here they have the form of wide swellings with narrower interspaces. Towards the mid-flank, the swellings become even wider and very low. Further ventrally they gradually fade out, and rarely reach the ventrolateral margin. The strength of the ornamentation increases on the body chamber and nodes appear at the ventrolateral margin (lateral nodes are absent). The mature body chamber (over 75 mm diameter) has a keeled venter with rather strong, projected ventrolateral nodes, and shows definite umbilical egression.

The suture line (Figures 74, 75) is ceratitic to partly subammonitic, with four, rather narrow and high lateral saddles. The first lateral lobe is very deep, widely expands posteriorly and strongly denticulated; the second and the third lateral lobes are reduced in all respects. Suspensive lobes are seen near the umbilical margin in one specimen (Figure 75). The shape of the saddles changes according to ontogeny: in small specimens (Figures 74a, 74b) they have monophyllic heads and show few incisions at their sides; in larger specimens

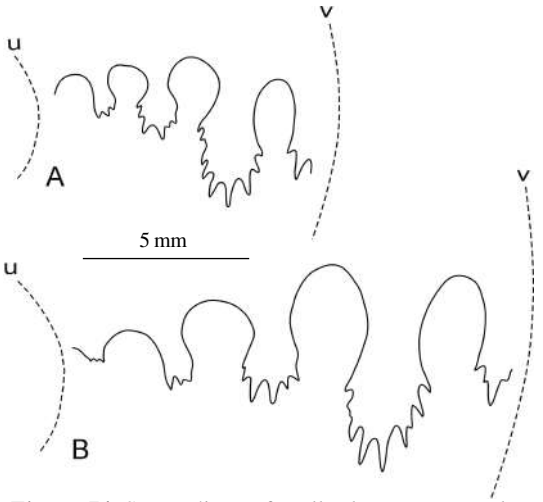


Figure 74. Suture lines of *Bullatihungarites emiliae* (MOJSISOVICS, 1882); M.98.239A, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone, A: suture line at 8 mm whorl-height, B: suture line at 14 mm whorl-height, u: umbilical margin, v: ventral margin

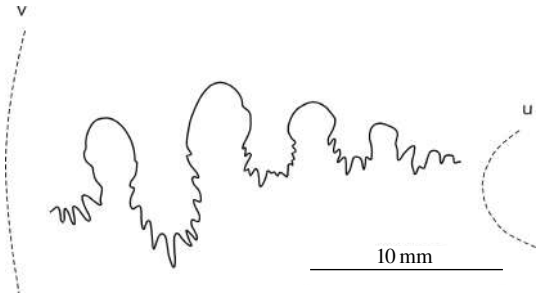


Figure 75. Suture line of *Bullatihungarites emiliae* (MOJSISOVICS, 1882); M.98.37, at 26 mm whorl-height, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventral margin

(Figure 75) the saddles are ceratitic to subammonitic, with more lateral incisions.

Remarks

The holotype (by monotypy) of *B. emiliae*, described and illustrated by MOJSISOVICS (1882, l. c.), is kept in the collection GBAW, Wien (inventory number: 1882/03/269). Another specimen, figured as *B. emiliae* by DIENER (1900, l. c.) was found in the collection of the MGSH (under the inventory number: T.1639.). Both mentioned specimens were studied by the present author and thus the identification of our specimens from the Balaton Highland is ascertained.

B. emiliae differs from *B. semiplicatus* (HAUER, 1896) by its narrower umbilicus and by smaller number of umbilical nodes and ribs.

The specimen figured as "*Ceratites* (*Hungarites*) *plicatus*" by HAUER (1896, pl. IX, figs 8–10), checked by the present author in the collection NHMW (Wien), stands very close to *B. emiliae*, and here they are tentatively synonymised.

In the present author's opinion, BRACK & RIEBER (1993, l. c.) too widely interpreted the species "*Hungarites zalaensis*" (BÖCKH, 1872), which is, in fact, the junior synonym of *H. mojsisovicsi* (ROTH, 1871). They have a large collection of "*zalaensis*" from the Latemar; it was studied by the present author in the collection PIMUZ, Zürich. Some of their figured specimens (BRACK & RIEBER 1993, pl. 1, figs 3, 7, 8) correspond to *H. mojsisovicsi*. On the other hand, most specimens [l. c., pl. 1, figs 1, 2, 4, 5, 6, text-figs 15a, b; and also in GAETANI (ed.) 1993, pl. 6, fig. 9] show definite characters of *B. emiliae*, including the distinctive umbilical nodes/bulges, and the fading out lateral swellings. Especially the umbilical nodosity strongly contradicts to the attribution to *H. mojsisovicsi* (= "*zalaensis*"), which has absolutely smooth umbilical margin.

The specimens figured as "*Hungarites* cf. *plicatus* (HAUER, 1896)" by BRACK & RIEBER (1993, l. c.) were also examined by the present author. By applying the synonymy between the species *plicatus* and the senior synonym *emiliae*, the specimens figured by BRACK & RIEBER (1993, pl. 2, figs 1–3) may belong to *B. emiliae*. The others (BRACK & RIEBER 1993, pl. 2, figs 4, 8, 9) are tentatively attributed to *B. semiplicatus* (HAUER, 1896).

One specimen figured as *H. mojsisovicsi* by the present author (VÖRÖS 1998, pl. IV, fig. 6.) is now included into the synonymy of *B. emiliae*.

The nomenclatural and taxonomical misinterpretation of "*H. zalaensis*" (= *H. mojsisovicsi*) can be seen also in MANFRIN et al. (2005, l. c., figs 9/24–27), who figured typical specimens of *B. emiliae* under the name "*zalaensis*". On the other hand, one of their figured specimens (l. c., fig. 9/28), in the present author's opinion, seems to belong to *B. semiplicatus* (HAUER, 1896).

Distribution

B. emiliae was described from the upper Anisian of the Southern Alps and the Balaton Highland, where it ranges from the Illyrian Reitzi Subzone to the Crassus Subzone.

Bullatihungarites semiplicatus (HAUER, 1896)
Plate XXXVIII: 2–4; Figures 76, 77.

v * 1896 *Ceratites (Hungarites) semiplicatus* n. sp. — HAUER, Cephalopoden aus der Trias von Bosnien, II, p. 265, pl. XI, figs 4–6.
v ? 1993 *Hungarites* cf. *plicatus* (HAUER, 1896) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 462 (partim), pl. 2, figs 4, 8, 9 (only), (non figs 1–3).
1995 *Hungarites zalaensis* (BÖCKH, 1872) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 551 (partim), pl. III, fig. 7 (only), non fig. 6.
1995 *Hungarites zalaensis* (BÖCKH, 1972) — DE ZANCHE et al., Dolomites, p. 145, pl. II, fig. 7.

Material

Four specimens from Vászoly (2) and Mencshely (2).

Measurements

	D	WH	WW	U
INV 2017.261.1.	54.6	25.3	13.9	?
INV 2017.260.1.	45.4	21.4	10.8	9.4
INV 2017.259.1.	35.3	17.1	9.1	7.1

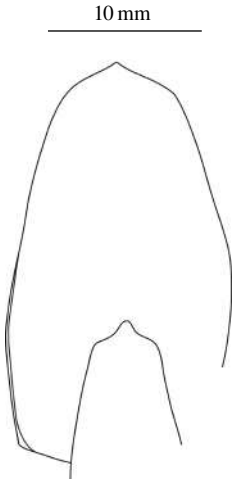


Figure 76. Cross section of *Bullatihungarites semiplicatus* (HAUER, 1896), INV 2017.261.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone

Description

Small *Bullatihungarites* with very involute, compressed conch. The whorl-section is high oval. The umbilical wall is subrounded to oblique. The flanks are gently convex, almost flat and meet the venter at a sharp and smooth ventrolateral shoulder. The venter has a narrow and rather high, subrounded keel, separated from the ventrolateral shoulders by narrow, concave belts. The ornamentation consists of rectiradiate, partly sinuous ribs, or rather folds. The ribs start with small nodes or bulges (9 on a half whorl) at the umbilical margin; here they have the form of wide swellings with narrower interspaces. Towards the mid-flank, the swellings become wider and lower. Further ventrally they gradually fade away, and usually do not reach the ventrolateral margin. Lateral and ventrolateral nodes are absent.

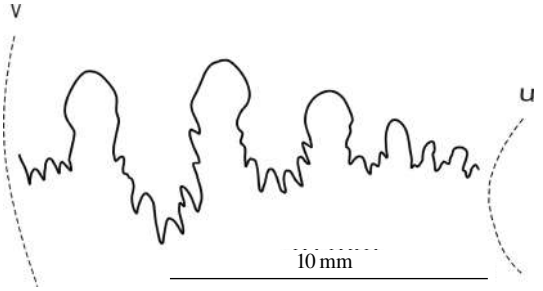


Figure 77. Suture line of *Bullatihungarites semiplicatus* (HAUER, 1896); INV 2017.259.1., at 15 mm whorl-height, Mencshely, loose, Reitzi Zone, Reitzi or Avisianum Subzone, u: umbilical margin, v: ventral margin

The suture line (Figure 77) is ceratitic, tending to subammonitic, with at least three, narrow and high lateral saddles. The first lateral lobe is very deep, and profoundly denticulated; the second and the third lateral lobes are reduced in all respects. Suspensive lobes are seen near the umbilical margin.

Remarks

The original specimen (holotype by monotypy) of *B. semiplicatus*, described and illustrated by HAUER (1896) was examined by the present author in the collection NHMW (Wien), thus the identification of the specimens from the Balaton Highland is approved.

In consitution, and general features of ornamentation, *B. semiplicatus* has many similarities to *B. emiliae* (MOJSISOVICS, 1882). It differs from the type species by having a significantly wider umbilicus and denser ribbing.

The specimens figured as "*Hungarites* cf. *plicatus* (HAUER, 1896)" by BRACK & RIEBER (1993) were examined by the present author in the collection PIMUZ, Zürich. Some of them (BRACK & RIEBER 1993, pl. 2, figs 4, 8, 9) are tentatively attributed to *B. semiplicatus,* the others BRACK & RIEBER (1993, pl. 2, figs 1–3) may belong to *B. emiliae*.

One of the specimens figured as "*Hungarites zalaensis* (BÖCKH, 1872)" by MIETTO & MANFRIN (1995, pl. III, fig. 7) and figured again by DE ZANCHE et al. 1995, pl. II, fig. 7) is here regarded as a typical representative of *B. semiplicatus*.

Distribution

B. semiplicatus was described from the upper Anisian of the Dinarides and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Reitzi and Avisianum Subzones.

Genus ***Nodihungarites*** n. gen.

Type species: *Nodihungarites bocsarensis* (ARTHABER, 1903)

Diagnosis: Medium to large-sized hungaritids with involute, compressed conch. Whorl section high oval to subtrapezoidal; umbilical wall vertical. Venter with sharp ventrolateral shoulder and high keel on phragmocone; fastigate on body chamber. Smooth umbilical margin and flank on phragmocone; weak to stronger ribs and very strong ventrolateral nodes on body chamber. Suture ceratitic, four lateral saddles, first lateral lobe very deep with moderate denticulation.

Derivatio nominis: Referring to the coarse nodes at the ventrolateral margin of the body chamber.

Nominal species:

Nodihungarites bocsarensis (ARTHABER, 1903, p. 25, pl. II, fig. 1.)

Nodihungarites vinczei n. sp.

Discussion: Hitherto, the late Anisian hungaritids of the Tethyan province (except the Sephardic ones) were assembled into one genus, namely the *Hungarites*, with the type species *H. mojsisovicsi* (ROTH, 1871). In the concept of the present monograph, considering the essential morphological characters of the type species, *Hungarites* includes only weakly ornamented species, without any nodes. Therefore, a new genus *Nodihungarites* was necessary to be introduced for the forms with strong ventrolateral nodes on the body chamber. The phragmocone of the new genus is weakly ornamented or smooth, just as that of *Hungarites*. the diagnostic difference appears on the body chamber which has strong ventrolateral nodes in *Nodihungarites* whereas it remains smooth in *Hungarites*. The venter and especially the ventrolateral nodosity of

Nodihungarites shows similarities to the Sephardic genera *Israelites*, described by PARNES (1962) from Israel, but the latter has strong lateral nodes, in contrast to the smooth or only ribbed flanks of *Nodihungarites*.

Distribution: Late Anisian; Balaton Highland. At the Balaton Highland *Nodihungarites* ranges from the Illyrian Avisianum to Crassus Subzones.

Nodihungarites bocsarensis (ARTHABER, 1903)
Plate XXXVIII: 5, 6; Plate XXXIX: 1; Figures 78, 79.

v * 1903 *Hungarites Bocsárensis* ARTH. — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 25, pl. II, fig. 1.
v non 1989 *Hungarites bocsarensis* ARTHABER, 1903 — VÖRÖS & PÁLFY, Vászoly, p. 19., pl. II, fig. 1.
v non 1993 *Hungarites bocsarensis* — VÖRÖS, Reitzi Zone, p. 27, pl. V, fig. 4.

Material
Three specimens from Vászoly.

Measurements

	D	WH	WW	U
Holotype T.771.	72.5	40.2	18.2	11.4
INV 2017.262.1.	114.9	46.6	26.9	22.9
INV 2017.263.1.	107.5	47.5	24.4	21.3

Description

Large *Nodihungarites* with involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is subrounded to vertical. The umbilical margin is smooth. The flanks are gently convex, almost flat and meet the venter at a sharp ventrolateral shoulder. On the phragmocone the venter has a rounded but definite keel, well separated from the ventrolateral shoulders by gently concave bands. The ornamentation on the phragmocone is very weak or absent. Widely spaced, coarse and pointed nodes appear gradually on the mature body chamber, which has a fastigate venter and shows definite umbilical egression.

The suture line (Figure 79) is ceratitic, with four entire lateral saddles. The first lateral lobe is very deep and moderately denticulated; the second and the third lateral lobe are reduced in all respects. Suspensive lobes are seen near the umbilical margin.

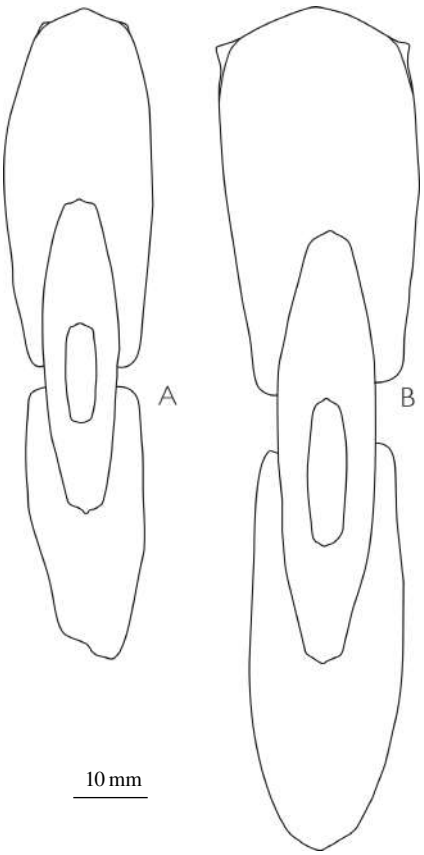


Figure 78. Cross sections of *Nodihungarites bocsarensis* (ARTHABER, 1903), A: T 2017. 13.1., Balatonfüred, Bocsár Hill, loose, Reitzi Zone (?); B: INV 2017.262.1., Vászoly, P–11a, loose, Reitzi Zone, Avisianum Subzone (?)

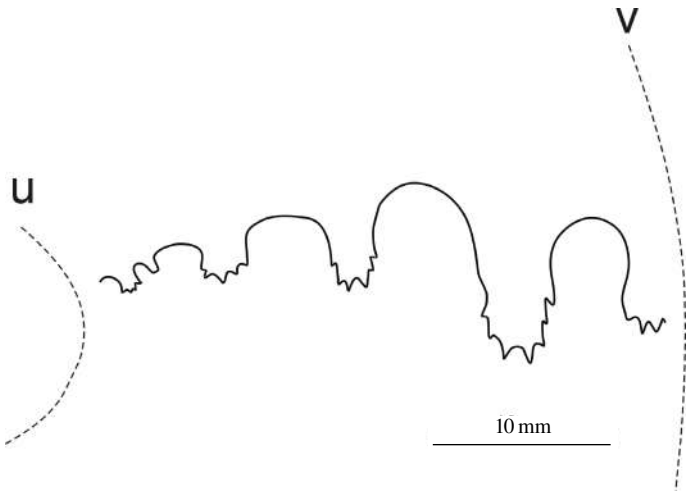


Figure 79. Suture line of *Nodihungarites bocsarensis* (ARTHABER, 1903); Holotype, T.771., at 42 mm whorl-height, Balatonfüred, Bocsár Hill, loose, Reitzi Zone (?), u: umbilical margin, v: ventral margin

Remarks

The type specimen (holotype by monotypy) of *N. bocsarensis* is kept in the collection of the MGSH (under the inventory number: T.771.) and was examined by the present author. The original figure by ARTHABER (1903, pl. II, fig.1) properly illustrates that only the initial part of the body chamber was preserved on the holotype, showing gradually stronger ventrolateral nodes. Our specimens from Vászoly have more complete body chamber with more developed nodosity; nevertheless their identification with *N. bocsarensis* is endorsed.

MIETTO & MANFRIN (1995, p. 554) used the combination of names "*Israelites bocsarensis* (ARTHABER)". This view can not be accepted because the genus *Israelites* PARNES, 1962, besides the strong ventrolateral nodosity, has pointed lateral nodes, which are absent in *N. bocsarensis*.

In previous papers (VÖRÖS & PÁLFY 1989, VÖRÖS 1993) the present author used a too wide interpretation of *N. bocsarensis*; the cited items are here described as *N. vinczei* n. sp.

Distribution

Up to now, *N. bocsarensis* was recorded only from the Balaton Highland where its range is restricted to the Illyrian Avisianum Subzone and the Crassus Subzone.

Nodihungarites vinczei n. sp.
Plate XXXVIII: 7; Plate XL: 1.

v 1989 *Hungarites bocsarensis* ARTHABER, 1903 — VÖRÖS & PÁLFY, Vászoly, p. 19., pl. II, fig. 1.
v 1993 *Hungarites bocsarensis* — VÖRÖS, Reitzi Zone, p. 27, pl. V, fig. 4.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: M.89.81.

Locus typicus: Vászoly, Trench 11a, Bed 16/A.

Stratum typicum: Ochre-yellow limestone (Vászoly Formation); upper Illyrian, Secedensis Zone, Crassus Subzone.

Derivatio nominis: After the name of Péter VINCZE, renowned Hungarian geologist and fossil hunter.

Diagnosis: Medium to large-sized *Nodihungarites* with involute, compressed conch. Whorl section high oval to subtrapezoidal; umbilical wall vertical. Venter fastigate on phragmocone and on body chamber. Smooth umbilical margin and flank on phragmocone; strong ribs and very strong ventrolateral nodes on body chamber. Suture ceratitic.

Material

Two specimens from Vászoly.

Measurements

	D	WH	WW	U
Holotype M.89.81	98.3	39.7	23.1	21.3
Paratype PAL 2017.46.1.	80.7	32.7	16.8	16.5

Description

Medium to large-sized *Nodihungarites* with involute, compressed conch. The whorl-section is high oval to subtrapezoidal. The umbilical wall is subrounded to vertical. The umbilical margin is smooth. The flanks are gently convex, almost flat and meet the venter at a marked ventrolateral shoulder. The phragmocone and the body chamber are fastigate. The ornamentation on the phragmocone is very weak or absent. On the body chamber widely spaced, coarse ribs appear gradually, starting in the inner third of the flank. The ribs become stronger ventrally and bear pointed nodes at the ventrolateral margin. The body chamber shows definite umbilical egression.

The suture line is very poorly seen; indecipherable.

Remarks

This new species stands rather close to *N. bocsarensis* (ARTHABER, 1903) but differs by its strong ribbing on the body chamber. Moreover, the phragmocone of *N. vinczei* is simply fastigate, in contrast to the keeled venter of *N. bocsarensis*.

In previous works of the present author (VÖRÖS & PÁLFY 1989, VÖRÖS 1993) a specimen of *N. vinczei* was attributed to *N. bocsarensis*.

Distribution

Hitherto, *N. vinczei* is known only from the Balaton Highland where it was found in the Illyrian Crassus Subzone.

Superfamily Danubitoidea SPATH, 1951
Family Danubitidae SPATH, 1951
Subfamily Danubitinae SPATH, 1951
Genus **Celtites** MOJSISOVICS, 1882
Type species: *Celtites epolensis* (MOJSISOVICS, 1878)

Celtites ? sp. A
Plate XL: 6.

Material
Two specimens from Felsőörs (1) and Mencshely (1).

Measurements

	D	WH	WW	U
INV 2017.269.1.	22.8	6.5	6.4	10.3

Description
Small *Celtites* with very evolute, nearly serpenticone conch. The whorl-section is oval to subquadratic. The umbilical wall is subrounded. The flanks are moderately convex and meet the arched venter at an indistinct ventrolateral margin. The flanks are ornamented with mostly prorsiradiate and somewhat projected ribs (around 14 on a half whorl) and nodes. There are no umbilical nodes. The ribs bear lateral nodes on the inner third of the whorl, and stronger nodes at the ventrolateral margin. There is a very low and broad blunt keel on the smooth venter.
Suture lines are not seen.

Remarks
The scarcity of the material and the poor preservation do not allow any more specific identification of these ammonoids. On the basis of the rather strong ribbing, the ventrolateral nodosity and the definite, but very low and broad ventral keel, our specimens have similarity to those figured as "*Celtites* ? nov. sp. ind. B." by SALOMON (1895, p. 187, pl. VI, fig. 19). This original specimen was checked by the present author in the BSM (München). The similarity is also apparent with the specimens figured as "*Celtites* sp. B (sensu SALOMON, 1895)." by MIETTO et al. (2005, p. 493, figs 9/4–8, 13, 14). Our specimens differ from both above mentioned items by the presence of lateral nodes. Some specimens, figured as "*Celtites* cfr. *Buchii* KLIPST." by DE LORENZO (1897, p. 145, pl. XX, fig. 1), *Celtites* div. sp. by AIRAGHI (1912, pl. IV, figs 1–5) and as *Celtites* sp. by RIEBER (1973, p. 70, pl. 17, figs 7–9, only), show similar nodosity but their lateral nodes are very near to the umbilical margin.

Distribution
At the Balaton Highland this taxon occurs in the Illyrian Avisianum and Crassus Subzones.

Celtites ? sp. B
Plate XL: 7.

Material
One specimen from Balatoncsicsó.

Measurements

	D	WH	WW	U
M.89.6.	31.5	7.1	5.8	17.5

Description
Medium-sized *Celtites* with very evolute, serpenticone conch. The whorl-section is oval. The umbilical wall is subrounded. The flanks are moderately convex and pass gradually into the arched venter. The flanks are ornamented with slightly prorsiradiate ribs or rather swellings (around 10 on a half whorl). There are no true nodes; the radial swellings become stronger at mid-flank.
Suture lines are not seen.

Remarks

This specimen can not be identified with any species of *Celtites* known from the accessible literature. It shows some degree of similarity to the largest specimen figured as "*Celtites* sp. A." by MANFRIN et al. (2005, p. 493, fig. 9/19, only).

Distribution

At the Balaton Highland this taxon occurs in the Illyrian Avisianum Subzone.

Family Aplococeratidae SPATH, 1951

Genus **Aplococeras** Hyatt, 1900

Type species: *Aplococeras avisianum* (MOJSISOVICS, 1882)

Aplococeras avisianum (MOJSISOVICS, 1882)
Plate XXXIX: 2–5; Plate XL: 2, 4.; Figure 80.

v * 1882 *Dinarites avisianus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 13, pl. XXVII, figs 17–21.
v 1882 *Dinarites Doelteri* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 14, pl. XXVII, figs 22–24.
1921 *Dinarites avisianus* MOJS. sensu lato — BUBNOFF, Forno, p. 418, pl. III, figs 1–5, text-figs 3, 10.
? 1927 *Dinarites avisianus* MOJSISOVICS — OGILVIE GORDON, Dolomiten, p. 61, pl. VII, fig. 10.
1969 *Aplococeras avisianus* (MOJSISOVICS) — ASSERETO, Zona ad Avisianus, p.126, figs 1/1–5, 2/1–6, 8, 9, 11.
v 1973 *Aplococeras* cf. *misanii* (MOJSISOVICS) — RIEBER, Grenzbitumenzone, p. 64 (partim), pl. 17, figs 3, 5, 6, 14.
v 1993 *Aplococeras avisianum* (MOJS., 1882) — BRACK & RIEBER, Anisian/Ladinian boundary, p. 478, pl. 12, figs 9, 11, 12, text-fig. 17c.
v 1993 *Aplococeras avisianum* — VÖRÖS, Reitzi Zone, p. 27, pl. IV, figs 5, 6.
v 1993 *Aplococeras avisianum.* — GAETANI (ed.), Anisian/Ladinian boundary field workshop, p. 117, pl. 13, figs 4, 5.
1995 *Aplococeras avisianum* (MOJSISOVICS, 1882) — MIETTO & MANFRIN, Middle Triassic ammonoid, p. 549, pl. II, figs 8–10.
1995 *Aplococeras avisianum* (MOJSISOVICS, 1882) — DE ZANCHE et al., Dolomites, p. 138, pl. I, fig. 1, pl. II, figs 1, 2.
v 1998 *Aplococeras avisianum* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 38, 42, 50, pl. IV, figs 8–10.
v 2002 *Aplococeras avisianum* (MOJSISOVICS) — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, figs 18, 19.
2003 *Aplococeras avisianum* (MOJSISOVICS, 1882) — MIETTO et al., Bagolino, p. 457, pl. 1, figs 1, 2, pl. 2, figs 3, 5.
2005 *Aplococeras avisianum* (MOJSISOVICS, 1882) — MANFRIN et al., Latemar, p. 487, figs 5/5–9, 26–28.

Material

20 specimens from Felsőörs (1), Szentkirályszabadja (1), Vászoly (1), Mencshely (7), Sóly (6) and Balatoncsicsó (4).

Measurements

	D	WH	WW	U
INV 2017.265.1.	35.1	10.1	?	?
M.98.38	31.5	10.8	?	13.6
M.98.170A	29.8	8.4	?	12.5
INV 2017.266.1.	26.5	9.6	7.2	11.6
INV 2017.264.1.	17.4	5.8	4.1	6.2
INV 2017.268.1.	13.1	4.7	4.6	4.9

Description

Small *Aplococeras* with very evolute, nearly serpenticone conch. The whorl-section is oval. The umbilical wall is subrounded. The flanks are moderately convex, form continuous curve from the umbilicus to the arched and smooth venter. The flanks are ornamented with mostly rursiradiate and convex to sinuous ribs or rather swellings (12 to 16 on a half whorl). The strength and style of the ribbing are variable. In typical case the ribs start near the umbilicus with strong, or even bullate swelling and gradually fade out towards the venter. A few secondary ribs intercalate irregularly. The ribbing is stronger on the phragmocone; the body chamber usually bears only growth rugae, or finer ribs, without bulges.

Suture lines are poorly seen (Figure 80): ceratitic, with three lateral saddles and a moderately denticulated first lateral lobe

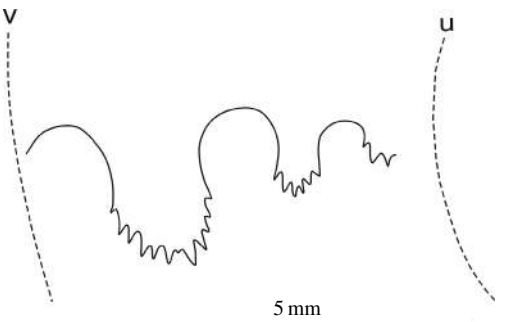


Figure 80. Suture line of *Aplococeras avisianum* (MOJSISOVICS, 1882); M.98.38, at 7 mm whorl-height, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventral margin

Remarks

The type series of *Aplococeras avisianum (="Dinarites avisianus")* figured by MOJSISOVICS (1882, pl. XXVII, figs 17–21) was examined by the present author in the collection GBAW (Wien) thus the identification of the specimens from the Balaton Highland is approved. The same syntypes were studied in detail, and re-figured by ASSERETO (1969, l. c.) but a lectotype was not designated by him, neither by the present author. Nevertheless, the range of the morphological variation of *A. avisianum* is well demonstrated by the syntype series.

The figured types of "*Dinarites Doelteri*" (MOJSISOVICS, 1882) were also investigated in the collection GBAW (Wien), and the synonymy of this species with *A. avisianum* was endorsed, as it was stated previously also by several authors (KITTL 1894, p. 105; SALOMON 1895, p. 197; BUBNOFF 1921, p. 418; SPATH 1951, p. 35; MANFRIN et al. 2005, p. 487).

The specimens figured as "*Aplococeras* cf. *misanii* (MOJSISOVICS) by RIEBER (1973, pl. 17, figs 3, 5, 6, 14.) were examined by the present author in the collection PIMUZ, Zürich; some of them (RIEBER 1973, pl. 17, figs 3, 5, 6, 14) are regarded as belonging to *A. avisianum*, the others (l. c., pl. 17, figs 1, 2, 4: smooth and more evolute forms) probably represent the species *Lecanites misanii*. The specimens do not reveal suture lines, therefore this generic attribution remains doubtful.

One of the specimens figured as *A. avisianum* in previous works by the present author (VÖRÖS 1993, pl. IV, fig. 6; and also in GAETANI [ed.] 1993, pl. 13, fig. 4) was tentatively identified as *A.* aff. *smithi* SILBERLING & NICHOLS, 1982 by MIETTO et al. (2003, p. 457) and MANFRIN et al. (2005, p. 487), though without any explanation. This rather coarsely ribbed specimen (re-figured here on Plate XL: 2) was compared to the figures of *A. smithi* given by SILBERLING & NICHOLS (1982, pl. 21, figs 31–37), portraying very finely costate specimens, and no kind of apparent similarity was found between the two items. Therefore the suggestion by MIETTO et al. (2003) and MANFRIN et al. (2005) was not accepted.

MANFRIN et al. (2005, p. 489, figs 5/10–18) described a new species: *Aplococeras transiens* MIETTO & MANFRIN, 2005, a rather evolute and very weakly ornamented form, and claimed that it represents a transition from *A. avisianum* to *Lecanites misanii* (MOJSISOVICS, 1882). *A. transiens* can be accepted as a new species of the genus *Aplococeras*, comprising the extremely finely ornamented marginal forms. On the other hand, its ceratitic suture severely contrasts to the goniatitic suture of *Lecanites*, therefore it can not be a "connecting link".

Following the ideas expressed by ASSERETO (1969) on the possible identity between *A. avisianum* and "*Lecanites vogdesi*" HYATT & SMITH, 1905, MIETTO et al. (2003) and MANFRIN et al. (2005) made very thorough comparative studies and concluded that the Alpine and the North American species are synonymous. Although the morphological arguments of the mentioned authors seem convincing, the present author does not wish to be committed in this question and the items regarding the species "*vogdesi*" are not included into the present synonymy.

Distribution

A. avisianum was described from many places of the upper Anisian of the Southern Alps. At the Balaton Highland it ranges from the Illyrian Avisianum Subzone to the Crassus Subzone.

Aplococeras laczkoi (ARTHABER, 1903)

Plate XL: 5.

v * 1903 *Dinarites Laczkói* ARTH. — ARTHABER, Neue Funden Muschelkalk des südl. Bakony, Revision, p. 19, pl. I, fig. 3.
v 1998 *Aplococeras* cf. *laczkoi* (ARTHABER, 1903) — VÖRÖS, Balaton-felvidék, p. 42, pl. IV, fig. 7.
v 2002 *Aplococeras* cf. *laczkoi* (ARTHABER) — VÖRÖS, Paleoenvironmental distribution, p. 486, pl. 1, fig. 20.
2003 *Aplococeras* cf. *laczkoi* (ARTHABER, 1911) — MIETTO et al., Bagolino, p. 458, pl. 1, fig. 3, pl. 2, fig. 4.
2005 *Aplococeras laczkoi* (ARTHABER, 1911b) — MANFRIN et al., Latemar, p. 490, figs 5/1–4.

Material

Two specimens, from Vászoly (1) and Sóly (1).

Measurements

	D	WH	WW	U
M.98.52	20.2	6.4	6.1	9.4

Description

Very small *Aplococeras* with very evolute, serpenticone conch. The whorl-section is oval to subcircular. The umbilical wall is subrounded. The flanks are convex and form continuous curve from the umbilicus to the arched and smooth venter. The flanks are ornamented with mostly rursiradiate and partly sinuous, rather strong ribs (around seven on a half whorl). The ribs start near the umbilicus with strong bulges; reach the venter with uniform strength, where they bear strong, nearly pointed nodes. The nodes are in opposite position at the sides of the smooth venter. Secondary ribs were not observed. The inner whorls show coarse swellings instead of true ribbing.

Suture lines are not seen.

Remarks

The type specimen (holotype by monotypy) of *A. laczkoi* was examined by the present author in the collection of the MGSH (under the inventory number: T.1646.). It is a fragment with half whorls, but the coiling and the characteristic ornamentation are properly seen. Moreover, it shows a ceratitic suture what supports the attribution of *laczkoi* to *Aplococeras*. The identification of our newly collected specimens with *A. laczkoi* is fully endorsed.

The specimens figured as *A. laczkoi* by MIETTO et al. (2003) and MANFRIN et al. (2005), from Bagolino and the Latemar, respectively, are typical representatives of this species.

Distribution

A. laczkoi was described from the upper Anisian of Balaton Highland and the Southern Alps. At the Balaton Highland its range is restricted to the Illyrian Avisianum Subzone.

Family Lecanitidae HYATT, 1900

Genus **Lecanites** MOJSISOVICS, 1882

Type species: *Lecanites glaucus* (MÜNSTER, 1834)

The family Lecanitidae, represented solely by the genus *Lecanites*, was tentatively inserted to the superfamily Danubitoidea by TOZER (1981, p. 95) and this solution is accepted here. MANFRIN et al. (2005, p. 487) suggested to synonymise the family Lecanitidae with the Aplococeratidae, with giving priority to the former. They argued that, in external shell morphology, continuous transition seemed to connect the two key species of the mentioned families, namely *Lecanites misanii* (MOJSISOVICS, 1882) and *Aplococeras avisianum* (MOJSISOVICS, 1882). At the same time, they stated that *L. misanii* has goniatitic suture in contrast to the ceratitic suture of *A. avisianum*. Considering the rather simple shell morphology and small size of the mentioned species, the present author gives greater importance to the type of the suture, which is essentially different in the two species and this difference is diagnostic for the two genera and, cosequently for the two families. Therefore the family Lecanitidae, enclosing the genus *Lecanites*, is kept as a separate unit in the present monograph.

Lecanites misanii (MOJSISOVICS, 1882)

Plate XL: 3; Figure 81.

* 1882 *Dinarites Misanii* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 15, pl. XXX, figs 11–13.

? 1897 *Dinarites Misanii* MOJS. — DE LORENZO, Lagonegro, p. 146, pl. XX, fig. 2.

