



## *Stratigraphic study of the Sierra Santa Rita*

Ing. Jorge Tovar

1969, pp. 165-170. <https://doi.org/10.56577/FFC-20.165>

*in:*

*The Border Region, Chihuahua and the United States*, Cordoba, D. A.; Wengerd, S. A.; Shomaker, J. W.; [eds.], New Mexico Geological Society 20<sup>th</sup> Annual Fall Field Conference Guidebook, 228 p. <https://doi.org/10.56577/FFC-20>

---

*This is one of many related papers that were included in the 1969 NMGS Fall Field Conference Guidebook.*

---

## **Annual NMGS Fall Field Conference Guidebooks**

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual [Fall Field Conference](#) that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

### **Free Downloads**

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

### **Copyright Information**

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

*This page is intentionally left blank to maintain order of facing pages.*

# STRATIGRAPHIC STUDY OF THE SIERRA SANTA RITA

by  
ING. JORGE TOVAR  
Petróleos Mexicanos

## ABSTRACT

A detailed reconnaissance study of the Sierra Santa Rita has been made and Paleozoic sedimentary rocks exposed there have been measured. Measurements were made with a planetable, and the total thickness is 1073 meters. The age of the sedimentary rocks is considered to be Leonardian. Two litho stratigraphic units were differentiated: the lower unit is dolomite which is thought to correlate with the Concha Formation exposed in the Palomas Mountains in Chihuahua and in New Mexico; the upper unit of sandstone, shale and dolomite, in this paper is called (informally) the Santa Rita formation. In addition to the stratigraphic column, a location-map of the area of study is included (Figure 1). A stratigraphic correlation table (Figure 2), gives a perspective of the Paleozoic outcrops in the states of Chihuahua and eastern Sonora. A correlation with the exposed section in the Big Hatchet Mountains, which was measured and described by Robert A. Zeller, is also included.

## RESUMEN

Se efectuó un reconocimiento detallado de la Sierra de Santa Rita, habiéndose medido el total de sedimentos Paleozoicos que en ella afloran, tales mediciones se hicieron con plancheta y el espesor medido correspondió a 1073 mts. La edad de los sedimentos se consideró Leonardiana, se diferenciaron dos unidades litoestratigráficas, la inferior de dolomias que a nuestro parecer puede corresponder a la Formación Concha expuesta en las Montañas Palomas, Chihuahua, y en Nuevo Mexico; la superior de areniscas, lutitas y dolomias, que en este trabajo nombramos informalmente como Formación Santa Rita. Además de la columna estratigráfica, se anexan un plano de localización del área en cuestión Figura No. 1, y una tabla de correlación estratigráfica Figura No. 2, que nos da una semblanza de los afloramientos paleozoicos en los Estados de Chihuahua, Oriente de Sonora, y su correlación con la columna expuesta en las Montañas Big Hatchet la cual fue medida y descrita por el Robert A. Zeller.

## INTRODUCTION

The object of this paper is to present the latest studies that have been undertaken in the Sierra Santa Rita, since they provide new data mainly concerning stratigraphy. The presence of sandstone facies, suggesting near-shore shallow-water deposits in northern Mexico in the upper part of the Leonard, has been observed by me only in the Sierra Santa Rita and in Sierra La Salada, which is located immediately to the north of the town of Ascension, Chihuahua. These facies, and the great increase in thickness, indicate a notable change in the depositional conditions for this area. These data will aid in the interpretation of the regional Paleozoic paleogeography.

The area in question has been previously studied by the following personnel from Petróleos Mexicanos: Ingenieros Eduardo Rodriguez S., Teodoro Diaz G., and Arsenio Navarro G. Preliminary photogeologic work also has been done by the Instituto de Geología of the Universidad Nacional Autónoma de Mexico.

## STRATIGRAPHY

A complete stratigraphic column of Paleozoic rocks exposed in the Sierra Santa Rita was measured. This mountain range is located in the Basin and Range physiographic province. The range is relatively narrow and long with a regional northwest-southeast alignment, as is typical of this part of the province. The northeastern flank of Sierra Santa Rita is a large fault escarpment. Dipping beds exposed in the escarpment form a cuesta sloping to the

southwest. The fault parallels the front of the range and is a normal fault showing its maximum displacement in the extreme south, where, except for a short covered area, it separates the Leonard sedimentary rocks of the mountain from the middle Albian rocks that crop out in the foothills.

In the extreme northern part of the range, and separated from it by 80 meters of cover, 30 meters of sandstones which crop out are in probable fault contact with a 70-meter thick section of dolomite that is overlain by 100 meters of sandstone (Diaz and Navarro, 1964, p. 80). In my opinion this sequence of sedimentary rocks corresponds to the aforementioned frontal faulted block, because the sandstone that caps this section is also found capping the section exposed in the mountain. In addition to the frontal fault, which appears to bifurcate in the extreme north, there exist transverse faults that affect mainly the northern part of the range.

