



Mexican Upper Cretaceous rudists (Hippuritida, Bivalvia): Taxonomic, stratigraphic, and geologic data

Jose Maria Pons^{a,1,*}, Pedro García Barrera^b, Angélica Oviedo^c, Enric Vicens^a

^a Departament de Geologia, Universitat Autònoma de Barcelona, 08193, Bellaterra, Barcelona, Spain

^b Museo de Paleontología, Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico

^c Facultad de Ingeniería, Universidad Autónoma de Chihuahua, Mexico

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ABSTRACT

Analysis of seventy published papers dealing with Mexican Upper Cretaceous rudists, together with consultation of the newest geological maps covering the areas with mentioned rudist fossil localities, evidenced that: a) several among the Turonian-Maastrichtian species mentioned are junior synonyms, *nomen nudum*, insufficiently described, or have untraceable types. According to modern standards, around sixty species seem acceptable, Antillocaprinidae (12), Hippuritidae (11), Plagioptychidae (9), and Radiolitidae (27). Only three species (Turonian) are common with Eurasia. All the Santonian-Maastrichtian rudists (54) are exclusively American species, either ascribed to Eurasian (9) or to American (21) genera. b) Research on rudists helped to improve the stratigraphy in some areas, and to point out or clear up some geological issues in others. c) The restudy of the geology in some areas, of some rudist collections in museums, and of some rudist groups, are much necessary and must be undertaken.

1. Introduction

The Lower and middle Cretaceous limestones from Mexico have been deeply investigated since the end of nineteenth century, due mainly to their economic interest in petroleum exploration; they have also been intensely quarried as material for construction. Since rudist bivalve shells are a conspicuous component of these limestones, reports or paleontological studies of this fossil group are quite abundant in the geological literature of the area. Although not as conspicuous as Lower and middle Cretaceous ones, Upper Cretaceous limestones and their rudists have also received much attention. Moreover, Late Cretaceous rudist faunas are much more diverse than Early and middle Cretaceous ones.

Many papers including descriptions of rudist taxa, most of them new, were written during the twentieth century. Some of these descriptions do not fit the modern standards and, although several of the original specimens are preserved and available for study in museums, other could not be traced, as well as the stratigraphy of the localities was not always clear or accurate. Taxonomic revisions began to be frequent

during the twenty-first century, centered on Mexican material or including it within a wider scope, and paying special attention to biostratigraphy.

The scope of this paper is (1) to provide a complete updated survey on the present day knowledge of Mexican Late Cretaceous rudists, (2) to stress their contribution to the stratigraphy and geology of the Mexican Upper Cretaceous, and (3) to point out those aspects deserving further study.

This paper is dedicated to the memory of the late Dr. Gloria Alencáster. For her important contribution to the knowledge of the Mexican rudist faunas and for having introduced and motivated the authors to follow her with the study of these interesting fossil bivalves.

2. Material and methods

This research is an exhaustive review of the previously published papers, including recent ones written by the authors, and observations on type specimens. The available references and descriptions about Mexican Upper Cretaceous rudists in the extant literature were restudied

* Corresponding author. Departament de Geologia, Universitat Autònoma de Barcelona, 08193, Bellaterra, Barcelona, Spain.

E-mail addresses: josepmaria.pons@uab.cat (J.M. Pons), pedrogarcia@ciencias.unam.mx (P. García Barrera), aoviedo@uach.mx (A. Oviedo), enric.vicens@uab.cat (E. Vicens).

¹ Jose Maria Pons present adress. Apartat de Correus n. 65, 08193, Bellaterra, Barcelona, Spain. jmpnsm@gmail.com

and all the data summarized and organized in a data table (Appendix 1)². When existing, the repository of type specimens has also been traced, although not all the collections have already been revisited. The geologic maps 1:250 000 and 1:50 000 published by the *Servicio Geológico Mexicano* are at <http://www.sgm.gob.mx/cartas/Cartas_Ed.jsp>, <http://www.sgm.gob.mx/cartas/Cartas_Ed50.jsp>, and <<https://www.sgm.gob.mx/CartasDisponibles/>> as well as the *Léxico Estratigráfico de México* <https://www.sgm.gob.mx/Lexico_Es/> of the same federal institution. These documents were used to resolve questions about the localities' original references. Recent regional geological studies were also consulted to confirm or correct both the lithological units reported as a source of the rudist specimens, and their geologic age. Recent papers concerning Mexican Late Cretaceous age-significant micro- and macrofossils helped for this last purpose.

The institutional repositories of the specimens recognized in this study are: FCMP = Museo de Paleontología de la Facultad de Ciencias de la UNAM, México; IGM= Colección Nacional de Paleontología at the Instituto de Geología de la UNAM, México; LACM = Natural History Museum of Los Angeles, California, USA; NMNH= Smithsonian, National Museum of Natural History, Washington D.C., USA; MNHN = Muséum National d'Histoire Naturel, Paris, France; PUAB= Paleontological Collections of the Universitat Autònoma de Barcelona, Bellaterra, Spain; TMM = Bureau of Economical Geology Collection at the Texas Memorial Museum in Austin, Texas, USA; UCBL-EM = Collection de l'École Nationale supérieure des Mines de Paris, Université Claude Bernard, Lyon I, Villeurbanne, France; UMMP= University of Michigan, Museum of Paleontology, Ann Arbor, Michigan, USA.

3. Results

Late Cretaceous rudists species have been reported or described and published from seventeen of the thirty-two Mexican States (Fig. 1). These are: Baja California (BC), Chiapas (Chis), Chihuahua (Chih), Coahuila (Coah), Guerrero (Gro), Hidalgo (Hgo), Jalisco (Jal), México (Mex), Michoacán (Mich), Morelos (Mor), Nuevo León (NL), Oaxaca (Oax), Querétaro (Qro), San Luis Potosí (SLP), Tabasco (Tab), Tamaulipas (Tamps), and Veracruz (Ver). Rudist families include mainly Antillocaprinidae, Hippuritidae, Plagioptychidae, and Radiolitidae, but also Requieniidae (see: Carter, 2011 for supra-generic classification of the Bivalvia, Mollusca).

Cenomanian rudists are not considered in this paper. These rudist taxa, including mainly Caprinuloideinae among other families, correspond to what it is known as "American mid Cretaceous" rudist faunas, significantly differing from Late Cretaceous ones. Most Cenomanian outcrops are often linked to Lower Cretaceous rocks from which, after the published data, are not easy to discriminate. Nevertheless, some considerations on probable Cenomanian radiolitids are included in the next section 3.1.

3.1. Turonian rudists

Turonian limestones with rudists have been reported in the geological maps of many Mexican States: Chih, Ojinaga Formation; Coah, Indidura Formation; Gro, Morelos Formation; Hgo, El Doctor Formation; Jal, Mex, El Doctor Formation; Mich, Mor, Mexcala Formation; Qro, El Doctor Formation; SLP, El Abra Formation; and Ver, Guzmantla Formation. The authors collected specimens of *Hippurites resectus* Defrance (1821), together with *Durania arnaudi* (Choffat, 1886-1902) and, in a lower bed, *Eoradiolites liratus* (Conrad, 1852), from limestones cropping out at Llano las Hormigas, Villa de Guadalupe, SLP (Oviedo, 2006; Oviedo et al., 2007).

Hippurites resectus Defrance (1821) is a cosmopolitan species, originally described from Uchaux, France, considered characteristic of the

upper Turonian. It is a relatively abundant fossil in Mexico, where the transverse sections of right valves naturally exposed on limestone bedding tops are popularly known as 'patitas de gato' (cat tracks). *Hippurites mexicana* Bárcena (1875) or *Hippurites resectus* var. *mexicana* (Bárcena), and also *Hippurites calamitiformis* Bárcena (1875) (non *Monopleura calamitiformis* (Bárcena) from Coalcoman, Mich) are junior synonymies. These species have been reported also from Sierra de Barbosa, Cañada Grande, W Santa Catarina, San Luis-Matehuala, La Calera (SLP), Cerro La Peña, Cerro Santa Ana (Coah), Cerro de Cadereyta (Qro), Valle Mezquital (Hgo), Cerro de Escamela (Ver), Apaxco (Mex), and Yautepec (Mor). The specimens figured by Douvillé (1897, p.230, pl. 32, Figs. 15, 16) as *Hippurites* sp. from "near Mexico" correspond to *Hippurites resectus* specimens, probably from Apaxco (Appendix 1).

Durania arnaudi (Choffat, 1886-1902) was first described, as *Biradiolites Arnaudi*, from Coz-Juncal, Alcantara, Runa and Monte Serves, Portugal, remarking the differences with *Biradiolites cornupastoris* Des Moulins, 1826 (= *Durania cornupastoris*). Besides the type form, the author distinguished three more varieties (*intermedia*, *Runaensis*, *expansa*), indicating the wide morphological variability observed within the species. The species (within the genus *Durania*) has been subsequently reported from different upper Cenomanian-Turonian localities in southern Europe and northern Africa (see Steuber, 2002). *Sauvagesia kellyi* Jones (1938), from Sierra de la Peña, Coah, is a *Durania* and a junior synonym of *D. arnaudi*, as is probably *Durania coahuilensis* Müllerried (1952). *Durania gonzalezi* Müllerried (1950b), from El Sotolar, Manuel Benavides, Chih, as well as other reports of the author as *D. cornupastoris* (Des Moulins) or *D. cf. gonzalezi* from other Mexican localities (Müllerried, 1950d, 1953) also seem to be junior synonyms of *D. arnaudi* (Appendix 1).

Eoradiolites liratus (Conrad, 1852) was proposed, as *Hippurites liratus* and figured in external lateral view of the right valve, based on specimens from Bhamdun, S of Beyrouth, Lebanon, in rocks attributed to lower Turonian. The species, assigned to the genus *Radiolites*, was described and figured by Parona (1909) based on both valves of silicified specimens from Abeih, also S of Beyrouth, a locality considered lower Cenomanian. The same year, Douvillé (1909) proposed the new genus *Eoradiolites*, and Douvillé (1910) assigned the species to this genus and fixed the horizon as being lower Cenomanian. Subsequently, *E. liratus* has been profusely reported from different localities in Eurasia and northern Africa (see Steuber, 2002); its attribution also to the Turonian in northern Africa corresponds in fact to misidentifications of *Eoradiolites schweinfurthi* (Zittel, 1883) (Pons et al., 2011).

The reinterpretation of the radial bands, down-and-outward folds of the growth lamellae instead of up-and-inward folds, and the outer shell layer structure of Bauman's (1958) *Radiolites* species, *newelli* and *müllerriedi*, from Cerro Corona, Cuernavaca, Mor, indicates that these species correspond to the genus *Eoradiolites* and both show the diagnostic characters of *E. liratus*. *Radiolites mendozei* Bárcena, 1877-1879, cited from different localities, SLP, Qro, Gro, Mich, and Ver, sometimes together with *H. resectus*, may also be a junior synonym of *E. liratus* (Appendix 1).

The radiolitids and other rudists described as Turonian by Palmer (1928) from Huescalapa, Jal, are in fact Albian (Alencáster and García-Barrera, 2008).

The requeniids *Apricardia mongesi* Müllerried, 1947b in Cerro Peñuela (Ver) and *Apricardia* sp. in Apaxco (Mex) (Müllerried, 1936b) were reported as occurring together with *Hippurites resectus*.

Stratigraphy and Geology. The mentioned localities in SLP are mapped as El Abra Formation (Albian-Santonian) by SGM (1998c, 1999b, 2010a). The stratigraphy of mentioned localities in other Mexican states is as yet far to be unambiguously established. The formations: El Doctor (Albian-Cenomanian), Indidura (Cenomanian-Turonian), Ojinaga (Turonian-Santonian), Morelos or Cuautla (Aptian-Cenomanian), Guzmantla (Turonian-Santonian), and Calizas de Escamela (Turonian) have been reported (SGM, 1997b, 1998a, 2000a, 2000b, 2001, 2002, 2010b).

Hippurites resectus is a helpful Turonian indicator and *Durania arnaudi*

² References marked with an asterisk (*) are those treated in the Appendix.

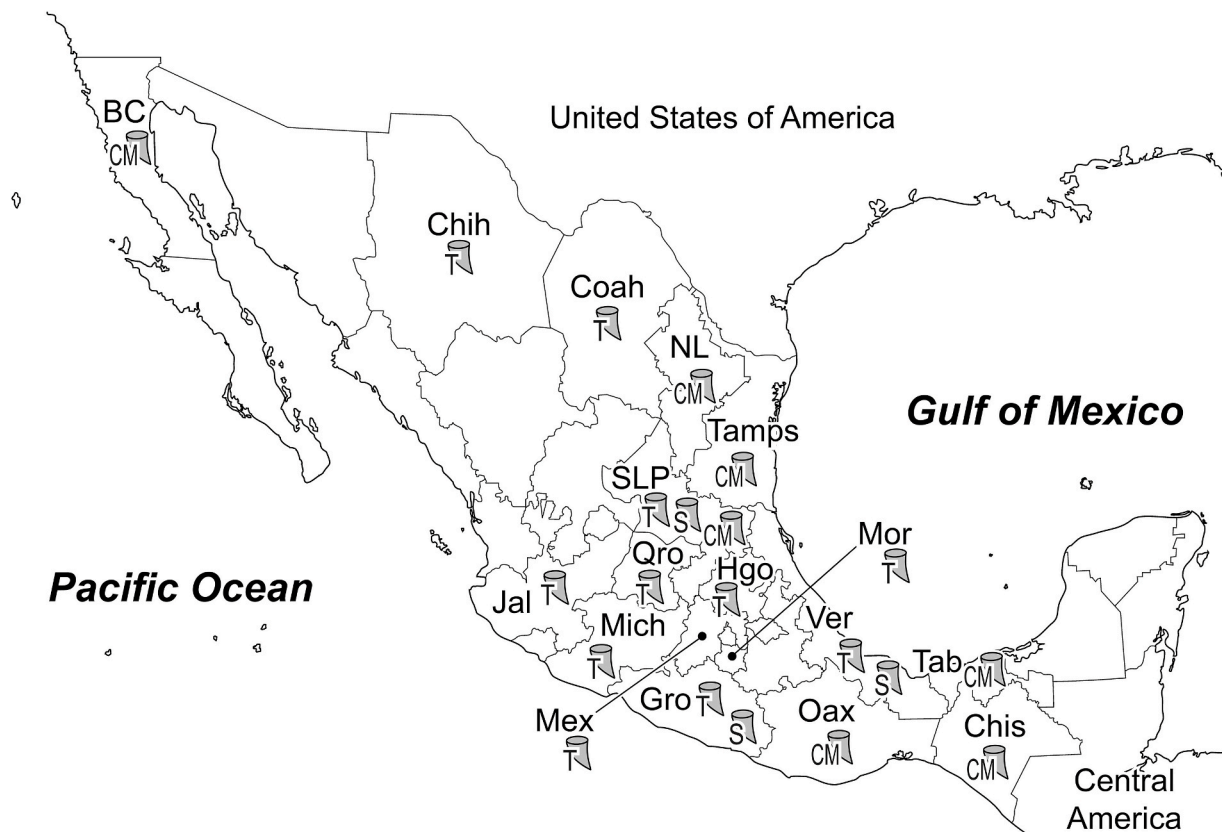


Fig. 1. Rudists reported in the Upper Cretaceous of Mexican States. (BC=Baja California; Chih = Chihuahua; Chis = Chiapas; Coah = Coahuila; Gro = Guerrero; Jal = Jalisco; Mex = México; Mich = Michoacán; Mor = Morelos; NL=Nuevo León; Qro = Querétaro; SLP=San Luis Potosí; Tamps = Tamaulipas; Ver = Veracruz) (T = Turonian; S=Santonian; C=Campanian; M = Maastrichtian).

occurs in the same bed. *Eoradiolites liratus*, although reported at some of the same localities, occurs always in lower beds, and may indicate the Cenomanian.

