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Coptocampylodon? *rhaeticus* n.sp., a New Problematic Microfossil ("*incertae sedis*") from the Rhaetian Dachstein Limestone of the Northern Calcareous Alps (Germany, Austria)

Felix **SCHLAGINTWEIT**[1], Sigrid **MISSONI**[2] and Hans-Jürgen **GAWLICK**[2]

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Abstract

A new problematic microfossil is described as *Coptocampylodon*? *rhaeticus* n.sp. from the Rhaetian Dachstein Limestone of the Northern Calcareous Alps. The new species is composed of a long cylindrical and an irregular rounded body, both showing narrow axial cavity. It is similar to *Coptocampylodon*? *elliotti* RADOIČIĆ 1969 from the Cenomanian of Montenegro, but lacks the longitudinal grooves in the cylindrical part. In the Alpine Dachstein Limestone it has been detected at several localities where it occurs as an abundant constituent of biosparitic limestones along with the benthic foraminifera *Triasina hantkeni* MAJZON, *Aulotortus sinuosus* WEYNSCHENK, Duostominidae and dasycladales *Griphoporella curvata* (GÜMBEL) and *Diplopora adnetensis* FLÜGEL.

1. INTRODUCTION

During Late Triassic times, the Northern Calcareous Alps were part of a wide shelf exhibiting characteristic margin-parallel facies zonation located at the western end of the Tethyan Ocean (e.g. TOLLMANN, 1976, 1985; GAWLICK, 2000 with references; MANDL, 2000).

The Norian–Rhaetian Dachstein Limestone is generally divided into the bedded lagoonal Dachstein Limestone and the Dachstein reefal limestone, i.e. protected internal lagoonal facies and typical outer platform settings with reefal and peri-reefal facies (e.g. ZANKL, 1971; LEIN, 1987; GAWLICK, 2000 – fig. 4). The Norian bedded Dachstein Limestone is typically represented by so-called Lofer cycles in the central platform area (FISCHER, 1964; ENOS & SAMANKASSOU, 1998). Within the "reef-limestones", corals and calcareous sponges are the main frame-builders (ZANKL, 1969; SENOWBARI-DARYAN, 1990). Famous localities of Dachstein reef-limestones within the Northern Calcareous Alps include for example, the Hohe Göll (ZANKL, 1969) and the Gosaukamm (WURM, 1982).

Within any shallow water platform carbonates, the main important microfossil groups (calcareous algae and benthic foraminifera) show a well pronounced facies sensitivity enabling the differentiation of typical facies-dependent assemblages (SENOWBARI-DARYAN & SCHÄFER, 1979). The calcareous algae belonging to the dasycladales, are discussed in the works of FLÜGEL (1975), PIROS et al. (1994), SENOWBARI-DARYAN & SCHÄFER (1979) and SENOWBARI-DARYAN & FLÜGEL (1993). In the latter work, for example, 11 species of dasycladales including 2 taxa indicated to be restricted to the Rhaetian interval have been listed for the Alpine Norian–Rhaetian platform carbonates. Recent investigations however, showed that present knowledge of the algal inventory of the Dachstein Limestone is still far from being complete (SCHLAGINTWEIT et al., 2001). In the framework of the ongoing investigations a new problematic microfossil has been detected in great abundance in biosparitic limestones (grain- to rudstones), and is described herein as *Coptocampylodon*? *rhaeticus* n.sp.

Besides several illustrations in the alpine literature, the material treated in the present paper comes from the Kehlstein near Berchtesgaden (Germany), the area west of Lofer (Austria) and the Rofan Mountains, Tyrol (Austria). The Rhaetian Dachstein limestone nearby and south of the Kehlstein house (samples Ber 101) has been chosen as the type-locality.

2. GEOLOGICAL SETTING

Mount Kehlstein in the Berchtesgaden Alps tectonically belongs to the higher Tirolic nappe (FRISCH & GAWLICK, 2001, in press) and was part of the Rhaetian lagoonal area south of the Kössen Basin (GOLEBIOWSKI, 1990, 1991). The sedimentary sequence consists of Norian lagoonal Dachstein limestone at the base, followed by marls and carbonates of the Kössen Formation (BRAUN, 1998 – cum lit.)

[1] Lerchenauerstrasse 167, D-80935 Munich, Germany; e-mail: EF.Schlagintweit@t-online.de

[2] University Leoben, Institute for Geosciences, Prospektion and Applied Sedimentology, Peter-Tunner-Str. 5, A-8700 Leoben, Austria.

