

MISSISSIPPI
STATE GEOLOGICAL SURVEY

WILLIAM CLIFFORD MORSE, Ph. D.
DIRECTOR



FROM
BULLETIN 53
CLAY COUNTY

FOSSILS
MIDWAY FORAMINIFERA AND OSTRACODA

By
VIRGINIA HARRIETT KLINE, Ph. D.

UNIVERSITY, MISSISSIPPI
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CONTENTS

| | Page |
|-----------------------------------|------|
| Introduction | 5 |
| Stratigraphy | 5 |
| Description of Foraminifera | 13 |
| Family Textulariidae | 13 |
| Family Verneuilinidae | 13 |
| Family Valvulinidae | 16 |
| Family Lagenidae | 17 |
| Family Polymorphinidae | 39 |
| Family Nonionidae | 44 |
| Family Heterohelicidae | 44 |
| Family Buliminidae | 47 |
| Family Ellipsoidinidae | 50 |
| Family Rotaliidae | 52 |
| Family Cassidulinidae | 55 |
| Family Chilostomellidae | 56 |
| Family Globigerinidae | 58 |
| Family Globorotaliidae | 59 |
| Family Anomalinidae | 59 |
| Description of Ostracoda | 64 |

| | Page |
|---------------------------------------|------|
| Family Cytherellidae | 64 |
| Family Cypridae | 64 |
| Family Bairdidae | 65 |
| Family Cytheridae | 66 |
| Logs and locations of test holes..... | 72 |
| Plates and explanations | 79 |
| Index | 97 |

ILLUSTRATIONS

| | |
|--|----|
| Plates I to VII.—Midway Foraminifera | 81 |
| Plate VIII.—Midway Ostracoda | 95 |

CLAY COUNTY FOSSILS MIDWAY FORAMINIFERA AND OSTRACODA

VIRGINIA HARRIETT KLINE, PH.D.

INTRODUCTION

During the Spring and Summer of 1942 about 300 hand auger tests were bored in Clay County by field crews under the supervision of Dr. Harlan R. Bergquist. Included in the samples collected for stratigraphic purposes and clay testing were about a hundred samples of Midway chalks and clays which have been examined for microfossils.

The Clay County Midway is rich in both species and specimens of foraminifera and ostracoda, including a number of new forms. In the following discussion a total of 110 species or varieties of foraminifera is described and illustrated. A complete list of foraminifera would include, probably, about 120 species. About 25 species of ostracoda are present, of which number 12 are illustrated and described. Most of the remainder are probably new.

Earlier bulletins of the Mississippi Geological Survey have listed some of the Midway macrofossils of the state, but no previous record of the microfossils has been published. This report is the second in a contemplated series on microfossils of the various formations in the state. The first, a study of the Jackson foraminifera and ostracoda of Scott County made by Dr. Bergquist, appeared as a part of Bulletin 49 of the Mississippi Geological Survey.

The material studied was collected, washed, and placed in temporary mounts under the supervision of Dr. Bergquist. All illustrations were drawn by Mary Louise Pegues.

Subsequent identifications and additions to the manuscript that are marked HRB are by Dr. Bergquist.

STRATIGRAPHY

The Midway series crops out as a north-south trending belt about 3 to 5 miles wide in the extreme western part of Clay County. It overlies the Prairie Bluff chalk unconformably.

Highest Midway strata are not present, cropping out in Webster County to the west.

In Mississippi the Midway series has been divided into two formations: the Clayton chalk overlain by the Porters Creek clay. Both formations are present in Clay County.

The Clayton chalk is poorly developed and exposed only in limited areas, for the most part along hillsides. Thicknesses are not great, averaging about 25 feet.

The basal Clayton chalk in most places consists of a layer only a few inches thick of very sandy clay or silt which is sometimes glauconitic. Overlying the sandy zone the typical Clayton is made up of glauconitic, micaceous, finely sandy gray chalk which may grade upward into gray or tan clays and silt in the extreme upper part of the formation.

