AUSTRIAN JOURNAL OF EARTH SCIENCES
[MITTEILUNGEN DER ÖSTERREICHISCHEN GEOLOGISCHEN GESELLSCHAFT]

AN INTERNATIONAL JOURNAL OF THE AUSTRIAN GEOLOGICAL SOCIETY

VOLUME 95/96 2002/03 2004

EDITING: Grasemann Bernhard, Wagreich Michael
PUBLISHER: Österreichische Geologische Gesellschaft
Rasumofskygasse 23, A-1031 Wien
TYPESETTER: Irnberger Norbert, irnberger.net
PRINTER: Copy-Shop Urban
Bahnstraße 26a, 2130 Mistelbach
ISSN 0251-7493

Austrian Journal of Earth Sciences | Volume 95/96 | 37 - 45 | Vienna | 2004

Murania reitneri n. sp., a new sclerosponge from the Upper Jurassic of the Northern Calcareous Alps (Plassen Formation, Austria and Germany)

Felix SCHLAGINTWEIT

Lerchenauerstr. 167, 80935 München, Germany, Email: EF.Schlagintweit@t-online.de

KEYWORDS

Sclerosponges
Upper Jurassic
Plassen Formation
Northern Calcareous Alps
Austria
Germany

Abstract

The Plassen Formation (Kimmeridgian-Berriasian) of the Northern Calcareous Alps, the so-called Upper Kimmeridgian "reefal" facies, is rich in sponges and corals. A new sclerosponge is described as *Murania reitneri* n. sp. from (1) the Upper Kimmeridgian of the Krahstein near Bad Mitterndorf, (2) the Falkenstein at Lake St. Wolfgang, (3) the Litzelkogel near Lofer (all Austria), and (4) the Untersberg (Germany). Due to morphological affinities, *M. reitneri* n. sp. can be considered an Upper Jurassic fore-runner of the Lower Cretaceous type-species *Murania lefeldi* Kazmierzcak. In the Upper Kimmeridgian reefal limestones of the Plassen Formation, *Murania reitneri* n. sp. forms flat crusts upon metazoan bioclasts in platform margin to fore-reef and upper slope deposits, and rare occurrences within back-reef facies. This is the first record of the genus *Murania* from the Jurassic.

1. Introduction

For the Jurassic period, many different kinds of reef types have most frequently been reported from the Oxfordian-Kimmeridgian interval (Leinfelder et al., 2002: Fig. 7). According to these authors (p. 485), reefs were rare on the southern Tethyan margin during the Kimmeridgian. The Northern Calcareous Alps are part of the so-called southern Tethyan domain ("Adria-Apulia"), and debris-rich stromatoporoid-chaetetid-coral reefs have been reported from various localities of the Plassen Formation (Fenninger and Holzer, 1972; Steiger and Wurm, 1980; Dya, 1992; Schlagintweit et al., 2003). The dominance or high numerical density of stromatoporoids and chaetetids differentiates the shallow-water Adria-Apulia reefs from those of the northern Tethyan domain (Leinfelder et al., 2002: p. 508). Taking a closer look at the literature data, it can be stated that stromatoporoids described from the Northern Calcareous Alps (e.g. Fenninger et al., 1963; Fenninger and Hötzl, 1965; Fenninger, 1969) are not exclusively from platform margin deposits, but also from inner platform facies. Data for Alpine Upper Jurassic stromatoporoids are available from the works of Flügel (1964), Steiger and Wurm (1980) and Dya (1992). Recent reinvestigations of many of these occurrences of the Plassen Formation have shown that calcified sponges (including coralline sponges) represent abundant and typical constituents of the Alpine Upper Jurassic "reefs". A new sclerosponge has been detected, introduced here as Murania reitneri n. sp.

2. Geological Setting

The type-locality of the new sclerosponge *Murania reitneri* n. sp. is at Mount Krahstein east of Bad Mitterndorf in the Styrian Salzkammergut of Austria. The Upper Jurassic shallow water

Species	References	Remarks
Actinostromaria shimizui Yabe and Sugiyama 1935	(1) (2)	Other occurrences in the PF of Untersberg (fide Dya, 1992)
Actinostromaria tokadiense (Yabe and Sugiyama 1935)	(1)	
Consinocodium japonicum Endo 1961	(1) (3)	Only known from the type-locality (Torinosu Limestone, Japan)
Cornyella? sp.	(4)	
Cylicopsis verticalis Turnsek	(3)	Other occurrences in the PF of Untersberg, Plassen
Milleporidium kitaminensis Hashimoto 1960	(1)	
Murania reitneri n. sp.	(4)	Other occurrences in the PF of Untersberg, Falkenstein/Lake St. Wolfgang
Neuropora lusitanica Termier and Termier 1985	(3)	Other occurrences in the PF of Trisselwand, Untersberg
Peronidella sp.	(4)	
Pseudoseptifer spengleri (Heritsch 1921)	(1) (2) (4)	= *Bauneia* sp. aff. *multitabulata* (Deninger), Flügel (1964: Pl. 12, fig. 6), type locality is Mt. Plassen
Ptychochaetetes globosus Koechlin 1947	(2)	
"Sclerosponge" sensu Koch et al. 1994 (presumably = Bryozoe 1 Radoicic of Fenninger and Holzer 1972)	(3)	Ubiquistic form in the Alpine PF (e.g. Falkenstein/Schwarzau, Plassen, Untersberg, Trisselwand)
Spongiomorpha asiatica Yabe and Sugiyama	(2) (4)	Other occurrences: Tressenstein (Fenninger, Flügel and Hötzl, 1963), Sandling (Fenninger, 1969)
Stromatopora (Parastromatopora) memorianaumanni Yabe and Sugiyama 1935	(1)	
Thalamopora lusitanica Termier 1985	(3)	Other occurrences in the PF of Untersberg, Falkenstein/Schwarzau, Falkenstein /Lake St. Wolfgang

