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Observations on *Dissocladella annulata* (Elliott, 1993) nov. comb. (Calcareous algae, Dasycladales) from the Cenomanian of west Serbia

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Abstract. Based on material from the type area at Tetrebovo in the Zlatibor massif of W Serbia, the Cenomanian dasycladalean alga originally described as *Harlanjohnsonella annulata* by Elliott (1968, typified 1993 *in:* Granier & Deloffre), is emended and revisited as *Dissocladella annulata* (Elliott) nov. comb. The evidence of tufts of short secondaries arising at the top of the drop-like primaries allows its transfer to the genus *Dissocladella* Pia, 1936. This species displays a different degree of skeleton calcification which is described in detail. The monospecific genus *Harlanjohnsonella* Elliott becomes invalid, as being a junior synonym of *Dissocladella*.

Key words. Dasycladales, *Dissocladella annulata* (Elliott) nov. comb., systematic taxonomy, Cenomanian, Serbia.

Апстракт. Дазикладацејску врсту из ценоманских слојева Тетребова (јужни Златибор) описао је Elliott (1968, типификована 1993 *у*: Granier & Deloffre) као *Harlanjohnsonella annulata* nov. gen., nov. spec. Преиспитивањем узорака из типског локалитета добијени су детаљнији подаци о грађи ове врсте – документовано је постојање секундарних огранака. Овај податак указао је на њену припадност роду *Dissocladella* Pia, а на основу тога моноспецифични род *Harlanjohnsonella* је инвалидизиран. Дијагноза врсте *Dissocladella annulata* (Eliott, 1968) nov. comb. допуњена је уз детаљне илустрације о структури скелета.

Кључне речи: Dasycladales, *Dissocladella annulata* (Elliott) nov. comb., систематска таксономија, ценоман, Србија.

Introduction

In 1968 Elliott described a new dasycladalean genus and species as *Harlanjohnsonella annulata* from transgessive, basal Upper Cretaceous, possibly Cenomanian of "Tetrebovo, Dlaglica SE of Zlatibor massif, SW Serbia" with the following diagnosis of the genus *"Weakly calcified thin-walled tubular and annular dasyclad, with successive verticils showing numerous swollen primaries, the presumed secondaries not being calcified"*. The species is typified 1993 in Granier & Deloffre Discussing the relationships, Elliott concluded *"that the form now described was, in fact, a dasyclad of very similar plant morphology to D.* (Dissocladella) *savitriae, but more weakly calcified"* and because *"there is no direct fossil evidence of secondary branch-structure the species cannot correctly be referred to Dissocladella."*

Based on material sampled at the type locality (Radoičić 1995), from which new thin sections have been prepared, it is documented that the genus *Harlanjohnsonella* Elliott represents a younger synonym of *Dissocladella* Pia confirming Elliott's presumption. The scope of the present paper is a taxonomic revision and detailed illustratation of *Dissocladella annulata* (Elliott) nov. comb.

Geological setting

The Cretaceous deposits of the southern (Tetrebovo, Vis, Fig. 1) and of the central Zlatibor Mountains are rare remnants of a Cretaceous (Albian–?Lower Senonian) cover resting upon ultramaphic rocks. First data on the Cretaceous strata of southern Zlatibor were given by Elliott (1968, "possibly Cenoma-

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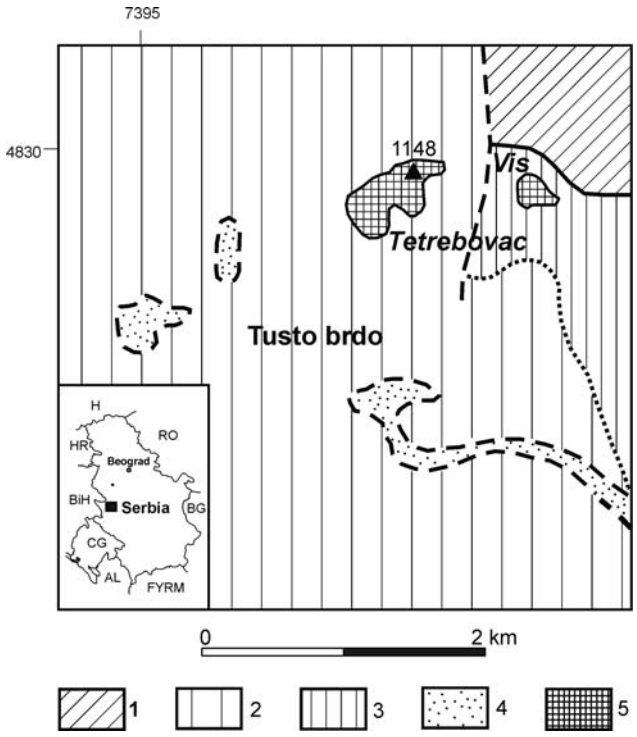

Fig. 1. Geological map of the Tetrebovo area, according to RAMPNOUX (1970, fig. 145), and Geological map sheet Prijepolje 1:100000, ĆIRIĆ *et al.* (1977). Legend: **1,** Upper Triassic limestones; **2,** Serpentinites; **3,** Habzburgites; **4,** Weathering crust, Lower Cretaceous; **5,** Upper Cretaceous limestones (?Albian–Cenomanian).

Fig. 2. Tetrebovo hill, northern view, Cretaceous deposit are covered by forest.

nian", based on RAMPNOUX's data and fossil material) and RAMPNOUX (1974). The presence of Turonian strata was documented by RADOIČIĆ (1995) at Vis (Fig. 1), in the central Zlatibor and Ravni area in the eastern part of Zlatibor. Regrettably, these data was ignored in the context of geological mapping for the Prijepolje sheet (ĆIRIĆ *et al*. 1977), and by subsequent researchers (e.g., DIMITRIJEVIĆ *et al*. 2002: Geology of Zlatibor).

The Tetrebovo succession (Figs. 1, 2), overlies peridotites. According to RAMPNOUX (1970, p. 275, fig. 145; 1974, p. 63), it starts with a Lower Cretaceous weathering crust. In detail the succession consists of:

– basal conglomerates,

– sandy limestones with gastropods, at places limestones with "*Harlanjohnsonella*" *annulata* ELLIOTT, and,

– limestones with *Chondrodonta joannae* CHOFAT, *Radiolites lusitanicus* PARONA and *R. peroni* DOUVILLE.

This succession was ascribed to the Turonian by RAMPNOUX in 1970, afterwards in 1974 to the Cenomanian–Turonian as being equal to that one at Ravni (East Zlatibor). In the meantime, the rudist limestones in the Ravni area, dated as Turonian by PEJOVIĆ & PASIĆ (1958) were revised as being Cenomanian in age (RADOIČIĆ 1995). It should be mentioned, that this does not correspond to the same Ravni succession dated as Turonian by RADOIČIĆ. Afterwards, these sparsely outcropping Tetrebovo Cretaceous deposits were sampled only at places (RADOIČIĆ 1995). One of the oldest observed beds is represented by a marly limestone containing gastropods and large specimens of *Dissocladella annulata* (ELLIOTT) nov. comb., which are well visible without lens. Upward in the section, the limestone contains rare benthic foraminifera, the dasycladalean algae *Heteroporella lepina* PRATURLON, *Terquemella* sp. and a few fragments of *Dissocladella annulata*. They are followed by limestones with frequent foraminifera, respectively *Marssonella turris* (D'ORBIGNY), *Rotalia mesogeensis* TRONCHETTI, *Pseudorhipidionia casertana* (DE CASTRO), *Pseudocyclammina rugosa* (D' ORBIGNY) and *Praealveolin*a cf. *iberica* REICHEL. Between these beds and youngest observeds skeletal calcarenites (middle-upper Cenomanian), the limestone with relatively frequent *Pseudorhapydionina dubia* DE CASTRO is sampled.

