

## PHYLLOCERATIDS FROM THE UPPER JURASSIC DEPOSITS OF HĂGHIMAȘ MTS. (THE EASTERN CARPATHIANS – ROMANIA)

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**Abstract.** This paper deals with the taxonomic study of the Phylloceratids species found in the Kimmeridgian-Tithonian deposits from Ghilcoș and Ciofronca (Hăghimaș Mts). The number of species identified here reached 13 taxa. Also, there are revised all the species and specimens described by the previous authors: HERBICH (1878), NEUMAYR (1871, 1873) and PREDA (1973). *Phylloceras leptoptychum* and *Ph. bekasense* described HERBICH (1878) are proposed for removal from the nomenclature of species.

**Keywords:** Phylloceratids, taxonomy, Hăghimaș, Carpathians, Romania.

**Rezumat. Phylloceratide din Jurasicul superior din Munții Hăghimaș (Carpații Orientali – România).** În lucrare este prezentat studiul taxonomic al speciilor din grupul Phylloceratina găsite în depozitele kimmeridgian-tithoniene din Ghilcoș și Ciofronca (Munții Hăghimaș). Numărul speciilor cunoscute de aici ajunge acum la 13. De asemenea, în această lucrare sunt revizuite toate speciile/specimenele descrise din zonă de autorii anteriori: HERBICH (1878), NEUMAYR (1871, 1873) și PREDA (1973). Speciile *Phylloceras bekasense* și *Ph. leptoptychum* descrise de HERBICH (1878) sunt propuse aici pentru radiere din nomenclatorul speciilor (*nome nudum*).

**Cuvinte cheie:** Phylloceratide, taxonomie, Hăghimaș, Carpați, România.

### INTRODUCTION

The outcrops (F1, F2, F17 in GRIGORE et al., 2009 and 2011) that yielded the studied fauna are situated in Hăghimaș Mts. These outcrops are included in the Cheile Bicazului – Hăghimaș National Park. The group of Phylloceratids is well represented in this region (number of species and specimens), two acmes being registered: first in Platynota Zone and the second, in Acanthicum Zone (Loryi Horizon). In this paper, there are revised all the phylloceratid specimens described from these areas by previous authors; it was the opportunity to reassess two Herbich's species: *Phylloceras bekasense* and *Ph. leptoptychum*.

### Systematics

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

GIR = Geological Institute of Romania

GIA = Geological Institute of Austria (Bundesanstalt)

UBB = “Babeș Bolyai” University from Cluj Napoca

LGB = Geology Laboratory of Bucharest University

LPB = Palaeontology Lab. of Bucharest University

MPN = Museum of Natural Sciences - Piatra Neamț

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)

Suborder Phylloceratina ARKELL, 1950

Family Phylloceratidae ZITTEL, 1884

Subfamily Phylloceratinae ZITTEL, 1884

Genus *Phylloceras* SUESS, 1865

*Phylloceras isotypum* (BENECKE, 1866)

Pl. 1, Fig. 2

1866 *Ammonites isotypus*-BENECKE; p. 184; Pl. 7, Figs. 1; 2.

1871 *Phylloceras isotypum* BENECKE-NEUMAYR; p. 314; Pl. 13, Fig. 3.

1872 *Phylloceras isotypum* BENECKE-GEMMELLARO; p. 30; Pl. 1, Fig. 1.

1873 *Phylloceras isotypum* BENECKE-NEUMAYR; p. 158.

1878 *Phylloceras isotypum* BENECKE-HERBICH; p. 140; Pl. 2, Figs. 1a-b.

1896 *Phylloceras isotypum* BENECKE-CANAVARI; p.32; Pl. 4, Figs. 4a-b; 5; 6.

1973 *Phylloceras isotypum* BENECKE-PREDA; Pl. 3, Fig. 2.

1979 *Phylloceras isotypum* (BENECKE, 1866)-SAPUNOV; p. 26; Pl. 1, Figs. 2; 3a-b.

1986 *Phylloceras isotypum* (BENECKE)-SARTI; p. 484.

1993 *Phylloceras isotypum* (BENECKE, 1866)-SARTI; p. 49.

Material: LRh13G7, LRh14F7 Grigore Collection in GIR; NEUMAYR's specimens (1871): Collection of GIA; originates from grey sandy limestones – Ghilcoş outcrop (F2) and red nodular limestones – Ciofronca outcrop. Herbich's specimen: Collection of UBB originates from red nodular limestones – Ciofronca outcrop. Preda's specimen: Collection of MPN; originates from grey nodular limestones – Ghilcoş outcrop.

Table 1. Measurements of *Phylloceras isotypum* (BENECKE, 1866) specimens.  
Tabel 1. Măsurători ale exemplarelor de *Phylloceras isotypum* (BENECKE, 1866).

Specimen	Dmax	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	-	110	7	64	40	0.06	0.58	0.36	0.62
Herbich specimen	-	69	3	38	27	0.04	0.55	0.39	0.71
LRh13G7	55	55	4	35	24	0.07	0.64	0.44	0.68
LRh14F7	35	35	3	20	15	0.08	0.57	0.43	0.75

After SARTI (1986) the species includes two morphotypes: *isotypum* (BENECKE, 1866) – with subrectangular section and radial ribbing and second one - *apenninicum* CANAVARI, 1896 – with large oval section and curved ribbing.

Remarks: LRh13G7 is a phragmocone (Pl. 1, Fig. 2) and LRh14F7, a juvenile (D = 35 mm) which preserve 1/3 of the living chamber, the specific ornamentation folded and with fine ribs, more visible on lateral sides.

Occurrence: Lower Kimmeridgian in Ghilcoş (F, G profiles) and Ciofronca outcrops; Kimmeridgian in Italy, Sesquinosum /Beckeri interval in Bulgaria, former Yugoslavia.

*Phylloceras saxonicum* NEUMAYR, 1871

Pl. 1, Figs. 5, 6, 9

1871 *Phylloceras saxonicum*-NEUMAYR; p. 315; Pl. 13, Fig. 4; Pl. 14, Figs. 1a-b; 2.

1873 *Phylloceras saxonicum* NEUMAYR-NEUMAYR; p. 158.

1877 *Ammonites (Phylloceras) saxonicum* NEUMAYR-FAVRE; p. 30; Pl. 2, Fig. 8.

