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CENOMANIAN AMMONITES FROM THE  
SIERRA DE TLAHUALILO, COAHUILA, MEXICO

BY

LEWIS B. KELLUM and LEIGH W. MINTZ



from the

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MUSEUM OF PALEONTOLOGY  
THE UNIVERSITY OF MICHIGAN  
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10. Cenomanian Ammonites from the Sierra de Tlahualilo, Coahuila, Mexico, by Lewis B. Kellum and Leigh W. Mintz. Pages 267-287, with 8 plates and 1 figure.

## CENOMANIAN AMMONITES FROM THE SIERRA DE TLAHUALILO, COAHUILA, MEXICO

BY

LEWIS B. KELLUM and LEIGH W. MINTZ

### CONTENTS

Introduction .....	267
Acknowledgments .....	269
Fossil localities, their geographic and stratigraphic relations .....	269
Correlation .....	271
Systematic paleontology	
<i>Mantelliceras charlestoni</i> , sp. nov. ....	272
<i>Mantelliceras portalesi</i> , sp. nov. ....	273
<i>Graysonites reynoldsi</i> , sp. nov. ....	274
Genus <i>Tlahualiloceras</i> , gen. nov. ....	275
<i>Tlahualiloceras tlahualiloensis</i> , sp. nov. ....	276
<i>Budaiceras franciscoensis</i> , sp. nov. ....	277
<i>Budaiceras mexicanum</i> Böse .....	278
Literature cited .....	279
Plates .....	(After) 279

### INTRODUCTION

THE FOSSILS described in this paper were collected in the Cuenca de Francisco in the northern part of the Sierra de Tlahualilo, in southwestern Coahuila, Mexico. Lower Cretaceous Aurora limestone is exposed in the uplifts surrounding the Cuenca. The overlying Indidura formation is widely distributed in the basin. The fossils are from the Indidura formation and were collected in August, 1961.

An unimproved road from the Acatita Valley, which borders the Sierra de Tlahualilo on the east, enters the Cuenca de Francisco from the northeast and extends southward to Francisco canyon. The canyon, draining northward into the Cuenca (or basin) from the central part of the range, is midway between the twin peaks of Las Posas on the east and El Barro on the west. Each of these peaks is on the flank of a domed uplift at the margins of the range. The central part of the Sierra de Tlahualilo in the north, is therefore synclinal. A zone of steep dips connects the north flank of the two domes. It forms a monoclinial structure, of steep northward-dipping strata, which extends east-west across the range. This monocline forms the southern boundary of the Cuenca de Francisco. On the west the

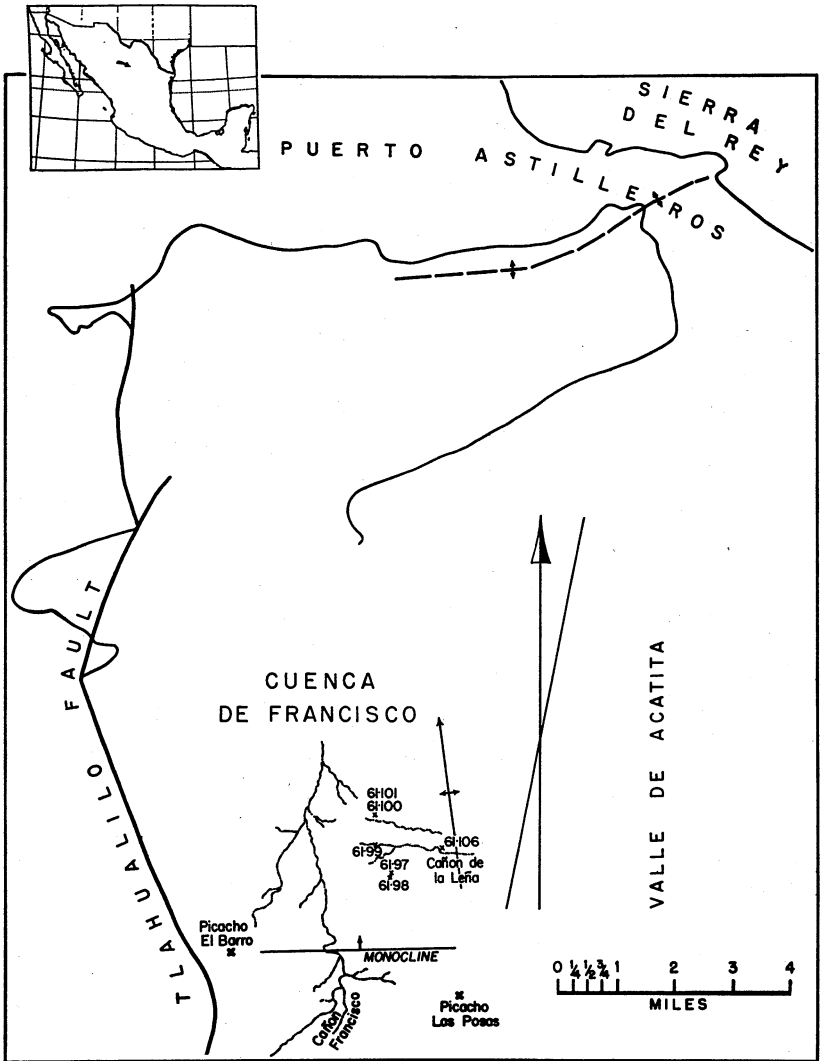


FIG. 1. Index map of fossil localities in the Cuenca de Francisco. Inset shows location of area covered by the index map.

