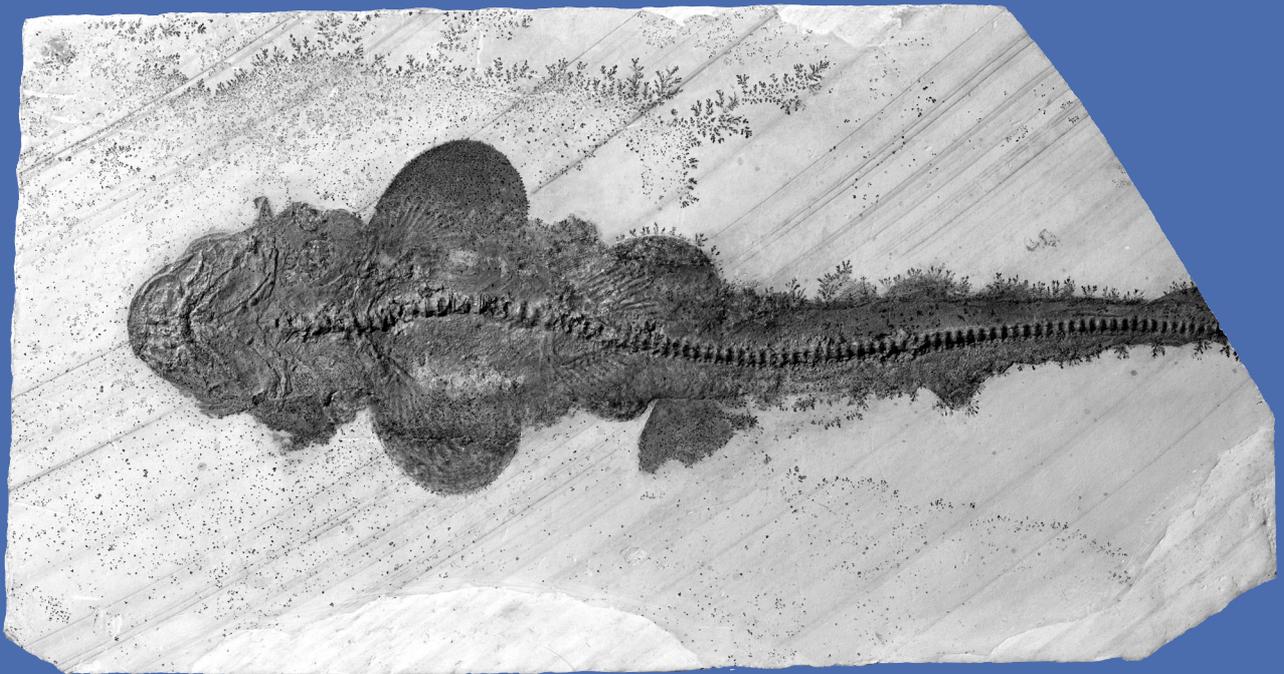


Zitteliana

An International Journal
of Palaeontology and Geobiology

Series A/Reihe A
Mitteilungen der Bayerischen Staatssammlung
für Paläontologie und Geologie

44



München 2004

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EDITORIAL NOTE

As of in 2003, the journal *Zitteliana* is published in two series.

Series A: Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie (ISSN 1612-412X) replaces the former „Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie“ (ISSN 0077-2070). The numbering of issues is continued (last published: Heft 43, 2003).

Series B: Abhandlungen der Bayerischen Staatssammlung für Paläontologie und Geologie (ISSN 1612-4138) continues the previous „Zitteliana – Abhandlungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie“ (ISSN 0373-9627).

Instructions for authors are included at the end of this volume.

HINWEIS DES HERAUSGEBERS

Vom Jahr 2003 an erscheint die Zeitschrift *Zitteliana* in zwei Reihen.

Die *Reihe A: Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie* (ISSN 1612-412X) ersetzt die bisherigen „Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie“ (ISSN 0077-2070). Die Bandzählung (zuletzt erschienen: Heft 43, 2003) wird fortgesetzt.

Die *Reihe B: Abhandlungen der Bayerischen Staatssammlung für Paläontologie und Geologie* (ISSN 1612-4138) führt die bisherige „Zitteliana – Abhandlungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie“ (ISSN 0373-9627) fort.

Hinweise für Autoren beider Reihen sind am Ende dieses Bandes enthalten.

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Cover illustration: *Phorcynis catulina* THIOLLIÈRE, 1854 (BSP 1990 XVIII 51) from the lower Tithonian of Zandt / Denkendorf (Bavaria), ventral view, 25 cm. Photograph: G. JANßEN (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Umschlagbild: *Phorcynis catulina* THIOLLIÈRE, 1854 (BSP 1990 XVIII 51) aus dem unteren Tithon von Zandt / Denkendorf (Bayern), Ventralansicht, 25 cm. Foto: G. JANßEN (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

The stratigraphical significance of *Cymaceras guembeli* for the boundary between Platynota Zone and Hypselocyclum Zone, and the correlation between Swabian and Franconian Alb.

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Abstract

Bed-by-bed collections of ammonites in Lower Kimmeridgian rocks of the Western and Central Swabian Alb and in the Northern Franconian Alb yielded, amongst others, specimens of the genus *Cymaceras*. The stratigraphical significance of this taxon with regard to the determination of the boundary between Platynota Zone and Hypselocyclum Zone, and the correlation between the Franconian and the Swabian Alb is discussed. The stratigraphical position of the proposed *guembeli* Horizon (SCHICK 2002, 2004a) is shown as a sequence of partial sections beginning in the Western Swabian Alb, crossing the Central Alb and ending in the Northern Franconian Alb.

Key words: Upper Jurassic, Lower Kimmeridgian, ammonites, *Cymaceras guembeli*, Swabian and Franconian Alb.

