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„Subbdelloidina“ luterbacheri RIEGRAF, 1987 (Encrusting Foraminifera) from Late Jurassic to Early Cretaceous Reefal Limestones of Albania and the Northern Calcareous Alps (Austria)

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6 Text-Figures, 1 Plate

Albanien
Oberösterreich
Nördliche Kalkalpen
Oberjura
Radiolarien
Benthische Foraminiferen
Stratigrafie
Paläoökologie

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Inhalt

„Subbdelloidina“ luterbacheri RIEGRAF, 1987 (inkrustierende Foraminifere) aus Riffkalken des Ober-Jura und der Unter-Kreide von Albanien und den Nördlichen Kalkalpen (Österreich)

Zusammenfassung

„Subbdelloidina“ luterbacheri RIEGRAF, 1987 ist eine wenig bekannte inkrustierende Foraminifere, die aus dem epikontinentalen Ober-Jura von Süddeutschland beschrieben wurde. In der vorliegenden Arbeit wird die Art erstmalig aus dem Tethys-Raum, und zwar den Nördlichen Kalkalpen und den Albaniden, beschrieben. Sie tritt in umgelagerten Flachwasserkalkkomponenten innerhalb oberjurassischer Tiefwasser-Brekzien in der Gegend von Kurbneshi (Albanien), der unterkretazischen Munella-Plattform (Albanien; Munella und Mali Shengit), und in den Barmsteinkalken der Ewigen Wand bei Bad Goisern und dem Plassenkalk des Plassen und des Untersberges im Mittelabschnitt der Nördlichen Kalkalpen auf. *„Subbdelloidina“ luterbacheri* RIEGRAF, 1987 wird erstmalig auch aus der Unter-Kreide bekannt gemacht und ist insgesamt aus dem Zeitbereich Oxfordium bis Aptium nachgewiesen. Während die Art im epikontinentalen Ober-Jura von Süddeutschland im Bereich von Schwamm-Buildups vorkommt, tritt sie in den untersuchten Lokalitäten in Korallen-Stromatoporoiden-Riffkalken auf. Die ausstehende notwendige Revision der sehr nahe stehenden Gattung *Placopsilina* D'ORBIGNY, 1850 ist der Grund, weshalb *„Subbdelloidina“ luterbacheri* RIEGRAF, 1987 in der vorliegenden Arbeit in offener Nomenklatur behandelt wird.

Abstract

„Subbdelloidina“ luterbacheri RIEGRAF, 1987 represents a poorly known encrusting foraminifera, described from the epicontinental Late Jurassic of South-Germany. In the present paper, it is described for the first time from the Tethyan realm, including the Northern Calcareous Alps and the Albanides. It occurs within components of shallow water limestone clasts resedimented in Late Jurassic deep water disorganised gravels in the Kurbneshi area (Albania), the Early Cretaceous Munella platform (Albania; Munella Mts., Mali Shengit), and is reported also from the Barmstein limestones of the Ewige Wand near Bad Goisern and Plassen Formation of Mount Plassen and Mount Untersberg in the central Northern Calcareous Alps. *„Subbdelloidina“ luterbacheri* RIEGRAF, 1987 is described for the first time from the Early Cretaceous, thus, at present the known stratigraphic range extends from Oxfordian to Aptian. Whereas in the epicontinental Late Jurassic of South-Germany it occurs within sponge build-ups, it is reported from coral-stromatoporoid reefal limestones in the investigated localities, often displaced along the platform slope or within basin deposits. The necessary revision of the allied genus *Placopsilina* D'ORBIGNY, 1850 is still missing, therefore *„Subbdelloidina“ luterbacheri* RIEGRAF, 1987 is used in open nomenclature in the present paper.

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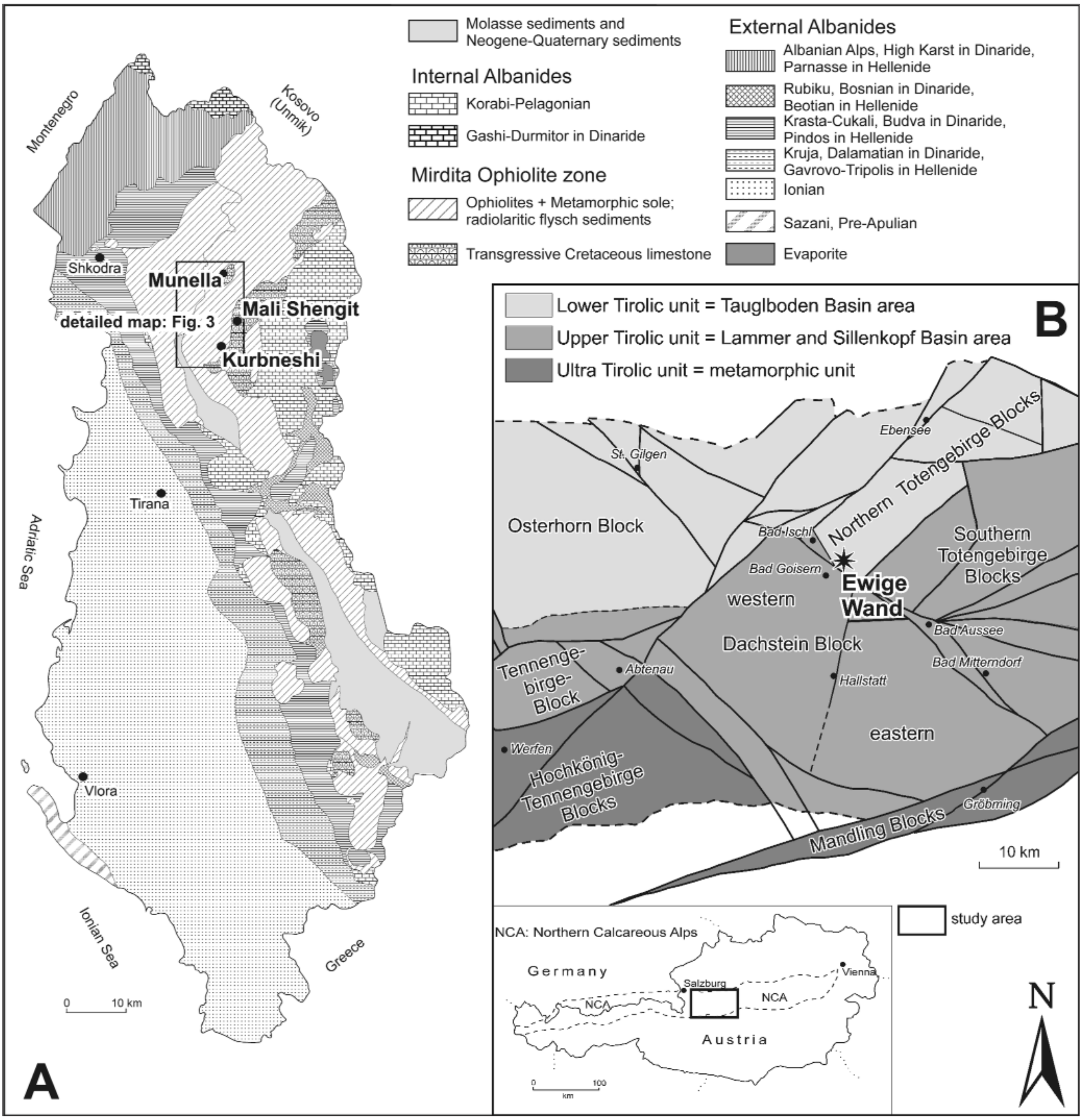
1. Introduction

