

PRELIMINARY REPORT ABOUT THE SILURIAN TO
MIDDLE DEVONIAN SEQUENCES NEAR NEKÉZSENY
(SOUTHERNMOST UPPONY MTS., NORTHERN HUNGARY)

by H. Kozur +)

Summary

The Silurian to Middle Devonian sequence of the Strázsa-hegy at Nekézseny (southernmost Uppony Mts.) and the Lower to Middle Devonian sequence of the Jöcsös-völgy near Nekézseny are briefly discussed. The Strázsahegy Formation (tuffs, tuffites, schalstein, diabase) is at least in its largest parts Middle Devonian in age. The beginning of this basic volcanism before the Upper Emsian (topmost Lower Devonian) can be excluded.

The Silurian sequence of the Strázsa-hegy section, reconstructed from olistolites within the Strázsahegy Formation, is very similar to the Silurian sequence of the Cellon profil in the Carnian Alps.

In the taxonomic part the conodont genus *Belodella* ETHINGTON the systematic position of "*Kockelella*" *patula* WALLISER are briefly discussed. 6 new conodont species and subspecies are described.

Zusammenfassung

Die silurische bis mitteldevonische Schichtenfolge des Strázsa-hegy bei Nekézseny (südlichstes Uppony-Gebirge) und die unter- bis mitteldevonische Schichtenfolge vom Jöcsös-völgy nahe Nekézseny werden kurz diskutiert. Die Strázsahegy-Formation (Tuffe, Tuffite, Schalstein, Diabase) hat zumindest größtenteils mitteldevonisches Alter. Der Beginn dieses basischen Vulkanismus vor dem Oberems (oberstes Unterdevon) kann ausgeschlossen werden.

Die silurische Abfolge des Strázsa-hegy-Profiles, die aus

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Olistolithen innerhalb der Strázsa-hegy-Formation rekonstruiert wurde, ist sehr ähnlich mit der silurischen Schichtenfolge des Cellon-Profiles in den Karnischen Alpen.

Im taxonomischen Teil werden die Conodontengattung *Belodella* ETHINGTON und die systematische Stellung von "*Kockelella*" *patula* WALLISER kurz gestreift. 6 neue Conodonten-Arten und Unterarten werden beschrieben.

1. INTRODUCTION

The crinoidal limestones and basic volcanics of the Strázsa-hegy section at Nekézseny in the southernmost Uppony Mts. (northern Hungary) were compared with Middle Triassic crinoidal limestones of Rudabánya Mts. and Aggtelek Karst by SCHRETER, 1945. PANTÓ, 1954, placed these sediments and volcanics into the Ladinian. BALOGH, 1964, had some reserve to this age determinations because of the absence of any stratigraphically important fossils, but on the other hand for the same reason he could also not reject this correlation.

KOVÁCS, 1981, investigated 6 samples from the Strázsa-hegy and he found in one of it Lower Devonian (higher Gedinian) conodonts. He assumed that the diabases, agglomerates and tuffs "partly alternate with limestones, partly seem to break through them" (KOVÁCS, 1981, p. 72). Because only one sample yielded conodonts, it could not be recognized that the limestones are all olistoliths that contain different conodont and ostracod faunas, from the Llandoveryan up to the Middle Devonian. Moreover, the exposure was bad in this time and therefore the olistolith character of the limestones could be only recognized in some parts of the outcrop.

Some brachiopod-bearing samples from the Strázsa-hegy section that I have got two years ago from Dr. Cs. DETRE (MÁFI, Budapest) yielded rich conodont faunas partly of Ludlowian, partly of Lochkovian ages. After these results the Strázsa-hegy sequence was studied in several excursions, partly together with Prof. Dr. K. BALOGH, MÁFI, Budapest. For comparison, also the sequence of the Jöcsös-völgy near Nekézseny was studied.

2. TAXONOMIC PART

Remarks to the genus *Belodella* ETHINGTON, 1959

Very rich *Belodella* material is present above all in the Lower Devonian samples of the Strázsa-hegy and Jöcsös-völgy sections. In the sample Ne 4 of the Jöcsös-völgy section more than 10 000 specimens were picked out. In the other Lower Devonian samples between 100 and 1000 specimens were found. In the Silurian samples only some specimens of *Belodella* were found, the richest samples yielded about 100 specimens.

The apparatus of all *Belodella* species consists of 3 main elements, an undenticulated one and two denticulated ones. Among the denticulated elements we can observe in all species

a morphotype with blunt anterior margin (triangular element) and a morphotype with acute anterior margin. The height of the blunt anterior margin of the triangular denticulated morphotype varies considerably. One of the two marginal carina that border the blunt anterior margin may shift towards the lateral area. By this, the anterior margin will be cut more obliquely. If this carina on the anterior part of the lateral surface will be weaker and weaker, a full transition can be observed to the morphotype with acute anterior margin.

If the blunt anterior margin will be lower and lower, the two marginal carina will finally growth together and also by this a transitional series to the denticulated element with acute anterior margin is present. This latter transitional series can be frequently observed in all *Belodella* species.

The undenticulated elements are more rare, but present in all *Belodella* species. They are a little similar to *Panderodus* ETHINGTON, 1959, but the basal striation, most typical for this genus, is always absent.

For these undenticulated elements the genus *Haplobelodella* KHODALEVICH & TSCHERNICH, 1973, was used. Also the type species of *Rotundacodina* CARLS & GANDL, 1969, *R. noguerensis* CARLS & GANDL, 1969, is similar, but probably not congeneric with *Belodella* ETHINGTON, 1959. The other species of *Rotundacodina* CARLS & GANDL, 1969, are quite different from *Belodella* ETHINGTON, 1959.

Most of the undenticulated elements have an acute anterior margin. But also transitional forms to triangular morphotypes can be often observed. In this case always the transitional series with the obliquely blunt anterior margin is present.

The intraspecific variability (width and length of the cone, length and inclination of the cusp) is high in all *Belodella* species, but some features are rather constant. If the surface is striated, this striation can be observed in all elements but the distinctness of the striation may be different.

Only 3 *Belodella* species could be distinguished in the Lower Devonian of the southernmost Uppony Mts.

1) *Belodella devonica* (STAUFFER, 1940), the type species of the genus.

Synonyma: *Belodus triangularis* STAUFFER, 1940

Belodus resimus PHILIP, 1965

Belodus multidentatus MOSKALENKO, 1966

? *Belodella humilidentata* SNIGIREVA, 1975

Belodella firminosa SNIGIREVA, 1981

2) *Belodella erecta* (RHODES & DINELEY, 1957)

Synonyma: *Paltodus valgus* PHILIP, 1965, (undenticulated element)

Belodus asiaticus MOSKALENKO, 1966

Belodus subtriangularis MOSKALENKO, 1966

? *Belodella praebreviscula* SNIGIREVA, 1975

Haplobelodella bicarinata SNIGIREVA, 1975

3) *Belodella striata* n. sp.

Some remarks to the systematic position of
"Kockelella" patula WALLISER, 1964

BARRICK & KLAPPER, 1976, established a phylomorphogenetic line from *Kockelella ranuliformis* through *K. amsdeni* - *K. stauros* to *K. variabilis*. There is no or a simple denticulated process in the Llandoveryan and Wenlockian *Kockelella* species. Only in the Lower to Middle Ludlowian *Kockelella variabilis* there is characteristically a bifurcated lateral process on at least one side of the blade, whereas the lateral process on the opposite side may be simple.

"*Kockelella*" *patula* WALLISER, 1964, does not fit into this evolutionary line. This Lower Wenlockian species is characterized by a widely expanded basal cavity, on which the upper platform surface bears up to 4 lateral rows of denticles and a curved, inconspicuous posterior process. Auxillary nodes may be present on the surface between the denticle rows.

On the other hand juvenile specimens of *Hadrognathus staurogathoides* WALLISER (see e.g. WALLISER, 1964, pl. 13, figs. 6, 9, 15) are very similar to "*Kockelella*" *patula* WALLISER. Larger specimens of "*Kockelella*" *patula* WALLISER (e.g. WALLISER, 1964, pl. 15, figs. 17, 18) are very similar to subadult specimens of *Hadrognathus staurogathoides* WALLISER (e.g. WALLISER, 1964, pl. 13, fig. 12).

It is therefore very probable that "*Kockelella*" *patula* WALLISER derived directly from *Hadrognathus staurogathoides* WALLISER, the type species of the genus *Hadrognathus* WALLISER, 1964. For this reason, "*Kockelella*" *patula* WALLISER is here placed into the genus *Hadrognathus* WALLISER. By this taxonomic revision the extraordinary position of *Hadrognathus patulus* (WALLISER) within the *Kockelella* line does not more exist. Within the *Hadrognathus* line *H. patulus* (WALLISER) has both in its morphology and in its stratigraphic occurrence a "normal" position.

The *Hadrognathus patulus* zone sensu WALLISER, 1964, is confirmed by the emendation of its index species. The forerunner of *H. patulus* is *H. staurogathoides* that occur from the *Pterospathodus celloni* zone until the *Pterospathodus amorphognathoides* zone, whereas *H. patulus* is the index species of the next higher zone above the *P. amorphognathoides* zone.

Description of new species and subspecies

Genus *Belodella* ETHINGTON, 1959

Type species: *Belodus devonicus* STAUFFER, 1940

Belodella striata n. sp.
(Pl. 9, figs. 1, 2; pl. 10, fig. 1)

Derivatio nominis: According to the striated surface.
Holotype: The specimen on pl. 9, fig. 2; rep.-no. D 504.
Locus typicus: Jöcsös-völgy near Nekezsény (southernmost

Uppony Mts.), outcrop near to the former mine entrance.
Stratum typicum: Jöcsösvölgy Formation, sample Ne 4, limestone with *Ozarkodina buchanaensis* (PHILIP) etc., basal Pragian.
Material: More than 100 specimens.

Diagnosis: The undenticulated element is a flat, basal rather broad simple cone. Anterior and posterior margin mostly acute, anterior margin rarely also obliquely blunt. Cusp moderately inclined. One lateral surface with shallow broad ridge in the lower half of the cone in front of its midline. In the higher parts of the cone this ridge is situated about in the midline, in the highest parts of the cone it is indistinct or absent. Opposite lateral surface with carina or narrow ridge parallel to the anterior margin. Both sides with coarse oblique striation.

Denticulated element with long, needle-like, highly fused denticles on the posterior margin. Anterior margin acute or truncated and than separated from the lateral surfaces by sharp ridges (triangular element). Lateral surfaces with distinct to indistinct striations. Upper part of the posterior margin with carina.

