

REVUE DE
PALÉOBIOLOGIE

VOLUME 39(1) – 2020



Une institution
Ville de Genève

www.museum-geneve.ch



Toarcian (Jurassic) Ammonitina fauna and stratigraphy from Bakonycsérnye (Hungary)

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Abstract

A newly collected Toarcian Ammonitina material from Bakonycsérnye (Hungary) is described and illustrated. Detailed ammonite biostratigraphical scheme is introduced for the Toarcian sequences of the Hungarian Transdanubian Central Range. Diverse Middle-Upper Toarcian Hammatoceratoidea (Hammatoceratidae and Erycitinae) assemblage is presented; Mediterranean and NW European faunal affinities are briefly discussed. Two new *Cagliceras* species are designated: *C. baldii* nov. sp. and *C. wegneri* nov. sp.

Keywords

Jurassic, Toarcian, Ammonitina, Hammatoceratoidea, Bakonycsérnye, Hungary.

1. INTRODUCTION

The aim of this study is to describe a newly collected Toarcian Ammonitina material from the Tűzköves Ravine (Tűzköves-árok) close to Bakonycsérnye (NE Bakony Mts, Transdanubian Central Range, Hungary), and to establish a detailed Middle-Upper Toarcian ammonite biostratigraphy. The site is one of the classic localities of Early and Middle Jurassic ammonites in the Mediterranean Province (Fig. 1), it has been made known by the classic works of Prinz (1904) and Géczy (1966, 1967a). Recently the Pliensbachian-Toarcian boundary fauna was revisited (Galács *et al.*, 2008), and a new Aalenian-Lower Bajocian ammonite assemblage and stratigraphy were dealt with by Galács *et al.* (2016). However, information on Toarcian ammonites, especially on the Late Toarcian Hammatoceratidae and Erycitinae remained limited in the previous works. During the last ten years hundreds of Toarcian and Aalenian ammonoids were collected bed by bed from three newly excavated sections. The assemblage is rich in previously unrecorded index fossils, and these taxa allowed completing the Toarcian biostratigraphy offered by the above mentioned authors. In this paper we focus on the biostratigraphy, the description of hildoceratid index species, and the Toarcian Hammatoceratoidea describing 14 hammatoceratid and seven erycitid species.

2. MATERIAL AND METHODS

All specimens described herein were collected by two of us (M. Dunai and Z. Evanics), and are deposited in private collections and in the collection of the Eötvös Museum of Natural History (Eötvös University, Budapest). As most taxa studied in this paper are thoroughly discussed in the literature, only short synonymies are cited (the types and the recent papers). Measurements (M) in mm. Abbreviations: D – diameter, H – whorl-height, W – whorl-width, U – umbilical width, PLW – primary ribs of the last whorl, SLW – secondary ribs of the last whorl, E – external lobe, L – lateral lobe, U – umbilical lobe, ES – external saddle, LS – lateral saddle.

3. GEOLOGICAL FRAMEWORK

The Bakony Mts is a segment of the Transdanubian Range, formed mainly by Triassic carbonate rocks positioned on Permian clastics, and originally overlain by Jurassic sediments. The Lower and Middle Lias of the Tűzköves Ravine is characterized by a sequence of well-bedded deeper-water limestones: Isztimér Limestone Formation (Hettangian to Sinemurian), and Tűzkövesárok Limestone Formation (Pliensbachian). The sedimentation was interrupted in the lowermost Toarcian, but the dark

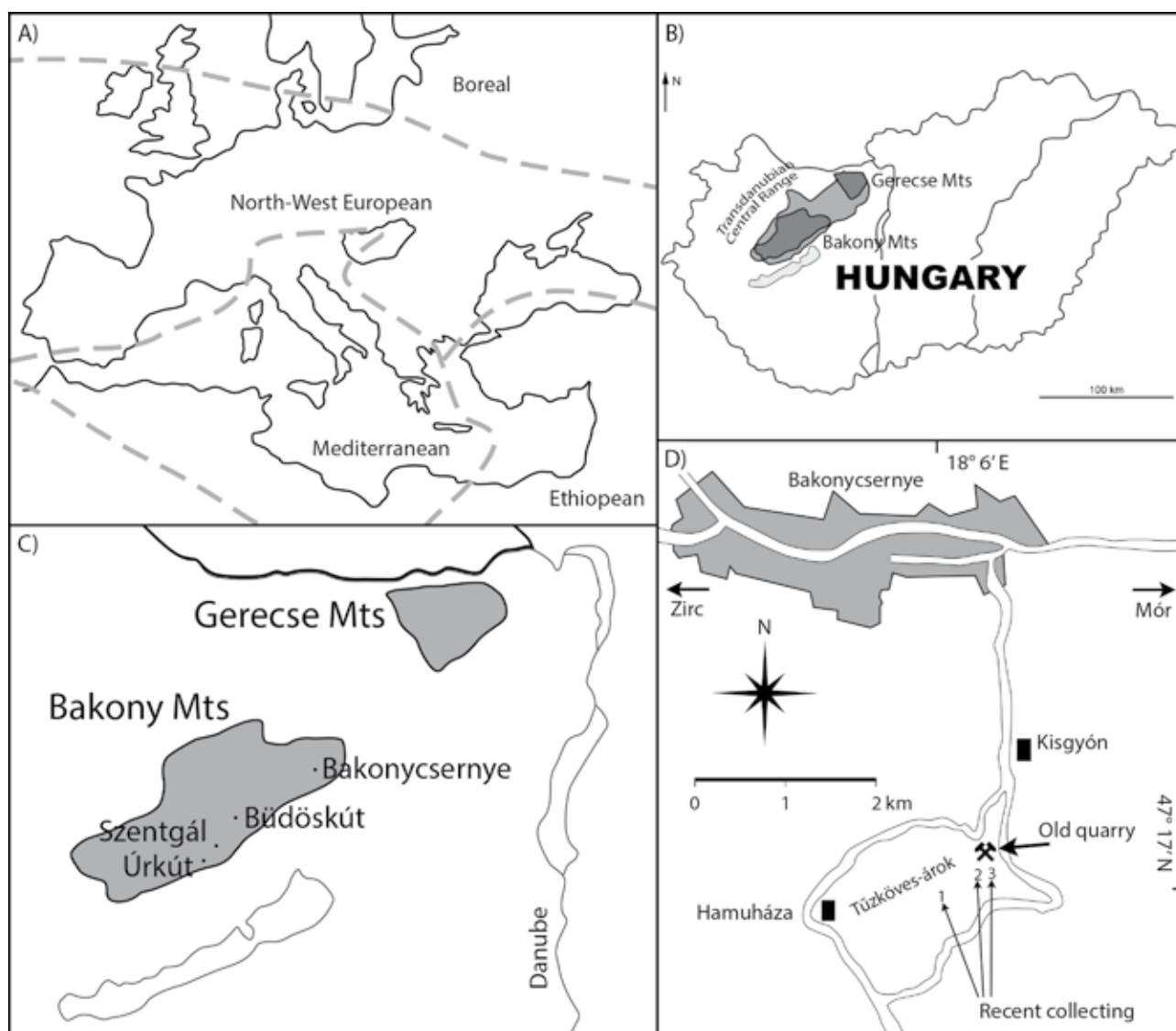


Fig. 1: A) Middle Toarcian ammonite faunal provinces in Europe (Page, 2008). B) The Transdanubian Central Range in Hungary with the Bakony and the Gerecse Mts. C) Location of Toarcian sites in the Bakony Mts. D) The Tüzköves Ravine localities of Bakonycsernye. 1 – TRNS2, 2 – TRNS1, 3 – KRS.

grey clay of the Úrkút Manganese Ore Formation that is typical of the early Toarcian Oceanic Anoxic Event and is known from other localities of the Transdanubian Range cannot be traced in the studied sections. The carbonate-dominated succession is overlain by the “Ammonitico Rosso marl” facies of pelagic origin that developed in two subfacies, both widely distributed from the Gerecse Mts to the SE Bakony Mts. The Kisgerese Marl Formation is thin-bedded, red nodular marl with variable carbonate and clay content. The upper boundary of the formation coincides with the boundary of the *Hildoceras bifrons* – *Merlaites gradatus* zones in the reference section (Kis-Gerecse Quarry, Gerecse Mts), but in other localities the Kisgerese Marl ranges up in the Upper Toarcian. From the lower Upper Toarcian the Kisgerese

Marl is replaced by well-bedded, red to greyish red, hard, nodular limestone with ferromanganese nodules and variable clay content. This is the Tölgyhát Limestone Formation that dominates the Aalenian and ranges to the Lower Bajocian (Knauer 2012). Both lithostratigraphical units are rich in moderately to well-preserved cephalopod internal molds in all exposures of the Tüzköves Ravine. In the studied locality the depositional sequence is not continuous, subsolution surfaces were observed (Tüzköves Ravine New Section 1: top of Bed 19, Tüzköves Ravine New Section 2: top of Bed 6), as well as limestone relicts with subsolution features occurred in Bed 4 of the TRNS1, and Bed 4 of the TRNS2. The beds that represent the Middle-lower Upper Toarcian are strongly condensed, and the exact lithological boundary

between the two subfacies cannot be traced. The local facies of the Tölgyhát Limestone slightly differs from that of the stratotype by thick-bedded, brittle marl. According to Konda (1989) its formation started around the boundary of the *Hildoceras bifrons* – *Phymatoceras erbaense* zones. The latter zone, however, was too widely defined and consisted of three currently used stratigraphical units (*Merlaites gradatus*, *Grammoceras thouarsense* and *Geczyceras speciosum* zones). The Tölgyhát Limestone that is characterized by darker red lenticular marl with ferromanganese nodules appears first in the *Dumortieria meneghinii* Zone. However, the nodular, marly limestone that differs from the Kisgerese Marl with thick layers and appears in the condensed beds in our sections, probably around the Middle-Upper Toarcian boundary (*Merlaites gradatus* – *Grammoceras thouarsense* zones) is considered as a transitional rock type that belongs to the Tölgyhát Limestone.

3. STRATIGRAPHIC SETTING

In the classic work of Prinz (1904) the Jurassic strata of the Tüzköves Ravine were subdivided into three ages: Middle Lias (γ – δ), Late Lias (ϵ – ζ), and Early Dogger (α – β). The Upper Liassic Toarcian was subdivided into three substages by Géczy (1961). Later, based on bed by bed collecting method, the Mediterranean ammonite biostratigraphy (Donovan, 1958) was used by Géczy

(1966, 1967a). A detailed Toarcian zonation with four chronozones was first described by Géczy (1967b) for strata of the Tüzköves sections. As the layers were characterized by moderate level of condensation, the Upper Toarcian subzonal units (*Dumortieria meneghinii* and *Pleydellia aalensis*) were omitted. Between 1965 and 1969 the Geological Institute of Hungary carried out a detailed collection of Jurassic rocks from a new section in the ravine, and the sequence was described by Konda (1969, 1989) on the basis of Géczy's zonation. This scheme was still used in the geological summaries of the Transdanubian Range by Vörös (1998) and Császár *et al.* (2012). The revision of the Pliensbachian-Toarcian boundary (Galács *et al.*, 2008) completed the stratigraphic arrangement with the basal Toarcian *Dactylioceras tenuicostatum* Zone (Table 1).

Our new excavations revealed thicker fossil-rich Toarcian layers with previously unrecorded subzonal index taxa. Despite the condensation six Middle-Upper Toarcian ammonite zones and eight subzones became distinguishable. The lithology, the Ammonitina assemblages and the stratigraphic units of our three sections are itemized in the next part, as well as newly collected *Hildoceratoidea* index species are described and illustrated. The new biostratigraphic achievement was summarized by Kovács (2017), and a detailed ammonite chronostratigraphy is presented herein following the syntheses of Elmi *et al.* (1997) and Page (2003) with some amendments (Table 1). The scheme corresponds

Table 1. Toarcian chrono- and subchronozones of sequences of the Tüzköves Ravine.
(The grey unit has not been demonstrated.)

Géczy (1967b), Galács <i>et al.</i> (2008)		Kovács (2017)	
Zone	Subzone	Subzone	Zone
<i>Dumortieria levesquei</i>			<i>Pleydellia aalensis</i>
			<i>Dumortieria meneghinii</i>
			<i>Geczyceras speciosum</i>
<i>Phymatoceras erbaense</i>		<i>Pseudogrammoceras fallaciosum</i>	<i>Grammoceras thouarsense</i>
		<i>Grammoceras striatulum</i>	
		<i>Pseudogrammoceras bingmanni</i>	
		<i>Merlaites alticarinatus</i>	<i>Merlaites gradatus</i>
		<i>Pseudogrammoceras subregale</i>	
		<i>Merlaites clausus</i>	
<i>Mercaticeras mercati</i> / <i>Hildoceras bifrons</i>	<i>Hildoceras semipolatum</i>	<i>Hildoceras bifrons</i>	<i>Hildoceras bifrons</i>
	<i>Hildoceras sublevisoni</i>	<i>Hildoceras sublevisoni</i>	
<i>Harpoceras falciferum</i>		<i>Harpoceras falciferum</i>	<i>Harpoceras serpentinum</i>
		<i>Harpoceras serpentinum</i>	
<i>Dactylioceras tenuicostatum</i>		<i>Orthodactylites semicelatum</i>	<i>Dactylioceras tenuicostatum</i>
	<i>Paltarpites paltus</i>	<i>Paltarpites paltus</i>	

to that was offered for the Middle-Upper Toarcian sequences of the Gerecse Mts by Kovács (2011). Our results prove that the Toarcian sedimentations of the Bakony and the Gerecse Mts are closely affiliated, and the recent Toarcian ammonite chronostratigraphy can be used in point of the whole Transdanubian Central Range.

4. DESCRIPTION OF THE SECTIONS

Three newly excavated sections are examined: Tüzköves Ravine New Section 1 (TRNS1), Tüzköves Ravine New Section 2 (TRNS2) and Kígyós Ravine Section (KRS).

4.1. Tüzköves Ravine New Section 1 (TRNS1)

The section is situated in the Tüzköves Ravine about 50 m southwest to the old quarry (Fig. 1). Layers of approximately 6 m thickness are excavated. The Ammonitina fauna is shown in Fig. 2.

The thickness of the *Hildoceras bifrons* Zone is ca. 110 cm, the layers consist of light red lenticular marl. Only the uppermost part (22 cm) is separated as Bed 28 that represents the *Hildoceras semipolitum* horizon of the *Bifrons* Subzone. Similarly to the KRS, two layers represent clearly the *Merlaites gradatus* Zone with almost the same thickness: Beds 27 (15 cm) and Bed 26 (20 cm). The base is defined by the appearance of genus *Merlaites*. The next two beds (Bed 25: 30 cm, Bed 24: 35 cm) are characterized by different lithologies (brownish red massive lenticular marl with ferromanganese nodules) and a condensed ammonite fauna. The index taxa represent three Middle-Upper Toarcian zones: *Merlaites gradatus*, *Grammoceras thouarsense* and *Geczyeras speciosum*. The condensed units of the TRNS1 and the KRS are of almost the same thickness. The lower and middle parts of the *Geczyeras speciosum* Zone (Beds 23-13: 63 cm) consist of thin layers of dark, brownish red, brittle marl, and despite the abundance of the *Phylloceratina* and *Lytoceras*, yielded almost only *hammatoceratid* and *erycitid* specimens. The base of the zone is unknown as index taxa appeared already in the previous condensed unit. Bed 23 (10 cm) is recognized as first “clear” bed of the zone for the disappearance of the Middle – lower Upper Toarcian *Grammoceratinae* species, and the occurrence of genus *Phlyseogrammoceras*. The upper part of this unit shows a change in lithology: Bed 12 (4 cm) and Bed 11 (15 cm) consist of light red clayey marl, while Bed 10 (10 cm) light green limestone. The base of the *Dumortieria meneghinii* Zone is marked by the first appearance of genus *Dumortieria*. Beds 9-7 (43 cm) are characterized by pink, loose or brittle marl, Bed 6 (2 cm) greyish green clay seam, while Bed 5 (65 cm) consists of alternating thick and loose, or thin and brittle pink marl layers. This unit yielded *Dumortieria taramellii* Fucini, *D. leesbergi* Branco, *Planammatoceras tenuinsigne*

(Vacek) specimens from debris. The base of the *Pleydellia aalensis* Zone is defined by the first appearance of genera *Pleydellia* or *Cotteswoldia*. Bed 4 (40 cm) consists of pink loose or massive marl with limestone relics, Bed 3 (60 cm) pink or light green clayey nodular limestone, and Bed 2 (30 cm) pink or light green brittle marl. This unit yielded *Pleydellia (Walkericeras) burtonensis* Buckman, *Cotteswoldia particostata* Buckman, *Planammatoceras tenuinsigne* (Vacek), *P. planinsigne* (Vacek), *Crestaites* cf. *clocheri* (Elmi & Rulleau), *Bredya subinsignis* (Oppel), *Cagliceras elaphum* (Merla), *C. rotundiformis* (Merla) and *C. robustum* (Merla) from debris. The base of the *Leioceras opalinum* Zone is defined by the first appearance of *Leioceras opalinum* (Reinecke). Bed 1 (10 cm) is characterized by red and greenish grey brittle marl.

4.2. Tüzköves Ravine New Section 2 (TRNS2)

The section is situated in the Tüzköves Ravine about 540 m southwest to the old quarry (Fig. 1). Layers of approximately 5.3 m thickness are excavated from which only the Upper Toarcian beds of 72 cm are described herein. The Ammonitina fauna is shown in Fig. 3.

The thickness of the *Hildoceras bifrons* Zone is unknown, only the uppermost part with reddish grey loose marl is separated as Bed 13 (10 cm). The *Merlaites gradatus* Zone is represented by one layer of the same rock (Bed 12: 5 cm). Bed 11 (26 cm) is characterized by different lithology (red and greenish grey brittle marl) and a condensed ammonite fauna. The index taxa indicate two Upper Toarcian zones: *Grammoceras thouarsense* and *Geczyeras speciosum*. The condensed units of the TRNS1 and KRS are thicker. The base of the *Geczyeras speciosum* Zone is unknown as index taxa appeared already in the condensed unit. Bed 10 is assigned as first “clear” bed of the zone for the disappearance of *Grammoceratinae* species. Bed 10 (10 cm) consists of red and greenish grey loose marl, Beds 9-8 (16 cm) red massive marl. The *Dumortieria meneghinii* Zone is defined by the first appearance of genus *Dumortieria*, only the first bed is mentioned here: Bed 7 (5 cm) consists of red massive marl.

4.3. Kígyós Ravine Section (KRS)

The section is situated about 30 m south to the old quarry, on the northern slope of the Kígyós Ravine (Fig. 1). Layers of approximately 2.5 m thickness are excavated. The Ammonitina fauna is shown in Fig. 4.

