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CONODONTS FROM THE PARACERATITES BINODOSUS ZONE (MIDDLE TRIASSIC) FROM THE MECSEK MTS., SOUTHERN HUNGARY AND FROM THE CHOČ NAPPE OF THE LOW TATRA MTS., CZECHOSLOVAKIA

(Figs. 10, Pls. 5)

A b s t r a c t: Conodonts from the Choč nappe of the Low Tatra Mts., associated with ammonoids species characteristic of Niveau 3 of A s s e r e t o, 1971 and from the Mecsek Mts., (with *P. binodosus)* are described. They indicate that localities belong to the *Paraceratites binodosus* Zone. Contributions are given to the problem of this Zone.

Р е з ю м е: В статье описаны конодонты из хочского покрова Низких Татр в соединении с видами аммоноидов типичных для Niveau 3 по A s s e r e t o, 1971, а также из горной цепи Мечек (с *P. binodosus*). Они показывают, что оба местонахождения относятся к зоне *Paraceratites binodosus*. Представлен вклад в решение проблемы этой зоны.

Introduction

Conodont associations displaying conspicuous similarity have been found from ammonite-bearing localities in the Pelsonian/Illyrian boundary strata of the Choč nappe of the Low Tatra Mts. (West Carpathians) and of the Mecsek Mts. (Southern Transdanubia, Hungary) — Fig. 1. The rich fauna enables a good correlation between the two regions, from where only brachiopods and scattered ammonoid findings were known formerly, and allows to give some contributions to the problem of the *Paraceratites binodosus* zone.

Mecsek Mts.

In the Triassic of the Mecsek Mts., the first (and until now the only one) stratigraphically valuable ammonite, *Paraceratites binodosus* (HAUER), was found by DETRE (1973), along the road leading to the top of the Misina hill (Fig. 2). The rock material, from which the specimen has been extracted, was put by him to the disposal of one of the present authors (KOVÁCS). It was less, than 1 kg, but has yielded the following, rich conodont fauna: (Fig. 4).

Gondolella bifurcata bifurcata (BUDUROV—STEFANOV)
(only typical forms) 32 specimens
Gondolella bifurcata hanbulogi (SUDAR—BUDUROV)
(Incl. transitional forms to the former) 537 specimens
Gondolella bulgarica (BUDUROV—STEFANOV) 30 specimens

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The last representatives of *G. bulgarica* indicate, that the age is still Pelsonian, probably the very uppermost part of that.

Low Tatra Mts.

In the Triassic limestones of the Choč nappe on the southern side of the Low Tatra A. Biely found poorly preserved ammonite fauna in a layer of dark-grey limestones of the Reifling type on the locality Zámostie—Dubová, 500 m nord — east from the centre of village.

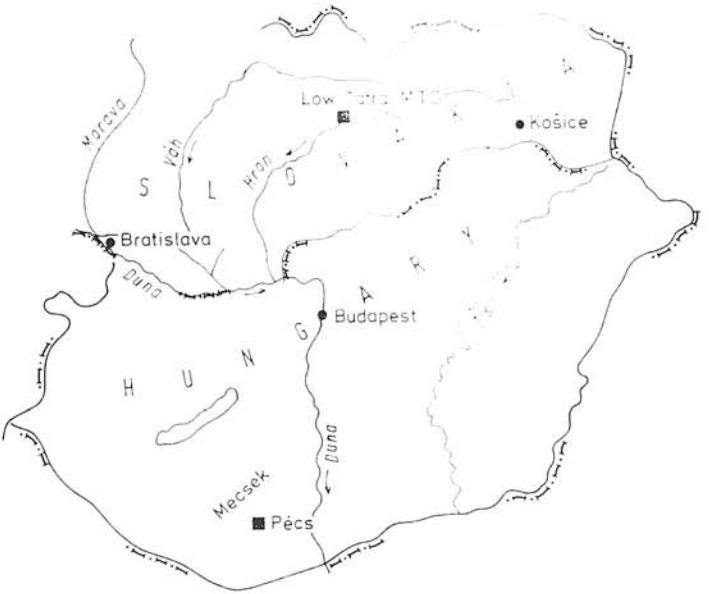


Fig. 1. Sketch map of localities.

According to M. Rakús (in this issue) it comprisses the species *Pleuronautilus* sp.; *Proavites* cf. *proavitus* ARTH.; *Ptychites* sp., *Judicarites* aff. *aryomphalus* (BEN.) *Bulogites* ex gr. *zoldianus* (MOJ.), *Semiornites* cf. *petersi* (MOJ.), *Semiornites* sp., indicating the Illyrian *Trinodosus* Zone. In fact this fauna is typical, of Niveau 3 of Assereto (1971), regarded by him as uppermost Pelsonian. From the same formation 4 samples were taken in the weight of 2.39 kg, 3.5 kg, 1.9 kg and 2.2 kg (Fig. 3).

Washed samples (treated by J. Papšová) contained the following conodont fauna: (Figs. 5—8).

Gondolella bulgarica (BUDUROV—STEFANOV)
Sample 66 — 64 specimens, s. 235 — 20 specimens, s. 234 — 10 specimens, s. 236 — 12 specimens.
Gondolella bifurcata hanbulogi (SUDAR—BUDUROV)
Sample 66 — 28 specimens, s. 235 — 20 specimens, s. 234 — 0, s. 236 — 21 specimens.

Gondolella bifurcata bifurcata (BUDUROV—STEFANOV)
only typical forms
Sample 66 — 5 specimens, s. 235 — 4 specimens, s. 234 — 0, s. 236 — 6 specimens.
Neospathodus kockeli (TATGE)
Sample 66 — 2 specimens, s. 236 — 1 specimen

The species *Gondolella bifurcata hanbulogi* is mostly represented by typical forms, partly juveniles. The assemblage *Gondolella bulgarica* consists in 1/4 of juvenile forms. Frequency and taxonomic analyses of platform conodont assemblages are discussed in this paper.

