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An Early Cretaceous Ammonoid Association from Upper Austria (Late Valanginian, Northern Calcareous Alps)

by

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Abstract

Early Cretaceous ammonoids were collected at the Hochkogel locality in the southernmost part of the Reichraming Nappe (Ebenforst Syncline, Northern Calcareous Alps). The cephalopod fauna sampled from marly parts of the Rossfeld Formation indicates Late Valanginian age.
The ammonoid fauna comprises 7 different genera, each apparently represented by 1-2 species. The occurrence at the Hochkogel section is dominated by *Bochianites* (49 %), *Ptychophylloceras* (18 %) and *Haploceras* (18 %). Ancyloceratids (represented only by bochianitids) are the most frequent component. Ammonitids and phylloceratids are roughly balanced (each about 20 %). Lytoceratids are represented with below average values (7 %). A single deepwater nautiloid and 2 belemnite guards complete the cephalopod fauna. Brachiopods, bivalves and gastropods make up the main components of the benthic macrofauna.
The deposition of the limestones in this area occurred in an unstable environment. Gravitational transport of different sediments and fragmented cephalopod specimens is assumed for the accumulated layers from the source area (situated to the south). The cephalopod fauna consists solely of Mediterranean elements.
Keywords: Ammonoids, Biostratigraphy, Early Cretaceous (Valanginian), Upper Austria, Northern Calcareous Alps

Zusammenfassung

Unterkreide Ammonoideen wurden an der Fundstelle Hochkogel im südlichsten Teil der Reichraming Decke (Ebenforst Mulde, Nördliche Kalkalpen) gesammelt. Die Cephalopoden Fauna aus den besammelten mergeligen Schichten der Rossfeld Formation, deutet auf Ober Valanginium hin.
Die Ammonoideen Fauna beinhaltet 7 verschiedene Gattungen, von welchen jede durch mindestens 1-2 Arten repräsentiert wird. Das Vorkommen der Lokalität Hochkogel wird durch *Bochianites* (49 %), *Ptychophylloceras* (18 %) und *Haploceras* (18 %) dominiert. Ancyloceratidae (durch *Bochianites* representiert) sind die häufigste Komponente. Ammonitidae und Phylloceratidae sind nahezu ausgeglichen (bei ca. 20 %). Lytoceratidae sind mit 7 % unterdurchschnittlich vertreten. Ein einziger Tiefwasser Nautilide und 2 Belemniten Rostren vervollständigen das Bild der Cephalopoden Fauna. Brachiopoden, Muscheln und Schnecken stellen die Hauptkomponenten der benthischen Makro-Fauna dar.
In einem instabilen Umfeld kam es im Ober Valanginium zur Ablagerung der Kalksteine, Mergel und Sandsteine dieses Gebietes. Gravitativer Transport vom Herkunftsort (im Süden gelegen) der verschiedenen Sedimente und der fragmentierter Ammonoideen Exemplare wird angenommen. Die Cephalopoden Fauna zeigt einen rein Mediterranen Charakter.
Schlüsselwörter: Ammonoideen, Biostratigraphie, Unter-Kreide (Valangin), Oberösterreich, Nördliche Kalkalpen

1. Introduction

In the Reichraming Nappe (Bajuvaric Unit, Northern Calcareous Alps), Valanginian cephalopod-bearing deposits are recorded in two different facies, the Schrambach and the Rossfeld Formation. Upper Valanginian sediments of the Rossfeld Formation comprise turbiditic marls and sandstones, whereas the Schrambach Formation is built by limestones with turbiditic sandstone intercalations (VAŠÍČEK & FAUPL, 1996). The source area for the Rossfeld Formation and the sandstone intercalations of the Schrambach Formation was situated to the south of the basin (FAUPL & WAGREICH, 1992; VAŠÍČEK & FAUPL 1996, 1998).
The Rossfeld Formation is restricted to southern parts of the Reichraming Nappe. It is interpreted as a synorogenic succession deposited at the beginning of the compressional deformation within the Austroalpine unit (FAUPL, 1979; DECKER et al., 1987). The palaeogeographical reconstruc-