3.2. Santonian rudists

The authors collected specimens of *Vaccinites macgillavryi* Palmer (1933) embedded in massive limestones at Sierra de La Ruda, Villa de Guadalupe, SLP and, in thick thickets from where the specimens can be easily recovered, at La Esperanza, Zitlala and on the Almolonga-Hueyitalpan road, Mártir de Cuilapan, Gro. A few specimens of *Durania curasavica* (Martin, 1885) were collected in the last locality (Oviedo, 2006; Oviedo et al., 2007).

Vaccinites macgillavryi Palmer (1933) was first described from Loma Yucatan, Cuba, poorly described according modern standards, and considered Maastrichtian. Recent research on the stratigraphy of this fossil locality (Rojas et al., 1996; Rojas, 2004) established its age as Santonian. *Durania curasavica* (Martin, 1885) is also reported from the same locality.

Transverse cross-sections of the right valve of *V. macgillavryi* display a wide variability in development and pinching of the two pillars, even among specimens of the same bed, and the tip of the ligament ridge is often difficult to observe because of recrystallization (Oviedo, 2006). Specimens from different localities in Gro were tentatively assigned (Alencáster et al., 1987) to European species (*V. praegiganteus*, *V. grossouvrei*, *V. gosaviensis*, and *V. giganteus*), probably because of all these reasons and to the small number of available specimens. On the other hand, the species name *macgillavryi* was erroneously applied (Sirna et al., 1990; Pons et al., 1992) to African specimens of *V. vesiculosus* (Woodward, 1855). The randomly oriented sections on polished slabs in building walls, coming from the quarries at Cerro Peñuela, Córdoba,

Ver, assigned by Müllerried (1947b) to *Hippurites* (*Vaccinites*) *boehmi* Douvillé pars., correspond also to *V. macgillavryi* (Appendix 1).

The report of *Durania curasavica* in the Suchiapa Formation at Tuxtla Gutiérrez, Chis (Alencáster and Michaud, 1987) should correspond to *Potosites tristantorresi* Alencáster and Pons, in Pons et al. (2010).

Stratigraphy and Geology. The locality Sierra de la Ruda, SLP, is mapped as El Abra Formation (Albian-Santonian) by SGM (1999b). The localities La Esperanza and road from Almolonga to Hueyitalpan, Gro, are mapped as Mexcala Formation (Turonian-Campanian) by SGM (1998b). The limestone quarries at Cerro Peñuela, Córdoba, Ver, are mapped as Guzmantla Formation (Turonian-Santonian) by SGM (2001).

3.3. Campanian and Maastrichtian rudists

Campanian and Maastrichtian rudist-bearing rocks have been reported from the states of Baja California (Rosario Formation), Tamaulipas (Mendez and San Felipe formations), San Luis Potosí (Cardenas Formation and Temazcal limestones), and Chiapas (Suchiapa, Ocozocoautla, and Angostura formations).

The stratigraphy and paleontology of the Cardenas Formation, in SLP, and the Suchiapa, Ocozocoautla, and Angostura formations, in Chis, have been intensively investigated during many years until present. The abundant published available data on age-indicative fossils (planktic and benthic foraminifers, ammonites, inoceramids) helped to date the successive rudist assemblages distinguished within these formations.

3.3.1. Rosario Formation rudists

White (1885) described the new genus and species *Coralliochama orcutti* based on specimens collected by Mr. C.R. Orcutt at Todos los Santos Bay, BC State, and donated to the NMNH (Appendix 1). The fossil

locality, Punta Banda, and the morphological variability within the species, have been intensively studied (Marincovich, 1975; Aranda Manteca, 1991; Götz et al., 2005). *Coralliochama flouriei* Damestoy (1965), from the same locality, is considered a junior synonymy (Marincovich, 1975). No other rudist species have been reported from this locality, nor has this species been reported in Mexico outside BC State. White (1885) indicated the species also occurs near the town of Wallala (=Gualala), Mendocino County, California. All records are, thus, on the Pacific coast.

Stratigraphy and Geology. The Rosario Formation (Campanian-Maastrichtian) is mapped, besides at Punta Banda, also N and S of Bahía Todos Santos by SGM (2003). The precise stratigraphic location of the rudist beds within the formation is not specifically established. Marincovich (1975) indicates a late Campanian to early Maastrichtian age.

3.3.2. Mendez Formation rudists

Rudists reported from this formation correspond to sparse specimens, with the collecting site well indicated but without details about its stratigraphic horizon. Stephenson (1922) and Adkins (1930) proposed several new species of radiolitids or identified other ones previously reported from Texas (USA). Their original descriptions and figures are not sufficient to identify these new species when new specimens from other localities are studied. The specimens (most of the taxa are represented by a single specimen) are kept in fossil collections (NMNH, TMM) available for restudy. A quick visit to the Adkins collection on the occasion of the Seventh International Congress on Rudists in Austin, Texas, revealed that *Durania aguila* Adkins (1930) is a *Chiapasella*, thus becoming the senior synonym of *Chiapasella trechmanni* Mitchell and Gunter, 2002, a species described from Jamaica (Mitchell and Pons, 2010). The same may possibly occur with other species: *Durania huasteca* Adkins (1930) seems to fit within the intraspecific variability of *Huasteca ojanthalensis* (Myers, 1968), as it is illustrated by Pons et al. (2013).

No more recent reports of rudists from the area have been published since then, except Müllerried's (1931a) *Coralliochama* n. sp. and *Sauvagesia* cf. *coloradensis* Stephenson. The former was never formalized, and the specimen has not been identified in IGM collections (Appendix 1).

Stratigraphy and Geology. The Mendez Formation in Tamps, where the specimens described by Stephenson (1922), Adkins (1930), and Müllerried (1931a) were collected, is considered Campanian-Maastrichtian by SGM (1999a, 2008a). The collecting area is in the Gulf Coastal Plain, where the outcrops of the Mendez Formation appear at the bottom of gullies, in windows excavated on the Quaternary alluvial.

3.3.3. San Felipe formation rudists

Two new species of radiolitids, *Sauvagesia degolyeri* and *Durania manuensis*, were proposed respectively by Stanton (1921) and Stephenson (1922) for specimens from the San Felipe Formation in Tamps (Appendix 1). No more reports of rudists from this formation have been published since then. Only the type specimens are available for restudy in museums' fossil collections (NMNH). Although based only on the study of original descriptions and figures, *Sauvagesia degolyeri* Stanton (1921) seems to be a senior synonym of *Sauvagesia acutocostata* Adkins (1930), both corresponding to the genus *Radiolites*, and *Durania manuensis* Stephenson (1922) seems to be a species belonging to the genus *Chiapasella*.

Stratigraphy and Geology. Stanton (1921) and Stephenson (1922) indicated the San Felipe Formation, in Tamps, for the fossils they described; nevertheless, the localities they indicated are now mapped as Mendez Formation (Campanian-Maastrichtian) by SGM (1999a). The outcrops of San Felipe Formation (Coniacian-Santonian) are mapped far to the W in this map by SGM (1999a).

3.3.4. Temazcal limestones rudists

Temazcal limestones is the informal unit name applied to the

limestones cropping out E of Villa Hidalgo, about 70 km NNE of San Luis Potosí City in SLP State, at Sierras de Álvarez, El Tablón, and Los Librillos, all of them included in the Sierras and Llanuras Occidentales of the Sierra Madre Oriental. The authors collected rudist specimens (Appendix 1) at the municipalities of Armadillo de los Infantes (Arroyo Tovar in Ranchito de los Guzmán), Villa Hidalgo (Cerro La Mesa and Hacienda El Durazno in Paradita del Refugio, El Potrero and Arroyo Temazcal in El Temazcal), and Guadalcázar (Cerro El Tanque, Cantera de Guadalcázar 1, and Cantera de Guadalcázar 2 in Charco Blanco, and Arroyo El Aguaje in Aguaje de los García) (Oviedo, 2006; Pichardo, 2008; Pons et al., 2010).

Stratigraphy and Geology. The Temazcal limestones localities are mapped as El Abra Formation (Albian-Santonian) by SGM (2000c, 2008b). The early Campanian age attributed to this rudist fauna is due to the presence of *Radiolites acutocostata* Adkins (1930), because its type locality in Texas is well dated by ammonites indicating the *Delawarella delawarensis* lower Campanian ammonite biozone (Young and Woodruff, 1985) and its absolute age has also been measured, ranging from 83.40 Ma to between 81.71 Ma and 80.54 Ma (Scott, 2005). *Potosites tristanatorresi* is a new species from that unit, and the age attributed to the other species, known from the Caribbean Province, although not so precisely established, does not contradict the early Campanian. A significant number of species from the Temazcal limestones are represented in the Suchiapa Formation at Chis State (Pons et al., 2016).

3.3.5. Cardenas Formation rudists

The stratigraphy and paleontology of the Cardenas Formation, around Cárdenas town, about 150 km E of San Luis Potosí City, in SLP State, is well known essentially by the research of Böse (1906) and Myers (1968). Both authors described many other fossil Mollusca besides rudists. Böse compared the stratigraphic succession of the Cardenas beds with that in Gosau, Austria. Myers defined the Cardenas Formation, divided it into three informally designated members, and subsequently recognized three assemblage zones: a lower one (*Durania ojanthalensis* Zone), a middle one (*Arctostrea aguila* Zone); and an upper one (*Tampsia floriformis* Zone); both lower and upper ones characterized by the presence of rudists. The authors collected specimens in the municipalities of Cárdenas (Arroyo la Atarjea, Cárdenas 1, Cárdenas 2, and Cárdenas 3) and Rayón (Amoladeras, Cuchilla Las Palomas, Arroyo Los Terrerillos, and Arroyo el Terrero) (Pons et al., 2013) (Appendix 1).

Stratigraphy and Geology. The Cardenas Formation is mapped as Campanian-Maastrichtian by SGM (1997a, 1999a). Pons et al. (2013) dated the two recognized rudist assemblages of the formation respectively as early and early late Maastrichtian, based on the distribution of co-occurring foraminifera (Omaña and Pons, 2000, 2003; Omaña et al., 2009). Some rudist species of the Cardenas Formation were identified in the Ocozacoautla (lower Maastrichtian) or the Angostura (upper Maastrichtian) formations in Chis State (Pons et al., 2016, 2017).

3.3.6. Suchiapa Formation rudists

The Upper Cretaceous rudist species from Chiapas State were described by Alencáster (1971), upon the numerous specimens collected along many years by F.K.G. Müllerried and kept, with the corresponding localities indicated, in the IGM collections. Although many rudist taxa were reported by Müllerried (1931b, c, 1933a, b, 1934, 1936b, 1942, 1947a) most of them were not described and/or figured. Alencáster (1971) referred to Müllerried's localities but neither correlating them nor indicating the corresponding lithological units.

The Suchiapa Formation was defined by Michaud (1987) for the upper part of the limestones attributed to the Sierra Madre Formation, probably with an unconformity between both formations, in the Chiapas Central Depression, Chis. The authors collected specimens in the Suchiapa Formation at several localities W and N of Tuxtla Gutiérrez, where the Suchiapa Formation is overlain by the Ocozacoautla Formation: Piedra Parada, SW of Ocuilapa; SW of Emiliano Zapata; Suchiapa river, W of Suchiapa; Santo Domingo river, W of Julián Grajales; S of Julián Grajales; and Rancho El Comitico quarry, N of Tuxtla Gutiérrez.

Also at localities SE of Tuxtla Gutiérrez, where this formation is overlain by the Angostura Formation: road to Paraíso del Grijalva 1, 2, and 3, between Laja Tendida and Paraíso del Grijalva; and road to El Santuario, SSE of San Francisco Pujilic (Pons et al., 2016, 2017, 2019) (Appendix 1). Most rudist species from the first group of localities are coincident with those of the Temazcal limestones in SLP, thus early Campanian, while those from the second group are late Campanian.

Stratigraphy and Geology. Results by Michaud (1987), Michaud and Fourcade (1989), and Cros et al. (1998) are based on a significant number of measured and correlated stratigraphic sections from the Chiapas Central Depression. These authors provided: (1) an accurate lithostratigraphic framework of the area (including this formation and those treated herein in 3.3.7 and 3.3.8); (2) a detailed paleogeographic reconstruction, and (3) a reasonable interpretation of the sedimentologic evolution of the Chiapas Cretaceous carbonate platform. These authors proposed that, in the area around Tuxtla Gutiérrez, the original “mid Cretaceous” carbonate mega-platform (Sierra Madre Formation) fragmented into several blocks, each following a different tectono-sedimentary evolution. A drowned block (Tuxtla Gutiérrez Block) constituted a basin (Tuxtla Gutiérrez Basin) that was filled during Campanian?–Maastrichtian. On the raised block (Angostura Block), and after a long hiatus, an insular shallow carbonate platform (Angostura Platform, Angostura Formation) installed directly above the Sierra Madre Formation. These authors’ tectono-sedimentary model was adopted by Pons et al. (2016) to locate the successive rudist assemblages recognized in the Suchiapa, Ocozocoautla, and Angostura formations in the Chiapas Central Depression.

3.3.7. Ocozocoautla Formation rudists

The Ocozocoautla Formation crops out N, S, and W of Tuxtla Gutiérrez, Chis. It is mainly composed of siliciclastic rocks, showing remarkable facies changes, corresponding to the infilling of the Tuxtla Gutiérrez Basin. Proximally, there are conglomerates at the base, followed up section by sandstones, sandy marls with micro-conglomerates intercalations, and a few limestones, with a rudist bed developed in its upper part. Distally, the siliciclastic rocks are fine-grained and the marls contain inoceramids and ammonites. The authors collected specimens at *Campo de Tiro* and *Los Chamaquitos*, NW of Ocozocoautla; *Abandoned Quarry*, W of Vicente Guerrero; km 178.2, road 145 from Ocozocoautla to Las Choapas; *Rancho*, NW of Vicente Guerrero; and E of Emiliano Zapata (Pons et al., 2016, 2017, 2019) (Appendix 1).

