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NEW JURASSIC CALCAREOUS ALGAE FROM CARPATHIAN CARBONATE PLATFORMS AND NEW TAXONOMICAL SUBDIVISIONS OF CLASS BRYOPSIDOPHYCEAE

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Abstract. Some new taxa of Late Jurassic calcareous algae, Class Bryopsidophyceae, Family Pseudoudoteaceae were described from the Getic and Central Transylvanian Carbonate Platforms as follows: *Pseudoudotea silvanensis* n. sp., *P. bortzii* n. sp., *Carpathea llewellyae* n. gen., n. sp., *Silvanella coronata* n. gen., n. sp. and *Bancilaea claviformis* n. gen., n. sp.
The biostratigraphic value of some Bryopsidophyceae algal - biozones was proved and defined for the Late Jurassic - Early Cretaceous sequence from the Bicaz Gorges (East Carpathians), Transylvanian Carbonate Platform.
The new tribes of Family Pseudoudoteaceae, Avrainvilleaceae and Rhipilliaceae were introduced.

Key words: *Bryopsidophyceae, Jurassic algae, Systematics, New taxa, New tribes, Biostratigraphical significance.*

INTRODUCTION

In the Romanian Carpathians and in the territory of its southern foreland - the Moesian Platform -, the Late Jurassic - Early Cretaceous displays various facies, different algal - flora accompanied by many other microfossils.

The reconstructed paleogeographic image of the territory embracing the Carpathians area and the Moesian Platform was drawn by Patrulius (1972), Patrulius *et al.* (1976). In his opinion, this territory "looks like a mosaic of carbonate platforms", including shelf and through basins, but the original picture has been much distorted and blurred by subsequent orogenies resulting in overthrusts. Within the East Carpathians a large outliner is represented by the Hăghimaş Nappe originating in the Central Transylvanian Carbonate Platform (Bicaz Valley, Ghilcoş Massif) during a mid - Cretaceous event. On the other hand, the large olistholites within Bucegi Mts., had a source area of limestone in the Getic Carbonate Platform (Figure 1A).

GEOLOGICAL SETTING, JURASSIC STRATIGRAPHY AND MICROFACIES

The large Getic Carbonate Platform covers from west to east different outliers of the Getic Nappe, like Vânturariţa Massif, the limestone of Piatra Craiului Massif, the Dâmbovicioara Basin (including Dâmboviţa Valley, Giuvala) and Piatra Mare - Postăvaru Massif, as well as the olistholites from the eastern slope of the Bucegi Massif (Figures 1B - C).

2.1. The olistholites distributed within eastern slope of the Bucegi syncline, part of the Getic Carbonate Platform

The limestone olistholites in this area have different ages (Triassic - Cretaceous) and originate from various limestone facies, which evolved in the eastern part of the Getic Carbonate Platform.

The olistholites have small or large volumes and appear like "segments" cut mainly from the Dogger - Malm stratigraphic sequence. Few olistholites resulted from sequence of Berriasian, Valanginian or Barremian - Early Aptian age.

The olistholites were incorporated in the Albian molasse deposits (Patrulius, 1969), or in the Neocomian - Barremian - Aptian flysch deposits distributed mainly on the eastern slope of the Bucegi Massif.

The stratigraphic sequence of the Middle and Late Jurassic can be studied within olistholite A, the biggest "boulder" outcropping in the Peleş Valley near Sinaia (Figure 1C).

The Middle Jurassic sequence begins with grey sandstone interbedded with marl containing *Bositra buchi* and *Macrocephalites macrocephalus* being of Late Bathonian - Early and Middle Callovian in age (Patrulius, 1969). The clastic sequence is covered after a disconformity by Oxfordian radiolarite, a

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siliceous condensed phase. The Kimmeridgian also corresponds to a condensed facies of Ammonitico Rosso, nodular limestone with *Aspidoceras acanthicum*, followed by a micrite - pelmicrite limestone with *Saccocoma* debris - plates and Microfilaments.

The transition from the Ammonitico Rosso slope - basinal facies to a shoal - shelf facies including oosparite and pelsparite took place during the Late Kimmeridgian.

The assemblage of algae and microfossils recorded for this time - interval in olistholite A is similar with the one found in olistholite C, which includes *Rivularia pumili* Dragastan (Cyanophyceae), *Garwoodia fissa* Dragastan, *Silvanella coronata* n. g., n. sp. (Bryopsidophyceae), *Valvulina alpina* Dragastan (Foraminiferida) and *Tubiphytes morronensis* Crescenti, *Aeolisaccus tintinniformis* Misik (Microproblematicae).

The Tithonian deposits of olistholite A include an assemblage comparable to the one in olistholite D. The limestone contains levels of pelmicrosparite and oncosparite with interlayer of biostromite, abundant in small *Nerinea* and *Pileolus*.

Bryopsidophyceae (*Pseudoudotea silvanensis* n. sp., *P. bortzii* n. sp., *Garwoodia bardosi* Dragastan) and miliolids dominate the algal assemblage. The age of this assemblage is Early Tithonian (Figure 2).

Towards the middle part of olistholite A, the sequence includes limestone micrite, intrasparitic breccia interbedded with very thin beds of oncomicrite (1 - 2 cm). The assemblage found for this time-interval can be compared with the one in olistholite E, which is poor in taxa, but has numerous specimens of *Paraortonella richteri* Dragastan (Syctonemataceae), *Valvulina alpina* and small oncoids.

Due to difficulties related to the topography of the outcrop, the last part of the sequence in olistholite A is not clear, being interrupted.

The algal assemblage of olistholite A is comparable with the one in olistholite B and contains: *Garwoodia bardosi* Dragastan (Pseudoudoteaceae), *Arabicodium jurassicum* Dragastan (Udoteaceae), *Textularia jurassica* Gümbel, *Aeolisaccus tintiniformis* Misik and *Tubiphytes morronensis* Crescenti. The age of the assemblage is Late Tithonian.

Garwoodia fissa, considered a stenotipic species found in pelsparitic bioclasts in the subtidal, semi - restricted distal lagoon and accompanied by *Rivularia pumili* (Rivulariaceae), confirmed the distribution of these taxa on the lagoon - shelf carbonate platform (Dragastan *et. al.*, 1998).

The new taxa of genus *Pseudoudotea*, *Silvanella* n. g., *Carpathea* n. g., as well as *Garwoodia bardosi*, are representative for subtidal, proximal lagoon facies, together with miliolids and "cluster" of biostromite built by *Nerinea* and *Pileolus*.

2.2. Central Transylvanian Carbonate Platform (eastern area)

The Central Transylvanian Carbonate Platform has produced some sections - sequences of the large tectonic outliers like the Hăghimaş Nappe (Săndulescu, 1967, 1984; Grasu, 1971; Dragastan, 1971, 1975) (Figure 1A).

In the Hăghimaş Nappe (Bicaz Gorges included) the Late Jurassic - Neocomian deposits belong to the following lithostratigraphic units:

- The **Ghilcoş Formation** Dragastan, 1997 corresponds to a slope basinal facies composed by red nodular limestone (Ammontico Rosso), interbedded with grey - greenish, bioturbate shally - sandstone and a rich fauna of ammonites. The "Acanthicum" Beds cover the stratigraphic time - interval including Platynota - Lithographicum to Ulmense biozones (Dragastan, 1975). The Ghilcoş Formation has a Kimmeridgian - Early Tithonian age.

- The **Făgetul Ciucului Formation** Dragastan, 1997 begins with ferriferous limonitic crust corresponding to a hardground, which passes to bioclastic, breccia limestone and to a reef barrier facies with Actinostromaria - Parastromatopora and Lithocodium of Late Tithonian age.

The Jurassic - Cretaceous boundary represents some sequences of shallow carbonate facies with pelagic - planctonic interferences containing Callpionellids and has a Tithonian (terminal) - Early Berriasian age. During the Late Berriasian sedimentation changed to a grainstone - bindstone facies with *Lithocodium aggregatum* accumulated on a reef - flat area. This facies passes to the *Cladocoropsis cretacica* - *Leviathania* back - reef lagoon facies. At its end, the Hauterivian sequence presents a brackish - lacustrine fresh water facies with *Favreina* and *Charophytes* (Figure 3).

2.2.1. Late Jurassic - Early Cretaceous calibration and algal - biozones.

Taking into account the rich microflora of calcareous algae and the calibration of samples reported from the Făgetul Ciucului Formation in the Bicaz Valley (Hăghimaş Nappe), the following algal biozones are introduced now:

Cyanophyceae

(using only taxa from this rank).

1. *Ortonella robusta* and *Paraortonella nitida* Biozone - Early to Late (basal) Tithonian (Figure 3);

2. *Rivularia moesica* Biozone - Late (middle part) Tithonian;

3. *R. globosa* Biozone - Late (terminal part) Tithonian and

4. *Ortonella lemoineae* Biozone - Berriasian - Early Valanginian.

This biozone can be used to draw the Jurassic - Cretaceous boundary.

Bryopsidophyceae

Family Pseudoudoteaceae

The taxa of Ancestral ecorticatae group of Pseudoudoteaceae have the following succession and time-interval:

1. *Garwoodia polytomica* Biozone - Late Tithonian;

2. *Hedstroemia orientalis* Biozone - Late Tithonian (middle part);

3. *H. exiguua* Biozone - Late Tithonian (upper part, but not terminal);

4. *H. hansi* Biozone - latest (terminal) Tithonian;

5. *H. villosa* Biozone - latest Berriasian - Early Valanginian and

6. *H. clavata* Biozone - Valanginian (midddle and upper parts).

The taxa of Ecorticatae - Partial corticatae and Corticatae groups of Family Pseudoudoeaceae present the following succession and time - interval:

1. *Hansiella fibrata* and *Niteckiella flabelliforme* Biozone - Late (basal) Tithonian;

2. *Bicaziella radiata* Biozone - Late (middle part) Tithonian;

3. *Margueritiella densa* Biozone - Late (middle part) Tithonian;

4. *Hasmasiella aggregata* and *Cupasiella juberiae* Biozone; these species corresponds with the lower boundary of biozone and *Bicaziella jurassica* appeared to the upper part indicated the upper boundary of biozone. The age of this biozone is Latest Tithonian and

5. *Pseudohedstroemia fasciculata* Biozone - Valanginian.

Family Halimedaceae

Among Halimedaceae only some taxa can be used to establish time - intervals for the Tithonian - Neocomian interval as follows:

1. *Palaeoporella tubulata* Biozone - Late (basal) Tithonian;

2. *Fagetiella angulata* Biozone - terminal Tithonian or appeared "near" the Jurassic - Cretaceous boundary and

3. *Pinnatiporidium cylindricus* Biozone - Early Valanginian.

Chlorophyceae

The taxon *Toomeyiella composita* of Family Chaetophoraceae is a good marker for the Berriasian - Valanginian boundary.

The definition of these algal biozones having different time - intervals is an attempt to use calcareous algae (other than Dasycladaceae) for a "fine", biostratigraphic scale.

SIPHONOUS - GREEN ALGAE - RECENT TAXONOMICAL APPROACHES

During the last years new data about the Siphonous - green algae accumulated, also including molecular biology for taxa with calcareous or non calcareous thalli, but not encompassing all 29 Recent genera of *Bryopsidales*; some taxonomical matters still remain unsolved. Silva (1993) shows that "the goal of taxonomy is not merely to provide names for all organisms. Of foremost importance is the use of taxonomic structure as a framework to which is attached, at appropriate places, all biological information, from whatever source, whether organismal or molecular... Taxonomy is not a science, but an art that involves subjective interpretation of innumerable objective data. The subjectivity of interpretation is influenced by numerous factors related both to the context (time, place, taxonomic group) and the interpreter (ability, training, experience, personality, interests, goals)".

The task is more difficult for fossil taxa of Bryopsidales. After Elliott (1984), a fossil is defined as the remains of a once - living organism, naturally buried and more or less mineralized in a process of fossilization, which affects the debris and implicitly the classification of algal material. The original calcification of living green algae is sometimes aragonitic or calcitic depending on the taxon or group of algae, but many taxa are non - calcareous.

Fossil Udoteaceae were for a long time considered to be Codiaceae, in contrast with many up to date arguments and features which argued that the recent family Codiaceae comprises a single genus, *Codium*, with over 120 species, having a multiaxial thallus, uncalcified and has an anatomical structure, which is different as internal morphology from that of genus *Udotea* (Silva, 1982, 1993; van den Hoeck *et. al.*, 1995).

Moreover, fossil Udoteaceae sensu Bassoullet et. al. (1983) also include genus *Halimeda*. But genus *Halimeda* corresponds to the type of the family Halimedaceae that was largely accepted by Hillis Colinvaux, 1984, 1986; Silva, 1993; van der Hoeck *et. al.*, 1995; Silva, Basson & Moe, 1996 and Littler & Littler, 1997.

The Tokyo Code (Greuter *et al.*, 1994) has provisions for retaining a name in current use when new information regarding the taxon in question and / or its nomenclature would result in the adoption of another name.... but the

taxonomists should remain free to decide whether a name is sufficiently important to warrant special treatment that overrides the rigidity in botanical nomenclature (Silva, 1996).

Three "taxonomical" systems are (still) in use for the identification and classification of fossil Bryopsidales:

- the system which includes the majority of algae having thalli crossed by "filaments" or branched tubular siphons (dicho- or polytomic), into the "bag" type - *Porostromata sensu* Pia, in Hirmer (1927). This classification system was improved in time by Mamet & Rudloff (1972), Monty & Mas (1981), Mamet & Roux (1981), Schäffer & Senowbari - Daryan (1983), Flügel et. al. (1991 ă 1992), Dragastan (1988, 1989, 1990, 1991) and Freytet (1997, 1998), for algae of non - marine facies. They attributed some taxa (*Girvanella, Ortonella, Paraortonella, Mitcheldeania*) to Cyanophyceae, and *Hedstroemia, Garwoodia* to filamentous Codiaceae - Chlorophycophyta (Bourque, Mamet & Roux, 1981; Mamet, Roux & Nassichuk, 1987; Roux, 1985; Richter, Dragastan & Gielisch, 1992) and more recently to Bryopsidales, family Pseudoudoteaceae (Dragastan *et. al.*, 1997, 1998);

- the system which tries to establish the position of some fossil taxa by comparison with the morphology and internal structure of thalli of recent taxa of Green - siphonous algae, correctly attributed to Bryopsidales by Tappan (1980). This method and the system of classification were resumed and developped afterwards by the introducing of an original system for Paleozoic (partly) and Mesozoic fossil genera, by Dragastan *et. al.* (1997, 1998).

An unanimously accepted classification system of recent algae is the one introduced by Silva, Basson & Moe (1996). This system distinguishes in Bryopsidales several families: Bryopsidaceae (*Bryopsis, Derbesia, Pedobesia, Trichosolen*), Caulerpaceae (*Caulerpa*), Codiaceae (*Codium*), Dichotomosiphonaceae (*Dichotomosiphon*), Halimedaceae (*Halimeda*), Pseudocodiaceae (*Pseudocodium*) and Udoteaceae (*Avrainvillea, Cladocephalus, Boodleopsis, Chlorodesmis, Cladocephalus, Penicillus, Pseudochlorodesmis, Rhipidosiphon, Udotea, Rhipilia, Rhipiliopsis* and *Tydemania*) and

- the "open" taxonomical system applied to marine and mostly to non - marine of Permian to Holocene algae (Reis, 1923 and Freytet, 1997, 1998). In the opinion of Freytet, "the attribution of a fossil form to a modern group can be quite difficult". Freytet "adopted for each species or genus a system suggesting several possible modern analogues, keeping in mind the similarites caused by diagenesis and the convergent phenomena that produce the same type of crystals in different groups".

In "Cladisticts of the Bryopsidales: a preliminary analysis", Vroom, Smith & Keeley (1998) use for the classification of the 29 taxa of this order, all important features, as follows: attachement modes of thalli, vegetative morphology of blade and stipe, anatomy of the thallus (uni- multiaxial, siphons, type of branching, constriction, septae, trabeculae, ecorticate - corticate), calcification, life history and cellular components.