1901 cf. *Dinarites Misanii* MOJS. — REIS, Fauna des Wettersteinkalkes I., p. 76, pl. II, figs 11–13.

v ? 1903 *Lecanites sibyllinus* nov. sp. — FRECH, Neue Cephalopoden, p. 17, pl. II, fig. 4.

? 1914 *Dinarites avisianus* MOJS. — HORN, Knollenkalkstufe, p. 18, pl. I, fig. 2.

v 1973 *Aplococeras* cf. *misanii* (MOJSISOVICS) — RIEBER, Grenzbitumenzone, p. 64 (partim), pl. 17, figs 1, 2, 4 (non figs 3, 5, 6, 14), (avisianum).

1995 *"Aplococeras" misanii* (MOJSISOVICS, 1882) — DE ZANCHE et al., Dolomites, p. 152, pl. I, figs 2–5.

2003 *Lecanites misanii* (MOJSISOVICS, 1882) — MIETTO et al., Bagolino, p. 458, pl. 1, fig. 7; pl. 2, fig. 1.

2005 *Lecanites misanii* (MOJSISOVICS, 1882) — MANFRIN et al., Latemar, p. 490, figs 5/19–25.

Material

Eight specimens from Mencshely.

Measurements

	D	WH	WW	U
INV 2017.267.1.	29.1	7.2	?	14.2

Description

Small-sized *Lecanites* with very evolute, serpenticone conch. The whorl-section is high oval. The umbilical wall is subrounded. The flanks are moderately convex, form continuous curve from the umbilicus to the arched and smooth venter. The flanks are smooth, or ornamented only with very weak growth lines.

The suture lines are partly seen (Figure 81): goniatitic, with three lateral saddles and two entire lateral lobes.

Remarks

From among the three original specimens of "*Dinarites Misanii*" figured by MOJSISOVICS (1882, pl. XXX, figs 11–13) only one, that on pl. XXX, fig. 13, was inspected by the present author. This incomplete specimen is kept in the

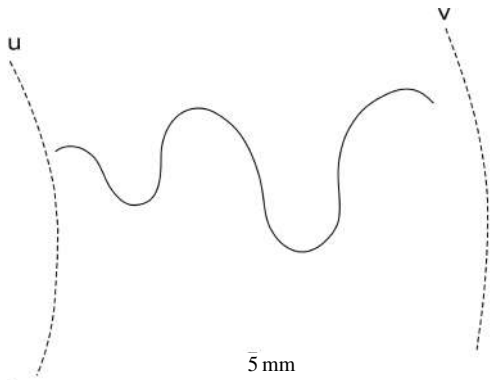


Figure 81. Suture line of *Lecanites misanii* (MOJSISOVICS, 1882); INV 2017.267.1., at 4 mm whorl-height, Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventral margin

collection of the MGSH (under the inventory number: T.860.). On the body chamber it has fine rursiradiate riblets or rather growth lines, reminding the weakly ornamented variants of *Aplococeras avisianum* (MOJSISOVICS, 1882). On the other hand the very evolute coiling, the high oval whorls and the suture with non-denticulated lobes (as stated by MOJSISOVICS 1882, p. 15) are clearly different from *Aplococeras* and support the attribution of *misanii* to the genus *Lecanites*. This is in accordance with the generic attribution by MIETTO et al. (2003) and MANFRIN et al. (2005).

On the basis of the very poor figure given by DE LORENZO (1897, pl. XX, fig. 2), this item of *L. misanii* is included into the synonymy only with query.

FRECH (1903) described a new species *Lecanites sibyllinus* from the "Buchenstein beds" of Felsőörs. The type specimen is kept in the collection of the MGSH (under the inventory number: T.1273.). It is somewhat larger than the usual representatives of *L. misanii*, but its general shape, morphology and the goniatitic suture do not contradict to the idea that *L. sibyllinus* may be a junior synonym of *L. misanii*.

The specimens figured as "*Aplococeras* cf. *misanii* (MOJSISOVICS) by RIEBER (1973) were examined by the present author in the collection PIMUZ, Zürich; some of them (RIEBER 1973, pl. 17, figs 3, 5, 6, 14) are regarded as belonging to *A. avisianum*, the others (l. c., pl. 17, figs 1, 2, 4: smooth and more evolute forms) probably represent the *Lecanites misanii*. The specimens do not reveal suture lines, therefore their generic attribution remains doubtful.

Distribution

L. misanii was described from the upper Anisian of the Southern Alps the Northern Calcareous Alps and perhaps the southern Appennines. At the Balaton Highland its range is restricted to the Illyrian Avisianum Subzone.

Family Longobarditidae SPATH, 1951
Subfamily Longobarditinae SPATH, 1951
Genus **Longobardites** MOJSISOVICS, 1882
Type species: *Longobardites breguzzanus* MOJSISOVICS, 1882

Longobardites zsigmondyi (BÖCKH, 1873)
Plate XL: 10, 11.

v * 1873 *Ammonites (Sageceras) Zsigmondyi* n. sp. — BÖCKH, Bakony Cer. Reitzi, p. 62.
v 1874 *Ammonites (Sageceras) Zsigmondyi* BÖCKH — BÖCKH, Südlichen Theiles des Bakony II, p. 177, pl. IV, fig. 14.
v 1882 *Longobardites Zsigmondyi* (BOECKH) E. v. M. — MOJSISOVICS, Mediterr. Triasprovinz, p. 185, pl. LII, fig. 4.
v 1901 *Longobardites parvulus* nov. spec. — REIS, Fauna des Wettersteinkalkes I., p. 92, pl. IV, figs 28–31; pl. VII, fig. 15.
v 1907 *Longobardites parvulus* REIS — REIS, Fauna des Wettersteinkalkes II., p. 117, pl. I, figs 5–8.
1963 *Longobardites zsigmondyi* (BÖCKH) 1874 — ASSERETO, Val Camonica, p. 71, pl. VIII, fig 2, text-fig. 27.
1966 *Longobardites* (*Longobardites*) *zsigmondyi* (BÖCKH, 1874) — ASSERETO, Longobardites, p. 974, pl. 68, figs 2–6, text-figs 6c, 7c, 10.
1968 *Longobardites (Longobardites)* cfr. *zsigmondyi* (BÖCKH) — VENZO & PELOSIO, Lenna in Val Brembana, p. 118, pl. XIV, figs 5, 7, 11.
v 1973 *Longobardites (Longobardites) zsigmondyi* (BOECKH) — RIEBER, Grenzbitumenzone, p. 64, pl. 17, fig. 15.
v 1973 *Longobardites (Longobardites)* cf. *zsigmondyi* (BOECKH) — RIEBER, Grenzbitumenzone, p. 64, pl. 17, fig. 13.
1982 *Longobardites* cf. *L. zsigmondyi* (BÖCKH) — SILBERLING & NICHOLS, Humboldt Range, p. 51, pl. 21, figs 26–28, text-fig. 34.
v 1989 *Longobardites zsigmondyi* (BÖCKH, 1872) — VÖRÖS & PÁLFY, Vászoly, p. 19.
v 1998 *Longobardites zsigmondyi* (BÖCKH, 1872) — VÖRÖS, Balaton-felvidék, p. 20, 26, 31, 38, 42, 48, pl. V, fig. 9.
2005 *Longobardites zsigmondyi* (BÖCKH, 1874) — MONNET & BUCHER, Nevada, p. 50, pl. 31, figs 10–13, text-fig. 49.

Material

51 specimens from Felsőörs (2), Szentantalfa (1), Vászoly (3), Mencshely (5), Sóly (36), Monoszló (1) and Iszkaszentgyörgy (3).

Measurements

	D	WH	WW	U
M.98.44	65.3	36.7	13.4	1.8
INV 2017.272.1.	36.1	22.5	7.1	?

Description

Medium to large *Longobardites* with extremely involute and compressed, oxycone conch. The whorl-section is very high lanceolate. The umbilicus is occluded; the umbilical margin is subrounded. The flanks are nearly flat. The venter is extremely sharp. The ornamentation is very weak or absent. One specimen shows irregularly spaced, very gentle, sinuous radial folds. These radial folds are the strongest at around the mid-flank and gradually disappear ventrally.

The suture line is poorly seen; ceratitic, with at least seven saddles visible.

Remarks

The original specimen (holotype by monotypy) of *L. zsigmondyi* is deposited in the collection of the MGSH (inventory number: T.844.), and was inspected by the present author. This species is particularly characteristic, therefore it can usually be identified easily even from fragmentary specimens.

ASSERETO (1966) produced an exhaustive taxonomical analysis of the genus *Longobardites*, including all Alpine and North American species, among others *L. zsigmondyi*. This species has simple, sharply lanceolate venter, whereas the venter of the type species *L. breguzzanus* MOJSISOVICS, 1882 tends to be fastigate.

Certain authors (including the present author) cited *L. zsigmondyi* with incorrect publication date (1872 or 1874). In fact BÖCKH (1873, p. 62) published a detailed description of *L. zsigmondyi*. It is only in Hungarian, nevertheless, the valid year of publication is 1873. The first illustration of *L. zsigmondyi* was published one year later by BÖCKH (1874, pl. IV, fig. 14).

Distribution

L. zsigmondyi was described from the upper Anisian of the Balaton Highland, the Southern Alps, the Northern Calcareous Alps and from Nevada. At the Balaton Highland it ranges from the Illyrian Camunum Subzone to the Avisianum Subzone.

Longobardites breguzzanus MOJSISOVICS, 1882

Plate XL: 8, 9.

* 1882 *Longobardites breguzzanus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterr. Triasprovinz, p. 185, pl. LII, figs 1, 2.
? 1882 *Longobardites* indet. ex aff. *Zsigmondyi* — MOJSISOVICS, Mediterr. Triasprovinz, p. 186, pl. LII, fig. 3.
? 1936 *Longobardites* cfr. *breguzzanus* MOJS. — STEFANOFF, Golo-Bărdo, p. 160, pl. IV, figs 19, 20.
1966 *Longobardites* (*Longobardites*) *breguzzanus* MOJSISOVICS, 1882 — ASSERETO, Longobardites, p. 969, pl. 67, figs 1–5, text-figs 6a, 7a.
1968 *Longobardites breguzzanus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, pl. XIV, fig. 10.
v 1998 *Longobardites breguzzanus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 20, 26, 31, 51, 52.

Material

24 specimens from Felsőörs (3), Szentantalfa (1), Sóly (18), Hajmáskér (1) and Öskü (1).

Measurements

	D	WH	WW	U
INV 2017.271.1.	23.4	13.5	?	?
INV 2017.270.1.	21.7	?	?	?

Description

Small to medium-sized *Longobardites* with extremely involute and compressed, oxycone conch. The whorl-section is high lanceolate. The umbilicus is occluded; the umbilical margin is subrounded. The flanks are nearly flat. The venter is sharply fastigate, with definite ventrolateral shoulders. The ornamentation is absent or consists of very weak growth lines.

The suture line is not visible.

Remarks

ASSERETO (1966) published an exhaustive taxonomical analysis of the genus *Longobardites*, including all Alpine and North American species, among others the type species *L. breguzzanus.* The venter of this species is fastigate, with definite ventrolateral shoulders; this gives the main difference from *L. zsigmondyi* (BÖCKH, 1873), where the venter is simply and very sharply lanceolate.

Some items of the present synonymy are included only on the basis of opinions by ASSERETO (1966) because the published figures do not allow to check the features of the venter of the respective specimens. This regards the items "*Longobardites* indet. ex aff. *Zsigmondyi*." by MOJSISOVICS (1882) and "*Longobardites* cfr. *breguzzanus* MOJS." by STEFANOFF (1936).

Distribution

L. breguzzanus was described from the upper Anisian of the Southern Alps, the Balaton Highland and perhaps from the Balkan Mountains. At the Balaton Highland it ranges from the Illyrian Pseudohungaricum Subzone to the Avisianum Subzone.

Superfamily Pinacoceratoidea MOJSISOVICS, 1879
Family Japonitidae TOZER, 1971
Genus **Japonites** MOJSISOVICS, 1893
Type species: *Japonites planiplicatus* (MOJSISOVICS, 1888)

Japonites ? sp.
Plate XLI: 1.

Material

One specimen from Felsőörs.

Measurements

	D	WH	WW	U
INV 2017.273.1.	65.5	27.5	?	?

Description

Medium-sized *Japonites* with moderately evolute, compressed conch. The whorl-section is high oval. The umbilical margin is crushed. The flanks are gently convex, and pass gradually into the arched venter. The ornamentation is very weak; it consists of very slightly rursiradiate radial folds. These radial folds are stronger in the inner half of the flank and gradually disappear ventrally.

The suture line is partially seen; ammonitic, with at least three phylloid lateral saddles. The first lateral lobe is very deep and wide and strongly denticulated; the second lateral lobe is also deep but very narrow.

Remarks

This single and incompletely preserved ammonoid specimen is only tentatively attributed to *Japonites*, mainly by the sutural characteristics. It is less evolute than the typical species of the genus.

Distribution

The genus has worldwide distribution in the Middle Triassic. At the Balaton Highland it was collected from the Illyrian Reitzi Subzone.

Family Sturiidae KIPARISOVA, 1958
Genus **Discoptychites** DIENER, 1916
Type species: *Discoptychites megalodiscus* (BEYRICH, 1867)

Discoptychites cf. *megalodiscus* (BEYRICH, 1867)
Figure 82.

* 1867 *Ammonites megalodiscus* — BEYRICH, Muschelkalk der Alpen, p. 135, pl. II.
1882 *Ptychites megalodiscus* (BEYRICH) E. v. M. — MOJSISOVICS, Mediterranen Triasprovinz, p. 253, pl. LXXVII, fig. 1, pl. LXXVIII, figs 1, 2.

1896 *Ptychites megalodiscus* BEYRICH spec. var. — TOULA, Kleinasien, p. 174, pl. XXI, fig. 1.
1907 *Ptychites megalodiscus* BEYR. (? var.) — REIS, Fauna des Wettersteinkalkes II., p. 137, pl. III, fig. 2, pl. IV, fig. 2, Text-fig. 14.
? 1913 *Ptychites megalodiscus* BEYR. sp. — TOULA, Westbosnien, p. 677, pl. XXIII, fig. 1.
1936 *Ptychites megalodiscus* BEYRICH sp. — STEFANOFF, Golo-Bărdo, p. 152, pl. II, figs 7, 8.
? 1960 *Discoptychites* cf. *megalodiscus* (BEYRICH) — KUMMEL, New Zealand, p. 494, figs 8, 22.
? 1963 *Discoptychites* cf. *megalodiscus* (BEYRICH) 1867 — ASSERETO, Val Camonica, p. 78, pl. VIII, fig. 7, text-fig. 28.
1984 *Discoptychites megalodiscus* (BEYRICH, 1867) — LEITHNER & KRYSTYN, Mitterberg, p. 190, pl. 2, fig. 1.
v 1998 *Discoptychites* cf. *megalodiscus* (BEYRICH, 1867) — VÖRÖS, Balaton-felvidék, p. 59.
2005 *Discoptychites* cf. *D. megalodiscus* (BEYRICH, 1867) — MONNET & BUCHER, Nevada, p. 48, text-fig. 46, pl. 23, fig. 10.
v 2010 *Discoptychites megalodiscus* (BEYRICH, 1867) — VÖRÖS, North Hungary, p. 10, pl. IV, fig. 3.

Material

24 incomplete and fragmentary specimens from Felsőörs (2), Vörösberény (10), Szentkirályszabadja (2) and Mencshely (10).

Measurements: The diameters of the largest, but still incomplete specimens: Felsőörs, Bed 84/F ~240 mm; Mencshely I, Bed 8 ~220 mm; Szentkirályszabadja, Bed 7 ~180 mm.

Description

Large *Discoptychites*, with involute, discoidal conch. The outer whorls and the body chamber are compressed, very high, oxycone; the inner whorls are gradually lower; the nucleus is globose (Figure 82). The maximum width of the whorl lies near the umbilical margin. The umbilicus is very narrow and tends to be occluded; the umbilical wall is subrounded. The flanks are almost flat, very slightly convex. The venter of the outer whorl and body chamber is acute. Ornamentation is not seen, except some fine growth lines.

The suture line is ammonitic with at least three, phylloid lateral saddles.

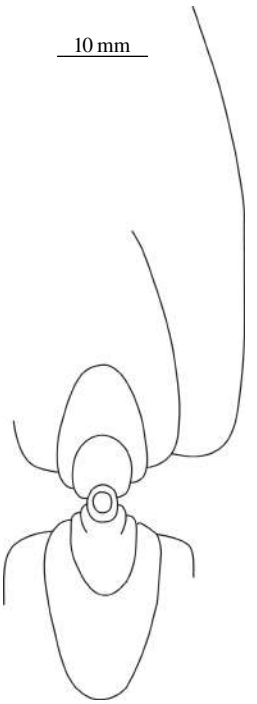


Figure 82. Cross section of *Discoptychites* cf. *megalodiscus* (BEYRICH, 1867); INV 2017.300.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone

Remarks

D. megalodiscus is the type species of the genus *Discoptychites*. It reaches significantly the largest size within the genus; moreover, it differs from other species of *Discoptychites* by its narrower umbilicus and much compressed conch and by the fact that the early globose stage is restricted to the innermost part (less than ten millimeter diameter) of the phragmocone. This feature is well seen in our specimens (Figure 82).

REIS (1907) figured good specimens of *D. megalodiscus*, but in the caption of his text-fig. 14, one of the specimens is cited as "*Beyrichites megalodiscus* MOJS. (? var.)", obviously by mistake.

The items by TOULA (1913) and KUMMEL (1960) are included to the present synonymy only with query, because the respective specimens are rather poorly preserved and/or very small.

As far as the poor photographs allow, the specimens figured by STEFANOFF (1936) probably belong to *D. megalodiscus*.

The specimen figured by ASSERETO (1963) corresponds to the diagnostic criteria of *D. megalodiscus*, except its rather small size.

Distribution

D. megalodiscus seems to have worldwide distribution; it was described from the upper Anisian of the Southern Alps, the Northern Calcareous Alps, Northern Hungary, the Balkan Mountains, Turkey, Nevada and probably from the Dinarides and New Zealand. At the Balaton Highland it ranges from the Illyrian Binodosus Subzone to the Avisianum Subzone.

Family Gymnitidae WAAGEN, 1895

Genus **Gymnites** MOJSISOVICS, 1882

Type species: *Gymnites incultus* (BEYRICH, 1867)

Gymnites sp.

Plate XLI: 2.

Material

Two specimens from Felsőörs (1) and Mencshely (1).

Measurements

	D	WH	WW	U
INV 2017.274.1.	58.7	?	?	31.8

Description

Medium to large *Gymnites* with evolute, nearly serpenticone conch. The whorl-section is high oval. The umbilical wall is subrounded. The flanks are moderately convex and form continuous curve from the umbilicus to the arched and smooth venter. The flanks are smooth, or ornamented only with very weak growth lines.

The suture lines are not visible.

Remarks

This taxon is represented by a large, but incomplete and poorly preserved fragment and a mould, showing the impression of inner whorls (Plate XLI: 2 is a rubber cast of that). These specimens are only tentatively attributed to *Gymnites*, mainly by the form and coiling of the whorls.

Distribution

The genus has worldwide distribution in the Middle Triassic. At the Balaton Highland it was collected from the Illyrian Avisianum Subzone.

Genus **Tropigymnites** SPATH,1951

Type species: *Tropigymnites planorbis* (HAUER, 1896)

Tropigymnites sp.

Plate XLI: 3.

v 2015 *Tropigymnites* sp. — VÖRÖS et al., New data, p. 320, pl. II, fig. 2.

Material

One specimen from Szentbékkálla (in the private collection of K. TAMÁS, Kővágóörs).

Measurements

	D	WH	WW	U
K. Tamás collection, Kővágóörs	42.0	17.0	?	16.0

Description

Small-sized *Tropigymnites* with very evolute conch. The whorl-section is very high oval. The umbilical wall is subrounded. The flank is moderately convex, almost flat and forms continuous arch from the umbilicus to the acute venter. The flanks are smooth, or ornamented only with very weak growth lines.

The suture lines are not visible.

Remarks

This single ammonoid specimen is only tentatively attributed to *Tropigymnites*, mainly by its coiling and acute venter. It is smaller than the typical representatives of the genus. The same specimen was illustrated by VÖRÖS et al. (2015, l. c.).

Distribution

The genus has worldwide distribution in the Middle Triassic. At the Balaton Highland it was collected loose from the scree of the Illyrian Substage.

Genus **Epigymnites** DIENER, 1916

Type species: *Epigymnites ecki* (MOJSISOVICS, 1882)

Epigymnites ecki (MOJSISOVICS, 1882)

Plate XLI: 4, 5.

* 1882 *Gymnites Ecki* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 238, pl. LX, fig. 3.

v 1895 *Gymnites Ecki* MOJS. — SALOMON, Marmolata, p. 191, pl. VIII, fig. 1.
1908 *Gymnites Ecki* MOJS. (C. RENZ) — FRECH & RENZ, Hydra, p. 459, pl. XV, fig. 4.
1910 *Gymnites Ecki* MOJSISOVICS — RENZ, Argolis, p. 39, pl. IV, fig. 2.
? 1910 *Gymnites* cfr. *Ecki* MOJS. — SIMIONESCU, Deşli-Caïra, p. 472, fig. 4.
? 1960 *Epigymnites ecki* (MOJSISOVICS) 1882 — ROSSI RONCHETTI, Grigne, p. 37, pl. VIII, fig. 4, text-fig. 3.
v 1973 *Gymnites* cf. *ecki* MOJSISOVICS, 1882 — RIEBER, GRENZbitumenzone, p. 71, pl. 16, fig. 8.
1994 *Epigymnites ecki* (MOJSISOVICS) — FANTINI SESTINI, Calcare di Esino 1, p. 269, pl. 1, fig. 1.
v 1998 *Epigymnites ecki* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 45, pl. XVI, fig. 3.

Material

Two specimens from Mencshely.

Measurements

	D	WH	WW	U
INV 2017.275.1.	102.5	44.8	18.1	26.1
INV 2017.276.1.	65.5	31.1	12.8	14.5

Description

Small to medium-sized *Epigymnites* with moderately evolute, compressed conch. The whorl-section is very high oval. The umbilical wall is subrounded. The flank is moderately convex, almost flat and forms continuous curve from the umbilicus to the highly arched venter. The flanks are smooth, apart from the body chamber, where a distinctive, longitudinal row of blunt nodes appears at around the mid-flank. The nodes are somewhat elongated adorally.

The suture lines are not visible except a few phylloid saddles.

Remarks

E. ecki is a very characteristic species, easy to recognize and identify by its single row of elongated nodes at the mid-flank. The item by SIMIONESCU (1910) is queried because the illustration is only a very poor drawing.

The specimen figured as *E. ecki* by ROSSI RONCHETTI (1960) is only a fragment with some suture line and does not show the distinctive ornament, therefore it is included into the synonymy only with question mark.

Distribution

E. ecki was described from the Anisian and Ladinian of the Southern Alps, the Northern Calcareous Alps, Greece and doubtfully from Romania (Dobrogea). At the Balaton Highland, the figured specimen was collected from the Illyrian Avisianum Subzone, but *E. ecki* was also recorded in the Ladinian Archelaus Zone (VÖRÖS 1998).

Family Ptychitidae MOJSISOVICS, 1882

Genus **Ptychites** MOJSISOVICS, 1875

Type species: *Ptychites rugifer* (OPPEL, 1865)

Ptychites cf. *oppeli* MOJSISOVICS, 1882

Plate XLI: 6.

* 1882 *Ptychites Oppeli* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 248, pl. LXXI, figs 1, 3, pl. LXXII, figs 1, 2.
1904 *Ptychites Oppeli* MOJSISOVICS 1882 — MARTELLI, Boljevici, p. 114, pl. IX, figs 1–3.
1910 *Ptychites Oppeli* MOJSISOVICS — RENZ, Argolis, p. 28, text-fig. 2.
1968 *Ptychites oppeli* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 119, pl. XIV, figs 13–17, pl. XV, figs 1, 3–5, pl. XVI, fig. 1.
1984 *Ptychites oppeli* MOJSISOVICS, 1882 — LEITHNER & KRYSTYN, Mitterberg, p. 190, pl. 1, fig. 2.
1988*Ptychites oppeli* MOJSISOVICS, 1882 — PRLJ & MUDRENOVIĆ, Pribudića, p. 17, pl. V, fig. 4.
v 1998 *Ptychites oppeli* MOJSISOVICS, 1882 — VÖRÖS, Balaton-felvidék, p. 21, 22, 48.
v 2010 *Ptychites oppeli* MOJSISOVICS, 1882 — VÖRÖS, North Hungary, p. 12, pl. II, fig. 7.

Material

35 specimens from Felsőörs (18), Vörösberény (1) and Szentbékkálla (16).

Measurements

	D	WH	WW	U
M.87.018A	55.6	28.5	?	9.2

Description

Small to medium-sized *Ptychites* with involute conch. The whorl-section is moderately high oval with maximum width near the umbilicus. The umbilicus is narrow and deep. The umbilical wall is subrounded, tending to be overhanging in the inner whorls. The flanks are gently convex and pass gradually into the moderately arched venter. The ornamentation consists of rectiradiate, gently sinuous folds separated by depressions of similar width. The folds gradually appear near the umbilical margin, strengthen in the middle of the flanks, may bear bulges at the ventrolateral margin and fade out on the venter. Their number increases by irregular insertion of secondary folds and reaches 13 on a half-whorl. The folding becomes weaker on the body chamber of larger specimens.

The suture line is rarely seen; it is ammonitic, with a deep and wide, deeply incised first lateral lobe and a similarly large, phylloid first lateral saddle; the auxiliar elements towards the umbilicus are much reduced .

Remarks

P. oppeli was profusely illustrated by MOJSISOVICS (1882) and VENZO & PELOSIO (1968) thus the identification of our specimens from the Balaton Highland seems satisfactory. The difference of *P. oppeli* from other member of the "rugiferi group" of MOJSISOVICS (1882: *P. dontianus* (HAUER, 1850), *P. eusomus* (BEYRICH, 1865), *P. seebachi* MOJSISOVICS, 1882, *P. stachei* MOJSISOVICS, 1882 and *P. breunigi* MOJSISOVICS, 1882) was portrayed by MOJSISOVICS (1882) and was discussed also by VÖRÖS (2010).

Distribution

P. oppeli was described from the Anisian of the Southern Alps, the Northern Calcareous Alps, the Dinarides, North Hungary and Greece. At the Balaton Highland it ranges from the Illyrian Trinodosus Subzone to the Felsoeoersensis Subzone.

Genus **Flexoptychites** SPATH, 1951

Type species: *Flexoptychites flexuosus* (MOJSISOVICS, 1882)

Flexoptychites cf. *studeri* (HAUER, 1857)

Plate XLI: 7.

* 1857 *Ammonites Studeri* HAUER — HAUER, Val Inferna, p. 146, pl. I, figs 1–4.
1867 *Ammonites Studeri* HAU. — BEYRICH, Muschelkalk der Alpen, p. 123, pl. I, fig. 5.
1882 *Ptychites Studeri* (Fr. v. HAUER) E. v. M. — MOJSISOVICS, Mediterranen Triasprovinz, p. 260, pl. LXIII, fig. 1.
1904 *Ptychites Studeri* HAUER sp. 1857 — MARTELLI, Boljevici, p. 127, pl. XII, fig. 1.
1913 *Ptychites Studeri* v. HAU. — TOULA, Westbosnien, p. 659, pl. XXIII, fig. 4.
1913 *Ptychites flexuosus* v. MOJS. nov. var. — TOULA, Westbosnien, p. 666, text-fig. 24, pl. XXV, fig. 16.
? 1936 *Ptychites studeri* HAU. — *plexuosus* MOJS. — STEFANOFF, Golo-Bărdo, p. 151, pl. I, figs 11, 12; pl. II, figs 1, 2.
? 1963 *Flexoptychites studeri* (HAUER) 1857 — ASSERETO, Val Camonica, p. 86, pl. XI, fig. 5, text-fig. 31.
1988 *Flexoptychites studeri* (HAUER), 1857 — PRLJ & MUDRENOVIĆ, Pribudića, p. 19, pl. IV, fig. 1.
v 2010 *Flexoptychites* cf. *studeri* (HAUER, 1857) — VÖRÖS, North Hungary, p. 12, pl. III, fig. 2.

Material

One specimen from Vászoly.

Measurements

	D	WH	WW	U
INV 2017.277.1.	53.4	29.1	15.1	5.4

Description

Medium-sized *Flexoptychites* with moderately compressed, involute conch. The whorl-section is high oval with maximum width near the umbilicus. The umbilicus is moderately narrow and deep. The umbilical margin is subrounded. The flanks are very slightly convex and pass gradually into the highly arched, narrowly rounded venter. The rather weak ornamentation consists of rectiradiate folds of uneven strength; some of them appear as secondary intercalations. The folds appear near the umbilical margin, become gently convex around mid-flank and fade out on the ventrolateral margin, where they tend to be slightly rursiradiate.

Suture lines are poorly visible; ammonitic, with wide and deeply denticulated first lateral lobe.

Remarks

F. studeri is similar to *F. flexuosus* (MOJSISOVICS, 1882) and *F. angustoumbilicatus* (BÖCKH, 1872) but it differs by its weaker and denser lateral folds which tend to be rursiradiate near the venter.

The specimens described as "*Ptychites studeri* HAU. — *plexuosus* MOJS." (sic) by STEFANOFF (1936) were illustrated by very poor photographs which do not allow to decide if the identification was correct. Moreover, STEFANOFF (1936) seems to merge, without any explanation, the species *studeri* and *flexuosus* (written correctly in the plate explanation), which view is not accepted by the present author.

The specimen figured as *F. studeri* by ASSERETO (1963) shows unusually wide and rounded venter, therefore this item is queried in the synonymy.

Distribution

F. studeri was described from the Anisian of the Southern Alps, the Dinarides, North Hungary and doubtfully from the Balkan Mountains. At the Balaton Highland it was collected from the Illyrian Reitzi Subzone.

Flexoptychites angustoumbilicatus (BÖCKH, 1872)

Plate XLII: 1–5.

v * 1872 *Arcestes angusto-umbilicatus* n. sp. — BÖCKH, A Bakony déli részének, p. 149, pl. VIII, figs 7, 8, pl. IX, fig. 9.
v 1873 *Arcestes angusto-umbilicatus* n. sp. — BÖCKH, Südl. Theiles des Bakony, p. 160, pl. VIII, figs 7, 8, pl. IX, fig. 9.
v 1875 *Arcestes angusto-umbilicatus* BÖCKH — STÜRZENBAUM, Ceratites Reitzi-szint, p. 258, pl. V, fig. 3.
1882 *Ptychites angusto-umbilicatus* (BOECKH) E. v. M. — MOJSISOVICS, Mediterranen Triasprovinz, p. 257, pl. LXV, figs 5, 6, pl. LXVI, fig. 1.
1882 *Ptychites noricus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 258 (partim), pl. LXIV, fig. 5 (non. pl. LXIV, fig. 6).
1901 *Ptychites angustoumbilicatus* BOECKH var. (?) — REIS, Fauna des Wettersteinkalkes I., p. 92, pl. V, figs 1–2.
1903 *Ptychites anguste-umbilicatus* BÖCKH — FRECH, Neue Cephalopoden, p. 13, pl. I, fig. 1.
1904 *Ptychites anguste-umbilicatus* BOECKH sp., 1873 — MARTELLI, Boljevici, p. 123, pl. XII, fig. 4.
? 1913 *Ptychites flexuosus* MOJS. — TOULA, Westbosnien, p. 663, text-fig. 23, pl. XXIV, fig. 9.
1968 *Flexoptychites angusto-umbilicatus* (BÖCKH) — VENZO & PELOSIO, Lenna in Val Brembana, p. 130, pl. XVII, figs 8, 10, 11, 13 (?).
v 1989 *Flexoptychites* cf. *angustoumbilicatus* (BÖCKH, 1872) — VÖRÖS & PÁLFY, Vászoly, p. 21.
non 1997 *Flexoptychites angustoumbilicatus* (BÖCKH) — URLICHS & Kurzweil, Württemberg, p. 4, figs 2, 3.
v 1998 *Flexoptychites angustoumbilicatus* (BÖCKH, 1872) — VÖRÖS, Balaton-felvidék, p. 21, 22, 59.
v 2010 *Flexoptychites* cf. *angustoumbilicatus* (BÖCKH, 1872) — VÖRÖS, North Hungary, p. 14, pl. III, fig. 1.

Material

188 specimens from Felsőörs (53), Vörösberény (2), Szentanatalfa (3), Szentkirályszabadja (41), Vászoly (47), Mencshely (36), Sóly (2), Balatoncsicsó (3) and Szentbékkálla (1).

Measurements

	D	WH	WW	U
INV 2017.278.1.	98.1	52.8	26.1	11.1
INV 2017.281.1.	95.8	52.5	24.8	9.1
INV 2017.279.1.	54.1	28.5	15.1	6.1
INV 2017.280.1.	51.9	26.9	?	?
M.89.130A	48.1	23.1	13.1	?

Description

Medium to large-sized *Flexoptychites* with compressed, involute conch. The whorl-section is high, acutely oval, with maximum width near the umbilicus. The umbilicus is very narrow. The umbilical margin is rounded but well-defined. The flanks are slightly convex and pass gradually into the moderately acute venter. The ornamentation consists of rectiradiate, irregularly spaced, strongly sinuous folds. The primary folds arise close to the umbilical margin and fade out near the venter. Their number is 10 to 12 on a half-whorl. On the ventral half of the flanks, the primary folds are intercalated by weaker falcoid secondary folds, one to four in number in each interspace. In one specimen the sinuous rim of the aperture seems to be preserved (Plate XL: 5).

Suture lines are rarely seen; ammonitic, with relatively narrow but deep, denticulated first lateral lobe and high, phylloid first lateral saddle; further, at least four, auxiliary elments of decreasing amplitude, appear towards the umbilicus.

Remarks

The original specimens of *F. angustoumbilicatus*, deposited in the collection of the MGSH (inventory numbers: T.308., T.325. and T.350.), and another, very typical specimen figured by STÜRZENBAUM (1875, pl. V, fig. 3, inventory number:

T.700.) were inspected by the present author. On the basis of its particularly characteristic ornamentation, this species can be identified easily even from fragmentary specimens, thus the identification of our specimens from the Balaton Highland is satisfactorily right.

In the description of his new species "*Ptychites noricus*", MOJSISOVICS (1882, p. 258) correctly stated that it was closely related to *F. angustoumbilicatus* in the ornamentation of the larger figured specimen (l. c., pl. LXIV, fig. 5). Detailed studies by MANFRIN et al. (2005, p. 500) proved that this specimen in fact belongs to *F. angustoumbilicatus*, while the other specimen figured by MOJSISOVICS (1882, pl. LXIV, fig. 6) remains the true "*Ptychites noricus*", i.e. by its correct name: *Lanceoptychites noricus* (MOJSISOVICS, 1882).

F. angustoumbilicatus is similar to *F. flexuosus* (MOJSISOVICS, 1882) in the character of the sinuous primary folds, but differs by the appearance of the secondary folds and by the significantly narrower umbilicus and highly arched venter. The rather strong and characteristic ornamentation, with falcoid secondary folds distinguishes *F. angustoumbilicatus* also from most other species of *Flexoptychites*.

