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UPPER JURASSIC — LOWER CRETACEOUS SEQUENCE OF THE KRÍŽNA—NAPPE (FATRIC) IN THE STRÁŽOVCE SECTION, STRÁŽOVSKÉ VRCHY MTS. (WESTERN CARPATHIANS)

(Figs. 4, Plates I—VIII)

Abstract: Described section incovers in detail a sequence of Upper Triassic — Lower Cretaceous sediments of Krížna nappe. A gradual deepening of sedimentary environments from coastal plains and shallow sea basin to deep neritic (?) environment is evident since Upper Triassic up to Middle Jurassic. Abyssal (?) sedimentation below CCL (Homole Group, ? Oxfordian — Kimmeridgian) has foregone a period of slowered pelagic Tithonian -Valanginian sedimentation with event of submarine erosian in shallower areas. A Hauterivian shallowing was accompanied with accelerated sedimentation rate and with origin of turbiditic activity. The basin deepened in Barremian, again.

Резюме: Профиль Под Стражовцами в центральной части Стражовских гор детально открывает последовательность осадконакопления верхнего триаса до нижнего мела крижнянского покрова. В течение времени от конца триаса до средней юры осадочная область постепенно углублялась от мелководной седиментации глубоконеритовой среды. После этапа абиссальной (?) седиментации оксфордско-кимериджских радиоляритов под уровнем CCL последовала замедленная пелагическая седиментация титон-валанга с эпизодами эрозии осадков в мелководнейших зонах. Мелководье в готериве сопровождало ускорение осадконакопления и возникновение мутности. Баррем значил новое углубление бассейна.

Introduction

Upper Jurassic — Lower Cretaceous complexes, which form a substantial part of the Krížna nappe sequence in the Strážovské vrchy Mts., has been intensively investigated in classical tectonical and regionally geological studies of this region (D. Andrusov, 1932; M. Maheľ, 1946, 1948, 1958 a, b, etc.). However, the stratigraphical studies have been restricted on simple evaluations of individual localities for a long time (E. Szörényi, 1957; M. S. Eristavi, 1961; M. Siblík, 163 etc.). Biostratigraphical investigations of continual sequence started only recently (K. Borza — J. Michalík — Z. Vašíček, 1979; Z. Vašíček — J. Michalík, 1980 etc.). J. Michalík — Z. Vašíček 1980 recognized in the „Neocomian" basin of Krížna nappe in Strážovské vrchy Mts. a shallower northern zone and deeper, pelagic region on the south. The sequence of the latter area is most perfectly incovered in escarpment of the state road Zliechov—Čičmany on southern slope of Mt. Strážovce. Upper Triassic/Lower Cretaceous sequences almost

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uniform gentle dipped to the north are incovered in three-and-half kilometer long out (cf. J. Michalík et al., 1980). In this article, Upper Jurassic — Lower Cretaceous sequence will be dealt more in detail. All the sedimentological features and floral and faunal remnants could not been evaluated: we have dealt with lithostratigraphy (J. Michalík), microfacies and microproblematics (K. Borza), nannoplanktic remnants (V. Gašparíko-

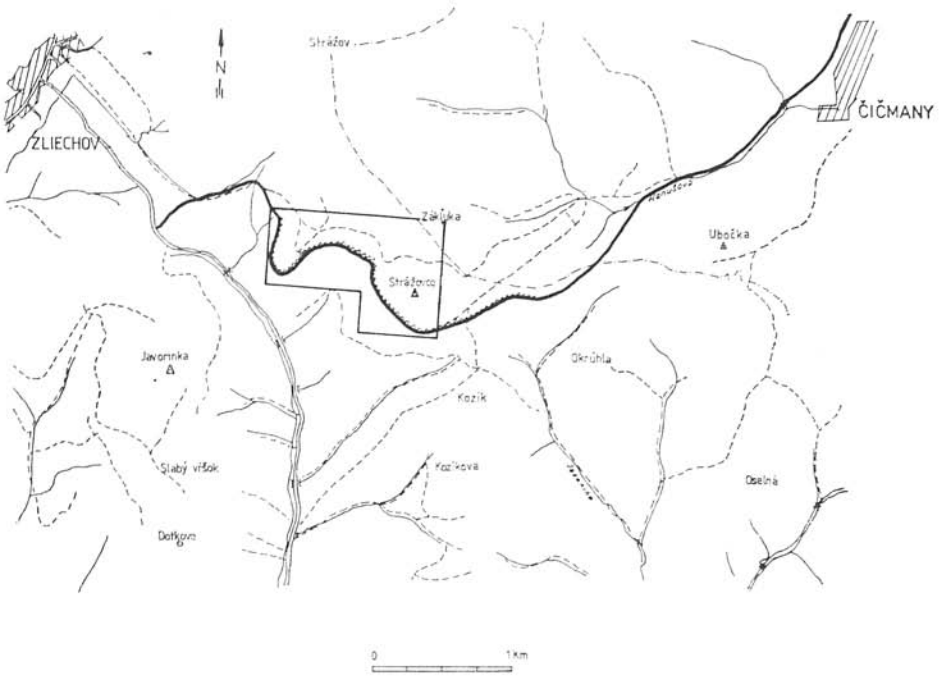


Fig. 1. A schematical situational sketch of the area between villages Zliechov and Čičmany in Strážovské vrchy Mts. The escarpment of the state road under Strážovce-hill is denoted with triangle belt. The area in the centre of the figure is illustrated in more detailed scale on Fig. 2.

vá), aptychi, ammonites and belemnites (Z. Vašíček.) Moreover, we are very obliged to M. Rakús for determination of some Liassic ammonites and to Mrs. E. Činčurová, who determined some Liassic belemnites. H. Brodnianska helped us by taking of microphotographs, and V. Švec and J. Šebor by taking of scanning-photographs. M. Ružová drawed the figures.

The macrofauna is relatively abundant: just the section between 2975—3280 yielded more than 550 specimens (160 ammonites, 40 belemnites, 300 aptychi, brachiopods, bivalves, echinoderms, gastropods etc.). Tintinnids and other microfaunal elements are current, but not very abundant. Calcareous nannoplankton is low diverse, strong recrystallised. Several species are important for Lower Cretaceous division, while the others range up to Upper Cretaceous.

Description of the sequence

Terrigeneous Carpathian Keuper Group (section between 300 and 1000 m) represents the oldest sedimentary complex incovered in the profile. Its lowermore part consists of varicoloured (reddish violet, yellowish, green-gray) claystones with clayey sandstone intercalations (main claystone member in

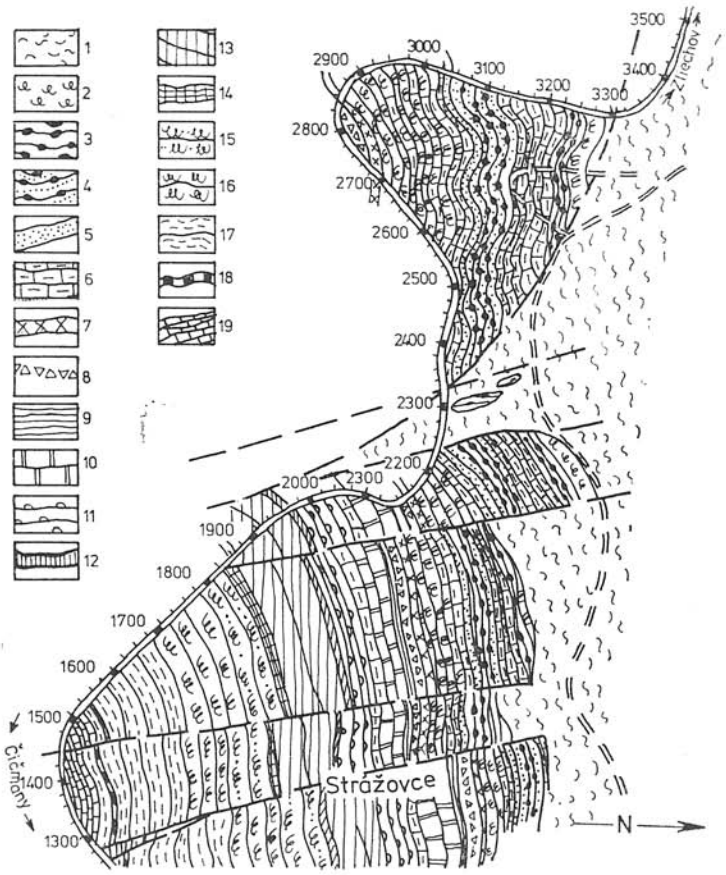


Fig. 2. A simplified geological sketch of the western slope of Strážovce-hill, builded by Upper Jurassic (Lower Cretaceous) carbonates. Numbers at the road are sections in meters. Legend: 1 — Albian claystones, 2 — spotted limestones, 3 — cherty limestones (Lower Barremian), 4 — Strážovce Formation, 5 — organodetrital layer on the base of Strážovce Fmt., 6 — micritic marly limestones, 7 — tuffitic limestone, 8 — Nozdrovice Breccia Bed, 9 — marly limestones, 10 — „Biancône" limestone, 11 — aptychal limestone, 12 — siliceous limestone, 13 — radiolarites of Homole Group, 14 — „Adnet" marls and limestones (Toarcian—Aalenian), 15 — siliceous marly spotted limestones of Janovky Fmt., 16 — Janovky Formation, 17 — Kopieniec Formation, 18 — red siltstone on the base of Kopieniec Fmt., 19 — Fatra Formation (upper Rhaetian).

