THRYSOPORELLA EISENBACHENSIS N. SP., A NEW DASYCLADALE (CALCAREOUS ALGA) FROM THE UPPER CRETACEOUS GOSAU-GROUP OF EISENBACH (AUSTRIA; SALZKAMMERGUT)

THRYSOPORELLA EISENBACHENSIS N. SP., EINE NEUE DASYCLADALE (KALKALGE) AUS DER OBERKRETAZISCHEN GOSAU-GRUPPE VOM EISENBACH (ÖSTERREICH; SALZKAMMERGUT)

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ZUSAMMENFASSUNG

Aus dem Mittel-Turonium der unteren Gosau-Gruppe von Eisenbach am Ostufer des Traunsees/oberösterreichisches Salzkammergut wird eine neue Dasycladale (Grünalge) als *Thrysoporella eisenbachensis* n. sp. beschrieben. Die neue Art tritt auf in einer Mergelkalklage die in eine mergelige Abfolge eingeschaltet ist. Mikrofaziell handelt es sich um einen lagunären Wackestone in dem die neue Art zusammen mit Mollusken, Gastropoden, Ostrakoden, *Neomeris circularis* Badve & Nayak, *Dissocladella*? *pyriformis* Schlagintweit, *Halimeda paucimedullaris* Schlagintweit & Ebli und Milioliden wie beispielsweise *Vidalina hispanica* Schlumberger gehäuft vorkommt. Die neue Art unterscheidet sich sich von anderen Vertretern der Gattung *Thrysoporella* insbesondere durch die hohe Anzahl primärer Wirteläste.

ABSTRACT

From the Middle Turonian of the lower Gosau Group of Eisenbach at the eastern side of Lake Traunsee/Upper Austrian Salzkammergut a new dasycladale is described as *Thrysoporella eisenbachensis* n. sp. The new taxon occurs within a marly limestone bed intercalated within a series of marls. The microfacies represents a lagoonal wackestone where the new species occurs together with pelecypod remains, ostracods, *Neomeris circularis* Badve & Nayak, *Dissocladella*? *pyriformis* Schlagintweit, *Halimeda paucimedullaris* Schlagintweit & Ebli and miliolids, e.g. *Vidalina hispanica* Schlumberger. The new species is distinguished from other representatives of *Thrysoporella* above all by its high number of primary branches.

1. INTRODUCTION

The Eisenbach Gosau occurrence at the eastern side of Lake Traunsee in the Upper Austrian Salzkammergut is already mentioned since Partsch (1826), Boué (1832) and the monography on the gastropods provided by Zekeli (1851). The first more detailed description has been presented by Weber (1960). Gosauian sediments comprising marls, marly limestones, limestones and black shales crop out along the Eisenbach brook for about two kilometres belonging to the Lower Gosau Group.
Dasycladales have been reported from the Lower Gosau subgroup of two different sedimentary environments, lagoonal mostly marly limestones and limestones containing rudists, corals and corallinacean algae („reefal" limestones) of (Upper) Turonian to Upper Santonian age (e.g. Schlagintweit 1993). Both environments are clearly different from their algal associations and with respect to the abundances of dasycladales it is distinctly larger in the lagoonal limestones. From the Campanian to Maastrichtian part of the Gosau Group no dasycladales have been reported so far. In the present paper a new dasycladale is described from the higher part of the Eisenbach stream as *Thrysoporella eisenbachensis* n. sp.

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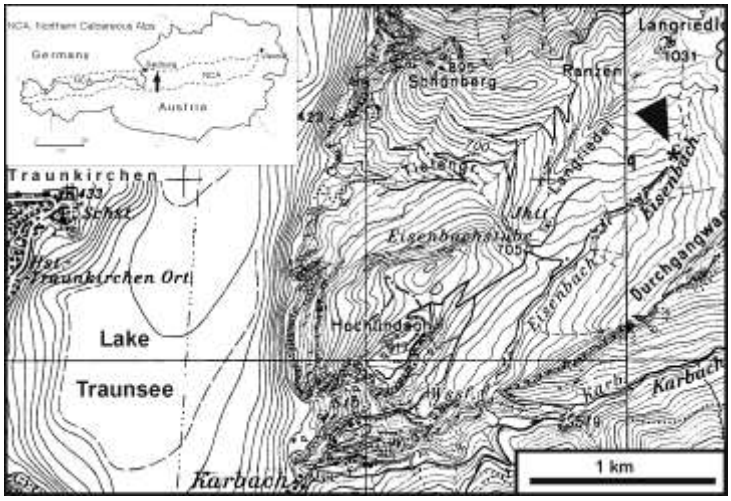

Text-Fig. 1: Geographical setting of the type-locality of *Thrysoporella eisenbachensis* n. sp. marked with an asterisk (from ÖK 25, sheet 67 Grünau im Almtal).