According to conodonts, the bed sequence is inverted; probably the question is in the local displacement of released blocks on declined slope.

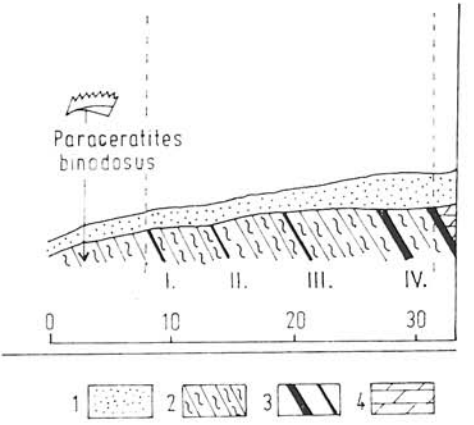


Fig. 2. Misina-hill section.
Explanations: 1 — loam; 2 — calcareous marls with limestone nodules; 3 — biomorph bedded limestones; 4 — secondary dolomites.

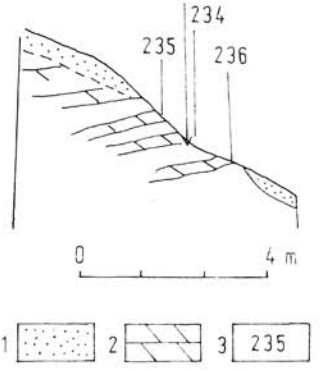


Fig. 3. Zámostie 87 section.
Explanations: 1 — loam; 2 — reifling-limestone; 3 — conodonts.
The line with arrow denotes loc. No. 66 with ammonoid fauna of R a k ú s (1986).

*Taxonomical part**

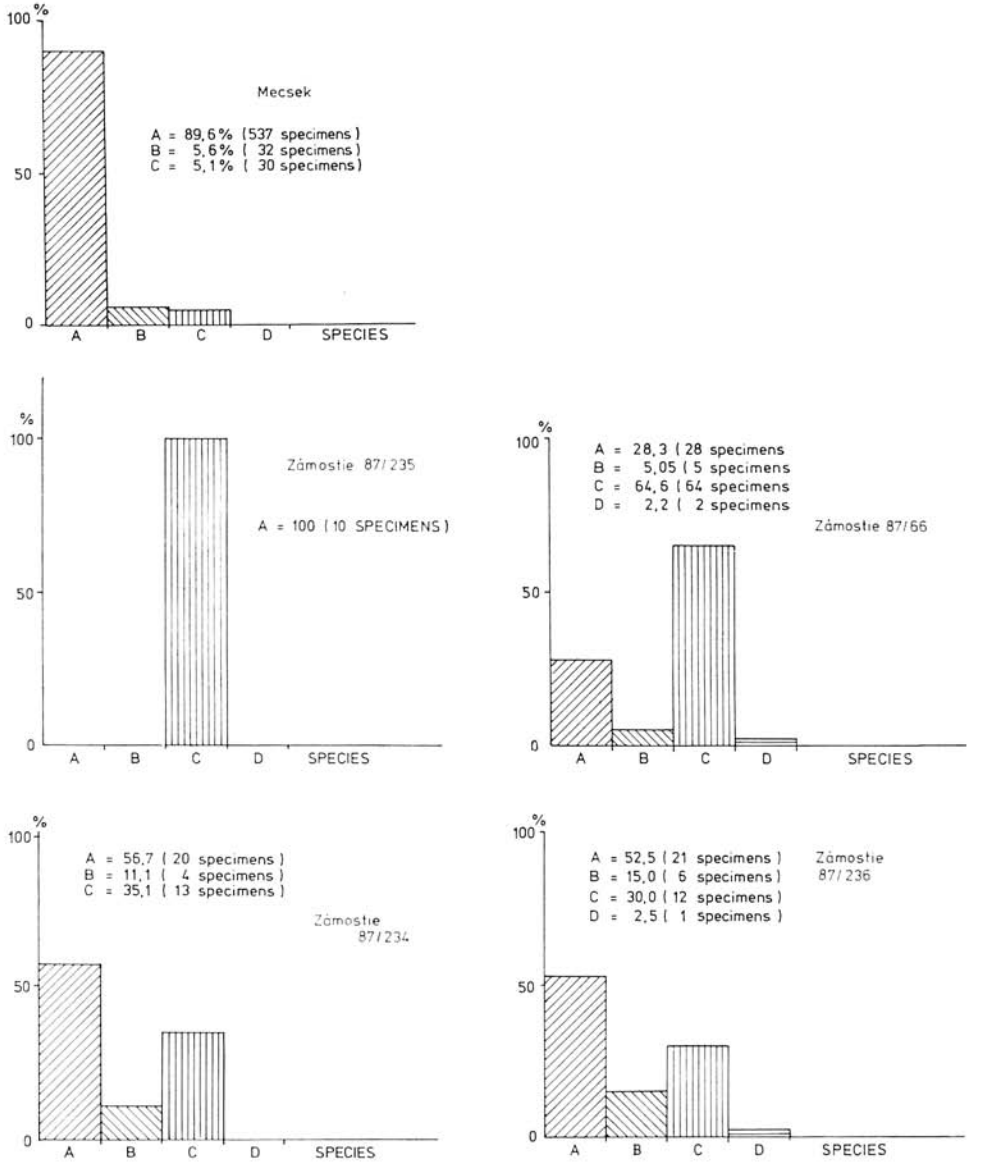
The revised taxonomy set up by the Triassic Conodont Working Group in 1979 and 1980 (still in press) is followed also here. The diagnostic morphological characteristics of the species discussed below are shown on Fig. 9 and 10.

Gondolella bifurcata bifurcata (BUDUROV—STEFANOV, 1972)
(Pl. II, Fig. 1; Pl. V, Fig. 1—9)

1972 *Paragondolella bifurcata* sp. n. — BUDUROV—STEFANOV, p. 843, Pl. 1, Figs. 1, 14, ?15—17, 18—20, 22—25; Pl. 2, Figs. 7—9, non! Pl. 1, Figs. 21; Pl. 2, Figs. 1—6.

