Západné Karpaty, séria paleontológia 17, pp. 41—56, Geol. Úst. D. Štúra, Bratislava 1993

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Upper Albian ammonites from locality Považský Chlmec near Žilina (Klape unit, Klippen Belt, Slovakia)

2 text-figs., 3 pls. (IX—XI), Slovak summary

A b s t r a c t . The submitted article deals systematically with Albian ammonite fauna found in the Klape unit at Považský Chlmec near Žilina. A total of 210 ammonite specimens were collected, on the basis of which 11 taxons have so far been identified. The assemblage contains fairly abundant heteromorphic forms (*Ancyloceratina*). The species *Dipoloceras cristatum* and *Hysteroceras orbignyi* identified at the locality make it possible to assign the assemblage in the lower part of the Upper Albian—*Mortoniceras (M.) inflatum* zone.

Key words. Slovakia, Western Carpathians, Upper Albian ammonites, systematic, zones.

Introduction

During his field works, primarily geological mapping and sedimentological studies 1976—78 (MARSCHALKO—KYSELA, 1979, 1980), Dr. J. KYSELA of the Dionýz Štúr Institute of Geology in Bratislava collected fairly abundant cephalopod fauna from several localities in the Klape unit of the Klippen Belt (in the area between Považská Bystrica and Žilina). The collected macrofauna was partly identified by Dr. KYSELA (1975) himself, but because of his premature death he failed to study it completely and publish the results.

KYSELA's macrofauna finds mostly lack accurate locations, the enclosed labels usually contain only a general designation of the locality. His richest finds came from two nearby localities designated as Považský Chlmec and Strážov. Ammonites from these two localities were preliminary classified and studied by I. KUŽELOVÁ as part of her student and scientific activity.

KUŽELOVÁ's (1988) studies suggest that the ammonites from these localities are of Upper Albian age. Their assemblages, however, indicate that the finds could not have been collected from a single faunistic layer, but from at least two to three layers assigned to different Upper Albian ammonite zones.

The locality Považský Chlmec is more easily accessible and therefore one of the authors collected further specimens from the local outcrops in 1989 and 1990. The studies confirmed that the ammonite assemblage in the Považský Chlmec area vary from the outcrop to another. KYSELA's ammonite collection and our finds were consequently systematically studied and the results are put forward in this article.

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Geological setting and locality description

The investigated locality is situated near the town of Žilina in the Klippen Belt which is bordered by the Bystrica unit of the Magura Flysch Belt in the north and by the Manín unit or Súľov Conglomerates of the Central Carpathians Paleogene in the south (see Fig. 1 in MARSCHALKO —KYSELA, 1980 and geological map HAŠKO—POLÁK, 1980).

The studied faunistic locality is situated in the Klape unit of the Klippen Belt. The locality consists of several outcrops distributed along the foot of a wooded ridge near the confluence of the Kysuca and Váh Rivers (see text-fig. 1). The Klape unit here was overthrusted towards the northwest onto variegated marls of uppermost Cretaceous age which are part of the Klippen Belt Kysuca Group. The Klape unit has a strongly scaly structure and is tectonically dissected. In the Lower Albian—Middle Cenomanian, a thick flysch formation was laid down in the Klape unit. Its conglomerate + sandstone/pelite ratio is variable. Pelites locally prevail over the clastic sediments. The pelites sometimes contain clay ironstone concretions to thin layers which, in earlier literature, are referred to as siderite or pelosiderite marls (e.g. ANDRUSOV, 1959). According to MARSCHALKO and KYSELA (1980), Albian to Cenomanian flysch deposits of the Klape unit attain thicknesses of 400 to 700 m.

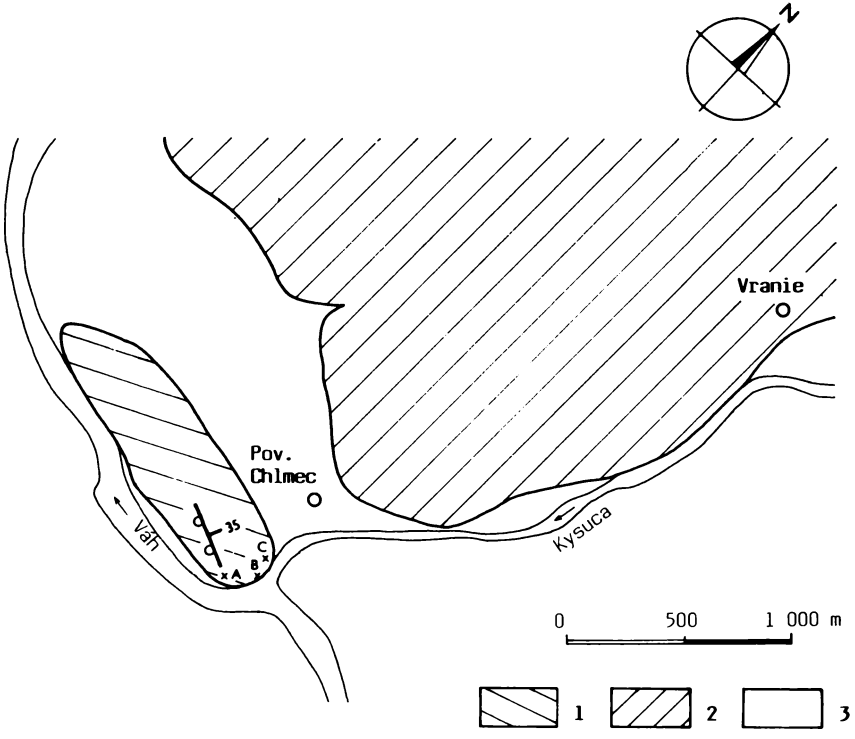

Fig. 1 Location of fossiliferous layers near Považský Chlmec:
A—abandoned quarry near boat dock; B—outcrop near the confluence of the Váh and Kysuca Rivers, now covered by talus; C—outcrop on a slope above the Kysuca. 1—Klape unit (Albian), 2—Kysuca unit (Turonian - Maastrichtian), 3—Quaternary deposits

