



***Hemicyclammina chalmasi* (SCHLUMBERGER, 1899) –
Larger Benthic Foraminifera
from the Upper Cretaceous Gosau Group
of the Northern Calcareous Alps (Gosau, Austria)**

FELIX SCHLAGINTWEIT*) & MICHAEL WAGREICH**)

1 Text-Figure and 1 Plate

Österreichische Karte 1 : 50.000
Blatt 96

Oberösterreich
Nördliche Kalkalpen
Gosau-Gruppe
Oberkreide
Lithofazies
Benthische Foraminiferen
Biostratigraphie

Inhalt

Zusammenfassung	367
Abstract	367
1. Introduction	368
2. Geological Setting	368
3. Micropaleontological Part	368
Plate 1	370
References	372

***Hemicyclammina chalmasi* (SCHLUMBERGER, 1899 – eine benthonische Großforaminifere
aus der oberkretazischen Gosau-Gruppe der Nördlichen Kalkalpen (Gosau, Österreich)**

Zusammenfassung

Die bethonische Großforaminifere *Hemicyclammina chalmasi* (SCHLUMBERGER, 1899) wurde in großen Mengen in flachmarinen Sandsteinen der Streiteck-Formation der unteren Gosau-Subgruppe von Gosau festgestellt. Dort kommt sie gemeinsam mit einigen Quinqueloculinen, Cuneolinen, Serpuliden und Schalenresten von Austern vor. Die wenig bekannte Foraminifere war von den Nördlichen Kalkalpen nicht bekannt und ist bislang nur aus dem Coniacium–Santonium der spanischen Pyrenäen und dem Campanium der Vardar-Zone, Jugoslawien beschrieben worden. Das Alter der Vorkommen bei Gosau ist vermutlich Ober-Turonium oder Unter-Coniacium.

Abstract

The larger benthic foraminifera *Hemicyclammina chalmasi* (SCHLUMBERGER, 1899) has been found in great abundance in shallow marine sandstones of the Streiteck Formation of Gosau, belonging to the lower Gosau Subgroup. Here it is associated with some quinqueloculinids, cuneolinids, serpulids and debris of pelecypods. This poorly known foraminifera, up to now not reported from the Northern Calcareous Alps, has so far only been known from the Coniacian–Upper Santonian of the Spanish Pyrenees and the Campanian of the Vardar Zone, Yugoslavia. The age of the occurrence in Gosau is most probably late Turonian or early Coniacian.

*) Dr. FELIX SCHLAGINTWEIT, Lerchenauerstraße 167, D 80935 München.
EF.Schlagintweit@t-online.de

**) Dr. MICHAEL WAGREICH, Institut für Geologische Wissenschaften, Universität Wien, Althanstraße 14, A 1090 Wien.
michael.wagreich@univie.ac.at

1. Introduction

Larger benthic foraminifera are typical constituents in the lower Gosau Subgroup (Upper Turonian–Santonian) of the Northern Calcareous Alps where they occur in a variety of shallow marine lithologies such as pure, marly or mixed siliciclastic carbonates. Not much attention, however, has been paid to this group of microfossils, and only a few reports exist (e.g. HÖFLING, 1985; SCHLAGINTWEIT, 1992; WEISS, 1977). Typical forms present in the Gosau Group include cuneolinids, lituolids, cyclamminids or meandropsinids.

This paper gives a report on the first record of the larger benthic foraminifera *Hemicyclammina chalmasi* (SCHLUMBERGER) in the basal, shallow-marine part of the lower Gosau Subgroup of the type locality of the Gosau Group at Gosau and Russbach.

2. Geological Setting

The sampled outcrop at the Neualm (Neualpe of STOLICZKA [1860]; SUMMESBERGER & KENNEDY [1996]) is situated at the northern margin of the continuous Gosau Group exposures in the area of Gosau (Upper Austria) and Russbach (Salzburg). The sampled sandstones are exposed about 200 m south of the alpine pasture Neualm (Text-Fig. 1). The outcrop extends from the main creek of the

Randobach up to a bend of the nearby forest road to the east.