*The specimens figured from the Mecsek Mts., Hungary, are reposited in the museum of the Hungarian Geological Institute; those from the Low Tatra Mts., Czechoslovakia in the museum of Geologický ústav Dionýza Štúra.

1972 *Paragondolella navicula navicula* (HUCKRIEDE) — Budurov—Stefanov, Pl. 2, Figs. 12—14.
1975 *Paragondolella bulgarica* sp. n. — BUDUROV—STEFANOV, only Pl. 1, Fig. 19.
1980 *Gondolella bifurcata* (BUDUROV—STEFANOV) — Kovács—Kozur, Pl. 2, Figs. 5—7.



Figs. 4—8. Abundance histograms of conodonts.
Explanations: A — *Gondonella bifurcata hanbulogi;* B — *Gondonella bifurcata bifurcata;* C — *Gondonella bulgarica;* D — *Neospathodus kockeli.*

Species	Platform outline	Platform margin	Adcarinal trough	Platform end	Carina (lateral view)	Last denticle (=mostly the cusp)
G. bifurcata bifurcata	parallel margin	not upturned, thickened	shallow to moderately deep	squared off, blunted or rounded	gradually lowering posteriorly	usually perpendicular
G. bifurcata hanbulogi	platform widest in the middle or with parallel margins	upturned thin	deep	pointed or rounded, rarely blunted	arched, posteriorly still moderately high	perpendicular or showing posteriorly: a brim or swelling is always present behind it
G. bulgarica	platform widest in the middle	more or less upturned, thin	moderately deep to deep	always pointed (either narrowly or widely)	arched, usually still high posteriorly	always grown together with the platform end: no trace of any brim or swelling is present behind it

Fig. 9. Diagnostic morphological characteristics of *Gondonella bifurcata bifurcata*, *G. bifurcata hanbulogi* and *G. bulgarica*.

1980 *Neogondolella bifurcata bifurcata* (BUDUROV—STEFANOV) — Pisa—Perri—Veneri, Pl. 60, Figs. 5—7.
1980 *Gondolella prava* KOZUR—SZABÓ, Kovács et al., Pl. 59, Figs. 12, 13.
1982 „*Gondolella*" *bifurcata* (BUDUROV—STEFANOV) — Sudar, Pl. 2, Figs. 2—6; Pl. 3, Figs. 1—2.

Remarks: This species has originally been established by BUDUROV—STEFANOV, 1972 because of the bifurcation of carina at the posterior platform end. Matured, massive forms without such a bifurcation had been further designated for a couple of years as "*Gondolella navicula*" HUCKRIEDE, 1958. At a more advanced knowledge of Triassic conodonts it has become evident, that bifurcation of carina is a matter of intraspecific variation and may occur in many *Gondolella* species, therefore has no taxonomical significance. All in matured stage massive, "navicula - type" forms of (higher) Pelsonian—Lower Illyrian age, either with or without a bifurcation, fall within the variation field of a single species. *G. bifurcata bifurcata* is distinguished from the Norian *G. navicula*, which seems often to be very similar at the first glance, by its small and inverted basal pit, which is enlarged in a flaring cavity in the latter. For differences against *G. bifurcata hanbulogi* see below.
Occurrence: Rare in the Lower Pelsonian, frequent in the Upper Pelsonian and Lower Illyrian, though this frequency in comparison with that of *G. bifurcata hanbulogi* was paleogeographically controlled.

Gondolella bifurcata hanbulogi (SUDAR—BUDUROV, 1972)
(Pl. I, Figs. 1—5; Pl. II, Figs. 3—4; Pl. III, Figs. 4—8; Pl. IV)

1972 *Paragondolella navicula navicula* (HUCKRIEDE) — Budurov—Stefanov, Pl. 2, Figs. 10—11.
1975 *Paragondolella bulgarica* sp. n. — BUDUROV—STEFANOV, only Figs. ?8 — 10, 11, 12, ?13, ?14, ?18, 21.

1979 *Paragondolella hanbulogi* sp. n. — SUDAR—BUDUROV, p. 50—51, Pl. 1, Figs. 9, 10; Pl. 2, Figs. 1—9; Pl. 3, Figs. 1—10, ?11, ?12.
1980 *Gondolella bifurcata* (BUDUROV—STEFANOV) — Kovács—Kozur, Pl. 2, Figs. 8a—b.
1980 *Neogondolella bulgarica* (BUDUROV—STEFANOV) — Pisa—Perri—Veneri, Pl. 60, Fig. 1; Pl. 61, Figs. 3, 4, 6, 8, 9.
1980 „*Gondolella*" *habulogi* (SUDAR—BUDUROV) — Sudar, Pl. 3, Figs. 3, 4, ?4, ?5; Pl. 4, Figs. 1—2, ?3—5.

Remarks: *G. bifurcata hanbulogi* is characterized typically by its thin and upturned, *bulgarica* — type platform margins, in contrast to *G. bifurcata bifurcata*, in which they are fairly thickened, of massive appearance and not upturned (see Fig. 10). However, there is a so wide transitional field between

Fig. 10. Vertical section of platform.

the two end — forms, that any boundary between them seems to be rather arbitrary. H. Kozur (1980 and in Kovács—Kozur, 1980) regarded *Paragondolella hanbulogi* SUDAR—BUDUROV, 1979 as a junior synonym of *Paragondolella bifurcata* BUDUROV—STEFANOV, 1972 while Sudar (1982) further continued with the opinion, that they constitute two different species. The wide transition between them and their equal range suggest, that they were two subspecies of the same species, of paleogeographically controlled distribution.

