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## AMMONITES IN BASAL PARTS OF REIFLING LIMESTONES IN CHOČ NAPPE ON SOUTHERN SLOPES OF NÍZKE TATRY MTS.

(Figs. 12, Pl. 1)



**Abstract:** The study of ammonites in basal parts of Reifling limestones in the Choč nappe revealed two faunal horizons. The first horizon represented by an assemblage from the locality Jasenie correspond to the Pelsonian, the *Balatonicus* zone. The second, stratigraphically higher horizon is represented by an assemblage from the locality Dubová—Zámotie. It is Illyrian and correspond to the *Trinodosus* Zone.

**Резюме:** Исследование аммонитов базальных частей райфлингских известняков хочского покрова показало существование двух фаунистических горизонтов. Первый горизонт, представляемый сообществом из местонахождения Ясение, отвечает пелсону, зоне *Balatonicus*. Второй, стратиграфически высший горизонт представлен сообществом из местонахождения Дубова—Замостие, которое иллирийского возраста и отвечает зоне *Trinodosus*.

### Introduction

Although Reifling limestones of the Choč nappe are quite frequent in the West Carpathians, ammonoid cephalopods are scarce (Rakús, 1960; Kollárová—Andrusovová, 1961, 1967).

In the past years, owing to increasing interest in the Reifling limestones, finds of ammonites were more frequent mainly in the basal parts (Bujnovský, 1978; Jendrejáková—Michalík—Pašová, 1981).

The following cephalopod fauna originates from two localities: Jasenie — a forest road cut, and Dubová—Zámotie. Both localities are in Reifling limestones of the Choč nappe on the southern slopes of the Nízke Tatry Mts.

### Locality Jasenie — forest road cut

The locality (text fig. 1) is 980 m NNW of the village Jasenie. It is a right cut of a forest road with exposed basal parts of Reifling limestones. There a rich assemblage of ammonites, brachiopods, gastropods, foraminifers and conodonts was found (Jendrejáková et al., 1981).

As for lithology (text fig. 3), the basal parts consist of grey, biomicrite bedded limestones (Kullmanová et al., 1984). The dominant component of the faunal spectrum is *Piarorhynchella trinodosi* (BITT.). Ammonites are scarce but there the significant zone species *Balatonicus* ex gr. *balatonicus* (MOJ.) and *Norites psilodiscus* ARTH. were found. Several juvenile ammonite tests from same locality are regarded as Pelsonian and ranged to the *Balatonicus* Zone.

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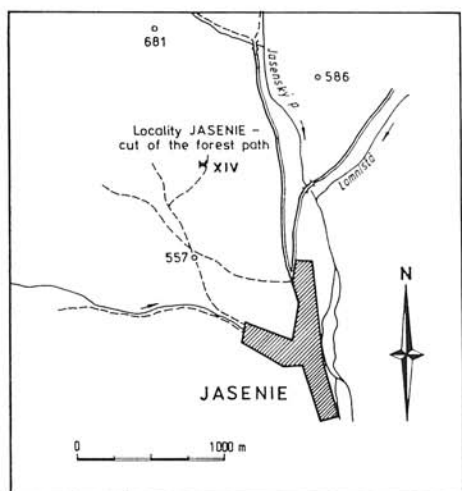


Fig. 1. Topographic situation of locality Jasenie forest road cut.

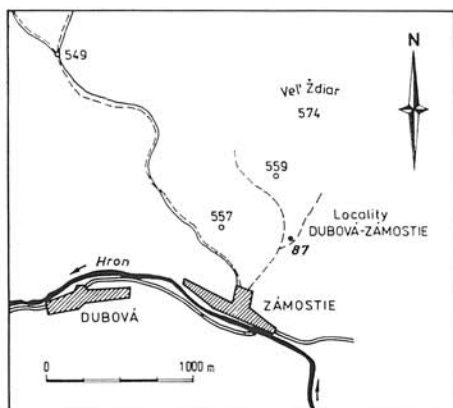


Fig. 2. Topographic situation of locality Dubová—Zámotie.

### Locality Dubová—Zámotie

The locality was found by A. Biely and is marked with No. 87 in documentation (text fig. 2). It is 800 m NE of the church in Zámotie and 210 m from B.M. 538. There are small outcrops of grey biomicrite limestones with local accumulations of crinoidal segments. The fauna is abundant in spite of the small size of the outcrop, and comprises cephalopods, brachiopods, small lamellibranchiates and gastropods, and plentiful conodonts.

