

# Ammonoids from the Aptian (Lower Cretaceous; Upper Austria) of the Northern Calcareous Alps

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(With 1 textfigure and 2 plates)

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## Abstract

6 taxa of ammonoids are described from the recently discovered locality Siegesbachgraben (Upper Austria) of the Lower Cretaceous Rossfeld Formation (Northern Calcareous Alps): *Pseudohaploceras* cf. *matheroni* (d'ORBIGNY, 1841), *Ptychoceras* sp., *Procheloniceras* cf. *pachystephanum* (UHLIG, 1883), ? *Cheloniceras* sp., *Deshayesites bedouliensis* CECCA, ROPOLO & GONNET, 1999, and ?*Deshayesites* sp. juv. The stratigraphically most significant *Deshayesites bedouliensis* and *Procheloniceras* cf. *pachystephanum* indicate the basal Aptian *Deshayesites oglanlensis* Zone. Palaeogeographically the Siegesbachgraben seems to have been a part of the seaway between Tethys and the Anglo-Paris Basin which opened in Late Barremian/Early Aptian times.

**Keywords:** Ammonoidea, Early Aptian, Northern Calcareous Alps

## Zusammenfassung

6 Taxa Ammoniten von der bislang unbekanntenen Lokalität Siegesbachgraben (Oberösterreich) aus der unterkretazischen Rossfeld Formation (Nördliche Kalkalpen) werden beschrieben: *Pseudohaploceras* cf. *matheroni* (d'ORBIGNY, 1841), *Ptychoceras* sp., *Procheloniceras* cf. *pachystephanum* (UHLIG, 1883), ? *Cheloniceras* sp., *Deshayesites bedouliensis* CECCA, ROPOLO & GONNET, 1999, ?*Deshayesites* sp. juv. Die stratigraphisch aussagekräftigsten *Deshayesites bedouliensis* und *Procheloniceras* cf. *pachystephanum* zeigen die *Deshayesites oglanlensis* Zone des tiefsten Aptiums an. Der Siegesbachgraben scheint Teil der Meeresverbindung zwischen Anglo-Pariser Becken und Tethys gewesen zu sein, die sich im späten Barremium/frühen Aptium etablierte.

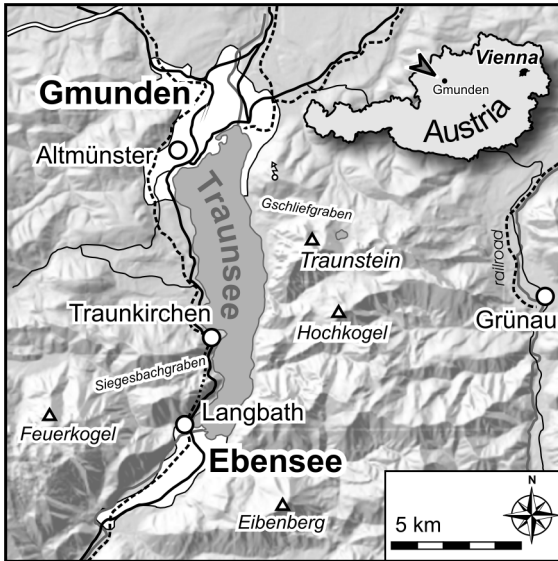
**Schlüsselwörter:** Ammonoidea, Unter-Aptium, Nördliche Kalkalpen

## Introduction, material and preservation

The Siegesbachgraben is a small western tributary of lake Traunsee, situated about 1 km south of Traunkirchen (Upper Austria; text-fig.1). The collection is from the siliciclastic Rossfeld Formation of Early Cretaceous age belonging to the Langbath Unit, a local part of the northern nappes of the Northern Calcareous Alps (EGGER 1996). It comprises

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Text-fig. 1: Sketch map of the Siegesbachgraben near Traunkirchen (Upper Austria) indicating also the closely neighboured but tectonically and stratigraphically distant Gschlieffgraben (with alterations after KROH & JAGT, in press).

ammonites, belemnites, a single echinoid, solitary scleractinians, a single fossil leaf and remnants of fossil wood, altogether more than 70 specimens. About 85 % are ammonites preserved in a soft yellowish brown, crumbly fine-grained sandstone. Most of them are deformed composite moulds without adherent shell. The juvenile stage is generally missing or merely indicated. Due to the degree of deformation, reconstruction of original shape and sculpture is difficult. All specimens are stored in the Museum of Natural History Vienna and are coated with ammonium chloride before photographing.

