

THE SOUTHERN TELLIAN SERIES AT NUMMULITES (NE ALGERIA): STRATIGRAPHY AND STRUCTURAL CONSEQUENCES

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Abstract:

The synthesis of stratigraphic and structural data of Constantinois limestone massifs has allowed the refining of the southern Tellian series at nummulites stratigraphy and proposing a structural model.

The most significant sites and less disturbed by tectonics, are the Taxas syncline and southern flank of Guerion massif, exactly at the Djebel Ras Rihane.

Also, at the level of Taxas syncline, and surmounting the hard ground which ended the Aptian neritic limestone, the marly levels had provided Cenomanian microfauna: *Favusella washitensis*, *Rotalipora appenninica*, *R. cushmani*, *R. brotzeni*, *Hedbergella* sp., and *Praeglobotruncana stephani*.

On the southern reverse of Djebel Ras Rihane, at the level of Chaabet Ras Chiboub notch, we can observe, on the hard ground that terminates the Aptian neritic limestones, a clayey Cenomanian over one hundred meters of thickness.

The samples from these clays have provided many *Hedbergella*, *Rotalipora brotzeni*, *R. cushmani*, *R. globotruncanoides* and *Praeglobotruncana* gr. *Stephani*.

The top of these clays has provided Coniacian foraminifera and revamped Cenomanian *rotalipora*.

The study of the stratigraphic series of southern neritic massifs allowed the refining of our predecessor's results.

Also the yellow marls stratigraphically surmounting the terminal Aptian- basal Albian through a hard ground, represents the Cenomanian-Turonian.

Microscopic analysis of samples from this hard ground highlights sedimentological phenomena that attest the emersion of Constantinois platform during the terminal Aptian- basal Albian.

In the Constantinois limestone massifs, "the southern Tellian units at nummulites " represent the normal marly cover of neritic limestones.

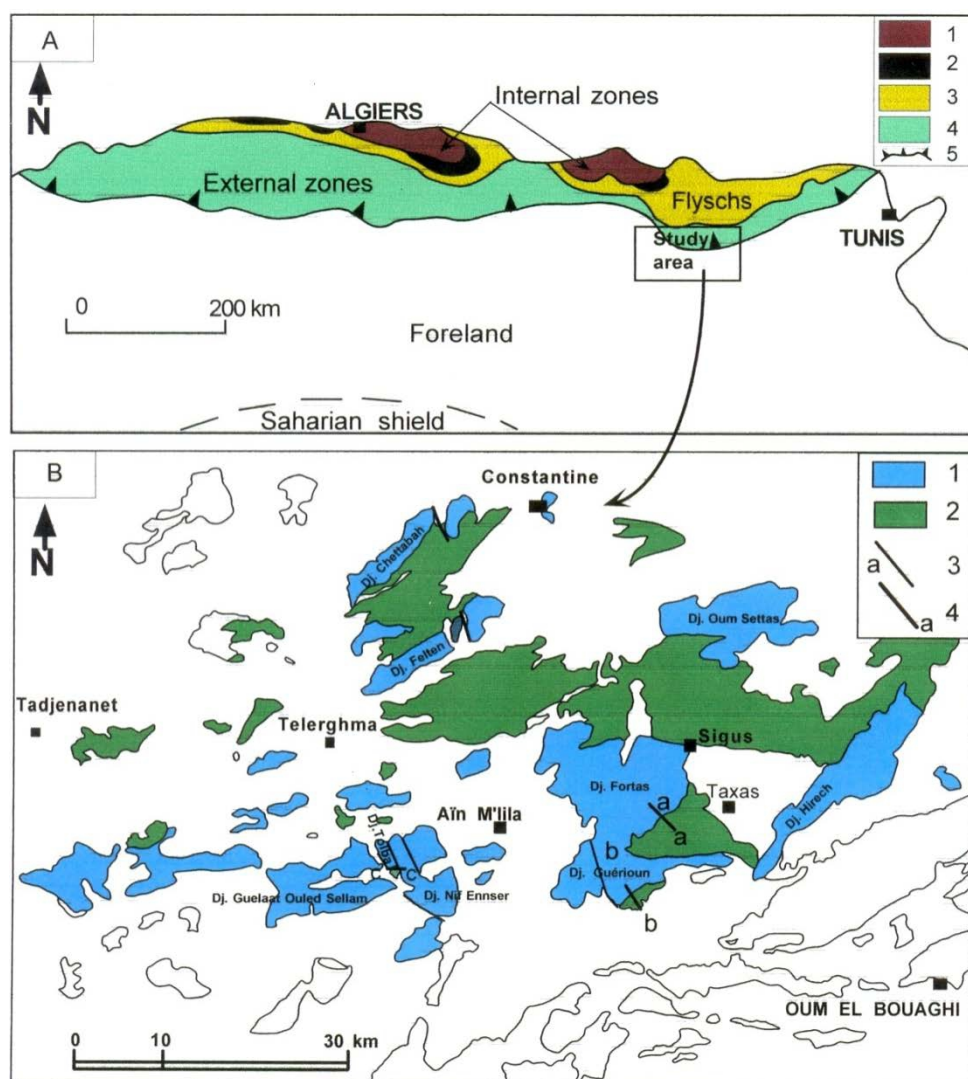
Key Words: Constantinois limestone massifs, Albo-Aptian, southern Tellian units, eastern Algeria