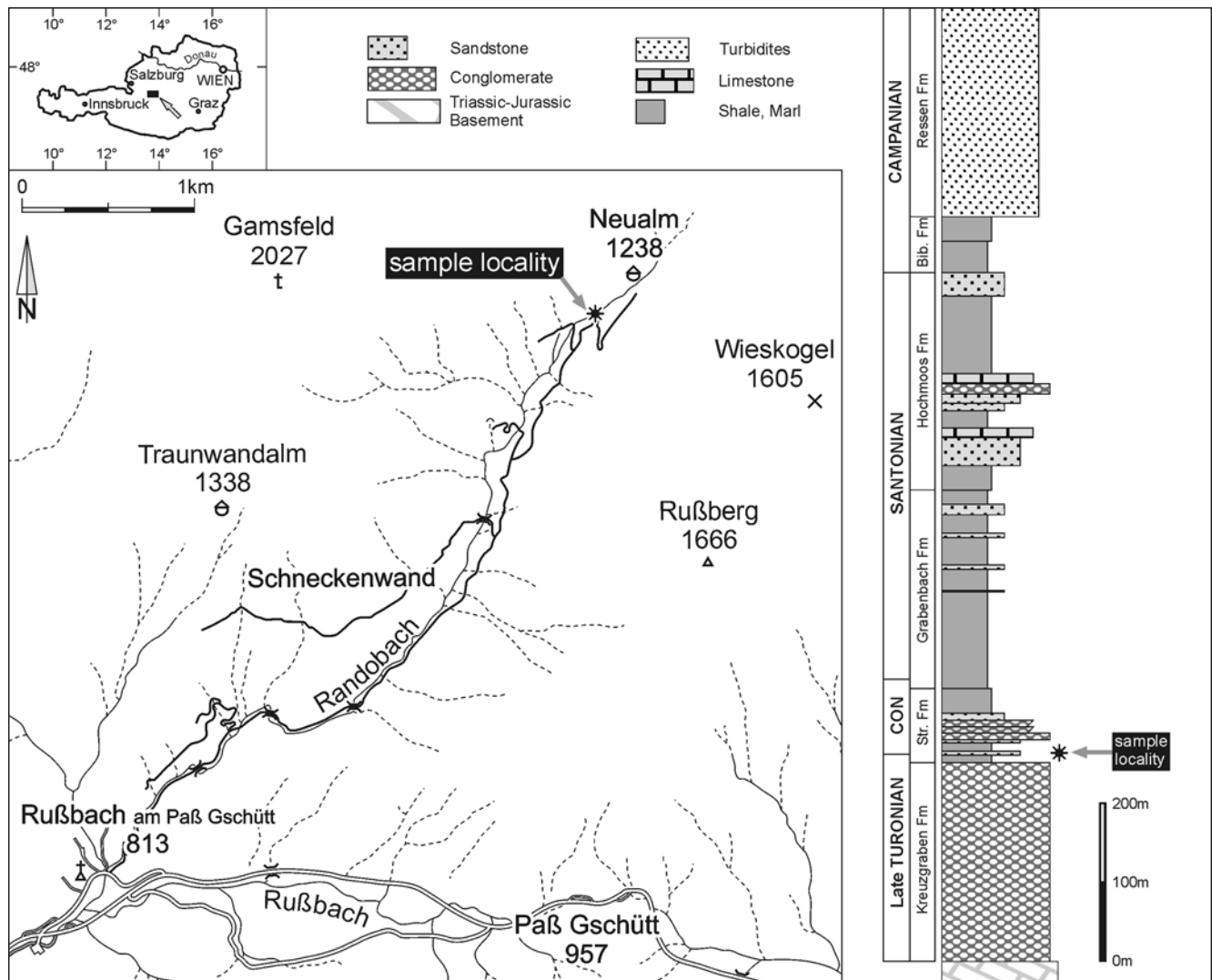
The lithology exposed consists of grey, bioturbated fine- to medium-grained calcarenitic sandstones. The geological map by PLÖCHINGER (1982: Geologische Karte von Österreich, 1:50.000, Blatt 96, St. Wolfgang) records only outcrops of the Kreuzgraben Formation and freshwater deposits around the Neualm. However, the sandstones most probably belong to the basal part of the Streiteck Formation, below a significant interval of fan-delta conglomerates (WAGREICH, 1988, 1989), and above the classical coal-bearing conglomerate succession of the Kreuzgraben Formation (e.g. STOLICZKA, 1860; KOLLMANN, 1982; WAGREICH, 1988, 1998). During the time of deposition of the sandstones the area of the Neualm probably formed part of the northern margin of a relatively small pull-apart basin (WAGREICH, 1988; WAGREICH & DECKER, 2001). The sandstones are probably part of a transgressive sequence (SANDERS et al., 1997).

