

JALPANIA QUERETANA, A NEW RUDIST (BIVALVIA-HIPPURITACEA) FROM THE MID-CRETACEOUS OF CENTRAL MEXICO

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ABSTRACT

A new caprinid rudist, *Jalpania queretana*, new genus and new species, is described from the reefal Taninul member of the mid-Cretaceous El Abra Formation, at "El Madroño", located in the northeast of the State of Querétaro, in central Mexico. The diagnostic characteristics of this new taxon are: medium sized, inequivalve, with outer surface smooth and covered by minute pores and with ligamental structures absent; right valve conical and left valve small, convex and dome-like. The inner shell layer is filled by circular and polygonal pallial canals. A row of tubercles in the anterior side of the left valve inserts into corresponding pits of the right valve.

Key words: Mid-Cretaceous, central Mexico, El Madroño, Querétaro, Caprinid rudist.

RESUMEN

Se describe un rudista caprinido, *Jalpania queretana* gen. nov., sp. nov., proveniente del miembro arrecifal Taninul de la Formación El Abra del Cretácico medio. Se encuentra en la localidad "El Madroño", situada al noreste del Estado de Querétaro, en el centro de México. Las características diagnósticas de este nuevo taxón son: concha de tamaño medio, inequivalva, con la superficie externa lisa y cubierta de pequeños poros; surco y cresta de ligamento ausentes; valva derecha cónica y valva izquierda pequeña, convexa, como domo. La capa interna de la concha está atravesada por canales paliiales circulares y poligonales. Una hilera de tubérculos en el lado anterior de la valva izquierda se inserta en las fosetas correspondientes de la valva derecha.

Palabras clave: Cretácico medio, México central, El Madroño, Querétaro, rudista caprinido.

INTRODUCTION

The new taxon *Jalpania queretana*, n. gen., n. sp., is from the fossiliferous locality named "El Madroño", after the Spanish word *madroño* given to the tree *Arbutus xalapensis*, which is very abundant in the area. The place is also known as "Laguna Colorada" (red lagoon) because of the red soil covering the area. The site is located in the northeastern portion of the State of Querétaro, in central Mexico (Figure 1). The access to El Madroño is by the Federal Road 120, in the stretch between the towns of Jalpan and Xilitla (99°15'W and 21°20'N). This locality is remarkable, not only by its extremely abundant and diverse fauna, but also for the excellent preservation of the fossil material which allows the collection of complete specimens. The preservation enhances the scope of any taxonomic study by providing a more clear three dimensional morphology.

STRATIGRAPHIC SETTING

The strata of El Madroño locality correspond to the stratigraphic unit El Abra Formation, which is the most widespread and thickest carbonate deposit in eastern Mexico (Kelum, 1930; Bonet, 1952). Based on lithological differences and

faunal associations, the El Abra Formation can be divided in two coeval members. The Taninul member represents the reefal facies of a platform margin (Bonet, 1952, 1963; Aguayo-Camargo, 1978, 1993) and El Abra member corresponds to its lagoonal or back-reef facies (Johnson, 1984), whose dominant fauna is composed of requienid rudists.

At El Madroño, a composite section 90 m thick was measured. The beds range from 5 cm to 3 m in thickness, and the dominant lithologies are rudists and rudist-skeletal packstone and grainstone (Enos *et al.*, 1983). The lower 35 m of the section are mostly covered by red soil. This covered limestone is slowly disintegrating by weathering into a fine white calcite powder. Through the etching of the matrix, the fossils becoming loose and free from the enclosing rock. The fossil shells are also affected by the weathering process, but less intensely. The upper uncovered portion of the cropping out deposit is a massive hard limestone.

DEPOSITIONAL SETTING

El Madroño locality is situated in the southeastern edge of what is known as the large Valles-San Luis Potosí Platform (Carrillo-Bravo, 1971). This feature forms part of the eastern ranges of the Sierra Madre Oriental, one of the main physiographic provinces of Mexico (Figure 1). At this locality most of the fossils are dislodged and randomly oriented but some are in growth position. The preservation is excellent, with many specimens complete and with both valves together. Fre-