A. Gaździcki et. al., 1979). The upper part of Carpathian Keuper sequence is represented by cycles of violetish gray claystones with dolomite intercalations, desiccation cracks and erosional marks (upper dolomite member in A. Gaździcki et al., 1979). Marine Fatra Formation (J. Michalík et al., 1979; 150—300, 1350—1520 m), represented here by marginal facies of small short-lived carbonate platform (cf. J. Michalík 1973, 1974, J. Michalík et al., 1980) caps the Triassic sequence. It is about 35 meters thick.

Basal Liassic sediments are represented by Kopieniec Formation (1000—1350, 1520—1680 m). Brown claystones with red siltstones and gray sandstone intercalations are equivalent of „basal clastics" (see A. Gaździcki et al., 1979). Marly limestone intercalations appear in upper part of the 60—70 m thick claystone complex.

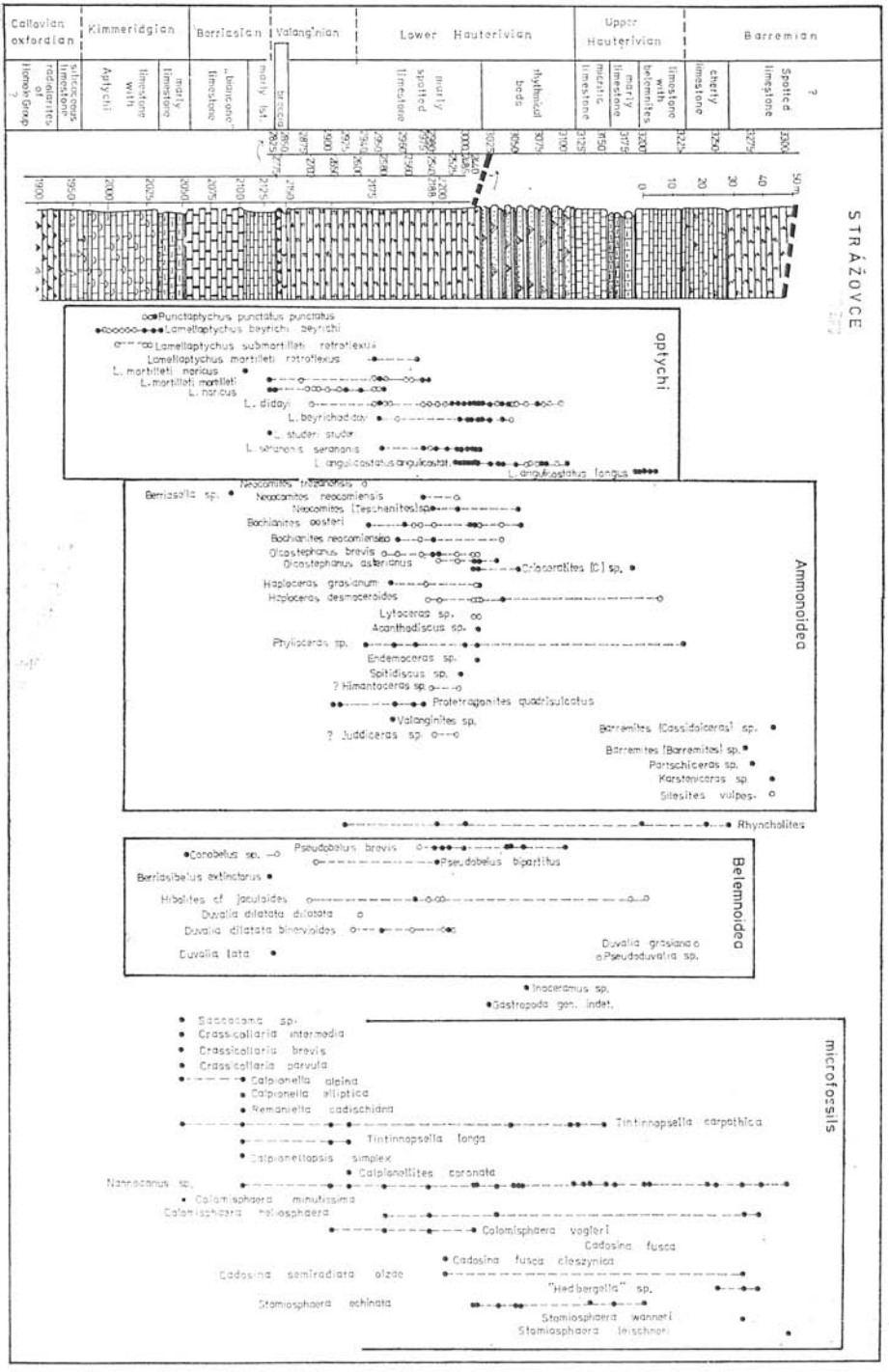
Following 50 m thick Janovky Formation (a part of Algäu Group ?, cf. A. Gaździcki et al., 1979) consists of well bedded gray spotted limestones with infrequent Sinemurian and Lotharingian ammonites. The higher horizons are more siliceous.

Several meters thick red marlstone complex with belemnite and ammonite fauna, Middle Toarcian in age (M. Rakús determined here *Dactylioceras (Peronoceras) sp.*, E. Činčurová *Salpingotheuthis acuarius* (Schlotheim) and *S. oxyconus* (Zieten), appears in the section between 1820—1850 m. Gray biomicritic limestone intercalations contain rich crinoidal ossicles; bivalve shell fragments, intraclasts and clastic quartz grains are less frequent. The complex is affected by synsedimentary slumping. About four meters thick layer of green-gray biomicritic limestone (1850—1865) covers the marls. The layer is overfilled with thin-shelled juvenile bivalve fragments [probably *Bositra buchi* (Roemer), see Pl. I, Fig. 1], ostracod shells, *Patellina sp.* and crinoid ossicles; clastic quartz grains are relatively seldom. M. Mišík (1964) described a very similar slumped „Adnet" complex covered by layer of „ash-gray limestone" from Mt. Borišov in Veľká Fatra Mts. He placed both units into Toarcian — Aelenian.

A horizon of greenish gray siliceous limestone with cherts and silicite intercalations lies above the mentioned complexes. The juvenile bivalve shell fragments gradually disappear here, globochaets (Pl. I, Fig. 2), crinoid ossicles, aptychi and fine shell debris are infrequent, while calcified radiolarians become more abundant. Clastic quartz and hydromica are rare.

Thick green and red radiolarite complex (1870—1965 m) is comparable with the Homole Group of K. Birkenmajer (1977). The radiolarites — products of very slow abyssal sedimentation below CCL consists of microcrystalline quartz and fibrous chalcedony with light coloured radiolarians (they are filled by chalcedony, less frequent by grained quartz, sometimes are replaced by calcite), sponge spicules and remnants of crinoid ossicles. Tiny rhomboeders and irregular aggregates of calcite occur in the matrix, pyrite crystals are less frequent. All the radiolarite complex is about 45 m thick.

Fig. 3. A biostratigraphical profile of the Upper Jurassic/Lower Cretaceous sequence of Krížna nappe at the locality Pod Strážovcami, with denoted occurrences of macrofossils.


Callovian oxfordian
Kimmeridgian
Berriasian
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Barremian
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Ammonoidea
Belemnoidea
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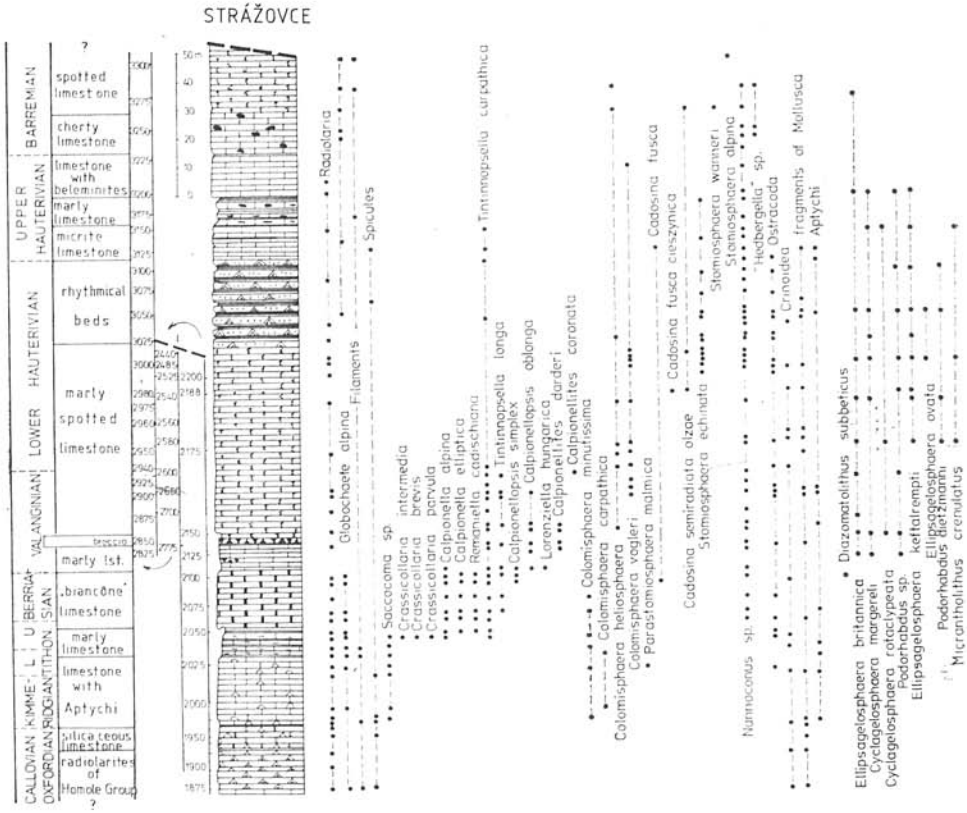