Only the upper part of the *Hildoceras bifrons* Zone was excavated. Two layers of red lenticular marl belong to the *Hildoceras bifrons* Subzone: Bed 12 (20 cm) and Bed 11 (13 cm). The *Merlaites gradatus* Zone is represented clearly by two layers of brownish red

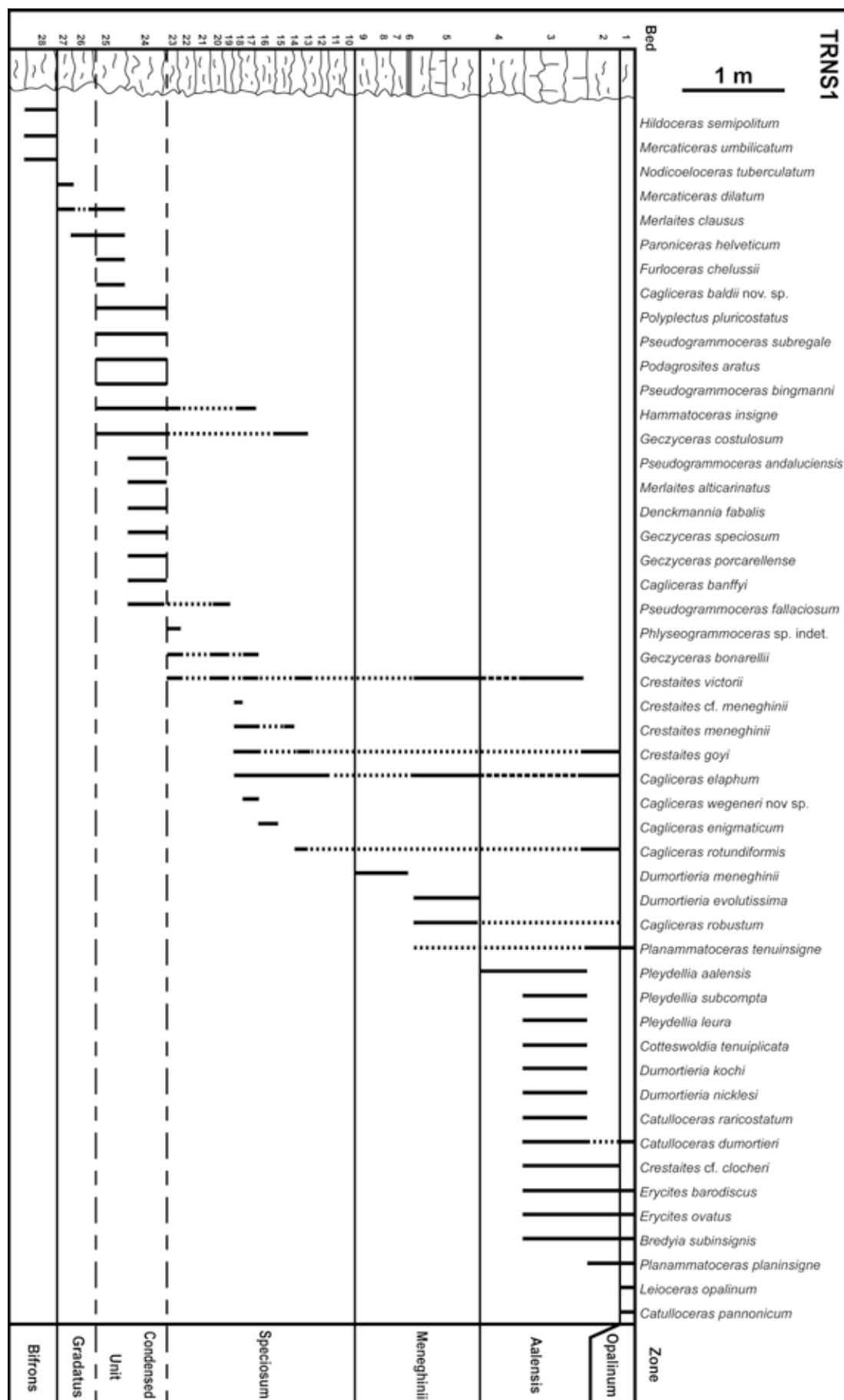


Fig. 2: Stratigraphic ranges of Ammonitina taxa of the Tüzköves Ravine New Section 1.

massive brittle marl with ferromanganese nodules (Bed 9: 20 cm, Bed 10: 14 cm). The zone is defined by the appearance of genus *Paroniceras*. The next three beds contain a condensed ammonite fauna. The index taxa represent three zones: *Merlaites gradatus*, *Grammoceras thouarsense* and *Geczyceras speciosum*. Bed 8 (30 cm) consists of thick-bedded, brownish red, lenticular, massive marl with ferromanganese nodules, Bed 7

(8 cm) red limestone with subsolution surface, and Bed 6 (25 cm) red, massive, brittle marl. The thickness of the *Geczyceras speciosum* Zone is about the half of that in the TRNS1. The base of the zone is unknown as index taxa appeared already in the condensed unit. For the disappearance of the *Phymatoceratidae*, and the presence of *Pseudogrammoceras* species typical of the lower Speciosum Zone, Bed 4 is assigned as first “clear” layer of the zone. Beds 5-4 (45 cm) consist of light red, massive marl with limestone relics characterized by subsolution features. Due to condensation it was difficult for earlier collectors to subdivide the uppermost Toarcian layers of the Tűzköves Ravine, only one unit (*Dumortieria levesquei* Zone) was used (Géczy, 1967b). Based on well-defined index fossils two zones are recognized herein (*Dumortieria meneghinii* and *Pleydellia aalensis*), however, similarly to the Toarcian stratigraphy of the Gerecse Mts, without subzonal-level subdivisions. In our sections the *Dumortieria meneghinii* Zone is marked by the first appearance of genus *Dumortieria*. Bed 3 (29 cm) consists of pink loose or massive marl. The *Pleydellia aalensis* Zone is defined by the first appearance of genera *Pleydellia* or *Cotteswoldia*. Beds 2-1 (61 cm) consist of pink loose to massive marl.

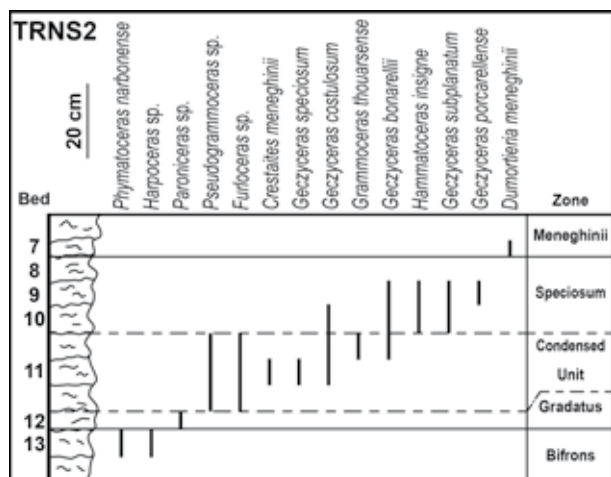


Fig. 3: Stratigraphic ranges of Ammonitina taxa of the Tűzköves Ravine New Section 2.

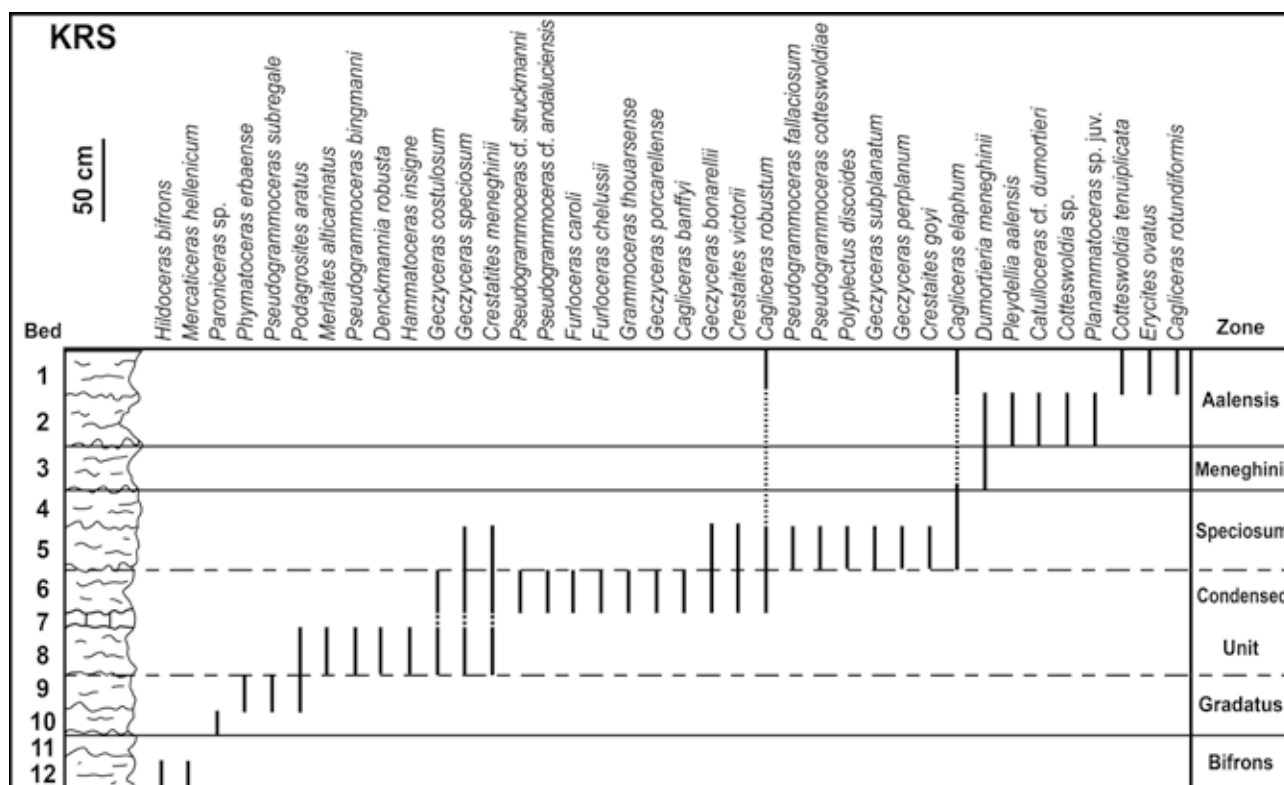


Fig. 4: Stratigraphic ranges of Ammonitina taxa of the Kígyós Ravine Section.

5. SYSTEMATIC PALAEONTOLOGY

Class Cephalopoda Cuvier, 1797
 Subclass Ammonoidea Zittel, 1884
 Order Ammonitida Fischer, 1882
 Suborder Ammonitina Fischer, 1882
 Superfamily Hildoceratoidea Hyatt, 1867
 Family Hildoceratidae Hyatt, 1867
 Subfamily Mercaticeratinae Guex, 1973
 Genus *Merlaites* Gabilly, 1974

***Merlaites clausus* (Merla, 1932)**

Pl. I, figs 1-2, 11

1932. *Brodiceras clausum* n. sp.– Merla, p. 35, pl. 3, figs 7-8, pl. 4, fig. 1.
 2010. *Merlaites clausus* (Merla).– Venturi *et al.*, p. 319.
 2015. *Merlaites clausus* (Merla).– Kovács, pl. 2, figs 3, 6.

Material: Two poorly preserved internal molds.

Description: Moderately involute, compressed coiling with a subovate whorl-section. Flanks slightly convex, venter high and narrow with a high keel. Sculpture of moderately strong, sigmoid, fasciculate ribs.

Remarks: Only seven diagnostic hildoceratid index species are described and figured in this paper. *M. clausus* is the index of the Clausus Subzone of the Gradatus Zone in the Mediterranean ammonite biostratigraphy. The species is a new record at Bakonycsérnyé.

Distribution: Gradatus Zone and Condensed Unit of TRNS1.

***Merlaites horvathae* (Géczy, 1966)**

Pl. I, figs 3-4

- v 1966. *Brodieia alticarinata horvathae* n. subsp.– Géczy, p. 25, text-fig. 16, pl. 2, fig. 4, pl. 37, fig. 8.
 1978. *Brodieia moltonii*.– Dezi & Ridolfi, p. 65, fig. 102 (non *Brodieia moltonii* Venzo in Pinna).
 1986. *Merlaites alticarinatus* f. *horvathae* (Géczy).– Elmi *et al.*, p. 98 (pars), text-figs 2/6, 3/4, pl. 2, fig. 4.
 2015. *Merlaites moltonii*.– Kovács, pl. 3, fig. 1 [non *Merlaites moltonii* (Venzo in Pinna)].

Material: Two internal molds of moderate preservation.

Description: Moderately involute coiling with deep umbilicus, high umbilical wall and rounded margin. Flanks slightly convex, venter broad and low with shallow grooves and a high, strong keel. Whorl-section subtrapezoid. Sculpture of moderately developed, fasciculate, rectiradiate, slightly sigmoid ribs. Three ribs emerge from low umbilical nodes, they weakly developed on the lower part of the flank and become stronger on the upper half.

Remarks: The species was described by Géczy (1966) as a subspecies of *M. alticarinatus* (Merla). Although the nominate species is similar in size and ornamentation, it has narrow ovate form with narrow venter and high and sharp keel, so the species level emendation of Géczy's

taxon is proposed herein. Based on morphology two other specimens are considered as representatives of *M. horvathae*: the *B. moltonii* figured by Dezi & Ridolfi (1978, fig. 102) from Italy, and the *M. moltonii* figured by Kovács (2015, pl. 3, fig. 1). *Merlaites moltonii* resembles in whorl-section and sculpture, but is a smaller and more evolute form. The type of *M. horvathae* and the Monte Carcatore specimen were recorded in the Erbaense Zone, the Algerian specimen in the Gradatus Zone, and the Gerece specimen in the Clausus Subzone. *M. horvathae* is recognized as an index of the Gradatus Zone in the Mediterranean ammonite stratigraphy.

Distribution: Condensed Unit of TRNS1.

Subfamily Grammoceratinae Buckman, 1905

Genus *Pseudogrammoceras* Buckman, 1901

***Pseudogrammoceras subregale* Pinna, 1968**

Pl. I, figs 5-6

1968. *Pseudogrammoceras subregale* n. sp.– Pinna, p. 51, pl. 4, figs 9-11, pl. 1nt, figs 18, 20, pl. 2nt, fig. 36.
 2006. *Pseudogrammoceras subregale* Pinna.– Géczy & Szente, pl. 9, figs 3-4.
 2013. *Pseudogrammoceras subregale* Pinna.– Kovács, p. 127.

Material: Three internal molds of different state of preservation.

Description: Evolute to moderately evolute coiling with wide and shallow umbilicus and low and rounded umbilical margin. Flanks slightly convex, venter narrow, high and carinate, whorl-section narrow, high-ovate. Sculpture of dense, rectiradiate and slightly sigmoid simple ribs.

Remarks: *P. subregale* is the earliest representative of the genus, and is considered as a subzonal index of the Subregale Subzone of the Gradatus Zone in the Mediterranean ammonite stratigraphy. It differs from other *Pseudogrammoceras* species in ornamentation with radial and less sigmoid ribbing.

Distribution: Gradatus Zone of KRS, Condensed Unit of TRNS1.

***Pseudogrammoceras bingmanni* (Denckmann, 1887)**

Pl. I, figs 7, 9-10

1887. *Ammonites* (? *Harpoceras*) *Bingmanni* n. sp.– Denckmann, p. 185, pl. 5, fig. 4, pl. 6, fig. 5, pl. 10, fig. 17.
 2013. *Pseudogrammoceras bingmanni* (Denckmann).– Kovács, p. 127, pl. 4, figs 1-2 (*cum syn.*).

Material: Nine internal molds of different state of preservation.

Description: Moderately involute coiling with moderately deep umbilicus, high, vertical umbilical wall, and somewhat angled margin. Flanks slightly convex, venter rounded and smooth with a high keel,

whorl-section high-ovate. Body chamber 3/4 whorl long, oblique and sigmoid peristome. Sculpture of moderately developed, dense, rectiradiate and sigmoid simple ribs.

Remarks: The species is characterized by a high level of morphological variability (Gabilly, 1976). It is the index of the Bingmanni Subzone of the Thouarsense Zone in the standard NW European ammonite biostratigraphy. The species is a new record at Bakonycsérnye.

Distribution: Condensed Unit of TRNS1 and KRS.

***Pseudogrammoceras* gr. *fallaciosum* (Bayle, 1878)**

Pl. I, fig. 8, Pl. II, figs 1-3

1878. *Grammoceras fallaciosum* nov. sp.— Bayle, pl. 78, figs 1-2.
 2007. *Pseudogrammoceras* gr. *fallaciosum* (Bayle).— Rulleau, p. 83, text-fig. 21/15, pl. 38, fig. 4, pl. 39, figs 3-5, pl. 40, fig. 1.
 2011. *Pseudogrammoceras fallaciosum* (Bayle).— Galácz *et al.*, 2011, p. 329, pl. 4, fig. 3, pl. 5, fig. 3.

Material: 14 internal molds of different state of preservation.

Description: Moderately evolute to moderately involute, compressed coiling with shallow umbilicus and rounded umbilical margin. Flanks slightly convex, venter narrow, high and carinate, whorl-section high elliptical. Sculpture of fine, slightly prorsiradiate and sigmoid simple ribs.

Remarks: In the revision of the taxon (Gabilly, 1976) the variability of the species was emphasized, and several Buckman taxa (*P. cotteswoldiae*, *P. expeditum*, *P. subfallaciosum*, *P. regale*, and *P. pedicum*) were regrouped as morphotypes of the nominate species. This taxonomic interpretation met with acceptance in the literature. The group is abundant in the Upper Toarcian sequences of the Gerecse Mts ranging from the Fallaciosum Subzone to the lower Speciosum Zone. Specimen EZPC7031 represents morphotype *subfallaciosum*, EZPC7461 is a morphotype *cotteswoldiae*, both occur only in the lower part of the Speciosum Zone in the Gerecse sections. EZPC6720 is very close in morphology to morphotype *regale*. All figured specimens came from the Speciosum Zone.

Distribution: Condensed Unit and lower Speciosum Zone of TRNS1, lower Speciosum Zone of KRS.

Genus *Podagrosites* Guex, 1973

***Podagrosites aratus* (Buckman, 1890)**

Pl. II, figs 4-5

1890. *Dumortieria arata* nov. sp.— Buckman, pl. 39, figs 1-5.
 2011. *Pseudogrammoceras aratum* (Buckman).— Lacroix, p. 287, pl. 135, figs 4-5.
 2013. *Podagrosites aratus* (Buckman).— Kovács, p. 128, pl. 1, figs 6-9 (*cum syn.*).

Material: Four relatively well-preserved internal molds.

Description: Evolute, compressed coiling with wide and shallow umbilicus and rounded umbilical wall and margin. Flanks slightly convex, venter tricarinate-bisulcate on the inner whorls, rounded with shallow grooves and carinate on the body chamber. Whorl-section ovate. Body chamber 5/8 whorl long, peristome oblique. Sculpture of strong, rectiradiate and slightly sigmoid simple ribs.

Remarks: The species is an index of the Gradatus Zone in the Mediterranean ammonite biostratigraphy. It is a new record at Bakonycsérnye. *P. aratus* is abundant in the Subregale Subzone in the Gerecse assemblages.

Distribution: Condensed Unit of TRNS1, and Gradatus Zone and Condensed Unit of KRS.

Genus *Grammoceras* Hyatt, 1867

***Grammoceras thouarsense* (d'Orbigny, 1843)**

Pl. II, figs 6-7

1843. *Ammonites thouarsensis*.— d'Orbigny, p. 222, pl. 57, figs 1-3.
 2002. *Grammoceras thouarsense* (d'Orbigny).— Metodiev, p. 171, text-fig. 5/1-5, pl. 1, figs 1-6 (*cum syn.*).
 2011. *Grammoceras thouarsense* (d'Orbigny).— Lacroix, p. 295, pl. 139, figs 6-7, pl. 140, figs 1, 4, pl. 141, figs 3, 7.

Material: Two poorly preserved internal molds.

Description: Evolute coiling with wide and shallow umbilicus, rounded margin and convex flanks. Venter low, rounded and carinate, whorl-section ovate. Sculpture of rectiradiate and sigmoid simple ribs.

Remarks: The species is an index of the Striatulum Subzone of the Thouarsense Zone in the standard NW European ammonite biostratigraphy. It differs from the closely affiliated *G. penestriatulum* Buckman in slightly more involute coiling and wider whorls. *G. thouarsense* is unknown in the Gerecse Mts, and is a new record at Bakonycsérnye.

Distribution: Condensed Units of TRNS2 and KRS.

Superfamily Hammatoceratoidea Schindewolf, 1964
 Family Hammatoceratidae Buckman, 1887

During the last decades, the Toarcian hammatoceratids have been thoroughly analysed in the literature (see Kovács, 2009; Venturi *et al.*, 2010; Sandoval *et al.*, 2011 with additional references). One Lower-Middle Toarcian genus (*Rarenodia* Venturi), three characteristic Middle-Upper Toarcian genera (*Geczyoceras* Martínez, *Hammatoceras* Hyatt, *Crestaites* Rulleau & Elmi), and four Upper Toarcian-Aalenian genera (*Bredyia* Buckman, *Planammatoceras* Buckman, *Parammatoceras* Buckman, *Accardia* Cresta) are accepted in this paper. Other hammatoceratid taxa (*Rhodaniceras* Elmi, *Paviaites* Cresta, *Eudmetoceras* Buckman, *Pseudaptetoceras* Géczy) are typical of the Aalenian. Five Toarcian genera

are documented herein in the Tüzköves Ravine sections: *Gecyceras*, *Hammatoceras*, *Crestaites*, *Bredya*, and *Planammatoceras*.

Genus *Gecyceras* Martínez, 1992

Type species: *Hammatoceras speciosum* Janensch, 1902. The type specimen (Janensch, 1902, pl. 10, fig. 1) was designated by Martínez (1992).

Diagnosis: Medium-sized or large, compressed, evolute or moderately evolute coiling, wide and shallow umbilicus, slightly convex flanks, weakly developed ventral keel, ovate whorl-section. Well-defined ribbing, usually with umbilical tubercles. Hammatoceratid suture-line: moderately to well-developed, ramified E, long, broad, ramified L, wide, high LS, divided, oblique U lobes.