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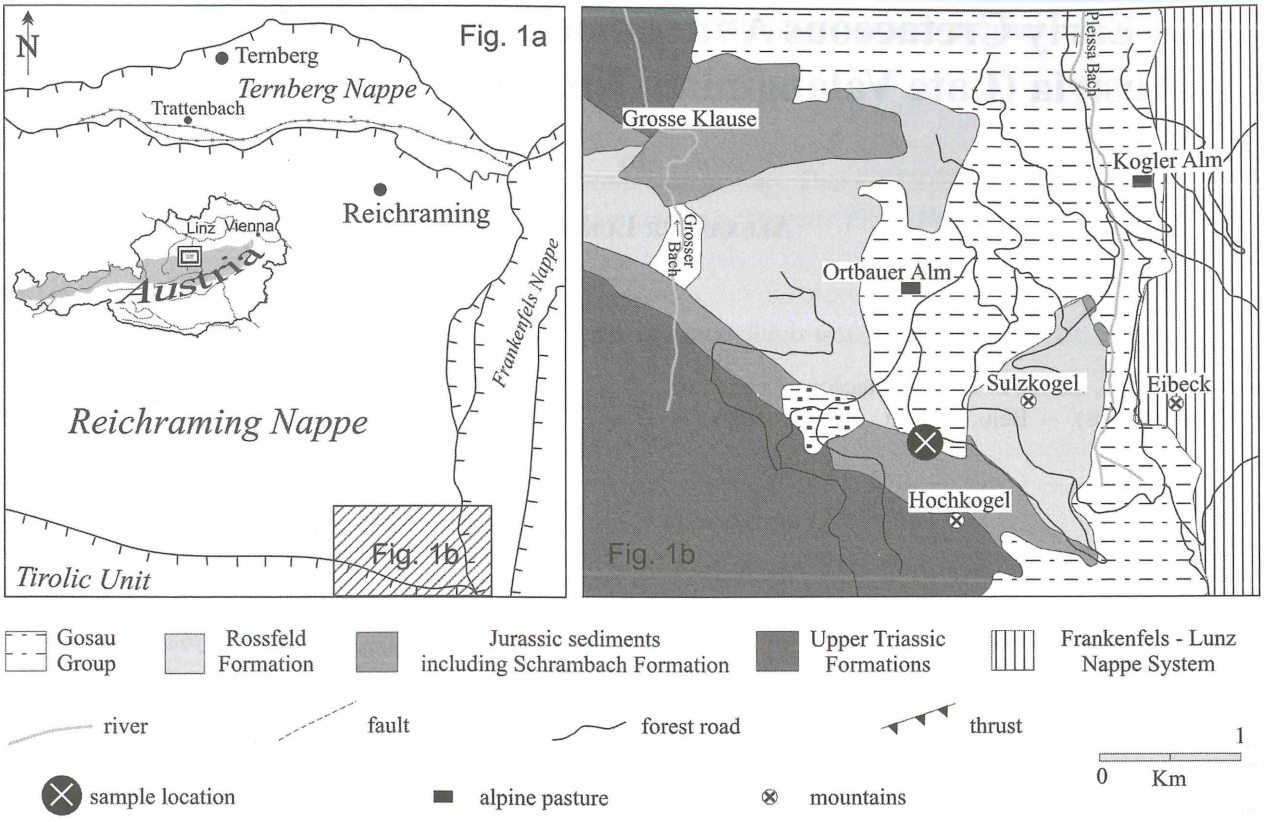

Figure 1: Fig. 1a. Locality map of Upper Austria showing tectonic situation (Reichraming Nappe, Frankenfels Nappe) around the section investigated within the Northern Calcareous Alps. Fig. 1b. Position of the Hochkogel locality and lithological formations of the Ebenforst Syncline.

tion of the investigated area through the Lower Cretaceous shows that the sedimentation of the Rossfeld Formation (sandstone intercalations within the lower part of the section), in the internal and eastern parts of the Northern Calcareous Alps (southern parts of the 'Bajuvarikum') is apparently connected with an uplift of the southernmost parts. This reflects either beginning subduction of the Penninic Ocean in the North or the obduction of oceanic crust of the former Vardar Ocean at the boundary Austroalpine/Southern Alps (SCHLAGINTWEIT, 1991). The stratigraphy of the Lower Cretaceous sediments around the investigated area is based on ammonoids. A new cephalopod fauna was collected in limestone interbeds of the Rossfeld Formation.

During the 1990s, a rich cephalopod fauna was collected from Lower Cretaceous sediments from the surrounding area of the herein presented locality (VAŠÍČEK & FAUPL, 1996, 1998, 1999; VAŠÍČEK et al., 1994; see also IMMEL, 1987).

The present contribution provides a detailed study of the rich and extraordinarily well-preserved Upper Valanginian ammonoid fauna from the Hochkogel section, which yields new and important biostratigraphical data, and presents new facts on the correlations within the Northern Calcareous Alps. The Hochkogel fauna is also correlated with the comparable faunas from the most recent papers on Lower Cretaceous faunas of LUKENEDER (1997, 1998, 2001a, b, 2003, 2004), LUKENEDER & HARZHAUSER (2003) and VAŠÍČEK & FAUPL (1996, 1998, 1999).

