

***Aspidoceras* AND *Pseudowaagenia* SPECIES (ASPIDOCERATIDAE, AMMONOIDEA)
FROM THE UPPER JURASSIC OF THE HĂGHIMAȘ MTS.
(EASTERN CARPATHIANS – ROMANIA)**

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Abstract. The paper presents seven species of the genus *Aspidoceras* Zittel 1868 and three species of the genus *Pseudowaagenia* Spath 1931, found in the "Acanthicum Beds" Formation, from the Ghilcoș Kimmeridgian (Hăghimaș Mountains, Romania). In addition to the species previously described by other authors (Neumayr, Herbich and Preda), six more species have now been highlighted that complete this association: *Aspidoceras sesquinosum*, *A. uninodosum*, *A. hystricosum*, *A. rogoznicense*, *Pseudowaagenia micropla* and *P. acanthophala*. At the same time, the specimens described by previous authors were also reviewed.

Keywords: Aspidoceratidae, paleontology, Hăghimaș, Carpathians, Romania.

Rezumat. Specii de *Aspidoceras* și *Pseudowaagenia* (Aspidoceratidae, Ammonoidea) din Jurasicul superior din Munții Hăghimaș (Carpații Orientali - România). Lucrarea prezintă șapte specii ale genului *Aspidoceras* Zittel 1868 și trei specii ale genului *Pseudowaagenia* Spath 1931, găsite în Formațiunea „Stratelor cu Acanthicum”, din Kimmeridgianul de la Ghilcoș (Munții Hăghimaș, România). Pe lângă speciile descrise anterior de alți autori (Neumayr, Herbich și Preda) au fost puse în evidență acum încă șase specii ce completează asociația de aici: *Aspidoceras sesquinosum*, *A. uninodosum*, *A. hystricosum*, *A. rogoznicense*, *Pseudowaagenia micropla* și *P. acanthophala*. Totodată au fost revizuite și exemplarele descrise de autorii anteriori.

Cuvinte cheie: Aspidoceratidae, paleontologie, Hăghimaș, Carpați, România.

INTRODUCTION

The aspidoceratid specimens herein described are part of the large ammonite assemblage collected from the Lacu Roșu area (Ghilcoș and Ciofronca outcrops) in the Hăghimaș Mountains (Eastern Carpathians) (Fig. 1). They were sampled from Kimmeridgian-Lower Tithonian deposits (the informal "Acanthicum Beds"), whose lithology, biostratigraphy and outcrops were previously described (GRIGORE et al., 2009; GRIGORE, 2011). The "Acanthicum Beds" Formation here is mainly composed of nodular limestone, sandstone and marl, with lateral variations in the detrital composition and a vertical increase in the detrital weight, from the Lower Kimmeridgian to the Lower Tithonian (Platynota-Fallauxi zones). The specimens were sampled from three outcrops: (1) the western walls of Ghilcoș (Fig. 1B - "F1"), where the Upper Jurassic deposits are affected by transversal faults showing lateral differences in lithology and thickness (sections K, T, R, W); (2) several large blocks (sections A, D, E, F, H), possibly slipped along the northwestern slope of this mountain (Fig. 1B - "F2"); and (3) exposures of Kimmeridgian rocks located in the spring area of the Oii Valley-Ciofranca ("F17"), near Poiana Albă (sites/outcrops codification as in GRIGORE et al., 2009).

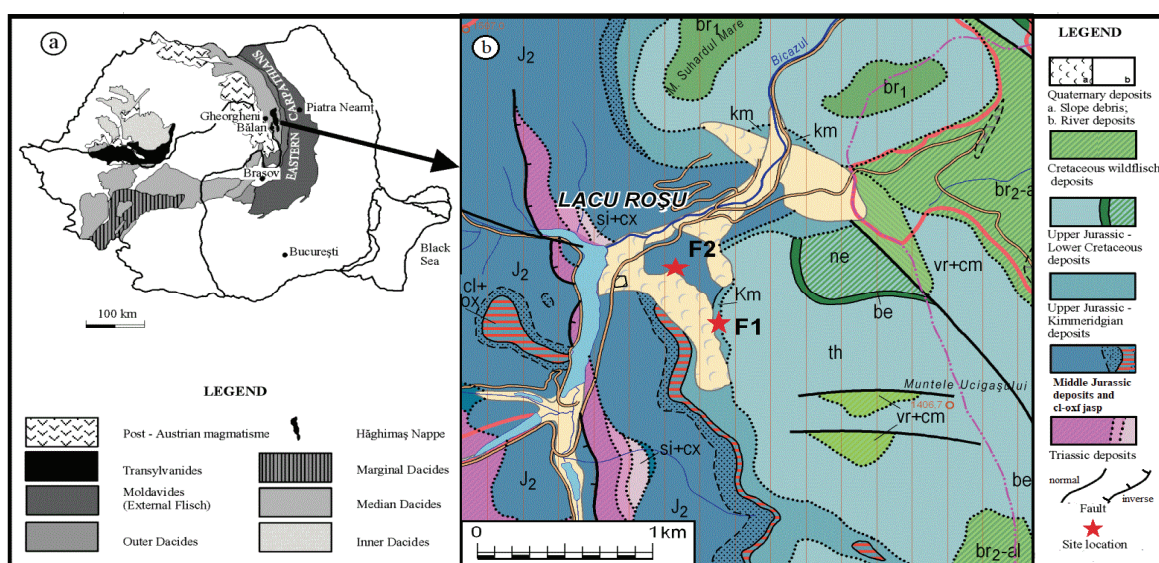


Figure 1. Localization of the outcrops: a) In Romania - Geotectonic sketch (after SĂNDULESCU, 1984); b) On the geological map scale 1: 50,000 (after Săndulescu al., 1975, revised GHEUCA & GRIGORE, 2010).

After the *Tarameliceras* species, the aspidoceratid group is the most frequent in the all ammonite assemblage. The specimens described by NEUMAYR (1873), HERBICH (1878), and PREDA (1973) are also reviewed. Ten taxa of this

group are described and illustrated, six being new occurrences for the region: *Aspidoceras sesquinosum*, *A. uninodosum*, *A. hystricosum*, *A. rogoznicense*, *Pseudowaagenia micropla* and *P. acanthophala*. The stratigraphic distribution established on the base of the assemblages shows, for the species of this two genera, that the interval of Divisum – Acanthicum Zones represents the level with highest frequency of species and specimens from the entire succession (Fig. 2).

| LOWER KIMMERIDGIAN | | | UPPER KIMMERIDGIAN | | | LOWER TITHONIAN | SUBSTAGE |
|-----------------------|------------------------------|----------------------|--------------------|---------|---------|-----------------|---|
| PLATYNOTA /SILENUM | HYPSELOCYCLUM /STROMBECKI | DIVISUM /HERBICHI | ACANTHICUM | EUDOXUS | BECKERI | HYBONOTUM | ZONE |
| | | | | | | | <i>Aspidoceras uninodosum</i> <i>Aspidoceras binodum</i> <i>Aspidoceras acanthicum</i> <i>Aspidoceras sesquinosum</i> <i>Aspidoceras hystricosum</i> <i>Aspidoceras longispinum</i> <i>Pseudowaagenia micropla</i> <i>Pseudowaagenia haynaldi</i> <i>Aspidoceras rafaeli</i> <i>Pseudowaagenia acanthophala</i> <i>Aspidoceras rogoznicense</i> |

Figure 2. Stratigraphic distribution of studied taxa through these sections.

