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Montenegrella? gracilis n. sp., a new calcareous alga (Dasycladales) from the Upper Barremian of Mt. Biokovo (Dinarides Mts., Croatia)

Branko Sokač and Tonći Grgasović

Croatian Geological Survey, Sachsova 2, Zagreb, Croatia; (tgrgasovic@hgi-cgs.hr)

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ABSTRACT

Montegrella? gracilis n.sp. (Dasycladales) is characterized by a thick calcareous envelope and narrow central cavity. Branches display two orders of laterals with alternate arrangement between consecutive whorls. The primaries are visibly differentiated into a thin, tendril-like stalk in the proximal part and a club-shaped or ellipsoidal inflated swelling in the distal part. The secondaries are poorly visible, of unclear shape and number, with a supposedly common starting point. In the type-locality, the alga occurs within a rich, typically Upper Barremian, algal assemblage. The validity of the genus *Montenegrella*, being disputed by BARATTOLO (1983), is commented upon by showing the generic attribution of the same or different species either to *Suppiluliumaella* or to *Montenegrella* by different authors.

Keywords: calcareous algae (Dasycladales), taxonomy, Barremian, Dinarides Mts., Croatia

1. INTRODUCTION

While re-reviewing thin-sections made from sample KJ-18 from Barremian deposits of Mt. Biokovo we noticed sections of some dasycladalean algae that were not mentioned in previously published papers. The description and illustrations of these previously identified algae, accompanied by short descriptions of lithology, lithofacies changes, and the stratigraphic position of the sample KJ-18 in the local geological column, were given in SOKAČ (2004, 2005, 2007) and SOKAČ & GRGASOVIĆ (2004, partly 2008). In addition, the outcrop in question was visited and discussed by the participants of the 9th International Congress on Fossil Algae, held in 2007 in Croatia. Data given in the afore-mentioned publications will not be repeated here.

The new species has been questioningly ascribed to *Montenegrella,* in spite of the validity of that genus being disputed. BARATTOLO (1983), in the description of his new species *Suppiluliumaella schroederi*, compared morphological characteristics of the species ascribed hitherto to *Suppiluliumaella* and *Montenegrella* and concluded, that morphological details mentioned in the generic description of *Montenegrella* SOKAČ & NIKLER (1973) were not sufficient for the erection of the new genus, which, should, therefore, be considered a younger synonym of *Suppiluliumaella*. Consequently, BARATTOLO (1983) suggested the transfer of all species described as *Montenegrella* by SOKAČ & NIKLER (1973), except perhaps *M. fusiformis*, as well as those described by DRAGASTAN (1978; *M. transdanubica* and *M. alimani*), to *Suppilulliumaella*. He accepts the possible identity of *Montenegrella verae* and *M. tubifera*, according to BASSOULLET et al. (1978). BERNIER (1978) thinks that *M. florifera* is inadequately known to be ascribed to *Suppiluliumaella*, whereas *M. corbarica* JAFFREZO (1975) could be ascribed to some other genus. Later authors also espoused different views. Some authors follow (or partly follow) BARATTOLO's (1983) opinion, whereas other continue to use *Montenegrella* in their identifications. Thus DRAGASTAN (1989) transfers his species *M. transdanubica* and *M. alimani* (DRAGASTAN, 1978) without any comment to *Suppiluliumaella*, adding simultaneously two new species (*S.leini* and *S. riedeli*). These, however, are represented by insufficiently clear illustrations, which make their generic attribution questionable. Similarly, there is no correct explanation for their inclusion in the synonymy of *Salpingoporella pygmaea*, as has been done by CARRAS et al. (2006). GRANIER & DELOFFRE (1993), in their inventory of Jurassic and Cretaceous fossil Dasycladales, omit any critical analysis of the relationship between *Suppiluliumaella* ELLIOTT 1968, and *Montenegrella* SOKAČ & NIKLER, 1978, the latter being invalidly described (no holotype was designated for its type-species). In this paper lectotypes are selected by the authors, thus giving *Montenegrella* and the species described on this occasion a valid status. In contrast to BARATTOLO (1983), CARRAS (1995) accepted the originally described *Montenegrella corbarica* JAFREZZO (1975) as a valid species, but transferred it to *Suppiluliumaella*, with one illustration (pl. 45, fig. 2) labelled *S. corbarica* (JAFFREZO). BUCUR (2001), in the chapter on the Lower Cretaceous, (p. 68), mentions *Suppiluliumaella (Montenegrella) tubifera* and in the same publication, on p. 142 (Stop 6), mentions and illustrates (pl. 8, figs 7-8; pl. 9) *Montenegrella tubifera* SOKAČ & NIKLER as the dominant species in the algal association. BUCUR & SĂSĂRĂN (2005), in their description of the Upper Jurassic and Lower Cretaceous deposits of the Trascău Mountains, mention and illustrate (p. 28, pl. 1, fig. 11), among others, *Montenegrella* cf. *florifera* BERNIER; that is, they accept both the genus *Montenegrella* and the species *M. florifera*. In MICHETIUC, CATINCUT & BUCUR (2008), the type-species of *Montenegrella* (*M. tubifera*) is mentioned and illustrated (p.220, pl. VI, fig. 2) as *Suppiluliumaella tubifera*. SCHLAGINTWEIT et al. (2006) give a picture (fig. 3/16) of an alga that is neither mentioned in the list of fossils nor in the list of sections pictured in fig. 3. However, an identical section is figured in GAWLICK et al. (2008, fig. 5/7) under the original name *Montenegrella tubifera* SOKAČ & NIKLER.

