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FASCICULI INSTITUTI GEOLOGICI HUNGARIAE
AD ILLUSTRANDAM NOTIONEM GEOLOGICAM ET PALAEONTOLOGICAM

geologica hungarica

SERIES PALAEONTOLOGICA FASCICULUS 61

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The Middle Jurassic brachiopods of the Transdanubian Range, Hungary

BUDAPEST, 2024

GEOLOGICA HUNGARICA ser. PAL. fasc. 61

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geologica hungarica SERIES PALAEONTOLOGICA, FASCICULUS 61

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The present volume is dedicated to the systematic description of the Middle Jurassic brachiopod fauna of the Transdanubian Range (Hungary). Comprising 1282 identified specimens, 28 species and 16 genera, it is the most diverse among the coeval brachiopod faunas of the Mediterranean Province.

This fauna was revealed rather slowly during the last decades. The first, partly vague, data were published from the Bakony Mts. in the mapping geological reports by Noszky (1943, 1953). More valuable progress were done in the Vértes Mts. by G. Vigh, who published his results of brachiopod samplings in a paper by Fülöp et al. (1960). Then, the voluminous and detailed collecting work by the staff of the Geological Institute of Hungary in the 1960's and 1970's, in the Bakony Mountains, led by J. Fülöp and J. Konda, yielded, among others, an extremely rich Middle Jurassic brachiopod fauna. This material and the previous collections by J. Noszky and G. Vigh served the basis of the present study.

The previous publications by Vörös (1993, 1997, 2001) and a co-authored paper (Vörös & Dulai 2007) gave only preliminary faunal lists and partial documentation of the Middle Jurassic brachiopod fauna of the Transdanubian Range but a complete taxonomical description was still awaited.

The introductory part of the monograph contains a chapter on the Middle Jurassic of the Bakony Mountains, including the concise description of the lithostratigraphy and short descriptions of the sections and localities and the full data base of the collected brachiopods. The next chapter presents the evaluation of the temporal and spatial changes in the brachiopod fauna.

The main part, devoted to the systematic palaeontology of the fauna, comprises descriptions of 28 species belonging to 16 genera. Four of the genera and one of the species are described here as new taxa. The descriptions are illustrated with 57 drawings, mainly of serial cross sections of the specimens. At the end, five photographic plates demonstrate the external features and variability of the described brachiopod species.

The author wishes to express his sincere thanks to many colleagues, who have assisted him in various ways during the course of his work. The publication of the present monograph as an issue of the series Geologica Hungarica was possible by the generous support by the Supervisory Authority for Regulatory Affairs (Budapest). Special thanks are due to A. Dulai (reviewer) and O. Piros and K. Palotás for the careful editing.

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by

ATTILA VÖRÖS

BUDAPEST, 2024

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On the front cover:
Composition of selected Middle Jurassic brachiopod specimens from the Bakony Mountains (Hungary)

Published by the Supervisory Authority for Regulatory Affairs — Kiadja a Szabályozott Tevékenységek Felügyeleti Hatósága

Responsible editor:
President of SARA

ISSN 0374-1893
ISBN 978-963-671-331-7

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Introduction

After the end-Permian biotic catastrophe and the latest Triassic extinction, the Jurassic Period saw a secondary flourishing episode in the history of the phylum Brachiopoda, with a peak in the late Middle Jurassic (e.g., CURRY & BENTON 2007, VÖRÖS 2010, VÖRÖS et al. 2016). This global phenomenon appeared in a somewhat different way in the Mediterranean Province, i.e., in the partly bathyal environments of the microcontinent system within the western Tethys, where the territory of the Transdanubian Range once belonged (VÖRÖS 1993a).

Here the recovery of the brachiopods was surprisingly rapid, as it was demonstrated by DULAI (2001) and BAEZA-CARRATALÁ et al. (2018) for the early Sinemurian, and the taxonomic diversity remained very high even in the Pliensbachian (VÖRÖS 2009). The early Toarcian extinction, which was perhaps the most significant in brachiopod history (VÖRÖS et al. 2016, 2019), put an end to this flourishing period. The post-extinction revival was rapid in the European faunas and lasted until the Callovian–Oxfordian peak of diversity; on the other hand, the Mediterranean faunas suffered a long-lasting diversity reduction up to the Bajocian (HALLAM 1987, VÖRÖS 1997). This short Middle Jurassic secondary flourishing of the Mediterranean brachiopods was finished by the commencing of the “age of radiolarites” (COLÁS & GARCÍA JORAL 2011), which lasted until the Kimmeridgian. The third diversity pulse of the Mediterranean Jurassic brachiopods, hallmarked by the pygopides, culminated in the Tithonian (VÖRÖS 2022).

Considering strictly the Transdanubian Range, the Early Jurassic brachiopod faunas were described in detail and illustrated properly (Sinemurian: DULAI 1992, 2003; Pliensbachian: VÖRÖS 2009), just as the Late Jurassic (Kimmeridgian and Tithonian: VÖRÖS 2022). The present author has been engaged with the significant Middle Jurassic brachiopod fauna since the 1980’s but the efforts resulted only in preliminary reports (VÖRÖS 1997, 2001; VÖRÖS & DULAI 2007). Now, due to the detailed work in the last years, the time has come to compile and publish the present volume.

The available material is extremely abundant (nearly 1300 specimens) and diverse. Besides 15 species of the Rhynchonellida, it includes 13 taxa of the Terebratulida. One species and four genera are introduced as new taxa. The whole material encompasses several rich assemblages from the Bajocian and two less diverse from the Bathonian. The present volume is devoted primarily to the taxonomic revision, description, and illustration of the Middle Jurassic brachiopods, collected from the Transdanubian Range in the last decades, and available in the public collections. The rich fossil material gave reason for an attempt to develop some notes on the palaeoenvironmental aspects. In addition, a detailed palaeobiogeographical evaluation of the fauna in relationship to other assemblages of the Western Tethyan domain is presented.

Acknowledgements

The author wants to express his sincere thanks to the late Prof. B. GÉCZY, his master, who always supported his progress in science and who consistently encouraged and forced him to work on the Jurassic brachiopods of the Bakony Mountains.

It is right and proper to commemorate here the indispensable activity of the late Dr. J. NOSZKY jun. who, in the 1940's, during his field-work in the Bakony Mountains collected enormous amount of Jurassic fossils. A fundamental part of the brachiopods, treated in this volume, is due to his effort.

Thanks are due to the late Dr. J. KONDA, and other field geologists and co-workers of the former Geological Institute of Hungary, who made voluminous collecting work in the Jurassic of the Bakony Mountains in the 1960's and supported the study of the fossils providing the basis of the present monograph.

Prof. A. GALÁCZ, an immediate colleague for years, and co-author in many papers, greatly improved the author's approach to scientific problems; he was a good companion in the field in Hungary and abroad. The author is indebted to his younger colleagues Drs. J. SZABÓ, I. FŐZY, J. PÁLFY, I. SZENTE, A. DULAI, O. SZIVES and I. MAGYAR for advices and valuable discussions. The manifold technical assistance of the late Dr. Gy. PITTER is gratefully acknowledged. Special thanks are due to Prof. J. PÁLFY for instructions on the application of statistical methods and the evaluation of the results, and to Prof. T. BUDAI for the help in the identification of localities in the Vértes Mountains.

Great part of the serial sections through the brachiopod specimens have been prepared by the author with additional work by A. DULAI and R. LUTZ; in the brachiopod photography the author was helped by E. HANKÓ. Their efforts and assistance are deeply acknowledged.

The author is grateful to Drs. K. PALOTÁS, O. SZIVES and L. MAKÁDI (Geological Collections of the Supervisory Authority for Regulatory Affairs [SZTFH, SARA], Budapest), Dr. I. ZORN (Geologische Bundesanstalt, Wien), the late Dr. R. FÖRSTER and Dr. M. NOSE (Bayerische Staatssammlung, München), Dr. S. MONARI (Università di Padova), Dr. C. D'ARPA (Museo Geologico G. G. Gemmellaro, Università di Palermo), Dr. E. S. TCHORZHEVSKY (Kharkov University) and the late Dr. H. SULSER (Engelburg) for access to the collections in their charge, providing information and advices and occasional loaning of specimens.

The research was partly supported by the grant of the Hungarian Scientific Research Fund (OTKA/NKFI project no: K123762). The author carried out the research and the compilation of the monograph at the Department of Palaeontology and Geology of the Hungarian Natural History Museum (Budapest) where, after being retired, he worked as a voluntary research fellow. Thanks are due to the leadership of the institution for the possibility.

The manuscript was critically reviewed by Dr. A. DULAI; his useful comments and advices significantly improved the present work.

Essential technical help was given by the Supervisory Authority for Regulatory Affairs (SZTFH, SARA), Budapest, whose kind permission for publishing this monograph as a volume of the Geologica Hungarica series Palaeontologica is much appreciated. Special thanks are due to Dr. O. PIROS AND DR. K. PALOTÁS for the careful editing and DTP work.

Previous research

The first indication of a Middle Jurassic brachiopod from the Bakony: "*Terebratula dorsoplicata*" by PAUL (1862, p. 228) was obviously misplaced stratigraphically. The description of the locality by PAUL at Olaszfalu with the red crinoidal limestone overlain by Cretaceous "Radiolithenschichten" clearly shows that the host rock of the mentioned brachiopod was the Lower Cretaceous Tata Limestone in the present-day usage. Thus, in contrast to the correct early records of Lower and Upper Jurassic brachiopods (PAUL 1862, BÖCKH 1874), proper Middle Jurassic brachiopods were recognized almost a century later in the Transdanubian Range.

NOSZKY (1943) published a short report on a "Dogger brachiopod facies with very peculiar *Rhynchonellina* sp. SW of Gyenespuszta, on the northern side of the hill at the 508 m point of elevation." He obviously referred to the large specimens of *Striirhynchia berchta*, which are very frequent at that locality and by their capillate ornamentation bear some similarity to *Rhynchonellina*, which is however a strictly Early Jurassic genus. Later NOSZKY (1953) gave another short note: "Dogger facies with brachiopods near Csapó-tanya (Hajag Hills, Szentgál)." This refers to the same closer region but further details on the fauna were not given.

The first correct and partly illustrated record of Middle Jurassic brachiopods from the Transdanubian Range, notably from the Vértes Hill, was due to G. VIGH (in FÜLÖP et al. 1960). He listed "*Rhynchonella*" *atla* OPP, "*R.*" *coarctata* OPP. and "*R.*" *coarctata* var. *miscella* OPP. and gave a photo of the last taxon. The brachiopods were collected at the Csóka Hill, in a section between the villages Mór and Csókakő, together with ammonoids proving a Bathonian age. Later FÜLÖP (1971) published sketch profiles of this locality with indication of Bajocian strata below the Bathonian. GALÁCZ (1995) revised the ammonoids from Csóka Hill and endorsed the presence of Bajocian elements in the fundamentally Bathonian fauna.

In the Bakony Mountains the knowledge of Middle Jurassic brachiopods advanced much more slowly despite the detailed geological mapping by the Geological Institute of Hungary (GIH) in the 1960's and 1970's. NOSZKY (1972) mentioned *Rhynchonella* div. gen. et sp., *Rhynchonellina* div. sp. and *Terebratula* div. sp. from Gyenespuszta, 508 m point of elevation, from crinoidal-brachiopodal ("Hierlatz") limestone of supposedly Bathonian age, and rightly indicated a lithological and faunal similarity to some South Alpine localities (Puez, Fanes, Feltrine) and the North Alpine Klauskalk.

As an important outcome of the mentioned geological mapping, the collected fossil material (ammonoids, gastropods, bivalves, brachiopods) was comprehensively studied (GALÁCZ 1976, 1980, 1995; SZABÓ 1979, 1980, 1981, 1982, 1983; SZENTE 1995). Some of the well-dated, ammonoid bearing Bajocian sections and localities (e.g., Lókút Hill, Som Hill; GALÁCZ 1976) yielded significant amount of brachiopods. It was also revealed that many occurrences of the crinoidal-brachiopodal limestones, formerly classified as Lower Jurassic "Hierlatz" limestones, were in fact Bajocian in age, e.g., at Fenyveskút and further localities along the northern slope of the Papod Hill (GALÁCZ 1988, fig. 5; VÖRÖS 1992). This new recognition gave motivation for detailed research of the abundant and indeed very diverse Middle Jurassic brachiopod material.

In a research paper on the Bakony fauna (VÖRÖS 1993b) and in a comprehensive evaluation of the Jurassic brachiopods of Hungary, VÖRÖS (1997) listed 20 Bajocian species from different localities of the Bakony and Vértes Mountains, in most cases with preliminary taxonomy. The same list was repeated in another review paper, illustrated by hand drawings (VÖRÖS 2001) and in the work by VÖRÖS & DULAI (2007), where some essential forms were documented by photographs, but without descriptions.

The detailed geological mapping by the Hungarian Geological Institute in the Vértes Mountains around the 2000's, revealed several generations of Jurassic neptunian dykes of various (in cases of giant) size penetrating the Upper Triassic massive carbonates. It was confirmed by the determination of A. GALÁCZ, that the infilling crinoidal-brachiopodal, ammonoid bearing limestones represent both the Bajocian and the Bathonian stages. The neptunian dykes yielded numerous brachiopods, from where A. VÖRÖS identified eight Middle Jurassic brachiopod taxa (CSÁSZÁR & PEREGI 2001). These results were repeated in a monographic closing report of the geological mapping (BUDAI & FODOR 2008, pp. 42–44, 244).

In the course of the commencing studies of the internal morphology of the Middle Jurassic brachiopods of the Transdanubian Range it became clear that the fauna contained curious, odd taxa with uncertain taxonomic relationships, and with no counterparts in the better known Early and Late Jurassic brachiopod faunas. In a joint project and publication with Spanish colleagues (BAEZA-CARRATALÁ et al. 2011) only a minor part of the taxonomical problems was solved. The full palaeontological documentation of the Middle Jurassic brachiopod fauna of the Transdanubian Range is now became indispensable.

Stratigraphy

Overview of the Middle Jurassic stratigraphy of the Transdanubian Range

The Middle Jurassic formations are widespread in the Transdanubian Range from the Zala region (in drillings) and in surface outcrops through the Bakony and Vértes Mountains to the Gerecse Mountains (Figure 1). For an overview see Galácz (1984) and Vörös & Galácz (1998). The lithostratigraphical definitions and detailed descriptions of the formations can be found in Főzy (2012) and in Babinszki et al. (2023).

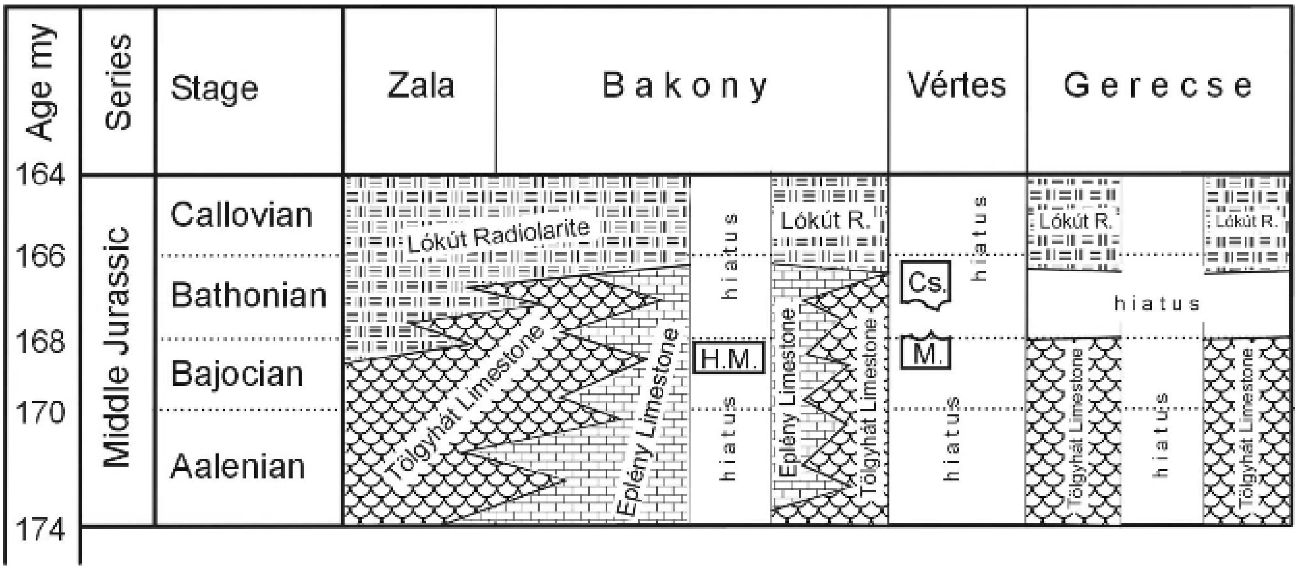


Figure 1. . Lithostratigraphical scheme showing the relationship between the Middle Jurassic formations in the Transdanubian Range. Compiled from Főzy (ed.) (2012) and Babinszki et al. (eds) (2023). H.M.: Hárskút Member, Cs.M.: Csókakő Member, Lókút R.: Lókút Radiolarite Formation

The pelagic and dominantly carbonate sedimentation, prevailed in the Early Jurassic, continued uninterruptedly in the basins, while intermittent non-deposition (hiatus) appeared on submarine topographic highs. In the early Middle Jurassic (Aalenian) the Rosso Ammonitico type, red, nodular or wavy-bedded **Tölgyhát Limestone** was the dominant formation, interfingered with the heteropic, greyish and partly siliceous **Eplény Limestone** in the deeper parts of the basins. This facies pattern persisted in the Bajocian and the Bathonian, interspersed with the sedimentary products of rejuvenated tectonic movements along the faults bordering the submarine highs. The extensional tectonics resulted in opening of fissures (neptunian dykes) and rock avalanches (scarp breccias). The coarse biodetrital, ferro-manganese stained limestones deposited in the neptunian dykes and in depressions on the uneven surfaces of the submarine horsts are called **Hárskút Member** (in the Bakony) and **Csókakő Member** (in the Vértes); and now both are classified into the **Tölgyhát Limestone Formation** (Babinszki et al. 2023). From the Bathonian onwards and in the Callovian the **Lókút Radiolarite** became entirely dominant all through the Transdanubian Range, except a few submarine highs. The deposition of this siliceous, cherty, almost carbonate-free formation prevailed up to the early Late Jurassic.

The basinal facies of the Bajocian Tölgyhát Limestone is almost free of brachiopods; only one locality yielded significant brachiopod fauna. On the other hand, the Hárskút and Csókakő members of the Tölgyhát Limestone Formation bear exceptional importance from the point of view of the present study because they yielded the overwhelming majority of our brachiopod material. These lithological units appear as various limestone types (Figure 2). The light red micritic limestone crowded with thin *Bositra* shell pieces may enclose fragments of various older limestone formations. The abundant, medium-sized, and small brachiopods and the occasional ammonoids partly bear ferro-manganese coatings. Many brachiopods are filled with sparry calcite. The other lithological type is a darker greyish-red limestone with very numerous, small, black manganese-oxide grains and coarse detritus of *Bositra* shells. The brachiopods and echinoderm fragments usually have manganese-oxide coatings as well.

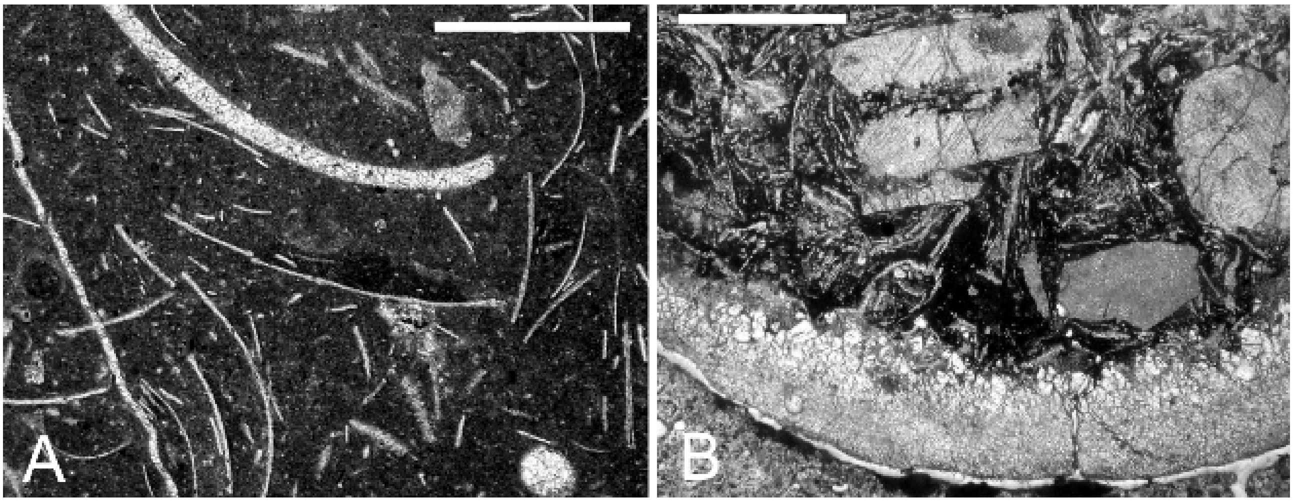


Figure 2. Thin section photomicrographs of the limestone types of the Hárskút Member of the Tölgyhát Formation. A: Micritic wackestone with thin *Bositra* shells and an ammonoid fragment; B: Brachiopod shell filled with packstone of *Bositra* and crinoid fragments. Scale bar: 1 mm

The Hárskút Member in the Bakony and the Csókakő Member in the Vértes, after a long period of non-deposition, were accumulated on the top of the Hettangian Kardosrét Limestone or formed neptunian dykes in the same formation. Rarely the neptunian dykes penetrated to the Upper Triassic Dachstein Limestone or (in the Vértes) even down to the Main Dolomite (CSÁSZÁR & PEREGI 2001, BUDAI & FODOR 2008). In the vertical neptunian dykes or depressions the Middle Jurassic rock is coarse biodetrital and massive, dominated by brachiopods and crinoids. In horizontal neptunian dykes, which might open in several phases, the limestone is more or less well-bedded and the fossils (gastropods, ammonoids, bivalves, brachiopods) are sometimes excellently preserved due to the thin ferro-manganese staining or coating.

The Hárskút Member in the Bakony Mountains is early to late Bajocian in age; dominantly latest Bajocian (Parkinsoni Zone: GALÁCZ 1976, 1980). On the other hand, two phases of deposition of this member was recognized in the Csókakő Member in the Vértes Mountains: one in the late Bajocian, another in the late Bathonian (GALÁCZ 1995 and pers. comm.).

Middle Jurassic brachiopod localities in the Transdanubian Range

Altogether 14 localities (including groups of localities) yielded Middle Jurassic (Bajocian and Bathonian) brachiopods, 10 in the Bakony and four in the Vértes Mountains (Figures 3 and 4). The Bajocian Stage is exposed in 12, while the Bathonian in two localities. Most of the localities yielded abundant and diverse assemblages mostly as bulk samples; one section was collected bed-by-bed and the ammonoid record supplied principally important stratigraphical information for the brachiopod fauna (Lókút, Lókút Hill IV). Together with some less significant ones, the brachiopod localities are listed and briefly commented below in geographical order from south-west to north-east.

1. KISNYERGES RAVINE (SZENTGÁL)

The fossiliferous locality, on the southern margin of the Hajag Hill, was noticed by J. NOSZKY in 1942, who mentioned ammonoid-bearing Liassic beds from here (NOSZKY 1953). An artificial excavation made by the Geological Institute of Hungary (GIH) in the 1960's exposed an incomplete Jurassic section from the Sinemurian to the Kimmeridgian (KONDA 1970). The ammonoids of the Bajocian beds of rosso ammonitico type were studied by GALÁCZ (1976). The beds belong to the Tölgyhát Formation (FŐZY 2012). Two specimens of *Apringia coarctata* were collected from Bed 12, put in the "Subcontractus" (= Niortense) Zone by GALÁCZ (1976).

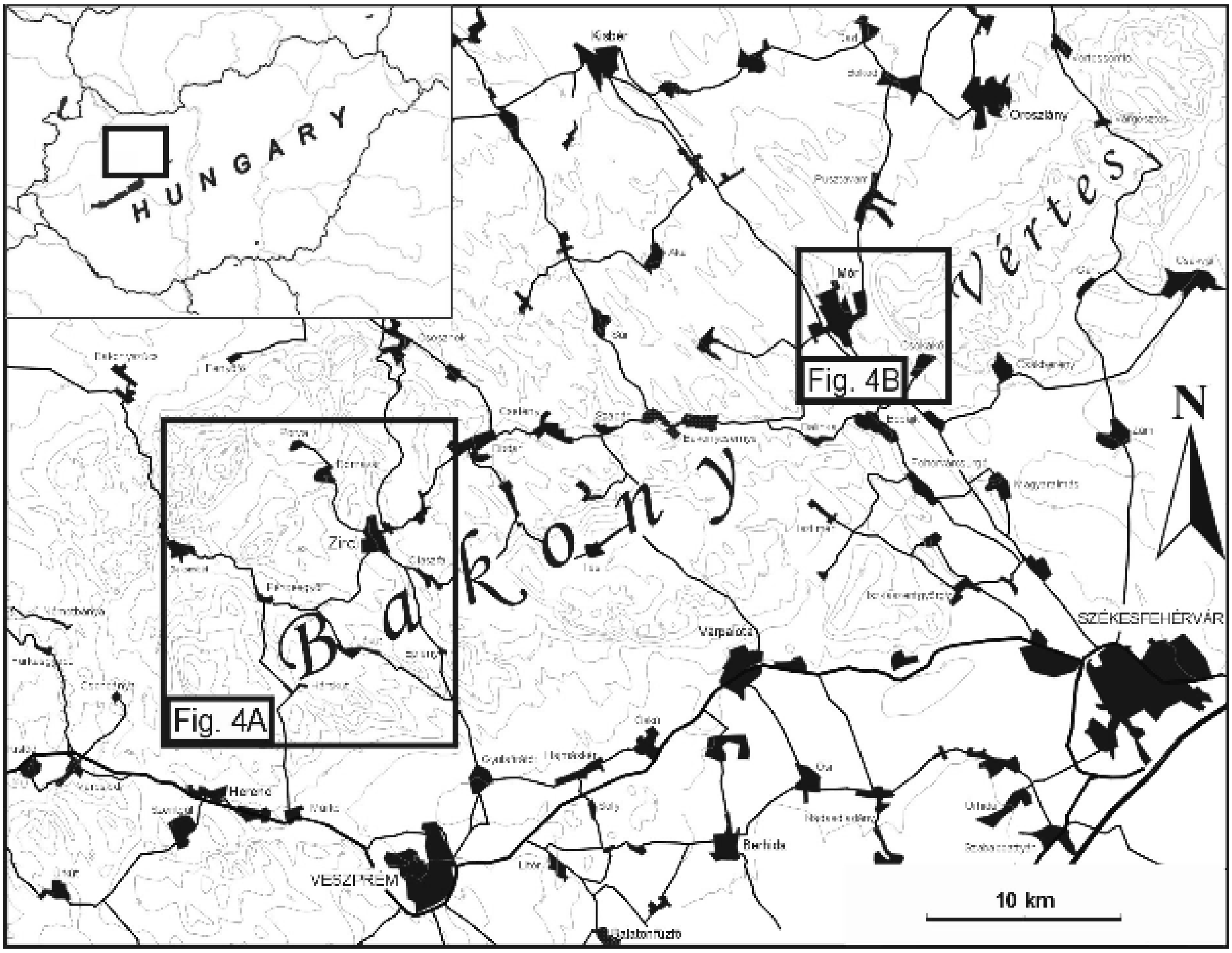


Figure 3. Situation map of the Transdanubian Range with indication of the locality maps in the northern Bakony Mountains (Figure 4A) and the eastern Vértes Mountains (Figure 4B)

2. GYENESPUSZTA (HÁRSKÚT)

This locality, on the eastern slope of the Hajag Hill, was discovered by J. NOSZKY in 1940, who reported "extremely curious *Rhynchonellina* sp." from a "Dogger brachiopod facies" at the 508 m point of elevation, 350 m south-west of the small farm called Gyenespuszta (NOSZKY 1943). KONDA (1970) gave more detailed description and compared this brachiopod limestone to the "Hierlatz facies". The present official name of this rock is the Hárskút Member of the Tölgyhát Formation (FŐZY 2012, BABINSZKI et al. 2023). GALÁCZ (1980) termed this locality as "exposure IV" and ranked it into the upper Bajocian Parkinsoni Zone. By the analogy of a nearby locality with similar *Bositra*- and brachiopod-bearing lithology, the deposition in a submarine fissure (neptunian dyke) was the suggested interpretation. Bulk samplings by the GIH, A. GALÁCZ and A. VÖRÖS in the late 1960's have resulted in a very abundant and diverse brachiopod fauna. The full list of brachiopod taxa with their specimen numbers (in parentheses):

Apringia atla (58)
Apringia coarctata (1)
Fenyveskutella fallax (7)
Striirhynchia berchta (4)
Striirhynchia microptycha (3)
Galatirhynchia galatensis (5)
Karadagithyris gerda (24)
Karadagithyris erycina (11)
Karadagithyris ? aff. *dolhae* (1)
Pseudopapodina laticoxa (9)
Hajagithyris fylgia (18)
Hajagithyris seguenzae (3)

3. Csapó-tanya (Hárskút)

In 1942, J. Noszky collected several hundred specimens from the "Dogger brachiopod facies" (The present official name of this rock is the Hárskút Member of the Tölgyhát Formation, see Főzy 2012; Babinszki et al. 2023), near a small lodge called Csapótanya (Noszky 1953, p. 4). The fixing of the geographical position of this locality was problematic. On the hand-written labels attached to the collected fossils, Noszky indicated the name of Szentgál as the closest village where Csapótanya officially belonged at that time. Looking through the register of farms and lodges in the district of Szentgál, the name Csapótanya was not found. It turned out that in 1956, afterwards Noszky's field-work, a large, mostly forested north-eastern part of the territory of Szentgál was administratively transferred to the newly established village Hárskút. The search in the register of Hárskút (available at https://mna.unideb.hu/pdf/ 022harskut-sorhu.doc) was successful: No. 127 item of the list is "Csapó-ház", with the notion: "Volt É.[pület]" (=former building). In the attached map this point No. 127 is placed to the south-eastern part of the Hajag Hill, approximately 300 m distance to the south-west from the point No. 113 "Gyenespuszta". The close proximity of the two localities is reflected by the very similar composition of their brachiopod faunas. The bulk sampling from Csapótanya by J. Noszky yielded the following taxa (specimen numbers in parentheses):

Apringia atla (87)
Apringia coarctata (9)
Septocrurella retrosinuata (8)
Fenyveskutella fallax (17)
Striirhynchia berchta (18)
Striirhynchia microptycha (35)
Galatirhynchia galatensis (87)
Karadagithyris gerda (19)
Karadagithyris erycina (3)
Karadagithyris ? aff. *dolhae* (5)
Pseudopapodina laticoxa (104)
Pseudopapodina recuperoi (1)
Hajagithyris fylgia (63)
Hajagithyris seguenzae (32)
Hajagithyris mykonionensis (1)

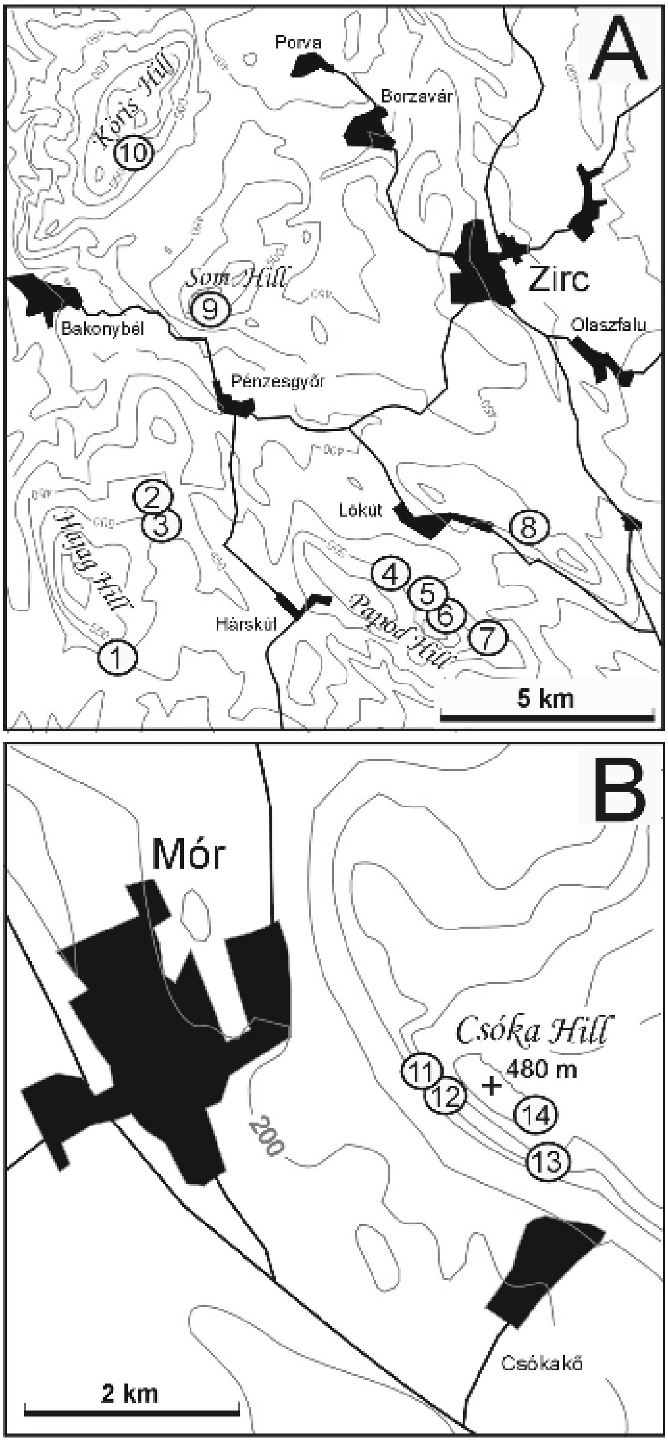


Figure 4. Situation map of the northern Bakony Mountains (A) and the eastern Vértes Mountains (B), showing the localities yielding Middle Jurassic brachiopods. 1: Kisnyerges Ravine (Szentgál); 2: Gyenespuszta (Hárskút); 3: Csapótanya (Hárskút); 4: Fenyveskút (Lókút), including Fenyveskút VIII and Fenyveskút N; 5: Papod 82 (Lókút); 6: Papod 83 (Lókút); 7: Szegle (=Szögle) (Gyulafirátót); 8: Lókút Hill IV (Lókút); 9: Som Hill (Bakonybél); 10: Kőris Hill (Bakonybél); 11: Csóka Hill (1959) (Mór); 12: Csóka Hill (1966) (Mór); 13: Csóka Hill, southern promontory (Csókakő); 14: Csóka Hill, loose (Csókakő)

4. Fenyveskút (Lókút)

This locality, about 1.5 km south of the village Lókút, was found by Noszky (1945) who collected here numerous big, five centimetre-long, specimens of Pliensbachian brachiopods. It is a cliff at the northern foot of the Papod Hill, along the southern side of a ravine called Répás-árok (Répás Ravine). In the course of geological mapping by the GIH in the 1960's a small trench was also excavated here which was named as "section VIII" (Konda 1970). Subsequent collections yielded, besides the Pliensbachian, diverse Sinemurian and Bajocian brachiopod assemblages, and the site was qualified as the richest Jurassic brachiopod locality in the Bakony Mountains and in 1992 it was presented to the international participants of the "Regional field symposium on Alpine brachiopods" (Vörös 1992). A comprehensive description of the complicated sedimentary features of the Fenyveskút "megabreccia" and its tectonic interpretation can be found in Galácz (1988) and Vörös (1992). As for the Bajocian brachiopods, two separate localities yielded valuable assemblages. Both localities expose the Hárskút Member of the Tölgyhát Formation.

Fenyveskút VIII. On the top of the cliff, a trench was excavated by the GIH in the 1960's (Konda 1970). This collection and subsequent samplings by A. Galácz and A. Vörös yielded a very abundant and diverse brachiopod fauna of early Bajocian age (probably Humphriesianum Zone; A. Galácz, pers. comm.). The list of taxa with specimen numbers in parentheses:

Apringia atla (1)
Apringia alontina (34)
Septocrurella retrosinuata (8)
Fenyveskutella fallax (16)
Pseudogibbirhynchia ? cf. *etalloni* (8)
Striirhynchia berchta (103)
Galatirhynchia galatensis (4)
Linguithyris pteroconcha (1)
Pseudopapodina laticoxa (4)
Pseudopapodina recuperoi (2)
Paralinguithyris pygopoides (18)
Hajagithyris fylgia (3)

Fenyveskút N. Some ten metres northwards from the Fenyveskút VIII, on the northern slope of the cliff, A. Galácz, I. Szente and A. Vörös collected numerous brachiopods from dark red limestone blocks of the megabreccia. The age was dated by ammonoids as late Bajocian, probably Niortense Zone (A. Galácz, pers. comm.). The list of taxa with specimen numbers in parentheses:

Apringia atla (20)
Apringia coarctata (2)
Galatirhynchia galatensis (2)
Karadagithyris gerda (19)
Hajagithyris fylgia (63)
Orthotoma ? sp. (1)
Zeilleria cf. *subbucculenta* (2)

5. Papod 82 (Lókút)

This sampling point is about 2 km south of the village Lókút, along the northern foot of the Papod Hill, about 500 metres south-eastward from the locality Fenyveskút. Few metres high cliff on the southern side of the valley Répás-árok poorly exposes the megabreccia complex surrounded by the Hettangian Kardosrét Limestone. From the red limestone (Hárskút Member of the Tölgyhát Formation) A. Vörös collected here two pieces of Bajocian brachiopods: *Nannirhynchia subpygmaea* (1) and *Karadagithyris gerda* (1).

6. Papod 83 (Lókút)

This sampling point is also along the northern foot of the Papod Hill, in further 1 km distance from Papod 82 along the southern side of the valley Répás-árok. The Jurassic rocks (Hárskút Member of the Tölgyhát Formation) exposed at this cliff are similar to those previously described from Papod 82. Here the Bajocian brachiopod assemblage, collected by A. Vörös, is somewhat more abundant and diverse: *Apringia atla* (3), *Galatirhynchia galatensis* (4), *Karadagithyris gerda* (26), *Hajagithyris fylgia* (1).

7. Szegle (=Szögle) (Gyulafirátót)

The exact geographical position of this locality is somewhat uncertain. It was mentioned by Laczkó (1898, p. 65) as "Szögle", a ridge near the cliff Mohoskő at the northern foot of the Papod Hill. On the label, attached to the collected fossils, the name "Répavölgy" is written, obviously corresponding to the valley Répás-árok. This site is supposed to be located around 1 kilometre eastward from the locality Papod 83. Laczkó (1898) collected here many brachiopods, allegedly from the Lower Jurassic Hierlatz Limestone. However, a part of his material proved to be Bajocian in age and probably came from the Hárskút Member of the Tölgyhát Formation: *Striirhynchia berchta* (15), *Galatirhynchia galatensis* (1), *Pseudopapodina laticoxa* (1).

8. Lókút Hill IV (Lókút)

Long after the vague indication of "*Am. ptychoicus*" "zwischen Eplény und Lókút" by Paul (1862, p. 229), Telegdi-Roth (1935) was the first to mention Middle Jurassic beds and ammonoids from this locality. In the course of geological

Table 1. Distribution and number of identified brachiopod specimens in the Lókút Hill section. Zonal scheme after GALÁCZ (1976)

Lókút IV (Bajocian shaft/pit)	*Septocrurella ? retrosinuata*	*Nannirhynchia subpygmaea*	*Capillirhynchia brentoniaca*	*Apringia* cf. *atla*	*Neocirpa* cf. *armenica*	*Pseudogibbirhynchia ?* cf. *etalloni*	*Linguithyris pteroconcha*	*Orthotoma ?* sp.	sum	
Bed										Zones
1		2			3				5	Niortense
2	1							1	2	
3	3	1		2	4			1	11	
4	5	16	2				1		24	
5	4	7							11	
6	3	2					1		6	Humphriesianum
7	4							2	6	
8							1		1	
9	1		2				1		4	
10		1	2						3	
11		1	1				1		3	
12			3						3	
13							1		1	Sauzei
23	1								1	
24	13								13	Laeviuscula
29						1			1	
sum	35	30	10	2	7	1	5	5	95	

mapping by the GIH in the 1960's a very long trench was excavated on the south-eastern crest of the Lókút Hill which was named as "section IV" (KONDA 1970). The trench exposed a continuous series of the lower part of the Jurassic System from the Hettangian to the Bajocian (KONDA 1970, FÜLÖP 1971). Later the uppermost, Bajocian part of the exposure was greatly enlarged, and bed-by-bed collecting was done from the several metres thick beds of ammonitico rosso type limestones (Tölgyhát Formation). The ammonoids and stratigraphy were published by GALÁCZ (1976, 1991, 2012). Due to the detailed and voluminous collection, many layers of the nodular ammonitico rosso (from the Laeviuscula Zone to the Niortense Zone) yielded remarkably rich brachiopod material: eight taxa with 95 specimens (Table 1).

9. SOM HILL (BAKONYBÉL)

The fossiliferous Middle Jurassic locality at the top of the hill was discovered by PAUL (1862, p. 228) who listed some diagnostic ammonoid species and compared the host rock to the Alpine "Klaus-schichten". (The present official name of this rock is the Hárskút Member of the Tölgyhát Formation, see FŐZY 2012, BABINSZKI et al. 2023). NOSZKY (1943) collected further ammonoids and proved the presence of the Bajocian. Brachiopods were first mentioned and collected by KONDA (1970), and then GALÁCZ (1976) who described the ammonoid stratigraphy, and, following the recognition of WENDT (1971), interpreted this locality as a neptunian dyke setting. In the 1970's and 1980's, J. SZABÓ, hunting for gastropods, made detailed excavations, enlarged the outcrop, and carried out bed-by-bed collections. In 1990, in his unpublished thesis, J. SZABÓ distinguished several layers within the horizontal neptunian dyke and also outside, in the regularly overlying upper Bajocian strata. The benthonic fossil community is dominated by gastropods SZABÓ (1979, 1980, 1981, 1982, and 1983) then bivalves (SZENTE 1995) and brachiopods on the third place. The smaller part of the brachiopod material was collected by J. SZABÓ and A. GALÁCZ from two distinct levels of the horizontal neptunian dyke. The ***lower level*** (beds No. 1 and 2: Humphriesianum Zone) yielded *Apringia atla* (2), *Septocrurella retrosinuata* (2) and *Fenyveskutella fallax* (1). The ***upper level*** (beds No. 3–6: Niortense and Garantiana Zones) yielded *Apringia coarctata* (1), *Fenyveskutella fallax* (1), *Striirhynchia subechinata* (1), *Karadagithyris gerda* (4) and *K. erycina* (8). The majority of the brachiopods were found loose by J. KONDA, J. SZABÓ, A. GALÁCZ and A. VÖRÖS at ***various points*** around the top of the Som Hill. Considering the overall stratigraphy of the exposures, the youngest Bajocian layers may represent the Parkinsoni Zone; consequently, the loose brachiopods probably came mainly from this zone:

Apringia atla	(5)
Apringia coarctata	(29)
Septocrurella retrosinuata	(3)
Karadagithyris gerda	(4)
Karadagithyris erycina	(3)
Linguithyris pteroconcha	(8)
Hajagithyris fylgia	(1)
Zeilleria ? cf. *beggiatoi*	(1)
Zeilleria cf. *subbucculenta*	(1)

10. KŐRIS HILL (BAKONYBÉL)

This outcrop, discovered by A. VÖRÖS and A. GALÁCZ, is along the road leading to the top of the Kőris Hill, approximately 1 km south of the peak, on the western flank of the valley Márvány-völgy. The dark red, manganiferous limestone, exposed in the road-cut and found in the surrounding debris (the Hárskút Member of the Tölgyhát Formation) yielded late Bajocian ammonoids and the following brachiopod fauna: *Apringia atla* (1), *Striirhynchia berchta* (3), *S. subechinata* (1), *Karadagithyris gerda* (6) and *Zeilleria* cf. *subbucculenta* (1).

11. Csóka Hill (1959) (Mór)

According to the description by Fülöp et al. (1960), this fossiliferous locality is on the steep slope of Csóka Hill not far south-eastward from the prominent crest named Éleskő (consisting of Lower Cretaceous Tata Limestone Formation). The red Middle Jurassic limestone formed a neptunian dyke penetrating the Upper Triassic Dachstein Limestone. The presently used official name of this Middle Jurassic limestone is the Csókakő Member of the Tölgyhát Formation (Babinszki et al. 2023). The red, micritic limestone contains a plenty of small ammonoids and brachiopods filled mostly with sparry calcite. The voluminous collection, made essentially by G. Vigh, yielded a diverse ammonoid fauna of minute specimens pointing to a late Bathonian age (Orbis Zone: Galácz 1995) and an abundant but less diverse brachiopod assemblage: *Apringia atla* (10), *Apringia coarctata* (20) and *Karadagithyris gerda* (1).

12. Csóka Hill (1966) (Mór)

In 1966, another collection of fossils was done by the team of the GIH (lead by L. Kocsis), probably very near to the locality 11. The type of the rock and the composition and small size of the diverse ammonoid fauna are also very similar and point to a late Bathonian age (Orbis Zone: A. Galácz, pers. comm.). The site was probably also a neptunian dyke filled with the red limestone of the Csókakő Member of the Tölgyhát Formation. The brachiopod fauna is also similar to that of the previous locality: *Apringia atla* (12), *Apringia coarctata* (45) and *Karadagithyris gerda* (2).

13. Csóka Hill, southern promontory (Csókakő)

In the course of the new geological mapping of the Vértes Mountains, in the early 2000's, a remarkable "mega-dyke", penetrating down to the Late Triassic Main Dolomite, and filled with the Csókakő Member of the Tölgyhát Formation, was recognized by G. Császár, Zs. Peregi and Gy. Ferencz (in Császár & Peregi 2001, Budai & Fodor 2008). At this particular point called "legdélibb nyúlvány" (= southernmost promontory) by Zs. Peregi, they collected the following brachiopods:

Apringia alontina (2)
Fenyveskutella paronai (1)
Pseudogibbirhynchia ? cf. *chiemiensis* (2)
Galatirhynchia galatensis (1)
Pseudopapodina laticoxa (6)

By the analogies with the Bakony faunas, this assemblage is considered of late Bajocian in age.

14. Csóka Hill, loose (Csókakő)

On the flat ridge of the Csóka Hill, in 1989, A. Dulai, A. Galácz and A. Vörös collected the following brachiopods from the loose pieces of the Middle Jurassic reddish, manganiferous limestone (now called Csókakő Member of the Tölgyhát Formation):

Pseudogibbirhynchia ? cf. *chiemiensis* (1)
Pseudogibbirhynchia ? cf. *etalloni* (1)
Galatirhynchia galatensis (2)
Striirhynchia berchta (3)
Pseudopapodina laticoxa (7)
Paralinguithyris pygopoides (1)
Hajagithyris fylgia (2)

Considering the analogies with the Bakony faunas, this assemblage is regarded as late Bajocian in age.

General palaeontology

Methods

In most cases the limestone matrix was removed from the brachiopod specimens by hammering; chisels and pincers were exceptionally useful. Some brachiopods were further prepared by electric vibration tools, or pneumatic needles. Frequently the outermost shell layer remained attached in the matrix. Rarely, the finest details of the surface ornamentation of the shells were visible when the outer surface of the specimen was naturally covered by some kind of mineralization (Fe-Mn coating) what served as a detachment seam.

Because of the hard limestone matrix, the internal morphology was revealed only by serial sectioning. Since the sectioned specimen was, at least partly, destroyed during the sectioning, for permanent documentation of the external features of the specimen a cast was prepared. A silicon rubber mould was made by using Szilorka H–1 mass and H–10 catalyst. The elastic mould was filled with plaster. Heating or burning of the specimens, for revealing adductor muscle scars, was used only rarely.

In the process of serial grinding, the brachiopod was first embedded into plaster. The posterior part of the lateral commissure and the plane of symmetry of the specimen were kept in vertical orientation. The block of plaster (with the oriented brachiopod) was mounted on a steel plate of the Cutrock-Croft parallel grinding instrument. This device keeps the orientation and grinds in very narrow intervals. In our practice, usually 0.1 mm grinding intervals were used. The brachiopods were sectioned (ground) from the tip of the beak to the distal end of the brachidium. In each phase, the actual cross section was examined; and the cross section was recorded by various methods: by making cellulose acetate peels; drawings on sheets of paper with the use of binocular microscope supplied with a prism and a horizontal drawing tube, and/or by making colour photographs by digital camera.

In order to make easier the comparative studies of other Mesozoic brachiopod workers and following the suggestions by Motchurova-Dekova et al. (2008), the “traditional” orientation of the cross sections (i. e., the ventral valve up) is used in the present work, in contrast to the reverse orientation introduced and recommended in the “revised Treatise” (e.g., Savage et al. 2002, Lee et al. 2006).

The identification of the brachiopods was made by the classical method of comparing their morphology with the use of descriptions and illustrations in old and recent monographs and papers. Additionally, the author visited some European palaeontological collections in order to make comparative studies on the holotypes and topotypical specimens of the relevant monographs or papers. These are: Geological Collections of the Supervisory Authority for Regulatory Affairs (SZTFH, SARA), Budapest; Bayerische Staatssammlung, München; Museo Geologico G. G. Gemmellaro, Università di Palermo.

The principal dimensions of the appropriate (more or less complete) and photographed specimens have been measured. The measurements (L = length, W = width, T = thickness, Ch = height of the commissure = deflection in the anterior commissure = deviation from the rectilinear, Cw = width of the deflexion of the anterior commissure) are given in millimetres (Figure 5).

The data of specific measurements were used for morpho-

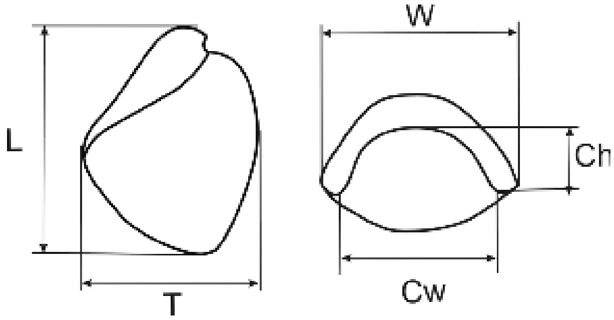


Figure 5. General measurements used in morphometrical study of brachiopods. L: length, T: thickness, W: width, Ch: height (amplitude) of the anterior commissure, Cw: width of the deflexion of the anterior commissure

metrical analysis and evaluated by multivariate statistics, including box-and-whiskers plots and graphs of principal component analysis (PCA), using the PAST freeware, v. 3.18 (Hammer et al. 2001).

In the palaeobiogeographical evaluations the neighbour-joining cluster analysis, principal coordinates (PCO) technique, and non-metric multidimensional scaling (NMDS), based on Simpson and Jaccard similarity indices were used, and the minimal spanning networks (MSN) were also plotted in some of the resulted graphs. These analyses were carried out using the PAST freeware, v. 3.18 (Hammer et al. 2001), as well.

The specimens illustrated on the photographic plates were whitened, i.e., coated with ammonium-chloride before making photographs.

The Brachiopod Fauna

The Middle Jurassic (Bajocian and Bathonian) rocks of the Transdanubian Range yielded 1282 identified brachiopod specimens, besides several hundred indeterminable fragments. The fauna consists of 28 species of 16 genera. All belong to the subphylum Rhynchonelliformea; the order Rhynchonellida is represented by 795 specimens, whereas the order Terebratulida is somewhat subordinate (487 specimens).

The fauna is strongly dominated by the rhynchonellide genus *Apringia* (347 specimens) and the terebratulide *Karadagithyris* (181 specimens). Three from the here introduced new genera: *Pseudopapodina* (134), *Hajagithyris* (128) and *Galatirhynchia* (106) are also profusely represented. The long-looped terebratulids are almost absent: the suborder Terebratellidina is represented only by five specimens.

Four of the genera and one of the species are described as new taxa in the chapter Systematic Palaeontology. One further species is also considered to be new, but in the lack of sufficient amount of material, it is described under open nomenclature with the use of the prefix “aff.”. A replacement name “nom. nov.” is also introduced. The taxa are listed below in systematical order:

Apringia atla (Oppel, 1863)
Apringia coarctata (Oppel, 1863)
Apringia alontina (Di Stefano, 1884)
Pseudogibbirhynchia ? cf. *etalloni* (Oppel, 1863)
Pseudogibbirhynchia ? cf. *chiemiensis* (Finkelstein, 1889)
Septocrurella retrosinuata (Vacek, 1886)
Fenyveskutella fallax n. sp.
Fenyveskutella ? *paronai* nom. nov.
Nannirhynchia subpygmaea Buckman, 1918
Striirhynchia berchta (Oppel, 1863)
Striirhynchia microptycha (Oppel, 1863)
Striirhynchia subechinata (Oppel, 1863)
Capillirhynchia brentoniaca (Oppel, 1863)
Neocirpa armenica Prozorovskaia, 1985
Galatirhynchia galatensis (Di Stefano, 1884)
Pseudopapodina laticoxa (Oppel, 1863)
Pseudopapodina ? *recuperoi* (Di Stefano, 1884)
Paralinguithyris pygopoides (Di Stefano, 1884)
Karadagithyris gerda (Oppel, 1863)
Karadagithyris cf. *erycina* (Gemmellaro, 1877)
Karadagithyris aff. *dolhae* (Szajnocha, 1882)
Hajagithyris fylgia (Oppel, 1863)
Hajagithyris seguenzae (Di Stefano, 1887)
Hajagithyris ? *mykonionensis* (Di Stefano, 1884)
Linguithyris pteroconcha (Gemmellaro, 1877)
Orthotoma ? sp.
Zeilleria cf. *subbucculenta* (Chapuis & Dewalque, 1853)
Zeilleria ? cf. *beggiatoi* (Parona, 1881)

The same taxa are listed in Table 2, with the indication of their occurrences at the respective localities and the specimen number data.

The stratigraphical distribution of the brachiopod taxa in the Bajocian ammonoid zones is shown in Table 3. It should be noted that in the case of some late Bajocian brachiopod taxa, the ammonoid dating of the respective localities was not available at the level of zones. These records are shown in Table 3 as ranging through the late Bajocian, and the uncertainty is indicated with grey background shading. Three Bajocian species, with no record in the early Bathonian, reappear in the late Bathonian Orbis Zone.

Table 2. The Middle Jurassic brachiopod taxa of the Transdanubian Range with the indication of their occurrences at the respective localities and the specimen number data

Localities	Hárskút, Gyenespuszta IV.	Hárskút, Csapótanya	Bakonybél, Som Hill (dyke)	Bakonybél, Som Hill (loose)	Szentgál, Kisnyerges Ravine	Bakonybél, Kőris Hill	Lókút, Fenyveskút VIII.	Lókút, Fenyveskút N	Lókút, Papod 83	Lókút, Papod 82	Gyulafirátót, Szegle	Lókút, Lókút Hill IV	Mór, Csóka Hill (1959)	Mór, Csóka Hill (1966)	Mór, Csóka Hill, southern promontory	Mór, Csóka Hill, ridge (loose)	
Taxa																	sum
Apringia atla	58	87	2	5		1	1	20	3			2	10	12		1	202
Apringia coarctata	1	9	1	29	2			2					20	45			109
Apringia olontina							34								2		36
Septocrurella retrosinuata		8	2	3			4					35					52
Fenyveskutella fallax	7	17	2				16										42
Fenyveskutella ? paronai															1		1
Nannirhynchia subpygmaea										1		30					31
Pseudogibbirhynchia ? cf. etalloni							5					1					6
Pseudogibbirhynchia ? cf. clarmiensis							3								2	2	7
Striirhynchia subechinata			1			1											2
Striirhynchia berchta	4	18				3	103				15					3	146
Striirhynchia microptycha	3	35															38
Capillirhynchia brentoniaca												10					10
Neocirpa cf. armenica												7					7
Galatirhynchia galatensis	5	87					4	2	4		1				1	2	106
Karadagithyris geyeri	24	19	4	4		6		63	26	1			1	2			150
Karadagithyris aff. dolbae	1	5															6
Karadagithyris ercina	11	3	8	3													25
Linguithyris pteroconcha				8			1					5					14
Pseudopapodina laricana	9	104					4				1				6	7	131
Pseudopapodina recuperoi		1					2										3
Paralinguithyris pygopoides							18									1	19
Hajagithyris fylgia	18	63		1			3	1	1							5	92
Hajagithyris seguenzae	3	32															35
Hajagithyris mykonionensis		1															1
Orthotoma ? sp.								1					5				6
Zeilleria ? cf. beggiatoi				1													1
Zeilleria cf. subbucculenta				1		1		2									4
sum	144	489	20	55	2	12	198	91	34	2	17	90	36	59	12	21	**1282**

Palaeoenvironmental notions

The main features of the Middle Jurassic palaeogeography of the Transdanubian Range were substantially inherited from the Early Jurassic, when the submarine topography of the area was dominated by a horst-and-graben system created by extensional normal faulting (VÖRÖS 1986, GALÁCZ 1988). Several submarine horsts and intervening basins were recognized in the Bakony (VÖRÖS & GALÁCZ 1998) and a major horst appears to dominate the Vértes area (BUDAI et al. 2008, p. 207).