Stratigraphy and Geology. Research on age-indicative fossils in the formation: planktic and benthic foraminifers (Omaña and Pons, 2003; Omaña, 2006); ammonites (Pons et al., 2016); and inoceramid bivalves (Alencáster and Omaña, 2006), indicates that the age of the Ocozocoautla Formation rudist bed is early Maastrichtian.

3.3.8. Angostura Formation rudists

The Angostura Formation is mainly composed of shallow-water limestones and crops out in the N 55° W trending synclines of the Chiapas Central Depression, Chis. At the central part of the Ocozocoautla Syncline, the Angostura Formation overlies the Ocozocoautla Formation and interdigitates with the sandy bioclastic limestones of the Juan Crispin Formation. It is interpreted as a marginal shallow carbonate platform (Ocuilapa Platform) surrounded by a belt of cross-bedded sandy bioclastic limestones prograding basinwards. At both flanks of the Grijalva Syncline, the Angostura Formation overlies unconformably the Suchiapa Formation, with bauxitic laterites developed between them both. It is interpreted as an insular shallow carbonate platform (Angostura Platform) (Michaud, 1987; Michaud and Fourcade, 1989; Pons et al., 2016). Rudists are abundant in the limestones of both platforms.

The authors collected specimens at: *Cerro Testigo*, *Old Quarry*, *Rancho La Peregrina*, and *Búfalo de Piedra*, respectively at km 195.5, 195.3, 189, and 187.4, road 145 from Ocozocoautla to Las Choapas; W of Vicente Guerrero; *Quarries*, W of Berriozábal; *Quarries El Tesoro*, NW of

Berriozábal; and E of Emiliano Zapata, corresponding to the Ocuilapa Platform. Also collections were made at: *Cerro Verde*, W of Veinte de Noviembre; *Colonia José María Morelos y Pavón*, SW of Belisario Domínguez Dam; road to Paraíso del Grijalva, between Laja Tendida and Paraíso del Grijalva; and SW of San Francisco Pujilic, corresponding to the Angostura platform (Pons et al., 2016, 2017). (Appendix 1).

Stratigraphy and Geology. The same rudist species are recorded in outcrops of both Ocuilapa and Angostura platforms. This indicates that the Angostura Formation has the same late Maastrichtian age W and E of Tuxtla Gutiérrez, where it overlies the Ocozocoautla Formation (early Maastrichtian) and directly overlies the Suchiapa Formation (late Campanian), respectively. Consequently, the Ocozocoautla and the Angostura formations are not lateral equivalents of each other as previously maintained (Castro-Mora et al., 1975; Sánchez Montes de Oca, 1979; Quezada-Muñetón, 1990; SGM, 2005). The late Maastrichtian age of the Angostura Formation, in both platforms, is also supported by data on planktic and benthic foraminifers (Omaña and Alencáster, 2019).

4. Discussion

4.1. Stratigraphy and geology

The localities with Turonian, Santonian, and early Campanian rudists in SLP State are all mapped as El Abra Formation (Albian-Santonian), with the Cardenas Formation (Campanian-Maastrichtian) overlying it, by SGM (1998b, 1999b, 2000b, 2000c, 2008, and 2010). The Sierra El Abra, on the easternmost side of the Sierra Madre Oriental, is a carbonate complex in which the El Abra Limestone (carbonate platform) and the Tamabra Limestone (transitional fore-reef to basin pelagic deposit) were distinguished. Both were first considered as members and later as formations. An Albian-Cenomanian age was considered for El Abra Formation (Coogan, 1973) although Aguayo Camargo (1978) reported, on top, a thin and wavy layer containing planktonic foraminifera dated as late Turonian.

On the western side of Sierra Madre Oriental, limestones, with successively Turonian, Santonian, and early Campanian rudist faunas, appear above the limestones with caprinuloideid rudists typical of the El Abra Formation. Oviedo et al. (2007) suggested that successive carbonate platforms installed above the El Abra platform, with poorly developed siliciclastic intervals in between them, until the Cardenas Formation deposited. Probably, in limited-extent outcrops, these intervals were interpreted as Cardenas Formation. As no other well-defined lithological units were available in the region, Pons et al. (2010) adopted the informal Temazcal limestones for those with early Campanian rudists. No other lithological units have been used for the upper Turonian or the Santonian rudist limestones in the area. The Ididura Formation and the San Felipe Formation are recognized for limestones, respectively at the Mesozoic Basin of Central Mexico and at the eastern margin of the Sierra Madre Oriental. Omaña et al. (2013) in a study of the Cenomanian/Turonian interval foraminifers W of the Valles-San Luis Potosi Platform, distinguished the El Abra Formation (Albian-Cenomanian), the Soyatal Formation (Turonian-Santonian), and the Cardenas Formation (Campanian-Maastrichtian). The Cardenas Formation is considered early-late Maastrichtian in Cárdenas (Pons et al., 2013). Definitively, the stratigraphy and sedimentology of the Turonian-Campanian rocks in this area is not satisfactorily known.

No major problems arise with the rest of Campanian and Maastrichtian formations, only the lack of a precise stratigraphic position of the rudist beds within some long-range units, as the Rosario and Mendez formations (Campanian-Maastrichtian) and the San Felipe Formation (Coniacian-Santonian) (SGM, 1999a; 2003a). The Cardenas Formation, with the biostratigraphy and depositional history by Myers (1968) and the taxonomic revision of the rudists by Pons et al. (2013), is reasonably clear. Similarly, the Suchiapa, Ocozocoautla, and Angostura formations, with the lithostratigraphic framework, paleogeographic reconstruction, and sedimentologic evolution of the Chiapas Carbonate Platform by

Michaud and Fourcade (1989), and the successive rudist assemblages distinguished by Pons et al. (2016), are also clear.

4.2. Taxonomy

Four rudist families: Antillocaprinidae MacGillavry, 1937, Hippuritidae Gray, 1848, Plagioptychidae Douvillé, 1888, and Radiolitidae d'Orbigny (1842), are well represented and diverse in the Mexican Upper Cretaceous. The knowledge on the species of each family is not uniform and many species need a restudy. Family Requiiniidae Kutassy, 1934 is rarely reported.

4.2.1. Antillocaprinidae (Table 1)

The modern study of the Mexican Upper Cretaceous Antillocaprinidae is still to be undertaken. Only the few specimens described by Alencáster (1971) and those by García Barrera and Avendaño in García Barrera et al. (1998) have been considered in the revision of the Antillocaprinidae by Mitchell (2013). Modern papers on Mexican rudists paleontology (Oviedo, 2006; Pons et al., 2010, 2016) include abundant references to Antillocaprinidae genus indeterminate, Antillocaprinidae indeterminate, *Antillocaprina* sp., *Titanosarcolites* sp., and some uncertain specific determinations, from different Campanian and Maastrichtian formations. Also, many undescribed Antillocaprinidae specimens are kept in the collections of Mexican museums. All this indicates that Mexican Antillocaprinidae may be diverse but are insufficiently known. It is time to start this study; the general revision by Mitchell (2013) may be used as a base.

The genus *Alencasteria* Mitchell, 2013 (type species *Alencasteria macrotubularis* Mitchell, 2013) was established based on Mexican material with part of the specimens from Vega del Paso, Chis (Suchiapa Formation) previously figured as *Titanosarcolites macgillavryi* by Alencáster (1971, pl. 5, Figs. 1, 4, pl. 18, Fig. 4, pl. 19, Fig. 1). The other specimens (Alencáster, 1971, pl. 4, Fig. 4, pl. 5, Figs. 2–3) were transferred to genus *Stellacaprina* Mitchell 2013 as *Stellacaprina macgillavryi* (Alencáster, 1971) or (Alencáster, 1971, pl. 5, Fig. 5) assigned to *Oligosarcolites monotubularis* (Mitchell and Gunter, 2006). Another Antillocaprinidae specimen described although not figured by Alencáster (1971) was assigned by Mitchell (2013) to *Caenosarcolites oddensis* (Stephenson, 1938).

The species *Antillocaprina trilobata* García Barrera and Avendaño, in García Barrera et al., 1998 from the Angostura Formation (Chis) was in part (García-Barrera et al., 1998; text-fig. 3.1, 2, 4) transferred to genus *Rotacaprina?* and in part (García-Barrera et al., 1998; text-fig. 3.3, 3.5) assigned to *Antillocaprina suboccidentalis* Chubb (1967) by Mitchell (2013).

The species *Antillocaprina pugniformis* (Palmer, 1933), considered a junior synonymy of *Antillocaprina quadrangularis* (Whitfield, 1897a) by Mitchell (2013), was described from the Angostura Formation (Chis) by Oviedo (2006). Recently collected specimens from the Angostura Formation are herein tentatively assigned to *?Parasarcolites adkinsoni* Mitchell and Gunter, 2006. Specimens from the Suchiapa Formation at Vega del Paso in the IGM collection labelled as “*Postcaprinula*” by Alencáster and new material recently collected has not been described up to now.

4.2.2. Hippuritidae (Table 1)

Only one species, the cosmopolite Turonian *Hippurites resectus* Defrance (1821) is common with the Eurasian Hippuritidae, and it is one of the more widespread hippuritid species in Mexico (Coah; Hgo; ?Jal; Mex; Mor; Qro; SLP). Genus *Vaccinites* is also common with Eurasia but the two species, *V. macgillavryi* Palmer (1933) and *V. vermunti* MacGillavry, 1937 (both SLP and Chis; the former also Ver), are only known from America (Caribbean Province). Some other reports of Eurasian hippuritid species in Mexico (*Hippurites* cf. *incisus* Douvillé, *Vaccinites giganteus major* Toucas, and *Vaccinites boehmi* Douvillé) by Müllerried (1930b, 1933b, 1936b, 1947b) are misidentifications.

Table 1

Rudist species recognized in the Mexican Upper Cretaceous (Turonian-Maastrichtian).

Species	Formation	Localities	State	Age
ANTILLOCAPRINIDAE				
<i>Alencasteria macrotubularis</i> Mitchell (2013)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Antillocaprina quadrangularis</i> (Whitfield, 1897a)	Angostura	Ocozocuaul to Las Choapas	Chis	IM
<i>Antillocaprina suboccidentalis</i> Chubb (1967)	Angostura	Ocozocuaul to Las Choapas	Chis	IM
<i>Caenosarcolites oddensis</i> (Stephenson, 1938)	Angostura	Ocuilapa	Chis	IM
<i>Oligosarcolites monotubularis</i> Mitchell and Gunter (2006)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>?Parasarcolites adkinsoni</i> Mitchell and Gunter (2006)	Angostura	Rancho La Peregrina	Chis	IM
<i>Rotacaprina?</i> <i>trilobata</i> (García Barrera and Avendaño in García-Barrera et al., 1998)	Angostura	Ocozocuaul to Las Choapas	Chis	IM
<i>Stellacaprina macgillavryi</i> (Alencáster, 1971)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Titanosarcolites giganteus</i> Whitfield (1897a)	Angostura	Ocozocuaul to Las Choapas	Chis	IM
Antillocaprinidae genus indeterminate [in Pons et al., 2010]	Temazcal Ist.	Temazcal	SLP	eC
Antillocaprinidae indet. [in Pons et al., 2016]	Suchiapa	El Comiteco Quarry	Chis	IC
“ <i>Postcaprinula</i> ” <i>Alencáster</i> [in collection IGM]	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
HIPPURITIDAE				
<i>Barrettia gigas</i> Chubb (1955)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Barrettia monilifera</i> Woodward (1862)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Barrettia ruseae</i> Chubb (1967)	Temazcal limestone; Suchiapa.	Guadalcázar; El Comiteco Quarry	SLP; Chis	eC
<i>Caribbea muellerriedi</i> (Vermunt, 1937)	Cardenas	Cárdenas	SLP	IM
<i>Hippurites resectus</i> Defrance (1821)	El Abra, Cuautla; El Doctor; Morelos; Guzmantla	Llano las Hormigas, Sierra de Barbosa, Qro; Cañada Grande, W Santa Catarina; Cerro de Cadereyta; Apaxco; Yauteppec; Cerro Escamela	SLP; Coah; Qro; Mex; Mor; Ver	T
<i>Parastroma trechmanni</i> Chubb (1967)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Praebarrettia armini</i> (Götz and Mitchell, 2009)	Cardenas	Rayón	SLP	eM

(continued on next page)

Table 1 (continued)

Species	Formation	Localities	State	Age
<i>Praebarretia sparcilirata</i> Whitfield (1897b)	Ocozocoautla	Ocozocoautla	Chis	eM
<i>Torreites sanchezi</i> (Douville, 1927)	Temazcal limestone	Armadillo de los Infante, Guadalcázar	SLP	eC
<i>Vaccinites macgillavryi</i> Palmer (1933)	El Abra; Mexcala; Guzmanla	Sierra de La Ruda; La Esperanza, Almolonga-Hueyitalpan; Cerro Peñuela	SLP; Gro; Ver	S
<i>Vaccinites vermunti</i> MacGillavry, 1937	Temazcal limestone; Suchiapa	Armadillo de los Infante, Villa Hidalgo, Guadalcázar; El Comiteco Quarry	SLP; Chis	eC
PLAGIOPTYCHIDAE				
<i>Coralliochama gboehmi</i> Böse (1906)	Cardenas	Cárdenas	SLP	M
<i>Coralliochama orcutti</i> White (1885)	Rosario	Punta Banda, Bahia Todos Santos	BC	IC-eM
<i>Mitrocaprina tschoppi</i> (Palmer, 1933)	Cardenas; Angostura	Cárdenas, Rayón; Old Quarry, Ocozocoautla to Las Choapas	SLP; Chis	IM
<i>Plagioptychus antillarum</i> (Douville, 1927)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Plagioptychus fragilis</i> Chubb (1967)	Angostura	Rancho La Peregrina	Chis	IM
<i>Plagioptychus muellerriedi</i> Alencáster (1971)	Ocozocoautla	Ocozocoautla	Chis	eM
<i>Mitrocaprina</i> sp. [in Pons et al., 2016]	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Plagioptychus</i> sp. [in Pons et al., 2010]	Temazcal limestone	Villa Hidalgo	SLP	eC
Plagioptychidae genus indeterminate [in Pons et al., 2010]	Temazcal limestone	Villa Hidalgo	SLP	eC
RADIOLITIDAE				
<i>Alencasterites mooretownensis</i> (Trechmann, 1924)	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Biradiolites aguillerae</i> Böse (1906)	Cardenas	Cárdenas	SLP	M
<i>Biradiolites cardenasensis</i> Böse (1906)	Cardenas; Ocozocoautla; Angostura	Cárdenas, Rayón; Ocozocoautla to Las Choapas	SLP; Chis	eM-IM
<i>Bournonia baileyi</i> Chubb, 1967	Suchiapa	Laja Tendida to Paraíso del Grijalva	Chis	IC
<i>Bournonia cancellata</i> Whitfield (1897a)	Angostura	Ocozocoautla to Las Choapas	Chis	IC
<i>Chiapasella aguillae</i> (Adkins, 1930)	Mendez; Angostura	San Antonio Rayón; Cerro Verde	Tamps; Chis	M
<i>Chiapasella radiolitifomis</i> (Trechmann, 1924)	Ocozocoautla	Ocozocoautla	Chis	eM-IM
<i>Chiapasella</i> sp. [in Pons et al., 2016]	Suchiapa	Piedra Parada, Suchiapa	Chis	eC
<i>Durania arnaudi</i> Choffat (1886-1902)	El Abra; Ojinaga; Morelos; Indidura	Llano las Hormigas; El Sotolar; Tlaquiltenango,	SLP; Chih; Mor; Coah	T

