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Palaeogeography, Palaeoclimatology, Palaeoecology 224 (2005) 186–199

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Biotic changes linked to a minor anoxic event (Faraoni Level, latest Hauterivian, Early Cretaceous)

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Received 19 January 2004; received in revised form 22 October 2004; accepted 23 March 2005

Abstract

A conspicuous renewal in the ammonite faunas of the Mediterranean Tethys occurred in the latest Hauterivian. This faunal turnover took place following a stepwise pattern. The first step occurred at the boundary between the *Pseudothurmannia ohmi* Subzone and the *Pseudothurmannia mortilleti* Subzone, coinciding with the base of the so-called Faraoni Level. This is a C_{org}-rich interval that has been recognised in several basins of the Mediterranean Tethys and seems to be the expression of a short-lived oxygen-deficient event. It correlates with a well-documented second-order peak transgression. The oxygen depletion preferentially affected the deep nektic ammonites, which would explain the extinctions within this group around the Faraoni Level. On the contrary, an increase in the trophic resources in the photic zone favoured the diversification of epipelagic ammonites. Concurrently, an abrupt change took place at this level in the nannoconid assemblage composition.

A minor second event, located at the base of the *Pseudothurmannia picteti* Subzone, was marked by the replacement of a few planktic ammonite species by closely related forms, and the structure of the ammonite assemblage was not substantially altered. The coincidence of this event with a further restructuring of the calcareous nannofossil assemblage suggests that some changes had to occur in the planktic ecosystem during the sea-level highstand subsequent to the peak transgression.

The third and last stage of the renewal process started in the upper part of the *P. picteti* Subzone, coinciding with a drastic sea-level fall. It is characterised by the extinction of many of the species that had appeared in the two previous events, resulting in an extensive modification of the assemblage structure. The regression would probably cause a drop in the primary productivity and, consequently, an improvement in the oxygenation level of the sea bottom. This would explain the extinction of several planktic ammonite species and the appearance of new nektic and nektobenthic lineages.

Keywords: Biotic changes; Anoxic event; Ammonites; Calcareous nannofossils; Hauterivian; Mediterranean Tethys

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doi:10.1016/j.palaeo.2005.03.034

1. Introduction

The ammonite faunas of the Mediterranean Tethys underwent a remarkable turnover during the latest Hauterivian and earliest Barremian. More than 90% of the species present in this interval were involved in the renewal, and taxa that had been major components of the Hauterivian assemblages (like the *Crioceratites–Pseudothurmannia* lineage or the genera *Plesiospitidiscus* and *Neolissoceras*) disappeared at that time and were replaced by typical Barremian groups (*Barremites* and the first representatives of Silesitidae, Holcodiscinae, and Leptoceratoidinae). Hoedemaeker (1995a,b) previously documented this turnover, which he related to a rapid eustatic sea-level fall. Such drop in sea level would have caused a severe telescoping of ammonite biotopes over the shelf edge, hence enhancing selection pressure and extinction.

The start of this renewal process coincides with the so-called Faraoni Level, a C_{org}-rich stratigraphic interval, which has been recognised in several western Mediterranean basins and has been interpreted as the sedimentary record of a short-lived oxygen-deficient event (Cecca et al., 1994; Baudin et al., 1999, 2002a,b). Moreover, marked changes in the microfloral and microfaunal assemblages have also been recorded within this interval (Coccioni et al., 1998).

In this paper, we analyse the extent and significance of this ammonite faunal turnover, which we reinterpret in the context of the Faraoni event.

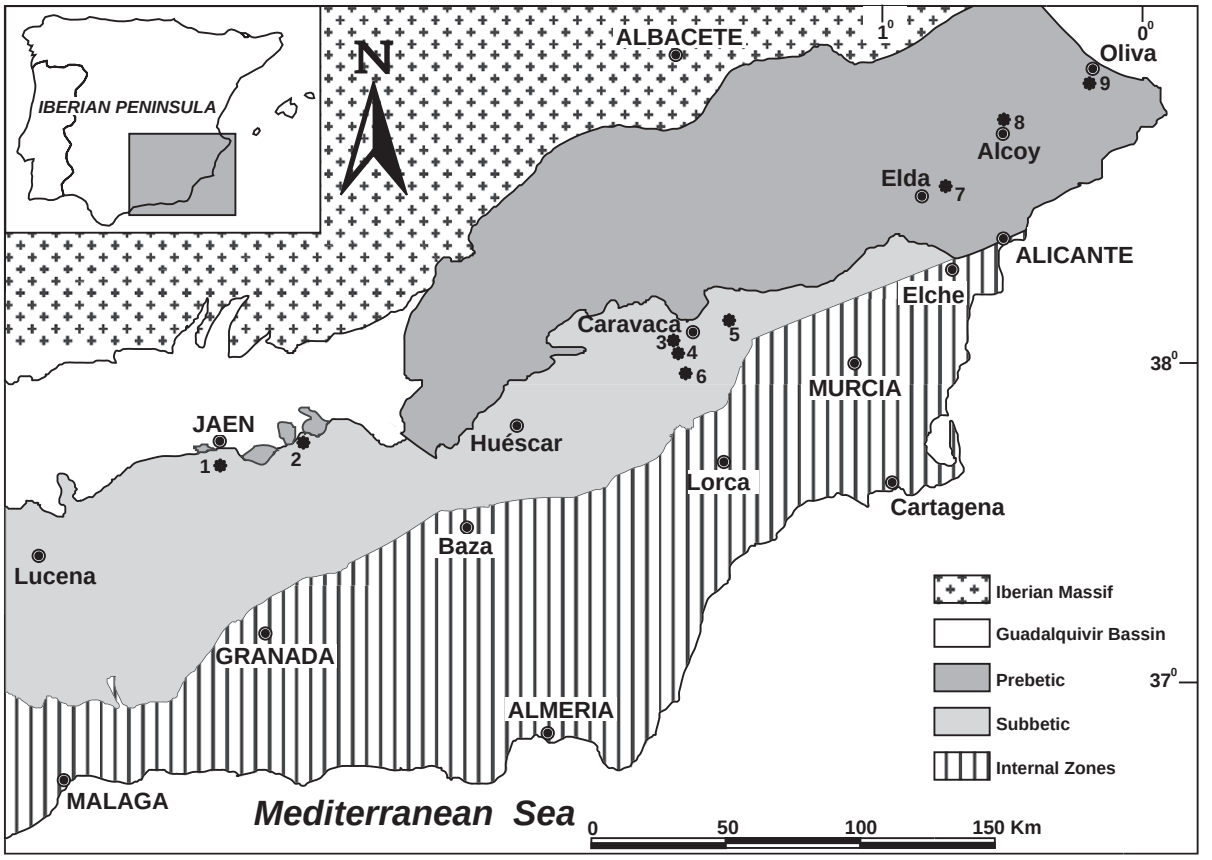

Fig. 1. Simplified geological map of the Betic Cordillera and location of the studied Hauterivian/Barremian boundary sections: (1) Barranco de la Aguzadera (sections X.G and X.G1); (2) Ermita de Cuadros (section X.EC); (3) Río Argos (sections X.Ag1, X.Ag4 and X.Ag5); (4) Barranco de Cavila (section X.Kv3); (5) Arroyo de Gilico (section X.V1); (6) Cerro del Tornajo (sections X.Tj1 and X.Tj2); (7) Sierra del Cid (sections X.A1 and X.A2); (8) Barranco de la Querola (section X.Q); (9) Cantera de l'Almuixic (section X.O).