

LOWER CRETACEOUS CARBONATE DEPOSITS FROM THE DEREZNA BOREHOLE (CARPATHO-BALKANIDES, EASTERN SERBIA) AND REMARKS ON SOME DASYCLADALEAN ALGAE

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Abstract An exploratory borehole cross-cutting Miocene deposits near Derezna (south of Kučevo town, Eastern Serbia) has intercepted Lower Cretaceous carbonate rocks in its lower part. The identified microfacies and micropaleontological associations indicate a Barremian age for these limestones. Among the identified dasycladalean algae, *Salpingoporella patrulei* Bucur, a generally rare alga, is here recorded in relatively high abundance. Its occurrence is recorded for the first time in Serbia. *Similiclypeina* aff. *somalica* (Conrad et al.) is another dasycladalean species identified for the first time in the region. Its presence allows us to make some remarks concerning the two genera *Similiclypeina* and *Piriferella*.

Keywords: Lower Cretaceous, Dasycladales, Taxonomy, Carpatho-Balkanides, Eastern Serbia

INTRODUCTION. GEOLOGICAL FRAMEWORK

The investigated area of Eastern Serbia belongs to the Carpatho-Balkanides which extend from the Danube to the north, to the Serbian/Bulgarian border to the south. According to Karamata & Krstić (1996) this area represents the Kučaj terrane, a large Alpine geotectonic unit (Fig. 1). According to Krätner & Krstić (2002), this area is part of the Getic units which include the Getic nappe north of the Danube, and its continuation in the Kučaj-Ljubaš and Sredna Gora zones in Eastern Serbia, south of the Danube (Fig. 2).

The Derezna borehole was drilled in the 1990s in Miocene sediments for investigations related to coal deposits in the region. Besides Derezna, occurrences of coals are known also from the villages Rakova Bara and Radenka located north of Kučevo town (Fig. 1). The Miocene sediments consist of marlstones, claystones with coal, conglomerates, and clays. They are surrounded by sediments of Early Cretaceous age (Berriasian to Albian; Kalenić et al., 1980, Fig. 3). Rock samples collected from the sedimentary succession indicate the presence of carbonate deposits in the lower part of the borehole. Their study represents the object of this paper.

MATERIAL AND METHODS

Eight limestone samples were collected from carbonate deposits recovered in the Derezna borehole and an equivalent number of thin sections were prepared. They are labelled RR4834 to RR4841 and are deposited in the I.I. Bucur collection in the Department of Geology, Babeş-Bolyai University, Cluj-Napoca. Microscope studies

were performed with a Zeiss Stemi 2000C stereomicroscope and a Carl Zeiss Axioscope petrographic microscope. For microphotographs a Canon Power Shot A640 digital camera was used. Carbonate rock description follows the textural classification of Dunham (1962).

MICROFACIES AND MICROPALaeONTOLOGICAL ASSEMBLAGES

Eight samples were recovered from limestone deposits drilled by the borehole, after crossing the Miocene deposits. The petrographic spectrum is dominated by muddy facies (wackestone, wackestone-packstone or packstone) and subordinate packstone-grainstone or coarse grainstone (Fig. 4a-h). All the facies varieties contain calcareous algae (mainly dasycladaleans, rare udoteaceans or rodophyceans). Other bioclasts include foraminifera, bivalve, gastropod, echinoderm, bryozoan, and brachiopod fragments. The calcareous algae assemblage contains the following species: *Salpingoporella patrulei* Bucur (Fig. 5a-f), *Salpingoporella muehlbergii* (Lorenz) [Fig. 6a-c, f, g(Sm), h(Sm), i(Sm), j(Sm); Fig. 7m(Sm)], *Salpingoporella* cf. *muehlbergii* (Fig. 6d, e), *Similiclypeina* aff. *somalica* Conrad, Peybernès & Masse [Fig. 6h(Ss)], *Similiclypeina conradi* Bucur [Fig. 6i(Sc), Fig. 7k], *Milanovicella?* sp. (Fig. 7a), *Korkyrella texana* Sokač (Fig. 7b, c), *Salpingoporella biokovenski* Sokač & Velić (Fig. 7d), *Clypeina* div. sp. (Fig. 7e-h), *Actinoporella podolica* (Alth) [Fig. 7i, j, l, m (Ap)], *Arabicodium?* sp. (Fig. 6k) and *Sporolithon rude* (Lemoine) [Fig. 6j (Sr)].

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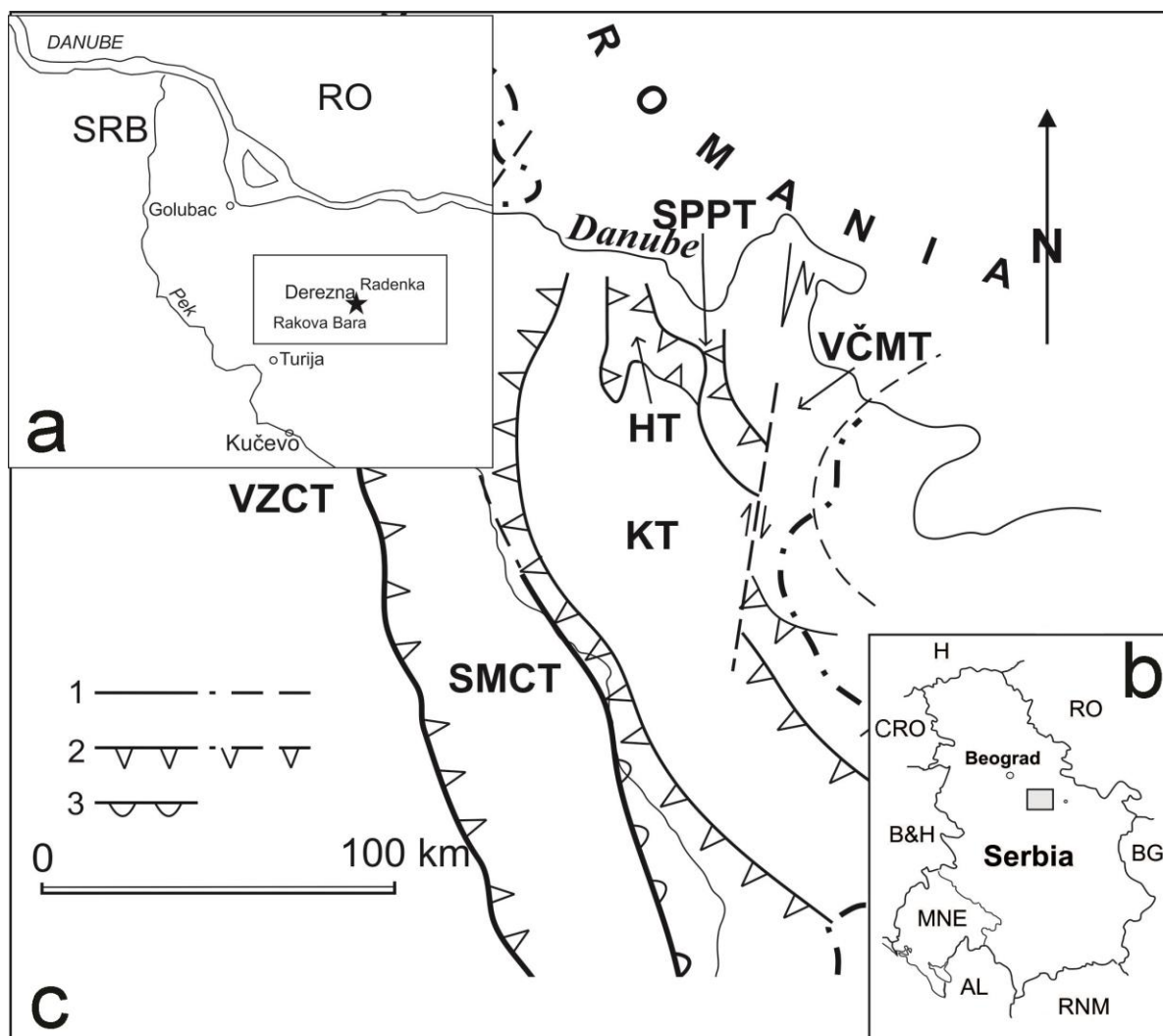