Table 3. The stratigraphical distribution of the brachiopod taxa in the Bajocian ammonoid zones in the Transdanubian Range

	EARLY BAJOCIAN				LATE BAJOCIAN			Occurrence in the late Bathonian Orbis Zone
	Discites	Laeviuscula	Sauzei	Humphriesianum	Niortense	Garantiana	Parkinsoni	
Pseudogibbirhynchia ? cf. etalloni		■■■■■	—	■■■■■				
Septocrurella retrosinuata		■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	
Capillirhynchia brentoniaca			■■■■■	■■■■■	■■■■■			
Linguithyris pteroconcha			■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	
Nannirhynchia subpygmaea				■■■■■	■■■■■			
Orthotoma ? sp.				■■■■■	■■■■■			
Apringia atla				■■■■■	■■■■■	■■■■■	■■■■■	+
Apringia alontina				■■■■■	■■■■■	■■■■■	■■■■■	
Fenyveskutella fallax				■■■■■	■■■■■	■■■■■	■■■■■	
Striirhynchia berchta				■■■■■	■■■■■	■■■■■	■■■■■	
Galatirhynchia galatensis				■■■■■	■■■■■	■■■■■	■■■■■	
Pseudopapodina laticosta				■■■■■	■■■■■	■■■■■	■■■■■	
Pseudopapodina recuperoi				■■■■■	■■■■■	■■■■■	■■■■■	
Parolinguithyris pygopoides				■■■■■	■■■■■	■■■■■	■■■■■	
Hajagithyris fileia				■■■■■	■■■■■	■■■■■	■■■■■	
Neocirpa armenica					■■■■■			
Apringia coarctata					■■■■■	■■■■■	■■■■■	+
Striirhynchia microptycha					■■■■■	■■■■■	■■■■■	
Striirhynchia subechinata					■■■■■	■■■■■	■■■■■	
Karadagithyris gerda					■■■■■	■■■■■	■■■■■	+
Karadagithyris cf. erycina					■■■■■	■■■■■	■■■■■	
Karadagithyris aff. dollae					■■■■■	■■■■■	■■■■■	
Hajagithyris seguenzae					■■■■■	■■■■■	■■■■■	
Pseudogibbirhynchia ? cf. chienensis					■■■■■	■■■■■	■■■■■	
Fenyveskutella ? paronai					■■■■■	■■■■■	■■■■■	
Hajagithyris ? mykonionensis					■■■■■	■■■■■	■■■■■	
Zeilleria cf. subbucculenta					■■■■■	■■■■■	■■■■■	
Zeilleria ? cf. beggiatoi					■■■■■	■■■■■	■■■■■	

The extensional and vertical tectonic movements, rejuvenated in the late Bajocian, and again in the late Bathonian, resulted in opening and filling of neptunian dykes, and rock avalanches (scarp breccias) along the steep slopes of the horsts (GALÁCZ 1988, VÖRÖS & GALÁCZ 1998, CSÁSZÁR & PEREGI 2001).

The overwhelming majority of the localities yielding the here examined Middle Jurassic brachiopods represents submarine horst settings, where the Hárskút and Csókakő Members of the Tölgyhát Formation were accumulated.

The single exception is the Lókút Hill locality (section), where the basinal facies (nodular Rosso Ammonitico) of the Tölgyhát Limestone was deposited. The brachiopod assemblage of this locality is significantly different from the bulk of the Bajocian faunas of the Bakony Mountains. Besides the widespread *Apringia, Septocrurella* and *Linguithyris*, it contains particular genera, e.g., *Nannirhynchia, Capillirhynchia* and *Neocirpa*, unknown from other Bajocian localities of the Bakony Mountains. A further curiosity of this assemblage is that, in spite of the nodular Rosso Ammonitico facies of the host rock, it is dominated by rhynchonellides much more strongly than in the other Bajocian assemblages in the Bakony Mountains. It is in sharp contrast to the faunal compositions recorded in the Pliensbachian (VÖRÖS 1986) and Tithonian (VÖRÖS 2022) where the rhynchonellides were absolutely subordinate in the basinal nodular limestone facies. A reasonable palaeoenvironmental interpretation of the peculiar brachiopod assemblage of the Lókút Hill locality remains unsettled.

In general, owing to the historical nature of the collections made at many of the submarine horst settings, the details of the sedimentary features (bedding, relation to substrate, etc.) are unknown. Only the horizontal neptunian dyke at Som Hill was properly investigated (J. SZABÓ, pers. comm.) but the detailed results are not yet published. Consequently, due to the insufficient data, a proper palaeoenvironmental evaluation of the brachiopod fauna, as were published by the present author for the Pliensbachian (VÖRÖS 1986, 2009) and the Tithonian (VÖRÖS 2022) is not possible for the Middle Jurassic of the Transdanubian Range. Instead, this chapter is restricted to some broad palaeoenvironmental considerations on the fauna.

A remarkable feature of the composition of the studied fauna is the dominance of the rhynchonellides over terebratulides, both in taxonomical diversity and in abundance. Particularly the latter value, the very high abundance of rhynchonellides (794 specimens, vs. 487 terebratulides: proportion 2 to 1), is unusual in the Jurassic brachiopod faunas of the studied area. Considering strictly the Bakony faunas, this rhynchonellide dominance seems particularly anomalous: in the Pliensbachian the ratio between Rhynchonellida and Terebratulida is about 1 to 3 (VÖRÖS 2009), and in the Tithonian is 1 to 6 (VÖRÖS 2022), thus the rhynchonellides were always significantly subordinate.

This local peak of abundance of rhynchonellides in the Middle Jurassic is in apparent conflict also with the diverging diversity trajectories of the orders of Terebratulida and Rhynchonellida in the late Mesozoic, when the terebratulides became prevalent (VÖRÖS et al. 2016, 2019). During the Mesozoic marine revolution (VERMEIJ 1977), the two orders responded differently to the increased predation pressure. In the mid-Jurassic, the rhynchonellides gradually declined, and the order survived mostly in the deeper seas where predation pressure was lower. In the same time, helped by other antipredatory mechanisms, the Terebratulida remained a successful order (VÖRÖS 2010).

Nevertheless, it seems that the Middle Jurassic rhynchonellides of the Transdanubian Range somehow escaped from the pressure of the increasing predation. Most of our rhynchonellides (notably the specimens of *Apringia* in the first place) came from Hárskút, Som Hill and Csóka Hill, where they predominate the fossil community. All these localities expose (proved or inferred) fillings of neptunian dykes. It may be supposed that these *Apringia* species developed a fissure/cavity dwelling way of life. They quickly colonised the newly opened fissures and proliferated before the harmful predators arrived this very peculiar habitat.

Looking at the general morphology of the Middle Jurassic brachiopods of the Transdanubian Range, perhaps the most remarkable feature is the smoothness of the specimens. Not only the terebratulides but the predominant rhynchonellides are almost exclusively smooth; capillation occurs but true ribbed forms are very rare. This seems to be a sign of the "thalassobathyal" (sensu ZEZINA 1997) nature of the brachiopod fauna, implying a submarine plateau palaeoenvironment in the western part of the Tethys (VÖRÖS 2005). This peculiarity corresponds to the intra-Tethyan character of the fauna, in harmony with the current palaeogeographical interpretations of the Transdanubian Range, as part of "Pelso" or "Adria" units, for the late Mesozoic (e.g., VÖRÖS 1993a, DERCOURT et al. 1993, CSONTOS & VÖRÖS 2004, GOLONKA et al. 2005, SCHMID et al. 2008, HAAS et al. 2011).

Palaeobiogeographical evaluation

The territory of the Transdanubian Range belonged to an intra-Tethyan microcontinent during all the Jurassic Period, and its brachiopod fauna was substantially Tethyan as well. The wider palaeobiogeographical unit, where they belonged to, was named Mediterranean Province (AGER 1967, 1971, 1973; VÖRÖS 1977, 1984, 1993a, 2016, 2022). The Middle Jurassic brachiopod fauna, concerned by the present study, is clearly Mediterranean in character. Nevertheless, its relationship to other Tethyan (Mediterranean) and peri-Tethyan faunas deserves a comparative analysis.

In the wide shelves surrounding the western part of the Tethys Ocean three major Middle to Late Jurassic brachiopod provinces: Boreal (or European), Mediterranean and Ethiopian (or Abyssinian), were outlined by AGER (1967, 1971, 1973), HALLAM (1971) and VÖRÖS (1984). The extension and content of the Mediterranean Province were further evaluated by VÖRÖS (1993a, 2016, 2022); the Boreal/European Province by WESTERMANN (2000) and, in some details by ALMÉRAS & ELMI (1982) and PROSSER (1993); whereas the Ethiopian Province was thoroughly analysed recently by multivariate methods by ABDELHADY & FÜRSICH (2015).

The present palaeobiogeographical analysis applies also multivariate methods to compare the Middle Jurassic brachiopod fauna of the Transdanubian Range with other brachiopod assemblages of the western Tethyan region. For the purpose of the numerical comparison, 17 occurrences/sampling areas, yielding well documented Bajocian and/or Bathonian brachiopod faunas, were selected in Europe, North Africa and Western Asia (Table 4).

Neighbour joining cluster analysis, Principal coordinates (PCO) technique, and Non-metric multidimensional scaling (NMDS), based on Simpson and Jaccard similarity indices were carried out using the PAST freeware, v. 3.18 (HAMMER et al. 2001). The minimal spanning network (MSN) was indicated in some cases.

The cluster analysis carried out from the Jaccard index data resulted in a principally tripartite dendrogram (Figure 6A). One of the clusters, containing the assemblages of the Transdanubian Range (Bako), Subbetic Zone (Sube), Sicily (Sici), Hallstatt (Hall), Trento Zone (Tren) and the eastern part of the Pieniny Klippen Belt (PKBE) may be labelled as Mediterranean. The assemblages of the Mecsek and Villány Mts. (MeVi), plus the Carpatho-Balkanides (CaBa) seem loosely connected to the Mediterranean cluster. The other, well separated cluster, with the assemblages of Southern England (SEng), Southern France (SFra), Southern Germany (SGer), the Atlas Mountains (MaAl); joined by the western part of the Pieniny Klippen Belt (PKBW) is termed European. Finally, the assemblages of Gebel Maghara (Sina), Tuwaiq Mts. (Tuwa)

Table 4. Some basic data of 17 Middle Jurassic brachiopod sampling areas accounted in the palaeobiogeographical comparison

Sampling area	Acronyms	Species richness	References
1. South England	SEng	65	Buckman (1918); Prosser (1993)
2. South Germany	SGer	30	Seifert (1963); Alméras & Ohmert (1995)
3. South France	SFra	27	Alméras & Peybernes (1979); Alméras & Elmi (1998)
4. Atlas Mts. (Morocco+Algeria)	MaAl	55	Alméras & Fauré (2008)
5. Transdanubian Range (Hungary	Bako	27	Vörös (herein)
6. Hallstatt (Austria)	Hall	14	Oppel (1863); Siblík & Lobitzer (2008)
7. Trento Zone (Italy)	Tren	30	Oppel (1863); Parona (1881, 1896); Ferrari (1962); Benigni et al. (1982)
8. Sicily (East+West)	Sici	32	Gemmellaro (1877), Di Stefano (1884b), Ritz (1928)
9. Subbetic Zone (Spain)	Sube	15	Baeza-Carratalá et al. (2011, 2014)
10. PKB West (Váh Valley)	PKBW	14	(Siblík (1979), Pevný (1969), Misík et al. (1994), Plasienka et al. (2010)
11. PKB East (Czorsztyn+Priborzhavskoye)	PKBE	25	Uhlig (1878, 1881), Wierzbowski et al. (1999), Szajnocha (1882), Tchorzhewsky & Radulović (1984)
12. Mecsek+Villány (Hungary)	MeVi	12	Vadász (1935); Vörös (1995, 2004)
13. Carpatho-Balkanides (Serbia+Bulgaria)	CaBa	27	Radulović & Rabrenović (1993); Radulović (1994, 1995); Tchoumatchenco (1978)
14. Transcaucasus (Armenia)	TrCa	14	Prozorovskaia (1985)
15. Tabas (Central Iran)	CeIr	11	Mukherjee & Fürsich (2014)
16. Gebel Maghara (Sinai, Egypt)	Sina	16	Abdelhady & Fürsich (2014), Hegab (1989)
17. Tuwaiq Mts. (Saudi Arabia)	Tuwa	11	Alméras (1987), Alméras et al. (2010)

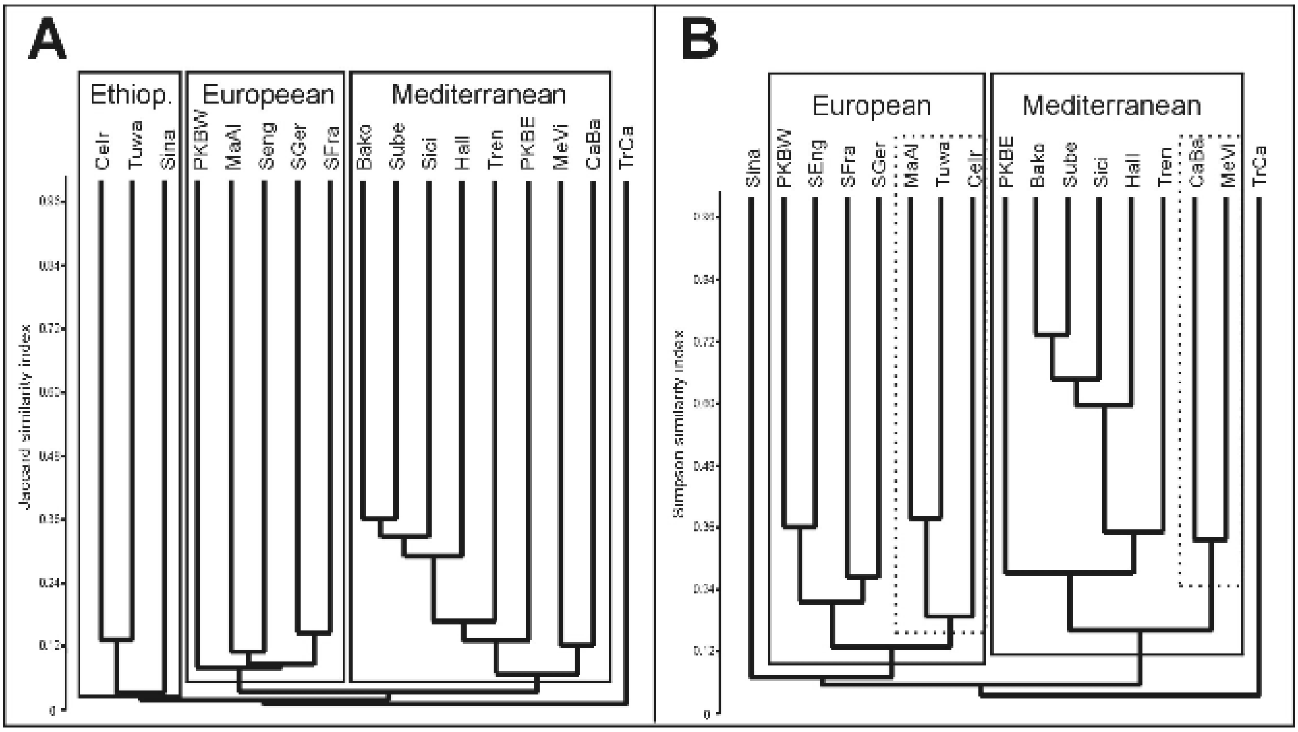


Figure 6. Results of cluster analysis of the Bajocian and Bathonian brachiopod dataset from selected localities of the western Tethys, based on the Jaccard (A) and Simpson (B) similarity indices. Simple clustering

and Tabas (CeIr) form a coherent cluster which may be called Ethiopian. Remarkably, the fauna of the Transcaucasus (TrCa) appears as an "outgroup".

On the other hand, only two major, composite clusters can be outlined in the dendrogram resulted from the Simpson index data (Figure 6B). The Mediterranean cluster (Bako, Sube, Sici, Hall, Tren) is clearly visible and is adjoined by the eastern part of the Pieniny Klippen Belt (PKBE), and more loosely by MeVi and CaBa. The other cluster is bipartite: the central element is the European tree (SGer, SFra, SEng and the western part of the Pieniny Klippen Belt: PKBW). The other branch comprises the Ethiopian assemblages of the Atlas Mountains (MaAl), Tuwaiq Mts. (Tuwa) and Tabas (CeIr). The Transcaucasus (TrCa) and, somewhat unexpectedly, the Gebel Maghara (Sina) assemblages seem to form "outgroups".

The results of the principal coordinates (PCO) technique, based on the Jaccard and Simpson indices are shown in Figure 7A. The results are somewhat less conclusive than those attained by the cluster analyses. In the Jaccard plot, the Mediterranean, European and Ethiopian groups (provinces) are clearly separated and outlined by arbitrarily drawn ellipses. The assemblages of Trento Zone (Tren) and the eastern part of the Pieniny Klippen Belt (PKBE) fall outside this ellipse and seem to form transition to the European group. The Simpson plot (Figure 7B) shows even more dispersed scatter. The Mediterranean and European groups are coherent, but many dots are outside the ellipses. The Ethiopian group is reduced to

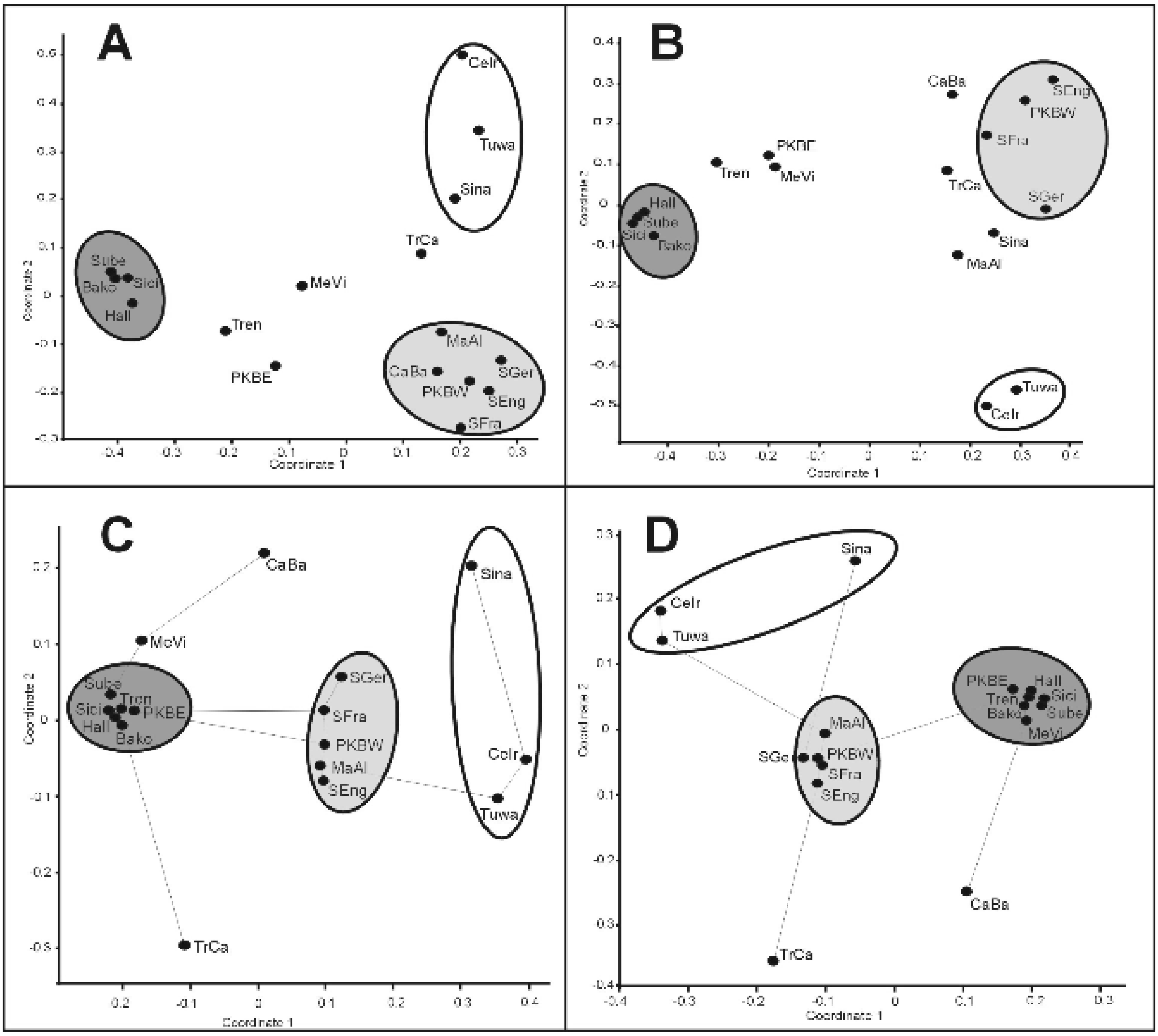


Figure 7. Results of the ordination analyses of the Bajocian and Bathonian brachiopod dataset from selected localities of the western Tethys based on the Jaccard and Simpson similarity indices. A: results of the principal coordinates (PCO) technique based on the Jaccard similarity index, B: results of the principal coordinates (PCO) technique based on the Simpson similarity index. C: results of the Non-metric multidimensional scaling (NMDS) technique based on the Jaccard similarity index, D: results of the Non-metric multidimensional scaling (NMDS) technique based on the Simpson similarity index. Dark shaded ellipses signify the Mediterranean, the light grey shaded ellipses signify the European faunal groups; blank ellipses signify the Ethiopian faunal groups. The lines of minimal spanning network is indicated in C and D. Outlying assemblages are discussed in the text

the Tuwaiq Mts. (Tuwa) and Tabas (CeIr) assemblages, while Gebel Maghara (Sina) seems to approach the European group/ellipse.

The Non-metric multidimensional scaling (NMDS) resulted in more conclusive and unanimous pictures both in the Jaccard and in the Sipmpson plots (Figures 7C and 7D). The three major groups/provinces (Mediterranean, European and Ethiopian) are well separated, and their ellipses encircle almost the same assemblages in the Jaccard and the Simpson plots, respectively. Only the place of the Mecsek and Villány Mts. (MeVi) differs in the two plots (enclosed in the European ellipse in the Simpson plot); while the assemblages of the Carpatho-Balkanides (CaBa) and Transcaucasus (TrCa) remain in outlying position. In the NMDS plots the minimal spanning networks are also indicated because they give further information on the mutual connections between the individual assemblages.

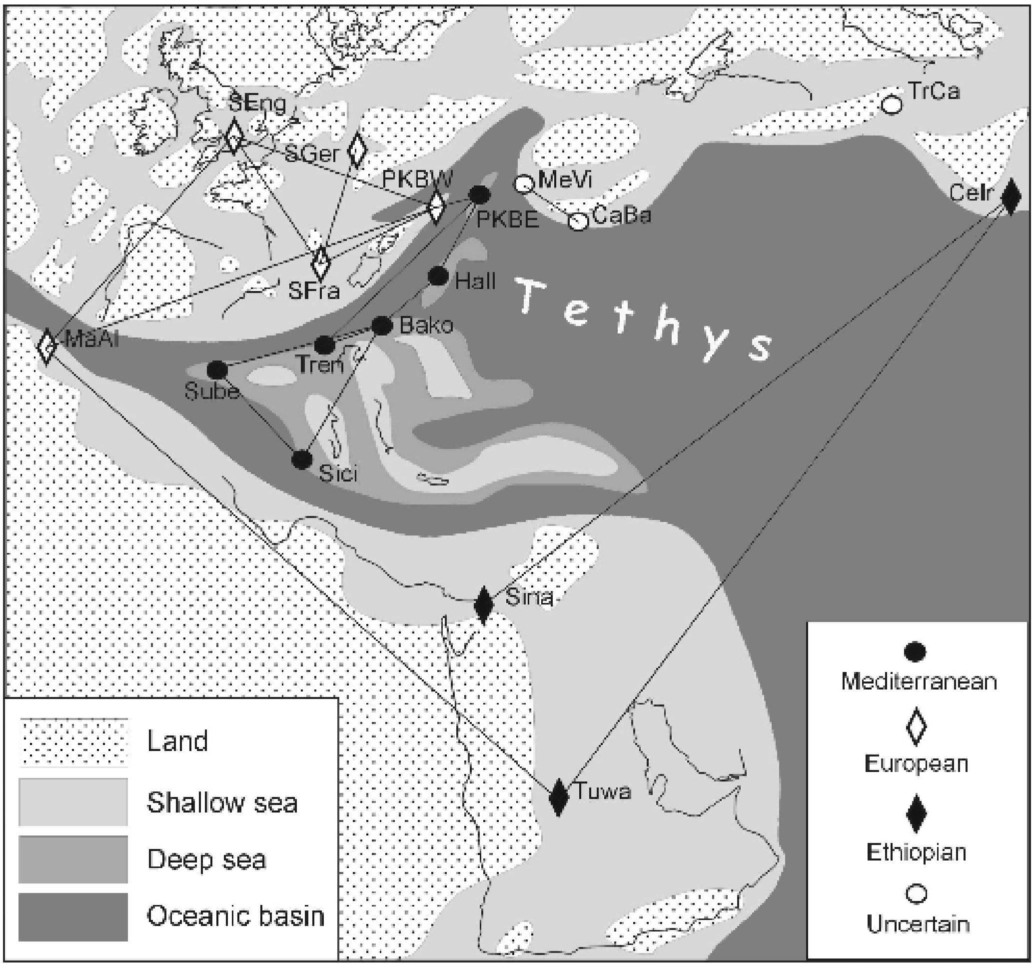


Figure 8. Middle Jurassic palaeogeographical map of the western Tethys showing the presumed sites and faunal characters of the compared brachiopod localities/assemblages, with the indication of the minimal spanning network based on NMDS technique based on the Jaccard similarity index. Base map modified from the Callovian map of Dercourt et al. (2000)

The most important conclusion, drawn from the above results, is that three brachiopod provinces existed in the Western Tethys in Bajocian/Bathonian times: the European, the Mediterranean and the Ethiopian. By this, the system of provinces previously defined by Ager (1971, 1973), Hallam (1971) and Vörös (1984) is endorsed. There are some apparently anomalous or hardly understood results. (1) The Transcaucasus (TrCa) assemblage remains in outlying position in all clusters and plots. (2) The Tabas assemblage (CeIr) seems to form a core element of the Ethiopian Province in contrast to its alleged palaeogeographical position along the northern margin of the Tethys. (3) The assemblage of the western part of the Pieniny Klippen Belt (PKBW) is adjoined to the European Province in all clusters and plots; on the other hand, the assemblage of the eastern part (PKBE) belongs or falls close to the Mediterranean Province, challenging the conventional concept of the Pieniny Klippen Belt as a coherent palaeogeographical unit (Czorsztyn Ridge).

The results of the present study, i.e., the faunistical characters of the 17 selected Bajocian and Bathonian brachiopod occurrences are plotted on a Middle Jurassic palaeogeographical map with the indication of the minimal spanning network based on the Jaccard plot resulted from the NMDS technique (Figure 8). The base map is a modified version of the corresponding map by Dercourt et al. (2000). The central element of this palaeogeographical scheme is a system of microcontinents in the internal part of the western Tethys Ocean, isolated by deep sea barriers from the European and African shelves. This palaeogeographical element was termed as Mediterranean microcontinent by Vörös (1987, 1993a, 2016).

The symbols of the Mediterranean and European faunas show a rather coherent picture in the palaeomap, except some problematical occurrences (Figure 8). The dots of the Mediterranean faunas fit well to the Mediterranean microcontinent system, adjoined by a smaller crustal fragment corresponding to the eastern part of the future Pieniny Klippen Belt. The open lozenges of the European faunas (including the western part of the Pieniny Klippen Belt on the submarine termination of the Briançonnais–Hochstegen peninsula), are reasonably restricted to the European shelf and epicontinental seas, except the Atlas locality which is situated to the south of the oceanic belt connecting the Tethys with the opening Central Atlantic.

Two of the black lozenges of the Ethiopian faunas (Sina, Tuwa) are on their right place at the African epicontinental sea, whereas the position of the Tabas fauna (Central Iran) on the northern margin of the wide Tethys Ocean is extremely conflicting. Its strong affinity to the "true" Ethiopian faunas is supported by the lines of the minimal spanning network. Further contradiction arises if looking at the rather closely lying fauna of Transcaucasus which has a composition totally different from that of Tabas. However, it should be borne in mind that both faunas are rather small (11 and 14 species).

The Mecsek+Villány and the Carpatho-Balkan faunas are definitely similar and closely spaced also from palaeogeographical point of view. They are along the European shelf margin, and accordingly, in some of the multivariate analyses (Figure 7A, B) they show a degree of European affinity. On the other hand, in other analyses (Figures 6A, B; 7D) their Mediterranean affinity is apparently stronger. It is probable that this part of the European margin started to be fragmented and drifted to the Tethys in the Bathonian. The corresponding microcontinents (Tisza, Dacia) were detached from the European continent at this time (Csontos & Vörös 2004, Haas et al. 2011) and their brachiopod faunas gradually received more and more Mediterranean influence.

Systematic palaeontology

In the following systematic descriptions, the classification of the revised "Treatise" (Savage et al. 2002; Lee et al. 2006, 2007) is followed, with a few exceptions. The genus *Galatirhynchia* n. gen. is added to the subfamily Cyclothyridinae. The new genera *Pseudopapodina* and *Paralinguithyris* deserved their own subfamilies (Pseudopapodininae and Paralinguithyridinae, respectively) and both are tentatively placed to the family Zugmayeriidae. The subfamily Karadagithyridinae is complemented with *Hajagithyris* n. gen.

The material is deposited in the collection of the Department of Palaeontology and Geology of the Hungarian Natural History Museum (HNHM), Budapest under the inventory numbers prefixed by "M.", "PAL", or "INV".

Order Rhynchonellida Kuhn, 1949
Superfamily Pugnacoidea Rzhonsnitskaia, 1956
Family Basiliolidae Cooper, 1959
Subfamily Basiliolinae Cooper, 1959
Genus ***Apringia*** de Gregorio, 1886
Type species: *Apringia giuppa* de Gregorio, 1886

This genus was originally described from the Toarcian by de Gregorio, including nearly smooth uniplicate species, occasionally with weak multiplication near the anterior commissures. The main features of the internal morphology of *Apringia* were first illustrated by Rousselle (1975, fig. D) who stated that on the basis of the absence of septalium and median septum and the presence of the "prefalcifer" (= hamiform) crura, the genus might belong to the family Basiliolidae. This was endorsed by the "revised Treatise" (Savage et al. 2002). The stratigraphical range of *Apringia* was extended down to the Sinemurian and Pliensbachian (Vörös 1983, 1997; Dulai 2003; Siblík 2003) and as high as the Bathonian (Benigni et al. 1982, Alméras & Elmi 1998, Wierzbowski et al. 1999, Vörös 2001, Siblík & Lobitzer 2008, Alméras & Fauré 2008).

By the latter authors, some of the well-known Middle Jurassic species e.g. "*Rhynchonella*" *atla* Oppel, 1863, "*R.*" *coarctata* Oppel, 1863 and "R." *alontina* Di Stefano, 1884 were ranked into the genus *Apringia*. Besides the shared external features, i.e., the high, (sometimes sharp) uniplication and apparent absence of strong ribbing, this attribution was supported by the presence of "prefalcifer" (= hamiform) crura (Benigni et al. 1982, Alméras & Elmi 1998, Siblík & Lobitzer 2008).

Andrade (2006) introduced a new genus *Mondegia* in the

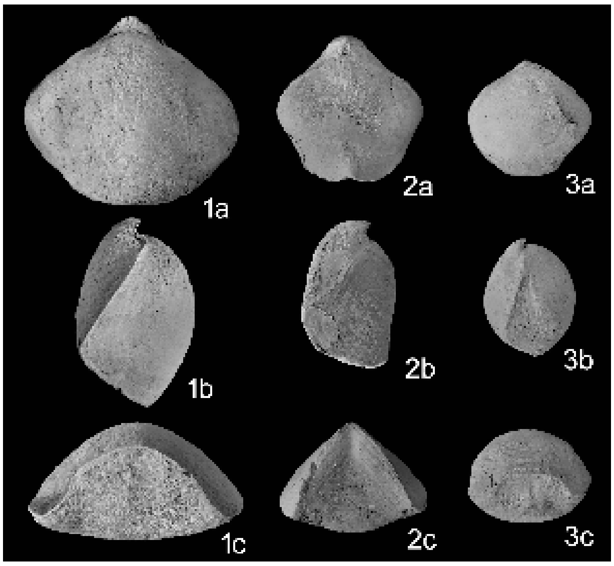


Figure 9. Illustration of *Apringia* species. 1. *Apringia atla* (Oppel, 1863), INV 2023.268., Csapótanya (Hárskút), upper Bajocian; 2. *Apringia coarctata* (Oppel, 1863), INV 2023.280., Som Hill (Bakonybél), upper Bajocian; 3. *Apringia alontina* (Di Stefano, 1884) INV 2023.285., Fenyveskút VIII (Lókút), lower Bajocian. Not to scale; a: dorsal view, b: lateral view, c: anterior view

subfamily of Lacunosellinae of the family Basiliolidae. The serial sections, published by Andrade, show typical falciform crura with long flanges. The type specimen and further typical specimens of the type species *M. limica* (Andrade 2006, figs. 35, 38/1, 38/3, 38/5) are rather sharply costate. Some other figured specimens (Andrade 2006, figs. 38/2, 38/4) are smooth and resemble certain species of *Apringia* (in classical sense, e.g., *atla* or *coarctata*) even by their sharply uniplicate anterior commissure. Andrade (2006) called the attention to the similarities between the two genera with special regard to the specimen *Apringia*? *atla* figured by Alméras & Elmi (1998). Alméras & Fauré (2008) insisted to regard this species, synonymized by them with *A. coarctata* (Oppel), as belonging to the genus *Apringia*. Nevertheless, Spanish authors (Baeza-Carratalá et al. 2014) seemed to prefer the combination *Mondegia atla*, and even the present author, as a co-author of the paper Baeza-Carratalá et al. (2011), was inclined to accept this, although with question mark.

On the other hand, the present study on the internal morphologies of several specimens of "*Rhynchonella*" *atla* Oppel, 1863, "*R.*" *coarctata* Oppel, 1863 and "R." *alontina* Di Stefano, 1884 revealed that all these three taxa possess hamiform crura (see the serial sections in the descriptions of the respective species), therefore their attribution to the genus *Apringia* is correct and should be maintained.

These three Middle Jurassic species of *Apringia* are represented in the Transdanubian Range by a very large material: 345 specimens; 258 from the Bajocian and 87 from the Bathonian. Their detailed study proves that *A. atla, A. coarctata* and *A. alontina* can well be separated by their external morphology; based mainly on the characters of the beaks and the anterior commissures (Figure 9). The qualitative classification, based on visual observations, is supported by statistical evaluation of morphometric data measured on 105 Bajocian and 57 Bathonian specimens of the three investigated species of *Apringia*. The general measurements applied to specimens of *Apringia* are shown in Figure 5. The database of measurements on the specimens of the three Bajocian species is given in Appendix 1; the measurements of the two Bathonian species in Appendix 2. The multivariate analysis (Principal Component; PCA) of five measurements taken on the Bajocian specimens of the three species of *Apringia* is shown in Figure 10. Further discussions on the separation of the species of *Apringia* are given in the descriptions of the respective species.

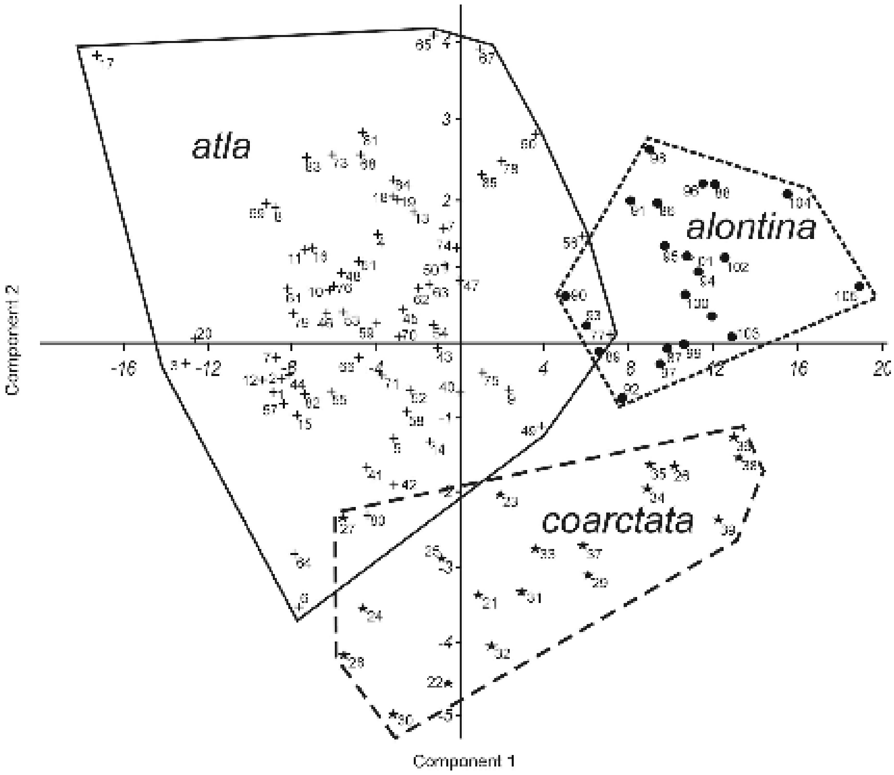


Figure10. Results of the Principal component analysis (PCA) on the basis of five data of measurements taken from 105 Bajocian specimens of three *Apringia* species

Apringia atla (Oppel, 1863)
Plate I: 1–6, 8, 9, 12; Figures 11–16

* 1863 *Rhynchonella Atla* Opp. – Oppel, Posidonomyen-Gesteinen, p. 208, pl. 6, figs. 1, 2.
1863 *Rhynchonella Atla*, var. *polymorpha.* – Oppel, Posidonomyen-Gesteinen, p. 208, pl. 6, fig. 3.
v 1877 *Rhynchonella Atla*, Opp. – Gemmellaro, Zona con Posidonomya alpina, p. 80, pl. IV (XIX), fig. 12, pl. IVbis (XX), fig. 10.
1878 *Rhynchonella penninica* n. sp. – Uhlig, Juraformation, p. 655, pl. XVII, fig. 5.
1881 *Rhynchonella penninica* Uhl. – Uhlig, Babierzowka, p. 418, pl. IX, fig. 11.
v 1881 *Rhynchonella penninica* Uhlig. – Böckh, Mecsek Jura, p. 38, pl. VII, fig. 3.
1899 *Rhynchonella Atla* Opp. – Simionescu, Rucăr, p. 220, pl. II, fig. 11.
v 1928 *Rhynchonella Atla* Opp. – Ruiz, Monte Inici, p. 31, pl. I, fig. 9.
v 1928 *Rhynchonella Atla* var. *polymorpha* Opp. – Ruiz, Monte Inici, p. 31, pl. I, fig. 10.
v 1935 *Rhynchonella penninica* Uhl. – Vadász, Mecsekhegység, p. 60.
1959 *Rhynchonella coarctata* Oppel *feruglioi* n.v. – Pointingher, M. Najarda, p. 83, pl. I, fig. 2.

non 1962 *Rhynchonella atla* Oppel – Ferrari, Rovereto, p. 105, pl. VIII, fig. 2.
non 1964 *Rhynchonella atla* Oppel – Sturani, Prealpi Venete, p. 37, pl. VI, fig. 3.
v non 1997 *Apringia atla* (Oppel) – Vörös, Jurassic brachiopods, p. 18, fig. 28.
? 1998 *Apringia* (?) *atla* (Oppel, 1863) – Alméras & Elmi, Vivaro-Cévenole, p. 10 (partim), pl. I, fig. 1 (only).
v non 2001 *Apringia atla* (Oppel) – Vörös, Bajocian and Bathonian, p. 179, fig. 2/1.
v non 2007 *Apringia atla* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, figs. 4, 5.
v 2007 *Apringia* cf. *atla* (Oppel, 1863) – Galácz et al., M. Kumeta, p. 348, fig. 4.4.
? 2008 *Apringia coarctata* (Oppel, 1863) – Alméras & Fauré, Téthys occidentale, p. 599, pl. I, fig. 11, text-fig. 7.
? 2008 *Apringia atla* (Oppel, 1863) – Siblík & Lobitzer, Mitterwand, p. 62, fig. 4.
v 2011 *Mondegia*? *atla* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 179, figs. 4/1-5, 5.
2014 *Mondegia atla* (Oppel) – Baeza-Carratalá et al., Subbetic, p. 6, figs. 4/1, 2.

Material

200, variously preserved specimens from Hárskút, Gyenespuszta IV (58), Hárskút, Csapótanya (87), Lókút, Fenyveskút VIII (1), Lókút, Fenyveskút N (20), Lókút, Papod 83 (3), Lókút, Lókút Hill (2), Bakonybél, Som Hill, lower level (2), Bakonybél, Som Hill, loose (5), Bakonybél, Kőris Hill (1), Csókakő, Csóka Hill, loose (1), Mór, Csóka Hill (1959) (10), Mór, Csóka Hill (1966) (12).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.268.	22.4	25.4	13.4	9.5
INV 2023.269.	20.5	22.8	13.9	8.1
INV 2023.270.	18.8	19.7	13.4	6.5
INV 2023.271.	24.1	24.4	15.8	12.4
INV 2023.272.	22.9	23.9	14.7	10.2
INV 2023.273.	26.8	31.1	18.1	10.9
INV 2023.274.	22.7	25.5	15.9	12.1
INV 2023.275.	18.5	18.1	14.1	11.8
INV 2023.278.	15.6	16.2	8.1	6.5

Description

External characters: Medium to large *Apringia* with laterally expanded subpentagonal to oval outline. The lateral margins are straight to gently convex and diverge with an apical angle from 90° to 110°, increasing with the size of the specimens. The maximum width is attained at mid-length. The valves are almost equally convex; the maximum convexity lies near the middle of the length in the dorsal valve, whereas it is shifted posteriorly in the ventral valve. The beak is suberect to erect, rather massive, conical, and pointed. The pedicle opening and the delthyrium is mostly covered by matrix, but they seem to be tiny and very narrow. There are no beak ridges at all, neither planareas developed. The lateral parts are gently convex, and the lateral commissures form a little elevated crest. In lateral view, the lateral commissures are nearly straight or slightly arched dorsally and run diagonally in ventral direction, where they pass gradually to the anterior commissure, forming a continuous curve. The anterior commissure is rather highly uniplicate. In typical cases it forms an unbroken arch, or the plica may develop asymmetrically. In the variant "*polymorpha*" the uniplication tends to be trapezoidal with one to four deflexions of various strength and with weak undulations developing near the anterior margin. This variant is continuously connected to the completely smooth typical *atla* with transitional forms (Figure 11). Their scatters in the multivariate analysis (PCA, Figure 12) show large overlap, proving that the two forms may be considered conspecific.

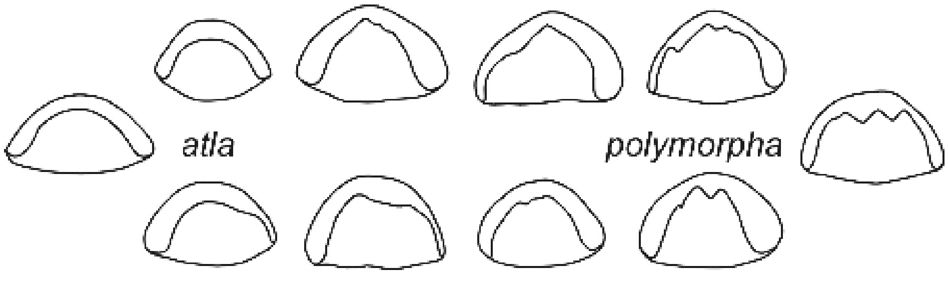


Figure10. Variation of the anterior commissure of Bajocian specimens of *Apringia atla* (Oppel, 1863). The typical atla is continuously connected with transitional forms to the variant "polymorpha". Not to scale

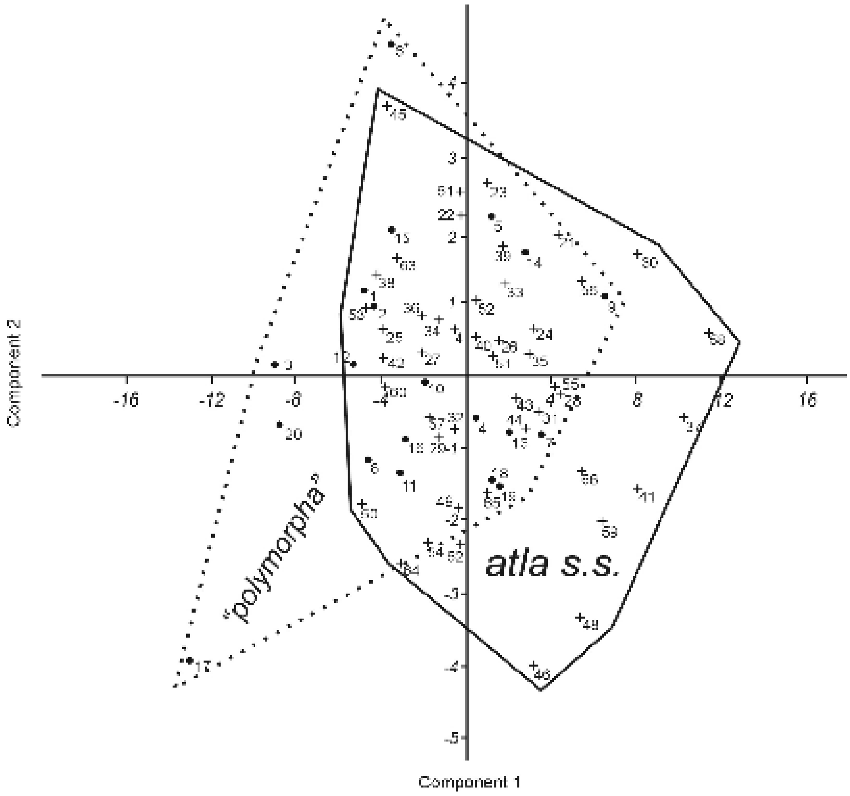


Figure 12. Results of the Principal component analysis (PCA) on the basis of five data of measurements taken from 85 Bajocian specimens of *Apringia atla* and its variant "polymorpha". Note the large overlap of the two scatters

Internal characters: (Figures 13, 14). *Ventral valve*: The delthyrial cavity is subquadrate trapezium-like in cross-section; with a single medial ventral groove connected with the muscle scars. The umbonal cavities are very narrow rounded triangular. The pedicle collar is well developed. The dental plates are slightly convergent ventrally. The hinge teeth are massive, wide, crenulation is not visible; denticula are well developed. The deltidial plates are disjuct, dorsally convex. *Dorsal valve*: The cardinal process is gently crenulated. Septalium were not recorded. Median septum is absent. The outer socket ridges are massive. The inner socket ridges are high and lean over the sockets. The hinge plates rise from the upper end of the inner socket ridges and are fused incipiently, then they become subhorizontal and wide. The crural bases start to evolve from the fused hinge plates; they emerge dorsolaterally and give rise to crura of hamiform (prefalciform) type; the subfalciform stage is not reached.

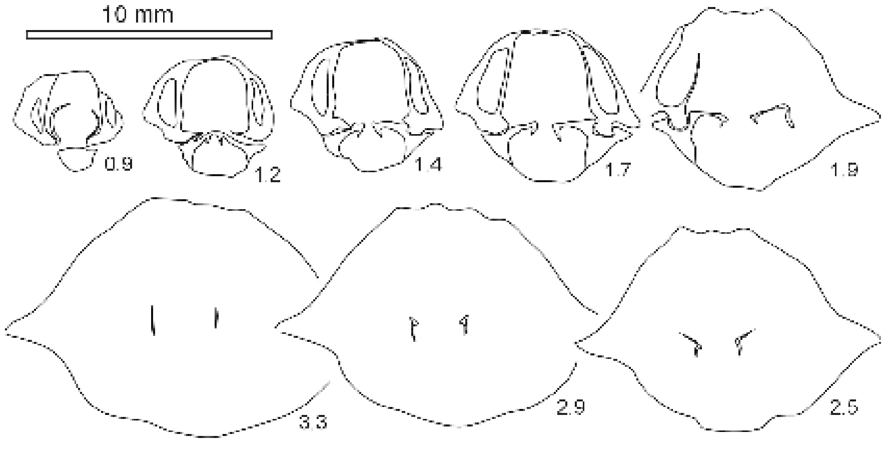


Figure 13. *Apringia atla* (Oppel, 1863). Eight transverse serial sections through the posterior part of a specimen from Gyenespuszta (Hárskút), upper Bajocian. INV 2023.276. Distances from the ventral umbo are given in mm. Original length of the specimen is 21.9 mm

Remarks

Oppel (1863, p. 208) clearly separated his new species *atla* with simple, arched uniplication from the closely related *coarctata* characterized with sharp uniplication. In the description of the latter species Oppel (l.c., p. 209) mentioned possible transitional forms between the two species in question, but after the study of a rather large material at his disposal (43 specimens) he maintained the separation of *coarctata* from *atla*.

Later authors (Uhlig 1881, Ruiz 1928, Pointingher 1959) discussed in different depths the possible separation or unification of the two species. Finally, Ferrari (1962, p. 105) was the first to definitely integrate them under the name *atla*, probably by page priority. It is worth mentioning that the material investigated by Ferrari (1962, p. 107) was somewhat smaller (30 specimens) than Oppel's.

This wide interpretation of the species *atla* became commonly accepted (e.g., Benigni et al. 1982, Alméras & Elmi 1998, Wierzbowski et al. 1999, Siblík & Lobitzer 2008). On the basis of examination of a limited material, the present

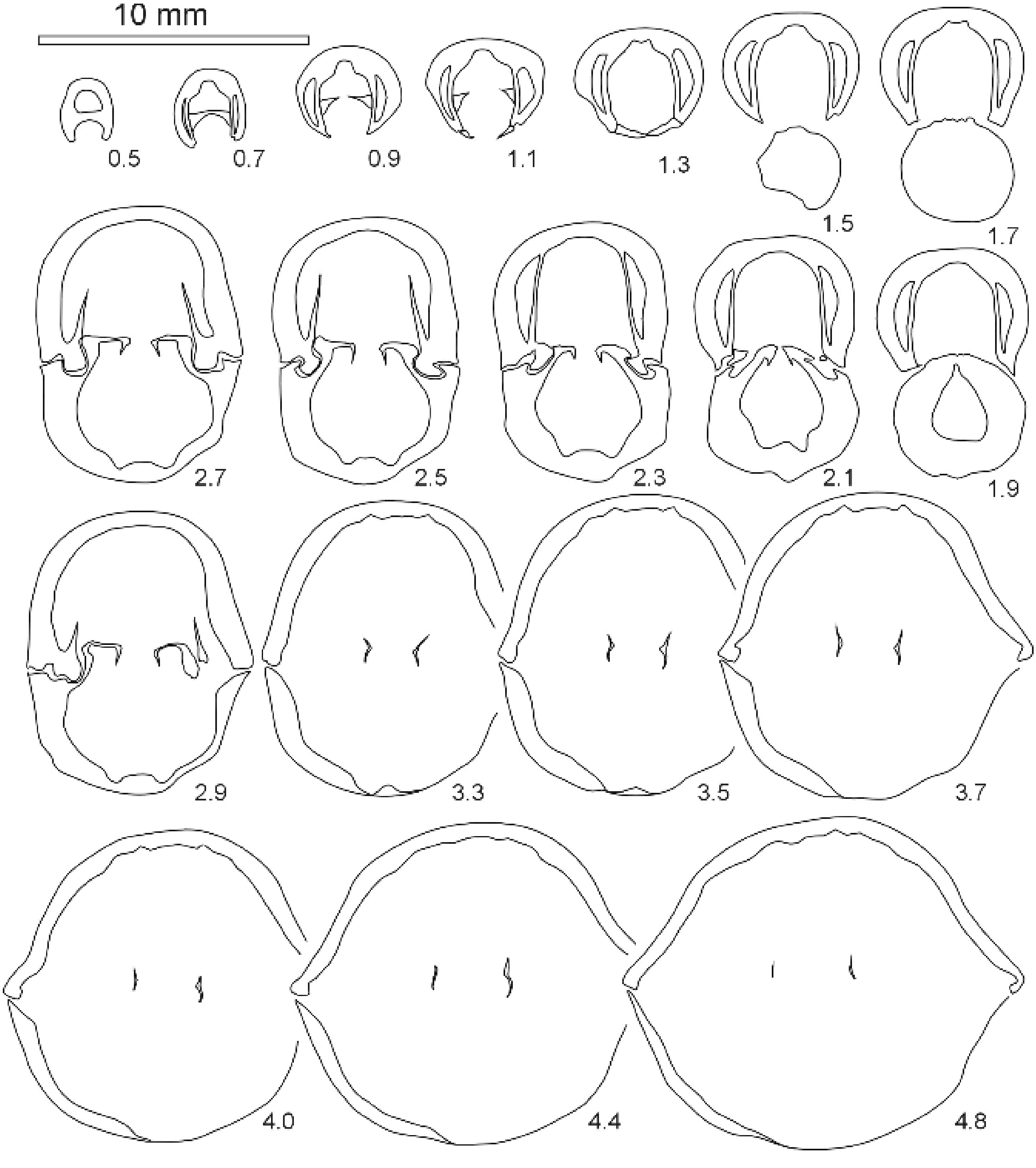


Figure 14. *Apringia atla* (Oppel, 1863). Nineteen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.277. Distances from the ventral umbo are given in mm. Original length of the specimen is 21.7 mm

author (Vörös 1997, 2001; Vörös & Dulai 2007) followed also this practice, which is now considered erroneous, according to the concept of the present paper outlined below.

The present detailed morphological investigation of 345 specimens of the *atla-coarctata* group from the Middle Jurassic of the Transdanubian Range revealed that the two species can well be differentiated (Figures 9, 10). As a result of the multivariate analysis (PCA), in the Bajocian material (105 measured specimens: Appendix 1) the scatters of *Apringia atla* and *A. coarctata* just a little overlap (Figure 10). On the other hand, in the Bathonian material (57 measured specimens: Appendix 2) the separation of the two species is perfect (Figure 15).