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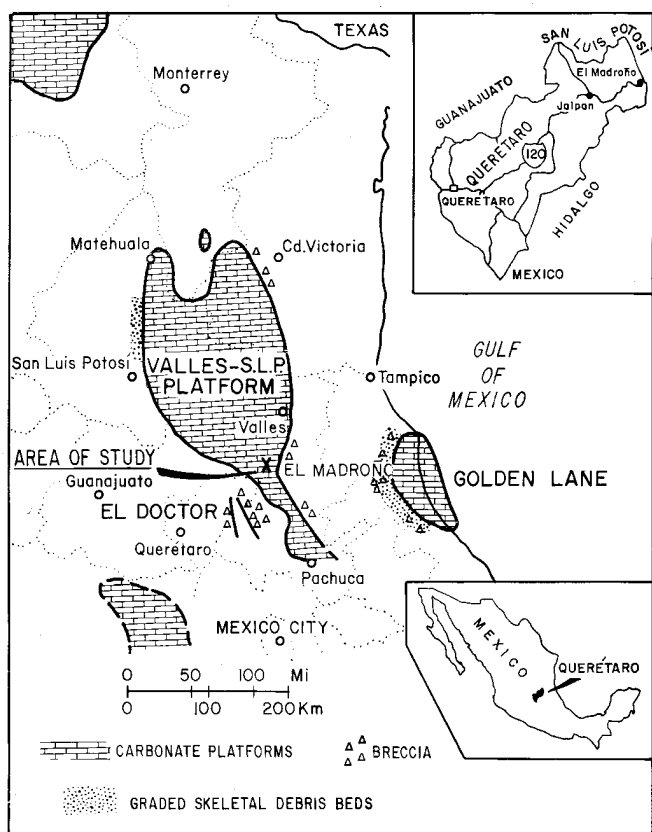


Figure 1. Location of El Madroño in the State of Querétaro and in the eastern margin of the Valles-San Luis Potosí Platform.

quently the details of the shell sculpture are intact, as well as the internal structures. These facts suggest that part of the reef is *in situ*, or if transported, it was only for a short distance. The depositional setting might have been a sand flat with material eroded from a nearby true reef (Enos *et al.*, 1983). El Madroño seems to represent a series of small discontinuous reef patches submerged in thick beds of bioclastic debris. The Taninul member of El Abra Formation (the reefal facies) dominates in those patches. Nevertheless, some representative elements of El Abra member (the lagoonal facies), although scarce, are also present in this locality.

FAUNAL COMPOSITION

The caprinid and radiolitid rudists are the dominant components of the assemblage. Among the caprinids there are several species of *Caprinuloidea*, *Kimbleia*, *Mexicaprina* and *Texicaprina*. The big caprinids are usually of recumbent habit. Among the radiolitids there are clusters of *Radiolites abraensis* Coogan (1973, 1977), *Radiolites costata* Scott (1990) and *Eoradiolites davidsoni* (Hill) (Young, 1984). Monopleurid and requienid rudists are less abundant. The second important component of this assemblage are the gastropods, usually of small size, that comprise about 20 families. As subordinate biota there are corals, algae, bryozoa, *Chondrodonta* and other

bivalves, and as rare elements, echinoids, sponges, crabs, worms and dwarf ammonites have also been collected.

AGE OF THE FAUNA

Until now, the age of the El Madroño deposit has been considered as late Albian or early Cenomanian (Alencáster, 1987; Alencáster and Aguilar, 1993). Among the caprinid rudists, *Texicaprina* is present in the middle and late Albian of Texas, Mexico, Cuba, Jamaica and Trinidad (Coogan, 1977); *Mexicaprina* is found in several localities of Mexico in the Taninul member of El Abra Formation (Coogan, 1977), as well as in the late Albian and Cenomanian beds of Texas (Coogan, 1973, 1977); *Caprinuloidea* has been abundantly reported in Albian and Cenomanian strata of Mexico, Texas and the Caribbean region (Palmer, 1928; Coogan, 1973, 1977; Young, 1984). *Kimbleia* is present in late Albian rocks of Texas and Mexico (Alencáster, 1987; Coogan, 1973, 1977). Among the radiolitid rudists, *Radiolites abraensis* is found in late Albian and Cenomanian beds of El Abra Formation of Mexico (Coogan, 1973, 1977) and *Eoradiolites davidsoni* only in the late Albian deposits of Texas and Mexico (Alencáster, 1987; Coogan, 1977; Young, 1984). Although the study of this fauna is still in process, its more probable age is late Albian, because (with the stratigraphic ranges known) *Texicaprina*, *Kimbleia* and *Eoradiolites davidsoni* are limited to the late Albian.

SYSTEMATIC PALEONTOLOGY

The repository of the studied material is the Museum of Paleontology of the Institute of Geology of the Universidad Nacional Autónoma de México, in Ciudad Universitaria, Delegación Coyoacán, 04510 D.F., Mexico.