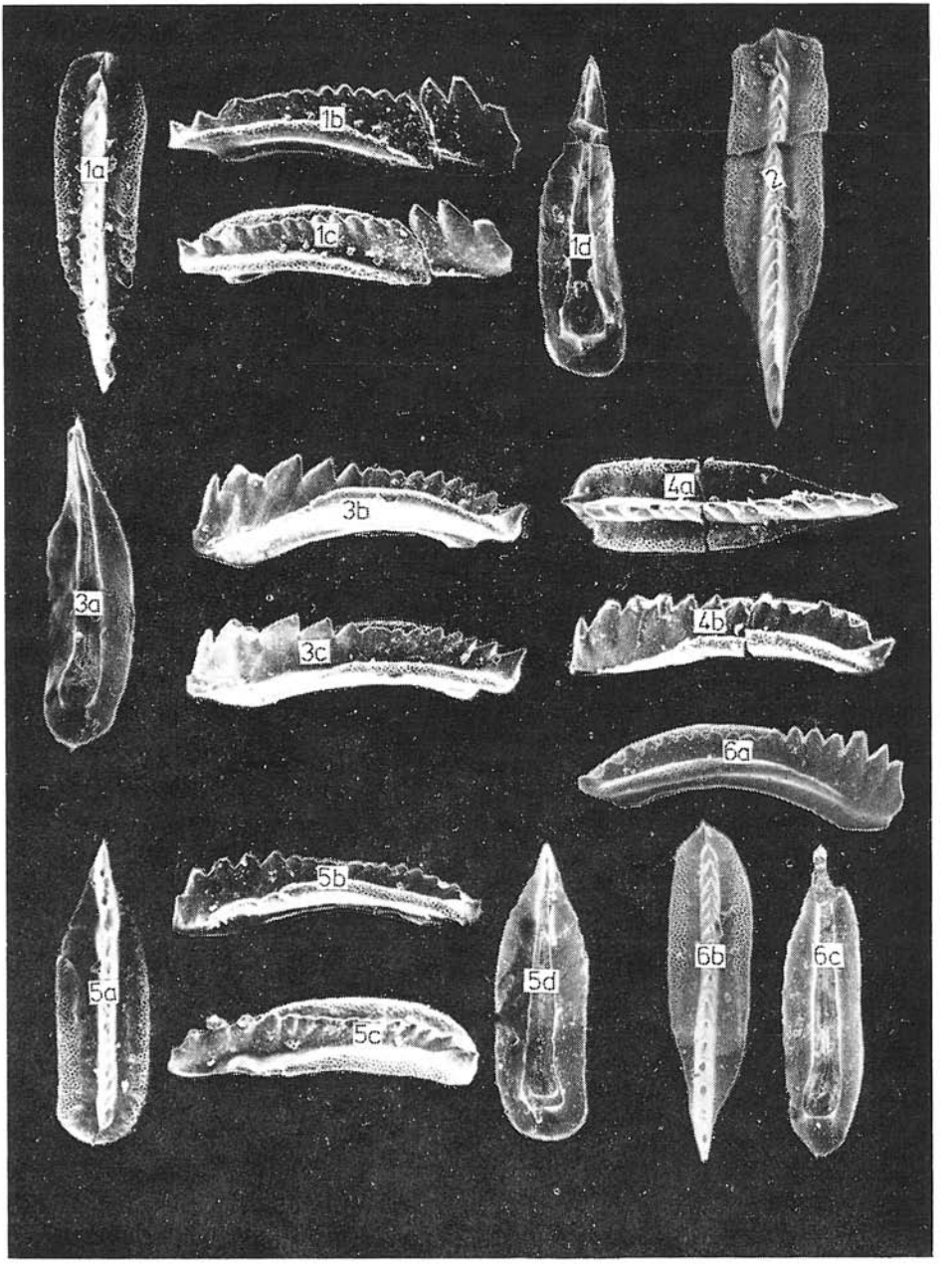
G. bifurcata hanbulogi is distinguished from *G. bulgarica* first of all by the appearence of a swelling or a brim behind the last denticle of the carina.

Plate I

Conodonts from the Mecsek sample, I. All magnifications are 100 ×.

Fig. 1a—d. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV) *G. hb.* 8, MÁFI T-5562.
Fig. 2. Transitional form between *G. b. hanbulogi* and *G. b. bifurcata*. *G. hb.* → *G. bif.* 4, MÁFI T-5563.
Fig. 3a—c. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). *G. hb.* 9, MÁFI T-5564.
Fig. 4a—b. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). *G. hb.* 10, MÁFI T-5565.
Fig. 5a—d. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). *G. hb.* 11, MÁFI T-5566.
Fig. 6a—c. Transitional form between *G. bulgarica* and *G. b. hanbulogi*, with *bulgarica*-type platform-end. *G. bu.* 12, MÁFI T-5567.

Plate I



Representatives of this subspecies occuring in the pelagic environments of the Dinarides (Sudar—Budurov, 1979; Sudar, 1982) and Nord Hungary (Aggtelek and Rudabánya Mts; Kovács, unpubl.), referring to the "Dinaric province" of Kozur, 1973, are usually larger and more delicate than those in the present material from the Central West Carpathians and Mecsek Mts.
Occurrence: Rare in the Lower Pelsonian, frequent in the Upper Pelsonian and Lower Illyrian. Dominance of the two subspecies against each other was paleogeographically controlled.