The above-mentioned flysch deposits in the Považský Chlmec area are the best exposed in an abandoned quarry near a boat dock on the right bank of the Váh River some 100 m down stream from its confluence with the Kysuca River, south of the village of Považský Chlmec (locality A in text-fig. 1). The overturned beds (28/35) are exposed over a thickness of about 9 m. The pelitic sequence is exposed particularly well (see text-fig. 2). The gray silty and sandy marlstones are thinly bedded. They break down to form plates and ovoids. Gray to brownish-gray sandtones (tarnish brown) are commonly fine-grained, sometimes laminated. The thickest layers are as much as 2 m thick. The sandstone beds are boudinaged. The sandstones lower bedding planes are with sole marks as is typical for flysch deposits. The macrofauna in two main layers marked in the lithological column in text-fig. 2. The lower fossiliferous layer (A_1) some 5 cm thick (because of the overturned bed sequence, this bed is exposed higher than A_2) contains fairly rare macrofauna

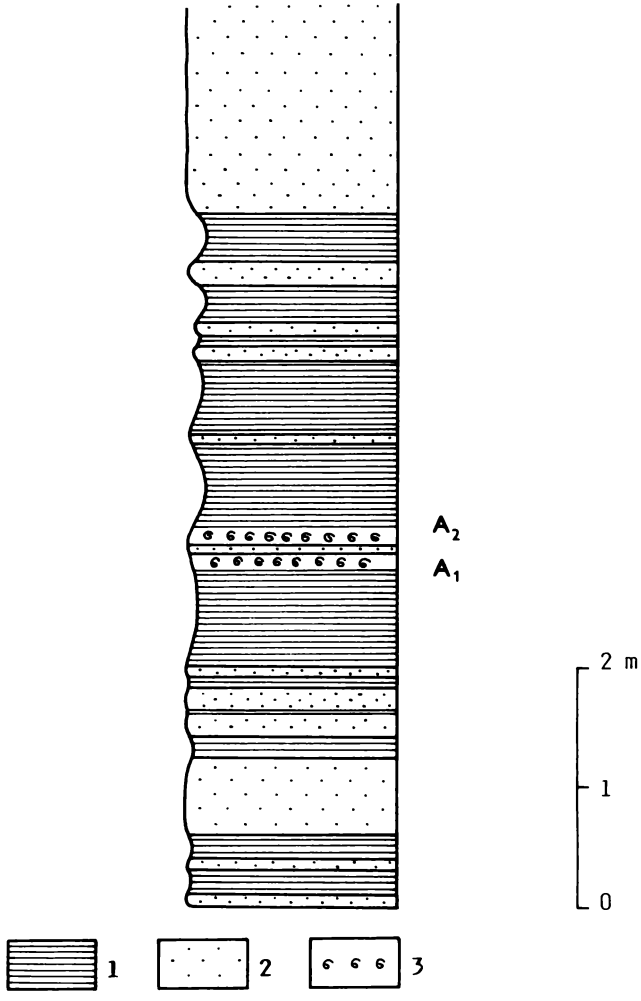

Fig. 2 Lithological section of the quarry near boat dock: 1—pelites, 2—sandstones, 3—faunistic layers

dominated by lytocerate and heteromorphic ammonites irregularly distributed within the layer. The upper fossiliferous layer (A_2) containing macrofauna is nearly 50 cm thick. Its base contains only small fragments of ammonite shells. Upwards, the number of shells and their size increase. They are dominated by ammonites of the genus *Puzosia.* Biggest but broken shells occur immediately below a thin sand layer with bioglyphs in a layer some 2 cm in thickness. The sand layer is overlain by a few cm of pelites without macrofauna which in turn are overlain by a sandstone bed of the overlying sedimentation rhythm. Aside from ammonites, the layer also contains abundant pelecypods (also *Birostrina sulcata* PARKINSON) and exceptional sea urchins, gastropods and belemnites. No representatives of the genus *Hysteroceras* were noted among the ammonites.

According to KYSELA, another faunistic layer (B) is allegedly situated directly at the confluence of the Kysuca and Váh Rivers. As the riverbank in this spot is currently covered by debris, no revision collection can be made.

The third faunistic layer (C) is a natural outcrop on a slope immediately above a trail along the Kysuca River, 50 m upstream from its confluence with the Váh River. The deposits exposed here have the character of pelosiderite or spherosiderite marls. The ammonite fauna includes abundant specimens of the genera *Hysteroceras* and *Puzosia.* In addition to ammonites, pelecypod shells, similar to those collected on the outcrop A, are also present. Strike and dip 14/32 in overturned position.

Systematic Part

The ammonite species are described in a manner commnoly applied in our professional paleontologic literature. The section - Measurements - contains the following abbreviations: D - shell diameter, H - whorl height, U - umbilicus width. Parentheses following the measured values H and U contain H/D and U/D ratios which characterize the shell coiling.

The systematic assignation is based on the fundamental system put forward by ARKELL et al. (1957) and later updated.

Superfamily *Phylloceratacea* ZITTEL, 1884
Family *Phylloceratidae* ZITTEL, 1884

Genus *Phylloceras* SUESS, 1865
Subgenus *Hypophylloceras* SALFELD, 1924

***Phylloceras (Hypophylloceras)* ex gr. *velledae* (MICHELIN, 1834)**
Pl. IX, fig. 1

1965 *Phylloceras (Hypophylloceras) velledae velledae* MICHELIN; WIEDMANN, p. 209; Pl. 11, fig. 1; Pl. 13, fig. 4, Pl. 21, fig. 4, text-fig. 49 (cum syn.)
1985 *Phylloceras (Hypophylloceras)* cf. *velledae velledae* (MICHELIN); THIEULOY in SOUQUET et al., p. 227; Pl. 6, figs. 1, 2
1990 *Ph. (H.) velledae velledae* (MICHELIN); MARCINOWSKI and WIEDMAN, p. 23; Pl. 1, fig. 1, text-fig. 13 (cum syn.)

M a t e r i a l : Only deformed internal moulds, sometimes with poorly visible sutures.

D e s c r i p t i o n : Medium-sized involute shells. The whorls are high and, as a result of the deformation, secondarily slightly arched. Whorl flanks pass almost gradually into the point umbilicus. They also pass onto the outer side which was probably rounded prior to the deformation.

