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A NEW OCCURRENCE OF TRIASSIC DEPOSITS NE OF ORAVIŢA (SOUTHERN CARPATHIANS, RUMANIA) AND ITS PALEOTECTONIC SIGNIFICANCE

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Abstract: Until recently, in the western part of the Southern Carpathians Triassic deposits were only known south of the Nera River between Sasca Montană and Moldova Nouă, belonging to the Sasca-Gornjak structural unit (Săndulescu 1975). Core analysis of a borehole drilled NE of Oraviţa (Brădişorul de Jos) led to the identification of a Triassic formation of the same type and age (Early-Middle Triassic) about 20 km further northerly than previously known. As in the Sasca Montană–Moldova Nouă area, the Triassic deposits are overlain by a Middle Jurassic sedimentary sequence, some tens of metres thick. The paper presents a biostratigraphical analysis of the foraminiferal assemblages that have been identified in the drill core, gives a brief description of the microfacies of the carbonate deposits encountered, and comments on the paleotectonic significance of the newly found Triassic occurrence.

Key words: Triassic, Southern Carpathians, biostratigraphy, tectonics.

Introduction

The Triassic deposits cropping out between Sasca Montană and Moldova Nouă (Fig. 1) in the western part of the Southern Carpathians were first mentioned by Böckh (1887). A review of all the investigations dealing with the so-called "Sasca Triassic" is given in Strutinski et al. (1987). More recently, two other papers were published on the subject by Mirăuţă & Gheorghian (1993) and Bucur et al. (1994). The former presents paleontological proofs (conodont assemblages) for the Ladinian age of, at least, part of the "ceratite-bearing black limestones" (Valea Cerbului Limestone Member in Bucur et al. 1994).

The study of a borehole drilled NE of Oraviţa, near the village of Brădişorul de Jos (Figs. 1, 2), permitted the identification of a Sasca-type Triassic in this sector as well. Maria Paica provided preliminary petrographic data on the stratographic succession encountered, Ioan I. Bucur performed the biostratigraphic and microfacies analyses, and C. Strutinski examined the implications on a regional scale of the Triassic finding.

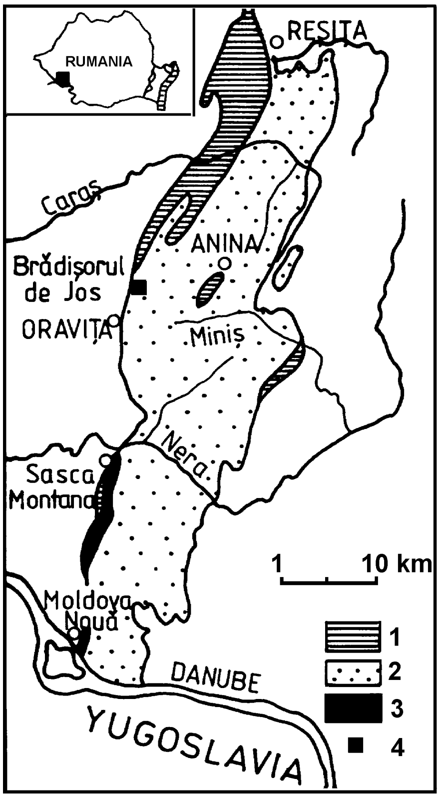


Fig. 1. The location of the Brădişorul de Jos borehole on the map of Rumania and within the Reşiţa-Moldova Nouă zone. **1** — Paleozoic deposits; **2** — Post-Triassic Mesozoic deposits; **3** — Triassic deposits from Sasca-Moldova Nouă; **4** — location of the 471 Bradişor borehole.

Biostratigraphical considerations

The stratigraphic sequence drilled by the 471 Brădişor borehole is synthetically presented in Fig. 3. The upper 70 metres drilled consist of biopelmicrites, biointramicrites and terrigeneous biomicrites. The biopelmicrites contain mollusc (lamellibranch and gastropod) fragments, nodosariid and involutinid forams and microoncoidal structures. Most fre-

