GEOL. CROAT.	48/1	1 - 7	4 Figs.	1 Tab.	2 Pls.	ZAGREB 1995

Dissocladella bystrickyi n.sp., a New Calcareous Alga (Dasycladaceae) from Upper Triassic Dolomites of Mt. Medvednica (Northern Croatia)

Branko **SOKAČ** & Tonći **GRGASOVIĆ**

Key words: Calcareous alga, Dasycladaceae, Upper Triassic dolomites, Croatia.

Ključne riječi: Vapnenačka alga, Dasycladaceae, Gornjotrijaski dolomiti, Hrvatska.

Abstract

Dissocladella bystrickyi n.sp. occurs in early diagenetic Upper Triassic dolomites, that were deposited in tidal flat and tidal channel environments in the carbonate platform interior. The new alga, assigned to the genus *Dissocladella*, is characterized by verticillate and distally flattened primary ramifications which give rectangular pores and each bear 5-7 club-shaped secondaries. Its stratigraphic position is probably within the Norian-Rhaetian.

Sažetak

Dissocladella bystrickyi n.sp. potječe iz ranodijagenetskih dolomita gornjeg trijasa taloženih u okolišu plimskih ravnica i plimskih kanala u unutrašnjosti karbonatne platforme. Nova alga pribrojena rodu *Dissocladella* odlikuje se vidljivo razmaknutim pršljenima i distalno spljoštenim primarnim ograncima četvrtastih pora koji nose 5-7 sekundarnih ogranaka. Stratigrafski položaj pretpostavlja se u rasponu norik-ret.

1. SYSTEMATIC DESCRIPTION

Family: Dasycladaceae KÜTZING, 1843
Genus *Dissocladella* PIA, 1936
Dissocladella bystrickyi n.sp.

Origin of the name: The species name is dedicated to the late dr. Ján Bystrický of Bratislava, Slovakia, an outstanding researcher of Triassic Dasycladaceae of the Slovakian Karst.

Type-locality: Outcrops of Upper Triassic dolomite in the road cutting near the shooting gallery in Gornje Vrapče, western suburb of Zagreb, on SW slopes of Mt. Medvednica (Figs. 1 and 2). The Greenwich coordinates are 15°53'43''E, 45°50'39''N, Z = 200 m.

Type stratum: Grey, light grey and dark grey skeletal-intraclastic dolomites, originated by early diagenetic dolomitization from an original wackestone calcareous sediment. The depositional environment can be interpreted as tidal flat and tidal channels in the interior of a carbonate platform. The fossiliferous bed refers to muddy sediment that was probably derived from the surrounding subtidal areas - lagoons.

Holotype: Oblique section figured in Pl. I, Fig. 7, from the sample VP-1. The available material includes about 30 fairly well preserved sections of different orientations, encountered in 90 thin-sections. The material is stored at the Institute of Geology, Zagreb.

Diagnosis: Cylindrical skeleton with a rather large axial cavity which bears alternately arranged large primary phloiophorous ramifications. They communicate with the axial cavity through a large pore, are distally compressed, and horizontally widened with a rectangular pore opening. Each primary ramification bears 5-7 phloiophorous and club-shaped secondaries.

Description: The available material contains numerous but more or less recrystallized and variously preserved sections of cylindrical skeleton, whose moldic cavity was filled up by drusy dolomite crystals during early diagenesis. While the dimensions (Table 1, D and d) vary greatly, they do not show considerable dissipation along the growth line in the scatter diagram (Fig. 3), which proves their high degree of correlation. This feature also strongly suggests, among other things, that all the sections studied belong to one species. The outer surface, clearly delineated in the surrounding sediment, is often worn and partly destroyed; a few sections, however, do suggest a primarily wavy surface with gentle swellings at the distal ends of primary ramifications (Pl. I, Figs. 9-11). The inner surface, while often partly damaged, originally was straight and clearly delineated (Pl. I, Figs. 5-7). A rather large axial cavity occupies, on average, 40-70% of the total diameter (most frequently 50-66%), and is filled with dark, fine-grained, muddy dolomitized sediment or secondary, light-coloured, drusy dolomite.

