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NEW DATA ON THE AGE OF THE LOWER CRETACEOUS FORMATIONS IN THE GERECSE MOUNTAINS (HUNGARY)

LÁSZLÓ FÉLEGYHÁZY and ANDRÁS NAGYMAROSY

Department of General and Historical Geology, Eötvös University, Múzeum krt. 4/a., 1088 Budapest – VIII, Hungary

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Abstract: We investigated the nannoflora of the Berzsek Marl Formation and the Lábatlan Sandstone Formation from the sequence of the Berzsek Hill at Lábatlan. The nannoplankton investigations show that the portion of the Berzsek Marl exposed on the surface is not older than the Lower Aptian. The uppermost part of the Lábatlan Sandstone overlying the Berzsek Marl can be correlated with the lower part of the Upper Albian substage.

Key words: Gerecse Mts., Berzsek Marl Formation, nannoplankton, Lower Aptian, Upper Albian.

Introduction

The exposure of the Berzsekhegy cement mine is situated in NE-Transdanubia, in some kilometers from the village Lábatlan (Fig. 1). The section exposes two formations. The underlying Berzsek Marl Formation is built up by pelagic *calcareous marls, siltstones, marls, clayey marls* and thin *sandstone* intercalations. Cephalopods and aptychi are common.

The overlying Lábatlan Sandstone Formation in the upper part of the section is characterized by the alternation of fine sandy and clayey siltstones and sandstones. The sandstone sequence is made up by characteristic turbiditic cycles.

In the exposure the thickness of the Berzsek Marl is approximately 68 *m* while that of the Lábatlan Sandstone is 38 *m*.

The comprehensive synthesis of the sequence was performed by Fülöp (1958).

The nannoflora of the investigated section has not been worked out yet in details, the only biostratigraphic age determination was based on ammonites (in Fülöp, 1958). According to this, the Berzsek Marl was formed in the Berriasian–Valanginian, while the Lábatlan Sandstone in the Hauterivian–Barremian stages.

Nannoplankton investigations

We investigated 73 samples from the 106 *m* thick sequences of Berzsek Hill out of which 49 contained calcareous nannoplankton.

The nannofloras of the Berzsek Marl, as it has already been pointed out by Báldi-Beke (1964) have low diversities and abundances. Usually 15–20 specimens of 4–5 species can be found in one slide which is extremely scarce. Unfortunately we must, therefore, draw the conclusions from the presence of one-two specimens even in the case of important index species, consequently it is practically impossible to assign the samples to nannozones. The age of the samples can be determined only in a wider interval (stages or their lower, middle, upper parts).

The nannoflora of the Lábatlan Sandstone is richer than that of the Berzsek Marl. The upper part of the formation

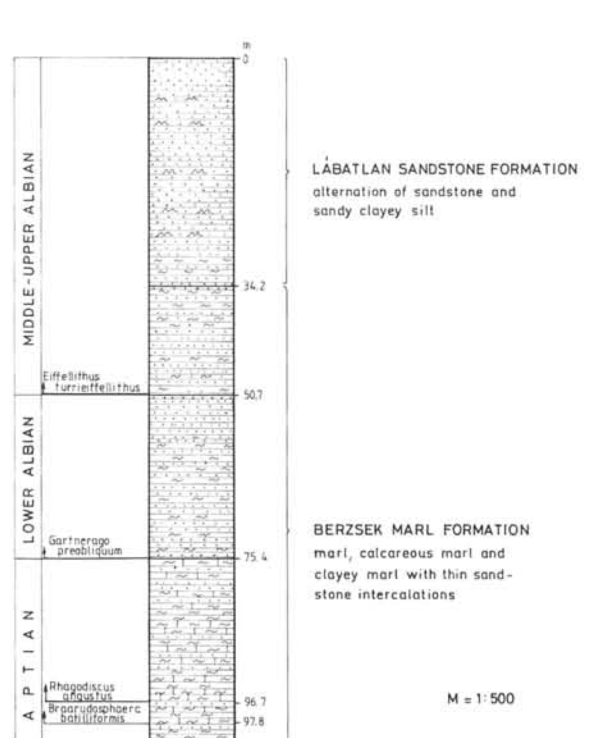

Fig. 1. First appearances of some important nannofosils in the stratigraphical column of the Berzsek Hill (ages are based on the nannoplankton investigations).

contains much more reworked forms than the lower one. The presence of *Nannoconus* is characteristic of the Lábatlan Sandstone though they are entirely lacking in the Berzsek Marl.

