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Macrocephalitid-bearing Lower Callovian (Middle Jurassic) beds in the Mecsek Mts (South Hungary)

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Abstract

In the former literature on the Jurassic of the Mecsek Mts it is traditionally taken as granted that the Middle Jurassic red, nodular, clayey limestone yields 'mixed' Bathonian and Callovian (i.e. macrocephalitid) ammonites, thus stratigraphically was dated as 'Bathonian–Callovian'. A revision of the localities where macrocephalitids were previously recorded or recently found, resulted in a limited collection of well-localized ammonites. Evaluation of these ammonites led to the conclusion that Bathonian and Callovian faunal elements could be well-distinguished as coming from either the red nodular limestone or from the overlying yellowish, massive limestone. This latter can be firmly dated as earliest Callovian, on the basis of the co-occurrence of *Bullatimorphites bullatus* and *Macrocephalites* at least one locality, in the Mátépart ravine at the Hidas Valley. As for palaeogeography, the assemblages fit in well with the tendency of the Jurassic in southern Hungary, when lithological facies, and the faunal associations as well, show more and more Tethyan affinities as advancing in the Jurassic. The paper gives short descriptions of the localities and the most important ammonites of the Lower Callovian.

Keywords: Mecsek Mts, South Hungary, Middle Jurassic, Bathonian, Callovian, ammonites

Introduction

On the basis of the *'Stephanoceras macrocephalum*' specimen figured by Böckh in his 1881 work, many subsequent authors also regarded the Callovian as represented in limestone facies in the Mecsek Mts. Vadász (1935, p. 60) distinguished, under the name 'Horizon of *Macrocephalites macrocephalus*', a unit of 'red, siliceous marls or massive, brownish-yellowish limestone' what he ranged, with a respective faunal list, into the Callovian. However, some later authors did not regard these beds as separable from the underlying limestones, and the two formations were treated as integrated, with a 'mixed Bathonian–Callovian fauna' (see e.g. Kovács 1953, Wein in Forgó et al. 1966, Nagy et al. 1978).

In the 1990's fossil collecting was carried out to clear the stratigraphy of the Bajocian and Bathonian formations, and this yielded macrocephalitids in some localities. These records served as bases for drawing the Bathonian/Callovian boundary in some sections, with the remarks that a closer study of these ammonites may reveal that these macrocephalitids indicate the uppermost Bathonian (Galácz 1994, p. 137).

Detailed study on this formerly collected material and some other ammonites from different, recently reinvestigated collections resulted in the detailed evaluation of these assemblages. The results supported the view that the facies change from red, nodular, clayey limestone into yellowish-greyish, massive siliceous limestone, what is best exposed in the Mátépart ravine in the Hidas Valley, was taken place at the Bathonian/Callovian boundary. The macrocephalitids and the accompanying faunal elements occurring in the Mecsek Mountains belong to groups indicating the basal Callovian.

Localities of macrocephalitid-bearing Lower Callovian beds in the Eastern Mecsek Mts

As it is mentioned above, the first references to occurrence of *Macrocephalites* in the Mecsek Mts is in the work of János Böckh. In his stratigraphic synthesis (Böckh