2. Geographical setting

The outcrop is situated in the Reichraming Nappe in Upper Austria. The exact position is about 5 km south of Brunnbach (652 m, ÖK 1:50,000, sheet 69 Großraming, Fig. 1). The outcrop is located in the southernmost part of the east-west striking Ebenforst Syncline along a forest road, running between the Sulzkogel (840 m) to the north and the Hochkogel (1157 m) to the south at the topmost part of the Reixengraben at 885 m.

The grey sandstone succession comprising the marly ammonoid-bearing beds (dipping 225/60°) is located on the nothern side of the Hochkogel, on a nearly vertical wall of the outcrop, which was exposed by road-cutting. The occurrence is exposed in 3 distinct beds of 10-40 cm thickness (fig. 2). The exact position of the ammonoid-occurrence is fixed by GPS data (global positioning system): N 47°47'15" and E 14°30'00" (fig. 2).

3. Geological setting and lithology

The Upper Valanginian cephalopods described here were collected from a little outcrop containing sandstones and marly limestones, located at the southern margin of the Ebenforst Syncline. The Ebenforst Syncline is situated in the southernmost part of the Reichraming Nappe of the Northern Calcareous Alps. This region is part of the Bajuvaric Unit, which is neighboured and overlain in the south

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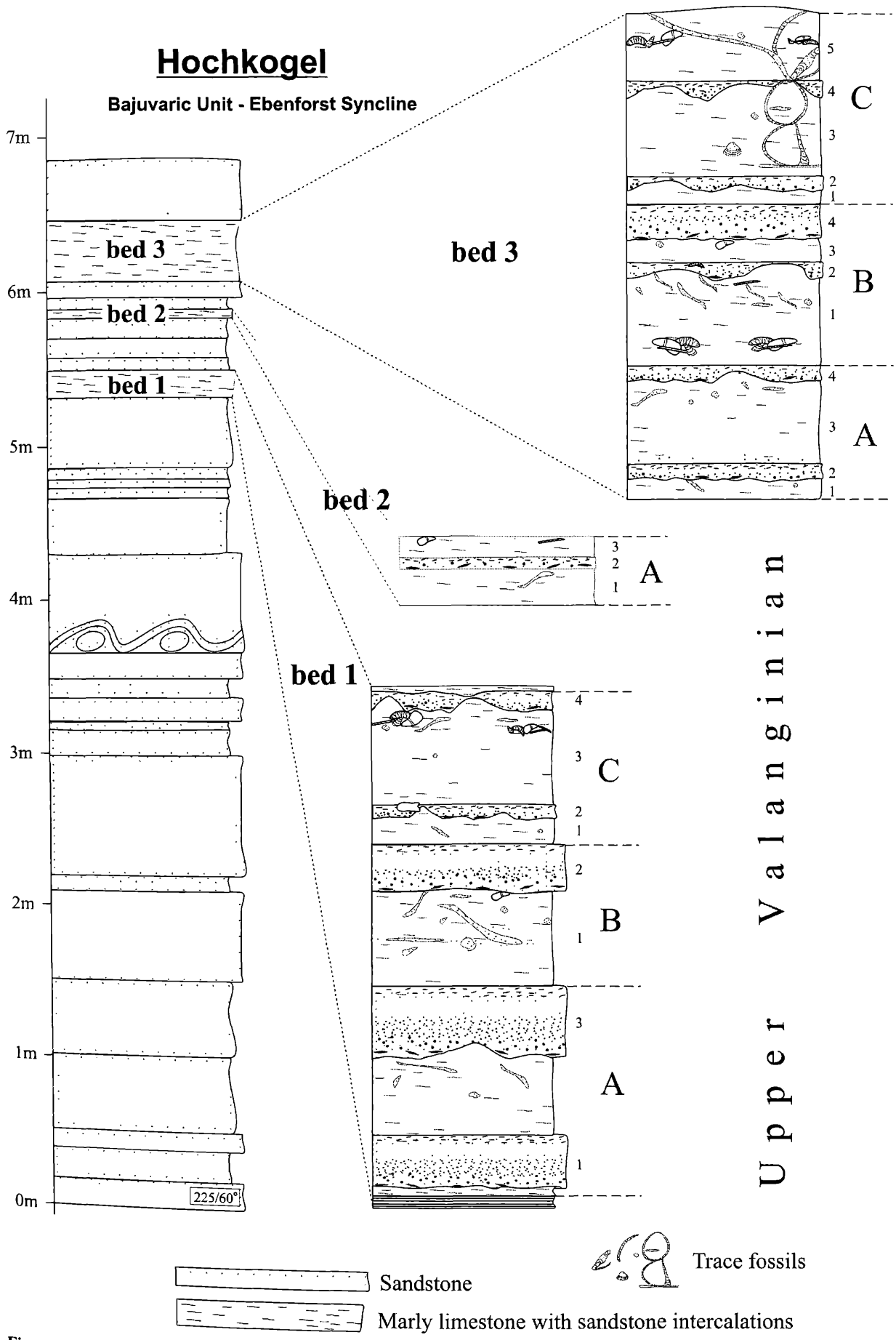

Figure 2: Position and expansion of the ammonoid beds within the log of the investigated outcrop at the road-cut on the northern flank of the Hochkogel.