Distribution: Frequent in the basal Pragian of the southernmost Uppony Mts.

Remarks: No other *Belodella* species has coarse striations on the lateral surfaces.

Neopanderodus ZIEGLER & LINDSTRÖM, 1971, is more slender with roundish cross section. The obverse side has a furrow and the striation is not clearly oblique like in the undenticulated element of *Belodella striata* n. sp.

Genus *Decoriconus* COOPER, 1975

Type species: *Paltodus costatus* REXROAD, 1967

Decoriconus magnistriatus n. sp.
(Pl. 5, fig. 2)

Derivatio nominis: According to the very coarse striation.

Holotype: The specimen on pl. 5, fig. 2; rep.-no. S 101.

Locus typicus: Strázsa-hegy at Nekézseny (southernmost Uppony Mts.).

Stratum typicum: Limestone olistolite, sample Sh 28 with *Ozarkodina excavata inflata* (WALLISER), *O. excavata posthamata* (WALLISER) etc. Upper *Ancoradella ploeckensis* zone (topmost part of Lower Ludlowian).

Material: 3 specimens.

Diagnosis: Single cone conodont. Sa element strongly recurvated.

Basal part broad. Anterior and posterior margins acute.

Posterior part lamella-like, smooth. Remaining surface, except of the basal parts, with very coarse striations.

Distribution: Topmost part of Lower Ludlowian.

Remarks: In spite of the fact that only 3 specimens of the Ta element could be found, this new species is described here, because it is the youngest representative of the genus *Decoriconus* COOPER, 1975, in our material. The new species can be easily distinguished from all other *Decoriconus* species by its strong recurvature, unknown in any element of other *Decoriconus* species, and by its very strong striation.

Genus *Neopanderodus* ZIEGLER & LINDSTRÖM, 1971

Type species *Neopanderodus perlineatus* ZIEGLER & LINDSTRÖM, 1971
= *Neopanderodus aratus* (CARLS & GANDL, 1969)

Neopanderodus hungaricus n. sp.
(Pl. 8, fig. 1)

Derivatio nominis: According to the occurrence in Hungary.

Holotype: The specimen on pl. 8, fig. 1; rep.-no. D 509.

Locus typicus: Strázsa-hegy at Nekézseny (southernmost Uppony Mts.).

Stratum typicum: Sample Sh 9, olistolite of gray crinoidal limestone with *Ancyrodelloides* cf. *omus* MURPHY & MATTI etc. Lower part of *Ancyrodelloides deltus* zone (middle part of Lochkovian, Lower Devonian).

Material: 7 specimens.

Diagnosis: Gradually arched, slender single cone with subcircular to oval cross section. Posterior margin rounded. Both lateral surfaces with very coarse striation. In the upper part only the anterior marginal area is smooth, in the lower part the anterior quarter to half of the lateral surface is smooth. Fine basal striation present, but not very distinct. Furrow on obverse side narrow, situated near to the posterior margin.

Distribution: Middle to higher Lochkovian (lower part of Lower Devonian) of southernmost Uppony Mts.

Remarks: *Neopanderodus hungaricus* n. sp. is the most primitive *Neopanderodus* species. Not only the anterior margin, like in some higher evolved *Neopanderodus* specimens is smooth but also anterior parts of the lateral surface.

Genus *Panderodus* ETHINGTON, 1959

Type species *Paltodus unicostatus* BRANSON & MEHL, 1933

Panderodus barricki n. sp.
(Pl. 3, figs. 2, 3; pl. 5, figs. 1, 6)

Derivatio nominis: In honour of Prof. Dr. J.E. BARRICK, Iowa City.

Holotype: The specimen on pl. 5, fig. 1; rep.-no. S 96

Locus typicus: Strázsa-hegy at Nekézseny (southernmost Uppony Mts.).

Stratum typicum: Limestone olistolite (sample Sh 32) with *Ozarkodina excavata inflata* (WALLISER), *O. excavata posthamata* WALLISER etc. Upper *Ancoradella ploeckensis* zone (topmost part of Lower Ludlowian).

Material: More than 100 specimens.

Diagnosis: Single cone conodont. All elements strongly recurvated. Straight lower part in M elements short, in Sb elements long. Basal part posteriorly elongated in the most specimens, but not elongated in some other ones. Anterior margin acute to acutely rounded, posterior margin acute. The width of the conodont decreases continuously from the base to the top of the unit.

Obverse side with two ribs. The anterior one runs a little before the midline. It is indistinct or even absent in the basal and in the uppermost parts of the unit. The posterior rib is situated immediately behind the furrow. This posterior rib begins in general a little deeper than the anterior one, but it disappears already in the recurvated area. Reverse side with one rib near to the midline or a little in front of it. This rib is missing in the basal and topmost parts of the cone. The posterior part of the recurvated area is mostly striated on both lateral surfaces. Basal striation distinct.

Distribution: Ludlowian of southernmost Uppony Mts.

Remarks: *Panderodus spasovi* DRYGANT sensu BARRICK, 1977, belongs probably to this species. The typical *P. spasovi* DRYGANT, 1974, from the Lower Wenlockian has one rib on the obverse side and no rib on the reverse side.

Panderodus recurvatus recurvatus (RHODES, 1953) is most similar to the new species. The reverse side is almost identical, but the rib is in general shorter and mostly situated near to the anterior margin. The obverse side has only one rib or even no rib. The width of the cone increases a little above the recurvature in some of the elements of *P. recurvatus recurvatus* (RHODES).

Panderodus praesemicostatus n. sp.

(Pl. 7, figs. 1-3; pl. 8, fig. 6; pl. 10, fig. 2)

Derivatio nominis: Supposed forerunner of *P. semicostatus* ZIEGLER & LINDSTRÖM, 1971.

Holotype: The specimen on pl. 7, fig. 1; rep.-no. D 515.

Locus typicus: Strázsa-hegy at Nekézseny (southernmost Uppony Mts.).

Stratum typicum: Olistolite of yellow-gray micritic limestone (sample Sh 31) with *Ozarkodina repetitor* (CARLS & GANDL), *O. pandora* MURPHY; MATTI & WALLISER etc. *I. eolatericrescens* - *O. repetitor* zone (= *A. deltus* zone). Middle to higher Lochkovian (lower part of Lower Devonian).

Material: More than 100 specimens.

Diagnosis: Single cone slender to moderately broad, mostly moderately and gradually arched, but its upper part is in some specimens strongly recurvated. Obverse side with low to pronounced central ridge and well defined posterior furrow. At least parts of the anterior lateral surface before the central ridge as well as the furrow with distinct fine striation. Reverse side without furrow and ridge, with moderately coarse striation on the whole surface. Basal part of cone on both sides with distinct, dense fine striation. The apparatus consists of several elements that are different in width and coarse sculpture, but all have the same kind of striation.

Distribution: Frequent in the middle and higher part of Lochkovian in the southernmost Uppony Mts.).

Remarks: The reverse side of *Panderodus semistriatus* ZIEGLER & LINDSTRÖM, 1971, is likewise coarsely striated. The furrow behind the ridge on the obverse side is finely striated,

but the posteriormost part of the unit is coarsely striated. On the other hand, no striation can be observed near to the anterior margin.

Panderodus recurvatus densistriatus n. subsp.
(Pl. 2, fig. 1-3)

Derivatio nominis: According to the dense striation of the posterior parts of lateral surface.

Holotype: The specimen on pl. 2, fig. 3; rep.-no. S 90.

Locus typicus: Strázsa-hegy at Nekézseny (southernmost Uppony Mts.).

Stratum typicum: Sample Sh 12. Limestone olistolite with *Ozarkodina sagitta rhenana* (WALLISER), *O. sagitta sagitta* (WALLISER) etc. Lower *O. sagitta* zone (*rhenana* subzone). Middle Wenlockian.

Material: More than 100 specimens.

Diagnosis: Single cone with broad basal part and strong recurvature. Basal area in its posterior part mostly expanded. Basal striation distinct and dense. Obverse side with furrow in the beginning of posterior third of the lateral surface, but without costa. Both sides of the furrow are coarsely and densely striated in the area of recurvature and a little below it. This striation is coarser than the basal one. Reverse side with shallow rounded elevation in the central part, without costa. Posterior half densely striated in the area of recurvature and a little below it. This striation is so fine like the basal one.

Distribution: Wenlockian of the southernmost Uppony Mts.

Remarks: *Panderodus recurvatus recurvatus* (RHODES, 1953) has only basal striation. Moreover, a costa is present on both lateral surfaces.

Panderodus praesemicostatus n. sp. is coarsely striated on the whole reverse side. On the obverse side both the furrow and the anterior part of the lateral surface are striated.

3. STRATIGRAPHIC RESULTS

The paleontological investigations have yielded very important data about the age of the Strázsahegy Formation (altered diabases, schalstein, tuffs, tuffites) in its type locality. The schalstein contains many inclusions of altered diabases and a few limestone inclusions. One of the latter inclusions yielded corals, among these *Multisolenia* cf. *tortuosa* FRITZ (determined by O.P. KOVALEVSKIJ and J.I. TESAKOVA) that shows according to these authors Llandoveryan to Wenlockian ages. A Llandoveryan age for this inclusion is probably indicated because the Wenlockian rocks known from olistolites within the tuffites have quite different facies.

Another inclusion yielded few, but stratigraphically important conodonts: *Polygnathus angustipennatus* BISCHOFF & ZIEGLER and *Polygnathus linguiformis linguiformis* HINDE. These determinations were checked by Prof. Dr. W. ZIEGLER, Frankfurt a. M., who placed this fauna into the *kockelianus* to basal *ensensis* zone (Middle to Upper Eifelian, see also

table 3). This age can be also concluded from the range of *P. angustipennatus* shown by WEDDIGE, 1977).

The presence of higher Eifelian inclusions within the schalstein indicates that the schalstein and the altered diabases cannot be older than higher Eifelian. The basal Devonian age for the volcanics supposed by KOVÁCS, 1981, and KOVÁCS & VETŐNE ÁKOS, 1983, could not be confirmed by the paleontological data presented above.

The tuffites and tuffs of the Strázsagehy Formation in its type locality contain numerous limestone olistolites. The stratigraphically youngest fauna from these olistolites comes from a coral-bearing yellowbrownish-gray limestone. It yielded an ostracod fauna with a strongly carinate *Kozłowskiella* species. Such species occur only in the higher Emsian and Middle Devonian. Because this species was only found in the outermost parts of this olistolite, it may derive from the tuffite itself. In both cases this fauna indicates that the tuffites should not be older than Upper Emsian and they belong most probably to the Middle Devonian. Other coral-bearing limestone olistolites yielded Pragian conodont faunas. These olistolites are still free of any tuffitic intercalation. Also these olistolites indicate a post-Pragian age of the tuffites and tuffs.