### Conventions

NHMW	Museum of Natural History Vienna	Wh	whorl height
D	diameter	Wb	whorl breadth
D <sub>max</sub>	maximum diameter	U	umbilicus

### Systematic Palaeontology

Suborder Ammonitina HYATT, 1889

Superfamily Desmoceratoidea ZITTEL, 1895

Family Desmoceratidae ZITTEL, 1895

Subfamily Puzosiinae SPATH, 1922

Genus *Pseudohaploceras* HYATT, 1900

Type-species: *Ammonites liptoviensis* ZEUSCHNER, 1856 by original designation of HYATT, 1900.

***Pseudohaploceras cf. matheroni* (d'ORBIGNY, 1841)**

Pl. 1, Fig. 1

Compare:

1841 *Ammonites Matheroni*; d'ORBIGNY: 148, pl. 48, figs. 1, 2.**M a t e r i a l**: NHMW/1981/42/2 a single specimen from the Siegesbachgraben.**D e s c r i p t i o n**: The specimen is a small (D 30 mm) and badly deformed internal mould laterally compressed by post-mortem crushing. The general shape was moderately involute with a relatively wide umbilicus and low whorl height. On the partially preserved body chamber, 3 straight and prorsiradiate constrictions arise at the umbilical seam, fading out at the outer quarter of the flank. Constrictions are preceded by collar ribs. 7 - 8 narrow ribs occur between the constrictions at the inner quarter of the flank, some of these ribs bifurcating midflanks.**R e m a r k s**: Straight constrictions, rib thickness, and also the wide umbilicus suggest that the specimen is a juvenile *Pseudohaploceras matheroni* (d'ORBIGNY, 1841). The related *Pseudohaploceras douvillei* (FALLOT, 1920) has more and falcoid constrictions and a narrower umbilicus. Ribs of *Pseudohaploceras liptoviense* (ZEUSCHNER, 1856) as well as those of *Pseudohaploceras ramosum* BOGDANOVA, 1991, are of variable thickness, some of them arising at the umbilicus. Open nomenclature is used here because the figured individuals (see DELANOY 1992) are generally considerably larger than the Alpine specimen.**O c c u r r e n c e**: According to DELANOY (1992), *Ps. matheroni* occurs from Late Barremian to Early Aptian. It is known from France, Spain, Bulgaria and Georgia.

Suborder Ancyloceratina Wiedmann, 1966

Superfamily Ancyloceratoidea GILL, 1871

Family Ptychoceratidae GILL, 1871

Genus *Ptychoceras* d'ORBIGNY, 1842**Type-species**: *Ptychoceras emericianum* d'ORBIGNY, 1842 by subsequent designation of DIENER, 1925.***Ptychoceras* sp.**

Pl. 2, Fig. 3

**M a t e r i a l**: NHMW/1981/42/1, a single fragment from the Siegesbachgraben.**D e s c r i p t i o n**: This tiny fragment consists of two very incompletely preserved shafts that are in contact. The proversum is smooth, the retroversum bears thin rursiradiate riblets. Dorsally on the curved part, a conspicuous, narrow oval space between the shafts is reminiscent of the eye of a needle.**M e a s u r e m e n t**: Wh is 4.9 mm at the curved part, the maximum Wh at the retroversum is about 4.5 mm.

**R e m a r k s :** Due to our interpretation as a fragment of a juvenile stage, the species determination remains open. The Alpine specimen differs from *Ptychoceras laeve* MATHERON, 1878, in that both shafts of the latter are smooth. It differs by the smooth proversum from *P. dittleri* VAŠÍČEK, 1972 and *P. obliquesulcatum* AVRAM, 1976. The latter species is the only one with inconspicuous oblique prorsiradiate ribbing of both shafts.

**O c c u r r e n c e :** Representatives of the genus *Ptychoceras* occur worldwide during a long time span from Early Hauterivian to Late Albian.

