

Description of the first Rhaetian nautiloid (*Grypoceras rhaeticum* n. sp.) from the Kössen Beds of the Fonsjoch near Achensee (Austria)

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With 6 figures in the text

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Abstract: *Grypoceras rhaeticum* n. sp. is the first nautiloid described from the Rhaetian. It has been found in the Kössen Beds at the Fonsjoch near Achensee (NE of Innsbruck, Austria). The taxonomy and the designation of the type species of the genus *Grypoceras* HYATT 1883 are discussed briefly.

Zusammenfassung: *Grypoceras rhaeticum* n. sp. ist der erste aus dem Rhät beschriebene Nautiloide. Er stammt aus den Kössener Schichten des Fonsjochs bei Achensee (Österreich). Die Festlegung der Typusart und der Umfang der Gattung *Grypoceras* HYATT 1883 werden kurz diskutiert.

Introduction

The evolutionary history of the Nautiloidea s. str. ("order" Nautilida) can be subdivided into two eras, the Post-Triassic era and the Pre-Jurassic era. Most lineages of the Pre-Jurassic nautiloid cephalopods became extinct before the end of the Triassic (Norian) and possibly only one or two lineages crossed the Triassic/Jurassic boundary. In the Lower Jurassic, a new radiation took place which gave rise to the numerous "post-Triassic" nautiloid genera (KUMMEL 1953).

Although nautiloids are a common faunal element in the Triassic of the Alpine and Himalayan Tethys region, America and the Far East, they are unknown from sedimentary rocks of Rhaetian age (compare KUMMEL 1953, DZIK 1984, TEICHERT & MATSUMOTO 1987, TEICHERT 1988). This is not quite true because during the course of this study we found four references in which Rhaetian nautiloids are mentioned (GÜMBEL 1861, MOJSI-

SOVICS 1873: 22, footnote, MULLER 1934, and KOZUR 1980). The specimens, however, were neither figured nor accurately described. The aim of this paper is to describe and figure a nautiloid from the Rhaetian for the first time and discuss the systematic and nomenclature of the genus *Grypoceras* HYATT, 1883.

Locality, material and methods

The specimen was found in the famous Fonsjoch section near Achensee northeast of Innsbruck, (Austria). A detailed account of this section can be found in KUSS (1983) and JANOFKSKE (1987). The only specimen was

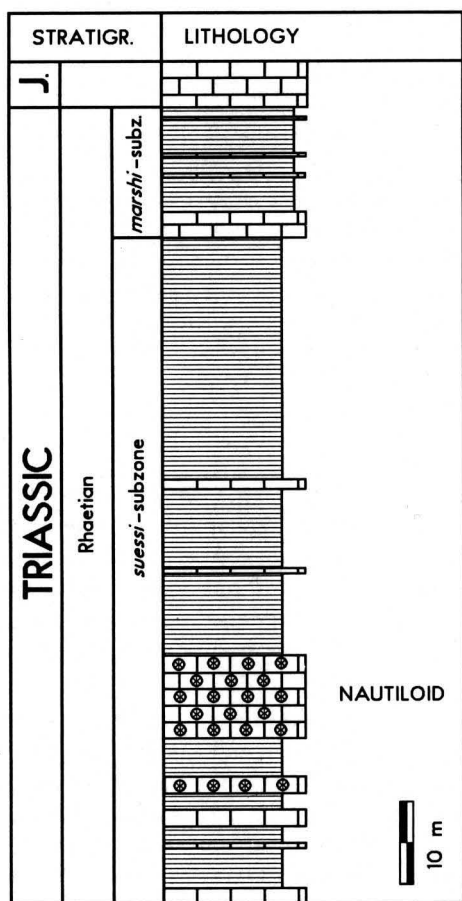


Fig. 1. Stratigraphic column of the Rhaetian Kössen Beds of the Fonsjoch section (near Achensee, Austria) (modified from JANOFKSKE 1987).

collected in a coral-bearing limestone ("Lithodendron-Kalk") of the *suessi*-subzone of the *Choristoceras marshi*-zone of the Rhaetian. A common ammonite of this bed is *Choristoceras rhaeticum* GÜMBEL. The section and the horizon with the nautiloid are shown in Fig. 1.