The schalstein and diabase (maximum age: higher Eifelian) and the tuffites and tuffs (maximum age: higher Emsian or Middle Devonian) show therefore a quite similar age. Most probably all the volcanics and athrogenic rocks belong to the same Middle Devonian volcanic activity.

From the olistolites within the tuffites a complete Silurian sequence from the Lower Wenlockian to Přidolian could be reconstructed (see table 2). From the *Hadrognathus patulus* zone of Lower Wenlockian until the *Ozarkodina eosteinhornensis* zone of the Přidolian all conodont zones could be found, mostly represented by their index species. Also the Upper Llandoveryan *Pterospathodus celloni* zone could be recognized in a small olistolite. This olistolite contains pebbles of greenish-gray calcareous sandstone and very rarely also pebbles of hard greenish shales that could be Upper Ordovician in age. Unfortunately these pebbles have not yielded any fossils. So they give only an evidence for a transgression within the Llandoveryan.

Soft black shales, of course, could not be preserved in form of olistolites. Their subordinate presence can be concluded from the presence of some smaller olistolites of dark to black marly limestones above all in the *Polygnathoides siluricus* zone of Middle Ludlowian and more rarely within the lower *Ozarkodina sagitta* zone. These dark to black marly limestones represent a transitional facies between pelagic, mostly reddish or pink limestones and black shales.

Some minor intercalations of greenish tuffitic material occur in several stratigraphic levels within the Silurian olistolites, but almost exclusively in the Wenlockian and Lower Ludlowian.

The Silurian sequence of the Strázsa-hegy section reconstructed from olistolites is very similar to that of the Cellon section in the Carnian Alps, but also some Silurian sequences of the Northern Greywacke Zone are similar.

Beside of conodonts (the conodont faunal list and the lithologic character of the investigated samples will be given in a paper by BALOGH & KOZUR, Acta Min.-Petr. Szeged, in press), present and mostly frequent in all Silurian olistolites, some fish remains, ostracods, and in the Prídolian also scolecodonts could be found in the insoluble residues. The partly rich Silurian macrofauna consists of orthocone nautiloids, brachiopods, pelecypods, subordinately also crinoids and corals. The most and largest olistolite bodies contain Lochkovian conodont faunas. These olistolites consist of dark to light gray, sparitic, sometimes also micritic limestones, often with crinoids, more rarely with brachiopods, pelecypods, and quite subordinate with graptolites. The best represented conodont fauna belongs to the Middle to Upper Lochkovian *Ancyrodelloides deltatus* zone (= *Icriodus eolatericrescens* - *Ozarkodina repetitor* zone), indicated by the presence of several *Ancyrodelloides* species, *Ozarkodina repetitor* CARLS & GANDL, *O. pandora* MURPHY; MATTI & WALLISER and other conodont species.

Beside of conodonts, some ostracods, Muellerisphaerida (microfossils of incertae sedis), holothurian sclerites and fish remains occur in the Lochkovian olistolites.

By far smaller and more rarely are Lower Devonian coral-bearing limestones. Most of these olistolites are free of conodonts, some yielded Pragian conodonts. Both the Lochkovian and - as mentioned already above - the Pragian olistolites are free of any tuffitic intercalations.

The Jöcsös-völgy section (near Nekézseny) at the old pit entrance has also yielded rich conodont faunas. The geological situation is here a little different from the Strázsa-hegy section as far as the small olistolites within the tuffites and tuffs have only yielded Lower Devonian conodonts. Moreover these tuffitic layers with small olistolites are underlain by Lower Devonian limestones. The lowermost fauna found in these partly crinoid-bearing, partly coral-bearing limestones belongs to the basal Pragian with *Ozarkodina buchensis* (PHILIP) and a huge amount of *Belodella*. The youngest conodont fauna recognized in these limestones yielded *Panderodus semicostatus* ZIEGLER & LINDSTRÖM that indicates Upper Emsian to Lower Eifelian age. One crinoidal limestone, not taken from the bedrock, has yielded Upper Lochkovian conodonts.

May be that also parts of the crinoid-coral limestones from the Jöcsös-völgy section are big olistolites. This cannot be decided because of the rather small exposure. But also in this case the tuffites and tuffs had to be younger than the youngest conodont fauna in these limestones (younger than Upper Emsian to Lower Eifelian). This fact confirms the observation from the Strázsa-hegy section that the tuffites and tuffs cannot be older than Upper Emsian and that these

tuffites and tuffs are most probably not much older than the diabase and schalstein that are Upper Eifelian or younger.

In the Jöcsös-völgy section also the maximum upper range of the tuffites and tuffs could be determined. The tuffites contain here some corals, among these also the genus *Heliolites*, unknown from sediments younger than Middle Devonian. Therefore the tuffites are restricted here to the Middle Devonian. The beginning of this volcanic activity in the topmost Lower Devonian cannot be quite excluded.

For the Lower Devonian gray, sometimes also reddish crinoidal and coral limestones of the Jöcsös-völgy section below the Middle Devonian athrogenic beds the term Jöcsösvölgy Formation is introduced here.

In the Strázsa-hegy section rocks of the Jöcsösvölgy Formation are only known from olistolites within the Strázsahegy Formation.

Large parts of the Jöcsösvölgy Formation of the Jöcsös-völgy are strongly ferruginous. This hydrothermal-metasomatic mineralisation is connected with the volcanism of the Strázsa-hegy Formation. In the Strázsa-hegy section such mineralized limestones are present among the olistolites.

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Explanation of plates

PLATE 1

All figured conodonts are from the Strázsa-hegy at Nekézseny (southernmost Uppony Mts.), sample Sh 12, olistolite of gray limestone with brownish-red fissure fillings, lower *Ozarkodina sagitta* zone (*rhenana* subzone), Middle Wenlockian.

- Fig. 1: *Panderodus simplex* (BRANSON & MEHL), conodont apparatus, rep.-no. S 9, a), b) stereopair, lateral view, obliquely from above, x 160; c) - e) different lateral views, x 160, c) direct lateral view, d) obliquely from behind, e) obliquely from anteriorly; f) anterior view, obliquely from below, x 200.
- Figs. 2, 3, 5, 6: *Decoriconus fragilis* (BRANSON & MEHL), fig. 2: x 200, rep.-no. S 103, fig. 3: ? cluster, x 160, rep.-no. S 104, fig. 5: x 200, rep.-no. S 105, fig. 6: x 240, rep.-no. S 106.
- Fig. 4: *Ozarkodina sagitta sagitta* (WALLISER), upper view, x 150, rep.-no. S 107.
- Fig. 7: *Ozarkodina sagitta rhenana* (WALLISER), lateral view, x 150, rep.-no. S 108.
- Fig. 8: *Ozarkodina sagitta rhenana* (WALLISER), transitional form to *O. sagitta sagitta* (WALLISER), x 200, rep.-no. S 15, a) lower view, b) lateral view.

PLATE 2

All figured conodonts are from Silurian olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Figs. 1 - 3: *Panderodus recurvatus densistriatus* n. subsp., sample Sh 12, gray limestone with brownish-red

- fissure fillings, lower *Ozarkodina sagitta* zone (*rhenana* subzone) Middle Wenlockian; fig. 1: reverse side, x 200, rep.-no. S 91; fig. 2: obverse side, x 94, rep.-no. S 92; fig. 3: holotype, obverse side, rep.-no. S 90, a) x 150, b) x 260.
- Figs. 4, 5: *Ozarkodina sagitta bohemia* (WALLISER), sample Sh 24, gray limestone, upper part of *Ozarkodina sagitta* zone (*bohemia* subzone), Upper Wenlockian; fig. 4: lateral view, x 150, rep.-no. S 8; fig. 5: x 120, rep.-no. S 111, a) lateral view, b) upper view.
- Fig. 6: *Ozarkodina excavata inflata* (WALLISER), sample Sh 23, greenish-gray micritic limestone with pink spots, slightly tuffitic, upper part of *Ancoradella ploeckensis* zone (topmost Lower Ludlowian), x 130, rep.-no. S 112, a) lateral view, b) upper view.
- Fig. 7: *Ozarkodina excavata posthamata* (WALLISER), sample Sh 28, dark brachiopod-bearing micritic limestone with greenish tuffites, upper part of *Ancoradella ploeckensis* zone (topmost Lower Ludlowian), x 130, rep.-no. S 113, a) lateral view, b) upper view.

PLATE 3

All figured specimens are from Silurian olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Fig. 1: *Dapsilodus obliquicostatus* (BRANSON & MEHL), sample Sh 24, gray limestone, upper part of *Ozarkodina sagitta* zone (*bohemia* subzone), Upper Wenlockian, x 130, rep.-no. S 114.
- Figs. 2, 3: *Panderodus barricki* n. sp., sample Sh 23, greenish-gray micritic limestone with pink spots, slightly tuffitic, upper part of *Ancoradella ploeckensis* zone (topmost Lower Ludlowian); fig. 2: obverse side, rep.-no. S 21, a) x 130, b) x 440; fig. 3: reverse side, x 100, rep.-no. S 98.
- Fig. 4: *Ozarkodina excavata inflata* (WALLISER), sample Sh 28, dark brachiopod-bearing micritic limestone with greenish tuffites, upper part of *Ancoradella ploeckensis* zone (topmost Lower Ludlowian), rep.-no. S 115, a) upper view, x 150, b) lateral view, x 160.
- Fig. 5: *Kockelella variabilis* WALLISER, upper view, sample Sh 1, brownish-red nodular nautiloid limestone, *Kockelella variabilis* zone (Lower Ludlowian), x 150, rep.-no. S 12.
- Fig. 6: *Polygnathoides siluricus* BRANSON & MEHL, upper view, sample Sh 22, dark gray to black, partly marly limestone, *Polygnathoides siluricus* zone (Middle Ludlowian), x 32, rep.-no. S 10.
- Fig. 7: juvenile brachiopod, sample and age as for fig. 6, x 78, rep.-no. S 123.

