CALCAREOUS NANNOFOSSILS AT THE CRETACEOUS/TERTIARY BOUNDARY IN TUNISIA

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ABSTRACT

The calcareous nannofossils from two more or less well exposed Maastrichtian-Danian sections in Tunisia (El Kef and Hédil) were studied. The uppermost Cretaceous *Micula prinsii* Zone as well as the lowermost Tertiary *Markalius inversus* Zone (NP 1) were found in both sections.

INTRODUCTION

During the VI African Micropaleontological Colloquium in Tunis, 1974, two sections across the Cretaceous/Tertiary boundary were visited and sampled: (1) Hédil (Salaj *et al.*, 1974, 59-66) and (2) El Kef (Salaj, 1974, 51-57) (Fig. 1a-1b). The Maastrichtian and Danian belong to the El Haria Formation (Burollet, 1956) consisting of limestones and marls. For details of the localities, lithologies and for the planktic foraminifera zonation of the sections, see Salaj *et al.*, 1974 and Salaj, 1974. The Cretaceous section from El Kef was also studied by Sissingh (1977) and Verbeek (1976, 1977).

CRITERIA FOR THE RECOGNITION OF THE UPPERMOST CRETACEOUS AND THE LOWERMOST TERTIARY

For the recognition of the uppermost Cretaceous we use the presence of the *Micula prinsii* Zone. *M. prinsii* Perch-Nielsen (in print) evolved from *Micula murus* and has long, bifurcated arms. Its first occurrence falls well after the first occurrence of *Abathomphalus mayaroensis*, the planktic foraminifer usually used for the recognition of Upper Maastrichtian. For the recognition of the lowermost Tertiary, the presence of the *Globigerina eugubina* Zone of earliest Danian age is necessary, since this zone includes only the lower part of the basal Tertiary *Markalius inversus* Zone (NP 1 of Martini, 1971). According

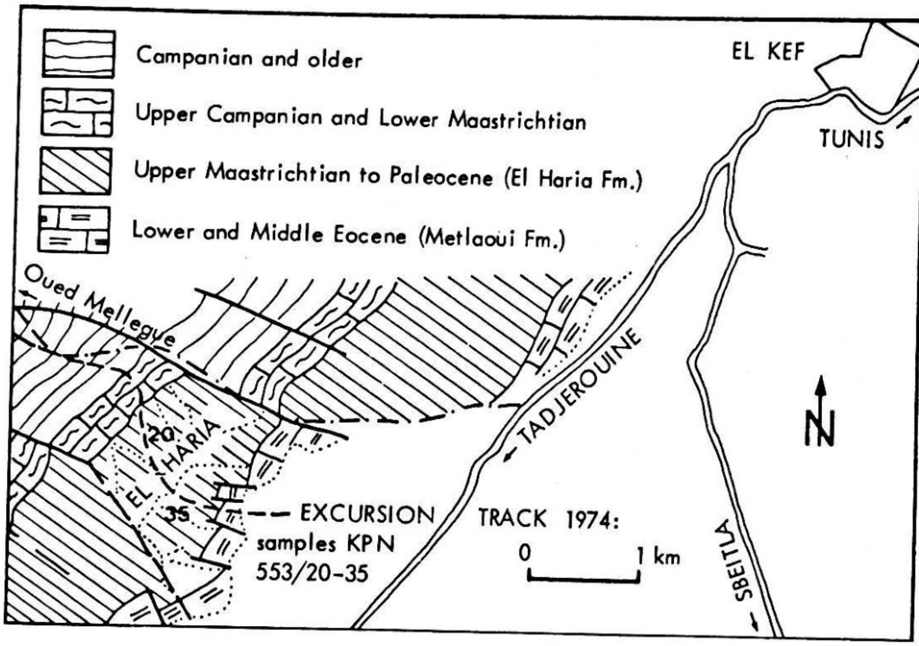

Fig. 1a. Locality map of the samples studied from EL KAF (after Salaj, 1974)

