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Towards an Aptian (Lower Cretaceous) ammonite biostratigraphy of the Mina Texali section, Central Atlantic province (Puebla State, Central Mexico)

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ABSTRACT

This work is a study of the ammonite record of a new stratigraphic section of Aptian age, at the Mina Texali (Puebla State, Central Mexico). A detailed biostratigraphic analysis was carried out on 309 specimens systematically sampled on a bed-by-bed basis. An Aptian ammonite zonation is proposed for the Mina Texali (= MT) section with two interval zones, *Dufrenoyia justinae* and *Caseyella* sp., and one informal biostratigraphic unit represented by the *Huastecoceras trispinosoides* beds. We also analyze the taxonomic composition, paleoecology and some systematic issues of the ammonite record of the MT section. The first record in Mexico of the genera *Pseudosaynella*, *Xerticeras* and the nautiloid *Heminautilus* is identified in this section. The ammonite assemblage is assigned to the proximal part of the outer neritic region of the continental shelf. The ammonite record of the studied section is diagnostic in establishing the lower-upper Aptian transition, and the local zonation of the MT provides important data for the development of an Aptian standard ammonite zonation for the Central Atlantic province.

1. Introduction

A new Aptian standard ammonite zonation for the Central Atlantic province (the southern part of North America and Central America), is necessary because the differences with the Mediterranean region are significant (Moreno-Bedmar et al., 2013; Reboulet et al., 2014). Great strides have been made in the last decade or so towards this goal in northern Mexico (e.g., Barragan, 2001; Barragán Manzo and Méndez Franco, 2005; Barragán and Maurrasse, 2008), and a new Aptian Mexican zonation is starting to develop (Moreno-Bedmar et al., 2013). The work here focuses on the abundant ammonite record of the Mina Texali section (= MT), Puebla State, Central Mexico, which represents a new Mexican ammonite biostratigraphic contribution that will aid in the development of a standard zonation for the Aptian of the Central Atlantic province. The ammonite richness of this Mexican section is comparable only to the ammonite record of the La Peña Formation of northeast Mexico. The MT section was sampled bed-by bed in six fieldwork campaigns during the last two years. By analyzing this ammonite record from a biostratigraphic point of view, we are able to develop a zonation for this particular section. We then compare this local, biostratigraphic scheme with the Mexican ammonite zonation of Moreno-Bedmar et al. (2013), and also with the standard Mediterranean ammonite zonation, Europe, of Reboulet et al. (2014). A short paleoecological analysis is also included, as well as systematic notes highlighting some of the taxonomic aspects.

2. Geographic location and stratigraphic setting

The study section is located in the southwestern corner of Puebla State, Mexico (Fig. 1) and is part of the region known as the Mixteca Terrain (Campa and Coney, 1983). An Early Cretaceous

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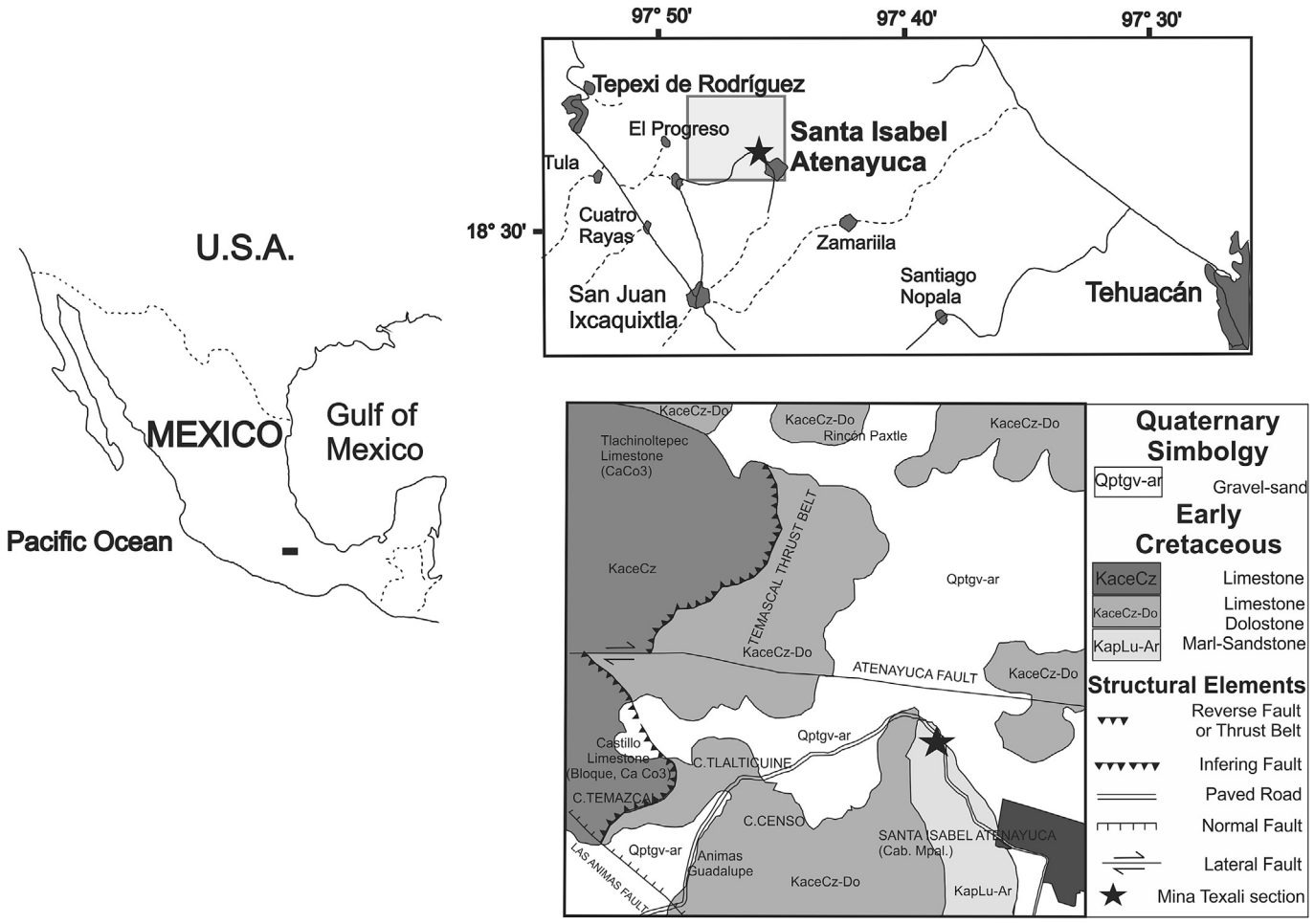

