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Small Benthic Foraminifera extinction and turnover across the Cretaceous/Tertiary boundary in a low latitude marine bathyal environment (e.g. Melah section: Tunisia)

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The benthic foraminiferal assemblages, in contrast to those of planktonic foraminifers, did not suffer severe mass extinction at the K/T boundary (Keller, 1988. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 66 (3-4): 153-171; Karoui-Yaakoub & Zaghib-Turki, 1998. *International Workshop on Cretaceous-Tertiary Transition (Mai 1998, Tunis), Abstracts*, 61; Zaghib-Turki *et al.*, 2000. *Sciences de la Terre et des planètes*, C.R. Académie Sciences. Paris, 33: 141-149.; Alegret *et al.*, 2003. *Marine Micropaleontology*, 48: 251-279).

Taxonomic and statistic analyses of small benthic foraminifera species in K/T transition deposits of the Melah section in northern Tunisia, supported by Benthic/Planktonic ratios, reveal that this faunal group was very diversified (136 species) and dominated by deep-sea species (e.g. *Anomalinoidea acuta*, *A. midwayensis*, *A. welleri*, *Gaudryina pyramidata*, *Bulimina midwayensis*, *B. trinitatensis*, *Cibicidoides alleni*). The successive assemblages were composed of about 50 to 80% of endobenthic ecological morphotypes.

Among all the Maastrichtian benthic species (109 species), 37 species became extinct at the K/T boundary. This extinction bioevent concerned 34% of the total Maastrichtian assemblage, and especially 30% of the total eutrophic species. Throughout the P0 zone, the extinction is considerably less severe and only three survivor species disappeared: two of buliminids and *A. welleri*. In contrast, through this earliest Danian zone, seven species appeared, among them the oligotrophy tolerant *Gavelinella danica*. From those initially surviving and becoming extinct within P1a subzone, a consistent cluster (27 species) was diminished. This cluster was composed of calcareous (buliminids, bolivinids, anomalinoids, marginulinids) and agglutinated (spiroplectaminids and saccaminids) species. Most of them (67%) were endobenthic. In contrast, across the P1a subzone interval, 13 endobenthic species appeared but *Gavelinella danica* thrived. Throughout the P1b subzone, 15 other species

became progressively extinct which were mainly endobenthic and both oligotrophic and low oxygen tolerant versus 7 other species which appeared.

Globally, the species richness marks a negative shift at the K/T boundary. In the detail, among those disappearing at the Melah section, few of them survived in shallower environments of El Kef, Elles and Selja area (e.g. *Cibicidoides alleni*, *Lenticulina comptoni*, *Nodosaria limbata*, *Bolivina decoratissima*, *Tritaxia midwayensis*, *Bulimina quadrata* and *Pseudoglandulina manifesta*). This species disappearance may be related to the decrease of oceanic organic matter flux to the sea floor which was simultaneous to the primary productivity decrease in the upper water column prevailing at the K/T boundary in response to the meteorite impact. Such a scenario had generated a sudden climate cooling.

After this mass extinction event a clear turnover was established at the earliest Danian. An almost complete recovery was achieved at the lower part of the P1a subzone. However, a less severe species richness decrease close to P1a/P1b boundary coincided with the eustatic curve excursion included in the chron 29n (Haq *et al.*, 1987. *Science*, 235:1156-1167) and may be related to a sea-level fall. After this temporary crisis the small benthic foraminifers species richness mark a progressive increase, then remains almost stable.