Stratigraphic analysis

Considering the stratigraphical conclusions the extinction-data could have been taken into account only in a small degree, because they can be used only in case of great number of specimens. Another probleme was, that the upper part of the sequence is represented by resedimented, turbidite-like deposits which contain a large number of reworked forms making the sequence upwards apparently "older".

Because of the above reasons, we determined the ages based on the first appearances of the species. As to stratigraphic ranges, we hold authentic the data of Thierstein (1973), Taylor in Lord (1982), Perch-Nielsen (1985), Jakubowsky (1987).

The most of the 26 species are persistent forms of little index value, they existed from the Jurassic or Berriasian to the end of the Cretaceous (Fig. 2). There are also a few – in our case reworked – species appearing in the Early Cretaceous.

	LÁBATLAN F.													BERZSEK MARL																																			
	F-15	F-2	E-104	E-94	E-64	E-38	E-36	D-26	D-24	D-12	D-11	D-5	D-2	L-II-76	L-II-75	L-II-74	L-II-73	L-II-72	L-II-71	L-II-70	L-II-67	L-II-58	L-II-49	L-II-31	L-II-30	L-II-28	L-II-26	L-II-19	L-II-18	L-II-16	L-II-12	L-II-10	L-106	L-101	L-98	L-77/A	L-77	L-73	L-62	L-59	L-52	L-51	L-47	L-41	L-35	L-33/A	L-22	L-8/A	L-2
Nannoconus colomii																																										1		1					
Nannoconus abundans																			1			1	1																1					2					
Cruciellipsis cuvillieri					1										1							1									1																		
Tetrapodorhabdus decorus																																												1					
Glaukolithus diplogrammus														1			1										1				2				1				1			1		2				1	
Watznaueria barnesae	K	K	K	2	S	K	K	K	K	K	K	K	K	K	K	K	K	K	K	2	K	K	K	K	K	2	K	K	K	K	K	2	K	K	K	K	2	K	K	K	K	K	2	S	K	2	K	K	K
Stradneria crenulata	1					2				1	2	1	1			1	2								1		2									1		1	1			2		2					
Cyclagelosphaera margerellii																											1																						
Haquis circumradiatus										1	1																																	2					
Microstaurus chiastius		1	1					1					2																				1							1							1		
Vershinella angusta																																												1					
Zeugrhabdotus embergeri						1		1													1	1	1		1														1					1				1	
Manivitella pemmatoidea																														1																			
Rhagodiscus asper														1			1								1					K			2		1									1			2	K	
Ellipsagelosphaera britannica		1			1							1													2																						1		
Diazomatolithus lehmannii					K			1														1			1																								
Braarudosphaera regularis						1	2								2		1	1				2																1	1	1		2		2				1	1
Nannoconus steinmannii																															1													2				1	1
Micrantolithus hoschutzii									1	1				1								1	1				2	1	2	1	2				1						1	1		1				2	
Nannoconus bermudezi																																				1						1							
Micrantolithus obtusus																																												1					1
Braarudosphaera battiliformis		1																																	1													1	
Braarudosphaera hockwoldensis												1	1																						1						1								
Rhagodiscus angustus			1																																														
Eprolithus apertior																	1								1		1																	K					1
Cribrosphaerella sp.																											1																						
Gartnerago preobliquum						1																																1						2		1			1
Eiffellithus turriseiffellithus										2																																							

Fig. 2. Nannofloras from the Berzsek Marl and Lábatlan Sandstone.

Plate 1.

