

The genus *Pseudolillia* (Maubeuge, 1949) (Ammonitina, Grammoceratinae) in the upper Toarcian of the Central Apennines (Cingoli, Macerata, Italy)

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KEY WORDS - *Hildoceratidae*, *Grammatoceratinae*, *Pseudolillia*, *Toarcian*, *Tethys*, *Central Apennines*.

ABSTRACT - The genus *Pseudolillia* was established by Maubeuge (1949) for the only specimen finding in North-Eastern France (Northwest European Province - Tethyan Realm). This genus of the upper Toarcian (Insigne zone) was afterwards reviewed by Elmi & Rulleau (1990), who recognised three species by studying a few specimens found in other provinces of France, as well as in other countries such as Spain, Portugal, and Morocco. The genus *Pseudolillia* has been recently found in the Central Apennines (Italy), Marconessa's Quarry of Cingoli (MC), during a biostratigraphic sampling (currently in progress) for the upper Toarcian outcrops (Bonarellii zone). We propose the new species *Pseudolillia apenninica*, on the basis of its typical traits, which distinguish our specimen from the three acknowledged species of the genus *Pseudolillia* of the Northwest European and Sub-Mediterranean Provinces. The discovery of *Pseudolillia* in the Tethyan Mediterranean Province is also of great interest for paleoecology and paleobiogeography and testifies an ammonitic faunal dispersal between the Tuscan-Umbrian-Marchean (TUM) basin and European epicontinental sea, perhaps related to eustatic changes according to Hallam's hypothesis (1987).

RIASSUNTO - [Il genere *Pseudolillia* (Maubeuge, 1949) (Ammonitina, Grammoceratinae) nel Toarciano superiore dell'Appennino centrale (Cingoli, MC, Italia)] Il genere *Pseudolillia* (Maubeuge, 1949) è stato originariamente stabilito sulla base di un solo esemplare trovato nella Francia Nord orientale; è stato poi ridefinito da Elmi & Rulleau (1990), tramite vari esemplari trovati anche in altre regioni della Francia, come in Spagna, Portogallo, e Marocco nel Toarciano superiore (zona a Insigne). Questo genere è stato recentemente rinvenuto anche nella Cava della Marconessa (SIELPA) di Cingoli (MC), Appennino marchigiano, durante un campionamento biostratigrafico attualmente in corso sugli affioramenti del Toarciano superiore (zona a Bonarellii). Il nostro esemplare presenta alcuni caratteri peculiari, diversi da quelli delle tre specie riconosciute del genere *Pseudolillia* della provincia europea, e per questo motivo proponiamo l'istituzione della nuova specie *Pseudolillia apenninica*. Il rinvenimento di questo genere anche nella provincia della Tetide mediterranea ha interesse paleoecologico e paleobiogeografico, ed evidenzia la presenza nel Toarciano superiore, di vie di scambio faunistico tra tale provincia e quella del mare epicontinentale europeo, forse connesse da moti eustatici secondo l'ipotesi di Hallam (1987). La grande rarità degli esemplari rinvenuti di questo genere, la loro limitata distribuzione geografica e gli adattamenti morfostutturali della conchiglia sembrano indicare, inoltre, che le nicchie ecologiche sfruttate da questi ammoniti furono molto peculiari, caratterizzate nella Tetide mediterranea da bacini di mare aperto e seamounts. Nessuna conclusione certa può tuttavia essere tratta, in mancanza di ulteriori dati, circa l'origine evolutiva e l'esatta collocazione tassonomica di questo genere.

INTRODUCTION

The authors of this paper have done a biostratigraphic sampling of a Toarcian outcrop in the Marconessa's Quarry (SIELPA) of Cingoli (MC), Marchean Apennines, Italy (for the geographical location see the geological field trip n° 9 in Passeri, 1994; see also Fig. 1). During this work of sampling, the authors have collected a very interesting and still unpublished ammonitic fauna of the lower Toarcian, *Hildaites serpentinus* (or *Levisoni*) biozone. This collection will be published soon. During the biostratigraphical sampling of the middle and upper Toarcian, before the interruption of this work by will of the society that owns the Marconessa's quarry, a specimen of ammonite to ascribe with certainty to genus *Pseudolillia* was found in good repair. This genus is now reported for the first time in Italy, and its finding sets interesting paleoecological and paleogeographical issues.