The ornamentation consits of dense, thin ribs of equal type, slightly S-like curved. The ribs are only visible on the outer half of the whorl.

Measurements: The maximum diameter of the shell Pch-72 (corresponding to the axis of elongation) is over 40 mm. Further measurements are meaningless because of the strong deformation.

Remarks: Due to the imperfect preservation of the material, particularly unknown whorl diameter, our specimens cannot be reliably assigned into the species *Ph. (H.) velledae*, although they have equal ornamenation.

Distribution: According to MARCINOWSKI and WIEDMANN (1990), reliably identified representatives of the species *Ph. (H.) velledae* are known from the Upper Aptian to Upper Albian of southeastern Europe, southern Atlantic Ocean, south Africa and Mozambique as well as from the Cenomanian of Madagascar. They were also noted in glauconitic limestones of the Vysoké Tatry series in the Vysoké Tatry Mts. (condensed Albian) on the Polish territory.

Superfamily *Tetragonitaceae* HYATT, 1990
Family *Gaudryceratidae* SPATH, 1927
Subfamily *Guadryceratinae* SPATH, 1927

Genus *Kossmatella* JACOB, 1907
Subgenus *Kossmatella* JACOB, 1907

***Kossmatella (K.)* cf. *muhlenbecki* (FALLOT, 1885)**
Pl. IX, fig. 7

1968 *K. (Kossmatella) muhlenbecki* (E. FALLOT); WIEDMANN and DIENI, p. 39; Pl. 2, fig. 9; Pl. 3, figs. 9, 11, 12, text-fig. 8
?1985 *Kossmatella (K.)* cf. *muhlenbecki* (FALLOT, 1885); THIULOY in SOUQUET et al., p. 221; Pl. 5, fig. 6

Material: A fragment of a fairly large half-whorl with remains of the shell itself.

Description: The preserved half-whorl has a low flat flanks which are fairly distinctly separated from the not very wide, arched outer side. They are also distinctly separated from the low umbilical wall which passes obliquelly onto the umbilicus.

The ornamentation on the outer part of the whorl consists of elevated stretches separated from each other by roughly equally wide, fairly deep furrows. The arched stretches form umbilical tubercles on the division between the flanks and umbilical wall. The furrows are S-shaped. They start immediately on the line of coiling. The furrows are deep in the lower part of the whorl, but toward the outer side they become narrower and shallower. On the outer side they are considerably narrower but continuous and convexely curved relative to the aperture. The whole shell is covered by fine, dense growth lines that have the same pattern as the furrows.

Measurements: The specimen is deformed and incomplete but still the maximum shell diameter in the axis of elongation can be estimated at 46 mm. With this diameter there are 10 umbilical tubercles and the same number of furrows on the half-whorl.

Remarks: The shell is incomplete and deformed and therefore it cannot be reliably identified. Some doubts arise even as to systematic assignation on the generic level because dense growth lines and numerous furrows on the whorl occur not only by the genus *Kossmatella* but also by some species of the genus *Anagaudryceras* SHIMIZU, 1934 (see e.g. *A. buddha* FORBES in KENNEDY and KLINGER, 1979; Pls. 8—11). However, juvenile whorls of the genus *Anagaudryceras* are devoid of furrows and therefore this genus can be ruled out. Deep furrows passing onto the outer side and flat flanks resemble the species *K. muhlenbecki*.

O c c u r r e n c e : The only specimen comes from the quarry at Považský Chlmec.

D i s t r i b u t i o n : WIEDMANN and DIENI (1968), note that the species concerned occurs exclusively in the Upper Albian of France, Spain and Sardinia.

***Kossmatella (K.) schindewolfi* WIEDMANN et DIENI, 1968**
Pl. IX, fig. 2

1968 *Kossmatella schindewolfi* nov. sp.; WIEDMANN and DIENI, p. 41; Pl. 3, fig. 13; Pl. 4, figs. 1, 3, ?2, text-figs. 11, 12
1990 *K. (Kossmatella) schindewolfi* WIEDMANN et DIENI; MARCINOWSKI and WIEDMANN, p. 30; Pl. 2, fig. 8 (cum syn.)

M a t e r i a l : Two flattened fairly small specimens with remain of the shell, partly deformed by lateral pressures.

D e s c r i p t i o n : An evolute medium-sized shell with numerous whorls. The whorls are low, the inner ones have rather rounded flanks gradually passing onto the outer and inner side alike. Probably as a result of deformation, the final whorl has flat flanks which are separated from the narrow and flat outer side by a barely visible edge.

The ornamentation of the earliest preserved part (D=5.5 mm) consist of dense and thin ribs of two different types - slightly thicker main ribs extending as far as the umbilicus between which there are 1 to 2 shorter and thinner ribs. Such a thinner rib may sometimes be diverted from the main one near the umbilicus thereby forming indistinct tubercles. By the shell diameter of some 11 mm, the ribs have a uniform character. At the same time there appear furrows on the whorl which create a characteristic ornamentation of wider arched stretches separated by furrows. The arched stretches with conspicuous wart-like forms begin on the final whorl above the line of coiling. The furrows become shallower and thinner towards the outer side and the stretches above the tubercles become wider.

M e a s u r e m e n t s : The maximum diameter of the deformed shell is some 32 mm. By D=23.0 mm (measured between two main axes of deformation) H=6.2 mm (0.27), U=10.8 mm (0.47). By the maximum shell diameter, the whole whorl is dotted with 16 tubercles and 15 furrows.

R e m a r k s : In spite of the deformation, numerous low evolutely coiled whorls, wart-like tubercles on the umbilicus, flat outer side, the number of tubercles per whorl and some other signs correspond to the diagnosis of the species concerned.

O c c u r r e n c e : The species in question occurs in the quarry at Považský Chlmec in layer A_1 marked in the section (along with the zone species *Dipoloceras cristatum*).

D i s t r i b u t i o n : The species' s authors note that *K. schindewolfi* occurs in the condensed Albian of southern Germany, France, Sardinia and Polish tract of the Vysoké Tatry Mts.

