

NEW DATA ABOUT THE AMMONITE GENUS
PSEUDOLIOCERAS BUCKMAN, 1889 (HARPOCERATINAE,
AMMONITINA) FROM THE TOARCIAŃ OF THE BALKAN
MOUNTAINS (BULGARIA)

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Abstract

This study examines the representatives of the ammonite genus *Pseudolioceras* Buckman, 1889 (Harpoceratinae, Ammonitina) from Bulgaria. It was inspired by some new discoveries from the Ozirovo Formation of the Balkan Mountains belt. Two localities yielded the ammonites which are the object of the present note: the topmost beds of the Ozirovo Formation at the valley of the river Zhidov dol (Troyanska Planina Mt, Central Balkan Mts) as well as the beds of the upper part of the Ozirovo Formation which are exposed to the north of the village of Dragovishtitsa (Mala Planina Mt, Western Balkan Mts). *Pseudolioceras* has previously been known by few ammonites of *P. lythense* (Young & Bird, 1828), from the Lower Toarcian Bifrons Zone. It is shown now that the genus occurs within the Upper Toarcian too, so the stratigraphical range of the genus has to be extended upwards. Two species are described and figured herein: *Pseudolioceras alienum* Dágis, 1967, from the top of the Dispansum Zone, as well as *Pseudolioceras beyrichi* (Schloenbach, 1865), from the Pseudoradiosa and the Aalensis Zones. Hence, the total range of *Pseudolioceras* in Bulgaria is recognized to be developed from the base of the Lower Toarcian Bifrons Zone to the top of the Upper Toarcian Aalensis Zone.

Key words: *Pseudolioceras*, Harpoceratinae, ammonites, Toarcian, Bulgaria

Introduction. This work is based on newly collected ammonites from two exposures of the Upper Toarcian in the Western and Central Balkan Mountains (Bulgaria). The aim is twofold: first, to give new evidence on the stratigraphic distribution of the genus *Pseudolioceras* in Bulgaria, and secondly, to describe the ammonites themselves. It was prompted by the circumstance that the ammonites of this genus were known so far by one species from the Lower Toarcian only. As new material has appeared recently, the concept about the stratigraphical distribution and the species composition of *Pseudolioceras* from Bulgaria has changed. Now it is much more comparable to the species and occurrences from outside the country. The account that follows is directed mainly to the taxonomic descriptions of the newly acquired specimens. It is because no ammonites of *Pseudolioceras* have been described and figured from Bulgaria before. There are also re-determinations of ammonites collected by previous workers which are associated with the new data.

Two localities have yielded the ammonites of *Pseudolioceras* for this study. The first one is situated in the valley of the river Zhidov dol, a right feeder of the river Cherni Osam (Troyanska Planina Mt, Central Balkan Mts, Lovech District) (Fig. 1A).