Fig. 1 Position of the investigated area. **a** Geographic position, northeast of Kučevo town. **b** Location inside the Serbian territory. **c** Terranes of Central part of Balkan peninsula, between the Moesian plate and the Adriatic Sea (modified, from Karamata and Krstić, 1996); VZCT - Vardar Zone Composite Terrane; SMCT - Serbian-Macedonian Composite Terrane; KT - Kučaj Terrane; HT - Homolje Terrane; SPPT - Stara Planina-Poreč Terrane; VČMT - Vrška Čuka -Miroč Terrane. 1, fault (observed and covered); 2, nappe; 3, tectonized boundary.

Benthic foraminifera are less frequent. They are represented by: *Mayncina* sp. (Fig. 8a), *Banatia aninensis* Schlagintweit & Bucur (Fig. 8b, c), *Moulladella jourdanensis* (Foury & Moullade) (Fig. 8d), small textulariaceans, miliolids and trocholinids [Fig. 6g (T)]

AGE OF THE LIMESTONES

Banatia aninensis is reported for the first time in Serbia in this study. This species was described initially from upper Barremian deposits of the Southern Carpathians, Romania (Schlagintweit & Bucur, 2017). For a long time, *Moulladella jourdanensis* was considered to characterize only the lower Barremian, (e.g. Arnaud-Vanneau, 1980). In fact, its range characterizes the upper Berriasian-lower Barremian interval (Bucur & Schlagintweit, 2018; Bucur et al., in press). However, the identified dasycladalean algae (e.g., *Salpingoporella muehlbergii*, *S. patrulei*, *Korkyrella texana*) exclude a prae-Barremian age for these deposits.

REMARKS ON SOME DASYCLADALEAN ALGAE

Salpingoporella patrulei Bucur, 1985
Fig. 4a-f

1985 *Salpingoporella patrulei* n. sp. – Bucur, p. 81, text-fig. 4, pls. 1-3, Barremian-lower Aptian, Pădurea Craiului, Apuseni Mountains, Romania.

1992 *Salpingoporella patrulei* Bucur – Bucur, p. 449, text-fig. 1, pl. 2, fig. 1-6, Barremian, Pădurea Craiului, Apuseni Mountains; pl. 2, fig. 7, Barremian-lower Aptian, Reșița-Moldova Nouă zone (Southern Carpathians), Romania.

1994 *Salpingoporella patrulei* Bucur – Bucur, p. 155, pl. X, fig. 23-24, upper Barremian-lower Aptian, Reșița-Moldova Nouă zone (Southern Carpathians), Romania.

1999 *Salpingoporella patrulei* Bucur – Bucur, p. 56, pl. II, fig. 1-10, Barremian, Pădurea Craiului, Apuseni Mountains, Romania.

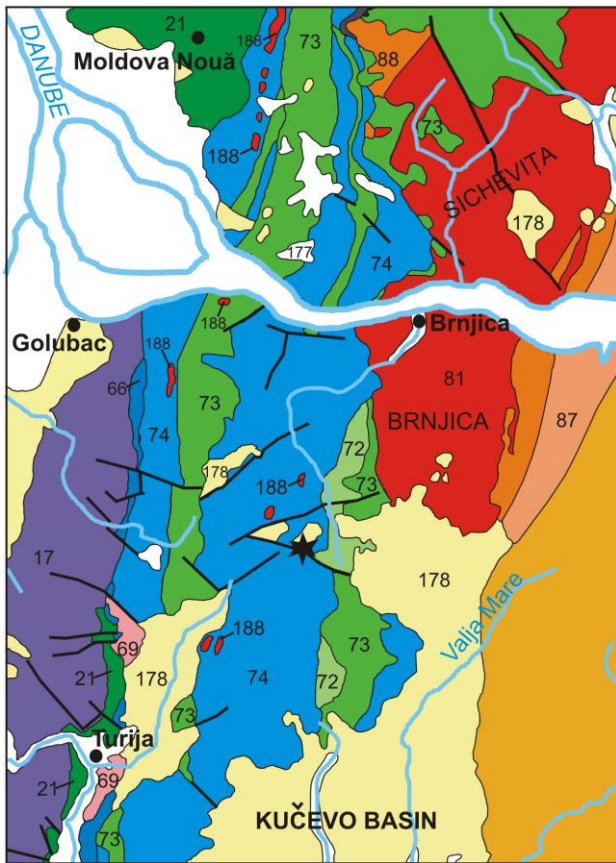


Fig. 2 Excerpt from the Geological Map of the Carpatho-Balkanides between Mehadia, Oravița, Niš and Sophia (Kräutner & Krstić, 2003). Lower Supragetic Unit (Moniom-Locva-Ranovac-Poronica Nappe): 17, Devonian-Lower Carboniferous; 21, Ordovician-Devonian. Getic Unit, Getic Nappe (Kučaj-Ljubaš-Sredna Gora Unit): 72, Alban (Valea Golumbului sandstone); 73, Barremian-Aptian (Urgonian, Plopa and Valea Minișului limestones); 74, Oxfordian-Kimmeridgian, Tithonian, Valanginian-Hauterivian. Post-tectonic sedimentary covers and magmatites: 178, Post-Laramian Miocene; 188, Post-Mesocretaceous Banatitic intrusions. The borehole Derezna is marked by the black star.