II. SYSTEMATIC PALAEONTOLOGY

Order Dasycladales Pascher, 1931
Family Triploporellaceae (Pia, 1910) Berger & Kaever, 1992
Genus ***Thrysoporella*** Gümbel, 1872
Thrysoporella eisenbachensis n. sp.
(Pl. 1, fig. 1-10, pl. 2, fig. 1-12)

Derivation of the name: The species name refers to the Gosau of Eisenbach where the new species has been detected.

Material: Four thin-sections prepared from sample EB-9B containing more than 30 specimens, most of them cut longitudinal or oblique.

Holotype and depository: Oblique section, figured as fig. 6, plate 1, thin-section BSP 2002-I-24. The holotype and another thin-sections (BSP 2002-I-25) are housed at the „Bayerische Staatssammlung für Paläontologie und historische Geologie".

Type-locality: Eisenbach profile on the eastern side of Lake Traunsee/Upper Austrian Salzkammergut at about 895 m above sea-level, Topographic Map of Austria 1 : 25.000 ÖK 67 Grünau im Almtal (see text-figure 1).

Type-stratum: Middle Turonian dark brownish, marly limestones, with gastropods, ostracods, plant remains, benthic foraminifera and dasycladales. The latter are represented by *Thrysoporella eisenbachensis* n.sp., *Dissocladella* ? *pyriformis* Schlagintweit and *Neomeris circularis* Badve & Nayak. More seldom, fragments of *Halimeda paucimedullaris* Schlagintweit & Ebli occur. Benthic foraminifera include miliolids, amongst them *Vidalina hispanica* Schlumberger. The marly limestones containing the new taxon are intercalated in a marly sequence rich in bivalves and gastropods. From a microfacies point of view and the occurring microbiota, a quiet water lagoonal setting within a marginal marine environment can be assumed. Consequently, we find many relative long and unbroken but often compressed thalli of *Thrysoporella eisenbachensis* n. sp.

Diagnosis: Representative of the genus *Thrysoporella* with cylindrical thallus made up of light brownish calcite. Main axis diameter most often secondary enlarged. Numerous branches up to 4th order with horizontally flattened primaries arranged perpendicular to the main axis.

Description: The cylindrical thallus bearing numerous branches (up to more than 30) is made up of light-brownish calcite. Some specimens exhibit strong curving that could point to a thallus division reported for example from *Thrysoporella pseudoperplexa* Granier & Braik. The inner surface of the thallus is irregularly shaped due to weak calcification around the proximal part of the primary branches. These cases correspond to a relative high d/D-ratio. In fact, the main axis (stem cell), however, was originally comparable small, detected in

one specimen that did not exhibit the mentioned pronounced decalcifications. Here, the main axis accounts about ¼ of the outer thallus diameter. Note that the axial hollow is nearly always completely filled with the surrounding micritic matrix. The exact shape of the primary branches cannot clearly be indicated but they must have been flattened producing a regular pattern of more or less rectangular pores in tangential sections. The branches of successive whorls were supposedly arranged in rectilinear rows. Each primary branch divides into two secondary branches (branching angle about 40-45^{o}) The number of higher order branches is unclear.The shape of the primaries seems is of the phloiophorous type whereas higher order branches are tubular with more or less constant diameters throughout their length.