Introduction

The southern units at nummulites are located in the external zones of the Eastern Algeria Alpine Belt (Fig.1: A & B).

Located only in the southern confines of the Constantinois neritic mole, the stratigraphy of these units contains the Senonian and Eocene formations rich with nummulites and represents Eocene coverage of the Peni-Tellian series, thrust on the Constantinois neritic platform Vila (1980).

The objectives of this paper are: the study of the stratigraphic Tellian series at nummulites and to establish structural relationships with their substratum.



A :Location of the study area in the frame of the Alpine belt

1-Socle Kabyle , 2-Dorsale Kabyle, 3-Flysch domain, 4-External zones, 5-Limit of Alpine belt

B : Location of Southern tellian series at Nummilites 1-Carbonate platform, 2- Southern tellian series at Nummilites, 3-Fault,4-Cross sections :

a---a :Cross section of Taxas syncline

b---b:Cross section of the southern reverse of Dj.Ras Rihane

c---c :Cross section of the valley between Dj.Tolba and Dj. Guelaat Ouled Hadj

Stratigraphic study

Cross section of Taxas syncline

Over the hard ground, and when conditions of outcrops allow it, we can observe (Fig. 2):

- Gray marls alternating with some levels of micritic limestones. The samples have delivered Cenomanian microfauna with: *Favusella washitensis*, *Rotalipora appenninica*, *R. cushmani*, *R. brotzeni*, *Hedbergella* sp., and *Praeglobotruncana stephani*.

- These marls are overlain by marly-limestones and marls which have delivered rich Santonian microfauna with: *Globotruncana linneiana*, *G. sigali*, and *G. fornicata*. At the base of these marls, in the Santonian microfauna there are revamped Cenomanien *Rotalipora*.

- Gray marls, often yellowish by alteration, the samples have delivered Campanian microfauna with: *Globotruncana linneiana*, *G. fornicata*, *G. elevata* and *G. stuatiformis*.

- Bar of bedded marly-limestones, very rich in inoceramids reported by Voûte (1967) to the Campanian

- Black marls, the base still Campanian, but the top reaches the Maastrichtian with *Globotruncana stuatii* and *G. contusa*.

- Marly-limestones, well bedded, forming a marked bar by topography. This bar is very rich in inoceramids; it was reported by Voûte (1967) to the Maastrichtian.

- Black Maastrichtian marls at the base and Paleocene at the top, the pelagic microfauna is quite rare, but benthic foraminifera are abundant.