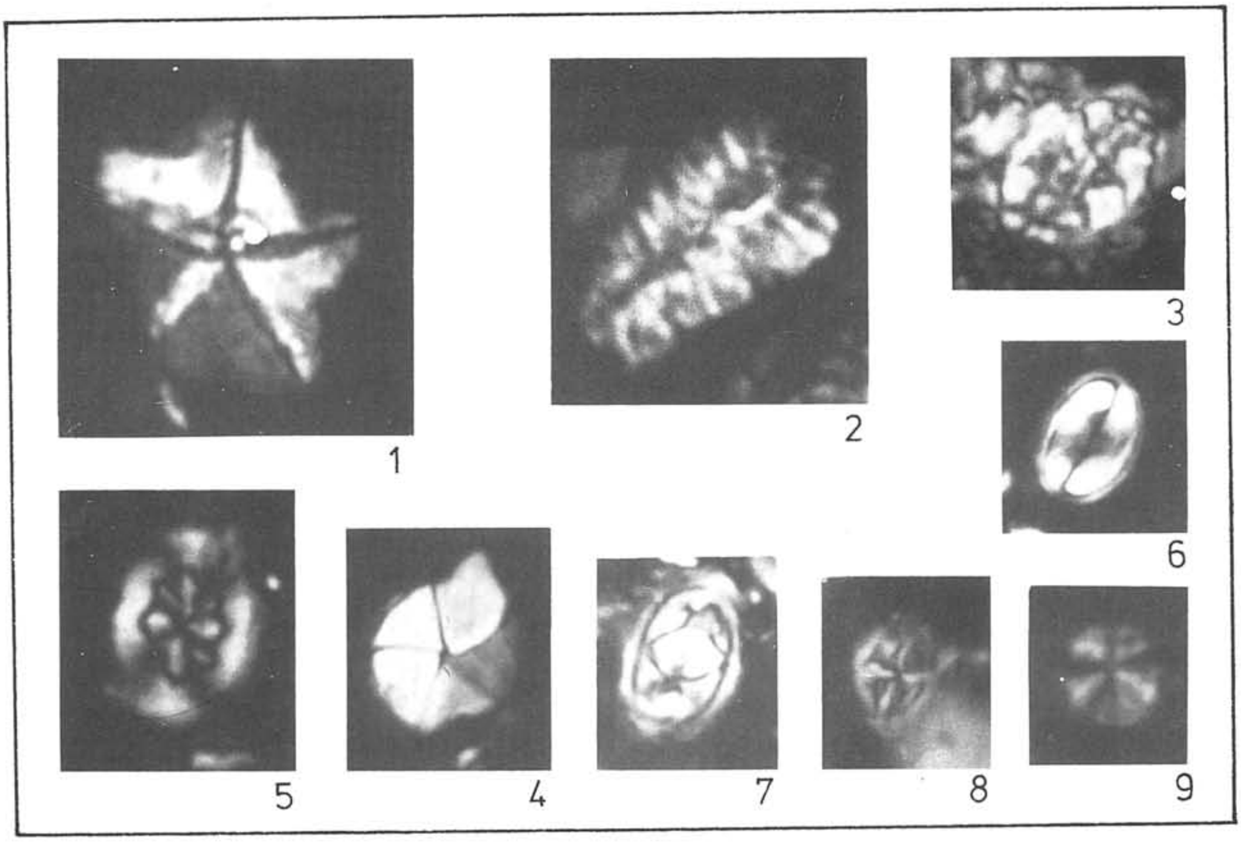

Fig. 1 – *Micrantolithus hoschulzii* (REINHARDT, 1966), THIERSTEIN (1971) Berzsek Marl F., crossed nicols; Fig. 2 – *Nannoconus steinmannii* KAMPTNER (1931) Lábatlan Sandstone F., crossed nicols; Fig. 3 – *Eiffellithus turriseiffelii* (DEFLANDRE in Deflandre and Fert 1954) REINHARDT (1965) Berzsek Marl F., crossed nicols; Fig. 4 – *Braarudosphaera batilliformis* TROELSEN and QUADROS (1971) Berzsek Marl F., crossed nicols; Fig. 5 – *Stradneria crenulata* (BRAMLETTE and MARTINI, 1964) NOËL (1970) Berzsek Marl F., crossed nicols; Fig. 6 – *Rhagodiscus asper* (STRADNER, 1963) REINHARDT (1967) Lábatlan Sandstone F., crossed nicols; Fig. 7 – *Zeugrhabdotus embergeri* (NOËL, 1959) PERCH-NIELSEN (1984) Lábatlan Sandstone F., crossed nicols; Fig. 8 – *Gartnerago preobliquum* JAKUBOWSKY (1986) Lábatlan Sandstone F., crossed nicols; Fig. 9 – *Eprolithus apertior* BLACK (1973) Lábatlan Sandstone F., crossed nicols.

All pictures have a magnification of 1200 X.

