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UNITED STATES DEPARTMENT OF THE INTERIOR

OLIGOCENE FORAMINIFERA FROM  
CHOCTAW BLUFF, ALABAMA

Prepared in cooperation with the  
ALABAMA GEOLOGICAL SURVEY

GEOLOGICAL SURVEY PROFESSIONAL PAPER 189-D

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Professional Paper 189—D

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OLIGOCENE FORAMINIFERA FROM CHOCTAW BLUFF  
ALABAMA

BY

JOSEPH A. CUSHMAN AND WINNIE McGLAMERY

Prepared in cooperation with the  
ALABAMA GEOLOGICAL SURVEY

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Shorter contributions to general geology, 1937

(Pages 103-119)



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## OLIGOCENE FORAMINIFERA FROM CHOCTAW BLUFF, ALABAMA.

By JOSEPH A. CUSHMAN and WINNIE MCGLAMERY

### INTRODUCTION

The exposure at Choctaw Bluff on the Alabama River, Clarke County, Ala., described by Smith<sup>1</sup> and Cooke,<sup>2</sup> is a bluff about 40 feet high. It is the southernmost outcrop of Tertiary limestone on the Alabama River. The section is as follows:

#### Section at Choctaw Bluff

	Ft.	in.
Pliocene or Pleistocene:		
Sand and red loam with gravel at base (terrace deposit)-----	20	
Miocene:		
Blue clay with lignitized or partly lignitized stumps-----	5	
Greenish, unfossiliferous clay-----	5	
Oligocene:		
Yellowish-gray soft marl with <i>Anomia</i> sp.-----	2-3	
Cream-colored argillaceous limestone with oysters and casts of other pelecypods; <i>Teredo circula</i> abundant at base-----	10	

In the collections of the Alabama Museum of Natural History there is a specimen of *Echinolampas aldrichi* from Choctaw Bluff, but the zone from which it came is not known.

The two beds at Choctaw Bluff that contain marine fossils are referred to the Chickasawhay marl member of the Byram marl by Cooke,<sup>3</sup> who bases his correlation chiefly on the presence in them of *Echinolampas aldrichi*, *Teredo circula*, and *Anomia* sp. Cooke regards the Chickasawhay marl as the youngest known part of the Vicksburg group (Oligocene), although some other geologists classify it as Miocene.

The limestone and soft marl carry a well-preserved foraminiferal fauna constituting a single faunal unit. For a study of the fauna, the Alabama Geological Survey made collections from the limestone and marl on three field trips during 1935—two in the spring and one in the autumn, when the river was unusually low. On one of these trips, fragmentary parts of an echinoid were collected from the upper part of the limestone. These seem too poorly preserved for specific identification.

<sup>1</sup> Smith, E. A., and others, Report on the geology of the Coastal Plain of Alabama, p. 114, Alabama Geol. Survey, 1894.

<sup>2</sup> Cooke, Wythe, Geology of Alabama: Alabama Geol. Survey Special Rept. 14, p. 289, 1926.

<sup>3</sup> Cooke, C. W., Notes on the Vicksburg group: Am. Assoc. Petroleum Geologists Bull., vol. 19, p. 1170, 1935.

The foraminiferal fauna of these beds is very interesting, as it is in many respects different from any others of the various known members of the Vicksburg. Although it includes species common both to the limestone and the soft marl above, showing that they are closely related, there are enough differences in the fauna to show that the ecologic conditions at the time of deposition of the marl and the limestone were not the same.

In the lower portion of the exposed section there is a peculiar fauna containing some forms which are difficult to place, such as the species of *Valvulamina*, a genus confined, so far as our previous knowledge showed, largely to the middle Eocene of western Europe, Cuba, and Florida. There is a possibility that these may have been reworked from older strata and do not belong with the other constituents of the fauna.

In the upper marl bed above the limestone are other species which have affiliations with the Miocene rather than with the Eocene. With these, however, are species which so far as we know are confined to the Oligocene. It is probable that these soft marls represent different ecologic conditions from those of the other formations in the Vicksburg group and that the differences in the faunas may be due to this cause.

Several species are illustrated here which cannot be definitely identified at present, but it has been thought that the figures may draw the attention of other workers to these species and that more may thus be learned about them. It is evident that not all the species of the marl are recorded here, but those which are represented by fairly numerous specimens are illustrated on the accompanying plates.

### SYSTEMATIC DESCRIPTIONS

#### Family TEXTULARIIDAE

#### Genus TEXTULARIA DeFrance, 1824

#### *Textularia subhauerii* Cushman

*Textularia subhauerii* Cushman, U. S. Geol. Survey Prof. Paper 129, pp. 89, 126, pl. 14, figs. 2a, b, 1922; Prof. Paper 133, p. 16, 1923; Prof. Paper 181, p. 8, pl. 1, fig. 10, 1935.

There are numerous specimens from the lower portion of the section which seem identical with this species, known from the Oligocene and upper Eocene of the Coastal Plain region of the United States.

**Textularia cf. T. agglutinans D'Orbigny**

Specimens very similar to that figured from the Byram marl<sup>4</sup> occurred at Choctaw Bluff in the limestone at water level and in the marl above the limestone.

**Textularia cf. T. candeiana D'Orbigny**

There are very rare specimens in the lower part of the section which have the later chambers very rapidly enlarging and which resemble this species, known from Miocene to Recent in the Florida region.

**Family VALVULINIDAE****Genus VALVULINA D'Orbigny, 1826****Valvulina sp.?**

Plate 24, figure 1

This species, though represented by several specimens, is not sufficiently well preserved to give full details for description. In some characters it remotely resembles *V. italiana* Cushman, from the Oligocene of Italy, but in other respects it is more like some of the species of the European Eocene. The early stages form a triangular test with flattened sides and fairly sharp angles. The later portion becomes spread out and in some specimens seems to have more than three chambers to the coil. It is a species which further material may show to be an important one for this horizon.

**Genus CLAVULINA D'Orbigny, 1826****Clavulina cf. C. tricarinata D'Orbigny**

Plate 24, figure 3

Although *C. tricarinata* has not been recorded from the Tertiary of the Gulf Coastal Plain of the United States, the specimens from the lower part of the Choctaw Bluff section are very similar to recent ones. They occur in some numbers in the lower part of the section. That these are true Clavulinas is shown by the well-developed tooth in the aperture. This is the earliest record in the American Tertiary of a true *Clavulina*, those heretofore recorded under this genus belonging to *Liebusella* or allied genera.

**Genus VALVULAMMINA Cushman, 1933****Valvulammina sp.?**

Plate 24, figure 2

The specimen shown in our figures evidently belongs to this genus, which so far as is known has been limited to the middle Eocene. Species close to this are recorded from the Eocene of the Paris Basin and also from Cuba. It may possibly have been derived from older sediments and redeposited. Further collecting will be necessary to establish its occurrence as an Oligocene fossil.

<sup>4</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 129-E, pl. 14, figs. 1a, b, 1922.

**Family MILIOLIDAE****Genus QUINQUELOCULINA D'Orbigny, 1826****Quinqueloculina crassa D'Orbigny?**

Plate 24, figure 4

The best-preserved species of this group in our material is that here figured. It is apparently the same as that referred to the above name from the Byram marl.<sup>5</sup> The chambers are rather sharply angled, and the entire surface has distinct longitudinal costae.

**Genus TRILOCULINA D'Orbigny, 1826****Triloculina sp.?**

Plate 24, figure 5

A small, smooth species is represented by several specimens, one of which is figured on plate 24. It occurs in the limestone at the base of the section.

**Genus PYRGO Defrance, 1824****Pyrgo inornata (D'Orbigny)? Cushman**

Plate 24, figures 6, 7

*Biloculina inornata* D'Orbigny, Foraminifères fossiles du bassin tertiaire de Vienne, p. 266, pl. 16, figs. 7-9, 1846.

Cushman, U. S. Geol. Survey Prof. Paper 129, p. 143, pl. 33, fig. 7, 1922; Prof. Paper 133, p. 57, 1923

This species has been previously recorded from the Byram marl and from the Mint Spring marl member of the Marianna limestone. Specimens are not well preserved in our material, but some of them show slight traces of longitudinal striations. These may possibly be worn specimens of *P. oligocenica* Cushman.<sup>6</sup>

**Family LAGENIDAE****Genus DENTALINA D'Orbigny, 1826****Dentalina cf. D. communis D'Orbigny**

Plate 24, figure 8

A very few specimens, mostly broken, of this species occur in the soft marl above the limestone. The figured specimen has but four chambers but is very similar to specimens referred to this species from the Mint Spring marl member of Leaf River, Miss.<sup>7</sup>

**Dentalina catenulata? H. B. Brady**

Plate 24, figure 9

Our figured specimen is more nearly complete and evidently the same as the form referred to this species from the Marianna limestone of Fishers Creek, Ala.<sup>8</sup> The test is smooth except for the short longitudinal

<sup>5</sup> Idem, p. 102, pl. 27, figs. 1, 2, 1922.