- Limestones and marly-limestone beds 0,2 to 0,5 m, light in patina, black on the break. The flint nodules are common especially in the lower part. These limestones are rich in nummulites (Late Ypresian).

- A thick series of marls with intercalations of lumachellic oyster beds. The samples have delivered rich Lutetian microfauna. Vila (1980) quotes: *Globigerina soldadoensis*, *G. linaperta*, *G. yeguaensis*, *Globorotalia boweri*, *G. topilensis*.

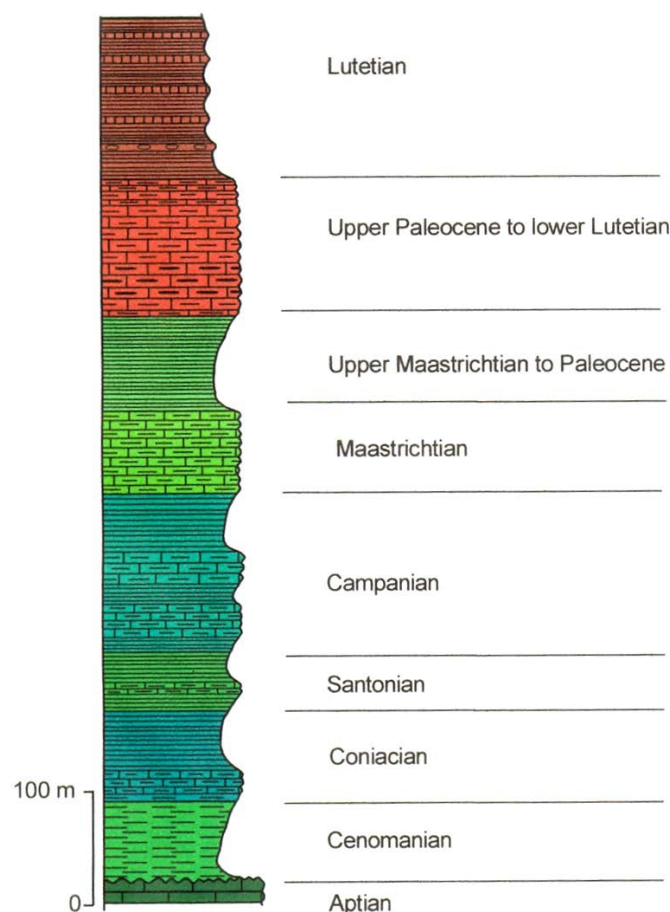


Fig. 2: Lithostratigraphic column of Texas syncline

Cross section of the southern reverse of Dj.Ras Rihane:

On the southern reverse of Djebel Ras Rihane, at the level of Chaabet Ras Chiboub notch, we can observe, on the hard ground that terminates the Aptian neritic limestones (Fig. 3):

-A clayey Cenomanian over one hundred meters of thickness, the samples from these clays have provided many *Hedbergella*, *Rotalipora brotzeni*, *R. cushmani*, *R. globotruncanoides* and *Praeglobotruncana* gr. *Stephani*; the terminal Cenomanian at *Rotalipora reicheli* is missing.

- The top of these clays has provided Coniacian foraminifera and revamped Cenomanian *Rotalipora*.

- One hundred meters of yellowish beige marls alternating with decimetric marly- limestone beds which have provided Coniacian microfauna at the base and the Santonian at the top.

-Above, come marls topped by a marly-limestone bar and marls again containing Campanian microfauna.

- Marls and marly limestone bar topped by black Maastrichtian marls.

-Black Paleocene marls.

-Phosphatic limestones at nummulites with flint, indicating the Ypresian.

