

Toarcian–Aalenian Hammatoceratinae (Ammonitina) from the Gerecse Mts (NE Transdanubian Range, Hungary)

by
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Abstract — The Toarcian–Aalenian Ammonoidea fauna of the Gerecse Mts belongs to the Mediterranean Province of the Mediterranean–Caucasian Realm. In this paper the Hammatoceratinae, represented by 7 genera (*Geczyeras*, *Crestaites*, *Hammatoceras*, *Bredya*, *Planammatoceras*, *Acardia*, *Pseudapertoceras*) and 31 species, are described and figured, and their stratigraphic distribution is recorded. Three new species: *Geczyeras martinezae* n. sp., *Geczyeras galazi* n. sp., and *Crestaites szentei* n. sp. are introduced. Taxonomic problems of the subfamily are briefly discussed; faunas of various localities of the NW European and Mediterranean Provinces are compared.

Keywords — Hammatoceratinae, Ammonitina, Toarcian, Aalenian, Jurassic, Gerecse Mts, Hungary.

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Introduction

The Gerecse Mts is located in the north-eastern part of Transdanubian Range of Hungary. The Toarcian to Bajocian ammonoid material of the Gerecse Mts (deposited in the Natural History Museum of the Faculty of Sciences of Eötvös Loránd University, Budapest) was collected between 1976 and 1982 from five sections: Pisznice, Kis-Gerecse, Bánya-hegy, Tölgyhát “A” and “B” (Figure 1), by the staff of the Geological Institute of Hungary. The first taxonomic analyses with quantitative and paleobiogeographic evaluations established that the fauna belongs to the Mediterranean Province of the Mediterranean–Caucasian Realm, and the Toarcian biostratigraphic subdivision of the NW European Province can also be applied (GÉCZY 1984, 1985, 1990). The ammonite assemblage of the Lower Bajocian Discites Zone of Tölgyhát Quarry was presented by CRESTA & GALÁCZ (1990). A detailed revision of the Middle Toarcian Ammonitina fauna with discussion of its paleobiogeographic affinities was provided by GÉCZY & SZENTE (2007), and the revision of the Upper Toarcian–Middle Aalenian Erycitinae was published by KOVÁCS & GÉCZY (2008). At the same time, a little known exposure on Kis-Teke-hegy was studied by GÉCZY et al. (2008), confirming the Middle Toarcian subdivision as well as describing some rare taxa (e. g. *Leukadiella helenae* RENZ, *Catacoeloceras dumortieri* DE BRUN, *Urkutites* sp.), hitherto unknown from the Gerecse Mts. The aim of this paper is to describe and figure specimens belonging to the Toarcian–Middle Aalenian Hammatoceratinae, as a contribution to the revision of the Toarcian–Aalenian Ammonitina of the Gerecse Mts. For this study, a nomenclatorial revision of the hammatoceratid assemblage of Bakonycsernye (central Transdanubian Range), described by GÉCZY (1966), was also accomplished. (The latter material is deposited in the

collection of the Geological Institute of Hungary).

The lithostratigraphy of the Jurassic sequences in the Gerecse Mts was established by CSÁSZÁR et al. (1998) and GÉCZY & SZENTE (2007). According to these authors, the Toarcian and Aalenian stages are characterised by the “Ammonitico Rosso marl” facies, which occurs in two subfacies. The Kisgercse Marl Formation is thin-bedded, red nodular marl with variable carbonate and clay content, typical of the Toarcian Tenuicostatum–Meneghinii Zones. From the Upper Toarcian it is replaced by the well-bedded, red, hard, nodular Tölgyhát Limestone Formation, which dominates the Aalenian and ranges up to the Bajocian Humphriesianum Zone. Although both lithostratigraphic units are rich in ammonoids, the Upper Toarcian–Aalenian fauna mainly consists of poorly preserved internal moulds.

The Upper Toarcian–Aalenian stratigraphic distribution of Ammonitina of the Gerecse sections was documented by KOVÁCS & GÉCZY (2008). The scarcity of the index fossils (e. g. *Phlyseogrammoceras*, *Pseudolioceras*, *Ospelioceras*, *Plydellia*, *Leioceras*, *Ludwigia*), and the poor state of preservation provide only a limited opportunity to apply the Upper Toarcian–Aalenian ammonite stratigraphy at the subzone-level. The Ammonitina faunas of the Gerecse sections are detailed on Tables 1–5. A general quantitative evaluation of the material was also reported by KOVÁCS & GÉCZY (2008). The earliest hammatoceratids appear in the Gradata Zone, the subfamily makes up 12% of the assemblage in the Thouarsense Zone, it reaches its highest proportion in the Speciosum Zone (70%), shows a decline in the Meneghinii (16%) and Aalensis Zones (14%), rebounds in the Opalinum Zone (32%), and represents 25% in the Murchisonae Zone. The subzone-level distributions of the Hammatoceratinae species are figured on Table 6.

Abbreviations of measurements — **D** = diameter, **H** = whorl-height, **h** = H/D, **W** = whorl-width, **w** = W/H, **U** = umbilical-width, **u** = U/D, **L** = length of fragment, **LWR** = ribs of the last whorl, **LWP** = primary ribs of the last whorl, **LWS** = secondary ribs of the last whorl.

Further abbreviations — **H** = Hammatoceratinæ; **P** = Pisznice section, **B** = Bánnya-hegy section, **G** = Kis-Gerecse section, **TA** = Tölgyhát A section, **TB** = Tölgyhát B section. To these abbreviations, number of bed and capitals are added to distinguish the specimens, found in the same bed (e.g. HG54A = specimen “A” from bed 54 of the Kis-Gerecse section that belongs to Hammatoceratinæ).

The figured specimens were coated with ammonium chloride. The beginning of the body chamber in the figures is marked by an *.

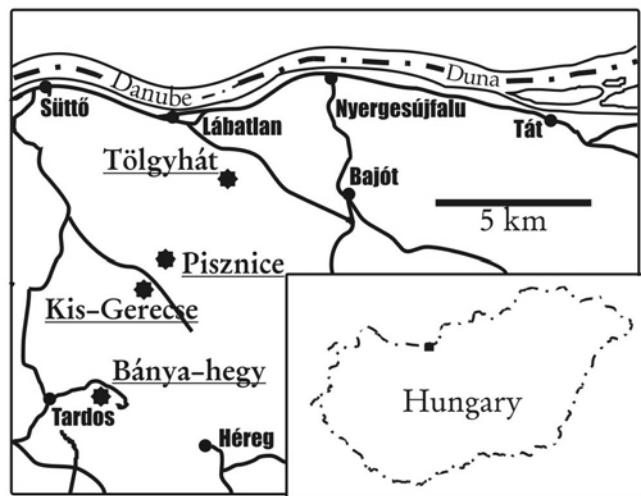


Figure 1 — Location of the Toarcian–Aalenian sections, examined in the Gerecse Mts.

Notes on the taxonomy and phylogeny of the Hammatoceratinæ

During the last thirty years, the Toarcian hammatoceratids have been thoroughly analysed by VENTURI (1975, 1982, 1994), MARTÍNEZ (1992), RULLEAU (1996, 2007), VENTURI & FERRI (2001), RULLEAU et al. (2001), BÉCAUD et al. (2005), and VENTURI & BILOTTA (2008, 2009). Based on these results, four characteristic Middle-Late Toarcian hammatoceratid genera are accepted in this paper: *Rarenodia* VENTURI, 1975, *Geczyceras* MARTÍNEZ, 1992, *Crestaites* RULLEAU & ELMY, 2001, *Hammatoceras* HYATT, 1867 (= *Pachammatoceras* BUCKMAN, 1921). *Rarenodia* is the earliest representative of the Hammatoceratoidea. Its prehammatoceratid suture-line is characterised by long, broad and ramified E, long, broad and moderately ramified L, and divided, slightly oblique U lobes. This structure differs from that of the taxa belonging to the Hildoceratidae, but it falls short of the complexity of the hammatoceratid suture-line (long and significantly ramified E and L, divided and oblique U, broad and complex saddles) appearing with *Geczyceras*. *Rarenodia* is known from the Bifrons Zone in the Gerecse Mts (GÉCZY & SZENTE 2007, GÉCZY et al. 2008).

As the Hammatoceratinæ show a wide diversity in the Aalenian, five new genera: *Bredgia* (1910), *Eudmetoceras* (1920), *Planammatoceras* (1922), *Euaptetoceras* (1922) and *Parammatoceras* (1925) were introduced by BUCKMAN in order to achieve a more transparent classification. His proposal has been hitherto controversial regarding the validity of these genera or the genus–subgenus relationships (see ARKELL 1957, WESTERMANN 1964b, 1969, WESTERMANN & RICCARDI 1972, 1982, DONOVAN et al. 1981, SCHWEIGERT et al. 2000, RULLEAU 2007), yet his conception was accepted by MARTÍNEZ (1992). Some new taxa were also erected: *Pseudammatoceras* and *Rhodaniceras* by ELMY (1963), *Pseudaptetoceras* and *Csernyeiceras* by GÉCZY (1966), *Ceccaites*, *Accardia* and *Pariaites* by CRESTA (1997). There is hardly any consensus regarding either the genus or the species-

level classification of the Aalenian hammatoceratids in the literature.

The taxonomic position of *Csernyeiceras* has been repeatedly discussed in the last fifteen years. Having created the genus with type species *H. verpillierense* ROMAN & BOYER, GÉCZY (1966) placed it in the Hammatoceratinæ, but maintained its relationship with *Praestrigites* (GÉCZY 1967a: 222). It was accepted by GALÁCZ (1980: 54), who claimed that the origin of the Bajocian *Strigoceras* can be found in the Aalenian *Csernyeiceras*–*Praestrigites* group. WESTERMANN (1993: 200) also put forward that the genus is the possible ancestor of the Strigoceratidae. CALLOMON & CHANDLER (1994: 26) emphasized its independent phyletic position and included the taxon in the revived Haugiinae. The genus was reinterpreted by SCHWEIGERT et al. (2000, 2007), and placed in the Phlycticeratinae. At the same time, two *Csernyeiceras* species (*Cs. christiana* ELMY & MOUTERDE, *Cs. apertum* ELMY & MOUTERDE) were reclassified by ELMY et al. (2007) as *Pseudaptetoceras*. The close affinity between *Csernyeiceras* and the Strigoceratidae was maintained by RULLEAU et al. (2001: 59) and MOYNE & NEIGE (2004: 121), but the genus was included in the Hammatoceratidae by PALLINI et al. (2005) and RULLEAU (2007). The taxon is considered to belong to the Phlycticeratinae in this paper.

Ceccaites was erected by CRESTA (1997) with type species *Ammonites sieboldi* OPPEL, of which taxonomic position was questioned several times. It was classified as *Hammatoceras* (VACEK 1886), as *Parammatoceras* (ELMY 1963, MARTÍNEZ 1992) and as *Euaptetoceras* (RULLEAU 1996). *Ceccaites* was not included in the Hammatoceratidae by RULLEAU et al. (2001: 47) and by RULLEAU (2007: 47), and there is no consensus in the literature regarding the taxon. It was confirmed by SEYED-EMAMI et al. (2006), although *A. sieboldi* was referred to as *Eudmetoceras* by COX & SUMBLER (2002) and as *Pseudaptetoceras* by RULLEAU (2007). *A. sieboldi* is placed within *Planammatoceras*, and the validity of *Ceccaites*

Table 1 — Distribution of Upper Toarcian and Aalenian Ammonitina, Kis-Gerecse section. — Not all beds lacking Ammonitina yield are marked, *Thouars.* = Thouarsense, *Aa.* = Aalensis, *Mur.* = Murchisonae).

		Speciosum (44 cm)	Speciosum (84 cm)	Menechini (14 cm)	Aa. (90 cm)	Opalimum (124 cm)	Mur. (105)
1	1						
2	2						
3	3						
4	4						
5	5						
6	6						
7	7						
8	8						
9	9						
10	10						
11	11						
12	12						
13	13						
14	14						
15	15						
16	16						
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38	38						
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41	41						
42	42						
43	43						
44	44						
45	45						
46	46						
47	47						
48	48						
49	49						
50	50						
51	51						
52	52						
53	53						
54	54						
55	55	■					
56	56	■					
57	57						
58	58						
59	59	■					
60	60	■					
61	61	■					
62	62	■	■				
63	63	■					

is not verified here. The diagnosis of *Ceccaites* (CRESTA, l.c.) does not seem to differ from that of *Planammatoceras*, while a closely allied taxon, *H. stenomphalum* PRINZ was included in the latter genus by RULLEAU (2007: 106). *Paviaites* might represent the microconch form of *Planammatoceras* (see CALLOMON & CHANDLER 1994: 25). The taxonomy of *Fissilobiceras* was reinterpreted by DIETZE et al. (2005) and CHANDLER et al. (2006). The genus was excluded from the Sonniniidae and transferred into the Hammatoceratidae with possible derivation from the Aalenian *Parammatoceras obiectum* BUCKMAN and the Lower Bajocian *Euaptetoceras* (DIETZE et al. 2005: 62–63). This reclassification was confirmed by BAETS et al. (2008).

Beside *Paviaites*, six genera and a subgenus are submitted for consideration in this paper to classify the Hammatoceratinæ in the Aalenian of the Mediterranean Province. Brief notes and examples of included species are given below. Confirmation of presence of *Eudmetoceras* in Hungary needs more research. According to the classification in this paper, the taxon is unknown in the Gerecse assemblage. *Rhodaniceras* has not been recorded from Hungary either. Species belonging to *Parammatoceras* have been described only from the Bakony Mts until now (see GÉCZY 1966).

Bredyia BUCKMAN, 1910 (= *Burtonia* BUCKMAN, 1910; *Pseudammatoceras* ELM, 1963), subgenus *Rhodaniceras* ELM, 1963.—Late Toarcian–Middle Aalenian. Notes: moderately evolute coiling, subquadrate–subtrapezoidal section, low keel, coarse, tuberculate ribbing, relatively simple hammatoceratid suture-line. Species: *B. subinsignis* (OPPEL), *B. branchoi* (PRINZ), *B. rugata* (BUCKMAN), *B. newtoni* BUCKMAN, *B. uretae* MARTÍNEZ, *B. fuentelsazensis* MARTÍNEZ, *B. guliensis* (RENZ), *B. mouterdei* (ELMI), *B. manflensis* WESTERMANN, *B. delicata* WESTERMANN.

Planammatoceras BUCKMAN, 1922.—Late Toarcian–Middle Aalenian. Notes: moderately evolute to evolute coiling, acute venter, ogival section, hollow-floored keel, dense, sinuous ribbing, short primaries, hammatoceratid suture-line. Species: *P. planiforme* BUCKMAN, *P. planinsigne* (VACEK), *P. tenuinsigne* (VACEK), *P. tricolore* WESTERMANN & RICCIARDI, *P. bosourense* (SATO), *P. tuberculata* (SATO), *P. gerthi* (JAWORSKI), *P. raceki* (BRASIL), *P. metellii* (GEMMELLARO), *P. lepsiusi* (GEMMELLARO), *P. brontes* (GEMMELLARO), *P. kochi* (PRINZ), *P. romani* ELM, *P. sieboldi* (OPPEL), *P. stenomphalum* (PRINZ), *P. monichense* TAYLOR.

Parammatoceras BUCKMAN, 1925.—Late Toarcian–Aalenian. Notes: moderately involute coiling, compressed, high whorl, suboval section, low keel, strong ribbing, long primaries, relatively simple hammatoceratid suture-line. Species: *P. obiectum* BUCKMAN, *P. alleoni* (DUMORTIER), *P. astraeum* (GEMMELLARO), *P. auerbachense* (DORN), *P. baconicum* (PRINZ), *P. richei* ELM, *P. jensenii* WESTERMANN.

Accardia CRESTA, 1997.—Late Toarcian–Early Bajocian. Notes: evolute coiling, ogival to suboval section, hollow-floored keel, strong ribbing, lateral tubercles, hammatoceratid suture-line. Species: *A. lorteti* (DUMORTIER), *A. diademoides* (MAYER), *A. procerinsigne* (VACEK), *A. liebi* (MAUBEUGE), *A. enricoi* CRESTA, *A. vigrassi*

(TAYLOR), *A. eximia* (PRINZ), *A. spinosa* (HANTKEN in PRINZ).

Eudmetoceras BUCKMAN, 1920.—Middle Aalenian–Early Bajocian. Notes: moderately evolute coiling, high whorl, road venter, subrectangular to subtrapezoid section, hollow-floored keel, coarse ornamentation, hammatoceratid suture-line. Species: *E. endmetum* BUCKMAN, *E. prosphues* BUCKMAN, *E. actinomphalum* (BRASIL), *E. subbeticum* LINARES, *E. renzi* (ELMI).

Pseudaptetoceras GÉCZY, 1966.—Late Aalenian–Early Bajocian. Notes: involute coiling, compressed, discoidal form, lanceolate to oval section, hollow-floored keel, weakly developed sculpture, hammatoceratid suture-line with slightly asymmetrical L lobe. Species: *P. klimakomphalum* (VACEK), *P. amalteiforme* (VACEK), *P. euaptetum* (BUCKMAN), *P. amplectens* (BUCKMAN), *P. tyrrhenicum* (RENZ), *P. dorsatum* (MERLA), *P. christiana* (ELMI & MOUTERDE), *P. apertum* (ELMI & MOUTERDE), *P. discoidale* WESTERMANN, *P. richei* (ELMI).

The evolution of the subfamily was studied by WESTERMANN (1964a, 1993), GÉCZY (1966), ELM (1967), VENTURI (1975, 1981, 1994, 1999, 2004), TINTANT & MOUTERDE (1981), DONOVAN et al. (1981), WESTERMANN & RICCIARDI (1985), MARTÍNEZ (1992), RULLEAU (1995, 2007), RULLEAU et al. (2001), VENTURI & FERRI (2001), MOYNE & NEIGE (2004), VENTURI & BILOTTA (2008, 2009). Accordingly, *Rarenodia*, the earliest hammatoceratid derived from the Phymatoceratidae, and ranged in the Falciferum–Gradata Zones. It is thought to be the ancestor of *Praerycites*, which appeared in the Bifrons Zone. Although the evolutionary lineage is not known in detail, it is supposed that all genera of the Hammatoceratinæ (*Geczyceras*, *Hammatoceras*, and *Crestaites*) radiating at the end of the Gradata Zone are direct descendants of *Rarenodia* and/or *Praerycites*. The detailed phylogeny of the Late Toarcian–Aalenian hammatoceratids also shows uncertainty. As the range of *Praerycites* needs further research, according to RULLEAU et al. (2001) and KOVÁCS & GÉCZY (2008), *Cagliceras*, the first representative of the Erycitinae radiated from the Hammatoceratinæ in the Late Toarcian, although, VENTURI & BILOTTA (2008) derived it directly from *Praerycites civitellensis* VENTURI. To answer the question it would be important to investigate the identity of *G. costatum* GABILLY and *P. civitellensis* (see CRESTA et al. 1989). The ancestor of the Graphoceratidae can be found in the Late Toarcian Hammatoceratinæ. *Pseudaptetoceras* became extinct in the Early Bajocian of the western Tethyan region, its disappearance marks the upper limit of the Discites Zone (RIOULT et al. 1997). However, it survived and can be traced in the Sauzei = “Crassico-costatum Zone” of South Alaska (WESTERMANN 1969, 1992, 1993). *Fissilobiceras* now regarded as the last representative of the subfamily ranges to the Humphriesianum Zone (DIETZE et al. 2005: 62). The direct descendants of the subfamily from the Late Aalenian are controversial (MOYNE & NEIGE 2004). The origin of Oppeliidae was briefly discussed by GALÁCZ (1980: 61), and the family was regarded again as descendant of the late Aalenian hammatoceratids (WESTERMANN & RICCIARDI 1985, WESTERMANN 1993). Sonniniidae is also considered to have been derived from the Hammatoceratinæ.

Table 2 — Distribution of Upper Toarcian and Aalenian Ammonitina, Pisznice section. — Not all beds lacking Ammonitina yield are marked; Gr. = Gradata, Th. = Thouarsense, Me. = Meneghinii, Murch. = Murchisonae, C. = Concavum, Su. = Subregale, Al. = Alticarinatus, Ha. = Haugi, Br. = Bradfordensis.

Table 3—Distribution of Upper Toarcian Ammonitina, Báná-hegy section.

Systematic paleontology

Superfamily Hammatoceratoidea SCHINDEWOLF, 1964

Family Hammatoceratidae BUCKMAN, 1887

Subfamily Hammatoceratinae BUCKMAN, 1887

Genus *Geczyceras* MARTÍNEZ, 1992

Type species — *Hammatoceras speciosum* JANENSCH, 1902. The type species (JANENSCH 1902, pl. 10, fig. 1) was designated by MARTÍNEZ (1992: 65).

Diagnosis — Medium or large-size form with evolute or moderately evolute coiling and compressed whorls. Wide and shallow umbilicus, slightly convex flanks, weakly developed ventral keel, oval cross-section. Well-defined ribbing, usually with small tubercles on the lower third of the flank. Hammatoceratid suture construction: moderately or well-developed and ramified E, long, broad and ramified L, divided and oblique U lobes.

Remarks — The genus was created by MARTÍNEZ (l.c.) for hammatoceratids which differ from the *H. insigne* group in evolute coiling, compressed whorls and fine ornamentation. Most of them appear prior to the Insigne Zone. The following species were included by MARTÍNEZ: *G. speciosum* (JANENSCH), *G. bonarellii* (PARISCH & VIALE), *G. porcarellense* (BONARELLI), *G. perplanum* (PRINZ), *G. victorií* (BONARELLI), *G. meneghinii* (BONARELLI), *G. goyi*, *G. allobrogense* (DUMORTIER), *G. clausum* (GABILLY), *G. costatum* (GABILLY) and *G. gabillyi*. Three of them, *G. victorií*, *G. meneghinii* and *G. goyi* were reclassified by RULLEAU &

ELMI as species belonging to *Crestaites* n. genus (RULLEAU et al. 2001: 76). In this paper it is regarded, that on the basis of the coiling style, the sculpture and the stratigraphic range, *Hammatoceras subplanatum* DE BRUN, *H. tipperi* SEYED-EMAMI and *H. roubanense* ELMI are to be placed in *Gesztyeras*. The following taxa are described here from the Gerecse assemblage: *G. speciosum*, *G. porcarellense*, *G. perplanum*, *G. bonarelli*, *G. costatum*, *G. aff. allobrogense* and *G. cf. clausum*. Introduction of two new species, *G. martinezae* n. sp. and *G. galaczi* n. sp. is proposed.

Distribution — The earliest representatives (*G. clausum*, *G. costatum* and *G. roubanense*) occur in the Variabilis /Gradata Zone (GABILLY 1973, GUEX 1975, MARTÍNEZ

1992, ELMI et al. 1998, 2007, BÉCAUD et al. 2005, GÉCZY & SZENTE 2007). The genus is abundant in the Thouarsense–Meneghinii Zones in the Mediterranean–Caucasian Realm (Europe, North Africa, Georgia, Iran), and also occurs in South and North America (see below). *G. tipperi* is known from the Reinesi Subzone (Portugal, ELMI et al. 2007), from the Pseudoradiosa/Meneghinii Zone (Iran, SEYED-EMAMI 1971, 1987, SEYED-EMAMI et al. 2008, Morocco, BENSHILI 1989, EL HAMMICH et al. 2009, France, RULLEAU 2007), and from the Aalensis Zone (Spain, SANDOVAL et al. 2007). *G. porcarellense* and *G. perplanum* were also recorded from the Lower Aalenian of Italy (MERLA 1934, PINNA 1968, KÄLIN & URETA 1987).

Table 4 — Distribution of Upper Toarcian and Aalenian Ammonitina, Tölgyhát A section. — Not all beds lacking Ammonitina yield are marked; **Sp.** = Speciosum, **Aal.** = Aalensis, **Mu.** = Murchisonae: 34 cm.

BEDS	Ammonitina																	Mu.												
	<i>Pseudogrammoceras</i> sp.	<i>Furloceras</i> sp.	<i>Polyptychus discoides</i> (ZIETEN)	<i>Grammoceras thauense</i> (D'ORBIGNY)	<i>Montenieriella nitida</i> ELMI & RULLEAU	<i>Gesztyeras bonarelli</i> (PARISCH & VIALLE)	<i>Crestaites</i> sp. n. sp.	<i>Dumortieria evolutissima</i> PRINZ	<i>Caglieras daphne</i> (MERLA)	<i>Gesztyeras aff. allobrogense</i> (DUMORTIER)	<i>Dumortieria stricta</i> PRINZ	<i>Erycites ornatus</i> GÉCZY	<i>Planammatoceras tenuisigillatum</i> (VACEK)	<i>Catervoldia subcompta</i> (BRANCO)	<i>Caglieras rotundiformis</i> (MERLA)	<i>Erycites bandisns</i> GEMMELLARO	<i>Bredia subfuscata</i> (OPPEL)	<i>Erdia branii</i> (PRINZ)	<i>Pleidellia</i> sp.	<i>Leineraea</i> sp.	<i>Erycites subquadrauta</i> GÉCZY	<i>Abbasitoides modestus</i> (VACEK)	<i>Tmetoceras</i> sp.	<i>Caryaeeras nephilense</i> (ROM. & BOY)	<i>Erycites fallax</i> ARKELL	<i>Planammatoceras planisigillatum</i> (VACEK)	<i>Anoloceras</i> sp.	<i>Ludwigia</i> sp.	Subzones	ZONES
1																														
2																														
3																														
4																														
5																														
6																														
7																														
11																														
12																														
14																														
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81	■	■	■																											

Table 5 — Distribution of Aalenian Ammonitina, Tölgyhát B section. — O., Opal. = Opalinum, Mu. = Murchisonae.

	BEDS	<i>Leioreras</i> sp.	<i>Leioreras</i> aff. <i>comptum</i> (REINECKE)	<i>Eryites fallifax</i> ARKELL	<i>Csveryeieras verpilliereae</i> (ROM. & BOY)	<i>Planammatoeras tenuinigra</i> (VACEK)	<i>Stauferia sinon</i> (BAYLE)	<i>Stauferia noszkeji</i> (GÉCZ)	<i>Ludwigia</i> sp.	<i>Anodioeras</i> sp.	<i>Eryptes intermedius</i> HANTNER in PRINZ	<i>Abbasitoides modestus</i> (VACEK)	<i>Planammatoeras planinigra</i> (VACEK)	<i>Planammatoeras kochii</i> (PRINZ)	<i>Ludwigia marchioniae</i> (SOWERBY)	<i>Planammatoeras stenomphulum</i> (PRINZ)	<i>Planammatoeras aff. planiforme</i> BUCKMAN	<i>Ludwigia obtusiformis</i> (BUCKMAN)	<i>Acaridia noszkeji</i> (GÉCZ)	<i>Acaridia eximia</i> (PRINZ)	<i>Pseudoleptoceras klimukomphalum</i> (VACEK)	<i>Brasilia</i> sp.	<i>Bredia rugata</i> (BUCKMAN)	<i>Strigoceras praeunitum</i> (BUCKMAN)	<i>Bradfordia</i> sp.	Subzones	ZONES
21																											
22																											
23																											
24																											
25																											
26																											
27																											
28																											
29		■																									
30			■																								
31																											
32				■	■																						
33		■																									
34																											
35	■																										
36	■																										
37	■																										
38	■	■																									
39	■		■																								
	O.	Comptum	Haugi	Mu.	Bradfordensis																						
	Opal.	(50 cm)		Murchisonae	(181 cm)																						

Geczyeras speciosum (JANENSCH, 1902)

(Figure 2)

- 1874: *Ammonites insignis* (SCHÜBLER) — DUMORTIER, p. 74, pl. 17, figs 1–2, pl. 18, figs 1–2
 1885: *Ammonites insignis variabilis* — QUENSTEDT, p. 395, pl. 50, fig. 1
 1902: *Hammatoceras speciosum* n. sp. — JANENSCH, p. 102, pl. 4, fig. 4, pl. 10, fig. 1
 1904: *Hammatoceras speciosum* JANENSCH — PRINZ, p. 72, pl. 38, fig. 2
 1907: *Hammatoceras speciosum* JANENSCH — RIAZ, p. 615
 1910: *Hammatoceras speciosum* JANENSCH — HAHN, p. 385
 1914: *Hammatoceras speciosum* JANENSCH — FOSSA MANCINI, p. 81
 1927: *Hammatoceras speciosum* JANENSCH — DAGUIN, p. 166, pl. 30, fig. 6
 1930: *Hammatoceras* sp. aff. *H. speciosum* JANENSCH — MITZOPOULOS, p. 37
 1932: *Hammatoceras speciosum* JANENSCH — DE BRUN, p. 183
 1959: *Hammatoceras insigne speciosum* JANENSCH — THEOBALD & CHEVIET, p. 59, p. 62, fig. 14, pl. 1, fig. 2
 1966: *Hammatoceras speciosum* JANENSCH — NUTSUBIDZE, p. 148, pl. 36, fig. 1
 1967: *Hammatoceras speciosum* JANENSCH — SEYED—EMAMI, p. 70, pl. 2, fig. 11, pl. 9, fig. 5
 1971: *Hammatoceras speciosum* JANENSCH — SEYED—EMAMI, pl. 2, fig. 11, pl. 9, fig. 5
 1974: *Hammatoceras speciosum* JANENSCH — ELMI et al., p. 52, p. 81, fig. 16/5, pl. 6, fig. 1
 1975: *Hammatoceras speciosum* JANENSCH — GUEX, p. 111, pl. 9, fig. 8, pl. 10, figs 1,3
 1976: *Hammatoceras speciosum* JANENSCH — SCHLEGELMILCH, p. 91, pl. 49, fig. 2, pl. 50, fig. 1
 1985: *Hammatoceras speciosum* JANENSCH — ELMI et al., pl. 5, fig. 3
 1989: *Hammatoceras speciosum* JANENSCH — BENSHILI, pl. 19, fig. 4
 1991: *Hammatoceras speciosum* (JANENSCH) — TIPPER et al., pl. 7, fig. 1
 1992: *Geczyeras speciosum* (JANENSCH) — MARTÍNEZ, p. 75, p. 78, fig. 12, pl. 3, figs 2–3, pl. 4, figs 1–2, pl. 5, figs 1–2, pl. 6, fig. 1, pl. 7, fig. 1, pl. 8, fig. 1
 1995: *Geczyeras* cf. *speciosum* (JANENSCH) — GOY et al., p. 101, pl. 12, fig. 5
 1996: *Hammatoceras speciosum* JANENSCH — RULLEAU, p. 3–4, figs 1/3–6, pl. 4, figs 1–2, pl. 5, figs 1–4, pl. 6, figs 2–5, pl. 7, figs 1–5, pl. 9, figs 3–4
 non 1996: *Hammatoceras speciosum* JANENSCH — RULLEAU, pl. 8, fig. 1, pl. 9, figs 1–2
 1996: *Hammatoceras speciosum* JANENSCH — JAKOBS & SMITH, p. 139, pl. 7, figs 1–4, 6
 1997: *Hammatoceras speciosum* JANENSCH — JAKOBS, pl. 17, figs 1–2
 1997: *Hammatoceras speciosum* JANENSCH — CASSEL, pl. 16, fig. 6
 2003: *Geczyeras* gr. *speciosum* — VENTURI & ROSSI, p. 71, fig. 74
 2005: *Hammatoceras speciosum* (JANENSCH) — POULTON et al., pl. 4, fig. 1

2006: *Gecyceras cf. speciosum* (JANENSCH) — CARACUEL et al., p. 36, fig. 5B

2006: *Hammatoceras speciosum* JANENSCH — TOPCHISHVILI et al., pl. 24, fig. 3

2007: *Hammatoceras speciosum* JANENSCH — RULLEAU, pl. 66, fig. 4, pl. 67, figs 2, 3, pl. 68, figs 1, 2, 4

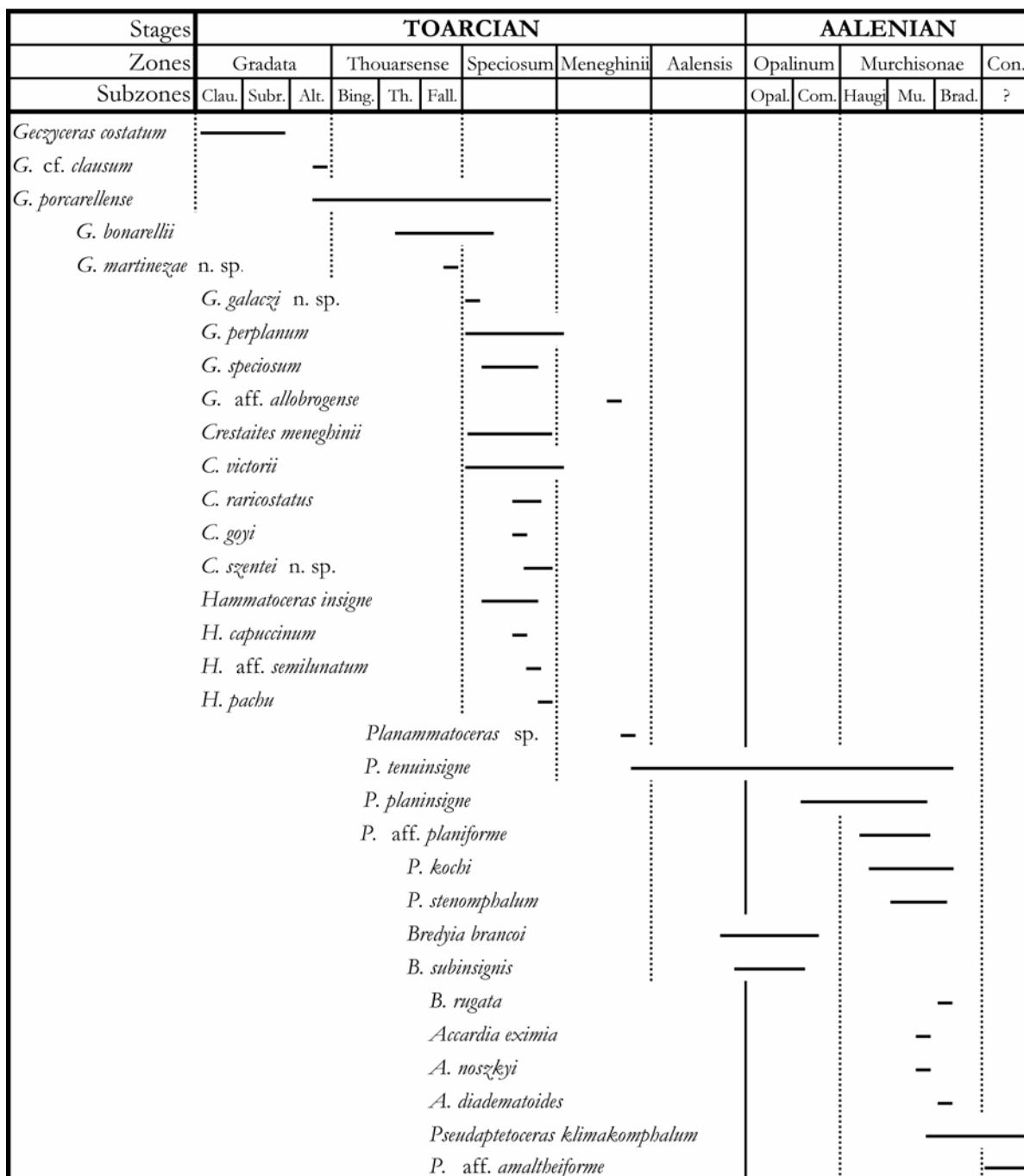
2008: *Hammatoceras cf. speciosum* JANENSCH — VENTURI & BILOTTA, pl. 18, figs 1a–d

2008: *Hammatoceras speciosum* JANENSCH — METODIEV, p. 103, fig. 6/f

Material — Twelve internal moulds of different state of preservation.

Measurements	D	H	h	W	w	U	u	LWR
HP98C	154	50	32%	22	44%	66	43%	76
HP99A	140	46	33%	21	45%	60	43%	88
HG51A	122	36	30%	20	55%	56	46%	72
HG54	110	36	33%	24	66%	44	40%	74

Table 6 — Distribution of Toarcian and Aalenian Hammatoceratinæ species in the Gerecse Mts. — Clau. = Clausus, Subr. = Subregale, Alt. = Alticarinatus, Bing. = Bingmanni, Th. = Thouarsense, Fall. = Fallaciosum, Op. = Opalinum, Co. = Comptum, Hau. = Haugj, Mu. = Murchisonae, Brad. = Bradfordensis, Con. = Concavum.



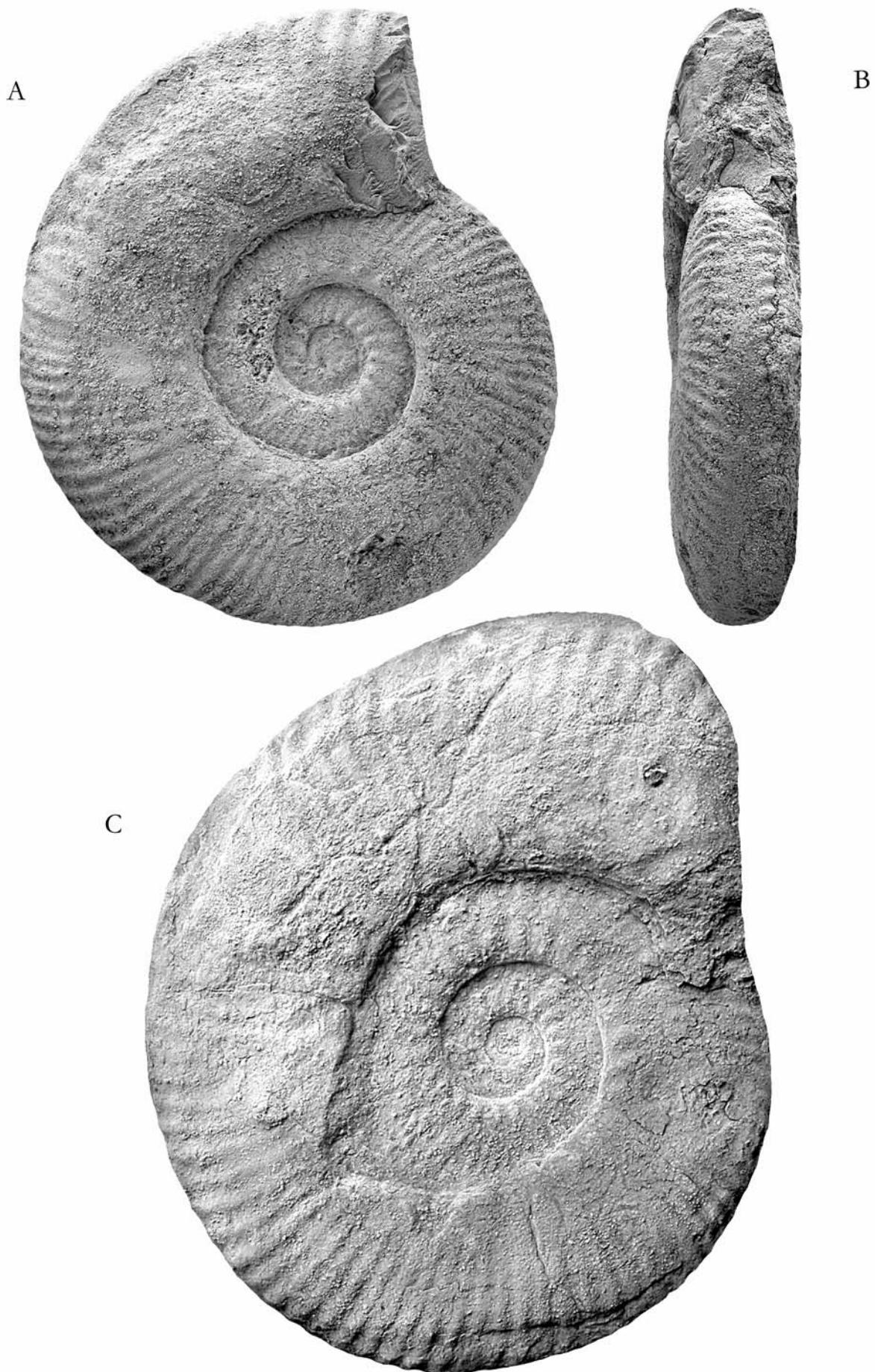


Figure 2 — *Geczyeras speciosum* (JANENSCH). — A–B: specimen (HG54) from Kis-Gerecse Speciosum Zone, lateral and ventral view, $\times 1$; C: specimen (HP99A) from Pisznice bed № 99, Speciosum Zone, lateral view, $\times 1$.

Description — Medium-size, moderately evolute form with a compressed, oval whorl-section. The umbilicus is relatively wide and shallow, the umbilical wall is steep, and the margin is rounded. The flanks are slightly rounded, almost flattened; the venter is narrow and convex with a weakly developed keel. The ornamentation is characterised by dense, moderately strong ribbing and regular, small, well-defined tubercles on the umbilical margin. Two or three straight, prorsiradiate ribs emerge from each tubercle, bend gently forward on the venter and fade away at the keel. No whole body chambers are preserved. A narrow constriction appears on the body chamber. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens show a very good agreement with the type (JANENSCH 1902, p. 102, pl. 4, fig. 4, pl. 10, fig. 1), as well as with the specimens figured by RULLEAU (1996, pl. 7, figs 3–5, pl. 9, figs 3–4). The Gerecse specimens are close in morphology to those of MARTÍNEZ (1992, pl. 6, fig. 1, pl. 7, fig. 1), but they differ by having no sigmoid ribbing. *G. speciosum* appears distinct from *H. insigne* in the more compressed whorls with oval cross-section, and in the dense and fine ribbing. It differs from *G. clausum* by being more finely ribbed with umbilical tubercles. It also differs from *G. ponarellense* by having large size with slightly more evolute coiling, and by bearing stronger umbilical tubercles. The specimen figured by RULLEAU (1996, pl. 5, fig. 4) has more evolute coiling. The *G. n. sp. aff. speciosum* recorded by GÉCZY & SZENTE (2007: 235) from the Alticarinatus Subzone of Pisznice section differs from the holotype by having no umbilical tubercles. It is

interpreted here as *G. cf. clausum* (see below).

Distribution — Upper Toarcian: Morocco (DUBAR 1936, TERMIER & DUBAR 1940, GARDET & GÉRARD 1946, EL ARABI et al. 1999, IGMOULLAN et al. 2001), Italy (FOSSA MANCINI 1915, MITZOPOULOS 1930), Portugal (MOUTERDE et al. 1964–1965), Austria (HAHN 1910), France (ROMAN 1919, DE BRUN 1932), Georgia (TOPCHISHVILI 1998). Thouarsense Zone: Portugal (MOUTERDE & RUGET 1967b), Spain (MARTÍNEZ 1992, 2008), Fallaciosum Subzone: Spain (GOY et al. 1994b), France (ELMI 1967, RULLEAU 1996). Insigne/Speciosum Zone: Germany (KNITTER & OHMERT 1983, ETZOLD et al. 1989), Spain (COMAS–RENGIFO & GOY 1978, MARTÍNEZ 1992), Morocco (DAGUN 1927, ELMI & FAUGÉRES 1974, BENSHILI 1989, EL HAMMICH et al. 2009), Algeria (ELMI et al. 1985), Portugal (MOUTERDE et al. 1971, YÉBENES et al. 1978), France (JANENSCH 1902, CORROY & GÉRARD 1933, MOUTERDE 1953, GUEX 1975, RULLEAU 1996, 2007), Italy (CRESTA 1994, VENTURI & ROSSI 2003), Bulgaria (METODIEV 2008), Georgia (NUTSUBIDZE 1966). Insigne Horizon: France (GABILLY 1976), Spain (GOY & MARTÍNEZ 1990), Insigne Subzone: France (RULLEAU 1996, CASSEL 1997, BÉCAUD 2006), Spain (GOY et al. 1988, GÓMEZ et al. 2008, GOY & MARTÍNEZ 2009), Speciosum Subzone: Portugal (ELMI et al. 2007). Levesquei Zone: Iran (SEYED-EMAMI 1967), Chile (HILLEBRANDT 1970). Yakounensis Zone (Upper Toarcian): North America (TIPPER et al. 1991, JAKOBS & SMITH 1996, JAKOBS 1997). The Gerecse specimens are common in the Speciosum Zone of Pisznice, Kis-Gerecse and Bánnya-hegy sections.

