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MICROPALEONTOLOGICAL ASSEMBLAGES FROM THE UPPER JURASSIC-LOWER CRETACEOUS DEPOSITS OF TRASCĂU MOUNTAINS AND THEIR BIOSTRATIGRAPHIC SIGNIFICANCE

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Abstract: Upper Jurassic-Lower Cretaceous deposits from the Trascău Mountains, mainly developed in a carbonate platform facies, were investigated for their micropaleontological content in several sections, starting from Petreşti-Sănduleşti area (in the northern part) to Rîmeți area (in the southern part).

Several micropaleontological assemblages were determined corresponding to the three depositional units identified in the region: Upper Oxfordian-Lower Kimmeridgian; Kimmeridgian-Lower Tithonian, and Upper Tithonian-Berriasian-Lower Valanginian. In the Upper Oxfordian-Lower Tithonian interval the carbonate deposits are developed in a slope facies, an external platform facies (including coral-microbial reefal buildups), and less frequently in an internal platform facies. The Upper Tithonian-?Berriasian deposits are well exposed in the Cheile Turzii section, and are represented mainly by coarse granular facies. The Berriasian-Lower Valanginian deposits, represented by shallow or very shallow water facies (shallow subtidal to intertidal or supratidal) were studied in several sections (Cheile Turzii, Dealul Secului, Brădeşti) as well as in the olithosliths from Poiana Aiudului. A rich algae and foraminifera assemblages were identified in the studied deposits. They are important for both biostratigraphy (age determination of the depositional units separated through sedimentological study) and paleoecology-paleogeography as comparative material for correlations with other regions of the Tethyan realm.

Keywords: Microfossils, biostratigraphy, carbonate rocks, Apuseni Mountains, Romania

1. INTRODUCTION. DEPOSITIONAL FRAMEWORK

The shallow water limestones from the Trascău Mountains crop out in two parallel alignments with a generally N-S orientation: Tureni-Buru-Rimetea-Cheile Aiudului alignment in the east, and the Lunca Arieşului-Râmeți (Bedeleu ridge) in the west (Fig. 1). These limestones were studied on the following sections: Tureni Gorges, Sănduleşti Quarry, Turda Gorges, Borzeşti Gorges, Buru, Rimetea (Piatra Secuiului), Aiud Gorges and Poiana Aiudului (the Quarry and Dealul Mare olistoliths) from the first alignment; Secului Hill, Brădeşti, Râmeți Gorges from the second alignment (Fig.1)

Sedimentological and facies studies of the carbonate deposits from the region (Săsăran, 2005) provide evidence for five facies associations: (1) the basin floor facies associations (identified in Tureni-Valea Mănăstirii area, the “Aptychus beds” *senso largo*); (2) Shelf slope facies associations (identified in Tureni Gorges, Buru, Rimetea, Aiud Gorges, and Bedeleu ridge); (3) open shelf edge facies associations, with bioconstructions and bioclastic shoals (identified in the Sănduleşti quarry, Borzeşti Gorges, Rimetea, Aiud Gorges and Bedeleu ridge); (4) open shelf facies associations with patch reefs (identified in the Turda Gorges, Rimetea, and Bedeleu ridge), and (5) sea shore and beach facies associations, represented by peritidal deposits (identified in the Turda Gorges, Borzeşti Gorges, Bedeleu ridge and in the olistiliths from Poiana Aiudului). Following the distribution of these facies associations Săsăran (2005) separated three isolated carbonate platforms: the Tureni-Buru platform; Rimetea-Aiud Gorges platform, and the Bedeleu-Râmeți platform. The three platforms were separated by deeper basinal areas in which , “Aptychus beds”-type deposits accumulated during the late Jurassic-early Cretaceous.

The development of the Upper Jurassic-Lower Cretaceous carbonate deposits from the Trascău Mountains could be most accurately studied in the Tureni-Buru area and is best illustrated by the Turda Gorges section (Fig. 2). Săsăran (2005) separated in this area three units with well defined boundaries (Fig. 2)

The micropaleontological study was made up of a large number of thin sections (more than 1500). The identified assemblages of benthic foraminifera and calcareous algae are very important for age determination of the deposits within the three depositional units.

2. MICROPALEONTOLOGICAL ASSOCIATIONS

Preliminary data on the micropaleontological content of the Upper Jurassic-Lower Cretaceous deposits from Trascău Mountains were published by Săsăran *et al.* (2000), Săsăran & Bucur (2001) and Bucur & Săsăran (2005). This study provides a synthetic overview of the micropaleontological content of the limestones in the area, and tries to follow the microfossils repartition within the three depositional units.