Superfamily Douvilleiceratoidea PARONA & BONARELLI, 1897

Family Douvilleiceratidae PARONA & BONARELLI, 1897

Subfamily Cheloniceratinae SPATH, 1923

Genus *Procheloniceras* SPATH, 1923

Type-species: *Ammonites stobieckii* d'ORBIGNY, 1850, by original designation.

***Procheloniceras* cf. *pachystephanum* (UHLIG, 1883)**

Pl. 1, Figs. 2a, b

Compare:

1883 *Acanthoceras pachystephanus* n. sp. – UHLIG: 255, pl. 24, figs. 1, 2, pl. 25.

1883 *Acanthoceras marcomannicum* n. sp. – UHLIG: 256, pl. 23, fig. 3, non fig. 2 (= *Procheloniceras marcomannicum*).

**M a t e r i a l :** NHMW/1981/42/4, a single, heavily deformed fragment consisting of about one third of a whorl of an adult individual.

**D e s c r i p t i o n :** The shell seems to have been evolute with slightly inflated flanks, the original section is unknown. Wh 12.5 mm and Wb 26.5 mm are measured values indicating heavy post-mortem deformation: Wb is exaggerated, whereas Wh is reduced. D originally has been > 60 mm. Undivided strong ribs are separated by slightly wider interspaces. In two cases, two ribs probably arise together at the umbilicus in the terminal part of the fragment. Another shorter rib in median position of the fragment is markedly narrower. Some ribs bear umbilical and lateral tubercles, indicating two rows of tubercles fading out at a larger diameter.

**D i s c u s s i o n :** Despite its unknown juvenile whorls, the specimen most closely resembles *Procheloniceras pachystephanum* (UHLIG), whose tubercles disappear in larger diameters. The similar *P. marcomannicum* (UHLIG, 1883) has narrower ribs, intercalated ones arising at the umbilical seam. In related species as *P. albrechtiaustriae* (UHLIG, 1883) and *P. sporadicum* (ROUCHADZÉ, 1933), conspicuous tuberculation remains on adult stages larger than 60 mm in diameter.

**O c c u r r e n c e :** In general, Early Aptian is considered to be the date of first appearance, but accurate modern data on the range of *P. pachystephanum* are unknown; occurrences in the uppermost Barremian cannot be excluded. In the Silesian Unit of the Outer Carpathians (VAŠÍČEK 1972), representatives of *Procheloniceras* occur in the Early Aptian. *P. pachystephanum* occurs in the Czech Republic, in Poland, France and in the Caucasus.

Genus *Cheloniceras* HYATT, 1903

Type-species: *Ammonites cornuelianus* d'ORBIGNY, 1841.

**?*Cheloniceras* sp.**

Pl. 1, Figs. 3a, b

**M a t e r i a l :** NHMW/1981/42/5; a single, larger, deformed fragment consisting of about one quarter of the whorl of an adult individual and four additional fragments. Especially the adapical part is imperfectly preserved.

**D e s c r i p t i o n :** Based on the preserved parts the general shape seems to have been moderately evolute. Due to post-mortem crushing, the flanks are flattened and the whorl height is diminished. Due to deformation, the original whorl section remains unclear: a high oval whorl section seems likely. In the terminal, less deformed part, the flanks are slightly inflated. Ventrolateral and umbilical shoulders seem to have been gently rounded, the short umbilical wall is oblique.

Ribs are rather dense and distinctly wider than the interspaces. At the adapical end of the whorl, the main ribs arise at the umbilical seam. Alternating intercalatories appear below mid-flanks, increasing to equal thickness towards the venter. The main ribs bear two rows of tubercles at the umbilicus and approximately mid-flanks. A single rib bifurcates in the lateral tubercle.

**D i s c u s s i o n :** The pentagonal whorl section, flat venter, and the dense and relatively narrow ribs with two rows of apparently disappearing tubercles indicate a relationship with the group of *Ch. cornuelianum* (d'ORBIGNY, 1841). Another close ally is *Ch. kiliani* (KOENEN, 1902), whose tubercles disappear rather early. At comparable diameters the latter species has a greater number of intercalatories. This is also the case in *Cheloniceras seminodosum* (SINZOW, 1906). Due to the poor preservation, generic assignation remains doubtful.

