

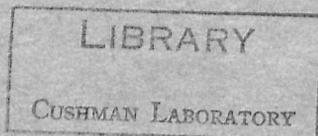
CONTRIBUTIONS
FROM THE
CUSHMAN LABORATORY
FOR
FORAMINIFERAL RESEARCH

VOLUME 24, PART 4
December, 1948

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SHARON, MASSACHUSETTS, U. S. A.
1948



CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

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These Contributions will be issued quarterly. They will contain short papers with plates, describing new forms and other interesting notes on the general research work on the foraminifera being done on the group by the workers in this laboratory. New literature as it comes to hand will be briefly reviewed.

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CONTRIBUTIONS FROM THE CUSHMAN
LABORATORY FOR FORAMINIFERAL RESEARCH

320. THE GENUS *COLEITES* AND ITS SPECIES

BY JOSEPH A. CUSHMAN and PEDRO J. BERMUDEZ

The genus *Coleites* is a specialized one which developed in the Paleocene and apparently became extinct in the Wilcox Eocene. Its peculiar ornamentation and subterminal aperture are distinctive. A number of species, mostly new, have been found in the West Indies and Central America.

We are indebted to Caridad V. Bermudez, wife of the junior author, for the drawings in this and the following paper.

Genus *COLEITES* Plummer, 1934

Genotype, *Pulvinulina reticulosa* Plummer

Coleites PLUMMER, Amer. Midland Nat., vol. 15, 1934, p. 605.—CUSHMAN, Foraminifera, 3rd Ed., 1940, p. 265.—BROTZEN, Sver. Geol. Under., ser. C, No. 493, 1948, p. 107.
Pulvinulina PLUMMER, 1927 (part).

Test trochoid in the young, in the adult uncoiling and broad; chambers in a single series; wall calcareous, coarsely perforate; aperture in the young ventral, in the adult subterminal, elliptical, with a slight tooth on the ventral side.—Paleocene and Wilcox Eocene.

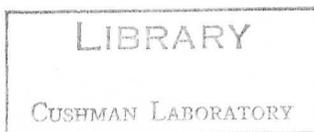
Some specimens from the Danian of Europe have been referred to this genus as well as specimens from other regions but we have not had specimens from those regions for study.

COLEITES RETICULOSUS (Plummer) (Pl. 13, figs. 1-4)

Pulvinulina reticulosa PLUMMER, Univ. Texas Bull. 2644, 1926 (1927), p. 152, pl. 12, fig. 5.

Coleites reticulosus PLUMMER, Amer. Midland Nat., vol. 15, 1934, p. 606, pl. 24, figs. 5-9.
—CUSHMAN and GARRETT, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 87, pl. 15, figs. 14-20.—CUSHMAN, l. c., vol. 16, 1940, p. 71, pl. 12, fig. 20; Foraminifera, 3rd Ed., 1940, Key, pl. 48, figs. 4-6.—TOULMIN, Journ. Pal., vol. 15, 1941, p. 606, pl. 81, fig. 21.—MARIE, Comptes Rendus Soc. Geol. France, 1943, No. 3, p. 19.—MARTIN, Stanford Univ. Publ., Univ. Ser., Geol. Sci., vol. 3, No. 3, 1943, p. 10 (list).
—BROTZEN, Sver. Geol. Under., ser. C, No. 493, 1948, p. 109, pl. 18, fig. 1; text figs. 29-33.

“Test broadly elongate, greatly compressed; peripheral margin very sharply acute and conspicuously flanged; chambers rapidly increasing,



very coarsely reticulate on both sides of the test obscuring all sutures on the dorsal face and all but the last one or two on the ventral face; sutures slightly depressed between the last two or three chambers on the ventral side; aperture a narrow slit on the umbilical side. Length up to .6 mm."

correction from
Mrs. Plummer:
3 1/2 miles southeast
of Corsicana,
Havard County

The types of this species are from the Paleocene, upper part of the Midway, Wills Point formation, ~~2 miles north~~ of Mexia, Texas. Similar specimens occur in the Wilcox Eocene of Woods Bluff, Ala. It is also recorded from the Wilcox Eocene, Salt Mountain limestone, Bashi and Hatchetigbee formations of Alabama and Vincentown formation of New Jersey. Other records are from the Eocene, Lodo formation, of California, basal Eocene of Egypt, and Danian and Paleocene of Sweden. Specimens from some of these areas are not available and from the figures more than one species may be included.

Our figured specimens from the Paleocene Madruga formation of San Juan y Martinez, Pinar del Rio Province, Cuba (Bermudez sta. C 24), seem to belong here.

COLEITES LAEVIGATUS Toulmin (Pl. 13, figs. 5-8)

Coleites laevigatus TOULMIN, Journ. Pal., vol. 15, 1941, p. 605, pl. 81, figs. 17-20.

"Test subcircular to elongate, compressed, about equally biconvex, periphery acute with narrow indistinct flange; early chambers tightly coiled, later chambers in mature specimens becoming uncoiled, six or seven in number in the final whorl, overlapping, narrow and curved in the earlier portion of the test, becoming broader in the later portion, final chamber as broad as long; sutures on the dorsal side usually indistinct, flush with the surface, limbate, curved, meeting the periphery at an acute angle and merging into the peripheral flange, ventral sutures simple, depressed, earlier ones curved, becoming straight in the later evolute portion of the test; wall rather coarsely perforate; aperture an elliptical opening adjacent and parallel to the periphery on the ventral side. Diameter up to 0.7 mm.; thickness up to 0.33 mm."

The types of this species are from the Wilcox Eocene, Salt Mountain limestone, from Richmond Branch, 1/2 mile north of Salt Mountain, Clarke Co., Ala. It is also recorded from the Paleocene, upper Midway limestone, of Ft. Gaines, Georgia.

A study of paratypes shows that this species has many of the characters of *Coleites* but largely lacks the distinctive ornamentation of the genotype.

COLEITES DANICUS Brotzen (Pl. 13, fig. 9)

Coleites danicus BROTZEN, Sver. Geol. Under., ser. C, No. 493, 1948, p. 113, pl. 18, fig. 2.

"Test subcircular to elongate, about equally biconvex, periphery acute

or keeled; 5-6 chambers in the last whorl of the coiled stage, in the rectilinear part up to five, sutures on the spiral side transparent, on the umbilical side slightly depressed. Wall in the young with raised suture ridges, mostly elevated near the middle part of the spiral side, and only few radial costae near the centre of the umbilical side. In the adult ornamented on both sides, reticulate, highest in the middle part of the sides, slightly on the margins and in the rectilinear part, without ornament on the last chamber of the uncoiled part. Aperture *Pulvinulinella*-like in the young ones and terminal in the adult."

The species is recorded as very rare in the Danian of Limhamn, Sweden, and two specimens have been found in the Ystad Paleocene, one in the upper and one in the lower part.

COLEITES CANCELLATUS (Cushman and Bermudez) (Pl. 13, figs. 10, 11)

Pulvinulinella cancellata CUSHMAN and BERMUDEZ, Contr. Cushman Lab. Foram. Res., vol. 12, 1936, p. 35, pl. 6, fig. 7.—BERMUDEZ, Mem. Soc. Cubana Hist. Nat., vol. 12, 1938, p. 21.—MARIE, Comptes Rendus Soc. Geol. France, 1943, No. 3, p. 19.

"Test trochoid, close coiled, nearly equally biconvex, periphery keeled; chambers indistinct, five or six in the final whorl; sutures indistinct, oblique, slightly curved; wall except the last chamber with a cancellated surface consisting of an irregularly polygonal, raised meshwork; aperture, an elongate, elliptical opening slightly on the ventral side of the periphery. Diameter 1.00 mm.; thickness 0.50 mm."

The types are from the upper Eocene, Jabaco formation, 4.5 kms. N. of Guanajay on the road to Mariel, Pinar del Rio Province, Cuba. Specimens are figured from the Paleocene of Rio Pasion, Peten Province, Guatemala. It is frequent in the Eocene of Cuba but rare in the Paleocene of Guatemala. The species is evidently to be included in the genus *Coleites*.