About 10 to 15 feet above the base of the Clayton is a bed characterized by an abundance of shells of *Ostrea pulaskensis* Harris. Below the top of the *O. pulaskensis* bed the fauna is a typically lower Midway one containing many species in common with the Kincaid formation of Texas and the lower Midway of Alabama. The *O. pulaskensis* bed is overlain by about 10 to 20 feet of typical Clayton chalk or of micaceous, glauconitic silty clays which lithologically resemble the overlying Porters Creek clay. Where clays form the upper part of the formation, the Clayton-Porters Creek contact must be drawn on the basis of faunal changes. This 10 to 20-foot interval contains a transitional fauna in which there is a mingling of Clayton fossils with Porters Creek fossils which make their first appearance in this zone. Plummer reports from the Midway of Texas at some localities a similar transitional zone in which such a characteristic lower Midway species as *Vaginulina gracilis* Plummer is associated with the typical upper Midway species *Cibicides alleni* (Plummer), *Vaginulina robusta* Plummer and *Gyroïdina subangulata* (Plummer). One species, *Polymorphina cushmani* Plummer, described as confined to the transitional zone in Texas, was also noted only in the same zone in Clay County. In the logs of test hole localities at the end of this report the Clayton-Porters Creek contact has been placed at the top of the highest bed showing typical lower Midway species rather than at the base of the bed containing the earliest Porters Creek

species. In the notes under descriptions of species these transitional beds are referred to as uppermost Clayton.

Of the 110 species and varieties of foraminifera herein described, 14 are confined to the lower Clayton or to the Clayton and the transitional beds; 14 Porters Creek species range downward into the uppermost strata, but are absent from the *O. pulaskensis* and lower beds. Ostracoda are not common in the Clayton. A single species is confined to this formation. Three Porters Creek species are present in the transitional zone. The *Turritella mortoni* Conrad bed, commonly present in the Clayton chalk of the state, has not been observed in Clay County.

In the following list of species identified from the Clayton, those which are confined to that formation are marked with a double asterisk; species from the uppermost beds which are also present in the Porters Creek clay are indicated by a single asterisk.

CLAYTON

- Spiroplectamina laevis (Roemer) var. cretosa Cushman
- *Clavulinoides midwayensis Cushman
- **Gaudryina sp.
- Marssonella oxycona (Reuss)
- Robulus midwayensis (Plummer)
- Robulus pseudo-costatus (Plummer)
- Robulus pseudo-costatus (Plummer) var. inornatus Kline, n. var.
- Robulus rosetta (Gumbel)
- Robulus turbinatus (Plummer)
- Lenticulina degolyeri (Plummer)
- **Marginulina earlandi (Plummer)
- *Hemicristellaria subaculeata (Cushman) var. tuberculata (Plummer)
- Dentalina aculeata (?) (d'Orbigny)
- **Dentalina basiplanata Cushman
- Dentalina crinita Plummer
- **Dentalina delicatula Cushman
- **Dentalina gardnerae (Plummer)
- *Dentalina plummerae Cushman
- Dentalina pseudo-obliquesriata (Plummer)
- Nodosaria latejugata Gumbel
- Nodosarina (Nodosaria) longiscata (d'Orbigny)
- Chrysalogonium granti (Plummer)
- Pseudoglandulina cf. caudigera (Schwager)
- Pseudoglandulina comata (Batsch)
- Pseudoglandulina manifesta (Reuss)