Alméras & Fauré (2008, p. 599) returned to the concept of *A. atla* and *A. coarctata* as separate species. However, the distinction they made was not based on morphological characters but on the supposedly different stratigraphical occurrence

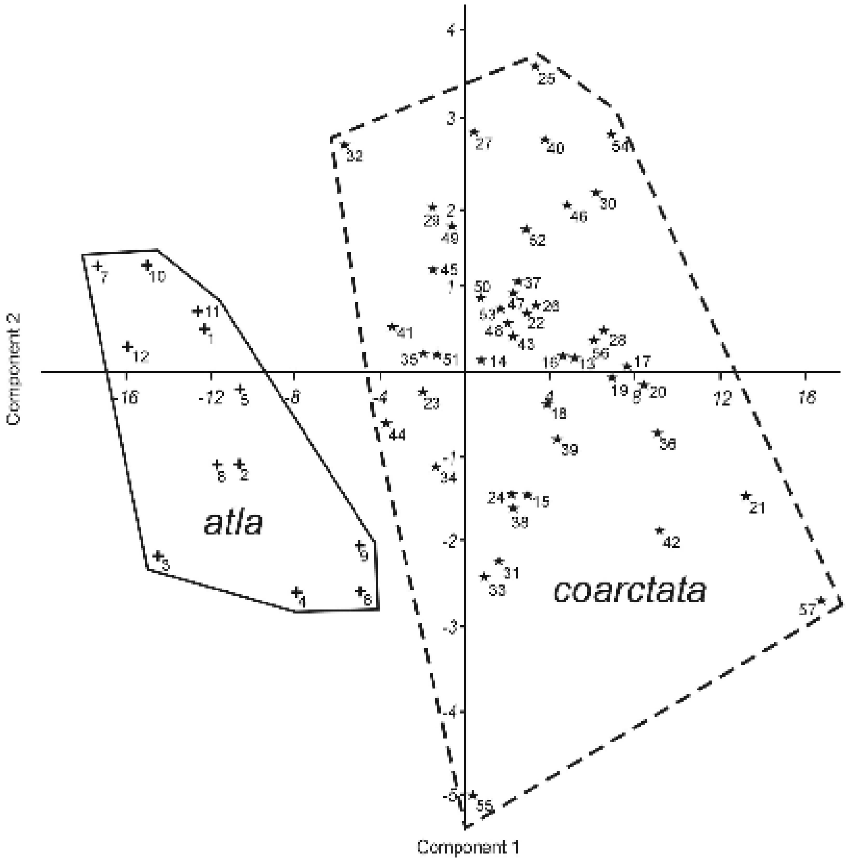


Figure 15. Results of the Principal component analysis (PCA) on the basis of five data of measurements taken from 57 Bathonian specimens of *Apringia atla* (Oppel, 1863) and *Apringia coarctata* (Oppel, 1863)

of the two taxa. Namely, Alméras & Elmi (1998) recorded two specimens of *A. atla* from the lower Bathonian (Zigzag Zone) of France, whereas Alméras & Fauré (2008) documented a few specimens of *A. coarctata* from the upper Bajocian (Niortense Zone) of Algeria. On the contrary of this concept, the present study proved that the stratigraphical discrepancy did not exist: *A. atla* and *A. coarctata* abounded together, in the respective populations, both in the Bajocian and in the Bathonian of the Transdanubian Range.

Alméras & Fauré (2008, fig. 7) proposed another intriguing model for the relationships between *A. atla* and *A. coarctata*, including their variants *polymorpha* and *miscella*, respectively, based on the supposed ontogeny of their anterior commissures. For the "*atla-polymorpha* group" the basic idea was a progress from a juvenile stage with simple uniplication to increasing size and complication (biplication or multiplication) of the commissure during ontogeny. Instead of study of concrete material, this theoretical model was based on figures taken from Oppel (1863) and Gemmellaro (1877). Nevertheless, its main conclusions for the "*atla-polymorpha* group" seem to be endorsed by the present studies on large *Apringia* material (Figures 11, 12) with the restriction that the transition from *atla* to *polymorpha* does not involve ontogenetic process: the two forms with similar sizes occur in great number within a single population. The size increase of *A. atla* in geologic time, postulated by Alméras & Fauré (2008), was also disproved by the comparison of the Bajocian and Bathonian assemblages in the Transdanubian Range which, instead of size increase, demonstrated significant diminution in time (Figure 16).

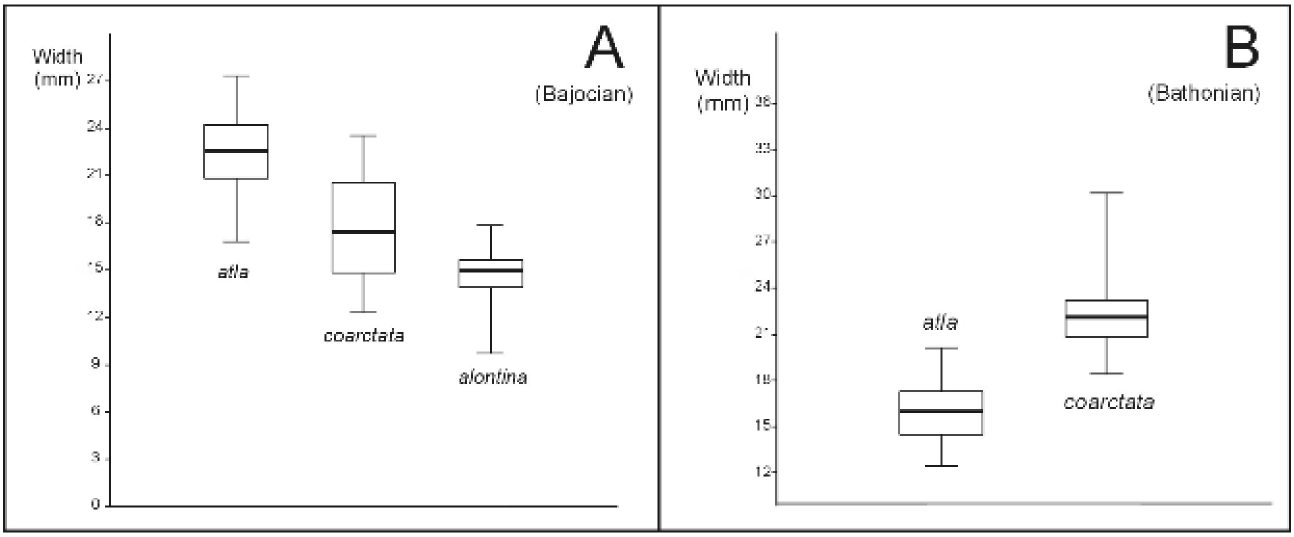


Figure 16. A) Box plots of three Bajocian species of *Apringia*, generated from measurements of the width of 105 specimens. B) Box plots of two Bathonian species of *Apringia*, generated from measurements of the width of 57 specimens. Note the temporal size increase of *Apringia coarctata* (Oppel, 1863) and diminution of *A. atla* (Oppel, 1863)

In the description of the variant *polymorpha*, OPPEL (1863, pp. 208–209) indicated its possible relation to the species *coarctata*, but eventually connected it to *atla*. Subsequent authors (RUIZ 1928; ALMÉRAS & ELMI 1998; ALMÉRAS & FAURÉ 2008; BAEZA-CARRATALÁ et al. 2011, 2014) preferred the latter idea. The examination of the copious material from the Bajocian of the Bakony Mountains definitely proved that the "variant *polymorpha*" belongs to the species *A. atla*. The multivariate analysis (PCA) of the "*atla-polymorpha* group" (67 measured specimens from the Bajocian localities: Appendix 1) showed that the scatters of *A. atla* and the "variant *polymorpha*" largely overlapped (50 points in the overlapping area). In any case, and what is more, the name "*polymorpha*" is not available as a species name, because it was preoccupied by an Eocene brachiopod "*Rh.*" *polymorpha* (MASSALONGO, 1850), according to UHLIG (1881, p. 418). After all, this morphogroup is considered a single species under the senior species name *atla* (by page priority).

The specimens illustrated by GEMMELLARO (1877, l.c.) were checked by the present author in the collections of the Università di Palermo in 1980; one of them is a regular *Apringia atla*, the other with two sharp plica in the anterior commissure represents the conspecific "variant *polymorpha*".

The "*Rh. penninica*", described by UHLIG (1878, l.c.) as a new species seems to be a typical representative of *Apringia atla*, and the other figured specimen (UHLIG, 1881, l.c.), showing a flat and a little irregular anterior commissure, may also belong to *A. atla*. The same refers to the records of "*Rh. penninica*" by BÖCKH (1881, l.c.) and VADÁSZ (1935, l.c.). The respective specimens were checked by the author in the Geological Collections of the SARA, Budapest; both items correspond to *A. atla*.

SIMIONESCU (1899, l.c.) illustrated an unusually flat specimen of *A. atla*.

The specimens illustrated by RUIZ as *A. atla* (1928, l.c.) were not available in the Museum G. G. Gemmellaro in Palermo, in 2023, when the author tried to check them. On the other hand, several typical specimens of *A. atla* and the variant "*polymorpha*" were found in the secondary material in the RUIZ collection, thus the presence of *A. atla* in Monte Inici was ascertained.

The new variant "*ferugliói*" by POINTINGHER (1959, l.c.) represents the "variant *polymorpha*" of *A. atla* in the concept outlined in the present paper.

The items illustrated by FERRARI (1962, l.c.), VÖRÖS (1997, l.c. and 2001, l.c.), and VÖRÖS & DULAI (2007, l.c.) under the name *A. atla* show sharp uniplications and are now attributed to *Apringia coarctata* (OPPEL, 1863) according to the concept of the present paper.

STURANI (1964, l.c.) figured a very nice specimen with three sharp plicas, the medial is the highest; two symmetrical additionals laterally. It is clearly different from *A. atla* and also from "var. *polymorpha*"; it may represent a new species related to *A. coarctata*.

ALMÉRAS & ELMI (1998, l.c.) illustrated two remarkable specimens under the name *A. atla*. One of them (l.c. pl. 1, fig. 1) may well correspond to the flat variant of *A. atla* ("var. *polymorpha*"). The other (l.c., pl. 1, fig. 2) bears distinct folds at its lateral flanges which feature never appears in *Apringia*; this specimen may belong to another genus.

The specimen figured by ALMÉRAS & FAURÉ (2008, l.c.) as *A. coarctata*, portrays a rather subrounded, not sharp uniplication, therefore in the concept outlined in the present paper, it may rather belong to *A. atla*.

SIBLÍK & LOBITZER (2008, l.c.) illustrated only serial sections of their material, thus the allocation of those specimens either to *A. atla*, or *A. coarctata* remains uncertain.

BAEZA-CARRATALÁ et al. (2011, l.c. and 2014, l.c.) figured typical specimens of *A. atla*, including the "variant *polymorpha*" as well.

Distribution

Middle Jurassic in the Eastern and Southern Alps, Pieniny Klippen Belt, Mecsek Mountains, Southern Carpathians, Sicily, Southern France, Atlas Mountains and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bathonian (Orbis Zone).

Apringia coarctata (OPPEL, 1863)
Plate I: 7, 10, 11, 13–15; Figures 10, 15, 17

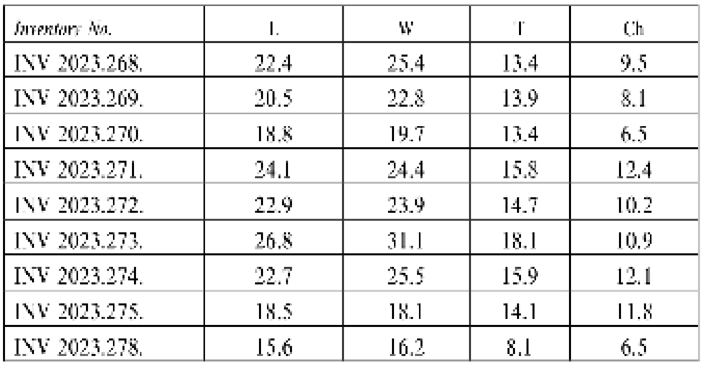
v *1863 *Rhynchonella coarctata* OPP. – OPPEL, Posidonomyen-Gesteinen, p. 209, pl. 6, fig. 4.
v 1863 *Rhynchonella coarctata*, var. *miscella*. – OPPEL, Posidonomyen-Gesteinen, p. 210, pl. 6, fig. 5.
1881 *Rhynchonella coarctata* OPP. – PARONA, Strati a Posidonomya, p. 275, pl. 5, fig. 25.
? 1886 *Rhynchonella* cf. *coarctata* OPPEL. – VACEK, St. Vigilio, p. 118, pl. XX, fig. 7.
v 1928 *Rhynchonella coarctata* OPP. e var. *miscella* OPP. – RUIZ, Monte Inici, p. 23.
1959 *Rhynchonella coarctata* OPPEL. – POINTINGHER, M. Najarda, p. 80, pl. I, fig. 1.
1960 *Rhynchonella coarctata* OPP, var. *miscella* OPP. – FÜLÖP et al., Vértes, p. 19, pl. II, fig. 1.
1962 *Rhynchonella atla* OPPEL – FERRARI, Rovereto, p. 105, pl. VIII, fig. 2.
? 1982 *Apringia* ? *atla* (OPPEL, 1863) – BENIGNI et al., Asiago, p. 59, pl. 2, fig. 2, text-fig. 10.

v 1997 *Apringia atla* (OPPEL) – VÖRÖS, Jurassic brachiopods, p. 18, fig. 28.
? 1999 *Apringia atla* (OPPEL, 1863) – WIERZBOWSKI et al., Pieniny Klippen Belt, p. 58, fig. 22/1.
v 2001 *Apringia atla* (OPPEL) – VÖRÖS, Bajocian and Bathonian, p. 179, fig. 2/1.
v 2007 *Apringia atla* (OPPEL, 1863) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, figs. 4, 5.
non 2008 *Apringia coarctata* (OPPEL, 1863) – ALMÉRAS & FAURÉ, Téthys occidentale, p. 599, pl. I, fig. 11, text-fig. 7.

Material

109, variously preserved specimens from Szentgál, Kisnyerges Ravine (2), Hárskút, Gyenespuszta IV (1), Hárskút, Csapótanya (9), Lókút, Fenyveskút N (2), Bakonybél, Som Hill, upper level (1), Bakonybél, Som Hill, loose (29), Mór, Csóka Hill (1959) (20), Mór, Csóka Hill (1966) (45).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.268.	22.4	25.4	13.4	9.5
INV 2023.269.	20.5	22.8	13.9	8.1
INV 2023.270.	18.8	19.7	13.4	6.5
INV 2023.271.	24.1	24.4	15.8	12.4
INV 2023.272.	22.9	23.9	14.7	10.2
INV 2023.273.	26.8	31.1	18.1	10.9
INV 2023.274.	22.7	25.5	15.9	12.1
INV 2023.275.	18.5	18.1	14.1	11.8
INV 2023.278.	15.6	16.2	8.1	6.5

Description

External characters: Medium to large *Apringia* with characteristically subpentagonal outline. The lateral margins are usually gently concave and diverge with an apical angle from 85° to 120°. The maximum width is attained near the middle of the length. The valves are almost equally convex; the maximum convexity lies near the posterior one third of the length in the ventral valve, whereas it is at mid-length in the dorsal valve. The lateral parts of the valves regularly form wing-like extensions which sometimes appear as protrusion in lateral view. The cone-shaped beak is erect to slightly incurved and highly pointed. The pedicle opening and the delthyrium are mostly covered by matrix. There are no beak ridges at all, neither planareas developed. The lateral parts are gently convex, and the lateral commissures form a little elevated crest. In lateral view, the lateral commissures are nearly straight, or a little arched dorsally, and run diagonally in ventral direction, where they join the anterior commissure with a rather sharp bend without deflexions. The anterior commissure is highly uniplicate with straight lateral parts and sharply pointed top. Rarely, an asymmetric plica may develop laterally (Pl. I: 15). The surface of the shells is smooth.

Internal characters: (Figure 17): *Ventral valve*: The delthyrial cavity is subquadrate to oval in cross-section; with ventral grooves connected with the muscle scars. The umbonal cavities are very narrow rounded triangular. The pedicle collar is well developed. The dental plates are subparallel. The hinge teeth are massive, wide, crenulation is not visible; denticula are present. The deltidial plates are disjuct. *Dorsal valve*: The cardinal process is weakly crenulated. Septalium were not recorded. Median septum is absent. The outer socket ridges are massive, lean over the sockets. The inner socket ridges are high and narrow. The hinge plates raise from the upper end of the inner socket ridges and initially are fused, then they become subhorizontal and wide. The crural bases start to evolve from the fused stage of the hinge plates; later they emerge dorsally and give rise to crura of hamiform (prefalciform) type.

Remarks

OPPEL (1863, p. 208), on the basis of examination of 43 specimens, clearly separated the species *coarctata* with high and sharp uniplication from *atla* with lower and wider plica. The relationships between the two species were discussed by later authors (UHLIG 1881, RUIZ 1928, POINTINGHER 1959), and finally, FERRARI (1962, p. 105) definitely integrated them under the name *atla*, probably by page priority.

The wide interpretation of the species *atla* became commonly accepted (e.g., BENIGNI et al. 1982, ALMÉRAS & ELMI 1998, WIERZBOWSKI et al. 1999, SIBLÍK & LOBITZER 2008). In previous works the present author (VÖRÖS 1997, 2001; VÖRÖS & DULAI 2007) followed also this practice which is now considered erroneous according to the concept outlined in the present paper.

On the basis of detailed morphological study of a larger material (345 specimens) of the *atla-coarctata* group from the Middle Jurassic of the Bakony and Vértes Mountains the separation of the two species was ascertained. The multivariate analysis (PCA) showed that in the Bajocian material (105 measured specimens: Appendix 1) the scatters of *Apringia atla*

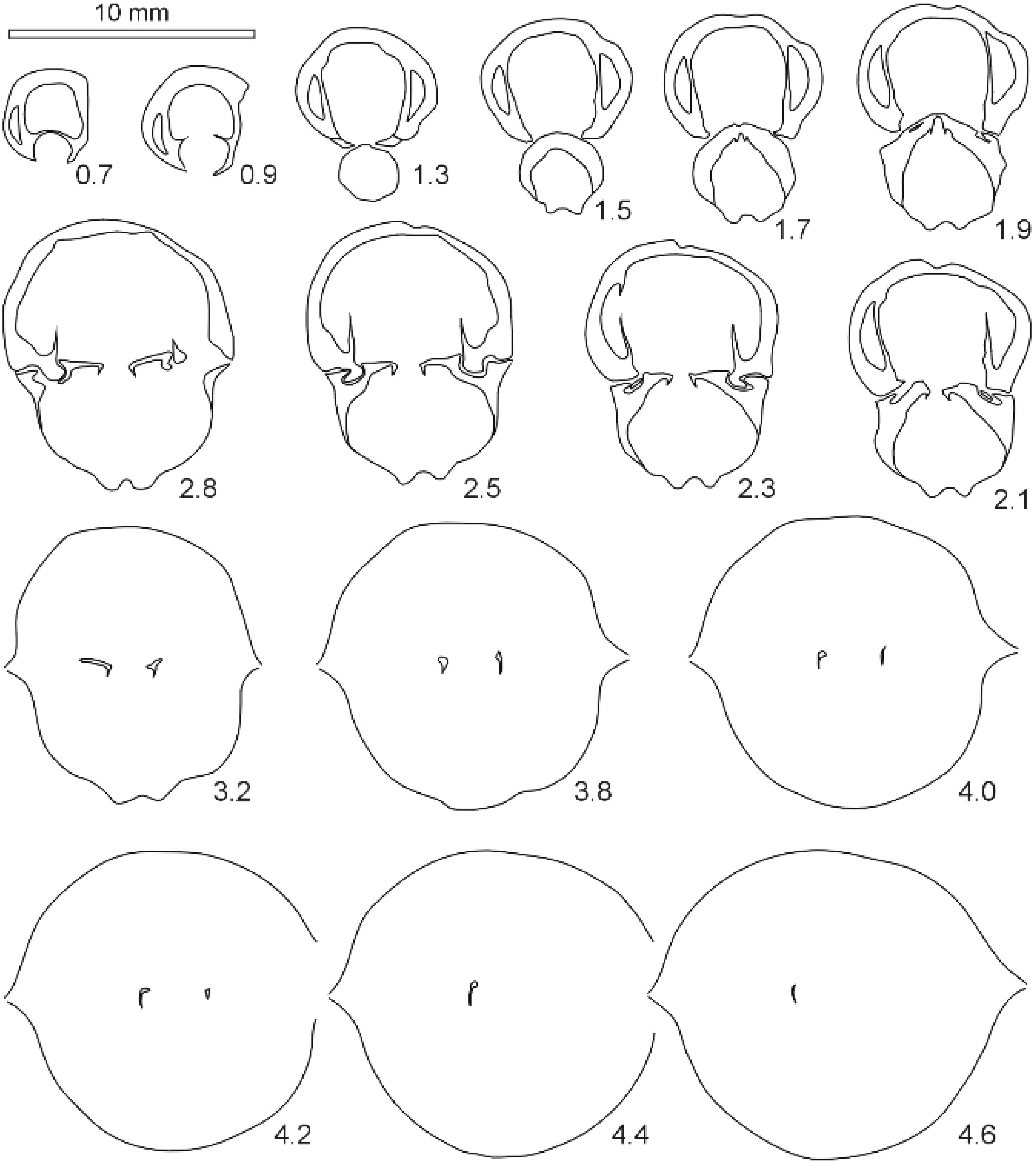


Figure 17. *Apringia coarctata* (Oppel, 1863). Sixteen transverse serial sections through the posterior part of a specimen from Csóka Hill (Mór), upper Bathonian. INV 2023.284. Distances from the ventral umbo are given in mm. Original length of the specimen is 23.6 mm

and *A. coarctata* only a little overlap (Figure 10). On the other hand, the analysis of the Bathonian material (57 measured specimens: Appendix 2) confirms the perfect separation of the two species (Figure 15).

Alméras & Fauré (2008, p. 599) restored the concept of *A. atla* and *A. coarctata* as separate species on the basis of the supposedly different stratigraphical occurrence of the two taxa. Alméras & Elmi (1998) recorded *A. atla* from the lower Bathonian (Zigzag Zone) of France, whereas Alméras & Fauré (2008) documented *A. coarctata* from the upper Bajocian (Niortense Zone) of Algeria. However, this kind of distinction of the two species cannot be accepted, because the present study proved that the stratigraphical separation did not exist: both *A. atla* and *A. coarctata* occurred together in great number both in the Bajocian and in the Bathonian of the Transdanubian Range.

The hypothetical relationships between *A. atla* and *A. coarctata*, including their variants *polymorpha* and *miscella*, were demonstrated by Alméras & Fauré (2008, fig. 7). This theoretical model was based on the supposed ontogeny of the anterior commissures of the taxa in question, based on figures taken from Oppel (1863) and Gemmellaro (1877) and its assumptions for the "*atla-polymorpha* group" are refuted according to the concept outlined in the present paper. On the other hand, the main conclusions of the model for the "*coarctata-miscella* group" seem to be confirmed by the present studies on a large *Apringia* material. The comparison of the Bajocian and Bathonian assemblages of *A. coarctata* in the Transdanubian Range demonstrated significant size increase of this species in time (Figure 16), as it was postulated by Alméras & Fauré (2008).

In the description of the variant *miscella*, Oppel (1863, pp. 208–209) indicated its possible relation to the species *coarctata* but mentioned possible transitional forms also to the forms *atla* and *polymorpha*. The detailed study of the large material from the Bajocian of the Bakony Mountains definitely proved that the "variant *miscella*" belongs to the species *A. coarctata* and represents the largest specimens within the size range of the species.

Vacek (1886, l.c.) illustrated a nice, faintly asymmetrical specimen with sharp plicae; it, may belong to "var. *polymorpha*," of *A. atla*, or rather represents a slightly aberrant *A. coarctata.*

Ruiz (1928, l.c.) described but not illustrated the variant "*miscella*" of *A. coarctata*. The author checked these specimens in the Museum G. G. Gemmellaro in Palermo and found one typical specimen of *A. coarctata*. On the other hand, the other specimen labelled as "var. *miscella*" was very incomplete (with missing anterior part) and might rather belong to *A. atla* (var. "*polymorpha*").

The specimen figured by Benigni et al. (1982, l.c.) under the name *Apringia* ? *atla* may belong rather to *A. coarctata*, because the peak of the diagnostic uniplication is broken but seems to be sharp. The same regards to the item by Wierzbowski et al. (1999, l.c.).

Alméras & Fauré (2008, l.c.) illustrated a specimen as *A. coarctata*, which however shows a subrounded, not sharp uniplication, consequently, considering the the concept outlined in the present paper, it is ranked to *A. atla.*

Distribution

Middle Jurassic in the Eastern and Southern Alps, Pieniny Klippen Belt. In the Transdanubian Range it occurs from the late Bajocian (Niortense Zone) to the late Bathonian (Orbis Zone).

Apringia alontina (Di Stefano, 1884)

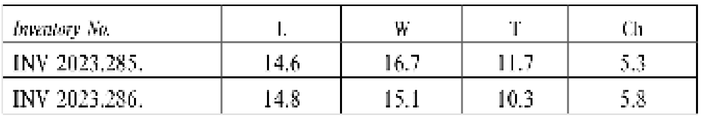
Plate I: 16, 17; Figures 9, 18

v *1884b *Rhynchonella Alontina*, Di Stef. – Di Stefano, Galati, p. 11, pl. I, figs. 10–14.
1899 *Rhynchonella Alontina* Di Stef. – Greco, Rossano, p. 99, pl. VIII, figs. 1–3.
v 1928 *Rhynchonella Alontina* Di Stef. – Ruiz, Monte Inici, p. 29.
v 1997 *Apringia alontina* (Di Stefano) – Vörös, Jurassic brachiopods, pp. 18, 23.
v 2001 *A. alontina* (Di Stefano) – Vörös, Bajocian and Bathonian, p. 179.
v 2007 *Apringia alontina* (Di Stefano, 1884) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 6.

Material

36, mostly well-preserved specimens from Lókút, Fenyveskút VIII (34) and Csókakő, Csóka Hill, southern promontory (2).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.285.	14.6	16.7	11.7	5.3
INV 2023.286.	14.8	15.1	10.3	5.8

Description

External characters: Medium sized, rather globose *Apringia* with rounded oval to subpentagonal outline. The lateral margins are gently convex and diverge with an apical angle around 105°. The maximum width is attained at mid-length. The valves are almost equally convex; the maximum convexity lies near the middle of the length. The beak is suberect, slender, highly conical and pointed. The pedicle opening and the delthyrium is mostly covered by matrix, but they must be tiny and very narrow. There are no beak ridges at all, neither planareas developed. The lateral parts are gently convex, and the lateral commissures form a little elevated crest. In lateral view, the lateral commissures are gently arched dorsally and run diagonally in ventral direction, where they pass gradually to the anterior commissure, forming a continuous curve. The anterior commissure is rather highly uniplicate showing an unbroken, symmetrical arch. The valves are completely smooth; faint growth lines occur irregularly.

Internal characters: (Figure 18): *Ventral valve*: The delthyrial cavity is subquadrate in cross-section. The umbonal cavi-

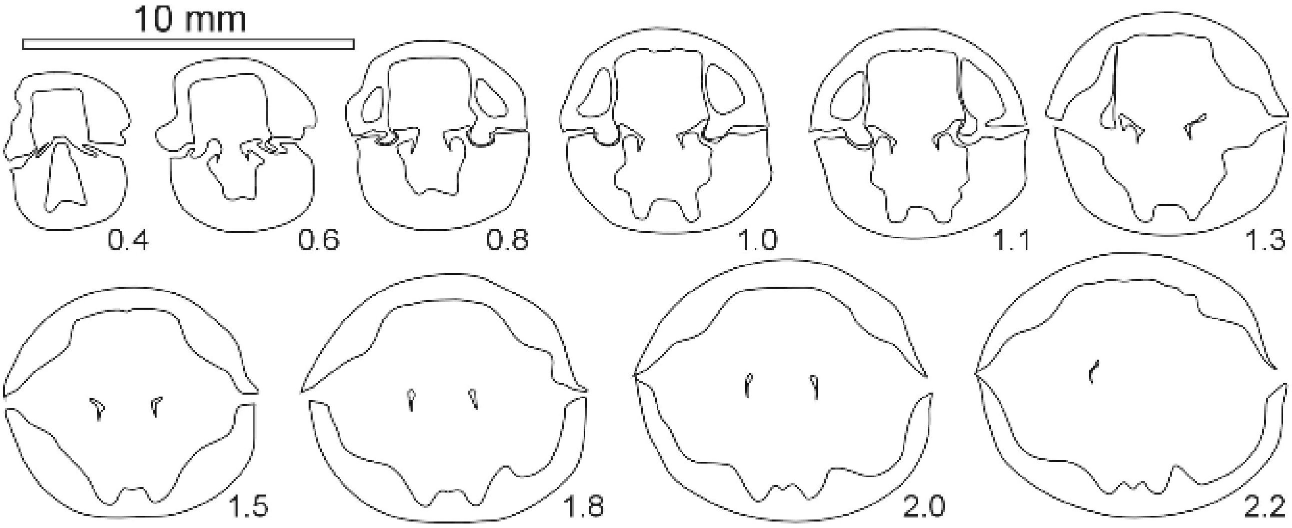


Figure 18. *Apringia alontina* (DI STEFANO, 1884). Ten transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.287. Distances from the ventral umbo are given in mm. Original length of the specimen is 14.6 mm

ties are rounded triangular. Pedicle collar was not observed. The subparallel dental plates are gently convex medially. The hinge teeth are massive, crenulation is not visible; denticula are indistinct. The deltidial plates were not observed. *Dorsal valve*: The cardinal process seems to be flat. Septalium were not recorded. Median septum is absent. The outer socket ridges are very wide and massive. The inner socket ridges are slender and slightly lean over the sockets. The hinge plates rise from the middle portion of the inner socket ridges. They are fused initially, and then they become free and dorsally tilted. The crural bases emerge dorsolaterally and give rise to crura of hamiform (prefalciform) type. The dorsal valve is thickened by secondary callus and reveals two deep grooves corresponding to the dorsal adductor scars.

Remarks

Apringia alontina has some similarity to certain specimens of *A. atla* showing evenly arched anterior commissure but differs by its constantly globose biconvex shell and the tiny, pointed, suberect beak, in contrast to the massive, high, and erect to slightly incurved beak of *A. atla*. The same characters differentiate *A. alontina* from *A. coarctata*; furthermore, the uniplication of the anterior commissure in *A. alontina* is always regularly arched, contrary to the sharp uniplication of *A. coarctata* (Figure 9). The multivariate analysis (Principal Component; PCA) of five measurements taken on the Bajocian specimens of the three species of *Apringia* (Appendix 1) shown in Figure 10 endorse the visual observations.

The specimens illustrated by GRECO (1899, l.c.) came probably from Aalenian beds, nevertheless their external morphology fits perfectly to *A. alontina* (DI STEFANO, 1884).

The specimen described but not illustrated by RUIZ (1928, l.c.) was examined by the author in the Museum G. G. Gemmellaro in Palermo; it may belong to *A. alontina*, though its beak is rather high.

Distribution

Middle Jurassic in Sicily and Calabria. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) probably to the late Bajocian.

Subfamily Pamirorhynchiinae OVCHARENKO, 1983
Genus ***Pseudogibbirhynchia*** AGER, 1962
Type species: *Rhynchonella moorei* DAVIDSON, 1852

Pseudogibbirhynchia ? cf. *etalloni* (OPPEL, 1863)
Plate I: 18–20; Figure 19

v *1863 *Rhynchonella Etalloni* OPP. – OPPEL, Posidonomyen-Gesteinen, p. 212, pl. 6, fig. 11.
v 1997 "*Rhynchonella*" *etalloni* OPPEL – VÖRÖS, Jurassic brachiopods, p. 17.
v 2001 "*Rhynchonella*" *etalloni* OPPEL – VÖRÖS, Bajocian and Bathonian, p. 177.
2008 „*Rhynchonella*" aff. *etalloni* OPPEL, 1863 – SIBLÍK & LOBITZER, Mitterwand, p. 68 (partim), pl. 2, fig. 8 (only), ? pl. 5, figs. 7, 10.

Material

Six, mostly poorly preserved specimens from Lókút, Fenyveskút VIII (5) and Lókút, Lókút Hill (1).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.289.	12.2	13.2	7.9	0
INV 2023.288.	13.9	15.1	?	?
INV 2023.290.	13.6	14.4	>8.3	1.4

Description

External characters: Medium sized *Pseudogibbirhynchia* with subpentagonal to transversely oval outline. The lateral margins are nearly straight and diverge with an apical angle of around 95°. The maximum width lies around the middle of the length. The valves are moderately convex; the dorsal valve is slightly more convex than the ventral valve. The maximum convexity is attained near the middle of the length, though this point is usually a little shifted posteriorly in the dorsal valve. The beak is incomplete but seems to be suberect and pointed. The pedicle opening and the delthyrium is hardly seen. There are no definite beak ridges; planareas are not developed. The lateral surfaces of the double valves are convex; the valves join by a blunt angle where the lateral commissures form a crest. In lateral view, the lateral commissures are nearly straight. The anterior commissure is weakly uniplicate. The low uniplication is trapezium-like and rather wide; its width exceeds the half of the total width of the specimen. The valves are ornamented with faint, partly dichotomous ribs. The ribs start at the umbones, their number increases, usually by bifurcation in the lateral region. The number of ribs is 10–12 at the anterior margin, where 5 to 6 ribs fall into the plica. There are two prominent ribs on the dorsal valve, running to the corners of the uniplication. The ribs are low but marked; in cross section the ribs and the interstices are equally rounded.

Internal characters: (Figure 19): *Ventral valve*: The delthyrial cavity is subquadrate in cross-section; the umbonal cavities are narrow rounded triangular. Pedicle collar was not recorded. The dental plates are convergent ventrally. The hinge teeth are massive. Deltidial plates were not recorded, probably due to the poor preservation of the sectioned specimen. *Dorsal valve*: Cardinal process is not recorded. The septalium and median septum are absent. The outer socket ridges are

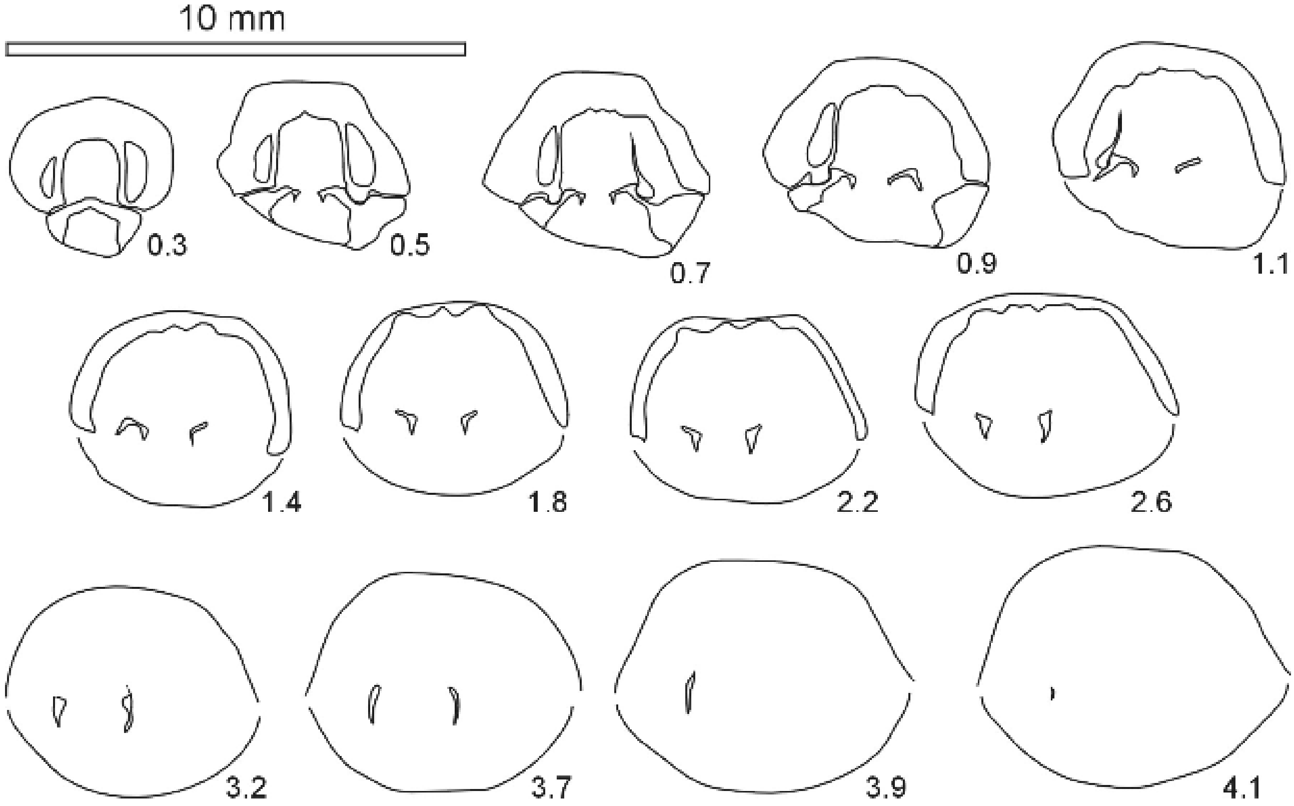


Figure 19. *Pseudogibbirhynchia* ? cf. *etalloni* (Oppel, 1863). Thirteen transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.290. Distances from the ventral umbo are given in mm. Original length of the specimen is 13.6 mm

wide. The inner socket ridges and the base of the hinge plates are thin. The hinge plates rise from the upper end of the inner socket ridges. They are gently convex and lean dorsally. The crural bases emerge dorsally and give rise to crura of hamiform type.

Remarks

The generic attribution of this species was left open in previous works. Now the serial sections (Figure 19) revealed the hamiform type of crura and the apparent absence of the median septum, characteristics of the genus *Pseudogibbirhynchia*. Considering the main extermal features (flattened dorsal valve, low uniplication, multicostate ornament), this generic attribution of "*R.*" *etalloni* seems very probable.

The two prominent ribs on the dorsal valve, running to the corners of the uniplication give an important diagnostic feature in the identification of our specimens with Oppel's originals.

Siblík & Lobitzer (2008, l.c.) illustrated three specimens under the name "*R.*" *etalloni*. One of them (l.c. pl. 2, fig. 8) fits well to this species; the other two seem to be too coarsely ribbed and probably do not belong here.

Distribution

Middle Jurassic in the Eastern and Southern Alps. In the Transdanubian Range it occurs in the early Bajocian (Laeviuscula and Humphriesianum Zones).

Pseudogibbirhynchia ? cf. *chiemiensis* (Finkelstein, 1889)

Plate I: 21–23

* 1889 *Rhynchonella Chiemiensis* n. sp. – Finkelstein, Hohen-Aschau, p. 99, pl. IV, figs. 4, 5.
? 1889 *Rhynchonella Vilsensis* nov. var. *oolithica*. – Finkelstein, Hohen-Aschau, p. 99, pl. IV, fig. 3.
? 1973 *Pseudogibbirhynchia chiemiensis* (Finkelstein, 1889) – Kamyschan & Babanova, Caucasus, p. 26, pl. I, figs. 4, 5.
? 1985 *Pseudogibbirhynchia chiemiensis* (Finkelstein, 1889) – Prozorovskaia, Transcaucasus, p. 103, pl. XX, fig. 1.

Material

Seven, moderately preserved specimens from Lókút, Fenyveskút VIII (3), Csókakő, Csóka Hill, southern promontory (2) and Csókakő, Csóka Hill, loose (2).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.293.	12.4	13.1	7.5	1.7
INV 2023.292.	14.9	14.2	9.1	1.1
INV 2023.291.	10.5	10.2	5.9	0.9

Description

External characters: Small to medium sized *Pseudogibbirhynchia*, with elongated subcircular outline. The lateral margins are gently convex and diverge with an apical angle from 95° to 105°. The maximum width is attained at mid-length. The valves are moderately and equally convex; the maximum convexity lies near the middle of the length. The beak is nearly straight to suberect, slender and pointed. The delthyrium is mostly covered by matrix but seems to be low and rather wide. There are no definite beak ridges; planareas are not developed. The valves join by an acute angle at the lateral commissures. In lateral view, the lateral commissures are nearly straight. The anterior commissure is straight. Fold or true sulcus is not developed, though there are stronger deflexions at the lateral extremites of the anterior margin. The valves are ornamented with distinct but not sharp ribs. The ribs start at the umbones, their number increases, by bifurcation and intercalation. The number of ribs is 10–12 near the umbones and 14–20 at the anterior margin.

Internal characters: These were not studied by serial sectioning because of the paucity of the material.

Remarks

In the absence of information on the internal features of the present material, the possible generic attribution is based on the data from Kamyschan & Babanova (1973, p. 26) and Prozorovskaia (1985, p. 103), who ranked the species "*R.*" *chiemiensis* to the genus *Pseudogibbirhynchia*.

Our specimens are very similar to "*R.*" *chiemiensis* illustrated by Finkelstein (1889, pl. IV, figs. 4, 5) and "*R.*" *vilsensis* nov. var. *oolithica*, figured by Finkelstein (1889, pl. IV, fig. 3). The species "*R.*" *vilsensis* of Oppel (1861, pl. 3, fig. 3) shows also apparent similarity to our specimens. In fact, our Bajocian *P.* cf. *chiemiensis* stands between the Aalenian *P. chiemiensis* and the Callovian *P.*? *vilsensis* (OPPEL, 1861) both stratigraphically and morphologically.

Among the records from the Caucasus, the specimens illustrated by KAMYSCHAN & BABANOVA (1973, l.c.) have more elevated uniplication and coarser ribs as compared to the figures by FINKELSTEIN (1889, l.c.); whereas those figured by PROZOROVSKAIA (1985, l.c.) are more similar to FINKELSTEIN's figures.

The specimens described as *Rhynchonella maleniana* n. sp. (GRECO 1899, p. 104, pl. VIII, figs. 16–18) are very similar to *P. chiemiensis*, but without inspection of the original specimens their inclusion into the synonymy would not be justified.

Distribution

Middle Jurassic in the Eastern Alps, Great Caucasus and Transcaucasus. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) probably to the late Bajocian.

Family Erymnariidae COOPER, 1959
Subfamily Septocrurellinae AGER, CHILDS & PEARSON, 1972
Genus ***Septocrurella*** WISNIEWSKA, 1932
Type species: *Rhynchonella Sanctae Clarae* ROEMER, 1870

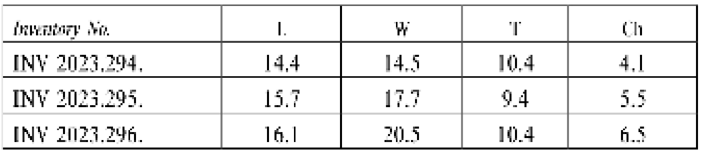
Septocrurella retrosinuata (VACEK, 1886)
Plate I: 24, Plate II: 1, 2; Figure 20

* 1886 *Rhynchonella retrosinuata* n. sp. – VACEK, St. Vigilio, p. 117, pl. XX, figs. 17–19.
v 1928 *Rhynchonella retrosinuata* VACEK – RUIZ, Monte Inici, p. 36, pl. I, fig. 13.
1962 *Rhynchonella retrosinuata* VACEK – FERRARI, Rovereto, p. 130, pl. IX, fig. 9.
1972 *Septocrurella retrosinuata* (VACEK, 1886) – FERRARI & MANARA, Monte Peller, p. 275, pl. XXIV, figs. 1, 2.
v 1997 *Septocrurella retrosinuata* (VACEK) – VÖRÖS, Jurassic brachiopods, pp. 17, 18, fig. 29.
v 2001 *Septocrurella retrosinuata* (VACEK) – VÖRÖS, Bajocian and Bathonian, pp. 177, 179, fig. 2/2.
v 2007 *Septocrurella* ? *retrosinuata* (VACEK, 1886) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, fig. 8.
? 2011 *Septocrurella microcephala* (PARONA, 1896) – BAEZA-CARRATALÁ et al., Eastern Subbetic, p. 185 (partim), figs. 7, 8 (only).

Material

52, mostly well-preserved specimens from Hárskút, Csapótanya (8), Lókút, Fenyveskút VIII (4), Lókút, Lókút Hill (35), Bakonybél, Som Hill, lower level (2) and Bakonybél, Som Hill, loose (3).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.294.	14.4	14.5	10.4	4.1
INV 2023.295.	15.7	17.7	9.4	5.5
INV 2023.296.	16.1	20.5	10.4	6.5

Description

External characters: Medium to large *Septocrurella* with rounded subtrigonal to subpentagonal outline; usually wider than long. The lateral margins are gently convex and diverge with an apical angle from 105° to 110°. The position of the line of the maximum width varies from mid-length to the anterior third of the length. The maximum convexity lies near the middle of the length. The valves are almost equally convex; in some cases, the ventral valve is more inflated posteriorly than the dorsal valve. The beak is suberect to erect, very tiny and pointed, but frequently broken away. The pedicle opening is not seen because the beak is often fragmentary. The delthyrium is very rarely and poorly seen; it is low and rather wide. The beak ridges are weakly developed or absent; there are no planareas. The lateral parts are gently convex, and the lateral commissures usually form a little elevated crest. In lateral view, the lateral commissures are nearly straight and run diagonally in dorsal direction and are gently serrated anteriorly. The anterior commissure is unisulcate; the sinus is trapezoidal and bears 3 to 5, somewhat rounded zig-zag deflections. The dorsal valve has an incipient sulcation posteriorly; the dorsal sulcus gradually develops anteriorly. The linguiform extension is usually a little projected anteroventrally. The valves are ornamented with numerous rounded ribs and irregularly spaced growth lines. The posterior area is smooth, the ribs appear at or beyond mid-length and become stronger anteriorly. Their number varies from 8 to 12, from which 3 to 5 ribs fall to the sulcus.

Internal characters: (Figure 20): *Ventral valve*: The delthyrial cavity is highly subquadrate in cross-section. The umbonal cavities are rounded triangular. Pedicle collar was not observed. The dental plates are gently convergent ventrally.

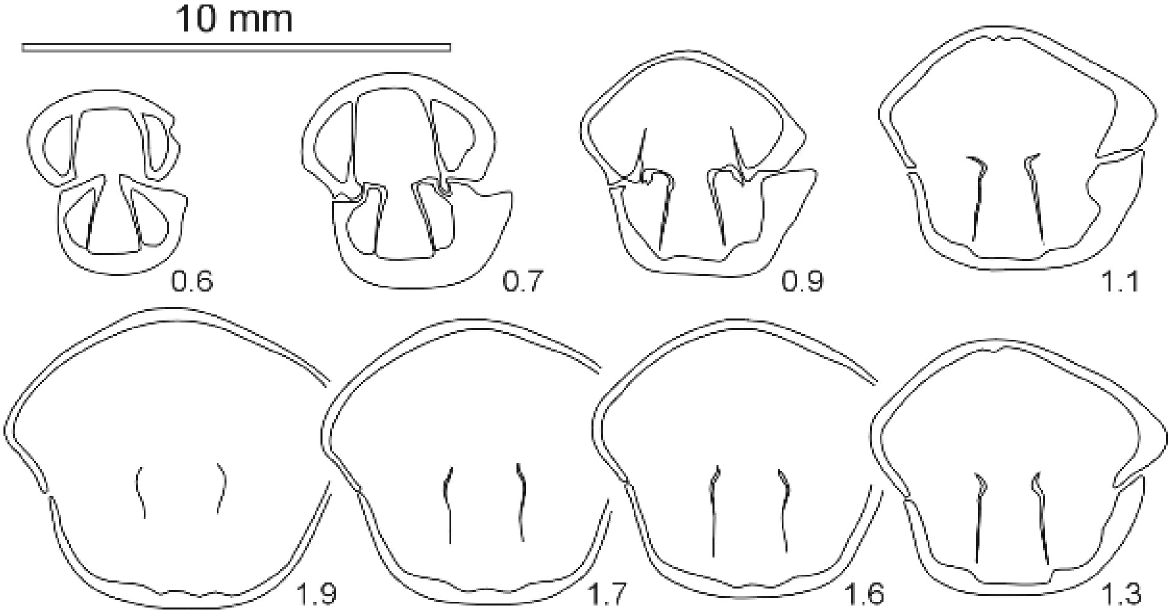


Figure 20. *Septocrurella retrosinuata* (Vacek, 1886). Eight transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.297. Distances from the ventral umbo are given in mm. Original length of the specimen is 13.0 mm

The hinge teeth are massive and outwardly oriented. *Dorsal valve*: Cardinal process was not observed. Septalium and median septum are absent. The outer socket ridges are wide. The inner socket ridges are high, slender and subvertical. The hinge plates are subhorizontal and give rise to the crural bases given off dorsally. The crural bases and the septiform crura are supported by subparallel crural plates in the umbonal region. At about the one-tenth of the length of the shell the crural plates become separated from the valve floor and continue in falcoid terminations.

Remarks

The unisulcate shell and the septiform crura with the crural plates, revealed by serial sectioning (Figure 20), definitely proved the attribution of our specimens to the genus *Septocrurella*.

On the basis of the good illustrations by Vacek (1886, l.c.), Ruiz (1928, l.c.) and Ferrari (1962, l.c.) the identification of our specimens with *S. retrosinuata* seems satisfactory.

Baeza-Carratalá et al. (2011, l.c.) illustrated two specimens under the name *S. microcephala* (Parona, 1896). One of them (l.c. fig. 6/5) may correspond to Parona's species. The other, sectioned specimen, figured only in anterior view, is rather flat with deep sulcus and shows four deflexions in the anterior commissure. On the basis of these features, it may rather belong to *S. retrosinuata* (Vacek, 1886).

Distribution

Middle Jurassic in the Southern Alps, Sicily and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Laeviuscula to Humphriesianum Zone) and from the late Bajocian.

Superfamily Norelloidea Ager, 1959
Family Norellidae Ager, 1959
Subfamily Norellinae Ager, 1959
Genus ***Fenyveskutella*** Vörös, 2009
Type species: *Fenyveskutella vighi* Vörös, 2009

Fenyveskutella fallax n. sp.
Plate II: 3–7; Figures 21, 22

v 1997 *Septocrurella* ? *microcephala* (Parona) – Vörös, Jurassic brachiopods, p. 18, fig. 30.
v 2001 *Septocrurella* ? *microcephala* (Parona) – Vörös, Bajocian and Bathonian, p. 179, fig. 2/4.
v 2007 *Septocrurella* ? *microcephala* (Parona, 1896) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 7.
v 2007 *Septocrurella* ? *micula* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 9.

Holotype: Hungarian Natural History Museum (Budapest), inventory number: PAL 2023.37.1.

Locus typicus: Hárskút, Csapótanya, grab sample.

Stratum typicum: Red brachiopod limestone (Tölgyhát Limestone Formation, Hárskút Member), upper Bajocian.

Paratypes: PAL 2023.38.1., PAL 2023.39.1., PAL 2023.40.1., PAL 2023.41.1. (sectioned paratype); PAL 2023.42.1. (sectioned paratype).

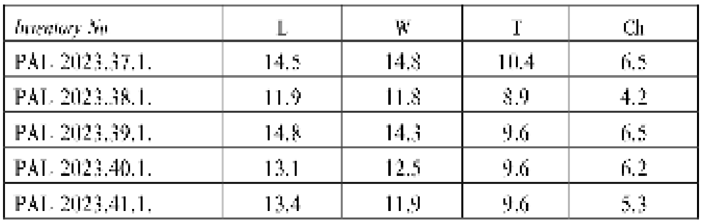
Derivatio nominis: Fallax <latin> = deceptive.

Diagnosis: Medium to large, globose, dorsibiconvex shells. Beak tiny, suberect to erect, pointed. No planareas. Lateral commissures straight, anterior commissure unisulcate to plicosulcate. Dorsal sulcus narrow posteriorly, wide and flat anteriorly. Dental plates subparallel. No median septum. Hinge plates wide, dorsally tilted. Crural bases emerge laterodorsally; crura close to the hamiform or subfalciform type.

Material

42, mostly well-preserved specimens from Hárskút, Csapótanya (17), Hárskút, Gyenespuszta IV (7), Lókút, Fenyveskút VIII (16), Bakonybél, Som Hill, lower level (1) and Bakonybél, Som Hill, upper level (1).

Measurements



Inventory No	L	W	T	Ch
PAL 2023.37.1.	14.5	14.8	10.4	6.5
PAL 2023.38.1.	11.9	11.8	8.9	4.2
PAL 2023.39.1.	14.8	14.3	9.6	6.5
PAL 2023.40.1.	13.1	12.5	9.6	6.2
PAL 2023.41.1.	13.4	11.9	9.6	5.3

Description

External characters: Medium to large, rather globose *Fenyveskutella* with rounded subtrigonal to subpentagonal outline. The lateral margins are convex; therefore the apical angle can not be measured correctly but it seems to vary between 95° and 100°. The position of the line of the maximum width varies from mid-length to the anterior third of the length. The maximum convexity lies around the middle of the length. The valves are rather strongly convex; the dorsal valve is conspicuously more convex posteriorly. The beak is suberect to erect, depressed, very tiny and pointed. The pedicle opening and the delthyrium are poorly seen but seem to be small and narrow. Beak ridges are absent; there are no planareas. The lateral parts are gently convex, and the lateral commissures run on a little elevated crest. In lateral view, the lateral commissures are nearly straight or gently arched dorsally and pass gradually to the anterior commissure. The anterior commissure is rather deeply unisulcate but variable in shape. Typically, it has a single median plica, and this case may be termed as plicosulcate (Pl. II: 3, 4, 6, 7). In other cases, the median portion of the unisulcate anterior commissure is nearly straight (Pl. II: 5). Rarely, two median plicae appear in the sulcus. The dorsal sulcus is very narrow at the posterior part and gradually becomes wide anteriorly but remains shallow. The linguiform extension is short and only slightly projected anteroventrally. The valves are typically smooth except the anteriorly developed plicae. The lateral flanks of some specimens are ornamented with weak and low, rounded plicae near the anterior margin. In the specimens with deflected anterior commissure, blunt plica appears anteriorly in the medial portion of the shell.

Internal characters: (Figures 21, 22): *Ventral valve*: The delthyrial cavity is subquadrate trapezium-like in cross-section. The umbonal cavities are rounded triangular. Pedicle collar was not observed. The dental plates are subparallel, slightly convergent ventrally. The hinge teeth are narrow and slender; denticula are indistinct. *Dorsal valve*: The cardinal process is gently crenulated. The septalium is poorly seen. Median septum is absent. The outer socket ridges are wide. The inner socket ridges are high and subvertical. The hinge plates are wide, dorsally tilted and form a consistent oblique plate with the inner socket ridges. More anteriorly they remained narrow. The crural bases emerge laterodorsally and give rise to crura which seems to stand close to the hamiform or subfalciform type, but only partly falcoid in distal cross sections. On decorticated specimens the narrow, short, subparallel adductor muscle scars are seen (Pl. II: 7).

Remarks

On the basis of the tiny beak, the strongly biconvex shell, the unisulcate to plicosulcate anterior commissure and the main internal features (absence of median septum, hamiform or subfalciform crura), the attribution of our new species to the genus *Fenyveskutella* Vörös, 2009 seems to be endorsed.