The limestone with *Dissocladella annulata* contains numerous large skeleton fragments, small and minute debris, different gastropods, molluscan shells

and rare crustacean fragments, also mentioned by ELLIOTT (1968). In the 25 thin sections studied, only one specimen of *Pseudorhipidionina casertana* and a few small foraminifera were observed. Clearly, *Dissocladella annulata* obviously populated shallow-water environments, probably of low salinity. At the type locality, the limestone with *Dissocladella annulata* can be ascribed to the lowermost Cenomanian.

Systematic taxonomy

Division Chlorophyta
Order Dasycladales PASCHER
Family Triploporellaceae (PIA, 1920)
Tribus Dissocladelleae ELLIOTT, 1977
Genus ***Dissocladella*** PIA, 1936 *in*: RAMA RAO and PIA, 1936
(Synonym *Harlanjohnsonella* ELLIOTT, 1968)

Dissocladella annulata (ELLIOTT, 1968),
nov. comb., revisited
Pls. 1–5, Pl. 6, Figs. 1–16

1968 *Harlanjohnsonella annulata* nov. gen., nov. sp. – ELLIOTT, p. 494, pl. 93, figs. 1-2, pl. 94, figs. 1-2.
1978 *Harlanjohnsonella annulata* ELLIOTT – BASSOULLET et al., p. 120, pl. 12, figs. 8-9.
non 1978 *Harlanjohnsonella annulata* ELLIOTT – LAUVERJAT & POIGNANT, p. 123, pl. 2, figs. 1, 5-6.
1995 *Harlanjohnsonella annulata* ELLIOTT – RADOIČIĆ, pl. 1, fig. 1.

Material. Twenty-five thin sections from the sample 022070, R. RADOIČIĆ collection RR4579 – 4584/9 deposited at the Geological Institute, Beograd.

Diagnosis. Elongated cylindrical thallus exhibiting a large central stem with moderately spaced horizontal whorls. The whorls consist of numerous laterals: drop-like primaries which, at the top, bear tufts of 5–6 thin phloiophorous secondaries. Primary calcification generally weak, stronger or only somewhat thicker around the proximal area of the primaries, becoming thinner outwards, especially at tip and around the secondaries. Possible presence of fertile and sterile individuals.

Description. Being rather variable in size, the skeleton of this species is rather thin with smooth inner surface. The primary calcification is diagenetically overgrown in variable degrees. Different degrees of recrystallization can be observed even within the same whorl. The weakly calcified distal part of the whorls, if not early diagenetically recrystallized, is more or less dissolved or abraded. Therefore, secondary laterals are preserved only in very rare cases, while poorly preserved secondaries are discernable as pores or open pores on the surface of many recrystallized skeletons (Pl. 1, Figs. 2, 4; Pl. 2, Figs. 3, 4; Pl. 3, Fig. 7; Pl. 4, Fig. 9; Pl. 5, Figs. 1–6). Only in some specimens, the membrane of the central stem can be recognized as a dark thin micritic line (Pl. 2, Figs. 1, 2, 5; Pl. 3, Fig. 7). The thin calcareous encrustation of the membrane is rarely preserved; it can be recognized only between two primaries of successive whorls, visible in some sections (Pl. 1, Fig. 4, arrows; Pl. 3, Fig. 4, left; Pl. 6, Figs. 4, 5). A thin-walled calcareous tube encloses the pores of primaries (Pl. 2. Fig. 1), Pl. 3, Fig. 6; Pl. 4, Fig. 1) or more frequently, the thin wall on the surface bears open pores of primaries (Pl. 1, Fig. 1; Pl. 2, Fig. 5; Pl. 3, Figs. 2–5). In rare specimens, the skeleton is dissolved so that it consists of a thin calcareous layer with irregular external surface, on which some parts of the basal calcification of the primaries can be recognized (Pl. 1, Fig. 3; Pl. 2, Figs. 6, 7).

The laterals are arranged in a plane; they are rarely slightly overlapping as shown in the specimen illustrated in Pl. 5, Fig. 8. In successive whorls, laterals do not alternate regularly, but occasionally alternation can be observed in a few successive whorls. In the proximal part the primaries display a regular funnel-like form; they communicate with the central stem by means of minute pores. In deep tangential sections, small basal pores can be seen gradually increasing from the center to the periphery (Pl. 4, Figs. 1). Transversal sections of primaries are circular in shape (Pl. 4, Figs. 1, 2; Pl. 5, Fig. 7, 8). In both, transversal and longitudinal sections of the skeleton, the pores are often secondarily enlarged or diminished and/or more or less deformed.

Besides more or less large specimens, the analyzed limestones of Tetrebovo contain numerous small and especially minute fragments of disintegrated skeletons. These have particular value for the recognition of the structure of this species and the processes of the skeleton alteration. Minute and small fragments as those shown in Pl. 1, Fig. 4 (arrows), Pl. 3, Fig. 3 (arrows), and Pl. 6, Figs. 1–7 indicate that some skeletons are characterized by a somewhat stronger primary calcification only of the shorter proximal part of the whorls, along with an especially thin calcification of the main axis membrane. Therefore, such a kind of calcification facilitated skeleton disintegration, more probably early post-mortem and becoming preserved as small or minute fragments. A further abiogenic stage of calcification resulted in the overgrowth of the primary calcification leading to irregular thallus coatings to variable degrees that is completely or partly coverage even within the same whorl.

Calcification and mode of preservation (Figs. 3 and 4) *Dissocladella annulata* is characterized by two types of primary calcification, shown in the drawings on Fig. 3/1 and 3/3; Figure 3/4 illustrates the relationship between these two types, on Fig. 4. are given different calcification types of the laterals and of the preservation of skeleton.

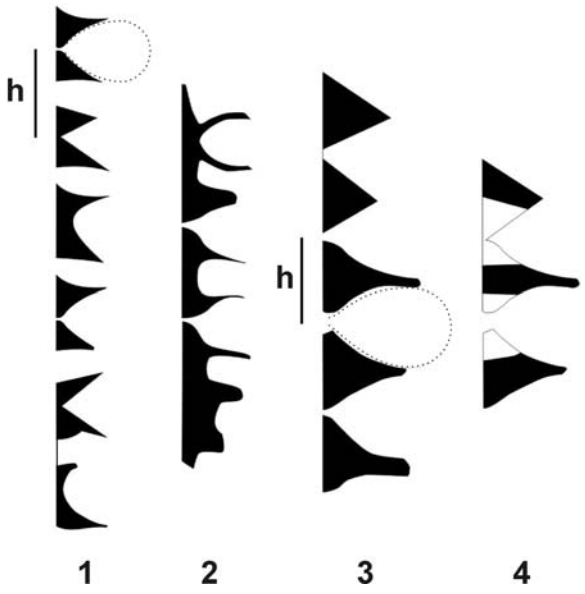

Fig. 3. Two types of calcification of *Dissocladella annulata* (longitudinal sections): **1, 2** – Skeleton A: relatively strong calcified proximal part of primaries which generally occur in the rock as dispersed elements of disintegrated skeleton; examples: Pl. 6, Fig. 1; Pl. 1, Fig. 4, arrows; Pl. 3, Fig. 3, arrows. **3** – B skeleton; example: Pl. 6, Fig. 9. **4** – Relation between A and B skeletons.