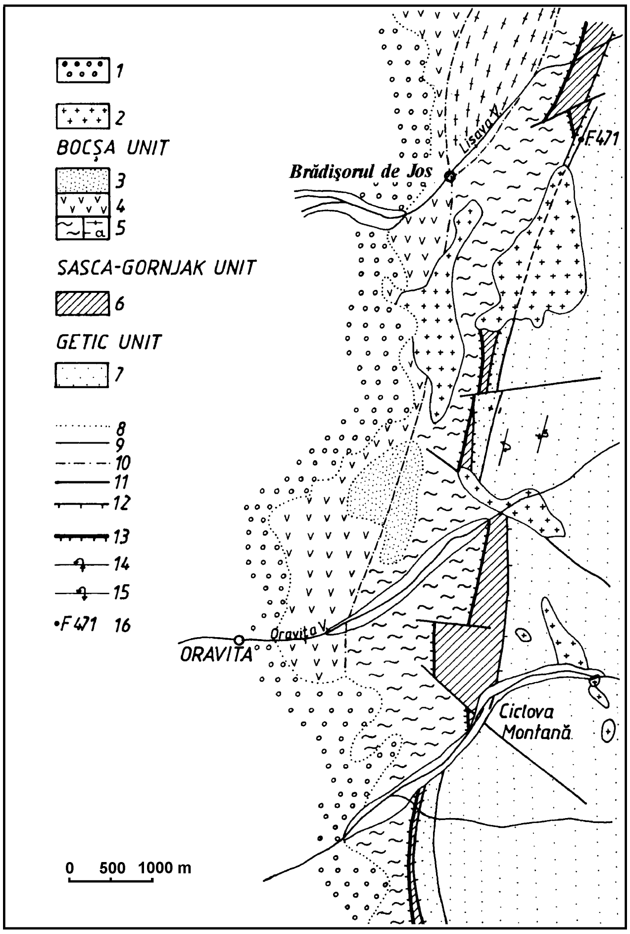


Fig. 2. Tectonic sketch of the Oraviţa area (after Iancu, in Ilinca et al. 1991, with permission). **1** — post tectonic cover (Quaternary-Neogene); **2** — banatitic magmatic rocks (Paleogene-Upper Cretaceous); **3** — carbonate rocks (Mesozoic); **4** — metamorphic rocks (Valea Caraşului series, Lower Paleozoic); **5**, **5a** — metamorphic rocks (Bocşiţa-Drimoxa series, Precambrian); **6** — terrigenous and carbonate rocks (Mesozoic-Permian); **7** — carbonate rocks (Mesozoic: Jurassic-Lower Cretaceous); **8** — discontinuity limit; **9** — normal limit; **10** — structural discordant limit; **11** — fault line; **12** — reverse fault line (Oravita Fault); **13** — overthrusting plane; **14** — reverse syncline; **15** — reverse anticline; **16** — location of the borehole 471 Brădişor.

quent among the foraminifers is *Trocholina conica* (Schlumberger) (Pl. II: Figs. 1–4), a species characteristic for the Middle Jurassic (Bathonian) (Schlumberger 1898; Reichel 1955). Beneath this sequence, the well passed through carbonatic and terrigeneous deposits of Triassic age. A first assemblage including *Glomospirella triphonensis* Baud et al. (Pl. III: Figs. 4, 5, 7–9), *Nodosaria skyphica* Efimova (Pl. III: Fig. 18), *Turriglomina mesotriasica* Koehn-Zaninetti (Pl. III: Figs. 16, 17) and rare dasyclads (?*Oligoporella* sp.) was identified in the biomicrite of sample 4773.

Glomospirella triphonensis, first described from the upper Anisian of the Prealpes (Baud et al. 1971), was later found in deposits corresponding largely to the Aegean–Anisian interval (Brönnimann et al. 1972; Efimova 1974; Gazdzicki et al. 1975; Zaninetti 1976; Oravecz-Schefer 1987; Pirdeni 1988; Trifonova 1992; Flügel et al. 1994).

Nodosaria skyphica is cited from the Spathian–lower Anisian of Bulgaria (Trifonova 1994), having, according to the same author, a spread ranging from the Lower Triassic (Caucasus) to the lower Illyrian (Western Carpathians).

As to *Turriglomina mesotriasica*, it is a species well-known in the Triassic of the entire Eurasian realm. In the Western Carpathians it has been identified in upper Anisian-lower Ladinian deposits (Salaj et al. 1983). In Hungary it was mentioned in deposits assigned to the upper Anisian (Oravecz-Schefer 1987), and Ladinian-Carnian, respectively (Berczi-Makk 1985, 1993; Berczi-Makk et al. 1993). In Bulgaria the same species has been described from deposits considered to belong to the Illyrian-basal Carnian (Trifonova 1987, 1993). Pirdeni (1987) mentions the species in the Anisian from Albania. In Greece (Rettori et al. 1994) it was cited in deposits assigned to the upper Bithynian–upper Ladinian, and in Italy from the Anisian-Ladinian level (Premoli-Silva 1971; Limongi et al. 1987; Zaninetti et al. 1990). *T. mesotriasica* has also been mentioned in the Ladinian of Turkey (Dager 1978), in the Carnian of the Caucasus (Efimova 1974), as well as in middle Anisian deposits from China (He Yan 1984; He Yan & Cai-Lian-quan 1991). According to Zaninetti (1976), the species is widespread in the Anisian–lower Ladinian of the whole Eurasian realm.

From the above it may be concluded that *T. mesotriasica* is known from the Anisian up to the Carnian, being most often cited within the upper Anisian–Ladinian interval. The deposits containing *Turriglomina mesotriasica* from the 471 Brădişorul borehole are comparable with those of the Valea Cerbului Limestone Member from Sasca Montană, in which *T. mesotriasica* was likewise identified (Strutinski et al. 1987; Mirăuţă & Gheorghian 1993; Bucur et al. 1994). According to conodont biostratigraphy (Mirăuţă & Gheorghian 1993), the Valea Cerbului Limestone Member has an Illyrian -early Ladinian age. Sample 4773, containing the above specified assemblage, may most probably correspond to the lower (upper Anisian) part of this member.

Another foraminifer assemblage has been identified in sample 4783. It includes *Ammodiscus multivolutus* Reitlinger (Pl. III: Fig. 15), *Agathammina*? *iranica* Zaninetti et al. (Pl. III: Fig. 12), *Trochammina almtalensis* Koehn-Zaninetti (Pl. III: Fig. 14), *Trochammina jaunensis* Brönnimann & Page; *Pilammina* cf. *densa* Pantič (Pl. III: Figs. 1–3, 6), *Glomospirella grandis* (Salaj) (Pl. II: Figs. 5–7, 9–12, 14, 16), *Glomospirella semiplana* Kochansky-Devidé & Pantič (Pl. II: Fig. 8), *Glomospira*? cf. *micas* He & Yue (Pl. III: Fig. 13), *Endotriadella* cf. *wirzi* Koehn-Zaninetti and rare specimens of *Meandrospira pussila* (Ho) (Pl. III: Fig. 10). The assemblage is quantitatively dominated by *Glomospirella grandis* (Salaj). This species has been frequently cited from the Anisian of the entire Eurasian realm: Koehn-Zaninetti (1969), Bechstädt & Bradner (1970), Baud et al. (1971), Premoli-Silva (1971), Brönnimann et al. (1973), Gazdzicki et al. (1975), Zaninetti (1976), Dager (1978), Salaj et al. (1983), Berczi-Makk (1985), Gaetani & Gorza (1989), Altiner & Kocygit (1993), Rettori et al. (1994). It is most widespread in the middle–upper Anisian.

Glomospirella semiplana Kochansky-Devidé & Pantič was mentioned from the same time interval (Baud et al.