Although Udoteaceae are considered to be a monophiletic group which includes among others genera *Udotea, Penicillus, Fabellia* (see Silva *et al.*, 1996), we consider that the separation of family Halimedaceae with type *Halimeda*, as shown by Silva, 1993 and Silva, Basson & Moe, 1996, is useful and supported by the "segmented" character of the thallus as a final stage within the evolutive line of suborder Halimedineae.

Furthermore, the maintaining of genera *Avrainvillea, Cladocephalus* and *Rhipilia* within family Udoteaceae is "forced", even though Vroom *et al.* (1998) show that the first two genera "are distinct members of Udoteaceae", while the third "could be also distinct".

Considering the thallus morphology of the fossil genera *Mitcheldeania, Pseudomitcheldeania, Nansenella, Suhardiella* or *Niteckiella*, which have branched siphons, with constrictions similar to those present in *Avrainvillea* (Littler & Littler, 1992), were introduced to the family Avrainvilleaceae nov. fam. Dragastan *et al.*,1999 (non,1997), whereas the fossil genera *Baratangia* and *Dendronella* were assigned to the family Rhipiliaceae nov. fam. Dragastan *et al.*, 1999 (non, 1997). The type genera of this families being Recent genera, the diagnosis of the families had to be done in Latin and is presented in 1999 in the paper of Dragastan & Richter (in press). The diagnosis in English for these 2 families was presented in Dragastan *et al.*, 1997.

A most important argument is that emphasized by Littler & Littler (1990), that for this order the ancestral, primitive type represents the starting point of a clear evolutive lineage which begins with the flabellate - unistratose type of genus *Udotea*.

Vroom *et al.* (1998) show that "a logical progression from solitary stipitate blades seen in this group would be the formation of blades, such as those in *Rhipocephalus*, where several flabellate blades arose from a single stipe. From *Rhipocephalus*, deconstruction of flabellate morphology to individual siphons to form a *Penicillus* type of morphology seems plausible". The terminal evolutive stage during

this line is that represented by the segmented thalli of *Halimeda* and *Tydemania*.

If transfer this hypotethical evolutive line to the fossil siphonous - green algae, respectively to Pseudoudoteaceae, the solitary blade of the ancestral ecorticatae type originated in the Cambrian (*Filaria, Fistulella, Kenella*) and continued during the Ordovician - Permian by genera *Hedstroemia, Garwoodia, Pseudohedstroemia*, being plausibly comparable with the ecorticatae or partial corticatae thalli of *Udotea*.

During the Mesozoic appeared also pseudoudoteacean algae including many species of genera *Hedsrtoemia, Garwoodia, Bicaziella, Franconiella* or *Hansiella*, the last 3 genera having a partial - or corticatae inner structure (Dragastan *et al.*, 1997).

The Halimedaceae composed of segmented thalli evolved probably also from the Ordovician by genera *Lowvillia, Dimorphosiphon, Palaeoporella*, but sure from the Permian - Triassic, by genus *Saxonia* introduced by Gebhardt & Schneider (1993) and by *Halimeda soltanensis* by Poncet (1989), both from the the Permian and by *Halimeda marrondei* (Flügel, 1988) from the Triassic.

During the Cretaceous - Recent interval many fossil and Recent species of genus *Halimeda* were recorded (Dragastan & Bucur, 1979; Bassoullet *et al.*, 1983; Herbig, 1986, Kuss & Conrad, 1991, Okla, 1992).

The study of Vroom *et al.* (1998) "emphasizes the difficulties in determining evolutionary relationships in the Bryopsidales using existing data" and in understanding finally the trends of evolution within this complex and ancient group.

PALAEOALGOLOGICAL DESCRIPTIONS

Phylum **CHLOROPHYTA**
Class **BRYOPSIDOPHYCEAE** Round, 1963
Order **BRYOPSIDALES** Schaffner, 1922
Family **PSEUDOUDOTEACEAE** Dragastan *et al.*, 1997

Ecorticatae Group
Pseudoudoteae nov. tribe

Thallus "blade" hemispherical, nodular, fan shaped, more or less flattened, simple or composed of "flabellae" crossed by dichotomic branched siphons, sometime tapering to the distal end; the siphons cylindrical, sheath perforated.

Remarks: Taking into account, the original diagnosis of family Pseudoudoteaceae Dragastan *et al.*, 1997, in this paper we used and added the term "blades" for thalli comparing with Recent morphology of species, of genus *Udotea* including also the dimensional data (width, length or height and thickness of "blades"). The dimensions (mainly of thickness) of Recent *Udotea* species are variable under 1 mm. and maximum 10 mm. The dimensions of Pseudoudoteaceae thalli are very small comparing with Recent species of genus *Udotea*.

Genus ***Pseudoudotea*** Dragastan *et al.*, 1997

Pseudoudotea silvanensis *n. sp.*

Plate 1, Figures 1 - 9

Derivatio nominis: "Silvanensis", species dedicated to Prof. Dr. Paul C. SILVA of Berkeley University, University Herbarium, California, for the major scientific contributions to the knowledge of many taxonomical phycological groups.

Holotype: Plate 1, Figure 1, Tithonian, Olistholite D, Sample 38 D, Bucegi Mts., Getic Carbonate Platform, Coll. L. P. B. V, No. 0789

Isotypes: Plate 1, Figure 3 - 9, Tithonian, Olistholite B and Kimmeridgian, Olistholite C, Bucegi Mts. and Dâmbovița Valley, Getic Carbonate Platform, Coll. L. P. B. V, No. 0790 - 0793; 0795.

Diagnosis: Thallus "blade" oblong or elliptical having 2 small lobes developed laterally and a tendency to be flattened. No anchoring system was observed.

The "blade" is crossed by dichotomical branched siphons growing more in diameter distally. The shape of siphon in vertical section is cylindrical being very large to the distal end. In cross section, the siphons have a subpolygonal contour and a large diameter. The sheath - wall calcified (microgranular calcite) and perforate. Between the walls of siphons there is a junction line, sometimes filled with microcrystalline calcite and presents interval - pores vertically disposed to the corner of the siphons.

Description: Thallus "blade" oblong or elliptical with a tendency to be laterally flattened, having 2 lobes, more or less symetrical disposed to the axis (Figure - Text 4a, Plate 1, Figure1). The degree of flattening is half of the thickness of the blade (Plate 1, Figure 5).

The thallus "blade" is crossed by dichotomic branched siphons. The siphons have a cylindrical shape in the vertical - axial section showing an irregular traject of walls (Figure - Text 4c; Plate 1, Figures 1, 2, 5).

The sheath - walls of the siphons were formed by microgranular calcite (Plate 1, Figure 2). In the vertical section the sheath - walls of the siphons became very thin and interrupted by pores (Figure - Text 4c, Plate 1, Figure 2). In the cross section the siphons present a sub-

polygonal shape, having a large lumen (Plate 1, Figure 9). The lumen was filled by coarse crystalline calcite (sparite) surrounded by microcrystalline calcite (Figure - Text 5, Plate 1, Figures 7, 9).

Between the sheath - walls of the adjacent siphons at this species appeared an empty - space filled with microcrystalline calcite so call "junction" line (Figure - Text 5).

In the cross section the "junction" line was filled by microcrystalline calcite and sometime to the corner of "polygon" siphon appeared isolate a "pore - corner", or a cavity, which is vertically disposed (Figure - Text 5, Plate 1, Figure 9).

The structure of the sheath - walls and the presence of "corner pores" between adjacent siphons are characteristic features of the species.

Dimensions in mm:

Width of thallus (W) = 2.10 - 2.60; Thickness of thallus – "blade" (Thb) = 1.0 - 1.20; Height of thallus (H) = 1.20 - 1.50; Diameter of the siphons: in basal part (db) = 0.040 - 0.050, in distal part (dd) = 0.080 - 0.150; Thickness of sheath - wall (thw) = 0.010 - 0.015; Thickness of sheath - double - walls (thdw) = 0.020 - 0.040;

Diameter of "corner pore" or cavity in the sheath - wall (dcp) = 0.010 - 0.020

Remarks: Pseudoudotea silvanensis n. sp., represents a Late Jurassic stock different from the Late Triassic (Norian) stock composed of *P. magna* Dragastan *et al.*, 1997, *P. granucalcarata* Dragastan *et al.*, *P. mediterranea* (Herak).

The Late Triassic *Pseudoudotea* species present one hemispherical "blade" (or flabellum).

The *P. magna* has a "blade" crossed by dichotomic branched siphons with a large diameter (Table 1) and interspaces between adjacent siphons (see Plate 8, Figures 9 - 10, in Dragastan *et al.*, 1997). *P. granucalcarata* and *P. mediterranea* also from Late Triassic have one hemispherical "blade".

The first species presents dichotomic branched siphons, medium, large in diameter, long and straight, heavy calcified different by inner structure of the sheath - walls. The second species shows a small "blade" crossed by dichotomic - branched siphons with thin, compact calcite sheath - wall, perforate.

By shape of siphons and the inner structure of sheath - walls, perforate and "corner pores" between polygonal adjacent siphons, *P. silvanensis* n. sp. presents distinctive features in comparison with some Triassic Pseudoudotea species.

Table 1. Dimensional data of some species of genus *Pseudoudotea*.

	Dimensions in mm					
Pseudoudotea taxa and age of deposits	**W**	**Thb**	**H**	**Db**	**dd**	**thw**
P. littlerorum nomen correct., Dragastan *et al.*, 1998 (Norian)	1.0	0.60 - 0.80	0.80	0.030	0.10	0.020 - 0.050
P. granucalcarata Dragastan *et al.*, 1997 (Norian)	1.70 - 3.0	-	1.66 - 3.70	0.030 - 0.050	0.060 - 0.070	0.010 - 0.020
P. magna Dragastan *et al.*, 1997 (Norian)	1.80 - 2.0 (4.50)	1.0 - 1.20	2.80 - 3.20 (6.20)	0.050	0.070 – 0.10	0.020 - 0.050
P. mediterranea (Herak), Late Triassic	1.80 - 2.0	0.80 - 1.20	1.20 - 1.50	0.020 - 0.030	0.080 - 0.090	0.010
P. flabellum Dragastan *et al.*, 1997 (Norian)	1.80 - 2.0	-	0.40 - 0.60	0.020	0.050 – 0.060	0.010 - 0.020
P. silvanensis n. sp., Late Jurassic	2.10 - 2.60	1.0 - 1.20	1.20 - 1.50	0.040 - 0.050	0.080 - 0.150	0.010 - 0.015
P. bortzii n. sp., Late Jurassic	3.0 - 4.50 (1 - 2 flabellae)	1.5	1.0 – 1.2	0.024 – 0.030	0.050 – 0.060	0.010 – 0.020

***Pseudoudotea bortzii** n. sp.*

Plate 2, Figures 1 - 5; Plate 3, Figures 1 - 2

Derivatio nominis: "bortzii" species dedicated to Louis C. BORTZ, (Advantage Resources, Denver) for the advices and the financial support for the study of fossil calcareous algae.

Holotype: Plate 2, Figure 2, Tithonian, Sample 2/2, Dâmbovița Valley, Getic Carbonate Platform, Coll. L. P. B. V, No. 0794.

Isotypes: Plate 2, Figures 1, 3 - 5; Samples 38 D; 38 D_1; 38 D_2, Bucegi Mts., Coll. L. P. B. V, No. 0796, 0797; Plate 3, Figures 1 - 2, Tithonian, Sample 5B/2, Dâmbovița Valley, Getic Carbonate Platform, Coll. L. P. B. V, No. 0813 - 0814.

Diagnosis: Thallus "blade" multistratos composed of hemispherical small "flabellae". The "flabellae" superposed one over other growing and overlapping laterally. The shape of "flabellae" is like a fan, crossed by short

dichotomic branched siphons disposed radially and straight. In the cross section the siphons have more or less a polygonal shape. The sheath - walls of siphons present some irregularities due to the large - space between adjacent siphons. The sheath - walls rarely perforated. The interspaces were filled with microcrystalline calcite (Plate 2, Figure 3; Plate 3, Figure 2).

Description: Thallus "blade" generally hemispherical, multistratose, compressed of 2 or 4 - 5 small "blades" or "flabellae", wich grow vertically and axial, overlapping each - other laterally. The thallus is crossed by short and straight dichotomic branched siphons. The sheath - walls present irregularities and between adjacent siphons large interspaces were filled with microcrystalline calcite (Figure - Text 6; Plate 2, Figures 2, 3).

In the cross section, the "blade" (flabellae) of thallus is round, little flattened laterally (Figure - Text 6b; Plate 2, Figure 3). The irregularities of sheath - walls and the large spaces filled with microcrystalline calcite are clear in cross section. The shape of siphons is obvious polygonal. The siphons show an axial lumen of coarsely crystalline calcite, encircle by microcrystalline calcite and a microgranular sheath - wall (Plate 2, Figure 3).

Dimensions in mm:

W = 3.0 - 4, 5 (isolate blade: W = 1.2 - 1.8, H = 1.0 - 1.2); Thb = 1.5; H = 1.0 - 1.2; db = 0.024 - 0.030; dd = 0.050 - 0.060; thw = 0.010 - 0.015; thdw = 0.025 - 0.030; Thickness of interspaces between siphons = 0.010 - 0.020

Remarks: Pseudoudotea bortzii n. sp. can be compared with *P. flabellum* Dragastan *et al.*, 1997 from Norian of Hydra, (Greece). Both species have a multistratose thalli composed of small "blades" (flabellae), hemispherical in shape.

The Norian species is different because it 2 - 3 small falbellae with another tendency of growing, mostly laterally. The siphons have approximately the same diameter comparing with new species, but the new taxon presents a different shape of siphon and in between has a large interspaces.

The new species can be also compared with the group of non - marine species of genus *Koeninguerella* Freytet, 1997 (subfossil and Pliocene - Pleistocene in age), which have thalli crossed by "filaments regulary cylindrical coated with micrite or microsparite", dichotomic branched disposed in fascicles. The new species differs by non fascicles disposed "filaments".

Pseudoudotea *sp.*

Plate2, Figures 6 - 7

Material: 1 specimen, Tithonian, Sample 3/2, Piatra Mare Massif, Coll. L. P. B. V, No. 0798, Getic Carbonate Platform.

Description: Thallus "foliose", more developed on the vertical - axis, irregularly in shape. The "blade" is crossed by long, straight dichotomic - branched siphons disposed very loosely in the thallus.

The sheath - walls perforate shows a clear - interspaces between adjacent siphons filled with microcrystalline calcite (Plate 2, Figure 6 - 7).

Dimensions in mm:

W = 3.0; Th = ?; H = 4.50; db = 0.050; dd = 0.070; thw = 0.005 - (0.008); thdw = 0.010 - 0.015; thickness of interspaces between adjacent siphons = 0.012 - 0.025.

Remarks: The Jurassic specimen is compared with *Pseudoudotea* sp. from Norian of Hydra (Greece). The specimen of Triassic is double in size, the diameter of siphons is different and the sheath - wall is strongly - calcified being without interspaces between adjacent siphons.

Carpathea *n. gen.*

Derivatio nominis: from the Carpathian mountains chain of Romania.

Diagnosis: Thallus nodular or hemispherical simple, unistratose or multistratose composed of small "blades" overlapping each other, axially and laterally. Thallus is crossed by very short dichotomic siphons, ovoide or ampuliform in shape, acuminate to the distal end. To the distal end is disposed a very small opening. The disposition pattern of the ovoidal - siphons has a telescopate - intercalary arrangement. The sheath - wall of siphons is microgranular calcite and present rarely, very small pores crossing the sheath. The shape of the siphons is a charateristic features of the genus.

Type species: Carpathea llewellyae n. gen., n. sp.