## LOWER PERMIAN

Concha Formation—Even though there are certain differences, like the increase of dolomite, disappearance of limestone, great increase of thickness, larger content of chert, and presence of sporadic sandy horizons, in this paper I call the 670 meter sequence of dolomite (Figure

## PLANO DE LOCALIZACION DE LA SIERRA DE STA. RITA.

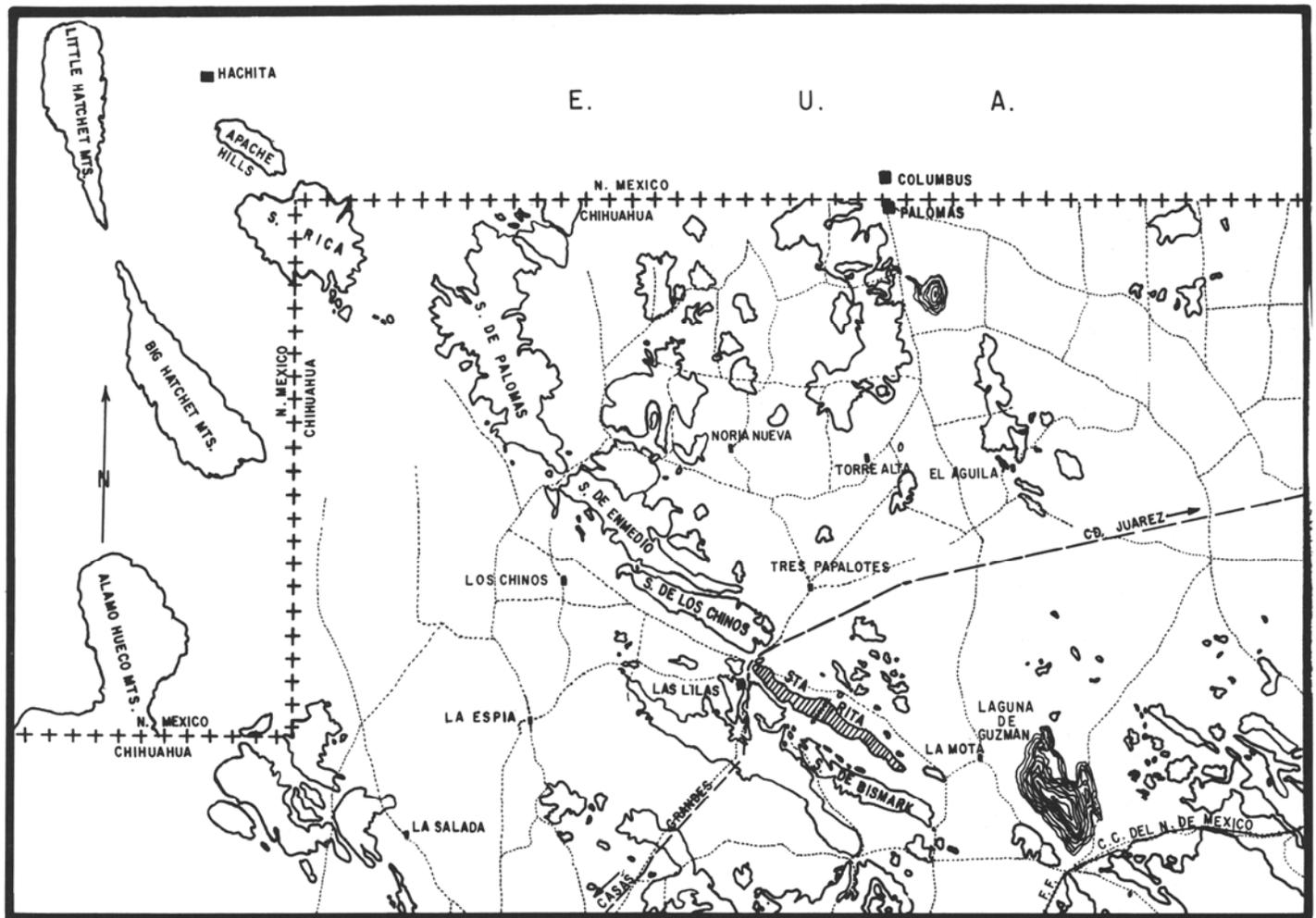


FIGURE 1

AREA ESTUDIADA  
SECCION MEDIDA.