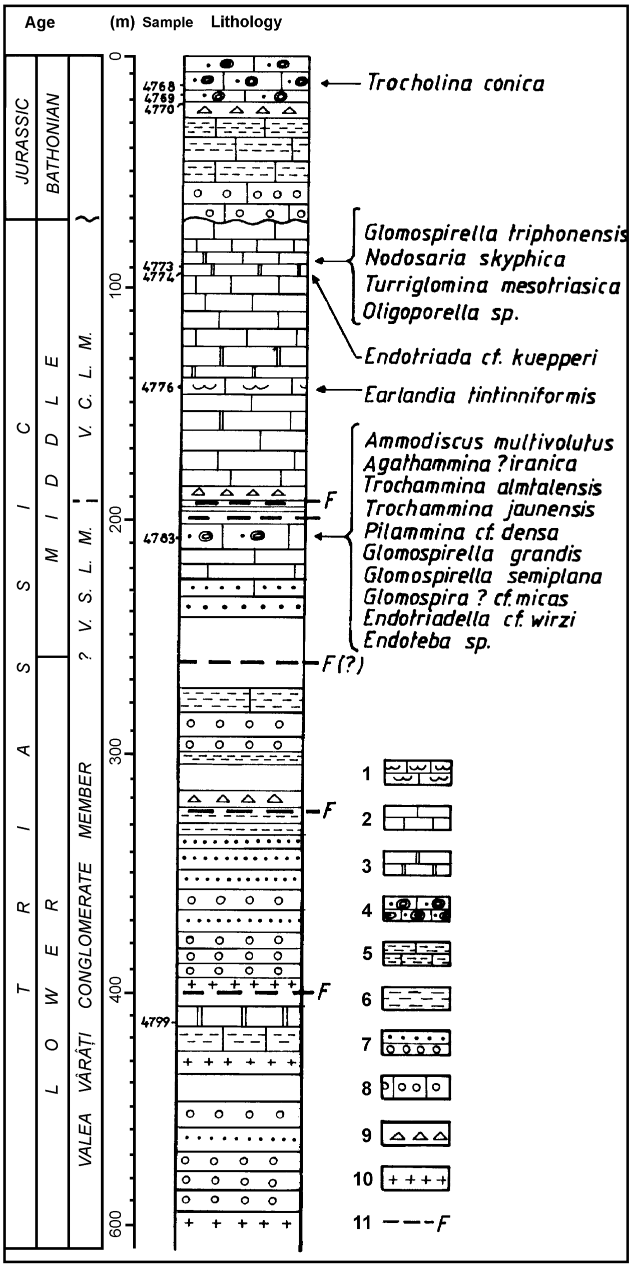


Fig. 3. Succession of the Mesozoic deposits bored by the 471 borehole of Brădișorul de Jos. **1** — fenestral limestones; **2** — micritic limestones; **3** — dolomites; **4** — oncoidic-bioclastic limestones; **5** — micritic limestones with argillaceous laminae; **6** — shales and siltstones; **7** — sandstones; **8** — calcareous sandstones; **9** — breccia and mylonites; **10** — vulcanic rocks (rhyolites); **11** — fault. **V.S.L.M.** = Valea Șușara Limestone Member; **V.C.L.M.** = Valea Cerbului Limestone Member.

1971; Efimova 1974; Gazdzicki et al. 1975; Salaj et al. 1983). According to Kristan-Tollmann & Tollmann (1983), it may be synonymous with *G. grandis*.

Among the other species of the described assemblage, *Pilammina densa*, *Trochammina almtalensis* and *Endotriadella wirzi* are widespread in the Pelsonian-Illyrian of the Eurasian domain (Zaninetti 1976; Salaj et al. 1983; Senowbari-Daryan et al. 1993; Bucur et al. 1994; Flügel et al. 1994).

Remarkable is the occurrence of rare specimens of *Meandrospira pussila* (Ho), well-known in deposits ascribed to the upper Scythian (Baud et al. 1974; Dager 1978; Berczi-Makk 1986; Pirdeni 1988). Some specimens of the same species were identified in Anisian deposits by Bechstädt & Bradner (1970) (as *M. iulia*), Brönnimann et al. (1973), Zaninetti (1976), Trifonova (1993), Flügel et al. (1994).

As a whole, the assemblage of sample 4783 corresponds most probably to the Pelsonian, i.e. to the Valea Șușara Limestone Member from Sasca Montană (Bucur et al. 1994). Beneath it, the well passed through primarily terrigeneous deposits with no fossil remains, which can be attributed, on lithological grounds, to the Lower Triassic (Valea Vârâți Conglomerate Member of Sasca Montană, cf. Bucur et al. 1994). The sequence is disturbed by several faults (Fig. 3).

In the succession dolomitic rocks occur either within the Anisian limestones (sample 4773, Pl. I: Fig. 11), or in association with the terrigeneous rocks (sample 4799, Pl. I: Fig. 12), without forming a distinct dolomitic member, as, for instance, at Sasca Montană (Dealul Redut Dolomitic Member, Bucur et al. 1994).

Microfacies and paleoenvironment of the oncoid-bearing limestones

Two levels of oncoid-bearing rocks have been identified in the 471 Brădișorul borehole. An **upper level** consists of bioclastic-oncoidic packstones with microoncoids, fragments of molluscs, echinoderms, more rarely bryozoans and foraminifers (Pl. I: Figs. 1-2). These deposits have been assigned to the Bathonian, due to the presence of *Trocholina conica* (Schlumberger) (Pl. II: Figs. 1-4). Among foraminifers, specimens of *Lenticulina* sp. and other nodosariaceans, as well as rare textularians have been also noticed. The matrix is micritic, with less than 1 % terrigeneous siltic material, sometimes preserving bioturbation structures.

The microoncoids (Pl. I: Figs. 3-8) show dimensions of 1.24-1.70/2.20-3.10 mm and spheroidal-ovoidal shapes. The core is most frequently represented by a bioclast (mollusc or echinoderm fragment). The cores of some oncoids with a relatively thin cortex are clasts of an older biomicritic, partially consolidated, sediment.