COLEITES ABUILLOTENSIS Cushman and Bermudez, n. sp. (Pl. 14, figs. 1, 2)

Test elongate, strongly compressed, nearly flat, 3 times as long as broad, greatest breadth toward the central portion, slightly convex ventrally, peripheral margin subacute; chambers numerous, 14 to 15 comprising the entire test, early portion involute, formed by 7 to 8 chambers, each connected with the preceding by the apertural openings; sutures slightly depressed, strongly curved on both sides of the test; wall distinctly reticulate; aperture a longitudinal slit at the middle of the peripheral edge of the last-formed chamber. Length of holotype 1.11 mm.; breadth 0.55 mm.; thickness 0.12 mm.

Holotype (Cushman Coll. No. 58452) from the lower Eocene, Aboullot River, Central Plain, Haiti.

This species is known only from the type locality. It differs from *C. reticulosus* (Plummer) in the less convex ventral side, more compressed form, and less acute peripheral margin.

COLEITES GUATEMALENSIS Cushman and Bermudez, n. sp. (Pl. 14, figs. 3-5)

Test strongly compressed, early portion trochoid and slightly thicker than the later portion, adult portion uncoiling but somewhat curved, periphery subacute, the early portion irregularly dentate, later slightly lobulate; chambers of the early trochoid portion rather indistinct, in the later uncoiled portion much more distinct; sutures distinct except in the early portion, strongly curved, depressed on the ventral side and slightly raised and limbate on the dorsal side; wall of the early coiled portion finely reticulate, the uncoiled portion nearly smooth; aperture in the adult elongate in the middle of the terminal border, slightly on the ventral side. Length of holotype 1.00 mm.; breadth 0.70 mm.; thickness 0.10 mm.

Holotype (Cushman Coll. No. 58454) from the lower Eocene, Rio Pasion, Peten Province, Guatemala.

This species differs from *C. aboullotensis* Cushman and Bermudez in the broader form, smoother test, and slightly raised, limbate ^{sutures} ~~costae~~ on the dorsal side.

COLEITES PASIONENSIS Cushman and Bermudez, n. sp. (Pl. 14, fig. 6)

Test only slightly longer than broad, thick, the dorsal side strongly convex, ventral side less convex, the adult portion tending to uncoil and much more compressed, periphery subacute, in the adult with a raised and thickened border on the dorsal side; chambers obscured by the surface ornamentation except the last two or three; sutures obscure, except the last two or three which are strongly raised and thickened on the dorsal side, only slightly so on the ventral side, only slightly curved; wall ornamented with very coarse reticulations on the early coiled portion, becoming much less coarse in the later uncoiled portion; aperture an elongate slit on the ventral margin of the last-formed chamber. Length of holotype 1.12 mm.; breadth 0.85 mm.; thickness 0.38 mm.

Holotype (Cushman Coll. No. 58457) from the lower Eocene, Rio Pasion, Peten Province, Guatemala.

This species differs from *C. reticulosus* (Plummer) in the very coarse reticulations of the early portion, the raised and thickened sutures of the dorsal side, and the more irregular periphery.

321. ADDITIONAL SPECIES OF PALEOCENE FORAMINIFERA
FROM THE MADRUGA FORMATION OF CUBA

BY JOSEPH A. CUSHMAN and PEDRO J. BERMUDEZ

Some of the species of the Madruga formation of Cuba have already been published in the preceding issue of these Contributions (vol. 24, pt. 3, September 1948, pp. 68-75, pls. 11, 12). The present species are an additional group of new ones not included in the previous paper. A list is given of some of the already known species which help to show the stratigraphic relationship of the Madruga formation with other formations of the same age elsewhere.

Family ROTALIIDAE

Genus VALVULINERIA Cushman, 1926

VALVULINERIA INSUETA Cushman and Bermudez, n. sp. (Pl. 14, figs. 7-9)

Test trochoid, biconvex, dorsal side nearly flat, ventral side strongly convex, slightly umbilicate, periphery broadly rounded; chambers few, 4 or 5 in the adult whorl, inflated, increasing very gradually in size as added; sutures distinct, depressed, curved; wall smooth; aperture at the ventral margin of the last-formed chamber with a distinct lip, partially covering the umbilicus. Length of holotype 0.55 mm.; breadth 0.47 mm.; thickness 0.32 mm.

Holotype (Cushman Coll. No. 58458) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species resembles *V. advena* Cushman and Siegfus, but differs in the slightly larger number of chambers, the last-formed one making up much less of the surface, and the lip much less prominent.

Genus GYROIDINA d'Orbigny, 1826

GYROIDINA MADRUGAENSIS Cushman and Bermudez, n. sp. (Pl. 14, figs. 10-12)

Test small, about as broad as long, thick, ventral side slightly umbilicate, dorsal side depressed in the center, periphery broadly rounded; chambers distinct, somewhat inflated, about six in the final whorl, increasing very gradually in size as added, on the dorsal side with a lobular extension, partially filling the central depression; sutures distinct, slightly depressed, ventrally somewhat sinuate, dorsally slightly curved; wall smooth; aperture a low opening at the ventral margin of the last-formed chamber extending from just below the periphery nearly to the umbilical area. Length 0.30-0.35 mm.; breadth 0.25-0.28 mm.; thickness 0.25 mm.

Holotype (Cushman Coll. No. 58460) from the Paleocene, Madruga

formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species differs from *G. subangulata* (Plummer) in the fewer chambers to the whorl and very depressed dorsal side with an extension of the chambers over this area.

Family ANOMALINIDAE

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA PRAEPISSITIFORMIS Cushman and Bermudez, n. sp. (Pl. 15, figs. 1-3)

Test fairly small, strongly compressed, about equally biconvex, periphery rounded, ventral side umbilicate, dorsal side slightly depressed in the earlier portion; chambers distinct, 10-12 in the adult whorl, of uniform shape, increasing very gradually in size as added, very slightly inflated; sutures distinct, very slightly depressed, curved; wall smooth; aperture at the base of the peripheral margin of the last-formed chamber extending over onto the ventral side, with a very slight lip. Length of holotype 0.47 mm.; breadth 0.40 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 58463) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species strongly resembles *Anomalina alazanensis* Nuttall, var. *spissiformis* Cushman and Stainforth from the Oligocene of Trinidad but differs in the smaller size, fewer chambers, and more strongly curved sutures.

ANOMALINA MADRUGAENSIS Cushman and Bermudez, n. sp. (Pl. 15, figs. 4-6)

Test of medium size, nearly bilaterally symmetrical, dorsal and ventral sides both depressed in the middle area, periphery rounded; chambers distinct, somewhat inflated, about 6 in the adult whorl, of uniform shape, very gradually increasing in size as added; sutures distinct, depressed, very slightly curved; wall smooth, coarsely perforate; aperture at the base of the peripheral margin of the last-formed chamber, extending slightly onto the ventral side, with a slight lip. Length of holotype 0.70 mm.; breadth 0.57 mm.; thickness 0.30 mm.

Holotype (Cushman Coll. No. 58466) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species resembles some of the forms that have been referred to *A. grosserugosa* (^{Cushman}Schwager) but differs from the typical form of that species in the bilaterally symmetrical test and fewer chambers.

ANOMALINA CUBANA Cushman and Bermudez, n. sp. (Pl. 15, figs. 7-9)

Test unequally biconvex, dorsal side nearly flattened in the central

area or slightly convex, ventral side more strongly convex with a distinct umbilical depression, periphery broadly rounded; chambers fairly distinct, slightly inflated on the dorsal side, strongly so on the ventral side, 5 or 6 in the adult whorl, increasing rather rapidly but uniformly in size as added; sutures fairly distinct and slightly depressed on the dorsal side, strongly depressed ventrally, sinuous; wall smooth, distinctly perforate; aperture at the base of the final chamber extending from near the periphery slightly onto the ventral side, without a definite lip. Length of holotype 0.85 mm.; breadth 0.70 mm.; thickness 0.40 mm.