Comments above show that there reigns a bewildering confusion regarding the attribution of individual species to one genus or another of *Suppiluliumaella* and *Montenegrella*. The usage of the two generic denominations by individual or even the same authors on different occasions, for the same or different species originally attributed to *Montenegrella*, shows the author's dilemmas, resulting in inconsistent generic attributions. This question can be viewed (and explained) from different perspectives, but the opinion here is that the main reason seems to be the lack of clearly defined criteria, summing up variously validated biologic parameters, in a sufficient and unambiguously applicable manner in order to establish a new taxon (genus or species). Such criteria should be accompanied by photomicrographs of three, four or more clear and unequivocal characteristic sections. Unfortunately, the establishing of new taxa is frequently based upon one or two, (seldom more), poorly preserved, often heavily recrystallized sections that do not permit the insight into real and robust morphological characteristics. The establishment of new taxa based on such inadequate sections, adjusted to the author's goals and personal opinion, makes the validity of a newly described taxon questionable, opening, at the same time, possibilities for further new combinations (and speculation). A description need not restrain the author's freedom of expression: the authors are free to write up, line up and follow their own ideas, but the facts should be the same and equally visible for everybody, without personal, supposed conclusions, being either described or shown graphically, and aimed at supporting the author's interpretation. The consequences of such inadequate and variable ranking of individual morphological parameters (e.g., can a bigger or smaller D and d in relation to an original description be a decisive criterion for separating species and, if so, which will be the limiting values?), may (unjustifiably) encourage various authors to establish and/or transfer taxa according to somebody's personal opinion, without providing new data. Following the aforementioned lack of critical analysis, and accepting only the last published opinion (which is often the case), opens a number of questions regarding the validity of individual species and their generic attribution. Examples abound, but we don't want to single out any particular example (each having an author) or to exempt ourselves. We are not convinced that these questions can be objectively treated by partial corrections on a case-by-case basis, with uncoordinated criteria,; instead, they can only deepen the existing confusion.

The difference between the genera *Suppiluliumaella* and *Montenegrella* is clearly visible in the growth of secondary branches. In *Suppiluliumaella* secondaries grow out of the entire surface of the distal end of the primary branch in the form of finger-like protrusions, but in *Montenegrella* secondaries grow out as a bunch or a bundle of branches (see comparison drawings in SOKAČ & NIKLER, 1973, tab. I). This is completely clear when the original material of the type species of both genera are compared (ELLIOTT, 1968, pl. 95, fig. 1-3; SOKAČ & NIKLER, 1973, pl. 2, fig. 1-4, pl. 3, fig. 1, 3).

Therefore we retain the genus *Montenegrella* to which we assign the new species, *Montenegrella? gracilis* n. sp. However, because of the unclear shape of the secondaries and their relationships with the distal ends of the primaries (a common point of departure is supposed), its generic attribution remains uncertain.

2. PALAEONTOLOGICAL DESCRIPTION

Genus *Montenegrella* SOKAČ & NIKLER in GRANIER & DELOFFRE, 1993, non SOKAČ & NIKLER, 1973

Montenegrella? gracilis n. sp.
(Pls. I-II)

Origin of the name: The species has been named after the thin, tendril-like stalks of the primary branches, giving the alga the appearance of a tender structure.

