



An Invertebrate Faunula in the Kössen Beds of Starnkogel (Bad Ischl, Upper Austria)

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5 Text-Figures, 1 Plate

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Blatt 96 Bad Ischl

Dachstein Limestone
Kössen Formation
Totes Gebirge
Brachiopods
Ichnofossils
Bivalves

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Eine Invertebraten-Faunula in den Kössener Schichten des Starnkogels (Bad Ischl, Oberösterreich)

Zusammenfassung

Aus mehreren Lagen von Kössener Schichten, die dem lagunären Dachsteinkalk des Steinbruchs am Starnkogel NNO von Bad Ischl bankparallel zwischengeschaltet sind, wird eine artenarme Bivalven- und Brachiopoden-Faunula beschrieben. Erstere setzt sich ausschließlich aus grabenden Formen zusammen, was für ein gut durchlüftetes Ablagerungsmilieu sowie ein kompaktes Substrat spricht. Die Brachiopoden-Faunula besteht lediglich aus 3 Taxa, wobei *Rhaetina pyriformis* (Suess) bei weitem dominiert. Selten findet sich auf Schichtflächen von mergeligen Kössener Einschaltungen die Lebensspur *Thalassinoides*. Diese verzweigten Spuren sprechen für episodische Sedimentation und weisen wahrscheinlich auf Ablagerungs-Unterbrechungen hin.

Abstract

In the Starnkogel Quarry NNE of Bad Ischl the upper part of the cyclically bedded "lagoonal" Dachstein Limestone is coarsely bedded (0.5–3 m) and locally shows a peculiar development, namely intercalations of Kössen type limestones and marls. The exclusive presence of burrowing forms in the bivalve faunula of the Kössen intercalations indicates well oxygenated bottom waters and firm substrate during the deposition of the Kössen Beds. The brachiopod faunula consists of 3 taxa and is dominated by *Rhaetina pyriformis* (Suess). Scarce findings of the ichnofossil *Thalassinoides* isp. are restricted to the marly intercalations of the Kössen Beds. *Thalassinoides* networks are characteristic for rather episodic sedimentation and probably indicate omission surfaces.

Introduction

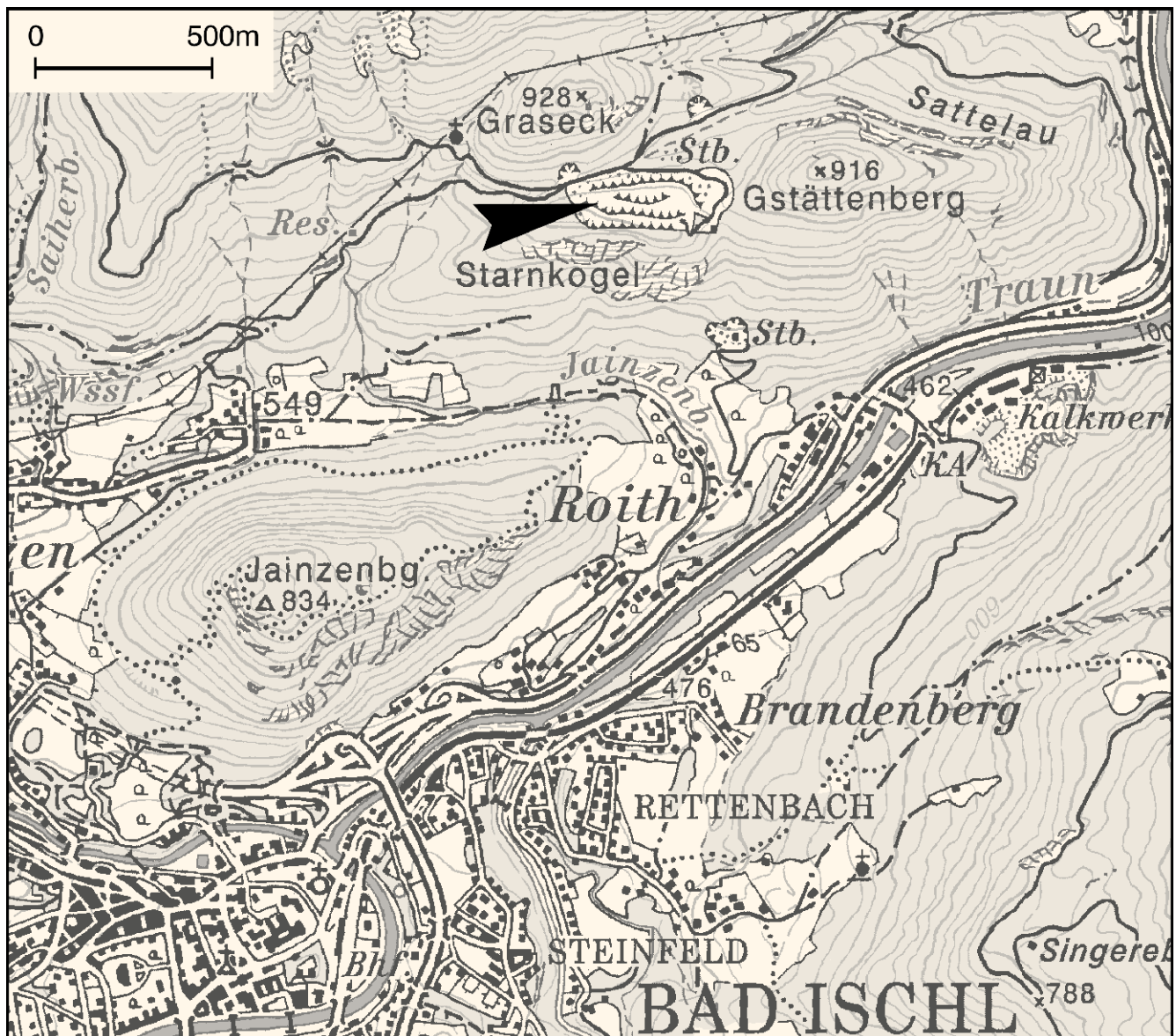
On Starnkogel NNE of Bad Ischl Dachstein Limestone is mined in a large quarry by BauMit Co. Ltd. for the production of lime, mortars, etc. (Text-Figs. 1, 2). Tectonically this area belongs to the Tyrolic unit of the northwestern Totes Gebirge mountain range (SCHÄFFER et al., 1976,