Holotype (Cushman Coll. No. 58469) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species differs from *A. madrugaensis* Cushman and Bermudez, n. sp. in the smoother wall, more sinuous sutures, and the aperture largely ventral and without a lip.

Genus CIBICIDES Montfort, 1808

CIBICIDES MADRUGAENSIS Cushman and Bermudez, n. sp. (Pl. 15, figs. 10-12)

Test rather small, nearly equally biconvex, ventral side slightly more convex than the dorsal, periphery angled, but slightly rounded, ventral side distinctly umbonate; chambers fairly distinct, little if at all inflated, 6 to 8 in the final whorl, of rather uniform size and shape; sutures distinct, strongly curved, little if at all depressed, distinctly limbate on the ventral side; wall smooth, finely perforate; aperture narrow, at the basal margin of the last-formed chamber, extending very slightly on the ventral side but nearly the length of the chamber on the dorsal side. Length of holotype 0.40 mm.; breadth 0.37 mm.; thickness 0.25 mm.

Holotype (Cushman Coll. No. 58472) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, ^{Madruga,} Habana Province, Cuba.

This species differs from *C. allenii* (Plummer) in the smaller size, more umbonate ventral side and smooth dorsal side.

CIBICIDES REPRIMATUS Cushman and Bermudez, n. sp. (Pl. 15, figs. 13, 14)

Test plano-convex, dorsal side flattened, ventral side strongly convex, periphery subacute, ventral margins slightly concave, ventral side with a slight umbilical boss; chambers fairly distinct, especially in the later portion, increasing very gradually in size as added, on the dorsal side with a distinct oral depression in the middle of the inner margin; sutures fairly distinct, very slightly depressed in the later portion of the ventral side and all of the dorsal side, ventrally curved, slightly sinuous, dorsally irregular with distinct lobular projections; wall smooth except for the

depressions of the dorsal side; aperture at the peripheral margin extending onto the dorsal side, with a slight lip at the peripheral portion. Length of holotype 0.77 mm.; breadth 0.70 mm.; thickness 0.40 mm.

Holotype (Cushman Coll. No. 58475) from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.

This species is peculiar in its dorsal side differing from *C. madruagaensis* Cushman and Bermudez, n. sp. in the more plano-convex form, very small umbilical boss, and the indentations of the dorsal side.

CIBICIDES MIRIFICUS Cushman and Bermudez, n. sp. (Pl. 16, figs. 1-3)

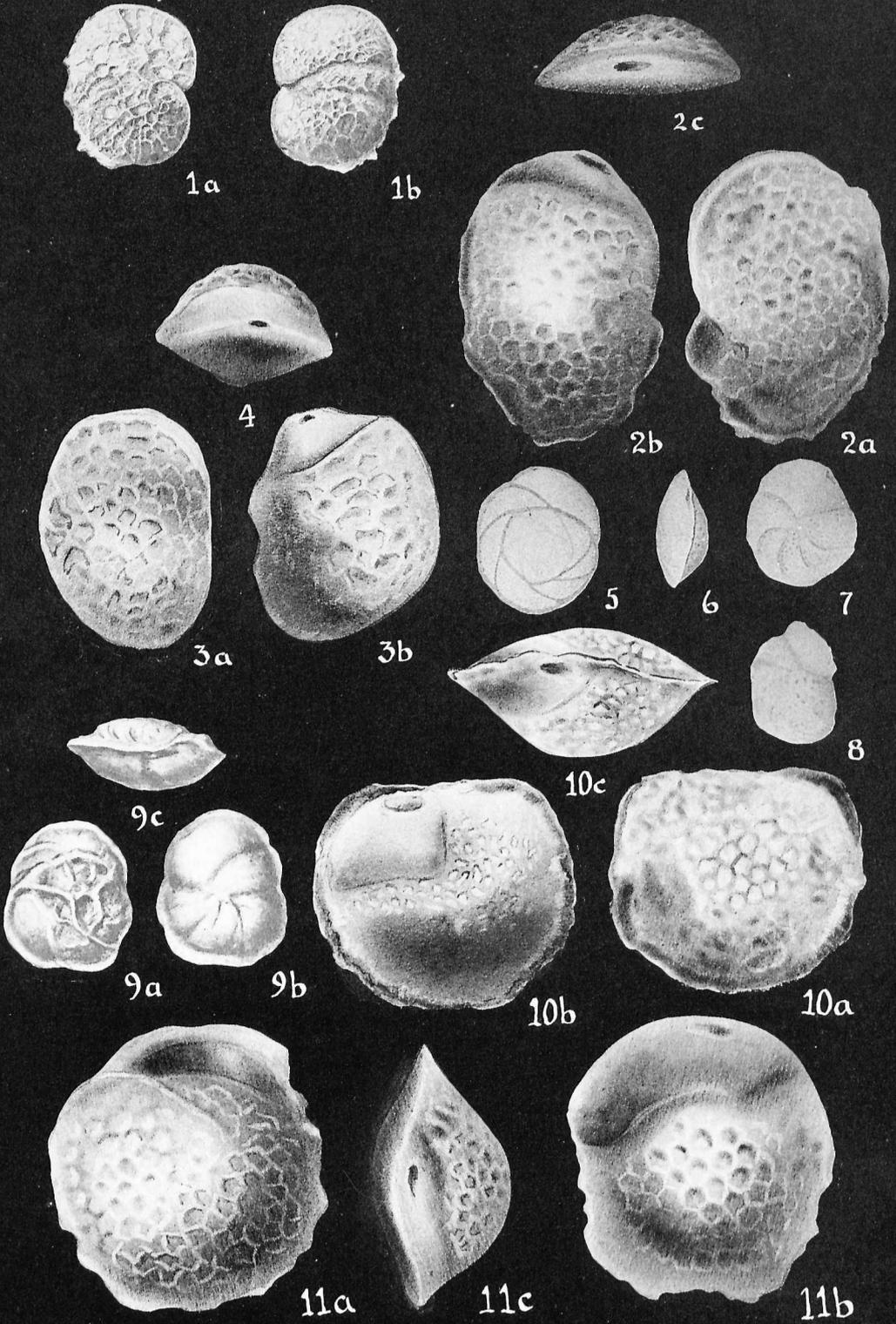
Test compressed, nearly equally biconvex, ventral side slightly more convex than the dorsal side, periphery angled, subacute, ventral side with a small but distinct umbonal boss, dorsal side with the central portion depressed in a close spiral; chambers distinct, 11-13 in the adult whorl, of uniform size, very gradually increasing in size as added, little if at all inflated; sutures distinct, not depressed except the last few on the ventral side, slightly curved; wall smooth, finely perforate; aperture at the base of the last-formed chamber, a small but distinct raised opening at the periphery, then extending over onto the dorsal side, with a very slight lip near the periphery. Length of holotype 0.52 mm.; breadth 0.47 mm.; thickness 0.23 mm.