The genus *Pseudolillia* was established by Maubeuge (1949) for an only specimen finding in the Murville's mine (Meurthe et Moselle - Lorraine,

France). Afterwards, Donovan (1962) added to this genus the species *Ammonites emilianus* of Reynès (1868), whose holotype comes from Causses (France). Garcia-Gomez & Rivas (1980) have established the species *Pseudolillia donovani* on the grounds of specimens found in the Betic Cordillera (Spain). Finally, the genus *Pseudolillia* was reviewed by Elmi & Rulleau (1990), who have confirmed that this rare and little substantiated genus of the upper Toarcian encloses only three species: *murvillensis*, *emiliana* and *donovani*.

GEOGRAPHIC DISPERSAL AND STRATIGRAPHY OF THE GENUS *PSEUDOLILLIA*

According to current knowledge, the genus *Pseudolillia* has a geographic dispersal area between Western Europe and Central Europe, with a northern boundary in Lorraine and southern boundary in the Moroccan Atlas. At present, this rare genus has been found, according to the review of Elmi & Rulleau (1990), in France (Lorraine-Murville, Les Causses, Belmont-Bas Beaujolais, Mont d'Or lyonnaise, Loire-Pouilly sous

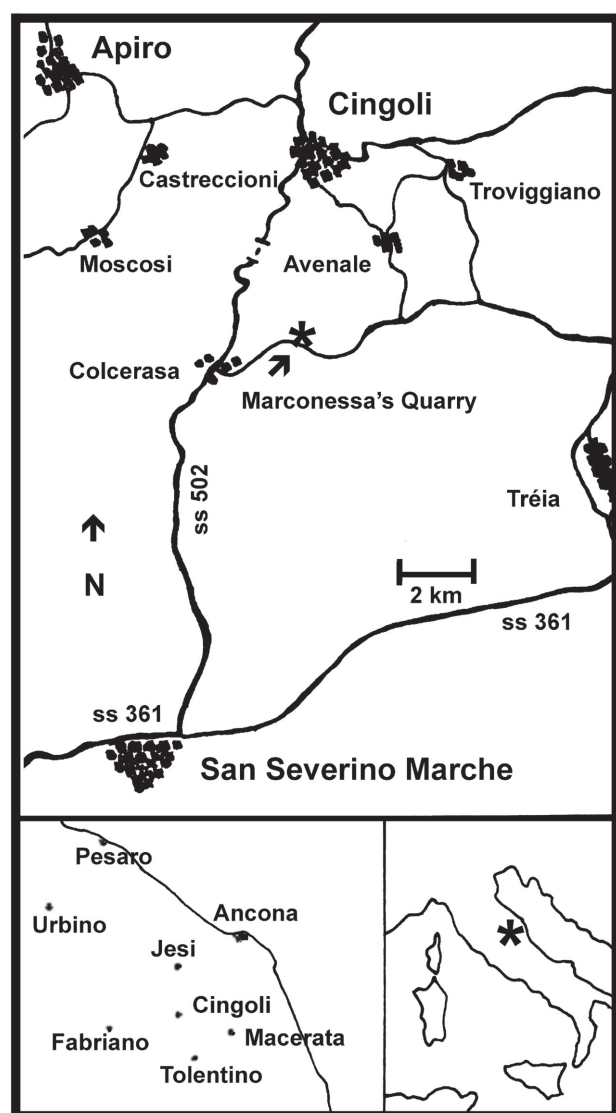


Fig. 1 - Location of the Marconessa's Quarry of Cingoli (MC), Italy.

Charlieu), in Spain (Iberian Cordillera, Betic Cordillera, Asturias), in Portugal, and in Morocco (Southern middle Atlas and Eastern High Atlas). One will be need to verify, according to Elmi & Rulleau (1990), the presence of *Pseudolillia* in the Central and Western Balkans (Sapunov, 1968) and in Hungary (Géczy, 1984, 1985). According to these authors the genus *Pseudolillia* is therefore widespread in the Western European epicontinental sea and in its southern edges (Northwest European and Sub-Mediterranean Provinces; see Page (1996) for paleogeographical terms) bordered by the Tethyan Ocean. Now, we have enlarged the geographic distribution area for the genus *Pseudolillia*, after its discovery in the Central Apennines.