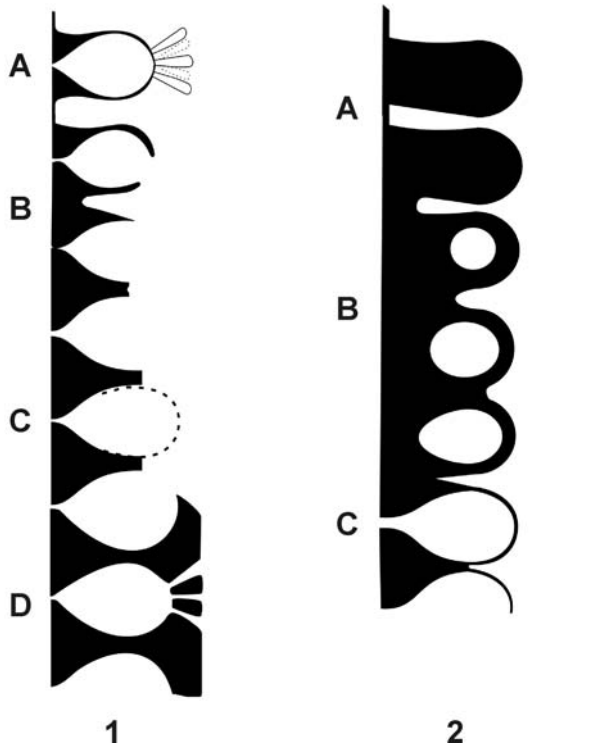

Fig. 4. *Dissocladella annulata* - different calcification types of the laterals and of the preservations of skeleton (longitudinal sections): **1A** – Skeleton A: primary calcification of primaries and secondaries with non-calcified space between the whorls; **1B** – More or less calcified distal part of primaries with advanced recrystallization in the space between the whorls; example: Pl. 4, Fig. 1 and 4, left; **1C** – Usual preservation of type B skeleton (collective calcified skeleton); example: Pl. 3, Figs. 2, 3, Pl. 6, Fig. 9. In the material studied, these parts of the skeleton are preserved as a mosaic trimmed by small calcite grains; **1D** – Recrystallized type B skeleton with only primary pores and with preserved secondaries, too; example: Pl. 2, Fig. 1 and Pl. 6, Fig. 13. **2A** – Completely recrystallized primaries in the annulated skeleton with encrusted stem membrane; example: Pl. 4, Fig. 3, right arrow. **2 A/B** – Different grades of recrystallized space between whorls, with or without preserved pores of primaries, type A skeleton; example: Pl. 4, Figs. 3, left arrow. **2C** – Calcification type of the primaries corresponding to the collective calcified skeleton sensu DE CASTRO (1997).

First type, skeletons of group A (A skeleton): relatively strong proximal calcification usually covering 1/3 of their length, and then distally gradually becoming thinner. Distally, delicate parts of the skeleton, including the secondaries (Fig. 4/1A), were not preserved in the studied material. The characteristic feature of the group A skeleton is that the specimens display a smaller size of the primary laterals (Fig. 3/1, Fig. 4/1A-B, and 2A), resulting in a primarily non-calcified space between the calcified whorls and an annulation of the skeleton (referring to the species name *annulata*). The best examples are illustrated in Pl. 4, Figs. 3, 5 also in Pl. 6, Figs. 1–7, 10 and 11, and also in Fig. 3/1, 4/1A and 2A.

Second type, skeletons of group B (B skeleton): this type is characterized by a) larger primary laterals which are, also in both transversal and longitudinal sections, in slight contact in the largest middle part of the lateral's length and b) by the stronger proximal calcification which, between successive whorls is compact - cf. collective calcified skeleton sensu DE CASTRO (1997, *"guaine calcificata collettiva"*). Secondarily altered, this skeleton part is formed by calcite mosaic trimmed by smaller grains. In the studied material the B skeleton is often preserved as non annulated relatively thin calcareous tubes (proximal area) with open pores of primaries (Pl. 3, Figs. 2–5). It has to be mentioned that in some recrystallized skeletons including secondaries, the "annulations" are reflected on the surface only as shallow feeble canals between the whorls (Pl. 4, Fig. 9; Pl. 5, Fig. 2). Therefore, the space between them is not calcified and as a consequence of this, the strong proximal primary calcification ends in this area (Fig. 5/3; Pl. 4, Figs. 3 left wall, and 4). Hence, this skeleton type is generally preserved as calcareous tubes mainly with open pores of the primaries at the surface.

Dimensions. The dimensions given by ELLIOTT (1968) are indicated between brackets.

Longest observed specimen (L): 12 mm

External diameter (excluding small form in Pl. 2, Fig. 5) (D): 1.18–3.10 mm (up to 2.25 mm)

Central stem diameter (d): 0.940–2.590 mm

d/D: 71% – 89.5% (about 74 %)

Thickness of the calcareous wall (e): 0.098–0.247 mm, maximum up to 0.330 mm (recrystallized – skeletons into secondaries) (0.26 mm)

Distance between successive whorls (h): 0.198–0.210 mm (0.19–0.25 mm)

Diameter of primary pores (p): 0.098–0.123 mm (0.13–0.14 mm)

Thickness of central stem membrane 0.015– 0.024 mm

Number of laterals in a whorl (w): 35–70 (48–50)

The distance between the whorls represents a fairly constant value, while the most variable biometric parameter is the main stem diameter.

Relationships As a consequence of the species emendation and new combination, *Dissocladella annulata* (ELLIOTT) is placed in the Tribus Dissocladelleae ELLIOTT, 1977. The genus *Harlanjohnsonella* ELLIOTT, 1968 (so far monospecific) becomes invalid as representing a synonym of *Dissocladella* PIA, 1936. Mention should be made, that the possible existence of secondary laterals was already assumed by ELLIOTT (1968) and integrated in the genus diagnosis. ELLIOTT anticipatorily remarked the similarity of "*Harlanjohnsonella*" *annulata* with *Dissocladella savitriae* PIA, 1936 (type-species of the genus) from the Maastrichtian–Danian of India showing some similar dimensional parameters (d, d/D, p) and both displaying typical thallus annulation. *Dissocladella annulata* (ELLIOTT) may show more variable and relatively larger external diameters and higher number of laterals per whorl (w about 40 in *D. savitriae*). Apart from this, the special type of calcification and different degree of preservation (due not only to diagenesis) seems to be a species-specific feature of *D. annulata*, not reported from *D. savitriae* with fully calcified ring-like elements enclosing both primaries and secondaries. Curiously, BASSOULLET *et al.* (1978, p. 92) mention an internal thallus undulation, though not mentioned in the original description. In any case, *D. annulata* lacks any internal undulation.

Remarks. In the generic discussion, ELLIOTT included the Carboniferous *Coelosporella*, the Permian *Epimastopora* and *Pseudoepimastopora*. From annular forms such as the Cretaceous *Neomeris cretacea* DELMAS & DELOFFRE non STEINMANN (DELMAS & DELOFFRE, 1962), *Dissocladella annulata "differs in the apparently simple branch-structure"*. Furthermore ELLIOTT concluded that "*a closer comparison can be made with Dissocladella*, *especially the Paleocene Dissocladella savitriae (PIA, 1936).*"

