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THE LOWER CRETACEOUS AMMONITES OF THE MANÍN UNIT (MT. BUTKOV, WEST CARPATHIANS)

(Pls. VI, Text-Figs. 2, Tab. 1)



Contribution
to Project No.
198

Abstract: The work is dealing with taxonomic and biostratigraphic evaluation of ammonite fauna obtained during detailed lithostratigraphic documentation of the Lower Cretaceous limestones sequence from Mt. Butkov in the Strážovské vrchy Mts. Distribution of remnants belonging to 22 Mediterranean species (2 of them being new ones) of 7 families (*Lytoceratidae*, *Ancyloceratidae*, *Olcostephanidae*, *Berriasellidae*, *Holcodiscidae*, *Desmoceratidae*, *Pulchellidae*) enables to make a reliable correlation with Mediterranean Lower Valanginian till the Upper Barremian ammonite zones. Abundance of the Lower Cretaceous cephalopod fauna in the sequences with relatively wide stratigraphic span advances the Butkov locality to the level of classic faunal localities not only in the Carpathians, but in the whole eastern part of the Tethyan Mediterranean area.

Резюме: В статье авторы занимаются таксономической и биостратиграфической оценкой аммонитовой фауны полученной во время детального литостратиграфического документирования последовательности нижнемеловых известняков горы Бутков в Стражовских горах. Распределение остатков принадлежащих 22 средиземноморским видам (из этого два новых) из семи семейств (*Lytoceratidae*, *Ancyloceratidae*, *Olcostephanidae*, *Berriasellidae*, *Holcodiscidae*, *Desmoceratidae*, *Pulchellidae*) предоставляет сделать достоверное сопоставление с средиземноморскими аммонитовыми зонами нижнего валанжина вплоть до верхнего баррема. Изобилие фауны нижнемеловых цефалоподов в толщах с относительно широким стратиграфическим диапазоном возвышает местонахождение Бутков на уровень классических фаунистических местонахождений не только в Карпатах, но и в целой восточной части средиземноморского Тетиса.

Introduction

Mts. Butkov and Kališčo (765 and 680 m a.s.l., respectively) are expressive morphological dominants of the hilly country on the western margin of the Strážovské vrchy Mts. with average elevation above sea level of 250—450 m hemming the Neogene basin from the east. Exploitation of raw materials for cement production on the NW slope of Mt. Butkov exposed a sequence of the Lower Cretaceous carbonates ascribed to the Manín unit by tradition. The Manín unit was characterized as a unit resembling the Central Carpathian units by a number of litho- and biofacial features, however, it was incorporated into the Klippen Belt on the basis of its position and tectonic style. Lately,

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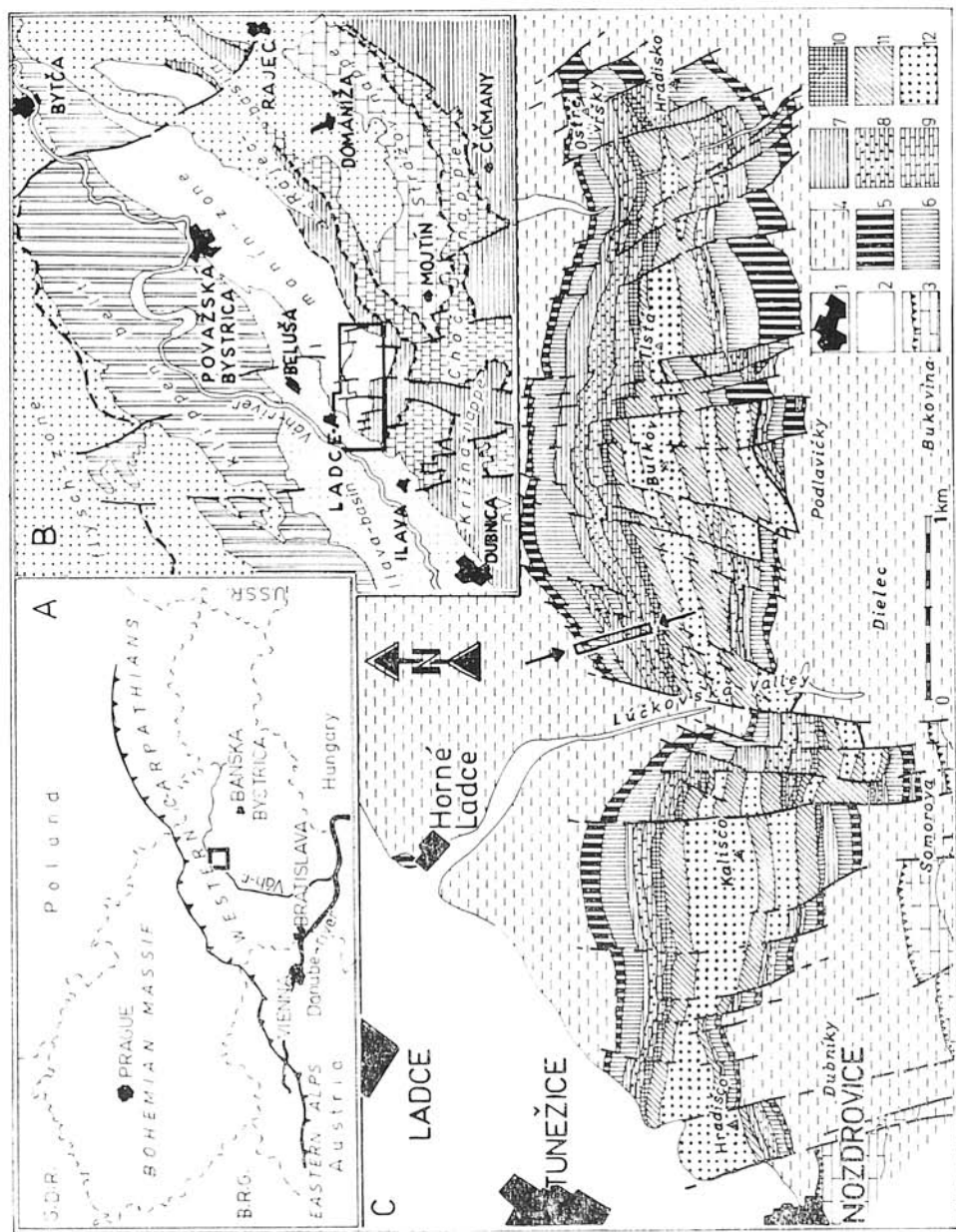
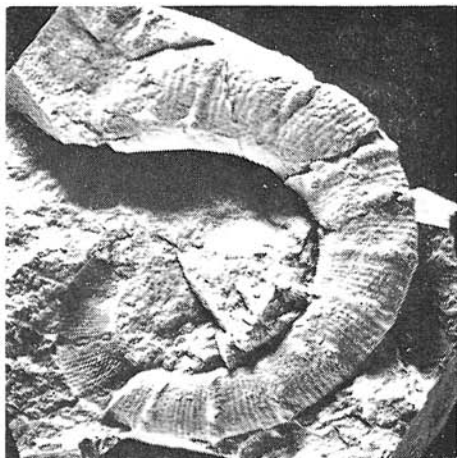
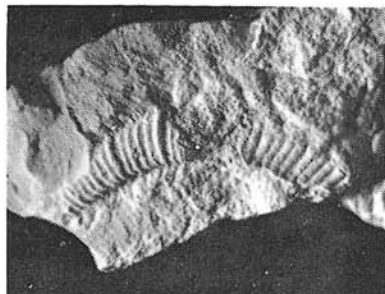


Fig. 1. Localization of the studied area within Czechoslovakia (A), in geological structural scheme of the Central Váh Basin (B) and localization of the studied profile (see arrows) in schematic geological map of Mts. Kalisko and Butkov (C).
Legend: 1 — urbanized region; 2 — Quaternary deposits; 3 — Križná nappe; 4 — Middle Cretaceous shale sequences; 5 — 12: Jurassic and Lower Cretaceous sequences of the Manin unit: 5 — "Urgonian" limestones; 6 — cherty detrital limestones and breccias; 7 — "belemnite" limestones (Barremian); 8 — cherty limestones (Hauterivian); 9 — sublithographic and spotted limestones (Upper Tithonian till Lower Hauterivian); 10 — nodular limestones (Oxfordian — Middle Tithonian); 11 — siliceous limestones and silicites (Dogger); 12 — crinoid limestones (Lias).

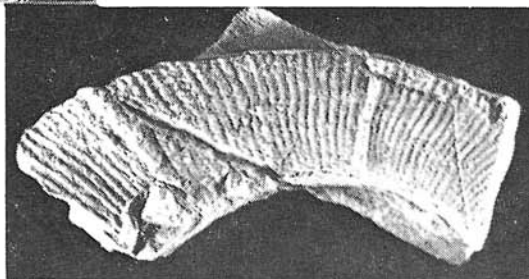
Plate I



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the Manín unit has been interpreted as a frontal peripheral tectonic unit of the Křižna nappe s. l. (Maheř, 1978, 1984). The Jurassic—Lower Cretaceous sequences in the region of Butkov are characterized by relatively deep-water development indicated by the presence of silicites and cherty limestones (Rakús, 1977). From this point of view also the Lower Cretaceous Butkov sediments were characterized as deep-water limestones poor in fossils. However, detailed litho-, microbio- and macrobiostratigraphic investigations (together with Dr. K. Borza, DrSc., cf. Vašíček et al., 1983) aimed lately at the Upper Jurassic—Lower Cretaceous sequence in Butkov made us to create a diverse view of bathymetric and environmental development of the area under consideration.

Sequence of nodular limestones divided by silicites intercalation is a product of sedimentation on submarine elevation in the period between the Oxfordian and the Middle Tithonian. In the end of the Middle Tithonian, sedimentation of light "sublithographic" limestones started, it lasted till the Upper Valanginian. In the lower part of the sequence of these limestones there are frequent beds of intraformational breccias passing to brecciated conglomerates with clasts of the Tithonian and Berriasian limestones (equivalent of Nozdovice breccia, Borza et al., 1980). Turbiditic beds frequent also in the overlying sequence occur in the upper, Valanginian part of the sequence. The Upper Valanginian till the Lower Hauterivian spotted limestones were formed on the margin of the basin occasionally slightly affected by turbiditic and contoured flow. These effects are not observed in the overlying sequences of cherty and brown-grey micritic limestones (Fig. 2) representing sediments of the upper part of the Lower and Upper Hauterivian. But the Barremian sequence of yellowish marly "belemnite" limestones with marl intercalations contains frequent intraformational breccias, detritus laminae and even the features of submarine sliding in uppermost part (cf. Fig. 2).

These deformations were caused by progradation of the carbonate platform slope. Slope sediments of this platform beginning with 4—6 m thick bed of limestone breccia consist of thin-bedded dark grey cherty organodetrital limestones. The upper part of the complex was developed in "the Urgonian facies". It is formed by light grey massive organodetrital limestones with frequent fragments of pachyodont bivalves, reef-building organisms, orbitolinid foraminifers and sporadic cherts. Fossils indicate the Aptian till the Lower Albian age of sedimentation of the complex whose sequence ends with hard-ground plane. The Upper Albian brown-grey claystones lie above this plane.

Plate I

Fig. 1. *Crioceratites (Cr.) nolani* KILIAN. Sp. BK 8-440/1. (SNM Z-19437). The Lower Hauterivian, 8th level, 440 m.

Fig. 2. *Himantoceras cf. trinodosum* THIEULOY. Sp. BK 8-530/6. (SNM Z-19438). The Upper Valanginian, 8th level, 530 m.

Fig. 3. *Crioceratites (Cr.) duvali* LÉVEILLÉ. Sp. BK 8-400/2. (SNM Z-19439). The Upper Hauterivian, 8th level, 400 m.

Fig. 4. *Crioceratites (Cr.) loryi* (SARKAR). Sp. BK 6-60/5. (SNM Z-19440). The Lower Hauterivian, 6th level, 60 m.