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by the Tyrolian Nappes (Staufen-Höllengebirgs Nappe). The Ebenforst Syncline is followed directly to the north by three additional synclines – the Anzenbach Syncline, the Schneeberg Syncline of the Reichraming Nappe and the Losenstein Syncline of the Ternberg Nappe – all of which are constituted by Lower Cretaceous sediments.

The locality is situated 500 m north of the border to the southern Tyrolian Units and is tectonically shifted into the Weyer Arc Structure. The Ebenforst Syncline is formed of a Jurassic sequence (Oberalm Formation, Scheiblberg-Kirchstein Formation, Hierlatzkalk). The core of the Ebenforst Syncline consists of the Lower Cretaceous Rossfeld Formation. The investigated ammonoid 'mass-occurrence' is situated in marly limestones of the Rossfeld Formation (Late Valanginian).

The terrigenous, proximal, deep-water turbiditic Rossfeld Formation of the Reichraming Nappe represents a synorogenic development. The Rossfeld Formation is mainly composed of grey silty marls accompanied by conglomerates and sandstones.

The sandstones are fine, grey calcareous with slump structures. The intercalated marly bioturbated limestones are light-coloured and are associated with a relatively monotonous benthic macrofauna (brachiopods and bivalves). The fabric is burrow-mottled to completely homogenised due to bioturbation and indicates rich benthic colonization.

The sedimentological situation at the Hochkogel outcrop differs somewhat from that of other 'Rossfeld Formation' localities. In most cases we find marls or marlstones with intercalated sandstone layers. In contrast to the latter situation, the Rossfeld Formation at the Hochkogel section shows approx. 30 m of fine, grey calcareous sandstones (5-50 cm beds) with mass-plant debris on their upper side. Three intercalated limestone beds of 10 to 40 cm thickness (rich in ammonoids) can be distinguished. These limestone beds are in turn marked by 'small' rhythmically intercalated turbiditic sandstone layers of about 2-3 cm. A short-term sedimentation is proposed for the sandstone layers, whereas the limestone- and marl-beds reflect 'normal' sedimentation rates.

The $CaCO_3$ (calcium carbonate contents, equivalents calculated from total inorganic carbon) display values of about 64 %. The weight % TOC values (total organic carbon) are about 2.7 % within the marls of the outcrop. The maximum amount of 3.1 mg/g sulphur stems from the middle of limestone bed 2.

4. Material and methods

During the course of this study, 155 determinable ammonoids, 640 undeterminable ammonoid fragments, 1 nautiloid, 2 belemnoids and 2 lamellaptychi were examined. Nearly every preservational stage was observed. Most of the specimens were crushed by sediment compaction. Some of the ammonoids show remnants of the aragonitic shell (still aragonitic). Most specimens show fragmentation. Juvenile stages were represented by only a few specimens. Due to the overall high number of specimens, however, even extraordinarily well-preserved individuals (e.g. lappets of microconchs) could be collected. The casts show perfectly preserved sculpture on the preserved shell.

In most cases the specimens are fragmented and show considerable tectonic deformation, which hampers precise determination to species level. The ammonoid fragments show original body-shape preservation and are not flattened as is usually the case in Lower Cretaceous sediments in most Austrian localities. They are orientated in various directions within the limestone beds, and are horizontally orientated in only few 'abundance beds' The latter beds are assumed to be autochthonous.

Bed-by-bed collecting and a systematic-taxonomic study provide the basic data for the statistical analysis of the ammonite fauna. Palaeontological, palaeoecological and sedimentological investigations, combined with studies of lithofacies in thin sections, peels from polished rock surfaces and geochemical investigations, yielded information about the environmental conditions in the area of deposition.

Calcium carbonate contents ($CaCO_3$) were determined using the carbonate bomb technique. Total carbon content was determined using a LECO WR-12 analyser. Total organic carbon (TOC) contents were calculated as the difference between total carbon and carbonate carbon, assuming that all carbonate is pure calcite. All the chemical analyses were carried out in the laboratories of the Department of Geology and the Department of Forest Ecology at the University of Vienna.

The material examined is deposited in the palaeontological collection of the Natural History Museum, Vienna, Austria (NHMW). All specimens in Plate 1 and 2 were coated with ammonium chloride before photographing.