Cuenca is bounded by the Tlahualilo fault which extends northward along the western side of the range. On the east is a broad, low, anticlinal fold which trends northward from the Las Posas uplift and plunges beneath the plain before reaching the northern end of the range. At the northern end

of the Sierra de Tlahualilo is another broad, low, anticlinal fold which trends east-west. This cross-fold is at the northern boundary of the Cuenca de Francisco, which, therefore, is a structural basin between two zones of crossfolding.

Specimens described in this paper are deposited in the Museum of Paleontology of The University of Michigan (UMMP).

#### ACKNOWLEDGMENTS

In August, 1961, the senior author spent a week in the Cuenca de Francisco accompanied by Ingenieros Santiago Reynolds, Santiago Charleston, and Jesús Alfonso Zwanziger of Petroleos Mexicanos. He wishes to express appreciation to these three geologists who assisted him in the field and to Ingeniero Raul Perez Fernandez, General Superintendent of Exploration in the Northeastern District for Petroleos Mexicanos, who arranged for them to take part in the project. Their field expenses were financed by Petroleos Mexicanos.

The field work of the senior author was financed by The University of Michigan, Museum of Paleontology. It is part of a larger program of geologic studies in northern Mexico supported by the Geological Society of America (Project 386), the University of Michigan Faculty Research Fund (Projects 115 and 874), and the Michigan Memorial Phoenix Project (Project 62).

Herbert W. Wienert, preparator in the Museum of Paleontology, accompanied the senior author from Ann Arbor, and had responsibility for logistics. Subsequently he photographed the fossils illustrated in this paper. The manuscript was critically read by Dr. C. A. Arnold and Dr. R. V. Kesling, members of the Editorial Board of the *Contributions from the Museum of Paleontology*. Their help is gratefully acknowledged.

#### FOSSIL LOCALITIES

##### THEIR GEOGRAPHIC AND STRATIGRAPHIC RELATIONS

The fossils are from three separate localities within a few miles of each other. Four, or possibly six, stratigraphic horizons are represented. Their lower stratigraphic range is limited by the presence of the underlying *Gryphaea mucronata* zone which, in this area, is widely distributed at the top of the Aurora limestone. The absence of typical Upper Cretaceous (Turonian) species in the collections from the Cuenca de Francisco, and their occurrence about fifteen miles to the south on the western side of the Sierra de Tlahualilo, tends to define the upper stratigraphic range of the ammonites here described.

*Graysonites reynoldsi*, collection 61-106, was found just north of the western end of Cañon de la Leña. It was in the float near the contact between the Indidura formation and the Aurora limestone. Associated with it were *Plesioturritites brazoensis* and *Cymatoceras hilli* from the underlying *Gryphaea mucronata* zone. The specimen of *Graysonites* is better preserved and has a lighter gray color than the other fossils, suggesting that it came from a different bed and that the association of these fossils in the float does not indicate their normal association in the stratigraphic section. In any case, the geographic position of collection 61-106 indicates that the fossils occurring there are from a lower stratigraphic horizon than any of the others found elsewhere in the Indidura formation in the Cuenca de Francisco.

*Mantelliceras charlestoni* and *M. portalesi*, collection 61-98, were found on the side of a gravel-capped knoll located in the southeastern part of the Cuenca de Francisco. The locality is north-northwest of Picacho de las Posas and about a mile S 65° W of Cañon de la Leña. It overlooks the hills to the north and east and is therefore several hundred feet stratigraphically above collection 61-106 which yielded *Graysonites reynoldsi*. Thin beds of buff-colored, chalky limestone, alternating with marly limestone, form a bench on the hillside where the two species of *Mantelliceras* were collected (Pl. I, Figs. 1-2).

*Gryphaea washitaensis* Hill (UMMP 44756), collection 61-97, was collected about 100 feet higher in the section at the highest exposure of bedrock seen here below the gravel. It is S 68° W of Cañon de la Leña.

Since the Indidura formation in the Cuenca de Francisco is nearly horizontal, except near the margins of the basin, the relative stratigraphic position of fossiliferous layers in two widely separated sections is indicated approximately by their elevation. The view shown in Plate II, Figure 1 was taken looking N 15° W from the top of the gravel-capped mesa, on the east side of which collections 61-97 and 61-98 were made. The gravel-capped hills in the center are formed by the Indidura formation, indicated by the light-colored gullies on the lower slopes. Collections 61-99, 61-100, and 61-101 were made here.

In the arroyo on the south side at the foot of these hills an exposure of well-stratified white to buff-colored limestone about 40 feet thick extends along the left side of the stream bed for nearly a thousand feet (Pl. II, Fig. 2). The only fossil found here, collection 61-99, was a single specimen of *Protocardia* sp. cf. *P. texana* (Conrad) (UMMP 44755). This locality is several hundred feet lower in elevation and also stratigraphically than collection 61-98 on the hillside one-half mile to the south.

Near the middle of the hillside to the north of this exposure collection

61-100 was made (Pl. II, Fig. 1). Fossils collected here include *Tlahualiloceras tlahualiloensis*, sp. nov.; *Budaiceras franciscoensis*, sp. nov.; and *Hemiaster calvani*. This locality is approximately at the same elevation as 61-98.