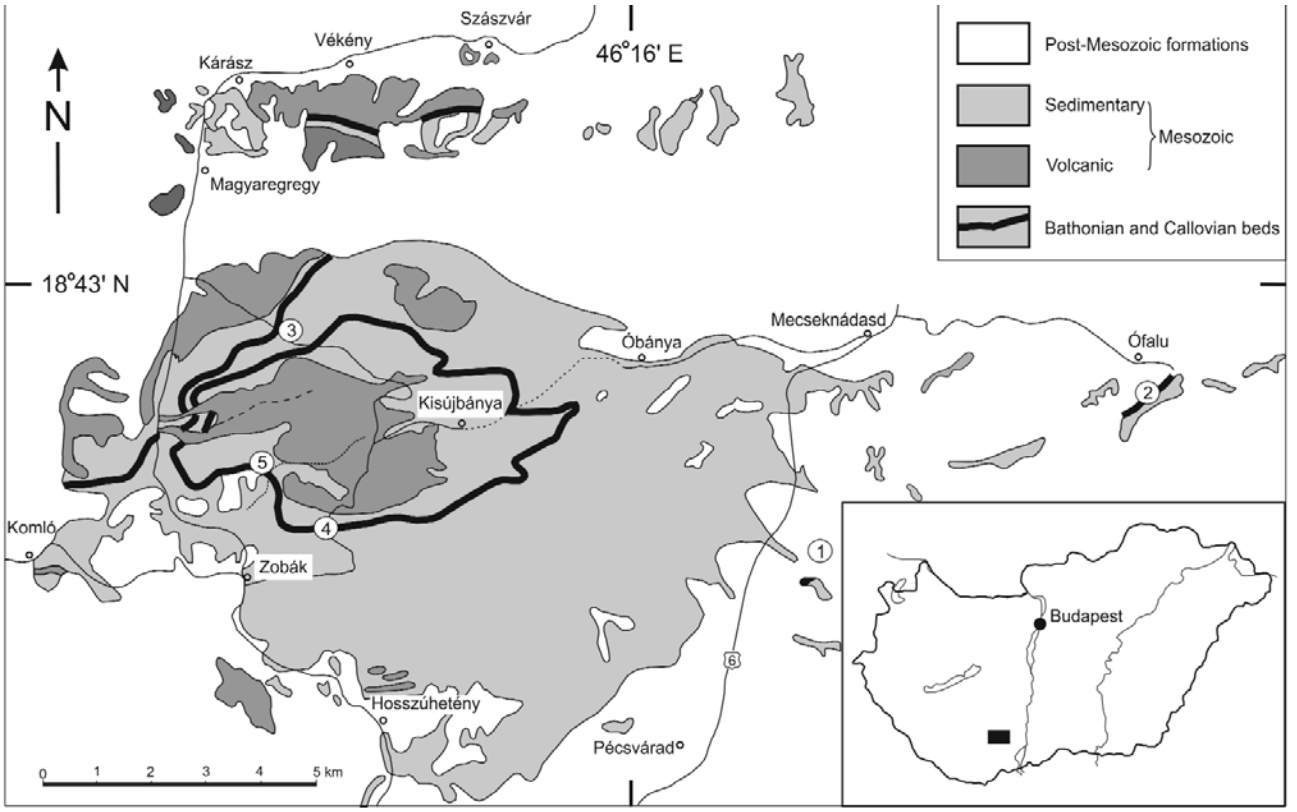

Figure 1. Simplified geological map of the eastern Mecsek Mts, with the localities of the Lower Callovian, macrocephalitid-bearing beds discussed in the text. 1: Pusztakisfalu; 2: Ófalu, Kalkthal; 3: Magyaregregy, Márévár Valley, Márévár Hill; 4: Csengő Hill roadcut; 5: Hidas Valley, Mátépart ravine

1880) he mentioned Pusztafalu (now Pusztakisfalu) as the locality of the *'Stephanoceras macrocephalum* SCHLOTH. sp.', what he figured later in his palaeontological monograph (1881, p. 55, pl. 6, fig. 5, pl. 7, fig. 2 and pl. 8, fig. 1; all figures showing the same and only specimen). This specimen is refigured with a photograph here on Pl. 2, fig. 3. The only other locality where BÖCKH recognised the level named by him as *'Stephanoceras macrocephalum* and *bullatum* beds' was the Kalkthal by Eszterpuszta (now village Ófalu). Here a small quarry existed in his time, where not the diagnostic ammonites, but the characteristic rock type was the base of identification (BÖCKH 1880, pp. 37–39).

VADÁSZ (1935, p. 60) identified his *'Macrocephalites macrocephalus* level' what he could 'hardly distinguish' from the Bathonian rocks, only in the Óbánya and Ófalu sections. Interestingly, in spite of the detailed description and figures of BÖCKH, VADÁSZ did not mention the index species in the faunal list he gave for his 'Callovien – *Macrocephalites macrocephalus* level'.

In later published works genus *Macrocephalites* or the species *M. macrocephalus* are frequently mentioned as evidences for the Callovian. These references are together with those to clearly Bathonian forms, consequently the assemblages, and the formations as well were ranged as of 'Bathonian–Callovian' (see e.g. HETÉNYI et al. 1976, p. 25; NAGY et al. 1978, p. 38). The references to macrocephalitids, as indicated also by labels of examples in various collections, mostly are to *Bullatimorphites* which is frequent in the Bathonian nodular limestone. These specimens, when lack the body chamber (what is commonly the case), could be similar to the inner whorls of certain *Macrocephalites*.

During repeated field studies in the last two decades, the localities mentioned in the literature or discovered independently were systematically re-investigated to locate the boundary between the lithologically well-distinguished Bathonian and overlying beds. The Bathonian red nodular clayey limestone (Óbánya Formation) and the yellowish, greyish, sometimes siliceous, massive limestone (Fonyászó Limestone Formation) above yielded diagnostic fossils only in a few places; these are listed and briefly described below.

Pusztafalu — the original locality of J. BÖCKH (1 in Figure 1)

Pusztafalu (now Pusztakisfalu) was the locality of the figured *Macrocephalites* of BÖCKH (1881). He found the specimen in the Mészkemence-völgy ('Lime-kiln Valley'), a little northwest of the village. He described two small quarries on the two sides of the valley, which even in his time were finished, and the exposures were very poor. However, he could identify the remnants of the Bathonian red nodular limestone and the Oxfordian limestone beds, and the yellowish limestone in between. This latter limestone yielded ammonite specimens, including his *'Stephanoceras macrocephalum* SCHLOTH. sp.'. In BÖCKH's time the lime burning being finished, small wonder that VADÁSZ could not identify these beds 50 years later in the valley (VADÁSZ 1935, pp. 61–62). Later field works proved also unsuccessful in

locating the original exposures. In the early 1960's Rudolf HETÉNYI, who directed the mapping project of the Mecsek Mts, made artificial exposures in the valley, which showed the succession clearly. The excavated Bathonian beds yielded ammonites, but the Callovian yellowish limestone did not give diagnostic forms. The Upper Jurassic part of the section was published by FŐZY (1993).

Ófalu, Mészvölgy (2 in Figure 1)

The Mészvölgy ('Kalkthal') section in Ófalu is one of the best known Middle Jurassic sections of the Mecsek Mts. In the old exposures the red, nodular Bathonian limestone was well exposed, and in temporal extensions of the section the overlying Callovian limestone beds were also visible in a small quarry. This situation was described by BÖCKH (1880, pp. 37–38), who mentioned yellowish-reddish limestone above the red clayey limestone. He did not find macrocephalitids, but the collected small assemblage (with '*Stephanoceras bullatum* D'ORB. sp.' and perisphinctids) suggested him the Lower Callovian.