Table 1: Stromatoporoids, calcified sponges (including sclerosponges) and chaetetids from the Upper Kimmeridgian Plassen Formation (PF) of the Krahstein in alphabetical order. References: (1) Flügel (1964) (2) Steiger and Wurm (1980) (3) Schlagintweit et al. (2003) (4) this work. PF = Plassen Formation.

Plassen Formation of this locality is well known since the works of Flügel (1964) and Steiger and Wurm (1980). As part of a revisit to the most important localities of the Plassen Formation in the Northern Calcareous Alps, i.e. the Krahstein has been re-investigated (Schlagintweit et al., 2003). The Plassen Formation evolves from cherty basinal sediments (e.g. spiculites, radiolarites) of Callovian to Oxfordian age to *Saccocoma*- and microfilament-bearing limestones followed by slope deposits with siliceous and calcified sponges, peloidal microbial crusts and calcisphaerulids. In addition to the new species *Murania reitneri* n. sp., other calcified sponges include (1) *Thalamopora lusitanica* Termier and Termier, (2) *Cylicopsis verticalis* Turnsek, (3) *Neuropora lusitanica* Termier and Termier, (4) *Peronidella* sp. and (5) *Cornyella*? sp (see tab. 1). The most frequent taxa, however, co-occurring with *Murania reitneri* n. sp. are (1) *Consinocodium japonicum* Endo, (2) *Spongiomorpha asiatica* Yabe and Sugiyama and (3) the problematic sponge *Radiomura cautica* Senowbari-Daryan and Schäfer. Upsection, coral-rich debris facies contain a rich association of dasycladales and other facies-diagnostic microfossils. The youngest outcropping sediments of the Plassen Formation are represented by back-reef deposits interfingering with oncoidal *Labyrinthina*-limestones. The Plassen Formation of Mt. Krahstein therefore represents a typical shallowing upwards succession. Tithonian or Berriasian sediments, known, for example, from the Plassen or other localities (e.g. Schlagintweit et al., 2003), are absent at the Krahstein.

The other localities besides the type locality where Murania reitneri n. sp. has been detected are listed below; for further details the reader is referred to the literature cited.

Falkenstein: The Falkenstein (altitude 717 m) is located at the eastern side of Lake St. Wolfgang, Salzkammergut of Austria and is composed of the Upper Jurassic Plassen Formation. For the sample locations of UK-6 and -116 see figure 2 in Kügler et al. (2003). Age: (Late) Kimmeridgian.

Litzelkogel: The Litzelkogel (altitude 1625 m) and the Gerhardstein (altitude 1536 m) near Lofer form a plateau that consists of Upper Jurassic shallow water limestones (Ferneck, 1962, Dya 1992). It is located a few kilometres southeast of Lofer. *Murania reitneri* n. sp. occurs together with microbial crusts, *Lithocodium aggregatum* Elliott, *Thaumatoporella parvovesiculifera* (Raineri), encrusting foraminifera and *Protopeneroplis* sp. No exact age can be given.

Untersberg: The samples were collected along the ski run at the Salzburger Hochthron at Mt. Untersberg, Germany (= locality 4 in Dya, 1992). The microfacies is comparable to the Krahstein. Age: Late Kimmeridgian or Early Tithonian according to Dya (1992).

3. Systematic Palaeontology

The suprageneric classification of the genus *Murania* Kazmierczak differs from author to author. For further discussions see Kazmierczak (1974), Termier et al. (1977) and Reitner (1992).

Phylum Porifera Grant, 1872
Genus ***Murania*** *Kazmierzcak, 1974*
Murania reitneri *n. sp.*
(Pl. 1, figs. 1-3, pl. 2, figs. 1-7).

? 1991 Microproblematicum MP 2 Fürsich and Werner: 41, fig. 5f, Kimmeridgian of the Lusitanian Basin/Portugal.

Derivation of the name: In honour of Prof. Joachim Reitner (University of Göttingen) for his contributions to the palaeobiology of fossil sponges.

Holotype: The specimen shown on plate 1, fig. 1; details of the specimen are shown on plate 1, fig. 3 and plate 2, fig. 6-7. The holotype and another thin-section from the type-locality are housed at the "Bayerische Staatssammlung für Paläontologie und historische Geologie", Munich under the inventory numbers BSP 2003 X-5 and -6. Paratypes: Specimens figured on plate 2, fig. 1-5.