New investigations in the central Albanides (Mirdita zone – e.g., Meco & Aliaj [2000], Robertson & Shallo [2000] with references therein), especially in the radiolaritic flysch sediments (= ophiolitic mèlanges – e.g. Perlat-Kurbnesh ophiolitic mèlange; see Hoxha, 2001 for explanation) and the overlying shallow water carbonates resulted in the detection of Late Jurassic reef carbonates and the reinterpretation of the ophiolitic mèlange as Middle to Late Jurassic radiolaritic flysch (Gawlick et al., 2004, 2005a, b) forming a huge relief due to accretionary processes. The Middle to Late Jurassic paleorelief in Mirdita area was sealed by a Late Jurassic to Early Cretaceous shallow water carbonate platform, deposited in a mobile tectonic environment. This scenario is very well comparable with the evolution of the carbonate clastic radiolaritic flysch basins in the Northern Calcareous Alps (Gawlick et al. [1999], Gawlick & Frisch [2003]) covered by the carbonates of the Plassen carbonate platform. The Plassen carbonate platform did not only seal the relief caused by Callovian to Oxfordian tectonics, but was also deposited in a mobile tectonic environment as to be expected in an active continental margin setting (Gawlick & Schlagintweit, 2006).

In the framework of the re-investigation of the Plassen carbonate platform in the Northern Calcareous Alps and the investigations in the central Albanides an encrusting foraminifera was found in Late Jurassic to Early Creta-



Text-Fig 1.
Investigated localities.
A) Simplified tectonic map of Albania (after Meco & Aliaj [2000], Robertson & Shallo [2000] and Xhomo et al. [2002]).
B) Tectonic map of the middle sector of the Northern Calcareous Alps (after Frisch & Gawlick, 2003).

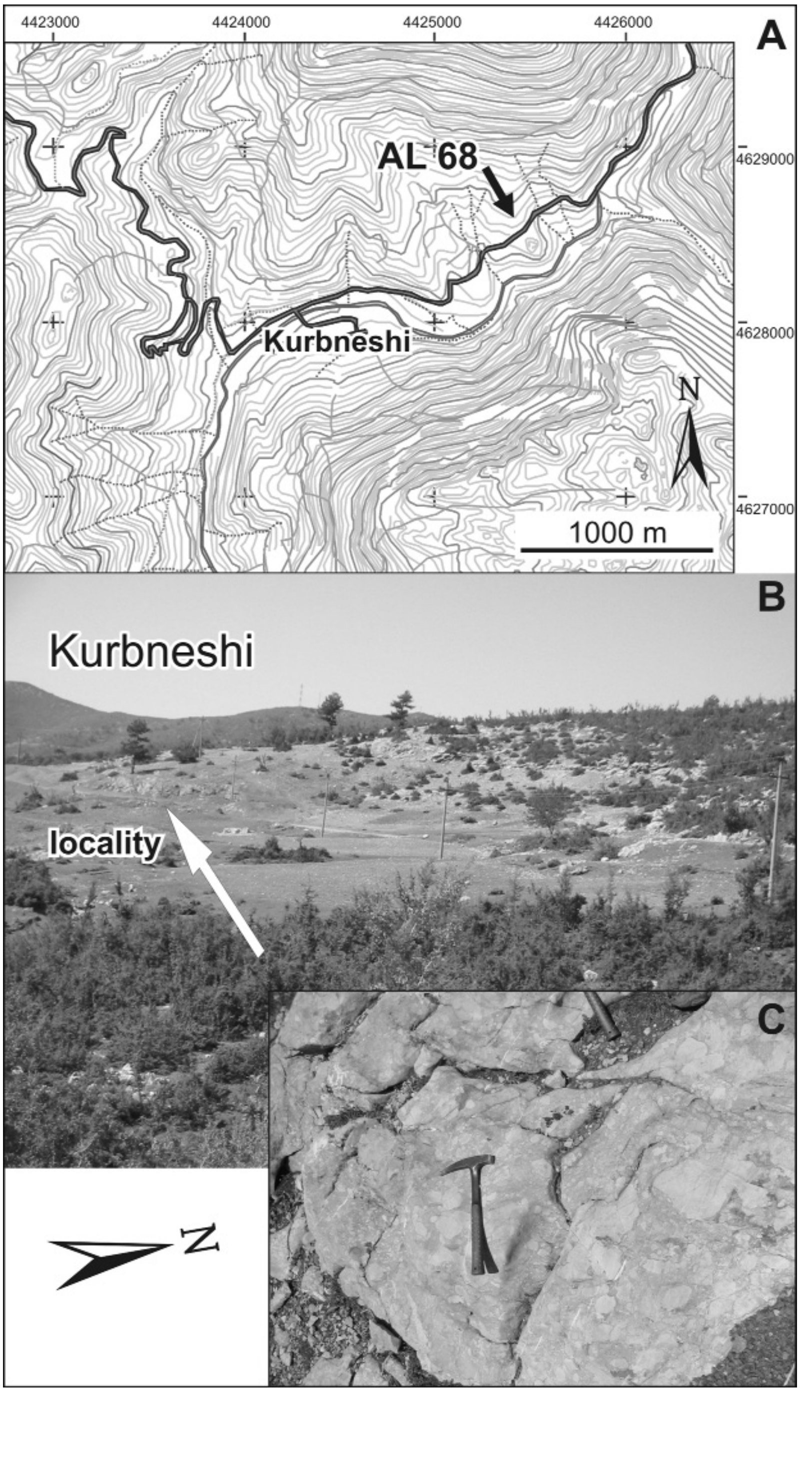
ceous reefal limestones (Fig. 1), attributed to *"Subbdelloidina" luterbacheri* RIEGRAF, 1987 originally described from the Late Jurassic of the Franconian Alb, South-Germany. In the following, new data concerning the palaeogeographic distribution, the stratigraphic range and the palaeoecological demands of this taxon are presented.