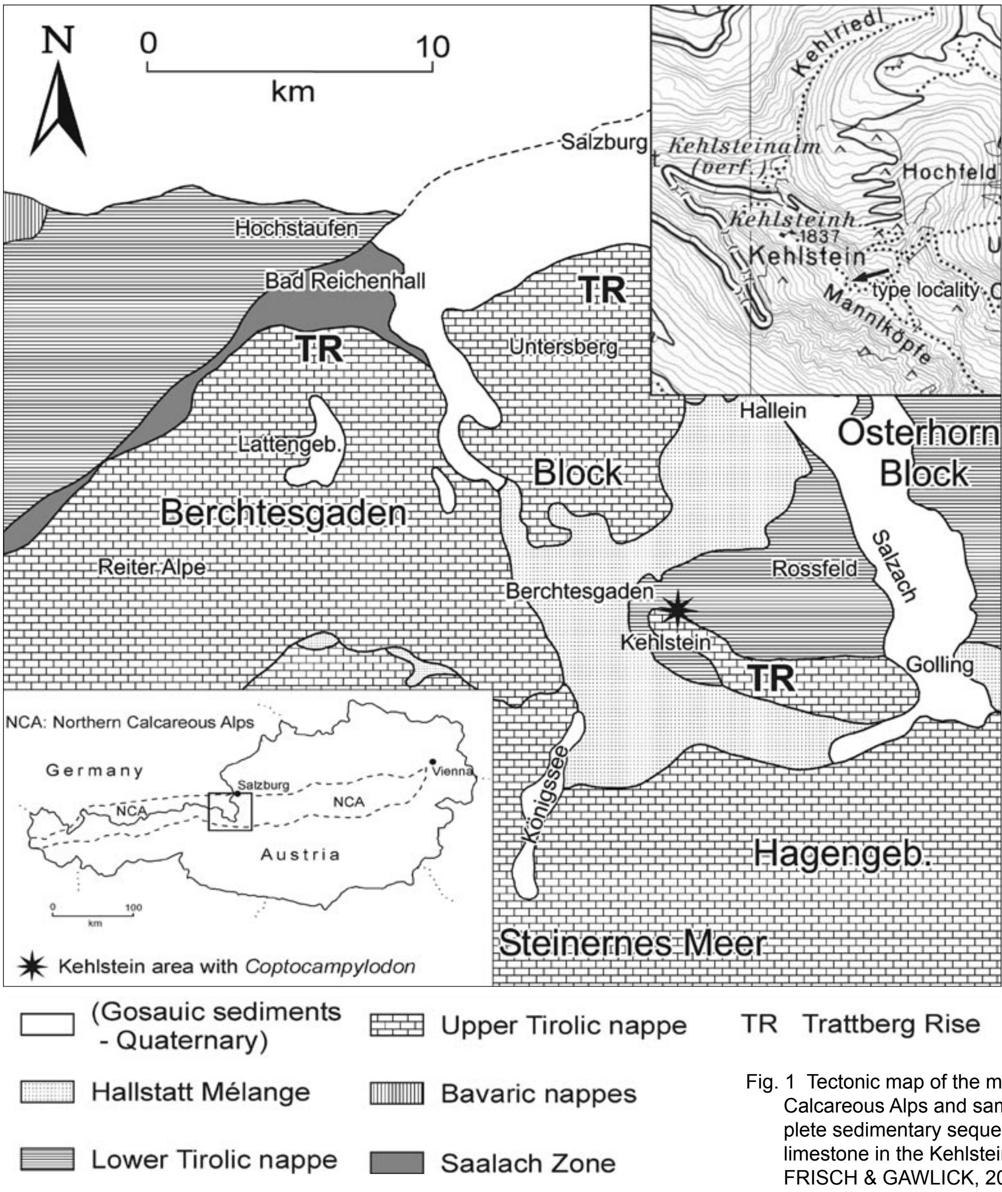

Fig. 1 Tectonic map of the middle part of the Northern Calcareous Alps and sample locations of the complete sedimentary sequences of Rhaetian Dachstein limestone in the Kehlstein and Lofer area (after FRISCH & GAWLICK, 2001, in press).

and Rhaetian lagoonal Dachstein limestone. On the top of the sequence, Late Jurassic mass-flow deposits occur with components of Dachstein limestone, Late Jurassic shallow water limestones and carbonates of the Late Jurassic Oberalm Formation (LEBLING, 1935; PLÖCHINGER, 1955; BRAUN, 1998 – cum lit., new unpublished results).

Most of the samples derive from the Rhaetian Dachstein Limestone or from Dachstein limestones near the Norian/Rhaetian boundary (Ber 101–1, Ber 101–4) in the southern area of mount Kehlstein or near the top of Kehlstein (Fig. 1). The sample Ber 101–12 represents a clast in an upper Jurassic mass-flow deposit with allochthonous shallow water microfossils deposited on top of the Rhaetian Dachstein limestone in the northern part of the Kehlstein.

Besides the type-locality, the new species has been detected from the following localities:

– northern side of the Lofer Kalvarienberg at 960 m AN (forest road), in the westward continuation of the southern rim of the Kössen basin; sample KS 79a, d; Rhaetian backreef and lagoonal Dachstein limestone (GOLEBIOWSKI, 1991);

– Rofan Mountains, Tyrol; sample RF 1–01; pebble in late Jurassic mass-flow deposits;

– Unken valley; mass-flow deposits ("Schwarzberg-klamm-Brekzie") of the Tauglboden Formation deriving from the Trattberg Rise (GARRISON & FISCHER, 1969);

– Hohes Brett, southern rim, south of the Jägerkreuz; Rhaetian slope sediments (ZANKL, 1969; BRAUN, 1998) (sample Ber 86/7);

– north of Pass Lueg on the Street B 162 from Werfen to Golling; samples Y 11, Y 7A, Kö6); Rhaetian Dachstein limestone intercalated by marls of the Kössen Formation (WEGERER & GAWLICK, 1999);

– lake Traunsee, south Ebensee; samples Po 10, 12, 16, 22; EB 7, Pr 6 97, EB 11 Pr 11, EB 24; Rhaetian lagoonal Dachstein limestone (WEGERER & GAWLICK, 1999).

3. SYSTEMATICS

It was ELLIOTT (1963) who established the new genus *Coptocampylodon* with the type-species *Coptocampylodon lineolatus* n.sp. from the Lower Cretaceous of the Middle East and Borneo. The generic diagnosis of *Coptocampylodon* was indicated as follows: "Small solid cylindrical bodies, longer axis gently curved or irregular, circular in cross-section but deeply incised by longitudinal grooves, ends irregularly rounded." As has been discussed by ELLIOTT, these microfossils *incertae sedis* have previously been assigned to acicularian spicules. In conclusion, however, ELLIOTT suggested that "*Coptocampylodon* comprises the skeletal remains of a small octocoral in which horny and calcareous joints alternated".

