Геолошки анали Балканскога полуострва Annales Géologiques de la Péninsule Balkanique	67	65–87	Београд, децембар 2006 Belgrade, December 2006

Trinocladus divnae and *Montiella filipovici* – a new species (Dasycladales, green algae) from the Upper Cretaceous of the Mountain Paštrik (Mirdita Zone)

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Abstract. Two new dasycladalean species from the Upper Cretaceous of the Mountain Paštrik, Kukes Cretaceous Unit of the Mirdita Zone are described:

Trinocladus divnae sp. nov. is characterized by variable size of the thallus, relatively narrow main axis, typical *Trinocladus* organization of the laterals and thin calcification limited to the distal part of the thallus which includes a swollen part of secondaries and short tertiaries. Often, the internal portion of the whorls (except sometimes the main stem membrane), tends to dissolve and form dissolution cavities filled with cement.

Montiella filipovici sp. nov. is characterized by a primary skeleton made of a thin individual sheath around a fertile ampullae, often obliterated by recrystallization. Four to six laterals, each giving one secondary and one fertile ampulla located on the upper side of the relatively thick short primary lateral.

Upper Cenomanian limestone with *Cisalveolina fraasi* and *Trinocladus divnae* sp. nov. was deposited immediately before the events that resulted in sea level rising. The middle and upper Cenomanian eustatic-tectonic processes had different effects in the Paštrik shallow water areas, depending on the distance from the basinal part of the Unit. Bathymetric changes in a part of the Paštrik sedimentary area were not significant, even negligible. *Montiella filipovici* is found in the post-*fraasi* shallow water sequence, assigned to the ?uppermost Cenomanian–lowermost Turonian (= *Whiteinella archaeocretacea* Zone *p. p.*; a short stratigraphic gap, in a part of the area, is noted). Shallow water limestone with Turonian taxa, corresponding to the *helvetca* Zone, occurs a few meters upward.

Supplementary note: the species *Cylindroporella parva* Radoičić is transferred in the genus *Montiella*, the species *Permocalculus elliotti* Johnson is transferred in the genus *Trinocladus*, while the species *Trinocladus bellus* Yu Jing is transferred in the genus *Belzungia*.

Key words: Dasycladales, new species, new combination, Cenomanian, Turonian, Mountain Paštrik, Kukes Cretaceous Unit, Mirdita Zone

Абстракт. Описане су двије нове врсте дазикладалеских алги: *Trinocladus divnae* sp. nov. из ценомана и *Montiella filipovici* sp. nov. из ?највишег ценомана–најнижег турона Паштрика (Кукеска кредна јединица, Мирдита Зона):

Врсту *Trinocladus divnae* sp. nov. карактерише талус веома варијабилних димензија, узана главна оса, организација огранака *Trinocladus* типа и слаба калцификација најчешће ограничена само на дистални дио талуса: око дисталног проширења секундарних и око терцијарних огранака. Унутарња структура, изузев каткада калцифициране мембране главне осе, била је веома подложна дисолуцији. Тако настала празнина обично је бивала испуњена цементом. Векстон-пекстоне са *Trinocladus divnae* sp. nov. Потиче из највишег дијела *Cisalveolina fraasi* зоне

Врсту *Montiella filipovici* sp. nov. карактерише танак примарни карбонатни омотач само око фертилних ампула који је најчешће уништен услед прекристализације. 4–6 релативно кратких масивних примарних огранака носе по један секундарни огранак и једну фертилну ампулу смјештену навише.

Горњоценомански кречњак са *Cisalveolina fraasi* и *Trinocladus divnae* sp. nov. депонован је непосредно прије догађаја који су узроковали пораст морског нивоа.

Средњо–горњоценомански тектонско-еустатички процеси различито су се одражавали на плитководни ареал зависно од удаљености односно близине басенског дијела Кукеске кредне јединице. Батиметријске промјене у дијелу овог плитководног седиментационог простора биле су незнатне. Пост-*fraasi* плитководну секвенцу карактерише исчезавање карактеристичних ценоманских фосила, осиромашење биоте,

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теригени принос (кварц), а мјестимично и разорени слојеви. *Montiella filipovici* нађена је у кречњачком слоју ове секвенце са учесталом *Halimeda elliotti* CONARD & RIOULT испод карбонатне секвенце која је латерални еквиваленат *helvetica* зоне. Овај дио пост-*fraasi* стуба приписан је ?највишем ценоману–најнижем турону (= *Whiteinella archaeocretacea* зона *p. p.*).

У додатној биљешци дати су подаци о новим комбинацијама: врста *Cylindroporella parva* пребачена је у род *Montiella*, *Permocalculus elliotti* у род *Trinocladus*, а *Trinocladus bellus* у род *Belzungia.*

Кључне ријечи: Dasycladales, нове врсте, нове комбинације, ценоман, турон, Паштрик, Кукеска кредна јединица, Мирдита зона.

Introduction

The Cretaceous succession of the Mountain Paštrik is an attached platform (superimposed paleogeography) overlaying the Diabase Chert Formation, serpentinite and Tithonian–Berriasian carbonate clastics (flysch auct.) in the north. From the middle Cenomanian into the Turonian, it was a ramp – a transitional stage from the platform to the basin.

Dasycladales, common in some of shallow water Albian, Cenomanian and Turonian levels of this area, have been mentioned or described by PEJOVIĆ & RADOIČIĆ, (1974), CHERCHI *et al*. (1976), CONRAD *et al*. (1977) and RADOIČIĆ (1978, 1983, 1984, 1994, 1998). The present note is a further contribution to the Dasycladales in Paštrik limestone: two new species – *Trinocladus divnae* and *Montiella filipovici* are described.

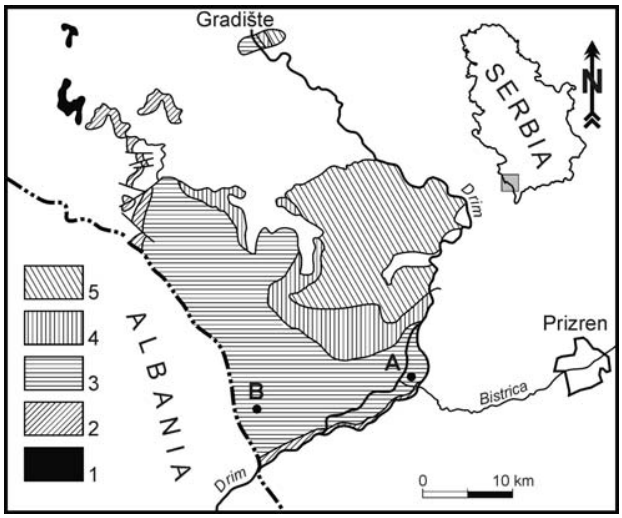

Fig. 1. Geological map of the Paštrik area, according to Geological map 1:000000, sheet Prizren (MENKOVIĆ *et al*., 1982), simplified (new stratigraphic data are not included). **1**, ?Barremian–Aptian, carbonate breccia and bioclastic limestone; **2**, shallow water Albian sediments, **3**, shallow water lower into upper Cenomanian; **4**, shallow water Turonian carbonates with rudists and hemipelagic limestone; **5**, Senonian, breccia, microbreccia, calcarenites and marly limestone with planktonics. New stratigraphic data are not included. **A**, Bistrica section; **B**, – Vrbnica 1 section.

Systematics

Order Dasycladales PACHER, 1931
Family *Triploporellaceae* (PIA, 1920) emend. BERGER & KAEVER, 1992
Subtribe *Triploporellinae* (PIA, 1920) emend. ASSOULLET *et al*., 1979

Genus ***Trinocladus*** RAINERI, 1922

According to ELLIOTT (1972, p. 619), the tubular thallus of *Trinocladus* is composed of "Successive verticils of radial branches, each branch showing outwardly widening primaries giving rise to several secondaries, and these in turn to bunches of tertiaries. Branches of the lower verticils may not show the full detail. Branches usually not alternate in position from verticil to verticil."

Based only on a transversal section, RAINERI (1922) maintained that a trichotomic partitition of the laterals is characteristic of the genus. In fact, the main generic feature is the form of laterals: club-shaped phloiophorous primaries with a more or less large subspheric distal part, similar shaped thinner secondaries, four or more per each primary, and bunches of similar short tertiaries.

It should be mentioned that, in some cases, recrystallized or poorly preserved *Trinocladus* tubes were also ascribed to *Permocalculus* or to *Griphoporella*. Specimens of such preservation are often really difficult to distinguish from some *Permocalculus*. Compare: fragments of *T. divnae* in Pl. 3, Figs. 10, 11, with "typical *Permocalculus* debris" illustrated by JOHNSON (1969, pl. 17) and by JOHNSON *in* JOHNSON & KASKA (1965, pl. 14). In the same paper, JOHNSON introduced a new species *Permocalculus elliotti,* which is, in fact, *Trinocladus* (see further text).