According to many authors (Maubeuge, 1949; Donovan, 1962; Guex, 1973, 1975; Goy, 1974; Garcia Gomez & Rivas, 1980), the genus *Pseudolillia* has a stratigraphical occurrence in the *Insigne* zone of the

upper Toarcian. In detail, according to Elmi & Rulleau (1990), the species *murvillensis* and *emiliana* are found in the *Insigne* subzone, whereas the species *donovani* is recorded on the top of the *Fallaciosum* subzone. According to these authors, in the province of Lyon the species *murvillensis* and *emiliana* are collected with large size specimens of *Hammatoceras* such as *insigne*, *cappucinum*, and *speciosum*. Rulleau et al. (2001) have suggested a new ammonite zonation for Northwest European provinces, and they have assigned to the genus *Pseudolillia* a stratigraphical layout situated between the top of the *Thouarsense* zone (*Fallaciosum* subzone) and the lower part of the *Dispansum* zone (*Insigne* subzone), where the species *murvillensis* and *emiliana* are recorded. This zonation is correlated, according to these authors, with a stratigraphical layout located between the *Bonarellii* zone and *Speciosum* zone of the ammonite zonation of the Mediterranean Province (Venturi, 1999). The specimen of *Pseudolillia* found in the Central Apennines is recorded in the *Bonarellii* zone.