The branched ramifications are clearly differentiated into large primaries, and tiny, tender, secondaries. The primaries are arranged in distinct whorls and they occupy alternate positions in consecutive whorls. The primaries are of a generally phloiophorous shape and are characterized by horizontally flattened distal ends (i.e. they are horizontally elongated), so that sections of their cavities appear different in both longitudinal sections and transverse sections. In longitudinal sections, ramifi-

Institute of Geology, Sachsova 2, 10000 Zagreb, Croatia.

Fig. 1 Geographical location of the type-locality of *Dissocladella bystrickyi* n.sp.

cations are seen to be perpendicular to subperpendicular to the thallus axis. Their diameter is almost equal throughout their length, i.e. from the large, often secondarily widened, pore, through which they are connected with the axial cavity, to near the outer surface. Rarely, sometimes on the same specimen, they do slightly widen towards their distal end (Pl. I, Figs. 5 and 7; Pl. II, Fig. 2). In transverse sections, they appear cylindrical in the proximal part and then widen more or less gradually or abruptly, thus assuming a courgette-like or a mushroom-like shape at their distal end (Pl. II, Figs. 9 and 11). As a result, the pores have a rectangular, horizontally elongated shape in tangential sections (Pl. I). This shape is the most conspicuous feature of *Dissocladella bystrickyi* n.sp., which makes it easy distinguishable from the other species of the genus (see the next chapter). Club-shaped secondary ramifications, 5-7 in number, grow out from the surface of the distal end of each primary ramification (Pl. II, Figs. 7 and 10). Cysts have not been observed, but they were probably situated in the spacious cavities of the primary ramifications.

Similarities and differences: *Dissocladella bystrickyi* n.sp. conforms, in its main characteristics, eg. the shape, arrangement, and branching of ramifications, to the characteristics of the genus *Dissocladella* as defined by PIA (in RAMA RAO & PIA, 1936). Although in general dimensions of the skeleton it is close to the type species, *D. savitriae* PIA, the new species clearly differs from it by considerably smaller number of ramifications per whorl, by their shape, which is clearly bubble-shaped in *D. savitriae*, and by the D/d ratio, which is variable in the new species but rather constant in *D. savitriae*. *Dissocladella bystrickyi* n.sp. also differs from *D. undulata* (RAINERI) by the D/d ratio, which is in *D. undulata* rather low and constant (BASSOULLET et al., 1978), though the two species have similar numbers of primary ramifications per whorl and of secondaries per primary ramification. Furthermore, there is a difference in the shape of the ramifications. *Dissocladella bystrickyi* n.sp. differs from *D. cretica* OTT, whose age is allegedly Rhaetian-Liassic (OTT, 1965), by its considerably smaller size (it is 5 to 10 times smaller) and by the different shape of the primary ramifications, which in *D. cretica* are bubble-shaped and its thallus is club-shaped. In comparision to the Lower Liassic species *D. lucasi* (CROS & LEMOINE), which was originally described as a *Linoporella* (CROS & LEMOINE, 1967), the new species differs by its distinctly smaller size and differently shaped primary ram-

Dimensions in mm:		Range	Mean ± standard deviation	Number of measurements
Maximum observed length	L	3.38		
Outer diameter	D	0.54-1.30	0.80±0.22	28
Inner diameter	d	0.27-0.96	0.47±0.17	28
Outer diameter/ inner diameter ratio	D/d	0.43-0.73	0.58±0.08	28
Distance between two consecutive whorls	h	0.10-0.15	0.13±0.02	15
Length of primary ramifications	l	0.08-0.20	0.14±0.04	14
Length of secondary ramifications	l'	0.05-0.09		7
Maximum (distal) diameter of primary ramifications	p_d	0.10-0.19		18
Proximal diameter of primary ramifications	p_p	0.05-0.12		12
Maximum diameter of secondary ramifications	p'	0.03-0.06		9
Number of ramifications in a whorl	w	8-16		5
Number of secondary ramifications on primary branch	w'	5-7		4

Table 1 Dimensions of *Dissocladella bystrickyi* n.sp.