1982); MANDL et al., in prep.). Here the higher parts of the cyclically bedded "lagoonal" Dachstein Limestone show a thickness of beds from 0.5–3 m. Locally a peculiar development, namely intercalations of Kössen type sediments, can be seen. These medium to dark grey or black, more or less marly limestones and clayey shales/marls are intercalated parallel to the bedding into the Dachstein Limestone

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Text-Fig. 1.
Topographic sketch of Starnkogel quarry.

sequence (Text-Fig. 3). Hit with the hammer, some of the Kössen layers show a bituminous smell and – in places – mineralization by disseminated pyrite is common (Text-Fig. 5). This fact probably points to an anaerobic depositional environment of part of the Kössen Beds in shallow subtidal pools within the Dachstein carbonate platform. Lofertic Dachstein limestone is missing.

For more details concerning palaeoenvironment see the discussions in the paragraphs below. Additional sedimentological data on the Starnkogel quarry were published by MOSHAMMER (2004, 2008) and LEUPRECHT & MOSHAMMER (2007).

In nearby Kössen type intercalations of the southwestern slope of Hohe Schrott bivalve coquinas and plant debris occur (SCHÖLLNER, 1967). A similar development is exposed in the lower course of Rettenbach stream just above Gasthaus Rettenbachmühle E of Bad Ischl. These outcrops were studied by HOHENEGGER & PILLER (1975) in respect to foraminifera ecology. Also in the large quarry of Gmundner Zement Co. on Pfeiferkogel SE of Ebensee the

coarse bedded Dachstein Limestone shows dark claystone intercalations of Kössen type.

The Faunula

Macrofossils are not very frequent in the quarry. Some Kössen layers are comparatively rich in fossils, in particular brachiopods and bivalves, scarcely also corals and gastropods can be found. Scarce findings of ichnofossils seem to be restricted to marly intercalations within the Kössen Beds. The faunula described below was collected in 2008 and 2009 by M. & J. Siblík, St. Druckenthaner (Bad Ischl) and H. Lobitzer and is kept in the collections of the Austrian Geological Survey in Vienna.

Bivalves

Three bivalve specimens were found. A somewhat incomplete, closed double-valved mould with preserved shell represents *Inoperna (Triasoperna) schafhaeutli* (STUR, 1851) (Pl. 1, Figs. 1, 2). This characteristic mytilid species was referred



Text-Fig. 2.
Aerial photograph of Starnkogel quarry.

to as "*Modiolus*" or "*Mytilus*" for a long time (see HAUTMANN, 2001 for synonymy). REPIN (1996) when erecting the sub-genus *Triasoperna* designated *Inoperna (Triasoperna) prima* REPIN, 1996 as type species. This latter taxon, according to HAUTMANN (2001), is a junior synonym of "*Modiola*" *schafhaeutli* STUR.

The most distinctive feature of *Inoperna (Triasoperna) schafhaeutli* is the divaricate plication of the thin shell. The plicae seem to be less developed near the ventral margin. This type of ornamentation indicates infaunal, burrowing mode of life (see e.g. SEILACHER, 1972), as it was also supposed for *Inoperna (Triasoperna) schafhaeutli* by HAUTMANN (2001) and for a species of *Inoperna* sensu stricto by HODGES (2000). Other authors (e.g. DELVENE, 2001), however, consider *Inoperna* s. s. as a semi-infaunal byssally attached form, by analogy of *Modiolus*.