- Saracenaria cf. sublatifrons* (Plummer)
 **Saracenaria trigonata* (Plummer)
 ***Vaginulina gracilis* Plummer
 Vaginulina legumen var. *elegans* d'Orbigny
 Vaginulina plumoides Plummer
 **Vaginulina robusta* Plummer
 Palmula cf. budensis (Hantken)
 Palmula cf. primitiva Cushman
 ***Palmula rugosa* (d'Orbigny)
 ***Frondicularia archiaciana* d'Orbigny
 Frondicularia cf. franki Cushman
 ***Lagena hispida* Reuss
 Lagena laevis (Montagu)
 Lagena cf. primigera H. B. Brady
 Lagena sulcata (Walker and Jacob) var. *semiinterrupta* Berry
 Guttulina problema d'Orbigny
 Globulina gibba d'Orbigny
 Pyrulina cylindroides (Roemer)
 ***Sigmomorphina* sp.
 ***Polymorphina cushmani* Plummer
 Polymorphina frondea (Cushman)
 ***Polymorphina* sp.
 Ramulina globulifera (H. B. Brady)
 Bullopora chapmani (Plummer)
 Bullopora laevis (Sollas)
 **Nonionella welleri* (Plummer)
 **Gumbelina morsei* Kline, n. sp.
 Planoglobulina acervulinoides Cushman
 **Eouvigerina excavata* Cushman
 Pseudouvigerina naheolensis Cushman and Todd
 Siphogenerinoides eleganta (Plummer)
 Bulimina (Desinobulimina) quadrata Plummer
 Entosolenia morsei Kline, n. sp.
 **Virgulina wilcoxensis* Cushman and Ponton
 Bolivina midwayensis Cushman
 Loxostoma applinae (Plummer)
 Ellipsonodosaria alexanderi Cushman
 Ellipsonodosaria plummerae Cushman
 ***Discorbis midwayensis* Cushman
 Valvulineria allomorphinoides (Reuss)
 **Gyroidina subangulata* (Plummer)
 **Eponides cf. tenera* (H. B. Brady)
 **Parrella expansa* Toulmin
 Siphonina prima Plummer
 Pulvinulina exigua H. B. Brady
 Pullenia quinqueloba (Reuss)
 **Globigerina compressa* Plummer
 Globigerina pseudo-bulloides Plummer
 Globigerina triloculinoides Plummer

- Anomalina cf. ammonoides* (Reuss)
Anomalina acuta (Plummer)
Anomalina midwayensis (Plummer)
***Anomalina midwayensis* (Plummer) var. *trochoidea* (Plummer)
**Cibicides alleni* (Plummer)
**Cibicides browni* Kline, n. sp.
Cibicides praecursorius (Schwager)
Cibicides vulgaris (Plummer)
Cytherella symmetrica Alexander
Argilloecia faba Alexander
Bairdia magna Alexander
Brachycythere formosa Alexander
**Brachycythere interrasilis* Alexander
Brachycythere plena Alexander
Cythereis prestwichiana Jones and Sherborn
Cythereis spiniferrima Jones and Sherborn
**Cytheromorpha scrobiculata* Alexander
Loxoconcha mississippiensis Kline, n. sp.
**Krithe perattica* Alexander

Except for the very limited outcrops of Clayton chalk, Midway rocks exposed in Clay County are of Porters Creek age. The formation reaches a maximum thickness of about 125 feet in the county.

Basal Porters Creek clays are highly calcareous or chalky and glauconitic. Fossils are very abundant in the lowermost 8 to 10 feet. Upward the rocks grade into silty micaceous tan or gray clays which are frequently waxy in appearance; the number of fossils decreases rapidly upward in these clays. All of the fossils examined were from the basal 25 feet of the formation.

In addition to the 14 Porters Creek species of foraminifera which first appear in the transitional zone at the top of the Clayton, 19 species are confined to the Porters Creek formation. Ostracods are more abundant in this formation than in the Clayton chalk. Three species are present in the Porters Creek and uppermost Clayton; a fourth, known by a single specimen, is confined to the Porters Creek.

In the following list of species identified from the Porters Creek clay, a single asterisk indicates those species which first appear in the uppermost Clayton, a double asterisk those confined to the Porters Creek.