Geczyceras costatum (GABILLY, 1973)

- 1973: *Hammatoceras costatum* nov. sp. — GABILLY, p. 421, pl. 67, figs 1–3
 1975: *Hammatoceras costatum* GABILLY — GUEX, p. 110, pl. 7, fig. 3
 1988: *Hammatoceras costatum* GABILLY — MARTÍNEZ, p. 63, pl. 1, fig. 7
 1992: *Geczyceras?* *costatum* (GABILLY) — MARTÍNEZ, p. 66, fig. 8, pl. 1, figs 1–2
 1997: *Hammatoceras* (*Geczyceras?*) *costatum* GABILLY — ELMI et al., p. 31, fig. 3
 2005: *Geczyceras costatum* GABILLY — BÉCAUD et al., figs 2/1–2
 2007: *Geczyceras* aff. *costatum* (GABILLY) — GÉCZY & SZENTE, pl. 10, figs 2–3

Material — Two fragmentary specimens.

Measurements	L	H	W	w
HP112	116	40	38	95%

Description — Robust form with convex lateral walls, rounded umbilical margins and shoulders. The venter is low and broad with a smooth band in the middle. The whorl-section is wide-oval with maximum width above the umbilical margin. The ornamentation consists of coarse, sigmoid, bullate ribbing. Projected, bullatiform primaries rise from the umbilicus with concave intervals, and bi- or trifurcate at the lower third. The strong secondaries bend forward on the venter and cease at the band. Intercalatories appear regularly between the bifurcating ribs. The suture-line is hammatoceratid.

Remarks — Despite being a fragment, the specimen HP112 figured by GÉCZY & SZENTE (2007, pl. 10, figs 2–3) is very close in morphology and sculpture to the

holotype (GABILLY 1973, pl. 67, figs 1–3, refigured by ELMI et al. 1997, p. 31, fig. 3), and agrees well with the specimens of GUEX (1975, pl. 7, fig. 3) and MARTÍNEZ (1992, pl. 1, fig. 1). The species is thought to be the earliest representative of the genus. Both GABILLY (1973: 423) and CRESTA et al. (1989: 93) maintained the affinity between *H. costatum* and the erycidids in morphology and ornamentation. The taxon shows a mixed character, however, it is included in the Hammatoceratinae on the basis of the long and developed E lobe (GABILLY, l. c.).

Distribution — Illustris horizon: France (GABILLY 1973, BÉCAUD et al. 2005, BÉCAUD 2006). Illustris Subzone: France (GUEX 1975). Clausus–Subregale Subzones:

Hungary, Gerecse Mts (GÉCZY & SZENTE 2007, GÉCZY et al. 2008). Variabilis/Gradata Zone: Spain (GOY et al. 1994b), Portugal (ELMI et al. 2007). Illustris–Bingmanni Subzones: Spain (MARTÍNEZ 1988, GOY & MARTÍNEZ 1990, MARTÍNEZ 1992). Thouarsense Zone: Spain

(COMAS–RENGIFO & GOY 1978). Specimen HP112 was collected from the Subregale Subzone (bed 112) of the Pisznice section (GÉCZY & SZENTE 2007) associated with *P. subfallaciosum*, *P. aratum*, *F. erbaense*, *D. robusta*, *D. pseudoerbaensis*, *Osperlioceras* sp.

Geczyceras porcarellense (BONARELLI, 1899)
(Figure 3)

- 1867–1881: *Ammonites insignis* SCHÜBLER — MENEGHINI, pl. 14, fig. 3, pl. 16, fig. 1
 1899: *Hammatoceras porcarellense* n. sp. — BONARELLI, p. 209
 1914: *Hammatoceras porcarellense* BONARELLI — FOSSA MANCINI, p. 69
 1934: *Hammatoceras porcarellense* BONARELLI — MERLA, p. 13, pl. 1, figs 5–9
 1967: *Hammatoceras porcarellense* BONARELLI — SEYED-EMAMI, p. 72, pl. 2, fig. 14, pl. 8, fig. 7
 1968: *Hammatoceras porcarellense* BONARELLI — PINNA, p. 56, pl. 2, fig. 11, pl. 3, fig. 9,
 1969: *Hammatoceras porcarellense* BONARELLI — PINNA, p. 15, pl. 4, fig. 10, holotype (refig. MENEGHINI, l. c., pl. 14, fig. 3)
 1971: *Hammatoceras porcarellense* BONARELLI — SEYED-EMAMI, pl. 2, fig. 14, pl. 8, fig. 7
 1978: *Hammatoceras porcarellense* BONARELLI — DEZI & RIDOLFI, p. 32, figs 31–34
 1981: *Hammatoceras porcarellense* BONARELLI — VENTURI, p. 87
 1982: *Hammatoceras porcarellense* BONARELLI — VENTURI, p. 87, fig. 134
 1987: *Hammatoceras porcarellense* BONARELLI — HILLEBRANDT, pl. 13, fig. 1
 1992: *Geczyceras porcarellense* (BONARELLI) — MARTÍNEZ, p. 83, p. 85, fig. 14, pl. 11, figs 2–4
 1994: *Hammatoceras* gr. *porcarellense* BONARELLI — VENTURI, pl. 5, figs a, b, pl. 7, fig. 6
 1996: *Hammatoceras porcarellense* BONARELLI — RULLEAU, p. 4, fig. 1/1, p. 6, pl. 20, figs 6–7
 1997: *Geczyceras porcarellense* (BONARELLI) — PETTINELLI et al., pl. 3, fig. 7
 2007: *Geczyceras* (?) aff. *porcarellense* (BONARELLI) — RULLEAU, pl. 74, fig. 2

Material — Six internal moulds of mediocre state of preservation, and 3 fragments.

Measurements	D	H	h	W	w	U	u	LWR
HP105C	100	31	31%	20	64%	43	43%	72
HP104	86	30	35%	18	60%	34	40%	84
HP108	81	30	37%	16	53%	30	37%	70
HP102A	74	20	27%	14	70%	35	47%	80

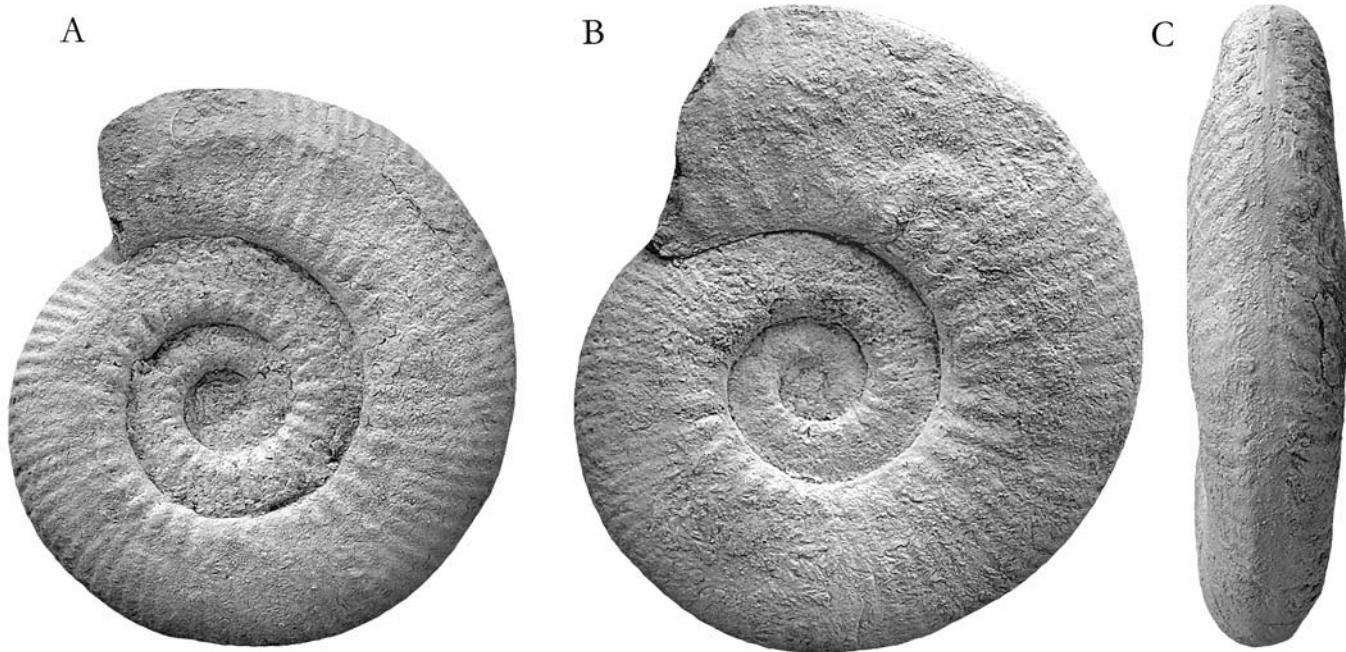


Figure 3 — *Geczyceras porcarellense* (BONARELLI). — A: Pisznice, bed №: 102, Speciosum Zone, lateral view, $\times 1$; B–C: lateral and ventral view, Pisznice, bed №: 104, Thouarsense Subzone, $\times 1$

Description — Moderately involute form with shallow umbilicus. Both the umbilical and the ventrolateral margins are rounded, the umbilical slope is approx. vertical. The

flanks are slightly convex, the venter is narrow, high and rounded with a smooth band in the middle. The whorl-section is high-oval. No whole body chamber is present.

The ornamentation is characterised by dense and fine ribbing bi- or trifurcating from small tubercles or short, nodular primary ribs placed on the umbilical margin. The ribs are straight and slightly prorsiradiate on the lateral wall, and bend gently forward on the venter. The suture-line is hammatoceratid.

Remarks — The specimens are close in morphology and ornamentation to the holotype (BONARELLI 1899: 209, PINNA 1969, pl. 4, fig. 10) and to the specimens figured by MERLA (1934, pl. 1, figs 5–9) and DEZI & RIDOLFI (1978: 32), however, they differ in having slightly more compressed whorls. The taxon resembles *G. speciosum* in style of coiling, but it differs by being smaller. *G. speciosum* is coarsely ribbed with stronger umbilical tubercles. Another similar form is *Cagliceras costulosum* but it differs in its radiate ribbing without umbilical tubercles, as well as in the erycidid suture-line (MERLA 1934: 13, KOVÁCS & GÉCZY 2008: 70).

Distribution — Upper Toarcian: Greece (RENZ 1927), Portugal (MOUTERDE & RUGET 1967a), Spain (LINARES & RIVAS 1971, GONZÁLEZ-DONOSO et al. 1970, GEYER & HINKELBEIN 1974), Italy (FOSSA MANCINI 1915, VENZO

1867–1881, PINNA 1968, PELOSIO 1968, DEZI & RIDOLFI 1978). Erbaense Zone: Italy (VENTURI 1994, NINI et al. 1997). Thouarsense–Insigne Zones: Portugal (MOUTERDE et al. 1971, MARTÍNEZ 1992). Insigne/Speciosum Zone: Italy (CECCA et al. 1990 CRESTA 1994, PETITINELLI et al. 1997, PARISI et al. 1998), Spain (GOY & ALFÉREZ 1974, GOY et al. 1988, GOY & MARTÍNEZ 1990), Speciosum Subzone: Portugal (ELMI et al. 2007). Insigne–Pseudoradiosa Zones: France (ELMI & RULLEAU 1991, RULLEAU 1996). Insigne–Levesquei Subzones: Spain (MARTÍNEZ 1992). Levesquei Zone: Iran (SEYED-EMAMI 1967), Portugal (MOUTERDE 1967). Levesquei–Aalensis Zones: Portugal (MOUTERDE & RUGET 1967b). Pseudoradiosa/Reynesi Zone: Spain (LINARES & SANDOVAL 1993, GARCÍA-GÓMEZ et al. 1994), France (RULLEAU 2007). Pseudoradiosa–Aalensis Zones: France (ELMI 1967). Pseudoradiosa Zone–Mactra Subzone: Spain (SANDOVAL et al. 2007). Upper Toarcian–Aalenian: Italy (BONARELLI 1899, FOSSA MANCINI 1914, MERLA 1934). Fluitans (= Aalensis) Zone: Argentina (HILLEBRANDT 1970, 1973, 1987). In the Gerecse Mts the species ranges from the uppermost Alticarinatus Subzone to the uppermost Speciosum Zone of the Pisznice section.

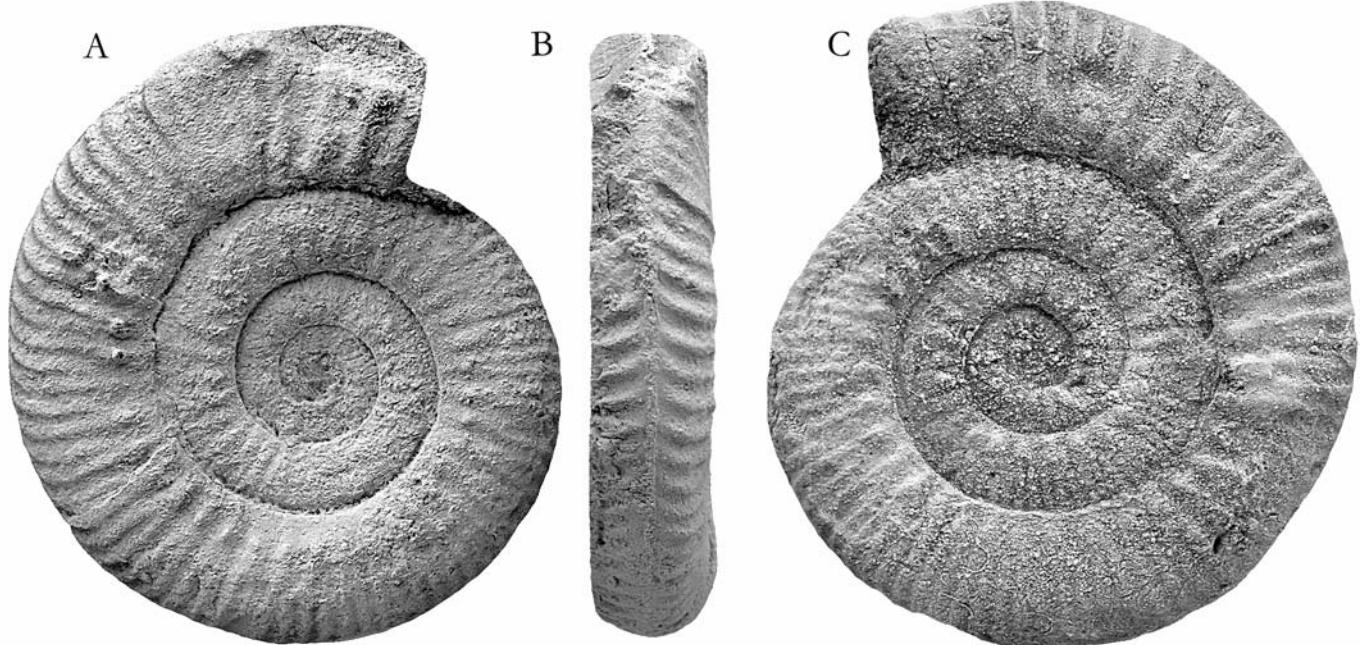


Figure 4 — *Geczcyceras perplanum* (PRINZ). — A–B: lateral and ventral view, Kis-Gerecse, bed №: 54, Speciosum Zone, ×1; C: lateral view, Pisznice, bed №: 100, Speciosum Zone, ×1.

***Geczcyceras perplanum* (PRINZ, 1904)**
(Figure 4)

- 1867–1881: *Ammonites insignis* SCHÜBLER — MENEGHINI, p. 55, pl. 12, fig. 3
- 1904: *Hammatoceras insigne* SCHÜBLER, mut. nov. *perplana* — PRINZ, p. 72
- 1914: *Hammatoceras clavatum* n. sp. — FOSSA MANCINI, p. 67
- ? 1930: *Hammatoceras perplanum* PRINZ — MONESTIER, p. 24, pl. 3, figs 1, 3
- 1934: *Hammatoceras perplanum* PRINZ — MERLA, p. 19, pl. 3, fig. 2
- 1934: *Hammatoceras clavatum* FOSSA MANCINI — MERLA, p. 20, pl. 3, fig. 4
- 1946: *Hammatoceras insigne* SCHÜBLER — GARDET & GÉRARD, p. 27
- 1958: *Erycites perplanum* (PRINZ) — DONOVAN, p. 58
- 1963: *Hammatoceras perplanum* PRINZ — KOTTEK, p. 123, pl. 14, fig. 1
- v 1966: *Hammatoceras perplanum* PRINZ — GÉCZY, p. 85, p. 86, fig. 72, pl. 24, fig. 4, pl. 41, fig. 4
- 1967: *Erycites perplanum* (PRINZ) — BARBERA, p. 21, pl. 4, figs 1a–d

- 1968: *Erycites perplanum* (PRINZ) — BARBERA, p. 21, p. 14, figs 16–17, pl. 4, figs 1 a–d
 1969: *Hammatoceras perplanum* PRINZ — PINNA, p. 15
 ? 1974: *Hammatoceras* nov. sp. aff. *perplanum* (KOTTEK non PRINZ) — ELMI et al., p. 81, fig. 16/6, pl. 4, fig. 1
 ? 1974: *Hammatoceras perplanum* PRINZ — SUAREZ VEGA, pl. 12, fig. 1
 1978: *Hammatoceras perplanum* PRINZ — DEZI & RIDOLFI, p. 36, figs 38–42
 1978: *Hammatoceras clavatum* FOSSA MANCINI — DEZI & RIDOLFI, p. 37, fig. 43
 1992: *Geczyceras perplanum* (PRINZ) — MARTÍNEZ, p. 87, p. 89, fig. 15, pl. 12, figs 3–4
 1992: *Geczyceras* aff. *perplanum* (PRINZ) — MARTÍNEZ, p. 92, fig. 16, pl. 13, figs 1–3
 1993: *Geczyceras perplanum* (PRINZ) — BERNAD, p. 130
 1994: *Hammatoceras perplanum* PRINZ — VENTURI, pl. 5, fig. c, pl. 7, fig. 12
 1996: *Hammatoceras perplanum* PRINZ — RULLEAU, p. 4, p. 9, fig. 3/2, pl. 18, figs 1–4, pl. 19, figs 1–2, 4
 1996: *Hammatoceras* aff. *perplanum* PRINZ — RULLEAU, pl. 18, figs 5–6
 ? 1996: *Hammatoceras* aff. *perplanum* PRINZ — RULLEAU, pl. 19, figs 5–6, pl. 20, figs 4–5
 2001: *Geczyceras perplanum* (PRINZ) — RULLEAU et al., p. 76
 2007: *Geczyceras* aff. *perplanum* (PRINZ) — RULLEAU, pl. 72, figs 1–3, pl. 73, fig. 4
 2007: “*Geczyceras*” *perplanum* (PRINZ) — ELMI et al., pl. 1, fig. 3
 2009: “*Geczyceras*” *perplanum* (PRINZ) — EL HAMMICH et al., pl. 4, figs 3–4

Material — Four internal moulds of different state of preservation, and 2 fragments.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HG54B	92	26	28%	22	84%	?	?	?	?
HG54A	82	22	27%	16	73%	43	52%	38	75
HP100A	86	20	23%	14	70%	50	58%	36	74

Description — Evolute, platycone form with a weakly developed ventral keel. The umbilicus is wide and shallow, the margin is rounded. The flanks are flattened with rounded shoulders. The whorl-section is wide-oval, approximately subtrapezoid with maximum width at the lower quarter of the flank. No whole body chamber is present. The ornamentation consists of well-defined, regular ribbing. Short, radiate primary ribs emerge from the umbilicus and develop into small tubercles above the umbilical margin. Two or three thin, slightly sigmoid secondaries rise from the tubercles and reach the keel. The suture-line is hammatoceratid.

Remarks — The holotype of *H. clavatum* (*Ammonites insignis* SCHÜBLER, MENEGHINI 1867–1881, pl. 12, fig. 3) designated by FOSSA MANCINI (1914: 67) is the same as that of *H. insigne perplana* (PRINZ 1904: 72), consequently *H. clavatum* is the junior synonym of *H. perplanum* (MERLA 1934: 19, DONOVAN 1958: 58, GÉCZY 1966: 86, MARTÍNEZ 1992: 87). The Gerecse specimens are in good agreement with the holotype. The taxon is close in morphology to *G. bonarelli* in subserpenticone coiling and tubercled ornamentation, but *G. perplanum* differs by having wider whorl (w>70%) and short primaries. *G. perplanum* also resembles *G. allobrogense* (BONARELLI 1899: 207, FOSSA MANCINI 1914: 67, 70), but the latter is a slightly more involute form with coarser ribbing and tubercles placed farther from the umbilical margin. Some specimens in the literature seem markedly distinct from the type. The specimen figured by ELMI et al. (1974, pl. 4, fig. 1) is characterised by a subtriangular section and lack of tubercles. The specimen

of SUAREZ VEGA (1974, pl. 12) is a robust form with deep umbilicus, it rather resembles *H. insigne*. The ribbings of the specimens figured by RULLEAU (1996, pl. 19, figs 5–6, pl. 20, figs 4–5) are more widely spaced, bifurcating at the mid-flank. MONESTIER (1930, pl. 3, figs 1, 3) recorded a fragment from Morocco, but it possesses a non-tuberculate broader whorl.

Distribution — Upper Toarcian: Italy (FOSSA MANCINI 1915, MERLA 1934, PINNA 1969, DEZI & RIDOLFI 1978), Spain (GEYER & HINKELBEIN 1974), Hungary, Bakony-csernye (GÉCZY 1966), Morocco (TERMIER & DUBAR 1940, FEDAN 1984). Insigne/Speciosum Zone: Italy (CRESTA et al. 1989, CRESTA 1994, PARISI et al. 1998), Spain (MARTÍNEZ 1992, BERNAD 1993), Portugal (MARTÍNEZ 1992, ALMÉRAS 1994, ELMI et al. 2007), France (ELMI & RULLEAU 1991, RULLEAU 1996), Algeria (ELMI 1986), Morocco (SADKI 1996), Tunisia (SEKATNI et al. 2008). Speciosum–Meneghinii Zones: Morocco (EL HAMMICH et al. 2009). Pseudoradiosa/Meneghinii/Levesquei Zone: Spain, France (MARTÍNEZ 1992, RULLEAU 1996), Morocco (BENSHILI 1989), Chile (HILLEBRANDT 1970). Pseudoradiosa Zone–Mactra Sub-zone: Spain (SANDOVAL et al. 2007). Levesquei Subzone: Spain (GOY et al. 1994b), France (RULLEAU 2007). Lower Aalenian: Italy (BARBERA 1967), Greece (KOTTEK 1963), Murchisonae Zone (Haugi Subzone): Italy (KÄLIN & URETA 1987). In the Gerecse Mts the taxon is typical of the Speciosum Zone of the Pisznice and Kis-Gerecse sections, and it occurs in the lower part of the Meneghinii Zone of the Pisznice section.

Geczyceras cf. clausum (GABILLY, 1973)

(Figure 5)

- 1973: *Hammatoceras clausum* nov. sp. — GABILLY, p. 432, pl. 66, figs 7–8
 1992: *Geczyceras* ? *clausum* (GABILLY) — MARTÍNEZ, p. 69, fig. 9, pl. 1, fig. 3
 2005: *Hammatoceras clausum* GABILLY — BÉCAUD et al., figs 2/3–4
 2005: *Hammatoceras* aff. *clausum* GABILLY — BÉCAUD et al., figs 2/5–6

Material — Two poorly preserved internal moulds.

Measurements	D	H	h	W	w	U	u
HP110C	128	38	30%	22	58%	60	47%
HP110D	118	36	30%	22	61%	56	47%



Figure 5 — *Geczyceras cf. clausum* (GABILLY). — Pisznice, bed №: 110, Alticarinatus Subzone, lateral view, ×1

Description — Medium-size, evolute, platycone form with subtriangular whorl-section. The umbilicus is wide and shallow, the umbilical wall is low, the margin is rounded. The flanks are slightly convex with rounded shoulders. The venter is narrow and rounded, bearing a smooth band in the middle. The ornamentation is characterised by moderately developed, non-tuberculate ribbing. Strong and radiate primaries emerge from the umbilicus, and bifurcate at the lower third. The secondaries bend forward from the furcation points, and fade away at the band. The suture-line is hammatoceratid.

Remarks — Although the specimens resemble the holotype (GABILLY 1973, pl. 66, figs 7–8, refigured by

BÉCAUD et al. 2005, figs 2/3–4) in ornamentation, they differ by being less involute. Both show the closest similarities in size, in morphology and in sculpture to the *H. aff. clausum* figured by BÉCAUD et al. (2005, figs 2/5–6), however, the poor state of preservation does not allow certain identification.

Distribution — Vitiosa Subzone/horizon: France (GABILLY 1973), Spain (MARTÍNEZ 1992). Phillipsi-Vitiosa horizons: France (BÉCAUD et al. 2005, BÉCAUD 2006). Alticarinatus Subzone: Portugal (ELMI et al. 2007). The Gerecse Mts specimens were obtained from the Alticarinatus Subzone, they were associated with *Furloceras chelussii*, *Geczyceras porcarellense*, *Pseudogrammoceras* sp.

Geczyceras bonarelli (PARISCH & VIALE, 1906) (Figure 6)

- 1906: *Hammatoceras Bonarelli* n. sp. — PARISCH & VIALE, p. 159, pl. 10, figs 1–4
 1914: *Hammatoceras Bonarelli* PARISCH & VIALE — FOSSA MANCINI, p. 69
 1915: *Hammatoceras Bonarelli* PARISCH & VIALE — PRINCIPI, p. 448, pl. 16, fig. 3
 1934: *Hammatoceras Bonarelli* PARISCH & VIALE — MERLA, p. 21, pl. 3, fig. 5
 1963: *Hammatoceras bonarelli* PARISCH & VIALE — KOTTEK, p. 122, p. 123, fig. 62, pl. 13, fig. 9
 1975: *Hammatoceras bonarelli* PARISCH & VIALE — GUEX, p. 112, pl. 9, fig. 12
 1978: *Hammatoceras bonarelli* PARISCH & VIALE — DEZI & RIDOLFI, p. 42, fig. 51
 ? 1978: *Hammatoceras aff. bonarelli* PARISCH & VIALE — DEZI & RIDOLFI, p. 43, figs 52–53

- 1991: *Hammatoceras bonarellii* PARISCH & VIALE — ELMI & RULLEAU, p. 323, fig. 2/4, pl. 4, figs 1–2
 1992: *Geczyceras* aff. *bonarellii* (PARISCH & VIALE) — MARTÍNEZ, p. 74, p. 75, fig. 11, pl. 3, fig. 1
 1993: *Hammatoceras bonarellii* PARISCH & VIALE — ELMI & RULLEAU, pl. 1, figs 3–4
 1995: *Geczyceras* cf. *bonarellii* (PARISCH & VIALE) — GOY et al., p. 99, pl. 12, figs 3–4
 1996: *Hammatoceras bonarellii* (PARISCH & VIALE) — RULLEAU, p. 3, p. 4, fig. 1/1, pl. 1, figs 1–4, pl. 2, fig. 4
 ? 1996: *Hammatoceras* aff. *bonarellii* (PARISCH & VIALE) — RULLEAU, pl. 2, fig. 3
 2001: *Geczyceras bonarellii* (PARISCH & VIALE) — VENTURI & FERRI, p. 229
 2007: *Hammatoceras* aff. *bonarellii* PARISCH & VIALE — RULLEAU, pl. 65, fig. 4, pl. 66, fig. 1
 2007: *Hammatoceras bonarellii* PARISCH & VIALE — ELMI et al., pl. 1, fig. 4
 2008: *Hammatoceras bonarellii* PARISCH & VIALE — VENTURI & BIOTTA, pl. 14, figs 2a–c, pl. 15, figs 1a–d

Material — Twelve internal moulds of different state of preservation, and 3 fragments.

Measurements	D	H	h	W	w	U	u
HP103	210	50	24%	24	48%	118	56%
HG59B	170	41	24%	22	54%	92	54%
HG59A	102	24	23%	16	66%	56	55%

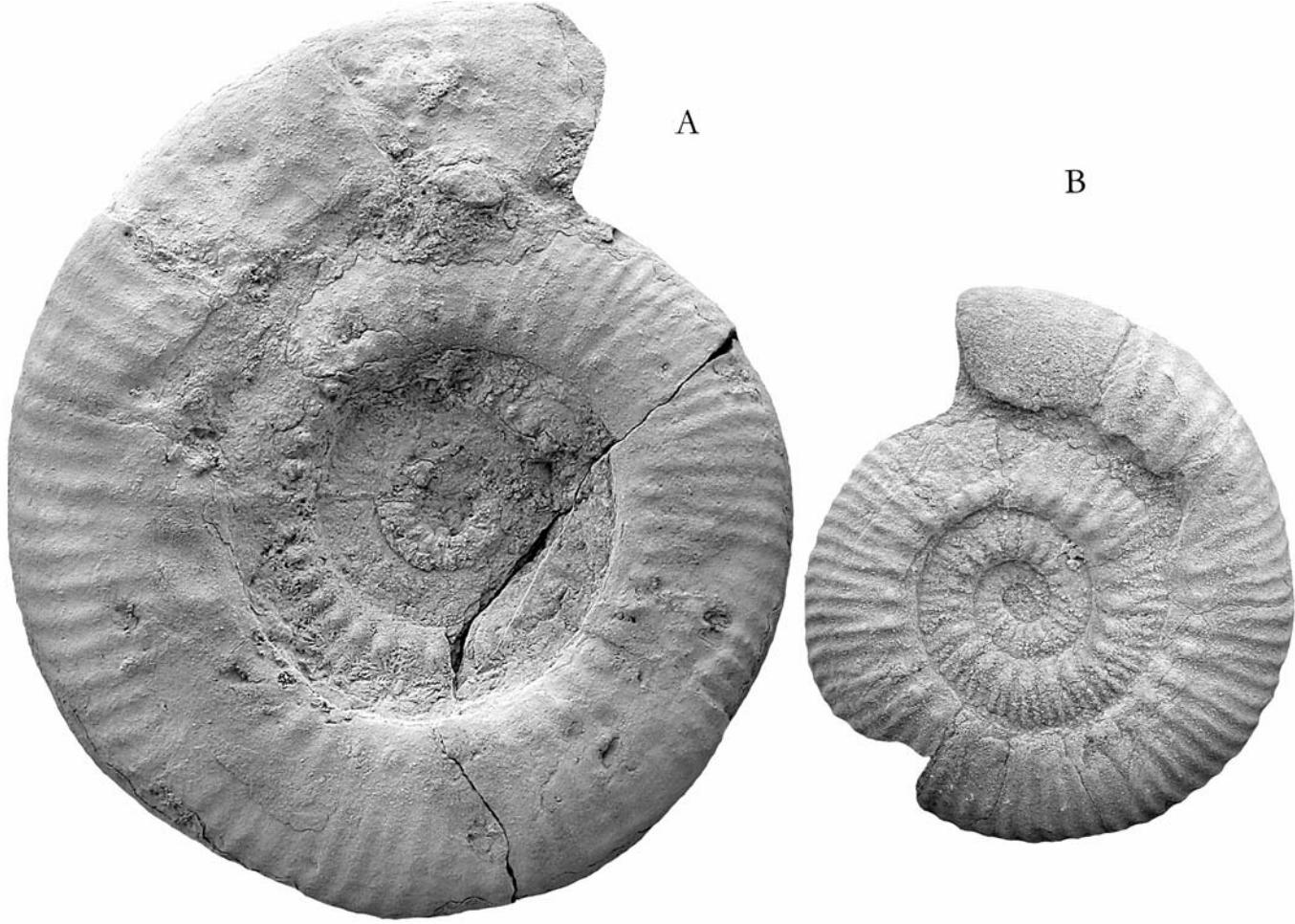


Figure 6 —*Geczyceras bonarellii* (PARISCH & VIALE). — A–B: lateral view of two specimens, both from Kis-Gerecse, bed №: 59, Alticarinatus Subzone, both $\times 0.75$.

Description — Large, serpenticon form with compressed whorls. The umbilicus is wide and shallow, the flanks are slightly convex. Both the umbilical and the ventrolateral edges are rounded. The convex and narrow venter bears a low keel. The cross-section is somewhat rounded subquadrangular on the inner whorls becoming narrow high-oval with maximum width at the lower third on the last whorl. The ornamentation consists of moderately strong, regular ribbing. Two or rarely three slightly prossiradiate and sigmoid ribs rise from small and well-defined umbilical tubercles and reach the

keel. Specimen HB16B bears 26 tubercles on the first half of the last whorl. No whole body chambers are preserved. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens are close to the holotype (PARISCH & VIALE 1906, pl. 10, figs 1–4) and to the specimens figured by RULLEAU (1996, pl. 1, figs 1–2, 3–4). The serpenticon coiling and the platycone whorls make the species distinguishable from most of the other taxa belonging to the genus, except *G. subplanatum*. The latter bears a striking resemblance to *G. bonarellii* with its

evolute coiling and narrow, compressed whorls, however, it differs by having higher whorls as well as finer ribbing with less developed tubercles (DE BRUN 1932, pl. 3, fig. 1, RULLEAU 1996, pl. 3, figs 1–2). Considering the coiling style and the relatively dense, fine and straight ribbing, the *H. aff. bonarellii* figured by DEZI & RIDOLFI (1978, fig. 52) seems to be similar to the *H. aff. subplanatum* figured by RULLEAU (1996, pl. 3, figs 3–4). The *H. aff. bonarellii*, presented by RULLEAU (l.c. pl. 2, fig. 3) possesses a moderately involute coiling which is not typical of the holotype.

Distribution — Upper Toarcian: Italy (PRINCIPI 1915, FOSSA MANCINI 1915, MERLA 1934, RAMACCIONI 1939),

Greece (RENZ 1910, 1913, 1927), Morocco (DUBAR 1936, EL ARABI et al. 2001). *Pseudomercaticeras latum* Subzone: Greece (KOTTEK 1963). *Thouarsense/Bonarellii* Zone: Italy (CRESTA 1994, PETTINELLI et al. 1997), Portugal (ELMI et al. 1989 2007, ALMÉRAS 1994), France (RULLEAU 2007), Tunisia (SEKATNI et al. 2008). *Fascigerum* Subzone: France (ELMI & RULLEAU 1991, RULLEAU 1996, 2007). *Fallaciosum* Subzone: France (ELMI 1967). *Insigne* Zone: France (GUEX 1975), Spain (ELMI et al. 1989, MARTÍNEZ 1992). *Meneghinii* Zone: Morocco (BENSHILI 1989), ?Algeria (ELMI 1986). In the Gerecse Mts the taxon is known from the upper *Thouarsense* Subzone to the lower *Speciosum* Zone.

Geczyceras aff. allobrögense (DUMORTIER, 1874)

(Figure 7)

- 1874: *Ammonites Allobrogensis* n. sp. — DUMORTIER, p. 79, pl. 19, figs 1–2
 1885: *Hammatoceras Allobrogense* DUMORTIER — HAUG, p. 648
 1904: *Hammatoceras Allobrogense* DUMORTIER — PRINZ, p. 75
 1914: *Hammatoceras allobrögense* (DUMORTIER) — FOSSA MANCINI, p. 70
 1934: *Hammatoceras allobrögense* (DUMORTIER) — MERLA, p. 11, pl. 1, fig. 2
 ? 1963: *Hammatoceras cf. allobrögense* (DUMORTIER) — KOTTEK, p. 124
 v 1966: *Hammatoceras allobrögense* (DUMORTIER) — GÉCZY, p. 47, fig. 35, pl. 7, fig. 2, pl. 38, fig. 7
 1978: *Hammatoceras cfr. allobrögense* (DUMORTIER) — DEZI & RIDOLFI, p. 35, fig. 37
 1992: *Geczyceras allobrögense* (DUMORTIER) — MARTÍNEZ, p. 104, fig. 20, pl. 18, figs 2–6
 1995: *Geczyceras allobrögense* (DUMORTIER) — GOY et al., p. 101, pl. 12, fig. 6
 1996: *Pseudammatoceras allobrögense* (DUMORTIER) — RULLEAU, p. 8, pl. 33, figs 5–6, pl. 34, figs 1–4
 2007: *Pseudammatoceras aff. allobrögense* (DUMORTIER) — RULLEAU, p. 104, fig. 29/8, pl. 77, fig. 4, pl. 78, fig. 3

Material — Single fragment of the last whorl of the phragmocone.

Measurements	L	H	h	W	w
HTA31	80	46	?	22	48%

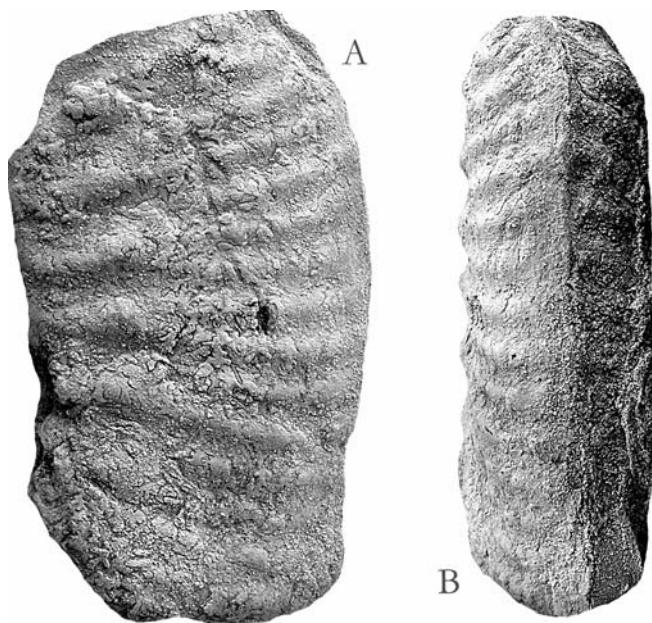


Figure 7 — *Geczyceras aff. allobrögense* (DUMORTIER). — Lateral (A) and ventral (B) view; Tölgyhát A, bed №: 31, Meneghinii Zone, ×1.

Description — Evolute, platycone form with acute venter. The umbilical wall is smooth, the margin is rounded. The flanks are slightly convex with high-oval whorl-section. Widely spaced, radiate, projected primary

ribs emerge from the umbilicus, and bifurcate from well-developed tubercles above the margin. The strong and gently concave secondaries, with irregular intercalatories between them, reach the keel and fade away. The suture-line is hammatoceratid.

Remarks — *G. allobrögense* is a relatively rare taxon with only a few detailed records and its classification shows uncertainty. Based on the ornamentation and the stratigraphic position, MARTÍNEZ (1992: 104) included it in *Geczyceras*. The specimens of RULLEAU (1996) differ from the type in ornamentation, and they came from the Opalinoides Subzone. Having been refigured they were assigned as *P. aff. allobrögense* (RULLEAU 2007). In this paper it is considered, that on the bases of the sculpture and the Upper Toarcian range, the taxon belongs to *Geczyceras*. The Gerecse fragment is close in morphology to the type (DUMORTIER 1874, pl. 19, figs 1–2), to the specimen documented by GÉCZY (1966), as well as to the fragments figured by MARTÍNEZ (1992, pl. 18, figs 2–6), but it is much bigger. The bifurcating ribbing with intercalatories was maintained by GÉCZY (1966: 47) and by MARTÍNEZ (1992: 106), and the type also seems to have similar sculpture, however, DUMORTIER (1874: 79) interpreted it as trifurcation. DEZI & RIDOLFI (1978: 35) described bifurcating-trifurcating ribs, but their specimen appears distinct from the type in the subcircular section. The taxon resembles *G. perplanum* in sculpture, but differs by having narrow oval section. Its tuberculate ribbing

is also similar to that of some species of *Accardia*, but the latter genus is characterised by lateral tubercles at mid-height position. Because of being a poorly preserved fragment, it can be identified only with uncertainty.

Distribution — Upper Toarcian: France (MARTÍNEZ 1992), Italy (FOSSA MANCINI 1915, MERLA 1934, DEZI & RIDOLFI 1978). Levesquei Zone: Hungary, Bakonycsernye

(GÉCZY 1966, 1967b). Levesquei Subzone: Spain (GOY & MARTÍNEZ 2009). Levesquei Subzone–lower Aalensis Zone: Spain (MARTÍNEZ 1992, GOY et al. 1995). Aalensis Zone: Morocco (EL HAMMACHI et al. 2009). Pseudoradiosa Zone–Mactra Subzone: Spain (SANDOVAL et al. 2007). Opalinoides Subzone: France (RULLEAU 1996, 2007). Specimen HTA31 occurs in the Meneghinii Zone.

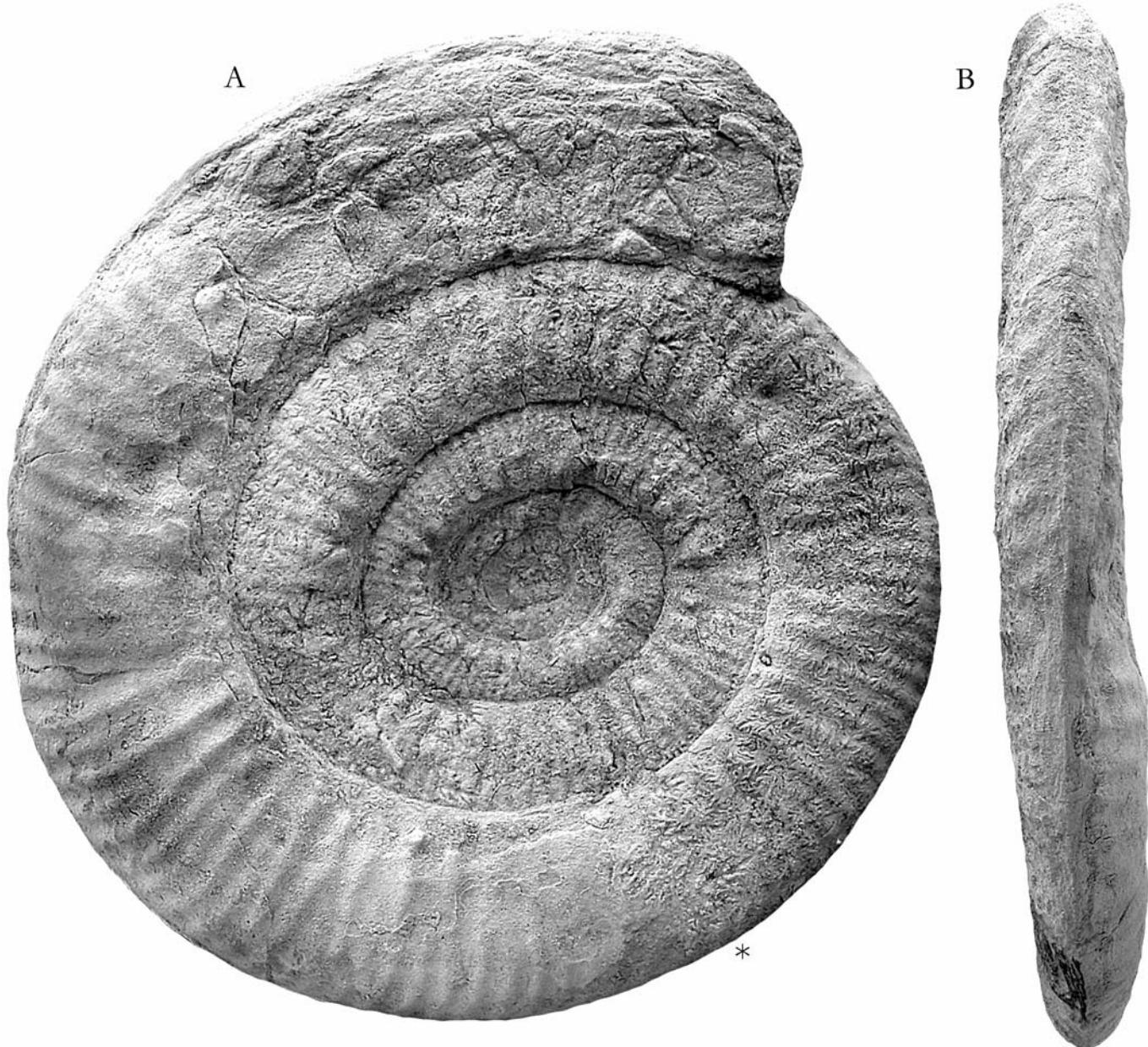


Figure 8 — *Geczyceras galaczi* n. sp., holotype (A1100). — Lateral (A) and ventral (B) view, Báná-hegy, bed №: 16, Speciosum Zone, ×0.87.