<sup>6</sup> Cushman, J. A., Cushman Lab. Foram. Research Contr., vol. 11, p. 26, pl. 4, figs. 5a, b, 1935.

<sup>7</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 129-E, p. 129, pl. 30, fig. 4, 1922.

<sup>8</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 133, p. 28, pl. 3, fig. 14, 1923.

costae above the sutures. The species is best known as a Recent one from the Indo-Pacific, a relationship noted in many other species of our Oligocene.

**Genus NODOSARIA Lamarck, 1812**

***Nodosaria catesbyi* D'Orbigny**

Plate 24, figure 10

*Nodosaria catesbyi* D'Orbigny, in De la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 16, pl. 11, figs. 8-10, 1839.

Cushman, Florida Geol. Survey Bull. 4, p. 28, pl. 5, fig. 4, 1930.

Cushman and Ponton, Florida Geol. Survey Bull. 9, p. 61, 1932.

Cushman and Cahill, U. S. Geol. Survey Prof. Paper 175, p. 14, pl. 5, fig. 5, 1933.

*Nodosaria* sp.? Cushman, U. S. Geol. Survey Prof. Paper 129, p. 130, pl. 30, fig. 5, 1922.

The figured specimen has three chambers similar to the one figured in the last reference above, which came from the Mint Spring marl member of Mississippi. Most of the Miocene and Recent specimens of this species have but two chambers, although three-chambered ones are occasionally found. Specimens were very rare in the soft marl above the limestone at Choctaw Bluff.

**Genus LAGENA Walker and Jacob, 1798**

***Lagena perlucida* Montagu**

Plate 24, figure 11

A very few specimens of a smooth species with a rather long tubular neck, such as here figured, were found in the soft marl above the limestone. Such specimens have been recorded from the Miocene of Florida.<sup>9</sup> They also closely resemble specimens from the Eocene referred to *L. laevis* (Montagu)?<sup>10</sup>

***Lagena costata* (Williamson) Reuss**

Plate 24, figure 12

This species has already been recorded from the upper Eocene Ocala limestone of Georgia and the Cooper marl of South Carolina.<sup>11</sup> Our specimens, one of which is here figured, came from the soft marl above the limestone.

***Lagena laevigata* (Reuss) Terrigi**

Plate 24, figure 13

Our figured specimen is very similar to that figured from the Byram marl<sup>12</sup> and recorded also from the Mint Spring marl. The species may belong to *Entosolenia*. Like the others of this group it came from the soft marl above the limestone.

**Family POLYMORPHINIDAE**

**Genus GUTTULINA D'Orbigny, 1826**

***Guttulina* cf. *G. lehneri* Cushman and Ozawa**

Plate 24, figure 14

Very rare specimens somewhat resemble the species described from the Eocene of Trinidad. More specimens are needed for a satisfactory determination of this species.

***Guttulina problema* D'Orbigny**

Plate 24, figure 15

This is a very widely distributed species with apparently a long vertical range. It has recently been recorded from the Jackson Eocene of Texas and the Cooper marl of South Carolina.<sup>13</sup> Like most of the members of this family at Choctaw Bluff, this species occurs in the soft marl above the limestone.

The two specimens figured on plate 24, figures 16 and 19, are somewhat related to *G. problema* and in other respects resemble the types of *G. lehneri*. More specimens are necessary to show the relationships of these three forms.

**Genus GLOBULINA D'Orbigny**

***Globulina gibba* D'Orbigny**

Plate 24, figure 17

There are numerous specimens in the soft marl above the limestone that are apparently to be identified with *Globulina gibba*, which has already been recorded at many localities in the Oligocene of Alabama and Mississippi,<sup>14</sup> as well as in other formations.

***Globulina inaequalis* Reuss var. *caribaea* D'Orbigny?**

Plate 24, figure 18

An irregularly spinose specimen from the soft marl above the limestone is here figured. Until more and better material is available it is referred to D'Orbigny's variety. The spinose projections are very irregularly scattered, much more so than in the Recent forms of the species.

***Globulina fimbriata* Cushman and McGlamery, n. sp.**

Plate 24, figure 20

Test planoconvex, periphery keeled, the edge frilled; chambers somewhat obscure on the convex side, several visible on the flattened side, the last-formed chamber making up all but a small elongate area at one side; sutures somewhat indistinct, not depressed; wall smooth, perforate; aperture obscure, apparently peripheral in the adult. Diameter 0.30 millimeter, height 0.10 millimeter.

<sup>9</sup> Cushman, J. A., Florida Geol. Survey Bull. 4, p. 29, pl. 5, fig. 5, 1930.

<sup>10</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 181, p. 22, pl. 9, fig. 3, 1935.

<sup>11</sup> Idem, p. 23, pl. 9, figs. 7, 8.

<sup>12</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 133, p. 25, pl. 3, fig. 12.

<sup>13</sup> Cushman, J. A., U. S. Geol. Survey Prof. Paper 181, p. 23, pl. 9, fig. 12, 1935.

<sup>14</sup> Cushman, J. A., and Ozawa, Yoshiaki, U. S. Nat. Mus. Proc., vol. 77, art. 6, p. 60, pl. 16, figs. 1-4, 1930.

Holotype (Cushman collection no. 23670) from limestone 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *G. inaequalis* Reuss var. *dolfussi* Cushman and Ozawa in the more rounded outline, the strongly fimbriate margin, and the peculiar arrangement of the final chamber on the flattened side.

Genus **POLYMORPHINA** D'Orbigny, 1826

**Polymorphina advena** Cushman

Plate 24, figure 21

*Polymorphina advena* Cushman, U. S. Geol. Survey Prof. Paper 129, p. 132, pl. 31, fig. 4, 1922.

Cushman, Cushman Lab. Foram. Research, Contr., vol. 5, p. 41, pl. 7, fig. 5, 1929.

Cushman and Ozawa, U. S. Nat. Mus. Proc., vol. 77, art. 6, p. 118, pl. 30, fig. 10, 1930.

This species was originally described from the lower Oligocene Mint Spring marl member of the Marianna limestone, Mint Spring Bayou, Miss. It occurs also in the Byram marl of Byram, Miss.

Our specimen, which came from the soft marl above the limestone, is typical in the rounded periphery and general shape of the chambers, but the wall is smooth except in the earliest portion, where it is very slightly costate.

Family **NONIONIDAE**

Genus **NONION** Montfort, 1808

**Nonion advenum** (Cushman) Cushman

Plate 24, figures 22, 23

*Nonionina advena* Cushman, U. S. Geol. Survey Prof. Paper 129, p. 139, pl. 32, fig. 8, 1922; Prof. Paper 133, p. 50, 1923.

Cushman and Applin, Am. Assoc. Petroleum Geologists Bull., vol. 10, p. 181, pl. 10, figs. 16, 17, 1926.

*Nonion advenum* Cushman, U. S. Geol. Survey Prof. Paper 181, p. 30, pl. 11, figs. 1-4, 1926.

The types of this species came from the lower Oligocene Mint Spring marl member of Mississippi. It is also widely distributed in the upper Eocene of the eastern Gulf Coastal Plain.

Genus **NONIONELLA** Cushman, 1926

**Nonionella danvillensis** Howe and Wallace

Plate 25, figure 1

*Nonionella danvillensis* Howe and Wallace, Louisiana Geol. Survey Bull. 2, p. 52, pl. 9, figs. 5a-c, 1932.

In the soft marl above the limestone are specimens which seem close to this species, which was described from the Jackson Eocene of Louisiana.

**Nonionella hantkeni** (Cushman and Applin) var. *spissa* Cushman

Plate 25, figure 2

*Nonionella hantkeni* (Cushman and Applin) var. *spissa* Cushman, Cushman Lab. Foram. Research Contr., vol. 7, p. 58, pl. 7, figs. 13a-c, 1931.

Ellisor, Am. Assoc. Petroleum Geologists Bull., vol. 17, no. 11, pl. 12, figs. 10, 12, 1933.

Cushman, U. S. Geol. Survey Prof. Paper 181, p. 31, pl. 12, figs. 6a-c, 1935.

This variety has a wide distribution in the Jackson Eocene, of Mississippi, Alabama, and South Carolina. Soft marl just above the limestone at Choctaw Bluff yielded specimens which seem to be identical with this variety. One of them is figured.

Genus **ELPHIDIUM** Montfort, 1808

**Elphidium cf. E. poeyanum** (D'Orbigny) Cushman

Plate 25, figures 5, 7

The figured specimens probably belong to this species, which is now living in the West Indian region and has been recorded as fossil back to the Miocene. It is fairly common in the soft marl above the limestone at Choctaw Bluff. Our figures show something of the variations in this material.