PORTERS CREEK

- Spiroplectammina laevis* (Roemer) var. *cretosa* Cushman
 **Clavulinoides midwayensis* Cushman
Gaudryina rugosa d'Orbigny
Heterostomella cuneata Sandidge
 ***Heterostomella* sp.
Marssonella oxyconca (Reuss)
 ***Dorothia* sp.
Robulus midwayensis (Plummer)
Robulus pseudo-costatus (Plummer)
Robulus pseudo-costatus (Plummer) var. *inornatus* Kline, n. sp.
 ***Robulus* cf. *pseudo-mammilligerus* (Plummer)
Robulus rosetta (Gumbel)
Robulus turbinatus (Plummer)
Robulus wilcoxensis Cushman and Ponton
Lenticulina degolyeri (Plummer)
 ***Lenticulina rotulata* (Lamarck)
 **Hemicristellaria subaculeata* (Cushman) var. *tuberculata* (Plummer)
Dentalina aculeata (?) (d'Orbigny)
Dentalina crinita Plummer
 ***Dentalina havanensis* Cushman and Bermudez
 **Dentalina plummerae* Cushman
Dentalina plummerae Cushman var.
Dentalina pseudo-obliquistriata (Plummer)
Dentalina cf. *solvata* Cushman
Dentalina (?) sp.
Nodosaria latejugata Gumbel
 ***Nodosaria oligotoma* Reuss
 ***Nodosarina* (*Nodosaria*) *aspera* (Reuss)
 ***Nodosarina* (*Frondicularia*) *goldfussi* (Reuss)
Nodosarina (*Nodosaria*) *longiscata* (d'Orbigny)
Chrysalogonium granti (Plummer)
Pseudoglandulina cf. *caudigeria* (Schwager)
Pseudoglandulina comata (Batsch)
Pseudoglandulina manifesta (Reuss)
 ***Saracenaria midwayensis* Kline, n. sp.
Saracenaria cf. *sublatifrons* (Plummer)
 **Saracenaria trigonata* (Plummer)
 ***Vaginulina glabra* (d'Orbigny)
Vaginulina legumen (Linnaeus)
Vaginulina legumen (Linnaeus) var. *elegans* d'Orbigny
Vaginulina plumoides Plummer
 **Vaginulina robusta* Plummer
Palmula cf. *budensis* (Hanther)
 ***Palmula delicatissima* (Plummer)
Palmula cf. *primitiva* Cushman
Frondicularia cf. *frankei* Cushman
Lagena laevis (Montagu)
 ***Lagena orbignyana* (Seguenza)

- Lagena sulcata* (Walker and Jacob) var. *semiinterrupta* Berry
Guttulina problema d'Orbigny
Globulina gibba d'Orbigny
Pyrulina cylindroides (Roemer)
Polymorphina frondea (Cushman)
Ramulina globulifera (H. B. Brady)
Bullopora chapmani (Plummer)
***Bullopora chapmani* (Plummer) var. *hispida* Kline, n. var.
Bullopora laevis (Sollas)
***Bullopora laevis* (Sollas) var. *hispida* Kline, n. var.
**Nonionella welleri* (Plummer)
**Gumbelina morsei* Kline, n. sp.
**Eouvigerina excavata* Cushman
Siphogenerinoides eleganta (Plummer)
Bulimina arkadelphiana Cushman and Parker var. *midwayensis*
Cushman and Parker
***Bulimina cacumenata* Cushman and Parker
Bulimina (*Desinobulimina*) *quadrata* Plummer
Entosolenia morsei Kline, n. sp.
**Virgulina wilcoxensis* Cushman and Ponton
Bolivina midwayensis Cushman
Loxostoma applinae (Plummer)
***Pleurostomella* cf. *brevis* var. *alternas* Schwager
Ellipsonodosaria alexanderi Cushman
Ellipsonodosaria plummerae Cushman
Valvulineria allomorphinoides (Reuss)
**Gyroidina subangulata* (Plummer)
**Eponides* cf. *tenera* (H. B. Brady)
**Parrella expansa* Toulmin
Siphonia prima Plummer
Pulvinulinella exigua (H. B. Brady)
***Allomorphina trigona* Reuss
***Chilostomella subtriangularis* Kline n. sp.
***Chilostomelloides eocenica* Cushman
Pullenia quinqueloba (Reuss)
**Globigerina compressa* Plummer
Globigerina pseudo-bulloides Plummer
Globigerina trilocolinoides Plummer
***Globotruncana* sp.
Anomolina acuta (Plummer)
Anomalina cf. *ammonoides* (Reuss)
Anomolina midwayensis (Plummer)
**Cibicides alleni* (Plummer)
**Cibicides browni* Kline, n. sp.
Cibicides praecursorius (Schwager)
Cibicides vulgaris (Plummer)
Cytherella symmetrica Alexander
Argilloecia faba Alexander
***Paracypris perapiculata* Alexander