Fig. 5. *Neocomites (Neocomites) teschenensis* (UHLIG). Sp. BK 8-550/11. (SNM Z-19441). The Upper Valanginian, 8th level, 550 m.

Thus, the Lower Cretaceous carbonate sequence may be divided into a lower, pelagic part and an upper part consisting of the sediments of neritic carbonate platform and its slope. Findings of ammonite fauna are the most frequent in the pelagic limestones. In their upper part (Barremian), ammonites are less frequent, but findings of belemnites are increasing. Cephalopod fauna in the lower part of detrital complex is represented only by rare belemnite findings. Remnants of cephalopods are totally missing in the upper, "Urgonian" part of detrital complex.

In the course of study of the sequences exposed by Butkov quarry (in the years 1980—1982) several hundreds of macrofauna findings were obtained. Cephalopods are prevailing in this set, mainly stratigraphically significant species of ammonites, aptychi and belemnites were systematically worked out. In the present work we pay an attention to detailed systematic elaboration of stratigraphically significant ammonite fauna.

Taxonomy and systematics

In the present chapter we shall examine in detail the taxa whose detailed study was enabled by sufficient well preserved material. Several findings belonging to the genera *Anahamulina*, *Karsteniceras*, *Costidiscus*, *Holcodiscus* cannot be taxonomically evaluated in advance in more detail owing to bad preservation or scarcity of occurrence. Also frequently occurring, but totally badly preserved barremitid ammonites from the Lower Barremian "Barremites marls" are concerned.

In systematic evaluation of ammonites we came out in principle from a natural system proposed by O. H. Schindewolf according to final summarization of 1968.

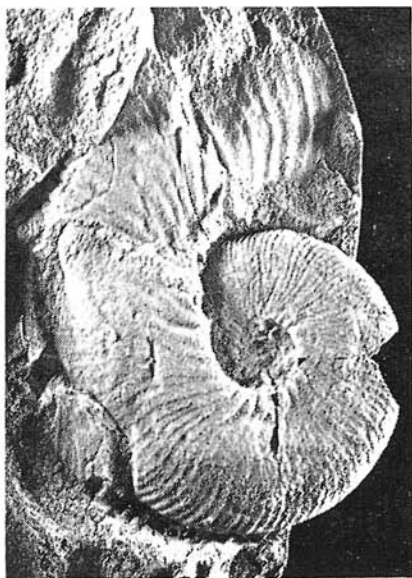
Morphological terms used in systematic descriptions of ammonites are common in our elementary zoopaleontological literature. In the paragraph dealing with measurement the following symbols are used (measured always in mm): D — shell diameter, H — height of whorl, U — width of umbilicus (width of whorl — B with regard to preservation of material cannot be measured). After the numerical data corresponding to measured values, H/D ratio is given in parentheses after the parameter H and U/D ratio after the parameter U, both ratios characterize the style of shell coiling.

- Subclass *Ammonoidea* ZITTEL, 1884
 Order *Lytocerotida* HYATT, 1889
 Superfamily *Lytocerotaceae* NEUMAYR, 1875
 Family *Lytocerotidae* NEUMAYR, 1875

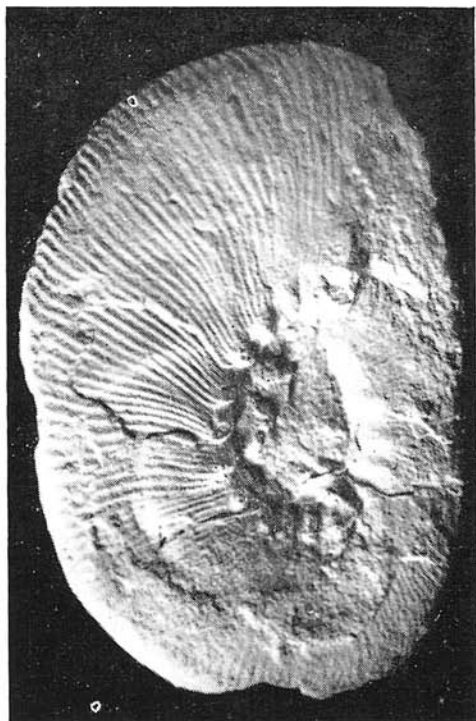
Plate II

- Fig. 1. *Neocomites (Teschentites)* cf. *jodariensis* (DOUVILLÉ). Sp. BK 8-470/16. (SNM Z-19442). The Lower Hauterivian, 8th level, 470 m.
 Fig. 2. *Olcostephanus (Olcostephanus)* cf. *astierianus* (D'ORBIGNY). Sp. BK 5-250/4. (SNM Z-19443). The Lower Hauterivian, 5th level, 250 m.
 Fig. 3. *Neocomites (Teschentites)* *neocomiensiformis neocomiensiformis* (UHLIG). Sp. BK 8-480/13. (SNM Z-19444). The Lower Hauterivian, 8th level, 480 m.

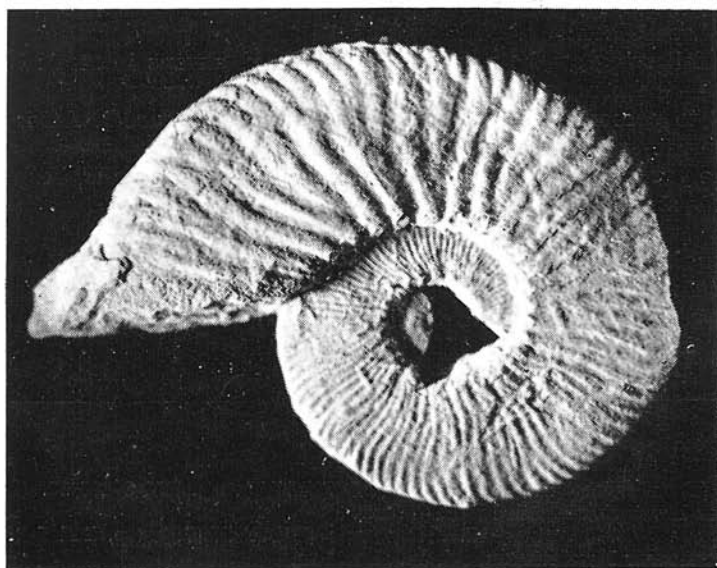
Plate II



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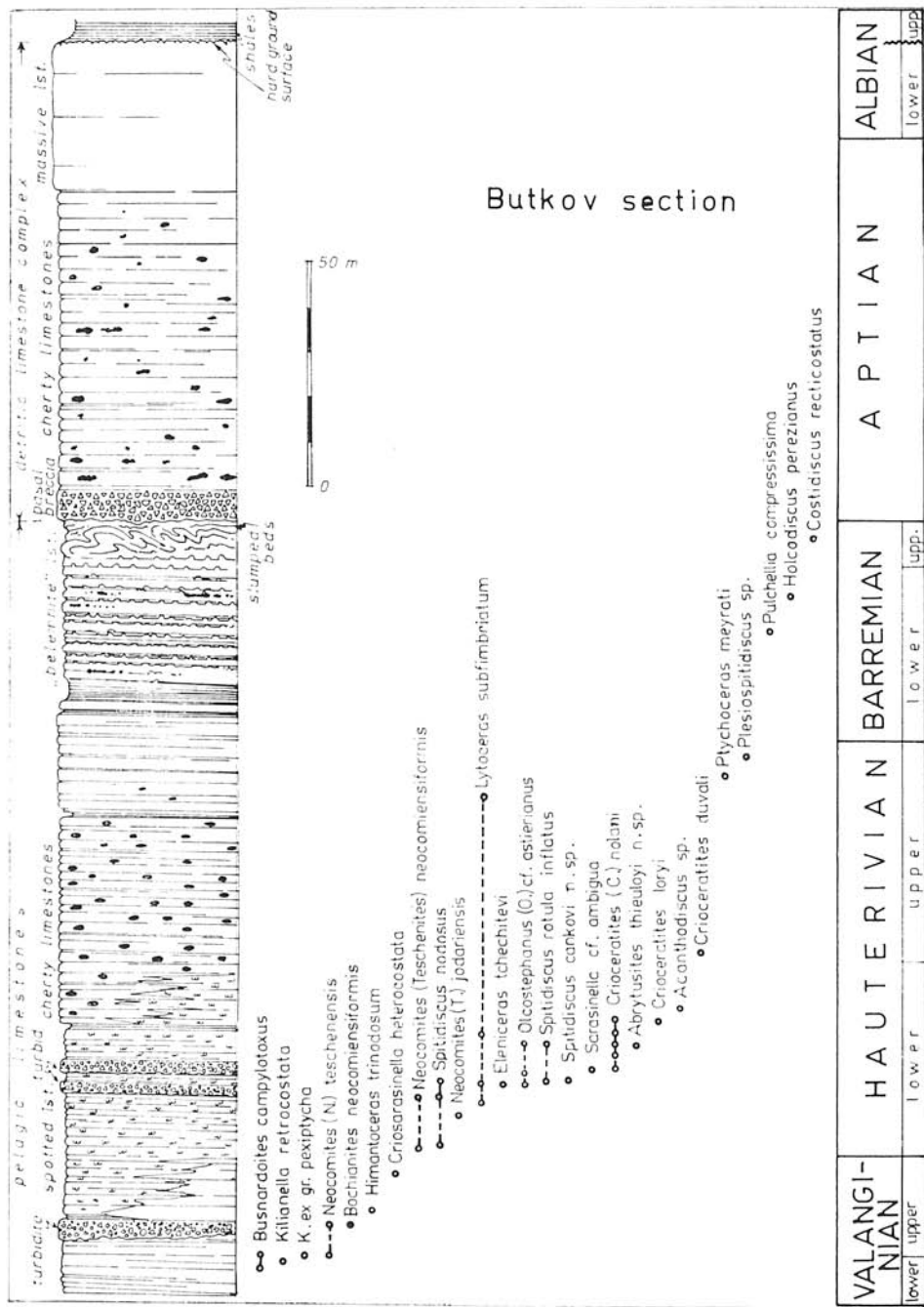


Fig. 2. Distribution of stratigraphically significant ammonite species in lithostratigraphic sequence exposed in Butkov quarry.
 Note: Further explanations to lithological column see in the text of the paper.

Subfamily *Lytoceratinae* NEUMAYR, 1875

Genus *Lytoceras* SUESS, 1865

Typical species: *Lytoceras postfimbriatum* PRINZ, 1904. Lower Cretaceous, France.

Lytoceras subfimbriatum (D'ORBIGNY, 1841)

Pl. IV, Fig. 1

1841 *Ammonites subfimbriatus* n. sp.; d'Orbigny, p. 121, Pl. 35, Figs. 1—4.

1976 *Lytoceras subfimbriatum* (D'ORBIGNY); Mandov, p. 53, Pl. 2, Fig. 3 (cum syn.).

1976 *Lytoceras* sp. aff. *L. subfimbriatum* (D'ORBIGNY); Mandov, p. 54, Pl. 2, Fig. 1 (cum syn.).

Material: Two specimens with relatively well preserved, almost complete last whorls (corresponding probably to living chamber) and with very imperfectly preserved internal whorls. The whorls are preserved as sculptural moulds deformed into the level of bedding plane (sp. BK8-450/3, 450/10).

Description: Evolute shells with low whorls whose apparently originally greater height than width is somehow stressed due to deformation. Planarily arched sides of the whorls pass fluently to external and umbilical wall. Umbilicus is wide. Sculpture of internal whorls is obscure. Collarlike main ribs stressed by slight constriction on its frontal side are apparent on the last whorl. There are 5 such ribs on the last whorl of sp. BK8-450/3, 9 main ribs are apparent in sp. BK8-450/10, but there were 10 or 11 of them on the whole. Great number of ribs in the latter specimen is only partly caused by accumulation of main ribs near aperture, since 4 main ribs are already developed on internal half of the 1st whorl. Besides the main ribs, shells are formed by dense, thin and corrugated ribs which are similarly as the mentioned main ribs slightly convexly bended towards the aperture. Density of the ribs is not constant, but it is arranged into equivalent sections. Each section begins with dense ribs which gradually become thin. In specimen BK8-450/3 each section comprises 3 main ribs (starting in front of the first, ending by the third one, position of the middle one does not influence directly arrangement of the ribs). In sp. BK8-450/10 one section comprises 4 main ribs.