**Elphidium cf. E. lessoni** (D'Orbigny) Cushman

Plate 25, figure 6

D'Orbigny described *E. lessoni* from the South Atlantic. The specimen figured here is very similar in general shape, in the peculiar coarse beading of the umbilical region, and in the shape and size of the retral processes. It does not seem to have been recorded as a fossil. Our specimens came from the soft marl above the limestone.

**Elphidium discoidale** (D'Orbigny) Cushman

Plate 25, figure 3

This is a living species of the West Indian region and has been recorded as far back as the Miocene Duplin marl of North Carolina and the St. Marys formation of Maryland. The umbilical region is decidedly raised and projects in peripheral view. In some respects this form resembles *E. culebrense*, from the Oligocene of the Panama Canal Zone. Like the others of this genus it came from the soft marl above the limestone.

**Elphidium sagrum** (D'Orbigny) Cushman

Plate 25, figure 4

In its somewhat rhomboid peripheral view and elongate, almost fused early retral processes this form resembles D'Orbigny's species, which occurs as a Recent species in the West Indies and is known as a Miocene fossil in Cuba, Florida, and North Carolina. Like the preceding, it came from the soft marl above the limestone.

## Family BULIMINIDAE

## Genus VIRGULINA D'Orbigny, 1826

*Virgulina zetina* Cole

Plate 25, figure 8

*Virgulina mexicana* Cole [not Cushman], Bull. Am. Paleontology, vol. 14, no. 51, p. 25, pl. 5, fig. 14, 1927. [Corrected to *V. zetina* in errata.]

*Virgulina zetina* Cushman, Cushman Lab. Foram. Research Contr., vol. 8, p. 22, pl. 3, fig. 15, 1932.

Our figured specimen shows the characters of the species, with its twisted test and the numerous inflated chambers, becoming longer than broad in the adult. This species was originally described from the Guayabal formation of Mexico, but our specimens are very close to it in their characters. They came from the soft marl at the top of the limestone.

*Virgulina vicksburgensis* Cushman

Plate 25, figure 9

*Virgulina* sp. (?) Cushman, U. S. Geol. Survey Prof. Paper 129, p. 92, pl. 16, figs. 2, 3, 1922.

*Virgulina vicksburgensis* Cushman, Cushman Lab. Foram. Research Special Pub. 6, p. 48, pl. 7, figs. 6a, b, 1936.

This species is found in all the formations of the Vicksburg group from the Red Bluff clay to the Byram marl. Our specimens came from the soft marl at the top of the limestone.

*Virgulina bramlettei* Galloway and Morrey

Plate 25, figure 10

*Virgulina bramlettei* Galloway and Morrey, Bull. Am. Paleontology, vol. 15, p. 37, pl. 5, fig. 14, 1929.

Cushman, Cushman Lab. Foram. Research Contr., vol. 5, p. 94, pl. 13, fig. 30, 1929; vol. 8, p. 20, pl. 3, figs. 9a, b, 1932.

Our figured specimen is not an adult but shows the general characters of the species, with the early portion twisted, the chambers comparatively few and higher than broad in the adult, the aperture long and narrow, with the upper end somewhat broadened. The species is known from the Miocene and Oligocene and is probably still living in the Pacific, as are other species of our Oligocene. The specimens came from the soft marl at the top of the limestone.

## Genus BULIMINELLA Cushman, 1911

*Buliminella* cf. *B. elegantissima* (D'Orbigny) Cushman

Plate 25, figure 15

The specimen here figured resembles D'Orbigny's figure but has probably more chambers than the typical, and the apertural face, not shown in its whole width in the view drawn, is more like *B. obtusata* Cushman, a Vicksburg Oligocene species. More material is necessary before it can be placed with certainty. It was found in the soft marl at the top of the limestone.

*Buliminella choctawensis* Cushman and McGlamery, n. sp.

Plate 25, figures 11, 16

Test elongate, subcylindrical, of rather uniform diameter throughout, composed of about 3 whorls; chambers distinct, not inflated, 6 to 8 in the adult whorl, rather uniform in shape throughout; sutures distinct, the spiral suture slightly depressed, the others flush with the surface; wall slightly roughened; aperture an arched semi-circular opening at the base of the apertural face, in the adult sometimes more elongate and subterminal. Length 0.30–0.40 millimeter, diameter 0.08–0.10 millimeter.

Holotype (Cushman collection no. 23671) from Oligocene limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species is very different from any other known American one and most closely resembles some of the forms described by Terquem from the middle Eocene of the Paris Basin, particularly "*Bulimina striato-punctata* Terquem," from which it differs in the more regular spiral development and more chambers to a coil.

## Genus BOLIVINA D'Orbigny, 1839

*Bolivina advena* Cushman

Plate 25, figure 12

*Bolivina advena* Cushman, Cushman Lab. Foram. Research Contr., vol. 1, pt. 2, p. 29, pl. 5, figs. 1a, b, 1925; vol. 2, pt. 3, p. 54, 1926.

Cushman, Stewart, and Stewart, San Diego Soc. Nat. History Trans., vol. 6, p. 67, 1930.

Cushman and Ponton, Florida Geol. Survey Bull. 9, p. 83, pl. 12, fig. 3, 1932.

This species has been recorded from the Miocene of California and Florida. Our figured specimen seems to be identical and extends the range downward. The specimens came from the soft marl at the top of the limestone.

*Bolivina tortuosa* H. B. Brady

Plate 25, figures 13, 21

*Bolivina tortuosa* H. B. Brady, Micr. Soc. Quart. Jour., vol. 21, p. 57, 1881; *Challenger* Rept., Zoology, vol. 9, p. 420, pl. 52, figs. 31, 32 [not 33, 34], 1884.

This species was originally described as a Recent Pacific species but is found to be common in the Miocene of southern Europe and northern Africa. To find it in very typical forms in the Oligocene of Alabama is very interesting. It supplies another connection between the Oligocene of our Gulf Coastal Plain region and the present-day Indo-Pacific. The specimens illustrated came from the soft marl at the top of the limestone.

*Bolivina paula* Cushman and Cahill

Plate 25, figures 14, 18, 19

*Bolivina paula* Cushman and Cahill ms., cited in Cushman and Ponton, Florida Geol. Survey Bull. 9, p. 84, pl. 12, figs. 6a, b, 1932.

Cushman and Cahill, U. S. Geol. Survey Prof. Paper 175, p. 26, pl. 8, figs. 14a, b, 1933.

This species is known from the Miocene of Maryland, Virginia, North Carolina, and Florida. Our specimens came from the soft marl at the top of the limestone.

***Bolivina plicatella* Cushman var. *mera* Cushman and Ponton**

This variety occurs in the soft marl at the top of the limestone and although showing some variation agrees with that from the Miocene of Florida.

***Bolivina mornhinvegi* Cushman**

Plate 25, figure 17

*Bolivina mornhinvegi* Cushman, Cushman Lab. Foram. Research Contr., vol. 11, p. 32, pl. 5, figs. 1a, b, 1935.

The types of this species came from the Oligocene 24 feet above a limestone ledge at the bottom of a hill on the road ascending from Waltersville, Miss., to the National Cemetery. It occurs in our material from the soft marl at the top of the limestone. It may be distinguished by the shape of the sutures and chambers and the coarsely perforate wall.

***Bolivina quadricosta* Cushman and McGlamery, n. sp.**

Plate 25, figure 20

Test rapidly tapering from the subacute initial end to the greatest breadth formed by the last pair of chambers, somewhat roughly quadrate in end view, periphery of the early portion more strongly truncate, later more rounded; chambers distinct, somewhat inflated, especially the later ones, earlier ones broad and low, later ones rather rapidly increasing in height as added; sutures distinct, depressed, earlier ones slightly curved, later ones somewhat sinuate; wall coarsely perforate, the early portion ornamented with 4 oblique costae, 2 at each side nearly parallel to the periphery; aperture high and narrow, at the base of the inner margin. Length 0.35 millimeter, breadth 0.20 millimeter.

Holotype (Cushman collection no. 23673) from limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *B. advena* Cushman in the more tapering test, less oblique sutures, much more inflation, and more rapid increase in size of the chambers.

***Bolivina* cf. *B. gracilis* Cushman and Applin**

Plate 26, figures 1, 2

The elongate forms figured on plate 26 came from the soft marl at the top of the limestone. In many of their characters they resemble the Eocene species described from the upper Eocene Jackson of Texas. The species is also recorded from the upper Eocene of Louisiana, Mississippi, and Alabama.

***Bolivina* sp.?**

Plate 26, figure 3

The broken specimen here figured seems to be very different from any of the other species from the soft marl above the limestone, and it is here shown in the hope that later workers may find complete specimens.