BASSOULLET *et al.* (1978, p. 120) essentialy refer to affinities with *Pseudoepimastopora*: "Le genre *Pseudoepimastopora* parait très voisin du genre *Harlanjohnsonella* et les differences n´apparaissent pas évidentes" and..... "cette espèce pourrait appartenir au genre *Pseudoepimastora*". BASSOULLET et al. (1978) furthermore express doubts on the existence of "annuli or rings" in *Harlanjohnsonella* (ELLIOTT 1968, p. 494). Also JAFFREZO *et al*. (1980) describing *Pseudoepimastopora pedunculata* were discussing affinities/differences to the genus *Harlanjohnsonella*. *Pseudoepimastpora*, however, cannot be considered in the discussion as it represents a nomen nudum (e.g. GRANIER & DELOFFRE 1993; GRANIER & GRGASOVIĆ 2000). In the "New taxonomy of Dasycladale Algae" presented by DELOFFRE (1988), *Harlanjohnsonella* ELLIOTT, 1968 is treated as a synonym of *Paraepimastopora* ROUX, 1979 although *Harlanjohnsonella* was established more than ten years earlier. *Paraepimastopora* is included by DELOFFRE (1988) in the Mastoporea PIA with aspondyle thalli, whereas in the original description ELLIOTT placed it in the tribus Thyrsoporelleae. DRAGASTAN (1975) reported *Harlanjohnsonella* sp. from the Lower Cretaceous of Romania, a form later included tentatively in the synonymy of *Anisoporella*? *cretacea* (DRAGASTAN 1967) by BUCUR (1995). From the Valanginian of Greece, DRAGASTAN & RICHTER (2003) described *Harlanjohnsonella fuechtbaueri* as a new species characterized by a head-and-peduncle thallus morphology: the peduncle bearing "*only primary vesiculiferous ramification with two shapes: a proximal tubular and the distal part globulous, like vesicle. The cylindrical peduncle is continued by a "head" made up of euspondyle verticils with vesiculiferous ramification"*. As shown in the present paper, *Harlanjohnsonella* represents a junior synonym of *Dissocladella*; therefore the generic position of the dasycladalean alga described by DRAGASTAN & RICHTER (2003) remains open. The authors also allege that *Dissocladella annulata* (ELLIOTT) should exhibit a head-and-peduncle type thallus, a view that must be rejected due to the studied abundant material. Concerning the section designated as holotype, in Pl. 4, Fig. 3, it has to be mentioned that the presence of a "head" is not sure (it may be the section of another specimen in a densely packed algal limestone).

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References

BASSOULLET, J.P., BERNIER, P., CONRAD, M.A., DELOFFRE, R. & JAFFREZO, M. 1978. Les algues Dasycladales du Jurasique et du Crétacé. *Géobios, mém. spec,* 3: 1–333.

BUCUR, I.I. 1999. Lower Cretaceous Dasyclad algae from the Padurea Craiului Massif (Northern Apuseni Mountains, Romania). *Acta Paleontologica Romaniae*, 2: 53–72.

ĆIRIĆ, A., OBRADINOVIĆ, Z., NOVAKOVIĆ, D., POPEVIĆ, A., KARAJIČIĆ, L., JOVIĆ, B. & SERDAR , R. 1977. *Geological Map of sheet Prijepolje*, 1: 100 000, K34-16.

DE CASTRO, P. 1997. Introduzione allo studio in sezione sottile delle Dasicladali fossili (An Approch to thin-sections study of fossil Dasycladales). *Quaderni dell'Accademia Pontaniana*, 22: 1–261.

DIMITRIJEVIĆ, N.M., LJUBOVIĆ OBRADOVIĆ, D. & DIMITRIJEVIĆ, M.D. 2002. Upper Cretaceous of the Ravni domain. *In*: DIMITRIJEVIĆ, M.D. (ed.) *Geologija Zlatibora*, 75–85.

DRAGASTAN, O. 1975. Upper Jurassic and Lower Cretaceous Microfacies from the Bicaz Valley Basin (East Carpathians*). Institut de Geologie et de Geophysique, Memoires*, 21: 1–87.

DRAGASTAN, O. & RICHTER, D.K. 2003. Calcareous algae and foraminifers from Neocomian limestones of Methana Peninsula, Asprovouni Mts. (Greece) and from south Dobrogea (Romania). *Analele Universităţii Bucureşti*, *Geology, Special Publication,* 1: 57–128.

ELLIOTT, G.F. 1968. Three new Tethyan Dasycladaceae (Calcareous Algae*). Palaeontology,* 11 (4): 491–497.

GRANIER, B. & DELOFFRE, R. 1993. Inventaire critique des algues dasycladales fossiles II^{o} Partie – les algues dasycladales du Jurassique et du Crétacé. *Revue de Paléobiologie*, 12 (1): 19–65.

GRANIER, B. & GRGASOVIĆ, T. 2000. Les algues Dasycladales du Permien et du Trias. Nouvelle tentative d´ inventaire bibliographique, géographique et stratigraphique. *Geologia Croatica*, 53 (1): 1–208.

JAFFREZO, M.A., POISSON, A. & AKBULUT, A. 1980. Les Algues au Crétacé inférieur des séries de type Bey Daglari (Taurides occidentales, Turquie). *Bulletin of the Mineral Research and Exploration Institute of Turkey*, 91 (1978): 76–88.

LAUVERJAT, J. & POIGNANT, A. 1978. Les algues de la série à Vascocératides du bassin occidental Portugais. *Cahiers de Micropaleontologie*, 3: 121–126.

PEJOVIĆ, D. & PAŠIĆ, M. 1958. Razviće turona u široj okolini sela Ravni i Sirogojna, zapadna Srbija. *Zbornik radova Geološkog instituta "Jovan Žujović"*, 10: 21–28.

RADOIČIĆ, R. 1995. Contribution to the study of Cretaceous biostratigraphy of Zlatibor Mountain. *Radovi Geoinstituta*, 31: 17–30 (in Serbian, English summary).

RAMPNOUX, J.P. 1970. Contribution à l'étude géologique des Dinarides: un secteur de la Serbie méridonale et du Montenegro orientale (Yougoslavie). *These,* Planche et Coupes, 176 pp.

RAMPNOUX, J.P. 1974. Contribution à l'étude des Dinarides: un secteur de la Serbie méridionale et du Montenegro orientale (Yougoslavie). *Mémoires de la Societé Géologique de France, Nouvelle serie*, 52 (1973), 119: 6–99.

Резиме

Опсервације о врсти *Dissocladella annulata* (ELLIOTT, 1993) nov. comb. (Dasycladales) из ценомана западне Србије

Кредне наслаге јужног (Тетребово, Вис, сл. 1) и централног Златибора остаци су кредног покрова (алб–?доњи сенон) на ултрамафитима. Први податак о креди на јужном Златибору дао је ELLIOTT (1968), а на основу података и материјала RAMPNOUX-а. Присуство туронских седимената документовано је знатно доцније на узвишењу Вис (сл. 2), на централном, и у области Равни на источном Златибору (RADOIČIĆ, 1995). Подаци о креди на јужном Златибору игнорисани су од стране тима који је радио гелошку карту листа Пријепоље 1:100 000 (ĆIRIĆ *et al*. 1978), као и од потоњих аутора студије о креди Златибора (DIMITRIJEVIĆ *et al.* 2002).

Систематика

Ред Dasyladales PACHER
Фамилија Triploporellaceae (PIA, 1920)
Триба Dissocladelleae ELLIOTT, 1977
Род ***Dissocladella*** PIA, 1936, in RAMA RAO and PIA, 1936
(Синоним *Harlanjohnsonella* ELLIOTT, 1968)

Dissocladella annulata (ELLOTT, 1968),
nov. comb., revisited
Табле 1–5; Таб. 6, сл. 1–16.

Дијагноза. Издужен цилиндричан талус са пространом централном стабљиком која носи раздвојене хоризонталне пршљенове. Пршљенови се састоје од бројних субсферичних примарних огранака који, на врху, носе 5–6 тањих флоиофорних секундарних огранака. Примарна калцификација је релативно слаба, јача или само нешто дебља у проксималном дијелу примарних огранака, отанчавајући дистално, особито у врху и око секундарних огранака. Могуће је постојање фертилних и стерилних индивидуа.

Врсту *Dissocladella annulata* карактерише знатна варијабилност димензија, скелет је релативно танак, глатке унутрашње површине. Примарна калцификација прекривена секундарно и прекристалисала у различитом степену, често неуједначено у истом пршљену. Секундарни огранци ријетко су очувани. Особеност ове врсте је различита калцификација – потојање два типа (тип А и Б, сл. 3). Скелет типа А има нешто ситније примарне огранке, те међу пршљеновима остаје примарно

некалцифициран простор што је узрок анулације скелета али и склоности ка десинтеграцији. Скелет типа Б има нешто крупније примарне огранке, јаче калцифициран проксимални дио, те компакну калцификацију међу пршљеновима (тип "колективне калцификације скелета" у смислу DE CASTRO-a, 1997). Очуваност скелета овог типа је другачија – то су кречњачке цјевчице са порама примарних огранака или са отвореним порама уколико зид није потпуније очуван. У скелету рано прекристалисалих јединки изгубљени су елементи унутарње грађе, али са отисцима секундарних огранака на површини скелета.