3. Micropaleontological Part

The classification used follows LOEBLICH & TAPPAN (1988).

Family: Cyclamminidae MARIE, 1941

Genus: *Hemicyclammina* MAYNC, 1953



Text-Fig. 1. Sketch map of sampled site near Russbach and stratigraphy of the lower part of the Gosau Group indicating the assumed position of the samples with *Hemicyclammina chalmasi* (SCHLUMBERGER).

Hemicyclammina chalmasi (SCHLUMBERGER, 1899)

(Pl. 1, Figs. 1–9)

- *1899 *Dictyopsella chalmasi* SCHLUMBERGER – SCHLUMBERGER, 463, Pl. 7, Fig. 4, Santonian of Spain.
1977 *Hemicyclammina chalmasi* (SCHLUMBERGER) nov. comb. – CORNELLA, 10, Fig. 3.
1978 *Hemicyclammina chalmasi* (SCHLUMBERGER) – CAUS et al.: 459, Pl. 1, Figs. 1–5.
1986 *Pseudocyclammina masiliensis* MAYNC – BILOTTE, Pl. 13, Fig. 5, Upper Santonian of Eastern Pyrenees.
2000 *Hemicyclammina chalmasi* (SCHLUMBERGER) – POLAVDER, 373, Pl. 1, Figs. 1–6, Campanian of the Vardar Zone.
2003 *Hemicyclammina chalmasi* (SCHLUMBERGER) – POLAVDER, Fig. 6.16, Campanian of the Vardar Zone.

Description: Test free, planspirally enrolled and involute (e.g. Pl. I, Fig. 3), biumbilical thickened (juvenile forms) or compressed (adult specimens) with later chambers rapidly increasing in height (peneropliform type of coiling). In very large specimens, the latest whorls show an evolute to semi-involute enrolling not covering all previous whorls. Due to the compression of the test, axial or oblique sections are dominating in our material whereas equatorial sections are comparable rare. The periphery is rounded. Sometimes, the tests are curved, due to bending of whorls away from the previous one (see also Fig. 3 in POLAVDER 1999). The wall is comparably thick (thickness: 0.15–0.25 mm) and coarsely agglutinated, composed of angular quartz grains, showing an orientation perpendicular to the surface. The outer part of the wall is represented by a thin imperforate layer (about 0.01–0.015 mm) mostly abraded in our material. The subepidermal layer is alveolar with comparable coarse alveoles (Pl. I, Fig. 7). Aperture single, an elongated slit at the base of the chambers (Pl. I, Fig. 9). The proloculus is globulous measuring 0.38 to 0.5 mm (2 values). The coarseness of the agglutinated wall material masks further details.