Superfamily *Ancyloceratacea* GILL, 1871
Family *Hamitidae* HYATT, 1900

Genus *Hamites* PARKINSON, 1811
Subgenus *Hamites* PARKINSON, 1811

***Hamites (Hamites) compressus* J. SOWERBY, 1814**
Pl. IX, figs. 3—5; Pl. XI, fig. 3

1941 *Hamites compressus* SOW.; SPATH, p. 617; Pl. 68, figs. 10—13, text-fig. 222 (cum syn.)
1968 *Hamites (Hamites) compressus* J. SOW.; WIEDMANN and DIENI, p. 57, text-figs. 30, 31 (cum syn.)

M a t e r i a l : Abundant fragments of postjuvenile whorls of various sizes and 3 juvenile shells (one of them from the locality Strážov), all of which are flattened in a bedding plane.

D e s c r i p t i o n : The shape of juvenile shells, fragments of adult whorls and SPATH's (1941) data suggest that the shells were crioceraticone-coiled throughout their ontogeny. The most juvenile part, roughly corresponding to the first whorl, is smooth, but further on there begins ornamentation composed of simple, fairly dense and sharp ribs which are slightly convexly bent towards the aperture. The ribs on the outer and inner side alike bear no signs of thinning.

M e a s u r e m e n t s : The biggest juvenile shell is some 24 mm in diameter. By D = 16 mm there are 31 ribs on a half-whorl.

R e m a r k s : The whorls of our specimens are deformed and therefore their section is unknown. The type and density of ribs best correspond to the species *H. compressus*. The species *Hamites rotundus* SOWERBY, 1814 also has a similar ornamentation except for its rursiradiate ribs. Owing to their outer morphology, the juvenile shells resemble the Barremian genus *Karsteniceras* ROYO y GOMEZ, 1945.

D i s t r i b u t i o n : According to WIEDMANN and DIENI (1968), *Hamites compressus* occurs in the Middle and deeper Upper Albian of England, Sardinia and Angola.

Subgenus *Metahamites* SPATH, 1930

***Hamites (Metahamites) passendorferi* MARCINOWSKI et WIEDMANN, 1990**
Pl. IX, figs. 6, 7

1930 *Hamites* sp.; PASSENDORFER, p. 662; Pl. 4, fig. 78
1990 *Hamites (Metahamites) passendorferi* sp. n.; MARCINOWSKI and WIEDMANN, p. 37; Pl. 3, figs. 2a, b, 3a, b, text-fig. 21

M a t e r i a l : Two fragments of the spiral part of the shell and four most complete specimens from the locality Strážov. All of them are strongly flattened in a bedding plane.

D e s c r i p t i o n : Shells whose initial parts are crioceraticone coiled (i.e. in a loose planispiral) and pass into a hook. The earliest preserved whorls are covered with a dense and thin uniform ribbing that is suddenly apparently grouped into ridges separated from each other by shallow depressions (starting by the diameter of 12 mm). On the ridges, 2 to 3 ribs join together to form faint marginal tubercle. In the beggining of the uncoiled part, the spaces between the individual ridges are wide, filled with as many as 6 simple ribs. On the straight shoulder, the number of ribs between ridge-like elevations with tubercles decreases to 3—4 and the ridges are even more pronounced by shallow grooves. The ribs become thicker near the hook. Some ribs fork on the bent. The total size of the shells is about 70—80 mm. The deformed spiral part is slightly more than 20 mm across.

R e m a r k s : Slovak specimens provided us with data on the so far unknown juvenile stage of the species *Metahamites passendorferi*. Related species *M. sablieri* (d' ORBIGNY, 1842) differs from *M. passendorferi* in the absence of marginal tubercles whereas *M. dalpiazi* WIEDMANN et DIENI, 1968 differs in the absence of ribbing. Overall morphology of a complete specimen (a specimen completely reconstructed by GEBHARD, 1979; Pl. 2, fig. 6) as well as the type of its ornamentation and suture formation (GEBHARD, 1979; text-fig. 30) make it possible to assign the species *Anisoceras arrogans* (GIEBEL) to the subgenus *Metahamites* rather than to the genus *Anisoceras*. Complete shells of the latter species are as much as 250 mm large.

D i s t r i b u t i o n : *Metahamites passendorferi* was previously known from the condensed Upper Albian of the Tatricum in the Polish tract of the Vysoké Tatry Mts. Our specimens were collected from the Upper Albian (*Dipoloceras cristatum* zone), the most complete specimens coming from the locality Strážov.

Genus *Hemiptychoceras* SPATH, 1925

***Hemiptychoceras* ex gr. *gaultinum* (PICTET, 1848)**
Pl. XI, fig. 2

1985 *Hemiptychoceras gaultinum* (PICTET); THIEULOY in SOUQUET, p. 232; Pl. 7, figs. 1, 2
1990 *Hemiptychoceras gaultinum* (PICTET); MARCINOWSKI and WIEDMANN, p. 40, text-fig. 22

M a t e r i a l : An incomplete external mould of a juvenile specimen strongly flattened in a bedding plane.

D e s c r i p t i o n : A small ptychoceracone shell composed of two mutually contacting juvenile shoulders connected by a knee-like bent. The smaller shoulder is covered by a fine and dense, rather oblique ribbing. The ornamentation thickens on the bent where the ribs become thicker but more sparsely distributed. On the termination, the ribs are straight and roughly perpendicular at the contact between the two shoulders. At the end of the bent, the ribs are oblique but directed to the opposite side than on the juvenile shoulder. The juvenile but mainly the second manifestation of shoulder constriction which are accompanied by stronger ribs.

M e a s u r e m e n t s : The maximum preserved lenght is a mere 23 mm. The shoulder height in the bent is some 4 mm.

R e m a r k s : Unlike most published illustrations which show the second and third shoulder of the shell, the Slovak specimen only has the incomplete first (juvenile) and the second shoulder. The ribbing and presence of constrictions might *Hemiptychoceras gaultinum* or *H. subgaultinum* BREISTROFFER. As accurate specific assignation cannot be made because the shell is deformed and juvenile.

O c c u r r e n c e : The only specimen was collected in the quarry near Považský Chlmec.