MATERIAL AND METHOD

The ammonite specimens mostly belong to the author's collection, deposited in the National Geological Museum repository (GIR) – Bucharest. The collections belonging to Professor Ion Preda (hosted in the Geological Department of University of Bucharest and Museum of Natural Sciences in Piatra Neamț) and Franz Herbich (hosted in the Museum of the “Babeș Bolyai” University in Cluj-Napoca) have been also reviewed.

The determination of species uses the method of comparison with similar specimens known in the scientific literature which are mentioned in synonymy. The type specimens (holotypes, lectotype, etc.) were the basic references in the comparative analysis (the morphology and morphometry), whenever possible. The taxonomical assignment of species also follows the observations and amendments in the classification proposed by Checa (1985) and Sarti (1993).

Abbreviations for the measurements, collections and outcrops:

Dmax = maximal diameter

Dph = phragmocone diameter

D = measured diameter

U = diameter of umbilicus

H = whorl height

W = whorl width

UBB = “Babeș Bolyai” University of Cluj Napoca

LGB = Geology Laboratory of Bucharest University

MPN = Museum of Natural Sciences - Piatra Neamț

IGR /GIR = Geological Institute of Romania (National Geological Museum)

GBA = Geological Institute of Austria (Bundesanstalt)

F1 = Outcrop from western Ghilcoș walls

F2 = Outcrop from north-western Ghilcoș slope

F17 = Outcrop from “Ciofronca”; all in GRIGORE et al., 2009

A, D... K = studied sections (GRIGORE, 2002, 2011)

SYSTEMATICS

Family Aspidoceratidae ZITTEL, 1895

Subfamily Aspidoceratinae ZITTEL, 1895

Genera *Aspidoceras* ZITTEL, 1868

Aspidoceras binodum (OPPEL, 1863)

Pl. 1, Fig. 6; Pl. 2, Figs. 1, 7.

1863 *Ammonites binodus* nov. sp. - OPPEL; p. 217.

1863 *Ammonites atavus* nov. sp. - OPPEL; p. 216; Pl. 58, Figs. 3a, b.

1863 *Ammonites iphicerus* nov.sp. - OPPEL; p. 218; Pl. 60, Figs. 2a, b.

1873 *Aspidoceras binodum* OPPEL – NEUMAYR; p. 198.

1888 *Ammonites inflatus binodus* - QUENSTEDT; p. 1020; Pl. 116, Fig. 15.

1888 *Ammonites inflatus reineckii* - QUENSTEDT; p. 1026; pl. 117, fig. 7.

1888 *Ammonites inflatus* - QUENSTEDT; p. 1029-1030; Pl. 117, Figs. 14-17.

1929 *Physodoceras binodum* OPPEL - WEGELE; p. 89; Pl.11, Figs. 3a, b.

1929 *Physodoceras iphicerum* OPPEL - WEGELE; p. 89; Pl. 11, Figs. 4a, b.

1973 *Aspidoceras binodum* (OPPEL) – PREDA; Pl. 18, Figs. 3-5.

1978 *Aspidoceras binodum* (OPPEL) - OLORIZ; p. 289; Pl. 24, Figs. 3-4.

1985 *Aspidoceras binodum* (OPPEL) - CHECA; p. 54; Pl. 1, Fig.1; Pl. 2, Figs. 2-5; Pl. 3, Fig. 1.

1993 *Aspidoceras binodum* (OPPEL) - SARTI; p. 125.

2021 *Aspidoceras binodum* (OPPEL, 1863) – BUJITOR & al.; p. 291; Figs. 9 E1-E2.

Material: Grigore Collection in GIR: LRa19F1, LRa20E1, LRa21F5, LRa27E2 (F2 outcrop). Neumayr's specimens (1873): collection not specified – only mentioned from Ghilcoș and Ciofronca. Preda's specimens (1973): Collection of MPN – inv. **60A MPN** - originates from green-grey sandstones; **69 MPN** - originates from green nodular limestones; **35 MPN** – originates from red nodular limestones; all from Ghilcoș outcrops.

Table 1. Measurements of *Aspidoceras binodum* (OPPEL, 1863) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|----------------------|------|-----|----|----|----|----|------|------|------|------|
| Lectotype | 48 | - | 48 | 15 | 20 | 29 | 0.31 | 0.42 | 0.60 | 1.45 |
| Preda 60A MPN | 39 | - | 39 | 11 | 16 | 26 | 0.28 | 0.41 | 0.67 | 1.62 |
| Preda 69 MPN | 37 | - | 37 | 9 | 21 | 16 | 0.24 | 0.56 | 0.43 | 0.76 |
| Preda 35 MPN | 43 | - | 43 | 11 | 21 | 21 | 0.25 | 0.49 | 0.49 | 1 |
| LRa20E1 | 88 | 78 | 70 | 22 | 30 | 38 | 0.31 | 0.43 | 0.54 | 1.27 |
| LRa21F5 | 68 | 63 | 63 | 20 | 26 | 33 | 0.31 | 0.41 | 0.52 | 1.27 |
| LRa27E2 | 30 | 30 | 30 | 9 | 14 | 18 | 0.30 | 0.47 | 0.60 | 1.28 |

Diagnosis: medium-sized aspidoceratid, evolute, with a narrow and deep umbilicus. The umbilical wall is vertical, with a rounded umbilical edge. The whorl section is reniform, depressed, and the venter is broadly curved. The ornamentation consists of two rows of tubercles with parallel elements, which are usually joined by an obvious rib. One of the rows has a periumbilical position and the other one is in the middle on the flank, the distance between them being less than 2/5 of the height of the whorl. The ornamentation is present on the entire conch.

Remarks: the specimens LRa20E1 and LRa21F5 (Pl. 2, Figs. 1 and 7; Table 1) have a medium size, partially preserving the living chamber, eroded or broken. The specific ornamentation is well highlighted on a large part of the conch, towards the final part being eroded in both specimens. The specimen LRa27E2 is of small size (Pl. 1, Fig. 4) and LRa19F1 is a fragment from a coil of a specimen of medium size; the specific ornamentation, the two rows of pair tubercles joined by fine ribs is present on both specimens. All have the whorl section less wider than in type specimen. Preda's specimens are small phragmocones in various states of preservation. The whorl section varies from compressed (69 MPN) to strongly depressed (60A MPN), probably deformed during the fossilization process.

Occurrence: Lower Kimmeridgian: Platynota-Strombecki zones from the Ghilcoș (F1, F2) outcrops and also Ciofronca (F17); Upper Oxfordian / Kimmeridgian: Bimammatum to Acanthicum zones in Europe (Italy, Spain, Germany).

Aspidoceras sesquinodosum (FONTANNES, 1876)

Pl. 2, Figs. 4-6, 8.

1876 *Ammonites sesquinodosum* FONTANNES – DUMORTIER & FONTANNES; p. 126; Pl. 18, Fig. 6a; in Checa Pl. 3, Fig. 3.

1978 *Aspidoceras binodum* (OPPEL) – OLORIZ; p. 289; Pl. 24, Fig. 2.

1978 *Aspidoceras acanthicum acanthicum* (OPPEL) – OLORIZ; p. 301; Pl. 23, Fig. 3.

1985 *Aspidoceras sesquinodosum* (FONTANNES) – CHECA; p. 57; Pl. 1, Fig. 2; Pl. 2, Fig. 6; Pl. 3, Figs. 2-3; Pl. 4, Figs. 1-2.

