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PALAEO

Palaeogeography, Palaeoclimatology, Palaeoecology 229 (2005) 137–157

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# Foraminiferal fauna recovered after the Late Permian extinctions in Iberia and the westernmost Tethys area

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Received 14 April 2004; received in revised form 28 November 2004; accepted 24 June 2005

## Abstract

The mass extinction at the end of the Permian has long been recognized as the greatest in the history of life. Foraminifers were common throughout the Permian–Triassic (P–T) interval and provide one of the best, and certainly the most informative, fossil records of the P–T crisis. This study addresses the recovery of foraminiferal faunas during the Triassic after the Late Permian extinction in the western Tethys, and particularly in Iberia, through the analysis of evolution rates both at the species and genus level. For the Tethys area in general, a rapid recovery of these faunas during the Olenekian is reflected by high rates of appearance of new taxa along with the reappearance of many “Lazarus” taxa. These taxa became stabilized throughout the Anisian and Ladinian, with a reduction in the rates of origination of new taxa and the presence of associations that were highly diversified, comprising large numbers of species.

The first foraminifers in the Triassic of Iberia can be observed at two different levels. The first of these is in the Upper Anisian, while the second level corresponds to the Upper Ladinian (Longobardian)–Lower Carnian. The Triassic associations of the basins of Iberia show paleobiogeographic characteristics that are generally “Tethyan”, most of these associations being well known for the “alpine” Triassic. For the Ladinian, some associations from NE Iberia (NE Iberian basin, Catalanian basin, and Pyrenean basin) also show “Germanic” affinities. Finally, also for the Ladinian, there is some evidence of the possible southward movement of faunas from the Sephardic domain to the Betic basin. This point, however, requires further investigation.

With the exception of faunas associated with the reefs of the Ladinian Catalanian basin, communities are usually of low diversity and typical of unstable, shallow marine facies.

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*Keywords:* Permian–Triassic boundary; Foraminifera; Extinctions; Western Tethys; Recovery; Iberia

## 1. Introduction

The end of the Paleozoic saw one of the most significant events in the history of life on Earth; two

mass extinctions occurring within a period of some 8 My (Kaiho et al., 2003) during the Late Guadalupian and Late Lopingian. Together these extinctions account for the disappearance of 75% to 96% of species, 83% of genera and 57% of the marine invertebrate families known to exist in the Permian (Sep-

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koski, 1989, 1990; Stanley, 1987; Erwin, 1993; Hallam and Wignall, 1997). These events led to the disappearance of the trilobites (although already in decline), the Rugosa and Tabulata corals, and notably

affected crinoids, brachiopods, bryozoans and ammonoids. The greatest losses were seemingly suffered by the shallow, warm water faunas of the Tethys (Stanley, 1987).

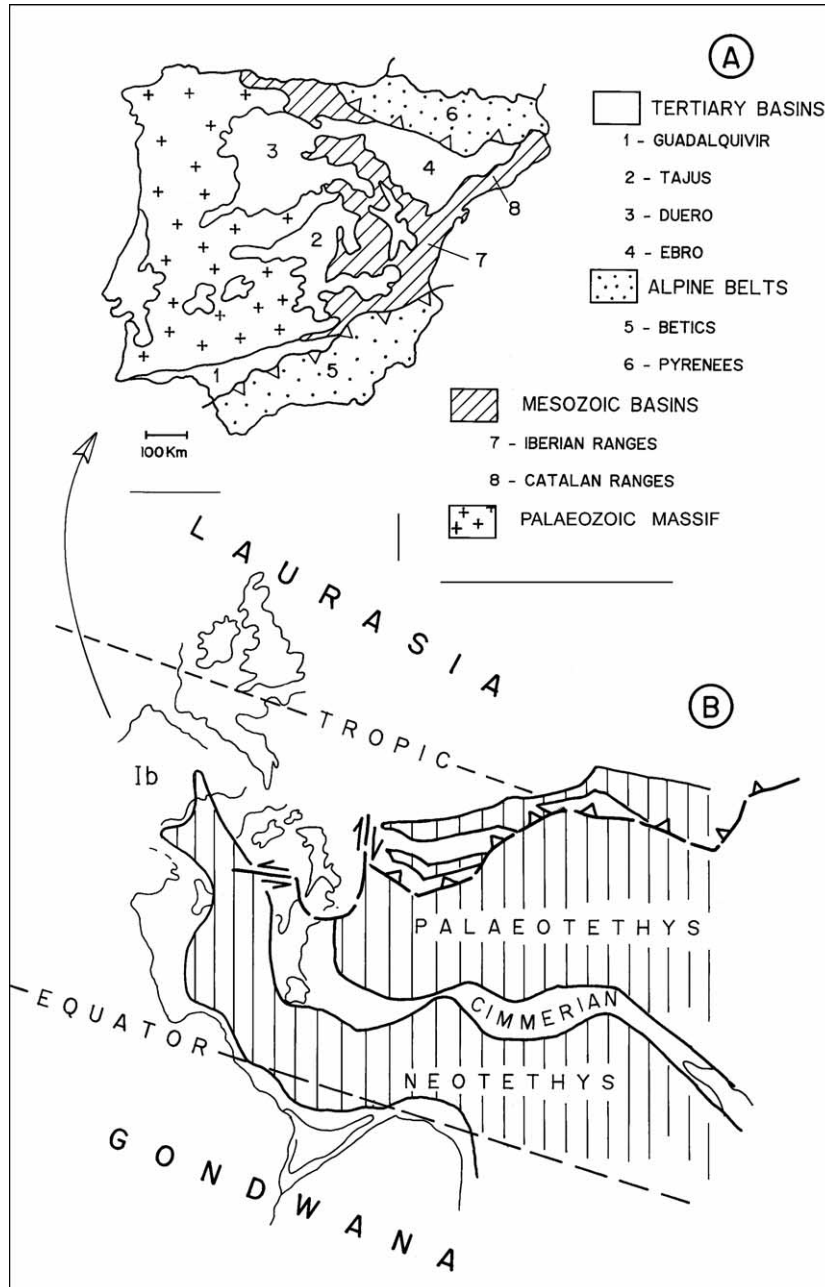


Fig. 1. (A) Geological sketch map of the Iberian Peninsula showing Mesozoic and Tertiary basins and main Alpine belts. (B) Paleogeographical reconstruction of western Tethys area for the Anisian. Ib—Iberia. Modified from Ziegler and Stampfli (2001).

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