- Bairdia magna Alexander
- Brachycythere formosa Alexander
- *Brachycythere interrasilis Alexander
- Brachycythere plena Alexander
- Cythereis prestwichiana Jones and Sherborn
- Cythereis spiniferrima Jones and Sherborn
- *Cytheromorpha scrobiculata Alexander
- Loxoconcha mississippiensis Kline, n. sp.
- *Krithe perattica Alexander

DESCRIPTION OF FORAMINIFERA

FAMILY TEXTULARIIDAE

Genus *SPIROPLECTAMMINA* Cushman, 1927

SPIROPLECTAMMINA LAEVIS (Roemer) var.

CRETOSA Cushman

Plate I, 1

Spiroplectammina laevis (Roemer) var. *cretosa* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 8, pt. 4, p. 87, pl. 11, fig. 3, 1932; Vol. 16, pt. 3, p. 52, pl. 9, fig. 3, 1940.

“Test tapering, usually somewhat longer than broad, the greatest breadth toward the apertural end, periphery subacute, apertural end only slightly rounded, broad in end view, tapering rapidly to the subacute periphery chambers with the early portion coiled, later biserial, distinct, the margin of the apertural face distinctly raised, giving a series of raised ridges at the suture lines and forming a raised zigzag line along the center of the test; wall finely arenaceous, stout, not usually collapsed; aperture a low opening on the inner margin of the apertural face with the peripheral portion of the face extending forward so that the aperture itself is in a reentrant. Length up to 0.65 mm.; breadth 0.45 mm.; thickness 0.25 mm.”

This variety, present in the Upper Cretaceous as well as the Midway, is especially characteristic of the Porters Creek clay, where tests are both widespread and abundant. In the Clayton chalk specimens are extremely rare.

FAMILY VERNEUILINIDAE

Genus *CLAVULINOIDES* Cushman, 1936

CLAVULINOIDES MIDWAYENSIS Cushman

Plate I, 2

Clavulina angularis Plummer (not d'Orbigny), Univ. Texas Bull. 2644, p. 70, 71, pl. 3, figs. 4, 5, 1927.

Clavulinoides midwayensis Cushman, Cushman Lab. Foram. Res., Spec. Publ. 6, p. 21, pl. 3, figs. 9, 15, 1936; Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 53, pl. 9, fig. 6, 1940.

“Test in microspheric form rapidly increasing in diameter toward apertural end, in megalospheric form with sides parallel in adult, in last-formed chambers with diameter decreasing, triangular throughout or in megalospheric form later portion rounded,

sides concave, in megalospheric form in adult becoming convex; chambers distinct, not inflated except in last chambers of megalospheric form; sutures distinct, very slightly depressed in earlier portions and in microspheric form, but in megalospheric form becoming deeply depressed in adult; wall coarsely arenaceous, often roughly finished; aperture in megalospheric form rounded, in microspheric form with somewhat irregular lobes projecting toward the angles of the test. Length up to 1.25 mm.; diameter 0.30-0.60 mm."

Tests of this species, reported from the upper Midway of Alabama and throughout the Midway of Texas, appear to be confined to the Porters Creek clay and uppermost Clayton chalk. Tests are frequently abundant.