The specimen figured as *F. flexuosus* by TOULA (1913) seems to belong rather to *F. angustoumbilicatus*.

The specimens figured as *F. angustoumbilicatus* by VENZO & PELOSIO (1968) are proper representatives of this species, with the only exception of (l. c., pl. XVII, fig. 13) which shows a sharply lanceolate body chamber, unknown, or at least quite unusual in *F. angustoumbilicatus.*

The specimen figured by URLICHS & KURZWEIL (1997) from Württemberg shows an ornamentation somewhat resembling *F. angustoumbilicatus*, but according to MANFRIN et al. (2005, p. 500), its suture line has a typical character of the genus *Parasturia*. This opinion is accepted here.

Distribution

F. angustoumbilicatus was described from the Anisian of the Balaton Highland, the Southern Alps, the Northern Calcareous Alps, the Dinarides and North Hungary. At the Balaton Highland it ranges from the Illyrian Camunum Subzone to the Crassus Subzone.

Flexoptychites flexuosus (MOJSISOVICS, 1882)
Plate XLIII: 1–3.

* 1882 *Ptychites flexuosus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 261, pl. LXIII, figs 2–8, pl. XLIV, figs 1–3, pl. XLVI, figs 2, 3.
1904 *Ptychites flexuosus* MOJSISOVICS 1882 — MARTELLI, Boljevici, p. 125, pl. X, 2–7.
1910 *Ptychites flexuosus* MOJSISOVICS — RENZ, Argolis, p. 25, text-fig. 1.
1913 *Ptychites flexuosus* MOJS. — TOULA, Westbosnien, p. 663, pl. XXIV, fig. 9.
? 1913 *Ptychites flexuosus* MOJS. — SIMIONESCU, Hagighiol, p. 342, 367, pl. VIII, fig. 7.
1915 *Ptychites flexuosus* MOJS. Var. — ARTHABER, Die Trias von Bithynien, p. 144, pl. XIII, fig. 1.
? 1931 *Ptychites flexuosus* MOJS. — ŽIVKOVIĆ, Zlatar, p. 90, pl. V, fig. 1.
? 1936 *Ptychites studeri* HAU. — *plexuosus* MOJS. — STEFANOFF, Golo-Bărdo, p. 151, pl. I, figs 11, 12; pl. II, figs 1, 2.
? 1958 *Ptychites flexuosus* MOJSISOVICS — SACCHI VIALLI & VAI, Fauna triassica bresciana, p. 75, pl. IV, fig. 34.
? 1963 *Flexoptychites flexuosus* (MOJSISOVICS) 1882 — ASSERETO, Val Camonica, p. 82, pl. IX, figs 1, 2, text-fig. 29.
1968 *Flexoptychites flexuosus* (MOJS.) — VENZO & PELOSIO, Lenna in Val Brembana, p. 127, pl. XVI, fig. 18, pl. XVII, fig. 9.
1988 *Flexoptychites flexuosus* (MOJSISOVICS), 1865 — PRLJ & MUDRENOVIĆ, Pribudića, p. 19, pl. V, fig. 2.
v 1989 *Flexoptychites acutus* (MOJSISOVICS, 1882) — VÖRÖS & PÁLFY, Vászoly, p. 21.
? 1992 *Flexoptychites flexuosus* (MOJSISOVICS), 1882 — SAKAČ, Central Croatia, p. 32, pl. V, fig. 4.
v 1998 *Flexoptychites flexuosus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 21, 22, 59.
1998 *Flexoptychites flexuosus* (MOJSISOVICS, 1865) — PETEK, Hrastenica, p. 132 and 139, pl. 4, figs 1–5.
v 2010 *Flexoptychites flexuosus* (MOJSISOVICS, 1882) — VÖRÖS, North Hungary, p. 13, pl. III, figs 4, 5.

Material

250 specimens from Felsőörs (19), Vörösberény (21), Szentantalfa (8), Szentkirályszabadja (47), Vászoly (53), Mencshely (67), Sóly (12), Balatoncsicsó (13), Szentbékkálla (3), Vöröstó (1) and Iszkaszentgyörgy (6).

Measurements

	D	WH	WW	U
INV 2017.282.1.	87.7	44.5	23.1	11.5
INV 2017.284.1.	58.9	29.9	19.1	8.1
INV 2017.283.1.	42.1	20.6	12.8	7.2

Description

Medium to large *Flexoptychites* with moderately compressed, involute conch. The whorl-section is rather high oval with maximum width near the inner third of the whorl. The umbilicus is rather narrow and deep. The umbilical wall is nearly vertical; the umbilical margin is rounded but rather well-marked. The flanks are slightly convex and pass gradually into the moderately and evenly arched venter. The ornamentation consists of rectiradiate, sinuous folds separated by depressions of similar width. The folds gradually appear near the umbilical margin and strengthen towards the venter where they fade out. The number of folds increases by occasional and irregular insertion of secondary folds and together are around 10 on a half-whorl. The inner whorls are usually smooth.

Suture lines are rarely and partly seen; ammonitic. The first lateral lobe is well-developed and deeply incised; the second lateral saddle is significantly higher than the first one; at least five accessory elements, with gradually decreasing amplitude appear towards the umbilicus.

Remarks

F. flexuosus is the type species of *Flexoptychites*. It differs from other species of the genera by its generally stronger lateral folds and less compressed conch with widely arched venter. The ample illustration given by MOJSISOVICS (1882) and VENZO & PELOSIO (1968) provides adequate picture on the morphology of *F. flexuosus* and reliable basis for the identification of our specimens from the Balaton Highland.

The specimens figured as *F. flexuosus* by SIMIONESCU (1913) and ASSERETO (1963) show rather straight lateral folds, therefore they are included in the synonymy only with question marks.

Some other items of the synonymy are queried because the published figures are very poor and do not show distinctive features; this regards the items by ŽIVKOVIĆ (1931), SACCHI VIALLI & VAI (1958) and SAKAČ (1992).

The specimens described as "*Ptychites studeri* HAU. — *plexuosus* MOJS." (sic) by STEFANOFF (1936) were illustrated also by very poor photographs. Moreover, STEFANOFF (1936) seems to merge, without any explanation, the species *studeri* and *flexuosus* (written correctly in the plate explanation), which opinion is not accepted here.

Distribution

F. flexuosus was described from the Anisian of the Southern Alps, the Northern Calcareous Alps, the Dinarides, Greece, Turkey and North Hungary and doubtfully from Romania (Dobrogea) and the Balkan Mountains. At the Balaton Highland it ranges from the Illyrian Trinodosus Subzone to the Crassus Subzone.

Flexoptychites cf. *acutus* (MOJSISOVICS, 1882)
Plate XLIII: 4.

* 1882 *Ptychites acutus* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 263, pl. LXIV, fig. 4, pl. LXV, fig. 1, pl. LXVI, figs 4–6.
? 1901 *Ptychites acutus* MOJS. var. (?) — REIS, Fauna des Wettersteinkalkes I., p. 93, pl. V, figs 3–13, pl. VII, figs 16–27.
? 1903 *Ptychites acutus* MOJS. — FRECH, Neue Cephalopoden, p. 13, pl. I, fig. 2.
? 1904 *Ptychites acutus* MOJSISOVICS 1882 — MARTELLI, Boljevici, p. 128, pl. XI, figs 5, 6.
1910 *Ptychites acutus* MOJSISOVICS — RENZ, Argolis, p. 26, pl. I, fig. 8.
? 1913 *Ptychites acutus* MOJS. — SIMIONESCU, Hagighiol, p. 341, 367, pl. V, fig. 2., text-fig. 73.
1963 *Flexoptychites acutus* (MOJSISOVICS) 1882. — ASSERETO, Val Camonica, p. 80, pl. IX, fig. 3.
1967 *Flexoptychites acutus* (MOJSISOVICS, 1882) — CASATI & GNACCOLINI, Alpi Orobie, p. 135, pl. 10, fig. 7.
v 1973 *Flexoptychites acutus* (MOJSISOVICS, 1882) — RIEBER, GRENZbitumenzone, p. 71, pl. 17, figs 21, 24, Text-fig. 19ad.
1988 *Flexoptychites acutus* (MOJSISOVICS), 1882 — PRLJ & MUDRENOVIĆ, Pribudića, p. 20, pl. V, fig. 1.
v 1989 *Flexoptychites acutus* (MOJSISOVICS, 1882) — VÖRÖS & PÁLFY, Vászoly, p. 21.
1996 *Flexoptychites acutus* (MOJSISOVICS, 1882) — FANTINI SESTINI, Calcare di Esino 2, p. 223, pl. 1, fig. 1.
v 1998 *Flexoptychites* cf. *acutus* (MOJSISOVICS, 1882) — VÖRÖS, Balaton-felvidék, p. 26, 29, 31, 38, 59.
1998 *Flexoptychites acutus* (MOJSISOVICS, 1882) — PETEK, Hrastenica, p. 133 and 140, pl. 5, fig. 1.
v 2010 *Flexoptychites acutus* (MOJSISOVICS, 1882) — VÖRÖS, North Hungary, p. 13, pl. IV, figs 1, 2.

Material

76 specimens from Vörösberény (11), Szentantalfa (13), Szentkirályszabadja (1), Vászoly (20), Mencshely (23), Balatoncsicsó (1), Örvényes (2), Szentbékkálla (1), Vöröstó (2), Hajmáskér (1) and Iszkaszentgyörgy (1).

Measurements

	D	WH	WW	U
M.87.017	100.5	48.5	23.4	13.5

Description

Medium to large *Flexoptychites* with strongly compressed, involute conch. The whorl-section is high oval to acute, tending to be lanceolate in some cases, with maximum width near the umbilicus. The umbilicus is narrow and deep. The umbilical wall is nearly vertical; the umbilical margin is subrounded. In a mature specimen (Plate XLIII: 1) the body chamber shows egression. The flanks are slightly convex; on the last whorl, and especially on the body chamber, the venter is acute. The ornamentation is rather weak; it consists of irregularly developed sinuous folds (10 to 12 on a half whorl), and growth lines. The inner whorls of the phragmocone is smooth.

Suture lines are partly seen; ammonitic. The first lateral lobe is well-developed and deeply incised; the second lateral saddle is about as high as the first one; multiple accessory elements, with gradually decreasing amplitude appear towards the umbilicus.

Remarks

F. acutus differs from all other species of *Flexoptychites* by its markedly and consistently acute venter. MOJSISOVICS (1882) and FRECH (1903) put emphasis on the strongly sinuous folds, showing very convex parts at mid-flank; this phenomenon occurs, but is not a general feature.

REIS (1901) illustrated a series of specimens under the name "*Ptychites acutus*". They are included into the synonymy only with question mark, because none of them shows an acute venter; it is true that most of the specimens are very small.

Some other items of the synonymy (FRECH 1903, MARTELLI 1904, SIMIONESCU 1913) are also queried, because they did not contain the diagnostic ventral views. Without this information the identification of the respective specimens with *F. acutus* remains doubtful.

Distribution

F. acutus was described from the Anisian of the Southern Alps, the Northern Calcareous Alps, the Dinarides, Greece and North Hungary and perhaps from Romania (Dobrogea). At the Balaton Highland it ranges from the Illyrian Trinodosus Subzone to the Crassus Subzone.

Genus **Parasturia** SPATH, 1951

Type species: *Meekoceras emmrichi* (MOJSISOVICS, 1882)

The systematic position of the genus *Parasturia* changed in the last decades. In the "Treatise" (ARKELL et al. 1957, p. L182) it was listed among the Ptychitidae. According to the proposed classification by TOZER (1981, p. 93) this genus was ranked into the family Sturiidae. Recently, MANFRIN et al. (2005, p. 500) argued convincingly that *Parasturia* should be included again to the Ptychitidae, and this opinion is accepted here.

Parasturia cf. *emmrichi* (MOJSISOVICS, 1882)

Plate XLIII: 5; Figure 83.

v * 1882 *Meekoceras Emmrichi* E. v. MOJSISOVICS — MOJSISOVICS, Mediterranen Triasprovinz, p. 219, pl. L, fig. 4.
? 1901 *Beyrichites Emmrichi* MOJS. spec. var. — REIS, Fauna des Wettersteinkalkes I., p. 100, pl. VI, fig. 19, pl. VII, fig. 32.
? 1907 *Beyrichites Emmrichi* var. *lateumbilicatus* REIS — REIS, Fauna des Wettersteinkalkes II., p. 136, pl. II, fig. 10, text-figs 12, 13.
non 1978 *Parasturia* cf. *emmrichi* (MOJSISOVICS) — URLICHS, Zwei alpine Ammoniten, p. 7, pl. 1, fig. 2., text-fig. 2.
1997 *Flexoptychites angustoumbilicatus* (BÖCKH) — URLICHS & Kurzweil, Württemberg, p. 4, figs 2, 3.
2005 *Parasturia emmrichi* (MOJSISOVICS, 1882) — MANFRIN et al., Latemar, p. 500, figs 10/9–14.

Material

Two specimens from Mencshely.

Measurements

	D	WH	WW	U
INV 2017.285.1.	42.7	21.8	13.8	5.6

Description

Small *Parasturia* with compressed, very involute conch. The whorl-section is high oval, with maximum width near the umbilicus. The umbilicus is very narrow. The umbilical margin is rounded but well-defined. The flanks are slightly convex and pass gradually into the highly arched venter. The flanks are almost smooth, except a few, irregularly spaced, gently sinu-

ous folds. On the ventral part of the flanks the primary folds are intercalated by extremely weak, falcoid secondary folds. This weak ornamentation is restricted to the body chamber; the phragmocone is smooth.

The suture lines are partly seen (Figure 83); ammonitic, with relatively narrow but deep, denticulated first lateral lobe; the phylloid first lateral saddle is narrowed at its base, the second lateral saddle is considerably higher than the first one; further, auxiliary elments of decreasing amplitude, appear towards the umbilicus.

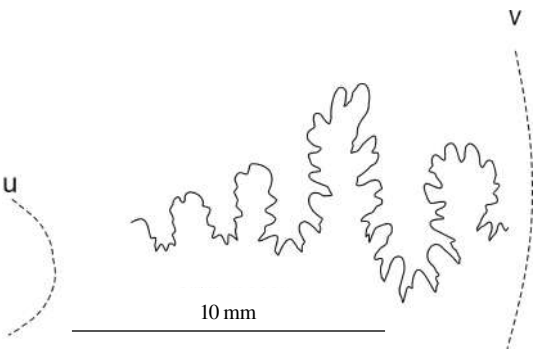


Figure 83. Suture line of *Parasturia* cf. *emmrichi* (MOJSISOVICS, 1882); INV 2017.283.1., at 16 mm whorl-height, Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone, u: umbilical margin, v: ventral margin

Remarks

The original specimen (holotype by monotypy) of *P. emmrichi* figured by MOJSISOVICS (1882) was checked by the present author in the collection GBAW, Wien (inventory number: 1882/03/265). The very weak ornamentation and the diagnostic constriction at the base of its first lateral saddle was clearly seen on the holotype. Thus the identification of our specimens from the Balaton Highland is ascertained.

The specimens of "*Beyrichites Emmrichi*" by REIS (1901) are illustrated by very poor figures, and this regards even more to the item "*Beyrichites Emmrichi* var. *lateumbilicatus*" by REIS (1907) where the drawing of suture line (REIS l. c., text-fig. 12) is only subammonitic and does not show at all the distinctive features of the lateral saddles. Nevertheless, these two items by REIS are tentatively included into the synonymy, with reliance on the opinion of MANFRIN et al. (2005, l. c.) who, hopefully by comparative study of the original material of REIS, definitely listed these items in their synonymy.

The specimen described and illustrated as "*Parasturia* cf. *emmrichi*" by URLICHS (1978) does not belong here but probably to a species of *Flexoptychites*, as it is well shown by the drawings of its suture line and cross section.

On the other hand, the specimen described as "*Flexoptychites angustoumbilicatus* (BÖCKH)" by URLICHS & KURZWEIL (1997), as MANFRIN et al. (2005, p. 500) affirmed previously, is a typical representative of *P. emmrichi*; the figured suture line (URLICHS & KURZWEIL, l. c., fig. 3) is perhaps the best and most complete illustration of the suture of *emmrichi*, with the diagnostic constriction of the first lateral saddle.

Distribution

P. emmrichi was described from the Anisian of the Southern Alps, from the German Muschelkalk and probably from the Northern Calcareous Alps. At the Balaton Highland it was collected from the Illyrian Avisianum Subzone.

Superfamily Arcestoidea MOJSISOVICS, 1875
Family Arcestidae MOJSISOVICS, 1875
Genus **Proarcestes** MOJSISOVICS, 1893
Type species: *Proarcestes bramantei* (MOJSISOVICS, 1869)

Proarcestes sp.
Plate XLIII: 6–9.

v 1993 *Proarcestes* sp. — VÖRÖS, Reitzi Zone, p. 25, pl. IV, fig. 1.
v 1998 *Proarcestes* sp. — VÖRÖS, Balaton-felvidék, p. 21, 35, 51, 53.
v 2002 *Proarcestes* sp. — VÖRÖS, Paleoenvironmental distribution, p. 488, pl. 2, fig. 5.

Material

48 specimens from Felsőörs (13), Vászoly (3), Mencshely (30) and Balatoncsicsó (2).

Measurements

	D	WH	WW	U
INV 2017.289.1.	37.4	21.1	23.1	?
INV 2017.287.1.	30.8	16.1	25.1	4.2
INV 2017.286.1.	25.5	13.1	22.1	2.4
INV 2017.288.1.	13.1	7.5	10.4	1.5

Description

Small *Proarcestes* with globose, involute conch. The whorl-section is strongly depressed, with maximum width near the umbilicus. The umbilicus is very narrow, but the other details are concealed by matrix. The flanks are very convex and form a continuous arch with the convex venter. The shell surface is smooth, without ornamentation. Most specimens have no constrictions, others show two marked, gently projected constrictions on a whorl; in one case four rectiradiate constrictions per whorl were observed (Plate XLIII: 9).

Suture lines are poorly visible; ammonitic, with multiple, equally narrow lobes and saddles, highest at the venter.

Remarks

The abundant *Proarcestes* material from the upper Anisian of the Balaton Highland consists of merely small and incomplete specimens. They probably represent more than one species. Most of the relatively better preserved specimens seem to stand close to those figured by RIEBER (1973, pl. 15, figs 19, 22, 23, 25) as "*Arcestes* (*Proarcestes*) *extralabiatus* MOJSISOVICS, 1875" (examined by the author in the collection PIMUZ, Zürich). However, as MOJSISOVICS (1882, p. 154) stated, *P. extralabiatus* has much similarity to *P. trompianus* (MOJSISOVICS, 1882). Moreover, the external features (globosity, the character and number of constrictions) of *P. bramantei* (MOJSISOVICS, 1869) do not differ significantly from the above mentioned two species. After all, the specific identification of our *Proarcestes* specimens from the Balaton Highland remains open.

Distribution

The genus *Proarcestes* has a wordwide distribution in the Middle Triassic; especially frequently recorded in the upper Anisian of the Southern Alps, the Northern Calcareous Alps, the Dinarides. At the Balaton Highland it ranges from the Illyrian Reitzi Subzone to the Secedensis Subzone, but was also recorded in the Ladinian Gredleri and Archelaus Zones (VÖRÖS 1998).

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Plates

Plate I

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV,.

1. *Norites gondola* (Mojsisovics, 1869) — INV 2017.136.1., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
2. *Norites gondola* (Mojsisovics, 1869) — INV 2017.137.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
3. Norites gondola (Mojsisovics, 1869) — INV 2017.138.1., Mencshely I, loose, Reitzi Zone, Reitzi Subzone (?); lateral view.
4. *Norites gondola* (Mojsisovics, 1869) — INV 2017.139.1., Felsőörs, Bed 99, Trinodosus Zone, Pseudohungaricum Subzone; a: lateral view, b: ventral view.
5. *Norites gondola* (Mojsisovics, 1869) — INV 2017.140.1., Szentbékkálla, loose, Trinodosus Zone (?) lateral view.
6. *Beyrichites* cf. *reuttensis (*Beyrich, 1867) — INV 2017.141.1., Szentantalfa, Bed 1, Trinodosus Zone, Pseudohungaricum Subzone; a: lateral view, b: ventral view.
7. *Lardaroceras barrandei* (Mojsisovics, 1882) — INV 2017.142.1., Felsőörs, Bed 91, Trinodosus Zone, Camunum Subzone; lateral view.
8. *Lardaroceras barrandei* (Mojsisovics, 1882) — INV 2017.143.1., Felsőörs, Bed 99, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
9. *Lardaroceras krystyni* Balini, 1992 — INV 2017.144.1., Felsőörs, Bed 93, Trinodosus Zone, Camunum Subzone; lateral view.
10. *Lardaroceras barrandei* (Mojsisovics, 1882) — M.98.4, Vörösberény, Bed 18, Trinodosus Zone, Camunum Subzone; a: lateral view, b: ventral view.
11. *Lardaroceras barrandei* (Mojsisovics, 1882) — M.98.5, Vörösberény, Bed 17, Trinodosus Zone, Camunum Subzone; lateral view.
12. *Lardaroceras pseudohungaricum* Balini, 1992 — M.98.18, Felsőörs, Bed 97, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.

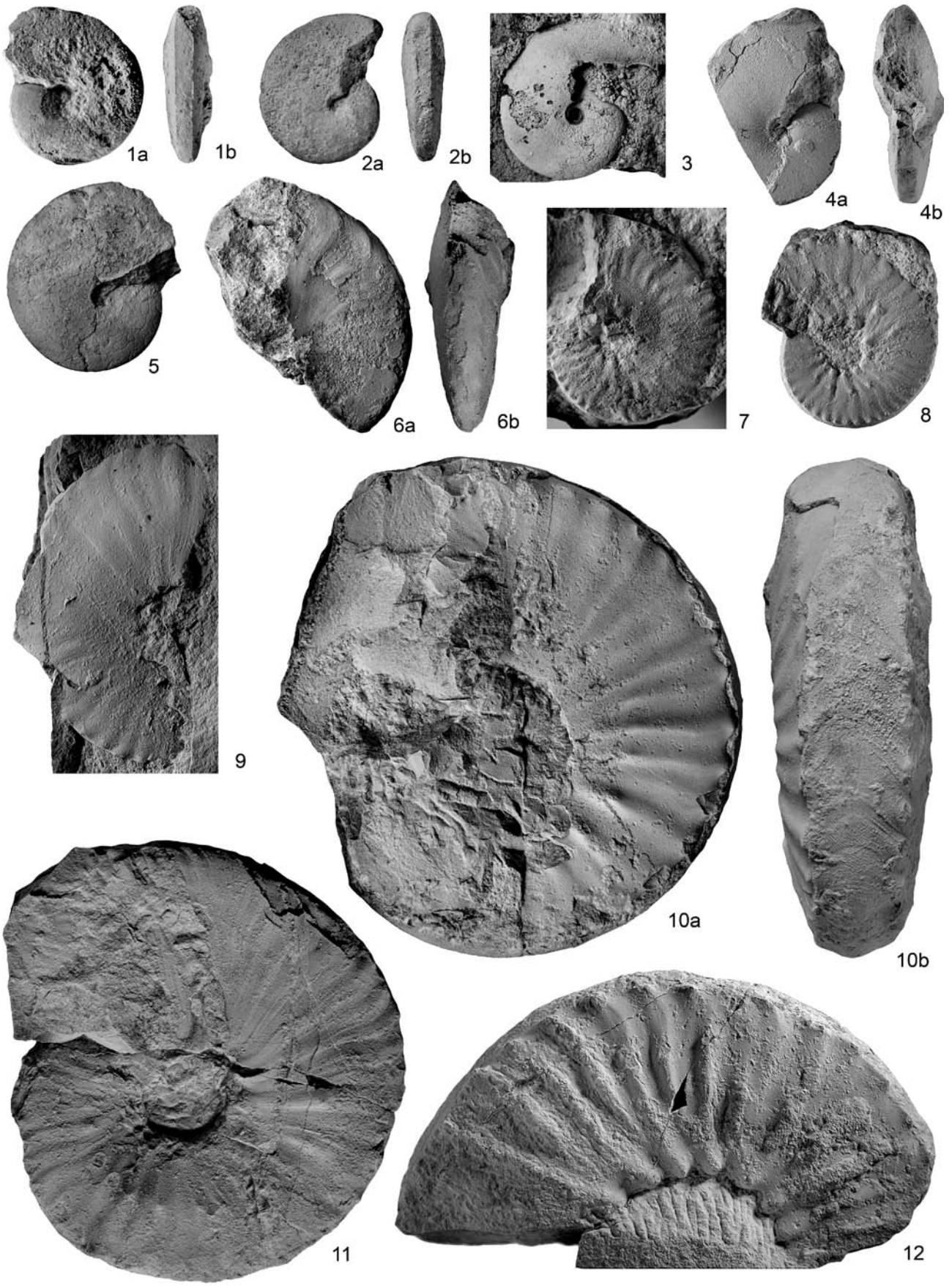
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Plate II

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Lardaroceras pseudohungaricum* BALINI, 1992 — M.98.168A, Vászoly, Trench P-11/a, Bed 5, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
2. *Lardaroceras pseudohungaricum* BALINI, 1992 — M.98.19, Felsőörs, Bed 99, Trinodosus Zone, Pseudohungaricum Subzone; a: lateral view, b: ventral view.
3. *Lardaroceras pseudohungaricum* BALINI, 1992 — INV 2017.145.1., Felsőörs, Bed 99, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
4. *Lardaroceras pseudohungaricum* BALINI, 1992 — M 2001.26., Felsőörs, Bed 100/E, Reitzi Zone, Felsoeoersensis Subzone; lateral view.
5. *Lardaroceras pseudohungaricum* BALINI, 1992 — INV 2017.146.1., Felsőörs, Bed 100/E, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view.
6 *Lardaroceras pseudohungaricum* BALINI, 1992 — INV 2017.147.1., Vörösberény, Bed 6, Reitzi Zone, Felsoeoersensis Subzone; lateral view.
7. *Lardaroceras pseudohungaricum* BALINI, 1992 — T.1666., Felsőörs, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view. Original specimen figured by MOJSISOVICS (1882, pl. XXX, fig. 19) as *"Ceratites hungaricus"*.
8. *Paraceratites* cf. *elegans* (MOJSISOVICS, 1882) — INV 2017.148.1., Felsőörs, Bed 90, Trinodosus Zone, Camunum Subzone; lateral view.
9. *Paraceratites trinodosus* (MOJSISOVICS, 1882) — INV 2017.149.1., Felsőörs, Bed 84/D, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
10. *Paraceratites trinodosus* (MOJSISOVICS, 1882) — INV 2017.150.1., Felsőörs, Bed 84/E, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
11. *Paraceratites trinodosus* (MOJSISOVICS, 1882) — M.98.8, Vörösberény, Bed 29, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
12. *Paraceratites trinodosus* (MOJSISOVICS, 1882) — INV 2017.151.1., Felsőörs, Bed 84/F, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.

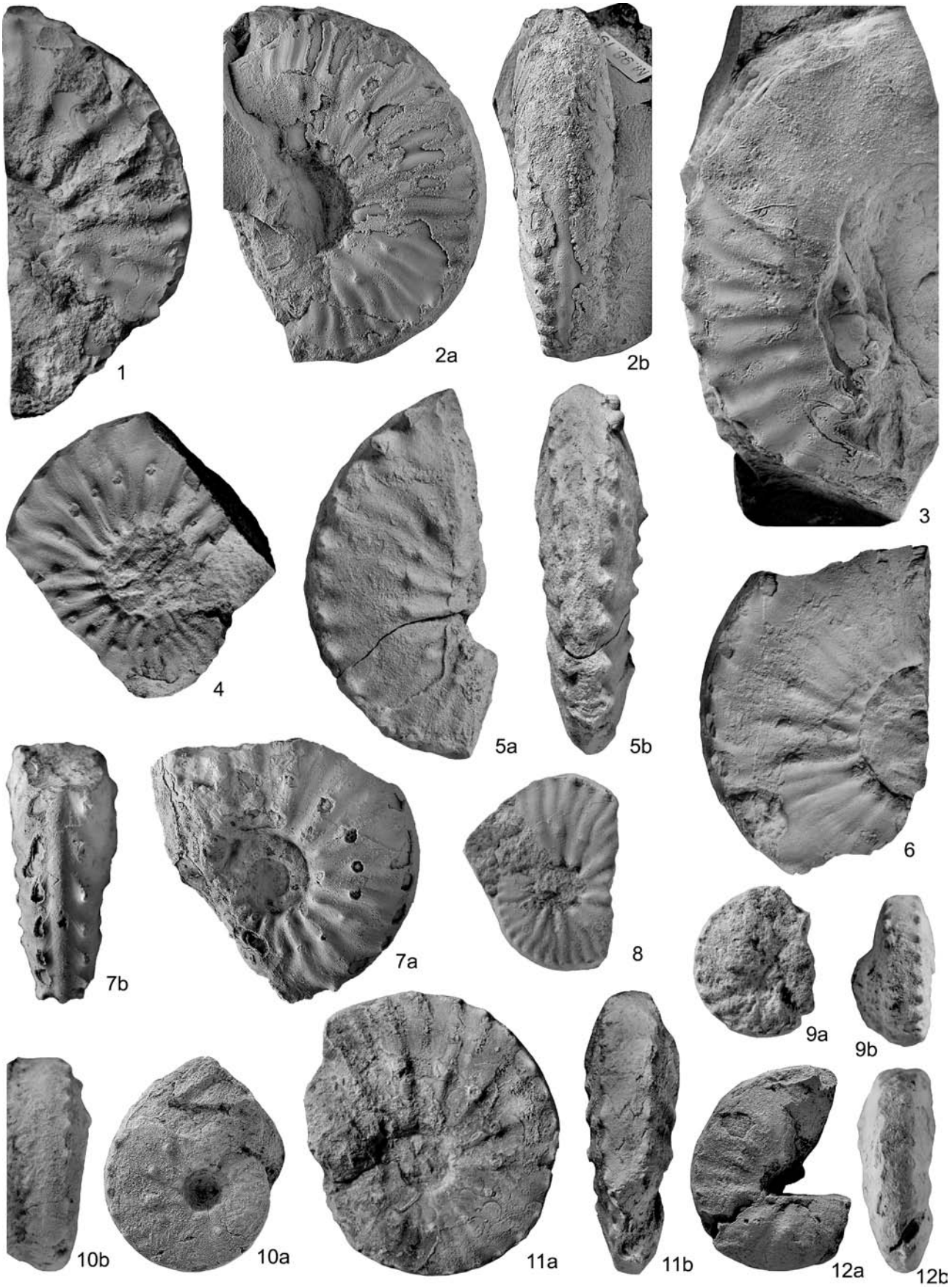
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Plate III

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Paraceratites trinodosus* (Mojsisovics, 1882) — INV 2017.152.1., Felsőörs, Bed 84/E, Trinodosus Zone, Trinodosus Subzone; lateral view.
2. *Paraceratites trinodosus* (Mojsisovics, 1882) — INV 2017.153.1., Vörösberény, Bed 29, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
3. *Paraceratites trinodosus* (Mojsisovics, 1882) — M.87.033, Monoszló, loose, Trinodosus Zone; a: lateral view, b: ventral view.
4. *Paraceratites* cf. *rothi* (Mojsisovics, 1882) — INV 2017.154.1., Felsőörs, Bed 84/E, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
5. *Paraceratites rothi* (Mojsisovics, 1882) — T.838., Felsőörs, Trinodosus Zone; a: lateral view, b: ventral view. Holotype figured by Mojsisovics (1882, pl. IX, fig. 7.) as *"Ceratites Rothi"*.
6. *Semiornites* cf. *aviticus* (Mojsisovics, 1882) — INV 2017.155.1., Szentkirályszabadja, Bed 20, Trinodosus Zone, Pseudohungaricum Subzone; a: lateral view, b: ventral view.
7. *Semiornites* cf. *cordevolicus* (Mojsisovics, 1882) — INV 2017.156.1., Vörösberény, Bed 27, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
8. *Semiornites* ? cf. *falcifer* (Hauer, 1896) — INV 2017.157.1., Mencshely II, Bed 9, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view.
9. *Semiornites* cf. *cordevolicus* (Mojsisovics, 1882) — INV 2017.158.1., Vörösberény, Bed 27, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
10. *Asseretoceras camunum* (Assereto, 1963) — M.89.187A, Vászoly, Trench P-11/a, Bed 3, Trinodosus Zone, Camunum Subzone; a: lateral view, b: ventral view.
11. *Asseretoceras camunum* (Assereto, 1963) — M.89.187B, Vászoly, Trench P-11/a, Bed 3, Trinodosus Zone, Camunum Subzone; a: lateral view, b: ventral view.
12. *Asseretoceras camunum* (Assereto, 1963) — M.89.52, Vöröstó, loose, Trinodosus Zone, Camunum Subzone (?); a: lateral view, b: ventral view.