1993 *Aspidoceras sesquinodosum* (FONTANNES) – SARTI; p. 122; Pl. 27, Fig. 1.

Material: Grigore Collection in GIR: Lra15A7, Lra43D2, Lra44D2, Lra45D3 (F2 outcrop); *Aspidoceras cf. sesquinodosum*: Lra32E3; Preda's specimens (1973): Collection of MPN – inv. 60B MPN (Pl. 17, Fig. 9) and 56 MPN (*A. bispinosus*, Pl. 18, Fig. 2) – both originating from red nodular limestones of the Ghilcoș outcrop (F1).

Table 2. Measurements of *Aspidoceras sesquinodosum* (FONTANNES, 1876) specimens

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|----------------------|------|-----|----|----|----|----|------|------|------|------|
| Lectotype | 65 | - | 65 | 24 | 25 | 25 | 0.37 | 0.38 | 0.38 | 1 |
| Preda 60B MPN | 36 | 36 | 36 | 10 | 16 | 17 | 0.27 | 0.44 | 0.47 | 1.06 |
| Preda 56 MPN | 49 | - | 49 | 14 | 21 | 20 | 0.28 | 0.43 | 0.41 | 0.95 |
| LRa15A7 | 75 | 75 | 64 | 20 | 27 | 28 | 0.31 | 0.42 | 0.44 | 1.04 |
| LRa45D3 | 70 | 70 | 70 | 20 | 30 | 30 | 0.28 | 0.43 | 0.43 | 1 |
| LRa43D2 | 60 | 50 | 60 | 16 | 27 | 30 | 0.26 | 0.45 | 0.50 | 1.11 |
| LRa44D2 | 57 | - | 57 | 15 | 27 | 27 | 0.26 | 0.47 | 0.47 | 1 |
| LRa32E3 | 96 | 94 | 96 | 25 | 42 | 42 | 0.26 | 0.44 | 0.44 | 1 |

Diagnosis: medium-sized aspidoceratid with convoluted conch, umbilicus of medium width and depth. The umbilical wall is vertical and the umbilical border almost angular. The section of the whorl is oval, with slightly convex flanks and converging towards a strongly curved venter. The ornamentation consists of two rows of tubercles: one periumbilical with spiniform tubercles of medium size and semi-numerous - perpendicular to the umbilical wall; the second row is median on the flank (at 2/5 of the height of the spire) and has rarer tubercles, which disappear on the living chamber (specific character). The lobar line generally has low denticulation and a greater development of the lobes compared to the saddles; the first lateral lobe is as deep as the siphonal. The saddles are bifid.

Discussion: CHECA (1985) reviewed the species and assigned it specimens with variable whorl section, from oval - compressed to reniform – depressed. SARTI (1993) separates these extremes into two morphotypes: morphotype 1 - with depressed section (widely curved flanks and venter) and morphotype 2 - with compressed section (flat flanks and tightly curved venter).

Remarks: All specimens are of medium size (D = 57-96 mm), only two of them partially preserving the living chamber (LRa43D2, LRa32E3 – Pl. 2, Fig. 6). The ornamentation is similar for all specimens, being built up by two rows of tubercles: one is periumbilical and the second arises at 2/5 of flank height; the tubercles of the second row are rarer than the first one. The tubercles of the periumbilical row are aligned with their maximum axis towards the umbilicus border and those on the flanks perpendicular to the flank height. The ornamentation disappears before the living chamber. The umbilicus is narrower than the type specimen for all specimens of my collection (Table 2). Two specimens (LRa43D2 and LRa15A7 – Pl. 2, Fig. 5) show the whorl section slightly more depressed (W/H>1) than the type specimen. Also Preda's specimens, 56 MPN (of medium size) and 60B MPN (of small size) representing two phragmocones have similar morphometric reports as my specimens.

The specimens of both aforementioned collections are comparable to the specimens described by CHECA (1985) and SARTI (1993) being comparable with one or another morphotype described by them as a transitional morph series.

Occurrence: Kimmeridgian: Strombecki - Acanthicum zones in Ghilcoş (F1 and F2) outcrops; Upper Oxfordian –Lower Tithonian: Bimammatum to Hybonotum zones (Strombecki/Divisum acme zone) in Europe (Italy, Spain, Germany, France, Bulgaria).

Aspidoceras uninodosum TOULA, 1907

Pl. 1, Fig. 4.

1888 *Ammonites inflatus nudatus* - QUENSTEDT; p. 1023-1024; Pl. 117, Figs. 3-4.

1888 *Ammonites unispinosus* - QUENSTEDT; p. 1024; Pl. 117, Fig. 5.

1985 *Aspidoceras uninodosum* TOULA - CHECA; p. 70; Pl. 4, Fig. 3; Pl. 6, Fig. 2; Pl. 7, Figs. 1-2.

1993 *Aspidoceras uninodosum* TOULA - SARTI; p. 122; Pl. 27, Fig. 1.

2003 *Aspidoceras uninodosum* TOULA - GYGI; p. 139; Figs. 161a, b.

Material: LRa31F4, LRa25E1, LRa26F1 Grigore Collection in GIR.

Table 3. Measurements of *Aspidoceras uninodosum* TOULA, 1907 specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|-----------|------|-----|-----|----|----|----|------|------|------|------|
| Lectotype | 125 | - | 125 | 42 | 46 | 47 | 0.33 | 0.37 | 0.38 | 1.02 |
| LRa31F4 | 94 | 71 | 80 | 24 | 36 | 43 | 0.30 | 0.45 | 0.54 | 1.19 |
| LRa25E1 | 31 | 23 | 31 | 9 | 14 | 16 | 0.29 | 0.45 | 0.52 | 1.14 |
| LRa26F1 | 40 | - | 40 | 10 | 20 | 22 | 0.25 | 0.50 | 0.55 | 1.10 |

Diagnosis: large aspidoceratid with convolute conch and medium-wide, deep umbilicus. The umbilical wall is vertical or flared in the adult stage, and the umbilical margin is rounded. The whorl section is typically oval. The ornamentation consists of two rows of tubercles: one periumbilical, with numerous and vigorous tubercles, and another lateral one, located more than 2/5 of the height (H) on the flank. The later row can be seen only up to a conch diameter of 50 mm. The suture line is moderately denticulated and composed of not very broad and shallow elements. The first lateral lobe is oblique and equal to the siphonal one, and the saddles are divided by short lobules.

Discussion: SARTI (1993, page 122) separates two morphotypes within this species: "M 1" - with thick and radial tubercles; "M 2" - with fine and numerous tubercles; the morphotypes are also different by the whorl section width, M1 having a more depressed section than M2.

Remarks: the specimen LRa31F4 (table 3) is large and preserves on 1/3 whorl a fragment of the living chamber; it has a deep umbilicus with a flared wall. The other specimens are small, only LRa25E1 (Pl. 1, Fig. 5) preserving a part of the living chamber (on approximately 1/5 whorl). All specimens present a narrower umbilicus and a bigger width of the whorl section (the whorl section is generally more developed) than the type specimen; they correspond morphometrically and morphologically (table 3) to M 1 morphotype of SARTI (1993).

Occurrence: Lower Kimmeridgian: Platynota-Strombecki zones in Ghilcoş (F2) outcrop; Kimmeridgian: Strombecki-Acanthicum zones in Italy; Divisum–Compsum zones in Spain, and Mutabilis–Eudoxus zones in Germany.