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The carbonate deposits from the first two units, mostly developed in slope facies, external platrom facies (including coral-microbial reefal buildups), and less frequently in internal platform facies, contain an assemblage of foraminifera and calcareous algae consisting of: *Alveosepta jaccardi* (SCHRODT) (Pl. I, fig. 1; Pl. II, fig. 1), *Andersenolina alpina* (LEUPOLD) (Pl. II, fig. 11), *Bramkampella arabica* REDMOND (Pl. II, fig. 6, 7), *Everticyclammina virguliana* (KOECHLIN), *Kurnubia palastiniensis* HENSON, *Labyrinthina mirabilis* WEYNSCHENK (Pl.I, fig.1, Pl. II, fig. 2-4), *Mohlerina basiliensis* (MOHLER) (Pl. II, fig. 12), *Neokilianina rahonensis* (FOURY & VINCENT) (Pl. I, fig. 2), *Parurgonina caelinensis* CUVILLIER, FOURY & PIGNATTI MORANO (Pl. II, fig. 5), *Protopeneroplis striata* WEYNSCHENK (Pl. II, fig. 2, 10), *Pseudocyclammina lituus* (YOKOYAMA), *Redmondoides lugeoni* (SEPTFONTAINE), *Anisoporella* (?) *cretacea* (DRAGASTAN), *Anisoporella* (?) *jurassica* (ENDO), *Campbelliella striata* CAROZZI (Pl. I, fig. 6), *Clypeina sulcata* (ALTH) (Pl. I, fig. 9), *Macroporella*(?) *lazuriensis* BUCUR (Pl. I, fig. 12), *Montenegrella* cf. *florifera* BERNIER (Pl. I, fig. 11), *Neoteutloporella socialis* (PRATURLON) (Pl. I, fig. 5), *Petrascula* cf. *piai* BACHMAYER (Pl. III, fig. 1), *Salpingoporella annulata* CAROZZI (Pl. I, fig. 7), *S. grudii* (RADOICIC), *S. pygmaea* (GUEMBEL) (Pl. I, fig. 8, 10), *Suppiluliumaella delphica* (CARAS), "*Carpathocodium anae*" (DRAGASTAN) (Pl. I, fig. 13), *Nipponophycus ramosus* YABE & TOYAMA, *Thaumatoporella parvovesiculifera* RAINERI. In reef facies, incrusting microorganisms are abundant: *Bacinella-Lithocodium, Iberopora bodeuri* GRANIER, *Koskinobulina socialis* CHERCHI & SCHROEDER, *Radiomura cautica* SENOWBARI-DARYAN & SCHAEFER, "*Tubiphytes*" *morronensis* CRESCENTI, together with *Mercierella dacica* DRAGASTAN.

The carbonate deposits situated in the lower part of the third unit (Turda Gorges section, Fig. 2) are represented mainly by coarse granular facies, and contain an assemblage with: *Andersenolina alpina* (LEUPOLD), *A. cherchiae* (ARNAUD-VANNEAU, BOISSEAU & DARSAC), *A. elongata* (LEUPOLD), *Achispirocyclina lusitanica* (EGGER) (Pl. II, fig. 13-15), *Bramkampella arabica* REDMOND, *Mohlerina basiliensis* (MOHLER), *Neokilianina* sp. (Pl. II, fig. 8), *Protopeneroplis* cf. *banatica* BUCUR, *P. ultragranulata* (GORBACHIK), *Pseudocyclammina lituus* (YOKOYAMA), *Troglotella incrustans* WERNLI & FOOKES, *Campbelliella striata* CAROZZI, *Clypeina catinula* CAROZZI (Pl. III, fig. 5), *C. parasolkani* FARINACCI & RADOICIC (Pl. III, fig.

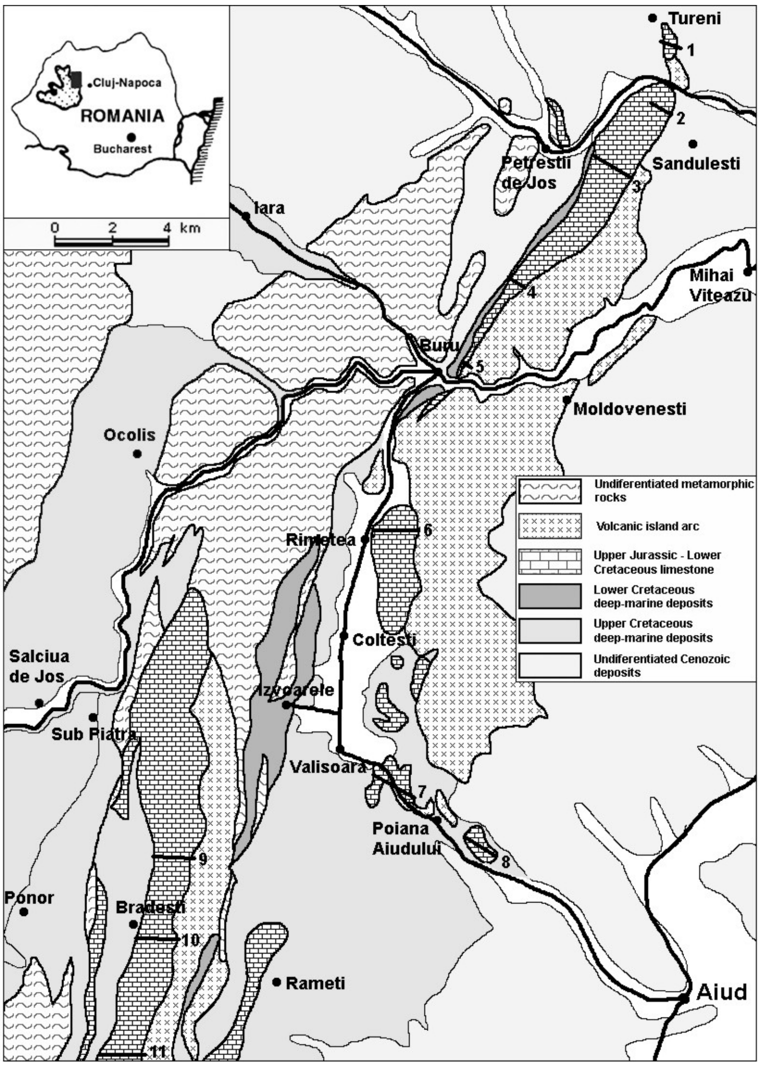

Fig. 1. – Sketch-map of the northern part of the Trascău Mountains, with emplacement of the sections studied: 1 - Tureni Gorges; 2 - Sănduleşti quarry; 3 - Turda Gorges; 4 - Borzeşti Gorges; 5 - Buru; 6 - Rimetea (Piatra Secuiului); 7 - Aiud Gorges; 8 - Poiana Aiudului; 9 - Secului Hill; 10 - Brădeşti; 11 - Râmeți Gorges)