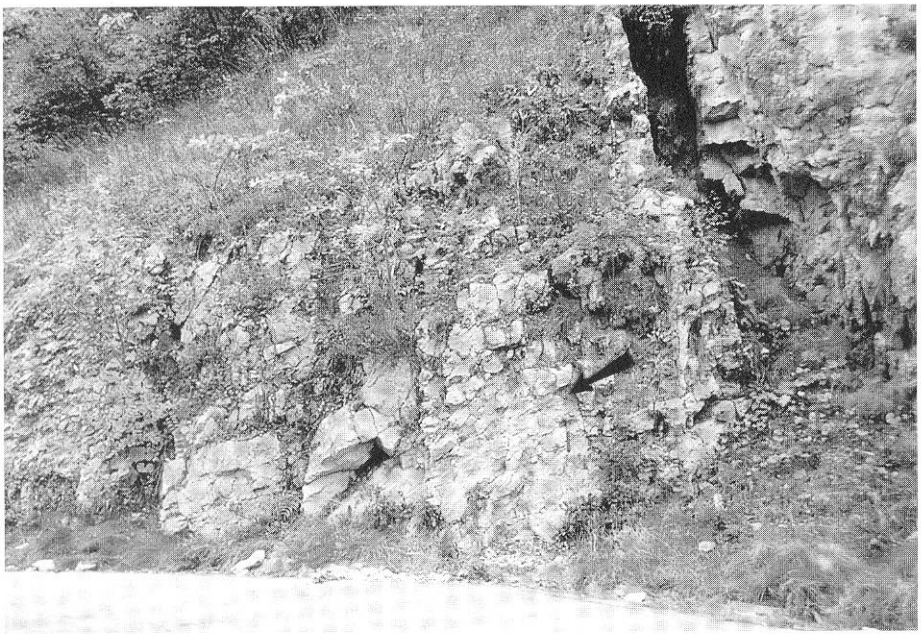

Fig. 2 Gornje Vrapče, the type-locality of *Dissocladella bystrickyi* n.sp. Arrow points to the algae-bearing bed.

ifications: in *D. lucasi*, the primary ramifications, though most frequently preserved at their distal ends only, appear regular, perhaps club-shaped, as indicated by a section figured by DRAGASTAN & TRAPPE (1986, Fig. 3/1). The same differences apply to the other two Lower Liassic species described by DRAGASTAN & TRAPPE (1986), *D. iberica* and *D. ebroensis*. These have been established on the basis of slightly larger values of the outer and inner diameters (*D. iberica*) and slightly smaller values of the same features (*D. ebroensis*), respectively. The absence of the following data in the descriptions of *D. iberica* and *D. ebroensis*: number of primary ramifications per whorl, number of secondaries per primary ramification, differences in the shape of ramifications, D/d ratio (though that last feature can considerably vary within the same species), raises the question of their validity. We believe that *D. iberica* and *D. ebroensis* are younger

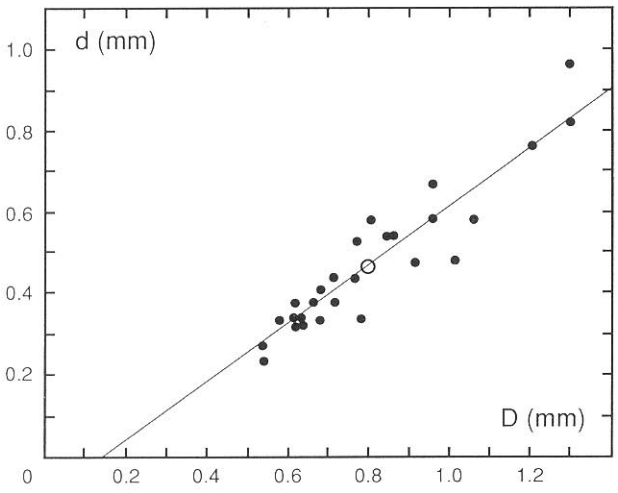

Fig. 3 *Dissocladella bystrickyi* n.sp. Scatter diagram for D (outer diameter) and d (inner diameter). Each point corresponds to a measured specimen and the circle represents the mean. Correlation coefficient r = 0.93.