Previously, without any knowledge on their internal morphology, our specimens were identified by the present author as *Septocrurella* ? *microcephala* (Parona, 1896), because of the deceptive external similarity to that species (see the above synonym list). The serial sectionings in the course of the present project revealed that our specimens have no subparallel crural plates, the crucial diagnostic features of the genus *Septocrurella* Wisniewska, 1932. On the other

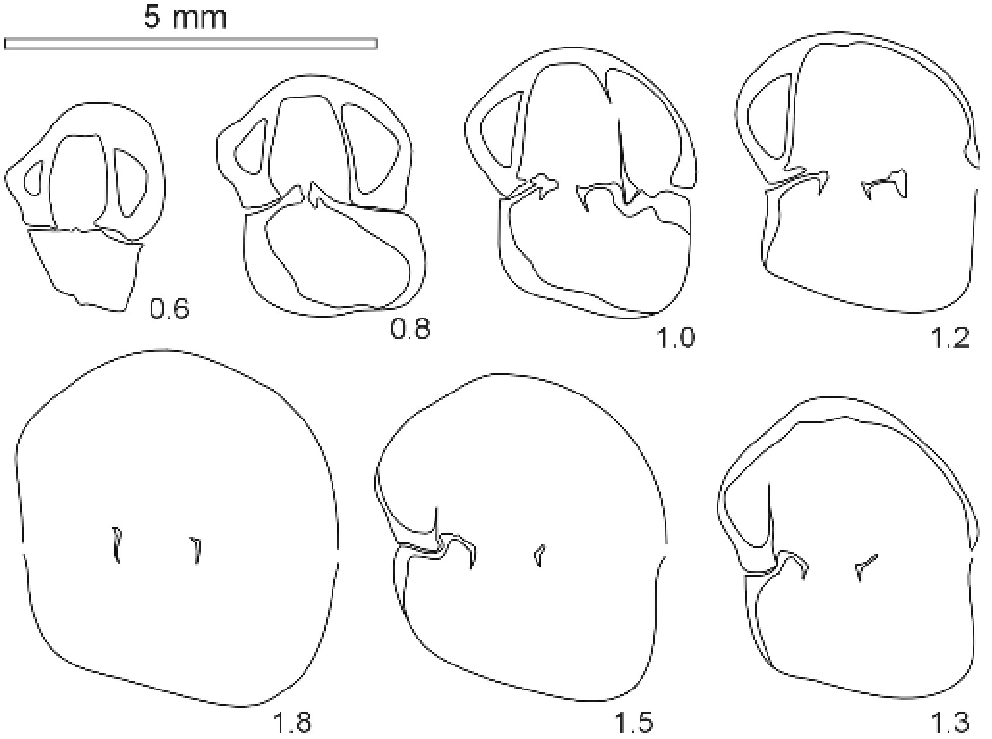


Figure 21. *Fenyveskutella fallax* n. sp. Seven transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. PAL 2023.42.1. (Sectioned paratype). Distances from the ventral umbo are given in mm. Original length of the specimen is 11.4 mm

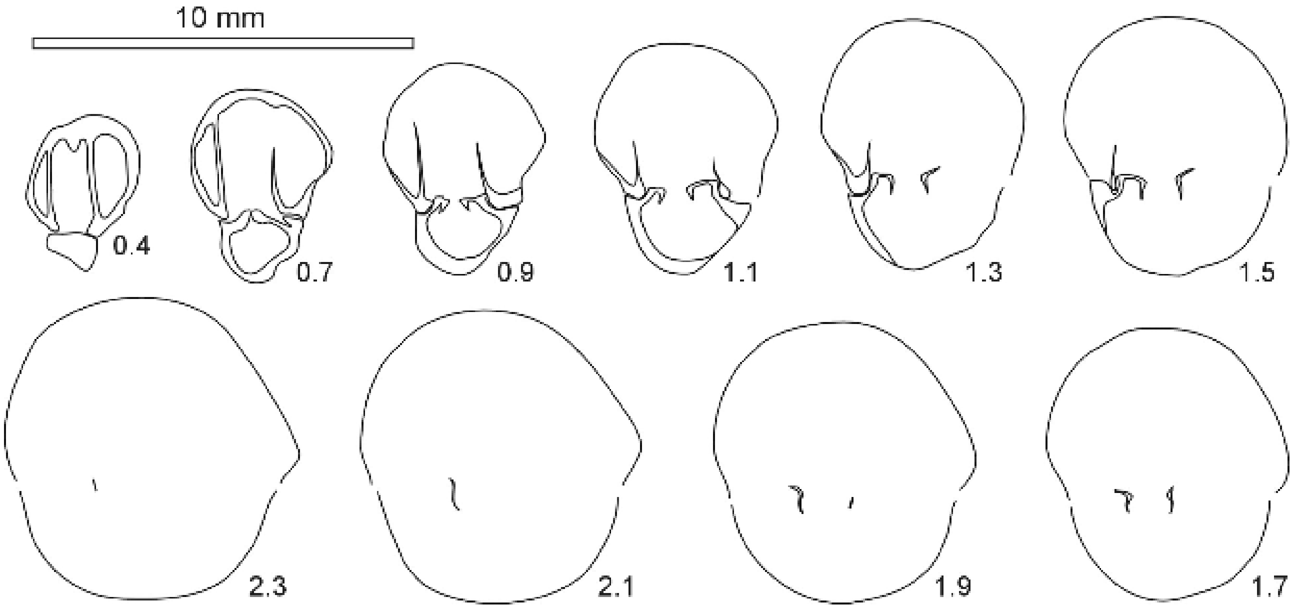


Figure 22. *Fenyveskutella fallax* n. sp. Ten transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. PAL 2023.41.1. (Sectioned paratype). Distances from the ventral umbo are given in mm. Original length of the specimen is 13.4 mm

hand, they share the most important internal features of *Fenyveskutella*. Up to now this genus has been recorded from the Early Jurassic (Pliensbachian) and the attribution of the new species *F. fallax* extends its range to the Middle Jurassic.

Fenyveskutella fallax n. sp. exemplifies a remarkable case of homoeochronous homoeomorphy between Middle Jurassic brachiopods. Its deceptive external similarity to *Septocrurella microcephala* (Parona, 1896) has been a pitfall for the present author for a long time. In this case the homoeomorphy was clarified by the new serial sections of *F. fallax* in the course of the present project, and the comparison to those published by FERRARI & MANARA (1972, p. 272, text-fig. 3) which portrayed the subparallel crural plates in *S. microcephala*. Similarly, these diagnostic internal features were documented by FERRARI (1962, p. 117, text-fig. 5) for the externally very akin *Septocrurella pederzanii* FERRARI, 1962. However, in the earlier literature there are a series of Middle Jurassic rhynchonellide species bearing homoeomorhic appearance (globose, strongly biconvex shells, tiny beak, weak plication, plicosulcate or unisulcate anterior commissure). For example: "*Rhynchonella*" *micula* OPPEL, 1863, "*R.*" *kaminskii* UHLIG, 1878, "*R.*" *hemicostata* PARONA, 1896, "*R.*" *calva* PARONA, 1896. Future studes of their internal features would decide if they belong to *Septocrurella*, *Fenyveskutella* or other genera.

The same goes for the series of plicosulcate forms described and illustrated by DE GREGORIO (1886a, pp. 24–25, pl. 5, figs. 13–28). These forms were published under an array of funny names ("*Terebratula*" *mata, gaza, sbilla, lepa, balfa, mitula, mirga, amilda, fita, spica, spicopsis, spersa, damoni, gisela, raza, tesa*), but probably represent different specimens of a single species. Clearing up this problem will probably be unsolved because the original fossil material of DE GREGORIO, the remains of which are deposited in the Museum G. G. Gemmellaro in Palermo, suffered irreversible damage during the World War II. In this Museum in 2023, the author was confronted with large packing cases full of a complete mixture of DE GREGORIO's material, heaps of bare specimens without boxes or labels, from the Palaeozoic to the Pliocene. Regrettably, no chance seems to separate and identify the Jurassic fossils described (and poorly illustrated) in the monographs by DE GREGORIO.

The specimen figured as *Septocrurella* ? *micula* (OPPEL, 1863) by VÖRÖS & DULAI (2007, pl. III, fig. 9) is here considered as belonging to *Fenyveskutella fallax* n. sp. In fact, the specimen markedly differs from the much wider "*R.*" *micula* (OPPEL, 1863) which, on the other hand, has apparent similarity to the Pliensbachian *Pisirhynchia retroplicata* (ZITTEL, 1869).

Distribution

In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Parkinsoni Zone).

Fenyveskutella ? *paronai* nom. nov.

Plate II: 8

1896 *Rhynchonella latifrons* n. f. – PARONA, Sette Comuni, p. 33, pl. II, figs. 25, 26.
1962 *Rhynchonella latifrons* PARONA – FERRARI, Rovereto, p. 127, pl. IX, fig. 12.

Material

One incomplete specimen from Csókakő, Csóka Hill, southern promontory.

Measurements

Inventory No.	L	W	T	Ch
INV 2023.298.	14.5	14.1	8.3	2.5

Description

External characters: Medium sized *Fenyveskutella* with rounded subtrigonal outline. The lateral margins are gently convex and diverge with an apical angle of about 100°. The maximum width is attained between the middle and the anterior third of the length. The maximum convexity lies near the middle of the length. The ventral valve is moderately, the dorsal valve gently convex. The beak is suberect, tiny and pointed. Due to the fragmentary state of preservation or covering by matrix, the pedicle opening and the delthyrium are not seen. The beak ridges are absent; there are no planareas. In lateral view, the lateral commissures are nearly straight and run diagonally in dorsal direction, where they pass gradually to the anterior commissure, forming a continuous curve. The anterior commissure is weakly unisulcate; the sinus forms a shallow and wide, trapezoidal curve. There is no posterior sulcation; the dorsal sulcus develops only very anteriorly. The valves are completely smooth with no traces of ribbing or plicae.

Internal characters: These were not studied by serial sectioning because of the paucity of the material.

Remarks

PARONA (1896, p. 33, pl. II, figs. 25, 26.) described and illustrated a subtrigonal, smooth rhynchonellide with wide and nearly flat unisulcation, and introduced it as a new species under the name "*Rhynchonella latifrons*". This combination of names was however preoccupied by the senior homonym "*Rhynchonella latifrons* STUR m. s." published by GEYER (1889, p. 54, pl. 6, figs. 25–31.). This frequently recorded taxon became then the type species of the genus *Jakubirhynchia*

TOMASOVYCH, 2007, with the proper authorship *J. latifrons* (GEYER, 1889) (TOMAŠOVÝCH, 2007, p. 213). Nevertheless, when PARONA (1896, l.c.) described the taxon "*Rhynchonella latifrons*", the species name was preoccupied, therefore the replacement name *Fenyveskutella* ? *paronai* nomen novum is introduced here.

Neither the original figure of PARONA, nor the present specimen from Csókakő reveal any details of the internal morphology, consequently the attribution of this taxon is based only its external similarity to *Fenyveskutella* VÖRÖS, 2009.

FERRARI (1962, l.c.) described and figured a specimen under the preoccupied name "*Rhynchonella latifrons* PARONA". In its external morphology, it corresponds well to the figures by PARONA, and to the presently illustrated specimen of *Fenyveskutella* ? *paronai* nom. nov.

Distribution

Middle Jurassic in the Southern Alps. In the Transdanubian Range it occurs in the late Bajocian.

Subfamily Laevirhynchiinae DAGYS, 1974

Genus ***Nannirhynchia*** BUCKMAN, 1918

Type species: *Nannirhynchia subpygmaea* BUCKMAN, 1918

Nannirhynchia subpygmaea BUCKMAN, 1918

Plate II: 9, 10

*1918 *Nannirhynchia subpygmaea*, WALKER MS. – BUCKMAN, Namyau, p. 67, pl. XIX, figs. 1, 2.

Material

31, mostly poorly preserved specimens from Lókút, Papod 82 (1) and Lókút, Lókút Hill (30).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.300.	8.9	8.7	5.6	1.3
INV 2023.299.	10.2	10.1	6.7	2.6

Description

External characters: Small *Nannirhynchia* with subcircular to subpentagonal outline. The lateral margins are convex; therefore, the apical angle can not be measured correctly but it seems to vary around 100°. The maximum width is attained near the middle of the length. The maximum convexity can be measured near the posterior one-third of the length. The ventral valve is uniformly and strongly convex. The posterior part of the dorsal valve is strongly inflated, but the medial portion of its anterior margin is straight or recoiled; this is due to a linguiform extension which is slightly projected anterodorsally. The beak is suberect, very tiny and pointed. The pedicle opening and the delthyrium are covered by matrix. The beak ridges are ill-defined; there are no planareas. The lateral parts are convex, and the lateral commissures usually form a little elevated crest. In lateral view, the lateral commissures are a little arched in dorsal direction, then abruptly curve ventrally and pass to the anterior commissure. The anterior commissure is simply but markedly parasulcate; the sulcation turns to a medial plica which rises well over the plane of the lateral commissures. The medial part of the plica is uniformly arched. The ventral sulcus and dorsal fold develop very anteriorly and produce a dorsally projected linguiform extension. The valves are completely smooth.

Internal characters: These were not studied.

Remarks

This taxon is the type species of the genus *Nannirhynchia* BUCKMAN, 1918. The genus was comprehensively discussed by ALMÉRAS et al. (1995) and further commented by VÖRÖS (2009).

Our specimens correspond rather well to the type species *N. subpygmaea* BUCKMAN, 1918 with simple parasulcate anterior commissure, and differ from the other well known Middle Jurassic species *N. pygmaea* (MORRIS, 1847) with more complicated anterior commissure. The obvious similarity to the Pliensbachian species *N. gemmellaroi* (PARONA, 1880) as illustrated by VÖRÖS (2009) is remarkable.

Distribution

Middle Jurassic in Western Europe. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Niortense Zone).

Superfamily Rhynchonelloidea d'Orbigny, 1847
Family Rhynchonellidae d'Orbigny, 1847
Subfamily Striirhynchiinae Kamyshan, 1968
Genus ***Striirhynchia*** Buckman, 1918
Type species: *Rhynchonella dorsetiensis* Davidson, 1884

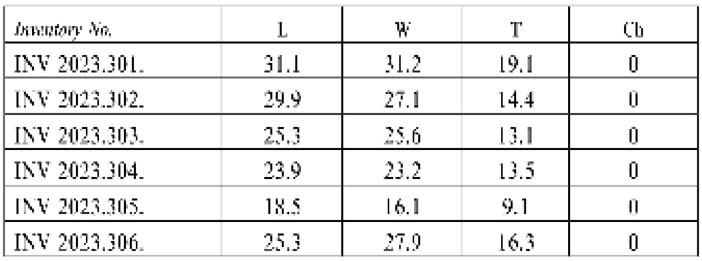
Striirhynchia berchta (Oppel, 1863)
Plate II: 11–16; Figures 23–25

v * 1863 *Rhynchonella Berchta* Opp. – Oppel, Posidonomyen-Gesteinen, p. 207, pl. 5, figs. 7, 8.
v 1884b *Rhynchonella Berchta* Opp. – Di Stefano, Galati, p. 9, pl. I, figs. 1–4.
v 1928 *Rhynchonella Berchta* Opp. – Ruiz, Monte Inici, p. 35, pl. I, figs. 11, 12.
v 1997 *Striirhynchia berchta* (Oppel) – Vörös, Jurassic brachiopods, p. 18, fig. 32.
v 2001 *S. berchta* (Oppel) – Vörös, Bajocian and Bathonian, p. 179, fig. 2/5.
v 2007 *Striirhynchia berchta* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57 (partim), pl. III, figs. 2, 3.
v non 2007 *Striirhynchia berchta* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57 (partim), pl. III, fig. 1.
2008 *Striirhynchia berchta* (Oppel, 1863) – Siblík & Lobitzer, Mitterwand, p. 68, pl. 5, fig. 2.
v 2011 *Striirhynchia berchta* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 176, fig. 3/7, 8.

Material

146, mostly well-preserved specimens from Hárskút, Csapótanya (18), Hárskút, Gyenespuszta IV (4), Lókút, Fenyveskút VIII (103), Gyulafirátót, Szegle (15), Bakonybél, Kőris Hill (3) and Csókakő, Csóka Hill, loose (3).

Measurements



Inventory No.	L	W	T	Cb
INV 2023.301.	31.1	31.2	19.1	0
INV 2023.302.	29.9	27.1	14.4	0
INV 2023.303.	25.3	25.6	13.1	0
INV 2023.304.	23.9	23.2	13.5	0
INV 2023.305.	18.5	16.1	9.1	0
INV 2023.306.	25.3	27.9	16.3	0

Description

External characters: Large *Striirhynchia* with elongated oval to transversely elongated subtriangular outline. The lateral margins are usually straight or gently concave. The apical angle varies from 75° to 100°, increasing but not proportionally with size. The maximum width is attained at around the anterior one-third of the length. The valves are nearly equally and moderately convex; the maximum convexity lies near mid-length in adult specimens, while it is in the posterior one-third in juveniles. The beak is very high, attenuated; straight to suberect. The end of the beak is frequently broken off; therefore, the position of the foramen is not seen. The delthyrium is poorly preserved; usually it forms a wide and high triangle. The blunt beak ridges are restricted to the beaks. The lateral parts are gently convex, and the lateral commissures form a little elevated crest; in some cases, the lateral parts may be depressed. In lateral view, the lateral commissures are almost straight in typical cases. In some specimens the posterior part of the lateral commissures are arched dorsally; in these cases a shallow planarea develops on the ventral valve (Pl. II: 11, 16). The anterior commissure is rectimarginate. The surface of the shells is finely capillate; the strength of the capillation reaches the degree of costulation near the anterior margin. On some decorticated specimens the mantle canal markings are visible (Pl. II: 12).

Internal characters: (Figures 23–25): *Ventral valve*: The delthyrial cavity is subquadrate to subpentagonal in cross-section, with ventral grooves connected with the muscle scars. The umbonal cavities are narrow triangular. The dental plates are divergent ventrally. The pedicle collar variously developed and always closely connected to the dental plates. The hinge teeth are very massive, oblique, and laterally oriented; denticula are well developed. *Dorsal valve*: The cardinal process is crenulated or has a shallow trough. Septalium and dorsal median septum are absent. The inner socket ridges are very high, almost vertical, and only slightly lean over the sockets. The outer hinge plates are absent; the crural bases emerge almost directly from the inner socket ridges. The crural bases are subparallel, blade-like and dorsally oriented. The crura are thin and narrow, in some cases become falcoid in cross section and diverge anteriorly. They may represent the spinuliform type.

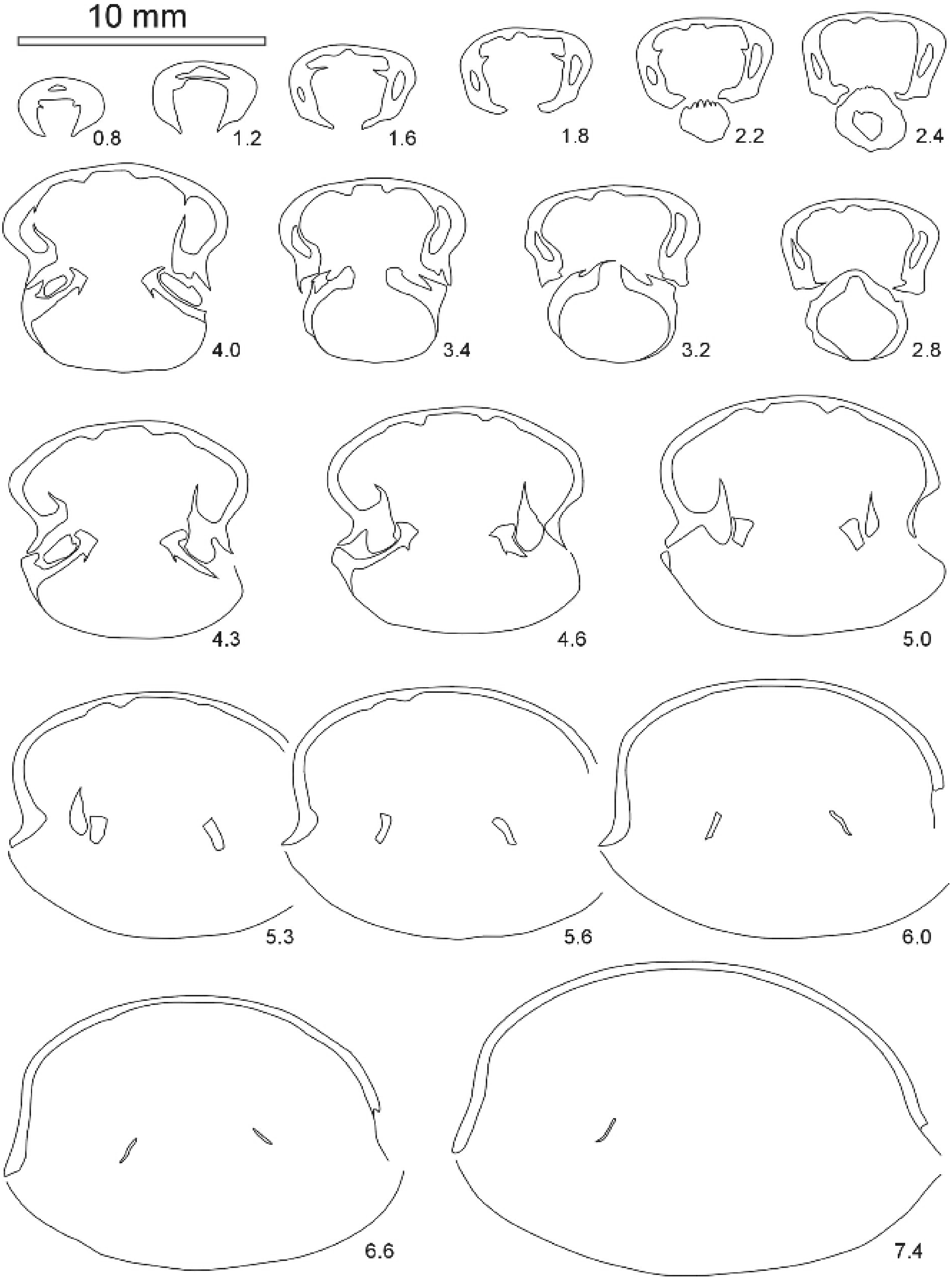


Figure 23. *Striirhynchia berchta* (Oppel, 1863). Eighteen transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.306. Distances from the ventral umbo are given in mm. Original length of the specimen is 25.8 mm

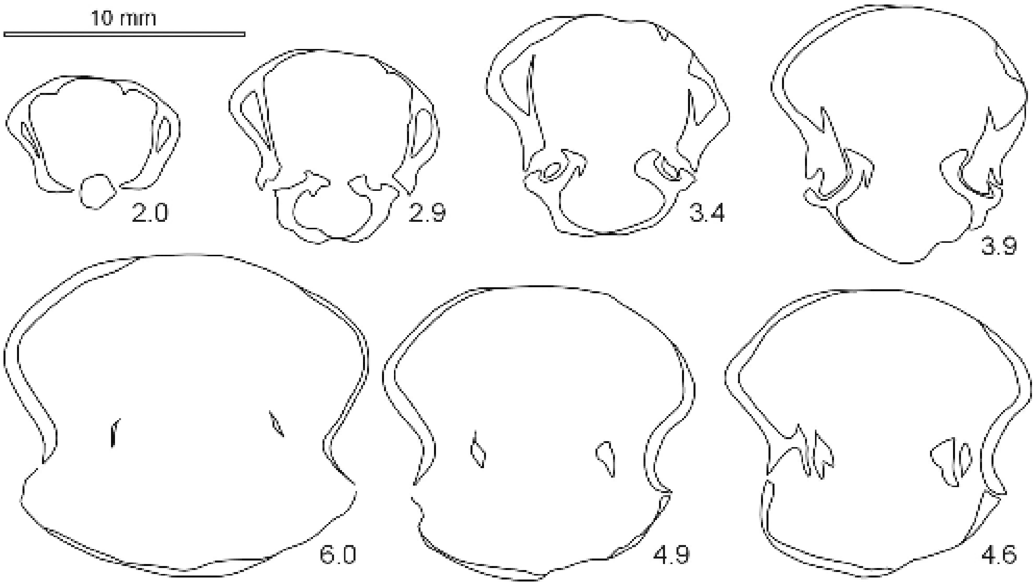


Figure 24. *Striirhynchia berchta* (Oppel, 1863). Seven transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.359. Distances from the ventral umbo are given in mm. Original length of the specimen is 28.1 mm

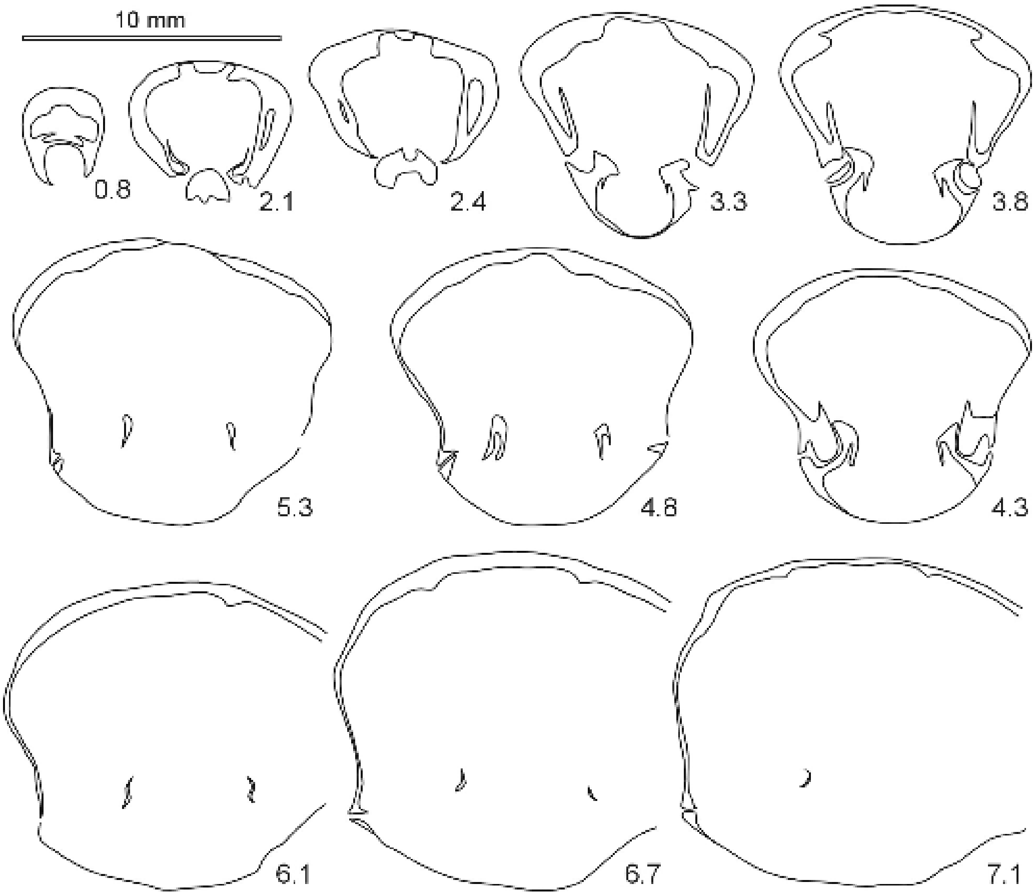


Figure 25. *Striirhynchia berchta* (Oppel, 1863). Eleven transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.360. Distances from the ventral umbo are given in mm. Original length of the specimen is 27.7 mm

Remarks

Considering the plentiful good illustrations of this species, e.g., Oppel (1863, l.c.), Di Stefano (1884b, l.c.), Siblík & Lobitzer (2008, l.c.), Baeza-Carratalá et al. (2011, l.c.), *S. berchta* (Oppel, 1963) is a well-documented and clear-cut species. The original specimens illustrated by Oppel (1863, pl. 5, figs. 7, 8) were inspected by the present author in the collections of the Bayerische Staatssammlung (München) and the identification of the specimens from the Bakony and Vértes Mountains is endorsed.

The generic attribution of this species to *Striirhynchia* Buckman, 1918 is supported by the wide triangular outline, the capillate (striate) ornament and the basic features of the internal morphology: dental plates, widely spaced crural bases, simple (probably arcuiform or spinuliform) crura. The single character, seemingly opposing this generic attribution, is the very high, nearly straight beak of the specimens of *S. berchta*, what is in contrast to the much lower beak of the type specimen of *Striirhynchia*, as illustrated in the "Treatise" (Savage et al. 2002, fig. 855/2).

The specimen illustrated by Ruiz (1928, l.c.) was checked by the present author in the Museum G. G. Gemmellaro in Palermo; it looks like a juvenile specimen of *S. berchta*.

Vörös & Dulai (2007, l.c.) interpreted too widely this species; one of their figured specimens (l.c. pl. III, fig. 1) is categorized as *Striirhynchia microptycha* (Oppel, 1863) in the present work.

Distribution

Middle Jurassic in the Eastern and Southern Alps, Sicily, and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Parkinsoni Zone).

Striirhynchia microptycha (Oppel, 1863)
Plate II: 17, 18; Figure 26

v *1863 *Rhynchonella Berchta* var. *microptycha* – Oppel, Posidonomyen-Gesteinen, p. 207, pl. 5, fig. 9.
v 2007 *Striirhynchia berchta* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57 (partim), pl. III, fig. 1 (only).

Material

38, mostly well-preserved specimens from Hárskút, Csapótanya (35) and Hárskút, Gyenespuszta IV (3).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.307.	23.3	29.2	14.1	4.8
INV 2023.308.	24.2	22.6	13.5	5.3

Description

External characters: Medium to large *Striirhynchia* with variable subtriangular outline from longitudinally to transversely elongated shape. The lateral margins are nearly straight or gently convex. The apical angle varies from 90° to 110° not proportionally with size. The maximum width is attained at around the anterior one-third of the length. The valves are nearly equally and moderately convex; the maximum convexity lies near mid-length. The beak is very high, attenuated; nearly straight to suberect. The end of the beak is frequently broken off; therefore, the position of the foramen is not seen. The delthyrium is poorly preserved; it seems to form a wide and low triangle. The beak ridges are indistinct and restricted to the beaks. The lateral parts are gently convex, and the lateral commissures form a little elevated crest. In lateral view, the lateral commissures are nearly straight. The anterior commissure is uniplicate; the width of the rather high plica exceeds the width of the specimens. The surface of the shells is rather strongly capillate. On a partly decorticated specimen the posterior main branches of the mantle canal markings are visible (Pl. II: 18).

Internal characters (Figure 26): *Ventral valve*: The delthyrial cavity is subquadrate trapezoidal in cross-section, with ventral grooves connected with the muscle scars. The umbonal cavities are narrow triangular. The dental plates are convergent ventrally. The pedicle collar connected to the dental plates. The rudimentary disjunct deltidial plates are dorsally convex. The hinge teeth are very massive; denticula are present. *Dorsal valve*: The cardinal process is poorly seen. Septalium and dorsal median septum are absent. The inner socket ridges are very high and lean over the sockets. The outer hinge plates are absent; the crural bases emerge directly from the inner socket ridges. The crural bases are subparallel, blade-like and dorsally oriented. The crura are thin and narrow, in some cases become crescentic in cross section and diverge anteriorly. The dorsal valve is thickened by secondary callus and reveals deep grooves corresponding to the dorsal adductor scars and the mantle canals.

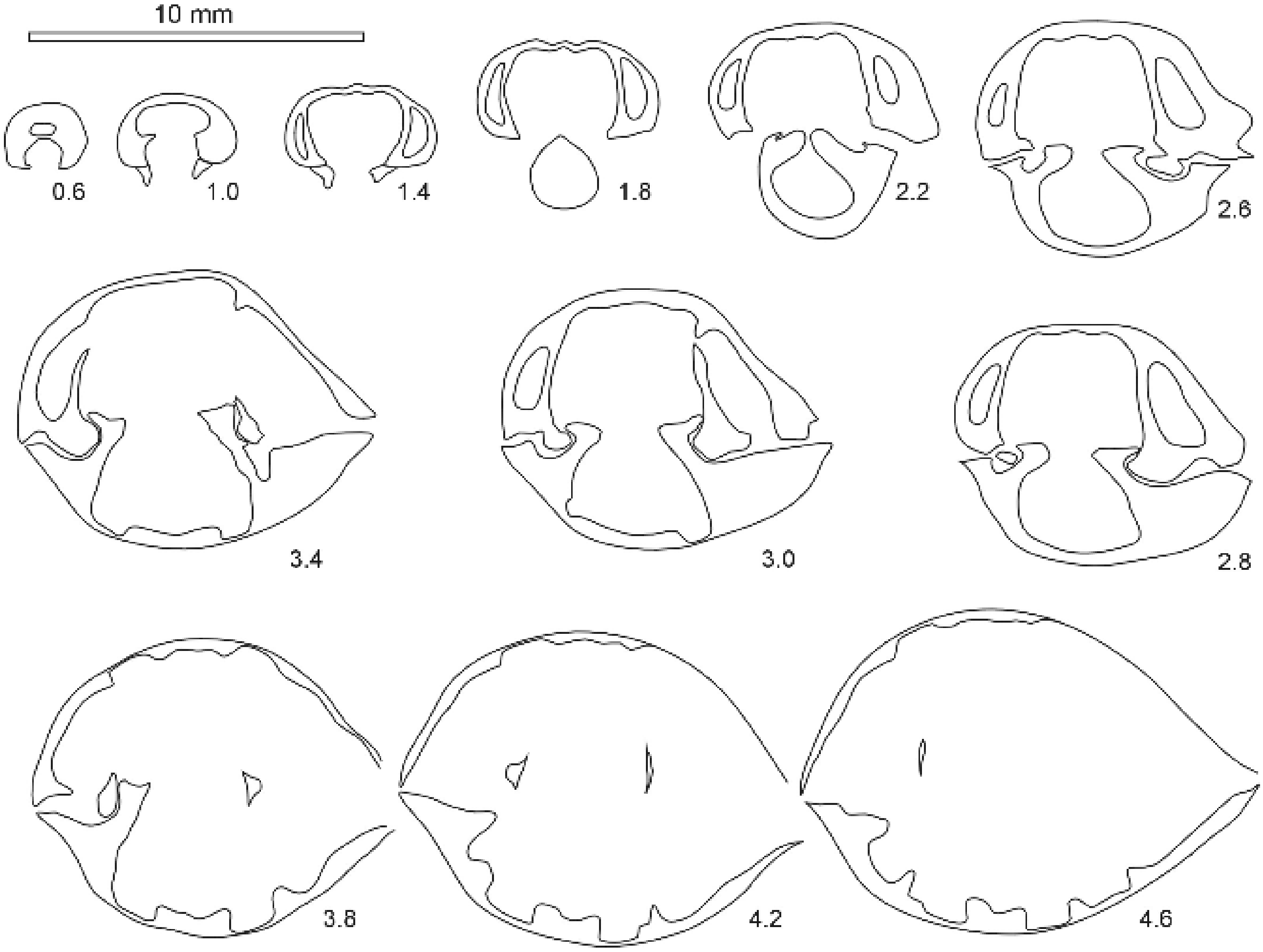


Figure 26. *Striirhynchia microptycha* (Oppel, 1863). Twelwe transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.361. Distances from the ventral umbo are given in mm. Original length of the specimen is 23.5 mm

Remarks

The original specimen of *S. microptycha*, illustrated by Oppel (1863, pl. 5, fig. 9) was inspected by the present author in the collections of the Bayerische Staatssammlung (München) thus the identification of our specimens from the Bakony Mountains is confirmed. Our specimens differ from the type only in their larger size.

Vörös & Dulai (2007, l.c., pl. III, fig. 1) interpreted too widely the species *Striirhynchia berchta* (Oppel, 1863) and wrongly included to this species a clearly uniplicate specimen which in the present work is categorized as *Striirhynchia microptycha* (Oppel, 1863).

Distribution

Middle Jurassic in the Eastern and Southern Alps. In the Transdanubian Range it occurs in the late Bajocian (Parkinsoni Zone).

Striirhynchia subechinata (Oppel, 1863)
Plate II: 19

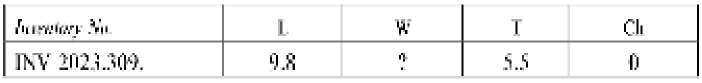
v * 1863 *Rhynchonella subechinata* Opp. – Oppel, Posidonomyen-Gesteinen, p. 211, pl. 6, figs. 8–10.
1892 *Rhynchonella* aff. *subechinata* Oppel. – Böse & Finkelstein, Castel tesino, p. 286, pl. VIII, figs. 3, 4.
non 1928 *Rhynchonella subechinata* Opp. – Ruiz, Monte Inici, p. 28, pl. I, fig. 8.
1956 *Rhynchonella subechinata* Opp. – Książkiewicz, Bachowice, p. 185 (partim), pl. XX, fig. 5, (? fig. 6.).
1966 *Striirhynchia* ? *subechinata* (Oppel, 1863) – Siblík, Kostelec, p. 156, pl. IV, fig. 2.
v 1997 *Striirhynchia subechinata* (Oppel) – Vörös, Jurassic brachiopods, p. 18.
? 1999 *Striirhynchia* cf. *subechinata* (Oppel, 1863) – Wierzbowski et al., Pieniny Klippen Belt, p. 58, fig. 22/1.
v 2001 *Striirhynchia subechinata* (Oppel) – Vörös, Bajocian and Bathonian, p. 179.

non 2003 *Striirhynchia subechinata* (Oppel) – Siblík, Hallstatt, p. 69, pl. I, fig. 15.
2008 *Striirhynchia subechinata* (Oppel, 1863) – Siblík & Lobitzer, Mitterwand, p. 69, pl. 5, figs. 1, 3, 4 (?).
non 2008 *Striirhynchia subechinata* (Oppel, 1863) – Alméras & Fauré, Téthys occidentale, p. 646, pl. V, fig. 10.
v 2011 *Striirhynchia subechinata* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 176, fig. 4/6.
? 2016b *Striirhynchia* cf. *subechinata* (Oppel, 1863) – Sulser, Brachiopoden der Schweiz, p. 154, fig. (unnumbered).

Material

Two partly incomplete specimens from Bakonybél, Som Hill, upper level (1) and Bakonybél, Kőris Hill (1).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.309.	9.8	?	5.5	0

Description

External characters: Small *Striirhynchia*, with rounded and elongated subtrigonal outline. The lateral margins are gently convex. They diverge with an apical angle of about 85°. The maximum width lies at about the anterior one-third of the length. The valves are almost equally convex; the maximum convexity is attained near the middle of the length. The beak is straight to suberect, high and pointed. The pedicle opening and the delthyrium are covered with matrix. There are no discrete beak ridges; planareas are not developed. The lateral commissures are straight and run in the middle of the lateral parts. The anterior commissure is straight and shows numerous weak deflexions. Both valves bear very shallow longitudinal medial depression, however these opposite flattenings do not reach the condition of a sulcus. The anterior two-thirds of the valves are fully costulated by strong capillae. In the medial part the ribs are stronger, and their number remains constant from their origin to the anterior margin; weaker supplementary riblets are added laterally.

Internal characters: These were not studied by serial sectioning because of the paucity of the material.

Remarks

This is the smallest species of the genus *Striirhynchia* and its attribution to this genus is also the less supported, in the absence of the knowledge of the internal features. Remarkably, Kamyshan (1968, pp. 55–57), when introducing the subfamily Striirhynchiinae, definitely excluded Oppel's species *subechinata* from the genus *Striirhynchia*, but as a matter of fact, without any reasoning. Nevertheless, the numerous records of *subechinata* combined with the generic name *Striirhynchia* may give appropriate support of the attribution applied here.

The original specimens of *S. subechinata* illustrated by Oppel (1863, pl. 6, figs. 8–10) were examined by the present author in the collections of the Bayerische Staatssammlung (München) thus the identification of the Bakony specimens is confirmed.

The specimen figured by Ruiz (1928, l.c.) was checked by the present author in the Museum G. G. Gemmellaro in Palermo. It is too large, and its beak is not straight but erect; it may not belong to this species but rather to *S. ucinensis* (Di Stefano, 1884).

Książkiewicz (1956, l.c.) figured two specimens; one of them (l.c. pl. XX, fig. 5) seems to belong to *S. subechinata*; the other (l.c. pl. XX, fig. 6) is too subcircular in outline and the ornamentation is not seen in the figure, therefore its attribution is considered uncertain.

The record by Siblík (2003, l.c.) is also excluded from the synonymy of *S. subechinata* because the illustrated specimen is too coarsely ribbed, and its beak is not straight.

Alméras & Fauré (2008, l.c.) figured a specimen under the name *S. subechinata* but it has a marked uniplication and probably belongs to the genus *Capillirhynchia*.

Some items of the above synonymy list (Wierzbowski et al. 1999, Sulser 2016b) are queried because of the poor preservation of the specimens or the low quality of the illustrations.

Distribution

Middle Jurassic in the Eastern, Western and Southern Alps, Pieniny Klippen Belt, Southern Poland, Sicily, and the Betic Cordilleras. In the Transdanubian Range it occurs in the late Bajocian (Niortense and Garantiana Zones).

Genus ***Capillirhynchia*** Buckman, 1918
Type species: *Rhynchonella wrightii* Davidson, 1852

This genus and its homoeomorphic new taxon *Pseudocapillirhynchia* Motchurova-Dekova, Radulović & Metodiev, 2009 was treated and discussed in detail by Motchurova-Dekova et al. (2009) with special attention on the shell microstructures of the two genera. Their new genus was allocated to the superfamily Pugnacoidea Rzhonsnitskaia, 1956 on the basis of the coarse fibrous shell microstructure and subfalciform crura. On the other hand, the genus *Capillirhynchia* (typified with *C. kardonikensis* Kamyschan, 1968) with fine fibrous shell microstructure and raduliform crura was kept in the superfamily Rhynchonelloidea. Moreover, Motchurova-Dekova et al. (2009, p. 1304) included two species into the new genus *Pseudocapillirhynchia*: the type species *P. platoni*, and perhaps "*Rhynchonella*" *brentoniaca* Oppel, 1863. In the absence of knowledge on its shell microstructure, the possible attribution of the latter species was supported by its allegedly subfalciform crura, mentioned by Vörös (1995, p. 191). However, as a matter of fact, in the serial sections by Vörös (1995, fig. 4) the type of crura of *Capillirhynchia brentoniaca* is not shown at all, and the crura was qualified as prefalcifer type in the text without any evidence. The new serial sections presented here (Figures 27, 28) proved that the crura of the species *brentoniaca* were definitely not subfalciform but were close to the spinuliform type. After all, even without knowledge on its shell microstructure, the species *brentoniaca* is here retained in the genus *Capillirhynchia*.

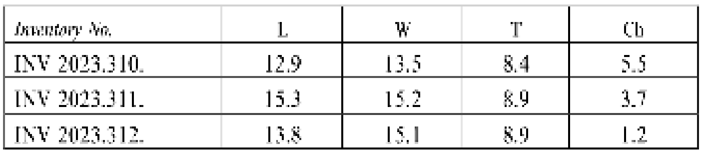
Capillirhynchia brentoniaca (Oppel, 1863)
Plate II: 20–22; Figures 27, 28

*1863 *Rhynchonella Brentoniaca* Opp. – Oppel, Posidonomyen-Gesteinen, p. 215, pl. 7, figs. 12–14.
1878 *Rhynchonella Beneckei* Neumayr 1871 – Uhlig, Juraformation, p. 647, pl. XVII, fig. 7.
1896 *Rhynchonella brentoniaca* Opp. – Parona, Sette Comuni, p. 35, pl. II, figs. 27, 28.
1968 *Capillirhynchia kardonikensis* Kamyschan, sp. nov. – Kamyschan, Capillate rhynchonellids, p. 54, pl. V, figs 3–5, text-fig. 2.
1973 *Capillirhynchia urupensis* Kamyschan, sp. nov. – Kamyschan & Babanova, Caucasus and Crimea, p. 48, pl. IV, figs. 8, 9, text-fig. 9.
1973 *Capillirhynchia vjalovi* Kamyschan, sp. nov. – Kamyschan & Babanova, Caucasus and Crimea, p. 49, pl. IV, figs. 10–13, text-fig. 10.
1973 *Capillirhynchia kardonikensis* Kamyschan, 1968 – Kamyschan & Babanova, Caucasus and Crimea, p. 50, pl. IV, figs. 14–16.
1973 *Capillirhynchia paronai* Kamyschan, nom. nov. – Kamyschan & Babanova, Caucasus and Crimea, p. 99, pl. XI, figs. 10, 11.
1982 *Rhynchonelloidella brentoniaca* (Oppel, 1863) – Benigni et al., Asiago, p. 63, pl. 2, fig. 4.
v 1995 *Capillirhynchia brentoniaca* (Oppel, 1863) – Vörös, Mecsek, p. 190, pl. I, figs. 5, 6; text-fig. 4.
v 1997 *Capillirhynchia ? brentoniaca* (Oppel) – Vörös, Jurassic brachiopods, pp. 17, 18.
v 1997 *Capillirhynchia ? kardonikensis* Kamyschan – Vörös, Jurassic brachiopods, p. 18.
1999 *Capillirhynchia brentoniaca* (Oppel, 1863) – Wierzbowski et al., Pieniny Klippen Belt, p. 58, fig. 22/1.
v 2001 *Capillirhynchia ? brentoniaca* (Oppel) – Vörös, Bajocian and Bathonian, pp. 176, 178, 179.
v 2001 *Capillirhynchia ? kardonikensis* Kamyschan – Vörös, Bajocian and Bathonian, p. 178.
2008 *Capillirhynchia brentoniaca* (Oppel, 1863) – Siblík & Lobitzer, Mitterwand, p. 68, pl. 3, fig. 2.
2016a *Capillirhynchia brentoniaca* (Oppel, 1863) – Sulser, Klippendecke, p. 398, fig. 7c.
2016b *Capillirhynchia brentoniaca* (Oppel, 1863) – Sulser, Brachiopoden der Schweiz, p. 155, fig. (unnumbered).

Material

10, mostly well-preserved specimens from Lókút, Lókút Hill.

Measurements



Inventory No.	L	W	T	Cb
INV 2023.310.	12.9	13.5	8.4	5.5
INV 2023.311.	15.3	15.2	8.9	3.7
INV 2023.312.	13.8	15.1	8.9	1.2

Description

External characters: Medium sized *Capillirhynchia* with rounded subpentagonal to transversely oval outline. The lateral margins are rather convex and diverge with an apical angle from 100° to 110°. The maximum width lies around the middle of the length. The valves are usually almost equally convex; in some cases, the posterior part of the ventral valve is slightly more convex than the dorsal valve. The maximum convexity is attained near the middle of the length. The beak is suberect to erect, cone-shaped and pointed. The pedicle opening is covered by matrix; the delthyrium is not seen. The beak ridges are insignificant, very rounded; planareas are not developed. The lateral surfaces of the double valves are gently convex; the lateral commissures form a little elevated crest. In lateral view, the lateral commissures are nearly straight, and run diagonally in ventral direction, where they join the anterior commissure with a rather blunt angle. The anterior commissure is uniplicate. The shape of the uniplication is variable from a simple, rather high arch to a rather low and wide, trapezium-like curve.

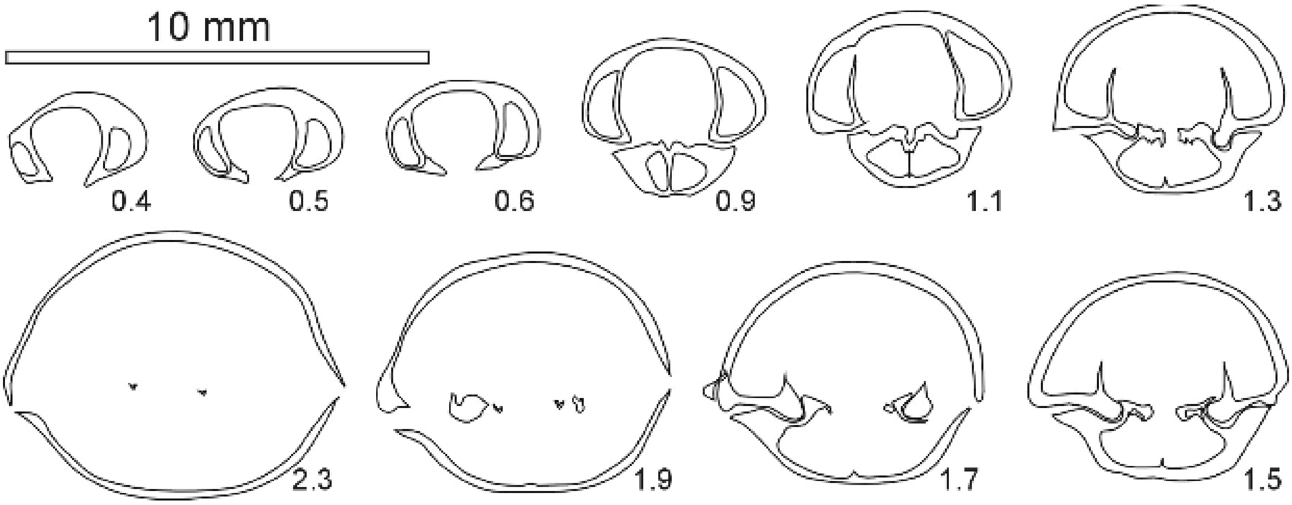


Figure 27. *Capillirhynchia brentoniaca* (Oppel, 1863). Ten transverse serial sections through the posterior part of a specimen from Lókút Hill IV (Lókút), Bed 9, lower Bajocian, Humphriesianum Zone. INV 2023.362. Distances from the ventral umbo are given in mm. Original length of the specimen is 15.0 mm

The width of the arched type of uniplication a little exceeds the half of the total width of the specimen, whereas the trapezoidal type of uniplication may attain the four-fifth of the total width. The valves are ornamented with faint striae and thin, irregularly spaced growth lines. The radial ornamentation is variable. On the majority of the specimens, the thread like striae run through the surface starting from the umbo and increasing in strength anteriorly. In other cases, the radial ornamentation is antidichotomous; near the anterior part of the uniplication the striae merge to form coarse plicae (Pl. II: 21).

Internal characters: (Figures 27, 28): *Ventral valve*: The delthyrial cavity is subquadrate to subpentagonal in cross-section. The umbonal cavities are narrow subtriangular. The dental plates tend to be subparallel. The massive hinge teeth are straight; denticula are present. Pedicle collar was not recorded. The disjunct deltidial plates are dorsally convex. *Dorsal valve*: Cardinal process is not seen. There is a deep and long septalium formed by the steeply inclined inner hinge plates. It is connected to a short, stout median septum which seems to be restricted to the umbonal cavity of the dorsal valve, posterior to the plane of articulation. The outer socket ridges are strong. The inner socket ridges are well-developed, moderately high, and lean over the sockets. The outer hinge plates are very narrow and subhorizontal. The crural bases project dorsally and give rise to very narrow and thin crura, close to the spinuliform type.

Remarks

The original definition of *Capillirhynchia* by Buckman (1918) without proper illustration was not enough informative. The first revision of this genus was given by Kamyschan (1968, p. 53) with detailed descriptions and illustration of the internal features. Four taxa were listed in the species composition of the genus, including a new species *C. kardonikensis* Kamyschan, 1968. Surprisingly, "*R.*" *brentoniaca* Oppel, 1863, apparently very similar to *C. kardonikensis*, was not included to *Capillirhynchia.*

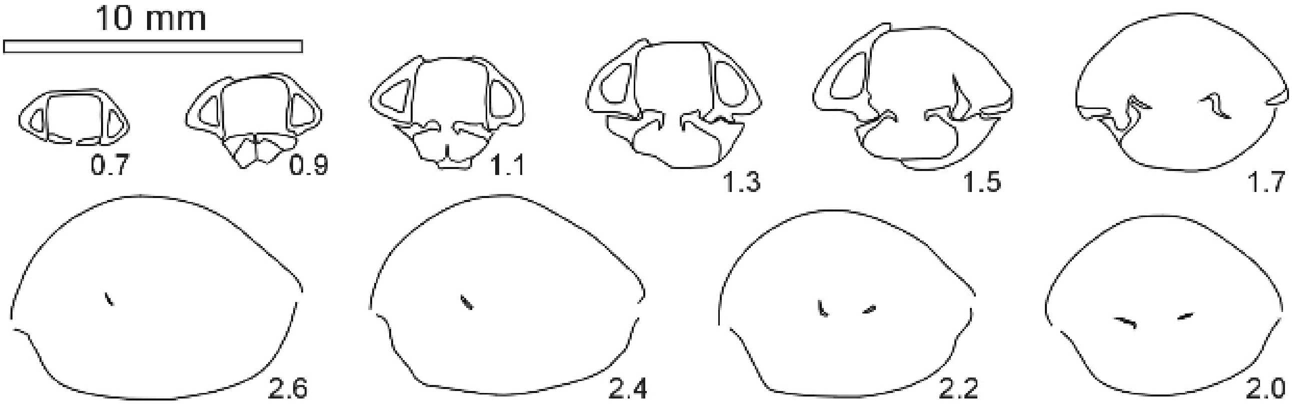


Figure 28. *Capillirhynchia brentoniaca* (Oppel, 1863). Ten transverse serial sections through the posterior part of a specimen from Lókút Hill IV (Lókút), Bed 12, lower Bajocian, Sauzei Zone. INV 2023.363. Distances from the ventral umbo are given in mm. Original length of the specimen is 18.0 mm

Later Kamyschan & Babanova (1973) described some new species of *Capillirhynchia* from the Middle Jurassic of the Caucasus (*C. urupensis, C. vjalovi,*) and the Crimea (*C. paronai*), which do not seem to be essentially different from Oppel's *brentoniaca*. Most remarkably, *C. paronai* was introduced as a new name based on the type of "*Rhynchonella brentoniaca* Opp." described correctly by Parona (1896, p. 35, pl. II, figs. 27, 28). The reason of the substitution of Oppel's species name was not clarified by the authors. Two explanations may be supposed. One is a case of homonymy, i.e., the assumption that Oppel's species name "*R.*" *brentoniaca* was preoccupated by a senior homonym and should be rejected. Neither the classic, nor the recent authors mentioned this kind of homonymy; on the contrary, they widely used and regarded Oppel's species name as valid (see the synonymy). The other explanation is that the morphological interpretation of *Capillirhynchia* by Kamyschan (1968) and Kamyschan & Babanova (1973) was narrow and therefore "*R.*" *brentoniaca* Oppel was not included to *Capillirhynchia* but was considered belonging to another genus.

This species was previously described and well illustrated by Oppel (1863), Parona (1896), Benigni et al. (1982), Vörös (1995) and Siblík & Lobitzer (2008). The original specimen figured by Oppel (1863) as "*R.*" *brentoniaca* was not available in the Bayerische Staatssammlung when the present author visited the collection, but the existing topotypical specimens showed well the main characters of the species. All the previous accounts, listed in the synonymy, and the descriptions and/or figures by Kamyschan (1968) and Kamyschan & Babanova (1973), though attached to different species, show clearly the most important external features, namely the capillation and the anterior ribbing, i.e., the antidichotomous costulation. Considering also the wide variations of the uniplicate anterior commissure from wide and low to narrow and high, *C. brentoniaca* is here interpreted as a widely variable species, probably including many forms previously described as independent species.

The internal morphology of *C. brentoniaca*, and its allies, as illustrated by Ferrari (1962, p. 116), Kamyschan (1968, p. 55), Kamyschan & Babanova (1973, pp. 49, 50) and herein (Figures 27, 28) seems to be rather coherent, with subparallel dental plates, septalium, short median septum, subhorizontal hinge plates and crura of spinuliform type. In the redefinition of *Capillirhynchia* Kamyschan & Babanova (1973, p. 48) also qualified the crura as: "shipovidnye – slabo sporovidnye" (= spinuliform – weakly calcariform).

In the sense of the above discussions the series of *Capillirhynchia* species described from the Caucasus and Crimea are included in the synonym list, portraying the wide variation of *C. brentoniaca* (Oppel, 1863).

The items of *C. kardonikensis* by Vörös (1997, l.c. and 2001, l.c.) refer to specimens now included to the widely interpreted *C. brentoniaca*.

Distribution

Middle Jurassic in the Eastern, Western and Southern Alps, Pieniny Klippen Belt, Mecsek Mountains, Crimea and Great Caucasus. In the Transdanubian Range it occurs from the early Bajocian (Sauzei Zone) to the late Bajocian (Niortense Zone).

Genus ***Neocirpa*** Prozorovskaia, 1985

Type species: *Neocirpa armenica* Prozorovskaia, 1985

Neocirpa armenica Prozorovskaia, 1985

Plate III: 1, 2; Figures 29, 30

*1985 *Neocirpa armenica* Prosorovskaya, sp. nov. – Prozorovskaia, Transcaucasus, p. 111, pl. XIV, figs. 1–17, pl. XXI, fig. 1.

Material

Seven moderately well-preserved specimens from Lókút, Lókút Hill.