0 5 10 15 20 30 40  
E S C A L A  
K I L O M E T R O S

3), which form the Sierra Santa Rita, the Concha Formation, because it is thought to be the equivalent of similar rocks cropping out in Sierra Palomas, Chihuahua, and in the Big Hatchet Mountains, New Mexico. Several facies changes present in Sierra Santa Rita are not considered to be sufficiently important to merit another formational name. On the other hand, the faunas, with the exception of the presence of fusulinids, is very similar to that present in Sierra Palomas and the Big Hatchet Mountains.

In the area of study, the basal 235 meters are composed of saccharoidal to microcrystalline dolomite in beds of 0.25 to 1.60 meters, with predominantly gray to violet-gray colors, and with light gray to white chert nodules that weather to yellowish-brown color, being more abundant in its middle and lower part. Fusulinids are present in rocks 33 meters above the base. These fusulinids, like those that have been subsequently found, were studied by William E. King of New Mexico State University. He based his identification and the Leonardian (?) age designation exclusively on size, form and silicified features, because the

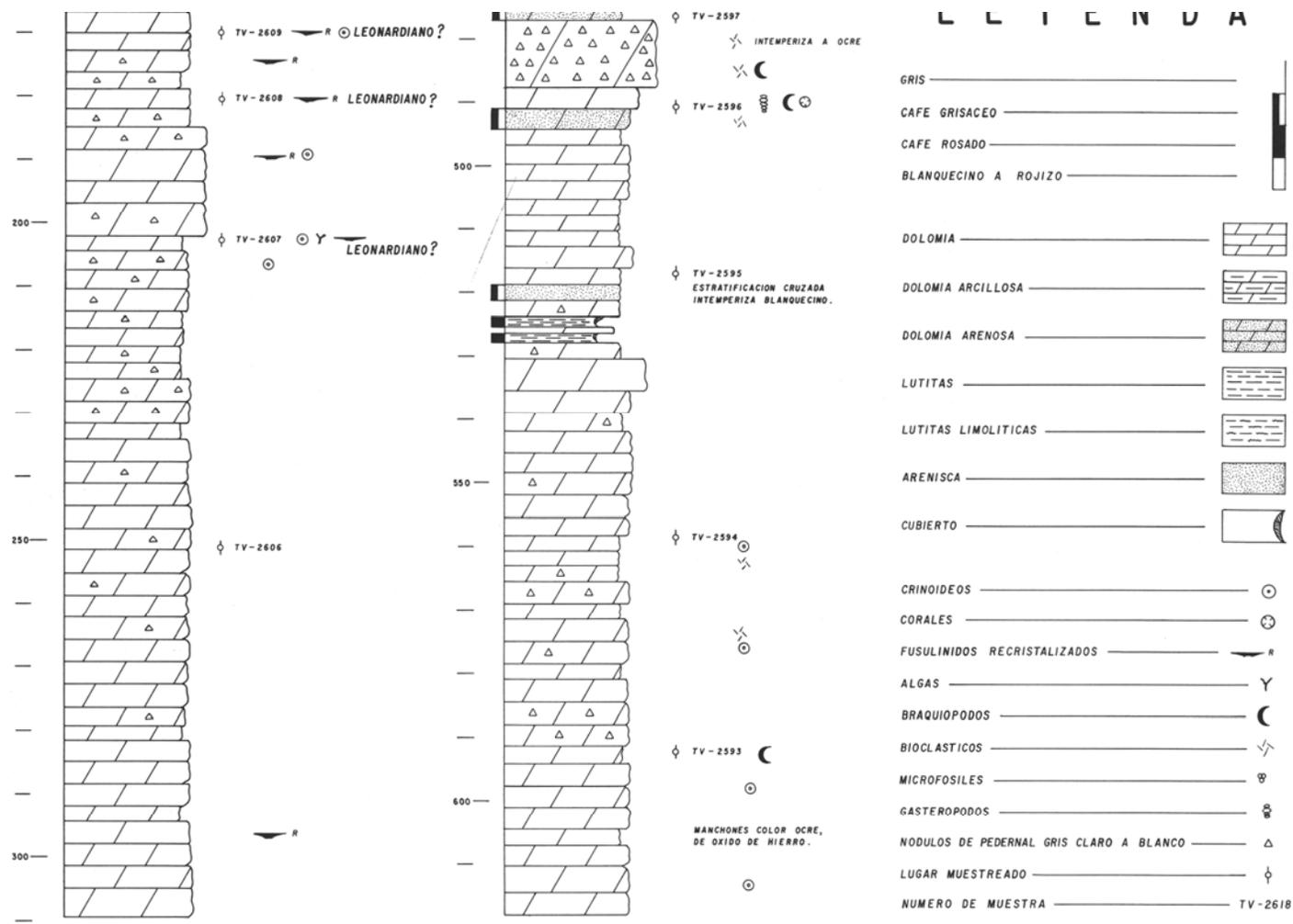
fusulinids were too badly recrystallized and silicified for specific identification. Previously, R. V. Hollingsworth of the Paleontological Laboratory in Midland, Texas, made a similar identification of the fusulinids collected in the same mountains. King also has studied well-preserved fusulinids of Leonardian age from rocks held to be equivalent in the Sierra La Salada. In addition to the fusulinids, crinoids are abundant throughout the section, and brachiopods and bryozoans are present at some horizons.