Dimensions:
Thallus diameter (D): 0,26 – 0,76 mm (mean 0,45 mm)
Inner thallus diameter:
- decalcified specimens (d*): 0,065-0,6 mm (mean 0,31 mm)
- Ratio d*/D: 0,46 – 0,79 (mean 0,68)
- calcified specimen (d): 0,065 mm (single specimen)
- Ratio d/D: 0,25 (single specimen)

Distance between two consecutive whorls (h): 0,072-0,08 mm
Diameter of primary branches (p): 0,04-0,05 mm
Diameter of secondary branches (p´): 0,016-0,032 mm
Diameter of tertiary branches (p´´): about 0,016 mm
Diameter of quartenary branches (p´´´): about 0,01 mm
Number of branches per whorl (w): more than 30 (single specimen)
Maximum thallus lenght observed (L): 4,65 mm

Remarks and comparisons:
The genus *Thrysoporella* has been established by Gümbel (1872) with the type-species *Thrysoporella cancellata* Gümbel from the Lutetian of France. At the beginning of the eighties the systematic revision of Cenozoic dasycladales provided by Deloffre & Genot (1982) shows only the type-species, since *Thrysoporella* ? *hatigamoriensis* Yabe & Toyama from the Upper Jurassic of Japan does not belong to the genus *Thrysoporella*. According to Bernier (1984) and Dragastan, Richter (1999) the latter species should be transfered to the genus *Trinocladus* Pia. Recently, Dragastan, Richter (1999) introduced the new subtribe Thrysoporellinae as follows: „*Algae with cylindrical, strongly calcified thalli, euspondyle, having mostly 4 orders of ramifications, disposed in verticils built by phloiophore ramifications, inflated distally (claviformous), simple or dichotomous and acrophore tetratomously ramifications*". Let us mention that the type-species displays small rectangular plates ("plaquettes") visible on the outer side of isolated specimens (Genot 1980: Pl. 25, fig. 4). This characteristic has not been mentioned from the other species (see below) that have been described only from thin-section material. With respect to the number of branches a regular division pattern of 1 (primary) : 2 (secondary) : 8 (tertiary) : 32 (fourth) has been noted by Granier & Braik (2002) for *Thrysoporella pseudoperplexa*. With this respect, only the number of two secondaries per primary branch can be recognized for *Thrysoporella eisenbachensis* n. sp., the number of higher order branches is unclear so far.
From the present state of knowledge the following species of *Thrysoporella* have been established since then:

- *Thrysoporella longa* Radoicic 1990, Paleocene of Iraq
- *Thrysoporella turgidipora* Radoicic 1990, Paleocene of Iraq
- *Thrysoporella alpina* Dragastan & Richter 1999, Tithonian of Greece
- *Thrysoporella pseudoperplexa* Granier & Braik 2002, Kimmeridgian of Algeria.

Thrysoporella alpina Dragastan & Richter is clearly different from *T. eisenbachensis* n. sp., and all other *Thrysoporella* species by long primaries that are strongly inclined to the main axis and its strongly calcified thallus. *Thrysoporella pseudoperplexa* Granier & Braik from the Upper Jurassic of Algeria is smaller (e.g. D = 0,21-0,45 mm) with low number of branches (w = 6-8) and higher vertical spacing (0,09-0,13 mm). *Thrysoporella longa* Radoicic is also smaller (D = 0,32-0,48 mm) with primaries that reach up to 0,12 mm in horizontal sections. A second species from the Paleocene of Iraq has been introduced by Radoicic (1990) as *Thrysoporella turgidipora* with smaller outer diameter (0,272-0,4 mm) and lower number of branches. The latter feature has not been indicated exactly, but from the figured specimens it can be inferred that the number of branches is < 10. In summary, the most characteristic feature of *Thrysoporella eisenbachensis* n. sp. distinguishing this form from the other representatives of the genus is the high number of primaries (see also comparison table 1 in Granier & Braik 2002). The weak calcification around the primary branches seems to be a characteristic also of other *Thrysoporella* species (e.g. Deloffre & Genot 1982: p. 170).

Stratigraphy: The characteristic association of the dasycladales *Dissocladella*? *pyriformis* Schlagintweit and *Neomeris circularis* Badve & Nayak together with *Halimeda paucimedullaris* Schlagintweit & Ebli has already been described from other localities of the Lower Gosau Subgroup of (Upper) Turonian to Upper Santonian age. In both localities (Pletzachalm/Sonnwend Mountains and Wegscheidgraben/Salzkammergut), *Thrysoporella eisenbachensis* n. sp. has so far not been detected. More detailed information on stratigraphy is available by means of calcareous nannofossils and foraminifera that have been obtained from the marls (sample EB-8) where the marly limestone sample with *Thrysoporella eisenbachensis* n. sp. (EB-9) is intercalated.