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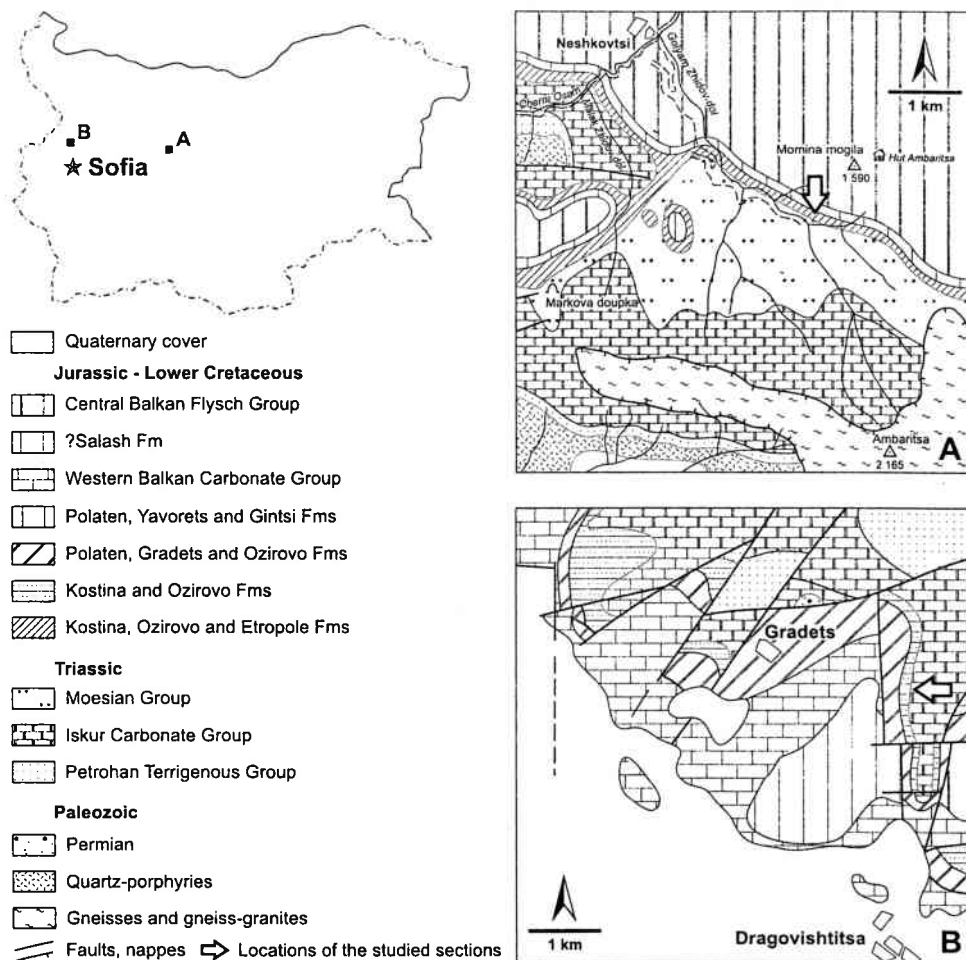


Fig. 1. Geological situation of the localities from which *Pseudolioceras* have been obtained: **A**-sketch of a part of Troyanska Planina Mt (Central Balkan Mts), with position of the locality in the valley of the Zhidov dol river; **B**-sketch of a part of Mala Planina Mt (Western Balkan Mts), with position of the locality near the village of Dragovishtitsa (after geological map of Bulgaria, M 1 : 100 000, simplified)

It concerns the topmost beds of the Ozirovo Formation in which a full set of ammonite zones of the Toarcian has been established. This sequence (about 1.5 m thick) consists of grey bioclastic limestones (phosphatized wackestones and iron ooid-bioclastic packstones). *Pseudolioceras* were found in the next to the last bed of the Ozirovo Formation, together with ammonites characteristic of the Aalensis Zone. The second locality is positioned at about 4 km to the north of the village of Dragovishtitsa (Mala Planina Mt, Western Balkan Mts, Sofia District) (Fig. 1B). It represents a part of the Ozirovo Formation which is already known from the literature [1]. *Pseudolioceras* in this outcrop came from the top of the Dispansum Zone and from the Pseudoradosa Zone. They are preserved in ferruginized limestones (ooid-bioclastic wackestones) and ooidal ironstones with lithoclasts and bioclasts.

Taxonomic descriptions

Family **HILDOCERATIDAE** Hyatt, 1867

Subfamily **HARPOCERATINAE** Neumayr, 1875

Genus *Pseudolioceras* Buckman, 1889

Type species. *Ammonites compactilis* Simpson, 1855, by original designation (BUCKMAN, 1889, p. 81) [2] = *Ammonites bouliensis* Young & Bird, 1822 – holotype (Whitby Museum 208), figured by BUCKMAN (1910, pl. 13) [3] and refigured by HOWARTH (1992, pl. 26, Figs 1a, b) [4].

DIAGNOSIS. According to Buckman's original definition [2] this genus includes ammonites which are: "Discoidal, compressed, hollow-carinate; whorls broad and subconvex, ornamented with subfalciform radii which approach the carina at an acute angle. The ribs are distinct only on the outer area, not prominent, rather broad, and rounded. The ventral area exhibits a very narrow space on each side of the carina, which space is sometimes scarcely defined from the lateral area; but when the test is absent the ventral portion is an ill-defined, scarcely carinate, convex area joining the two sides of the whorl. The carina is sharp, distinct, somewhat prominent, and hollow. The umbilicus is small, rather deep, formed of a series of very small steps; it has a flattened middle, indicating that in extreme youth there was less occlusion. The position of the septa with regard to one another indicates a medium-sized chamber". A modern diagnosis of the genus, with complete reference to nomenclature, geographic and stratigraphic distribution is given by Howarth [4].