Table 1 (continued)

Species	Formation	Localities	State	Age
<i>Durania curasavica</i> Martin (1885)	Mexcala	Los Hornos; Sierra de la Peña, Sierra de Santa Ana		
<i>Durania huasteca</i> Adkins (1930)	Mendez; Angostura	Almolonga-Hueyitalpan	Gro	S
<i>Durania manuelensis</i> Stephenson (1922)	San Felipe	Hacienda Cacalilao	Tamps	M
<i>Eoradiolites liratus</i> (Conrad, 1852)	El Abra; El Doctor; Morelos	Manuel Station	Tamps	C
<i>Huasteca ojanthalensis</i> (Myers, 1968)	Cardenas; Ocozocoautla	Villa de Guadalupe	SLP; Qro; Gro; Mich; Ver; Jal	Cen?-T
<i>Potosites tristantorresi</i> Alencáster and Pons, in Pons et al., 2010	Cardenas; Ocozocoautla	Cárdenas, Rayón; Ocozocoautla	SLP; Chis	eM
<i>Radiolites acutocostata</i> (Adkins, 1930)	Temazcal Ist.; Suchiapa	Armadillo de los Infante, Villa Hidalgo, Guadalcázar; El Comiteco Quarry	SLP; Chis	eC
“Radiolites” <i>macropticatus</i> Whitfield (1897a)	Temazcal Ist.; Suchiapa	Armadillo de los Infante, Villa Hidalgo, Guadalcázar; El Comiteco Quarry	SLP; Chis	eC
<i>Sauvagesia belti</i> Stephenson (1922)	Angostura	Colonia José María Morelos y Pavón	Chis	IM
<i>Sauvagesia coloradensis</i> Stephenson (1922)	Mendez	Chocoy Station	Tamps	M
<i>Sauvagesia degolyeri</i> Stanton (1921)	Mendez	Hacienda Chocoy	Tamps	M
<i>Sauvagesia morgani</i> Adkins (1930)	San Felipe	Haciendas Chocoy, Las Flores	Tamps	C
<i>Tampsia bishopi</i> Stephenson (1922)	Mendez	Hacienda Las Flores	Tamps	M
<i>Tampsia chocoyensis</i> Stephenson (1922)	Mendez	Hacienda Chocoy	Tamps	M
<i>Tampsia floriformis</i> Myers (1968)	Cardenas	Hacienda Las Flores	SLP	IM
<i>Thyrastylon adhaerens</i> Whitfield (1897a)	Angostura	Ocozocoautla to Las Choapas	Chis	IM
“Thyrastylon” <i>nicholasi</i> Whitfield (1897a)	Suchiapa; Ocozocoautla	Laja Tendida to Paraíso del Grijalva, Rio Suchiapa; Ocozocoautla	Chis	IC-eM
<i>Trechmannites rudissimus</i> (Trechmann, 1924)	Cardenas; Ocozocoautla	Cárdenas, Rayón; Ocozocoautla	SLP; Chis	eM-IM
REQUIENIIDAE				
<i>Apricardia mongesi</i> Müllerried (1947b)	Guzmantla	Cerro Peñuela, Córdoba	Ver	T
<i>Apricardia</i> sp. [in Müllerried, 1936b]	El Doctor	Apaxco	Mex	T

Age abbreviations: Cen = Cenomanian; T = Turonian; S=Santonian; C=Campanian; M = Maastrichtian; e = early; l = late Mexican States abbreviations: BC=Baja California; Chih = Chihuahua; Chis = Chiapas; Coah = Coahuila; Gro = Guerrero; Jal = Jalisco; Mex = México; Mich = Michoacan; Mor = Morelos; NL=Nuevo León; Qro = Querétaro; SLP=San Luis Potosí; Tamps = Tamaulipas; Ver = Veracruz.

Three multiple-fold hippuritid genera, characteristic of the Caribbean Province, are represented in Mexico: *Barrettia*, *Parastroma*, and *Praebarrettia*. The former with one species, *B. ruseae* Chubb (1967), in the lower Campanian (Temazcal limestones, SLP, and Suchiapa Formation, Chis) and two more, *B. gigas* Chubb (1955) and *B. monilifera* Woodward (1862), in the upper Campanian occurring together with *Parastroma trechmanni* Chubb (1967) (Suchiapa Formation, Chis). *Praebarrettia armini* (Götz and Mitchell, 2009) and *P. sparcilirata* (Whitfield, 1897b) both occur in the lower Maastrichtian, but in different formations and areas (Cardenas Formation, SLP, the former and Ocozocoautla Formation, Chis, the latter).

Torreites sanchezi (Douville, 1927) from the lower Campanian Temazcal limestones, SLP, and *Caribbea muellerriedi* (Vermunt, 1937) from the upper Maastrichtian Cardenas Formation, SLP, are peculiar hippuritids. The former by lacking the pore-canal system of the outer shell layer, and having canals in the inner shell layer, of the left valve. The latter by having non-compact structure in the outer shell layer of the right valve.

Hippurites llamas Müllerried (1948a), from Valle del Mezquital, Hgo, seems to be an indeterminate radiolitid.

4.2.3. *Plagiptychidae* (Table 1)

The genus *Coralliochama* White, 1885 (type species *Coralliochama orcutti*) was established based on specimens from the Rosario Formation at Punta Banda, Bahía de Todos los Santos, BC. Böse (1906) established *Coralliochama gboehmi* based on specimens from the Cardenas Formation at Cárdenas. Müllerried (1931a) described as *Coralliochama* n. sp. two fragments of right valves from Rayón (=San Antonio Rayón), Tamps. The author repeatedly cited the species (Müllerried, 1932a, 1947a) but never denominate it. Probably it coincides with Adkins' (1928) report of *Coralliochama* cf. *boehmi* from the Mendez Formation, Tamps. *Coralliochama* is an exclusively American genus.

Species of genera *Mitrocoprina* and *Plagiptychus* are widespread in Eurasia but none of them occurs in America, although some (*P. toucasianus*, *P. arnaldi*) were erroneously reported (Müllerried, 1933a, b, 1936b, 1947a; Chubb, 1959). Three *Plagiptychus* species are known from Mexico: (1) *Plagiptychus antillarum* (Douville, 1927) from the upper Campanian Suchiapa Formation, (2) *Plagiptychus muellerriedi* Alencáster (1971) from the lower Maastrichtian Ocozocoautla Formation, and (3) *Plagiptychus fragilis* Chubb (1967) from the upper Maastrichtian Angostura Formation, all in Chis. *Mitrocoprina tschoppi* (Palmer, 1933) occurs in the Maastrichtian Cardenas Formation, SLP, and Angostura Formation, Chis. Several other taxa have been reported in open nomenclature: *Mitrocoprina* sp. from the lower Campanian Temazcal limestones, in SLP, and Suchiapa Formation, in Chis; *Plagiptychus* sp. and *Plagiptychidae* genus indeterminate from the Temazcal limestones, SLP (Pons et al., 2010, 2016).

The Mexican *Plagiptychidae* species already named are fully described and illustrated, according to modern standards (Marincovich, 1975; Pons et al., 2013, 2017). Thus, any new find of them elsewhere may be unambiguously identified. Nevertheless, the abundant open nomenclature reports could indicate that new taxa are waiting to be described.

4.2.4. *Radiolitidae* (Table 1)

The knowledge of the abundant Mexican Upper Cretaceous Radiolitidae reported during last century is, up to now, unsatisfactory. Most original descriptions and illustrations do not fit modern standards, not allowing their unambiguous identification. Only some of the specimens are available in Museum collections for restudy, and some of the proposed new species were never formalized. Thus, the results herein, mainly based on the original publications, represent only tentative re-assignments or synonymies.

Among the genera being common in Eurasia, *Radiolites* Lamarck, 1801 has been rarely mentioned in the Upper Cretaceous of Mexico, while *Sauvagesia* Bayle 1857 and *Durania* Douville, 1908 are the most

cited. Nevertheless, some of the species assigned to these genera have been subsequently transferred to other ones (Mitchell and Pons, 2010). Probably, a careful revision of the original material, single specimens insufficiently described and figured, may lead to further changes.

The only species of the genus *Eoradiolites* Douville, 1909 reported from the Mexican Upper Cretaceous, *Eoradiolites liratus* (Conrad, 1852), occurs in the Cenomanian? or Turonian? of different localities (SLP, Qro, Mor, Gro, Mich, and Ver) and is the senior synonymy of Mexican species originally assigned to genus *Radiolites*: *R. mendozae* Bárcena, 1877-1879; *R. newelli* and *R. muellerriedi* Bauman 1858.

Reports of *Biradiolites* or *Distefanella*, *lombricalis* d'Orbigny (1847) or, *lumbricalis* Parona, 1901, sometimes with exchanged genera and species names, in Oax and Chis (Böse, 1910; Müllerried, 1932b, 1933b, 1936b, 1950a; Chubb, 1959), probably correspond to *Alencasterites mooretownensis* (Trechmann, 1924). Some other reports of Eurasian radiolitid species in Mexico (*Sauvagesia* cf. *da Rio* Catullo, *Radiolites* aff. *lusitanicus* Bayle, *Biradiolites canaliculatus* d'Orb., *Radiolites* cf. *subradius* Toucas, *Radiolites* cf. *galloprovincialis* Matheron, and *Praeradiolites* aff. *subcoquandi* Toucas) by Müllerried (1936b), only corresponding to names without description or figure, are also misidentifications.

Müllerried's (1946, 1947b) new species *Neoradiolites ordoñezi*, *Bournonia carrilloi*, and *Durania mexicana* are based on sections in building slabs, undeterminable because not showing sufficient diagnostic characters.

Several American species of the genus *Biradiolites* d'Orbigny (1847-51) have been reported, and accurately described, from the Maastrichtian Cardenas Formation, SLP, the upper Campanian Suchiapa Formation, Chis, the lower Maastrichtian Ocozocoautla Formation, Chis, and the upper Maastrichtian Angostura Formation, Chis. Similarly, for species of genus *Bournonia* Fischer, 1887, from the upper Campanian Suchiapa Formation, Chis, and the upper Maastrichtian Angostura Formation, Chis.

Five radiolitid genera are based on Mexican specimens: (1) *Tampsia* Stephenson, 1922, from the Maastrichtian Mendez Formation in Tamps; (2) *Chiapasella* Müllerried, 1931b, from the lower Maastrichtian Ocozocoautla Formation in Chis; (3) *Huasteca* Pons et al., 2013, from the lower Maastrichtian Cardenas Formation in SLP; (4) *Potosites* Alencáster and Pons in Pons et al. (2010), from the lower Campanian Temazcal limestones in SLP; and (5) *Trechmannites* Pons et al., 2013 from the Maastrichtian Cardenas Formation in SLP. None of them occur outside America. Two more genera are also exclusively American: *Alencasterites* Pons et al., 2016, reported from the upper Campanian Suchiapa Formation, Chis; and *Thyrastylon* Chubb, 1956 from the upper Maastrichtian Angostura Formation, Chis. The species originally assigned to *Radiolites* (*Lapeirousia*) *nicholasi* by Whitfield (1897a) and also attributed to *Macgillivrayia* Rojas et al., 1996, reported from the upper Campanian Suchiapa Formation and the lower Maastrichtian Ocozocoautla Formation, Chis, is tentatively assigned to *Thyrastylon? nicholasi* (Whitfield, 1897a).

Besides *Chiapasella radiolitiformis* (Trechmann, 1924) from the lower Maastrichtian Ocozocoautla Formation, and *Chiapasella aguila* (Adkins, 1930) from the upper Maastrichtian Angostura Formation, another, still unnamed, *Chiapasella* occurs in the early Campanian Suchiapa Formation, all of them in Chis (Pons et al., 2016). Müllerried (1931b) proposed the species *pauciplicata*, for a specimen from an unknown horizon at Cerro de la Silla, Monterrey, NL; the specimen, not figured and described as a rock fragment with three embedded incomplete specimens, has not been found in the collections of the IGM.

4.2.5. *Requeniidae* (Table 1)

The Requeniidae are rarely reported from the Mexican Upper Cretaceous, and poorly described. *Apricardia mongesi* Müllerried (1947b), has been based on randomly oriented sections in polished slabs of building walls, coming from quarries of the Guzmanla Formation at Cerro Peñuela, Ver. *Apricardia* sp. was reported by Müllerried (1936b) from Apaxco, Mex, a locality with *Hippurites resectus*.

4.3. Perspectives

The study, mainly field work, of the Turonian, Santonian, and lower Campanian limestones with rudists, above the mid Cretaceous El Abra Formation, in SLP State should be reprised with a modern scope. The present knowledge of the rudists may help.

Also, more field work is necessary to clear up the stratigraphy of rudist beds in Sierra de la Peña and Sierra Santa Ana, Coah, and Cerro Peña, Ver.

The relationship of *Coralliochama orcutti* White, 1885 with other *Coralliochama* species should be investigated. A better knowledge of the stratigraphic distribution of all them may be helpful.

Concerning the Mendez Formation in Tamps, both Stephenson (1922) and Stanton (1921) collections, at NMNH, and Adkins (1930) collection at TMM, need imperatively a careful restudy. Several of their species have only rarely (if any) been used subsequently, and a quick look to some of the specimens or an attentive examination of their figures suggest the presence of several synonymies or erroneous generic ascriptions. Although it is desirable, not much should be expected from new collecting in the area, as far as the original material mostly corresponds to occasional find of single specimens.