2001 *Salpingoporella patuliusi* Bucur – Bucur & Cociuba, p. 120, pl. 2, fig. 1-3, lower Barremian, Pădurea Craiului, Apuseni Mountains, Romania.

2001 *Salpingoporella patuliusi* Bucur – Pop & Bucur, p. 82, pl. VIII, fig. 9, upper Barremian, Vâlcan Mountains (Southern Carpathians), Romania.

2007 *Salpingoporella patuliusi* Bucur – Sokač, p. 84, pl. III, fig. 1-3, Upper Barremian, Biokovo Mountains (Dinaric Karst, Croatia).

2008 *Salpingoporella patuliusi* Bucur 1985 – Sokač & Grgasović, p. 262, pl. V, fig. 1-6, pl. VI, fig. 1-4, upper Barremian, Dinaric Karst, Croatia.

The specimens identified in Eastern Serbia present clear similarities with the type specimens: a narrow axial cavity with respect to the external diameter of the thallus; elongated phloioiphorous laterals with euspondyl arrangement and tilted to the central stem; calcification forming a distinct sheath around the axis and the laterals.

The general dimensions of the calcareous skeleton of the Serbian specimens and the Romanian type material are also comparable (Table 1).

Table 1 Comparative dimensions of *Salpingoporella patuliusi* Bucur from the type locality (Pădurea Craiului, Apusei Mountains, Romania) and Derezna borehole (Kučaj zone, Carpatho-Balkanides, Eastern Serbia).

	Type locality (Pădurea Craiului, Apuseni Mountains) (Bucur, 1985)	Borehole Derezna (Carpatho-Balkanides, Eastern Serbia) (this paper)
D	1.10-2.30 (mean 1.48)	1.10-2.40 (1.49)
d	0.11-0.28 (0.21)	0.20-0.45 (0.30)
d/D	0.10-0.24 (0.15)	0.17-0.28 (0.20)
l	0.56-1.00 (0.77)	0.55
p (dist.)	0.16-0.31 (0.22)	0.20
h	0.22-0.28 (0.26)	0.26
w	7-9	7-8

Initially, the age of the limestones from the type locality (Pădurea Craiului) was attributed to the Barremian–lower Aptian. Subsequently, Bucur & Cociuba (2001) reassigned it to the lower Barremian. It is difficult to estimate the age of the specimens from the Reșița-Moldova Nouă zone (Bucur, 1994). However, a late Barremian age could be presumed (the lower part of the Valea Minișului Formation). In the Vâlcan Mountains (Pop & Bucur, 2001), *Salpingoporella patuliusi* is associated with *Montseciella arabica* Henson, an orbitolinid that characterizes the upper Barremian to lowermost Bedoulian (Schroeder et al., 2010, fig. 3). Finally, Sokač & Grgasović, (2008) indicate a late Barremian age for the Dinaric Karst limestones containing *Salpingoporella patuliusi*. Summarizing, *Salpingoporella patuliusi* is well known from Barremian strata.

Similiclypeina aff. *somalica* Conrad, Peybernès & Masse, 1983

Fig. 5h(Ss)

Remarks

This alga was first illustrated by Bucur (1993, pl. 3, fig. 7, 9b, 10, 12-25) from limestones located in the median part of the Reșița-Moldova Nouă zone. It was described as a species which is similar to *Clypeina somalica* (Conrad, Peybernès & Masse, 1983), but with generally smaller dimensions, and was attributed to the genus *Similiclypeina* Bucur, 1993. The same alga was illustrated by Bucur et al. (2000, pl. VII fig. 19-24) from the eastern Pontides (Turkey). The specimen identified in Eastern Serbia has dimensional values within the variation range of the specimens described from the Reșița-Moldova Nouă Zone by Bucur (1993) and the Kirkaova section, Kale-

Table 2. Comparative dimensions of *Similiclypeina* aff. *somalica* from the Reșița Moldova Nouă zone (Southern Carpathians, Romania), Kirkaova (Kale-Gümüşhane, NE Turkey), and the specimen from Derezna borehole (Kučaj zone, Carpatho-Balkanides, Eastern Serbia).

	Reșița-Moldova Nouă zone (Southern Carpathians, Romania) (Bucur, 1993)	Kirkaova (Kale-Gümüşhane, NE Turkey) (Bucur et al., 2000)	Borehole Derezna (Carpatho-Balkanides, Eastern Serbia) (this paper)
D	0.36-0.54	0.35-0.50	0.45
d	0.16-0.23	0.14-0.20	0.25
d/D	0.30-0.46	0.40	0.55
l	0.19-0.23	0.15-0.20	0.13-0.20
p (dist.)	0.028-0.10	0.05-0.10	0.065-0.11
h	0.07-0.09	0.07-0.08	0.065-0.098