Almost two years later, a second representative was introduced by PATRULIUS (1965) as *Coptocampylodon fontis* from the Urgonian Limestones (Barremian–Aptian) of Romania, characterized by the frequent occurrence of an axial canal that is lacking in the type-species. Unfortunately, Patrulius did not designate a holotype, but syntypes. Based on *Coptocampylodon fontis*, DRAGASTAN (1967) established the new genus *Carpathoporella* with the type-species *Carpathoporella occidentalis* assumed to belong to the dasycladales, unfortunately also without the designation of a holotype. Later, RADOIČIĆ (1969) established the new species *Coptocampylodon elliotti* from the Cenomanian of Montenegro. The author considered *Carpathoporella occidentalis* DRAGASTAN as the younger synonym of *Coptocampylodon fontis*. As regards the type-species of *Coptocampylodon, C. lineolatus* ELLIOTT 1963, it has been assigned to a non-vertebrate coprolith (CUVILLIER et al., 1969). DRAGASTAN (1989) provided the new combination *Carpathoporella fontis* (PATRULIUS) and chose a holotype from the authors material.

In all these taxa, the presence or absence of an axial hollow has been the reason for some of the discussion. Following PATRULIUS (1965) there are representatives of *C. fontis* some of which show an axial hollow and others that do not. For example, BASSON & EDGELL (1971) reported and figured both, *Coptocampylodon lineolatus* ELLIOTT and *C. fontis* from the Lower Cretaceous of Lebanon co-occuring in the same sample. The same observation can also be made with the new species *Coptocampylodon*? *rhaeticus* n.sp. with specimens with and without a central hollow. The latter are interpreted as sections through the closed distal parts. BASSON & EDGELL (1971, p. 420) discuss another interpretation, that "there have been varying degrees of calcification of the thallus and the central canal".

Star-like sections have been referred to *Carpathoporella*? sp. by MASSE & ARNAUD-VANNEAU (1999, pl. 1, fig. 4–6) from the Lower Cretaceous of the Mid-Pacific Mountains, deep sea drilling leg 143, west of Hawaii. Following RADOIČIĆ (1969), the authors remark on similarities to transverse sections of the distal ramifications of the dasycladalean *Triploporella*? *neocomiensis* RADOIČIĆ (without axial canal) that, for example, have been figured by SOTAK & MISIK (1993, pl. 1, figs. 6–11). Equivalent fragments have been described as "Microproblematicum 3" from the Upper Barremian Urgonian Limestones of the Northern Calcareous Alps (SCHLAGINTWEIT, 1991: p. 29, fig. 13) and a similar interpretation has been assumed. BARATTOLO & DE CASTRO (1991, p. 54) assume that the remains of *Coptocampylodon* cf. *elliotti* from the Lower Cretaceous of southern Italy "could represent tufts of 5–6 trichophorous secondary branches of a *Selliporella*-like dasyclad".

Coptocampylodon fontis PATRULIUS has been removed from the dasycladales by JAFFREZO (1974), followed by BASSOULLET et al. (1978). Some affinities with charophytes have been supposed by DRAGASTAN (1989), a view that we cannot follow for facies considerations since *C. fontis* is typical of well-agitated outer platform settings, for example in the Urgonian limestones of the Northern Calcareous Alps (SCHLAGINTWEIT, 1991) and also the outer platform facies of the Rhaetian Dachstein limestones with *Coptocampylodon*? *rhaeticus* n.sp. (see below). RADOIČIĆ (1969), cautiously followed by MASSE & POIGNANT (1971), and LUPERTO SINNI (1979), stated the synonymy between *Carpathoporella occidentalis* DRAGASTAN and *Coptocampylodon fontis* PATRULIUS. GRANIER & DELOFFRE (1994) also excluded the genus *Coptocampylodon* ELLIOTT 1963 with the type-species *C. lineolatus* from the dasycladales. The Cenomanian species is questioned regarding its generic position and treated as *C.*? *elliotti* RADOIČIĆ. As already remarked by DRAGASTAN (1989 – p. 43), in the original description of *Coptocampylodon elliotti* no holotype has been designated by RADOIČIĆ (1969). Later, in the framework of the inventory of Mesozoic dasycladales provided by GRANIER & DELOFFRE (1994), a holotype for *Coptocampylodon*? *elliotti* was designated by RADOIČIĆ thus remaining the only species tentatively referred to the genus *Coptocampylodon* ELLIOTT. Regarding the genus *Carpathoporella* DRAGASTAN, it is treated as "nom. nud." by GRANIER & DELOFFRE (1994) due to the lack of a holotype, and the repeated establishment of the genus *Carpathoporella* DRAGASTAN 1989 is also treated as "nom. nud.", since being founded on another species, *Coptocampylodon fontis*.

A detailed synonymy is provided below for *Coptocampylodon fontis* PATRULIUS and *Coptocampylodon elliotti* RADOIČIĆ.

Genus *Coptocampylodon* ELLIOTT, 1963

Coptocampylodon fontis PATRULIUS, 1965

*1965 *Coptocampylodon fontis* n.sp. – PATRULIUS, p. 393, textfigs. 1a–0, 2a–f, pl. 1, a–f.

1966 *Coptocampylodon* (?) sp. – LUPERTO SINNI: pl. 2, fig. 3, Barremian–Aptian of S-Italy.

1967 *Carpathoporella occidentalis* n. gen., n.sp. – DRAGASTAN: 444, pl. 1, figs. 7, 9, pl. 2, figs. 10–16.

1969 *Coptocampylodon fontis* PATRULIUS – RADOIČIĆ: pl. 1, fig. 2, pl. 2, figs. 1–3, pl. 3, figs. 1–5.