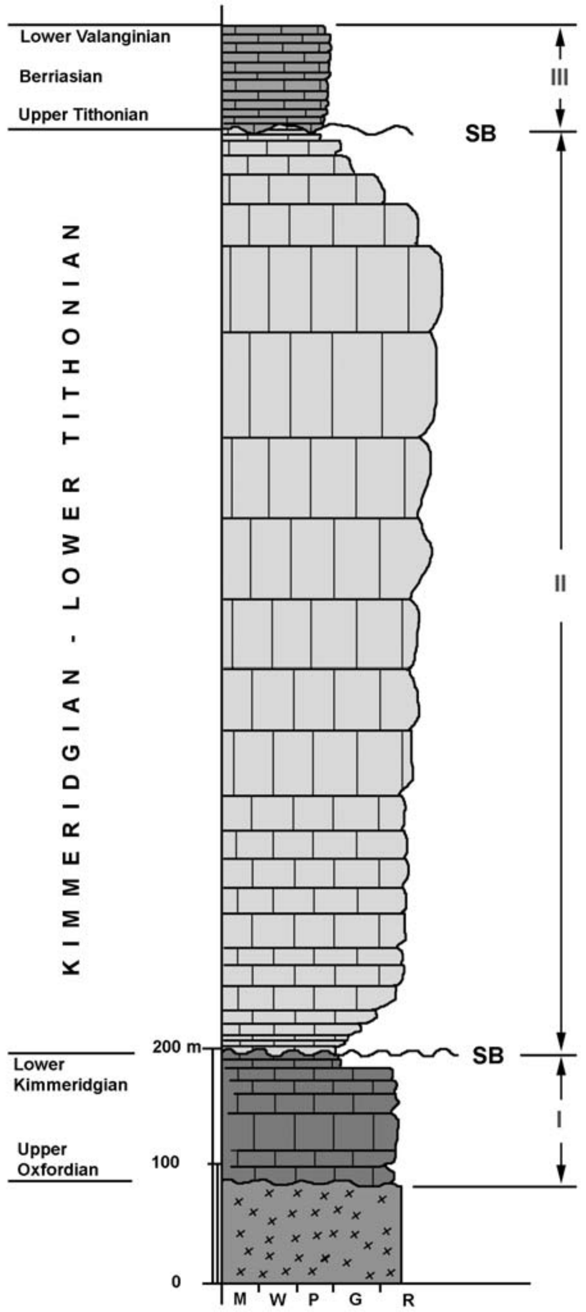

Fig. 2. – Succession of the Upper Jurassic-Lower Cretaceous limestones in the Turda Gorges area. I, II and III are the three identified depositional units. M, W, P, G and R correspond to mudstone, wackestone, packstone, grainstone and rudstone in Dunham's classification of carbonate rocks; SB = identified sequence boundaries

6, 8), *Otternstella lemmensis* (BERNIER), *Salpingoporella annulata* CAROZZI (Pl. I, fig. 4, Pl. III, fig. 8), *S. pygmaea* (GUEMBEL).

The upper part of the third unit is represented by shallow or very shallow water facies (shallow subtidal to intertidal or supratidal) in the Turda Gorges section and the olistoliths from Poiana Aiudului, or by external platform or slope facies (in the Dealul Secului and Brădeşti area). The benthic foraminifera and calcareous algae assemblages consist of: *Andersenolina alpina* (LEUPOLD) (Pl. IV, fig. 13), *A. campanella* (ARNAUD-VANNEAU, BOISSEAU & DARSAC), *A. cherchiae* (ARNAUD-VANNEAU, BOISSEAU & DARSAC) (Pl. IV, fig. 15), *A. delphinensis* (ARNAUD-VANNEAU, BOISSEAU & DARSAC) (Pl. IV, fig. 14), *A. elongata* (LEUPOLD) (Pl. IV, fig. 16, 17), *A.* aff. *molesta* (GORBACHIK (Pl. IV, fig. 12), *Anchispirocyclina lusitanica* (EGGER), *Charentia cuvillieri* NEUMANN, *Haplophragmoides joukowskyi* CHAROLLAIS, BROENNIMANN & ZANINETTI (Pl. IV, fig. 1-2), *Meandrospira favrei* (CHAROLLAIS, BROENNIMANN & ZANINETTI), *Mohlerina basiliensis* (MOHLER), *Montsalevia salevensis* (CHAROLLAIS, BROENNIMANN & ZANINETTI) (Pl. IV, fig. 3-8), *Neotrocholina valdensis* REICHEL, *Protopeneroplis banatica* BUCUR, *P. ultragranulata* (GORBACHIK) (Pl. IV, fig. 10-11), *Pseudocyclammina lituus* (YOKOYAMA), *Clypeina catinula* CAROZZI, *C. parasolkani* FARINACCI & RADOICIC, *C. solkani* CONRAD & RADOICIC, *C. sulcata* (ALTH) (only in Berriasian), *Macroporella* (?) *praturlonii* DRAGASTAN, *Macroporella* (?) *incerta* SOKAC & NIKLER, *Pseudocymopolia jurassica* (DRAGASTAN) (Pl. III, fig. 7, 9), *Rajkaella bartheli* (BERNIER), *Salpingoporella annulata* CAROZZI, *S. katzeri* CONRAD & RADOICIC and charophytes (Pl. III, fig. 4).

3. BIOSTRATIGRAPHIC SIGNIFICANCE

Some of the benthic foraminifera and calcareous algae identified in the three assemblages are very important because they indicate the age of the three depositional units.