Calcareous nannofossils and foraminifera of sample EB-8
(by Lilian Švábenická & Lenka Hrádecká)

The sample provided very rare calcareous nannofossils. Besides species reworked from older strata (Lower Cretaceous to Cenomanian) the following taxa appear in the Turonian, such as *Quadrum gartneri, Lucianorhabdus maleformis* , *L. quadrifidus* and *Eiffellithus eximius*. The latter two species give evidence for zone UC8b that is correlated with the Middle Turonian (sensu Burnett 1998). No younger nannofossil species have been observed.
The foraminiferal assemblage from EB 8 is formed mainly by miliolids, spirillinids and agglutinated taxa such as *Haplophragmoides, Bigeneria, Trochammina* and *Ammobaculites*. Two specimens of planktic foraminifera with *Marginotruncana schneegansi* (Sigal) and *Praeglobotruncana* sp. were found. Based on the character of the assemblage and the presence of *M. schneegansi* a Middle – Late Turonian age, probably M. schneegansi Zone (Robaszynski & Caron 1995) is assumed.
Summarizing, the sample containing the new dasycladale *Thrysoporella eisenbachensis* n. sp. can be refered to the Middle Turonian.
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III. APPENDIX 1: LITERATURE

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Plate 1 *Thrysoporella eisenbachensis* n. sp. from Lower Gosau Group of Eisenbach

Fig. 1. Wackestone with numerous deformed specimens and possible thallus division (specimen to the left). Thin-section EB-9 B (30-02), scale bar = 0,5 mm.

Fig. 2. *Thrysoporella eisenbachensis* n. sp. (below) together with *Dissocladella*? *pyriformis* Schlagintweit (above). Thin-section BSP 2002-I-24, scale bar = 0,2 mm.

Fig. 3. Wackestone with longitudinal section of *Thrysoporella eisenbachensis* n. sp. (middle left) and transverse section of *Dissocladella*? *pyriformis* Schlagintweit (right). Thin-section BSP 2002-I-25, scale bar = 0,5 mm.

Fig. 4. Several specimens in longitudinal and oblique sections. Note the strongly deformed thallus to the right. Thin-section BSP 2002-I-24, scale bar = 0,5 mm.

Fig. 5. Two oblique sections. Thin-section BSP 2002-I-24, scale bar = 0,2 mm.

Fig. 6. Holotype, oblique section showing the weak calcification around the numerous primary branches and the presence of 4 orders of branches on the left side (numbers 1 to 4). Thin-section BSP 2002-I-24, scale bar = 0,2 mm.

Plate 2 *Thrysoporella eisenbachensis* n. sp. from Lower Gosau Group of Eisenbach

Fig. 1.Oblique section of a deformed specimen. Thin-section EB-9 B-30-02, scale bar = 0,2 mm.

Fig. 2. Oblique longitudinal section. Thin-section BSP 2002-I-25, scale bar = 0,2 mm.

Fig. 3. Two oblique sections. Thin-section BSP 2002-I-25, scale bar = 0,2 mm.

Fig. 4. Transverse section. Thin-section BSP 2002-I-25, scale bar = 0,2 mm.

Fig. 5. Fragmentary oblique section. Thin-section BSP 2002-I-25, scale bar = 0,2 mm.

Fig. 6. Longitudinal section of the longest specimen observed (about 4,65 mm). Thin-section EB-9 B-32-02, scale bar = 1 mm.

Plate 3 *Thrysoporella eisenbachensis* n. sp. from Lower Gosau Group of Eisenbach

Fig. 1, 3. Longitudinal section, noting the irregular inner surface. Thin-sections EB-9 B-32-02 (fig. 1) and -31-02 (fig. 3), scale bar = 0,2 mm.

Fig. 2. Oblique section. Thin-section EB-9 B-31-02, scale bar = 0,2 mm.

Fig. 4. Tangential section of a fragment. Thin-section EB-9 B-32-02, scale bar = 0,2 mm.