Being the stratigraphy of the rudist assemblages in Chiapas (Suchiapa, Ocozocoautla, and Angostura formations) reasonably established within a consistent sedimentological framework (Pons et al., 2016), the subsequent research should focus on improving the taxonomy of the rudists. Only a limited number of Chiapas specimens were included in Mitchell's (2013) revision of the Antillocaprinidae. Plagioptychidae and Hippuritidae have been recently revised (Pons et al., 2017, 2019), but the Radiolitidae, the larger family, is waiting for a deep restudy providing complete descriptions and accurate figures.

5. Conclusion

Around sixty rudist species are recognized up today in the Mexican Upper Cretaceous (Table 1): Antillocaprinidae (12); Hippuritidae (11); Plagioptychidae (9); Radiolitidae (27); and Requiñiidae (2). A few of them are in open nomenclature although supposed different from the others. Several synonymies are evidenced among previously proposed species (Appendix 1).

Only three species are common with Eurasia: *Eoradiolites liratus* (Conrad, 1852), *Hippurites resectus* Defrance (1821) and *Durania arnaudi* (Choffat, 1886-1902). The first probably in the Cenomanian and the other in the Turonian, are widespread in outcrops of several Mexican States.

No coniacian rudists have been reported in Mexico

The only two Santonian species, *Vaccinites macgillavryi* Palmer (1933) and *Durania curasavica* (Martin, 1885) recognized in SLP and Gro states, are American species of cosmopolitan genera.

All the Campanian and Maastrichtian rudists are exclusively American species, either ascribed to Eurasian (9) or to American (21) genera. The four rudist families represented are remarkably diversified: Antillocaprinidae (9 genera, 12 species); Hippuritidae (5 genera, 9 species); Plagioptychidae (4 genera, 9 species); Radiolitidae (11 genera, 24 species). The stratigraphic range of most of the species is limited to one of

the two stages or to the lower or upper part of them. They have been reported mainly in BC, SLP, Tamps, and Chis states, and also in neighboring areas of NL, Oax, and Tab states.

Research on the rudist species and its consequent record helped to improve the stratigraphy in some areas and to point out or clear up several age issues in other, thus contributing to a better understanding of Mexican geology.

A lower and an upper Maastrichtian interval have been distinguished in the Cardenas Formation at SLP.

Lower Campanian, upper Campanian, lower Maastrichtian, and upper Maastrichtian intervals have been distinguished in what was previously considered Campanian-Maastrichtian in Chis.

The relationship between the Ocozocoautla and Angostura formations in Chis, previously considered a lateral facies change, has been evidenced, the Angostura Formation (upper Maastrichtian) laying above the Ocozocoautla Formation (lower Maastrichtian).

The record of Turonian, Santonian, and lower Campanian rudist assemblages in what is mapped as El Abra Formation (Albian-Santonian) in SLP evidenced that the stratigraphy and the sedimentological structure of this Formation needs a different explanation.

Also, the difficulties in assigning a lithological unit to the rudist species records indicates that, probably, other formations used in the Upper Cretaceous (or the mid Cretaceous) of the western margin of the 'Valles-San Luis Potosi Platform', as the San Felipe and Indidura formations, need to be re-evaluated.

Author statement

Jose Maria Pons, have contributed on all the aspects and phases of the research, ending with the elaboration of text, figure, and tables, and subsequent revision, coordinated by J.M.Pons. Pedro García-Barrera, have contributed on all the aspects and phases of the research, ending with the elaboration of text, figure, and tables, and subsequent revision, coordinated by J.M.Pons. Angélica Oviedo, have contributed on all the aspects and phases of the research, ending with the elaboration of text, figure, and tables, and subsequent revision, coordinated by J.M.Pons. Enric Vicens, have contributed on all the aspects and phases of the research, ending with the elaboration of text, figure, and tables, and subsequent revision, coordinated by J.M.Pons.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. Published papers dealing with Mexican Upper Cretaceous rudists

Author/Localities	Reported taxa	Current identification	Repository
Bárcena (1875)			
Mex, Apaxco; Mor, Yautepec; Qro; Hgo; SLP, Sierra de Barbosa, Cañada Grande	<i>Hippurites mexicana</i> n. sp.	<i>Hippurites resectus</i> Defrance (1821)	
Qro, Cerro de Cadereyta	<i>Hippurites calamitiformis</i> n. sp.	<i>Hippurites resectus</i> Defrance (1821) [non <i>Monopleura calamitiformis</i> (Bárcena) from Coalcoman, Mich]	

(continued on next page)

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Author/Localities	Reported taxa	Current identification	Repository
Bárcena (1877-1879) Mex, Apaxco; Mor. Yautepec; Oro; Hgo; SLP, Sierra de Barbosa, Cañada Grande SLP, Sierra de Barbosa; Oro; Gro; Mich; Ver (sometimes together with <i>Hippurites</i>) Qtro, Cerro de Cadereyta	<i>Hippurites mexicana</i> Bárcena <i>Radiolites Mendozae</i> n. sp. <i>Hippurites calamitiformis</i> n. sp.	<i>Hippurites resectus</i> Defrance (1821) ? <i>Eoradiolites liratus</i> (Conrad, 1852) <i>Hippurites resectus</i> Defrance (1821) [non <i>Monopleura calamitiformis</i> (Bárcena) from Coalcoman, Mich]	
White (1885) BC, Bahía Todos Santos Douvillé (1891-1897) Mex, near Mexico [?Apaxco] Böse (1899) Ver, calizas de Escamela	<i>Coralliochama orcutti</i> n. sp. <i>Hippurites</i> sp. <i>Hippurites</i> (<i>Vaccinites</i>) <i>mexicanus</i> Barc. <i>Hippurites</i> sp.	<i>Coralliochama orcutti</i> White (1885) <i>Hippurites resectus</i> Defrance (1821) <i>Hippurites resectus</i> Defrance (1821)	NMNH 186661–186665 UCBL-EM
Böse (1906) SLP, Cardenas Formation	<i>Coralliochama</i> G. <i>Boehmi</i> n. sp. <i>Radiolites Austinensis</i> Roem. <i>Biradiolites Aguilerae</i> n. sp. <i>Biradiolites Cardenasensis</i> n. sp. <i>Biradiolites Potosianus</i> n. sp.	<i>Coralliochama gboehmi</i> Böse (1906) ? <i>Biradiolites aguilerae</i> Böse (1906) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Biradiolites cardenasensis</i> Böse (1906)	? +IGM 1350,1351,1974 1354,1355,1357 1976,1977 1978
Böse (1910) Oax, Ejutla District Stanton (1921) Tamps, San Felipe Formation Stephenson (1922) Tamps, Mendez shale	<i>Biradiolites lumbricalis</i> d'Orb. <i>Sauvagesia degolyeri</i> n.sp. <i>Tampsia bishopi</i> n. gen, n. sp. <i>Tampsia chocoyensis</i> n. sp. <i>Sauvagesia belti</i> n. sp. <i>Sauvagesia coloradensis</i> n. sp. <i>Sauvagesia degolyeri</i> Stanton (?) <i>Durania manuelensis</i> n. sp.	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924) ? <i>Radiolites degolyeri</i> (Stanton, 1921) <i>Tampsia bishopi</i> Stephenson (1922) <i>Tampsia chocoyensis</i> Stephenson (1922) <i>Sauvagesia belti</i> Stephenson (1922) <i>Sauvagesia coloradensis</i> Stephenson (1922) ? <i>Radiolites degolyeri</i> (Stephenson, 1922) ? <i>Chiapasella manuelensis</i> (Stephenson, 1922)	NMNH 32482 NMNH 32499 32500,32501 32504 32505 32506
Adkins (1928) Tamps, Mendez Formation	? <i>Durania austinensis</i> (Römer) <i>Durania manuelensis</i> Stephenson <i>Sauvagesia degolyeri</i> Stanton <i>Sauvagesia belti</i> Stephenson <i>Sauvagesia coloradensis</i> Stephenson <i>Tampsia bishopi</i> Stephenson <i>Coralliochama</i> cfr. <i>boehmi</i> Böse	? ? <i>Chiapasella manuelensis</i> (Stephenson, 1922) ? <i>Radiolites degolyeri</i> (Stanton, 1921) <i>Sauvagesia belti</i> Stephenson (1922) <i>Sauvagesia coloradensis</i> Stephenson (1922) <i>Tampsia bishopi</i> Stephenson (1922) <i>Coralliochama</i> cf. <i>Coralliochama gboehmi</i> Böse (1906)	TMM BEG2066.5 BEG BEG
Adkins (1930) Tamps, Mendez Formation	<i>Durania aguila</i> n. sp. <i>Durania huasteca</i> n. sp. <i>Sauvagesia morgani</i> n. sp.	<i>Chiapasella aguila</i> (Adkins, 1930) ? <i>Huasteca huasteca</i> (Adkins, 1930) <i>Sauvagesia morgani</i> Adkins (1930)	
Müllerried (1930a) Mor, Yautepec; Mex, Apaxco	<i>Hippurites</i> (<i>Hippuritella</i> H. Douvillé; <i>Orbignya</i> <i>Toucas</i>) <i>resectus</i> nov. var. <i>mexicana</i> (Bárcena)	<i>Hippurites resectus</i> Defrance (1821)	
Müllerried (1930b) SLP, Cárdenas	<i>Hippurites</i> (<i>Hippuritella</i> H. Douvillé; <i>Orbignya</i> <i>Toucas</i>) cf. <i>incisus</i> (H. Douvillé) <i>Toucas</i>	? <i>Caribbea muellerriedi</i> (Vermunt, 1937)	
Müllerried (1930c) Mex, Apaxco	<i>Hippurites</i> (<i>Hippuritella</i> H. Douvillé; <i>Orbignya</i> <i>Toucas</i>) <i>calamitiformis</i> Bárcena	<i>Hippurites resectus</i> Defrance (1821)	
Müllerried (1931a) Tamps, Rayón [= San Antonio Rayón]	<i>Coralliochama</i> n. sp. <i>Sauvagesia</i> cf. <i>coloradensis</i> Stephenson	? <i>Coralliochama</i> sp. <i>Sauvagesia</i> cf. <i>coloradensis</i> Stephenson, 1922	
Müllerried (1931b) Chis, Ocozacoautla	<i>Chiapasella</i> n. gen. <i>radiolitiformis</i> (Trechmann) <i>Chiapasella</i> n. sp.? <i>Chiapasella pauciplicata</i> n. sp.	<i>Chiapasella radiolitiformis</i> (Trechmann, 1924) ? <i>Chiapasella radiolitiformis</i> (Trechmann, 1924) ? <i>Chiapasella pauciplicata</i> Müllerried (1931b)	
NL, Monterrey, Cerro de la Silla Müllerried (1931c) Chis, Ocozacoautla Müllerried (1932a) BC, SLP, Cárdenas Tamps, Rayón [= San Antonio Rayón] Müllerried (1932b) Oax, Ejutla Müllerried (1933a) Chis, Ocozacoautla Chis, Vega del Paso Müllerried (1933b) Chis	<i>Pseudobarrettia chiapasensis</i> n. gen., n. sp. <i>Coralliochama orcutti</i> (White, 1885) <i>Coralliochama</i> G. <i>Boehmi</i> Boese, 1906 <i>Coralliochama</i> n. sp. <i>Biradiolites lombricalis</i> d'Orb. sp. <i>Plagioptychus Arnaud</i> H. Douvillé, 1888 <i>Plagioptychus Toucas</i> Math., 1842 <i>Bourmonia</i> aff. <i>africana</i> H. Douvillé 1911 <i>Radiolites</i> cf. <i>galloprovincialis</i> Math. 1842 <i>Radiolites</i> cf. <i>subradiosus</i> <i>Toucas</i> 1908	? <i>Praebarrettia sparcilirata</i> (Whitfield, 1897b) <i>Coralliochama orcutti</i> White (1885) <i>Coralliochama gboehmi</i> Böse (1906) ? <i>Coralliochama</i> sp. ? <i>Alencasterites mooretownensis</i> (Trechmann, 1924) <i>Plagioptychus muellerriedi</i> Alencáster (1971) <i>Plagioptychus antillarum</i> (Douvillé, 1927) ? ? ?	