***Bolivina choctawensis* Cushman and McGlamery, n. sp.**

Plate 26, figure 4

Test in the early half tapering, later half with the sides nearly parallel or even contracted, initial end pointed, apertural end obliquely truncate, periphery slightly truncate; chambers numerous, low and broad, of nearly uniform shape throughout, very gradually increasing in size as added, not inflated; sutures distinct, little if at all depressed, nearly at right angles to the long axis; wall ornamented with a few longitudinal costae, about 4 on a side, the outer pair parallel to the periphery, the inner pair nearly parallel to the long axis of the test; aperture narrow, elongate, in the median portion of the base of the apertural face. Length 0.30 millimeter, breadth 0.15 millimeter.

Holotype (Cushman collection no. 23674) from limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *B. cookei* Cushman in the less compressed test, fewer and higher costae, less oblique sutures, and truncate apertural end.

***Bolivina* cf. *B. mexicana* Cushman**

Plate 26, figure 5

The figured specimen is incomplete but in some of its characters resembles *B. mexicana*, from the Oligocene of Mexico. More specimens are needed to give the full characters and a definite identification. It came from the soft marl above the limestone.

**Genus LOXOSTOMA Ehrenberg, 1854**

***Loxostoma vicksburgensis* (Howe) Cushman**

Plate 26, figures 6-8

*Pleurostomella vicksburgensis* Howe, Jour. Paleontology, vol. 4, p. 331, pl. 27, fig. 5, 1930.

This species was described from the Byram marl at Byram, Miss. In our material it was found both in the soft marl above the limestone and also in the limestone. As a very specialized species it has been one of the indicators that both lots of material are of Oligocene age.

The species was originally described as a *Pleurostomella*, which it does superficially resemble. The early stages do not show the peculiar caving in of one side of the last-formed chamber, and the test at this

stage seems typically a *Bolivina*. In the later development one side of the adult chamber almost entirely collapses, and there is often an irregular opening on the concave side, but the main opening is an elongate, narrow one and definitely terminal. It should be placed as a *Loxostoma*.

Genus **ANGULOGERINA** Cushman, 1927

*Angulogerina byramensis* (Cushman) Ellisor

Plate 26, figures 9, 10

*Uvigerina byramensis* Cushman, U. S. Geol. Survey Prof. Paper 129, pp. 95, 133, pl. 18, fig. 5, 1922; Prof. Paper 133, p. 34, pl. 4, figs. 10, 11, 1923.

*Angulogerina byramensis* Ellisor, Am. Assoc. Petroleum Geologists Bull., vol. 17, pl. 3, fig. 16, 1933.

This is one of the characteristic species of the Vicksburg, and numerous specimens occurred in our material. Our two figures show some of the variations in this species.

Genus **ENTOSOLENIA** Ehrenberg, 1848

*Entosolenia crumenata* Cushman

Plate 26, figure 11

*Entosolenia crumenata* Cushman, Cushman Lab. Foram. Research Contr., vol. 11, p. 31, pl. 4, figs. 9a, b, 1935.

This species was described from the Oligocene, 3 feet above the limestone ledge at the bottom of a hill on the road ascending from Waltersville, Miss., to the National Cemetery. Other species described from this locality also occur in our Choctaw Bluff material. This is one of the fairly common species in the marl above the limestone.

*Entosolenia?* sp.

Plate 26, figure 12.

The figured specimen is not very well preserved but appears in the Choctaw Bluff section. It may belong to *Entosolenia* or may possibly be an *Ellipsolagena*. More specimens are needed to determine its exact characters.

Family **ROTALIIDAE**

Genus **DISCORBIS** Lamarck, 1804

*Discorbis subaraucana* Cushman

Plate 26, figure 13

*Discorbis subaraucana* Cushman, Carnegie Inst. Washington Pub. 311, p. 41, pl. 7, figs. 1, 2, 1922.

Cushman, U. S. Geol. Survey Prof. Paper 181, p. 43, pl. 18, figs. 1a-c, 1935.

This species was originally described from off the southern coast of Florida. Later it was recorded from the Eocene Jackson formation of Alabama and from the Ocala limestone of Alabama and Georgia. Our

figured specimen shows how closely identical this Oligocene material is with that of the others and helps to fill in the gap in range between the Eocene and Recent.

*Discorbis choctawensis* Cushman and McGlamery, n. sp.

Plate 26, figures 15, 16

Test planoconvex, ventral side flattened or slightly concave, dorsal side slightly convex, periphery rounded, thickened; chambers distinct on the dorsal side, 6 in the final whorl, increasing rather rapidly but uniformly in size as added, ventrally obscured by the ornamentation; sutures on the dorsal side curved, strongly limbate, ventrally slightly depressed; wall very coarsely and conspicuously perforate, on the ventral side with a smooth thickened periphery and the remainder having raised, irregularly arranged, elongate masses, generally radial; aperture a low opening on the ventral side beneath a slight, projecting lip. Length of holotype 0.50 millimeter, breadth 0.35 millimeter, thickness 0.20 millimeter.

Holotype (Cushman collection no. 23675) from the limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *D. subaraucana* Cushman, with which it occurs, in the very coarsely perforate wall, smooth periphery on the ventral side, and very ornate central portion.

Genus **LAMARCKINA** Berthelin, 1881

*Lamarckina glabrata* (Cushman) Cushman

Plate 26, figure 17

*Pulvinulina glabrata* Cushman, U. S. Geol. Survey Prof. Paper 129, pp. 99, 138, pl. 22, figs. 6, 7, 1922; Prof. Paper 133, p. 45, pl. 6, figs. 11, 12, 1923.

*Lamarckina glabrata* Cushman, Cushman Lab. Foram. Research Contr., vol. 2, p. 11, pl. 1, figs. 6a-c, 1926.

Howe, Jour. Paleontology, vol. 2, p. 175, 1928.

This species is now recorded from the Byram marl, Mint Spring marl member of the Marianna limestone, and Red Bluff clay. There is considerable variation in the character of the dorsal side, our figured specimen showing the sutures raised much more than the average. Specimens are rather rare in the soft marl above the limestone.

Genus **EPONIDES** Montfort, 1808

*Eponides?* sp.

Plate 26, figure 18

The figured specimen shows fairly well the main features of this species but is not clear enough to show the details so that the species may be adequately described. The aperture is not perfect and in some respects resembles *Eponides* and also suggests *Pulvinulinella*.

**Eponides choctawensis Cushman and McGlamery, n. sp.**

Plate 27, figure 1

Test unequally biconvex, the ventral side somewhat more convex than the dorsal side, periphery broadly rounded; chambers very distinct, inflated, 6 or 7 in the last-formed whorl, of uniform size and increasing gradually in size as added; sutures distinct, on the dorsal side curved, limbate, on the ventral side depressed and nearly radiate; wall of the dorsal side smooth and polished, ventral side conspicuously papillate; aperture a low, elongate opening somewhat ventrally from the periphery along the border of the last-formed chamber. Diameter 0.35 millimeter, thickness 0.20 millimeter.

Holotype (Cushman collection no. 23677) from the limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *E. mansfieldi* Cushman in the fewer chambers, rounded periphery, and the papillae of the ventral surface rather evenly scattered instead of mostly near the center.

**Eponides alabamensis Cushman and McGlamery, n. sp.**

Plate 27, figure 2

Test unequally biconvex, ventral side strongly convex, dorsal side slightly raised, periphery acute, slightly keeled; chambers distinct, slightly if at all inflated on the dorsal side, ventrally strongly so, 6 in the adult whorl, of uniform shape, very gradually increasing in size as added; sutures distinct, on the dorsal side limbate, strongly oblique, ventrally gently curved; wall on the dorsal side smooth and polished, on the ventral side finely papillate with occasional costae across the sutures; aperture a low, elongate opening on the ventral side at the margin of the last-formed chamber. Diameter 0.35–0.40 millimeter, thickness 0.15–0.18 millimeter.

Holotype (Cushman collection no. 23678) from the limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *E. mansfieldi* in the fewer chambers, smaller size, and less papillate surface. From *E. choctawensis* it is distinguished by the very oblique sutures on the dorsal side, less inflated chambers, and less lobulate periphery.

**Genus ROTALIA Lamarck, 1804****Rotalia byramensis Cushman**

Plate 27, figure 3

*Rotalia byramensis* Cushman, U. S. Geol. Survey Prof. Paper 129, pp. 99, 128, pl. 23, fig. 1, 1922; Prof. Paper 133, p. 46, 1923.

This species is known from the Byram marl and Mint Spring marl member of the Oligocene. Very good specimens were obtained from Choctaw Bluff and help to fix the age of this material.