Measurement: In sp. BK8-450/3 if $D = 139$ mm, $H = 40$ mm (0.29), $U = 70$ mm (0.50) were measured. Maximum diameter of the sp. BK8-450/10 which is slightly deformed also by lateral pressure, so that it cannot be accurately measured, reaches 187 mm.

Notes and relations: Mandov (1976) states that typical representatives of the species *Lytoceras subfimbriatum* are characteristic by 4 or max. 5 thick ribs per one whorl. From our Butkov set an illustrated specimen corresponds to this requirement, another from the same stratigraphic level (but apparently not from the same bedding plane) corresponds to the Mandov's *Lytoceras* sp. by raised number of main ribs (1976, Tab. 2, Fig. 1). It is very probable that both types correspond to the same species within the species variability. Besides the number of main ribs, another questionable problem of species conception is probably represented by the moment when fine corrugated ribs appear on the shell for the first time. Uhlig (1883, p. 189) draws an attention to inaccuracies in representation of the d'Orbigny's type, in which

the sculpture of external whorls is falsely transferred even to internal whorls which should be in fact smooth.

Occurrence: Both our specimens come from the 8th level (450 m) — the Lower Hauterivian. We have not yet succeeded in finding equivalent specimens in the Barremian.

Distribution: According to literary data, the species *Lytoceras subfimbriatum* occurs in the Hauterivian and Barremian of the Mediterranean province.

Order *Ancyloceratida* WIEDMANN, 1966

Superfamily *Ancylocerataceae* MEEK, 1876

Family *Ancyloceratidae* MEEK, 1876

Subfamily *Crioceratinae* WRIGHT, 1952

Genus *Himantoceras* THIEULOY, 1964

Typical species: *Himantoceras trinodosum* THIEULOY, 1964. Upper Valanginian, France.

Himantoceras cf. *trinodosum* THIEULOY, 1964

Pl. I, Fig. 2

1964 *Himantoceras trinodosum* n. sp. THIEULOY, p. 206, Pl. 8, Fig. 1 a, b, Text-Fig. 2A.

1974 *Himantoceras* aff. *trinodosum* THIEULOY; Mandov, p. 145, Pl. 1, Fig. 1.

1979 *Himantoceras trinodosum* THIEULOY; Thieuloy in Busnardo et al., p. 49, Pl. 3, Figs. 10, 11.

Material: The only fragment of arch-like shell with imprint (BK8-530/6) preserved as a sculptural mould.

Description: Arch-like bended shell bears the ribs slightly concavely bended towards aperture. Ribs are divided into thicker main ribs and thinner additional ribs. There are probably 3 tubercles on the oldest, fully preserved main rib: umbilical tubercle is the most slight, implied, lateral tubercle is slight (approximately in the half of whorl's height), external tubercle is spinose, it outlasts perhaps also on the other ribs, where the other tubercles are not apparent. Slight constrictions are implied on juvenile part of the preserved shell in front of main ribs. There are 3—5 simple smooth additional ribs between the main ribs.

Measurement: Regarding incompleteness of the specimen with 40 mm long arch it can be just mentioned that maximum height of the whorl reaches 8 mm.

Notes: Fragment corresponding to the central (i. e. non-ephebic) ontogenetic stage is an indisputable representative of the genus *Himantoceras*. It is related especially to the species *H. trinodosum* differing from it by absence of internal and middle tubercles on the majority of main ribs and by lower number of inserted ribs.

Occurrence: The only finding is from the 8th level (530 m) — the Upper Valanginian.

Distribution: The given species is a zonal species of the Late Upper Valanginian in France (Thieuloy in Busnardo et al., 1979). Besides Bulgaria, representatives of the genus *Himantoceras* have been lately proved

also in the Lower Cretaceous of the Strážovská vrchovina highlands (Vašíček et al., 1983).

Genus *Crioceratites* LÉVEILLÉ, 1837

Subgenus *Crioceratites* LÉVEILLÉ, 1837

Typical species: *Crioceratites duvalii* LÉVEILLÉ, 1837. Hauterivian, France.

Crioceratites (Crioceratites) nolani (KILIAN, 1910)

Pl. I, Fig. 1

1842 *Crioceras Duvalii*, LÉVEILLÉ; d'Orbigny, p. 459. Pl. 113, Figs. 1—4.

1976 *Crioceratites (Crioceratites) nolani* (KILIAN; Mandov, p. 55, Pl. 3, Figs. 1, 2 (cum syn.).

1978 *C. (Crioceratites) nolani* (KILIAN); Immel, p. 35, Pl. 3, Fig. 3 (sum syn.).

1983 *Crioceratites (Crioceratites) nolani* KILIAN; Vašíček et al., Pl. 1, Fig. 6.

Material: The only whorl preserved as slightly deformed sculptural mould (sp. BK8-440 1).

Description: Markedly crioceratitically coiled shell. Sculpture is formed by thick tritubercular ribs with inserted thin ribs apparently reaching as far as the internal side of the whorl. There are 5—10 inserted ribs in the interval between two main ribs. Each half of the whorl bears 9 main ribs.

Measurement: It is not possible due to preservation of the specimen. Preserved diameter reaches about 60 mm.

Notes: Tritubercular ribs, number of main and inserted ribs correspond perfectly to the species diagnosis.

Occurrence: The found specimen comes from the 8th level (440 m) — the Lower Hauterivian.

Distribution: According to Immel (1978) the species *Crioceratites nolani* has very wide stratigraphic span from the Lower Hauterivian till the Lower Barremian.

Crioceratites (Crioceratites) duvali LÉVEILLÉ, 1837

Pl. I, Fig. 3

1837 *Crioceratites Duvalii* LÉVEILLÉ, p. 313, Pl. 22, Fig. 1 a, b.

1967 *Crioceratites (Crioceratites) duvalii* LÉVEILLÉ; Nagy, p. 69, ? Pl. 4, Fig. 1, Pl. 5, Fig. 1.

1978 *C. (Crioceratites) duvali* LÉVEILLÉ; Immel, p. 36 (cum syn.).

1978 *Crioceratites (Crioceratites) duvali* LÉVEILLÉ; Vašíček et al., Pl. 1, Fig. 9.

Material: The only fragment of the ephebic whorl (BK8-400/2).

Description: 3 main ribs are visible on the fragment of the whorl (one of them is only imperfectly preserved). Main ribs bear small tubercles on the perimeter; there is a slight implication of umbilical tubercles near umbilicus. There are 19 to 20 relatively thin additional ribs among the main ribs.

Notes: Absence of tritubercular ribs and a great number of inserted ribs correspond best to the species *C. duvali*.

Occurrence: The specimen was found on the 8th level (400 m) — the Upper Hauterivian.

Distribution: According to Immel (1978), the species *C. duvali* occurs most probably from the Upper Hauterivian till the basal Barremian.

Crioceratites (Crioceratites) loryi (SARKAR, 1955)

Pl. I, Fig. 4

1955 *Crioceras loryi* SARKAR, p. 40, Pl. 5, Fig. 2, Text-Fig. 5B.1972 *Crioceratites (Crioceratites) loryi* (SARKAR); Thieuloy, p. 41, Pl. 5, Figs. 1-5.1978 *C. (Crioceratites) loryi* (SARKAR); Immel, p. 42, Pl. 1, Figs. 4, Pl. 4, Fig. 2 (cum syn.).**Material.** One badly preserved specimen of medium size (sp. BK6-60/5).**Description:** Crioceratitically coiled shell with relatively fine sculpture. Thin ribs of uniform type are slightly visible on the internal whorl. Short spines are periodically observable on the perimeter. Then there are umbilical tubercles from which the ribs just slightly thicker than the other ones run out. The ribs beginning with tubercle are somehow more expressed in their ontogeny, though they can be never marked as thick ribs. There are slight tubercles on their perimeter corresponding to spine base. Last main ribs have implied constriction on the frontal side, bordered along the frontal margin by a simple rib. In such way implication of dual main ribs is created. There are 4 to 7 inserted ribs among the main ribs. Half of the whorl bears 7 or 8 main ribs.**Measurement:** If diameter $D = 58.5$ mm (almost max.), $H = 20$ mm (0.34), $U = 25$ mm (0.43).**Notes:** Butkov specimen corresponds by its sculpture to the specimen approximately of the same size represented by Immel (1978) in Tab. 4, Fig. 2.**Occurrence:** The specimen was found on the 6th level (60 m) — the Lower Hauterivian.**Distribution:** The species *C. loryi* represents a zonal species of the Lower Hauterivian in the Mediterranean area.Order *Ammonitida* HYATT, 1889Superfamily *Perisphinctaceae* STEINMANN, 1890Family *Olcostephanidae* HAUG, 1910Subfamily *Olcostephaninae* HAUG, 1910Genus *Olcostephanus* NEUMAYR, 1875Subgenus *Olcostephanus* NEUMAYR, 1875**Typical species:** *Ammonites astierianus* D'ORBIGNY, 1840. Lower Neocomian, France.*Olcostephanus (Olcostephanus) cf. astierianus* (D'ORBIGNY, 1840)

Pl. II, Fig. 2

1840 *Ammonites Astierianus* n. sp.; d'Orbigny, p. 115, Pl. 28, Figs. 1, 2.1967 *Olcostephanus (Olcostephanus) astierianus* (D'ORBIGNY); Dimitrova, p. 90, Pl. 43, Fig. 5.1976 *Olcostephanus (Olcostephanus) astierianus* (D'ORBIGNY); Mandov, p. 69, Pl. 11, Fig. 1 (cum syn.).**Material:** Planarily and laterally deformed specimen (BK5-250/4) which has for greater part preserved its original shell. Umbilicus is filled, so that

only the last whorl is apparent. Sp. BK8-470/13 and BK8-490/18 preserved as fragments.

Description: Semi-involute shell with the whorls pulled up to the height by deformation. Sculpture is formed by dense thin ribs running out from umbilical tubercles, being about 20 on the last whorl. About 5 ribs (min. 4, max. 6) run out from the tubercles. One free inserted rib interferes most probably the tubercles. The frontal rib running out from the tubercle is usually in a short time bifurcated above the umbilical tubercles. In addition, inserted (bifurcated) rib was formed in the interval delimited by these two ribs. The ribs pass through the external side without interruption and they are all of a uniform thickness on perimeter.

Measurement: The specimen is very deformed, so that there is no use in making detailed measurement. Diameter reaches (in axis of elongation) about 90 mm.

Notes: Our deformed specimen is closest to the species *O. astierianus* which should have 16—18 umbilical tubercles per a whorl (i.e. somewhat less than our specimen) by number of umbilical tubercles, number of ribs running out from them and by inserted ribs. The specimen is close also to the species *O. catulloi* by a great number of umbilical tubercles and by a great number of ribs running out from the tubercles (most often 5). However, according to description of Dimitrova (1976) the typical *O. catulloi* should have 23—26 umbilical tubercles from which most often 6 ribs run out. The species from the range of *O. psilostomus* (Neumayr & Uhlig) have a similar number of tubercles as our specimen, but only 3—4 ribs run out from them.

Occurrence: Pictured specimen was found on the 5th level (250 m) — the Lower Hauterivian. Besides this specimen, two incomplete juvenile shells were found on the 8th level (470 and 490 m) — the Lower Hauterivian.

Distribution: According to Mandov (1976) the species under consideration occurs in the Upper Valanginian till the Lower Hauterivian of the whole Mediterranean area.