VADÁSZ (1935, p. 60) found the same situation, and KOVÁCS (1953) in his limited faunal list even listed some Callovian species. However, these forms (e.g. '*Macrocephalites macrocephalus* SCHLOTHEIM', '*Cosmoceras* ex aff. *globosum* TILL'), when revised, turned out to be misidentified Bathonian *Bullatimorphites* (see GALÁCZ 2012).

In the 1980's the small quarry, where the Callovian limestone was formerly exposed, have been built in within the garden of a house. Therefore the re-investigation of the section (GALÁCZ 1984) could have been restricted to the Bathonian beds. However, twenty years before, in the 1960's, R. HETÉNYI, geologist for the Hungarian Geological Institute, collected here a small fauna, which includes a *Macrocephalites* (*Dolikephalites*) specimen (see below) from a yellowish limestone — evidently from the Lower Callovian. Accordingly, he mentioned in the description of the respective formation that in its upper part fossils indicating the Lower Callovian also appear (HETÉNYI et al. 1976, pp. 26–27).

Magyaregregy, Márévár Hill (3 in Figure 1)

In the early 1980's a small outcrop near the gate of the ruined Máré Fortress made the greenish-yellowish Callovian siliceous limestone visible, and a small faunula was collected. This included poorly preserved phylloceratids, a big *Parachoffatia* sp. indet. and a few fragmented macrocephalitids (see GALÁCZ 1994, p. 119).

Csengő Hill, Middle Jurassic outcrop in the road-cut above Zobákpuszta (4 in Figure 1)

This outcrop became open when maintenance exposed the rocks along the Zobákpuszta–Kisújbánya road in the early 1980's (CSÁSZÁR & HAAS 1984). Here the Bathonian red clayey limestone and the Callovian siliceous marls and limestone form a transition between the uppermost beds of the Bajocian *Zoophycos* marls and the Upper Jurassic radiolaritic cherts. From the red nodular limnestone and the siliceous marls a limited fauna was collected (GALÁCZ 1994, pp. 124-26, fig.4). In the local grey, siliceous limestone, above the red limestone, a poorly preserved *Macrocephalites* sp. specimen was found, which served as the basis to draw the Bathonian/Callovian boundary just below.

Hidas Valley, Mátépart ravine (5 in Figure 1)

The best section to study the macrocephalitid-bearing beds is that in the Mátépart ravine, which is a southern side valley of the Hidas Valley. The sequence was described and dated formerly in GALÁCZ 1994 (pp. 126–131, text-fig. 5). The red, clayey, nodular limestone (Óbánya Formation) is overlain, with a sharp lithological change, by massive grey or yellowish limestone beds, with a thin (3–4 cm) clay bed in between.

The ammonites found in highest position within the red limestone indicated the Upper Bathonian Oxycerites orbis Zone, thus a stratigraphic gap between the locally developed Bathonian and Callovian rocks was suspected. The overlying whitish, cherty limestone was dated as Oxfordian (FŐZY 1993).

The Callovian rocks form three massive beds (in 75 cm total thickness), of which only the lower two are fossiliferous. These two beds yielded assemblages with apparently the same elements, thus they are treated here as stratigraphically identical. The assemblages show typical Mediterranean compostion, with overwhelming majority of phylloceratids.

The lower bed (No. 3) yielded 27 phylloceratid, 3 lytoceratid and 9 ammonoid specimens (70, 7 and 23%, repectively), the middle, richest bed gave 84 phylloceratid, 1 lytoceratid and 21 ammonoid specimens (79, 1 and 20%, respectively). Ammonoids are represented mainly by perisphinctids (*Homoeoplanulites* micro- and macroconchs), tulitids (*Bullatimorphites* m and M) and diagnostic macrocephalitids. Co-occurrence of *Bullatimorphites bullatus* and *Macrocephalites cannizzaroi* allows an age determination as earliest Callovian.

Species descriptions

Below short descriptions are given on the most common or the stratigraphically diagnostic taxa. In the synonymies references are given only to the original descriptions, to former records of the forms from the region, and to important revisions of the species in quesion. The specimens are deposited in the Natural History Museum of the Eötvös Loránd University.

Phylloceras kunthi NEUMAYR, 1871
Plate 1, fig. 1

1871 *Phylloceras Kunthi* nov. sp.; NEUMAYR, p. 312, pl. 12, fig. 6; pl. 13, figs 1a–b.
1977 *Phylloceras kunthi* NEUMAYR; JOLY, p. 162, pl. 3, fig. 2; pl. 39, fig. 9.
1980 *Phylloceras kunthi* NEUMAYR, 1871; GALÁCZ, p. 33, pl. 3, figs 3–4.
2000 *Phylloceras kunthi* NEUMAYR, 1871; JOLY, p. 47.

From the richly represented phylloceratids only this form is figured. Originally described from the Lower Callovian of the Gosauthal area (NEUMAYR 1871, p. 312), the species has been mentioned also from the Upper Bajocian and the Bathonian. JOLY (1977, p. 162 and 2000, p. 47) gave detailed revision of the species which is distinguished by its narrow, almost flattened whorls and narrow umbilicus. Examples of the species occurred in the Upper Bajocian of the Bakony Mts (GALÁCZ 1980, p. 33), and VADÁSZ (1935, p. 60) also listed in his Lower Callovian faunal list.