2. Geological Setting and Localities

1) Kurbneshi area, Albania
(Text-Fig. 6.5, 6.9–6.10; Pl. 1, Figs. 1–5, 7–9, 12)

In Kurbneshi area (Fig. 2), in the part of the so-called Perlat-Kurbnesh radiolaritic flysch (e.g. GAWLICK et al. 2004, 2005a, b), radiolarites, dated by means of radiolarians as Bajocian to Oxfordian (GAWLICK et al., unpublished data), are followed by series of disorganised gravels in the sense of PICKERING et al. (1989) containing incorporated Late Jurassic shallow-water limestones mainly of reefoid facies (Text-Fig. 2C), crudely determined as Kimmeridgian-Tithonian in age based on findings of *Protopeneroplis* cf. *striata* WEYNSCHENK, 1950 (Text-Fig. 6.9) and a possible fragment of *Clypeina sulcata* (ALTH, 1882; Text-Fig. 6.10). The fixo-sessile foraminifera *"Subdelloidina" luterbacheri* RIEGRAF, 1987 was found fixed to corals together with various other (micro-) encrusters including serpulids, sponges such as *Consinocodium japonicum* ENDO, 1961 (Text-Fig. 6.5; Pl. 1, Fig. 5) and the incertae sedis *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFFER, 1979 and *Koskinobullina socialis* CHERCHI & SCHROEDER, 1979. In addition, the calcareous alga *Nipponophycus ramosus* YABE & TOYAMA, 1928 , a typical reef inhabitant (e.g. SENOWBARI-DARYAN et al., 1994) occurs.

Most of the specimens figured on the present paper derive from the Kurbneshi locality.



This Late Jurassic shallow-water limestone clasts containing *"Subdelloidina" luterbacheri* RIEGRAF, 1987 derived from an unknown eroded carbonate platform not located nearer so far. Following RADOIČIĆ (1982), these clasts could be remnants of a former carbonate platform of the so-called "transitional belt", e.g. the "Durmitor Prokletije Carbonate Platform" stretching in a NW–SE belt from Montenegro to Albania (RADOIČIĆ 1982: Fig. 1). In fact, the description of RADOIČIĆ (1982: p. 18) shows analogies with the data obtained from the Kurbneshi and Munella localities: "Synsedimentary tectonic in the Kimmeridgian further reduced this Jurassic platform, so that shallow-water sedimentation continued only in the southern (external) part to the end of the Jurassic time, or into the lowermost Neocomian. Thus, it did not survive the Late Cimmerian events, which caused this platform to draw and the basinal area to expand, followed by flysch sedimentation". This discussion will be focused with more details after finishing our investigations.

2) Munella Platform (Mali i Munelles), Albania
(Pl. 1, Figs. 5, 11; Text-Fig. 6.7–6.8, 6.13)

The Munella platform (Fig. 4) is located northeast of Kurbneshi (Fig. 3). Here, the shallow water carbonates follow ophiolitic rocks that in turn are overlain by calpionellid limestones with intercalated disorganised gravels similar to the Perlat-Kurbnesh radiolaritic flysch. This flyschoid-type facies was attributed to the Berriasian and also the whole Valanginian by PEZA & MARKU (2002). With a stratigraphic gap during the Hauterivian, these deposits should be followed transgressively by Barremian and Aptian Urgonian-type shallow-water limestones. Our new investigations have shown that the Berriasian to Valanginian sediments belong to a shallowing-upwards

Text-Fig. 2.
The occurrence of *„Subbdelloidina" luterbacheri"* RIEGRAF, 1987 in the Kurbneshi area, Albania.
A) Topographic map.
B) Outcrop, road northeast of Kurbneshi.
C) Type sediment (disorganised gravel).

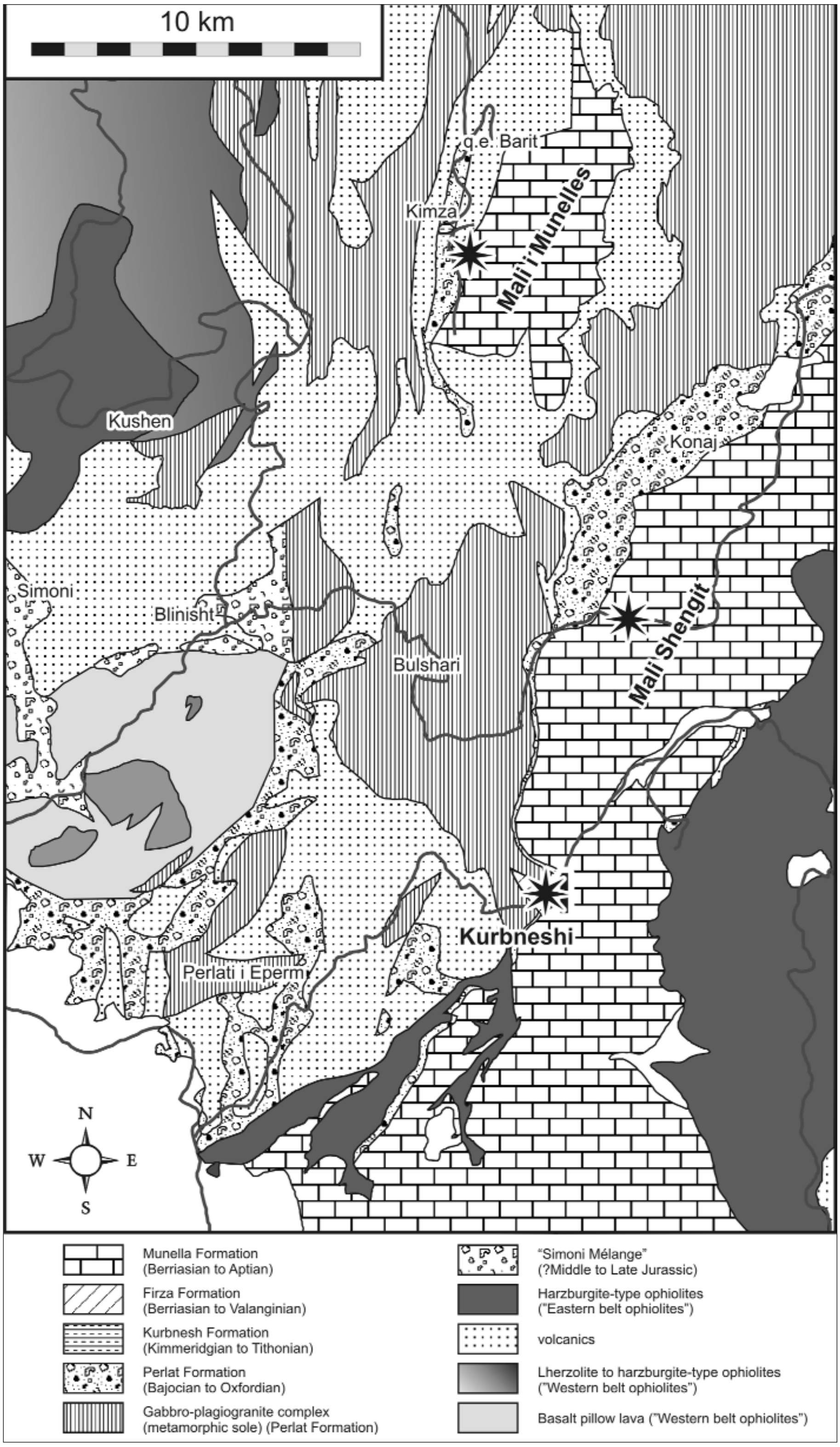
cycle finishing with Valanginian shallow-water limestones topped by an emersion surface. The latter is transgressively overlain again by shallow water limestones, Barremian and/or Aptian in age. The Valanginian limestones mainly comprise platform margin deposits with corals and stromatoporoids interfingering with back-reef and occasional lagoonal deposits of reduced thicknesses. In this paper we focus on the occurrence of *"Subdelloidina" luterbacheri* RIEGRAF, 1987 that was found in three samples; the new geological, stratigraphical and micropaleontological data obtained from the recent and still continuing investigations of the Early Cretaceous Munella carbonate platform will be published separately.