Family *Berriasellidae* SPATH, 1922

Subfamily *Neocomitinae* SPATH, 1924

Genus *Neocomites* UHLIG, 1905

Subgenus *Neocomites* UHLIG, 1905

Typical species: *Ammonites neocomiensis* D'ORBIGNY, 1840. Valanginian, France.

Neocomites (Neocomites) teschenensis (UHLIG, 1902)

Pl. I. Fig. 5

1902 *Hoplites teschenensis* n. sp.; Uhlig, p. 56, Pl. 3, Fig. 4.

1975 *Neocomites (Teschenites) teschenensis* (UHLIG); Vašíček, p. 85, Pl. 4, Fig. 1 (cum syn.).

Material: One incomplete specimen (BK 8-550 11).

Description: Convolute shell with relatively high, flat whorls. Sculpture is formed by expressive ribs which are wide and flat (especially on the external side). Ribs, usually arranged in pairs, run out from the umbilical tuber-

cle. The only rib runs out sporadically from the umbilical tubercle. One short inserted rib occurs occasionally on the external side each. Ribs bifurcated at umbilicus are apparent also on the internal whorls.

Measurement: Owing to incompleteness of the specimen, it may be just stated that maximum diameter varies around 40 mm.

Occurrence: The figured specimen comes from the 8th level (550 m) — the Upper Valanginian.

Distribution: *Neocomites teschenensis* is mentioned in literature with a relatively wide stratigraphic span. But in accordance with Thieuloy (1977) we presume that it occurs only in the lower part of the Upper Valanginian.

Subgenus *Teschenites* THIEULOY, 1971

Typical species: *Hoplites neocomiensis* UHLIG, 1902. Valanginian, Moravian-Silesian Beskid Mts.

Neocomites (Teschenites) neocomiensiformis neocomiensiformis (UHLIG, 1902)
Pl. II, Fig. 3

1902 *Hoplites neocomiensis* D'ORBIGNY sp.; Uhl ig, p. 54, Pl. 3, Fig. 2, Pl. 4, Fig. 11, ? Fig. 3.

1977 *Neocomites (Teschenites) neocomiensiformis neocomiensiformis* (UHLIG, 1901); Thieuloy, p. 95, Pl. 1, Fig. 1, Pl. 2, Figs. 1—3 (cum syn.).

Material: A greater amount of incomplete specimens, e.g. BK 5-250/2, BK 6-86/11, BK 7-535, BK 8-450/4, BK 8-470/14, BK 8-480/20, BK 8-490/12 and three slightly deformed, well preserved specimens (BK 8-475/4, BK 8-480/13, BK 5-270/18).

Description: Convolute shells of medium to great size with relatively wide umbilicus and medium-high, flat whorls. There are thin and dense *Neocomites*-like ribs corresponding to sculpture of the species *Neocomites neocomiensis* (d'ORBIGNY) on the internal whorls. Ribs are inclined forward (proversional) on living chamber and towards aperture they are thicker. On transition of phragmocone to living chamber two ribs usually run out from the umbilical tubercles, simple rib without tubercle is put between them, later it is one rib to which another rib is joined in various height or bifurcation of the ribs occurs.

Measurement: Owing to deformation of the shells, the obtained values do not express quite exact parameters:

	D	H	U
sp. BK 8-480/13	72,—	27,— (0.37)	24,— (0.33)
sp. BK 5-270/18	55,—	23,— (0.42)	16,— (0.29)

In the former sp. 40 ribs on perimeter of the shell (in the latter — 34) fall on a last half-whorl and 14 tubercles at umbilicus (in the latter — 12).

Occurrence: Subspecies occurs usually in the Lower Hauterivian on the 8th level (450—490 m), on the 7th level (535 m), on the 6th level (85 m) and on the 5th level (250—270 m) — the Lower Hauterivian.

Distribution: According to Thieuloy (1977) the given subspecies

occurs in the Uppermost Valanginian and the Lower Hauterivian in France, Bulgaria and Rumania. Uhlig (1902) figures and describes this species on the basis of stratigraphically univocally ranged material of L. H o h e n e g g e r from the sediments of the Silesian in the Moravian-Silesian Beskids.

Neocomitse (Teschenites) cf. jodariensis (DOUVILLÉ, 1906)

Pl. II, Fig. 1

1906 *Hoplites jodariensis* DOUVILLÉ, p. 207, Pl. 13, Fig. 7.

1977 *Neocomites (Teschenites) jodariensis* (DOUVILLÉ); Thieuloy, p. 102, Pl. 1, Fig. 3, Pl. 6, Figs. 1—3.

1983 *Neocomites (Teschenites) cf. jodariensis* DOUVILLÉ; Vašíček et al., Pl. 1, Fig. 7.

M a t e r i a l: Fragmental specimens (e.g. BK 1-80/23, BK 5-85/3, BK 8-470 9, 23) and one almost complete specimen (BK 8-470 16) preserved as flat depressed sculptural mould. There is a rest of lamellaptychus in the living chamber perhaps "in situ".

D e s c r i p t i o n: Semi-involute shell with dense and fine ribs on the internal whorls. On internal whorls majority of ribs reaches as far as umbilicus where periumbilical tubercles are apparent. 2—3 ribs usually run out from them. Inserted ribs sometimes started in about half of whorl's height. Main ribs are sigmoidal. Only one rib corresponding to the main ribs runs out most often from umbilical tubercles on the younger part of phragmocone. Two inserted ribs in interval between two main ribs are added to them. These additional ribs look as continuation of umbilical tubercles, but they do not reach them. Their course resembles coupled arrangement of the main ribs. Terminal part of the last whorl which is imperfectly preserved and which belongs probably to the living chamber bears thicker and thinner ribs than those from the previous part.

M e a s u r e m e n t: If diameter $D = 45$ mm, $H = 21$,- (0.47) and $U = 10$ (0.22). 12 umbilical tubercles and about 50 ribs on perimeter fall on half of the whorl.

N o t e s: Density of costation and narrow umbilicus correspond to the species *N. (T.) jodariensis*. Owing to imperfect preservation of the living chamber, an exact identification with the type is not quite possible. Another related species with thin ribs and narrow umbilicus is *N. (T.) flucticulus* THIEULOY which has thinner ribs.

Plate III

Fig. 1. *Kilianella ex gr. pexiptycha* (UHLIG). Sp. BK 8-565 15. (SNM Z-19445). The upper part of the Lower Valanginian, 8th level, 565 m.

Fig. 2. *Abrytusites thieuloyi* n. sp. Sp. BK 7-530 3. (SNM Z-19446). The Lower Hauterivian, 7th level, 530 m. Juvenile, slightly deformed specimen preserved in chert. Epifaunal remnants are apparent on the surface of the shell with very thin inter-ribs.

Fig. 3. *Eleniceras tchekitevi* BRESKOVSKI. Sp. BK 6-95 14. (SNM Z-19447). The Lower Hauterivian, 6th level, 95 m.

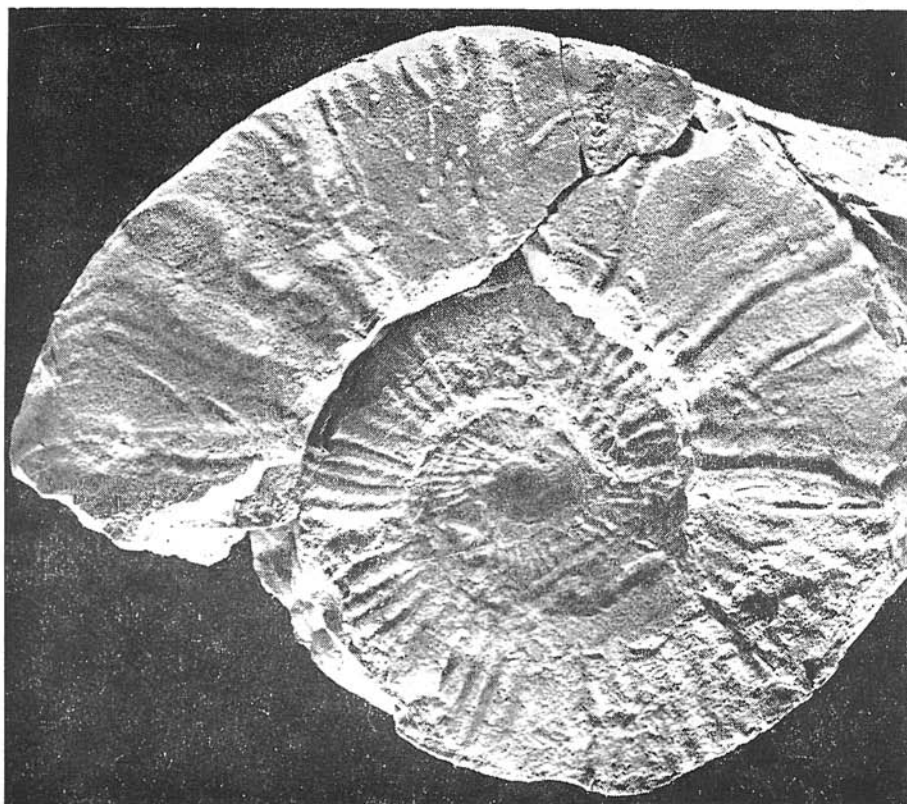
Plate III



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2



3

Occurrence: *N. (T.) cf. jodariensis* occurs especially on the 8th level (470 m), then it was found on the 6th level (85 m) and on the 1th level (75 and 80 m) — the Lower Hauterivian.

Distribution: Thieuloy (1977) mentions the species *N. (T.) jodariensis* from the Upper Valanginian and the Lower Hauterivian sediments of Vocont trough region.

Genus *Eleniceras* BRESKOVSKI, 1967

Typical species: *Eleniceras stevrecensis* BRESKOVSKI, 1967. Lower Hauterivian, Bulgaria.

Eleniceras tchechitevi BRESKOVSKI, 1967

Pl. III, Fig. 3

1967 *Eleniceras tchechitevi* BRESKOVSKI, p. 50, Pl. 1, Fig. 2, Pl. 2, Fig. 1, Pl. 3, Fig. 1, Pl. 4, Fig. 1, Pl. 5, Fig. 1.

1977 *Eleniceras tchechitevi* BRESKOVSKI; Thieuloy, p. 105, Pl. 1, Fig. 4, Pl. 4, Figs. 2, 3, 4 (cum syn.).

Material: The only specimen with flat depressed, imperfectly preserved internal whorls and partly deformed last half-whorl (sp. BK 6-95).

Description: Evolute shell. Straight ribs inclined towards aperture occur on the oldest preserved internal whorl. Some of them are bifurcated in slight umbilical tubercles, simple ribs are usually put between them. In the next stage the ribs gradually straightened. Umbilical tubercles are probably missing, bifurcation of the ribs at umbilicus is rare. Inserted ribs reaching half of the whorl's height occur sporadically or some of the ribs are bifurcated here. First distinct constriction is apparent near the beginning of the last whorl (indistinctly implied constriction seems to be on the last but one whorl). Constrictions on the whole last whorl are expressive. There are 5-6 constrictions limited by two thick ribs on older half-whorl linking to the last but one whorl. The ribs are thicker behind constrictions and they are bearing three tubercles. Umbilical and lateral tubercles occurring in 2/3 of the whorl's height are thicker than external tubercles. Simple ribs (usually 4) are apparent between constrictions, one of the ribs is bifurcated. The ribs between constrictions on terminal half-whorl are becoming thin or disappearing, their number being reduced. Ribs hemming constrictions along the frontal side bear at first slight umbilical tubercle, external tubercle is just implied, tubercles are gradually disappearing, ribs are becoming thinner and they totally disappear. Thick ribs with constrictions (with tubercles) are undeveloped. On the shell's perimeter the ribs suddenly inclined to aperture and they pass the internal side without interruption in form of a thick arch. Number of constrictions rises to 8 on terminal half of the whorl. The last 4 constrictions are just implied, but thick back ribs remain.

Measurement: If shell diameter $D = 130$ mm, $H = 43$ mm (0.33), $U = 56$ mm (0.43). The ribs between constrictions are becoming thinner if diameter equals to ca. 90 mm, they are disappearing if $D =$ ca. 110 mm.

