



The Jurassic/Cretaceous boundary in the Apulco area by means of calpionellids and calcareous dinoflagellates: An alternative to the classical Mazatepec section in eastern Mexico



Rafael López-Martínez^{a,*}, Ricardo Barragán^a, Daniela Reháková^b

^a Instituto de Geología, Universidad Nacional Autónoma de México, Ciudad Universitaria, Delegación Coyoacán, C.P. 04510 México D.F., Mexico

^b Comenius University, Faculty of Natural Sciences, Department of Geology and Palaeontology, Mlynská dolina G, 842 15 Bratislava, Slovak Republic

ARTICLE INFO

Article history:

Received 3 April 2013

Accepted 20 July 2013

Keywords:

Calpionellids
Calcareous dinoflagellates
Tithonian
Berriasian
J/K boundary
Mexico

ABSTRACT

A detailed bed-by-bed sampling within the Pimienta and the Lower Tamaulipas Formations from a section in the Apulco area (Puebla State, Eastern Mexico), allows the delimitation of the Jurassic/Cretaceous boundary. The Late Tithonian was identified by the presence of calpionellids of the Crassi-collaria Zone (Colomi Subzone) and calcareous dinocysts of the Proxima Zone. The Tithonian/Berriasian boundary was placed at the acme of *Calpionella alpina* (small forms) between samples MZT 45–46. The Berriasian was divided into two main units, namely the Calpionella Zone, further subdivided into the Alpina, Ferasini and Elliptica subzones, and the Calpionellopsis Zone, within which only the Oblonga subzone was identified. The vertical distribution of calpionellids and their assemblages in the biozones of this Mexican section fit those from other Tethyan areas.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

The Jurassic/Cretaceous boundary was defined in the “Colloque sur la limite Jurassique–Crétacé” in Lyon-Neuchâtel, 1973. After this colloquy, there was a consensus to place the Boundary between the Crassi-collaria and the Calpionella Zones regarding calpionellids and at the base of the Jacobi Zone for ammonites (Hoedemaeker and Leereveld, 1995; Michalík and Reháková, 2011; Wimbledon et al., 2011; among others).

In Mexico, the bad preservation of calpionellids and high ammonite endemism (e.g. Verma and Westermann, 1973) make the location of the Jurassic–Cretaceous boundary especially difficult.

Nonetheless, different points of view have been discussed on this regard by some authors (Cantú-Chapa, 1967, 1989; Adatte et al., 1992; Stinnesbeck et al., 1993) and the Jurassic/Cretaceous boundary remains uncertain.

In eastern Mexico, Cantú-Chapa (1967) reported the Jurassic–Cretaceous (J/K) boundary from a stratigraphic section from the outskirts of the town Mazatepec in Puebla State.

However, this definition has been subject of debate mainly considering the resolution of the sampling. In that work, the definition of the J/K boundary is also mostly based on endemic ammonite species; and a low value was given to the calpionellids as biostratigraphic markers.

The present work exposes the results of the high-resolution-sampled section in that same area, namely the “Apulco” section, as an alternative to the classical Mazatepec locality type for the Jurassic/Cretaceous boundary in eastern Mexico.

2. Location and geological settings

The studied section is located at 20°00'55.28" N and 97°24'21.96" W in the “Sierra Norte de Puebla”, near the Mazatepec locality, along the margin of the Apulco River. It belongs to the “Eastern Sierra” Madre geological sub-province and is composed by two formations (Fig. 1).

At its lower part, the Pimienta Formation (Heim, 1926) consists of cherty intercalations within grayish to blackish clayey limestones with sporadic bentonitic lenses to the top.

Upwards, the Pimienta Formation gradually passes into the Lower Tamaulipas Formation (Belt, 1925). This was originally described as a fine-grained, compact limestone with well-marked bedding, predominantly gray in color. It includes a large number of chert lenses and nodules of irregular shape at its top.

* Corresponding author.

E-mail addresses: rafaelopez83@hotmail.com (R. López-Martínez), ricardor@geologia.unam.mx (R. Barragán), rehakova@fns.uniba.sk (D. Reháková).