Kurzfassung

Horizontiert aufgesammeltes Ammonitenmaterial aus Bänken des Unter-Kimmeridgiums („Weißjura γ “), von der Westlichen- und Mittleren Schwäbischen Alb und der Nördlichen Frankenalb, enthielt auch Ammoniten der Gattung *Cymaceras*. Ihre stratigraphische Bedeutung für die Abgrenzung zwischen Platynota- und Hypselocyclum-Zone und der Korrelation zwischen der Frankenalb und der Schwäbischen Alb wird diskutiert. Die stratigraphische Position des vorgeschlagenen *guembeli*-Horizonts (SCHICK 2002, 2004a) wird anhand einer Kette von Teilprofilen dargestellt, die in der Westalb beginnt, die Mittlere Schwäbische Alb durchquert und in der Nordalb Frankens endet.

Schlüsselwörter: Oberjura, Unter-Kimmeridgium, Ammoniten, *Cymaceras guembeli*, Schwäbische und Fränkische Alb

1. Introduction

Several papers have been published since 1987 about ammonites of the genus *Cymaceras* collected in “Weißjura γ ” rocks

(Lower Kimmeridgian) in the Franconian Alb. In the past, specimens of *Cymaceras* have been regarded as amongst the rarest ammonites one could find in Jurassic rocks of southern Germany. Recently, however, hundreds of specimens were collected near Titting (Central Franconian Alb), because their stratigraphical position was precisely known (SCHAIRER & SCHLAMPP 1991; SCHLAMPP 1987, 1991, 1992). Bed-by-bed collections there and in the Northern Franconian Alb near Kälberberg (GRADL & SCHAIRER 1997), showed that the acme of the dimorph pair of *Cymaceras* (*Cymaceras guembeli* (OPPEL) and its micrococh partner *Cymaceras (Trochiskio-ceras) bidentosum* (QUENSTEDT) occurs in the vicinity of the boundary between the Platynota Zone and Hypselocyclum Zone (SCHAIRER 2000, 2001).

A number of *Cymaceras* specimens have also been discovered in the Lacunosamergel Formation (Weißjura γ) of the Swabian Alb since 1995. Although not as numerous as in the Franconian Alb they are more widespread, i.e. in seven localities in the Western and Central Swabian Alb. The faunal association of ammonites in Swabia is identical to that described from Kälberberg, but a correlation based on lithostratigraphy was impossible because no section was measured in the quarry near Kälberberg (the Mantlach section had not been published at that time). No detailed sections with accompanying lists of stratigraphically collected ammonites have been published for the Platynota and Hypselocyclum Zones of the Northern Franconian Alb.

As a result a number of questions remained unanswered. For example, the fact that *Cymaceras guembeli* appears in Swabia after a noticeable change in lithology poses the question whether this is also the case in Franconia. Moreover, does *C. guembeli* co-occur with *Sutneria platynota*, like *Trochiskio-ceras bidentosum* does (ref. GRADL & SCHAIRER 1997; ZIEGLER 1979), or does it only occur in the Hypselocyclum Zone? Older literature failed to provide answers because there were contradictory statements and opinions. For example, WEGELE (1930: p. 8) states that the stratigraphical position of *Cymaceras* lies mainly in the upper Suberium Zone, which is comparable to the upper Hypselocyclum Zone sensu GEYER (1961). KUHN (1933), however, was convinced that some of the specimens described by WEGELE (1930) were undoubtedly found in the Platynota Zone.

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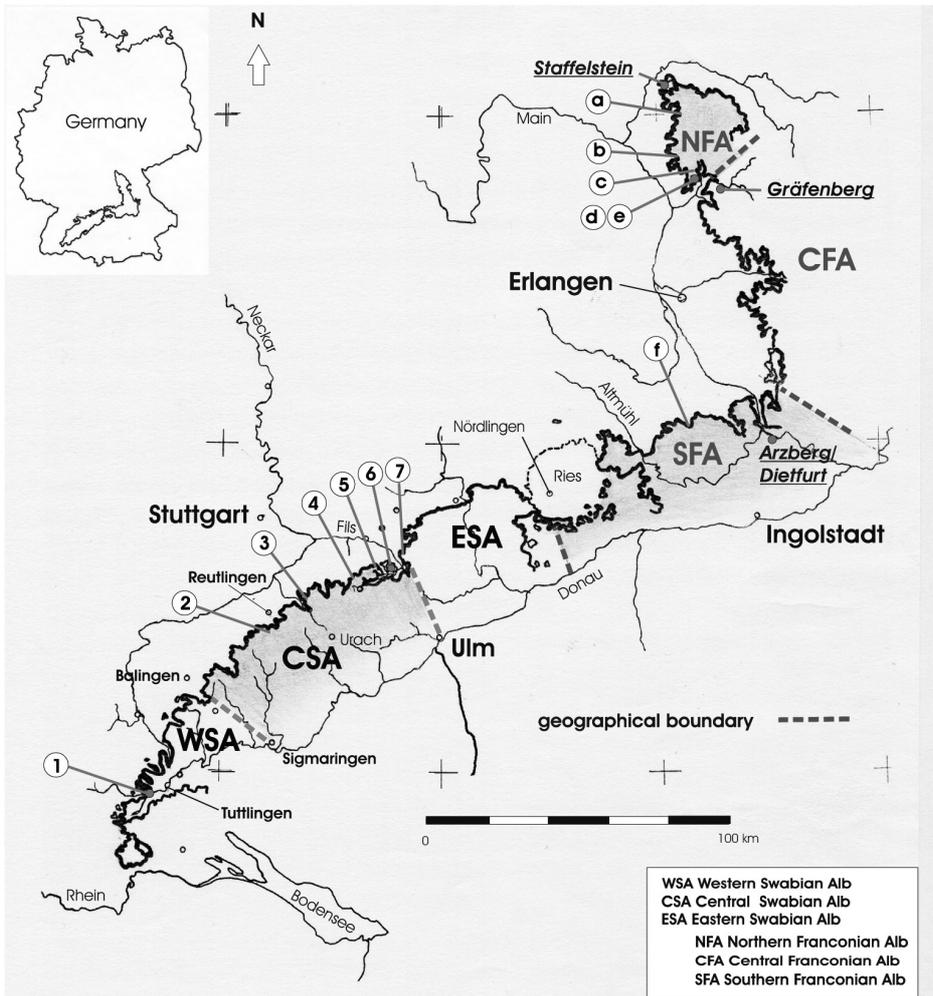


Figure 1: Geographical setting of the Swabian and Franconian Alb. Encircled spots mark sites with *in situ* collected ammonites of the genus *Cymaceras*.