Fig. 5. Deep tangential section cutting the main axis (middle). Thin-section EB-9 B-30-02, scale bar = 0,2 mm.

Fig. 6. Longitudinal section; note the large axial hollow due to incomplete calcification around the primary branches. Thin-section EB-9 B-32-02, scale bar = 0,2 mm.

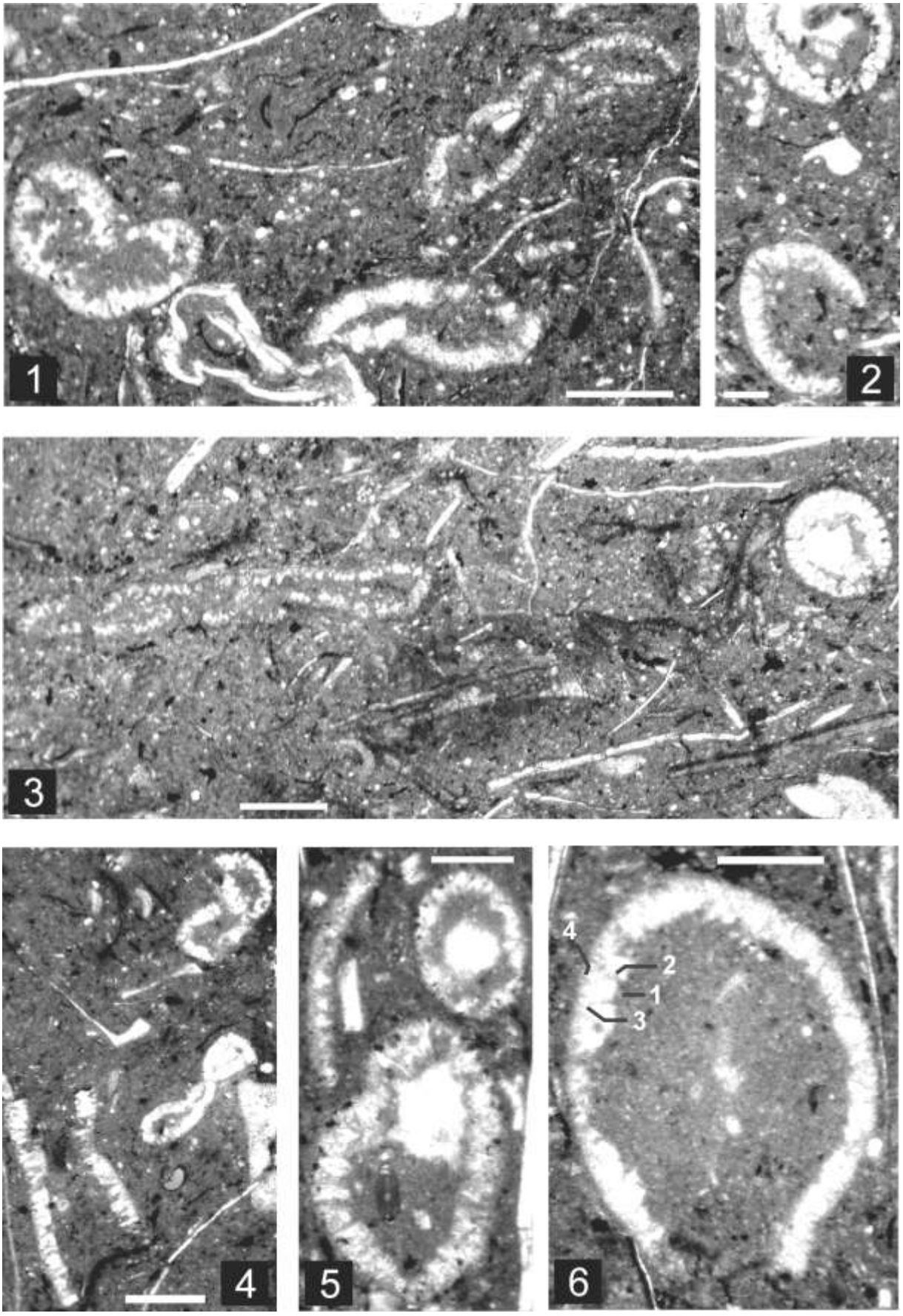
Fig. 7. Oblique section. Thin-section EB-9 B-31-02, scale bar = 0,2 mm.