Remarks: The genus was introduced by Martínez (1992) for hammatoceratids that differ from the *Hammatoceras insigne* group in morphology (evolute coiling, compressed whorls, finer ornamentation), in suture-line (short E, much more intricate L and LS1) and in stratigraphic range (some appear prior to the Insigne Zone). The validity has been discussed in the literature; the taxon was acknowledged by Rulleau (2009), Kovács (2009), Venturi *et al.* (2010), Sandoval *et al.* (2012), Martínez *et al.* (2012, 2015), but it was regarded as a synonym of *Hammatoceras* by Howarth (2013).

At Csernye a single species was recorded by Géczy (1966) that is classified recently as *Gecyceras*: *Hammatoceras perplanum* Prinz (Upper Toarcian). In the revision of the hammatoceratid material of the Gerecse Mts (Kovács, 2009), ten species were described in the Middle-Upper Toarcian: *G. speciosum* (Janensch), *G. porcurellense* (Bonarelli), *G. perplanum* (Prinz), *G. bonarellii* (Parisch & Viale), *G. costatum* (Gabilly), *G. costulosum* (Merla), *G. martinezae* Kovács, *G. galaczi* Kovács, *G. cf. clausum* (Gabilly), and *G. aff. allobrogense* (Dumortier). (The latter is assigned herein to *Bredya*.) The new Tüzköves Ravine assemblage is characterized by an abundant but less diverse *Gecyceras* material than that of the Gerecse Mts. The most frequent species are *G. costulosum* (Merla) and *G. bonarellii*. The occurrence of *G. subplanatum* (de Brun) in this Mediterranean locality is remarkable.

Distribution: Variabilis/Gradatus-Aalensis Zone: Europe, North Africa, Georgia, Iran, South and North America. Hungary: Bakony Mts (Csernye, Szentgál), Gerecse Mts.

Gecyceras speciosum (Janensch, 1902)

Pl. III, figs 1-2, 3-4

- 1902. *Hammatoceras speciosum* n. sp.—Janensch, p. 102, pl. 4, fig. 4, pl. 10, fig. 1.
- 2009. *Gecyceras speciosum* (Janensch).—Kovács, p. 8, fig. 2/A-C (*cum syn.*).
- 2015. *Gecyceras speciosum* (Janensch).—Martínez *et al.*, p. 15, pl. 3, fig. 1, pl. 5, fig. 1.

Material: Eight internal molds of different state of preservation.

Description: Moderately evolute coiling with a compressed, ovate whorl-section. Umbilicus relatively wide and shallow, umbilical wall steep, margin rounded. Flanks slightly convex, venter narrow and rounded with a weakly developed keel. Sculpture of dense, moderately strong ribs 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 cease at the keel. Narrow constriction on the body chamber.

Remarks: The species is characterized by moderate intraspecific variability of involution (Rulleau, 2009). The ornamentation of *G. porcurellense* differs by weakly developed umbilical tubercles and finer ribs.

Distribution: Condensed Units and Speciosum Zone of all three sections.

Gecyceras bonarellii (Parisch & Viale, 1906)

Pl. IV, figs 1-2, Pl. V, fig. 1

- 1906. *Hammatoceras Bonarellii* n. sp.—Parisch & Viale, p. 159, pl. 10, figs 1-4.
- 2009. *Hammatoceras* gr. *bonarellii* Parisch & Viale.—Rulleau, p. 39, text-fig. 13/1, pl. 3, fig. 3, pl. 4, figs 1, 3-5, pls 5-7, pl. 8, fig. 1.
- 2009. *Gecyceras bonarellii* (Parisch & Viale).—Kovács, p. 15, fig. 6/A-B (*cum syn.*).
- 2015. *Gecyceras* aff. *bonarellii* (Parisch & Viale).—Martínez *et al.*, p. 15, pl. 1, fig. 3.

Material: 18 internal molds of different state of preservation.

Description: Large, subserpenticone coiling with compressed whorls, wide and shallow umbilicus, slightly convex flanks, rounded umbilical and ventrolateral margins. Narrow and convex venter with a low keel. Whorl-section somewhat rounded subquadrangular on the inner whorls, and narrow high-ovate with maximum width at the lower third on the last whorl. Sculpture of moderately strong, regular ribs. Two or rarely three slightly prorsiradiate and sigmoid ribs emerge from small and well-defined umbilical tubercles and reach the keel.

Remarks: The species differs from *G. subplanatum* in lower and wider whorls and well-developed umbilical tubercles.

Distribution: Condensed Units and Speciosum Zone of all three sections.

Gecyceras costulosum (Merla, 1934)

Pl. IV, figs 3, 4-5

- 1934. *Hammatoceras costulosum* n. sp.—Merla, p. 13, pl. 1, figs 3-4.
- 2015. *Gecyceras costulosum* (Merla).—Martínez *et al.*, p. 17, pl. 6, fig. 6.

Material: 23 internal molds of different state of preservation.

Description: Moderately evolute coiling with low umbilical wall, rounded umbilical and ventrolateral margins. Flanks slightly convex, venter rounded with a thin, smooth intersection or low keel in the middle. Whorl-section high-ovate with maximum width at the lower third. Sculpture of moderately strong primary and weakly developed secondary ribs. Rectiradiate primaries emerge from the umbilical margin. They are dense on the inner whorls, but more widely spaced on the last whorl. The primaries regularly trifurcate at the lower third of the flanks. The thin secondaries are curved gently forward on the inner whorls, while they are radiate on the last whorl.

Remarks: The classification of the species was discussed in the literature. *Hammatoceras costulosum* Merla is treated as *Geczyceras* in this paper.

Distribution: Condensed Units and Speciosum Zone of all three sections.

Geczyceras perplanum (Prinz, 1904)

Pl. V, fig. 2

1904. *Hammatoceras insigne* Schübler, mut. nov. *perplana*.– Prinz, p. 72.
 2009. *Geczyceras* gr. *perplanum* (Prinz).– Rulleau, p. 46, text-fig. 14/5, pls 23-24.
 2009. *Geczyceras perplanum* (Prinz).– Kovács, p. 13, fig. 4/A-B (cum syn.).
 2015. *Geczyceras perplanum* (Prinz).– Martínez *et al.*, p. 16, pl. 4, fig. 1, pl. 5, figs 2-3, pl. 6, fig. 1.

Material: One poorly preserved fragmentary internal mold.

Description: Evolute coiling with slightly convex flanks and subovate whorl-section. Strong primary ribs emerge

from the umbilicus, bifurcate on the margin, the furcation points tuberculate on the inner whorls. The primaries are longer on the last whorl, and the furcation points move close to the shoulder.

Remarks: The species shows moderate intraspecific variability in the whorl-section that ranges from subrectangular to ovate. The morphology of our specimen resembles the one figured by Rulleau (2009) on plate 23, fig. 1.

Distribution: Speciosum Zone of KRS.

Geczyceras porcurellense (Bonarelli, 1899)

Pl. V, figs 3-4

1899. *Hammatoceras porcurellense* n. sp. – Bonarelli, p. 209.
 2009. *Geczyceras porcurellense* (Bonarelli).– Kovács, p. 12, fig. 3/A, B-C (cum syn.).
 2010. *Geczyceras porcurellense* (Bonarelli).– Venturi *et al.*, p. 349.
 2015. *Geczyceras porcurellense* (Bonarelli).– Martínez *et al.*, p. 16, pl. 1, fig. 4, pl. 6, fig. 4.

Material: Three internal molds of moderate preservation.

Description: Moderately involute coiling with shallow umbilicus, rounded umbilical and ventrolateral margins, and vertical umbilical slope. Flanks slightly convex, venter narrow, high and rounded with a smooth band in the middle, whorl-section high-ovate. Sculpture of dense and fine ribs that bi- or trifurcating from small tubercles on the umbilical margin. The ribs are straight and slightly prorsiradiate on the lateral side, and bend gently forward on the venter.

Remarks: The species is closely allied to *G. speciosum* in morphology, but differs in finer ornamentation.

Distribution: Condensed Units of all three sections.

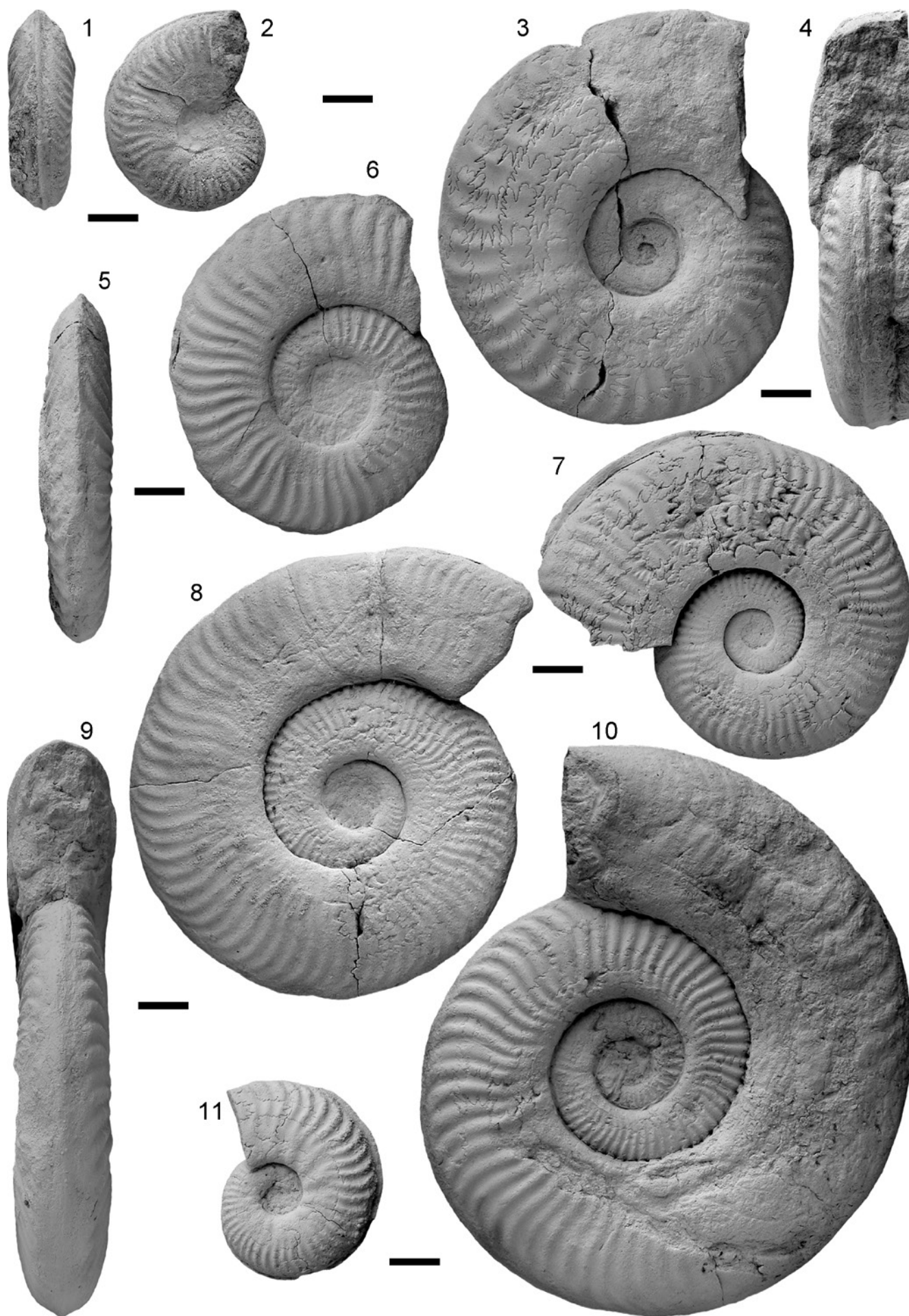
Plates

The specimens have been coated with ammonium chloride before photography.

Plate I

- Figs 1-2: *Merlites clausus* (Merla), EZPC7019, TRNS1, Condensed Unit.
 (D 41, H 18.5, H/D 45%, W 12, W/D 29.2%, U ?9, U/D 22%)
 Figs 3-4: *Merlites horvathae* (Géczy), DM2016/02, TRNS1, Condensed Unit.
 (D 86, H 32, H/D 37.2%, W 20, W/D 23.2%, U 27, U/D 31.3%)
 Figs 5-6: *Pseudogrammoceras subregale* Pinna, EZPC7498, KRS, Gradatus Zone.
 (D 73, H 24, H/D 32.8%, W 14, W/D 19%, U 30, U/D 41%)
 Fig. 7: *Pseudogrammoceras bingmanni* (Denckmann), EZPC7442, KRS, Condensed Unit.
 (D 75, H 30, H/D 40%, W 14, W/D 18.6%, U 24, U/D 32%)
 Fig. 8: *Pseudogrammoceras* gr. *fallaciosum* (Bayle) morphotype *regale* Buckman, EZPC6720,
 TRNS1, Speciosum Zone. (D 96, H 23, H/D 24%, W 17, W/D 17.7%, U 42, U/D 43.7%)
 Figs 9-10: *Pseudogrammoceras bingmanni* (Denckmann), EZPC6718, TRNS1, Condensed Unit.
 (D 115, H 33, H/D 28.6%, W 20, W/D 17.3%, U 51.5, U/D 44.7%)
 Fig. 11: *Merlites clausus* (Merla), DM2016/01, TRNS1, Condensed Unit.
 (D 40, H 18, H/D 45%, W 12, W/D 30%, U 9, U/D 22.5%)

Scale bars equal 1 cm.



***Geczyceras subplanatum* (de Brun, 1932)**

Pl. VI, figs 5-6

1932. *Hammatoceras subplanatum* n. sp.– de Brun, p. 183, pl. 3, fig. 1.

2009. *Hammatoceras subplanatum* de Brun.– Rulleau, p. 39, fig. 13/7, pl. 9, figs 1-2.

Material: Three poorly preserved internal molds.

Description: Large, evolute coiling with wide and shallow umbilicus, and low and rounded umbilical wall and margin. Flanks slightly convex, venter high, narrow and carinate, whorl-section narrow high-ovate. Sculpture of fine and dense ribs and weakly developed umbilical tubercles. Two or three rectiradiate ribs rise from each tubercle, and bend forward on the shoulder.

Remarks: Based on morphology and stratigraphic range, the species is assigned to *Geczyceras* herein. It resembles *G. bonarellii* in evolute coiling and compressed whorls, but differs in higher whorls, finer and denser ribs, and very small tubercles. *G. subplanatum* is known in France, it has not been recorded in Hungary before.

Distribution: Speciosum Zone of TRNS2 and KRS.

Genus *Hammatoceras* Hyatt, 1867

Type species: *Ammonites insignis* Schübler in Zieten, 1830, by subsequent designation Hyatt (1867).

Diagnosis: Moderately evolute to involute coiling, deep umbilicus, high umbilical margin, convex flank, broad, rounded venter, moderately developed keel, wide subovate or subtriangular whorl-section. Strong ribs with tubercles or nodes. Hammatoceratid suture-line: well-developed, ramified E, broad, ramified L, divided, oblique U lobes.

Remarks: The various systematic conceptions of the taxon in the last decades were discussed by Rulleau (2009) and Kovács (2009). The stratigraphic position of *Hammatoceras* is restricted to the Insigne/Speciosum Zone. Sexual dimorphism is recognized, subgenus *H. (Onychoceras)* Wunstorff is thought to be a microconch form.

At Csernye *H. insigne simile* Géczy and *H. aff. insigne* (Zieten) was recorded by Géczy (1967a) in the Erbaense

Zone. The two fragmentary *H. csehnemethi* Géczy specimens in the Upper Toarcian of Úrkút and Csernye (Géczy, 1965) probably represent genus *Rarenodia*. In the Gerecse assemblages four *Hammatoceras* species are known in the Speciosum Zone: *H. insigne* (Schübler in Zieten), *H. aff. semilunatum* (Quenstedt), *H. trigonatum* (Quenstedt) (= *cappucinum* Buckman), *H. pachu* (Buckman).

Distribution: lower Upper Toarcian: Europe, North Africa, Ukraine, Russia, the Caucasus, Iran, Afghanistan, North and South America, Japan, Vietnam, Philippines, Indonesia. Hungary: Bakony Mts (Csernye, Úrkút), Gerecse Mts.

***Hammatoceras insigne* (Schübler in Zieten, 1830)**

Pl. V, figs 5-6, Pl. VI, figs 1-2, 3-4

1830. *Ammonites insignis* Schübler.– Zieten, p. 20, pl. 15, fig. 2.

2009. *Hammatoceras* gr. *insigne* (Schübler in Zieten).– Rulleau, p. 42, text-figs 13/5, 14/1, 3-4, pl. 11, figs 1-2, pls 15-19.

2009. *Hammatoceras insigne* (Schübler in Zieten).– Kovács, p. 31, fig. 20/A-B (*cum syn.*).

Material: 11 internal molds of moderate preservation.

Description: Moderately evolute coiling with a deep and wide umbilicus. Umbilical wall high and rounded, umbilical and ventrolateral margins rounded. Flanks convex, venter broad and rounded with a low keel. Whorl-section wide-ovate with maximum width at the lower third. Sculpture of strong ribbing. Rectiradiate primaries arise from umbilical nodes or from the margin, and bi- or trifurcate at mid-height. The secondaries bend forward on the venter and cease at the keel.

Remarks: The intraspecific variability of the species were treated by Martínez (1992) and Rulleau (2009). Some of our specimens differ from the type by lack of umbilical nodes and presence of bullate primary ribs. *H. insigne simile* Géczy is a slightly more evolute morphotype of the nominate species.

Distribution: Condensed Units and Speciosum Zone of all three sections.

Plate II

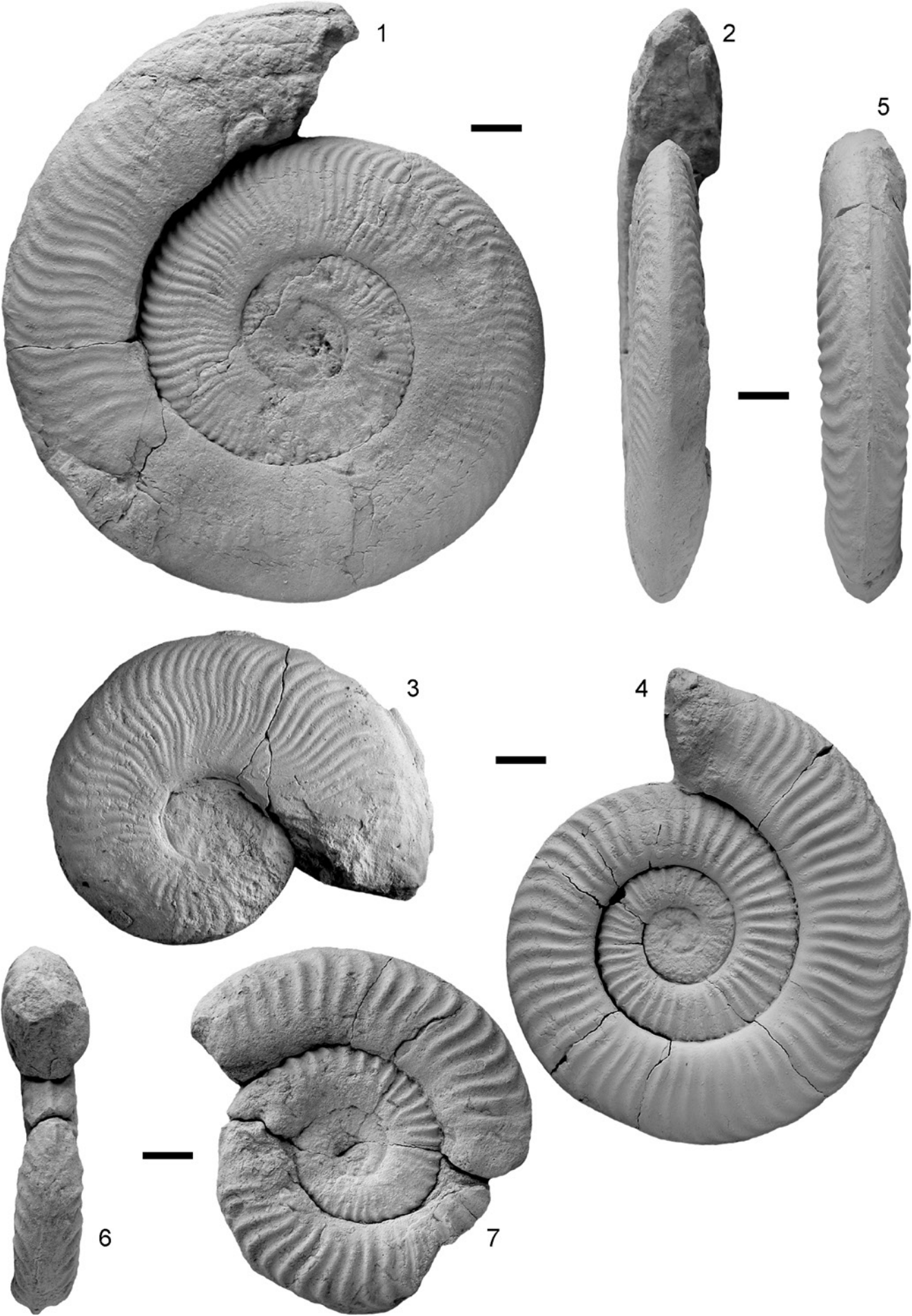
Figs 1-2: *Pseudogrammoceras* gr. *fallaciosum* (Bayle) morphotype *subfallaciosum* Buckman, EZPC7031, TRNS1, Speciosum Zone. (D 118, H ?, W 19, W/D 16%, U ?)