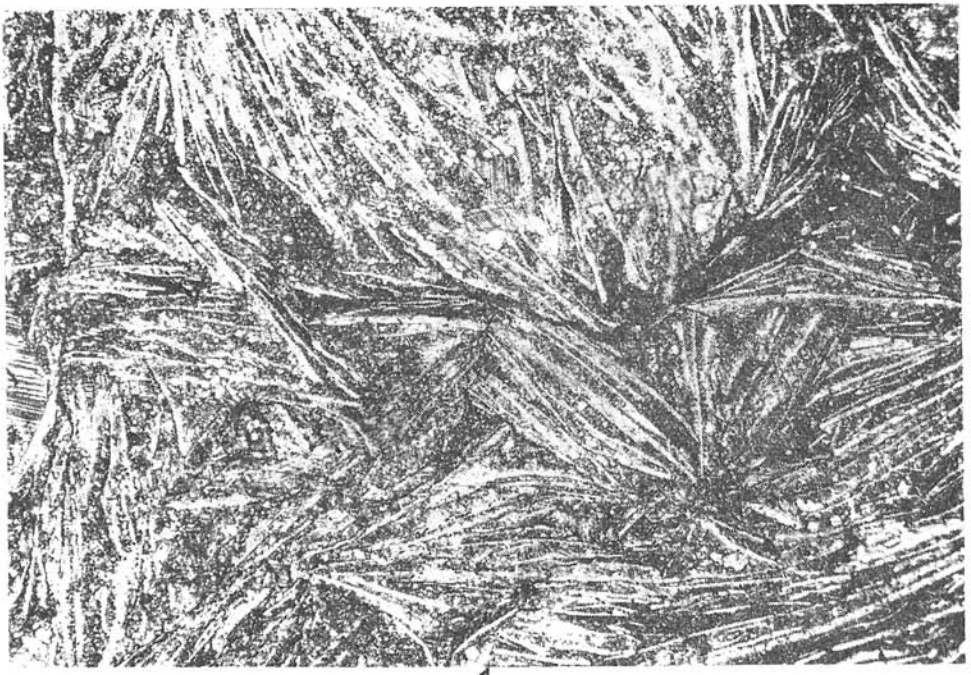
Fig. 4. A biostratigraphical profile of the Upper Jurassic/Lower Cretaceous sequence of Krížna nappe at the locality Pod Strážovcami, with denoted occurrences of microfossils.

J. Lefeld (1979) supposed this complex to be of Oxfordian-Kimmeridgian age, while the Bajocian — Kellowayian carbonates could have been mostly dissolved during Kellowayian — Oxfordian deepening in the Fatric.

Following sequence of well bedded gray- to greenish gray siliceous limestones with marly lamines fills the section 1965—2020 m. Micritic, locally slightly recrystallized carbonate contains seldom quartz grains, muscovite, chlorite and hydromica plates, scarcely small authigene quartz crystals. On the other hand, the shell debris, calcified radiolarians, sponge spicules, thin-shelled bivalve shell fragments („filaments"), crinoid ossicles, juvenile ap-

Plate I.

Fig. 1. Microfacies with juvenile bivalve shells fragments in reddish brown unclearly nodular limestone, Toarcian, 1822 m, thin section No 7563, magnification 22 x. — Fig 2. Radiolarian microfacies. Gray micritic limestone, Kelloway—Oxfordian, 1925 m, thin section No 7569, magn. 30 x.



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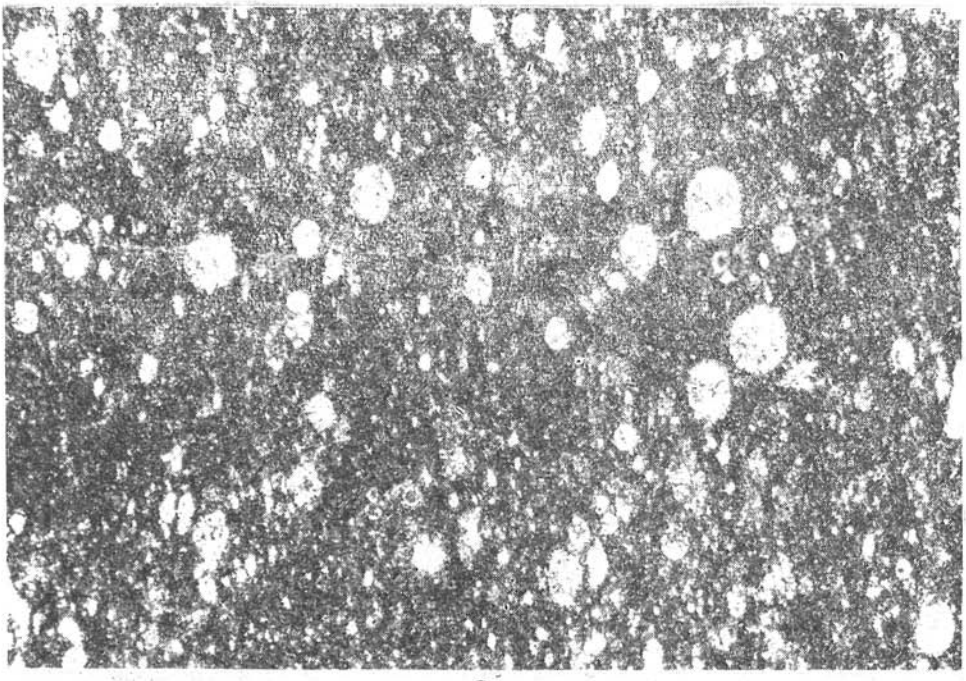

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tychi and belemnites are relatively frequent. The microfauna: *Saccocoma sp.* (Pl. II, Fig. 1), *Colomisphaera carpathica* (Borza), *C. minutissima* (Colom) (Pl. VII, Fig. 1), *Didemnoides moreti* (Durand Delga) etc. indicates probably Kimmeridgian age (Fig. 3).

Red and gray marly limestones(2020—2040 m) contain numerous juvenile aptychi (*Lamellaptychus beyrichi* (Oppel), *Punctaptychus punctatus puctatus* (Voltz) and others, (cf. Fig. 3). Specimens of pelagic crinoid *Saccocoma sp.* of lowermore horizons are arranged in thin laminae (Pl. II, Fig. 2), however, this unidirectional arrangement disappears in the higher part of sequence (Pl. III, Fig. 1). Crinoid ossicles, short „filaments", *Parastomiosphaera malmica* (Borza) (Pl. VII, Fig. 2), *Colomisphaera minutissima* (Colom) (Pl. VII, Fig. 3), *C. carpathica* (Borza) and other microfossils occur in relatively high amount. Both the aptychal limestones and lower part of the overlying marly limestones belong, according to the character of their micro- and macrofaunal assemblages, to the lower Tithonian.

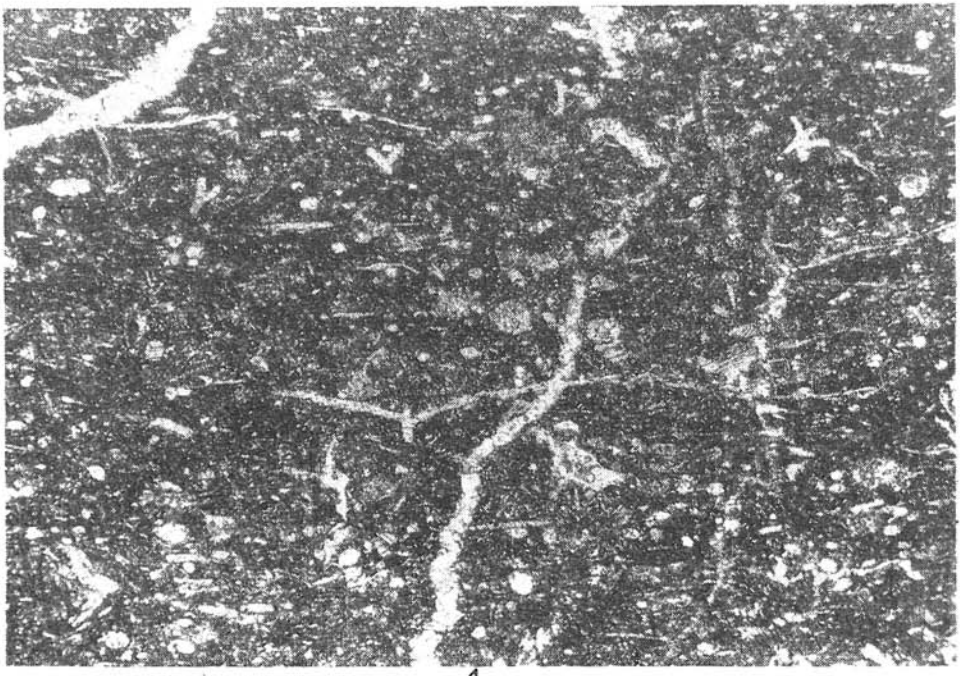
Upper part of the gray marly (micritic) limestones contains abundant radiolarians, crinoid ossicles and ostracods. The microfaunal assemblage: *Crassicollaria intermedia* (Durand Delga), *C. brevis* Remane, *Calpionella alpina* Lorenz, *Tintinnopsella carpathica* (Murgeanu et Filipescu), *Colomisphaera minutissima* (Colom) etc. (cf. Pl. VII, Fig. 4 and text — fig. 4) indicates Crassicolaria Zone of Upper Tithonian.