Among the species ascribed to the genus *Trinocladus,* there are those which do not have a branching pattern characteristic to *Trinocladus*. Only Paleogene species from China, *Trinocladus bellus* JU YING, 1976, which has a *Belzungia* type of arrangement of the laterals will be mentioned (see farther text).

Trinocladus divnae sp. nov.

Pl. 1, Figs. 1–14; Pl. 2, Figs. 1–8; Pl. 3, Figs. 1–6

Origin of name. The species is dedicated to my friend and colleague Dr. DIVNA JOVANOVIĆ (Belgrade)

for her contribution to the study of depositional environments of the Late Paleozoic in northwestern Serbia.

Holotype. Slightly oblique transversal section of the calcareous tube shown in Fig. 2 (= Pl. 1, Fig. 1), thin slide RR2379, sample 013577, author's collection deposited in the Geological Institute, Belgrade.

This section shows the thinly calcified central stem membrane with well preserved insertion points of 4 laterals. The central stem, the irregular space around it and between the laterals were early post mortem filled with matrix. Open pores on the calcareous tube surface (dentate surface) is the evidence of the tertiaries. Primary and secondary laterals are not preserved predominantly due to dissolution in the post-filling phase with matrix. The two primaries are not completely obliterated by recrystalization (arrows). Dissolution cavities were subsequently filled with cement. This space, corresponding to the space of the laterals R1-R3 has an inverted triangular form (Fig. 2, arrows).

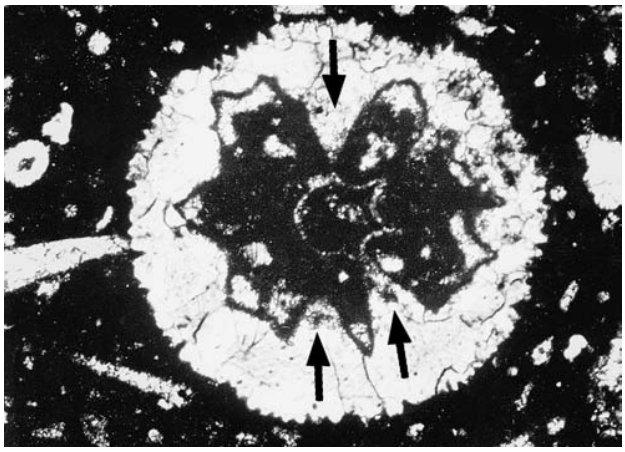

Fig. 2. *Trinocladus divnae* sp. nov. Holotype, slightly oblique section; thin slide RR2379, × 61,5. Notice the insertion points of 4 laterals. Arrows: recrystallized space of inverted triangular forms corresponding to units of laterals (R1-R3), and on the bellow the two pores of primaries which are not completely obliterated by recrystalization.

Isotypes. Specimens in thin slides RR2379 and 2380. Some of them illustrated in Pl 1, Figs. 2, 3, 9, 13; Pl. 2, Figs. 2, 9; Pl. 3, Figs. 2, 3, 4.

Other materials. Specimens in thin slides RR2448-2351 and RR2343-2346a, samples 015126 and 015130 collected in 1973 near Miljaj

Type locality and type level. Southeastern slope of Mountain Paštrik, Graždanik–Bistrica–Dobruše belt, Geological map SFRJ 1:100 000, Sheet Prizren. The sample 013577 was collected in 1972 from the top part of the *Cisalveolina fraasi* Zone in the Bistrica section north of the Bistrica River, east of the Drim River (Fig. 1).

The Albian–Cenomanian succession of the Bistrica lies on Upper Triassic limestone (= large block sliding, during the Cimmerian event in the Diabase Chert Formation) and on the Diabase Chert Formation (RADOIČIĆ, 1994).

In the Bistrica column, about 220–230 meters thick, *Salpingoporella milovanovici* RADOIĆIĆ (last occurrence) and *Suppiluliumaella schroederi* BARATTOLO (Pl. 7, Figs. 2–4) occur in the level at about 180 meters. Upward from 200 meters, the foraminiferal assemblage is notably impoverished (*Cuneolina*, *Nezzazatinella*, miliolids, a few *Pseudolituonella reicheli* MARIE, *Chrysalidina gradata* D'ORBIGNY and *Pseudocyclammina)*; the new datum is the first occurrence of the "*Bry*2" – bryozoan species known only from the *Cisalveolina fraasi* Zone. *Cisalveolina fraasi* REICHEL was found in the 210th meter. Some beds of the *fraasi* Zone abound in hydrozoans (monospecific assemblage, RADOIČIĆ, 1994, pl. 2, fig. 4). Frequent sponge spicules, *Pieninia oblonga*, bryozoan zoeciums, rare *Heteroporella lepina* PRATURLON, *Montiella parva* (RADOIĆIĆ), microproblematica "*Pr10*", a few corals, gastropods, moluscan fragments, *Neithea* and *Eoradiolites* are also present. Sediments younger than the Cenomanian are outcropping in the western Drim riverside (Western Našec section, RADOIČIĆ, 1994).

Diagnosis. Thallus cylindrical, central stem narrow with whorls consisting of three orders of similarly shaped phloiophorous laterals; 7–8 primary laterals bear probably six relatively long secondaries, giving rise to bunches of fine short tertiaries. Distal widening of the laterals relatively small, maximum of 0,076 mm in the primaries, about 0,050 mm in the secondaries and about 0.025 mm in the tertiaries. Length of the primary lateral is almost equal to both secondary and tertiary laterals. Primary calcification delicate, prevailing around the distal portion of the thallus.

Dimensions (in mm) (extreme in the brackets):

Outer diameter 0.710–1.640 (1.947).

Main stem diameter (given on a few sections only) 0.126–0.177.

Length of primary laterals (= pores) nearly half the wall thickness.

Distance between whorls about 0.100.

Description. *Trinocladus divnae* sp. nov. in the Paštrik material is quite differently preserved. The primary feature of some specimens are completely or prevailing obliterated by recrystallization (Pl. 1, Figs. 4, 7, 10, 11, 14; Pl. 3, Figs. 1–4). Open pores on many of the corpuscule surface (dentate surface) correspond to external moulds of parts of the tertiaries (Pl. 1); their distal unpreserved part form a cortex. In a few sections, some pores, swelling of secondaries or rarely of primaries, are visible (Pl. 1, Figs. 5, 8, 10; Pl. 3, Figs. 5, 6).

Sometimes, the contour of the main stem is also recognizable (Pl. 1, Figs. 5, 9; Pl. 3, Figs. 2, 4), or, even, the calcified stem membrane is preserved as a thin black line (Pl. 1, Fig. 7). The central stem and proximal whorl area, in a few individuals, occur as a cavity with the internal wall surface more or less zig-zag undulated (Pl. 1, Figs. 6, 9, 10).

The internal structure of the specimen shown in Pl. 1, Fig. 9 seems, at a first glance, relatively well preserved. The structure of the whorls, in this case, is obliterated: only contours of the recrystallized whorl areas and the intervening space can be distinguished.

Here, subcircular sections give a wrong impression that they are sections through thick laterals. Most likely, the membrane of the primary and secondary laterals are not at all or only slightly calcified. They were enveloped in a thick mucilage layer giving a cuplike form to every unit of laterals (triangular in the sections), which are, in this case, completely recrystallized.

Individuals with a calcified distal thallus area, around the swelling of secondaries and of dense short tertiaries, are presented as thin-walled cylindrical calcareous tubes, relatively resistant to dissolution and abrasion (Pl. 2, Figs. 1–5). The small sized fragments of this thin fine-porous calcified wall is difficult to recognize as dasycladalean skeleton elements (Pl. 3, Figs. 10, 11).

Comparing these differently preserved specimens, I could not immediately decide: whether they were the same species. Specimens with a thin distal calcification are ascribed to *Trinocladus divnae* because of the somewhat larger size of the thallus and, especially, the difference in the preservation are not of specific maximal values. Smaller individuals generally had an early-altered internal structure (recrystallized) and were more resistant to break. The thin calcareous wall of larger specimens, although resistant to dissolution and abrasion, were more friable.

Relations. This species resembles *Trinocladus tripolitanus* RAINERI the most, which has the same number of primary laterals but is not so variable in the size of the thallus. The main difference lies in the distal part of the thallus: relatively delicate secondaries of *Trinocladus divnae* bear dense bunches of fine tertiaries, forming a resistant thin calcified wall.

Trinocladus sp. from the Maastrichtian of Iraq (RADOIČIĆ, 1979, pl. 2, fig. 4) now is tentatively referred to *Trinocladus divnae*.

It does not exclude that the alga presented as "*Griphoporella* sp." by SCHLAGINTWEIT, 1992, pl. 1, fig. 7 is a thin-walled specimen of *Trinocladus divnae*.

