

## THE WESTPHALIAN MACROFLORA IN RETEZAT MOUNTAINS: MAIN EVIDENCE FOR THE MESOZOIC AGE OF MOST ROCKS INCLUDED IN „THE TULIȘA SERIES” (SOUTHERN CARPATHIANS).

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**Abstract:** Beside the fossil remains and the parallelisms of lithofacies nature, one of the decisive arguments to support this age, as considered in relationship with the essential constituency of this series has been the identification, of a Westphalian macroflora within the lithostratigraphic unit placed in the basal part of the Tulisa Series from the Retezat Mountains.

**Key words:** Southern Carpathians, Retezat Mountains, Tulisa Series, Westphalian macroflora.

After the Tulisa Series had been defined as a Paleozoic entity (Pavelescu, 1953), there have been progressively included in this series all the weakly metamorphosed rocks (of Paleozoic and Mesozoic age), and even the highly metamorphosed crystalline schists of Proterozoic age, in Retezat Mountains and on the northern slope of Vâlcan Mountains. Also during this period, there have been additionally included in the Tulisa Series weakly metamorphosed rocks of various ages from other regions of the Southern Carpathians.

The Westphalian macro-flora in Retezat Mountains has been collected by Ion Stănoiu in the year 1975.

Therefore, on the Southern slope of this massive up in the sector stretching between Tulisa Peak and Serpilor Peak, at 3,5 km South of Tulisa Peak and at 0,5 km North of the Șerpilor Peak, and overlying the Carbonate-Graphitic Formation (showing a high degree of metamorphism), of the Lainici-Paiusi Group (Precambrian-?Cambrian), lies discordantly the Valea de Brazi Formation of about 100 m in thickness. Above this formation some crystalline schists and intensely metamorphosed granitoid rocks develop tectonically. In its basal part one can individualize the Stana Bradului Member (of some 10 m in thickness), characterized by lenticular breccia and serniphitic conglomerate (probably laminated especially as a consequence of the tectonic activity), encompassing micaschists and paragneiss elements. In the upper part stands out the Culmea Serpilor Member (up to 150 m), predominantly constituted of black graphitous metapsephites (with vegetal remains), and grey lithic metapsmites metariolites (Stănoiu, 1982a, Stănoiu et Lejal-Nicol, 1983) plus rare metapsephites interbedded. The macrofloristic association indicating the Westphalian, originates from the black metapellits of Culmea Serpilor and consists of *Odontopteris brardi* Brongniart, *O. gimmi* R et W. Remy, *Odontopteris* sp., *Cyclopteris* sp., cf. *Neuropteris heterophylla* Brongniart, *Neuropteris obliqua* Brongniart, *N.aff.ovata* Hoffmann, *N.aff.hollandica*

Stockmans, *N.aff.schlehani* Stur, *N.aff.auriculata* Brogniart, *N.aff.tenuifolia* Schlotheim, *Neuropteris* sp., *Neuraethopteris* sp., *Pecopteris* sp., *Reticulopteris* sp., *Lonchopteris* aff. *petiti* Buisine, *L.aff.rugosa* Brongniart, *Lonchopteris* sp., *Ginkgophytopsis flabellata* (Lindley et Hutton) Hoeg, *Ginkgophytopsis* sp. and *Cordaites* sp. This trees macro-vegetation assemblage, comparable to the Westphalian macroflora that occurs in the north of France and in the Ruhr Basin, indicates a tropical wet climate environment. The species *Lonchopteris rugosa* and *Neuropteris holandica* are index fossil biozone and subzone from Duckmantian (inferior part of the Westphalian): Cleal (1991).

The most part of the Westphalian Macroflora, from the basal part of the “Tulisa Series”, is different and older than the Westphalian Macroflora mentioned by Dragastan et. al. (1997) and other authors, in Southern Carpathians.

The indicated macrofloristic assemblage has been originally ascribed, provisionally (Stănoiu, 1982a), to the Devonian.