5. Fauna of the Hochkogel section

The Hochkogel section yielded an extraordinarily rich invertebrate fauna consisting of ammonoids (800), nautiloids (1), lamellaptychi (3), echinoderms (*Phyllocrinus*, 1), brachiopods (*Triangope* sp., 1) and bivalves (e.g. inoceramids and others, 9). Some parts of these layers contain at least 30 ammonoid specimens (fragments) per 1 dm^2. The fossiliferous part of the section shows remarkably abundant bochianitids. The abundant and generally well-preserved cephalopods (except fragmentation) are: *Phylloceras thetys*, *Ptychophylloceras ptychoicum*, *Ptychophylloceras semisulcatum*, *Lytoceras subfimbratum*, *Lytoceras lepidum*, *Lytoceras sutile*, *Lytoceras* sp., *Leptotetragonites honnoratianus*, *Haploceras grasianum*, *Haploceras extracornutum*, *Neocomites* sp., *Bochianites neocomiensis*, a single nautiloid and 2 lamellaptychi (Fig. 3). The author generally follows the classification of Cretaceous Ammonoidea by Wright et al. (1996). The suture lines are visible on only few specimens (e.g. *Ptychophylloceras ptychoicum*), which also show shell preservation (aragonitic). The cephalopod fauna consists of numerous Mediterranean elements (dominated by *Bochianites*) (Fig.

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3). No Boreal ammonoids were observed (for comparison see also HOEDEMAEKER, 2002; RAWSON, 1995; VAŠÍČEK & FAUPL, 1996, 1998).

The assumed 'allochthonous', fragmented cephalopod fauna at the Hochkogel section is composed of specimens which were transported from other habitats into the pelagic basin of the Rossfeld Formation. These fragmented specimens are accompanied by layers showing orientated ammonoid shells (e.g. *Bochianites*) on bedding planes. Thus, a reorientation through bottom currents is assumed for the specimens concentrated in such thin layers.

Additional taphonomic processes which occurred within sediments at the Hochkogel section are under investigation by the author (LUKENEDER, in prep.) and will be presented in a separate paper. These include biostratinomy, which involves preservational processes occurring between the death of the organism and its final emplacement within the sediment (mechanical), and fossil diagenesis, which involves fossilization processes occurring after burial (chemical). Biostratinomic processes can be subdivided into four categories: 1) reorientation and transport, 2) disarticulation, 3) fragmentation and 4) corrasion.

One remarkable aspect is the absence of olcostephanids at the Hochkogel section. VAŠÍČEK & FAUPL (1998) assumed that the most apparent difference between the investigated localities of the Reichraming Nappe and localities in the Vocontian basin was the abundance of olcostephanids within sediments of the Vocontian basin and adjacent shelf versus their only sporadic occurrence in the Reichraming Nappe. LUKENEDER (2004), however, points out the importance of determining where the assemblage was deposited palaeogeographically and/or straitigrapically within this unstable region. Accordingly, different localities of the same syncline (e.g. Ebenforst Syncline), located only 200 m apart, show differences in the frequency of the same genus (e.g. *Olcostephanus*) ranging from approx. 0 % - 50 %. Recent contributions show that olcostephanids form a major and important group (46 %) in the investigated area, comparable with the French localities. The only benthic macrofossils observed in the ammonite beds are bivalves and brachiopods. Carefully selected and washed samples of the limestones contain primarily fine silt-sized, angular quartz grains, some pyrite and phosphatic material (fish scales and teeth). The rare, generally poorly preserved micro-invertebrate fauna consists of a few foraminifera (planktonic), radiolarians, ostracods, and sponge spicules (investigated in thin sections).

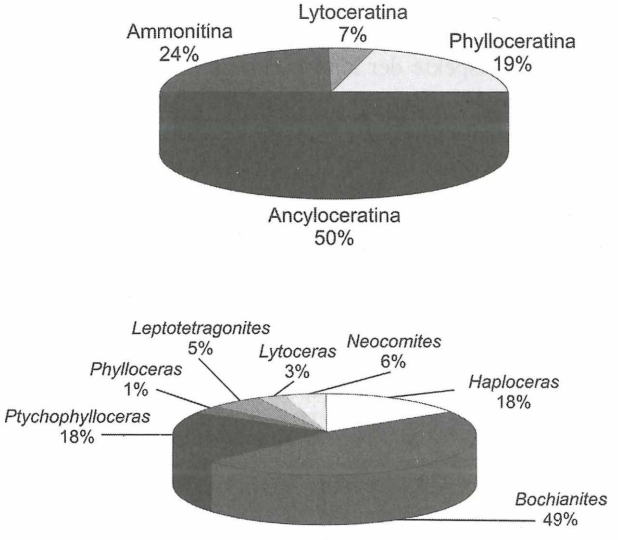

Figure 3: Ammonoid assemblage from the Hochkogel locality. Note the dominance of the Ancyloceratina and its abundant genus *Bochianites*.