synonyms of *D. lucasi* because those border values that have been quoted for these species come very close to the border values of *D. lucasi* (see comparative table in SCHLAGINTWEIT, 1991), and, moreover, all the three species seem to be established on a very limited number of sections. In general, slightly larger or slightly smaller values, particularly when referring to the dimensions of the thallus, cannot be taken as key criteria for differentiating taxa. This is especially true when dealing with species of the same genus and/or same age, because rather large variation ranges can be found to exist on specimens derived from one sample, as is the case also with *D. bystrickyi* n.sp. (and often also in species of other genera). The new species is distinguished from two species described by DRAGASTAN (1989): the Tithonian *D. bakalovae* and the Lower Cretaceous *D. urgoniana*, by a smaller number of primary ramifications per whorl and their shape at the distal end, which in *D. bystrickyi* n.sp. is flattened and horizontally elongated. The same differences are observed in comparisions made with *D. intercedens* BAKALOVA, which is, moreover, inadequately known and very poorly illustrated (BAKALOVA, 1978). *Dissocladella bystrickyi* n.sp. differs from *D. hauteriviana* MASSE by having more primary ramifications per whorl and more secondaries per primary ramification; in addition, pores of the primary ramifications in *D. hauteriviana* are clearly round in tangential section and the primaries themselves are situated obliquely (MASSE, 1976, Pl. 4, Figs. 12, 14 and 16). In spite of similarities between the new species and *D.? pyriformis* SCHLAGINTWEIT concerning the thallus dimensions, an approximately equal D/d ratio and its variations, and the number of secondaries per primary ramification, the differences are nonetheless clear: in *D.? pyriformis* the primary ramifications are more regularly club-shaped, their number per whorl is much larger (35-45), and they are tightly compressed to each other (SCHLAGINTWEIT,

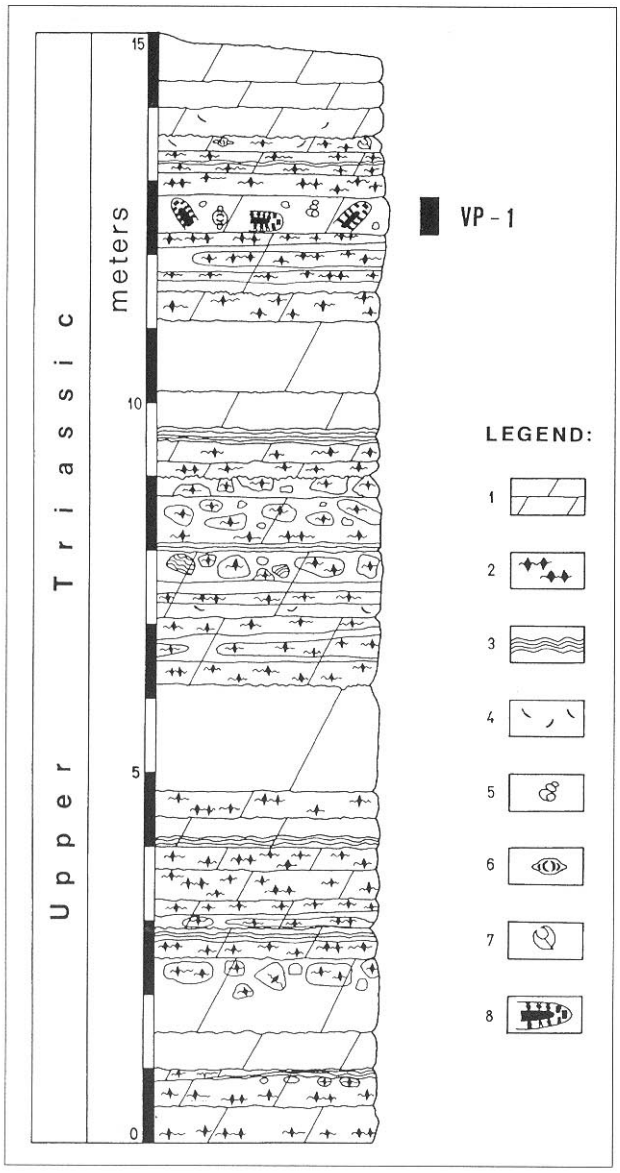

Fig. 4 Lithostratigraphic column of the type locality of *Dissocladella bystrickyi* n.sp. Legend: 1) dolomite; 2) fenestral fabric; 3) stromatolite; 4) bioclasts; 5) gastropods; 6) involutinid foraminifera; 7) megalodonts; 8) *Dissocladella bystrickyi* n.sp.; VP-1 - sample designation.