The Westphalian macroflora considered in the present paper (sampled from the bottom section of the Tulisa Series, that unconformably overlies the highly metamorphosed Proterozoic crystalline schists) has provided the main evidence in support of the Mesozoic age of most of the rocks included within the Tulisa Series.

Subsequently to the Westphalian macroflora identification, a paper accompanied by a geological map was prepared (Stănoiu and Lejal-Nicol, 1983) and submitted to the Editing Committee of the publications of the Geological Institute in Bucharest. That paper illustrated the fact that most rocks included within the Tulisa Series (of Paleozoic age) in the Retezat and Vâlcan Mountains lies discordantly above the Valea de Brazi Formation and were the very weakly metamorphosed counterpart of the Mesozoic (from Liassic to Late Cretaceous included) sedimentary rocks in the Cerna Zone in the Mehedinți Mountains and on the southern slope of Vâlcan Mountains.

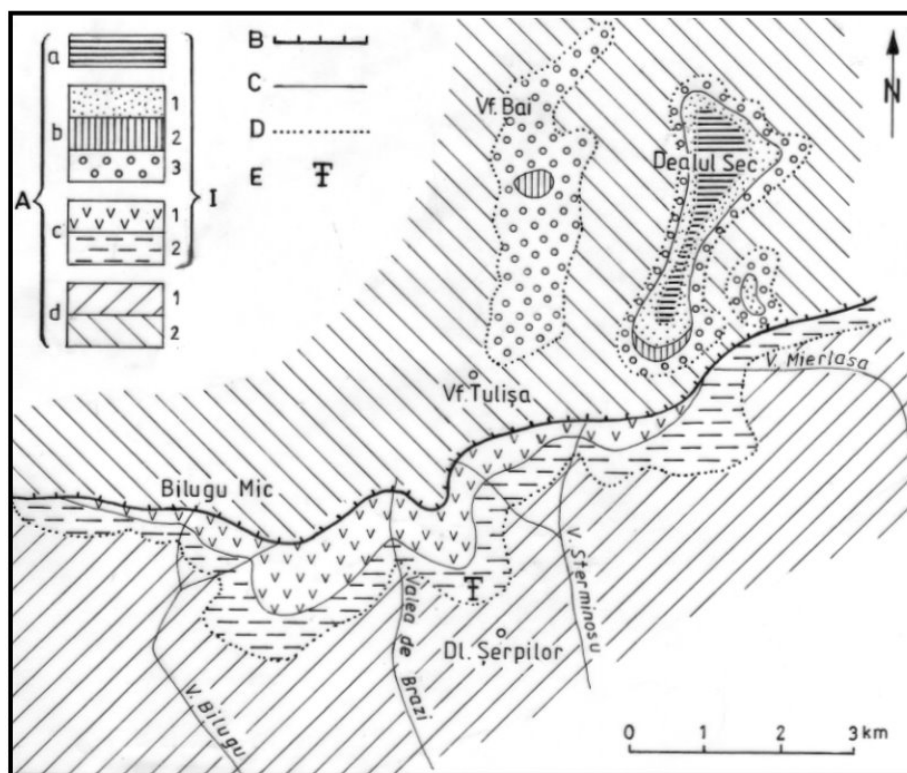
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After the Tulisa Series had been defined as a Paleozoic entity (in the year 1953), there have been progressively included in this series all the weakly metamorphosed rocks (of Paleozoic and Mesozoic age, and even the highly metamorphosed crystalline schists of Proterozoic age) in Retezat Mountains and on the northern slope of Valcan Mountains. Also during this period, there have been additionally included in the Tulisa Series weakly metamorphosed rocks of various ages from other regions of the Southern Carpathians. The Westphalian macro-vegetation considered in the paper (sampled from the bottom section of the Tulisa series, that disconformably overlies the highly metamorphosed Proterozoic crystalline schists) has provided the main evidence in support of the Mesozoic age of

most of the rocks included within the Tulisa Series.