Discussion: Carpathea n. gen. can be compared with the genus *Pseudoudotea* Dragastan *et al.*, 1997 (Late Triassic - Jurassic), by the morphology of thallus "blade". The new genus differs essentially by the short, ovoidal shape of the siphons and telescopate disposition of siphons along the thallus.

The genus *Pseudohedstroemia* Mamet & Roux, 1978 (Visean) presents the "tubes" dicho and trichotomic branched with a flexuous, irregularly traject joined in a "mesh" structure, which is different in comparison with the new genus.

The genus *Nansenella* Mamet & Roux, 1987 (Bashkirian - Sakmarian in age) shows another inner structure of thallus having 2 kind of branched "siphons". The only resemblance is the presence of "ampuliferous" parts along the siphons (see original reconstruction of thallus in Mamet & Roux, p. 15, Figure 7). In general, these inflated areas are comparable with the shape of entire siphon of the genus *Carpathea*.

A very close shape of siphons was found to the genus *Dubrovnikiella* Dragastan, 1990 (a Neocomian taxon), which has a thallus crossed by dichotomic branched siphons, subromboidal, ovoidal in shape, probably medullar and the distal end of the siphons is acuminate. The difference consists in the presence of cortical, filiform, simple siphons to the margin of thallus in continuation of ampuliform siphon (see reconstruction of thallus, in Dragastan, 1990, p. 24, Plate 8, Figure 2). The new taxon does not present the cortical, filiform siphons.

Carpathea llewellyae *n. sp.*

Plate 3, Figures 3 - 5; Plate 5, Figures 1 - 2

Derivatio nominis: Species dedicated to Dr. Llewellya HILLIS from Woods Hole Institute (USA) for the contribution in the field of phycology.

Holotype: Plate 3, Figure 3, Tithonian, Dâmbovița Gorges, Sample 11, Coll. L. P. B. V, No. 0799, Getic Carbonate Platform.

Isotypes: Plate 3, Figures 4, 5, Tithonian, Dâmbovița Gorges,, Samples 2/2; 2/2a; Coll. L. P. B. V, No. 0800 - 0800a; Plate 5, Figures 1 - 2, Tithonian, Dâmbovița Gorges, Sample 5/1, Coll. L. P. B. V, No. 0807, Getic Carbonate Platform.

Diagnosis: Thallus "blade" uni - or multistratose crossed by short, dichotomic branched siphons. The siphons present an ovoidal, ampullaceous shape. The proximal and distal parts of the siphons were equal in diameter and very narrow. To the distal end, there is a small opening of the siphon. The siphons show an intercalary, telescopate arrangement, like a bunch. The sheath - walls of the siphons were formed by microgranular calcite, rarely the pores were observed crossing the sheath.

Description: Thallus of medium size, unistratose, fan- shaped having or not, some mini - lobes (Plate 3, Figures 3, 5) or multistratose (Plate 5, Figures 1 - 2). The multistratose thallus is composed of 3 small "bushes" axially disposed and 2 or 3 bushes laterally.

The thallus is crossed by short, ovoidal, ampullaceous siphons, radially disposed (Figure - Text 7a; Plate 3, Figure 3). The siphons have the both, proximal and distal parts very narrow and equal in diameter. To the distal end, there is a small opening characteristic to the siphonous green - algae. The dichotomic branched siphons present a telescopate, intercallary disposition. Due to this arrangement the siphons formed small "bunches". The sheath - walls of siphons were very thin, built by microgranular calcite and sometime crossed by few pores placed in the midlle part of the siphons or near the branched area (Figure - Text 7b).

Dimensions in mm:

W = 1.80 - 4.0; Th = ?; H = 0.90 - 2.50; db = 0.025 - 0.040; diameter of the siphons in the middle part = 0.090 - 0.10; dd = 0.020 - 0.030; diameter of the distal opening (do) = 0.010; thw = 0.007 - 0.015; thdw = 0.015 - 0.022; thickness of interspace cavity = 0.005 - 0.007.

Remarks: Carpathea llewellyae n. sp. can be compared with *Pseudoudotea flabellum* Dragastan *et al.*, 1997 (Norian) by the outer morphology of thallus, uni - or multistratose. The Triassic species has a "blade", which grow only laterally, being different by inner structure of thallus and the shape of siphon. The new taxon is comparable with *Pseudohedstroemia polytomica* Mamet & Roux, 1978 (Visean), which have dicho - and trichotomic tubes with an irregularly, flexuous traject disposed in a "conical mesh - sheath" structure. The shape of "tubes" and branching are different in comparison with the new species.

The *P. spongiosa* Dargastan, 1989 from Tithonian is different because the thallus consists of "bundles" of 4 polytomic "filaments" arranged in small bushes. The filaments flaring distally.

The *Nansenella multifurcata* Mamet & Roux, 1987 (Bashkirian - Sakmarian) has a thallus crossed by polytomic branched siphons. The only "so far" ressemblance is the presence of ampullaceous parts allong the traject of siphons.

The *Dubrovnikiella illyrica* Dragastan, 1990 (Neocomian) presents a partial corticatae construction of thallus being crossed by medullary short, small, ampullaceous siphons and a cortical simple or dichotomic, filiform siphons. Only the shape of medullary siphons is comparable with the new taxon.

Silvanella *n. gen.*

Derivation nominis: Genus dedicated to Prof. Dr. Paul C. SILVA, from University Herbarium, University of California, Berkeley (USA) for his fundamental contributions to the knowledge of algae and for the implementation of taxonomical stability in the phycological nomenclature.

Diagnosis: Thallus hemispherical crossed by dichotomic branched siphons very narrow in the proximal part and strong widened distally having a "trumpet - like" shape. Sometime, the "trumpet" siphons linked laterally to the same distal level forming a "corona". In the vertical section on the small axis, the thallus blade appeared flattened laterally, being composed by one or two small "blades" (Plate 4, Figures 4 - 6).

The sheath - walls of the siphons were built by microgranular calcite and the interspaces between siphons filled with micrite. In the sheath, no pores were observed.

Type species: Silvanella coronata n. sp.

Remarks: Silvanella n. gen. has a fan - shaped thallus "blade", flattened laterally being different from the genus *Halimedoides* Mamet & Roux, 1987 (Sakmarian in age) composed by "pseudo - segments", conical in shape, large distally, possibly flattened. The "pseudo - segments" probably were crossed by very fine "tubes" filled with micrite.

In our oppinion, it is possible also another interpretation, the "pseudo - segments" could be siphons, very widened distally and comparable to the shape of siphons found also, to the new genus, but also clearly different.

Genus *Brandneria* Senowbari - Daryan *et al.*, 1993 (Late Anisian in age) had have a hemispherical multibranched thallus and after our opinion it is a pseuoudoteacean alga of completely corticatae inner structure. The large siphons, which become club - shaped widened distally corespond in our interpretation to the medullary siphons surrounded by fine, cortical, simple or dichotomic - branched siphons, which formed together, a "disk" - in the distal part of club - shaped area. Taking into account the original reconstruction of thallus (p. 242, Figure 14, in Senowbari - Daryan *et al.*, 1993, Figure - Text 9) and our proper interpretation (Figure - Text 10), the new genus has another kind of siphons and construction, which corresponds to partial corticatae group of pseudoudoteacean algae. The forma *conica* of genus *Toutinella* Freytet, 1997 of non - marine facies having conical - fascicle in shape is comparable with the shape of siphons of the new taxon, but being totally different.

Silvanella coronata *n. sp.*

Plate 4, Figures 1 - 7

Derivatio nominis: from the shape like a "corona" when the siphons touched distally, each - other to form a large "disk".

Holotype: Plate 4, Figure 1, Tithonian, Sample 5B/1, Dâmbovița Valley, Getic Carbonate Platform, Coll. L. P. B. V, No. 0804.

Isotypes: Plate 4, Figures 4 - 7; Tithonian; Figures 4 - 5, Samples 5/1; 5B/1, Dâmbovița Valley, Coll. L. P. B. V, No. 0805; Figures 6 - 7, Kimmeridgian, Olistholite C, Sample C, Bucegi Mts., Coll. L. P. B. V, No. 0806, 0806a, 0806b.

Diagnosis: Thallus hemispherical composed of one or rarely two "flabellae" with a tendency to be flattened laterally. The thallus is crossed by dichotomic branched siphons, tubular, narrow in the proximal part and strongly widened to the distal part. To the distal end the siphon become very large, like a "trumpet", or a funnel.

The sheath - walls of the siphons were built by microgranular calcite and the interspaces are filled with micrite. The pores of sheath - walls were not observed.

Description: Thallus "blade" hemispherical, unistratose or rarely bistratose, slightly flattened laterally having more or less a triangular - shape in the transversal vertical section (Plate 4, Figures 4, 5, 6). The "blades" are crossed by dichotomic - branched siphons. The siphons have a long proximal part, tubular - cylindrical with a small diameter. The siphons grow slightly, becoming conical, extremely large, like a "trumpet" or a "funnel" in the distal part (Figures - Text 8; Plate 4, Figures 2 - 3). Sometime the siphons in the distal part fusioned to form a disk or a "corona" (Plate 4, Figure 3). In the vertical section (small axis), the thallus – "blade" has a sub- or triangular shape, being flattened laterally (Plate 4, Figures 4 - 7).

The siphons in these sections present the same shape having a long proximal, tubular, small diameter, growing and becaming very large, extremely wide, like a funnel in the distal part (Plate 4, Figure 7). The sheath - wall built by microgranular calcite, sometime presents interspaces filled with micrite. The pores of sheath - wall not observed.

Dimensions in mm:

H = 1.80 - 2.10; W = 2.80 - 3.0; Th = 0.72 - 1.50; db = 0.025 - 0.030; distal diameter under "trumpet" = 0.060 - 0.070; dd (funnel or trumpet) = 0.090 - 0.120; thw = 0.014 - 0.020.

Remarks: Silvanella coronata n. sp. can be compared with *Halimedoides arctica* Mamet & Roux, 1987 having a thallus crossed by siphons very large in the distal part, dichotomic or trichotomic branched, but different because the siphons are flattened laterally and the thallus blade is built by "pseudosegments".

Brandneria dolomitica Senowbari - Daryan *et al.*, 1993 presents after our interpretation, the thallus crossed by a large medullary siphons, cylindro - conical in shape strongly inflated distally, club - shaped surrounded by fine, cortical simple or dichotomic branched siphons, which pierced the distal "disk" (Figure - Text 10). Due to the partial cortical structure of thallus, this taxon belongs to the pseudoudoteacean partial corticatae group, being different in comparison with the new taxon.

Toutinella sardiniana Freytet, 1997 forma *conica* of non - marine Permian, Escalaplano Basin, Sardinia, has "fascicles of first order, fan in shape" with large diameter (100 - 300 μm), close in shape and diameter to the new taxon.

Bancilaea *n. gen.*

Derivatio nominis: Genus dedicated to Prof. Dr. Ion Băncilă, University of Bucharest, for the fundamental geological contributions to the knowledge of the Romanian territory.

Diagnosis: Thallus "blade" unistratose, fan - shaped crossed by dichotomic branched

siphons, radially disposed. The siphons long, cylindrical and claviform in the distal part. The distal part of the siphons inflated has an acuminate end and is crossed by a very narrow opening. The sheath - walls of the siphons are thick, strongly calcified, possibly miniperforate. The walls are built by a thin, inner microgranular calcite and an outer layer fibrous calcite.

Remarks: Bancilaea n. gen. presents a siphons, claviform in shape, which can be compared with the shape of siphons from the thalli of genus *Hedstroemia* Rothpletz, 1913. The morphology of siphons could be appropiated with trichotomic tubes, included in one sheath to the genus *Pseudohedstroemia* Mamet & Roux, 1978.

Genus *Dendractis* Reis, 1923 a non - marine Miocene alga shows dichotomic "siphons" inflate to the distal part, but also different from the new taxon.

Bancilaea claviformis *n. sp.*

Plate 5, Figures 3 - 4; Plate 6, Figures 1 -5

Derivatio nominis: "claviformis" from the shape of siphons.

Holotype: Plate 6, Figure 1, Tithonian, Dâmbovița Valley, Sample 7/1, Getic Carbonate Platform, Coll. L. P. B. V, No. 0808.

Isotypes: Plate 6, Figures 2 -5; 2 - 3. Samples 25C/2 and 25; Kimmeridgian, Olistholite C, Bucegi Mts., Coll. L. P. B. V, No. 0809, 0809a; 4 - 5. Sample 5B/Dâmbovița, Tithonian, Dâmbovița Gorges, Getic Carbonate Platform, Coll. L. P. B. V, No. 0810, 0810a.

Diagnosis: Thallus "blade" unistratose, fan - shaped crossed by dichotomic branched siphons. The siphons have a claviform shape being cylindrical to the proximal part, more inflated to the distal area, acuminate and pierced by small opening. Sheath - walls are mini perforate composed by 2 layers of calcite.

Descriptions: Thallus "blade" fan shaped sometime presents very small lobes (Plate 6, Figure 2). The thallus is crossed by straight siphons radially disposed (Figure - Text 11). The siphons show a cylindrical shape in the proximal part and grow distally becoming claviform and acuminate. To the distal end of siphon is an opening, like a pore suggesting a typical siphonous structure. The sheath - walls of the siphons strongly calcified crossed by minipores. The walls are composed by two layers: inner thin, microgranular calcite and an outer thick microfibrous calcite.

Dimensions in mm:

H = 0.90 - 1.0; W = 1.50 - 1.70; Th = ?; db = 0.020 - 0.030; dd = 0.050 - 0.060; thw = 0.015 - 0.025; thdw = 0.030 - 0.035.

Remarks: Bancilaea claviformis n. sp. by the shape of siphons can be compared with some species of genus *Hedstroemia*.

H. halimedoidea Rothpletz, 1913 (Ordovician - Devonian) has a cylindrical siphons also growing in diameter distally being different in comparison with the new taxon by the claviform shape and by the wall structure of siphons.

Some Late Jurassic - Early Cretaceous species, like *H. ramulosa* Dragastan, 1989, *H. exiguua* Dragastan, 1989 and *H. clavata* Dragastan, 1989 have claviform siphons, but very short and without so strongly calcified sheath - walls.

The Hedstroemia species belongs to the ancestral ecorticatae group of pseudoudoteacean algae.

Pseudohedstroemia polyfurcata Mamet & Roux, 1978 (Middle Visean) presents another kind of "tubes", trichotomic, all incorporated in a sheath of conical shape.

Dendractis compacta Reis, 1923 a Miocene non - marine species with thallus crossed by dichotomic - siphons, also inflated in the distal part, but the siphons are not claviform in shape, acuminate to the end and pierced by a tiny pore, different to the new taxon.

Partial Corticatae

Bicazielleae nov. tribe

Thalli formed by 2 kind of tubular - siphons: V - shaped dichotomic or trichotomic branched siphons with "laterals" disposed at an angle of 45 - 90^0.

Genera: Bicaziella Dragastan, 1988 nomen correctum in Dragastan *et al.*, 1998, instead of Bicasiella; *Hasmasiella* Dragastan, 1990.

Genus ***Bicaziella*** Dragastan, 1988

(nomen correctum from Bicaz River instead of Bicasiella)

Bicaziella jurassica Dragastan, 1988

Plate 3, Figures 6 - 9

1988. *Bicasiella jurassica* n. sp. Dragastan, p. 363, Plate III, Figure 1 - 5

Paratypes: Plate 3, Figures 6 - 9; 6, 8, Latest Tithonian, Sample 5B/1, Dâmbovița Valley, Sample 62E, Early Tithonian, Coll. L. P. B. V, No. 801; 801a; 7, Olistholite E, Bucegi Mts.; 9. Olistholite C, Kimmeridgian, Sample C_1, Bucegi Mts., Coll. L. P. B. V, No. 0802 - 0803.

Description: Thallus "blade" hemispherical crossed by 2 kind of siphons:

- V shaped dichotomic branched siphons with a divergent angle of 10^0 - 20^0 disposed preferentially to the top of the "blade" and
- dichotomic branched siphons with lateral branches arranged at an angle of 45^0 or 90^0.