1878 *Phylloceras saxonicum* NEUMAYR-HERBICH; p. 140; Pl. 14, Fig. 2.

1973 *Phylloceras saxonicum* NEUMAYR-PREDA; Pl. 2, Fig. 1.

1976 *Phylloceras* cf. *saxonicum* NEUMAYR-JOLY; p. 172; Pl. 7, Fig. 3.

1979 *Phylloceras saxonicum* NEUMAYR-SAPUNOV; p. 26; Pl. 1, Fig. 6.

Material: LRh17M1, LRh18F6, LRh19W5.0, LRh40F2, LRh41J, LRh76T5.0, LRh83E1 Grigore Collection in GIR. Holotype: Collection of GIA - originates from limestone of Ghilcoş outcrop. Herbich's specimens: Collection of UBB - originates from red nodular limestones - Ghilcoş (F1) and Ciofronca outcrops. Preda's specimen: inv. 31MPN (Pl. 2, Fig. 1) in Collection of MPN - originates from reddish nodular limestones (W profile) – base of Ghilcoş outcrop.

Table 2. Measurements of *Phylloceras saxonicum* NEUMAYR, 1871 specimens.  
Tabel 2. Măsurători ale exemplarelor de *Phylloceras saxonicum* NEUMAYR, 1871.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	98	98	98	3	56	28	0.03	0.58	0.29	0.50
Herbich specimen	250	-	-	-	-	-	-	-	-	-
Preda 31MPN specimen	100	100	71	5	45	23	0.07	0.63	0.32	0.51
LRh17M1	75	75	64	6	37	19	0.09	0.58	0.30	0.51
LRh18F6	63	75	63	5	35	19	0.08	0.56	0.30	0.54
LRh19W5,0	61	61	61	5	35	17	0.08	0.57	0.28	0.49
LRh40F2	53	53	53	4	30	15	0.07	0.57	0.28	0.50
LRh41J	75	75	75	5	45	22	0.07	0.60	0.29	0.49
LRh76T5,0	44	44	40	3	25	13	0.10	0.62	0.32	0.52
LRh83E1	46	40	40	3	24	13	0.07	0.60	0.32	0.54

Remarks: only LRh83E1 preserves a part from the living chamber the other being phragmocones. All specimens are medium or small in size (Table 2) and the best preserved is LRh17M1, which preserves the specific ornamentation. The Herbich's specimen is big sized and its suture line is presented by NEUMAYR (1871; Pl. 14, Fig. 2). Preda's specimen is also big in size but in bad condition of preservation (eroded).

Occurrence: Lower Kimmeridgian in Ghilcoş (W, T, F, M profiles) and Ciofronca outcrops; Early Kimmeridgian in Bulgaria, France, Switzerland and Madagascar.

*Phylloceras consanguineum* GEMMELLARO, 1876

Pl. 1, Figs. 4; 8 (*P. leptoptychum* HERBICH) 10a-b

1876 *Phylloceras consanguineum*-GEMMELLARO; p. 7; Pl. 15, Figs. 2; 3.

1876 *Ammonites praeposterius* FONTANNES-DUMORTIER & FONTANNES; p. 30; Pl. 6, Figs. 1; 2.

\*1878 *Phylloceras leptoptychum*-HERBICH; p. 141; Pl. 1, Figs. 5a-b.

- \*1896 *Phylloceras consanguineum* GEMMELLARO-CANAVARI; p. 30; Pl. 4, Fig. 3 (Neotype).  
 1960 *Phylloceras (Phylloceras) consanguineum* GEMMELLARO-CHRIST; p. 56; Pl. 2, Fig. 1.  
 1973 *Phylloceras (Calliphylloceras) leptoptychum* HERBICH-PREDA; Pl. 2, Fig. 5; Pl. 4, Fig. 1.  
 1979 *Phylloceras consanguineum* GEMMELLARO-SAPUNOV; p. 25; Pl. 1, Fig. 1.  
 1986 *Phylloceras consanguineum* GEMMELLARO-SARTI; p. 484; Pl. 1, Figs. 3a-b.  
 1993 *Phylloceras consanguineum* GEMMELLARO-SARTI; p. 49.  
 1994 *Adabofoloceras consanguineum* (GEMMELLARO)-ZEISS & al.; p. 368; Pl. 1, Fig. 2.

Material: LRh16D3, LRh84A3, LRh85A1, LRh86K32, LRh87K32 Grigore Collection in GIR. Herbich's specimen (*Phylloceras leptoptychum*): inv. 2053 UC in Collection of UBB - originates from green sandy limestones – Ghilcoș outcrop. Preda's specimens: inv. 14aMPN, 62aMPN in Collection of MPN - both from grey nodular limestones; inv. 62bMPN originates from green sandstones – all from Ghilcoș outcrop.

Table 3. Measurements of *Phylloceras consanguineum* GEMMELLARO, 1876 specimens.  
 Tabel 3. Măsurători ale exemplarelor de *Phylloceras consanguineum* GEMMELLARO, 1876.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Neotype	91	-	91	6	53	28	0.07	0.58	0.31	0.53
Herbich 2053 UC ( <i>P.leptoptychum</i> )	52	34	52	3	30	16	0.05	0.58	0.31	0.53
Preda 14aMPN specimen	64	64	64	4	38	21	0.06	0.59	0.33	0.55
Preda 62aMPN specimen	52	-	52	4	30	18	0.08	0.58	0.35	0.60
Preda 62bMPN specimen	46	-	46	3	27	18	0.06	0.59	0.39	0.67
LRh84A3	41	40	41	3	24	13	0.07	0.58	0.32	0.54
LRh85A1	32	-	30	2.5	18	11	0.08	0.60	0.37	0.61
LRh86K32	-	-	-	-	24	13	-	-	-	0.54
LRh87K32	26	-	26	2	15.5	9	0.08	0.60	0.35	0.58

Discussion: this species has raised concerns due to its morphology, however, most authors have finally put equal sign between taxa *Phylloceras consanguineum*, *P. praeposterius*, and *P. leptoptychum* presenting features and ornamental shells with identical morphometric features; i.e. *Phylloceras leptoptychum* HERBICH species become *nome nudum*.

Remarks: LRh16D3 and LRh86K32 are two fragments of big specimens, which preserve very well the specific ornamentation; the other are phragmocones, small in size of which LRh84A3 are the best preserved (not deformed). Preda's 14aMPN specimen is a large phragmocone very well preserved (Pl. 1, Fig. 4).