Among cephalopods are *Pleuromutilus* sp., *Proavites* cf. *proavitus* ARTH., *Ptychites* sp., *Judicrites* aff. *eryomphalus* (BEN.), *Bulogites* ex gr. *zoldianus*

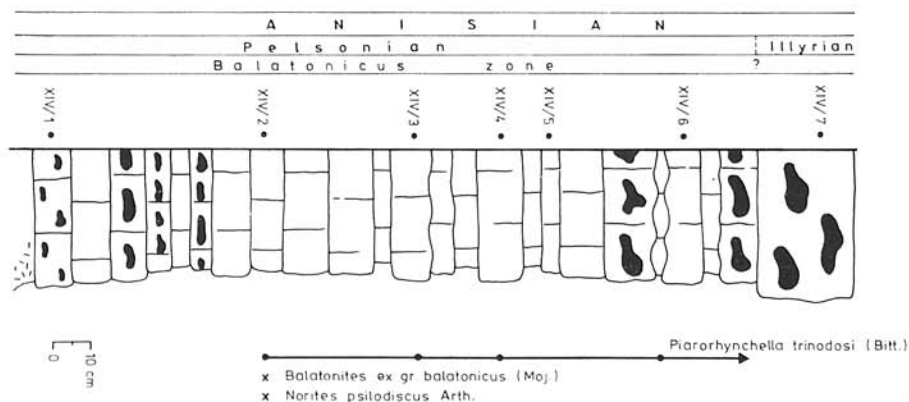


Fig. 3. Lithostratigraphical section on the lower part of the Reifling limestones at the locality Jasenie — cut of the forest path.

(MOJ.), *Semiornites* cf. *petersi* (MOJ.) and *Semiornites* sp. The assemblage is Illyrian and corresponds to the *Trinodosus* Zone.

Here I want to express my gratitude to A. Biely and J. Michalík for offering the ammonites for the study and to J. Szabó for consultations concerning *B. balatonicus*.

### Systematic part

*Nautilida* AGASSIZ, 1847  
*Tainoceraidae* HYATT, 1883  
*Pleuromautulus* MOJSISOVICS, 1882  
*Pleuromautulus* sp.  
 Text fig. 4

**Material:** An incomplete stone core representing a phragmocone and a part of a living chamber.

Dimensions: <sup>1)</sup>	D	WH	WT	d
	36.5	16.6	—	11.0

**Remark:** Preserved relics of morphologic characters indicate a mature specimen, because the section of the body chamber (text fig. 4) shows a slightly fastigate ventrum, whereas it is rounded on phragmocone. The test sculpture only preserved in fragments. Under a side light the phragmocone shows thin, retroverse, straight "ribs". On the body chamber are relics of tubercles approximately on the deflexion of the test section.

The suture line is partly preserved (text fig. 4). It is characterized by an external lobe and a shallow, wide lateral lobe.

**Stratigraphic range:** Illyrian, the Zone *Paraceratites trinodosus* on the locality Dubová—Zámotie.

Superfamily *Noritaceae* KARPINSKÝ, 1889  
 Family *Noritidae* KARPINSKÝ, 1889  
*Norites* MOJSISOVICS, 1869

*Norites psilodiscus* ARTHABER, 1896  
 Text fig. 5, Pl. 1, Figs. 4, 5

1896 *Norites psilodiscus* ART. — ARTHABER: Die Cephalopoden fauna der Reiflinger Kalke, p. 92, Pl. 8, Fig. 4a-c.

**Material:** An incomplete silicified core.

Dimensions:	D	WH	WT	d
	10.2	5.2	3.4	2.5

<sup>1)</sup> All dimensions are in mm.

**Description:** A small involute test laterally compressed. The section of the last whorl is high oval (text fig. 4). Ventrums are tabulate, gently arched. Transition into sides of the whorls is marked with edges. The periventral part of the whorl and its sides form an arch. In the periumbilical part of the whorl is a longitudinal depression emphasizing the rounded umbilical edge. Umbilicus is broad and younger whorls are distinct. Suture line is not preserved.

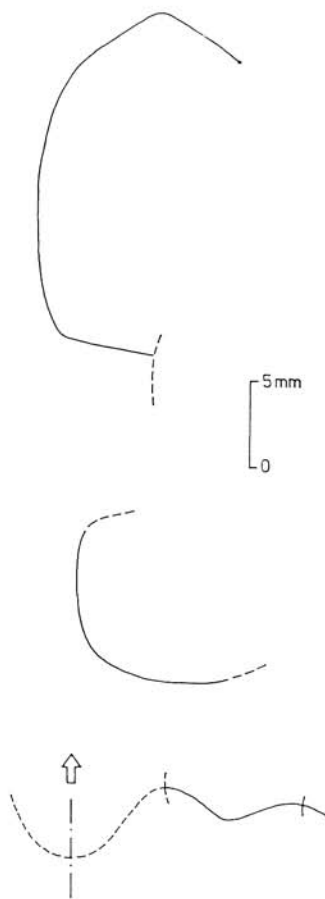


Fig. 4. *Pleuronautilus* sp., section of last whorl, body chamber and suture line.