Geczyceras galaczi n. sp.
(Figure 8)

? 1978: *Hammatoceras* n. sp.? — DEZI & RIDOLFI, p. 30, fig. 29

Holotype — HB16B (A1100, Natural History Museum of the Faculty of Sciences of Eötvös University)

Derivation of name — In honour of András GALÁCZ, Hungarian paleontologist.

Type horizon and locality — Lower part of Speciosum Zone, bed 16 of Báná-hegy Quarry near Tardos, Gerecse Mts.

Diagnosis — Evolute form with wide and shallow umbilicus. Low umbilical and slightly convex lateral walls, high, rounded and carinate venter. Narrow-oval whorl-section. Bifurcating ribs emerge from tubercles placed close to the umbilical margin. Hammatoceratid suture-line.

Material — One well-preserved internal mould.

Measurements	D	H	h	W	w	U	u
HB16B	194	44	23%	20	45%	112	58%

Description — Large, evolute, platycone form with wide and shallow umbilicus. Both the umbilical and the ventrolateral margins are rounded. The flanks are slightly convex, almost flattened, the venter high, narrow and rounded, with a weakly developed carina. The whorl-section is compressed narrow-oval. The ornamentation is characterised by moderately developed, dense ribbing with small umbilical tubercles on the inner whorls. Two slightly prorsiradiate ribs arise from each tubercle, bend forward on the venter, and cease at the keel. The tubercles become weakly developed, elongated nodes from the penultimate whorl. The ribbing becomes somewhat irregular on the body chamber, intercalatories and single ribs appear, and some ribs bifurcate only on the lateral wall. There are 49 ribs on the first half of the last whorl. More than half whorl of the body chamber is present. It bears a narrow and shallow constriction at a quarter whorl before the end of the phragmocone. The suture-line is hammatoceratid with moderately long, ramified E, long and broad L, divided and oblique U lobes.

Remarks — The new taxon differs from all forms that

have been described in the literature. It resembles *G. bonarellii* in the coiling style and the sculpture, but differs by possessing slightly higher whorls and by having no regular umbilical tubercles on the last two whorls. *G. subplanatum* is another closely allied species. However, bearing stronger and more widely spaced ribbing, *G. galaczi* n. sp. differs from its holotype (DE BRUN 1932, p. 183, pl. 3, fig. 1), and from the *H. subplanatum* figured by RULLEAU (1996, pl. 3, figs 1–2), and agrees more with those *G. aff. subplanatum* which were also figured by RULLEAU (l.c., pl. 3, figs 3–4, pl. 4, figs 4–5). The new taxon is similar in morphology to the *Hammatoceras* n. sp.? presented by DEZI & RIDOLFI (1978, p. 30, fig. 29), which has an evolute form with a similar sculpture, and a constriction on the body chamber, but it differs from HB16B by having slightly wider whorl-section with a broader and lower ventral part.

Distribution — The specimen of DEZI & RIDOLFI originates from the Upper Toarcian. The holotype of *Geczyceras galaczi* n. sp. occurs in the lower part of the Speciosum Zone in bed 16 of the Báná-hegy section. It was associated with *G. speciosum*, *P. differens* and *C. enigmaticum*.

Geczyceras martinezae n. sp.

(Figure 9)

Holotype — HG58 (A1101, Natural History Museum of the Faculty of Sciences of Eötvös University)

Derivation of name — In honour of Gemma Martínez GUTIÉRREZ, Spanish paleontologist.

Type horizon and locality — Fallaciosum Subzone, bed 58 of the Kis-Gerecse Quarry near Sütő

Diagnosis — Evolute coiling with wide and gradually deepening umbilicus. Vertical umbilical and convex lateral walls, rounded venter with low carina. Oval whorl-section. Well-defined, bifurcating ribbing rising from tubercles placed close to the umbilical margin. Hammatoceratid suture-line.

Material — Single internal mould of the phragmocone of mediocre preservation.

Measurements	D	H	h	W	w	U	u	LWR
HG58	120	34	28%	26	76%	62	52%	80

Description — Medium-size, evolute form with convex flanks. The umbilicus is wide and gradually deepening. The umbilical wall is low and vertical, both the margin and the shoulder are rounded. The venter is moderately wide and high. A weakly developed keel present on the inner whorls is replaced by a smooth band on the last half whorl. The whorl-section is oval with maximum width at the mid-height. The body chamber is not preserved. The ornamentation consists of relatively strong ribbing and well-defined, rounded tubercles. The tubercles are placed on the umbilical margin of the inner whorls, but they occur slightly above the margin on the last whorl. Two radiate, slightly sigmoid ribs emerge from all tubercles and fade away at the carina. Some irregular single ribs rising from tubercles appear on the last whorl, which bears 80 ribs. The suture-line is hammatoceratid: both the E and the L lobes are

well-developed and ramified, the U lobe is divided and oblique.

Remarks — The new species differs from the hammatoceratids described in the literature so far. It resembles the fragmentary *G. speciosum* figured by MARTÍNEZ (1992, pl. 8, fig. 1) in coiling style and sculpture. However, specimen HG58 is distinct from the type of *G. speciosum* in the more evolute coiling with oval section and in the radiate, sigmoid ribbing. Moreover, the constrictions typical of the Gerecse *G. speciosum* specimens are missing. Another closely allied form is *G. porcarellense*, but it has a more involute shell with fine sculpture. The new species also differs from *G. bonarellii* in its more involute coiling and more convex flanks with sigmoid ribbing.

Distribution — The studied specimen occurred in the Fallaciosum Subzone of the Kis-Gerecse section associated with a *Grammoceras* sp. in bed 58.

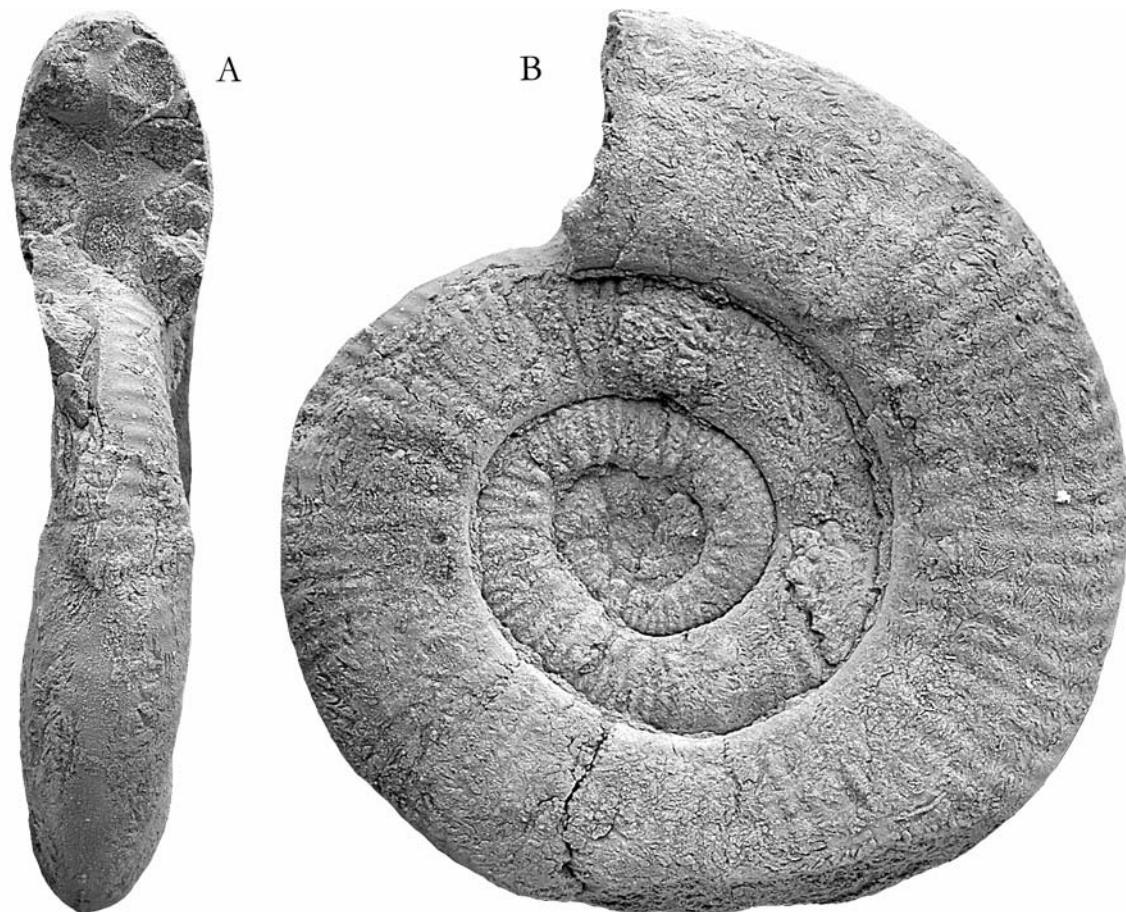


Figure 9 – *Geczyceras martinezae* n. sp., holotype (A1101). — Ventral (A) and lateral (B) view, Kis-Gerecse, bed №: 58, Fallaciosum Subzone, ×1.

Genus *Crestaites* RULLEAU & ELMI, 2001

Type species — *Hammatoceras meneghinii* BONARELLI, 1899. The type species (MENECHINI 1867–1881, pl. 13, fig. 1) was designated by RULLEAU & ELMI (RULLEAU et al. 2001: 76).

Diagnosis — Evolute, compressed form with wide umbilicus and weakly developed ventral keel. Well-defined ribbing persisting throughout the shell is interrupted on the venter, and is characterised by elongated primaries branching at the lower third or at the mid-height of the flank without tubercles. Hammatoceratid suture-line with moderately or well-developed E, broad and ramified L, divided and oblique U lobes.

Remarks — *Crestaites* was erected by RULLEAU & ELMI (l.c.) for hammatoceratid species which are characterised by possessing evolute coiling and long primary ribs bifurcating without tuberculation typical of *Geczyceras* and *Hammatoceras*, and are known from the Meneghinii/Pseudoradiosa Zone of the Mediterranean–Caucasian Realm. Three

taxa were originally included: *Crestaites meneghinii* (BONARELLI), *C. victorii* (BONARELLI), *C. goyi* (MARTÍNEZ). *H. tipperi* SEYED-EMAMI were classified within the genus by ELMI et al. (2007), however, RULLEAU's classification (2007) including it in *Geczyceras* seems more plausible. Based on the main morphological features, *H. meneghinii raricostatum* GÉCZY, 1966 is placed into *Crestaites* as *C. raricostatus* in this paper. Introduction of a new species, *Crestaites szentei* n. sp. is proposed as well.

Distribution — The genus shows a more extended stratigraphic range than it was supposed by its authors. The earliest representatives occur in the Toarcian of Greece (RENZ 1927), in the Insigne/Speciosum Zone of Italy, Portugal, Spain and Hungary (see below), and it was also documented from the Levesquei Zone of Iran (SEYED-EMAMI 1967), Aalensis Zone of France (RULLEAU 1996), Portugal (MOUTERDE & RUGET 1967b), and Morocco (BENSHILI 1989, EL HAMMICH et al. 2009).

Crestaites meneghinii (BONARELLI, 1899)

(Figure 10–11)

1867–1881: *Ammonites insignis* SCHÜBLER — MENECHINI, p. 59, pl. 13, fig. 1

1899: *Hammatoceras Meneghinii* n. sp. — BONARELLI, p. 208

1904: *Hammatoceras insigne* SCHÜBL. mut. nov. *reussisimile* — PRINZ, p. 71

1910: *Hammatoceras Meneghinii* BONARELLI — HAHN, p. 385

1914: *Hammatoceras Meneghinii* BONARELLI — FOSSA MANCINI, p. 74



Figure 10 – *Crestaites meneghinii* (BONARELLI). — Lateral view, Kis-Gerecse, bed №: 56, Speciosum Zone, ×0.85.

- 1934: *Hammatoceras Meneghinii* BONARELLI — MERLA, p. 10, pl. 1, fig. 1
- 1943: *Hammatoceras Meneghinii* BONARELLI — MAXIA, p. 96, pl. 1, fig. 7
- 1969: *Hammatoceras meneghinii* BONARELLI — PINNA, pl. 4, fig. 11 (refig. MENEGHINI, l.c.)
- 1978: *Hammatoceras meneghinii* BONARELLI — DEZI & RIDOLFI, p. 26, fig. 23, p. 27, fig. 24
- 1991: *Hammatoceras meneghinii* BONARELLI — ELMI & RULLEAU, p. 323, fig. 2/1, pl. 2, figs 1–2
- 1991: *Hammatoceras meneghinii* BONARELLI — ELMI & RULLEAU, p. 323, fig. 2/2, pl. 2, figs 3–4
- 1992: *Geczyeras meneghinii* (BONARELLI) — MARTÍNEZ, p. 97, p. 99, fig. 18, pl. 15, figs 1–5, pl. 16, fig. 1
- 1992: *Geczyeras aff. meneghinii* (BONARELLI) — MARTÍNEZ, p. 100, pl. 16, figs 2–3
- 1996: *Hammatoceras meneghinii* BONARELLI — RULLEAU, p. 6, pl. 22, figs 1–2
- 2005: *Crestaites meneghinii* (BONARELLI) — PALLINI et al., p. 14, pl. 12, fig. 2, pl. 16, fig. 9
- 2007: *Crestaites aff. meneghinii* (BONARELLI) — RULLEAU, pl. 74, fig. 1
- 2007: *Crestaites meneghinii* (BONARELLI) — ELMI et al., pl. 1, figs 1a–b, pl. 4, figs 1a–b
- 2008: *Hammatoceras meneghinii* BONARELLI — VENTURI & BILOTTA, pl. 14, figs 1a–c
- 2008: *Crestaites meneghinii* (BONARELLI) — GÉCZY et al., pl. 3, fig. 4
- 2009: *Crestaites cf. meneghinii* (BONARELLI) — EL HAMMACHI et al., pl. 4, fig. 6

Material — Eight moderately preserved internal moulds, and 1 fragment.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HG56C	205	51	25%	26	51%	114	55%	?	?
HG54D	200	50	25%	24	48%	110	55%	48	100
HG55C	190	46	24%	31	67%	100	53%	40	?
HB12A	142	36	25%	30	83%	74	52%	50	100

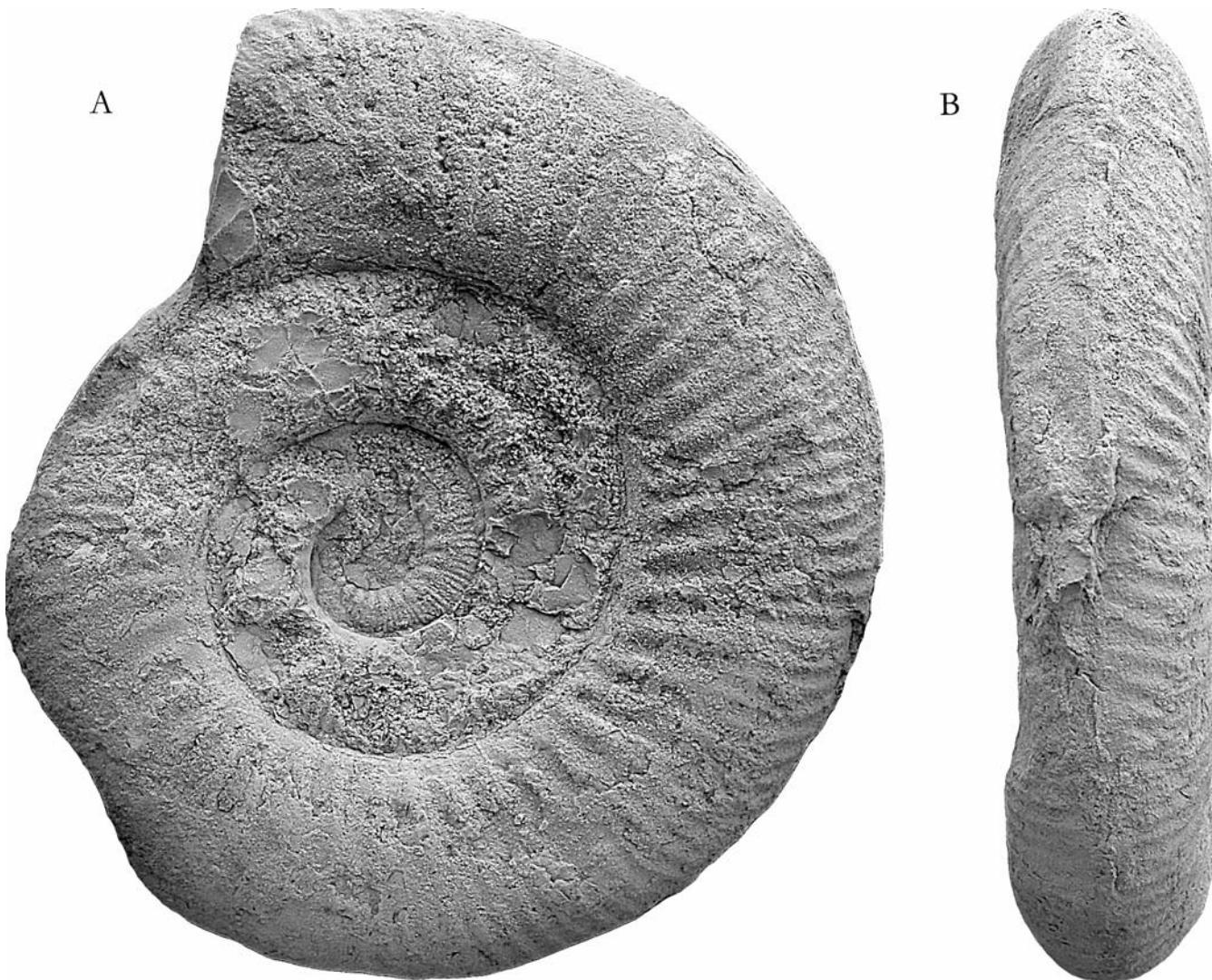


Figure 11 — *Crestaites meneghinii* (BONARELLI). — Lateral (A) and ventral (B) view, Báná-hegy, bed №: 12, Speciosum Zone, ×1.

Description — Large, evolute, compressed form with a wide and shallow umbilicus. The flanks are slightly convex, neither umbilical, nor ventrolateral margins are present. The venter is narrow, high and rounded, with a weakly developed carina. The whorl-section is narrow-oval. The body chamber is about 5/6 whorl in length. The projected and oblique peristome is preceded by a wide and shallow constriction, and another narrow constriction occurs at the half whorl of the body chamber. The ornamentation consists of dense, gently biconcave ribbing without tuberculation. The primary ribs are rursiradiate on the umbilical wall and prorsiradiate on the flank. They branch into two or three thinner secondaries at about the lower third or the mid-height of the flanks on the inner whorls. The furcation points move up to the upper third on the last whorl. The gently sigmoid secondaries bend forward on the venter and reach the keel. Both the specimens HB12A and HG54D

bear about 50 primaries HG56C 100 secondaries on the last whorl. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens seem to agree with the holotype (MENEGHINI 1867–1881, pl. 13, fig. 1, PINNA 1969, pl. 4, fig. 11), and the specimen of DEZI & RIDOLFI (1978, p. 26, fig. 23), in morphology and sculpture, although slight intraspecific variabilities occur. The cross-section of HG54D (w: 48%) is narrower than that of the holotype, while HB12A has gently wider whorls (w: 83%) (Figure 11). The latter is close to the *H. meneghinii* presented by RULLEAU (1996, pl. 22, figs 1–2), and to the *H. victori* figured by EIMI & RULLEAU (1991, pl. 3, figs 1–2, refigured by RULLEAU 1996, pl. 21, figs 1–2), which is more finely ribbed than the type (MENEGHINI 1867–1881, pl. 14, fig. 2). These specimens are probably represent a transitional form between *C. meneghinii* and *C. victori*. *Geczyeras. bonarellii*, *G. subplanatum* and *G. galaczi* n. sp. resemble *C. meneghinii* in the

evolute coiling and dense ribbing, but the latter lacks the umbilical tubercles typical of *Gecyoceras*. *C. victorii* has a more robust form with coarse ribs, and two or more constrictions. The inner whorls of *C. meneghinii* are similar to that of *C. goyi*, but the latter bears stronger and less sinuous ribbing.

Distribution — Upper Toarcian: Italy (BONARELLI 1899, FOSSA MANCINI 1914, MAXIA 1943, DEZI & RIDOLFI 1978, PASSERI et al. 2008), Austria (HAHN 1910), Greece (RENZ 1912b, 1927), Morocco (TERMIER & DUBAR 1940). Thouarsense–Insigne Zones: Portugal (MOUTERDE et al. 1971). Speciosum–Meneghinii Zones: Italy (CRESTA 1994),

Portugal (ELMI et al. 2007). Insigne Subzone–Levesquei Subzones: Spain (MARTÍNEZ 1992). Meneghinii/Pseudoradiosa/Reynesi Zone: Spain (LINARES & SANDOVAL 1993, GARCÍA-GÓMEZ et al. 1994), Portugal (PERROT 1955, MOUTERDE et al. 1980), Italy (PINNA 1969), France (ELMI & RULLEAU 1991, RULLEAU 2007), Morocco (EL ARABI et al. 1999, EL HAMMICH et al. 2009). Levesquei–Aalensis Zones: Portugal (MOUTERDE 1967, MOUTERDE & RUGET 1967b). Aalensis Zone: Morocco (BENSHILI 1989). In the Gerecse Mts, the taxon is typical of the Speciosum Zone of the Pisznice, Kis-Gerecse and Bánnya-hegy sections.

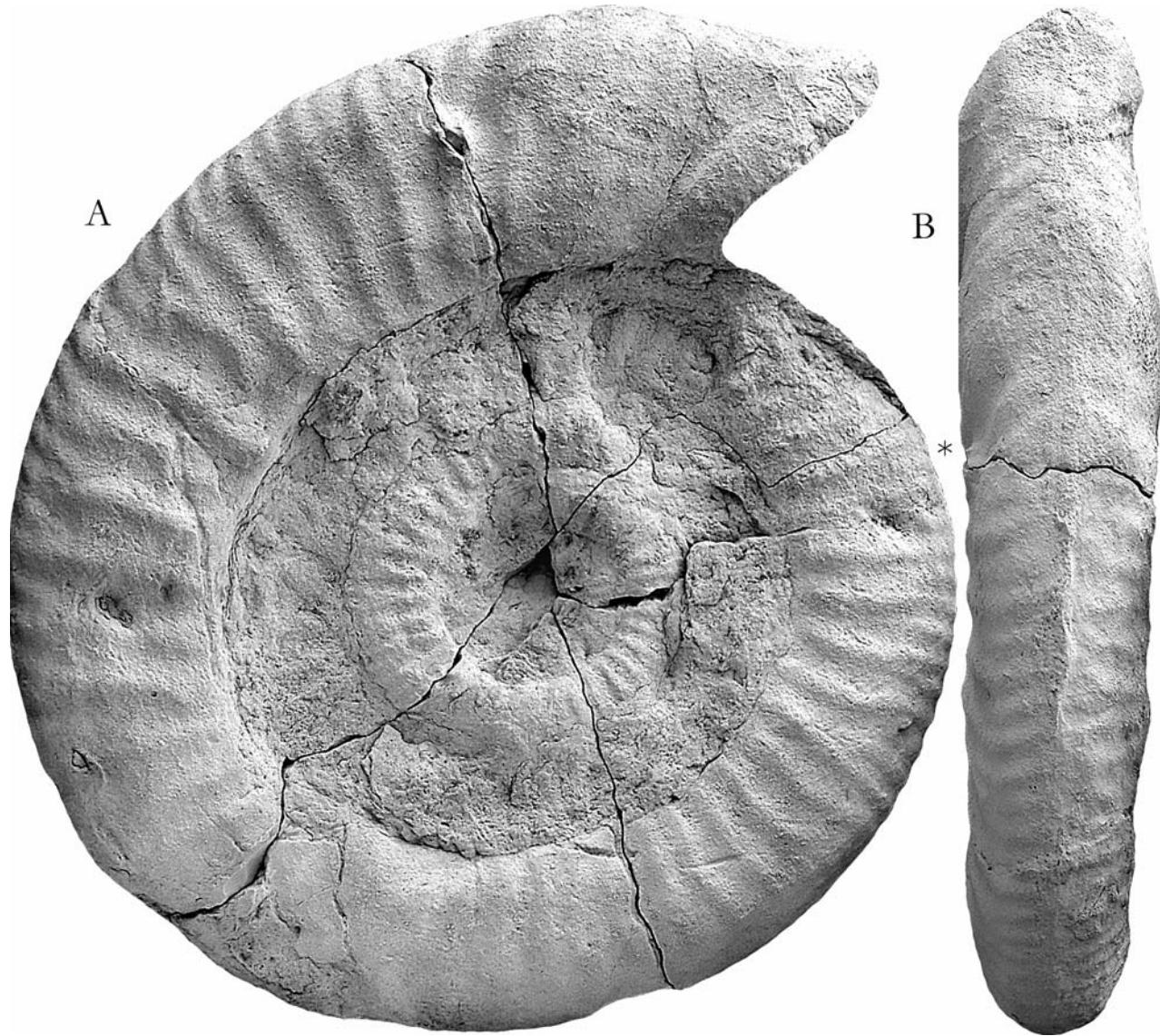


Figure 12 — *Crestaites raricostatus* (GÉCZY). — Lateral (A) and ventral (B) view, Pisznice, bed №: 98, Speciosum Zone, ×0.7.

***Crestaites raricostatus* (GÉCZY, 1966)**
(Figure 12–13)

- v 1966: *Hammatoceras meneghinii raricostatum* n. subsp. — GÉCZY, p. 84, fig. 71, pl. 23, pl. 41, fig. 3
1978: *Hammatoceras aff. meneghinii raricostatum* GÉCZY — DEZI & RIDOLFI, p. 28, figs 25–27, p. 29, fig. 28

Material — Three internal moulds of moderate preservation.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HP98F	224	56	25%	38	68%	130	58%	40	80
HB15C	214	52	24%	34	65%	121	56%	-	-



Figure 13 – *Crestaites raricostatus* (GÉCZY). — Lateral view, Bánnya-hegy, bed №: 15, Speciosum Zone, $\times 0.8$.

Description — Large, compressed, evolute form with wide and shallow umbilicus. Both the low umbilical wall and the margin are rounded. The flanks are slightly convex with rounded shoulders. The venter is relatively broad and low with a weakly developed carina. The cross-section is suboval with maximum width a little above the umbilical margin. The body chamber is about a whorl in length. The projected and oblique peristome is preceded by a wide and shallow constriction. Before this, the whorl is gently flared in 35 mm in length. Another narrow constriction appears on the first half of the body chamber. The ornamentation consists of well-defined, slightly biconcave ribbing. Strong and radiate primaries emerge from the umbilicus, bend first forward at the margin, then backward on the lower third of the flank. The intercostal space is wider than the rib width. The primaries bifurcate at mid-height on the phragmocone

without tuberculation. The furcation points move up to the upper third on the last half of the body chamber. The secondaries bend forward and reach the keel. The ribbing becomes weakly developed on the last third of the body chamber. The suture-line is hammatoceratid.

Remarks — The specimens show good agreement in size and morphology with the holotype, but they differ in the absence of the intercalatory ribs mentioned by the author (GÉCZY 1966: 85). They also resemble the material of DEZI & RIDOLFI (1978: 28–29). The difference between the hammatoceratid suture-line and the suture of the holotype with shorter E lobe was emphasized by GÉCZY (l.c.). Such suture building is also typical of *Crestaites victori*, *C. szentei* n. sp. and *Caigleras enigmaticum*, so it can be considered as a transition between the erycidids and the hammatoceratids (GÉCZY 1965: 21, 1966: 64, MARTÍNEZ 1992: 96). The constrictions on the

body chamber are another proof for the affinity of these taxa. The species is close to *C. meneghinii* in size and in coiling style, but the latter differs by having narrow whorls with more closely spaced ribbing. *C. rivicostatum* differs from both *C. victori* and *C. szentei* n. sp. by having larger size, higher whorls, as well as by bearing longer primaries on the body chamber.

Distribution — The holotype is known from probably

the Meneghinii Zone of the Bakonycsernye section, Hungary (GÉCZY 1966: 85). In Italy, the taxon was described from the Upper Toarcian of Monte Carcatora (DEZI & RIDOLFI 1978). The Gerecse specimens occur in the Speciosum Zone. HP98F was associated with *P. emiliana*, *P. murrillensis*, *C. enigmaticum*, *G. speciosum*, *C. meneghinii*, *C. goyi*, *C. victori*, *C. szentei* n. sp., and *Pseudogrammoceras* sp.



Figure 14 — *Crestaites victori* (BONARELLI). — Lateral view, Bánnya-hegy, bed №: 15, Speciosum Zone, ×1.

***Crestaites victori* (BONARELLI, 1895)**
(Figures 14–15)

- 1867–1881: *Ammonites insignis* SCHÜBLER — MENEGHINI, p. 56, pl. 14, fig. 2
1899: *Hammatoceras Victorii* n. sp. — BONARELLI, p. 209
1904: *Hammatoceras strictum* n. sp. — PRINZ, p. 73
1910: *Hammatoceras Victorii* BONARELLI — HAHN, p. 386, pl. 17, figs 1–2
1914: *Hammatoceras Victorii* BONARELLI — FOSSA MANCINI, p. 71
1915: *Hammatoceras Victorii* BONARELLI — PRINCIPI, p. 447, pl. 16, fig. 2
1965: *Hammatoceras victori* BONARELLI — GÉCZY, p. 20, fig. 2, p. 31, pl. 2
1967: *Hammatoceras aff. victori* BONARELLI — SEYED-EMAMI, p. 74, pl. 2, fig. 12, pl. 9, fig. 6
1968: *Hammatoceras victori* BONARELLI — PINNA, p. 22, pl. 2, fig. 4, pl. 2, fig. 12
1969: *Hammatoceras victori* BONARELLI — PINNA, pl. 5, fig. 9 (refig. MENEGHINI, l.c.)
1971: *Hammatoceras aff. victori* BONARELLI — SEYED-EMAMI, pl. 2, fig. 12, pl. 9, fig. 6
non 1973: *Hammatoceras aff. victori* BONARELLI — GABILLY, p. 435, pl. 68, figs 3–4
1978: *Hammatoceras victori* BONARELLI — DEZI & RIDOLFI, p. 39, figs 46–47
1978: *Hammatoceras cfr. victori* BONARELLI — DEZI & RIDOLFI, p. 40–41, figs 48–50
1991: *Hammatoceras victori* BONARELLI — ELMI & RULLEAU, pl. 3, figs 3–4
? 1991: *Hammatoceras victori* BONARELLI — ELMI & RULLEAU, pl. 3, figs 1–2
1992: *Hammatoceras victori* BONARELLI — MARTÍNEZ, p. 93, p. 95, fig. 17, pl. 10, figs 1–2, pl. 11, fig. 1
1996: *Hammatoceras victori* BONARELLI — RULLEAU, p. 6, pl. 20, figs 1–2
1996: *Hammatoceras* sp. — RULLEAU, pl. 6, fig. 1
? 1996: *Hammatoceras victori* BONARELLI — RULLEAU, p. 6, pl. 21, figs 1–2
2007: *Crestaites victori* (BONARELLI) — RULLEAU, pl. 74, fig. 3
2007: *Crestaites gr. victori* (BONARELLI) — ELMI et al., pl. 1, fig. 5

Material — Eleven internal moulds of mediocre preservation, and 20 fragments.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HG51D	160	38	24%	29	76%	87	54%	?	?
HB12B	154	38	25%	32	84%	81	53%	37	76
HP96A	144	34	24%	28	82%	80	56%	36	74
HB15B	122	32	26%	25	78%	66	54%	32	65

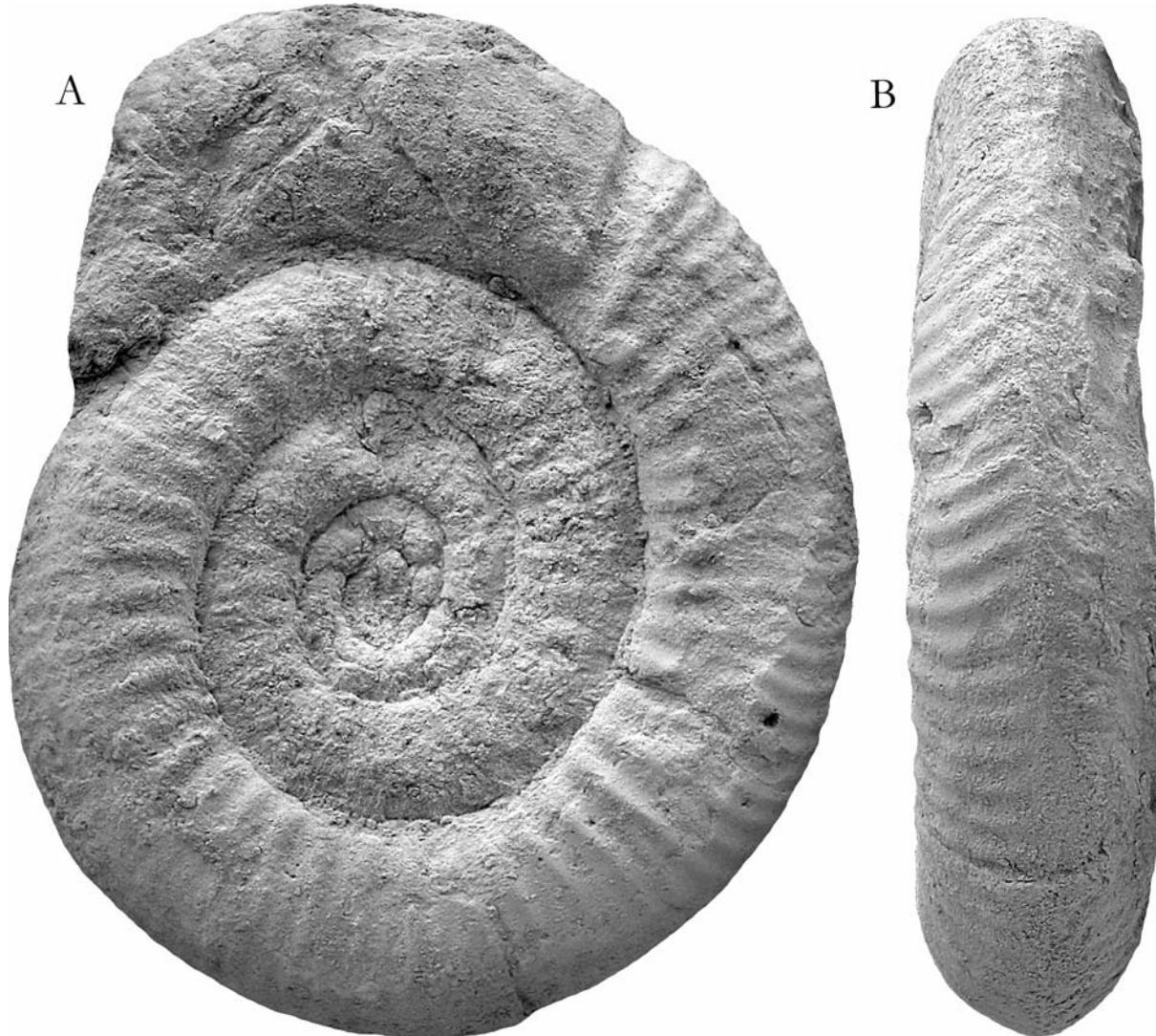


Figure 15 — *Crestaites victorii* (BONARELLI). — Lateral (A) and ventral (B) view, Pisznice, bed №: 96, Speciosum Zone, ×1.

Description — Large, evolute form with wide and shallow umbilicus. Both the umbilical and the ventrolateral margins are rounded, the flanks are convex. The venter is moderately broad, high and rounded, with a low carina. The whorl-section is wide-oval with maximum width at the lower third. Both the phragmocone and the body chamber bear some slightly prossiradiate and deep, irregularly placed constrictions. The length of the body chamber is about a whorl. The peristome is simple, projected and oblique, preceded by a wide, prossiradiate constriction. The ornamentation is characterised by coarse, Y-shaped ribbing without tuberculation. Primary ribs emerging on the umbilical wall become elongated nodes on the lower third of the flank, and bifurcate, rarely trifurcate at about the mid-height. The primaries are radiate on the inner whorls with equal rib-

width and intercosta. The sharp secondaries bend forward on the venter and fade away by the keel. The ribbing become prossiradiate and more widely placed from the penultimate whorl. Specimen HP96A bears 36, while HP98E bears 30 primaries on the last whorl. The suture-line is hammatoceratid, but the E is less developed.

Remarks — Some specimens (e.g. HP96A, Figure 15) are well consistent in morphology with the type (MENE-GHINI 1867–1881, pl. 14, fig. 2), and with the specimens figured by PINNA (1968, pl. 2, fig. 4), ELM & RULLEAU (1991, pl. 3, figs 2–4) and MARTÍNEZ (1992, pl. 10). Others (HB14C, HB15B, Figure 14), which are characterised by more widely spaced ribbing, resemble the specimens of HAHN (1910, pl. 17, figs 1–2), GÉCZY (1965, pl. 2) and DEZI & RIDOLFI (1978, figs 46–50). MENEGHINI (l.c.),

PRINZ (1904: 73), HAHN (1910: 387) and DEZI & RIDOLFI (l.c.) emphasized the presence of the constrictions occurring randomly on the whole shell. This feature is typical of the Gerecse material as well. The suture-line shows a transitional structure between hammatoceratids and erycidids. The *Hammatoceras* aff. *victori* BONARELLI described by GABILLY (1973: 435, pl. 68, figs 3–4) from the Bingmanni Subzone was assigned by MARTÍNEZ (1992: 71) as the holotype of *Geszyeras* ? *gabillyi* n. sp.. The taxon differs from *C. goyi* and *C. meneghinii*, as well as from *Cagliceras* *picenum*, *C. crassiventris* and *C. enigmaticum* by possessing wider whorls with coarse ribbing. It also differs from *C. szentei* n. sp. by having higher whorls and denser ribbing.

Distribution — Upper Toarcian: Italy (BONARELLI 1899, FOSSA MANCINI 1915, PRINCIPALI 1915, VENZO 1952, PELOSIO 1968, DEZI & RIDOLFI 1978), Austria (HAHN

1910), Greece (RENZ 1912b, 1927), Portugal (MOUTERDE & RUGET 1967a), Spain (MOUTERDE 1978, MOUTERDE et al. 1978), Ukraine, Crimea (IPPOLITOV et al. 2008). Erbaense Zone: Hungary (GÉCZY 1965, 1967b). Insigne Zone: Italy (CRESTA et al. 1989, CRESTA 1994), Insigne Subzone: Spain (MARTÍNEZ 1992). Meneghinii/Pseudoradiosa/Reynesi Zone: France (RULLEAU 2007), Spain (LINARES & SANDOVAL 1993, GARCÍA-GÓMEZ et al. 1994), Reynesi Subzone: Portugal (ELMI et al. 2007), France (RULLEAU 2007). Levesquei Zone: Iran (SEYED-EMAMI 1967), Levesquei Subzone: France (CASSEL 1997). Meneghinii-Aalensis Zones: Morocco (EL HAMMICH et al. 2009). Aalensis Zone: France (RULLEAU 1996). Aalensis-Buckmani Subzones: Spain (SANDOVAL et al. 2007). In the Gerecse Mts, it is abundant in the Speciosum Zone, and occurs in the lower Meneghinii Zone.

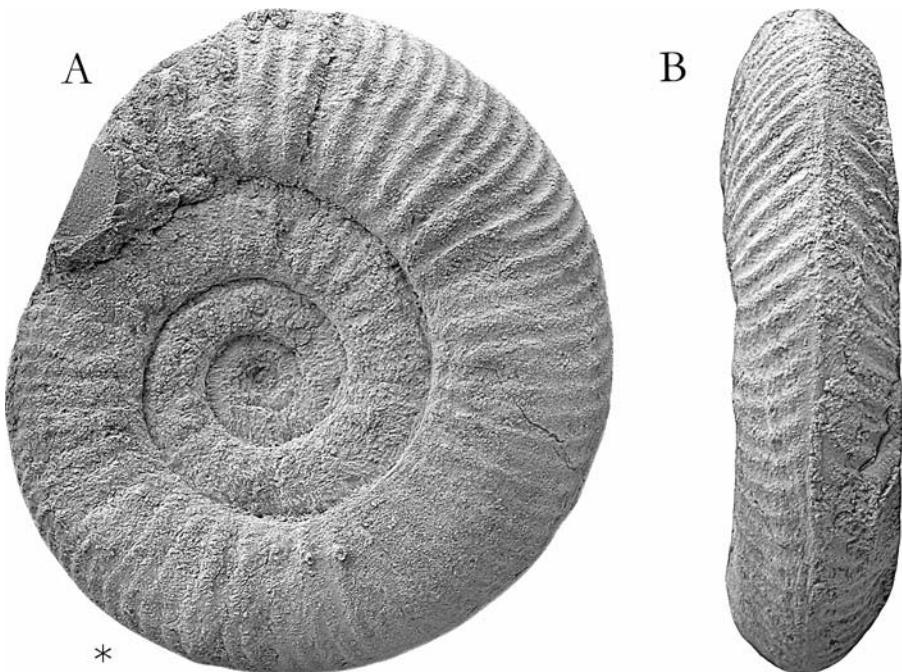


Figure 16 — *Crestaites goyi* (MARTÍNEZ). — Lateral (A) and ventral (B) view, Pisznice, bed №: 98, Speciosum Zone, ×1.