Family *Dasycladaceae* (KUTZING, 1843) emend. BERGER & KAEVER, 1992
Tribe *Dasycladeae* PIA, 1920

Genus ***Montiella*** MORELLET & MORELLET, 1922

The genus *Montiella* is characterized by a simple cylindrical thallus consisting of whorls with two orders of laterals. The primary laterals arranged in quincunxes bear one fertile ampulla and one secondary lateral enlarged distally.

Type species is *Montiella munieri*, from the Montian of Belgium. Other species of the genus, *Montiella macropora*, was contemporary described from the Thanetian of the Paris Basin. Isolated specimens and fragments of the both species were studied by GÉNOT (1978, 1987, *in*: DELOFFRE & GÉNOT, 1982). This author (1982, p. 108) compares the calcareous sleeve of both species with those in some *Neomeri*s "chés lesquelles les ramifications primaries et l'extrémité proximale des ramifications secondaires ne sont jamais conservées."

The find of genus *Montiella* in the Cretaceous sediments is of a later datum: when *Cylindroporella elitzae* BAKALOVA and *Cylindroporella benizarensis* FOURCADE *et al*. were transferred to the genus *Montiella* (RADOIČIĆ, 1980, GRANIER, 1990). The difference in the extent of calcification of the Paleocene and Cretaceous *Montiellae* is readily evident. In contrast to the Paleocene species, the known Cretaceous species have a calcareous sheath around the proximal part of the whorl with, in the some specimens, a well preserved morphology of the central stem.

In the calcareous sheath of the known Cretaceous *Montiellae*, as a rule, the pore of the secondary is not differentiated from the pore of the primary lateral (secondary effect). They look like a single pore: a thick and short proximal part with a fertile ampulla followed by somewhat narrower tube, distally enlarged having the protective function of the ampulla.

Besides the fertile ampullae, other whorl elements are often not or only partially preserved. Therefore, it is often difficult to distinguish the calcareous sleeves of *Montiella* from those of *Cylindroporella*. Bearing in mind that the type species of the genus *Cylindroporella* is poorly preserved (some structural elements are obliterated), the question is: what is *Cylindroporella?* The *Cylindroporella* problem is discussed by BARATTOLO and PARENTE (2000).

Montiella filipovici sp. nov.
Pl. 4, Figs. 1–9; Pl. 5, Figs. 1–12; Pl. 6, Figs. 1–4

Origin of name. The species is dedicated to my friend and colleague Dr. Ivan Filipović (Belgrade), for his contribution to the study of on the Paleozoic in Western Serbia.

Holotype. Oblique section of the specimen in Pl. 4, Fig. 1, thin slide RR2328, sample 015117, author's collection deposited in the Geological Institute, Belgrade.

Isotypes. Different sections in thin slides RR2326 to 2336, partly illustrated in Pl. 1, Figs. 2–9; Pl. 3, Figs. 1–12; Pl. 3, Figs. 1–4.

Type level and locality. Sample 015117 was collected in 1973 from the upper part of the section Vrbnica 1, southern slope of the Mountain Paštrik. This section is exposed on the footpath between Vrbnica–Drim and Miljaj–Ninaj, east of the section Vrbnica 2 (CHERCHI *et al*., 1976); Geological map SFRJ 1:100000, Sheet Prizren (Fig. 1).

Lateral equivalents of the sediments with *Cisalveolina fraasi,* in the Vrbnica 1 section, are followed by

some ten meters of limestone with a prevailing weak terrigenous influx, changed and impoverished biota. A few meters upward, limestone abounding in halimedacean algae was sampled (15117). This bed, grainstone-packstone dominated by *Halimeda elliotti* CONARD & RIOULT, *Halimeda* sp. and some other halimedacean algae is the type level of *Montiella filipovici* sp. nov. The association also contains *Montiella parva* (RADOIČIĆ), *Terquemella* sp., sparse fragments of *Neomeris* and *Heteroporella lepina* PRATURLON, a few foraminifera *Nezzazatinella*, *Cuneolina*, *Reticulinella*, miliolids, rare ostracodes and metazoan fragments (Pl. 6, Figs. 5, 6, 8–11).

Further upwards (the bedding is not well visible), the lower Turonian (equivalent to the *helvetica* Zone) is documented by *Moncharmontia apenninica* (DE CASTRO), *Pseudocyclammina sphaeroidea* GENDROT (sample 015119), and the rudists *Hippurites, Durania*, *Biradiolites* and *Distefanella*. The interval between the *Cisalveolina fraasi* Zone and the lower Turonian is equivalent or partly equivalent to the *Whiteinella archaeocretacea* Zone

In the Gradište succession (the same Cretaceous Unit, Fig. 1), *Halimeda elliotti* occurs abundandly in some beds of the Hemipelagic Sequence (= *Whitinella archaeocretacea* and *Helvetotruncana helvetica* zones). In the Metohija Cretaceous Unit, the abundance of *Halimeda elliotti* associated with *Helvetotruncana helvetica* is known from the Zabel Section (RADOIČIĆ, 1993, 1998).

Diagnosis. Thallus with a narrow central stem and whorls commonly consisting of 6 laterals, exceptionally 4 or 5. Primary laterals arranged in quincunxes, short and relatively thick, each bears a fertile ampulla and a secondary lateral. Egg shaped slightly inclined upward fertile ampulla located on the upper side of the primary lateral close to the central stem, a secondary lateral grows from its distal end. Ampulla pedunculus is short, usually not clearly differentiated.

Walls of the fertile ampullae have been individually calcified. This primary calcareous skeleton is altered or partly altered.

Dimensions (in mm) (extreme value in brackets):

External diameter 0.607–0.708 (0.759); the transverse section with 5 laterals in the whorl shown in Pl. 5, Fig. 5 is a specimen with a narrower thallus diameter – 0.430 mm.

Diameter of the main stem (0.075) 0.101 – 0.151 (0.177).

Length of the ampulla with pedunculus 0.180.

Length of the primary laterals up to 0.127.

Diameter of the fertile ampulla up to 0.170.

Diameter of the primary lateral about 0.051.

Description. The surface of the calcareous tubes was more or less eroded, often to half of the fertile ampullae (Pl. 4, Fig. 9). The fertile ampullae primary have been individually calcified as more or less thin carbonate envelopes (about 0.002 mm). A similar primary calcification is not observed in the laterals, they were poorly preserved, probably due to weak or no calcification at all. The form of their distal-cortical part is not known (it seems they were much enlarged). The best example of individual calcified fertile ampullae is the transverse section in Pl. 2, Fig. 5. Some other sections, with a preserved individual sheath around the ampullae, and primary contact between them are illustrated in the same plate. In the same calcareous tube, parts of the skeleton may be differently preserved. An example of the different grade of the obliterated structure in the same whorl is the transversal section in Pl. 2, Fig. 4: well preserved, slight contact between the ampullae observable as a black line, and both, the sheath and the space between the ampullae are almost obliterated by advanced recrystallization in the other part of the section. The mentioned transverse section with 5 laterals is also an example of gradual alteration. The original sheath around the ampullae is preserved in part of this section, and obliterated by recrystallization in the other part.

Relations. *Montiella elitzae* and the very similar *Montiella benizarensis* are species with a larger thallus bearing 6–8 laterals per whorl and more variable dimensions than *M. filipovici* characterized by slightly variable thallus dimensions.

Some specimens of *Cylindroporella elitzae* and *Cylindroporella benizarensis* (are these two species?) are a nice examples of a post-mortem process resulting in axis widening at the whorl level (RADOIČIĆ *et al*., 2005, pl 1, fig. 3). The primary calcification around the fertile ampullae in these species is not preserved, except the thin calcification around fertile ampulla of *Montiella elitzae* from Eastern Serbia (RADOIČIĆ, 1980, pl. 2, fig. 4), which indicates the same primary calcification as that of *Montiella filipovici*.

A list of algal flora in the Cretaceous of Paštrik

(in alphabetic order):

Acroporella radoicicae PRATURLON, Pl. 8, Fig. 3
Bacinella irregularis RADOIČIĆ
Charophyta
Coptocampylodon fontis (PATRULIUS)
Coptocampylodon sp.
Clypeina pastriki RADOIČIĆ
Cylindroporella sp. div.
Dissocladella?, Pl. 8, Fig. 5
Halimeda elliotti CONARD & RIOULT, Pl. 6, Figs. 8–10
Halimeda sp. (spec. nov.?), Pl. 6, Fig. 12
Halimedaceae sp. div.
Heteroporella lepina PRATURLON, Pl. 7, Fig. 10
Koskinobulina socialis CHERCHI & SCHROEDER
Lithocodium aggregatum ELLIOTT
Lithocodioidea, different species
Marinella lugeoni PFENDER, Pl. 7, Fig. 9
Montiella filipovici sp. nov., Pl. 1, Pl. 2, Pl. 3, Figs. 1–6
Montiella parva (RADOIČIĆ), Pl. 4, Pl. 5, Pl. 6, Figs. 1–4
Neomeris (Drimella) drimi RADOIČIĆ
Neomeris sp., Pl. 2, Fig. 9
Neomeridae, subgenus?
?*Pseudoclypeina*, Pl. 7, Fig. 6
Pseudolikanella cf. *danilovae* (RADOIĆIĆ)

Pseudolithotamnium album (PFENDER), Pl. 7, Fig. 7
Salpingoporella hasi CONRAD, RADOIČIĆ & PEYBERNES
Salpingoporella milovanovici RADOIČIĆ
Salpngoporella pygmaea (GÜMBEL)
Salpingoporella turgida (RADOIČIĆ)
Suppiluliumaella schroederi BARATTOLO, Pl. 7, Figs. 2–4
Solenoporaceae
Suppiluliumaella sp., Pl. 8, Fig. 1
Terquemella div. sp.
Trinocladus divnae sp. nov., Pl. 1, Pl. 2, Pl. 3, Figs. 1– 6
Trinocladus aff. *tripolitanus* RAINERI, Pl. 3, Figs. 8, 9
Trinocladus?, Pl. 3, Fig. 7
Triploporella sp.
Digfferent microbial epiliths

Supplementary note

Montiella parva (RADOIČIĆ, 1983) comb. nov.