Locus typicus: Mount Krahstein, Styrian Salzkammergut of Austria. Limestones cropping out in the curve of the forest way, about 170 m NNE of the summit, about 1540 m above sea level (Fig. 2), topographic map of Austria ÖK 96 Bad Mitterndorf, 1 : 50.000. The geographic coordinates are 13° 59´ longitude and 47° 34´ latitude.

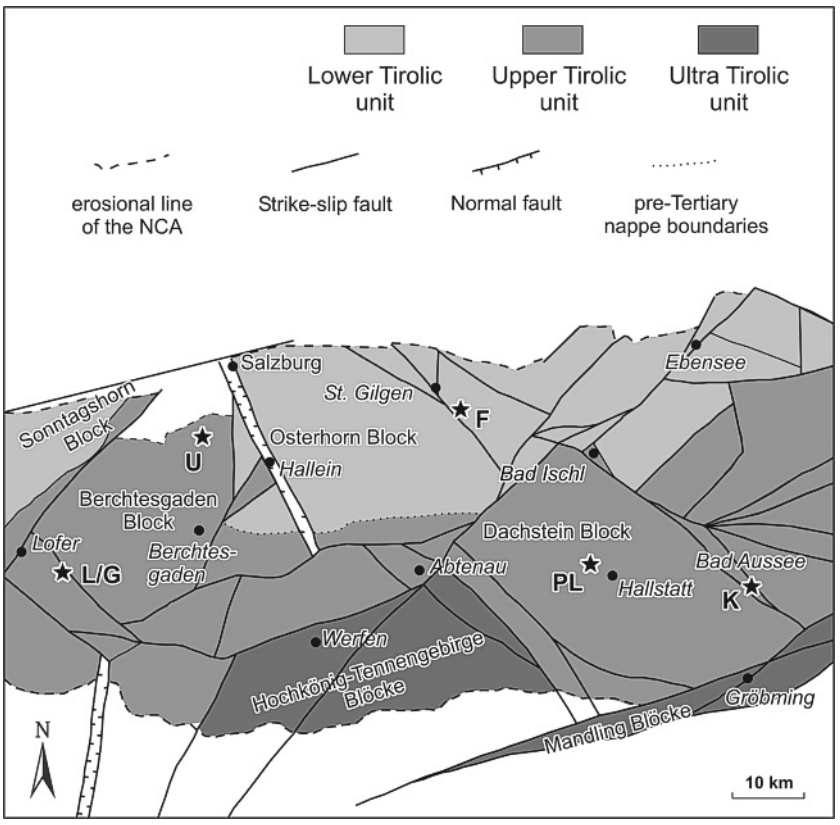


Figure 1: Recent tectonic block configuration of the central part of the Northern Calcareous Alps after Frisch and Gawlick (2003) with type-locality of the Plassen Formation (Pl) and occurrences of *Murania reitneri* n. sp., K = Krahstein, L/G = Litzelkogel-Gerhardstein, F = Falkenstein, U = Untersberg.

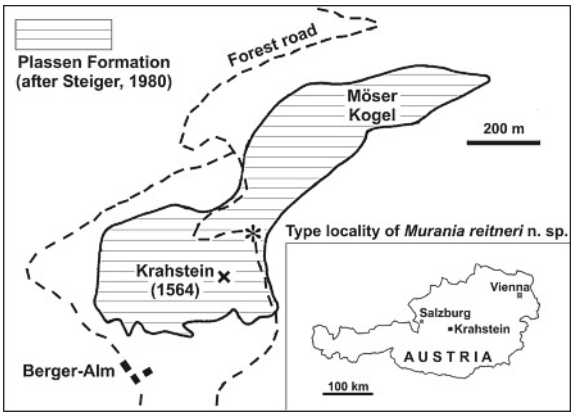


Figure 2: Schematic map of the area of the Krahstein (Styria, Austria) and outcrops of the Plassen Formation after Steiger (1980).

Stratum typicum: White coloured limestones of the Plassen Formation corresponding to the "reef-facies" of Steiger and Wurm (1980: facies map in fig. 4). In the sample containing the holotype, *Murania reitneri* n. sp. occurs together with *Lithocodium aggregatum* Elliott, both encrusting *Spongiomorpha asiatica* Yabe and Sugiyama. In addition, remains of *Tubiphytes* and the calcified sponge *Cornyella*? sp. and the problematic alga *Consinocodium japonicum* Endo are present. Due to the occurrence of the dasycladales *Clypeina sulcata* (Alth), *Thrysoporella pseudoperplexa* Granier and Braik, *Petrascula bursiformis* (Ettalon) and the benthic foraminifera *Labyrinthina mirabilis* Weynschenk in higher parts of the type-section, the reefal limestones have been assigned to the Upper Kimmeridgian (Schlagintweit et al., 2003).

Diagnosis: Solid crusts composed of close-set columns of small diameter. Plumos spicular skeleton consisting of short subtylostyle sclerites. Due to the smaller dimensions, it is distinguished from the Lower Cretaceous *M. lefeldi* Kazmierczak (type-species). The morphological appearance, however, resembles the type-species from the Aptian of the Slovakian Tatra Mountains.