About 25 feet higher stratigraphically than 61-100 we collected fragments of *Budaiceras mexicanum* Böse (UMMP 44719) and *Lima* sp. from the float on the hillside. This is collection 61-101.

The stratigraphic sequence and geographic relation of the fossiliferous localities described above are summarized in Table I.

TABLE I

## STRATIGRAPHIC CORRELATION OF LOCALITIES AND THEIR EQUIVALENTS IN TEXAS

Texas Equivalent Formations	Localities
	61-101 <i>Budaiceras mexicanum</i>
	61-97 <i>Gryphaea washitaensis</i>
Buda Ls.	61-100 <i>Budaiceras franciscoensis</i> ; <i>Tlahualiloceras tlahualiloensis</i> ; <i>Hemiaster calvani</i> .
Buda Ls. or Del Rio Clay	61-98 <i>Mantelliceras charlestoni</i> ; <i>M. portalesi</i>
	61-99 <i>Protocardia</i> sp. cf. <i>P. texana</i> .
Upper Georgetown Ls.	61-106 <i>Graysonites reynoldsi</i>

The fossils of collection 61-100 may not come from exactly the same bed as those of collection 61-98, one-half to three quarters of a mile away, but they occur at nearly the same elevation and are therefore close to the same stratigraphic position.

## CORRELATION

The genus *Graysonites* Young 1958, insofar as known in Texas, is restricted to four formations: the Del Rio clay, the Grayson marl, the top of the Georgetown limestone, and the top of the Main Street limestone. It is of Lower Cenomanian age (Young, 1958, p. 171).

Böse (1927, p. 154) records the genus *Mantelliceras* from the Del Rio

clay. He also lists (p. 27) *Budaiceras* and *Mantelliceras*, from the Buda limestone, which he regards of Upper Cenomanian age in northeastern Coahuila.

Jones (1938, p. 82) places the Del Rio and Buda formations in the Lower Cenomanian and equivalent to strata in the middle of Member 2 of the Indidura formation in Sierra de la Peña, southern Coahuila. The only species in Member 2, so far reported in common with the Indidura strata in the Cuenca de Francisco are *Hemiasper calvani* Clark and *Gryphaea washitaensis* Hill. The only ammonite genus in common is *Mantelliceras*. Adkins (1931, p. 42) says the genus *Mantelliceras* marks the Lower Cenomanian.

Stephenson and others (1942) in the correlation chart of the Atlantic, Gulf Coastal Plain, and Trans-Pecos Texas show the Buda limestone and Del Rio Clay in the Lower Cenomanian in Texas.

In the Cuenca de Francisco the strata which yielded *Graysonites reynoldsi* would therefore be correlated with the upper Georgetown limestone of Texas. The strata from which *Mantelliceras portalesi* and *M. charlestoni* came may be equivalent to either the Del Rio Clay or the Buda limestone of Texas, and to the middle part of Member 2 of the Indidura formation in Sierra de la Peña, Coahuila. The shales which yielded *Tlahualiloceras tlahualiloensis* and *Budaiceras franciscoensis*, and also that which contained *B. mexicanum* would be correlated with the Buda limestone. All are of Lower Cenomanian age.

#### SYSTEMATIC PALEONTOLOGY

Family Acanthoceratidae Hyatt, 1900

Subfamily Mantelliceratinae Hyatt, 1903

Genus *Mantelliceras* Hyatt, 1903

*Genotype*.—By original designation, *Ammonites mantelli* J. Sowerby, 1814, *The Mineral Conchology of Great Britain*, Vol. 1, p. 119, Pl. 55.

***Mantelliceras charlestoni* Kellum and Mintz, sp. nov.**

(Pl. III, Fig. 1-2; Pl. IV, Fig. 1)

*Description*.—Shell inflated, moderately evolute, coiled in one plane; venter narrowly flattened; ribs coarse, prominent, approximately equal in width to the interspaces and crossing the venter without diminution; 23 ribs visible on the nearly complete outer whorl; alternating primary and secondary ribs, faintly tuberculate, the primary ribs beginning at the umbilical border, secondary ribs beginning at or below the middle of the flanks; ribs slightly flexuous, bending backward across the venter; indis-



tinct umbilical, ventrolateral, and one or, possibly, two rows of lateral tubercles. Suture unknown.

*M. charlestoni* closely resembles *M. mantelli* (J. Sowerby) from the Lower Cenomanian of Europe (*Treatise*, p. L. 412, Fig. 1), but is larger with fewer, wider ribs. It is about the same size as *M. budaense* Adkins, from the Buda limestone of Texas, but, on the last whorl, has more ribs which are more closely spaced, and does not show the elevated whorl section of the younger stages mentioned by Adkins (1931, p. 41).

*Dimensions*.—Maximum diameter of shell: 7.83 cm; maximum width of outer whorl near anterior: 3.27 cm; maximum height of outer whorl near anterior: 3.14 cm; width of umbilicus: 1.98 cm.

*Holotype*.—UMMP 44718.

*Occurrence*.—Indidura formation.

*Locality*.—On side of gravel-capped knoll, an erosional remnant at eastern edge of gravel-capped ridge, in the Cuenca de Francisco, S 68° W of Cañon de la Leña, and northwest of Picacho de las Posas. Collection No. 61-98; Accession No. 1961/K-71.

*Remarks*.—We have only a single specimen of this species. It is preserved as an internal mold of buff, hard limestone, with remnants of the shell material adhering. The specimen was collected by Santiago Charleston for whom the species is named.