DISCUSSION. *Pseudolioceras* is the longest lived member of the subfamily Harpoceratinae, appearing first in the Serpentinum Zone of the Lower Toarcian and surviving until the Laeviuscula Zone of the Lower Bajocian [4, 5]. This genus is widespread in the northern regions of Europe, Asia and Canada and does not occur in Tethyan localities or farther south [4]. It is best known from its occurrences in Britain: the Alum Shale Formation, and the Striatulus Shale Formation (Yorkshire), *Leda ovum* Beds (Northamptonshire), Cotswold Sands and the Cephalopod Bed (Gloucestershire) [4]. Abundant and well-preserved material with authentic stratigraphical record is documented from the Toarcian in Southern France as well [5]. The genus is a major component of the Upper Toarcian ammonite successions in Northern Siberia and the Far East where its species constitute the zonal and subzonal set of the substage [6]. The wide range in morphology with respect to the umbilical width and rib-density that occurs in *Pseudolioceras* has led to the proposal of many specific names in the literature. According to Howarth [4] most of the old names are based on type specimens without records of the original stratigraphical positions. Having at his disposal a rich and well-documented collection of *Pseudolioceras* as well as the original type specimens from England, Howarth has drawn a conclusion that two species cover all the occurrences of the genus in Europe from the Serpentinum to the Dispansum Zones (Fig. 3): *P. lythense* (Young & Bird, 1828) (Serpentinum Zone-Dispansum Zone) and *P. bouliense* (Young & Bird, 1822) (Bifrons Zone-Thouarsense Zone). *Pseudolioceras beyrichi* (Schloenbach, 1865) is another species that occurs higher up in the Pseudoradiosa and Aalensis Zones and in the lower part of the Opalinum Zone (Aalenian). It seems that a different succession of *Pseudolioceras* species is developed in the Upper Toarcian in N Siberia and the NE Russia, having evolved probably from *P. lythense*, a wider umbilicus and more prominent ribbing (Fig. 3). The most frequent and the most important species from that area is *Pseudolioceras alienum* Dągys, 1967. At the end of the Aalenian Opalinum Zone further evolution in the *Pseudolioceras* lineage moved north-eastwards through Japan and Alaska, to western and arctic Canada and Spitzbergen, where it is represented by species of more evolute whorls, stronger and falcate ornament, separated in subgenus *Tugurites* by SEY, KALACHEVA & WESTERMANN [7].

In Bulgaria *Pseudolioceras* is less frequent than in NW Europe. The first record of the genus have appeared from the thin Lower Toarcian Bifrons Zone in the section at the hamlet of Neshkovtsi (Central Balkan Mts, Lovech District), from which several ammonites determined as *Pseudolioceras xistense* Monestier have been reported [8]. After a critical re-examination of these specimens they have been accepted to be

typical examples of *P. lythense* (Young & Bird). Other discoveries of *P. lythense* of the same age have recently been found in one more locality – the section near the village of Beledie Han (Western Balkan Mt, Sofia District) [9]. *P. boubliense* is not recorded in Bulgaria yet. In order to form a link with the newly collected *P. alienum* Dagens and *P. beyrichi* (Schloenbach), from the Upper Toarcian Dispansum, Pseudoradiosa and Aalensis Zones, which are described below, it should be found in the Variabilis or Thouarsense Zones, but such occurrences have yet to be discovered. Owing to the difficulty in obtaining enough specimens, the stratigraphical distribution and specific composition of *Pseudolioceras* remain insufficiently well-evaluated. Even poorer in *Pseudolioceras*, Bulgarian localities seem, however, to contain a mixture of species both typical of NW Europe and N Siberia. In this way, they can be adopted as a possible liaison path between the European and Siberian occurrences of the genus.

OCCURRENCE. Lower Toarcian (Serpentinum Zone) to Lower Bajocian (Laeviuscula Zone). Europe, Caucasus, Transbaikal, NE Siberia, Japan, Alaska, Canada, Greenland, Spitzbergen. Bulgaria: Toarcian (Bifrons, Dispansum, Pseudoradiosa and Aalensis Zones), Western and Central Balkan Mts.