The cortex, having a thickness of 0.10-0.34 mm, consists of micritic laminae that cover the microoncoid body only on certain sectors, thinning out towards the margins. Frequently, the micrite is recrystallized to a fine-grained microsparite. The micritic crusts incorporate small bioclasts and, more rarely, small quartz crystals, being framed by ferruginous films and sometimes by incrusting foraminifers of nubeculariid type.

Oncoids with a micritic cortex have been described previously by Massari & Dieni (1983), Kuss (1988). These authors mostly agree that this kind of oncoid forms in a carbonate sedimentation environment of low energy, some tens of metres deep.

Sample 4783 represents an oncoidic grainstone (Pl. I: Figs. 9-10) belonging to a **second level**, that, on microfaunal grounds (Fig. 3), has a middle Anisian age. The rock consists of a biopelsparitic groundmass that includes numerous foraminifers, fragments of lamellibranchs and echinoderms and very rarely silty quartz grains (under 1 %). As a rule, the oncoids have subcentimetric (0.4–0.5 cm) dimensions; sometimes, however, their length may reach 1.5 cm, depending on the length of the lamellibranch fragment that generally forms the core. The shape varies from spheroidal to irregular (most frequently) and mimics the shape of the core. The lamellibranch fragments constituting the core are often perforated marginally by endolithic cyanobacteria.

The cortex shows a thickness that varies between 0.05 and 2.50 mm. Sometimes, particularly if the cortex is very thin, it develops only on one side of the core-building bioclast (Pl. I: Fig. 10). The cortex has a girvanelloid-type structure, consisting of tubes with 0.15–0.30 mm diameter (Pl. I: Figs. 14–16). This structure is frequently destroyed by micritization. Where the cortex is better developed it takes the form of a cauliflower (Pl. I: Figs. 9, 13). Both the core and the growth zones of the cortex are traced by ferruginous films.

Girvanella oncoids have been described, among others, by Peryt (1980, 1981), Biddle (1983), Kuss (1990). According to Peryt (1980, 1981), oncoids with *Girvanella* may have different origins, but seemingly prefer quiet basins, characterized by tens of metres depths, as well as low sedimentation and subsidence rates.

However, the oncoids from the 471 Brădişorul borehole are much like those described by Čatalov (1983) as porostromatic oncoids in the Ladinian–Carnian from Bulgaria, and particularly those within the oncobiosparite and oncointrasparite levels, considered to be formed in a high energy medium, where superficial oncoids (with a thin cortex) predominate.

Paleotectonic considerations

The presence of Triassic deposits in a borehole NE of Oraviţa must be considered in the context of previous investigations (e.g. Grubic 1967) which established: (1) the existence at the end of the Paleozoic and during the Mesozoic of two distinct sedimentary basins in the area geographically corresponding to the junction between the Carpathians and the Balkans, and (2) the tectonic contact between them, marked by the N-S oriented Oraviţa Lineament (Strutinski 1987) which continues to the south, across the Danube River, as the Ridanj-Krepoljin fault zone (Grubic 1967).

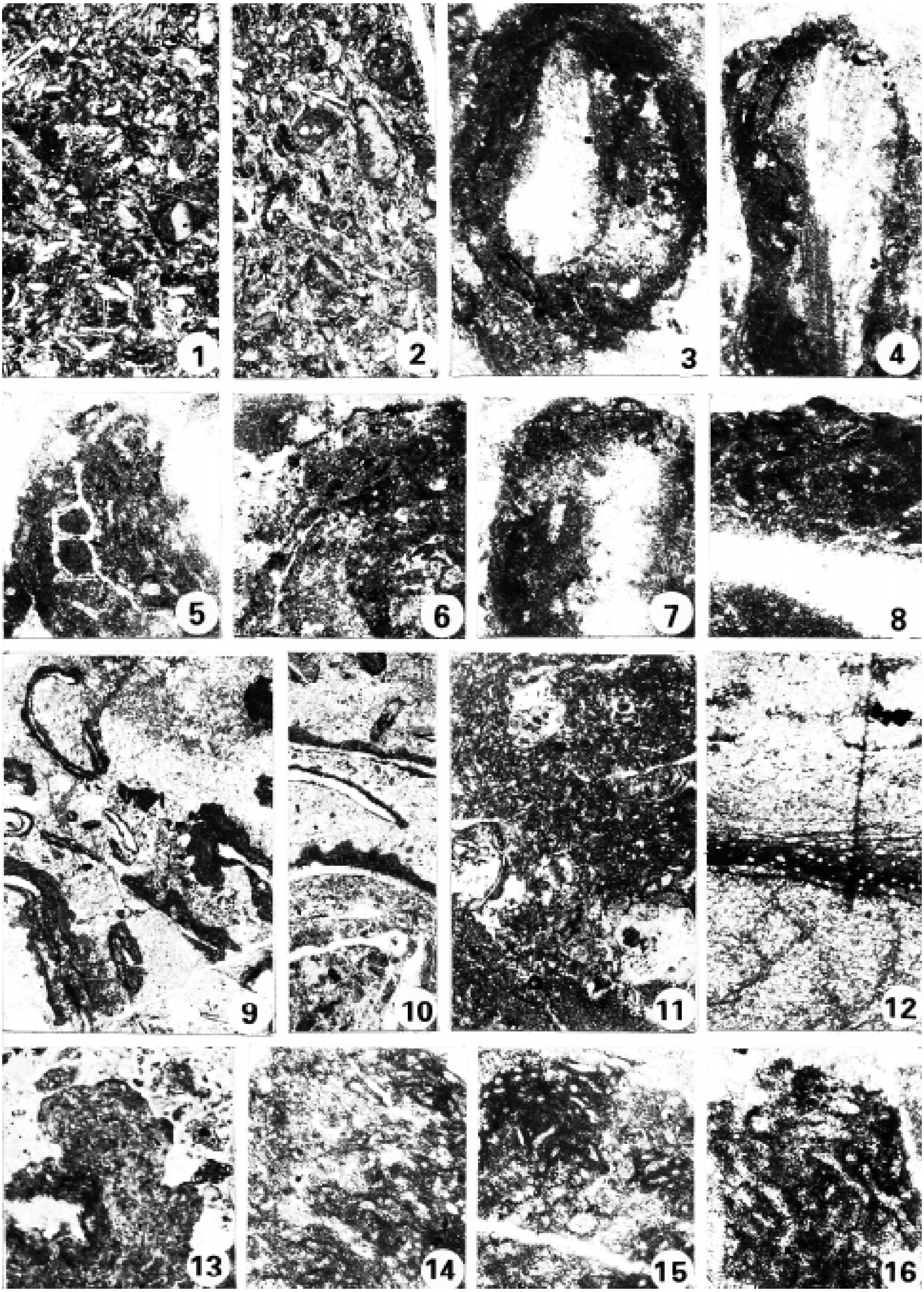
The main distinguishing feature of the western, more internal, basin was considered to be the presence of a Lower-Middle Triassic formation which overlies a terrigeneous Upper Paleozoic (C_3-P_1) sequence, and is in turn unconformably overlain by Middle Jurassic deposits (Boldur et al. 1964; Grubic 1967; Strutinski et al. 1987). In contrast, in the eastern basin Triassic deposits were apparently missing, while the Jurassic is generally represented by all its stages, covering either Upper Paleozoic sediments, or directly the metamorphic basement. The stratigraphic succession of the western basin is considered to have been fully preserved only south of the Danube, where it is well exposed in the environs of Gornjak (Eastern Serbia). The eastern basin may comprise the whole of the Reşiţa-Moldova Nouă zone north of the Danube and the Golubac and Rtanj-Kučaj zones south of it, thus representing the cover of the Getic domain.