Fig. 3: *Pseudogrammoceras* gr. *fallaciosum* (Bayle) morphotype *cotteswoldiae* Buckman, EZPC7461, KRS, Speciosum Zone. (D 77, H 29, H/D 37.6%, W 11, W/D 14.2%, U 23, U/D 29.8%)

Figs 4-5: *Podagrosites aratus* (Buckman), EZPC7419, TRNS2, Condensed Unit. (D 94, H 25, H/D 26.5%, W 17.5, W/D 18.6%, U 48, U/D 51%)

Figs 6-7: *Grammoceras thouarsense* (d'Orbigny), EZPC7034, TRNS1, Condensed Unit. (D 73, H 20, H/D 27.3%, W 16, W/D 22%, U 39, U/D 53.4%)

Scale bars equal 1 cm



Genus *Crestaites* Rulleau & Elmi, 2001

Type species: *Hammatoceras meneghinii* Bonarelli, 1899. The type specimen (Meneghini, 1867-1881, pl. 13, fig. 1) was designated by Rulleau & Elmi (in Rulleau *et al.*, 2001).

Diagnosis: Evolute, compressed coiling, wide umbilicus, slightly convex flanks, high, carinate venter. Strong ribs, elongated primaries branching at the lower third or at the mid-height of the flank without tubercles. Hammatoceratid suture-line: moderately to well-developed E, broad, ramified L, divided, oblique U lobes.

Remarks: *Crestaites* was erected by Rulleau & Elmi (l.c.) for hammatoceratids that are characterized by evolute coiling and long primary ribs bifurcating with weakly developed nodes or without any tuberculation, and are known in the Meneghini/Pseudoradosa Zone of the Mediterranean-Caucasian Realm. The validity of the taxon is debated; it was accepted by Howarth (2013), but rejected by Martínez *et al.* (2015), while *Crestaites* was placed within Erycitinae by Venturi & Bilotta (2008) and Venturi *et al.* (2010). The genus shows a close relationship to *Cagliceras* concerning the presence of constrictions and the affinities in the suture construction as both taxa were descendants of *Geczyeras*. The suture-line of *C. raricostatus* or *C. victorii* with relatively short E lobe can be regarded as a transitional structure between hammatoceratids and erycitids. Based on morphological reasons, however, the original classification is accepted herein. As genus *Pseudammatoceras* is not accepted as valid taxon in this paper (see below), one more species is included in *Crestaites*: *C. clocheri* (Rulleau & Elmi). Two species were recorded by Géczy (1966, 1967b) at Csernye that are classified recently as *Crestaites*: *Hammatoceras meneghinii raricostatum* Géczy (Levesquei Zone), and *H. victorii* Bonarelli (Erbaense Zone). In the Upper Toarcian layers of the Gerecse Mts five species are known: *Crestaites meneghinii* (Bonarelli), *C. raricostatus* (Géczy), *C. victorii* (Bonarelli), *C. goyi* (Martínez), and *C. szentei* Kovács (Kovács, 2009). The new Csernye assemblage yielded 56 *Crestaites* specimens of which the most frequent species are *C. victorii* and *C. meneghinii*. The lack of *C. szentei* in this material is surprising as the taxon was relatively abundant in the Gerecse assemblages and it is recorded here in the Upper Toarcian of Szentgál as well. Our *Crestaites* material is closely affiliated to that was presented from Monte Carcatora (Italy) by Dezi & Ridolfi (1978).

Distribution: Insigne/Speciosum-Aalensis Zone: Italy, France, Portugal, Spain, Morocco, Iran. Hungary: Bakony Mts (Csernye, Úrkút, Szentgál), Gerecse Mts.

***Crestaites meneghinii* (Bonarelli, 1899)**

Pl. VII, fig. 1

1899. *Hammatoceras Meneghinii* n. sp.– Bonarelli, p. 208.

2009. *Crestaites* gr. *meneghinii* (Bonarelli).– Rulleau, p. 47, text-fig. 15/1-2, 5, pl. 25, fig. 6, pl. 27, fig. 1, pl. 28, figs 1-3.

2009. *Crestaites meneghinii* (Bonarelli).– Kovács, p. 20, figs 10-11 (*cum syn.*).

Material: 18 internal molds of different state of preservation.

Description: Large, evolute, compressed coiling with a wide and shallow umbilicus. Flanks slightly convex, venter narrow, high and rounded with a weakly developed keel. Whorl-section narrow-ovate. Body chamber 5/6 whorl long. Projected and oblique peristome preceded by a wide and shallow constriction. Another narrow constriction at the half whorl of the body chamber. Sculpture of dense, gently biconcave ribbing. Primaries 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.

Remarks: Similarly to the Gerecse material, the species is characterized by a moderate intraspecific variability of the whorl-width.

Distribution: Condensed Units and Speciosum Zone of all three sections.

***Crestaites cf. meneghinii* (Bonarelli, 1899)**

Pl. VIII, fig. 1

Material: One internal mold of moderate preservation.

Remarks: The morphology of the specimen is closely affiliated with that of the nominate species. It agrees in compressed whorls, and in lack of constriction, but differs in more evolute coiling, and in style of ribbing with shorter, trifurcating primaries on the inner whorls.

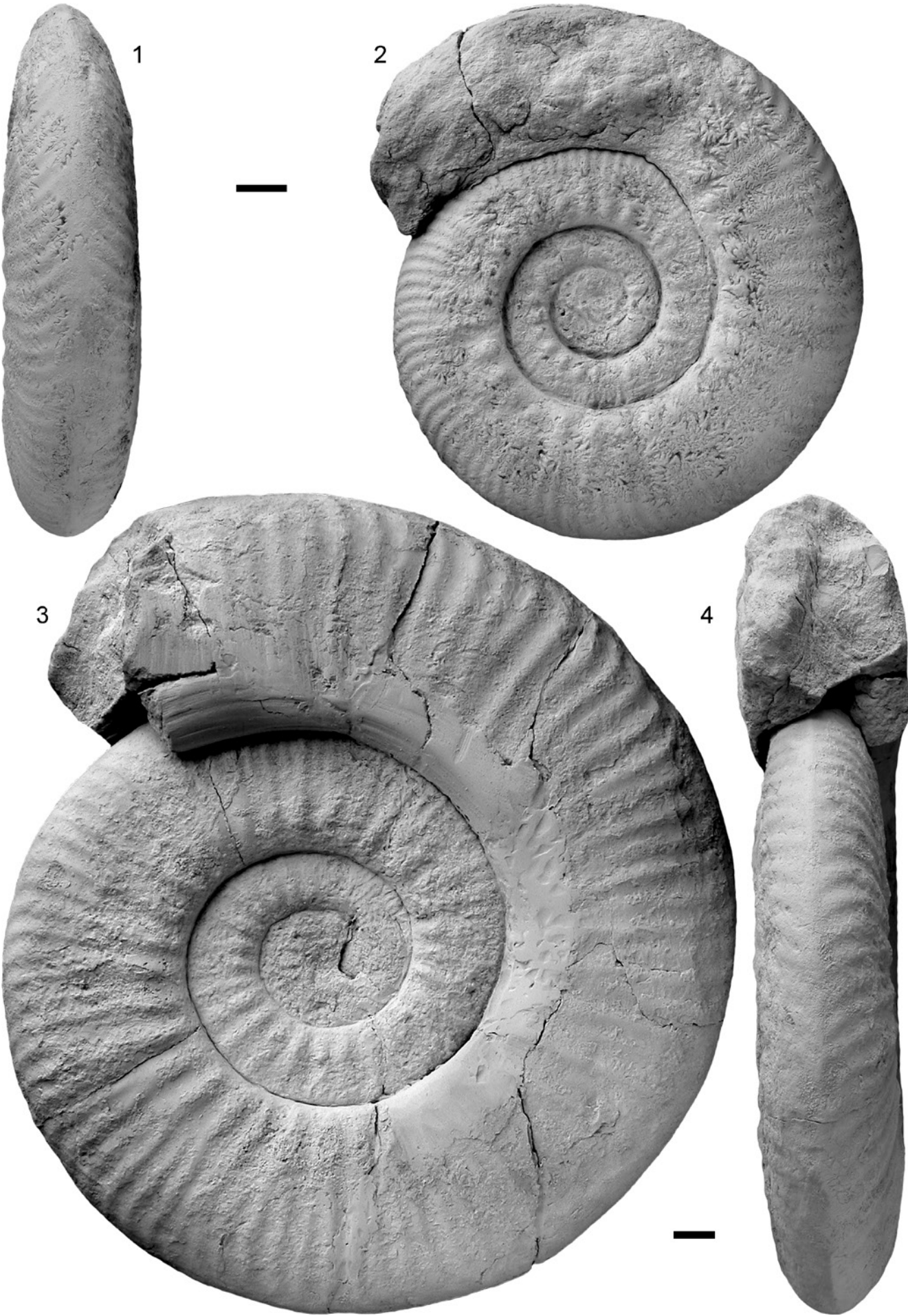
Distribution: Speciosum Zone of TRNS1.

Plate III

Figs 1-2: *Geczyeras speciosum* (Janensch), EZPC6737, TRNS1, Speciosum Zone.
(D 112, H 32, H/D 28.5%, W 24, W/D 21.4%, U ?54, U/D 45.5%)

Figs 3-4: *Geczyeras speciosum* (Janensch), EZPC7600, TRNS2, Condensed Unit.
(D 204, H ?60, H/D 29.4%, W 39, W/D 19%, U ?93, U/D 45.5%)

Scale bars equal 1 cm



***Crestaites cf. clocheri* (Rulleau & Elmi, 2001)**

Pl. VII, fig. 2

2001. *Pseudammatoceras clocheri* nov. sp.—Rulleau & Elmi, p. 77, pl. 31, figs 2-3.
 2009. *Pseudammatoceras clocheri* Rulleau & Elmi.—Rulleau, p. 50, text-fig. 15/6-7, pls 32-34.

Material: One wholly septate and one fragmentary internal molds.

Description: Evolute coiling with wide and shallow umbilicus, rounded umbilical margin, slightly convex flanks, low and carinate venter. Whorl-section subrectangular on the inner whorls, subovate on the last whorl. Sculpture of irregularly nodate primaries on the inner whorls, while strong, rectiradiate, bi- or trifurcating ribs on the last whorl.

Remarks: Based on morphology the species is assigned to *Crestaites* herein. Our specimens are similar to the juvenile example figured by Rulleau (2009, pl. 32, fig. 3) but both differ in irregular ribbing on the inner whorls. The evolute *Bredya* cf. *broilii* (Renz) specimen recorded by Géczy (1966) bears similar inner ribs but has broader whorls.

Distribution: Aalensis Zone of TRNS1.

***Crestaites goyi* (Martínez, 1992)**

Pl. VII, figs 3-4, Pl. IX, fig. 2

1992. *Geczyceras goyi* n. sp.—Martínez, p. 101, fig. 19, pl. 16, fig. 4, pl. 17, figs 1-2, pl. 18, fig. 1.
 2009. *Crestaites goyi* (Martínez)—Rulleau, p. 49, text-fig. 15/4, pl. 30, figs 1, 3-4 only.
 2009. *Crestaites goyi* (Martínez)—Kovács, p. 25, fig. 16/A-B (cum syn.).

Material: Eight internal molds of different state of preservation.

Description: Evolute, platycone coiling with a wide and shallow umbilicus. Umbilical and ventrolateral margins rounded, flanks convex, venter narrow and rounded with a low keel. Whorl-section ovate with maximum width at the lower third. Ribs strong 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.

Remarks: The species differs from *C. meneghinii* in stronger and less sigmoid ribbing.

Distribution: Speciosum-Aalensis Zone of TRNS1 and KRS.

***Crestaites gr. victorii* (Bonarelli, 1899)**

Pl. VII, fig. 5, Pl. VIII, figs 2, 3, Pl. IX, figs 1, 3

1899. *Hammatoceras Victorii* n. sp.—Bonarelli, p. 209.
 2009. *Crestaites gr. victorii* (Bonarelli)—Rulleau, p. 49, text-fig. 15/3, pl. 26, figs 2-4, pl. 27, figs 2-3, pl. 31, fig. 1.
 2009. *Crestaites victorii* (Bonarelli)—Kovács, p. 25, figs 14-15/A-B (cum syn.).

Material: 23 internal molds of different state of preservation.

Description: Large, evolute coiling with a wide and moderately deep umbilicus. Umbilical and ventrolateral margins rounded, flanks convex, venter moderately broad, high and rounded, with a low keel. Whorl-section wide-ovate with maximum width at the lower third. Slightly prorsiradiate and deep, irregularly placed constrictions on the phragmocone and the body chamber. Body chamber one whorl long. Peristome simple, projected and oblique, preceded by a wide, prorsiradiate constriction. Sculpture of coarse ribbing with 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 furcation points on the inner whorls bear small tubercles on some specimens. The sharp secondaries bend forward on the venter and cease at the keel. Ribbing prorsiradiate and more widely placed from the penultimate whorl.

Remarks: The type of the taxon is a fragmentary specimen (Meneghini 1867-1881, pl. 14, fig. 2) without the innermost whorls. Whole specimens were illustrated by Rulleau (2009), and it is clear that the species shows a moderate intraspecific variability of the whorl-width and the sculpture. The tubercles at the furcation points are similar to those of *Geczyceras perplanum* (see Rulleau, l.c. pl. 31, fig. 1), the specific difference is the presence of relatively deep constrictions that are not typical of *Geczyceras*. The rib density can also vary. Some specimens agree well with the type (e.g. EZPC6629 with tuberculate inner whorls), others moderately differ in morphology. Specimen EZPC6772 bears tubercles on the body whorl, while EZPC7467 is characterized

Plate IV

Figs 1-2: *Geczyceras bonarellii* (Parisch & Viale), EZPC7376, TRNS1, Speciosum Zone.

(D 148, H 33, H/D 22.2%, W 724, W/D 16.2%, U 87, U/D 58.7%)

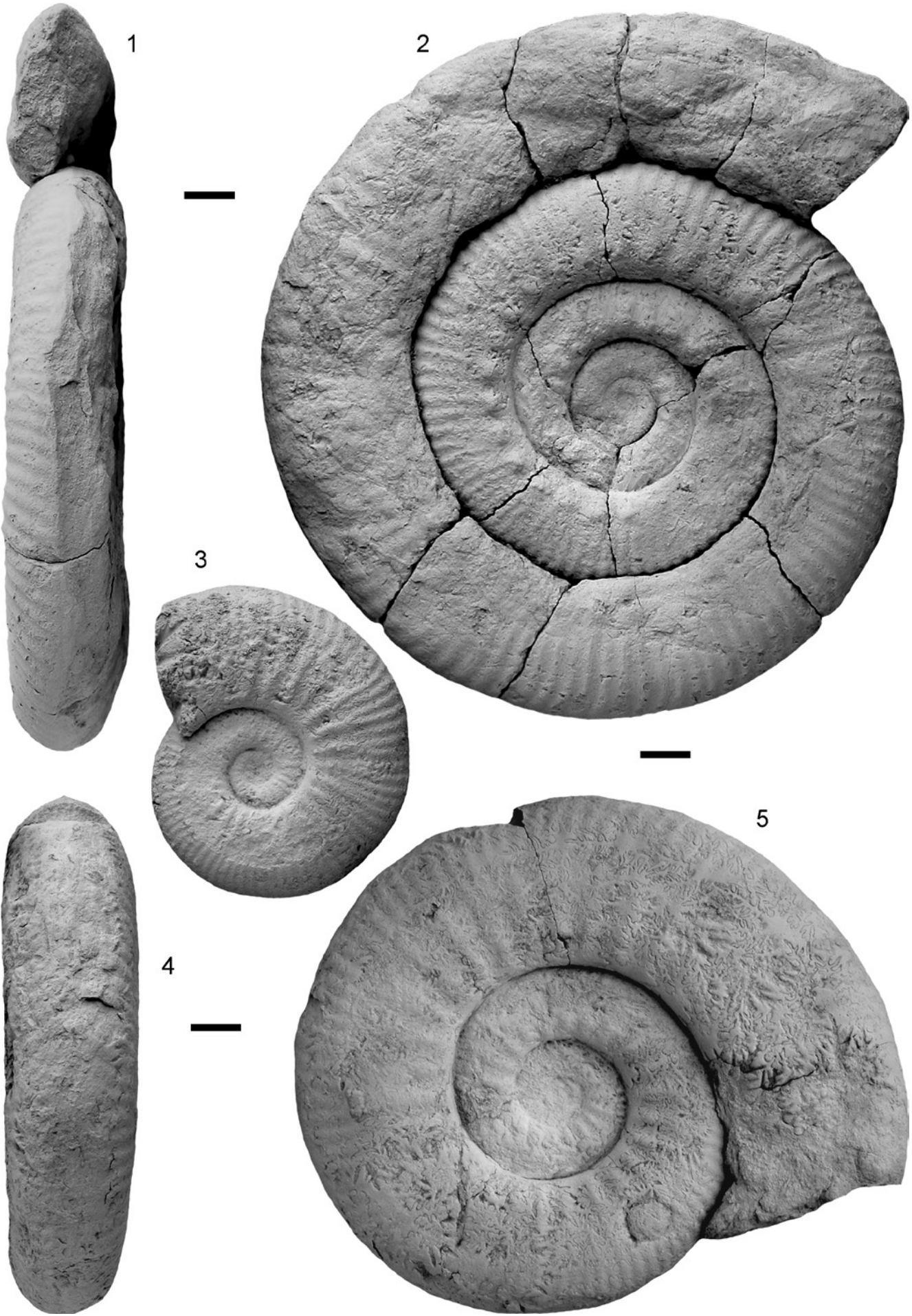
Fig. 3: *Geczyceras costulosum* (Merla), DM2016/05, TRNS1, Speciosum Zone.

(D 65, H 24, H/D 37%, W 22, W/D 33.8%, U 22, U/D 33.8%)

Figs 4-5: *Geczyceras costulosum* (Merla), EZPC7420, KRS, Condensed Unit.

(D 122, H 37, H/D 30.3%, W 26, W/D 21.3%, U 53, U/D 43.4%)

Scale bars equal 1 cm



by a narrow-ovate whorl-section with irregularly bi- or trifurcating sigmoid ribs and intercalatories, similarly to the specimens figured by Dezi & Ridolfi (1978, p. 31, fig. 30) and by Rulleau (2009, pl. 26, fig. 4, pl. 27, fig. 3). Similar variability is typical of the *C. victorii* material that was collected at Szentgál (Bakony Mts) and is housed in the Eötvös Museum of Natural History.

Distribution: Speciosum Zone of TRNS1 and KRS.

***Crestaites* ? sp.**

Pl. X, fig. 5

Description: Large, poorly preserved but almost complete specimen with evolute coiling and wide and shallow umbilicus. Flanks slightly convex, shoulder rounded, venter low and rounded with a weakly developed keel, whorl-section wide-ovate. Sculpture of moderately developed ribs. Strong, rectiradiate primaries rise from the umbilical margin and bifurcate on the lower third. The slightly prorsiradiate secondaries bend forward on the shoulder. Three narrow constrictions on the phragmocone. Suture-line richly intricate.

Remarks: The ornamentation of the specimen resembles that of *Crestaites* gr. *victorii* or *C. raricostatus*, but the size is different. Based on morphology and eryctid-like suture construction, the specimen might represent a transitional hammatoceratid form, and included herein within genus *Crestaites*.

Distribution: Speciosum Zone of TRNS1.

Genus *Bredyia* Buckman, 1910

Type species: *Ammonites subinsignis* Oppel, 1856 (= *Burtonia crassornata* Buckman, 1910). The type specimen (Buckman 1910, pl. 9, fig. 1) was designated by Senior (1977).