Genus GAUDRYINA d'Orbigny, 1839

GAUDRYINA RUGOSA d'Orbigny

Plate VII, 11

Gaudryina rugosa d'Orbigny, Mem. soc. geol. France, Vol. 4, p. 44, pl. 4, figs. 20, 21, 1840.

Gaudryina rugosa Plummer, Univ. Texas Bull. 2644, p. 135, pl. 8, fig. 11, 1927.

Gaudryina rugosa Cushman, Rept. Tenn. Div. Geol. Surv. Bull. 41, p. 20, pl. 1, figs. 9, 10, 1931.

"Test elongate, tapering, greatest breadth toward the apertural end, periphery broadly rounded, early triserial portion usually much reduced, but the change to the biserial stage very abrupt; chambers numerous, usually distinct in the biserial portions, indistinct in the triserial portion, very slightly inflated in the later development; sutures becoming more distinct in the later portion, straight, very slightly oblique; wall rather coarsely arenaceous but usually fairly smoothly finished; aperture in the ordinary specimens, narrow, at the inner margin of the chamber with distinct lobular projections at the sides, in very long specimens the aperture tending to be somewhat higher. Length 0.50-1.00 mm."

Several specimens, found in a sample of basal Porters Creek clay from a test hole (M168) in a pasture at a point 37 feet west of the road and 0.4 mile south of the railroad at Pheba, appear to be the same as the Cretaceous species. These were compared

with specimens from the Selma chalk of Clay County and found to be identical.—HRB.

GAUDRYINA sp.

Plate VII, 14

Both the young and adult forms of this large species of *Gaudryina* were found in a few Clayton chalk samples. The young tests show only the triserial stage with flattened sides and rounded to subacute angles. The sutures on these are slightly depressed. Adult forms have 3 or 4 biserially arranged chambers above the triserial stage. These chambers are somewhat compressed laterally with lobed angles giving a subquadrate transverse section. The sutures of the biserial part are deeply incised on some specimens. The walls of all tests are arenaceous and usually contain conspicuous pieces of glauconite cemented with the sand grains of various sizes. The arched aperture is at the base of the last formed chamber.—HRB.

Genus *HETEROSTOMELLA* Reuss, 1865*HETEROSTOMELLA CUNEATA* Sandidge

Plate VII, 4

Heterostomella cuneata Sandidge, Jour. Pal. Vol. 6, No. 3, p. 269, pl. 41, figs. 11, 15, 16, 1932.

“Test elongate, tapering, cuneiform, sides flattened or slightly concave, initial end pointed, tripyramidal, apertural portion quadrilateral, apertural face broad and slightly arched, angles marked by a row of small fistulae; chambers variable in number, eight in the holotype, first few triserial, later ones becoming biserial, low, flat; sutures not clearly defined, sometimes slightly impressed; wall finely arenaceous, surface irregular; aperture terminal, located near the middle of the last-formed chamber, small, round, with a short tube-like neck. Length of holotype, 0.45 mm.”

Three specimens like that figured were found in a sample of basal Porters Creek clay from a test hole (M168) in a pasture at a point 37 feet west of the road and 0.4 mile south of the railroad in Pheba. These were compared with specimens from the Ripley formation of Clay County and appeared to be identical.—HRB.

HETEROSTOMELLA sp.

Plate VII, 3

Test elongate, triangular in transverse section, expanding rapidly with some curvature from triserial portion; angles subacute, periphery somewhat lobate along adult biserial chambers; sides flattened to slightly concave; sutures strongly curved upward, depressed in biserial portion; wall smooth, finely arenaceous; aperture with short stout cylindrical neck, at base of last chamber.—HRB.

Specimens were found only in a sample of lower Porters Creek clay from a gully on the Sim Dixon property (NE.1/4, SW.1/4, NE.1/4, Sec. 33, T. 15 S., R. 3 E.) 2 1/2 miles northwest of Montpelier.