**O c c u r r e n c e :** In Mediterranean areas (Caucasus, Bulgaria, France, Spain), *Cheloniceras* is the typical representative of Early Aptian. It also occurs in Boreal Europe (England, Germany).

Superfamily Deshayesitoidea STOYANOW, 1949

Family Deshayesitidae STOYANOW, 1949

Subfamily Deshayesitinae STOYANOW, 1949

Genus *Deshayesites* KAZANSKY, 1914

Type-species: *Ammonites deshayesi* d'ORBIGNY, 1840, by original designation of KAZANSKY, 1914.

***Deshayesites bedouliensis* CECCA, ROPOLO & GONNET, 1999**

Pl. 2, Fig. 1

1998 *Deshayesites bedouliensis* CECCA, ROPOLO & GONNET; CECCA et al.: pl. 1, fig. 1.

1999 *Deshayesites bedouliensis* n. sp. – CECCA, ROPOLO & GONNET: 270, pl. 1, fig. 1, pl. 2, pl. 3, figs. 1, 2, pl. 4, pl. 5, figs. 1, 2, pl. 6, fig. 1, pl. 7, fig. 1, pl. 8, fig. 1.

**M a t e r i a l :** NHMW/1981/42/6, the best preserved specimen and five unregistered fragments of adult body chambers.

**D e s c r i p t i o n :** NHMW/1981/42/6, a large and moderately evolute macroconch, is laterally flattened by diagenetic compaction. The terminal half of the last whorl of the body chamber is indicated by fragments of the last suture. The umbilicus is relatively wide, the umbilical wall steep and low. The last whorl is of medium height, squeezed to the bedding surface. The section of the whorls is not known.

Relatively strong and at the marginal flank equally thick ribs are separated by interspaces of approximately equal width. On the body chamber, falcoid rursiradiate primary ribs arise at the umbilical seam with a distinct umbilical tubercle. About mid-flanks, the original concave course changes into a shallow convexity. Between the primaries, single, in one case two secondary ribs of various length arise mid-flanks. The ribbing at the terminal part of the phragmocone is similar. In a single case, two intercalated ribs are developed instead of one. The secondary ribs arise on the inner quarter of the flank and are longer than those on the body chamber.

**M e a s u r e m e n t :** The (D) of the deformed shell is less than about 175 mm. At  $D = 169.8$  mm,  $Wh = 64.0$  mm ( $Wh/D = 0.38$ ),  $U = 56.0$  mm ( $U/D = 0.33$ ). The measured values are influenced by deformation. At  $D_{max}$  17 primary ribs and together with the secondary ones 38-40 ribs are present at the ventral margin per one half of the whorl.

**D i s c u s s i o n :** *Deshayesites bedouliensis* is, according to the original description, a very variable species, especially in the umbilicus width and also in the density of ribbing. Preserved parameters of the Alpine specimen correspond best to this species. *Deshayesites semenovi* BOGDANOVA, 1999, is a related species. It differs especially by the narrower umbilicus, higher whorls and the fewer primary ribs. The macroconchs of the species *D. weissii* NEUMAYR & UHLIG, 1881, bear relatively similar, somewhat narrower ribs as well. Among other feature, however, they have more ribs inserted and, on the whole, they are more densely ribbed.

**O c c u r r e n c e :** After CECCA et al. (1999), *D. bedouliensis* occurs in the type area in France in the basal Aptian (*Oglanlensis* Zone).

### **?*Deshayesites* sp. juv.**

Pl. 2, Fig. 2

**M a t e r i a l :** NHMW/1981/42/3, a small flattened shell with a better preserved terminal half of the last whorl.

**D e s c r i p t i o n :** A small, half-involute shell with relatively high whorls and a rather wide umbilicus. Slightly rounded umbilical shoulders incline continuously towards the umbilical seam. The venter is narrowly rounded. The sculpture consists of primary ribs and intercalated ones. The simple and bifurcated primary ribs arise at the umbilicus. The first three slightly falcoid ones bifurcate below midflanks at the adapical end of the preserved whorl. At the bifurcation they bear a small lateral tubercle. Near the umbilical seam, they are usually enhanced by little tubercles. In addition to the simple non-tuberculated ribs, covering the whole flanks and that seem to be only slightly narrower than the tuberculate ones, shorter, and undivided ones are intercalated irregularly. They arise roughly at the level of the lateral tubercles.