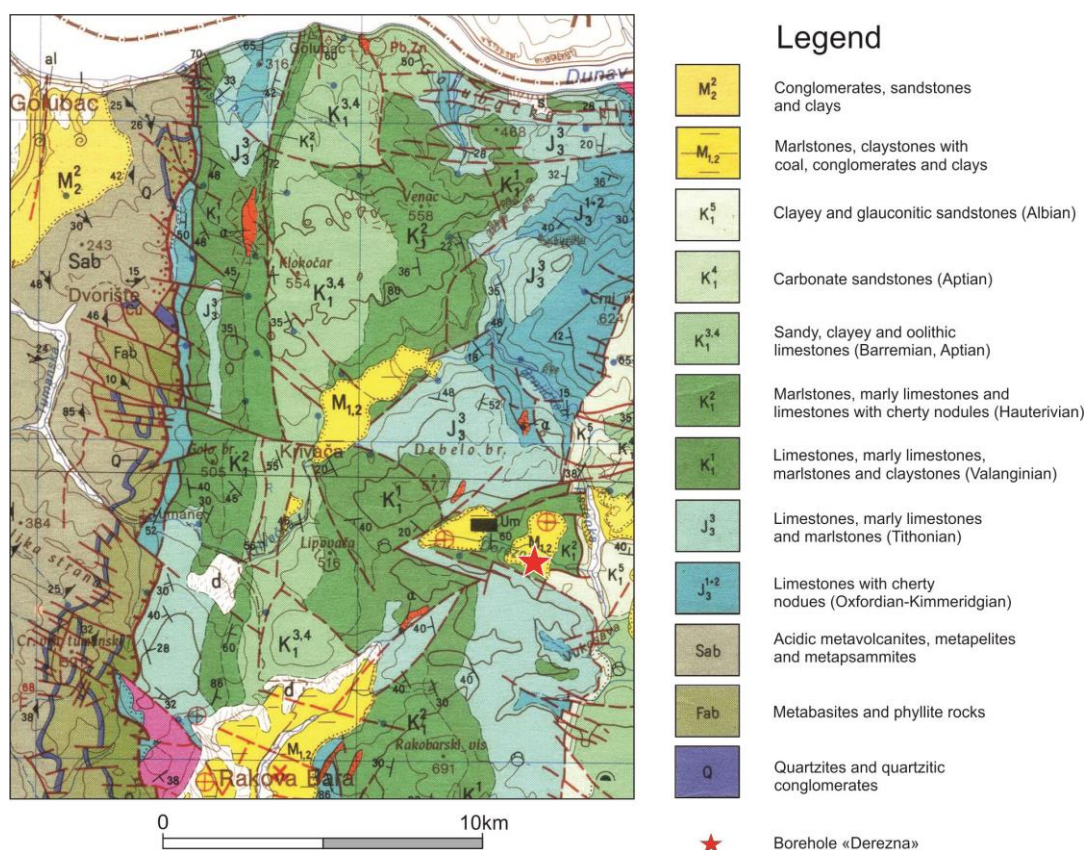


Fig. 3 Excerpt from the Basic Geological Map, 1:100 000, Sheet Kučevo (Kalenić & Hadži-Vuković, 1980). The borehole Derezna is marked by the red star.

Gümüşhane region, NE Turkey (Bucur et al., 2000) (see Table 2).

The genus *Similiclypeina* was introduced by Bucur (1993) in order to reunite the *Clypeina*-like dasycladaleans which contain non-spaced whorls that touch each other and are often vertically welded. The genus diagnosis was the following (Bucur, 1993, p. 105): „Thallus made up of overlapping whorls of primary ramifications. Ramifications slightly tilted with respect to the axial cavity, welded at their proximal part and, usually, loose at their distal end. Overlapping whorls touching one another, partly welded into a more or less compact calcareous sheath“. Some species doubtfully attributed to the genus *Clypeina* Michelin (e.g., *Clypeina? alrawii* Radoičić, 1978; *Clypeina? somalica* Conrad et

al., 1983) have been transferred to the genus *Similiclypeina*, and a new species, *Similiclypeina conradi* was introduced (Bucur, 1993).

Sokač (1996) created the genus *Piriferella* with *Piriferella spinosa* as type species from the Lower Cretaceous of Croatia. He introduced the species *Clypeina somalica* in the new combination as *Piriferella somalica*. According to Sokač (1996, p. 29): „By the arrangement and density of branches and their independent mode of growth, all of which results in a similar general appearance of the thallus, *Piriferella* nov. gen. comes more closely to *Similiclypeina*, which is however, characterized by *Actinoporella* type ramifications (i.e., gradually widening toward exterior) and by vertically flattened coronas.“ We have to underline