6. Biostratigraphy

The association indicates that the cephalopod-bearing beds in the Rossfeld Formation belong to the *Saynoceras verrucosum* ammonite Zone of the early Late Valanginian (according to the results of the Lyon meeting of the Lower Cretaceous Ammonite Working Group of the IUGS; 'Kilian Group'; HOEDEMAEKER et al., 2003).

Stages		Zones	Subzones
HAUTERIVIAN	Upper	*P. ohmi*	*P. picteti*
			P. catulloi
			P. ohmi
		B. balearis	
		P. ligatus	
		S. sayni	
	Lower	*L. nodosoplicatum*	
		C. loryi	*O. (J.) jeannoti*
			C. loryi
		A. radiatus	
VALANGINIAN	Upper	*C. furcillata*	*T. callidiscus*
			C. furcillata
		N. peregrinus	*O. (O.) nicklesi*
			N. peregrinus
		S. verrucosum	*K. pronecostatum*
			S. verrucosum
	Lower	*B. campylotoxus*	*K. biassalense*
			B. campylotoxus
		T. pertransiens	
BERRIASIAN	Upper	*S. boissieri*	*T. otopeta*
			T. alpillensis
			B. picteti
			M. paramimounum
	Middle	*S. occitanica*	*D. dalmasi*
			B. privasensis
			T. subalpina
	Lower	*B. jacobi*	

Figure 4: The stratigraphic position within the Late Valanginian (*S. verrucosum* Zone) of the Hochkogel fauna (in grey) in the Ebenforst Syncline. Table after HOEDEMAEKER et al. (2003, with modifications).

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The biostratigraphically indicative cephalopods are: *Phylloceras thetys*, *Ptychophylloceras ptychoicum*, *Ptychophylloceras semisulcatum*, *Lytoceras subfimbratum*, *Lytoceras lepidum*, *Lytoceras sutile*, *Lytoceras* sp., *Leptotetragonites honnoratianus*, *Haploceras grasianum*, *Haploceras extracornutum* and *Bochianites neocomiensis*.
Although *Saynoceras verrucosum* is missing, the ammonoid assemblage, the abundance of *Bochianites neocomiensis* (see for example LUKENEDER, 2004) and the occurrence of *Haploceras extracornutum* hint at the early Late Valanginian *Saynoceras verrucosum* Zone.

7. Results and Conclusions

The tectonically strongly deformed Lower Cretaceous sediments of the Ebenforst Syncline do not necessarily create the perfect conditions for excellent preservation of ammonoids. The macrofauna, as already stated, is represented especially by ammonoids. The whole section yielded about 800 ammonoids (includes fragments). The ammonoid moulds are restricted to the limestone beds. No ammonoids were found within the encompassing sandstone layers. The latter were formed by turbidity currents, show gradation and, on their top, plant debris. Some specimens (e.g. *Ptychophylloceras*) described from the Hochkogel show exceptional shell preservation (LUKENEDER, in prep.). The accompanying invertebrate fauna consists of nautiloids, lamellaptychi, echinoderms (*Phyllocrinus*), brachiopods (*Triangope*) and bivalves (e.g. inoceramids and others).
The stratigraphic investigation of the ammonoid fauna revealed that the Hochkogel section comprises lower Upper Valanginian sediments of the *Saynoceras verrucosum* Zone and belongs exclusively to the Mediterranean Province. No descendants of the Boreal Province are observed at the Hochkogel section.
The following Mediterranean genera are observed: *Phylloceras*, *Ptychophylloceras*, *Ptychophylloceras*, *Lytoceras*, *Leptotetragonites*, *Haploceras* and *Bochianites*. The ammonoid assemblage, the abundance of *Bochianites neocomiensis*, and the occurrence of *Haploceras extracornutum* hint at the *S. verrucosum* ammonoid Zone.
Sorting, packing due to sedimentological or biological effects, and alignments or concentration due to transport or bottom currents can be observed. Thus, the analysis of the macrofauna and the sedimentological data support the interpretation of a highly dynamic palaeoenvironment on the slope to basin. The suggested palaeogeographic position of the studied section indicates an influence of turbiditic redeposition ('debris flow') and an allochthonous origin of the fragmented ammonoids collected. The shell transport took place via 'mudflows' after the embedding in the sediment, as is reflected in the different alignments of the ammonoid shells and fragments within the sediment. The badly preserved, fragmented specimens within the marly limestone layers were apparently transported from a nearby, more shallow area such as that situated to the south, where they had been deposited primarily. The fragmentation and the diverse orientations of the ammonoid specimens within the sediment furnish evidence for a post-mortem turbidity-flow transport of the shells.
The ammonoid beds are accompanied by layers showing orientated 'autochthonous' straight ammonoid shells (e.g. *Bochianites*) on bedding planes. Thus, for the specimens concentrated in such thin layers, a reorientation due to bottom currents is probable. Note that caution should be exercised when applying the terms autochthonous and allochthonous in cephalopods.
The main investigation topics of future work on the ammonoids from the remarkable Hochkogel section will be the taphonomy and microstructure of the ammonoid shells. This will be accompanied by research on the original position and environmental conditions of the sedimentation area. This ultimately leads to the question whether the ammonoid assamblage is 'autochthonous' or 'allochthonous' The expected answers are essential for geodynamic and palaeooceanographic conclusions.