Crestaites goyi (MARTÍNEZ, 1992) (Figure 16)

- ? 1978: *Hammatoceras* aff. *meneghinii* *raricostatum* GÉCZY — DEZI & RIDOLFI, p. 28, fig. 26
- 1991: *Hammatoceras* *meneghinii* BONARELLI — ELMI & RULLEAU, p. 323, fig. 2/2, pl. 2, figs 3–4
- 1992: *Geszyeras* *goyi* n. sp. — MARTÍNEZ, p. 101, p. 103, fig. 19, pl. 16, fig. 4, pl. 17, figs 1, 2, pl. 18, fig. 1
- 1996: *Hammatoceras* (*Geszyeras*) *goyi* MARTÍNEZ — RULLEAU, p. 6, pl. 21, figs 5–6
- 2007: *Crestaites* *goyi* (MARTÍNEZ) — RULLEAU, pl. 73, fig. 2

Material — One internal mould of moderate preservation.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HP98A	88	23	26%	20	87%	44	50%	40	80

Description — Evolute, platycone form with a wide and shallow umbilicus. Both the umbilical and the ventro-lateral edges are rounded, the flanks are convex. The venter is narrow and rounded, with a low carina. The whorl-section is oval with maximum width at the lower third. The non-tuberculate ribbing is well-defined and slightly sinuous.

Radiate primaries rise from the umbilicus, become stronger on the margin and bifurcate at the mid-height. The secondaries first bend gently backward, then forward at the shoulder, and reach the keel. A part of the body chamber is preserved. The suture-line is not visible.

Remarks — The Pisznice specimen is close in mor-

phology to the holotype (MARTÍNEZ 1992, pl. 17, fig. 1) and to the specimen of RULLEAU (1996, pl. 21, figs 5–6), but it bears radiate primaries, so its ribbing is slightly less sigmoid. The taxon differs from *C. meneghinii* in the size and ornamentation. The latter is of a large form with dense and more flexuous ribbing. *C. victori* differs by having broad whorl and coarse, more widely spaced primaries. Regarding the sculpture, the *Hammatoceras* aff. *meneghinii*

raricostatum GÉCZY, figured by DEZI & RIDOLFI (1978, p. 28, fig. 26) is considered here as *Crestaites goyi* (MARTÍNEZ, 1992).

Distribution — Upper Toarcian: ?Italy (DEZI & RIDOLFI 1978). Insigne–Levesque Subzones: Spain (MARTÍNEZ 1992), Pseudoradiosa Zone: France (ELMI & RULLEAU 1991, RULLEAU 1996, 2007). Specimen HP98A came from the Speciosum Zone.

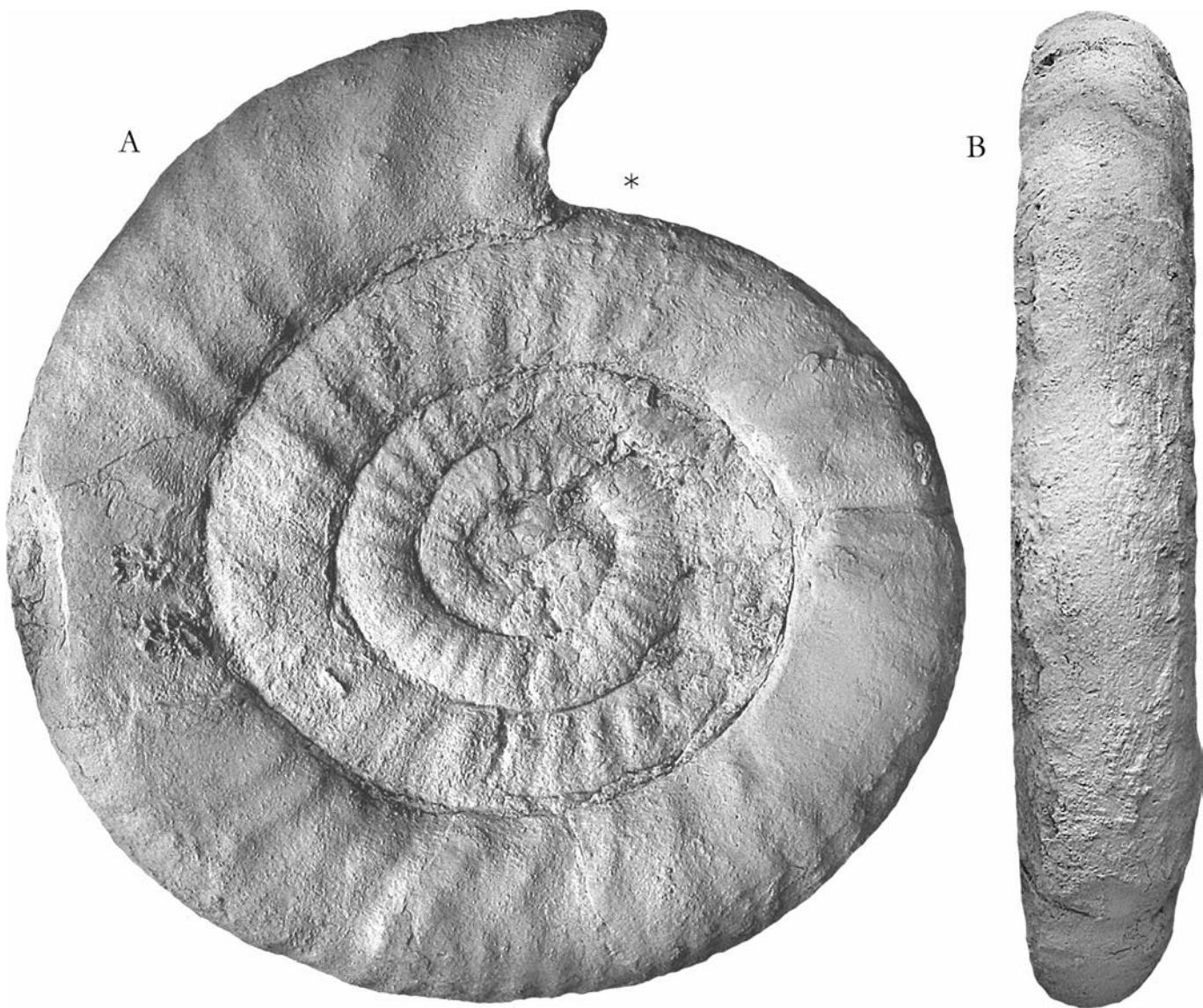


Figure 17 — *Crestaites szentei* n. sp. — Holotype (A1102), lateral (A) and ventral (B) view, Pisznice, bed №: 98, Speciosum Zone, ×1.

***Crestaites szentei* n. sp.**
(Figures 17–19)

1978: *Erycites* n. sp.? — DEZI & RIDOLFI, p. 60, figs 89, 89a

Holotype — HP98E (A1102, Natural History Museum of the Faculty of Sciences of Eötvös University)

Paratypes — HG51C (A1103), HG53A (A1104), HG54E (A1105)

Derivation of name — In honour of István Szente, Hungarian paleontologist.

Type horizon and locality — Speciosum Zone, Pisznice Quarry near Sütő, Gerecse Mts.

Diagnosis — Subserpenticone coiling with wide and shallow umbilicus. Low umbilical wall, convex lateral wall, rounded and carinate venter. Oval whorl-section, coarse, prorsiradiate, furcating ribbing. Constrictions on the body chamber, hammatoceratid suture-line.



Figure 18—*Crestaites szentei* n. sp. — **A:** paratype (A1105), lateral view, Kis-Gerecse, bed №: 54, Speciosum Zone, ×1; **B:** paratype (A1104), lateral view, Kis-Gerecse, bed №: 53, Speciosum Zone, ×1.

Material — Eleven internal moulds of different state of preservation and 5 fragmentary specimens.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HG51C	163	38	23%	31	82%	95	58%	34	82
HP98E	160	38	24%	30	79%	90	56%	29	66
HG54E	150	36	24%	29	80%	84	56%	27	71
HG53A	146	34	23%	28	82%	82	56%	22	?

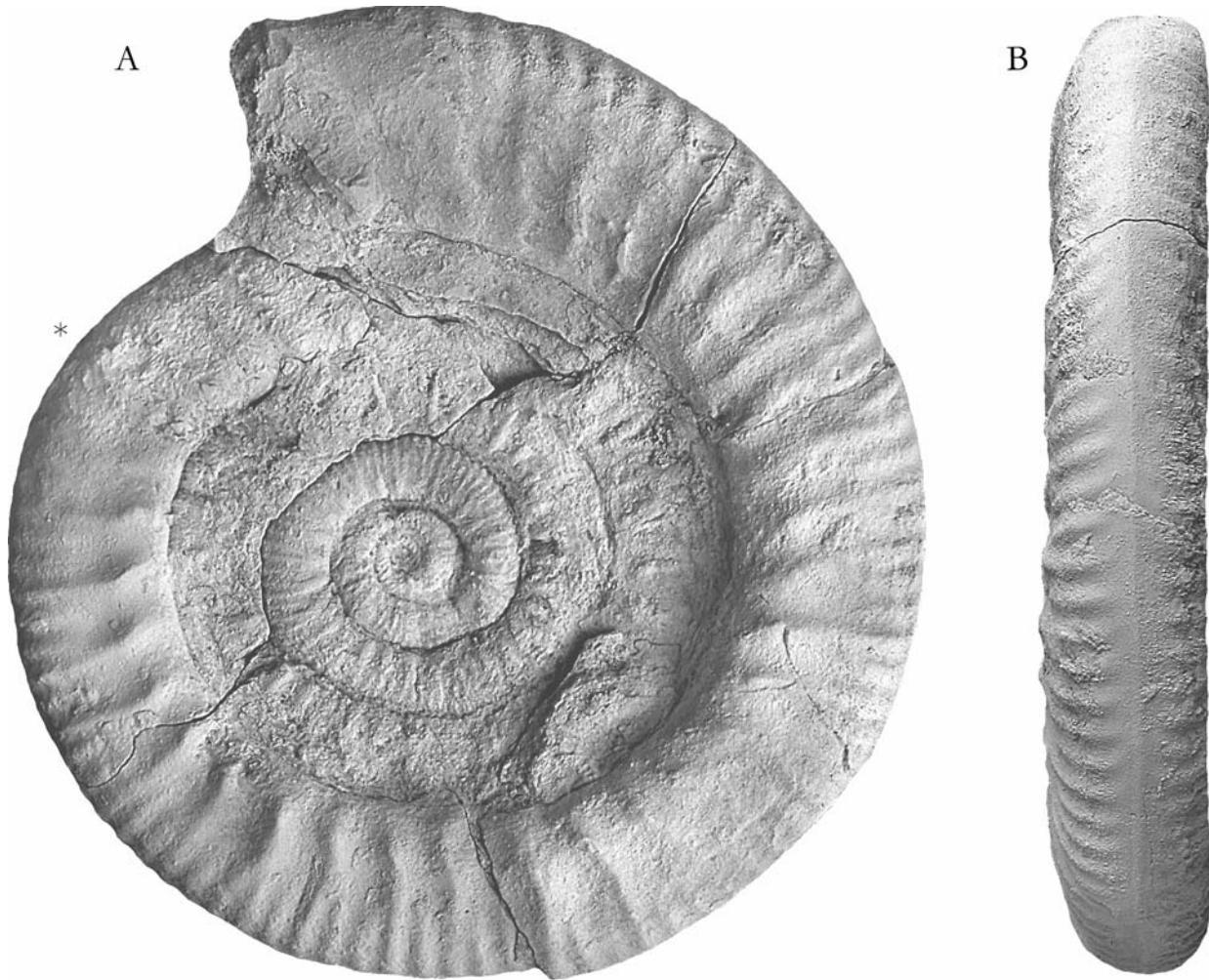


Figure 19 — *Crestaites szentei* n. sp. — Paratype (A1103), lateral (A) and ventral (B) view, Kis-Gerecse, bed № 51, Speciosum Zone, ×0.8.

Description — Large, subserpenticonic, gradually growing coiling. The umbilicus is wide and shallow with low and rounded umbilical wall. The flanks are convex, both the umbilical and the ventrolateral edges are rounded. The venter is relatively broad, low and rounded, with a low keel on the phragmocone, replaced by a smooth band on the body chamber. The whorl-section is moderately wide-oval with maximum width at the mid-flank. The body chamber is about one whorl in length. The projected, oblique and prorsiradiate peristome is preceded by a wide constriction, and two narrow and prorsiradiate constrictions are also present on the body chamber. The ornamentation is characterised by well-defined, prorsiradiate ribbing persisting throughout the shell. Strong and straight primary ribs emerge from the umbilicus with slightly broader interspace than the rib-width, and branch into 2–3 secondary

ribs at the mid-height of the flank. The primaries tend to develop into projected and elongated bullae on the body chamber, and become gently curved and twice as widely spaced with concave intercosta from the last half of the penultimate whorl. The coarse secondaries are first radiate, then bend forward on the venter and fade at the keel, so the ribbing shows a sigmoid or gently biconcave shape on the body chamber. Intercalatories appear on the last whorl. The suture-line is hammatoceratid: the E lobe is moderately developed and ramified, its length is about half of the L, both L and LS are broad and ramified, U is oblique and divided.

Remarks — Regarding the morphology and the suture-line, the taxon shows close affinity with both *Crestaites* and *Cagliceras*, representatives of two different subfamilies. The suture resembles that of *C. victori* and that of *Cagliceras enigmaticum*; it can be regarded as a

transitional type. Moreover, the constrictions on the body chamber, which had been considered as a typical characteristic of *Hammatoceras* in the Insigne Zone (HAHN 1910, RULLEAU 1996), also occur on *Cagliceras crassiventris* (DEZI & RIDOLFI 1978: 53, KOVÁCS & GÉCZY 2008: 67) and *C. enigmaticum* (KOVÁCS & GÉCZY 2008: 72). None the less, based on the striking similarity between *C. victorii* and *C. szentei* n. sp., as well as on the bullate sculpture, the new species is classified as a member of *Crestaites*. The sharp and projected primaries of the paratype HG51C (Figure 19) are typical of the new species, whereas its less widely spaced ribbing is similar to that of *C. victorii*. This specimen might represent a transitional form between the two closely allied taxa. The Monte Carcatora specimen, which was figured and described as *Erycites* n. sp.? by DEZI & RIDOLFI (1978: 60, figs 89, 89a), appears to be identical with *C. szentei* n. sp., therefore the presence of the taxon in the Upper Toarcian of Italy seems justified.

C. meneghinii differs from *C. szentei* n. sp. in having high and narrow whorls with fine sculpture and in lacking constrictions. *C. raricostatus* differs in possessing slightly more involute coiling and higher whorls, and in bearing more closely spaced ribbing with longer primaries. *C. victorii* resembles the new taxon in almost all respects of morphology but it differs in being a slightly more involute form with less coarse ribs. Beside the Hammatoceratinae, both *Cagliceras elaphum* and *C. crassiventris* appear similar to the new species in size and coiling style, however, all *Cagliceras* species but *C. enigmaticum* are characterised by eryciditid suture-line with less developed E lobe. Furthermore, *C. elaphum* has high-oval whorl-section, and its primaries are markedly shorter. The section of *C. crassiventris* is much narrower and its ribbing is less defined.

Distribution — *Crestaites szentei* n. sp. is abundant in the Speciosum Zone of the Pisznice, Kis-Gerecse and Bánha-hegy sections.

Genus *Hammatoceras* HYATT, 1867

Type species — *Ammonites insignis* SCHÜBLER in ZIETEN (1830). The type species was designated by HYATT (1867: 98).

Diagnosis — Moderately evolute or involute form with varying size. Deep umbilicus, high umbilical margin, convex flank, broad and rounded venter with moderately developed keel. Wide suboval or subtriangular whorl-section. Well-defined ribbing with tubercles or nodes. Hammatoceratid suture-line with developed and ramified E, broad and ramified L, divided and oblique U lobes.

Remarks — The various systematic conceptions, which concerned the taxon since it was created as *Ammatoceras* by HYATT in 1867, were discussed mainly by GÉCZY (1966), DONOVAN et al. (1981), MARTÍNEZ (1992), RULLEAU (1996, 2007), and RULLEAU et al. (2001). Four *Hammatoceras* species are documented here from the Gerecse material: *H. insignis* (SCHÜBLER in ZIETEN), *H. semilunatum* (QUENSTEDT), *H. trigonatum* (QUENSTEDT) (= *cappucinum* BUCKMAN), *H. pachu* (BUCKMAN).

Distribution — As genera *Gecyoceras*, *Crestaites*, *Planhammatoceras*, *Eudmetoceras*, *Bredya*, *Accardia*, *Parammatoceras*, and *Pseudaptetoceras* have been separated, the range of *Hammatoceras* is restricted to the Upper Toarcian of Europe (MARTÍNEZ 1992), North Africa (DAGUIN 1927, TERMIER & DUBAR 1940, BENSHILI 1989, EL ARABI et al. 2001, TADILI et al. 2004, EL HAMMICH et al. 2009), Ukraine (PARYSHEV 1974), Russia (KALACHEVA 1988), Caucasus (KRYMHOLTS 1961, NUTSUBIDZE 1966, ROSTOVSEV 1992), Iran (SEYED-EMAMI 1967, 1971, SEYED-EMAMI et al. 2004), Afghanistan (MONTENAT 2009), North America (IMLAY 1968, 1984, JAKOBS 1997, JAKOBS & SMITH 1996, PÁLFY et al. 1997), South America (JAWORSKI 1926, HILLEBRANDT 1970, 1987, HILLEBRANDT & WESTERMANN 1985, RICCARDI et al. 2005, CHEN 2008), Japan (SATO 1954), Vietnam (SATO 1972, ? KHUC VU et al. 2005), Philippines (SATO 1975), and Indonesia (WESTERMANN et al. 1978).

Hammatoceras insignis (SCHÜBLER in ZIETEN, 1830) (Figure 20)

- 1830: *Ammonites insignis* — SCHÜBLER in ZIETEN, p. 30, pl. 15, figs 2 a–c
- 1867: *Hammatoceras insignis* — HYATT, p. 89 (= *Ammatoceras insignis*, HYATT, p. 98)
- 1878: *Hammatoceras insignis* SCHÜBLER — BAYLE, pl. 81, figs 1, 2–3
- ? 1882: *Harpoceras insignis* SCHÜBLER — WRIGHT, p. 453, pl. 65, figs 1–3
- 1902: *Hammatoceras insignis* SCHÜBLER — JANENSCH, p. 97, pl. 9, figs 1–2
- 1937: *Hammatoceras* cfr. *insigne* SCHÜBLER — VIALLI, p. 127
- 1965: *Hammatoceras insignis simile* n. subsp. — GÉCZY, p. 22, fig. 3, pl. 3
- 1966: *Hammatoceras insignis* SCHÜBLER — NUTSUBIDZE, p. 144, pl. 31, figs 4–5
- 1975: *Hammatoceras insignis* (ZIETEN) — GUEX, p. 111, pl. 9, figs 10–11, 13, pl. 10, figs 5, 7
- 1975: *Hammatoceras insignis* (ZIETEN) — GOY & ROBLES, p. 273, pl. 4, fig. 1
- 1976: *Hammatoceras insignis* (ZIETEN) — SCHLEGELMILCH, p. 91, pl. 48, fig. 3 (refig. ZIETEN, l.c.)
- 1978: *Hammatoceras* cfr. *insigne* (SCHÜBLER) — DEZI & RIDOLFI, p. 38, figs 44–45
- 1983: *Hammatoceras insignis* (SCHÜBLER) — KNITTER & OHMERT, pl. 1, fig. 10
- 1992: *Hammatoceras insignis* (SCHÜBLER in ZIETEN) — MARTÍNEZ, p. 112, pl. 116, fig. 21, pl. 19, fig. 1, pl. 20, figs 1–3, pl. 21, figs 1–7, pl. 22, figs 1–5
- 1995: *Hammatoceras* cf. *insigne* (SCHÜBLER in ZIETEN) — GOY et al., p. 101, pl. 12, fig. 7
- 1996: *Hammatoceras insignis* (SCHÜBLER) — RULLEAU, p. 4, p. 7, figs 1–3, pl. 10, figs 1–6,

- 1996: *Hammatoceras gr. insigne* (SCHÜBLER) — RULLEAU, pl. 11, figs 1–4, pl. 12, figs 1–4, pl. 13, figs 1–2, 5–6
 1996: *Hammatoceras insigne* (ZIETEN) — JAKOBS & SMITH, p. 139, pl. 7, fig. 5
 1997: *Hammatoceras insigne* (SCHÜBLER in ZIETEN) — CARIOU & HANTZPERGUE, pl. 11, figs 3–4
 2007: *Hammatoceras insigne* (SCHÜBLER in ZIETEN) — RULLEAU, pl. 68, fig. 3, pl. 69, fig. 2, pl. 70, figs 1, 3, pl. 71, fig. 2
 2007: *Hammatoceras gr. insigne* (SCHÜBLER in ZIETEN) — FAURÉ, p. 44, pl. 6, fig. 13
 2009: *Hammatoceras gr. insigne* (SCHÜBLER in ZIETEN) — EL HAMMICH et al., pl. 4, fig. 1

Material — One poorly preserved internal mould and a fragmentary specimen.

Measurements	D	H	h	W	w	U	u
HP101C	158	44	28%	31	70%	80	51%
HP97B	114	38	33%	31	86%	45	39%

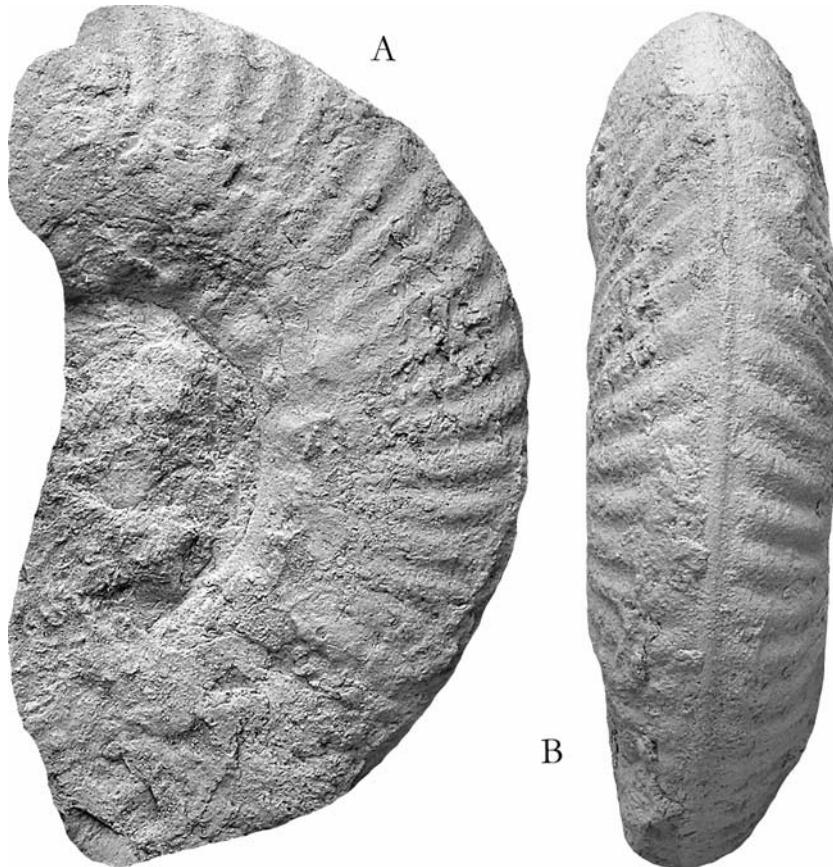


Figure 20 — *Hammatoceras insigne* (SCHÜBLER in ZIETEN). — Lateral (A) and ventral (B) view, Pisznice, bed №: 97, Speciosum Zone, ×1.

Description — Medium-size, moderately evolute coiling. The umbilicus is slightly deep and wide, the umbilical wall is high and rounded. Both the umbilical and the ventrolateral margins are rounded. The flanks are convex, the venter is gently broad and rounded, it bears a well-developed, low keel. The whorl-section is wide-oval with maximum width at the lower third. The ornamentation consists of strong ribbing with well-defined umbilical tubercles. Two or three straight and prorsiradiate ribs arise from the tubercles, bend slightly forward on the venter and fade away by the carina, alternating on the two sides. The suture-line is hardly visible.

Remarks — In spite of being a fragment, specimen HP97B appears to agree well with the type (ZIETEN 1830, pl. 15, fig. 2), and with the specimens figured by BAYLE (1878, pl. 81, figs 2–3), by MARTÍNEZ (1992, pl. 20, fig. 1, pl. 21, fig. 1) and by RULLEAU (1996, pl. 11,

figs 3–4, pl. 13, figs 1–2). HP101C seems distinct from the type in the more evolute coiling with more compressed whorls. These variabilities were documented by MARTÍNEZ (1992, pl. 19, fig. 1) and by RULLEAU (1996, pl. 11, figs 1–2). With its slightly sigmoid ribbing, it shows striking resemblance to *H. insigne simile* described by GÉCZY (1965: 22, pl. 3) and *H. cfr. insigne* figured by DEZI & RIDOLFI (1978: 38, fig. 44). *H. insigne* differs from *G. speciosum* in having more rounded whorls, and from *H. trigonatum* in having smaller size and rounded flanks with oval section, and coarser sculpture. *H. semilunatum* differs from *H. insigne* in having somewhat depressed whorls with low venter and wide oval section, and in having no regular umbilical tubercles.

Distribution — Upper Liassic: Greece (RENZ 1910, 1925a, 1927), Argentina (JAWORSKI 1926). Upper Toarcian: Germany (JANENSCH 1902, SCHLEGELMILCH 1976),

Italy (DEZI & RIDOLFI 1978), Portugal (MOUTERDE et al. 1964–1965), Austria (JAKOBSHAGEN 1965, FISCHER 1966), Great Britain (Jurens Zone: WRIGHT 1882, MARTÍNEZ 1992), Morocco (DAGUIN 1927, DUBAR 1936, EL ARABI et al. 2001), Caucasus (NUTSUBIDZE 1966, ROSTOVSEV 1992). Hillebrandti – Yakounensis Zones: North America (TIPPER et al. 1991, JAKOBS 1997, PÁLFY et al. 1997), *P. tenuicostatum* Zone: Argentina (RICCARDI et al. 2005, RICCARDI 2008), “*P. lotharingica*” Zone: Chile [*H. ex gr. insignis*] (HILLEBRANDT & WESTERMANN 1985). Erbaense Zone: Hungary (GÉCZY 1965, 1967b). Insigne/Dispansum Zone: France (MOUTERDE 1953, GUEX 1975, ELMY & RULLEAU 1991, 1993, CARIOU & HANTZPERGUE 1997,

FAURÉ 2007), Morocco (BENSHILI 1989, EL HAMMICH et al. 2009), Germany (KRUMBECK 1943, ETZOLD et al. 1989, OHMERT & ROLF 1994), Caucasus (TOPCHISHVILI et al. 2006). Insigne Subzone: Germany (KNITTER & OHMERT 1983), France (RULLEAU 1996, 2007), Spain (GOY & ROBLES 1975, COMAS–RENGIFO & GOY 1978, GOY et al. 1988, 1994b, 1995, MARTÍNEZ 1992, 2008, GOY & MARTÍNEZ 2009), Insigne Horizon: Spain (GOY & MARTÍNEZ 1990), Gruner Subzone: France (CASSEL 1997). Levesquei Zone: Iran (SEYED–EMAMI 1967), Romania (POPA & PATRULIU 1996). Meneghinii Zone: Morocco (EL HARIRI et al. 2006). The Gerecse specimens occur in the Speciosum Zone (Pisznice section).

Hammatoceras trigonatum (QUENSTEDT, 1885)

(Figure 21)

- 1845: *Ammonites insignis* SCHÜBLER in ZIETEN — D'ORBIGNY, p. 347, pl. 112
 1882: *Harpoceras insigne* SCHÜBLER — WRIGHT, p. 453, pl. 66, figs 1–3
 1885: *Ammonites insignis compressus* — QUENSTEDT, p. 395, pl. 49, fig. 10
 1885: *Ammonites insignis glabratus* — QUENSTEDT, p. 398, pl. 50, fig. 3
 1885: *Ammonites insignis trigonatus* — QUENSTEDT, p. 399, pl. 50, fig. 5
 1904: *Hammatoceras subinsigne* OPPEL, nov. mut. *Wrighti* — PRINZ, p. 74–75
 1904: *Hammatoceras subinsigne* OPPEL, mut. *trigonata* QUENSTEDT — PRINZ, p. 75
 1904: *Hammatoceras subinsigne* OPPEL, mut. *compressa* QUENSTEDT — PRINZ, p. 75
 1904: *Hammatoceras subinsigne* OPPEL, mut. *glabratra* QUENSTEDT — PRINZ, p. 75
 1914: *Hammatoceras trigonatum* n. sp. — FOSSA MANCINI, p. 81
 1921: *Hammatoceras cappucinum* n. sp. — BUCKMAN, pls. 206a–b
 1954: *Hammatoceras aff. cappucinum* BUCKMAN — DONOVAN, p. 47
 1976: *Hammatoceras insigne* (ZIETEN) — SCHLEGELMILCH, p. 91, pl. 48, fig. 4
 1992: *Hammatoceras cappucinum* BUCKMAN — MARTÍNEZ, p. 123, p. 125, fig. 23, pl. 26, figs 1–2, pl. 27, figs 1–2, pl. 28, figs 1–2
 1994: *Hammatoceras cappucinum* BUCKMAN — ELMY, p. 100, pl. 35, figs 4a–b (lectotype, refigs D'ORBIGNY, l.c.), 5, pl. 36, figs 1a–b, 2a–c
 1996: *Hammatoceras speciosum* JANENSCH (*H. cappucinum* BUCKMAN) — RULLEAU, pl. 8, fig. 1, pl. 9, figs 1–2
 2007: *Hammatoceras speciosum* JANENSCH (*H. cappucinum* BUCKMAN) — RULLEAU, pl. 69, fig. 1

Material — One internal mould of mediocre preservation.

Measurements	D	H	h	W	w	U	u
HB14E	195	60	31%	44	73%	85	43%

Description — Large, evolute coiling with moderately wide and deep umbilicus. The umbilical wall is high and perpendicular or gently oblique. The umbilical margin is rounded, the flank is slightly convex, almost flattened. The carinate venter is narrow and highly arched on the last whorl, without ventrolateral shoulder. The whorl-section is triangular with maximum width at above the margin. No whole body chamber is present. The ornamentation consists of moderately developed ribbing. Radiate and furcating ribs emerge from the margin, bend strongly forward on the venter and reach the keel. Hammatoceratid suture-line.

Remarks — QUENSTEDT (1885: 395–399) introduced three new subspecies (*A. insignis compressus*, *A. insignis glabratus*, *A. insignis trigonatus*) for *A. insignis* specimens which differ from SCHÜBLER's type by being much larger and by having characteristic triangular whorl-section. He also listed similar forms (p. 391): *A. insignis* (D'ORBIGNY, 1845, pl. 112), and *H. insigne* (WRIGHT, 1882, pls 65–66). The similarity between QUENSTEDT's specimens had been remarked by PRINZ (1904: 74–75), and one of them, *A. insignis trigonatus* was emended by FOSSA MANCINI

(1914: 81) as *H. trigonatum* n. sp. (including *A. insignis compressus*) with the type figured by D'ORBIGNY (l.c.). However, the new *Hammatoceras* taxon remained unknown in the literature. BUCKMAN (1921, pls 206a–b) introduced *Hammatoceras cappucinum* n. sp. without any diagnoses and description, based on two specimens, which are well consistent with those shown by D'ORBIGNY (l.c.), WRIGHT (pl. 66) and QUENSTEDT (pl. 49, fig. 10, pl. 50, fig. 5). *H. compressum* QUENSTEDT was recorded by KRUMBECK (1941, 1943, 1944) from Germany. BUCKMAN's taxon name became accepted in the literature: the *Harpoceras insigne* figured by WRIGHT (pl. 66) was identified as *H. aff. cappucinum* by DONOVAN (1954), *H. cappucinum* was described and figured by MARTÍNEZ (1992) from Spain, and the *A. insignis* specimens of the D'ORBIGNY collection were reinterpreted as *H. cappucinum* by ELMY (1994). On the other side, the close affinity between the different specimens of D'ORBIGNY, BUCKMAN and QUENSTEDT was emphasized by ELMY (1994) and RULLEAU (1996, 2007). Based on the priority, *H. cappucinum* BUCKMAN is considered as a junior synonym of *H. trigonatum* (QUENSTEDT) in this paper. The lectotype

of *H. trigonatum* is the *A. insignis* SCHUBLER figured by D'ORBIGNY (1845, pl. 112, figs 1–2). The Gerecse specimen is very close in morphology to the lectotype (D'ORBIGNY l.c.), both to the holotype and the paratype of *H.*

cappucinum (BUCKMAN, 1921, pls 206a–b), and to the specimen figured by RULLEAU (1996, pl. 9, figs 1–2), but due to the poor state of preservation of inner whorls, umbilical tubercles are not visible.



Figure 21 — *Hammatoceras trigonatum* (QUENSTEDT). — Lateral (A) and ventral (B) view, Báná-hegy, bed №: 14, Speciosum Zone, ×0.8.

Distribution — Jurens Zone: Britain (WRIGHT 1882). Fallaciosus–Dispansus beds: Germany (KRUMBECK 1941, 1943, 1944). Insigne Zone: Germany (ETZOLD et al. 1989), France (ELMI & RULLEAU 1993). Insigne Subzone: Spain (MARTÍNEZ 1992, GÓMEZ et al. 2008, GOY & MARTÍNEZ

2009), France (RULLEAU 1996, BÉCAUD 2006), Insigne Horizon: France (GABILLY 1976, ELMI & RULLEAU 1991). Gruner Subzone: Spain (MARTÍNEZ 2008). The Gerecse specimen appears in the Speciosum Zone of the Báná-hegy section.

Hammatoceras pachu (BUCKMAN, 1921) (Figure 22)

- 1921: *Pachammatoceras pachu*, nov. — BUCKMAN, pl. 207
1933: *Pachammatoceras Pachu* BUCKMAN — GÉRARD & BICHELONNE, p. 420
1940: *Pachammatoceras Pachu* BUCKMAN — GÉRARD & BICHELONNE, p. 41, pl. 16, fig. 2
1961: *Pachammatoceras pachu* BUCKMAN — MAUBEUGE, pl. 6, fig. 2
1967: *Pachammatoceras aff. pachu* BUCKMAN — SEYED-EMAMI, p. 76, pl. 2, fig. 13, pl. 9, fig. 7
1971: *Pachammatoceras aff. pachu* BUCKMAN — SEYED-EMAMI, pl. 2, fig. 13, pl. 9, fig. 7
1992: *Hammatoceras pachu* (BUCKMAN) — MARTÍNEZ, p. 127, p. 129, fig. 24, pl. 24, fig. 1, pl. 25, figs 1–2
1996: *Hammatoceras* sp. — RULLEAU, p. 4, p. 7, fig. 2/5, p. 9, fig. 3/1, pl. 8, figs 2–3
1996: *Hammatoceras gr. pachu* BUCKMAN — RULLEAU, pl. 14, figs 5–6, pl. 15, figs 3–5, pl. 16, figs 1–4, pl. 17, figs 1–4
2007: *Hammatoceras gr. pachu* BUCKMAN — RULLEAU, pl. 70, fig. 2, pl. 71, fig. 1

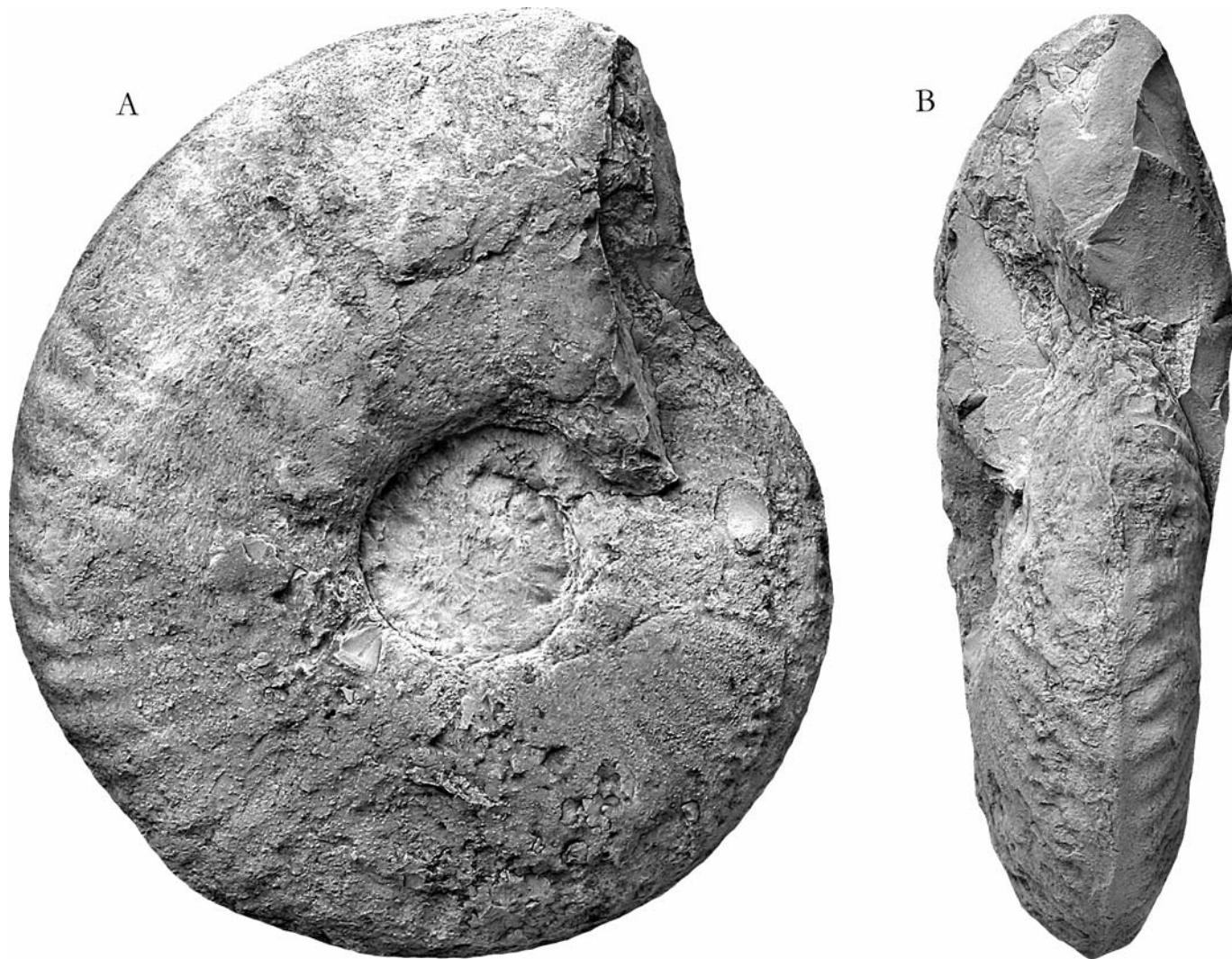


Figure 22 — *Hammatoceras pachu* (BUCKMAN). — Lateral (A) and ventral (B) view, Kis-Gerecse, bed №: 49, Speciosum Zone, $\times 1$.

Material — Single internal mould of mediocre preservation, and a fragmentary specimen.

Measurements	D	H	h	W	w	U	u
HG49	140	62	44%	48	77%	34	24%

Description — Medium-size, involute coiling with narrow and deep umbilicus. The umbilical wall is high and rounded, both the margin and the shoulder are rounded, the flanks are convex. The carinate venter is moderately high, broad and rounded. The whorl-section is wide suboval with maximum width at the lower third. No whole body chamber is preserved. The ornamentation is characterised by moderately developed, wide and prorsiradiate ribbing. Short prim rise from umbilical tubercles and branch into 2–3 secondaries at the lower third. The secondaries terminate by the keel. Hammatoceratid suture-line.

Remarks — The morphological agreement between the Gerecse specimens and the holotype (BUCKMAN 1921, pl. 207) is very close. *Hammatoceras pachu* is clearly distinct from *H. insigne*, *H. semilunatum* and *H. trigonatum* in the more involute form. *H. trigonatum*

possesses subtriangular section with less convex lateral walls, while *H. semilunatum* bears no umbilical tubercles.

Distribution — Upper Toarcian: Iran (SEYED-EMAMI 1967), ?Morocco (EL ARABI et al. 2001). Insigne Zone: France (ELMI & RULEAU 1991), Insigne Subzone: France (BÉCAUD 2002, 2006, RULEAU 2007), Spain (COMAS–RENGIFO et al. 1988, GOY et al. 1988, GÓMEZ et al. 2008), Gruner Horizon: Spain (GOY & MARTÍNEZ 1990). Insigne–Pseudoradiosa Zones: Spain (MARTÍNEZ 1992). Insigne–Levesquei Subzones: Spain (GOY & MARTÍNEZ 2009). Pseudoradiosa Zone: Spain (COMAS–RENGIFO & GOY 1978). Levesquei Zone: France (GÉRARD & BICHELONNE 1940, MAUBEUGE 1961). The Gerecse specimens (HG49, HP97E) originate from the upper Speciosum Zone.

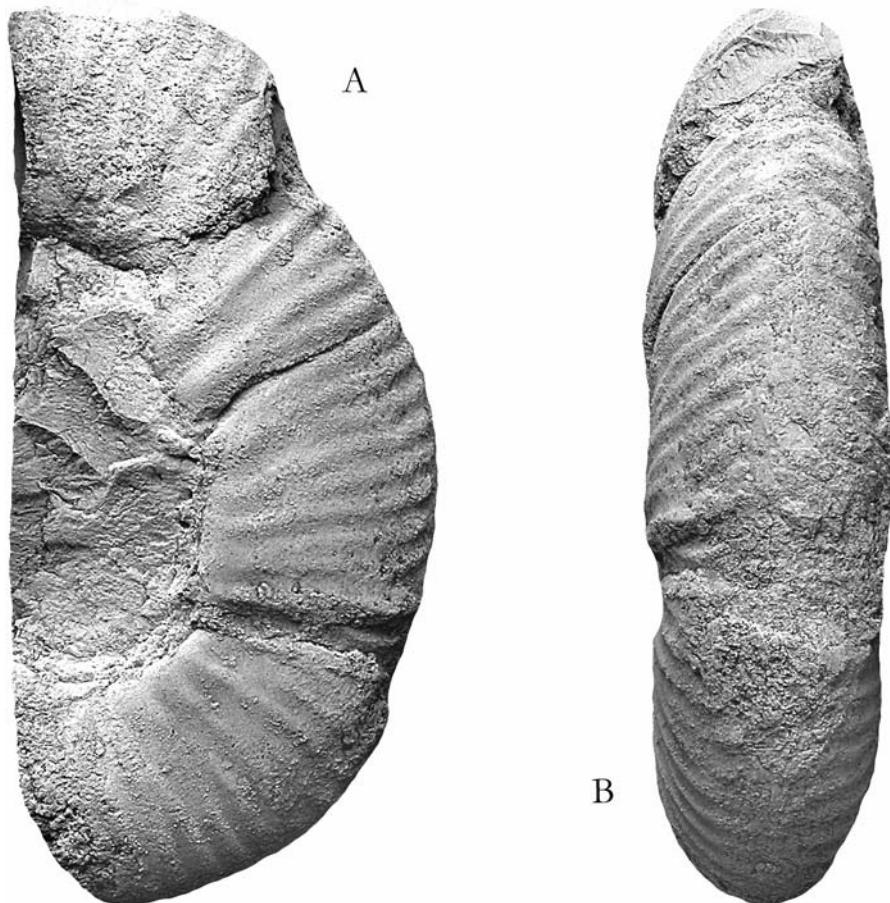


Figure 23—*Hammatoceras aff. semilunatum* (QUENSTEDT). — Lateral (A) and ventral (B) view, Báná-hegy, bed №: 15, Speciosum Zone, ×1.