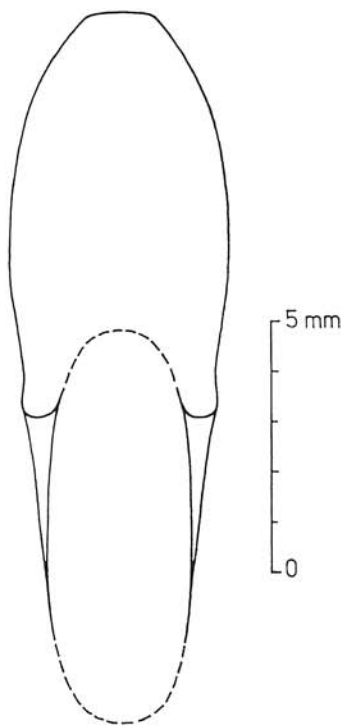


Fig. 5. *Norites psilodiscus* ARTH., section of whorls of young specimen.

**Remark:** The specimen from the locality Jasenie — the forest road cut represents a juvenile stage, so the exact determination was hardly possible. The section of the last whorl preserved, of the periumbilical depression and of the wide umbilicus resemble the species *Norites psilodiscus* ARTHABER, 1896. The presence of the periumbilical depression on the sides of the whorl differs this species from all other species of the genus *Norites*.

Stratigraphic range: Arthaber (1896) did not determine the exact stratigraphic position except that it originated from Reifling limestones. On the locality Jasenie the specimen was found together with *Balatonicus* ex gr. *balatonicus* and this is why we range it to the Pelsonian.

*Meekoceratinae* WAAGEN, 1895  
*Proavites* ARTHABER, 1896

Discussion: Arthaber (1896, p. 103) ranged his new genus *Proavites* to the subfamily *Kymatitinae* WAAGEN, 1895. Later on Spath (1934) and then Kummel (1957) included the taxon in the subfamily *Dagnoceratinae* SPATH, 1934. Recently Tozer (1981) ranged it to the subfamily *Meekoceratinae*, regarding the subfamily *Kymatitinae* as a synonym to the subfamily *Meekoceratinae*.

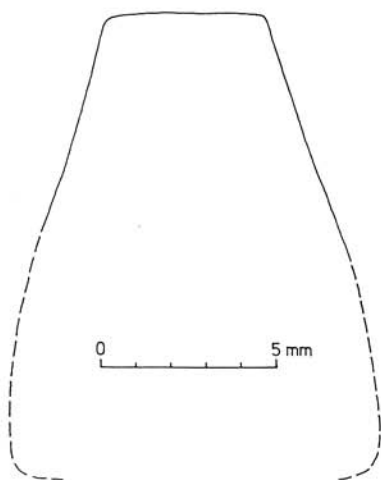


Fig. 6. *Proavites* cf. *proavitus* ARTH., whorl section.

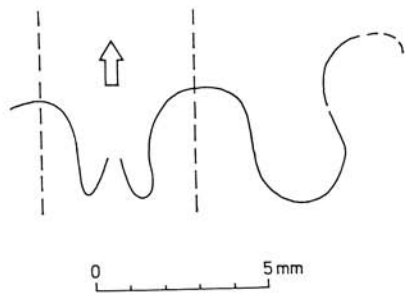


Fig. 7. *Proavites* cf. *proavitus* ARTH., suture line.

It follows that the above authors were not sure about the exact taxonomic ranging of the genus *Proavites* to the subfamily *Meekoceratinae*. With respect to characteristic features like the whorl profile, tabulate keel, and the suture-line we regard it as right to range the genus *Proavites* to the subfamily *Meekoceratinae*.

In its external morphology the genus *Proavites* resembles the genus *Norites* MOJSISOVICS, 1878. They differ in variable suture line. Basal parts of lateral lobes of the genus *Proavites* are smooth and there are about 6 of them. The profile of whorls is trapezoid with less arched sides than in the genus *Norites*.

Stratigraphic range: Arthaber (1896, p. 103) did not determine the exact position except that it originated from Reifling limestones. In the West Carpathian the genus occurs in the Upper Anisian, the *Trinodosus* zone.

Geographic range: Arctic and Tethys bioprovinces (Tozer, 1980).

*Proavites* cf. *proavitus* ARTHABER, 1896

Text figs. 6, 7, Pl. 1, Fig. 2

**Material:** Two incomplete fragments of whorls with partly preserved suture line.

**Description:** The section of preserved whorls is hightrapezoid (text fig. 6). Ventrum is flat, separated from sides by distinct but rounded edges. Sides of the whorls are flat, periventral part of the profile is slightly depressed.

The suture line (text fig. 7) is rudimentary. The external lobe is smaller, divided by a small secondary saddle extending to about the half of height of the external lobe. The first lateral lobe is also small and slightly surpasses the base of the external lobe.  $S_1$  is low and rather wide. Bases of all lobes preserved are smooth.

**Remark:** Although the specimens are incomplete, taxonomic ranging was possible with respect to the section of the whorl and the suture line. Specimens from the locality Dubová—Záměstie are in their whorl section well correlable to the lectotype of the species, depicted by Arthaber, 1896, p. 105, Pl. 10, Fig. 3.