### ***Mantelliceras portalesi* Kellum and Mintz, sp. nov.**

(Pl. IV, Figs. 3-4)

*Description*.—Shell moderately compressed, moderately evolute, coiled in one plane; venter narrowly flattened; ribs coarse, prominent, approximately equal in width to the interspaces, increasing in width from the umbilicus to the ventrolateral angle, crossing the venter without diminution; twenty-five ribs visible on nearly complete outer whorl; alternating primary and secondary ribs bearing ventrolateral and lateral tubercles; ventrolateral tubercles more prominent on the posterior part of the outer whorl; lateral tubercles obscure; faint umbilical tubercles present on the primary ribs. Umbilical wall vertical; the primary ribs begin at the umbilical border, secondary ribs begin one-fourth of the distance from the umbilicus to the venter; ribs slightly flexuous, bending posteriorly across the venter. Whorl section higher than wide (height/width ratio 1.39), overlapping nearly one-fourth of the inner whorl, concealing the ventrolateral and lateral tubercles.

A single fragmentary leaf-like lobe of the suture is visible on the outer whorl.

*M. portalesi* differs from *M. charlestoni*, sp. nov., with which it occurs, in its greater diameter, less prominent tubercles, and more compressed cross section. At a shell diameter of 7.83 cm the width of whorl is 2.61 cm in *M. portalesi* and is 3.27 in *M. charlestoni*.

*Dimensions*.—Maximum diameter of shell: 10.33 cm; maximum width of outer whorl near anterior: 2.9 cm; maximum height of outer whorl near anterior: 3.9 cm; width of umbilicus: 3.67 cm.

*Holotype*.—UMMP 44721.

*Occurrence*.—Indidura formation.

*Locality*.—On side of gravel-capped knoll, an erosional remnant at eastern edge of gravel-capped ridge, in the Cuenca de Francisco, S 68° W of Cañon de la Leña, and northwest of Picacho de las Posas.

Collection No. 61-98; Accession No. 1961/K-71.

*Remarks*.—We have only a single specimen of the species. It is preserved as an internal mold of hard, buff limestone with remnants of the shell material adhering. The specimen was collected by Santiago Charleston and is named for Rogelio Portales who was associated with the senior author in field work elsewhere in the Sierra de Tlahualilo during the early part of the summer.

#### Genus *Graysonites* Young, 1958

*Genotype*: By original designation, *Graysonites lozoi* Young, 1958, p. 172, Pl. 27, Figs. 1-11, Text-figs. 1b, 1c, 1d, 1f.

#### *Graysonites reynoldsi* Kellum and Mintz, sp. nov.

(Pl. III, Fig. 3; Pl. V, Figs. 3-4)

*Description*.—Shell coiled in one plane, moderately compressed, moderately evolute with slight overlap barely concealing the ventro-lateral tubercles on the inner whorls; whorl section higher than wide, height/width ratio of outer whorl varying from 1.46 to 1.54; venter broadly flattened, nodose along the ventrolateral angle; ribs prominent, widely spaced on the outer whorl, submantellicerine on the inner whorl; ribs straight except toward the aperture where they are slightly inclined anteriorly. Umbilical wall broadly rounded; ribs dying out at the umbilical wall, becoming much weaker anteriorly; each rib on the outer whorl bears a single prominent bulla between the umbilicus and the middle of the flank; twelve ribs present on four-fifths of the outer whorl preserved; prominent horns on ventrolateral angle of the outer whorl toward the aperture, horns first appear at radius of 53.7 mm; posteriorly on the ventrolateral angle the horns give way to nodes which are closely connected to ventral clavae on either side of the midline of the venter; anteriorly the horns become more

prominent but on our specimen the two nearest the aperture are broken off or badly worn; the ribs decline in height ventrally from the bulla and on four, near the central portion of the outer whorl, they disappear completely between the bulla and the horn; anterior and posterior to this interval the ribs are continuous between the bulla and the horn or node.

Suture with deep, wide, first lateral lobe, much shorter elements dorsal to the first lateral lobe, much less phylloid than other species of the genus, probably due to the worn condition of the specimen which is an internal mold.

*Graysonites reynoldsi* may be separated from *G. lozoi* Young in having one bulla on each rib of the outer whorl instead of two; from *G. wooldridgei* Young by the appearance of the horns at a younger growth stage; from *G. adkinsi* Young by the disappearance of the clavae where the horns begin along the ventrolateral angle, instead of the persistence of strong clavae connected to the horns; and from *G. fountaini* Young in its more evolute coiling, more prominent ventro-lateral horns beginning at a later growth stage, and correspondingly later suppression of peripheral clavae on the outer whorl.

*Dimensions*.—Maximum diameter of shell: 13.08 cm; maximum width of outer whorl near anterior: 3.23 cm; maximum height of outer whorl near anterior: 4.97 cm; width of umbilicus: 4.2 cm.

*Holotype*.—UMMP 44723.

*Occurrence*.—Indidura formation.

*Locality*.—Float near the contact of the Aurora limestone and Indidura formation, just north of the western end of Cañon de la Leña in the Cuenca de Francisco, Coahuila, Mexico. Collection No. 61-106; Accession No. 1961/K-77.

*Remarks*.—We have only a single specimen of this species. It is preserved as an internal mold of hard, light gray to buff limestone. The specimen was collected by Santiago Charleston. It is named for Santiago Reynolds who was also associated with the senior author in field studies in the Cuenca de Francisco.

