CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

242. THE MEGALOSPHERIC AND MICROSPHERIC FORMS OF *FRONDICULARIA SAGITTULA* VAN DEN BROECK AND THEIR BEARING ON SPECIFIC DESCRIPTIONS

By JOSEPH A. CUSHMAN

The figured specimens of *Frondicularia sagittula* Van den Broeck are all from the same bottom sample off Porto Rico, 18° 32′ 15″ N., 66° 22′ 10″ W., 240-300 fathoms. As is usual the megalospheric form is much the more common and, in its adult form, smaller than the adult microspheric form. The microspheric specimens, Pl. 5, figs. 1, 2, would undoubtedly be described by some workers as a distinct species if they were found by themselves. This shows the desirability of always having both microspheric and megalospheric forms of a species before describing it as new.

The largest specimen found, Pl. 5, fig. 3, is a microspheric one. The proloculum is $\frac{1}{30}$ the diameter of those of the larger megalospheric forms. There are eleven coiled chambers including the proloculum before the frondicularian chambers are developed. There are fourteen of these before the basal ends of the chambers extend backward, a condition which appears immediately following the proloculum in the megalospheric forms. In fig. 3*a* the early stages of fig. 3 are photographed by transmitted light to better show the individual coiled chambers.

With these early stages of the microspheric form alone, such as figs. 1 and 2, the specimens might perhaps be placed in the genus *Palmula*. The specimen in fig. 1 developed even further than the same stage in fig. 3 and might have formed an even larger test than fig. 3 had it completed its development.

The outline of the test varies greatly also. The microspheric early stages are generally rhomboid while the megalospheric

forms are roughly triangular. Here also the sides may vary from convex to nearly straight and, in extreme forms as Pl. 6, fig. 2, they may be concave.

These specimens show the necessity of having both the microspheric and megalospheric forms of a species before the generic position can be determined with certainty and of also having a reasonably large series of both forms before the full specific characters can be adequately described. Fortunately foraminifera are usually numerous enough so that patient search of sufficient material will give the necessary specimens for complete description.

243. *TRETOMPHALUS MYERSI*, A NEW SPECIES FROM THE PACIFIC

By JOSEPH A. CUSHMAN

Little has been added to the knowledge of the species of *Tretomphalus* since a paper published in these Contributions, vol. 10, 1934, pp. 79-101, pls. 11, 12.

Some excellent Pacific specimens of the genus have been turned over to me for identification by Dr. Earl H. Myers who has been making a study of the living animal. Excellent specimens of *Tretomphalus clarus* Cushman and *T. planus* Cushman are present in samples from the Thousand Islands, in the western end of the Java Sea. Another species, which seems to be new, is present from two other localities, and is here described.

TRETOMPHALUS MYERSI Cushman, n. sp. (Pl. 6, figs. 4-6)

Test in the earliest portion close-coiled throughout, *Discorbis*-like, moderately convex, not involute; chambers distinct, fairly numerous, 6 in the earlier whorls, 4 or 5 per whorl in the adult, the earlier ones higher than broad, in the adult becoming increasingly broader and lower; sutures distinct, slightly depressed in the adult, in the earlier stages not depressed and strongly limbate, much more strongly curved in the adult; wall smooth, rather coarsely perforate, of a brownish color, final subspherical chamber also conspicuously perforate; apertures in the adult

consisting of numerous pores on the lower part of the spherical chamber. Height 0.32-0.35 mm.; diameter 0.32-0.42 mm.

Holotype (Cushman Coll. No. 39198) from off La Jolla, California. Other specimens evidently identical are from off Corny Point, Hardwicke Bay, on west shore of Yorke Peninsula, South Australia.

This species differs from *Tretomphalus bulloides* (d'Orbigny) in the more limbate sutures, more coarsely perforate wall, and the distinct change in shape from the earlier to the adult chambers.

Dr. Myers is of the opinion that the flattened specimens shown in figs. 5 *a*, *b* also belong in this species and this will be discussed with other data in regard to the life history in his forthcoming paper.

244. *GAUDRYINA CANADENSIS*, NEW NAME

By JOSEPH A. CUSHMAN

A number of species from the Cretaceous of Canada were described from well samples (Cushman, Some Foraminifera from the Cretaceous of Canada, Trans. Roy. Soc. Canada, 3d ser., vol. 21, sec. 4, 1927, pp. 127-132, pl. 1) and among them one described as *Bigenerina angulata*, new species. The specimens, like numerous others from these well samples, were much distorted in fossilization. Through the kindness of Dr. R. T. D. Wickenden of the Canadian Geological Survey, a large series of specimens from the same well as that from which the type came have been made available for study. None of these tests are perfect but all are contorted in varying degrees. From another well, London Ribstone Well No. 1, core sample at 1930 feet, L. S. D. 14 of sec. 10, Tp. 43, Range 3, W. of 4th meridian, there are numerous specimens much better preserved. These show that the species is really triserial at the base and biserial in the adult although a few specimens appear to become uniserial in the later stages. As *angulata* has already been used in the genus *Gaudryina*, a new name for this species is proposed as follows:

GAUDRYINA CANADENSIS Cushman, new name (Pl. 6, figs. 7, 8)

Bigenerina angulata CUSHMAN, Trans. Roy. Soc. Canada, 3d ser., vol. 21, sec. 4, 1927, p. 131, pl. 1, fig. 10.

Test elongate, earliest portion triserial, becoming biserial early in the development and in some specimens tending to become uniserial; chambers distinct, inflated, 10 to 16 in the adult biserial portion, very gradually increasing in size as added; sutures distinct, depressed; wall arenaceous with a large proportion of cement, easily contorted in fossilization; aperture enlarged at the base, tending to become terminal and more rounded in the uniserial chambers. Length 0.80-1.25 mm.; breadth 0.22-0.25 mm.

The wall has an abundance of brownish cement, apparently chitinous, and was apparently flexible so that in fossilization very few specimens kept their original shape.

The species is evidently related to *Gaudryina bearpawensis* Wickenden but that species has a much greater proportion of triserial chambers and the biserial stage much shorter with no apparent tendency to become uniserial.

Gaudryina canadensis is apparently restricted to beds of Lower Cretaceous age but has a wide distribution in the Canadian plains. Dr. Wickenden has "found specimens in wells along the Athabaska near latitude 56°. Specimens occur in wells as far south as the international boundary in southwestern Saskatchewan and as far east as Moose Jaw in this same province."

