

# AMMONITE ZONATION FOR THE LOWER CRETACEOUS OF THE MEDITERRANEAN REGION; BASIS FOR THE STRATIGRAPHIC CORRELATIONS WITHIN IGCP-PROJECT 262



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## ABSTRACT

This report is the synthesis of the discussions held during the 2nd Workshop of the Lower Cretaceous Cephalopod Team of IGCP-Project 262: Tethyan Cretaceous Correlation (Mula, SE Spain, July 2-5, 1992). It presents a new proposition of zonal scheme for the Lower Cretaceous of the Mediterranean Region and justifications about the choice of the index-species for some biostratigraphical units.

**Keywords:** Ammonite biostratigraphy, Zonal scheme, Lower Cretaceous, Mediterranean Region.

## RESUMEN

Se presentan las conclusiones del "2nd Workshop of the Lower Cretaceous Cephalopod Team of IGCP-Project 262: Tethyan Cretaceous Correlation", celebrado en Mula (SE de España) durante los días 2 al 5 de julio de 1992. Se incluye la propuesta de un nuevo esquema zonal basado en ammonites para el Cretácico Inferior del ámbito mediterráneo, así como notas aclaratorias sobre la elección de las especies índice de algunas unidades bioestratigráficas.

**Palabras clave:** Ammonites, Bioestratigrafía, Esquema zonal, Cretácico Inferior, Región Mediterránea.

## INTRODUCTION

After publication of the results of the 1st Workshop of the Lower Cretaceous Cephalopod Team (IGCP 262: Tethyan Cretaceous Correlation) held in Digne in 1990 (Hoedemaeker and Bulot, 1990) it appeared necessary to organize a follow-up meeting. The discussions in Digne have stimulated many specific investigations as to Lower Cretaceous ammonite zones. The many new data collected necessitated some revisions of the zonal scheme. With this aim, the Working Group organized a new meeting, held in Mula (SE Spain) on the 2nd to 5th of July, 1992. Only the conclusions of this meeting are published here (Table 1). More detailed data on Lower Cretaceous cephalopod biostratigraphy

(regional synthesis, outstanding problems...) will be published in a separate volume in 1993.

The Lower Cretaceous ammonite zonation given here has been developed during more than a century in the western Mediterranean area. It is the most precise and most detailed zonation available for the Tethyan palaeobiogeographic realm. Though the zonation is not, and cannot be, applicable for the whole Tethyan Realm, it is considered the standard zonation on which zonations from other regions should be gauged.

All zones and subzones presented here are biozones and defined by first appearance of ammonites species, which are not always the index species. The index species of the Berriasian subzones of *B. privasensis*, *M. paramimounum*, *B. picteti*, and *T. alpillensis* begin in an

		ZONES	SUBZONES	HORIZONS
ALBIAN (15)	upper	S. (S.) dispar	S. (S.) dispar	
		M. inflatum	S. (F.) blancheti	
	middle	E. lautus		
		E. loricatus		
	lower	H. dentatus	H. spathi	
		D. mammillatum	L. lyelli	
APTIAN	upper	L. tardefurcata		
		H. jacobi		
	middle	A. nolani	D. nodosocostatum	
		P. melchioris (14)		
	lower	E. subnodosocostatum		
		D. furcata		
D. deshayesi				
BARREMIAN	upper	D. weissii		
		D. tuarkyricus		
		M. sarasini (13)		H. ridzewskyi (13)
		I. giraudi		
	lower	H. feraudianus		
		H. sartousiana (12)		
HAUTERIVIAN	upper	A. vandenheckii		
		H. caillaudianus (11)		
		S. nicklesi		N. pulchella (10)
	lower	S. hugii		
		P. angulicostata <i>auct.</i> (9)	P. catulloi	
		B. balearis	P. angulicostata <i>auct.</i>	
VALANGINIAN	upper	"P. ligatus" (8)		
		S. sayni		C. cruasense (7)
	lower	L. nodosoplicatum (6)		
		C. loryi		O. (J.) jeannoti (5)
BERRIASIAN	upper	A. radiatus		C. loryi (5)
		N. (T.) pachydricranus (4)		
		H. trinodosum		N. (T.) callidiscus
	lower	S. verrucosum (3)		C. furcillata
		B. campylotoxus		O. (O.) nicklesi
		T. pertransiens		
BERRIASIAN	upper	T. otopeta		
		F. boissieri	T. alpillensis (2)	
	middle	T. occitanica	B. picteti	
		B. jacobi (1)	M. paramimounum	
lower		D. dalmasi		
		B. privasensis		
		T. subalpina		

Table 1. Ammonite zonation for the Lower Cretaceous of the Mediterranean Region.

earlier subzone. Also the base of the "*P. ligatus*" Zone does not correspond to the entry of its index species.