Swabian Alb, 1: Geislingen/Donau; 2: Genkingen; 3: Neuffen, (Dettinger Hörnle); 4: Bossler; 5 Fuchseck, 6: Hausener Wand; 7: Geislinger Längental.

Franconian Alb, a: Ludwag; b: Zeegendorf; c: Drügendorf; d and e: Ebermannstadt, with the two quarries „am Feuerstein“ and „am Kalkofenbruch“; e: Mantlach.

Having observed that the vertical extension of the *guembeli* acme in Swabia rarely exceeds 20-30 cm, there seemed to be an excellent opportunity to correlate the Franconian Alb and the Swabian Alb using the *guembeli* Horizon. In order to do this it was necessary to measure and study sections in the Franconian Alb by collecting ammonites from as many outcrops as possible to determine the *guembeli* acme. To this end five sections were measured in the Northern Franconian Alb, each yielding the *guembeli* acme. The foremost goal was to find a unified boundary between the Franconian and Swabian Alb near the boundary of the Platynota and Hypselocyclum Zone. Additionally, the newly collected ammonite fauna was used to produce a correlation with the zonal scheme for the sub-Mediterranean realm of ATROPS (1982) (or: CARIOU & HANTZPERGUE 1997).

2. Different Definitions of the Platynota-Hypselocyclum Zone Boundary

The boundary between the Platynota and Hypselocyclum Zone in the Franconian Alb is not identical with the boundary in the Swabian Alb. The lithostratigraphic term „Platynota-Mergel“ or „Weißjura γ 1“ (Malm γ 1“) of SCHMIDT-KALER (1962) has different meanings in Franconia and Swabia. In the Southern and Central Franconian Alb the Platynota-Mergel are identical with the Platynota Zone sensu ATROPS (1982), which

is defined as a „Taxon Range Zone“ (TRZ). *Sutneria platynota* first appears in the basal „Ammonitenbreccie“ and disappears about 0.5 m below the lithological boundary of Weißjura γ 2 (Ataxioceraten-Schichten) as shown by SCHAIRER (1974). GEYER (1961) notes that Weißjura γ 1 and the Platynota Zone in the Swabian Alb are almost the same. GEYER's Platynota Zone ends in a *platynota* acme, proposed by VEIT (1936) to be the upper boundary of his Platynota Zone. The last occurrence datum (LOD) of *S. platynota* lays approximately 4 m above this acme, in the type locality of the Lacunosamergel Formation (SCHICK 2004a).

The lower boundary of the Hypselocyclum Zone sensu ATROPS (1982) is by definition bound to the LOD of *Sutneria platynota*, and not to the first occurrence datum (FOD) of *Schneidia lussasense*. In further subdividing the Hypselocyclum Zone, ATROPS (1982) uses *Schneidia lussasense* as the index fossil for his *lussasense* Horizon, which is the lowermost biohorizon of the Hippolytense Subzone within the Hypselocyclum Zone. According to ATROPS (1982), *Schneidia lussasense* is accompanied by *Parataxioceras hippolytense*, which continues to appear after the LOD of *S. lussasense*, representing the *hippolytense* Horizon (Fig. 2).

As far as fieldwork is concerned, it is difficult to find this boundary in the outcrops, especially in the Central Swabian Alb. Sections there show a huge „transition gap“ between the LOD of *Sutneria platynota* and FOD of *Schneidia lussasense*. This undefined gap ranges from 2.5 to 3.5 m in the Central

Upp. Kimmeridg.	SE-France			Franconian & Swabian Alb		
	ATROPS (1982)			SCHICK (2002, 2004)		
	Zones	Subzones	Horizons	Horizons	Subzones	Zones
Lower Kimmeridgian	Acanthicum					Mutabilis/ Eulepidus
	Divisum		Balderum	Balderum	Uhlandi	Divisum
	Hypselocycl.	Lothari	Perayensis	Perayensis		Hypselocycl./ Strombecki
			Semistriatum			
			Hypselocyclum			
			Discoidale			
		Hippolytense	Hippolytense			
			Lussasense	Guembeli		
	Platynota	Guilherandense	Guilherandense			Platynota
Thieuloyi						
Desmoides		Desmoides				
		Enayi				
Orthosphinctes						
		Amoeboceras				
Ox.	Planula	Galar				Galar

Figure 2: Zonal scheme of the Lower Kimmeridgian for the submediterranean realm (SE France) by ATROPS (1982) and for Southern Germany (Swabian and Franconian Alb) by SCHICK (2002, 2004). Note the difference of the substage-boundary (arrow) in the two regions.

Swabian Alb, sometimes even more. In some outcrops in Swabia not a single specimen of *S. platynota* has been found at this elevated position. In fact, in the Swabian Alb it is more difficult to find some of the very rare *Sutneria platynota* beyond the very prominent *platynota* acme than to find *Cymaceras guembeli*. This gap exists also in SE France, in those sections described by ATROPS (1982).