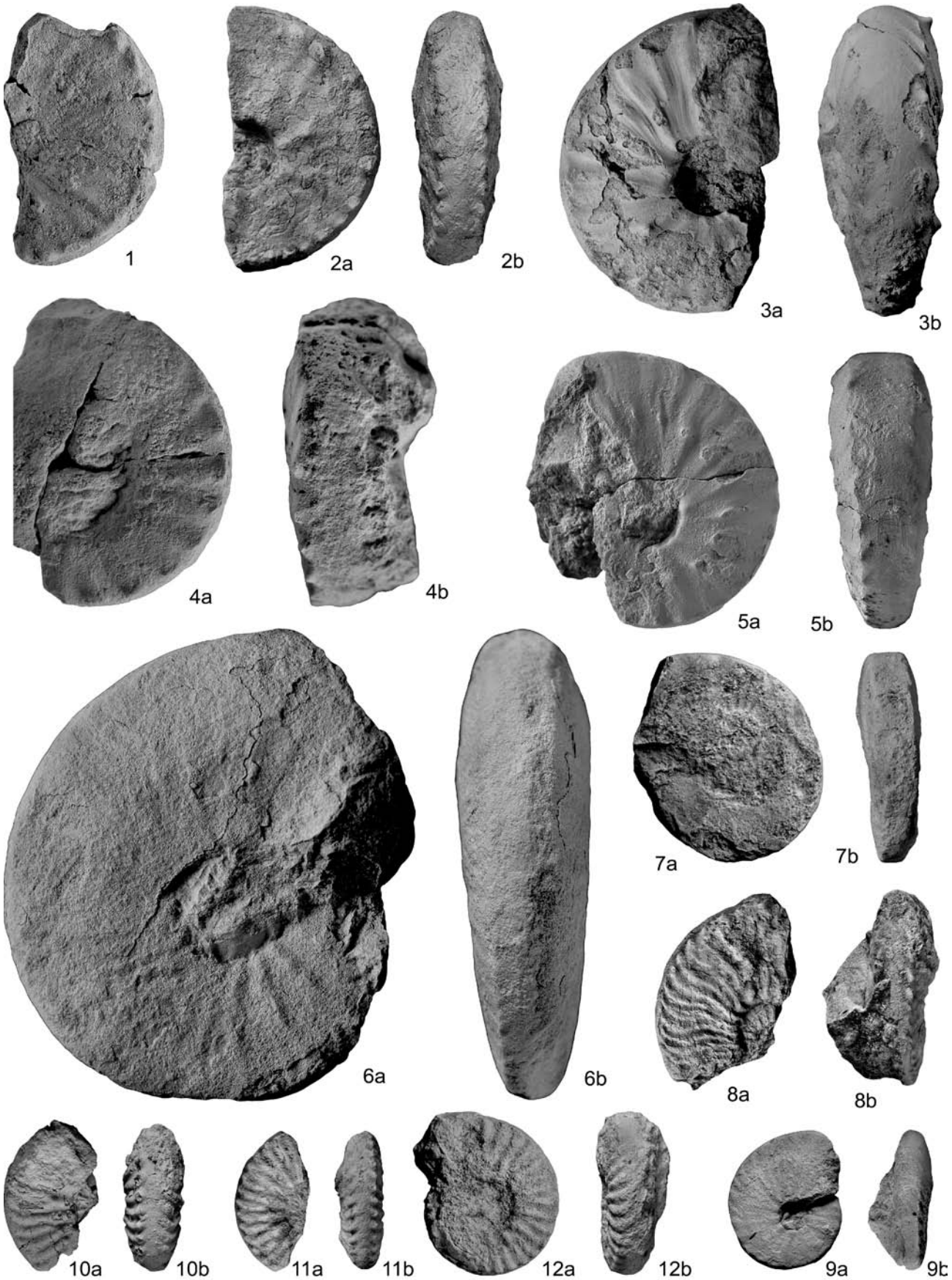
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Plate IV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Asseretoceras camunum* (Assereto, 1963) — INV 2017.159.1., Felsőörs, Bed 90, Trinodosus Zone, Camunum Subzone; lateral view.
2. *Asseretoceras camunum* (Assereto, 1963) — INV 2017.160.1., Felsőörs, Bed 99/C, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
3. *Asseretoceras camunum* (Assereto, 1963) — INV 2017.161.1., Felsőörs, Bed 99/C, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
4. *Asseretoceras camunum* (Assereto, 1963) — INV 2017.162.1., Felsőörs, Bed 99/C, Trinodosus Zone, Pseudohungaricum Subzone; lateral view.
5. *Megaceratites* cf. *subnodosus* (Mojsisovics, 1882) — INV 2017.163.1., Vörösberény, Bed 28, Trinodosus Zone, Trinodosus Subzone; lateral view.
6. *Megaceratites* cf. *subnodosus* (Mojsisovics, 1882) — INV 2017.164.1., Szentantalfa, Bed 2/A, Trinodosus Zone, Camunum Subzone; a: lateral view, b: ventral view.
7. *Megaceratites* cf. *subnodosus* (Mojsisovics, 1882) — M.98.9, Vörösberény, Bed 27, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
8. *Megaceratites* cf. *subnodosus* (Mojsisovics, 1882) — M.89.168A, Vászoly, Trench P-11/a, Bed 5, Trinodosus Zone, Pseudohungaricum Subzone; a: lateral view, b: ventral view.


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Plate V

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. . *Megaceratites* cf. *subnodosus* (MOJSISOVICS, 1882) — INV 2017.165.1., Felsőörs, Bed 84/B, Trinodosus Zone, Trinodosus Subzone; a: lateral view, b: ventral view.
2. *Megaceratites* ? cf. *friccensis* (ARTHABER, 1916) — M.98.87, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
3. *Kellnerites bosnensis* (HAUER, 1887) — M.98.6, Felsőörs, Bed 100/E, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view.
4. *Kellnerites bosnensis* (HAUER, 1887) — INV 2017.166.1., Mencshely I, Bed 16, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view.
5. *Kellnerites bosnensis* (HAUER, 1887) — INV 2017.167.1., Szentkirályszabadja, Bed 12, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; a: lateral view, b: ventral view.
6. *Kellnerites* cf. *bispinosus* (HAUER, 1896) — INV 2017.168.1., Felsőörs, Bed 100/E, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view.

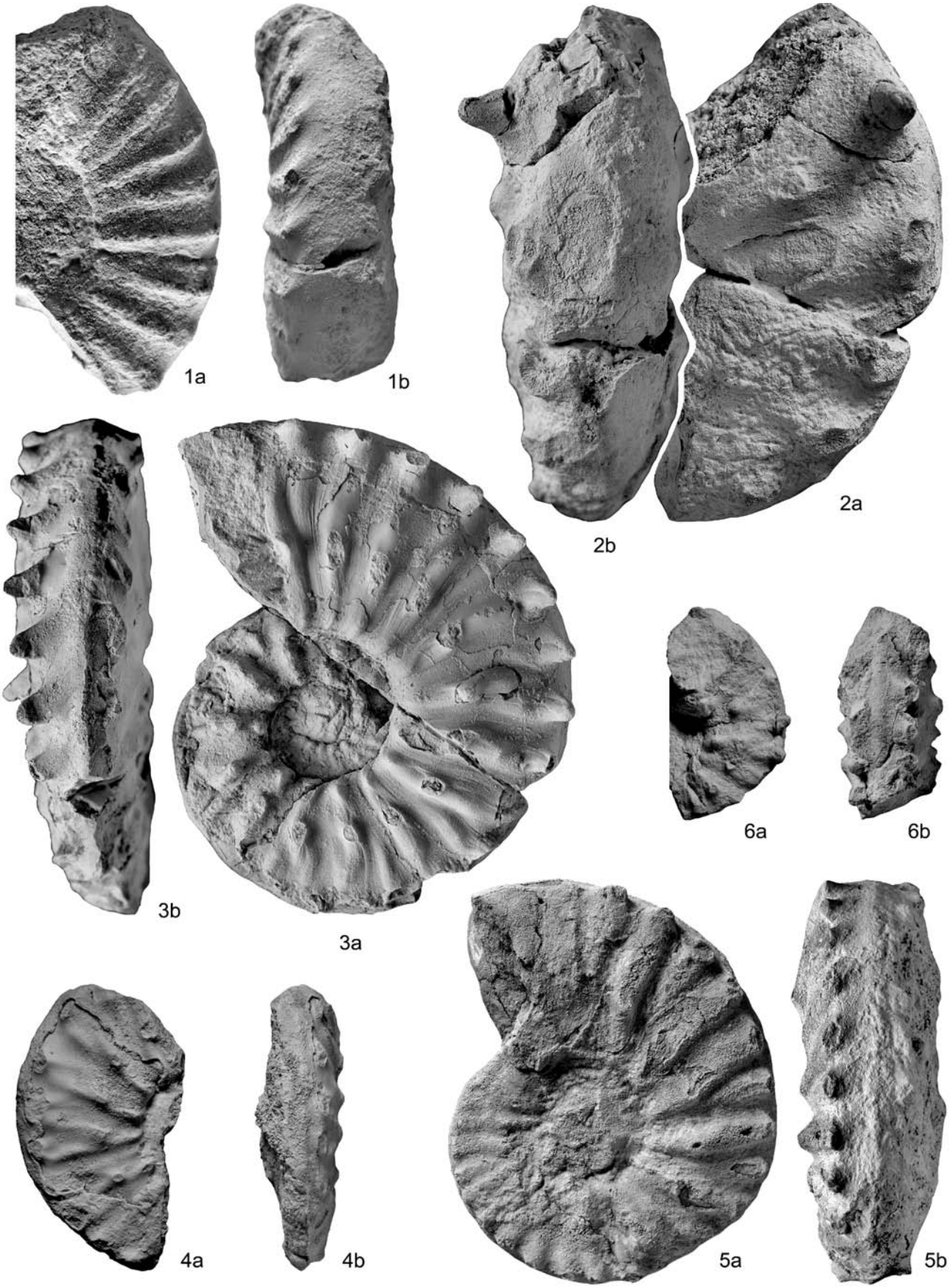
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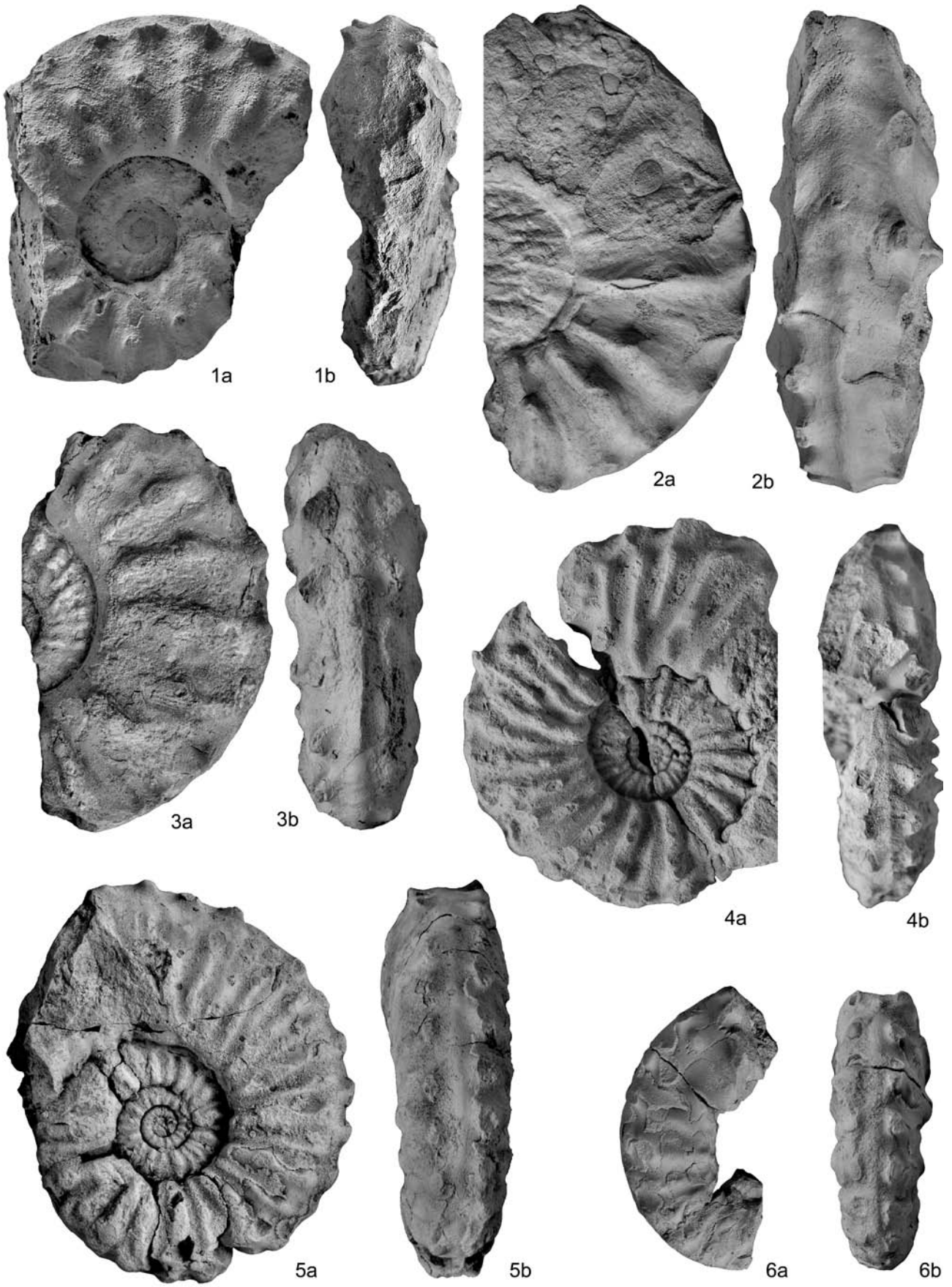
Plate VI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — T.694., Felsőörs, Reitzi Zone, Felsoeoersensis Subzone; a: lateral view, b: ventral view. Lectotype figured by STÜRZENBAUM (1875, pl. V, fig. 1) as "*Ceratites Felső Örsensis* n. sp." and by MOJSISOVICS (1882, pl. XIII, fig. 1) as *"Ceratites Felsö-Örsensis"*.
2. *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — M.98.11, Szentkirályszabadja, loose, Reitzi Zone, Felsoeoersensis Subzone (?); a: lateral view, b: ventral view.
3. *Kellnerites felsoeoersensis* (STÜRZENBAUM, 1875) — INV 2017.169.1., Vászoly, Shaft P-XV, Reitzi Zone, Felsoeoersensis Subzone (?); a: lateral view, b: ventral view.
4. *Epikellnerites angustecarinatus* (HAUER, 1896) — INV 2017.170.1., Mencshely, Bed 9, Reitzi Zone, Reitzi Subzone.
5. *Epikellnerites angustecarinatus* (HAUER, 1896) — INV 2017.171.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view. Specimen figured by KOVÁCS et al. (1990, pl. III, fig. 4) as *"Protrachyceras" reitzi* (BÖCKH), and alleged to came from Shaft P-XVIII.
6. *Epikellnerites angustecarinatus* (HAUER, 1896) — INV 2017.172.1., Vászoly, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.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3a
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4b
5a
5b
6a
6b

Plate VII

All figures are magnified twice unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Geological and Paleontological Department, Hungarian Natural History Museum, under the inventory numbers prefixed by INV or PAL. and in the Museum of the Mining and Geological Survey of Hungary (Budapest), under the inventory number prefixed by T.

1. *Epikellnerites* cf. *angustecarinatus* (HAUER, 1896) — INV 2017.173.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
2. *Epikellnerites* cf. *angustecarinatus* (HAUER, 1896) — INV 2017.174.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
3. *Epikellnerites tamasi* n. sp. — Holotype, PAL 2017.10.1., Szentbékkálla, loose, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.
4. *Epikellnerites* cf. *tamasi* n. sp. — Paratype. PAL 2017.11.1., Vászoly, Trench P-11/c, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.
5. *Epikellnerites* aff. *tamasi* n. sp. — T.863., Felsőörs, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view. Original specimen figured by MOJSISOVICS (1882, pl. XXXIV, fig. 1) as *"Ceratites* nov. forma indet. aff. *hungarico"*.
6. *Epikellnerites vaszolyensis* n. sp. — Holotype, PAL 2017.12.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.

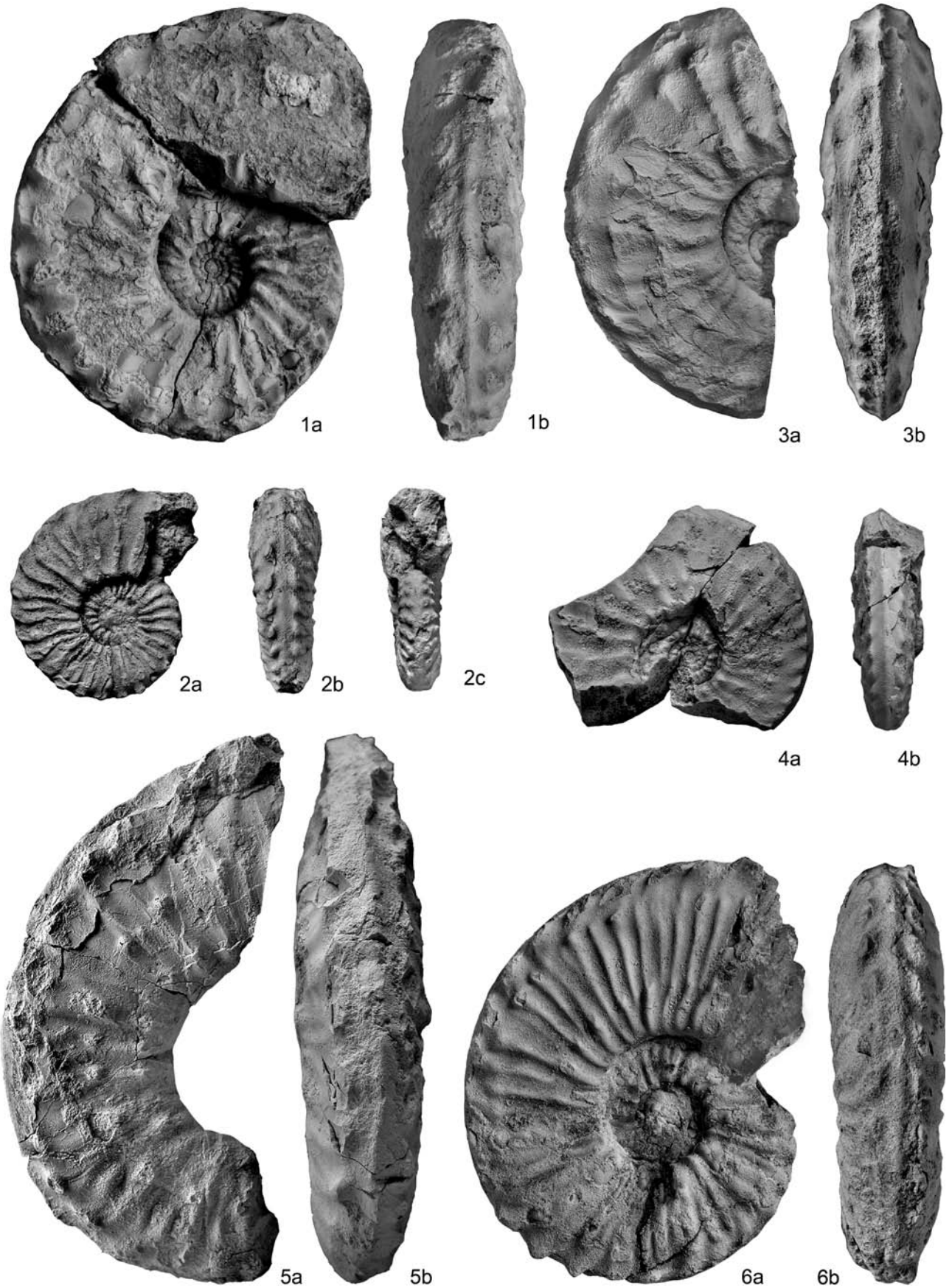
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Plate VIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or PAL.

1. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.13.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
2. *Epikellnerites vaszolyensis* n. sp. — Paratype, M.98.14., Vászoly, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
3. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.14.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
4. *Epikellnerites vaszolyensis* n. sp. — Paratype, M.98.74., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
5. *Epikellnerites vaszolyensis* n. sp. — Paratype, M.87.006., Szentbékkálla, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
6. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.15.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
7. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.16.1., Vászoly, Shaft P-XVIII, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view. Specimen figured by Kovács et al. (1990, pl. III, fig. 1) as "*Parakellnerites* sp. nov. 1", and alleged to came from P-11/a).
8. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.17.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.

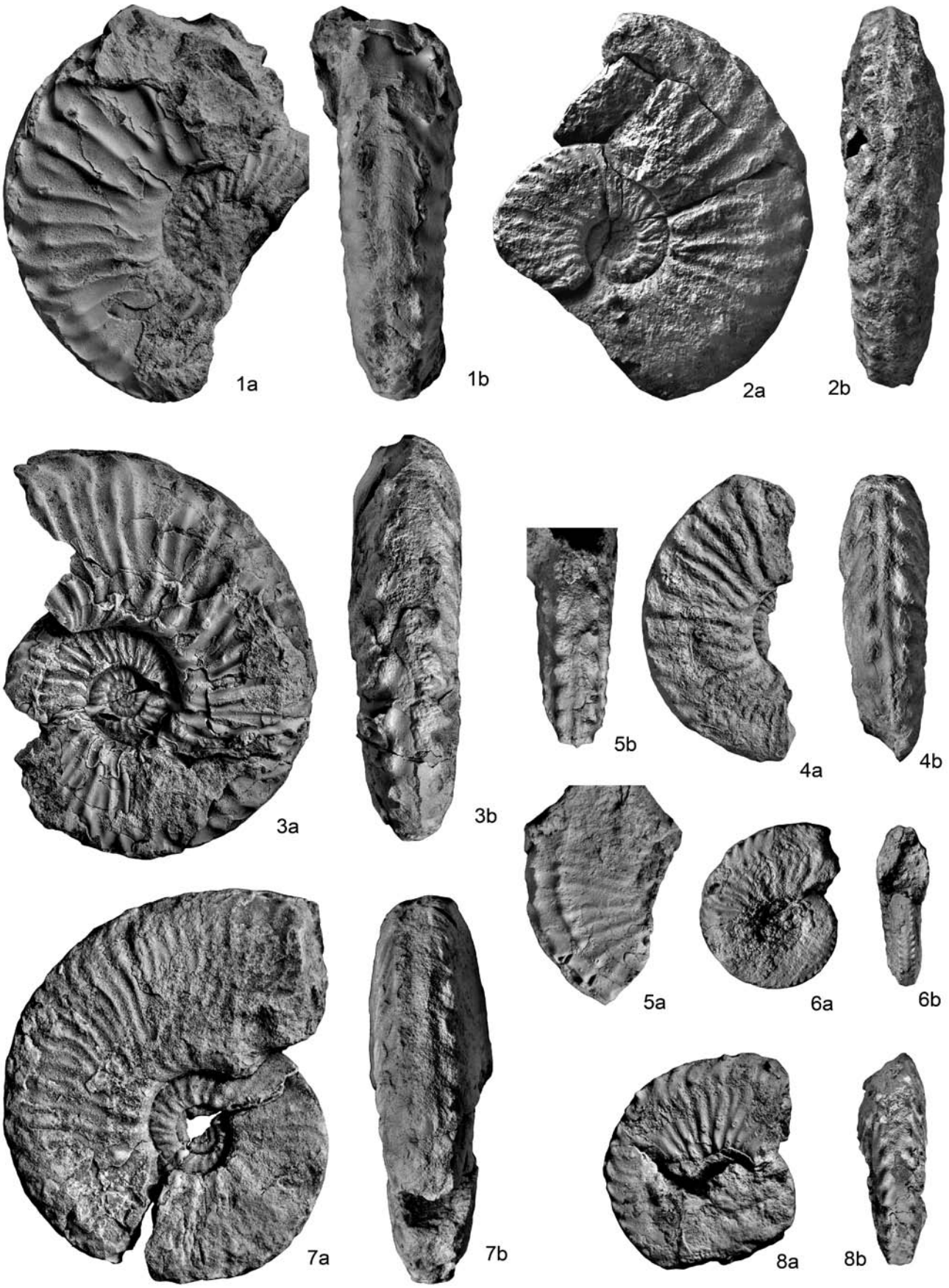
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Plate IX

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by INV, or PAL, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.18.1., Vászoly, Shaft P-XVIII, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
2. *Epikellnerites vaszolyensis* n. sp. — Paratype, PAL 2017.19.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
3. *Epikellnerites pseudocholnokyi* n. sp. — Paratype, PAL 2017.22.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
4. *Epikellnerites pseudocholnokyi* n. sp. — Holotype, PAL 2017.20.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
5. *Epikellnerites pseudocholnokyi* n. sp. — Paratype, PAL 2017.21.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
6. *Epikellnerites spinatus* n. sp. — Holotype, PAL 2017.23.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
7. *Epikellnerites spinatus* n. sp. — Paratype, PAL 2017.24.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); lateral view.
8. *Hyparpadites liepoldti* (Mojsisovics, 1882) — Lectotype, T.689., Felsőörs, Reitzi Zone, Liepoldti Subzone; a: lateral view, b, c: ventral views, d: magnified part of c. Lectotype figured by Mojsisovics (1882, pl. VIII, fig. 1 and pl. IX, fig. 9) as *"Arpadites (Ceratites) Liepoldti"*.
9. *Hyparpadites liepoldti* (Mojsisovics, 1882) — INV 2017.175.1., Szentkirályszabadja, Bed 16, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; a: lateral view, b: ventral view.
10. *Hyparpadites liepoldti* (Mojsisovics, 1882) — INV 2017.176.1., Vászoly, Shaft P-XVIII, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.


1a


1b


2a


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8d


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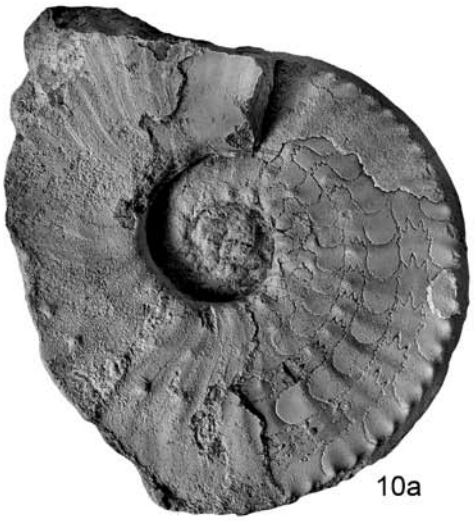
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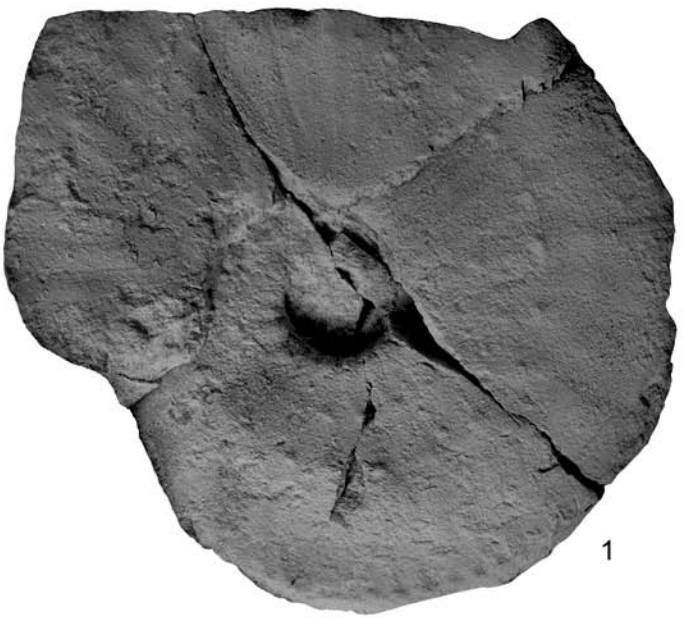
10b

Plate X

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, unless otherwise indicated.

1. *Hyparpadites liepoldti* (Mojsisovics, 1882) — M.98.22, Felsőörs, Bed 102, Reitzi Zone, Liepoldti Subzone (?); lateral view..
2. *Hyparpadites liepoldti* (Mojsisovics, 1882) — INV 2017.177.1., Szentkirályszabadja, Bed 16, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; a: lateral view, b: ventral view.
3. *Hyparpadites liepoldti* (Mojsisovics, 1882) — In private collection of L. Varga (Úny), Vászoly, Trench P-11/c, loose, Reitzi Zone, Liepoldti Subzone; lateral view.
4. *Hyparpadites liepoldti* (Mojsisovics, 1882) — INV 2017.178.1., Szentkirályszabadja, Bed 13, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; lateral view.
5. *Hyparpadites liepoldti* (Mojsisovics, 1882) — INV 2017.179.1., Szentkirályszabadja, Bed 16, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; lateral view.
6. *Hyparpadites* cf. *liepoldti* (Mojsisovics, 1882) — INV 2017.180.1., Sóly, Bed 11, Reitzi Zone, Avisianum Subzone; half of the specimen; a: lateral view, b: ventral view.
7. *Hyparpadites* aff. *liepoldti* (Mojsisovics, 1882) — M.89.136, Vászoly, Trench P-11/a, Bed 9, Reitzi Zone, Liepoldti Subzone; a: lateral view, b: ventral view.



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2b

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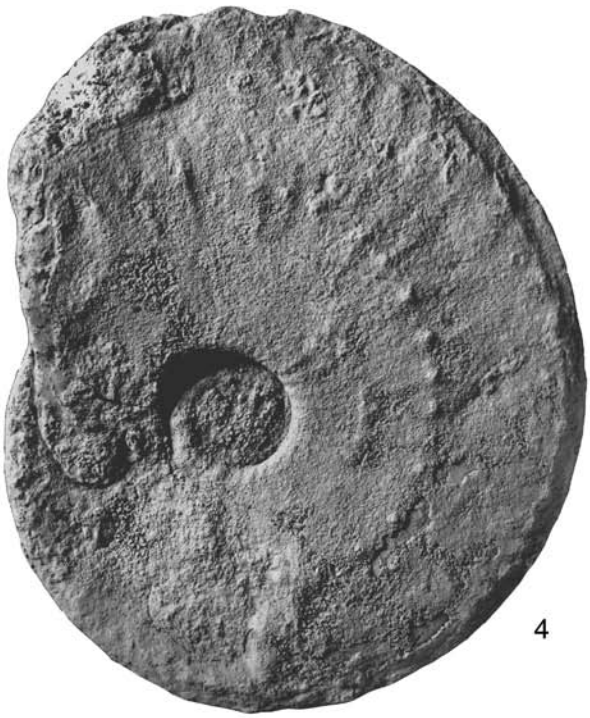
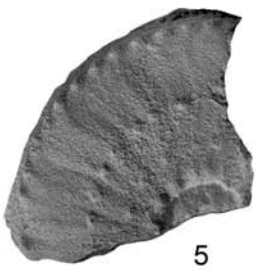


4



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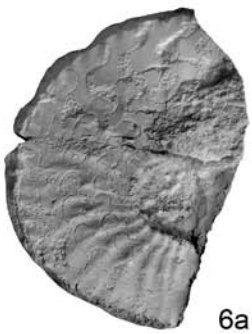


6a

6b

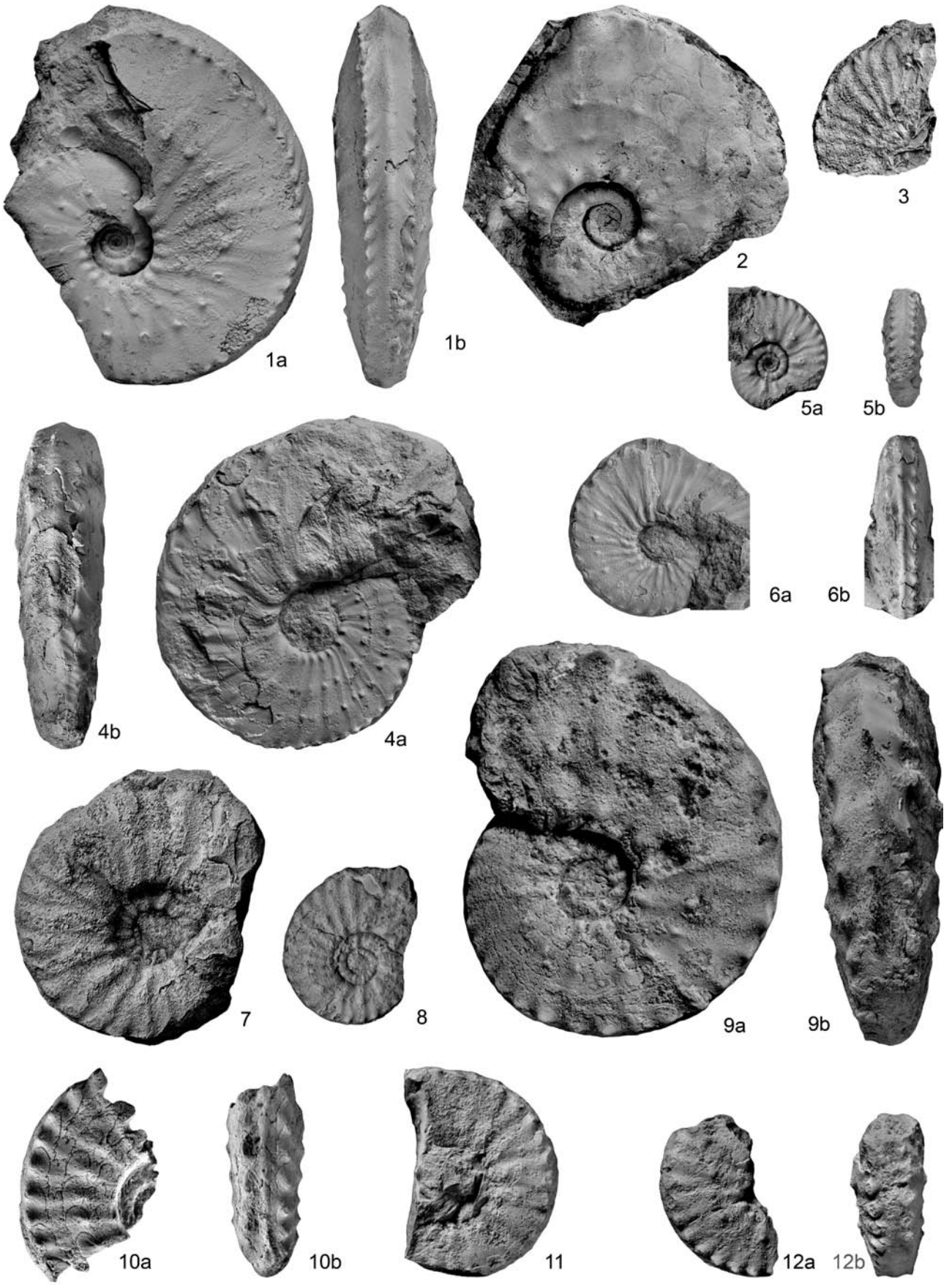
7a

7b

Plate XI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by INV or PAL, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T., unless otherwise indicated.

1. *Hyparpadites liepoldti* (Mojsisovics, 1882) — In private collection of K. Tamás (Kővágóörs), Szentkirályszabadja, loose, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.
2. *Hyparpadites liepoldti* (Mojsisovics, 1882) — In private collection of K. Tamás (Kővágóörs), Szentkirályszabadja, loose, Reitzi Zone, Liepoldti Subzone (?); lateral view.
3. *Hyparpadites szaboi* n. sp. — Paratype, PAL 2017.27.1., Mencshely I, Bed 14, Reitzi Zone, Liepoldti Subzone; lateral view.
4. *Hyparpadites szaboi* n. sp. — Holotype, PAL 2017.25.1., Vászoly, Shaft P-XVII, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view. Specimen figured by Kovács et al. (1990, pl. III, fig. 2) as "*Parakellnerites* sp. nov. 2".
5. *Parakellnerites* cf. *frauenfelderi* Rieber, 1973 — T 2017.1.1., Vászoly, Shaft P-XVII, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.
6. *Hyparpadites szaboi* n. sp. — Paratype, PAL 2017.26.1., Vászoly, Shaft P-XVII, Reitzi Zone, Liepoldti Subzone (?); a: lateral view, b: ventral view.
7. *Parakellnerites frauenfelderi* Rieber, 1973 — INV 2017.181.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; lateral view.
8. *Parakellnerites frauenfelderi* Rieber, 1973 — INV 2017.182.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; lateral view.
9. *Parakellnerites frauenfelderi* Rieber, 1973 — T 2017.2.1, Vászoly, P-11/c, loose, Reitzi Zone, Liepoldti Subzone; a: lateral view, b: ventral view.
10. *Parakellnerites* cf. *frauenfelderi* Rieber, 1973 — INV 2017.183.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
11. *Parakellnerites* cf. *frauenfelderi* Rieber, 1973 — INV 2017.184.1., Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone; lateral view.
12. *Parakellnerites* cf. *frauenfelderi* Rieber, 1973 — INV 2017.185.1., Vászoly Trench P-2, Bed 4, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.