On the northern slope of Valcan and Parang Mountains, under the crystalline schists of the Godeanu Nappe and above the Danubian rocks, there occur entities which correspond, although the more intensely transformed (subject to strong tectonic actions and weakly metamorphosed), to the Obarsia Unit rocks (green schists with meta-basites and lens that include : serpentinites; meta-radiolarites; red and green meta-shales; rocks of the Sinaia and the Azuga Formations type) and to the Firizu Unit (the Azuga and the Sinaia Formations), that have been provisionally categorized as "the Puru Nappe" (Stănoiu, 1984; Stănoiu et al., 1996-1997) , a unit which Voitesti (1923) had inferred to exist.



**Figure 1** Geological map of the Tulișa Mountain region.

A – Cerna Unit. I – Tulișa Series. a – Danubian Trench Basin (Dealul Sec Formation; Upper Cretaceous metapelites, metapsamites, metapsephites). b – Cerna Basin: 1- Dealul Cornetului Formation (Upper Jurassic – Lower Cretaceous recrystallised limestones with the crinoidal stem); 2 – Coasta Laturii Formation (Middle Jurassic metapsamites); 3 – Varful Bai Formation (Lower Jurassic metapelites, metapsamites, metapsephites). c – Variscan Molase: 1 – Culmea Bradului Formation (Upper Paleozoic metapelites, metapsamites, metapsephites, metariodacites, milonites); 2 – Valea Bradului Formation (Westphalian: Duckmantian...; metapelites, metapsamites, metapsephites). d – Proterozoic crystalline schists: 1 – Lainici – Păiuș Group; 2 – Drăgșan Group. B – overthrust plane. C – lithologic boundary. D – unconformity boundary. E – fossiliferous site.

Among the most significant paleontological, stratigraphic and tectonic pieces of information that have substantiated the new stratigraphic and tectonic image of the Tulișa Series

(Stănoiu, in press) one has to mention the following: Mesozoic (Triassic - ? Liassic) fossils have been identified within certain limestone lens associated to the final part of the Tulișa

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Series on the northern slope of Vâlcan Mountains (Solomon et al., 1976); a rich macroflora and macrofauna assemblage of Liassic age has been identified within rocks (the Vidruța-Răstovanu Formation) that were ascribed to the Tulișa Series (of Paleozoic age) on the northern slope of Vâlcan and Parâng Mountains (Stănoiu, 1982b); a Westphalian age has been ascertained for macroflora sampled by Ion Stănoiu from the bottom part of the Tulisa Series in Retezat Mountains (Stănoiu and Lejal-Nicol, 1983, 1997); the major stratigraphic and tectonic details on the Tulișa Series outlined in the case of the northern slope of Parang and Vâlcan Mountains (Stănoiu, 1984, in Stănoiu, 1997 and Stănoiu et al., 1966-1967); the major stratigraphic and tectonic details on the Tulisa Series outlined in the case of the northern slope of the Vâlcan Mountains (Berza et al., 1988 b).

Finally, the conclusion which many researches (Ghika-Budești, 1934; Manolescu; 1937; Pavelescu et Răileanu, 1963; Solomon et al, 1976; Stănoiu, 1976, 1982 a, 1982 a, 1982b,

1984, 2000; Berza et al., 1988a, 1988b; Stănoiu et Lejal-Nicol, 1983, 1997; Stănoiu et al. 1996-1997 etc.), concerned with the studying of Tulisa Series have arrived at, pointed out that the stratigraphic succession of this so-called "series" is mostly of Mesozoic (Jurassic and Cretaceous) age.

There has been noticed that the lithostratigraphic units which had been ascribed to the Tulișa Series on the northern slope of Vâlcan and Parâng Mountains display an age and a stratigraphy similar to that described by Manolescu (1937), Paliuc (1934) and Ghika-Budești (1934) before the year 1953.

On the southern slope of Vâlcan Mountains, outside the areal of „Tulișa Series”, inside the areal above which lies the „Schela Formation” (Semaka, 1963:With a rich Liassic Macroflora) are outlying? (Semaka, 1963) rocks with Upper Carbonifer plants remains. These rocks with Upper Carbonifer plants remains were assigned by Dragastan (in Dragastan et. al., 1997) to Vaidei Formation.

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