Occurrence: Kimmeridgian/Lower Tithonian - Divisum/Hybonotum interval (?) in Ghilcoș (K, D, A profiles) outcrop; Kimmeridgian/Lower Tithonian - Divisum/Verruciferum interval in Italy and Early Kimmeridgian in Bulgaria.

#### Subfamily Calliphylloceratinae SPATH, 1927

##### Genus *Calliphylloceras* SPATH, 1927

##### *Calliphylloceras manfredi* (OPPEL, 1865)

Pl. 1, Figs. 7, 12

1865 *Ammonites Manfredi*-OPPEL; p. 215; Pl. 57, Figs. 2a-c.

1871 *Phylloceras Manfredi* OPPEL-NEUMAYR; p. 333; Pl. 14, Fig. 8.

1973 *Phylloceras (Calliphylloceras) manfredi* OPPEL-PREDA; Pl. 5, Fig. 3; Pl. 18, Fig. 7.

Material: LRh23F6, LRh24F5 LRh25F4, LRh26W, LRh27W5.0, LRh28F5, LRh37A9, LRh38R1, LRh39F3 Grigore Collection in GIR. Preda's specimens: three in Collection of MPN - inv. 24aMPN (Pl. 18, Fig. 7) - originates from grey-greenish sandstones; 24bMPN (Pl. 5, Fig. 3) - originates from grey limestones; 24cMPN - originates from green nodular limestones; all from Ghilcoș outcrop (F2).

Table 4. Measurements of *Calliphylloceras manfredi* (OPPEL, 1865) specimens.  
 Tabel 4. Măsurători ale exemplarelor de *Calliphylloceras manfredi* (OPPEL, 1865).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D
Holotype	68	68	6	36	26	0.09	0.53	0.38	0.72
Preda 24aMPN specimen	59	59	5.5	24	8	0.09	0.41	0.14	0.33
Preda 24bMPN specimen	56	53	5	30	17	0.09	0.57	0.32	0.57
Preda 24cMPN specimen	28	26	4	13	10	0.15	0.50	0.38	0.77
LRh23F6	39	39	5	21	14	0.13	0.54	0.36	0.67
LRh24F5	34	34	4	18	11.5	0.12	0.53	0.34	0.64
LRh25F4	46	46	5	24	17	0.11	0.52	0.37	0.71
LRh26W	32	32	3.5	19	12	0.11	0.59	0.37	0.63
LRh27W5.0	25	25	3.5	14	11	0.14	0.56	0.44	0.78
LRh28F5	20.5	20.5	2.5	12	8.5	0.12	0.58	0.41	0.71
LRh37A9	35	35	4	19	13	0.11	0.54	0.37	0.68
LRh38R1	28	28	4	16	9.5	0.14	0.57	0.34	0.59
LRh39F3	41	34	4	19	15	0.12	0.56	0.44	0.79

Remarks: they are small to medium sized phragmocones with close parameters to the holotype. Two of Preda's specimens are large sized and preserve a small part of the living chamber (Table 4).

Occurrence: Lower Kimmeridgian in Ghilcoş (E, F, A, W, R profiles) outcrops; Oxfordian (to Lower Kimmeridgian?) in Switzerland and Austria.

*Calliphyloceras benacense* (CATULLO, 1847) in NEUMAYR, 1871  
Pl. 1, Figs. 1, 3; ("*P. bekasense*" HERBICH) Pl. 2, Figs. 12 a, b

1847 *Ammonites benacensis*—CATULLO; p. 9; Pl. 13, Figs. 1a-b.

\*1871 *Phylloceras benacense* CATULLO—NEUMAYR; p. 336; Pl. 15, Figs. 3a-c.

1873 *Phylloceras benacense* CATULLO—NEUMAYR; p. 159.

1877 *Phylloceras benacense* CATULLO—GEMMELLARO; p. 180; Pl. 15, Fig. 1; Pl. 17, Fig. 1.

1878 *Phylloceras benacense* CATULLO—HERBICH; p. 142.

?1878 *Phylloceras Bekasense*—HERBICH; p. 143; Pl. 3, Figs. 1a-b.

1976 *Calliphyloceras benacense* (CATULLO)—JOLY; p. 192; Pl. 10, Fig. 1.

1986 *Calliphyloceras benacense* (CATULLO)—SARTI; p. 485; Pl. 1, Fig. 1.

1993 *Calliphyloceras benacense* (CATULLO)—SARTI; p. 51.

Material: LRh20D3, LRh21D10, LRh22G1, LRh75A, LRh74B15, LRh78K23, LRh82A1 Grigore Collection in GIR. Herlich's specimen in the Collection of UBB - was found by HERBICH (1878, p. 142) and analysed by NEUMAYR (1873, p. 159); it is in bad condition of preservation.

Table 5. Measurements of *Calliphyloceras benacense* (CATULLO, 1847) specimens.  
Tabel 5. Măsurători ale exemplarelor de *Calliphyloceras benacense* (CATULLO, 1847).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	72	-	72	-	43	25	-	0.62	0.35	0.58
Herlich specimen	152	152	152	15	88	50	0.10	0.58	0.33	0.57
LRh22G1	46	-	36	4	19	>12	0.11	0.53	0.33	0.63
LRh74B15	77	-	~77	~5	~48	>8	0.06	0.62	>0.10	>0.17
LRh75A3	76	75	65	4	39	20	0.06	0.60	0.31	0.51
LRh78K23	33	-	33	3	19	13	0.09	0.57	0.39	0.68
LRh82A1	52	49	48	5	28	17	0.10	0.58	0.35	0.61

Remarks: deformed (flattened) specimens from marly and silty deposits; all present the features of the Neumayr (1871) described specimen. LRh75A3 is the best preserved, with a long part of the living chamber deformed; LRh74B15 preserves also partially the fine ribbed wall of the conch (Pl. 1, Fig. 1).

Occurrence: Kimmeridgian – Divisum /Beckeri interval in Ghilcoş (K, G, A, D, B profiles) outcrops; Kimmeridgian - Italy (Northern and Sicily), Switzerland, Austria, India and Madagascar.