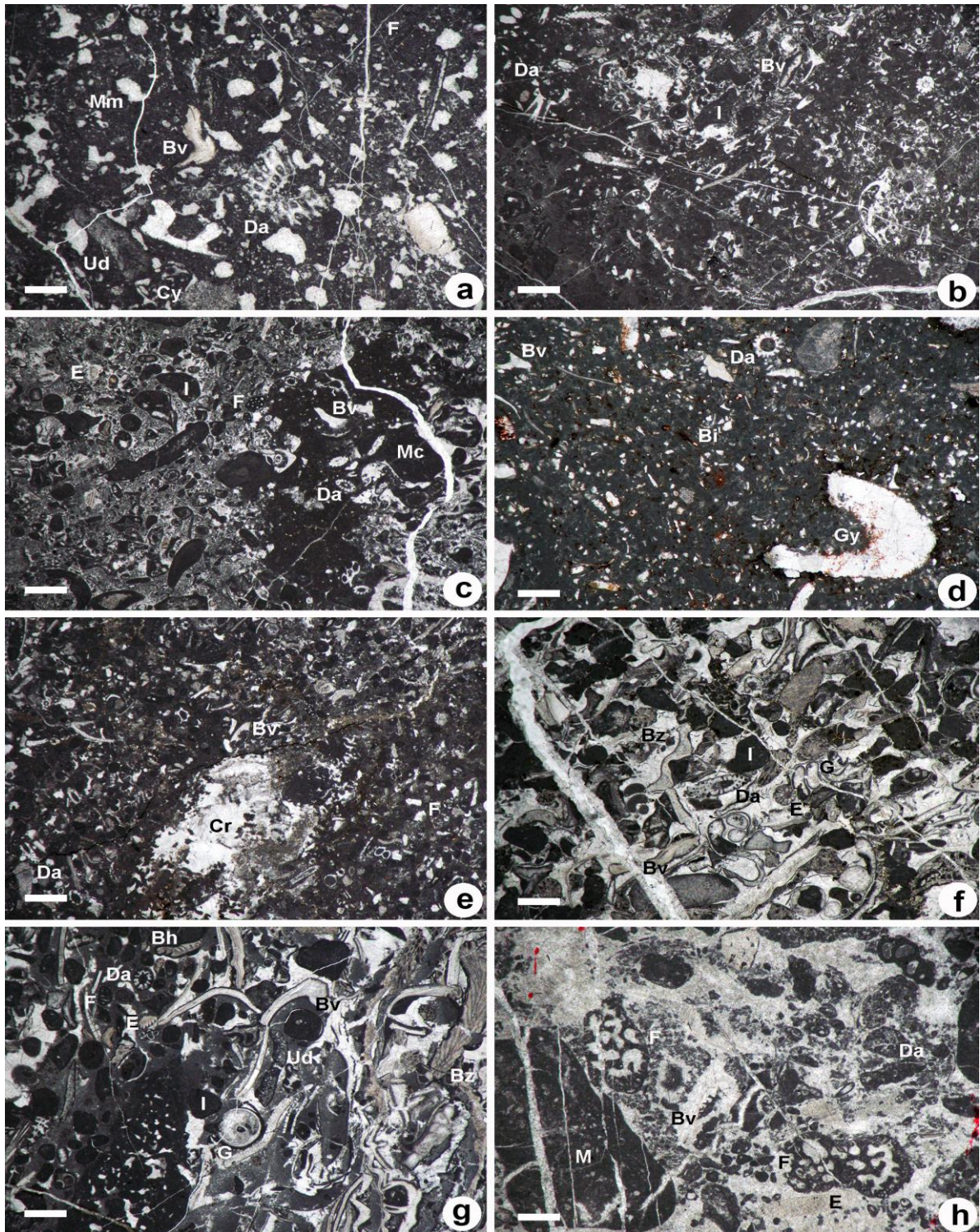


Fig. 4 Microfacies. **a** Fenestral wackestone with dasycladalean (Da) and udoteacean (Ud) algae, bivalve (Bv) fragments, cyanobacteria (Cy), and foraminifera (F). Some bioclasts are bound by a microbial mass (Mm); thin section RR4834. **b** Wackestone to packstone with frequent dasycladalean algae (Da), bivalve (Bv) fragments, foraminifera (F), and frequent micritic intraclasts (I); thin section RR4835. **c** Packstone-grainstone with dasycladalean algae (Da), small bivalve (Bv) and echinoderm (E) fragments, foraminifera (F), and frequent intraclasts (I); Large micritic clasts (Mc) probably resulting from the microbial binding of different small clasts; thin section RR4836. **d** Packstone with numerous small bioclasts (Bi), rare larger bivalve (Bv) fragments, dasycladalean (Da) and gymnocodiacean (Gy) algae; thin section RR4837. **e** Packstone recrystallized corals (Cr), bivalve (Bv) fragments, rare foraminifera (F), and frequent dasycladalean (Da) algae; thin section RR4838. **f** Coarse grainstone with bivalve (Bv), echinoderm (E), bryozoan (Bz), and gastropod (G) fragments, dasycladalean (Da) algae, and micritic intraclasts (I) thin section RR4839. **g** Coarse packstone to grainstone with bivalve (Bv), echinoderm (E), bryozoan (Bz), brachiopod (Bh), and gastropod (G) fragments, dasycladalean (Da) and udoteacean (Ud) algae, rare foraminifera (F), and micritic intraclasts (I); thin section RR4840. **h** Coarse grainstone-rudstone with large incrusting foraminifera (F), bivalve (Bv) and echinoderm (E) fragments, dasycladalean (Da) algae, and large clasts with micritic-microbial structure (M); thin section RR4841. Scale bar is 1 mm.

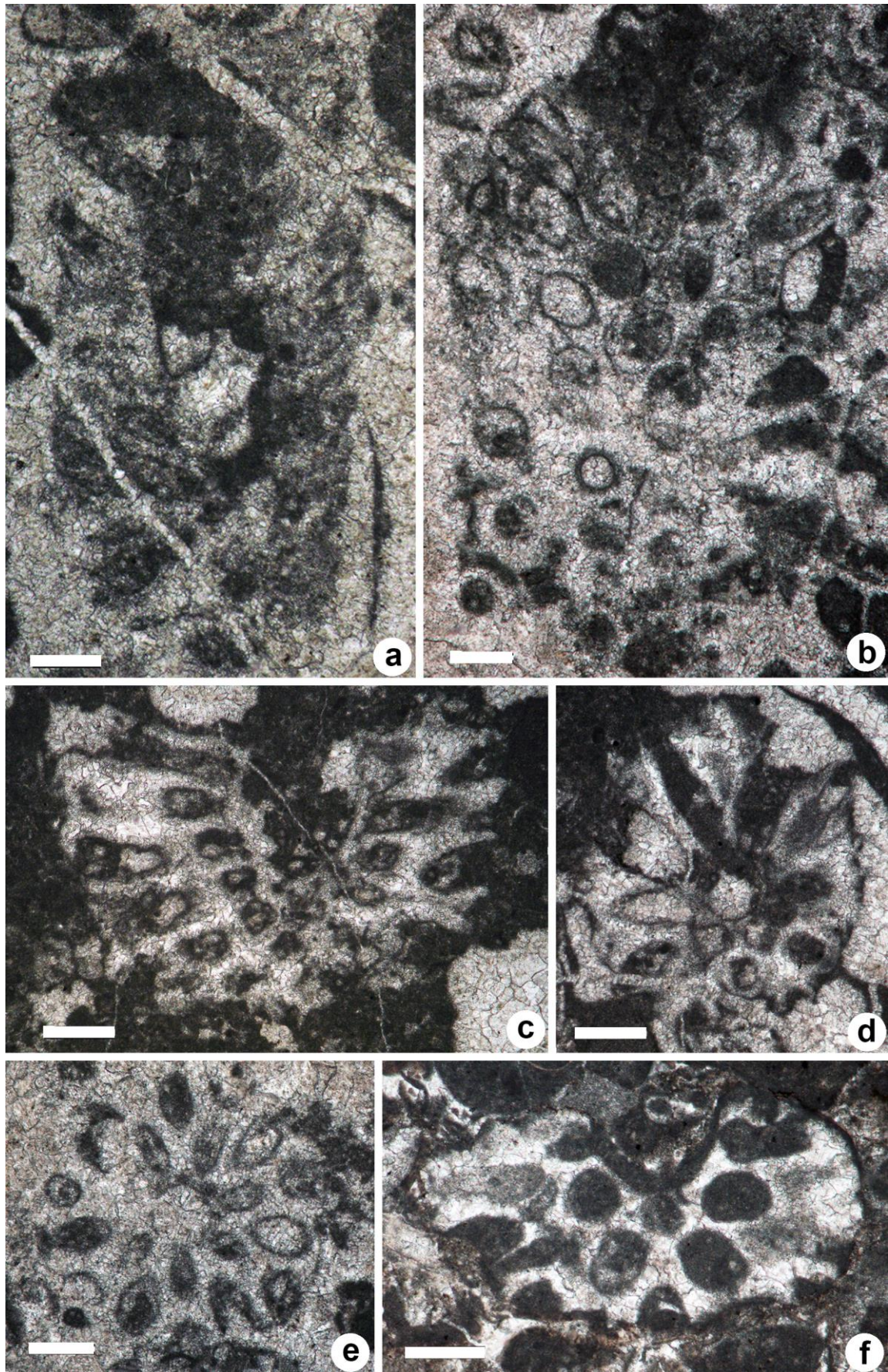


Fig. 5 Calcareous algae. **a-f** *Salpingoporella patrulusi* Bucur. a, longitudinal, slightly oblique section; thin section RR4841. b, c, f, oblique tangential sections; thin section RR4841(b), RR4834(c) and RR4840 (f). d, transverse-oblique section; thin section RR4834. e, transverse section; thin section RR4841. Scale bar is 0.25 mm.