Description: Massive encrusting calcareous skeleton consisting of close-set (sub)parallel columns (diameter 0.16-0.32 mm) that are arranged more or less vertically with respect to the substratum. Depending on the substrate surface, the columns may also show radial arrangement (e.g. pl. 2, fig. 3). In thin-section, the skeleton appears as yellowish calcite. At their distal ends, the columns taper and may become independently from each others. In cross-sections, the columns clearly display a polygonal (mostly pentagonal and hexagonal) shape (pl. 2, fig. 1-2). The contact between adjacent columns is marked by a somewhat darker microsparitic line. Sometimes the crusts alternate with *Lithocodium aggregatum* Elliott (pl. 1, fig. 1). The basal skeleton is made up of thin subtylostyle spicules (length: 96-296 µm, mean 177 µm) arranged in a fan-shape around the central axis of each column, and subparallel to the calcite fibres of the skeleton (= axinellide structure, e.g. Reitner and Keupp, 1989: p. 75). The spicules are arranged at low angle with respect to the longitudinal axis of the columns, sometimes more or less subparallel. In the distal portion, the spicule casts are filled with dark micrite that, according to Reitner (1992), is an indication of their very early diagenetic solution.

Remarks and differences: Following Reitner and Keupp (1989), *Murania* represents a coralline sponge with a basal skeleton crust lacking any clear vertical or horizontal structural elements. "However, numerous close-set crusts can form solid, lamellar bodies. The soft part obviously lived only in the outermost, uncalcified zone. In Mesozoic reefs *Murania* partly played an important role in the cementation of framebuilding organisms. It disappeared with the increasing occurrence of coralline red algae during Mid- to Upper Cretaceous times" (op. cit., p. 75, translated).

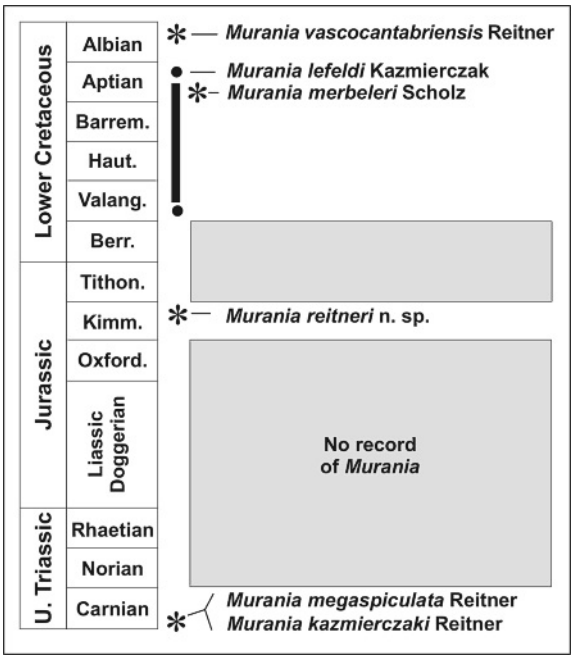


Figure 3: Stratigraphic occurrences of different representatives of *Murania* Kazmierczak.

In total, 5 species of the genus *Murania* Kazmierzcak have been described, up to now, from the Upper Triassic and the Lower Cretaceous (see Table 2). The oldest representatives are from the Lower Carnian of the Dolomites/Italy, the youngest species *M. vascocantabriensis* has been described from the Upper Albian of N-Spain. According to literature data, the type species is known from the Hauterivian to Aptian (Kazmierzak, 1974; Masse and Termier, 1992). Thus, the occurrence of *Murania reitneri* n. sp. in the Upper Kimmeridgian is the first report within this long-lasting time period from the Upper Carnian to the Valanginian, where no representatives of *Murania* are hitherto reported. Only *Murania lefeldi* has been reported from various locations (Aptian of Tatra Mountains/Slovakia, type-locality; Lower Aptian Schrattenkalk of Allgäu/S-Germany, Scholz, 1984; Hauterivian and Barremian of S-France, Masse and Termier, 1992; Lower Cretaceous of the Gulf of Mexico, Reitner, 1992). All other species are so far known only from their type-localities. Due to the general morphology, the diameter of columns or the dimensions of the spicules, *Murania reitneri* n. sp. is similar to the type-species *Murania lefeldi*. The smaller height of the crust is not necessarily a clear distinguishing criteria that could only be either an effect of different growth stages or just incidental sampling. In general, the diameter of the columns is smaller in *Murania reitneri* n. sp., never exceeding 0.32 mm (mean value 0.24 mm). Additionally, in

Species	Occurrence	General morphology	Dimensions (cm)	Diameter of columns (mm)	Spicules (µm)
Murania lefeldi Kazmierczak 1974	Aptian of Tatra Mountains, Slovakia	Crust-formig	height < 0.4	0.25 -0.5 mean: 0.3 Scholz, 1984: 0,3-0,6 mm	L: 150-220 mean: 200 D: 28-33 mean: 30
Murania merbeleri Scholz 1984	Lower Aptian of Vorarlberg	branching	width up to 17 height up to 12	0.3 – 0.6	L: > 400 D: 20–30
Murania vascocantabriensis Reitner 1992	Upper Albian of N-Spain		width 0.23 height 0.25	0.3-0.6 mean: 0.45	L: 300-600 mean: 400 D: 20-35
Murania kazmierczaki Reitner 1992	Lower Carnian of Dolomites, N-Italy	Crust forming	width 3.5 height 9	About 0.25-0.32	L: 125-150
Murania megaspiculata Reitner 1992	Lower Carnian of Dolomites, N-Italy	One single, prominent column	See: Diameter of column	width: about 1.3 height: > 3	L: 600-1200 mean: 1000 D: 40-80
Murania reitneri n. sp.	Upper Kimmeridgian of NCA, Austria	Crust-forming	width up to 1.5 height up to 0.21	0.16-0.32 mean: 0.24	L: 96-296 mean: 177 D: 24-40

Table 2: Comparative table of different *Murania* species.