The most significant species of the first assemblage is *Alveosepta jaccardi*. This foraminifer was first described from the Upper Oxfordian of Switzerland (Schrodt, 1894) as *Cyclammina jaccardi*. Mohler (1938) illustrated this species as *Pseudocyclammina sequana* (Merian) var. *minor*, *P. sequana* (Merian) var. *major*, and *Pseudocyclammina personata* Tobler from the Upper Oxfordian (Sequanian) and the Kimmeridgian of the Jura Mountains (Switzerland) (see also Maync, 1958). It was also described from the Oxfpordian-Lower Kimmeridgian by Maync (1960), Upper Oxfordian-Lower Kimmeridgian (Abate *et al.*, 1974, Pelissié & Peybernès, 1982; Cociuba, 1977; Pop & Bucur, 2001; Septfontaine, 1988), Middle Oxfordian-Lower Kimmeridgian (Septfontaine, 1981), Upper Oxfordian-Middle Kimmeridgian (Noujaim Clark & Boudaher-Fadel, 2001), Upper Oxfordian-Kimmeridgian (Bernier, 1984), Lower Kimmeridgian (Redmond, 1964; Pelissié *et al.*, 1984; Hüsner, 1985; Tasli, 1993) or Kimmeridgian (Altiner, 1991).

Summarising, the distribution time interval of *Alveosepta jaccardi* is Middle-Upper Oxfordian to Lower-Middle Kimmeridgian (see also Bassoullet, 1997). Following this, we can consider that the first depositional unit from the Upper Jurassic-Lower Cretaceous deposits of Trascău Mountains, containing *Alveosepta jaccardi* is Late Oxfordian-Early Kimmeridgian in age. The calcareous algae assemblage (*Macroporella*(?) *lazuriensis, Salpingoporella annulata, S. pygmaea, Suppiluliumaella delphica*) is consistent with this age determination (Granier & Deloffre, 1993; Bucur, 1999).

Within the limestones of the first depositional unit some foraminifera also appear which were found in the second unit as well: *Andersenolina alpina, Bramkampella arabica, Redmondoides lugeoni, Everticyclammina virguliana, Pseudocyclammina lituus, Kurnubia palastiniensis, Labyrinthina mirabilis, Neokilianina rahonensis, Parurgonina caelinensis, Mohlerina basiliensis, Protopeneroplis striata*. The most important species from this assembalge seem to be *L. mirabilis, P. caelinensis, N. rahonensis* and *K. palastiniensis*.

Labyrinthina mirabilis was described by Weynschenk (1951) from Upper Jurassic deposits of Austria and was subsequently cited from the Upper Jurassic by Weynschenk (1956), Fourcade & Neumann (1965) and Septfontaine (1981). Later on, most authors have referred this species to the Upper Oxfordian-Kimmeridgian (Peybernès, 1976; Pelissé *et al.*, 1984) to the Kimmeridgian (Ramalho, 1969; Fourcade, 1970; Steiger & Wurm, 1980; Dya, 1992; Schlagintweit *et al.*, 2005) or to the Kimmeridgian-Lower Tithonian (Pop & Bucur, 2001). In the synthesis of Bassoullet (1997) *Labyrinthina mirabilis* is dated to the latest Oxfordian-Early Tithonian.

Parurgonina caelinensis was first described from the Kimmeridgian-Portlandian by Cuvillier *et al.* (1968). The species was attributed to the Upper Jurassic by Schroeder *et al.* (1975 and Septfontaine (1988), to the Oxfordian (Septfontaine, 1981), Lower Kimmeridgian (Pelissié *et al.*, 1984; Tasli, 1993) and the Kimmeridgian-Lower Tithonian (Pop & Bucur, 2001). The range given by Bassoullet (1997) is latest Oxfordian—Early Tithonian)

Neokilianina rahonensis was found in Lower Kimmeridgian deposits (Foury & Vincent, 1967) and reported from the Lower Kimmeridgian (Pelissié *et al.*, 1984; Tasli, 1993), Kimmeridgian (Jafrezzo, 1980; Dya, 1992) or Kimmeridgian-Lower Tithonian (Pop & Bucur, 2001; Schlagintweit *et al.*, 2005). Bassoullet (1997) reported this species to be restricted to the Kimmeridgian.

Kurnubia palastiniensis described from the Jurassic of Israel (Henson, 1948) was subsequently reported from the Upper Jurassic (Abate *et al.*, 1974), Callovian-Portlandian (Jaffrezo, 1980), Lower Oxfordian (Pelissié & Peybernès, 1982), Oxfordian-Lower Kimmeridgian (Peybernès, 1976), Kimmeridgian (Hottinger, 1967; Fourcade, 1970; Altiner, 1991: Dya, 1992) or Kimmeridgian-Lower Tithonian (Pop & Bucur, 2001: Schlagintweit *et al.*, 2005) In Bassoullet (1997) the range of this species is given as Oxfordian-Middle Tithonian.

Concluding, these four important species for the Upper Jurassic have a stratigraphical rage from the Late Oxfordian to the Early-Middle Tithonian. Other species such as *P. striata, M. basiliensis, P. lituus, E. virguliana* have a broader stratigraphical distribution (Bassoullet, 1997)

The calcareous algae assemblage from the second sequence (*Anisoporella(?) jurassica, Campbelliella striata, Clypeina sulcata, Salpingoporella annulata, S. grudii, S. pygmaea, Suppiluliumaella delphica*) characterise the whole of the Oxfordian-Tithonian time interval, some of them also passing in the Lower Cretaceous (Barattolo, 1991, Granier & Deloffre, 1993; Bucur, 1999). Taking into consideration all these data we can conclude that the second depositional unit is of a Middle-Late Kimmeridgian-Early Tithonian age.