#### Genus *Tlahualiloceras* Kellum and Mintz, gen. nov.

*Genotype*.—Here designated, *Tlahualiloceras tlahualiloensis* Kellum and Mintz, sp. nov.

*Generic diagnosis*.—Shell large, moderately evolute, compressed, coiled in one plane; whorl-section higher than wide; venter rounded, biclavate; ribs simple, generally straight, tuberculate; umbilical, lateral, and ventro-lateral tubercles and peripheral clavae present.

*Remarks.*—*Tlahualiloceras* is separated from *Acanthoceras* Neumayr by its rectangular whorl section and the absence of a keel or siphonal tubercles. It differs from *Mantelliceras* Hyatt in its larger size, whorl section higher than wide, simple unbranching ribs and biclavate venter. From *Graysonites* Young it is distinguished by its larger size, more evolute form, absence of prominent horns and absence of phylloid elements on the sutures.

***Tlahualiloceras tlahualiloensis* Kellum and Mintz, sp. nov.**

(Pl. VI, Fig. 1; Pl. VII, Figs. 1-2; Pl. VIII, Fig. 1)

*Description of holotype.*—Shell large, coiled in one plane, moderately compressed, moderately evolute; whorl section higher than wide, height to width ratio 1.67; umbilical wall steeply rounded; flanks crossed by numerous ribs which begin at the umbilicus and persist across the venter; ribs fairly prominent, straight to slightly flexed near anterior portion of the outer whorl, rather closely spaced on posterior half of outer whorl, and more distant on anterior half; interspaces approximately equal to width of ribs on the posterior half and about twice as wide as ribs anteriorly, increasing in width toward the aperture; ribs cross the venter becoming broader and less prominent there; umbilical, lateral, and ventrolateral tubercles on each rib with a peripheral clavus on either side of the midline of the venter. Tubercles sharper on posterior half of the outer whorl; lateral and umbilical tubercles becoming bulla, the ventrolateral tubercles becoming nodes on the anterior half of the outer whorl; peripheral clavae becoming more prominent anteriorly; twenty-two ribs present on the nearly complete outer whorl, twelve on the posterior half of the outer whorl and ten on the anterior. The anterior half of the outer whorl appears to be the living chamber.

Suture fragmentary, with long leaf-shaped first lateral lobe; other elements smaller, frilled, discontinuous.

*Dimensions of holotype.*—Maximum diameter of shell: 36.8 cm; maximum width of outer whorl near anterior: 8.72 cm; maximum height of outer whorl near anterior: 12.65 cm; maximum width of whorl at most prominent lateral bulla, about 12.5 cm. from anterior end of outer whorl: 11.96 cm; width of umbilicus: 10.8 cm.

*Description of hypotype.*—One fragment of the anterior or intermediate portion of an outer whorl (UMMP 44491), from the same locality, is referred to this species. It is illustrated in Plate VIII. Whorl section higher than wide, height/width ratio approximately 1.6; ribs and tubercles prominent, ribs straight, about half as wide as interspaces; eight ribs preserved

in an interval of 21.25 cm; umbilical, lateral, and ventrolateral tubercles about equally spaced on each rib; umbilical wall steeply rounded; venter and suture not preserved on this specimen. We have both the natural mold and cast of nearly half a whorl.

*Types*.—Holotype, UMMP 44490; Hypotype, UMMP 44491.

*Occurrence*.—Indidura formation.

*Locality*.—Bench, or shoulder, of buff-colored, chalky to marly limestone about middle of south side of gravel-capped hills shown on Plate II, Figure 1, Cuenca de Francisco, N 33° W of Picacho de las Posas. Collection No. 61-100; Accession number: 1961/K-72.

*Remarks*.—This species clearly belongs in the family Acanthoceratidae Hyatt, but we are unable to find a genus into which it readily falls. We are therefore setting up a new genus to receive it.

Our specimens are related to *Acanthoceras cunningtoni* Böse (1927, p. 201, Pl. II, Fig. 1) which Young (1958, p. 176) considers a synonym of his *Graysonites adkinsi*. Böse (1927, p. 203) records *A. cunningtoni* from the Lower Cenomanian (upper Georgetown beds). *T. tlahualiloensis* occurs with *Budaiceras* and with *Hemiaster calvani* Clark which are somewhat higher stratigraphically. It comes from beds several hundred feet above the zone of *Gryphaea mucronata* and above the occurrence of *Graysonites reynoldsi*, sp. nov., in the Cuenca de Francisco.

Family Lyelliceratidae Spath, 1921

Genus *Budaiceras* Böse, 1927

*Genotype*: By original designation, *Budaiceras mexicanum* Böse, 1927, p. 259.

***Budaiceras franciscoensis* Kellum and Mintz, sp. nov.**

(Pl. V, Figs. 1, 2, 5)

*Description*.—Shell discoidal, moderately evolute; the whorl much higher than wide, of helmet shape in cross section; the flanks flattened; venter moderately sharpened; ribs falciform, about 10 to the inch on the outer half of the flank, curving anteriorly toward the ventrolateral angle and forming a chevron across the venter; some of them do not reach the umbilical border and some are stronger than others on the inner part of the flank; they broaden on the outer part of the flank and have a well-defined tubercle at the ventrolateral angle; along the center of the venter is another row of spirally lengthened, low, and sharp tubercles or clavi, forming an undulated keel; here the number of tubercles coincides with the ribs, so that each rib has one ventral and two ventrolateral tubercles. The suture is unknown.