***Hammatoceras aff. semilunatum* (QUENSTEDT, 1885)**
(Figure 23)

- 1874: *Ammonites insignis* (SCHÜBLER) — DUMORTIER, p. 74, pl. 17, figs 4–5
 1885: *Ammonites insignis semilunatus* — QUENSTEDT, p. 397, pl. 50, fig. 2
 1902: *Hammatoceras semilunatum* n. sp. — JANENSCH, p. 104, pl. 9, fig. 3
 1907: *Hammatoceras semilunatum* JANENSCH — RIAZ, p. 615
 1914: *Hammatoceras semilunatum* JANENSCH — FOSSA MANCINI, p. 82
 1925: *Hammatoceras semilunatum* (QUENSTEDT) — ERNST, p. 141, p. 143, fig. 9, pl. 4, figs 1–3, pl. 8, figs 18 a–b
 1932: *Hammatoceras semilunatum* JANENSCH — DE BRUN, p. 182
 ? 1940: *Pachammatoceras semilunatum* QUENSTEDT — GÉRARD & BICHELONNE, p. 41, pl. 22, fig. 1
 1966: *Hammatoceras cf. semilunatum* JANENSCH — NUTSUBIDZE, p. 149, pl. 31, figs 6–7
 1974: *Hammatoceras semilunatum* JANENSCH — PARYSHEV, pl. 1, fig. 1
 1976: *Hammatoceras semilunatum* (QUENSTEDT) — SCHLEGELMILCH, p. 91, pl. 49, fig. 1 (refig.: QUENSTEDT, l.c.)
 1992: *Hammatoceras semilunatum* (QUENSTEDT) — MARTÍNEZ, p. 119, p. 121, fig. 22, pl. 23, figs 1–3
 1996: *Hammatoceras semilunatum* (QUENSTEDT) — RULLEAU, p. 4, p. 7, fig. 2/4, pl. 14, figs 1–4
 1996: *Hammatoceras aff. semilunatum* (QUENSTEDT) — RULLEAU, pl. 15, figs 1–2
 2007: *Hammatoceras semilunatum* (QUENSTEDT) — RULLEAU, pl. 71, fig. 3

Material — A fragment of the body chamber.

Measurements	D	H	h	W	w	U	u
HB15D	120	36	30%	32	88%	44	36%

Description — Medium-size form with moderately involute coiling and wide-oval whorl-section. Both the umbilical and the ventrolateral margins are rounded, the flanks are convex, the venter is broad, moderately high and rounded and carinate with a low keel. The ribbing is coarse and slightly flexuous. Bullate primaries rise from the umbilical edge and bifurcate at the lower third of the flank. The well-defined secondary ribs bend forward on the

venter and fade away by the keel.

Remarks — The poor preservation does not allow exact arrangement. The specimen resembles *H. insigne* in morphology, but, regarding the slightly depressed whorls, the coarse ribbing and the absence of umbilical tubercles, the affinity with *H. semilunatum* seems more plausible. However, the Gerecse specimen differs from the type by having weaker and less widely spaced ribs.

Distribution — Upper Toarcian: France (DE BRUN 1932, GÉRARD & BICHELONNE 1933), Chile (COX 1956), Georgia (NUTSUBIDZE 1966), Ukraine (PARYSHEV 1974), North Amerika (TIPPER et al. 1991). Insigne/Dispansum Zone: Germany (ERNST 1925, KRUMBECK 1943, ETZOLD et al. 1989), Morocco (ELMI & FAUGÉRES 1974), France (JANENSCH 1902, MOUTERDE 1953,

ELMI & RULLEAU 1993, RULLEAU 1996), Insigne Subzone: Spain (MARTÍNEZ 1992, 2008, GOY & MARTÍNEZ 2009), France (ELMI & RULLEAU 1991, RULLEAU 1996, 2007, BÉCAUD 2006). Levesquei Zone: France (GÉRARD & BICHELONNE 1940, MÉGNIEN 1958). The specimen occurs in the Speciosum Zone of the Bánánya-hegy section.

Genus *Planammatoceras* BUCKMAN, 1922

Type species — *Planammatoceras planiforme* BUCKMAN, 1922 (BUCKMAN 1922, pl. 356).

Diagnosis — Moderately evolute, compressed coiling with slightly deep umbilicus. Acute venter with hollow keel, gently convex flanks, high-oval whorl-section. Well-defined, branching, sigmoid ribbing with moderately long primaries and prorsiradiate secondaries. Lateral tubercles, although not typical, may occur. Hammatoceratid suture construction with developed, ramified E, long, broad, ramified L, and divided, oblique U lobes.

Remarks — Despite the almost general consensus in the literature considering the validity of the taxon (except GÉCZY 1966, BRAUN & JORDAN 1976, and TAYLOR 1988), its connection with other forms has been questioned. *Pseudaptetoceras* was classified as a subgenus of *Planammatoceras* by WESTERMANN & RICCARDI (1982, 1985), (accepted by HILLEBRANDT & WESTERMANN 1985, and SEYED-EMAMI 1987), on the other hand, *Planammatoceras* was assigned as a subgenus of *Eudmetoceras* by BRAUN & JORDAN (1976), and TAYLOR (1988). *Planammatoceras* was further regarded as a genus without subgenera by DONOVAN et al. 1981, MARTÍNEZ 1992, CRESTA 1997, RULLEAU et al. 2001, PALLINI et al. 2005, and RULLEAU 2007. According to CALLOMON & CHANDLER (1994: 25) and DIETZE et al. (2005: 62), *Planammatoceras* and *Pseudaptetoceras* represent independent lineages in the Ammonitina phylogeny. The introduction of *Pseudaptetoceras christiana* and *P. apertum* by ELMI & MOUTERDE (1997) with Upper Toarcian appearance seems to confirm the latter phylogenetic account.

The following *Planammatoceras* species have been described from the Mediterranean–Caucasian Realm (see GÉCZY 1966, NUTSUBIDZE 1966, SEYED-EMAMI 1967, MARTÍNEZ 1992, CRESTA 1997, RULLEAU 2007): *P. planiforme* BUCKMAN, *P. planinsigne* (VACEK), *P. tenuinsigne* (VACEK), *P. kochi* (PRINZ), *P. brontes* (GEMMELLARO), *P. lepsiensi* (GEMMELLARO), *P. metellii* (GEMMELLARO), *P. vaseki* (BRASIL), *P. romani* ELMI, *P. gerthi* (JAWORSKI), *P. tricolore* WESTERMANN & RICCARDI. Based on the morphology (style of coiling, compressed whorl, non-tuberculate ribbing, hollow-floored keel), both *Hammatoceras sieboldi* (OPPEL) and *H. stenomphalum* PRINZ are included in the genus in this paper. About 35 specimens were described by GÉCZY (1966) from

Bakonycsernye, which belong to *Planammatoceras* according to recent interpretations: *Hammatoceras planiforme*, *H. planiforme stredai*, *H. planinsigne merlai*, *H. tenuinsigne*, *H. kochi*, *H. aff. gerthi*, *H. sieboldi*, *H. stenomphalum*. Both *H. tenerum szoerenyiæ* and *H. mediterraneum* (GÉCZY l.c.) can be considered as *Paviaites* species. From the Gerecse Mts *P. tenuinsigne*, *P. planinsigne*, *P. kochi*, *P. stenomphalum*, *P. aff. planiforme* are recorded in this paper.

Distribution — The earliest representatives appear in the uppermost Toarcian of the Mediterranean Province (MERLA 1934, TERMIER & DUBAR 1940, GÉCZY 1966, PINNA 1968, PELOSIO 1968, MOUTERDE et al. 1971, 1980, LINARES & RIVAS 1971, LINARES et al. 1971, DEZI & RIDOLFI 1978, NICOSIA & PALLINI 1978, (?) CRESTA et al. 1989 CECCA et al. 1990, VENTURI 1994, SANDOVAL et al. 2007, 2008). Its early occurrence was also recorded from Poland (MYCZYNSKI 2004), Portugal (MOUTERDE & RUGET 1967b), probably France (CORROY & GÉRARD 1933), and north-east Spain (CHAVARRI & VELASCO 1980). The genus shows a worldwide range in the Aalenian of Europe (SCHRÖDER 1927, ARKELL 1957, HOFFMANN 1966, SCHLEGELMILCH 1985, BRANGER & GRONNIN 1994, HENRIQUES et al. 1995, CONTINI et al. 1997, CHRIST 1999, METODIEV & SAPUNOV 2001), North Africa (LELIEVRE 1960, ELMI & FAUGÉRES 1974, SADKI 1994a, 1996, EL HARIRI et al. 2006, SEKATNI et al. 2008, EL HAMMICH et al. 2009), North America (IMLAY 1984, TAYLOR 1988, POULTON 1991, POULTON & TIPPER 1991, PÁLFY & HART 1994, JAKOBS & SMITH 1996, POULTON et al. 2005), South America (ARKELL 1957, HILLEBRANDT 1970, WESTERMANN & RICCARDI 1972, 1982, WESTERMANN et al. 1980, HILLEBRANDT & WESTERMANN 1985, RICCARDI et al. 2005), Crimea (PERMYAKOV et al. 1991), Caucasus (KAZAKOVA 1985, TOPCHISVILI et al. 1998, ROSTOVSEV 1992), Iran (SEYED-EMAMI 1967, SEYED-EMAMI et al. 2005, 2006), Tajikistan (MELNIKOVA 2006), Tibet (YIN 2006, YIN et al. 2006), ? Thailand (BRAUN & JORDAN 1976) and Japan (SATO 1954, 1961, 2005, HIRANO 1973, MATSUMOTO 1978). Without documentation of species, the occurrence of the genus in East Africa (ARKELL 1956, KAMEN-KAYE 1978, KAPILIMA 2003), as well as in Vietnam (KHUC VU et al. 2005) needs more evidence.

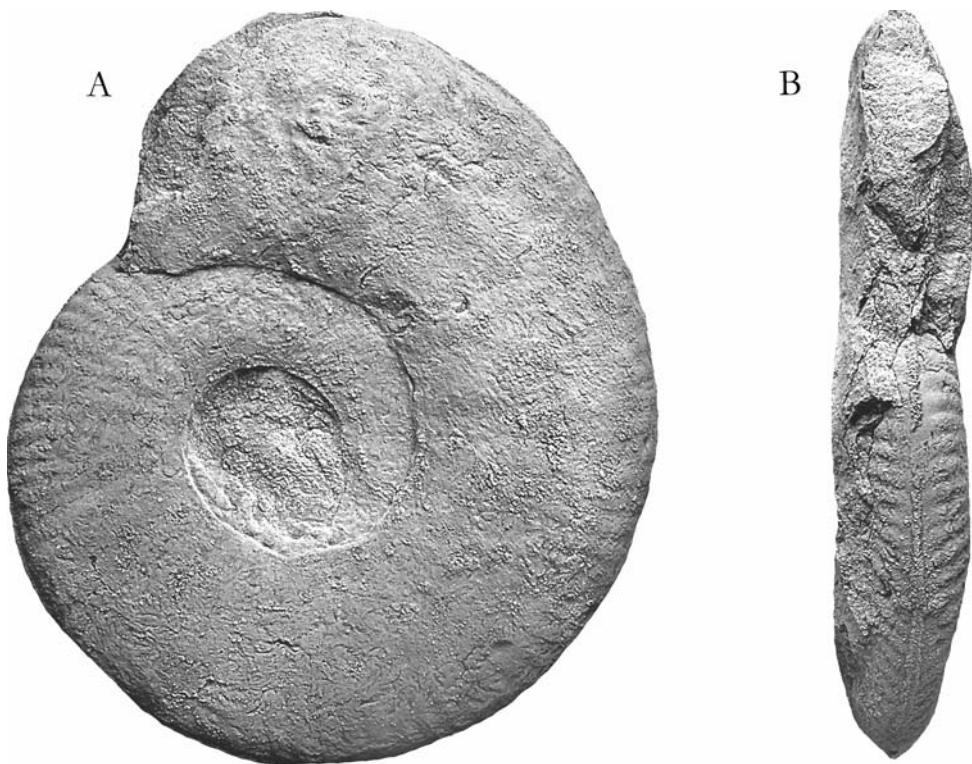


Figure 24 — *Planammatoceras tenuinsigne* (VACEK). — Lateral (A) and ventral (B) view, Kis-Gerecse, bed №: 32, Aalensis Zone, ×1.

***Planammatoceras tenuinsigne* (VACEK, 1886)**
(Figure 24–25)

- 1886: *Hammatoceras tenuinsigne* n. sp. — VACEK, p. 88, pl. 12, figs 6–7
 1904: *Hammatoceras tenuinsigne* VACEK — PRINZ, p. 78
 1910: *Hammatoceras* sp. aff. *tenuinsigne* VACEK — HAHN, p. 386, pl. 16, fig. 7
 1914: *Hammatoceras tenuinsigne* VACEK — FOSSA MANCINI, p. 75
 1923: *Hammatoceras tenuinsigne* VACEK — ROMAN & BOYER, p. 33, pl. 7, fig. 1
 1932: *Hammatoceras tenuinsigne* VACEK — DE BRUN, p. 184, pl. 2, fig. 7
 1934: *Hammatoceras* cf. *tenuinsigne* VACEK — KUHN, p. 21, pl. 2, fig. 6
 1937: *Hammatoceras tenuinsigne* VACEK — VIALLI, p. 125
 1940: *Hammatoceras tenuinsigne* VACEK — GÉRARD & BICHELONNE, pl. 14, fig. 3
 1961: *Hammatoceras* (*Hammatoceras*) cf. *tenuinsigne* VACEK — KRYMHOLTS, p. 105, pl. 6, fig. 5
 1963: *Planammatoceras tenuinsigne* (VACEK) — ELMI, p. 87, fig. 32, p. 88, fig. 33
 v 1966: *Hammatoceras tenuinsigne* VACEK — GÉCZY, p. 62, fig. 49, pl. 13, figs 2–3, pl. 39, fig. 6, pl. 41, fig. 6
 1966: *Hammatoceras tenuinsigne* VACEK — NUTSUBIDZE, p. 147, pl. 34, fig. 1
 1992: *Planammatoceras tenuinsigne* (VACEK) — MARTÍNEZ, p. 169, p. 172, fig. 34, pl. 37, fig. 6(1)
 1994a: *Planammatoceras tenuinsigne* (VACEK) — GOY et al., pl. 2, fig. 11
 1996: *Planammatoceras tenuinsigne* (VACEK) — RULLEAU, pl. 33, figs 3–4
 1997: *Planammatoceras tenuinsigne* (VACEK) — CRESTA, p. 32, p. 33, fig. 5, pl. 1, figs 1, 3–6
 2001: *Planammatoceras tenuinsigne* (VACEK) — RULLEAU et al., p. 56, fig. 9, pl. 26, fig. 5
 2002a: *Planammatoceras tenuinsigne* (VACEK) — CRESTA, p. 183, fig. 119
 2005: *Planammatoceras tenuinsigne* (VACEK) — GARCÍA-FRANK, pl. 4, fig. 10
 2005: *Planammatoceras tenuinsigne* (VACEK) — PALLINI et al., p. 15, pl. 11, figs 1–5, pl. 16, fig. 12
 2006: *Planammatoceras tenuinsigne* (VACEK) — TOPCHISHVILI et al., pl. 25, figs 1–2
 2007: *Planammatoceras tenuinsigne* (VACEK) — RULLEAU, pl. 79, fig. 3
 2008: *Planammatoceras tenuinsigne* (VACEK) — GÉCZY et al., p. 40, fig. 4, pl. 4, fig. 1
 2009: *Planammatoceras tenuinsigne* (VACEK) — EL HAMMACHI et al., pl. 5, figs 3–4

Material — Twelve internal moulds of different state of preservation.

Measurements	D	H	h	W	w	U	u
HG12A	150	56	37%	36	64%	50	33%
HP58A	140	53	38%	34	64%	40	28%
HTA25A	126	45	36%	22	49%	48	38%
HG32A	100	37	37%	18	48%	33	33%

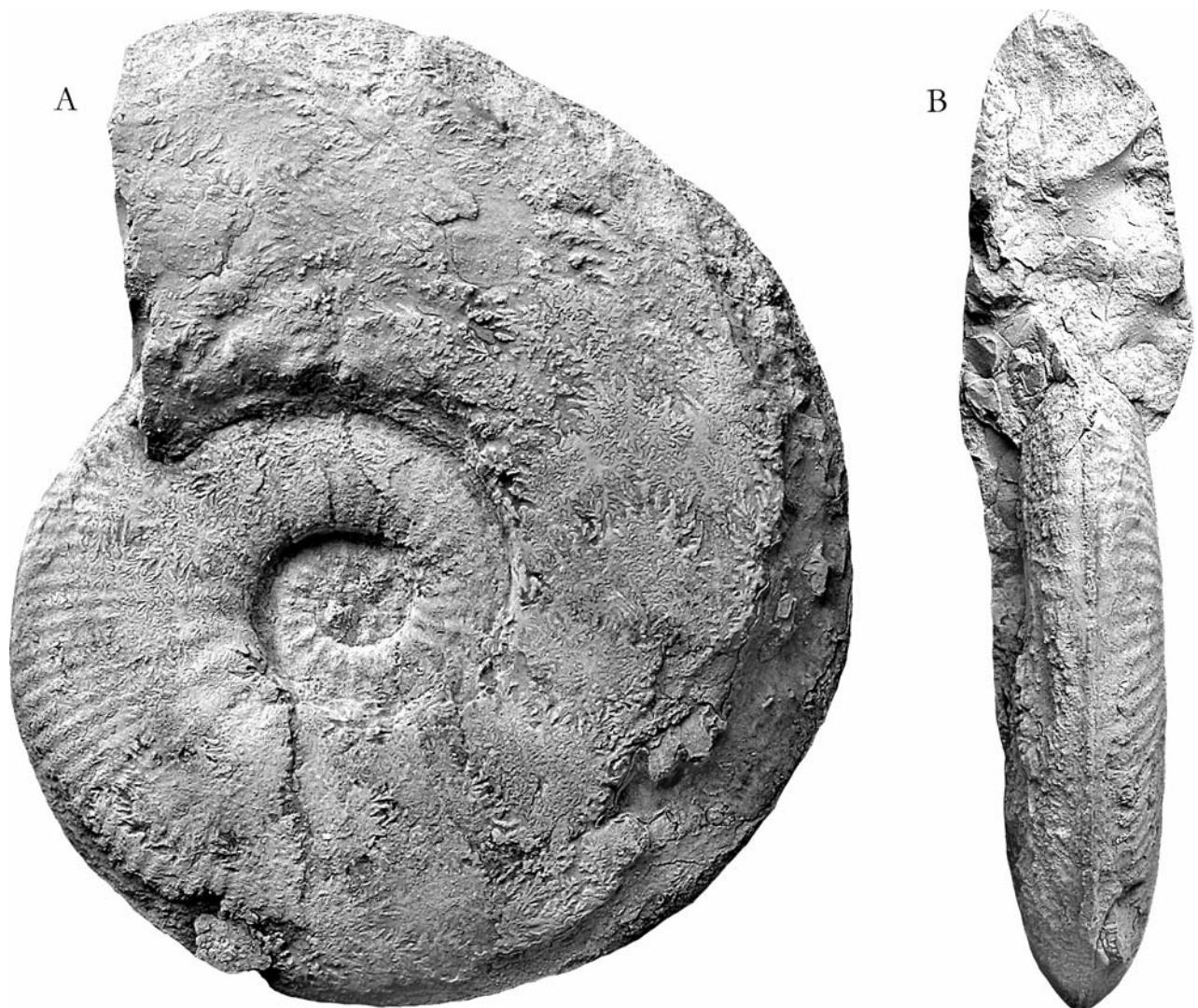


Figure 25 — *Planammatoceras tenuinsigne* (VACEK). — Lateral (A) and ventral (B) view, Kis-Gerecse, bed №: 12, Comptum Subzone, ×1.

Description — Large, moderately evolute, discoid form with compressed oval whorl-section. The umbilical wall is low with rounded margin. The flanks are slightly convex, the venter is narrow and high, and the conella indicates a well-developed, hollow ventral keel. The ornamentation consists of dense and slightly biconcave ribbing without tuberculation. The primaries are rursiradiate on the umbilical walls and recirradiate on the flanks. They bifurcate at the lower third. The thinner secondaries bend forward on the venter and fade away at the keel. Intercalatory ribs appear irregularly between the secondaries. The ribbing is persistent throughout the whole shell, but it becomes less developed from the last whorl of the phragmocone. No body chamber is preserved. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens are markedly close in morphology to the type (VACEK 1886, pl. 12, figs 6–7), however, some of them (e.g. HTB30B, or the Kis-Teke-hegy specimen figured by GÉCZY et al. 2008, pl. 4, fig. 1) show intraspecific variability by having a slightly more evolute shell. This variability was typical of the Bakony-csernye assemblage as well. *P. tenuinsigne* is similar to *G. porcarellense* in ribbing, but differs by having no umbilical

tubercles, and by bearing an acute and carinate ventral part. Another closely allied form is *P. vaseki* in ornamentation, but it has broader whorl-section. The taxon differs from *P. planiforme* by having slightly more involute coiling and denser ribbing. It also differs from *P. planinsigne* by possessing finer and less curved primary ribs without lateral tubercles. The sculpture of *P. kochi* is markedly less developed.

Distribution — Upper Toarcian: Morocco (TERMIER & DUBAR 1940). Insigne Zone: France (CORROY & GÉRARD 1933). Levesquei Zone: Spain (LINARES et al. 1971). Levesquei–Murchisonae Zones: Hungary, Bakony-csernye (GÉCZY 1966, 1967a, 1967b). Aalensis–Opalinum Zones: Spain (LINARES & RIVAS 1971). Aalensis–Murchisonae Zones: Italy (CECCA et al. 1990). Aalenian: Austria (HAHN 1910), Crimea (PERMYAKOV et al. 1991). Lower Aalenian: Georgia (NUTSUBIDZE 1966, TOPCHISVILI et al. 1998, 2006). Upper Aalenian: Morocco (GARDET & GÉRARD 1946). Opalinum Zone: France (GÉRARD & BICHELONNE 1940), Spain (SANDOVAL et al. 2008). Opalinum–Murchisonae Zones: Spain (LINARES et al. 1988, SANDOVAL et al. 2007), Italy (CRESTA 1996), Morocco (PALLINI et al. 2005). Opalinum–Bradfordensis Subzones: Spain (LINARES & SANDOVAL 1993). Comptum–Murchisonae Sub-

zones: Spain (MARTÍNEZ 1992), Comptum–Haugi Sub-zones: Italy (CRESTA 2002a). Murchisonae Zone: Morocco (EL HAMMICH et al. 2009). Opalinoides Subzone: France (ELMI & RULLEAU 1993). Comptum Subzone–Murchisonae Zone: Italy (CALLOMON et al. 1995). Spain (LINA-RES et al. 1988), France (RULLEAU 1996, RULLEAU 2007, RULLEAU et al. 2001), Caucasus (KRYMHOLTS 1961).

Haugi Subzone: Spain (GARCÍA–FRANK 2005). Bradfordensis Subzone: Spain (LINARES & SANDOVAL 1992), Tunisia (SEKATNI et al. 2008).

In the Gerecse Mts, the taxon is known from the Meneghinii–Murchisonae Zones. Its first representative (HTA25A) appears in bed 25 of the section Tölgyhát A, associated with *Dumortieria* sp., *C. elaphum* and *E. ovatus*.

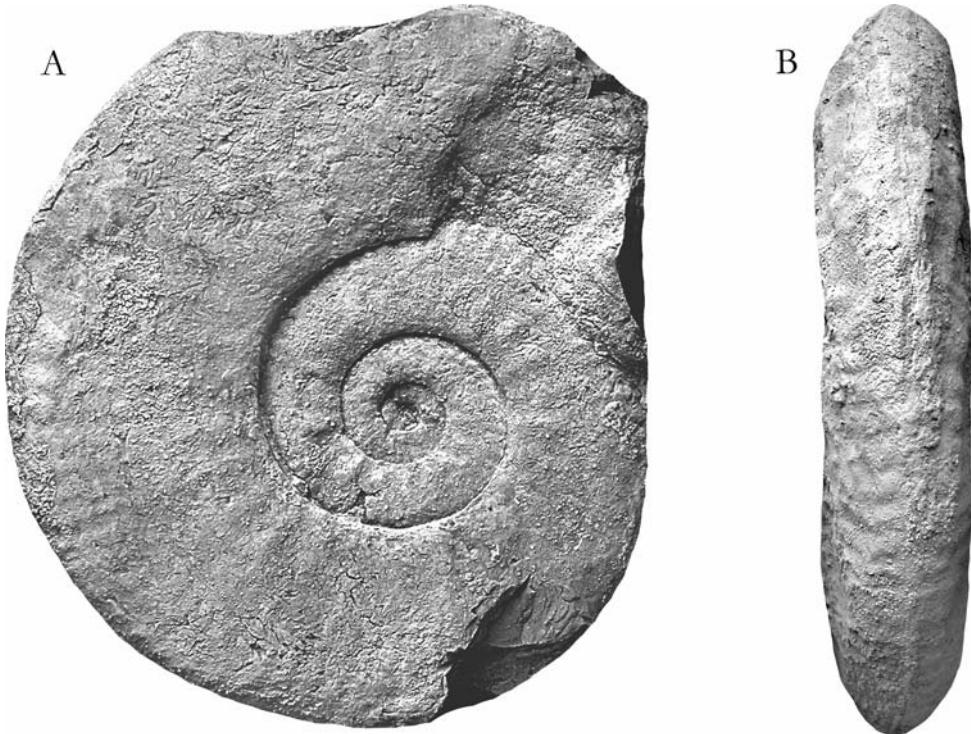


Figure 26 — *Planammatoceras planinsigne* (VACEK). — Lateral (A) and ventral (B) view, Tölgyhát A, bed №: 3, Comptum Subzone, ×1.

***Planammatoceras planinsigne* (VACEK, 1886)**
(Figure 26–27)

- 1881: *Ammonites insignis* SCHÜBLER — MENEGHINI, p. 58, pl. 12, fig. 2 (refig.: PINNA, 1969, pl. 6, fig. 1)
 1886: *Hammatoceras planinsigne* n. sp. — VACEK, p. 89, pl. 13, figs 1–6
 1899: *Hammatoceras planinsigne* VACEK — BONARELLI, p. 209
 1904: *Hammatoceras planinsigne* VACEK — PRINZ, p. 72
 1904: *Hammatoceras dispansum* LYCETT — PRINZ, p. 82, pl. 22, fig. 2
 ? 1910: *Hammatoceras cf. planinsigne* VACEK — HAHN, p. 385
 1914: *Hammatoceras planinsigne* VACEK — FOSSA MANCINI, p. 76
 ? 1914: *Hammatoceras planinsigne* VACEK — ZUFFARDI, p. 590
 1927: *Hammatoceras planinsigne* VACEK — SCHRÖDER, p. 12
 ? 1930: *Hammatoceras cf. vigilense* GREGORIO (= *H. planinsigne* VACEK) — MITZOPOULOS, p. 36
 1934: *Hammatoceras aff. planinsigne* VACEK — MERLA, p. 15
 1937: *Hammatoceras planinsigne* VACEK — VIALLI, p. 126, pl. 3, fig. 3
 ? 1940: *Hammatoceras planinsigne* VACEK — GÉRARD & BICHELONNE, p. 41, pl. 15, fig. 2
 1960: *Planammatoceras* sp. cf. *planinsigne* VACEK — LELIÈVRE, p. 32, pl. 6, fig. 5
 ? 1963: *Hammatoceras aff. planinsigne* VACEK — RIEBER, p. 68, Abb. 11, pl. 8, fig. 1
 1966: *Hammatoceras planinsigne* VACEK — BEIMEL & GEYER, p. 25, pl. 3, fig. 8, pl. 6, fig. 15
 v 1966: *Hammatoceras planinsigne* VACEK — GÉCZY, p. 58, fig. 47, pl. 11, figs 1, 3, pl. 39, figs 3–4
 v non 1966: *Hammatoceras planinsigne* VACEK — GÉCZY, pl. 11, fig. 2, pl. 41, fig. 7
 v 1966: *Hammatoceras planinsigne merlai* n. subsp. — GÉCZY, p. 61, fig. 48, pl. 13, fig. 1, pl. 39, fig. 5
 1968: *Hammatoceras planinsigne* VACEK — PINNA, p. 20, pl. 2, fig. 7, pl. 2, fig. 10
 1972: *Planammatoceras cf. planinsigne* (VACEK) — WESTERMANN & RICCIARDI, p. 27, pl. 2, fig. 5
 1978: *Hammatoceras planinsigne* VACEK — DIEZI & RIDOLFI, p. 33, fig. 35
 1982: *Planammatoceras (P.) planinsigne* (VACEK) — WESTERMANN & RICCIARDI, p. 19, fig. 3 (lectotype), p. 21, pl. 2, fig. 1
 1990: *Planammatoceras gr. planinsigne* (VACEK) — CECCA et al., pl. 2, fig. 1
 1992: *Planammatoceras aff. planinsigne* (VACEK) — MARTÍNEZ, p. 165, pl. 37, fig. 3
 1994: *Planammatoceras planinsigne* (VACEK) — CALLOMON & CHANDLER, p. 25, pl. 4, fig. 1
 1995: *Planammatoceras cf. planinsigne* (VACEK) — GOY et al., p. 102, pl. 13, fig. 1

- 1996: *Planammatoceras planinsigne* (VACEK) — RULLEAU, pl. 32, figs 1–4, pl. 33, figs 1–2
 1997: *Planammatoceras brontes* (GEMMELLARO) — CRESTA, p. 31 (pars), pl. 2, fig. 7
 non 2001: *Planammatoceras planinsigne* (VACEK) morphotype *dubari* (MAUBEUGE) — RULLEAU et al., p. 56, fig. 7, pl. 27, fig. 1
 2002a: *Planammatoceras cf. planinsigne* (VACEK) — CRESTA, p. 181, fig. 118
 2004: *Planammatoceras (Planammatoceras) planinsigne* (VACEK) — MYCZYNSKI, p. 105, fig. 34/6
 2005: *Planammatoceras planinsigne* (VACEK) — PALLINI et al., p. 15, pl. 12, figs 3, 5, pl. 14, fig. 3, pl. 16, fig. 10
 2005: *Planammatoceras planinsigne* (VACEK) — SATO, pl. 14, fig. 7
 2005: *Planammatoceras planinsigne* (VACEK) — GARCÍA-FRANK, pl. 3, fig. 7
 2005: *Planammatoceras cf. planinsigne* (VACEK) — GARCÍA-FRANK, pl. 3, fig. 8
 ? 2005: *Planammatoceras planinsigne?* (VACEK) — SEYED-EMAMI et al., p. 366, fig. 7E
 2006: *Planammatoceras aff. planinsigne* (VACEK) — SEYED-EMAMI et al., p. 268, fig. 6(13–16)
 2007: *Planammatoceras planinsigne* (VACEK) — RULLEAU, p. 106, fig. 29/2, pl. 78, fig. 2
 2008: *Planammatoceras planinsigne* (VACEK) — GALÁCZ et al., p. 348, figs 4.1, 4.2

Material — Five poorly preserved internal moulds, and 1 fragment.

Measurements	D	H	h	W	w	U	u
HTB37A	180	76	42%	55	72%	60	33%
HG12C	134	43	32%	22	51%	56	41%
HTA3A	98	36	36%	19	53%	34	34%

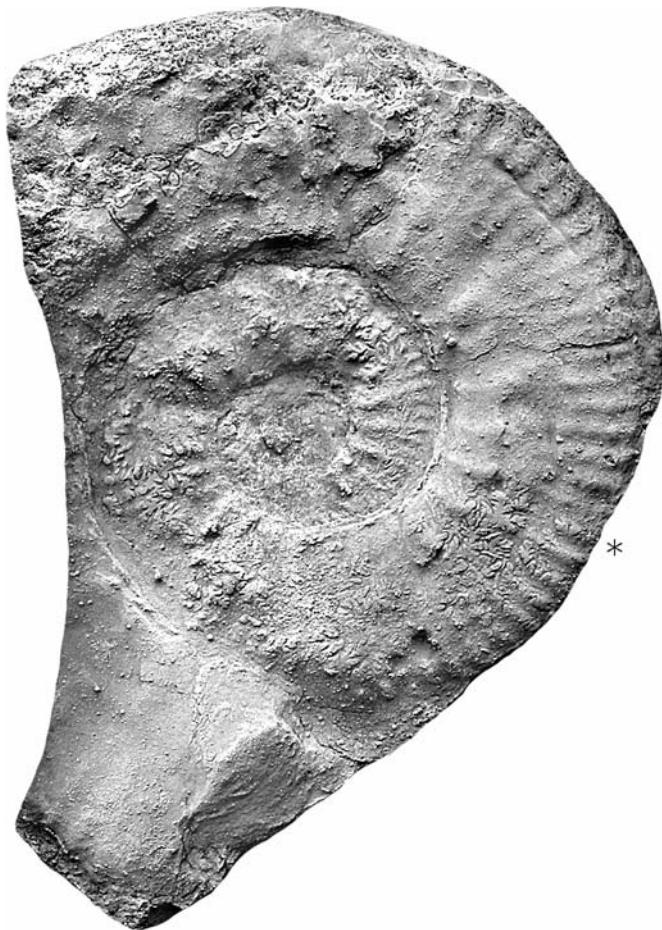


Figure 27 — *Planammatoceras planinsigne* (VACEK). — Lateral view, Kis-Gerecse, bed №: 12, Comptum Subzone, ×0.9.

Description — Large, moderately evolute coiling with low umbilical wall and rounded margin. The lateral walls are slightly convex, the whorl-section is compressed high-oval with maximum width at the lower third. The venter is narrow and high, it bears a conella indicating a hollow ventral keel. The ornamentation consists of well-developed, biconcave ribbing persisting throughout the shell. Coarse, rursiradiate primary ribs emerge on the umbilical wall and they

become rectiradiate on the flanks. They branch into two-three thinner, slightly sigmoid secondary ribs at the lower third. The secondaries bend forward on the venter, reach the keel and fade away. Intercalatories appear irregularly between the secondaries. No body chamber is present. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens agree well with the lectotype (figured by WESTERMANN & RICCARDI 1982, fig. 3), however, due to the poor state of preservation, the lateral tubercles of the furcation points seem less developed. The taxon differs from *G. ponarellense* by possessing strong and curved primary ribs and acute, carinate venter. According to WESTERMANN & RICCARDI (1972: 27, 1982: 19) four species of the genus (*P. planiforme*, *P. tenuinsigne*, *P. planinsigne*, *P. bosurensis*) may be interpreted as a single (bio)species. Although *P. planinsigne* is very close to the related forms, significant differences also can be found. The short, curved, concave and tuberculate primaries are not typical of *P. planiforme*, *P. tenuinsigne* and *P. kochi*. The *P. planinsigne* (VACEK) morphotype *dubari* (MAUBEUGE) figured by RULLEAU et al. (2001, pl. 27, fig. 1) was reinterpreted as *P. planiforme* by RULLEAU (2007, pl. 79, fig. 2). Based on the morphological features, this reinterpretation appears well-established.

Distribution — Upper Toarcian: France (CORROY & GÉRARD 1933, GÉRARD & BICHELONNE 1940), Spain (BEHMEL & GEYER 1966), Italy (MITZOPOULOS 1930, MERRA 1933, PINNA 1968, DEZI & RIDOLFI 1978), Greece (RENZ 1912b). Upper Toarcian–Upper Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Meneghinii Zone: Italy (PELOSIO 1968, NICOSIA & PALLINI 1978, VENTURI 1994). Upper Aalensis–Opalinum Zones: Poland (MYCZYNSKI 2004). Aalensis–Murchisonae Zones: Italy (CECCA et al. 1990). Aalenian: Portugal (RENZ 1912a, CAMARATE FRANCA & MOUTERDE 1964–1965). Lower–Middle Aalenian: Austria (JAKOBSHAGEN 1965), Italy (CRESTA 2002a), Peru (COX 1956, WESTERMANN et al. 1980). Upper Aalenian: Germany (RIEBER 1963), Iran (SEYED-EMAMI et al. 2005). Opalinum Zone: Spain (MARTÍNEZ 1992, SANDOVAL et al. 2008). Opalinum–Concavum Zones: Spain (SANDOVAL et al.

2007). Opalinum–Bradfordensis Subzones: Spain (LINA-RES & SANDOVAL 1993). Comptum Zone: Italy (CRESTA 1994, 1996, CALLOMON et al. 1995). Comptum Subzone: France (RULLEAU 1996, 2007), Spain (GARCÍA–FRANK 2005), Tunisia (SEKATNI et al. 2008). Scissum bed: Britain (COX & SUMBLER 2002). Comptum–Bradfordensis Subzones: Spain (GOY et al. 1995). Murchisonae Zone: Spain (FERNÁNDEZ–LÓPEZ & SUÁREZ–VEGA 1979, ALVARO et al. 1989), France (RULLEAU et al. 2001), Morocco (EL

HAMMICH et al. 2009). Opalinoides Subzone: France (ELMI & RULLEAU 1993). Scissum–Bradfordensis Zones: Britain (CALLOMON & CHANDLER 1994). Bradfordensis Zone?: Iran (SEYED–EMAMI et al. 2006). Murchisonae–Concavum Zones: Caucasus (KAZAKOVA 1985), ?Japan (SATO 2005). Concavum Zone: Argentina (WESTERMANN & RICCARDI 1982), Morocco (BENSHILI 1989). In the Gerecse assemblage the genus is typical of the Comptum–Murchisonae Subzones.

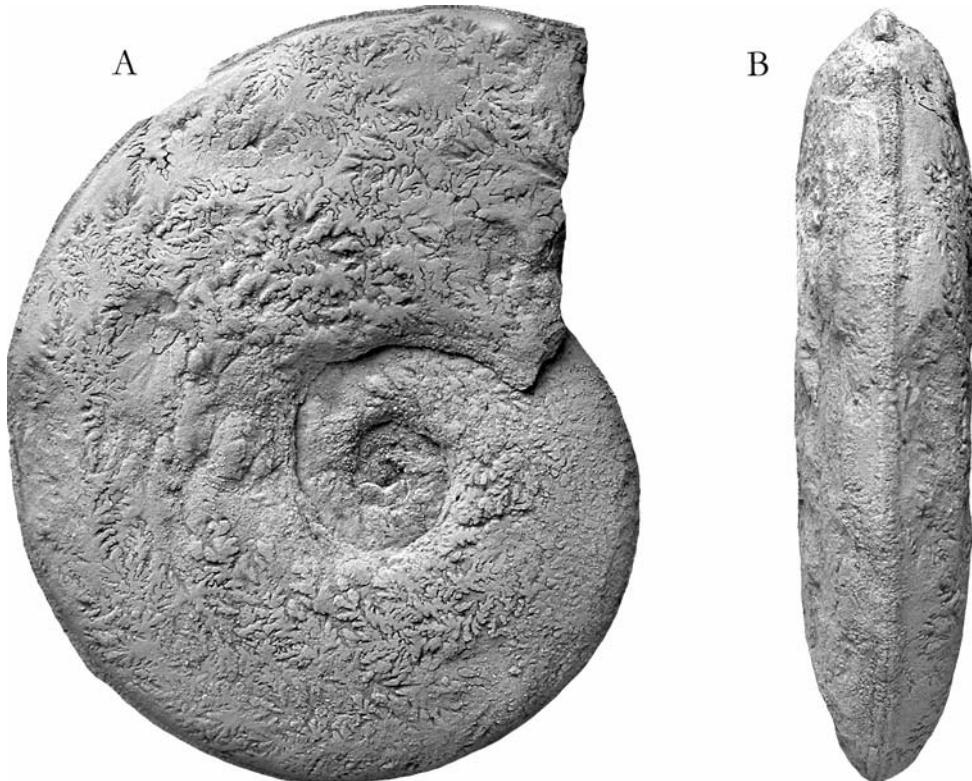


Figure 28 — *Planammatoceras kochi* (PRINZ). — Lateral (A) and ventral (B) view, Tölgyhát B, bed №: 28, Murchisonae Subzone, ×1.

***Planammatoceras kochi* (PRINZ, 1904)**
(Figure 28)

- v 1904: *Hammatoceras Kochi* nov. sp. — PRINZ, p. 80, fig. 10, pl. 19, figs 1a–c
- v 1914: *Hammatoceras Kochi* PRINZ — FOSSA MANCINI, p. 84
- v 1966: *Hammatoceras kochi* PRINZ — GÉCZY, p. 76, fig. 63, pl. 18, fig. 1, pl. 40, fig. 9
- v 1966: *Hammatoceras aff. kochi* PRINZ — GÉCZY, p. 76, fig. 64, pl. 19, fig. 1
- v 1966: *Hammatoceras cf. kochi* PRINZ — GÉCZY, p. 76, pl. 18, figs 2–3
- 1972: *Eudmetoceras* (?) cf. *kochi* (PRINZ) — WESTERMANN & RICCARDI, p. 30, pl. 3, figs 2–3
- 1985: *Planammatoceras* (*Pseudaptetoceras*?) cf. *kochi* (PRINZ) — HILLEBRANDT & WESTERMANN, p. 31

Material — Four internal moulds of mediocre preservation.

Measurements	D	H	h	W	w	U	u
HTB30A	156	52	33%	24?	46%	62?	40%
HTB28A	108	47	43%	20	43%	32	30%

Description — Large, moderately evolute form without ventrolateral shoulder. The umbilical wall is steep, the margin is rounded. The flanks are gently convex, the venter is narrow, high and rounded, it bears conella indicating a hollow-floored keel. The whorl-section is compressed oval with maximum width at the lower third of the flank. The ornamentation is characterised by weakly

developed, dense, slightly prorsiradiate ribbing without tuberculation. The ribs are absent from the outer whorls of the phragmocone. Half of the body chamber is preserved on specimen HTB29A. The suture-line is hammatoceratid.

Remarks — The Gerecse specimens are very close to the type (PRINZ 1904, pl. 19, fig. 1, refigured by GÉCZY 1966, pl. 18, fig. 1), and are similar in sculpture to the

fragments of WESTERMANN & RICCARDI (1972, pl. 3, figs 2–3), however, the latter seem to be slightly more involute. The main characteristic feature of the taxon, the significantly weak ribbing was maintained by PRINZ (1904: 80), and the specimens figured here confirm the author's description. Both PRINZ (l.c.) and GÉCZY (l.c.) had emphasized the close relationship between the species and *H. tenuinsigne* and *H. planinsigne*, but the taxon was included in *Eudmetoceras*(?) by WESTERMANN & RICCARDI (1972: 30), then it was reclassified as *Planammatoceras (Pseudaptetoceras) kochi*

by HILLEBRANDT & WESTERMANN (1985: 31). The species is included in *Planammatoceras* in this paper. The closest form is *P. tenuinsigne*, however, it bears more developed ribbing.

Distribution — Upper Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Concavum–lower Sowerbyi Zones and Malarguensis (= lower Concavum) Zone: Chile (WESTERMANN & RICCARDI 1972, HILLEBRANDT & WESTERMANN 1985). In the Gerecse Mts, the species is known from the Murchisonae Zone.