The third depositional unit contains in its lower part an assemblage with *Andersenolina alpina, A. elongata, Anchispirocyclina lusitanica, Bramkampella arabica, Pseudocyclammina lituus, Neokilianina* sp., *Mohlerina basiliensis, Protopeneroplis* cf. *banatica* and *Protopeneroplis ultragranulata*.

A. lusitanica is an important component of this assemblage. This species was reported from the Tithonian (Fourcade, 1970; Peybernès, 1976; Pelissié *et al.*, 1984; Schlagintweit *et al.*, 2005), Tithonian-Berriasian (Ramalho, 1969; Dragastan, 1975, Dya, 1992) or Berriasian-Valanginian (Sotak, 1989). *Protopeneroplis ultragranulata* was found in deposits of Middle Tithonian to Barremian age (Heinz & Isensmidt, 1988; Bucur, 1993, 1997), but is more frequent in Berriasian-Lower Valanginian deposits. *Protopeneroplis banatica* is so far known only from the Lower Cretaceous (Bucur, 1993, 1997; Schlagintweit & Ebli, 1999)

Special mention should be also made for *Bramkampella arabica*. This species was first described from uppermost Jurassic-lowermost Cretaceous deposits by Redmond (1964). Gorbachik & Mohamad (1997) identified this species in the Berriasian of the Crimea. Noujaim Clark & Boudaher-Fadel (2001) reported it from Upper Berriasian-Lower Valanginian deposits from Lebanon and consider this species as a index for the Lower Cretaceous. However, in Trascău, *B. arabica* was found in all three depositional units, together with a micropaleontological assemblage characteristic for the Kimmeridgian-Upper Tithonia-?Berriasian.

Based on the above micropaleontological assemblage we attribute the lower part of the third depositional unit from Trascău to the Late Tithonian-?Early Berriasian. The middle and upper part of this sequence contain an association with: *Andersenolina alpina, A. campanella, A. cherchiae, A. delphinensis, A. elongata, A. molesta, Anchispirocyclina lusitanica, Charentia cuvillieri, Haplophragmoides joukowskyi, Meandrospira favrei, Mohlerina basiliensis, Montsalevia salevensis, Neotrocholina valdensis, Protopeneroplis banatica, P. ultragranulata, Pseudocyclammina lituus, Clypeina catinula, C. parasolkani, C. solkani, C. sulcata* (only in the lower part), *Selliporella neocomiensis, Macroporella(?) praturlonii, Macroporella(?) incerta, Pseudocymopolia jurassica, Rajkaella bartheli, Salpingoporella annulata, S. katzeri* and charophytes.

The *Andersenolina* assemblage is typical for the basal Lower Cretaceous (Berriasian-Valanginian) (Arnaud Vanneau *et al.*, 1988; Bucur *et al.*, 1995; Neagu, 1994, 1995; Mancinelli & Coccia, 1999). The association *H. joukowskyi, M. favrei* and *M. salevensis* characterise the Lower Valanginian (Charollais *et al.*, 1966; Azema *et al.*, 1979; Darsac, 1983; Salvini Bonnard *et al.*, 1984; Bucur, 1988; Altiner, 1991; Schlagintweit & Ebli, 1999). The algae association also characterise the Berriasian-Valanginian time interval (Barattolo, 1991; Granier & Deloffre, 1993; Bucur, 1999). The distinction between the two stages could be made based on *Selliporella neocomiensis*. This dasycladalean alga is restricted mainly to Middle-Upper Berriasian rocks (Jaffrezo, 1980; Luperto-Sinni and Masse, 1993; Masse, 1993; Granier and Deloffre, 1993; Bucur, 1999; Bucur and Săsăran, 2003).

Following this analysis, we can conclude that the third depositional unit from the carbonate deposits of Trascău Mountains is late Tithonian-Valanginian in age.

CONCLUSION

The Upper Jurassic-Lower Cretaceous carbonate deposits from Trascău Mountains contain a diversified assemblage of benthic foraminifera and calcareous algae. Many of the identified species are cited for the first time in this region. They are important for biostratigraphy, specific asemblages characterising the three depositional units separated by sedimentological studies. The first unit, containing *Alveosepta jaccardi*, is late Oxfordian-Early Kimmeridgian in age. The second unit is characterised by the presence of *Labyrinthina mirabilis, Neokilianina rahonensis, Parurgonina caelinensis* and *Kurnubia palastiniensis*, an association indicating the Middle-Late Kimmeridgian-Early Tithonian. The third unit has a late Tithonian-Valanginian age, and is characterised by the presence of *Anchispirocyclina lusitanica, Protopeneroplis ultragranulata, P. banatica, Haplophtragmoides joukowskyi* and *Montsalevia salevensis* as well as by the Early Cretaceous *Andersenolina* group. *Selliporella neocomiensis*, an alga restricted to the Middle-Late Berriasian, is important for delimitating between the Berriasian and Valanginian The identified micropaleontological assemblages can also serve for comparisons with other Tethyan regions with Upper Jurassic-Lower Cretaceous deposits.