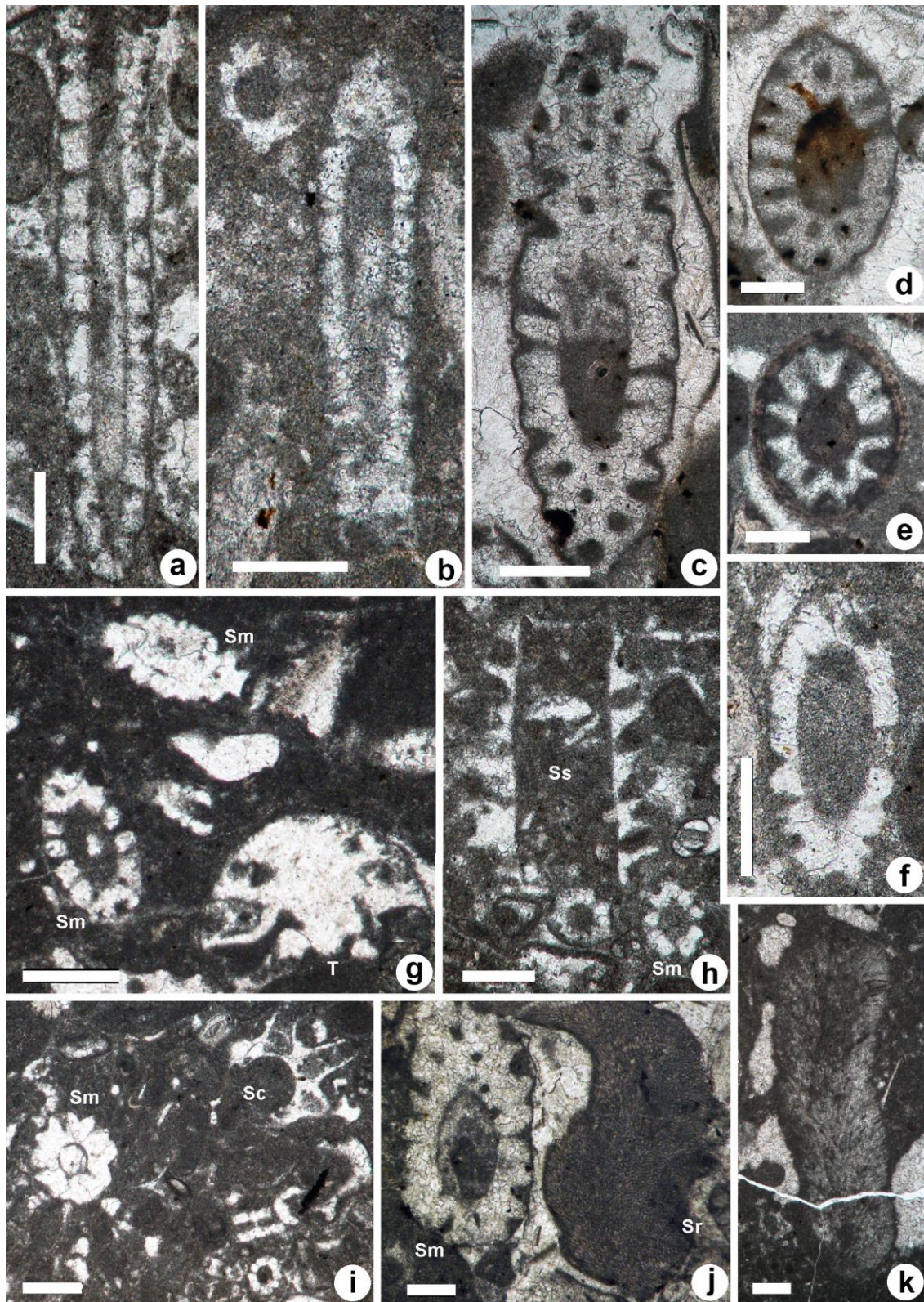


Fig. 6 Calcareous algae. **a-c, f** *Salpingoporella muehlbergii* (Lorenz); **a**, longitudinal section, thin section RR4835; **b**, longitudinal-slightly oblique, and transverse sections; thin section RR4838; **c, f** oblique sections; thin sections RR4839 (**c**) and RR4838 (**f**). **d, e** *Salpingoporella* cf. *muehlbergii* (Lorenz); thin RR4839 (**d**) and RR4840(**e**). **g** *Salpingoporella muehlbergii* (Lorenz) (Sm) oblique section, and foraminifer trocholinid (T); thin section RR4836. **h** *Similiclypeina* aff. *somalica* Conrad, Peybernès & Masse (Ss) longitudinal section, and *Salpingoporella muehlbergii* (Lorenz) (Sm) transverse section; thin section RR4835. **i** *Salpingoporella muehlbergii* (Lorenz) (Sm) transverse section, and *Similiclypeina conradi* Bucur (Sc) transverse-oblique section; thin section RR4835. **j** *Salpingoporella muehlbergii* (Lorenz) (Sm) oblique section, and *Sporolithon rude* (Lemoine) (Sr); thin section RR4839. **k** *Arabicoodium* sp.; thin section RR4834. Scale bar is 0.25 mm.

here that in the diagnosis of the genus *Similiclypeina* (Bucur, 1993, p. 105), no information is given on the presence of *Actinoporella* type ramifications (i.e., laterals), or possible coronas. Further comments on the genus *Similiclypeina* are made by Sokač, 1996 at page 30 where he describes „*Piriferella somalica*“ stating: „Therefore, *Similiclypeina* would include forms with different characteristics: forms with horizontally, elongated corona- or vestibule-like swellings in the proximal part of the ramifications (*S. conradi* and *S. iustini*), forms with no such swellings at all (*S. alrawii* and *S. somalica*) and forms with two types of secondary ramifications, one growing out from the cylindrical stalk of the thallus (sic!), another on the primary branches (*S. pupnatensis*). As basal swelling of ramifications is generally agreed to be crucial for distinguishing *Actinoporella* from *Clypeina*, and thus became, by general consensus, a criterion of generic rank, it would be illogical to erect a genus that would unite forms with and without such an important feature“. In fact, Sokač (1996) transfers the characteristics of the species *S. conradi* to the entire genus without taking into account the given diagnosis of genus *Similiclypeina*. In addition, he mentions corona located inside the whorls, between the laterals. The enlarged portion at the base of the laterals of *S. conradi* is interpreted as two coronas. Bucur et al. (2000, p. 452) commented on these aspects, showing that (translated from French): „The presence of "corona" in *Similiclypeina conradi* (type species of the genus *Similiclypeina*) underlined by Sokač (1996), who consider that the author neglected this character in the generic diagnosis is, in our opinion, unacceptable. Following Berger and Kaefer (1992) „... **Corona superior** = the total of the circularly arranged processes at the upper side of a cap at the insertion of the cap rays into the stalk (main axis). Each cap ray bears one corona segment, each corona superior segment bears a species-specific number of protuberances... **Corona inferior** = the total of circularly arranged processes at the underside of the cap surrounding the insertion of the cap rays into the stalk. If a corona inferior is present, one corona process belongs to each cap ray. The corona inferior is always devoid of protuberances“. Starting from this definition we can ask how could a "corona" be formed between the laterals of the same verticil? Because it is not corona, the specific aspect of the laterals of *S. conradi* was not considered as a character of generic value, and was not mentioned in the genus diagnosis...“ In other words, if we follow the logic of the existence of corona on the lateral basal side of the laterals, we have to speak about „left corona“ and „right corona“, an assumption that does not correspond to any of the known characteristics of dasycladalean algae. Otherwise, the characteristic aspect of the laterals of *Similiclypeina conradi* could result from the presence of non-calcified reproductive cysts in the lower part of the laterals. Regarding *Humiella? pupnatensis* Sokač, 1987, [synonymized by Bucur (1993) with *Similiclypeina*

somalica], we question the existence of "secondary ramifications" starting directly from the stalk. Probably the author (Sokač, 1996) was referring to sterile and not secondary ramifications. In addition, Sokač (1987) speaks about secondary short „ramifications,, located in the distal part of the primary fertile „ramifications,,. However, these secondary laterals are difficult to observe and they may correspond to simple irregularities of the calcareous sleeve.