*Calliphyloceras kochi* (OPPEL, 1865) in ZITTEL, 1868  
Pl. 1, Fig. 11

1865 *Ammonites Kochi*—OPPEL; p. 550

\*1868 *Phylloceras Kochi* OPPEL—ZITTEL; p. 65; Pl. 6, Fig. 1; Pl. 7, Figs. 1; 2

1871 *Phylloceras Kochi* OPPEL—NEUMAYR; p. 337; Pl. 15, Figs. 4a-b

1876 *Ammonites gorgoneus* FONTANNES—FONTANNES & DUMORTIER; p. 36; Pl. 5, Fig. 1

1879 *Ammonites (Phylloceras) kochi* OPPEL—FAVRE; p. 24; Pl. 2, Figs. 8a-b

1879 *Phylloceras gorgoneum* FONTANNES—FONTANNES; p.4; Pl. 1, Fig. 4

1976 *Calliphyloceras kochi* (OPPEL)—JOLY; p. 224; Pl. 10, Fig. 4

1976 *Calliphyloceras kochi* (OPPEL)—AVRAM; p. 19; Pl.7, Figs.1a-b

1984 *Calliphyloceras kochi* (OPPEL)—SARTI; p. 485; Pl. 1, Figs. 2a-b

1994 *Calliphyloceras kochi* (OPPEL)—ZEISS; p. 370; Pl. 1, Fig. 5

Material: LRh1K38 Grigore Collection in GIR.

Table 6. Measurements of *Calliphyloceras kochi* (OPPEL, 1865) specimens.  
Tabel 6. Măsurători ale exemplarelor de *Calliphyloceras kochi* (OPPEL, 1865).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	190	-	190	6	113	57	0.03	0.59	0.30	0.50
LRh1K38	56	35	~56	3.5	29	>14	0.08	0.52	>0.25	>0.48

Remarks: my specimen (Pl. 1, Fig. 11) is slightly deformed (provided by marls) and preserves ½ from the living chamber; also, it preserves partially the conch wall ornated with thin ribs, on the external side. By its features is more close to the Zittel specimen (in Zittel; Pl. 7, Fig. 1a-b).

Occurrence: Lower Tithonian (Semiforme Zone) in Ghilcoş (K profile) outcrop; Lower Tithonian in France; Tithonian in Switzerland, Czech Republic, Morocco and, Madagascar.

Genus *Holcophylloceras* SPATH, 1927  
*Holcophylloceras polyolcum* (BENECKE, 1866) in NEUMAYR, 1871  
 Pl. 2, Fig. 4

- 1866 *Ammonites polyolcus*–BENECKE; p. 182; Pl. 8, Figs. 1a-b; 2.  
 \*1871 *Phylloceras polyolcum* BENECKE–NEUMAYR; p.341; Pl. 17, Figs. 6; 7.  
 1873 *Phylloceras polyolcum* BENECKE–NEUMAYR; p. 159.  
 1878 *Phylloceras polyolcum* BENECKE–HERBICH; p. 144; Pl. 2, Figs. 2a-b.  
 1973 *Phylloceras (Holcophylloceras) polyolcum* BENECKE–PREDA; Pl. 2, Fig. 4; Pl. 9, Fig. 3.  
 1976 *Holcophylloceras polyolcum* (BENECKE)–JOLY; p. 255; Pl. 24, Fig. 1; Pl. 25, Fig. 1; Pl. 26, Fig. 1.  
 1979 *Holcophylloceras polyolcum* (BENECKE)–SAPUNOV; p. 30; Pl. 2, Figs. 3; 4; 5.  
 1993 *Holcophylloceras polyolcum* (BENECKE)–SARTI; p. 50.

Material: LRh7F7, LRh8E1, LRh9F3, LRh10F4 Grigore Collection in GIR. Herbich's specimens: Collection of UBB; figured specimen originates from greenish sandy limestones – Ghilcoș outcrop (F2); other specimens originate from red nodular limestones – Ghilcoș (F1) and Ciofronca outcrops. Preda's specimens: three in Collection of MPN: inv. 20aMPN (Pl. 2, Fig. 4) – originate from bluish nodular limestones (Platynota /Hypselocyclum interval); inv. 20bMPN (Pl. 9, Fig. 3) – originates from red nodular limestones; inv. 65MPN – originates from green sandy limestones; all the specimens are from Ghilcoș outcrop.

Table 7. Measurements of *Holcophylloceras polyolcum* (BENECKE, 1866) specimens.  
 Tabel 7. Măsurători ale exemplarelor de *Holcophylloceras polyolcum* (BENECKE, 1866).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	129	-	129	14	68	42.5	0.11	0.53	0.33	0.62
Herbich specimen	93	-	93	10	50	32	0.11	0.54	0.34	0.64
Preda 20aMPN specimen	69	64	57	8	31	~12	0.14	0.54	0.21	~0.39
Preda 20bMPN specimen	~59	-	55	9.5	28	~6	0.17	0.51	0.11	~0.21
Preda 65MPN specimen	93	-	81	11	51	~24	0.13	0.63	0.30	~0.47
LRh7F7	122	102	102	13	56	36	0.13	0.55	0.35	0.64
LRh8E1	107	106	107	12	59	35	0.11	0.55	0.33	0.59

Remarks: all the specimens are phragmocones, only LRh7F7 and LRh8E1 are the best preserved (Pl. 2, Fig. 4); from Table 7 we can see the variability of some parameter as the width in the juvenile stage.

Occurrence: Lower Kimmeridgian in Ghilcoș (E, F, W, K profiles) and Ciofronca outcrops; Kimmeridgian in Italy, Switzerland, India, and Madagascar.