Lissoceras voultense (OPPEL, 1865)
Plate 4, fig. 1

1865 *Ammonites voultensis* nov.; OPPEL, p. 319.
1881 *Haploceras vallis-calcis* n. sp.; BÖCKH, p. 39, pl. 9, figs 8–9.
1910 *Haploceras nudum* n. sp.; TILL, p. 263, pl. 16, figs 9–11.
1915 *Haploceras* (*Lissoceras*) *voultense* (OPP.); LÓCZY, p. 279, text-figs 35–37.
2000 *Lissoceras* (*Lissoceras*) *voultense* (OPPEL, 1865); BESNOSOV & MITTA, p. 51, pl. 11, figs 4–5 (only).

Two specimens came from Bed 3 of the Mátépart section, of which better preserved one is figured here. This is an incomplete specimen, the end of the body chamber, with the aperture, is missing. A medium-size form, with high-oval cross-section and umbilicus slightly wider than the average in the genus.

L. voultense, cited from the Upper Bathonian up to the Middle Callovian is the latest member of the *Lissoceras* lineage which appears in the Upper Bajocian and endures with practically unsculptured, yet well-recognizable species.

LÓCZY (1915, p. 279) recognized first that *'Haploceras vallis-calcis* n. sp.' of BÖCKH (1881, p. 39, pl. 9, figs 8–9) is the junior synonym of *Haploceras voultense* of OPPEL (1865, p. 319), just as *Haploceras nudum* of TILL (1910, p. 263, pl. 16, figs 9–11) from Villány. BESNOSOV & MITTA (2000) figured three specimens under this name. All are small forms, that on fig. 6 could be even a microconch.

Macrocephalites (Macrocephalites) cannizzaroi (GEMMELLARO, 1871)
Plate 3, figs 1–2, 4–5; Plate 4, fig. 3

1871 *Stephanoceras Cannizzaroi* GEMMELLARO, p. 249, pl. 14, figs 9–11.
1881 *Stephanoceras macrocephalum* SCHLOTH. sp.; BÖCKH, p. 55, pl. 6, fig. 5; pl. 7, fig. 2; pl. 8, fig. 1.
2002 *Macrocephalites cannizzaroi* (GEMMELLARO, 1871); GALÁCZ 2002a, p. 246, figs 169–171.

The figured specimens are the better preserved ones from the Mátépart ravine. The specimen what BÖCKH described and figured (see synonymy) also belongs into this species. This specimen, kept in the collections of the Hungarian Geological and Geophysical Institute (catalogue number J.2004), is refigured here (Plate 4, fig. 3). The name *cannizzaroi* is applied, as a proper label for the densely-ribbed forms with high-triangular whorl-section known in the Mediterranean.

The specific features of *M. cannizzaroi* are the compressed whorl-section, the lowly arched venter and the dense ribbing with slightly prorsiradiate ribs branching below mid-whorl.

Macrocephalites (Dolikephalites) sp. indet.
Plate 3, fig. 3

This is a relatively small specimen, though real size cannot be told because the incomplete example does not show the suture-lines. These smaller, narrowly umbilicated forms with strong, straight ribs are usually ranged into subgenus *Dolikephalites*, what is regarded as the microconch of the macroconchiate *Macrocephalites* s. str. (see e.g. THIERRY 1978).

This specimen came from the Kalkthal section of Ófalu, and belongs to the R. HETÉNYI collections of the Hungarian Geological and Geophysical Institute. An important specimen, because neither in earlier times (e.g. BÖCKH 1881; VADÁSZ 1935), nor later (PATAKY et al. 1982; GALÁCZ 1984) ammonites proving the presence of the Lower Callovian did not turn up at this locality.

Homoeoplanulites (Homoeoplanulites) homoeomorphus BUCKMAN, 1922
Plate 2, fig. 3

1922 *Homoeoplanulites homoeomorphus*, nov.; BUCKMAN (in 1909–30), pl. 328.
1958 *Choffatia* (*Homoeoplanulites*) *homoeomorpha* (S. BUCKMAN); ARKELL (in 1951–59), p. 225, pl. 30, figs 1, 3, 4, 5; pl. 31, figs 1, 2.

Several specimens are available, but entire ones are missing. However, the eccentric coiling of the bigger part of the last whorl indicate sizes between 120 and 130 mm. This matches well the size of the holotype (120 mm, BUCKMAN 1922 in 1909–30, pl. 328). A slight difference when compared to the type is the somewhat denser ribbing. Nevertheless, numerous specimens in the literature (e.g. DIETL 1994, pl. 10, fig. 3; MÖNNING 1995, pl. 10, figs 2–5; MANGOLD et al. 2012, pl. 21, figs 7–8) indicate that the rib density, just as it is so frequent in perisphinctids, shows wide variability within species.

H. homoeomorphus is most frequently recorded from the Upper Bathonian, however, Lower Callovian occurrences were not precluded even by ARKELL (1958, p. 226).

Homoeoplanulites (Homoeoplanulites) sp.
Plate 4, fig. 2

1970 *Homoeoplanulites* (m. *Homoeoplanulites*) nov. sp. A; MANGOLD, p. 67, pl. 4, fig. 3.
1985 *Homoeoplanulites* (*Homoeoplanulites*) *homoeomorphus* BUCKMAN [m]; MÖNNING, pl. 10, fig. 4 (only).