The conversion of biozones into bio-chronozones requires the selection and designation of stratotypes; only chronozones can be used to define stages. This conversion has still to be made, and probably lengthy discussions are needed on stratigraphic principles. The Working Group has no competence to recommend about stage boundaries; this is reserved to the Working Groups of the IUGS Subcommission on Cretaceous Stratigraphy.

## EXPLANATIONS OF THE NUMBERS ON THE TABLE

1. ***Berriasella jacobii* Zone.** In contradiction to the solution adopted in Digne (Hoedemaeker and Bulot, 1990) it was not considered practical anymore to subdivide this zone into two subzones. According to Le Hégarat (1973), all species that occur in the former *Pseudosubplanites grandis* Subzone also occur in the *Berriasella jacobii* Subzone. Nevertheless the *B. jacobii* Subzone contains species that do not occur in the *P. grandis* Subzone (for instance species of the subgenera *Delphinella* and *Dalmasiceras*). The *grandis* association can therefore be considered an impoverished *jacobii* association and should be rejected as a separate subzone.

2. ***Tirnovella alpillensis* Subzone.** This name is provisionally applied to designate the interval occupied by the "un-named association" of the Digne Report (Hoedemaeker and Bulot, 1990). This interval remains defined by the first appearance of several ammonite species that hitherto were considered characteristic for the Valanginian (belonging to the genera *Thurmanniceras*, *Kilianella*, *Sarasinella*, *Neocomites*, *Olcostephanus*). The identification of these species is however in dispute. Coordinated studies should clarify this question in the future. *T. alpillensis* itself appears in the *B. picteti* Subzone, but has its acme in the *T. alpillensis* Subzone. The upper limit of this subzone coincides with the appearance of *Thurmanniceras otopeta*. Hoedemaeker (1982) characterized the ammonite association of this subzone as a mixture of Berriasian and Valanginian species and prefers its inclusion in the Valanginian. This mixture continues into the *T. otopeta* Zone, which tempted some participants to include the latter zone into the Berriasian. However, the Berriasian-Valanginian boundary is, in accordance with the Copenhagen recommendations (Birkelund *et al.*, 1984), maintained at the base of the *Otopeta* Zone.

3. ***Saynoceras verrucosum* Zone.** The intensive investigations of L. Bulot and J. P. Thieuloy in SE France and of M. Company in SE Spain resulted in a change of the zonation of the upper Valanginian. It appeared possible to distinguish three ammonites horizons within the *S. verrucosum* Zone (i.e. the biostratigraphic interval between the first appearance of *S. verrucosum* and the first appearance of *Olcostephanus nicklesi*). Bulot and Thieuloy could distinguish a basal horizon with *Saynoceras verrucosum*, a middle horizon with *Karakaschiceras*

*pronecostatum*, and an upper horizon with *Varlheideites peregrinus*. Bulot and Thieuloy still need further study before they will introduce these horizons formally.

4. ***Neocomites (Teschinites) pachydicranus* Zone.** The same investigations compelled Bulot, Company, and Thieuloy to lower the rank of *N. (T.) callidiscus* Zone to horizon, because it cannot be recognized if the index species is absent. As *Himantoceras trinodosum* is often rare or even absent, it was considered more workable to replace the former *H. trinodosum* and *N. (T.) callidiscus* zones by the *N. (T.) pachydicranus* Zone, which covers virtually the same biostratigraphic interval. The *N. (T.) pachydicranus* Zone has been introduced by Company (1987) and defined by the first appearance of *Olcostephanus nicklesi* (senior synonym of *O. sanctifirminensis*); it ends at the first appearance of *Breistroffarella castellanensis*. As the latter appears hardly later than *Acanthodiscus radiatus* the attendants of the Workshop have no scruples as to change the original definition of the *N. (T.) pachydicranus* Zone. *H. trinodosum* is retained as the name for the lower subzone of the *N. (T.) pachydicranus* Zone. Within this lower subzone two horizons could still be distinguished, viz. the *Olcostephanus nicklesi* Horizon at the base and the *Criosarasinella furcillata* Horizon at the top. The *N. (T.) callidiscus* Horizon is the lower horizon of the yet unnamed upper subzone of the *N. (T.) pachydicranus* Zone.

5. ***Crioceratites loryi* Zone.** The rank of both *Crioceratites loryi* and *Olcostephanus (Jeannoticeras) jeannoti* Subzones was lowered to horizon, because the ranges of these two species are still not precisely known.