245. THE FORAMINIFERA OF THE TYPE LOCALITY OF THE YEGUA FORMATION OF TEXAS*

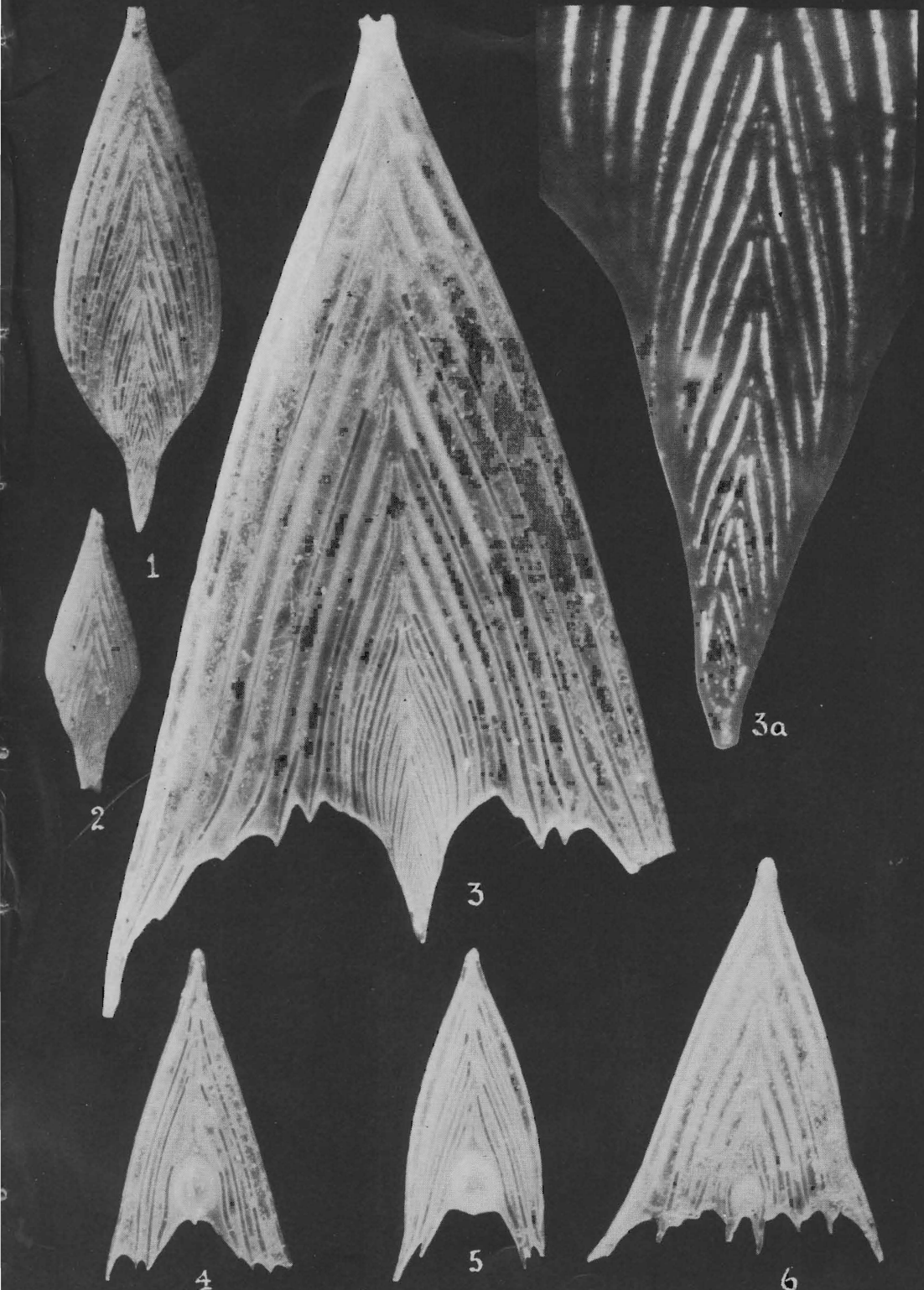
By JOSEPH A. CUSHMAN and ESTHER R. APPLIN

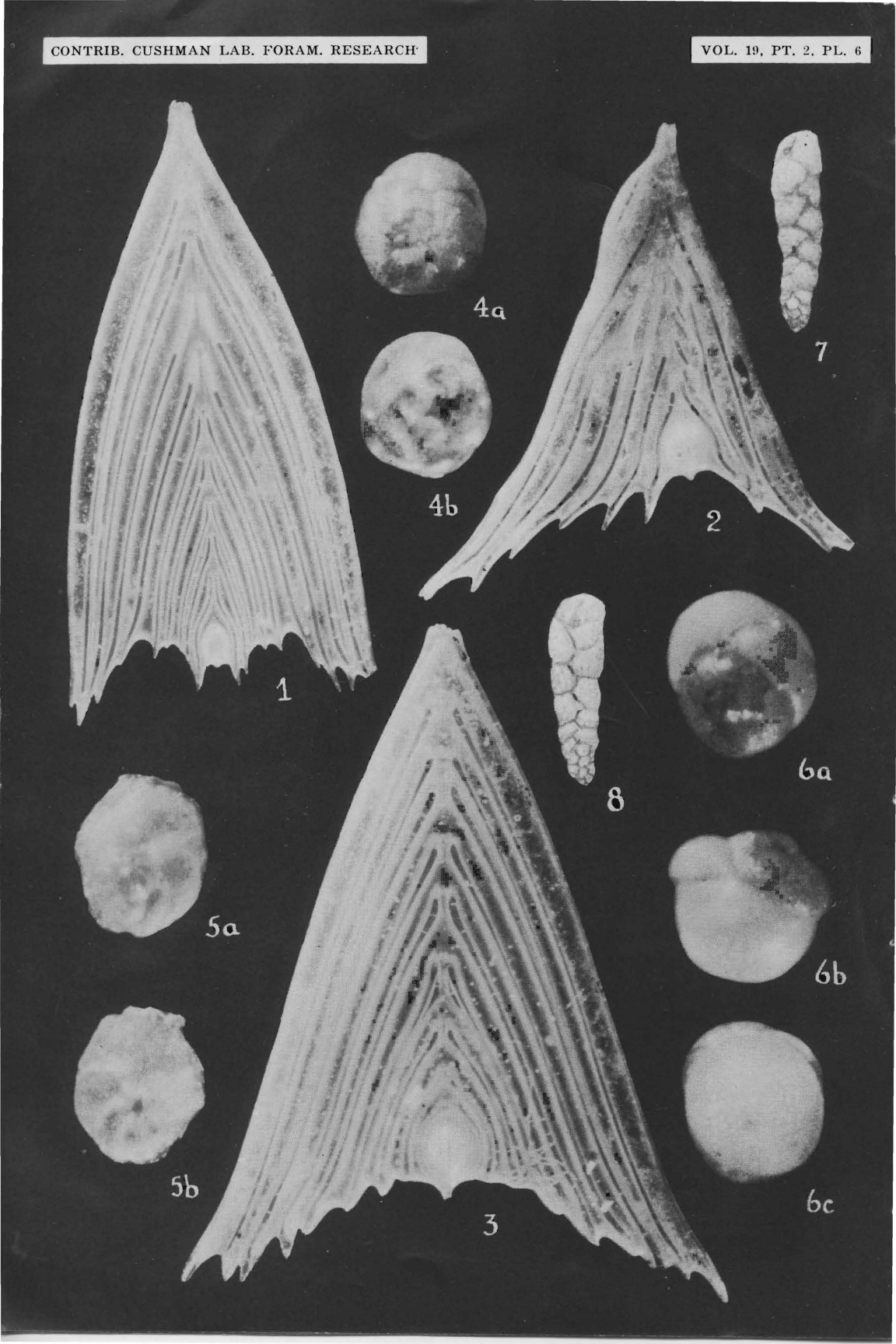
In continuation of studies of foraminiferal faunas from type localities of various formations, the Yegua formation has been studied from collections made at the type locality. The species

* Published by permission of the Acting Director, United States Geological Survey.

EXPLANATION OF PLATE 5

FIGS. 1-6. *Frondicularia sagittula* Van den Broeck. Recent, off Porto Rico. × 27. 3 *a*, × 110. Enlargement of early part of fig. 3. Photographed by transmitted light. 1-3, Microspheric forms. 4-6, Megalospheric forms.


1
2
3
3a
4
5
6


1
2
3
4a
4b
5a
5b
6a
6b
6c
7
8

are figured on the accompanying plates.

The type locality of the Yegua formation is near the mouth of Elm Creek, a branch of Yegua Creek, in Lee County, Texas. The material used in this study is from samples collected by Grace Newman and Norman Reed under Dr. E. T. Dumble's direction in May, 1926, and is from three localities as follows:

Loc. I. One mile west, up the creek from the point where the Giddings-Mannheim Road crosses Elm Creek, Lee Co., Texas.

Loc. II. Elm Creek at Orell's Crossing, Lee Co., Texas.

Loc. III. Price's Crossing on Elm Creek, Lee Co., Texas.

Further information in regard to these localities may be found in "The Geology of East Texas," by E. T. Dumble (Univ. Texas Bull. 1869, 1918, pp. 102-106).

We are indebted to Mr. Walter Belt for his painstaking work in picking out and mounting much of this material.

The fauna, as will be seen by the notes, is closely associated with that of the Claiborne, Cook Mountain formation, of Louisiana and Texas, and with the Guayabal formation of Mexico.