The middle member consists of 117 meters of gray microcrystalline to saccharoidal dolomite in beds of 0.20 to 1.50 meters, with a few interbeds of reddish-brown, silty shale, grayish-brown sandy dolomite and one bed of sandstone. It contains abundant light-gray chert in its middle part which weathers to yellowish brown. Its fauna consists of fusulinids, corals, brachiopods, gastropods and crinoids, all of which are in isolated zones.

The upper member 318 meters thick, consists exclusively







**LEONARDIANO  
DE LA SIERRA  
DE STA. RITA**

*Sección medida aproximadamente  
a 9 Km. al S74° E  
del Rancho Las Lilas*

ING. JORGE TOVAR R.  
MAYO-1969

FIG. 3

sandstone (in part calcareous), which weather to purplish-red and yellowish-brown. Red and yellow medium-bedded siltstone and red to gray and reddish-yellow shale zones up to 10 meters in thickness are present. Near the top of this member an igneous intrusion was observed similar to those previously mentioned. Member no. 4 contains 38 meters of principally medium-to-thick-bedded gray dolomite with chert nodules. Interbedded light gray to reddish quartzitic sandstone, in part calcareous and conglomeratic, are also present. The dolomite contains brachiopod and small gastropods typical of the Leonardian.

The top of the Santa Rita formation is tentatively placed where calcareous conglomerate with fragments of limestone, dolomite, and chert first appears. Above this conglomerate there are light-gray and reddish calcareous siltstone, red sandstone, and shale, which apparently belong to the Lower Cretaceous. Above the exposed section of Santa Rita formation there is a large covered area succeeded by sedimentary rocks of definite Cretaceous age.

The other measured section of the Santa Rita formation was made in the previously described Concha Formation locality (Figure 3). At this locality the Santa Rita formation consists of 94 meters of predominantly white to reddish sandstones, with isolated interbeds of thin-to-thick-bedded sandy and clayey dolomite, and silty shale in beds up to 8 meters in thickness. The dolomite contains some poorly preserved fusulinids.

This section probably corresponds to Member no. 1 measured in the canyon southeast of Rancho Las Lilas, as the upper part of the member at that locality was covered or faulted.

## CONCLUSIONS AND RECOMMENDATIONS

1. The high porosity possessed by some of the dolomites in the Concha Formation exposed in the Sierra Santa Rita, represents an attractive feature in the subsurface, in that they may be potential reservoir rocks for hydrocarbons.
2. Sandstones in the Santa Rita formation in the subsurface, under favorable conditions, could also be good hydrocarbon reservoirs.
3. The Sierra Santa Rita appears to be the southwestern flank of a normally faulted anticline, whose northeastern flank is downthrown toward the northeast. This buried faulted structure may also represent a potential accumulation site for hydrocarbons. Because of this, it is recommended that a seismicographic survey be conducted of this area, and if the buried structure is confirmed, that it be drilled.

## REFERENCES CITED

- Diaz, Teodoro and Navarro, Arsenio, 1964, Lithology and Stratigraphic Correlation of the Upper Paleozoic in the Region of Palomas, Chihuahua: West Tex. Geol. Soc. Publication No. 64-50 (Geology of Mina Plomosas-Placer de Guadalupe Area, Chihuahua, Mexico) p. 65-84.
- Ramirez, J. C. and Acevedo F., 1957, Notas sobre la Geologia de Chihuahua: Bol. Assoc. Mexicana Geol. Petrol., vol. 9, nos. 9 y 10 (Sept.-Oct.), pp. i-xiv, 583-770; publicado por primera vez en Julio de 1958.
- Rodriguez, S. E., 1956, Estratigrafia de la Region Paleozica de Palomas, Chihuahua: Inf. Geol. Petroleos Mexicanos, NE-M, 656 (inedito).
- Zeller, R. A., 1965, Stratigraphy of the Big Hatchet Mountains Area, New Mexico: New Mex. Inst. Mining and Technology, State Bureau of Mines and Min. Resources, Memoir 16.
- Editor's note: See first day's road log for published columnar sections from Diaz and Navarro paper.



View south into Mexico from top of Big Hatchet Peak in Hidalgo County, New Mexico. Large SE plunging U-Bar syncline in middle ground is rimmed by Lower Cretaceous reef limestone. Alamo Hueco Mountains in near background.

Photo by Robert A. Zeller, Jr.