An incomplete specimen with very wide umbilicus, flattened whorl-sides and narrow venter. The dense ribbing consists of thin, but rounded, slightly prorsiradiate primary ribs which bifurcate high on the lateral side. Faint constrictions (three) appear on the last preserved whorl of which last one is the beginning of the body chamber.

The coiling and ribbing show close similarity to the unique form described by MANGOLD (1970, p. 67) as *Homoeoplanulites* (*H.*). sp. nov. A from the Upper Bathonian Prohecticoceras retrocostatum Zone. MANGOLD compared his specimen to *'Planisphinctes* (*Lobosphinctes*) n. sp. b aff. *insertus* (BU.)' of WESTERMANN (1958, pl. 47) which is a wholly septate, big (130 mm minimum phragmocone diameter) ammonite from the Upper Bathonian of Osnabrück. Its very wide umbilicus, narrow whorls and style of rib-branching make it similar indeed, so the suggestion by MANGOLD (op.cit, p. 67) to regard it as the macroconch of his new form seems to be well-based. Another similar form is the Sicilian Lower Callovian *Homoeoplanulites* (*H.*). *leptus* (GEMMELLARO, 1873, pl. 11, figs 5–6), with the single difference: narrower umbilicus (see GALÁCZ 2002b). Also similar is the form figured by MÖNNING (1995, pl. 10, fig. 4) as *H.* (*H.*) *homoeomorphus* BUCKMAN, showing umbilicus of medium width, dense ribbing and marked change in sculpture on the body chamber.

Homoeoplanulites (Parachoffatia) arkelli
MANGOLD, 1970
Plate 1, figs 6–7

1959 *Choffatia subbakeriae* (D'ORBIGNY); ARKELL, 1959 in 1951–59, p. 215, pl. 30, fig. 2 (only)
1970 *H.* (M. *Parachoffatia*) *arkelli* nov. nom.; MANGOLD, p. 77, pl. 3, fig. 2.
1994 *Homoeoplanulites* (*Parachoffatia*) *arkelli* MANGOLD [M]; DIETL, p. 11, pl. 6, figs 2a–b; pl. 9, fig. 1.
1995 *Homoeoplanulites* (*Parachoffatia*) *arkelli* MANGOLD 1970; MÖNNING, p. 61, text-fig. 21e; pl. 11, fig. 2.

This is a small macroconch, one of the macroconchiate counterparts of *Homoeoplanulites* s. str. spp. in the Mecsek assemblages. This comparatively small size and the dense and strong primary ribs appear as distinguishing features.

The species was based on the Lower Cornbrash example figured by ARKELL (1951–59, pl. 30, fig. 2), what MANGOLD (1970) named as a new form. Fine specimens were figured by DIETL (1994) from the topmost Bathonian, but Lower Callovian occurences are also recorded (e.g. MÖNNING 1995).

Other, poorly preserved *Parachoffatia* specimens also occur in the assemblages.

Bullatimorphites (Bullatimorphites) bullatus
(D'ORBIGNY, 1846)
Plate 2, figs 1–2, 4–5

1846 *Ammonites bullatus,* D'ORBIGNY; D'ORBIGNY, p. 412, pl. 142, figs 1, 2.
1994 *Bullatimorphites bullatus* forme macroconque *bullatus* (D'ORBIGNY, 1846); THIERRY et al., p. 131, pl. 56, fig. 1.

This species is represented by several specimens in the material, the better ones are from the Mátépart ravine. These specimens match well the lectotype designated by ARKELL (1954 in 1951–59, p. 108, text-fig. 34). This particular specimen, according to WESTERMANN (1958, p. 64), and later to those who made the revision of the D'ORBIGNY material, is the original of D'ORBIGNY'S figures, thus should be regarded as the holotype (THIERRY et al. 1994, p. 131). The holotype is of 90 mm diameter, which is a size noticeably smaller than that of the Upper Bathonian *B. hannoveranus* and related Upper Bathonian forms.

B. bullatus is an important, stratigraphically diagnostic ammonite, regarded ever since OPPEL (1856–58) as the basal zone of the Callovian in the Submediterranean region (see THIERRY et al. 1997).

Bullatimorphites (Sphaeroptychius) microstomus
(D'ORBIGNY, 1846)
Plate 1, figs 2–3, 4–5

1846 *Ammonites microstoma* D'ORBIGNY; D'ORBIGNY, p. 413, pl. 142, figs 3, 4.
1994 *Bullatimorphites bullatus* forme microconque *microstoma* (D'ORBIGNY, 1846); THIERRY et al., p. 132, pl. 56, figs 2, 3.

Several specimens, mostly in poor state of preservation. Inner and middle whorls with narrow umbilicus, the last whorl, which is the body chamber, is eccentrically coiled, with widely opening umbilicus. The features of the aperture cannot be seen because there is no completely preserved specimen in the material. The ribbing is dense with inner and outer ribs of nearly the same strength. Inner ribs branch into two or three secondaries at the middle of the flanks.

'Ammonites microstoma' is regarded by most authors as the microconch pair of *Bullatimorphites* (*B.*) *bullatus*, however, the (sub)genus arrangement is different. Some authors (e.g. WESTERMANN 1958, SANDOVAL 1983, MÖNNING 1995) preferred *Bomburites*, while in the D'ORBIGNY revison the authors could have not decide (see THIERRY et al. 1994, p. 133). Here an earlier opinion (GALÁCZ 1980, p. 79) is followed, when regarding *microstoma* as a microconch of a *Bullatimorphites* str., then the name *Sphaeroptychius* is applied, and *Bomburites* is kept for microconchiate *Kheraiceras* s. str.