Order FORAMINIFERA

Family LITUOLIDAE

Genus HAPLOPHRAGMOIDES Cushman, 1910

HAPLOPHRAGMOIDES EXCAVATUS Cushman and Waters, var. (Pl. 7, fig. 1)

Haplophragmoides excavata CUSHMAN and WATERS, var. WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 389.

This variety was noted by Weinzierl and Applin from the Yegua formation. It is represented by very few and rather poorly preserved specimens in our collections and therefore it has not been possible to determine its full characters. The original notes are as follows: "Our variety differs from the

---

EXPLANATION OF PLATE 6

FIGS. 1-3. *Frondicularia sagittula* Van den Broeck. Recent, off Porto Rico. × 27. Megalospheric forms. 4-6. *Tretomphalus myersi* Cushman, n. sp. Recent, off La Jolla, California. × 75. 4, 5, Paratypes. *a*, dorsal views; *b*, ventral views. 6, Holotype. *a*, dorsal view; *b*, side view; *c*, ventral view. 7, 8. *Gaudryina canadensis* Cushman, new name. Lower Cretaceous, Canada. × 45.

species in being less strongly compressed, in having only the last three or four chambers excavated and never so clearly, or completely as in the true *Haplophragmoides excavata.* Also the Claiborne form is a heavier, much less delicate species than its Cretaceous relative." Our specimens are from Locality III.

HAPLOPHRAGMOIDES MAURICENSIS Howe and Ellis (Pl. 7, fig. 2)

Haplophragmoides mauricensis HOWE and ELLIS, in HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 30, pl. 1, figs. 3-5.

Test small, planispiral, slightly evolute, periphery broadly rounded, slightly lobulate; chambers distinct, somewhat inflated, about eight in the adult coil, increasing very gradually in size as added; sutures depressed, nearly radial; wall finely arenaceous, exterior smoothly finished; aperture a low opening at the base of the last-formed chamber. Diameter 0.23-0.27 mm.; thickness 0.10 mm.

Specimens are decidedly smaller than the types from the Claiborne of Louisiana but in their general characters seem to be identical. Specimens occur at all three localities and show a remarkably uniform size.

HAPLOPHRAGMOIDES cf. DIBOLLENSIS Cushman and Applin (Pl. 7, fig. 3)

Rare specimens seem somewhat related to this Jackson Eocene species but they are too few in number to be certain of the full characters.

Genus AMMOBACULITES Cushman, 1910

AMMOBACULITES MAURICENSIS Howe (Pl. 7, fig. 4)

Ammobaculites mauricensis HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 30, pl. 1, figs. 13, 14.

A few specimens seem to belong to this species described from the Claiborne Eocene of Louisiana. There seems to be a wide variation in the form and in the relative number of chambers in the coiled portion. It occurs at two of the three localities.

Family TEXTULARIIDAE

Genus SPIROPLECTAMMINA Cushman, 1927

SPIROPLECTAMMINA cf. MISSISSIPPIENSIS (Cushman) (Pl. 7, fig. 5)

Very rare specimens seem referable to this species which is widely distributed in the lower Oligocene and upper Eocene of America. The species described by Cole as *Textularia zapotensis* is probably the same.

Family VALVULINIDAE

Genus EGGERELLA Cushman, 1933

EGGERELLA CUSHMANI (Weinzierl and Applin) (Pl. 7, fig. 6)

Verneuilina cushmani WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 393, pl. 42, figs. 4 *a*, *b*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 32, pl. 1, figs. 11, 12.

Eggerella cushmani CUSHMAN, Special Publ. 8, Cushman Lab. Foram. Res., 1937, p. 46, pl. 5, figs. 4, 5.

"Test small, triserial in the adult, rounded in section, increasing rapidly in diameter toward the apertural end; chambers distinct, slightly inflated, earliest whorl with five chambers; sutures distinct, depressed; wall arenaceous, surface somewhat roughened; aperture, a low opening at the inner margin of the last-formed chamber, with or without a lip. Length 0.50 mm.; diameter 0.35 mm."

This species has already been recorded from the Claiborne of Texas and Louisiana. It is common in the Yegua collections.

Family MILIOLIDAE

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA YEGUAENSIS Weinzierl and Applin (Pl. 7, fig. 7)

Quinqueloculina seminulum STADNICHENKO (not LINNÉ), Journ. Pal., vol. 1, No. 3, 1927, p. 226, pl. 38, fig. 28.

Quinqueloculina yeguaensis WEINZIERL and APPLIN, l. c., vol. 3, 1929, p. 393, pl. 44, figs. 4 *a*, *b*.—CUSHMAN and THOMAS, l. c., vol. 4, 1930, p. 34, pl. 3, figs. 1, 2.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 36, pl. 2, fig. 8.—ISRAELSKY, Proc. 6th Pac. Sci. Congress, 1939, p. 572, pl. 2, figs. 2, 3.

Test somewhat longer than broad, the apertural end somewhat exserted, periphery rounded; chambers quinqueloculine, moderately inflated; sutures distinct, very slightly depressed; wall smooth; aperture nearly circular, not meeting the previous chamber, with a distinct apertural tooth, slightly expanded at the free end. Length 0.60-0.65 mm.; breadth 0.35-0.40 mm.

The species was described from our Locality III and the figured specimens are topotypes. It is not common.

It has been recorded from the Claiborne Eocene of Texas and Louisiana and from the Eocene of California.

QUINQUELOCULINA MAURICENSIS Howe (Pl. 7, fig. 8)

Quinqueloculina mauricensis HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 35, pl. 4, figs. 8-10.

Test longer than broad, periphery angled or slightly keeled; chambers distinct, subtriangular in transverse section, projecting at both the apertural and basal ends; sutures distinct, slightly depressed; wall smooth and polished, but dull over the keel; aperture terminal, circular, with a slightly thickened lip. Length 0.50 mm.; breadth 0.30 mm.

The types of this species are from the Claiborne Eocene of Louisiana. The single specimen here figured from the Yegua seems to be identical. It is from Locality III.

Genus TRILOCULINA d'Orbigny, 1826

TRILOCULINA MINDENENSIS Howe (Pl. 7, fig. 10)

Triloculina mindenensis HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 37, pl. 3, figs. 11-13.

Test somewhat longer than broad, periphery broadly rounded; chambers distinct, inflated, ends not projecting beyond the periphery; sutures distinct, slightly depressed; wall smooth; aperture terminal, semicircular, with a large tooth. Length 0.50-0.55 mm.; breadth 0.40-0.45 mm.

This species was described from the Claiborne Eocene of Louisiana. It occurs at Locality III.

Family OPHTHALMIDIIDAE

Genus CORNUSPIRA Schultze, 1854

CORNUSPIRA cf. OLIGOGYRA Hantken (Pl. 7, fig. 9)

A single specimen was found in the material from Locality III. The species apparently has a wide range in the Eocene and Oligocene.

Family LAGENIDAE

Genus ROBULUS Montfort, 1808

ROBULUS ALATO-LIMBATUS (Gümbel) (Pl. 7, fig. 11)

Robulina alato-limbata GÜMBEL, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 10, 1870, p. 643, pl. 1, figs. 70 *a*, *b*.

Cristellaria alato-limbata CUSHMAN and APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 171, pl. 8, figs. 8 *a*, *b*.

Robulus alato-limbatus COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 18, pl. 4, fig. 1.—HOWE and WALLACE, Geol. Bull. 2, Louisiana Geol. Survey, 1932, p. 37, pl. 3, figs. 2 *a*, *b*.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 15, pl. 6, figs. 2 *a*, *b*.—CORYELL and EMBICH, Journ. Pal., vol. 11, 1937, p. 299, pl. 41, fig. 16.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 40, pl. 4, fig. 18.—CUSHMAN and SIEGFUS, Trans. San Diego Soc. Nat. Hist., vol. 9, 1942, p. 404, pl. 15, figs. 19-21.

Test close-coiled, last-formed coil composed of few chambers, usually seven in number, the central region with a large umbo not greatly projecting above the general surface, but distinct, periphery with a narrow keel; chambers distinct, not inflated; sutures distinct, not depressed, strongly curved; wall smooth; aperture radiate. Diameter 0.60-0.65 mm.