The specimen is badly weathered on one side and at the end of the body chamber. It was mechanically prepared and photographed during various stages of the preparation. During the preparation it broke into three pieces. One of these pieces was sectioned to study the siphuncular cord. A reconstruction of the conch is given in Fig. 3.

Termini

The termini are used in accordance with the orientation of the animal in the conch. Therefore, extern and intern or umbilical are replaced by ventral and dorsal. All other termini can be found in the "Treatise of Invertebrate Paleontology".

Previous reports on Rhaetian nautiloids

As already briefly mentioned in the introduction, there are several reports on Rhaetian nautiloids in literature. However, none of the mentioned specimens has been described and/or figured in detail. This was probably the reason that compilations, for example the "Treatise" (KUMMEL et al. 1960) or other papers (KUMMEL 1953, TEICHERT & MATSUMOTO 1987, TEICHERT 1988 a.o.) did not list any Rhaetian nautiloids. MOJSISOVICS (1873: 22, footnote) gave a brief description of a specimen already mentioned in GÜMBEL (1861: 411) as "*Nautilus mesodicus* HAUER" from the Rhaetian Kössen Beds near Kössen (Austria). We include here the short description given by MOJSISOVICS (1873: 22, footnote) (translation, additions in parentheses): "*Nautilus mesodicus* GÜMBEL ... is an easily distinguishable species, which displays a slighter increase (of what?) and a much wider umbilicus. The whorls are wider than high. The lateral lobe is much shallower than in *Nautilus mesodicus*. The siphuncle lies in the lower third of the height of the chamber (i. e. shifted towards the dorsum). A small lobus on the umbilicus is present. The fragmentary character of the specimen did not allow the establishment of a new species". The specimen is here referred to as *Grypoceras* sp. and compared with the specimen described below. KOZUR (1980) listed a *Grypoceras* sp. from the Rhaetian of the Germanic basin. No description or figure is given. MÜLLER (1934) mentioned a *Pleuromutilus* sp. from the Rhaetian of Nevada which was also probably never described in full. The age determination may be debatable.

Systematics and description

Nautiloidea AGASSIZ, 1849

Nautilida AGASSIZ, 1847

Grypoceratidae HYATT, 1900

Genus *Grypoceras* HYATT, 1883

Type species: *Grypoceras mesodicum* HYATT, 1883 (see remarks).

Diagnosis: Medium-sized nautiloids with an adult size of about 15 to 16 cm in diameter. The whorls are involute, the whorl section is inverse subtrapezoidal. There are no ornamentations except for growth lines. The ventral and dorsal shoulders are more or less angular. Venter and flanks are straight or slightly convexly curved. The suture shows a comparably deep lateral and dorsal lobus. An ventral lobus is always present but may be comparably shallow. A deep and wide hyponomic sinus is present. The siphuncle is thick and shifted towards the dorsum. The septal necks are ortho- to cyrtoconic, the septal segments slightly inflated. The embryogenesis is unknown.

Stratigraphic range: Carnian to Rhaetian.

Remarks: The genus *Grypoceras* HYATT, 1883 is herein restricted to forms with angular ventral shoulders. KUMMEL (1953, 1964) also included several forms with rounded shoulders. These are excluded herein. The angular ventral shoulders seem to be a constant feature during ontogeny, as it is shown in the described specimen and in the juvenile specimen of *Grypoceras guembeli* (see MOJSISOVICS 1873: pl. 7, fig. 2). If *Grypoceras* is derived from a form of *Grypoceras* s. l with rounded shoulders, the character "angular" ventral shoulders might be regarded as apomorphic, and the remaining forms must be excluded from *Grypoceras* s. str. The stratigraphic distribution indicates that this lineage appeared for the first time in the Upper Triassic (Carnian). For discussion of the type species see under *Grypoceras mesodicum* HYATT, 1883.