PLATE 4

All figured conodonts are from Silurian olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Figs. 1, 3: *Panderodus recurvatus recurvatus* (RHODES), reverse side, sample Sh 2, pink micritic nautiloid limestone, *Ozarkodina crisper* zone (Upper Ludlowian); fig. 1: rep.-no. S 100, a) x 100, b) detail of the middle part, x 320, c) detail of the basal part, x 320; fig. 3: x 100, rep.-no. S 122.
- Fig. 2: *Ozarkodina eosteinhornensis* (WALLISER), transitional form to *O. remscheidensis* (ZIEGLER), sample Sh 35, light gray, partly fossiliferous sparitic crinoidal limestone, *Ozarkodina eosteinhornensis* zone (Prídolian), x 66, rep.-no. S 18, a) upper view, b) lateral view.
- Fig. 4: *Ozarkodina crisper* (WALLISER), juvenile specimen, anterior part broken away, sample and age as for fig. 1, rep.-no. S 119, a) lateral view, x 320, b) upper view, a little oblique, x 300.
- Figs. 5, 6: *Ozarkodina excavata excavata* (BRANSON & MEHL), lateral view; fig. 5: sample and age as for fig. 1, x 100, rep.-no. S 11; fig. 6: sample Sh 16, pink micritic limestone with some nautiloids, Upper Ludlowian, x 72, rep.-no. 121.

PLATE 5

Alle figured conodonts are from olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Figs. 1, 6: *Panderodus barricki* n. sp., sample Sh 23, greenish-gray micritic limestone with pink spots, slightly tuffitic, upper part of *Ancoradella ploeckensis* zone (topmost Lower Ludlowian); fig. 1: holotype, rep.-no. S 96, a) x 130, b) detail of lower part, x 320, c) detail of strongly recurvated part, x 360.
- Fig. 2: *Decoriconus magnistriatus* n. sp., holotype, sample Sh 28, dark brachiopod-bearing micritic limestone with greenish tuffites, upper part of *Ancoradella ploeckensis* zone (topmost part of Lower Ludlowian), x 300, rep.-no. S 101.
- Fig. 3: *Ozarkodina excavata excavata* (BRANSON & MEHL), lateral view, a little obliquely from above, sample Sh 16, pink micritic limestone with some nautiloids, Upper Ludlowian, x 72, rep.-no. 102.
- Figs. 4, 5: *Ozarkodina remscheidensis remscheidensis* (ZIEGLER), sample Sh 23a, gray sparitic crinoidal limestone, Lower Lochkovian (basal Lower Devonian); fig. 4: lateral view, x 86, rep.-no. D 523; fig. 5: upper view, x 66, rep.-no. D 524.
- Fig. 7: *Ozarkodina confluens* (BRANSON & MEHL), sample Sh 35, light gray sparitic limestone with some crinoids, *Ozarkodina eosteinhornensis* zone (Prídolian), x 72, rep.-no. S 99.

PLATE 6

All figured conodonts are from olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the

Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Fig. 1: *Ozarkodina pandora* MURPHY; MATTI & WALLISER, sample Sh 5, dark gray crinoid-bearing limestone, upper part of *Ancyrodelloides deltus* zone (Upper Lochkovian, lower part of Lower Devonian), rep.-no. D 525, a) lateral view, x 100, b) lower view, x 110.
- Fig. 2: *Ozarkodina excavata excavata* (BRANSON & MEHL), lateral view, sample Sh 16, pink micritic limestone with some nautiloids, Upper Ludlowian, x 54, rep.-no. S 116.
- Figs. 3, 8: *Ancyrodelloides asymmetricus* (BISCHOFF & SANNE MANN), fig. 3: sample and age as for fig. 1, rep.-no. D 526, a) lateral view, x 44, b) upper view, x 48; fig. 8: sample Sh 29, light gray micritic limestone, upper part of *Ancyrodelloides deltus* zone (Upper Lochkovian, deeper part of Lower Devonian), x 160, rep.-no. D 527.
- Figs. 4, 5: *Belodella erecta* (RHODES & DINELEY), undenticulated element; fig. 4: sample Sh 31, yellow-gray micritic limestone, upper part of *Ancyrodelloides deltus* zone to lower part of *Pedavis pesavis* - *Pandorinella optima* zone (Upper Lochkovian, deeper part of Lower Devonian), x 120, rep.-no. D 528; fig. 5: sample and age as for fig. 1, x 180, rep.-no. D 529.
- Fig. 6: *Pandorinella frankenwaldensis* (BISCHOFF & SANNE MANN), sample and age as for fig. 1, x 86, rep.-no. D 530.
- Fig. 7: *Ozarkodina stygia* FLAYS, sample and age as for fig. 8, x 180, rep.-no. D 531, a) lateral view, a little obliquely from above, b) upper view.
- Fig. 9: *Ozarkodina wurmi* (BISCHOFF & SANNE MANN), lateral view, sample Sh 9, gray crinoidal limestone, lower part of *Ancyrodelloides deltus* zone (Middle Lochkovian, deeper part of Lower Devonian), x 66, rep.-no. D 532.
- Fig. 10: *Ozarkodina repetitor* (CARLS & GANDL), lateral view, sample and age as for fig. 4, x 150, rep.-no. D 533.

PLATE 7

All figured conodonts are from olistolites in tuffites and tuffs of the Middle Devonian Strázsahegy Formation in the Strázsa-hegy section at Nekézseny (southernmost Uppony Mts.).

- Figs. 1-3: *Panderodus praesemicostatus* n. sp.; figs. 1, 2: sample Sh 31, yellow-gray micritic limestone, upper part of *Ancyrodelloides deltus* zone to lower part of *Pedavis pesavis* - *Pandorinella optima* zone (Upper Lochkovian, deeper part of Lower Devonian); fig. 1: holotype, obverse side, rep.-no. D 515, a) x 120, b) detail of basal part, x 360, c) detail of the middle part, x 360; fig. 2: obverse side, rep.-no. D 516, a) x 120, b) detail of the middle part, x 440, c) detail of the basal part, x 440; fig. 3: basal cone partly preserved, sample Sh 29, light gray micritic limestone, upper part of the *Ancyrodelloides deltus* zone (Upper Lochkovian), deeper part of Lower Devonian), x 110, rep.-no. D 514.

Fig. 4: *Ozarkodina wurmi* (BISCHOFF & SANNEMANN), lateral view, sample and age as for fig. 3, x 94, rep.-no. D 534.

PLATE 8

- Fig. 1: *Neopanderodus hungaricus* n. sp., reverse side, holotype, Strázsa-hegy at Nekézseny (southernmost Uppony Mts.), sample Sh 9, olistolite of gray crinoidal limestone, lower part of *Ancyrodelloides deltus* zone (Middle Lochkovian, deeper part of Lower Devonian), rep.-no. D 509, a) x 130, b) detail of basal part, x 720, c) detail of middle part, x 320.
- Fig. 2: *Belodella erecta* (RHODES & DINELEY), denticulated element, Strázsa-hegy at Nekézseny (southernmost Uppony Mts.), olistolite of light gray micritic limestone, upper part of *Ancyrodelloides deltus* zone (Upper Lochkovian, deeper part of Lower Devonian), x 130, rep.-no. D 538.
- Fig. 3: Carinate *Kozlowskiella* sp., Strázsa-hegy at Nekézseny (southernmost Uppony Mts.), sample Sh 19, olistolite of yellowbrownish-gray crinoidal-coral limestone, Upper Emsian (topmost Lower Devonian) to Middle Devonian, x 44, rep.-no. D 539.
- Fig. 4: *Polygnathus angustipennatus* BISCHOFF & ZIEGLER, Strázsa-hegy at Nekézseny (southernmost Uppony Mts.), sample Sh 34, inclusion in the schalstein, *Tortodus kockelianus* to basal *Polygnathus xylus ensensis* zone, Middle to Upper Eifelian, x 60, rep.-no. D 501, a) lateral view, b) upper view.
- Fig. 5: *Belodella devonica* (STAUFFER), denticulated element, Jöcsös-völgy near Nekézseny (southernmost Uppony Mts.), section at the old pit entrance, sample Ne 4, gray micritic limestone, basal Pragian, x 86, D 540.
- Fig. 6: *Panderodus praesemicostatus* n. sp., obverse side, locality, sample and age data as for fig. 5, x 94, rep.-no. D 511.
- Fig. 7: *Polygnathus linguiformis linguiformis* HINDE, upper view, locality sample and age data as for fig. 4, x 72, rep.-no. D 502.

PLATE 9

- Figs. 1, 2: *Belodella striata* n. sp., Jöcsös-völgy near Nekézseny (southernmost Uppony Mts.), sample Ne 4, gray micritic limestone, basal Pragian; fig. 1: denticulated element, rep.-no. D 535, a) detail of upper part, x 480, b) detail of middle part, striation well visible, x 360, c) complete specimen, x 78; fig. 2: holotype, undenticulated element, rep.-no. D 504, a) x 150, b) detail of upper part, striation well visible, x 440, c) detail of lower part, striation well visible, x 440.

PLATE 10

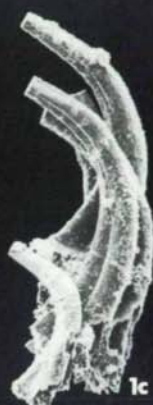
All figured specimens are from Jöcsös-völgy section at the old pit entrance in the Jöcsös-völgy near Nekézseny (southernmost Uppony Mts.).

- Fig. 1: *Belodella striata* n. sp., undenticulated element, sample Ne 9, small gray limestone olistolites in crinoid- and coral-bearing tuffites, basal Pragian, rep.-no. D 507, a) complete specimen, x 100, b) detail of lower part, x 300.
- Fig. 2: *Panderodus praesemicostatus* n. sp., reverse side, sample Ne 4, gray micritic limestone, basal Pragian, rep.-no. D 513, a) detail from the middle part, x 440, b) complete specimen, x 94.
- Fig. 3: *Panderodus semicostatus* ZIEGLER & LINDSTRÖM, obverse side, sample Ne 5, gray sparitic crinoidal limestone, Upper Emsian to Lower Eifelian (topmost Lower Devonian to basal Middle Devonian), rep.-no. D 522, a) detail from the middle part, x 300, b) detail from the lower part, x 300, c) complete specimen, x 94.
- Fig. 4: *Ozarkodina buchanensis* (PHILIP), lateral view, sample and age as for fig. 2, x 200, rep.-no. D 536.
- Fig. 5: *Belodella devonica* (STAUFFER), denticulated element, sample and age as for fig. 2, x 80, rep.-no. D 537.