1a
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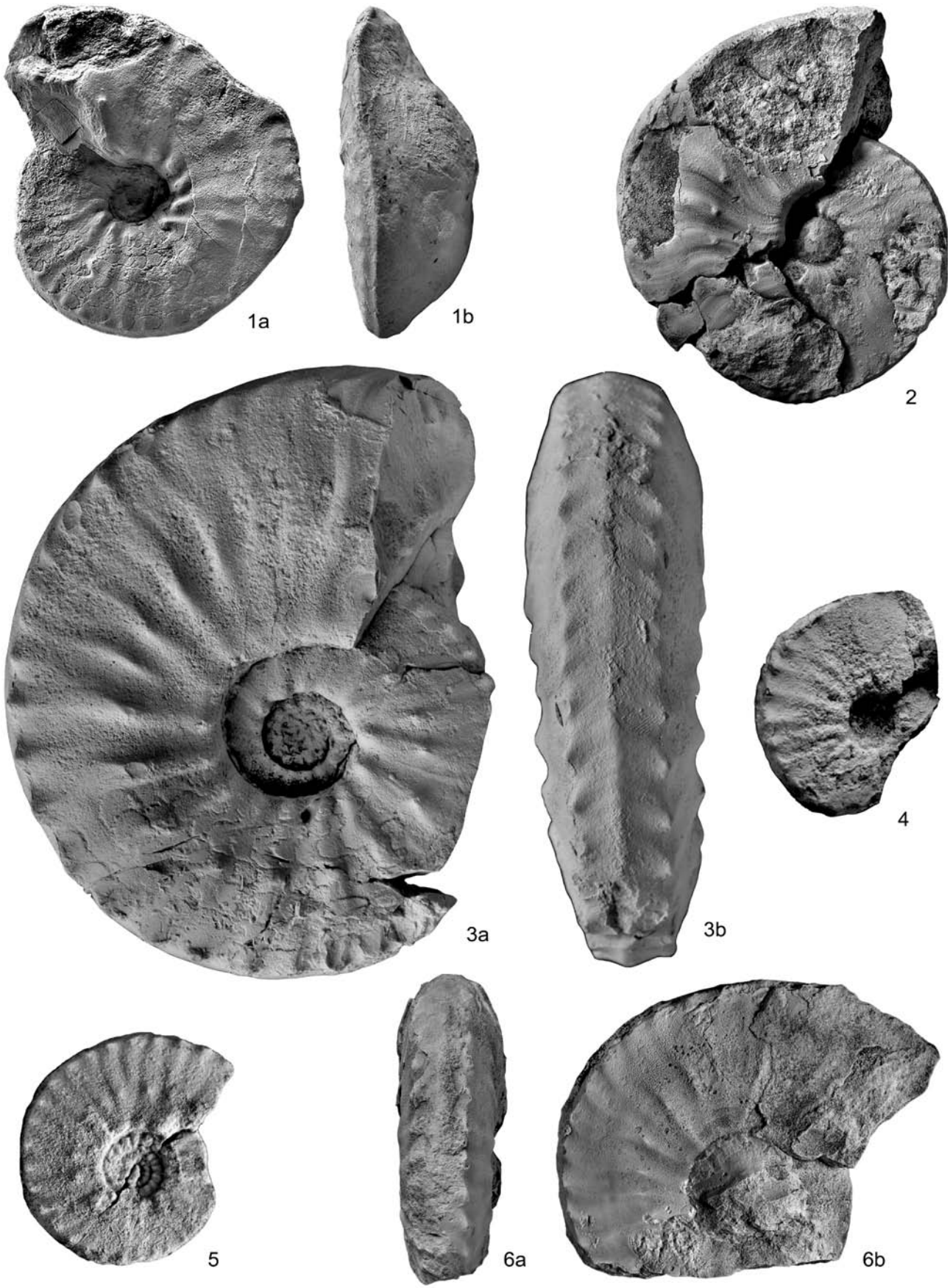
9a
9b
10a
10b
11
12a
12b

Plate XII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parakellnerites boeckhi* (Roth, 1871) — Holotype, T.681., Felsőörs, loose, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
2. *Parakellnerites boeckhi* (Roth, 1871) — INV 2017.186.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone (?); lateral view.
3. *Parakellnerites boeckhi* (Roth, 1871) — M.98.28, Felsőörs, Bed 105 (?), Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
4. *Parakellnerites boeckhi* (Roth, 1871) — M.98.31B, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
5. *Parakellnerites boeckhi* (Roth, 1871) — M.98.31A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
6. *Parakellnerites boeckhi* (Roth, 1871) — T 2017.4.1., Vászoly, Trench P-11/c, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.


1a
1b
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3a
3b
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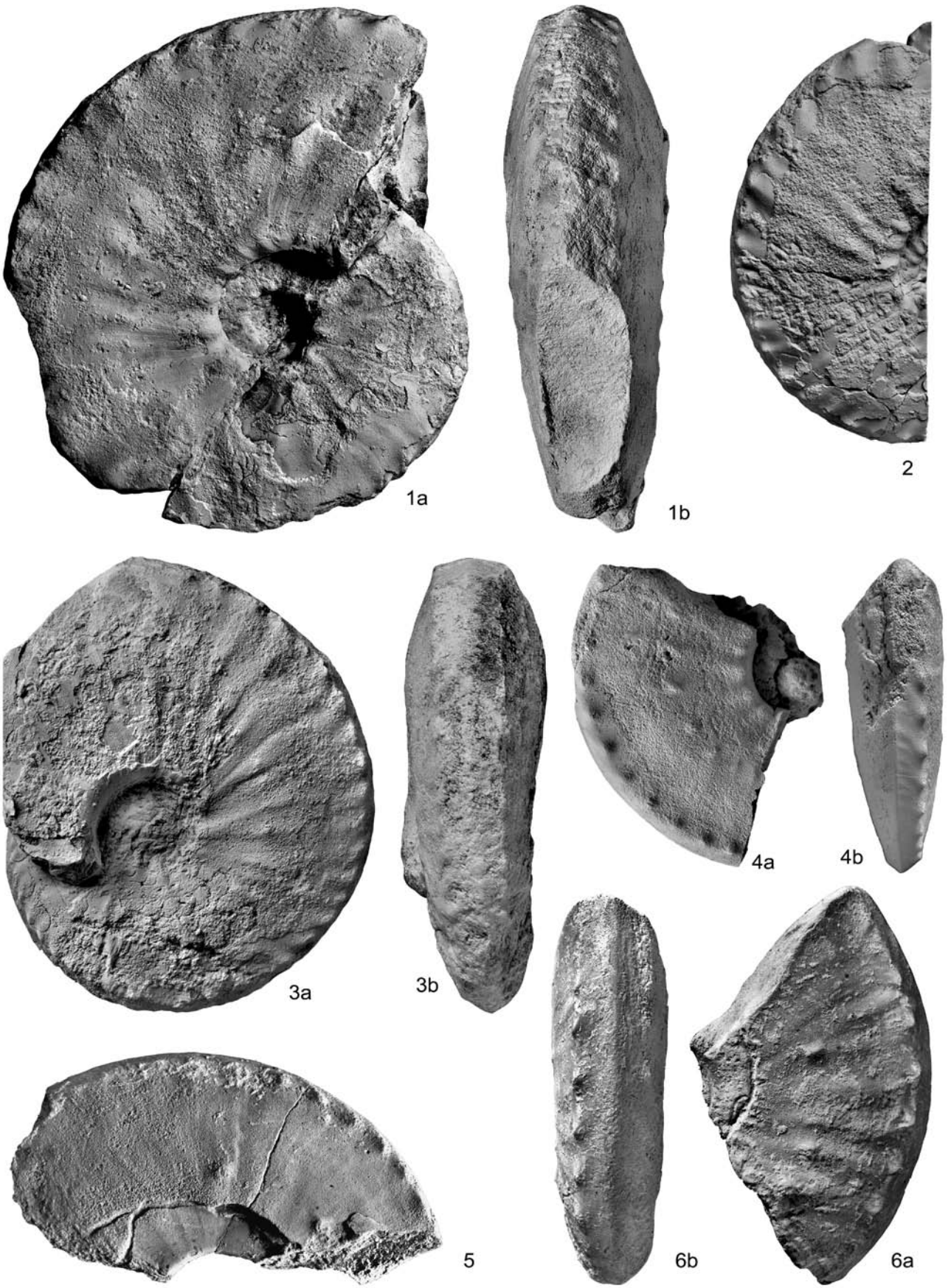
5
6a
6b

Plate XIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by PAL, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parakellnerites boeckhi* (Roth, 1871) — T 2017.5.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
2. *Parakellnerites boeckhi* (Roth) — T 2017.6.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); lateral view.
3. *Parakellnerites boeckhi* (Roth) — T 2017.3.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
4. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, T.699., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view. Specimen figured by Mojsisovics (1882, pl. pl. XXX, fig. 17), as *"Ceratites hungaricus"*.
5. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, PAL 2017.29.1., Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone; lateral view.
6. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, PAL 2017.28.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.


1a
1b
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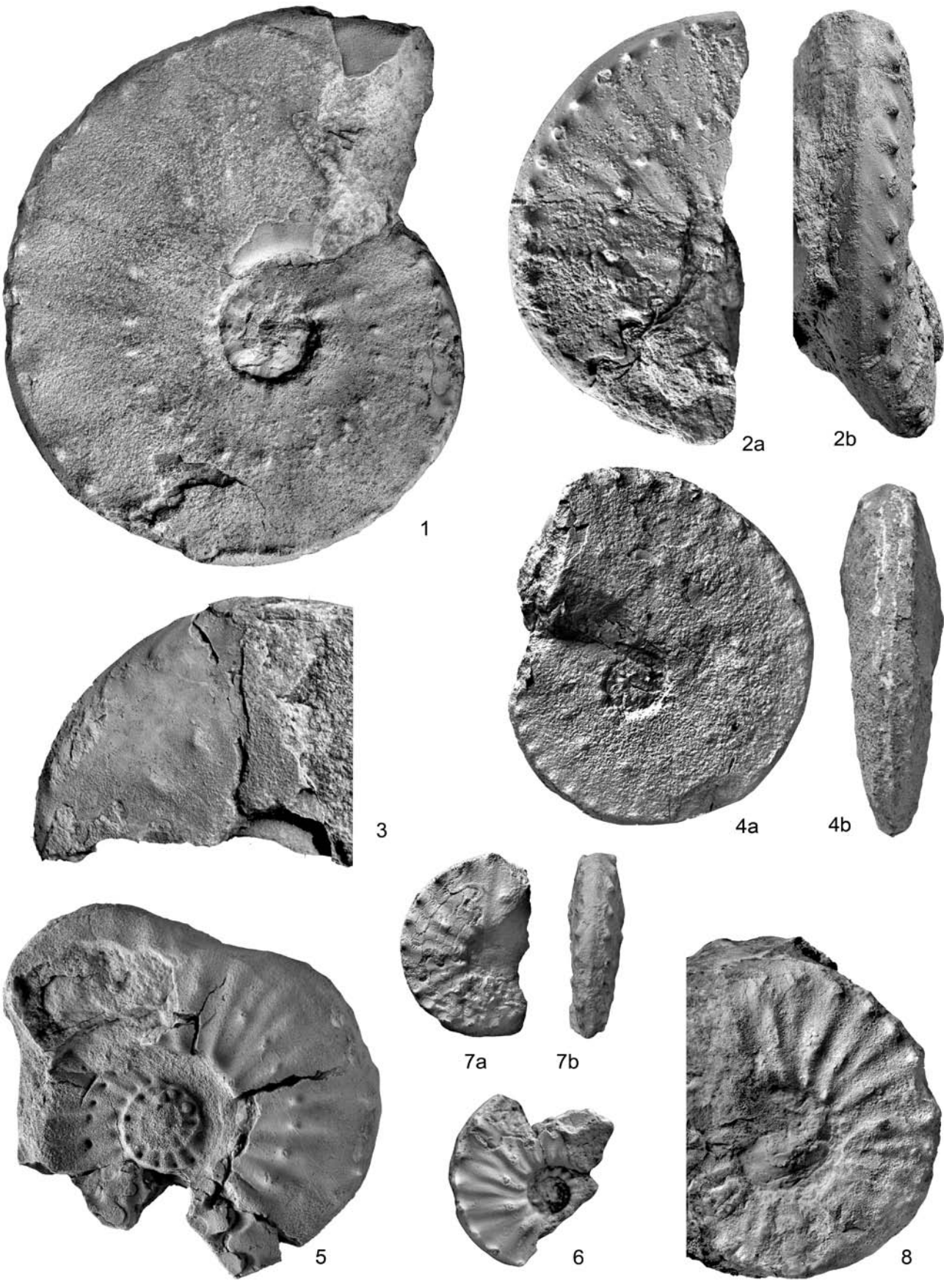
3a
3b
4a
4b
5
6b
6a

Plate XIV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., PAL, or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parakellnerites stuerzenbaumi* n. sp. — Holotype, PAL 2017.30.1., Vászoly, Trench P-14, Reitzi Zone, Avisianum Subzone (?); lateral view.
2. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, PAL 2017.31.1., Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
3. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, M.89.86, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; half of the specimen; lateral view.
4. *Parakellnerites stuerzenbaumi* n. sp. — Paratype, M.89.83, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view.
5. *Parakellnerites hungaricus* (Mojsisovics, 1882) — Lectotype, T.828., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?); lateral view. Specimen figured by Mojsisovics (1882, pl. pl. XXX, fig. 21), as *"Ceratites hungaricus"*.
6. *Parakellnerites hungaricus* (Mojsisovics, 1882) — INV 2017.187.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone; lateral view.
7. *Parakellnerites hungaricus* (Mojsisovics, 1882) — INV 2017.188.1., Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
8. *Parakellnerites hungaricus* (Mojsisovics, 1882) — M.89.75, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; lateral view.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2a
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4a
4b
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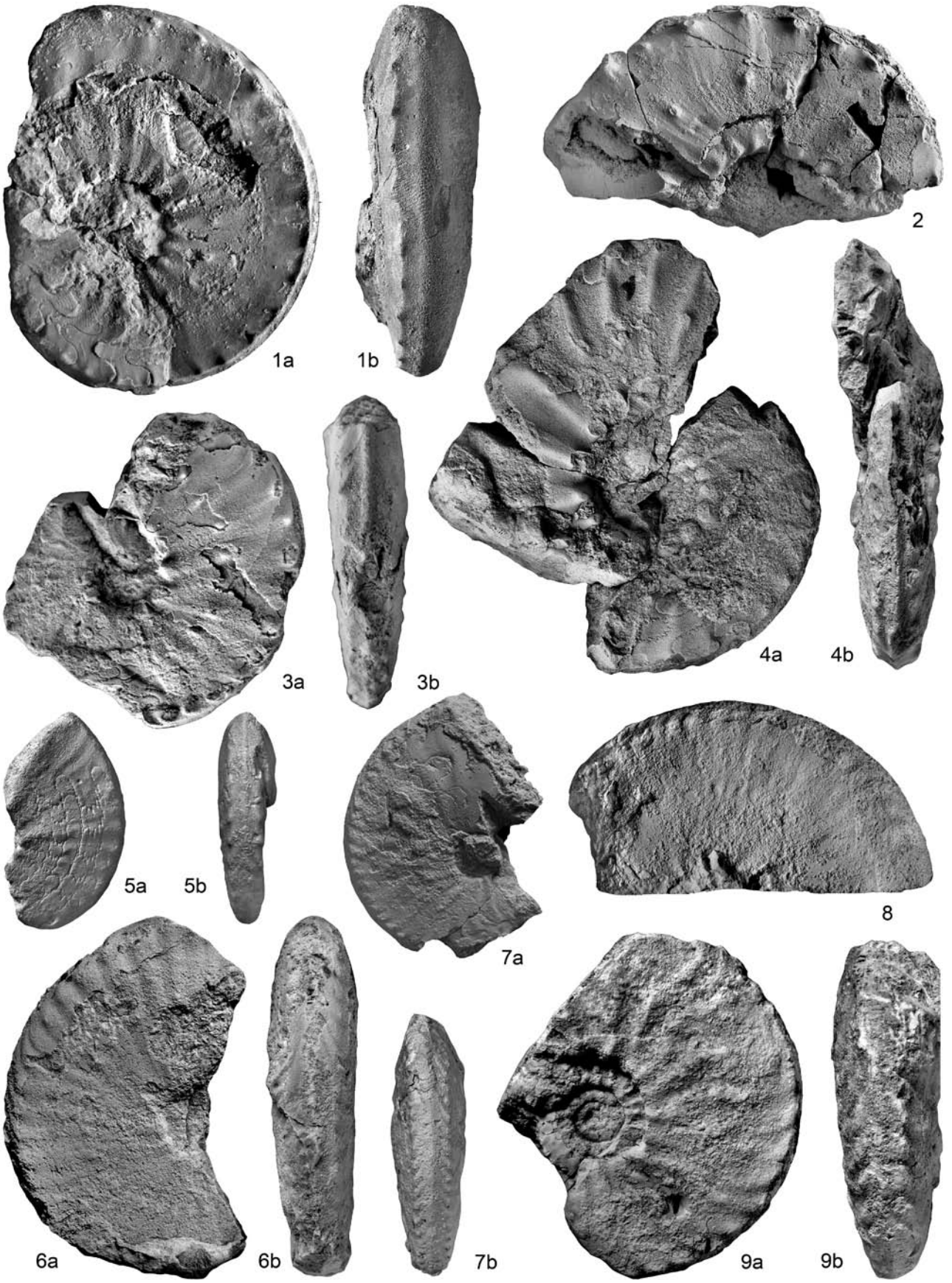
7a
7b
8

Plate XV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parakellnerites hungaricus* (Mojsisovics, 1882) — INV 2017.189.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
2. *Parakellnerites* aff. *hungaricus* (Mojsisovics, 1882) — T.698., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?); lateral view. Specimen figured by Mojsisovics (1882, pl. pl. XXX, fig. 18), as *"Ceratites hungaricus"*.
3. *Parakellnerites* aff. *hungaricus* (Mojsisovics, 1882) — INV 2017.190.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
4. *Parakellnerites* aff. *hungaricus* (Mojsisovics, 1882) — INV 2017.191.1., Mencshely I, loose, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
5. *Parakellnerites* cf. *rothpletzi* (Salomon, 1895) — INV 2017.192.1., Felsőörs, Bed 111/F, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
6. *Parakellnerites* cf. *rothpletzi* (Salomon, 1895) — INV 2017.193.1., Mencshely I, Bed 2, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
7. *Parakellnerites* cf. *rothpletzi* (Salomon, 1895) — INV 2017.194.1., Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
8. *Parakellnerites* cf. *rothpletzi* (Salomon, 1895) — INV 2017.195.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone; lateral view.
9. *Parakellnerites* aff. *rothpletzi* (Salomon, 1895) — T 2017.7.1., Vászoly, Trench P-11/c, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.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5b
6a
6b
7a
7b
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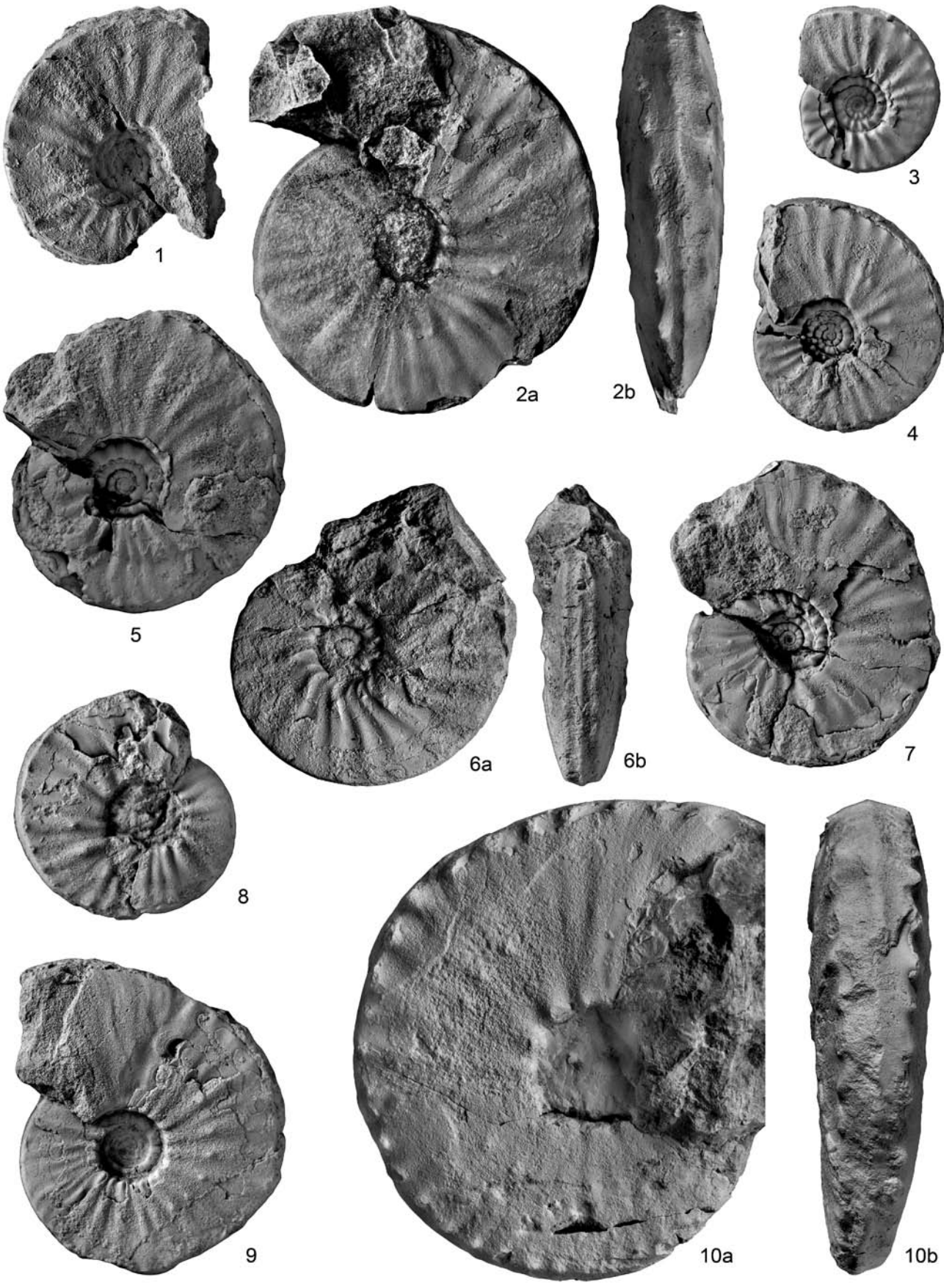
9a
9b

Plate XVI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parakellnerites loczyi* (ARTHABER, 1903) — Lectotype, T.1259., Hajmáskér, loose, Reitzi Zone, Avisianum Subzone (?); lateral view.
2. *Parakellnerites loczyi* (ARTHABER, 1903) — INV 2017.196.1., Vászoly, Shaft P-XVIII, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view. Specimen figured by KOVÁCS et al. (1990, pl. III, fig. 3) as "*Parakellnerites* sp. nov. 3".
3. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.47A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
4. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.88, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
5. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.43A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
6. *Parakellnerites loczyi* (ARTHABER, 1903) — INV 2017.197.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone; a: lateral view, b: ventral view.
7. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.42, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
8. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.48, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
9. *Parakellnerites loczyi* (ARTHABER, 1903) — M.98.46, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
10. *Parakellnerites* cf. *zoniaensis* BRACK & RIEBER, 1993 — T 2017.8.1., Vászoly, Trench P-14, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.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2a
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6a
6b
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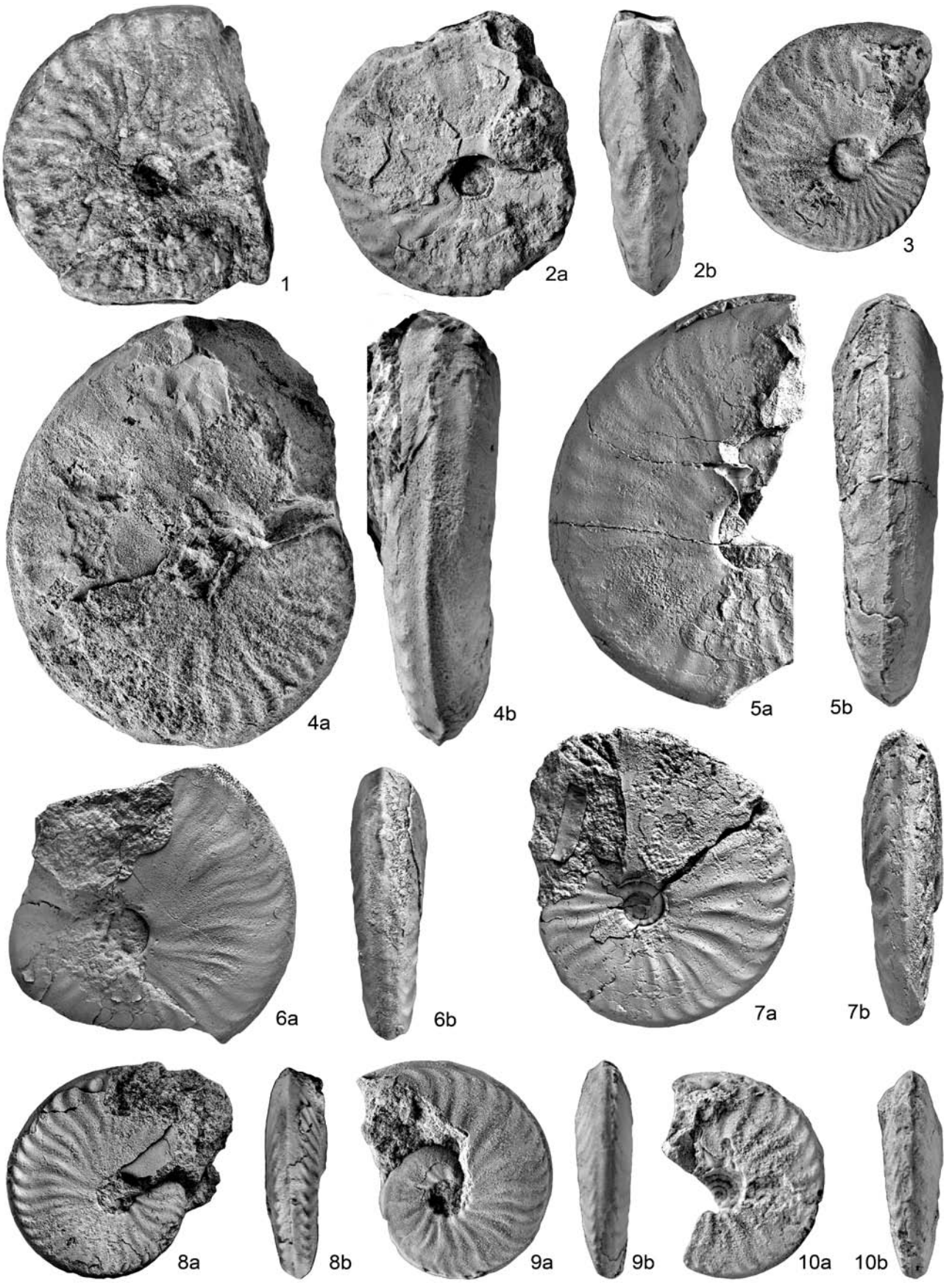
10a
10b

Plate XVII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography (except Figure 1). Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Parahungarites arthaberi* (DIENER, 1899) — Lectotype, T.310., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?), lateral view.
2. *Parahungarites arthaberi* (DIENER, 1899) — INV 2017.198.1., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
3. *Parahungarites arthaberi* (DIENER, 1899) — INV 2017.199.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; lateral view.
4. *Parahungarites arthaberi* (DIENER, 1899) — INV 2017.200.1., Mencshely II, Bed 4, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
5. *Parahungarites arthaberi* (DIENER, 1899) — M.87.021, Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
6. *Parahungarites arthaberi* (DIENER, 1899) — INV 2017.201.1., Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
7. *Parahungarites arthaberi* (DIENER, 1899) — M.98.146, Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
8. *Parahungarites arthaberi* (DIENER, 1899) — M.98.147, Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
9. *Parahungarites arthaberi* (DIENER, 1899) — M.98.223A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
10. *Parahungarites arthaberi* (DIENER, 1899) — INV 2017.202.1., Sóly, Bed 9, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.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8a
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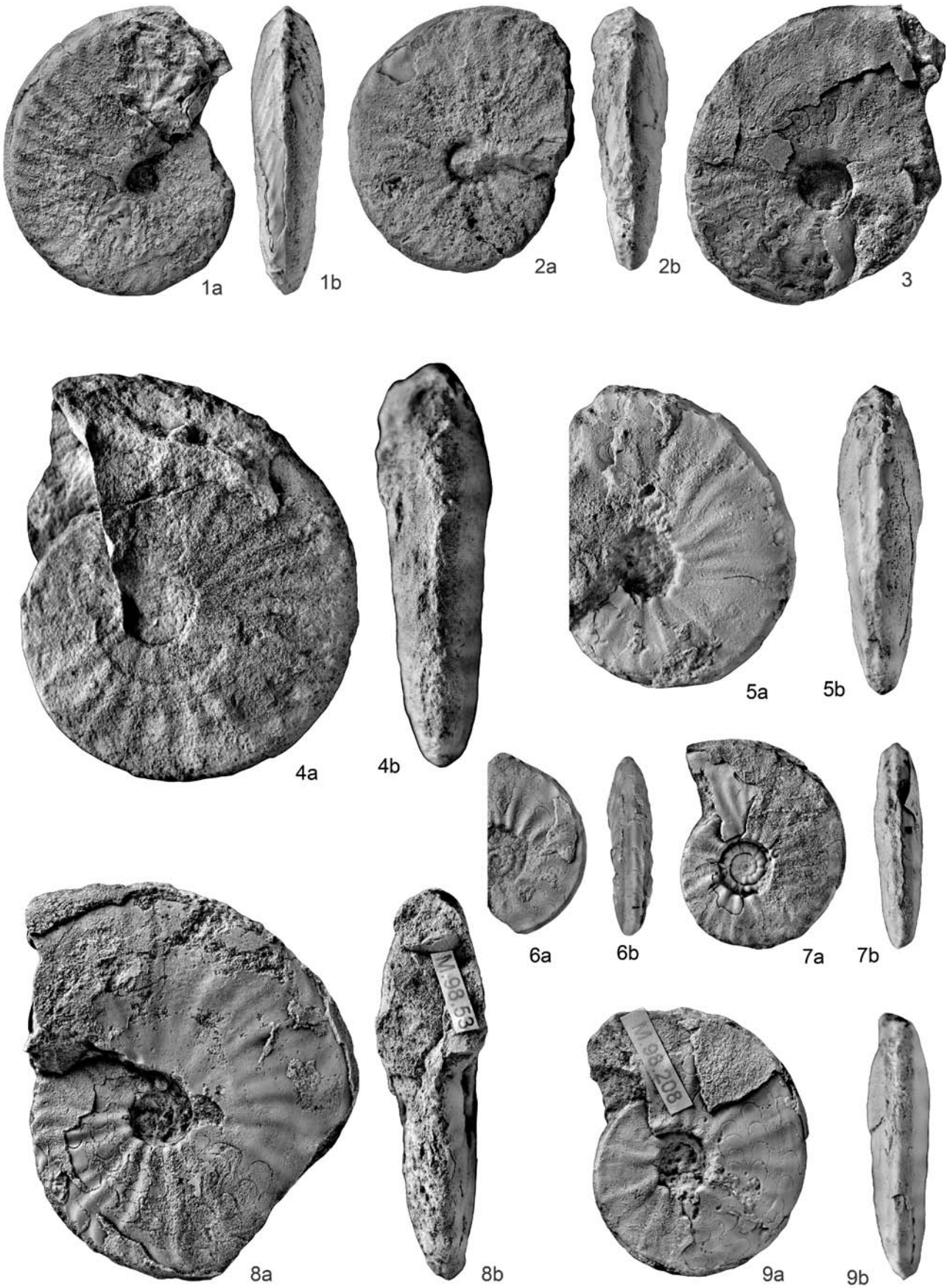
9b
10a
10b

Plate XVIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., INV or PAL.

1. *Parahungarites arthaberi* (Diener, 1899) — M.98.68, Sóly, Bed 9, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
2. *Parahungarites arthaberi* (Diener, 1899) — M.98.69, Sóly, Bed 9, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
3. *Parahungarites arthaberi* (Diener, 1899) — M.98.227, Sóly, Bed 8, Reitzi Zone, Avisianum Subzone; lateral view.
4. *Parahungarites arthaberi* (Diener, 1899) — INV 2017.203.1., Szentkirályszabadja, Bed 6, Reitzi Zone, Reitzi + Avisianum Subzone; lateral view.
5. *Parahungarites solyensis* n. sp. — Paratype, M.98.208A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
6. *Parahungarites solyensis* n. sp. — Paratype, PAL 2017.32.1., Vászoly, Trench P-17, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
7. *Parahungarites solyensis* n. sp. — Paratype, M.98.212A, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
8. *Parahungarites solyensis* n. sp. — Holotype, M.98.53, Sóly, Bed 9, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
9. *Parahungarites solyensis* n. sp. — Paratype, M.98.208B, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.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7a
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M.98.53
8b
M.98.208
9a
9b

Plate XIX

All figures are in natural size. Specimens have been coated with ammonium chloride before photography (except Figures 1, 2 and 3). Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Reitziites reitzi* (Böckh, 1872) — Lectotype, T.696., Felsőörs, loose (collected by J. Böckh, 1870), Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
2. *Reitziites reitzi* (Böckh, 1872) — T.3103., Felsőörs, loose (collected by Z. Schréter, 1911), Reitzi Zone, Reitzi Subzone, lateral view.
3. *Reitziites reitzi* (Böckh, 1872) — T.3212., Felsőörs, loose (collected by B. Zsigmondy, 1871), Reitzi Zone, Reitzi Subzone, lateral view.
4. *Reitziites* cf. *reitzi* (Böckh, 1872) — INV 2017.204.1., Sóly, Bed 21, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
5. *Reitziites reitzi* (Böckh, 1872) — M 2001.27, Felsőörs, Bed 105, Reitzi Zone, Reitzi Subzone, lateral view.
6. *Reitziites reitzi* (Böckh, 1872) — INV 2017.205.1., Felsőörs, loose near Bed 108, Reitzi Zone, Reitzi Subzone, lateral view.
7. *Reitziites reitzi* (Böckh, 1872) — M.98.21, Felsőörs, loose near Bed 104, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
8. *Reitziites reitzi* (Böckh, 1872) — INV 2017.206.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.