D i s t r i b u t i o n : According to THIEULOY in SOUQUET et al. (1985), the species *Hemiptychoceras gaultinum* occurs in the Upper Albian of France and Sardinia whereas according to MARCINOWSKI and WIEDMANN (1990) also in Rumania. The specimes *H. subgaultinum* is known from the Tatric on the Polish territory.

Superfamily *Hoplitaceae* DOUVILLÉ, 1890
Family *Desmoceratidae* ZITTEL, 1895
Subfamily *Puzosiinae* SPATH, 1922

Genus *Puzosia* BAYLE, 1878
Subgenus *Puzosia* BAYLE, 1878

***Puzosia (Puzosia)* ex gr. *mayoriana* (d' ORBIGNY, 1841)**
Pl. X, fig. 4; Pl. XI, fig. 4

1984 *Puzosia (Puzosia)* ex gr. *mayoriana* (d' ORBIGNY); WRIGHT and KENNEDY, p. 55; Pl. 3, figs. 1, 2, 4, 6, 9—12; Pl. 4, figs. 1, 2, 5—7, text-figs. 1A, B, 2C, H, M, 3N—R, 4A—E (cum. syn.)

Material: Abundant shells of different sizes subjected to various degrees of deformation. They were preserved either as internal moulds with incomplete sutures or as external moulds sometimes with remains of the shells themselves.

Description: Small, medium to large semiinvolute shells. When undeformed, the shells have a steep and fairly low umbilical wall which passes into whorl flanks through a narrow rounded zone. The whorl flanks are fairly low, flatly rouded in the lower part while in the upper part they gradually pass into a widely rounded outer side. The whorls are lined with conspicuous sigmoidal constrictions which are short relatively thin ribs. The constrictions are rather narrow and deep. In the centre of the whorl flanks, the constrictions are strongly convexly arched towards the aperture and further on they form a lobe arched to the opposite side. On the outer side they are convexly bent towards the aperture. On the front side, particularly on specimens with the preserved shell, the constrictions are accompanied by a relatively thick rib. Between the constrictions there are dense, fairly thin ribs which occur exclusively on the outer side. They continue uninerrupted onto the outer side. Here the ribs are convexly bent towards the aperture. Between two constrictions there are some 18—22 ribs but the largest specimens have only 16 of them. The above-described ribbing only occurs on shells whose diameter exceeds 10 mm.

Measurements: On the specimen Pch-25 (flattened, only slightly deformed by lateral pressure), at D=43.0 mm, H=15.0 (0.35) and U=14.8 (0.34). By the maximum diameter of 45 mm there are 5 constrictions per whorl.

Remarks: Considerably arched constrictions on the whorl flanks, their overall sigmoidal shape and depth as well as the fairly open umbilicus allow us to assign the Slovak specimens into the sphere of the species *Puzosia mayoriana* (d'ORBIGNY). It is impossible to assign them accurately because of the shell deformations and problems related to detailed identification of other possible species from the sphere *P. mayoriana* (see WRIGHT—KENNEDY,1984).

Distribution: According to WRIGHT and KENNEDY (1984), *Puzosia mayoriana* ranges in age at least from the Upper Albian to Upper Cenomanian. It is very widely distributed throughout the world.

Superfamily *Acanthocerataceae* HYATT, 1900
Family *Brancoceratidae* SPATH, 1933
Subfamily *Brancoceratinae*, 1993

Genus *Hysteroceras* HYATT, 1900

***Hysteroceras orbignyi* (SPATH, 1922)**
Pl. XI, fig. 6

1932 *Hysteroceras orbignyi* (SPATH); p. 483; Pl 49, fig. 4; Pl. 50, fig. 2; Pl. 52, figs. 3, 4, 8; Pl. 56, fig. 15, text-figs. 161a—d, 166a, 167a—3 (cum syn.)
1990 *Hysteroceras orbignyi* (SPATH); MARCINOWSKI and WIEDMANN, p. 82, text-fig. 25c, d (cum syn.)

Material: A number of deformed, mostly small external and internal moulds.

Description: Small to medium-sized evolute shells with a low umbilical wall, low whorls and a weak keel on the circumference. The earliest part of the shell is smooth (until the diameter of about 5 mm). Then start fairly wide ribs, either simple or forking near the umbilicus. The adult whorls have conspicuous, S-shaped ribs. Interrib distances are much wider than the ribs themselves. The points of forking are further pronounced by an umbilical tubercle. The rib forking on many specimens is only very limited therefore simple ribs prevail. In this case, ribs starting with the umbilical tubercle regularly

alternate with inserted ribs that are slightly shorter and have no umbilical tubercle. On the circumference, all the ribs are bent aperturally and near the blunt keel they disappear.

M e a s u r e m e n t s : The maximum diameter of the shell Pch-116 is 42 mm. By D=35.5 (measured between the main axes of deformation), H=11.0 (0.31), U=16.7 (0.47). By the maximum diameter, the whole whorl has 38 ribs.

R e m a r k s : The species concerned has a somewhat variable ornamentation as regards rib density (normally 36—40 ribs per whorl) and the number of forked and simple ribs. As far as similar species are concerned, *Hysteroceras varicosum* (SOWERBY, 1824) lacks conspicuous apertural bending of the ribs while *Hysteroceras carinatum* SPATH, 1934 has a perfect keel on the shell circumference.

O c c u r r e n c e : The species *H. orbignyi* is abundant in the faunistic horizon C.

D i s t r i b u t i o n : The species is the Upper Albian subzone species. It is known not only from Europe but also from Africa, Madagascar and Venezuela. MARCINOWSKI and WIEDMANN (1990) noted the species at the locality Wielka Rowień (Tatric) in the Vysoké Tatry Mts.

***Hysteroceras carinatum* SPATH, 1922**
Pl. XI, fig. 5

1982 *Hysteroceras carinatum* SPATH; RENZ, p. 49; Pl. 11, figs. 9a, b, 10a, b, 11a, b, text-fig. 34 (cum syn.)
1990 *Hysteroceras carinatum* SPATH; MARCINOWSKI and WIEDMANN, p. 83; Pl. 8, fig. 3

M a t e r i a l : An external mould flattened into a bedding plane.