8. Acknowledgements

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PLATE 1

Exposures of the detailed Upper Valanginian logs with indicated ammonoid beds 1-3.

Fig. 1 Lower part of the Hochkogel section at the road cut. Author with left hand on bed 1.

Fig. 2 Detail of Fig. 1 showing section below bed 1.

Fig. 3 Lowermost part of the Hochkogel section showing slump structures (approx. 30 cm in diameter).

Fig. 4 Log with indicated position of ammonoid beds 1, 2 and 3.

Fig. 5 Detail of bed 1 with numbers on separated layers.

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PLATE 2

Late Valanginian cephalopods from the Rossfeld Formation within the Ebenforst Syncline (Upper Austria). Typical representatives of the Hochkogel assemblage.

Fig. 1 *Ptychophylloceras ptychoicum* (QUENSTEDT), Hochkogel section – x 1, NHMW 2004 z0116/0001.

Fig. 2 *Ptychophylloceras ptychoicum* (QUENSTEDT), Hochkogel section – x 1, NHMW 2004 z0116/0002.

Fig. 3 *Ptychophylloceras semisulcatum* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0003.

Fig. 4 *Ptychophylloceras semisulcatum* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0004.

Fig. 5 *Phylloceras thetys* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0005.

Fig. 6 *Phylloceras thetys* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0006.

Fig. 7 *Lytoceras sutile* OPPEL, Hochkogel section – x 2, NHMW2004 z0116/0007.

Fig. 8 *Lytoceras lepidum* (D'ORBIGNY), Hochkogel section – x 2, NHMW 2004 z0116/0008.

Fig. 9 *Leptotetragonites* cf. *honnoratianus* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0009.

Fig. 10 *Haploceras grasianum* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0010.

Fig. 11 *Haploceras extracornutum* CECCA, Hochkogel section – x 2, NHMW 2004 z0116/0011.

Fig. 12 ?*Neocomites* sp., Hochkogel section – x 1, NHMW 2004 z0116/0012.

Fig. 13 ?*Neocomites* sp., Hochkogel section – x 1, NHMW 2004 z0116/0013.

Fig. 14 ?*Neocomites* sp., Hochkogel section – x 1, NHMW 2004 z0116/0014.

Fig. 15 ?*Neocomites* sp., Hochkogel section – x 1, NHMW 2004 z0116/0015.

All specimens in Plate 2 and 3 were coated with ammonium chloride before photographing.

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PLATE 2

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PLATE 3

Late Valanginian cephalopods from the Rossfeld Formation within the Ebenforst Syncline (Upper Austria). Typical representatives of the Hochkogel assemblage.

Fig. 1 Fragment of a body chamber of an indet neocomitid ammonoid, Hochkogel section – x 1, NHMW2004 z0116/0016.

Fig. 2 Microconch -lappet of *Neocomites* sp. (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004z0116/0017.

Fig. 3 Fragment of a body chamber of an indet neocomitid ammonoid, Hochkogel section – x 1, NHMW 2004 z0116/0018.

Fig. 4 Fragment of a body chamber of an indet neocomitid ammonoid, Hochkogel section – x 1, NHMW 2004 z0116/0019.

Fig. 5 *Bochianites neocomiensis* (D'ORBIGNY), Hochkogel section – x 2, NHMW 2004 z0116/0020.

Fig. 6 Nautiloid, Hochkogel section – x 2, NHMW 2004 z0116/0021.

Fig. 7 Accumulation of *Bochianites* neocomiensis (D'ORBIGNY) and *Ptychophylloceras*, Hochkogel section – x 1, NHMW 2004 z0116/0022.

Fig. 8 Accumulation of *Bochanites* sp. and *Ptychophylloceras semisulcatum* (D'ORBIGNY), Hochkogel section – x 2, NHMW 2004 z0116/0023.