Cylidroporella parva n. sp., RADOIČIĆ, 1983: pl. 1, figs. 1–5; pl. 2, figs. 1–2; thin slide RR3557, author's collection, Geological Institute of Serbia.

Turonian, Tripolitania, Libya,

The taxon is found in the type level of *Montiella filipovici* and also in association with *Trinocladus divnae* (Pl. 6, Figs. 5–7).The subaxial section, Fig. 7, is the only specimen of this species with preserved pores of primary laterals upward bearing the fertile ampulla (the structure of the genus *Montiella*). The secondary laterals most probably were not calcified.

From the Turonian of Sinai in Egypt, the species was presented by IMAM (1996, 1b, not 1a). A primary calcification of this specimen, the individual sheaths enclosing the fertile ampullae which is the feature of the genus *Montiella,* is well preserved in the part of this recrystallized body.

Trinocladus elliotti (JOHNSON, 1965) comb. nov.

Permocalculus elliotti n. sp., JOHNSON (*in* JOHNSON & KASKA) 1965: pl. 5, figs. 1–5; thin slide 18587, (USNM in Washington, Division of Paleobotany, no 42340), earliest Early Cretaceous, possibly Late Jurassic, Rosario area of Spanish Honduras.

Although the calcareous sheath of the illustrated specimens is diagenetically altered, sections in figures 1–3 give sufficient data on the dasycladalean nature of this species. Branching arrangement – primary, secondary (Figs. 2, 3, on left) and tertiary (Fig. 3) laterals is of the *Trinocladus* pattern. Accordingly, the species is transferred into the genus *Trinocladus* RAINERI, 1922. In order to obtain a diagnosis, a study of the type material is necessary.

Belzungia bella (YU JING, 1976) comb. nov.

Trinocladus bellus. spec. nov., YU JING, 1978: pl. 8, figs. 10 (thin slide 28434) and 11 (thin slide 28435), ?Fig. 9, non Fig. 12, Paleocene–Ypresian of Lungma Region, China

The holotype of *Trinocladus bellus* is a large fragment of the calcareous tube – longitudinal-oblique section through 6 or 7 whorls. The insertion points of the primary laterals in this section are not preserved because the main stem is secondary enlarged. Thick short primaries, thick irregular secondaries and somewhat thinner tertiaries, give rise to further laterals, thin and anarchically arranged. Whorls bearing such arrangement of laterals characterize the genus *Belzungia,* MORELLET, 1908. The new combination refers to two out of four sections illustrated by YU JING (1978, fig. 10), holotype and transversal section in Fig. 12. This species, introduced on insufficient material, is different from other *Belzungia* species by coarser proximal (3 orders) and seemingly somewhat more anarchically arranged distal laterals.

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Резиме

Trinocladus divnae и *Montiella filipovici* – нове врсте (Dasycladales, зелене алге) из горње креде Паштрика (Мирдита зона)

Из горњокредних седимената Паштрика (Кукеска кредна јединица, Мирдита зона) описане су двије нове врсте дазикладалеса:

Triploporella divnae sp. nov.

Холотип. Мало искошен попречан пресјек приказан на табли 1, сл. 1.

Дијагноза. Цилиндричан талус са узаном централном стабљиком која носи, на растојању, пршљенове са три реда огранака сличног облика. 7–8 примарних огранака дају највјероватније по сест секундарених, а ови по сноп кратких терцијарних огранака. Дужина оба, секундарног и терцијарног, приближно је једнака дужини примарног огранка. Калцифициран је често само танак дистални дио талуса (врх секундарних и терцијани огранци), ријетко и мембрана главне стабљике. Секундарне промјене знатне.

Стратиграфски положај и типски локалитет. Горњи (али не најгорњи ценоман), виши дио зоне са *Cisalveolina fraasi* у профилу Бистрице на југоисточним падинама Паштрика.

Montiella filipovici sp. nov.

Холотип. Кос лонгитудинални пресјек приказан на табли 4, сл. 1.

Дијагноза. Талус са узаном централном стабљиком и пршљеновима који обично имају 6, изузетно 4 или 5 огранака. Кратки релативно масивни примарни огранци носе фертилну ампулу и један секундарни дистално проширен огранак. Фертилна ампула је смјештена на гоњојој страни огранка близу централне стабљике, педункулус ампуле веома кратак, нејасно диференциран. Танак кречњачки омотач депонован је појединачно око фертилних ампула.

Примарни, а особито секундарни огранци били су слабо или нијесу уопште били калцифицирани.

Битне примарне црте рода *Montiella* прекристализацијом бивају изгубљене. Стога се такве кречњачке цјевчице могу погрешно приписати роду *Cylindroporella*, премда до данас, с обзиром на лошу очуваност типског материјала, није дефинисано што су битне одлике овог рода.

Montiella filipovici потиче из седимената највишег ценомана–најнижег турона који леже непосредно испод кречњака са туронским микрофосилима и рудистима, а откривени су у профилу Врбница 1 на јужним падинама Паштрика, између Миљаја и Нинаја.

У додатној биљешци дати су укратко подаци о новим комбинацијама за врсте *Cylindroporella parva* RADOICIC, 1983, која је преведена у род *Montiella* MORELLET & MORELLET, 1922, *Permocalculus elliotti* JOHNSON, 1965 која је пребачена у род *Trinocladus* RAINERI, 1922 и *Trinocladus bellus* YU JING, 1978, која је пребачена у pod *Belzungia* MORELLET, 1908.

PLATE 1

Figs. 1–14. *Trinocladus divnae* spec. nov.

1. Holotype, slightly oblique transversal section also shown in text-fig. 2; arrows: the inverted triangular form corresponds to the space of the laterals; thin slide RR2379; × 33.

2, 3, 6, 12. Oblique (2, 6, 12) and transversal (3) section. Specimens of the same preservation; thin slides RR2379, 2379, 2338, 2338; × 33.

5. Transversal section of the damaged specimen; notice poorly preserved primary latera (arrow); thin slide RR2344; × 53.

7. Oblique section (fragment). Pores of the primary and the secondary laterals have been completelly obliterated by recrystallization, thin central stem membrane with insertion points of worls is well preserved; thin slide RR2336; × 33.

8. Oblique section of recrystallized specimen with 3 deformed pores of primaries. Dense pores of tertiaries are visible at the top of the section; thin slide RR2338; × 33.

9. Oblique section of the strangely preserved specimen (see text); thin slide RR2379; × 33.

10. Slightly oblique transversal section with rare primary pores; thin slide RR2346/1; × 33.

11, 14. Recrystallized specimens, transversal sections: thin slide RR2344; × 33.