Measurements

Inventory No.	L	W	T	Ch
INV 2023.314.	15.9	18.5	10.3	10.1
INV 2023.313.	17.2	20.4	12.5	11.7

Description

External characters: Medium sized *Neocirpa* with a gently subrounded subpentagonal outline. The lateral margins are gently convex to nearly straight and diverge with an apical angle of around 120°. The maximum width can be measured at the middle of the length. The outline in lateral view is rounded rhomboid-like. The dorsal valve is convex posteriorly but

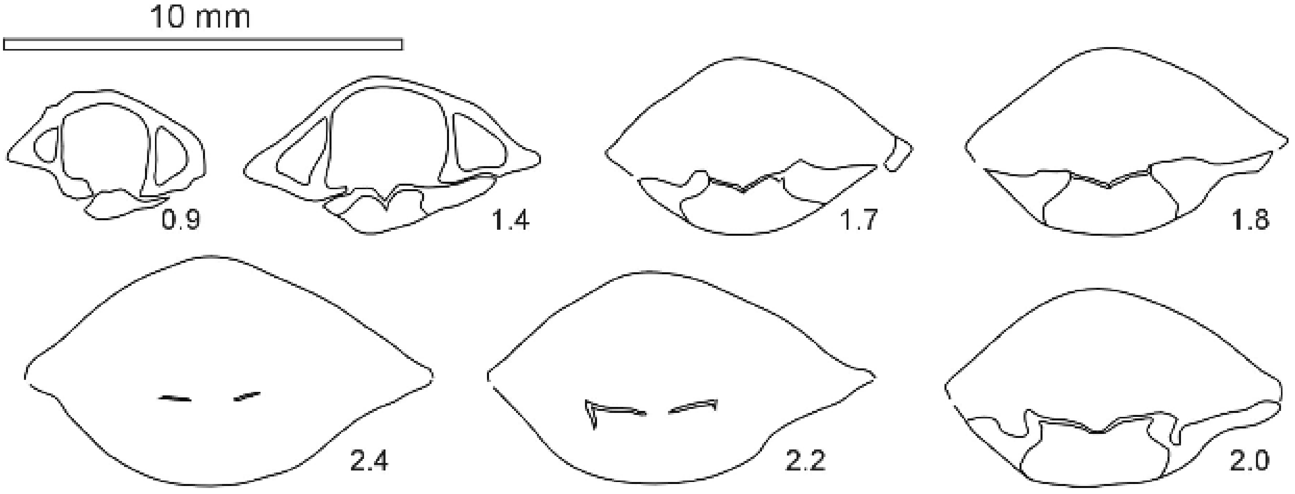


Figure 29. *Neocirpa armenica* Prozorovskaia, 1985. Seven transverse serial sections through the posterior part of a specimen from Lókút Hill IV (Lókút), Bed 1, upper Bajocian, Niortense Zone. INV 2023.364. Distances from the ventral umbo are given in mm. Original length of the specimen is 17.0 mm

flattened anteriorly. The ventral valve is somewhat resupinate: convex in lateral view, but gently concave in anterior view. This is due to a ventral sulcus, starting from the posterior one third of the valve and corresponding to a fold in the dorsal valve. The lateral parts of the double valve appear as wing-like extensions. The beak is rather high and gibbose; erect to slightly incurved. The pedicle opening and the delthyrium are not well seen. There are definite beak ridges in the ventral valve. The lateral surfaces are gently concave; a part of the lateral commissure form an elevated ridge. In lateral view the lateral commissures are nearly straight: they run diagonally to the anterolateral extremities, where they show weak deflections. The anterior commissure is uniplicate and forms a rather high, unbroken arch. It is serrated, usually with 3 to 5 zigzag deflections which increase in strength medially. The umbonal area of the shells is smooth; ribs appear at around the anterior one-third of the length. The ribbing is weak on the lateral flanks but in the central fold and sulcus the costae become very strong towards the anterior margin. The number of costae remains constant (3–5) in the fold, with no bifurcation or intercalation.

Internal characters: (Figures 29, 30): *Ventral valve*: The delthyrial cavity is subquadrate trapezium-like in cross-section; the umbonal cavities are subtriangular. Pedicle collar is present. The deltidial plates are disjunct, dorsally convex. The dental plates are subparallel. The hinge teeth are weak, wide, and almost smooth; denticula are ill-defined. *Dorsal valve*: Cardinal process was not recorded. The outer socket ridges are massive, flat. The inner socket ridges and the base of the hinge plates are thin. The hinge plates rise from the upper end of the inner socket ridges. They are horizontal and united into a coherent plate. The middle portion of the plate bears a groove and forms a septalium-like structure. The median septum is feeble. The crural bases emerge from the medial terminations of the hinge plates. The crura are poorly recorded.

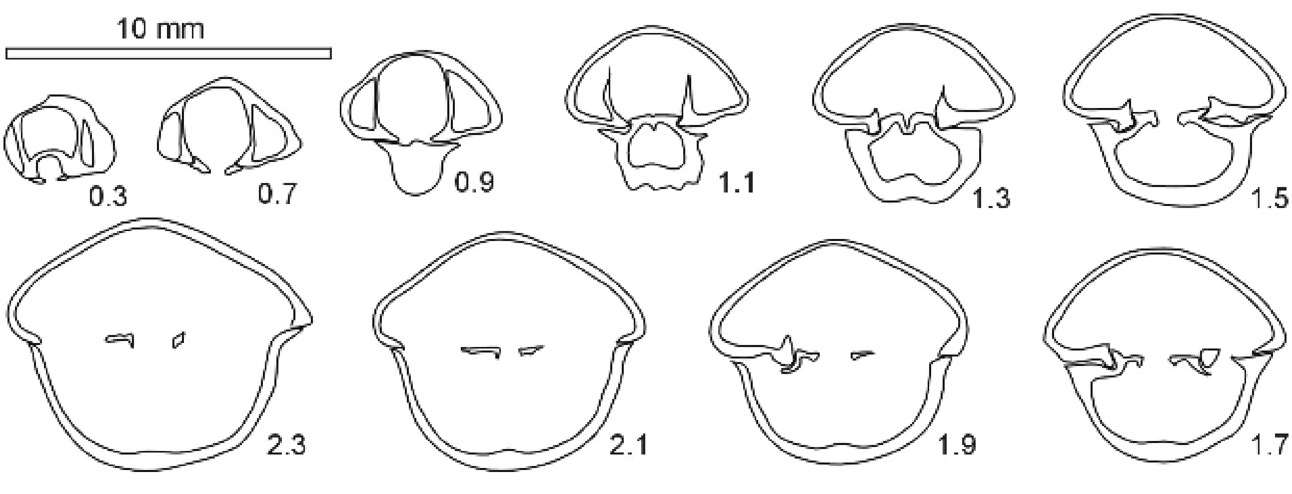


Figure 30. *Neocirpa armenica* Prozorovskaia, 1985. Ten transverse serial sections through the posterior part of a specimen from Lókút Hill IV (Lókút), Bed 3, upper Bajocian, Niortense Zone. INV 2023.365. Distances from the ventral umbo are given in mm. Original length of the specimen is 15.5 mm

Remarks

The specimens from the Niortense Zone of Lókút (Bakony Mountains) bear nearly perfect similarity to the figured specimens of *Neocirpa armenica* published by PROZOROVSKAIA (1985, l.c., from the Subfurcatum = Niortense Zone). The internal features (subparallel dental plates, flat, horizontal hinge plates fused by septalium) fit also well. Thus, the identification of our specimens with *N. armenica* seems justified.

N. nachitschevanica PROZOROVSKAIA, 1985 (PROZOROVSKAIA, 1985, p. 111) does not significantly differ from *N. armenica*.

Distribution

Middle Jurassic (late Bajocian) in Transcaucasus. In the Transdanubian Range it occurs in the late Bajocian (Niortense Zone).

Superfamily Hemithyrididoidea RZHONSNITSKAIA, 1956
Family Cyclothyrididae MAKRIDIN, 1955
Subfamily Cyclothyridinae MAKRIDIN, 1955

Genus ***Galatirhynchia*** n. gen.
Type species: *Galatirhynchia galatensis* (DI STEFANO, 1884)

Diagnosis: Small subtrigonal, flabelliform rhynchonellide; sharply multicostate; hinge margin nearly straight; beak straight, attenuated. Pedicle collar well-developed, dental plates strong, subparallel. Dorsal median septum and septalium absent. Hinge plates reduced; crural bases widely spaced; crura thin, narrow.

Derivatio nominis: After the type locality Galati Mamertino, city in eastern Sicily (Messina Province).

Nominal species:
G. galatensis (DI STEFANO, 1884)
G. baldaccii (DI STEFANO, 1884)

Discussion

The new genus *Galatirhynchia* has very strong external similarity to *Cardinirhynchia* BUCKMAN, 1918, in small size, flabelliform, sharply multicostate shell and almost rectilinear hinge line. The single remarkable external difference is in the nearly straight, attenuated beak of *Galatirhynchia* contrary to the more depressed, suberect beak of *Cardinirhynchia*. The most important diagnostic difference in their internal morphology is the total absence of dorsal median septum in *Galatirhynchia* in contrast to the marked median septum of *Cardinirhynchia*. Further, perhaps less significant features: large and strong pedicle collar and very widely spaced crural bases in *Galatirhynchia.*

It may be mentioned also that the serial sections of *Cardinirhynchia* by SEIFERT (1963) suggest that the sharp ribbing appear on the outer surface of the thick shells, whereas the inner surface is smooth. The sectioned specimens of *Galatirhynchia* (see later Figures 32, 33) reveal thinner and undulating shell walls, i.e., the inner surface of their shells is also weakly rippled.

The absence of the median septum justifies the attribution of *Galatirhynchia* to the subfamily Cyclothyridinae instead of Cardinirhynchiinae.

Galatirhynchia galatensis (DI STEFANO, 1884)
Plate III: 3–7; Figures 31–33

v *1884b *Rhynchonella Galatensis*, DI STEF. – DI STEFANO, Galati, p. 15, pl. I, figs. 28, 29.
? 1900 *Rhynchonella Galatensis* DI-STEF. – GRECO, Monte Foraporta, p. 113, pl. XIII, fig. 5.
v 1928 *Rhynchonella galatensis* DI STEF. – RUIZ, Monte Inici, p. 24, pl. I, fig. 4.
v 1997 *Cardinirhynchia galatensis* (DI STEFANO) – VÖRÖS, Jurassic brachiopods, p. 18, fig. 31.
v 2001 *Cardinirhynchia galatensis* (DI STEFANO) – VÖRÖS, Bajocian and Bathonian, p. 178, fig. 2/3.
v 2007 *Cardinirhynchia galatensis* (DI STEFANO, 1884) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, fig. 10.

Material

106, mostly well-preserved specimens from Hárskút, Csapótanya (87), Hárskút, Gyenespuszta IV (5), Lókút, Fenyveskút VIII (4), Lókút, Fenyveskút N (2), Lókút, Papod 83 (4), Gyulafirátót, Szegle (1), Csókakő, Csóka Hill, southern promontory (1) and Csókakő, Csóka Hill, loose (2).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.315.	9.8	12.7	6.5	0
INV 2023.316.	10.3	11.6	5.9	0
INV 2023.317.	8.9	11.1	5.3	0
INV 2023.318.	10.8	12.1	6.5	0
INV 2023.319.	8.5	11.1	4.7	0

Description

External characters: Medium sized *Galatirhynchia*, with laterally expanded subtrigonal, flabelliform outline. The lateral margins are straight to moderately concave and diverge with an apical angle from 100° to 115°. The maximum width lies near the middle of the length. The valves are almost equally convex; the maximum convexity is attained near the middle of the length. In some cases, the dorsal valve is more inflated posteriorly. The beak is straight to suberect; very high and attenuated. The pedicle opening is covered with matrix; the delthyrium narrow and high. There are blunt beak ridges in the ventral valves; no planareas. In lateral view, the lateral commissures are straight and gently serrated. The anterior commissure is rectimarginate and shows rather sharp zig-zag deflections. The valves are multicostate throughout; the ribs of variable strength and sharpness start at the umbones. Their strength increases anteriorly, and, by bifurcations, their number reaches 10 to 25 at the anterior margin. Measurements taken from 34 specimens of *G. galatensis* (Appendix 3) proved that there is no correlation between the shell size (width) and the number of ribs (Figure 31). Along the anterior margin a frontal flattening is observable in many specimens. This means that the rate of the horizontal growth stopped, and its vector changed to vertical.

Internal characters: (Figures 32, 33): *Ventral valve*: The delthyrial cavity is inverted trapezoidal in cross-section. The umbonal cavities are narrow triangular. The dental plates are divergent ventrally. The pedicle collar is well-developed; occupies almost the whole umbonal cavity. The hinge teeth are massive, vertically inserted; denticula are indistinct. *Dorsal valve*: The cardinal process is smooth. Septalium and dorsal median septum are absent. The inner socket ridges are very high, vertical or oblique and only slightly lean over the sockets. The hinge plates are reduced; the crural bases emerge almost directly from the inner socket ridges. The crural bases are subparallel, thin, and dorsally oriented. The crura are very thin and narrow, slightly converge anteriorly; their distal part was not observed.

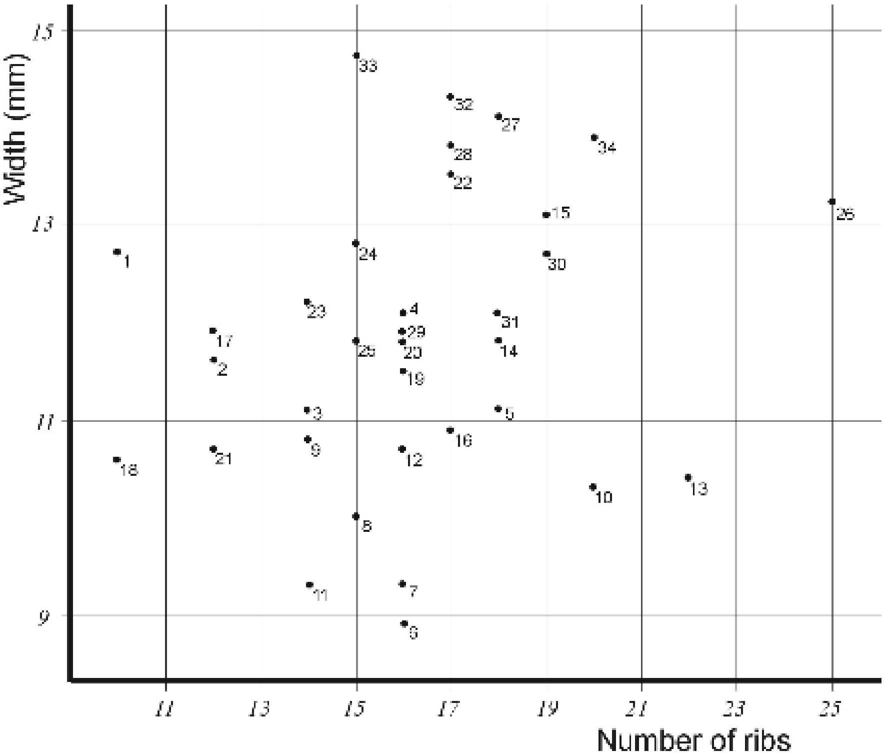


Figure 31. Plot of number of ribs against the width of 34 specimens of *Galatirhynchia galatensis* (Di Stefano, 1884) from a single upper Bajocian locality: Csapótanya (Hárskút). Note the absence of correlation between the two data

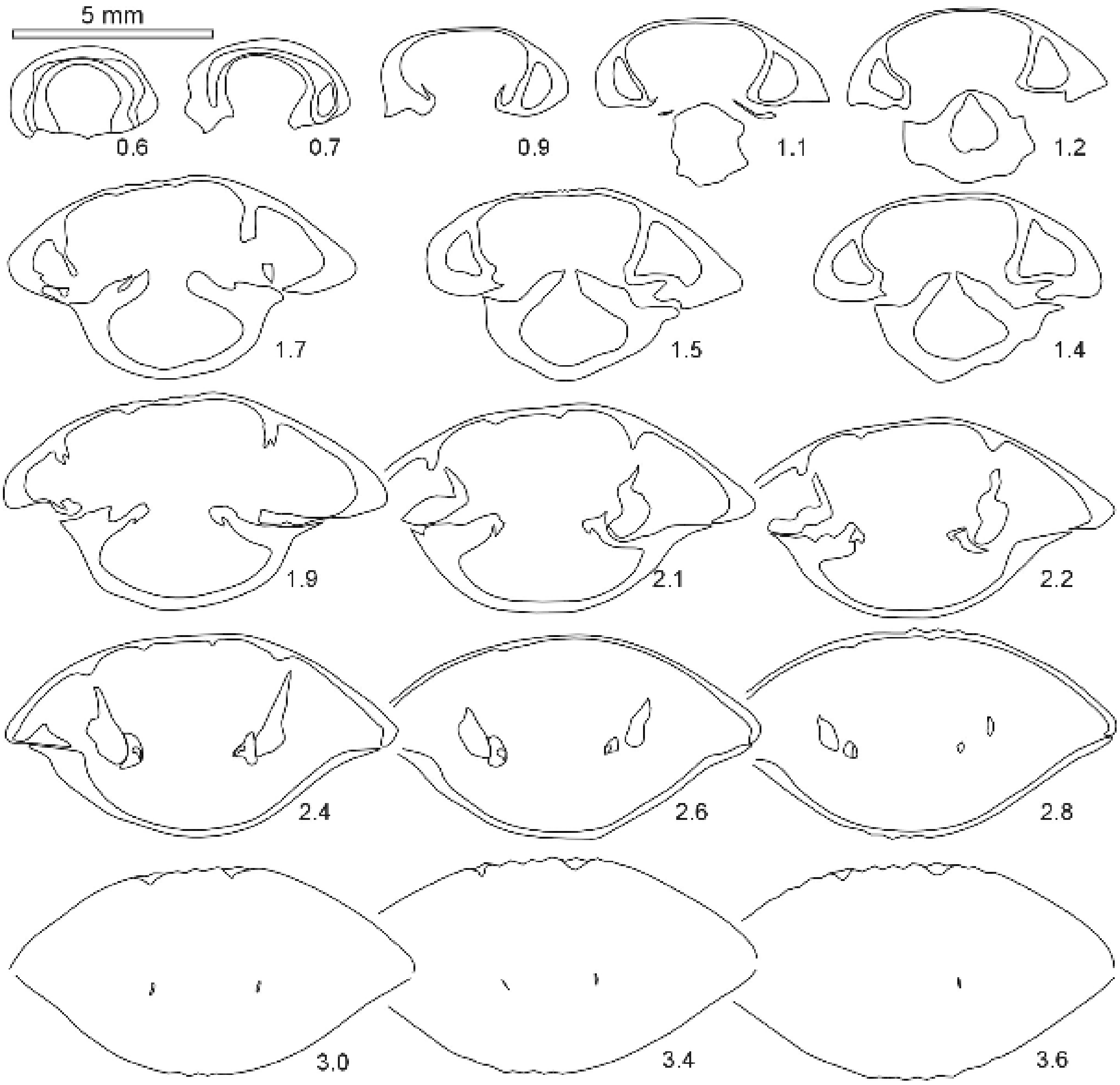


Figure 32. *Galatirhynchia galatensis* (Di Stefano, 1884). Seventeen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.367. Distances from the ventral umbo are given in mm. Original length of the specimen is 10.9 mm

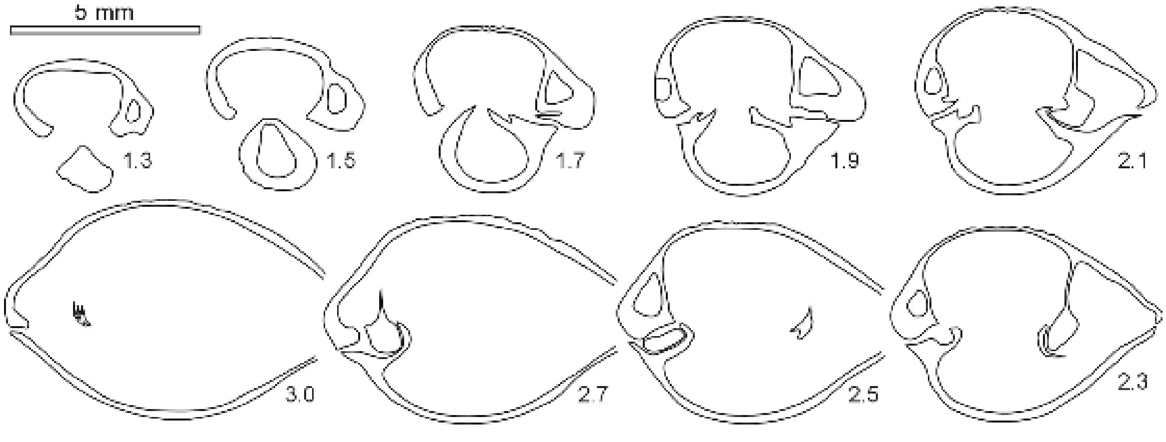


Figure 33. *Galatirhynchia galatensis* (Di Stefano, 1884). Nine transverse serial sections through the posterior part of a specimen from Gyenespuszta (Hárskút), upper Bajocian. INV 2023.366. Distances from the ventral umbo are given in mm. Original length of the specimen is 9.4 mm

Remarks

This is the type species of *Galatirhynchia* n. gen. Previously, without knowledge of the internal features of their material, the species *galatensis* was reasonably but mistakenly placed into the genus *Cardinirhynchia* by Vörös (1997, l.c., 2001, l.c.) and Vörös & Dulai (2007, l.c.).

The original specimens of *G. galatensis* were examined by the author in the Museo Geologico (Università di Palermo) thus the identification of our specimens with Di Stefano's species is warranted. Even the frontal flattening at the anterior margins of some specimens was observable.

A closely related species *G. baldaccii* (Di Stefano, 1884) differs from *G. galatensis* by its very narrow and high uniplication in its anterior commissure.

The specimen illustrated by Greco (1900, l.c.) as "*R. galatensis*" is too much globose with subcircular outline and its beak is broken off, thus this item is queried in the synonymy.

Distribution

Middle Jurassic in Sicily and perhaps in the Southern Apennines. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Parkinsoni Zone).

Order Terebratulida Waagen, 1883
Suborder Terebratulidina Waagen, 1883
Superfamily Dielasmatoidea Schuchert, 1913
Family Zugmayeriidae Dagys, 1963

On the basis of the presence of massive dental plates and the absence of septalium and dorsal median septum, the new genera *Pseudopapodina* and *Paralinguithyris* are here attributed to the family Zugmayeriidae. This action extends the range of this Triassic family to the Middle Jurassic. Besides the difference in their geological ranges, particular morphological features of *Pseudopapodina* n. gen. and *Paralinguithyris* n. gen. seem to justify the erection of two separate subfamilies for the two new genera.

Subfamily **Pseudopapodininae** n. subfam.

Large, elongated oval, flatly biconvex shells; attenuated, straight to suberect beak; rectimarginate commissures. Strong, subparallel dental plates; reduced hinge plates; no dorsal median septum; thin crura; short loop of teloform(?) type with indistinct transverse band.

Genus ***Pseudopapodina*** n. gen.

Type species: *Pseudopapodina laticoxa* (Oppel, 1863)

Diagnosis: Same as for the subfamily.
Derivatio nominis: With reference to the apparent external similarity to the genus *Papodina* Vörös, 1983.
Nominal species:
P. laticoxa (Oppel, 1863)
P. ? *recuperoi* (Di Stefano, 1884).

Discussion

Without the knowledge of its internal morphology, the here designated type species "*R.*" *laticoxa* Oppel, 1863 was tentatively ranked into the genus *Papodina* by Vörös & Dulai (2007) and Baeza-Carratalá et al. (2011, 2014). The serial sectioning done during the present project (see later Figures 34–39) revealed an unexpected internal structure of this species with strong dental plates and a short but complicated loop. These new data justified the introduction of a new genus *Pseudopapodina*, the homoeomorphic counterpart of *Papodina*. On the basis of its particular internal morphology, the new genus was best compared to the members of and ranked to the Triassic family Zugmayeriidae where it deserved to have an own subfamily Pseudopapodininae. This is explained and justified by the distance in geologic time (Triassic versus Middle Jurassic) and the particular type of the loop of *Pseudopapodina*.

The other, tentatively included species *P.* ? *recuperoi* (Di Stefano, 1884) is very similar externally, and possesses dental plates, but detailed information on its internal morphology is lacking because the paucity of material prevented serial sectioning.

Besides the obvious heterochronous homoeomorphy between the terebratulide genera *Papodina* (Pliensbachian) and *Pseudopapodina* (Bajocian), the latter new genus has an apparent resemblance to the Middle Jurassic rhynchonellide genus

Striirhynchia Buckman, 1918. The similarity is particularly obvious to the species *S. berchta* (Oppel, 1983) represented abundantly in the present Bajocian material, portraying a remarkable case of homoechronous homoeomorphy.

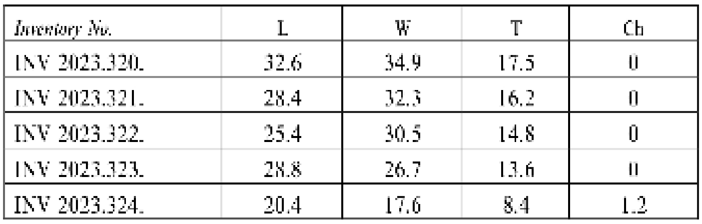
Pseudopapodina laticoxa (Oppel, 1863)
Plate III: 8–12; Figures 34–39

v * 1863 *Terebratula laticoxa* Opp. – Oppel, Posidonomyen-Gesteinen, p. 204, pl. 5, fig. 2.
v non 1928 *Terebratula laticoxa* Opp. – Ruiz, Monte Inici, p. 43, pl. II, fig. 1.
v 1997 „*Terebratula*" *laticoxa* (Oppel) – Vörös, Jurassic brachiopods, p. 18.
v 2001 „*Terebratula*" *laticoxa* (Oppel) – Vörös, Bajocian and Bathonian, p. 178.
v 2007 *Papodina* ? *laticoxa* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 17.
v 2011 *Papodina*? *laticoxa* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 191, fig. 6/2.
2014 *Papodina laticoxa* (Oppel) – Baeza-Carratalá et al., Subbetic, p. 6, fig. 4/12.

Material

131, mostly well-preserved specimens from Hárskút, Csapótanya (104), Hárskút, Gyenespuszta IV (9), Lókút, Fenyveskút VIII (4), Gyulafirátót, Szegle (1), Csókakő, Csóka Hill, southern promontory (6) and Csókakő, Csóka Hill, loose (7).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.320.	32.6	34.9	17.5	0
INV 2023.321.	28.4	32.3	16.2	0
INV 2023.322.	25.4	30.5	14.8	0
INV 2023.323.	28.8	26.7	13.6	0
INV 2023.324.	20.4	17.6	8.4	1.2

Description

External characters: Large *Pseudopapodina* with transversely oval to subtriangular outline. The lateral margins are usually straight or gently convex. The anterior margin forms an almost perfect half-circle. The apical angle varies from 90° to 105°. The maximum width is attained at around the middle or at the anterior one-third of the length. The valves are nearly equally and moderately convex; the maximum convexity lies near the mid-length. The beak is high, attenuated; straight to suberect. The end of the beak is regularly broken off; therefore, the position of the foramen is not seen. The delthyrium is poorly preserved; usually it seems narrow and high. The ventral beak ridges are rather short and blunt. The lateral parts are gently convex. In most cases (Pl. III: 10, 11), along the lateral commissures, the shell margins abruptly curve inward, due to the cessation of longitudinal (outward) growth. This phenomenon is well seen in cross sections (e.g., Figures 34, 36).

In lateral view, the lateral commissures are almost straight. The anterior commissure is rectimarginate. The surface of the shells is almost smooth, except fine irregular growth lines. Weak radial capillation can be observed on some specimens (Pl. III: 10, 12). The substance of the shell is somewhat fibrous or foliaceous, unusual among terebratulides.

Internal characters: (Figures 34–39): *Ventral valve*: The delthyrial cavity is quadratic to trapezoidal in cross-section, with traces of muscle scars on the ventral floor. The umbonal cavities are rounded triangular. Pedicle collar was not recorded. The deltidial plates are very thick, closely disjunct. The dental plates are subparallel. The hinge teeth are massive, inwardly oriented; denticula are well developed. *Dorsal valve*: The cardinal process is formed by a crenulated, concave platform. The outer socket ridges are wide. The inner socket ridges bend well over the sockets. Septalium and median septum are absent. Hinge plates are not developed; the crural bases grow directly from the inner surface of the inner socket ridges. The crura are thin and widely divergent. The loop is short, hardly attains the one third of the length of the dorsal valve, and in one case (Figure 34) is largely masked by secondary callus. In its overall structure the loop may be compared to the diploform or teloform types, with the basic differences that it is short, and a median septum is absent. The descending branches are rather wide and slightly convergent. The ascending branches are narrower and convergent posteriorly; at their posterior end the very narrow transverse band may be resorbed (Figures 35, 38). The distal surface of the loop seems to bear tiny verrucae (Figures 35, 39).

Remarks

The type specimen of *Pseudopapodina laticoxa* figured by Oppel (1863, l.c.) was inspected by the author in the collec-

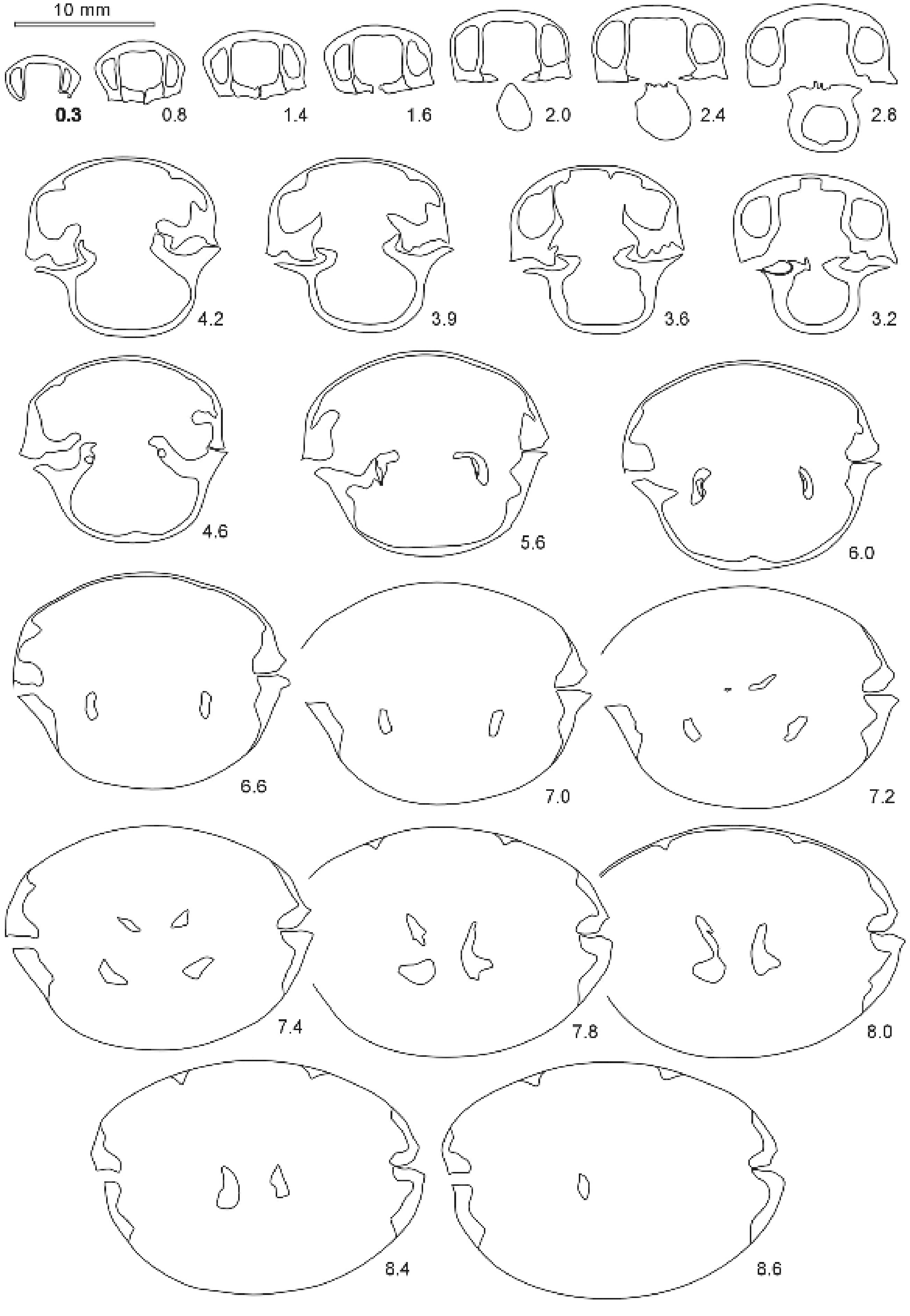


Figure 34. *Pseudopapodina laticoxa* (Oppel, 1863). Twenty-two transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.368. Distances from the ventral umbo are given in mm. Original length of the specimen is 29.3 mm

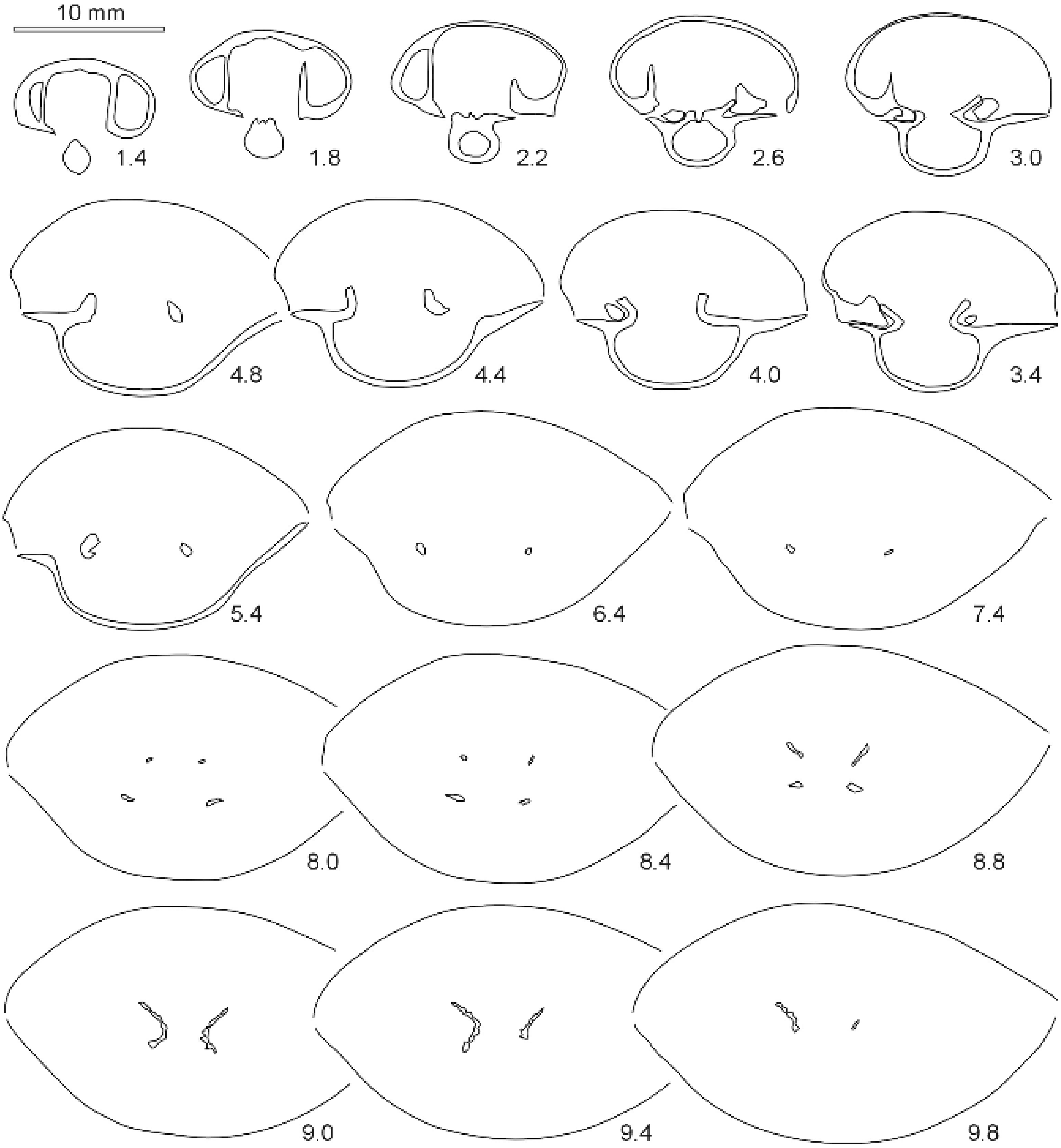


Figure 35. *Pseudopapodina laticoxa* (Oppel, 1863). Eighteen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.369. Distances from the ventral umbo are given in mm. Original length of the specimen is 32.2 mm

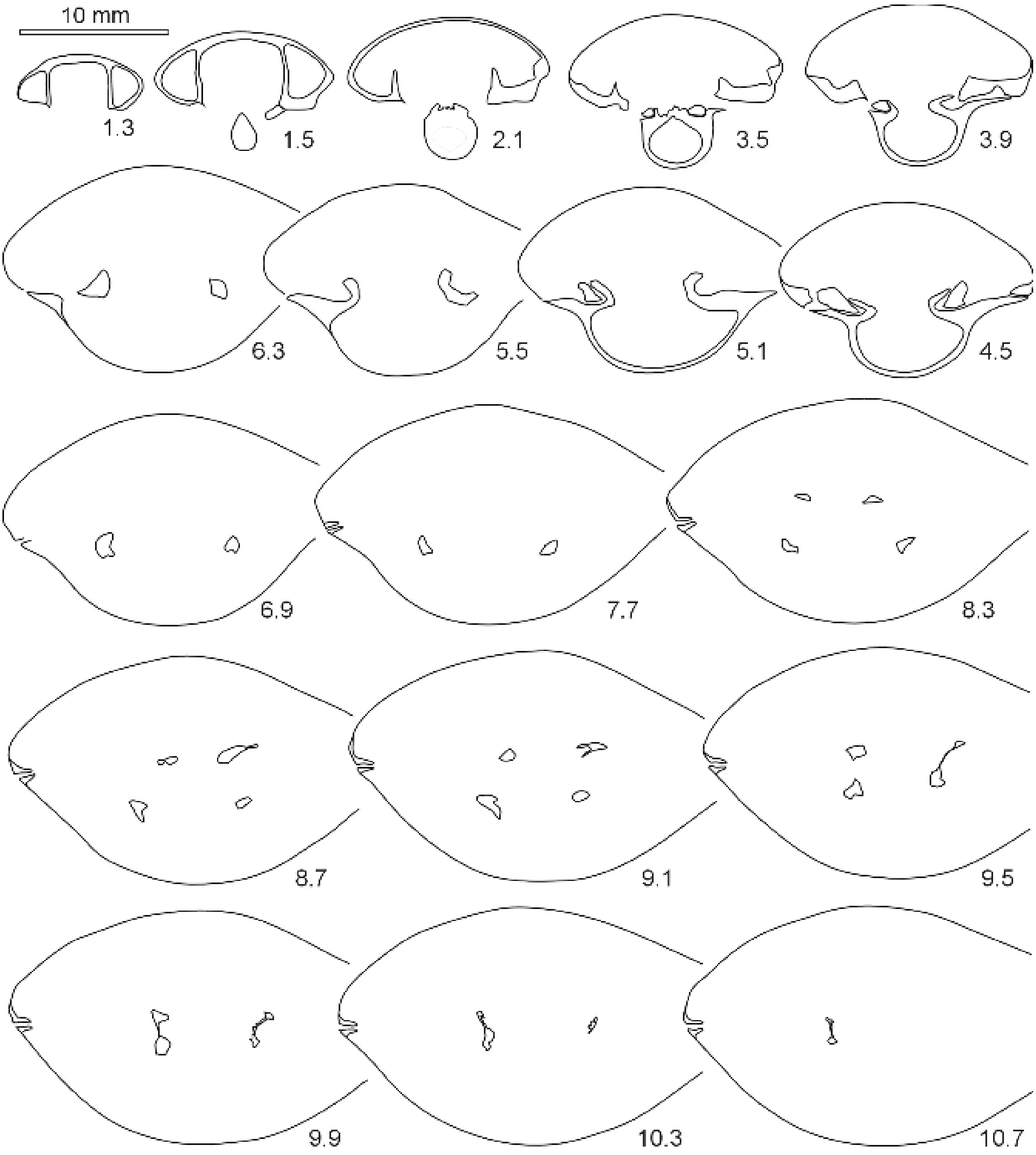


Figure 36. *Pseudopapodina laticoxa* (Oppel, 1863). Eighteen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.370. Distances from the ventral umbo are given in mm. Original length of the specimen is 33.2 mm

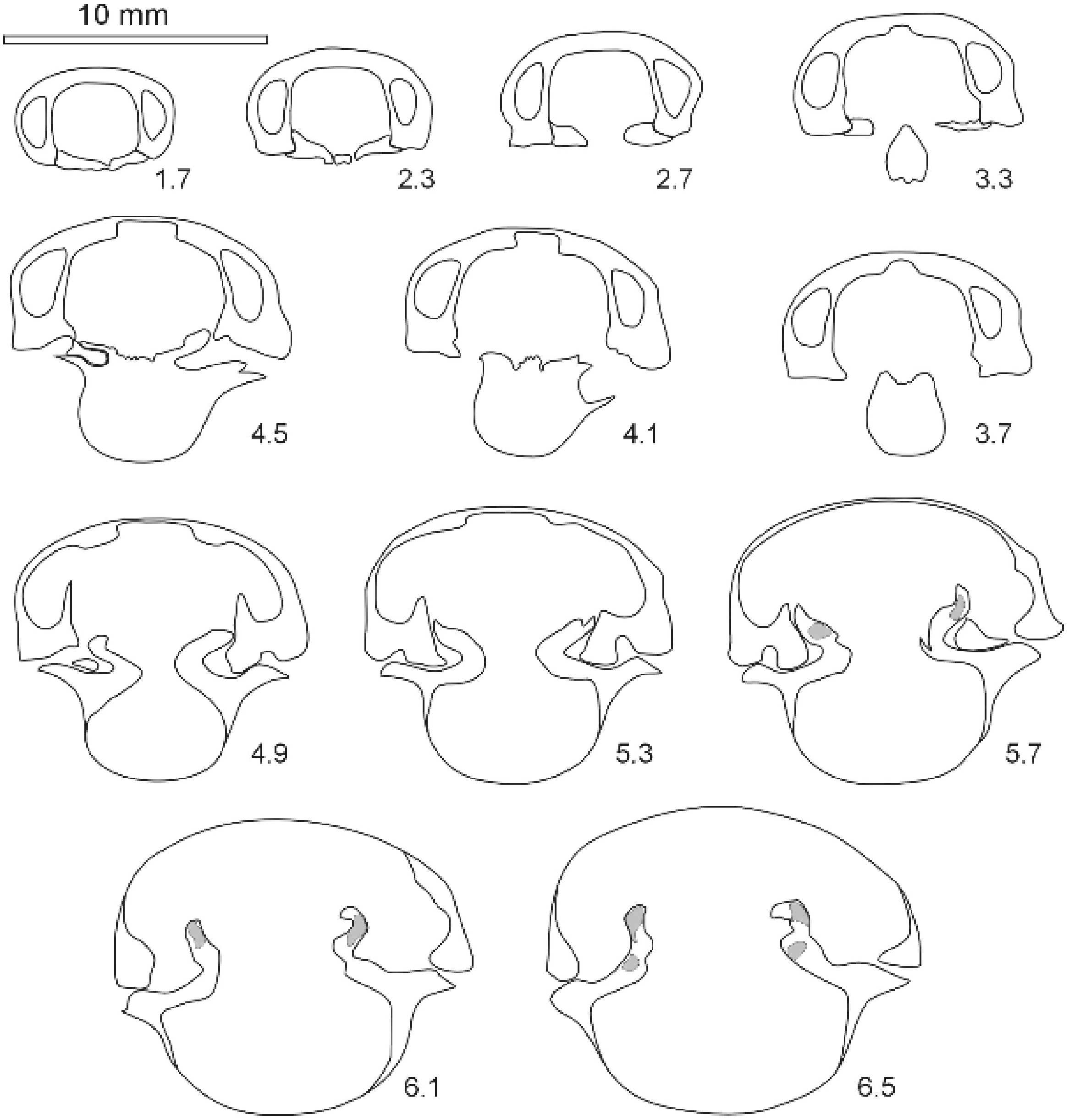


Figure 37. *Pseudopapodina laticoxa* (Oppel, 1863). Twelwe transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.371. Distances from the ventral umbo are given in mm. Original length of the specimen is 33.7 mm

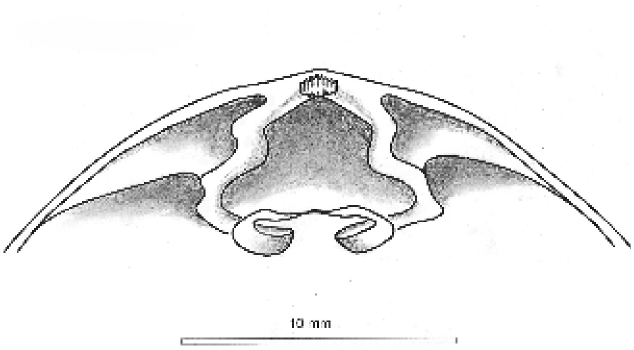


Figure 38. *Pseudopapodina laticoxa* (Oppel, 1863). Csapótanya (Hárskút), upper Bajocian. Ventral view of the dorsal valve interior. Reconstruction based on serial sections from the specimen INV 2023.368 (see Figure 34)

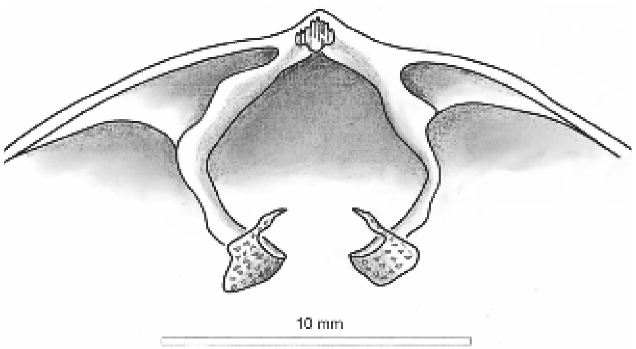


Figure 39. *Pseudopapodina laticoxa* (Oppel, 1863). Csapótanya (Hárskút), upper Bajocian. Ventral view of the dorsal valve interior. Reconstruction based on serial sections from the specimen INV 2023.369 (see Figure 35)

tions of the Bayerische Staatssammlung (München) thus the identification of our specimens is endorsed. Even the characteristic inward curving of the lateral margins of both valves was observable.

The items (illustrations) of the above synonymy list correspond well to the concept of the species *P. laticoxa* except that of Ruiz (1928, l.c.). This specimen was examined by the author in the Museum G. G. Gemmellaro in Palermo; it perhaps rather may belong to *Hajagithyris seguenzae* (Di Stefano, 1887).

Distribution

Middle Jurassic in the Eastern and Southern Alps, Sicily and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Parkinsoni Zone).

Pseudopapodina ? *recuperoi* (Di Stefano, 1884)

Plate III: 13, 14

v *1884b *Terebratula Recuperoi*, Di Stef. – Di Stefano, Galati, p. 18, pl. I, figs. 33–40.
v 1997 *Papodina* ? *recuperoi* (Di Stefano) – Vörös, Jurassic brachiopods, p. 18, fig. 37.
v 2001 *Papodina* ? *recuperoi* (Di Stefano) – Vörös, Bajocian and Bathonian, p. 178, fig. 2/7.
v 2007 *Papodina* ? *recuperoi* (Di Stefano, 1884) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 16.
v 2011 *Papodina*? *recuperoi* (Di Stefano, 1884) – Baeza-Carratalá et al., Eastern Subbetic, p. 191, fig. 6/1.

Material

Three partly incomplete specimens from Hárskút, Csapótanya (1) and Lókút, Fenyveskút VIII (2).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.326.	28.3	?	11.8	0
INV 2023.325.	23.8	18.9	9.7	0

Description

External characters: Small to medium *Pseudopapodina* with very elongated oval to subtriangular outline. The lateral margins are usually straight or gently concave. The apical angle varies from 60° to 70°. The maximum width is attained at around the anterior one-third of the length. The valves are nearly equally and gently convex; the maximum convexity lies near mid-length. The beak is extremely high, attenuated; straight to suberect. The end of the beak is regularly broken off; therefore, the position of the foramen is not seen. The delthyrium is poorly preserved; usually it forms a narrow and high triangle. The ill-defined beak ridges are restricted to the ventral beaks. The lateral parts are gently convex, and the lateral commissures usually form a little elevated crest; in some cases, the lateral parts may be depressed. In lateral view, the lateral commissures are almost straight, or their posterior part may be arched dorsally (Pl. III: 14). The anterior commissure is rectimarginate or very gently unisulcate. The surface of the shells is almost smooth, except growth lines and very fine radial capillation.

Internal characters: These were not studied by serial sectioning because of the paucity of the material. Through the transparent shell of one specimen (Pl. III: 13) the dental plates are seen in the ventral beak.

Remarks

The type specimens of *Pseudopapodina recuperoi* figured by Di Stefano (1884b, l.c.) were inspected by the author in the Museo Geologico (Università di Palermo) thus the identification of our specimens is endorsed.

The items by Vörös (1997, l.c., 2001, l.c.), Vörös & Dulai (2007, l.c.) and Baeza-Carratalá et al. (2011, l.c.) of the above synonymy list correspond well to the present concept of the species *P. recuperoi.*

Distribution

Middle Jurassic in Sicily and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian.

Subfamily **Paralinguithyridinae** n. subfam.

Medium-sized, subtrigonal, sulcate-carinate shells; high, suberect beak; unisulcate commissure. Strong, subparallel dental plates; indistinct hinge plates; no septalium and dorsal median septum; divergent crura; wide, ring-like loop with convergent descending lamellae.

Genus ***Paralinguithyris*** n. gen.

Type species: *Paralinguithyris pygopoides* (Di Stefano, 1884)

Diagnosis: Same as for the subfamily.

Derivatio nominis: With reference to the apparent external similarity to the genus *Linguithyris* Buckman, 1918.

Nominal species:

P. pygopoides (Di Stefano, 1884)
? *P. redii* (Di Stefano, 1884)
? *P. gemmellaroi* (Di Stefano, 1884)
? *P. chydas* (Di Stefano, 1884)

Discussion

In the course of the study of the type material of "*Aulacothyris*" *pygopoides* Di Stefano, 1884 in Palermo in 1980, the present author recognized the dental plates in the broken beaks of some specimens. The dental plates were also observed in the specimens from the Bajocian of the Bakony Mountains; at the same time the attribution of these specimens to the Zeilleriidae was apparently out of question because of the absence of median septum. Therefore, in the previous publications (Vörös 1997, 2001; Vörös & Dulai 2007; Baeza-Carratalá et al. 2011) the respective specimens were ranked into the Triassic genus *Zugmayeria* with question mark. The recently produced serial sections (see later Figures 40–43) reveal particular details of the internal structure of the species *pygopoides* and justified the introduction of the new genus *Paralinguithyris* and the new subfamily Paraliguithyridinae. The ring-like loop of *Paralinguithyris*, grown directly from the inner socket ridges, with frequently resorbed distal termination reminds that of *Papodina* Vörös, 1983, and partly of some cancellothyridid genera, e.g., *Eucalathis* Fischer & Oehlert, 1890, but the presence of massive dental plates render *Paralinguithyris* to the Zugmayeriidae.

The original specimens of some other species of Di Stefano (1884b: *redii, gemmellaroi, chydas*), tentatively included here to *Paralinguithyris,* were also inspected by the present author. They share the main characters of *P. pygopoides* (e.g., the rather attenuated, suberect beak with beak ridges) but the presence of dental plates was not ascertained in the intact specimens. One of them was illustrated by Baeza-Carratalá et al. (2011, fig. 3/3) under the name *Viallithyris*? *redii* but without any information on the internal features.

Paralinguithyris pygopoides (Di Stefano, 1884)

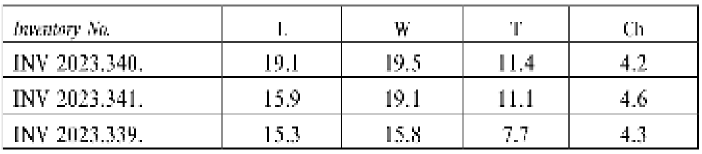
Plate V: 2–4; Figures 40–43.

v *1884b *Aulacothyris pygopoides*, Di Stef. – Di Stefano, Galati, p. 26, pl. II, figs. 27, 28.
v 1997 *Zugmayeria ? pygopoides* (Di Stefano) – Vörös, Jurassic brachiopods, p. 18, fig. 36.
v 2001 *Zugmayeria ? pygopoides* (Di Stefano) – Vörös, Bajocian and Bathonian, p. 178, fig. 2/10.
v 2007 *Zugmayeria ? pygopoides* (Di Stefano, 1884) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 20.
v 2011 *Zugmayeria*? *pygopoides* (Di Stefano, 1884) – Baeza-Carratalá et al., Eastern Subbetic, p. 186, fig. 6/4.

Material

19 variously preserved specimens from Lókút, Fenyveskút VIII (18) and Csókakő, Csóka Hill, loose (1).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.340.	19.1	19.5	11.4	4.2
INV 2023.341.	15.9	19.1	11.1	4.6
INV 2023.339.	15.3	15.8	7.7	4.3

Description

External characters: Medium sized *Paralinguithyris* with rounded subtriangular outline. The lateral margins are usually straight to gently concave; the anterior margin is bilobate. The apical angle varies from 85° to 90°. The maximum width is attained near the anterior third of the length. The valves are moderately and equally convex. The maximum convexity lies near mid-length. The beak is very high, suberect; other details of the beak, foramen and delthyrium can not be recorded due to the poor preservation. There are weak, blunt beak ridges in both valves, delimiting shallow planareas. In lateral view, the lateral commissures are nearly straight, gently sinuous. The anterior commissure is distinctly unisulcate in its medial portion. A well marked and narrow sulcus starts near the umbo of the dorsal valve and runs to the anterior margin. The corresponding ventral fold is less accentuated and mostly appears only anteriorly. The surface of the shells is almost smooth, except fine growth lines and thin capillae.