Type locality: Mt. Biokovo (South Croatia), in a road cut situated approximately in the middle between the Vošac mountain hut and the Sv. Jure peak (1762 m, Fig. 1). Coordinates: 43° 19' 36'' N, 17° 03' 44'' E.

Type stratum: The sample KJ-18 with the new alga belongs to the level of light brown, well-bedded limestone, with bed thickness ranging from 0.3 to 1.2 m. The microfacies types are fenestral, skeletal- and oncoid-bearing, intraclastic grainstone and skeletal–peloidal packstone. The allochems include irregular intraclasts, small pellets, micritized skeletons of benthic foraminifera and gastropods, and, less commonly, oncoids, skeletons and bioclasts of dasycladalean algae, and centripetally micritized shell bioclasts. The lithological succession is represented by an alternation of mudstone, algal and foraminiferal wackestone, and sporadic occurrences of skeletal–intraclastic grainstone.

The stratigraphic position of sample KJ-18 is the Upper Barremian, determined by the rich dasycladalean association, and with the first occurrence of *Palorbitolina lenticularis* in the strata immediately above the investigated sample. The first occurrence of *P. lenticularis*, before the occurrence of the Early Aptian praeorbitolinids, indicates a Late Barremian age in the Karst Dinarides (VELIĆ, 2007), although the lowermost occurrence of this foraminifera has been proven to be Early Barremian (GRANIER et al., 2013).

For a detailed description of the fossil assemblage, geographic and stratigraphic position see SOKAČ (2004, 2005, 2007), SOKAČ & GRGASOVIĆ (2004, 2008).

Holotype: Transverse-oblique section in slide KJ-18/126, pictured in Pl. I, fig. 4. Isotypes are represented by variously oriented sections figured in Pls. I-II. The original material will be stored in the Collection of holotypes at the Croatian Natural History Museum in Zagreb, Demetrova 1.

Diagnosis: Cylindrical, unbranched thallus with a relatively narrow central cavity (small value of d) with regard to the outer diameter (D). Bipartite branches alternate in densely arranged whorls. Primaries are characterized by a thin tendril-like stalk, which, in the outer half of their total length, visibly thickens, becoming club-shaped or ellipsoidal. The secondaries are of unclear shape, appearing to be very short, their existence being indicated by a funnel-shaped widening as a continuation of the primaries' distal ends. The shape and the dimensions of the funnel-shaped widening suggest their common starting point.

Dimensions in mm

Maximum observed thallus length	L	6,80
Outer thallus diameter	D	1,76-3,90
Innet thallus diameter	d	0,40-1,20
Relation inner/outer diameter	d/D	0,150 – 0,330
Distance between neighbouring whorls	h	0,16-0,24
Proximal diameter of primaries	p	0,04-0,09
Distal diameter of primaries	p'	0,22-0,34
Length of primaries	l	0,92-1,56
Number of primaries per whorl	w	26-30
Inclination of primaries	α	30º-40º
Length of secondaries	l'	? 0,16-0,20
Number of secondaries on a primary branch	w'	? 3-4

Description: The new species is characterized by an unbranched, cylindrical thallus, consisting of fine- to medium-grained mosaic calcite which replaced the original, probably aragonite skeleton. The clearly delimited, narrow central cavity occupies from about 15% up to one third of the total diameter at the most. The outer surface of the thick calcite envelope, perforated by pores and small canals of the branches, depending on the position of the plane of section, appears to be rather uniformly abraded, thus being relatively regular and usually delimited by a thin, dark micritic rim. The inner surface is smooth and also delimited by a thin micritic rim.

Bipartite branches are arranged in regular whorls; in the neighbouring whorls, the primaries occupy alternating positions (Pl. II, figs. 1, 4). Phloiophorous primaries are characterized by a thin, tendril-like stalk with a diameter of 0.04 to 0.09 mm in their proximal half; they gradually widen into a swollen distal half (p' 0.22-0.34 mm), thus assuming, in general, a relatively regular club-like shape (Pl. I, figs. 1, 4, 8). In oblique and oblique-tangential sections, the swollen distal parts appear as more or less rounded or ellipsoidal pores (Pl. I, figs. 1, 6; Pl. II, figs. 1, 4). The variable shape of the pores, some of which suggest the possibility of being vertically compressed, is probably only the consequence of relationships between their being vertically inclined and the position of the plane of section. The branches grow obliquely and are directed upwards. The direction of their growth makes an angle with the horizontal plane section of (α) 30°-40°. Whorls are comparatively densely arranged, so that the distal parts of individual branches touch mutually, both within the same whorl and with the branches of the neighbouring whorls (Pl. I, fig. 2; Pl. II, fig. 4).