13. Oblique section of damaged specimen, the preservation similar to those in fig. 9, thin slide RR2378; × 33.

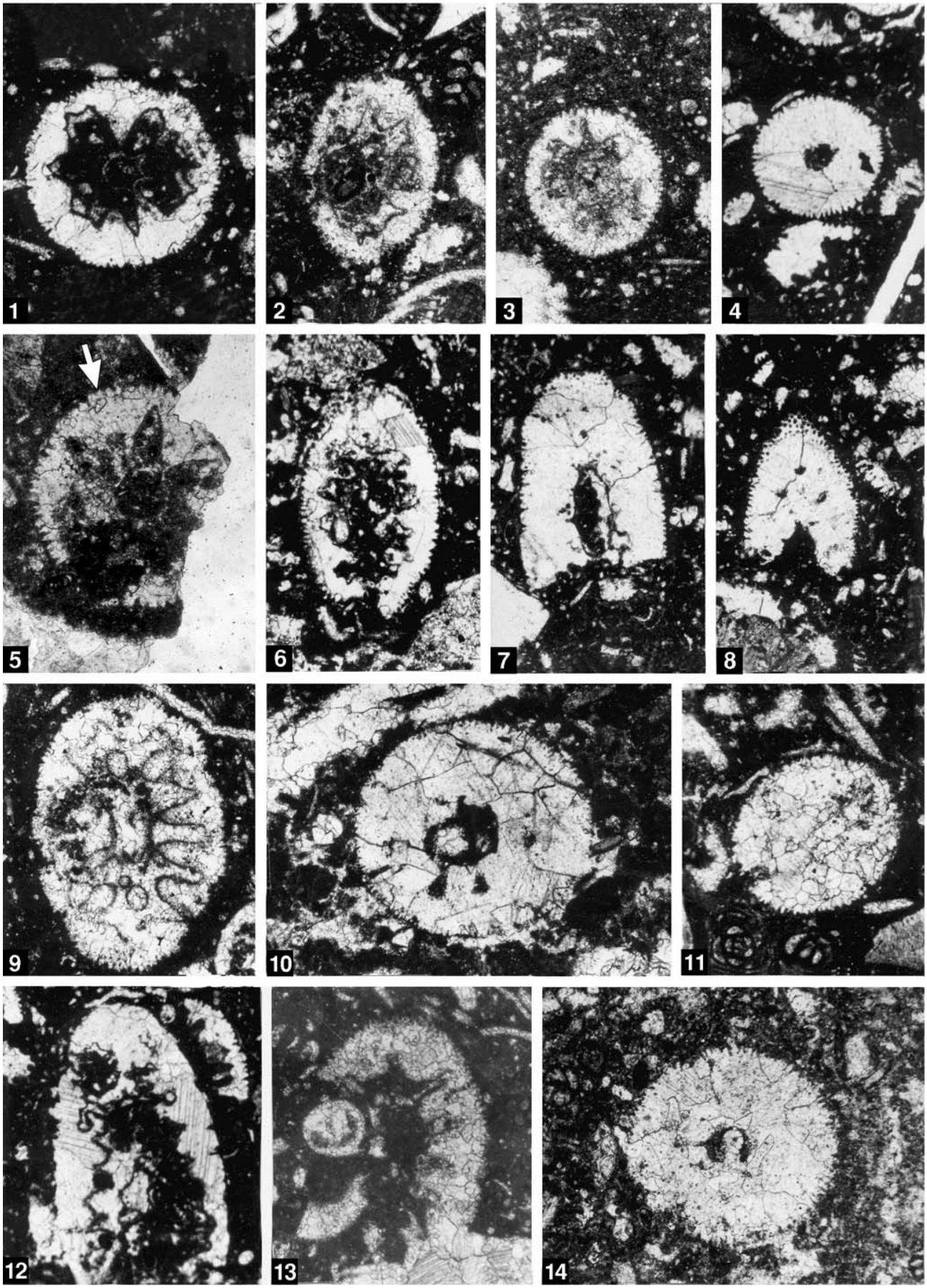
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PLATE 2

Figs. 1–8. *Trinocladus divnae* spec. nov.

1, 4, 5, 7. Oblique and transversal sections of the specimens with calcified more or less thin distral area Fig. 1 is the largest specimen of the collection; in its middle tangential section of the fragment with pores of swollen parts of secondaries; thin slides RR2344, 2346, 2344/1, 2379; × 33.

2, 3. Fragments of longitudinal section; swollen parts of the secondaries are well preserved; thin slides RR2380, 2343/1; × 33.

6. Damaged specimens of partially recrystallized interior, some pores of seconradies recognizable; thin slide RR2343/1; × 33.

8. Fragment of prevailing recrystallized specimen with two primary pores and open pores of tertiaries at the outer surface; thin slide RR2344/1; × 52.

Fig. 9. *Neomeris* sp.. Oblique section, thin slide RR2345; × 20.

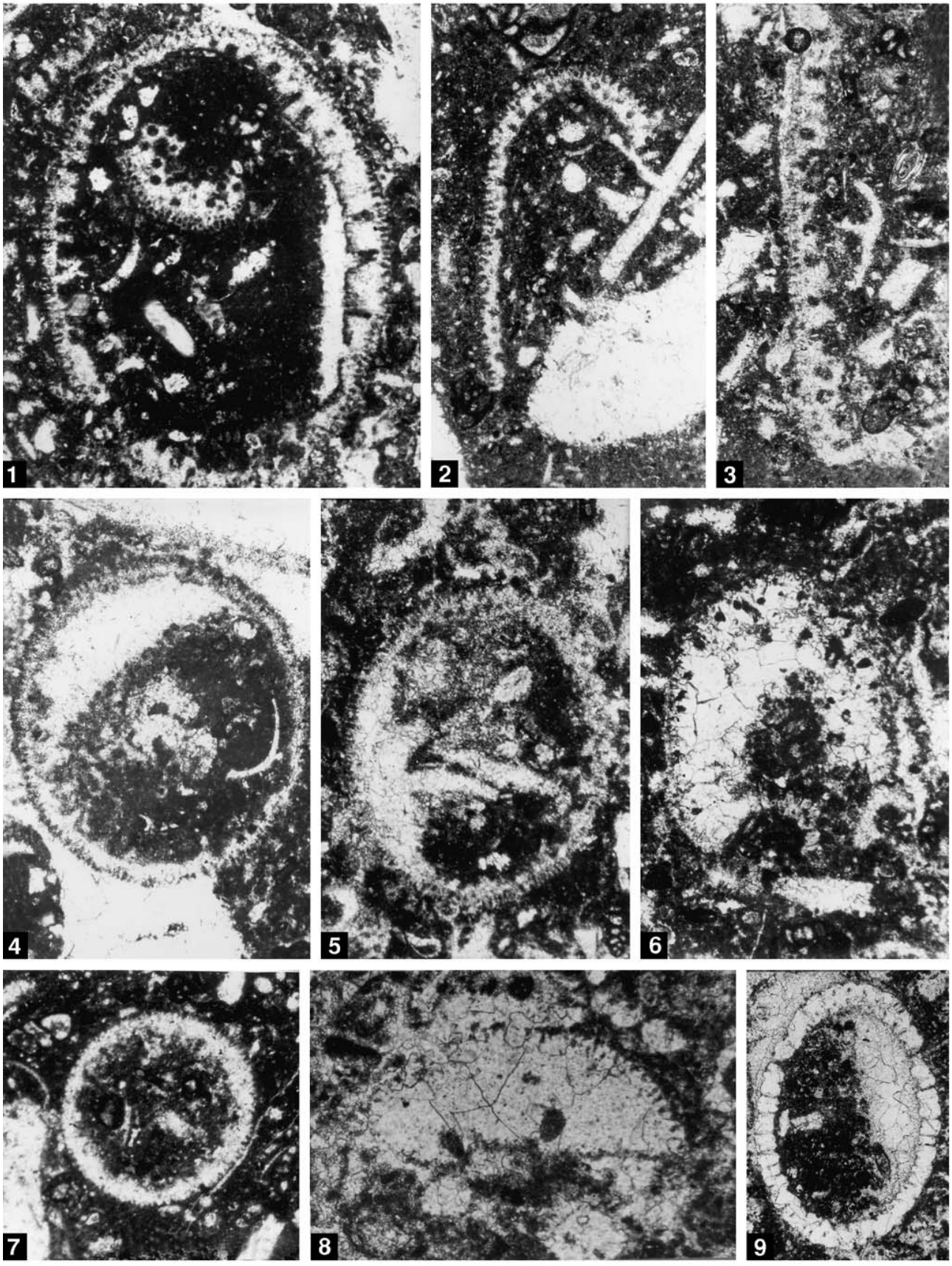
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PLATE 3

Figs. 1–6. *Trinocladus divnae* spec. nov.

1–4. Oblique (1, 2, 4) and transversal (3) section. Specimens obliterated by recrystallization; the contours of central stem, in the specimens 2 and 3, are recognizable, slightly deformed central stem of the specimen 1 is filled by micrite; thin slides RR2345, 2380, 2379, 2379; × 33.

5. Fragment of tangential section with pores of secondary laterals, thin slide RR2343/1; × 33.

6. Slightly oblique transversal section of recrystallized specimen with rare, pores of secondary laterals; thin slide RR2343/1; × 33.

Fig. 7. *Trinocladus* sp. Thin slide RR2380; × 52.

Figs. 8, 9. *Trinocladus* aff. *tripolitanus* RAINERI. Fragmnts; thin slides RR2344 and RR 2346; × 52

Figs. 10, 11. *Trinocladus divnae* spec. nov. Fragments of calcified thin distal part, thin slides RR2348, 2346/1; × 30.