Sample Al 877 represents a coral-stromatoporoid boundstone with diverse micro-encrusters, e.g. *Radiomura cautica* SENWOBARI-DARYAN & SCHÄFER, 1979. Deposition is assumed in an outer reefal to fore-reefal environment.

Sample A-3699 represents a reddish limestone that can be classified as intraclastic packstone. *"Subdelloidina" luterbacheri* RIEGRAF, 1987 was found as isolated bioclast, detached from the original substrate. It is associated with the benthic foraminifera *Montsalevia salevensis* (ZANINETTI, SALVINI-BONNARD, CHAROLLAIS & DECROUEZ, 1987 (Text-Fig. 6.7–6.8), debris of Dasycladales (*Salpingoporella* sp.), the problematic serpulid tube *Carpathiella triangulata* MISIK, SOTAK & ZIEGLER, 1999 and representatives of the microproblematicum *Coptocampylodon* PATRULIUS, 1966. The mentioned association is assumed secondary as taphocoenosis as transportation of the foraminifera tests are assumed. Deposition is assumed in a back-reef zone with a mixing of lagoonal bioclasts.

Sample A-3705 represents a grey limestone that can be classified as bioclastic packstone to rudstone composed mainly of large coral and stromatoporoid bioclasts together with remains of siliceous sponges. *"Subdelloidina" luterbacheri* RIEGRAF, 1987 occurs encrusting on coral bioclasts together with other microencrusters such as *Radiomura cautica* SENWOBARI-DARYAN & SCHÄFER, 1979 (Fig. 6.1). Dasycladales are represented by *Salpingoporella istriana* (GUSIČ, 1966) BASSOULLET et al., 1978 (Text-Fig. 6.2, 6.13).

From a stratigraphic point of view, a Valanginian age is documented with the occurrence of the benthic foraminifera *Montsalevia salevensis* (ZANINETTI, SALVINI-BONNARD, CHAROLLAIS & DECROUEZ, 1987) (Fig. 6.7-6.8) and the Dasycladale *Salpingoporella istriana* (GUSIČ, 1966) BASSOULLET et al., 1978 (e.g. CHAROLLAIS et al., 1988; BUCUR, 1999a,b; GRANIER, 2001; GRANIER & DELOFFRE, 1993; SCHROEDER et al., 2000).



Text-Fig. 3.
Sample localities in Kurbneshi area, Mali Shengit and Munella Mountain (Mali i Munelles).
Simplified geological map on base of the Harta Gjeologjike e Shqiperise 1 : 200.000 (XHOMO et al., 2002), redrawn on base of own results.

3) **Mali Shengit, Albania**
(Text-Fig. 6.3, 6.6, 6.11, 6.12; Pl. 1, Fig. 10)

Mali Shengit Mountains are located north of Kurbneshi (Fig. 3). According to common opinion, Mali Shengit carbonate platform should be the southward continuation of Munella platform and is therefore part of the great Early Cretaceous carbonate platform on top of the ophiolites. The sample A-3752-1 containing *„Subdelloidina“ luterbacheri* RIEGRAF, 1987 cannot be dated directly. Other samples from this locality contain the Dasycladale *Biokoviella gusici* SOKAČ, 2004 (Text-Fig. 6.11–6.12) and the benthic foraminifera *Recteodictyoconus giganteus* SCHROEDER, 1964 (Fig. 6.6) and *Mesorbitolina texana* (ROEMER, 1849) (Fig. 6.3).

Recteodictyoconus giganteus represents an index fossil for the Lower Aptian (SCHROEDER, 1964; SCHROEDER et al., 2002), *Mesorbitolina texana* ranges from Upper Aptian to Middle Albian (SCHROEDER, 1985). Thus, our samples can be assigned to the Aptian.

4) **Ewige Wand, Northern Calcareous Alps, Austria**
(Text-Fig. 6.4; Pl. 1, Figs. 6, 13)