Inoperna (Triasoperna) schafhaeutli is well known from the Rhaetian of both the Northern Calcareous Alps and the Southern Alps, as well as from the Carpathians and the Apennines (see DIENER, 1923; HAUTMANN, 2001). Outside Europe it was recorded from Iran by REPIN (1996) and by HAUTMANN (2001).

Two internal moulds of slightly open-valved specimens have been identified as *Homomya* sp. cf. *lariana* (STOPPANI,

1861) (Plate 1, Figs. 3, 4). Their umbonal and dorsal region cannot be extracted from the rock matrix. Their outline, however, recalls *H. lariana*, a Rhaetian species known from the Southern and Suisse Alps (see DIENER, 1923) and from Hungary (VÉGH, 1964). *Homomya lagenalis* (SCHAFHÄUTL, 1852), another species known from the Kössen Beds has a more elongated posterior region. The genus *Homomya* is not uncommon in the Kössen Beds. A fine specimen of *Homomya caffii* DESIO is figured even as a guide fossil of the Triassic in ROSENBERG & ZAPFE (1954).

The exclusive presence of burrowing forms in the bivalve fauna of the Starnkogel Quarry indicates well oxygenated bottom waters and firm substrate during deposition of the Kössen Beds exposed there.

Brachiopods

More or less fragmentary or damaged shells of *Rhaetina pyriformis* (Suess, 1854) are the commonest findings there. This species was found also on other localities of the Totes Gebirge area, e.g. on Eibenberg ESE of Ebensee, from where rich assemblages of brachiopods and bivalves have been reported by ZAPFE (1949a, b). *Rhaetina pyriformis* (Suess) has been described also from other regions in the Salzkam-



Text-Fig. 3.
Thin intercalation of Kössen-type marly limestone in bedded Dachstein Limestone.

mergut, as from the Kendlbach profile in the Osterhorn region south of lake Wolfgangsee.

Scarce and monospecific findings of the brachiopod *Rhaetina gregaria* (Suess) have been published by ROSENBERG (1969) and SIBLIK & LOBITZER (2003) from the surroundings of Knerzenalm near Altaussee. Occurrences of *Rhaetina pyriformis* (Suess) are also known from other localities in these middle parts of the Northern Calcareous Alps, as e.g. from the "Oberrhät-Limestone" of the Rötelswand reef, from Steinplatte and from the Kössen Formation of Steinergraben in Wiestal, from Gaissau, in the eastern part of the Northern Calcareous Alps from the Tonion area and the Mariazeller Bürgeralm (see e.g. SIBLIK, 1988).

Our brachiopod material includes 7 specimens of *Rhaetina pyriformis* (up to 54 mm of length, Pl. 1, Figs. 5–7), 2 specimens of *Zeilleria* cf. *austriaca* (ZUGMAYER, 1880) and 1 specimen of *Zeilleria norica* (Suess, 1859). There was also material of 4 specimens of *Rhaetina pyriformis* and 1 damaged *Zeilleria* sp. at disposal for study, borrowed from the collection of the Austrian Geological Survey in Vienna (leg. B. Moshammer).

After GOLEBIEWSKI (1991) the Kössen type sediments of Totes Gebirge belong to his Hochalm Member, which is part of the Kössen Formation. The *Rhaetina*-Biofazies represents the shallowest depositional environment of all Kössen brachiopod biofazies with a water depth up to about 20 m.

Ichnofossils

Very scarce, imperfectly preserved findings of the ichnogenus *Thalassinoides* (mostly attributable to burrowing of the whole shrimp populations; cf. SEILACHER, 2007) seem to be restricted to the marly intercalations of Kössen type. Text-Fig. 4 shows at least one true "Y"-branching typical of *Thalassinoides*; also smooth surfaces, distances between the tunnels and their diameters correspond to the usual morphology of *Thalassinoides* (cf., e.g., UCHMAN, 1995). The *Thalassinoides* networks usually represent mid- to deep tier of burrowing structures (e.g., BROMLEY, 1996, p. 239). The ichnogenus is characteristic for rather episodic sedimentation which enables longer time intervals of development of colonization horizons. In some sequences, *Thalassinoides* networks marked gaps between turbidite or tempestite events and may indicate omission surfaces (e.g., MIKULÁŠ, 2006). However, if a firm ground (stiff mud bottom) develops, the tunnels bear scratch patterns and are classified as *Spongeliomorpha* (e.g., SEILACHER, 2007). *Thalassinoides* does not develop in day-by-day modelled shiftgrounds or in soupgrounds. If these substrates are affected by shrimp burrowing, the resulting form falls to the ichnogenus *Ophiomorpha*. Such burrows show a peculiar geometry of networks/boxworks and the tunnels have to be protected from a collapse by a wall lining (cf. SEILACHER, 2007).



