



## ***Juraphyllites bucovinicus* (UHLIG, 1900) – A rare phylloceratid species from the Early Jurassic of the Prașca klippe (Rarău Syncline, Eastern Carpathians, Romania)**

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### **Abstract**

In 1900, Uhlig proposed five new species of ammonites and one brachiopod species, Early Jurassic in age, from the Prașca Klippe (Rarău Syncline, Eastern Carpathians). "*Rhacophyllites bucovinicus*" is the only phylloceratid described, which displays a very wide umbilicus and a unique small keel near the aperture. Following Uhlig's holotype, new specimens were found, only recently, and a toptype series was formed. After the Uhlig's holotype, new specimens were found only recently forming a toptype series. Previously quoted records in different areas (e.g. Bocskorbergs – Bakony Mountains, Hungary; Montagna del Casale – Sicily, Italy; Hierlatz – Northern Calcareous Alps, Austria; Male Karpaty – Western Carpathians, Slovakia ) are discussed, as well as the modern assignment of the species.

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**Keywords:** ammonite, previous records, toptype series, comments.

### **Introduction**

The genus *Juraphyllites* was proposed by Müller (1939) as having *Phylloceras diopsis* GEMMELLARO 1884 as type-species, following to solve the ambiguous usage of *Rhacophyllites* ZITTEL, 1884. The genus emphasizes the "Liassic species with a modified body chamber" and "ornate Jurassic phylloceratids" (Müller, 1939, pp. 536). Later, Arkell (1957, pp. 189–192) saw *Juraphyllitidae*

as a distinct family of the Early Jurassic phylloceratids. *Rhacophyllites* sensu ZITTEL remains valid for the Late Triassic, and, in specific regions, for the transitional fauna of the Triassic-Jurassic boundary, including beds considered Jurassic in age: e.g. Nevada (Guex et al., 1995 fide Yin et al., 2007); the Himalayas of Southern Tibet (Yin et al., 2007).

The *Juraphyllitidae* family includes several genera which exhibit an umbilicus that is unusually wide for the phylloceratid group,

as well as a steep umbilical wall. Several modifications should be pointed out in relation to the Treatise on Invertebrate Paleontology, Part L, 1957: e. g. *Nevadaphyllites* GUEX 1982 and *Togaticeras* RAKÚS 1993 were added as new genera, while *Galaticeras* SPATH, 1938 was removed. Juraphyllitids display more or less flattened flanks with fine ribs, which run frequently near the venter and only in certain taxa start from the umbilicus wall. The coarse ribs have been described in particular cases (e. g. Central Apennine Mountains, Dommergues et al., 1994). The ribbed sculpture occurs especially on the body chamber (*Juraphyllites* species), but it can be also observed on the phragmocon (*Meneghiniceras*, “*Harpophylloceras*”). The lack of ribs characterizes *Paradasyceras*, *Togaticeras*, certain species of *Juraphyllites* etc. Several taxa also develop peristomal modifications. Thus, frequently, simple constrictions occur (*Togaticeras stella*, *Juraphyllites libertus* etc.), or constrictions, lappets and a ventral rostrum, as *J. dorsoplanatus* and *J. bucovinicus* display (the lappets of the latter were described only by Meister et al., 2011). “*Harpophylloceras*” *eximius* could also have several constrictions as intraspecific variability (e.g. Machioni and Meister, 2003). *Meneghiniceras* and *Harpophylloceras* are the classic phylloceratid genera which develop a true keel along the whole venter. *J. bucovinicus*, on the other hand, displays a small keel near the aperture. Generally, the key for identification is the change of the body chamber in adult specimens, as reflected in the sculpture, the whorl section, the degree of coiling, the umbilical wall, the peristomal modifications (Meister et al., 2011).

The general pattern of the suture line is simple, with few elements. The external lobe is short or very short, the lateral lobe is usually large and asymmetric, displaying three parts/prongs, while the accessory lobes exhibit two parts (rarely is there a tendency towards three parts). The saddles are diphylic, rarely triphylic, with the first lateral saddle (L/U) higher than the external one (E/L). The accessory saddles sometimes display an oblique axe. The suture lines can become more

complicated in certain areas (e.g. Central Apennine Mountains, Dommergues et al., 1994).