Fig. 1. Map showing the location of the MT section at Santa Isabel Atenayuca, Puebla, Central Mexico. After González-León et al. (2014).

(Barremian-early Albian) succession of deposits occurs in this area in what is known as the Zapotitlán Basin (Martínez-Amador et al., 2001; Mendoza-Rosales, 2010), and is composed of the following formations: Zapotitlán Fm. (Barremian), San Juan Raya Fm. (Aptian) and Cipiapa Fm. (Albian).

The Mina Texali section is located to the NW of the town of Santa Isabel Atenayuca (W 97°46′59.3″, N 18°33′8.9″, Fig. 1). The section has a total thickness of approximately 30 m, and consists of calcareous shale and sandstone interbedded with marl and limestone beds, with frequent occurrences of ammonites (Fig. 2).

The San Juan Raya Formation outcrops on the southern side of this basin (Calderón, 1956; Mendoza-Rosales, 2010; Löser et al., 2013; Serrano-Brañas and Centeno-García, 2014) where sandstone, shale, and intercalated limestone beds are exposed. Mendoza-Rosales (2010) interpreted the San Juan Raya Fm. as being deposited in shallow marine conditions on a clastic shelf, based on the lithofacies as well as the fossil content from the lagoonal and interspersed turbiditic sandstones and shales. This formation shows lateral facies variations (Calderón, 1956; Barceló, 1978), and to the south, the San Juan Raya Formation transitions to a marine platform limestone, as is observed in the Agua de Burro Formation (Barceló, 1978).

The Mina Texali section shows a gradual upward increase in the percentage of carbonate material and a corresponding decrease in arenites (Fig. 2). The lowest part consists of a sequence of marls and sandstones in tabular greenish beds with a thickness of 10–30 cm; the nodular calcareous marl beds show fine, parallel laminations, and some sandstone lenses contain gastropods and bivalves. The medium gray marls are regularly intercalated with sublitharenites consisting of abundant clasts of quartz, plagioclase, micas and fragments of schists and granitoids, cemented together by carbonates. These rocks have a layered matrix embedded with subangular clasts, and range in thickness from 30 cm to over one meter. They contain ammonites, bivalves, echinoids and scarce gastropods, and some of the beds yield abundant yellow limonite nodules. Fining-up graded sandstone beds also occur at some levels, and current marks are observed on the top surfaces of some of these beds. Cut-and-fill structures are also present in certain sandstone layers, which are evidence of small channels. Scarce limestones also occur in medium beds as laminated wackestones. The upper half of the section is dominated by calcareous deposits, with the middle part of the section exposing an impressive sequence of bioclastic wackestones consisting of sparse (15–20%) bioclasts and organics set in a micrite matrix. Bioclasts are mainly fragments of mollusk shells infilled with sparry calcite and are up to 1 mm in length. Rare single crystal echinoid plates are found, as well as calcispheres. Massive limestone beds also occur, some of which exceed one meter in thickness. These beds become thinner (10–40 cm) towards the top, and are typically bioclastic wackestones containing ammonites, gastropods and bivalves. Only one calcareous bed in the uppermost part of the section has a thickness of more than one meter. These calcareous beds are regularly intercalated with marly intervals varying in thickness from about 30 cm to more than one meter. These marls also contain ammonites, gastropods and bivalves.