***Pseudolioceras alienum* Dagens, 1967 (Fig. 2 e-g)**

1967. *Pseudolioceras alienum* Dagens, p. 54, pl. 1, Figs 7, 8; pl. 3, Fig. 2 [10].

1974. *Pseudolioceras alienum* Dagens; Dagens, p. 48, pl. 17, Figs 1-8 [11].

TYPE. The holotype (specimen No. 312-18, kept at the Institute of geology and geophysics in Novosibirsk, coll. No. 312) is described and figured by DAGIS (1967, p. 54, pl. 1, Figs 8a, b) [10]. It comes from Upper Toarcian of the Omolon Massif, NE Russia. Eight syntypes from the same region, which are housed at the Institute of geology and geophysics in Novosibirsk as well (coll. No. 420) are described and figured later by the same author [11]. This species is an index of a standard zone in N Siberia which is equivalent of the standard zonal set from the Variabilis to the Aalensis Zones in NW Europe [6].

MATERIAL. Two specimens were collected from the top of the Dispansum Zone (M576 and M643) in the locality to the north of the village of Dragovishtitsa (Ozirovo Formation, No. 16), Mala Planina Mt, Western Balkan Mts, Sofia District.

MEASUREMENTS:

Holotype (No. 312-18) [10] – $D=35.0$; $H=18.0$ (0.51); $E=10.0$ (0.29); $O=9.0$ (0.26).

Syntypes described and figured by Dagens [11], similar in size with Bulgarian specimens:

No. 420-177 – $D = 43.0$; $H = 22.0$ (0.51); $E = 12.0$ (0.28); $O = 10.0$ (0.23).

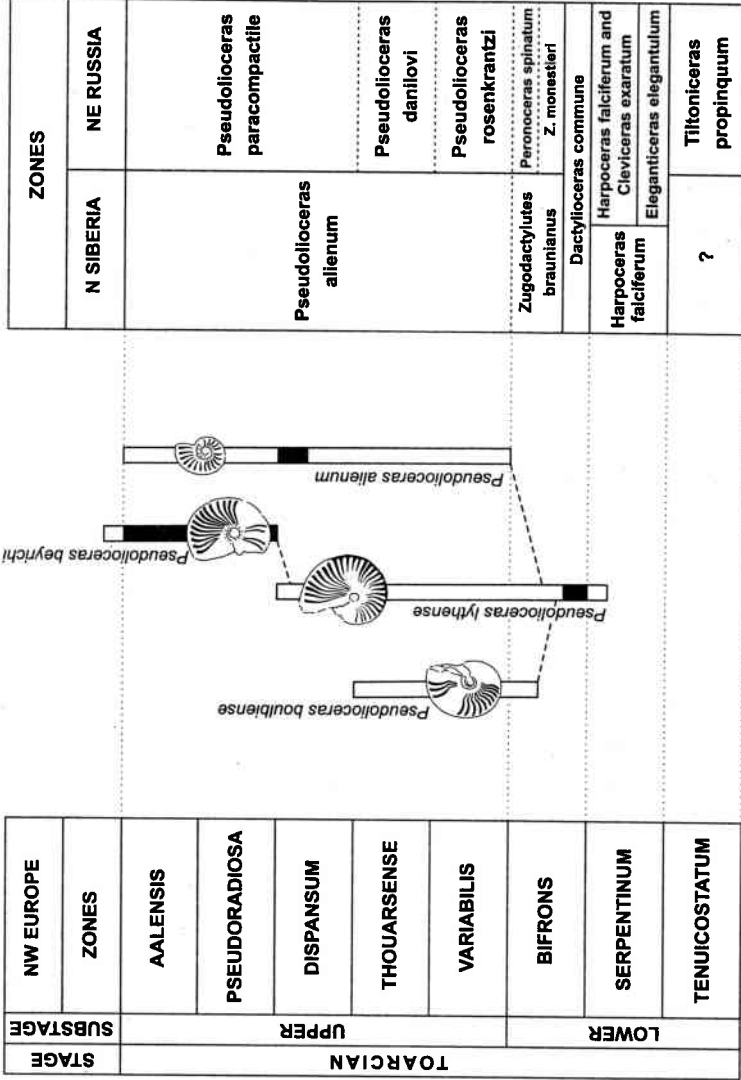
No. 420-178 – $D = 41.0$; $H = 20.0$ (0.49); $E = 11.0$ (0.27); $O = 9.0$ (0.22).