Order Hippuritoida Newell, 1965
 Superfamily Hippuritacea Gray, 1848
 Family Caprinidae d'Orbigny, 1850

Genus *Jalpania* new genus

Type species—*Jalpania queretana* new species, by original designation.

Diagnosis—Medium sized, highly inequivalve shell with a conical right valve and subquadrate commissural outline; left valve smaller, convex, with eccentric apex and lacking a projected beak, outer shell surface with minute pores; shell wall filled by small polygonal and circular tabulate pallial canals throughout. In the anterior margin of the left valve a row of rounded tubercles is present with the corresponding pits in the right valve. Accessory cavities and ligamental structures are absent.

Derivation of name—From Jalpan, the largest nearby town to the studied El Madroño locality.

Jalpania queretana new species

(Plates 1, 2)

Diagnosis—As for genus.

Description—Medium sized specimens with highly inequivalve shells. Right valve conical, straight or slightly curved, and gradually tapering toward the acute base and with two longitudinal ridges at both sides of the ventral region. Left valve smaller, convex, dome-like, with eccentrically rounded summit and without a projecting beak. The commissural outline of both valves varies in shape from trigonal to subquadrate or even to suboval. The dorsal side of the left valve is very steep and corresponds to its highest point; from this eccentric apex the height decreases gently toward the margins. Two prominent radial acute keels diverge from the apex and delimit a trigonal area in the ventral side, which is flat or concave. This surface corresponds to the flat ventral area of the right valve. Outer shell layer very thin, completely covered by regularly distributed tiny circular pores of about 0.2 to 0.3 mm. When specimens show this layer eroded, the pallial canals are exposed as longitudinal, closely tabulated narrow tubes in the right valve, and as radial tubes diverging from the top in the left valve. In cross section, the pallial canals are circular or polygonal, of about 0.5 to 1.0 mm of diameter; they fill the whole inner shell layer of both valves, with exception of the teeth and myophore, which are compact, showing rounded wrinkles in their surfaces.

The hinge consists of a large and acute anterior tooth located in the left valve, which is inclined from the anterior side to the posterior margin; the posterior tooth is shorter and separated by a narrow groove from the still shorter and tooth-like posterior myophore. There is not a tooth-like anterior myophore. A narrow and long groove dorsal to the anterior tooth corresponds to the dental socket of the equally long and narrow tooth of the right valve, which is flanked by two dental sockets.

The large body cavity is surrounded by the commissural shelf, a flat and narrow band running along the periphery of the valve. It is pierced throughout by small polygonal and circular pallial canals. Along the anterior portion of the commissural shelf of the left valve, a row of small protruding tubercles (that look like the beads of a necklace) is present (Figure 2). The size of these structures varies from 1 to 7 mm, and in the juvenile specimens they are rounded and tend to be oval in the adults. Also, the number of tubercles varies from 17 to 20, being this number independent of the size or age of the individuals. In opposition to the tubercles of the left valve, there is a row of pits in the right valve, that contains them. These structures may correspond to the anterior myophore.

The body cavity of both valves is occupied by many closely-set, paper-thin tabulae. There are not accessory cavities nor ligamental structures.

The growth pattern of this species is remarkable in that the adult specimens have tabulate conical right valves of juve-

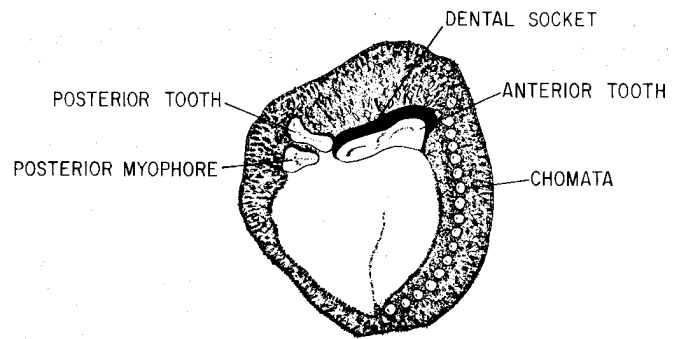


Figure 2. Left valve showing the anterior tubercles (chomata), the anterior and posterior teeth and the posterior myophore.

nile individuals attached to their sides. In the area of attachment, there are longitudinal fine ribs in both the parent and daughter specimens, which interlock with each other (Figure 3).