Conclusions

The here presented results give a clear support to the concept that the Bathonian and the Lower Callovian formations are well separable in the Mecsek Mountains.

Former conclusions on the age of the red, nodular, clayey limestone as yielding a 'mixed' Bathonian and Callovian fauna, could be challenged now also from above: the overlying yellowish-greyish massive limestone yields Lower Callovian ammonites. The exclusively Bathonian age of the red nodular limestone was established earlier (GALÁCZ 1994), and now the overlying beds with their assemblages could be well distinguished, and can be ranged unequivocally into the basal Callovian.

The faunal content of the Callovian limestone reflects a stage of the faunal development on the northern marginal zone of the gradually widening Mediterranean Tethys. The Mecsek and Villány Mountains are survivors of this wider, and later fragmented palaeogeographic region, the Tisza Unit (for a detailed discussion see VÖRÖS 2011). In Early Jurassic times this unit was a part of the passive continental margin forming the northern, European border of the Tethys. Later in the Early and then in the Middle Jurassic this ocean-facing zone detached from the continental mass, and as an independent microcontinent became progressively influenced by the open Tethys. This development brought about appearances of pelagic sediments, and Upper Liassic, then Bajocian and Bathonian faunal assemblages with more and more Tethyan elements which replaced the former faunas of northwest European affinity. These changes resulted in the Submediterranean faunal composition of the Lower Callovian beds, with high proportion of phylloceratids and with Ammonitina represented by Mediterranean counterparts of Subboreal elements (see e.g. the macrocephalitids).

This faunal development clearly supports the concept first put forward by GÉCZY (1973), who stated that the (ammonite) faunal differences between the mainly calcareous Lower and Middle Jurassic sequences (e.g. in the Bakony Mts) and the coeval, characteristically detrital or clayey developments (e.g. in the Mecsek Mts) cannot be explained by facies differences only. He argued that the differing faunal composition of the two areas can be due to the different palaeogeographic origins of these regions. In Hungary the now northerly Transdanubian Range (incl. the Bakony Mts) once belonged to the southern, Gondwana margin, while the southern-lying Mecsek and Villány Mts represent fragments of the northern, European margin of the Jurassic Tethys. The here treated Early Callovian period represents the time when both areas reached the pelagic and deep-water Tethyan environment, where they arrived from very different points of origin.

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Plate 1

Figure 1. *Phylloceras kunthi* NEUMAYR, Hidas Valley, Mátérpart ravine.
Figures 2–3, 4–5. *Bullatimorphites* (*Sphaeroptychius*) *microstomus* (D'ORBIGNY), Hidas Valley, Mátépart ravine.
Figures 6–7. *Homoeoplanulites* (*Parachoffatia*) *arkelli* MANGOLD, Hidas Valley, Mátépart ravine.

All figures natural size. Asterisk indicates end of phragmocone.

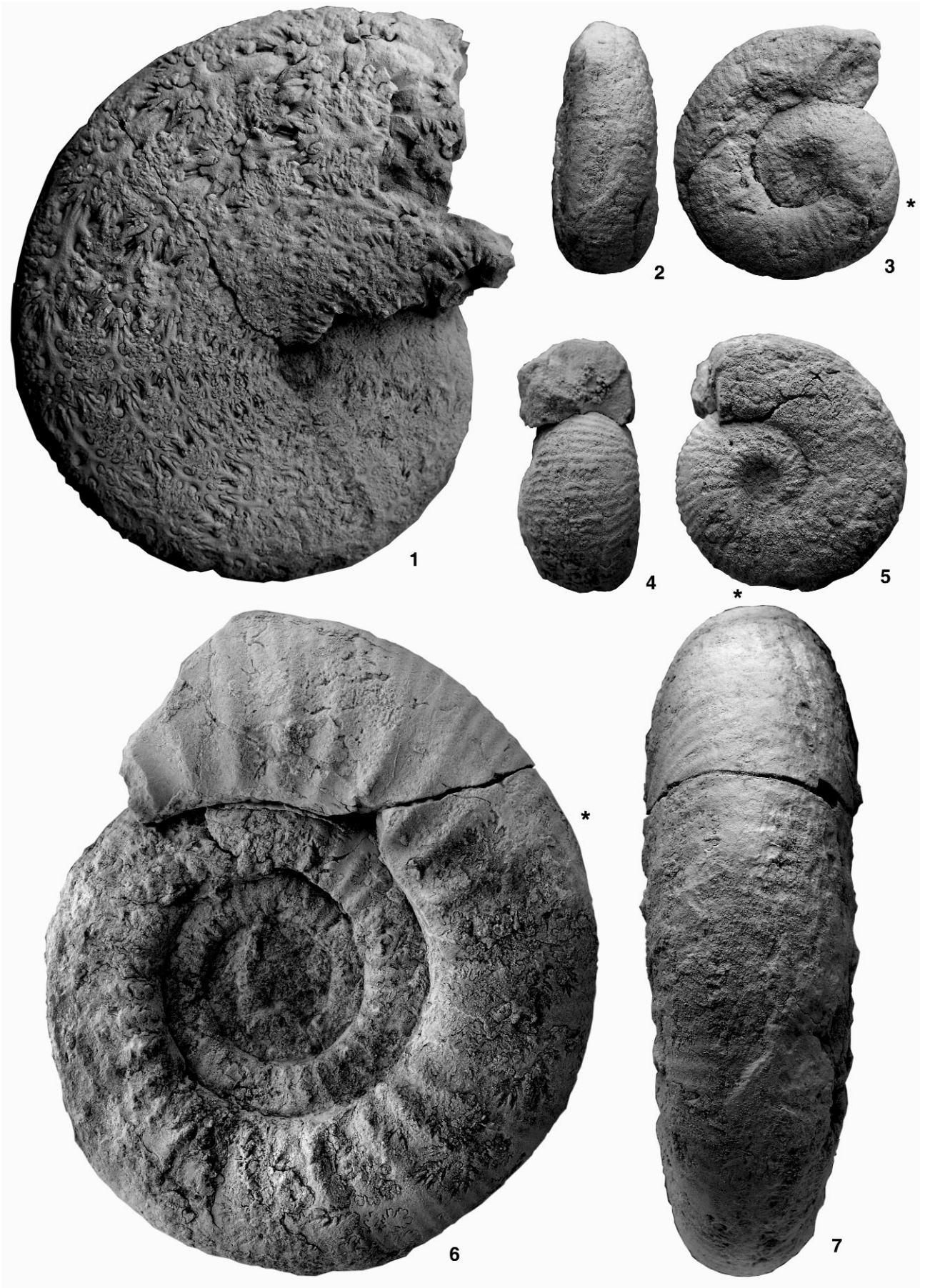
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Plate 2