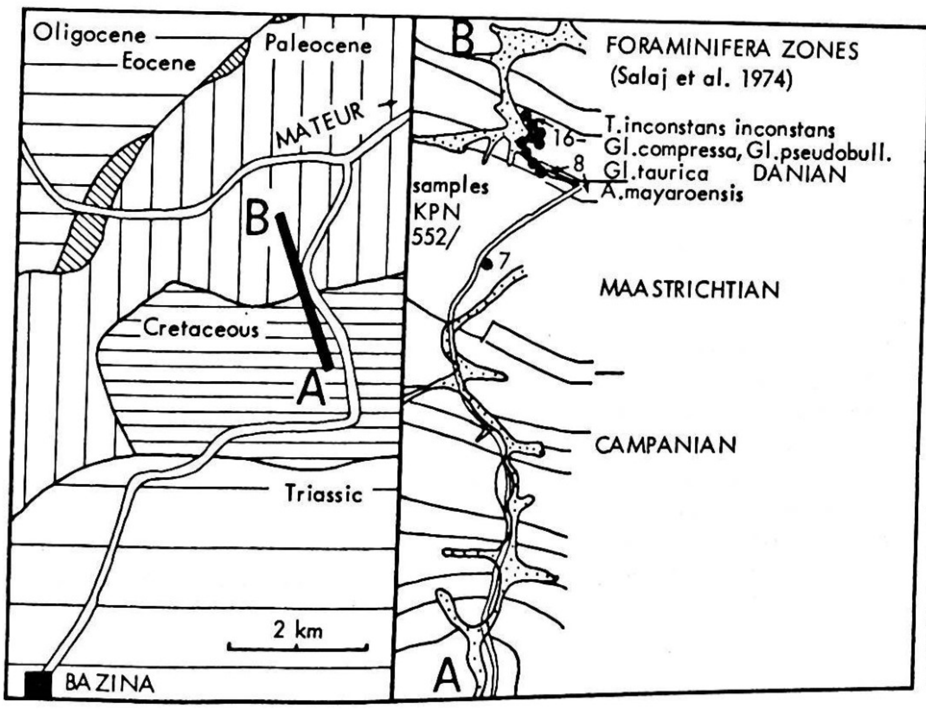

Fig. 1b. Locality map of the samples studied from HEDIL (after Salaj *et al.*, 1974)

to Salaj (1974, p.53), the *Globigerina taurica* Zone as defined by Morozova (1960) and reported from the two sections treated in this paper, corresponds to the *G. eugubina* Zone as defined by Luterbacher & Premoli-Silva (1964) and the *G. bulloides* Zone of Kraschenninnikov (1964).

HEDIL

Maastrichtian

Coccoliths are common and moderately well preserved in the Upper Maastrichtian. The assemblage is typical Tethyan, with the consistent presence of *Lithraphidites quadratus*, *Ceratolithoides* sp., *Semihololithus priscus*, *Micula murus* and only very rare *Nephrolithus frequens* besides the rich cosmopolitan flora. (Table 1 shows only the stratigraphically important Maastrichtian forms). Sample 7 was taken near the base of unit 7a of Salaj *et al.* (1974, fig. 2), sample 8 in unit 7b, sample 9 at the top of 7b, more or less in the river. The remaining samples derive from unit 7c which spans the Cretaceous/Tertiary boundary. Sample 10 was still considered Upper Maastrichtian, collected a few metres down the river, while the stratigraphic position of sample 11 - collected some 5 m further down the river - was uncertain in the field. The coccolith assemblage of sample 11 was typical of the *M. prinsii* Zone.