The existence of secondaries seem without question; however, due to corrosion of the outer surface they are mostly erased, only seldom being preserved, and poorly visible in only some parts of some sections (Pl. I, fig. 4). Despite not knowing how much of the outer surface of the skeleton has been abraded during transport, the secondaries seem to have been very short indeed (length - l' 0.16-0.20 mm). The existence of secondaries, their dense arrangement, and probably their common starting point is also indicated by partially visible, shallow, funnel-shaped widenings occurring at the distal ends of the primaries (Pl. I, figs. 4, 8; Pl. II, fig. 8). However, their number and shape remain unknown. The shape and width of the funnel-shaped widening suggests a phloiophorous shape for the secondaries and 3?-4 in number per bundle. These uncertainties in the position and growth form of the secondaries make the generic attribution debatable.

Similarities and differences: With regard to the originally described species of *Montenegrella*, the new species is distinguished by the regularity of the primaries, pronounced thin, tendril-like stalks in the proximal half and regular, club-shaped or ellipsoidal swelling in the distal (outer) half of the calcareous envelope. In addition, it is distinguished by a thick calcite envelope and thin, regularly shaped central cavity. With regard to *Montenegrella florifera* BERNIER and *M. corbarica* JAFREZZO, the difference is visible in the distance between neighbouring whorls (h), the shape of the primaries, and in clearly visible and well-developed, rather massive, secondaries in both these species. With regard to *Suppiluliumaella transdanubica* (DRAGASTAN) and *S. alimani* (DRAGASTAN), of which the latter does not show any remarkable difference to the type-species of *Suppiluliumaella*, the differences concern the value of the inner diameter, shape of the primaries, and independent growth of the secondaries out of the primaries' distal ends, as distinct from these characteristics being well-developed in the mentioned species. With regard to *S. leini* DRAGASTAN and *S. riedeli* DRAGASTAN, their unclear photographic illustrations make direct comparison impossible. The differences to *S. elliotti* BAKALOVA and *S. schroederi* BARATTOLO concern the shape and massiveness of the primary branches, the relationship between the inner and outer diameters, and the growth form of the secondaries, regarding the same features in the new species.

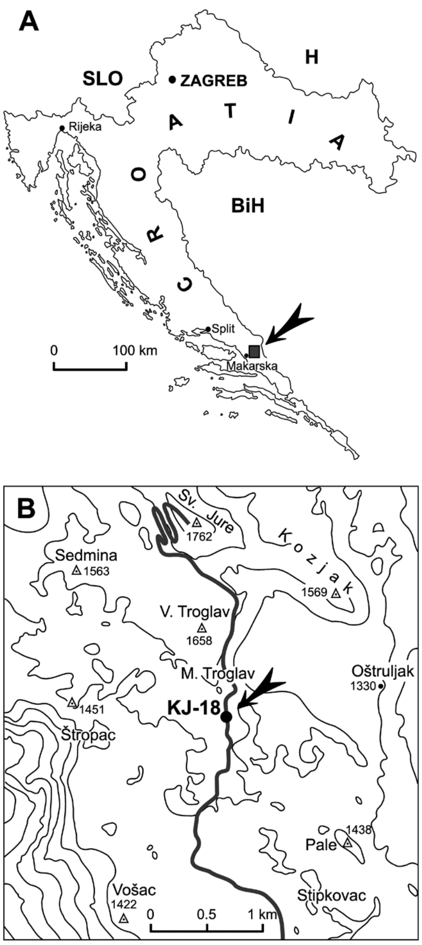

Figure 1: (A) General location of the sample KJ–18 locality in the Croatian territory. (B) Simplified map of the area of the central Biokovo Mt., type locality of *Montenegrella? gracilis* n.sp. (from SOKAČ, 2005).