FAMILY VALVULINIDAE

Genus MARSSONELLA Cushman, 1933

MARSSONELLA OXYCONA (Reuss)

Plate VII, 10

Gaudryina oxycona Reuss, Sitz. Akad. Wiss. Wien, Vol. 40, p. 229, pl. 12, fig. 3, 1860.

Marssonella oxycona Cushman, Contr. Cushman Lab. Foram. Res., Spec. Publ. No. 8, 56, pl. 5, figs. 27-29, pl. 6, figs. 1-17, 1937. Toulmin, Jour. Pal. Vol. 15, No. 6, p. 573, pl. 78, figs. 12, 13, 1941.

“Test trochiform, conical, rapidly and evenly tapering, circular in transverse section, apertural end flattened, in early stages with four or five chambers to a whorl, later reduced to three and sometimes to two; chambers short, not inflated, simple (not labyrinthic); sutures indistinct, very slightly if at all depressed; wall arenaceous, studded with numerous clear grains, rather smoothly finished; aperture a small semicircular opening at base of the inner margin of the last-formed chamber, near the center of the apertural end of the test. Length up to 1 mm.; maximum diameter up to 0.64 mm.”

The figured specimen is rather coarsely arenaceous with only two chambers showing on the flattened apertural end. Its general appearance is much like that of *Textulariella cretosa* Cushman but the chambers are not subdivided. The specimen came from a sample of uppermost Clayton chalk from a test hole (M65A) on the Dr. T. D. Houston property (NW.1/4, NE.1/4,

NW. 1/4, Sec. 10, T. 16 S., R. 3 E.), above a roadcut 1/4 mile west of Prairie Creek.—HRB.

Genus **DOROTHIA** Plummer, 1931

DOROTHIA sp.

Plate VII, 6, 7a, b

Test nearly conical with slight curvature, slightly compressed laterally in adult portion; chambers arranged in a trochoid spire with 4 or 5 in the initial whorl, later triserial, and finally biserial; sutures faintly impressed where chambers overlap; wall smoothly finished, of finely arenaceous material; aperture a small arched opening in middle of the base of the last chamber with a slight thickening of the wall along either side.

This form bears some surficial resemblance to the genus *Gaudryina*, but when specimens are sectioned at intervals across the axis they are seen to have chambers added in a trochoid spire and at least 4 are visible near the initial end.

Sutures are less distinct and the test more conical than those of *D. alabamensis* Cushman from the Midway of Alabama. Tests are found sparingly in the Porters Creek clay and in the uppermost Clayton chalk beds.

Specimen VII, 6 is from Porters Creek clay in gully above test hole M49, on J. Christopher property, 2 1/2 miles north of Pheba; VII, 7a, b is from the Clayton chalk, test hole M49, S3.

FAMILY LAGENIDAE

Genus **ROBULUS** Montfort, 1808

ROBULUS MIDWAYENSIS (Plummer)

Plate I, 3

Cristellaria midwayensis Plummer, Univ. Texas Bull. 2644, p. 95, 96, pl. 13, figs. 5a-c, 1927.

Robulus midwayensis Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 55, pl. 9, fig. 12, 1940; Vol. 18, pt. 2, p. 26, pl. 5, figs. 4a, b, 5, 1942. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 579, pl. 78, fig. 23, 1941.

“Test large, circular, very closely coiled, full bodied, though somewhat compressed; periphery distinctly angular but not flanged in its typical form; chambers 10-12 in adult form, smooth, narrow, gently curved, radiate from a conspicuous central boss and tapering somewhat toward the peripheral mar-

gin; aperture at apex of broad septal face. Diameter up to 1.5 mm., usually less."

Typical specimens of this species are common, though nowhere abundant, throughout the lower Midway.

ROBULUS PSEUDO-COSTATUS (Plummer)

Plate I, 5

Cristellaria pseudo-costata Plummer, Univ. Texas Bull. 2644, p. 98, 99, pl. 7, figs. 9a, b, 1927.

Robulus pseudo-costatus Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 55, pl. 9, fig. 18, 1940.