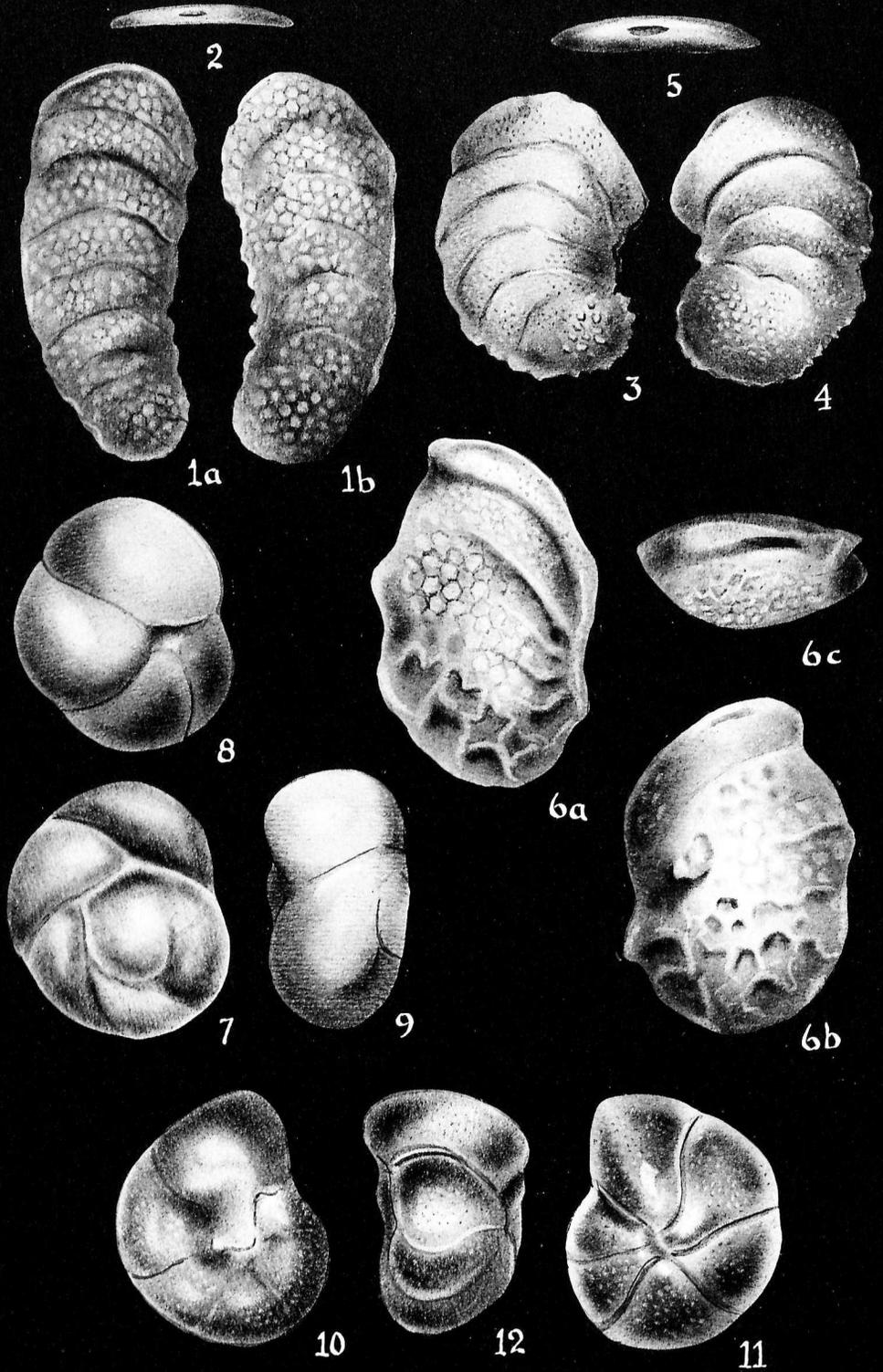
Holotype (Cushman Coll. No. 58477) from the Paleocene, Madruga formation, San Juan y Martinez, Pinar del Rio Province, Cuba.

This species differs from *C. madruagaensis* Cushman and Bermudez, n. sp. in the more compressed test, sharper peripheral angle, larger number of chambers, larger proportion of the dorsal side taken up by the last-formed whorl.

EXPLANATION OF PLATE 13

FIGS. 1-4. *Coleites reticulosus* (Plummer). 1a, b, Types. From Paleocene, shallow ditch at road corner southeast of new Corsicana Reservoir on the road to Mildred, Navarro Co., Texas. (After Plummer). $\times 40$. a, dorsal view; b, ventral view. 2a-c, From Plummer loc. 70, Paleocene, 5 miles SW. of Lytton Springs from 5 to 20 feet above the basal greensand of the Midway formation, Caldwell Co., Texas. $\times 70$. a, dorsal view; b, ventral view; c, peripheral view. 3, 4, From Paleocene, Madruga formation San Juan y Martinez, Pinar del Rio Province, Cuba. $\times 75$. 3a, dorsal view; 3b, ventral view. 4, Peripheral view of another specimen. 5-8. *C. laevigatus* Toulmin. From the Wilcox Eocene, Salt Mountain limestone, Richmond Branch, $\frac{1}{2}$ mi. N. of Salt Mountain, Ala. (After Toulmin). 5, 8, Paratypes. 6, 7, Peripheral and ventral views of holotype. $\times 27$. 5, Dorsal view. $\times 37$. 8, Ventral view. $\times 18$. 9. *C. danicus* Brotzen. Type. From Paleocene, Ystad, Sweden. (After Brotzen). $\times 75$. a, dorsal view; b, ventral view; c, peripheral view. 10, 11. *C. cancellatus* (Cushman and Bermudez). 10, From the upper Eocene, Jabaco formation, Pinar del Rio Province, Cuba, $\times 42$. 11, From the Paleocene of Rio Pasion, Peten Province, Guatemala, $\times 77$. a, a, dorsal views; b, b, ventral views; c, c, peripheral views.





Numerous already known species in the Madruga formation seem to confirm its Paleocene age, as follows:

- Angulogerina wilcoxensis* Cushman and Ponton
Anomalina acuta Plummer
Bulimina arkadelphiana Cushman and Parker, var. *midwayensis* Cushman and Parker
Bulimina (Desinobulimina) quadrata Plummer
Cibicides alleni (Plummer)
Cibicides blanpiedi Toulmin
Cibicides praecursorius (Schwager)
Cibicides vulgaris (Plummer)
Coleites reticulosus (Plummer)
Eowigerina excavata Cushman
Frondicularia naheolensis Cushman and Todd
Globigerina pseudobulloides Plummer
Globorotalia crassata (Cushman), var. *aequa* Cushman and Renz
Globorotalia wilcoxensis Cushman and Ponton, var. *acuta* Toulmin
Nodosaria affinis Reuss
Nodosaria longiscata d'Orbigny
Palmula delicatissima (Plummer)
Pseudowigerina naheolensis Cushman and Todd

There are many other species present in the Madruga formation, a number of which were described or noted in the previous issue of these Contributions.

EXPLANATION OF PLATE 14

FIGS. 1, 2. *Coleites abutilloensis* Cushman and Bermudez, n. sp. From the lower Eocene, Abutilot River, Central Plain, Haiti. $\times 52$. 1, Holotype. *a*, dorsal view; *b*, ventral view. 2, Paratype, peripheral view. 3-5. *C. guatemalensis* Cushman and Bermudez, n. sp. From lower Eocene, Rio Pasion, Peten Province, Guatemala. $\times 40$. 3, Holotype, dorsal view. 4, Paratype, ventral view. 5, Paratype, peripheral view. 6. *C. pasionensis* Cushman and Bermudez, n. sp. From lower Eocene, Rio Pasion, Peten Province, Guatemala. $\times 47$. Holotype. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. 7-9. *Valvulineria insueta* Cushman and Bermudez, n. sp. From Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba. $\times 70$. 7, Holotype, dorsal view. 8, Paratype, ventral view. 9, Paratype, peripheral view. 10-12. *Gyroidina madrugaensis* Cushman and Bermudez, n. sp. From Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba. $\times 125$. 10, Holotype, dorsal view. 11, Paratype, ventral view. 12, Paratype, peripheral view.

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322. A FORAMINIFERAL FAUNA
FROM THE NEW ALMADEN DISTRICT, CALIFORNIA*

BY JOSEPH A. CUSHMAN and RUTH TODD

This paper records a foraminiferal fauna from the New Almaden quick-silver district, Santa Clara County, California, in rocks ascribed to the Franciscan group. The present collection was made by Edgar H. Bailey and Donald L. Everhart, of the U. S. Geological Survey, who are mapping the district.

The fossil locality lies in a road cut in a small stream valley in the southwest quarter of sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian. On the standard topographic sheet of the Los Gatos, California, quadrangle (scale: 1/62,500) it is at a point 4.1 inches from the west edge of the map and 2.3 inches from the north edge. The locality is reached by a small secondary road which trends southwesterly from Shannon Road at a point 0.7 mile west of Guadalupe Creek. The fossils are found in the road cut about 0.23 mile from the Shannon Road junction.

