

**GLOCHICERAS HYATT (OPPELIDAE, AMMONOIDEA)
FROM THE UPPER JURASSIC DEPOSITS OF THE HĂGHIMAȘ MTS.
(THE EASTERN CARPATHIANS – ROMANIA)**

GRIGORE Dan

Abstract. Species of the ammonite genus *Glochiceras* from the Kimmeridgian-Tithonian deposits of Ghilcoș (Hăghimaș Mts, Romania) are described and figured. In addition to specimens from the author's collection, previously reported occurrences of this genus from the same area described by NEUMAYR (1873), HERBICH (1878) and PREDA (1973) are discussed. Five species of the genus *Glochiceras* are reported from the Hăghimaș Mts for the first time: *Glochiceras (Glochiceras) lens*, *G. (Lingulaticeras) modestum*, *G. (L.) semicostatum*, *G. (L.) lingulatum* and *G. (L.) procurvum*. Special attention is paid to insufficiently known species *G. jugens*, *G. balanense* and *G. tenuifalcatum* described by NEUMAYR (1873).

Keywords: *Glochiceras*, Opepliidae, paleontology, Hăghimaș, Carpathians, Romania.

Rezumat. *Glochiceras* Hyatt (Opepliidae, Ammonoidea) din depozitele Jurasicului superior din Munții Hăghimaș (Carpații Orientali – România). Sunt descrise speciile genului *Glochiceras* din depozitele Kimmeridgian-Tithoniene din Ghilcoș (Munții Hăghimaș, România). Pe lângă exemplarele din colecția autorului sunt discutate și ocurențele anterioare ale acestui gen din aceeași regiune, descrise de NEUMAYR (1873), HERBICH (1878) și PREDA (1973). Cinci specii ale genului *Glochiceras* sunt raportate din Munții Hăghimaș pentru prima dată: *Glochiceras (Glochiceras) lens*, *G. (Lingulaticeras) modestum*, *G. (L.) semicostatum*, *G. (L.) lingulatum* and *G. (L.) procurvum*. O atenție specială s-a acordat speciilor insuficient cunoscute *G. jugens*, *G. balanense* and *G. tenuifalcatum*, descrise de NEUMAYR (1873).

Cuvinte cheie: *Glochiceras*, Opepliidae, paleontologie, Hăghimaș, Carpați, România.

INTRODUCTION

The described ammonite fauna comes from the “Acanthicum Beds” of the Lacu Roșu area (Ghilcoș/Uciगाșu and Ciofronca), Hăghimaș Massif - Eastern Carpathians (Fig. 1). The litho- and bio- stratigraphy of this Upper Jurassic deposits has been previously described in detail (GRIGORE, 2002, 2011; GRIGORE et al., 2009).

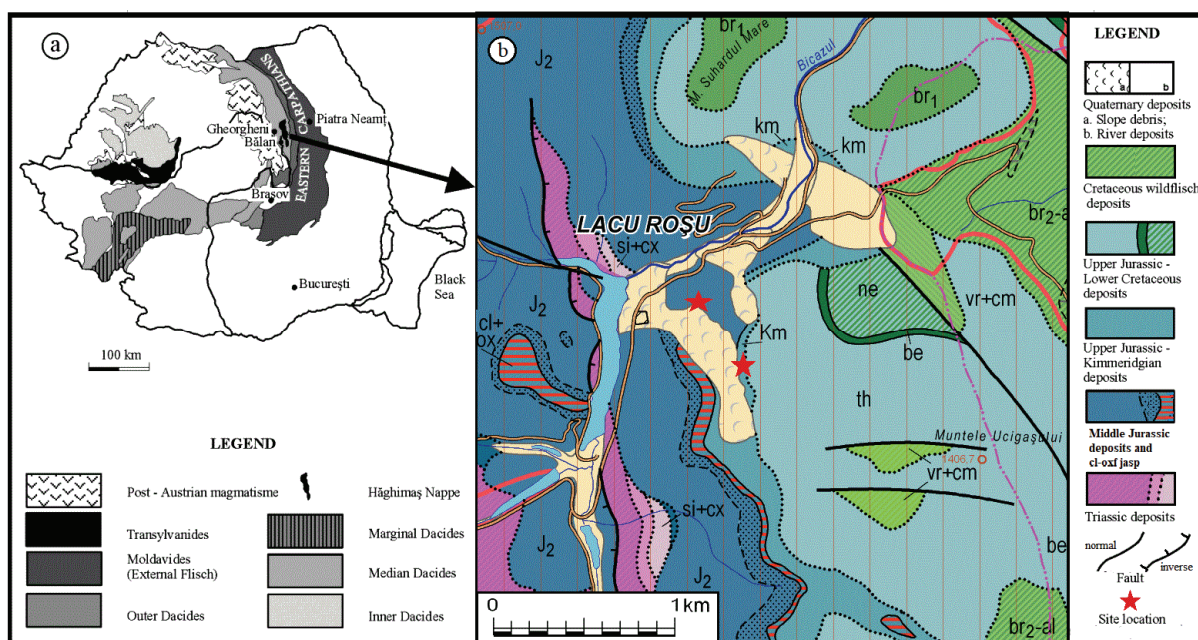


Figure 1. Localization of sites: a) in Romania - geotectonic sketch (after SÂNDULESCU, 1984); b) on the geological map scale 1: 50,000 (after SÂNDULESCU et al., 1975, revised GHEUCA & GRIGORE, 2010).