Gondolella bulgarica (BUDUROV—STEFANOV, 1975)
(Pl. I, Fig. 6; Pl. II, Fig. 5; Pl. III, Figs. 2—3)

1972 *Paragondolella bifurcata* sp. n. — BUDAROV—STEFANOV, Pl. 1, Fig. ?21
1975 *Paragondolella bulgarica* sp. n. — BUDUROV—STEFANOV, p. 774, Pl. 1, Figs. 1—7, 15, 16, ?17, 20, ?22, ?23, non! Figs. ?8—10, 11, 12, ?13, ?14, ?18, 19, 21.
1977 *Neogondolella bulgarica* (BUDUROV—STEFANOV) — Nicora, Pl. 5, Figs. 8—14.
1980 *Gondolella bulgarica* (BUDUROV—STEFANOV) — Kovács—Kozur, Pl. 2, Figs. 1—2.
1980 *Neogondolella bulgarica* (BUDUROV—STEFANOV) — Pisa—Perri—Veneri, Pl. 61, Figs. 1, 2, ?5, 10, 11, ?12, non! Pl. 60, Fig. 1; Pl. 61, Figs. 3—6, 7, 8, 9.
1980 *Gondolella bulgarica* (BUDUROV—STEFANOV) — Szabó—Kovács et al., p. 59, Fig. 7.
1982 *„Gondolella" bulgarica* (BUDUROV—STEFANOV) — Sudar, Pl. 1, Figs. 5—8; Pl. 2, Fig. 1.

Remarks: *G. bulgarica* is characterized by its thin, more or less upturned platform margin and first of all by its characteristically formed, narrowly or widely, but always pointed (in upper view) platform end: the last denticle of the carina (usually as the cusp) is fused with the thin, here more upturned and higher posterior platform margin and a swelling or brim is never present behind it. Furthermore, in lateral view, this last denticle points posteriorly and lies exactly in the plane of the posterior platform margin.

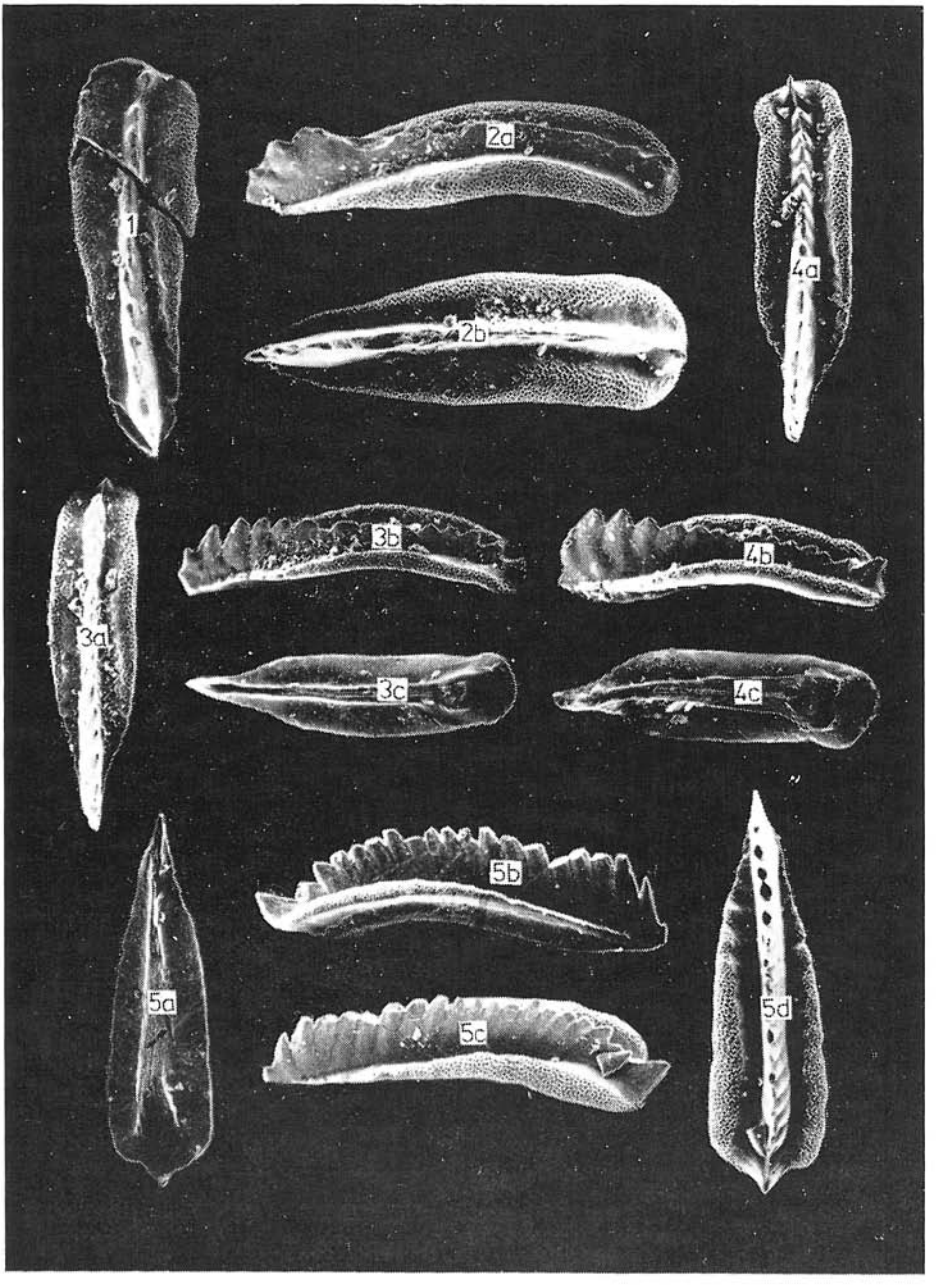
Both *G. bifurcata* and *G. bifurcata hanbulogi* seems to have developed from *G. bulgarica*. Morphological transitions (especially to *G. bifurcata hanbulogi*) can be observed.
Occurrence: Aegean—Pelsonian; in the Lower Pelsonian predominates, while in the Upper Pelsonian becomes rarer and rarer in contrast to its succesors, *G. bifurcata bifurcata* and *G. bifurcata hanbulogi*.

Plate II

Conodonts from the Mecsek sample, II. All magnifications are 100 ×.

