The Cenomanian/Turonian Boundary Event: A review of the micropalaeontological evidence

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The Cenomanian/Turonian Boundary Event (CTBE, Bonarelli Event or OAE ll) is one of the most distinctive of the mid-Cretaceous "anoxic events" and has been recorded on (almost) every continent. The first detailed documentation of the palaeontological changes across the CTBE was the seminal paper by Dick Jefferies (1962). His palaeoecological inferences were coloured by the contemporary work of Burnaby (1962), who's interpretation of the ecology of benthic foraminifera (and the depth of the chalk sea) was unfortunately highly inaccurate. Although Hart & Tarling (1974) attempted to show that the CTBE was a widespread "event", Schlanger & Jenkyns (1976) were probably the first to recognise the possible link with oceanic anoxia.

In the 1980s, Jarvis and co-workers in the U.K. (Jarvis *et al*., 1988) and Kauffman and co-workers in the U.S.A. (Pratt *et al*., 1985; Kauffman & Eicher, 1988) identified the global nature of the "event" and the extinctions associated with it. The CTBE is now grouped with the "Oceanic anoxic events" of the mid-Cretaceous and recognised world-wide (e.g., Europe, USA, Brazil, West Africa, Morocco, Tunisia, Middle East, Russia, India, Australia and in many ocean basins and on oceanic plateaux). The anatomy of the $\delta^{13}C$ and $\delta^{18}O$ excursions has been studied in detail and the curves are near-identical world-wide. The palaeontological turnover is global and the various extinction events regarded as synchronous. The majority of these are at the level of genus or species (not family) and this separates the CTBE from the "Big Five" extinction events. Milankovitch cycles indicate a possible duration for the "event" of 300,000 to 500,000 years: a relatively short period of time in which to cause (and recover from) such an oceanic perturbation.

Despite the volume of work thrown at the CTBE in the last 20 years (post – Jarvis *et al*., 1988), are we any nearer to understanding what happened? Was it a sudden sea level rise (or fall)? Was it a sudden "cold" event in the general mid-Cretaceous greenhouse climate? Was it an expansion of the oxygen minimum zone in the oceans or was it simply that the normal oxygen minimum zone was drawn onto the expanded mid-Cretaceous shelves during a sea level highstand? What do the occurrence of oceanic black mudstones or red beds tell us about the oceans below the oxygen minimum zone?

The debate continues……!

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