*Holcophylloceras mediterraneum* (NEUMAYR, 1871) emended JOLY, 1976  
 Pl. 2, Figs. 6; 11

- \*1847 *Ammonites zignodianum*–D'ORBIGNY; p. 182  
 1871 *Phylloceras mediterraneum*–NEUMAYR; p. 340; Pl. 17, Figs. 2; 3; 4; 5  
 1877 *Phylloceras mediterraneum* NEUMAYR–GEMMELLARO; p. 182; Pl. 17, Fig. 2  
 1896 *Phylloceras mediterraneum* NEUMAYR–CANAVARI; p. 38; Pl. 5, Fig. 2  
 1973 *Phylloceras (Calliphylloceras) zignodianum* D'ORBIGNY–PREDA; Pl. 4, Fig. 2; Pl. 5, Fig. 4; non Pl. 2, Fig. 3 (= *Sowerbyceras loryi loryi*)  
 1976 *Holcophylloceras mediterraneum* (NEUMAYR)–JOLY; p. 249; Pl. 23, Fig. 5; Pl. 26, Fig. 4  
 1979 *Holcophylloceras mediterraneum* (NEUMAYR)–SAPUNOV; p. 29; Pl. 2, Fig. 2  
 1986 *Holcophylloceras mediterraneum* (NEUMAYR)–SARTI; p. 486  
 1993 *Holcophylloceras mediterraneum* (NEUMAYR)–SARTI; p. 50

Material: LRh2F6, LRh6F1, LRh31F1 and morphotype *zignodianum* (D'ORBIGNY): LRh3F5, LRh4F8, LRh5F3, LRh15F3 Grigore Collection in GIR. Preda's specimen (inv. 16aMPN) in Collection of MPN - originates from red nodular limestones – Ghilcoș outcrop.

Table 8. Measurements of *Holcophylloceras mediterraneum* (NEUMAYR, 1871) specimens.  
 Tabel 8. Măsurători ale exemplarelor de *Holcophylloceras mediterraneum* (NEUMAYR, 1871).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype (morphotype <i>mediterraneum</i> )	107	-	107	14	56	32	0.13	0.52	0.30	0.57
LRh2F6	50	50	43	6	22	~12	0.14	0.51	0.28	0.54
LRh31F1	75	62	75	9	39	~19	0.12	0.52	0.25	0.49
Morphotype <i>zignodianum</i>	95	-	95	9.5	48	32	0.10	0.51	0.34	0.67
Preda 16aMPN specimen	34	27	34	7	17	9	0.20	0.50	0.26	0.53
LRh3F5	39	23	34	5	18	10	0.15	0.53	0.29	0.55
LRh4F8	35	35	35	4.5	18	~11	0.13	0.51	0.31	0.61
LRh5F3	39	39	34	4.5	18	>11	0.13	0.53	0.32	0.61
LRh15F3	32	32	29	5	14.5	8.5	0.17	0.50	0.29	0.59

I take in consideration Joly's (1976, p. 243-249) observations, which put the *H. zignodianum* (D'ORBIGNY, 1847) in the *H. mediterraneum* species, as its microconch.

Remarks: only LRh31F1, LRh3F5 and 16aMPN preserve partially the living chamber, while the others are phragmocons small in size except the first. Most of them present 5 to 6 constrictions/whorl, with *H. zignodianum* particularities in shape and only LRh31F1 and LRh2F6 (Pl. 2, Fig. 6) respect Neumayr's features.

Occurrence: Lower Kimmeridgian – Platynota/Strombecki interval in Ghilcoş (E, F and probably W profiles) outcrops; Oxfordian /Lower Kimmeridgian in Italy, France, Germany, Austria, Hungary, Poland, Russia and Egypt.

Subfamily Ptychophylloceratinae COLLIGNON, 1955

Genus *Sowerbyceras* PARONA & BONARELLI, 1895

*Sowerbyceras tortisulcatum* (D'ORBIGNY, 1840)

Pl. 2, Figs. 1; 3

1840 *Ammonites tortisulcatus*-D'ORBIGNY; p. 161

1849 *Ammonites tortisulcatus* D'ORBIGNY-D'ORBIGNY; p. 506; Pl. 189

1871 *Phylloceras tortisulcatus* D'ORBIGNY-NEUMAYR; p. 344; Pl. 17, Fig. 10

1878 *Phylloceras tortisulcatus* D'ORBIGNY-HERBICH; p. 145; Pl. 3, Figs. 3a-b

1974 *Sowerbyceras tortisulcatum* (D'ORBIGNY)-BARBULESCU; p. 127; Pl. 6, Figs. 22; 23

non 1973 *Sowerbyceras tortisulcatum* (D'ORBIGNY)-PREDA; Pl. 4, Figs. 6; 7 (= *Sowerbyceras silenium*)

1979 *Sowerbyceras tortisulcatum* (D'ORBIGNY)-SAPUNOV; p. 35; Pl. 4, Figs. 2a-b

Material: LRh42A10, LRh43E1, LRh44B5, LRh45F, LRh46F7, LRh47A10, LRh48A, LRh49F7 Grigore Collection in GIR. Herbich's specimens: Collection of UBB - the figured ones originate from nodular limestones of Ghilcoş outcrop; about the others we haven't details.

Table 9. Measurements of *Sowerbyceras tortisulcatum* (D'ORBIGNY, 1840) specimens.  
Tabel 9. Măsurători ale exemplarelor de *Sowerbyceras tortisulcatum* (D'ORBIGNY, 1840).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	88	-	88	23	38	28	0.26	0.43	0.32	0.74
Herbich specimen	75	-	75	14	35	38	0.19	0.47	0.51	1.08
LRh42A10	64	42	60	11	30	26	0.18	0.50	0.43	0.87
LRh43E1	64	40	61	11	29	27	0.18	0.48	0.44	0.93
LRh44B5	~55	-	~55	12	~27	25	0.22	0.49	0.45	0.92
LRh45F	56	-	56	10.5	26	29	0.19	0.46	0.52	1.11
LRh46F7	~54	-	~54	~9.5	~26	25	0.18	0.48	0.46	0.96
LRh47A10	70	-	70	13	34	29	0.19	0.41	0.41	0.85
LRh48A10	56	-	56	8	28	24	0.24	0.50	0.43	0.86
LRh49F7	>73	54	64	13	30	>24	0.20	0.47	0.37	0.80

Remarks: only three specimens preserve a small part from the living chamber, while the others are phragmocones. Some of them have a narrow umbilicus and larger section than the holotype because they are deformed.

Occurrence: Kimmeridgian - Platynota/Acanthicum interval in Ghilcoş (A, F, B profiles) and Ciofronca outcrops; Oxfordian /Lower Kimmeridgian in France, Switzerland, Italy and Bulgaria.