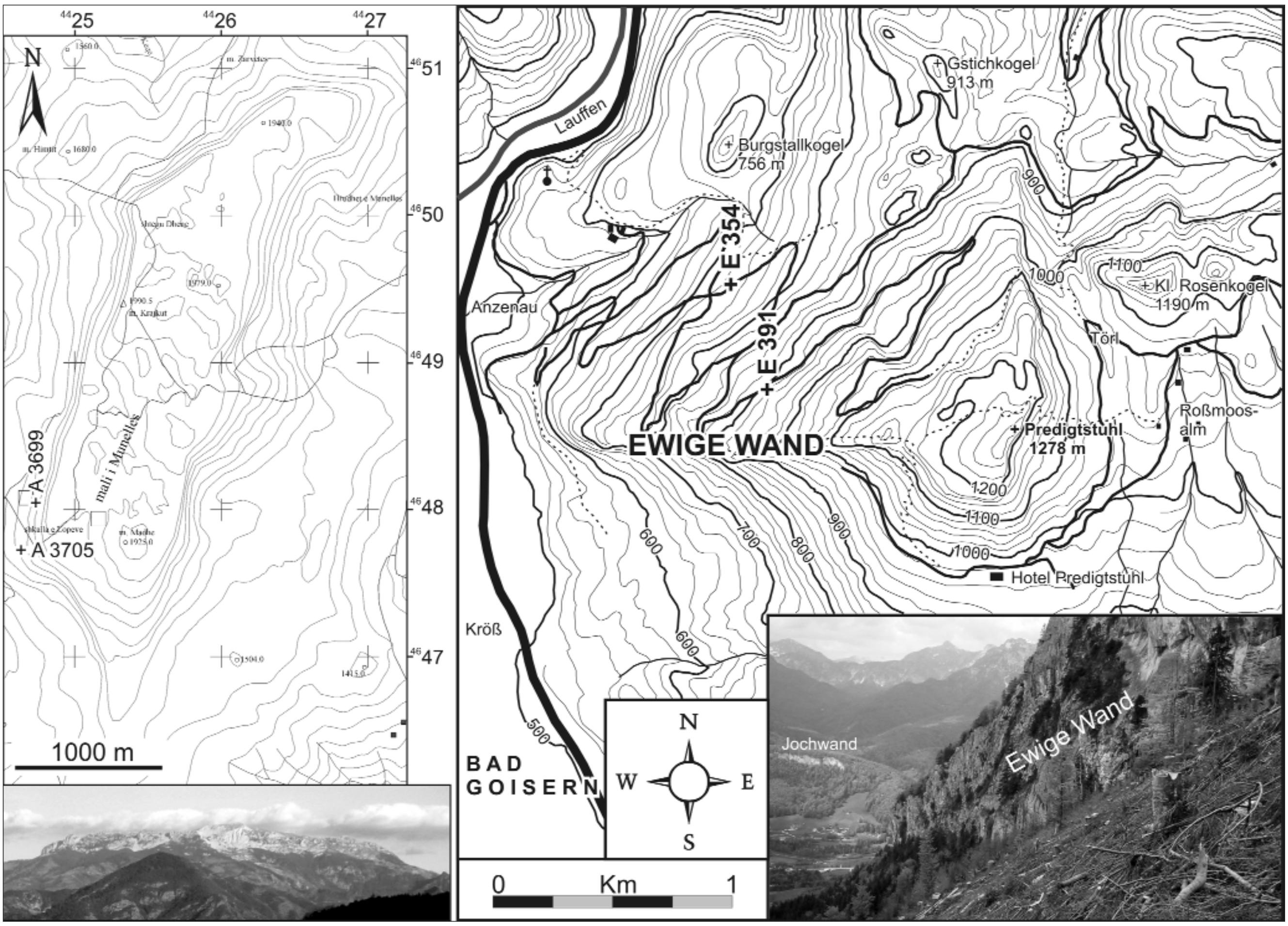
The Ewige Wand (Fig. 4) northeast of Bad Goisern in the Austrian Salzkammergut is composed of Late Jurassic to Early Cretaceous disorganised gravels intercalated within pelagic limestones and was investigated recently with about 200 thin-sections. With respect to the clast spectrum and the intercalation in calpionellid limestones of the Oberalm Formation, the disorganised gravels of the Ewige Wand correspond very well with the type-locality of the Barmstein limestones (see GAWLICK et al., 2005, for details). With respect to the Barmsteine, however, more clasts of slope facies occur expressed also by the common occurrence of certain microfossils such as *„Tubiphytes“ morronensis* CRESCENTI, 1969 or *Terebella lapilloides* MÜNSTER in GOLDFUSS, 1833. A single finding of the benthic foraminifera *Kurnubia palastiniensis* HENSON, 1948 indicates that occasionally also sediments of the Plassen carbonate platform, older than the Late Tithonian maybe reworked in Barmstein limestones (BASSOULLET, 1997, for details on stratigraphy). In other samples *Protopeneroplis ultragranulata* (GORBATCHIK, 1971) occurs (Fig. 6.4). *„Subdelloidina“ luterbacheri* RIEGRAF, 1987 was found in two samples, E-354 and E-391, with tests fixed to corals and stromatoporoid.

Not described and figured in detail are the single findings of *„Subdelloidina“ luterbacheri* RIEGRAF, 1987 in the Plassen Formation of the central Northern Calcareous Alps, e.g. Mount Plassen and Mount Untersberg.

3. Micropalaeontology

The species description is based on the analysis of random thin sections as the species was found only in indurated carbonate rocks.

Order: Foraminiferida EICHWALD, 1830
Family: Placopsilinidae RUMBLER, 1913
Subfamily: Placopsilinidae RUMBLER, 1913
Genus: *Subbdelloidina* FRENTZEN, 1944 em.



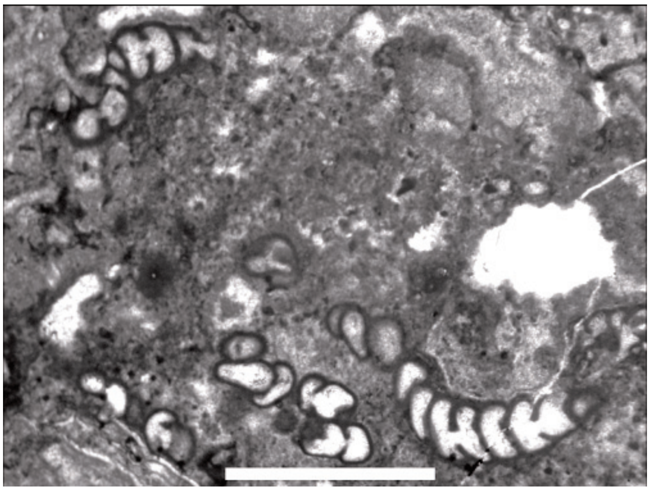
Text-Fig. 4.
Topographic maps of the other occurrences of *„Subbdelloidina“ luterbacheri* RIEGRAF, 1987.
A) Munella, Albania.
B) Ewige Wand near Bad Goisern, Northern Calcareous Alps, Austria.

Remarks: The generic diagnosis of the genus *Subbdelloidina* is summarized by LOEBLICH & TAPPAN (1988: p. 80): "Test attached, bulbous proloculus followed by irregularly arranged or rectilinear chambers that increase gradually in size as added; wall agglutinated; aperture terminal, single." This definition must be revised with respect to the chamber development. We believe, that the gradual increase of chamber size is just a specific feature of the type-species *"S." haeusleri* FRENZEN, 1944. Taking a look at some specimens of *"Subbdelloidina" luterbacheri* RIEGRAF, 1987 (e.g. Figs. 29–31 in RIEGRAF, 1987) a sudden increase in size of the latest chambers can be observed. In this case the gradual increase in chamber size is only valid for the initial and juvenile part and not for the adult part. In the diagnosis provided by MIKHAELEVICH (2004: p. 251) the test of *"Subbdelloidina"* is said to be "attached completely".

According to the observations of RIEGRAF (1987) and our new material the generic diagnosis of *"Subbdelloidina"* as above cited from LOEBLICH & TAPPAN (1988) is emended as follows: "Test attached, may be free on the final stage ... ". Already RIEGRAF (1987: p. 32) in his species diagnosis of *"S." luterbacheri* indicates that after the initial part "subsequent stages ... " may be "free or attached", a feature also observable in our material.