SYSTEMATICS OF THE GENUS *PSEUDOLILLIA* AND DESCRIPTION OF THE APENNINIC SPECIMEN

Order AMMONOIDEA Zittel, 1884

Suborder AMMONITINA Hyatt, 1989

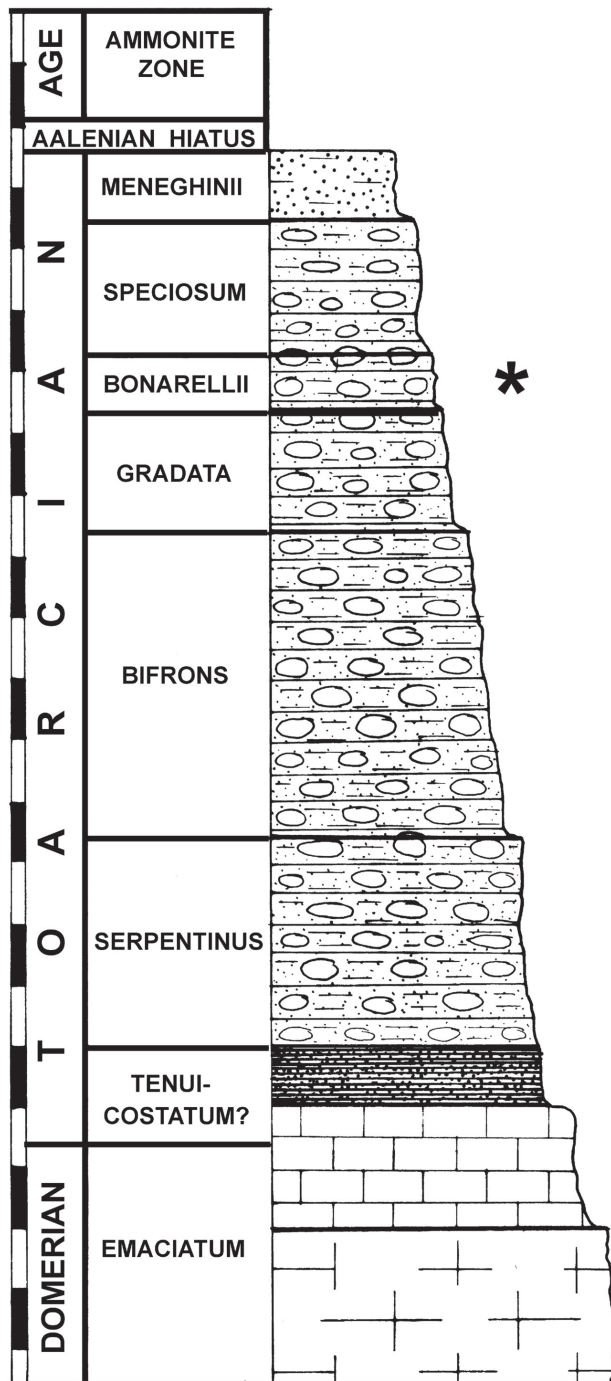
Superfamily HILDOCERATACEAE Hyatt, 1867

Family HILDOCERATIDAE Hyatt, 1867

Subfamily GRAMMOCERATINAE Buckman, 1905

Elmi & Rulleau (1990) have made a synoptic diagnosis of the genus *Pseudolillia*, which is characterized by large-sized specimens, that can be summarized and improved as follows: the shell has more or less involute whorls, with a sub-trapezoidal whorl section that reaches the maximum thickness near the umbilical wall; its keel is strong and the venter is flat or rounded, without sulci. The umbilical wall is typically very high and more or less vertical. The ornament shows ribs almost straight, radiate (rectiradiate or «gammiradiée» by Elmi & Rulleau, 1990), more or less projected on the ventro-lateral edges. The ribs are fine and dense in the inner whorls; they decrease in number during the growth of the outer whorls until they disappear in the fully-grown stage. The suture line is simple, typical of the Hildoceratidae, with asymmetrical lobes and little jagged saddles.

Most of the authors (Donovan, 1962; Gabilly, 1976; Garcia-Gomez & Rivas, 1980; Donovan et al. 1981; Elmi & Rulleau, 1990) have included the genus *Pseudolillia* in the subfamily of Grammatoceratinae, by reason of some characters above mentioned in the diagnosis. However, Maubeuge (1949) and Arkell (1957) have included this genus in the subfamily of Phymatoceratinae. These authors, in fact, emphasize a strong likeness of *Pseudolillia* with *Lillia*, *Crassicerias* and *Brodieia*; whereas most of the aforesaid authors believe it to be likely the descent of *Pseudolillia* from last Grammatoceratinae, such as *Protogrammoceras* or *Esericeras*.



LEGEND

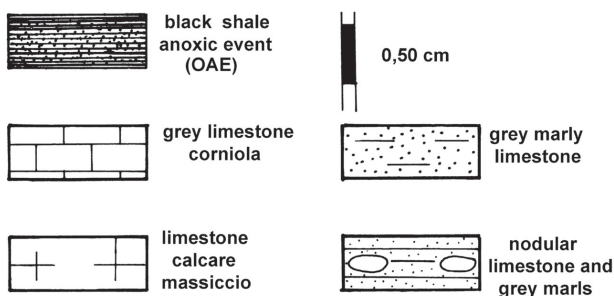


Fig. 2 - Log of the Marconessa's Quarry. The asterisk (*) marks the bed with *Pseudolillia apenninica*.

Genus *Pseudolillia* Maubeuge, 1949

Pseudolillia apenninica n. sp.
(Figs. 3a-c, 4-5)

Material - A well preserved phragmocone MSA 3121 of medium-large size, that shows the beginning of the body-chamber.

Derivatio nominis - From the location of the recording: the Marchean (Central) Apennines, where the genus *Pseudolillia* is reported for the first time in Italy.

Holotype - MSA 3121 from Marconessa's Quarry (SIELPA), near to Cingoli (MC), Italy.

Typebed - Nodular limestone and grey marls of the upper Toarcian (see the log: Fig. 2).

Diagnosis and description of the holotype - Moderately involute platycone shell with a high and compressed sub-triangular whorl section, which shows maximum thickness near the umbilical edge. The venter is rounded, but it is not flat, without sulci, with a moderately strong keel. The umbilical edge is slightly rounded, while the umbilical wall is very high and vertical, typical of the genus.

The ornament shows straight and little strong ribs, fine and dense in the inner whorls, almost rectiradiate, but with a strong ventral projection. During the ontogenesis, the ribs become less strong and more sparse until they disappear in the last third round of whorl, near the beginning of the body-chamber.

The suture (Fig. 4) is little jagged; it shows a wide and deep lobe L. The lobe U_2 is long and narrow, the lobe U_3 is small. The suture also shows two little lobes in the umbilical wall. The lobe E is long about the half length of the lobe L.

Measurements - Shell diameter at maximum size: 118 mm (D); umbilical diameter: 46 mm (UD); UD/D ratio = 0.39; whorl breadth at maximum size: 24 mm (b); whorl height at maximum size: 44 mm (h); b/h ratio = 0.55.

