

## **Biochronology and paleontology of mid-Cretaceous radiolarians from Northern Apennines (Italy and Betic Cordillera (Spain)**

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Highly diverse radiolarian faunas of middle Cretaceous age have been recovered from pelagic and hemipelagic sequences recording the Barremian-Turonian interval in Mediterranean Regions. Several lithologies (limestones, cherty limestones, marls and siliceous shales) were thoroughly examined for radiolarian occurrences in continuous successions of deep-water facies. The study includes localities in the Umbria-Marche Apennines (Apulian Block) and on the External Zones of the Betic Cordillera (Southern Iberian Paleomargin).

The taxonomy and biochronology of the Mid-Cretaceous radiolarians has been studied in order to construct a precise radiolarian zonation in the Western Mediterranean, on the basis of their vertical distribution. Only the true sequence of species in the fossil record allows one to establish the order in which they evolved. Therefore a detailed biochronological analysis was used as a basis for tracing evolutionary lineages and to elucidate the phylogenetic relationships of the examined taxa. Finally, generic and suprageneric classifications have been partly revised based on my own analysis of the faunal succession.

The biochronology has been carried out by means of Unitary Association Method (Guex 1977, 1991). A database recording the appearance of 303 species in 29 superposed horizons selected from six hundred samples of seven sections has been used to establish a sequence of 21 Unitary Associations. Each of these associations is defined by the totality of characteristic species pairs. The biochronological analysis has allowed the definition of nine new radiolarian biochronologic units for the middle Cretaceous, each of which is labelled either as a zone or a subzone. These biochronologic units are tied to chronostratigraphy by means of planktonic Foraminifera and calcareous nannofossils previously studied by other authors at the same localities.

Two major radiolarian faunal changes coincide with well established major Cretaceous oceanic anoxic events (OAE): early Aptian to late Albian (OAE 1A- OAE 1C) and Cenomanian- Turonian boundary (OAE 2).

All radiolarian species (303) used in the biochronology have been described with complete synonymies. Illustrations include several specimens of each species in order to elucidate the morphologic variability. Three families, 16 genera and 84 species are described as new.