2.1 A Unifying Boundary at the Base of the Hypselocyclum Zone: The *guembeli* Horizon

The introduction of this biohorizon at the base of the Hypselocyclum Zone in southern Germany has minimised but not resolved the “transition gap” problem because *Cymaceras guembeli* generally occurs prior to *Schneidia lussasense*. Introducing the *guembeli* Horizon takes advantage of the rich ammonite-fauna that our region has to offer, and at the same time establishes a comparable boundary for the Hypselocyclum Zone of the neighbouring Albs. A change in lithofacies between the LOD of *Sutneria platynota* and the FOD of *C. guembeli* greatly facilitates any search for the boundary. This change in facies can be very abrupt, especially in the Central and Southern Franconian Alb, or less pronounced as is the case in the Central Swabian Alb and in the NW of the Northern Franconian Alb (Fig. 3a, b). In either case, it is clearly visible and detectable, and it produces a prominent peak in the γ -Ray-Log (SCHICK 2004b; γ -Ray-Log for some sections in Franconia measured in 2002, unpublished). This facies change has led to the introduction of the “Polyplocusmergel Submember” in

the Lacunosamergel Formation (see Figs 3, 4, the grey-tinted field).

The vertical distribution of *Cymaceras guembeli* is very limited. The *guembeli* Horizon is about 25-30 cm thick in the section of the “Hausener Wand”, the type locality for the Lacunosamergel Formation (SCHICK 2002, 2004a). In other outcrops it can be reduced to a few centimetres, or can be up to 60-70 cm thick, and sometimes, as the Mantlach and Bossler sections show, it can even exceed the one metre mark (SCHAIRER 2000, 2001; SCHICK, this paper). Its geographical distribution is wide: N Switzerland, Swabian and Franconian Alb, (as shown in Fig. 4), Slovakian Carpathians (*Cymaceras perundatum*), and Sicily (Fig. 5).

2.2 The Ammonites of the *guembeli* Horizon

The sculptural varieties and the generic descents of the genus *Cymaceras* s. str. have been discussed in several papers. SCHAIRER & SCHLAMPP (1991) provide excellent descriptions of the four species *Cymaceras (Cymaceras) guembeli*, *Cymaceras (C.) franziskae*, *Cymaceras (C.) perundatum* and *Cymaceras (Trochiskioceras) bidentosum*. GEYER (1959), ZIEGLER (1979), and SCHWEIGERT (1995) published papers about possible generic descents and dimorphisms. Further references on these topics can be found in the aforementioned publications.

Cymaceras guembeli is indeed a remarkable ammonite. It possesses many qualities that index fossils ought to possess. Its vertical distribution is very limited and its geographical distribution is wide. A short lifespan of the subgenus is obvious. It occurs frequently, if the acme is detected, and is

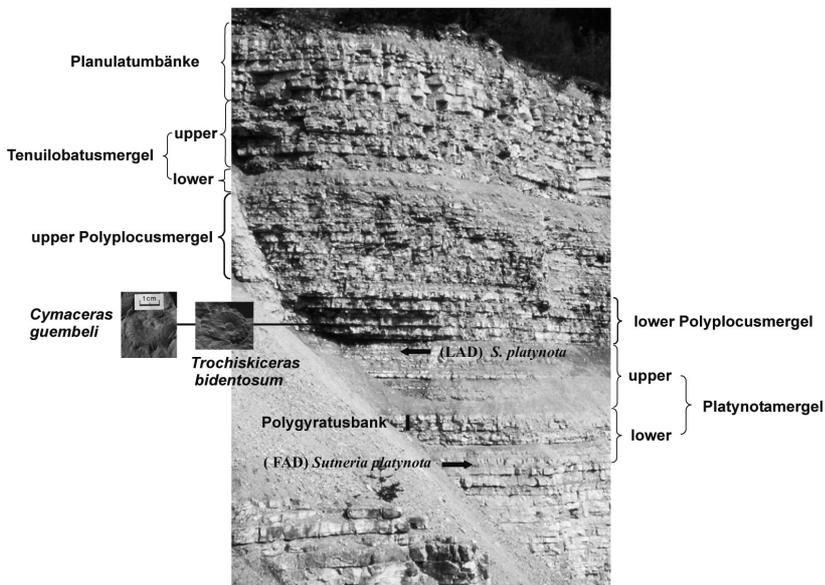


Figure 3a: Close-up view of the main wall in the abandoned quarry “am Feuerstein”, 1.5 km W of Ebermannstadt. This picture shows about 60 % (approximately 19-20 m) of the complete section of “Malm γ ”. Bedsets bear the names of submembers of the type section of the Lacunosamerigel Formation of the Swabian Alb. The distance between the last occurrence datum of *Sutneria platynota* and the first occurrence datum of *Cymaceras guembeli* is about one metre. (Note: the small pictures of *Cym.* are of material found in Hausen).



Figure 3b: A detailed view of the Hausener Wand outcrop. The alternating calcareous marlstone- and marlstone-beds represent the Polyplocusmergel. *Cymaceras guembeli* occurs just above the basal bed (indicated by the arrow). The comparison of the two sections between Ebermannstadt and the Hausener Wand reveals the differences in facies, whereas the thickness of this submember is about the same. The triangles (a, b) mark the beginning and the end of the lower Polyplocusmergel.

easy to identify. Due to its peculiar shape and characteristic ornamentation even small fragments of moulds or steinkerns can be identified. *Cymaceras guembeli* is only known from the Hypselocyclum Zone; in other words, it does not co-occur with *Sutneria platynota*. The associated ammonite fauna of *Cymaceras guembeli* in Swabia is much the same as that described by GRADL & SCHAIRER (1997) and SCHAIRER (2000, 2001) for Franconia. The *guembeli* Horizon contains the following ammonites: densely ribbed juvenile *Schneidia*; *Schneidia lussasense* will be present if there is enough winnowing in the reworked beds; a small variety of *Parataxioceras* aff. *lothari*; a transitional form of *Ardescia ?hippoytense*; *Ardescia inconditum*, which is not frequent; another form resembling *Parataxioceras evolutum*; *Parataxioceras pseudoeffrenatum*, and a high number of more or less unidentifiable ammonite fragments. A complete list of ammonites will be provided in a forthcoming paper (SCHICK in prep.). At this boundary there is not only a drastic change in lithofacies, but the ammonite fauna of Ataxioceratinae also changes its ribbing pattern from tripartite-polygyrate (*Orthosphinctes/Ardescia*) to polygyrate-polyplacoid (*Ataxioceras/Parataxioceras*).