Remarks - Our new species *apenninica* cleanly differs in some characters from all the acknowledged species of the genus *Pseudolillia*, but it also shows the typical characters of this genus. The species *murvillensis* has an involute shell and a coil covering about 1/2 of the height of the whorls, but its section is wide and swollen; whereas *apenninica* has a very compressed whorl section with less coil covering and it has a typical appearance of a flattened platycone shell. The venter of *murvillensis* is wide and flat, whereas *apenninica* shows a narrow and rounded venter, which is not flattened and is not sulcate, like some typical Harpoceratinae of the Mediterranean Province as *Neotaffertia* and *Martanites*. The ornament of the inner whorls of *murvillensis* is less strong than in *apenninica*.

The species *emiliana* shows a very involute whorls, a coil covering about 2/3 of the height of the whorl, a



Fig. 3 - *Pseudolillia apenninica*, n. sp., holotype (x 1), from Marconessa's Quarry.

high sub-trapezoidal whorl section and a wide and almost flat venter; whereas *apenninica* has the least involute shell of the genus *Pseudolillia*, it also shows a very flattened whorls and a sub-triangular whorl section and its venter is narrow and rounded. The ornamentation of the inner whorls of *emiliana* is stronger than in *apenninica*, but it disappears early in the growth of the shell like in *murvillensis*.

The species *donovani* shows some characters of the ornamentation and morphology of the shell similar to that of *apenninica*; on the other hand *donovani* shows a moderately involute shell, a coil covering about 1/2 of the height of the whorl, and a high sub-oval section more swollen than in *apenninica*. *Donovani* has a lower umbilical wall and a little rounded umbilical edge, almost sloping and not completely vertical, contrary to the other species of *Pseudolillia*. Moreover, the ornament of *donovani* disappears early compared to our new species *apenninica*. The specimen of *donovani* most similar to *apenninica* is the specimen shown by Elmi & Rulleau (1990, Pl. 7, figs. 3-4): it is the specimen of all the Sub-Mediterranean and the Northwest European Provinces whose stratigraphical occurrence is with certainty the top of the *Fallaciosum* subzone (*Insigne* zone or *Thouarsense* zone), therefore

more ancient compared to the other French congeners. This specimen however differs from our species *apenninica* in its ornament that disappears early and also in the greater involution of its shell.

Beyond the aforesaid morphological traits, our species *apenninica* differs from *murvillensis* and *emiliana* in its stratigraphical occurrence. According to the current ammonites zonation of the Mediterranean

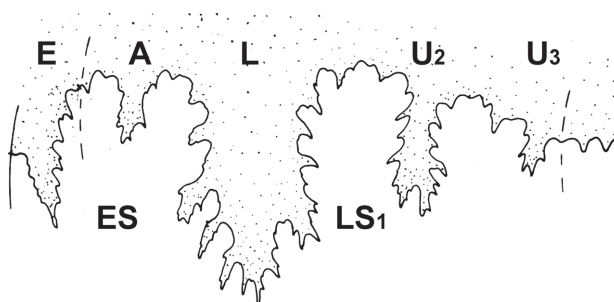


Fig. 4 - Suture line of *Pseudolillia apenninica* n. sp., holotype, (x 2), at 87 mm of diameter size.

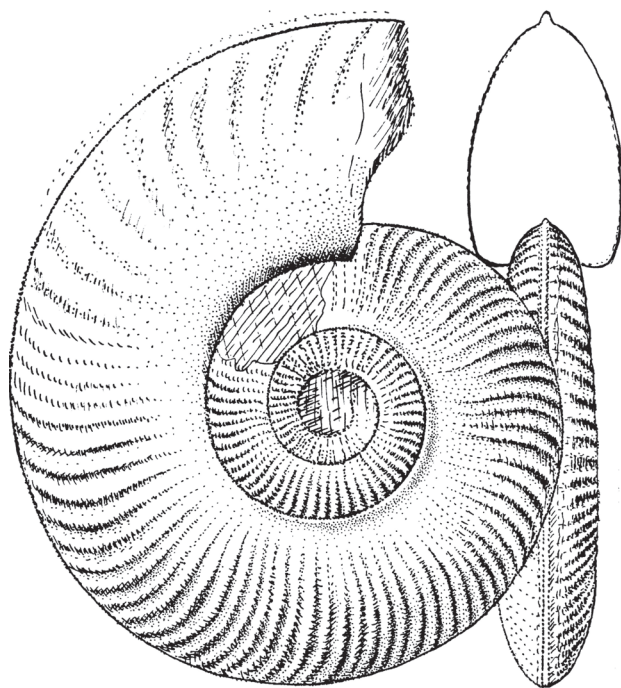


Fig. 5 - Holotype drawing of *Pseudolillia apenninica* n. sp. (x 0.75).