The species described here belong to the Genus *Glochiceras* Hyatt (Family Opepliidae Douvillé). The Opepliidae Family is well represented in the region in terms of number of species and specimens, occurring throughout the Kimmeridgian - Lower Tithonian. Species belonging to Taramelliceratinae are most diverse and abundant, while Glochiceratinae are relatively uncommon and characterized by lower diversity.

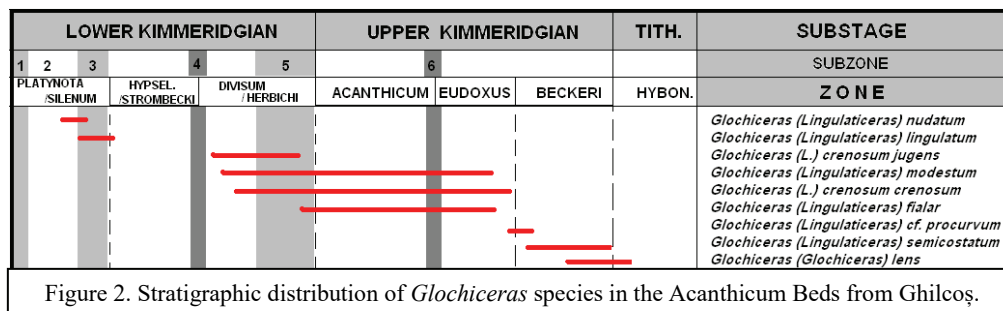


Figure 2. Stratigraphic distribution of *Glochiceras* species in the Acanthicum Beds from Ghilcoş.

The relative diversity of *Glochiceras* presented in Figure 2 shows an “acme interval” of this group, within the Divisum-Acanthicum zones. It should be noted that *Glochiceras* s.l. are considered as microconchiate counterparts of Taramelliceratinae, and sometimes supposed micro- and macroconchs are described under the same species name (see for example BAUDOIN & al. (2011)). In our opinion, more detailed observations focused on the study of parallel micro- and macroconchiate morphospecies of the two presumed dimorphic groups (*Taramelliceras* and *Glochiceras* s.l.) is necessary. For the moment, we can say that the number of species of *Glochiceras* is twice less compared to that of Taramelliceratinae in the studied succession. In the Mediterranean paleo-bio province, Glochiceratinae are relatively uncommon and represented by a small amount of species. For that reason and some biological considerations, we prefer to use the old classification. And professor Wierzbowski (2010) consider this generic review is premature, in some cases.

MATERIAL AND METHOD

The analysed specimens belong to the author’s collection, stored in the National Geological Museum (MNG – of GIR, Geological Institute of Romania) - Bucharest. Additionally, *Glochiceras* specimens from the collections of the University of Bucharest and the Museum of Natural Sciences in Piatra Neamţ belonging to Professor Ion PREDA were used in this study. Also, all the specimens described by previous authors (NEUMAYR, 1873; HERBICH, 1878; PREDA, 1973) from the area under investigation have been reviewed.

In the determination of the species, we used the method of comparison with the specimens known from literature, which are mentioned in the synonymy. The specific determination was made especially related to the holotype (or other type specimens), comparing the morphometric parameters and morphology.

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 = “Babeş Bolyai” University from Cluj Napoca
MPN = Museum of Natural Sciences - Piatra Neamţ

F1 = Outcrop from western Ghilcoş walls

F2 = Outcrop from north-western Ghilcoş slope

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

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

Family Oppeliidae Bonarelli, 1894

Subfamily Glochiceratinae Hyatt, 1900

Genus *Glochiceras* Hyatt, 1900 *sensu* ZIEGLER, 1974

Subgenus *Glochiceras* Hyatt, 1900

Glochiceras (Glochiceras) lens Berckhemer in ZIEGLER, 1958

Pl. 1, Fig. 15

*1958 *Glochiceras (Glochiceras) lens* Berckhemer n.sp. - ZIEGLER; p. 112; Pl. 10, Figs. 11 - 14.

Material: LRp479D24, LRp480D24; *G. (G.) cf. lens*: LRp481D24 Grigore Collection in GIR.

Table 1. Measurements of *Glochiceras (Glochiceras) lens* Berckhemer in ZIEGLER, 1958 specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	22	-	22	6	10	6	0.26	0.44	0.26	0.60
LRp481D24	43	-	43	14	15	>5	0.32	0.35	>0.12	>0.33

Remarks: my specimens, LRp479D24 and LRp480D24 are external moulds (in silts) that preserve the specific peristomal area. The specimen LRp481D24 differs from the holotype, being larger and more evolute, with ventral wrinkles pointed at more than ½ of the conch (Table 1).

Occurrence: Upper Kimmeridgian–Beckeri Zone in Ghilcoș outcrops (D profile); Upper Kimmeridgian–Subeumela Subzone (Beckeri Zone) in Germany and France.

Subgenus *Lingulaticeras* Ziegler, 1958
Glochiceras (*Lingulaticeras*) *fialar* (Oppel, 1863)
Pl. 1, Figs. 1, 2, 3

1863 *Ammonites fialar* - Oppel; p. 205; Pl. 53, Fig. 6.

1876 *Ammonites* (*Haploceras*) *fialar* Oppel-Loriol; p. 25; Pl. 5, Fig. 1.

1878 *Haploceras fialar* Oppel-Herbich; p. 147; Pl. 4, Figs. 3a - c.