Danian

Also in the Danian coccoliths are usually common and moderately well preserved. The change in the assemblage from the underlying Maastrichtian to the Danian is found in most Cretaceous/Tertiary boundary sections: a dramatic decrease in Maastrichtian forms at the expense of *Thoracosphaera*, *Braarudosphaera* and a few other 'survivors'. *Biantholithus sparsus* is extremely rare. *Cruciplacolithus tenuis* occurs already in sample 13 and *Chiasmolithus danicus* in sample 16. The presence of the three lower - middle Danian zones could thus be established. Sample 12 was taken some 10 m further down the river and thought to derive from the *G. taurica* Zone. Samples 13 through 15 were collected on a slope with about 1 m distance between the samples and come from the *G. pseudobulloides* Zone according to Dr. J. Salaj (pers. comm. 1974). Sample 16 was collected from the lowermost part of the *G. compressa* Zone. With the zonal assignments given above, the correlation between the planktic foraminifer zonation and the calcareous nannofossil zonation corresponds more or less to the one given i.e. by Berggren (1972).

DISCUSSION

According to the present study, the uppermost Cretaceous is well developed in this sequence. On the other hand, the lowermost Tertiary seems to be very thin; Salaj *et al.* (1974, p.62) give some 10 - 20 cm thickness to the *G. taurica* Zone. They also stress that there is no