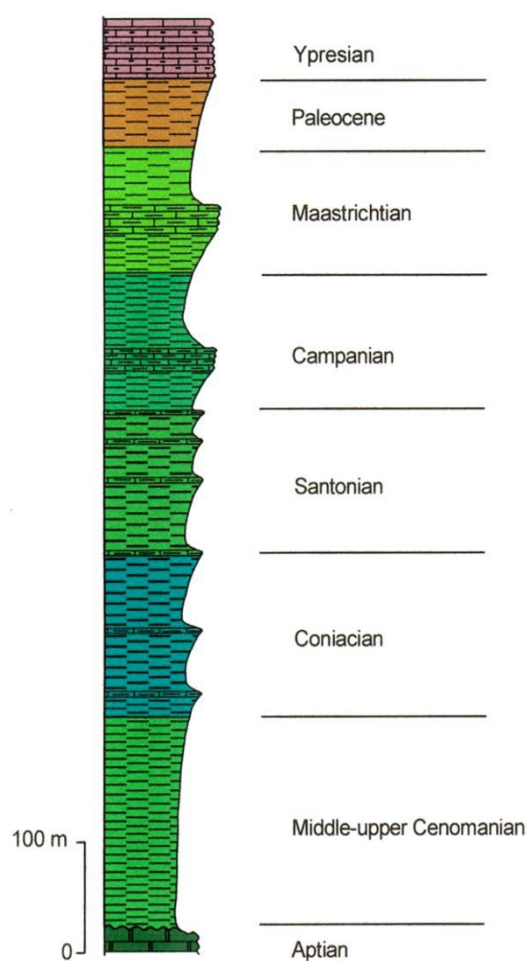


Fig.3: Lithostratigraphic column of Dj.Ras Rihane southern flank

The valley between Djebel Tolba and Djebel Guelaat Ouled Hadj

Over the gray lightened limestones at Miliolids of the Terminal Aptian which are ended by a hard ground (Fig. 4), we observe a nodular micritic limestone at algae and *Calcisphaerulidae*

This hard ground is surmounted by micritic limestones with conglomeratic appearance and marls where urchins were recognized, gender of *Hemiaster batnensis*.