Murania lefeldi, the spicules are arranged more oblique to the longitudinal column axis with angles of 30° to 40° (see Text-fig. 1 in Kazmierczak, 1974). The inner spicular zone of *Murania lefeldi* often shows a "dark coloration" in contrast to the outer part, a phenomenon so far not observed in *Murania reitneri* n. sp. Although stratigraphic positions alone should not be taken for differentiation of species, there is a considerable time-span between the oldest known occurrences of *M. lefeldi* in the Hauterivian (Masse and Termier, 1992) and the Upper Kimmeridgian findings of *M. reitneri* n. sp.

4. Conclusions

Murania reitneri n. sp. is the first report of the genus *Murania* Kazmierczak 1974 from Jurassic strata. For the time period between the Upper Carnian to Valanginian, the genus *Murania* has hitherto not been recorded. The occurrence of *Murania reitneri* n. sp. in the Upper Kimmeridgian of the Northern Calcareous Alps coincides with the Upper Jurassic peak of coral-stromatoporoid and microbial reef types (Leinfelder et al., 2002: Fig. 7). Within the Lower and Middle Jurassic, microbial reefs are almost completely absent and coral-stromatoporoid reefs are rare to very rare with regionally restricted occurrences (op. cit.). In the Alpine Plassen Formation, the new species occurs within a comparably rich association of calcified sponges and corals of subordinate importance. It is also associated with a diverse assemblage of micro-encrusters and with microbial crusts. Taking into account all data from the different Alpine occurrences, *Murania reitneri* n. sp. is typically found in outer platform facies, including back-reef facies (rare), reef facies and fore-reefal to upper slope deposits (most common). Here, together with other encrusting taxa *Murania reitneri* n. sp. played an important role in the cementation of framebuilding organisms.

Acknowledgements:

The samples of the Krahstein have been taken and provided by Dr. O. Ebli (c/o University of Munich), those from the Falkenstein by U. Kügler (c/o University of Leoben). Logistical support of H.-J. Gawlick (c/o University of Leoben) is kindly acknowledged. To whom it may concern: thanks to an anonymous intimate sponge specialist for helpful remarks. Mike Edwards (Vienna) improved the English.

References:

Dya, M., 1992. Mikropaläontologische und fazielle Untersuchungen im Oberjura zwischen Salzburg und Lofer. PhD Thesis, Technical University of Berlin, 137 pp.

Fenninger, A., 1969. Die Hydrozoenfauna des Sandling (Kimmeridgium, Nördliche Kalkalpen). Anzeiger der österreichischen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse, 106. Jahrgang, 33-35.

Fenninger, A. and Holzer, A., 1972. Fazies und Paläogeographie des oberostalpinen Malms. Mitteilungen der Österreichischen Geologischen Gesellschaft, 63, 52-141.

Fenninger, A., Flügel, H. and Hötzl, H., 1963. Bericht über paläontologisch-mikrofazielle Untersuchungen an ostalpinen Plassenkalken s.l. Anzeiger der österreichischen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse, 100, 324-327.

Fenninger, A. and Hötzl, H., 1965. Die Hydrozoa und Tabulozoa der Tressenstein- und Plassenkalke (Ober-Jura). Mitteilungen des Museums für Bergbau, Geologie und Technik am Landesmuseum "Joanneum", Graz, 27, 1-63.

Ferneck, F.E., 1962. Stratigraphie und Fazies im Gebiet der mittleren Saalach und des Reiteralm-Gebirges: ein Beitrag zur Deckenfrage in den Berchtesgadener Alpen. PhD Thesis, Technical University of Munich, 107 pp.

Flügel, E., 1964. Ein neues Vorkommen von Plassenkalk (Ober-Jura) im Steirischen Salzkammergut, Österreich. Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 120/2, 213-232.

Frisch, W. and Gawlick, H.-J., 2003. The nappe structure of the central Northern Calcareous Alps and its disintegration during Miocene tectonic extrusion a contribution to understanding the orogenic evolution of the Eastern Alps. International Journal of Earth Sciences, 92, 712-727.

Fürsich, F.T. and Werner, W., 1991. Palaeocecology of coralline sponge-coral meadows from the Upper Jurassic of Portugal. Paläontologische Zeitschrift, 65/1-2, 35-69.

Kazmierczak, J., 1974. Lower Cretaceous Sclerosponge from the Slovakian Tatra Mountains. Palaontology, 17/2, 341-347.