Both the top part of gray marly limestones and thick layered gray micritic „biancône" limestones (about 20 m thick) belong (based on microfauna) to the Uppermost Tithonian-Berriasian (2047—2088 meters). „Biancône" limestones contain dispersed radiolarians, ostracods, bivalve shell fragments, aptychal fragments and fine shell debris; authigene dolomite rhomboeders belong to minor constituents. The microfaunal assemblage *Calpionella alpina* Lorenz, *C. elliptica* Cadisch, *Crassicolaria parvula* Remane, *Remaniella cadischiana* (Colom), *Tintinnopsella carpathica* (Murgeanu et Filipescu), *T. longa* (Colom), *Nannoconus* aff. *steinmanni* Kamptner etc. (see text — fig. 4) indicate the Carpionella Zone. Some tintinnids are conjugated.

Upper „biancône" limestones contain only scarce organic remnants (Pl. VII, Fig. 1): *Calpionella alpina* Lorenz, *C. elliptica* Cadisch (Pl. VII, Fig. 5), *Remaniella cadischiana* (Colom), *Tintinnopsella carpathica* (Murgenau et Filipescu), *T. longa* (Colom), *Calpionellopsis simplex* (Colom), (Pl. VII, Fig. 6), *C. oblonga* (Cadisch), *Lorenziella hungarica* Knauer et Nagy (Pl. VII, Fig. 7), *Cadosina fusca* Wanner, globochaets, radiolarians, crinoid ossicles, and strong recrystallized nannocone association (including an important Berriasian — Valanginian species *Diazomatolithus subbeticus* Grün). Mentioned microfossils and also fragment of ammonite *Berriasella* (2085 m) and aptych *Lamellaptychus mortilleti-noricus* Trauth (2105 m)

Plate II.

Fig. 1. Saccocoma microfacies in gray fine-grained limestone, Kimmeridgian, 1975 m, thin section No 7581, magn. 30 x. — Fig. 2 Lamina with *Saccocoma* sp. in gray micritic limestone, Lower Tithonian, 2030 m. thin section No 7585, magn. 30 x.



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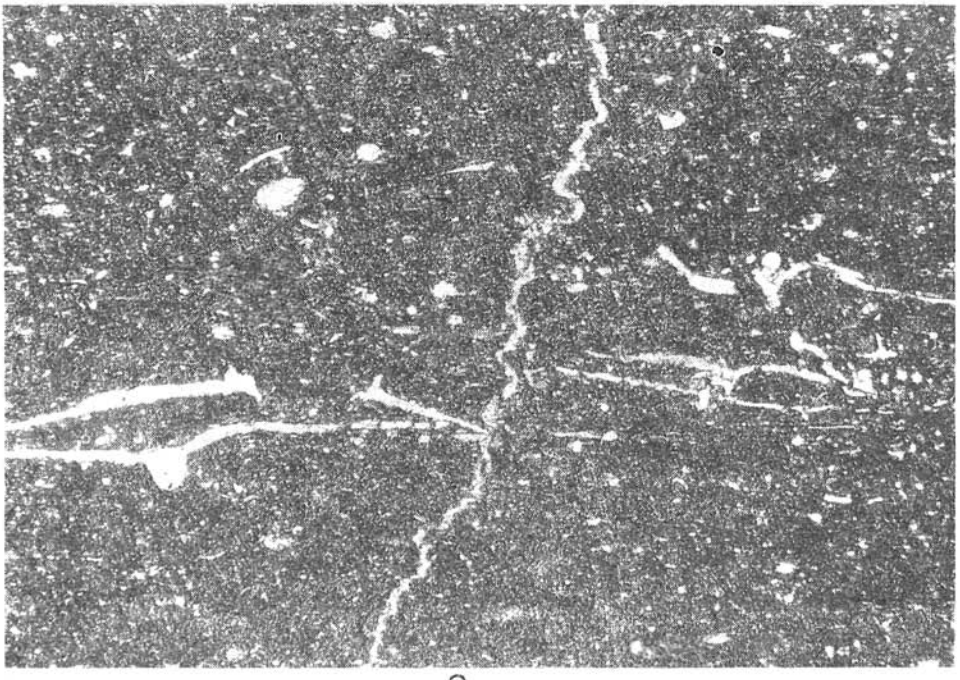

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support the assumpton that section 2088—2110 m belong to the Calpionellopsis Zone. The tintinnids, occurring in this zone are often deformed (Pl. VII, Fig. 8), clastic quartz grains and authigene pyrite crystals are rare.

Gray marly micritic limestones, distinctly spotted in the higher part (2110—2160 m) represent the Valanginian. They contain *Calpionella alpina* Lorenz, *Calpionellites darderi* (Colom) (Pl. VII, Figs. 9—10), *C. coronata* Trejo (Pl. VII, Fig. 11), *Tintinnopsella carpathica* (Murgeanu et Filipescu) (Pl. VII, Fig. 12), *T. longa* (Colom), *Calpionellopsis oblonga* (Cadisch), *Lorenziella hungarica* Knauer et Nagy etc. (Text — fig. 4), radiolarians, bivalve shell fragments, aptychi (*Lamellaptychus* cf. *noricus* (Winkler), 2142 m and fine shell debris. Tintinnids are often deformed, currently conjugated. Qartz grains of silt fraction are infrequent, just like small muscovite plates, authigene dolomite rhomboeders, epigenetic pyrite cubes and phosphate aggregates. Strong recrystallized calcareous nannoplankton assemblages contain wide range species like *Ellipsagelosphaera britannica* (Stradner) Perch-Nielsen, *Cyclagelosphaera margareli* Noël, *C. rotaclypeata* Bukry, *Podorhabdus sp.*

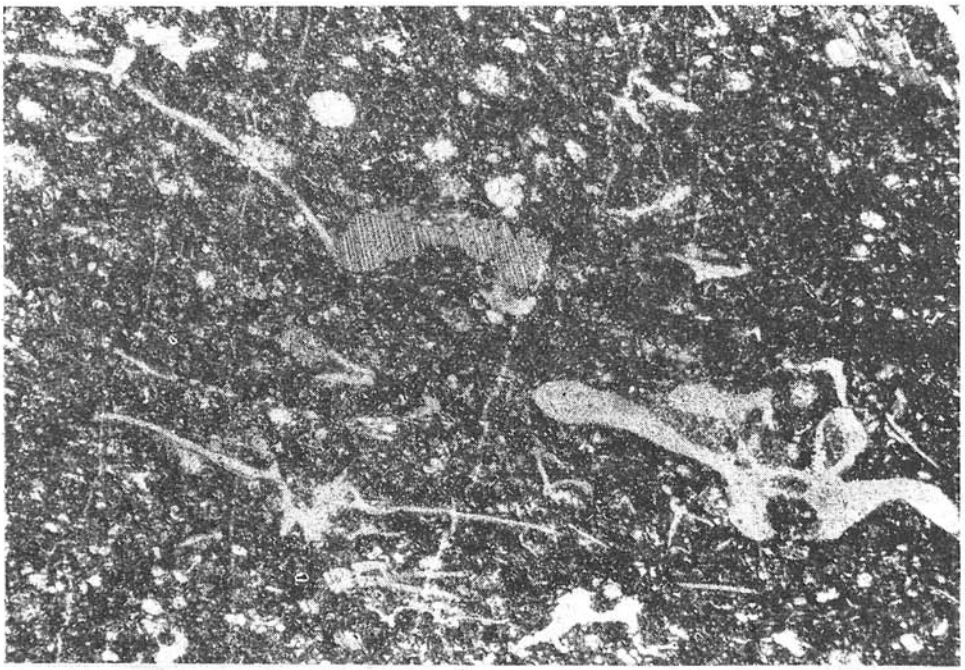
On the base of Valanginian sequence (2125, 2700—2720 m) lies a fine-clastic limestone horizon, accompanied with detrital limestone in close overlie. Limestone fragments in the breccia have irregular shape (Pl. IV, Fig. 2), different colour and size (0,5—3 cm). According to the micropaleontological analysis, the majority of fragments belongs to the Calpionella Zone (Upper Tithonian/Berriasian), Lower Tithonian fragments are rare. Similar brecciated horizon occurs in Nozdrovice area (see K. Borza et al., 1979). Thus, this horizon could be used as a marker in correlations of relatively distant profiles. We suggest a new name *Nozdrovice Breccia* for it.

First fossiliferous horizon crops out in the section 2180—2190 m. Ammonites from these beds indicate lowermost Hauterivian, belemnite *Pseudobelus bipartitus* Blainville could be restricted on Valanginian according to R. Combemorel, 1973. The section 2350—2600 m is macrofaunistically well correlable with section 2940—3050 m (cf. text-fig. 2.) *Duvalia dilatata,* coming from 2600 m could occur in the Valanginian, but its culmination point was in the Hauterivian. Imperfectly documented Valanginian deposits of 2600—2940 m contain predominantly low diversity aptychal assemblage with important finding of *Duvalia lata* (Blainville).