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Author/Localities	Reported taxa	Current identification	Repository
	<i>Sauvagesia</i> cf. <i>Da Rio</i> Catullo, 1834	?	
	<i>Distefanella lumbricalis</i> Parona, 1900	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
	<i>Plagioptychus</i> Arnaud nov. var. <i>chiapasensis</i>	? <i>Plagioptychus antillarum</i> (Douvillé, 1927)	
	<i>Radiolites lusitanicus</i> Bayle, 1857	?	
	<i>Hippurites</i> (<i>Vaccinites</i> Fischer) <i>giganteus</i>	?	
SLP	d'Hombres-Firmas var. <i>major</i> Toucas, 1904	? <i>Caribbea muellerriedi</i> (Vermunt, 1937)	
	<i>Hippurites</i> (<i>Hippuritella</i> H. Douvillé) cf. <i>incisus</i> (H. Douvillé) Toucas 1908		
Oax	<i>Biradiolites lumbricalis</i>	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
Müllerried (1934)			
Chis, [?Ocozacoautla]	<i>Sauvagesia</i> (o <i>Durania</i>) n. sp.	? <i>Thyrastylon? nicholasi</i> (Whitfield, 1897a)	
Müllerried (1936a)			
Mex	No details about <i>Barrettia</i> species		
Müllerried (1936b)			
Chis, Turonian	<i>Distefanella lumbricalis</i> (d'Orb.) Douvillé	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
	<i>Sauvagesia</i> cf. <i>da Rio</i> Catullo	?	
	<i>Radiolites</i> aff. <i>lusitanicus</i> Bayle	?	
Mex, Apaxco, Turonian	<i>Apricardia</i> sp.	<i>Apricardia</i> sp.	
	<i>Hippurites resectus</i> var. <i>mexicana</i>	? <i>Hippurites resectus</i> Defrance (1821)	
SLP, Huasteca, San Felipe beds, Turonian	<i>Sauvagesia degolyeri</i> Stanton	? <i>Radiolites degolyeri</i> (Stanton, 1921)	
Chis, Turonian	<i>Barrettia</i>	? <i>Barrettia</i> sp.	
	<i>Plagioptychus</i> <i>Toucasi</i> Math.	? <i>Plagioptychus antillarum</i> (Douvillé, 1927)	
Chis, Coniacian	<i>Chiapasella radiolitiformis</i> (Trechmann)	<i>Chiapasella radiolitiformis</i> (Trechmann, 1924)	
	Müllerried		
	<i>Pseudobarrettia</i>	? <i>Praebarrettia sparcilirata</i> (Whitfield, 1897b)	
	<i>Biradiolites canaliculatus</i> d'Orb.	?	
Chis, Coniacian-Santonian	<i>Durania</i> cf. <i>austinensis</i>	?	
Chis, Santonian	<i>Radiolites</i> cf. <i>subradiosus</i> Toucas	?	
	<i>Vaccinites giganteus</i> d'Hombres-Firmas var. <i>major</i> Toucas	?	
	<i>Radiolites</i> cf. <i>galloprovincialis</i> Mathéron	?	
Chis, Campanian	<i>Praeradiolites</i> aff. <i>subcoquandi</i> Toucas	?	
Above	<i>Coralliochama</i>	? <i>Coralliochama</i> sp.	
	<i>Biradiolites Aguilerae</i> Boese	<i>Biradiolites aguilerae</i> Böse (1906)	
	<i>Biradiolites cardenasensis</i> Boese	<i>Biradiolites cardenasensis</i> Böse (1906)	
Jones (1938)			UMMP
Coah, Sierra de Santa Ana, Sierra de la Peña	<i>Sauvagesia kellyi</i> n. sp.	? <i>Durania arnaudi</i> Choffat (1886-1902)	16839, 16840–47, 16901
Müllerried (1942)			
W Chis, Campanian	<i>Coralliochama</i>	? <i>Coralliochama</i> sp.	
	<i>Biradiolites aguilerae</i> Böse	<i>Biradiolites aguilerae</i> Böse (1906)	
	<i>Biradiolites cardenasensis</i> Böse	<i>Biradiolites cardenasensis</i> Böse (1906)	
	<i>Praeradiolites</i> aff. <i>subcoquandi</i> Toucas	?	
W Chis, Santonian	<i>Vaccinites giganteus</i> d'Hombres-Firmas var. <i>major</i> Toucas	?	
	<i>Radiolites</i> cf. <i>galloprovincialis</i> Mathéron	?	
	<i>Radiolites</i> cf. <i>subradiosus</i> Toucas	?	
W Chis, Coniacian	<i>Chiapasella radiolitiformis</i> (Trechmann)	<i>Chiapasella radiolitiformis</i> (Trechmann, 1924)	
	Müllerried		
	<i>Pseudobarrettia</i>	? <i>Praebarrettia sparcilirata</i> (Whitfield, 1897b)	
	<i>Biradiolites canaliculatus</i> d'Orb.	?	
	<i>Durania</i> cf. <i>austinensis</i> (Roemer)	?	
	<i>Radiolites</i> cf. <i>subradiosus</i> Toucas	?	
W Chis, upper Turonian	<i>Distefanella lumbricalis</i> (d'Orb.) Douvillé	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
	<i>Sauvagesia</i> cf. <i>da-rio</i> Toucas	?	
	<i>Radiolites</i> aff. <i>lusitanicus</i> Bayle	?	
	<i>Apricardia</i> sp.	<i>Apricardia</i> sp.	
	<i>Sauvagesia degolyeri</i> Stanton	? <i>Radiolites degolyeri</i> (Stanton, 1921)	
	<i>Barrettia</i>	<i>Barrettia</i> sp.	
	<i>Plagioptychus toucasi</i> Math.	? <i>Plagioptychus antillarum</i> (Douvillé, 1927)	
Müllerried (1946)			
Ver, Córdoba, Cerro de Peñuela	<i>Neoradiolites ordoñezi</i> n. sp.	? (undeterminable sections on building slabs)	
Müllerried (1947a)			
BC	<i>Coralliochama orcutti</i> White	<i>Coralliochama orcutti</i> White (1885)	
SLP, Cárdenas	<i>Coralliochama G. boehmi</i> Boese	<i>Coralliochama gboehmi</i> Böse (1906)	
Tamps, Rayón [= San Antonio Rayón]	<i>Coralliochama</i> n. sp.	? <i>Coralliochama</i> sp.	
Chis, Vega del Paso	<i>Plagioptychus toucasianus</i>	? <i>Plagioptychus antillarum</i> (Douvillé, 1927)	
Chis, Ocozacoautla	<i>Plagioptychus arnaudi</i>	<i>Plagioptychus muellerriedi</i> Alencáster (1971)	
Müllerried (1947b)			
Ver, Córdoba, Cerro Peñuela	<i>Apricardia mongesi</i> n. sp.	? (undeterminable sections on building slabs)	
	<i>Hippurites</i> (<i>Vaccinites</i>) <i>boehmi</i> Douvillé pars.	? <i>Vaccinites macgillavryi</i> Palmer (1933)	
	<i>Bourmonia carrilloi</i> n. sp.	? (undeterminable sections on building slabs)	
	<i>Durania mexicana</i> n. sp.	? (undeterminable sections on building slabs)	
	<i>Neoradiolites ordoñezi</i> n. sp.	? (undeterminable sections on building slabs)	
Müllerried (1948a)			
Hgo, Valle del Mezquital, W of Tepé	<i>Hippurites llamas</i> n. sp.	? (undeterminable radiolitid)	

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Author/Localities	Reported taxa	Current identification	Repository
Müllerried (1948b) Tab, Pasomono	<i>Durania austinensis</i> (Roemer) Parona	? (undeterminable radiolite fragment of right valve)	
Müllerried (1950a) NW Oax, SW Nochistlán [= Nochistlán]	<i>Titanosarcosites</i> <i>Barrettia monilifera</i> Woodward, 1862	<i>Titanosarcosites</i> sp. <i>Barrettia monilifera</i> Woodward (1862)	
Oax, W of Ejutla	<i>Distefanella lombricalis</i> (d'Orbigny) 1847, Douvillé, 1913	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
Gro, SE of Chilpancingo	<i>Distefanella lombricalis</i> (d'Orbigny) 1847, Douvillé, 1913	? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
NL, Cerro de la Silla, Monterrey	<i>Chiapasella pauciplicata</i> Müllerried, 1931	? <i>Chiapasella pauciplicata</i> Müllerried (1931b)	
Müllerried (1950b) Chih, El Sotolar, Manuel Benavides	<i>Durania gonzalezi</i> n. sp.	? <i>Durania arnaudi</i> Choffat (1886-1902)	
Müllerried (1950c) Mex, Apaxco [+Hgo]	<i>Hippurites</i> (<i>Hippuritella</i>) <i>resectus</i> var. <i>mexicana</i> (Bárcena, 1875) Müllerried, 1930 <i>Hippurites</i> (<i>Hippuritella</i>) <i>calamitiformis</i> Bárcena, 1875	<i>Hippurites resectus</i> Defrance (1821) <i>Hippurites resectus</i> Defrance (1821)	
Müllerried (1950d) Mor, Tlaquiltenango, Los Hornos	<i>Durania cornu-pastoris</i> (Des Moulins) Parona pars.	? <i>Durania arnaudi</i> Choffat (1886-1902)	
Müllerried (1952) Coah	<i>Durania coahuilensis</i> n. sp.	? <i>Durania arnaudi</i> Choffat (1886-1902)	
Müllerried (1953) Coah, Hendidura [= Indidura] Formation	<i>Durania kellyi</i> (Jones) pars <i>Durania</i> cf. <i>cornupastoris</i> (Desmoulins) Parona <i>Durania</i> cf. <i>D. gonzalezi</i> <i>Durania kellyi</i> (Jones) sp. <i>Hippurites</i> (<i>Hippuritella</i>) H. Douvillé; Orbignya Toucas) <i>resectus</i> var. <i>mexicana</i> (Bárcena) Müllerried, 1930	? <i>Durania arnaudi</i> Choffat (1886-1902) ? <i>Durania arnaudi</i> Choffat (1886-1902) ? <i>Durania arnaudi</i> Choffat (1886-1902) ? <i>Durania arnaudi</i> Choffat (1886-1902) <i>Hippurites resectus</i> Defrance (1821)	
Bauman (1958) Mor, Cuautla Formation	<i>Radiolites newelli</i> n. sp. <i>Radiolites muellerriedi</i> n. sp.	? <i>Eoradiolites liratus</i> (Conrad, 1852) ? <i>Eoradiolites liratus</i> (Conrad, 1852)	NMNH 27198 27199
Chubb (1959) Central Chis, Carretera Formation	<i>Biradiolites</i> ssp. Caprinidae	? <i>Biradiolites</i> sp. ?Caprinidae indet.	
Central Chis, Campeche Beds	<i>Chiapasella radiolitiformis</i> <i>Titanosarcosites</i>	<i>Chiapasella radiolitiformis</i> (Trechmann, 1924) ? <i>Titanosarcosites</i> sp.	
Central Chis, Nuevo Beds	<i>Durania nicholasi</i> <i>Plagiopychus</i> aff. <i>P. toucas</i> Matheron	<i>Thyrastylon?</i> <i>nicholasi</i> (Whitfield, 1897a) ? <i>Plagiopychus antillarum</i> (Douvillé, 1927)	
Central Chis, San Luis Conglomerate	<i>Coralliochama</i> aff. <i>C. g. boehmi</i> Böse	? <i>Plagiopychus muellerriedi</i> Alencáster (1971)	
Central Chis, Piedra Parada Beds	" <i>Pseudobarrettia</i> "	? <i>Praebarrettia sparcilarata</i> (Whitfield, 1897b)	
Central Chis, Sierra Madre Limestone (uppermost part)	? <i>Barrettia</i> <i>Distefanella lombricalis</i>	? <i>Barrettia</i> sp. ? <i>Alencasterites mooretownensis</i> (Trechmann, 1924)	
	<i>Sauvagesia</i> ssp. <i>Durania</i> ssp.	? <i>Sauvagesia</i> sp. ? <i>Durania</i> sp.	
Damestoy (1965) SC, 19 km S of Ensenada	<i>Coralliochama flouriei</i> n. sp.	<i>Coralliochama orcutti</i> White (1885)	MNHN
Myers (1968) SLP, Cardenas Formation	<i>Coralliochama gboehmi</i> Böse	<i>Coralliochama gboehmi</i> Böse (1906)	TMM 15567, 15582, 15583 15568, 15584 15569 15560, 15580 15511–15513 14925, 14955 14921, 14933 14996, 14984
	<i>Hippurites muellerriedi</i> (Vermunt) <i>Hippurites perkini</i> n. sp. <i>Biradiolites aguilerae</i> Böse <i>Biradiolites cardenasensis</i> Böse <i>Tampsia floriformis</i> n. sp. <i>Tampsia poculiformis</i> n. sp. <i>Durania ojanthalensis</i> Myers, 1968	<i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Biradiolites aguilerae</i> Böse, 1906 <i>Biradiolites cardenasensis</i> Böse, 1906 <i>Tampsia floriformis</i> Myers (1968) <i>Tampsia floriformis</i> Myers (1968) <i>Huasteca ojanthalensis</i> (Myers, 1968) [= <i>Huasteca huasteca</i> (Adkins, 1930)]	
Alencáster (1971) Chis, Vega del Paso Chis, Ocozacoautla Chis, Ocozacoautla [?]	<i>Plagiopychus</i> cf. <i>P. jamaicensis</i> (Whitfield) <i>Plagiopychus muellerriedi</i> n. sp. <i>Plagiopychus agariciformis</i> n. sp.	<i>Plagiopychus antillarum</i> (Douvillé, 1927) <i>Plagiopychus muellerriedi</i> Alencáster (1971) <i>Coralliochama gboehmi</i> Böse (1906) [probably from Cárdenas]	IGM 2130–2133 2134–2141 2124, 2125
Chis, Ocuilapa	<i>Titanosarcosites giganteus</i> (Whitfield)	pars <i>Titanosarcosites giganteus</i> (Whitfield, 1897a); pars <i>Alencasteria macrotubularis</i> Mitchell (2013); pars <i>Caenosarcosites oddsensis</i> (Stephenson, 1938)	2173–2178
Chis, Vega del Paso Chis, Ocozacoautla Chis, Vega del Paso Chis, Vega del Paso Chis, Berriozábal Chis, Ocozacoautla Chis, Ocozacoautla	<i>Titanosarcosites macgillavryi</i> n. sp. <i>Biradiolites rudissimus</i> Trechmann <i>Biradiolites cancellatus</i> (Whitfield) <i>Bournomia cardenasensis</i> (Böse) <i>Thyrastylon chubbi</i> n. sp. <i>Sauvagesia macroplacata</i> (Whitfield) <i>Durania ojanthalensis</i> Myers	<i>Stellacaprina macgillavryi</i> (Alencáster, 1971) <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Bournomia baileyi</i> Chubb (1967) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Thyrastylon adhaerens</i> (Whitfield, 1897a) "Radiolites" <i>macroplacata</i> Whitfield (1897a)	2173–2178 2092–2097 2105–2109 2110–2114 2088–2091 2084–2087 2127–2129