Generally, the *Juraphyllitidae* family exhibits a considerable diversity and frequency in the Early Jurassic rocks of the Tethyan Realm, and, consequently, in the Prahă Klippe, as opposed to the Euroboreal Realm, where only *Tragophylloceras* has adapted to the specific environmental conditions and a limited number of immigrants of Tethyan juraphyllitids have been quoted (Howarth, 1976; Keupp and Schweigert, 2008).

### Geological setting

The Early Jurassic rocks of the Prahă Peak occur as a sedimentary klippe in the Early Cretaceous wildflysch of the Rarău Syncline, belonging to Transylvanian Nappes (Olt Nappe), sensu Săndulescu (1984). It can be reached following the pathways along the Valea Seacă stream and Mesteacă stream, or from the Pojorâta village (see Fig. 1). Red nodular limestone, massive limestone and thin marl strata have built the klippe, which has an upside-down position in the wildflysch. Its dimensions, as recorded by means of the digs carried out up to the present moment, reach over 60 m in length and over 7–8 m in height.

The klippe was discovered by Uhlig (1900), who highlighted the most valuable aspects in relation to it, namely the abundance of the ammonites, the Early Jurassic age, the similitude with the Adnet region etc. From the site, Uhlig erected six new species, five of ammonites and one brachiopod species. Other researchers (Trauth, 1906; Popescu and Patrușiu, 1964; Turculeț, 1965, 1971; Turculeț et al., 2002 etc.) have stressed the importance of the klippe by improving the paleontological content and the biostratigraphic information.

### Previous records of *Juraphyllites bucovinicus* (UHLIG, 1900)

Following Uhlig’s work, no new specimens of *Juraphyllites bucovinicus* were found in the Prahă Klippe until a few years

ago (Țibuleac, 2009). Moreover, few quotations of this species appear in the scientific literature.

Kovács (1932, 1942) described two subspecies from the Early Jurassic limestone of the Bakony Mountains. *Rh. bucovinicus hungarica* KOVÁCS, 1932 displays a modified body chamber, with a short keel, and more obvious and strong ribs than in the Uhlig's species. No any constrictions. The specimens of *Rh. bucovinicus aberrans* KOVÁCS (1942) were collected from the Early Jurassic limestone of Bocskorbergs.

They are poorly-preserved, but the general shape, as well as several features of “*Rh.* *bucovinicus*”, were, nevertheless, observed, namely the fact that the keel rises on the last 1/5 of the whorl, and fine ribs accompany it. The larger size of the shell, the closer umbilicus, a particular umbilical edge, as well as the absence of constrictions, represent the main differences. It is worth noting that the presence of constrictions on phylloceratid specimens depends greatly on the state of preservation (Fantini Sestini, 1974; Wiedenmayer, 1977).