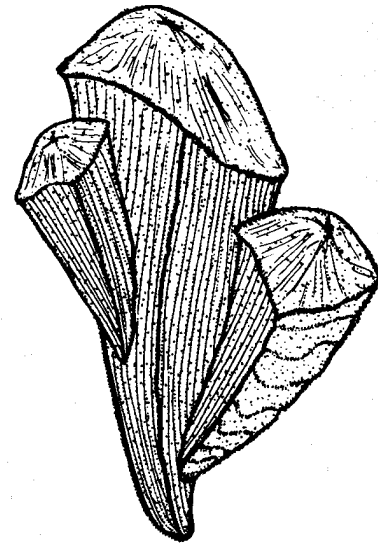


Figure 3. "Bouquet" of three individuals.

The measurements of the studied specimens are given in Table 1.

Derivation of name—The specific name of *Jalpania queretana* refers to Querétaro, the state of Mexico where El Madroño locality is situated.

Discussion—*Jalpania* is assigned to the family Caprinidae because of the presence of pallial canals. However, this is not a typical Caprinidae genus because the left valve is uncoiled and lacks a projected umbonal beak, since it is convex and like a cap, similar to the left valve of many radiolitids. The main distinctive features of *Jalpania* are the presence of pores on the outer surface of both valves, the small and convex left valve, and the most important, the existence in the anterior region, of tubercles in the left valve and of pits in the right valve. These structures are similar to those named collectively chomata by Stenzel (1971) present in some ostreid genera. In