1971 *Carpathoporella occidentalis* DRAGASTAN – MASSE & POIGNANT: 260, pl. 1, fig. 7, Hauterivian to Lower Aptian of the Provence area/S France.

1971 *Carpathoporella occidentalis* DRAGASTAN – BASSON & EDGELL: pl. 4, figs. 6–8, Aptian of Lebanon.

1972 *Carpathoporella* sp. – FOURCADE et al.: pl. 4, fig. 1, Barremian–Aptian of the internal Prebetic/Spain.

1973 *Carpathoporella occidentalis* DRAGASTAN – BAKALOVA: pl. 2, fig. 7, Lower Cretaceous Lovech Urgonian Group of Bulgaria.

1978 *Coptocampylodon fontis* PATRULIUS – BABIĆ & GUŠIĆ: pl. 2, fig. 4, Barremian–Albian of Mt. Ivanšćica/Croatia.

1979 *Coptocampylodon fontis* PATRULIUS – LUPERTO-SINNI: 442, pl. 43, figs. 2–6, 8–10, with synonymy, Barremian–Aptian of Apulia/S Italy.

1980 *Coptocampylodon fontis* PATRULIUS – ARNAUD-VANNEAU: pl. 112, figs. 5–6, Upper Barremian Urgonian Limestones of S France.

1986 *Coptocampylodon fontis* PATRULIUS – MANTEA & TOMESCU: pl. 12, figs. 1–6, Metaliferi Mts. of Romania.

1987 *Carpathoporella fontis* (PATRULIUS) – MASSE & ROSSI: fig. 5(b), Lower Aptian of Venezuela.

1989 *Carpathoporella fontis* DRAGASTAN – DRAGASTAN: 40, pl. 17, figs. 2–8, Barremian–Lower Aptian in the Carpathian and in the Moesian Platform/Romania (with synonymy, validation and designation of lectotype).

1991 *Carpathoporella fontis* (PATRULIUS) – MISIK et al.: pl. 5, fig. 6, Lower Cretaceous carbonate pebbles from the Western Carpathians.

1991 *Coptocampylodon fontis* PATRULIUS – SCHLAGINTWEIT: 29, pl. 8, figs. 6–8, Upper Barremian–Aptian Urgonian Limestones of the Northern Calcareous Alps/Germany and Austria.

1992 *Coptocampylodon fontis* PATRULIUS – MASSE, ARIAS & VILAS: pl. 3, fig. 12, Aptian–Albian of the prebetic Zone/Spain.

1993 *Carpathoporella fontis* (PATRULIUS) – SOTAK & MISIK: pl. 1, fig. 12, Barremian–Aptian of the Western Carpathians.

1994 *Acicularia* sp. – CSÁSZÁR et al.: pl. 8, fig. 4, Upper Barremian–Lower Aptian of the Schratten Limestone of Vorarlberg/Austria.

1994 *Coptocampylodon*? *fontis* PATRULIUS nom. nud. – GRANIER & DELOFFRE, p. 28.

1995 *Coptocampylodon fontis* PATRULIUS – CARRAS: pl. 54, fig. 7, Lower Cretaceous of Greece.

1999 *Coptocampylodon fontis* PATRULIUS – MASSE & ARNAUD-VANNEAU: 60, pl. 1, figs. 1–3, Late Hauterivian–Barremian of Mid-Pacific Mountains, deep sea drilling leg 143, west of Hawaii.

2001 *Coptocampylodon fontis* PATRULIUS – BUCUR: pl. 10, fig. 2, Upper Aptian of the Resita–Moldova Noua Zone/Southern Carpathians of Romania.

Coptocampylodon? *elliotti* RADOIČIĆ, 1969

*1969 *Coptocampylodon elliotti* n.sp. – RADOIČIĆ: 199, pl. 4, figs. 1–2, Cenomanian of Montenegro.

1989 *Carpathoporella elliotti* (RADOIČIĆ) nov. comb. – DRAGASTAN: 43 (not figured).

1991 *Coptocampylodon elliotti* RADOIČIĆ – BARATTOLO & DE CASTRO: pl. 3, fig. 2, Aptian of the Sorrento peninsula/S Italy.

1994 *Coptocampylodon*? *elliotti* RADOIČIĆ – GRANIER & DELOFFRE, p. 21, validation with designation of lectotype (not figured).

As can be seen from the references cited, *Coptocampylodon fontis* PATRULIUS represents a widespread microfossil occurring within Upper Jurassic to Albian strata, with the greatest distribution in the Barremian Aptian interval (“Urgonian facies”). For *Coptocampylodon elliotti* RADOIČIĆ, although also established in the sixties as *C. fontis*, we can only mention the occurrence in southern Italy (see synonymy) besides the type-locality in the Dinarides.

***Coptocampylodon*? *rhaeticus* n.sp.**

(Pl. I, Figs. 1–7; Pl. II, Figs. 1–12)

1989 “Dasycladacean algae characterized by small spiny thalli” – STANTON & FLÜGEL: pl. 38, figs. 1–2, 7, pl. 39, figs. 3–4, Upper Rhaetian “reef”-complex of the Steinplatte/Austria.

Origin of the name: The species name refers to the stratigraphic occurrences in the Rhaetian stage.

Type-locality: Kehlstein area, ÖK 93 Bad Reichenhall, 1850 m AN, path from the Kehlstein house to the Hohe Göll at the base of late Jurassic mass-flow deposits (Fig. 1).