Fig. 8. Longitudinal section of a fragment. Thin-section EB-9 B, scale-bar = 0,2 mm.

Fig. 9. Oblique section with strong compression so that the two opposite walls nearly touch each other. Thin-section EB-9 B-31-02, scale bar = 0,2 mm.

Fig. 10. Oblique section. Thin-section EB-9 B-31-02, scale bar = 0,2 mm.

Fig. 11. Fragmentary tangential section. Thin-section EB-9 B, scale bar = 0,2 mm.



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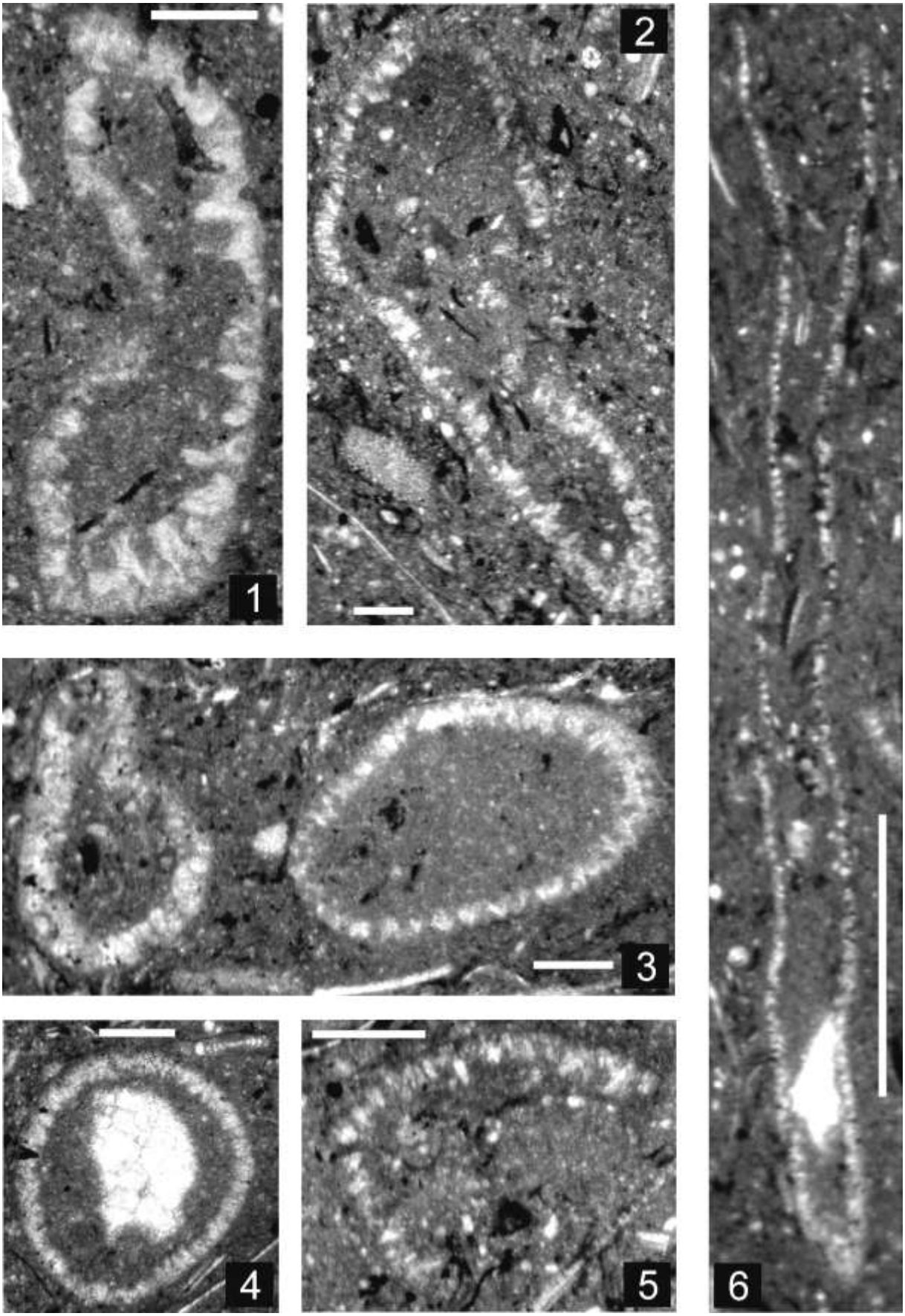