Very little is known about the ammonite fauna from the Hypselocyclum Zone in the Southern and Central Franconian Alb. No lists of stratigraphically collected material have been published. Further work will reveal whether *Cymaceras guembeli* maintains its position at the base of the Hypselocyclum Zone (Ataxioceraten-Schichten).

Trochiskioceras bidentosum is not found as often as *Cymaceras guembeli*. The smaller size (10-12 mm) is certainly one of the limiting factors. Its stratigraphical distribution ranges

from the uppermost beds of the Platynota Zone, where it co-occurs with *Sutneria platynota*, to the lowermost beds of the Hypselocyclum Zone together with *C. guembeli* (GRADL & SCHAIRER 1997; SCHICK, this paper). ZIEGLER's interpretation (1979) that this species is more or less restricted to siliceous sponge facies within the Platynota Zone has been disproved, because all the specimens found in the Central Swabian Alb and in the Northern Franconian Alb came from rocks of bedded mudstone to limestone facies, with the exception of those from the outcrop in Geisingen where *T. bidentosum* does occur in sponge facies.

The Ebermannstadt section yielded a single specimen of *Cymaceras perundatum* (Fig. 7), just above the basal bed of the Polyplocusmergel, from where the other *Cymaceras* species were extracted (Fig. 3a). Only a single specimen of *Cymaceras franziskae* was found approximately 2 m below the first occurrence of *Cymaceras guembeli* in the Bossler section (Figs 4, 6). GRADL & SCHAIRER (1997) believe that the phylogenetic line of *Cymaceras* s. str. starts with coarsely ribbed *C. franziskae*, being the predecessor of *C. guembeli*, and ends with the densely ribbed *C. perundatum*. This concept is supported by their finds, near Kälberberg where *C. franziskae* was associated by *Sutneria platynota*, thus appearing before *C. guembeli*. Only three specimens of *C. franziskae* have been found so far (Fig. 6). The theory has yet to be proven for *C. perundatum*, because the find in Ebermannstadt co-occurred with *C. guembeli*. This does not necessarily mean that *C. perundatum* represents a morphological variety of *C. guembeli*, although it seems to be just that. More material would help to clarify this.