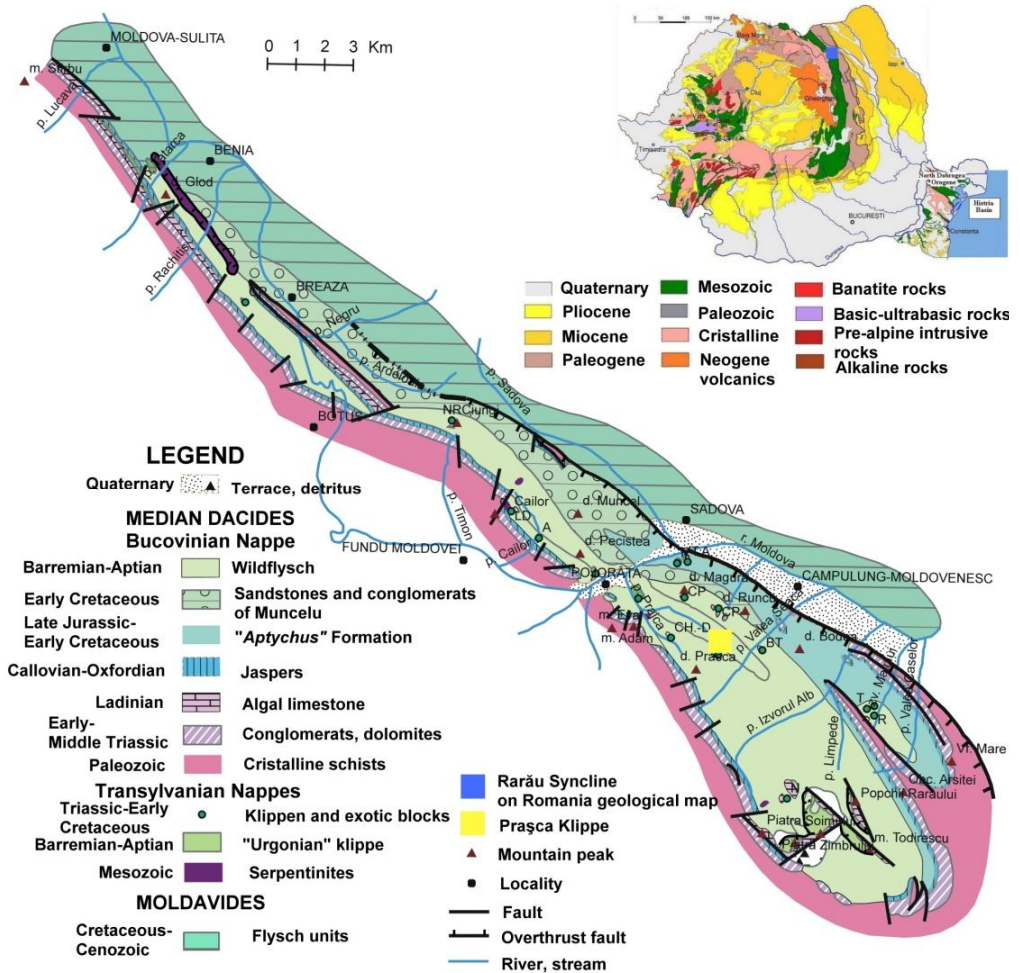


Fig. 1 Geological setting of the Prașca Klippe (Map drawn after Turculeț, 1971).

Gugenberger (1936) also signaled the species – *Rhacophyllites* *cf.* *bucovnicus* – in the Montagna del Casale (Sicily), in the form of a fragment of the body chamber; the specimen (Pl. XIV, figs. 15 a,b) exhibits the keel and a few ribs near the venter, one of them being very coarse; the presence of the rostrum is doubtful, based on the broken end of the fragment. In a synonymy part, Gugenberger (1936) included a specimen from Hierlatz – *Rhacophyllites* *sp. aff. lariensi* MEN. – Geyer (1886, p. 226, Pl. II, figs 1,2). Based on the picture provided, it represents a phragmocon and, possibly, the beginning of the body chamber. The sculpture of fine concave ribs, as well as the probably incomplete suture line (only three saddles and lobes), corresponds to the ribbing style of Uhlig's species. There are, however, several differences: the flanks seem to be more convex and the umbilicus wider than in Uhlig's species; there are only two constrictions on the last whorl, while "*bucovnicus*" displays six constrictions; the absence of the apertural zone is also significant for a certain determination.

Meister and Freibe (2003) compared *J. quadrii planulata* FUCINI (1901) with *J. bucovnicus*, the main differences being the wider-spaced constrictions and the raising keel near the aperture on the latter.

Blau (1998) assigned to *J. libertus* (Pl. I, Fig. 18) a specimen which exhibits several morphological similitudes with "*J.*" *bucovnicus*, namely the coiling, the similar constrictions and ribbed sculpture, the small keel that seems to rise near the aperture, and the first lateral saddle of the suture line (Fig. 18, p. 200), which displays an irregular

triphyllic ending: the lobes are similar, especially U<sub>2</sub>, which has a tendency to divide into three prongs. The main differences are the closer umbilicus and the stems of the saddles, which are not as robust as in Uhlig's species.

Recently, Meister et al. (2011) signaled a specimen at Chtelnica (Male Karpaty, Western Carpathians, Slovakia). The inner whorls are smooth, with 3–4 constrictions, while the last whorl displays only obvious one, most likely due to the state of preservation. The sculpture consists of fine prorsiradial and slightly flexuous ribs, which start near the umbilical edge and cross the venter, forming gentle "chevrons." A well-developed rostrum, as well as lower lateral lappets, was also noted. If one ignores the main zone of the chevrons, no keel is noticeable. The description of the suture line, with the diphyllic and robust stem of the saddles, is in agreement with the "*bucovnicus*" species. Several variations should, however, be noted, namely the sculpture style, with the salient flexuous ribs starting in the vicinity of the umbilicus, the closer umbilicus on an adult specimen, as well as the lateral lappets.