1929 *Haploceras fialar* Oppel-Wegele; p. 31.

1958 *Glochiceras* (*Lingulaticeras*) *fialar* (Oppel)-Ziegler; p. 134; Pl. 13, Figs. 5 - 9.

?1993 *Glochiceras* (*Lingulaticeras*) *fialar* (Oppel)-Sarti; p. 57; Pl. 1, Fig. 5.

2015 *Lingulaticeras fialar* (Oppel)-Fozy; Pl. 11, Fig. 5.

Material: LRp148A8, LRp170D2, LRp352R1, LRp398W5,0, LRp471A Grigore Collection in GIR. Herbich's specimen (1878): Collection of UBB; originates from grey-greenish limestones (with *Terebratulina janitor*) – Ghilcoș outcrop (F1). Preda's specimens (1973): Collection of MPN inv. 5MPN (Pl.10, Fig.5); originates from grey nodular limestones – Ghilcoș outcrop (F2).

Table 2. Measurements of *Glochiceras* (*Lingulaticeras*) *fialar* (Oppel, 1863) specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	30	-	30	10	12	7.5	0.33	0.39	0.25	0.62
Herbich's specimen	46	-	46	15	18	11	0.32	0.39	0.23	0.61
LRp148A8	30	19	30	11	11	8	0.37	0.37	0.27	0.72
LRp170D2	27	19	27	9	10	7.5	0.33	0.37	0.28	0.75
LRp471A	23	17	22	8	8	5	0.36	0.36	0.23	0.62

Remarks: all specimens are characterized by only partially preserved aperture, and full outline of lappets cannot be observed; the LRp352R1 specimen is small, and LRp398W5.0 is fragmentary. Some of the specimens have small differences from the holotype: the discontinuous side groove and the faded ribs; the LRp148A8 and LRp471A specimens have a larger umbilicus than the holotype (Table 2). The specimen figured by Herbich has a big size and preserves the specific ornamentation very well, but lacking its aperture.

Occurrence: Kimmeridgian- Divisum-Acanthicum zones in the Ghilcoș outcrops (R, W profiles); Lower Kimmeridgian in Europe (Italy, Spain, France, Germany).

Glochiceras (*Lingulaticeras*) *crenosum crenosum* (Quenstedt, 1887)
Pl. 1, Figs. 11-12

1873 *Haploceras Balanense* - Neumayr; p. 162; Pl. 31, Fig. 5.

1878 *Haploceras Balanense* Neumayr-Herbich; p. 147.

1879 *Haploceras Fialar* Oppel-Fontannes; p. 8; Pl. 2, Fig. 1.

1887 *Ammonites lingulatus crenosus*-Quenstedt; p. 847; Pl. 92, Fig. 32.

1958 *Glochiceras* (*Lingulaticeras*) *crenosum* (Quenstedt)-Ziegler; p. 136; Pl. 13, Figs. 10-15.

1978 *Glochiceras* (*Lingulaticeras*) sp.gr. *G.(L.) crenosum* (Quenstedt)-Oloriz; p. 122.

2002 *Glochiceras* (*Lingulaticeras*) *crenosum* - Rogov & Efimov; Fig. 2 d.

2011 *Taramelliceras compsum* (Oppel) Morph *crenosum* [m] (= microconch)-Baudouin et al.; p. 626; Pl. 1, Fig. 7; Pl. 7, Figs. 5-11; Pl. 8, Figs. 4-10.

Material: LRp169A, LRp219A, LRp363K7, LRp357R1; *G. cf. crenosum*: LRp472K23 Grigore Collection in GIR. Neumayr's specimen (1973) as *Haploceras Balanense*: Collection of GIA; originates from greenish sandy limestones – Ghilcoș outcrop (F1). Herbich's specimen (1878) as *Haploceras Balanense*: Collection of UBB; originates from limestones of Ghilcoș outcrop.

Table 3. Measurements of *Glochiceras* (*Lingulaticeras*) *crenosum crenosum* (Quenstedt, 1887) specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	28	-	28	8	13	7	0.28	0.46	0.25	0.54
Neumayr's specimen	30	-	30	7.5	13	9	0.25	0.43	0.30	0.69
LRp169A	26.5	25	26	9.5	11	7.5	0.36	0.42	0.29	0.68
LRp219A	25	21	21	6.5	9	5	0.31	0.43	0.24	0.55

Remarks: all my specimens are well preserved but mainly lacks aperture; only the LRp219A specimen preserves part of the jugal apophyses. They all present the morphological features of the subspecies, and morphometrically only the

LRp169A has a slightly thicker cross-section compared with the holotype. The conferred specimen is a fragment from the living chamber of a large individual ($H > 13$, $G > 7$), without ribs around the peristome (Table 3).

Discussion: Neumayr's specimen is medium-sized and damaged on one side; it preserves the characteristic ornamentation well, but the peristomal region doesn't have apophyses. If Neumayr's specimen described as *Haploceras Balanense* in 1873 would have been recognized as a new species, Quenstedt's taxa, which has the same morphological and morphometric characteristics, should be considered as its synonyms; it is still uncertain why Ziegler (1958), in his review, did not appreciate Neumayr's taxon as a new species based on priority; the issue remains in question.

Occurrence: Kimmeridgian - Divisum-Beckeri zones in Ghilcoş outcrops; Upper Kimmeridgian- Acanthicum - Beckeri zones in Europe.