Province, the *Thouarsense* zone of the Sub-Mediterranean and Northwest European Provinces is equivalent to the *Bonarellii* zone, while the *Dispansum* zone is equivalent to the *Speciosum* zone (Venturi, 1999). Our species *apenninica* is collected with “*Hammatoceras*” (*Géczyeras*) *bonarellii* and therefore it would appear, as in the case of the species *donovani*, earlier than *murvillensis* and *emiliana*, whose stratigraphical occurrence is ascribed instead to the *Dispansum* zone, that is equivalent to the *Speciosum* zone of the Mediterranean Province. According to Elmi & Rulleau (1990, 1991) the only specimen of *donovani* recorded in France (Lafarge Quarry of Belmont) has a stratigraphical occurrence at the top of the *Fallaciosum* subzone of the *Insigne* zone, currently the *Thouarsense* zone; it is a precursor of the species of *Pseudolillia* of the upper *Insigne* subzone, currently the *Dispansum* zone.

Stratigraphic occurrence - *Bonarellii* zone of the upper Toarcian (see Fig. 2); in fact our specimen of *Pseudolillia apenninica* was collected with “*Hammatoceras*” (*Géczyeras*) *bonarellii*. A more detailed faunal assemblage for the new species *P. apenninica* will be impossible until the society that owns the Marconessa's Quarry removes its hindrance to our work of biostratigraphical sampling.

DISCUSSION AND CONCLUSIONS

The discovery in the Central Apennines of the record of the genus *Pseudolillia* has extended our knowledge of the geographic distribution of this rare genus of ammonites of the upper Toarcian; and it also poses

some paleoecological, paleobiogeographical and evolutionary taxonomy problems.

Elmi & Rulleau (1990) have stated, on the basis of their analysis of paleobiogeography and paleoecology of the genus *Pseudolillia*, that the acknowledged species of this genus are typical of continental shelf seas with shallow waters (50-100 m). Nevertheless, the same authors have claimed that the specimens of *Pseudolillia* found in Spain (Betic Cordillera) would testify that the species *donovani* also survives in deeper waters, if they are characterized by islands and seamounts. This habitat would have favoured the geographical dispersal of the populations of this genus, in addition to supporting other taxa of ammonites of the upper Toarcian, such as *Gruneria*.

The morphology of *Pseudolillia apenninica*, which is a compressed platycone and moderately involute shell with a keel, would seem to confirm the paleoecological analysis of Elmi & Rulleau (1990), that the species of this genus were adapted to survive in shallow waters, or in deeper waters if characterized by islands and seamounts. According to current paleoecological and paleogeographical knowledge, a similar habitat characterized by shallow waters and seamounts was typical of the Tuscan-Umbrian-Marchean basin (TUM) during the Toarcian age.

The dispersal of the ammonitic fauna along the seaways from South to North of the Tethyan Realm has been hypothesised by some authors (Pinna & Levi-Setti, 1971, 1973; Elmi & Rulleau, 1996) and it has been put in relation to eustatic changes (Hallam, 1987). The dispersal of the populations of the genus *Pseudolillia* seems to confirm these claims.

We have described the new species *Pseudolillia apenninica* for its typical traits, which distinguish this species from the three other acknowledged species of genus *Pseudolillia* of the Sub-Mediterranean and Northwest European Provinces. At the current and limited status of research, this new species seems to be endemic to the Mediterranean Province of the Tethyan Realm. *P. apenninica* seems to be, both for morphological traits and for stratigraphic occurrence, the most ancient member of its genus. New data would confirm a possible origin of the species of this genus by some kind of geographic speciation (allopatric or parapatric) between the Mediterranean and the Sub-Mediterranean Provinces.

Nevertheless, the issue of whether phyletic derivation of this rare genus of ammonites comes from Phymatoceratinae or from Grammoceratinae remains unclear at the current status of research. In this study it is this second hypothesis which is favoured, however any reliable answer is at the moment impossible, without a more detailed study of the ontogenetic growth of the shell inner whorls and major paleogeographic and biostratigraphic data.

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