The sheath - walls were formed by microgranular calcite with interspaces between walls crossed rarely by irregularly disposed tiny pores (?).

Dimension in mm:

H = 3.0 - 3.2; W = 3.20 - 3.60; Th = ?; V shaped distal diameter of siphons = 0.050 -

0.075; dichotomic siphons branched after an angle of 45^0 - 90^0: 1. basal main siphon = 0.090, 2. lateral or axial branched siphons = 0.050 - 0.060; thw = 0.010 - 0.015.

Corticatae

Franconielleae nov. tribe

Thalli formed by 3 kind of branched siphons: tubular, trichotomic or polytomic with laterals disposed at an angle of 90^0, V - shaped dichotomic branched siphons and fine, simple or branched siphons (cortical).

Genera: Bicaziella Dragastan, 1988; *Franconiella* Dragastan, 1990

Genus ***Franconiella*** Dragastan, 1990

Plate 6, Figures 6 - 7

1990. *Franconiella polyfurcata* n. sp. Dargastan, p. 7, Plate 3, Figures 1 -3; Plate 4, Figures 1 - 2.

Specimen as Isotype from 1990: Plate 6, Figures 6 - 7, Tithonian, Sample 35A, Coll. L. P. B. V, No. 0387, Giuvala Massif, Dâmbovicioara Basin, Getic Carbonate Platform.

Description: Thallus – "blade" fan - shaped, initial, unistratose and after multistratose composed of small hemispherical blade (Plate 6, Figure 6).

The "blades" crossed by radially disposed siphons. The siphons are different branched:

- tubular trichotomic or polytomic siphons, branched at an angle of 90^0;
- V - shaped dichotomic siphons with a divergent angle of 10^0 and
- cortical fine, filiform siphons, simple or dichotomic branched oriented to the basal or to the top parts of the thallus.

Dimensions in mm:

H = 2.70; W = 4.0; Th = ?; diameter of trichotomic or polytomic siphons branched at an angle of 90^0 = 0.040 - 0.060; diameter of V - shaped branched siphons = 0.030 - 0.040; diameter of cortical, filiform siphons = 0.010

Hansielleae nov. tribe

Thallus crossed by 3 kind of branched siphons: Y - shaped dichotomic, V - shaped dichotomic or polytomic (symmetrical or asymmetrical branched with laterals disposed only one side or trichotomic branched) and fine, long, simple or dichotomic branched siphons disposed at an angle of 90^0. Presence of calcitic bodies as sporangia.

Genera: Hansiella Dragastan, 1990, *Erikiella* Dragastan, 1990

Genus ***Hansiella*** Dragastan, 1990

Hansiella fibrata Dragastan, 1990

Plate 6, Figures 8 - 9

1990 *Hansiella fibrata* n. sp. Dragastan, p. 13, Plate 7, Figures 1 - 2

Paratype: Plate 6, Figure 8, Late Tithonian, Sample 32, Ghilcoş, Coll. L. P. B. V, No. 0812, Bicaz Gorges, East Carpathians, Transylvanian Carbonate Platform.

Description: Thallus fan - shaped, unistratose crossed by branched siphons radially distributed, sometime with deep break off, inside of the blade, filled with coarsely crystalline calcite (Plate 6, Figure 8). The thallus is crossed by two kind of branched siphons:

- Y - shaped dichotomic branched siphons, like an open fork with two divergent branches after an angle of 40^0 - 50^0, sometime trichotomic branched after an angle of 90^0
- V - shaped dichotomic siphons with symmetrical or asymmetrical branches, only on the one side with a divergent angle of 10^0 - 20^0.

Between the Y- and V - shaped dichotomic siphons which correspond to medullar tissue, there are fine, cortical siphons disposed in "bunches" to the basal middle and to the top of the" blade".

Sheath - walls of microcrystalline calcite.

Dimension in mm:

H = 3.0 - 3.60; W = 5.5 - 6.0; Th = ?; diameter of Y - shaped siphons = 0.060 - 0.080; diameter of V - shaped siphons = 0.030 - 0.050; diameter of cortical, fine siphons = 0.010.

PROPOSAL OF NEW TAXONOMICAL SUBDIVISIONS OF FAMILY PSEUDOUDOTEACEAE

Family **PSEUDOUDOTEACEAE** Dragastan *et al.*, 1997

Ancestral ecorticatae

Hedstromieae nov. tribe

Thalli crossed by dicho - polytomic siphons, which increase in diameter distally sometime disposed in bundles.

Genera: Hedstroemia Rothpletz, 1913 - Ordovician - Visean; Late Triassic - Jurassic - Cretaceous;

Pseudohedstroemia Mamet & Roux, 1978 - Visean;

"*Cayeuxia*" sp. 1, sensu Senowbari - Daryan *et al.*, 1993 - Late Triassic (Carnian)

"*Cayeuxia*" sp. 3, sensu Senowbari - Daryan *et al.*, 1993 - Late Triassic (Carnian)

Garwoodieae nov. tribe

Thalli formed by dicho - trichotomic and polytomic with 3 up to 7 lateral - branches disposed at an angle of 90^0 (rarely 45^0).

Genera: Garwoodia Wood, 1941 - Ordovician - Permian; Late Triassic - Jurassic - Cretaceous;

"*Cayeuxia*" sp. 2, sensu Senowbari - Daryan *et al.*, 1993 - Late Triassic (Carnian)

Ecorticatae

Pseudoudoteae nov. tribe

Thalli "blade" crossed by dichotomic branched siphons, sometime tapering to the distal end, which have the sheath - walls strongly - calcified and pierced by tiny pores.

Genera: Pseudoudotea Dragastan *et al.*, 1997 - Late Triassic - Jurassic;

Hydraea Dragastan *et al.*, 1997 - Late Triassic

Carpatheae nov. tribe

Thalli consisting of dichotomic branched siphons, short - elipsoidal or long, cylindro - claviform and strongly acuminate to the distal end; sheath - walls microgranular calcite.

Genera: Carpathea n. gen. - Late Jurassic;

Bancilaea n. gen. - Late Jurassic

Silvanelleae nov. tribe

Thalli crossed by dichotomical branched siphons very narrow in the proximal part and strong widened distally, like a "trumpet" or a "corona".

Genus: Silvanella n. gen. - Late Jurassic

Partial corticatae

Gaspesielleae nov. tribe

Thalli formed by different kind of branched siphons: V - and Y shaped dichotomic siphons and trichotomic of "Hedstroemia" type siphons; some dichotomic siphons present a lateral branch disposed at an angle of 90^0.

Genus: Gaspesiella Mamet & Roux, 1981 – Silurian

Bicazielleae nov. tribe

Thalli formed by 2 kind of tubular siphons: V - shaped dichotomic and dicho- or trichotomic branched siphons, the "laterals" disposed at an angle variable between 45^0 - 90^0.

Genera: Bicaziella Dragastan, 1988, nom. correctum in Dragastan *et al.*, 1998 (non Bicasiella) - Late Jurassic - Early Cretaceous;

Hasmasiella Dragastan, 1990 - Late Jurassic

Brandnerieae nov. tribe

Thalli composed of long or short, simple or dichotomic branched siphons, conical in shape, large in diameter (medullar siphons) and surrounded or crossed by fine, simple or branched cortical siphons.

Genera: Halimedoides Mamet & Roux, 1987 - Sakmarian;

Brandneria Senowbari - Daryan *et al.*, 1993 - Middle Triassic (Anisian)

Dubrovnikielleae nov. tribe

Thalli formed by two kind of siphons: trichotomic, "subromboidal" – ovoidal (ampulaceous) branched siphons (probably medullar) and simple or dichotomic, fine, filamentous siphons, cortical.

Genus: Dubrovnikiella Dargastan, 1990 - Early Cretaceous (Neocomian).

Corticatae

Franconielleae nov. tribe

Thalli formed by three kind branched siphons: tubular trichotomic or polytomic siphons branched after an angle of 90^0 (medullar), V - shaped dichotomic siphons and fine, simple or branched siphons, (cortical).

Genera: Bicaziella Dragastan, 1988 - Late Jurassic;

Franconiella Dragastan, 1990 - Late Jurassic - Early Cretaceous

Hansielleae nov. tribe

Thalli composed of three kind of branched siphons: Y - shaped dichotomic, V - shaped dichotomic or polytomic, symmetrical or asymmetrical branched (laterally only on the one side), fine, long simple or branched siphons, and sometime present dicho-(trichotomic) siphons branched after an angle of 90^0. "Calcitic bodies" as reproductive organs.

Genera: Hansiella Dragastan, 1990 - Late Jurassic - Early Cretaceous;

Erikiella Dragastan, 1990 - Early Cretaceous

Rectangulineae nov. tribe

Thalli composed by dichotomic branched siphons disposed axially (medullar) and simple or dichotomic branched siphons making an "angular - arch" in the middle part of the cortex after continued by simple or dichotomic siphons.

Genus: Rectangulina Antropov, 1959 - Late Devonian; Early Triassic.

PROPOSAL OF NEW TAXONOMICAL SUBDIVISIONS OF FAMILY AVRAINVILLEACEAE

Family **AVRAINVILLEACEAE**

Dragastan *et al.*, 1999, non 1997

Dragastan *et al.*, 1997, have introduced the *Avrainvilleaceae* nov. family, but only with English original description; because the type family is the Recent genus *Avrainvillea* to become valid a Latin diagnosis for the family was presented in 1999, (Dragastan & Richter, in press).

Genera: Avrainvillea (Recent), *Mitcheldeania, Pseudomitcheldeania, Bevocastria, Niteckiella, Nansenella* (Fossils).

Bevocastrieae nov. tribe

Thalli formed by simple "girvanelloid" or V - shaped dichotomic, moniliform branched siphons (with 80 – 100% of constrictions).

Genera: Bevocastria Garwood, 1931 - Ordovician - Permian; Late Triassic - Jurassic - Cretaceous;

Mitcheldeania Wethered, 1886 emend. Mamet & Roux, 1975 - Carboniferous - Jurassic - Cretaceous;

Nansenelleae nov. tribe

Thalli crossed by tubular, sinous, V- or Y shaped dichotomic or trichotomic branched siphons, ampuliform and inflated in some area of the siphons; sometime the dichotomic siphons branched after an angle of 45° – 90°; slightly or more moniliform (10 – 20 % of constrictions).

Genera: Nansenella Mamet & Roux, 1987 - Baschkirian - Sakmarian;

Suhardiella Dragastan, 1988 - Early Cretaceous;

Ghimbaviella Dragastan, 1990 - Late Jurassic

Niteckielleae nov. tribe

Thalli crossed by large, unbranched, moniliform siphons, continued with V- or Y shaped dichotomic branched siphons and dicho - trichotomic (?) siphons branched after an angle of 90^0.

Genus: Niteckiella Dragastan, 1988 - Late Jurassic - Early Cretaceous

Jabrianelleae nov. tribe

Thalli composed by large, basal, dichotomic siphons intermingled with moniliform, simple or dichotomic branched siphons (10 % of constrictions).

Genus: Jabrianella Dragastan, 1993 - Middle Jurassic (Callovian), diagnosis of genus emended now (see reconstruction of thallus, Figure - Text 12).

Perachoraelleae nov. tribe

Thalli of slightly moniliform category (less 10 % of constrictions) composed by fine, wavy, dichotomic siphons starting from a proximal inflated area or swelling; swellings of different shape.

Genus: Perachoraella Dragastan, Richter, Gielisch & Kube, 1998 - Late Jurassic (Kimmeridgian - Tithonian).

Pseudomitcheldeania Schlagintweit, 1990 – Late Jurassic - Early Cretaceous.

PROPOSAL OF NEW TAXONOMICAL SUBDIVISIONS OF FAMILY RHIPILIACEAE

Family **RHIPILIACEAE**

Dragastan *et al.*, 1999, non1997

See the commentary for the family *Avrainvilleaceae*.

Genera: *Rhipilia*, *Rhipilopsis* (Recent), *Baratangia*, *Dendronella* (Fossils).

Baratangieae nov. tribe

Thalli composed by flexuous, dichotomic, slightly moniliform branched siphons disposed like a "grid", sometime with cohesion "papillae".

Genera: Baratangia Badve & Kundal, 1986 - Cretaceous

Dendronella Moussavian & Senowbari - Daryan, 1988 emend. Barattolo *et al.*, 1993 - Late Triassic (Carnian).

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EXPLANATIONS OF FIGURES – TEXT

Figure 1. Studied areas (Hăghimaş, Bicaz Valley, Bucegi, Piatra Mare, Giuvala, Dâmboviţa Valley) and distribution of the olistholites in the eastern slope of Bucegi Mts.
A. Studied areas; B. Olistholites of the eastern slope of Bucegi Mts. (from Patrulius, 1969) C. Olistholites from Peleş Valley, scale 1: 25000.

Figure 2. Lithological column of the olistholite A (Middle – Late Jurassic) from Peleş Valley, in comparison with the lithology, the age and microfossils from olistholites C, D, E, B of St. Ana Valley (Bucegi Mts.).

Figure 3. Late Jurassic and Early Cretaceous lithological column of Hăghimaş Nappe, Ghilcoş section (Bicaz Valley) and some definitory algal – biozones.

Figure 4. *Pseudoudotea silvanensis* n. sp., reconstruction of thallus (a. vertical – axial section, b. vertical transversal section – thallus is laterally flattened, c. dichotomic branched siphons and distribution of pores crossing the sheath, d. cross section and pattern distribution of the siphons, e. detail in the sheath – walls and „pores" between walls).

Figure 5. *Pseudoudotea silvanensis* n. sp., sheath – wall detail of siphons, distribution of pores – sheath, junction line and interspaces cavities between walls.

Figure 6. *Pseudoudotea bortzii* n. sp., reconstruction of thallus (a. vertical axial section, b. cross section).

Figure 7. *Carpathea llewellyae* n. gen., n. sp., reconstructin of thallus and shape of dichotomic branched siphons.

Figure 8. *Silvanella coronata* n. gen., n. sp., reconstruction of thallus.

Figure 9. Reconstruction of the alga *Brandneria dolomitica* n. gen., n. sp., exhibiting the branching pattern of the individual stem and growth type, not to scale (from original of Senowbari – Daryan *et al.*, 1993).

Figure 10. Reinterpretation of branching pattern siphons to alga *Brandneria dolomitica* Senowbari – Daryan *et al.*, 1993.

Figure 11. *Bancilaea claviformis* n. gen., n. sp., reconstruction of thallus in vertical – axial section.

Figure 12. *Jabrianella paralella* Dragastan, 1993, new interpretation of thallus construction in the vertical – axial section exhibiting the branching pattern of the siphons.