This species originally described from the Eocene of Southern Europe has been recorded in the American Jackson and Claiborne Eocene. The records include South Carolina, Alabama, Mississippi, Louisiana, Texas, and California, and also Mexico and Panama. It occurs at Localities II and III in the Yegua material.

ROBULUS GUAYABALENSIS (Cole) (Pl. 7, fig. 12, 13)

Lenticulina guayabalensis COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 14, pl. 1, figs. 3, 4.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1932, p. 42, pl. 5, fig. 7.

Test close-coiled in the young but becoming somewhat evolute in the last part of the adult coil, strongly umbonate, periphery acute, with a slight keel; chambers distinct, not inflated, nine to eleven in the adult coil, of uniform shape, increasing very gradually in size as added; sutures distinct, little if at all depressed, strongly oblique, slightly curved; wall smooth; aperture terminal, radiate, extending downward into the apertural face. Diameter 0.40-0.60 mm.

The types are from the Eocene, Guayabal formation, of Mexico and it is recorded also from the Claiborne Eocene of Louisiana. It occurs at all three of the Yegua localities.

ROBULUS JUGOSUS Cushman and Thomas (Pl. 7, fig. 14)

Robulus jugosus CUSHMAN and THOMAS, Journ. Pal., vol. 4, 1930, p. 36, pl. 3, figs. 4 *a*, *b*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 41, pl. 5, figs. 4, 5.

Test close-coiled, compressed, periphery acute with a low, blunt keel; chambers distinct, five to seven in the last-formed coil, earlier ones somewhat indistinct, later ones increasing gradually in length as added; sutures somewhat limbate, slightly raised along the middle and proximal portions; earlier ones somewhat nodose or beaded, later ones smooth; wall smooth except for the nodes and raised sutures; aperture terminal, radiate, at the upper angle of the peripheral face which is broad and slightly convex. Length 0.50-0.55 mm.; breadth 0.30-0.40 mm.

The types of this species are from the Claiborne, Cook Mountain formation, of Texas. It is also recorded from the same formation in Louisiana. We have specimens from all three of the Yegua localities. There is considerable variation in the ornamentation of the sutures.

ROBULUS JUGOSUS Cushman and Thomas, var. (Pl. 7, figs. 15, 16)

Rare specimens from our Yegua collections are evidently related to this species but differ in the broader form and the ornamentation which is strongly beaded in the early stages, then rapidly disappears. Specimens occur at Localities I and III.

Genus VAGINULINA d'Orbigny, 1826

VAGINULINA cf. WRIGHTI Cole (Pl. 7, fig. 17)

The single specimen figured is from Yegua Locality I. It is very much like the specimen figured by Cole as *Vaginulina wrighti* from the Guayabal formation of Mexico (Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 21, pl. 3, fig. 13). Length 0.45 mm.; breadth 0.16 mm. Cole's type measured 0.58 mm. in length and the species is recorded as very rare.

Family POLYMORPHINIDAE

Genus GUTTULINA d'Orbigny, 1839

GUTTULINA IRREGULARIS (d'Orbigny) (Pl. 7, fig. 18)

Globulina irregularis D'ORBIGNY, Foram. Foss. Bass. Tert. Vienne, 1846, p. 226, pl. 13, figs. 9, 10.

Guttulina irregularis CUSHMAN and THOMAS, Journ. Pal., vol. 3, 1929, p. 177, pl. 23, figs. 2 *a-c*.—CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 25, pl. 3, figs. 4, 5; pl. 7, figs. 1, 2.—HOWE and WALLACE, Geol. Bull. 2, Louisiana Geol. Survey, 1932, p. 48, pl. 8, fig. 8.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 24, pl. 9, figs. 13-16.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 52, pl. 6, fig. 20.

(For further references see U. S. Geol. Survey Prof. Paper 181, 1935, p. 24.)

This species is widely distributed in Europe and America and ranges from Eocene to the Miocene. It occurs at Localities I and II in the Yegua collections.

Genus GLOBULINA d'Orbigny, 1839

GLOBULINA GIBBA d'Orbigny (Pl. 7, fig. 19)

Globulina gibba D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 266, No. 10, Modèles, No. 63; Foram. Foss. Bass. Tert. Vienne, 1846, p. 227, pl. 13, figs. 13, 14—CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 60, pl. 16, figs. 1-4.—HOWE and WALLACE, Geol. Bull. 2, Louisiana Geol. Survey, 1932, p. 46, pl. 8, figs. 11 *a*, *b*.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 25, pl. 9, fig. 18.—HOWE and WALLACE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 53, pl. 6, figs. 25, 26.

(For further references see U. S. Geol. Survey Prof. Paper 181, 1935, p. 25.)

This is a widely distributed species but is especially abundant in the Eocene and lower Oligocene of America. It occurs at all three of the Yegua localities.

Genus GLANDULINA d'Orbigny, 1826

GLANDULINA cf. LAEVIGATA d'Orbigny (Pl. 7, fig. 21)

A single specimen from Locality III may belong to this species.

Genus SIGMOMORPHINA Cushman and Ozawa, 1928

SIGMOMORPHINA PSEUDOREGULARIS Cushman and Thomas (Pl. 7, fig. 20)

Polymorphina regularis STADNICHENKO (not VON MÜNSTER), Journ. Pal., vol. 1, No. 3, 1927, p. 231, pl. 38, figs. 18, 19.

Sigmomorpha (*Sigmomorphina*) *pseudoregularis* CUSHMAN and THOMAS, l. c., vol. 3, 1929, p. 178, pl. 23, figs. 5 *a-c*.—WEINZIERL and APPLIN, l. c., p. 400, pl. 43, fig. 4.

Sigmomorphina pseudoregularis CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 125, pl. 32, figs. 8 *a-c*.

"Test large; length about twice the width and thickness a little more than half the width; median longitudinal ridge on both sides with sutures sloping backward, both right and left sets beginning at right side of ridge, the left set crossing the ridge and bending in a gentle curve backward, while those on the right begin at the right of the ridge and extend backward in a more nearly direct fashion, both sets reaching the periphery and giving the shell only a semiequitant appearance, the two sides so nearly equal as to give a bilateral symmetry; aperture round, radiate, the apertural end showing four chambers." Length 0.65-0.80 mm.; breadth 0.32-0.35 mm.

So far as the records show, this species is limited to the Claiborne Eocene of America and should prove to be an excellent index fossil for this formation. In the Yegua it occurs at Localities I and III.

SIGMOMORPHINA SEMITECTA (Reuss) (Pl. 7, fig. 22)

Polymorphina semitecta REUSS, Sitz. Akad. Wiss. Wien, vol. 55, pt. 1, 1867, p. 91, pl. 3, fig. 10.

Sigmomorphina semitecta CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 129, pl. 33, figs. 6, 7.—HOWE and WALLACE, Geol. Bull. 2, Louisiana Geol. Survey, 1932, p. 50, pl. 8, figs. 4 *a-c*.—HOWE, l. c., Geol. Bull. 14, 1939, p. 55, pl. 7, figs. 9, 10.

"Test compressed, oval to ovate, broadly rounded at the base, tapering toward the aperture; chambers elongate, arranged in a clockwise sigmoid series, all extending down to the base, but not involute; sutures scarcely depressed, distinct; wall smooth, the apertural end often with fistulose tubes; aperture radiate." Length 0.40 mm.; breadth 0.25 mm.

There is a single specimen from Locality II in the Yegua that seems typical. It has already been recorded from the Claiborne of Louisiana.

SIGMOMORPHINA SEMITECTA (Reuss), var. TERQUEMIANA (Fornasini). (Pl. 7, fig. 23)

Polymorphina amygdaloides TERQUEM (not REUSS), Mém. Soc. Géol. France, ser. 3, vol. 2, 1882, p. 141, pl. 14 (22), figs. 30, 31.