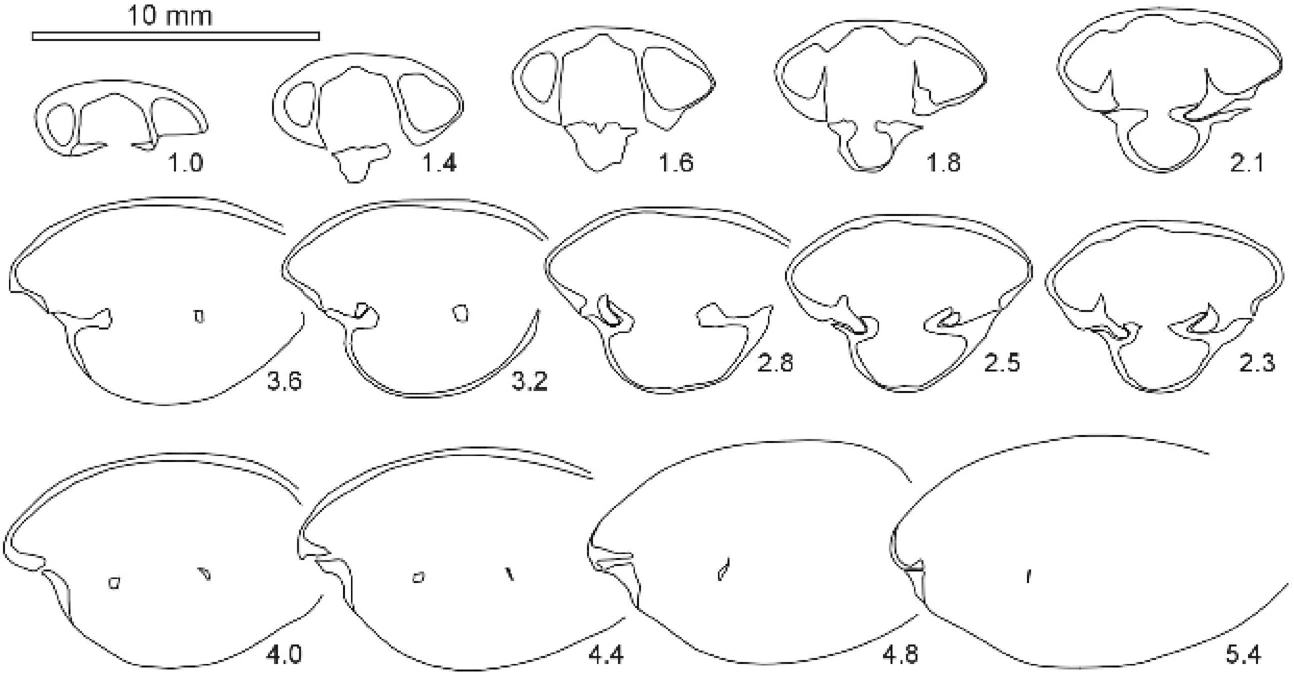


Figure 40. *Paralinguithyris pygopoides* (Di Stefano, 1884). Fourteen transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.372. Distances from the ventral umbo are given in mm. Original length of the specimen is 16.0 mm

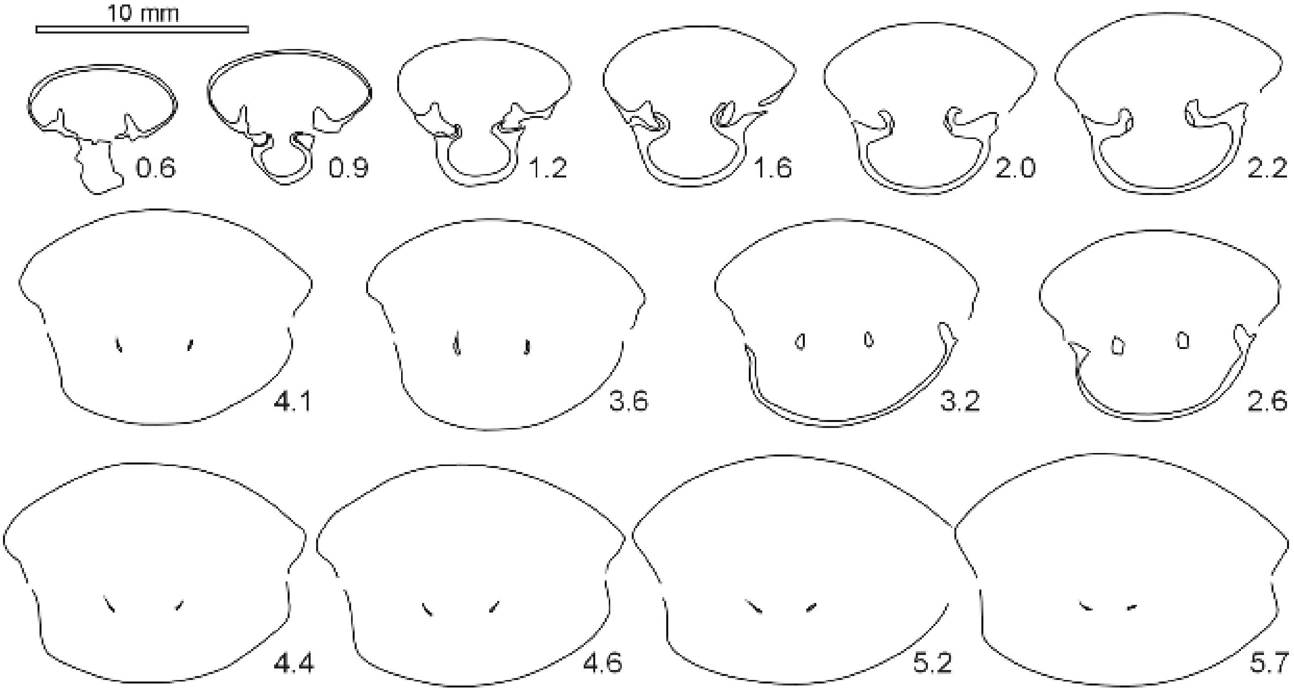


Figure 41. *Paralinguithyris pygopoides* (Di Stefano, 1884). Fourteen transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.373. Distances from the ventral umbo are given in mm. Original length of the specimen is 17.5 mm

Internal characters: (Figures 40–43): *Ventral valve*: The delthyrial cavity is quadratic in cross-section, with traces of muscle scars on the ventral floor. The umbonal cavities are rounded triangular. Pedicle collar was not recorded. The deltidial plates are poorly seen. The dental plates are subparallel to slightly convergent ventrally. The hinge teeth are massive, inwardly oriented; denticula are present. *Dorsal valve*: The cardinal process is flat and gently crenulated. The outer socket ridges

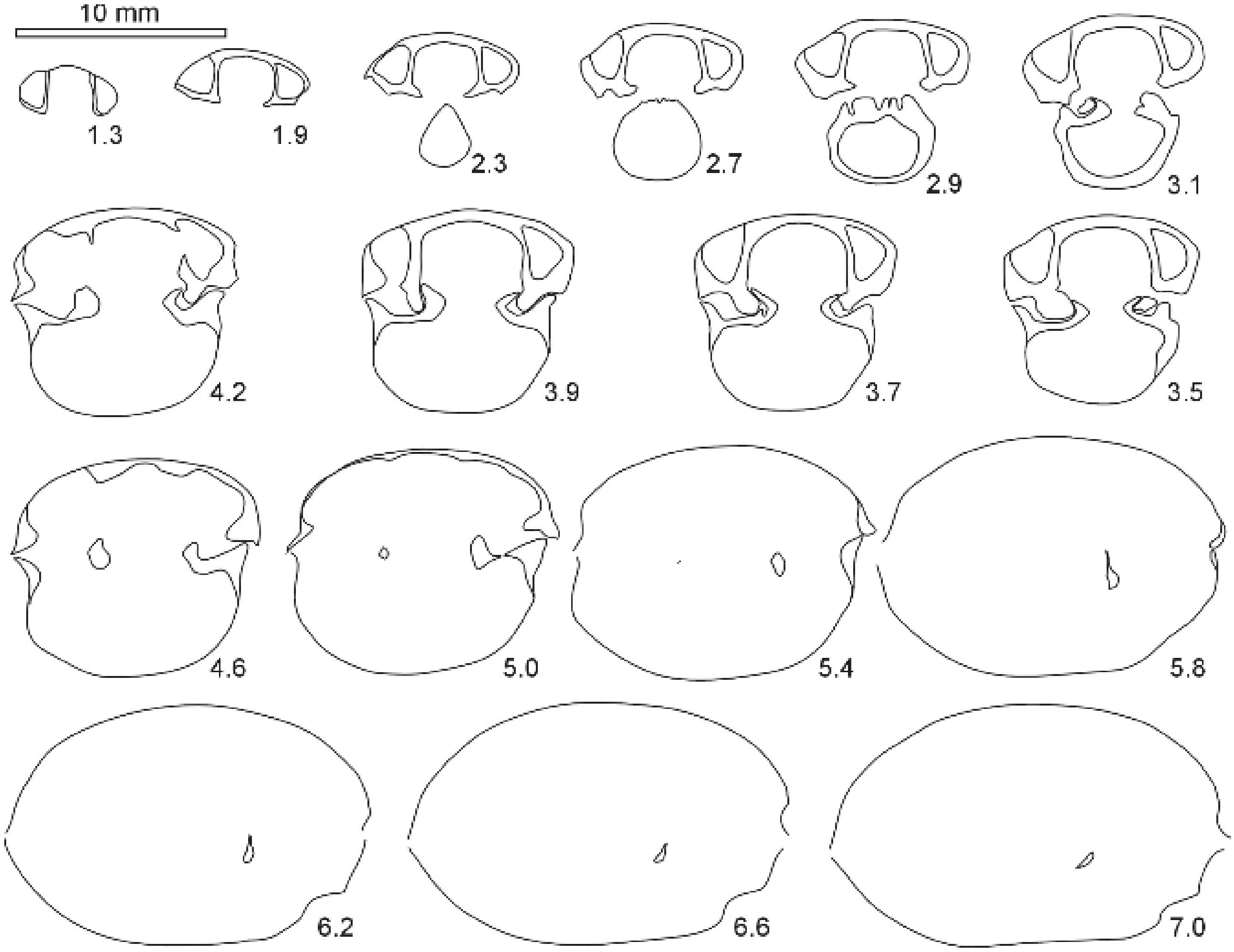


Figure 42. *Paralinguithyris pygopoides* (Di Stefano, 1884). Seventeen transverse serial sections through the posterior part of a specimen from Fenyveskút VIII (Lókút), lower Bajocian. INV 2023.374. Distances from the ventral umbo are given in mm. Original length of the specimen is 15.8 mm

are wide. The inner socket ridges lean well over the sockets. Septalium and median septum are absent. Hinge plates are not developed; the crural bases grow directly from the inner socket ridges. The crura are widely divergent; the crural processes are low and somewhat crescentic in cross-section. The loop is wide, ring-like, with rapidly convergent thin descending lamellae. The transverse band is not preserved (probably resorbed).

Remarks

The type specimens of *Paralinguithyris pygopoides* figured by Di Stefano (1884b, l.c.) were inspected by the author in the Museo Geologico (Università di Palermo) therefore the identification of our specimens is justified.

The items of the above synonymy list (Vörös 1997, l.c.; 2001, l.c.; Vörös & Dulai 2007, l.c.; Baeza-Carratalá et al. 2011, l.c.) correspond well to the present concept of the species *P. pygopoides.*

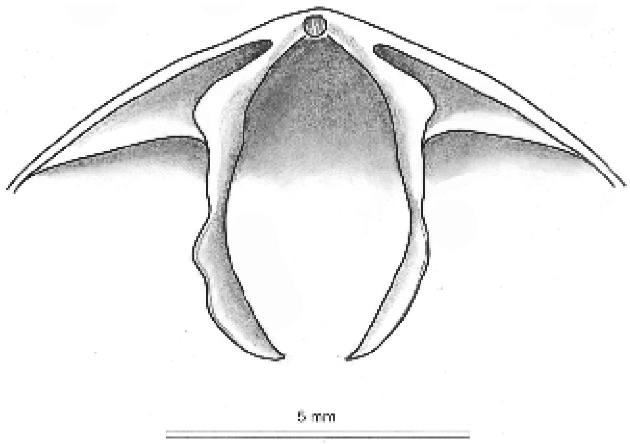


Figure 43. *Paralinguithyris pygopoides* (Di Stefano, 1884). Fenyveskút VIII (Lókút), lower Bajocian. Ventral view of the dorsal valve interior. Reconstruction based on serial sections from the specimen INV 2023.373. (see Figure 41)

Distribution

Middle Jurassic in Sicily and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian.

Superfamily Loboidothyridoidea Makridin, 1964
Family Muirwoodellidae Tchorszhevsky, 1974
Subfamily Karadagithyridinae Tchorszhevsky, 1974

In the revised Treatise (Lee et al. 2006) this subfamily contains two genera *Karadagithyris* and *Karadagella*. They appear as externally very similar and seem to differ only internally in the development of their crural plates. Even this feature is rather vaguely defined by Lee et al. (2006, p. 2106); for *Karadagithyris*: "hinge plate processes [= crural plates] … resting on valve floor only apically.", and for *Karadagella*: "crural plates … in early ontogeny resting on dorsal valve floor, becoming free in later stages." The above two definitions, describe similar or nearly the same circumstance. This uncertainty might lead some authors to wrong decision between *Karadagithyris* and *Karadagella,* e.g., Vörös (2013, p. 384) mistakenly placed his new Oxfordian species *szentei* to *Karadagella*, instead of *Karadagithyris*.

However, the original distinction between the two genera, given in their diagnoses by Tchorszhevsky (1974, p. 54, regrettably only in Russian), is very clear. For *Karadagella*: "The processes of the outer hinge plates *do not rest* on the floor of the dorsal valve". For *Kardagithyris*: "The strongly developed processes of the outer hinge plates *rest* on the floor of the dorsal valve". This principle was rightly used by Tchorszhevsky & Radulović (1984) and Vörös (1995) and is applied also here.

The content of the subfamily Karadagithyridinae was enlarged by Vörös (2022, p. 47) with the insertion of the Late Jurassic genus *Svaljavithyris* Tchorszhevsky, 1989. The subfamily is here further complemented with the inclusion of the new genus *Hajagithyris*.

Genus ***Karadagithyris*** Tchorszhevsky, 1974
Type species: *Karadagithyris babanovae* Tchorszhevsky, 1974

Following the original definition of *Karadagithyris* by Tchorszhevsky (1974, p. 54) i.e., that the crural plates rest on the dorsal valve floor; the next three species are attributed to this genus: *K. gerda* (Oppel, 1863), *K. erycina* (Gemmellaro, 1877) and *K.* aff. *dolhae* (Szajnocha, 1882).

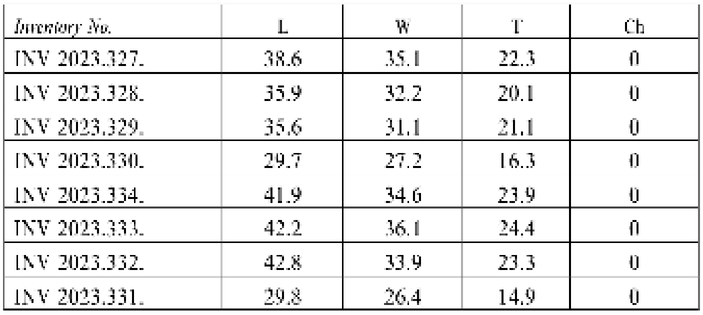
Karadagithyris gerda (Oppel, 1863)
Plate III: 15–18, Plate IV: 1–4, 8; Text-figures 44–46

v * 1863 *Terebratula Gerda* Opp. – Oppel, Posidonomyen-Gesteinen, p. 204, pl. 5, fig. 1.
v ? 1877 *Terebratula Gerda*, Opp. – Gemmellaro, Zona con Posidonomya alpina, p. 75.
v 1877 *Terebratula Phryne*, Gemm. – Gemmellaro, Zona con Posidonomya alpina, p. 78 (partim), pl. IVbis, fig. 9.
? 1899 *Terebratula Gerda* Oppel. – Simionescu, Rucăr, p. 226, pl. II, fig. 8; pl. III, fig. 15.
? 1928 *Terebratula Hungarica* Suess. – Ruiz, Monte Inici, p. 45, text-fig. 1.
v ? 1928 *Waldheimia cadomensis* Deslong. – Ruiz, Monte Inici, p. 68.
v non 1928 *Terebratula Gerda* Opp. – Ruiz, Monte Inici, p. 47, pl. II, figs. 3, 4.
non 1984 *Karadagithyris gerda* (Oppel, 1863) – Tchorszhevsky & Radulović, Carpathians and Carpatho-Balkanides, p. 152, pl. III, figs. 13-16, 17–20; text-fig. 15.
? 1993 *Karadagithyris gerda* (Oppel, 1863) –Radulović & Rabrenović, Carpatho-Balkanides, p. 119 (partim), pl. 1, fig. 12 (non fig. 11).
v 1997 *Karadagithyris gerda* (Oppel) – Vörös, Jurassic brachiopods, p. 18, fig. 33.
v 2001 *Karadagithyris gerda* (Oppel) – Vörös, Bajocian and Bathonian, p. 178, fig. 2/6.
v 2007 *Karadagithyris gerda* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 12.
v 2011 *Karadagithyris gerda* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 188 (partim), figs. ľ–5, 9, 10, non fig. 3/6.
2014 *Karadagithyris gerda* (Oppel) – Baeza-Carratalá et al., Subbetic, p. 6 (partim), figs. 4/10, 11, (non figs. 4/8, 9).

Material

150, mostly well preserved specimens from Hárskút, Gyenespuszta IV (24), Hárskút, Csapótanya (19), Lókút, Fenyveskút N (63), Lókút, Papod 83 (26), Lókút, Papod 82 (1), Bakonybél, Som Hill, upper level (4), Bakonybél, Som Hill, loose (4), Bakonybél, Kőris Hill (6), Mór, Csóka Hill (1959) (1) and Mór, Csóka Hill (1966) (2).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.327.	38.6	35.1	22.3	0
INV 2023.328.	35.9	32.2	20.1	0
INV 2023.329.	35.6	31.1	21.1	0
INV 2023.330.	29.7	27.2	16.3	0
INV 2023.334.	41.9	34.6	23.9	0
INV 2023.333.	42.2	36.1	24.4	0
INV 2023.332.	42.8	33.9	23.3	0
INV 2023.331.	29.8	26.4	14.9	0

Description

External characters: Large *Karadagithyris* with variable, elongated oval to subtriangular outline. The lateral margins are usually straight or gently convex. The anterior margin forms an almost perfect half-circle. The apical angle is very variable from 75° to 90°. The maximum width is usually attained at around the middle of the length, but it may be shifted to the anterior quarter in elongated forms. The valves are nearly equally and moderately convex; the maximum convexity lies near mid-length or may be shifted towards the posterior one-third. The beak is massive and rather high, erect to slightly incurved. The rather large and circular foramen seems to be permesothyrid, but the delthyrium is poorly seen. The lateral parts are usually gently convex or flat. In many cases planarea-like depressions develop in the ventral valves, delimited by blunt beak ridges (Pl. III: 15, 17). On these gently concave planareas the lateral commissures usually form a little elevated crest. In lateral view, the lateral commissures are almost straight or gently arched dorsally. The anterior commissure is rectimarginate. The surface of the shells is almost smooth, except fine, irregularly spaced growth lines.

Internal characters: (Figures 44–46): *Ventral valve*: The pedicle collar is well-developed. The fused deltidial plates form a ventrally arched symphytium. The delthyrial cavity is circular to oval in cross section, with traces of ventral muscle scars. The hinge teeth are rather massive, obliquely inserted; denticula are present. *Dorsal valve*: The cardinal process is well-developed, and strongly crenulated. The outer socket ridges are narrow but strong. The inner socket ridges lean moderately over the sockets. The hinge plates are subhorizontal, rather massive and very wide; they attach to the upper part of the inner socket ridges. The crural bases appear in the posterior part of the umbonal cavity where the inner hinge plates are still fused by the cardinal process. They connect the inner endings of the hinge plates with the dorsal valve floor as dorsally divergent plates. The crura are falciform with transition to the septiform type. The crural plates are long, thin and subparallel, their thickened dorsal parts bend laterally. They are released from the floor of the dorsal valve at about the 0.15 of the valve length. The loop is poorly recorded; it seems to have a narrowly arched connecting band and tiny terminal points.

Remarks

The serial sections (Figures 44–46) demonstrate the crural plates resting on the dorsal valve floor, thus the attribution of the species *gerda* to *Karadagithyris* is endorsed.

This frequently cited and illustrated species abundantly occur in the Bajocian of the Bakony Mountains, and this allowed confining the range of its morphological variation. The main features of *K. gerda*, distinctive from the other biconvex species of *Karadagithyris*, are the slightly subpentagonal outline, the perfectly rectimarginate commissures and the massive

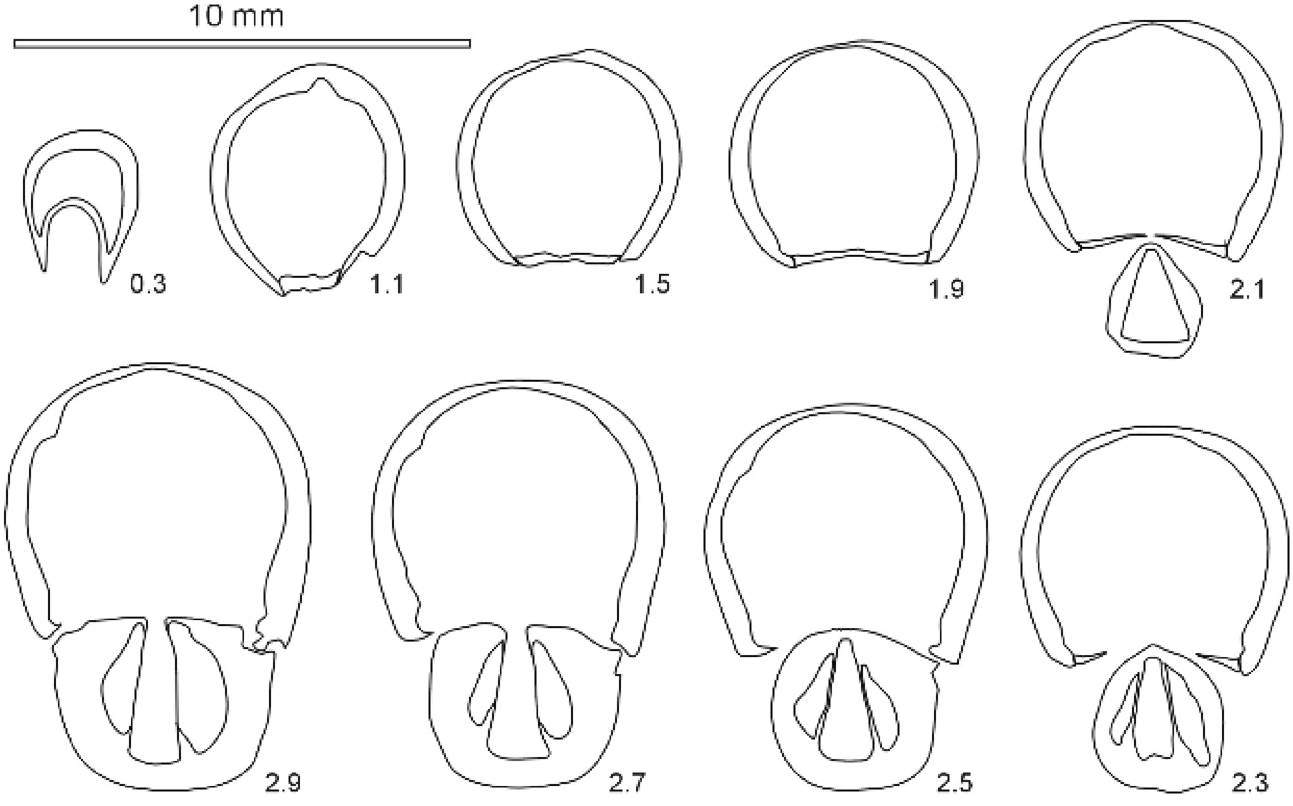


Figure 44. *Karadagithyris gerda* (Oppel, 1863). Nine transverse serial sections through the posterior part of a specimen from Gyenespuszta (Hárskút), upper Bajocian. INV 2023.331. Distances from the ventral umbo are given in mm. Original length of the specimen is 29.8 mm

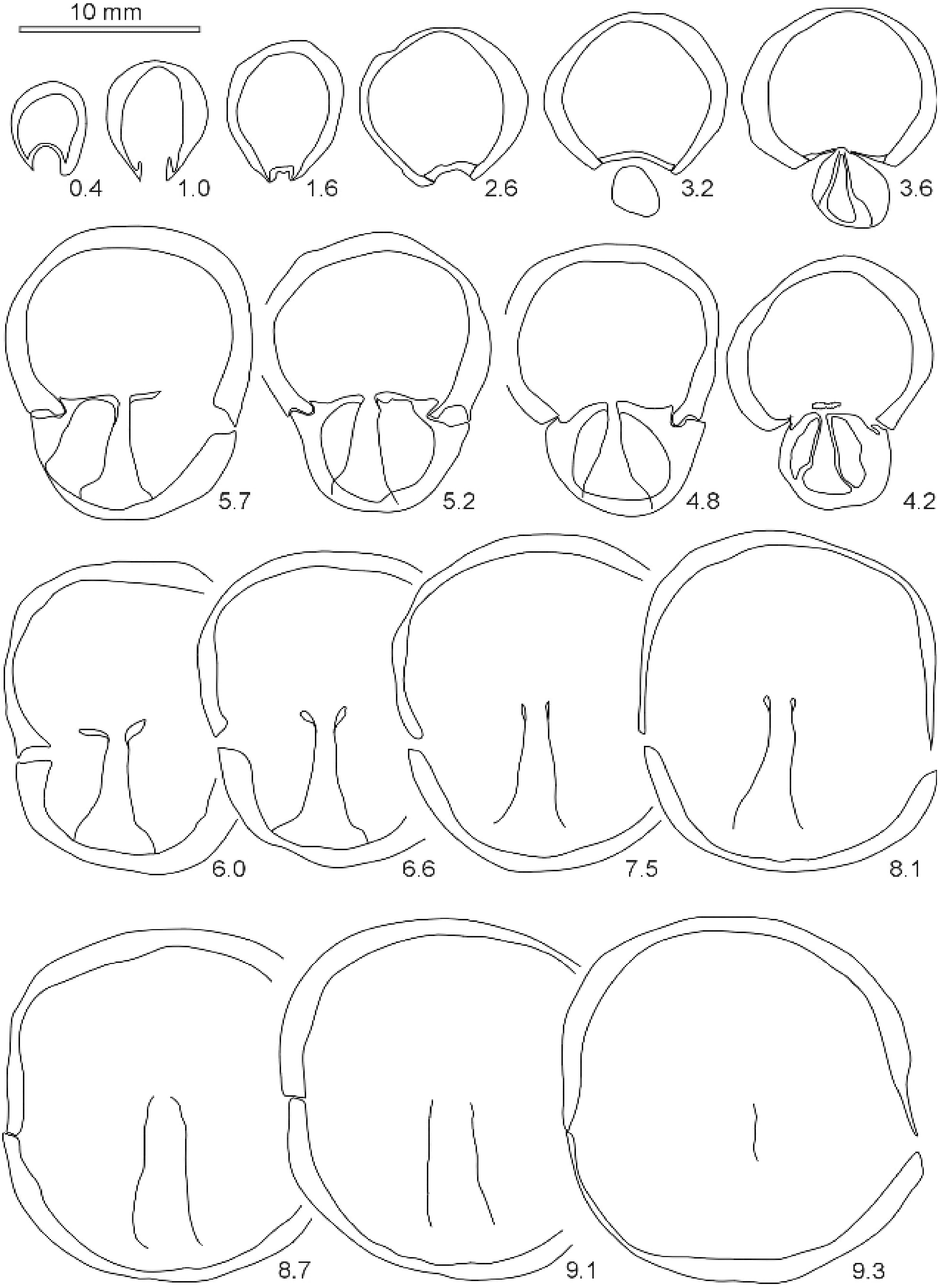


Figure 45. *Karadagithyris gerda* (OPPEL, 1863). Seventeen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.332. Distances from the ventral umbo are given in mm. Original length of the specimen is 42.8 mm

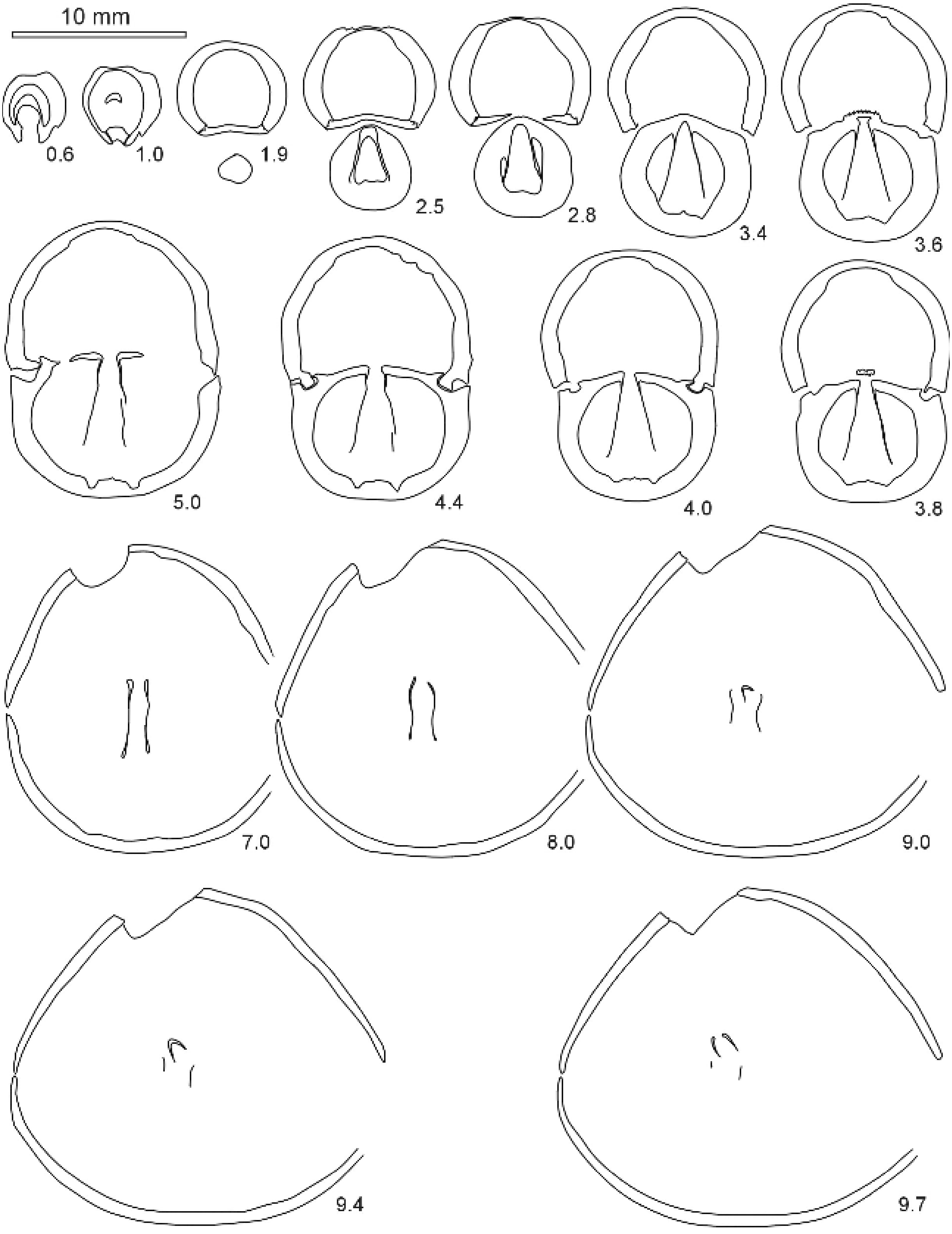


Figure 46. *Karadagithyris gerda* (Oppel, 1863). Sixteen transverse serial sections through the posterior part of a specimen from Papod 83 (Lókút), upper Bajocian. INV 2023.375. Distances from the ventral umbo are given in mm. Original length of the specimen is >28.0 mm

but rather highly elevated and slightly incurved beak. These charcters were also observed by the present author on the original specimen of Oppel (1863, pl. 5, fig. 1) kept in the Bayerische Staatssammlung (München).

The type species *Karadagithyris babanovae* TCHORSZHEVSKY, 1974 is much less biconvex and bears tiny, depressed beak. *K. makridini* TCHORSZHEVSKY & RADULOVIĆ, 1984 and *K. simionescui* TCHORSZHEVSKY & RADULOVIĆ, 1984 are also less biconvex and have more elongated drop-shaped outline and high beak.

Karadagithyris erycina (GEMMELLARO, 1877) differs by its more oval outline and smaller and depressed umbo; *K. dolhae* (SZAJNOCHA, 1882) by its more elongated, somewhat subpentagonal outline and very wide, trapezoidal uniplication.

GEMMELLARO (1877, p. 75) described, without illustration, a specimen under the name "*T. Gerda*" what the present author inspected in the Museo Geologico (Università di Palermo) and had the opinion that it probably represents *K. gerda*. Two other specimens were figured by GEMMELLARO (1877, pl. IVbis, figs. 8, 9) under the name "*Terebratula Phryne*". In the present author's opinion, one of them (l.c. pl. IVbis, fig. 9) may rather belong to *K. gerda*.

SIMIONESCU (1899, l.c.) figured two specimens of *K. gerda*. One of them (l.c., pl. II, fig. 8) is incomplete, the other (pl. II, fig. 15) is juvenile, but both may be ranked to *K. gerda* with query. It is worth mentioning that TCHORSZHEVSKY & RADULOVIĆ (1984, p. 156, 178) based a new species *Karadagithyris simionescui* on SIMIONESCU's above mentioned record. However, their published figures (l.c., pl. IV, figs. 5–8) portray rather different forms, which may represent a separate species, in fact different from *K. gerda*.

The voluminous contribution by RUIZ (1928) on the Bathonian brachiopods of Monte Inici needed a sound taxonomical revision, which started at the visit by the author in the Museum G. G. Gemmellaro in Palermo in October 2023. Even on the basis of the published figures it seemed that RUIZ (1928) misinterpreted the species *K. gerda*, and this was endorsed by the present author in the course of the personal examination of the respective specimens. The specimen illustrated as "*Terebratula Hungarica* Suess" (l.c., text-fig. 1) was not available in the collection, but on the basis of the figures, in the present author's opinion, it is a true *K. gerda*. On the other hand, the specimens figured as "*Terebratula Gerda*" (l.c., pl. II, figs. 3, 4) stand much closer to *K. erycina* (GEMMELLARO, 1877). Another specimen described but not illustrated by RUIZ (1928, l.c.) under the name "*Waldheimia cadomensis*" was checked and tentatively interpreted by the present author as a juvenile specimen of *K. gerda*.

The specimens figured by TCHORSZHEVSKY & RADULOVIĆ (1984, pl. III, figs. 13–16, 17–20) under the name *K. gerda* do not belong here because of their flattened dorsal valve, incurved beak and uniplicate anterior commissure. This taxon was described by VÖRÖS (1995) as *K. eduardi* n. sp.

The item by RADULOVIĆ & RABRENOVIĆ (1993, l.c.) is queried because one of the specimens (l.c., pl. I, fig. 11) has a flattened dorsal valve.

The specimens illustrated by BAEZA-CARRATALÁ et al. (2011, l.c.) correspond well to *K. gerda*, except that in fig. 3/6 which seems to be closer to *K. dolhae* on the basis of its wide and low uniplication.

BAEZA-CARRATALÁ et al. (2014, l.c.) figured four specimens as *K. gerda*. Two of them correspond to this species, however those in figs. 4/8 and 4/9 stand closer to *K. erycina* (GEMMELLARO, 1877), considering their rather tiny and depressed beaks.

Distribution

Middle Jurassic in the Eastern and Southern Alps, Southern Carpathians, Sicily, and the Betic Cordilleras. In the Transdanubian Range it occurs from the late Bajocian (Niortense Zone) to the late Bathonian (Orbis Zone).

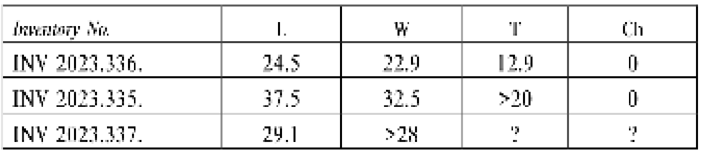
Karadagithyris cf. *erycina* (GEMMELLARO, 1877)
Plate IV: 5–7; Figures 47, 48

v * 1877 *Terebratula Erycina*, GEMM. – GEMMELLARO, Zona con Posidonomya alpina, p. 77, pl. IVbis (XX), figs. 6, 7.
? 1884a *Terebratula sphaeroidalis* SOW. – DI-STEFANO, Trapani, p. 736, pl. XV, figs. 8, 9.
? 1899 *Terebratula sphaeroidalis* SOW. – GRECO, Rossano, p. 106, pl. VIII, fig. 22.
? 1899 *Terebratula* sp. (I) – SIMIONESCU, Rucăr, p. 227, pl. III, figs. 13, 14.
v ? 1928 *Terebratula Phryne* GEMM. – RUIZ, Monte Inici, p. 49, pl. II, fig. 5.
v 2007 *Karadagithyris* ? *erycina* (GEMMELLARO, 1877) – GALÁCZ et al., M. Kumeta, p. 349, fig. 4.7.
v 2007 *Karadagithyris phryne* (GEMMELLARO, 1877) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, fig. 13.
v 2007 *Karadagithyris erycina* (GEMMELLARO, 1877) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, fig. 15.
? 2014 *Karadagithyris gerda* (OPPEL) – BAEZA-CARRATALÁ et al., Subbetic, p. 6 (partim), figs. 4/8, 9, non figs. 4/10, 11.

Material

25, mostly poorly preserved specimens from Hárskút, Gyenespuszta IV (11), Hárskút, Csapótanya (3), Bakonybél, Som Hill, upper level (8) and Bakonybél, Som Hill, loose (3).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.336.	24.5	22.9	12.9	0
INV 2023.335.	37.5	32.5	>20	0
INV 2023.337.	29.1	>28	?	?

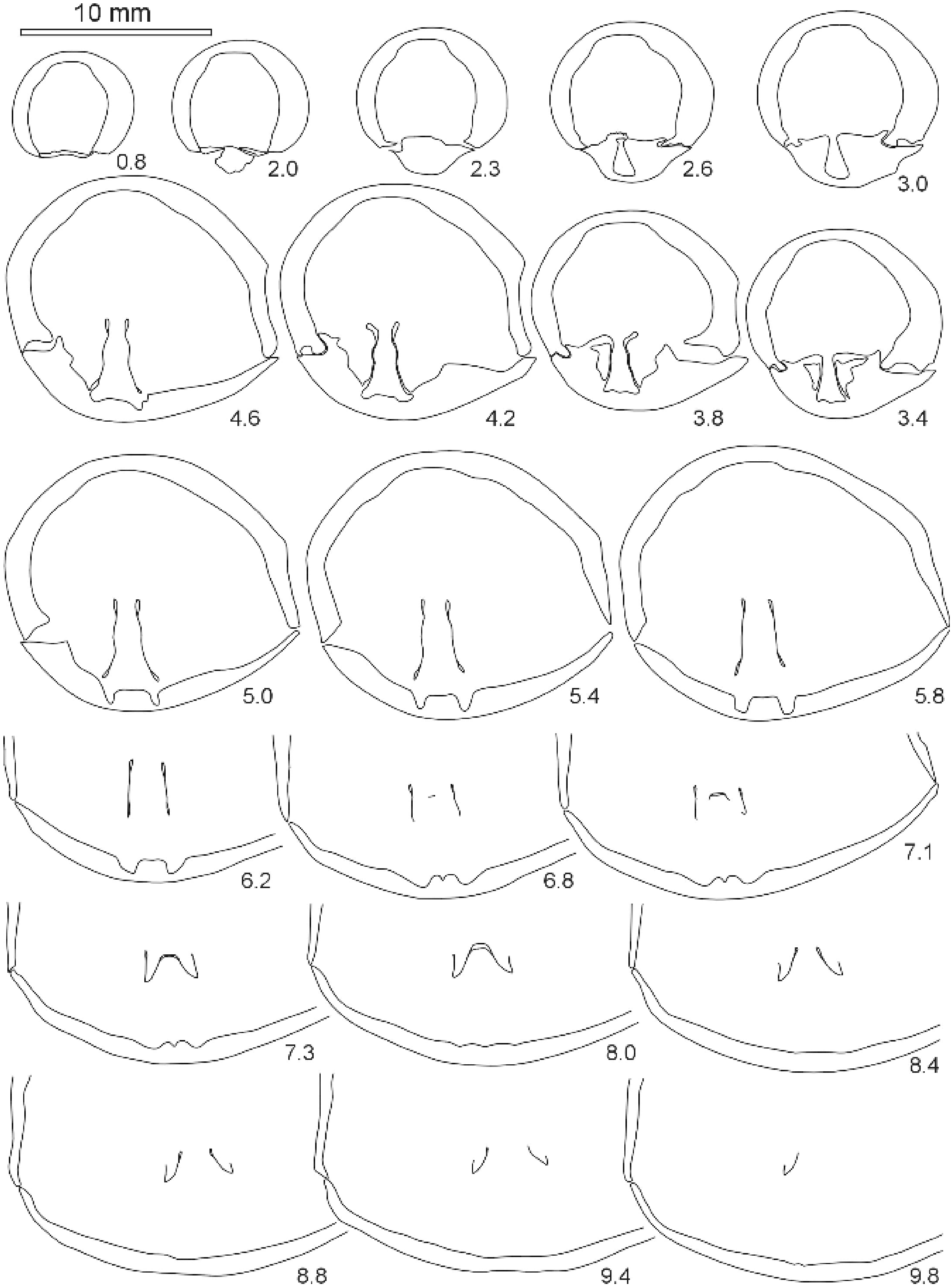


Figure 47. *Karadagithyris* cf. *erycina* (Gemmellaro, 1877). Twenty-one transverse serial sections through the posterior part of a specimen from Som Hill (Bakonybél), upper Bajocian. INV 2023.337. Distances from the ventral umbo are given in mm. Original length of the specimen is >30.0 mm

Description:

External characters: Medium sized *Karadagithyris* with elongated oval outline. The lateral margins are usually gently convex. The anterior margin forms a continuous half-circle. The apical angle varies from 90° to 95°. The maximum width is usually attained at around the middle of the length. The valves are nearly equally and moderately convex; the maximum convexity lies near mid-length. The beak is stout and rather depressed, slightly incurved. The rather large and labiate foramen is permesothyrid; the delthyrium seems to be low and wide (Pl. IV: 6). The lateral parts are gently convex or flat. In some cases, planarea-like depressions develop in the ventral valves, delimited by blunt beak ridges (Pl. III: 6). In lateral view, the lateral commissures are almost straight, or their posterior segment is gently arched dorsally. The anterior commissure is rectimarginate. The surface of the shells is almost smooth, except fine, irregularly spaced growth lines.

Internal characters: (Figures 47–48): *Ventral valve*: Pedicle collar was not recorded. The posteriorly fused deltidial plates form a symphytium. The delthyrial cavity is circular to oval in cross section, with a wide trace of the ventral muscle scar. The hinge teeth are rather massive, inserted diagonally; denticula are well developed. *Dorsal valve*: Cardinal process is present. The outer socket ridges are rather wide. The inner socket ridges gently lean over the sockets. The hinge plates are subhorizontal and wide; they grow from the upper part of the inner socket ridges. The crural bases appear in the posterior part of the umbonal cavity. They connect the inner endings of the hinge plates with the dorsal valve floor as dorsally divergent plates. The crura are falciform with transition to the septiform type. The crural plates are long, thin and subparallel, their thickened dorsal parts bend laterally. They are released from the floor of the dorsal valve at about the 0.18 of the valve length. Two deep grooves (corresponding to the dorsal adductor muscle scars) run between the dorsal attachment line of the crural plates. The loop is rather wide subtrigonal, ending in long, divergent flanges. The transverse band is highly arched with trapezoidal top, and projects a little posteriorly.

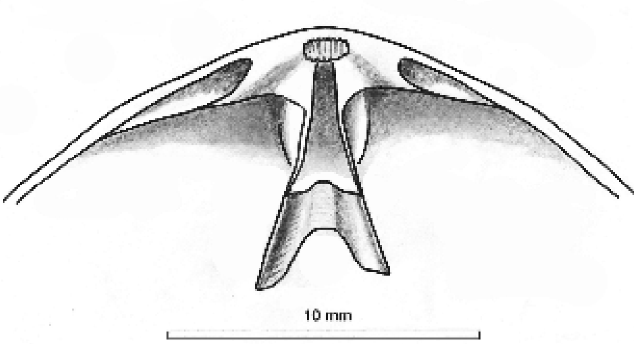


Figure 48. *Karadagithyris* cf. *erycina* (GEMMELLARO, 1877). Som Hill (Bakonybél), upper Bajocian. Ventral view of the dorsal valve interior. Reconstruction based on serial sections from the specimen INV 2023.337 (See Figure 47)

Remarks

The serial sections (Figures 47, 48) properly demonstrate that the species *erycina* belongs to the genus *Karadagithyris*.

The type specimens of *K. erycina* figured by GEMMELLARO (1877, l.c.) were inspected by the author in the Museo Geologico (Università di Palermo) therefore the identification of our specimens seems to be endorsed.

The species *K. erycina* stands close to *K. gerda* but differs by its more oval outline and smaller and depressed umbo.

The specimens figured by DI-STEFANO (1884a, l.c.) and GRECO (1899, l.c.) under the name "*T. sphaeroidalis* SOW." are very similar to *K. erycina* and probably belong here.

The specimen illustrated by SIMIONESCU (1899, l.c.) as "*Terebratula* sp. (I)" shows the traces of crural plates in the dorsal view (l.c., fig. 13a), therefore it is considered belonging to *Karadagithyris*. From among the species of this genus, SIMIONESCU's specimen seems to be the most similar to *K. erycina*.

RUIZ (1928, pl. II, fig. 5) figured two specimens under the name "*Terebratula Phryne* GEMM." The specimens were inspected by the author in the Museum G. G. Gemmellaro in Palermo and in his opinion these specimens stand closer to *K. erycina* (GEMMELLARO, 1977)

The specimen illustrated by VÖRÖS & DULAI (2007, pl. III, fig. 13) as *K. phryne* (GEMMELLARO) is here re-figured (Pl. IV: 6) and considered to be *K. erycina*.

Two of the specimens illustrated by BAEZA-CARRATALÁ et al. (2014, l.c.) under the name *K. gerda*, those in fig. 4/8 and 4/9, are here regarded as standing closer to *K. erycina*. Therefore, this item is cited in the synonymy with question mark.

Distribution

Middle Jurassic in the Southern Carpathians, Sicily, Calabria and the Betic Cordilleras. In the Transdanubian Range it occurs in the late Bajocian.

Karadagithyris aff. *dolhae* (SZAJNOCHA, 1882)
Plate V: 1; Figure 49.

v 2007 *Karadagithyris* aff. *dolhae* (SZAJNOCHA, 1882) – VÖRÖS & DULAI, Transdanubian Range, p. 57, pl. III, fig. 14.
? 2014 *Karadagithyris eduardi* (VÖRÖS) – BAEZA-CARRATALÁ et al., Subbetic, p. 5 (partim), fig. 5/13 (only).

Material

6, mostly well-preserved specimens from Hárskút, Gyenespuszta IV (1) and Hárskút, Csapótanya (5).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.338.	35.9	29.5	21.4	3.5

Description

External characters: Large *Karadagithyris* with elongated oval outline. The lateral margins are gently convex and pass into the anterior margin along a continuous curve. The anterior margin is subcircular. Both valves are rather strongly and uniformly convex. The beak is slightly incurved and is truncated by a rather large, subcircular to elongate oval pedicle open-

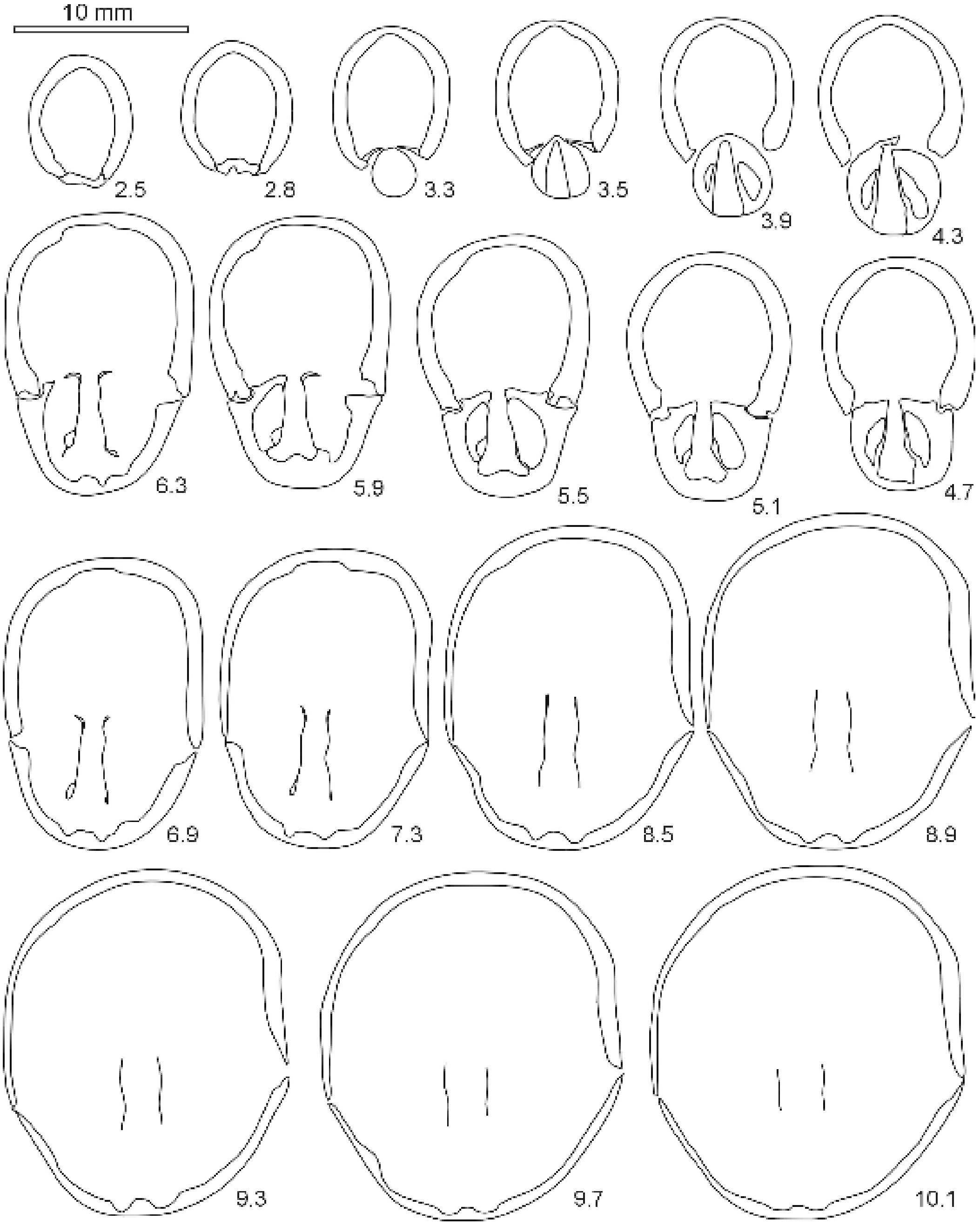


Figure 49. *Karadagithyris* aff. *dolhae* (Szajnocha, 1882). Eighteen transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.338. Distances from the ventral umbo are given in mm. Original length of the specimen is >34.0 mm

ing. The beak ridges are blunt; a planarea-like shallow depression is developed on the pedicle valve. The lateral commissure is gently sinuous; at first it is slightly arched dorsally then it is deflected ventrally at the anterior third of the length, where it passes to the anterior commissure. The anterior commissure is gently uniplicate; the low and wide trapezoidal plica is straight in the middle portion; its width nearly reaches the width of the shell. Except the fine growth lines, the surface of the shell is not ornamented.

Internal characters: (Figure 49): *Ventral valve*: Pedicle collar was not recorded. The very thick deltidial plates are posteriorly fused forming a symphytium. The delthyrial cavity is oval in cross section, with a weak trace of the ventral muscle scar. The hinge teeth are rather slender, diagonally inserted; denticula are well developed. *Dorsal valve*: The cardinal process is well-developed; crenulation was not recorded. The outer socket ridges are narrow but marked. The inner socket ridges lean very little over the sockets. The hinge plates are somewhat ventrally oriented, rather massive and wide; they attach to the upper part of the inner socket ridges. The crural bases and the crural plates appear in the posterior part of the umbonal cavity. They run from the inner endings of the hinge plates to the dorsal valve floor, where they are thicker. The crura may be termed as falciform with transition to the septiform type. The crural plates are long, thin and diverge dorsally, their thickened dorsal parts bend laterally. They are released from the floor of the dorsal valve at about the 0.2 of the valve length. The distal part of the loop is not recorded.

Remarks

The serial sections (Figure 49) demonstrate the crural plates resting on the floor of the dorsal valve, thus the attribution of this species to *Karadagithyris* is endorsed.

Our specimens from the Bajocian of the Bakony Mountains show the wide, flat, and trapezoidal uniplication, characteristic of "*Terebratula Dolhae*" Szajnocha, 1882, but their uniplication is much lower than that of Szajnocha's species. Therefore, they are only regarded as allied to *dolhae* with reference to the relationship.

One specimen illustrated by Baeza-Carratalá et al. (2014, fig. 5/13) under the name "*Karadagithyris eduardi* (Vörös)" is clearly different from that species by its large size, subpentagonal outline and equibiconvex shells. On the other hand, on the basis of its wide and low, trapezoidal uniplication, it is rather similar to *K.* aff. *dolhae* as figured in the present paper.

Distribution

Middle Jurassic in the Betic Cordilleras. In the Transdanubian Range it occurs in the late Bajocian.

Genus ***Hajagithyris*** n. gen.

Type species: *Hajagithyris fylgia* (Oppel, 1863)

Diagnosis: Medium to large, subtrigonal to oval, biconvex, sulcate-carinate shells; erect to slightly incurved beak; unisulcate commissure. No dental plates; wide hinge plates; divergent crural plates resting on valve floor; loop short with flanges, transverse band highly arched.

Derivatio nominis: After the name of Hajag Hill (Bakony Mountains, Hungary).

Nominal species:

H. fylgia (Oppel, 1863)
H. seguenzae (Di Stefano, 1887)
H. mykonionensis (Di Stefano, 1884)
? *H. alamanni* (Di Stefano, 1884)

Discussion

Hajagithyris n. gen. differs from other genera of the subfamily Karadagithyridinae by its unisulcate anterior margin and the widely divergent, long crural plates resting on the dorsal valve floor.

The type species *H. fylgia* (Oppel) and some other species described by Di Stefano (1884b) (*redii, alamanni*) were tentatively attributed to

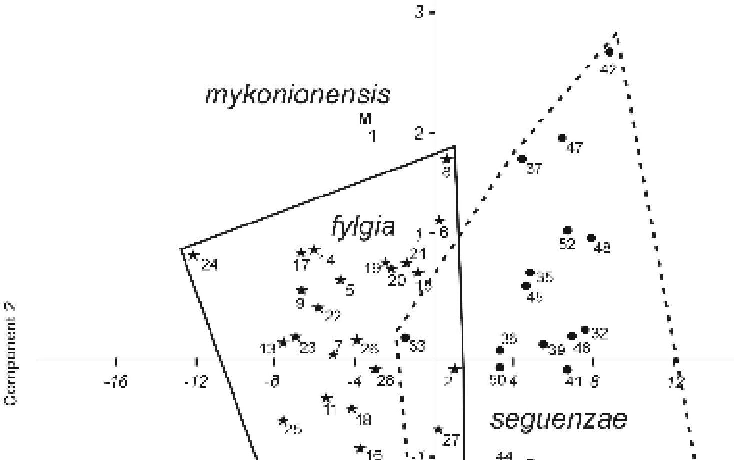


Figure 50. Results of the Principal component analysis (PCA) on the basis of five data of measurements taken from 52 Bajocian specimens of three *Hajagithyris* species

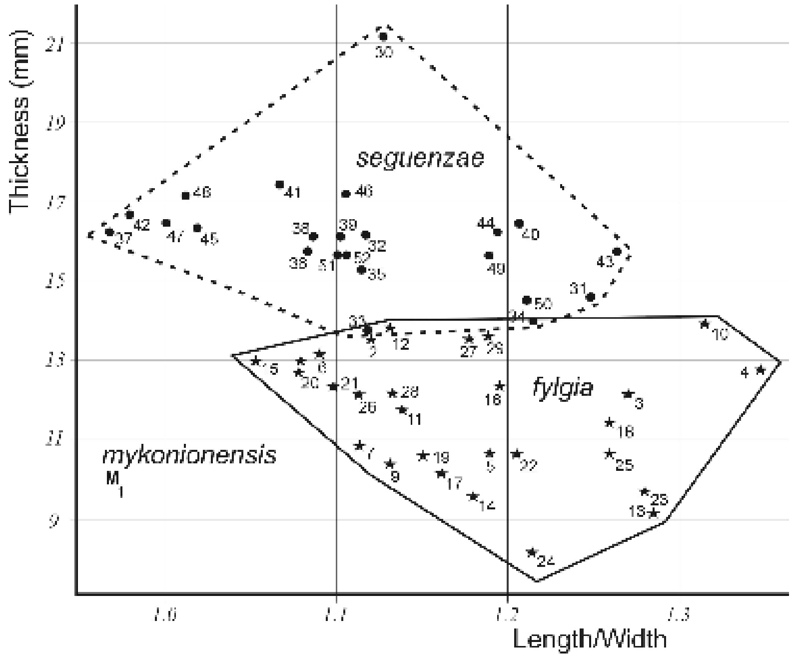


Figure 51. Plot of length/width ratio against the thickness of 52 Bajocian specimens of three *Hajagithyris* species

the Pliensbachian genus *Viallithyris* Vörös, 1978 by Vörös & Dulai (2007) and Baeza-Carratalá et al. (2011). Besides the age difference, the two genera are somewhat different externally as well, in outline and in the shape of the unisulcation what is trapezoidal in *Viallithyris* and simple in *Hajagithyris* n. gen. Some degree of homoeomorphy exists also in their internal morphology: the crural plates of *Hajagithyris* n. gen. are similar to the "brachidum support" of *Viallithyris*. However, the latter is a spicula skeleton and portrays variable shapes (Vörös 1978), always different from the widely divergent, rather massive crural plates of *Hajagithyris* n. gen.