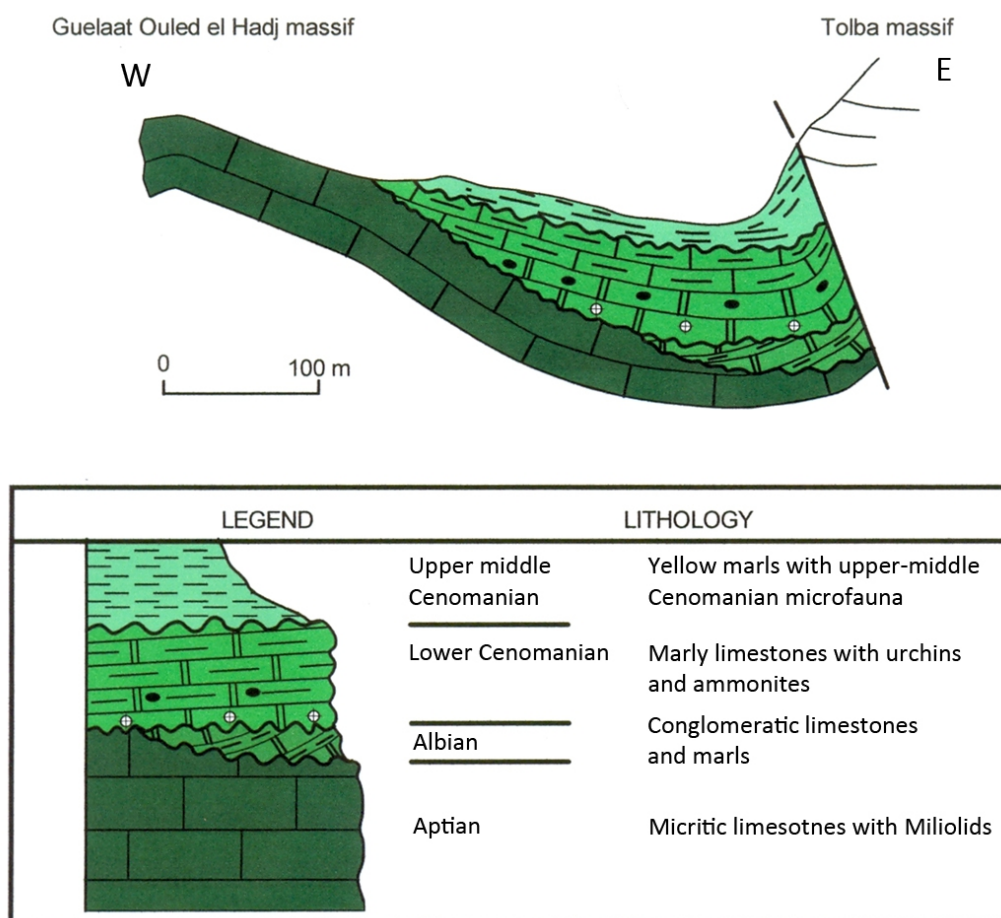


Fig.4: Geologic cross-section revealing the existence of neritic lower Cenomanian

- Above, ten meters of phosphatic limestones at Ammonites intercalating with conglomeratic levels and ending with a hard ground.

- Yellow marls finishing this series, the microfauna from these marls indicate the upper-middle Cenomanian.

To our knowledge this valley is the only place in the southern neritic massifs where Ammonites indicating the Cenomanian were collected.

These Ammonites were dated by C.Meister (Natural History Museum of Geneva). It is *Mantelliceras saxbii*. Sharpe (1856).

For Reymont Richard & Bengston (1986), it is the lower Cenomanian of the zone at Mantelli.

For Kennedy, Juignet & Wright (1986), it is the lower Cenomanian and more precisely it is the middle part of the lower Cenomanian.

In the same place, Bär (1957) noted the presence of pyritic indeterminate Ammonites and urchins including *Hemiaster batnensis* Coquand, well known in the Aurès Cenomanian.

The hard ground on the top of the lower Cretaceous

When conditions of outcrops allow it, we can observe this hard ground in all massifs of Constantinois Mountains (photo 1).