**Rotalia choctawensis Cushman and McGlamery, n. sp.**

Plate 27, figure 4

Test about equally biconvex, periphery somewhat serrate, especially in the later portion, bluntly angled, ventral side with a prominent umbilical plug; chambers 10 to 12 in the adult whorl, of rather uniform shape, increasing very gradually in size as added; sutures of the dorsal side slightly curved, raised, ventrally nearly radial and deeply excavated; wall roughened on both sides; aperture a small opening at the ventral margin of the last-formed chamber. Diameter up to 1.00 millimeter; thickness 0.50 millimeter.

Holotype (Cushman collection no. 23679) from the Oligocene limestone at water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *R. byramensis* in the larger number of chambers, lack of definite spines, and very rough surface.

**Rotalia alabamensis Cushman and McGlamery, n. sp.**

Plate 27, figure 5

Test strongly and almost equally biconvex, periphery acute with a somewhat erose keel, ventral side with a small but distinct umbilical plug; chambers about 8 in the adult whorl, not inflated, of rather uniform size, increasing very gradually in size as added, on the dorsal side almost entirely obscured by the ornamentation; sutures of the dorsal side curved, mostly obscured, on the ventral side radiate, depressed, especially toward the umbilical end; wall of the dorsal side covered with irregularly scattered, rounded coarse papillae, ventrally smooth and polished; aperture ventral, a short opening at the base of the apertural face. Diameter 0.40–0.45 millimeter, thickness 0.25–0.28 millimeter.

Holotype (Cushman collection no. 23680) from limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *R. byramensis* in the lack of spines or peripheral angles to the chambers, the development of a prominent keel, and the coarsely papillate dorsal side.

**Genus CANCRIS Montfort, 1808****Cancris sagra (D'Orbigny) var. pauciloculata Cushman and McGlamery, n. var.**

Plate 27, figure 6

*Pulvinulina sagra* Cushman [not D'Orbigny], U. S. Geol. Survey Prof. Paper 133, p. 45, pl. 6, figs. 9, 10, 1933.

Variety differing from the typical form in the fewer and higher chambers.

Holotype of variety (Cushman collection no. 23681) from the limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This varietal form has hitherto been recorded only from the Glendon limestone of the Oligocene.

Genus *BAGGINA* Cushman, 1926

*Baggina thalmani* Pijpers?

Plate 26, figure 14

*Baggina thalmani* Pijpers, Géologie et paléontologie de Bonaire, p. 69, text figs. 97-99, 1933.

Our figured specimen has the rounded openings of the ventral side somewhat scattered instead of in a nearly circular line, and the dorsal side is very obscure. There are, however, decided resemblances between the two. Pijpers' material was obtained from the upper Eocene of the island of Bonaire. Our specimens came from the soft marl above the limestone at Choctaw Bluff.

Family AMPHISTEGINIDAE

Genus *ASTERIGERINA* D'Orbigny, 1839

*Asterigerina subacuta* Cushman

Plate 28, figure 1

*Asterigerina subacuta* Cushman, U. S. Geol. Survey Prof. Paper 129, p. 100, pl. 24, figs. 1-3, 1922; Prof. Paper 133, p. 47, 1923.

This species was not well figured in the original plate, and our figures here will give a clearer idea of its appearance. The dorsal side is flattened and the ventral side strongly convex with a slight umbo in the center; the periphery is distinctly keeled. Previous records from the Oligocene have been from the Byram marl. It occurs in the soft marl above the limestone at Choctaw Bluff.

*Asterigerina choctawensis* Cushman and McGlamery, n. sp.

Plate 28, figure 2

Test almost equally biconvex, the dorsal side tending to be slightly evolute, umbonate in the center of both sides, periphery acute and slightly keeled; chambers distinct, not inflated, 12 or more in the adult whorl, of rather uniform shape and increasing very gradually in size as added, the inner series of supplementary chambers on the ventral side much smaller than the outer series; sutures distinct, slightly limbate, especially on the dorsal side, where they are strongly curved; wall smooth, finely perforate, except on the ventral side near the aperture, where it is finely papillate; aperture low, elongate, below a slight lip near the periphery on the ventral side. Diameter 0.80 millimeter, thickness 0.40 millimeter.

Holotype (Cushman collection no. 23682) from limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species somewhat resembles *Amphistegina chipolensis* Cushman and Ponton, from the Miocene of Florida, and may be an ancestral form of that species, although we have placed ours in the genus *Asterigerina*.

Our specimen differs in the lack of definite angles in the sutures on the dorsal side; it is less evolute and has a smaller umbo on the ventral side and smaller rhomboid chambers.

*Asterigerina bracteata* Cushman

Plate 28, figure 3

*Asterigerina bracteata* Cushman, Cushman Lab. Foram. Research Contr., vol. 5, p. 48, pl. 8, figs. 6a-c, 1929.

The types of this species were found in the Oligocene Byram marl of Byram, Miss. Our specimens, which are identical, came from the soft marl above the limestone at Choctaw Bluff.

*Asterigerina alabamensis* Cushman and McGlamery, n. sp.

Plate 28, figure 5

Test unequally biconvex, ventral side much more convex than the dorsal, periphery sharply keeled, the keel translucent and fimbriate, the dorsal side almost completely involute; chambers of the dorsal side distinct, curved, not inflated, of uniform shape, increasing very slightly in size as added, ventrally the chambers rather obscure, the supplementary chambers only showing in later growth; sutures very distinct, strongly curved and slightly limbate on the dorsal side, ventrally curved, obscure; wall smooth; aperture an irregular elongate opening on the ventral side at the base of the last-formed chamber. Diameter 0.45 millimeter, thickness 0.20 millimeter.

Holotype (Cushman collection no. 23683) from limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *A. subacuta* Cushman in the slightly more convex dorsal side, lack of a definite umbo, narrower chambers, and thinner, fimbriate keel.

Family CASSIDULINIDAE

Genus *CASSIDULINA* D'Orbigny, 1826

*Cassidulina crassa?* D'Orbigny

Plate 28, figure 4

There are in our collection a very few specimens that can be referred to D'Orbigny's species with some question. Similar forms occur in the Miocene of the Gulf and Atlantic Coastal Plain areas, and our specimens from Choctaw Bluff, in the soft marl above the limestone, are very similar to these.

Family ANOMALINIDAE

Genus *CIBICIDES* Montfort, 1808

*Cibicides choctawensis* Cushman and McGlamery, n. sp.

Plate 28, figure 6

Test planoconvex, dorsal side flattened and somewhat evolute, the ventral side convex and involute,

periphery subacute; chambers distinct, very slightly inflated, about 10 in the final whorl, low and broad, of uniform shape, increasing very gradually in size as added; sutures distinct, limbate, strongly curved; wall smooth, finely perforate; aperture a low, arched opening at the periphery and extending over onto the dorsal side below a slightly extended lip of the last-formed chamber. Diameter 0.30-0.35 millimeter, thickness 0.12 millimeter.

Holotype (Cushman collection no. 23684) from hard limestone, 2 to 3 feet above water level, Choctaw Bluff, Alabama River, Ala.

This species differs from *C. americana* Cushman in the greater number of chambers, more evolute dorsal side, and more nearly circular outline.

Genus **CIBICIDELLA** Cushman, 1927

*Cibicidella* sp.

Plate 28, figure 7

The figured specimen is evidently immature and may possibly belong to *Planorbulina*. No adult specimens with well-defined characters are available. It occurred in the soft marl above the limestone at Choctaw Bluff.

Family **PLANORBULINIDAE**

Genus **GYPSINA** Carter, 1877

*Gypsina rubra* (D'Orbigny) Heron-Allen and Earland

Plate 28, figure 8

*Planorbulina rubra* D'Orbigny, Annales sci. nat., vol. 7, no. 4, p. 280, 1826.

Fornasini, Accad. sci. Ist. Bologna Mem., 6th ser., vol. 5, p. 44, pl. 2, fig. 3, 1908.

*Gypsina rubra* (D'Orbigny), Heron-Allen and Earland, Zool. Soc. London Trans., vol. 20, p. 725, pl. 53, figs. 35-37, 1915.

Cushman, U. S. Geol. Survey Prof. Paper 129, pp. 98, 138, pl. 22, fig. 3, 1922; Prof. Paper 133, p. 47, 1923.

This species has already been recorded from the Oligocene as occurring in all the formations of the Vicksburg group. The figured specimen is an unusually well-developed one.

*Gypsina vesicularis* (Parker and Jones) Carter

Plate 28, figure 9

Our figured specimen represents the planoconvex form which has already been recorded from the Chipola formation of the Miocene of Florida.<sup>15</sup> Our specimen is from the soft marl above the limestone at Choctaw Bluff.

<sup>15</sup> Cushman and Ponton, Florida Geol. Survey Bull. 9, p. 105, pl. 16, figs. 9a, b, 1932.