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PLATES EXPLANATIONS

PLATE I

Fig. 1 – Bioclastic-peloidal grainstone with *Alveosepta jaccardi* (SCHRODT) and *Labyrinthina mirabilis* WEYNSCHENK. Sample 1816, Borzeşti Gorges.
Fig. 2 – Bioclastic-intraclastic packstone with *Neokilianina rahonensis* (FOURY & VINCENT). Sample 552, Turda Gorges.
Fig. 3 – Bioclastic-intraclastic grainstone with *Salpingoporella annulata* (CAROZZI)*, S. pygmaea* (GUEMBEL) and *Clypeina sulcata* (ALTH). Sample 517, Turda Gorges.
Fig. 4 – Bioclastic wackestone-packstone with *Salpingoporella annulata* (CAROZZI). Sample 670, Turda Gorges.
Fig. 5 – *Neoteutloporella socialis* (PRATURLON). Sample 656, Turda Gorges
Fig. 6 – *Campbeliella striata* CAROZZI. Sample 460, Turda Gorges.
Fig. 7 – *Salpingoporella annulata* CAROZZI. Sample 505, Turda Gorges.
Fig. 8 – *Salpingoporella pygmaea* (GUEMBEL). Sample 6347, Turda Gorges.
Fig. 9 – *Clypeina sulcata* (ALTH). Sample 508, Turda Gorges.
Fig. 10 - *Salpingoporella pygmaea* (GUEMBEL) . Sample 1722, Borzeşti Gorges.
Fig. 11 – *Montenegrella* cf. *florifera* BERNIER. Sample 901a, Râmeți Gorges
Fig.12 – *Macroporella*(?) *lazuriensis* BUCUR. Sample 1725, Borzeşti Gorges.
Fig.13 – "*Carpathocodium anae*" (DRAGASTAN). Sample 1722, Borzeşti Gorges.
Scale bar is: 0,125 mm (Fig.7, 8); 0,25 mm (Fig.9); 0,5 mm (Fig.6, 10, 12, 13); 1 mm (Fig.1-5, 11)

PLATE II
Fig. 1 – *Alveosepta jaccardi* (SCHRODT). Sample 1720, Borzeşti Gorges.
Fig. 2 – *Labyrinthina mirabilis* WEYNSCHENK and *Protopeneroplis striata* WEYNSCHENK. Sample 1822, Borzeşti Gorges.
Fig. 3 – *Labyrinthina mirabilis* WEYNSCHENK. Sample 1069, Rimetea.
Fig. 4 – *Labyrinthina mirabilis* WEYNSCHENK. Sample 1085, Rimetea.
Fig. 5 – *Parurgonina caelinensis* CUVILLIER, FOURY & PIGNATTI MORANO, Sample 1601, Borzeşti Gorges.
Fig. 6, 7 – *Bramkampella arabica* REDMOND. Sample 1725, Borzeşti Gorges
Fig. 8 – *Neokilianina* sp. Sample 505, Turda Gorges.
Fig. 9 – *Neokilianina* sp. Sample 516, Turda Gorges.
Fig. 10 – *Protopeneroplis striata* WEYNSCHENK. Sample 409, Tureni Gorges.
Fig. 11 – *Andesenolina alpina* (LEUPOLD). Sample 1142, Rimetea.
Fig. 12 – *Mohlerina basiliensis* (MOHLER). Sample1022, Rimetea.
Fig. 13-15 – *Anchispiricyclina lusitanica* (EGGER). Sample 529, Turda Gorges.
Scale bar is 0,25 mm (Fig. 6); 0,4 mm (Fig. 7); 0,5 mm (Fig. 1-6, 8-15)

PLATE III
Fig. 1 – *Petrascula* cf. *piai* BACHMAYER. Sample 1270, Secului Hill.
Fig. 2-3 – *Selliporella neocomiensis* (RADOICIC). Sample 591, Turda Gorges
Fig. 4 – Packstone with charophytes. Sample 588, Turda Gorges.
Fig. 5 – *Clypeina catinula* CAROZZI. Sample 538, Turda Gorges.
Fig. 6 – *Clypeina parasolkani* FARINACCI & RADOICIC. Sample 1242B, Secului Hill.
Fig. 7 – *Pseudocymopolia jurassica* (DRAGASTAN). Sample 7406 Poiana Aiudului.
Fig. 8 – *Salpingoporella annulata* CAROZZI and *Clypeina parasolkani* FARINACCI & RADOICIC. Sample 1242, Secului Hill.
Fig. 9 – *Pseudocymopolia jurassica* (DRAGASTAN). Sample 1209, Secului Hill.
Scale bar is: 0,5 mm (fig. 4-7); 1 mm (fig. 1-4, 8, 9)

PLATE IV
Fig. 1, 2 – *Haplophragmoides joukowskyi* CHAROLLAIS, BROENNIMANN & ZANINETTI. Sample 128 Brădeşti.
Fig. 3, 5 – *Montsalevia salevensis* (CHAROLLAIS, BROENNIMANN & ZANINETTI). Sample 1286 Brădeşti.
Fig. 4, 6-8 – *Montsalevia salevensis* (CHAROLLAIS, BROENNIMANN & ZANINETTI). Sample 1283 Brădeşti.
Fig. 9 – *Andesenolina* sp. Sample 1323, Brădeşti.
Fig. 10, 11 – *Protopeneroplis ultragranulata* (GORBACHIK). Sample 1323, Brădeşti.
Fig. 12 – *Andersenolina* aff. *molesta* (GORBACHIK). Sample 1323, Brădeşti.
Fig. 13 – *Andesenolina alpin* (LEUPOLD). Sample 1240, Secului Hill.
Fig. 14 – *Andesenolina delphinensis* (ARNAUD-VANNEAU, BOISSEAU & DARSAC). Sample 1323, Brădeşti.
Fig. 15 – *Andesenolina cherchiae* (ARNAUD-VANNEAU, BOISSEAU & DARSAC). Sample 1305, Brădeşti.
Fig. 16-17 – *Andersenolina elongata* (LEUPOLD). Sample 1240, Secului Hill.
Scale bar is: 0,125 mm (Fig. 1-8, 10); 0,250 mm (Fig. 9, 11, 13-17)