**Stratigraphic range:** On the locality Dubová—Záměstie our specimens occur together with Illyrian species. Arthaber (l. c., p. 241) found them in the lower Reifling limestones.

*Ptychites* MOJSISOVICS, 1875*Ptychites* sp.

Pl. 1, Fig. 3.

**Material:** From the locality Dubová — Záměstie comprised one specimen evidently belonging to this taxon but its more exact determination was impossible. It occurred together with *Paraceratites trinodosus*.

*Balatonitidae* SPATH, 1951*Balatonites* MOJSISOVICS, 1879*Balatonites* ex gr. *balaticus* (MOJSISOVICS, 1873)

Text fig. 8a, b, Pl. 1, Figs. 7, 8

**Material:** One partly preserved, silicified specimen and two fragments of whorls.

Dimensions:	D	WH	WT	d
	31.6	11.6	6.0	12.4

**Description:** A small, convolute test with a fastigate section of the last whorl preserved (text fig. 8a). Ventrum is roof-shaped, with a sharper keel in the axial part. Sides of the whorl are slightly arched, parallel in the periumbilic part of the whorl height. Transition of the ventral part of the whorl section to sides is stressed by deflexion with a periventral series of tubercles. In the approximate half of the whorl height is the median series of tubercles. Transition of sides into umbilical wall is also emphasized by the umbilical series of tuber-

celes. The umbilical wall is perpendicular to the symmetry plain of the test. Umbilicus is wide and shallow.

The surface of whorls is covered with distinct, slightly prorsiradiate ribs with the above series of tubercles on them. Sometimes the periumbilical zone shows indications of bifurcation. Ribs use to be separated by deeper intercalar constrictions.

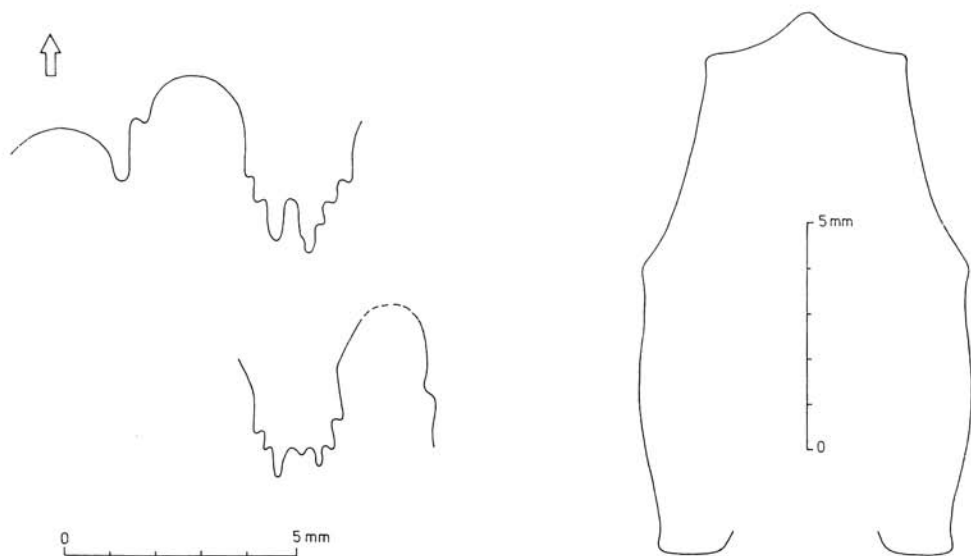


Fig. 8. *Balatonites* ex gr. *balatonicus* (MOJ.), whorl section and suture line.

The suture line (text fig. 8b) is only partly preserved and has a ceratitid character. External lobe is shallow and wide. The first lateral lobe is quite deep, intensely dissected at the base.

**Remark:** The specimen from the locality Jasenie — forest road cut, is well comparable to the lectotype as depicted by Mojsisovics, 1882, Pl. IV, Fig. 2a, b. Because of its poor preservation we were not sure in ranging the specimen to *balatonites*, although it is close to *balatonicus* in its whorl section, distribution of tubercles and character of costation. It is also the opinion of Dr. I. Szabó (Budapest) who examined our specimen.

Regrettably, Mojsisovics (1882) did not depict the suture line. The suture line depicted by Arthaber (1896, Pl. VI, Figs. 2d, 3c) shows small deviations, mainly in the secondary saddle of the external lobe. The secondary saddle of our specimen is wider and lower. There are also differences in the downcutting of the basal part of the first lateral lobe.

**Stratigraphic range:** Mojsisovics (1882, p. 80) ranged the species to the zone with "*Ceratites binodosus*". Validity of the *binodosus* zone was discussed for a long time (Assereto, 1971) and recently also contested. De-

tailed level study of ammonites fauna in the area of Tethys (K r y s t ý n, 1983) showed that the original *binodosus* zone of MOJSISOVICS, is in the zone *balatonicus* and corresponds to the Pelsonian. We also range the specimen from Jasenie to the Pelsonian and in the zone with *balatonicus*.