Polymorphina amygdaloides REUSS, var. *terquemiana* FORNASINI, Mem. Accad. Inst. Sci. Bologna, ser. 5, vol. 9, 1900-1902 (1902), p. 72, fig. 25 (in text).

Sigmomorphina semitecta (REUSS), var. *terquemiana* CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 129, pl. 33, figs. 4, 5; pl. 34, figs. 2, 3; pl. 35, fig. 1.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 28.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 55, pl. 7, figs. 11, 12.—CUSHMAN and TODD, Contr. Cushman Lab. Foram. Res., vol. 18, 1942, p. 35, pl. 6, figs. 16, 17.

This variety differs from the typical form in its more elongate lanceolate test, consisting of elongated chambers, and in its more acute initial end.

The only Yegua specimens are from Locality I. In America it has been recorded from the Eocene, Midway, of Alabama, Claiborne of Louisiana, and Jackson of Georgia and Alabama.

Family NONIONIDAE

Genus NONION Montfort, 1808

NONION PLANATUM Cushman and Thomas (Pl. 7, fig. 24)

Nonion planatum CUSHMAN and THOMAS, Journ. Pal., vol. 4, 1930, p. 37, pl. 3, figs. 5 *a*, *b*.—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 60, pl. 8, figs. 6 *a*, *b*.—CUSHMAN and GARRETT, l. c., vol. 15, 1939, p. 81, pl. 14, figs. 12, 13.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 58, pl. 7, figs. 24, 25.—CUSHMAN, U. S. Geol. Survey Prof. Paper 191, 1939, p. 4, pl. 1, figs. 15 *a*, *b*.

Nonion umbilicatulus (MONTAGU), var. COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 23, pl. 5, fig. 6.—WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 401.

Test planispiral, close-coiled, compressed, bilaterally symmetrical, biumbilicate, periphery rounded; chambers distinct, but not inflated, about ten in the last-formed coil, which is almost completely involute, peripheral face of the last chamber convex; sutures distinct, earlier ones flush with the surface, later ones very slightly depressed, ending in a thickened ring with slight inward projections about the umbilici; wall smooth, finely perforate; aperture a crescent-like slit at the base of the last-formed

chamber. Diameter 0.25-0.35 mm.; thickness 0.10-0.12 mm.

This species was described from the Claiborne Eocene of Texas. It is also recorded from the Eocene, Guayabal formation, of Mexico; from the Wilcox Eocene of Mississippi and Alabama; the Cook Mountain Eocene of Louisiana and Texas; and the Poway conglomerate of California. It occurs at all three localities in the Yegua.

Genus NONIONELLA Cushman, 1926

NONIONELLA HANTKENI (Cushman and Applin), var. FAYETTEI (Cushman and Ellisor) (Pl. 7, fig. 25)

Nonion hantkeni (CUSHMAN and APPLIN), var. *fayettei* CUSHMAN and ELLISOR, Contr. Cushman Lab. Foram. Res., vol. 8, 1932, p. 41, pl. 6, figs. 3 *a*, *b*.

Nonionella hantkeni (CUSHMAN and APPLIN), var. *fayettei* ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 17, No. 11, 1933, pl. 7, figs. 9 *a*, *b*. —CUSHMAN, U. S. Geol. Survey Prof. Paper 191, 1939, p. 30, pl. 8, figs. 6 *a-c*.

"Test elongate, much compressed, slightly umbilicate, periphery rounded; chambers distinct, numerous, 10 to 12 in the last-formed whorl in the adult, increasing somewhat in length as added but changing very little in height; sutures distinct, slightly curved, those of the early portion limbate and often slightly raised, later ones becoming flush with the surface and the limbate character disappearing; wall smooth except for the slightly raised limbate sutures in the earlier portion, very finely perforate; aperture a narrow slit at the base of the apertural face of the last-formed chamber, between it and the preceding coil." Length 0.30 mm.; breadth 0.18-0.20 mm.

The Yegua specimens are rare and much smaller than the types from the Jackson Eocene of Louisiana and others from the Jackson of Texas. It may be that the Yegua specimens are young ones not fully developed. They occur only at Locality III.

Family BULIMINIDAE

Genus VIRGULINA d'Orbigny, 1826

VIRGULINA cf. ZETINA Cole (Pl. 7, fig. 26)

A single specimen from Yegua Locality III may belong to this species but is not entirely typical. More specimens are needed to make the identification certain.

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA TAYLORI Howe (Pl. 7, fig. 27)

Bolivina taylori HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 67, pl. 9, figs. 9, 10.

Test about two and a half times as long as broad, strongly compressed, periphery acute but not keeled; chambers of uniform shape, increasing regularly in size as added, not inflated; sutures distinct, limbate, strongly oblique, not depressed; wall smooth, finely perforate; aperture elongate, narrow, slightly rounded at the inner end. Length 0.30-0.35 mm.; breadth 0.12-0.15 mm.

Specimens occur at all three of the Yegua localities. The types are from the Cook Mountain Eocene of Louisiana and the Yegua specimens seem very typical.

Genus LOXOSTOMA Ehrenberg, 1854

LOXOSTOMA CLAIBORNENSE Cushman (Pl. 7, fig. 28)

Loxostoma claibornense CUSHMAN, Special Publ. 6, Cushman Lab. Foram. Res., 1936, p. 59, pl. 8, figs. 15 *a*, *b*; l. c., Special Publ. 9, 1937, p. 175, pl. 20, figs. 23, 24.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 68, pl. 9, fig. 11.

Bolivina gracilis COLE (not CUSHMAN and APPLIN), Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 26, pl. 5, fig. 13.

"Test elongate, about three times as long as broad, somewhat compressed, periphery broadly rounded, gradually tapering to the greatest breadth near the apertural end; chambers distinct, very slightly inflated, distinctly overlapping, in the early portion much broader than high, in the adult with the height and breadth about equal; sutures distinct, slightly limbate, sigmoid, slightly tapering, more strongly so in the early portion; wall very coarsely perforate, otherwise smooth; aperture rounded, with a distinct lip, tending to become terminal." Length 0.35-0.40 mm.; breadth 0.10-0.12 mm.

This seems to be an excellent index fossil for the Claiborne Eocene. The types are from the Claiborne of Texas and it is recorded from the Claiborne, Cook Mountain formation, of Louisiana and from the Guayabal of Mexico. It occurs in the Yegua at Localities I and II.

Family ROTALIIDAE

Genus GYROIDINA d'Orbigny, 1826

GYROIDINA SOLDANII d'Orbigny, var. OCTOCAMERATA Cushman and G. D. Hanna (Pl. 8, fig. 1)

Gyroidina soldanii D'ORBIGNY, var. *octocamerata* CUSHMAN and G. D. HANNA, Proc. Calif. Acad. Sci., ser. 4, vol. 16, 1927, p. 223, pl. 14, figs. 16-18.—COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 29, pl. 2, figs. 21-23.—CUSHMAN and M. A. HANNA, Trans. San Diego Soc. Nat. Hist., vol. 5, 1927, p. 56, pl. 5, fig. 7.—CUSHMAN and SCHENCK, Univ. Calif. Publ., Bull. Dept. Geol. Sci., vol. 17, 1928, p. 312, pl. 44, figs. 3-5.—WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 406.—CUSHMAN and THOMAS, l. c., vol. 4, 1930, p. 40, pl. 4, figs. 2, 3.—CONDIT, l. c., vol. 4, 1930, p. 260 (list).—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 62.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 45, pl. 18, figs. 4 *a-c*.—CUSHMAN and MCMASTERS, Journ. Pal., vol. 10, 1936, p. 514.—GLAESSNER, Problems of Paleontology, Moscow Univ., vols. 2-3, 1937, p. 379, pl. 3, figs. 27 *a-c*.—BERMÚDEZ, Mem. Soc. Cubana Hist. Nat., vol. 12, No. 1, 1938, p. 12.—PARR, Journ. Roy. Soc. W. Australia, vol. 24, 1937-38, p. 83, pl. 2, figs. 14 *a-c*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 75, pl. 9, figs. 34-36.—CUSHMAN and SIEGFUS, Trans. San Diego Soc. Nat. Hist., vol. 9, 1942, p. 418, pl. 17, figs. 31 *a-c*.

