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TITLE: Cenozoic mass extinctions in the deep sea: What perturbs the largest habitat on Earth?

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ABSTRACT:

Deep-sea benthic foraminifera live in the largest habitat on Earth, constitute an important part of its benthic biomass, and form diverse assemblages with common cosmopolitan species. Modern deep-sea benthic foraminiferal assemblages are strongly influenced by events affecting their main food source, phytoplankton (a relationship known as bentho-pelagic coupling). Surprisingly, benthic foraminifera did not suffer significant extinction at the end of the Cretaceous, when phytoplankton communities underwent severe extinction. Possibly, bentho-pelagic coupling was less strong than today in the warm oceans of the Cretaceous?Paleogene, because of differences in the process of food transfer from surface to bottom, or because more food was produced below the photic zone by litho-autotrophs. Alternatively, after the end-Cretaceous extinction the food supply from the photic zone recovered in less time than previously thought. In contrast, deep-sea benthic foraminifera did undergo severe extinction (30%?50% of species) at the end of the Paleocene, when planktic organisms show rapid evolutionary turnover, but no major extinction. Causes of this benthic extinction are not clear: net extinction rates were similar globally, but there is no independent evidence for global anoxia or dysoxia, nor of globally consistent increase or decrease in productivity or carbonate dissolution. The extinction might be linked to a global feature of the end-Paleocene environmental change, i.e., rapid global warming. Cenozoic deep-sea benthic faunas show gradual faunal turnover during periods of pronounced cooling and increase in polar ice volume: the late Eocene?early Oligocene, the middle Miocene, and the middle Pleistocene. During the latter turnover, taxa that decreased in abundance during the earlier two turnovers became extinct, possibly because of increased oxygenation of the oceans, or because of increased seasonality in food delivery. The Eocene-Oligocene was the most extensive of these turnovers, and bentho-pelagic coupling may have become established at that time.

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