Glochiceras (Lingulaticeras) crenosum jungens (Neumayr, 1873) emended here
Pl. 1, Figs. 7a, b; 8

1873 *Haploceras jungens* - Neumayr; p. 162; Pl. 31, Fig. 7.

1993 *Glochiceras (Lingulaticeras) cfr. jungens* (Neumayr)-Sarti; p. 57.

2015 „*Glochiceras*” *jungens* (Neumayr)-Fozy; Pl. 19, Figs. 2 and 8.

Material: LRp216A2, LRp179A7 Grigore Collection in GIR.

Table 4. Measurements of *Glochiceras (Lingulaticeras) crenosum jungens* (Neumayr, 1873) specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	32	-	32	11	12	8.5	0.34	0.37	0.26	0.71
LRp216A2	22.5	-	22.5	7.5	9	6.5	0.33	0.40	0.29	0.72
LRp179A7	21	14.5	21	6.5	10	6.5	0.31	0.48	0.31	0.65

Discussion: this taxon was appreciated by Ziegler as the synonym of *G. crenosum*, considering it only an isolated case with a morphology close to that of the mentioned specia. In 1993 Sarti brought two other similar specimens from the Ammonitico Rosso Formation; in this study there were also two other specimens found in our region. I prompt here that Neumayr's specimens comes from Piennine Klipen - Salzkammergut (Austria). I therefore consider it to be a subspecies of *G. crenosum*, since the differences are very small and rarely expressed (in a restrictive area, to date).

Remarks: both of my specimens are small sized (Table 4), of which only LRp179A3 partially preserves aperture; both specimens exhibit external falcooid ribs on the last half of the whorl, similar to holotyp described by Neumayr (1873).

Occurrence: Lower Kimmeridgian-Divisum Zone in Ghilcoş outcrops (A profile); Lower Kimmeridgian-Divisum Zone (?) in Austria and Upper Kimmeridgian-Beckeri Zone in Italy.

Glochiceras (Lingulaticeras) semicostatum Berckhemer, 1959
Pl. 1, Figs. 13, 14

1958 *Glochiceras (Lingulaticeras) cfr. crenosum* (Quenstedt)-Ziegler; Pl. 13, Fig. 16.

1958 *Glochiceras (Lingulaticeras) semicostatum* Berckhemer-Ziegler; p. 159.

1959 *Glochiceras semicostatum* Berckhemer-Holder & Ziegler; p. 205; Pl. 17, Fig. 3.

Material: LRp221D18; LRp523D18; LRp520D32, LRp475H11, LRp477D30; *Gl. (L.) cf. semicostatum*: LRp476B15, LRp522D26 Grigore Collection in GIR.

Table 5. Measurements of *Glochiceras (Lingulaticeras) semicostatum* Berckhemer, 1959 specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	29	-	29	9.5	11	-	0.32	0.39	-	-
LRp221D18	33	-	33	12	13	8	0.36	0.39	0.24	0.61

Remarks: LRp221D18 specimen is a half whorl and LRp523D18, half a conch, both of which have morphological and morphometric parameters comparable to those of the lectotype (Table 5). The LRp520D32 specimen is a mould that preserves the ornament and thin part of the conch. The specimens conferred (LRp476B15, LRp522D26) to this species are less well preserved as fragments in silts.

Occurrence: Upper Kimmeridgian- Eudoxus Zone in Ghilcoş outcrops (R, W profiles); Upper Kimmeridgian-Eudoxus Zone in France (Crussol) and Germany.

Glochiceras (Lingulaticeras) modestum Ziegler, 1958
Pl. 1, Figs. 5, 6

1958 *Glochiceras (Lingulaticeras) modestum* - Ziegler; p. 139; Pl. 14, Figs. 3, 4, 5.

Material: LRp171A7, LRp174D2; *G. (L.) cf. modestum*: LRp373K7, LRp439T5, LRp369H11, LRp402T1.5 Grigore Collection in GIR.

Remarks: both specimens are small in size and do not conserve the peristoma; morphologically, they present the specific characters and the morphometric parameters are comparable to those of the holotype (Table 6). The specimens conferred to this species are in a poor conservation status, with the falcooid ribs less obvious.

Occurrence: Upper Kimmeridgian-Acanthicum Zone in Ghilcoș outcrops (R, W profiles); Upper Kimmeridgian- Acanthicum - Eudoxus zones in Germany.

Table 6. Measurements of *Glochiceras (Lingulaticeras) modestum* Ziegler, 1958 specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	26	-	26	8	10	-	0.31	0.40	-	-
LRp171A7	23.5	-	23.5	8	10	7	0.34	0.42	0.30	0.70
LRp174D2	23	-	23	7	10	6.5	0.30	0.43	0.28	0.65
LRp369H11	21	-	21	9	8	5	0.43	0.38	0.24	0.62
LRp402T1.5	17	13	17	5.5	7	5	0.32	0.41	0.29	0.71

Glochiceras (Lingulaticeras) nudatum (Oppel, 1858)

Pl. 1, Fig. 4

1858 *Ammonites nudatus*-Oppel; p. 687.

?1873 *Haploceras tenuifalcatum* Neumayr-Neumayr; p. 162; Pl. 31, Fig. 6.

1878 *Haploceras tenuifalcatum* Neumayr-Herbich; p. 147.

1879 *Haploceras tenuifalcatum* Neumayr-Fontannes; p. 9; Pl. 2, Fig. 2.