Plate 1

1a

1b



1c

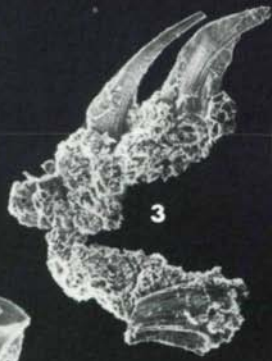
1d

1e

1f



2



3



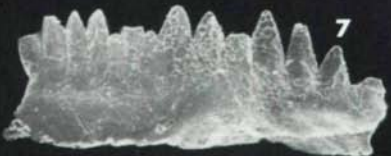
4



5



6



7



8a



8b

Plate II

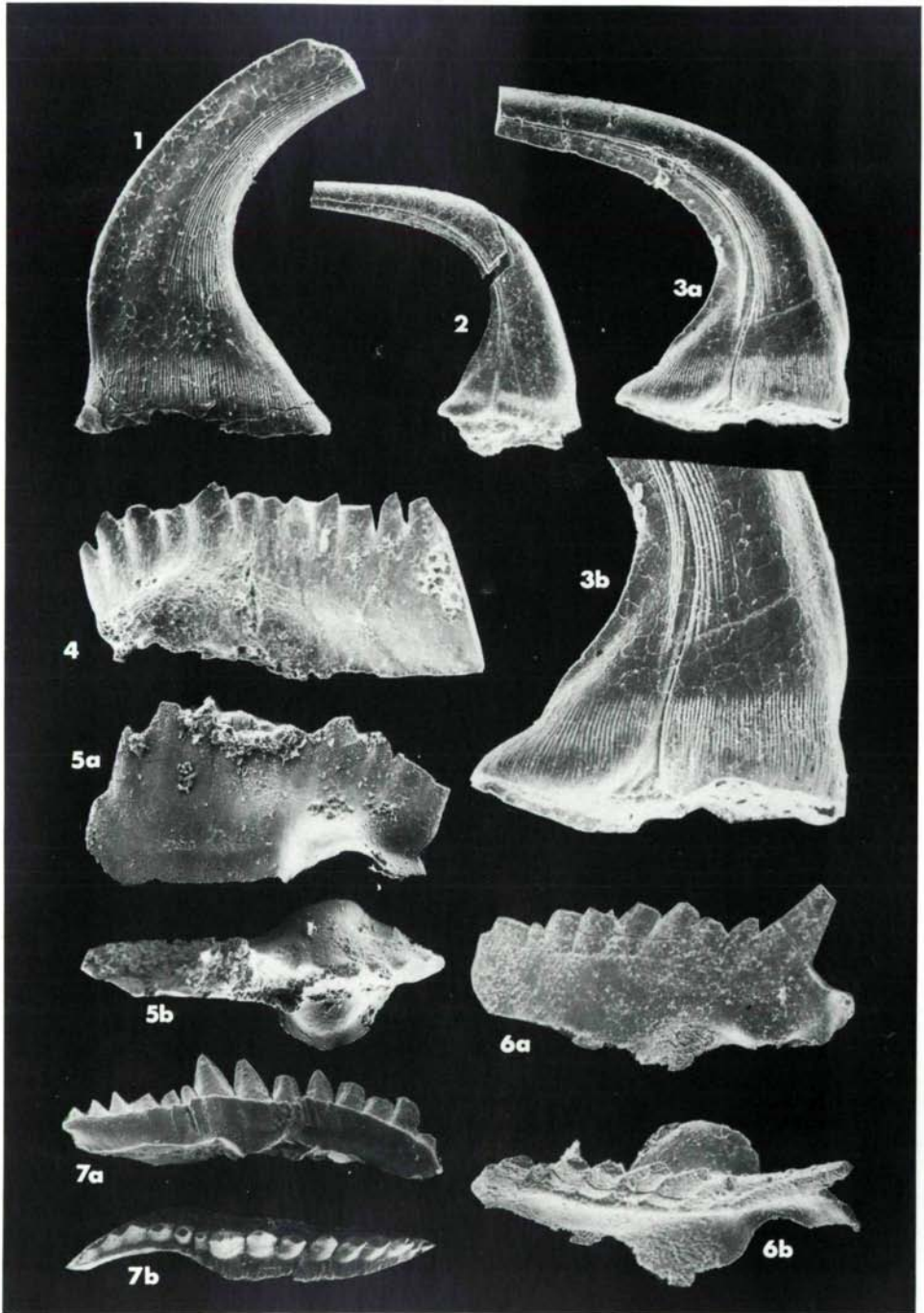


Plate III

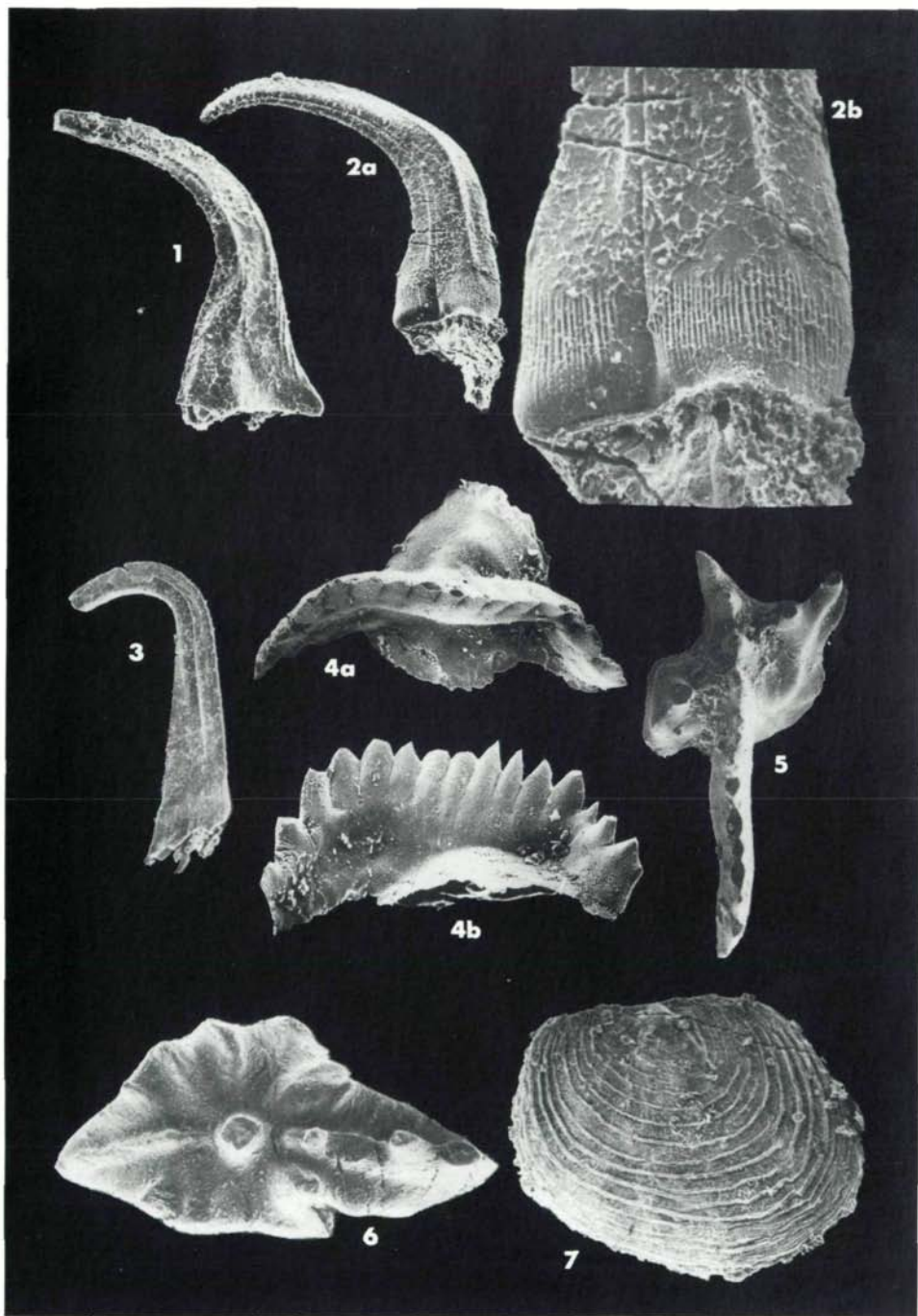


Plate IV

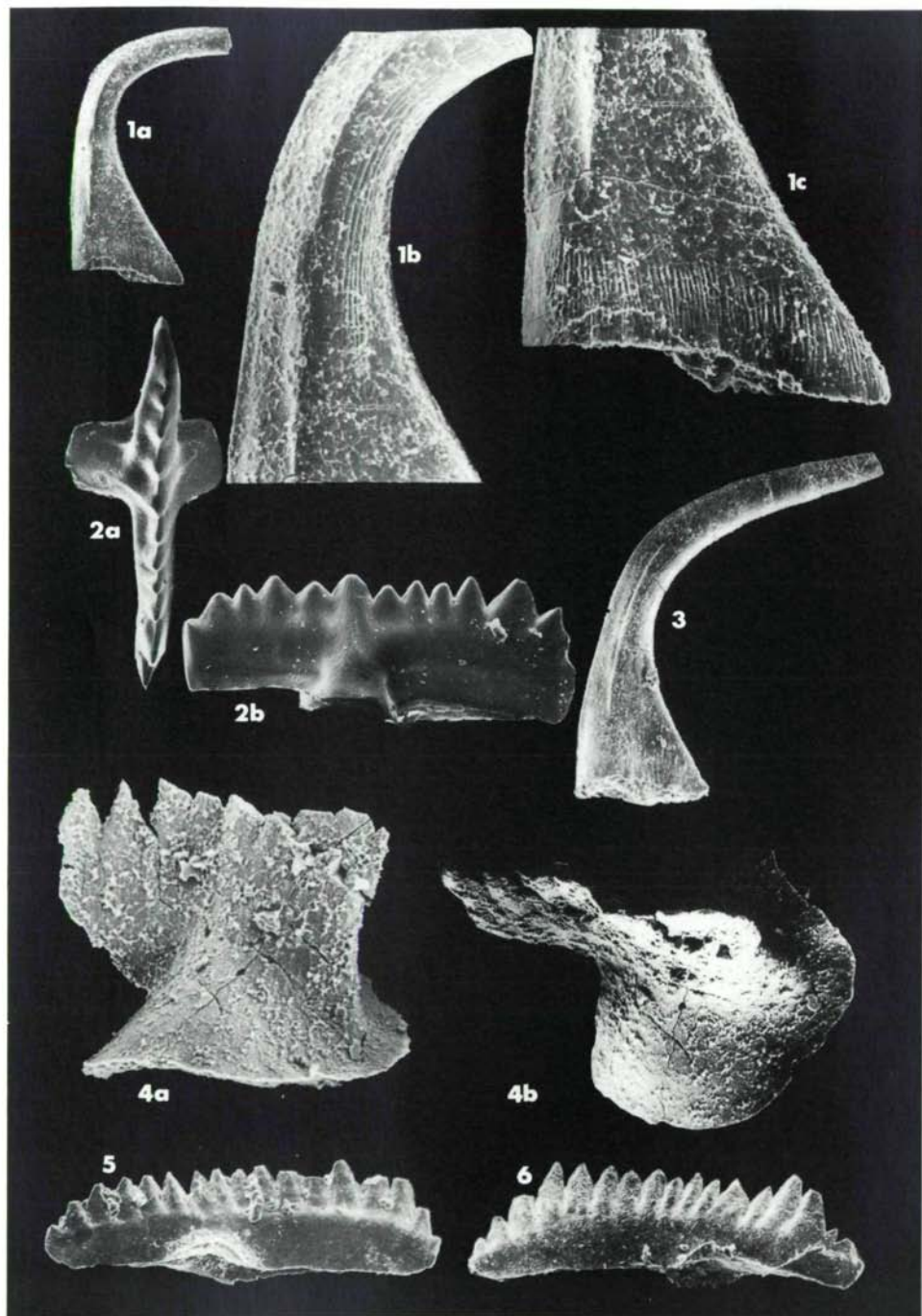


Plate V

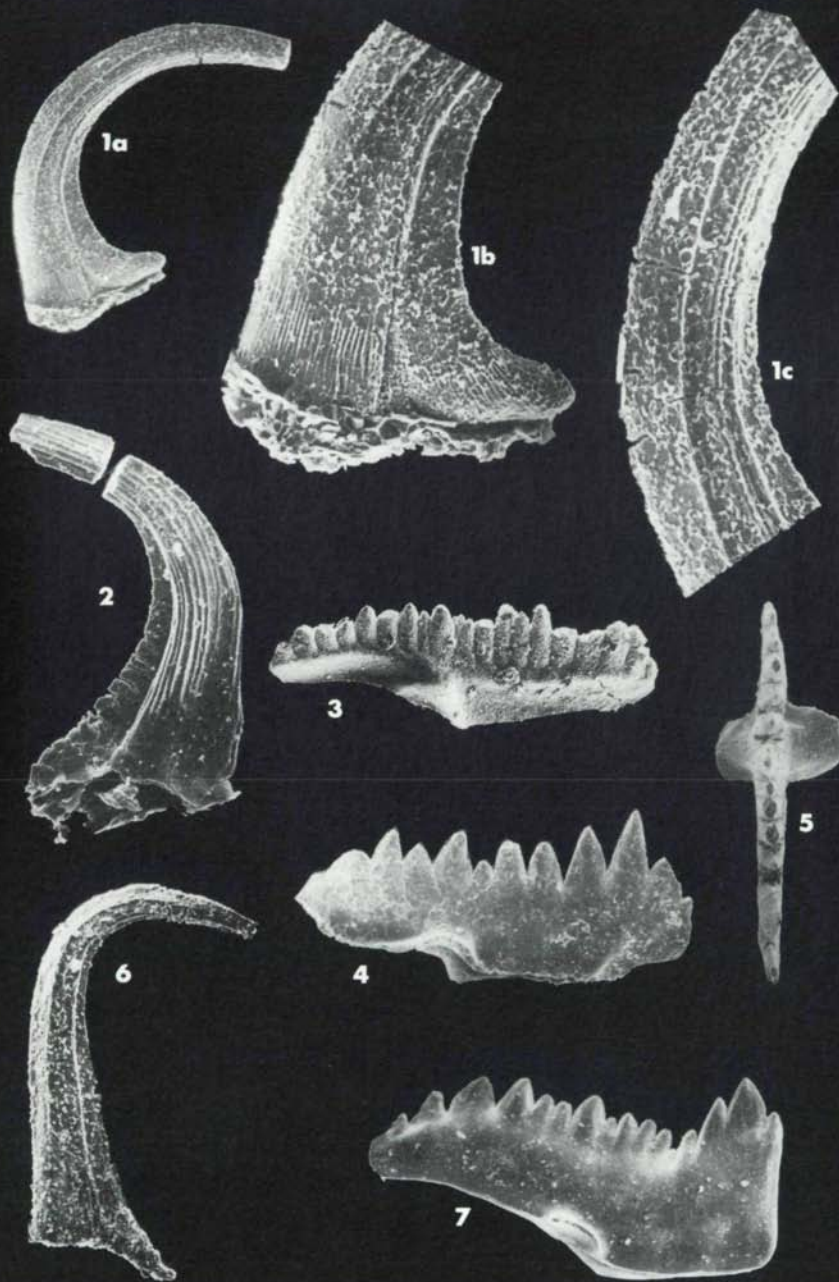


Plate VI

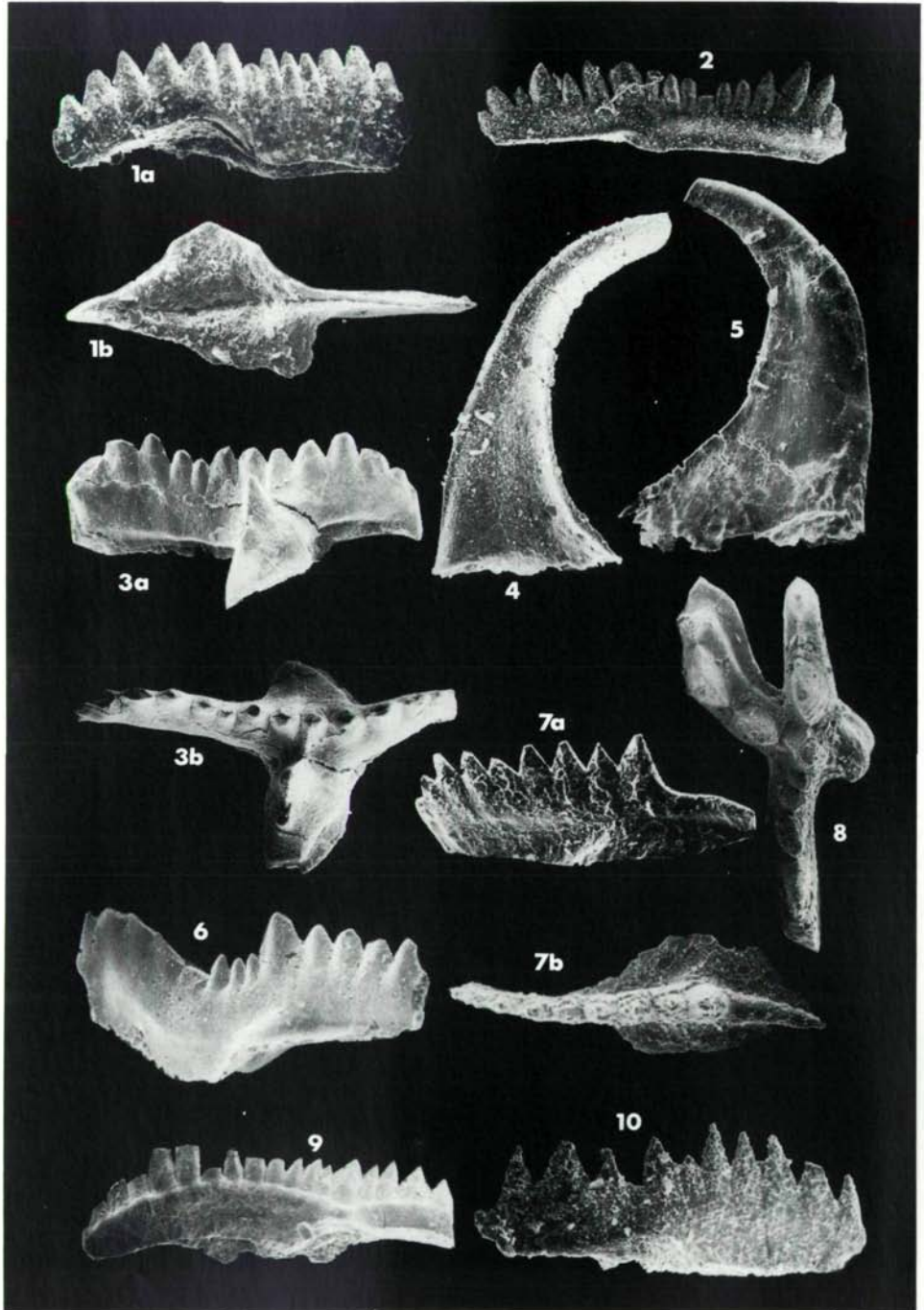


Plate VII

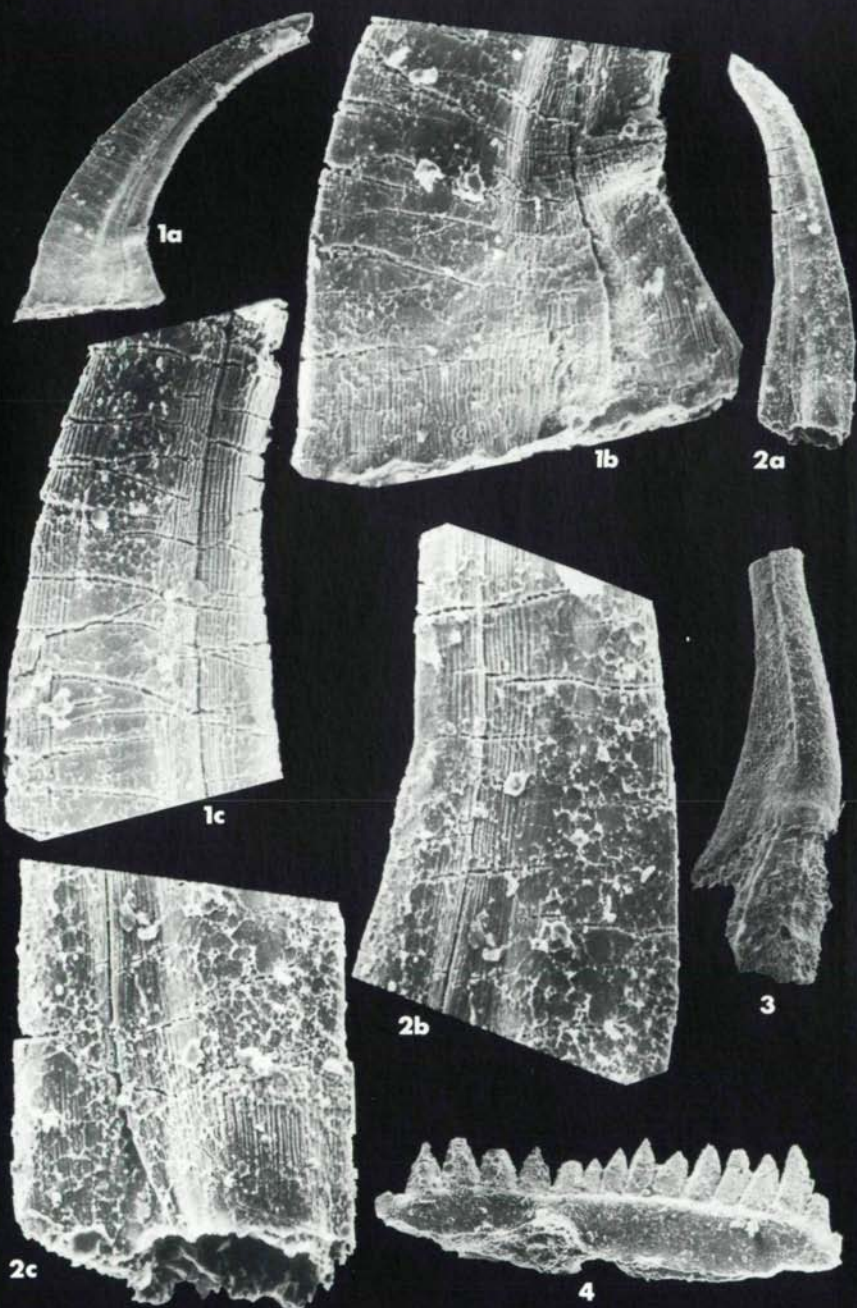


Plate VIII

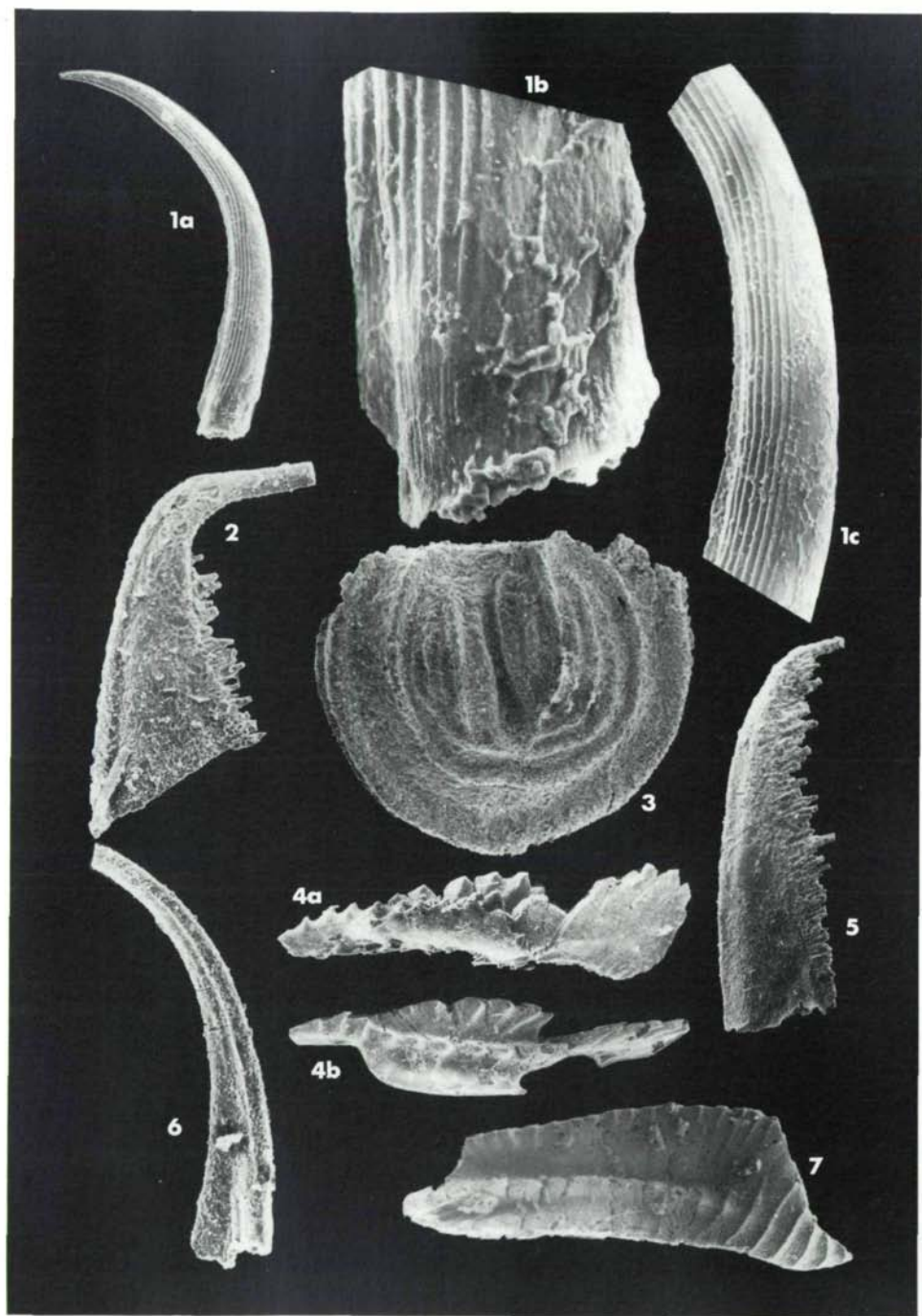


Plate IX

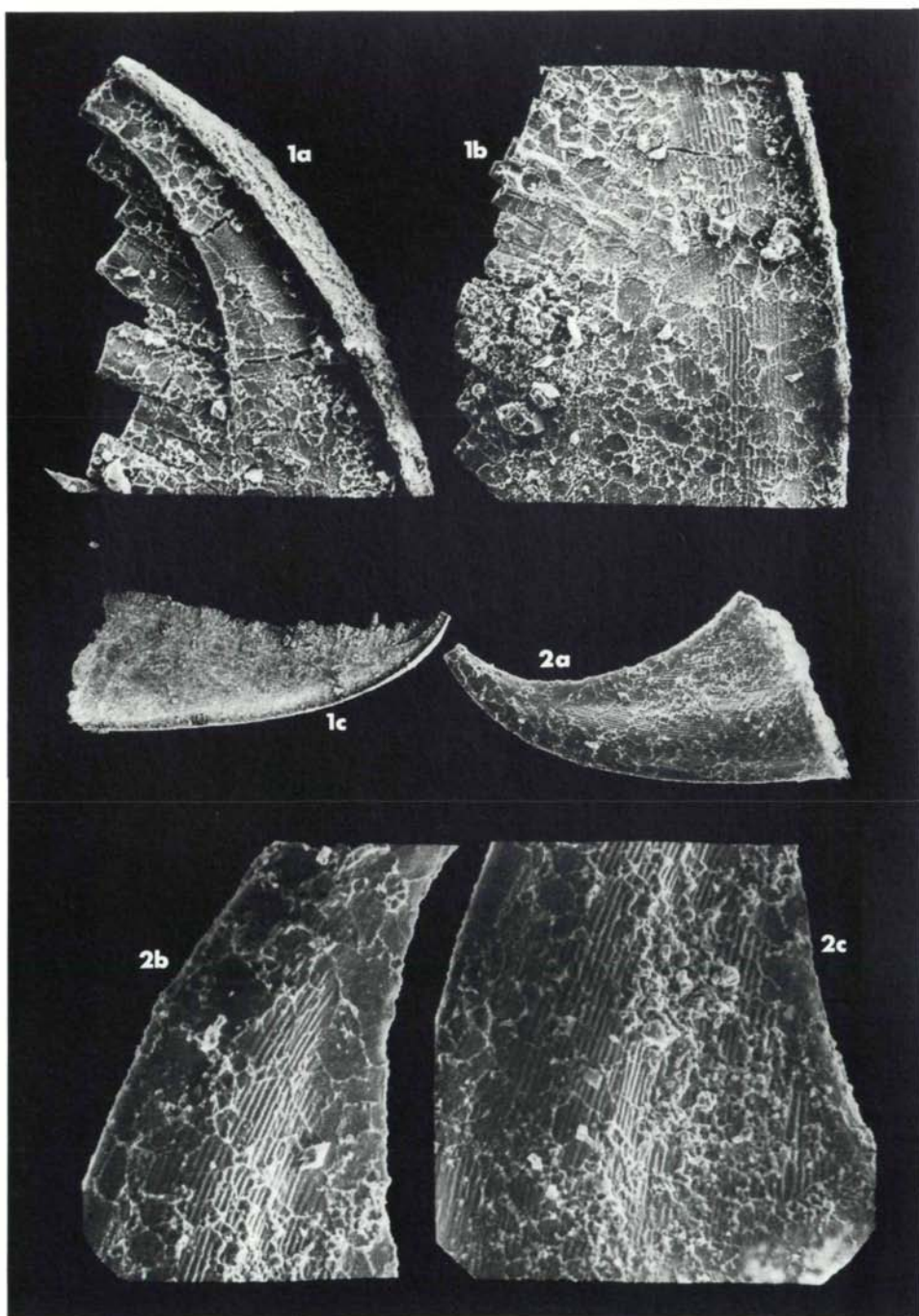


Plate X

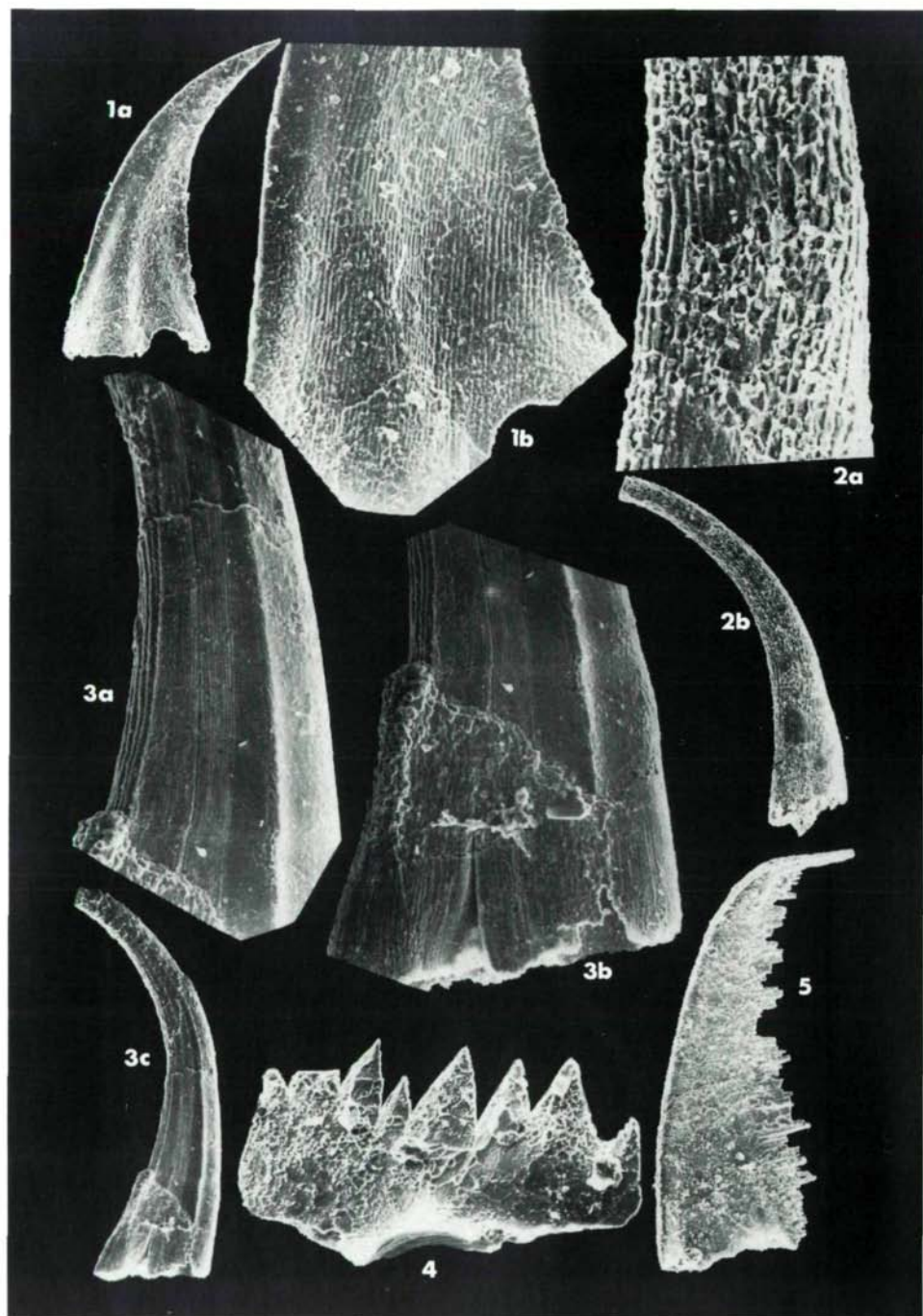


Table 1 a: Graptolite zonation of the Silurian

Age	Graptolite zone
Lower Devonian	<i>Monograptus uniformis</i>
Pridolian	<i>Monograptus transgrediens</i>
	<i>Monograptus ultimus</i> - <i>Monograptus formosus</i>
Ludlowian	<i>Monograptus fritschi linearis</i>
	36 <i>Monograptus leintwardiensis</i>
	35 <i>Monograptus tumescens</i> - <i>Monograptus incipiens</i>
	34 <i>Monograptus scanicus</i>
	33 <i>Monograptus nilssoni</i> - <i>Monograptus colonus</i>
Wenlockian	32 <i>Monograptus ludensis</i>
	<i>Monograptus deubeli</i>
	<i>Retiolites nassa</i>
	31 <i>Cyrtograptus lundgreni</i>
	30 <i>Cyrtograptus ellesae</i>
	29 <i>Cyrtograptus linnarssoni</i>
	28 <i>Cyrtograptus rigidus</i>
	27 <i>Monograptus riccartonensis</i>
	26 <i>Cyrtograptus murchisoni</i> <i>Cyrtograptus centrifugus</i>
Llandoveryian	25 <i>Monograptus crenulatus</i>
	24 <i>Monograptus griestoniensis</i>
	23 <i>Monograptus crispus</i>
	22 <i>Monograptus turriculatus</i> - <i>Rastrites linnaei</i>
	21 <i>Monograptus sedwickii</i>
	20 <i>Monograptus convolutus</i> - <i>Monograptus lobiferus</i>