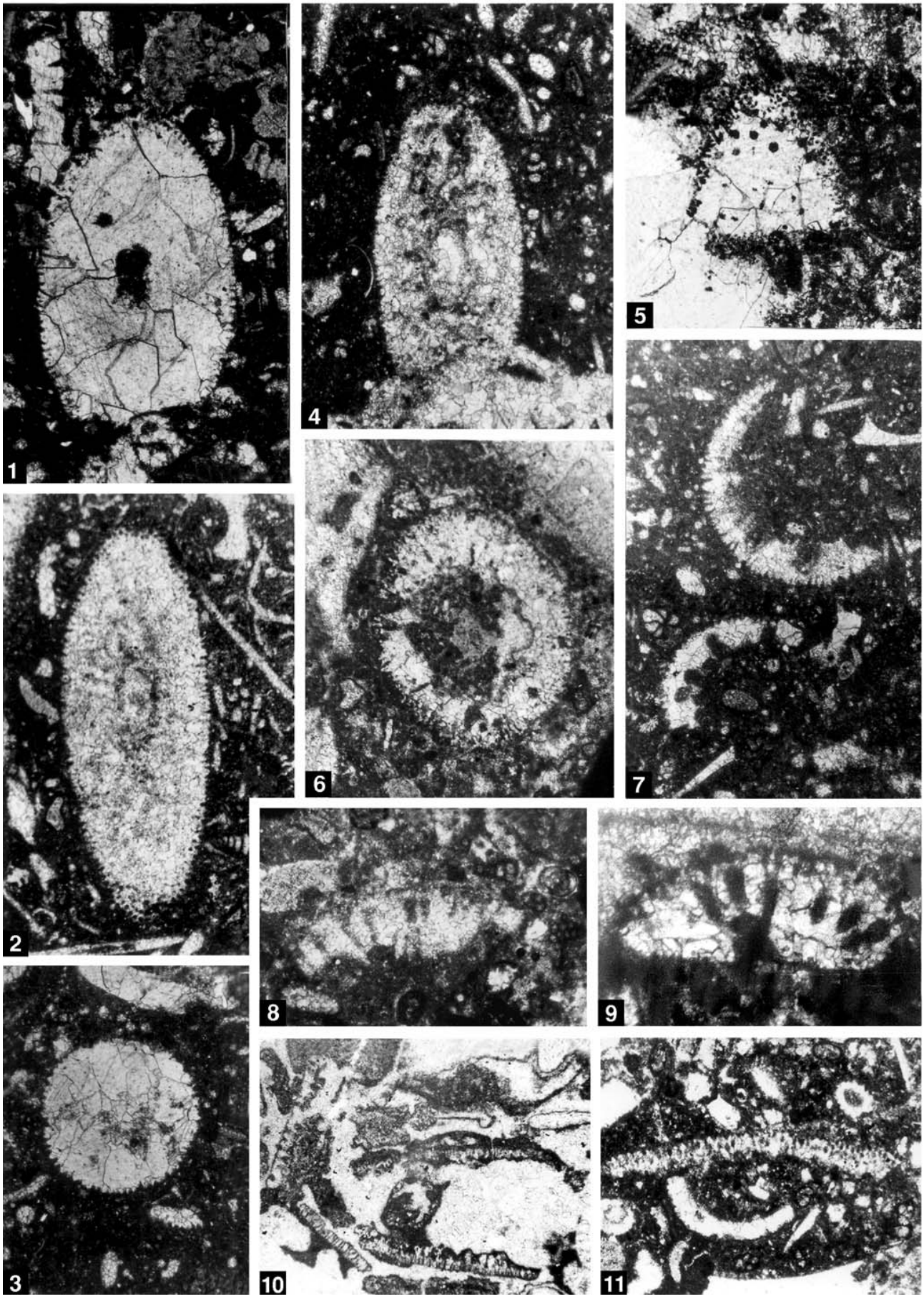
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PLATE 4

Figs. 1–9. *Montiella filipovici* spec. nov.

1. Holotype, sub-longitudinal oblique section; thin slide RR2328; × 60.

2–8. different more or less oblique sections; thin slides RR2334; 2335/2, 2330, 2335, 2327, 2326/1, 2326; 2 = × 40; 6, 7, 8 = × 60; 4, 5 = × 63.

9. slightly oblique longitudinal section; thin slide RR2328; × 40.

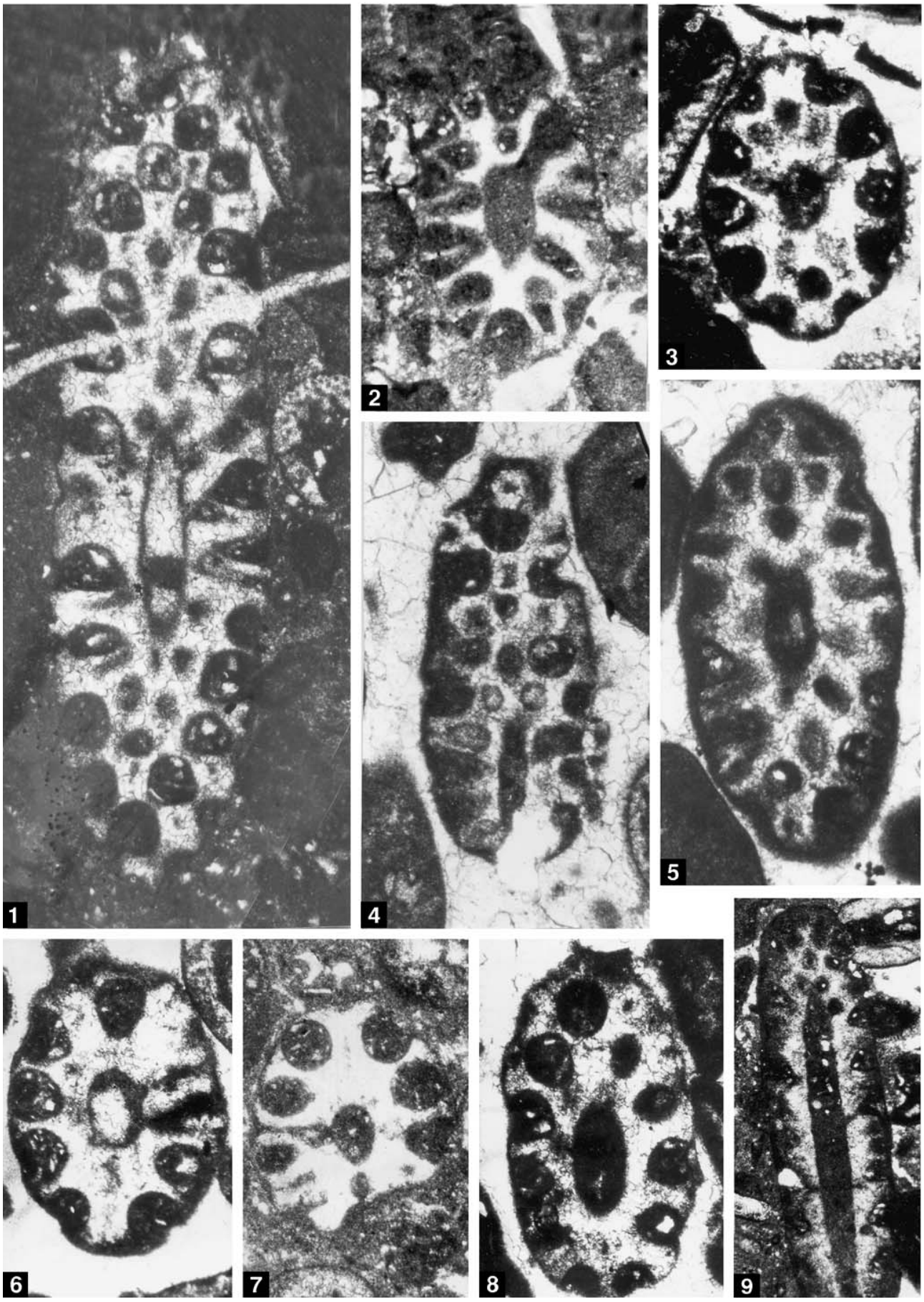
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PLATE 5

Figs. 1–12. *Montiella filipovici* spec. nov.

1. Tangential section. Notice characteristic section through primary laterals and ampulla (arrows); thin slide RR2327; × 63.

2, 3. Oblique sections; thin slides RR2335, 2326/1; × 63.

4–10. Transversal sections; thin slides RR2327/1, 2332, 2332, 2326/1, 2327, 2326, 2335/2; × 60; 9 = × 63.