*1887 *Ammonites lingulatus expansus*- Quenstedt; p. 847; Pl. 92, Figs. 29, 30.

1887 *Ammonites lingulatus*-Quenstedt; p. 848; Pl. 92, Fig. 37.

1958 *Glochiceras (Lingulaticeras) nudatum* (Oppel)-Ziegler; p. 133; Pl. 12, Figs. 8-11.

1995 *Glochiceras (Lingulaticeras) nudatum* (Oppel)-Oloriz et al.; p. 25.

Material: LRp173F4, LRp175F4, LRp176F4 Grigore Collection in GIR. Neumayr's specimens (1973): Collection of GIA – originates from red nodular limestones – Ghilcoș outcrop (F1). Herbich's specimen (1878): Collection of UBB; originates from greenish sandy limestones (with *Pygope janitor*) – Ghilcoș outcrop (F1).

Table 7. Measurements of *Glochiceras (Lingulaticeras) nudatum* (Oppel, 1858) specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Neotype	30	-	30	9	12	-	0.31	0.40	-	-
Neumayr specimen	30	-	30	11	11	7.5	0.37	0.37	0.25	0.68
Herbich specimen	31	-	31	12	12	8	0.38	0.38	0.25	0.67
LRp173F4	23	-	23	6.5	10.5	8	0.28	0.46	0.35	0.76
LRp175F4	24	-	24	5	12	8	0.21	0.50	0.33	0.67

Remarks: the LRp173F4 specimen is fragmentary and does not conserve the peristome, but its morphological and morphometric parameters are comparable to those of Neumayr's (1873) specimen (Table 7). The other two specimens are small and have a narrower umbilicus than the holotype.

Neumayr's specimen is medium-sized and does not conserve the peristoma; it shows some ornamental differences from the holotype: the ribs on the last whorl portion are more strong in the lower half of the flank, and the umbilicus is wider. Herbich's specimen is medium in size and has the same morphological and morphometric peculiarities as Neumayr's once. It may be a case similar to that of the taxon *G. jugens* (see discussion), but until the appearance of other specimens remain in the spectrum of the synonym of this species.

Occurrence: Lower Kimmeridgian- Platynota Zone in Ghilcoș outcrops (F, W profiles); Upper Oxfordian(?) – Lower Kimmeridgian (Platynota Zone) in Germany.

Glochiceras (Lingulaticeras) lingulatum (Quenstedt, 1858)

Pl. 1, Fig. 9, 10

1858 *Ammonites lingulatus*-Quenstedt; p. 619; Pl. 76, Fig. 17.

1876 *Ammonites (Haploceras) Fialar* Oppel-Loriol; p. 25; Pl. 2, Fig. 4.

1887 *Ammonites lingulatus*-Quenstedt; p. 847; Pl. 92, Figs. 31, 34.

1887 *Ammonites lingulatus expansus*-Quenstedt; p. 850; Pl. 92, Fig. 48.

1929 *Haploceras falcula* Quenstedt-Wegele; p. 31; Pl. 28, Fig. 5.

1958 *Glochiceras (Lingulaticeras) lingulatum* (Quenstedt)-Ziegler; p. 131; Pl. 12, Figs. 1-6.

Material: LRp167F5, LRp168E1 Grigore Collection in GIR.

Table 8. Measurements of *Glochiceras (Lingulaticeras) lingulatum* (Quenstedt, 1858) specimens.

Specimen	Dmax	Dph	D	U	H	W	U/D	H/D	W/D	W/H
Lectotype	36	-	36	8	16	10	0.22	0.45	0.28	0.62
LRp167F5	32	20	31	7	13	8	0.23	0.42	0.26	0.61
LRp168E1	27	-	24	6	10	6	0.25	0.42	0.25	0.60

Remarks: both specimens conserve only partially the peristoma, with some of the lappets; compared to the holotype, they do not show ornamental differences, but morphometrically they have a narrower section and larger umbilicus (Table 8).

Occurrence: Lower Kimmeridgian- Platynota Zone in Ghilcoş outcrops (R, W profiles); Upper Oxfordian – Lower Kimmeridgian (Platynota Zone) in Germany.

Glochiceras (Lingulaticeras) cf. procurvum Ziegler, 1958

Material: LRp433B5 Grigore Collection in GIR.

Remarks: the specimen represents a whorl fragment with a characteristic ribs (polyfurcated, falcoïdes) for this species, but with hardly noticeable wrinkles in the ventral region.

Occurrence: Upper Kimmeridgian–Beckeri Zone in Ghilcoş outcrops (R, W profiles); Upper Kimmeridgian - Subeumela Subzone (Beckeri Zone) in Germany.

Incertae sedis

Glochiceras (Paralingulaticeras) lithographicum (Oppel, 1863)

1863 *Ammonites lithographicus*-Oppel; p. 248; Pl. 68, Figs. 1 - 3.

1873 *Oppelia lithographica* Oppel-Neumayr; p. 168.

1878 *Oppelia lithographica* Oppel-Herbich; p. 154; Pl. 8, Fig. 3.

1958 *Glochiceras (Paralingulaticeras) lithographicum* (Oppel)-Ziegler; p. 152; Pl. 16, Figs. 1 - 4.

non1973 *Oppelia (Streblites) lithographica* Oppel-Preda; Pl. 16, Fig. 3 (*Taramelliceras intersistens*).