	19 <i>Monograptus gregarius</i>
	18 <i>Monograptus cyphus</i>
	17 <i>Monograptus atavus</i>
	16 <i>Acidograptus acuminatus</i> 15 <i>Glyptograptus persculptus</i>
Ordovician	

Table 1b: Silurian conodont zonation after Walliser, 1964 and Barrick Klapper, 1976. Slightly modified.

Subdivision	Conodont zonation
Lower Devonian	<i>Icriodus woschmidti</i>
Pridolian	<i>Ozarkodina eosteinhornensis</i>
	<i>Ozarkodina crispa</i>
	<i>Ozarkodina snajderi</i>
Ludlowian	<i>Polygnathoides siluricus</i>
	<i>Kockelella</i>
	<i>variabilis</i>
	<i>Ancoradella ploeckensis</i>
	<i>Ozarkodina crassa</i>
	<i>O. s. bohémica</i> subz.
	<i>Kockelella stauros</i>
	<i>Ozarkodina sagitta</i>
	<i>O. s. rhenana</i> subz.
	<i>Kockelella amsdeni</i>
	<i>Hadrognathus patulus</i>
	<i>K. ranuliformis</i>
	<i>Pterospathodus amorphognathoides</i>
Llandoveryan	<i>Pterospathodus celloni</i>
Ordovizium	Bereich I

Table 2: Silurian sequence from the Strázsa-hegy at Nekézseny /southernmost Uppony Mts./ reconstructed from olistolites within higher Emsian to Middle Devonian tuffites. Comparison with the Silurian sequence of the Cellon section /Carnic Alps/.

Carnian Alps	Strázsa-hegy /southern Uppony Mts./	Conodont zone	Age
Megaerella Beds /light, partly fossiliferous limestones/	light, partly fossiliferous limestones	<i>Ozarkodina eosteinhornensis</i>	Prídolian
Alticola Limestone /grey and pink nautiloid limestones/	grey and pink limestones and nautiloid limestones	<i>O. crispa</i> <i>O. snajderi</i>	Ludlowian
Cardiola Beds /black limestones and shales/	dark grey limestones and marls	<i>P. siluricus</i>	