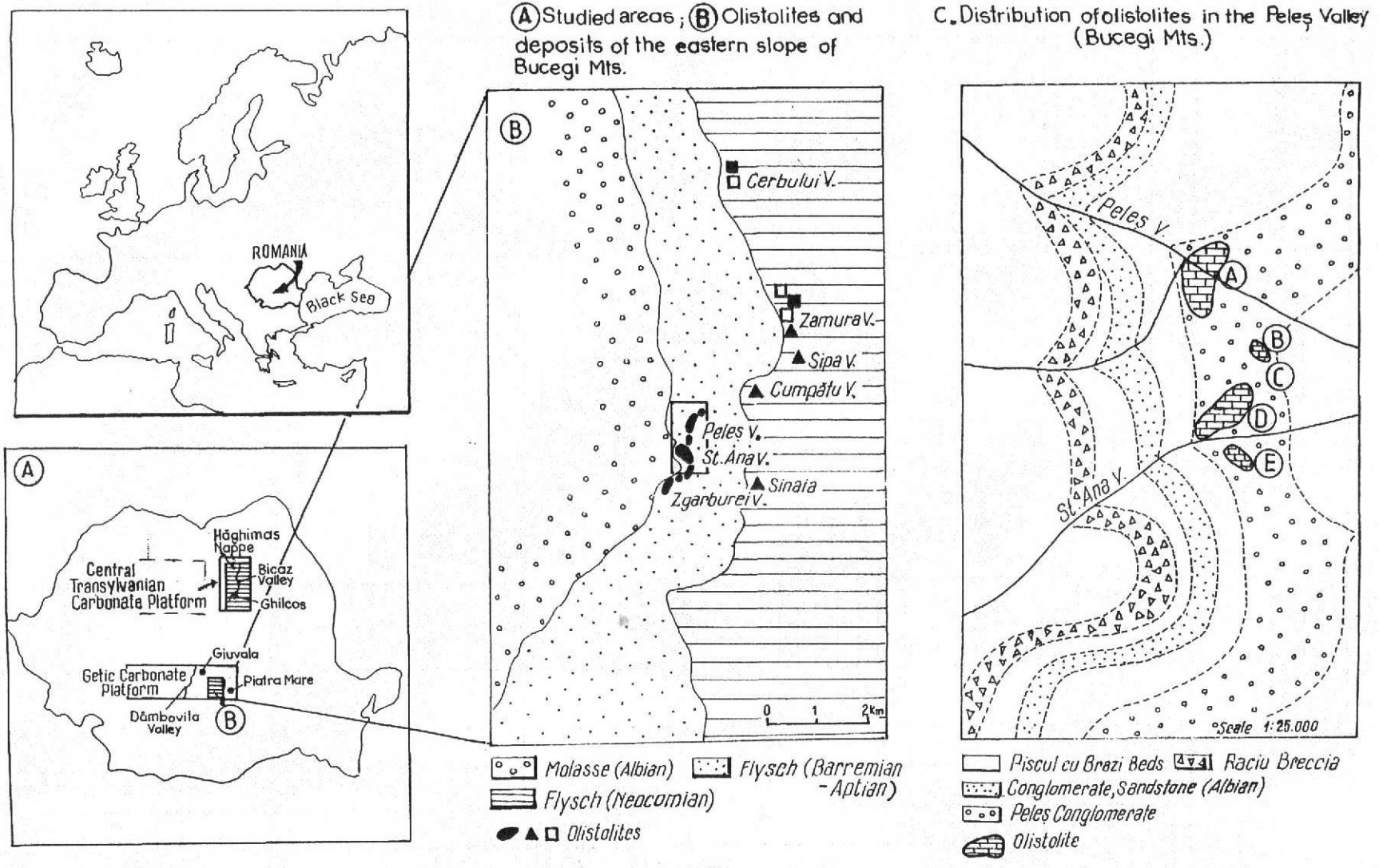

ROMANIA
Black Sea
A
Central Transylvanian Carbonate Platform
Hăghimaş Nappe
Bicaz Valley
Ghilcos
Getic Carbonate Platform
Giuvala
Piatra Mare
Dâmbovita Valley
B
(A) Studied areas ; (B) Olistolites and deposits of the eastern slope of Bucegi Mts.
Cerbului V.
Zamura V.
Sipa V.
Cumpătu V.
Peleş V.
St. Ana V.
Sinaia
Zgarburei V.
0 1 2km
Molasse (Albian)
Flysch (Barremian - Aptian)
Flysch (Neocomian)
Olistolites
C. Distribution of olistolites in the Peleş Valley (Bucegi Mts.)
Peleş V.
St. Ana V.
Scale 1:25.000
Piscul cu Brazi Beds
Raciu Breccia
Conglomerate, Sandstone (Albian)
Peleş Conglomerate
Olistolite

Figure 1

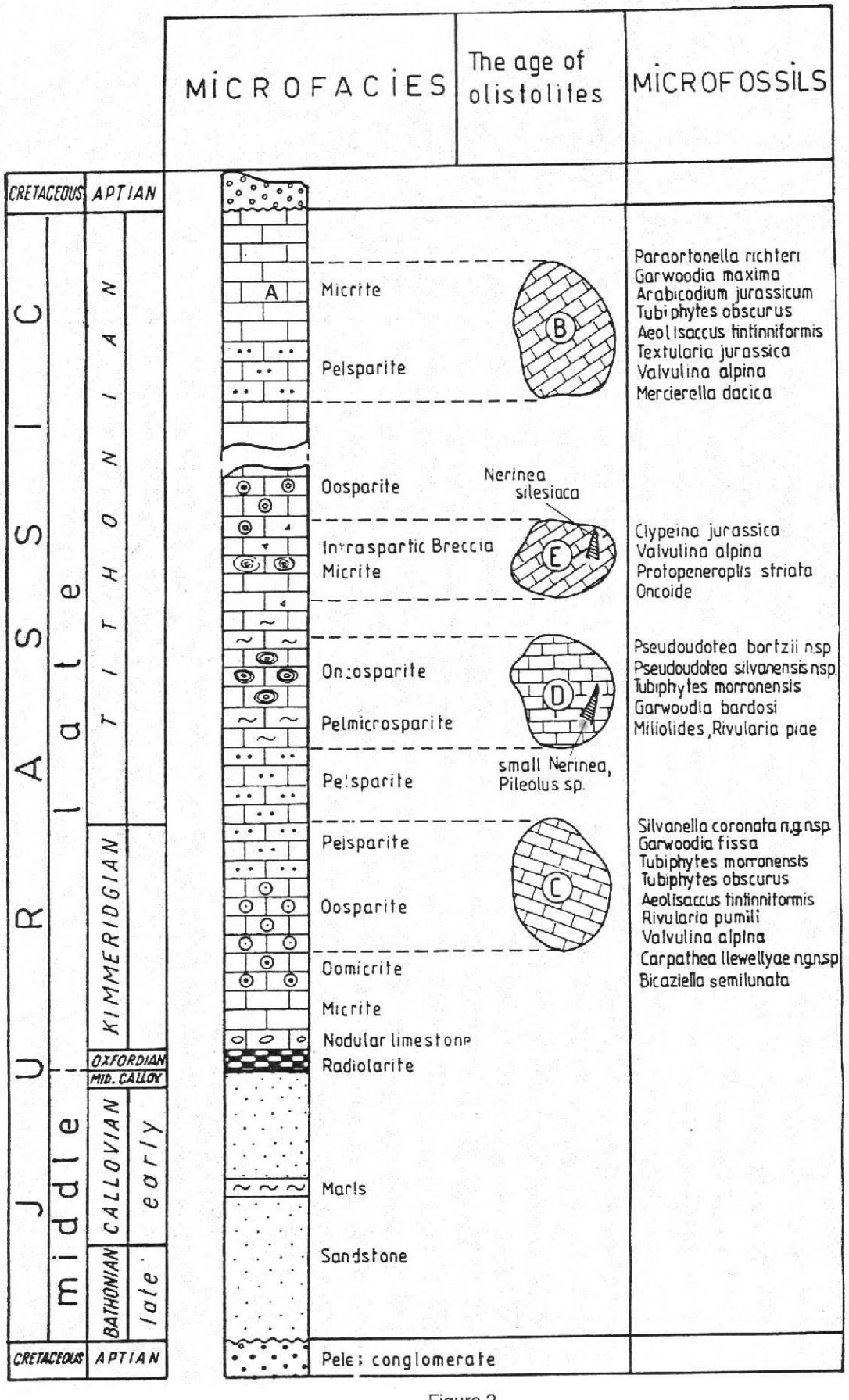

MICROFACIES
The age of olistolites
MICROFOSSILS
CRETACEOUS
APTIAN
JURASSIC
late
middle
TITHONNIAN
KIMMERIDGIAN
OXFORDIAN
MID. CALLOV
CALLOVIAN
BATHONIAN
early
late
CRETACEOUS
APTIAN
A
B
C
D
E
Micrite
Pelsparite
Oosparite
Nerinea silesiaca
Intraspartic Breccia
Micrite
Oncosparite
Pelmicrosparite
Pelsparite
small Nerinea, Pileolus sp.
Pelsparite
Oosparite
Oomicrite
Micrite
Nodular limestone
Radiolarite
Marls
Sandstone
Pele; conglomerate
Paraortonella richteri
Garwoodia maxima
Arabicodium jurassicum
Tubiphytes obscurus
Aeolisaccus tintinniformis
Textularia jurassica
Valvulina alpina
Mercierella dacica
Clypeina jurassica
Valvulina alpina
Protopeneroplis striata
Oncoide
Pseudoudotea bortzii n.sp
Pseudoudotea silvanensis n.sp.
Tubiphytes morronensis
Garwoodia bardosi
Miliolides, Rivularia piae
Silvanella coronata n.g.n.sp.
Garwoodia fissa
Tubiphytes morronensis
Tubiphytes obscurus
Aeolisaccus tintinniformis
Rivularia pumili
Valvulina alpina
Carpathea llewellyae n.g.n.sp.
Bicaziella semilunata

Figure 2

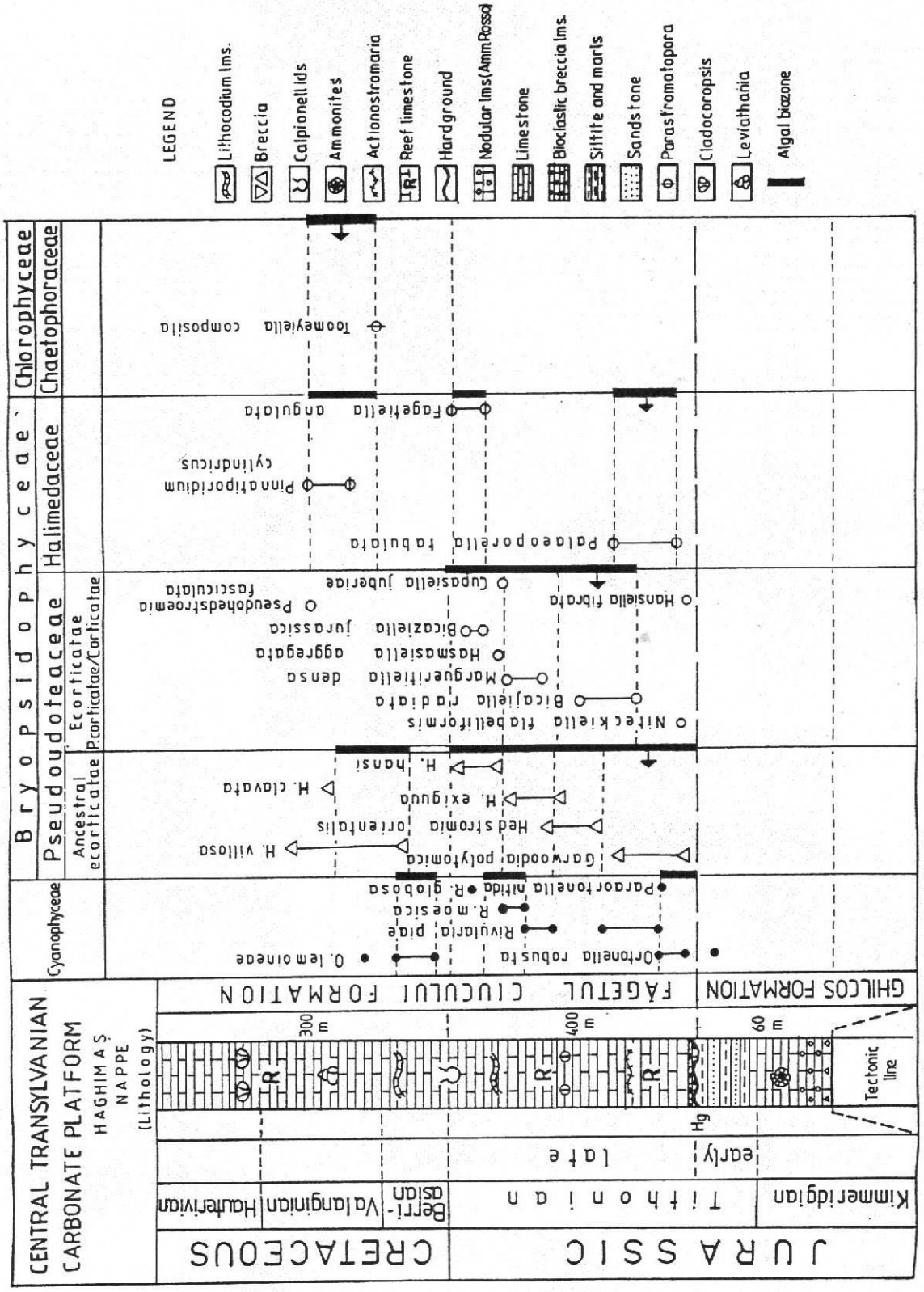

CENTRAL TRANSYLVANIAN CARBONATE PLATFORM
HAGHIMAŞ NAPPE
(Lithology)
JURASSIC
CRETACEOUS
Kimmeridgian
Tithonian
early
late
Berri-asian
Valanginian
Hauterivian
GHILCOS FORMATION
FAGETUL CIUCULUI FORMATION
Tectonic line
Hg
R
60 m
400 m
300 m
LEGEND
Lithocodium lms.
Breccia
Calpionellids
Ammonites
Actinostromaria
Reef limestone
Hardground
Nodular lms(AmmRosso)
Limestone
Bioclastic breccia lms.
Siltite and marls
Sandstone
Parastromatopora
Cladocoropsis
Leviathania
Algal biozone
Cyanophyceae
Bryopsidophyceae
Pseudoudoteaceae
Halimedaceae
Chaetophoraceae
Chlorophyceae
Ancestral ecorticatae
Ecorticatae
P.corticatae/Corticatae
O. lemoinea
Orthonella robusta
Rivularia piae
R. moesica
Parafortonella nitida
R. globosa
Garwoodia polytomica
Hedstromia orientalis
H. exigua
H. hansi
H. clavata
H. villosa
Nitteckiella flabelliformis
Bicrustella radiata
Margueritella densa
Hasmasiella aggregata
Bicrustella jurassica
Pseudohedstroemia fasciculata
Cuneasiella juberiae
Hensiella fibrata
Paraleptoporella tabulata
Pinnatiporidium cylindricus
Fagetiella angulata
Toomeyella composita