Planammatoceras stenomphalum (PRINZ, 1904) (Figure 29)

- | | |
|---|--|
| ? | 1886: <i>Hammatoceras Sieboldi</i> OPPEL — VACEK, p. 31, pl. 12, figs 1–3 |
| v | 1904: <i>Hammatoceras stenomphalum (angusto-umbilicatum)</i> HANTK. msc.) nov. sp. — PRINZ, p. 79, pl. 19, fig. 2 |
| v | 1904: <i>Hammatoceras Mágocy</i> nov. sp. — PRINZ, p. 74, pl. 34, fig. 2 |
| | 1914: <i>Hammatoceras stenomphalum</i> PRINZ — FOSSA MANCINI, p. 83 |
| v | 1966: <i>Hammatoceras sieboldi stenomphalum</i> (PRINZ) — GÉCZY, p. 70, figs 55–56, pl. 16, figs 1–5, pl. 40, figs 1–4 |
| | 2007: <i>Planammatoceras (?) stenomphalum</i> (PRINZ) — RULLEAU, p. 106, pl. 82, fig. 4 |

Material — Three internal moulds of mediocre preservation, and 1 fragment.

Measurements	D	H	h	W	w	U	u
HTB29C	112	50	44%	24	48%	30	27%
HTB29B	85	36	42%	20	55%	26	30%
HG5B	80	35	44%	19	54%	21	26%

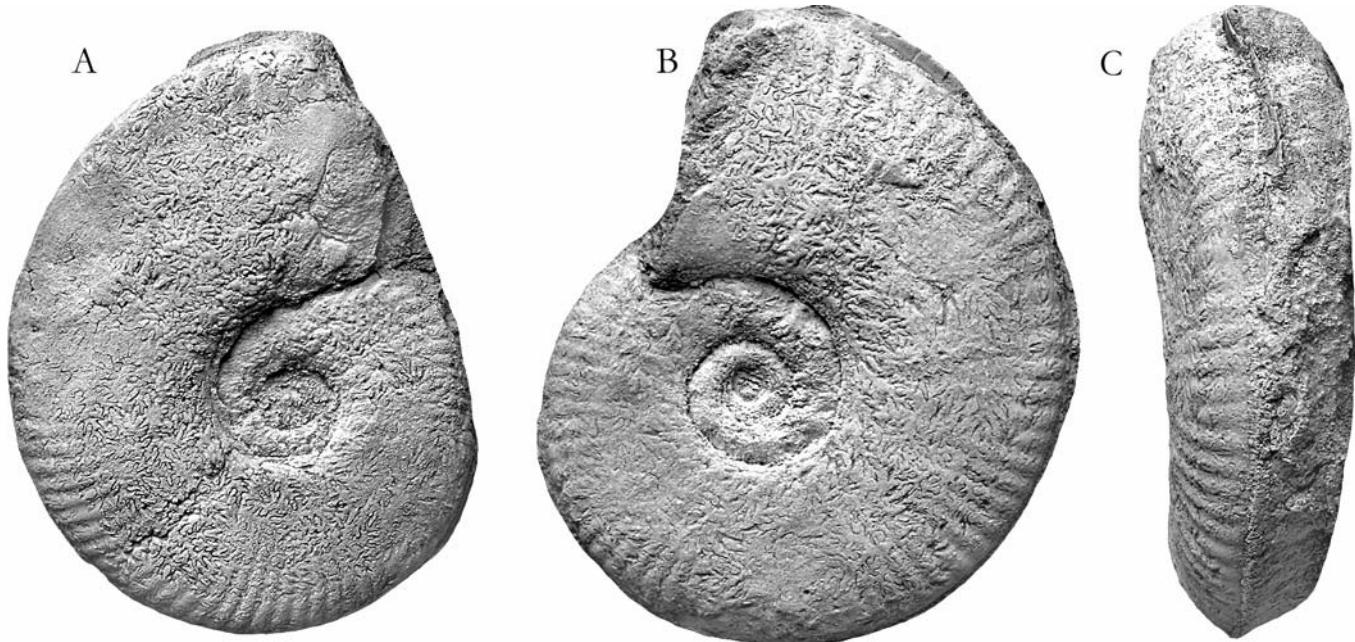


Figure 29 — *Planammatoceras stenomphalum* (PRINZ). —A: Lateral view, Kis-Gerecse, bed №: 5, Murchisonae Zone, ×1; lateral (B) and ventral (C) view of specimen from Tölgyhát B, bed №: 29, Murchisonae Subzone, ×1.

Description — Moderately involute, compressed form with high, hollow-floored keel. The umbilicus is narrow and slightly deep, the margin is rounded, the flanks are convex without shoulder. The venter is somewhat broad, high and rounded. The whorl-section is oval with maximum width little below mid-height. No whole body chamber is present. The ornamentation consists of fine, dense ribbing without tuberculation. The ribs become a little more widely spaced on the outer whorls. Radiate primaries

rise from the margin, and branch into 2–3 secondaries at about the lower quarter. The radial or gently prorsiradiate secondary ribs fade away at the carina. The number of secondaries of HTB29C is about 70, and that of HTB29B is 60. The suture-line is hammatoceratid with slightly asymmetrical L lobe.

Remarks — The Gerecse specimens agree well with the type (GÉCZY 1966, pl. 16, fig. 1) and with the other documented specimens from Bakonycsernye, and they

are also very close to the specimen figured by RULLEAU (2007, pl. 82, fig. 4). Based on the general morphological features, *H. Mágocsy* (PRINZ 1904) was included in *H. sieboldi stenomphalum* by GÉCZY (1966: 70). The validity of the taxon had not been confirmed in the literature (see MARTÍNEZ 1992), it was RULLEAU (2007) who first emended it to valid species. The resemblance between the taxon and *P. tenuinsigne* or *P. kochi* was already emphasized by PRINZ (1904: 81) and GÉCZY (1966: 71), therefore RULLEAU's classification including the species

in *Planammatoceras* seems well-established. The taxon is closely allied to *P. sieboldi*, but it differs by having symmetrical oval section, and more rectiradiate, non-tuberculate, fine and dense ribbing. It also differs from *P. planinsigne* and *P. tenuinsigne* by possessing finer and less sigmoid ribs.

Distribution — Upper Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Murchisonæ Zone: France (RULLEAU 2007). The Gerecse specimens are known from the Murchisonæ–Bradfordensis Subzones.

Planammatoceras aff. planiforme BUCKMAN, 1922 (Figure 30)

- 1922: *Planammatoceras planiforme* — BUCKMAN, pl. 356
 1960: *Planammatoceras cf. planiforme* BUCKMAN — LELIÈVRE, p. 31, pl. 6, figs 1–2
 1963: *Planammatoceras planiforme* BUCKMAN — ELMI, p. 82, fig. 30, pl. 11, fig. 1
 1963: *Hammatoceras (Planammatoceras) planiforme* BUCKMAN — RIEBER, p. 69, pl. 8, fig. 10
 v 1966: *Hammatoceras planiforme* BUCKMAN — GÉCZY, p. 56, fig. 45, pl. 11, fig. 4, pl. 39, fig. 1
 v 1966: *Hammatoceras planiforme stredai* n. subsp. — GÉCZY, p. 57, fig. 46, pl. 12, fig. 1, pl. 39, fig. 2
 1967: *Planammatoceras planiforme planiforme* BUCKMAN — SEYED-EMAMI, p. 85, pl. 3, fig. 3, pl. 10, fig. 4
 1971: *Planammatoceras planiforme planiforme* BUCKMAN — SEYED-EMAMI, pl. 3, fig. 3, pl. 10, fig. 4
 1985: *Planammatoceras planiforme* BUCKMAN — SCHLEGELMILCH, p. 28, pl. 3, fig. 3
 1992: *Planammatoceras planiforme* BUCKMAN — MARTÍNEZ, p. 175, fig. 36, pl. 38, figs 2–3, pl. 39, figs 1–2, pl. 40, fig. 1
 1993: *Planammatoceras planiforme planiforme* BUCKMAN — SEYED-EMAMI et al., p. 21, pl. 4, fig. 2
 2001: *Planammatoceras planiforme* BUCKMAN — METODIEV & SAPUNOV, p. 67, fig. 2/1, pl. 1, fig. 3
 2007: *Planammatoceras planiforme* BUCKMAN — RULLEAU, p. 106, pl. 79, fig. 2
 2009: *Planammatoceras planiforme* BUCKMAN — EL HAMMICH et al., pl. 5, fig. 5

Material — Two fragmentary specimens.

Measurements	L	H	W	w
HTB28E	125	50	22	44%
HP56A	95	50	?	

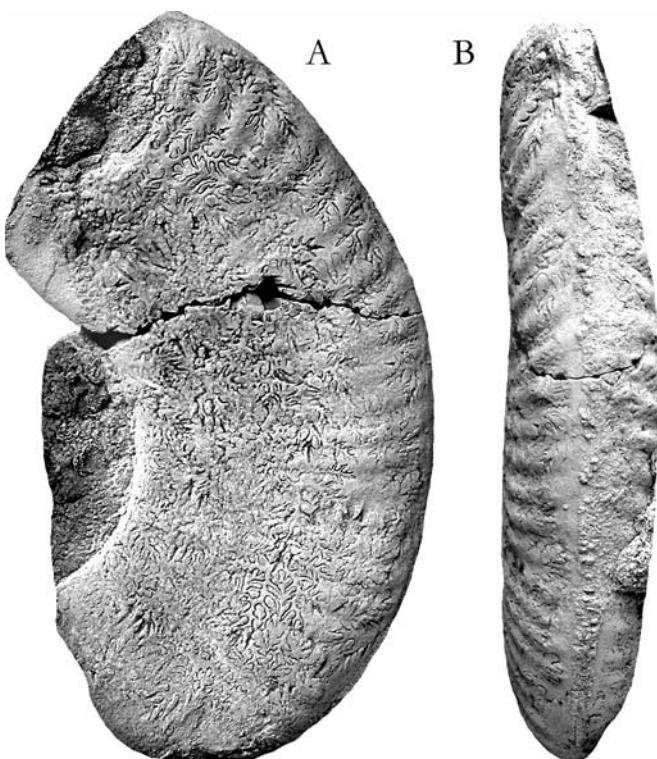


Figure 30 — *Planammatoceras aff. planiforme* BUCKMAN.
 — Lateral (A) and ventral (B) view, Tölgyhát B, bed №: 28,
 Murchisonæ Subzone, ×8.

Description — Moderately evolute, compressed form with hollow-floored keel. The umbilical wall is steep, the margin is rounded. The flanks are slightly convex, the shoulders are rounded. The venter is narrow and moderately high. The whorl-section is high-oval. The ornamentation consists of moderately developed, non-tuberculate ribbing. Radial primaries emerge from the umbilicus and branch into 2–3 secondaries around the lower third of the flank. The radial secondaries bend forward on the venter and cease at the carina. The suture-line is hammatoceratid.

Remarks — Both the morphology and sculpture of the fragments resemble the holotype (BUCKMAN 1922, pl. 356). The fragments seem to be close in main features to the holotype, as well as to the specimens figured by LELIÈVRE (1960, pl. 6, figs 1–2), ELMI (1963, pl. 11, fig. 1), GÉCZY (1966, pl. 11, fig. 4), SEYED-EMAMI (1967, pl. 10, fig. 4), SCHLEGELMILCH (1985, pl. 3, fig. 3), MARTÍNEZ (1992, pl. 38, fig. 2, pl. 39, figs 1–2), RULLEAU (2007, pl. 79, fig. 2), and EL HAMMICH et al. (2009, pl. 5, fig. 5), however, the umbilical wall of specimen HTB28E (Figure 30) is somewhat lower. In spite of the resemblance, the fragments can not be arranged with certainty.

Distribution — Levesquei Zone: Portugal (MOUTERDE & RUGET 1967b). Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Comptum Subzone: Tunisia (SEKATNI et al. 2008). Comptum Subzone–Murchisonæ Zone: Spain (LINARES et al. 1988, LINARES & SANDOVAL 1993). Murchisonæ

Zone: Spain (GARCÍA-GÓMEZ et al. 1994), Morocco (ELMI & FAUGÈRES 1974), Chile (HILLEBRANDT 1970). Murchisonae–Bradfordensis Zones: Morocco (EL HAM-MICHI et al. 2009). Murchisonae Zone–Bradfordensis Subzone: Britain (CALLOMON & COPE 1995, COX & SUMBLER 2002), France (ELMI 1963, RULLEAU 2007), Iran (SEYED-EMAMI 1967), Spain (MARTÍNEZ 1992), Bulgaria (METODIEV & SAPUNOV 2001). Opalinoides Subzone: France (ELMI & RULLEAU 1993). Sehndensis

Subzone: Germany (RIEBER 1963). Murchisonae Subzone: Spain (URETA 1988), France (CASSEL 1997). Murchisonae–Bradfordensis Subzones: Spain (GARCÍA-FRANK 2005). Bradfordensis Subzone: Morocco (SADKI 1996). Murchisonae–Concavum Zones: Spain (SANDOVAL et al. 2007). "Zurheria" groeberi Zone: Argentina (RICCARDI et al. 2005, RICCARDI 2008). The Gerecse specimens were obtained from the Haugi–Murchisonae Subzones.

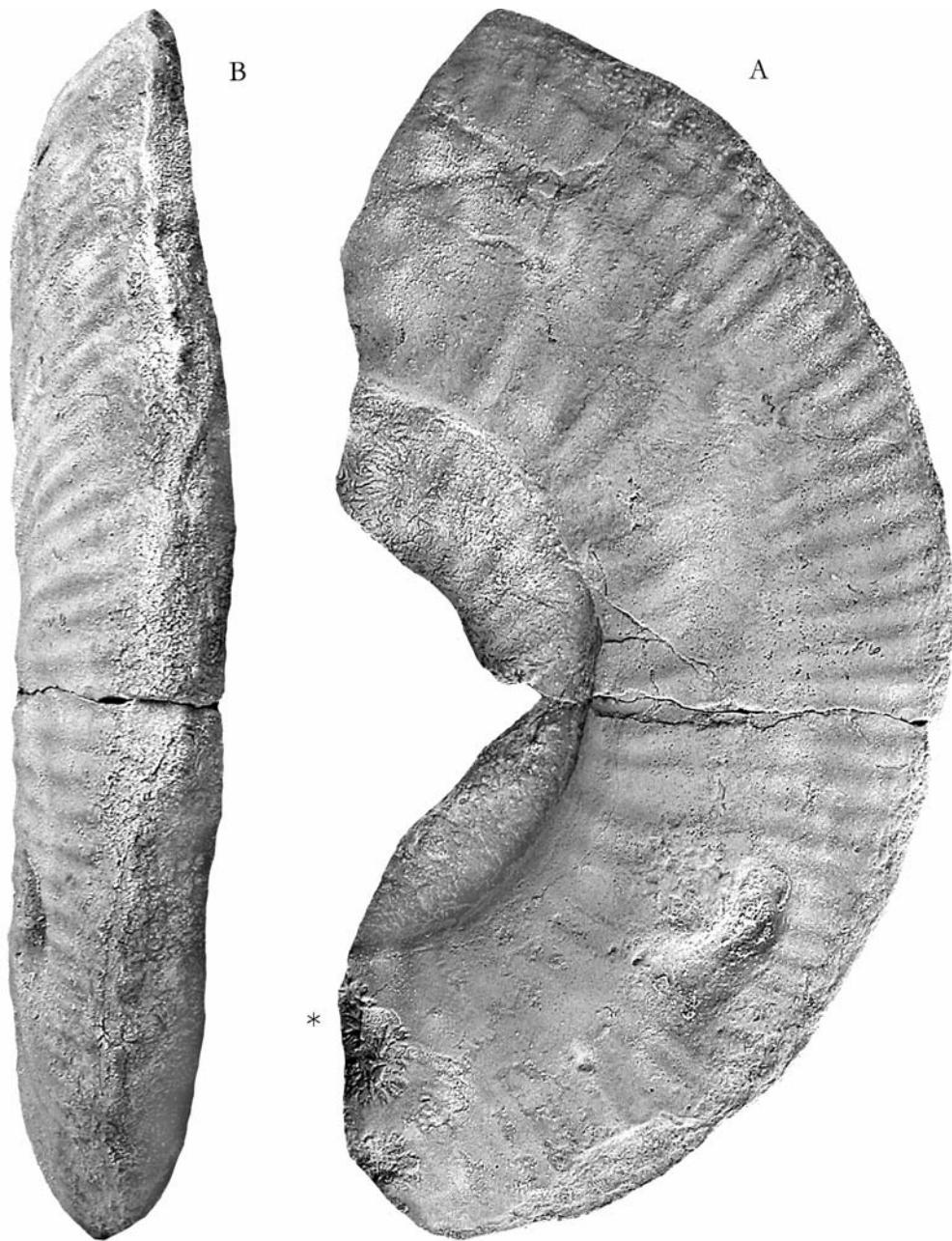


Figure 31—*Planammatoceras* sp.—Lateral (A) and ventral (B) view, Bánnya-hegy, bed №: 1, Meneghinii Zone, ×0.8.

***Planammatoceras* sp.**
(Figure 31–32)

Material—Two fragmentary specimens.

Measurements	L	H	W	w
HB1	210	68	24	35%
HG37	180	58	24	41%

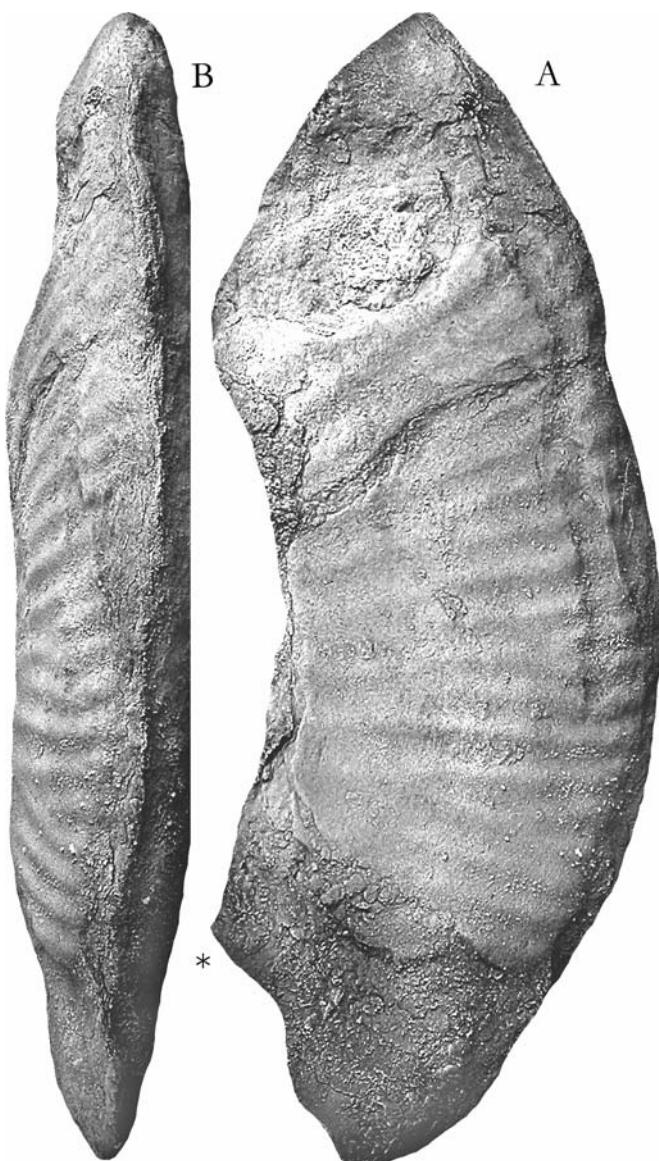
Description — Moderately evolute, discoidal form with acute venter. The umbilical wall is steep, the margin is rounded, the flanks are slightly convex without shoulder. The high venter bears hollow-floored keel. The whorl-section is ogival. The ornamentation consists of non-tuberculate, wide ribs. Concave primaries rise from the umbilicus, and bi- or trifurcate at the lower third. The gently prorsiradiate secondaries bend forward on the venter and cease at the keel. Irregular ribs (single primary, branching secondary) appear on specimen HG37 (Figure 32). The suture-line is scarcely visible, but shows hammatoceratid character.

Remarks — The specimens are similar to *P. romani* in the compressed section, but the latter differs in sculpture bearing coarser, sigmoid ribbing (MARTÍNEZ 1992, pl. 37, fig. 1). The irregular ribbing of HG37 resembles that of the *P. planiforme* figured by ELMI (1963, pl. 11, fig. 1). Both Gerecse specimens bear close affinity to *Pseudapertoceras apertum* in morphology and ornamentation. This taxon had been erected by ELMI & MOUTERDE (1997) as *Csernyeiceras apertum* nov. sp., and was reclassified as *Pseudapertoceras* by ELMI et al. (2007). It is characterised by evolute form, acute venter with compressed, ogival section and strong ribbing. But, being fragments, none of the specimens figured here can be arranged with certainty.

Distribution — *P. apertum* is known from the Aalensis Zone of Portugal (ELMI & MOUTERDE 1997, ELMI et al. 2007) and Tunisia (SEKATNI et al. 2008). The Gerecse specimens occur in the upper part of the Meneghinii Zone. Specimen HB1 was associated with *Dumortieria* sp. and *Calliceras* sp. in bed 1 of the Bánnya-hegy section, and HG37 was associated with *D. meneghinii* in bed 37 of the Kis-Gerecse section.

⇒

Figure 32 — *Planammatoceras* sp. — Lateral (A) and ventral (B) view, Kis-Gerecse, bed №: 37, Meneghinii Zone, ×0.85.



Genus *Bredyia* BUCKMAN, 1910

Type species — *Burtonia crassornata* BUCKMAN, 1910 (= *Ammonites subinsignis* OPPEL, 1856).

Diagnosis — Evolute to moderately evolute, robust form with subquadrate–suboval section. Deep umbilicus, low ventral keel. Coarse, bi- or trifurcating ribbing on the inner whorls, which becomes less developed on the last whorl of the mature shell. Nodes on the lower part of the flank. Relatively simple hammatoceratid suture-line.

Remarks — The genus was accepted by ARKELL (1957). ELMI (1963) erected *Pseudammatoceras* with type species *A. subinsignis* OPPEL for Upper Toarcian–Aalenian hammatoceratids characterised by massive coiling and coarse ornamentation. SENIOR (1977) rejected the validity of ELMI's taxon and considered *Bredyia* as the valid genus on the principle of priority. DONOVAN et al. (1981) also regarded *Pseudammatoceras* as junior synonym of *Bredyia*, but there has been no consent in the literature on this subject. Some authors preferred BUCKMAN's taxon (WESTERMANN 1969, WESTERMANN & RICCIARDI 1972, HILLEBRANDT & WESTERMANN 1985, MARTÍNEZ 1992, CRESTA 1997), how-

ever, RULLEAU (1996, 2007) and RULLEAU et al. (2001) confirmed the validity of both taxa. Based on SENIOR's, MARTÍNEZ's and CRESTA's classification, *Bredyia* is considered here as a valid genus. *B. subinsignis* (OPPEL), *B. brancoi* (PRINZ) and *B. rugata* (BUCKMAN) are described from the Gerecse Mts.

The sexual dimorphism of the genus was detailed by SENIOR (1977) and became confirmed in the literature, including *Rhodaniceras* as microconch (HILLEBRANDT & WESTERMANN 1985, RULLEAU et al. 2001). MARTÍNEZ (1992) distinguished *B. subinsignis* [M] and *B. brancoi* [M] as macroconchs, and *B. newtoni* [m], *B. fuentelsazensis* [m] and *B. diadematooides* [m] as microconchs. The collecting work in the Gerecse Mts yielded only nine specimens belonging to *Bredyia*, all of them macroconch form.

Distribution — The first representatives appear in the Aalensis Zone of Mediterranean and NW European Provinces (Spain: MARTÍNEZ 1992, URETA et al. 1999, SANDOVAL et al. 2001, GARCÍA–FRANK 2005, France: ELMI 1967, RULLEAU et al. 2001, Bulgaria: METODIEV 2008,

Crimea: IPPOLITOV et al. 2008, Tunisia: SEKATNI et al. 2008, Morocco: EL HAMMICH et al. 2009). The genus shows a world-wide distribution in the Aalenian, it occurs in Europe (see below), North Africa (LELIÈVRE 1960, ELMI & FAUGÈRES 1974, SADKI 1994a, 1996), Caucasus (KAZAKOVA 1985, ROSTOVSEV 1992, TOPCHISHVILI et al. 2006), Iran (SEYED-EMAMI 1967, 1971, 1987, SEYED-

EMAMI et al. 2006, 2008), North America (POULTON & TIPPER 1991, TIPPER et al. 1991, JAKOBS & SMITH 1996), South America (HILLEBRANDT 1970, WESTERMANN & RICCARDI 1972, WESTERMANN et al. 1980, HILLEBRANDT & WESTERMANN 1985, RICCARDI et al. 2005), Southeast Asia and Japan (SATO 1972, 1975, SUKAMTO & WESTERMANN 2005, HASIBUAN 2008).

Bredya subinsignis (OPPEL, 1856)

(Figure 33–34)

- 1856: *Ammonites subinsignis* — OPPEL, p. 487
 1874: *Ammonites subinsignis* (OPPEL) — DUMORTIER, p. 261, pl. 53, figs 3–5
 1904: *Hammatoceras Dumortieri* — PRINZ, p. 74
 1905: *Hammatoceras subinsigne* OPPEL — BENECKE, p. 331, pl. 32, figs 2–3, pl. 33
 1910: *Burtonia crassornata* — BUCKMAN, p. 97, pl. 9, fig. 1, pl. 10, fig. 1
 1925: *Bredya crassornata* — BUCKMAN, pl. 577
 1925b: *Hammatoceras subinsigne* OPPEL — RENZ, p. 10, pl. 1, fig. 5
 1927: *Hammatoceras subinsigne* OPPEL — SCHRÖDER, p. 12, pl. 1, fig. 5
 1940: *Hammatoceras subinsigne* OPPEL — GÉRARD & BICHELONNE, p. 41, pl. 17, fig. 2
 1961: *Hammatoceras (Hammatoceras) subinsigne* OPPEL — KRYMHOLTS, p. 99, pl. 6, figs 4, 6
 1963: *Pseudamatoceras subinsigne* (OPPEL) — ELMI, p. 15, pl. 1, figs 1–2
 1963: *Pseudamatoceras dumortieri dumortieri* (PRINZ) — ELMI, p. 23, pl. 1, fig. 4
 1963: *Pseudamatoceras dumortieri crassum* n. subsp. — ELMI, p. 25, pl. 3, figs 1–3
 1966: *Hammatoceras subinsigne* (OPPEL) — NUTSUBIDZE, p. 145, pl. 32, fig. 1, pl. 33, fig. 1
 1966: *Hammatoceras righi* n. sp. — GÉCZY, p. 39, fig. 27, pl. 5, fig. 3, pl. 37, fig. 18
 1967: *Pseudamatoceras cf. subinsigne* (OPPEL) — SEYED-EMAMI, p. 77, pl. 10, fig. 2
 1967: *Pseudamatoceras dumortieri dumortieri* (PRINZ) — SEYED-EMAMI, p. 78, pl. 2, fig. 19, pl. 8, figs 8–9
 1976: *Hammatoceras subinsigne* (DUMORTIER) — SCHLEGELMILCH, p. 91, pl. 48, fig. 5
 1977: *Bredya subinsignis* (OPPEL) — SENIOR, p. 682, pl. 81, figs 1–4, pl. 82, figs 1–5, pl. 83, figs 1–2, 5–6, pl. 84, figs 1–24
 1992: *Bredya subinsignis* (OPPEL) — MARTÍNEZ, p. 140, fig. 26, pl. 29, fig. 1, pl. 30, figs 1–2, 4, pl. 31, figs 1, 3–8, pl. 32, figs 1–4
 1993: *Bredya crassornata* (BUCKMAN) — ELMI & RULLEAU, p. 153, fig. 8
 1994: *Bredya subinsignis* (OPPEL) — CALLOMON & CHANDLER, p. 26
 1994: *Bredya subinsignis* (OPPEL) — GOY et al., pl. 1, fig. 13, pl. 2, figs 9–10
 1996: *Bredya subinsignis* (OPPEL) — SCHWEIGERT, p. 2, pl. 1, figs 1, 2, pl. 2, figs 1–2
 1996: *Pseudamatoceras subinsigne* (OPPEL) — RULLEAU, p. 8, pl. 28, figs 1–2, pl. 29, figs 3–6
 1996: *Bredya crassornata* BUCKMAN — RULLEAU, p. 8, pl. 27, figs 1–2
 2001: *Pseudamatoceras subinsigne* (OPPEL) — METODIEV & SAPUNOV, p. 62, pl. 1, figs 1–2
 2001: *Pseudamatoceras subinsigne* (OPPEL) — RULLEAU et al., pl. 24, figs 3–5, pl. 25, fig. 3, pl. 30, fig. 4
 2005: *Bredya subinsignis* (OPPEL) — GARCÍA-FRANK, pl. 3, figs 1–2
 2007: *Pseudamatoceras subinsigne* (OPPEL) — RULLEAU, p. 102, fig. 28/7, pl. 76, fig. 7
 2007: *Bredya crassornata* BUCKMAN — RULLEAU, p. 104, pl. 77, fig. 1

v

Material — Two internal moulds of poor state of preservation, and 1 fragment.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HTA17A	80	32	40%	20	62%	28	35%	20	60
HTA12A	80	34	42%	26	76%	24	30%	-	-

Description — Medium-size, moderately evolute form with a low ventral keel. The umbilicus is somewhat deep, the wall is steep with rounded margin. The flanks are convex, the shoulder is rounded, the venter is broad, low and rounded. The whorl-section is wide subtrapezoid at the inner whorls, but becomes slightly more compressed on the last whorl with maximum width at the lower third. The ornamentation consists of coarse, nodate ribbing. Broad primary ribs rising from the margin become elongated nodes, and trifurcate at the lower third of the flank. The strong and radiate secondaries become gently projected at the shoulder, bend forward on the venter and cease at the keel. No body chamber is preserved. The suture-line is hammatoceratid.

Remarks — The specimen HTA17A figured here (Figure 33) agrees well with the lectotype of *H. subinsignis* designated by RENZ (1925b, pl. 1, fig. 5), and with the

holotype of *B. crassornata* (BUCKMAN 1910, pl. 9, fig. 1). It is also close to the specimens of DUMORTIER (1874, pl. 53, figs 4–5, refigured by RULLEAU et al. 2001, pl. 24, fig. 4), and of MARTÍNEZ (1992, pl. 31, fig. 1, pl. 32, figs 1–2). The primaries of HTA12 (Figure 34) differ from the type by being less nodate. It resembles the specimen figured by MARTÍNEZ (l.c. pl. 32, fig. 3). *Parammatoceras alleoni* (DUMORTIER) is a closely allied form in morphology, but it differs by having less rounded lateral walls, and by bearing non-tuberculate, flexuous ribbing. *B. rugata* possesses sparser and more projected ribs. Considering the morphological features, *H. righi* GÉCZY, 1966 (the type deposited in the Geological Institute of Hungary) is regarded as junior synonym of *B. subinsignis* in this paper.

Distribution — Upper Toarcian: Italy (PINNA 1968). Aalensis Zone: France (RULLEAU et al. 2001). Aalensis

Subzone: Bulgaria (METODIEV 2008). Aalensis–Comptum Subzones: Spain (MARTÍNEZ 1992, GOY et al. 1994a, URETA et al. 1999, SANDOVAL et al. 2001, CRESTA et al. 2001, GARCÍA–FRANK 2005). Buckmani horizon: France (CONTINI 1970). Buckmani–lower Comptum Subzones: Spain (URETA & GOY 1986, LINARES et al. 1988, SANDOVAL et al. 2001). Lower Aalenian: Germany (KRUMBECK 1943), Romania (POPA 1981). Opalinum Zone: France (GÉRARD & BICHELONNE 1940, ELMY 1963, RULLEAU 1996, 2007), Spain (FERNÁNDEZ–LÓPEZ et al. 1988, GOY et al. 1988, SANDOVAL et al. 2007, 2008), Italy (CRESTA 1994), Germany (SCHWEIGERT 1996), Caucasus (KRYMHOLTS 1961, NUTSBIDZE 1966, TOPCHISHVILI 1978, KAZAKOVA 1985, TOPCHISHVILI et al. 1998, 2006), Iran (SEYED–EMAMI 1967). Lineatum Subzone: France (ELMY & RULLEAU 1993). Scissum Bed: England (SENIOR 1977, CALLOMON & CHANDLER 1994, CALLOMON & COPE 1995, COX & SUMBLER 2002). Comptum Subzone: Portugal (HENRIQUES et al. 1995). Murchisonae Zone: Bulgaria (METODIEV & SAPUNOV 2001), England (SENIOR 1977). Haugi Subzone: Spain (LINARES & SANDOVAL 1993). The Gerecse specimens occur in the Aalensis–Opalinum Zones.

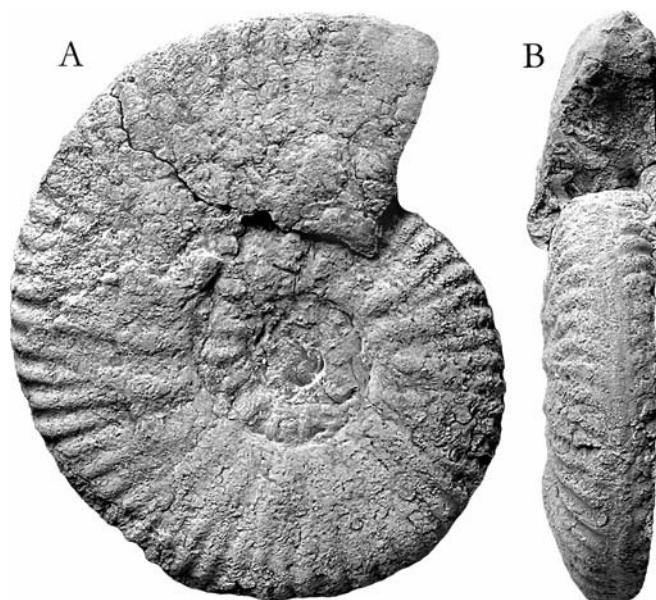


Figure 33 — *Bredya subinsignis* (OPPEL). — Lateral (A) and ventral (B) view, Tölgyhát A, bed №: 17, Aalensis Zone, ×1.

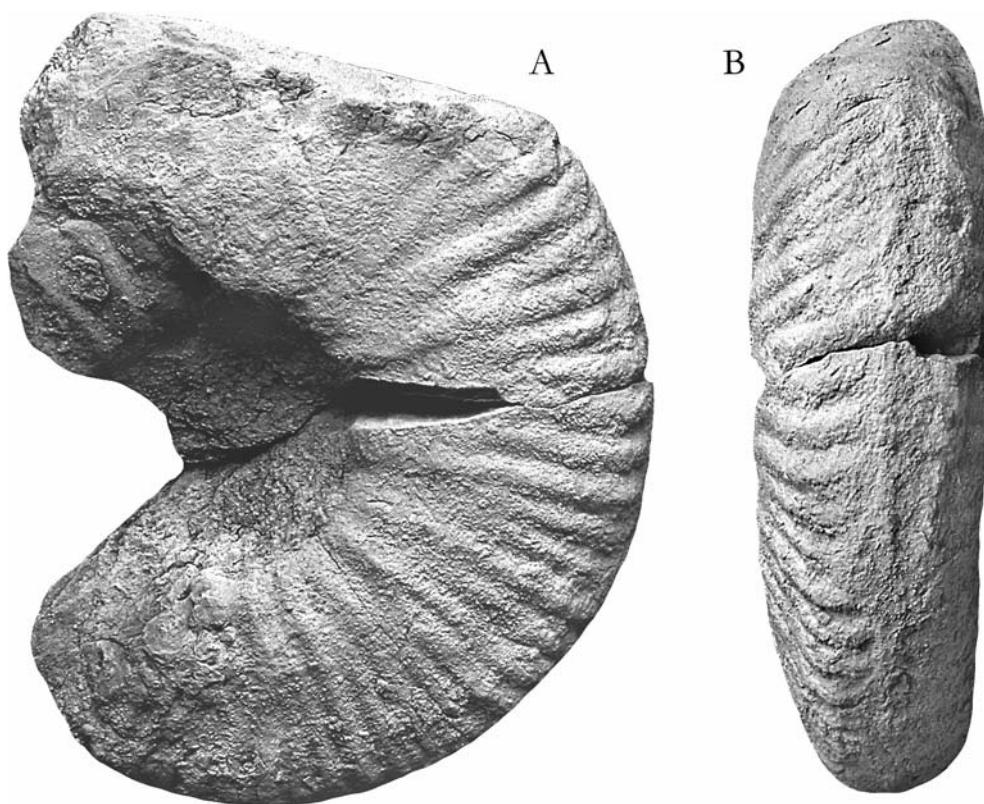


Figure 34 — *Bredya subinsignis* (OPPEL). — Lateral (A) and ventral (B) view, Tölgyhát A, bed №: 12, Opalinum Subzone, ×1.

***Bredya brancoi* (PRINZ, 1904)**
(Figure 35)

- 1879: *Ammonites aff. Sieboldi* OPPEL — BRANCO, p. 97, pl. 5, fig. 5
- v 1904: *Hammatoceras Sieboldi* OPPEL nov. var. *Brancoi* — PRINZ, p. 77, pl. 38, fig. 1
- 1905: *Hammatoceras lotharingicum* n. n. — BENECKE, p. 335, pl. 30, fig. 7, pl. 32, fig. 1, pl. 34
- 1940: *Hammatoceras lotharingicum* BENECKE — GÉRARD & BICHELONNE, p. 40, pl. 21, fig. 1
- 1963: *Parammatoceras boyeri* nov. sp. — ELMY, p. 49, fig. 20, pl. 7, figs 1–2
- v 1966: *Hammatoceras brancoi* PRINZ — GÉCZY, p. 34, fig. 21, pl. 3, fig. 2, pl. 4, fig. 3(?), pl. 37, fig. 13
- 1967: *Pseudammatoceras boyeri* (ELMY) — SEYED–EMAMI, p. 83, pl. 3, fig. 1, pl. 10, fig. 1

- 1992: *Bredya brancoi* (PRINZ) — MARTÍNEZ, p. 151, pl. 33, fig. 1
 1996: *Pseudammatoeceras boyeri* (ELMI) — RULLEAU, p. 6, pl. 24, figs 1–2
 2001: *Pseudammatoeceras boyeri* (ELMI) — RULLEAU et al., p. 56, fig. 4, pl. 24, figs 1–2, pl. 25, fig. 8
 2001: *Parammatoceras boyeri* ELMI — METODIEV & SAPUNOV, p. 66, figs 2/4–5, pl. 1, fig. 4
 2005: *Pseudammatoeceras* cfr. *brancoi* (PRINZ) — PALLINI et al., p. 15, pl. 12, fig. 4
 2007: *Pseudammatoeceras boyeri* (ELMI) — RULLEAU, p. 102, fig. 28/6, pl. 75, figs 1–2

Material — Three poorly preserved internal moulds, and 2 fragments.

Measurements	D	H	h	W	w	U	u
HTA12B	150	60	40%	40	66%	46	31%
HP64	126	52	41%	32	62%	36	29%

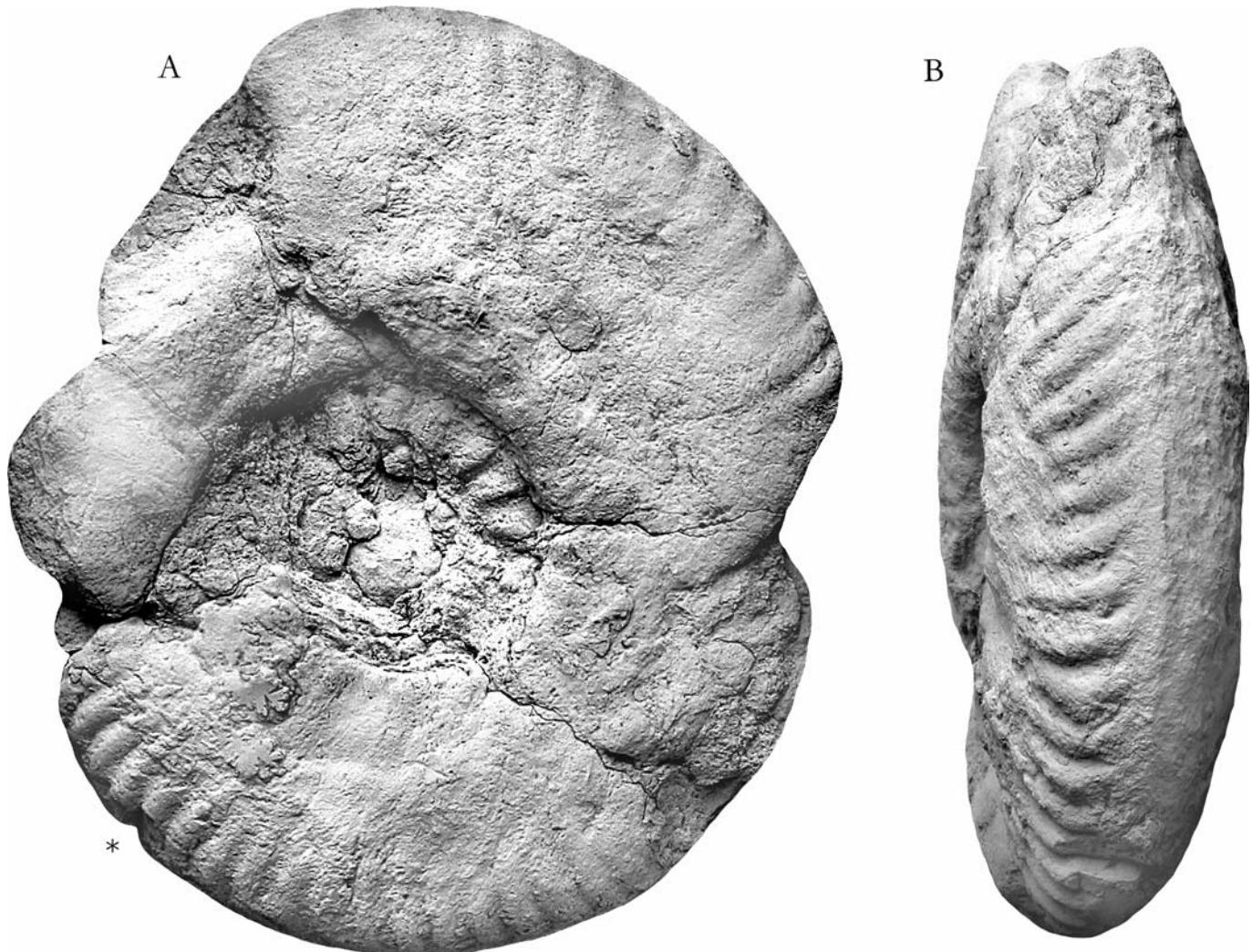


Figure 35 — *Bredya brancoi* (PRINZ). — Lateral (A) and ventral (B) view, Tölgyhát A, bed №: 12, Opalinum Subzone, ×1.

Description — Large, moderately evolute form with deep umbilicus. The umbilical wall is steep, both the margin and the shoulder are rounded. The flanks are slightly convex, the venter is broad, low and carinate. The whorl-section is subtrapezoidal with maximum width at the lower third. Specimen HTA12B bears a 3/4 whorl long part of the body chamber. The ribbing is moderately strong. Broad, nodate, radial primaries rise from the margin, and trifurcate at the lower third. The secondaries bend forward on the venter and cease at the keel, alternating on the two sides. The suture-line is not visible in all detail.