*Judicarites* MOJSISOVICS, 1896  
*Judicarites* aff. *euryomphalus* (BENECKE, 1866)  
 emed MOJSISOVICS, 1882)  
 Pl. 1, Fig. 9

**Material:** One negative impression and two whorl fragments.

Dimensions:	D	WH	WT	d	R
	34.0	10.5	—	14.5	26

**Description:** A small evolute form with a distinct costation. Ribs are simple, slightly prorsiradiate, mainly in the periventral part of the whorl height. The ribs begin on the umbilical edge. On the transition of sides to the ventrum, the ribs get apertural-bent, weakened, and disappear at keel. There are 26 ribs on the last whorl preserved. Suture line is not preserved.

**Remark:** The specimen from the locality Zámostie—Dubová resembles Mojsisovics (1882, Pl. 38, Fig. 6) depiction, only its tubercles on ribs are missing. The tubercles were mentioned but not depicted by Mojsisovics (Pl. 38, Fig. 6).

**Stratigraphic range:** Illyrian, zone with *Paraceratites trinodosus*.

**Geographic range:** The species is plentiful in the areas of Judicaria and Lombardian (Mojsisovics, 1882; Gaetani, 1969; Assereto, 1971). It is not known in the West Carpathians.

*Ceratitidae* MOJSISOVICS, 1879  
*Bulogites* ARTHABER, 1912  
*Bulogites* ex gr. *zoldianus* (MOJSISOVICS, 1882)  
 Text fig. 9a, b, Pl. 1, Fig. 6

**Material:** One incomplete specimen representing a part of body chamber.

**Remark:** Material from Zámostie—Dubová comprised an incomplete specimen. According to its costation and section of the last whorl preserved, we ranged it among the forms *Bulogites zoldianus*.

The terminal part of phragmocone with transition in the body chamber shows a wide-elliptic section of the whorl rounded ventrum. The section of the body chamber (text fig. 9b) shows roof-shaped ventral part of the whorl with blunt keel.

On the transition of sides to ventrum is periventral series of tubercles. On the body chamber they have the character of nodos.

The surface of our specimen is covered with thick ribs, either simple or bifurcated. Bifurcation is in the half of the whorl height. There also is a tubercle in the place of bifurcation.



Stratigraphic range: Mojsisovics (1887, p. 39) found the specimen in *binodosus* beds. Assereto (1963, p. 64) and Gaetani (1969, p. 520) described it from the Middle Anisian without exact determination.

*Semiornites* ARTHABER, 1912

*Semiornites* cf. *petersi* (MOJSISOVICS, 1882)

Text figs. 10, 11, Pl. 1, Fig. 1

Material: One incomplete specimen.

Dimensions:	D	WH	WT	d
	33.3	18.2	8.5	6.0

Description: An involute, laterally compressed test. Elliptical whorl section (text fig. 10). Ventrum is rounded and passes continuously to whorl sides.

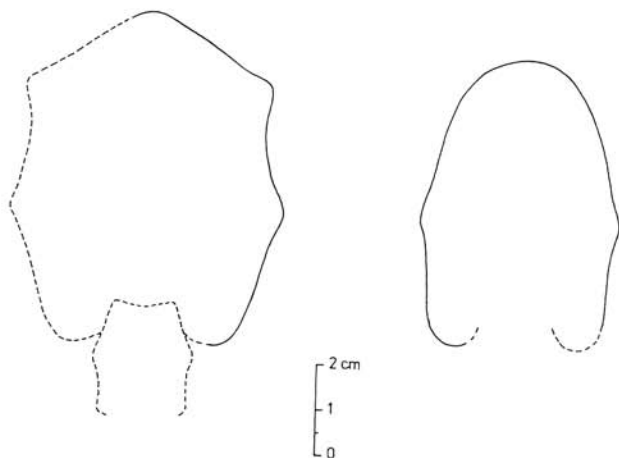


Fig. 9. *Bulogites* ex gr. *zoldianus* (MOJ.), section of last whorl and body chamber.

The whorl sides are flat, slightly parallel. Umbilicus is narrow. Umbilical wall and edge are markedly rounded. The whorl surface is ornamented with inconspicuous sigmoid ribs, showing dichotomic bifurcation. Ribs get thinner towards the ventre to disappear there.

Suture line is only partly preserved (text fig. 11). External lobe is broad, quite shallow, whereas the first lateral lobe is narrow and almost twice so deep as  $E_1$  and  $S_2$  are downcut on sides.

Remark: Exact determination was prevented by poor preservation. In its habitus our specimen is most resemblant to the species *Semiornites petersi* (MOJ.) and it is likely to represent its immature stage.

Stratigraphic range: Our specimen originates from the Zone *P. trinodosus* (MOJSISOVICS, 1882, p. 27) and it was found on the locality Dubová — Zámotie.

*Semiornites* sp.

On the locality Dubová—Zámotie a fragment of whorl was found. After reconstruction of the whorl section and costation reliefs it is ranged among the forms *S. lennanus*. The fragment was found together with the species, *S. cf. petersi* and is ranged to the Illyrian.