**M e a s u r e m e n t :** Due to deformation, the measured values are only approximations. At  $D = 21$  mm (close to the maximum diameter)  $Wh$  is about 8.2 mm (0.39) and the umbilicus width  $U$  is 6.2 mm (0.295). On the last half-whorl, 13 ribs run as far as the umbilicus; at the ventral margin, 22 ribs are visible.

**D i s c u s s i o n :** The indicated lateral tubercles on the ribs of juvenile shells contradict the diagnosis of the genus *Deshayesites* in contrast to the basic morphology of the Alpine specimen. Lateral tubercles are usually developed in certain representatives of the Late Aptian subfamily Acanthohoplitinae. Their ventral side is, however, either wide, or it has a developed siphonal furrow, missing in the Alpine material. The same problems that arise in the genus assignation also exist in determining the species. Equivalent juvenile growth stages of deshayesitids with a small shell diameter (e.g. BOGDANOVA 1983, 1991) usually have denser S-shaped ribs; simple ribs do not reach as far as the umbilicus and lack lateral tubercles. The only exception seems to be a juvenile shell depicted by AVRAM (1995, pl. 20, fig. 8) under the name *Deshayesites* cf. *gracilis* CASEY, 1964.

### Palaeogeography

The Siegesbachgraben is a rather isolated locality. Representatives of the genera *Deshayesites* and *Procheloniceras* are of palaeogeographical importance: *Deshayesites bedouliensis* is a lately established taxon, whereas *Procheloniceras* cf. *pachystephanum* belongs to the "old" ones. The former species is known solely from the basal Aptian in the type area, La Bédoule. The procheloniceratids occur extensively in the Mediterranean and Boreal basins of Europe due to the new seaway that opened between the Anglo-Paris basin and the Tethys in Late Barremian/Early Aptian times (e.g. MUTTERLOSE 1992, VAŠÍČEK & MICHALÍK 2002: Fig. 6.6). The Siegesbachgraben is interpreted as being a part of this seaway.

### Conclusions

The ammonite locality of Siegesbachgraben is unique for its specific siliciclastic development and stratigraphic position. It is reminiscent of ammonite-bearing, but stratigraphically substantially older deposits of the Rossfeld Formation in the Reichraming Nappe (e.g. VAŠÍČEK & FAUPL 1996). As already stated by IMMEL (1987), the Early Aptian in the Northern Calcareous Alps is only poorly documented by ammonites. A single locality of comparable age is Glemmbach (Tyrol, Thiersee Syncline), which is, however, developed in carbonate facies.

Due to poor preservation, 39.6% of the ammonites have not been identified specifically. Of the determinable ones, the deshayesitids (28.6%) and cheloniceratids (11.1%) dominate. At suborder level, phylloceratids represent 9.5%, ancyloceratids 4.8% and lycocerotids 3.2%. Merely 3.2% of those specimens that are unidentified at the species level belong to genus *Pseudohaploceras* of the suborder Ammonitina. Stratigraphically, *Deshayesites bedouliensis* and *Procheloniceras* cf. *pachystephanum* are the most significant and indicate the basal Aptian *Deshayesites tuarkyricus* Zone, recently renamed into *Deshayesites oglanlensis* Zone (HOEDEMAEKER, REBOULET et al. 2003).