1978 *Glochiceras (Paralingulaticeras) lithographicum* (Oppel)-Oloriz; p. 127; Pl. 9, Figs. 4, 5.

Material: Neumayr's specimen (1973): Collection of GIA – originates from grey-greenish limestones – Ghilcoş outcrop (F1).

The only known specimen in the region is Neumayr's, a "very good specimen", sampled from the upper green limestone, from the Ghilcoş outcrop. Was stored in the Austrian Institute of Geology (Bundesanstalt) in Vienna. The copy figured by Herbich is a copy by Zittel, as stated by the author; he recalls only one specimen collected by Neumayr and, respectively, presented by him. Now it is no longer in the inventory of the Vienna Collection.

Occurrence: Lower Tithonian–Hybonotum Zone in Ghilcoş outcrops (R, W profiles)(?); Lower Tithonian–Hybonotum / Lithographicum Zone in Germany, France, Spain and Bulgaria.

CONCLUSIONS

The ammonites assemblage in the Ghilcoş region was enriched with five species of the Genus *Glochiceras*: *G. (Glochiceras) lens*, *G. (Lingulaticeras) modestum*, *G. (L.) semicostatum*, *G. (L.) lingulatum* and *G. (L.) procurvum*.

The species *G. (Paralingulaticeras) lithographicum* (Oppel) was not identified on this occasion, although deposits belonging to the Lower Tithonian were highlighted; the analysis of the specimens described by the previous authors revealed that only Neumayr's (1873) remains to confirm the presence of the species in the region. The species described by Neumayr (1873), *G. jugens*, *G. Balanense* and *G. tenuifalcatum* are discussed and revised here, being proposed to discussion by the international forum by *G. Balanense*, with reference to its priority towards *G. crenosum* (Quenstedt, 1887).

ACKNOWLEDGEMENTS

I would like to thank to Prof. Sorin Baciu (from the Iaşi University) for granting access to the Preda Collection material hosted by the Natural Science Museum of Piatra Neamţ. I thank Prof. Dr. Eugen Grădinaru (Faculty of Geology and Geophysics, University of Bucharest) for his valuable advice. Special thanks to the Secretary of the Jurassic Commission of the Interdepartmental Stratigraphical Committee of Russia, Mikhail Rogov (Geological Institute of Russian Academy of Sciences).

This paper was financially supported by the "Programul de finanţare a Instalaţiilor şi Obiectivelor Speciale de Interes Naţional/ The Programme for the Financing of Installations and Special Objectives of National Interest - IN2019" and the National Programme "Elaborarea hărţilor naţionale geologice/ Elaboration of national geological - PN19-45-01-03", both funded by the Romanian Government.

REFERENCES

- BARTHEL W. & SCHAIRER G. 1977. Die Cephalopoden des Korallenkalks aus dem Oberen Jura von Laisacker bei Neuburg a. d. Donau. II. *Glochiceras*, *Taramelliceras*, *Neochetoceras* (Ammonoidea). *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Histor. Geologie*. München. **17**: 103-113.
- BAUDOIN C., BOSELLI P., BERT D. 2011. The OPELLIIDAE of the *Acanthicum* Zone (Upper Kimmeridgian) from Mount Crussol (Ardèche, France): ontogeny, variability and dimorphism of the genera *Taramelliceras* and *Streblites* (Ammonoidea). *Revue de Paléobiologie*. Muséum d'histoire naturelle de la Ville de Genève. Genève. **30**(2): 619-684.