No. 420-183 – $D = 30.0$; $H = 14.0$ (0.47); $E = 7.0$ (0.23); $O = 7.0$ (0.23).

No. 420-185 – $D = 32.0$; $H = 16.0$ (0.50); $E = 9.0$ (0.28); $O = 8.5$ (0.27).

Bulgarian specimens:

Fig. 2. *Pseudolioceras* from the Upper Toarcian of the Balkan Mountains (Bulgaria). a-d: *Pseudolioceras beyrichi* (Schloenbach, 1865), wholly septate from the base of the Pseudoradiosa Zone (locality to the north of the village of Dragovishtitsa, Ozirovo Formation, No. 16): a- lateral view of specimen M591, b- ventral view of the same specimen; c- lateral view of specimen M592 ($\times 1.4$), d- ventral view of the same specimen ($\times 1.4$). e-g: *Pseudolioceras alienum* Dagens, 1967, incomplete phragmocones from the top of the Dispansum Zone (locality to the north of the village of Dragovishtitsa, Ozirovo Formation, No. 16) ($\times 1.4$): e- lateral view of specimen M643; f- lateral view of specimen M576, g- ventral view of the same specimen. h-l: *Pseudolioceras beyrichi* (Schloenbach, 1865), from the Aalensis Zone (locality Zhidov dol, Ozirovo Formation, No. 8); h-j – probably wholly septate: h- lateral view of specimen M4221, i- lateral view of specimen M4202, j- lateral view of specimen M4198; k, l- specimen M4203 consisting of the phragmocone and the body chamber, without preserved mouth-border: k- lateral view, l- ventral view. The photographs shown in the figure were taken by the author, and the specimens were given a thin coating of ammonium chloride. All figures are in natural size unless stated otherwise.

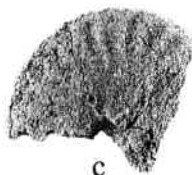




a



b



c



d



e



h



f



g



i



k



l



j

M576 - $D = 18.0$; $H = 8.5$ (0.47); $E = 5.0$ (0.28); $O = 5.2$ (0.28).

M643 - at $D = 20.0$; $H = 9.4$ (0.47); $E = 5.4$ (0.27); $O = 5.4$ (0.27).

DESCRIPTION. Small-sized and moderately involute and compressed ammonites of high and subelliptical whorls, with strong ventral keel, which is flanked by narrow smooth areas, and well rounded umbilical edges. Whorl sides are slightly rounded and convergent to the venter in the outer half. Umbilical walls are sloping to steeply inclined towards a moderately opened and deep umbilicus. The ribs are single, falcoid, relatively strong and widely spaced for *Pseudolioceras*, with a short and strongly prorsiradiate portion near the umbilical area, then a sweep backwards on the one third of the sides and finally an acute projection forwards below the ventrolateral edge.

DISCUSSION. The main species to be compared with *Pseudolioceras alienum* is *P. lythense*. Howarth [4] considered former to be a synonym of *P. lythense*, but there are enough morphological differences between them which are a good reason for their separation as different species. The constant differences are the umbilical width and the form of the umbilical walls. In *P. alienum* the umbilicus is wider and less variable in size, and the umbilical walls are beveled, while in *P. lythense* the umbilicus is considerably smaller and the umbilical walls are vertical to undercut. Differences in the ornament are also marked - the dorsal halves of the ribs are shorter and more prominent in *P. alienum*, while those of *P. lythense* tend to be longer and more striate. Besides the ornament in *P. alienum* is coarser and more widely-spaced than in *P. lythense*. It is probable that *P. alienum* is descendant of *P. lythense* whose lineage disjoins from that of *lythense* moving north-eastwards from Europe to Asia at the beginning of the late Toarcian time and setting up as a different stock that giving rise to a series of different species.