Occurrence: The only adult specimen comes from the 6th level (95 m) — the Lower Hauterivian.

Distribution: According to Thieuloy (1977) the species *Eleniceras tchetchitevi* occurs in the Uppermost Valanginian and in the Lower Hauterivian.

Genus *Kilianella* UHLIG, 1905

Typical species: *Hoplites pexiptychus* ULIG, 1882. Valanginian, the Alps.

Kilianella ex gr. *pexiptycha* (UHLIG, 1882)

Pl. III, Fig. 1

1882 *Hoplites pexiptychus* n. sp.; Uhlig, p. 389, Pl. 4, Figs. 4, ? 5.

1975 *Kilianella pexiptycha* (UHLIG); Vašíček, p. 86, Pl. 4, Fig. 4, Pl. 5, Fig. 3, Pl. 8, Figs. 2, 3 (cum syn.).

Material: One imperfectly preserved, incomplete specimen (BK 8-565/15).

Description: Evolute shell with low whorls. Sculpture is formed by thick ribs on the best preserved section of the last whorl, further on periodic constrictions are apparent. The ribs are slightly bended, arched to the aperture. They are either simple or bifurcated. Bifurcation occurs disunitedly in about half of the whorl's height. There is always a simple rib in front of the constrictions. Thinner rib may split off near umbilicus from very thick flat rib behind the constrictions. There are 6 ribs at umbilicus and 9 ribs on perimeter between 2 constrictions (the only preserved specimen).

Measurement: If $D = 34$ mm, $H = 10,-$ (0.30), $U = 15,-$ (0.44).

Notes: On the basis of relatively straight ribs broadening towards the outer side and lacking tubercles, we presuppose that the given specimen belongs to the range of the species *K. pexiptycha*.

Occurrence: The figured specimen comes from the 8th level (565 m) — the upper part of the Lower Valanginian.

Distribution: According to the latest biostratigraphic investigations, the given species occurs in the upper Lower Valanginian (e. g. Hoedemaeker, 1982).

Kilianella retrocostata SAYN, 1907

Pl. IV, Fig. 4

1907 *Thurmannia Roubaudi* D'ORB. var. *retrocostata* var. nov.; Sayn, p. 49, Pl. 6, Figs. 11, 15.

1982 *Thurmanniceras* (*Kilianella*) *retrocostatum* SAYN; Hoedemaeker, Pl. 5, Fig. 3.

1983 *Kilianella* ex gr. *pexiptycha* UHLIG; Vašíček et al., Pl. 1, Fig. 1.

Material: Imprint of about one half of the shell with fragment consisting of 1/4 of the last and equivalent part of the last but one whorl (BK 8-565/7) preserved as a sculptural mould.

Description: Evolute shell strikingly costated. There are 4 shallow constrictions inclined forward on the half of the last whorl. Rib bifurcated at umbilicus followed after constrictions. There are 4 ribs among constrictions and the above-mentioned bifurcated rib. The only one of 4 ribs is bifurcated roughly

in the half of whorls (the other ones are simple). Ribs on the preserved section are markedly bended towards juvenile beginning on peripheral part of the whorl. Ribs are without tubercles. About 23 ribs fall on half of the whorl, if diameter of the shell is about 30 mm.

Occurrence: Specimen comes from the 8th level (565 m) — the upper part of the Lower Valanginian.

Distribution: According to Thieuloy in Busnardo et al. (1979) and Hoedemaeker (1982), the given Lower Valanginian species survives till the Latest Lower Valanginian (zone with *Busnardoites campylotoxus*).

Genus *Busnardoites* NIKOLOV, 1966

Typical species: *Ammonites desori* PICTET et CAMPICHE, 1858—1860. Valanginian, Switzerland.

Busnardoites campylotoxus (UHLIG, 1902)

Pl. VI, Fig. 2

1902 *Hoplites campylotoxus* n. sp.; Uhlig, p. 49, Pl. 4, Figs. 1, 2, ? 3.

1975 *Thurmanniceras campylotoxum* (UHLIG); Vašíček, p. 90, Pl. 6, Figs. 1—3, Text-Fig. 5 (cum syn.).

1977 *Busnardoites campylotoxus* (UHLIG); Nikolov, p. 112, Pl. 3, Fig. 4, Pl. 4, Figs. 1, 2, Text-Fig. 3.

1979 *Thurmanniceras campylotoxum* (UHLIG); Thieuloy, p. 46, Pl. 2, Figs. 4—6.

Material: Almost complete shell in combination of incomplete mould with imprint preserved as corroded sculptural mould (BK 8-560/1).

Description: Almost evolute shell with medium-high, relatively flat whorls converging to perimeter. Sculpture is formed by relatively thick flat sigmoidal ribs inclined forward. Ribs start at umbilicus as simple ribs with implied tubercle-like thickening. Ribs are bifurcated near umbilicus, in about quarter of the whorl's height. They apparently do not continue on the external side of the rib and they end with marginal thickenings. Constrictions are not apparent.

Measurement: If $D = 44$ mm, $H = 18,-$ (0.41), $U = 13.5$ (0.31). 1/4 of the last whorl on perimeter bears about 17 ribs.

Plate IV

Fig. 1. *Lytoceras subfimbriatum* (D'ORBIGNY). $\times 0.5$. Sp. BK 8-450/3 SNM Z-19448 The Lower Hauterivian, 8th level, 450 m.

Fig. 2. *Sarasinella cf. ambigua* (UHLIG). Sp. BK 8-480/6. (SNM Z-19449). The Lower Hauterivian, 8th level, 450 m.

Fig. 3. *Criosarasinella heterocostata* (MANDOV). Sp. BK 8-510/2. (SNM Z-19450). The uppermost Valanginian, 8th level, 510 m. External part of the last whorl preserved as imprint. Relic of the previous whorl shows distinct coiling in free spiral.

Fig. 4. *Kilianella retrocostata* SAYN. BK 8-565/7. (SNM Z-19451). The upper part of the Lower Valanginian, 8th level, 565 m.

Fig. 5. *Pulchellia compressissima* (D'ORBIGNY). Sp. BK 8-170/9. (SNM Z-19452). The Lower Barremian, 8th level, 170 m.

Plate IV



1



4



5



2



3

Notes: Fragment of the whorl of the specimen BK 8-570/2 belongs also to a range of the given genus. In comparison with the species *B. campylotoxus* it has less regularly bifurcated ribs, and tubercles are implied on some ribs in the half of the whorl's height. Nikolov (1977) compares the species *B. campylotoxus* with other representatives of the genus.

Occurrence: The only well determinable specimen was found on the 8th level (560 m) — the uppermost Lower Valanginian.

Distribution: According to Thieuloy in Busnardo et al. (1979), the species *Busnardoites campylotoxus* is a zonal species for the uppermost part of the Lower Valanginian. Nikolov (1977) gives occurrence from the Upper Valanginian (zone with *Saynoceras verrucosum*) in Bulgaria.

Genus *Sarasinella* UHLIG, 1905

Typical species: *Hoplites ambiguus* UHLIG, 1902. ? Valanginian, Moravian-Silesian Beskids.

Sarasinella cf. *ambigua* (UHLIG, 1902)

Pl. IV, Fig. 2

1902 *Hoplites ambiguus* n. sp.; Uhlig, p. 45, Pl. 6, Figs. 3—5.

1975 *Sarasinella ambigua* (UHLIG); Vašíček, p. 95, Pl. 7, Figs. 1, 2, 4, Text-Fig. 7 (cum syn.).

Material: The only specimen with non-preserved oldest whorls, with subsequent whorls in form of sculptural mould and incomplete, strongly deformed last whorl (BK 8-480/6).

Description: Evolute shell. Only tritubercular ribs were apparently developed in the earliest stage. Sculpture is similar in the further ontogeny, ribs with tubercles alternate sporadically with a simple inserted rib without tubercles. Ribs are slightly posteriorly bended. One or two thinner, inserted ribs without tubercles are often, but irregularly placed among tritubercular ribs. Several tritubercular ribs without inserted ribs follow often one after another. Inserted ribs run out usually from umbilical tubercles, but sometimes two tritubercular ribs run out from these tubercles, whereby the back rib from the mentioned pair is thinner than a frontal one near umbilicus. Central line of tubercles is somewhat above the whorl's centre. Behind this line, hitherto flat part of the whorls converges to external side. When diameter is about 35 mm, all tubercles become slight and they gradually disappear. Very imperfectly preserved terminal half of the last whorl, excluding umbilical part with slight, elongated elevations, bears ribs without tubercles. Ribs are simple in this part or they are bifurcated at umbilicus, some of them are bifurcated on the whorl's perimeter.

Measurement: Maximum diameter is about 60 mm. If $D = 40$ mm, $H = 13.5$ (0.34), $U = 15$,- (0.375), if $D = 36$ mm, $H = 12.5$ (0.35), $U = 14$,- (0.39).

Notes: The whorls corresponding to medium ontogenetic stage are perfectly preserved in our specimen. Tritubercular character of the ribs and evolute coiling correspond to the genus *Sarasinella*. Tritubercular costation lasts till diameter of about 40 mm, what is much longer than in the species *Sarasinella varians* UHLIG, 1910. Type material of the species *Sarasinella ambigua* has just

adult whorls preserved, unfortunately, juvenile ones are unknown. On the basis of analogy of sculpture on the last whorl of Butkov specimen and the oldest preserved whorls of Uhlig's (1902) originals, it may be presupposed that the described specimen belongs to the species range of *Sarasinella ambigua*.

Occurrence: Our only specimen comes from the 8th level (480 m) — the Lower Hauterivian.

Distribution: Genus *Sarasinella* has been hitherto predominantly considered for the Upper Valanginian. Uhlig's type material has not univocal stratigraphic classification: it may belong either to the Upper Valanginian or to the Lower Hauterivian. Thieuloy (1977) mentions occurrence of the specimen denoted as *Sarasinella cf. ambigua* (p. 108) in the Lower Hauterivian of Vocent trough.

Genus *Criosarasinella* THIEULOY, 1977

Typical species: *Criosarasinella furcillata* THIEULOY, 1977. Upper Valanginian, France.

Criosarasinella heterocostata (MANDOV, 1976)

Pl. IV, Fig. 3

1976 *Crioceratites* (*Crioceratites*) *majoricensis heterocostatus* n. subsp.; Mandov, p. 57, Pl. 5, Figs. 1, 3.

1977 *Criosarasinella heterocostata* (MANDOV); Thieuloy, p. 111, Pl. 5, Fig. 8.

1983 *Criosarasinella heterocostata* MANDOV; Vašíček et al., Pl. 1, Fig. 5.

Material: Imprint of the half of last whorl, incomplete part of the second half and small parts of the last but one whorl (sp. BK 8-510 2).

Description: Crioceratitically coiled shell. On the oldest preserved part simple ribs prevail, some of them were somewhat thicker, bitubercular or tributercular. On the next part simple, straight ribs beginning with inexpressive elongated umbilical tubercles are apparent. Two ribs run out sporadically from these tubercles. In the only case a short inserted rib appears on perimeter. Ribs are slightly sigmoidal on terminal half of the last whorl; they begin with elongated umbilical tubercles. Bifurcation of the ribs occurs only exceptionally. Majority of the ribs is bifurcated in various height on external half of the whorl, bifurcation is sometimes replaced by short (corresponding) inserted rib. Some ribs remain simple — unbifurcated during whole ontogeny. Only on perimeter the ribs are bended anteriorly. Ribs become less frequent towards aperture.

Measurement has an orientation character: if $D = 50$, - (max.), $H = 15$, - (0.30), $U = 25$, - (0.50).

Notes: Freely (crioceratitically) coiled whorls and a lot of bifurcated or inserted ribs on perimeter range the shell to the genus *Criosarasinella*. From the hitherto known representatives of the genus, freely coiled whorls remain till maturity in the only species — *Criosarasinella heterocostata*. On the last whorl of this species main and additional ribs are not differentiated.