Dimensions:

Equatorial diameter	Thickness, central part	Thickness, last whorl
6.8 mm	2.0 mm	1.1 mm
5.12 mm	1.2 mm	0.8 mm
4.8 mm	1.12 mm	1.5 mm
3.0 mm	1.06 mm	1.28 mm
2.88 mm	1.2 mm	1.44 mm
2.6 mm	0.64 mm	1.0 mm
2.4 mm	0.9 mm	0.72 mm

Remarks: The genus *Hemicyclammina* MAYNC, 1953 encloses two species, the type-species *H. sigali* MAYNC (Cenomanian of Algeria) and *H. chalmasi* (SCHLUMBERGER). The taxon has been established originally as *Dictyopsella chalmasi* sp. nov. by SCHLUMBERGER (1899), coming from the Santonian of Trago di Noguera/Spain. SCHLUMBERGER (1899: p. 463) already noted the more or less symmetrical sides of the test and the spiral enrolling ("enroulées en spirale comme un *Peneroplis*"). The comparable short description additionally mentions 13 to 14 chambers that are visible from the exterior, the marked chamber sutures and the arenaceous test. Also well visible from the single isolated specimen figured by

SCHLUMBERGER is the rapid increase of chamber width in equatorial sections, much more pronounced than that of the height.

In the framework of the micropaleontological contribution on the Senonian of the Martigues area of southern France, GENDROT (1968: p. 682) restudied the original material of SCHLUMBERGER expressing doubts on its generic status ("ne semble pas être une vraie *Dictyopselle*"). GENDROT already observed that the species "possède un test labyrinthique qui la rapproche plutôt des *Pseudocyclammina*" but didn't provide a species emendation. Later on, CORNELLA (1977) and CAUS et al. (1978) introduced the new combination *Hemicyclammina chalmasi* (SCHLUMBERGER) by evidencing the alveolar wall structure and the apertural features. Since then, the species in question has – according to our knowledge – only been reported by POLAVDER (2000, 2003) from the Upper Cretaceous of the Dinarids.

Facies: The sandstones are interpreted as nearshore, shallow neritic deposits based on their fossil content and abundant bioturbation including trace fossils like *Planolites* and rare *Ophiomorpha*. A depositional depth around the fair weather wave base can be inferred from the lack of marl intercalations and the well sorted sandstones. Generally, the paucispecific character of the microfauna points to a stress environment. Besides the abundant *Hemicyclammina* tests, there are some miliolids and very rare cuneolinids. Calcareous algae are very rare, only comprising remains of the dasycladale *Acicularia* sp. that may also become incorporated in the test wall (Pl. I, Fig. 8). Deduced from the literature data and our observations, a strong facies preference for siliciclastic environments (e.g. near-shore or deltaic settings, clastic influenced lagoon) is inferred.