Certain external homoeomorphy can be recognized between *Hajagithyris* n. gen. and *Paralinguithyris* n. gen., but their internal morphology is strikingly different: crural plates in *Hajagithyris* n. gen. versus dental plates in *Paralinguithyris* n. gen. Due to the external homoeomorhy, the generic position of some species described by Di Stefano (1884b) and some other gently sulcate, subpentagonal species remains uncertain without knowledge of their internal features.

Five measurement data, taken from 52 specimens of *Hajagithyris* n. gen. specimens from the same locality (Appendix 4) were evaluated by multivariate statistics using the PAST freeware, v. 3.18 (Hammer et al. 2001). The Principal Component Analysis (PCA) resulted in two distinct and only slightly overlapping clusters of *H. fylgia* and *H. seguenzae*, emphasized by arbitrarily drawn polygons in Figure 50 and a discrete point corresponding to *H. mykonionensis*. More convincing deviation between the three species can be seen in the plot of length per width (L/W) versus thickness (T) measurements (Figure 51), where the overlap between the scatters of *H. fylgia* and *H. seguenzae* is negligible.

Hajagithyris fylgia (Oppel, 1863)
Plate V: 5–11; Figures 50–54

v * 1863 *Terebratula Fylgia* Opp. – Oppel, Posidonomyen-Gesteinen, p. 205, pl. 5, figs. 3, 4.
non 1874 *Terebratula fylgia* (Oppel), 1863. – Eudes-Deslongchamps, Terrains Jurassiques, Brachiopodes, p. 329, pl. 95.
v ? 1877 *Terebratula Fylgia*, Opp. – Gemmellaro, Zona con Posidonomya alpina, p. 75.
? 1881 *Terebratula* cfr. *Fylgia* Opp. – Parona, Strati a Posidonomya, p. 269, pl. 5, fig. 14.
v non 1928 *Terebratula Fylgia* Opp. – Ruiz, Monte Inici, p. 44, pl. II, fig. 2.
v 1928 *Terebratula simplex* Buckm. – Ruiz, Monte Inici, p. 55.
v 1928 *Terebratula subcarpathica* Szaj. – Ruiz, Monte Inici, p. 59, pl. II, fig. 10.
v 1997 „*Terebratula*" *fylgia* Oppel – Vörös, Jurassic brachiopods, p. 18, fig. 35.
v 2001 „*Terebratula*" *fylgia* Oppel – Vörös, Bajocian and Bathonian, p. 178, fig. 2/9.
? 2003 „*Terebratula*" *fylgia* Oppel – Siblík, Hallstatt, p. 69, pl. I, fig. 16.
v 2007 *Viallithyris* ? *fylgia* (Oppel, 1863) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 18.
v 2007 *Viallithyris* ? cf. *alamanni* (Di Stefano, 1884) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 19.
? 2008 „*Terebratula*" *fylgia* Oppel, 1863 – Siblík & Lobitzer, Mitterwand, p. 72, pl. 5, fig. 5.
v 2011 *Viallithyris*? *fylgia* (Oppel, 1863) – Baeza-Carratalá et al., Eastern Subbetic, p. 189, figs. 3/1, 2.

Material

92, mostly well-preserved specimens from Hárskút, Gyenespuszta IV (18), Hárskút, Csapótanya (63), Lókút, Fenyveskút VIII (3), Lókút, Fenyveskút N (1), Lókút, Papod 83 (1), Bakonybél, Som Hill, loose (1), Bakonybél, Kőris Hill (6) and Csókakő, Csóka Hill, loose (5).

Measurements

Inventory No.	L	W	T	Cb
INV 2023.345.	22.1	19.7	13.5	2.7
INV 2023.346.	20.7	16.3	12.1	1.7
INV 2023.347.	20.1	14.9	12.7	1.2
INV 2023.348.	18.9	15.9	10.6	2.1
INV 2023.342.	20.5	18.8	13.1	3.9
INV 2023.343.	18.7	16.8	10.8	1.7
INV 2023.349.	21.6	18.5	14.1	4.5

Description

External characters: Medium to large *Hajagithyris* with very rounded subtriangular to elongated oval outline. The apical angle varies from 70° to 90°. The maximum width is attained usually at around the anterior one-third of the length. The valves are equally and moderately convex; the maximum convexity lies near mid-length. The beak is rather high, erect to slightly incurved. The foramen is incomplete but appears to be permesothyrid. The delthyrium is concealed by matrix but seems to be rather wide and low. The ventral beak ridges are very short and blunt. In lateral view, the lateral commissures are gently sinuous, almost straight; they join with a continuous arch to the unisulcate anterior commissure. The sinus is moderately deep and rather narrow; usually it occupies about the half of the whole width of the shell. In typical cases, the sinus is uniformly arched. The dorsal sulcus develops close to the anterior margin; the ventral fold is indistinct. The surface of the shells is almost smooth, except fine growth lines; radial capillation is frequent.

Internal characters: (Figures 52–54): *Ventral valve*: The pedicle collar is well-developed. The posteriorly fused deltidial plates form a symphytium. The delthyrial cavity is subcircular in cross section. The hinge teeth are rather slender, obliquely

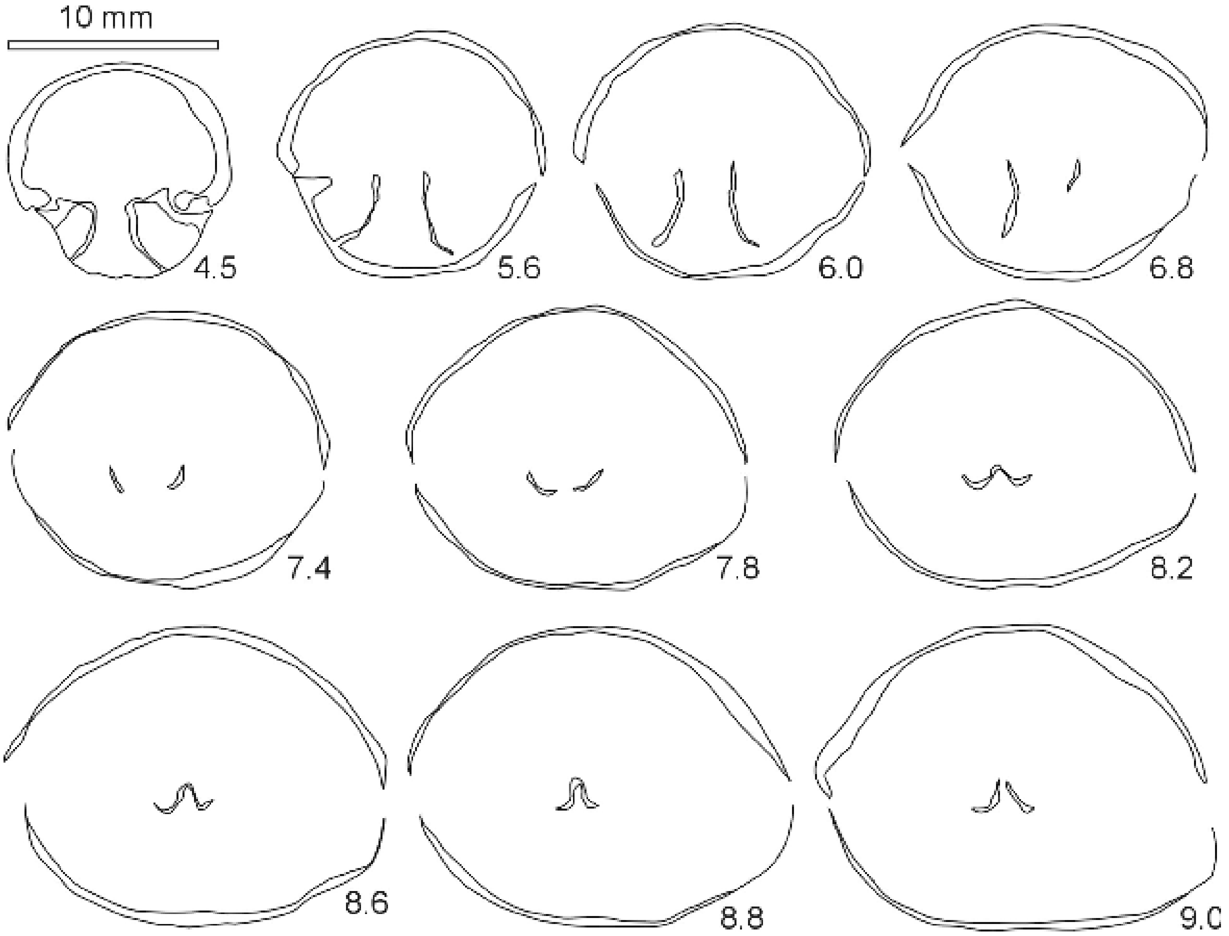


Figure 52. *Hajagithyris fylgia* (Oppel, 1963). Ten transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.378. Distances from the ventral umbo are given in mm. Original length of the specimen is 22.8 mm

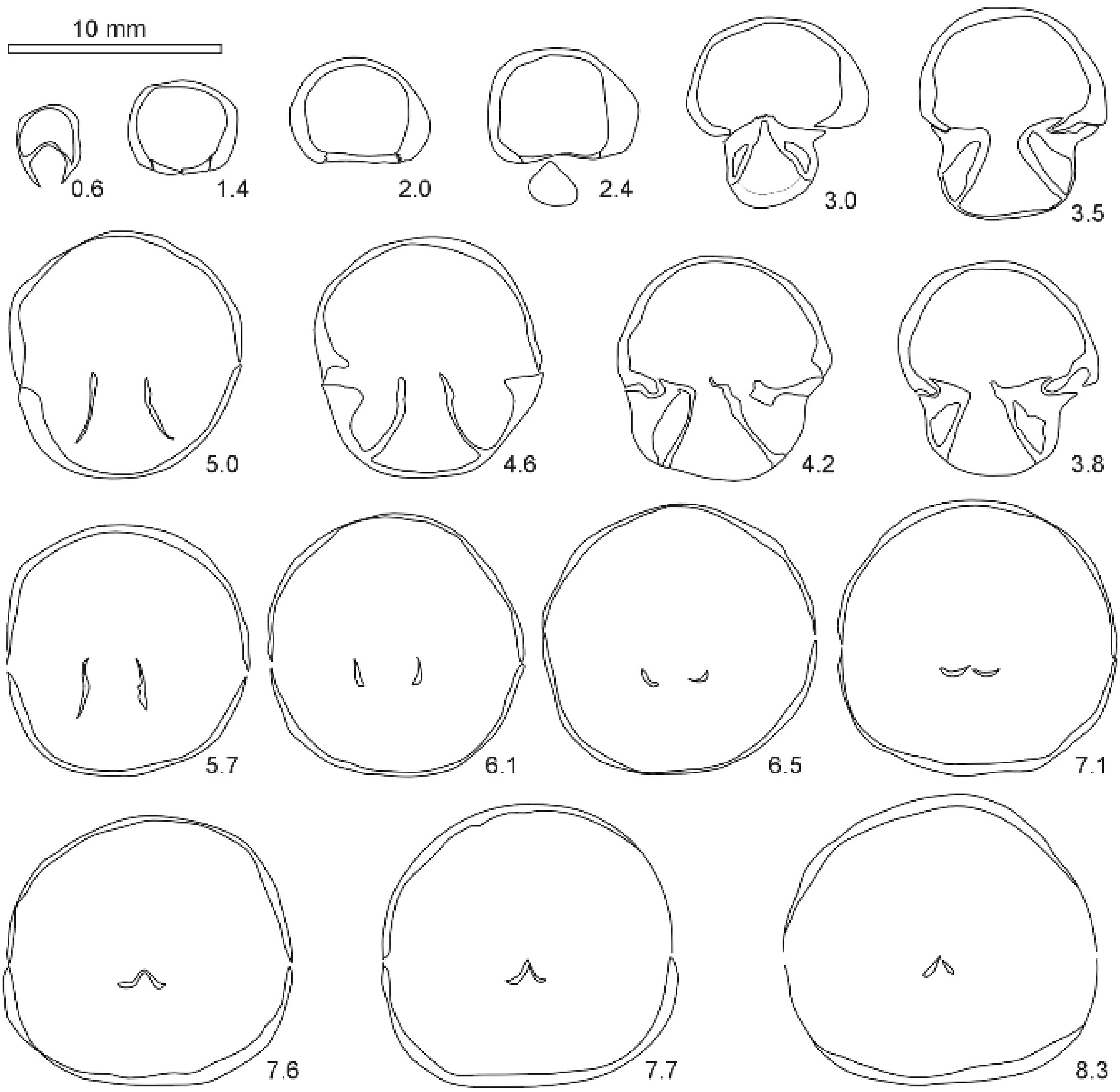


Figure 53. *Hajagithyris fylgia* (Oppel, 1963). Seventeen transverse serial sections through the posterior part of a specimen from Gyenespuszta (Hárskút), upper Bajocian. INV 2023.349. Distances from the ventral umbo are given in mm. Original length of the specimen is 21.6 mm

inserted; denticula are well developed. *Dorsal valve*: The cardinal process is moderately developed, with weak crenulation. The outer socket ridges are rather wide and flat. The inner socket ridges lean well over the sockets. The hinge plates are subhorizontal, rather massive and wide; they grow from the inner surface of the inner socket ridges. The crural bases and the very widely divergent crural plates appear in the posterior part of the umbonal cavity. They connect the inner endings of the hinge plates with the dorsal valve floor. The crura may be termed as falciform with transition to the septiform type. The crural plates are long, somewhat thickened and diverge dorsolaterally. They are released from the floor of the dorsal valve at about the 0.26 of the valve length. The loop is narrow and ends in short, pointed terminations; the transverse band is low but becomes highly arched, crest-like anteriorly.

Remarks

The original specimens of "*T.*" *fylgia* illustrated by Oppel (l.c.) were inspected by the present author in the Bayerische Staatssammlung (München), thus the identification of our specimens is confirmed.

The morphological differences of *H. fylgia* from the other species of *Hajagithyris* were studied by morphometrical analysis, see Figures 50, 51.

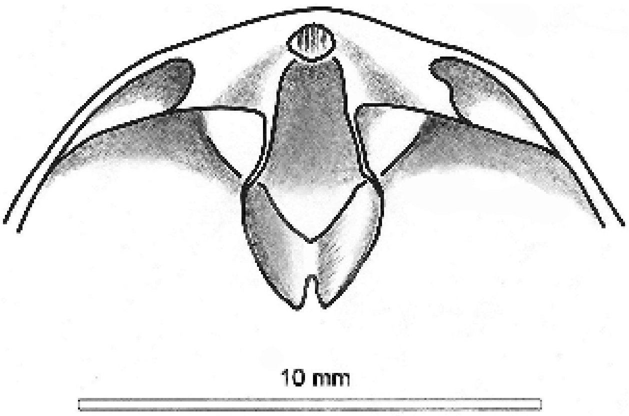


Figure 54. *Hajagithyris fylgia* (Oppel, 1963). Gyenespuszta (Hárskút), upper Bajocian. Ventral view of the dorsal valve interior. Reconstruction based on serial sections from the specimen INV 2023.349 (see Figure 53)

Eudes-Deslongchaps (1862–1885, pl. 95) illustrated several specimens under the name "*T. fylgia* Oppel" but all these show "biplicate" (sulciplicate) anterior commissures thus may not belong to the unisulcate *fylgia*. (The plate 95 of this work was published in 1874, according to Rothpletz 1886, p. 4.)

The specimens described by Gemmellaro (1877, l.c.) and figured by Parona (1881, l.c.), respectively, do not show any trace of sulcus or anterior sinus, therefore they may rather belong to some species of *Karadagithyris*.

The taxonomical revision of the Bathonian brachiopods from Monte Inici described by Ruiz (1928) by the author in the Museum G. G. Gemmellaro in Palermo in October 2023 revealed that Ruiz (1928) misinterpreted the species *fylgia*. The specimen illustrated by Ruiz (1928, l.c.), as "*Terebratula Fylgia* Opp." is in fact a rectimarginate rhynchonellide. On the other hand, the collection contains several typical specimens of *H. fylgia*. One of these was described (without illustration) by Ruiz (1928, p. 55) under the name "*Terebratula simplex* Buckman". The other, very small specimen with gentle sinus, was figured as "*Terebratula subcarpathica* Szaj." (Ruiz 1928, pl. II, fig. 10), but Szajnocha's species is much larger and rectimarginate. Consequently, this item is here interpreted as representing a juvenile specimen of *H. fylgia*.

Siblík (2003, l.c.) and Siblík & Lobitzer (2008, l.c.) illustrated the same poorly preserved and partly distorted specimen as "*Terebratula*" *fylgia*. It is, however, too much elongated and convex; probably does not belong to this species.

The specimen figured by Vörös & Dulai (2007, l.c.) under the name *Viallithyris* ? cf. *alamanni* (Di Stefano, 1884) is now included to the range of variation of the species *H. fylgia*.

Distribution

Middle Jurassic in the Eastern and Southern Alps, Sicily and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian.

Hajagithyris seguenzae (Di Stefano, 1887)
Plate V: 12–14; Figure 55

v *1887 *Pygope Seguenzae* Di Stef. n. sp. – Di Stefano, Capo S. Andrea, p. 172.
? 1928 *Terebratula (Pygope) Seguenzae* Di Stef. – Ruiz, Monte Inici, p. 66, pl. II, figs. 14–16.
v 1997 „*Terebratula*" *seguenzae* Di Stefano – Vörös, Jurassic brachiopods, p. 18.
v 2001 „*Terebratula*" *seguenzae* Di Stefano – Vörös, Bajocian and Bathonian, p. 178.

Material

35, mostly poorly preserved specimens from Hárskút, Gyenespuszta IV (3) and Hárskút, Csapótanya (32).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.350.	28.4	25.2	21.1	2.8
INV 2023.351.	20.6	16.5	14.6	3.4
INV 2023.352.	25.6	22.9	16.1	3.1

Description

External characters: Large *Hajagithyris* with very rounded subtiangular to short oval outline. The lateral margins are gently convex. The apical angle varies from 75° to 85°. The maximum width is attained at around the middle of the length or a little more anteriorly. The valves are equally and strongly convex; the maximum convexity lies near mid-length. The beak is massive, high, suberect to erect. The large foramen seems to be permesothyrid. The delthyrium is concealed by matrix but appears to be rather wide and low. The ventral beak ridges are blunt. In lateral view, the lateral commissures are straight or gently sinuous; they join continuously to the unisulcate anterior commissure. The sinus is shallow and wide; usually it occupies more than the half of the whole width of the shell. The dorsal sulcus is restricted to the anterior part; definite ventral fold is not developed. The surface of the shells is ornamented with irregular growth lines and radial capillation.

Internal characters: (Figure 55): *Ventral valve*: Pedicle collar and deltidial plates were not observed. The delthyrial cavity is subcircular in cross section. The hinge teeth are slender and very obliquely inserted; denticula are present. *Dorsal valve*: Cardinal process was not observed. The outer socket ridges are rather wide but marked. The inner socket ridges lean strongly over the sockets. The hinge plates are subhorizontal, rather narrow; they grow from the inner part of the inner socket ridges. The crural bases and the widely divergent crural plates appear in the posterior part of the umbonal cavity. They run from the inner endings of the hinge plates to the dorsal valve floor. The crural plates are somewhat thickened and diverge dorsolaterally. They are released from the floor of the dorsal valve at about the 0.22 of the valve length. The loop is narrow; the transverse band is low but anteriorly becomes highly arched, crest-like.

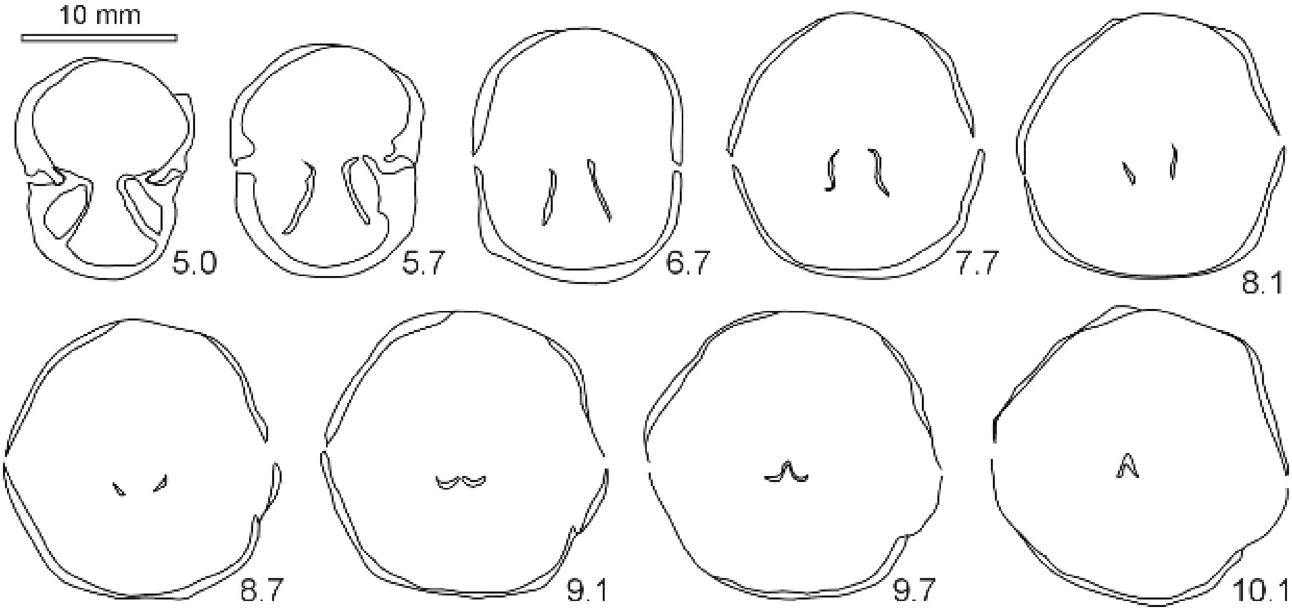


Figure 55. *Hajagithyris seguenzae* (Di Stefano, 1887). Nine transverse serial sections through the posterior part of a specimen from Csapótanya (Hárskút), upper Bajocian. INV 2023.350. Distances from the ventral umbo are given in mm. Original length of the specimen is 28.2 mm

Remarks

H. seguenzae differs from other species of *Hajagithyris* by its much greater convexity and globose shape. The comparisons to the other species by morphometrical analysis carried out on the basis of five measured data (PCA) and the plot of length per width versus thickness data are shown in Figures 50 and 51.

Di Stefano (1887, p. 172) published the name "*Pygope Seguenzae*" in faunal list, but he gave a short diagnosis as well, with comparison to "*P. Mykonionensis* Di Stef.". Consequently, this species name, being published before 1930, is available and valid.

The original specimens of Di Stefano were illustrated by Ruiz (1928, pl. II, figs. 15, 16) thus the identification of our specimens is endorsed. The original specimens were not available in 2023 in the Museo Geologico G. G. Gemmellaro, Palermo, but the figures by Ruiz are convincing. The *H. seguenzae* specimen illustrated by Ruiz (1928, l.c.) from M. Inici was also missing from the collection. On the other hand, the present author found several typical specimens of *H. seguenzae* in the Ruiz collection in other boxes under different names (*T. wrightii* Dav., *T. ghianga* De Gr., *T. laticoxa* Opp.).

Alméras & Fauré (2008, p. 710) gave short description of some specimens from western Algeria under the name *Linguithyris seguenzae* (Di Stefano, 1887), but without any illustration the identification of the specimens seems doubtful. Even if they represent Di Stefano's species, they may not belong to the genus *Linguithyris* but more probably to *Hajagithyris*.

Distribution

Middle Jurassic in Sicily. In the Transdanubian Range it occurs in the late Bajocian.

Hajagithyris ? *mykonionensis* (Di Stefano, 1884)
Plate V: 15

v *1884b *Pygope Mykonionensis*, Di Stef. – Di Stefano, Galati, p. 25, pl. II, figs. 4–6.
v 1928 *Terebratula (Pygope) mykonionensis* Di Stef. – Ruiz, Monte Inici, p. 62, pl. II, fig. 11.
? 2008 *Linguithyris mykonionensis* (Di Stefano, 1884) – Alméras & Fauré, Téthys occidentale, p. 710, pl. XIV, figs. 7, 8.

Material

One well preserved specimen from Hárskút, Csapótanya.

Measurements

Inventory No.	L	W	T	Cb
INV 2023.353.	18.7	19.3	9.9	3.4

Description

External characters: Medium-sized *Hajagithyris* with very rounded subpentagonal outline. The lateral margins are gently convex. The apical angle is around 100°. The maximum width is attained at around the middle of the length. The valves are uniformly and gently convex; the maximum convexity lies near mid-length. The beak is broken but it seems that it was moderately high and erect. The foramen and the delthyrium are not seen. There are no definite beak ridges. In lateral view, the lateral commissures are nearly straight; they join gradually to the unisulcate anterior commissure. The sinus is well-marked, narrow, and uniformly arched; it occupies about the half of the width of the shell. The dorsal sulcus starts at around the middle of the length; the ventral fold is rather low. The surface of the shells is almost smooth, except irregular growth lines and fine radial capillation.

Internal characters: These were not studied by serial sectioning because of the paucity of the material. Traces of crural plates are barely visible through the transparent shell of the posterior part of the dorsal valve.

Remarks

The original specimens of Di Stefano were inspected by the present author in the Museo Geologico (Universitá di Palermo) therefore the identification of our specimen is endorsed. Through the transparent shell of one of the originals (Di Stefano 1884b, pl. II, fig. 4) two subparallel traces of crural plates can be seen what supports the attribution of *mykonionensis* to the genus *Hajagithyris*.

The morphometrical comparison of *H. mykonionensis* to other species of the genus is shown in Figures 50, 51.

The specimen illustrated by Ruiz (1928, l.c.) as "*Terebratula (Pygope) mykonionensis* Di Stef." was checked by the present author in the Palermo collection; it is a typical *H. mykonionensis*.

Alméras & Fauré (2008, l.c.) illustrated two specimens under the name *Linguithyris mykonionensis*, but without any information on their internal features. In general shape, they are very similar to *H. mykonionensis*, and may represent this species, but in the present author's opinion their attribution to *Linguithyris* is definitely erroneous.

Distribution

Middle Jurassic in Sicily and the Atlas Mountains (?). In the Transdanubian Range it occurs in the late Bajocian.

Superfamily Dyscolioidea Fischer & Oehlert, 1891
Family Nucleatidae Schuchert, 1929
Genus ***Linguithyris*** Buckman, 1918
Type species: *Terebratula bifida* Rothpletz, 1886

Linguithyris pteroconcha (Gemmellaro, 1877)
Plate V: 16–18; Figure 56

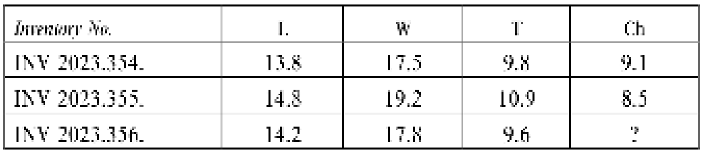
v * 1877 *Terebratula pteroconcha*, Gemm. – Gemmellaro, Zona con Posidonomya alpina, p. 76, pl. IV (XIX), fig. 13.
? 1881 *Terebratula pteroconcha* Gemm. – Parona, Strati a Posidonomya, p. 271, pl. 5, fig. 17.
1882 *Terebratula nepos* n. f. – Parona & Canavari, Brachiopodi oolitici, p. 342, pl. X, figs. 1–4.
v 1884b *Pygope pteroconcha*, Gemm. sp. – Di Stefano, Galati, p. 20.
? 1886 *Terebratula (Pygope) Aspasia* var. *minor* Zitt. – Vacek, St. Vigilio, p. 114, pl. XX, fig. 1.
1886b *Terebratula nepos* Canav. – De Gregorio, Valpore, p. 13, pl. 4, figs. 49–50.
1899 *Pygope Bouéi* Zeuschn. – Simionescu, Rucăr, p. 227, pl. II, figs. 9, 10.
v ? 1935 *Terebratula* cf. *excavata* Desl. – Vadász, Mecsek hegység, p. 60.

1962 *Linguithyris nepos* (Canavari) – Ferrari, Rovereto, p. 144, pl. X, fig. 7.
1966 *Linguithyris curviconcha* (Oppel, 1863) – Siblík, Kostelec, p. 156, pl. IV, fig. 1.
1967 *Linguithyris curviconcha* (Oppel, 1863) – Kunz, Kalkvoralpen, p. 267, pl. I, figs. 3–6.
1972 *Nucleata nepos* (Canavari, 1882) – Ferrari & Manara, Monte Peller, p. 315, pl. XXX, figs. 1, 2.
1982 *Linguithyris nepos* (Canavari, 1882) – Benigni et al., Asiago, p. 66, pl. 2, figs. 7, 8, text-figs. 13, 14.
? 1984 *Nucleata carpathicae* n. sp. – Tchorszhevsky & Radulović, Carpathians and Carpatho-Balkanides, p. 160, 180, pl. V, figs. 1–8.
? 1989 *Linguithyris maximus* Tchorszhevsky, sp. nov. – Tchorszhevsky, Nucleatidae, p. 26, pl. II, fig. 1.
? 1989 *Linguithyris dragoviensis* Tchorszhevsky, sp. nov. – Tchorszhevsky, Nucleatidae, p. 26, pl. II, fig. 2.
? 1989 *Linguithyris remisovi* Tchorszhevsky, sp. nov. – Tchorszhevsky, Nucleatidae, p. 28, pl. II, fig. 3.
1993 *Linguithyris curviconcha* (Oppel, 1863) –Radulović & Rabrenović, Carpatho-Balkanides, p.119, pl. 2, fig. 6.
v 1995 *Linguithyris nepos* (Canavari, 1882) – Vörös, Mecsek, p. 192, pl. I, figs. 7–9; text-fig. 5.
v 1997 *Linguithyris nepos* (Canavari) – Vörös, Jurassic brachiopods, pp. 18, 24, figs. 34, 50.
1999 *Linguithyris curviconcha* (Oppel, 1863) – Wierzbowski et al., Pieniny Klippen Belt, p. 58, fig. 22/1.
v 2001 *Linguithyris nepos* (Canavari) – Vörös, Bajocian and Bathonian, pp. 178, 179, figs. 2/8, 3/2.
v 2011 *Linguithyris nepos* (Canavari, 1882) – Baeza-Carratalá et al., Eastern Subbetic, p. 190, fig. 6/3.
v 2007 *Linguithyris nepos* (Canavari, 1882) – Vörös & Dulai, Transdanubian Range, p. 57, pl. III, fig. 11.
2014 *Linguithyris nepos* (Canavari, 1882) – Baeza-Carratalá et al., Subbetic, p. 15, figs. 4/7, 5/9, 10.
? 2016a *Linguithyris* sp. (Oppel, 1863) – Sulser, Klippendecke, p. 398, fig. 7g.

Material

14, partly well-preserved specimens from Lókút, Fenyveskút VIII (1), Lókút, Lókút Hill (5) and Bakonybél, Som Hill, loose (8).

Measurements



Inventory No.	L	W	T	Ch
INV 2023.354.	13.8	17.5	9.8	9.1
INV 2023.355.	14.8	19.2	10.9	8.5
INV 2023.356.	14.2	17.8	9.6	?

Description

External characters: Medium-sized *Linguithyris* with rounded, laterally expanded subtriangular outline. The apical angle varies from 105° to 115°.The lateral margins are nearly straight, then become convex and arch continuously into the anterior margin. The anterior margin is bilobate; it shows two anterior extremities, and the middle portion is concave. The pedicle valve is more convex than the brachial one; the maximum convexity lies in the anterior one-third of the length. The beak is slightly incurved; the pedicle opening and the delthyrium can not be seen. The beak ridges are rather sharp on the ventral valve. In lateral view the lateral commissure is gently sinuous; it joins with an abrupt curve to the deeply unisulcate anterior commissure. The width of the sinus is around the one-third of the total width of the shell. The depth of the sinus nearly equals to its width. The sulcus of the brachial valve is deep and long; it is very narrow but present at the posterior part. The corresponding fold in the ventral valve appear at around mid-length. The linguiform extension is moderately projected anteroventrally. The surface of the shell is ornamented with irregularly spaced growth lines.

Internal characters: (Figure 56): *Ventral valve*: Pedicle collar was not observed. The delthyrial cavity is subcircular to rounded subtrigonal in cross section. The deltidial plates are thin and fused posteriorly. The hinge teeth are narrow; denticula are poorly developed. *Dorsal valve*: The cardinal process is simple. The outer socket ridges are rather wide and flat. The inner socket ridges bend slightly over the sockets. The hinge plates are reduced and grow from the medial part of the inner socket ridges. They are subhorizontal, thin and narrow. The crural bases are thin and indistinct. The crural processes are slightly crescentic in cross section. The loop is narrow and short. The arch of the transverse band is very low and flat. The narrow and short adductor muscle scars are subparallel to slightly divergent (Pl. V: 18).

Remarks

The Early to Middle Jurassic genus *Linguithyris*, together with its Late Jurassic successor *Vjalovithyris*, are emblematic members of the Mediterranean Jurassic brachiopod faunas. This neatly sulcate stock has very stable and essentially similar morphology, e.g., the Pliensbachian *Linguithyris aspasia* (Zittel, 1869) can easily be mistaken for the Tithonian *Vjalovithyris rupicola* (Zittel, 1870).

Only a little distinction can be drawn within the Middle Jurassic species of *Linguithyris* on the basis of their outline and the depth of the sulcus. The type species *L. bifida* (Rothpletz, 1886) and *L. curviconcha* (Oppel, 1863) have rather subpentagonal outline, relatively shallow sulcus and anteriorly projected linguiform extension, whereas *L. pteroconcha*

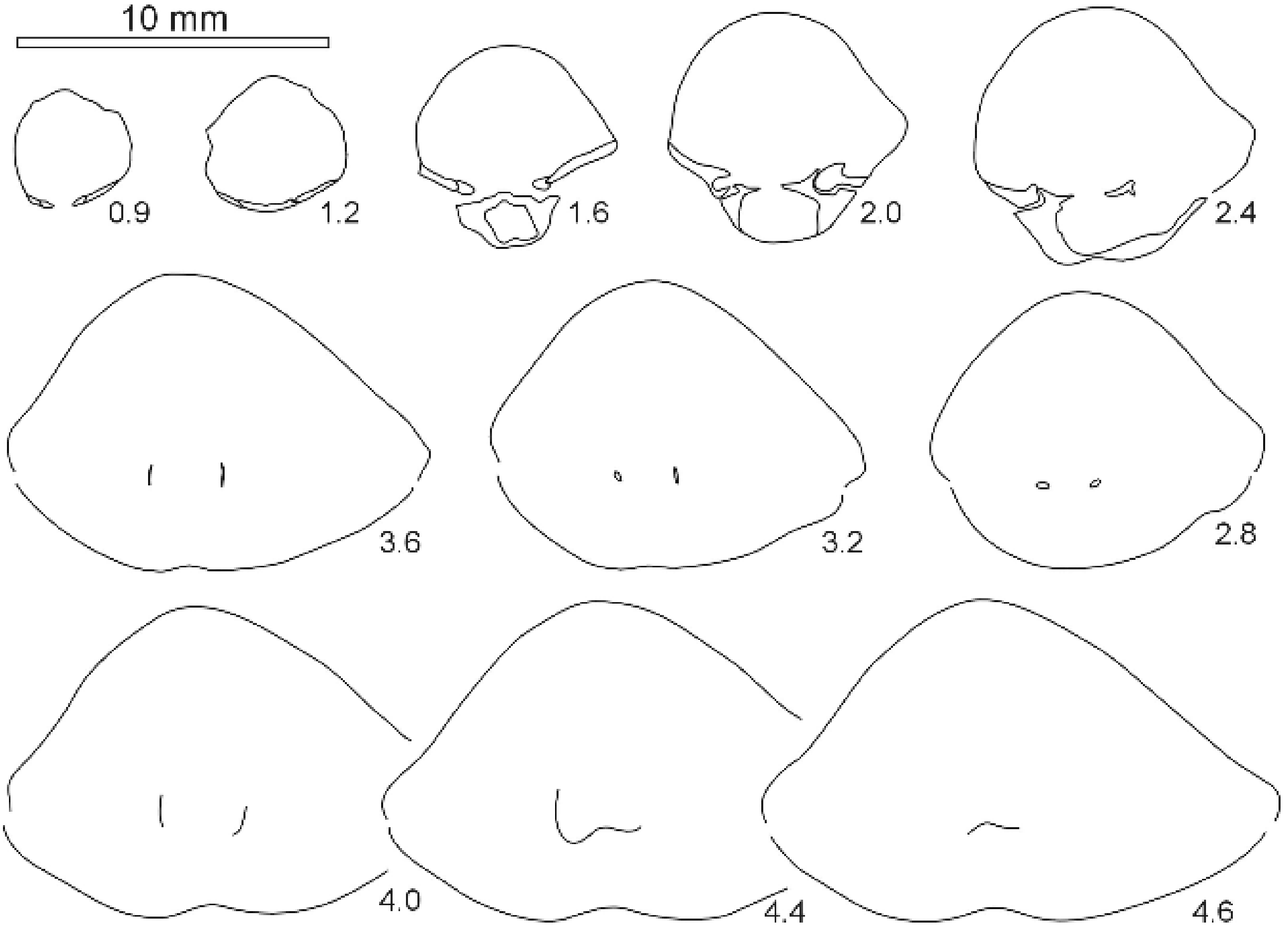


Figure 56. *Linguithyris pteroconcha* (GEMMELLARO, 1877). Eleven transverse serial sections through the posterior part of a specimen from Som Hill (Bakonybél), upper Bajocian. INV 2023.379. Distances from the ventral umbo are given in mm. Original length of the specimen is 16.8 mm

(GEMMELLARO, 1877) and *L. nepos* (CANAVARI, 1882, auct.) bear more subtrigonal outline, deeper sulcus and rather ventrally projected linguiform extension. This second group is morphologically very homogeneous, and in the present author's opinion the mentioned two taxa are conspecific. Consequently, the name *L. nepos* is considered the junior subjective synonym of *L. pteroconcha* and thus, GEMMELLARO's name is used in the present paper as valid.

The original specimens illustrated by GEMMELLARO (1877, l.c.) were inspected by the present author in the Museo Geologico (Università di Palermo) thus the identification of the specimens from the Bakony Mountains is endorsed.

The specimen figured by PARONA (1881, l.c.) as "*Terebratula pteroconcha*" has a very flat sulcus and elongated outline and seems to belong rather to the genus *Hajagithyris*.

VACEK (1886, l.c.) illustrated a very small specimen under the name *Terebratula (Pygope) Aspasia* var. *minor*. It may belong to *L. pteroconcha* but tends to be closer to *L. curviconcha* (OPPEL, 1863).

VADÁSZ (1935, l.c.) mentioned "*Terebratula* cf. *excavata* DESL." in faunal list. The respective (fragmentary) specimens were checked by the author in the Geological Collections of the SARA, Budapest; they apparently correspond to *L. pteroconcha*.

The new species "*Nucleata carpathicae*" by TCHORSZHEVSKY & RADULOVIĆ (1984, l.c.) may fit well to the variation of *pteroconcha* but this synonymy would not be justified solely on the basis of the published (rather poor) figures. The same regards to further new species erected by TCHORSZHEVSKY (1989, l.c.: *L. maximus, L. dragoviensis* and *L. remisovi*); all three-stand close to *L. pteroconcha*.

In two items: RADULOVIĆ & RABRENOVIĆ (1993, l.c.) and WIERZBOWSKI et al. (1999, l.c.) the respective specimens are termed by the respective authors as *Linguithyris curviconcha* but in both cases the illustrations portray rather subtrigonal forms with very short linguiform extensisons, therefore they are regarded here as belonging to *L. pteroconcha*.

The specimen figured by SULSER (2016a, l.c.) as *Linguithyris* sp. seems to be very close to *L. pteroconcha*.

Distribution

Middle Jurassic in the Eastern, Western and Southern Alps, Pieniny Klippen Belt, Mecsek Mountains, Southern

Carpathians, Sicily, and the Betic Cordilleras. In the Transdanubian Range it occurs from the early Bajocian (Sauzei Zone) to the late Bajocian.

Superfamily Uncertain
Family Orthotomidae MUIR-WOOD, 1936
Genus ***Orthotoma*** QUENSTEDT, 1869
Type species: *Terebratula heyseana* QUENSTEDT, 1869

Orthotoma ? sp.

Plate V: 19; Figure 57

Material

Six mostly poorly preserved specimens from Lókút, Fenyveskút N (1) and Lókút, Lókút Hill (5).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.344.	12.4	11.5	6.2	0

Description

External characters: Medium sized *Orthotoma* with rounded, slightly elongated oval outline. The hinge margin is arcuate and does not protrude from the outline. The apical angle is about 80°. The maximum width is attained at mid-length. The valves are gently and equally convex; the maximum convexity lies close to the middle of the length. The beak is broken but seems to be erect. The beak ridges are blunt. The lateral commissures are straight or very gently sinuous. The anterior commissure is straight. The shells are ornamented by weak radial capillation and fine growth lines.

Internal characters: (Figure 57): *Ventral valve*: Pedicle collar was not recorded. The deltidial plates are poorly developed. The delthyrial cavity is low subtriangular. *Dorsal valve*: The articulation and the major part of the dorsal valve are masked with callus thickenings. There is no median septum. The crural bases and the crura are tiny. The loop is short and narrow and ends in a rather irregularly arched transverse band.

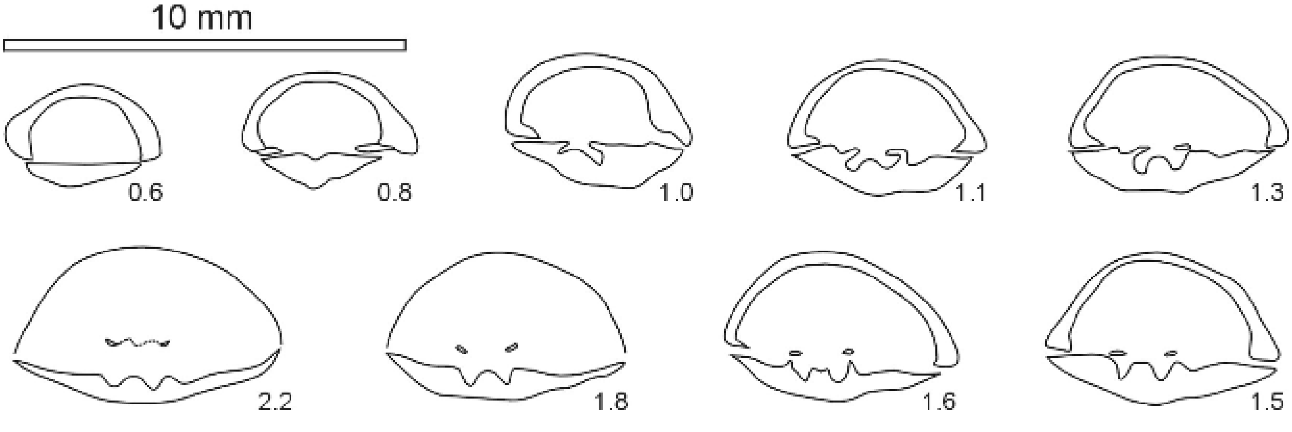


Figure 57. *Orthotoma* sp. Nine transverse serial sections through the posterior part of a specimen from Lókút Hill IV (Lókút), Bed 3, upper Bajocian, Niortense Zone. INV 2023.380. Distances from the ventral umbo are given in mm. Original length of the specimen is 10.7 mm

Remarks

The very simple, subcircular and lenticular shape of the shells is not against the attribution of our specimens to the genus *Orthotoma*. A little more convincing data came from the serial sections (Figure 57): the absence of dental plates and median septum, and the short and narrow loop seem to endorse this generic attribution.

Distribution

In the Transdanubian Range it occurs from the early Bajocian (Humphriesianum Zone) to the late Bajocian (Niortense Zone).

Suborder Terebratellidina Muir-Wood, 1955
Superfamily Zeillerioidea Allan, 1940
Family Zeilleriidae Allan, 1940
Subfamily Zeilleriinae Allan, 1940
Genus ***Zeilleria*** Bayle, 1878
Type species: *Terebratula cornuta* J. de C. Sowerby, 1824

Zeilleria cf. *subbucculenta* (Chapuis & Dewalque, 1853)
Plate V: 21

* 1853 *Terebratula subbucculenta*. N. – Chapuis & Dewalque, Luxembourg, p. 212 (partim), pl. XXXVI, figs. 4a–c, (non pl. 4, figs. d–f)
1874 *Terebratula* (*Waldheimia*) *subbucculenta* (Chap. et Dew.), 1853. – Eudes-Deslongchamps, Terrains Jurassiques, Brachiopodes, p. 298 (partim), pl. 86, fig. 5, (non figs. 1–3, 6–7)
? 1882 *Waldheimia orba* n. f. – Szajnocha, Karpat. Klippen, p. 79, pl. II, fig. 5.
1992 *Zeilleria subbucculenta* (Chapuis & Dewalque, 1853) – Alméras & Sadki, Haut Atlas, p. 189, pl. II, fig. 15.
non 1993 *Rugitela subbucculenta* (Chapuis & Dewalque, 1853) – Radulović & Rabrenović, Carpatho–Balkanides, p. 121, pl. 2, fig 13.
1995 *Zeilleria subbucculenta* (Chapuis & Dewalque, 1853) – Alméras & Ohmert, Humphriesi-Oolith, p. 300, pl. 5, figs. 12, 13.
1998 *Zeilleria subbucculenta* (Chapuis & Dewalque, 1853) – Alméras & Elmi, Vivaro-Cévenole, p. 78, pl. VIII, figs. 1, 2.
2008 *Zeilleria subbucculenta* (Chapuis & Dewalque, 1853) – Alméras & Fauré, Téthys occidentale, p. 713, pl. XIV, figs. 13–17, text-figs. 48, 49.
2016b *Ornithella subbucculenta* (Chapuis & Dewalque, 1853) – Sulser, Brachiopoden der Schweiz, p. 335, fig. (unnumbered)

Material

Four moderately preserved specimens from Lókút, Fenyveskút N (2), Bakonybél, Som Hill, loose (1) and Bakonybél, Kőris Hill (1).

Measurements

Inventory No.	L	W	T	Ch
INV 2023.358.	24.1	23.1	11.5	0

Description

External characters: Medium to large *Zeilleria* with rounded subpentagonal outline. The apical angle is about 90°. The maximum width is attained at about the middle of the length. The valves are moderately ventribiconvex; the maximum convexity lies near the middle of the length or is shifted somewhat posteriorly. The beak is rather high; not fully preserved but seems to be erect to slightly incurved. The beak ridges are indistinct. Together with the point of the beak, the foramen is broken but seems to be permesothyrid. The delthyrium is concealed by matrix. In lateral view, the lateral commissures are straight or gently arched ventrally; their posterior part run on a low, sharp ridge. The anterior commissure is rectimarginate or tends to be slightly uniplicate. The surface of the shell bears numerous fine growth lines and several, regularly spaced growth rugae.

Internal characters: These were not studied by serial sectioning because of the paucity of the material. Traces of dental plates and a marked median septum can be seen on the umbonal part of the figured specimen (Pl. V: 21).

Remarks

Z. subbucculenta is a very frequently recorded species with subrounded, slightly subpentagonal outline. Recently Alméras & Fauré (2008) published a detailed and sound morphological analysis based on 110 measured specimens (l.c., fig. 48). Our measured specimens from the Bajocian of the Bakony Mountains fit well to the above-mentioned range of variation of *Z. subbucculenta*.

Alméras & Elmi (1998) evaluated the early descriptions of this species, including the original figures by Chapuis & Dewalque (1953) and stated that from their figured specimens only one (l.c., pl. XXXVI, figs. 4a–c) was considered the type of *Z. subbucculenta*, whereas the other (l.c., pl. XXXVI, figs. 4d–f) probably belongs to the genus *Rugitela*; being more convex with corrugated lateral margins.

Eudes-Deslongchamps (1874, l.c.) interpreted also too widely the species; from his figured specimens only one (l.c., pl. 86, fig. 5) seems to belong to *Z. subbucculenta*, the others are too much elongated forms. (The plate 86 of this work was published in 1874, according to Rothpletz 1886, p. 4.)

Alméras & Elmi (1998) and Alméras & Fauré (2008) also discussed the difference between *Zeilleria* and *Rugitela* (where the species *subbucculenta* was ranked by some authors). Following their opinion, the specimen figured by

RADULOVIĆ & RABRENOVIĆ (1993, l.c.) as "*Rugitela subbucculenta*" in fact belongs to *Rugitela* on the basis of its thickened lateral margins with corrugations, but may represent another species, namely *R. waltoni* (DAVIDSON, 1851).

The item "*Waldheimia orba* n. f." by SZAJNOCHA (1882, l.c.) may belong to *Z. subbucculenta* according to ALMÉRAS & SADKI (1992, p. 189).

The specimens described as *Zeilleria Ippolitae* DI-STEF. n. sp. (DI-STEFANO 1884a, p. 738, pl. XV, figs. 12, 13) are very similar to *Z. subbucculenta*, but to synonymize them without studying the original specimens would not be correct.

Distribution

Middle Jurassic in Luxembourg, Southern France, Southern Germany, the Western Alps and the Atlas Mountains. In the Transdanubian Range it occurs in the late Bajocian.

Zeilleria ? cf. *beggiatoi* (PARONA, 1881)
Plate V: 20

*1881 *Terebratula Beggiatoi* TAR. (ms.). – PARONA, Strati a Posidonomya, p. 269, pl. 5, fig. 15.
? 1962 *Rhynchonellina beggiatoi* (PARONA) – FERRARI, Rovereto, p. 122, pl. IX, fig. 2.

Material

One partly incomplete specimen from Bakonybél, Som Hill, loose.

Measurements

Inventory No.	L	W	T	Ch
INV 2023.357.	8.3	7.5	4.1	0

Description

External characters: Small *Zeilleria* with subcircular outline. The apical angle is about 90°. The maximum width is attained at about the middle of the length. The valves are moderately ventribiconvex; the maximum convexity lies near the middle of the length. The beak is moderately high; it is not fully preserved but seems to be suberect. Blunt beak ridges run to the posterolateral extremities. The foramen is not preserved. The delthyrium is concealed by matrix. In lateral view, the lateral commissures are straight and gently arched ventrally. The anterior commissure is rectimarginate tending to be a widely uniplicate. The surface of the shell is smooth except a few weak growth lines.

Internal characters: These were not studied by serial sectioning because of the paucity of the material.

Remarks

The generic attribution of this very small and almost characterless form has been controversial and remains doubtful. In the original description, PARONA (1881, l.c.) used the combination of names "*Terebratula Beggiatoi*". Later PARONA (1896, p. 33) with no proper morphological evidence, tentatively attributed his species *beggiatoi* to *Rhynchonellina*, and this was followed by FERRARI (1962) without any further explanation. However, this attribution of a Middle Jurassic species is not tenable because the genus *Rhynchonellina* was restricted to the Early Jurassic. Moreover, supposing that our specimen from the Bakony indeed represents the species *beggiatoi*, it may not belong to the rhynchonellides, because its shell does not show the fibrous structure (characteristic of rhynchonellides); on the contrary, it reveals fine punctulation (characteristic of terebratulides). The tentative attribution to *Zeilleria* is supported only by weak traces of dental plates seen in the damaged beak of the specimen.

Distribution

Middle Jurassic in the Southern Alps. In the Transdanubian Range it occurs in the late Bajocian.