Kok Limestone /brownish ferruginous nodular limestone/	greenish-grey limestones with ferruginous spots, brownish to reddish-brownish ferruginous nodular limestone and nautiloid limestone	<i>K. variabilis</i>	
Trilobite and Aulacopleura Beds /alternating shales and ferruginous limestone beds/	grey limestones with intercalations of reddish-brownish ferruginous limestones, black marly limestones	<i>O. sagitta</i> <i>Hadrognathus patulus</i>	Wenlockian
Lower Beds and Uggwa Limestone Formation	light grey limestone with pebbles /see footnote 1/ not fossil-proven	<i>P. amorphognathoides</i> <i>P. celloni</i>	Llandoveryian
		Bereich I	Ordovician

Shales cannot be found in the olistolites. The presence of dark to black marly limestones and marls in the olistolites most probably indicates the presence of black shales in the original sequence. Than the similarities of the Silurian from the Carnian Alps /Cellon section/ and the southern Uppony Mts. /Strázsa-hegy at Nekézseny/ are still larger.

1/ The pebbles consist of ferruginous limestone, greenish-grey calcareous sandstone, greenish siltstone and tuff.

Subdivision		Ammonoid Zonation	Conodont Zonation
Bohemian	German		
Upper Devonian		<i>Phaciceras lunicosta</i> Id.	<i>S. hermanni</i> / <i>P. cristatus</i>
Middle Devonian	Givetian	<i>Maenioceras terebratum</i> <i>Maenioceras molarium</i> <i>Cabrieroceras crispiforme</i> <i>Werneroceras vernarhenanum</i>	<i>Polygnathus varcus</i> <i>Polygnathus xylus ensensis</i>
	Eifelian	<i>Werneroceras ruppachense</i> <i>Foordites occultus</i> <i>Pinaclites Juglerti</i>	<i>Tortodus kockelianus kockelianus</i> <i>Tortodus kockelianus australis</i> <i>Polygnathus costatus costatus</i> <i>Polygnathus costatus partitus</i>
Dalejian		<i>Sellanarcestes wenckenbachi</i>	<i>Polygnathus costatus patulus</i>