*B. franciscoensis* differs from *B. frechi* (Lasswitz) (1904, p. 28, Pl. VI,

Fig. 6) of the Buda limestone in its smaller size, more falciform and closer spaced ribbing that forms a chevron along the venter, and its more parallel flanks. From *B. mexicanum* Böse (1927, p. 259, Pl. IX, Figs. 16-23; Pl. X, Figs. 1-3) it differs in its flatter, more parallel flanks, in its falciform ribs, and in the persistence of the ribs across the venter to form a chevron-like pattern.

*Dimensions of holotype*.—Length of the fragment of the whorl: 2.24 cms; height of whorl: 1.28 cms; width of whorl: .75 cms.

*Holotype*.—UMMP 44717.

*Occurrence*.—Indidura formation.

*Locality*.—Bench or shoulder of buff-colored, chalky to marly limestone about middle of south side of gravel-capped hills shown on Plate II, Figure 1, Cuenca de Francisco, N 33° W of Picacho de las Posas. Collection No. 61-100; Accession number: 1961/K-72.

*Remarks*.—According to Böse's (1927, p. 256) delineation of the genus, *B. franciscoensis* is a very young specimen. Only about one-third of a whorl of the holotype, and only known specimen, is preserved. The genus is common in the Cenomanian of Texas and Böse's generic description of a young specimen delineates the characters of *B. franciscoensis* so closely that we have some confidence in assigning it to his genus *Budaiceras*. The specimen is an internal mold in buff-colored limestone, with desert polish on elevated surfaces.

#### *Budaiceras mexicanum* Böse

(Pl. IV, Fig. 2)

*Budaiceras mexicanum* Böse, 1927, p. 259, Pl. IX, Figs. 16-23; Pl. X, Figs. 1-3.

*Delineation*.—Shell discoidal, inflated, moderately evolute; umbilical wall well rounded; ornamentation of four broad, low ribs to the inch, curving broadly across the flank, the concave side anterior, widening toward the ventrolateral angle and terminating there in a faint broad tubercle; some ribs begin at the umbilical border and others on the flank just above the umbilicus. The venter and cross-section of the whorl are not visible on our specimen. The suture is not preserved.

One small, fragmentary, external mold was found in the float at the highest stratigraphic level observed in the Indidura formation of the Cuenca de Francisco, during the 1961 field season. For comparison, there are, in the Museum at The University of Michigan, several specimens of this species, collected by W. I. Robinson in 1941 from the same area. Therefore, although the state of preservation of our specimen leaves much to be desired, it is identified with some confidence.

*Dimensions.*—Length of whorl fragment preserved: 3.19 cms; height of whorl: 1.79 cms.

*Figured specimen.*—UMMP 44719.

*Other specimen.*—Cast from which figured specimen was made, UMMP 44720.

*Occurrence.*—Indidura formation.

*Locality.*—In float on hillside about 25 feet above bench or shoulder where collection 61-100 was made, near middle of south side of gravel-capped hills (Pl. II, Fig. 1), in the Cuenca de Francisco, N 33° W of Picacho de las Posas. Collection No. 61-101; Accession No. 1961/K-73.

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#### PLATES

## EXPLANATION OF PLATE I

Indidura formation in the Cuenca de Francisco.

FIG. 1. Outcrop in gully S 68° W of Cañon de la Leña. Thin beds of platy, buff-colored limestone, in upper part of the Indidura formation.

