

New Evidence from Black Shales: Palynological Assemblages of the upper portion of Marne a Fucoidi Formation from the Umbria-Marche Succession (Northern Apennines, central Italy).

Ruii, E.¹, Buratti, N.², Rodriguez-Barreiro, I.³, Capezzuoli, E.⁴,
Gambacorta, G.⁴, Diez, B.^{5,6}, Kustatscher, E.^{3,7}, Spina, A.¹

1-Dipartimento di Fisica e Geologia, Università di Perugia; 2- TotalEnergies SE, Centre Scientifique & Technique Jean Féger; 3-Museum of Nature South Tyrol, Bindergasse, Italy; 4- Department of Earth Sciences, University of Florence; 5-Centro de Investigación Mariña, Universidade de Vigo; 6-Departamento de Xeociencias Mariñas e Ordenación do Territorio, Universidade de Vigo; 7-Department of Natural History, Tirolean State Museum, Krajnc-Straße

Corresponding author email: emanuele.ruii@dottorandi.unipg.it

The Marne a Fucoidi Formation from the Umbria-Marche Succession marks the late-Early Cretaceous time interval. This formation consists of multicolor marlstones and marly limestones, interbedded by black shale levels. These dark-colored organic-rich levels represent the stratigraphic expression of the development of dysoxic to anoxic conditions at the sea bottom. Some of them have been linked to Oceanic Anoxic Events (OAEs), events of widespread marine anoxia, such as the early Albian OAE1b. Despite their common occurrence within the Marne a Fucoidi, the analysis of their palynological content remains poorly constrained. In the present study, the microfloristic assemblages of black shale levels from Marne a Fucoidi Formation of Bottaccione, Fiume Bosso and Roccaccia sections were analyzed for the first time. The palynological assemblages show the common occurrence of sporomorph taxa such as *Cyathidites* spp., *Cicatricosisporites venustus*, *Callialasporites dampieri* and *Afropollis jardinus*, and dinocysts as *Kleithriasphaeridium atlasiense*, *Pterodinium aliferum*, *Odontochitina operculata*, *Litosphaeridium arundum* and *L. conispinum*. The key species *L. conispinum* was recorded in all studied sections. Its first occurrence marks the late Albian in the Tethyan domain. The occurrence of *Elaterosporites klaszii* and *E. verrucatus*—typical of the Albian to Cenomanian—was also recorded in this study. These taxa were found in association with *L.*

conispinum in the Fiume Bosso section, and below the first occurrence of *L. conspicinum* in the Bottaccione section. The analysis of the palynological content—particularly the distribution of dinoflagellate cysts—provides key insights into the paleobiogeographic dynamics of the Tethyan realm during the Early Cretaceous, revealing ecological responses to regional and global events and further highlighting their value as biostratigraphical and paleoenvironmental indicators.