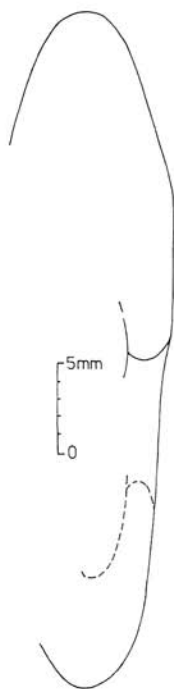


Fig. 10. *Semiornites* cf. *petersi* (MOJ.), section of whorls.

*Stratigraphic evaluation of fauna*

The ammonite fauna described in the paleontological part, represents two horizons differing in faunal content and in superposition:

— The lower horizon, represented by fauna from the locality Jasenie — forest road cut, ranged to the Pelsonian and to the zone *Balatonites balatonicus*. The horizon is characterized by the species *Balatonites* ex gr. *balatonicus* (MOJ.), *Norites psilodiscus* ARTHABER and by several juvenile stages. They can, however, not be exactly defined. In our opinion, this poorer assemblage corresponds to the level 1 or 2 of Assereto (1971), especially according to the presence of the genus *Balatonites* (Szabó et al., 1979).

As already mentioned, we regard the above fauna as Pelsonian, corresponding to the zone *Balatonicus* in the sense of (Assereto, 1971).

In our case there is a question whether the fauna corresponds to the entire zone *balatonicus* or only to its part. Since in the basement of the Reifling limestones are still grey dolomites with dasycladaceans, formerly ranged to the Pelsonian (Biely—Bystrický, 1964), we may regard the fauna from Jasenie as corresponding partly to the *balatonicus* zone. Results of investigations performed by J. Bystrický (personal information) show that *Physoporella discita*

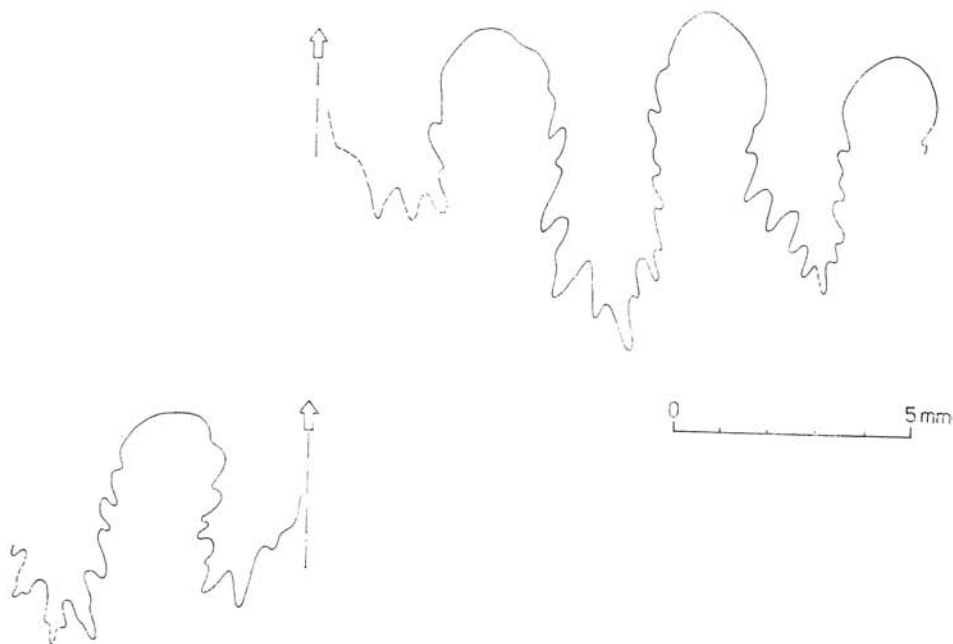


Fig. 11. *Semiornites* cf. *petersi* (MOJ.), suture line.

(GUMB.) PIA, indicative of the Pelsonian age of dolomites, is to be ranged to the Anisian without a more exact determination of a substage. It is also possible that the underlying dolomites are Bitynian and the ammonite assemblage corresponds to the entire *balatonicus* zone. The problem cannot be solved unambiguously at the present state of knowledge.

— The upper horizon is represented by fauna from the locality Dubová—Zámotie: *Pleuromutilus* sp., *Proavites* cf. *proavitus* ARTHABER, *Ptychites* sp., *Judicrites* aff. *euryomphalus* (BENECKE), *Bulogites* ex gr. *zoldianus* (MOJ.), *Semiornites* cf. *petersi* (MOJ.), *Semiornites* sp. (cf. *S. lennanus* (MOJ.)). This is Illyrian fauna and belongs to the zone *Paraceratites trinodosus* (text fig. 12). It corresponds to niveau 3 of Assereto (1971).