Trochiskioceras bidentosum is regarded as being the dimorph

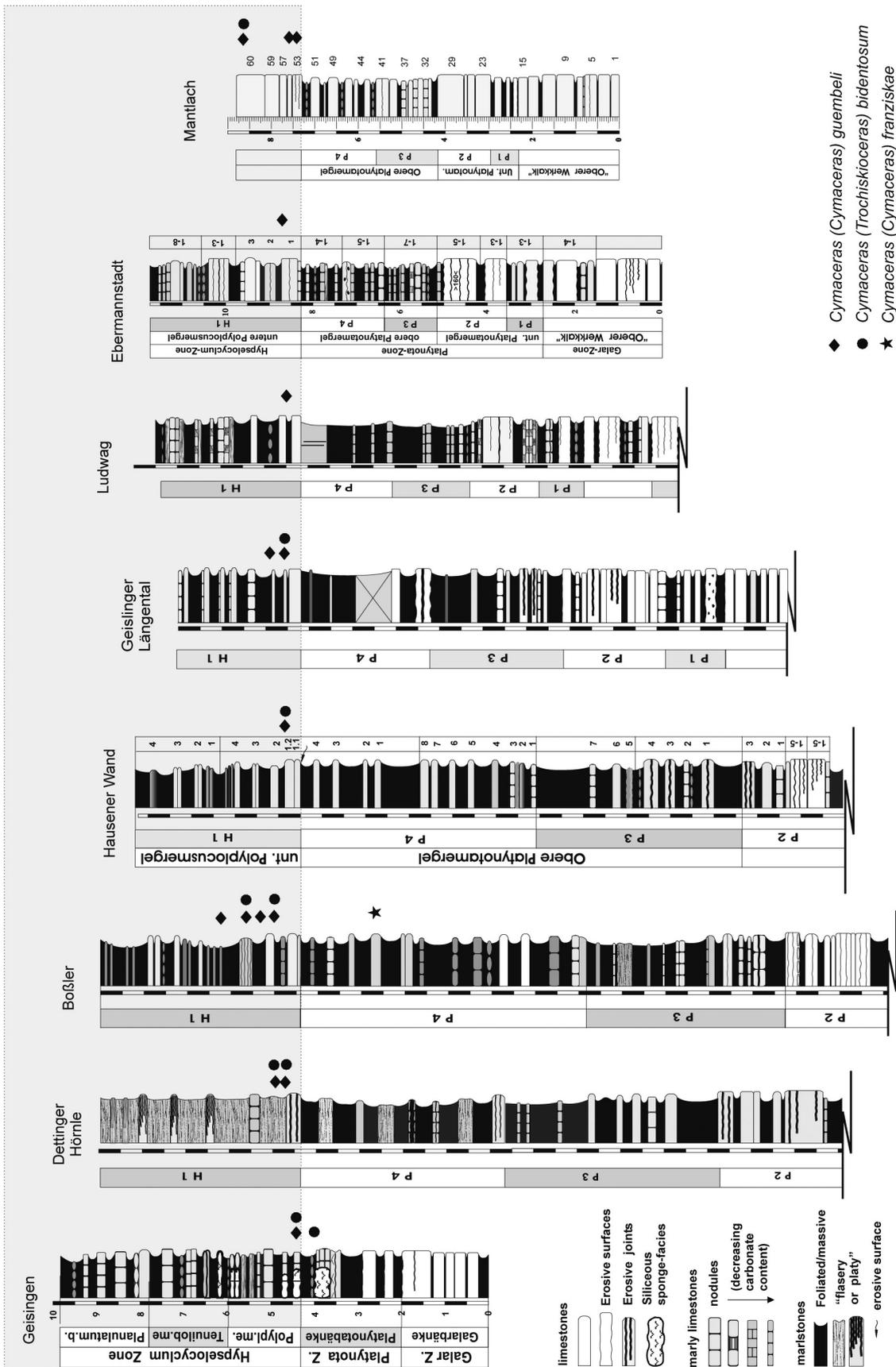


Figure 4: Partial sections of the profile across Western and Central Swabian Alb and the N Franconian Alb. The occurrences of the three different species of *Cymaceras* are marked. The prominent bed below the first occurrence datum (FOD) of *Cymaceras guembeli* marks the beginning of the Polyplocusmergel (Hypselocyclum Zone). Note the bedsets P 3 and P 4 that represent the upper Platynotamerigel Submember. They clearly reflect the differences in thickness within the profile. Sections on the left contain a high number of thick marlstone beds that gradually decrease towards the Franconian Alb.



Figure 5: *Cymaceras (Cymaceras) guembeli* from the Jurassic of Sicily, excavated from a neptunian dyke by WENDT (1971, Tübingen). Its diameter measures 20 mm. The body chamber is not complete; it broke off on the end. Its keel begins to undulate at a diameter of approximately 12 mm. Scale bar = 5 mm. (Institut und Museum für Geologie und Paläontologie, Tübingen).

partner of *Cymaceras guembeli*. It seems very likely that it is also the dimorph partner of *Cymaceras franziskae*, because it already occurs in the Platynota Zone. Studies involving more material might reveal morphological differences between the *Trochiskioceras bidentosum* material from the two zones. It is probable that these morphological differences would include a lower number of ventral nodes, as is the case with *C. franziskae*, which possesses a lesser number of coarsely shaped ribs on the flanks than *C. guembeli*. The presumed lower number of nodes could correlate with the lower number of ribs.

3. The Correlation between Swabian Alb and Franconian Alb

Bed-by-bed sampling in a total of twelve sections in the Lacunosamergel Formation in the Swabian Alb and in the Weißjura γ ("Dornig-Fm") in the Northern Franconian Alb revealed that *Cymaceras guembeli* is ideally suited for correlation purposes. The position of the *Cymaceras* finds in all these sections are described here, and eight partial sections are shown in the profile across the Swabian and Northern Franconian Alb (Fig. 4). Unfortunately, no appropriate outcrop exposing the boundary of the above-mentioned biozones was encountered in the E Swabian Alb. In contrast there are plenty of outcrops in the S Franconian Alb. So far I have not encountered *Cymaceras guembeli* in any of the quarries which have played an important role in the recent research history of the Franconian Alb, i.e. Gräfenberg, Hartmannshof, and Arzberg. SCHAIRER (2000, 2001) recently described the first *Cymaceras* collected bed-by-bed from an outcrop in the Southern Franconian Alb (Mantlach). This section is used in this paper for correlation purposes (Fig. 4).

3.1 Sections with *Cymaceras guembeli* in the Swabian Alb

Six of the seven sections described here were measured in the

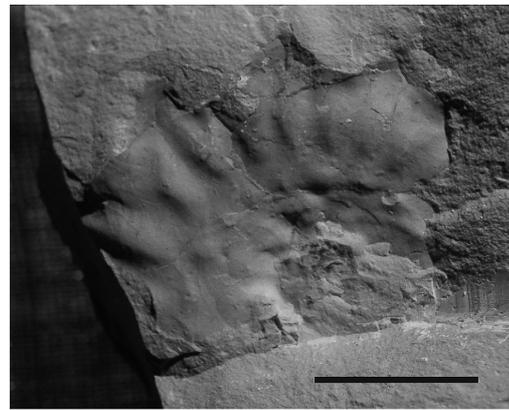


Figure 6: *Cymaceras (Cymaceras) franziskae* from the Bossler section, 1.65 m below the basal bed of the Polyplocusmergel. The incomplete specimen is a mixture between a steinkern and a mould. It measures 25 mm across at the widest points. It can be regarded as one of the most rare ammonite finds one can make nowadays in the Albs. Scale bar = 10 mm. (Leg. SCHICK)

Central Swabian Alb. Only one section represents outcrops of the westernmost Swabian Alb. Sections of the Lacunosamergel Formation of the Western Swabian Alb increase in thickness in the NE direction. Unfortunately, no complete section could be measured there. The description begins in the West and continues to the East.

Geisingen/Donau

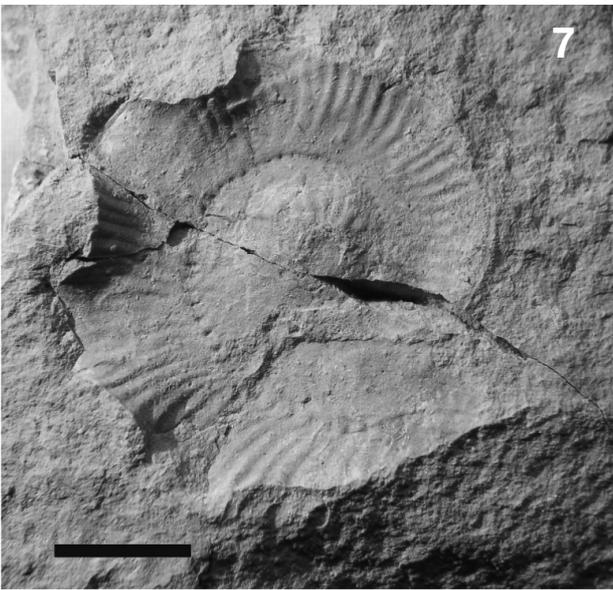
TK 25, 8018 Tuttlingen (34 75 500, H: 53 10 500), 1.5 km NE of Geisingen; Fig.1: 1.