1a

1b

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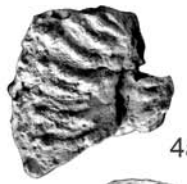
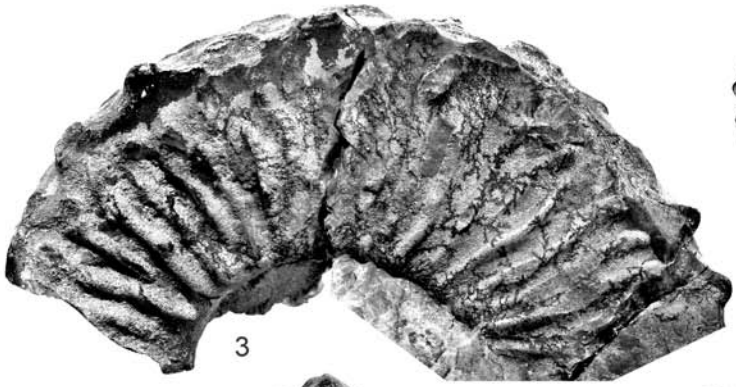
5



4a

4b



3

6

7a

7b

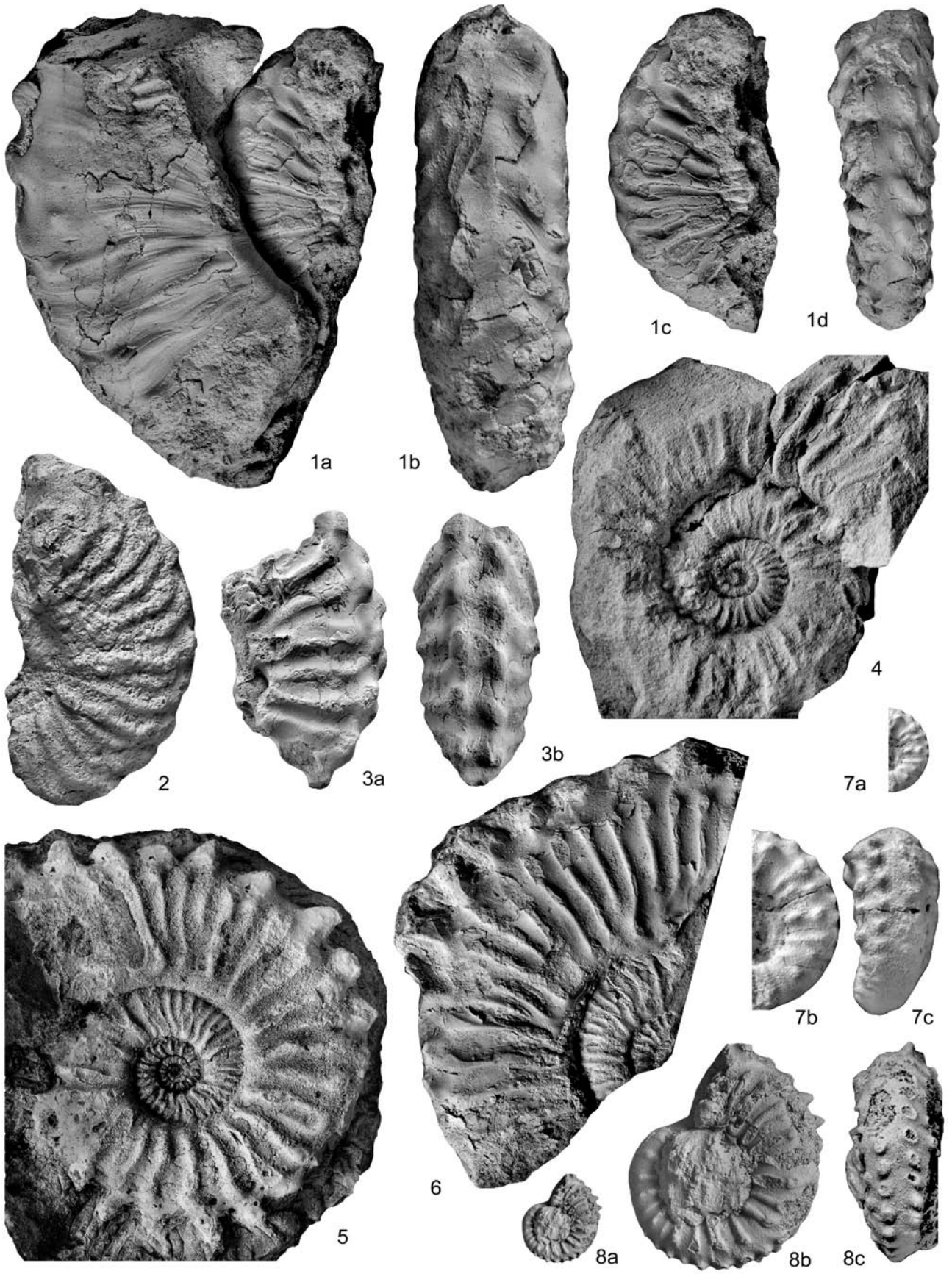
8a

8b

Plate XX

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T. unless otherwise indicated.

1. *Reitziites reitzi* (Böckh, 1872) — INV 2017.207.1., Vászoly, Trench P-11/d, loose, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view, c: inner whorl in lateral view, inner whorl in ventral view.
2. *Reitziites* cf. *reitzi* (Böckh, 1872) — INV 2017.208.1., Mencshely II, loose, Reitzi Zone, Reitzi Subzone, lateral view.
3. *Reitziites reitzi* (Böckh, 1872) — INV 2017.209.1., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
4. *Reitziites reitzi* (Böckh, 1872) — INV 2017.210.1., Szentkirályszabadja, Bed 10, Reitzi Zone, Reitzi + Avisianum Subzone; lateral view.
5. *Reitziites reitzi* (Böckh, 1872) — In private collection of L. Varga (Úny), Vászoly, Shaft P-XIII, Reitzi Zone, Reitzi Subzone; lateral view.
6. *Reitziites reitzi* (Böckh, 1872) — T 2017.9.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone; lateral view.
7. *Reitziites* cf. *ecarinatus* (Hauer, 1896) — M.89.110, Vászoly, P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone, juvenile specimen, a: lateral view, b: lateral view (magnified: 2.5 ×), c: ventral view (magnified: 2.5 ×).
8. *Reitziites reitzi* (Böckh, 1872) — INV 2017.211.1., Mencshely I, loose, Reitzi Zone, Reitzi Subzone, juvenile specimen, a: lateral view, b: lateral view (magnified: 2.5 ×), c: ventral view (magnified: 2.5 ×).


1a
1b
1c
1d
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3a
3b
4
5
6
7a
7b
7c
8a
8b
8c

Plate XXI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T., unless otherwise indicated.

1. *Reitziites reitzi* (Böckh, 1872) — T 2017.10.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
2. *Reitziites reitzi* (Böckh, 1872) — In private collection of L. Varga (Úny), Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone; lateral view.
3. *Reitziites reitzi* (Böckh, 1872) — M.98.108, Vászoly, Trench P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
4. *Reitziites reitzi* (Böckh, 1872) — INV 2017.212.1., Vászoly, Shaft P-XVIII, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
5. *Reitziites reitzi* (Böckh, 1872) — M.98.15, Vászoly, Trench P-2, Bed 4, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
6. *Reitziites reitzi* (Böckh, 1872) — INV 2017.213.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
7. *Reitziites reitzi* (Böckh, 1872) — INV 2017.214.1., Vászoly, loose, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.

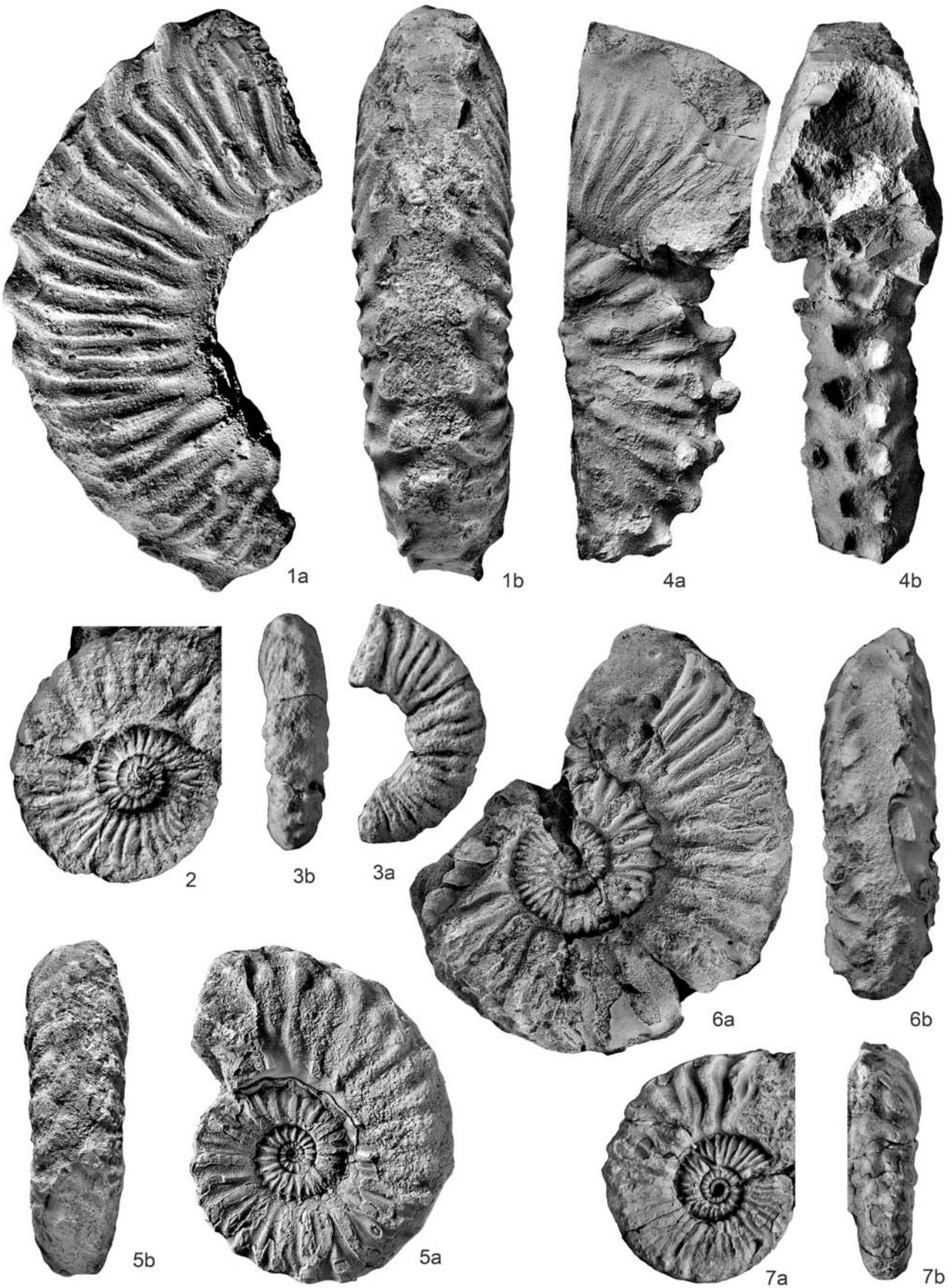
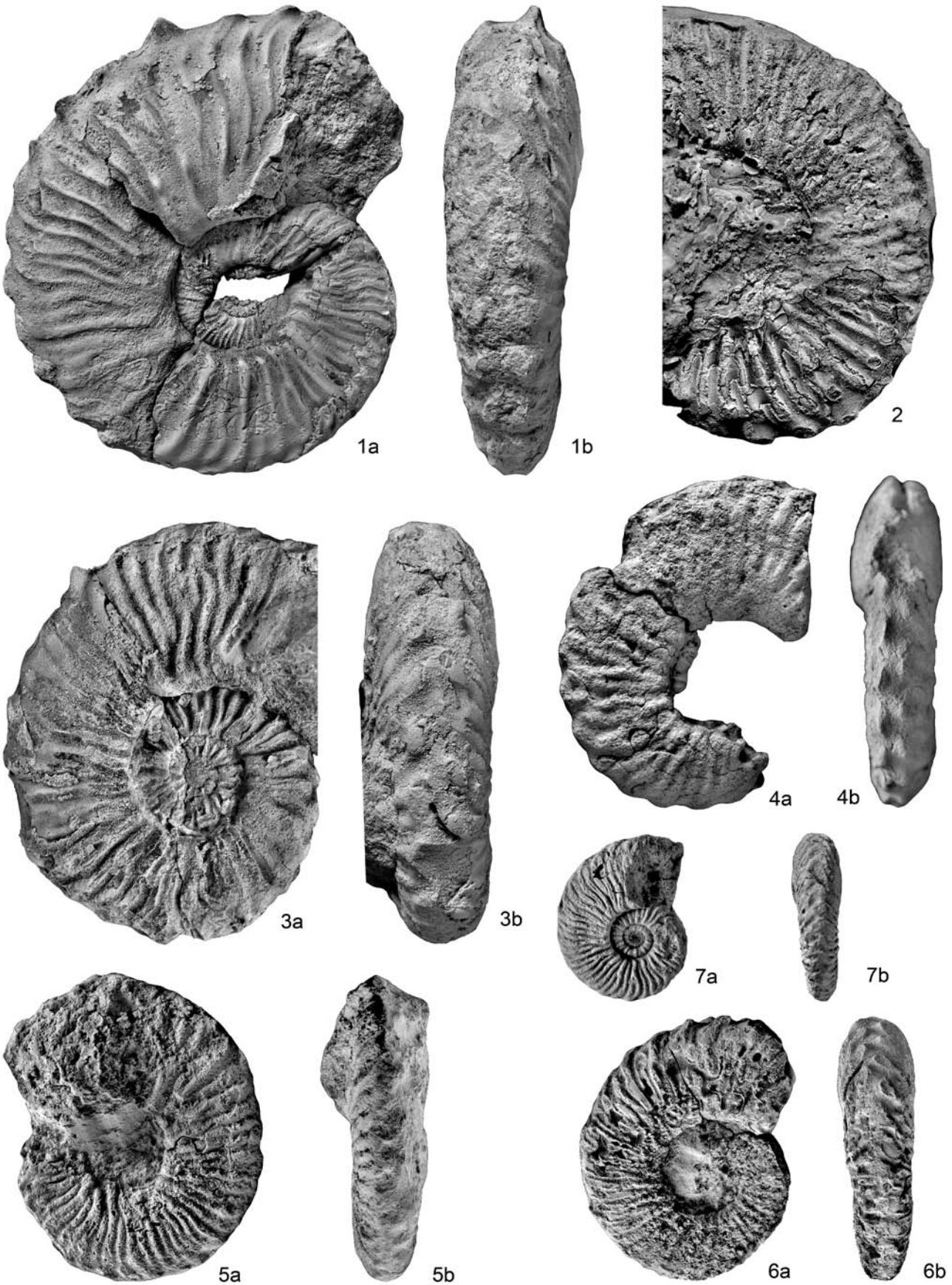

1a
1b
4a
4b
2
3b
3a
6a
6b
5b
5a
7a
7b

Plate XXII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Reitziites reitzi* (Böckh, 1872) — INV 2017.215.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
2. *Reitziites reitzi* (Böckh, 1872) — INV 2017.216.1., Vászoly, Trench P-11/d, Reitzi Zone, Reitzi Subzone; part of a specimen and silicon rubber cast of an imprint; lateral view.
3. *Reitziites reitzi* (Böckh, 1872) — T 2017.11.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
4. *Reitziites reitzi* (Böckh, 1872) morphotype *cholnokyi* — M.89.129A, Vászoly, Trench P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
5. *Reitziites reitzi* (Böckh, 1872) morphotype *cholnokyi* — INV 2017.217.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
6. *Reitziites reitzi* (Böckh, 1872) morphotype *cholnokyi* — INV 2017.218.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
7. *Reitziites reitzi* (Böckh, 1872) morphotype *cholnokyi* — M.89.129B, Vászoly, Trench P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.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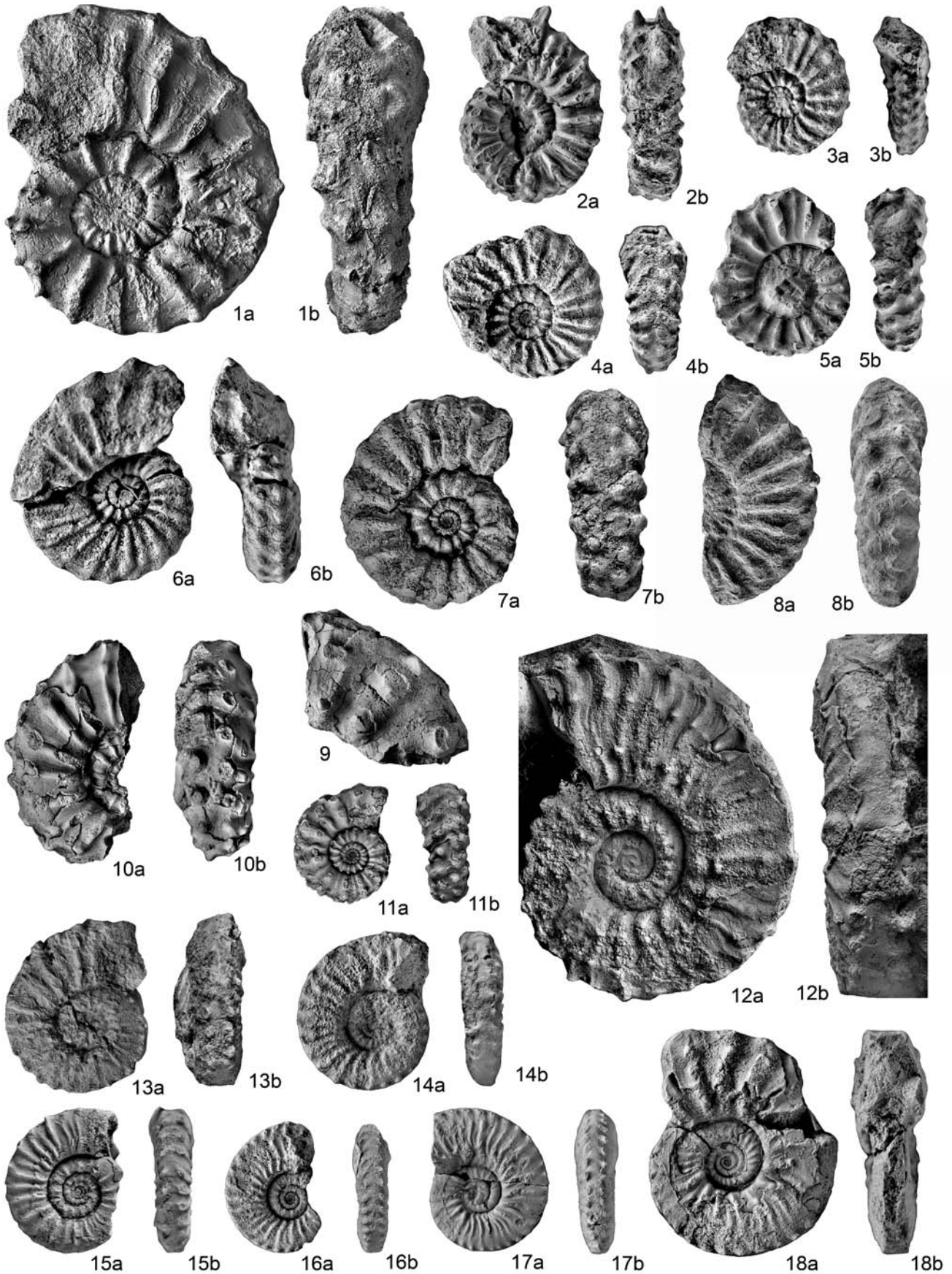
4a
4b
7a
7b
5a
5b
6a
6b

Plate XXIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, unless otherwise indicated.

1. *Reitziites ecarinatus* (Hauer, 1896) — M.87.009, Szentbékkálla, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
2. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.220.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
3. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.221.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
4. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.222.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
5. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.223.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
6. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.224.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
7. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.225.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
8. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.226.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
9. *Reitziites* cf. *ecarinatus* (Hauer, 1896) — M.98.218, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; lateral view.
10. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.227.1., Vászoly, Trench P-17, Reitzi Zone, Reitzi Subzone; a: lateral view, b: ventral view.
11. *Reitziites ecarinatus* (Hauer, 1896) — INV 2017.228.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?); a: lateral view, b: ventral view.
12. *Latemarites bavaricus* (Reis, 1901) — In private collection of K. Tamás (Kővágóörs), Sóly, loose, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
13. *Latemarites bavaricus* (Reis, 1901) — INV 2017.229.1., Vörösberény, loose from the uppermost part of the exposure in the road-cut, Reitzi Zone, Avisianum Subzone (?); a: lateral view, b: ventral view.
14. *Latemarites bavaricus* (Reis, 1901) — M.98.29, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
15. *Latemarites bavaricus* (Reis, 1901) — M.98.86, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
16. *Latemarites bavaricus* (Reis, 1901) — M.98.70, Mencshely I, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
17. *Latemarites bavaricus* (Reis, 1901) — M 2001.28, Felsőörs, Bed 110 (?), Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
18. *Latemarites bavaricus* (Reis, 1901) — M.98.80, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.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13b
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14b
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15b
16a
16b
17a
17b
18a
18b

Plate XXIV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Latemarites bavaricus* (Reis, 1901) — M.98.33, Sóly, Bed 8, Reitzi Zone, Avisianum Subzone; lateral view.
2. *Latemarites bavaricus* (Reis, 1901) — M.98.66, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
3. *Latemarites bavaricus* (Reis, 1901) — M.98.57, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
4. *Latemarites bavaricus* (Reis, 1901) — M.98.84, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
5. *Latemarites bavaricus* (Reis, 1901) — M.98.66, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone; lateral view.
6. *Latemarites bavaricus* (Reis, 1901) — M.89.135, Vászoly, Trench P-11/a, Bed 15, Reitzi Zone, Reitzi Subzone; lateral view.
7. *Latemarites bavaricus* (Reis, 1901) — INV 2017.230.1., Mencshely II, Bed 4, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
8. *Latemarites bavaricus* (Reis, 1901) — INV 2017.231.1., Szentkirályszabadja, Bed 5, Reitzi Zone, Reitzi + Avisianum Subzone; a: lateral view, b: ventral view.
9. *Latemarites bavaricus* (Reis, 1901) — INV 2017.232.1., Szentkirályszabadja, Bed 5, Reitzi Zone, Reitzi + Avisianum Subzone; a: lateral view, b: ventral view.
10. *Detoniceras* ? sp. — M.98.233, Sóly, Bed 7, Reitzi Zone, Reitzi + Avisianum Subzone; a: lateral view, b: ventral view.
11. *Halilucites* cf. *obliquus* (Hauer, 1896) — INV 2017.233.1., Felsőörs, Bed 111/K, Secedensis Zone; lateral view.
12. *Halilucites* cf. *arietitiformis* (Hauer, 1896) — INV 2017.234.1., Felsőörs, Bed 111/B, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
13. *Halilucites rusticus* (Hauer, 1896) — INV 2017.235.1., Felsőörs, Bed 111/D, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
14. *Halilucites rusticus* (Hauer, 1896) — M.98.63, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; lateral view.

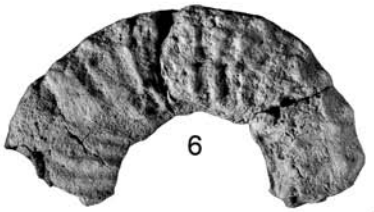
1

2a

2b

3a

3b



6

7a

7b

4a

4b

5

8a

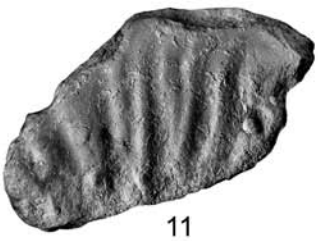
8b

9a

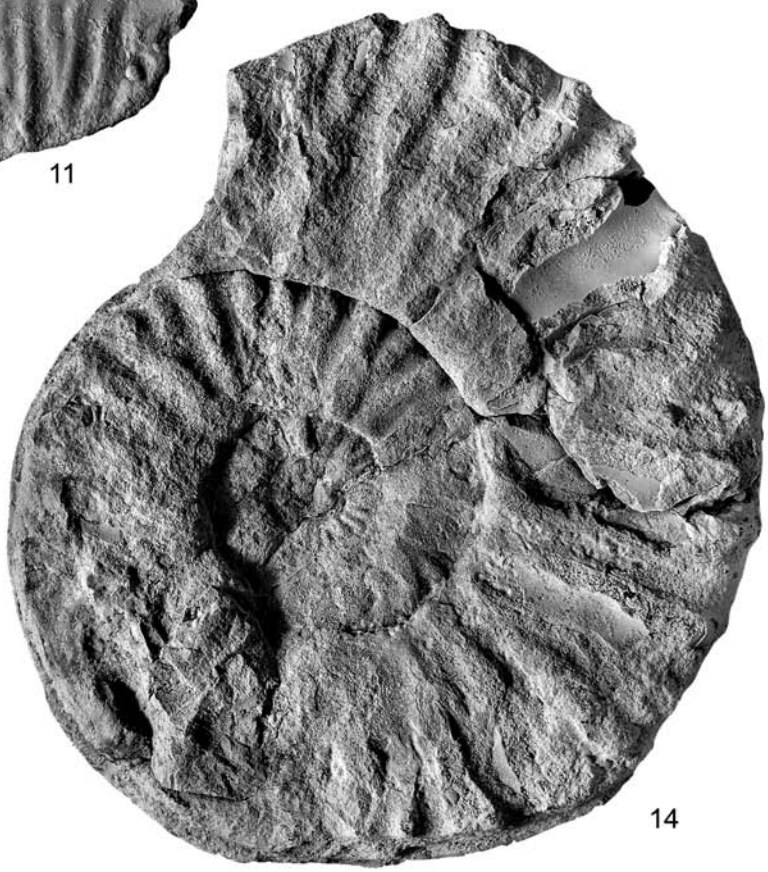
9b

10a

10b



11



14

12b

12a

13b

13a

Plate XXV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., INV or PAL.

1. *Halilucites rusticus* (Hauer, 1896) — M.98.63, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view of the specimen in Pl. XXIII, Fig. 14; a part of the body chamber removed.
2. *Stoppaniceras* cf. *variabile* Rieber, 1973 — INV 2017.236.1., Felsőörs, Bed 113, Secedensis Zone, Crassus Subzone; silicon rubber cast of the imprint of a specimen; lateral view.
3. *Stoppaniceras rieberi* n. sp. — Holotype, M.98.26, Felsőörs, Bed 116, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view.
4. *Stoppaniceras rieberi* n. sp. — Paratype, PAL 2017.33.1., Felsőörs, Bed 111/I, Reitzi Zone, Avisianum Subzone; a: lateral view, b: ventral view.
5. *Stoppaniceras rieberi* n. sp. — Paratype, PAL 2017.35.1., Felsőörs, Bed 112, Secedensis Zone, Crassus Subzone; lateral view.
6. *Stoppaniceras rieberi* n. sp. — Paratype, PAL 2017.34.1., Felsőörs, Bed 112, Secedensis Zone, Crassus Subzone; lateral view.
7. *Stoppaniceras rieberi* n. sp. — Paratype, M.98.27, Felsőörs, Bed 116, Secedensis Zone, Crassus Subzone; lateral view.

1b

1a

2

3a

3b

4a

4b

5

6

7

Plate XXVI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Stoppaniceras* aff. *rieberi* n. sp. — M.98.25, Felsőörs, Bed 116, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view.
2. *Stoppaniceras* cf. *ellipticum* (HAUER, 1887) — M.98.117, Sóly, road-cut, loose, Reitzi Zone, Avisianum Subzone (?), lateral view.
3. *Stoppaniceras* cf. *ellipticum* (HAUER, 1887) — M.98.59, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, lateral view.
4. *Stoppaniceras* cf. *ellipticum* (HAUER, 1887) — INV 2017.237.1., Szentkirályszabadja, Bed 5, Reitzi Zone, Reitzi + Avisianum Subzone, lateral view.
5. *Stoppaniceras hermanni* n. sp. — Holotype, M.98.16, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view.

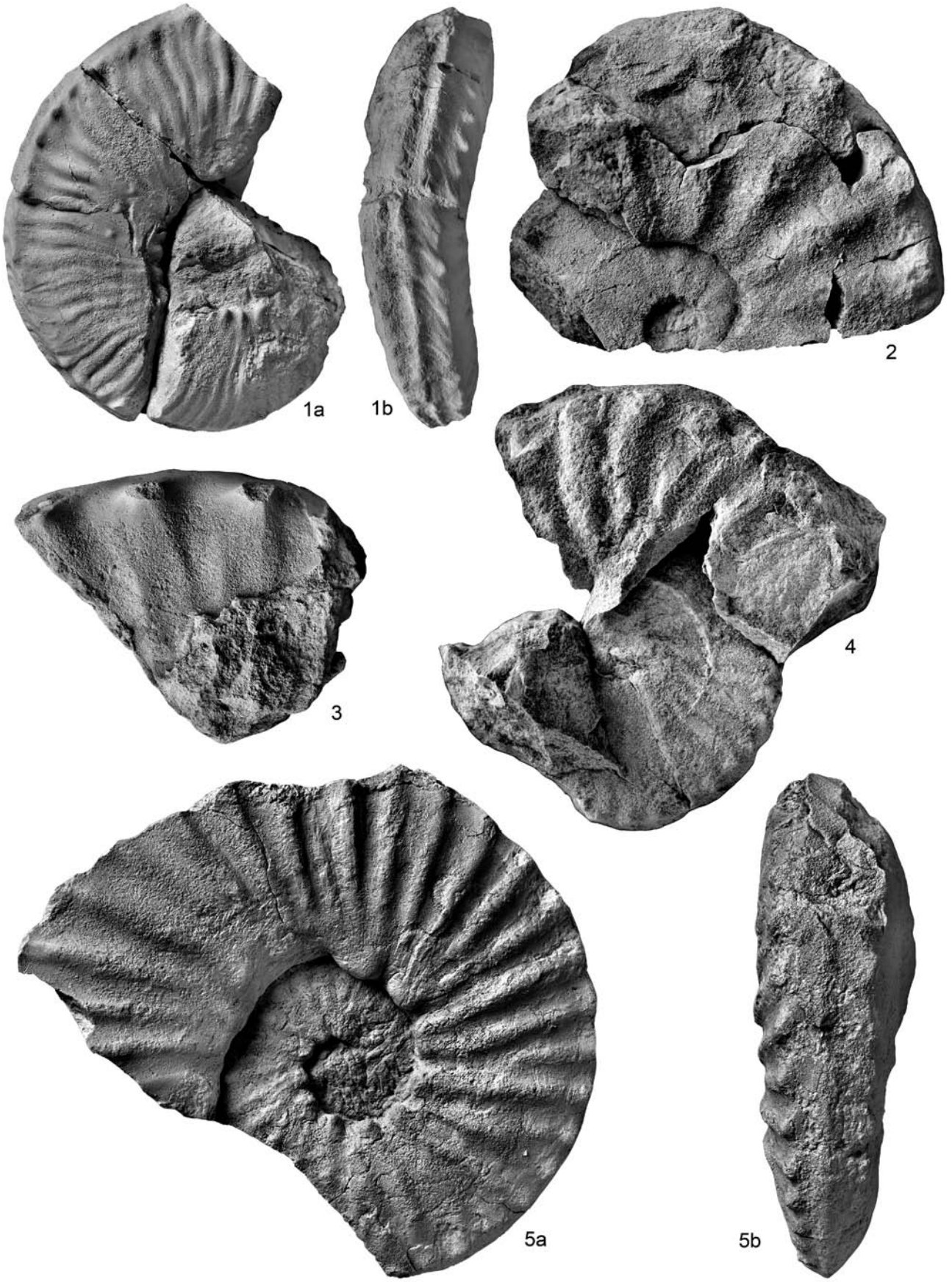

1a
1b
2
3
4
5a
5b

Plate XXVII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., INV or PAL.

1. *Stoppaniceras hermanni* n. sp. — Paratype, PAL 2017.36.1., Vászoly, Trench P-17, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view.
2. *Stoppaniceras budaii* n. sp. — Paratype, PAL 2017.37.1., Felsőörs, Bed 111 (loose), Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
3. *Stoppaniceras budaii* n. sp. — Holotype, M.87.42, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
4. *Repossia* cf. *acutenodosa* Rieber, 1973 — INV 2017.238.1., Felsőörs, Bed 117, Secedensis Zone, Crassus Subzone; lateral view.
5. *Repossia* cf. *acutenodosa* Rieber, 1973 — M.98.23, Felsőörs, Bed 116, Secedensis Zone, Crassus Subzone; a: lateral view, b: ventral view.

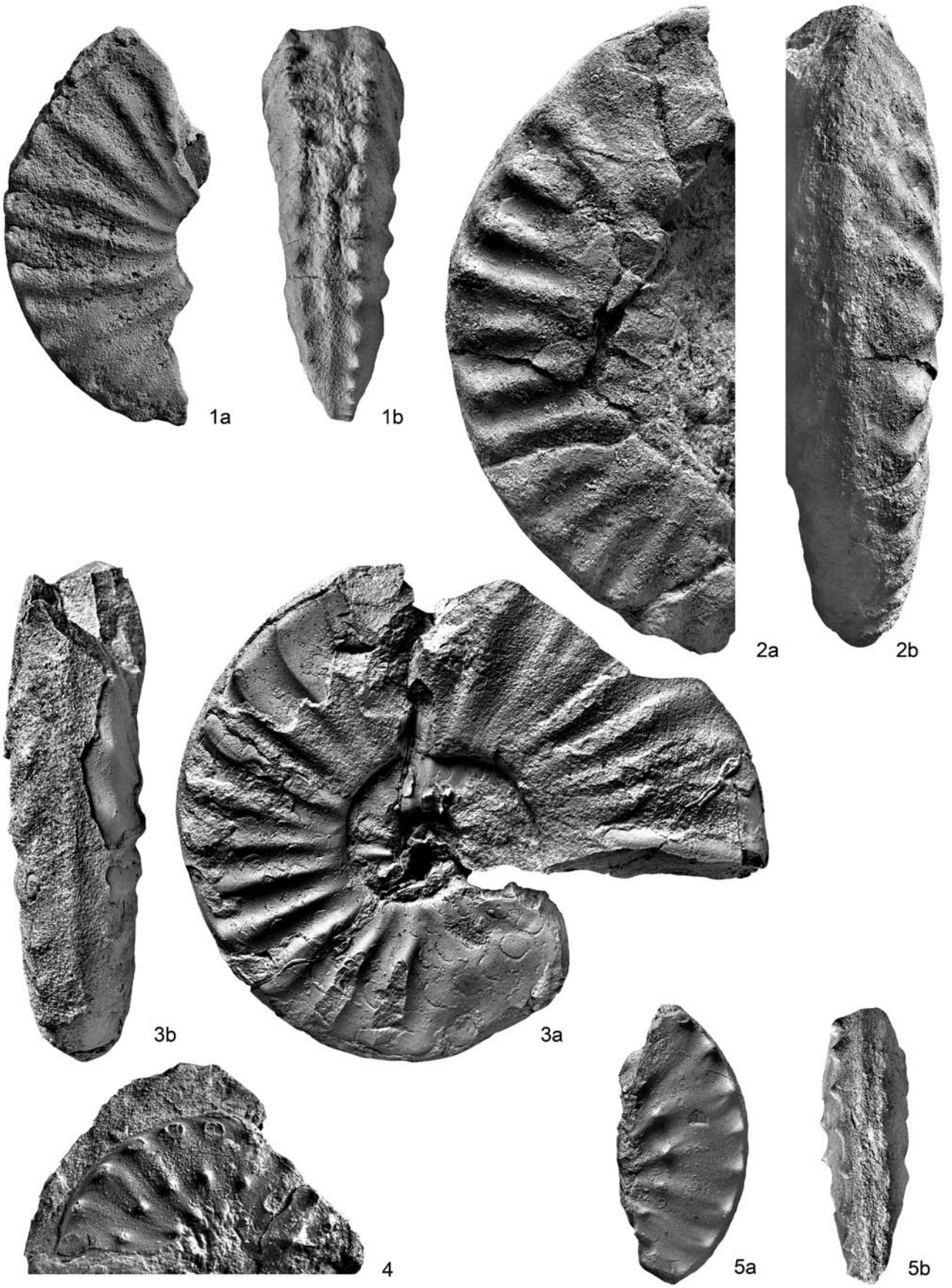

1a
1b
2a
2b
3b
3a
4
5a
5b

Plate XXVIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Ticinites* cf. *ticinensis* Rieber, 1973 — INV 2017.239.1., Barnag, loose, Secedensis Zone (?), a: lateral view, b: ventral view.
2. *Ticinites hantkeni* (Mojsisovics, 1882) — Topotype, T.3088., Felsőörs, loose, Secedensis Zone (?), a: lateral view, b: ventral view.
3. *Ticinites hantkeni* (Mojsisovics, 1882) — M.98.72, Felsőörs, Bed 111/J, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
4. *Ticinites hantkeni* (Mojsisovics, 1882) — INV 2017.240.1., Felsőörs, Bed 111/J, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
5. *Ticinites hantkeni* (Mojsisovics, 1882) — INV 2017.241.1., Felsőörs, Bed 111/K, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
6. *Ticinites* cf. *hantkeni* (Mojsisovics, 1882) — INV 2017.242.1., Felsőörs, Bed 111/K, Secedensis Zone, Crassus Subzone, a: lateral view, b: silicon rubber cast of the inner whorls.
7. *Ticinites* cf. *hantkeni* (Mojsisovics, 1882) — INV 2017.243.1., Felsőörs, Bed 111/J, Secedensis Zone, Crassus Subzone, a: lateral view, b: silicon rubber cast of the inner whorls.