Attributed species:

Grypoceras mesodicum HYATT, 1883, Norian, Austria

Grypoceras guembeli (MOJSISOVICS, 1873), Carnian, Austria

Grypoceras involutum KIESLINGER, 1924, Carnian, Timor

Grypoceras quenstedti (HAUER, 1849), Norian, Austria

Grypoceras rhaeticum n. sp. Rhaetian, Austria

Grypoceras sp. (MOJSISOVICS, 1873), Rhaetian, Kössen, Austria.

Grypoceras mesodicum HYATT, 1883

non 1845 *Nautilus mesodicus* n. sp. QUENSTEDT, p. 60.

1846 *Nautilus mesodicus* QUENSTEDT. HAUER, p. 36/7, pl. 10, fig. 4–6.

1873 *Nautilus mesodicus* FR. v. HAUER. MOJSISOVICS, p. 21/2, pl. 8, fig. 1.

1883 *Grypoceras mesodicum* (HAUER). HYATT, p. 269.

1953 *Grypoceras (Grypoceras) mesodicum* (HAUER) 1846. KUMMEL, p. 53.

1980 *Grypoceras* sp. aff. *mesodicum* (HAUER). TURÇULET, p. 27 ff.

Holotype: HAUER (1849: pl. 10, fig. 4–6).

Locus typicus: Sommeraukogel near Aussee, Austria, Alps.

Stratum typicum: Norian.

Diagnosis: CH/CW-index about 1.0. Whorls overlap previous whorl by 2/3. Lateral lobus comparably deep.

Description (after MOJSISOVICS, 1873: 22) (additions in parentheses): "Whorls slightly higher than broad, rapidly increasing, overlapping 2/3 of the previous one. Lateral parts of the shell smooth, slightly (convexly) curved. Sharp and angular ventral shoulders, umbilical shoulders less angular, but distinct. Umbilical walls high with slight curvature against the umbilicus. Venter slightly convexly curved on the septated part of the phragmocone, on body chamber slightly concavely curved. Suture line with a shallow lobus on the venter and a large lateral lobus, which occupies the entire breadth. The saddle between external and lateral lobe lies exactly on the arcuated edge of the venter. The lobe saddle between lateral lobe and internal lobe is situated exactly on the umbilical shoulder. The siphuncle is positioned slightly below the midth of chamber height (shifted towards the dorsum). (The embryonic development is yet unknown.)

Dimensions:

diameter (probably adult size) = 150 mm

height of the last whorl = 78 mm

width of the last whorl = 72 mm

umbilical width (from dorsal shoulders) = 30 mm

umbilical width = 21 mm

(venter breadth = 2,5 cm)

(Indices: chamber width/chamber height = 1.1; chamber width/venter breadth = 3)

There are slight variations regarding the breadth of the venter." (The CW/VB-index seems to increase during ontogenesis, i. e. the chamber width increases stronger than the venter breadth.)

Stratigraphic range and occurrences: Norian, Carnian Alps (see MOJSISOVICS 1873–75, 1902), Romania, Bucovina (TURÇULET 1980).

Remarks: HYATT (1883) deliberately fixed the misidentified specimen of "*Nautilus mesodicus* QUENSTEDT, 1845" figured by HAUER (1846: pl. 10, fig. 4–6) as the type species of his new genus *Grypoceras*. In such a case, this action is deemed to be the proposition of a new nominal species; i. e. *Grypoceras mesodicum* HYATT, 1883 ("Code", Art. 70 (c) (i)). "*Nautilus*" *mesodicus* QUENSTEDT, 1845 is probably identical with "*Nautilus*" *quenstedti* HAUER, 1850 as suggested by HAUER (1850). The generic assignment of this species is still unclear (*Clydonautilus*?).

Grypoceras rhaeticum n. sp.

Derivatio nominis: After the occurrence in the Rhaetian stage.

Holotype: GPIUMH no. 2515, Figs. 2–6.

Type locality: Fonsjoch section near Achensee, NE of Innsbruck, Austria.

Type horizon: Rhaetian, *Choristoceras marshi*-subzone (see Fig. 1).

Diagnosis: A representative of the genus *Grypoceras* with a CH/CW index of 1.1 and a CW/VB index of 3.5.