Kügler, U., Schlagintweit, F., Suzuki, H. and Gawlick, H.-J., 2003. Stratigraphie und Fazies des höheren Mittel- bis Ober-Jura im Bereich des Falkensteinzuges am Wolfgangsee, Salzkammergut (Österreich) mit besonderer Berücksichtigung der Plassen-Formation (Kimmeridgium). In: Weidinger, J.T., Lobitzer, H. and Spitzbart, I. (Editors), Beiträge zur Geologie des Salzkammergutes, Gmundner Geo-Studien, 2, 97-106.

Leinfelder, R.R., Schmid, D.U., Nose, M. and Werner, W., 2002. Jurassic reef patterns the expression of a changing globe. In: Kießling, W., Flügel, E. and Golonka, J. (Editors), Phanerozoic Reef Patterns, SEPM Special Publication, 72, 465-520.

Masse, J.-P. and Termier, G., 1992. Les spongiaires du Crétacé inférieur (Hauterivien-Aptien inférieur) de Provence (Sud-Est de la France). Géologie Méditerranéenne, 19/2, 89-123.

Reitner, J., 1992. « Coralline Spongien » - Der Versuch einer phylogenetisch-taxonomischen Analyse. Berliner geowissenschaftliche Abhandlungen, E, 1, 1-352.

Reitner, J. and Keupp, H., 1989. Basalskelette bei Schwämmen Beispiel einer polyphyletischen Entwicklung. Die Geowissenschaften, 3, 71-78.

Schlagintweit, F., Gawlick, H.-J., Ebli, O., Rünstler, H. and Suzuki, H., 2003. Die Plassen-Formation (Kimmeridgium) des Krahstein (Steirisches Salzkammergut, Österreich) und deren Unterlagerung: Neue Daten zur Fazies, Biostratigraphie und Sedimentologie. In: Weidinger, J.T., Lobitzer, H. and Spitzbart, I. (Editors), Beiträge zur Geologie des Salzkammergutes, Gmundner Geo-Studien, 2, 87-96.

Scholz, H., 1984. Sklerospongien aus dem Allgäuer Schrattenkalk. Neues Jahrbuch für Geologie und Paläontologie, Monatshefte, 10, 635-643.

Steiger, T., 1980. Geologische Aufnahme des Zauchenbachtales und des Krahstein-Massivs am Südrand des Toten Gebirges N´ Bad Mitterndorf (Nördliche Kalkalpen, Steirisches Salzkammergut, Österreich). Mitteilungen der Gesellschaft der Geologie- und Bergbaustudenten Österreichs, 36, 213-245.

Steiger, T. and Wurm, D., 1980. Faziesmuster oberjurassischer Plattform-Karbonate (Plassen-Kalke, Nördliche Kalkalpen, Steirisches Salzkammergut, Österreich). Facies, 2, 241-284.

Termier, G., Termier, H. and Vachard, D., 1977. Etude comparative de quelques Ischyrosponges. Géologie Méditerranéenne, 6/2, 139-180.

Wood, R.A. and Reitner, J., 1986. Poriferan affinites of Mesozoic stromatoporoids. Palaeontology, 29/3, 469-473.

Received: 11. October 2003
Accepted: 23. April 2004

Felix SCHLAGINTWEIT

Lerchenauerstr. 167, 80935 München, Germany,
Email: EF.Schlagintweit@t-online.de

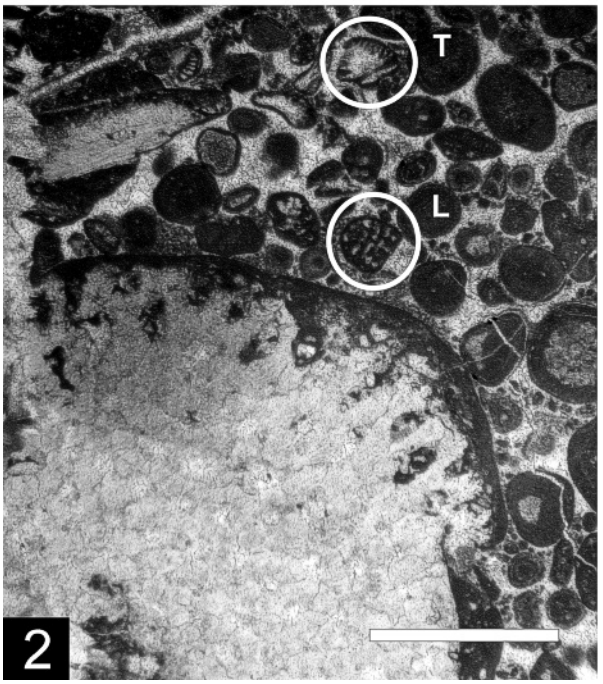
Plate 1 Murania reitneri n. sp. from the Upper Jurassic Plassen Formation of the Northern Calcareous Alps

Figure 1: Longitudinal section, holotype. Note growth interruption and encrusting association with *Lithocodium aggegatum* Elliott. Locality Krahstein, thin-section BSP 2003 X-5, scale bar = 1 mm.

Figure 2: Oblique section within high energetic platform margin facies containing numerous benthic foraminifera amongst *Trocholina* cf. *alpina* (Leupold) (T) and *Labyrinthina mirabilis* Weynschenk (L). Locality Falkenstein, Lake St. Wolfgang, thin-section UK 116, scale bar = 1 mm.