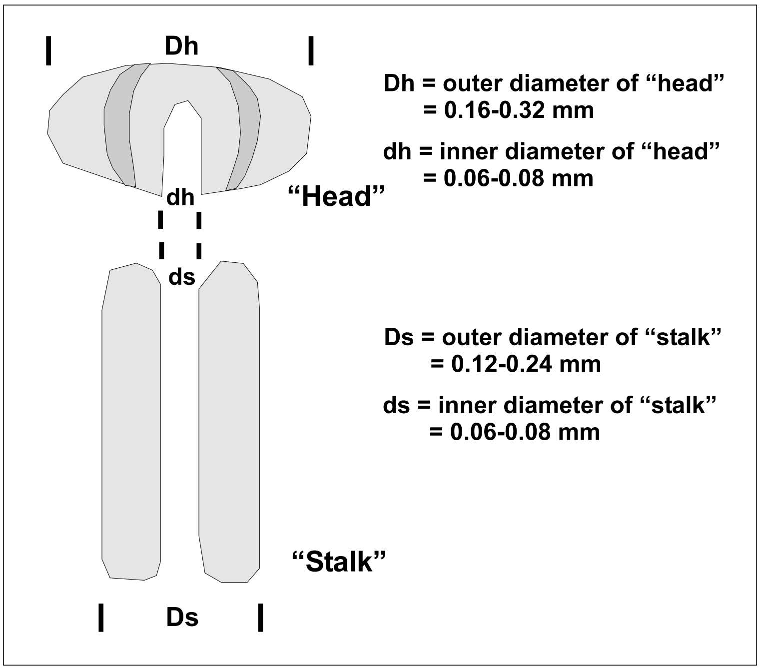

Fig. 2 Dimensions and reconstruction of *Coptocampylodon*? *rhaeticus* n.sp.

Type strata: Packstones and grainstones, gray to light brown limestones, m-thick bedded sequence of the lagoonal Rhaetian Dachstein limestone overlying the Kössen beds and the "Hauptlithodendronkalk". The latter was deposited in a transgressive–regressive cycle and approximates the Norian–Rhaetian boundary (GOLEBIOWSKI, 1991) consisting of massive coralline beds. Above the "Hauptlithodendronkalk" the lagoonal Rhaetian Dachstein limestone occurs forming an isolated platform between the Koessen basin to the north and the Hallstatt area to the south (GAWLICK, 2000).

Holotype: Cross-section figured on Pl. 1, Fig. 5, Sample Ber 101–4a. The material is stored at the "Institut for Geowissenschaften, Universität Leoben".

Diagnosis: Small representative of the genus with a comparably long cylindrical part ("stalk") with a narrow axial hollow and without marginal outer grooves. Rounded part ("head") with or without an axial hollow and a low number of marginal grooves.

Description: The new species is composed of a comparably long cylindrical ("stalk") (e.g. Pl. 1, Fig. 3) and an irregular rounded body ("head") (e.g. Pl. 1, Fig. 6), both showing a relatively narrow central or axial hollow. In the material studied, no specimens were found where both parts were in original mutual contact. That both parts belong to the same taxon, however, is obvious since these always occur in great abundance together (e.g. Pl. 2, Fig. 10). The solid cylindrical part up to 1.15 mm in length is often slightly curving and shows smooth outer and inner surfaces. In the cylindrical part, the central hollow comprises approximately 30% of the outer diameter.

The ball-shaped part shows marginal grooves (mostly 7) at the outer part (e.g. Pl. 2, Fig. 1). Since these do not transect the calcareous skeleton/wall, these cannot be termed pores. The relative diameter of the central hollow is very variable (mostly ~25%) with respect to the outer diameter. It is assumed that those sections, with a very small central hollow are cut more distally, near a closed end. The latter is evidenced by sections without any central hollow (Pl. 1, Fig. 6). These do not show the grooves, an effect that could be secondary in origin (e.g. abrasion in a high-energy environment).

Dimensions: see Fig. 2.

Remarks: *Coptocampylodon*? *fontis* besides being larger (e.g. D = 0.2–0.6 mm, acc. to DRAGASTAN, 1989), differs from *Coptocampylodon*? *rhaeticus* n.sp. in its higher number of marginal grooves (9–15 acc. to DRAGASTAN, 1989). Moreover these are more regularly of a semicircular shape whereas in C.? *rhaeticus* they are more irregular often with a more acute inner part.

Coptocampylodon? *rhaeticus* n.sp. is very close to *C.*? *elliotti* RADOIČIĆ from the Cenomanian of Montenegro. In fact, the biometric data of the specimens from the Rhaetian Dachstein Limestone are in the range of the Cenomanian species. The main difference is the absence of marginal grooves in the cylindrical part of C.? *rhaeticus* n.sp. showing a smooth outer surface. These grooves are well developed in *C.*? *elliotti* RADOIČIĆ (RADOIČIĆ, 1969: pl. 4, fig. 1, pl. 5, fig. 2, pl. 6, figs. 1–4). In *C.*? *elliotti* the marginal grooves often show a tendency to become externally closed as already remarked by DRAGASTAN (1989, p. 43). In *C.*? *rhaeticus* n.sp. the groves usually display a clear concave shape (e.g. Pl. 1, Fig. 5) and only occasionally become very narrow (e.g. Pl. 1, Fig. 6, left specimen).

Facies:

– **Oolitic grainstones:** these limestones are fine-grained and very well sorted consisting mainly of ooids that are built up around small bioclasts. Here *Coptocampylodon*? *rhaeticus* n.sp. is very abundant and is associated with textulariids, involutinids, nodosariids (*Austrocolomia*? sp.) and *Trochammina*? sp. Samples: Ber 101/4A to 4D (locality Kehlstein near Berchtesgaden).

– **Packstones:** the overall thin-section appearance clearly indicates that this microfacies is closely related to the described oolithic grainstones. Thus, components are directly comparable. There are some larger echinoid fragments irregularly distributed in the sediment resulting in a somewhat poorer grade of sorting. Samples: Ber 101/4A (locality Kehlstein near Berchtesgaden).