Test small, dorsally flattened, ventrally much convex and strongly umbilicate, composed of about three whorls, periphery broadly rounded; chambers distinct, very slightly if at all inflated, eight in the adult whorl; sutures distinct, slightly depressed, dorsally somewhat oblique, ventrally radial; wall finely perforate, smooth and polished; aperture elongate, arched, from the periphery at least half way to the umbilicus along the ventral border of the last-formed chamber, with a very slight lip. Diameter 0.30-0.40 mm.; thickness 0.20-0.25 mm.

This is evidently a widely distributed species in the Eocene of Claiborne and Jackson age. It is recorded from the Claiborne Eocene of Texas and Louisiana and the Jackson Eocene of North Carolina and Alabama, from the Eocene of California, the Guayabal formation of Mexico, and the Eocene of Cuba, the Caucasus region of Russia, and from West Australia. There are a few records from the lower Oligocene. It occurs in the Yegua collections at Localities II and III.

Genus EPONIDES Montfort, 1808

EPONIDES MEXICANUS (Cushman) (Pl. 8, fig. 2)

Pulvinulina mexicana CUSHMAN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 300, pl. 7, figs. 7, 8.

Eponides mexicana CUSHMAN, Journ. Pal., vol. 1, No. 2, 1927, p. 165, pl. 26, figs. 6, 7.—CUSHMAN and M. A. HANNA, Trans. San Diego Soc. Nat. Hist., vol. 5, 1927, p. 54, pl. 5, figs. 8, 9.—COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 29, pl. 2, figs. 6-8.—NUTTALL, Journ. Pal., vol. 4, 1930, p. 276; vol. 9, 1935, p. 129, pl. 15, figs. 15, 16.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 75, pl. 9, figs. 31-33 (not pl. 10, figs. 1-3).

"Test unequally biconvex, dorsal side forming a low cone, ventral side only slightly biconvex, periphery subacute, subcarinate, last-formed coil with eight to ten chambers, only those of the last-formed coil visible from the ventral side, which is umbonate; sutures distinct, very slightly limbate on the dorsal side, ventrally very slightly depressed near the periphery, becoming limbate near the umbilicus, and often fusing on the inner margin and forming a ring; wall distinctly but rather finely perforate; aperture elongate on the middle part of the inner margin of the ventral side of the last-formed chamber."

This species was described from the Eocene, Tantoyuca formation, of Mexico. It is also recorded from the Guayabal formation of Mexico, the Eocene of Venezuela and California, and the Claiborne, Cook Mountain formation, of Louisiana. It occurs in all three of the Yegua localities.

It has fewer chambers and a more acute periphery than *E. guayabalensis* Cole.

EPONIDES GUAYABALENSIS Cole (Pl. 8, figs. 3, 4)

Eponides guayabalensis COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 29, pl. 2, figs. 17-19.—CUSHMAN and THOMAS, Journ. Pal., vol. 3, 1929, p. 180, pl. 23, figs. 6 *a-c*.—WEINZIERL and APPLIN, l. c., pl. 42, figs. 1 *a-c*.—NUTTALL, l. c., vol. 4, 1930, p. 276.

Eponides patelliformis STADNICHENKO, l. c., vol. 1, No. 3, 1927, p. 232, pl. 38, figs. 6-8.

Eponides mexicana HOWE (not CUSHMAN), Geol. Bull. 14, Louisiana Geol. Survey, 1939, pl. 10, figs. 1-3 (not pl. 9, figs. 31-33).

Test trochoid, unequally biconvex, dorsal side usually strongly convex, ventral side much less convex, but variable, periphery subacute or rounded, ventrally umbonate with a heavy raised

ring about the middle; chambers of the early portion obscure, later more distinct, numerous, twelve to fourteen in the adult whorl, of uniform shape, increasing very slightly in size as added; sutures slightly limbate, flush with the surface on the dorsal side, ventrally slightly depressed, dorsally strongly oblique, ventrally nearly radial; wall smooth, distinctly perforate; aperture a low arched slit on the ventral side of the last-formed chamber. Diameter 0.60-0.75 mm.; thickness 0.35-0.45 mm.

This species originally described from the Eocene, Guayabal formation, of Mexico occurs also in the Claiborne Eocene of Texas and Louisiana. It occurs in all three of the Yegua localities.

EPONIDES GUAYABALENSIS Cole, var. YEGUAENSIS Weinzierl and Applin
(Pl. 8, figs. 5, 6)

Eponides guayabalensis COLE, var. *yeguaensis* WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 406, pl. 42, figs. 2 *a-c*.—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 62, pl. 9, figs. 1 *a-c*.

This variety differs from the typical form in its smaller size, fewer chambers, nine to ten in the adult whorl, and more acute periphery.

The types of the variety are from the Eocene, Yegua formation, of Texas. It has also been recorded from the Cook Mountain formation of Texas and the Eocene, Poway conglomerate, of California. In our material it occurs at all three localities in the Yegua, usually with the typical form, and it is sometimes difficult to separate the two.

Genus SIPHONINA Reuss, 1850

SIPHONINA CLAIBORNENSIS Cushman (Pl. 8, fig. 7)

Siphonina claibornensis CUSHMAN, Proc. U. S. Nat. Mus., vol. 72, Art. 20, 1927, p. 4, pl. 3, figs. 5 *a-c*.—CUSHMAN and THOMAS, Journ. Pal., vol. 3, 1929, p. 181, pl. 24, figs. 2 *a-c*.—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 62.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 76, pl. 10, figs. 4-6, 10, 11.

"Test small, nearly circular, nearly equally biconvex, somewhat compressed, periphery angled, sharply acute, with a very slightly developed keel, lobulate; chambers usually five in the last-formed volution, slightly inflated on the ventral side; sutures distinct, strongly oblique, slightly curved, somewhat limbate on

the dorsal side, on the ventral side nearly radial, depressed; wall smooth, very distinctly perforate; aperture elongate, narrowly elliptical, occupying the whole height of the chamber, with a distinct lip but no definite neck." Length 0.25-0.35 mm.; thickness 0.12-0.15 mm.

This is a characteristic species of the Claiborne Eocene of Texas and Louisiana and recorded also from the Eocene of California. It occurs at all three of the Yegua localities. It is probable that some of the Claiborne records for *Siphonina tenuicarinata* Cushman may be *S. claibornensis*.

Family CASSIDULINIDAE

Genus CERATOBULIMINA Toula, 1915

CERATOBULIMINA EXIMIA (Rzehak) (Pl. 8, figs. 8, 9)

Pulvinulina eximia RZEHAK, Ann. k. k. Nat. Hofmuseums, vol. 3, pt. 3, 1888, p. 263, pl. 11, figs. 7 *a-c*.

Ceratobulimina eximia CUSHMAN and HARRIS, Contr. Cushman Lab. Foram. Res., vol. 3, 1927, p. 174, pl. 29, figs. 3, 4; pl. 30, figs. 12-16. —STADNICHENKO, Journ. Pal., vol. 1, No. 3, 1927, p. 233, pl. 38, figs. 9-11.—CUSHMAN and THOMAS, l. c., vol. 3, 1929, p. 182, pl. 24, figs. 3 *a-c*.—WEINZIERL and APPLIN, l. c., p. 407, pl. 42, figs. 3 *a*, *b*.—NUTTALL, l. c., vol. 4, 1930, p. 277.—PLUMMER, Amer. Midland Nat., vol. 17, 1936, p. 460, figs. 6-10 (in text).—GRAVELL and HANNA, Bull. Amer. Assoc. Petr. Geol., vol. 22, 1938, p. 1007, pl. 5, figs. 12, 14.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 80, pl. 11, figs. 12, 13.