11. Tangential-oblique section, fragment; thin slide RR2331; × 63.

12. Transversal-oblique section of damaged fragmen; thin slide RR2331; × 60.

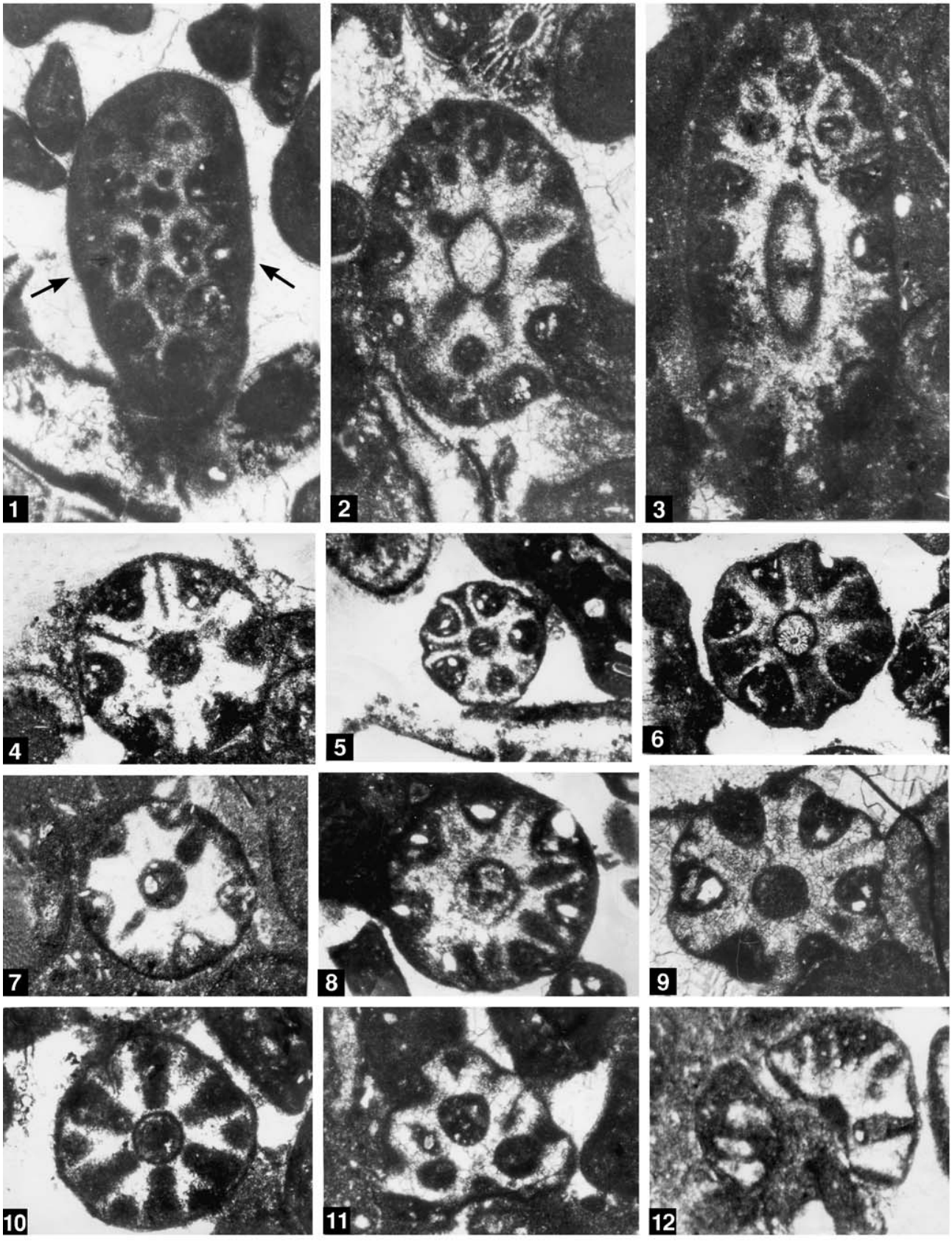
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PLATE 6

Figs. 1–4. *Montiella filipovici* spec. nov. Different oblique sections; thin slides RR2327, 2333, 2333, 2331; × 60; 4 = × 63.

Figs. 5–7. *Montiella parva* (RADOIČIĆ). Longitudinal (5, 6) and oblique section (7); thin slides RR2336, 2327 (type level of *M. filipovici*), 2379 (type level of *Trinocladus divnae*); × 63.

Figs. 8–10. *Halimeda elliotti* CONARD & RIOULT. Longitudinal, oblique and transversal section, thin slides RR2330, 2328, 2236/1; 8 = × 40; 9, 10 = × 45.

Fig. 11. *Neomeris* sp. Fragment; thin slide RR2331; × 60.

Fig. 12. *Halimeda* sp. (spec. nov.?). Thin slide RR2332; × 34.

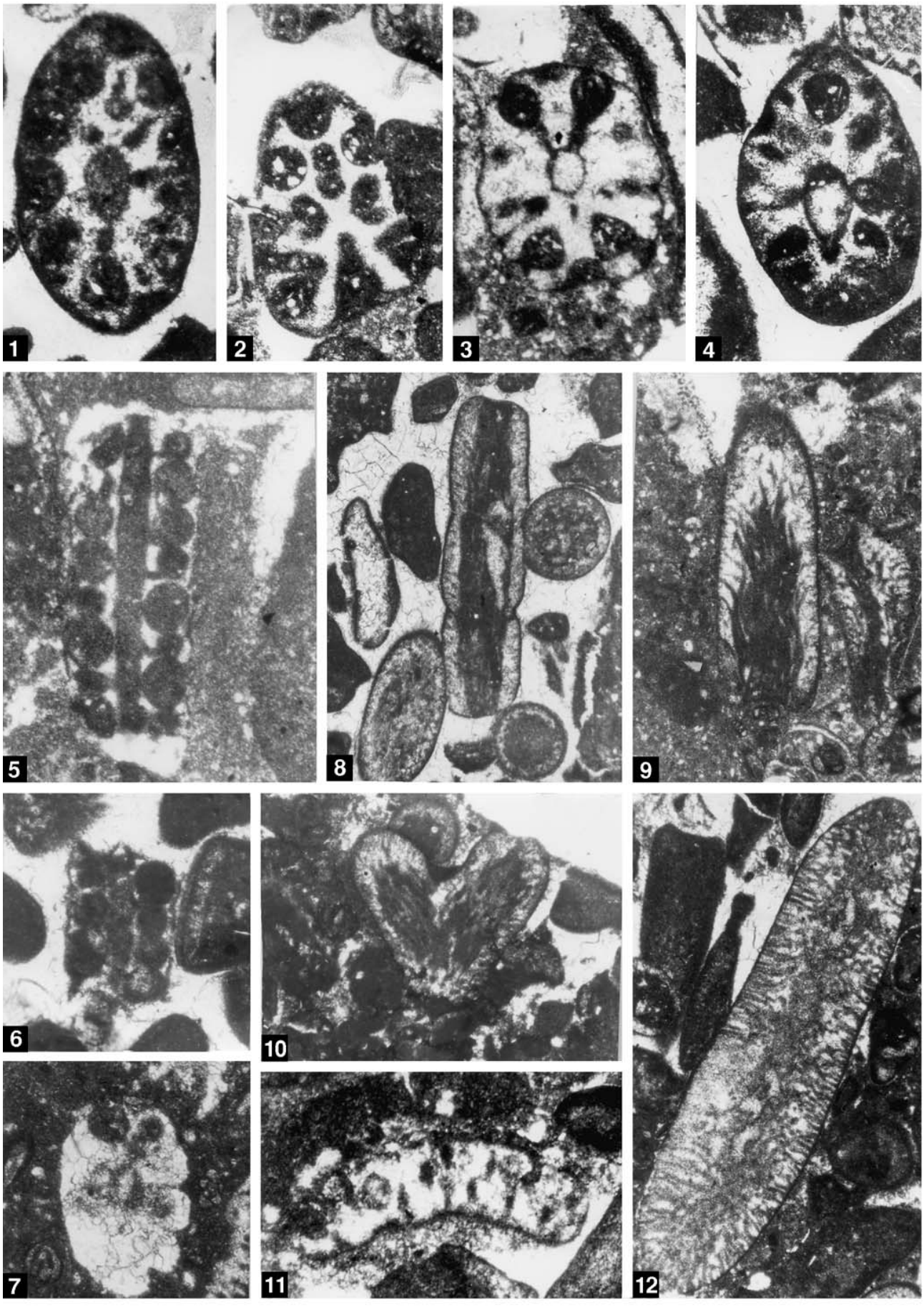
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PLATE 7

Figs. 1. *Salpingoporella hasi* CONRAD, RADOIČIĆ & REY. Microfacies; thin side RR2389; × 37.

Figs. 2–4. *Suppililuimaella schroederi* BARATTOLO (until recently known only from Apennines – BARATTOLO, 1984); thin slides RR2381, 2381/1; × 33.

Fig. 5. Problematic microfossil *"Pr-10"* and fragment of *Neomeris*; thin slide RR2345; × 44.

Fig. 6. *Pseudoclypenia*?. Fragment; thin slide RR6015 (*Valdanchella dercourti* Zone); × 67.

Fig. 7. *Pseudolithothamnium album* (PFENDER) (monospecific assemblage); thin slide RR23471/1; × 10.

Fig. 8. Sponge spicules, type level of *Trinpocladus divnae*; thin slide RR2379; × 33.

Fig. 9. *Marinella lugeoni* PFENDER. Thin slide RR2340; × 36.

Fig. 10. *Heteroporella lepina* PRATURLON. Fragment; thin section RR3246; × 36.