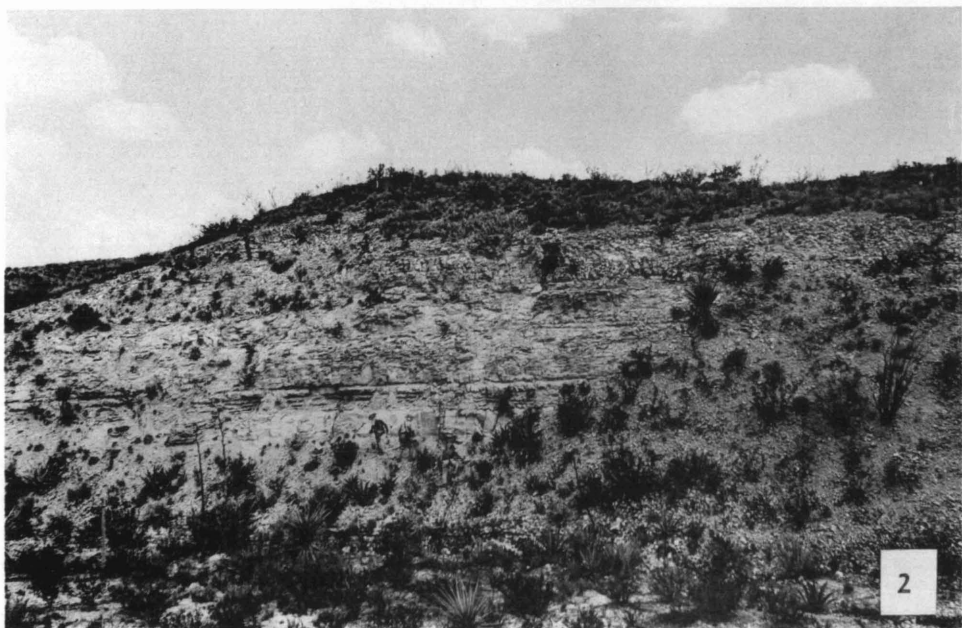
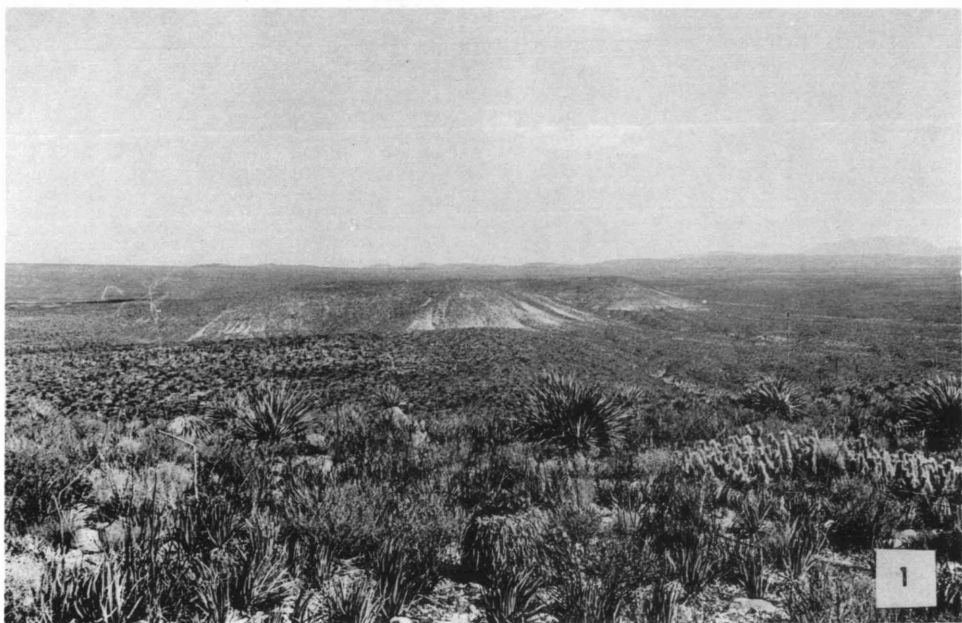
FIG. 2. Trashy float of buff-colored, platy limestone, characteristic of the Indidura formation. Bench or shoulder on east side of gravel-capped mesa S 68° W of Cañon de la Leña.



PLATE I



PLATE II



**EXPLANATION OF PLATE II**

**Indidura formation in the Cuenca de Francisco.**

**FIG. 1.** View N 15° W across Cuenca de Francisco to gravel-capped mesa of the Indidura formation, indicated by the light-colored gullies on the lower slopes. Fossil collections 61-99, 61-100, and 61-101 were made on the southeast side of these hills.

**FIG. 2.** Outcrop of buff-colored limestone in cut bank of arroyo on south side of hills shown in Fig. 1. Fossil collection 61-99 was made here.

## EXPLANATION OF PLATE III

	PAGE
<i>Mantelliceras charlestoni</i> Kellum and Mintz, sp. nov. ....	272
FIGS. 1-2. Ventral and umbilical views of holotype, UMMP 44718. Indidura formation; collection 61-98. ( $\times 1$ ).	
<i>Graysonites reynoldsi</i> Kellum and Mintz, sp. nov. ....	274
FIG. 3. Umbilical view showing part of suture of holotype, UMMP 44723. Indidura formation; collection 61-106. ( $\times 2$ ).	

PLATE III



PLATE IV



1



2



3



4

## EXPLANATION OF PLATE IV

(All figures  $\times 1$ )

	PAGE
<i>Mantelliceras charlestoni</i> Kellum and Mintz, sp. nov. ....	272
FIG. 1. Umbilical view. UMMP 44718. Indidura formation; collection 61-98.	
<i>Budaiceras mexicanum</i> Böse .....	278
FIG. 2. Umbilical view of cast of natural mold of fragment of whorl. UMMP 44719. Indidura formation; collection 61-101.	
<i>Mantelliceras portalesi</i> Kellum and Mintz, sp. nov. ....	273
FIGS. 3-4. Ventral and umbilical views of holotype. UMMP 44721. Indidura formation; collection 61-98.	

## EXPLANATION OF PLATE V

	PAGE
<i>Budaiceras franciscoensis</i> Kellum and Mintz, sp. nov. ....	277
FIGS. 1-2. Opposite side views of holotype, UMMP 44717. Indidura formation; collection 61-100. ( $\times 2$ ).	
FIG. 5. Ventral view of holotype. ( $\times 2$ ).	
<i>Graysonites reynoldsi</i> Kellum and Mintz, sp. nov. ....	274
FIGS. 3-4. Ventral and umbilical views of holotype, UMMP 44723. Indidura formation; collection 61-106. ( $\times 1$ ).	