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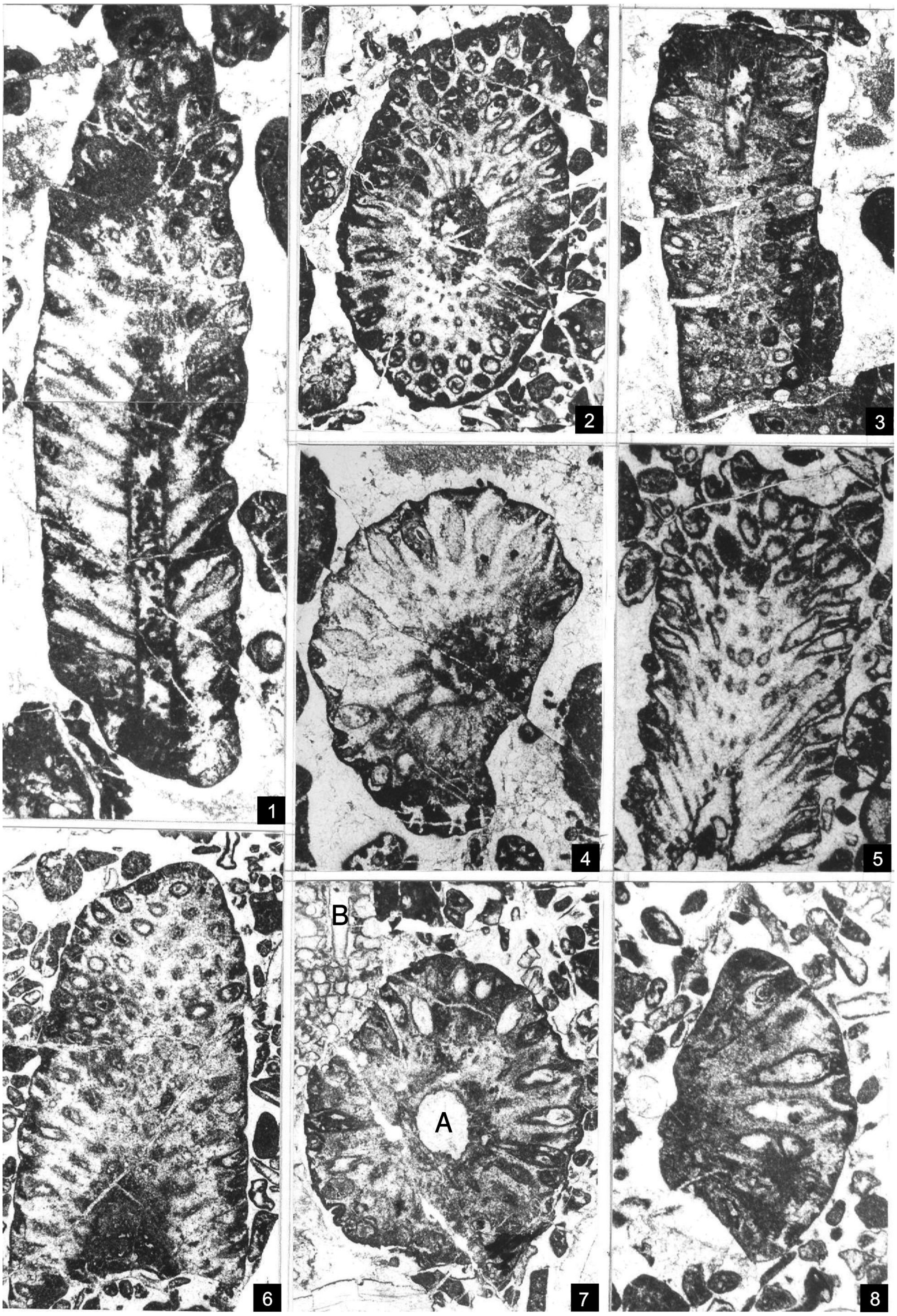

PLATE I

Montenegrella? gracilis n. sp.

1 Longitudinal-oblique section. Slide KJ-18/4, x22.
2 Oblique section. Slide KJ-18/141, x14.
3 Tangential-longitudinal section. Slide KJ-18/142, x17.
4 Transverse-oblique section. Holotype. Slide KJ-18/146, x17.
5–6 Longitudinal-tangential sections. Slides: Fig. 5, KJ-18/245, x22; Fig. 6, KJ-18/242, x14.
7 A *Montenegrella*? *gracilis* n. sp., transverse section. B *Cylindroporella lyrata* MASSE & LUPERTO-SINNI, longitudinal-tangential section. Slide KJ-18/93, x14.
8 Transverse section (fragment). Slide KJ-18/216, x22.