Figure 3: Detail of figure 1 (holotype), showing spiculae with mainly subparallel arrangement towards column axis. Locality Krahstein, thin-section BSP 2003 X-5, scale bar = 0.3 mm.


1


T
L
2

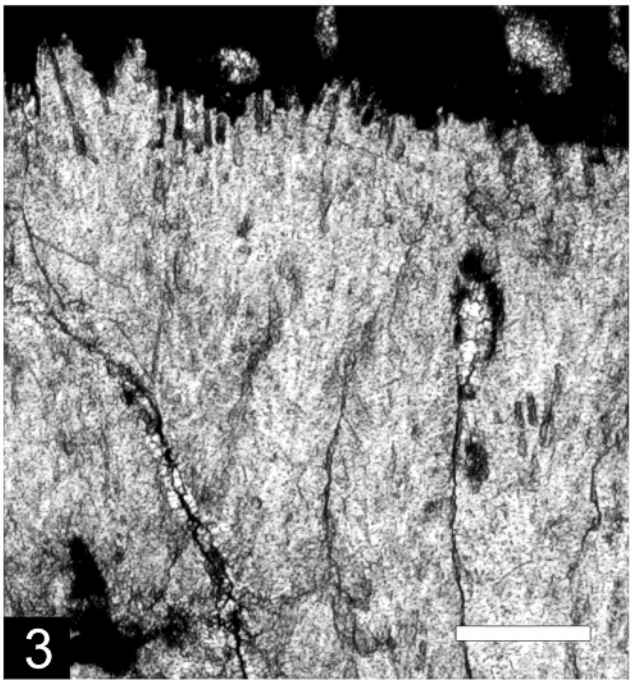

3

Plate II Murania reitneri n. sp. from the Upper Jurassic Plassen Formation of the Northern Calcareous Alps

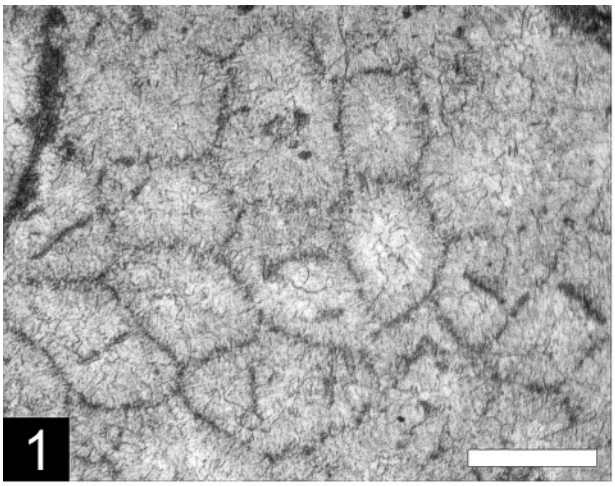
Figure 1: Transverse section through columns showing polygonal shapes. Locality Litzelkogel, thin-section LK 24-1, scale bar = 0.3 mm.

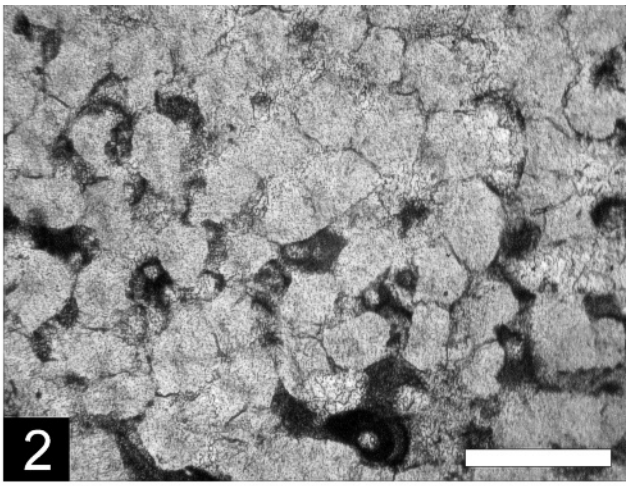
Figure 2: Transverse section through columns, detail from figure 4. Locality Falkenstein, Lake St. Wolfgang, thin-section UK 6, scale bar = 0.3 mm.

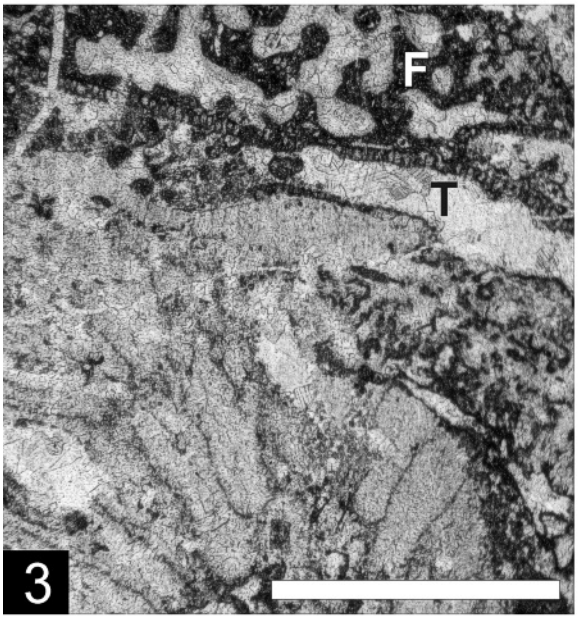
Figure 3: Longitudinal section; note following encrustation by *Thaumatoporella parvovesiculifera* (Raineri) (T) and sessile foraminifera (F). Locality Litzelkogel, thin-section LK 24-1, scale bar = 1 mm.