The foraminifera occur in or near prominent limestone beds which, at the fossil locality, trend northwesterly and dip 33° SW. The limestone is interbedded with greenstone tuff and some chert throughout a zone 170 feet in exposed width, but individual limestone beds are no more than a few feet thick. The limestone beds pinch out along the strike to the northwest, and to the southeast the rock unit is faulted off a few hundred feet from the fossil locality. The limestone is gray to buff in color on fresh exposures and weathers to a whitish hue. It is characterized by a few intercalated thin lenses of chert, which are not as numerous as those in the same limestone "horizon" elsewhere in the district, and by thin partings of shale along the bedding planes. The better-preserved foraminifera may be found in the crumbly material near the contacts of the limestone and the greenstone tuff with which it is interbedded.

The limestone in which the foraminifera are found is a part of a deformed and faulted discontinuous "horizon" that extends throughout the New Almaden district. The limestone has been traced to that mapped as the Calera limestone member in the Santa Cruz quadrangle to the west, in turn, limestone which is identical in character may be followed northwestward in discontinuous pods and lenses to the quadrangles of the San Francisco folio. These rocks are a part of the Franciscan group of the California Coast Ranges which has generally been regarded as Upper Jurassic in age.

* Published by Permission of the Director, U. S. Geological Survey.

The foraminifera described in this paper were first discovered in 1946 by Senor José Henrique Pantin, formerly a graduate student at Stanford University, who made a study of the possibilities of correlating by heavy minerals certain limestones throughout a 22-mile interval in the California Coast Ranges. A few specimens of the foraminifera were submitted to Dr. Hans E. Thalmann, who made tentative identifications.

The only megafossils that have been found in these rocks in the New Almaden district are *Nerinea* sp., which is regarded as either Upper Jurassic or Lower Cretaceous in age, fragments of *Inoceramus* shells, and a few exceptionally large *Cidaridites* spines, which are apparently useless for age determination.

The foraminifera here described and figured do not include all of the forms present as the state of preservation and deformed condition of many of the tests make even generic determinations questionable or impossible. None of the species seems identifiable with any previously described species. Fourteen genera have been recognized, some with considerable question. Of these, six genera are known from beds as old as Jurassic or older, one from Lower Cretaceous beds only, five from beds not older than Lower Cretaceous, and two from beds not older than Upper Cretaceous. Thus the foraminifera would seem to indicate that these beds are younger than Jurassic. It is of interest that none of the species described as zone markers in the Upper Cretaceous of California¹ were found in this material from the New Almaden district. It seems best, therefore, to refer this material to the Lower Cretaceous.

The great abundance of specimens of *Globigerina* and *Globorotalia* as compared to the other genera suggests deposition under pelagic conditions, not necessarily in deep water, but at least in an area closely connected with open ocean.

We are indebted to Donald L. Everhart for the information about the stratigraphic setting of this fauna. The types and figured specimens are deposited in the Cushman Laboratory for Foraminiferal Research at Sharon, Mass. The washed material containing unpicked specimens is deposited in the U. S. National Museum in Washington, D. C.

SYSTEMATIC DESCRIPTIONS

Family TEXTULARIIDAE

Genus TEXTULARIA DeFrance, 1824

TEXTULARIA ? *ALMADENENSIS* Cushman and Todd, n. sp. (Pl. 16, fig. 4)

Test short, stout, and compact, only slightly broader than thick,

¹ Cushman, Joseph A., and Paul P. Goudkoff, Some Foraminifera from the Upper Cretaceous of California, Contr. Cushman Lab. Foram. Res., vol. 20, 1944, pp. 53-64, pls. 9, 10.

periphery broadly rounded throughout, apertural end bulging; chambers numerous, low, rapidly increasing in breadth at first, more gradually in the adult stage, slightly inflated; sutures straight, nearly horizontal, indented; wall arenaceous, of fine grains, smoothly finished; aperture a low, narrow slit in a slight reëntrant at the base of the apertural face of the last-formed chamber. Length 0.45-0.65 mm.; breadth 0.35-0.50 mm.; thickness 0.30-0.40 mm.

Holotype (Cushman Coll. No. 58481) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *T. subglabra* Cushman in its more inflated test and less distinct chambers and sutures. It occurs rarely. As the initial chambers are very small and difficult to see and may possibly be triserial for a very small proportion of the test, the generic position of this species is questionable.

Family VERNEUILINIDAE

Genus GAUDRYINA d'Orbigny, 1839

GAUDRYINA ALMADENSIS Cushman and Todd, n. sp. (Pl. 16, fig. 5)

Test small, slender, periphery indented, triserial portion roughly triangular in section, comprising less than half the length of the test; chambers distinct, slightly inflated in the adult, gradually increasing in size as added; sutures distinct, deeply incised, straight, oblique; wall coarsely arenaceous; aperture not observed. Length up to 0.75 mm.; diameter 0.25 mm.

Holotype (Cushman Coll. No. 58482) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species resembles *G. bearpawensis* Wickenden from the Upper Cretaceous, Bearpaw shale of western Canada, but differs in being more robust and less attenuated. It differs from *G. bentonensis* (Carman) in its much longer triserial portion.

Genus PSEUDOCLAVULINA Cushman, 1936

PSEUDOCLAVULINA CALIFORNICA Cushman and Todd, n. sp. (Pl. 16, fig. 6)

Test small, elongate, early triserial portion short, broad, triangular, and slightly offset from the later uniserial portion which is circular in section and less broad than the triserial portion; early chambers indistinct, later uniserial ones distinct, inflated, very slightly increasing in size as added; sutures horizontal and distinctly incised in the uniserial portion; wall rather coarsely arenaceous; aperture a small circular opening in a depression at the end of the last-formed chamber. Length up to 0.90

mm.; diameter of uniserial portion 0.25 mm.; breadth of triserial portion 0.30 mm.

Holotype (Cushman Coll. No. 58485) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *P. arenata* (Cushman) in its more prominent triserial portion and larger, more robust test. It occurs commonly.

PSEUDOCALVULINA ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, fig. 7)

Test of about equal breadth throughout, the earlier $\frac{2}{5}$ of test triangular in section and gradually tapering, later part of test irregularly circular in section; chambers indistinct and not inflated in the early part, distinct, irregular in shape, and slightly inflated in the later part; sutures distinct and deeply incised, particularly in the uniserial part; wall coarsely arenaceous and roughly finished; aperture a small, circular opening in a depression at the end of the last-formed chamber. Length up to 0.40 mm.; diameter 0.20-0.25 mm.

Holotype (Cushman Coll. No. 58486) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *P. californica* n. sp. in the triserial portion being proportionately longer and less broad and the uniserial chambers more irregular in shape. It is rare in this material.

PSEUDOCALVULINA CORIA Cushman and Todd, n. sp. (Pl. 16, fig. 8)

Test nearly cylindrical except for the tapering, triangular initial part which comprises about $\frac{1}{3}$ of the test; chambers indistinct, especially in the triserial part, not inflated, low, and very gradually increasing in height in the uniserial part; sutures indistinct, not depressed; wall finely arenaceous and very smoothly finished; aperture a circular opening at the end of the last-formed chamber, not protruding. Length up to 1.35 mm.; diameter 0.25-0.35 mm.

Holotype (Cushman Coll. No. 58489) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species is distinguished by its very smoothly finished surface and the even, uninflated test. It occurs commonly.

Family VALVULINIDAE

Genus ARENOBULIMINA Cushman, 1927

ARENOBULIMINA sp. (Pl. 16, fig. 10)

A single specimen belonging to this genus was found in the material. It rather closely resembles *A. americana* Cushman known from the Upper

Cretaceous, but is less smoothly finished. Its dimensions are: length 0.54 mm.; diameter 0.38 mm.

Genus DOROTHIA Plummer, 1931

DOROTHIA ? ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 11, 12)

Test of large size for the genus, biserial portion comprising most of the test, slightly compressed, periphery strongly indented; chambers few, large, inflated; sutures straight, oblique, very deeply incised; wall coarsely arenaceous, roughly finished; aperture a high, round opening at the base of the apertural face, sometimes obscured. Length up to 1.10 mm.; breadth up to 0.76 mm.; thickness up to 0.60 mm.