We have found six species altogether which appear from the basis of the Aptian continuously in chronological order. These are as follows:
Braarudosphaera batilliformis TROELSEN and QUADROS (1971), *Braarudosphaera hockwoldensis* BLACK (1973), *Rhagodiscus angustus* (STRANDER 1963) REINHARDT (1971), *Eprolithus apertior* BLACK (1973), *Gartnerago preobliquum* JAKUBOWSKY (1986), *Eiffellithus turriseif-felii* (DEFLANDRE in DEFLANDRE and FERT, 1954) REINHARDT (1965).

Out of these species the latter four have stratigraphic significance recognized all over the world. The presence of the two *Braarudosphaera* species – and mainly that of the *Braarudosphaera batilliformis* found in the lowermost investigated sample of the Berzsek Marl – confirms the hypothesis concluded on the other four species, namely, that the prevailing part of the sequence is undoubtedly not older than the Aptian. Naturally, may not be excluded the possibility that the layers lying more deeply under the surface are possibly of Upper Barremian age (Fig. 1).

A younger Aptian age is indicated by the *Rhagodiscus angustus* found in the middle part of the marl.

Two specimens of the *Eiffelithus turriseiffelii* indicating the youngest age have been found in the top layers of the Berzsek Formation. This species has not been found anymore above this level, but our age determination is confirmed by the *Gartnerago preobliquum* occurring in the upper part of the sequence. Its range namely overlaps that of the *Eiffelithus turriseiffeli* at the base of the Upper Albian. According to the zonation of Jakubowsky (1987), the *Eiffellithus turriseiffeli* subzone represents the upper part of the *Gartnerago preobliquum* zone and thus, our results properly demonstrate the overlapping.

Since we could find nannoplankton indicating younger age than the *Eiffellithus turriseiffeli* neither in the uppermost part of the sequence, nor in the upper part of the Berzsek Marl Formation, we may conclude that neither the uppermost part of the sequence is younger than the base of the Upper Albian.

The nannoplankton age data, the turbiditic nature of the Lábatlan Sandstone and its insignificant thickness in absolute value suggest that its deposition was much faster than that of the Berzsek Marl.

Since the results of the stratigraphic evaluation of the nannoplankton and ammonite investigations are not in accordance, it is necessary to recollect and restudy both fossil groups.

The young age of the Lower Cretaceous series of Berzsek Hill, compared to the former age determinations is not so surprising if we take into account that the Köszörükőbánya Conglomerate Member exposed some kilometers away and previously thought to be of Barremian age is proved to be of Upper Aptian–Albian age according to the latest investigations (Sztanó and Báldi–Beke, 1990). Though continuous connection can not be seen on the surface between the profiles of Berzsek Hill and Köszörükőbánya, it may be presumed that the Köszörükőbánya Conglomerate Member is the heteropic facies of the Lábatlan Sandstone or of the conglomerate in its top part. The Albian age of the member is confirmed by the common occurrence of forms.

Since till now only two surface sections of Lower Cretaceous of the Gerecse Mountains have passed nannoplankton investigation, it is possible that the subsurface part of the formation really overlaps the Valanginian–Hauterivian and Barremian stages, as it was proposed by Fülöp (1958).

Correlation

The nearest occurrence similar to that of the Lower Cretaceous of the Gerecse Mountains is known from Czechoslovakia, from the basement of the Danube Plain. According to Seneš (1960), in the surroundings of the village Mužla two drillings reached this group. These subsided blocks of Lower Cretaceous are bordered by the Muráň Line to the west and by the Hurbanovo-Diósjenő Line to the north.

Already Hantken (1868) pointed out the sedimentological similarity between the Lower Cretaceous of the Gerecse Mountains and the Rossfeld Beds of the Northern Calcareous Alps. The Neocomian age published previously was also in good concordance with the age relations of the "locus typicus" of the Rossfeld Beds. It has been proved, however, that the upper part of the Rossfeld Beds ("Grabenwald-schichten") reached up to the Aptian stage, as well (Fuchs, 1968). In the eastern part of the Northern Calcareous Alps the age of the "Neocomian Aptychus beds" also reaches the Aptian stage, which does not mean yet a great difference compared to the new Hungarian age data. The beginning of the formation of the coarse detrital sandstones can be placed to the boundary of the Aptychus beds and the Tannheim Beds, that is to the Albian stage (Plöchinger, 1980). It seems, as if the appearance of pelagic coarse detrital materials in the Northern-Alpine-type Lower Cretaceous sequences would show a kind of a "progressive lateness' to the east.

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