Diagnosis: Evolute to moderately evolute coiling, robust form, deep umbilicus, low ventral keel, subquadrate to suboval whorl-section. Coarse, bi- or trifurcating ribs on the inner whorls becoming weaker on the last whorl of the mature shell, nodes on the lower part of the flank. Somewhat simple hammatoceratid suture-line: long, narrow E, long, wide L, short, oblique U lobes, high ES and LS.

Remarks: *Bredyia* probably originated from *Crestaites* in the latest Toarcian and flourished in the Aalenian. The genus is characterized by sexual dimorphism including either genus *Rhodanicerias*, or e.g. *B. newtoni* Buckman [m], *B. fuentelsazensis* Martínez [m] as microconch forms (Martínez, 1992). In the Hungarian assemblages only macroconchs are known.

Based on morphological features genus *Pseudammatoceras* Elmi is considered herein as a synonym of *Bredyia* (see Senior, 1977; Kovács, 2009; Howarth, 2013). Species which were assigned to *Pseudammatoceras* by Rulleau (2009) are treated as belonging to other genera: *Pseudammatoceras clocheri* Rulleau & Elmi belongs to genus *Crestaites* (see above), while *Ammonites allobrogense* Dumortier, *A. diadematoïdes* Mayer and *Hammatoceras broilii* Renz are placed within *Bredyia* herein. *Pseudammatoceras boyeri* Elmi is recognized as a morphotype of *B. brancoi* (Prinz). These four species are known in the Transdanubian Central Range. In the Upper Toarcian beds of Csernye five taxa were described by Géczy (1966) that represent the genus: *Hammatoceras vighi* Géczy (junior synonym of *B. subinsignis*), *H. baconicum* (Prinz), *H. brancoi* (Prinz), *H. allobrogense* (Dumortier), and *H. percus* (Gregorio), while in the Aalenian *H. rugatum* (Buckman), *H. prinzi* Géczy, *H. diadematoïdes* (Mayer), *H. cf. broilii* Renz, *H. ? hungaricum* Géczy and *H. ? hantkeni* Géczy were recorded. In the Gerecse Mts three species occur around the Toarcian-Aalenian boundary: *B. subinsignis* (Oppel), *B. brancoi* (Prinz), and *B. cf. allobrogense* (Dumortier), while *B. rugata* (Buckman) and *B. diadematoïdes* (Mayer) range in the Middle Aalenian.

Distribution: Aalensis Zone-Aalenian: Europe, North Africa, Crimea, the Caucasus, Iran, North and South America, SE Asia, Japan. Hungary: Bakony Mts (Csernye, Búdöskút, Szentgál), Gerecse Mts.

***Bredyia subinsignis* (Oppel, 1856)**

Pl. VIII, figs 4, 5, Pl. X, figs 1-2

1856. *Ammonites subinsignis* Oppel, p. 487.

1977. *Bredyia subinsignis* (Oppel).—Senior, p. 682, pls 81-84, text-figs 2/a-k, n-s, 3/a-c, 4-7.

2009. *Bredyia subinsignis* (Oppel).—Kovács, p. 47, figs 33-34 (*cum syn.*).

Plate V

Fig. 1: *Geczyceras bonarellii* (Parisch & Viale), EZPC7462, KRS, Condensed Unit.

(D 70, H 20, H/D 28.5%, W 18, W/D 25.7%, U ?34, U/D 48.5%)

Fig. 2: *Geczyceras perplanum* (Prinz), EZPC7466, KRS, Speciosum Zone.

(D ?145, H 36, H/D 24.8%, W 24, W/D 16.5%, U 84, U/D 58%)

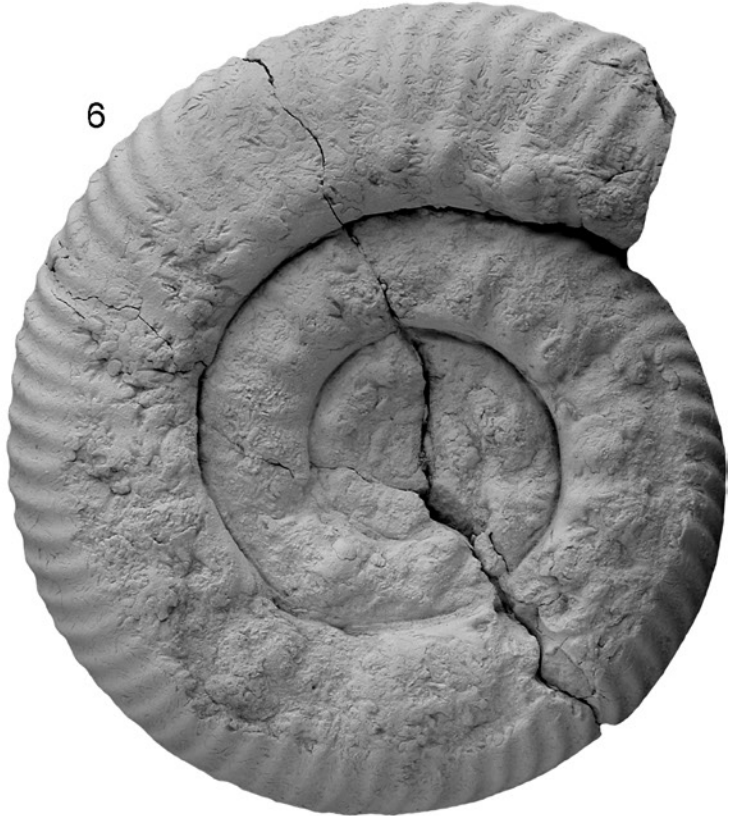
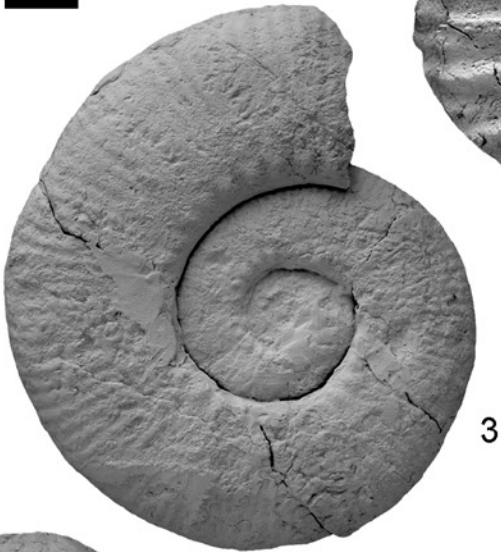
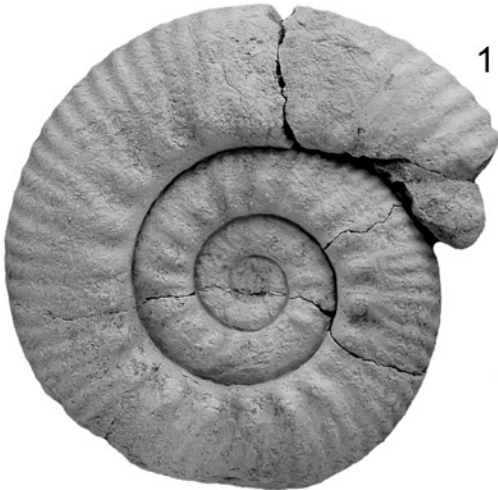
Figs 3-4: *Geczyceras porcarense* (Bonarelli), EZPC7609, TRNS2, Speciosum Zone.

(D 74, H 25, H/D 33.7%, W 18, W/D 24.3%, U 29, U/D 39%)

Figs 5-6: *Hammatoceras insigne* (Schubler in Zieten), EZPC7608, TRNS2, Speciosum Zone.

(D 115, H 30, H/D 26%, W 30, W/D 26%, U 60, U/D 52%)

Scale bars equal 1 cm



Material: Six internal molds in different state of preservation.

Description: Moderately evolute to moderately involute coiling with a low ventral keel. Umbilicus somewhat deep, wall steep with rounded margin. Flanks convex, shoulder rounded, venter broad, low and rounded. Whorl-section wide subtrapezoid on the inner whorls, but slightly more compressed on the last whorl with maximum width at the lower third. Sculpture 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 slightly projected at the shoulder, bend forward on the venter and cease at the keel.

Remarks: The species is characterized by moderate intraspecific variability of the whorl width and the ornamentation.

Distribution: Aalensis Zone of TRNS1.

Genus *Planammatoceras* Buckman, 1922

Type species: *Planammatoceras planiforme* Buckman, 1922, by original designation.

Diagnosis: Moderately evolute to involute, discoid coiling, acute venter, hollow keel, gently convex flanks, high-ovate whorl-section. Well-defined, branching, sigmoid ribbing with moderately long primaries with or without lateral tubercles, and dense, prorsiradiate secondaries. Hammatoceratid suture-line: developed, ramified E, long, broad, ramified L, divided, oblique U lobes.

Remarks: The genus is characterized by sexual dimorphism, the microconch forms are the species of genus *Paviaites* Cresta. *Planammatoceras* is probably a descendant of *Crestaites* radiating in the Meneghinii Zone. In the Betic Cordillera (Sandoval *et al.*, 2011) and in the Transdanubian Central Range the earliest representatives of *Planammatoceras* appear in the Upper Toarcian beds, then the genus shows abundance in the Aalenian. According to Géczy (1966, 1967b, 1968) both *P. tenuinsigne* (Vacek) and *P. planinsigne* (Vacek) occur first in the Levesquei Zone. In the Gerecse Mts the first appearance of *P. tenuinsigne* is known in the Meneghinii Zone.

Distribution: Uppermost Toarcian: Europe, North

Africa. Aalenian: Europe, North Africa, North and South America, Crimea, the Caucasus, Iran, Tajikistan, Tibet, Japan, ?Vietnam, ?Thailand.

Planammatoceras planinsigne (Vacek, 1886)

Pl. X, figs 3-4

1886. *Hammatoceras planinsigne* n. sp. – Vacek, p. 89, pl. 13, figs 1-6.
 2009. *Planammatoceras* (*Planammatoceras*) *planinsigne* (Vacek). – Rulleau, p. 63, text-fig. 17/6, pl. 55, fig. 2, pl. 57, fig. 1, pl. 58, pl. 59, fig. 1, pl. 60, fig. 3, pl. 73, fig. 1, non pl. 74, fig. 2 (= *P. tenuinsigne*).
 2009. *Planammatoceras planinsigne* (Vacek). – Kovács, p. 40, figs 26-27 (*cum syn.*).

Material: One wholly septate specimen of moderate preservation.

Description: Moderately involute coiling with slightly convex flanks. Whorl-section compressed high-ovate with maximum width at the lower third. Venter narrow and high with a ventral hollow keel. Coarse, rursiradiate primary ribs emerge on the umbilical wall, they are 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 cease. Intercalatories appear irregularly between the secondaries.

Remarks: A single specimen occurs in the uppermost Toarcian, the species is rather abundant in the Aalenian.

Distribution: Aalensis Zone-Aalenian: TRNS1.

Planammatoceras tenuinsigne (Vacek, 1886)

Pl. XI, figs 1-2, 3-4

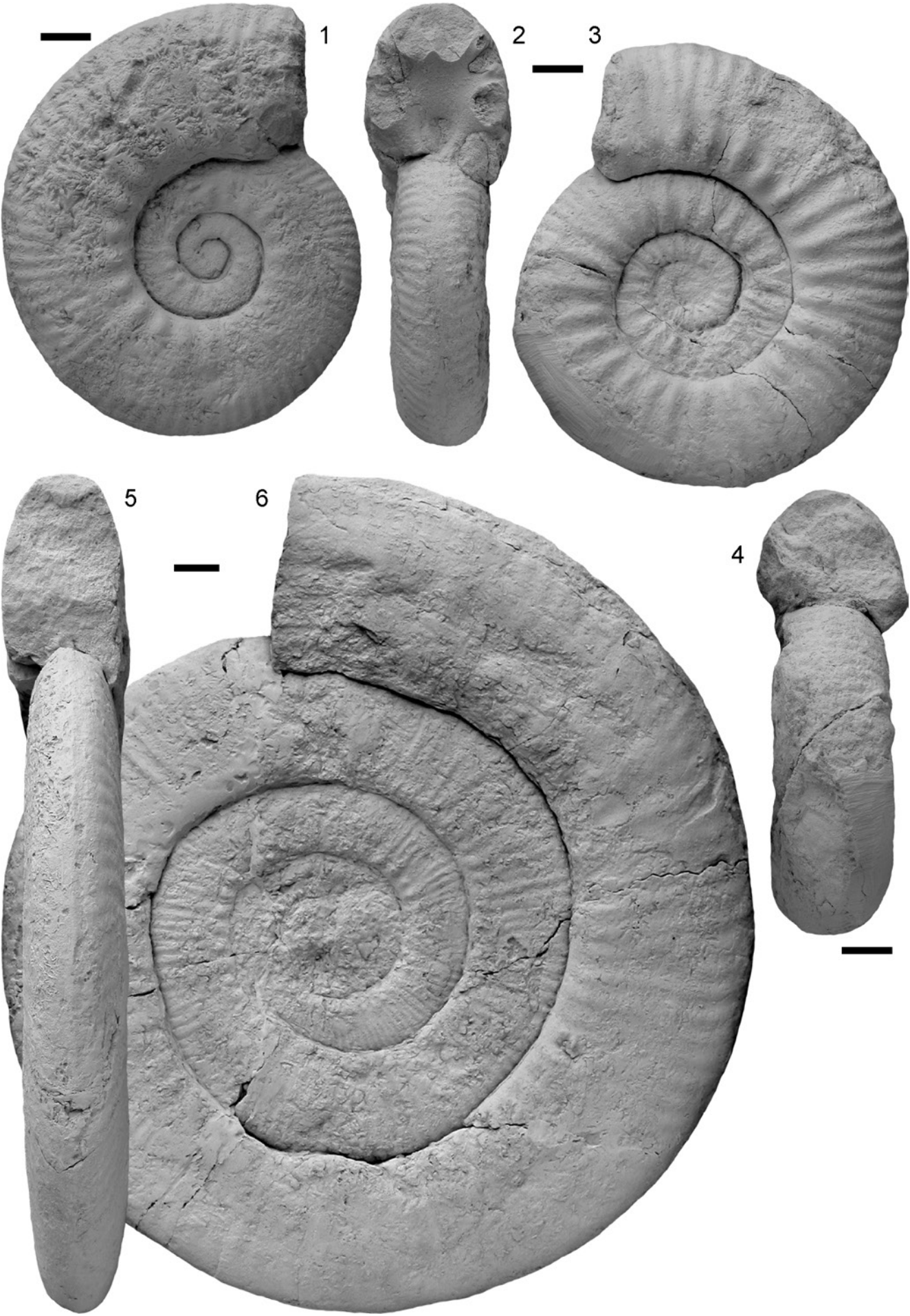
1886. *Hammatoceras tenuinsigne* n. sp. – Vacek, p. 88, pl. 12, figs 6-7.
 2009. *Planammatoceras* (*Planammatoceras*) *tenuinsigne* (Vacek). – Rulleau, p. 63, text-fig. 17/7, pl. 57, figs 2-3, pl. 59, fig. 2, pl. 61, fig. 1, pl. 74, fig. 2 (non *P. planinsigne*).
 2009. *Planammatoceras tenuinsigne* (Vacek). – Kovács, p. 38, figs 24-25 (*cum syn.*).

Material: 12 internal molds in different state of preservation.

Description: Moderately involute, discoid form with

Plate VI

Figs 1-2: *Hammatoceras insigne* (Schubler in Zieten), DM2016/04, TRNS1, Speciosum Zone. (D 88, H 30, H/D 34%, W 29.5, W/D 33.5%, U 32, U/D 36.3%)
 Figs. 3-4: *Hammatoceras insigne* (Schubler in Zieten), EZPC7161, TRNS1, Speciosum Zone. (D 89, H 27, H/D 30.3%, W 27, W/D 30.3%, U 40, U/D 45%)
 Figs 5-6: *Geczyoceras subplanatum* (de Brun), EZPC7596, TRNS2, Speciosum Zone. (D 193, H 48, H/D 24.8%, W 27, W/D 14%, U 109, U/D 56.4%)
 Scale bars equal 1 cm



a compressed, high-ovate whorl-section. Umbilicus moderately narrow, umbilical wall and margin rounded. Flanks slightly convex, venter narrow and high with a ventral hollow keel. Sculpture of dense and slightly biconcave ribs without tuberculation. Primaries rursiradiate on the umbilical walls, rectiradiate on the flanks, bifurcate at the lower third. The thinner secondaries bend forward on the venter and cease at the keel. Intercalary ribs appear irregularly between the secondaries.

Remarks: The species differs from *P. planinsigne* by finer and less curved primary ribs without lateral tubercles.

Distribution: Meneghinii Zone-Aalenian: TRNS1 and TRNS2.

Family Erycitidae Spath, 1928

The taxon was not accepted by Howarth (2013) and Dietze *et al.* (2013), as the subfamily Erycitinae was placed within the Hammatoceratidae. We follow the classification of Sandoval *et al.* (2015) including three subfamilies (Erycitinae Spath, 1928, Podagrosiceratinae Westermann & Riccardi, 1979, Zurcheriinae Hyatt, 1900). The Upper Toarcian-Aalenian Erycitinae are typical of the Mediterranean-Caucasian Realm, but occur in Alaska, Thailand, Tibet and New Zealand as well. The Podagrosiceratinae derived from the Erycitinae, and range in the Upper Toarcian-Aalenian of South America. Genera of Zurcheriinae range in the Mediterranean-Caucasian Realm, except *Zurcheria* that occurs also in South America.

Subfamily Erycitinae Spath, 1928

Remarks: The Toarcian genera of the subfamily were recently discussed by Kovács & Géczy (2008), Rulleau (2009), Venturi *et al.* (2010), Sandoval *et al.* (2011, 2015), and Howarth (2013) with additional references. Five genera belong to the Erycitinae: *Praerycites* Venturi, *Cagliceras* Rulleau & Elmi, *Erycites* Gemmellaro, *Abbasitoides* Géczy and *Abbasites* Buckman (= *Ambersites* Buckman). In the newly excavated Csernye sections two genera are recorded in the Toarcian layers:

Cagliceras and *Erycites*. The sexual dimorphism that is typical of the Aalenian erycitids has not been documented in the Toarcian material.

The earliest representative of the subfamily is *Praerycites*. It is known in the Bifrons-Gradatus zones, and is thought to be one of the descendants of the family Dactylioceratidae. According to Venturi & Bilotta (2008) genus *Cagliceras* that appeared in the Speciosum Zone, derived directly from *Praerycites civitellensis* Venturi. However, transitional forms between hammatoceratid and erycitid genera with similar morphology but different suture construction are also recognized (Kovács & Géczy, 2008), and it seems plausible that the ancestor of *Cagliceras* was genus *Geczyceras* as a descendant of *Praerycites* (Rulleau, 2009). The descendant of *Cagliceras* is genus *Erycites* that appeared in the uppermost Toarcian and flourished in the Aalenian. The genus and its descendants can be divided into two groups: the *Erycites fallifax* – *Abbasites* group is characterized by a sphaerocone, involute coiling, whereas the *Erycites gonionotus* – *Abbasitoides* group is marked by an evolute, planulate shell. Aalenian *Erycites* species are thought to be ancestors of genera belonging to the subfamily Zurcheriinae, while *Abbasites* was probably the ancestor of families Otoitidae and Stephanoceratidae. *Abbasitoides* can be regarded as the earliest representative of the branch that leads to the Stephanoceratinae.