– **Grainstones to packstone with a typical bimodal sorting:** the fine-grained portion of this microfacies type is comparable to the above described oolitic grainstones. Within this, larger components consisting of intraclasts, bioclasts (echinoids, gastropods, corals) and the larger tests of the *Triasina hantkeni* MAJZON are dispersed. Besides rare coral fragments, influences from the reef facies are present with the scattered remains of *Alpinophragmium perforatum* FLÜGEL (FLÜGEL, 1967; SCHÄFER & SENOWBARI-DARYAN, 1978). According to SCHÄFER & SENOWBARI-DARYAN (1978), *Triasina hantkeni* is well distributed in the algal–foraminiferal detritus facies (“Algen–Foraminiferen–Detritus–Fazies”). Additionally, there are also fragments of udoteacean algae. Samples: Ber 101/6, 101/1A (locality Kehlstein near Berchtesgaden).

– **Rudstone to bioclastic packstone:** large clasts of corals, gastropods and the dasycladalean *Diplopora adnetensis* FLÜGEL, 1975 are closely packed within a sparitic matrix. Foraminifera are present with some involutinids and *Triasina hantkeni* MAJZON, 1954. According to FLÜGEL (1975), *D. adnetensis*, originally described from the Upper Rhaetian reef limestone of Adnet near Hallein/Salzburg, typically occurs with corals in the back-reef facies. Sample: Ber 101/12 (locality Kehlstein near Berchtesgaden).

Remains of *Coptocampylodon*? *rhaeticus* n.sp. within identical microfacies of Upper Triassic platform carbonates have already been figured in the Alpine literature but without concrete identification:

– SCHOTT (1984): pl. 34, fig. 6 (middle left), biopelmicrite to pelmicrite (MF type B 5), Upper Rhaetian “Reef limestone” Brünnstein–Auerbach region/Lower Inn Valley.

– MATZNER (1986): pl 8, fig. 11, oolitic packstone–grainstone (MF–6), transition from the Dachstein reef limestones to the Zlambach Formation; locality: “Am Kleinen Zwicker”, Steiermark/Austria.

– BÖHM (1986): pl. 34, fig. 2 (grapestone facies) and fig. 5 (oolite with *Triasina hantkeni* and *Trochammina* sp.); locality: Grimming, Steiermark/Austria.

Concerning the occurrences at Grimming, BÖHM (1986) notes, that the oolitic facies only is reported from the Rhaetian “*when no reef was present to shelter the lagoon and ooid bar could develop*”. The well-agitated facies types with remains of *Coptocampylodon*? *rhaeticus* n.sp. figured by MATZNER (1986) and BÖHM (1986) are directly comparable to the material presented here.

From the Upper Rhaetian “reef”-complex of the Steinplatte/Austria, STANTON & FLÜGEL (1989) were the first to recognize the specimens as “*Dasycladacean algae characterized by small spiny thalli*”. They are abundant in their “*microfacies C 12*” that “*comprises the strata overlying the relatively massive mound facies*” (capping facies) ascribed to a platform margin environment (STANTON & FLÜGEL, 1989: p. 38).

Stratigraphy: Taking into account the occurring faunal and floral elements, our samples with *Coptocampylodon*? *rhaeticus* n.sp. can be referred to the Rhaetian (e.g. GRGASOVIĆ, 1997: *Triasina hantkeni* Taxon-range-zone; DE CASTRO, 1990; SENOWBARI-DARYAN & FLÜGEL, 1993). This determination is also supported by evidence from conodonts (sample Ber 101–2: *Misikella posthernsteini* KOZUR & MOCK, Conodont colour Alteration Index 1.0 – see also BRAUN, 1998) from the Kössen Formation at the Mount Kehlstein, which at Kehlstein directly underlies the Rhaetian Dachstein Limestone.

In the western continuation, west of Lofer, the Rhaetian Dachstein limestone occurs over marls and coral limestones of the Koessen Formation (not proven by conodonts) in the same sedimentary position as at Mount Kehlstein. To the west, *Coptocampylodon*? *rhaeticus* n.sp. occurs in the Steinplatte area in the Rhaetian Dachstein limestone (STANTON & FLÜGEL, 1989). In the whole area some Rhaetian Dachstein limestones with *Coptocampylodon*? *rhaeticus* n.sp. occur as components within Late Jurassic mass-flow deposits (Kehlstein area, Schwarzbergklammbrekzie and Rofan mountains) eroded from nearby topographic rises (Trattberg Rise, e.g. Kehlstein) due to the closure of the Tethys Ocean in Jurassic times (GAWLICK et al., 1999 with references).

4. CONCLUSIONS

The calcitic “bodies“ of the microfossil *incertae sedis* *Coptocampylodon*? *rhaeticus* n.sp. are very abundant and widespread in the Rhaetian Dachstein Limestone and the “Upper Rhaetian reef limestone” of the Northern Calcareous Alps characterizing high-energy outer platform to platform margin facies. Its systematic position so far remains uncertain. The interpretation as possible secondary ramifications of *Triploporella* species such as *T.*? *neocomiensis* (RADOIČIĆ, 1969), assumed by previous workers for Cretaceous Coptocampylodons has to be rejected due to the findings in the Rhaetian. The calcareous remains obviously do not represent single individuals but parts representing an unknown function of a larger organism of unknown systematic position.