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Author/Localities	Reported taxa	Current identification	Repository
Chis, Ocozocoautla [?]	<i>Tampsia floriformis</i> Myers	<i>Huasteca ojanthalensis</i> (Myers, 1968) [? = <i>Huasteca huasteca</i> (Adkins, 1930)] <i>Tampsia floriformis</i> Myers (1968) [probably from Cárdenas]	2102–2104
Chis, Ocozocoautla	<i>Durania nicholasi</i> (Whitfield)	<i>Thyrastylon? nicholasi</i> Whitfield (1897a)	2098–2101
Chis, Vega del Paso	<i>Barrettia monilifera</i> Woodward	<i>Barrettia monilifera</i> Woodward (1862)	2150–2156
Chis, Vega del Paso	<i>Barrettia multilirata</i> (Whitfield)	pars <i>Barrettia monilifera</i> Woodward (1862); pars <i>Barrettia gigas</i> Chubb (1955); pars <i>Parastroma trechmanni</i> Chubb (1967)	2142–2146
Chis, Vega del Paso	<i>Barrettia gigas</i> Chubb	pars <i>Barrettia gigas</i> Chubb (1955); pars <i>Parastroma trechmanni</i> Chubb (1967)	2147–2149
Chis, Ocozocoautla	<i>Praebarrettia sparcilirata</i> (Whitfield)	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897b)	2158–2166
Chis, Ocozocoautla	<i>Chiapasella radiolitifformis</i> (Trechmann)	<i>Chiapasella radiolitifformis</i> (Trechmann, 1924)	2115–2123, 2185
Marincovich (1975)			LACM
BC, Punta Banda, Rosario Formation	<i>Coralliochama orcutti</i> White, 1885	<i>Coralliochama orcutti</i> White (1885)	
SLP, W Santa Catarina, Cuautla Formation	<i>Hippurites resectus</i> Defrance, 1821 var. <i>mexicana</i> Barcena, 1875	<i>Hippurites resectus</i> Defrance (1821)	
SLP, San Francisco, Valle de Fantasmas, Cuautla Formation	<i>Radiolites</i> sp.	?	
SLP, Charco Blanco, Cuautla Formation	<i>Sauvagesia</i> sp.	?	
Jal, Cementos Tolteca quarry	<i>Durania</i> sp.	?	
Alencáster et al. (1987)	<i>Radiolites</i> sp. cf. <i>R. newelli</i> Bauman, 1958	? <i>Eoradiolites liratus</i> (Conrad, 1852)	
Gro, La Esperanza, Almolonga-Hueytalpan	<i>Vaccinites praegiganteus</i> Toucas, 1904 <i>Vaccinites grossouvrei</i> Douvillé, 1894 <i>Vaccinites gosaviensis</i> Douvillé, 1890 <i>Vaccinites giganteus</i> d' Hombro-Firmas (1838) <i>Vaccinites</i> sp.	<i>Vaccinites macgillavryi</i> Palmer (1933) <i>Vaccinites macgillavryi</i> Palmer (1933) <i>Vaccinites macgillavryi</i> Palmer (1933) <i>Vaccinites macgillavryi</i> Palmer (1933) <i>Vaccinites macgillavryi</i> Palmer (1933)	IGM 4309–4310 4311 4312 4313–4314 4315
Waite (1987)			
Chis, Sierra Madre Limestone	<i>Sauvagesia</i> sp.	? <i>Sauvagesia</i> sp.	
Perrilliat (1989)			
Mexico	all Mexican types up to date		
Alencáster and Michaud (1990)			
Chis, Suchiapa Formation	<i>Vaccinites inaequicostatus vermunti</i> Mac Gillavry <i>Durania curasavica</i> (Martin)	<i>Vaccinites vermunti</i> MacGillavry, 1937 ? <i>Potosites tristanorresi</i> Alencáster and Pons, in Pons et al., 2010	IGM 4564–4566 4567
Aranda-Manteca (1991)			
BC, Punta Banda, Rosario Formation	<i>Coralliochama orcutti</i> White, 1885	<i>Coralliochama orcutti</i> White (1885)	
Alencáster and Pons (1992)			
Chis, Angostura Formation	“ <i>Radiolites</i> ” <i>macroplicatus</i> Whitfield, 1897	“ <i>Radiolites</i> ” <i>macroplicatus</i> Whitfield (1897a)	IGM
Chis, Ocozocoautla Formation	<i>Chiapasella radiolitifformis</i> (Trechmann, 1924)	<i>Chiapasella radiolitifformis</i> (Trechmann, 1924)	2087bis, 6193, 6194 2118, 2184, 6196–6198 IGM/FCMP
García-Barrera et al. (1998)			
Chis, Angostura Formation	<i>Antillocaprina trilobata</i> García Barrera and Avendaño, 1998	pars <i>Rotacaprina? trilobata</i> García Barrera and Avendaño, in García Barrera et al., 1998; pars <i>Antillocaprina suboccidentalis</i> Chubb (1967)	
Alencáster et al. (1999a)	<i>Coralliochama gboehmi</i> Böse	<i>Coralliochama gboehmi</i> Böse (1906) [?from Cárdenas]	2124, 2125 IGM
SLP, Cardenas Formation, Amoladeras	<i>Praebarrettia sparcilirata</i> (Whitfield) <i>Coralliochama gboehmi</i> Böse <i>Bournomia cardenasensis</i> (Böse) <i>Durania ojanthalensis</i> Myers	<i>Praebarrettia armini</i> (Götz and Mitchell, 2009) <i>Coralliochama gboehmi</i> Böse, 1906 <i>Biradiolites cardenasensis</i> Böse (1906) <i>Huasteca ojanthalensis</i> (Myers, 1968) [? = <i>Huasteca huasteca</i> (Adkins, 1930)]	
SLP, Cardenas Formation, Cárdenas	<i>Biradiolites rudissimus</i> Trechmann <i>Durania ojanthalensis</i> Myers	<i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Huasteca ojanthalensis</i> (Myers, 1968) [? = <i>Huasteca huasteca</i> (Adkins, 1930)]	
Alencáster et al. (1999b)	<i>Bournomia cardenasensis</i> (Böse) <i>Radiolites macroplicatus</i> Whitfield <i>Coralliochama gboehmi</i> Böse <i>Tampsia floriformis</i> Myers	<i>Biradiolites cardenasensis</i> Böse (1906) <i>Coralliochama gboehmi</i> Böse (1906) <i>Coralliochama gboehmi</i> Böse (1906) <i>Tampsia floriformis</i> Myers (1968)	
SLP, San Luis-Matehuala	<i>Hippurites resectus mexicana</i> Bárcena <i>Eoradiolites</i> cf. <i>liratus</i> (Conrad) <i>Durania austinensis</i> (Römer)	<i>Hippurites resectus</i> Defrance (1821) <i>Eoradiolites liratus</i> Conrad (1852) <i>Potosites tristanorresi</i> Alencáster and Pons, in Pons et al., 2010	IGM
Alencáster et al. (2001)	<i>Vaccinites</i> sp.	<i>Vaccinites macgillavryi</i> Palmer (1933)	
SLP, Cárdenas; Chiapas	<i>Tampsia</i> <i>Praebarrettia</i> <i>Radiolites</i> <i>Bournomia</i> <i>Durania</i> <i>Thyrastylon</i> <i>Coralliochama</i>	<i>Tampsia</i> sp. <i>Praebarrettia</i> sp. <i>Radiolites</i> sp. <i>Bournomia</i> sp. <i>Durania</i> sp. <i>Thyrastylon</i> sp. <i>Coralliochama</i> sp.	

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Author/Localities	Reported taxa	Current identification	Repository
	<i>Hippurites</i> <i>Biradiolites</i> <i>Plagioptychus</i> <i>Sauvagesia</i>	<i>Hippurites</i> sp. <i>Biradiolites</i> sp. <i>Plagioptychus</i> sp. <i>Sauvagesia</i> sp.	
Alencáster and Omaña (2005) SLP, Cárdenas Formation	<i>Biradiolites cardenasensis</i> Böse <i>Biradiolites rudissimus</i> Trechmann <i>Radiolites macroplicata</i> Whitfield <i>Durania ojanchalensis</i> Myers	<i>Biradiolites cardenasensis</i> Böse (1906) <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>?Coralliochama gbohemi</i> Böse (1906) <i>Huasteca ojanchalensis</i> (Myers, 1968) [<i>?Huasteca huasteca</i> (Adkins, 1930)]	
Chis, Angostura Formation	<i>Tampsia floriformis</i> Myers <i>Tampsia bishopi</i> Stephenson <i>Thyrastylon adherens</i> (Whitfield) <i>Coralliochama gbohemi</i> Böse <i>Praebarrettia sparcilirata</i> (Whitfield) <i>Titanosarcolithes</i> <i>Barrettia</i> <i>Macgillavrya</i> <i>Parastroma</i> <i>Antillocaprina</i> <i>Plagioptychus</i>	<i>Tampsia floriformis</i> Myers (1968) <i>?Tampsia bishopi</i> Stephenson (1922) <i>?Thyrastylon?</i> sp. <i>Coralliochama gbohemi</i> Böse (1906) <i>Praebarrettia armini</i> (Götz and Mitchell, 2009) <i>Titanosarcolithes</i> sp. <i>Barrettia</i> sp. <i>?Thyrastylon?</i> sp. <i>Parastroma</i> sp. <i>Antillocaprina</i> sp. <i>Plagioptychus</i> sp.	
Filkorn et al. (2005) Chis, Angostura Formation	<i>Sauvagesia macroplicata</i> (Whitfield, 1897)	"Radiolites" <i>macroplicata</i> Whitfield (1897a)	
Götz et al. (2005) N BC, Rosario Formation	<i>Coralliochama orcutti</i> White	<i>Coralliochama orcutti</i> White (1885)	IGM/PUAB
Oviedo (2006) SLP, Cárdenas, Amoladeras, Cardenas Formation	<i>Biradiolites rudissimus</i> Trechmann, 1924	<i>Trechmannites rudissimus</i> (Trechmann, 1924)	
SLP, Cárdenas, Amoladeras, Cardenas Formation	<i>Bourmonia cardenasensis</i> Böse, 1906	<i>Biradiolites cardenasensis</i> Böse, 1906	
SLP, Llano las hormigas, (El Abra Formation)	<i>Durania arnaldi</i> (Choffat, 1891)	<i>Durania arnaldi</i> Choffat (1886-1902)	
Gro, Almolonga-Hueyitlalpan, Cuautla Formation	<i>Durania curasavica</i> (Martin, 1885)	<i>Durania curasavica</i> Martin (1885)	
SLP, Amoladeras, Cardenas Formation	<i>Durania ojanchalensis</i> Myers, 1968	<i>Huasteca ojanchalensis</i> (Myers, 1968) [<i>? = Huasteca huasteca</i> (Adkins, 1930)]	
Gro, Temalac, Cuautla Formation	<i>Durania</i> nov. sp.	<i>Durania</i> sp.	
SLP, Cerritos, (Cardenas Formation)	<i>Durania?</i> sp.	<i>Durania?</i> sp.	
SLP, La Calera, El Doctor Formation;	<i>Durania</i> sp.	<i>Durania</i> sp.	
SLP, Llano las hormigas, (El Abra Formation)	<i>Eoradiolites liratus</i> (Conrad, 1852)	<i>Eoradiolites liratus</i> (Conrad, 1852)	
SLP, Temazcal; Cantera Cerro El Cristito; El Aguaje, Guadalcázar, (Cardenas Formation)	<i>Radiolites acutocostata</i> (Adkins, 1930)	<i>?Radiolites degolyeri</i> (Stanton, 1921)	
SLP, Cárdenas, Cardenas Formation	<i>Tampsia floriformis</i> Myers, 1968	<i>Tampsia floriformis</i> Myers (1968)	
Chis, Malpaso road (Ocozocoautla Formation)	<i>Thyrastylon adhaerens</i> (Whitfield, 1897)	<i>Thyrastylon adhaerens</i> (Whitfield, 1897a)	
Chis, Ocozocoautla; Río Suchiapa, Ocozocoautla Formation	" <i>Thyrastylon</i> " <i>nicholasi</i> (Whitfield, 1897)	<i>Thyrastylon? nicholasi</i> (Whitfield, 1897a)	
SLP, Temaxcal; Cantera Cerro El Cristito, (Cardenas Formation)	<i>Radiolitidae</i> nov. gen.	<i>Potosites tristanatorresi</i> Alencáster and Pons, in Pons et al., 2010	
SLP, Cárdenas, Cardenas Formation	<i>Coralliochama gboehmi</i> Böse, 1906	<i>Coralliochama gboehmi</i> Böse (1906)	
SLP, Cárdenas, Amoladeras, Cardenas Formation	<i>Mitrociprina tschoppi</i> (Palmer, 1933)	<i>Mitrociprina tschoppi</i> (Palmer, 1933)	
Chis, Ocozocoautla, Ocozocoautla Formation	<i>Plagioptychus muellerriedi</i> Alencáster, 1971	<i>Plagioptychus muellerriedi</i> Alencáster (1971)	
SLP, La Calera, El Doctor Formation; Llano las hormigas, (El Abra Formation)	<i>Hippurites resectus</i> DeFrance, 1821	<i>Hippurites resectus</i> DeFrance (1821)	
SLP, Amoladeras; Cardenas Formation; Chiapas, Malpaso road (Angostura Formation)	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897)	pars <i>Praebarrettia armini</i> Götz and Mitchell (2009); pars <i>Praebarrettia sparcilirata</i> Whitfield (1897b)	
SLP, Sierra de la Ruda, (El Abra Formation); Gro., La Esperanza; Almolonga-Hueyitlalpan, Cuautla Formation	<i>Vaccinites macgillavryi</i> Palmer, 1933	<i>Vaccinites macgillavryi</i> Palmer (1933)	
Chis, Cantera rancho El Comiteco, (Angostura Formation)	<i>Vaccinites vermunti</i> Mac Gillavry, 1937	<i>Vaccinites vermunti</i> MacGillavry, 1937	
SLP, Temaxcal; Cantera Cerro El Cristito, (Cardenas Formation)	<i>Vaccinites</i> nov. sp.	<i>Vaccinites vermunti</i> MacGillavry, 1937	
Chis, Malpaso road (Ocozocoautla Formation)	<i>Antillocaprina pugniformis</i> (Palmer, 1933)	<i>Antillocaprina quadrangularis</i> (Whitfield, 1897a)	
Chis, Malpaso road (Ocozocoautla Formation)	<i>Titanosarcolithes giganteus</i> (Whitfield, 1897)	pars <i>Titanosarcolithes giganteus</i> (Whitfield, 1897a); pars <i>Alencasteria macrotubularis</i> Mitchell (2013)	
Chis, Vega del Paso	<i>Titanosarcolithes macgillavryi</i> Alencáster, 1971	<i>Stellacaprina macgillavryi</i> (Alencáster, 1971)	
Chis, Malpaso road, rancho La Peregrina (Ocozocoautla Formation)	<i>Titanosarcolithes</i> nov. sp.	<i>Alencasteria macrotubularis</i> Mitchell (2013)	
Schafhauser and Karlsruhe (2006) SLP, Cardenas Formation	<i>Mitrociprina</i> cf. <i>tschoppi</i> Palmer, 1933 <i>Coralliochama gboehmi</i> Böse, 1906 <i>Macgillavrya nicholasi</i> (Whitfield, 1897) <i>Bourmonia cardenasensis</i> (Böse, 1906) <i>Tampsia poculiformis</i> Myers, 1968 <i>Hippurites perkinsi</i> Myers, 1968	<i>?Mitrociprina tschoppi</i> Palmer (1933) <i>Coralliochama gboehmi</i> Böse (1906) <i>?Thyrastylon? nicholasi</i> Whitfield (1897a) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Tampsia floriformis</i> Myers (1968) <i>Caribbea muellerriedi</i> (Vermunt, 1937)	