The genus the most "similar" (if not identical) is *Placopsilina* D'ORBIGNY, 1850. In fact, the attached way of life, the wall structure, the aperture and the rectilinear main test arrangement are identical (see LOEBLICH & TAPPAN, 1988: p. 80). As vague distinction criteria, *Placopsilina* is said to possess an early planisprally enrolled stage. HELM (2005: p. 64) cautiously stated a possible synonymy between *"Subbdelloidina" haeusleri* FRENTZEN, 1944 (type-species of *"Subbdelloidina"*) and *Placopsilina cenomana* D'ORBIGNY, 1850. The latter taxon was long time considered as representing the type-species of *Placopsilina* (e.g. LOEBLICH & TAPPAN, 1988). The thorough study of HODGKINSON (1992), however, showed that *Placopsilina cenomana* was erroneously considered as type-species but *Placopsilina scorpionis* D'ORBIGNY, 1850. Unfortunately, the wall structure was not described nor investigated in this work; also the type material of this taxon is not available according to HODGKINSON (1992). Therefore, HODGKINSON stresses that all *Placopsilina* species should be treated in open nomenclature as *"Placopsilina"* expressing the strong need for revision (HODGKINSON, 1992, SCHMIDT & JÄGER [1993]: p. 172, HART et al. [2005]: p. 315). Also the short diagnosis of both genera given by MIKHAELEVICH (2004: p. 251) do not offer clear criteria for the distinction. This revision, of course, will result in some impact also on the genus *Subbdelloidina*, being the reason that at the moment also the representatives of this genus should be treated in open nomenclature. Due to our new results, both "species" are no longer stratigraphically widely separated. It should be noted, that in his "year 2000 classification of the agglutinated foraminifera" both species *Placopsilina* and *Subbdelloidina* are treated as two different genera within the family Placopsilinidae by KAMINSKI (2004).

SCHMIDT & JÄGER (1993) indicate in their tabulation for the generic identification of some encrusting foraminifera the aperture of *Subbdelloidina* as „multiple" in contrast to LOEBLICH & TAPPAN (1988) or younger classifications (e.g. MIKHAELEVICH, 2004).



Text-Fig. 5.
„Subbdelloidina" luterbacheri RIEGRAF, 1987 within coral-stromatoporoid boundstone with diverse micro-encrusters, e.g. *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, 1987 (outside of picture!).
Munella locality, sample Al 877, scale bar = 2 mm.

Type species: *Subbdelloidina haeusleri* FRENTZEN, 1944

„Subbdelloidina" luterbacheri RIEGRAF, 1987

(Text-Fig. 5; Pl. 1, Fig. 1–13)

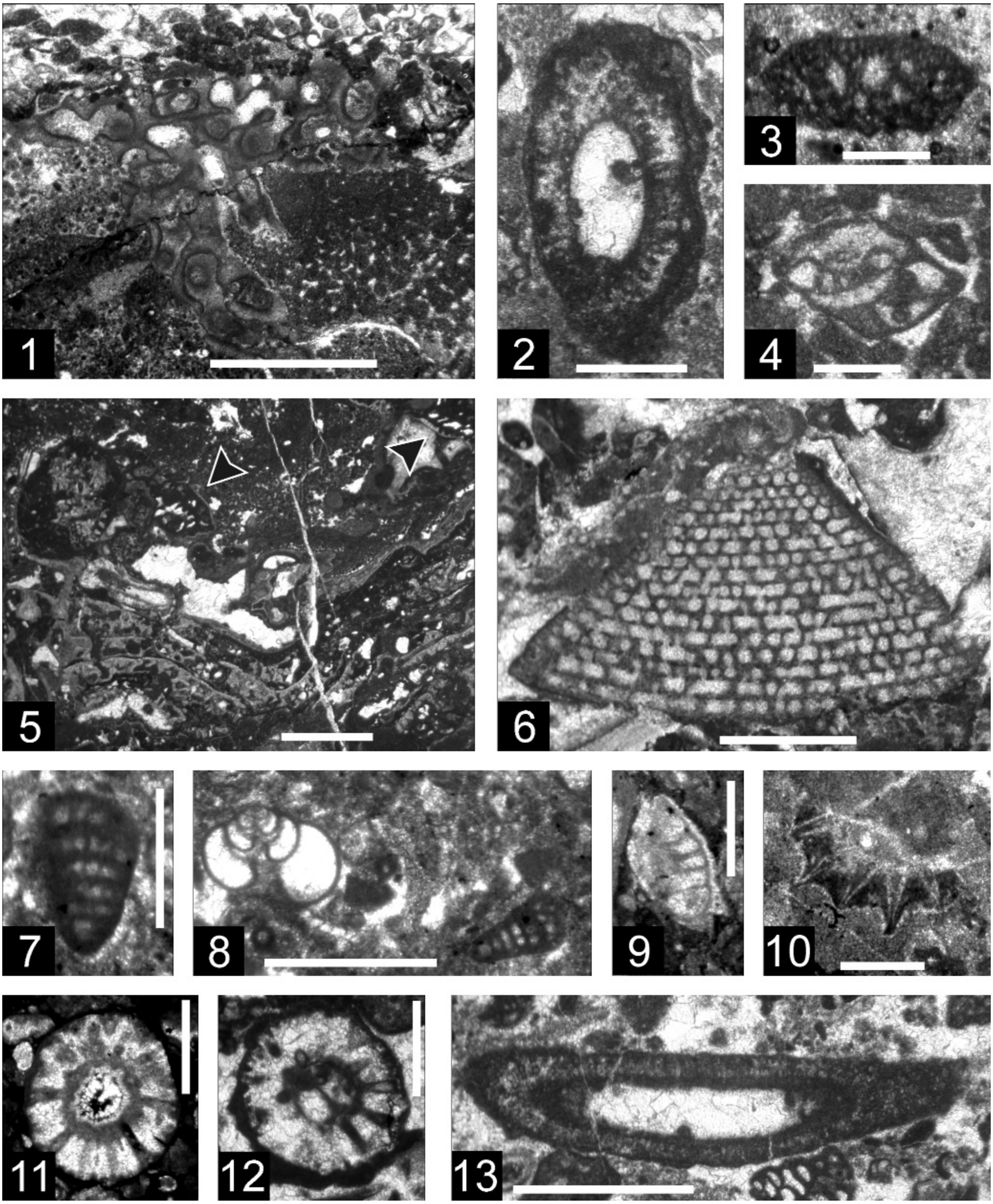
*1987 *Subbdelloidina luterbacheri* n. sp. – RIEGRAF: 32, Figs. 1–16, 20–59, Kimmeridgian-Tithonian of Southern Germany.
2005 *Subbdelloidina luterbacheri* RIEGRAF, 1987 – HELM: 64, Pl. 12, Fig. 4, Oxfordian of Northwest Germany (with synonymy).