- FONTANNES F. 1879. Description des Ammonites des calcaires du Chateau de Crussol (Ardeche). *Georg Libraire*. Lyon. 122 pp.
- FOZY I. 2015. *A Dunántúli-középhegység oxfordi–barremi (felső-jura–alsó-kréta) rétegsora: cephalopoda-fauna, biosztratigráfia, öskörnyezet és medencefejlődés*. MTA Doktori Értekezés Tézisei. Magyar Tudományos Akadémia. Budapest. 149 pp.
- GHEUCA I. & GRIGORE D. 2010. *Harta geologică 1:50000 Foaia Dămuc (reambulată)* - digital. Institutul Geologic al României. București.
- GRIGORE D. 2002. *Formațiunea cu Acanthicum din regiunea Lacu Roșu (Msv. Hăghimaș-Carpații Orientali) – posibil hipostatotip al limitei Kimmeridgian – Tithonic*. *Stratigrafie. Paleontologie*. Teză doctorat. Universitatea „Alexandru Ioan Cuza”. Iași. 347 pp.
- GRIGORE D. 2011. Kimmeridgian – Lower Tithonian Ammonite Assemblages from Ghilcoș – Hăghimaș Massif (Eastern Carpathians – Romania). *Acta Palaeontologica Romaniaiae*. Edit. Presa Universitară Clujeană. Cluj Napoca. **7**: 177-189.
- GRIGORE D., LAZĂR IULIANA, GRASU C., GHEUCA I., CIOBANETE D., CONSTANTINESCU A., MARCU IULIA. 2009. Paleontological sites from Cheile Bicazului – Hășmaș National Park. *Oltenia. Studii și comunicări. Științele Naturii*. Muzeul Olteniei. Craiova. **25**: 355-365.
- HERBICH F. (1878): Das Széklerland mit Berücksichtigung der angrenzenden Landesteile, geologisch und paläontologisch beschrieben. *Jahrbuch der Koeniglichen Ungarischen geologischen Reichsanstalt in Budapest*. Budapest. **1**: 19-363.
- HOLDER H. & ZIEGLER B. 1959. Stratigraphische und faunistische Beziehungen im Weissen Jura (Kimmeridgien) zwischen Süddeutschland und Ardeche. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*. Stuttgart. **108**: 150 – 214.
- LORIO P. 1876 -1878. Monographie paléontologique des couches de la zone à Ammonites tenuilobatus de Baden. - *Mémoires de la Société paléontologique Suisse*. Basel. **4 - 5**: 1-200.
- NEUMAYR M. 1873. Die Fauna der Schichten mit Aspidoceras acanthicum *Abhandlungen der Kaiserlich-Königlichen Geologischen Reichsanstalt*. Wien. **5(6)**: 141-257.
- OLORIZ F. 1978. *Kimmeridgiense-Tithonico inferior en el Sector central de las Cordilleras Beticas (Zona subbetica)*. *Paleontologia, Bioestratigrafia*. Phd Tesis. University Granada. Granada. **184(1-2)**: 758 pp.
- OLORIZ S. F., RODRIGUEZ-TOVAR F.J., MORENO ESCAMEZ ANA T. 1995. Analisis ecostratigrafico y sedimentologico de materiales del Jurásico superior epicontinental en el sector oriental del Paleomargen Suriberico (Provincia de Albacete). *Al-Basit, Revista de Estudios Albacetenses*. Instituto de Estudios Albacetenses "Don Juan Manuel" de la Excma. Diputación de Albacete. Albacete. **36**: 5-85.
- OPEL A. 1863. Ueber jurassische Cephalopoden. *Palaeontologische Mittheilungen aus dem Museum des Königlich-Bayerischen Staates*. Stuttgart. **3**: 163-216.
- PREDA I. 1973. Variațiile de facies și biostratigrafia Jurasicului superior din Munții Hăghimaș. *Studii și Cercetări de Geologie, Geografie și Biologie, Seria Geologie-Geografie*. Piatra Neamț. **2**: 11-21.
- QUENSTEDT F.A. 1887-1888. *Die Ammoniten des Schwabischen Jura. III. Der Weisse Jura*. E. Schweizerbart'sche Verlagshandlung. Stuttgart. 817-1140.
- ROGOV M. A. & EFIMOV V. M. 2002. On the possibility to establish zones of Submediterranean ammonite scale in Lower Kimmeridgian of Russian Platform. *Bulletin of Moscow Society of Naturalists. Geological series*. **77(1)**: 43-46.
- ROLL A. 1931. Die Stratigraphie des oberen Malm im Lauchert-gebiet (Schwäbische Alb) als Grundlage für tektonische Untersuchungen. *Abhandlungen der Preussischen geologischen Landesanstalt, Neue Folge*. Berlin. **135**: 1-164.
- SARTI C. 1993. Il Kimmeridgiano delle Prealpi Veneto-Trentine: fauna e biostratigrafia. *Memorie del Museo civico di storia naturale di Verona. Sezione scienze, Terra*. Verona **5**: 1-144.
- SĂNDULESCU M., CONTESCU L., MUREȘAN M., MUREȘAN G., KRAUTNER H. G., POPA G. 1975. Harta geologică 1:50000 Foaia Dămuc. *Institutul de Geologie și Geofizică*. București.
- SĂNDULESCU M. 1984. *Geotectonica României*. Edit. Tehnică. București. 336 pp.
- WEGELE L. 1929. Stratigraphische und faunistische Untersuchungen im Oberoxford und Unterkimmeridge Mittelfrankens. *Palaeontographica Abteilung A*. Schweizerbart and Borntraeger. Stuttgart. **72**: 1-94.
- WIERZBOWSKI A., GLOWNIAK EWA & PIETRAS K. 2010. Ammonites and ammonite stratigraphy of the Bimmamatum Zone and lowermost Planula Zone (Submediterranean Upper Oxfordian) at Bobrowniki and Raciszynin the Wielun Upland, central Poland. *Volumina Jurassica*. Polish Geological Institute – National Research Institute. Warsaw. **8**: 49-102.
- ZIEGLER B. 1958. Monographie der Ammoniten gattung *Glochiceras* im Epikontinentalen Weissjura Mitteleuropas. *Palaeontographica Abteilung A*. Schweizerbart and Borntraeger. Stuttgart. **110**: 93-164.

