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Gone but not forgotten – Casualties of the last global extinction

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The extinction of a group of elongate, cylindrical deep-sea (mid bathyal-mid abyssal) benthic foraminifera occurred during the mid-Pleistocene Climatic Transition (MPT), between 1.2 and 0.55 Ma. It was first recognised ~25 years ago and until recently its full impact was undocumented. Our studies in twenty ODP cores from the North Atlantic, South Atlantic, Caribbean, Mediterranean, Southern Ocean, North Indian, South China Sea, North-east Pacific and South-west Pacific, show that at least 76 species and 24 genera became extinct during this period of major global climate and oceanographic change. A further 8 species and 3 genera declined dramatically during the MPT, but survived through in low numbers in geographically-restricted refugia. One complete family (Stilostomellidae – 23 species), characterised by a distinct tooth structure in its necked aperture, became extinct at this time; and a second family (Pleurostomellidae – 24 species), also characterised by unusual elliptical or hooded apertures, was killed off except for three species that appear to have just survived through. A further 32 species in the large Nodosariidae family (including all the Subfamily Plectofrondiculariinae) also died out and most of these too, had unusual cribrate or narrow, constricted apertures.

Prior to the MPT, most of the extinct species had cosmopolitan distributions at middle bathyal to middle abyssal depths (600–3500 m), although a minority had geographically-limited distributions. Our studies indicate that ~20% of the global diversity of benthic foraminifera at these depths (other than the diverse unilocular taxa) became extinct during the MPT. This was an extinction rate of ~30% of the middle bathyal-upper abyssal fauna/myrs, which is an order of magnitude greater than the background extinction rate for deep-sea benthic foraminifera of ~2–3%/ myrs.

Our studies are based on a taxonomic review of the Pliocene-Pleistocene members of the Stilostomellidae, Pleurostomellidae, Plectofrondiculariinae and Nodosariidae with cribrate apertures. The review is being prepared for publication as a monograph. The following genera of benthic foraminifera became extinct at this time: *Awhea*, *Chrysalogonium*, *Cribronodosaria*, *Ellipsoglandulina*, *Ellipsoidella*, *Ellipsoidina*, *Ellipsopleurostomella*, *Ellipsopolymorphina*, *Glandulonodosaria*, *Mucronina*, *Nodosarella*, *Orthomorphina*, *Parafrondicularia*, *Plectofrondicularia*, *Myllostomella*, *Siphonodosaria*, *Stilostomella*, *Strictocostella* and several new genera yet to be described. Apparently surviving through in low numbers with restricted distribution were *Neugeborina*, *Pleurostomella*, *Proxifrons*, *Rectuvigerina* and *Vulvulina*.