Figure 3

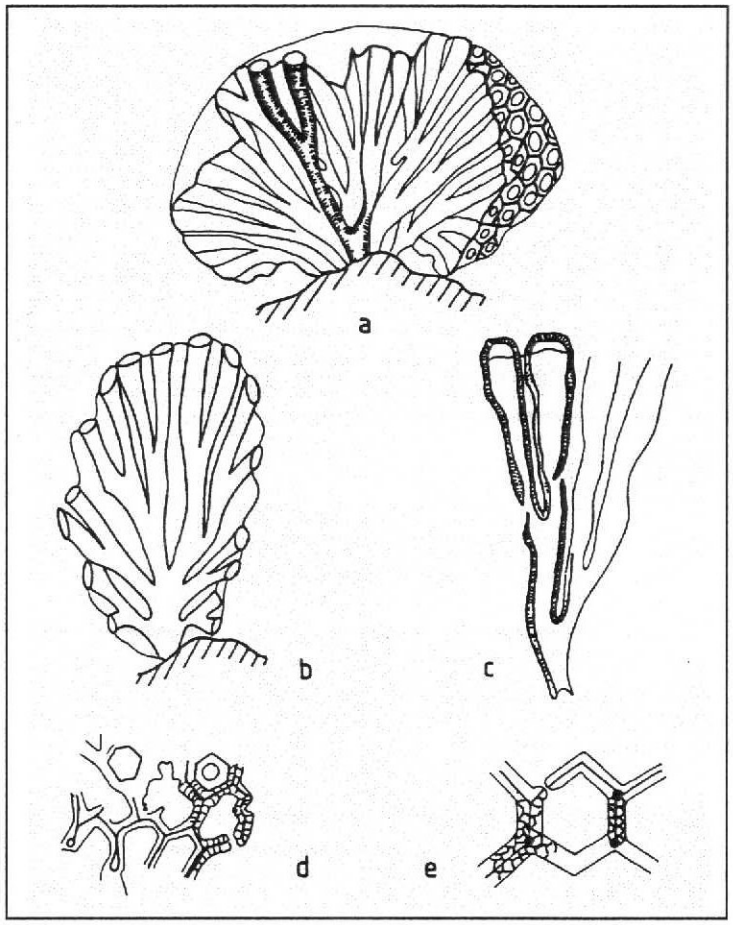


Figure 4

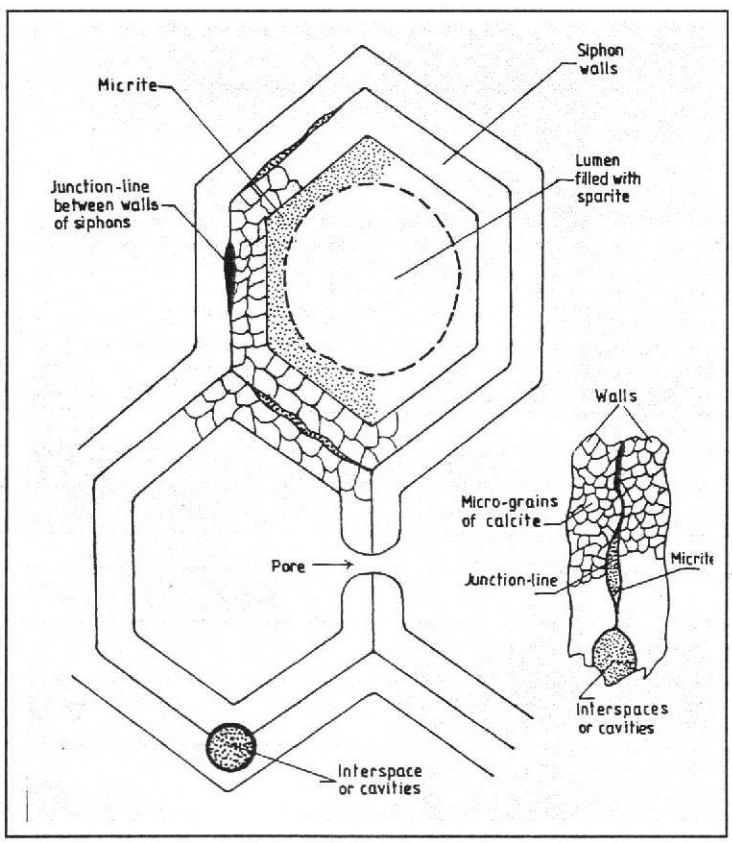
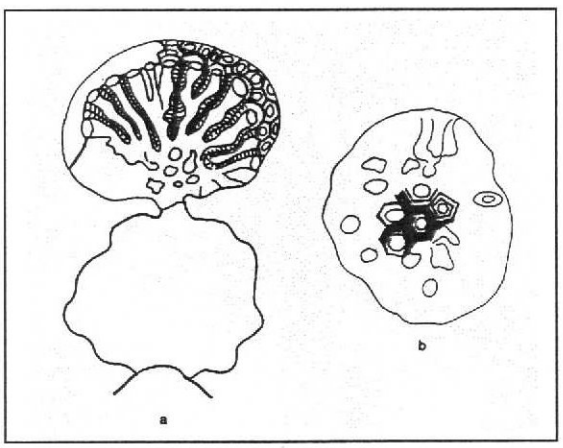


Figure 5



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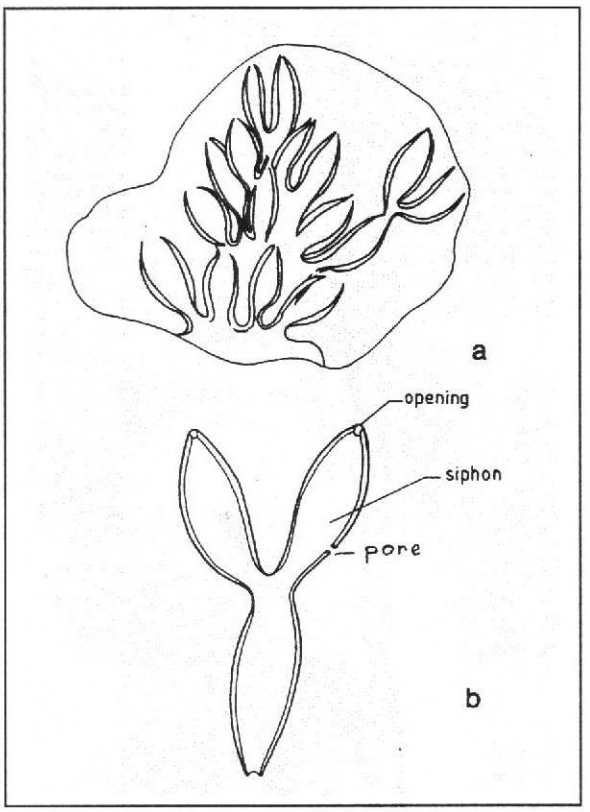

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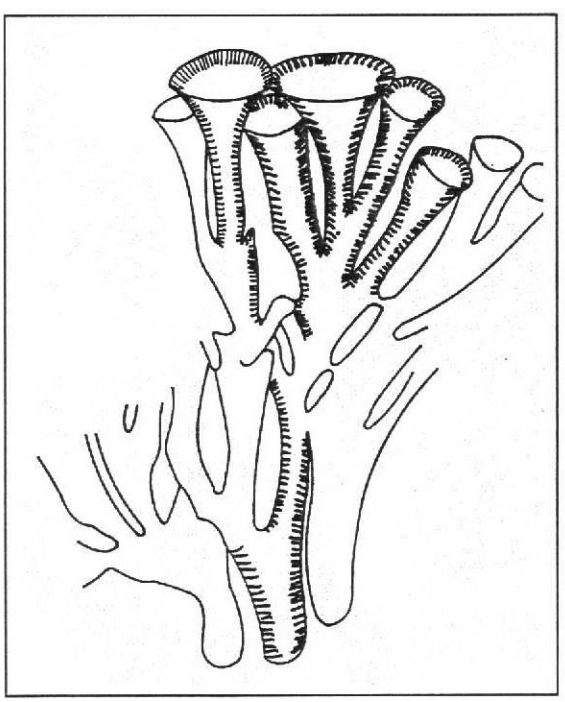

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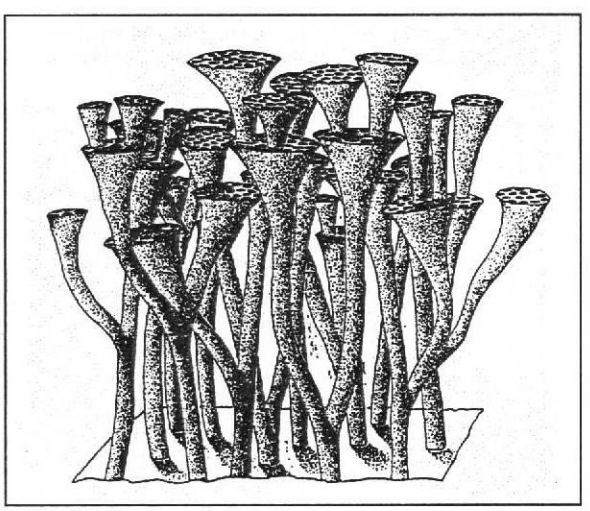

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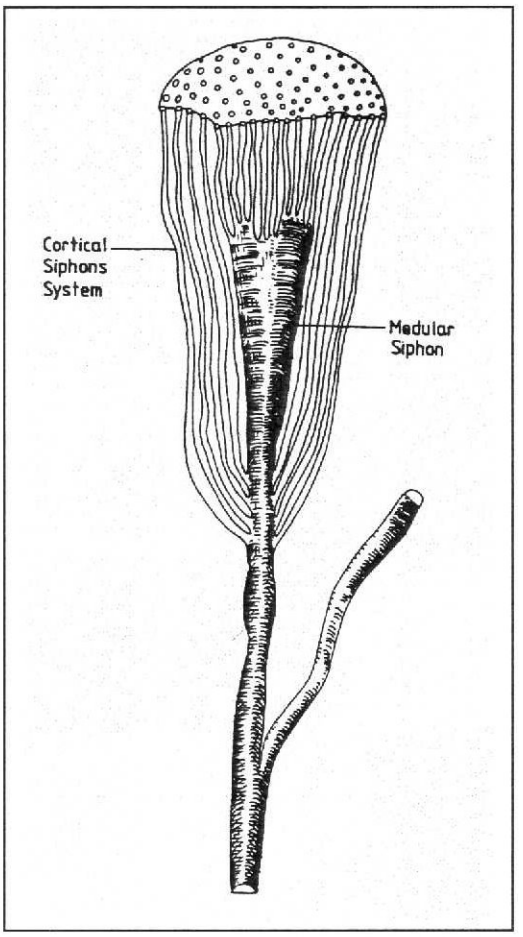

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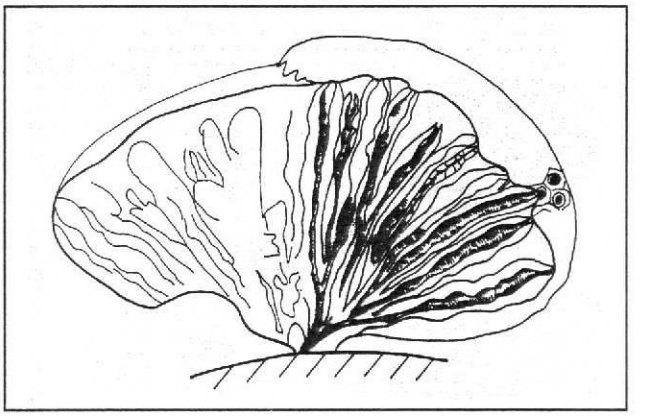

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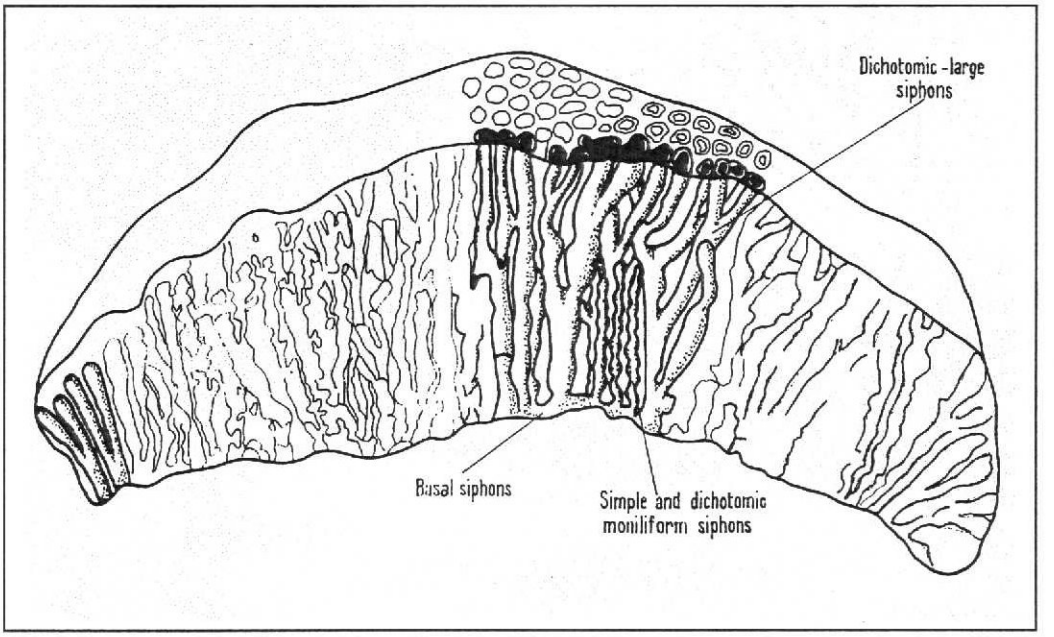


Figure 12

PLATES

Plate I

Figures 1 – 9. ***Pseudoudotea silvanensis*** n. sp.;

1. Holotype, Coll. L.P.B. V, No. 0789, vertical – axial section, Tithonian, Olistholite D, Bucegi Mts., Getic Carbonate Platform;
2. Detail in holotype, double – walls in between with interspaces;

3 – 9. Isotypes, , Coll. L.P.B. V, No. 0790, 0791, 0792, 0793, 0795, Kimmeridgian, Olistholite C; Tithonian, Olistholite B, Bucegi Mts. and Dâmbovița Valley (Figure 4);

3, 6 – 8 Cross section; 5. Vertical – transversal section; 9. Cross section with clearly double – walls (see arrow – dw), interspaces between adjacent siphons (i) and interspaces pores (p) disposed between siphons in the angular area. Scale bar in mm.

Plate II

Figures 1 – 5. ***Pseudoudotea bortzii*** n. sp.;

2. Holotype, Coll. L.P.B. V, No. 0794, vertical – axial section, Tithonian, Dâmbovița Valley, Getic Carbonate Platform;

1, 3 – 5. Isotypes , Coll. L.P.B. V, No. 0796, 0797, 0797a, Tithonian, Olistholite D, Bucegi Mts.

3. cross section, we can see double walls and interspaces cavities.

Figures 6 – 7. ***Pseudoudotea*** sp., 1 specimen, , Coll. L.P.B. V, No. 0798, vertical – axial section, showing double – walls of the siphons and interspaces between walls; the sheath – wall perforate, Tithonian, Piata Mare Massif, Getic Carbonate Platform.

Plate III

Figures 1 – 2. ***Pseudoudotea bortzii*** n. sp.;

Isotypes, Coll. L.P.B. V, No. 0813 - 0814, vertical – axial section, Tithonian, Dâmbovița Valley, Getic Carbonate Platform; 2. vertical – axial section, enlarged double sheath – walls, interspaces and sheath – walls crossed by pores.

Figures 3 – 5. ***Carpathea llewellyae*** n. g., n. sp.;

3. Holotype, Coll. L.P.B. V, No. 0799, vertical – axial section, siphons short, ovoidal, ampullaceous in shape with telescopate arrangement, Tithonian, Dâmbovița Gorges, Getic Carbonate Platform;

4 – 5. Isotypes, Coll. L.P.B. V, No. 0800 – 0800a.

Figures 6 –9. ***Bicaziella*** **jurassica** Dragastan, 1988, Paratypes, Coll. L.P.B. V, No. 0801, 0801a, 0802, 0803; 6, 8 – Late Tithonian, , Dâmbovița Valley; Olistholite E, Tithonian; 9. Olistholite C, Kimmeridgian, Bucegi Mts., Getic Carbonate Platform.

Plate IV

Figures 1 – 7. ***Silvanella coronata*** n. gen., n. sp.;

1. Holotype, Coll. L.P.B. V, No. 0804, vertical – axial section, Tithonian, Dâmbovița Valley, Getic Carbonate Platform; 2 – 3. Holotype enlarged, see the disposition and typical shape of siphons with distal part like a „trumpet".

4 – 7. Isotypes, Coll. L.P.B. V, No. 0805, 0806, 0806a, 0806b, vertical transversal section; see the shape of the „blades" and the typical shape of the siphons; 4 – 5. Tithonian, Dâmbovița Valley; 6 – 7. Olistholite C, Kimmeridgian, Bucegi Mts., Getic Carbonate Platform.

Plate V

Figures 1 – 2. ***Carpathea llewellyae*** n. gen., n. sp.;

Isotype, Coll. L.P.B. V, No. 0807, Tithonian, Dâmbovița Gorges, Getic Carbonate Platform.

Figures 3 – 4. ***Bancilaea claviformis*** n. gen., n. sp.;

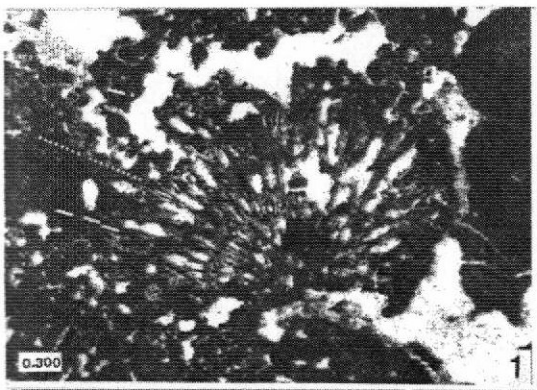
Holotype enlarged, see the characteristic shape of the siphons, distal part acuminate and the opening; „sheath – walls crossed by minipores".