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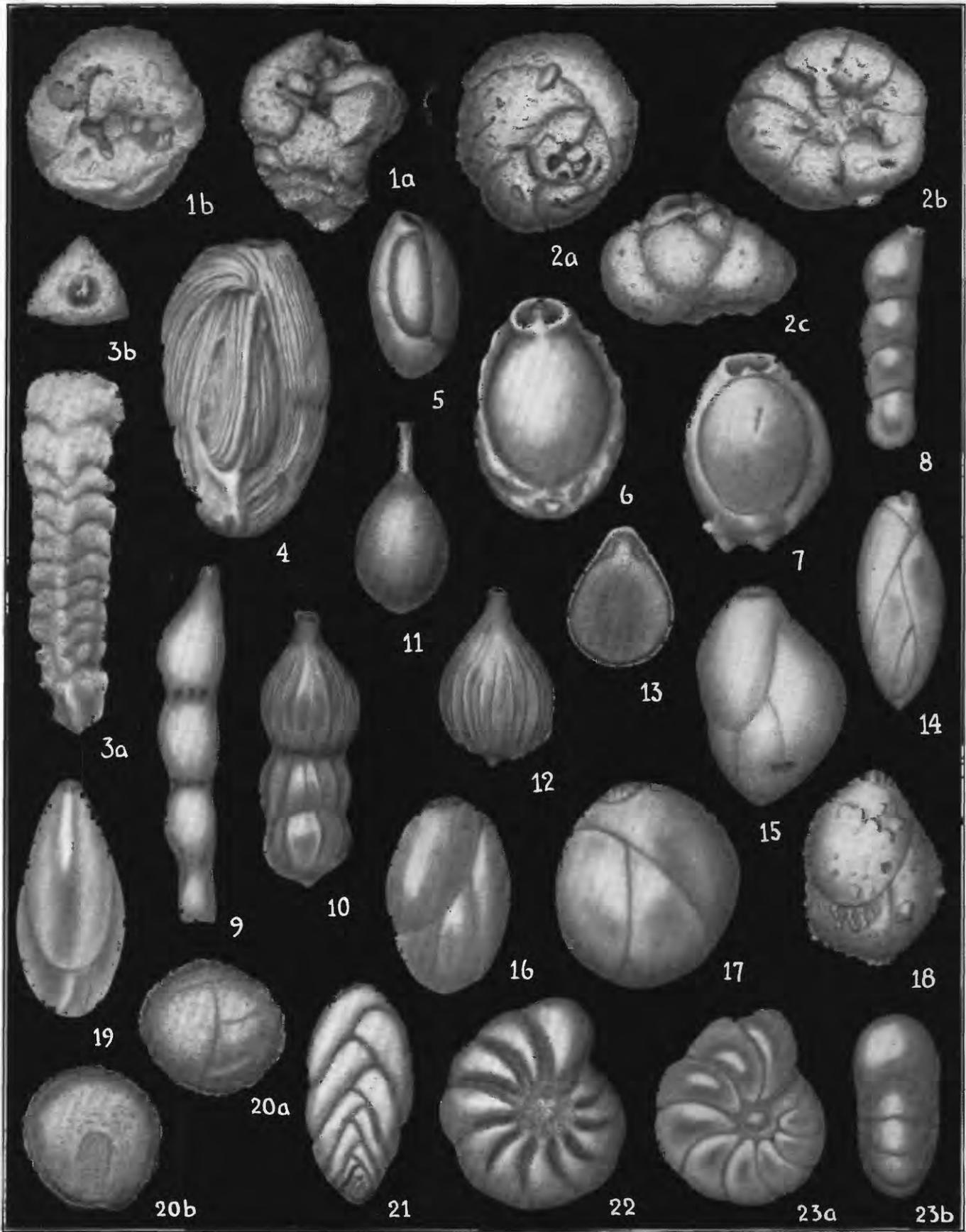
PLATES 24–28

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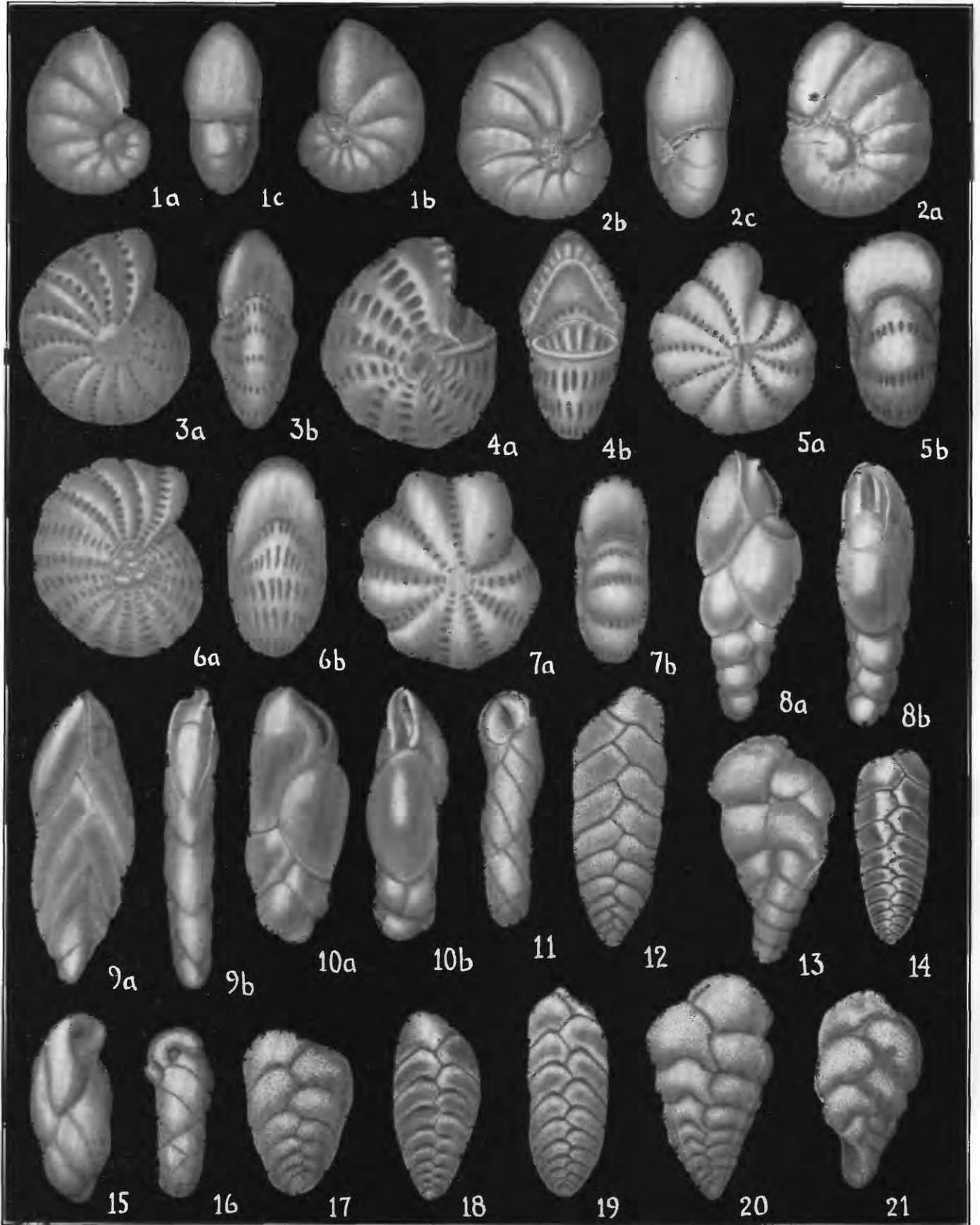
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PLATE 24

- FIGURE 1. *Valvulina* sp.? *a*, Front view; *b*, apertural view.  $\times 33$ .  
2. *Valvulammina* sp.? *a*, Dorsal view; *b*, ventral view; *c*, peripheral view.  $\times 50$ .  
3. *Clavulina* cf. *C. tricarinata* D'Orbigny. *a*, Ventral view; *b*, apertural view.  $\times 33$ .  
4. *Quinqueloculina crassa* D'Orbigny?  $\times 70$ .  
5. *Triloculina* sp.?  $\times 90$ .  
6, 7. *Pyrgo inornata* (D'Orbigny)? Cushman. 6,  $\times 70$ ; 7,  $\times 90$ .  
8. *Dentalina* cf. *D. communis* D'Orbigny.  $\times 70$ .  
9. *Dentalina catenulata*? H. B. Brady.  $\times 80$ .  
10. *Nodosaria catesbyi* D'Orbigny.  $\times 120$ .  
11. *Lagena perlucida* Montagu.  $\times 90$ .  
12. *Lagena costata* (Williamson) Reuss.  $\times 130$ .  
13. *Lagena laevigata* (Reuss) Terrigi.  $\times 130$ .  
14. *Guttulina* cf. *G. lehneri* Cushman and Ozawa.  $\times 60$ .  
15. *Guttulina problema* D'Orbigny.  $\times 70$ .  
16, 19. *Guttulina* cf. *G. problema* D'Orbigny. 16,  $\times 60$ ; 19,  $\times 70$ .  
17. *Globulina gibba* D'Orbigny.  $\times 90$ .  
18. *Globulina inaequalis* Reuss var. *caribaea* D'Orbigny?  $\times 80$ .  
20. *Globulina fimbriata* Cushman and McGlamery, n. sp. *a*, Dorsal view; *b*, ventral view.  $\times 90$ .  
21. *Polymorphina advena* Cushman.  $\times 60$ .  
22, 23. *Nonion advenum* (Cushman) Cushman. 22,  $\times 70$ ; 23, *a*, side view; *b*, peripheral view;  $\times 120$ .