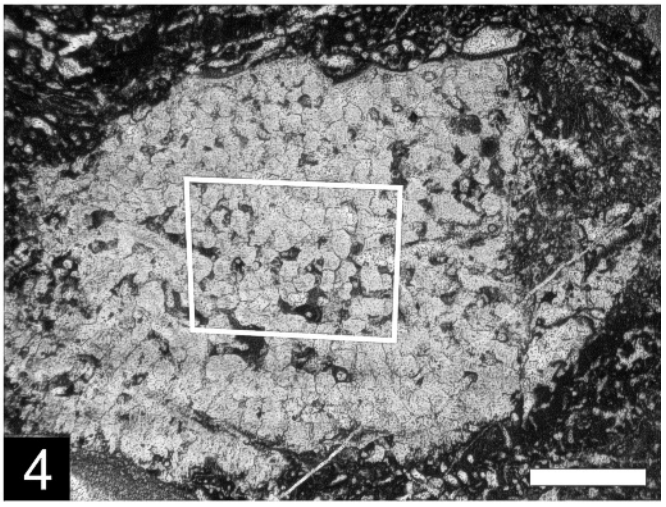
Figure 4: Transverse section. Locality Falkenstein, thin-section UK 6, scale bar = 1 mm.

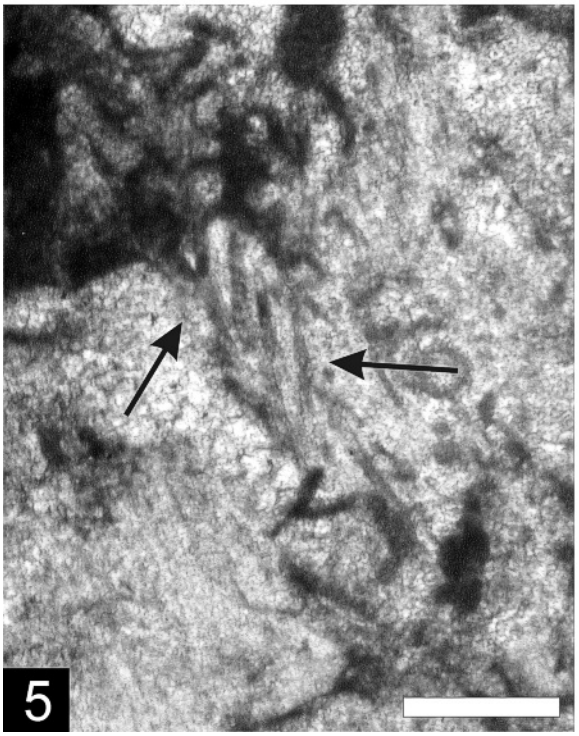
Figure 5-7: Details showing spiculae (arrows). 5: Locality Falkenstein, Lake St. Wolfgang, thin-section UK 6, scale bar = 0.3 mm; 6-7: Locality Krahstein, thin-section BSP 2003-X-5 scale bar = 0.3 mm.

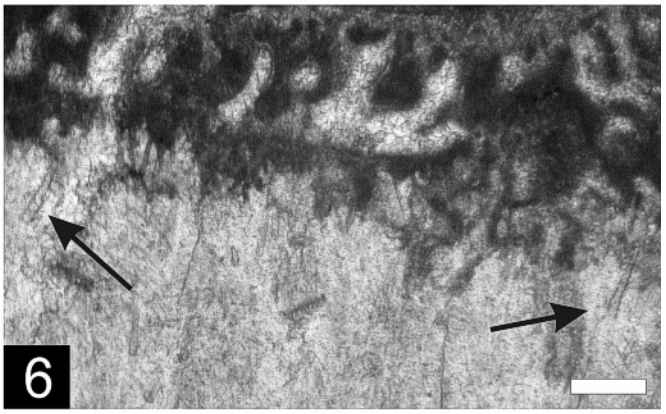

1

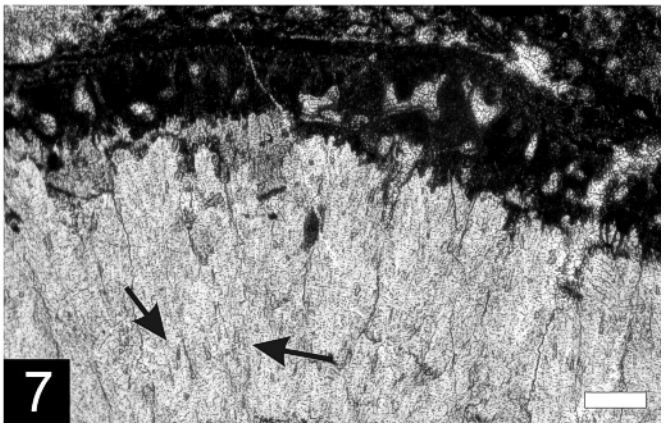

2


F
T
3


4


5


6


7