Regarding the Oraviţa fault system, there are at least three different interpretations of it. According to Săndulescu (1984), the Oraviţa "line" marks the front of the Locva Nappe, considered to be the lowest sheet of the Supragetic domain, thrusted from west to east over the Getic domain. In this interpretation, the Triassic from Sasca Montană and Moldova Nouă would belong to a third structural unit — the Sasca-Gornjak stripped sheet (Săndulescu 1975) — wedged between the Getic and Supragetic domains.

A different opinion is held by Iancu (Iancu 1986; Iancu in Ilinca et al. 1991). According to her, the Oraviţa fault does not mark the front of a nappe, since it has a post-nappe, admittedly Miocene, age. Thus, it is considered that the Supragetic nappes, including the Sasca-Gornjak stripped sheet, were folded together after their emplacement and only afterwards cut by the Oraviţa fault, along which back-thrusting took place (Fig. 2). This view is particularly based on the fact that in the Oraviţa region the homonymous fault dips steeply (70°) to the east. Keeping this line of reasoning, Iancu does not disagree with Săndulescu, that the Oraviţa fault actually represents the eastern limit of the Supragetic domain, but considers that this is only due to the fact that, in accordance with the back-thrusting model, an important uplift of the Getic compartment took place, causing the complete erosion of the Supragetic units east of the fault.

There is, however, a disagreement of what is actually understood as Oraviţa fault or Oraviţa "line". According to Săndulescu (1975, 1984), this "line" apparently lies to the west of the Sasca-Gornjak "wedge", whereas in Iancu's view, it lies to the east (Fig. 2). In a previous paper (Strutinski et al. 1987), we showed that the Oraviţa "line" is, in fact, a branched system of faults, the Oraviţa fault proper being the most westerly of them, which borders the Triassic deposits to the west. At the same time we favoured an interpretation opposed to the essentially constrictive tectonic models of the above authors. Thus, in spite of sharing with Săndulescu (1975, 1984) and Iancu (1986) the view that the depositional site of the formations making up the Sasca-Gornjak Unit lay in the western proximity of the Reşiţa-Moldova Nouă zone, we did not consider the former to have been thrusted over the latter, from W to E, but instead, to have migrated sublongitu-