Figures 1–2, 4–5. *Bullatimorphites* (*Bullatimorphites*) *bullatus* (D'ORBIGNY), Hidas Valley, Mátépart ravine.
Figure 3. *Homoeoplanulites* (*Homoeoplanulites*) *homoeomorphus* BUCKMAN, Hidas Valley, Mátépart ravine.

All figures natural size. Asterisk indicates end of phragmocone.

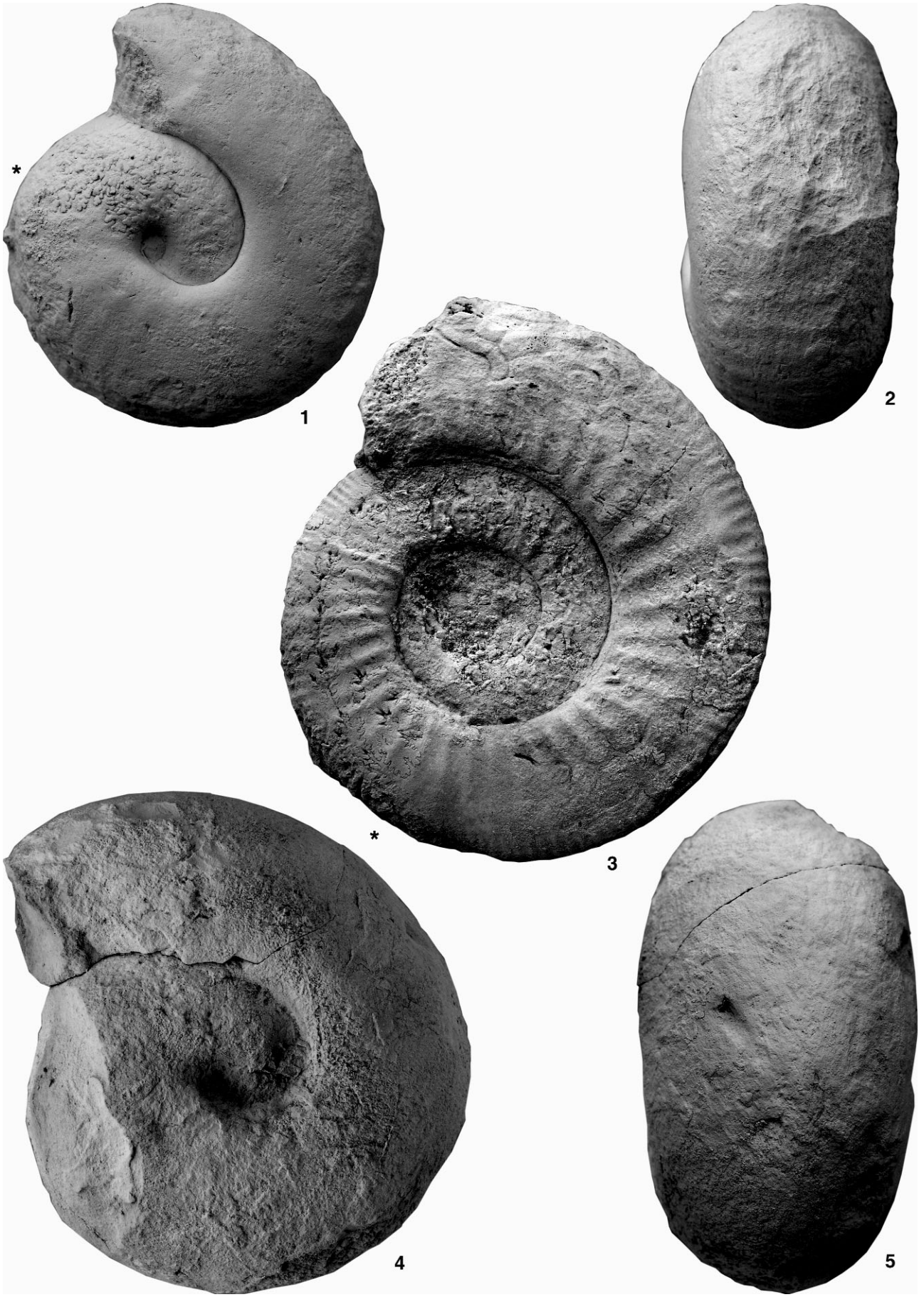
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Plate 3