PLATE I

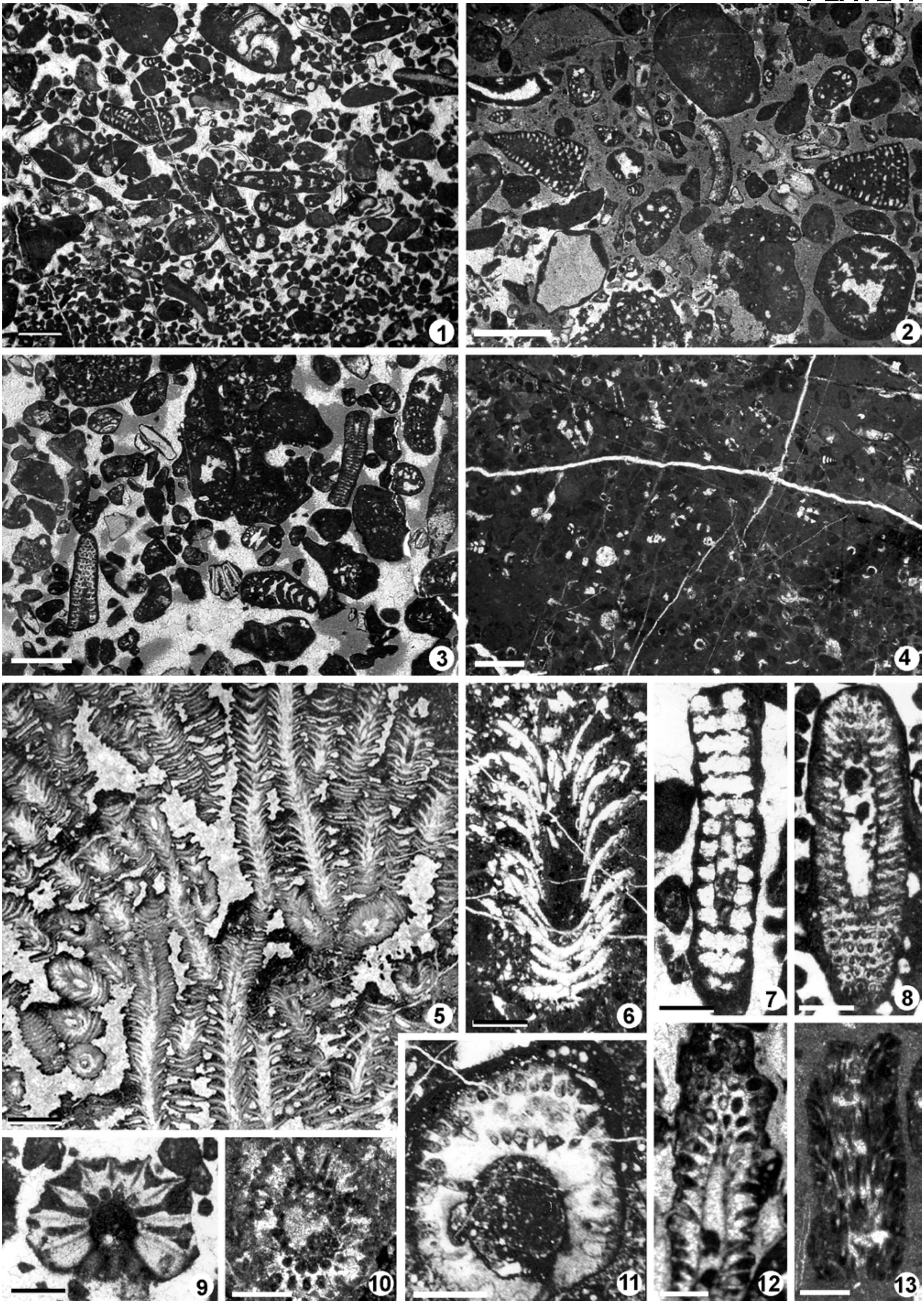

PLATE II

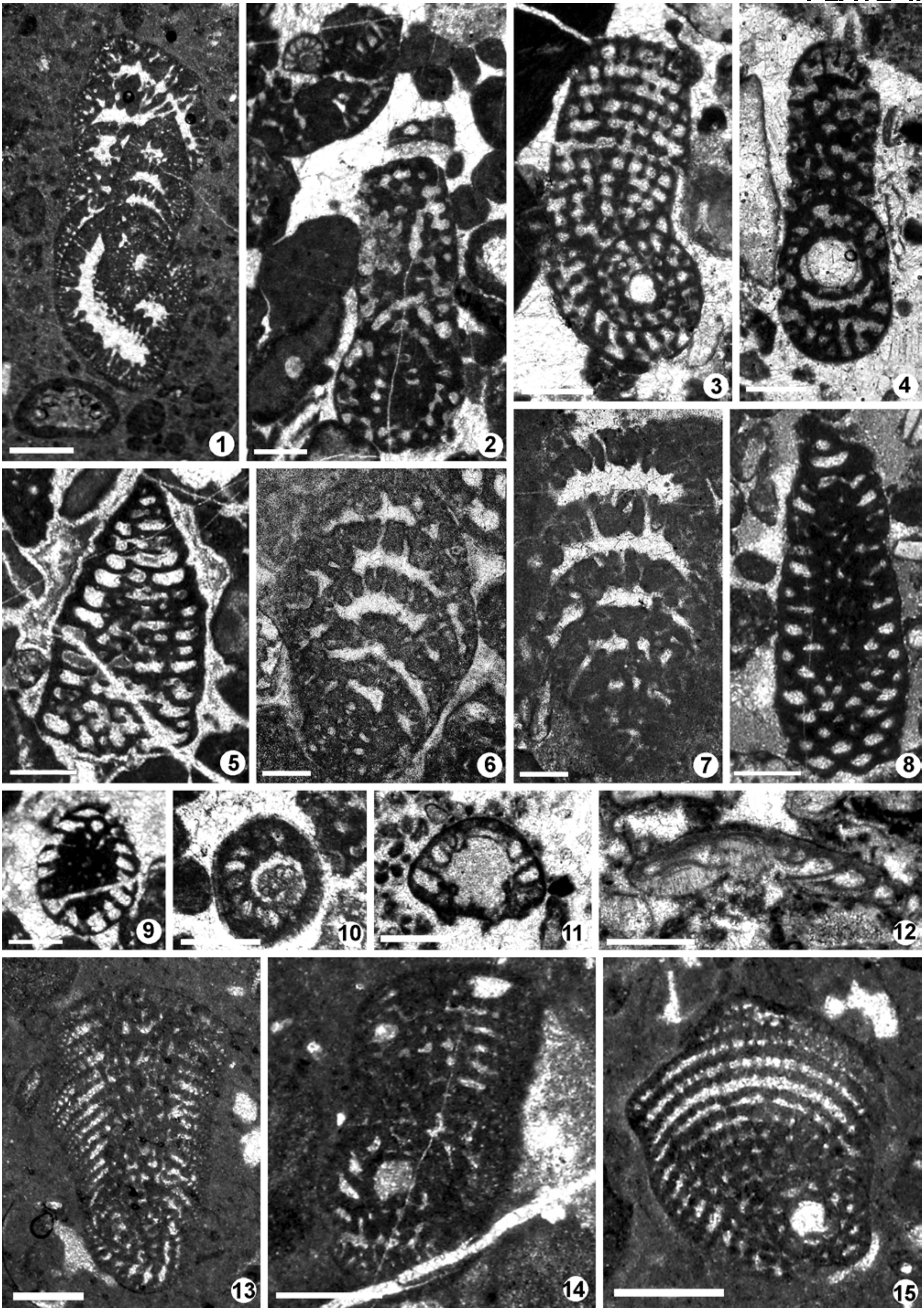