Dissocladella annulata била је настањена у плитководном ареалу, највјероватније у условима смањеног салинитета. Кречњаци са *Dissocldella annulata* у типском локалитету приписани су најнижем ценоману.

PLATE 1

Dissocladella annulata (ELLIOTT, 1993) nov. comb., emended, aspects of different skeleton preservation.

Fig. 1. Relatively well preserved oblique section of type B skeleton with calcification reaching from the main stem to p.p. distal parts of the primary laterals; note, that in the topmost whorl, the primary laterals are in slight contact. Thin section RR4584/7.

Fig. 2. Oblique section of type B skeleton altered by endolithic activity; in parts of the wall secondaries are discernible. Thin section RR4583.

Fig. 3. Oblique section of a dissolved skeleton with only a very thin remnant of the proximal part being preserved. Note some primary pores in the upper part of the figure. Thin section RR4583/5.

Fig. 4. Slightly oblique transverse section of a completely recrystallized type B skeleton with denticulated outer (moulds of secondaries) and smooth inner surface. Arrows: minute fragments of primaries (type A skeleton), in two of which parts of the encrusted stem membrane are preserved. Thin section RR4583/2.

Scale bar for all figures = 0.50 mm

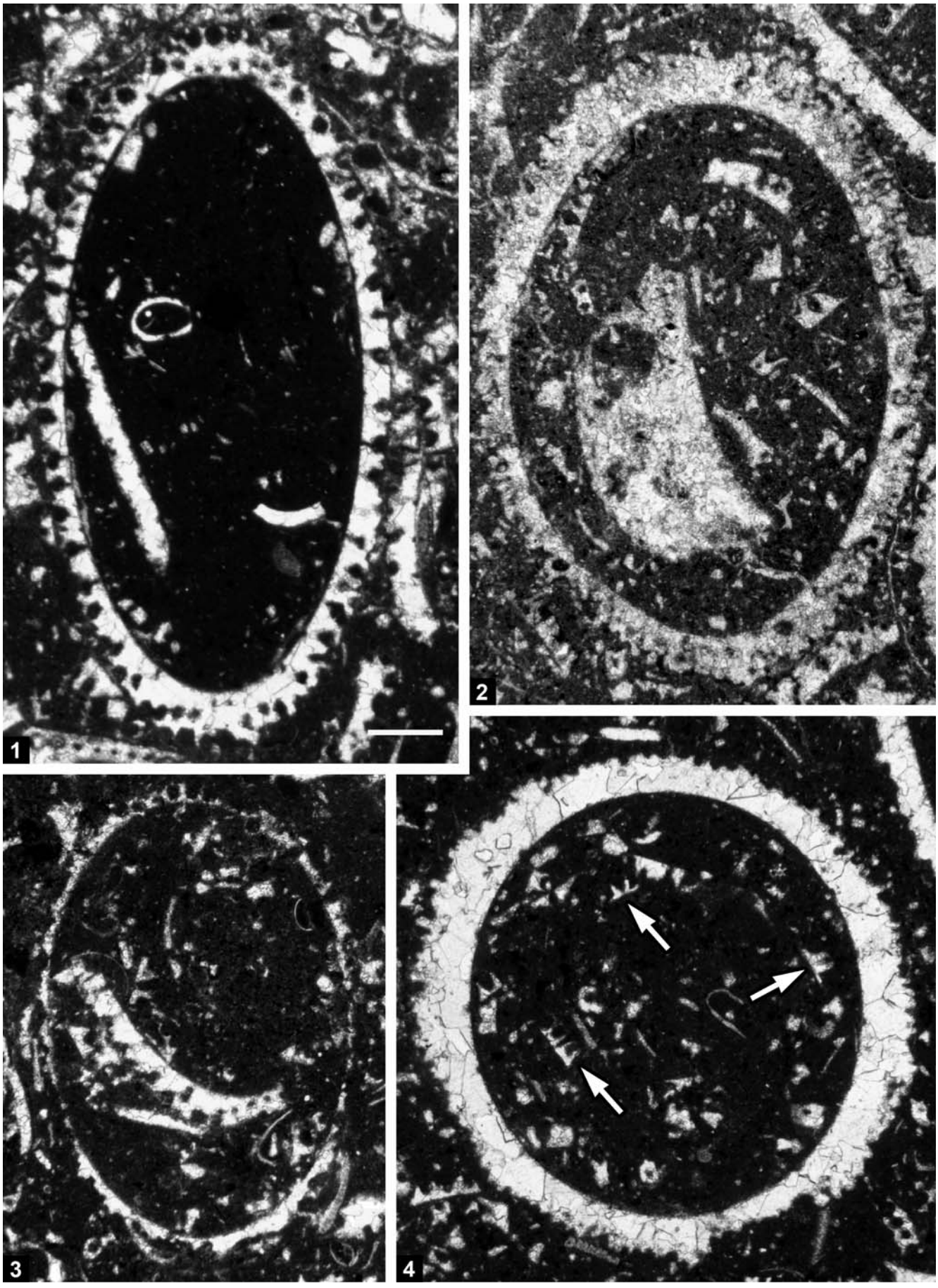
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PLATE 2

Dissocladella annulata (ELLIOTT, 1993) nov. comb., emended.

Fig. 1. Relatively well preserved, slightly oblique trnsverse section with main stem preserved as a thin micritic line; arrow: somewhat thicker part of the skeleton wall with a few poorly preserved open pores of secondaries. Thin section RR4584/8.

Figs. 2, 3. Transverse sections of poorly preserved, recrystallized and more or less dissolved skeletons with, in the upper part, slightly visible micritic main stem membrane. Thin sections RR4583/1 and 4583/7.

Fig. 3. Slightly oblique transverse section of a recrystallized type B skeleton, partly dissolved, with denticulate outer and smooth inner surface. Thin section RR4583/7.

Fig. 4. Oblique section of a large fragment, partly recrystallized, altered by endolithic activity and showing some relatively well visible open pores of secondary laterals. Thin section RR4583.

Fig. 5. Slightly oblique transverse section with only the proximal part of the skeleton and the main stem membrane as a thin micritic line being preserved. Thin section RR4583.

Figs. 6, 7. Transverse and longitudinal section of skeletons in nearly last stadium of dissolution; in both the inner surface is smooth. In Fig. 6, left, note the fragment of longitudinal wall section with three drop-like pores of primary laterals; Thin sections RR4584/8 and 4583/5.

Scale bar for all figures = 0.50 mm.