*Sowerbyceras silenium* (FONTANNES, 1876)

Pl. 2, Figs. 5, 8, 10

1876 *Phylloceras tortisulcatus* D'ORBIGNY-GEMMELLARO; p. 49; Pl. 10, Figs. 1a-b

\*1876 *Ammonites (Phylloceras) silenium*-FONTANNES; p. 33; Pl. 5, Fig. 2

1973 *Phylloceras tortisulcatus* D'ORBIGNY-PREDA; Pl. 4, Figs. 6; 7

1986 *Sowerbyceras silenium* (FONTANNES)-SARTI; p. 485

1993 *Sowerbyceras silenium* (FONTANNES)-SARTI; p. 52; Pl. 1, Figs. 1a-b

Material: LRh23F1, LRh51F3, LRh52F5, LRh53E3, LRh54F4, LRh55F7, LRh56F1, LRh57F5, LRh58F1, LRh59F4, LRh60E1, LRh61F6, LRh62E1, LRh63F1, LRh64F6, LRh65E1, LRh66F1, LRh67G1, LRh68G1, LRh69T1.0, LRh80W1, LRh82W1 Grigore Collection in GIR. Preda's specimens: Collection of MPN (inv. 16bMPN / Fig. 7) originates from red nodular limestones; other from grey nodular limestones – both from Ghilcoş outcrops.

Remarks: my specimens are of different dimensions but not exceeding 65 mm (Table 10); only few of them partially preserve the living chamber. In this population it is observed a decrease with the size of constrictions number, which is in juvenile stage. Preda's specimen (Pl. 2, Fig. 8) presented as *P. tortisulcatum* presents the features of this species, with more oval section and narrow umbilicus.

Table 10. Measurements of *Sowerbyceras silenium* (FONTANNES, 1876) specimens.  
 Tabel 10. Măsurători ale exemplarelor de *Sowerbyceras silenium* (FONTANNES, 1876).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	63	-	63	14	31	26	0.23	0.49	0.41	0.84
Preda 16bMPN specimen	36	-	36	9	17	15	0.25	0.47	0.42	0.88
LRh51F3	63	-	63	14.5	29	>25	0.22	0.46	0.40	0.86
LRh52F5	49	-	41	9	21	19	0.22	0.51	0.46	0.90
LRh53E3	61	-	61	13	29	>28	0.21	0.47	0.47	0.96
LRh54F4	57	42	57	8	31	27	0.14	0.54	0.47	0.87
LRh55F7	49	46	46	9	25	23	0.20	0.54	0.50	0.92
LRh56F1	42	-	42	9	21	17	0.21	0.50	0.40	0.81
LRh57F5	37	-	37	7	19	17	0.19	0.51	0.46	0.89
LRh58F1	38	-	38	7	20	17	0.18	0.53	0.45	0.85
LRh59F4	43	35	35	8	17	17	0.23	0.49	0.48	1
LRh60E1	36	-	36	6	19	18	0.17	0.53	0.50	0.95
LRh61F6	34	28	34	7	17	13	0.21	0.50	0.38	0.76
LRh62E1	22	-	22	4.5	11	10	0.20	0.50	0.45	0.91
LRh63F1	41	-	41	13	17	16	0.32	0.41	0.39	0.94
LRh64F6	29	-	29	6	14	14	0.21	0.48	0.48	1
LRh65E1	26	-	26	4.5	14	11	0.17	0.54	0.42	0.78
LRh66F1	24	-	20	4.5	11	10	0.22	0.55	0.50	0.91
LRh67G1	33	-	33	6	17	14	0.18	0.51	0.42	0.82
LRh68G1	31	-	29	6	14	13	0.21	0.48	0.45	0.93
LRh69T1,0	32	-	30	5.5	16	13	0.18	0.53	0.43	0.81
LRh80W1	41	-	41	9	18	16	0.22	0.44	0.39	0.89
LRh82W1	28	-	28	6	13	11	0.21	0.72	0.39	0.85

Occurrence: Lower Kimmeridgian – Platynota/Divisum interval in Ghilcoș outcrops (W, T, G, F, E profiles); Lower Kimmeridgian in Italy, France, Switzerland, Bulgaria.

*Sowerbyceras loryi loryi* (MUNIER CHALMAS, 1875) emended SARTI, 1993  
 Pl. 2, Figs. 7; 9

1875 *Sowerbyceras Loryi*-MUNIER-CHALMAS în HEBERT; p. 388

1877 *Ammonites (Phylloceras) Loryi* MUNIER-CHALMAS-FAVRE; p. 19; Pl. 1, Fig. 14

1973 *Phylloceras (Calliphylloceras) zignodianum* D'ORBIGNY-PREDA; Pl. 2, Fig. 3

1993 *Sowerbyceras loryi* morfa *loryi* (MUNIER CHALMAS)-SARTI; p. 54; Pl. 1, Figs. 3; 4

Material: LRh29K6, LRh30K7, LRh50J, LRh70T6.0, LRh71D3, LRh72T1.0, LRh73T1.0 Grigore Collection in GIR. Preda's specimen: inv. 25MPN in Collection of MPN; originates from red nodular limestones of Ghilcoș (F1).

Table 11. Measurements of *Sowerbyceras loryi loryi* (MUNIER CHALMAS, 1875) specimens.  
 Tabel 11. Măsurători ale exemplarelor de *Sowerbyceras loryi loryi* (MUNIER CHALMAS, 1875).

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Sarti specimen (Fig.4)	64	41	64	11	32	29	0.17	0.50	0.45	0.85
Preda 25MPN specimen	54	-	54	9	25	22	0.17	0.46	0.41	0.88
LRh29K6	53	-	53	11	26	21	0.21	0.49	0.40	0.81
LRh30K7	41	-	33	6.5	18	15	0.20	0.56	0.45	0.83
LRh50J	55	32	49	10	23	>18	0.20	0.47	>0.37	>0.78
LRh70T6.0	35	-	28	5	15	13	0.18	0.54	0.46	0.87
LRh71D3	31	-	31	6	16	>10	0.19	0.52	>0.32	>0.62
LRh72T1,0	32	-	30	5	15	13	0.17	0.50	0.43	0.87
LRh73T1,0	24	-	22	4	11	9.5	0.18	0.50	0.43	0.86

Remarks: all the specimens are of a small or medium size and only LRh50J preserves partially the living chamber. Preda's specimen is better preserved (Pl. 2, Fig. 9) but presents a more narrow section than Sarti's one<sup>2</sup>.

Occurrence: Upper Kimmeridgian in Ghilcoș outcrops (K, T, D, J profiles); Kimmeridgian (Divisum/Beckeri interval) in Bulgaria, Italy, Switzerland, France.