The determination of *Coptocampylodon*? *rhaeticus* n.sp. as a facies dependent fossil is a good aid for determining the palaeogeographic position of some outcrops in the Late Triassic of the Northern Calcareous Alps. This palaeogeography was destroyed by the later tectonic shortening (Jurassic to Eocene) with polyphase nappe formation and in later times by lateral tectonic extrusion. During these processes blocks moved towards the north and east out of their original palaeogeographic position. For reconstruction of the Late Triassic palaeogeography it is necessary to determine facies zones by clear stratigraphic data. Thus, the occurrence of *Coptocampylodon*? *rhaeticus* n.sp. in the Rhaetian Dachstein limestones may help in the reconstruction of the original Late Triassic palaeogeography. Pebbles of Rhaetian Dachstein limestone with *Coptocampylodon*? *rhaeticus* n.sp. in Late Jurassic massflow deposits show the destruction of the Late Triassic palaeogeography since the Late Jurassic and allow the reconstruction of the present day eroded Trattberg Rise.

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PLATE 1

Coptocampylodon? *rhaeticus* n.sp. from the Upper Triassic Dachstein Limestone of the Northern Calcareous Alps

1 Grainstone with abundant remains of *Coptocampylodon*? *rhaeticus* n.sp. Locality: Kehlstein, thin-section Ber 101–12, scale bar = 1 mm.

2 Grainstone to rudstone with bimodal grain-size distribution. Larger components include debris of corals and dasycladacean algae, e.g. *Diplopora adnetensis* FLÜGEL (right side). Locality: Kehlstein, thin-section Ber 101–12, scale bar = 1 mm.

3 Poorly washed packstone with sections of *Coptocampylodon*? *rhaeticus* n.sp. Locality: Rofan Mountains/Tyrol, thin-section RF 1–01, scale bar = 0.5 mm.

4 Grainstone with *Coptocampylodon*? *rhaeticus* n.sp. and involutinid foraminifera. Locality: Kehlstein, thin-section Ber 101–1A, scale bar = 1 mm.

5 Ooid grainstone with cross-section of *Coptocampylodon*? *rhaeticus* n.sp. with irregular inner surface, holotype. Locality: Kehlstein, thin-section Ber 101–4A, scale bar = 0.5 mm.

6, 7 Grainstone with cross-sections of *Coptocampylodon*? *rhaeticus* n.sp. Locality: Kehlstein, thin-section Ber 101–12, scale bar = 0.5 mm.

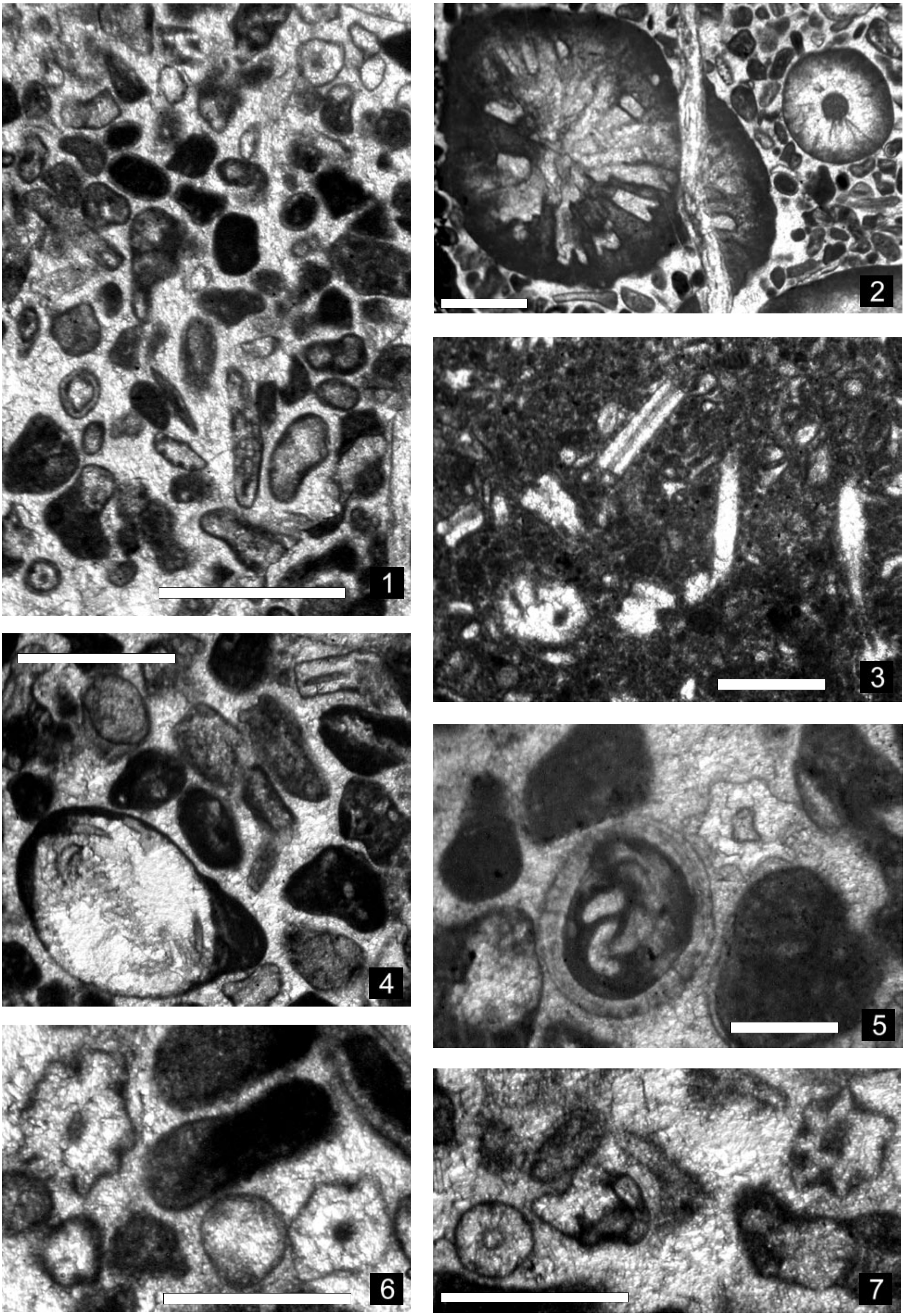
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PLATE 2

Coptocampylodon? *rhaeticus* n.sp. from the Upper Triassic Dachstein Limestone of the Northern Calcareous Alps

1–2 Cross-section. Locality: Kehlstein, thin-section Ber 101–1A, scale bars = 0.2 mm.