Description: The test of *„Subbdelloidina" luterbacheri* is either entirely attached to the hard substrate (e.g. Pl. 1, Fig. 13) or partially with its early stage, later may grow erect away from it (e.g. Pl. 1, Fig. 10). These parts can break away and found scattered within the substrate pretending an unattached way of life. In some cases, the foraminiferal test itself, respectively the juvenile part, serves as hard substrate for the adult stage (e.g. Pl. 1, Figs. 1, 4). The

Text-Fig. 6. S. 59
Microfacies and some biostratigraphically important microfossils.
1) Clast with microproblematicum *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, 1979 and remain of siliceous sponge (right below).
Munella locality, sample A 3705, scale bar = 2 mm.
2) Dasycladale *Salpingoporella istriana* (GUSIČ, 1966) BASSOULLET et al., 1978, oblique section.
Munella locality, sample A 3705, scale bar = 0.5 mm.
3) Benthic foraminifer *Mesorbitolina texana* (ROEMER, 1849), axial section slightly oblique.
Mali Shengit locality, sample A 3744, scale bar = 0.3 mm.
4) *Protopeneroplis ultragranulata* (GORBATCHIK, 1971), oblique section.
Ewige Wand locality, sample E 320, scale bar = 0.3 mm.
5) Fore-reef boundstone with massive crusts composed of *Consinocodium japonicum* (ENDO, 1961), *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, 1979, serpulids and *„Subbdelloidina" luterbacheri* RIEGRAF, 1987 (arrows).
Kurbneshi locality, sample Al 66, scale bar = 2 mm.
6) Benthic foraminifer *Recteodityoconus giganteus* SCHROEDER, 1964, axial section.
Mali Shengit locality, sample A 3746-1, scale bar = 1 mm.
7) Benthic foraminifer *Montsalevia salevensis* (ZANINETTI, SALVINI-BONNARD, CHAROLLAIS & DECROUEZ, 1987).
Munella locality, sample A 3699, scale bar = 0.3 mm.
8) Benthic foraminifera *Pfenderina?* aff. *aureliae* NEAGU, 1979 (left) and *Montsalevia salevensis* (ZANINETTI, SALVINI-BONNARD, CHAROLLAIS & DECROUEZ, 1987) (right).
Munella locality, sample A 3699, scale bar = 0.5 mm.
9) Benthic foraminifer *Protopeneroplis* cf. *striata* WEYNSCHENK, 1950, oblique section.
Kurbneshi locality, sample Al 52, scale bar = 0.3 mm.
10) Possible fragment of Dasycladale *Clypeina sulcata* (ALTH, 1882).
Kurbneshi locality, sample Al-52, scale bar = 0.5 mm.
11–12) Dasycladale *Biokoviella gusici* SOKAČ, 2004.
Mali Shengit locality, samples A 3744 and A 3746-1, scale bar = 0.5 mm.
13) Dasycladale *Salpingoporella istriana* (GUSIČ, 1966) in BASSOULLET et al., 1978, oblique longitudinal section.
Munella locality, sample A 3705, scale bar = 1 mm.

wall is homogeneous, finely agglutinating. Chambers are numerous and straight tests may reaches sizes of several millimetres. Especially in the adult part, the chambers are distinctly higher than wide, except the latest chambers that may become elongated (Pl. 1, Fig. 4). In the attached part, chambers gradually increase in size; when the test grows away from the substratum, the chambers may increase distinctly in size (see also Fig. 29-31 in RIEGRAF, 1987). Tests growing upon older parts may show changing growth directions of chambers looking like a biserial arrangement of the latter (Pl. 1, Figs. 11–12). The aperture seems to be a low slit near the basal part of the attached side, later becoming terminal.

Remarks: The wall composition of *"Subbdelloidina" luterbacheri* is directly linked to the enclosing matrix, respectively the availability of test building material. In our material – micritic matrix within sheltered reefal environments – the wall is homogeneous, finely agglutinating. In the reefal limestones of NW Germany a high content of incorporated sponge spicules or rhaxes are reported



(HELM, 2005: p. 64). Agglutinated sponge rhaxes and coarser quartz grains were rarely reported also from the type-material by RIEGRAF (1987).

The reduced number of chambers in our material (up to 15) in comparison with the type material of RIEGRAF (1987: 25 or more) can simply be explained that the original material from the Late Jurassic of the Franconian Alb was represented by isolated specimens washed-out from marls whereas our samples are from random thin-sections. Due to the irregular growth directions observed in many specimens, the whole number of chambers can in these cases of course not be determined. All other morphological characteristics fit well with the original description. In our material, also the phenomen called "pseudomultiserial chamber arrangement" by RIEGRAF (1987) can be observed. Due to rapid change in growth directions, for example, a biserial chamber arrangement or branching of the test can be pretended. An encrusting foraminifera with a real biserial chamber arrangement (in part, not throughout!) is *Flatschkofelia anisica* RETTORI, SENOWBARI-DARYAN & ZÜHLKE (1996) from the Middle Triassic of the Dolomites, North-Italy.

Stratigraphy: Taking into account all data obtained from the literature and our samples, the known stratigraphic range of *"Subbdelloidina" luterbacheri* RIEGRAF, 1987 can be indicated as Late Jurassic (Oxfordian) to Late Aptian. These observations clearly show that the species is no more an exclusively Late Jurassic taxon.

Paleoenvironment: "*Subbdelloidina" luterbacheri* RIEGRAF, 1987 is restricted to coral-stromatoporoid reefal limestones. The surrounding matrix is predominantely micritic suggesting sheltered parts within the reefal environment. The taxon was never observed in high-energetic sparitic microfacies. The species may occur together with *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, 1979 and *Consinocodium japonicum* ENDO, 1961 within massive encrustations suggesting fore-reefal to proximal slope settings. LUKENEDER & HARZHAUSER (2003) reported *Placopsilina cenomana* "in a rather broad sense" encrusting within ammonoid shells that were deposited in assumed water depths between 50 and 100 m from the Schrambach Formation (Valnaginian) of Upper Austria. From its type-locality, the Franconian Alb of South-Germany, "*Subbdelloidina" luterbacheri* RIEGRAF, 1987 was described as isolated, washed-out specimens from marls associated with "sponge-algal bioherms". This particular environment referred as "sponge megafacies" sensu MATYSZKIEWICS (1997), however, is lacking in both areas, in the Northern Calcareous Alps and also the Albanides. Due to the co-occurrence with calcareous green algae, the Tethyan coral-stromatoporoid limestones are interpreted as more shallow paleoenvironments at the platform margin whereas the sponge-build-ups or -mud mounds can be referred to middle slope or middle ramp facies. In the epicontinental Late Jurassic of Germany, these environments disappeared around the Jurassic/Cretaceous boundary as the sea retreated in southern directions (e.g. LEMCKE, 1981). This overall palaeogeographic situation explains both, the stratigraphic limitation in South-Germany and its persisting in the Early Cretaceous in parts with suitable environments still prevailing, as in the Albanides. This is a further example clearly showing the interrelationships of stratigraphic occurrences and its direct palaeoenvironmental control on local and regional scales.