Aspidoceras acanthicum (OPPEL, 1863) in NEUMAYR, 1873

Pl. 1, Fig. 2.

1863 *Ammonites acanthicus* OPP. - OPPEL; p. 219.

*1873 *Aspidoceras acanthicum* OPPEL - NEUMAYR; p. 195; Pl. 41 (Lectotype).

1878 *Aspidoceras acanthicum* OPPEL – HERBICH; p. 171; non Pl. 17, Fig. 2 (= *A. longispinum*).

1903 *Aspidoceras montisprimi* nov.sp. - CANAVARI; p. 93; Pl. 30, Figs. 1 a-b.

1903 *Aspidoceras acanthicum* OPPEL - CANAVARI; p. 96; Pl. 29, Figs. 1 a-b.

- ?1973 *Aspidoceras acanthicum* OPPEL – PREDA; Pl. 10, Fig. 11.
 1985 *Aspidoceras acanthicum* (OPPEL) - CHECA; p. 74; Pl. 8, Fig. 1.
 1993 *Aspidoceras acanthicum* (OPPEL) - SARTI; p. 124; Pl. 26, Fig. 2.
 2021 *Aspidoceras acanthicum* (OPPEL, 1863) – BUJITOR et al.; p. 290; Figs. 9D1-D2.

Material: Grigore Collection in NGM-GIR LRa1A4, LRa2A8, LRa3X5, LRa4K10; Herbich's specimens (1878): in the Collection of UBB – originates from Ghilcoș, Ciofronca and Hăghimașul Negru outcrops. Preda's specimen (1973): the Collection of MPN – inv. 22A MPN and originates from the red nodular limestones of Ghilcoș (F1) outcrop.

Table 4. Measurements of *Aspidoceras acanthicum* (OPPEL, 1863) in NEUMAYR, 1873 specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|---------------|------|-----|-----|------|----|----|------|------|------|------|
| Lectotype | 174 | - | 174 | 61 | 61 | 64 | 0,35 | 0,35 | 0,37 | 1,05 |
| Preda 22A MPN | 85 | 85 | 81 | 25.5 | 32 | 29 | 0.33 | 0.40 | 0.35 | 0.91 |
| LRa1A4 | 160 | 126 | 160 | 54 | 56 | 54 | 0.34 | 0.35 | 0.34 | 0.96 |
| LRa2A8 | 170 | 116 | 170 | 55 | 64 | 61 | 0.32 | 0.36 | 0.36 | 0.95 |
| LRa3X5 | 156 | 120 | 145 | 48 | 56 | 52 | 0.33 | 0.38 | 0.36 | 0.93 |
| LRa4K10 | 137 | 137 | 137 | 37 | 46 | 45 | 0.27 | 0.33 | 0.33 | 0.98 |

Diagnosis: large aspidoceratid with a convoluted conch and a medium-wide, shallow umbilicus. The umbilical wall is narrow and vertical, and the umbilical edge, subangular. The section of the whorl is oval, with almost flat sides and a convex venter. The ornamentation consists of two rows of tubercles, one periumbilical, the other lateral, located at 2/5 of the height of the whorl; the periumbilical row is frequent and regular, while the lateral row has a uniform distribution of elements only up to a diameter of 90 mm, from where it becomes irregular (having at most 7 tubercles per turn). The lobar line is not known.

Discussion: Following the determination of the specimens, we took into account the observations and the amendment made by SARTI (1993), who considered the specimen figured by NEUMAYR (1873) as the lectotype for this species.

Remarks: Our specimens are large, most of them partially preserving the living chamber (LRa4K10 is a phragmocon only). The whorl section is typically oval and the ornamentation consists of two rows of tubercles spaced at 2/5 of the flank height. The periumbilical row is frequently preserved and regular, while the lateral row has an uniform distribution of elements only up to a conch diameter of approximately 90 mm. Starting of this diameter, it becomes irregular (having at most 7 tubercles per whorl) in all specimens. They also show some differences in comparison to Neumayr's specimen (1873, Pl. 41): the umbilicus is narrower (an ontogenetic feature) and the whorl section is slightly more compressed, the values remaining within the spectrum of variability of the species for specimens of our collection. Preda's specimen (22A MPN) is a medium-sized phragmocone and presents at this diameter (85 mm) a wider umbilicus and a more compressed section of the whorl. Herbich's specimens are little known, the illustrated one (1878, 17/2) showing the typical characters of *A. longispinum*.

Occurrence: Kimmeridgian: Divisum-Acanthicum zones in Ghilcoș (F1 and F2) outcrops; Kimmeridgian: Divisum (Uhlandi)-Acanthicum zones in Italy, Bulgaria, France; Divisum (Uhlandi) to the Beckeri zones in Spain, Germany and England.

Aspidoceras longispinum (SOWERBY, 1825)

Pl. 2, Figs. 2-3.

- 1825 *Ammonites longispinus* – SOWERBY; p. 164; Pl. 501, Fig. 2.
 1830 *Ammonites bispinosus* – ZIETEN; p. 22; Pl. 16, Fig. 4.
 1863 *Ammonites hoplisus* OPP.- OPPEL; p. 259; Pl. 73, Figs. 4d, 5.
 non1873 *Aspidoceras longispinus* SOWERBY – NEUMAYR; p. 196; Pl. 42, Figs. 1a-c (= *A. hystricosum*).
 1873 *Aspidoceras bispinosum* ZIETEN – NEUMAYR; p. 198.
 1875 *Ammonites longispinus* SOWERBY - FAVRE; p. 43; Pl. 6, Figs. 5a-b.
 1877 *Ammonites (Aspidoceras) longispinus* SOWERBY - FAVRE; p. 60; Pl. 7, Figs. 7a-b.
 1878 *Ammonites (Aspidoceras) acanthicus* OPPEL - LORIOL; p. 110; pl. 17, Fig. 2a.
 1878 *Aspidoceras longispinus* SOWERBY - HERBICH; p. 172; Pl. 16-17, Fig. 1.
 1878 *Aspidoceras acanthicum* OPPEL – HERBICH; p. 171; Pl. 16-17, Fig. 2.
 1888 *Ammonites bispinosus* - QUENSTEDT; p. 1031; Pl. 118, Figs. 1-2.
 1903 *Aspidoceras subbinodiferum* nov.sp. - CANAVARI p. 12; Pl. 3, Figs. 1a-b, f.
 non1973 *Aspidoceras longispinum* SOWERBY – PREDA; Pl. 17, Fig. 3 (= *A. hystricosum*).
 1973 *Aspidoceras bispinosum* ZIETEN – PREDA; Pl. 18, Fig. 2.
 1985 *Aspidoceras longispinum* (SOWERBY) - CHECA; p. 76; Pl. 9, Figs. 1-3; Pl. 10, Fig. 2.
 1993 *Aspidoceras longispinum* (SOWERBY) - SARTI; p. 125.

Material: Grigore Collection in NGM-GIR LRa9K15, LRa10A10. Neumayr's specimen (*A. bispinosum*, 1873): Collection of GBA – originates from red nodular limestones of Ciofronca. Herbich's specimens (1878): in Collection of UBB – four specimens which originates from gray sandy limestones with *Pygope janitor* of the Ghilcoș outcrop and from the red nodular limestones of Ciofronca. PREDA's specimens (1973): in Collection of MPN – inv. 6 MPN originates from gray limestones and inv. 22B MPN, from red nodular limestones, both from the Ghilcoș outcrop.