Holotype (Cushman Coll. No. 58491) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species is distinctive in its large, inflated chambers separated from each other by deeply incised sutures.

Genus TRITAXILINA Cushman, 1911

TRITAXILINA ? ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, fig. 9)

Test sharply triangular and tapering for the first part, later reducing in breadth and finally becoming circular in section; chambers of the triangular part indistinguishable, in the cylindrical part very indistinct; sutures very indistinct, oblique on the triangular part, horizontal on the cylindrical part; wall rather coarsely arenaceous; aperture a circular opening at the end of the last-formed chamber. Length up to 1.35 mm.; breadth of triangular part 0.37-0.42 mm.; breadth of uniserial part 0.25-0.35 mm.

Holotype (Cushman Coll. No. 58495) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

Material is too scanty to permit complete examination to determine the number of chambers in the first whorl and whether or not the wall is labyrinthic. Therefore, the generic determination must remain questionable and the species may be found to belong in *Pseudoclavulina* or *Martinottiella*.

Family BULIMINIDAE

Genus BULIMINA d'Orbigny, 1826

BULIMINA sp. (Pl. 16, fig. 13)

A single specimen which appears to belong to this genus was found. Its mode of preservation is different from that of most of the specimens as the test is very smooth, white and translucent. The chambers are very rapidly increasing in size as added so that the last whorl forms most of

the test, thus resembling *B. murchisoniana* d'Orbigny in shape. Length 0.35 mm.; diameter 0.27 mm.

Genus **BOLIVINA** d'Orbigny, 1839

BOLIVINA sp. (Pl. 16, fig. 14)

A very few specimens were found of a species of *Bolivina* which seems to be quite distinct and entirely unlike any described species. The test is thick and robust. The sutures are straight and nearly horizontal, the chambers low, and the periphery not indented. The aperture is a long, narrow slit extending from the base of the apertural face up to the apex of the test. The specimens vary in length from 0.30 to 0.45 mm., and in breadth from 0.15 to 0.20 mm.

Family **ROTALIIDAE**

Genus **GYROIDINA** d'Orbigny, 1826

GYROIDINA sp. (Pl. 16, fig. 16)

A very few specimens of a rotaloid form were found. This species is strongly convex on the ventral side and slightly so on the dorsal. It has a narrow last whorl of five chambers visible from the dorsal side. The earlier whorls and chambers are indistinct. The apertural face is high and truncate. The aperture is unobservable. Diameter 0.35 mm.; thickness 0.30 mm.

Genus **EPONIDES** Montfort, 1808

EPONIDES sp. (Pl. 16, fig. 15)

There was found a single specimen of a small, flattened, planoconvex form showing as many as three whorls and ten or eleven chambers per whorl on the dorsal side. The aperture is not observable. Diameter 0.35 mm.; thickness 0.15 mm.

Family **GLOBIGERINIDAE**

Genus **GLOBIGERINA** d'Orbigny, 1826

GLOBIGERINA ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 18, 19)

Test trochoid, compressed, composed of 2 to 2½ whorls, spire low, umbilicus large, open; chambers distinct, seven in the adult whorl, very little increasing in size as added in the adult; sutures distinct, depressed, radial; wall rough, probably due to the original spinosity of the surface; aperture opening into the umbilicus. Diameter 0.45-0.60 mm.; thickness 0.20-0.25 mm.

Holotype (Cushman Coll. No. 58502) from the Cretaceous?, road cut, SW. ¼ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *G. cretacea* d'Orbigny in having seven instead of five chambers in the adult whorl and in the more open umbilicus. It

somewhat resembles *G. planispira* Tappan from the Lower Cretaceous of Texas but is twice as large and the chambers are less spherical in shape and so the periphery is less lobulated. It occurs very abundantly.

GLOBIGERINA sp. (Pl. 16, fig. 17)

A large, distinctive *Globigerina* in this material is represented by only two specimens. It is extremely high-spired, composed of five or six globular chambers per whorl, and the test composed of $2\frac{1}{2}$ whorls. The chambers do not increase very much in size as added. The umbilicus is deep and open. It seems to be undescribed and so is figured for future reference. Diameter 0.50-0.55 mm.; height 0.35-0.50 mm.

Genus HASTIGERINELLA Cushman, 1927

HASTIGERINELLA sp. (Pl. 16, fig. 20)

A few specimens of a *Hastigerinella* were found. They appear to be close to *H. simplex* Morrow known from the Upper Cretaceous of Kansas, Nebraska, and South Dakota, but differ in having fully five chambers in the adult whorl and in the chambers being less elongated. Greatest diameter 0.45 mm.; thickness 0.18 mm.

Family GLOBOROTALIIDAE

Genus GLOBOROTALIA Cushman, 1927

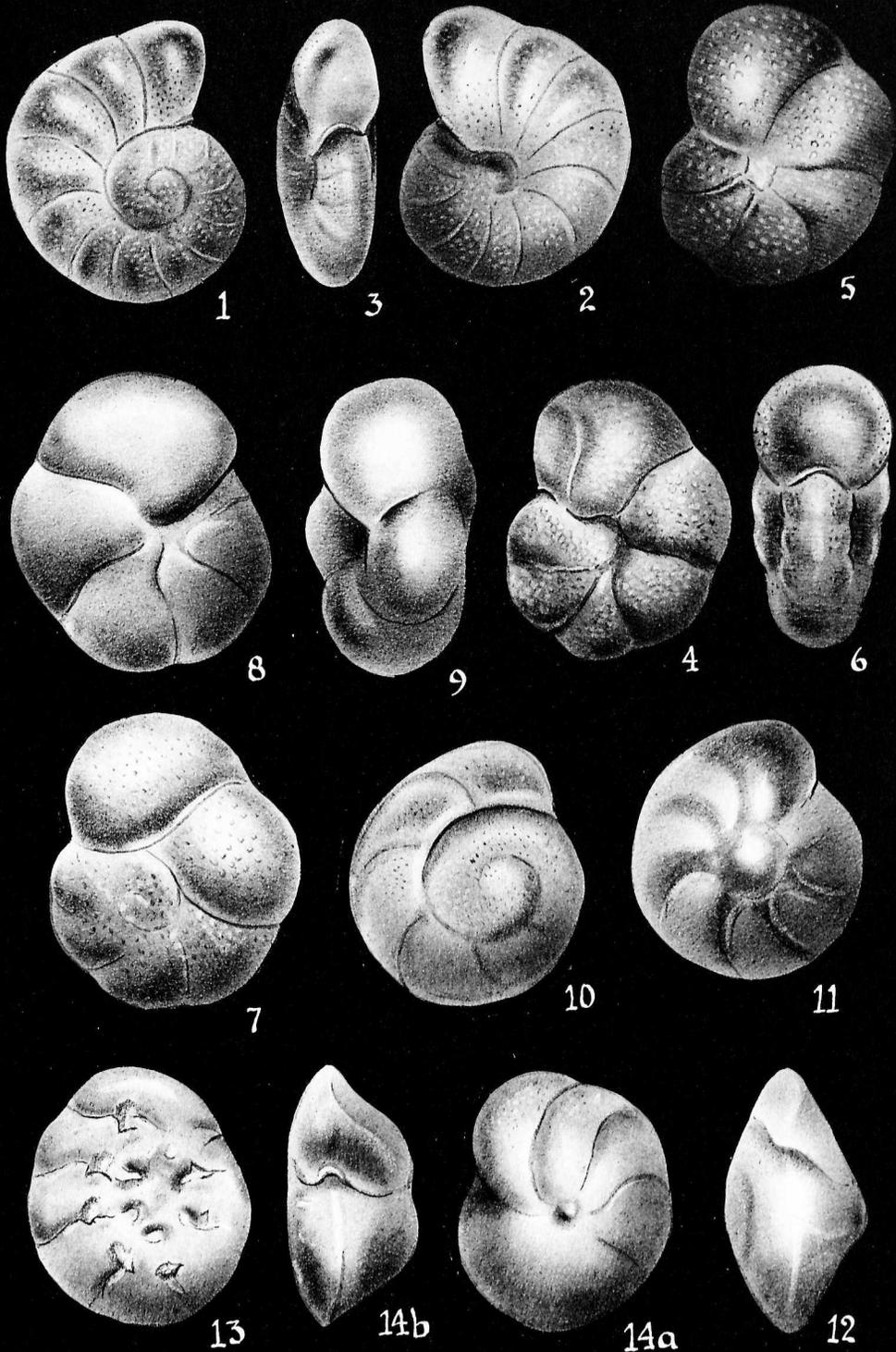
GLOBOROTALIA CALIFORNICA Cushman and Todd, n. sp. (Pl. 16, figs. 22, 23)