PLATE III

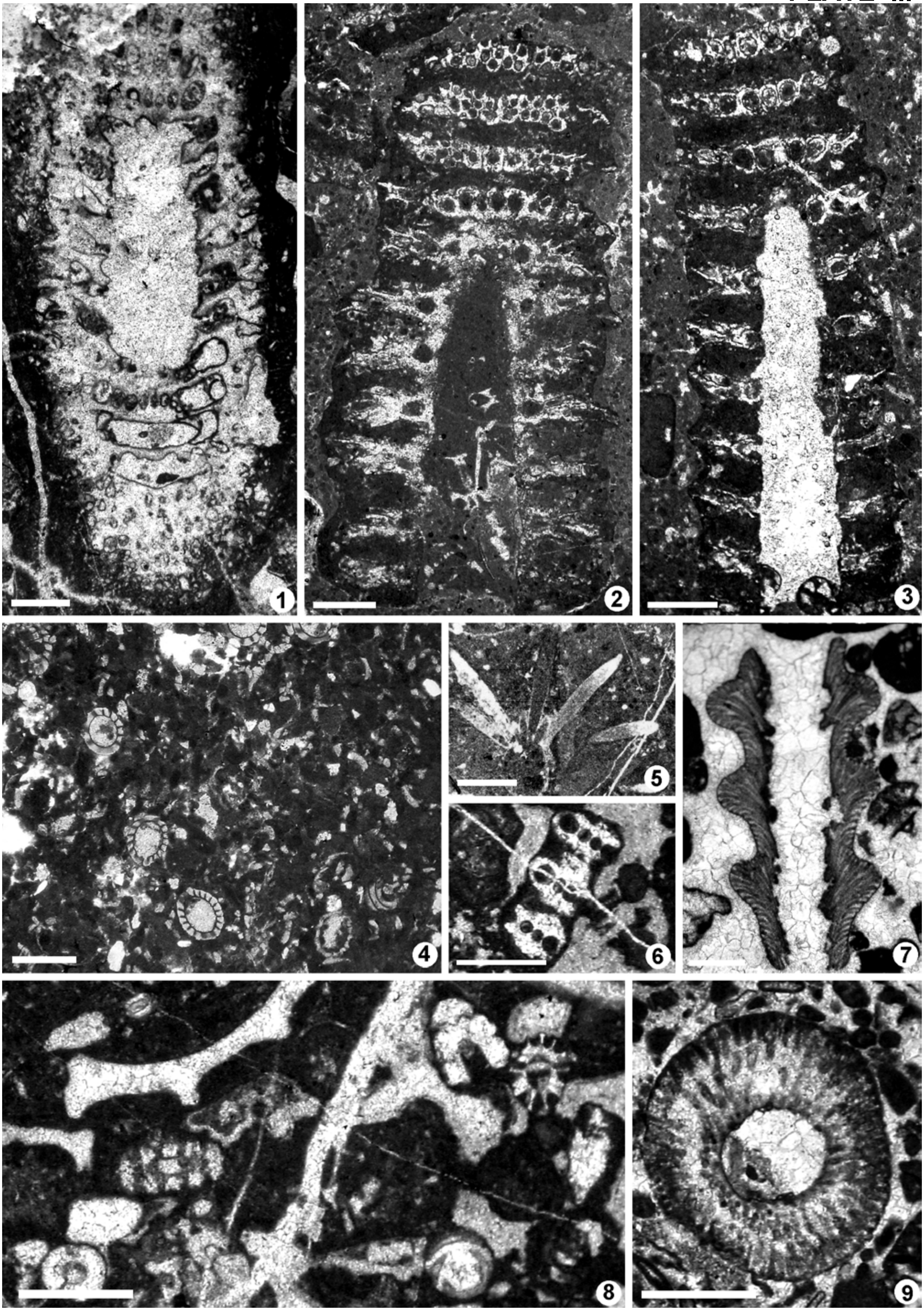

PLATE IV