Figures 1–2, 4–5. *Macrocephalites* (*Macrocephalites*) *cannizzaroi* (GEMMELLARO), Hidas Valley, Mátépart ravine.
Figure 3. *Macrocephalites* (*Dolikephalites*) sp. indet., Ófalu, Kalkthal.

All figures natural size. Asterisk indicates end of phragmocone.

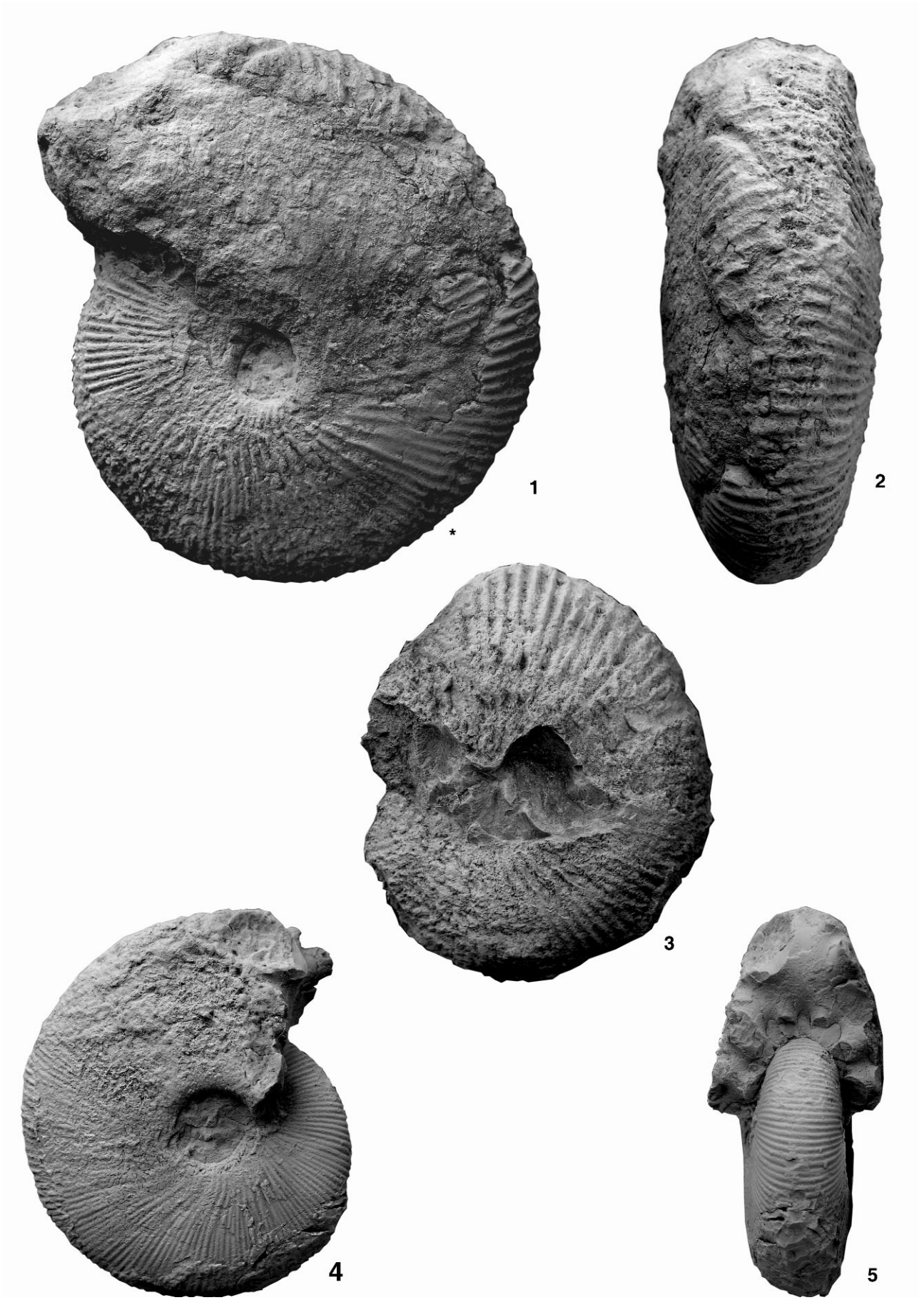
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Plate 4

Figure 1. *Lissoceras voultense* (OPPEL), Hidas Valley, Mátépart ravine.
Figure 2. *Homoeoplanulites* (*Homoeoplanulites*) sp., Hidas Valley, Mátépart ravine.
Figure 3. *Macrocephalites* (*Macrocephalites*) *cannizzaroi* (GEMMELLARO), the original specimen of BÖCKH (1881) from Pusztakisfalu. In the collections of the Hungarian Geological and Geophysical Institute, J 2004.

All figures natural size. Asterisk indicates end of phragmocone.


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