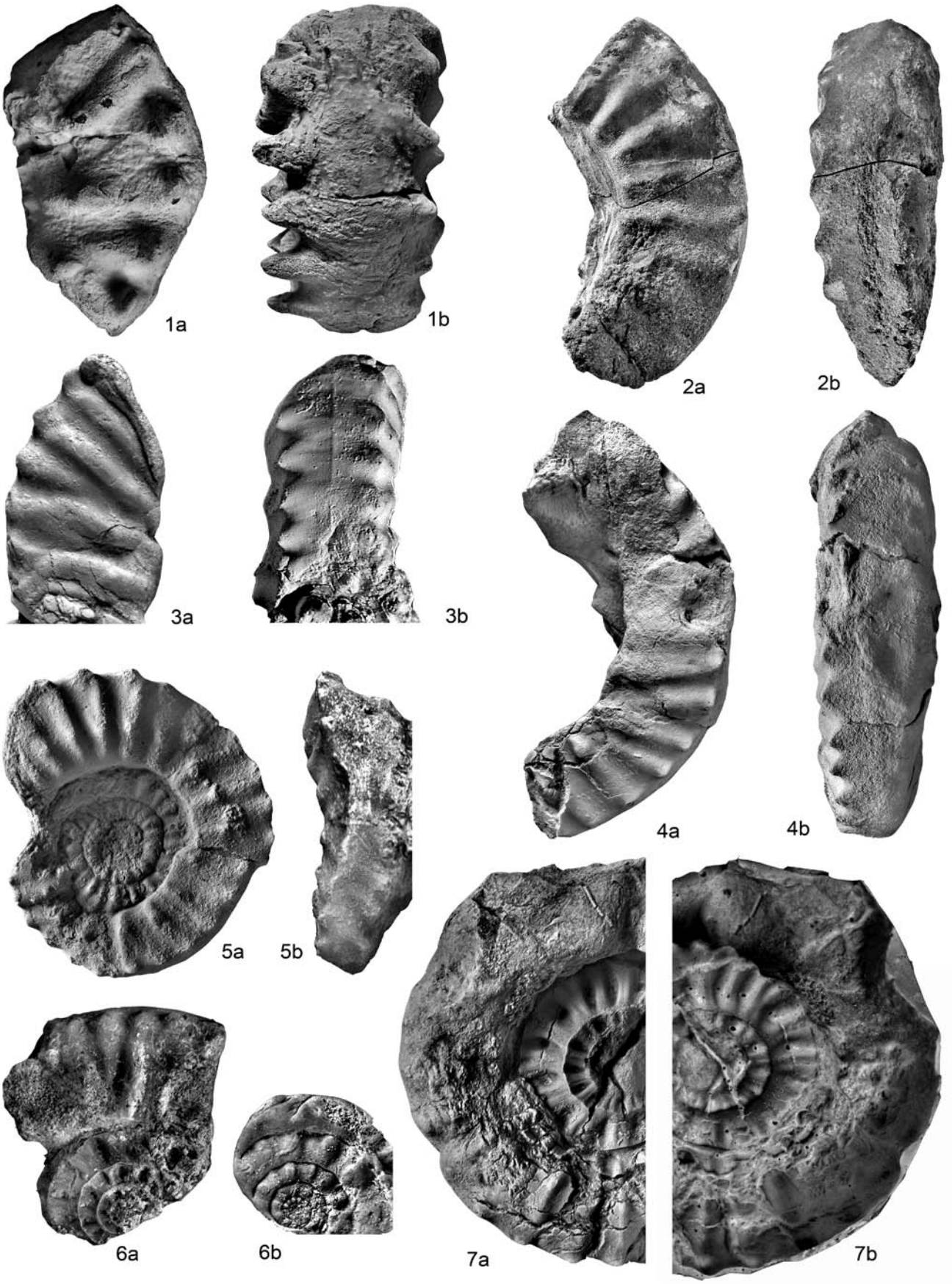
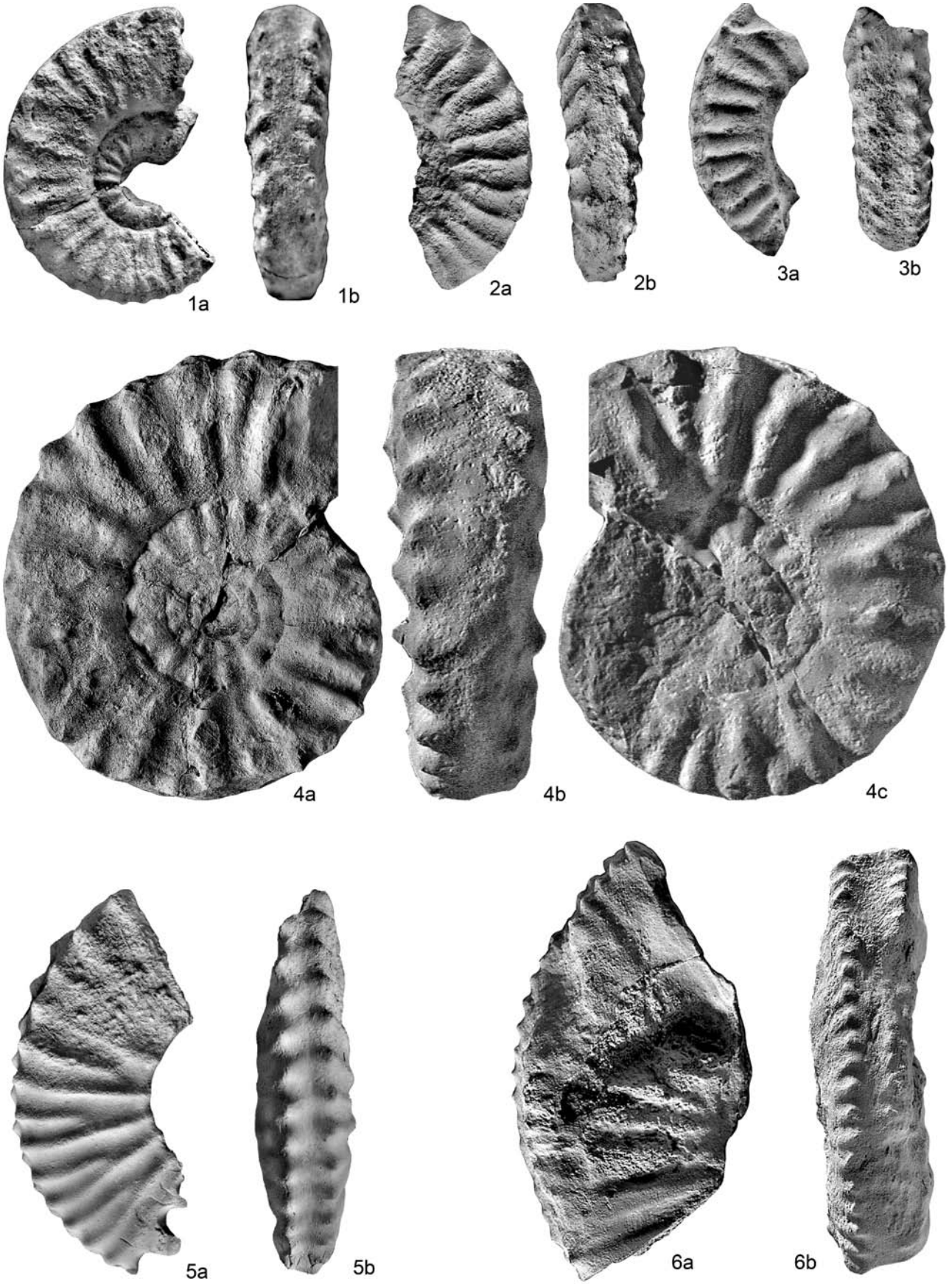

1a
1b
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b

Plate XXIX

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Ticinites* ? aff. *hantkeni* (MOJSISOVICS, 1882) — M.89.109, Vászoly, Trench P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
2. *Ticinites* ? aff. *hantkeni* (MOJSISOVICS, 1882) — INV 2017.244.1., Mencshely I, loose, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.
3. *Ticinites* ? aff. *hantkeni* (MOJSISOVICS, 1882) — INV 2017.245.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
4. *Ticinites crassus* (HAUER, 1896) — M.98.61, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: left lateral view, b: ventral view, c: right lateral view (all reduced 0.9 ×).
5. *Chieseiceras* sp. A — M.98.24, Felsőörs, Bed 116, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
6. *Chieseiceras chiesense* (MOJSISOVICS, 1882) — M 2009.341.1., Felsőörs, Bed 129/A, Secedensis Zone, Secedensis Subzone, a: lateral view, b: ventral view.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3b
4a
4b
4c
5a
5b
6a
6b

Plate XXX

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Chieseiceras chiesense* (Mojsisovics, 1882) — M 2009.346.1., Felsőörs, Bed 129/A, Secedensis Zone, Secedensis Subzone, a: lateral view, b: ventral view.
2. *Nevadites* cf. *avenonensis* Brack & Rieber, 1993 — M 2009.343.1., Felsőörs, Bed 126, Secedensis Zone, Secedensis Subzone, a: lateral view, b: ventral view.
3. *Nevadites* cf. *avenonensis* Brack & Rieber, 1993 — M 2009.342.1., Felsőörs, Bed 126, Secedensis Zone, Secedensis Subzone, oblique lateral view.
4. *Hungarites mojsisovicsi* (Roth, 1871) — Paralectotype, T.3085., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view, c: partial suture line, magnified. Specimen figured as "*Ceratites Zalaensis* n. sp." by Böckh (1872, 1873, pl. VII, fig. 2), and as "*Hungarites Mojsisovicsi* (Boeckh)" by Mojsisovics (1882, pl. VIII, fig. 3).
5. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.246.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
6. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.247.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, lateral view.

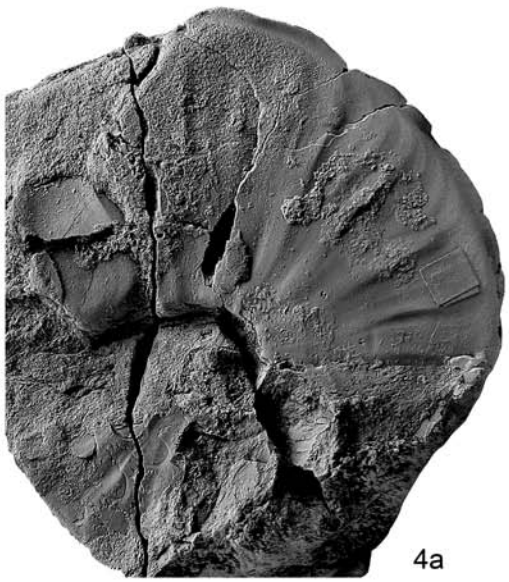
1a

1b

2a

2b

3

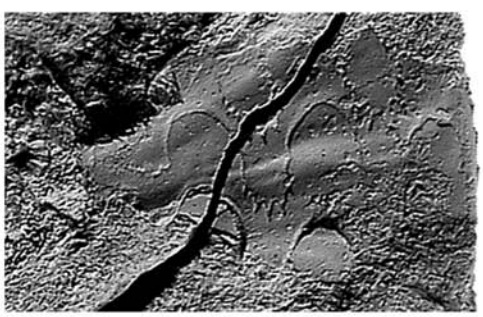


4a

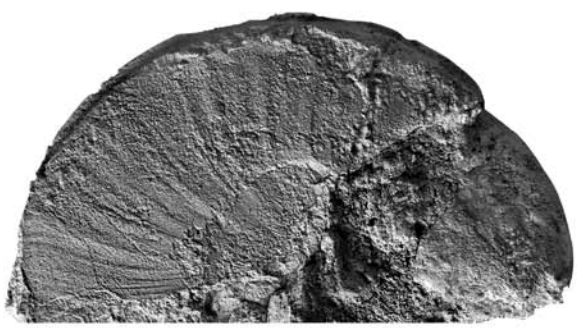
4b

5a

5b



4c



6

Plate XXXI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Hungarites mojsisovicsi* (Roth, 1871) — Lectotype, T.1662., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view. Specimen figured as "*Ceratites Zalaensis* n. sp." by Böckh (1872, 1873, pl. VII, fig. 1), and as "*Hungarites Mojsisovicsi* (Boeckh)" by Mojsisovics (1882, pl. VII, fig. 6).
2. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.248.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
3. *Hungarites mojsisovicsi* (Roth, 1871) — M.98.152A, Sóly, Bed 5, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
4. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.249.1., Szentkirályszabadja, Bed 18, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone, a: lateral view, b: ventral view.
5. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.250.1., Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.

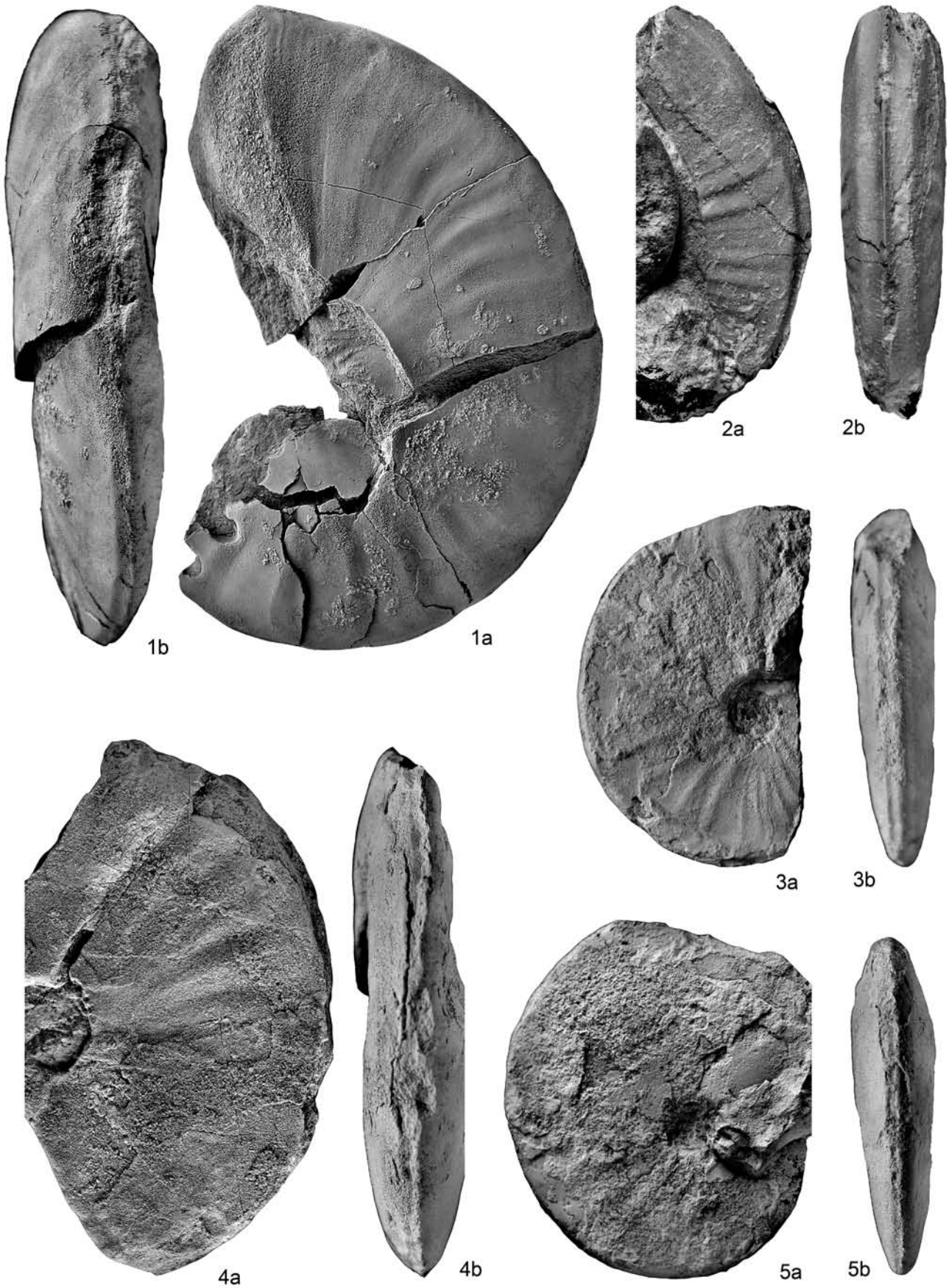

1b
1a
2a
2b
3a
3b
4a
4b
5a
5b

Plate XXXII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.251.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view, c: lateral view of the same specimen, a part of the body chamber removed, d: ventral view of the same specimen, a part of the body chamber removed, to show the almost tricarinate venter.
2. *Hungarites mojsisovicsi* (Roth, 1871) — M.98.35, Sóly, Bed 9, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
3. *Hungarites mojsisovicsi* (Roth, 1871) — M.98.36, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, lateral view.
4. *Hungarites mojsisovicsi* (Roth, 1871) — T 2017.12.1., Vászoly, Trench P-11/c, loose, Reitzi Zone, Reitzi Subzone; lateral view.

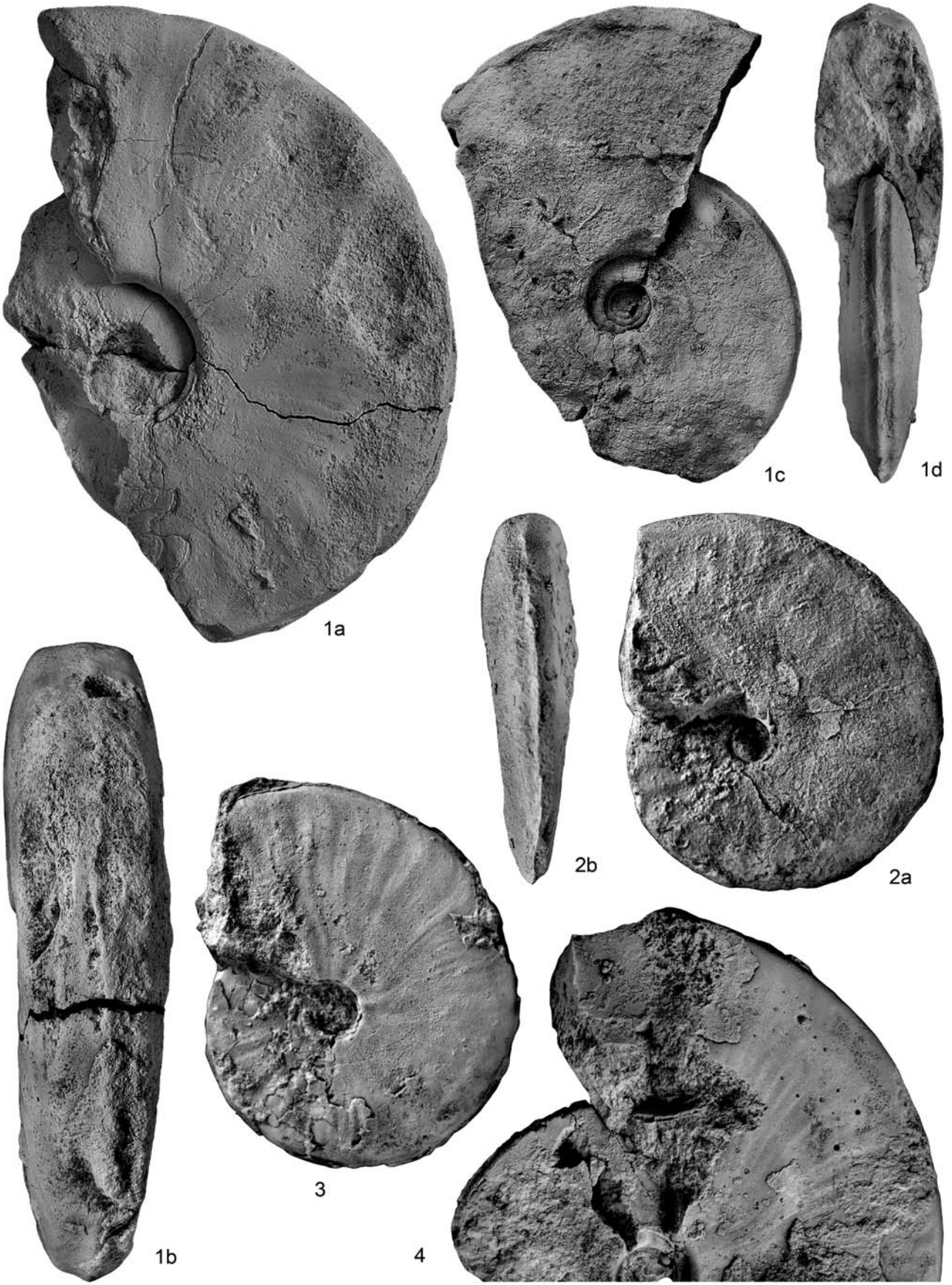

1a
1c
1d
2b
2a
1b
3
4

Plate XXXIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.252.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
2. *Hungarites mojsisovicsi* (Roth, 1871) — M.89.101, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.

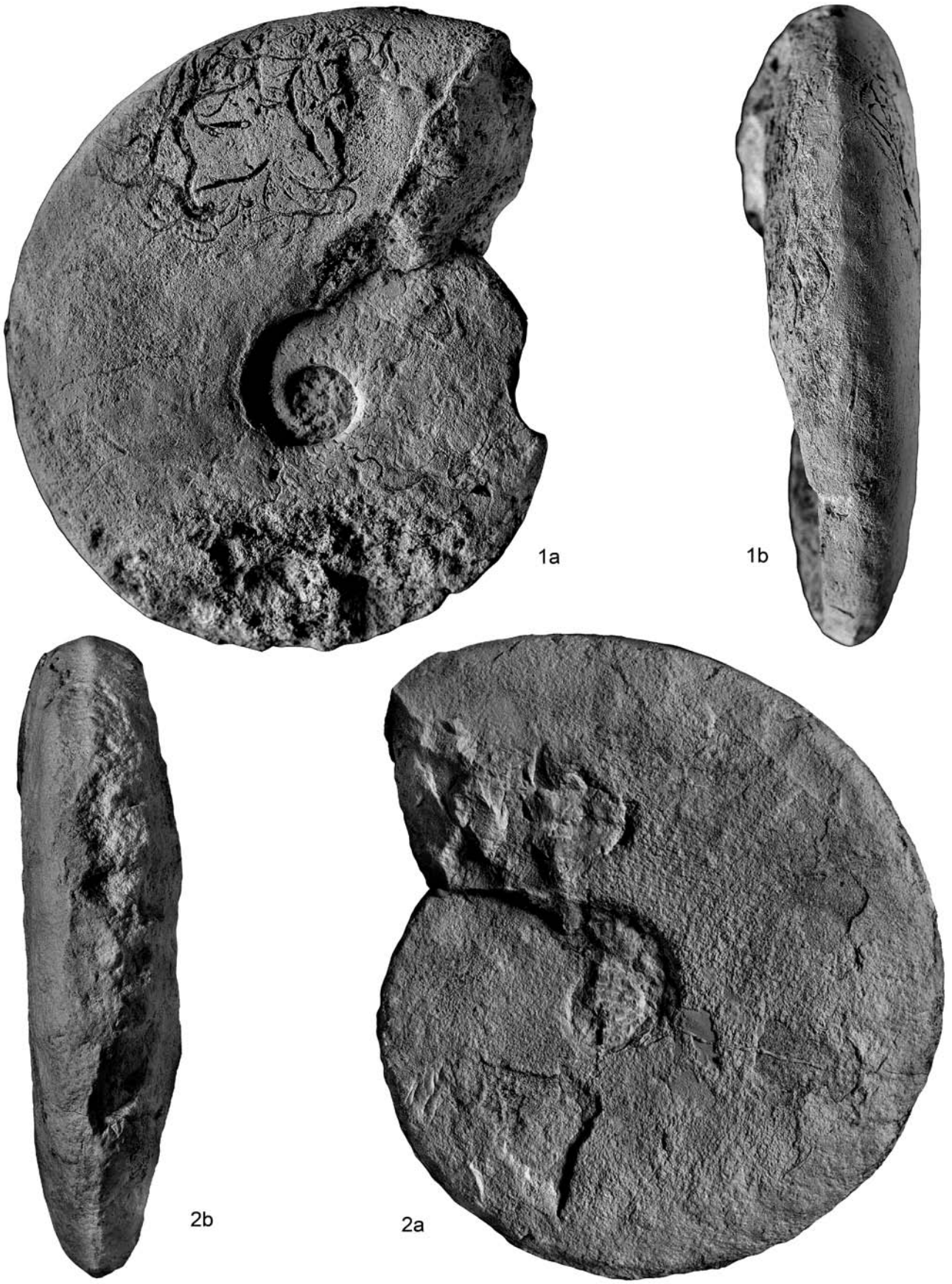
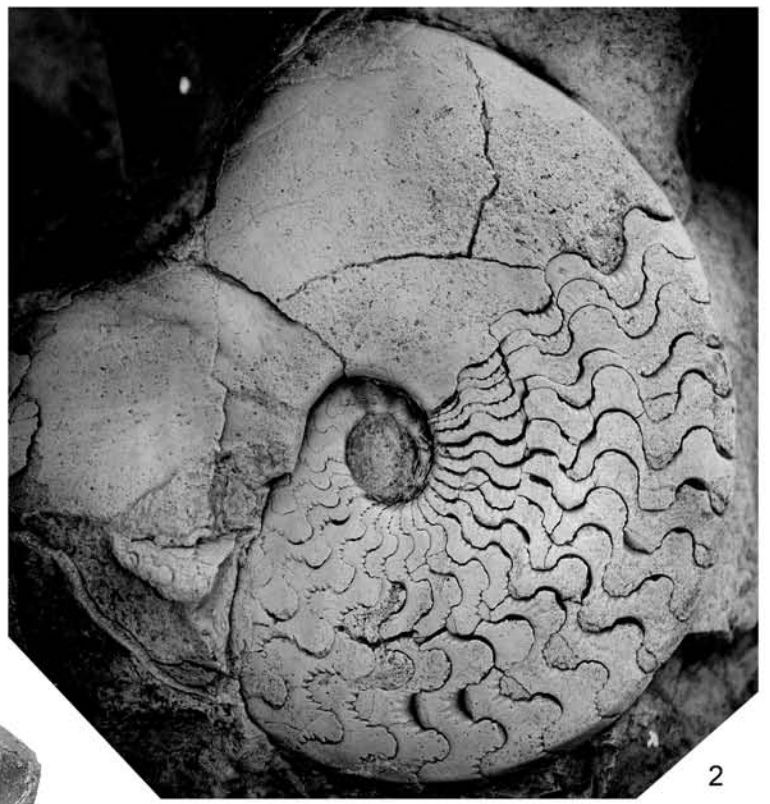

1a
1b
2b
2a

Plate XXXIV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., INV, or PAL.

1. *Hungarites mojsisovicsi* (Roth, 1871) — M.89.90, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, lateral view.
2. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.301.1., Barnag, loose, Reitzi Zone (?), lateral view.
3. *Hungarites mojsisovicsi* (Roth, 1871) — INV 2017.253.1., Felsőörs, Bed 111/D, Reitzi Zone, Avisianum Subzone, lateral view.
4. *Hungarites sinuosus* n. sp. — Paratype, M.89.100, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
5. *Hungarites sinuosus* n. sp. — Holotype, PAL 2017.38.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.

1



2

3

4a

4b

5b

5a

Plate XXXV

All figures are in natural size. Specimens have been coated with ammonium chloride before photography (except Figures 4a, b). Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by PAL, or INV, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Hungarites sinuosus* n. sp. — Paratype, PAL 2017.39.1., Vászoly, loose, Reitzi or Secedensis Zone, a: lateral view, b: ventral view.
2. *Hungarites sinuosus* n. sp. — Paratype, PAL 2017.40.1., Mencshely I, loose, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view.
3. *Hungarites sinuosus* n. sp. — Paratype, PAL 2017.41.1., Vászoly, loose, Reitzi or Secedensis Zone, a: lateral view, b: ventral view.
4. *Hungarites costosus* Mojsisovics, 1882 — Holotype, T.693., Felsőörs, loose, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view.
5. *Hungarites* cf. *costosus* Mojsisovics, 1882 — INV 2017.254.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, lateral view.

1a

1b

2a

2b

5

3a

3b

4a

4b

Plate XXXVI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by PAL.

1. *Hungarites szentei* n. sp. — Holotype, PAL 2017.42.1., Vászoly, Trench P-14, Secedensis Zone (?), Crassus Subzone (?), a: lateral view, b: ventral view.
2. *Hungarites szentei* n. sp. — Paratype, PAL 2017.43.1., Vászoly, Trench P-14, Secedensis Zone (?), Crassus Subzone (?), a: lateral view, b: ventral view.
3. *Hungarites szentei* n. sp. — Paratype, PAL 2017.44.1., Szentkirályszabadja, Bed 6, Reitzi Zone, Reitzi + Avisianum Subzone, a: lateral view, b: ventral view.
4. *Hungarites szentei* n. sp. — Paratype, PAL 2017.45.1., Szentkirályszabadja, Bed 5, Reitzi Zone, Reitzi + Avisianum Subzone, lateral view.

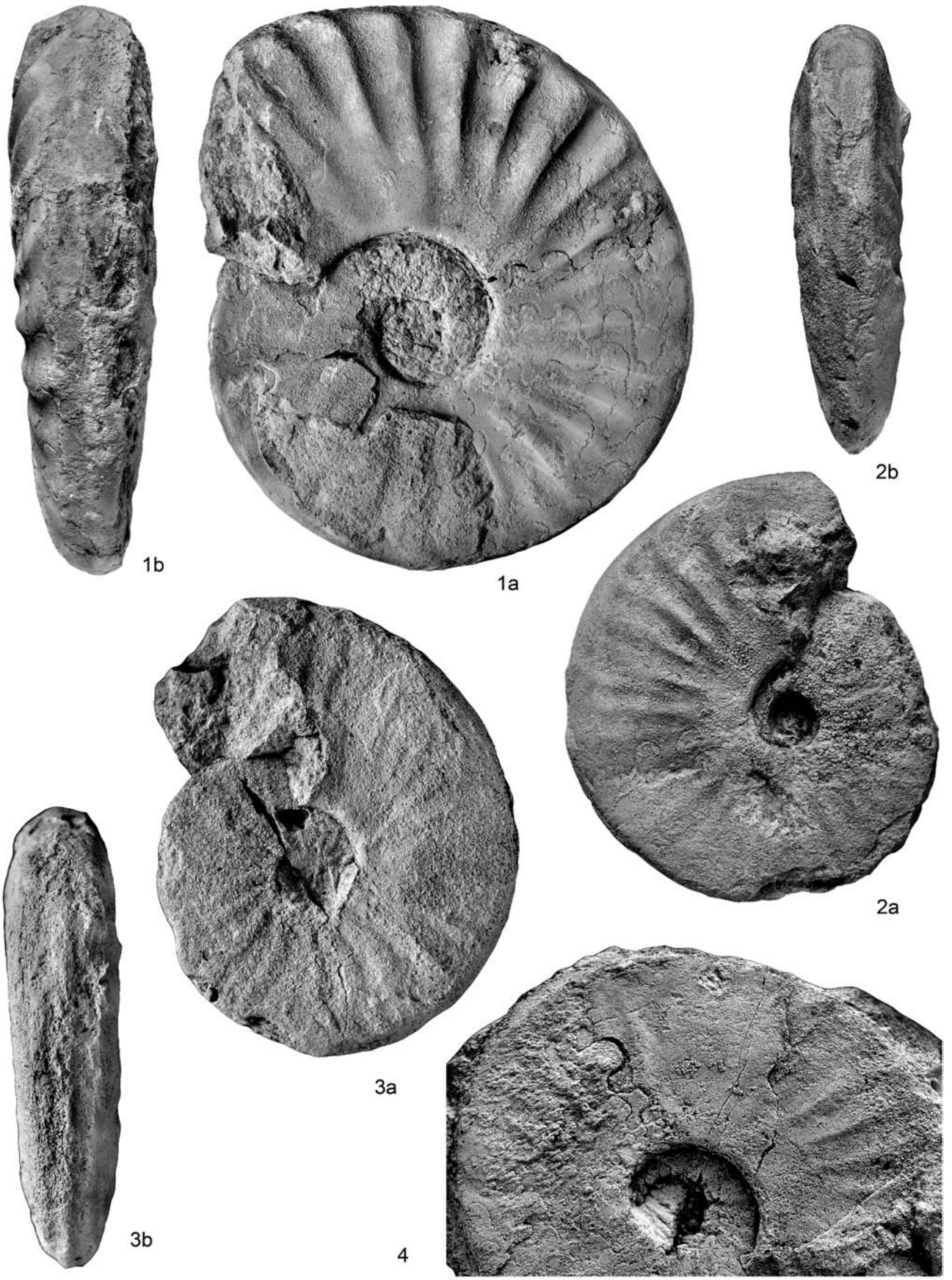

1b
1a
2b
2a
3a
3b
4

Plate XXXVII

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Bullatihungarites emiliae* (Mojsisovics, 1882) — INV 2017.255.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view, c: ventral view (magnified: 2.5 ×), to show the wide, blunt keel.
2. *Bullatihungarites emiliae* (Mojsisovics, 1882) — M.98.208C, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
3. *Bullatihungarites emiliae* (Mojsisovics, 1882) — INV 2017.256.1., Mencshely I, loose, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.
4. *Bullatihungarites emiliae* (Mojsisovics, 1882) — INV 2017.257.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
5. *Bullatihungarites emiliae* (Mojsisovics, 1882) — M.98.239A, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
6. *Bullatihungarites emiliae* (Mojsisovics, 1882) — M.98.40, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
7. *Bullatihungarites emiliae* (Mojsisovics, 1882) — INV 2017.258.1., Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view.
8. *Bullatihungarites emiliae* (Mojsisovics, 1882) — M.98.229A, Sóly, Bed 7, Reitzi Zone, Avisianum Subzone, lateral view.