The brachiopod *Piarorhynchella trinodosi* (BITT.) is a significant component in faunal spectra of the above mentioned horizons. It is very frequent on both localities. In the Carpathian literature (Bystrický, 1968) this species was

regarded as the Illyrian index species. Our study shows its appearance as early as in the Pelsonian, in the *balatonicus* zone, so its stratigraphic range must be greater than presumed. Szabó et al. (1979) described *P. trinodosi* from almost the same position on the locality Felsoors (Balaton Highland).

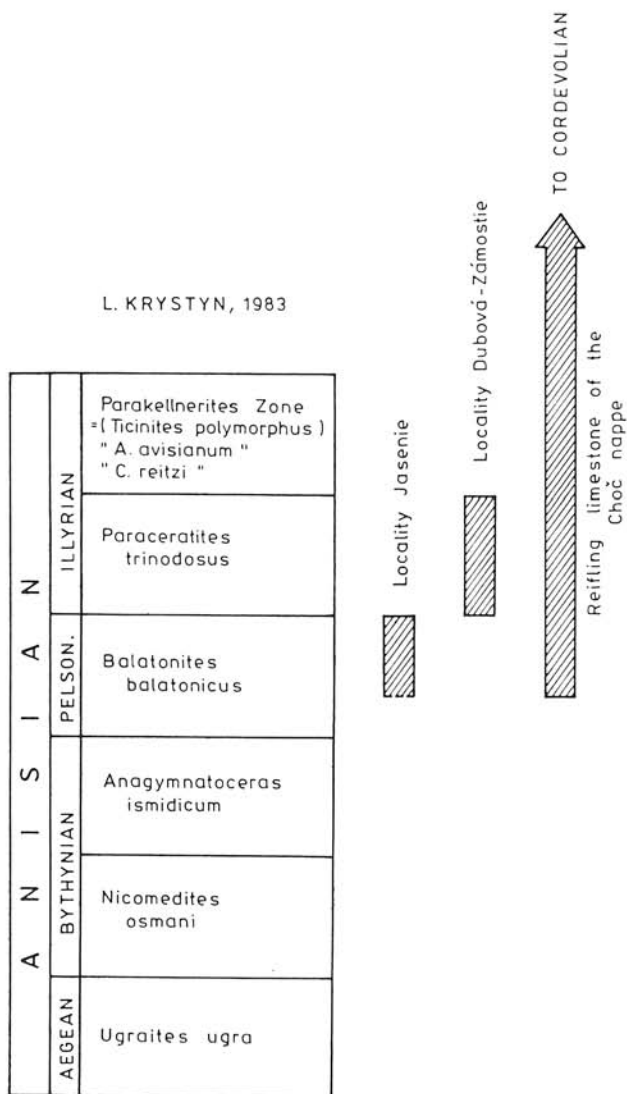


Fig. 12. Stratigraphical position of ammonite fauna from the lower part of the Reifling limestones of the Choč nappe.

*Notes on stratigraphic range of Reifling limestones in Choč nappe*

Generally, the Reifling limestones of the Choč nappe were ranged to the Upper Anisian (Illyrian)—Ladinian (Longobardian). The lower stratigraphic boundary was defined by *P. trinodosi* (BITT.), referred to as Illyrian, and by superposition of the limestones above the Ramsau dolomites regarded as Pelsonian (Bystrický—Biely, 1964; Bystrický, 1983, p. 55).

The upper boundary was gradually precised according to ammonite occurrences (Rakús, 1960; Kollárová—Andrusovová, 1973). Now it is ranged to the Cordevolian. The ammonite fauna from Jasenie indicates the lower stratigraphic boundary of the Reifling limestones as Pelsonian. Jendrejáková et al. (1981) also put it to the Pelsonian. Basing on the existing information we may say that the base and the top of the Reifling limestones are determined as Pelsonian—Cordevolian according to ammonites. There, however, is a question whether the two boundaries are synchronous or not in the entire West Carpathians. In the southwestern part of the Choč nappe on southern slopes of Nízke Tatry Mts. (Zvolenské Nemce—Priechod) where the typical Reifling limestone facies disappears to be replaced by shallow-water facies. The base of the Reifling limestones may be partly heterochronous. The top part (Cordevolian) seems synchronous up to the area of the Malé Karpaty Mts. (Masaryk et al., 1984). Perhaps, it is because of the permanent and more deepening facies regime of the Reifling limestones in the whole Choč nappe.

*Conclusions*

The ammonite assemblage from basal parts of the Reifling limestones of the Choč nappe is indicative of two biozones: the lower one corresponding to the *balatonicus* zone and the upper one corresponding to the *trinodosus* zone.

Basing upon that, we put the base of the Reifling limestones into the Pelsonian — the *balatonicus* zone.

Translated by E. Jassingerová

## Plate 1

Fig. 1. *Semiornites* cf. *petersi* (MOJSISOVICS, 1882); locality: Dubová—Zámotie, Illyrian, *Trinodosus* Zone, 1.5×.

Fig. 2. *Proavites* cf. *proavitus* ARTHABER, 1896; locality: Dubová—Zámotie, Illyrian, *Trinodosus* Zone, 1.5×.