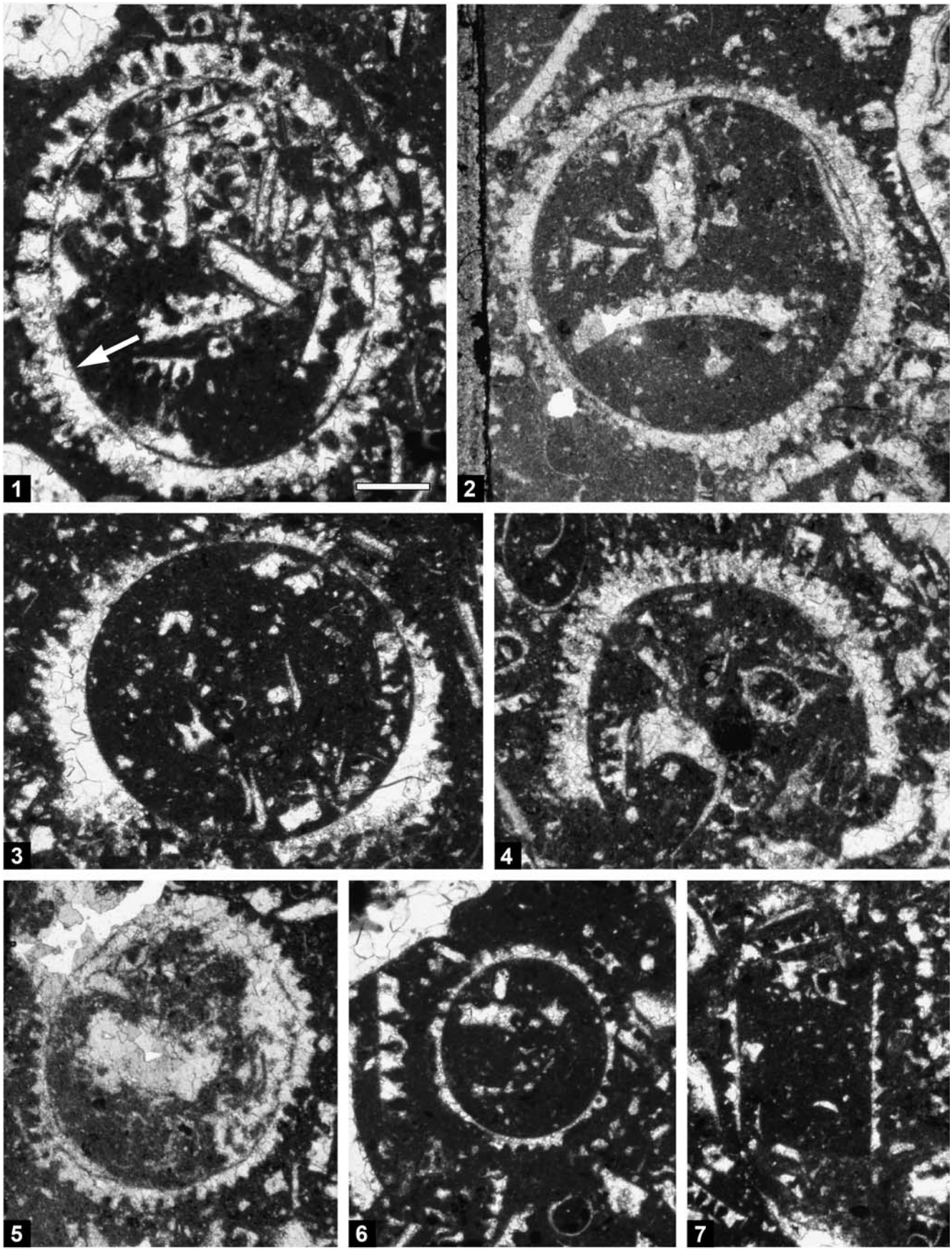
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PLATE 3

Dissocladella annulata (ELLIOTT, 1993) nov. comb., emended.

Fig. 1. Longitudinal section of a prevailing recrystallized calcareous tube (9 mm in length) in which some subsequently recrystallized pores of primaries are discernible. Thin section RR4584.

Figs. 2, 3. Longitudinal-oblique sections of thin type B skeleton's wall showing open pores of primaries on the surface. Arrows in Fig. 3: small fragments; note on the left: calcification of group A, *versus* those of group B skeletons; detail shown in Fig.4. Thin sections RR4584 /5 and 4584/1.

Fig. 4. Detail of the section in Fig. 3, A versus B type skeletons; note the white lines: the relationship of the distance between the whorls (c-c): in group A (left) and B (right). Thin section RR4584/1.

Fig. 5. Transverse section. Thin secttion RR4583/4.

Fig. 6. Oblique section of the smallest skeleton observed. Thin section RR4584/2.

Fig. 7. Recrystallized skeleton, note (arrow), two pores of primaries arising from the micrite main stem (micrite line) (lower arrow). In the upper part a few pores of secondaries are slightly discernible (upper arrow). Thin scetion RR4583/5.

Scale baar for all figures = 0.50 mm.

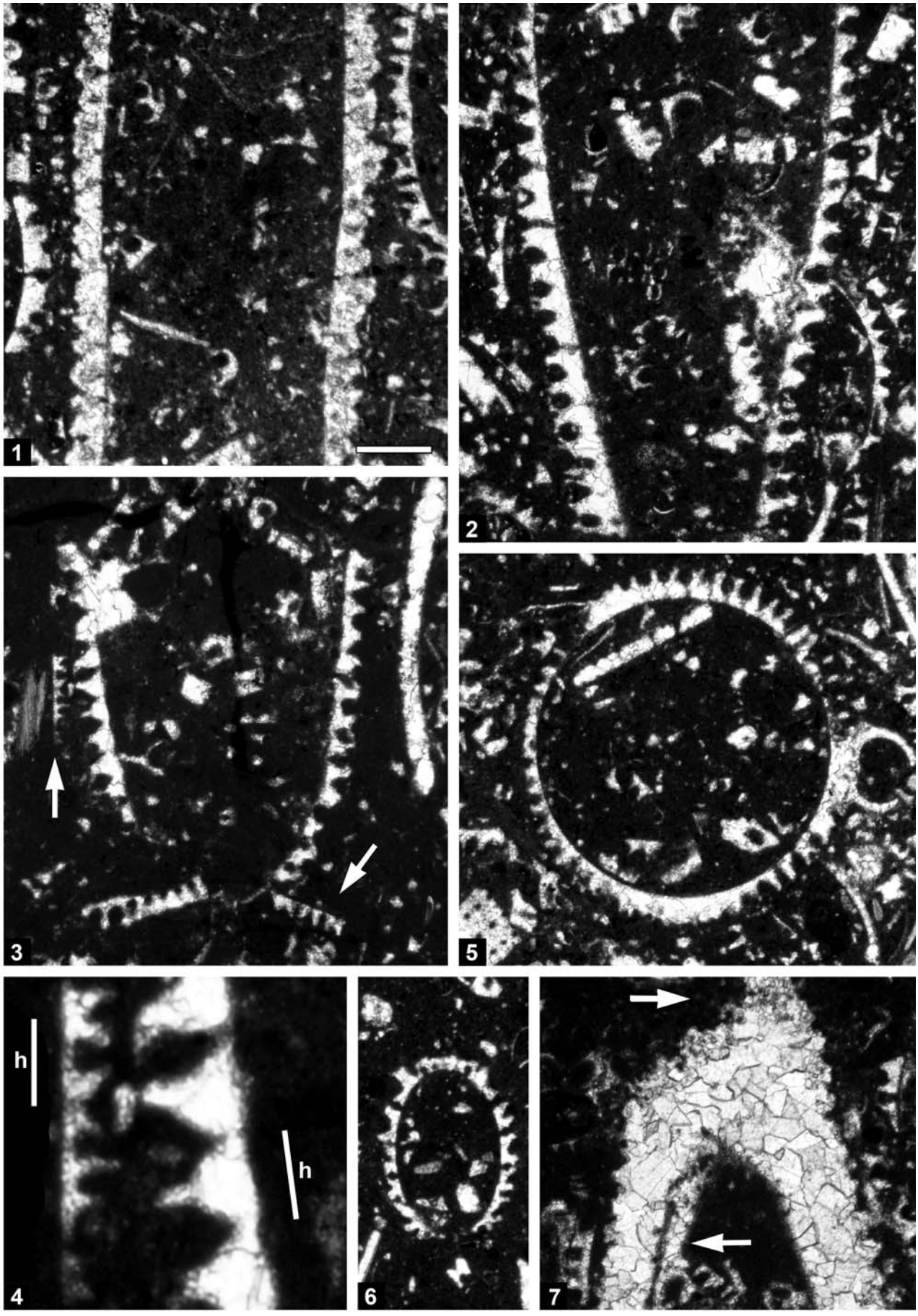
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PLATE 4

Dissocladella annulata (ELLIOTT, 1993) nov. comb., emended

Figs. 1, 4. Longitudinal-oblique sections of annulated, selectively altered skeletons. Only the space between the whorls in the proximal area is recrystallized, while the primary calcification is preserved in their distal parts (left in both figures). Thin sections RR4584/8 and 4584/5.