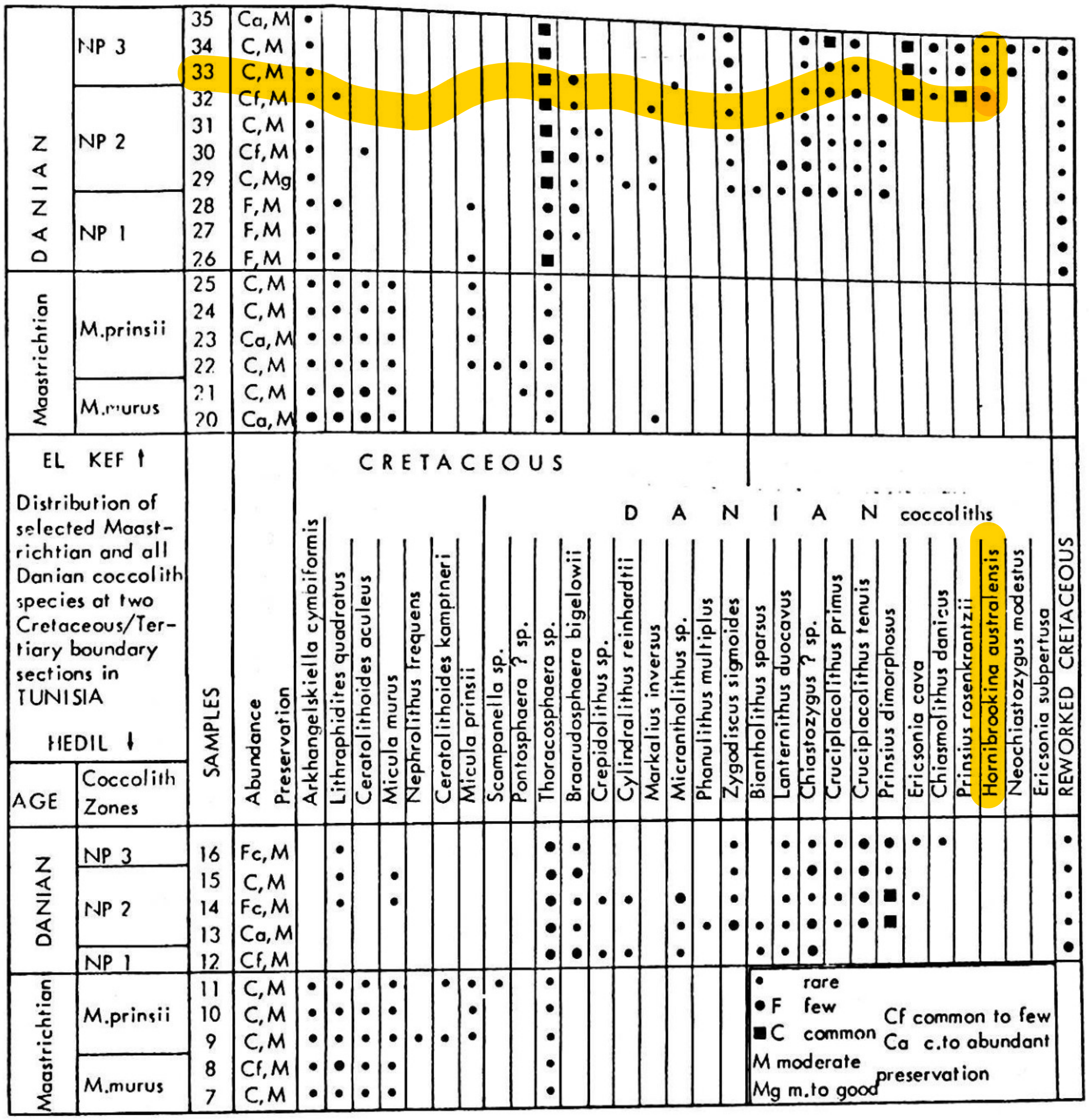

Fig. 2. Distribution of calcareous nannofossils near the Cretaceous/Tertiary boundary in Tunisia. NP 1 = *Markalius inversus* Zone. NP 2 = *Cruciplacolithus tenuis* Zone. NP 3 = *Chiasmolithus danicus* Zone.

lithologic change between the Maastrichtian and the Danian in this region: marls are found below and above the Cretaceous/Tertiary boundary. Unfortunately, a single, continuous section is not exposed.

EL KEF

Maastrichtian and Danian

Coccoliths are common and moderately well preserved in the Upper Maastrichtian. Also in this sequence, the assemblage is typical Tethyan (see above) and *N. frequens* was not found. On the other hand, *M. prinsii* is slightly more common here than in the Hédil profile.

All samples studied here and listed in Fig. 2 were sampled in units 8 and 9 of Salaj (1974, fig. 2) and belong to the El Haria Formation. The Cretaceous/Tertiary boundary falls within unit 8 and is not marked lithologically according to Salaj (1974). Samples 20 and 21 are from the *A. mayaroensis* Zone, samples 22 through 31 or 32 from the *G. taurica*, *G. pseudobulloides*, and *G. compressa* Zones and samples 33 through 35 from the *G. inconstans* Zone. The outcrop conditions are such that the thickness of the section and the distances between the samples are not easily recognizable. In addition, tectonical disturbances (faulting) seem to complicate the geology of the area.

In the Danian, coccoliths are less common than in the Maastrichtian, but moderately well preserved. *Thoracosphaera*, which is rare in the Maastrichtian, becomes the dominant form in the lowermost three samples here assigned to NP 1, the basal Tertiary coccolith zone. The assemblage otherwise includes only reworked Cretaceous forms until the first occurrence of *C. tenuis* in sample 29. Since many other forms have their first occurrence also in this sample, it seems likely that samples 28 and 29 were taken too far apart or that there is a short hiatus betwen them. Also the first occurrence of *C. danicus* coincides with the first occurrence of several other species in a way to suggest a gap between the samples or a hiatus. Of special interest is the presence of *Hornibrookina australis* or a very similar form in the *C. danicus* Zone. *H. australis*, originally described from the southern hemisphere, occurs also in the Paleocene (NP 6) of the South Atlantic (DSDP Site 356, Perch-Nielsen, 1977) and on the Crimea, but it has not been recorded from northern Europe.

DISCUSSION

According to the recent coccolith studies the uppermost Cretaceous is well developed in this sequence and the lowermost Tertiary also seems to be fairly complete. However, sampling gaps and/or hiatus are present and more detailed fieldwork is necessary in order to find 'the ideal sequence' which may exist in this area.

CONCLUSIONS

The coccolith study of the two Cretaceous/Tertiary boundary sections in the El Haria Formation of Tunisia suggests that continuous sections do exist in this area. However, more detailed fieldwork is necessary in order to find better exposed sections or, alternatively, some excavating of the examined sections might be attempted.

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