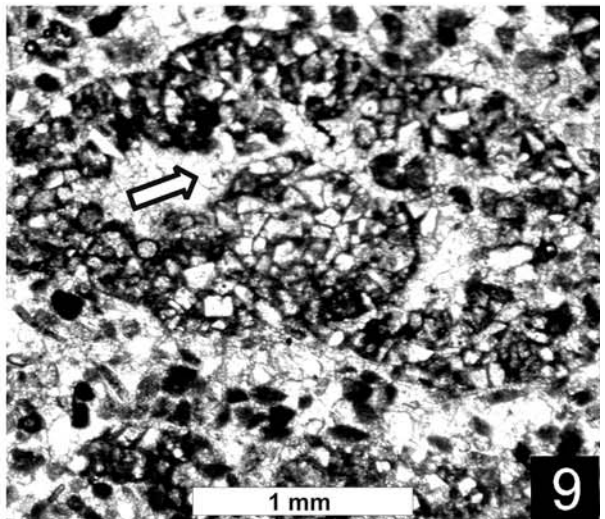
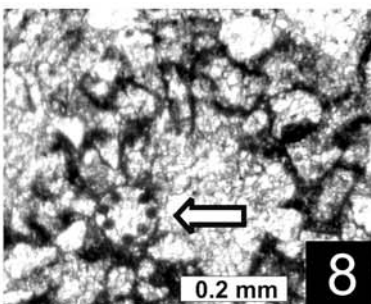
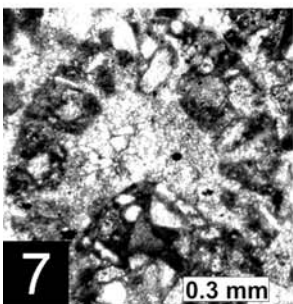
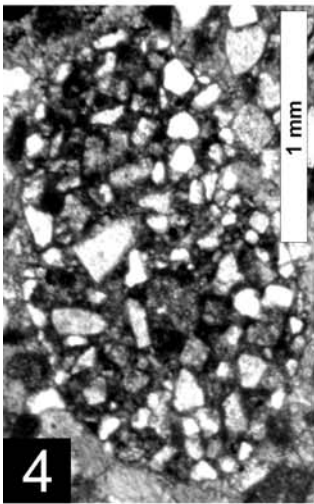
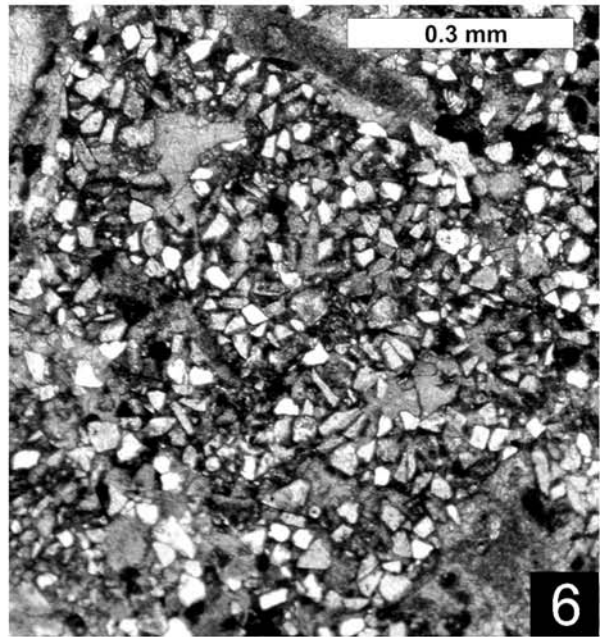
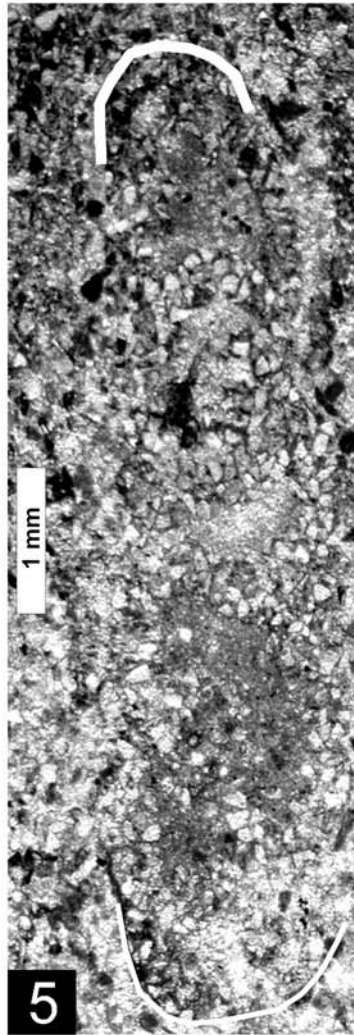
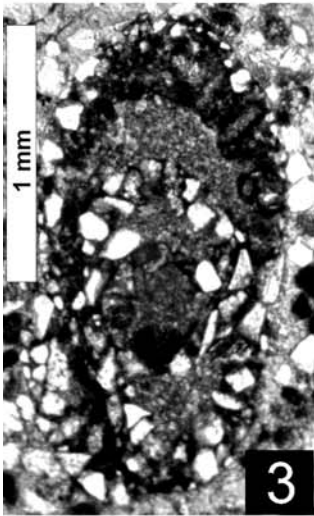
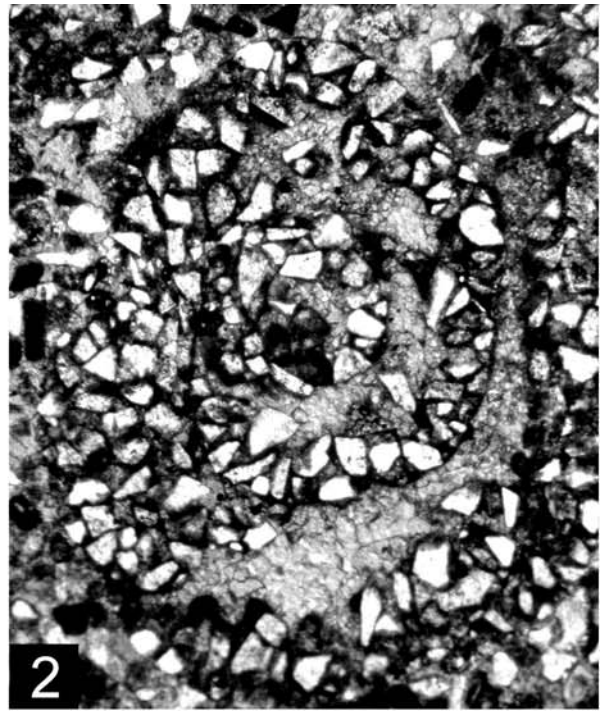
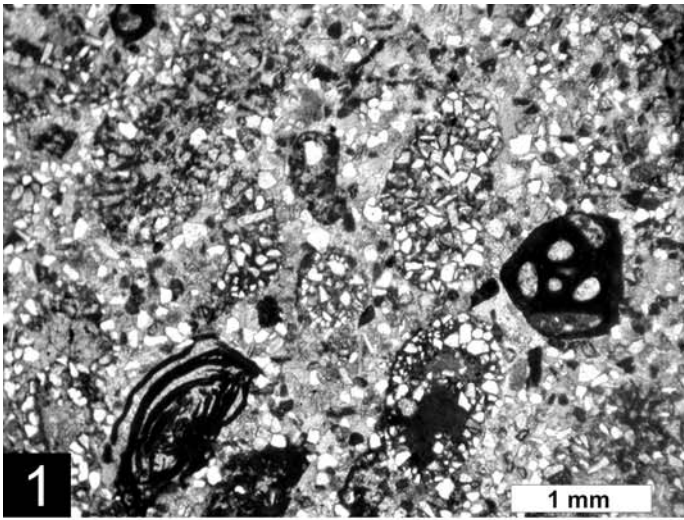
Stratigraphy: The age of the sandstones can only be deduced indirectly, as no ammonites or inoceramids were found in this outcrop. The gastropod *Actaeonella laevis* is present in a sandstone layer about 1.5 m above the sampled bed, which points to a Late Turonian to Early Santonian age (e.g. KOLLMANN & SUMMESBERGER, 1982). KENNEDY & SUMMESBERGER (1996) and TRÖGER & SUMMESBERGER (1994) mentioned the Late Turonian ammonite *Barroisiceras haberfellneri* in a marl exposure only a few tens of metres to the northwest of our sample location. Calcareous nannofossils from these marls indicate the Late Turonian to Early Coniacian standard nannofossil zone CC13 (*Marthasterites furcatus* zone, zonation of PERCH-NIELSEN, 1985). The stratigraphic relationships of these Upper Turonian marls to the sampled sandstones cannot be ascertained due to extensive cover by alluvium and vegetation. Thus, a Late Turonian to Early Coniacian age is probable for the sandstones.