Valanginian/Hauterivian boundary lies inside a thick gray spotted limestone complex with marly intercalations: their frequence and thickness increases upward. The section 2940—3030 m yielded relatively rich aptychi and ammonite collection clearly Hauterivian in age. With exception of base of Hauterivian (around 2940 m), several subspecies of *Lamellaptychus mortilleti* Pictet et Loriol dominate in aptychal fauna; several species (*Lamellapty-*

Plate III.

Fig. 1. Saccocoma microfacies in gray marly limestones, Lower Tithonian, 2035 m, thin section No 7586, magn. 30 x. — Fig. 2. Limestone with *Calpionella alpina* and *Tintinnopsella carpathica* (Calpionella Zone), upper Tithonian/Berriasian, 2050 m, thin section No 7588, magn. 90 x.



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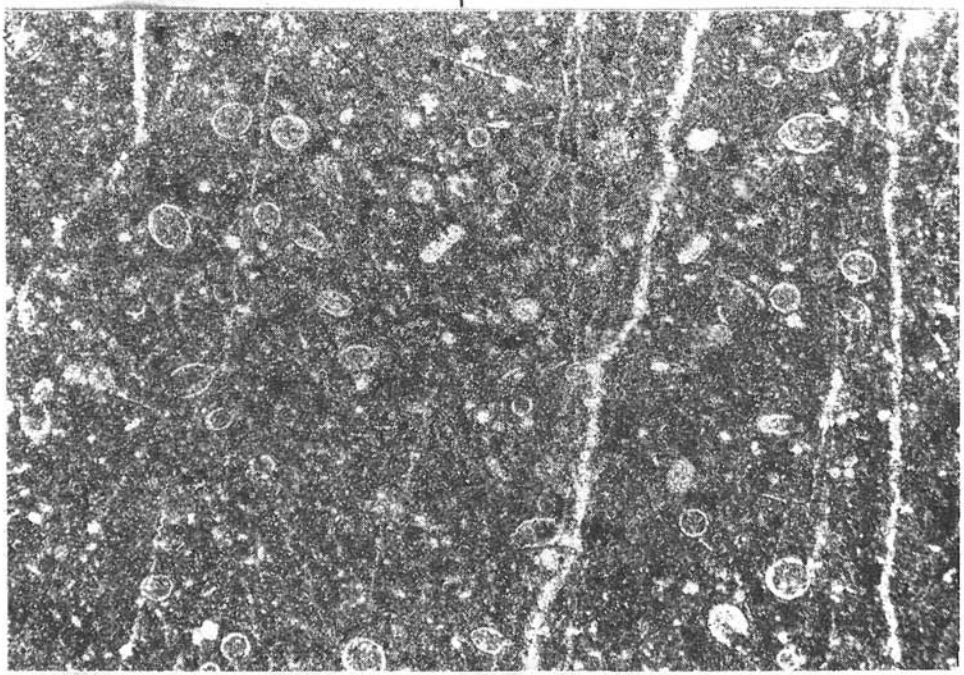

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chus didayi (Coquand), *L. seranonis* (Coquand) etc.] apper at the first time. Species diversity of aptychal assemblage remarkably decreases in the section above 2985 m. Bochianitids and small limonitized planspirally coiled molds of juvenile ammonite shells represent the ammonite fauna below 2965 m (cf. Z. Vašíček — J. Michalík, 1980). The sculpture of crioceraticone coiled shells, occurring higher (2985—2995 m) in sequence differs from true *Crioceratites* (being closer to *Aegocrioceras*). The first true *Crioceratites* has been found at 3005 m. All the described spotted limestone complex consists of micrite with abundant nannocones. Calcareous nannoplankton assemblages reached the maximum diversity in this section. *Ellipsagelosphaera keftalrempti* Grün is the major constituent of Hauterivian assemblages also in other localities of Strážovské vrchy Mts. This species is well identifiable even in optical microscope: it has small central aperture and none expressive ornamentation. Its stratigraphical range reaches Upper Hauterivian, having the peak in Lower Hauterivian. This dominating species is accompanied with *E. britannica* (Stradner) Perch-Nielsen, *E. ovata* (Bukry) Black, *Cyclagelosphera margereli* Noël, *C. rotaclypeata* Bukry, *Podorhabdus dietzmanni* (Reinhardt), *Micrantholithus crenulatus* Bramlette et Sullivan. Other organisms are infrequent: *Colomisphaera vogleri* (Borza) (Pl. VII, Fig. 13), *C. heliosphaera* (Vogler) (Pl. VII., Fig. 14), *Stomiosphaera echinata* Nowak (Pl. VII, Fig. 15), *Cadosina fusca* Wanner, *C. fusca cieszynica* Nowak (Pl. VII, Fig. 16), *C. semiradiata olzae* Nowak, *Tintinnopsella carpathica* (Murgeanu et Filipescu). Sporadically occurs crinoid ossicles, bivalve shell fragments, ostracods, radiolarians, foraminifers and fine shell debris, authigene dolomite rhombs, clastic quartz grains (in silt fraction) and epigenetic pyrite.

A distinct complex of rhythmically builded organodetrital, cherty and marly spotted limestones with marly intercalations at the top of rhythms (3030—3130 m) is the most characteristic member of the Lower Cretaceous sequence. Each rhythm begins with detrital horizon (the first one is about 2,5 m thick) with gradated bedding, which gradually pass into finer-grained rocks. The basal intrasparite horizons contain frequent intraclasts up to 0,6 mm — sized. The pelsparite consist of 0,2 mm sized fragments. Although reworked organic remnants form the major constitutent of rocks: crinoid ossicles, bivalve shell fragment, echinoid spines, uniserial bryozoan fragments, selenoporid fragments, foraminifers, more complete specimens are rare: *Cadosina fusca cieszynica* Nowak, *C. semiradiata olzae* Nowak etc. Clastic quartz grains and authigene quartz and feldspar crystals occur seldomly, dispersed in the matrix. Black-gray chert nodules formed in these beds, lined with gray transitional zones (Pl. V, Fig. 2). Similar „zonal" cherts were described by M. Mišík — K. Borza (1976, Pl. XVII, Fig. 1) from Triassic

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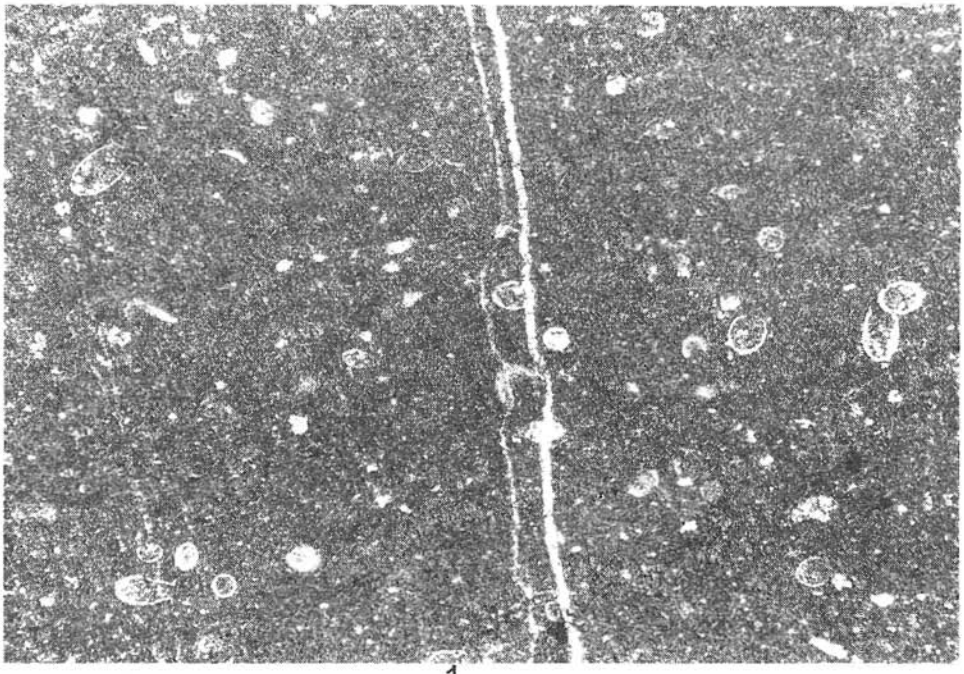
Plate IV.

Fig. 1. Limestone with *Calpionella elliptica* and *Tintinnopsella carpathica* (Calpionellopsis Zone), 2090 m, thin section No 7592, magn. 90 x. — Fig. 2. Fine clastic limestone breccia with the clasts derived mostly from Calpionella Zone, Valanginian, 2120 m, thin section No 7594, magn. 22 x.