Fig. 3. *Ptychites* sp., locality Dubová—Zámotie. Illyrian, *Trinodosus* Zone, natural size.

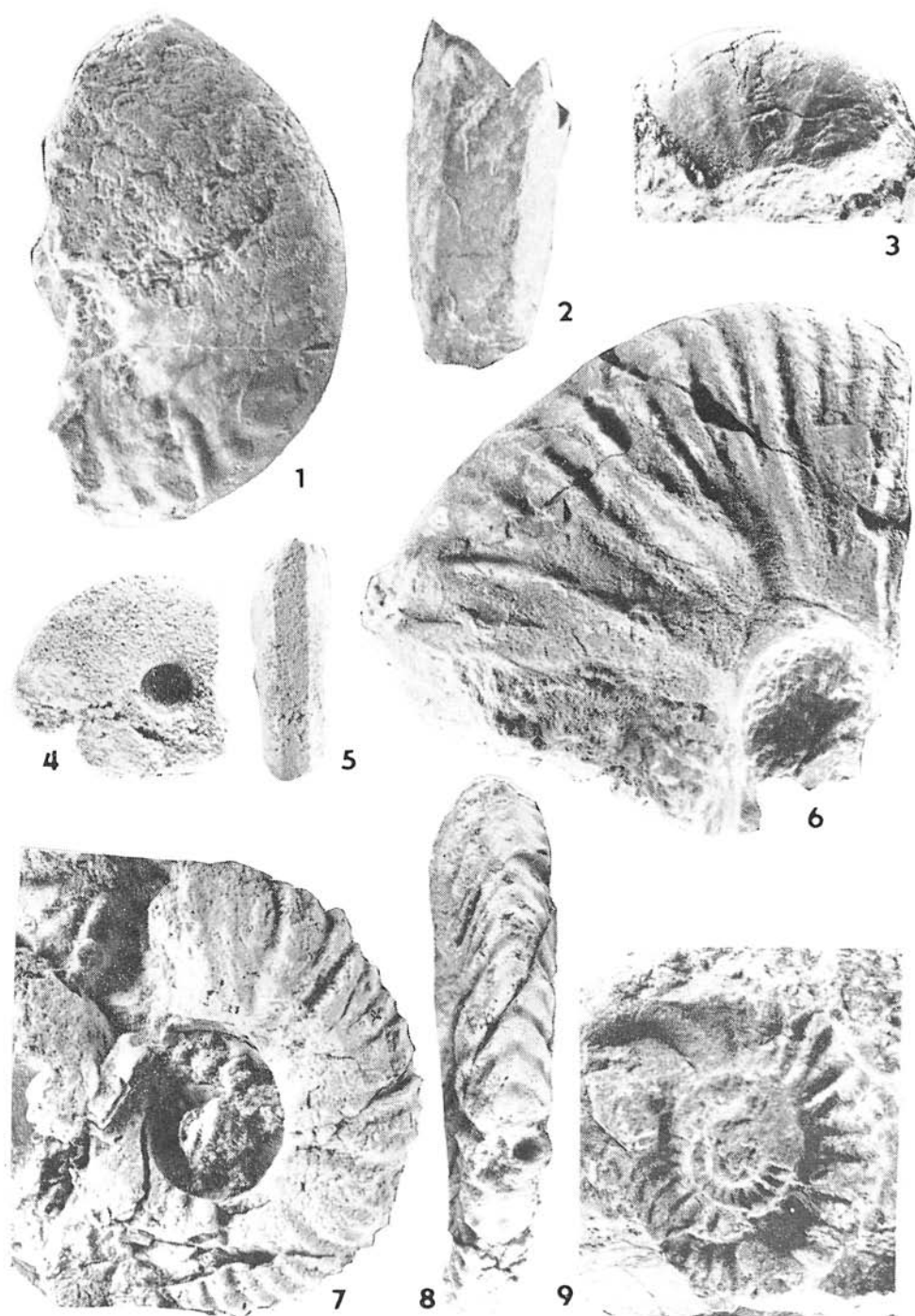
Figs. 4, 5. *Norites psilodiscus* (ARTHABER, 1896); locality: Jasenie, forest path cut, Pelsonian, *Balatonicus* Zone, 2.5×.

Fig. 6. *Bulogites* ex gr. *zoldianus* (MOJSISOVICS, 1882); locality: Dubová—Zámotie, Illyrian, *Trinodosus* Zone, natural size.

Figs. 7, 8. *Balatonicus* ex gr. *balatonicus* (MOJSISOVICS, 1873); locality: Jasenie, forest path cut, Pelsonian, *Balatonicus* Zone, 2×.

Fig. 9. *Judicrites* aff. *euryomphalus* (BENECKE, 1866 emend. MOJSISOVICS, 1882); locality: Dubová—Zámotie, Illyrian, *Trinodosus* Zone, 0.5×.

Photograph C. Michalíková



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