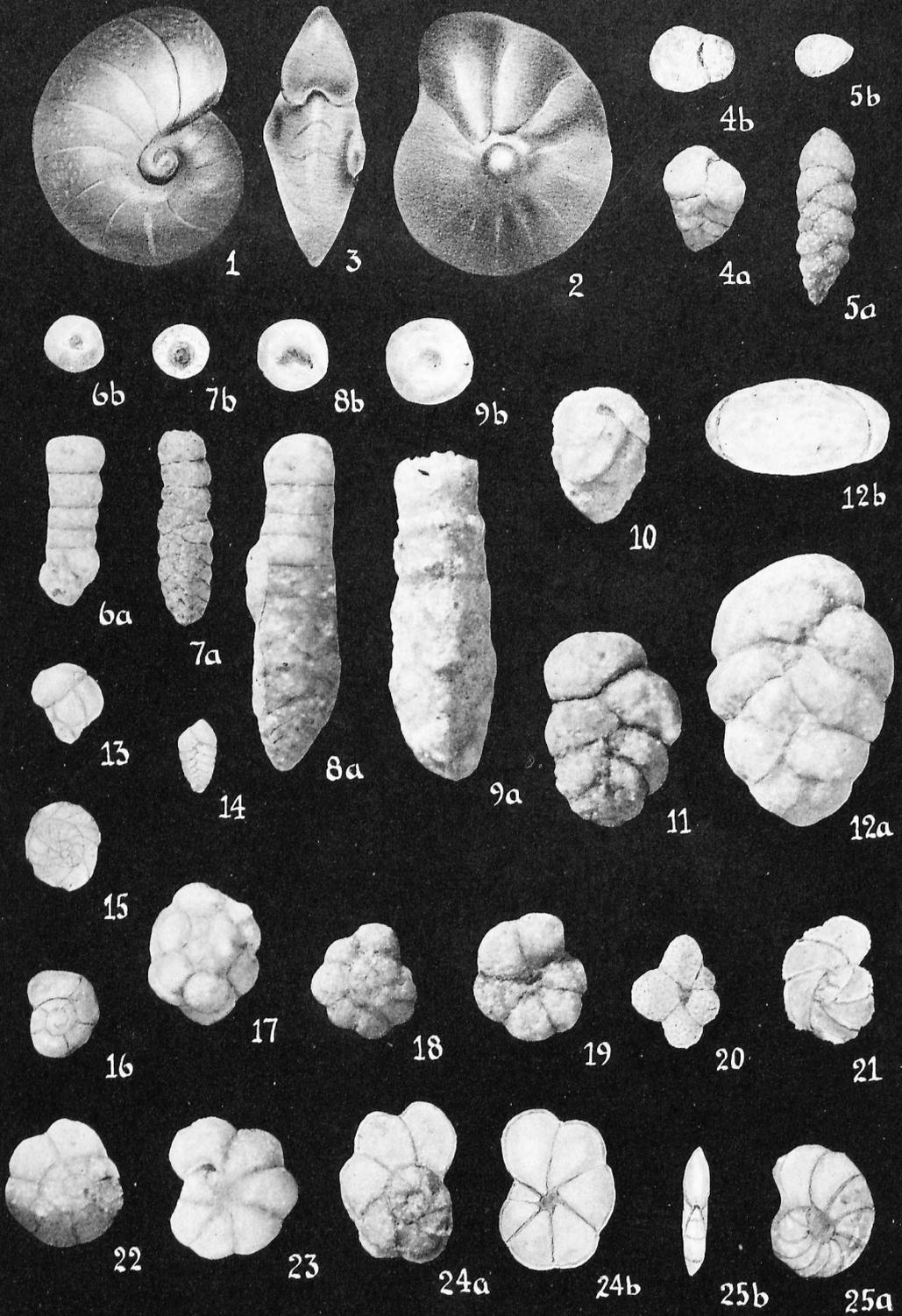
Test trochoid, composed of $2\frac{1}{2}$ to 3 whorls, rather high-spired, periphery angled but not keeled, lobulated, umbilicus large, deep, and open; chambers indistinct, $6\frac{1}{2}$ or 7 in the adult whorl, flattened dorsally, slightly inflated ventrally, especially at their inner ends, very slightly if at all increasing in size in the adult whorl; sutures distinct, limbate and slightly curved on the dorsal side, deeply incised and radial on the ventral side; wall roughened, spinose; aperture a large, arched opening under the edge of the last-formed chamber extending from the umbilicus to the periphery, with a slight protruding lip. Diameter 0.50-0.75 mm.; thickness 0.25 mm.

EXPLANATION OF PLATE 15

Figs. 1-3. *Anomalina praepissiformis* Cushman and Bermudez, n. sp. $\times 90$. 1, Holotype, dorsal view. 2, Paratype, ventral view. 3, Paratype, peripheral view. 4-6. *A. madrugaensis* Cushman and Bermudez, n. sp. $\times 60$. 4, Holotype, ventral view. 5, Paratype, dorsal view. 6, Paratype, peripheral view. 7-9. *A. cubana* Cushman and Bermudez, n. sp. $\times 55$. 7, Holotype, dorsal view. 8, Paratype, ventral view. 9, Paratype, peripheral view. 10-12. *Cibicides madrugaensis* Cushman and Bermudez, n. sp. $\times 95$. 10, Holotype, dorsal view. 11, Paratype, ventral view. 12, Paratype, peripheral view. 13, 14. *C. reprimatus* Cushman and Bermudez, n. sp. $\times 47$. 13, Holotype, dorsal view. 14a, b, Paratype. a, ventral view; b, peripheral view.

All specimens are from the Paleocene, Madruga formation, under highway bridge on Central San Antonio, Madruga, Habana Province, Cuba.





Holotype (Cushman Coll. No. 58509) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *G. marginaculeata* Loeblich and Tappan from the Lower Cretaceous of Texas in being larger, in lacking the spinose keel, and in the umbilicus being larger and more open. It occurs very abundantly.

GLOBOROTALIA DECORATA Cushman and Todd, n. sp. (Pl. 16, fig. 21)

Test trochoid, composed of about 2 whorls, spire slightly elevated, umbilicus large and open, periphery angled and slightly keeled, slightly lobulated; chambers few, 6 to 8 in the last-formed whorl, indistinct, not inflated, very slightly increasing in size as added; sutures distinct, limbate, distinctly raised and curved on the dorsal side, incised and radial on the ventral side; wall finely spinose but otherwise unornamented except by the limbate sutures; aperture under the edge of the last-formed chamber, opening into the umbilicus, protected by a slight lip. Diameter 0.50-0.60 mm.; thickness 0.20-0.25 mm.

Holotype (Cushman Coll. No. 58513) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *G. californica* n. sp. chiefly in the raised, limbate sutures on the dorsal side and also in its somewhat less elevated spire, although that seems to be a variable feature in both species.