Table 5. Measurements of *Aspidoceras longispinum* (SOWERBY, 1825) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|---------------|------|-----|-----|------|------|----|------|------|------|------|
| Checa's | 86 | - | 86 | 32 | 33 | 29 | 0.37 | 0.38 | 0.34 | 0.88 |
| Herbich's A | 223 | - | 223 | 85 | 85 | 89 | 0.38 | 0.38 | 0.40 | 1.05 |
| Herbich's B | 89 | - | 89 | 27.6 | 36.5 | 46 | 0.31 | 0.41 | 0.52 | 1.27 |
| Herbich's C | 191 | 132 | 191 | 59 | 80 | 76 | 0.31 | 0.42 | 0.40 | 0.95 |
| - | - | - | 132 | 45 | 50 | 59 | 0.34 | 0.38 | 0.45 | 1.19 |
| Herbich's D | 76 | - | 76 | 23.5 | 31 | 30 | 0.31 | 0.41 | 0.39 | 0.97 |
| Preda 6 MPN | 68 | 68 | 68 | 21 | 27 | 33 | 0.31 | 0.40 | 0.48 | 1.22 |
| Preda 22B MPN | 52 | 52 | 52 | 13 | 23 | 25 | 0.25 | 0.44 | 0.48 | 1.09 |
| LRa9K15 | 41 | 41 | 41 | 14 | 16 | 28 | 0.34 | 0.39 | 0.68 | 1.75 |
| LRa10A10 | 70 | - | 70 | 22 | 28 | 37 | 0.31 | 0.40 | 0.53 | 1.32 |

Diagnosis: large aspidoceratid with convolute conch and medium-wide, shallow umbilicus. The umbilical wall is vertical, with a rounded edge. The section of the whorl varies between oval-compressed to oval-depressed, with convex-parallel flanks and curved venter. The ornamentation consists of two rows of equal and semi-numerous tubercles (between the periumbilical and lateral rows there is more than 2/5 of the flank height). The tubercles of the two rows form pairs are connected by weakly developed ribs. The lateral tubercles are spiniform and perpendicular to the flanks. The suture line is generally poorly denticulated, with saddles wider than the lobes; the first lateral lobe is palmar in shape, having five auxiliary lobules.

Remarks: Our specimen LRa9K15 (Pl. 2, Fig. 2) is small representing a phragmocone, which has an extremely depressed whorl section. The specimen LRa10A10 (Pl. 2, Fig. 3) is of medium size, deformed, but the specific ornamentation is well preserved; at this diameter it presents a narrow umbilicus and a depressed section.

Herbich's specimens: "A" - is large and preserves 1/2 whorl from the living chamber and presents an isometric section; "B" - is of medium size and has a narrow umbilicus and a depressed whorl section; "C" (the figured specimen) - it is large in size and very well preserved (it preserves and 1/4 whorl from the living chamber); from Herbich's description it follows that the morphological and morphometric parameters of this specimen are very close to those of the type specimen. Specimen "D" (the described as "*A. acanthicum*") is of medium size and preserves the ornamentation well; at this size has a narrow umbilicus, but the section, more compressed. Preda's specimens are of medium size and represent two phragmocones that well preserve the specific ornamentation; at this size it presents a narrow umbilicus and a depressed whorl section.

Occurrence: Kimmeridgian: Divisum to Beckeri zones in the Ghilcoş and Ciofronca outcrops; Kimmeridgian: Divisum (Uhlandi) to the Beckeri zones in Italy, Spain, Germany, Bulgaria, France, Switzerland; Eudoxus Zone in England.

Aspidoceras hystricosum (QUENSTEDT, 1888)

Pl. 1, Fig. 1.

1873 *Aspidoceras longispinum* SOWERBY - NEUMAYR; p. 196; Pl. 42, Figs. 1a-c.

1888 *Ammonites inflatus hystricosus* - QUENSTEDT; p. 1062; Pl. 122, Fig. 3.

1973 *Aspidoceras longispinum* SOWERBY - PREDA; Pl. 17, Fig. 3.

1985 *Aspidoceras hystricosum* (QUENSTEDT) - Checa; p. 81; Pl. 1, Figs. 3-4; Pl. 9, Fig. 4; Pl. 10, Fig. 1; Pl. 11, Fig. 1; Pl. 12, Fig. 1.

1993 *Aspidoceras hystricosum* (QUENSTEDT) - SARTI; p. 125.

Material: Grigore Collection in NGM-GIR: LRa11A9, LRa24H; *Aspidoceras* cf. *hystricosum*: LRa12A8, LRa23H11; Neumayr's specimen ("*A. longispinum*", 1873): Collection of GBA - originates from the green-gray sandy limestones of the Ghilcoş outcrop. PREDA's specimen (1973): in the Collection of MPN - inv. 26/23 MPN originates from the green-gray sandy limestones of the Ghilcoş outcrop.

Table 6. Measurements of *Aspidoceras hystricosum* (QUENSTEDT, 1888) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|-----------------|------|-----|-----|----|----|----|------|------|------|------|
| Neumayr's | 135 | - | 135 | 50 | 48 | 60 | 0.37 | 0.35 | 0.44 | 1.25 |
| Preda 26/23 MPN | 107 | 107 | 102 | 37 | 37 | 46 | 0.36 | 0.36 | 0.45 | 1.24 |
| LRa11A9 | 28 | 35 | 38 | 12 | 14 | 20 | 0.31 | 0.37 | 0.53 | 1.43 |
| LRa12A8 | 29 | - | 24 | 7 | 10 | 14 | 0.29 | 0.42 | 0.58 | 1.40 |
| LRa24H | - | - | - | - | 39 | 49 | - | - | - | 1.26 |

Diagnosis: convolute conch with deep umbilicus, vertical umbilical wall and rounded edge. The section of the whorl is reniform, depressed, with strongly convex flanks and converging towards a large, curved venter. The ornamentation consists of two rows of thick tubercles, whose elements are parallel; the distance between the two rows is 1/2 of the height of the whorl. There are connecting radial ribs between the tubercles, which are strong in the internal whorls and gradually fade towards the living chamber. The suture line is generally very denticulated, with broad and deep major elements; the first lateral lobe is tricuspid, slightly asymmetrically and of equal depth as the siphonal one. The saddles are symmetrical, evenly divided.

Remarks: the specimens of our collection are small (LRa11A9, LRa12A8) and medium-sized and partially preserve the living chamber. They have the morphological and morphometric (Table 6) parameters of the *A. hystricosum* species, being comparable to the type specimen.

Neumayr's specimen, described and figured as *Aspidoceras longispinum* is a large phragmocone that shows the specific characters of the *A. hystricosum* species: depressed whorl section on the entire shell, coarse tuberculation, and the suture line with deep lobes, the first lateral lobe being tricuspid and asymmetrical. Preda's specimen, described as "*Aspidoceras longispinum*", is a phragmocone of medium size and presents the same characteristics as the specimen described by Neumayr also as "*Aspidoceras longispinum*".

Occurrence: Kimmeridgian: Divisum (Uhlandi) to Eudoxus zones in the Ghilcoș outcrops (F2, ?F1); Upper Kimmeridgian- Lower Tithonian: Acanthicum to Hybonotum zones in Europe (Italy, Spain, Germany).

Aspidoceras rogoznicense (ZEUSCHNER, 1846)

Pl. 1, Fig. 7.

1846 *Ammonites rogoznicensis* ZEUSCHNER – ZEUSCHNER; Pl. 4, Figs. A, b, c; in R.C. Moore: p. L 339, Fig. 444/ 2a-b.