D e s c r i p t i o n : An evolute shell with low whorls. They have flat flanks which become rounded only on the transition to the outer side. The outer side seems to be fairly narrow, with an indistinct keel on the circumference. The umbilical wall is low, probably rather steep on undeformed specimens.

The earliest whorls were smooth. The first ribs appear since the diameter of 7 mm. On the main ribs there gradually appear faint umbilical tubercles and thus the ribs acquire sigmoidal character. The main ribs mostly alternate with accessory ones.

M e a s u r e m e n t s : By D=18.0 mm, the specimen Pch-16 has H=7.0 (0.39) and U=7.2 (0.40). The final whorl has D=17.5 mm and 34 ribs on the circumference.

R e m a r k s : The specimen is characterized by a conspicuous keel (still more pronounced owing to shell deformation), which is a typical feature of this species.

D i s t r i b u t i o n : According to RENZ (1982), the species *Hysteroceras carinatum* occurs in *Hysteroceras orbignyi* subzone (Upper Albian). It is distributed in Europe, Africa, Venezuela and the Polish tract of the Vysoké Tatry Mts.

Subfamily *Mojsisovicsiinae* HYATT, 1903

Genus *Dipoloceras* HYATT, 1900
Subgenus *Dipoloceras* HYATT, 1900

***Dipoloceras (Dipoloceras) cristatum* (DELUC in BRONGNIART, 1822)**
Pl. X, figs. 1—3

1931 *Dipoloceras cristatum* (DELUC MS); SPATH, p. 365; Pl. 32, figs. 1—3; Pl. 33, fig. 4; Pl. 35, figs. 6—8, 10—15, text-figs. 119—121, 122a, e—h (cum syn.)
1990 *D. (Dipoloceras) cristatum* (DELUC in BRONGNIART); MARCINOWSKI and WIEDMANN, p. 83; Pl. 8, fig. 4 (cum syn.)
1990 *Dipoloceras cristatum* (BRONGNIART); IVANOV and STOJKOVA, Pl. 3, fig. 4a, b

M a t e r i a l : Four strongly deformed external moulds with indistinct, poorly preserved inner whorls.

D e s c r i p t i o n : Large evolute shells with low whorls. The umbilical wall probably was not distinguished, the whorl flanks are likely to have been rounded prior to the deformation. The outer side is fairly narrow, with a keel.

The ornamentation consists of various ribs of different lenght. Subparallel rib couples positioned close to one another are conspicuous. They start on the umbilicus and are mutually separated by a deep inerrib furrow. In the middle of the whorl height or still lower these rib couples join together to form a single clearly collar-like rib. In the space between the collar-like ribs are two inserted ribs. The ribs have different lengths and thicknesses. In the adult part of the shell there are three inserted ribs. Two of them extend as far as the umbilicus and the third one ends in the middle of the whorl height. The shell (particularly in its juvenile part) was covered by a dense but inconspicuous spiral (i.e. transverse) ribbing. All the ribs initially were more or less straight, but on the outer half of the whorl they were strongly bent towards the aperture.

M e a s u r e m e n t s : The maximum diameter of the deformed specimen Pch-28 is some 85 mm. At this diameter there are 4 collar-like tubercles on a half-whorl and approximately 19 ribs on the circumference (including the rib couples on the umbilicus).

R e m a r k s : Though strongly deformed, the Slovak specimens still retained their characteristic collar-like ribs and spiral rib tubercles.

O c c u r r e n c e : The species *Dipoloceras cristatum* was found in the quarry Považský Chlmec in the faunistic layer A_1.

D i s t r i b u t i o n : The species concerned is a zone species of the lowermost Upper Albian. It is distributed worldwide. It has also been noted in the Tatric condensed Albian in the Polish tract of the Vysoké Tatry (MARCINOWSKI and WIEDMANN, 1990)

Subfamily *Mortoniceratinae* SPATH, 1925

Genus *Prohysteroceras* SPATH, 1921
Subgenus *Goodhalites* SPATH, 1932

***Prohystoceras (Goodhalites)* cf. *delabechei* SPATH, 1934**
Pl. XI, fig. 1

1934 *Prohysteroceras (Goodhalites) delabechei* sp. nov.; SPATH, p. 456; Pl. 49, fig. 13; Pl. 52, fig. 1; Pl. 53, figs. 1—3; Pl. 54, fig. 9a, b

M a t e r i a l : A poorely preserved external mould. Impressions of juvenile whorls, the final one and a quarter of which is external mould damaged in two places. Flattened into a bedding plane and slightly deformed by lateral presesure. 2/3 of the final whorl are preserved (traceable).

D e s c r i p t i o n : A semievolute shell with a low umbilical wall gradually but swiftly passing into flat flanks of fairly low whorls; and a narrow, slightly rounded unlimited outer side. The keel on the circumference is lined with furrows on both sides. The ornamentation of the juvenile whorls is preserved as a impression (but that of the earliest whorls is missing) forming simple, slightly S-like bent ribs. The existence of inserted ribs cannot be ruled out as well. One such a rib may have been in each interval which starts with umbilical ridge-like tuberculation. In the beginning of such an interval preserved as external mould, the ornamentation is composed of main ribs regularly alternating with shorter inserted ribs. All the ribs widen towards the circumference. Main and inserted ribs alternate one by one on the final whorl. The main ribs start with an elongated umbilical tubercle above the umbilical wall, then gradually widen and are made pronounced by lateral tubercles. Further away, on the outer side, the ribs thicken and give rise to elevated trian-

gular forms. The inserted ribs occupy slightly more thah a half of the whorl height. They also have manifestations of lateral tubercles and, from this moment, they are quite similar to the main ribs. All the ribs on the outer side are alike and bent toward the aperture. They finally end near the keel. Throughout its height, the final whorl has a conspicuous spiral ornamentation.

M e a s u r e m e n t s : Dmax is some 52 mm. By the best preserved diameter (roughly between the axes of deformation) D^+ = 49.0 mm, H^+ = 18.4 mm (0.375 - 0.38), U = 18.3 mm (0.375). At this diameter, half-whorl has 8 main ribs and 15 or 16 marginal ones.