*Sowerbyceras loryi pseudosilenium* SARTI, 1993  
 Pl. 2, Fig. 2

1993 *Sowerbyceras loryi* morphotyp *pseudosilenium*-SARTI; p. 55; Pl. 1, Fig. 2.

Material: LRh32B15, LRh33B13, LRh34K32, LRh35B13, LRh36D23, LRh77D29, LRh79K23, LRh81K27 Grigore Collection in GIR.

Table 12. Measurements of *Sowerbyceras loryi pseudosilenum* SARTI, 1993 specimens.  
Tabel 12. Măsurători ale exemplarelor de *Sowerbyceras loryi pseudosilenum* SARTI, 1993.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Holotype	58	-	58	13	27	-	0.22	0.46	-	-
Paratype	48	-	48	10	22.5	18.5	0.21	0.47	0.39	0.82
LRh32B15	54	-	54	8	30	>12	0.15	0.56	>0.22	>0.40
LRh33B13	32	-	32	4	19	>7	0.13	0.59	>0.22	>0.37
LRh34K32	57	-	57	7	34	>11	0.12	0.60	>0.19	>0.32
LRh35B13	75	-	75	14	37	>11	0.19	0.49	>0.15	>0.30
LRh36D23	46	-	44	6	25	>10	0.14	0.57	>0.23	>0.40
LRh77D29	58	-	58	9	41	>13	0.15	0.71	>0.22	>0.32
LRh79K23	33	27	33	6	16	15	0.18	0.48	0.45	0.94
LRh81K27	42	-	42	9	20	>4	0.21	0.48	>0.09	>0.20

Remarks: LRh79K23 specimen is the only well preserved one; the others are deformed (flattened) providing from marls. All present the features of this species, with a projected ventral groove and bourrelet.

Occurrence: Upper Kimmeridgian - Eudoxus/Beckeri in Ghilcoş outcrops (K, B, D profiles); Beckeri Zone in Italy.

Genus *Ptychophylloceras* SPATH, 1927

*Ptychophylloceras ptychoicum* (QUENSTEDT, 1845)

1845 *Ammonites ptychoicum*-QUENSTEDT; p. 219; Pl. 17, Figs. 12a-c

1871 *Phylloceras ptychoicum* (QUENSTEDT)-NEUMAYR; p. 326; Pl. 16, Fig. 10

1973 *Phylloceras (Ptychophylloceras) ptychoicum* (QUENSTEDT)-PREDA; Pl. 3, Fig. 3

1976 *Ptychophylloceras ptychoicum* (QUENSTEDT)-JOLY; p. 287; Pl. 34, Fig. 4

1979 *Ptychophylloceras ptychoicum* (QUENSTEDT)-SAPUNOV; p. 33; Pl. 3, Figs. 6a-b; Pl. 4, Fig. 3

1986 *Ptychophylloceras ptychoicum* (QUENSTEDT)-SARTI; p. 486

Material: LRh11K36, LRh12K32 Grigore Collection in GIR. Preda's specimen: Collection of PLB; it originates from yellow sandstones – upper layers (= maybe levels through K30 – K40) – Ghilcoş outcrop (F1).

Remarks: Preda's specimen represents only a fragment from a whorl in a silty sample, which preserves some of the specific ornamental bourrelets. LRh11K36 specimen is almost similar, with more prominent bourrelets; LRh12K32 is a juvenile with three thin and flexuous constrictions and bourrelets on the ventral side.

Occurrence: Lower Tithonian – Hybonotum Zone in Ghilcoş outcrop (K profile); Tithonian from Europe (Italy, France, Switzerland, Germany, Poland, Bulgaria, Czech Republic), India, Crimea, Algeria, Madagascar.