Description: The specimen is badly weathered on the right side, and the ventral side of the body chamber is missing. The end of the body chamber, however, is partly preserved, therefore the length of the body chamber could be determined. The shell is partly preserved but heavily recrystallized. Some chambers are filled with micritic limestone while others are filled with a diagenetic and coarsely crystalline calcite. The specimen has a maximum diameter of about 13 cm. When complete, it may have measured about 16 cm in diameter. The body chamber measures slightly more than half a whorl. The specimen was probably adult because the distance of the last septa to the previous one is considerably smaller than the distances between previous septa. The total number of septa can only be estimated, because the inner whorls have been destroyed by diagenesis. There are about 20 septa per revolution. The shell is involute with a comparably large and perforated umbilicus. The whorls overlap about



Fig. 2. *Grypoceras rhaeticum* n. sp. from the Rhaetian Kössen Beds of the Fonsjoch section near Achensee (Austria), lateral view; scale in cm.

half or 2/3 of the previous whorl (Fig. 5). The ventral shoulders are angular, the venter is almost straight. The flanks of the shell are straight or only slightly convexly curved. The dorsal shoulders are also angular. The fragmentary end of the body chamber indicates a wide and deep hyponomic sinus. This results in an invers subtrapezoidal cross section of the whorl. There are no shell ornamentations visible except some growth lines at the end of the body chamber. The chamber height rapidly increases — it almost doubles within one half of a whorl, whereas the CW/CH-index remains almost constant. The siphuncle is thick and in a subdorsal position. The siphuncular segments are slightly inflated. The septal necks are ortho- to cyrtochoanitic (Fig. 6). The suture line shows a moderately deep lateral lobe and small lateral saddles on the ventral and dorsal shoulders. The ventral lobe is comparably shallow.

Measurements:

Width of the umbilicus (from dorsal shoulders): 3.3 cm.

Venter breadth (at the last chamber): 1.5 cm.

Chamber height (at the last but one septum): 5.8 cm.

Chamber width (reconstructed from intact left side and position of the siphuncle) = 5.8 cm.

Indices: Chamber height/chamber width (CH/CW) = 1.0

Chamber width/venter breadth (CW/VB) = 3.5

Comparisons: The specimen from the Rhaetian ("*Nautilus mesodicus* GÜMBEL" = *Grypoceras* sp., herein) briefly described by MOJSISOVIC (1873) has slightly broader chambers. The index CH/CW is lower than 1.0 according to MOJSISOVIC (1873). In *Grypoceras mesodicum* HYATT, 1883 the H/W-index is almost 1, and the CW/VB-index is about 3. Both Rhaetian specimens differ from *Grypoceras mesodicum* HYATT, 1883 by the shallower lateral lobe. However, the presumed adult size of all three specimens (and species) is very similar (about 15 to 16 cm). The new species described herein is the last representative of the *Grypoceras*-lineage which appeared in the Carnian and became extinct in the uppermost Triassic.

Ecologic implications

Despite an intensive survey of the Upper Triassic Kössen Beds, this specimen was the only nautiloid found. The Kössen Beds represent the back reef facies of the Dachstein reef limestone. This may explain why the nautiloids are so rare. Nautiloids were probably inhabitants of the fore-reef areas of the Dachstein reefs and may have drifted as empty shells into the lagoons. The scarcity of nautiloids is in marked contrast to the diversity of ammonoids which sometimes occur in large numbers. They probably lived in these lagoons.