Remarks — The Gerecse specimen figured here is close to the holotype (GÉCZY 1966, pl. 3, fig. 2), as well as

to the specimens of GÉRARD & BICHELONNE (1940, pl. 21, fig. 1), ELMI (1963, pl. 7, fig. 1), MARTÍNEZ (1992, pl. 33, fig. 1) and RULLEAU et al. (2001, pl. 25, fig. 8). *H. lotharingicum* BENECKE is the junior synonym of PRINZ's taxon (GÉCZY 1966: 35, RULLEAU 1996: 6). The identity of *Pseudammatoeceras boyeri* and *B. brancoi* was claimed by RULLEAU (l.c.), the two taxa can be regarded as morphotypes (PALLINI et al. 2005: 15). *Pseudammatoeceras grandis* ELMI is characterised by wider umbilicus and less defined sculpture. The ribbing of *B. subinsignis* becomes less prominent above 90 mm diameter. *Parammatoceras obtectum* is also closely allied form, but its umbilicus is shallow, the venter is broad and low, and the primaries less developed.

Distribution — Uppermost Toarcian: France (PALLINI et al. 2005). Aalensis Zone: France (ELMI & RULLEAU 1991, RULLEAU 1996, 2007, RULLEAU et al. 2001), Portugal (ALMÉRAS 1994), Morocco [ELMI et al. 1999, EL HAMMICH et al. 2009, BENSHILI 1989: *Parammatoceras* gr. *lotharingicum* (BEN.)]. Lugdunensis Subzone: France (FAURÉ & ALMÉRAS 2006). Pseudoradiosa–Opalinum Zones: France (GÉRARD & BICHELONNE 1940). Lower Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Opalinum Zone: France (CONTINI 1970),

Spain (MARTÍNEZ 1992). Comptum Subzone: Spain (GOY et al. 1994, SANDOVAL et al. 2001). Murchisonae Zone: Spain (GARCÍA–YEBRA et al. 1972), ?France (ELMI 1963). Obtusiformis Subzone: England (CALLOMON & COPE 1995, COX & SUMBLER 2002). Concavum Zone: Bulgaria (METODIEV & SAPUNOV 2001). *H. (Pseudamatoceras) cf. lotharingicum* was recorded from the Aalensis Zone, Lugdunensis Subzone from France (BÉCAUD 2006). The Gerecse specimens are typical of the Aalensis–Opalinum Zones.

Bredyia rugata (BUCKMAN, 1925)

(Figure 36)

- 1879: *Ammonites subinsignis* (OPPEL) DUM. — BRANCO, p. 94, pl. 4, fig. 3
 1882: *Harpoceras insigne* SCHÜBLER — WRIGHT, p. 453, pl. 65, figs 4–5
 1889: *Hammatoceras dolium* n. sp. — BUCKMAN, p. 661, pl. 22, figs 17–18
 1925: *Parammatoceras rugatum* nov. — BUCKMAN, pl. 578, figs 1–2
 1926: *Parammatoceras dolium* BUCKMAN — BUCKMAN, pl. 641
 1939: *Hammatoceras rugatum* BUCKMAN — ROCHÉ, p. 160
 1960: *Hammatoceras guliense* RENZ — LELIÈVRE, p. 26, pl. 5, figs 7–8
 1963: *Pseudamatoceras rugatum rugatum* (BUCKMAN) — ELMI, p. 28, fig. 8, pl. 4, fig. 1
 1963: *Pseudamatoceras rugatum irregulare* n. subsp. — ELMI, p. 32, fig. 9, pl. 4, fig. 2
 1963: *Pseudamatoceras rugatum vergissoni* n. subsp. — ELMI, p. 34, fig. 10, pl. 4, fig. 3
 v 1966: *Hammatoceras rugatum* (BUCKMAN) — GÉCZY, p. 40, fig. 28, pl. 5, fig. 4, pl. 38, fig. 1
 v 1966: *Hammatoceras prinzi* n. sp. — GÉCZY, p. 67, fig. 53, pl. 15, fig. 2, pl. 39, fig. 10
 1967: *Pseudamatoceras* cf. *rugatum* BUCKMAN — SEYED-EMAMI, p. 82
 1996: *Pseudamatoceras* aff. *rugatum* (BUCKMAN) — RULLEAU, p. 8, pl. 36, figs 1–2

Material — Single internal mould of mediocre preservation.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HTB26A	100	34	34%	30	88%	40	40%	18	54



Figure 36 — *Bredyia rugata* (BUCKMAN). — Lateral view, Tölgyhát B, bed №: 26, Bradfordensis Subzone, ×1.

Description — Medium-size, moderately evolute coiling with slightly deep umbilicus. The umbilical wall is steep, both the margin and the shoulder are rounded. The

flanks are convex, the broad and rounded venter bears a low carina. The whorl-section is wide and rounded subtriangular with maximum width at the lower third. The ornamentation consists of coarse, bullate ribbing. Broad, projected, radiate primary ribs emerge from the margin with wide and concave intervals. They become projected bullae and trifurcate at the lower third on the inner whorls and at the mid-height on the last whorl. The specimen bears 18 primaries on the last whorl. The strong and radiate secondaries bend gently forward on the venter and cease at the keel. No body chamber is present. The suture-line is hammatoceratid.

Remarks — The specimen is very similar to the holotype (BUCKMAN 1925, pl. 578) in coiling style and ribbing, but the last whorl is somewhat higher. It is also close to the specimens of ELMI (1963, pl. 4, fig. 1) and GÉCZY (1966, pl. 5, fig. 4). The species was included in *Ceccaites* by CRESTA (1997: 40), but the validity of this genus needs more research. Regarding the markedly different sculpture, as well as the dissimilar type of carina, *A. sieboldi* OPPEL and *H. dolium* BUCKMAN do not seem to be closely allied forms. Based on the morphology, the species is classified as *Bredyia* in this paper. The taxon is especially rare, and the specimens figured in the literature show slight differences in morphology and ornamentation, however, these differences can be interpreted as intraspecific variabilities. Three other specimens are also closely allied forms, they can be included in the taxon. The robust form of *Ammonites subinsignis* docu-

mented by BRANCO (1879, pl. 4, fig. 3), bearing broad, projected primaries trifurcating at the mid-flank shows close affinity to the holotype. The *H. guliense* RENZ figured by LELIÈVRE (1960, pl. 5, figs 7–8) agrees well with *B. rugata* in the main morphological features (GÉCZY 1966: 41). It was maintained by RULLEAU (1996: 8) that *Hammatoceras prinzi* (GÉCZY 1966, p. 67, fig. 53, pl. 15, fig. 2) could be classified as *B. rugata*. After studying the holotype of *H. prinzi* (deposited in the Geological Institute of Hungary), RULLEAU's proposal is accepted here.

Distribution — Middle Aalenian: France (RULLEAU

1996). Upper Aalenian: Hungary, Bakonycsernye (GÉCZY 1966). Opalinum Zone: Spain (MARTÍNEZ 1992). Murchisonae Zone: France (ROCHÉ 1939, CONTINI 1970), Iran (SEYED–EMAMI 1967), Morocco (LELIÈVRE 1960). Opalinoides Subzone: France (ELMI & RULLEAU 1993). Murchisonae Subzone: England (CALLOMON & COPE 1995, COX & SUMBLER 2002). Concavum horizon: France (CALOO 1971, MOUTERDE et al. 1972). “*Pseudammato*
ceras” dolium: Limitatum Subzone, Portugal (PAVIA & ENAY 1997). The Gerecse specimen was collected from the Bradfordensis Subzone.

Genus *Accardia* CRESTA, 1997

Type species — *Ammonites lorteti* DUMORTIER, 1874. The type species (DUMORTIER 1874, pl. 54, fig. 1) was designated by CRESTA (1997: 34).

Diagnosis — Evolute, compressed coiling with wide umbilicus. Moderately convex flanks, hollow-floored keel, ogival–suboval whorl-section. Well-defined ribbing with long primaries and short secondaries, and lateral tubercles at the furcation points. Hammatoceratid suture-line with long, ramified E, long, broad, ramified L, and divided, oblique U lobes.

Remarks — The genus was created for a group of markedly similar Aalenian hammatoceratids differing from *Planammato*
ceras. It was accepted by RULLEAU et al. (2001), and there is a general consent in the literature regarding the species included in the taxon: *A. lorteti* (DUMORTIER), *A. liebi* (MAUBEUGE), *A. enricoi* CRESTA, *A. diademato*
ides (MAYER), *A. procerinsigne* (VACEK), *A. fossai* (MERLA). Based on the morphology, inclusion of *Eudmetoceras vigrassi* TAYLOR, *H. spinosum* HANTKEN in PRINZ, *H. eximum* HANTKEN in PRINZ, *H. noszkyi* (GÉCZY) in the genus is proposed here. About 20 specimens were documented by GÉCZY (1966) from Bakonycsernye, which belong to *Accardia* according to recent interpretations: *H. liebi*, *H. diademato*
ides, *H. lorteti multistriatum*, *H. spinosum*, *H. spinosum* kovaci, *H. spinosum eximum*, *H. rugatum noszkyi*. From the Gerecse assemblage three taxa are recorded here: *A. diademato*
ides, *A. eximia*, *A. noszkyi*.

Distribution — The genus appears in the Upper Toarcian of France (GÉRARD & BICHELONNE 1940, MAUBEUGE 1961) and probably in Spain (MARTÍNEZ 1992). It is typical of the Aalenian of the Mediterranean–Caucasian Realm. It was recorded from Germany (SCHRÖDER 1927, RIEBER 1963, SCHLEGELMILCH 1985), Austria (BESLER 1959), Switzerland (MAUBEUGE 1967), Hungary, Bakonycsernye (GÉCZY 1966), Italy (VACEK 1886, VIALLI 1937, CECCA et al. 1990, CALLOMON et al. 1994, CRESTA 1994, 1997, 2002b), Spain (FERNÁNDEZ–LÓPEZ et al. 1988, LINARES et al. 1988, MARTÍNEZ 1992, SANDOVAL et al. 2007, 2008), Portugal (MOUTERDE et al. 1980, HENRIQUES 2000), Greece (RENZ 1910, 1927), France (ROMAN 1935, ELMI 1963, ELMI & RULLEAU 1993, RULLEAU 1996, 2007, RULLEAU et al. 2001), Britain (CALLOMON & CHANDLER 1994), Bulgaria (METODIEV 1997, METODIEV & SAPUNOV 2001), Poland (GEDL 2008), Morocco (TERMIER & DUBAR 1940, LELIÈVRE 1960, SADKI 1994a, 1996, EL HAMMACHI et al. 2009), Caucasus (NUTSUBIDZE 1966, KAZAKOVA 1975, 1985, ROSTOVSEV 1992), Iran (SEYED–EMAMI 1987, SEYED–EMAMI et al. 2006, 2008). *Planammato*
ceras spinosum (HANT.) was recorded from Morocco (BENSHILI 1989). It is known from the Lower Dogger of South America (BURCKHARDT 1903), and from the Packardi Zone (upper Concavum Zone) of North America (TAYLOR 1988). The genus disappears in the Discites Zone (ELMI 1963, MARTÍNEZ 1992).

Accardia diademato *ides* (MAYER, 1871)

(Figure 37)

- 1871: *Ammonites diademato*
ides — MAYER, p. 243, pl. 8, fig. 9
- ? 1934: *Hammatoceras cf. diademato*
ides MAYER — KUHN, p. 23
- 1960: *Hammatoceras cf. diademato*
ides MAYER — LELIÈVRE, p. 26, pl. 5, figs 5–6
- 1963: *Hammatoceras diademato*
ides MAYER — RIEBER, p. 68, pl. 8, figs 5–8
- 1963: *Pseudammato*
ceras cf. diademato
ides (MAYER) — ELMI, p. 18
- 1966: *Hammatoceras diademato*
ides MAYER var. *guliensis* RENZ — NUTSUBIDZE, p. 146, pl. 32, fig. 2, pl. 33, figs 2–3
- v 1966: *Hammatoceras diademato*
ides (MAYER) — GÉCZY, p. 43, fig. 32, pl. 7, fig. 4, pl. 38, fig. 5
- v non 1966: *Hammatoceras diademato*
ides radaszji n. subsp. — GÉCZY, p. 45, fig. 33, pl. 6, fig. 3, pl. 38, fig. 6
- 1967: *Bredya diademato*
ides MAYER — MAUBEUGE, p. 84
- non 1968: *Hammatoceras cf. radaszji* GÉCZY — PINNA, p. 23, pl. 2, fig. 6, pl. 2 n.t., fig. 15
- 1985: *Hammatoceras diademato*
ides (MAYER) — SCHLEGELMILCH, p. 27, pl. 3, fig. 1
- ? 1987: *Pseudammato*
ceras guliense (RENZ) — SEYED–EMAMI, p. 377, pl. 3, fig. 3
- 1992: *Bredya diademato*
ides (MAYER) — MARTÍNEZ, p. 158, fig. 30, pl. 34, figs 8–10
- 1996: *Pseudammato*
ceras diademato
ides (MAYER) — SADKI, p. 162, pl. 3, fig. 1
- 2001: *Accardia diademato*
ides (MAYER) — RULLEAU et al., pl. 31, fig. 1
- 2005: *Bredya diademato*
ides (MAYER) — GARCÍA–FRANK, pl. 5, fig. 10
- 2006: *Accardia diademato*
ides (MAYER) — SEYED–EMAMI et al., p. 269, figs 5/8, 5/16

2007: *Accardia* (?) *diadematoides* (MAYER) — RULLEAU, p. 106, pl. 81, fig. 1
 2008: *Accardia* aff. *diadematoides* (MAYER) — SEYED-EMAMI et al., p. 255, fig. 6N

Material — One internal mould of mediocre preservation.

*Measurements	D	H	h	W	w	U	u
HG4	90	38	42%	30	79%	32	35%

* Measurements of the phragmocone. The whole diameter is 132 mm.

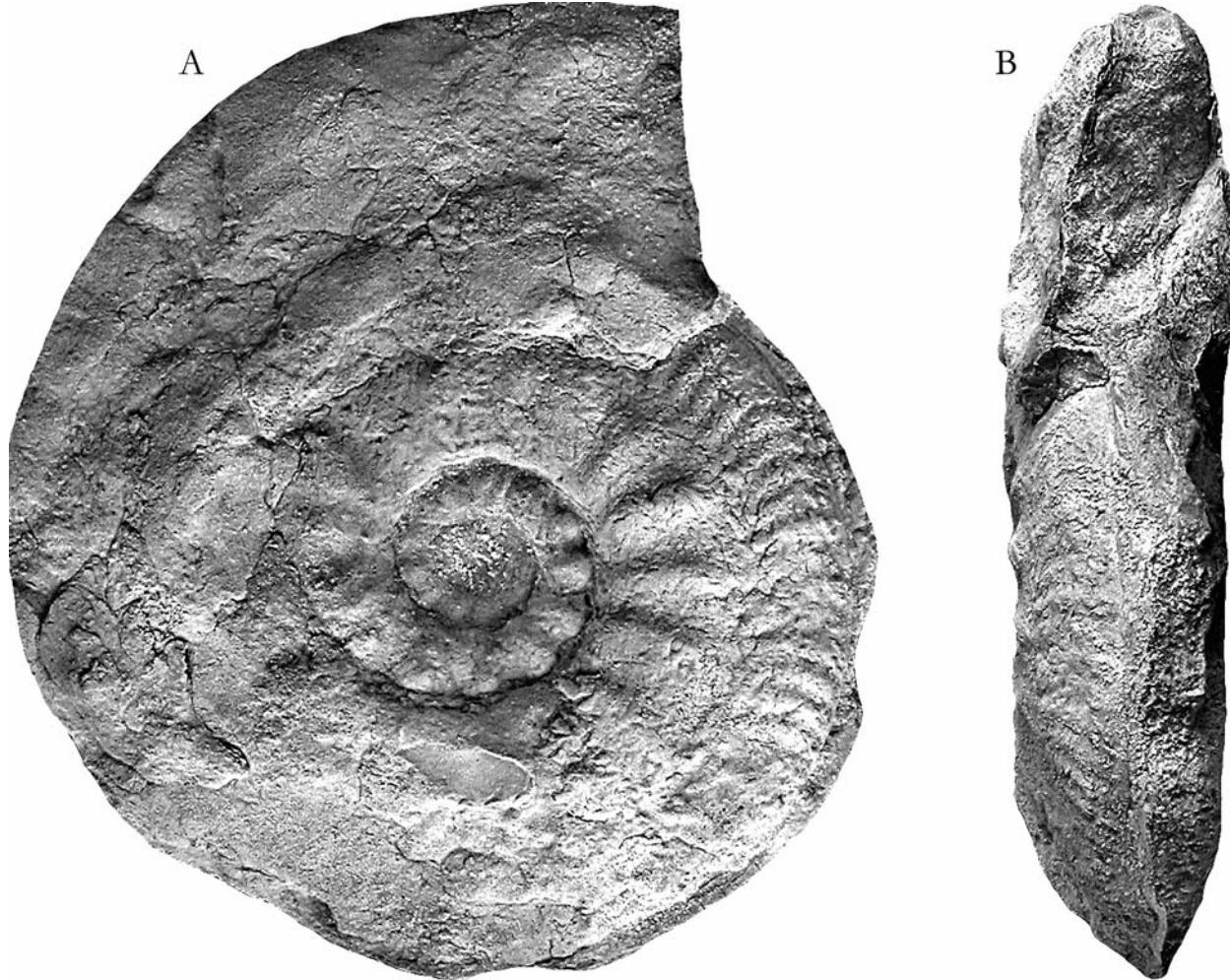


Figure 37 — *Accardia diadematoides* (MAYER). — Lateral (A) and ventral (B) view, Kis-Gerecse, bed №: 4, Bradfordensis Subzone, ×1.

Description — Medium-size, moderately involute form with hollow-floored keel. The umbilicus is deep, the wall is steep and high, the margin is rounded. The flanks are convex, the shoulder is rounded, the venter is broad, low and convex. The whorl-section is wide-oval with maximum width at the lower third. The specimen bears a part of the body chamber of 3/4 whorl. The ornamentation can be found only on the phragmocone, it consists of well-defined ribbing. Bullate, radial primaries emerge from the umbilicus and trifurcate from nodes at the mid-flank. The bullae become more widely spaced, narrower but projected ribs on the last whorl of the phragmocone, and the nodes become less developed. The fine, concave secondaries reach the carina and fade away. Intercalatories appear between the secondaries. The suture-line is hammatoceratid.

Remarks — The holotype (MAYER 1871, pl. 8, fig. 9), and most of the figured specimens in the literature are

small-size forms, so the species was interpreted as one of the microconchs of *Bredia* by MARTÍNEZ (1992). However, there are three large specimens that can be compared with the Gerecse specimen. The fragmentary *H. diadematoides* figured by RIEBER (1963, pl. 8, fig. 6) is a large form, moreover, its style of coiling and sculpture agree well with that of specimen HG4. The dimensions and the ornamentations of both the *A. diadematoides* presented by SEYED-EMAMI et al. (2006, fig. 5/16) and the *A. aff. diadematoides* figured by SEYED-EMAMI et al. (2008, fig. 6N) with long, nodate primaries and concave secondaries are very close to that of HG4.

Distribution — Upper Aalenian–Lower Bajocian: Morocco (LELIÈVRE 1960), Spain (SEYFRIED 1978). Opalinum Zone: Caucasus (NUTSUBIDZE 1966), ?Iran (SEYED-EMAMI 1987). Bradfordensis–Concavum Zones: Spain (GARCIA-FRANK 2005), Iran (SEYED-EMAMI et al. 2006, 2008). Brad-

fordensis Subzone: Spain (URETA 1988), Portugal (HENRIQUES 2000). Bradfordensis–Concavum Subzones: Spain (MARTÍNEZ 1992, LINARES & SANDOVAL 1993, SANDOVAL et al. 2008), Morocco (SADKI 1994a, 1996), France (RULLEAU et al. 2001). Gigantea Subzone: Spain (SANDOVAL et al. 2007). Gigantea–Concavum Subzones: Spain

(GARCÍA–FRANK 2005). Concavum Zone: France (CONTINI 1970, ELMI & RULLEAU 1993), Spain (FERNÁNDEZ–LÓPEZ et al. 1988). Lower Dogger: Italy (KUHN 1934). Sowerby Zone: France (MAYER 1871), Hungary, Bakonycsernye (GÉCZY 1966, 1967b). The Gerecse specimen came from the Bradfordensis Subzone.

***Accardia eximia* (HANTKEN in PRINZ, 1904)**

(Figure 38)

- 1904: *Erycites eximius* nov. sp. HANTK. msc. — PRINZ, p. 94, pl. 14, fig. 1a–b
- ? 1910: *Erycites eximius* (HANTK.) PRINZ — HAHN, p. 387, pl. 17, fig. 3
- ? 1923: *Hammatoceras Vaceki* nov. sp. — ROMAN & BOYER, p. 32, pl. 9, fig. 1
- 1966: *Hammatoceras spinosum eximium* (HANTKEN in PRINZ) — GÉCZY, p. 51, fig. 40, pl. 9, fig. 2, pl. 43, fig. 9

Material — One internal mould of mediocre preservation.

Measurements	D	H	h	W	w	U	u
HTB28C	160	50	31%	32	64%	70	44%

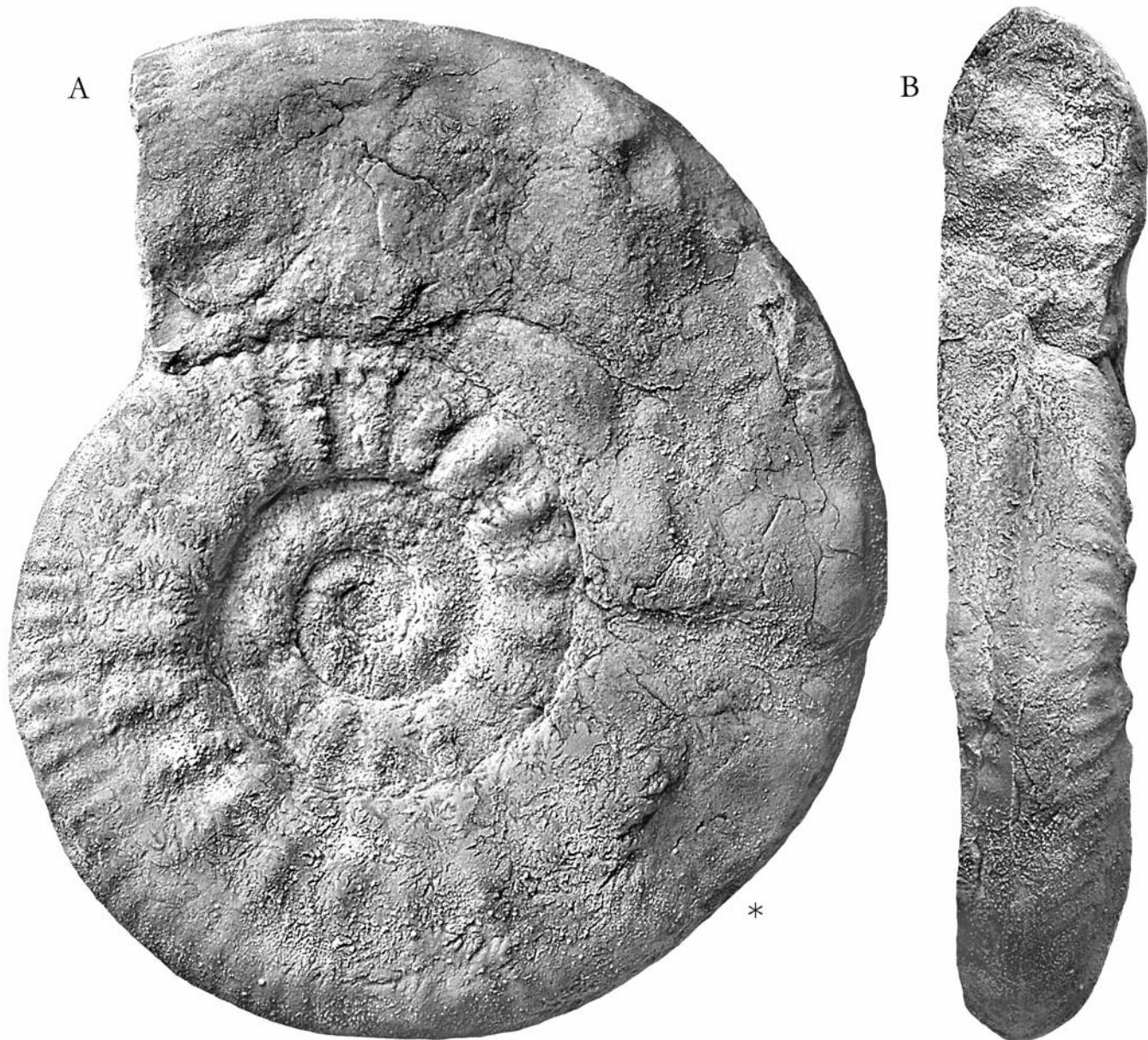


Figure 38 — *Accardia eximia* (HANTKEN in PRINZ). — Lateral (A) and ventral (B) view, Tölgyhát B, bed №: 28, Murchisonae Subzone, ×1.

Description — Large, evolute form with wide and moderately deep umbilicus. Both the umbilical wall and the margin are rounded, the flanks are convex, the shoulder is rounded. The venter is broad, low and rounded on the inner whorls, it becomes narrower and higher on the last whorl. The venter bears a high carina. The section is oval with maximum width at the lower third. The specimen bears a part of the body chamber of about a half whorl. The ornamentation preserved only on the phragmocone consists of coarse, nodate ribbing. Radiate, projected, bullate primaries rise from the umbilicus, and bi- or trifurcate from tubercles a little below mid-height. The slightly prorsiradiate secondaries bend forward on the venter and cease at the keel. Intercalatories appear irregularly. The last half whorl of the phragmocone bears 12 primary and 38 secondary ribs. The suture-line is hammatoceratid.

Remarks — The Gerecse specimen agrees well in morphology and suture-line with the holotype (PRINZ 1904, pl. 14, figs 1a–b, GÉCZY 1966, pl. 9, fig. 2, pl. 43, fig. 9), and it is very close to the *H. spinosum* HANTKEN in PRINZ figured by GÉCZY (1966, pl. 8, fig. 3). *A. eximia* is distinct from *A. eximia* in the more evolute and narrower form with thinner and somewhat irregular primaries (see PRINZ 1904, pl. 18, figs 1–2, GÉCZY 1966, figs 1–2). The *E. eximus* documented by HAHN (1910, pl. 17, fig. 3) is similar to the type in the number and in the widely spaced position of the primaries, however, it differs by having more evolute coiling with more prorsiradiate ribbing. The *H. Vaceki* published by ROMAN & BOYER (1923) resembles *A. eximia* in morphology and in sculpture, it might be classified as *A. eximia*. The *Pseudammatoceras (Accardia?) mouterdei* ELMI figured by RULLEAU (2007, pl. 82, fig. 1) is a markedly close form. The morphology of the two taxa appears identical, only the sculptures show slight differences with the gently curved and somewhat sharper primaries of *P. mouterdei*. The two species are considered as morphotypes in this paper. *A. enricoi* is similar in morphology, but it differs from *A. eximia* by being more finely ribbed. *A. eximia* differs from *A. lorteti* by possessing long, bullatiform primaries with less sharp tubercles and less sigmoid secondaries. The *Planammatoceras spinosum eximum*

(GÉCZY) recorded by ELMI & RULLEAU (1993: 154) can rather be determined as *Pseudammatoceras mouterdei* (L. RULLEAU, pers. comm.).

Distribution — ?Meneghinii Zone: Austria (FISCHER 1966). Lower Dogger: Hungary, Bakonycsernye (PRINZ 1904, GÉCZY 1966), ?Austria (HAHN 1910). *H. vaceki* was recorded from the Murchisonae Zone (ROMAN & BOYER 1923), *P. mouterdei* is known from the Opalinoides Subzone (RULLEAU 1996, 2007) to Concavum Zone (ROCHÉ 1939, ELMI 1963, CALOO 1971, MOUTERDE et al. 1972) from France. The Gerecse specimen HTB28C came from the Murchisonae Subzone.

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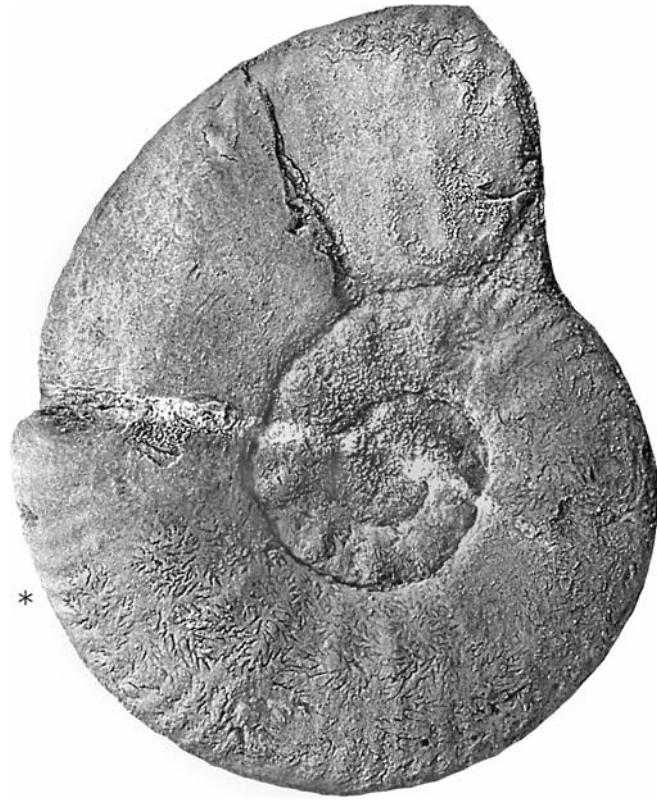


Figure 39 — *Accardia noszkyi* (GÉCZY). — Lateral view, Tölgyhát B, bed No: 28, Murchisonae Subzone, ×1.

Accardia noszkyi (GÉCZY, 1966)

(Figure 39)

v 1966: *Hammatoceras rugatum noszkyi* n. subsp. — GÉCZY, p. 41, fig. 29, pl. 5, fig. 1, pl. 38, fig. 2

Material — Single internal mould of mediocre preservation.

Measurements	D	H	h	W	w	U	u	LWP	LWS
HTB28B	105	38	36%	20	52%	40	38%	22	47

Description — Medium-size, moderately evolute form with wide and slightly deep umbilicus. The umbilical wall, the margin and the shoulder are rounded, the flanks are somewhat convex. The venter is moderately broad and high, it bears conella. The cross-section of the inner whorls is wide-oval becoming narrower oval on the last whorl with maximum width at the lower third. Specimen HTB28B bears a part of the body chamber of a third whorl-length. The

ornamentation characterised by bullate ribbing on the inner whorls becomes less developed and irregularly spaced on the last half whorl of the phragmocone. Strong, radial primary ribs rise from the margin and bi- or rarely trifurcate from tubercles at the mid-height. The tubercles are missing on the last whorl. The fine and slightly sigmoid secondaries, visible only on the last whorl, bend forward on the venter and fade away at the keel. The suture-line is hammatoceratid.

Remarks — Based on the revision of the Bakonycsernye hammatoceratids, the Gerecse specimen appears very similar to *H. rugatum noszkyi* (GÉCZY 1966 p. 41, fig. 29, pl. 5, fig. 1, pl. 38, fig. 2). Both their sizes and sutures are identical, moreover, their morphology and sculpture with the alteration of the primary ribs are very close, but the type slightly differs by having higher umbilical wall with subtriangular section. These two specimens make possible the emendation of GÉCZY's taxon. *H. rugatum noszkyi* was assigned as subspecies, however, it differs from the holotype of *H. rugatum*

(BUCKMAN 1925, pl. 578, figs 1–2) by bearing hollow-floored keel and nodose, but finer ornamentation. As species belonging to *Bredia* are mainly characterised by low carina and by coarse ribbing, *H. noszkyi* is placed in *Accardia* here. *A. noszkyi* differs from *A. lorteti* in style of coiling and in lack of sharp lateral tubercles. It also differs from *A. eximia* in size and in being more finely ribbed.

Distribution — The type is known from the Upper Aalenian of Bakonycsernye (GÉCZY 1966). The Gerecse specimen was obtained from the Murchisonae Subzone.

Genus *Pseudaptetoceras* GÉCZY, 1966

Type species — *Harpoceras klimakomphalum* VACEK, 1886. The type species (VACEK 1886, pl. 8, fig. 16) was designated by GÉCZY (1966: 77).

Diagnosis — Involute, discoid form with narrow, deep umbilicus. Narrow, high whorls, carinate venter, ogival–oval section. Weakly developed ornament with long primary and sigmoid secondary ribs. Ramified hammatoceratid suture-line with long E, slightly asymmetrical L and divided oblique U lobes.

Remarks — The taxon was created by GÉCZY (1966: 77) based on the systematic criticism by ARKELL (1957: L267) and LELIÈVRE (1960: 33) relating to *Eudmetoceras* and *Euaptetoceras* erected by BUCKMAN (1920, 1922) without any diagnosis or definition. According to GÉCZY (l.c.), the reinterpretation of these taxa is necessary, as *Eudmetoceras amplexens* BUCKMAN appears markedly distinct from the type species (*E. eudmetum* BUCKMAN) in the more involute form, and the less developed ribbing, but it is significantly close to *Euaptetoceras euaptetum* BUCKMAN, the type species of the genus. The uncertain classification was noticed by RENZ (1925b), who interpreted *Harpoceras klimakomphalum* VACEK as *H. (Eudmetoceras) klimakomphalum*. This species had been reclassified as *Hammatoceras* by BUCKMAN (1889) emphasizing its connection with *H. amplexens*. ARKELL (l.c.) considered *Euaptetoceras* as synonymy of *Eudmetoceras*, however, LELIÈVRE (l.c.) maintained again the difference between them. GÉCZY (l.c.) regarded *Eudmetoceras* as synonymy of *Hammatoceras*, and introduced subgenus *Pseudaptetoceras* (including species of *Euaptetoceras*) with type species *Harpoceras klimakomphalum* VACEK for Aalenian hammatoceratids with involute, compressed, discoid form.

In his detailed analysis of the Hammatoceratinae, WESTERMANN (1964a: 407–421) interpreted *Euaptetoceras* as a subgenus of *Eudmetoceras*, and rejected the validity of *Pseudaptetoceras* (see WESTERMANN, 1969: 63–72). The type was identified as *Eudmetoceras (Euaptetoceras) klimakomphalum* by SEYED-EMAMI (1967, 1971), WESTERMANN (l.c.), WESTERMANN & RICCIARDI (1972) and IMLAY (1984). Although the validity of *Pseudaptetoceras* had been verified by MOUTERDE et al. (1972), it was ignored by GABILLY (1973), and the taxon was considered as synonymous with *Euaptetoceras* by DONOVAN et al. (1981). Later WESTERMANN & RICCIARDI (1982)

regarded *Pseudaptetoceras* as a subgenus of *Planammatoceras* (HILLEBRANDT & WESTERMANN 1985, WESTERMANN & RICCIARDI 1985, SEYED-EMAMI 1987). KAPILIMA (1984) quoted the type as *Planammatoceras (Euaptetoceras)*, and it was recorded as *Planammatoceras klimakomphalum* by CRESTA & GALÁCZ (1990) and CRESTA (1994, 1996). The validity of the genus was neither accepted by MARTÍNEZ (1992). However, from the late 1990s GÉCZY's taxon met with acceptance, the type was regarded as *Pseudaptetoceras klimakomphalum* again (CALLOMON et al. 1995, RIOULT et al. 1997). The reinterpretation of the Hammatocerataceae by RULLEAU et al. (2001) elicited an almost general agreement among the paleontologists of the Mediterranean–Caucasian Realm. The type has been referred to as *Pseudaptetoceras* by COX & SUMBLER (2002), MYCZYNSKI (2004), PALLINI et al. (2005), EL HAMMICH et al. (2006), BIRKENMAYER (2007), SEKATNI et al. (2008), therefore the validity of the taxon as one of the Hammatoceratinae genera appears well-established (ELMI et al. 2007, RULLEAU 2007). On the other hand, authors of “*The Jurassic of the Circum-Pacific*” (2005) or RICCIARDI (2008) insisted on the subfamily-level classification of *Planammatoceras (Pseudaptetoceras)*.

Two species are described here from the Gerecse assemblage: *P. klimakomphalum* (VACEK) and *P. aff. amalteiforme* (VACEK).

Distribution — *P. christiana* and *P. apertum* occur in the Aalensis Zone (Portugal: ELMI & MOUTERDE 1997, ELMI et al. 2007, Tunisia: SEKATNI et al. 2008, Morocco: EL HAMMICH et al. 2009) and in the Opalinum Zone (Morocco: EL ARABI et al. 2001). The genus is known from the Upper Aalenian of Italy (KÄLIN & URETA 1987, CALLOMON et al. 1995, CRESTA 1996), France (MAUBEUGE 1969), Spain (URETA 1988, LINARES & SANDOVAL 1993), Portugal (MOUTERDE et al. 1980, PAVIA & ENAY 1997), Germany (HOFFMANN 1966), Switzerland (CHRIST 1999), and the Caucasus (ROSTOVSEV 1992). It is typical of the Upper Aalenian–Lower Bajocian of Europe in Spain (GARCÍA-DUENAS et al. 1967, LINARES & RIVAS 1971, LINARES et al. 1971, SEYFRIED 1978, FERNÁNDEZ-LÓPEZ & SUÁREZ-VEGA 1979, URETA & GOY 1986, FERNÁNDEZ-LÓPEZ et al. 1988, LINARES et al. 1988, ALVARO et al. 1989, FERNÁNDEZ-LÓPEZ & GÓMEZ 1990,

MARTÍNEZ 1992, GARCÍA–FRANK 2005, SANDOVAL et al. 2008), in Portugal (MOUTERDE et al. 1972), in Italy (CRESTA & GALÁCZ 1990), in France (BLAISON et al. 1966, ELMI 1967, MAUBEUGE 1969, CONTINI 1970, BRANGER & GRONNIN 1994), in Britain (MORTON 1994, CALLOMON & COPE 1995, COX & SUMBLER 2002), in Germany (BAYER 1969, SCHLEGELMILCH 1985), in Hungary (GÉCZY 1966, CRESTA & GALÁCZ 1990), as well as of North and East Africa (DAGUIN 1927, ELMI & FAUGÈRES 1974, ELMI et al. 1974, 1999, SADKI 1994a, 1994b, 1996, SADKI & MOUTERDE 1994, EL ARABI et al. 1999, KAPILIMA 2003, MEKAHLI et al. 2004, SEKATNI et al. 2008), North America (WESTER-

MANN 1964b, 1969, IMLAY 1984, TAYLOR 1988, POULTON et al. 2005), and South America (BURCKHARDT 1903, HILLEBRANDT 1970, WESTERMANN & RICCARDI 1972, HILLEBRANDT & WESTERMANN 1985, GRÖSCHKE & HILLEBRANDT 1993, RICCARDI et al. 2005). It was also described from the Lower Bajocian of Turkey (BREMER 1966, KUZNETSOVA et al. 2003). The last representative is *P. amplectens*. It is characterised by a worldwide range (CONTINI 1994) and became extinct in the basal Bajocian, however, according to WESTERMANN (1969, 1992, 1993), it disappeared from the fauna only in the “Sauzei=Crassicostatum Zone” of South Alaska.

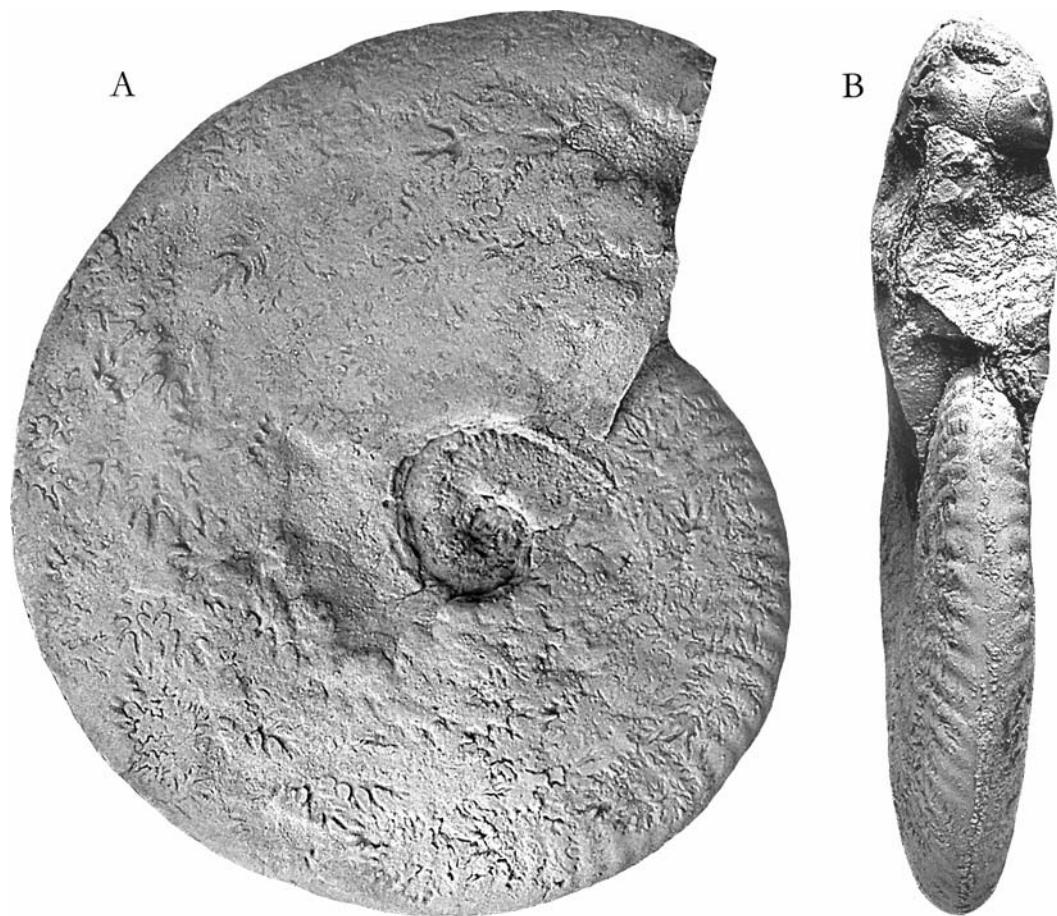


Figure 40 — *Pseudaptetoceras klimakomphalum* (VACEK). — Lateral (A) and ventral (B) view, Tölgyhát B, bed №: 28, Bradfordensis Subzone, ×1.