3 Cross-section. Locality: Kehlstein, thin-section Ber 101–1A–1, scale bar = 0.2 mm.

4, 6 Cross-section. Locality: Kehlstein, thin-section Ber 101–12, scale bar = 0.2 mm.

5 Cross-section. Locality: Lofer Kalvarienberg, thin-section KS 79 A, scale bar = 0.2 mm.

7 Longitudinal section with axial hollow. Locality: Kehlstein, thin-section Ber 101–4B, scale bar = 0.2 mm.

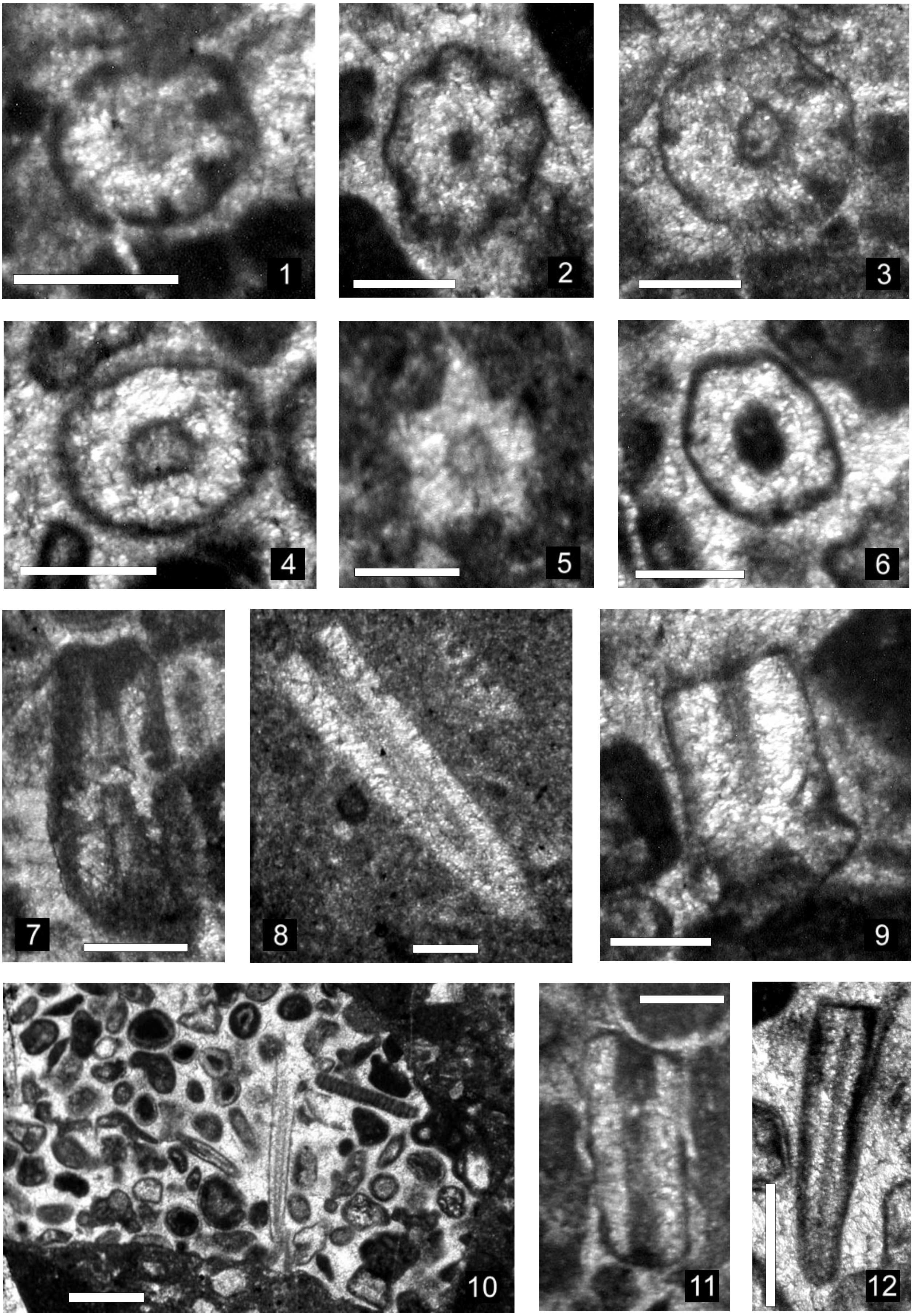
8 Longitudinal oblique section. Locality: Lofer Kalvarienberg, thin-section KS 79 A, scale bar = 0.2 mm.

9 Fragment possibly showing the transition between the smooth cylindrical part and the furrowed part. Locality: Kehlstein, thin-section Ber 101–1A, scale bar = 0.2 mm.

10 Variously oriented sections. Locality: Kehlstein, thin-section Ber 101–12, scale bar = 0.5 mm.

11 Longitudinal section of broken fragment. Locality: Kehlstein, thin-section Ber 101–4A, scale bar = 0.2 mm.

12 Longitudinal section with central hollow. Locality: Kehlstein, thin-section Ber 101–12, scale bar = 0.5 mm.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