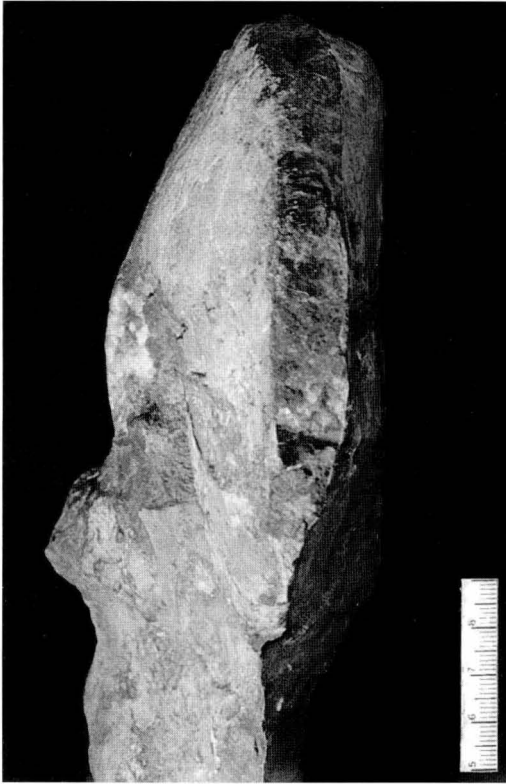


Fig. 3. *Grypoceras rhaeticum* n. sp. from the Rhaetian Kössen Beds of the Fonsjoch section near Achensee (Austria), ventral view; scale in cm.

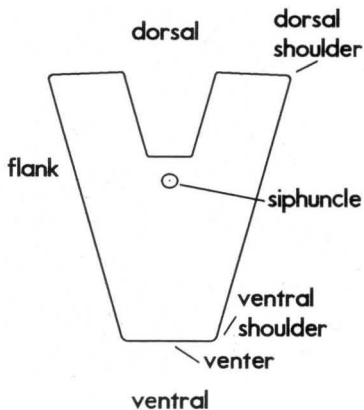


Fig. 4. Schematic cross section of the conch of *Grypoceras rhaeticum* n. sp.

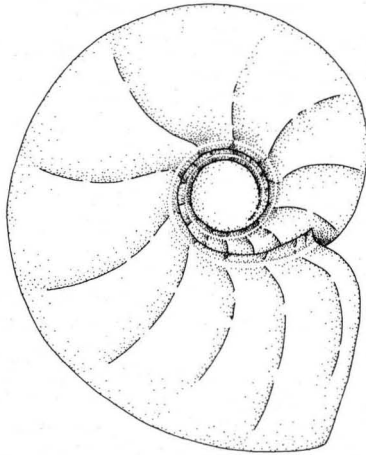


Fig. 5. Reconstruction of the conch of *Grypoceras rhaeticum* n. sp.

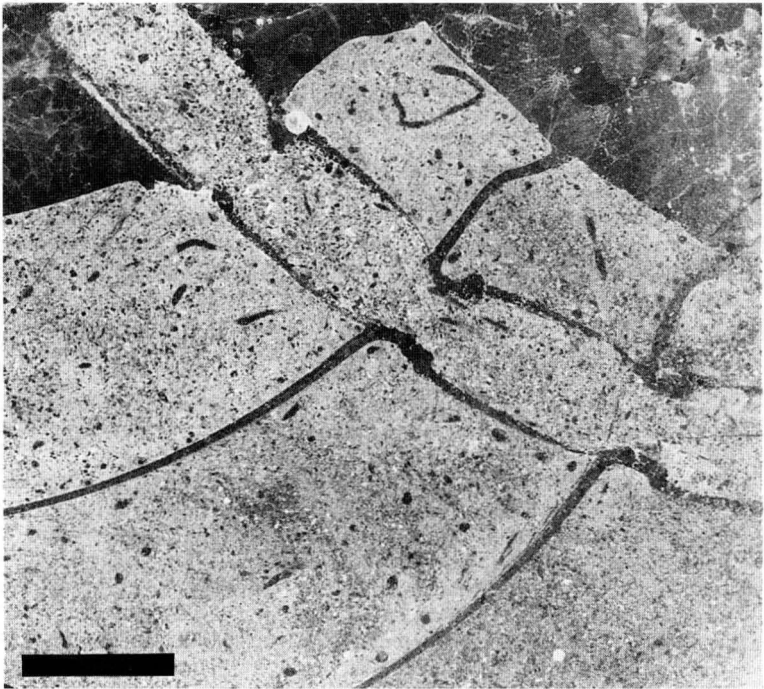


Fig. 6. Longitudinal section through the siphuncular cord of *Grypoceras rhaeticum* n. sp.; scale = 0.5 cm.

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