			<i>Polygnathus serotinus</i>
Zlichovian	Emsian	Graptolite Zonation =====	<i>Polygnathus laticostatus</i> <i>Polygnathus gronbergi</i> <i>Polygnathus dehiscens</i>
		<i>Monograptus yukonensis</i>	
Pragian	Siegenian	<i>Monograptus telleri</i>	<i>Icriodus huddlei</i> - <i>Pandorinella steinhornensis miae</i>
		<i>Monograptus falcarius</i>	<i>Pandorinella exigua</i> <i>Pedavis pesavis</i> - <i>Pandorinella optima</i>
Lochkovian		<i>Monograptus hercynicus</i>	<i>Icriodus eolatericrescens</i> - <i>Ozarkodina repetitor</i> <i>Ancyrodeilloides deltus</i>
		<i>Monograptus uniformis</i>	<i>Icriodus postwoschmidti</i> - <i>O. remscheidensis</i> <i>Icriodus woschmidti</i> - <i>Ozarkodina remscheidensis</i>
Silurian		<i>Monograptus transgreidensis</i>	<i>Ozarkodina easteinhornensis</i>

Table 3: Subdivisions, ammonoid/graptolite zonations and conodont zonation of Lower and Middle Devonian. Compiled and slightly modified after ERBEN, 1962, ERBEN & ZAGORA, 1968, KLAPPER & ZIEGLER, 1979, LANE & ORMISTON, 1979, MASHKOVA, 1979, ZIEGLER, 1979, SCHÖNLAUB (ed.), 1980

Table 4: Lower and Middle Devonian sequence of the Uppony Mts.

Upper Devonian	grey, rarely reddish bedded limestones, nodular limestones, tuffs, subordinately shales
Givetian	diabases and schalstein with limestone inclusions
Eifelian	Uppony Limestone Formation: light tuff, tuffite with massive, light to dark limestone olistolites reef limestone grey limest.
Emsian	Sträza-hegy Formation
Siegen.	Öcsös-völgy Formation grey to yellowish coral-bearing and crinoidal limestones
Lochkovian	light to dark grey, mostly sparitic, partly also micritic limestone and crinoidal limestone
S i l u r i a n	