Hemicyclammina chalmasi (SCHLUMBERGER) has so far been reported from Coniacian–Campanian strata (CAUS et al., 1981; POLAVDER, 1999). Whether this interval represents the total stratigraphic range of the taxon, however, is not clear since there are only rare reports in the literature. Moreover, the obvious strong facies preference for siliciclastic environments limits its occurrence to pure shallow water carbonates.

Plate 1

Larger benthic foraminifera *Hemicyclammina chalmasi* (SCHLUMBERGER) from the Upper Cretaceous Streiteck Formation of Gosau.

- Fig. 1: Mixed carbonatic-siliciclastic microfacies with abundant tests of *Hemicyclammina chalmasi* (SCHLUMBERGER) and miliolids.
Fig. 2: Equatorial section, slightly oblique of juvenile specimen.
Fig. 3: Axial section.
Fig. 4: Subaxial section.
Fig. 5: Axial section of large specimen measuring about 6.8 mm in length.
Fig. 6: Equatorial section, slightly oblique of juvenile specimen.
Fig. 7: Detail of wall structure showing alveolar nature.
Fig. 8: Detail of wall structure showing agglutinated *Acicularia* sp. (arrow).
Fig. 9: Oblique equatorial section showing the slit-like aperture at the chamber base (arrow).