### Systematic Paleontology

The lectotype of *Juraphyllites bucovnicus* is housed at the Austrian Geological Survey in Vienna. The new specimens were collected *in situ* from the *Echioceras raricostatum* Zone, *Paltechioceras aplanatum* Sub-biozone (Sinemurian), marked here by *P. romanicus* (UHLIG, 1900), and they form a topotype series.

Phylum Mollusca LINNÉ 1758  
Class Cephalopoda CUVIER, 1795  
Subclass Ammonoidea ZITTEL, 1884  
Order *Phylloceratida* ARKELL, 1950  
Family *Juraphyllitidae* ARKELL, 1950

Genus *Juraphyllites* MÜLLER, 1939

Type species: *Phylloceras diopsis* GEMMELLARO, 1884

*Juraphyllites bucovinicus* (UHLIG, 1900)

Pl. I, figs. 1-6, 9-10.

? 1882 *Phylloceras* sp. aff. *lariense* Geyer, p.226, Pl. II, figs. 1,2.1900. *Rhacophyllites bucovinicus* n. sp. UHLIG, p. 18. T. I, Fig. 2 a-e.? 1936. *Rhacophyllites* cfr. *bucovinicus* Uhlig. Gugenberger, p. 164 (30), t. XIV, figs. 15 a,b.1942. *Rhacophyllites bucovinicus* Uhlig var. *hungarica*, Kovács p. 122.1942. *R. bucovinicus* Uhlig var. *aberans*, Kovács p. 122.? 1998 *Juraphyllites libertus* Blau, Taf. I, Fig 18.2010. *Juraphyllites bucovinicus* (UHLIG, 1900). Meister et al., p. 34, figs. 5 j-o,t.

**Material:** Over the past years, 15 specimens of *J. bucovinicus* have been collected, either complete or lacking the apertural part.

**Description:** These specimens confirm Uhlig's description, forming a topotype series. In the adult stage, the coiling is evolute, but the umbilicus diameter seems to decrease with the ontogenetic stage, and several specimens with a tendency to a convolute shell were observed (Table 1, Pl. I, Fig 5). The almost flat flanks preserved six constrictions (the smallest specimen with six constrictions is 1.53 cm): the first five constrictions are slightly proverse and nearly regularly spaced (at distances of 0.40–0.55 cm in the case of a diameter of 3.5 cm), while the last one occurs at a distance that is almost double. Fine and concave ribs occur only in the last part of the body chamber, crossing the venter, where they display salient "chevrons." The short keel rises near the aperture, and in particular cases the ribs crossing it develop very fine tubercles; the keel prolongs into a small rostrum, rarely preserved (Pl. I, Fig. 1). At the end of the body chamber, the whorl section shifts from the oval shape that characterizes the rest of conch to a trapezoidal one (for the oval shape, the maximum width is reached near the middle of the whorl section); the large base of the trapeze is close to the venter. All the adult specimens have small dimensions (under 4 cm), which point to the micromorph form of the species (Meister et al., 2011).

The suture line exhibits 5–6 lobes: the external one is short; the lateral lobe is

divided into three parts/prongs, being very slightly asymmetrical; the following lobe has two parts, with a tendency of becoming three parts in the adult stage, while the remaining 2–3 lobes are very small and monophyllic. The first saddle is smaller than the first lateral one, having a tendency of becoming triphyllic; the first lateral saddle is irregularly triphyllic, and the third one is diphyllic, with a tendency of becoming triphyllic. The line is completed by two or three small monophyllic saddles.

**Comments:** Juraphyllitids are common in the Praşca Klippe, being quoted more frequently in its base, namely in the *Arnioceras semicostatum* Zone, and in its top, namely in the *Echioceras raricostatum* Zone (the extreme zones known up to the present moment only through digs).