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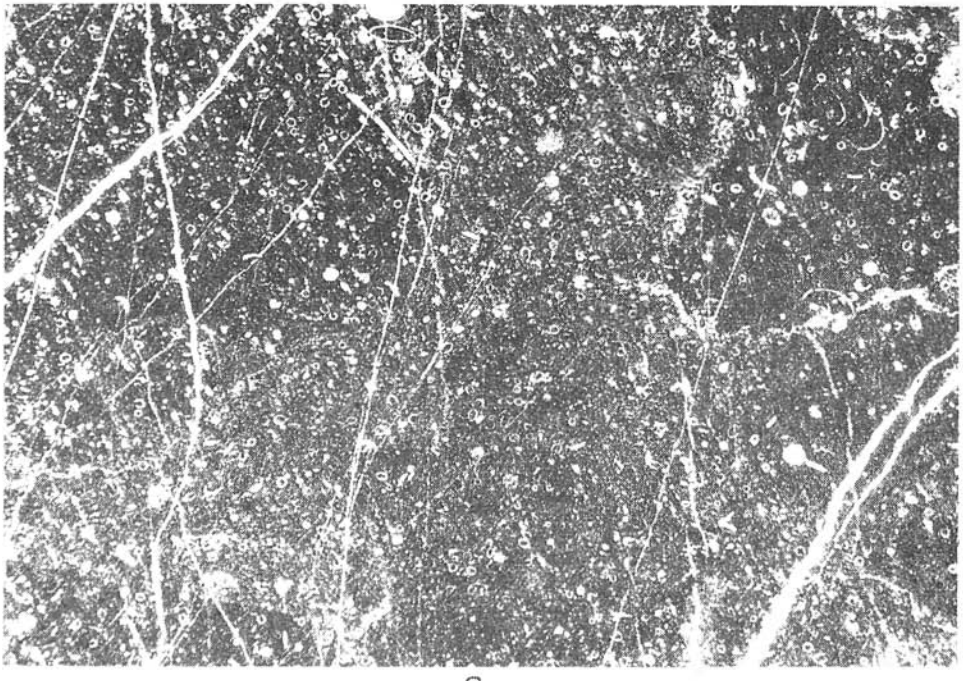

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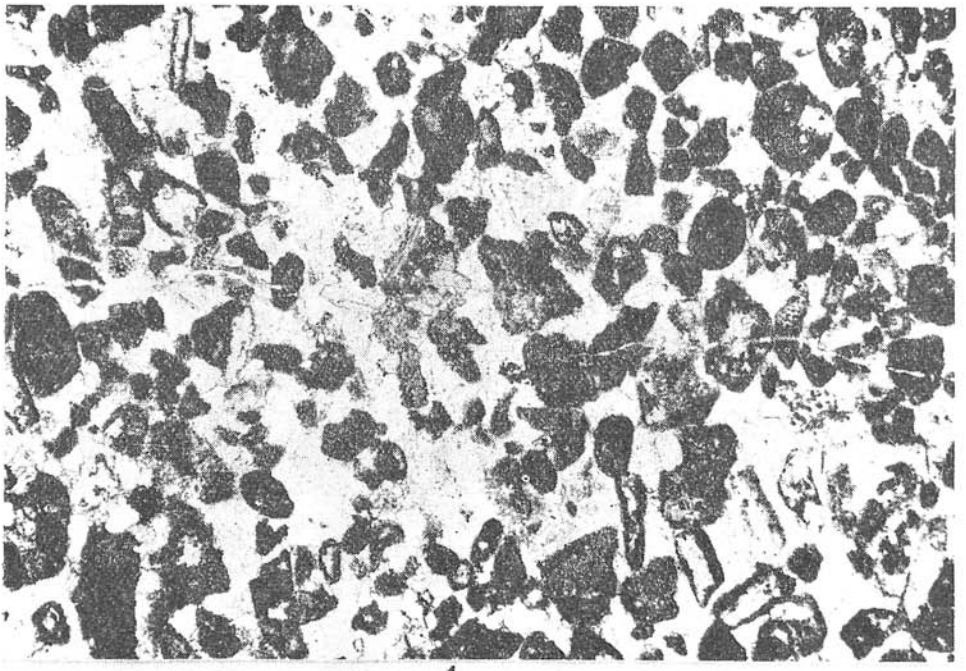
Hallstatt Limestone of Slovakian Karst. The cherts consist of crystalline quartz with aggregates and authigene carbonate rhombs; frequent cracks were filled by secondary calcite. Ammonites practically disappear above 3050 m: the fauna of these beds consists of aptychal fragments and belemnite rostra (Hauterivian species *Pseudobelus brevis,* predominantly). Transported fragments of shallow-marine benthic fauna (grastropods and inoceramas) occur sporadically. Low diverse aptychal assemblage is dominated by *Lamellaptychus angulicostatus longus* Trauth, sole *L. didayi* (Coquand) has been found at 3090 m). According to M. S. Gąsiorowski (1962), the latter species could not survive the Lower/Upper Hauterivian boundary. However, preservation state of the specimens does not exclude possible derivation from older horizons. Gray spotted limestones, forming the upper part of rhythms are from the lithological point of view, practically identical with the rocks of Lower Hauterivian spotted limestone complex. However, specimens of *Colomisphaera vogleri* (Borza) occur only rare. Similar rhythmic cherty limestone complex occurs in analogical position in the southern part of Malá Fatra Mts. (personal communication of M. Rakús). We suggest to call this complex, which could represent an easy recognizable marker horizon as Strážovce — Formation.

About 35 m thick light weathering (marly) micritic limestones (3130—3230 m) follow above. They contain belemnite rostra, sole aptychi and long echinoid spines. Their microfaunal composition is similar to the underlying complex.

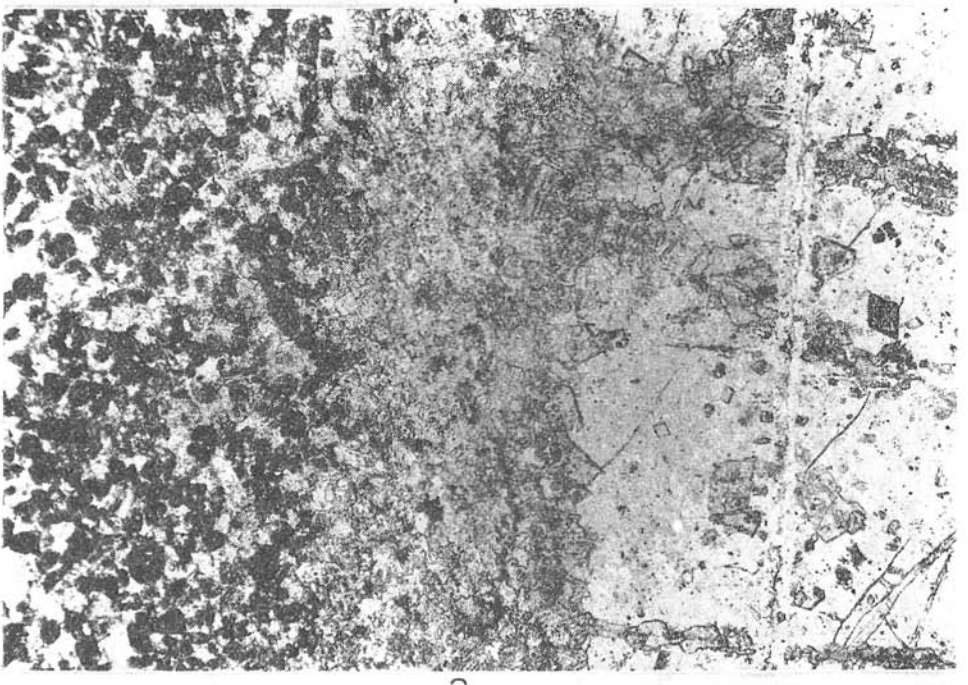
A complex of shaly cherty limestones and gray micritic (locally spotted) limestones in their overlie forms the higher part of sequence. Frequent nannocones come from low diversified assemblages with dominant *Ellipsagelosphaera sp.* Rare *„Hedbergella"* occurs for the first time in this sequence, accompanied with *Spirillina sp., Lenticulina sp., Didemnoides moreti* (Durand Delga), *Didemnum carpathicum* Mišík et Borza, *Stomiosphaera wanneri* Borza, *S. alpina* Leischner etc. (see text—fig. 4). Bivalve shell fragments, ostracods, radiolarians, fine shell debris, phosphate intraclasts and pyrite crystals form a minor constituent of the rock. *Barremites sp.* appears for the first time (3270 m), at 3280 m accompanied by other Lower Barremian ammonites (see text—fig. 3). Upper Barremian—Aptian horizont were amputed by fault, which separates today the limestone sequence from Albian claystones.

Plate V.

Fig. 1. Gray fine-grained intrasparitic limestone, Hauterivian, 2958 m, thin section Na 7618, magn. 30 x. — Fig. 2. Pelsparit with chert nedule (right side of the figure) in the middle transitional zone. The chert contains small carbonate rhomboeders. Hauterivian, 3025 m, thin section No 7624, magnification 30 x.



1



2

Descriptions of formal lithostratigraphic units

Nozdrovice Breccia Bed. (new term).
Name: after village Nozdrovice by Košeca in Strážovské vrchy Mts., Slovakia.
General lithology: see in the text.
Type locality: outcrops in road from Dubníky-hill to Nozdrovice, by water reservoir.
Hypostratotype locality: escarpment of state road Zliechov—Čičmany just in the curve W of the Strážovce-hill, Strážovské vrchy Mts.
Boundaries: The lower boundary is at the top of Tithonian /Berriasian „biancône" limestone, the upper one with marly limestone complex.
Thickness: several decimeters up to 1,5 m.
Fossils: only the microfauna derived from underlying horizons.
Age: Lower Valanginian?

