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Approaching trophic structure in Late Jurassic neritic shelves: A western Tethys example from southern Iberia

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Abstract

The palaeoenvironmental conditions and trophic structure of a mid-outer neritic biota (microfossils, mainly forams, and macroinvertebrate assemblages) have been approached in middle Oxfordian–lowermost Kimmeridgian deposits from the Prebetic Zone (Betic Cordillera) in south-eastern Spain. According to relationships between fossil assemblages and lithofacies, a general seaward trend is identified which displays decreasing sedimentation rates and nutrient inputs, but increasing substrate consistency and presumably depth.

Midshelf, terrigenous-rich deposits in the External Prebetic relate to the highest sedimentation rates and nutrient availability. These two parameters correlate with the highest content in vagile-benthic, calcareous perforate, epifaunal forams, as well as with potentially deep infaunal forams and infaunal macroinvertebrates. Outer-shelf lumpy deposits in the Internal Prebetic show the lowest sedimentation rates and nutrient availability and the highest records for macro–micro nektonics and planktics. In contrast, vagile-benthic, calcareous perforate epifaunal and potentially deep infaunal forams are scarcer in the midshelf environments. Colonial encrusting forams, benthic microbial communities and sessile benthic macro-invertebrates increase from the middle to outer shelf.

Trophic-analysis structuring through the integration of benthic microbial communities, foraminiferal and macroinvertebrate fossil assemblages makes it possible to interpret: (a) a trophic-level frame composed of producers and primary and secondary consumers; (b) a main trophic-group differentiation in suspension-feeders, detritus-feeders, browsers, grazers, carnivores and scavengers; (c) a preliminary approach to food-chain structure supported by suspension-feeders, deposit-feeders and predators (active prey-selection carnivores); and (d) a food-pyramid model, which takes into account both recorded fossils and envisaged — i.e., ecologically inferred-organisms.

Keywords: micro- and macroinvertebrates; trophic relationships; paleoenvironmental features; epicontinental platform; Upper Jurassic

1. Introduction and geological setting

The Prebetic Zone (Betic Cordillera, Fig. 1) displays epicontinental shelf deposits accumulated on the South-Iberian palaeomargin during the Mesozoic, in the External and the Internal Prebetic (Jerez-Mir, 1973).