VALVULINIDAE, MILIOLIDAE, LAGENIDAE, POLYMORPHINIDAE, AND NONIONIDAE FROM CHOCTAW BLUFF, ALABAMA.



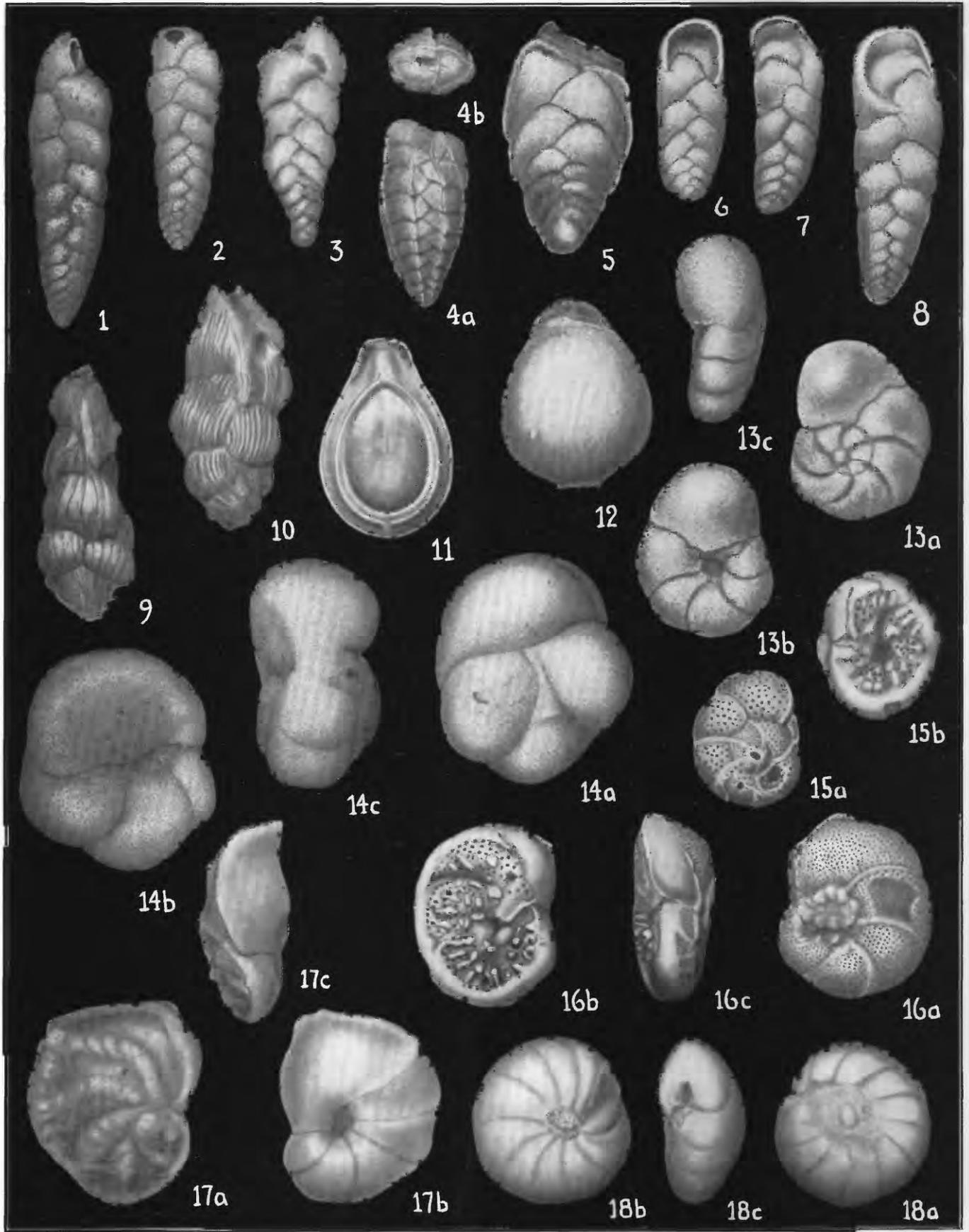
NONIONIDAE AND BULIMINIDAE FROM CHOCTAW BLUFF, ALABAMA.

PLATE 25

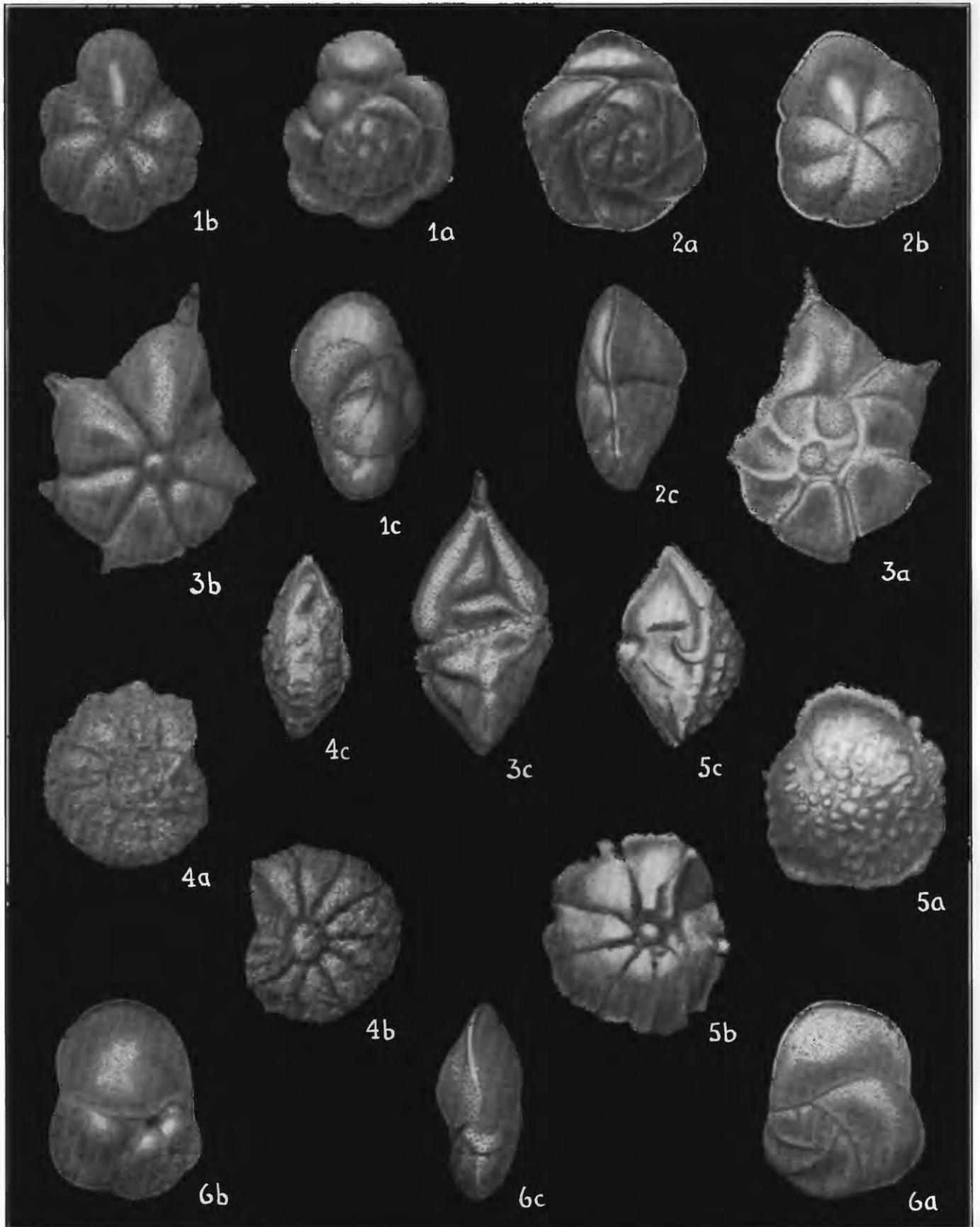
- FIGURE 1. *Nonionella danvillensis* Howe and Wallace. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .
2. *Nonionella hantkeni* (Cushman) and Applin var. *spissa* Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .
3. *Elphidium discoidale* (D'Orbigny) Cushman. *a*, Side view; *b*, apertural view.  $\times 80$ .
4. *Elphidium sagrum* (D'Orbigny) Cushman. *a*, Side view; *b*, apertural view.  $\times 120$ .
- 5, 7. *Elphidium* cf. *E. poeyanum* (D'Orbigny) Cushman. *a*, Side view; *b*, apertural view.  $\times 90$ .
6. *Elphidium* cf. *E. lessoni* (D'Orbigny). *a*, Side view; *b*, apertural view.  $\times 60$ .
8. *Virgulina zetina* Cole. *a*, Front view; *b*, side view.  $\times 120$ .
9. *Virgulina vicksburgensis* Cushman. *a*, Front view; *b*, side view.  $\times 120$ .
10. *Virgulina bramlettei* Galloway and Morrey. *a*, Front view; *b*, side view.  $\times 120$ .
- 11, 16. *Buliminella choctawensis* Cushman and McGlamery, n. sp. 11, Holotype; 16, paratype.  $\times 120$ .
12. *Bolivina advena* Cushman.  $\times 145$ .
- 13, 21. *Bolivina tortuosa* H. B. Brady. 13,  $\times 145$ ; 21,  $\times 90$ .
- 14, 18, 19. *Bolivina paula* Cushman and Cahill.  $\times 145$ .
15. *Buliminella* cf. *B. elegantissima* (D'Orbigny).  $\times 120$ .
17. *Bolivina mornhinwegi* Cushman.  $\times 90$ .
20. *Bolivina quadricosta* Cushman and McGlamery, n. sp. Holotype.  $\times 120$ .