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Appendices

Appendix 1. Bajocian *Apringia* measurements

No.	Taxon	Locality	L	W	T	Ch	Cw
1	*Apringia atla "polymorpha"*	Csapótanya	23,1	25.2	16,2	12.5	20.1
2	*Apringia atla "polymorpha"*	Csapótanya	22,8	24.4	16,3	12.1	20,7
3	*Apringia atla "polymorpha"*	Csapótanya	23,6	28,5	17,1	13.6	22,9
4	*Apringia atla "polymorpha"*	Csapótanya	21,1	21,1	15,8	8,5	19,4
5	*Apringia atla "polymorpha"*	Csapótanya	19,4	21,2	16,3	10,9	17,5
6	*Apringia atla "polymorpha"*	Csapótanya	22,8	22,7	17,7	14,4	18,6
7	*Apringia atla "polymorpha"*	Csapótanya	20,1	20,1	13,1	7,9	17,4
8	*Apringia atla "polymorpha"*	Csapótanya	22,7	25.6	17,1	9.9	20.9
9	*Apringia atla "polymorpha"*	Csapótanya	17,1	18.6	12,2	9.1	15.5
10	*Apringia atla "polymorpha"*	Csapótanya	21,7	23.1	16,1	10.1	19,9
11	*Apringia atla "polymorpha"*	Csapótanya	22,1	24,3	14,1	10,5	21,6
12	*Apringia atla "polymorpha"*	Csapótanya	21,5	26,6	15,1	12,9	21,5
13	*Apringia atla "polymorpha"*	Csapótanya	20,9	21,7	13,9	8,1	17,1
14	*Apringia atla "polymorpha"*	Csapótanya	19,3	20,2	13,3	10,9	17,3
15	*Apringia atla "polymorpha"*	Csapótanya	24,1	24,4	15,8	12,4	18,2
16	*Apringia atla "polymorpha"*	Csapótanya	22,9	23.9	14,7	10,2	20.5
17	*Apringia atla "polymorpha"*	Csapótanya	26,8	31.1	18,1	10.9	26,4
18	*Apringia atla "polymorpha"*	Gyenespuszta	20,8	22,9	12,9	8,5	17,9
19	*Apringia atla "polymorpha"*	Gyenespuszta	20,4	22,9	12,9	8,5	18,1
20	*Apringia atla "polymorpha"*	Gyenespuszta	23.6	29,2	14,5	13,8	22,9
21	*Apringia coarctata*	Csapótanya	18,5	18,1	14,1	11,8	14,7
22	*Apringia coarctata*	Csapótanya	18,3	19,1	14,5	13,5	15,5
23	*Apringia coarctata*	Csapótanya	19,3	17,4	14,7	9,9	13,5
24	*Apringia coarctata*	Csapótanya	20,5	20.9	15,2	13.8	18.6
25	*Apringia coarctata*	Csapótanya	17,7	20.5	13,8	12.2	16,2
26	*Apringia coarctata*	Csapótanya	13,6	14.1	9,1	7.8	11,1
27	*Apringia coarctata*	Fenyveskút N	22,5	23,5	14,7	13.2	16,6
28	*Apringia coarctata*	Fenyveskút N	19,8	22,7	15,3	14,9	18,3
29	*Apringia coarctata*	Kisnyerges Ravine	14.2	16,6	10,1	10,6	13,4
30	*Apringia coarctata*	Som Hill	17,2	21,5	15,4	14.8	17,4
31	*Apringia coarctata*	Som Hill	17.1	17,5	11,5	11,6	14,5
32	*Apringia coarctata*	Som Hill	17.1	17,8	12,5	12,6	15,5
33	*Apringia coarctata*	Som Hill	16,6	17,1	10,8	10,9	14,8
34	*Apringia coarctata*	Som Hill	14,8	14,8	9,1	8,5	11,1
35	*Apringia coarctata*	Som Hill	13,2	15,8	9,1	8,3	11,4
36	*Apringia coarctata*	Som Hill	12,2	12.4	7,9	6.6	10.1
37	*Apringia coarctata*	Som Hill	15,1	16.9	10,5	10.2	12,5
38	*Apringia coarctata*	Som Hill	12,1	12,3	7,1	6,9	10,1
39	*Apringia coarctata*	Som Hill	11,9	12,5	8.1	7,9	10,7
40	*Apringia atla*	Csapótanya	19,9	19,6	14,2	9,5	14,9
41	*Apringia atla*	Csapótanya	20,8	22,4	14,7	12,1	17,7

Appendix 1. Continuation

No.	Taxon	Locality	L	W	T	Ch	Cw
42	*Apringia atla*	Csapótanya	20,4	21,6	14,5	11,9	16,7
43	*Apringia atla*	Csapótanya	19,1	21.8	13,1	9,7	15,8
44	*Apringia atla*	Csapótanya	22,4	24,5	15,6	12.1	20,7
45	*Apringia atla*	Csapótanya	20.4	22,5	14,5	9.5	16,4
46	*Apringia atla*	Csapótanya	22.1	24,3	15,4	10,7	18,6
47	*Apringia atla*	Csapótanya	18.5	20,8	13.1	8,4	16.2
48	*Apringia atla*	Csapótanya	21,2	23,1	14,3	10,1	20,5
49	*Apringia atla*	Csapótanya	16,5	17,9	11,7	9,1	14,1
50	*Apringia atla*	Csapótanya	18,3	22.5	13,2	8,6	15,9
51	*Apringia atla*	Csapótanya	20,5	23,4	14,8	9.6	19,2
52	*Apringia atla*	Csapótanya	19,5	21,5	14,5	10.4	17,1
53	*Apringia atla*	Csapótanya	23.2	22,5	15.7	10,2	18.3
54	*Apringia atla*	Csapótanya	19,9	20,1	13,3	9,3	17,6
55	*Apringia atla*	Csapótanya	20,3	24,5	15,2	11,8	19,2
56	*Apringia atla*	Csapótanya	16,3	17,7	10,8	6,1	13,1
57	*Apringia atla*	Csapótanya	22,5	25,4	16,3	12.5	19,4
58	*Apringia atla*	Csapótanya	21,3	20,9	13,8	10.8	16,7
59	*Apringia atla*	Csapótanya	22.4	21,5	13.9	10,1	18.1
60	*Apringia atla*	Csapótanya	17.8	18,5	12.9	5.1	14.5
61	*Apringia atla*	Csapótanya	22,9	24,9	17,4	10,6	19,6
62	*Apringia atla*	Csapótanya	19,6	21.8	13,2	9,2	17,4
63	*Apringia atla*	Csapótanya	18,3	21,8	12,8	9,1	17,9
64	*Apringia atla*	Csapótanya	22,3	23,6	17,6	13.9	18,9
65	*Apringia atla*	Csapótanya	18.7	22,6	12,3	5.9	18,5
66	*Apringia atla*	Csapótanya	21.1	22,5	14.6	10,8	18.9
67	*Apringia atla*	Csapótanya	18,4	20,5	12,6	5,1	17,1
68	*Apringia atla*	Csapótanya	21,3	23,5	14,9	8,1	18,9
69	*Apringia atla*	Gyenespuszta	21,8	27.3	15,9	10.4	21,1
70	*Apringia atla*	Gyenespuszta	19,9	21.9	13,7	10.1	18,1
71	*Apringia atla*	Gyenespuszta	20.6	22,4	14,5	10.7	17,6
72	*Apringia atla*	Gyenespuszta	23.4	26,2	15.9	12,1	18.8
73	*Apringia atla*	Gyenespuszta	20.9	25,2	14.6	8.8	19.9
74	*Apringia atla*	Gyenespuszta	19.5	20,1	14,2	7,7	16,1
75	*Apringia atla*	Gyenespuszta	17,8	19.2	14,2	8,9	15,5
76	*Apringia atla*	Gyenespuszta	20,2	23.9	15,7	10.2	20,3
77	*Apringia atla*	Gyenespuszta	15,6	16,8	9,9	7.1	12,2
78	*Apringia atla*	Gyenespuszta	17.5	20,1	11.7	6.4	16.1
79	*Apringia atla*	Gyenespuszta	22.8	25,3	14.6	11,5	20.1
80	*Apringia atla*	Gyenespuszta	19,4	21,9	15,4	12,6	18,8
81	*Apringia atla*	Gyenespuszta	21,3	24.2	13,8	8,1	18,8
82	*Apringia atla*	Csapótanya	22,7	25.5	15,9	12.1	17,6
83	*Apringia atla*	Csapótanya	22,4	25.4	13,4	9.5	21,1

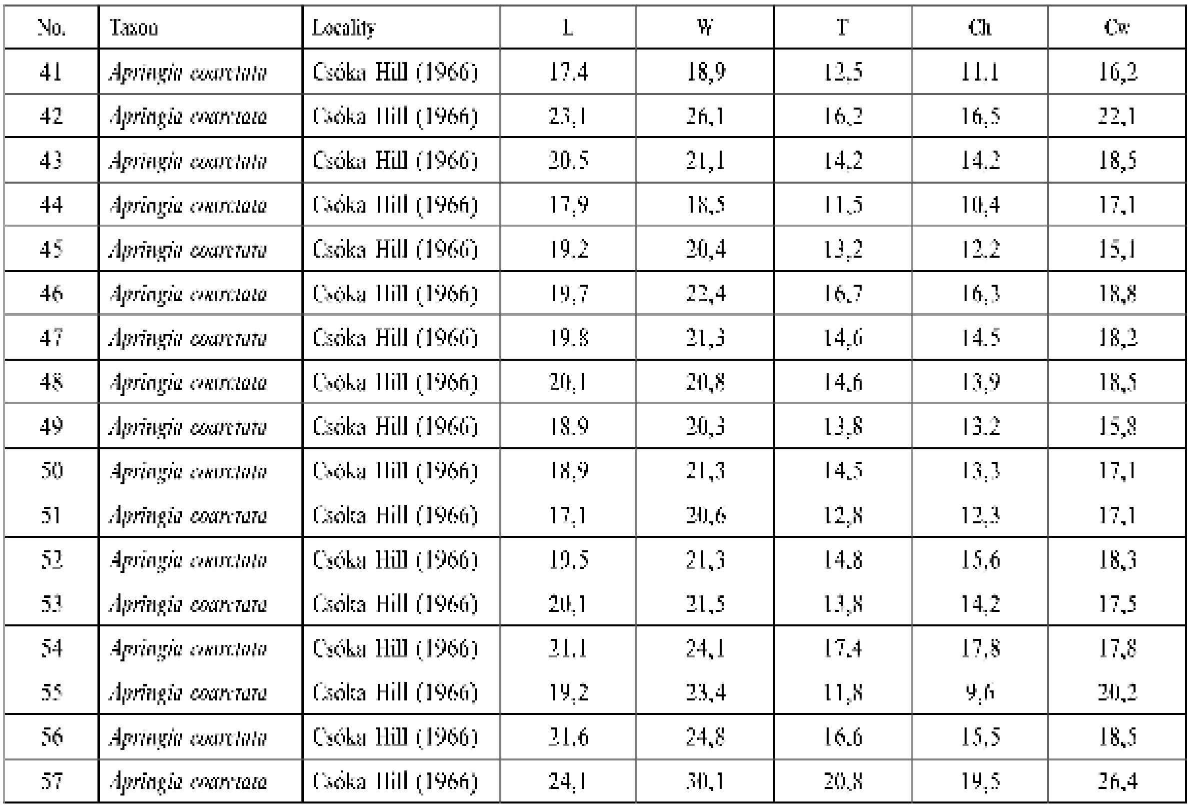
Appendix 1. Continuation

No.	Taxon	Locality	L	W	T	Ch	Cw
84	*Apringia atla*	Csapótanya	20,5	22,8	13,9	8,1	18.1
85	*Apringia atla*	Csapótanya	18,8	19,7	13,4	6,5	16.2
86	*Apringia alontina*	Fenyveskút VIII	14,8	15,5	11,6	4,1	10.5
87	*Apringia alontina*	Fenyveskút VIII	14,8	15,1	10,4	6,1	9,7
88	*Apringia alontina*	Fenyveskút VIII	13,1	14,7	9,3	3,4	9,5
89	*Apringia alontina*	Fenyveskút VIII	15,9	16,6	11,6	7,1	11.9
90	*Apringia alontina*	Fenyveskút VIII	16,2	17,8	11,1	7,1	13.8
90	*Apringia alontina*	Fenyveskút VIII	16,2	17,8	11,1	7,1	13,8
91	*Apringia alontina*	Fenyveskút VIII	15,8	15,7	10,2	4,8	12.3
92	*Apringia alontina*	Fenyveskút VIII	14,8	15,6	10,6	7,5	12,4
93	*Apringia alontina*	Fenyveskút VIII	16,1	17,3	11,1	7,1	12.5
94	*Apringia alontina*	Fenyveskút VIII	13,6	14,2	10,1	4,6	9,8
95	*Apringia alontina*	Fenyveskút VIII	13.4	15.2	10.2	4,9	11.9
96	*Apringia alontina*	Fenyveskút VIII	13,5	13,9	8,9	3,6	11,3
97	*Apringia alontina*	Fenyveskút VIII	15.1	15.5	10.2	6,5	9.5
98	*Apringia alontina*	Fenyveskút VIII	14,2	17,1	8,7	4,3	11,8
99	*Apringia alontina*	Fenyveskút VIII	13.6	13.9	10.5	5,7	10.7
100	*Apringia alontina*	Fenyveskút VIII	12,8	14,6	9,1	5,4	11,6
101	*Apringia alontina*	Fenyveskút VIII	13,8	14,4	10,5	4,5	10.3
102	*Apringia alontina*	Fenyveskút VIII	13,1	13,6	8,4	4,3	9,8
103	*Apringia alontina*	Fenyveskút VIII	12,6	12,9	10,3	4,8	8,9
104	*Apringia alontina*	Fenyveskút VIII	12,5	12,4	9,1	2,2	6,7
105	*Apringia alontina*	Fenyveskút VIII	10,1	9,7	5,9	2,8	6,9

Appendix 2. Bathonian *Apringia* measurements

No.	Taxon	Locality	L	W	T	Ch	Cw
1	*Apringia atla*	Csóka Hill (1966)	14,1	15,8	8,9	6,1	11,5
2	*Apringia atla*	Csóka Hill (1966)	15,6	16,2	8,1	6,5	13,8
3	*Apringia atla*	Csóka Hill (1966)	13,8	15,4	7,6	2.9	12.4
4	*Apringia atla*	Csóka Hill (1966)	19,2	17,9	11,5	4,5	14,3
5	*Apringia atla*	Csóka Hill (1966)	14,6	16,2	8,6	7,1	13,4
6	*Apringia atla*	Csóka Hill (1966)	16,9	20,1	10,4	8.6	16.9
7	*Apringia atla*	Csóka Hill (1966)	12,8	12,4	7,1	3,7	9,4
8	*Apringia atla*	Csóka Hill (1966)	14,5	16,7	9,1	5,1	12,7
9	*Apringia atla*	Csóka Hill (1966)	18,9	19,1	11,6	7.7	16.1
10	*Apringia atla*	Csóka Hill (1966)	13,3	13,1	7,2	5,6	10,9
11	*Apringia atla*	Csóka Hill (1966)	14,9	14,7	8,9	5,8	11,6
12	*Apringia atla*	Csóka Hill (1966)	13,2	14,2	7.2	3.9	9,9
13	*Apringia coarctata*	Csóka Hill (1966)	22,4	22,3	15,7	14,9	19,5
14	*Apringia coarctata*	Csóka Hill (1966)	19,5	21,6	14,9	12,2	17,1
15	*Apringia coarctata*	Csóka Hill (1966)	20,1	23,1	14,7	12.8	19.3
16	*Apringia coarctata*	Csóka Hill (1966)	22,1	22,4	15,5	14,9	19,3
17	*Apringia coarctata*	Csóka Hill (1966)	22,7	23,9	16,8	16,4	20,7
18	*Apringia coarctata*	Csóka Hill (1966)	20,5	23,1	15,5	14.1	19.1
19	*Apringia coarctata*	Csóka Hill (1966)	21,3	24,5	15,8	16,7	20,4
20	*Apringia coarctata*	Csóka Hill (1966)	23,5	24,1	16,3	17,1	21,2
21	*Apringia coarctata*	Csóka Hill (1966)	23,3	28,1	18,6	18.9	23.9
22	*Apringia coarctata*	Csóka Hill (1966)	20,3	22,2	15,1	14,5	18,1
23	*Apringia coarctata*	Csóka Hill (1966)	19,1	18,8	12,2	11,5	17,6
24	*Apringia coarctata*	Csóka Hill (1966)	22,1	21,8	13,4	12.8	19.1
25	*Apringia coarctata*	Csóka Hill (1966)	19,4	21,2	16,8	16,2	16,8
26	*Apringia coarctata*	Csóka Hill (1966)	19,7	22,6	15,7	14,4	18,1
27	*Apringia coarctata*	Csóka Hill (1966)	20,1	18,8	15,8	13.5	16.3
28	*Apringia coarctata*	Csóka Hill (1966)	23,9	22,1	14,7	16,9	20,4
29	*Apringia coarctata*	Csóka Hill (1966)	18,4	20,1	13,6	12,8	15,1
30	*Apringia coarctata*	Csóka Hill (1966)	22,8	22,9	18,4	15.6	17.8
31	*Apringia coarctata*	Csóka Hill (1966)	19,5	22,7	13,4	12,1	19,5
32	*Apringia coarctata*	Csóka Hill (1966)	16,7	18,4	12,4	10,8	12,5
33	*Apringia coarctata*	Csóka Hill (1966)	19,7	23,2	13,7	11.1	18.5
34	*Apringia coarctata*	Csóka Hill (1966)	19,5	21,9	12,8	10,6	16,1
35	*Apringia coarctata*	Csóka Hill (1966)	18,2	20,6	12,3	11,9	16,1
36	*Apringia coarctata*	Csóka Hill (1966)	24,4	25,7	16.9	16.5	20.5
37	*Apringia coarctata*	Csóka Hill (1966)	18,9	21,6	14,4	15,1	18.5
38	*Apringia coarctata*	Csóka Hill (1966)	18,2	22,9	14,1	13,2	20,1
39	*Apringia coarctata*	Csóka Hill (1966)	20,6	23,5	15,8	13.9	19.5
40	*Apringia coarctata*	Csóka Hill (1966)	19,8	20,8	16,8	15,8	18,1

Appendix 2. Continuation



No.	Taxon	Locality	L	W	T	Ch	Cw
41	*Apringia coarctata*	Csóka Hill (1966)	17.4	18,9	12,5	11.1	16,2
42	*Apringia coarctata*	Csóka Hill (1966)	23,1	26,1	16,2	16,5	22,1
43	*Apringia coarctata*	Csóka Hill (1966)	20.5	21,1	14,2	14.2	18,5
44	*Apringia coarctata*	Csóka Hill (1966)	17,9	18,5	11,5	10,4	17,1
45	*Apringia coarctata*	Csóka Hill (1966)	19.2	20,4	13,2	12.2	15,1
46	*Apringia coarctata*	Csóka Hill (1966)	19,7	22,4	16,7	16,3	18,8
47	*Apringia coarctata*	Csóka Hill (1966)	19.8	21,3	14,6	14.5	18,2
48	*Apringia coarctata*	Csóka Hill (1966)	20,1	20,8	14,6	13,9	18,5
49	*Apringia coarctata*	Csóka Hill (1966)	18.9	20,3	13,8	13.2	15,8
50	*Apringia coarctata*	Csóka Hill (1966)	18,9	21,3	14,5	13,3	17,1
51	*Apringia coarctata*	Csóka Hill (1966)	17,1	20,6	12,8	12,3	17,1
52	*Apringia coarctata*	Csóka Hill (1966)	19,5	21,3	14.8	15,6	18,3
53	*Apringia coarctata*	Csóka Hill (1966)	20,1	21,5	13,8	14,2	17,5
54	*Apringia coarctata*	Csóka Hill (1966)	21,1	24,1	17,4	17,8	17,8
55	*Apringia coarctata*	Csóka Hill (1966)	19,2	23,4	11,8	9,6	20,2
56	*Apringia coarctata*	Csóka Hill (1966)	21,6	24,8	16.6	15,5	18,5
57	*Apringia coarctata*	Csóka Hill (1966)	24,1	30,1	20,8	19,5	26,4

Appendix 3. Bajocian *Galatirhynchia* measurements

No.	Taxon	Locality	L	W	T	Ribs
1	*Galatirhynchia galatensis*	Csapótanya	9.8	12,7	6,5	10
2	*Galatirhynchia galatensis*	Csapótanya	10,3	11,6	5,9	12
3	*Galatirhynchia galatensis*	Csapótanya	8,9	11,1	5,3	14
4	*Galatirhynchia galatensis*	Csapótanya	10,8	12,1	6,5	16
5	*Galatirhynchia galatensis*	Csapótanya	8,5	11,1	4,7	18
6	*Galatirhynchia galatensis*	Csapótanya	7,9	8.9	5.0	16
7	*Galatirhynchia galatensis*	Csapótanya	8,1	9,3	5,4	16
8	*Galatirhynchia galatensis*	Csapótanya	8.0	10	5,6	15
9	*Galatirhynchia galatensis*	Csapótanya	8,1	10,8	6,1	14
10	*Galatirhynchia galatensis*	Csapótanya	8,7	10.3	5,5	20
11	*Galatirhynchia galatensis*	Csapótanya	7,8	9,3	5,1	14
12	*Galatirhynchia galatensis*	Csapótanya	7,4	10.7	4,9	16
13	*Galatirhynchia galatensis*	Csapótanya	7,5	10,4	5,6	22
14	*Galatirhynchia galatensis*	Csapótanya	7,4	11.8	5,1	18
15	*Galatirhynchia galatensis*	Csapótanya	8,5	13,1	5,6	19
16	*Galatirhynchia galatensis*	Csapótanya	8,9	10.9	4,7	17
17	*Galatirhynchia galatensis*	Csapótanya	8,8	11,9	6,1	12
18	*Galatirhynchia galatensis*	Csapótanya	9.3	10,6	6,1	10
19	*Galatirhynchia galatensis*	Csapótanya	8,6	11,5	5,6	16
20	*Galatirhynchia galatensis*	Csapótanya	10,1	11.8	6,5	16
21	*Galatirhynchia galatensis*	Csapótanya	9,5	10,7	6,3	12
22	*Galatirhynchia galatensis*	Csapótanya	9.5	13,5	5,9	17
23	*Galatirhynchia galatensis*	Csapótanya	9,6	12,2	6,1	14
24	*Galatirhynchia galatensis*	Csapótanya	9.4	12,8	6,5	15
25	*Galatirhynchia galatensis*	Csapótanya	9,1	11,8	6,1	15
26	*Galatirhynchia galatensis*	Csapótanya	9.8	13,2	7,9	25
27	*Galatirhynchia galatensis*	Csapótanya	10,3	14,1	6,6	18
28	*Galatirhynchia galatensis*	Csapótanya	10.1	13,8	6,9	17
29	*Galatirhynchia galatensis*	Csapótanya	10,4	11,9	6,5	16
30	*Galatirhynchia galatensis*	Csapótanya	9,7	12,7	6,4	19
31	*Galatirhynchia galatensis*	Csapótanya	9,8	12,1	6,8	18
32	*Galatirhynchia galatensis*	Csapótanya	9.7	14,3	6,3	17
33	*Galatirhynchia galatensis*	Csapótanya	11.6	14,7	8,5	15
34	*Galatirhynchia galatensis*	Csapótanya	10,2	13,9	8,2	20

Appendix 4. Bajocian *Hajagithyris* measurements

No.	Taxon	Locality	L	W	T	Cb	Cw	L/W
1	*Hajagithyris nykurionensis*	Csapótanya	18,7	19,3	9,9	3,4	10,1	0,968911917
2	*Hajagithyris fylgia*	Csapótanya	22,1	19,7	13,5	2,7	12,2	1,121827411
3	*Hajagithyris fylgia*	Csapótanya	20.7	16,3	12,1	1,7	10.6	1.26993865
4	*Hajagithyris fylgia*	Csapótanya	20.1	14.9	12,7	1,2	8,6	1.348993289
5	*Hajagithyris fylgia*	Csapótanya	18,9	15,9	10,6	2,1	10,8	1,188679245
6	*Hajagithyris fylgia*	Gyenespuszta	20,5	18,8	13,1	3,9	12,9	1,090425532
7	*Hajagithyris fylgia*	Gyenespuszta	18.7	16,8	10,8	1,7	9,1	1.113095238
8	*Hajagithyris fylgia*	Csapótanya	20,7	19.2	12,9	3,3	13,8	1.078125
9	*Hajagithyris fylgia*	Csapótanya	17,3	15,3	10,3	2,2	9,2	1,130718954
10	*Hajagithyris fylgia*	Csapótanya	24,7	18,8	13,9	3,1	10.1	1,313829787
11	*Hajagithyris fylgia*	Csapótanya	18.1	15,9	11,7	3,1	8,7	1.13836478
12	*Hajagithyris fylgia*	Csapótanya	22,4	19.8	13,8	3,6	10,8	1.131313131
13	*Hajagithyris fylgia*	Csapótanya	18,1	14,1	9,1	2,1	9,1	1,283687943
14	*Hajagithyris fylgia*	Csapótanya	18.4	15,6	9,5	2,1	10.2	1.179487179
15	*Hajagithyris fylgia*	Csapótanya	20.1	19.1	12,9	2,2	11.8	1.052356021
16	*Hajagithyris fylgia*	Csapótanya	19,6	16.4	12,3	2,1	9,8	1,195121951
17	*Hajagithyris fylgia*	Csapótanya	17,3	14,9	10,1	2,2	9,9	1,161073826
18	*Hajagithyris fylgia*	Csapótanya	19.9	15,8	11,4	1,9	10.5	1,259493671
19	*Hajagithyris fylgia*	Csapótanya	20.6	17.9	10,6	1,6	11.7	1.150837989
20	*Hajagithyris fylgia*	Csapótanya	19,2	17,8	12,7	2,7	11,5	1,078651685
21	*Hajagithyris fylgia*	Csapótanya	20,1	18,3	12,3	2,8	11,8	1,098360656
22	*Hajagithyris fylgia*	Csapótanya	18.2	15,1	10,6	2,4	10.1	1.205298013
23	*Hajagithyris fylgia*	Csapótanya	18.3	14.3	9.6	2,1	9,6	1,27972028
24	*Hajagithyris fylgia*	Csapótanya	14,2	11,7	8,1	1,7	7,4	1,213675214
25	*Hajagithyris fylgia*	Csapótanya	17.5	13,9	10,6	1,6	8.6	1,258992806
26	*Hajagithyris fylgia*	Csapótanya	18.7	16,8	12,1	2,4	10.1	1.113095238
27	*Hajagithyris fylgia*	Csapótanya	21,9	18.6	13,5	2,5	11,8	1.177419355
28	*Hajagithyris fylgia*	Csapótanya	19,7	17,4	12,1	2,4	10,3	1,132183908
29	*Hajagithyris fylgia*	Csapótanya	20,8	17,5	13,6	2,5	10,7	1,188571429
30	*Hajagithyris seguenzae*	Csapótanya	28.4	25,2	21,1	2,8	17.4	1.126984127
31	*Hajagithyris seguenzae*	Csapótanya	20,6	16.5	14,6	3,4	11,6	1,248484848
32	*Hajagithyris seguenzae*	Csapótanya	25,6	22,9	16,1	3,1	16,1	1,11790393
33	*Hajagithyris seguenzae*	Csapótanya	19.7	17,6	13,7	2,5	11.8	1,119318182
34	*Hajagithyris seguenzae*	Csapótanya	21.5	17.7	13,9	3,8	10.8	1.214689266
35	*Hajagithyris seguenzae*	Csapótanya	23,5	21.1	15,2	2,7	15,5	1.113744076
36	*Hajagithyris seguenzae*	Csapótanya	22,1	20,4	15,7	5,6	12,9	1,083333333
37	*Hajagithyris seguenzae*	Csapótanya	21.1	21,8	16,2	4,5	14.7	0.967889908
38	*Hajagithyris seguenzae*	Csapótanya	22.4	20.6	16,1	3,1	12.1	1.087378641
39	*Hajagithyris seguenzae*	Csapótanya	23,7	21,5	16,1	5,6	14,2	1,102325581
40	*Hajagithyris seguenzae*	Csapótanya	24,6	20,4	16,4	4,6	14,1	1,205882353
41	*Hajagithyris seguenzae*	Csapótanya	23.9	22,4	17,4	4,4	14.7	1.066964286
42	*Hajagithyris seguenzae*	Csapótanya	23.9	24.4	16,6	4,2	17.9	0.979508197
43	*Hajagithyris seguenzae*	Csapótanya	22,5	17,8	15,7	2,5	11,5	1,264044944

Appendix 4. Continuation

No.	Taxon	Locality	L	W	T	Ch	Cw	L/W
44	*Hajagithyris seguenzae*	Csapótanya	22,8	19,1	16,2	4,9	13,1	1,193717277
45	*Hajagithyris seguenzae*	Csapótanya	22,2	21,8	16,3	3,7	14,1	1,018348624
46	*Hajagithyris seguenzae*	Csapótanya	24,1	21,8	17,2	5,8	15,3	1,105504587
47	*Hajagithyris seguenzae*	Csapótanya	22,6	22,6	16,4	5,9	15,8	1
48	*Hajagithyris seguenzae*	Csapótanya	24,1	23,8	17,1	4,3	15,9	1,012605042
49	*Hajagithyris seguenzae*	Csapótanya	24,6	20,7	15,6	5,1	13,5	1,188405797
50	*Hajagithyris seguenzae*	Csapótanya	23,6	19,5	14,5	4,6	14,1	1,21025641
51	*Hajagithyris seguenzae*	Csapótanya	23,6	21,4	15,6	4,2	11,8	1,102803738
52	*Hajagithyris seguenzae*	Csapótanya	24,5	22,2	15,6	3,7	16,5	1,103603604

Plates

Plate I

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 Palaeontology and Geology, Hungarian Natural History Museum, under the inventory numbers prefixed by INV

1. *Apringia atla* (Oppel, 1863) – INV 2023.268., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
2. *Apringia atla* (Oppel, 1863) – INV 2023.269., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
3. *Apringia atla* (Oppel, 1863) – INV 2023.270., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
4. *Apringia atla* (Oppel, 1863) – INV 2023.271., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
5. *Apringia atla* (Oppel, 1863) – INV 2023.270273., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
6. *Apringia atla* (Oppel, 1863) – INV 2023.272., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
7. *Apringia coarctata* (Oppel, 1863) – INV 2023.376., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
8. *Apringia atla* (Oppel, 1863) – INV 2023.274., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
9. *Apringia atla* (Oppel, 1863) – INV 2023.275., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
10. *Apringia coarctata* (Oppel, 1863) – INV 2023.279., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
11. *Apringia coarctata* (Oppel, 1863) – INV 2023.280., Bakonybél, Som Hill, loose, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
12. *Apringia atla* (Oppel, 1863) – INV 2023.278., Mór, Csóka Hill (1966), upper Bathonian; a: dorsal view, b: anterior view, c: lateral view.
13. *Apringia coarctata* (Oppel, 1863) – INV 2023.281., Mór, Csóka Hill (1966), upper Bathonian; a: dorsal view, b: anterior view, c: lateral view.
14. *Apringia coarctata* (Oppel, 1863) – INV 2023.282., Mór, Csóka Hill (1966), upper Bathonian; a: dorsal view, b: anterior view, c: lateral view.
15. *Apringia coarctata* (Oppel, 1863) – INV 2023.283., Mór, Csóka Hill (1966), upper Bathonian; a: dorsal view, b: anterior view, c: lateral view.
16. *Apringia alontina* (Di Stefano, 1884) – INV 2023.285., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
17. *Apringia alontina* (Di Stefano, 1884) – INV 2023.286., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
18. *Pseudogibbirhynchia* ? cf. *etalloni* (Oppel, 1863) – INV 2023.288., Lókút, Lókút Hill, Bed 29, lower Bajocian, Laeviuscula Zone; dorsal view.
19. *Pseudogibbirhynchia* ? cf. *etalloni* (Oppel, 1863) – INV 2023.289., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view, d: ventral view.
20. *Pseudogibbirhynchia* ? cf. *etalloni* (Oppel, 1863) – INV 2023.290. (plaster cast of a sectioned specimen), Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
21. *Pseudogibbirhynchia* ? cf. *chiemiensis* (Finkelstein, 1889) – INV 2023.291., Csókakő, Csóka Hill, loose, upper(?) Bajocian; a: dorsal view, b: anterior view, c: lateral view.
22. *Pseudogibbirhynchia* ? cf. *chiemiensis* (Finkelstein, 1889) – INV 2023.292., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
23. *Pseudogibbirhynchia* ? cf. *chiemiensis* (Finkelstein, 1889) – INV 2023.293., Csókakő, Csóka Hill, southern promontory, upper(?) Bajocian; a: dorsal view, b: anterior view, c: lateral view.
24. *Septocrurella retrosinuata* (Vacek, 1886) – INV 2023.294., Hárskút, Csapótanya, late Bajocian; a: dorsal view, b: anterior view, c: lateral view.

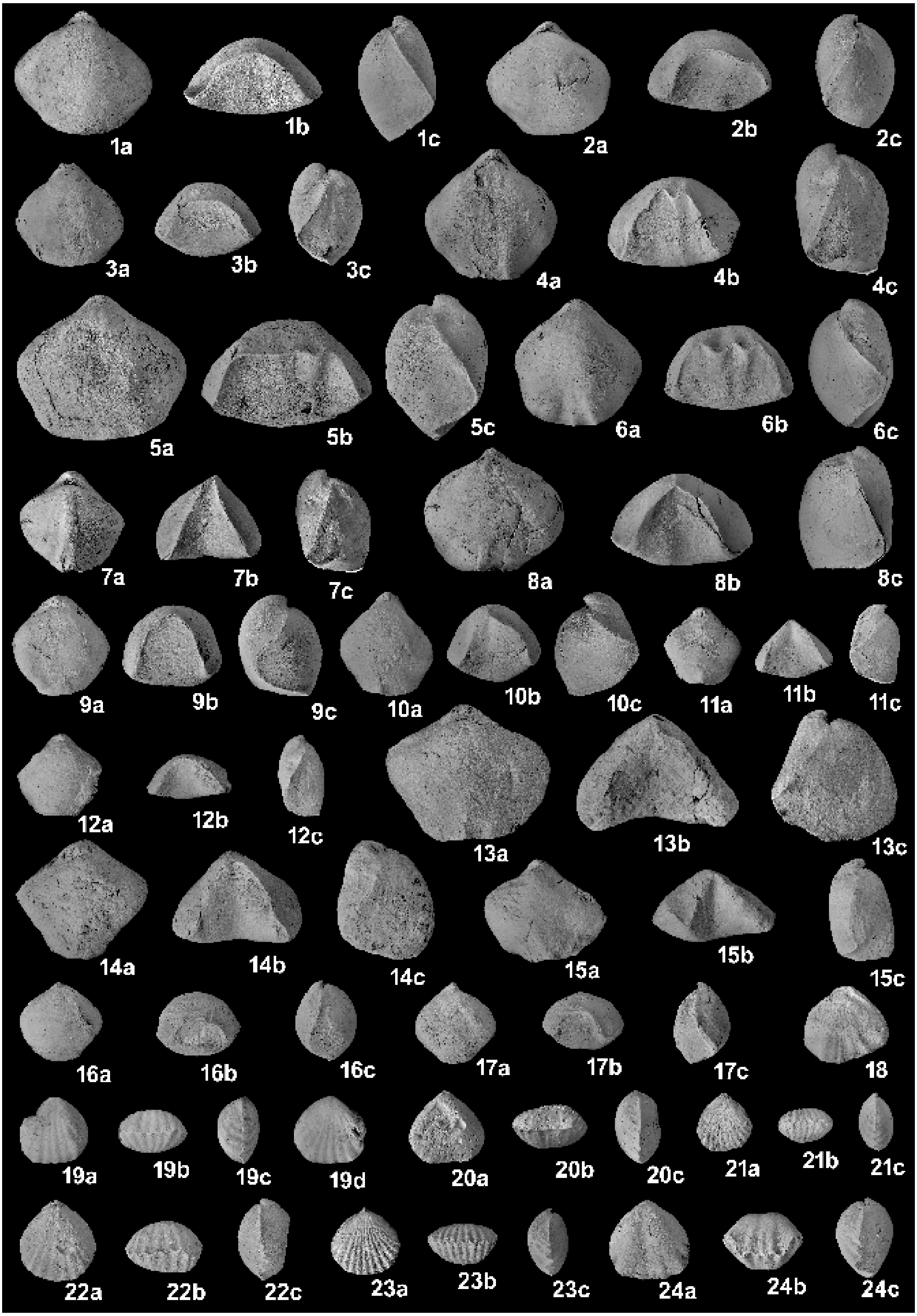

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Plate II

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 Palaeontology and Geology, Hungarian Natural History Museum, under the inventory numbers prefixed by PAL. or INV

1. *Septocrurella retrosinuata* (Vacek, 1886) – INV 2023.295., Lókút, Lókút Hill, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view.
2. *Septocrurella retrosinuata* (Vacek, 1886) – INV 2023.296., Lókút, Lókút Hill, lower Bajocian, Humphriesianum Zone; a: dorsal view, b: anterior view, c: lateral view.
3. *Fenyveskutella fallax* n. sp. – PAL 2023.37.1. (holotype), Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
4. *Fenyveskutella fallax* n. sp. – PAL 2023.38.1. (paratype), Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
5. *Fenyveskutella fallax* n. sp. – PAL 2023.39.1. (paratype), Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
6. *Fenyveskutella fallax* n. sp. – PAL 2023.40.1. (paratype), Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
7. *Fenyveskutella fallax* n. sp. – PAL 2023.41.1. (plaster cast of a sectioned paratype), Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
8. *Fenyveskutella* ? *paronai* nom. nov. – INV 2023.298., Csókakő, Csóka Hill, southern promontory, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
9. N*annirhynchia subpygmaea* Buckman, 1918 – INV 2023.299., Lókút, Lókút Hill, Bed 5, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view, d: dorsal view (magnified 2.5×).
10. *Nannirhynchia subpygmaea* Buckman, 1918 – INV 2023.300., Lókút, Lókút Hill, Bed 4, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view.
11. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.301., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
12. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.302., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
13. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.303., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
14. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.304., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
15. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.306. (plaster cast of a sectioned specimen), Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
16. *Striirhynchia berchta* (Oppel, 1863) – INV 2023.305., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
17. *Striirhynchia microptycha* (Oppel, 1863) – INV 2023.308., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
18. *Striirhynchia microptycha* (Oppel, 1863) – INV 2023.307., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
19. *Striirhynchia subechinata* (Oppel, 1863) – INV 2023.309., Bakonybél, Som Hill, neptunian dyke, upper level, upper Bajocian, Niortense Zone(?), a: dorsal view, b: anterior view, c: lateral view, d: dorsal view (magnified 2.5×).
20. *Capillirhynchia brentoniaca* (Oppel, 1863) – INV 2023.310., Lókút, Lókút Hill, Bed 4, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view.
21. *Capillirhynchia brentoniaca* (Oppel, 1863) – INV 2023.311., Lókút, Lókút Hill, Bed 9, lower Bajocian, Humphriesianum Zone; a: dorsal view, b: anterior view, c: lateral view.
22. *Capillirhynchia brentoniaca* (Oppel, 1863) – INV 2023.312., Lókút, Lókút Hill, Bed 11, lower Bajocian, Humphriesianum Zone; a: dorsal view, b: anterior view, c: lateral view.

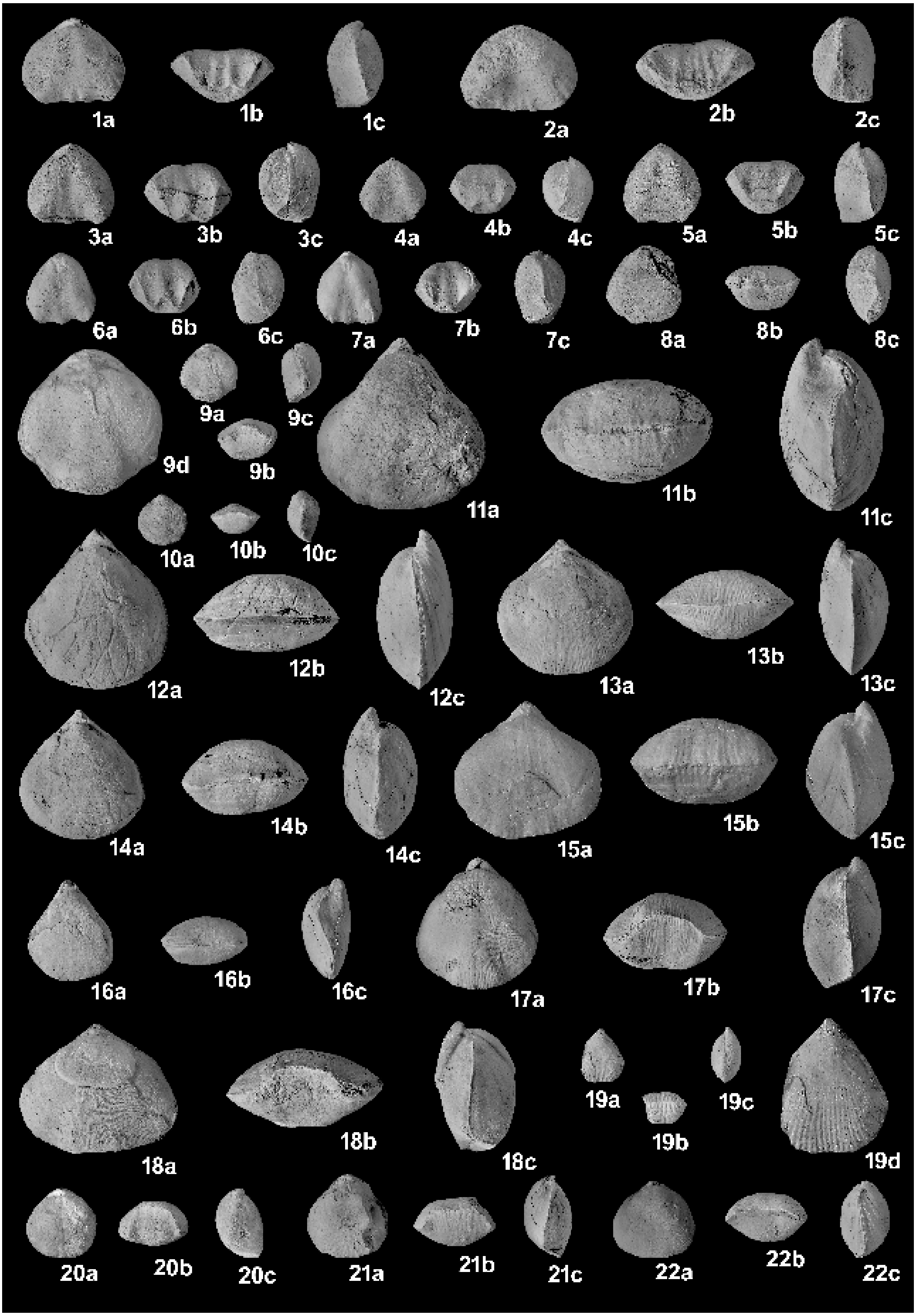
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Plate III

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 Palaeontology and Geology, Hungarian Natural History Museum, under the inventory numbers prefixed by INV

1. *Neocirpa armenica* Prozorovskaia, 1985 – INV 2023.313., Lókút, Lókút Hill, Bed 1, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view.
2. *Neocirpa armenica* Prozorovskaia, 1985 – INV 2023.314., Lókút, Lókút Hill, Bed 3, upper Bajocian, Niortense Zone; a: dorsal view, b: anterior view, c: lateral view.
3. *Galatirhynchia galatensis* (Di Stefano, 1884) – INV 2023.315., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
4. *Galatirhynchia galatensis* (Di Stefano, 1884) – INV 2023.316., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
5. *Galatirhynchia galatensis* (Di Stefano, 1884) – INV 2023.317., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
6. *Galatirhynchia galatensis* (Di Stefano, 1884) – INV 2023.318., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
7. *Galatirhynchia galatensis* (Di Stefano, 1884) – INV 2023.319., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
8. *Pseudopapodina laticoxa* (Oppel, 1863) – INV 2023.320., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
9. *Pseudopapodina laticoxa* (Oppel, 1863) – INV 2023.324., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
10. *Pseudopapodina laticoxa* (Oppel, 1863) – INV 2023.321., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
11. *Pseudopapodina laticoxa* (Oppel, 1863) – INV 2023.323., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
12. *Pseudopapodina laticoxa* (Oppel, 1863) – INV 2023.322., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
13. *Pseudopapodina* ? *recuperoi* (Di Stefano, 1884) – INV 2023.325., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
14. *Pseudopapodina* ? *recuperoi* (Di Stefano, 1884) – INV 2023.326., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
15. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.327., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
16. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.328., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
17. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.330., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
18. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.329., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.

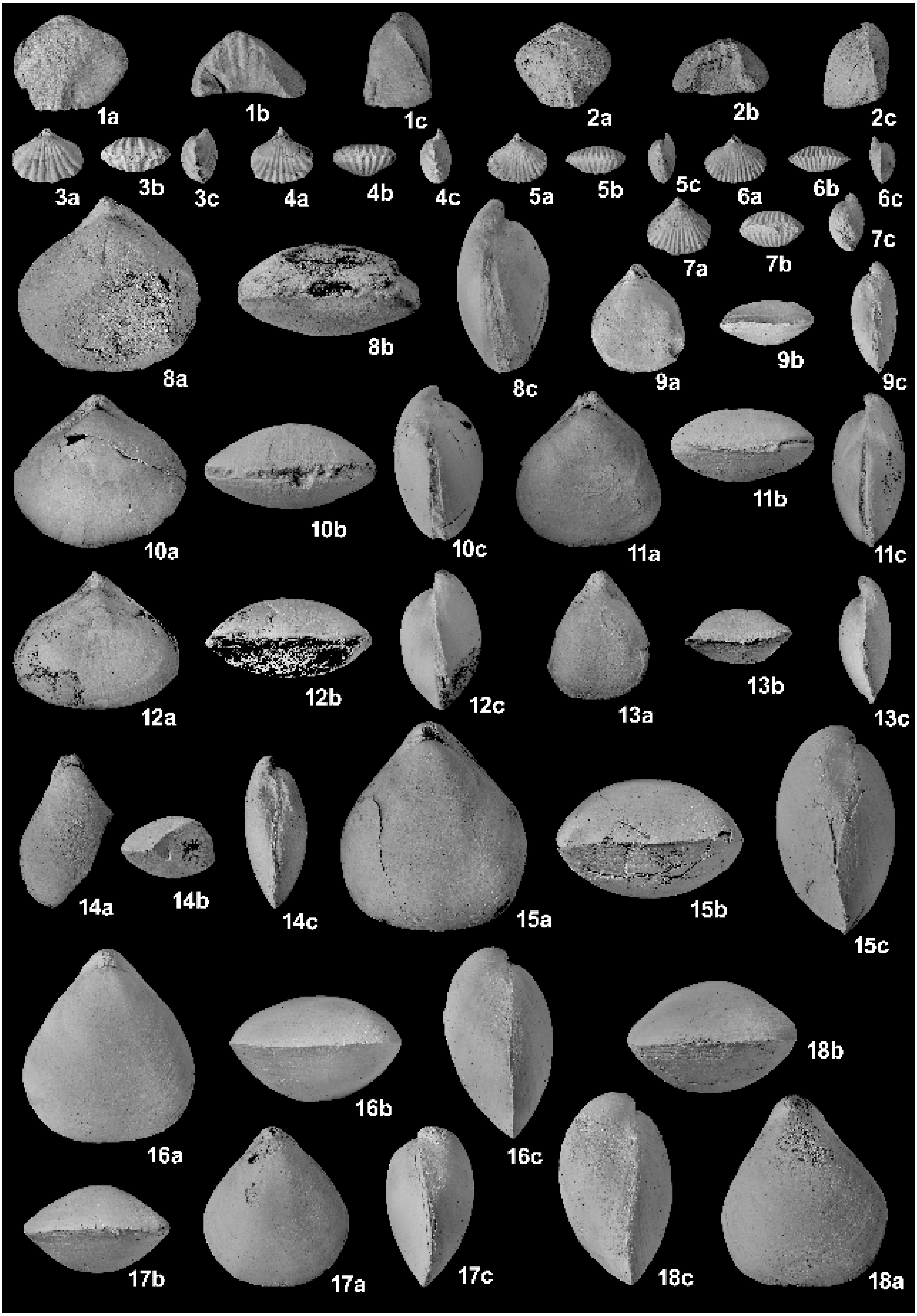
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Plate IV

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography, except figure 8. Specimens are deposited in the collection of the Department of Palaeontology and Geology, Hungarian Natural History Museum, under the inventory numbers prefixed by M. or INV

1. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.331. (plaster cast of a sectioned specimen), Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
2. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.332. (plaster cast of a sectioned specimen), Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
3. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.333., Lókút, Fenyveskút N, upper Bajocian, Niortense Zone(?); a: dorsal view, b: anterior view, c: lateral view.
4. *Karadagithyris gerda* (Oppel, 1863) – INV 2023.334., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
5. *Karadagithyris* cf. *erycina* (Gemmellaro, 1877) – INV 2023.336., Bakonybél, Som Hill, neptunian dyke, upper level, upper Bajocian, Niortense Zone(?); a: dorsal view, b: anterior view, c: lateral view.
6. *Karadagithyris* cf. *erycina* (Gemmellaro, 1877) – INV 2023.335., Bakonybél, Som Hill, neptunian dyke, upper level, upper Bajocian, Niortense Zone(?); a: dorsal view, b: anterior view, c: lateral view.
7. *Karadagithyris* cf. *erycina* (Gemmellaro, 1877) – INV 2023.337. (plaster cast of a sectioned specimen), Bakonybél, Som Hill, neptunian dyke, upper level, upper Bajocian, Niortense Zone(?); dorsal view.
8. Mass accumulation of shells of *Karadagithyris gerda* (Oppel, 1863) – M.87.065., Lókút, Fenyveskút N, upper Bajocian, Niortense Zone(?).

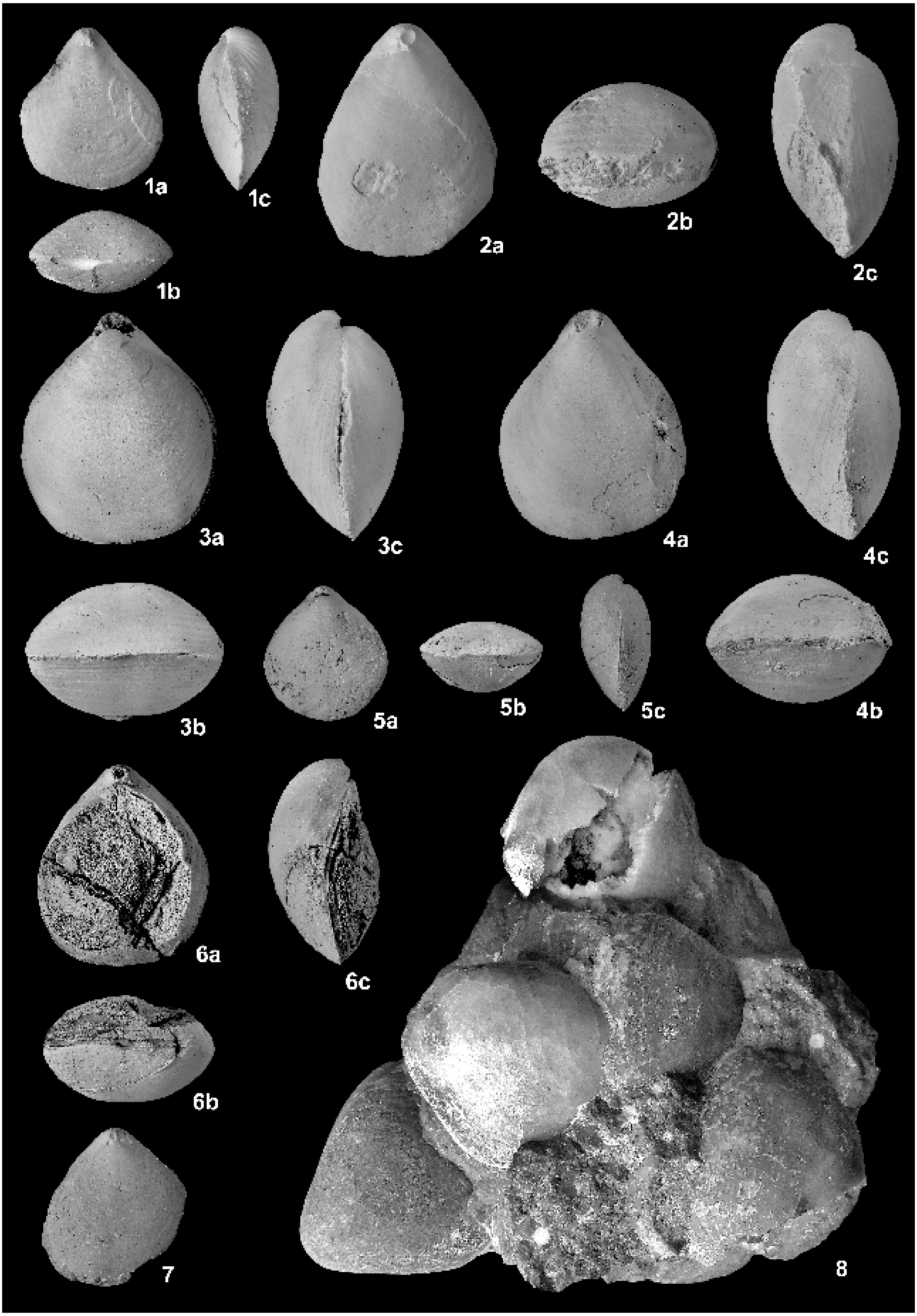
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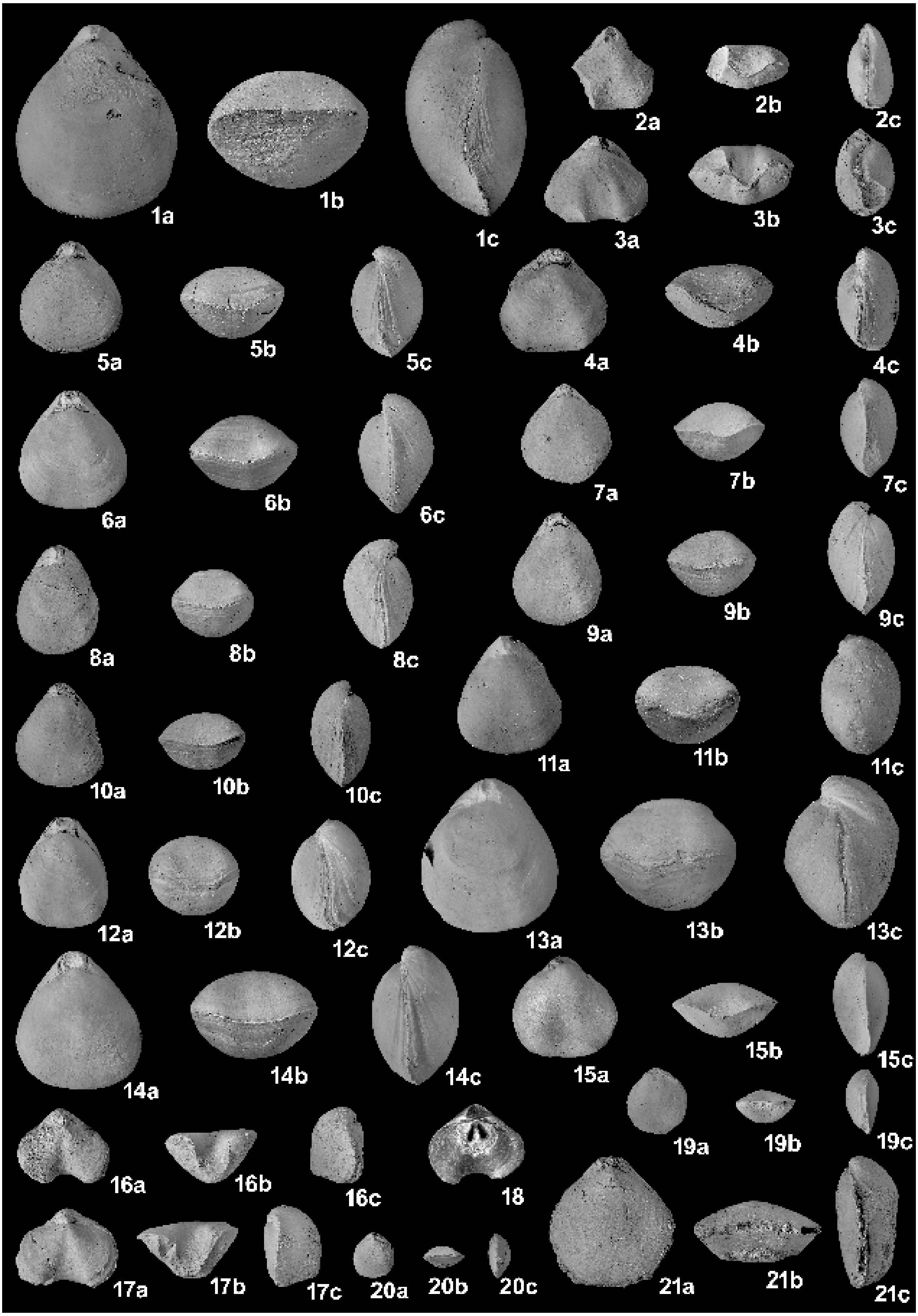
Plate V

All figures are in natural size unless otherwise indicated. Specimens have been coated with ammonium chloride before photography, except figure 18. Specimens are deposited in the collection of the Department of Palaeontology and Geology, Hungarian Natural History Museum, under the inventory numbers prefixed by INV

1. *Karadagithyris* aff. *dolhae* (Szajnocha, 1882) – INV 2023.338., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
2. *Paralinguithyris pygopoides* (Di Stefano, 1884) – INV 2023.339., Csókakő, Csóka Hill, loose, upper Bajocian(?); a: dorsal view, b: anterior view, c: lateral view.
3. *Paralinguithyris pygopoides* (Di Stefano, 1884) – INV 2023.341., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
4. *Paralinguithyris pygopoides* (Di Stefano, 1884) – INV 2023.340., Lókút, Fenyveskút VIII, lower Bajocian, Humphriesianum Zone(?); a: dorsal view, b: anterior view, c: lateral view.
5. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.342., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
6. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.345., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
7. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.343., Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
8. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.347., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
9. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.346., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
10. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.348., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
11. *Hajagithyris fylgia* (Oppel, 1963) – INV 2023.349. (plaster cast of a sectioned specimen), Hárskút, Gyenespuszta, upper Bajocian, Parkinsoni Zone; a: dorsal view, b: anterior view, c: lateral view.
12. *Hajagithyris seguenzae* (Di Stefano, 1887) – INV 2023.351., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
13. *Hajagithyris seguenzae* (Di Stefano, 1887) – INV 2023.350. (plaster cast of a sectioned specimen), Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
14. *Hajagithyris seguenzae* (Di Stefano, 1887) – INV 2023.352., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
15. *Hajagithyris* ? *mykonionensis* (Di-Stefano, 1884) – INV 2023.353., Hárskút, Csapótanya, upper Bajocian; a: dorsal view, b: anterior view, c: lateral view.
16. *Linguithyris pteroconcha* (Gemmellaro, 1877) – INV 2023.354., Lókút, Lókút Hill, Bed 9, lower Bajocian, Humphriesianum Zone; a: dorsal view, b: anterior view, c: lateral view.
17. *Linguithyris pteroconcha* (Gemmellaro, 1877) – INV 2023.355., Lókút, Lókút Hill, Bed 13, lower Bajocian, Sauzei Zone; a: dorsal view, b: anterior view, c: lateral view.
18. *Linguithyris pteroconcha* (Gemmellaro, 1877) – LiptSom., Bakonybél, Som Hill, loose, upper Bajocian(?); dorsal view showing the adductor muscle scars.
19. *Orthotoma* ? sp. – INV 2023.344., Lókút, Lókút Hill, Bed 11, lower Bajocian, Humphriesianum Zone; a: dorsal view, b: anterior view, c: lateral view.
20. *Zeilleria* ? cf. *beggiatoi* (Parona, 1881) – INV 2023.357., Bakonybél, Som Hill, loose, upper Bajocian(?); a: dorsal view, b: anterior view, c: lateral view.
21. *Zeilleria* cf. *subbucculenta* (Chapuis & Dewalque, 1853) – INV 2023.358., Bakonybél, Som Hill, loose, upper Bajocian(?); a: dorsal view, b: anterior view, c: lateral view.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Index of genus and species names

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.