Text-Fig. 4.
"Y"-branching *Thalassinoides* trace fossils in marly Kössen Beds.



Text-Fig. 5.
Mineralization by disseminated pyrite in Kössen Beds.

Plate 1

Bivalves and brachiopods from the Kössen Beds exposed in the Starnkogel Quarry.
The specimens are coated with ammonium-chloride.
All figures in natural size.

Figs. 1, 2: *Inoperna (Triasoperna) schafhaeutli* (STUR, 1851).

Fig. 1: right valve; coll. no.: GBA 2010/117/0001.

Fig. 2: left valve; same specimen

Figs. 3, 4: *Homomya* sp. cf. *lariana* (STOPPANI, 1861).

Fig. 3: left valve; coll. no.: GBA 2010/117/0002.

Fig. 4: right valve, same specimen; coll. no.: GBA 2010/117/0002.

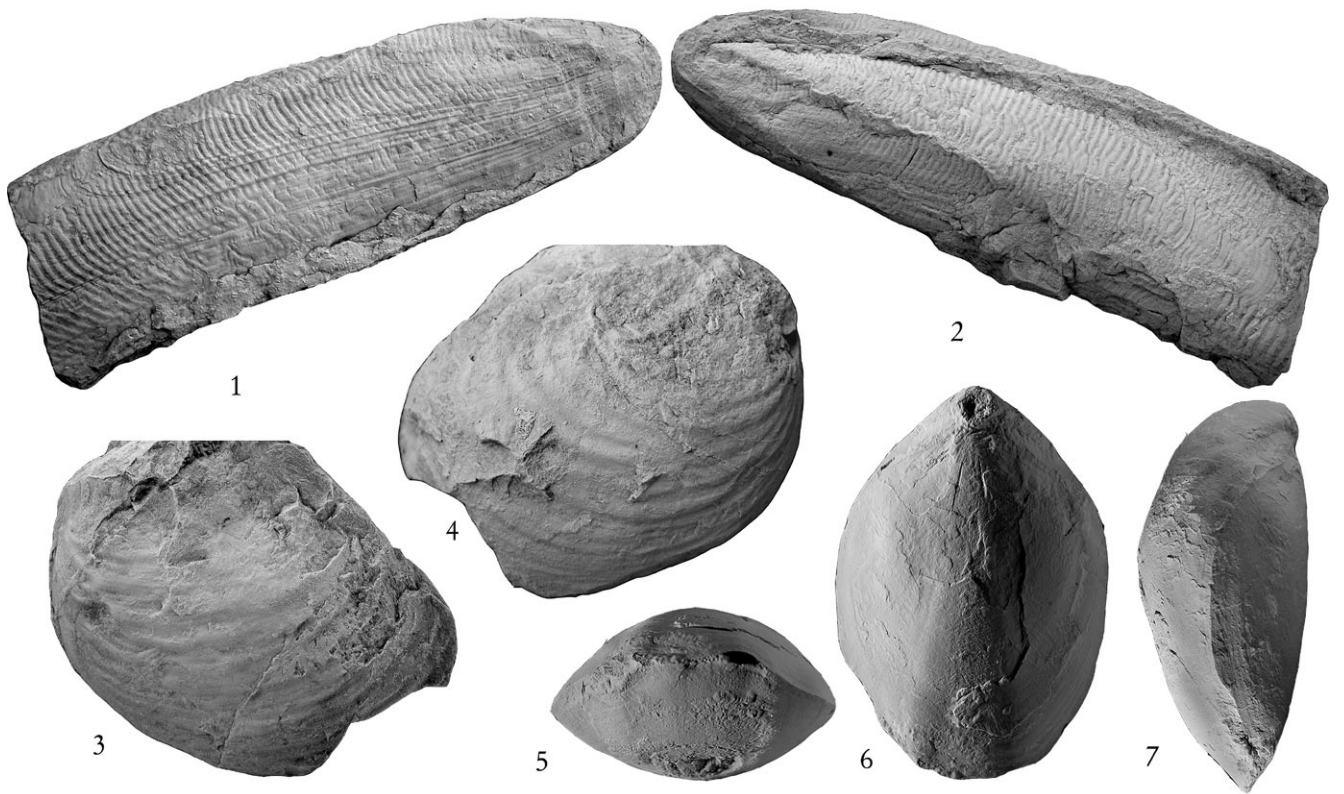
Figs. 5–7: *Rhaetina pyriformis* (SUESS, 1854).
Coll. no.: GBA 2010/117/0004.

Fig. 5: anterior view.

Fig. 6: dorsal view.

Fig. 7: lateral view.

Photos of Figs. 5–7: J. Brožek (Prague).



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