Occurrence: The figured specimen comes from the 8th level (510 m) — the Uppermost Valanginian.

Distribution: According to Thieuloy (1977) representatives of the

genus *Criosarasinella* occur just below the level of occurrence of the zonal species *Teschenites callidiscus* THIEULOY in the uppermost Valanginian.

Genus *Acanthodiscus* UHLIG, 1905

Typical species: *Ammonites radiatus* BRUGUIÈRE, 1979. Lower Hauterivian, France.

Acanthodiscus sp.

Pl. V, Fig. 1

Material: Fragment of one half of last, strongly deformed whorl preserved as a sculptural mould (sp. BK 5-200/7).

Description: Probably convolute shell. There are tritubercular main ribs on the whorls. There are bifurcated and simple additional ribs among them. All ribs seem to be simply bended posteriorly. There were spines on tubercles placed at thicker main ribs, umbilical spines seemed to be the thinnest. Central line of spines is closer to umbilical spines than to peripheral ones. One inserted rib whose connection with the tubercles is just implied leads from each side to the central tubercles. Only 4 additional ribs among the main ribs reach umbilicus. On perimeter there are about 7 ribs among the main ribs. Slight constriction is implied in front of the main ribs. About 5 main ribs with tubercles fall on half of the whorl.

Measurement: Owing to incompleteness and deformation the specimen is unmeasurable. Diameter of the shell reaches about 45 mm.

Notes: Juvenile, deformed whorl prevents the species from exact determination, while there should be no doubts about the genus correspondence. Characteristic feature of our specimen is a great number of additional ribs among the main ribs reaching as far as umbilicus, majority of them being bifurcated. Tritubercular ribs are developed, if diameter of the shell is relatively small and, eventually, all ribs are bended towards aperture. On the basis of the given features, juvenile specimen from the range of the species *Acanthodiscus vaceki* NEUMAYR et UHLIG may be concerned.

Occurrence: The specimen comes from the 5th level (200 m) — the Lower Hauterivian.

Distribution: All species of the genus *Acanthodiscus* occur in the Lower Hauterivian.

Family *Holcodiscidae* SPATH, 1924

Genus *Spitidiscus* KILIAN, 1910

Typical species: *Ammonites rotula* SOWERBY, 1829. Hauterivian, England.

Plate V

Fig. 1. *Acanthodiscus* sp. Sp. BK 5-200/7. (SNM Z-19453). The Lower Hauterivian, 5th level, 200 m.

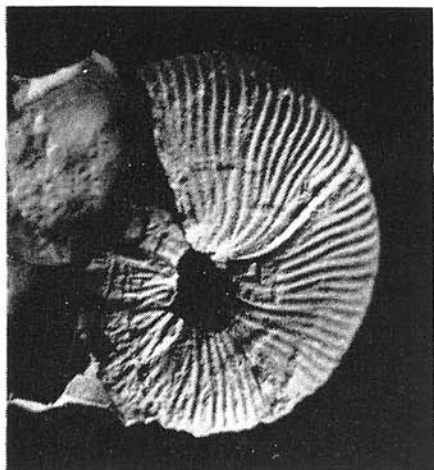
Fig. 2. *Spitidiscus rotula inflatus* KILIAN. Sp. BK 8-470/28. (SNM Z-19454). The Lower Hauterivian, 8th level, 470 m.

Fig. 3. *Spitidiscus nodosus* MANDOV. Sp. BK 7-520/2. (SNM Z-19455). The Lower Hauterivian, 7th level, 520 m. Incomplete shell preserved in cherty limestone with striking umbilical tubercles on the main ribs (partly broken).

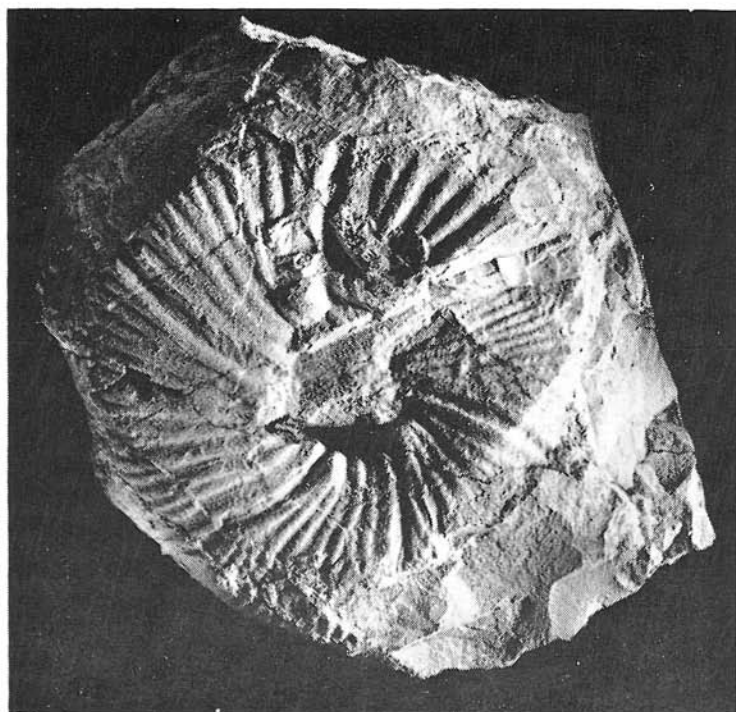
Plate V



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3

Spitidiscus nodosus MANDOV, 1976

Pl. V, Fig. 3

1976 *Spitidiscus nodosus* n. sp.; Mandov, p. 86, Pl. 20, Fig. 1, Pl. 21, Fig. 1.

Material: Two specimens: the larger is represented by incomplete sculptural mould preserved in siliceous cherty limestone with unpreparable internal whorls (sp. BK 7-520/2), the smaller is imperfectly preserved and deformed (sp. BK 8-470/18).

Description: Semi-involute shell with relatively high and perhaps not so wide whorls. Sides of the last whorl are slightly arched. They pass quite suddenly, but without edge into sheer umbilical wall. Sides pass fluently into relatively narrow, but rounded external side. The greatest width of the whorl is about in $\frac{2}{3}$ of the whorl's height. Sculpture is formed by mostly bifurcated, slightly bended ribs inclined to aperture, alternated with wide, expressive constrictions. There are 6 constrictions on the last whorl. They are slightly inclined and bended posteriorly. Frontal side of constrictions is bordered with simple rib, a little thicker than the other ribs. In front of this rib there is a zone of bifurcated ribs. Bifurcation occurs mostly disunitedly, but roughly in about half of the whorl's height. Ribs bifurcated at umbilicus may occur irregularly as well. Simple, as well as bifurcated ribs may begin with implied comblike tubercle. Then section of the ribs attached to back side of constrictions running out in form of bunches from strongly jutting umbilical tubercle follows. Ribs run out from it usually three by three, rarely even four by four. In the section limited by two constrictions, 6 to 7 ribs reach umbilicus, there are about 14 to 17 ribs on perimeter.

Measurement: In the only measurable diameter $H = 26.7$ mm (0.39), $U = 16.5$ mm (0.24) were measured, when $D = 68.7$ mm. Maximum diameter of the shell reaches ca. 90 mm. In the diameter measured about 40 peripheral ribs fall on half of the whorl.

Notes and relations: The figured specimen is smaller than Mandov's holotype (1976). Description and striking periumbilical tubercles correspond well to morphology of internal whorls of the given species. In general, the species *S. nodosus* is related to the species *S. meneghini* and *Sp. cankovi* n. sp. But both latter specimens lack umbilical tubercles. In addition, *Sp. cankovi*

Plate VI

Fig. 1. *Spitidiscus cankovi* n. sp. Holotype, sp. BK 6-80/2. (SNM Z-19456). The Lower Hauterivian, 6th level, 80 m.

Fig. 2. *Busnardoites campylotoxus* (UHLIG). Sp. BK 8-560/5. (SNM Z-19457). The upper part of the Lower Valanginian, 8th level, 560 m.

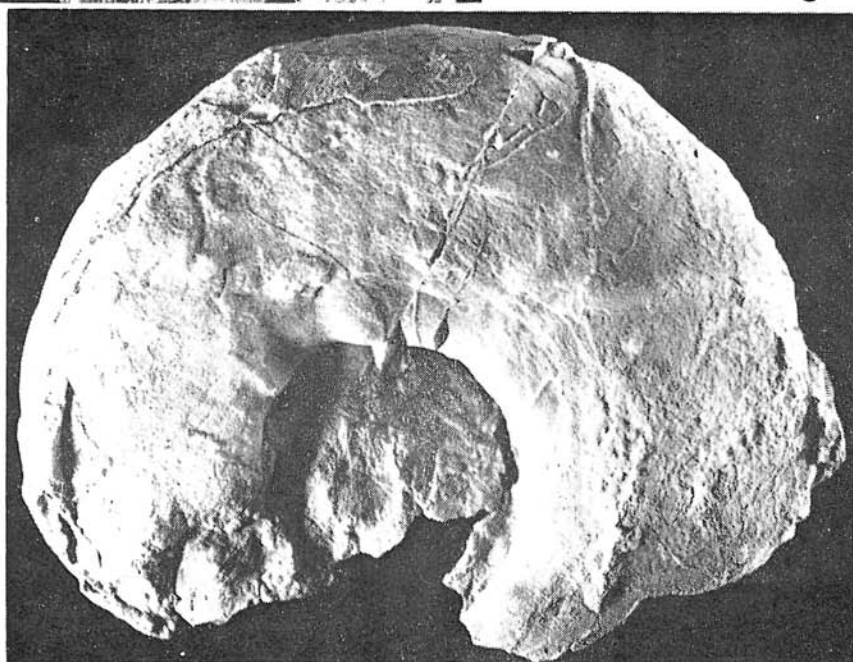
Fig. 3. *Abrytusites thieuloyi* n. sp. Sp. BK 6-95/20. (SNM Z-19458). The Lower Hauterivian, 6th level, 95 m. Incomplete adult whorl.

All specimens are in their natural size except Pl. IV, Fig. 1 (x 0.5). The shells were bleached with ammonium chloride before photographing.

Shells in Pl. I, Figs. 1, 3, 4, Pl. II, Fig. 1, Pl. III, Fig. 3. Pl. IV, Figs. 2—5, Pl. VI, Figs. 1, 3 were photographed by M. Grmelová, the other shells by K. Mezihráková.

Figured material is deposited in collections of the Slovak National Museum in Bratislava under the given inventory numbers.

Plate VI



has a smaller density of the ribs in comparable diameter. Comparison with other related species is given by Mandov (1976).

Occurrence: The found specimens come from the 7th level (520 m) — the Lower Hauterivian.

Distribution: The species *Spitidiscus nodosus* has been hitherto known only from the Lower Hauterivian in Bulgaria.

Spitidiscus cankovi n. sp.

Pl. VI, Fig. 1

1935 *Holcodiscus (Spitidiscus) van-den-heckeii*, D'ORB.; Cankov, p. 71, Pl. 2, Fig. 1.

1967 *Spitidiscus meneghinii* (ZIGNO in RODIGHIERO); Dimitrova, p. 150, Pl. 77, Fig. 5.

1983 *Spitidiscus cf. meneghinii* ZIGNO; Vašíček et al., Pl. 1, Fig. 8.

Holotype: Specimen figured in Pl. VI, Fig. 1 is marked by number BK 6-80/2. It is deposited in collections of the Slovak National Museum in Bratislava — No. SNM Z — 19456.

Stratum typicum: The Lower Hauterivian.

Locus typicus: Butkov quarry near the village Ladce.

Derivatio nominis: Species name in honour of Prof. Dr. V. Cankov from Sofia who was the first to picture specimen of new species described here.

Material: The only specimen preserved as a sculptural mould slightly deformed by overlying beds (BK 6-80 2).