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Author/Localities	Reported taxa	Current identification	Repository
Oviedo et al. (2007) SLP	<i>Praebarrettia? sparcilirata</i> (Whitfield, 1897)	<i>Praebarrettia armini</i> (Götz and Mitchell, 2009)	IGM/PUAB
SLP; Gro.	<i>Hippurites resectus</i> Defrance, 1821 <i>Durania arnaudi</i> (Choffat, 1891) <i>Vaccinites macgillavryi</i> Palmer, 1933 <i>Durania curasavica</i> (Martin, 1885)	<i>Hippurites resectus</i> Defrance (1821) <i>Durania arnaudi</i> Choffat (1886-1902) <i>Vaccinites macgillavryi</i> Palmer (1933) <i>Durania curasavica</i> Martin (1885)	
SLP, Non-designed massive limestones unit	<i>Vaccinites</i> n. sp. <i>Barrettia monilifera</i> Woodward, 1862 <i>Torreites sanchezi</i> (Douvillé, 1927) <i>Radiolites acutocostata</i> (Adkins, 1930)	<i>Vaccinites vermunti</i> MacGillavry, 1937 <i>Barrettia ruseae</i> Chubb (1967) <i>Torreites sanchezi</i> (Douvillé, 1927) <i>?Radiolites degolyeri</i> (Stanton, 1921)	
SLP, Cardenas Formation (lower)	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897) <i>Biradiolites rudissimus</i> Trechmann, 1924 <i>Bournomia cardenasensis</i> (Böse, 1906) <i>Durania ojanchalensis</i> Myers, 1968	<i>Praebarrettia armini</i> (Götz and Mitchell, 2009) <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Huasteca ojanchalensis</i> (Myers, 1968) [<i>? = Huasteca huasteca</i> (Adkins, 1930)]	
SLP, Cardenas Formation (upper)	<i>Mitrocaprina tschoppi</i> (Palmer, 1933) <i>Hippurites muellerriedi</i> Vermunt, 1937 <i>Tampsia floriformis</i> Myers, 1968	<i>Mitrocaprina tschoppi</i> (Palmer, 1933) <i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Tampsia floriformis</i> Myers (1968)	
Schafhauser and GötzStinnesbeck (2007) SLP, Cardenas Formation	<i>Mitrocaprina</i> cf. <i>tschoppi</i> Palmer <i>Coralliochama gboehmi</i> Böse <i>Durania ojanchalensis</i> Myers	<i>?Mitrocaprina tschoppi</i> Palmer (1933) <i>Coralliochama gboehmi</i> Böse (1906) <i>Huasteca ojanchalensis</i> (Myers, 1968) [<i>? = Huasteca huasteca</i> (Adkins, 1930)]	
	<i>Macgillavryia nicholasi</i> (Whitfield) <i>Biradiolites aguilerae</i> Böse <i>Bournomia cardenasensis</i> Böse <i>Tampsia poculiformis</i> Myers <i>Tampsia floriformis</i> Myers <i>Hippurites perkini</i> Myers <i>Hippurites muellerriedi</i> (Vermunt) <i>?Praebarrettia sparcilirata</i> (Whitfield)	<i>?Thyrastylon? nicholasi</i> Whitfield (1897a) <i>Biradiolites aguilerae</i> Böse (1906) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Tampsia floriformis</i> Myers (1968) <i>Tampsia floriformis</i> Myers (1968) <i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Praebarrettia armini</i> (Götz and Mitchell, 2009)	
Pichardo (2008) SLP, Non-designed limestones unit	<i>Biradiolites</i> sp. <i>Durania</i> sp. <i>Radiolites acutocostata</i> (Adkins, 1930) <i>Radiolitidae</i> nov. gen.	<i>Biradiolites</i> sp. <i>Durania</i> sp. <i>?Radiolites degolyeri</i> (Stanton, 1921) <i>Potosites tristanorresi</i> Alencáster and Pons, in Pons et al., 2010	PUAB
	<i>Mitrocaprina</i> sp. <i>Plagioptychus</i> sp. <i>Barrettia monilifera</i> Woodward, 1862 <i>Torreites sanchezi</i> (Douvillé, 1927) <i>Vaccinites</i> sp.	<i>Mitrocaprina</i> sp. <i>Plagioptychus</i> sp. <i>Barrettia ruseae</i> Chubb (1967) <i>Torreites sanchezi</i> (Douvillé, 1927) <i>Vaccinites vermunti</i> MacGillavry, 1937	
Götz and Mitchell (2009) SLP, Cardenas Formation	<i>Laluzia armini</i> Götz and Mitchell, 2009	<i>Praebarrettia armini</i> (Götz and Mitchell, 2009)	IGM 9023,9017, 9020-9022, 8888 IGM/PUAB/FCMP 09/032
Pons et al. (2010) SLP, Temaxcal limestones	<i>Potosites tristanorresi</i> Alencáster and Pons	<i>Potosites tristanorresi</i> Alencáster and Pons, in Pons et al. (2010)	
	<i>Radiolites acutocostata</i> (Adkins, 1930) <i>Barrettia</i> cf. <i>ruseae</i> Chubb, 1967 <i>Torreites sanchezi</i> (Douvillé, 1927) <i>Vaccinites vermunti</i> Mac Gillavry, 1937 <i>Plagioptychus</i> sp. <i>Plagioptychidae</i> genus indeterminate A <i>Plagioptychidae</i> genus indeterminate B <i>Antillocaprinidae</i> genus indeterminate	<i>?Radiolites degolyeri</i> (Stanton, 1921) <i>Barrettia</i> cf. <i>ruseae</i> Chubb (1967) <i>Torreites sanchezi</i> (Douvillé, 1927) <i>Vaccinites vermunti</i> MacGillavry, 1937 <i>Plagioptychus</i> sp. <i>Plagioptychidae</i> genus indeterminate <i>Plagioptychidae</i> genus indeterminate <i>Antillocaprinidae</i> genus indeterminate	1288 719 1286 712, 81000 0919 684 = 9537 1286 706 81016 9538
Mitchell and Pons (2010) Tamps, Mendez Formation Mitchell (2013) Chis	<i>Chiapasella aguila</i> (Adkins, 1930) <i>Caenosarcolites oddensis</i> (Stephenson, 1938) <i>Antillocaprina suboccidentalis</i> Chubb, 1968 <i>Rotacaprina? trilobata</i> (García-Barrera and Avendaño) <i>Alencasteria macrotubularis</i> Mitchell, 2013 <i>Stellacaprina macgilavryi</i> (Alencáster, 1971) <i>? Oligosarcolites monotubularis</i> Mitchell and Gunter, 2006	<i>Chiapasella aguila</i> (Adkins, 1930) <i>Caenosarcolites oddensis</i> (Stephenson, 1938) <i>Antillocaprina suboccidentalis</i> Chubb (1967) <i>Rotacaprina? trilobata</i> (García-Barrera and Avendaño, in García Barrera et al., 1998) <i>Alencasteria macrotubularis</i> Mitchell (2013) <i>Stellacaprina macgilavryi</i> (Alencáster, 1971) <i>? Oligosarcolites monotubularis</i> Mitchell and Gunter (2006)	TMM BEG2066.5 IGM
Pons et al. (2013) SLP, Cardenas Formation	<i>Biradiolites aguilerae</i> Böse, 1906 <i>Biradiolites cardenasensis</i> Böse, 1906 <i>Huasteca ojanchalensis</i> (Myers, 1968) <i>Tampsia floriformis</i> Myers, 1968 <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Caribbea muellerriedi</i> (Vermunt, 1937)	<i>Biradiolites aguilerae</i> Böse (1906) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Huasteca ojanchalensis</i> (Myers, 1968) [<i>? = Huasteca huasteca</i> (Adkins, 1930)] <i>Tampsia floriformis</i> Myers (1968) <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Caribbea muellerriedi</i> (Vermunt, 1937) <i>Praebarrettia armini</i> (Götz and Mitchell, 2009)	IGM/PUAB

(continued on next page)

(continued)

Author/Localities	Reported taxa	Current identification	Repository
Pons et al. (2016) Chis, Suchiapa Formation (Angostura Block)	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897) sensu lato <i>Coralliochama gboehmi</i> Böse, 1906 <i>Mitrocaprina tschoppi</i> (Palmer, 1933)	<i>Coralliochama gboehmi</i> Böse (1906) <i>Mitrocaprina tschoppi</i> (Palmer, 1933)	IGM/PUAB/FCMP
	<i>Alencasteria macrotubularis</i> Mitchell <i>Stellacaprina? macgillavryi</i> (Alencáster) Antillocaprinidae indet. “Postcaprinula” Alencáster (in collection) <i>Barrettia monilifera</i> Woodward, Whitfieldiella gigas (Chubb) <i>Parastroma trechmanni</i> Chubb <i>Plagioptychus</i> sp. <i>Mitrocaprina</i> sp. <i>Alencasterites mooretownensis</i> (Trechmann) <i>Bournonia baileyi</i> Chubb, <i>Biradiolites?</i> sp. <i>Thyrastylon? nicholasi</i> (Whitfield) Antillocaprinidae indet.	<i>Alencasteria macrotubularis</i> Mitchell (2013) <i>Stellacaprina? macgillavryi</i> (Alencáster, 1971) Antillocaprinidae indet. “Postcaprinula” Alencáster (in collection IGM) <i>Barrettia monilifera</i> Woodward (1862) <i>Barrettia gigas</i> (Chubb, 1955) <i>Parastroma trechmanni</i> Chubb (1967) <i>Plagioptychus antillarum</i> (Douvillé, 1927) <i>Mitrocaprina</i> sp. <i>Alencasterites mooretownensis</i> (Trechmann, 1924) <i>Bournonia baileyi</i> Chubb (1967) <i>Biradiolites?</i> sp. <i>Thyrastylon? nicholasi</i> Whitfield (1897a) Antillocaprinidae indet.	
Chis, Suchiapa Formation (Tuxtla Gutiérrez Block)	<i>Barrettia</i> sp. cf. <i>B. ruseae</i> Chubb <i>Vaccinites vermunti</i> Mac Gillavry <i>Radiolites acutocostata</i> (Adkins) <i>Potosites tristantorresi</i> Alencáster and Pons	<i>Barrettia</i> sp. cf. <i>B. ruseae</i> Chubb (1967) <i>Vaccinites vermunti</i> MacGillavry, 1937 ? <i>Radiolites degolyeri</i> (Stanton, 1921) <i>Potosites tristantorresi</i> Alencáster and Pons, in Pons et al., 2010	IGM/PUAB/FCMP
	<i>Chiapasella</i> sp. <i>Praebarrettia sparcilirata</i> (Whitfield) <i>Plagioptychus muellerriedi</i> Alencáster <i>Biradiolites cardenasensis</i> Böse <i>Chiapasella radiolitiformis</i> (Trechmann) <i>Huasteca ojanthalensis</i> (Myers)	<i>Chiapasella</i> sp. <i>Praebarrettia sparcilirata</i> (Whitfield, 1897b) <i>Plagioptychus muellerriedi</i> Alencáster (1971) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Chiapasella radiolitiformis</i> (Trechmann, 1924) <i>Huasteca ojanthalensis</i> (Myers, 1968) [= <i>Huasteca huasteca</i> (Adkins, 1930)]	
Chis, Angostura Formation	<i>Thyrastylon? nicholasi</i> (Whitfield) <i>Trechmannites rudissimus</i> (Trechmann) <i>Antillocaprina pugniformis</i> (Palmer) <i>Antillocaprina trilobata</i> (García Barrera and Avendaño)	<i>Thyrastylon? nicholasi</i> Whitfield (1897a) <i>Trechmannites rudissimus</i> (Trechmann, 1924) <i>Antillocaprina quadrangularis</i> Whitfield (1897a) pars <i>Rotacaprina? trilobata</i> García Barrera and Avendaño, in García Barrera et al., 1998; pars <i>Antillocaprina suboccidentalis</i> Chubb (1967)	IGM/PUAB/FCMP
	<i>Caenosarcolites oddsensis</i> (Stephenson) <i>Caenosarcolites scholaris</i> Mitchell <i>Eosarcolites radiatus</i> Mitchell <i>Titanosarcolites giganteus</i> (Whitfield) Antillocaprinidae indet. <i>Plagioptychus</i> sp. <i>Mitrocaprina</i> sp. “ <i>Radiolites</i> ” <i>macroplicatus</i> Whitfield <i>Biradiolites cardenasensis</i> Böse <i>Biradiolites?</i> sp. <i>Bournonia cancellata</i> (Whitfield) <i>Chiapasella radiolitiformis</i> (Trechmann) <i>Thyrastylon adhaerens</i> (Whitfield)	<i>Caenosarcolites oddsensis</i> (Stephenson, 1938) ? ? <i>Titanosarcolites giganteus</i> Whitfield (1897a) Antillocaprinidae indet. <i>Plagioptychus fragilis</i> Chubb (1967) <i>Mitrocaprina tschoppi</i> (Palmer, 1933) “ <i>Radiolites</i> ” <i>macroplicatus</i> Whitfield (1897a) <i>Biradiolites cardenasensis</i> Böse (1906) <i>Biradiolites?</i> sp. <i>Bournonia cancellata</i> Whitfield (1897a) <i>Chiapasella radiolitiformis</i> (Trechmann, 1924) <i>Thyrastylon adhaerens</i> Whitfield (1897a)	
Pons et al. (2017)			IGM/PUAB/FCMP
Chis, Suchiapa Formation (Angostura Block)	<i>Plagioptychus antillarum</i> (Douvillé, 1927) <i>Mitrocaprina</i> sp.	<i>Plagioptychus antillarum</i> (Douvillé, 1927) <i>Mitrocaprina</i> sp.	
Chis, Ocozacoautla Formation	<i>Plagioptychus muellerriedi</i> Alencáster, 1971	<i>Plagioptychus muellerriedi</i> Alencáster (1971)	IGM/PUAB/FCMP
Chis, Angostura Formation (Tuxtla Gutiérrez Block)	<i>Plagioptychus fragilis</i> Chubb, 1967	<i>Plagioptychus fragilis</i> Chubb (1967)	
Pons et al. (2019)			IGM/PUAB/FCMP
Chis, Suchiapa Formation (Tuxtla Gutiérrez Block)	<i>Mitrocaprina tschoppi</i> (Palmer, 1933) <i>Vaccinites vermunti</i> Mac Gillavry, 1937	<i>Mitrocaprina tschoppi</i> (Palmer, 1933) <i>Vaccinites vermunti</i> MacGillavry, 1937	
Chis, Suchiapa Formation (Angostura Block)	<i>Barrettia</i> cf. <i>ruseae</i> Chubb, 1955 <i>Barrettia monilifera</i> Woodward, 1862 <i>Barrettia gigas</i> Chubb, 1955 <i>Parastroma trechmanni</i> Chubb, 1967	<i>Barrettia</i> cf. <i>ruseae</i> Chubb (1967) <i>Barrettia monilifera</i> Woodward (1862) <i>Barrettia gigas</i> Chubb (1955) <i>Parastroma trechmanni</i> Chubb (1967)	IGM/PUAB/FCMP
Chis, Ocozacoautla Formation	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897)	<i>Praebarrettia sparcilirata</i> (Whitfield, 1897b)	

Mexican States abbreviations: BC=Baja California; Chih = Chihuahua; Chis = Chiapas; Coah = Coahuila; Gro = Guerrero; Jal = Jalisco; Mex = México; Mich = Michoacan; Mor = Morelos; NL=Nuevo León; Qro = Querétaro; SLP=San Luis Potosí; Tamps = Tamaulipas; Ver = Veracruz Institutional repositories abbreviations in text: 2. Material and methods. Not visited collections are indicated in bold.

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