1978 *Aspidoceras* sp. Aff. *A. longispinum* (SOWERBY) – OLORIZ; p. 293; Pl. 24, Fig. 1.

1985 *Aspidoceras rogoznicense* (ZEUSCHNER) – CHECA; p. 98; Pl. 16, Figs. 1-4.

1993 *Aspidoceras rogoznicense* (ZEUSCHNER) – SARTI; p. 126.

2015 *Aspidoceras* cf. *rogoznicense* (ZEUSCHNER, 1846) – BERGER; p. 50; Fig. 27.

2020 *Aspidoceras rogoznicense* (ZEUSCHNER, 1846) – SARTI; p. 180; Pl. 38, Figs. 1A-B, 2.

2021 *Aspidoceras rogoznicense* (ZEUSCHNER, 1846) – BUJITOR & al.; p. 292; Figs. 9H1-H3.

Material: Lra47R5,0 Grigore Collection in GIR.

Table 7. Measurements of *Aspidoceras rogoznicense* (ZEUSCHNER, 1846) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|-----------|------|-----|----|----|----|----|------|------|------|------|
| Lectotype | 25 | - | 25 | 9 | 11 | 15 | 0,36 | 0,44 | 0,60 | 1,36 |
| LRa47R5,0 | 90 | 90 | 90 | 24 | 43 | 49 | 0,27 | 0,48 | 0,54 | 1,14 |

Diagnosis: medium to large aspidoceratid with convoluted conch and deep umbilicus. It is characterized by a rapid growth of the whorl in width. The umbilical wall is flared, the umbilical edge being rounded. The section of the whorl is reniform, strongly depressed, with convex flanks and a very wide arched venter. The ornamentation consists of two rows of strong and dense tubercles. The distance between the two strings is 2/5 of the height of the whorl; as a particularity, the existence of a larger number of tubercles than in the periumbilical one is observed in the external row. In the internal whorls, up to a stage, there are only lateral tubercles, which are very vigorous. The lobar line is generally weakly denticulated, with shallow lobes and saddles. The first lateral lobe is slightly asymmetrical, and the sellae are divided short and roughly symmetrical.

Discussion: The initial description was made on a microconch (obs. Checa), which was not enough to define the specific parameters; for this reason, the observations made by Checa and Sarti, who analysed and described this species based on medium and large specimens, should also be taken into account.

Remarks: the specimen of our collection is a large phragmocone, with a convolute conch and a reniform (depressed) whorl section. The umbilicus is deep and narrower than type specimen shows; the umbilical wall is slightly flared and has a rounded edge. The ornamentation consists of two rows of strong and dense tubercles. The distance between the two strings is 2/5 of the height of the spiral; particularly, more numerous tubercles characterize the external row.

Occurrence: Lower Tithonian - Hybonotum zone in the Ghilcoș outcrop (F1); Lower Tithonian in Italy, Spain, Germany, Bulgaria, France, Hungary.

Incerte sedis

Aspidoceras rafaelli (OPPEL, 1863)

The presence of this species is uncertain, being mentioned by previous authors (Herbich and Neumayr) based on some fragments; it was not found upon this study.

?1873 *Aspidoceras rafaelli* OPPEL – NEUMAYR; p. 201.

?1878 *Aspidoceras rafaelli* OPPEL – HERBICH; p. 178.

Herbich (1878) only mentions in his work a few shell fragments that have irregular tuberculation and external costation, without describing them in detail. The specimens of Herbich originate from green sandstones with *Pygope janitor* of the Ghilcoș outcrop and from red nodular limestones of Ciofronca, probably Upper Kimmeridgian in age.

Genus *Pseudowaagenia* SPATH, 1931

Pseudowaagenia micropla (OPPEL, 1863)

Pl. 1, Fig. 5.

1863 *Ammonites microplus* nov.sp. - OPPEL; p. 218; Pl. 58, Figs. 4a-b.

1877 *Ammonites (Aspidoceras) microplus* OPPEL - FAVRE; p. 63; Pl. 7, Figs. 4a-b.

- 1877 *Aspidoceras microplum* OPPEL - GEMMELLARO; p. 232; Pl. 15, Figs. 11a-b.
 non1878 *Aspidoceras microplum* OPPEL – HERBICH; p.172; Pl. 14-15, Fig. 4 (= *Pseudowaagenia acanthomphala*).
 1878 *Ammonites (Aspidoceras) microplus* OPPEL - LORIOL; p. 118; Pl. 19, Figs. 3a-b.
 1888 *Ammonites inflatus epesus* - QUENSTEDT; p. 1021; Pl. 116, Fig. 19.
 1888 *Ammonites microplus* - QUENSTEDT; p. 1022; Pl. 116, Fig. 21.
 1903 *Aspidoceras microplum* OPPEL - CANAVARI; Pl. 7, Fig. 4a-b.
 1973 *Aspidoceras* sp. – PREDA; Pl. 15, Fig. 5.
 1978 *Aspidoceras (Pseudowaagenia)* sp. cf. *A. (Pseudowaagenia) microplum* (OPPEL) - OLORIZ; p. 315; Pl. 26, Fig. 6.
 1985 *Pseudowaagenia micropla* (OPPEL) - CHECA; p. 116; Pl. 21, Figs. 2-6.
 1987 *Pseudowaagenia micropla* (OPPEL) - PAVIA & al.; Pl. 3, Fig. 3.
 1993 *Pseudowaagenia micropla* (OPPEL) - Sarti; p. 129.
 2021 *Pseudowaagenia micropla* (OPPEL, 1863) – BUJITOR & al.; p. 297; Figs. 10 F1-F2.

Material: Grigore Collection in GIR: LRa38D2. PREDA's specimen (1973): in Collection of MPN – inv. 22C MPN originates from red nodular limestones of the Ghilcoş outcrop.

Table 8. Measurements of *Pseudowaagenia micropla* (OPPEL, 1863) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|---------------|------|-----|----|----|----|----|------|------|------|------|
| Lectotype | 56 | - | 56 | 18 | 23 | 16 | 0,32 | 0,41 | 0,29 | 0,69 |
| Preda 22C MPN | 35 | 35 | 35 | 11 | 15 | 13 | 0,31 | 0,43 | 0,37 | 0,86 |
| LRa38D2 | 50 | 46 | 50 | 14 | 23 | 19 | 0,28 | 0,46 | 0,38 | 0,83 |

Diagnosis: medium-sized aspidoceratid with convoluted conch, medium-wide and shallow umbilicus. The umbilical wall is vertical, narrow, with a rounded edge. The whorl section is oval - compressed, the flanks being almost flat, parallel and the venter is narrow-rounded. The ornamentation consists of a periumbilical row of small and numerous tubercles. The lobar line was presented by Checa and is generally very simple and characterized by lobes narrower than the saddles.

Remarks: the specimen LRa38D2 (Pl. 1, Fig. 2) is of medium size and preserves the beginning of the living chamber. The umbilicus is a little deep and has a vertical, narrow and rounded edge. It has an oval whorl section, with flat (parallel) flanks and a narrow (tightly curved) venter. The ornamentation is made up of a single row of periumbilical tubercles, fine and dense. Compared to the type specimen, it has a narrower umbilicus and a slightly wider whorl section (Table 8). Preda's specimen is a small phragmocone, which preserves the specific ornamentation; the whorl section is wider than that of the type specimen.