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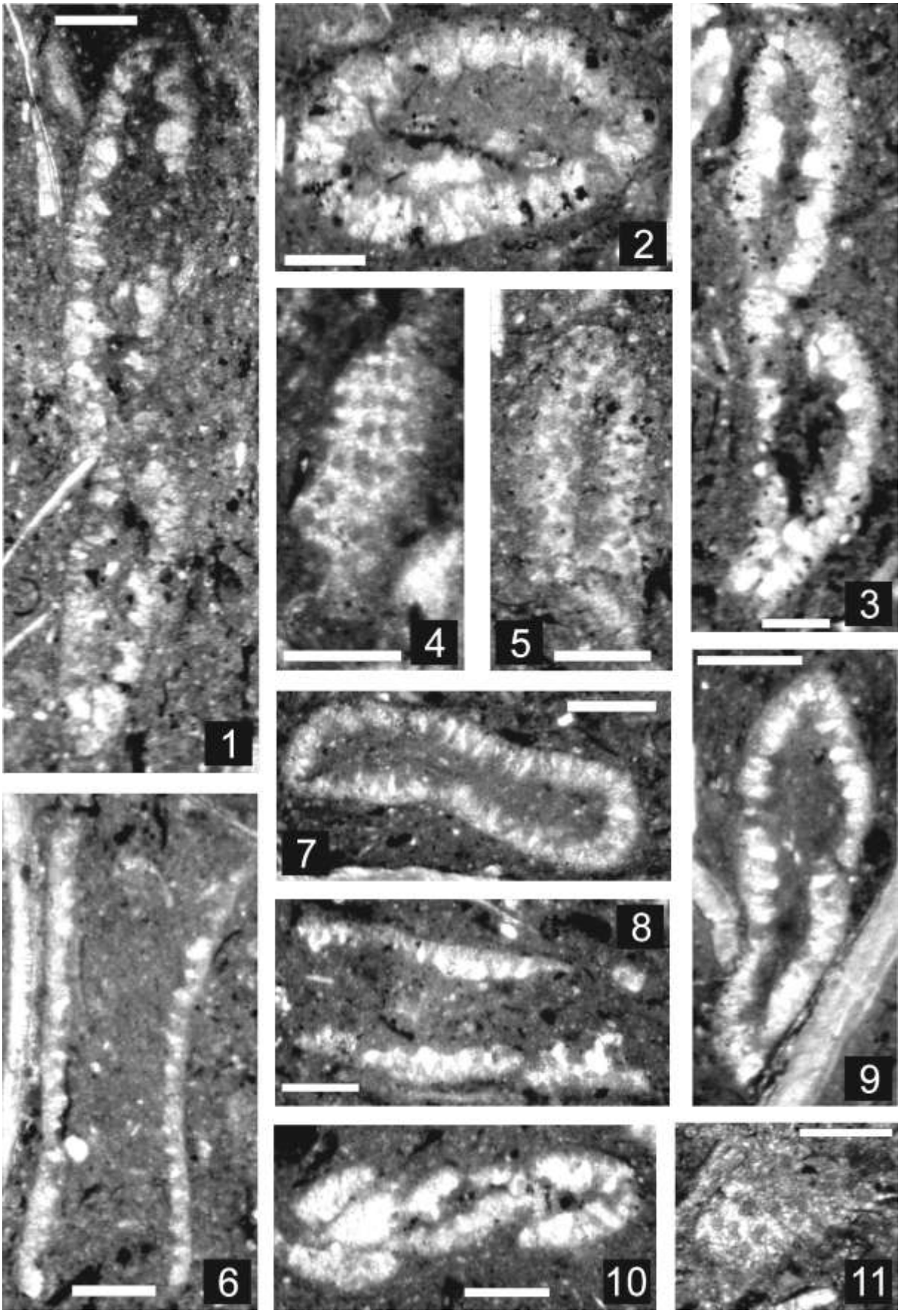

Plate 3