Figs. 11–12. Ostracods from the type level of *Montiella filipovic*i; thin slide; RR2332; × 60.

Fig. 13. *Jurella*? from the type of *Montella filipovici*; thin slide RR2331; × 60.

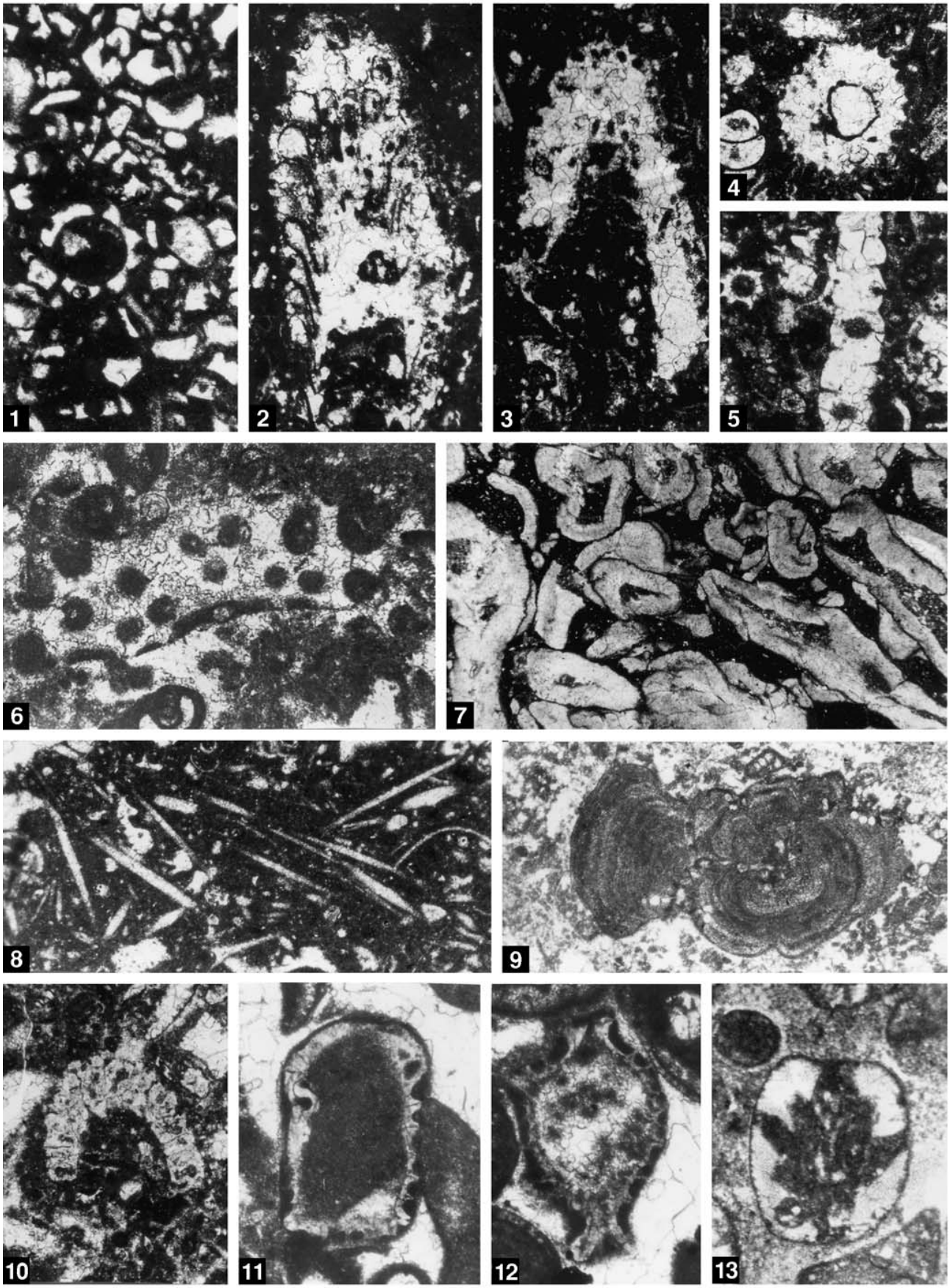
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PLATE 8

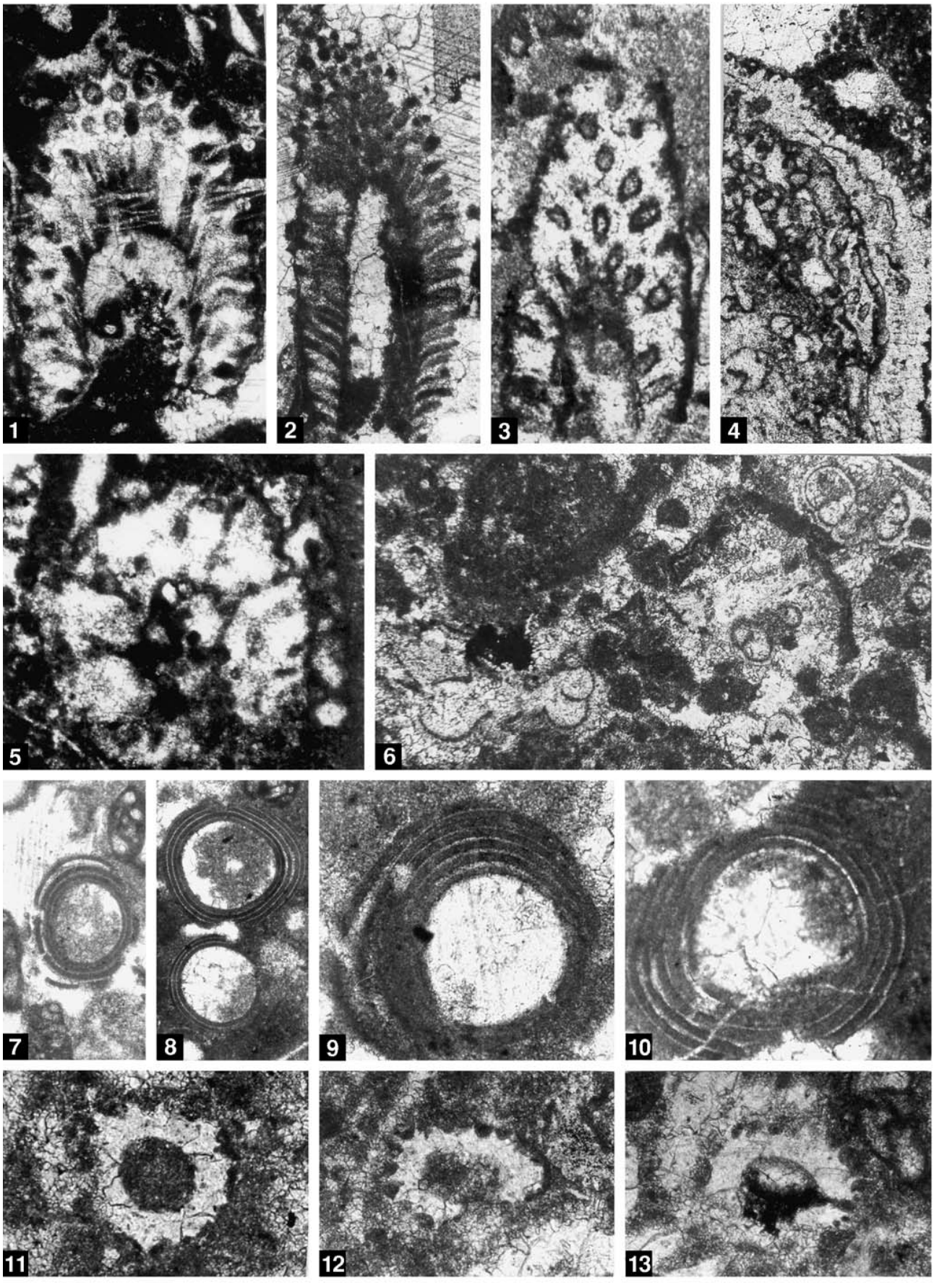
Figs. 1–6. Aptian bioclastic sediments of the northern Paštrik:
1. *Suppiluliumaella* sp. Thin slide RR2422; × 35,5.
2. *Salpingoporella pygmaea* (GÜMBEL). Thin slide RR2422; × 35,5.

3, 4, 6. *Acroporella radoicicae* PRATURLON (3) algal crusts (4) and *Planomalina* sp. (6); thin slide RR2045; 2045/1; 3 = × 43; 4, 6 = × 30.

5. *Dissocladella*?; thin slide RR2422, × 60.

Figs. 7–10. Problematic microfossil "*Pr 11*" from the Lower Cenomanian of the Vrbnica; Thin slide RR2318/4; 7, 8 = × 85; 9, 10 = × 175.

Figs. 11–13. Problematic microfossil "*Pr 10*" in association with *Trinocladus divnae*; thin slides RR2344, 2344, 2343; × 130.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