In its limbate and raised sutures this species makes one think of *Globo-*

EXPLANATION OF PLATE 16

FIGS. 1-3. *Cibicides mirificus* Cushman and Bermudez, n. sp. From the Paleocene, San Juan y Martinez, Pinar del Rio Province, Cuba. $\times 80$. 1, Holotype, dorsal view; 2, Paratype, ventral view. 3, Paratype, peripheral view. 4. *Textularia* ? *almadenensis* Cushman and Todd, n. sp. a, side view; b, end view. 5. *Gaudryina almadenensis* Cushman and Todd, n. sp. a, side view; b, end view. 6. *Pseudoclavulina californica* Cushman and Todd, n. sp. a, side view; b, apertural view. 7. *P. almadenensis* Cushman and Todd, n. sp. a, side view; b, apertural view. 8. *P. coria* Cushman and Todd, n. sp. a, side view; b, apertural view. 9. *Tritaxilina* ? *almadenensis* Cushman and Todd, n. sp. a, side view; b, apertural view. 10. *Arenobulimina* sp. 11, 12. *Dorothia* ? *almadenensis* a, side view; b, apertural view. 10. *Arenobulimina* sp. 11, 12. *Dorothia* ? *almadenensis* a, side view; b, end view. 13. Cushman and Todd, n. sp. 11, Paratype. 12, Holotype, a, side view; b, end view. 13. *Bulimina* sp. 14. *Bolivina* sp. 15. *Eponides* sp. 16. *Gyroidina* sp. 17. *Globigerina* sp. 18, 19. *G. almadenensis* Cushman and Todd, n. sp. 18, Holotype, dorsal view. 19, Paratype, ventral view. 20. *Hastigerinella* sp. 21. *Globorotalia decorata* Cushman and Todd, n. sp. 22, 23. *G. californica* Cushman and Todd, n. sp. 22, Holotype, dorsal view. 23, Paratype, ventral view. 24. *G. almadenensis* Cushman and Todd, n. sp. a, dorsal view; b, ventral view. 25. *Planomalina* ? *almadenensis* Cushman and Todd, n. sp. a, side view; b, peripheral view.

Figs. 4-25, From the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif. All figures $\times 38$.

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truncana canaliculata (Reuss) but it has no trace of a secondary keel, and so belongs in *Globorotalia*. It occurs commonly.

GLOBOROTALIA ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, fig. 24)

Test compressed, composed of about 2 whorls, flattened dorsally, inner ends of chambers slightly elevated ventrally, periphery sharply angled, slightly keeled, entire in the young, becoming progressively more lobulated as growth proceeds; chambers few, distinct, 6 or 7 in the last-formed whorl, rapidly increasing in size as added; sutures distinct, radial and depressed on the ventral side, flush with the surface, limbate, and curved on the dorsal side; wall smooth, appearing finely granular; aperture an arched slit under the edge of the last-formed chamber, extending from the umbilicus to the periphery. Greatest diameter up to 0.65 mm.; thickness 0.20 mm.

Holotype (Cushman Coll. No. 58514) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species differs from *G. californica* n. sp. in its much more flattened test and more rapid increase in size of chambers. It occurs commonly.

Family ANOMALINIDAE

Genus **PLANOMALINA** Loeblich and Tappan, 1946

PLANOMALINA ? ALMADENENSIS Cushman and Todd, n. sp. (Pl. 16, fig. 25)

Test compressed, becoming slightly uncoiled, umbilicate on both sides, periphery sharp, entire; chambers 9 or 10 in the last whorl, gradually increasing in size as added, not inflated; sutures distinct, limbate, flush with the surface, strongly curved, joining at their inner ends to form an indistinct limbate ring around the umbilicus; wall smooth; aperture a low, arched opening at the base of the chamber, on the periphery. Greatest diameter 0.50-0.60 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 58517) from the Cretaceous ?, road cut, SW. $\frac{1}{4}$ sec. 24, T. 8 S., R. 1 W., Mt. Diablo meridian, New Almaden district, Santa Clara Co., Calif.

This species appears to belong in this genus which is represented by a single species, *P. apsidostroba* Loeblich and Tappan, from the Lower Cretaceous, Main Street limestone, of Texas. It differs from that species in its larger size and the sutures being not raised above the surface of the test and in the lack of any peripheral keel. It occurs abundantly. Its assignment to this genus is questioned as, due to the preservation of the material, it is difficult to be certain whether or not there is any trochoid stage in the initial part of the test.

323. AMENDMENT TO THE DIAGNOSIS OF
LOCKHARTIA HUNTI OVEY,

(Ann. Mag. Nat. Hist., ser. 11, vol. xiii, 1946 [1947], pp. 571-576.).

BY C. D. OVEY

British Museum (Natural History)

To my friend Mr. T. F. Grimsdale I am much indebted for drawing my attention to the inadvertent misprinting of the dimensions of *Lockhartia hunti* in the diagnosis (op. cit. p. 572). The words "Average diameter 1.57 mm., average height 2.00 mm." should read "Average height 1.57 mm., average diameter 2.00 mm.", as is quite obvious from the figures of the species. In the same paper *L. hamei* should be spelled *L. haimeii* (Davies).

RECENT LITERATURE ON THE FORAMINIFERA

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

- Asano, Kiyoshi.** New Species of Pliocene Foraminifera from Oga Peninsula, Akita Prefecture.—Journ. Geol. Soc. Japan, vol. 46, No. 551, 1939, pp. 413-427, 4 text figs.
—Three new species described and figured: *Gaudryina yabei*, *G. (Pseudogaudryina) oga*, and *Elphidium hanzawaia*.
- On Some Species of the Family Nodosariidae found in the Tertiary Formations of the Philippine Islands.—L. c., vol. 49, No. 586, July 20, 1942, pp. 288-294, pl. 11 (7).—Many species listed, a few figured, the following new: *Robulus sumaguensis*, *R. pseudoechinatus*, *Planularia mindoroensis*, and *P. luzonica*.
- Hanzawaia*, a New Genus of Foraminifera, from the Pliocene of Japan.—Trans. Pal. Soc. Japan, vol. 51, No. 180, 1944, pp. 97, 98, pl. 4 (1).—Describes this new genus with the genotype *H. nipponica* n. sp. The genus is related to *Cibicides* and *Planulina*.
- di Napoli Alliata, E.** Esame Micropaleontologico di Campioni Raccolti dal Prof. Marchesini nella Zona del Monte Conera (Ancona).—Giornale di Geologie, ser. 2a, vol. 18, 1945-46 (1946), pp. 29-32.—Numerous lists of Foraminifera given.
- Globotruncana* nell'Eocene della Sicilia Centrale.—Riv. Ital. Pal., Anno 54, fasc. 1, 1948, pp. 1-10, text fig. 2A-C.
- Prantl, Ferdinand.** Vyskyt rodu Psammosiphon Vine, 1882 v ceskem devonu (On the Occurrence of the Genus Psammosiphon Vine, 1882 in the Devonian of Bohemia).—Vestník Statního geologického ústavu, vol. 22, 1947, pp. 225-234, pls. I, II.—A new species described and figured, *Psammosiphon remesi*.

- Colom, G.** Estudios Sobre la Sedimentacion Profunda de las Baleares desde el Lias Superior al Cenomanense-Turonense.—Instituto "Lucas Mallada" de Investigaciones Geologicas Consejo Superior de Investigaciones Cientificas, Madrid, 1947, pp. 1-149, pls. I-XXVIII, text figs. 1-22.—A detailed discussion of the Liassic and Cretaceous formations of the region with figures of Foraminifera and other microfossil groups.
- Henson, F. R. S.** Foraminifera of the Genus *Trocholina* in the Middle East.—Ann. Mag. Nat. Hist., ser. 11, vol. 14, July 1947 (April 1948), pp. 445-459, pls. 11-13.—Several new species and a new variety are described and the genus placed in the Family Ophthalmidiidae.
- New Trochamminidae and Verneulinidae from the Middle East.—L. c., September 1947 (June 1948), pp. 605-630, pls. 14-18, 1 text fig.—Many new species are described and figured and the following new genera erected: *Kurnubia* (genotype *K. palastiniensis* n. gen., n. sp.); *Pfenderina* (genotype *Eorupertia neocomiensis* Pfender); *Dukhania* (genotype *D. conica* n. gen., n. sp.).
- de Cizancourt, Mme.** Quelques Nummulitidés nouveaux ou non encore signalés de l'Éocène de Cuba.—Bull. Soc. Géol. France, ser. 5, vol. 17, 1947, pp. 513-522, pls. 24, 25.—Several species and varieties are described and figured, three new.
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