Genus *Cagliceras* Rulleau & Elmi, 2001

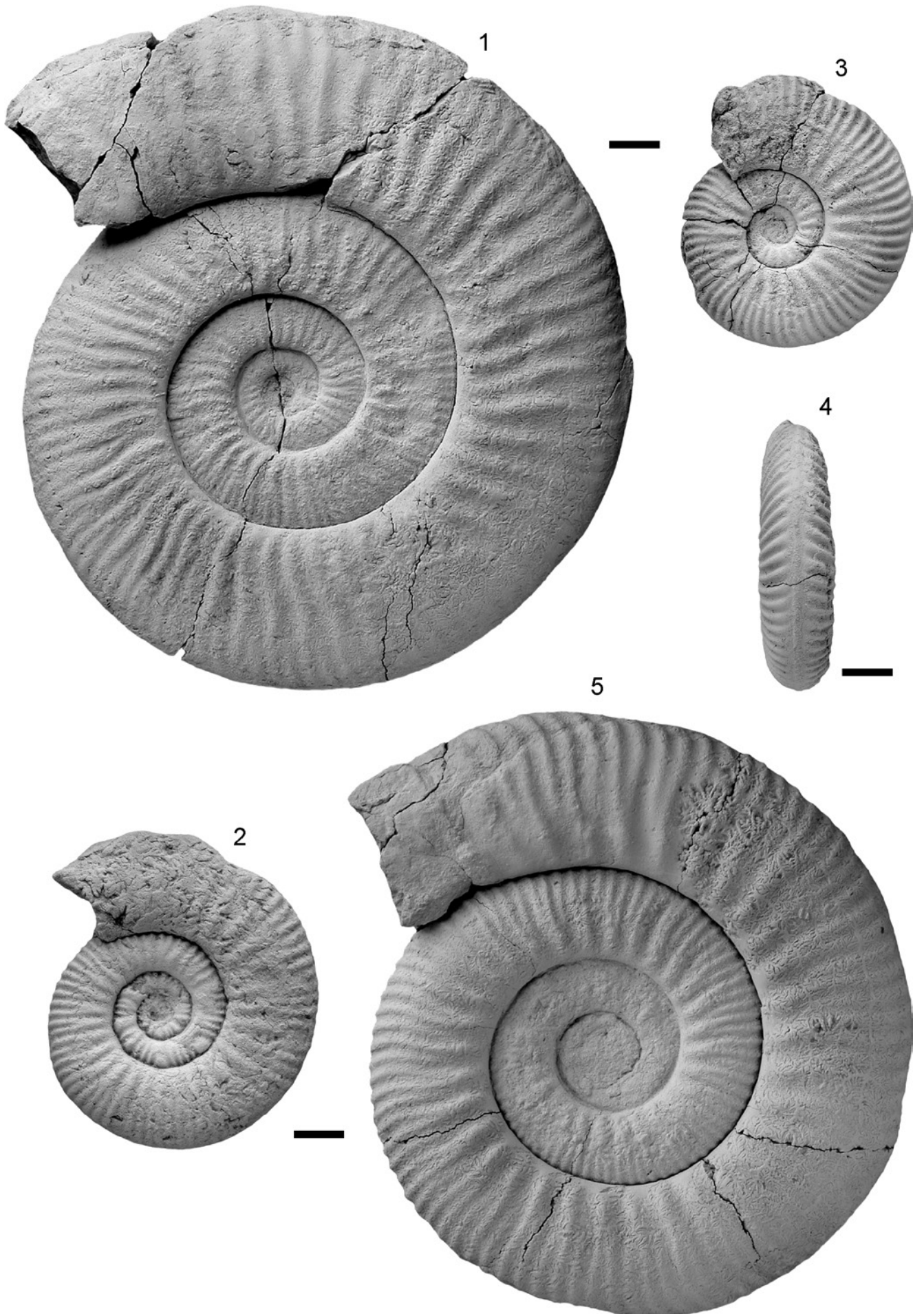
Type species: *Erycites elaphus* Merla, 1934. The type species (Merla, 1934, p. 25, pl. 4, fig. 5) was designated by Rulleau & Elmi (in Rulleau *et al.*, 2001).

Diagnosis: Medium-sized, evolute coiling, wide umbilicus, moderately convex flanks, ovate to subcircular whorl-section. The keel is weakly developed on the inner whorls and disappears during the ontogenesis. Strong ribbing with ventral interruption. Erycitid suture-line: short E, weakly developed, oblique ES, long, ramified L, broad LS, divided, oblique U lobes.

Remarks: The plausible separation of the *Erycites elaphus* – *E. picenus* group was suggested by Merla (1934) and Venturi (1994). The taxon *Cagliceras* was

Plate VII

- Fig. 1: *Crestaites meneghinii* (Bonarelli), EZPC7373, TRNS1, Speciosum Zone.
(D 143, H 39, H/D 27.2%, W 25, W/D 17.4%, U 70, U/D 49%)
- Fig. 2: *Crestaites* cf. *clocheri* (Rulleau & Elmi) (1/1), EZPC6950, TRNS1, Aalensis Zone.
(D 63, H 20, H/D 31.7%, W ?14, W/D 22.2%, U 27, U/D 42.8%)
- Figs 3-4: *Crestaites goyi* (Martínez), EZPC6742, TRNS1, Speciosum Zone.
(D 53, H 18.5, H/D 35%, W 12, W/D 22.6%, U 19, U/D 35.8%)
- Fig. 5: *Crestaites* gr. *victorii* (Bonarelli), EZPC7467, KRS, Speciosum Zone.
(D 129, H 31, H/D 24%, W 20, W/D 15.5%, U 70, U/D 54.2%)
- Scale bars equal 1 cm



erected by Rulleau & Elmi (in Rulleau *et al.*, 2001) for erycitids with specific morphological features (evolute coiling, relatively compressed whorl-section) and of Upper Toarcian range. Five species were assigned to the genus: *Cagliceras elaphum* (Merla), *C. rotundiformis* (Merla), *C. robustum* (Merla), *C. crassiventris* (Merla), and *C. picenum* (Fossa Mancini). *C. crassiventris* was excluded from *Cagliceras* by Sandoval *et al.* (2015) as the type specimen represents a Bajocian *Docidoceras* species. On the other hand, based on morphology and stratigraphic range, *C. banffy* (Prinz) and *C. enigmaticum* Kovács & Géczy are included in the genus herein, although Sandoval *et al.* (l.c.) argued that these taxa should also be excluded. However, the first one is a characteristic erycitid species, and the second one represents a transitional form between the *Hammatoceras* and *Erycitinae*, so we retain the erycitid classification.

At Csernye four species (*Erycites elaphus* Merla, *E. banffy* Prinz, *E. cf. robustus* Merla, and *E. cf. rotundiformis* Merla) – all are interpreted recently as *Cagliceras* – were recorded by Géczy (1966, 1967b), probably in the Levesquei Zone. At Úrkút *C. elaphus* is known in the uppermost Toarcian (Géczy, 1965, 1968).

In the revision of the erycitid material of the Gerecse Mts (Kovács & Géczy, 2008) seven Upper Toarcian species were described: *C. elaphum* (Merla), *C. crassiventris* (Merla), *C. robustum* (Merla), *C. rotundiformis* (Merla), *C. picenum* (Fossa Mancini), *C. enigmaticum* Kovács & Géczy and *C. costulosum* (Merla). (*Hammatoceras costulosum* Merla is assigned to *Geczyceras* in this paper). In the Gerecse Mts the earliest representatives appear in the Speciosum Zone, the genus flourishes in the Meneghinii-Aalensis zones, and disappear in the Opalinum Zone. The highest diversity of the genus in Europe is typical of the Italian and Hungarian localities; the most closely allied *Cagliceras* material with significant morphological variability was presented by Dezi & Ridolfi (1978) from Monte Carcatora. The occurrence of the genus is sporadic in NW European localities (e.g. Germany: *C. elaphum*, France: *C. elaphum*, *C. picenum*). Analysis of more than 90 *Cagliceras* specimens from

the Csernye and the Gerecse Mts assemblages proves that the stratigraphic range of three species (*C. elaphum*, *C. robustum* and *C. rotundiformis*) are almost the same, and they are closely allied in size and morphology. The differences in style of ribbing (prorsiradiate: *elaphum*, rectiradiate and sharp: *rotundiformis*, rectiradiate and bullate: *robustum*) that were recognized as specific features by Merla (1934) seem to be only gradual (see Rulleau, 2009, pl. 80, fig. 3). Further three taxa that are closely related to this group need to be revised. The morphology and the suture-line of *Hammatoceras personatum* Fossa Mancini is similar to that of *C. rotundiformis*, this species was arranged as *Cagliceras* by Rulleau (l.c.). The morphology of the wholly septate internal mold of *E. personatiformis* Géczy (Upper Toarcian, Csernye) is also very close to that of *C. rotundiformis*, hence Géczy's taxon is considered herein as a junior synonym of the latter. *Erycites geczyi* Pinna in the Upper Toarcian of Alpe Turati was interpreted as a junior synonym of *C. robustum* by Sandoval *et al.* (2015). In our opinion, *C. robustum* and *C. rotundiformis* might be interpreted as morphotypes of a single biospecies: *C. gr. elaphum* (Merla).

Distribution: Upper Toarcian-Lower Aalenian: Europe, North Africa, ?Iran. Hungary: Bakony Mts (Csernye, Úrkút, Szentgál), Gerecse Mts.

Cagliceras gr. elaphum (Merla, 1934)

Pl. XI, figs 7-8, Pl. XII, figs 1-2, 3-4, Pl. XIII, figs 4-5

1934. *Erycites elaphus* n. sp. – Merla, p. 25, pl. 4, fig. 5.

2008. *Cagliceras elaphum* (Merla). – Kovács & Géczy, p. 66, fig. 4, pl. 1, figs 1-3, pl. 2, fig. 1, pl. 3, figs 1-2 (*cum syn.*).

2015. *Cagliceras elaphum* (Merla). – Sandoval *et al.*, p. 81, pl. 1, figs 1-2, 4-5 (*cum syn.*).

Material: 39 internal molds in different state of preservation.

Description: Medium-sized, evolute coiling with a wide and moderately deep umbilicus. Flanks convex, ventrolateral shoulder and venter rounded with a thin and weakly developed keel. Inner whorl-section wide-

Plate VIII

Fig. 1: *Crestaites cf. meneghinii* (Bonarelli), EZPC6774, TRNS1, Speciosum Zone.

(D 119, H 28, H/D 23.5%, W 20, W/D 16.8%, U 64, U/D 53.7%)

Fig. 2: *Crestaites gr. victorii* (Bonarelli), EZPC6751, TRNS1, Speciosum Zone.

(D 103, H 26, H/D 25.2%, W 24, W/D 23.3%, U 44, U/D 42.7%)

Fig. 3: *Crestaites gr. victorii* (Bonarelli), EZPC6772, TRNS1, Speciosum Zone.

(D 124, H 26, H/D 21%, W ?, U 72, U/D 58%)

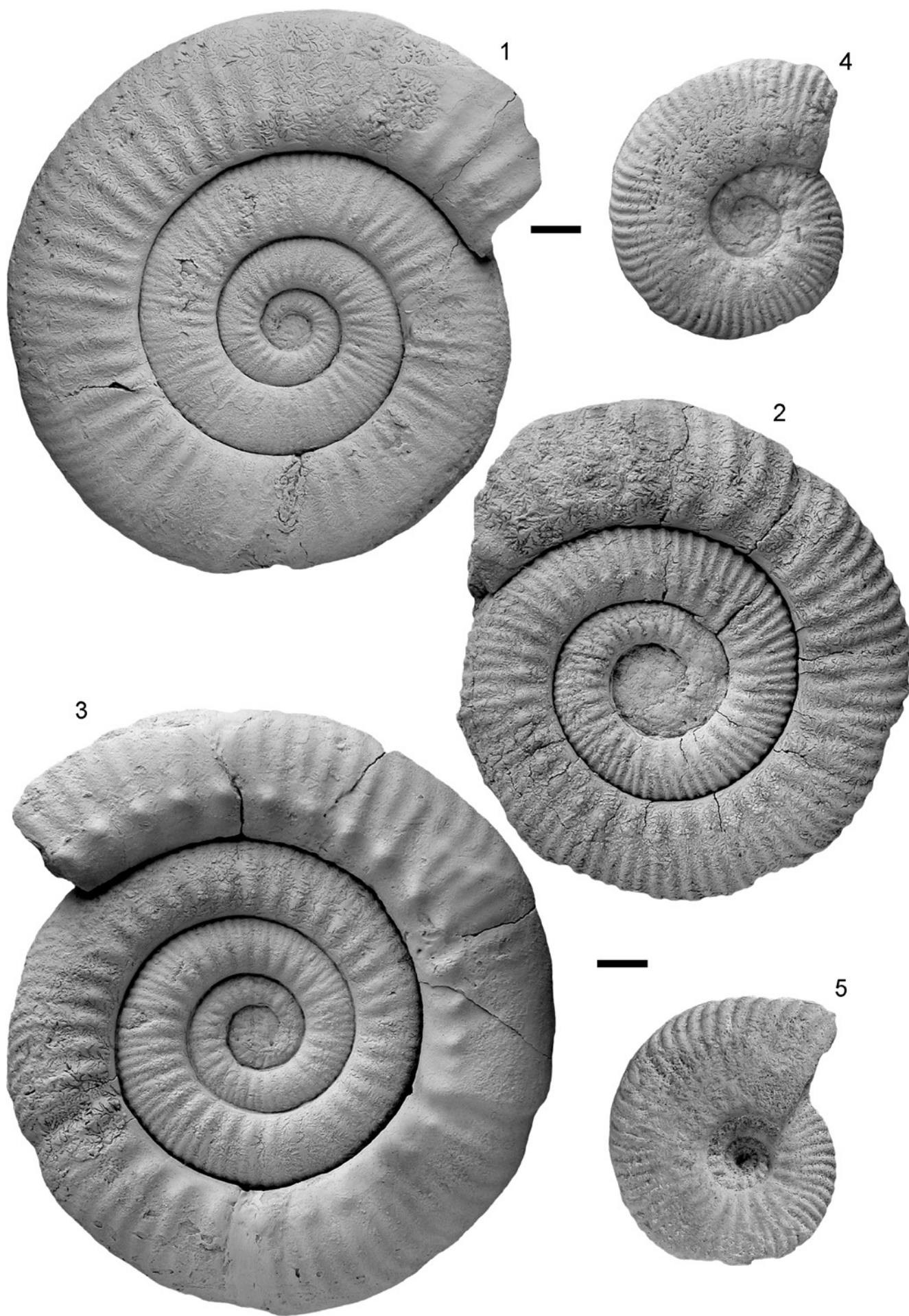
Fig. 4: *Bredya subinsignis* (Oppel), EZPC6669, TRNS1, Aalensis Zone.

(D 58, H 21, H/D 36.2%, W 11, W/D 19%, U 20, U/D 34.4%)

Fig. 5: *Bredya subinsignis* (Oppel), DM2016/13, TRNS1, Aalensis Zone.

(D 57, H 25, H/D 43.8%, W 12, W/D 21%, U 15, U/D 26.3%)

Scale bars equal 1 cm



ovate, section of the body chamber high-ovate with maximum width at the lower third. Sculpture of strong ribs. Short, thick, moderately prorsiradiate primary ribs emerge on the umbilical wall. The primaries grow up into pseudotubercles on several examples. Primaries branch into 2-3, rarely 4 secondary ribs at the lower third of the flank. Primaries sharper, more widely spaced and prorsiradiate on the body chamber, and the furcation zone moves up to the mid-flank. The thinner, prorsiradiate secondaries bend forward, and cease at the keel, and they tend to be less developed on the body chamber. Body chamber 4/5 whorl long. Projected, oblique peristome preceded by a shallow constriction.

Remarks: As in the Gerecse Mts, the most frequent *Cagliceras* species at Csernye is *C. gr. elaphum*. It is characterized by significant intraspecific variability of the whorl-section (subcircular to subovate), and of the style of ribbing (acutely to slightly prorsiradiate, short to elongated, widely spaced to dense primary ribs). The large specimen (EZPC7560) is close in morphology to the one figured as *C. elaphum pannonicum* by Géczy (1965) in the Upper Toarcian of Úrkút. The species differs from *Crestaites victorii* in weaker ribbing with short primaries. *E. barodiscus* differs in remarkably robust form with broader whorls and coarse sculpture.

Distribution: Speciosum-Aalensis Zone of all three sections.

***Cagliceras gr. elaphum* (Merla, 1934) morphotype
rotundiformis (Merla, 1934)**

Pl. XI, figs 5-6, Pl. XIII, fig. 1

1934. *Erycites rotundiformis* n. sp.– Merla, p. 24, pl. 3, fig. 6
2008. *Cagliceras rotundiformis* (Merla).– Kovács & Géczy, p. 69, fig. 6, pl. 5, figs 1-3 (*cum syn.*).
2015. *Cagliceras rotundiformis* (Merla).– Sandoval *et al.*, p. 83, pl. 1, fig. 3 (*cum syn.*).

Material: Six internal molds of moderate preservation.

Remarks: The morphotype differs from the closely affiliated *C. elaphum* and *C. robustum* in regular sub-circular section and in ornamentation with fine, sharp, rectiradiate ribs.

Distribution: Speciosum-Aalensis Zone of TRNS1 and KRS.

***Cagliceras gr. elaphum* (Merla, 1934) morphotype
robustum (Merla, 1934)**

Pl. XIII, figs 2-3

1934. *Erycites robustus* n. sp.– Merla, p. 25, pl. 2, fig. 6a-b, pl. 3, fig. 7.
2008. *Cagliceras robustum* (Merla).– Kovács & Géczy, p. 68, pl. 5, fig. 4 (*cum syn.*).
2009. *Cagliceras robustum* (Merla).– Rulleau, p. 77, pl. 78, fig. 6.

Material: Seven internal molds of moderate preservation.

Remarks: The morphotype differs from *C. elaphum* by slightly wider whorls and rectiradiate, bullate ribbing. Its classification is discussed in the literature. Venturi *et al.* (2010) placed it within *Praerycites*, however, the latter genus ranges in the Bifrons-Gradatus zones. According to Sandoval *et al.* (2015) *robustum* should be excluded from *Cagliceras* as the tuberculate sculpture is not typical of the genus. In our opinion the lectotype of the taxon (Merla 1934, pl. 2, fig. 6 designated by Sandoval *et al.*, 2015) is characterized by only bullate and not tuberculate primary ribs, and this feature can be interpreted within the variability of the *elaphum* – *rotundiformis* – *robustum* group. The morphotype is probably the ancestor of *Erycites barodiscus*.

Distribution: Meneghinii-Aalensis Zone of TRNS1, Condensed Unit to Aalensis Zone of KRS.

***Cagliceras banffy* (Prinz, 1904)**

Pl. XIV, figs 1-2, 3-4

1904. *Erycites Bánffy* nov. sp.– Prinz, p. 87, fig. 11, pl. 32-33, fig. 5, pl. 38, fig. 9.
1966. *Erycites banffy* Prinz.– Géczy, p. 94, fig. 80, pl. 26, fig. 3 (*cum syn.*).

Material: Three poorly preserved internal molds.

Description: Large, evolute coiling with a wide and moderately deep umbilicus. Flanks moderately convex, venter rounded with a weakly developed keel, whorl-section wide-ovate. Primary ribs strong, dense, bi- or trifurcating on the phragmocone, while simple and widely spaced on the body chamber, secondaries thinner.

Remarks: Based on morphology, suture construction and stratigraphic range, the taxon is classified within

Plate IX

Fig. 1: *Crestaites gr. victorii* (Bonarelli), EZPC7569, KRS, Speciosum Zone.

(D 110, H 27, H/D 24.5%, W 20, W/D 18%, U 60, U/D 54.5%)

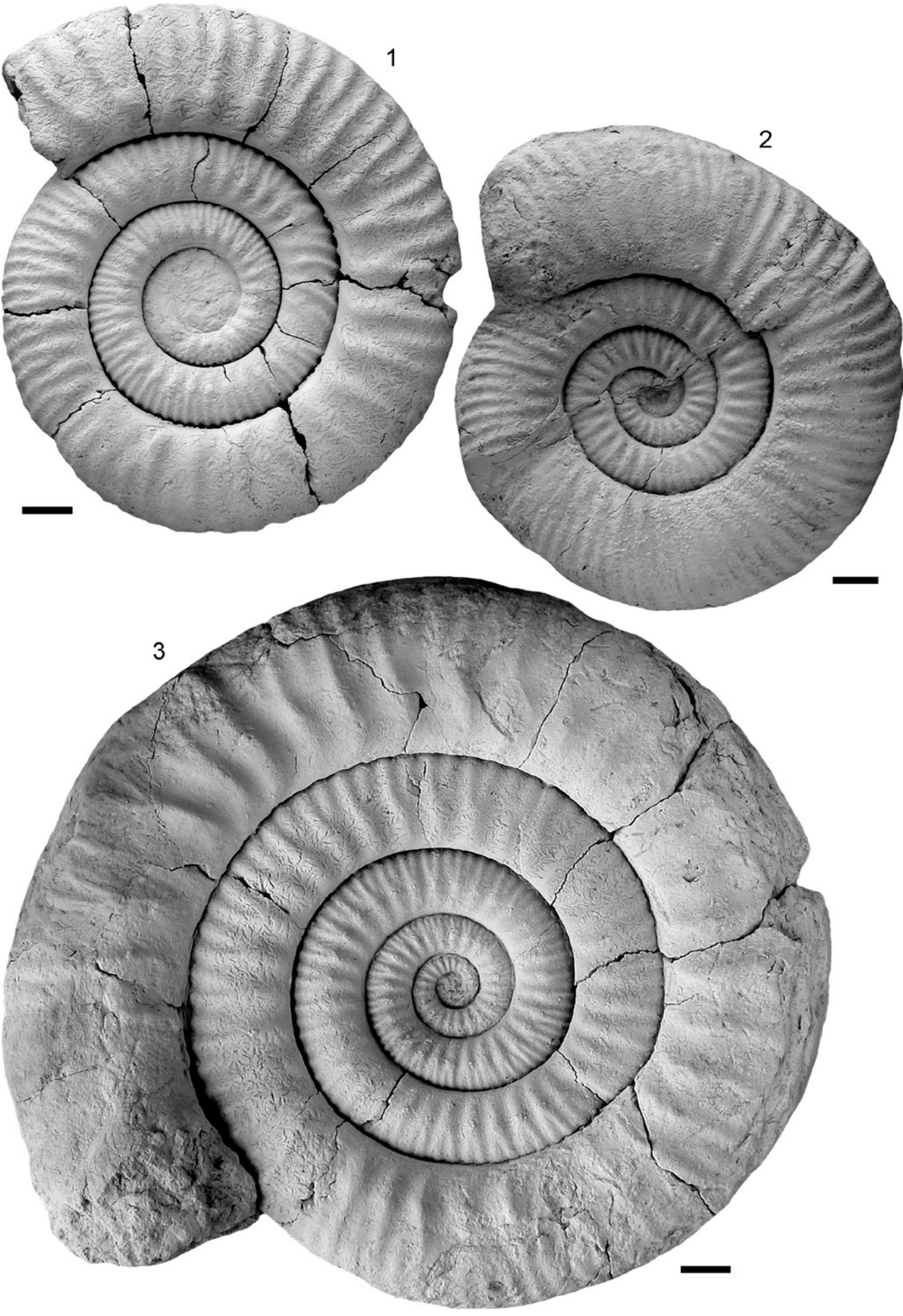
Fig. 2: *Crestaites goyi* (Martínez), DM2016/11, TRNS1, Aalensis Zone.