6. ***Lyticoceras nodosoplicatum* Zone.** This zone had better not be subdivided at the moment. The *Cruasiceracruasense* Subzone was transferred to the *Subsaynella sayni* Zone.

7. ***Cruasiceracruasense* Subzone.** Firstly, large forms of *Subsaynella sayni* were found to occur already in the *C. cruasense* beds. This is the reason why these beds were incorporated in the *S. sayni* Zone instead of in the *L. nodosoplicatum* Zone. Secondly, the *C. cruasense* Subzone had better be lowered in rank to horizon—the lowest horizon of the *S. sayni* Zone—because *C. cruasense* has not yet been reported from outside SE France and its range is not yet precisely known.

8. **"*Plesiospitidiscus ligatus*" Zone.** This zone correspond with, and this name is preferred above, the term "un-named association" used in the Digne Report (Hoedemaeker and Bulot, 1990). The inverted commas mean that the index species is not a true *P. ligatus*, but *P. ligatus* (*non* D'Orbigny, *sed* subseq. litt.). This zone still awaits redefinition and a recognizable ammonite association should be described.

9. ***Pseudothurmannia angulicostata auct.* Zone.** Hoedemaeker produced evidence that this zone should be subdivided into two parts on account of the great difference in the ammonite faunas of the lower and upper parts. Though this difference is great enough to warrant the introduction of two separate zone, the attendants of

the Workshop provisionally prefer two subzones in the *P. angulicostata* auct. Zone. The lower subzone provisionally still bears the name *P. angulicostata* auct. Subzone. It is possible that *P. ohmi* (Winkler) is a senior synonym of *P. angulicostata* Lapeyre, non D'Orbigny (= *P. angulicostata* auct.); this should still be proved. For the upper subzone the name of *Pseudothurmannia catulloi* was proposed. *P. picteti* (Sarkar) is a junior synonym of *P. catulloi* (Parona). The Hauterivian-Barremian boundary remains provisionally at the base of the *Spitidiscus hugii* Zone in accordance with the Copenhagen recommendations (Birkelund *et al.*, 1984).

**10. Nicklesia pulchella Zone.** This zone comprises only a few beds in the type section of Angles, and if the index species is not present it cannot be recognized. It has therefore been lowered in rank to horizon at the upper part of the *Subpulchellia nicklesi* Zone.

**11. Holcodiscus caillaudianus Zone.** This spelling should be used instead of *H. caillaudi*.

**12. Heinzia sartousiana Zone.** It should be mentioned that the level with *Camereiceras limentinus* is included in this zone.

**13. Martelites sarasini Zone.** As *Colchidites securiformis*, used in the former Soviet Union as index for the highest zone of the Barremian, cannot be found in the stratotype at Angles, the *C. securiformis* Zone was replaced by the *Martelites sarasini* Zone. *M. sarasini* also occurs in the upper Barremian of eastern Europe. *Martelites* is the genus name proposed to designate those representatives of "*Colchidites*" that have normally coiled outer whorls (i.e. the non-hooked forms) (Delanoy, in press). These forms seem to be restricted to the *M. sarasini* Zone. The name *Turkmeniceras turkmenicum*, used for the upper horizon of the *M. sarasini* Zone, was replaced by *Hemihoplites ridzewskiyi*, because the ammonite of the latter name has a greater areal distribution.

**14. Parahoplites melchioris Zone.** *P. melchioris* is preferred above *Columbiceras tobleri* as index species because *C. tobleri* also occurs in the subjacent *E. subnodocostatum* Zone. It should be stressed that the Aptian zonation adopted here has been developed in the former USSR and not only in Georgia as has been erroneously stated by the authors of the Digne Report (Hoedemaeker and Bulot, 1990).

**15. Albanian.** The attendants of the Workshop did not deem it wise to make any changes in the zonation of the Tethyan Albanian.

## CONCLUDING REMARKS

The development of the ammonite zonation of the Tethyan Lower Cretaceous, which has been primarily a French matter because of the famous frequency and good preservation of the ammonites in this series in SE France and the location of many stratotypes, has been neglected for a long time (from 1915 to 1965). The publication of the results of the "Colloque sur le Crétacé inférieur" in 1965 painfully showed the necessity of modern and revisional studies on Lower Cretaceous ammonites and their distribution. These studies resulted in the updated standard ammonite zonation presented here. This table is merely the state-of-the-art and it will be clear that there will be many refinements and corrections in the future. This workshop is the last within the cadre of IGCP-Project 262. It is the wish of all attendants to continue these workshops in the future, either within an other IGCP cadre or in connection with an IUGS-Program.

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