Fig. 2. Longitudinal-oblique section of type B skeleton. Thin section RR4584/1.

Fig. 3. Longitudinal-oblique section of an annulated skeleton in which, in contrast to that one in Fig. 2, the whorls with the primaries are completely recrystallized (Fig. 4/2A), while the space between the whorl is not filled; arrows: thin encrusted stem membrane (right) and (left) recrystallized basal part of the space between the whorls. Thin section RR4582.

Fig. 5. Tangential section corresponding to the skeleton shown in Fig. 2. Thin section RR4584/5.

Fig. 6. Slightly deformed longitudinal-oblique section of type A skeleton similar to that one shown in Fig. 3, poorly preserved and slightly deformed. Thin section RR4584/2.

Fig. 7. Fragment of a longitudinal-oblique section of a type A skeleton; note the encrusted main stem membrane on the right. Thin section RR4584.

Fig. 8. Oblique section of type A skeleton with encrusted stem membrane between the whorls. Thin section RR4584/6.

Fig. 9. Oblique section of a recrystallized skeleton altered by endolithic activity; secondaries discernible in the upper part (arrow). Thin section RR4583/3.

Scale bar for all figures = 0.50 mm.

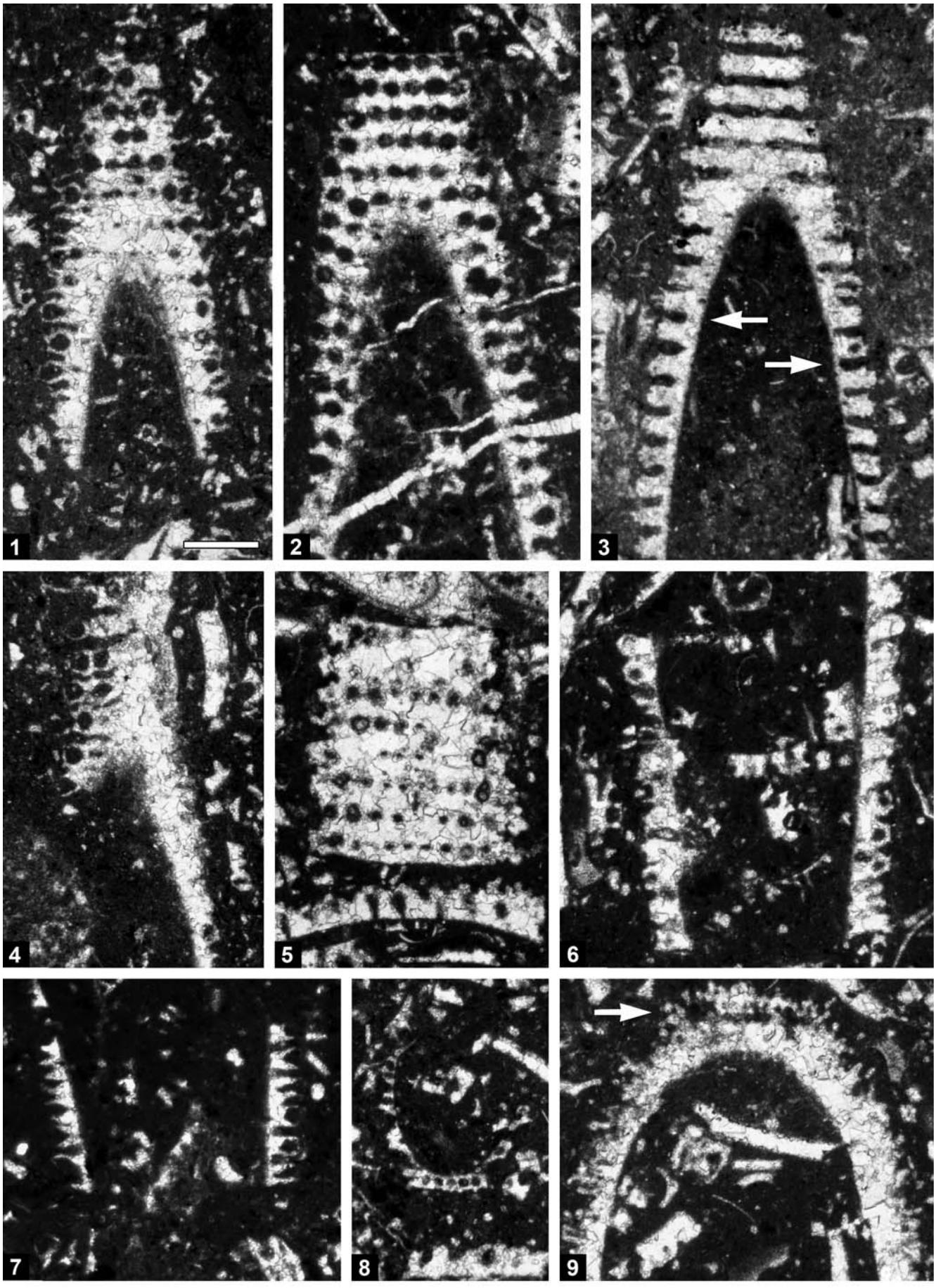
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PLATE 5
Dissocladella annulata (ELLIOTT, 1993) nov. comb.

Fig. 1. Fragment of a tangential section with pores of secondaries in the upper part. Thin section RR4583/1.

Figs. 2–6. Poorly preserved recrystallized oblique sections and fragments with pores of secondaries on the surface. Thin sections RR4584/2, 4584/2, 4584/4, 4584/3 and 4584/9.

Figs. 7, 8. Tangential-oblique and shallow tangential section; "pores" between whorls in Fig. 7 are in fact pseudopores. Thin sections RR4584/2 and 4584/4.

Fig. 9. Oblique deep tangential section. Thin section RR4584/7.

Fig. 10. Tangential section with pseudopores (= not uniformly calcified space between whorls). Thin section RR4583/5.

Scale bar for all figures = 0.50 mm.