Within the juraphyllitid species, "*bucovinicus*" seems to require particular attention. It was proposed by Uhlig (1900) based on a well-preserved and nearly complete specimen, unlike the arietitids, which were described based on fragmentary cast shells. The species was described in comparison with "*Rh. eximius*" HAUER (1854) "*Rh. lariensis*" (MENECHINI, 1875) and "*Rh. mimatensis*" (d'ORBIGNY, 1845). All the species share a convolute/evolute shell, the "*bucovinicus*" showing the widest umbilicus and more flattened flanks. The short keel, which rises near the aperture in Uhlig's species, was regarded as being a feature similar to those of the "*eximius*" (a keel along the whole venter) and "*lariensis*" (a tuberculated keel). In the case of "*bucovinicus*," the keel prolongs into a small

rostrum. The sculpture shows few similitudes with respect to the ribbing style: in the case of “*bucovinicus*,” fine ribs run parallel to the aperture, only on the lateral-ventral part of the body chamber, while “*eximius*” and “*lariense*” exhibit ribs starting from the

vicinity of the umbilicus and even reaching the phragmocon. “*Bucovinicus*” and “*eximius*” share the same pattern in terms of disposition and trajectories of the constrictions.

Table 1 Biometric parameters of the *Juraphyllites bucovinicus* specimens (the values are in cm)

Specimen	Diameter (D)	Umbilicus (U)	Height	Width	U/D	Wh/H
PrB 1	3.45	1.46	1.15	0.79	0.42	0.69
PrB 2	3.22	1.37	1.13	0.80	0.43	0.70
PrB 3	3.25	1.32	1.17	0.73	0.41	0.62
PrB 4	3.31	1.36	1.17	0.86	0.41	0.74
PrB 5	3.15	1.29	1.10	0.77	0.41	0.70
PrB 6	3.11	1.28	1.11	0.77	0.41	0.69
PrB 7	2.86	1.18	1.15	0.68	0.41	0.58
PrB 8	2.85	1.18	1.23	0.70	0.41	0.54
PrB10	2.53	1.10	0.94	0.58	0.43	0.61
PrB12	2.25	0.96	0.89	-	0.43	-
PrB15	2.62	1.10	1.10	0.70	0.42	0.64
PrB17	2.59	1.09	-	0.58	0.42	-
PrB27	2.00	0.86	0.76	0.48	0.43	0.63
PrB29	1.53	0.65	0.54	0.38	0.42	0.70

*Juraphyllites bucovinicus* also resembles several other species. Thus, with the exception of the apertural ending, *J. bucovinicus* shares a rather similar coiling and appearance of constrictions with small specimens of *J. libertus* (Pl. I, Fig. 7). The main differences are the closer umbilicus and the increased number of constrictions which occur more irregularly on *J. libertus* than on *J. bucovinicus*; the whorl section is oval, with the bigger width near the umbilicus in the case of “*libertus*”; moreover, when preserved, the ribbing sculpture is slightly different – more pronounced, with better-spaced ribs and more developed “chevrons.” The suture line exhibits the same general similarity, *J. libertus* having four diphylic saddles (sometimes with a tendency towards triphylic). The external lobe, the lateral lobe and the following one are, again, similar.

A quite similar disposition of the constrictions is exhibited by *Togaticeras*

*stella*, the main differences being the closer umbilicus, with an inclined umbilical wall, and a slightly periumbilical keel (Pl. I, Fig. 8). Moreover, the whorl section is platycone at “*stella*.” The suture line has a similar shape, but with three dyphylic saddles and three monophyllic ones; the lobes display the same general pattern.

In relation to the phylloceratids, Fantini Sestini (1974) noted that in several specimens of *Meneghinceras* from the Italian Pliensbachian, the tuberculated keel of the adult stage is preceded by one similar to that of *Harpophylloceras*. As a result, the necessity of their separation by Spath (1927) becomes questionable. (Prior to this paper, Fucini (1923/1920) and Schroder (1927) assigned “*eximius*” to *Meneghinceras* – fide Fantini Sestini, 1974). Different points of view have been formulated since: either the related genera *Meneghinceras*, *Harpophylloceras* and *Juraphyllites* are of subgeneric rank (Macchioni

and Meister, 2003), or *Meneghiniceras* and *Harpophylloceras* are synonymous (Schweigert, 2005; Keupp and Schweigert, 2008), *Juraphyllites* remaining a distinctive genus. In the first case, *Meneghiniceras* has priority, but sometimes it is quoted (along with *Harpophylloceras*) as a subgenus of *Juraphyllites*. (Blau and Meister, 1991; Géczy and Meister, 1998; Meister and Friebe, 2003).