***Pseudaptetoceras klimakomphalum* (VACEK, 1886)**
(Figures 40–41)

- 1886: *Harpoceras klimakomphalum* — VACEK, p. 81, pl. 8, figs 16–17
 1903: *Harpoceras klimakomphalum* VACEK — BURCKHARDT, p. 15, pl. 2, figs 1–3
 1904: *Harpoceras (Lioceras) amalteiforme* VACEK mut. nov. *involuta* — PRINZ, p. 120
 1914: *Hammatoceras klimakomphalum* VACEK — FOSSA MANCINI, p. 77
 1924: *Euaptetoceras infernense* ROMAN — BUCKMAN, pl. 396b
 1925b: *Hammatoceras (Eudmetoceras) klimakomphalum* var. VACEK — RENZ, p. 16
 1930: *Deltotoceras Corryi* nov. sp. — GÉRARD, p. 508, pl. 49
 ? 1937: *Hammatoceras* cfr. *klimatokomphalum* [sic.] VACEK — VIALLI, p. 125
 1940: *Deltotoceras Corryi* — GÉRARD & BICHELONNE, p. 52, pl. 32, fig. 1
 ? 1941: *Hammatoceras* sp. — ALTHOFF, p. 38, pl. 6, fig. 11
 ? 1960: *Euaptetoceras infernense* ROMAN — LELEËVRE, p. 35, pl. 6, figs 7–8
 v 1966: *Hammatoceras (Pseudaptetoceras) klimakomphalum* (VACEK) — GÉCZY, p. 78, fig. 65, pl. 19, fig. 2, pl. 40, fig. 11

- v 1966: *Hammatoceras (Pseudaptetoceras) cf. klimakomphalum* (VACEK) — GÉCZY, p. 80, fig. 66, pl. 20, fig. 2, pl. 40, fig. 12
- v 1966: *Hammatoceras (Pseudaptetoceras) klimakomphalum involutum* (PRINZ) — GÉCZY, p. 80, fig. 67, pl. 20, figs 1, 3, pl. 40, fig. 13, pl. 41, fig. 1
- v 1966: *Hammatoceras (Pseudaptetoceras) klimakomphalum paenamplentes* n. subsp. — GÉCZY, p. 81, fig. 68, pl. 24, fig. 1, pl. 40, fig. 14
- 1967: *Eudmetoceras (Euaptetoceras) klimakomphalum* (VACEK) — SEYED-EMAMI, p. 94, pl. 3, figs 9–10, pl. 11, fig. 5
- 1969: *Eudmetoceras (Euaptetoceras) klimakomphalum* (VACEK) — WESTERMANN, p. 74
- 1971: *Eudmetoceras (Euaptetoceras) klimakomphalum* (VACEK) — SEYED-EMAMI, pl. 3, figs 9–10, pl. 11, fig. 5
- 1972: *Eudmetoceras (Euaptetoceras) cf. klimakomphalum klimakomphalum* (VACEK) — WESTERMANN & RICCARDI, p. 31, pl. 3, fig. 4
- 1982: *Planammatoceras (Pseudaptetoceras) klimakomphalum* (VACEK) — WESTERMANN & RICCARDI, p. 21, textfig. 4/C–E (lectotype, refig. VACEK, l.c.)
- 1984: *Planammatoceras (Euaptetoceras) cf. klimakomphalum* (VACEK) — KAPILIMA, p. 46, pl. 5, figs 1–2
- 1985: *Planammatoceras (Pseudaptetoceras) klimakomphalum* (VACEK) — HILLEBRANDT & WESTERMANN, p. 30, pl. 6, figs 2–4
- 1987: *Planammatoceras (Pseudaptetoceras) aff. klimakomphalum* (VACEK) — SEYED-EMAMI, p. 379, pl. 4, fig. 1
- 1988: *Euaptetoceras klimakomphalum* (VACEK) — LINARES et al., pl. 2, fig. 13
- 2004: *Planammatoceras (Pseudaptetoceras) aff. klimakomphalum* (VACEK) — SEYED-EMAMI et al., p. 88, pl. 2, fig. 6
- 2004: *Pseudaptetoceras* gr. *klimakomphalum* (VACEK) — MYCZYNSKI, p. 106, fig. 24/1

Material — Five internal moulds of mediocre preservation, and 1 fragment.

Measurements	D	H	h	W	w	U	u
HP49	162	74	45%	26	35%	?	?
HTB28D	124	58	46%	20	34%	24	19%
HTB23A	108	49	45%	20	40%	22	20%
HTB22A	100	48	48%	20	41%	20	20%

Description — Large, involute, discoidal form with narrow and deep umbilicus. The umbilical wall is high and vertical, the margin is rounded. The flanks are slightly convex, almost flat, without shoulder. The narrow venter bears conella indicating a high, hollow-floored keel. The whorl-section is ogival with maximum width below the mid-flank. The ornamentation cannot be visible in all detail, but is characterised by weakly developed, flexuous ribbing. Fine, radial primaries emerge from the umbilicus and branch at about the mid-height. The sigmoid secondaries bend forward on the venter and fade away by the carina. The hammatoceratid suture-line consists of broad, ramified E, moderately long, slightly narrow, ramified and somewhat asymmetrical L, and oblique, quartering U lobes.

Remarks — In spite of the poor preservation, the Gerecse specimens appear to agree in morphology and ornamentation with the lectotype (VACEK 1886, pl. 8, figs 16–17, refigured by WESTERMANN & RICCARDI 1982, textfig. 4/C–E), as well as with the specimens of BUCKMAN (1924, pl. 396b), GÉCZY (1966, pl. 19, fig. 2, pl. 20, figs 1–3, pl. 24, fig. 1), HILLEBRANDT & WESTERMANN (1985, pl. 6, fig. 4), and SEYED-EMAMI (1987, pl. 4, fig. 1). Specimen HTB28D (Figure 40) bears umbilical conella, which feature was recorded from the Bakonycsernye material by GÉCZY (1966: 78) as well. Both the morphology and ornamentation of the *Hammatoceras* sp. figured by ALTHOFF (1941, pl. 6, fig. 11) seem well consistent with the lectotype (VACEK, l.c.). *Deltotoceras corroyi* GÉRARD was reinterpreted as *Euaptetoceras amalteiforme* by SEYED-EMAMI (1967: 93). This reclassification seems justified, but, on the basis of the author's description (GÉRARD 1930: 508), and of the compressed, ogival section, the specimen appears to be *P. klimakomphalum*.

The most closely allied form is *P. amalteiforme*, but it differs by having broader, oval whorls, slightly stronger secondary ribs and less developed primaries on the inner

whorls ceasing on the body chamber.

Distribution — Aalensis–Opalinum Zones: Morocco (EL HAMMACHI et al. 2006, 2009). Lower Dogger: South America (BURCKHARDT 1903). Aalenian: Spain (AZÉMA et al. 1971, SEYFRIED 1978). Uppermost Aalenian: Portugal (MOUTERDE & RUGET 1967a). Opalinoides Subzone: Tunisia (SEKATNI et al. 2008). Haugi Subzone: Italy (KÄLIN & URETA 1987). Klimakomphalum Biozone: Italy (CRESTA 1994). Bradfordensis Subzone: Britain (CALLOMON et al. 1995, CALLOMON & COPE 1995, COX & SUMBLER 2002). Murchisonae–Bradfordensis Zones: Italy (CRESTA 1996). Murchisonae–Concavum Zones: Italy (San Vigilio: CALLOMON et al. 1995). Concavum Zone: Italy (CECCA et al. 1990, CRESTA & GALÁCZ 1990), Spain (HENRIQUES et al. 1995), Iran (SEYED-EMAMI 1967), Algeria (ELMI et al. 1974), Morocco (DAGUIN 1927, BENSHILI 1989, EL ARABI et al. 2001), Tanzania (KAPILIMA 1984, 2003). Aalenian–Bajocian boundary: South America (RICCARDI et al. 2005). Upper Aalenian–Lower Bajocian: Hungary, Bakonycsernye (GÉCZY 1966, 1967b), Spain (FOUCAULT 1971). Gigantea Subzone–Discites Zone: Spain (SANDOVAL et al. 2007). Concavum–Discites Zones: France (GÉRARD 1930), Spain (HERNÁNDEZ–MOLINA et al. 1991), Portugal (MOUTERDE et al. 1972). Limitatum Subzone: Spain (LINARES & SANDOVAL 1993), Portugal (HENRIQUES 1995, HENRIQUES et al. 1995, PAVIA & ENAY 1997), Morocco (SADKI 1994a, 1996). Formosum horizon: France (CONTINI 1970). Limitatum–Discites Sub-zones: Spain (LINARES et al. 1988). Concava–lower Sowerby Zone: South America (WESTERMANN & RICCARDI 1972). Malarguensis Zone: South America (HILLEBRANDT & WESTERMANN 1985, GRÖSCHKE & HILLEBRANDT 1993, RICCARDI 2008). Discites Zone: France (ELMI 1967), Morocco (ELMI & FAUGÈRES 1974). The Gerecse specimens came from the Murchisonae Subzone–?Concavum Zone.

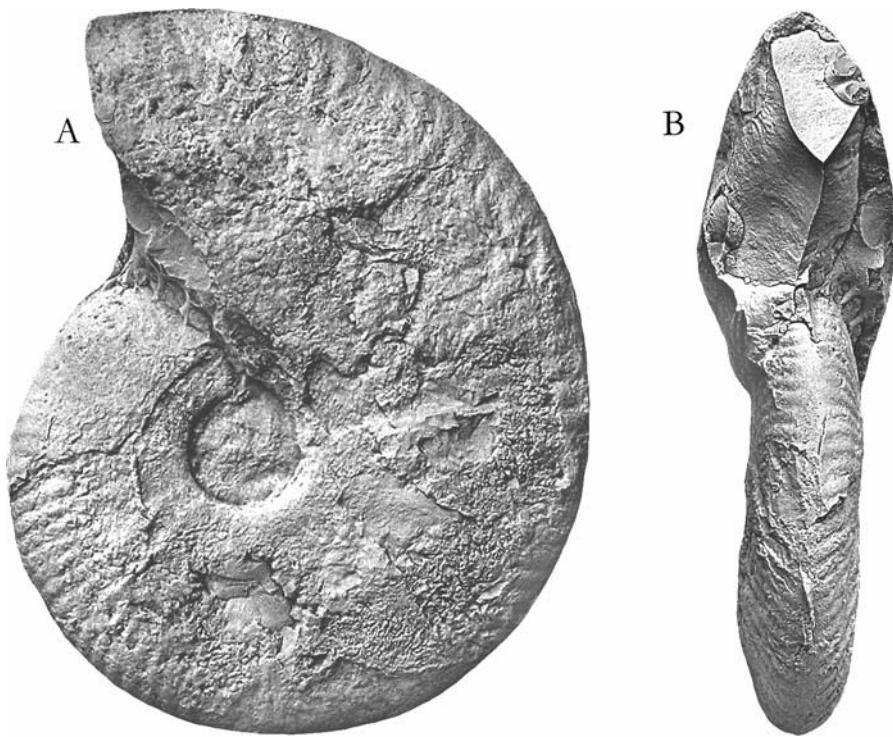


Figure 41 — *Pseudaptetoceras klimakomphalum* (VACEK). — Lateral (A) and ventral (B) view, Tölgyhát B, bed №: 22, ventral part, Bradfordensis Subzone, $\times 1$.

Pseudaptetoceras aff. *amaltheiforme* (VACEK, 1886)
(Figure 42)

- 1886: *Harpoceras amaltheiforme* n. sp. — VACEK, p. 81, pl. 9, figs 1–4
1904: *Harpoceras (Lioceras) amaltheiforme* VACEK — PRINZ, p. 119
1914: *Hammatoceras amaltheiforme* VACEK — FOSSA MANCINI, p. 78
1925b: *Hammatoceras (Eudmetoceras) amaltheiforme* VACEK — RENZ, p. 15
non v 1937: *Hammatoceras amaltheiforme* VACEK — VIALLI, p. 123, pl. 2, figs 2–4
v 1966: *Hammatoceras (Pseudaptetoceras) amaltheiforme* (VACEK) — GÉCZY, p. 82, fig. 69, pl. 21, pl. 41, fig. 5
1966: *Eudmetoceras (Enaptetoceras) amaltheiforme* (VACEK) — BREMER, p. 158, pl. 15, fig. 2
1967: *Eudmetoceras (Enaptetoceras) amaltheiforme* (VACEK) — SEYED-EMAMI, p. 91, pl. 3, fig. 8, pl. 11, figs. 1–2
1971: *Eudmetoceras (Enaptetoceras) amaltheiforme* (VACEK) — SEYED-EMAMI, pl. 3, fig. 8, pl. 11, figs 1–2
1982: *Eudmetoceras?* (*Enaptetoceras?*) *amaltheiforme* (VACEK) — WESTERMANN & RICCARDI, textfig. 4/A–B
1990: *Eudmetoceras (Enaptetoceras) amaltheiforme* (VACEK) — CRESTA & GALÁCZ, pl. 9, figs 1–2
v 1990: *Eudmetoceras (Enaptetoceras) sp. aff. amaltheiforme* (VACEK) — CRESTA & GALÁCZ, pl. 2, fig. 3, pl. 3, pl. 4, fig. 1
1993: *Eudmetoceras (Enaptetoceras) amaltheiforme* (VACEK) — SEYED-EMAMI et al., p. 22, pl. 4, fig. 5

Material — One internal mould of poor state of preservation.

Measurements	D	H	h	W	w	U	u
HP48	134	64	48%	30	47%	23	17%

Description — Medium-size, involute form with narrow and deep umbilicus. The umbilical wall is steep, the margin is rounded. The flanks are slightly convex, the venter is moderately wide, low and rounded. It bears conella indicating a hollow-floored keel. The whorl-section is oval with maximum width at the mid-height. No body chamber is present. The ornamentation consists of weakly developed ribbing dying out on the last whorl. The suture-line is scarcely visible, but shows hammatoceratid construction.

Remarks — On the basis of morphology, the Gerecse specimen can be well connected with the lectotype (VACEK 1886, pl. 9, fig. 1) designated and refigured by WESTERMANN & RICCARDI (1982, textfig. 4/A–B), and also with the specimens of GÉCZY (1966, pl. 21), SEYED-EMAMI

(1967, pl. 11, figs 1–2) and CRESTA & GALÁCZ (1990, pl. 3, pl. 9). However, the poor state of preservation does not allow certain arrangement. *P. amplectens* is a closely allied form, but it differs by bearing coarser ribbing, and by having more oblique umbilical slope with a subtriangular section (BUCKMAN 1920, pl. 180a, fig. 1, ELM 1963: 73, fig. 27, HOFFMANN 1966: 15, pl. 2, fig. 1, WESTERMANN 1969, pl. 21, fig. 1, SCHLEGELMILCH 1985: 28). The wide umbilicus of *H. amaltheiforme* and *H. amaltheiforme* var. *verruosa* specimens figured by VIALLI (1937, pl. 2, figs 2–4) is not typical of *P. amaltheiforme*. They probably represent *Planammatoceras*.

Distribution — Uppermost Aalenian: Hungary, Bakony-csernye (GÉCZY 1966). Murchisonae Zone: Italy (CECCA et al. 1990). Bradfordensis Subzone: Spain (LINARES & SAN-

DOVAL 1992, 1993). Gigantea Subzone–Concavum Zone: Spain (SANDOVAL et al. 2007). Concavum Subzone: Morocco (SADKI 1994a, 1996). Formosum Subzone: Italy (CALLOMON et al. 1995). Telegdirothi Biozone: Italy (CRESTA 1994). Concavum Zone: Italy (CRESTA 1996), Iran (SEYED-EMAMI 1967). Sparsicostatus–Mowichense (=Murchisonae–Concavum) Zones: Oregon (TAYLOR 1988, POULTON et al. 2005). Concavum–Discites Zones: Spain (SANDOVAL &

CHANDLER 2000), Tunisia (SEKATNI et al. 2008). Discites Zone: Italy (CRESTA & GALÁCZ 1990), Spain (HERNÁNDEZ–MOLINA et al. 1991). Discites Subzone: Turkey (BREMER 1966). Lower Bajocian: Turkey (KUZNETZOVA et al. 2003). In the Gerecse Mts, the taxon was described from the Discites Zone of Tölgyhát Quarry by CRESTA & GALÁCZ (1990). The specimen figured here came from the (?)Concavum Zone of the Pisznice section (bed 48).

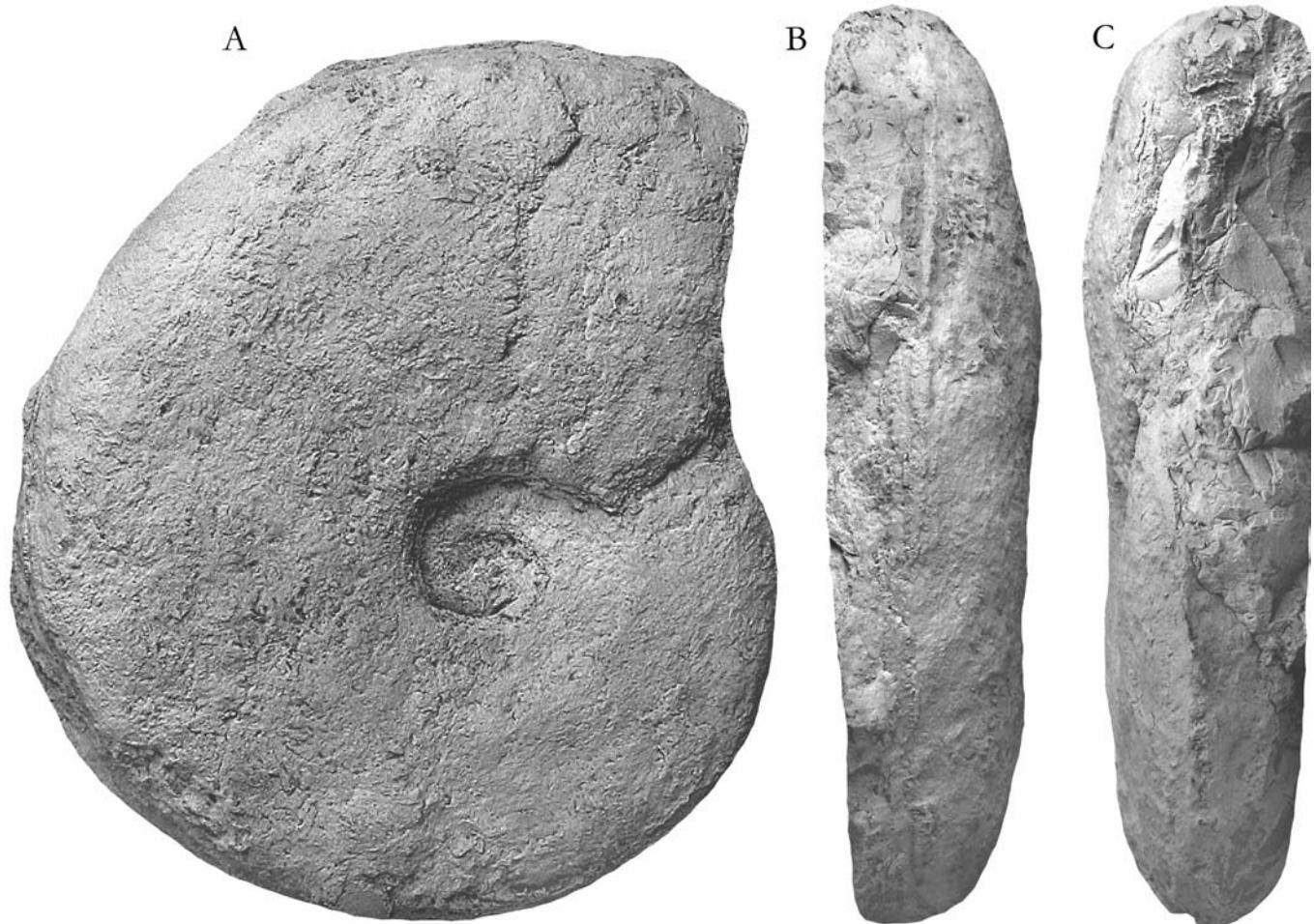


Figure 42 — *Pseudaptetoceras* aff. *amaltheiforme* (VACEK). — Lateral (A) and ventral (B) and “apertural” (C) view, Pisznice, bed №: 48, ? Concavum Zone, ×1.

Comparisons of some Hammatoceratinae faunas of the Mediterranean–Caucasian Realm

The Gerecse hammatoceratid fauna described here can be compared with various materials from both the Mediterranean and the NW European Provinces with adoption of the taxonomic nomenclature used in this paper (Table 7–9).

The diversity of the Late Toarcian hammatoceratids is elaborated in the literature. Assemblages of Central Apennines (Italy) were documented by MERLA 1934, DEZI & RIDOLFI 1978, CRESTA et al. 1989, VENTURI 1994, VENTURI & FERRI 2001, VENTURI & ROSSI 2003, and VENTURI & BILOTTA 2008. The hammatoceratids of Lyon region (France) were described by RIAZ 1907, MOUTERDE 1953, ELMY & RULLEAU 1991, 1993, RULLEAU 1996, 2007, and RULLEAU et al. 2001. The Spanish faunas were detailed from the Iberian Range by BEHMEL & GEYER 1966,

URETA & GOY 1986, MARTÍNEZ 1992, URETA et al. 1999, SANDOVAL et al. 2001, from the Betic Range by LINARES & RIVAS 1971, GEYER & HINKELBEIN 1974, GARCÍA-GÓMEZ et al. 1994, SANDOVAL et al. 2001, 2007, CARACUEL et al. 2006. Assemblages of Moroccan Atlas were recorded by DAGUIN 1927, DUBAR 1936, TERMIER & DUBAR 1940, ELMY & FAUGÈRES 1974, ELMY et al. 1974, BENSHILI 1989, SADKI 1996, ELMY et al. 1999, EL ARABI et al. 2001, IGMOULLAN et al. 2001, TADILI et al. 2004, EL HAMMICH et al. 2009. The close affinity of the Gerecse hammatoceratids with the Italian, Spanish, Moroccan and French materials is undoubtful. Both provinces are characterised by wide range of *Geczyceras* and *Crestaites*, although regarding the diversity of *Geczyceras*, the Gerecse fauna is

closer to that of Spain, but considering *Crestaites* the same species occur in the Gerecse Mts and in the Central Apennines. On the other hand, *Hammatoceras* and *Bredyia* are less diversified in the Mediterranean Province, also scarce in Morocco, Italy and in the Betic Range, therefore, their sporadic appearance in the Gerecse material establishes again the paleobiogeographic connection with NW Europe. The Upper Toarcian occurrence of *Planammatoceras* is more characteristic in the Mediterranean Province, on the other side, the earliest representatives of *Pseudaptetoceras* appear in North Africa, Portugal and France (Table 7).

The Aalenian Gerecse hammatoceratid assemblage can be compared with the Bakonycsernye material documented by GÉCZY (1966). In contrast to the Gerecse Mts where the presence of the Concavum Zone is uncertain (KOVÁCS & GÉCZY 2008: 60), the Aalenian–Bajocian sequence of the Bakonycsernye section is continuous, its fauna contains numerous species typical of the Concavum Zone or around the Aalenian–Bajocian boundary. Except for this difference, the two materials agree well in diversity on the whole: the proportion of identical hammatoceratid species is 43%. However, the absence of *Parammatoceras*, as well as the low diversity of *Accardia* in the Gerecse Mts is remarkable. Considering the lack of *Parammatoceras*, the low diversity of *Bredyia* and *Planammatoceras*, as well as the average diversity of *Accardia* and *Pseudaptetoceras*, the Gerecse hammatoceratids appear to be typical of the Mediterranean Province, but the scarcity of *Eudmetoceras* is notable. The Italian occurrences were discussed by VACEK 1886, CALLOMON et al. 1995 (San Vigilio), and CECCA et al. 1990, CRESTA 1994, 1996 (Monte Nerone). The fauna of the Betic Range was detailed by GARCÍA–DUENAS et al. 1967, LINARES & RIVAS 1971, LINARES et al. 1988, HERNÁNDEZ–MOLINA et al. 1991, LINARES & SANDOVAL 1992, 1993, SANDOVAL et al. 2001, 2007. The Moroccan fauna was documented by DAGUIN 1927, TERMIER & DUBAR 1940, GARDET & GÉRARD 1946, LELIÈVRE 1960, ELMI & FAUGÈRES 1974, BENSHILI 1989, SADKI 1994a, 1994b, 1996, EL ARABI et al. 1999, 2001, ELMI et al. 1999, EL HAMMICH et al. 2009 (Table 8).

The Aalenian Bakonycsernye and Gerecse faunas also show affinity with those which were described from the NW European Province by CALLOMON & CHANDLER 1990, 1994, CALLOMON & COPE 1995, COX & SUMBLER 2002, CHANDLER & CALLOMON 2009 (Dorset region),

ROMAN & BOYER 1923, ELMI & RULLEAU 1993, RULLEAU 1996, 2007, RULLEAU et al. 2001 (Lyon region), MARTÍNEZ 1992, SANDOVAL et al. 2001 (Iberian Range), RENZ 1912a, PERROT 1955, PERROT & MOUTERDE 1957, CAMARATE FRANCA & MOUTERDE 1964–1965, MOUTERDE et al. 1972, 1980, HENRIQUES 1995, 2000, HENRIQUES et al. 1995, PAVIA & ENAY 1997 (Lusitanian Basin), SEYED–EMAMI 1967, 1971, 1987, and SEYED–EMAMI et al. 1993, 2004, 2005, 2006, 2008 (North and Central Iran) (Table 9). Although *Bredyia* is less diversified, the Bakonycsernye hammatoceratids are markedly close to that of the Lyon region. Regarding the occurrences of *Accardia*, *Planammatoceras* and *Pseudaptetoceras*, the Gerecse assemblage appears to bear proportion to that of NW Europe. The hammatoceratids documented from different localities of North and Central Iran are closely related to those of NW Europe (SEYED–EMAMI et al. 2001, 2006, 2008), but they show close affinity with both the Bakonycsernye and the Gerecse materials as well, mainly regarding the diversity of *Pseudaptetoceras*. Although the taxonomic character of the Toarcian–Aalenian Ammonoidea in the Gerecse Mts is obviously Mediterranean (proportion of Phylloceratina and Lytoceratina is 64% in total in the Thouarsense, and 92% in the Murchisonae Zones), yet as the Tethys Ocean was connected to the epicontinental sea of NW Europe, the Mediterranean Ammonitina is generally similar to that of the contemporary NW European Province (SANDOVAL et al. 2001, GÉCZY & SZENTE 2007, MAROK et al. 2007, PAGE 2008). The Gerecse Ammonitina fauna on the whole, as well as the Hammatoceratinae characterised by both Mediterranean and NW European genera also confirm the connection.

Despite its world-wide distribution, the subfamily is unknown from the Arctic region, otherwise it has a well-defined cosmopolitan character during the Late Toarcian–Aalenian. There are only a few genera which can be considered as typical representatives of the Mediterranean–Caucasian Realm. The Upper Toarcian *Crestaites* is the unique common hammatoceratid, which was recorded only from European, North-African and Iranian localities. *Accardia* seems to be represented by *A. vigrassi* TAYLOR in North America (TAYLOR 1988), and by *A. cf. lorteti* in South America (BURCKHARDT 1903). *Rhodaniceras* and *Paviaites* appear to be rare taxa, their detailed distribution needs more research.

Conclusions

As a result of recent studies of the Gerecse Ammonitina assemblage, the abundance of the erycitid (KOVÁCS & GÉCZY 2008) and the hammatoceratid faunas became apparent. The Hammatoceratinæ is represented by 7 genera and 31 species, and its Upper Toarcian diversity with 19 species is one of the highest in the Mediterranean–Caucasian Realm. Some species, whose Hungarian occurrence has been known only from the Bakony Mts, are described now from the Gerecse Mts as well (*Crestaites rericostatus*, *C. victorii*, *Geczyceras* aff. *allobrogense*, *Hammatoceras insigne*, *Planammatoceras planinsigne*, *P. kochi*, *P. stenomphalum*, *P. aff.*

planiforme, *Bredyia subinsignis*, *B. brancoi*, *B. rugata*, *Accardia diadematooides*, *A. eximia*, *A. noszkyi*, *Pseudaptetoceras klimakomphalum*). Some species are first recorded from Hungary (*Geczyceras bonarelli*, *G. cf. clausum*, *Crestaites goyi*, *Hammatoceras trigonatum*, *H. pachu*, *H. aff. semilunatum*). The rich material made possible to introduce three new hammatoceratid species (*Geczyceras galaczi* n. sp., *G. martinezae* n. sp., *Crestaites szentei* n. sp.). Both the validity of the genera *Geczyceras* and *Crestaites* introduced in the last decades, and the validity of *Pseudaptetoceras* are confirmed in this paper.

The Úrkút section (Bakony Mts) yielded a rich Middle-

Upper Toarcian Ammonitina assemblage, however, only a few specimens belong to the Erycitinae and Hammatoceratinae were collected (GÉCZY 1965, 1967c). The Bakony-csernye sections were characterised by a rich Aalenian hammatoceratid material, but the Toarcian erycidids and

hammatoceratids were also rather scarce (GÉCZY 1966, 1967a, 1967b). The Bakony and the Gerecse assemblages adequately complement each other; consequently, they provide a more complex knowledge of the Hammatocerataceae of the Transdanubian Range of Hungary.

Table 7 — Comparison of taxonomic composition of Late Toarcian hammatoceratid faunas in the NW European and Mediterranean Provinces.

Moroccan Atlas Mediterranean P.	Iberian Range (Spain) NW European P.	Lyon region (France) NW European P.	Betic Range (Spain) Mediterranean P.	C. Apennines (Italy) Mediterranean P.	Gerecse Mts (Hungary) Mediterranean P.
Geczyceras <i>G. speciosum</i> <i>G. porcarellense</i> <i>G. bonarelli</i> <i>G. perplanum</i> <i>G. tipperi</i> <i>G. allobrogense</i> (DUMORTIER)	Geczyceras <i>G. speciosum</i> <i>G. porcarellense</i> <i>G. bonarelli</i> <i>G. perplanum</i> <i>G. allobrogense</i> <i>G. costatum</i> (GABILLY) <i>G. clausum</i> (GABILLY) <i>G. gabillyi</i> MARTINEZ	Geczyceras <i>G. speciosum</i> (JANENSCH) <i>G. porcarellense</i> (BONARELLI) <i>G. bonarelli</i> (PARISCH et VIALE) <i>G. perplanum</i> (PRINZ) <i>G. tipperi</i> (SEYED- EMAMI) <i>G. subplanatum</i> (BRUN)	Geczyceras <i>G. speciosum</i> <i>G. porcarellense</i> <i>G. bonarelli</i> <i>G. perplanum</i> <i>G. allobrogense</i> <i>G. costatum</i> <i>G. galaczi</i> n.sp. <i>G. martinezae</i> n.sp.	Geczyceras <i>G. speciosum</i> <i>G. porcarellense</i> <i>G. bonarelli</i> <i>G. perplanum</i> <i>G. allobrogense</i> ? <i>G. aff. subplanatum</i> ? <i>G. galaczi</i> n.sp.	Geczyceras <i>G. speciosum</i> <i>G. porcarellense</i> <i>G. bonarelli</i> <i>G. perplanum</i>
Crestaites <i>C. meneghinii</i> <i>C. cf. meneghinii</i> <i>C. victori</i> <i>C. aff. victori</i>	Crestaites <i>C. meneghinii</i> <i>C. victori</i> <i>C. goyi</i>	Crestaites <i>C. meneghinii</i> (BONARELLI) <i>C. victori</i> (BONARELLI) <i>C. goyi</i> (MARTINEZ)	Crestaites <i>C. meneghinii</i> <i>C. victori</i>	Crestaites <i>C. meneghinii</i> <i>C. victori</i> , ? <i>C. goyi</i> <i>C. raricostatus</i> (GÉCZY) <i>C. szentei</i> n.sp.	Crestaites <i>C. meneghinii</i> <i>C. victori</i> <i>C. goyi</i> <i>C. raricostatus</i> <i>C. szentei</i> n.sp.
Hammatoceras <i>H. insigne</i> <i>H. cf. pachu</i> <i>H. n. sp. aff.</i> <i>semilunatum</i> <i>H. praefallax</i> (MONESTIER)	Hammatoceras <i>H. insigne</i> <i>H. trigonatum</i> <i>H. pachu</i> <i>H. semilunatum</i> <i>H. praefallax</i>	Hammatoceras <i>H. insigne</i> (SCHÜBLER) <i>H. trigonatum</i> (QUENSTEDT) <i>H. pachu</i> (BUCKMAN) <i>H. semilunatum</i> (QUENSTEDT)	Hammatoceras <i>H. praefallax</i>	Hammatoceras <i>H. insigne</i>	Hammatoceras <i>H. insigne</i> <i>H. trigonatum</i> <i>H. pachu</i> H. aff. <i>semilunatum</i>
Planammatoceras <i>P. tenuinsigne</i> (VACEK)	Planammatoceras <i>P. planinsigne</i> (VACEK)	Planammatoceras <i>P. sieboldi</i> (OPPEL)	Planammatoceras <i>P. aff. planiforme</i> <i>P. aff. tenuinsigne</i> <i>P. brontes</i> (GEMMELLARO)	Planammatoceras <i>P. planiforme</i> BUCKMAN <i>P. planinsigne</i> <i>P. tenuinsigne</i>	Planammatoceras <i>P. tenuinsigne</i> <i>P. sp.</i>
Accardia <i>A. procerinsigne</i>	Accardia <i>A. lorteti</i> (DUMORTIER)	Accardia <i>A. cf. procerinsigne</i> (VACEK)	Accardia <i>A. procerinsigne</i>		
Bredyia <i>B. brancoi</i>	Bredyia <i>B. subinsignis</i> <i>B. brancoi</i> <i>B. uretae</i> MARTINEZ <i>B. newtoni</i> BUCKMAN	Bredyia <i>B. subinsignis</i> (OPPEL) <i>B. brancoi</i> (PRINZ) (=boyeri ELM) <i>B. clocheri</i> (RULLEAU & ELM)	Bredyia <i>Bredyia</i> sp		Bredyia <i>B. subinsignis</i> <i>B. brancoi</i>
Pseudaptetoceras <i>P. apertum</i> (ELMI & MOUTERDE) <i>P. christiana</i> (ELMI & MOUTERDE)		Pseudaptetoceras <i>Pseudaptetoceras</i> sp.		Parammatoceras <i>P. astraeum</i> (GEMMELLARO)	

Table 8 — Comparison of taxonomic composition of Aalenian hammatoceratid faunas in the Mediterranean Province.

Moroccan Atlas Mediterranean Province	Betic Range (Spain) Mediterranean Province	San Vigilio (Italy) Mediterranean Province	Mt. Nerone (Italy) Mediterranean Province	Bakonycsernye (Hungary) Mediterranean Province	Gerecse Mts (Hungary) Mediterranean Province
Bredyia <i>B. subinsignis</i> (OPPEL) <i>B. brancoi</i> (PRINZ) <i>B. guliensis</i> (RENZ) <i>B. flexuosa</i> (ELMI)	Bredyia <i>B. subinsignis</i> <i>B. uretae</i> MARTINEZ	Bredyia ? <i>B. subinsignis</i>	Bredyia <i>B. subinsignis</i>	Bredyia <i>B. subinsignis</i> <i>B. brancoi</i> <i>B. rugata</i> (BUCKMAN)	Bredyia <i>B. subinsignis</i> <i>B. brancoi</i> <i>B. rugata</i>
Rhodaniceras <i>Rh. rhodanicum</i> (RENZ) <i>Rh. dubari</i> SADKI	Rhodaniceras <i>Rh. cf. rhodanicum</i>				
	Paviaites <i>P. tenerus</i> (VACEK) <i>P. mediterraneus</i> (GÉCZY)	Paviaites <i>P. tenerus</i>	Paviaites <i>P. tenerus</i>	Paviaites <i>P. tenerus</i> <i>P. mediterraneus</i>	
Parammatoceras <i>P. obtectum</i> BUCKMAN <i>P. cf. megacanthum</i> (BRASIL)	Parammatoceras <i>P. obtectum</i> <i>P. alleoni</i> (DUMORTIER) <i>P. auerbachense</i> (DORN)	Parammatoceras <i>P. obtectum</i>		Parammatoceras <i>P. obtectum</i> <i>P. cf. megacanthum</i> <i>P. baonicum</i> (PRINZ) <i>P. auerbachense</i> <i>P. ? hungaricum</i> (GÉCZY) <i>P. cf. ferrugineum</i> MAUB.)	
Planammatoceras <i>P. planiforme</i> BUCKMAN <i>P. planinsigne</i> (VACEK) <i>P. tenuinsigne</i> (VACEK) <i>P. sieboldi</i> (OPPEL)	Planammatoceras <i>P. planiforme</i> <i>P. planinsigne</i> <i>P. tenuinsigne</i> <i>P. brontes</i> (GEMMELLARO) <i>P. cf. sieboldi</i>	Planammatoceras <i>P. planinsigne</i> <i>P. tenuinsigne</i> <i>P. sieboldi</i>	Planammatoceras <i>P. planinsigne</i> <i>P. tenuinsigne</i>	Planammatoceras <i>P. planiforme</i> <i>P. planinsigne</i> <i>P. tenuinsigne</i> <i>P. sieboldi</i> <i>P. stenomphalum</i> (PRINZ) <i>P. kochi</i> (PRINZ) <i>P. aff. gerthi</i> (JAWORSKI)	Planammatoceras <i>P. aff. planiforme</i> <i>P. planinsigne</i> <i>P. tenuinsigne</i> <i>P. stenomphalum</i> <i>P. kochi</i>
Accardia <i>A. lorteti</i> (DUMORTIER) <i>A. procerinsigne</i> (VACEK) <i>A. spinosa</i> (HANTKEN) <i>A. diadematooides</i> (MAYER)	Accardia <i>A. lorteti</i> <i>A. procerinsigne</i> <i>A. diadematooides</i>	Accardia <i>A. lorteti</i> <i>A. lorteti multicostata</i> (GÉCZY) <i>A. procerinsigne</i> <i>A. liebi</i> (MAUBEUGE)	Accardia <i>A. lorteti</i> <i>A. procerinsigne</i> <i>A. liebi</i> <i>A. fossai</i> (MERLA)	Accardia <i>A. lorteti multicostata</i> (GÉCZY) <i>A. liebi</i> <i>A. spinosa</i> <i>A. eximia</i> <i>A. noszkyi</i> (GÉCZY)	Accardia <i>A. diadematooides</i> <i>A. eximia</i> (PRINZ) <i>A. noszkyi</i>
Pseudaptetoceras <i>P. klimakomphalum</i> (VACEK) <i>P. amaltheiforme</i> (VACEK) <i>P. infernense</i> (ROMAN) <i>P. apertum</i> (ELMI & MOUTERDE)	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. amaltheiforme</i> <i>P. cf. discus</i> (MERLA) <i>P. dorsatum</i> (MERLA) <i>P. amplectens</i> BUCKMAN <i>P. infernense</i>	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. amaltheiforme</i>	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. amaltheiforme</i> <i>P. dorsatum</i> <i>P. discus</i> <i>P. amplectens</i>	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. amaltheiforme</i> <i>P. dorsatum</i> <i>P. discus</i> <i>P. discus pannonicus</i> (GÉCZY)	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. aff. amaltheiforme</i>
Eudmetoceras <i>E. eudmetum</i> BUCKMAN <i>E. prosphues</i> BUCKMAN <i>E. masticonense</i> ELMI <i>E. cf. masticonense</i>	Eudmetoceras <i>E. subbeticum</i> LINARES <i>E. prosphues</i> <i>E. cf. masticonense</i>		Eudmetoceras <i>E. eudmetum</i>		

Table 9 — Comparison of taxonomic composition of Aalenian hammatoceratid faunas in NW Europe and Iran.

Dorset region (Britain) NW European Province	Lyon region (France) NW European Province	Iberian Range (Spain) NW European Province	Lusitanian Basin (Portugal) NW European Province	North and Central Iran NW European Province
Bredyia <i>B. subinsignis</i> (OPPEL) <i>B. rugata</i> (BUCKMAN) <i>B. brancai</i> (PRINZ) (= <i>boyeri</i> ELM)	Bredyia <i>B. subinsignis</i> <i>B. rugata</i> <i>B. newtoni</i> BUCKMAN <i>B. lagardettei</i> RULLEAU & ELM	Bredyia <i>B. subinsignis</i> <i>B. rugata</i> <i>B. brancai</i> <i>B. newtoni</i> <i>B. fuentelsazensis</i> MARTINEZ <i>B. buxtorfi</i> (RENZ)	Bredyia <i>B. subinsignis</i> <i>B. rugata</i> <i>Rhodaniceras</i> sp.	Bredyia <i>B. subinsignis</i> <i>B. cf. rugata</i> <i>B. brancai</i> <i>B. guliensis</i> (RENZ) <i>B. flexuosa</i> (ELM) <i>B. iranica</i> <i>B. shahmirzadensis</i> <i>B. alborensis</i> <i>B. stabli</i> SEYED-EMAMI
Parammatoceras <i>P. grande</i> ELM	Parammatoceras <i>P. alleoni</i> (DUMORTIER) <i>P. auerbachense</i> (DORN)	Parammatoceras <i>P. alleoni</i> <i>P. aff. auerbachense</i>	Parammatoceras Parammatoceras sp.	Parammatoceras <i>P. alleoni</i> <i>P. aff. ferrugineum</i> (MAUBEUGE)
Planammatoceras <i>P. planiforme</i> BUCKMAN <i>P. planinsigne</i> (VACEK) <i>P. sieboldi</i> (OPPEL) <i>P. tenellum</i> CALLOMON & CHANDLER	Planammatoceras <i>P. planiforme</i> <i>P. planinsigne</i> <i>P. sieboldi</i> <i>P. tenuinsigne</i> (VACEK) <i>P. stenomphalum</i> (PRINZ) <i>P. aff. tricolore</i> WESTERMANN & RICCARDI	Planammatoceras <i>P. planiforme</i> <i>P. aff. planinsigne</i> <i>P. tenuinsigne</i> <i>P. sieboldi</i> <i>P. raceki</i> (BRASIL) <i>P. aff. romani</i> ELM	Planammatoceras <i>P. aff. planinsigne</i> <i>P. aff. sieboldi</i>	Planammatoceras <i>P. planiforme</i> <i>P. aff. planinsigne</i> <i>P. cf. sieboldi</i> <i>P. cf. tricolore</i>
Accardia <i>A. lorteti</i> (DUMORTIER) <i>A. aff. procerinsigne</i> (VACEK)	Accardia <i>A. lorteti</i> <i>A. enricoi</i> CRESTA <i>A. liebi</i> (MAUBEUGE) <i>A. cf. fossai</i> (MERLA) <i>A. mouterdei</i> (ELM) <i>A. eximia</i> (PRINZ) <i>A. diadematooides</i> (MAYER) (<i>H. raceki</i> ROMAN & BOYER)	Accardia <i>A. lorteti</i>	Accardia <i>A. lorteti</i> <i>A. diadematooides</i>	Accardia <i>A. diadematooides</i>
Pseudaptetoceras <i>P. klimakomphalum</i> (VACEK) <i>P. amplexens</i> (BUCKMAN)	Pseudaptetoceras <i>P. richei</i> (ELM)	Pseudaptetoceras Pseudaptetoceras sp.	Pseudaptetoceras <i>P. apertum</i> (ELM & MOUTERDE) <i>P. christiana</i> (ELM & MOUTERDE) <i>P. klimakomphalum</i> <i>P. amplexens</i> <i>P. sp. aff. richei</i> <i>P. infernense</i> (ROMAN)	Pseudaptetoceras <i>P. klimakomphalum</i> <i>P. amalteiforme</i> (VACEK) <i>P. amplexens</i>
Eudmetoceras <i>E. eudmetum</i> BUCKMAN	Eudmetoceras <i>E. prosphues</i> BUCKMAN <i>E. aff. actinomphalum</i> (BRASIL) <i>E. renzi</i> (ELM)	Eudmetoceras sp.	Eudmetoceras <i>E. prosphues</i>	Eudmetoceras <i>E. prosphues</i>

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