Plate VI

Figures 1 – 5. ***Bancilaea claviformis*** n. gen., n. sp.;
1. Holotype, Coll. L.P.B. V, No. 0808, vertical – axial section, Tithonian, Dâmbovița Gorges, Getic Carbonate Platform;
2 - 5. Isotypes, Coll. L.P.B. V, No. 0809, 0809a, 0810, 0810a;
2 – 3. Olistholite C, Kimmeridgian, Bucegi Mts.; 4 - 5. Tithonian, Dâmbovița Valley, Getic Carbonate Platform.

Figures 6 – 7. ***Franconiella polyfurcata*** Dragastan, 1990;
Isotype, Coll. L.P.B. V, No. 0387, vertical – axial section, Tithonian, Giuvala Massif, Dâmbovicioara Basin, Getic Carbonate Platform.

Figures 8 – 9. ***Hansiella fibrata*** Dragastan, 1990;
Paratype, Coll. L.P.B. V, No. 0812, Tithonian, Ghilcoş, Bicaz Gorges, East Carpathians, Transylvanian Carbonate Platform;
8. see the V – and Y – shaped branching siphons (dicho – trichotomic) and fine cortical siphons in the basal part of the thallus.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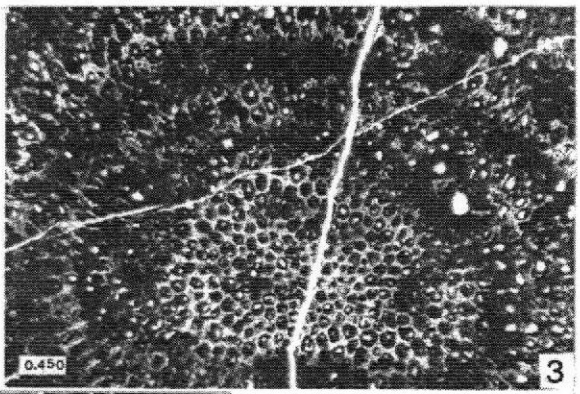
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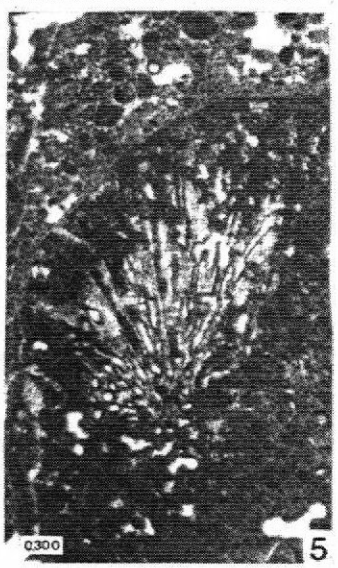
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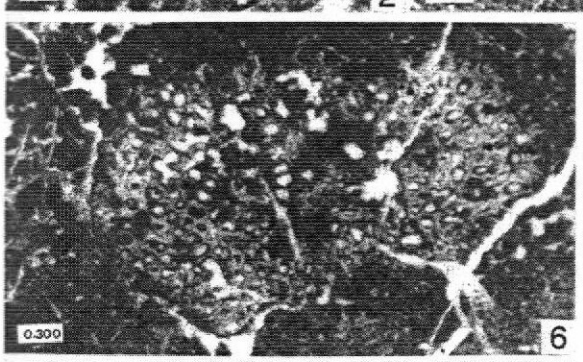
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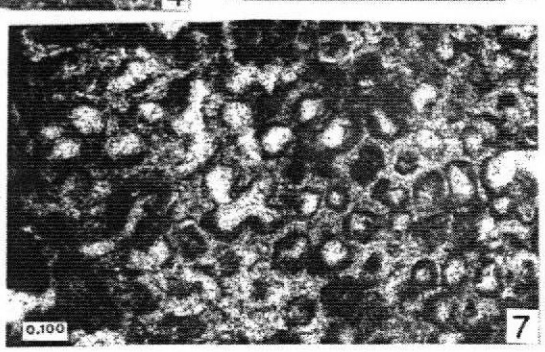
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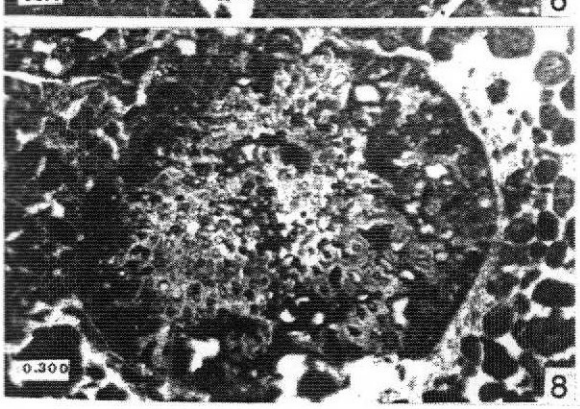
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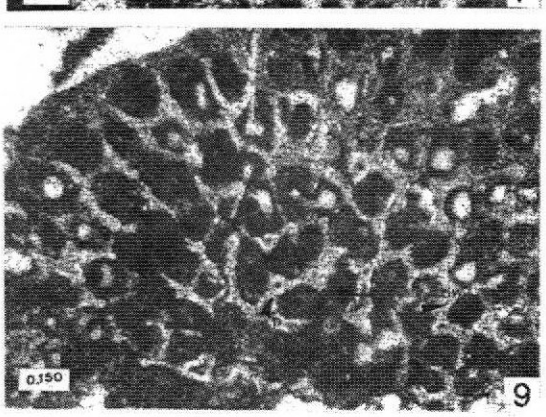
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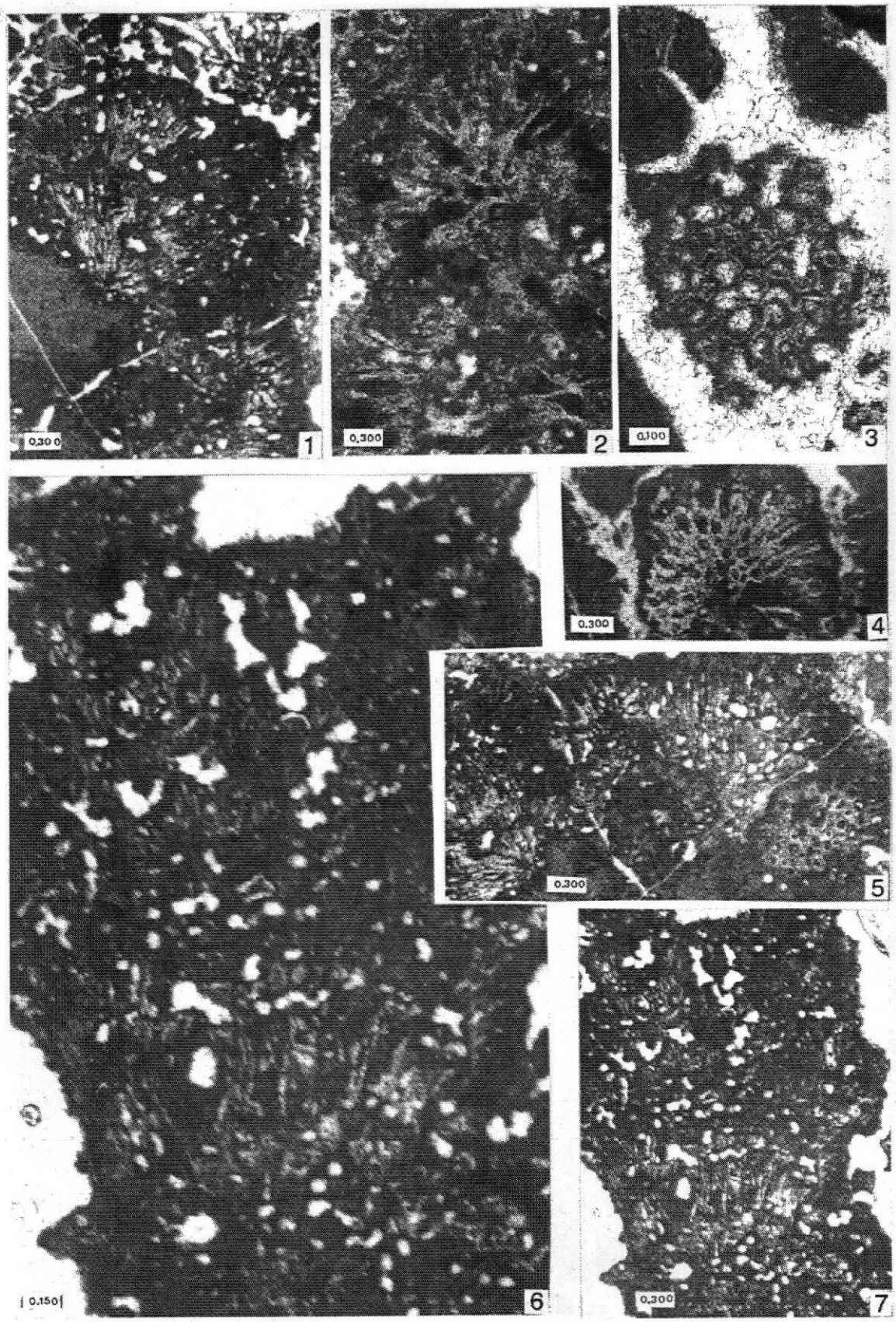
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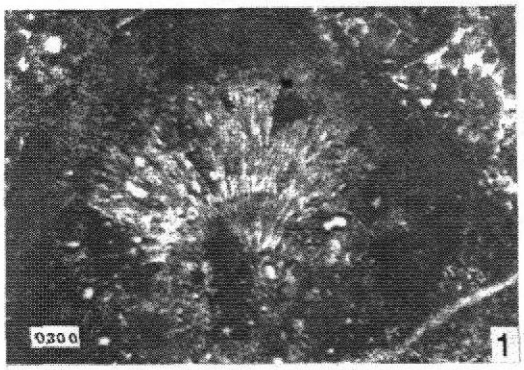
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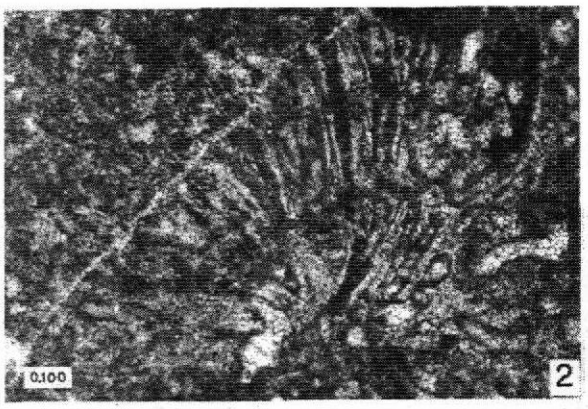
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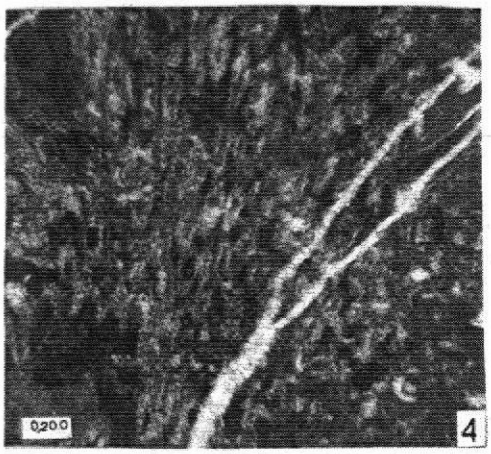
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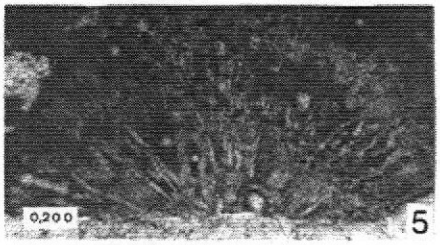