The quarry in Geisingen is the westernmost active quarry of the Swabian Alb where the Lacunosamergel Formation is completely exposed. The section has a thickness of merely 20 m, which is among the smallest thicknesses of the Lacunosamergel measured in the Swabian Alb. Its Platynota Zone has an average thickness of 2.5 m. Dome-shaped siliceous sponge mounts within the upper Platynota Zone yielded a higher number of *Trochiskioceras bidentosum* side by side with *Sutneria platynota*. These mounts pinch out laterally. There, and in parts of the quarry where bedded facies dominate, beds above yielded only a few *Cymaceras guembeli*. The rather small siliceous sponge mounts yield a densely packed ammonite fauna, reflecting a very long time-span. Occurrence of glauconite inside these sponge mounts supports the interpretation of condensation.

Genkingen.

TK 25 Blatt 7521 Reutlingen (R: 35 13 420, H: 53 63 500); Fig. 1: 2.

Just a few hundred metres outside Genkingen, on the road to Gönningen, the Lacunosamergel Formation crops out. The outcrop ends at top of the Lower Platynotamergel. The formation continues in the nearby bed of the rivulet "Wiesaz". The rivulet banks are overgrown and rubble covers most of the soft, marly beds of the upper Platynotamergel Submembers. It is not possible to measure a section. After gaining approxima-



Figures 7 and 8: *Cymaceras (Cymaceras) perundatum* from the Ebermannstadt section, 0.4-0.5 m above the base of the Polyplocusmergel (see Fig. 3b). The mould (Fig. 7) is better preserved as the broken specimen (Fig. 8). This specimen measured approximately 41-42 mm fully grown. Stratigraphically collected specimens of *C. perundatum* are very rare. Scale bar = 10 mm. (Leg. SCHICK).

tely 10 m in height, a small step-like rapid crosses the rivulet bed. It marks the facies change from marlstone to calcareous marlstone beds, representing the base of the Polyplocusmergel Submember. It contains a high number of ammonite fragments, amongst them *Cymaceras guembeli*.

Neuffen: Dettinger Hörnle

TK 25, Blatt 7422 Lenningen (R: 35 26190, H: 73 78560), 2 km SW of Neuffen; Fig. 1: 3.

One of the best outcrops of the Lacunosamergel Formation in the Central Swabian Alb is located within the abandoned quarry of Dettinger Hörnle. Due to the pronounced facies change that occurs between the upper Platynotamergel and the Polyplocusmergel, the thick bed at the base of the Polyplocusmergel is traceable over a few hundred metres. It has an eroded base, clearly visible in some parts of the quarry, where it lies in a carved out channel. Its thickness varies between 20 and 40 cm. Where the basal bed thins out synsedimentary erosion has continued to reduce its thickness. Specimens of *Cymaceras guembeli* were found in the marl beds above the basal bed, but only in places where erosion had not taken place.

A skeleton of *Machimosaurus* was found and extracted from Dettinger Hörnle quarry some 30 years ago. The excavation was carried out by the "Staatliche Museum für Naturkunde Stuttgart". Last year, during preparation of the find, a *Cymaceras guembeli* was detected in the matrix, enabling a precise biostratigraphical dating of *Machimosaurus* (pers. communication by G. SCHWEIGERT).

Bossler.

TK 25, Blatt 7323, Weilheim an der Teck (R: 35 43 460, H: 53 85 480), 4 km E of Weilheim; Fig. 1: 4.

A landslide created this outcrop. VEIT (1936) measured a section here. This was the second location where he claimed to have encountered *Cymaceras guembeli*. However, on in-

vestigation the bed that VEIT referred to did not contain any *C. guembeli*. Their FOD is some 2 m higher up in the section, just at the base of the second calcareous marlstone bed of the Polyplocusmergel. This section revealed a last *C. guembeli* specimen 1.3 m above its first occurrence. It is the greatest distance measured between the FOD and the LOD of *C. guembeli* in the Swabian Alb. Unlike other sections where only one or two beds contain these ammonites, the majority of the dimorph pair of *Cymaceras* at Bossler was detected in a stack of several beds measuring 60-70 cm. A marly bed 1.65 m below the base of the Polyplocusmergel yielded a single specimen of the very rare *Cymaceras (Cymaceras) franziskae* SCHAIRER & SCHLAMPP, 1991. The fossil is incomplete (Fig. 6). As a result of the low conservation-potential of this marlstone bed it represents a mixture between a steinkern and a mould.

Fuchseck.

TK 25, Blatt 7324 Geisingen a. d. Steige-West (R: 35 50 490, H: 53 89 030), 2.5 km SW of Schlaf; Fig. 1: 5.

An outcrop created by a landslide. This site is one of the places where only a few marker-beds of the lower marl section are visible. Rubble and soil cover this area and dense vegetation covers the marlstone part. It was not possible to measure a complete section. The thickness of the Platynota Zone is approximately 15 m; the bed at the base of the Polyplocusmergel is 30 cm thick. *Cymaceras guembeli* was found in the bed just above; no *T. bidentosum* was encountered. The overlying bed yielded *Partaxioceras lothari*.

Hausener Wand

TK 25, Blatt 7324 Geisingen a. d. Steige-West (R: 35 57 240, H: 53 86 220), 1.5 km NW of Bad Überkingen; Fig. 1: 6.