Diagnosis: Semi-involute shell with high whorls bearing wide, blunt and thin ribs combined with striking constrictions. Constrictions are accompanied with ribs thicker than the other ones.

Description: Semi-involute shells with high whorls and very expressive sculpture. The most striking element is represented by deep, almost straight constrictions inclined towards aperture. From both sides the constrictions are bordered with thick ribs. Rib in front of constrictions is simple, the back one is complicated. It begins with two ribs running out from umbilicus. In the interval limited by these ribs there are usually one simple inserted rib and another rib splitting from the rib bordering constriction on peripheral part of the whorl. Some of the ribs may be missing. The rest of interval between constrictions on terminal half of the whorl is filled with two ribs bifurcating in about 1/2 of the whorl's height (but not on the same level). There are 7 constrictions on the last whorl. In the interval between two constrictions there are usually 5 ribs at umbilicus and 10—12 ribs on perimeter. All ribs including constrictions are inclined towards aperture on external side.

Measurement: On the specimen BK 6-80/2 the following parameters were measured: when $D = 82$ mm, $H = 35$.- (0.43), $U = 21$.- (0.25). Maximum diameter reaches ca. 85 mm. Half of the whorl bears about 32 ribs, when diameter equals to 82 mm.

Notes: The pictured specimen is very close to the Bulgarian specimen figured by Cankov (1935) and later again by Dimitrova (1967) who ranges it to the species *Sp. meneghinii* (cf. *synonymics*). Mandov (1976, p. 85)

Table 1

Comparison of ammonite stratigraphy of the Valanginian—Hauterivian sediments in the SE France and Manin sequence of Butkov locality

		Vocont trough	Butkov
Upper Hauterivian		<i>Pseudothurmania angulicostata</i> (D'ORBIGNY)	
		<i>Plesiospitidiscus ligatus</i> (D'ORBIGNY) <i>Subsajnella sayni</i> (PAQUIER)*	<i>Plesiospitidiscus</i> sp. <i>Crioceratites duvali</i>
Lower Hauterivian		<i>Lyticoceras nodosoplicatum</i> (KILIAN et REBOUL) <i>Olcostephanus jeannoti</i> (d'ORBIGNY) <i>Crioceratites loryi</i> (SARKAR) <i>Acanthodiscus radiatus</i> (BRUGUIÈRE)	<i>Crioceratites loryi</i> <i>Acanthodiscus</i> sp.
Valanginian	Upper	<i>Teschenites callidiscus</i> THIEULOY** <i>Himantoceras trinodosum</i> THIEULOY <i>Saynoceras verrucosum</i> (D'ORBIGNY)	<i>Criosarasinella</i> <i>heterocostata</i> <i>Himantoceras</i> cf. <i>trinodosum</i>
	Lower	<i>Busnardoites campylotoxus</i> (UHLIG) <i>Thurmanniceras pertransiens</i> (SAYN) <i>Thurmanniceras otopeta</i> THIEULOY	<i>Busnardoites campylotoxus</i>

* Moullade and Thieuloy (1967) mention also *Crioceratites duvali* LÉVEIL-LÉ as a zonal species from this zone.

** The species *Cr. heterocostata* (MANDOV) is characteristic for the lower part of this zone.

who ranges the Cankov's specimen to the species *Sp. meneghinii* too, draws an attention to a higher number of constrictions than it is usual in the latter species. From the comparison of Bulgarian and our specimens with a type of the species *Sp. meneghinii* (RODIGHERO, 1919, Tab. 3, Fig. 7) it follows that *Sp. cankovi* differs considerably by a high number of constrictions (in Bulgarian specimen it is raised probably near aperture) and less numerous and thicker ribs.

Occurrence: The found specimen comes from the 6th level (80 m) — the Lower Hauterivian.

Distribution: For the time being, the species *Sp. cankovi* has been known only from the Hauterivian in Bulgaria.

Spitidiscus rotula inflatus KILIAN, 1912
Pl. V, Fig. 2

- 1912 *Spitidiscus (Holcodiscus) rotula* SOW. sp. (PAWL. sp.) var. *inflata* KILIAN, p. 2, Pl. 1, Fig. 2 a—b.
1919 *Polyptychites Meneghinii* de ZIGNO in schedis; Rodighiero, p. 94, Pl. 3, Fig. 4 (non Fig. 7 = *Sp. meneghinii*).
1972 *Spitidiscus rotula inflatus* KILIAN; Thieuloy, p. 32, Pl. 2, Figs. 4, 5, Pl. 3, Figs. 2, 3; Text-Figs. 4 c, d, e, 5.

Material: The only sculptural mould strongly depressed into the bedding plane (sp. BK 8-470/28).

Description: Involute shell with high and formerly wide whorl (before deformation). Sculpture is formed by numerous thin, slightly sigmoidal ribs inclined forward and separated into several sections by constrictions. There are about 4—5 ribs at umbilicus and about 17 ribs on the shell's perimeter between two constrictions. There are 5 constrictions on the last whorl. Narrow constrictions are hemmed by ribs, rib in front of constrictions is thicker. 4—5 ribs split off on various level from the rib behind constriction. Other ribs in the interval between two constrictions are bifurcated on uneven level in about half of the whorl's height. Only one rib remains simple, non-bifurcated. Triple rib occurs in front of the rib bordering constrictions along the frontal side. The ribs pass the external side without interruption.

Measurement: Maximum measurabile diameter (roughly in axis of elongation of deformed shell) is 52 mm. When $D = 52$ mm, $H = 27$ mm (0.52), $U = 10$ mm (0.19). Owing to deformation, values are only of orientation character. In the measured diameter 42 ribs come to half of the whorl.

Notes: Owing to deformation of our specimen, width of the whorl cannot be applied in determination. By the type of costation our specimen resembles the species from *Spitidiscus rotula* (SOWERBY) — or *Spitidiscus inflatus* — group in conception of Zwierycki (1914) and Dimitrova (1967). Thanks to Thieuloy (1972) it turned out that choice of the species name *inflatus* by J. Zwierycki was unlucky and the former author proposes new species name *Sp. mikadiensis* for *Sp. inflatus*. Type material of the species *Sp. mikadiensis* is characterized by very narrow umbilicus ($U/D = 0.15$), while our specimen has $U/D = 0.19$ in spite of narrowing of umbilicus stressed by deformation. This feature prevents our specimen from its identification with the African species. On the other hand, size of umbilicus and corresponding numbers of the ribs between two constrictions are close to the subspecies *Spitidiscus rotula inflatus* KILIAN pictured by Thieuloy (1972). Rodighiero's specimen (1919, Tab. 3, Fig. 4) seems to be very close to our material by degree of preservation and size. Dimitrova's specimen (1967, Tab. 77, Fig. 2 denoted as *Sp. inflatus*) has slightly thinner costation than typical representatives of described subspecies.

Occurrence: The only found specimen comes from the 8th level (470 m) — the Lower Hauterivian.

Distribution: According to J.—P. Thieuloy the given subspecies occurs in the Lower Hauterivian from the *Lyticoceras nodosoplicatum* Zone in France. It is known also from the Hauterivian in Italy.

Genus *Plesiospitidiscus* BREISTROFFER, 1947

Typical species: *Ammonites ligatus* D'ORBIGNY, 1840. Neocomian, Basses Alpes (France).

Plesiospitidiscus sp.

Material: Almost complete last whorl preserved as slightly deformed sculptural mould (sp. BK 8-360/1). Umbilical region is unpreparably filled with sediment.

Description: Shell with flat, high and narrow whorls. Sides are slightly arched with the greatest width in about half of height, then they slightly converge to narrow external side. Sculpture is formed by thin main ribs standing out most markedly near the external side of the shell. Ribs especially on terminal part of the whorl were accompanied with slight constrictions. Ribs slightly inclined to aperture are almost straight. Only near external side they are bended forward. They pass external side by arch bended anteriorly. Dense growth lines up to little ribs of similar course as main ribs are inserted among the main ribs.

Measurement has orientation character, it is irrelevant due to filled umbilicus: $D = 49,-$ $H = 21,-$ (0.43) $U = 15,-$ (0.31) $B = 11,-$ (0.22); max. $D = 55$ mm. There are 9 main ribs on last half-whorl.

Notes: Determination is strongly impeded by absence of knowledge of umbilicus width. Coming out from sculpture and morphology as a whole, two genera come into consideration: *Plesiospitidiscus* BREISTROFFER, 1947 and *Spitidiscus* KILIAN, 1910. From the genus *Spitidiscus* only the Lower Hauterivian species *Spitidiscus fasciger* THIEULOY, 1972 is related to our species. But it differs especially by flattened external side and almost direct course of the main ribs on this side; there are only 10 or 11 ribs on the whole whorl.

Genus *Plesiospitidiscus* with the Upper Hauterivian species *Plesiospitidiscus ligatus* (D'ORBIGNY) has more expressive main ribs, their number is smaller than in the Butkov specimen. Owing to similar section of the whorl and stratigraphic position we incline to the range of the species *P. ligatus* and, thus to the genus *Plesiospitidiscus*.

Occurrence: The only specimen comes from the 8th level (360 m) — the Upper Hauterivian.

Distribution: Typical species of the genus (*Plesiospitidiscus ligatus*) is the Late Hauterivian zonal species in France.

Superfamily *Desmocerataceae* ZITTEL, 1895

Family *Desmoceratidae* ZITTEL, 1895

Subfamily *Puzosiinae* SPATH, 1922

Genus *Abrytusites* NIKOLOV et BRESKOVSKI, 1969

Typical species: *Pachydiscus neumayeri* HAUG, 1889. Barremian, Tyrol.

Abrytusites thieuloyi n. sp.

Pl. III, Fig. 2, Pl. VI, Fig. 3

1972 *Abrytusites* ? nov. sp. A; Thieuloy, p. 39, Pl. 4, Figs. 4, 5, Text-Fig. 4 n, o, p.

Holotype: Specimen pictured by Thieuloy (1972, in Pl. 4, Fig. 4). It is deposited in Thieuloy's collection in Dolomieu Institute, Grenoble — No. ID 10133.

Stratum typicum: The Lower Hauterivian.

Locus typicus: Rottier (Drôme), France.

Derivatio nominis: Name chosen in honour of Dr. J.—P. Thieuloy who characterized the new species in 1972, but he did not denote it by species name.

Paratype: Juvenile specimen from the same collection and locality pictured by Thieuloy (1972) in Pl. 4, Fig. 5.

Material: Material itself comprises several incomplete, mostly larger specimens preserved as deformed sculptural moulds (sp. BK 6-95/20, BK 8-310.1 etc.). Juvenile specimen BK 7-530/3 is preserved in chert.

Diagnosis: Semi-evolute shells on juvenile whorls with slightly spitidiscid sculpture in maturity with 8 expressive constrictions accompanied with thin ribs beginning in umbilicus with slightly tubercles.

Description: Semi-evolute, large shells with relatively high and wide whorls. Umbilical wall is low, it falls inside the whorl. It is separated from the sides by narrow rounded zone. Sides are slightly arched, they are mostly arched above half of the whorl's height. Sides pass fluently to rounded external side. Whorls are smooth except several blunt ridges or ridge-like ribs slightly convex towards aperture. Ribs begin with blunt tubercles on umbilical side. In remaining course they are inexpressive, but continuing uninterruptedly even on the external side. Here they are slightly bended towards the beginning of the shell. Shallow, wide constrictions gradually disappearing towards the shell's perimeter are implied behind the ribs in the lower part of the whorl.

On smaller, also deformed specimen (BK 7-530/3) there are growth lines up to dense, thin ribs (especially on the external part of the whorls) of spitidiscid character among the main ribs accompanied with constrictions.

Measurement: It is inaccurate owing to imperfect preservation of terminal part of the shell (in sp. BK 6-95/20 when $D =$ (roughly max.) $= 117$ mm, $H = 46$, - (0.39), $U = 37$ (0.32), $B = 36$, - affected by deformation (0.31). Half of the whorl bears 4 ribs. In the juvenile specimen BK 7-530/3 whorl's width is somewhat greater than height.