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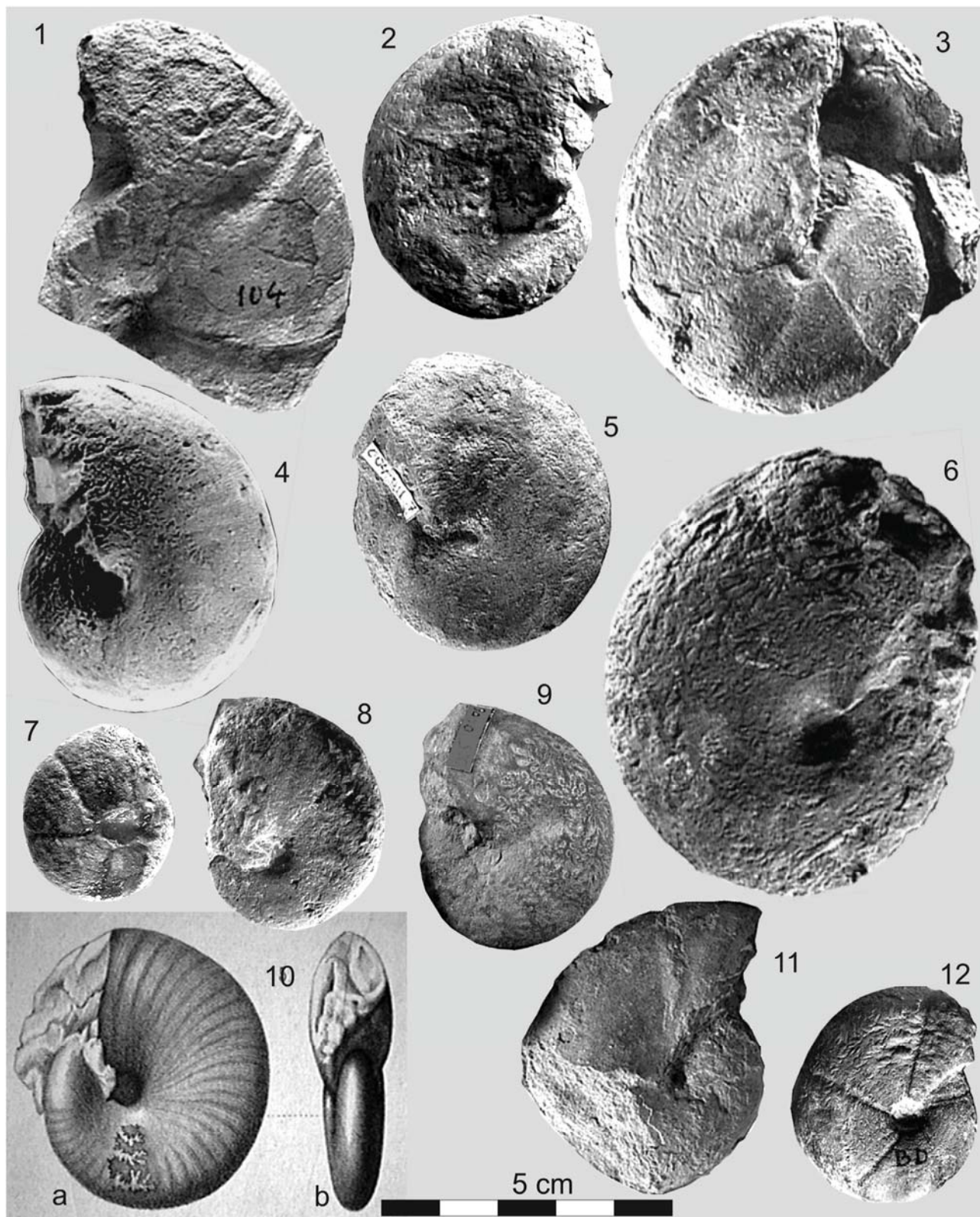
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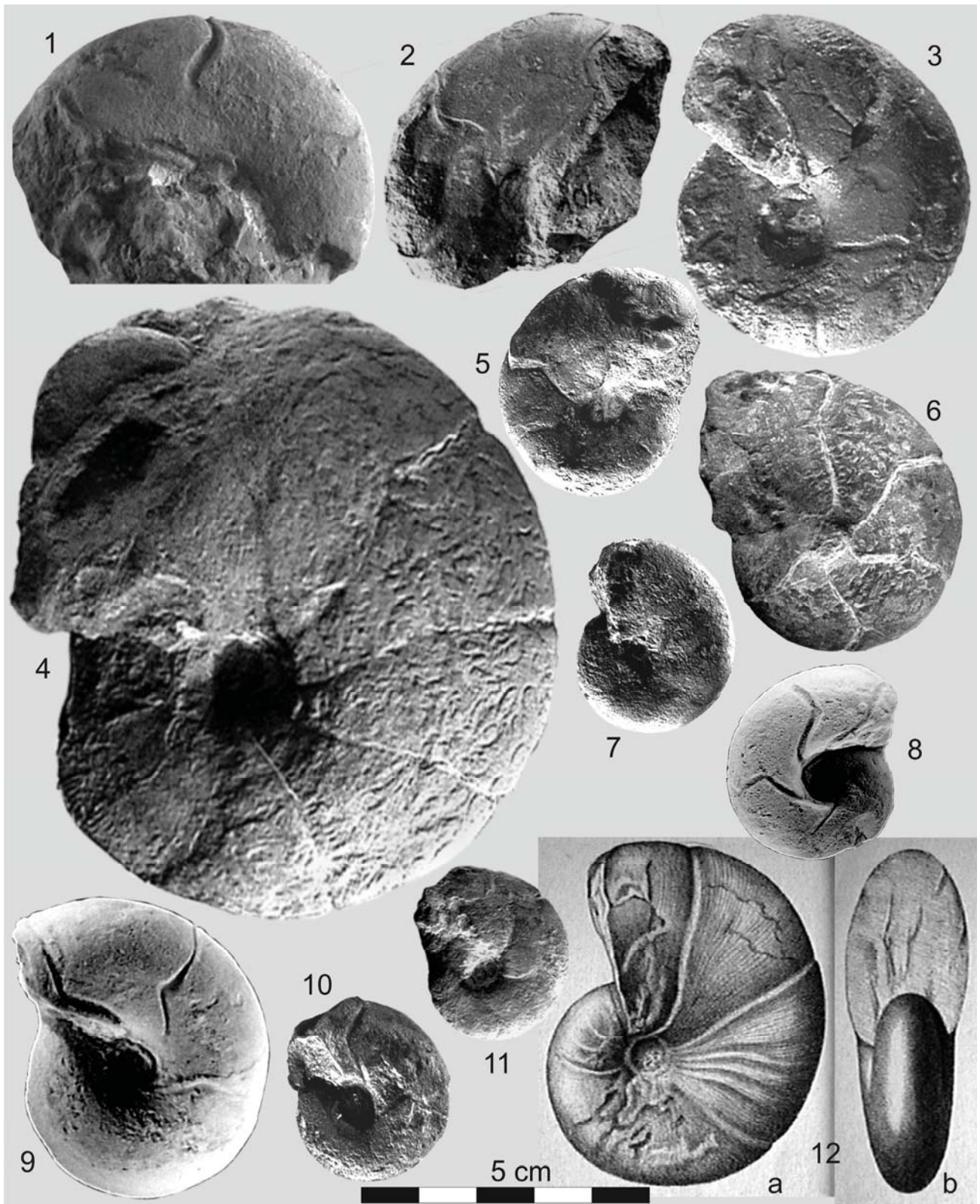
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PLATE 1 / PLANȘA 1



**PLATE 2 / PLANȘA 2**



## PLATE 1 / PLANȘA 1

- Figure 1. *Calliphylloceras benacense* (CATULLO) (LRh74B15); grey sandstones, Late Kimmeridgian-Beckeri Zone. / Figura 1. *Calliphylloceras benacense* (CATULLO) (LRh74B15); gresii cenușii, Kimm. sup.-Zona Beckeri.
- Figure 2. *Phylloceras isotypum* BENECKE (LRh13G7); reddish nodular, Early Kimmeridgian. / Figura 2. *Phylloceras isotypum* BENECKE (LRh13G7); nodular vișiniu, Kimm. inf.
- Figure 3. *Calliphylloceras benacense* (CATULLO) (LRh75A3); green nodular, Early Kimmeridgian-Divisum Zone. / Figura 3. *Calliphylloceras benacense* (CATULLO) (LRh75A3); nodular verzui, Kimm. inf.-Zona Divisum.
- Figure 4. *Phylloceras consanguineum* GEMMELLARO (Preda 14a MPN); grey limestone, Late Kimmeridgian. / Figura 4. *Phylloceras consanguineum* GEMMELLARO (Preda 14a MPN); calcare cenușii, Kimm. sup.
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