Schweigert (2005) went as far as to regard “*lariense*” and “*eximius*” as a single biospecies, with the juvenile or pre-adult specimens being assigned to “*eximius*,” as only in adult stage of “*lariense*” does the tuberculated keel develop. This synonymy overlooked the several other differences between the species in question that were emphasized by Fucini (1899). Thus, *M. lariense* has a rounded umbilical edge, unlike “*eximius*,” which displays a distinct angular edge and an oblique, flat or slightly concave umbilical wall. As noted above, “*eximius*” could also display several constrictions as intraspecific variability – Machioni and Meister (2003).

Several authors regarded “*lariense*” and “*eximius*” as distinct genera, until a new taxonomic proposal was made (Géczy and Meister, 2007). Moreover, Rakús (1993, pp. 943) considered that a new subfamily was necessary within the juraphyllitidae for the genera featuring the keel, namely *Meneghiniceras* and *Harpophylloceras*.

Patrulus (1960) assigned Uhlig’s species to the *Harpophylloceras* genus and, later, Turculeț (1970) even proposed a new subgenus, *Bucoviniceras*, based on the intermediate features. Meister and Friebe (2003) and Meister et al. (2011) considered “*bucovinicus*” as a *Juraphyllites* species. Our opinion leaned, at first, towards Patrulus’ assignment, given the fact that the presence of the small keel could be viewed as a new distinctive character for several phylloceratids genera, namely *Harpophylloceras* and *Meneghiniceras*. Thus, the keel is a synapomorphic character in the case of the juraphyllitids, which means that *Juraphyllites*, *Harpophylloceras* and *Meneghiniceras* form a distinct clade. However, a species with a true keel, *Harpophylloceras cristatum* STUR m.s.,

1875, was quoted earlier by Rakús (1999) for the *Oxynoticeras oxynotum* Zone. Consequently, we suppose that Uhlig’s species evolved a keel independently, as an ontogenetic pattern, probably without descendants. The assignment to the *Juraphyllites* genus seems suitable, at least at this stage of the research. The proposal of the *Bucovinicus* subgenus (Turculeț, 1970) could be valid if other species proved to display the intermediate features, especially the small keel near the aperture.

## Conclusions

New specimens of *Juraphyllites bucovinicus* were added to the Uhlig’s holotype, which is stored at the Austrian Geological Survey in Vienna. They were collected *in situ* from the *stratum-typicum* (*Paltechioceras aplanatum* Sub-biozone, marked here by *P. romanicus*; *Echioceras raricostatum* Zone), and they form a topotype series. The main significance of *Juraphyllites bucovinicus* resides into a small keel near the aperture developed as an ontogenetic pattern. We suppose that the species developed this keel independently, probably without descendants. This assertion is supported by the earlier appearance of the first juraphyllitid with a keeled venter from the *Oxynoticeras oxynotum* Zone, namely *Harpophylloceras cristatum* STUR m.s., 1875 (RAKÚS, 1999).

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**CAPTION OF PLATE****Plate I**

Figs. 1-6 *Juraphyllites bucovincus* (UHLIG, 1900), (x 1), Prașca Klippe, *Echioceras raricostatum* Zone, specimens 1, 4, 3, 5, 8, 29.

Fig.7 *Juraphyllites libertus* (GEMMELLARO, 1884), (x 1), Prașca Klippe, *Echioceras raricostatum* Zone.

Fig. 8 *Togaticeras stella* (SOWERBY, 1833), (x 1), Prașca Klippe, *ex situ Arnioceras semicostatum* Zone.

Fig. 9 Suture line of *Juraphyllites bucovincus* (UHLIG, 1900), (x 3,2). specimen 4. Prașca Klippe, *Echioceras raricostatum* Zone.

Fig. 10 *Juraphyllites bucovincus* (UHLIG, 1900), (x 1), Uhlig's original figures, Pl. I, fig. 5.

**Plate I**