Grigore Dan

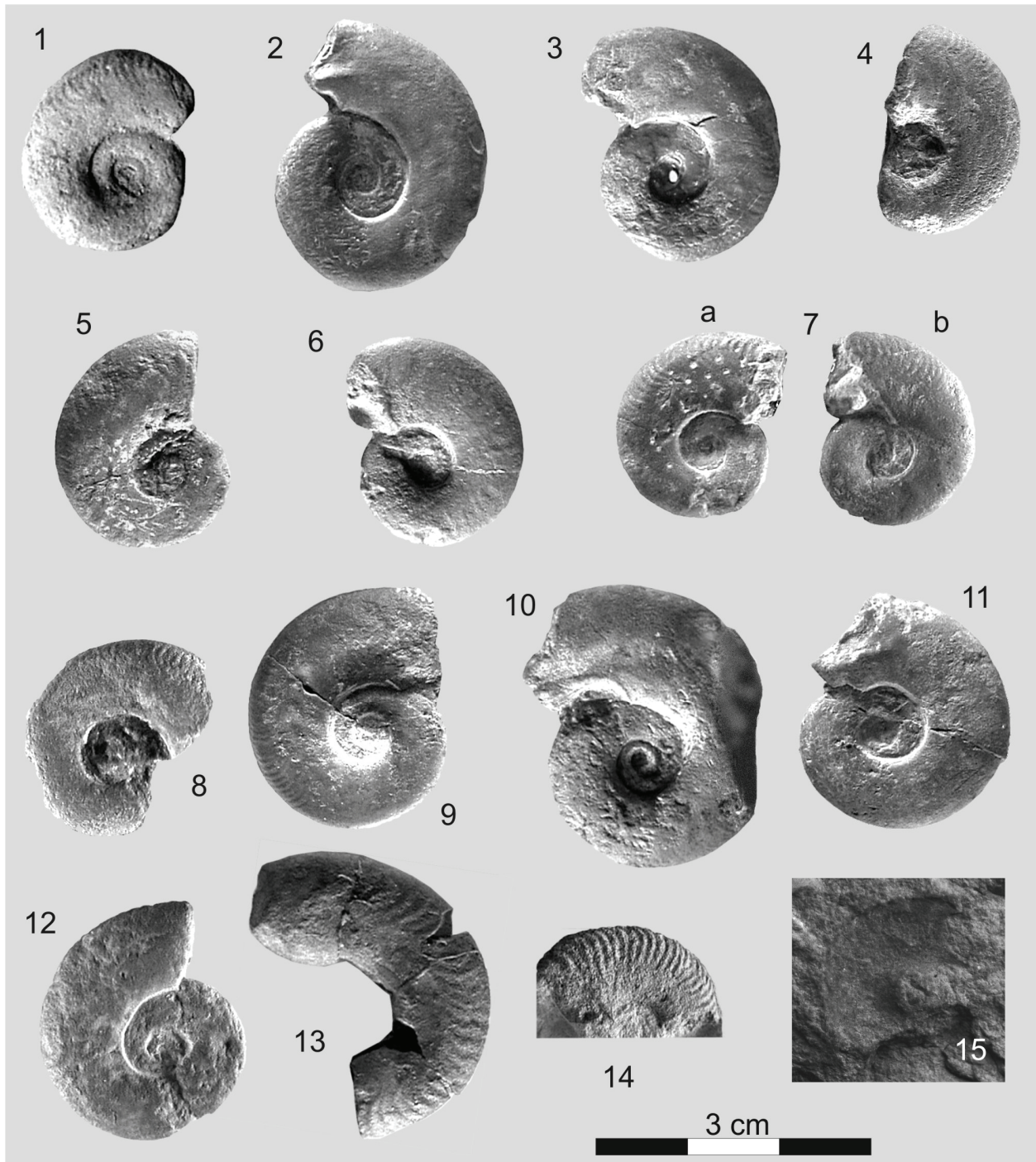
Geological Institute of Romania 1st Caransebeș Street, 012271 - Bucharest, Romania.

E-mail: dan1_grigore@yahoo.com

Received: March 30, 2019

Accepted: August 23, 2019

PLATE 1



1. *Glochiceras (Lingulaticeras) fialar* (Oppel) (LRp471A); green nodular limestone, Kimmeridgian, Ghilcoş; 2. *G. (L.) fialar* (Oppel) (LRp148A8); green nodular limestone, Early Kimmeridgian-Divisum Zone, Ghilcoş; 3. *G. (L.) fialar* (Oppel) (LRp170D2); green nodular limestone, Late Kimmeridgian-Acanthicum Zone, Ghilcoş; 4. *G. (L.) nudatum* (Oppel) (LRp173F4); green nodular limestone, Early Kimmeridgian-Strombecki Zone, Ghilcoş; 5. *G. (L.) modestum* Ziegler (LRp171A7); green nodular limestone, Early Kimmeridgian-Divisum Zone, Ghilcoş; 6. *G. (L.) modestum* Ziegler (LRp174D2); green nodular limestone, Late Kimmeridgian-Acanthicum Zone, Ghilcoş; 7. *G. (L.) crenosum jugens* (Neumayr) (LRp179A7); green nodular limestone, Early Kimmeridgian-Divisum Zone, Ghilcoş; 8. *G. (L.) crenosum jugens* (Neumayr) (LRp216A2); green nodular limestone, Early Kimmeridgian-Divisum Zone, Ghilcoş; 9. *G. (L.) lingulatum* (Quenstedt) (LRp168F1); green nodular limestone, Early Kimmeridgian-Platynota Zone, Ghilcoş; 10. *G. (L.) lingulatum* (Quenstedt) (LRp167F5); green nodular limestone, Early Kimmeridgian-Strombecki Zone, Ghilcoş; 11. *G. (L.) crenosum crenosum* (Quenstedt) (LRp219A); green nodular limestone, Kimmeridgian, Ghilcoş; 12. *G. (L.) crenosum crenosum* (Quenstedt) (LRp169A); green nodular limestone, Kimmeridgian, Ghilcoş; 13. *G. (L.) semicostatum* Berckhemer (LRp221D18); grey limestones, Late Kimmeridgian-Eudoxus Zone, Ghilcoş; 14. *G. (L.) semicostatum* Berckhemer (LRp520D32); greenish sandstones, Late Kimmeridgian-Beckeri Zone, Ghilcoş; 15. *G. (L.) lens* (Berckhemer) (LRp479D24); green nodular limestone, Kimmeridgian-Beckeri Zone, Ghilcoş.