R e m a r k s : The spiral ornamentation, keel and tubercles on the ribs suggest a mortoniceratid. The two rows of tuberculation allow us to rule out the genus *Mortoniceras* MEEK. The very pronounced spiral ornamentation best corresponds to the subgenus *Goodhalites* which usually attains large dimensions. The Slovak specimens lack forked ribs on the umbilical tubercles and have extremely thick ribs on the outer side and therefore we assign them to the species *G. delabechei.*

O c c u r r e n c e : The only specimen comes from the outcrop at the confluence of the Kysuca and Váh Rivers (layer B).

D i s t r i b u t i o n : According to SPATH (1934), *G. delabechei* occurs in *H. varicosum* subzone (Upper Albian), England.

Fauna composition and stratigraphic assessment

The macrofauna finds at Považský Chlmec came from three places located close to one another as is suggested by text-fig. 1. The richest finds were collected in an abandoned quarry. Here, the following ammonite species were indentified:

Phylloceras (Hypophylloceras) ex gr. *velledae* (MICHELIN), *Kossmatella (K.) schindewolfi* WIEDMANN et DIENI, *K. (K.)* cf. *muhlenbecki* (FALLOT), *Hamites (H.) compressus* SOWERBY, *Hamites (Metahamites) passendorferi* MARCINOWSKI et WIEDMANN, *Hemiptychoceras* ex gr. *gaultinum* (PICTET), *Puzosia* ex gr. *mayoriana* (d'ORBIGNY), *Dipoloceras (D.) cristatum* (DELUC.) Aside from the genus *Puzosia*, other desmoceratid are also present here (e.g. representatives of the genus *Beudanticeras*). Nevertheless, as a result of a strong deformations, they can be hardly identified in detail. The accompanying fauna largely comprises pelecypods, mostly inoceramus-related, e.g. zone fossil *Birostrina sulcata* (PARKINSON), with less abundant gastropods, belemnites and sea urchins.

The percentages of the principal macrofaunistic elements the layer A_1 in the quarry are as follows:

Ammonoidea			82.0
	Phylloceratida	10	
	Lytoceratina	13	
	Ancyloceratina	25	
	Ammonitida	34	
Belemnoidea			6.5
Bivalvia			6.5
Gastropoda			2.5
Echinoidea			1.5
plant remnants			1.0
			100.00

[+]D and H measured without the missing keel. If complete shells were preserved, the higher denominator would result in lower H/D but mainly U/D values.

The above percentages based on 210 finds show that cephalopods (including belemnites) account for 89 % of the fossils. The cephalopods comprise fairly abundant heteromorphic shells (*Ancyloceratina*) and order *Ammonitida* dominated by desmocerates, namely the genus *Puzosia* (over 20 %). Pelecypods are also relatively abundant.

The interesting species *Prolysteroceras* (*Goodhalites*) cf. *delabechi* SPATH was collected only on the outcrop near the confluence of the Kysuca and Váh Rivers.

The third layer is characterized by abundant ammonites *Puzosia* ex gr. *mayoriana* (d'ORBIGNY) and *Hysteroceras orbignyi* (SPATH). *Hysteroceras carinatum* SPATH occurs only exceptionally. Pelecypods including the genus *Birostrina* are fairly numerous.

The zone division of the Albian is currently (HOEDEMAEKER and BULOT, 1990) based on standard ammonite zones and subzones of the so called European faunistic province put forward by OWEN (1979, 1984) whose subzones in the uppermost Albian zone were subsequently altered. The resulting updated Upper Albian division is as follows:

	Zones	Subzones
Upper Albian	*Stoliczkaia dispar*	S. (S.) dispar
		S. (F.) blancheti
		Callihoplites auritus
		Hysteroceras varicosum,
	Mortoniceras (Mortoniceras) inflatum	*Hysteroceras orbignyi*
		Dipoloceras cristatum
Uppermost Middle Albian	*Euhoplites lautus*	Anahoplites daviesi
		Euhoplites nitidus

The above scheme suggests that deposits exposed in the quarry near Považský Chlmec are of the Upper Albian age. The exceptional occurrence of the subzone species *Dipoloceras cristatum* proves the existence of the subzone of the same name corresponding to the basal Upper Albian. Similarly, the abundant species *Hysteroceras orbignyi* found on the right bank of the Kysuca River attests to the following Upper Albian subzone "orbignyi". As is suggested by *Prohysteroceras (goodhalites) delabechei* occurrence, the third, poor faunistic layer could probably be assigned close to the latter subzone.

Generally, the faunistic layers in the Klape unit near Považský Chlmec correspond to the lower part of the ammonite zone *Mortoniceras (M.) inflatum*, i.e. lower part of the Upper Albian.

Conclusion

The ammonite fauna assigned into two basal subzone of the Upper Albian ammonite zone *Mortoniceras inflatum* clearly has a Mediterranean character. The specific composition resembles that

of Upper Albian ammonites described by PASSENDORFER (1930) as well as MARCINOWSKI and WIEDMANN (1990) from the condensed Albian in the Tatricum of the Polands' s Vysoké Tatry Mts.

The ammonite assemblage from Klape unit flysch sediments in the Klippen Belt suggests that the Mediterranean faunistic province comprises not only the Central Carpathians but also the more northerly Klippen Belt because boreal elements of the so called hoplitid faunistic province are completely absent here.

The incompleteness of the ammonite shells and location of the individual faunistic horizons amidst flysch sediments at Považský Chlmec prove that their macrofauna was redeposited here from the shallower-water environments.

Translated by Ľ. Böhmer

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ZDENĚK VAŠÍČEK — MILOŠ RAKÚS

Vrchnoalbské amonity z lokality Považský Chlmec pri Žiline (Klapská jednotka, bradlové pásmo, Slovensko)

Resumé

Amonitová fauna preukazujúca stratigrafickú príslušnosť k dvom bazálnym subzónam vrchnoalbskej amonitovej zóny *Mortoniceras inflatum* je rýdzo mediterránneho charakteru. Druhové zloženie je do značnej miery blízke vrchnoalbským amonitom z kondenzovaného albu, ktoré popísali PASSENDORFER (1930) a MARCINOWSKI—WIEDMANN (1990) z tatrika poľskej časti Vysokých Tatier.

