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# Cretaceous Oceanic Anoxic Events and the Radiation of Radially Elongated Chambered Planktonic Foraminifera

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Our investigation, spanning about 40 My, on the distribution and abundance of planktonic foraminifera with radially elongated chambers from the lower Cretaceous in different well-dated sections from several areas and geological settings, highlight that these peculiar morphological forms became a consistent component of foraminiferal assemblages around the Oceanic Anoxic Events (OAEs). Some species and genera even have their first occurrences close to the main OAEs. In particular, the first radiation of hedbergellids with elongated chambers just predates the latest Hauterivian Faraoni Anoxic Event. This suggest that the development of elongated chambers may be interpreted as the response of planktonic foraminifera to sea-water nutrification and deoxygenation which might have stimulated the evolution of calcareous plankton. The chamber elongation may represent a morphostructural adaptation to new trophic strategy, allowing the organism to harvest a greater volume of water at minimal metabolic cost. The large abundance of planktonic foraminifera with radially elongated chambers is a markedly evident feature across the Selli and the Bonarelli Events (early Late Aptian OAE1a and latest Cenomanian OAE2, respectively). However, each Cretaceous OAE shows its own peculiarities in terms of stratigraphical distribution, relative abundance, and diversity of these morphotypes. We speculate that the relative abundance of the elongated chambered planktonic foraminifera may be proportional to the strength of the environmental perturbation related to the OAEs. Several lines of evidence and comparison with the patterns recognized at different stratigraphical levels and settings suggest that water oxygenation could not have been the only controlling factor governing the development of elongated chambered in Early Cretaceous plank-

tonic foraminifera. Most likely, an interplay of several physical-chemical factors (i.e., dissolved oxygen concentration, temperature, salinity, nutrients, type of food, trace elements) was responsible for the development of such a morphological adaptation.