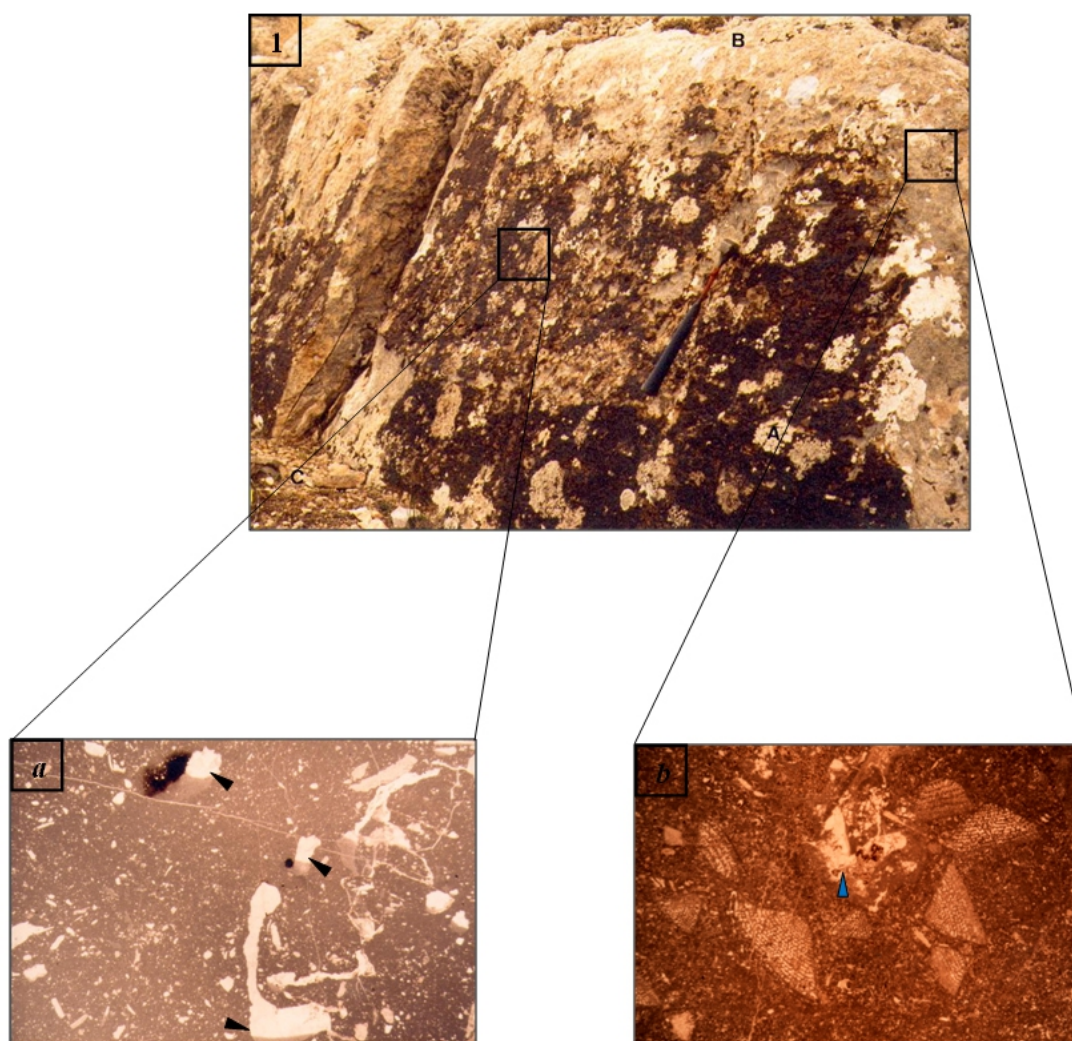


Photo 1: Macroscopic appearance of the hard ground on the top of Apto-Albian limestones.

A. Hard ground, B. Apto-Albian limestones, C. Yellow Cenomanian marls

a and b: Microscopic appearance of the hard ground on the top of Apto-Albian limestones.

Black arrows : Geopetal Figures, Blue arrow : Dissolution

Microscopic observation of thin sections from samples of this hard ground shows many small cavities partially or completely filled by internal sediment (*a* & *b*). This internal sediment consists of micrite and microcrystals of pyrite. These small cavities came from the dissolution of shells and shell debris of rudists when they are in a sedimentary environment where aragonite is unstable (ex: vadose zone). A cavity takes birth and can be filled with micrite. Residual vacuum is filled with calcite in mosaic; these diagenetic phenomena are interpreted as emersion marks.

This hard ground, where are localized dissolutions, of sedimentary origin is indisputable and cannot be mechanical as claimed by Vila (1980). It reflects an emersion of the neritic mole at that time Chadi (1991).

Conclusion

The study of the stratigraphic series of southern neritic massifs has allowed the refining of our predecessor's results. Yellow marls stratigraphically overlaying on the terminal Aptian-basal Albian through a hard ground, representing the middle Cretaceous. The presence of Ammonites remove all ambiguity about the age of these marls, dated Cenomanian-Turonian by Bär (1957) and which Vila (1980) reports to the "Miocene revamping the Cenomanian".

Microscopic analysis of samples from the hard ground surface has highlighted sedimentological phenomena of the emersion of the Constantinian platform during the terminal Aptian-basal Albian. The lower Cenomanian, conglomeratic and discordant, exists only in the Valley between Djebel Tolba and Djebel Guelaat Ouled el Hadj.

The Senonian shows lacuna in its base, also at the Taxas syncline, the Coniacian that surmounts the middle Cretaceous whereas it is the Santonian in the southern reverse of Djebel Guerioum.

These variations in thickness and these lacunas may be the result of socle structure legacy during the tectonic events that began at the Albian and which continued during the late Cretaceous.

Acknowledgement

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