Test slightly longer than broad, biconvex, broadly oval in peripheral view, periphery rounded, ventral side umbilicate; chambers eight to ten in the adult whorl, increasing gradually in size as added; slightly inflated on the ventral side; sutures distinct, on the dorsal side with a distinct angle, ventrally nearly radial, occasionally limbate and raised on the dorsal side; wall smooth, polished; aperture comma-shaped in the peripheral face of the last-formed chamber. Length 0.50-0.60 mm.; breadth 0.40-0.55 mm.; thickness 0.30-0.35 mm.

This species seems to be an index fossil for the Claiborne Eocene. It occurs in the Claiborne of Texas and Louisiana and in the Guayabal formation of Mexico. It is one of the most abundant species in the Yegua and occurs at all the horizons in all three localities.

Family GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA cf. YEGUAENSIS Weinzierl and Applin

A single broken specimen from Yegua Locality III may belong to this species.

Family GLOBOROTALIIDAE

Genus GLOBOROTALIA Cushman, 1927

GLOBOROTALIA CRASSATA (Cushman) (Pl. 8, fig. 10)

Pulvinulina crassata CUSHMAN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 300, pl. 7, fig. 4.

Globorotalia crassata COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 34, pl. 1, figs. 7, 8.—WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 408.—NUTTALL, l. c., vol. 4, 1930, pp. 276, 288.—CUSHMAN and BARKSDALE, Contr. Dept. Geol. Stanford Univ., vol. 1, 1930, p. 67, pl. 12, figs. 7 *a*, *b*.—GLAESSNER, Studies in Micropaleontology, Moscow Univ., vol. 1, 1937, p. 31, pl. 1, figs. 7 *a-c*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 84, pl. 12, figs. 7-9.—CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 74, pl. 12, fig. 19.

"Test small, plano-convex, the dorsal side nearly flat, ventral

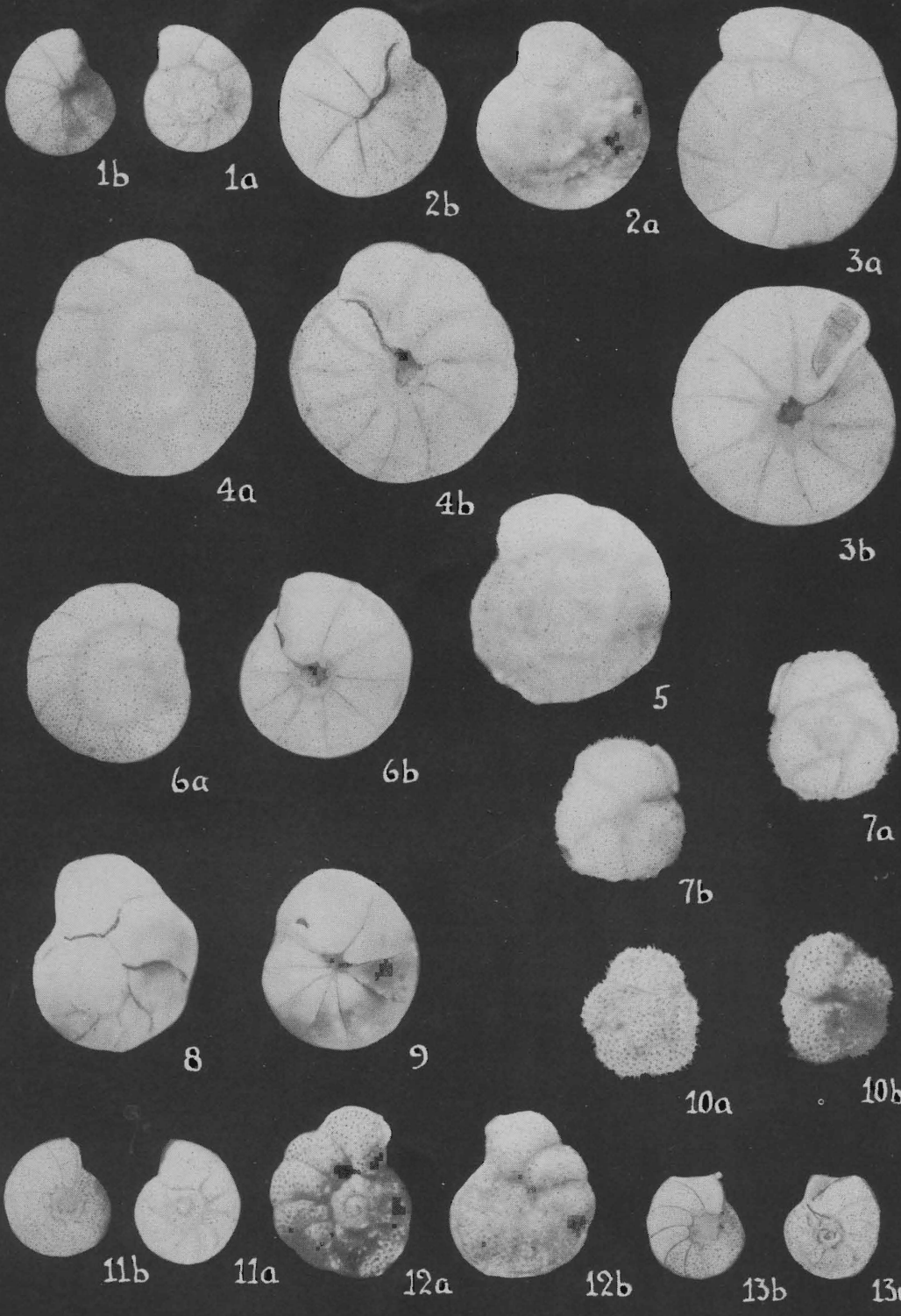
---

EXPLANATION OF PLATE 7

(All figures about × 65)

FIG. 1. *Haplophragmoides excavatus* Cushman and Waters, var. Loc. III. 2. *H. mauricensis* Howe and Ellis. Loc. I. 3. *H.* cf. *dibollensis* Cushman and Applin. Loc. I. 4. *Ammobaculites mauricensis* Howe. Loc. I. 5. *Spiroplectammina* cf. *mississippiensis* (Cushman). Loc. III. 6. *Eggerella cushmani* (Weinzierl and Applin). Loc. II. 7. *Quinqueloculina yeguaensis* Weinzierl and Applin. Loc. III. *a*, *b*, opposite sides. 8. *Q. mauricensis* Howe. Loc. III. *a*, *b*, opposite sides. 9. *Cornuspira* cf. *oligogyra* Hantken. Loc. III. 10. *Triloculina mindenensis* Howe. Loc. III. *a*, *b*, opposite sides. 11. *Robulus alato-limbatus* (Gümbel). Loc. III. 12, 13. *R. guayabalensis* (Cole). Loc. I. 14. *R. jugosus* Cushman and Thomas. Loc. I. 15, 16. *R. jugosus* Cushman and Thomas, var. 15, Loc. I. 16, Loc. III. 17. *Vaginulina* cf. *wrighti* Cole. Loc. I. 18. *Guttulina irregularis* (d'Orbigny). Loc. II. 19. *Globulina gibba* d'Orbigny. Loc. III. 20. *Sigmomorphina pseudoregularis* Cushman and Thomas. Loc. III. 21. *Glandulina* cf. *laevigata* d'Orbigny. Loc. III. 22. *Sigmomorphina semitecta* (Reuss). Loc. II. 23. *S. semitecta* (Reuss), var. *terquemiana* (Fornasini). Loc. I. 24. *Nonion planatum* Cushman and Thomas. Loc. II. 25. *Nonionella hantkeni* (Cushman and Applin), var. *fayettei* (Cushman and Ellisor). Loc. III. *a*, dorsal view. *b*, ventral view. 26. *Virgulina* cf. *zetina* Cole. Loc. III. 27. *Bolivina taylori* Howe. Loc. III. 28. *Loxostoma claibornense* Cushman. Loc. I.