Amonitové spoločenstvo pochádzajúce z flyšových sedimentov klapskej jednotky v bradlovom pásme preukazuje, že nielen centrálne Karpaty, ale tiež severnejšie ležiace bradlové pásmo patrí k mediterránnej faunistickej provincii, lebo boreálne prvky tzv. hoplitidnej faunistickej provincie tu vôbec nie sú zastúpené.

Neúplnosť amonitových schránok a pozícia jednotlivých faunistických horizontov vo flyšových profiloch v Považskom Chlmci ukazujú, že táto makrofauna sa nenachádza v pôvodnom životnom prostredí, ale bola redeponovaná z plytkovodnejších podmienok.

Explanations of Plates IX—XI

Plate IX
Fig. 1 *Phylloceras (Hypophylloceras)* ex gr. *velledae* (MICHELIN), x1, specimen SNMZ 21.404. Považský Chlmec, quarry near boat dock
Fig. 2 *Kossmatella (K.) schindewolfi* WIEDMANN et DIENI, x1, specimen SNMZ 21.405 Považský Chlmec, quarry near boat dock
Figs. 3—5 *Hamites (H.) compressus* J. SOWERBY; Figs. 3, 4, x1 and Fig. 5, x1.5, specimen SNMZ 21.406 and SNMZ 21.407 (different magnification). Považský Chlmec, quarry near boat dock
Figs. 6, 7 *Hamites (Metahamites) passendorferi* MARCINOWSKI et WIEDMANN, xl, specimen SNMZ 21.408 with imperfectly preserved spiral juvenile part and specimen SNMZ 21.409. Quarry near Strážov

Plate X
Figs. 1—3 *Dipoloceras (D.) cristatum* (DELUC in BRONGNIART), x1, specimens SNMZ 21.410 and SNMZ 21.411
Fig. 2 View of the outer side of the specimen shown on Fig. 1. Považský Chlmec, quarry near boat dock
Fig. 4 *Puzosia (P.)* ex gr. *mayoriana* (d' ORBIGNY), x1, specimen SNMZ 21.412. Považský Chlmec, quarry near boat dock

Plate XI
Fig. 1 *Prohysteroceras (Goodhalites)* cf. *delabechei* SPATH, x1, specimen SNMZ 21.413. Považský Chlmec, outcrop near confluence of the Váh and Kysuca Rivers
Fig. 2 *Hemiptychoceras* ex gr. *gaultinum* (PICTET), x1, specimen SNMZ 21.414. Považský Chlmec, quarry near boat dock
Fig. 3 *Hamites (H.) compressus* J. SOWERBY, x1, specimen SNMZ 21.415. Považský Chlmec, quarry near boat dock

Fig. 4 *Puzosia (P.)* ex gr. *mayoriana* (d' ORBIGNY), x1, specimen SNMZ 21.416, quarry near Strážov
Fig. 5 *Hysteroceras carinatum* (SPATH), x1, specimen SNMZ 21.417. Považský Chlmec, outcrop on a slope above the Kysuca
Fig. 6 *Hysteroceras orbignyi* (SPATH) x1, specimen SNMZ 21.418. Považský Chlmec, outcrop on a slope above the Kysuca.
Fig. 7 *Kossmatella (K.)* cf. *muhlenbecki* (FALLOT), x1, specimen SNMZ 21.405. Považský Chlmec, quarry near boat dock

The shells were bleached by ammonia chlorides and then photographed by K. MEZIHORÁKOVÁ from the Ostrava University. The specimens are deposited at the Dionýz Štúr Institute of Geology and the Slovak National Museum in Bratislava under the above-given registration numbers.

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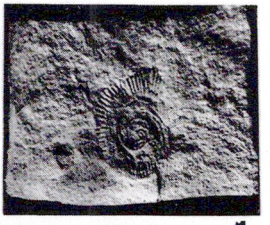

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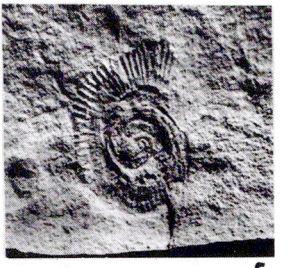

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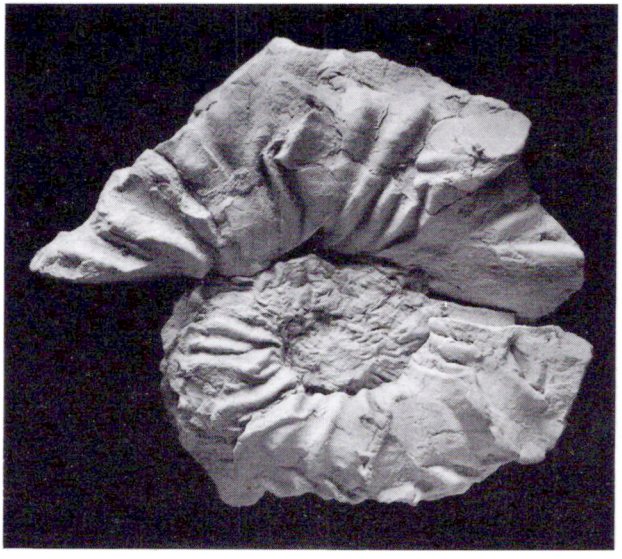

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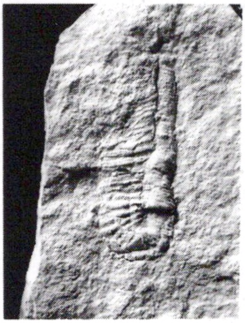

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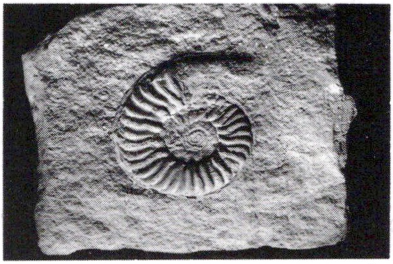

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Keosmatella (k) cf.