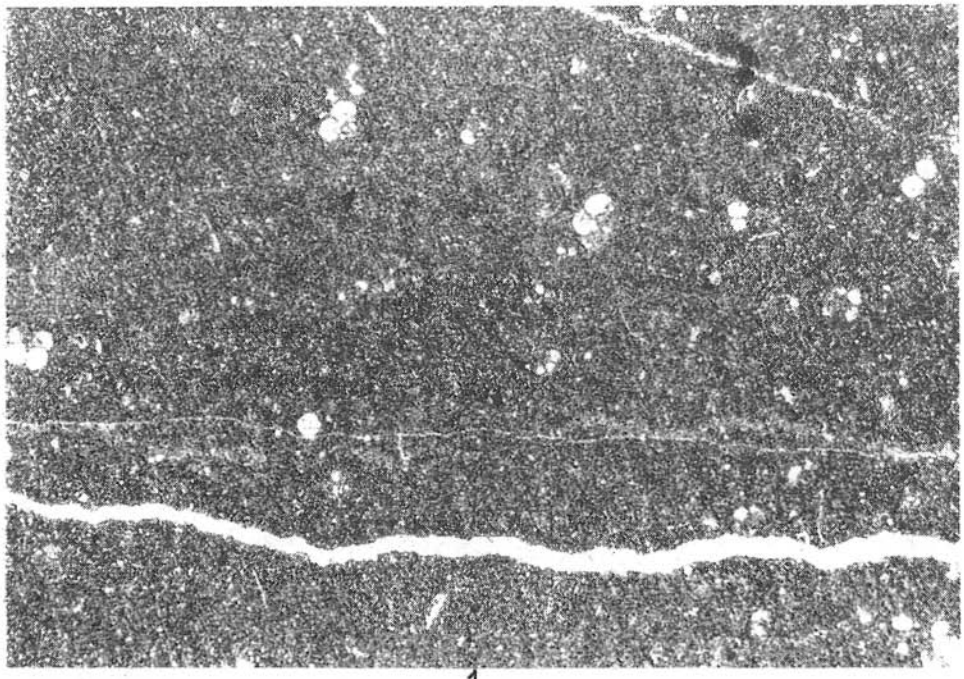
Strážovce Formation (new name).
Name: after Strážovce-hill under Mt. Strážov between Zliechov and Čičmany, Strážovské vrchy Mts., Slovakia.
General lithology: see the text above.
Type locality: Escarpment of state road Zliechov—Čičmany in the slope of Strážov hill, 3030—3130 m W of Hanušova valley (see text—fig. 2).
Hypostratotypes: not established as yet.
Boundaries: the lower one is with marly spotted limestone complex, marked with thick (2,5 m) organodetrital layer. The upper with light marly micritic limestone is marked with marly intercalation.
Thickness: variable, total thickness probably exceeds 30 m.
Fossils: As those listed in the text (text—fig. 3, 4).
Age: Upper Hauterivian.

Conclusions

The results, obtained by investigation of the section Pod Strážovcami, confirm earlier conclusions on the development of Lower Cretaceous sequence of Krížna nappe in Strážovské vrchy Mts. area (cf. J. Michalík — Z. Vašíček, 1980; Z. Vašíček — J. Michalík, 1980). Abyssal sedimentation of Homole Group radiolarites was a culmination of Upper Triassic—Lower—Middle Jurassic deepening trend. Tithonian, Berriasian and Valanginian sediments were deposited during a period of stagnant pelagic, slowered sedimentation. Lower Valanginian horizon of carbonate breccia consist of Lower Tithonian and Upper Tithonian/Berriasian (Calpionella Zone) limestones is stratigraphically and lithologically identic with the breccia horizon from Noz-

Plate VI.

Fig. 1—2. Gray spotted micritic limestones with marly admixture and „Hedbergella" sp., Barremian. Fig. 1 — thin section No 7653 from 3285 m, magnified 30 x; Fig. 2 — thin section No 7655 from 3308 m, magnified 70 x.



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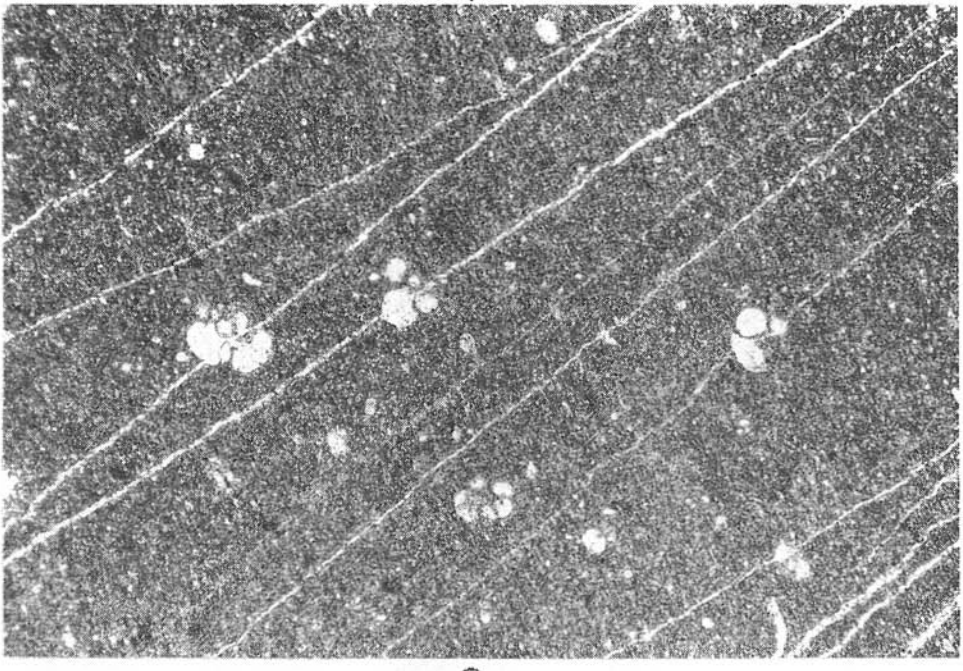

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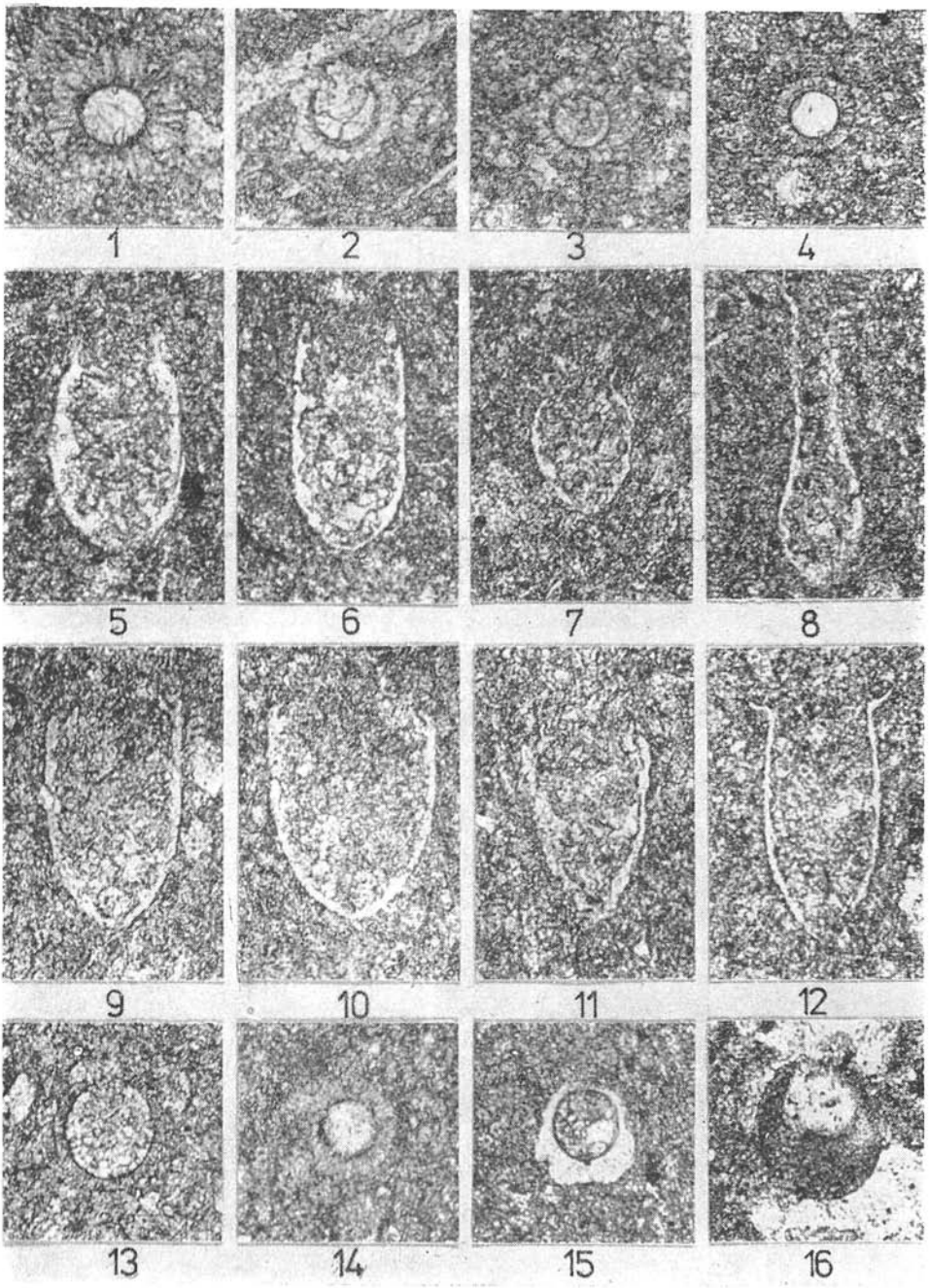

Plate VII.

