



Aptian and Albian (Early Cretaceous) ammonites from Lampazos and the Bisbee groups (Sonora State, northwest Mexico)

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ABSTRACT

A taxonomic study was carried out of 34 ammonites collected from the Agua Salada and Nogal formations (Lampazos Group) and the Mural Limestone (Bisbee Group) in the Sonora State, northwest of Mexico. Twenty-one taxa are described, with 13 being endemic of the Central Atlantic province: *Puzosia* (*Anapuzosia*) sp. juv. cf. *tucuyensis*, *Parasilesites* cf. *bullatus*, *Beudanticeras* *parandieri*, "*Beudanticeras*" *newtoni*, *Beudanticeras* sp., *Desmoceras* (*Pseudouhligella*) cf. *vetus* (en=endemic), *Engonoceras complicatum* (en), *Engonoceras stolleyi*, *Protengonoceras gabbi* (en), *Protengonoceras neolobitoides* (en), "*Eodouvilleceras* cf. *adkinsi*" (en), *Huastecoceras?* sp. (en), *Hypacanthoplites* sp., *Immunitoceras immunitum* (en), *Immunitoceras* cf. *trinitensis* (en), *Kazanskyella minima* (en), *Kazanskyella spathi* (en), *Quitmanites ceratitosus* (en), *Quitmanites fosteri* (en), and *Quitmanites* sp. (en), between them we erected one new species: *Protengonoceras neolobitoides*. The record of Aptian-Albian ammonites in Sonora is scarce, therefore the ammonites herein studied are valuable due to the number of endemic taxa that could be used in future biostratigraphic works. In addition, these taxa allow a revision of the stratigraphic frame: The Agua Salada Formation is now considered from late Aptian to early Albian; the Nogal Formation is confined to late Albian; the Cerro Las Conchas succession is limited to middle Albian; and the age of the Cerro La Ceja Member is late Aptian.

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1. Introduction

About twenty years ago, numerous field work campaigns were carried out by one of us (C. G.-L.), where the ammonites herein studied were collected. Some of these ammonites were also objects of study of Mora Villalobos' Bachelor's thesis (1998), but this is the first time that they are formally published. The ammonite collection carried out by C. G.-L. was performed without bed by bed control. However, the samples were taken considering the position within the formation such as lower/middle or upper part of the studied formation. Despite the lack of a bed by bed sampling control the ammonites herein studied are interesting for several

reasons among them: a remarkable presence of very well-preserved ammonite specimens; the first time that these specimens are reported formally and the scarcity of ammonite record in these lithostratigraphic units. The taxonomic work is also remarkable due the presence of an abundant endemic taxa; the scarcity of specimens of these taxa makes it important to report them.

In this paper, we study the collected ammonites from a taxonomical point of view. This allows us to recognize 21 taxa and among them we erect one new species. The sampling method only allows us to have limited age control despite this; we can proportionate an adequate age-calibration of the studied formations. In addition, this age control will be the starting point of a future bed by bed sampling of the localities herein studied.

1.1. Previous works

From southeast to northeast Sonora, the Lower Cretaceous succession (Fig. 1) shows a conspicuous change in facies going towards

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Fig. 1. Geographic map of Sonora, northern Mexico, showing location of Rancho Agua Salada, Cerro Las Conchas and Rancho Bufalo sections.

the Lampazos area (Fig. 2). These rocks are mostly calcareous and represent shallow marine platform and deeper basinal environments. In the Lampazos region, the Lampazos Group (González-León et al., 2006) is composed of several formations, the El Aliso, Agua Salada, Espinazo del Diablo, Nogal and its laterally equivalent Los Picachos (Herrera and Bartolini, 1983; González-León, 1988).

The Lower Cretaceous Bisbee Group of northern and central Sonora (Fig. 2) comprises the Glance Conglomerate (mainly Upper Jurassic), Morita, Cerro de Oro, Mural Limestone and Cintura formations. The Glance, Morita and Cintura formations are composed by terrigenous units that represent alluvial and fluvial environments, whereas the Cerro de Oro and Mural formations are transgressive marine intervals. These formations have been dated based on their local abundance of fossils of ammonites and planktonic foraminifera.