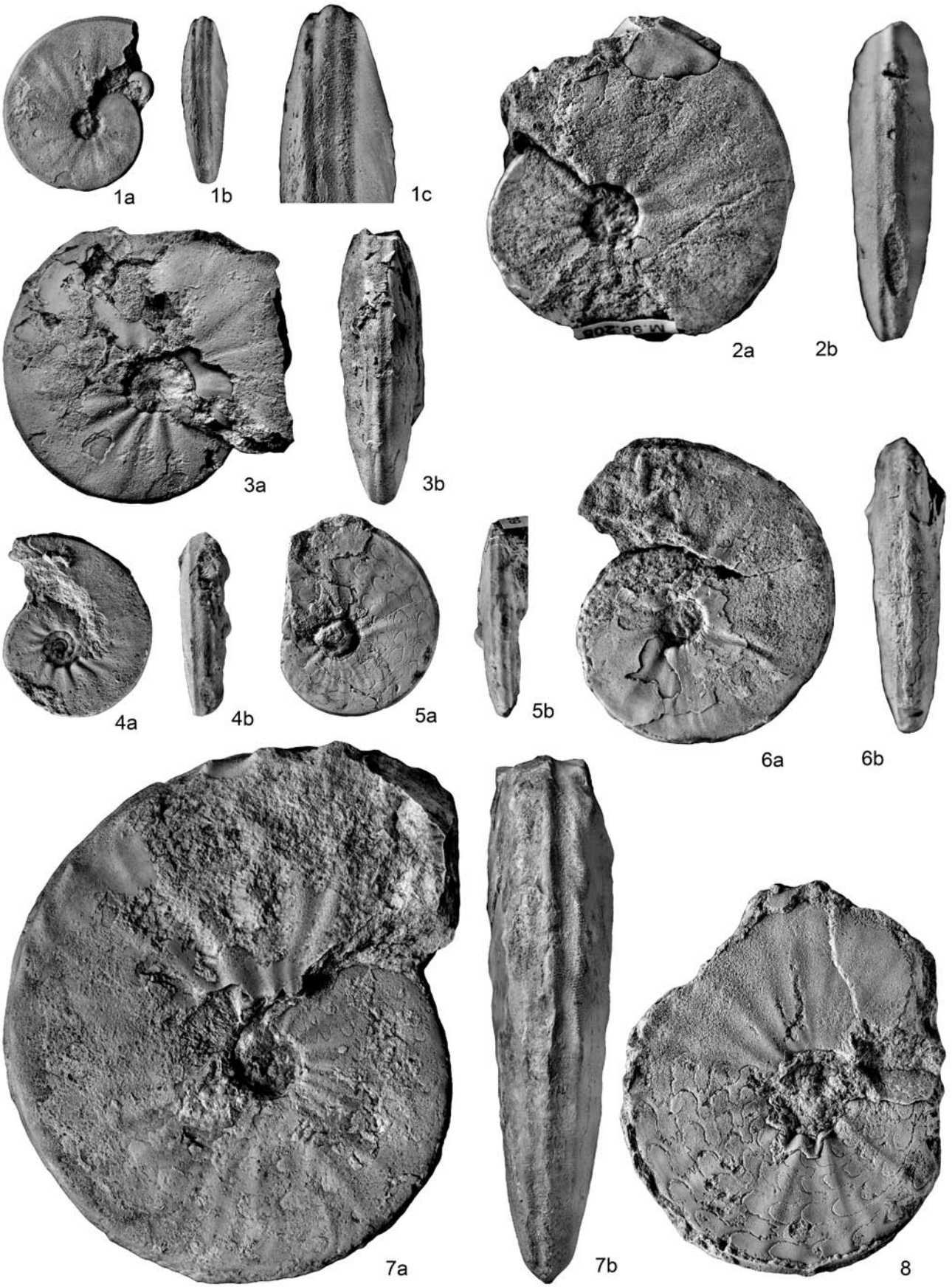

1a
1b
1c
2a
2b
3a
3b
4a
4b
5a
5b
6a
6b
7a
7b
8

Plate XXXVIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., INV or PAL, and in the Mining and Geological Survey of Hungary (Budapest) under the inventory numbers prefixed by T.

1. *Bullatihungarites* cf. *emiliae* (Mojsisovics, 1882) — M.98.37, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
2. *Bullatihungarites* cf. *semiplicatus* (Hauer, 1896) — INV 2017.259.1., Mencshely, loose, Reitzi Zone, Avisianum Subzone (?), a: lateral view, b: ventral view.
3. *Bullatihungarites semiplicatus* (Hauer, 1896) — INV 2017.260.1., Vászoly, Trench P-11/c, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.
4. *Bullatihungarites semiplicatus* (Hauer, 1896) — INV 2017.261.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone, lateral view.
5. *Nodihungarites bocsarensis* (Arthaber, 1903) — Holotype, T.771., Balatonfüred, Bocsár Hill, loose, Reitzi Zone, a: lateral view, b: ventral view. Arrow indicates the beginning of the body chamber.
6. *Nodihungarites bocsarensis* (Arthaber, 1903) — INV 2017.262.1., Vászoly, Trench P-11/a, loose, Reitzi Zone, Avisianum Subzone (?),lateral view. Arrow indicates the beginning of the body chamber
7. *Nodihungarites vinczei* n. sp. — Paratype, PAL 2017.46.1., Vászoly, Trench P-11/a, loose, Reitzi Zone, Avisianum Subzone (?), lateral view. Arrow indicates the beginning of the body chamber

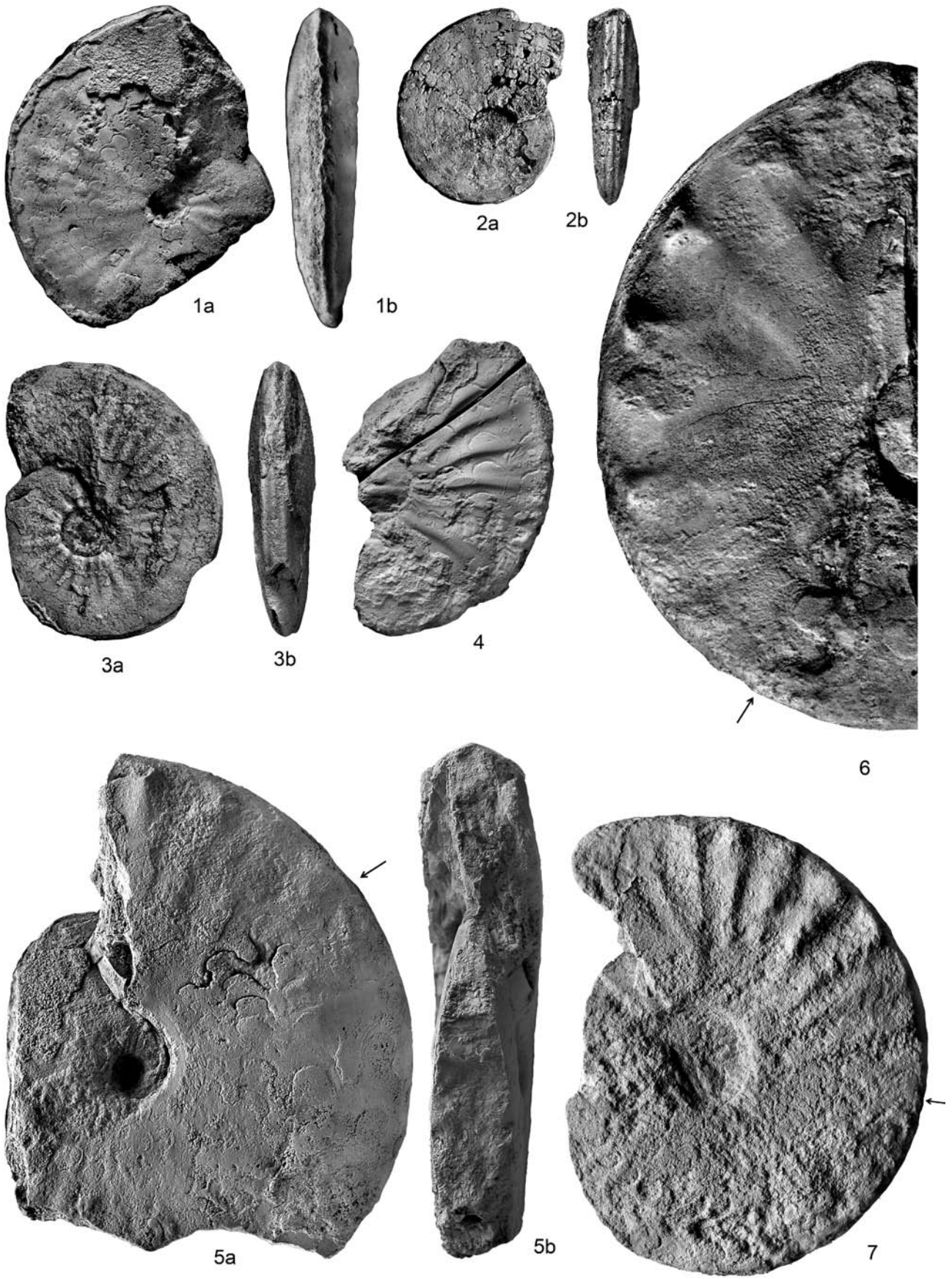

1a
1b
2a
2b
3a
3b
4
6
5a
5b
7

Plate XXXIX

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Nodihungarites bocsarensis* (ARTHABER, 1903) — INV 2017.263.1., Vászoly, Trench P-11/a, loose, Reitzi Zone, Avisianum Subzone (?), a: left lateral view, b: right lateral view, c: ventral view, d: left lateral view of the same specimen, a part of the body chamber removed, e: ventral view of the same specimen, a part of the body chamber removed, to show the almost tricarinate venter on the phragmocone. Arrow indicates the beginning of the body chamber.
2. *Aplococeras avisianum* (MOJSISOVICS, 1882) — INV 2017.264.1., Mencshely, loose, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.
3. *Aplococeras avisianum* (MOJSISOVICS, 1882) — INV 2017.265.1., Mencshely I, Bed 2, Reitzi Zone, Avisianum Subzone, lateral view.
4. *Aplococeras avisianum* (MOJSISOVICS, 1882) — M.98.170A, Sóly, Bed 1, Reitzi Zone, Avisianum Subzone, lateral view.
5. *Aplococeras avisianum* (MOJSISOVICS, 1882) — M.98.38, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, lateral view.

1a

1d

1b

1c

1e

2a

2b

3

4

5

Plate XL

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Nodihungarites vinczei* n. sp. — Holotype, M.89.81, Vászoly, Trench P-11/a, Bed 16/A, Secedensis Zone, Crassus Subzone, a: lateral view, b: ventral view. Arrow indicates the beginning of the body chamber
2. *Aplococeras avisianum* (Mojsisovics, 1882) — INV 2017.266.1., Mencshely I, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
3. *Lecanites misanii* (Mojsisovics, 1882) — INV 2017.267.1., Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone, lateral view.
4. *Aplococeras avisianum* (Mojsisovics, 1882) — INV 2017.268.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view, c: lateral view (magnified: 2.5 ×).
5. *Aplococeras laczkoi* (Arthaber, 1903) — M.98.52, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view, c: lateral view (magnified: 2.5 ×).
6. *Celtites* ? sp. A — INV 2017.269.1., Mencshely I, Bed 7, Reitzi Zone, Avisianum Subzone, a: lateral view, b: lateral view (magnified: 2.5 ×), c: ventral view (magnified: 2.5 ×).
7. *Celtites* ? sp. B — M.98.6, Balatoncsicsó, St. Balázs church ruins, Reitzi Zone, Avisianum Subzone (?); lateral view.
8. *Longobardites breguzzanus* Mojsisovics, 1882 — INV 2017.270.1., Felsőörs, Bed 99/A, Trinodosus Zone, Pseudohungaricum Subzone, lateral view.
9. *Longobardites breguzzanus* Mojsisovics, 1882 — INV 2017.271.1., Felsőörs, Bed 99, Trinodosus Zone, Pseudohungaricum Subzone, a: lateral view, b: ventral view.
10. *Longobardites* cf. *zsigmondyi* (Böckh, 1874) — INV 2017.272.1., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
11. *Longobardites zsigmondyi* (Böckh, 1874) — M.98.44, Sóly, Bed 6, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.

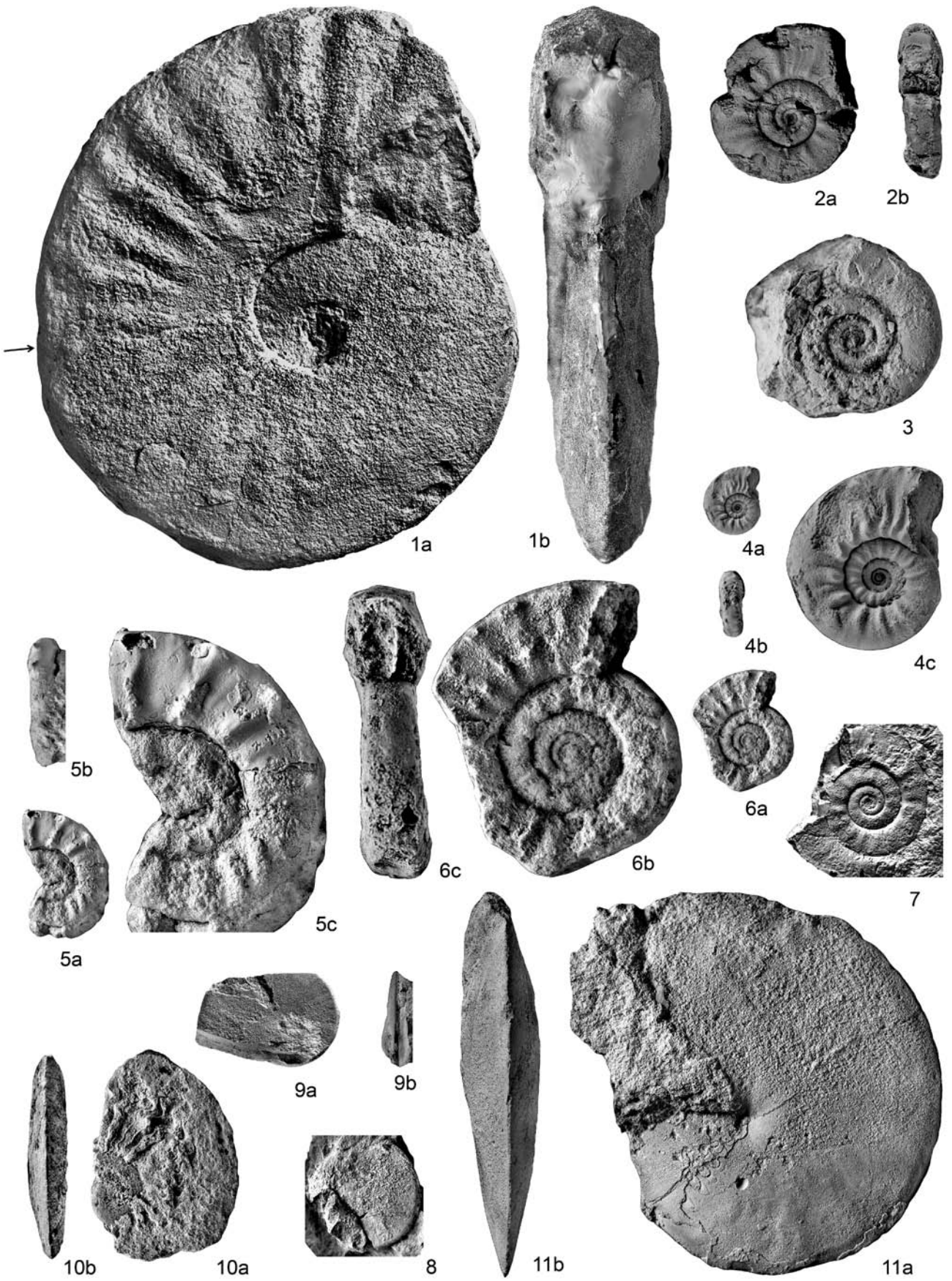
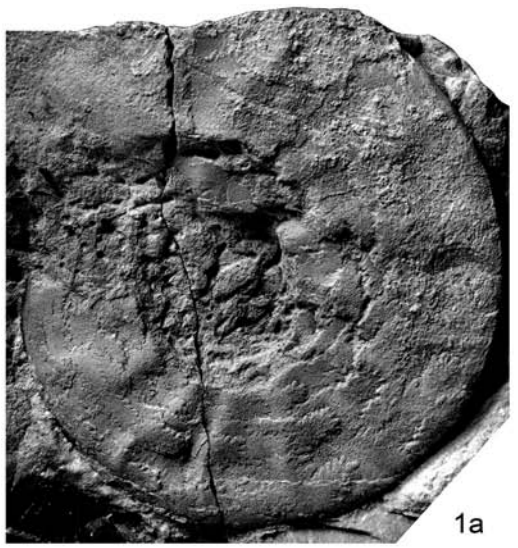

1a
1b
2a
2b
3
4a
4b
4c
5a
5b
5c
6a
6b
6c
7
8
9a
9b
10a
10b
11a
11b

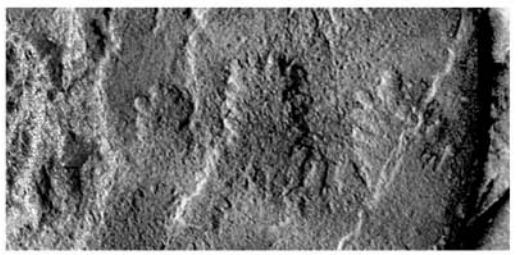
Plate XLI

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV, unless otherwise indicated.

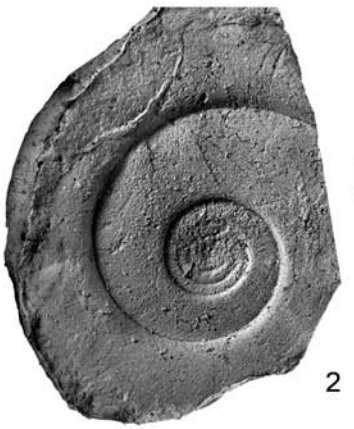
1. *Japonites* ? sp. — INV 2017.273.1., Felsőörs, Bed 105, Reitzi Zone, Reitzi Subzone, a: lateral view, b: partial suture line.
2. *Gymnites* sp. — INV 2017.274.1., Felsőörs, Bed 111/H, Reitzi Zone, Reitzi Subzone, silicon rubber cast of an imprint, lateral view.
3. *Tropigymnites* sp. — In private collection of K. TAMÁS (Kővágóörs), Szentbékkálla, loose, Reitzi Zone (?); a: lateral view, b: ventral view.
4. *Epigymnites ecki* (MOJSISOVICS, 1882) — INV 2017.275.1., Mencshely I, Bed 2, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
5. *Epigymnites* cf. *ecki* (MOJSISOVICS, 1882) — INV 2017.276.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone, lateral view.
6. *Ptychites* cf. *oppeli* MOJSISOVICS, 1882 — M.87.018A, Szentbékkálla, loose, Trinodosus Zone (?); lateral view.
7. *Flexoptychites* cf. *studeri* (HAUER, 1857) — INV 2017.277.1., Vászoly, Trench P-2, Bed 4, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.



1a



1b



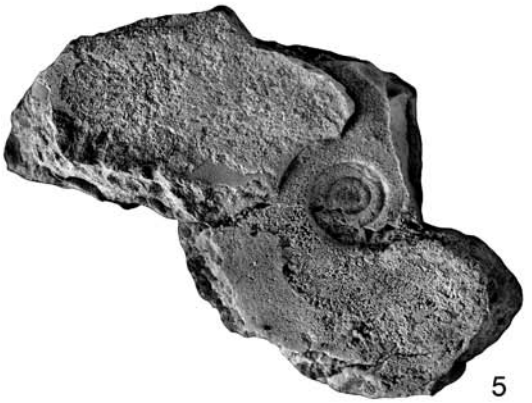
2

3a

3b

4a

4b



5

6

7a

7b

Plate XLII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography. Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Flexoptychites angustoumbilicatus* (Böckh, 1872) — INV 2017.278.1., Felsőörs, Bed 97, Trinodosus Zone, Pseudohungaricum Subzone, a: lateral view, b: ventral view.
2. *Flexoptychites angustoumbilicatus* (Böckh, 1872) — M.89.130A, Vászoly, Trench P-11/a, Bed 14, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
3. *Flexoptychites angustoumbilicatus* (Böckh, 1872) — INV 2017.279.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
4. *Flexoptychites angustoumbilicatus* (Böckh, 1872) — INV 2017.280.1., Felsőörs, Bed 111/E, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
5. *Flexoptychites angustoumbilicatus* (Böckh, 1872) — INV 2017.281.1., Szentkirályszabadja, Bed 18, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone, a: lateral view, b: ventral view..

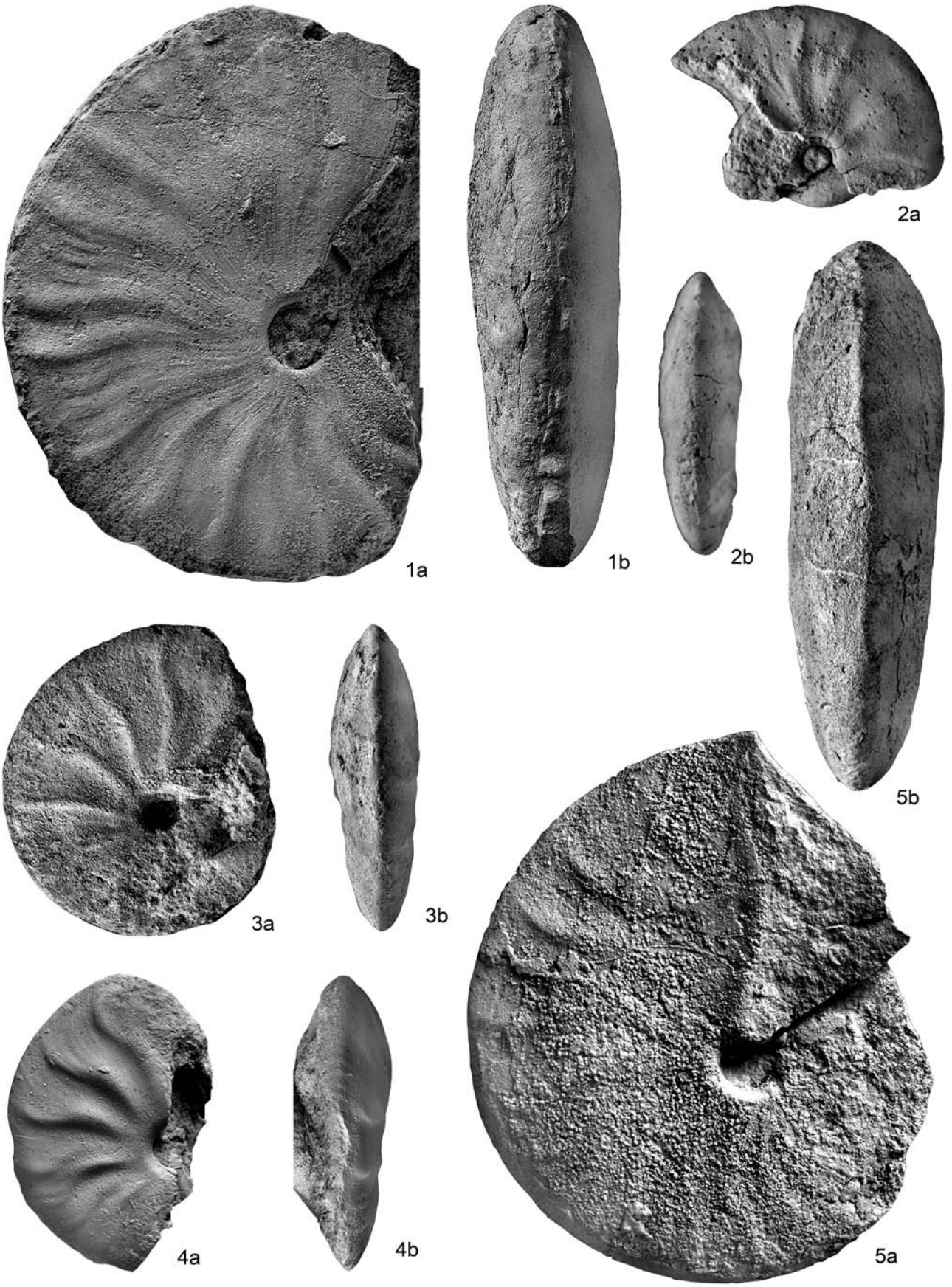
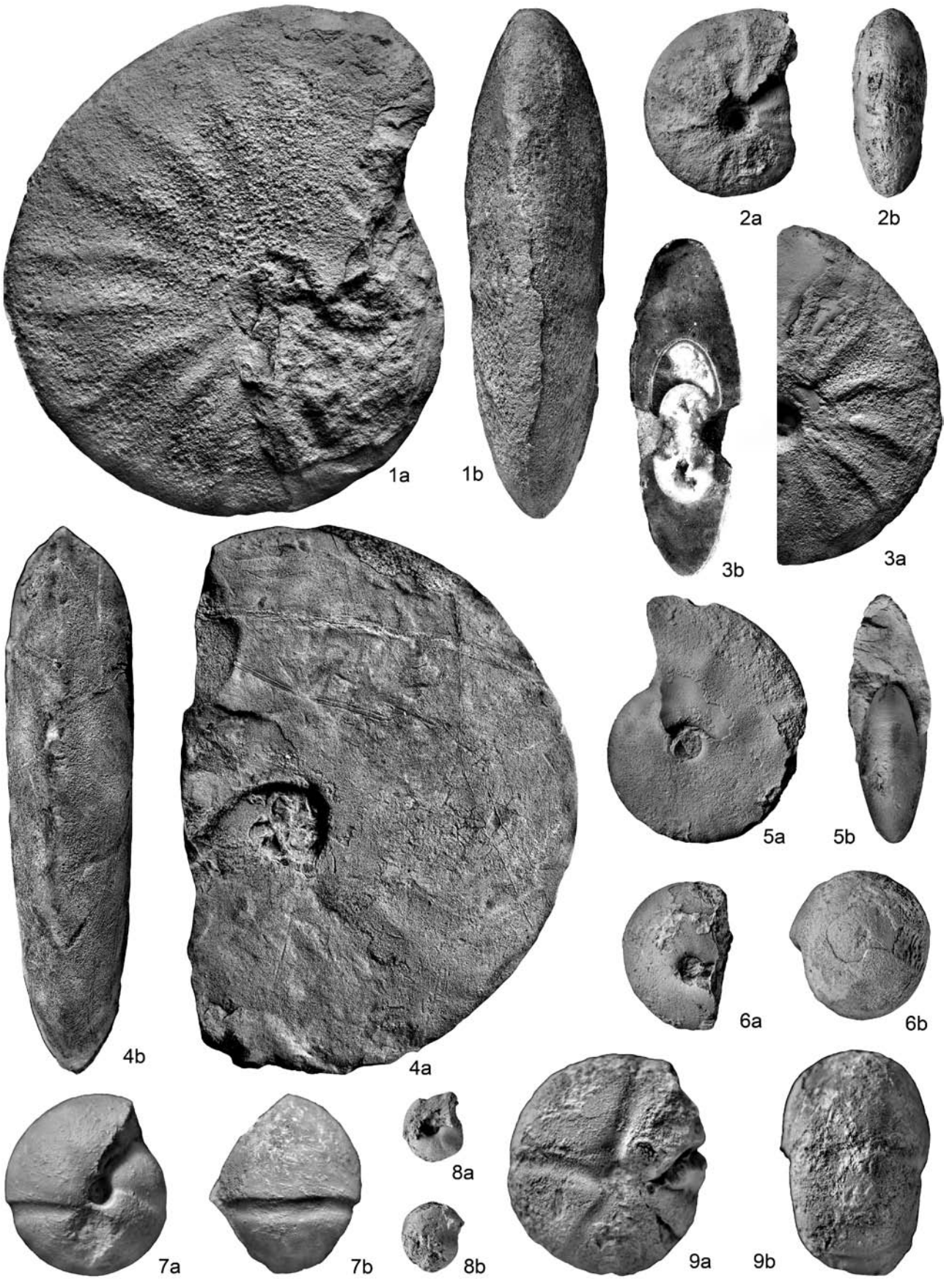

1a
1b
2a
2b
5b
3a
3b
4a
4b
5a

Plate XLIII

All figures are in natural size. Specimens have been coated with ammonium chloride before photography (except Fig. 3b). Specimens are deposited in the collection of the Department of Paleontology and Geology, Hungarian Natural History Museum (Budapest), under the inventory numbers prefixed by M., or INV.

1. *Flexoptychites flexuosus* (Mojsisovics, 1882) — INV 2017.282.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone, a: lateral view, b: ventral view.
2. *Flexoptychites flexuosus* (Mojsisovics, 1882) — INV 2017.283.1., Mencshely I, Bed 9, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
3. *Flexoptychites flexuosus* (Mojsisovics, 1882) — INV 2017.284.1., Szentkirályszabadja, Bed 14, Reitzi Zone, Felsoeoersensis + Liepoldti Subzone, a: lateral view, b: cross section.
4. *Flexoptychites* cf. *acutus* (Mojsisovics, 1882) — M.87.017, Szentbékkálla, loose, Reitzi Zone (?), a: lateral view, b: ventral view.
5. *Parasturia* cf. *emmrichi* (Mojsisovics, 1882) — INV 2017.285.1., Mencshely I, Bed 3, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
6. *Proarcestes* sp. — INV 2017.286.1., Mencshely I, loose, Reitzi Zone, Reitzi Subzone (?), a: lateral view, b: ventral view.
7. *Proarcestes* sp. — INV 2017.287.1., Felsőörs, Bed 111/H, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.
8. *Proarcestes* sp. — INV 2017.288.1., Mencshely I, Bed 8, Reitzi Zone, Reitzi Subzone, a: lateral view, b: ventral view.
9. *Proarcestes* sp. — INV 2017.289.1., Mencshely I, Bed 5, Reitzi Zone, Avisianum Subzone, a: lateral view, b: ventral view.


1a
1b
2a
2b
3b
3a
4b
4a
5a
5b
6a
6b
7a
7b
8a
8b
9a
9b

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Names given in *italics* are synonyms or only mentioned in the text. Numbers in bold indicate pages on which a description is given; numbers in *italics* indicate pages where text-figures occur; Roman and Arabic numbers indicate plate and figure numbers, respectively.

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ATTILA VÖRÖS (retired) is currently a voluntary fellow of the Department of Paleontology and Geology of the Hungarian Natural History Museum, where he has been a curator of invertebrate palaeontology since 1970. University degrees (Eötvös Loránd University, Budapest): Dr. rer. nat. (M. Sc.) (1971) Habilitation (2000), Professor h. c. (2007). Academic degrees (Hungarian Academy of Sciences): C. Sc. (1985), D. Sc. (1997), Corresponding Member (2004), Ordinary Member (2010). He was Vice-President (2005–2011) and President (2011–2017) of the Section of the Earth Sciences of the Hungarian Academy of Sciences. He is Voting Member of the Subcommision on Triassic Stratigraphy (International Commission on Stratigraphy) and Honorary Member of the Hungarian Geological Society. His main fields of scientific interest are Mesozoic palaeontology, stratigraphy and palaeogeography.

The present volume is dedicated to the systematic description of the Late Anisian ammonoid fauna of the Balaton Highland. With 2104 identified ammonoid specimens, 85 species and 37 genera, it is one of the most diverse among the Anisian brachiopod faunas of the Alpine region and probably of the world.

The discovery of this exceptionally rich fauna is chiefly due to the pioneering geological work and publications by J. BÖCKH from 1870 to 1874, and the subsequent monograph by MOJSISOVICS (1882). In the framework of the ambitious international project entitled "Wissenschaftliche Erforschung des Balatonsees" (Scientific Research of the Lake Balaton), led and supervised by L. LÓCZY, the publications by DIENER (1899, 1900) ARTHABER (1903) and FRECH (1903) significantly contributed to the knowledge of the Anisian ammonoids of the Balaton Highland. After several decades, the field works done by I. SZABÓ and T. BUDAI (and many others) stimulated new, systematic collections of fossils done by the staff of the Geological Institute of Hungary. In the early 1980's, excavations and bed-by-bed collections of several key sections were carried out under the supervision of the present author and yielded several thousand ammonoid specimens from the Anisian strata of the Balaton Highland. The Late Anisian ammonoid fauna had significance for establishing the Ladinian GSSP; this interest invoked the modern re-evaluation of the ammonoid biostratigraphy of the Balaton Highland (VÖRÖS 1993, VÖRÖS et al. 1996, 2003b, 2009). The palaeoecological, and palaeobiogeographical aspects of the diverse ammonoid fauna were also published (VÖRÖS 1992, 1996, 2001, 2002) and some general patterns of ammonoid extinctions and diversity changes were also discussed (VÖRÖS 2010b, 2014).

The introductory part of the monograph contains a chapter on the Upper Anisian stratigraphy of the Balaton Highland, including concise description of the lithostratigraphy. The next, voluminous chapter presents the descriptions of the sections and localities; the stratigraphic columns of the sections with the ranges of the ammonoid taxa, and the full data base of the collected ammonoids.

The main part, devoted to the systematic palaeontology of the fauna, comprises descriptions of 85 species belonging to 37 genera. Four of the genera and fourteen of the species are described here as new taxa. The descriptions are illustrated with 65 drawings of cross sections and suture lines. At the end, 43 photographic plates demonstrate the external features of the described ammonoid species.

The author wishes to express his sincere thanks to Prof. T. BUDAI for the continuous and manifold support in the preparation of this monograph. Many thanks are also due to those many colleagues, who have assisted the author in various ways during the course of his work, whose names will not be listed here. The publication of the monograph was sponsored by the Hungarian Academy of Sciences. Essential technical support was given by the Geological Institute of Hungary (now Mining and Geological Survey of Hungary) whose kind permission for publishing this monograph as a volume of the Geologica Hungarica series is much appreciated. Special thanks are due to O. Piros for the careful editing.