1991, Pl. 1, Figs. 1-2). Comparison with the species *D. pulcherrima* BUCUR can only be performed by correlation with the author's description, because this species is established on only one section (BUCUR, 1993, Pl. 3, Fig. 26) with, in our opinion, a poor degree of preservation, which does not allow insight into the actual structure of alga. *D. pulcherrima* has elongated ovoid primary ramifications, while in the new species they are distally flattened with a distinct alternating arrangement in consecutive whorls. There is also a difference in the ratio between the length of the primary and secondary ramifications, which seems to be lower in *D. pulcherrima*. Comparisons of other dimensions between these two species would not be validly acceptable because the dimensions for *D. pulcherrima* only refer to one specimen.

2. STRATIGRAPHIC POSITION

Dissocladella bystrickyi n.sp. has been found in a tectonically isolated outcrop of early-diagenetic dolomites. The 15 m thick package figured in Fig. 4 occurs within a typical Hauptdolomit sequence consisting of frequent alternations of dolomicrite, fenestral dolopelmicrite, and, somewhat less commonly, dolostromatolites. The two latter lithological types occur most frequently as intercalations, lenses, and larger or smaller fragments in a dolomicritic matrix. No significant fossil remains, which would have enabled a more precise age determination, have been found, except bivalve and gastropod fragments and completely dolomitized small foraminifera. Furthermore, a more precise position of the fossiliferous bed within the complete Hauptdolomit sequence cannot be established because of tectonic disturbances and the repeated occurrences of lithologically similar packages due to reverse faulting. By means of correlation with lithologically identical deposits of the typically developed Upper Triassic rocks in the neighbouring areas, where their Norian-Rhaetian age has at places been demonstrated by fossils, the occurrence of *Dissocladella bystrickyi* can be inferred to be situated within the same stratigraphic range.

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3. REFERENCES

BAKALOVA, D. (1978): Algues calcaires de la formation de Brestnica (Tithonique supérieur-Barrémien supérieur).- Rev.Bulgarian Geolog.Soc., 39/1, 3-16.

BASSOULLET, J.P., BERNIER, P., CONRAD, M.A., DELOFFRE, R. & JAFFREZO, M. (1978): Les Algues Dasycladacées du Jurassique et du Crétacé.- Géobios, Mém.spéc., 2, 330p.

BUCUR, I.I. (1993): Some new or poorly known clcareous algae (Dasycladales, Gymnocodiaceae) in the Lower Cretaceous deposits from the Resita-Moldova Noua Zone (Southern Carpathians, Romania).- Rev. Esp. Micropal., XXV/1, 93-126.

CROS, P. & LEMOINE, U. (1967): Dasycladacées nouvelles ou peu connues du Lias inférieur des Dolomites et de quelques autres régions méditerranées (2e partie).- Rev.Micropaléont., 9/4, 246-257.

DRAGASTAN, O. (1989): Calcareous Algae (new and revised). Microproblematicae and Foraminiferida of Jurassic-Lower Cretaceous deposits from the Carpathian area.- Rev.Espań.Micropaleont., 21/1, 5-65.

DRAGASTAN, O. & TRAPPE, J. (1986): Some Dasyclad algae of the Sinemurian from the north-western Iberian Chains (Spain).- Paläont.Z., 60, 3/4, 169-179.

MASSE, J.P. (1976): Les calcaires urgoniens de Provence. Valanginien-Aptien. Stratigraphie, paléontologie, les paléoenvironnements et leur évolution.- Unpublished PhD Thesis, Université d'Aix-Marseille II, Marseille, 445p.