PLATE V

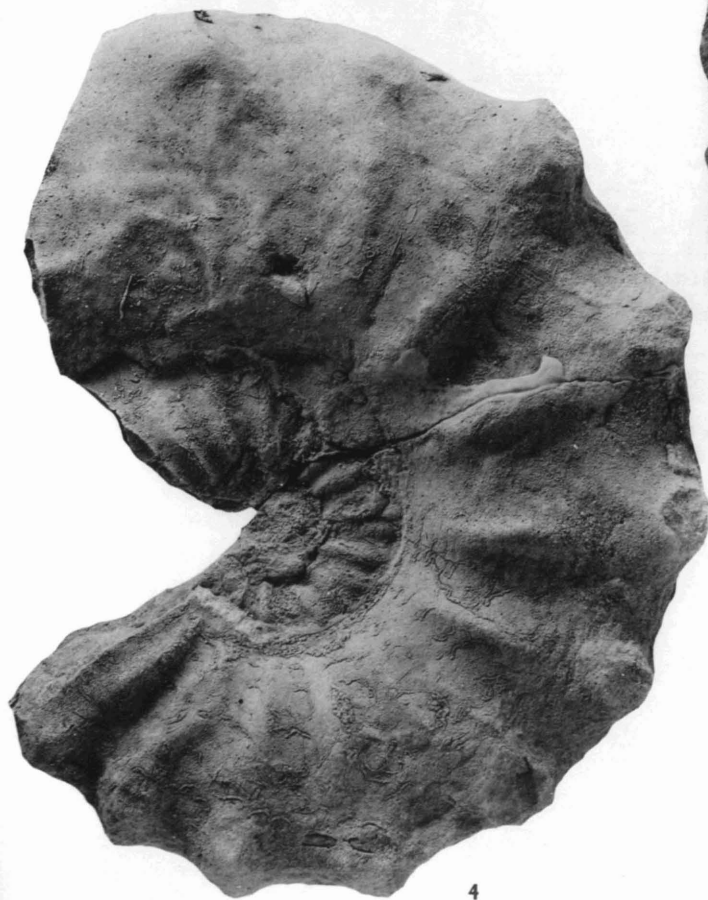
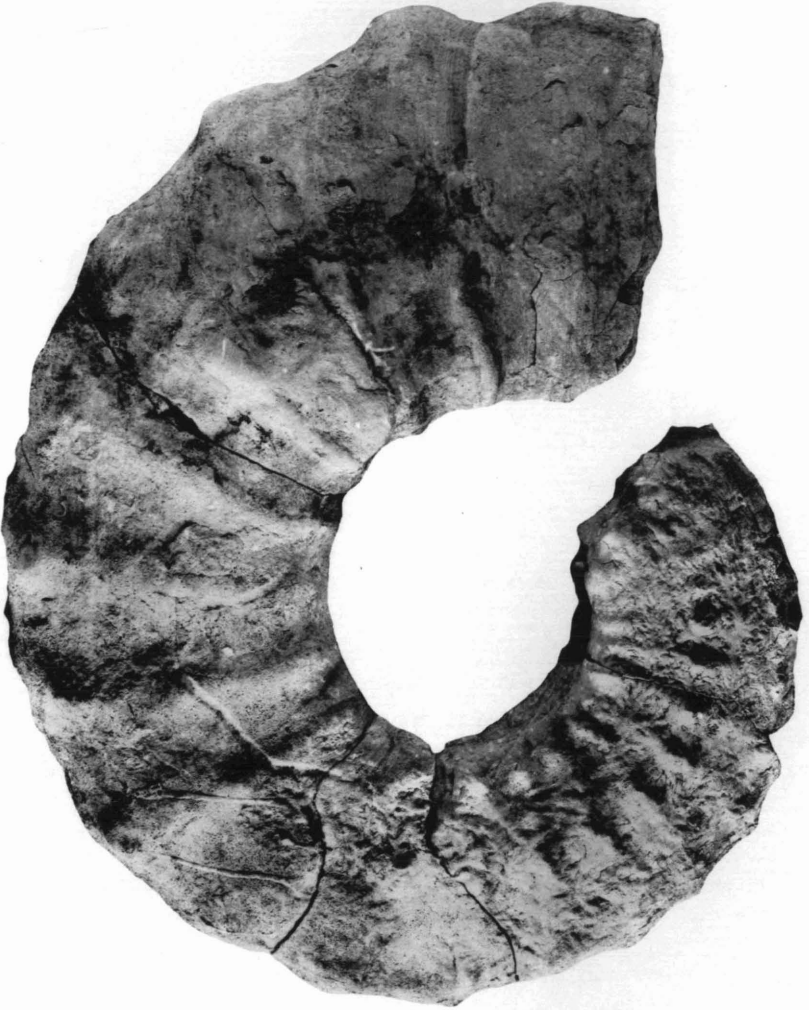


PLATE VI



EXPLANATION OF PLATE VI

(Figure  $\times \frac{1}{3}$ )

	PAGE
<i>Tlahualiloceras tlahualiloensis</i> Kellum and Mintz, n. sp. ....	276
FIG. 1. Umbilical view of holotype, UMMP 44490. Indidura formation; collection 61-100.	

## EXPLANATION OF PLATE VII

Both figures  $\times \frac{1}{2}$ )

	PAGE
<i>Tlahualiloceras tlahualiloensis</i> Kellum and Mintz, n. sp. ....	276
FIGS. 1. Apertural view of holotype, UMMP 44490. Indidura formation; collection 61-100.	
FIG. 2. Ventral view (aperture downward) of holotype.	

PLATE VII



1



2

PLATE VIII



EXPLANATION OF PLATE VIII

(Figure  $\times \frac{2}{3}$ )

	PAGE
<i>Tlahualóceras tlahualóensis</i> Kellum and Mintz, n. sp. ....	276
FIG. 1. Umbilical view of hypotype, UMMP 44491. Indidura formation; collection number 61-100.	