The genus *Piriferella* (Sokač, 1996) was created based on the typical „pyrifer,, (pyriform would be better) shape of its laterals (Sokač, 1996, p. 28). In fact, neither the type species (*P. spinosa*) nor „*P. somalica*“ are characterized by typical pyriform laterals. The laterals of *Piriferella spinosa* have a variable shape that ranges from ovoidal to vesiculiform or slightly phloioiphorous/rarely pyriform (see Sokač, 1996, pl. XXI). Otherwise, if we consider the laterals of *Piriferella* as typical pyriform then this genus would become a junior synonym of the Triassic genus *Physoporella* Steinmann, 1903 emend. Grgasović 1995 (see also Bucur et al., 2000, p. 452). Based on the considerations stated above on the genus *Similiclypeina*, Bucur (2000) transferred the species *Heteroporella? paucicalcareia* Conrad, 1970 to the genus *Similiclypeina* in the new combination *Similiclypeina paucicalcareia* (Conrad). Controversies concerning the two genera (*Similiclypeina* and *Piriferella*) and their attributed species continued in the following years. In an abstract published in the abstract volume of the 6th regional symposium on calcareous algae, held in Milano, Conrad et al. (2009) restricted the competence of the genus *Similiclypeina* to the type species. All the above mentioned species were attributed to the genus *Piriferella*. Moreover, the authors (Conrad et al., 2009) proposed the synonymization of the species *Clypeina somalica* Conrad, Peybernès & Masse, 1983, *Piriferella spinosa* Sokač, 1996, and *Salpingoporella verrucosa* Sokač, 1996 under the combination *Piriferella somalica* (Conrad, Peybernès & Masse). On the poster presented by the same authors (Conrad et al., 2009) during the Milano symposium the species *Heteroporella? paucicalcareia* was also transferred to the genus *Piriferella* in the combination *Piriferella paucicalcareia* (Conrad). Finally, the author's initiative (Conrad et al., 2009) to publish a paper on this subject was abandoned. However, this approach was accepted without any objections by Bucur (2011), at least for *Piriferella paucicalcareia*. It was rightly rejected by Granier (2013). Granier ascribed the species *Clypeina somalica* to the genus *Holosporella* (see also Granier, 1992), restricted the interpretation of the genus *Similiclypeina* to its type species (*S. conradi*) and ascribed the species *Heteroporella? paucicalcareia* to the genus *Clypeina* in the new combination *Clypeina paucicalcareia* (Conrad). In fact, the shape of the laterals of *Heteroporella? paucicalcareia* has nothing to do with the pyriform shape. Thus, even if one accepts the well establishment of the genus *Piriferella*, the species *paucicalcareia* cannot be assigned to this genus.