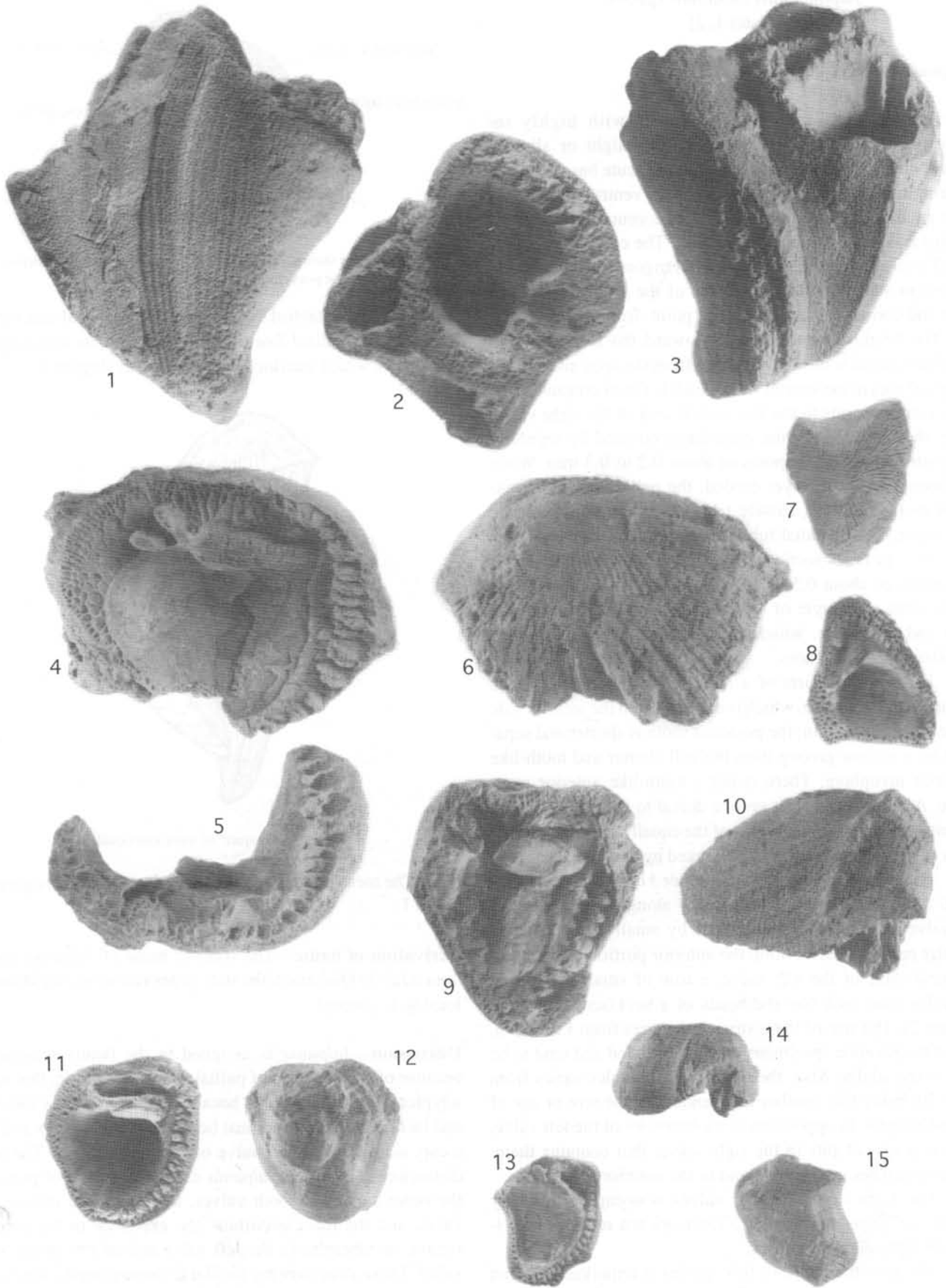


Table 1. Measurements (in mm) of specimens of *Jalpania queretana* n. gen., n. sp. from the mid-Cretaceous of the Jalpan area, Querétaro, Mexico.

	Sample no.	Length	Diameter	
			A-P	D-V
Holotype (LV)	IGM-6763	45	67	48
Paratype (LV)	IGM-6764	21	28	30
Paratype (RV)	IGM-6765	75	47	41
Paratype (RV)	IGM-6766	74	44	42
Juvenile (RV)	-	54	29	15
Juvenile (RV)	-	45	26	18
Juvenile (RV)	-	-	18	12
Paratype (LV)	IGM-6767	34	40	43
Paratype (LV)	IGM-6768	23	41	-
Paratype (LV)	IGM-6769	35	43	48
Paratype (RV)	IGM-6770	105	54	42
Paratype (LV)	IGM-6771	17	28	25
Paratype (RV)	IGM-6772	46	39	32
Paratype (LV)	IGM-6773	35	53	50
Paratype (LV)	IGM-6774	17	22	27
Paratype (LV)	IGM-6805	24	28	28
Paratype (LV)	IGM-6806	18	21	21

Abbreviations: IGM, Instituto de Geología, Mexico. D-V, dorso-ventral; RV, right valve; LV, left valve; A-P, antero-posterior.

the oysters these structures consist in tubercles (anachomata) in the right valve and pits (catachomata) in the left valve. The term dent or denticles used by some authors for these structures, according to Stenzel (1971) should be regarded as inappropriate and misleading because they are neither homologous nor analogous to the teeth and sockets of normal dentate bivalves and their function has not been explained in oysters. Therefore, based on the morphological evidence derived from this study, it is suggested that the most appropriate name for these structures should be chomata in the sense proposed by Stenzel (1971). Considering that there is not anterior myophore in *Jalpania* similar to the posterior one, one may assume that tubercles and pits could be inserted by muscles involved in the mechanism that closed the valves, replacing the function of the anterior myophore.

The growth form is also a very interesting feature of this species. They grew in "bouquets", the juveniles cemented to the sides of the parents (Figure 3). Where this growth pattern occurs, the shape of the body cavity of the adult varies according to the pressure of the attached young specimens.

Jalpania is not comparable to any other genus, although some genera have similar features. For instance, *Roussellia* Douvillé (1898, p.151), from the Maastrichtian of the Pyrenees, is similar in its conical, straight right valve, the convex left valve, the lack of ligament and the polygonal and circular tabulate pallial canals. Nevertheless it differs from *Jalpania* in many aspects, among others, the pallial canals are only present in the right valve, whose tooth is of crescentic shape; the muscle insertions are in thickened areas of the shell wall, and therefore there is not tooth-like posterior myophore, nor anterior tubercles and pits.

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Plate 1. *Jalpania queretana* gen. nov., sp. nov., from the mid-Cretaceous of "El Madroño", Querétaro (all figures at natural size). Figures 1-3—Paratype IGM-6766, right valves of four individuals growing in "bouquet"; 1, 3, lateral views; 2, apertural view. Figures 4-6—Holotype IGM-6763; 4, 6, left valve, internal and external views; 5, right valve, apertural view. Figures 7, 8—Paratype IGM-6771, left valve, external and internal views. Figures 9, 10—Paratype IGM-6767, left valve, internal and side views. Figures 11, 12—Paratype IGM-6764, left valve, internal and external views. Figures 13-15—Paratype IGM-6774, left valve, internal, side and external views.