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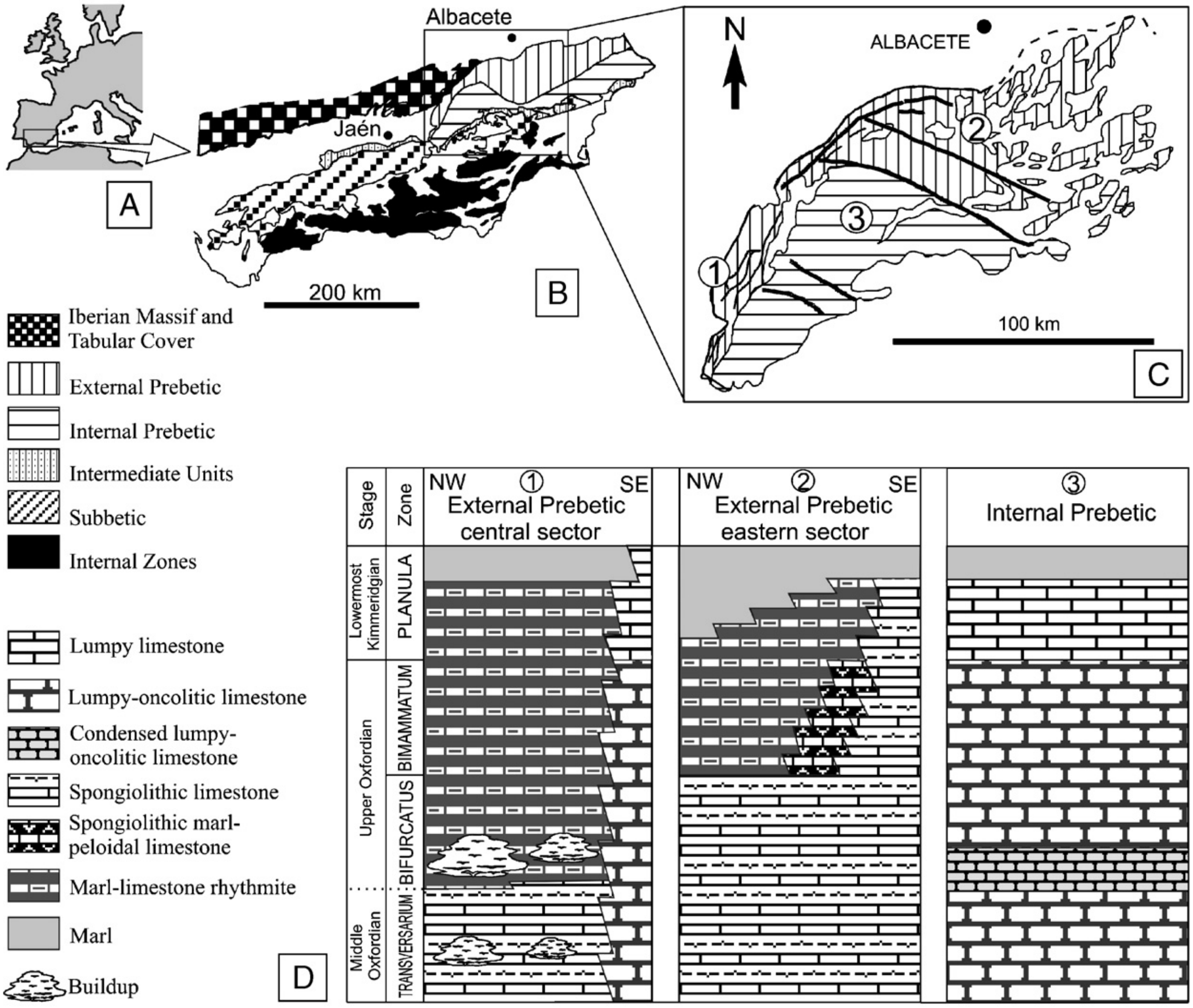

Fig. 1. Geological sketch of the Prebetic Zone and stratigraphic distribution of Mid-Oxfordian to lowermost Kimmeridgian lithofacies. (A) Location. (B) and (C) geological setting of studied area. (D) Simplified lithofacies stratigraphy and paleogeography.

These paleogeographical units represent proximal and distal areas in this neritic, carbonate and carbonate–siliciclastic shelf system. Geographically, outcropping areas in the Prebetic Zone are divided into the central (Sierra de Cazorla and Sierra de Segura) and eastern (Altos de Chinchilla) sectors. The succession studied (Fig. 1) mainly corresponds to the Middle–Upper Oxfordian, and locally ranges into the lowermost Kimmeridgian (Planula Zone).

Oxfordian rocks indicate the first hemipelagic–pelagic sedimentation over a discontinuity surface capping white oolitic limestones and dolomites of the Early–Middle Jurassic shelf that developed in the southern margin of Iberia (García-Hernández et al., 1981). The upper boundary of the studied succession is biostratigraphically recognized in either a marl–limestone rhythmite that includes the first Kimmeridgian deposits or an omission surface or hardground preceding this rhythmite.

The main goal of the present study is to interpret fossil assemblages from the mid-outer shelf in terms of palaeocommunity analysis. To this end, macro and microinvertebrate assemblages (mainly foraminifera) are characterised and their relation to the lithofacies are examined. The assemblage composition and distribution enable us to analyse the diversity, lifestyle and feeding habits, and to interpret the controlling environmental, eco-sedimentary parameters. Finally, the trophic structure (food chains, food web and food pyramid) is approached.