Fig. 9 Accumulated fragments of *Ptychophylloceras semisulcatum* (D'ORBIGNY), Hochkogel section – x 1, NHMW 2004 z0116/0024.

Fig. 10 *Lamellaptychus* sp., Hochkogel section – x 2, NHMW 2004 z0116/0025.

Fig. 11 Belemnite rostrum, Hochkogel section – x 1, NHMW 2004 z0116/0026.

Fig. 12 Bivalve, Hochkogel section – x 1, NHMW 2004 z0116/0027.

Fig. 13 *Triangope* sp., Hochkogel section – x 1, NHMW 2004 z0116/0028.

Fig. 14 *Phyllocrinus* sp. , Hochkogel section – x 3, NHMW2004 z0116/0029.

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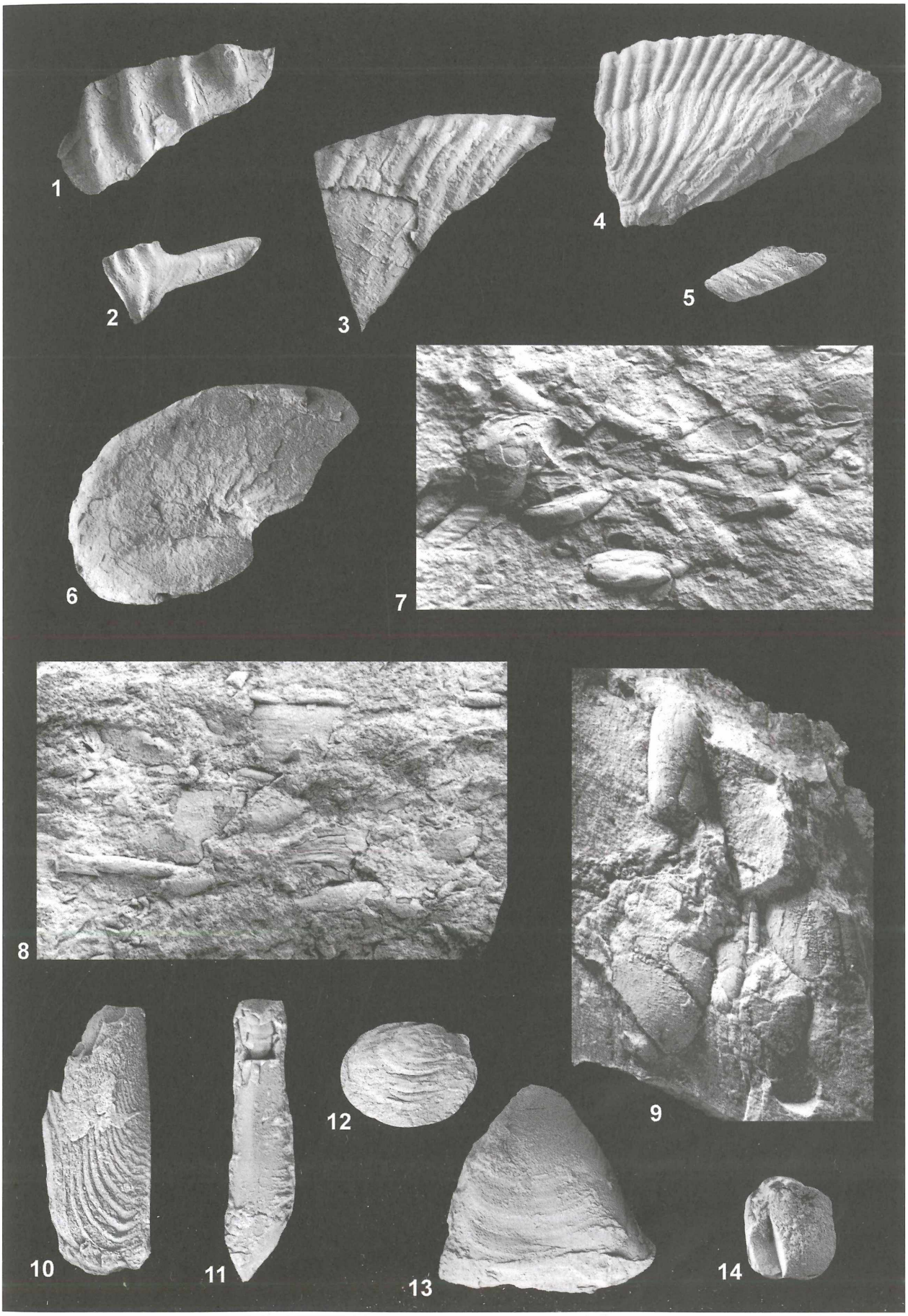
PLATE 3



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