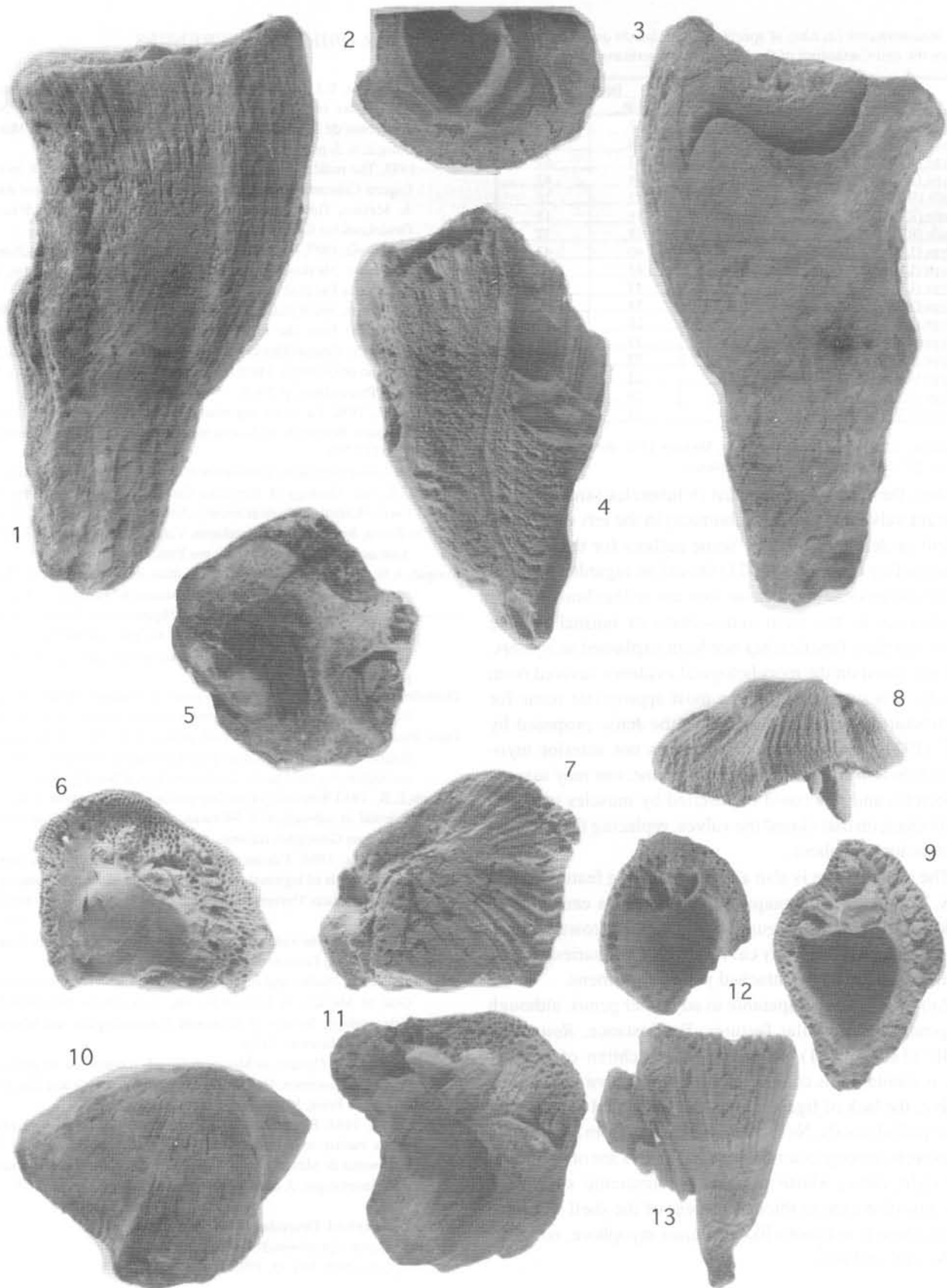


Plate 2. *Jalpania queretana* gen. nov., sp. nov., from the mid-Cretaceous of "El Madroño", Querétaro (all figures at natural size). Figures 1-3—Paratype IGM-6770; 1, 3, right valve lateral views; 2, cross section of the same. Figures 4, 5—Paratype IGM-6765, right valve lateral view and cross section of the same. Figures 6, 7—Paratype IGM-6768, left valve, internal and external views. Figures 8, 9—Paratype IGM-6805, left valve, side and internal views. Figure 10—Paratype IGM-6769, left valve side view. Figure 11—Paratype IGM-6773, left valve internal view. Figures 12, 13—Paratype IGM-6772, right valve, apertural and lateral views.