PLATE 26

- FIGURES 1, 2. *Bolivina* cf. *B. gracilis* Cushman and Applin.  $\times 120$ .  
3. *Bolivina* sp.?  $\times 70$ .  
4. *Bolivina choctawensis* Cushman and McGlamery, n. sp. Holotype. *a*, Front view; *b*, apertural view.  $\times 120$ .  
5. *Bolivina* cf. *B. mexicana* Cushman.  $\times 90$ .  
6-8. *Loxostoma vicksburgensis* (Howe) Cushman.  $\times 90$ .  
9, 10. *Angulogerina byramensis* (Cushman) Ellisor.  $\times 120$ .  
11. *Entosolenia crumenata* Cushman.  $\times 130$ .  
12. *Entosolenia?* sp.  $\times 180$ .  
13. *Discorbis subaraucana* Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 120$ .  
14. *Baggina thalmani* Pijpers? *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .  
15, 16. *Discorbis choctawensis* Cushman and McGlamery, n. sp. 15, Paratype, *a*, dorsal view; *b*, ventral view;  $\times 70$ ;  
16, holotype, *a*, dorsal view; *b*, ventral view; *c*, apertural view;  $\times 70$ .  
17. *Lamarckina glabrata* (Cushman) Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 120$ .  
18. *Eponides?* sp. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .



BULIMINIDAE AND ROTALIIDAE FROM CHOCTAW BLUFF, ALABAMA.



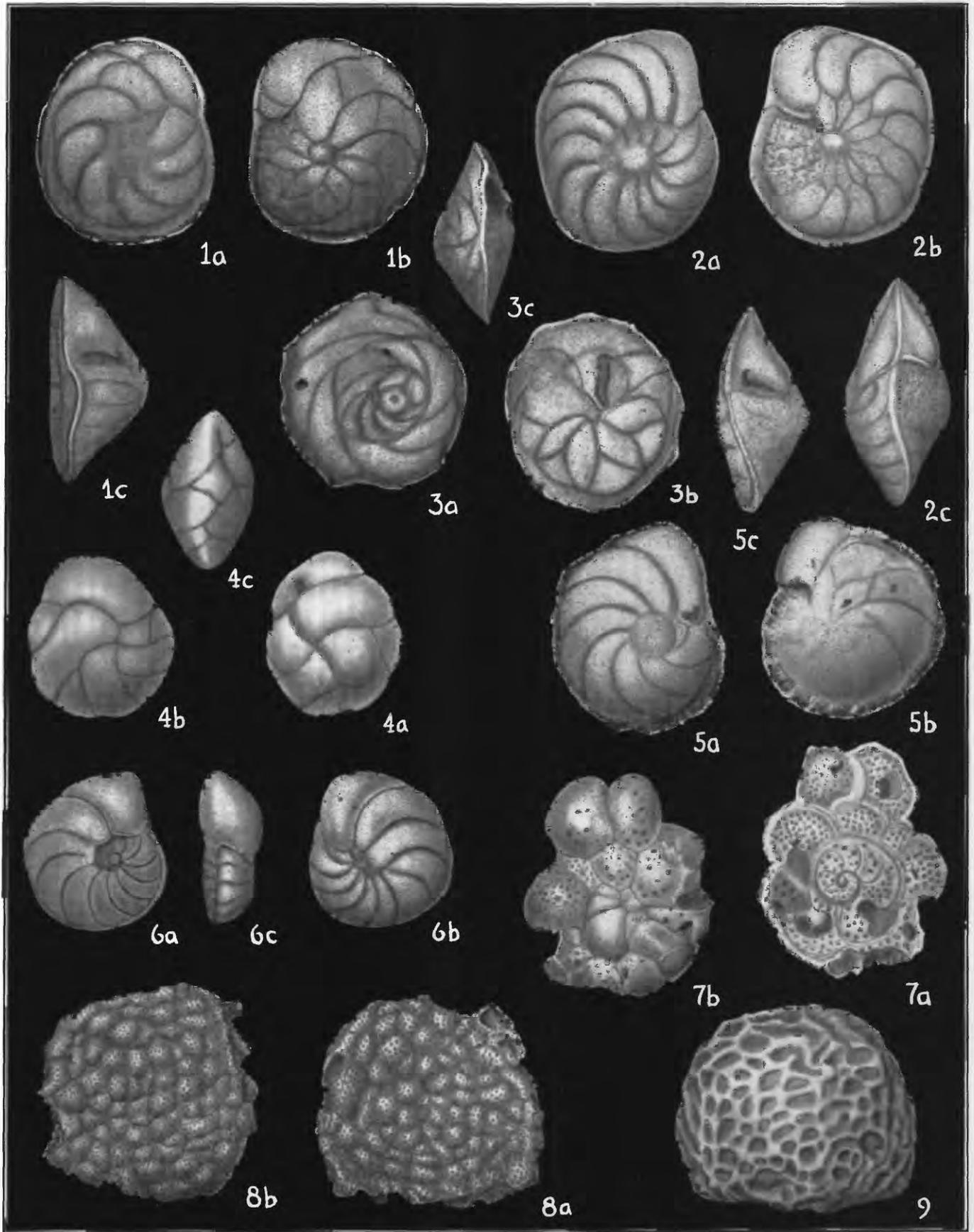
ROTALIIDAE FROM CHOCTAW BLUFF, ALABAMA.

PLATE 27

- FIGURE 1. *Eponides choctawensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 120$ .
2. *Eponides alabamensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 120$ .
3. *Rotalia byramensis* Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 120$ .
4. *Rotalia choctawensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 33$ .
5. *Rotalia alabamensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .
6. *Canceris sagra* (D'Orbigny) var. *pauciloculata* Cushman and McGlamery, n. var. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 70$ .

PLATE 28

- FIGURE 1. *Asterigerina subacuta* Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .
2. *Asterigerina choctawensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 50$ .
3. *Asterigerina bracteata* Cushman. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 130$ .
4. *Cassidulina crassa?* D'Orbigny. *a*, *b*, Opposite sides; *c*, peripheral view.  $\times 120$ .
5. *Asterigerina alabamensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 90$ .
6. *Cibicides choctawensis* Cushman and McGlamery, n. sp. Holotype. *a*, Dorsal view; *b*, ventral view; *c*, apertural view.  $\times 80$ .
7. *Cibicidella* sp. *a*, Dorsal view; *b*, ventral view.  $\times 80$ .
8. *Gypsina rubra* (D'Orbigny) Heron-Allen and Earland. *a*, *b*, Opposite sides.  $\times 50$ .
9. *Gypsina vesicularis* (Parker and Jones) Carter.  $\times 90$ .



AMPHISTEGINIDAE, CASSIDULINIDAE, ANOMALINIDAE, AND PLANORBULINIDAE FROM CHOCTAW BLUFF, ALABAMA.



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