1
2
3
4
5
6
7a
7b
8a
8b
9
10a
10b
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25a
25b
26
27
28


1b
1a
2b
2a
3a
4a
4b
3b
5
6a
6b
7a
7b
8
9
10a
10b
11b
11a
12a
12b
13b
13a

side strongly convex, last-formed whorl with usually four to six chambers, periphery subacute; chambers inflated, especially on the ventral side; sutures distinct, slightly depressed on the dorsal side, strongly so on the ventral side; wall ornamented with short spinose processes closely set; aperture elongate, on the inner edge of the ventral face of the last-formed chamber." Diameter 0.30-0.35 mm.; thickness 0.18 mm.

This species is recorded from the Claiborne Eocene of Texas and Louisiana, from the Guayabal and Aragon formations of Mexico, from the Martinez formation of California, from the Eocene of submarine cores of the western Atlantic, and from the Eocene of the Caucasus region of Russia.

It is rare in the Yegua collections from Localities I and III.

Family ANOMALINIDAE

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA COSTIANA Weinzierl and Applin (Pl. 8, fig. 11)

Anomalina costiana WEINZIERL and APPLIN, Journ. Pal., vol. 3, 1929, p. 409, pl. 44, figs. 7 *a-c*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 86, pl. 13, figs. 9-11.

Test small, compressed, about equally biconvex, periphery angled, subacute; chambers distinct, slightly inflated, nine or ten in the adult whorl, of uniform shape, increasing very gradually in size as added; sutures distinct, slightly limbate, thickened and raised near the center on the dorsal side, gently curved; wall coarsely perforate, smooth except for the central part of the dorsal side where there is a distinct thickening near the center; aperture a low opening near the periphery at the base of the last-formed chamber. Diameter 0.30-0.35 mm.; thickness 0.12-0.15 mm.

EXPLANATION OF PLATE 8

(All figures about × 65)

a, dorsal view; *b*, ventral view.

FIG. 1. *Gyroidina soldanii* d'Orbigny, var. *octocamerata* Cushman and G. D. Hanna. Loc. II. 2. *Eponides mexicanus* (Cushman). Loc. II. 3, 4. *E. guayabalensis* Cole. Loc. II. 5, 6. *E. guayabalensis* Cole, var. *yeguaensis* Weinzierl and Applin. Loc. I. 7. *Siphonina claibornensis* Cushman. Loc. I. 8, 9. *Ceratobulimina eximia* (Rzehak). 8, Loc. I. 9, Loc. II. 10. *Globorotalia crassata* (Cushman). Loc. III. 11. *Anomalina costiana* Weinzierl and Applin. Loc. II. 12. *Cibicides sassei* Cole. Loc. III. 13. *C. pseudowuellerstorfi* Cole. Loc. II.

This seems to be a characteristic species of the Claiborne Eocene. It is recorded from Texas and Louisiana, and in the Yegua collections occurs at all three localities.

Genus CIBICIDES Montfort, 1808

CIBICIDES SASSEI Cole (Pl. 8, fig. 12)

Cibicides sassei COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 35, pl. 4, figs. 10, 11.—CUSHMAN and THOMAS, Journ. Pal., vol. 3, 1929, p. 182, pl. 24, figs. 4 *a-c*; l. c., vol. 4, 1930, p. 41, pl. 4, figs. 4 *a-c*.—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 64, pl. 9, figs. 5 *a-c*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 88, pl. 13, figs. 18, 19.

Test plano-convex, dorsal side nearly flat, ventral side moderately convex, periphery subacute, slightly lobulate; chambers distinct, eight to ten in the adult whorl, increasing gradually in size as added, slightly if at all inflated; sutures distinct, slightly depressed, curved on both sides; wall coarsely perforate; aperture extending on both sides from the periphery, low. Diameter 0.45 mm.; thickness 0.15 mm.

The types are from the Eocene, Guayabal formation, of Mexico. It is also recorded from the Claiborne Eocene of Texas and Louisiana and from the Poway conglomerate of California. In the Yegua collections it occurs rarely at Locality III.

CIBICIDES PSEUDOWUELLERSTORFI Cole (Pl. 8, fig. 13)

Cibicides pseudowuellerstorfi COLE, Bull. Amer. Pal., vol. 14, No. 51, 1927, p. 36, pl. 1, figs. 13, 14.—CUSHMAN and DUSENBURY, Contr. Cushman Lab. Foram. Res., vol. 10, 1934, p. 64, pl. 9, figs. 4 *a-c*.—HOWE, Geol. Bull. 14, Louisiana Geol. Survey, 1939, p. 88, pl. 13, figs. 1-3.

Test plano-convex, dorsal side flat, ventral side only slightly convex, periphery acute, slightly carinate; chambers numerous, ten to twelve in the adult whorl, very gradually increasing in size as added, not inflated; sutures curved on both sides, somewhat limbate; wall coarsely perforate; aperture at the periphery and extending over onto the dorsal side, low. Diameter 0.25-0.35 mm.; thickness 0.10-0.12 mm.

The types of this species are from the Eocene, Guayabal formation, of Mexico and it is recorded from the Claiborne Eocene of Louisiana and the Poway conglomerate of California. The Yegua specimens are smaller than the types and occur at all three localities.

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the foraminifera that have come to hand:

Brotzen, Fritz. Die Foraminiferengattung Gavelinella nov. gen. und die Systematik der Rotaliiformes.—Sveriges Geologiska Undersökning, Ser. C, No. 451, 1942, pp. 1-60, pl. 1, 18 text figs.—*Gavelinella* new genus (genotype, *Discorbina pertusa* Marsson); *Gyroidinoides* new genus (genotype, *Rotalina nitida* Reuss); *Pseudovalvulineria* new genus (genotype, *Rosalina lorneiana* d'Orbigny); *Anomalinoides* new genus (genotype, *A. plummerae* new name for *Anomalina grosserugosa* Plummer [not Gümbel]); *Globorotalites* new genus (genotype, *Globorotalia multisepta* Brotzen); *Rotalipora* new genus (genotype, *Rotalipora turonica*, n. sp.) New species include *Gavelinella costata, G. bullata, G. tumida, G. baltica, and G. tormarpensis.* Several new family groups proposed.

Dunbar, Carl O. and **Lloyd G. Henbest.** Pennsylvanian Fusulinidae of Illinois.—Illinois State Geological Survey, Bull. 67, 1942, pp. 1-218, pls. 1-23, text figs. A, 1-13. A complete account of the group with chapters on stratigraphy, morphology, preparation and study, systematic review of the genera, description of species (35 species and varieties described and figured, 16 new), checklist of genera and species, and bibliography.

Schenck, Hubert G. *Acila princeps*, a new Upper Cretaceous pelecypod from California.—Journ. Pal., vol. 17, No. 1, Jan., 1943, pp. 60-68, pls. 8, 9, 2 text figs. Notes a few foraminifera on pp. 62 and 66.

Hussey, Keith M. Distinctive new species of foraminifera from the Cane River Eocene of Louisiana.—L. c., No. 2, March, 1943, pp. 160-167, pls. 26, 27. One new genus and eleven new species described as follows: *Cyclammina caneriverensis, Pseudoclavulina elongata, Goësella gibbosa, Karreriella ovata, Marginulina variata, Nodosaria primitiva, Nodoplanulis* new genus, *N. elongata, Bifarina turriformis, Siphonina carinata, Anomalina nodosa,* and *Cibicides hypoconoides.*

Logue, L. L. and **M. W. Haas.** Paranonion, a new genus of foraminifera from the Miocene of Venezuela.—L. c., pp. 177, 178, pl. 30 (part). *Paranonion* new genus, genotype *P. venezuelanum* n. sp.

Thompson, M. L. Permian fusulinid from Peru.—L. c., pp. 203-205, pl. 33. *Schwagerina* aff. *S. laxissima* Dunbar and Skinner.

Kelley, Frederic Richard. Eocene Stratigraphy in western Santa Ynez mountains, Santa Barbara County, California.—Bull. Amer. Assoc. Petr. Geol., vol. 27, No. 1, 1943, pp. 1-19, pl. 1, text figs. 1-4, tables 1-3. Lists numerous foraminifera.

J. A. C.