(D 115, H 35, H/D 30.4%, W ?24, W/D 20.8%, U 53, U/D 46%)

Fig. 3: *Crestaites gr. victorii* (Bonarelli), EZPC6629, TRNS1, Speciosum Zone.

(D 170, H 40, H/D 23.5%, W 30, W/D 17.6%, U 96, U/D 56.4%)

Scale bars equal 1 cm



Cagliceras. *C. banffy* is a rare endemic species, it is known only in the Bakony Mts (Csernye and Úrkút). Our specimens show slight variability in density of simple ribs on the body chamber.

Distribution: Condensed Units of TRNS1 and KRS.

***Cagliceras enigmaticum* Kovács & Géczy, 2008**

Pl. XV, figs 1-2

2008. *Cagliceras enigmaticum* n. sp.—Kovács & Géczy, p. 72, pl. 6, figs 3-4, pl. 7, figs 1-3.

Material: One wholly septate internal mold of moderate preservation.

Description: Medium-sized, subserpenticone coiling with gradually growing whorls. Umbilicus wide and shallow. Flanks slightly convex, almost flattened, shoulder rounded, venter narrow and rounded with a thin and low keel. Whorl-section ovate with maximum thickness at the lower third. Two moderately deep and straight constrictions on the lateral side of the body chamber. Sculpture of coarse ribs. Thick, nodate, rectiradiate primary ribs emerge on the umbilical wall, regularly bifurcate at the lower third of the flank, they are more widely spaced on the body chamber. The slightly thinner, moderately sigmoid secondaries curve forward on the venter, and cease alternating on the two sides of the keel.

Remarks: The species resembles *C. picenum* in evolute coiling, but differs in more compressed whorls, and by bearing more widely spaced, longer, sharper, and projected primary ribs. According to Sandoval *et al.* (2015) the taxon should be excluded from genus *Cagliceras*, but *C. enigmaticum* is considered as a transitional form between the Hammatoceratinae and the Erycitinae, hence maintaining the genus level classification is proposed herein. The species also occurs in the Upper Toarcian of Italy.

Distribution: Speciosum Zone of TRNS1.

***Cagliceras baldii* nov. sp.**

Pl. XV, figs 3-4

2008. *Cagliceras* sp. aff. *crassiventris* (Merla).—Géczy *et al.*, pl. 5, fig. 2.

Holotype: 2016.51.1 (Eötvös Museum of Natural History, Budapest).

Derivation of name: In honour of Professor Tamás Báldi (1935-2014), late Hungarian geologist and palaeontologist.

Type locality and horizon: condensed beds of Gradatus-Speciosum Zones, Bakonycsernye, TRNS1, Bakony Mts.

Material: Two internal molds of moderate preservation.

Diagnosis: Evolute, planulate coiling, flat flank, rounded venter, subrectangular section, bi- or trifurcating ribs, erycitid suture-line.

Description: Evolute, planulate coiling with a wide and shallow umbilicus. Umbilical wall low and rounded, margin rounded. Flanks flat and subparallel, shoulder rounded, venter broad and rounded with a narrow and low keel. Whorl-section subrectangular. Sculpture of prorsiradiate, slightly sigmoid and dense ribs. Primaries short, thick, nodulate, slightly prorsiradiate, and bi- or trifurcate at the lower third. Their width and intercosta are of the same size. The specimen bears 31 primary ribs on the last whorl. The secondaries bend forward and cease at the keel. Intricate suture-line: short, broad E, oblique, asymmetric ES, long, broad, ramified L on the upper third of the flank, high, broad, ramified LS1, short, oblique U lobes.

Remarks: Based on morphology, suture construction and stratigraphic range, the new species is assigned to genus *Cagliceras*. It differs from other *Cagliceras* species mainly in narrow subrectangular whorl-section. The specimen came from the condensed Bed 25 of the TRNS1, it was associated with *Merlaites clausus* (Merla), *Paroniceras helveticum* Renz, *Furloceras chelussii* (Parisch & Viale), *Pseudogrammoceras subregale* Pinna, *P. bingmanni* (Denckmann), *Podagrosites aratus* (Buckman), *Geczyeras costulosum* (Merla), *Hammatoceras insigne* (Schubler in Zieten).

***Cagliceras wegneri* nov. sp.**

Pl. XV, figs 5-6

Holotype: 2016.52.1 (Eötvös Museum of Natural History, Budapest).

Derivation of name: In honour of Alfred Lothar Wegener (1880-1930).

Plate X

Figs 1-2: *Bredya subinsignis* (Oppel), DM2016/12, TRNS1, Aalensis Zone.

(D 65, H 24, H/D 37%, W 18, W/D 27.7%, U 23, U/D 35.3%)

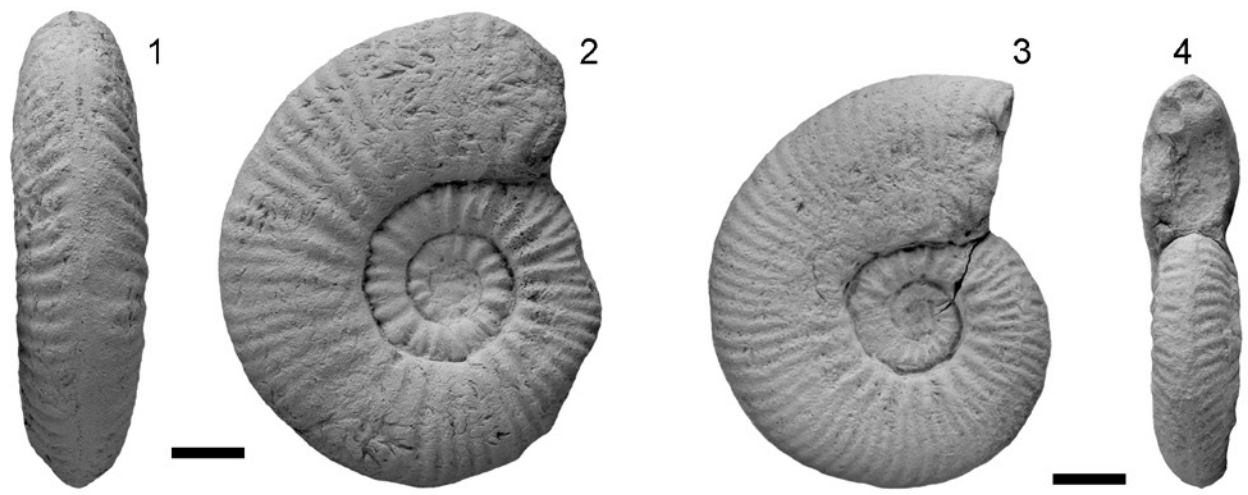
Figs 3-4: *Planammatoceras planinsigne* (Vacek), DM2016/15, TRNS1, Aalensis Zone.

(D 58, H 24, H/D 41.3%, W 13, W/D 22.4%, U 18, U/D 31%)

Fig. 5: *Crestaites* sp., EZPC6750, TRNS1, Speciosum Zone.

(D 280, H 71, H/D 25.3%, W ?44, W/D 15.7%, U 156, U/D 55.7%)

Scale bars equal 1 cm



Type locality and horizon: Speciosum Zone, Bakony-csernye, TRNS1, Bakony Mts.

Material: One well-preserved, wholly septate internal mold.

Diagnosis: Evolute coiling, convex flank, rounded venter, subovate section, paired ribs, erycitid suture-line.

Description: Evolute coiling with wide, gradually deepening umbilicus, low, convex umbilical wall, and rounded margin. Flanks convex, shoulder rounded, venter low, narrow and rounded with a narrow and low keel. Whorl-section wide-ovate with maximum width at the lower third. Body chamber not preserved. Sculpture of moderately strong, dense, rectiradiate and straight ribs on the inner whorls, while moderately sigmoid ribs on the last whorl. Primaries short, nodulate and slightly prorsiradiate, they regularly bifurcate at the lower fourth. Secondaries prorsiradiate. The specimen bears 37 primary and 76 secondary ribs on the last whorl. One shallow constriction on the last whorl. Richly intricate erycitid suture-line: short, narrow E, oblique, ramified, asymmetric ES, long, broad, ramified L, broad, ramified LS1, short, oblique U lobes.

Remarks: Based on morphology, suture construction and stratigraphic range, the new species is assigned to genus *Cagliceras*. *C. gr. elaphum* (Merla) differs by more prorsiradiate ribs with long and widely spaced primaries, *C. picenum* (Fossa Mancini) differs by longer, sharper and less sigmoid primary ribs. The holotype came from Bed 17 of the TRNS1, it was associated with *Geczyceras bonarellii* (Parisch & Viale), *Hammatoceras insigne* (Schubler in Zieten), *Crestaites gr. victorii* (Bonarelli), *C. cf. victorii*, *C. meneghinii* (Bonarelli), *C. goyi* (Martínez), *Cagliceras gr. elaphum* (Merla).

Genus *Erycites* Gemmellaro, 1886

Type species: *Erycites fallifax* Arkell, 1957. The holotype of *Erycites fallifax* (*Ammonites fallax*, Benecke, 1865, pl. 6, fig. 1) as the type species of the genus was designated by Arkell (1957, p. L267, fig. 308.3).

Diagnosis: Medium-sized, moderately evolute to subcadicone coiling, wide-ovate, subcircular, subquadrate or ovate whorl-section, convex flanks, rounded shoulder,

rounded, smooth or weakly carinate venter. Coarse to fine, branching ribs with ventral interruption. Erycitid suture-line: short E, weakly developed ES, long, widely ramified L, broad LS, divided, oblique U lobes.

Remarks: The stratigraphic range of *Erycites* is restricted to the uppermost Toarcian and the Aalenian Stage. In the Upper Toarcian beds of the Csernye sections five taxa: *Erycites subquadratus* Géczy, *E. baconicus* Hantken in Prinz, *E. reussi* (Hauer), *E. ovatus* Géczy, and *E. fallifax* Arkell, while at Úrkút *E. subquadratus* were recorded by Géczy (1966, 1967b, 1968). The Toarcian occurrence of *E. fallifax* is not confirmed herein. *E. barodiscus* Gemmellaro was not mentioned in Géczy's works, however, the reinvestigation of the Csernye material in the collection of the Hungarian Geological Institute proved its presence (Galács & Kovács, 2013). In the Gerecse Mts three species occur in the Meneghinii-Aalensis zones: *E. ovatus* Géczy, *E. barodiscus* Gemmellaro (= *E. subquadratus* Géczy), and *E. gerecsensis* Kovács & Géczy; in the studied assemblage *E. barodiscus* was the most abundant erycitid around the Toarcian-Aalenian boundary (Kovács & Géczy, 2008).

Distribution: Upper Toarcian-Aalenian: Europe, North Africa, the Crimea, the Caucasus, Iran, Tibet, ?Thailand, ?New Zealand. Hungary: Bakony Mts (Csernye, Úrkút, Büdöskút, Szentgál), Gerecse Mts.

Erycites barodiscus (Gemmellaro, 1886)

Pl. XVI, figs 1-2, 3-4, 5-6

1886. *Hammatoceras* (*Erycites*) *barodiscus*.— Gemmellaro, p. 206.
 2008. *Erycites barodiscus* Gemmellaro.— Kovács & Géczy, p. 76, text-fig. 10, pl. 10, figs 1-2, pl. 11, fig. 3.
 2015. *Erycites barodiscus* Gemmellaro.— Sandoval *et al.*, p. 85, pl. 2, figs 1-3, pl. 3, fig. 1.

Material: 20 specimens of different state of preservation.

Description: Moderately evolute coiling. Umbilicus narrow and deep on the inner whorls, wider and shallower on the last whorl. Flanks of the inner whorls convex, but moderately rounded on the last whorl. Venter broad, low and rounded with a narrow, smooth band in the middle.

Plate XI

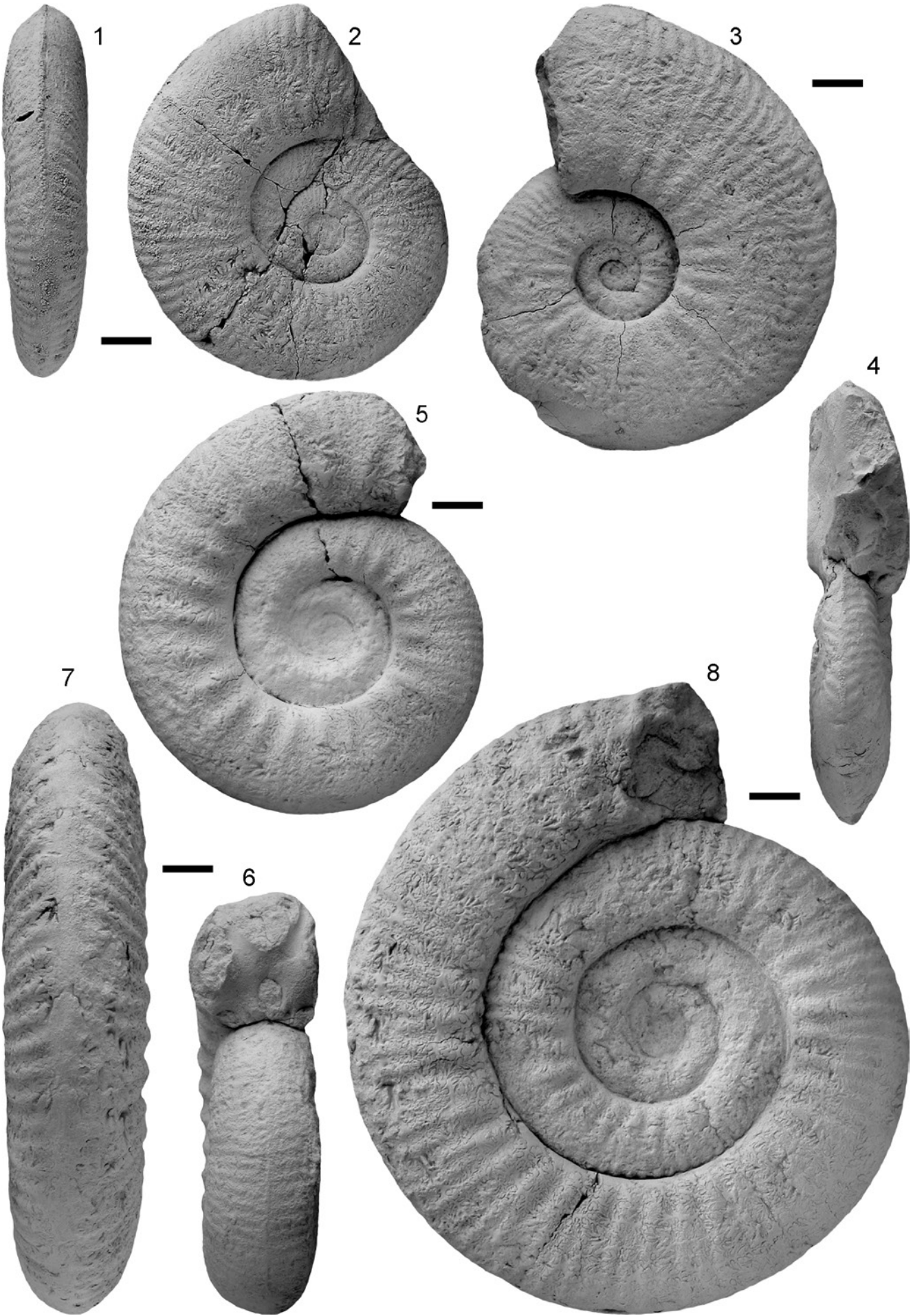
Figs 1-2: *Planammatoceras tenuinsigne* (Vacek), EZPC6948, TRNS1, Aalensis Zone.
 (D 74, H 26.5, H/D 35.8%, W 15, W/D 20.2%, U 28, U/D 37.8%)

Figs 3-4: *Planammatoceras tenuinsigne* (Vacek), DM2016/14, TRNS1, Aalensis Zone.
 (D 88, H 37, H/D 42%, W 16, W/D 18%, U 25.5, U/D 29%)

Figs 5-6: *Cagliceras gr. elaphum* (Merla) morphotype *rotundiformis* (Merla), EZPC6960, TRNS1, Aalensis Zone.
 (D 84, H 26, H/D 31%, W 28, W/D 33.3%, U 38, U/D 45.2%)

Figs 7-8: *Cagliceras gr. elaphum* (Merla), EZPC6770, TRNS1, Speciosum Zone.
 (D 125, H 28, H/D 22.4%, W 26, W/D 20.8%, U 69, U/D 55.2%)

Scale bars equal 1 cm



Whorl-section depressed subcircular to wide-ovate on the phragmocone, and wide-ovate on the body chamber with maximum width at the mid-flank. Last whorl always wider than the penultimate one. Body chamber about 3/4 whorl long. Projected, oblique peristome preceded by a wide, deep and oblique constriction. Sculpture of coarse ribs persisting throughout the shell. Thick, slightly prorsiradiate primary ribs emerge on the umbilical wall branching into 2-3 secondaries at mid-height, they are more widely spaced on the body chamber with concave interspaces. The thinner secondaries bend gently forward and cease in the middle of the ventral part, alternating on the two sides.

Remarks: The species is probably the descendant of the *Cagliceras elaphum* group, from that it differs in somewhat more involute coiling, broad whorls and strong ribs. It shows moderate intraspecific variability in morphology. *E. gerecsensis* Kovács & Géczy bears nodulate primary ribs on the body chamber, this taxon is considered herein as a morphotypes of *E. barodiscus*. Some specimens in the material studied herein differ from the type in style of ribbing: the primaries are sharp, and the secondaries cross the venter on the body chamber.

Distribution: Aalensis Zone-Aalenian: TRNS1.

***Erycites sutneri* (Gemmellaro, 1886)**

morphotype *ovatus* Géczy, 1966

Pl. XVI, figs 7, 8-9

1886. *Hammatoceras* (*Erycites*) *Sutneri*.—Gemmellaro, p. 205.

1966. *Erycites ovatus* n. sp.—Géczy, p. 104, fig. 91, pl. 30, fig. 1, pl. 42, fig. 10.

2008. *Erycites ovatus* Géczy.—Kovács & Géczy, p. 74, text-figs 7-9, pl. 8, figs 1-3, pl. 9, figs 1, 4, pl. 10, fig. 3.

Material: Three relatively well-preserved internal molds.

Description: Moderately evolute coiling. The whorls grow gradually, the body chamber is higher and wider than the penultimate whorl. Flanks convex on the inner whorls, flattened on the body chamber. Venter broad, low and rounded on the phragmocone, high and narrow on the last whorl without keel. Inner whorl-section wide-ovate, while the section highly-arched ovate on the body chamber. Body chamber 3/4 whorl long. Peristome prorsiradiate with a projected edge and a shallow constriction behind. Sculpture of weakly developed, prorsiradiate ribs. The primaries rise from the umbilical

wall and trifurcate at the lower third of the whorl. The fine secondary ribs are straight and prorsiradiate, and cease close to the shoulder. Secondaries hardly visible on the body chamber.