OTT, E. (1965): *Dissocladella cretica*, eine neue Kalkalge (Dasycladaceae) aus dem Mesozoikum der griechischen Inselwelt und ihre phylogenetischen Beziehungen.- N.Jb.Geol.Pal., Mh., 11, 683-693.

RAMA RAO, L. & PIA, J. (1936): Fossil Algae in the uppermost Cretaceous beds (the Niniyur Group) of the Trichinopoly District, S. India.- Mem.Geol. Surv.India, Palaeontologia Indica, N.S., 21/4, 1-49.

SCHLAGINTWEIT, F. (1991): *Dissocladella? pyriformis* n.sp., new chlorophycean Alga from the Upper Cretaceous of the Northern Calcareous Alps (Gosau Formation/Branderfleck Formation).- Rev. Micropaléont., 34/3, 191-200.

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PLATE I

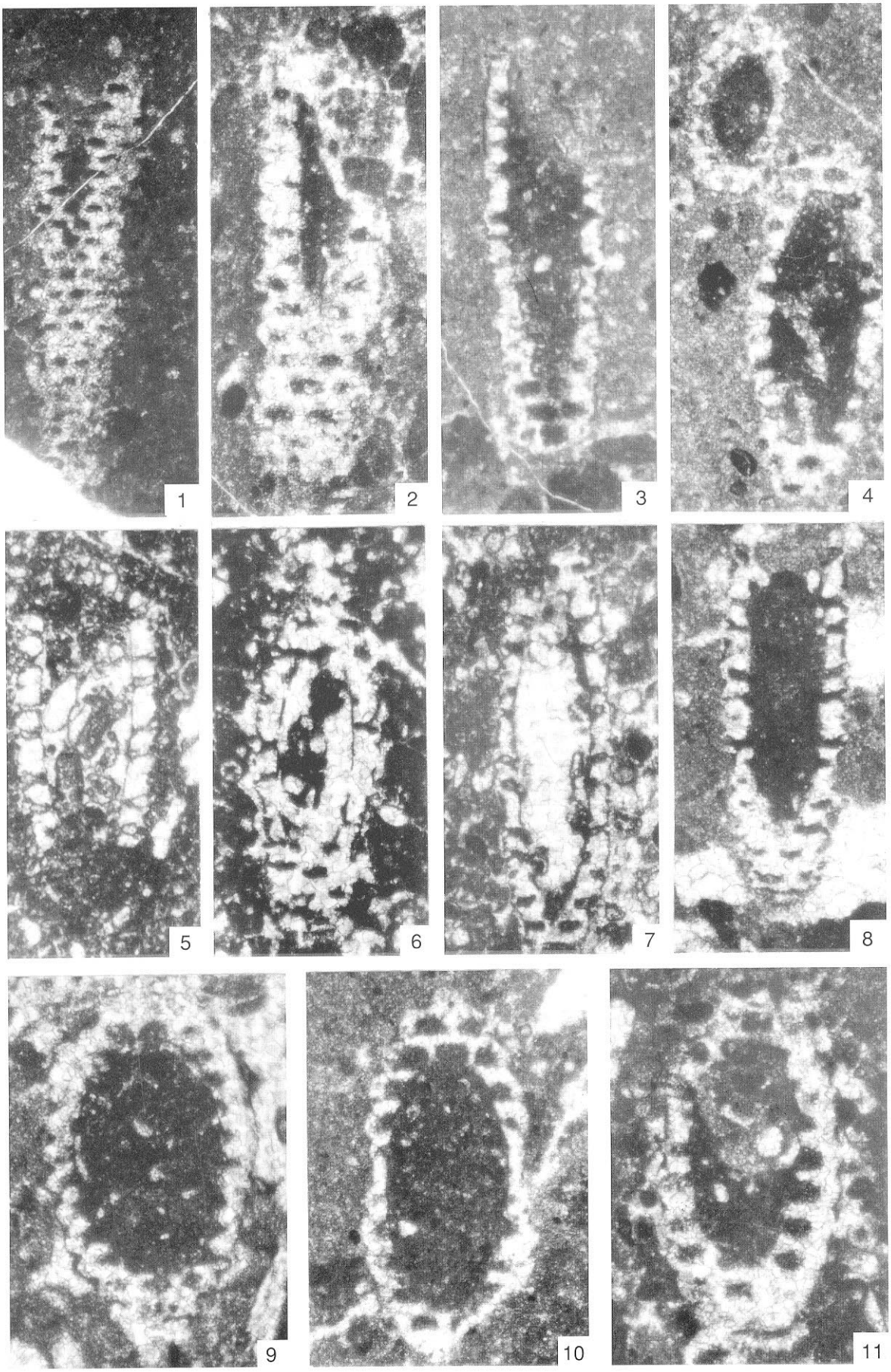
Dissocladella bystrickyi n.sp.