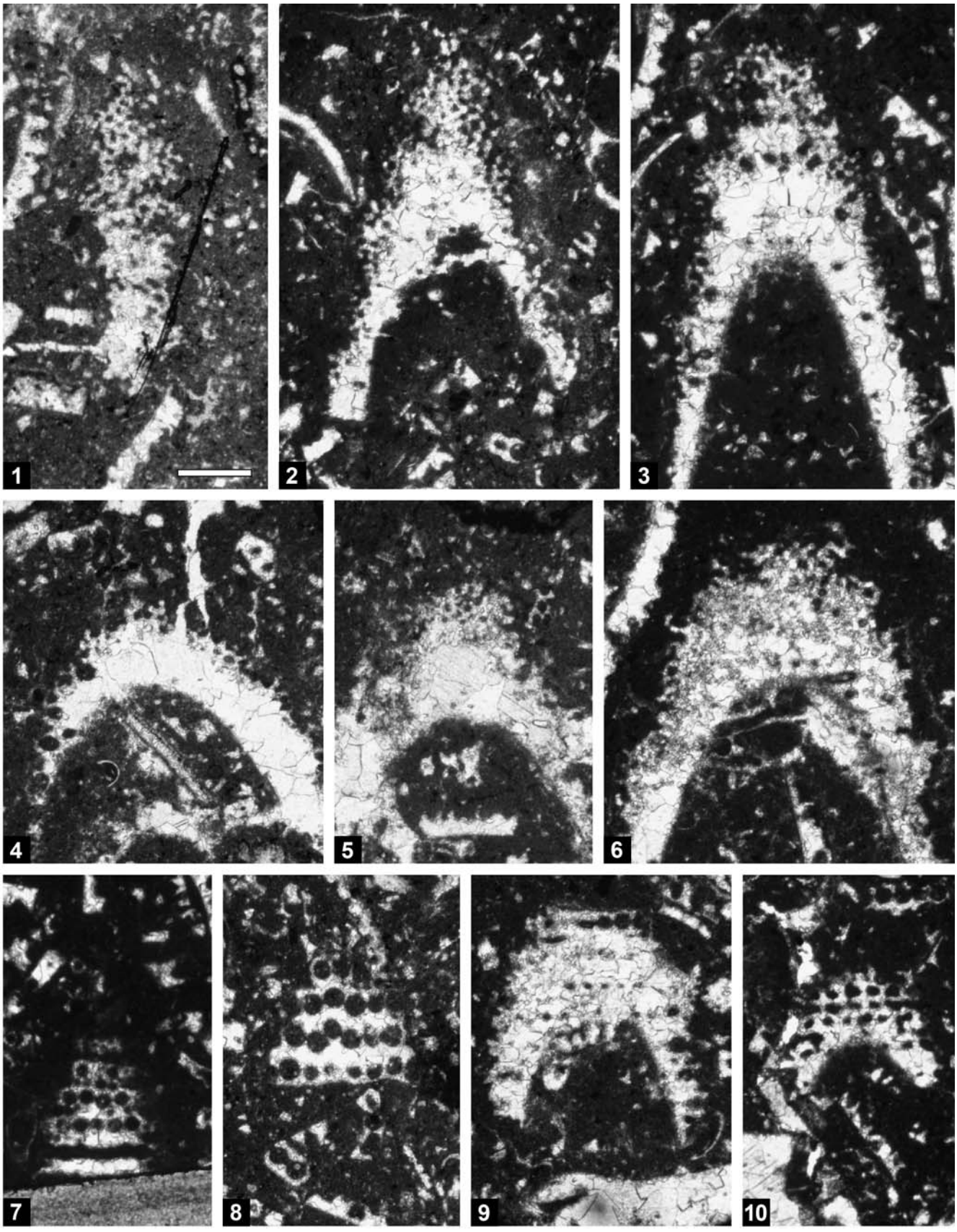
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PLATE 6

Dissocladella annulata (ELLIOTT, 1993) nov. comb., emended (Figs. 1–16), and associated organisms (Figs. 17–21).

Figs. 1–8, 10. Longitudinal and longitudinal-slightly oblique sections of different minute and small fragments of type A skeletons. Thin sections RR4584, 4583/2, 4584/5, 4584/2, 4581, 4584/8, 4584/7, 4584/1, 4583/2 and 4584.

Fig. 9. Longitudinal section, fragment of type B skeleton. Thin section RR4583/4.

Fig. 11. Tangential section of a type A skeleton, corresponding to longitudinal section of skeleton in Fig. 10. Thin section RR4583/2.

Fig. 12. Fragment, longitudinal section of a recrystallized type B skeleton with few open pores of secondaries. Thin section RR 4583/4.

Fig. 13. Fragment of a slightly oblique transverse section with three pores of secondaries. Thin section RR4583/5.

Fig. 14. Fragment of recrystallized transverse section with denticulate surface. Thin section RR4584/4.

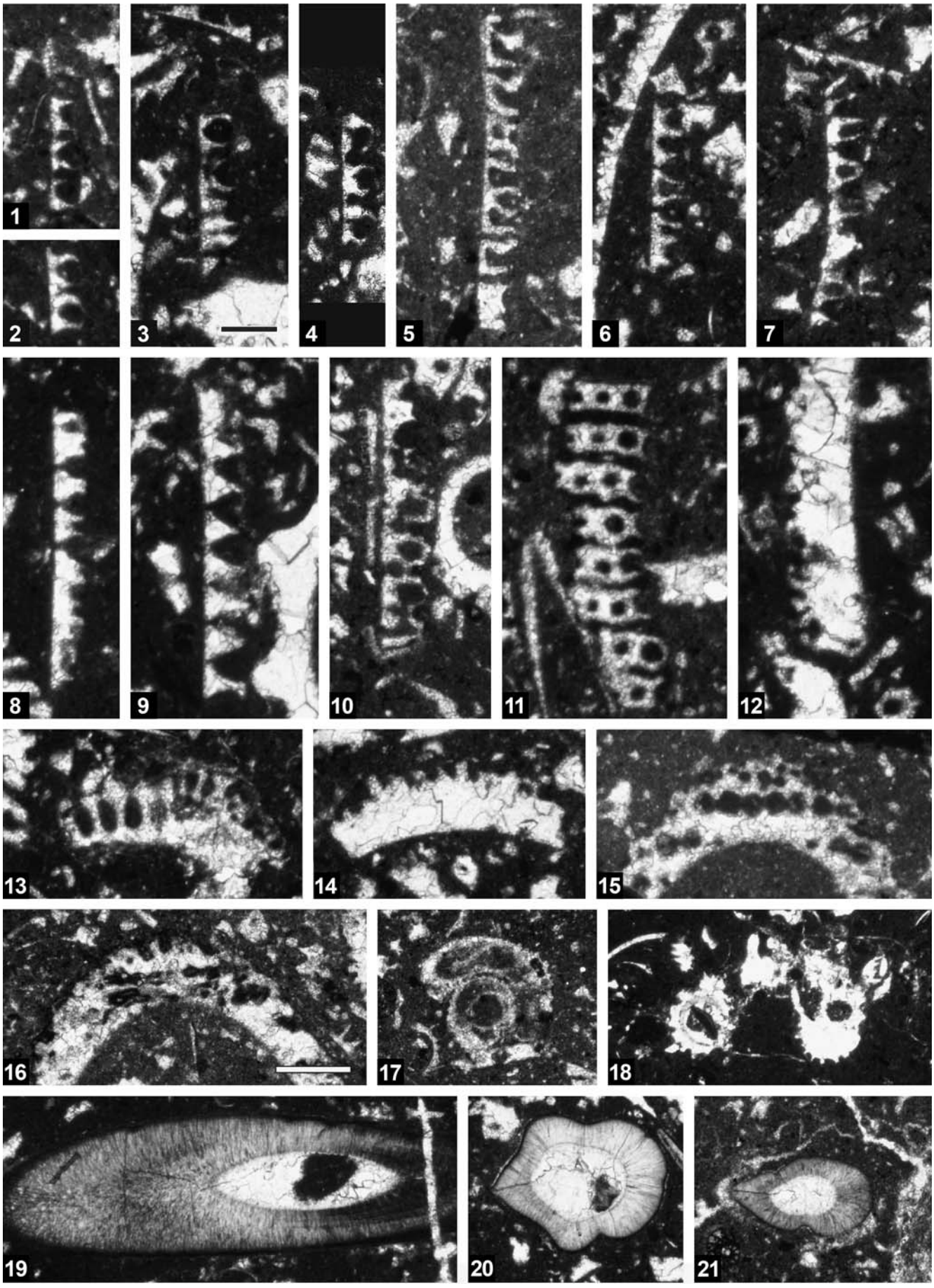
Fig. 15. Oblique section, note pores of secondaries . Thin section RR4586/5.

Figs. 16. Oblique section of a recrystallized skeleton affected by endolithic activity within the primaries. Thin section RR 4583.

Figs. 17, 18. Microgastropods. Thin section RR4583/6.

Figs. 19–21. Sections of crustaceans – *Carpathocancer* SCHLAGINTWEIT & GAWLICK (former *Carpathiella* MISIK, SOTAK & ZIEGLER). Thin sections RR4583/2, 4584/6 and 45 84/3.

Figures 1–15: scale bar = 0.25 mm; figures 16–21: scale bar = 0.50 mm.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