This is the type locality for the Lacunosamergel Formation and the *guembeli* Horizon (SCHICK 2004a, 2004b). A landslide has exposed the Lacunosamergel over a length of a several

hundred metres. It displays the most complete section in the Central Swabian Alb. The boundary extends over 150 m. VEIT (1936) measured a section here, detecting several *Cymaceras guembeli* for the first time. This convinced him that *C. guembeli* should be used as an important guide fossil in the biostratigraphy of the Swabian Alb. The places where he measured his sections are still accessible and are not completely overgrown. Unfortunately, unnoticed by VEIT, part of the Hausener Wand is traversed by a fault. Consequently, approximately 2 m of the upper Platynota Zone is missing in his section (SCHICK 1996). *Cymaceras guembeli* appears above the basal bed of the bedset “untere Polyplocusmergel” (Fig. 3b).

Geislinger Längental

TK 25, Blatt 7324 Geislingen an der Steige-West (R.: 35 60 100, H.: 53 91 100), 4 km N of Geislingen an der Steige; Fig. 1: 7.

This natural outcrop in the NW end of the valley “Längental” is exposed in a rivulet-bed, which has cut deeply into the soft marlstone beds. Recent winter storms have resulted in a lot of fallen timber, blocking access to the *Cymaceras guembeli* beds. Although the beds are quite marly, they yielded a number of *C. guembeli* and *C. bidentosum*. Juvenile *Schneidia* and some early forms of *Parataxioceras lothari* can also be found amongst the material.

3.2 Sections with *Cymaceras guembeli* in the Franconian Alb

Five of the sections described in this paper are situated in the Northern Franconian Alb. The only published section from the Southern Franconian Alb that yielded stratigraphically collected *Cymaceras* has been described by SCHAIRER (2000, 2001).

The descriptions start in the southern part of the Northern Franconian Alb where a number of quarries are concentrated.

Ebermannstadt

TK 25, Blatt 6233 Ebermannstadt, quarry „am Feuerstein“, 1.5 km W of Ebermannstadt (R: 44 40 290, H: 55 16 700); quarry „am Kalkofen“, 1.2 km N of Ebermannstadt (R: 44 40 290, H: 55 17 480); Fig. 1: d, e.

These two abandoned quarries yielded several *Cymaceras guembeli*. The position of the *Cymaceras* acme is shown in Fig. 3a. Both sections are much the same, with the exception of their vertical and lateral extension. The Kalkofen quarry is much smaller and the section ends just a few metres above the Platynota-Hypselocyclum Zone boundary. The Feuerstein quarry is still the most complete Malm γ section in the Northern Franconian Alb. Practically all the submembers and bedsets that have been described for the Lacunosamergel Formation can be found in this section. Approximately 19–20 m of the proposed Ebermannstadt Formation is shown in Fig. 3a.

Drügendorf

TK 25, Blatt 6132 Drügendorf, quarry near „der Kapelle“,

5 km NW of Ebermannstadt (R: 44 37 500, H: 55 19 200); Fig. 1: c.

The active quarry between Eschlipp and Drügendorf yielded a section very similar to the sections from Ebermannstadt, except that the deposited rocks of the Polyplocusmergel (lower Hypselocyclum Zone) are more marly. First occurrence of *Cymaceras guembeli* in the Drügendorf quarry is the same as in the two quarries near Ebermannstadt, just above the basal bed.

Zeegendorf

TK 25, Blatt 6132 Buttenheim (R: 44 34 150, H: 55 26 150), 1.2 km SE of Zeegendorf; Fig. 1: b.

The two small abandoned quarries near Zeegendorf are only about 2 km away from the abandoned quarry am “Unterberg”, which is located 0.5 km NE of Tiefenhöchststadt. This quarry yielded an ammonite-fauna described by GRADL & SCHAIRER (1997) under the name “Kälberberg”. The Platynota Zone of the Zeegendorf section reaches a thickness of 3.1 m. This is one of the smallest thicknesses of the Platynota Zone measured in Franconia so far. *Cymaceras guembeli* was found just above the basal bed of the Polyplocusmergel.

Ludwag

TK 25, Blatt 6032 Scheßlitz (R: 44 34 340, H: 55 35 480); Fig. 1: a.

The disused “Schmaus-quarry” is situated 4 km SE of Scheßlitz, on the western outskirts of the nearby village of Ludwag. The section was measured on the main wall of “the old quarry”. A lot of rubble covers the marly Platynota Zone. In the eastern part of the quarry, the lower Polyplocusmergel are exposed and *Cymaceras guembeli* was found in the marly layer above the basal bed of the Polyplocusmergel. Compared with the sections around Ebermannstadt, the Platynotamergel are thicker in Ludwag and the Polyplocusmergel (lower Hypselocyclum Zone) are marlier. This tendency continues towards the NW region of the Franconian Alb.

Mantlach

TK 25, Blatt 6933 Thalmässing, 700 m WNW of Mantlach; Fig. 1: f.

This location and its ammonite-fauna were described by SCHAIRER (2000, 2001). Hundreds of ammonites of the genus *Cymaceras* were collected there. The section shows that limestone beds dominate while marlstone beds are drastically reduced. The thickness of the Platynotamergel Submember is estimated at a little less than 5 metres.

4. Conclusions

This study contributes to the knowledge of the stratigraphical distribution of *Cymaceras guembeli*. The FOD of *C. guembeli* marks the beginning of the Hypselocyclum Zone in the Swabian and Franconian Alb. The stratigraphical value of *C. guembeli*, which can easily be determined, lies in its wide geographical distribution and, at the same time, short vertical

extension. There is neither a change of boundaries nor in subdivisions to be made, when integrating the *guembeli* Horizon into the zonal scheme of ATROPS (1982). His zonal scheme is ideally suited for the Lower Kimmeridgian rocks in Franconia, because it follows the naturally formed subdivisions. It serves both the biostratigraphical and the lithostratigraphical aspects of Platynota Zone and the Hypselocyclum Zone. Necessary changes had to be made in the Swabian Alb. GEYER's (1961) upper boundary of the Platynota Zone had to be shifted upward by about 4-5 m in the Central Swabian Alb to match the zonal chart of the sub-Mediterranean realm (SCHICK 2004a, 2004b).

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