On the basis of foraminifera, the Cerro de Oro and Mural Limestone are upper Barremian-lower Aptian and upper Aptian to middle Albian age respectively (Scott and González-León, 1991; González-León and Lucas, 1995; Lawton et al., 2004). Based on foraminifera and ammonites the age of the Lampazos Group, ranges from late Barremian-early Aptian to middle-late Albian (Scott and González-León, 1991; Monreal and Longoria, 2000).

Despite the presence of ammonites in some of these formations from the Lower Cretaceous rocks of Sonora, few systematic and biostratigraphical studies have been published. Almazán-Vázquez (1990) study the fauna of this locality and illustrated ammonites assigned to *Engonoceras serpentinum*, *Thurmanniceras stippi*, *Metengonoceras inscriptum*, *M. hilli*, *Engonoceras complicatum*, *E. gibbosum* and *E. stolleyi*.

Ammonites from the Bisbee Group have been reported from the Cerro de Oro and Mural Limestone formations. From the Cerro de Oro Formation, González-León and Lucas (1995) have tentatively identified and illustrated *Dufrenoyia rebecca* Young and ammonites from the Mural Limestone in different parts of Sonora have been illustrated as *Hypacanthoplites milletioides* (Rosales-

Domínguez et al., 1995) and *Hypacanthoplites immunitum* (Stoyanow), *Dufrenoyia* sp., *Burckhardtites* sp. (Lawton et al., 2004).

The Lampazos Group has yielded a more abundant and diverse ammonite fauna than the Bisbee Group. Several species were listed and illustrated from the Agua Salada and Nogal formations by González-León and Buitrón (1984) and Herrera et al. (1984). Whereas the ammonites from the Cerro Las Conchas section were collected from an interval assigned to the Mural Limestone by Monreal (1997).

2. Stratigraphic summary and fossil localities

2.1. Lampazos area

2.1.1. Agua Salada Formation

The stratigraphic section of the Agua Salada Formation outcrops in the locality of Rancho Agua Salada within the Lampazos area in east-central Sonora (Fig. 2). It was described by Herrera and Bartolini (1983) and González-León (1988) as a 250–350 m thick sedimentary succession that gradationally overlies the restricted shallow marine El Aliso Formation. The current research updates the previous work of González-León (1988) regarding the thickness of the Agua Salada Formation where the author estimated 350 m for this formation. Our observations find that the strata in the Rancho Agua Salada are faulted, folded and duplicated, and they have an incomplete thickness of 137 m; in addition, their base is not exposed in the area.

The lower part of the section (Fig. 3) starts at locality UTM12R646516; 3257320 and at its base shows a 10 m thick succession of thin to thick-bedded, calcareous shales, that grade upwards to a 5 m thick succession of nodular, medium to thick-bedded shaly limestone. This interval is followed upwards by a 12 m thick succession of limestone beds, each one up to 2 m thick, with abundant articulated oysters. Immediately above, with a sharp contact, there is an interval of 40 m thick. In its lower part, the succession consists of black shales with ammonites and in its middle-upper part by interbedded thin nodular to bedded, black chert and cherty limestone. The fauna in this unit is abundant and consist of articulated thin-shelled bivalves and few beds of limestone with oysters.

The Agua Salada Formation continues with a 15 m thick succession of bioclastic mudstone-wackestone, cherty limestone with abundant articulated thin-shelled bivalves, black and brown chert and interbedded black shale. Above, there occurs a 20 m thick succession, in which shale dominates over thin-bedded, fossiliferous nodular chert and limestone. Upwards, a 20 m thick succession of massive black shales follows with abundant complete shells of bivalves and ammonites. The upper part of this formation consists of a 15 m thick succession of dark gray, massive shale with subordinate thin beds of mudstone, scarce ammonites and bivalves. The upper part of the Agua Salada Formation is located at point UTM12R647089; 3257897, where it grades into the Lampazos Formation. The age of the Agua Salada Formation has been considered as lower Aptian through the presence of planktonic foraminifera (Monreal and Longoria, 2000), and upper Aptian on the basis of ammonites (Scott and González-León, 1991).

2.1.2. Nogal Formation

The Nogal Formation is 540 m thick, and is divided into three numbered members representing sediments deposited in shallow to open shelf marine environments (González-León, 1988). The uppermost member called 3 is a fossiliferous interval, 230 m thick, which consists of alternating sequences of thin to medium-bedded limestone and shaly limestone, shale and minor fine-

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