References

- BILOTTE, M. (1986): Le Crétacé supérieur des plates-formes est-pyrénéennes. – *Strata, Act. Lab. Géol. Séd. Paléont. Univ. Paul-Sabatier Toulouse, sér 2*, 5, 1–438; Toulouse.
- CAUS, E., CORNELLA, A. & PONS, M.J. (1978): Foraminiferos bentónicos del Santoniense sudpirenaico (Montsec de Rubies, Prov. de Lérida, España). Nueva adscripción genérica de *Dictyopsella chalmasi* SCHLUMBERGER. – *Rev. Esp. Micropal.*, **10/3**, 453–460, Madrid.
- CAUS, E., CORNELLA, A., GALLESÍ, J., GILI, E., MARTINEZ, R. & PONS, J.M. (1981): Field guide – Excursions to Coniacian–Maastrichtian of South Central Pyrenees (WGCM, 3rd Working Session in Tresp). – *Publ. Geol.*, **13**, 1–17, Barcelona.
- CORNELLA, A. (1977): Foraminiferos bentónicos del Santoniense del BCO. De la Front de la Plata. Montsec de Rubies (Prov. de Lérida). – *Univ. Aut. Barcelona, Publ. Geol.*, **8**, 1–45, Barcelona.
- HÖFLING, R. (1985): Faziesverteilung und Fossilvergesellschaftungen im karbonatischen Flachwasser-Milieu der alpinen Oberkreide (Gosau-Formation). – *Münchener geowiss. Abh.*, (A), **3**, 1–241, München.
- KOLLMANN, H.A. (1982): Gosauablagerungen im Becken von Gosau. – In: PLÖCHINGER, B.: Erläuterungen zu Blatt 95 St. Wolfgang im Salzkammergut, 30–34, Wien (Geol. Bundesanst.).
- KOLLMANN, H.A. & SUMMESBERGER, H. (1982): Excursions to Coniacian–Maastrichtian in the Austrian Alps. – WGCM, 4th Meeting, Gosau Basins in Austria, Wien.
- MAYNC, W. (1953): *Hemicyclammina sigali* n. gen. n. sp. from the Cenomanian of Algeria. – *Cushman Found. Foram. Res., Contr.*, **4/4**, 148–150, Washington D.C.
- PERCH-NIELSEN, K. (1985): Mesozoic calcareous nannofossils. – In: BOLLI, H.M., SAUNDERS, J.B. & PERCH-NIELSEN, K. (Eds.): *Plankton Stratigraphy*, 329–426 (Cambridge Univ. Press).
- POLAVDER, S. (2000): On some little known foraminiferal species from the Senonian of the Vardar Zone. – *Proc. 2nd Romanian Symp. Palaeont. Cluj-Napoca, Acta Paleont. Roman.*, **2** (1999), 361–371, Bucharest.
- POLAVDER, S. (2003): Upper Cretaceous integrated biostratigraphy in the western belt of the Vardar Zone. – *Geol. Carpathica*, **54/2**, 81–92, Bratislava.
- SANDERS, D., KOLLMANN, H. & WAGREICH, M. (1997): Sequence development and biotic assemblages on an active continental margin: The Turonian–Campanian of the Northern Calcareous Alps, Austria. – *Bull. Soc. géol. France*, **168**, 351–372, Paris.
- SCHLAGINTWEIT, F. (1992): Benthonische Foraminiferen aus Flachwasserkarbonaten der Oberkreide der Nördlichen Kalkalpen (Gosauschichtgruppe, Österreich). – *Mitt. Österr. Geol. Ges.*, **84**, 327–353, Wien.
- STOLICZKA, F. (1860): Über eine der Kreideformation angehörende Süßwasserbildung in den nordöstlichen Alpen. – *Sitzungsber. K.K. Akad. Wiss., math.-naturwiss. Cl.*, **38**, 482–496, Wien.
- SUMMESBERGER, H. & KENNEDY, W.J. (1996): Turonian ammonites from the Gosau Group (Upper Cretaceous; Northern Calcareous Alps; Austria) with a revision of *Barroisiceras haberfellneri* (HAUER, 1866). – *Beitr. Paläont.*, **21**, 105–177, Wien.
- TRÖGER, K.-A. & SUMMESBERGER, H. (1994): Coniacian and Santonian inoceramid bivalves from the Gosau Group (Cretaceous, Austria) and their biostratigraphic and palaeobiogeographic significance. – *Ann. Naturhist. Mus. Wien*, **96A**, 161–197, Wien.
- WAGREICH, M. (1988): Sedimentologie und Beckenentwicklung des tieferen Abschnittes (Santon–Untercampan) der Gosauschichtgruppe von Gosau und Rußbach (Oberösterreich – Salzburg). – *Jb. Geol. B.-A.*, **131**, 663–685, Wien.
- WAGREICH, M. (1989): Coarsening-upward fan-delta sequences in the Lower Streiteck Formation (Santonian) of the Gosau Group near Gosau (Upper Austria). – *N. Jb. Geol. Paläont. Mh.*, **1989**, 47–64; Stuttgart.
- WAGREICH, M. (1998): Lithostratigraphie, Fazies und Sequenzstratigraphie der Gosau Gruppe von Bad Ischl und Strobl am Wolfgangsee (Oberturon–Maastricht, Nördliche Kalkalpen, Österreich). – *Jb. Geol. B.-A.*, **141/2**, 209–234, Wien.
- WAGREICH, M. & DECKER, K. (2001): Sedimentary tectonics and subsidence modelling of the type Upper Cretaceous Gosau basin (Northern Calcareous Alps, Austria). – *Int. J. Earth Sci.*, **90**, 714–726, Berlin.
- WAGREICH, M. & FAUPL, P. (1994): Palaeogeography and geodynamic evolution of the Gosau Group of the Northern Calcareous Alps (Late Cretaceous, Eastern Alps, Austria). – *Palaeogeogr., Palaeoclimatol., Palaeoecol.*, **110**, 235–254, Amsterdam.
- WEISS, W. (1977): Korrelation küstennaher und küstenferner Faziesbereiche in den Unteren Gosau-Schichten (Oberkreide, Österreich) nach Foraminiferen. – *N. Jb. Geol. Paläont. Mh.*, **1977(5)**, 289–302, Stuttgart.