4. Conclusions

The encrusting foraminifera "*Subbdelloidina" luterbacheri* RIEGRAF, 1987 is common in Late Jurassic to Early Cretaceous coral-stromatoporoid reefal limestones in Albania where it was found in the area of Kurbneshi, the Munella Mts. and Mali Shengit. In the Northern Calcareous Alps it is comparably rare, so far reported only from the Barmstein Limestones of the Ewige Wand and the Plassen Formation of Mount Plassen and Mount Untersberg in the Austrian Salzkammergut. Within Alpine Late Jurassic to Early Cretaceous reefal limestones the encrusting foraminifera *Coscinophragma* aff. *cribrosa* (REUSS, 1846) is much more frequent. "*Subbdelloidina" luterbacheri* RIEGRAF, 1987 was paid only little attention in literature assuming a much wider paleogeographical distribution as recorded so far. Its stratigraphic occurrence is no longer restricted to Late Jurassic strata, due to the findings in Lower Cretaceous reefal limestones of Albania. Originally reported from marly successions in an assumed middle ramp environment in South-Germany, the Tethyan findings are from more shallower settings within platform margin coral-stromatoporoid limestones.

Plate 1

"Subbdelloidina" luterbacheri RIEGRAF, 1987
from the Late Jurassic–Early Cretaceous of the Albanides and the Northern Calcareous Alps

Fig. 1: Strongly coiled and irregular grown specimen; note chambers in the adult part distinctly wider than high.
Sample Al-63, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 2: Specimen of rectilinear growth showing single, areal chamber connections.
Sample Al-68, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 3: Irregular grown specimen.
Sample Al-67, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 4: Specimen with coiled juvenile part becoming errect in the final part; note elongated final chambers.
Sample Al-72, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 5: Encrustation community including *Consinocodium japonicum* ENDO, 1961 (below), *"Subbdelloidina luterbacheri"* RIEGRAF, 1987 (arrow) and *Radiomura cautica* SENOWBARI-DARYAN & SCHÄFER, 1979 (left above).
Sample Al-66, Late Jurassic of Kurbneshi (Albania), scale bar = 1.0 mm.

Fig. 6: Specimen (arrow) fixed to stromatoporoid *Astrostylopsis* cf. *tubulata* (GERMOVŠEK, 1954).
Sample E-391, Late Jurassic to Early Cretaceous Barmstein limestone of Ewige Wand (Austria), scale bar = 0.5 mm.

Fig. 7: Sample Al-66, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 8: Sample Al-46, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

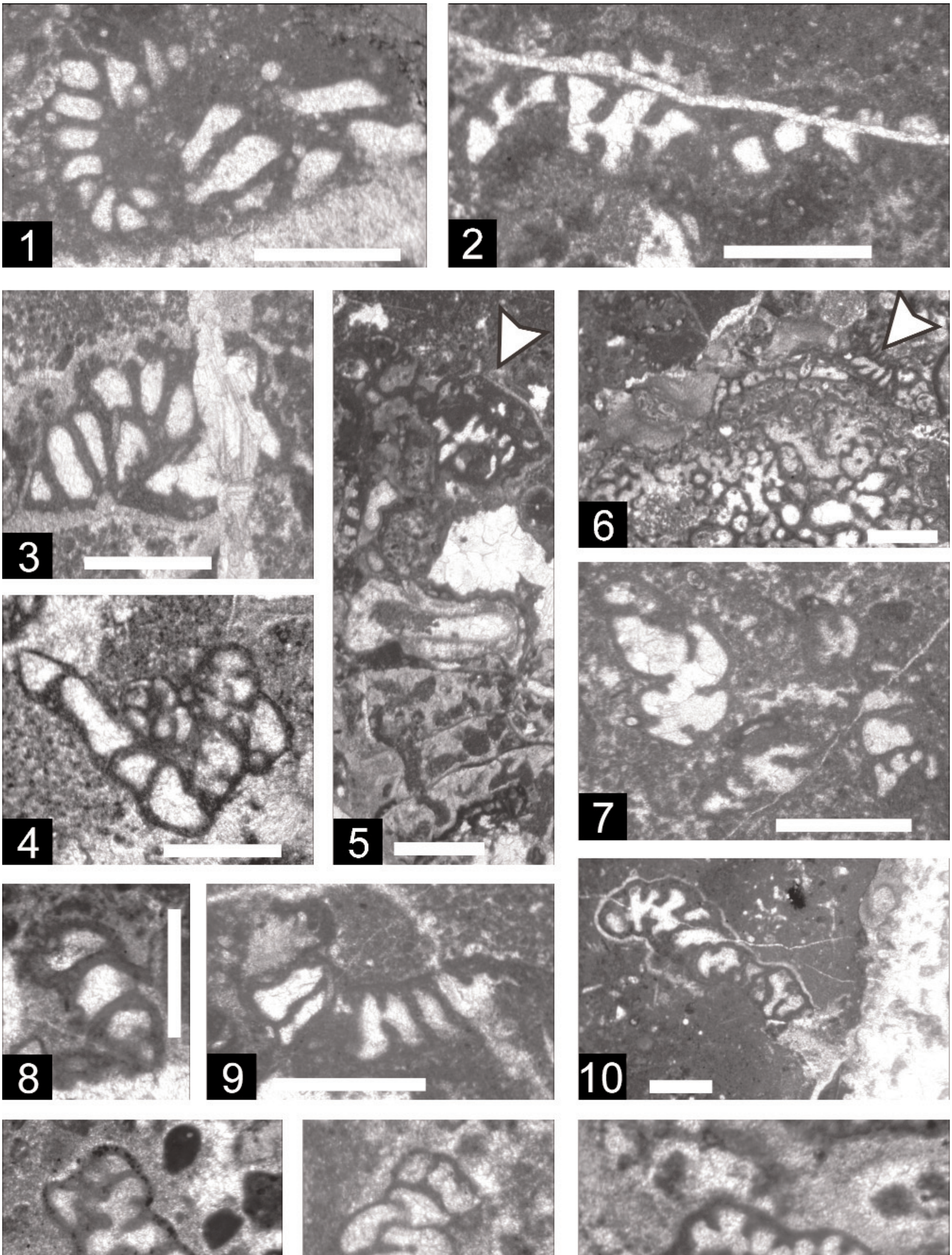
Fig. 9: Slightly curving specimen showing rectilinear chamber arrangement and areal aperture between chambers.
Sample Al-66, Late Jurassic of Kurbneshi (Albania).

Fig. 10: Specimen fixed to the substratum (right) and long free part; note changing of growth axis pretending multilinear chamber arrangement.
Sample A-3752-1, Early Cretaceous (?Early Late Aptian) of Mali Shengit (Albania), scale bar = 1.0 mm.

Fig. 11: Specimen showing "pseudobiserial" chamber arrangement in the final part.
Sample A-3699, Early Cretaceous (Valanginian) of Munella (Albania), scale bar = 0.5 mm.

Fig. 12: Specimen showing "pseudobiserial" chamber arrangement.
Sample Al-69, Late Jurassic of Kurbneshi (Albania), scale bar = 0.5 mm.

Fig. 13: Specimen fixed to the substrate with rectilinear chamber growth.
Sample E 354, Late Jurassic to Early Cretaceous Barmstein limestone of Ewige Wand (Austria), scale bar = 1.0 mm.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