Fig. 1. *Gondolella bifurcata bifurcata* (BUDUROV—STEFANOV). *G. hb.* → *G. bif.* 5, MÁFI T-5568.
Fig. 2a—b. *Gondolella bifurcata bifurcata* (BUDUROV—STEFANOV). *G. hb.* → *G. bif.* 6, MÁFI T-5569.
Fig. 3a—c. Transitional form between *G. b. hanbulogi* and *G. b. bifurcata G. hb.* → → *G. bif.* 3, MÁFI T-5570.
Fig. 4a—c. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). *G. hb.* 13, MÁFI T-5571.
Fig. 5a—d. *Gondolella bulgarica* (BUDUROV—STEFANOV). *G. bu.* 11, MÁFI T-5572.

Plate II



Conclusions

The similar conodont fauna proves, that the bed in the Choč nappe of the Low Tatra Mts. containing *Paraceratites* belongs to the same zone as the one in the Mecsek Mts., namely to the *binodosus* - Zone. Even, the former is older within this zone, being *Gondolella bulgarica* more frequent in it than *Gondolella bifurcata hanbulogi*. The sample from the Mecsek Mts., according to composition of fauna, can be best correlated with the "youngest" one from the Low Tatra Mts., with sample Nr. 236.

The position and existence of this zone as chronozone is presently a matter of discussion because of its transitional character (survival of typical Pelsonian and appearence of typical Illyrian ammonoids) and because of the difficulties in distinguishing *P. binodosus* from *P. trinodosus*. For a long time *P. binodosus* was regarded as the guide fossil of the Pelsonian substage (cf. Waagen—Diener in Mojsisovics, 1895; Pia, 1930). However, Assereto (1971)

Plate III

Conodonts from the Mecsek and Low Tatra samples.

Fig. 1. *Neospathodus kockeli* (TATGE). (The cusp is broken). Zámostie—Dubová 78/66; 250×; S-4673.
Figs. 2—3. *Gondolella bulgarica* (BUDUROV—STEFANOV) — juv. — Misina Hill; 150×; Spec. N. 12.
Figs. 4—5. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV) — juv. — Misina Hill; 125×; Spec. N. 13.
Figs. 6—8. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV) — juv. — Misina Hill; 125×; Spec. N. 14.

Plate IV

Conodonts from the Low Tatra sample.

Figs. 1—2. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). Zámostie—Dubová 78/66; 150×. S-4685-6.
Figs. 3—4. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV), juv. Zámostie—Dubová 78/66; 95×. S-4693-4.
Figs. 5—8. *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV), juv. Zámostie—Dubová 78 66; Figs. 5—6. — 70×; Fig. 7. — 75×; Fig. 8. (partly broken form with upturned platform margin) 115×. S 5161, 5163, 4612, 4680.
Figs. 9—10. *Gondolella bifurcata hanbulogi* juv (SUDAR—BUDUROV). Zámostie—Dubová 78/66; 50×. S-8777-8.

Plate V

Figs. 1—4. *Gondolella bifurcata bifurcata* (BUDUROV—STEFANOV). Zámostie— Dubová 78/66; primitive form; 50×. S-8781-2, 4602, 4616.
Figs. 5—6. *Gondolella bifurcata bifurcata* (BUDUROV—STEFANOV), transitional form to *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV). Zámostie—Dubová 78/66; Figs. 5—6 — 70×. S-4661-2.
Figs. 7—9. *Gondolella bifurcata bifurcata* (BUDUROV—STEFANOV), transitional form to *Gondolella bifurcata hanbulogi* (SUDAR—BUDUROV) Zámostie—Dubová 78/66; Figs. 7—8 — 70×; Fig. 9 — 75×. S-4697-9.