No other species between *P. alienum* and *P. lythense* have been found in Bulgaria until now. So the discovery of these two small ammonites in the association of the Dispansum Zone was surprising. More surprising was the absence of sufficiently comparable specimens from NW Europe and the good match with the individuals from Northern Siberia and North-eastern Russia published by Dągis [10, 11] which are almost identical with those from Bulgaria. Although small, incomplete and slightly leached, they seem to be typical examples of the species, having similar ornament and whorl proportions.

OCCURRENCE. Upper Toarcian. N Siberia (*P. alienum* Zone), NE Russia. Bulgaria (top of the Dispansum Zone).

Pseudolioceras beyrichi (Schloenbach, 1865) (Fig. 2a-d, h-l)

1865. *Ammonites beyrichi* sp. nov. Schloenbach, p. 170, pl. 27, Figs 4, 5 [12].

TYPE. This species is based on two syntypes, probably from the Opalinum Zone (Aalenian), from Mainzholzen and Wenzeln (Braunshweig), NW Germany. Lectotype designated by КАЛАЧЕВА and СЕЙ [13] is the specimen figured by SCHLOENBACH (1865, pl. 27, Figs 5a, b) [12].

MATERIAL. Six specimens were collected as follows: M591 and M592 - from the base of the Pseudoradiosa Zone at the locality to the north of the village of Dragovishtitsa (Ozirovo Formation, No. 16), Mala Planina Mt, Western Balkan Mts, Sofia District; M4198, M4242, M4203 and M4221, from the Aalensis Zone at the locality Zhidov dol (Ozirovo Formation, No. 8), Troyanska Planina Mt, Central Balkan Mts, Lovech District.

MEASUREMENTS:

Lectotype [12] - $D = 67.0$; $H = 35.0$ (0.52); $E = 15.0$ (0.22); $O = 9.0$ (0.14).

M591 - $D = 55.0$; $H = 28.0$ (0.51); $E = 13.0$ (0.24); $O = 8.5$ (0.15).

M592 - $H = 12.6$; $E = 6.5$; $O = 2.0$.

M4198 - $D = 34.0$; $H = 18.0$ (0.53); $E = -$; $O = 5.5$ (0.16).

← Fig. 3. Stratigraphic occurrence of the species of genus *Pseudolioceras* described in this paper, plotted against the zonal sets for the Toarcian in NW Europe [5], N Siberia and NE Russia [6].

M4203 - $D = 78.0$; $H = 39.0$ (0.50); $E = 19.0$ (0.24); $O = 12.0$ (0.15).

M4221 - $D = 44.0$; $H = 23.0$ (0.52); $E = -$; $O = 6.5$ (0.15).

DESCRIPTION. Small to medium-sized individuals with involute and compressed whorls having a tall, hollow and floored ventral keel, prominent and rounded umbilical edge, and vertical to undercut umbilical walls. The umbilicus is small, deep and slightly variable in size. The whorl section is high, with maximum width near the middle of the sides, which are feebly concave at the inner half and converging at the outer half towards the narrow venter. The ornament consists of single and falcid ribs which are weak and prorsiradiate on the inner half of the whorls. Ribs bend backwards at mid-whorl and become wider, moderately strong and rursiradiate. They curve gently forwards just below the ventrolateral edge. In smaller specimens as well as on the internal growth stages of the biggest specimens available for this description, the inner half of the ribs has more incisive relief that quickly gets a striate pattern. Some of ribbing inception is visible on the umbilical walls where they are concave. The biggest specimen collected has a last suture-line at 55 mm diameter, followed by half a whorl of body chamber with no preserved aperture.

DISCUSSION. This is the highest occurrence of *Pseudolioceras* in Bulgaria. This species differs from *P. alienum* by having thicker and more convex whorls, less defined venter and more depressed inner half of the lateral sides. Besides, it has more distinct umbilical edge, which is emphasized by the vertical walls of the deep umbilicus. Compared with the lectotype, Bulgarian specimens have slightly bigger whorl breadth and umbilical width.

OCCURRENCE. Pseudoradiosa and Aalensis Zones (Upper Toarcian) to the lower part of the Opalinum Zone (Aalenian). Britain (Cotswolds), France (Lyon region), NW Germany (Hanover), Far East (southern coast of the Sea of Okhotsk), Northern Caucasus, Bulgaria (Balkan Mts).

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