Plate I: Figs. 1, 2 — Biomicrites with oncoids, mollusc and echinoderm fragments, scarsely bryozoans and foraminifers (*Trocholina*). *1* — sample 4770 (m.19), Bathonian, ×6; *2* — sample 4769 (m.18.4), Bathonian, ×6. **Figs. 3–8** — Micritic oncoids. *3–7* — sample 4769 (m.18.4), Bathonian, ×60; *8* — sample 4770 (m.19), Bathonian, ×60. **Figs. 9, 10** — Biodolosparites with *Girvanella* oncoids and foraminifers. Sample 3783 (m.206), Valea Şuşara Limestone Member (Pelsonian); *9* — ×4; *10* — ×6. **Fig. 11** — Biodolomicrites with scarsely mollusc fragments and foraminifers. Sample 4773 (m.90), Valea Cerbului Limestone Member (Illyrian-lower Ladinian), ×6. **Fig. 12** — Laminitic dolomite. Sample 4799 (m.415), Valea Vârâţi Conglomerate Member (Lower Triassic), ×10. **Figs. 13–16** — Structural details of *Girvanella* oncoids. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian); *13* — ×15; *14–16* — ×60.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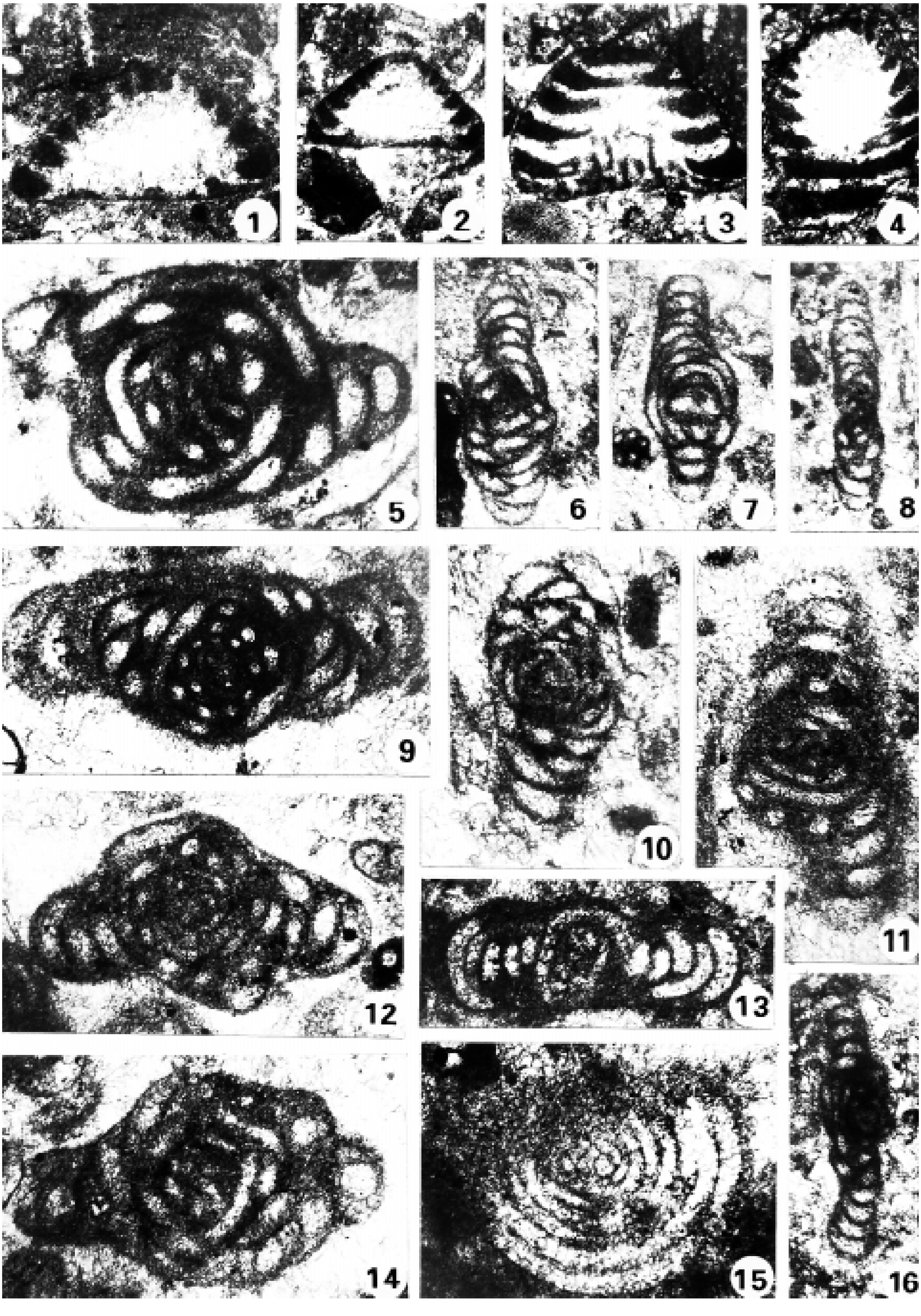
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dinally along a sinistral transcurrent system, the Oraviţa Lineament. Structural arguments in favour of this view are discussed elsewhere (Strutinski 1987) and refer to the linear erosional outline of the lineament, the subhorizontal striations in fault planes regarded as movement vectors, the frequency of "exotic" fault erratics along various segments of the system and the en-echelon trend of the folding in the Reşiţa-Moldova Nouă zone with regard to the Oraviţa Lineament. This point of view is now supported by additional paleogeographical and lithostratigraphic arguments.

First it should be stressed that the differences between the two sedimentary realms as outlined by Grubic (1967) are by no means important. On the contrary, Năstăseanu & Maksimovic (1983) emphasize the great similarity that exists between the sedimentary formations of the Getic and Sasca-Gornjak units, respectively. This similarity may be observed both at the Permian, and the Jurassic-Lower Cretaceous level. As concerns the Triassic formation of the Sasca-Gornjak Unit, we showed (Strutinski et al. 1987) that the arenito-ruditic complex (Valea Vârâţi Conglomerate Member, cf. Bucur et al. 1994) reworked mainly medium-grade metamorphic rocks, including microclinic gneisses, widespread in the Getic basement, in contrast to the underlying Permian conglomerates in which only low-grade metamorphics of the Locva Series, occurring to the west, are reworked. These differences strongly suggest that the area of provenance of the debris accumulated in the Lower Triassic basin was situated to the east, and not to the west, as during Permian times. This may be interpreted in the sense that, whereas the Upper Paleozoic basin extended much to the east, in accordance with the areal distribution of the Permo-Carboniferous deposits within the Getic domain (Fig. 1), the Triassic depocentre was situated mainly to the west of the Oraviţa Lineament, its eastern confines extending only locally beyond it (Fig. 4a). The Triassic from Brădişorul de Jos fits this interpretation, as it probably belongs to the Reşiţa-Moldova Nouă zone, hence to the cover of the Getic Unit. Paleogeographically, however, it is obviously linked to the Triassic of the Sasca-Gornjak Unit, mainly occurring south of the Danube, from which it has supposedly been severed by a sinistral longitudinal transport along the Oraviţa Lineament. In this view, the Triassic occurrences from Sasca Montană and Moldova Nouă (Fig. 1) would represent tectonic slices marking the displacement trail (Fig. 4b). Another element in support of our transcurrency model is the absence of a Liassic formation in the northwestern part of the Reşiţa-Moldova Nouă zone, i.e. E and NE of Oraviţa. This means that the stratigraphic columns of the Jurassic from this zone and from the Sasca-Gornjak Unit south of the Danube (Năstăseanu & Maksimovic 1983) are apparently the same. Accordingly, the two or three "lenses" of detrital formations that occur between Oraviţa and Sasca Montană along the Oraviţa Lineament seem to represent dislodged slices of the Valea Vârâţi Conglomerate Member of Early Triassic age, rather than Lower Liassic deposits, as we find them figured on the maps (Maier et al. 1973; Năstăseanu et al. 1975). The first assumption is in good agreement with our hypothesis, while the latter had to accept the exotic nature of the slices, due to the absence of Liassic deposits in the undisturbed stratigraphic succession of the neighbourhood (Getic Unit).