Discussion: the two specimens correspond to the species, according to Checa's observations, the width of the section varying ontogenetically.

Occurrence: Kimmeridgian: Divisum to Acanthicum zones in the Ghilcoş (F1, F2) outcrops; Kimmeridgian: Platynota to the Acanthicum zones in Spain and Germany.

Pseudowaagenia haynaldi (HERBICH, 1868)

Pl. 1, Fig. 3.

- 1868 *Ammonites haynaldi* – HERBICH; p. 12.
 1873 *Aspidoceras haynaldi* HERBICH – NEUMAYR; p. 194; Pl. 42, Figs. 3a-b.
 1878 *Aspidoceras haynaldi* – HERBICH; p. 169; Pl. 14-15, Figs. 1a-b.

Material: Herbich Holotype (1878): in the Collection of BB - inv. **2045UC**, originating from green sandy limestones of the Ciofronca outcrop.

Table 9. Measurements of *Pseudowaagenia haynaldi* (HERBICH, 1868) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|----------|------|-----|----|----|----|----|------|------|------|------|
| Holotype | 56 | 52 | 56 | 18 | 23 | 16 | 0,32 | 0,41 | 0,29 | 0,69 |

Holotype description: Herbich's specimen (**2045UC**) is a medium-sized aspidoceratid with an evolute shell, which preserves only ¼ whorl from the living chamber (Table 9). The umbilicus is shallow and the umbilical wall is narrow, vertical and with an angular edge. The whorl section is oval, compressed, with maximum thickness in the lower third of the flanks. The ornamentation consists of two rows of tubercles, fine, parallel and spaced 2/3 of the flank highness; tuberculation is dense. Tubercles are connected by radial ribs, which cross the venter, in the form of folds. The lobar line is not known.

Occurrence: originating from green sandy limestones of Ciofronca outcrop - Upper Kimmeridgian; Kimmeridgian – Acanthicum to the Beckeri zones in Italy, Spain, Germany.

Pseudowaagenia acanthomphala (ZITTEL, 1870)

- 1870 *Aspidoceras acanthomphalus* - ZITTEL; p. 79; Pl. 5, Figs. 4a-b.
 1878 *Aspidoceras microplum* OPPEL – HERBICH; p. 172; Pl. 14-15, Figs. 4a-b.

Material: Herbich's specimen ("*Aspidoceras microplum*", 1878): in the Collection of UBB – originating from green sandstones with *Pygope janitor* of the Ghilcoş outcrop.

Table 10. Measurements of *Pseudowaagenia acanthomphala* (ZITTEL, 1870) specimens.

| Specimen | Dmax | Dph | D | U | H | W | U/D | H/D | W/D | W/H |
|-----------|------|-----|----|----|----|----|------|------|------|------|
| Lectotype | 56 | 56 | 56 | 22 | 21 | 19 | 0.39 | 0.37 | 0.34 | 0.90 |
| Herbich's | 96 | 60 | 96 | 46 | 28 | 24 | 0.48 | 0.29 | 0.25 | 0.86 |

Herbich's specimen described as *Aspidoceras microplum* (1878; Pl. 14-15, Fig. 4) is large sized and well preserved, with the entire living chamber. The shape of the whorl section is comparable with that of the Zittel's specimen; the umbilicus, however, is more open ($U/D = 0.48$) at this diameter than in the type specimen.

Occurrence: originating from green sandstones with *Pygope janitor* of the Ghilcoș outcrop - Upper Kimmeridgian; Upper Kimmeridgian – Cavouri (Eudoxus) to the Beckeri zones in Italy, Spain and France.

CONCLUSIONS

The ammonites assemblage from the Ghilcoș Kimmeridgian is enriched with four more taxa of the *Aspidoceras* genus and two of the *Pseudowaagenia*: *A. sesquinosum*, *A. uninodosum*, *A. hystricosum*, *A. rogoznicense*, *Pseudowaagenia micropla* and *P. acanthomphala*. The specimens previously described by NEUMAYR (1873), HERBICH (1878) and PREDA (1973) are reviewed here.

The stratigraphical range of the *Aspidoceras* species shows some differences from the similar occurrences of the Alpine Belt; *Aspidoceras binodum* and *A. uninodosum* are found only in the Lower Kimmeridgian (Platynota-Strombecki zones); *A. sesquinosum* also shows more restrictive distribution, only between Strombecki to Acanthicum zones.

This is how PARENT et al. (2008) show that the *Aspidoceratidae* group includes the *Sutneria* taxons, as sexually dimorphic male; we can conclude that the presence here of many species of both groups with similar stratigraphic distribution and acme levels are premises that future studies will be able to establish some male-female couples between this two groups – *Aspidoceras* and *Sutneria*.