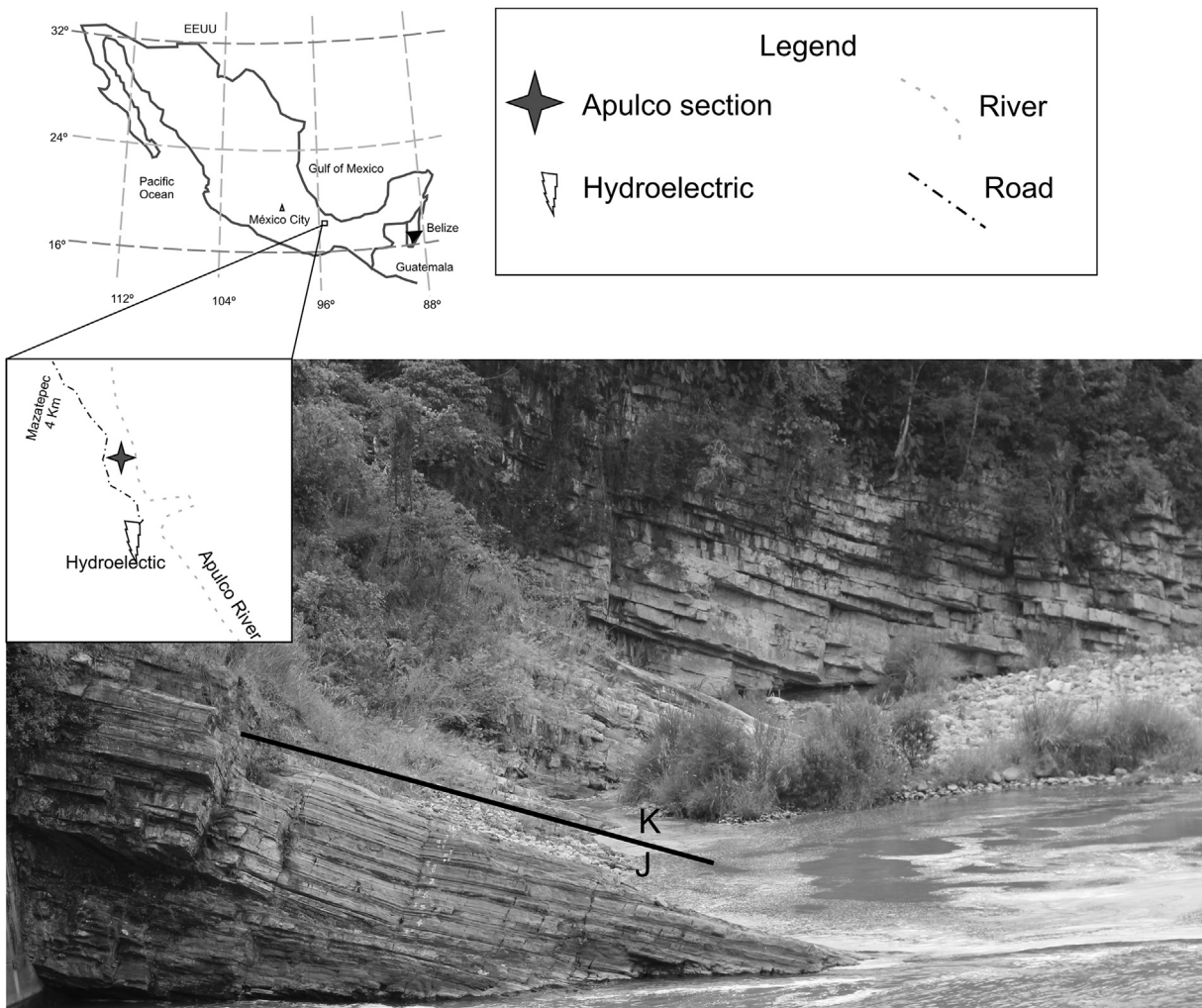


Fig. 1. Map of Mexico displaying the location of the Jurassic/Cretaceous section studied herein. Note on the image the typical lithology and the site for the Jurassic/Cretaceous boundary in outcrop.

3. Material and methods

This work combines biostratigraphical and taphonomical analyses in the frame of a high resolution sampling.

A total of 99 strata were sampled and analyzed both macroscopically and under the microscope.

The Signor–Lipps and the taphonomic effect are well-known indexes for the mass extinctions (Arz et al., 1999). Nevertheless, they are not usually taken into account for the systematic studies towards the definition of the Jurassic/Cretaceous boundary.

The scarcity of calpionellids in Mexican J/K sections usually makes difficult to identify specimens or association markers for wise biozonations.

In this work, the high resolution sampling allows a high probability for calpionellid identification in several thin sections from the same stratigraphic level.

On the other hand, the taphonomic effect on the preservation of calpionellids especially that of the collars of their loricas precludes the determination at the species level. Thus, to avoid this effect, it is also necessary to study different thin sections from the same stratigraphic level.

Another taphonomic phenomenon is the presence of many reworked specimens, especially of the genus *Crassicollaria*. The

small size of calpionellids makes very difficult to differentiate within a certain assemblage the accumulated and reworked materials.

4. Results

The biostratigraphical division of the section follow the standard biozonation published by different authors (Remane et al., 1986; Altiner and Özkan, 1991; Reháková, 1995; Pop, 1997; Reháková and Michalík, 1997; Grün and Blau, 1997; Lakova et al., 1999; Skourtsis–Coroneou and Solakius, 1999; Grabowski and Psczólkowski, 2006; Andreini et al., 2007; Boughdiri et al., 2009; Benzaggagh et al., 2010; Lukeneder and Reháková, 2007; Pruner et al., 2010 and others). The vertical distribution of calpionellids and calcareous dinoflagellates allows the identification of the following zones.

4.1. *Crassicollaria* Zone, Colomi Subzone. Upper Tithonian (samples MZT: 1–45)

This zone was recognized within the sediments of the Pimienta Formation at the base of the section. The layers have parallel stratification with intercalations of grain flows displaying erosional

Download English Version:

<https://daneshyari.com/en/article/6431438>

Download Persian Version:

<https://daneshyari.com/article/6431438>

[Daneshyari.com](https://daneshyari.com)