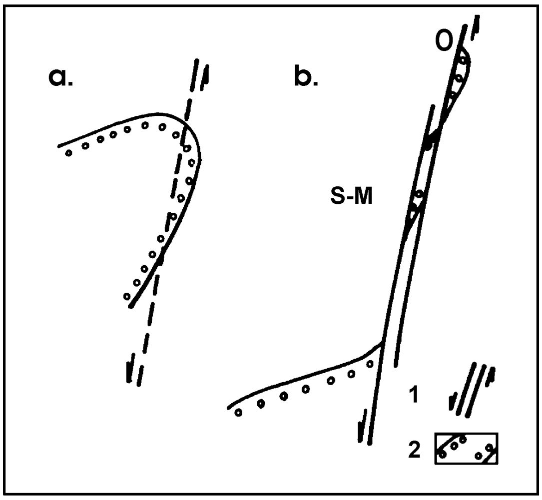
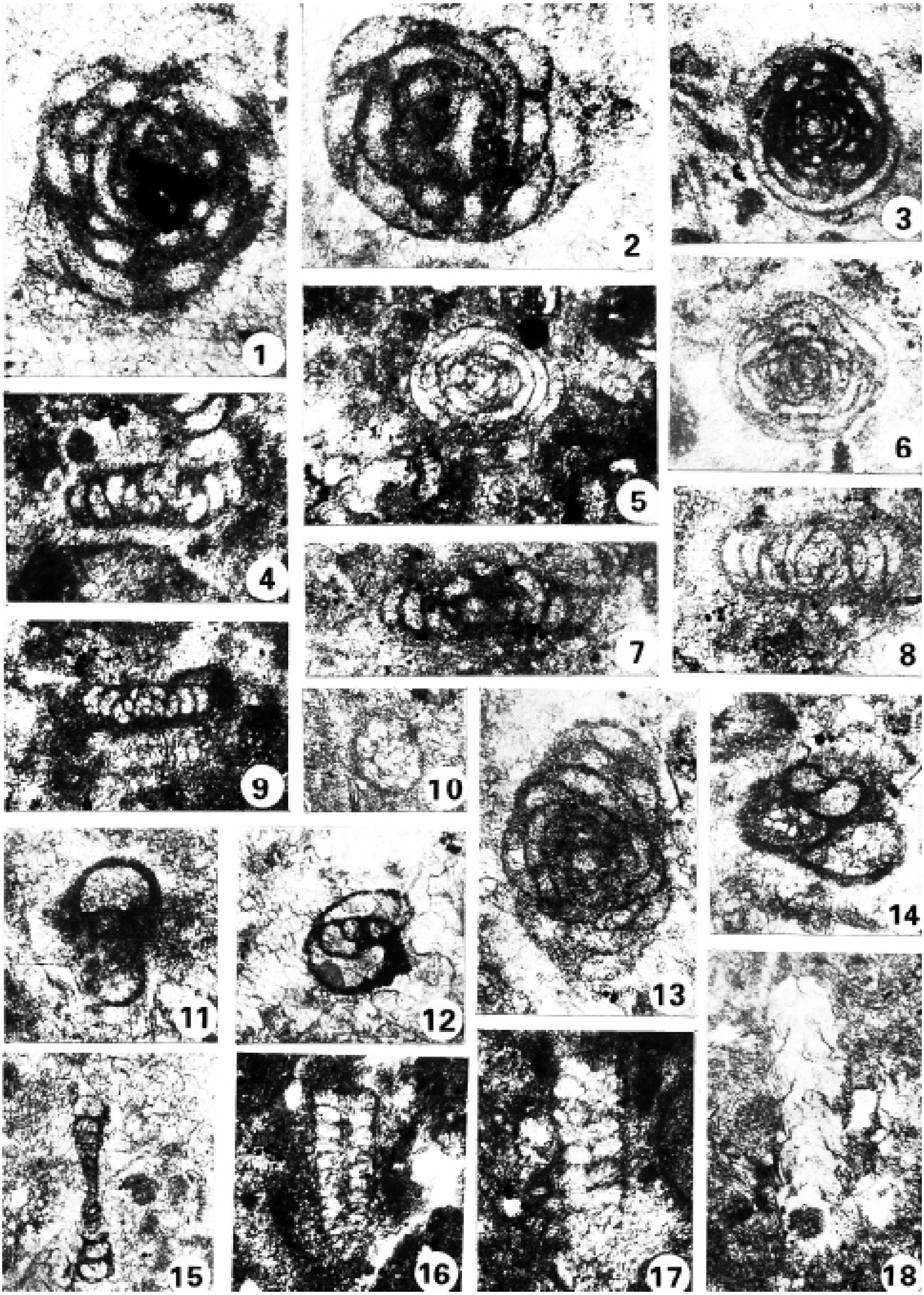


Fig. 4. Fragmentation of the Triassic according to the transcurrency hypothesis (not to scale). **a** — situation before the beginning of the activity along the Oraviţa Lineament; **b** — present situation. **1** — Oraviţa Lineament; **2** — margin of Triassic basin. **O** = Oraviţa; **S-M** = Sasa Montană-Moldova Nouă tract.