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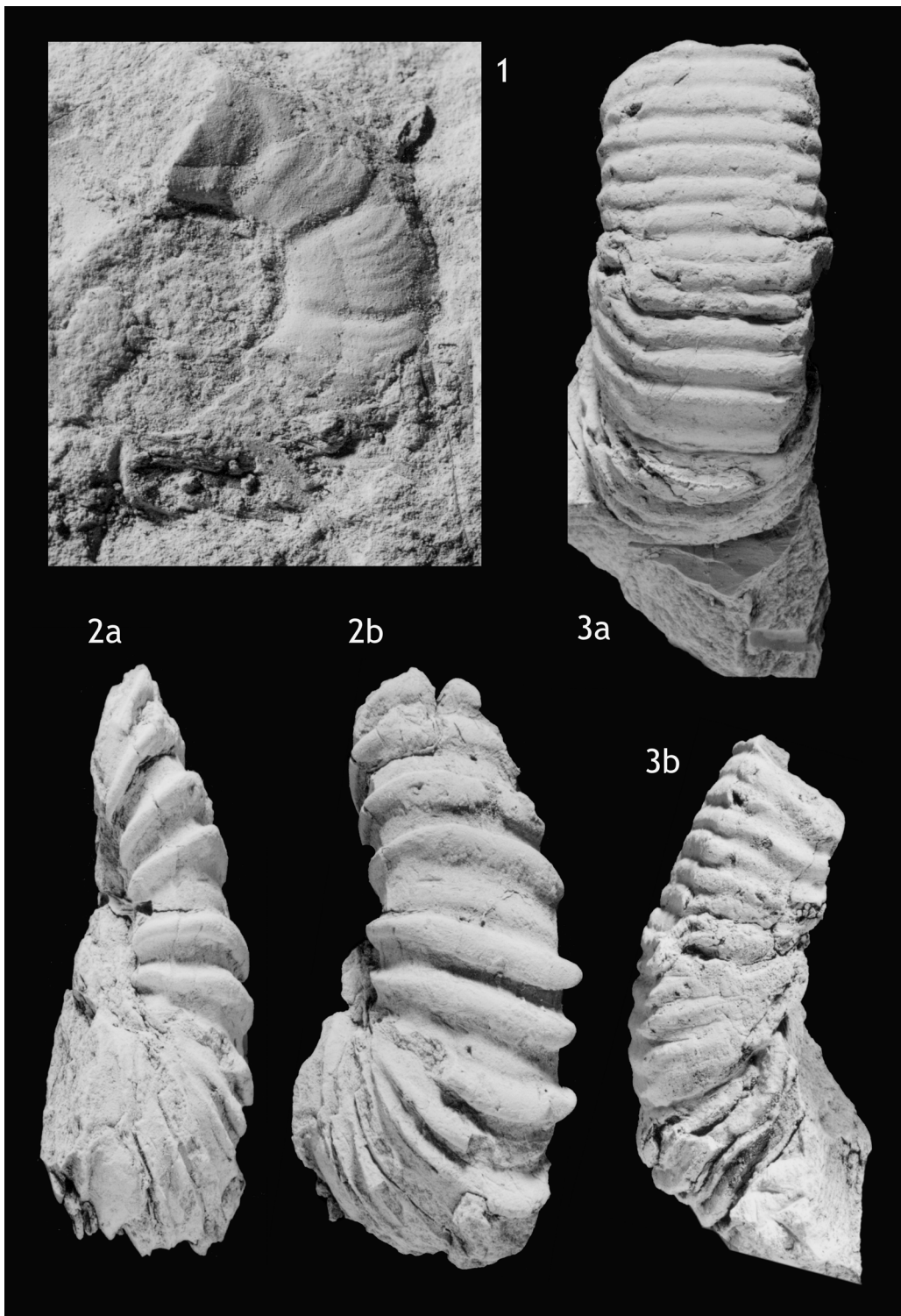
**Plate 1**

Fig. 1: *Pseudohaploceras cf. matheroni* (d'ORBIGNY).  
NHMW/1981/42/2, x 2

Figs. 2 a, b: *Procheloniceras cf. pachystephanum* (UHLIG); a – lateral view, b – ventral view.  
NHMW/1981/42/4, x 1,1

Figs. 3 a, b: *?Cheloniceras sp.*; a – a view of ventral side, b – lateral view.  
NHMW/1981/42/5, x 1

All specimens are from the HORVATH property, Siegesbachgraben, Upper Austria



**Plate 2**

Fig. 1: *Deshayesites bedouliensis* CECCA, ROPOLO & GONNET.  
NMHW/1981/42/6, x 0,75

Fig. 2: ?*Deshayesites* sp. juv.  
NMHW/1981/42/3, x 2,5

Fig. 3: *Ptychoceras* sp.  
NMHW/1981/42/1, x 3

All specimens are from the HORVATH property, Siegesbachgraben, Upper Austria