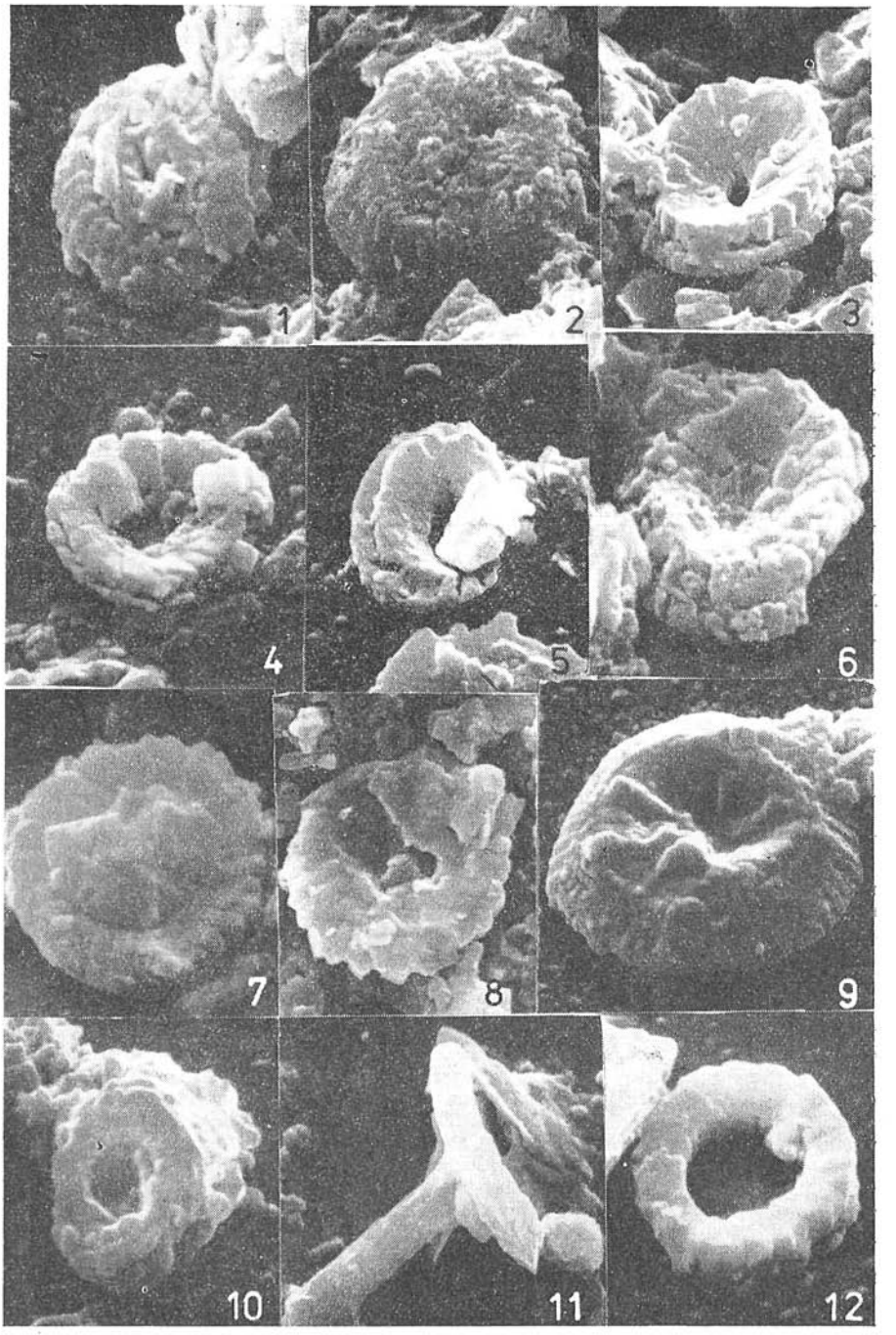

Plate VIII.

drovice area (cf. K. Borza et al., 1979). Uniform composition of Nozdrovice Breccia Bed clasts, derived exclusively from underlying horizons indicate a submarine erosion of moderately elevated segments of bottom. Differentiation of the bottom relief in Lower Hauterivian, slight shallowing and successive increasing of sedimentation rate culminated with turbiditic events on the Lower/Upper Hauterivian boundary. These events produced the Strážovce-Formation — an extensive body of rhythmically bedded intrasparites, pelsparites and micrites. The basin deepened again in Lower Barremian. The bottom fall has been accompanied by spreading of cherty limestone sedimentation and by decline of faunal diversity.

Slowering (locally up to condensation?) of sedimentation can be demonstrated by orientation of pelagic crinoids and other organic remains into lamines without any significant transport (Pl. II., Fig. 2). This arrangement pattern disappears in the higher horizons (on the Lower Hauterivian boundary).

The microbiostratigraphical zones are represented with unequal expressiveness. The absence of Chitinoidella and Praetintinnopsella Zones (Middle Ti-

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Plate VII.

Fig. 1. *Colomisphaera carpathica* (Borza), Kimmeridgian, 1990 m, thin section No 7582. — Fig. 2. *Parastomiosphaera malmica*, (Borza), Lower Tithonian, 2025 m, thin section No 7584. — Fig. 3. *Colomisphaera minutissima* (Colom), Lower Tithonian, 2025 m, thin section No 7584. — Fig. 4. *Colomisphaera minutissima* (Colom), Upper Tithonian, 2045 m, thin section No 7587. — Fig. 5—7. *Calpionella elliptica* Cadisch (Fig. 5), *Calpionellopsis simplex* (Colom) (Fig. 6), and *Lorenziella hungarica* Knauer et Nagy (Fig. 7), Berriasian, 2100 m, thin section No 7593. — Fig. 8. Deformed *Tintinnopsella* sp., Berriasian, 2100 m, thin section No 7593. — Fig. 9—10. *Calpionellites darderi* (Colom), Valanginian, 2140 m, thin section No 7596. — Fig. 11. *Calpionellites coronata* Trejo, Valanginian, 2925 m,, thin section No 7616. — Fig. 12. *Tintinnopsella carpathica* (Murgeanu et Filipescu), Valanginian, 2755 m., thin section No 7611. — Fig. 13. *Colomisphaera vogleri* (Borza), Hauterivian, 2210 m, thin section No 7599. — Fig. 14. *Colomisphaera heliosphaera* (Vogler), Hauterivian, 2605 m, thin section No 7607. — Fig. 15. *Stomiosphaera echinata* Nowak, Hauterivian, 2380 m, thin section No 7601. — Fig. 16. *Cadosina fusca cieszynica* Nowak, Hauterivian, 2988 m, thin section No 7620. All the figures magnified 285 x.

Plate VIII.

Fig. 1. *Ellipsagelosphaera keftalrempti* Grün, distal view, Lower Hauterivian, 3000 m, sample No 148/78., 5000 x. — Fig. 2. *Ellipsagelosphaera* cf. *keftalrempti* Grün, distal view, Lower Hauterivian, 2415 m, sample 138/78, magn. 5000 x. — Fig. 3. *Ellipsagelosphaera keftalrempti* Grün, proximal view, Lower Hauterivian, 3050 m, sample No 150/78, magn. 3500 x. — Fig. 4—5. *Ellipsagelosphaera ovata* (Bukry) Black, proximal view, Lower Hauterivian, 3000 m, sample No 148/78, magn. 3000 x. — Fig. 6. *Ellipsagelosphaera* sp., proximal view, Upper Hauterivian, 3200 m, sample No 156/78, magn. 5000 x. — Fig. 7—8. *Cyclagelosphaera* sp., proximal view, Valanginian, 2150 m, sahple No 135/78 (Fig. 7) and Lower Hauterivian 300 m, sample 148/78 (Fig. 8). Magnification 5000 x in both the cases. — Fig. 9. *Cyclagelosphaera* aff. *rotaclypeata* Bukry, distal view, Lower Hauterivian, 2950 m, sample No 146/78, magnification 4000 x. — Figs. 10—11. *Diazomatolithus* sp., (Fig. 10., 5000 x) and *Podorhabdus* sp. (Fig. 11., 4500 x), Lower Hauterivian, 300 m. sample No 148/78. — Fig. 12. *Diazomatolithus* sp., Berriasian, 21000 m, sample No 134/78. Magnification 7000 x. All the photos taken on SEM JEOL-21.

thonian) is most conspicuous, as well as the inexpressiveness of Crassicolaria and Calpionellites Zones. The role of various factors, causing this phenomenon (submarine erosion, imperfect fossil record, condensation of faunal horizons etc.) in mutual combination, can be explained after detail knowledge of further profiles in neighbouring areas. However, we can state even at the present knowledge, that our Upper Jurassic/Lower Cretaceous microfossil assemblages are clearly less diversified and less abundant than those of marginal Fatric Belá-unit and/or units of Klippen Belt.

Translated by J. Vitko

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