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Early and Middle Jurassic palynostratigraphy of the Lusitanian Basin in the proto-Atlantic context

Palinoestratigrafia do Jurássico Inferior e Médio da Bacia Lusitânica no contexto proto-Atlântico

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Sumário: A palinologia é uma ferramenta muito útil nos trabalhos de bioestratigrafia e interpretações paleoambientais, e que pode ser aplicada no conhecimento da geologia da Bacia Lusitânica. Assim, foi desenvolvido um estudo palinoestratigráfico de alta-resolução em 8 cortes do Jurássico Inferior e Médio (Sinemuriano superior—base do Batonian) da Bacia Lusitânica e, neste trabalho, são apresentados os intervalos de ocorrência e bioeventos associados aos principais taxa identificados, nomeadamente no grupo dos quistos de dinoflagelados.

Palavras-chave: Quistos de dinoflagelados, Palinologia, Bioestratigrafia, Jurássico, Bacia Lusitânica

Keywords: Dinoflagellate cysts, Palynology, Biostratigraphy, Jurassic, Lusitanian Basin

The Lusitanian Basin is located in central western Portugal and is infilled mainly with Jurassic strata. The macro- and microfossil biostratigraphy of this basin is relatively well studied, but palynological data are scarce. We address this problem with a high-resolution palynostratigraphic study, based mainly on dinoflagellate cysts, of a Lower and Middle Jurassic composite section from the Lusitanian Basin. We analysed 301 productive samples of marls and marly limestones for palynomorphs from eight outcrops: São Pedro de Moel, Brenha, Peniche, Fonte Coberta, Maria Pares, Vale das Fontes, São Gião and Cabo Mondego, together comprising an upper Sinemurian–lowermost Bathonian succession. The resulting biostratigraphic scheme identifies 28 significant palynomorph bioevents for the late Pliensbachian–earliest Bathonian interval (Correia, 2018; Correia et al., 2018, 2019). They include: the Toarcian Oceanic Anoxic Event (T-OAE, or Jenkyns Event), the Global Boundary Stratotype Section and Point (GSSP) for the Toarcian Stage at Peniche, the GSSP for the Bajocian Stage at Cabo Mondego, and the Auxiliary Boundary Stratotype Section and Point (ASSP) for the Bathonian Stage at Cabo Mondego.

This high-resolution dinoflagellate cyst record documents the earliest-known appearance of this group in the Lusitanian Basin; this inception was at the base of the late Pliensbachian, with first

occurrences (FOs) of four species. The event also reflects dramatic changes during the T-OAE among marine organisms, including the extinction of taxa. In the Lusitanian Basin, the beginning of the T-OAE, which occurred at the base of the *Hildaites levisoni* ammonite biozone, is marked by the extinction of *Luehndea spinosa*, the temporary disappearance of *Nannoceratopsis* and a general reduction in dinoflagellate cyst abundance; an increase in prasinophyte abundance also occurs. These bioevents correlate with the negative carbon ($\delta^{13}\text{C}_{\text{carb}}$) and oxygen ($\delta^{18}\text{O}$) isotope excursion records previously established for the Lusitanian Basin (e.g. Hesselbo et al., 2007; Suan et al., 2010; Ullmann et al., 2020). The increase in dinoflagellate cyst FOs during the early Bajocian to earliest Bathonian reflects the Middle Jurassic radiation of this planktonic group. Despite their relatively long stratigraphic ranges, the spore *Kraeuselisporites reissingeri* and the pollen *Classopollis* spp., *Araucariacites australis* and *Callialasporites* spp. are useful local additional stratigraphic indicators.

The dinoflagellate cyst assemblages indicate that the Lusitanian Basin is an intermediate area between the Boreal and Tethyan realms, containing taxa characteristic of both. It thus represents a transition between northern and southern Europe during the previous phases of opening the North Atlantic Ocean.

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