Plate III

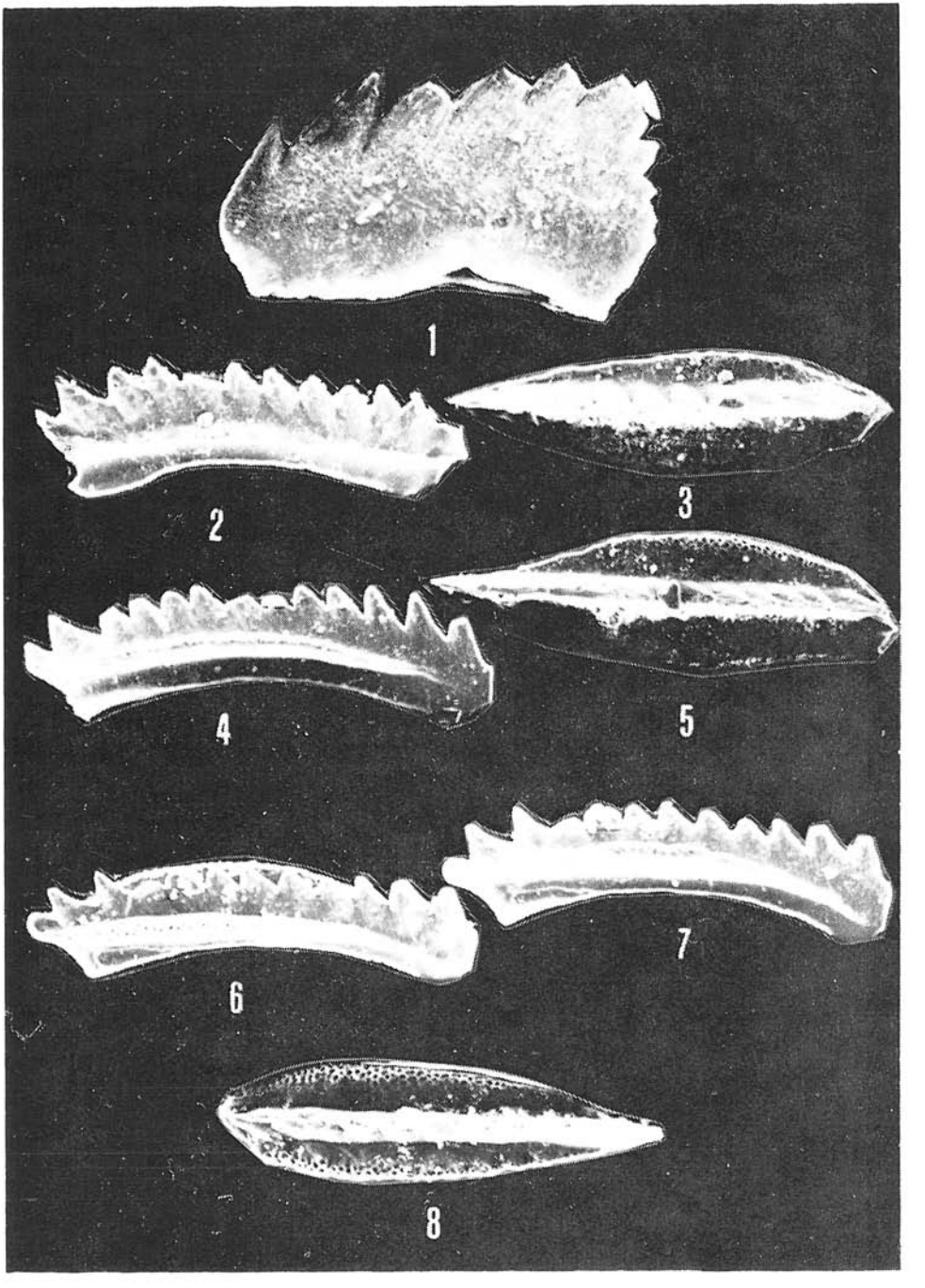


Plate IV

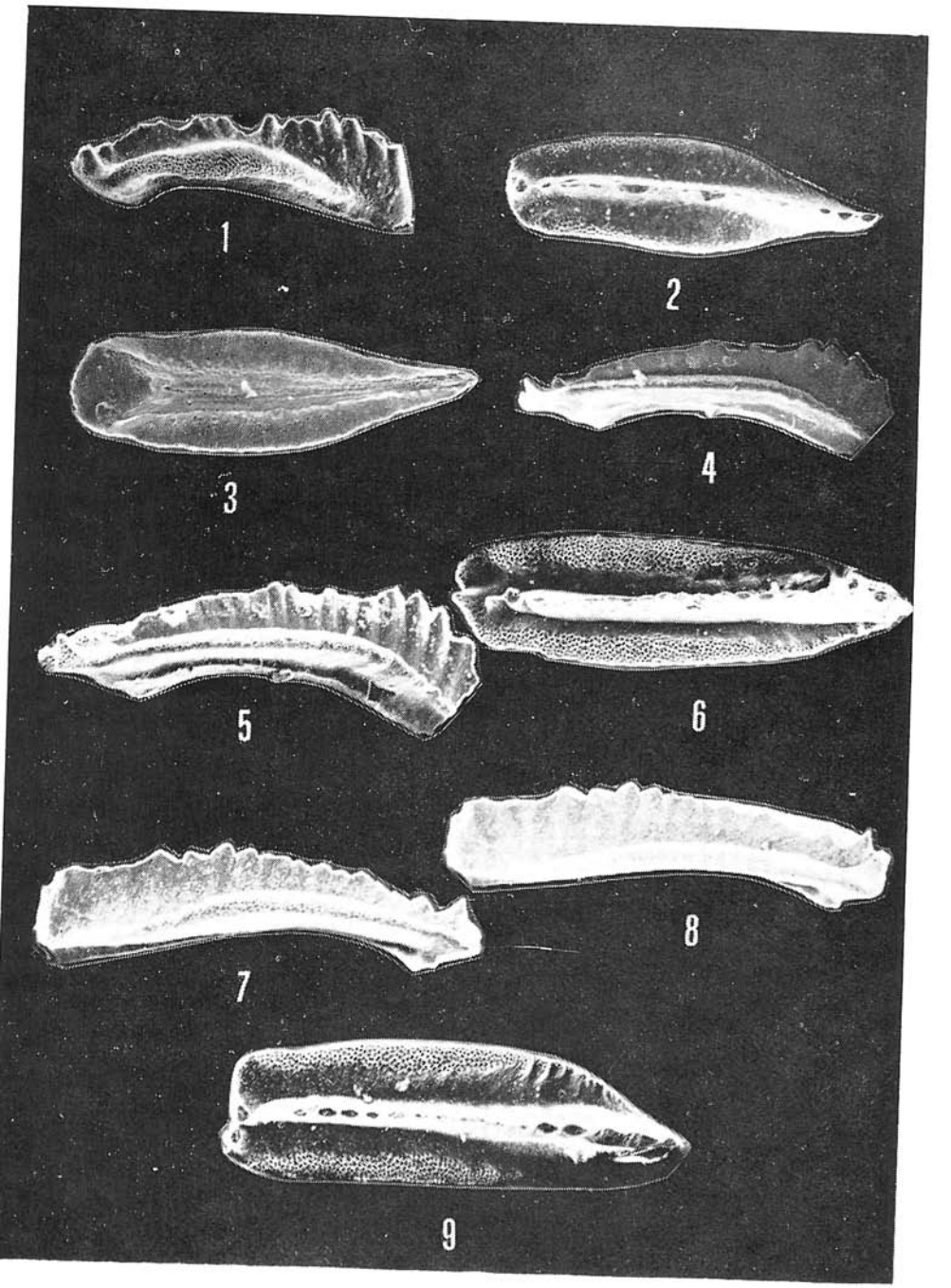
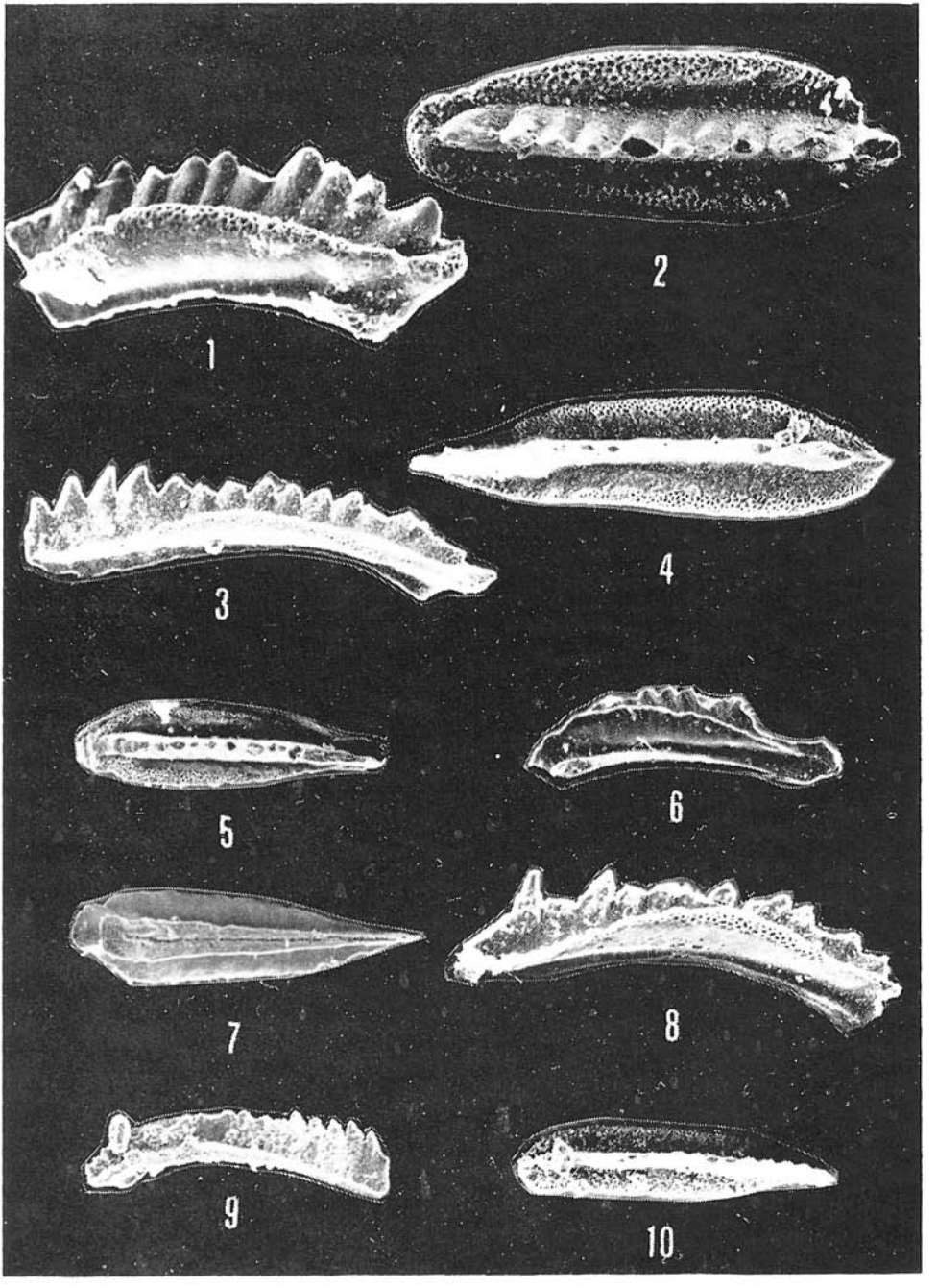