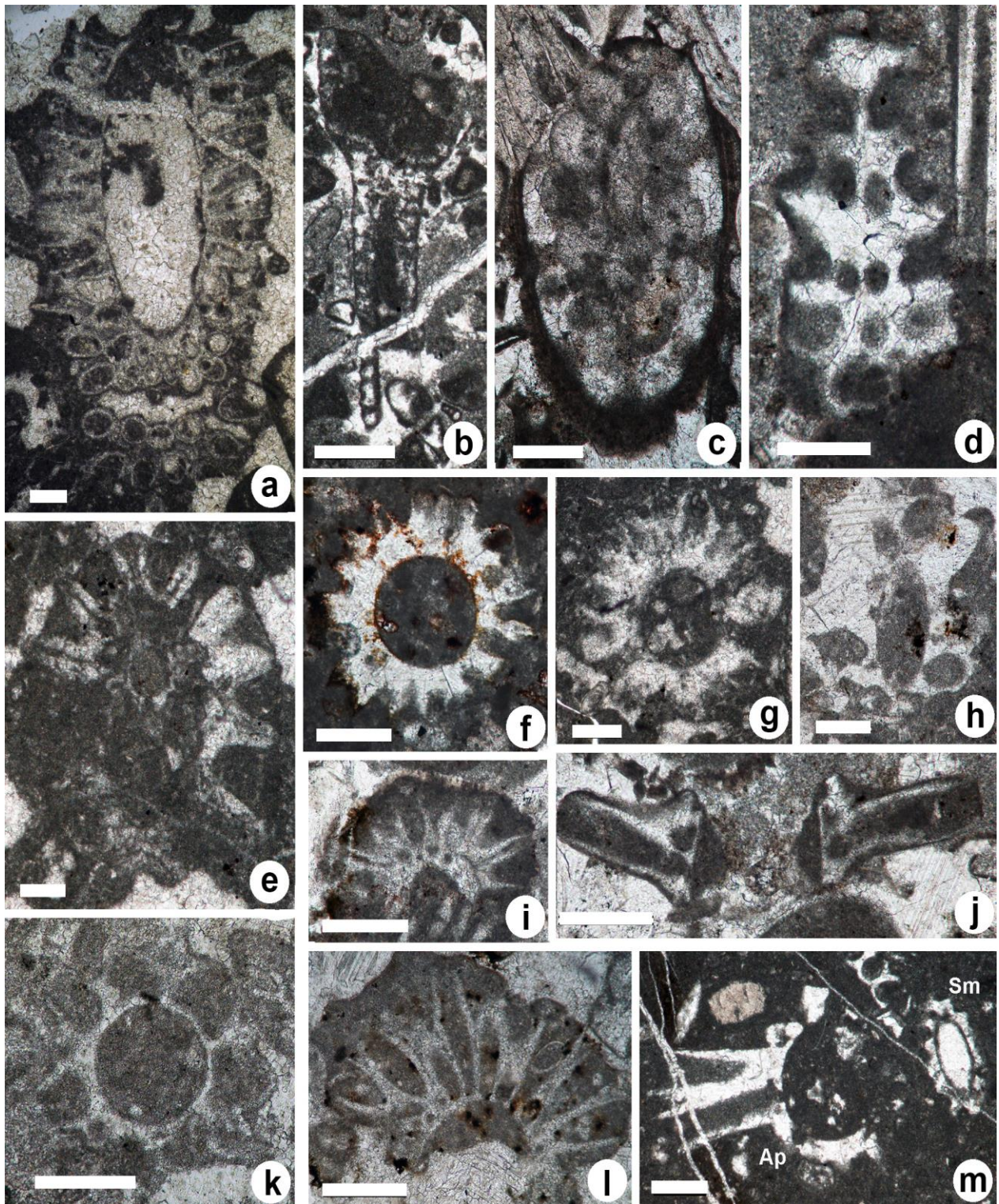


Fig. 7 Calcareous algae. **a** *Milanovicella?* sp., oblique section; thin section RR4834. **b, c** *Korkyrella texana* (Sokač); **b**, longitudinal section showing the lower stalk and part of the upper cap; thin section RR4835; **c**, oblique section of a cap; thin section RR4840. **d** *Salpingoporella biokovenssis* (Sokač), longitudinal-tangential section; thin setion RR4840. **e-h** *Clypeina* div. sp. e., oblique section; thin section RR 4834; **f, g**, transverse sections; thin section RR4837 (**f**) and RR4834 (**g**). **i, j, l** *Actinoporella podolica* (Alth), oblique sections; thin section RR4840 (**i, j**) and RR4839 (**l**). **k** *Similiclypeina conradi* Bucur, transverse section; thin section RR4835. **m** *Actinoporella podolica* (Alth) (Ap) and *Salpingoporella muehlbergii* Lorenz (Sm), oblique sections; thin section RR4835. Scale bar is 0.25 mm.

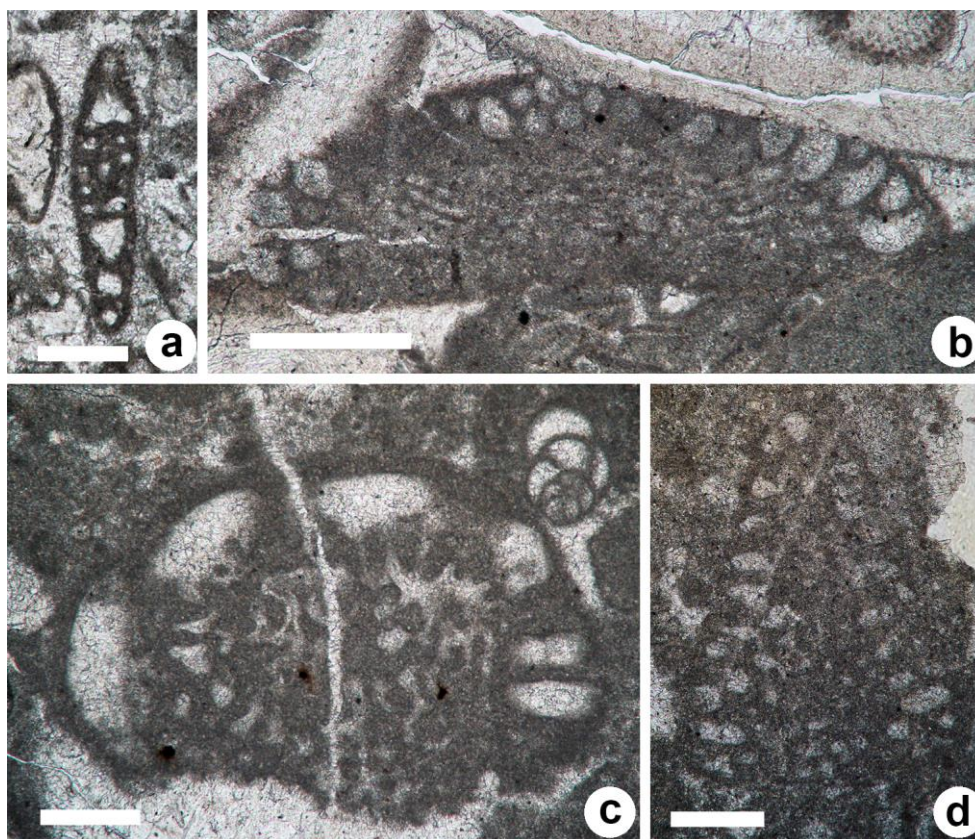


Fig. 8. Foraminifera. **a** *Mayncina* sp., subaxial section; thin section RR4836. **b, c** *Banatia aninensis* Schlagintweit & Bucur; **b**, axial section; thin section RR4840; **c**, transverse-oblique section; thin section RR4834. **d** *Moulladella jourdanensis* (Foury & Moullade), subaxial section; thin section RR4834. Scale bar is 0.25 mm.

It is obvious that even Granier (2013) eludes the diagnosis of the genus *Similiclypeina* (Bucur, 1993) by interpreting it in the sense of the type species, *S. conradi*. The author (Granier, 2013, p. 60) mentions: „...it would be safer to revert to Bucur's (2000) view: *Heteroporella? paucicalcareia* is a *Clypeina*-like species the verticils of which are set rather close together. Because the species lacks the typical pattern of the laterals in *Similiclypeina conradi* Bucur, 1993, it should "naturally" be relocated among the representatives of *Clypeina* (Michelin, 1845).” Or, the reason to erect the genus *Similiclypeina* (Bucur, 1993) was to group together species with *Clypeina*-like verticils but with closed-set verticils. Frequently, *Clypeina* species are preserved as separate whorls spread in the sediment. The large distance between successive whorls leads to a rare potential of preservation within the succession (see the example of *Clypeina besici* Pantić in Granier & Deloffre, 1994 (Pantić, 1965), or *Clypeina helvetica* Morellet & Morellet, 1918 from Eocene (cf. Schlagintweit et al., 2013); see also *Clypeina* in Genot, 1980; 1987; 2009, and in Granier & Lethier, 2019). By contrast, *Heteroporella? paucicalcareia* presents a compact skeleton since its whorls are welded in their vertical succession (see for instance the detached specimens in Bucur, 2011, pl. 1, fig. 6). As a consequence, the generic affiliation of these controversial species still remains open.

CONCLUSIONS

1. The limestones crossed by the Derezna borehole contain mainly muddy facies types (wackestone, wackestone-packstone or packstone) and subordinate coarse grainstone. All these varieties are relatively rich in calcareous algae (especially dasycladaleans).
2. *Salpingoporella patrulei* is recorded with a high frequency within the calcareous algae inventory. The entire association contains species known from the Barremian–Aptian interval.
3. The foraminiferal association is scarce and contains species (*Moulladella jourdanensis*, *Banatia aninensis*) that indicate a Barremian age. *Banatia aninensis* is identified for the first time in Serbia, and second time outside its type locality.
4. This micropaleontological association is very similar to the one identified in the Reșița-Moldova Nouă zone (Bucur, 1994, 1997; Schlagintweit & Bucur, 2017), a fact indicating that the Reșița-Moldova Nouă sedimentary basin (Getic Nappe) continues south of the Danube into the Kučaj zone.

5. Two algae (*Salpingoporella patrulei* and *Similiclypeina* aff. *somalica*) are identified for the first time in Serbia. They allow us to make some paleontological and taxonomical remarks concerning the status of the genera *Similiclypeina* Bucur, 1993 and *Piriferella* Sokač, 1996. The way these algae were interpreted by various authors in the last decades indicates that their status still remains an open issue.

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