Remarks: According to Cresta (2002), *E. ovatus* is a junior synonym of *E. sutneri*. The erycitid material of the Gerecse Mts with well-preserved specimens ensured a possibility for a detailed comparison (Kovács & Géczy, 2008). The two taxa are closely affiliated: their sizes are about the same, whorls are compressed, ornamentations and suture-lines are almost identical, but several morphological differences are also recognized: the coiling of *E. ovatus* is somewhat more evolute, the whorl-section of the inner whorl is depressed on *E. sutneri*, while compressed on *E. ovatus*, and the body chamber of *E. ovatus* is more compressed. The validity of *E. ovatus* was also accepted by Sandoval *et al.* (2015). However, the above mentioned results may not verify the morphological differences as specific ones, so Géczy's taxon is considered herein as a morphotype of *E. sutneri*. The species differs from the similar *E. fallifax* by more evolute coiling with compressed penultimate whorl and broad body chamber, and more ramified L lobe. In the Gerecse Mts *E. ovatus* appears in the uppermost Toarcian beds, and ranges in the Aalenian.

Distribution: Aalensis Zone-Aalenian: TRNS1 and KRS.

6. FAUNAL AFFINITIES

The Toarcian cephalopod faunas of the Bakony and Gerecse Mts (Transdanubian Central Range) are closely allied to those of Italy and Greece, and represent the Mediterranean (or West Tethyan) Province of the Mediterranean-Caucasian Realm. This ammonoid faunal province is characterized by deep-water facies and the dominance of Phylloceratina and Lytoceratina. The Ammonitina faunas of the Mediterranean and of the neighbouring NW European Province are significantly different in the Lower-Middle Toarcian. Although the faunas become somewhat similar in the Upper Toarcian the difference remains typical, and this fact shows a stronger provincialism than it was recognized by Dera *et al.* (2011). Several Ammonitina genera (*Mesodactylites*, *Telodactylites*, *Collina*, *Cingolites*, *Urkutites*, *Merca-ticeras*, *Merlaites*, *Furloceras*, *Rarenodia*, *Cagliceras*)

Plate XII

Figs 1-2: *Cagliceras* gr. *elaphum* (Merla), EZPC6778, TRNS1, Speciosum Zone.
(D 102, H 24, H/D 23.5%, W 22, W/D 21.5%, U 44, U/D 43%)

Figs 3-4: *Cagliceras* gr. *elaphum* (Merla), EZPC7560, TRNS2, Condensed Unit.
(D 217, H 53, H/D 24.4%, W 45, W/D 20.7%, U 122, U/D 56.2%)

Scale bars equal 1 cm



are rather typical of the Mediterranean area, others (*Catacoeloceras*, *Peronoceras*, *Mucrodactylites*, *Eleganticeras*, *Pseudolioceras*, *Osperleioceras*, *Haugia*, *Denckmannia*, *Podagrosites*, *Esericeras*, *Hudlestonia*, *Gruneria*) are abundant in the NW European region. The most important zonal index species of *Dactylioceras*, *Hildaite*s, *Hildoceras*, *Harpoceras*, *Orthildaite*s, *Pseudogrammoceras*, *Grammoceras*, *Dumortieria*, and *Pleydellia* are common in both regions, but notably differ in diversity.

Within the Hammatoceratoidea there is also a difference in the paleogeographic distribution. The material described herein can be compared with various faunas in the Mediterranean and the NW European Provinces with adoption of the taxonomic nomenclature used in this paper (for arrangements and references see Kovács & Géczy, 2008; Kovács, 2009; Sandoval *et al.*, 2015). The Upper Toarcian Hammatoceratoidea faunal composition of Bakonycsérnye is almost identical with that of the Gerecse Mts. The presence and diversity of *Geczyoceras*, *Crestaites*, *Planammatoceras*, *Bredyia*, *Cagliceras* and *Erycites* are remarkably similar, the only difference concerns the diversity of *Hammatoceras*. Although the number of *Hammatoceras* specimens is higher, the genus is less diversified at Csernye than in the Gerecse Mts, the Gerecse material with four species is closer to the NW European Province. On the other hand, diversity of the Dumortieriinae (*Dumortieria*, *Cotteswoldia*, *Pleydellia*) is much higher in the Csernye assemblages. Nevertheless, the studied faunas of the Gerecse and the Bakony Mts (Csernye, Szentgál, Úrkút) are closely affiliated. The differences can be explained as results of the condensation that is characteristic in the Middle-Upper Toarcian at Csernye and Úrkút, while only in the uppermost Toarcian of the Gerecse sections. In summary it can be stated that beside the identical rock types, the ammonite faunas of the two areas complete adequately each other. The whole Transdanubian Central Range assemblage is considered as a homogenous Ammonitida fauna, and called herein as a Toarcian TCR-fauna.

The close affinity of this assemblage with the Italian, Spanish, Moroccan and French materials is undoubted. Both faunal provinces are characterized by wide range of *Geczyoceras* and *Erycites*, these genera are regarded as cosmopolitan taxa. Considering, however, the large

numbers and high diversity of *Crestaites* and mainly of *Cagliceras*, the presence of the Lower-Middle Toarcian *Rarenodia* and *Praerycites*, the early appearance of *Planammatoceras* and the lack of early representatives of *Pseudaptetoceras*, the TCR-fauna looks a characteristic Mediterranean one with strict Italian relationship. On the other hand, occurrences of *Hammatoceras* and *Bredyia* – both are less diversified in Italy, Greece, southern Spain and North Africa – show NW European affinity.

The TCR-fauna as a whole shows a mixed palaeobiogeographic feature. Although the dominance of Phylloceratina and Lytoceratina and the presence of several Ammonitina known only in Italy are clear Mediterranean features, the co-existence of characteristic Mediterranean and NW European Ammonitina taxa indicates a Submediterranean transitional area between the two faunal provinces.

ACKNOWLEDGEMENTS

We are grateful to András Galács, Miklós Kázmér, István Sente and Emőke Tóth (Eötvös University, Budapest) for professional help and advice. Critical comments by Louis Rulleau (France) and András Galács helped to improve the manuscript. Figs 1-4 were prepared by Domonkos Verestői-Kovács (Budapest). László Sövény (Bonyhád, Hungary) kindly offered his ammonite material from Csernye to study and publish.

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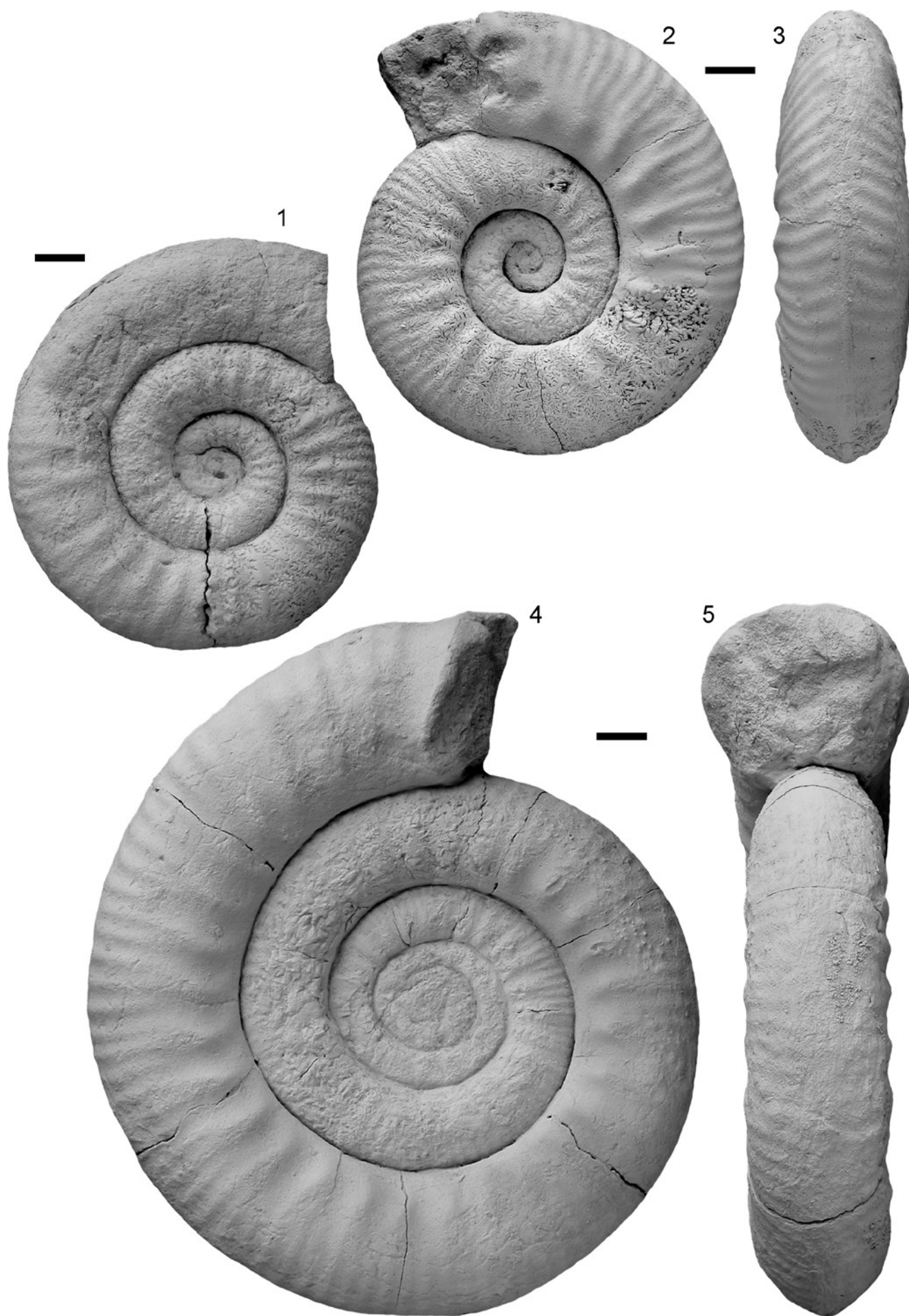
Plate XIII

Fig. 1: *Cagliceras* gr. *elaphum* (Merla) morphotype *rotundiformis* (Merla), EZPC6637, TRNS1, Aalensis Zone.
(D 85, H 23, H/D 27%, W 16, W/D 18.8%, U 42, U/D 49.4%)

Figs 2-3: *Cagliceras* gr. *elaphum* (Merla) morphotype *robustum* (Merla), DM2016/18, TRNS1, Aalensis Zone.
(D 91, H 27, H/D 29.6%, W 23, W/D 25.2%, U 43, U/D 47.2%)

Figs 4-5: *Cagliceras* gr. *elaphum* (Merla), DM2016/16, TRNS1, Speciosum Zone.
(D 142, H 37, H/D 26%, W 33, W/D 23.2%, U 78, U/D 55%)

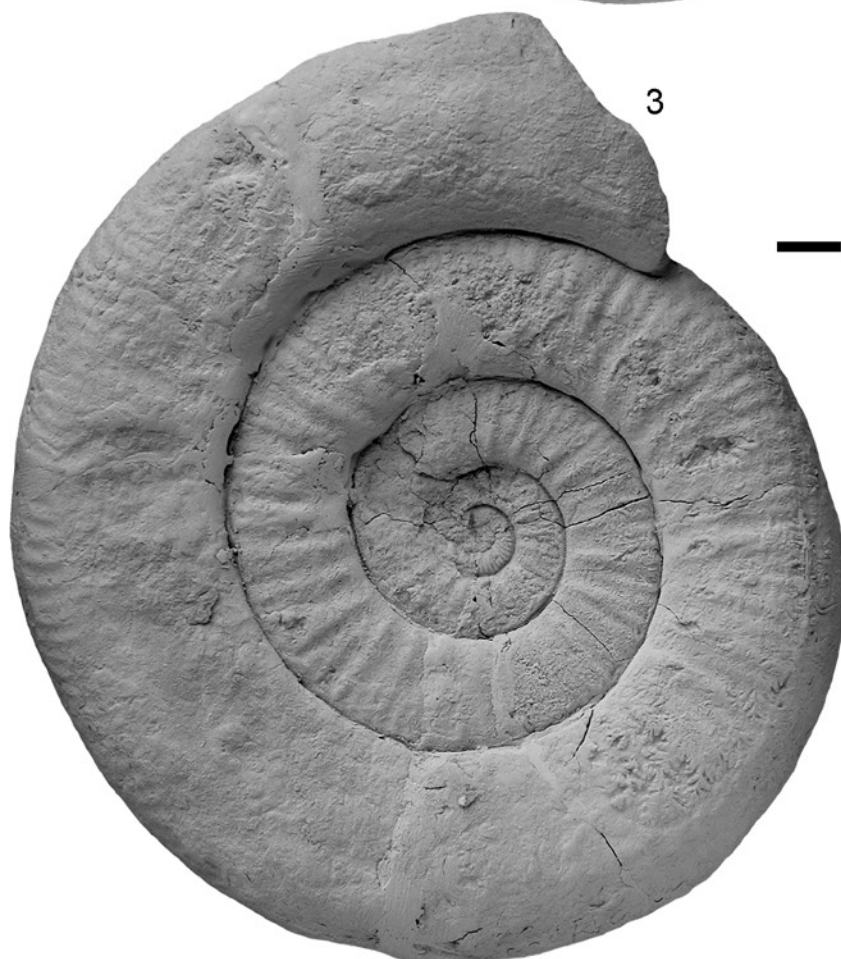
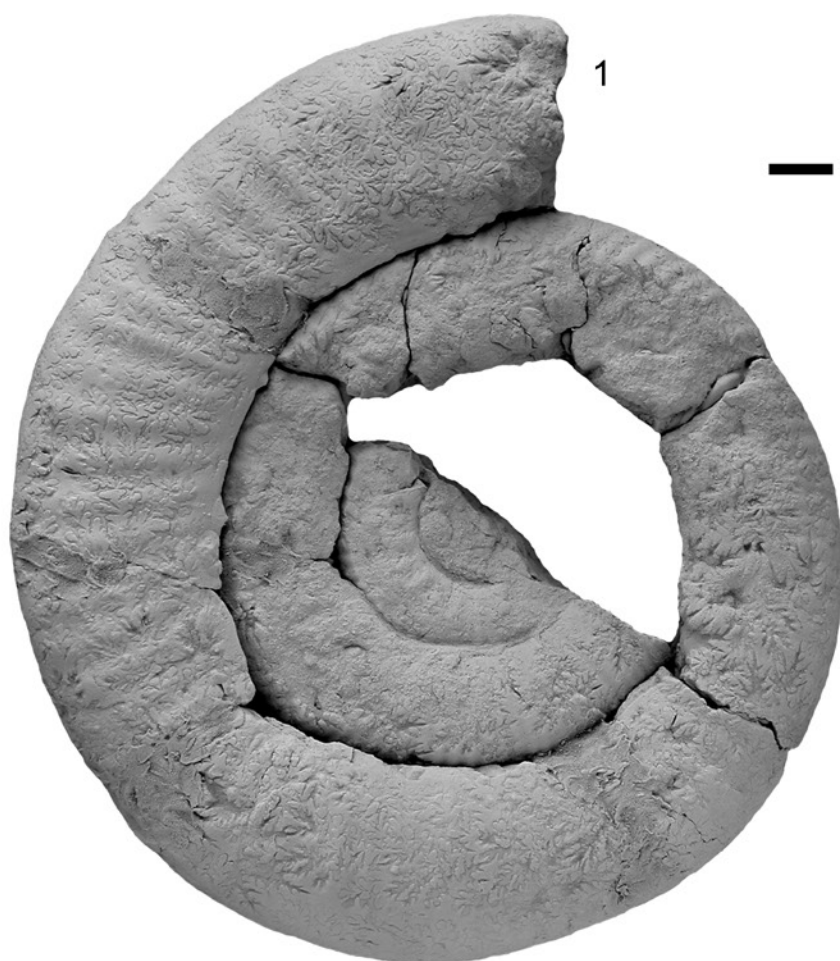
Scale bars equal 1 cm



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Plate XIV

- Figs 1-2: *Cagliceras banffy* (Prinz), EZPC7409, KRS, Condensed Unit.
(D 150, H 35, H/D 23.3%, W 26, W/D 17.3%, U 81, U/D 54%)
- Figs 3-4: *Cagliceras banffy* (Prinz), DM2016/19, TRNS1, Condensed Unit.
(D 153, H 38, H/D 24.8%, W 29, W/D 19%, U 81, U/D 53%)
- Scale bars equal 1 cm



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Plate XV

Figs 1-2: *Cagliceras enigmaticum* Kovács et Géczy, EZPC6765, TRNS1, Speciosum Zone.

(D 115, H 28, H/D 24.3%, W 20, W/D 17.3%, U 67, U/D 58.2%)

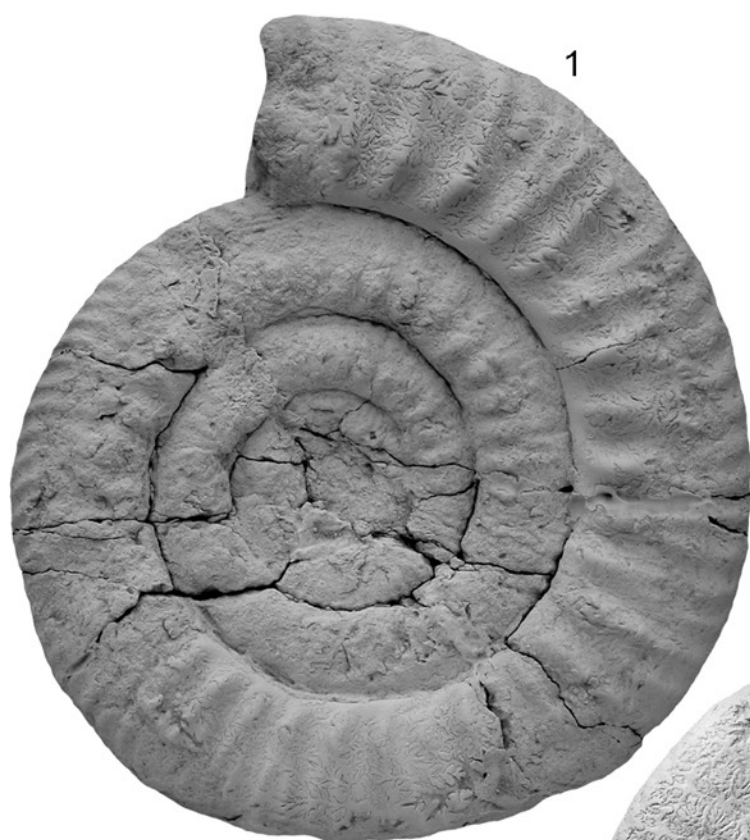
Figs 3-4: *Cagliceras baldii* nov. sp., holotype, TRNS1, Condensed Unit.

(D 86, H 22, H/D 25.5%, W 15, W/D 17.4%, U 46, U/D 53.4%)

Figs 5-6: *Cagliceras wegneri* nov. sp., holotype, TRNS1, Speciosum Zone.

(D 120, H 30, H/D 25%, W 26, W/D 21.6%, U 68, U/D 56.6%)

Scale bars equal 1 cm



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Plate XVI

- Figs 1-2: *Erycites barodiscus* (Gemmellaro), DM2016/21, TRNS1, Aalensis Zone.
(D 91, H 30, H/D 33%, W 32, W/D 35%, U 40, U/D 44%)
- Figs 3-4: *Erycites barodiscus* (Gemmellaro), DM2016/22, TRNS1, Aalensis Zone.
(D 71, H 22, H/D 31%, W 30, W/D 42.2%, U 31.5, U/D 44.3%)
- Figs 5-6: *Erycites barodiscus* (Gemmellaro), EZPC6961, TRNS1, Aalensis Zone (1/1).
(D 67, H 23, H/D 34.3%, W 25, W/D 37.3%, U 25, U/D 37.3%)
- Fig. 7: *Erycites sutneri* (Gemmellaro) morphotype *ovatus* Géczy, 1966, EZPC6962, TRNS1, Aalensis Zone.
(D 62, H 22, H/D 35.4%, W 18, W/D 29%, U 23, U/D 37%)
- Figs 8-9: *Erycites sutneri* (Gemmellaro) morphotype *ovatus* Géczy, 1966, EZPC6956, TRNS1, Aalensis Zone.
(D 109, H 31, H/D 28.4%, W 23, W/D 21%, U 51, U/D 46.2%)
- Scale bars equal 1 cm