Plate V



pointed out, that it is restricted only to the uppermost part of the Pelsonian (Niveau 3). G a e t a n i (1969 and pers. comm.) proposes, that it should be assigned to the Illyrian because of the appearence of *Paraceratites* and other Illyrian ammonoid genera (which is a usual biostratigraphic procedure). K o z u r (1980) treated it as a subzone, dividing it between the Pelsonian and the Illyrian, while in the range - chert of K o v á c s—K o z u r (1980) it was shown in the Illyrian. It was not dealt with in the Triassic ammonoid time scale proposed by the IGCP Project 4 (Z a p f e, 1983).

In terms of conodont - biostratigraphy the samples investigated, even the one from the Mecsek Mts. with the last representatives of *G. bulgarica*, should rather be assigned to the uppermost part of the Pelsonian (Niveau 3 of A s s e r e t o, 1971) being the extinction of this species a remarkable and easily recognizable boundary. *G. bulgarica→G. bifurcata hanbulogi→G. bifurcata bifurcata* constitute one phylogenetic lineage; in the lower part of the Pelsonian *G. bulgarica* predominates, the two others are rare, while in its upper part the situation is the opposite: *G. bulgarica* becomes rarer and rarer and the two others predominate (usually one of them in different facial environments) (cf. S z a b ó —K o v á c s et al., 1980; K o v á c s, several unpublished sections in Hungary). Higher up only two subspecies of *G. bifurcata* survived into the Lower Illyrian.

Conodont biostratigraphical study of (complete) sections through the Pelsonian/Illyrian boundary in the two regions will be a subject of further joint work by the present authors.

Noteworthy is the close conodont - faunal relationship of the two units at this time. It is only the Pelsonian/Illyrian boundary - interval, in which conodont-bearing facies occur in all the three Triassic regions of Hungary, but the composition of fauna in the Mecsek Mts. in Southern Hungary is different from the contemporaneous ones of the two others. Namely, the open-marine, deeper--water Triassic of Northern Hungary (Rudabánya Mts.) is characterized by a Dinaric - type conodont - fauna, while the Balaton Highland Triassic of pelagic intrashelf basin facies (Transdanubian Midmountains) by a South - Alpine type (cf. K o v á c s, 1983, p. 88).

It should be noted, however, that the similarity between the two areas investigated is true only for the conodont - associations. In the Mecsek Mts. conodont--bearing facies do not occur higher up and its Middle Triassic is of more external type with predominating vermicular limestones, similar to the autochthonous High Tatric series on the Polish side, where occurrence of conodonts is not reported up to now even from this time-interval.

Translated by P. Papšo

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