Notes: Thieuloy's (1972) and our specimens have not preserved suture, so that their exact generic position is henceforth doubtful. External morphology of especially ephebic shells corresponds to description presented by Nikolov—Breskovski (1969). Ornamentation, degree of whorls coiling and stratigraphic position of our material correspond well to French material which is better preserved. The species *A. thieuloyi* differs from the species *Abrytusites juliany* (HONNORAT-BASTIDE, 1890) by more narrow umbilicus and greater number of the ribs with constrictions on one whorl (8 against 6). New species differs from the Lower Barremian species *A. neumayeri* (HAUG, 1889) and *A. sulcatum* NIKOLOV et BRESKOVSKI, 1969 mainly by sculpture (cf. Nikolov—Breskovski, 1969).

Occurrence: Our specimens come from the 6th level (95 m), 7th level (530 m) approximately from the stratigraphic position corresponding to the French Early Hauterivian *Crioceratites loryi* Zone. Then it is badly preserved specimen from the 8th level (310 m) — the Upper Hauterivian.

Distribution: Genus *Abrytusites* is known from the Lower Hauterivian till the Lower Barremian. The species *Abrytusites thieuloyi* has been hitherto known only from the Lower Hauterivian in France.

Superfamily *Pulchelliaceae* DOUVILLÉ, 1890

Family *Pulchellidae* DOUVILLÉ, 1890

Genus *Pulchellia* UHLIG, 1883

Typical species: *Ammonites galeatus* BUCH, 1839. Barremian, Columbia.

Pulchellia compressissima (D'ORBIGNY, 1840)

Pl. IV, Fig. 5

1840 *Ammonites compressissimus* D'ORBIGNY, p. 210, Pl. 61, Figs. 4, 5.

1966 *Pulchellia compressissima* (D'ORBIGNY); Breskovski, p. 107, Pl. 10, Fig. 10 (cum syn.).

1967 *Pulchellia compressissima* (D'ORBIGNY); Dimitrova, p. 164, Pl. 80, Figs. 3, 4 (cum syn.).

1983 *Pulchellia compressissima* D'ORBIGNY; Vašíček et al., Pl. 1, Fig. 10.

Material: The only juvenile, badly preserved sculptural mould (sp. BK 8-170/9).

Description: Involute shell with deep pointlike umbilicus with high whorls mostly arched in about half of their height. Sculpture is formed by wide ribs separated by narrow, inter-rib furrows. Ribs are distinct only on external half of the whorls, but disappearing towards umbilicus. On external side ribs end with implied tubercles. External side was most probably smooth.

Measurement: Values have only orientation character owing to state of preservation. When $D = 19$ mm (it is close to maximum), $H = 11$ mm (0.58), $U = 1$ mm (0.05).

Notes: According to external morphology, the similar species is *Nicklesia pulchella* (D'ORBIGNY). Owing to interruption of the ribs on external side, correspondence to the genus *Nicklesia* is excluded.

Occurrence: The only juvenile specimen comes from the 8th level (170 m) — the Lower Barremian.

Distribution: The species *Pulchellia compressissima* is mentioned in the Lower Barremian of the Mediterranean region.

Conclusion

The Lower Cretaceous ammonite fauna from Butkov locality is in the period of the Late Valanginian till the Late Hauterivian very close to ammonite fauna of deep-water sediments of Vocont trough in France. The comparison is striking from Tab. 1. French zonal species of the Valanginian determined by Thieuloy in Busnardo et al. (1979) and of the Hauterivian published by Thieuloy (1977) are presented in the left half of the table, while in the right half there are findings of the same or very related species in Butkov locality.

Dominating species of the Early Lower Valanginian, significant zonal species of the Early Lower Valanginian *Saynoceras verrucosum* and zonal species of the Late Lower Hauterivian *Olcostephanus jeannoti* and *Lyticoceras nodosoplicatum* have not yet been found on exposed levels of Butkov quarry.

Significant zone with the species *Pseudothurmannia angulicostata* considered either for the Uppermost Hauterivian or as the basal Barremian is not directly proved in Butkov by ammonite fauna. However, it is indirectly proved by occurrence of the specimen determined as *Plesiospitidiscus* sp. in the basement and by occurrence of the Lower Barremian species *Pulchellia compressissima* (D'ORBIGNY) in the overlying beds.

While the Lower Barremian is documented quite frequently in Butkov by barremitid ammonites and representatives of the genera *Anahamulina* HYATT, *Karsteniceras* ROYO Y GOMEZ, by the species *Holcodiscus* cf. *perezianus* (d'ORBIGNY) etc., the Upper Barremian (only its base) is documented by the only finding of the shell from the species range of *Costidiscus recticostatus* (D'ORBIGNY). All ammonite fauna found has true Mediterranean character.

Translated by O. Mišániová

REFERENCE

- BORZA, K. — GAŠPARÍKOVÁ, V. — MICHALÍK, J. — VAŠÍČEK, Z., 1980: An Upper Jurassic—Lower Cretaceous sequence of the Križna-nappe (Fatric), Strážovské vrchy Mts. Geol. Zbor. Geol. carpath. (Bratislava), 31, 4, pp. 541—562.
- BRESKOVSKI, S., 1966: Biostratigrafija na barema južno ot selo Brestok, Varnensko. Trudove v'rchu geol. na Bălgarija, ser. Pal. (Sofia), 8, pp. 71—121.
- BRESKOVSKI, S., 1967: Eleniceras — genre nouveau d'Ammonites hauteriviennes. Izv. Geol. Inst., Ser. Paleont. (Sofia), 16, pp. 47—52.
- CANKOV, V., 1935: Beležki v'rchu roda Holcodiscus. God. Sofij. Univ., Fiz. Matem. (Sofia), 31, 3, pp. 57—111.
- DIMITROVA, N., 1967: Fosilie na Balgarija IV, Dolna kreda — glavonogi. Izd. BAN, Sofia, Mon. 35, pp. 1—236.
- DOUVILLÉ, R., 1906: Esquisse géologique des Préalpes subbétiques. 215 pp. Paris.
- HOEDEMAEKER, PH. J., 1982: Ammonite biostratigraphy of the Uppermost Tithonian, Berriasian and Lower Valanginian along the Rio Argos (Caravaca, SE Spain). Scripta Geol. (Leiden), 65, pp. 1—81.
- IMMEL, H., 1978: Die Crioceratiten (Ancyloceratida, Ammonoidea) des mediterranen und borealen Hauterive—Barrem (Unterkreide). Palaeontographica, Abt. A; (Stuttgart), 163, pp. 1—85.
- KILIAN, W. — REBOUL, P., 1912: Sur quelques Holcodiscus nouveaux de l'Hauterivien de la Bégude par la Palud (B.—A.). Compte Rendu 41^e Congrès Assoc. Français Avanc. Scient. (Nimes).
- LÉVEILLÉ, CH., 1837: Descriptions de quelques nouvelles coquilles fossiles du Département des Basses-Alpes. Mém. Soc. géol. France (Paris), 2, pp. 313—315.
- MAHEL, M., 1978: Manin tectonic unit: relations of the Klippen Belt and Central West Carpathians. Geol. Zbor. Geol. carpath. (Bratislava), 29, 2, pp. 197—214.
- MAHEL, M., 1984: Geological structure of the Strážovské vrchy Mts. Geol. Inst. D. Stúr. Monogr. (Bratislava), 450 pp.
- MANDOV, G., 1974: Predstaviteli na rod Himantoceras Thieuloy, 1964 (Ammonoidea) v dolnokrednite otloženija v Bălgarija. Spisok Balgar. geol. Druž. (Sofia), 35, 2, pp. 143—148.
- MANDOV, G., 1976: Chotrivskijat etaž v Zapadnite Balkanidi i negovata amonitna fauna. God. Sofij. Univ., Geol. geogr. (Sofia), 67, pp. 11—99.
- NAGY, I. Z., 1967: Unterkretazische Cephalopoden aus dem Gerecse-Gebirge I. Ann. hist.-natur. Mus. nat. Hung. (Budapest), 59, pp. 53—79.
- NIKOLOV, T. G., 1977: On the ammonite genus Busnardoites Nikolov, 1966 (Berriassellidae, Lower Cretaceous). Geologica Balcan. (Sofia), 7, 4, pp. 107—118.

- NIKOLOV, T. — BRESKOVSKI, S., 1969: Abrytusites-nouveau genre d'ammonites barrémiennes. *Izv. Geol. Inst., Ser. Paleont. (Sofia)*, 18, pp. 91—96.
- D'ORBIGNY, A., 1840—1842: Paléontologie française. Terrains Crétacé I. Céphalopodes. Paris.
- RAKÚS, M., 1977: Doplnky k litostratigrafii a paleogeografii jury a kriedy manínskej série na strednom Považí. *Geol. Práce, Spr. (Bratislava)*, 68, pp. 21—38.
- RODIGHERO, A., 1919: Il sistema Cretaceo del Veneto Occidentale compresso fra l'Adige a il Piave, con speciale riguardo al Neocomiano dei Sette Comuni. *Paleontogr. italica (Pisa)*, 25, pp. 39—125.
- SARKAR, S., 1955: Révision des Ammonites déroulées du Crétacé inférieur du Sud-Est de la France. *Mém. Soc. géol. France (Paris)*, 34, 72, p.
- SAYN, G., 1907: Les Ammonites pyriteuses des marnes valangiennes du Sud-Est de la France. *Mém. Soc. géol. France (Paris)*, 15, pp. 29—68.
- SCHINDEWOLF, O. H., 1968: Studium zur Stammesgeschichte der Ammoniten VII. *Abh. Akad. Wiss. Lit., math.-naturwiss. Kl. (Mainz)*, 3, pp. 735—901.
- THIEULOY, J.-P., 1964: Un Céphalopode remarquable de l'Hauterivien basal de la Drôme: *Himantoceras* n. g. *Bull. Soc. géol. France (Paris)*, 6, pp. 205—213.
- THIEULOY, J.-P., 1972: Biostratigraphie des lentilles à pérégrinelles (Brachiopodes) de l'Hauterivien de Rotier (Drôme, France). *Géobios (Lyon)*, 5, pp. 5—53.
- THIEULOY, J.-P., 1977: La Zone à *Callidiscus* du Valanginien supérieur vocontien (Sud-Est de la France). *Lithostratigraphie, ammonitofaune, limité Valanginien—Hauterivien, corrélations. Géologie alpine (Grenoble)*, 53, pp. 83—143.
- THIEULOY, J.-P., 1979: Hypostratotype mésogéen de l'étage Valanginien (Sud-Est de la France). In: *Busnardo, R. — Thieuloy, J.-P. — Moullede, M. et al. Comité Français de la stratigraphie. Ed. C.N.R.S. (Paris)*, 6, pp. 37—57.
- UHLIG, V., 1882: Zur Kenntnis der Cephalopoden der Rossfeldschichten. *Jber. K.-Kön. geol. Reichsanst. (Wien)*, 32, pp. 373—396.
- UHLIG, V., 1883: Die Cephalopodenfauna der Wernsdorfer Schichten. *Denkschr. Österr. Akad. Wiss., math.-naturwiss. Kl. (Wien)*, 47, pp. 1—290.
- VASIČEK, Z., 1975: Zur Revision der Ammoniten von den Oberen Tešín-Schichten (Valendis-Stufe). *Sbor. geol. Véd, Paleont. (Praha)*, 17, pp. 71—107.
- VASIČEK, Z. — MICHALÍK, J. — BORZA, K.: To the "Neocomian" biostratigraphy in the Křižna-nappe of the Strážovské Vrchy Mountains (northwestern Central Carpathians). *Zitteliana (München)*, 10, pp. 467—483.
- ZWIERZYCKI, J., 1914: Die Cephalopodenfauna der Tendaguruschichten in Deutsch Ostafrika. *Arch. Biontol. (Berlin)*, 3, 4, pp. 1—96.

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