1 Tangential-oblique section, x23.
2-11 Various oblique sections (fig. 7 holotype), x31.

PLATE II

Dissocladella bystrickyi n.sp., x31.

1, 3-5 Oblique sections.
2 Longitudinal section.
6-9, 11 Transverse sections.
10 Tangential section.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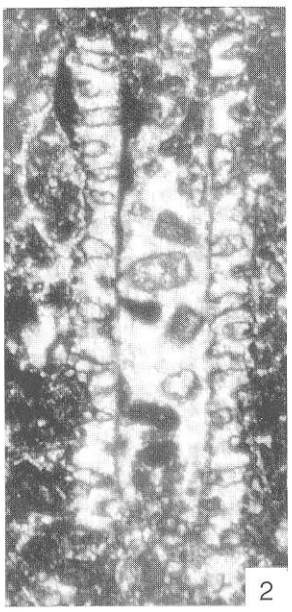
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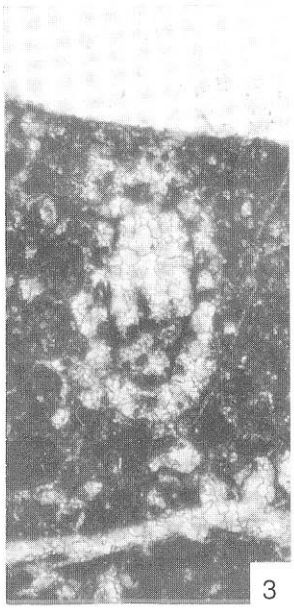
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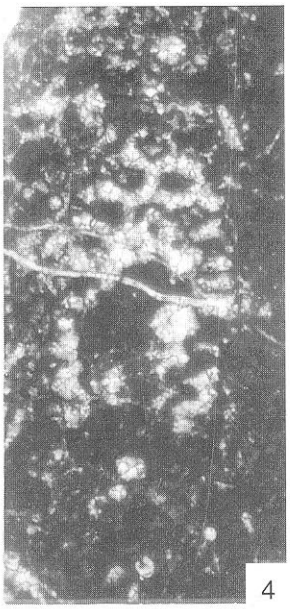
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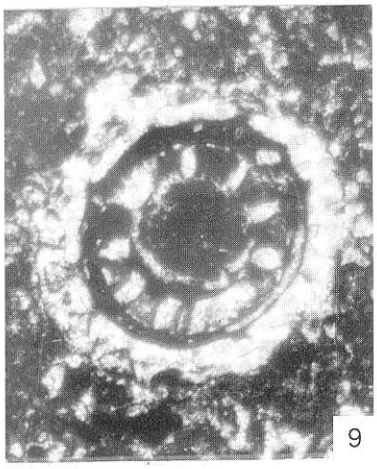
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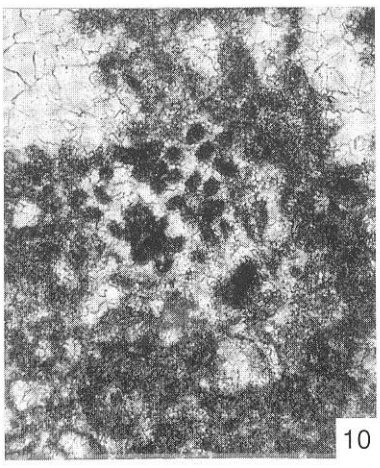
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