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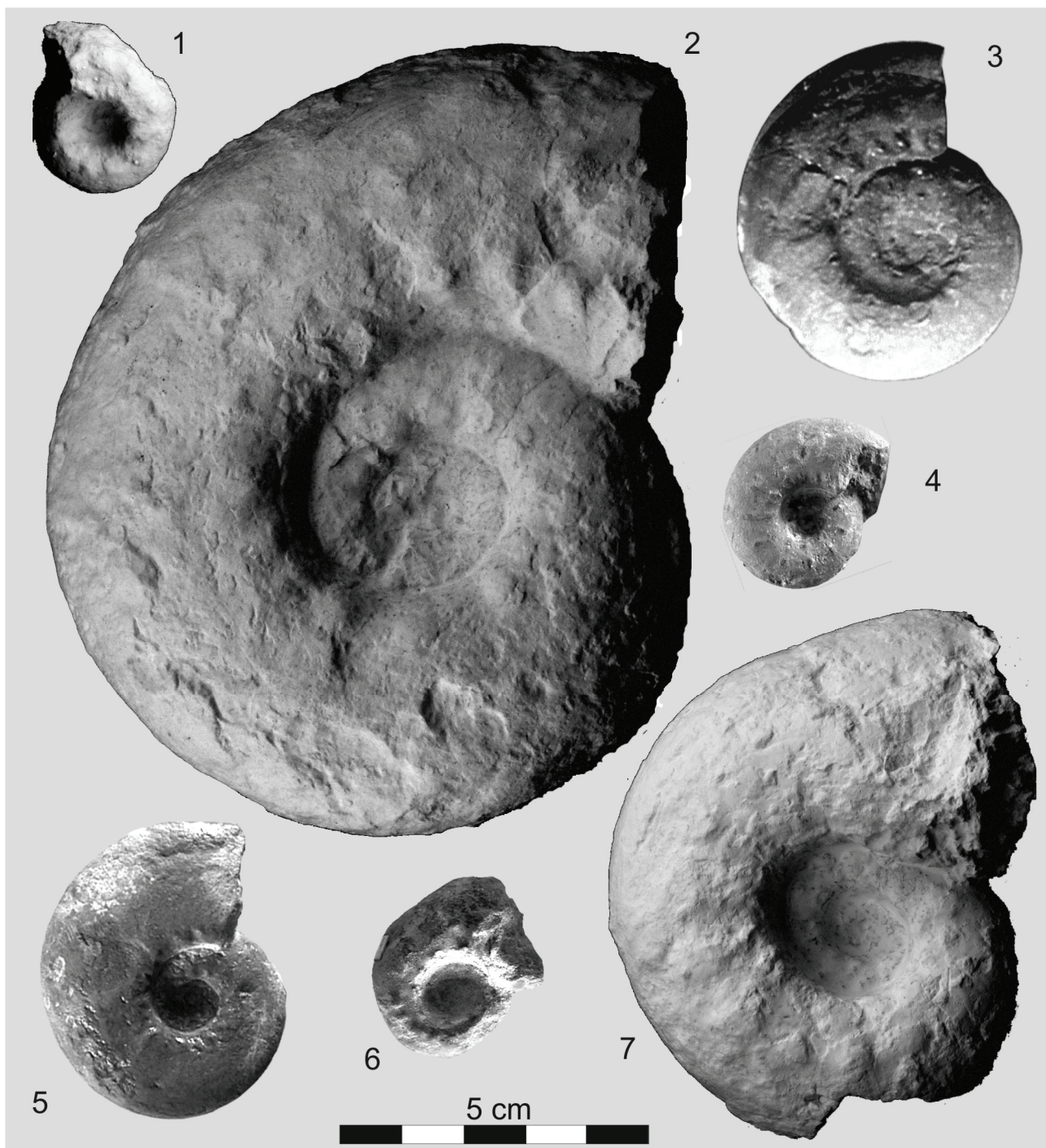
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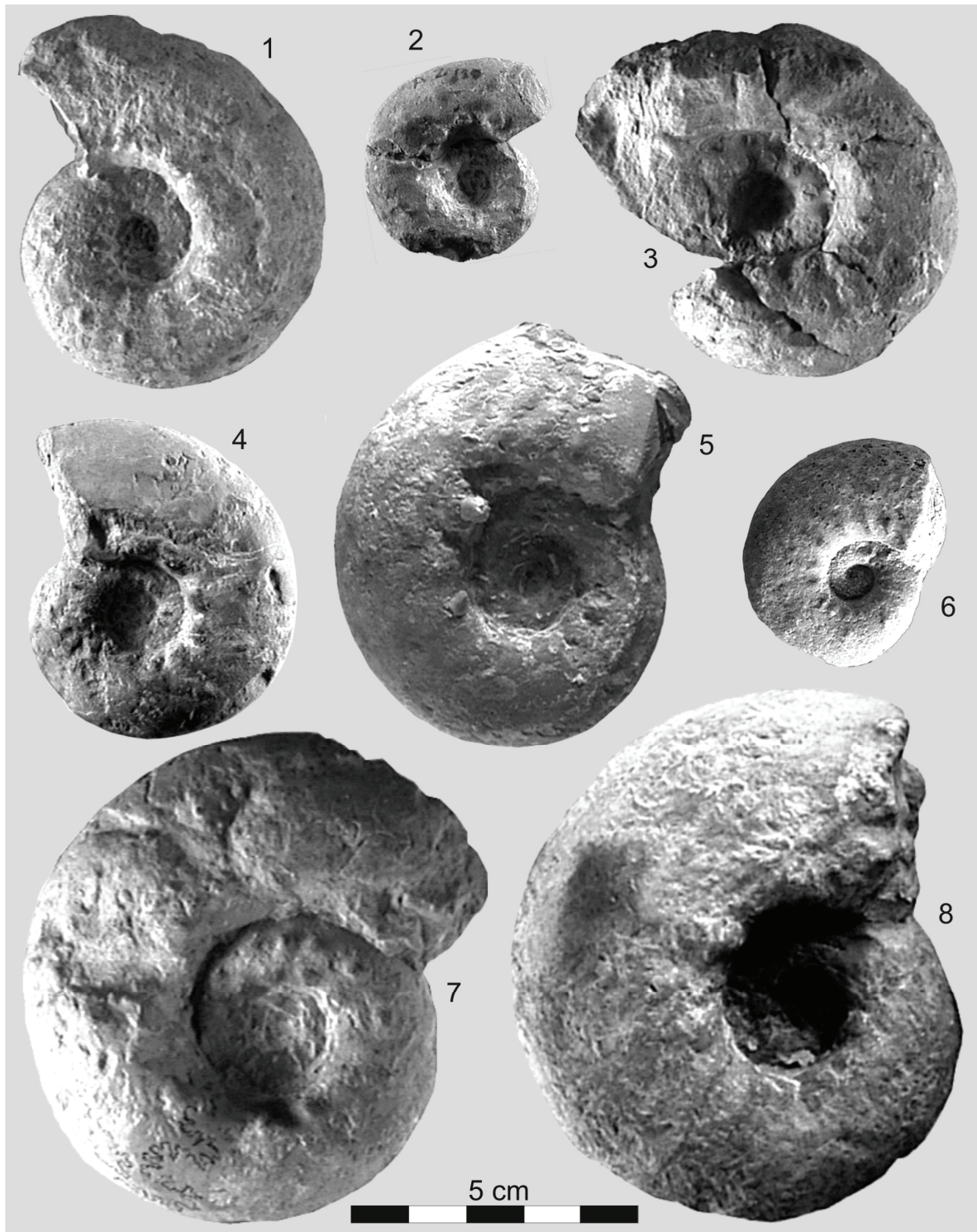
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Plate 1



Figures: 1. *Aspidoceras hystricosum* (QUENSTEDT) (LRa12A8) – green nodular facies, Ghilcoș (F2), Lower Kimmeridgian (Divisum Zone); 2. *Aspidoceras acanthicum* (OPPEL) (LRa4K10) - red nodular facies, Ghilcoș (F1), Upper Kimmeridgian (Acanthicum Zone); 3. *Pseudowaagenia haynaldi* (HERBICH) (Holotype: 2045 UC) - green-grey sandstone facies, Ciofronca outcrop (F17), Upper Kimmeridgian; 4. *Aspidoceras uninodosum* TOULA (LRa25E1), juvenile - green nodular facies, Ghilcoș (F2), Lower Kimmeridgian (Platynota Zone); 5. *Pseudowaagenia micropla* (OPPEL) (LRa38D2) - green nodular facies, Ghilcoș (F2), Upper Kimmeridgian (Acanthicum Zone); 6. *Aspidoceras binodum* (OPPEL) (LRa27E2), juvenile - green nodular facies, Ghilcoș (F2), Lower Kimmeridgian (Strombecki Zone); 7. *Aspidoceras rogoznicense* (ZEUSCHNER) (LRa47R5,0), deformed – red nodular facies, from the Ghilcoș walls (F1), Lower Tithonian (Hybonotum Zone).

Plate 2



Figures: 1. *Aspidoceras binodum* (OPPEL) (LRa21F5) – green-grey facies, Ghilcoş (F2), Lower Kimmeridgian (Strombeki Zone); 2. *Aspidoceras longispinum* (SOWERBY) (LRa9K15), deformed – red nodular facies, from the Ghilcoş walls (F1), Upper Kimmeridgian (Acanthicum Zone); 3. *Aspidoceras longispinum* (SOWERBY) (LRa10A10) – green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Divisum – Uhlandi SubZone); 4. *Aspidoceras sesquinodosum* (FONTANNES) (LRa29E3) - green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Strombeki Zone); 5. *Aspidoceras sesquinodosum* (FONTANNES) (LRa15A7), deformed – green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Divisum Zone); 6. *Aspidoceras* cf. *sesquinodosum* (FONTANNES) (LRa32E3) – green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Strombeki Zone); 7. *Aspidoceras binodum* (OPPEL) (LRa20E1) – green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Platynota Zone); 8. *Aspidoceras sesquinodosum* (FONTANNES) (LRa32E3) – green nodular facies, Ghilcoş (F2), Lower Kimmeridgian (Strombecki Zone).