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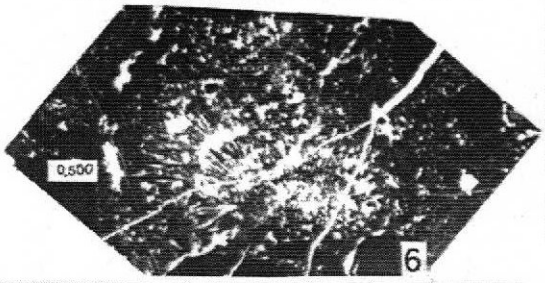
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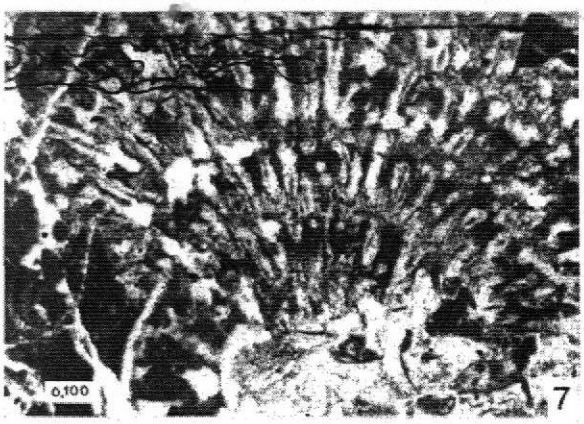
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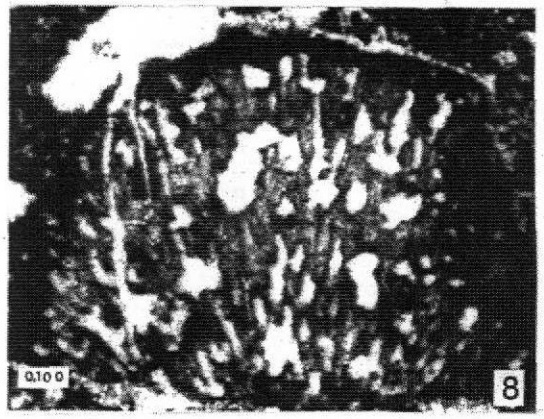
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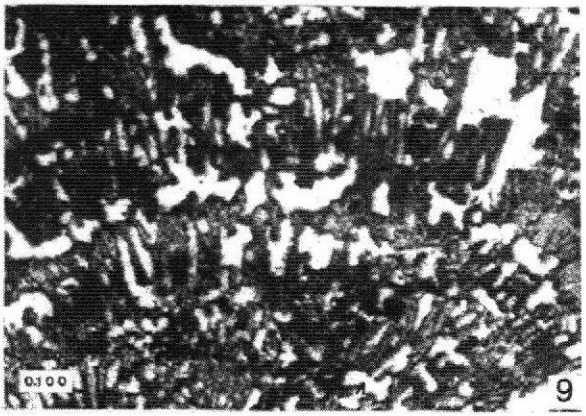
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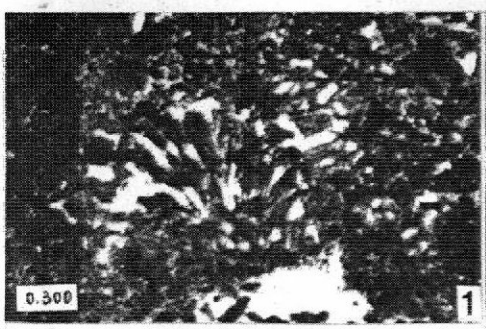
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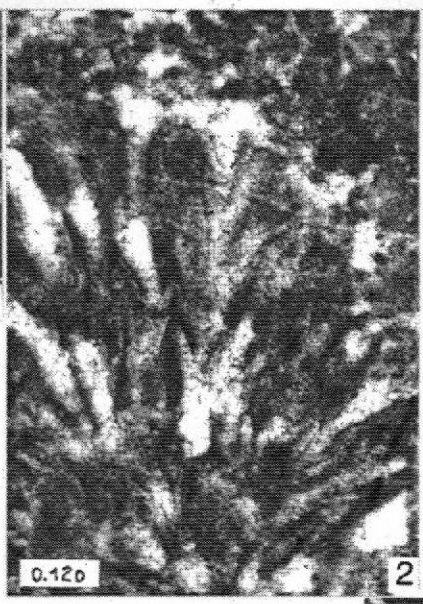
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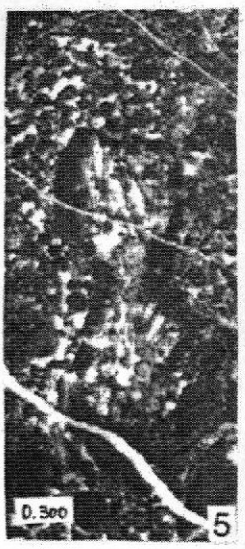
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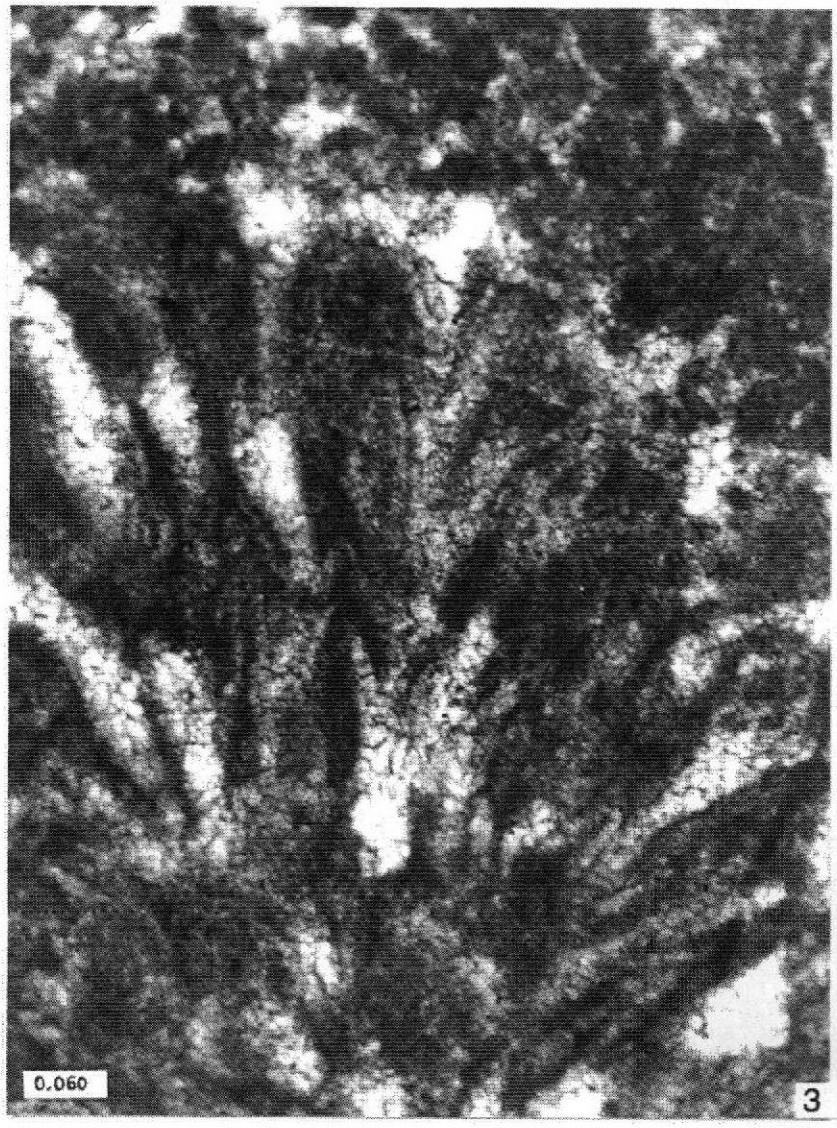
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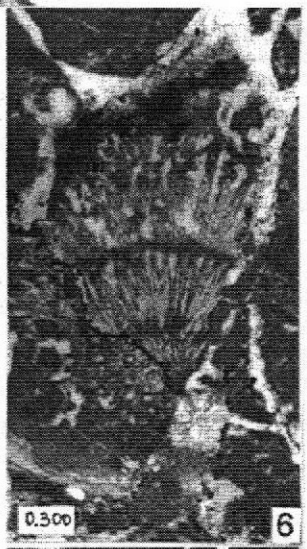
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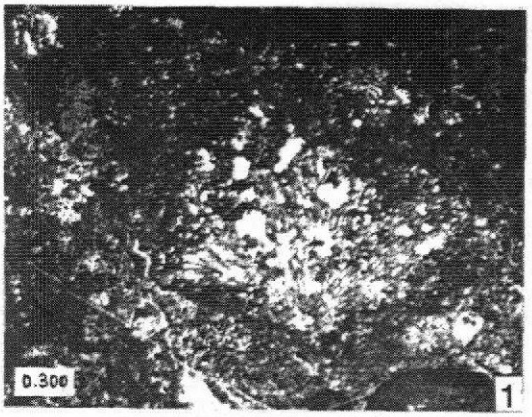
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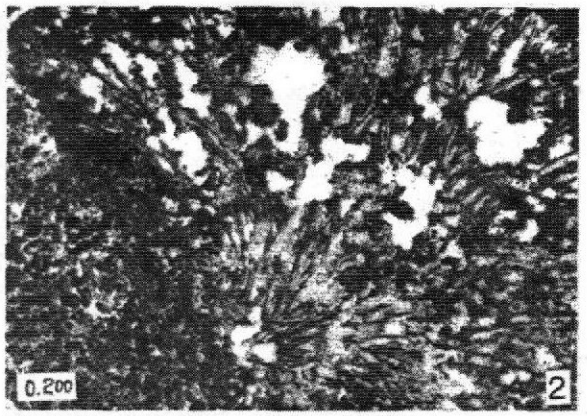
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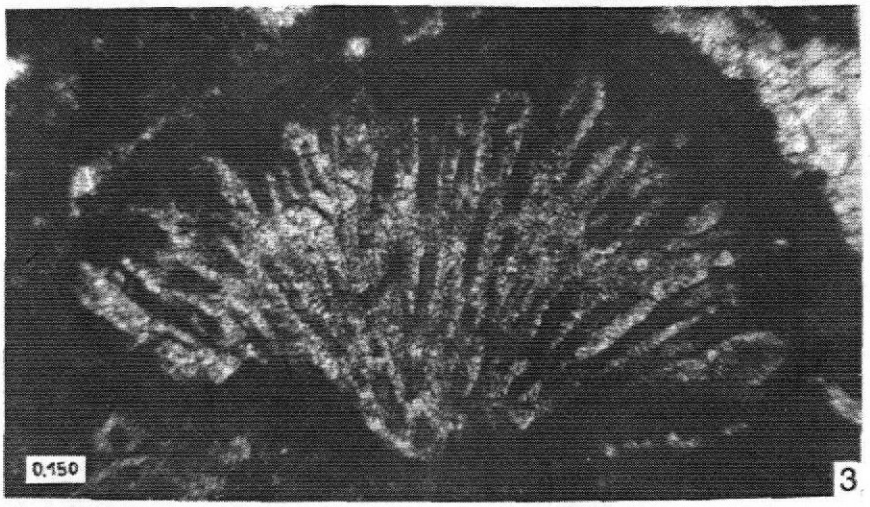
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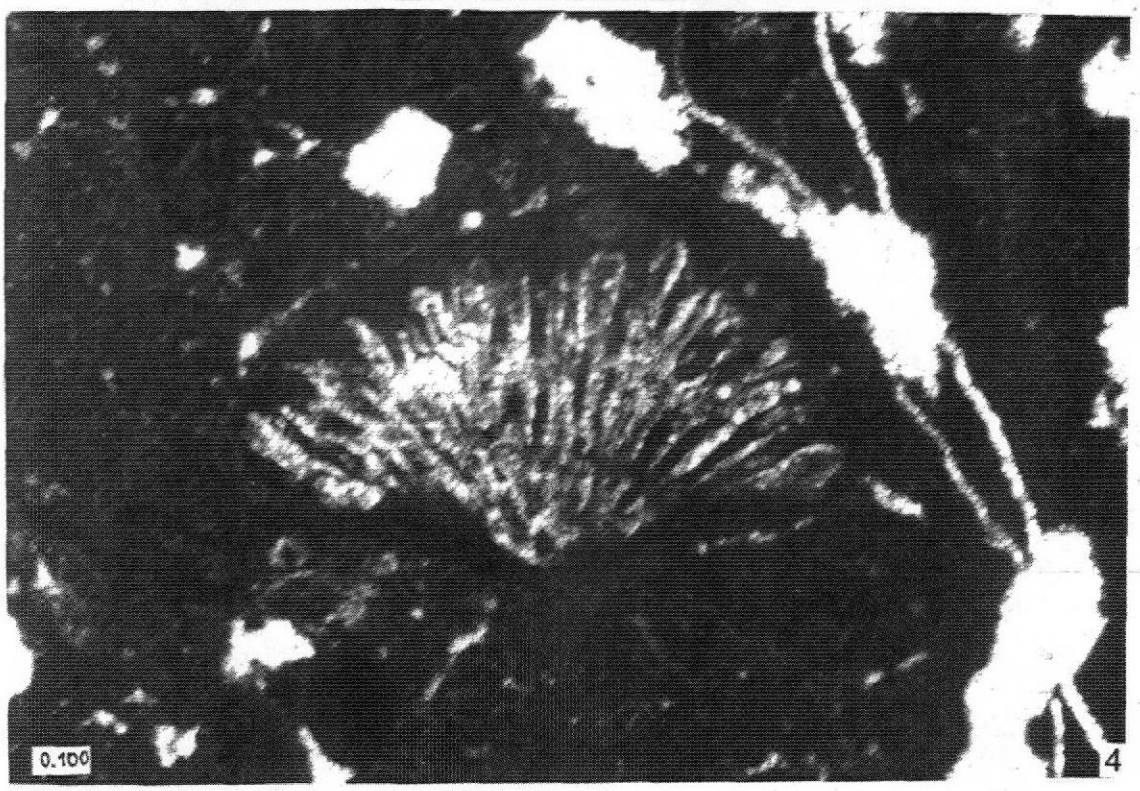
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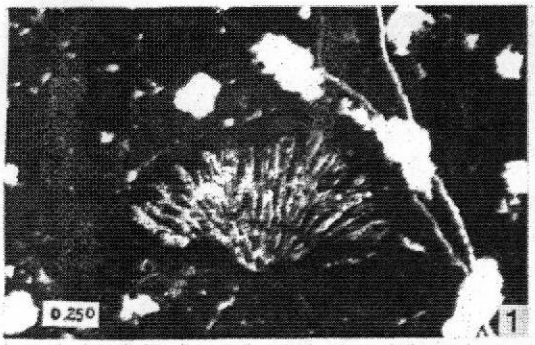
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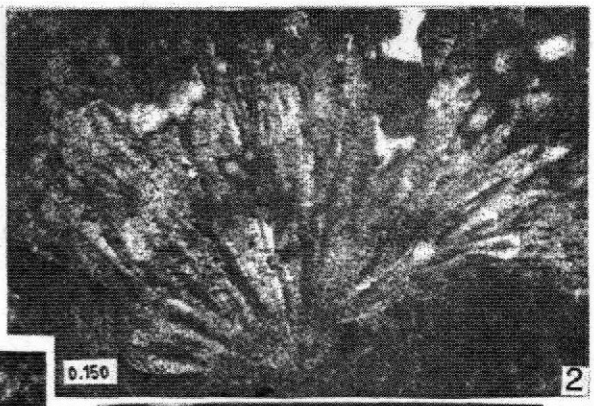
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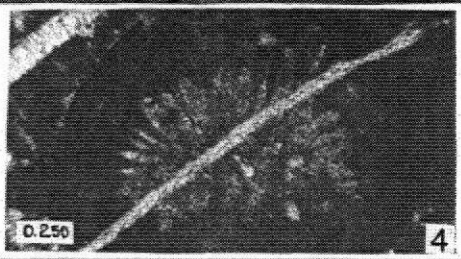
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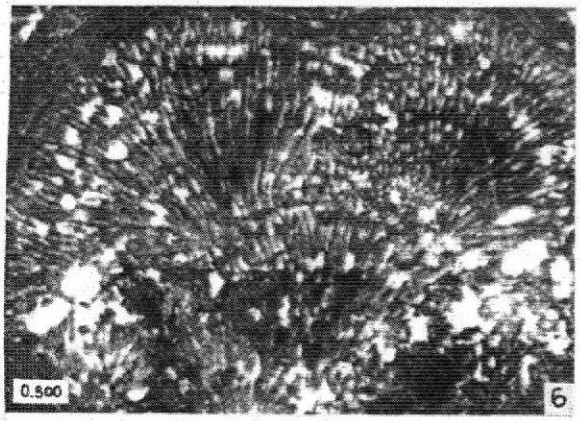
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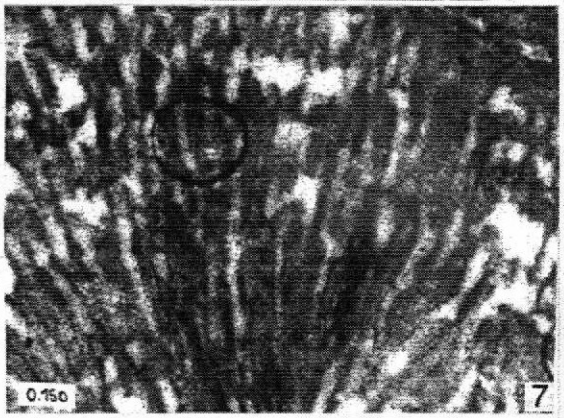
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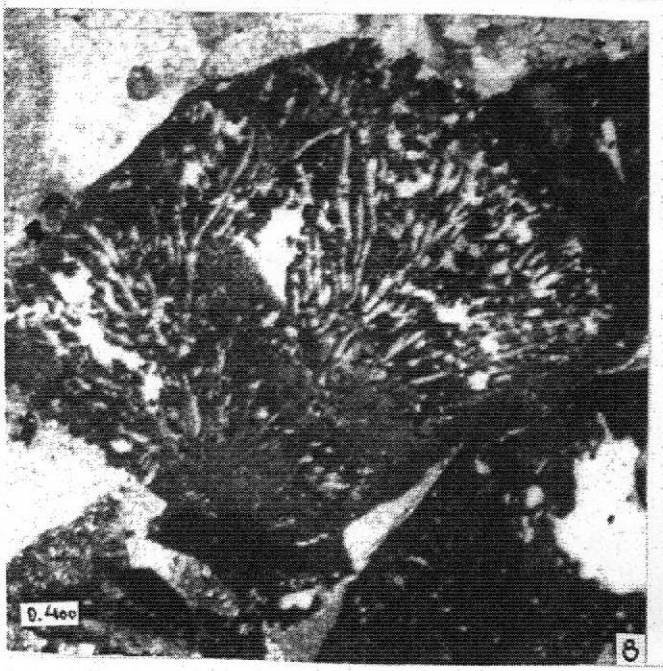
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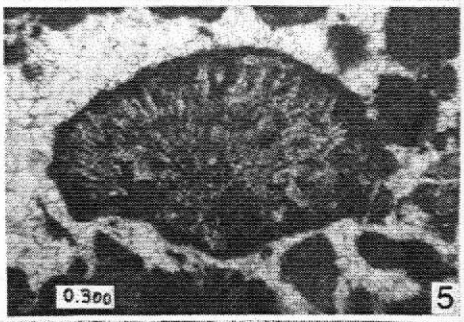
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