To conclude, the paleogeographic evolution in the area of junction between the Carpathides and the Balkanides does not favour the hypothesis of two distinct sedimentary realms (Grubic 1967), but, instead, suggests tilting about horizontal, most probably N-S directed, axes of the bottom of a single sedimentary basin, that brought about the shifting of the depocentre axes alternatively more to the east (during Late Paleozoic and probably Liassic times), or to the west (during the Triassic). As a consequence, some stratigraphic terms (Triassic, and Liassic, respectively) are generally confined to distinct parts of the basin, whereas others, of larger extent (e.g. Permian) show the same features irrespective of their position with regard to the Oraviţa Lineament. It would be difficult to explain these aspects by assuming the existence of two basins with an essentially different evolution. On the other hand, even accepting the idea of a single sedimentary basin, the E-W shortening hypothesis (e.g. Săndulescu, 1984), assumes a tectonic transport of the Sasca-Gornjak Unit across the basin elongation and the facies zones, thus requiring the juxtaposition, along the collision front (Oraviţa "line") of rocks that, if similar in age, would be dissimilar lithofacially. Such situations, which would support the thrust hypothesis, have not been found, anyhow. Besides, the thrust hypothesis is highly speculative, since most of the evidence for it is thought to be buried under the Supragetic domain.

Plate II: Figs. 1–4 — *Trocholina conica* (Schlumberger). *1* — sample 4769 (m.18.4), Bathonian, ×120; *2–4* — sample 4770 (m.19), Bathonian, ×60. **Figs. 5–7, 9–12, 14, 16** — *Glomospirella grandis* (Salaj). Sample 4783 (m.206), Valea Susara Limestone Member (Pelsonian); *5, 9–12, 14* — ×120; *16* — ×60. **Figs. 13, 15** — *Glomospirella* sp. Sample 4773 (m.90), Valea Cerbului Limestone Member (Illyrian-lower Ladinian), ×120. **Fig. 8** — *Glomospirella semiplana* Kochansky-Devidé & Pantič. Sample 4783 (m.2006), Valea Şuşara Limestone Member (Pelsonian), ×60.



The transcurrency model, is, by contrast, much more plausible from present surface and subsurface data. Beyond structural elements characteristic of strike-slip faulting, there are also paleogeographical reasons in favour of it. Thus, the similarity of facies on both sides of the Oraviţa Lineament points to the fact that the transcurrent movement took place subparallel to the basin elongation and the facies zones. Besides, the distance between the most northerly occurrences of Triassic formations south of the Danube (Gornjak zone) and the Triassic reported herein in the subsurface NE of Oraviţa (approx. 70–80 km), may be an indication of the amount of displacement along the Oraviţa Lineament. As regards the age of the lineament, it must be pre-Upper Cretaceous as it obviously served as a conduit for the Upper Cretaceous magmatites ("banatites") that are confined to the fault zone.

Conclusions

The investigation of the sedimentary pile crossed by the 471 borehole near Brădişorul de Jos (NE of Oraviţa, Southern Carpathians), proved the existence of a Triassic succession under a cover of Middle Jurassic limestones. The foraminifer assemblages provided by two samples allow us to ascribe the upper, calcareous, section of the Triassic deposits to the Middle Triassic (Pelsonian-lower Ladinian) and to correlate it with the Valea Şuşara and the Valea Cerbului Limestone Members of the Sasca Formation (Bucur et al. 1994). The lower, terrigeneous part of the succession, disturbed by faults, belongs most probably to the Lower Triassic, and may be correlated with the Valea Vârâţi Conglomerate Member (Bucur et al. 1994). The subsurface occurrence of Triassic deposits NE of Oraviţa makes it necessary to reappraise the geological structure of the region. It is considered that the Triassic from Oraviţa belongs structurally to the Reşiţa-Moldova Nouă zone, i.e. to the Getic Unit. Paleogeographically, however, it must be linked to the Triassic of the Sasca-Gornjak Unit to the west. Therefore, the paleogeographical evolution in the zone of junction between the Carpathides and Balkanides, points to a single sedimentary basin that was, already in the course of its evolution or afterwards, displaced sublongitudinally by the Oraviţa Lineament, regarded as an important transcurrent system. In this view, the Oraviţa Triassic represents the till now missing counterpart of the Triassic from Eastern Serbia, displaced from it counterclockwise by about 70–80 km. Along the displacement trail the Triassic deposits appear as dislodged slices, e.g. at Sasca Montană and Moldova Nouă. In spite of local overthrusts in the vicinity of the Oraviţa Lineament, the main features of the contact between the Getic and the Sasca-Gornjak units indicate that it is primarily a strike-slip structure.

Plate III: Figs. 1–3, 6 — *Pilammina* cf. *densa* Pantič. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian); *1, 2* — ×120; *3, 6* — ×60. **Figs. 4, 5, 7–9** — *Glomospirella triphonensis* Baud, Zaninetti & Brönnimann. Sample 4773 (m.90), Valea Cerbului Limestone Member (Illyrian-lower Ladinian), ×120. **Fig. 10** — *Meandrospira pussila* (Ho). Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian), ×120. **Fig. 11** —*Endotriada* sp. Sample 4783 (m.206), Valea Şuşara Limestone Member, ×120. **Fig. 12** — *Agathammina? iranica* Zaninetti, Brönnimann, Bozorgnia & Huber. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian), ×120. **Fig. 13** — *Glomospira?* sp. cf. *Glomospira? micas* He & Yue. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian), ×120. **Fig. 14** — *Trochammina almtalensis* Koehn-Zaninetti. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian), ×120. **Fig. 15** — *Ammodiscus multivolutus* Reitlinger. Sample 4783 (m.206), Valea Şuşara Limestone Member (Pelsonian), ×120. **Figs. 16, 17** — *Turriglomina mesotriasica* Koehn-Zaninetti. Sample 4773 (m.90), Valea Cerbului Limestone Member (Illyrian-lower Ladinian), ×120. **Fig. 18** — *Nodosaria skyphica* Efimova. Sample 4773 (m.90), Valea Cerbului Limestone Member (Illyrian-lower Ladinian), ×120.

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