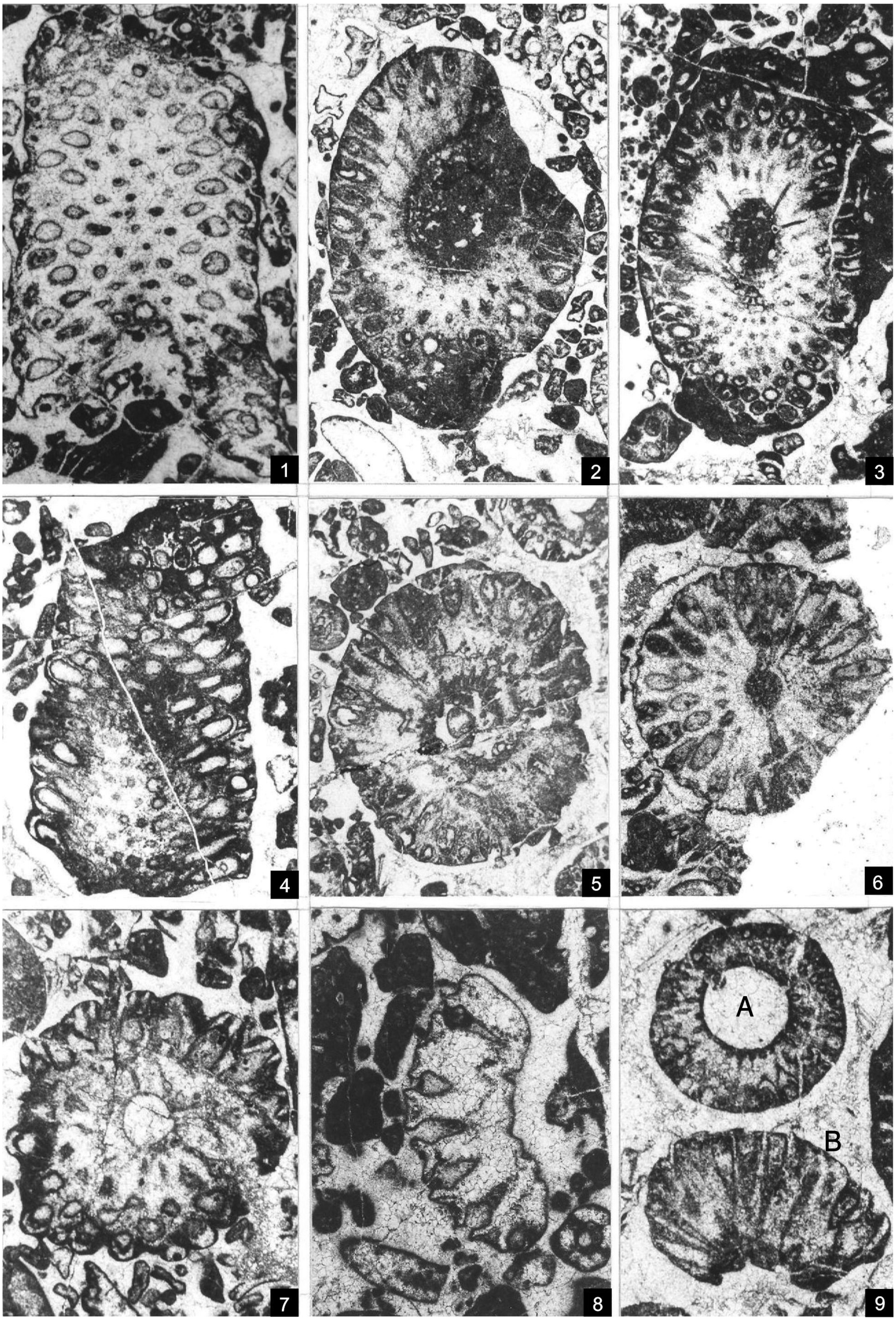

PLATE II

Montenegrella? gracilis n. sp.

1 Oblique-tangential section. Slide KJ-18/27, x17.
2–3 Oblique sections. Slides: Fig. 2, KJ-18/229, x14; Fig. 3, KJ-18/156, x14.
4 Tangential section. Slide KJ-18/218, x17.
5–7 Transverse sections. Slides: Fig. 5, KJ-18/64, x14; Fig. 6, KJ-18/183, x17; Fig. 7, KJ-18/215, x22.
8 Part of oblique section. Slide: Kj-18/16, x22.
9 A *Cymopolia velici* SOKAČ & NIKLER, transverse section. B *Montenegrella*? *gracilis* n. sp., fragment. Section KJ-18/214, x22.