"Test much compressed, not completely involute, changing from the loosely coiled form to linear development in specimens developed beyond maturity; periphery bound by a distinct, thin, transparent flange; chambers 7-8 in last whorl, ornamented by two to four irregularly developed thin costae that follow roughly the direction of coiling; sutures marked by thin, high, uneven ridges; aperture protruding from a strongly inflated septal face. Diameter up to .7 mm."

Specimens of this species exhibit extremely great variation, the figured specimen being a median type. Many tests show very prominently developed costae extending the length of the test; others show as few as two faint costae appearing on only one chamber.

Plummer reports this species as confined to the basal Midway, one of the most distinctive forms of that unit. In the Clay County material it is wide spread and abundant in the Clayton chalk, but is also known by a few specimens from the basal Porters Creek clay at two localities, where it is associated with typical Porters Creek fossils.

ROBULUS PSEUDO-COSTATUS (Plummer) var. INORNATUS Kline, n. var.

Plate I, 6

Test much compressed, almost completely involute; periphery with a distinct, thin, transparent flange which is usually broken; chambers about 7 in final whorl, smooth; sutures marked by thin, high ridges which vary from smooth to crenulated; septal face less strongly inflated than in species; aperture less distinctly protruberant. Average diameter about .5 mm.

Plummer describes the species as being characterized by costae which may be almost absent in some specimens. Associated with typical tests of *R. pseudo-costatus* (Plummer) were other specimens which showed a complete lack of costae and a much less strongly inflated septal chamber.

The variety is nowhere as abundant as the species. It is characteristic of Clayton beds, but has been identified from the Porters Creek clay at two localities.

Holotype: *Ostrea pulaskensis* bed, Clayton chalk, test hole M93, 3.8 to 11.0 feet below surface, 1 1/2 miles northwest of Montpelier; Type slide I, 6, Mississippi Geological Survey.

ROBULUS cf. PSEUDO-MAMMILLIGERUS (Plummer)

Plate I, 12

Cristellaria pseudo-mammilligera Plummer, Univ. Texas Bull. 2644, p. 98, pl. 7, figs. 11a, b, 1927.

Robulus pseudo-mammilligera Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 55, pl. 9, fig. 16, 1940.

"Test very slightly elongate, strongly compressed; periphery bounded by a rather thick keel that shows on some specimens a slight lobation; chambers 9-11 in final convolution, distinctly curved; sutures marked by conspicuous tapering elevations curving outward from an irregularly developed central boss or from a group of protuberances; aperture radiate, protruding. Diameter up to 1.6 mm."

In the highest Porters Creek clays examined were several large tests which may belong to this species. They differ from the typical form in possessing a rather wide thin flange which is usually broken.

ROBULUS ROSETTA (Gumbel)

Plate I, 9

Robulina rosetta Gumbel, K. bayer. Akad. Wiss. Munchen, Math.-Physik. Cl., Abh., Vol. 10, pt. 2, p. 642, pl. 1, figs. 73a, b, 1868 (1870).

Robulus rosetta Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 55, pl. 9, fig. 24, 1940.

Cushman reports this species from the lower Midway in Alabama. In Clay County *R. rosetta* (Gumbel) is one of the most abundant Midway species of *Robulus*. It has a range throughout

the Midway but is more characteristic of the Clayton formation.

ROBULUS TURBINATUS (Plummer)

Plate I, 7

Cristellaria turbinata Plummer, Univ. Texas Bull. 2644, p. 93, 94, pl. 7, figs. 4a, b; pl. 13, fig. 2, 1927.

Robulus turbinatus Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 55, pl. 9, fig. 17, 1940.

“Test circular, considerably compressed; peripheral margin sharp and extended into a fragile, white flange that is typically ragged; chambers 8 in final convolution, narrow, smooth; sutures strongly elevated and of about equal width from the large umbonal area to the periphery, very strongly curved; aperture at apex of narrow septal face. Diameter up to .6 mm.”

Typical specimens of this species are widely distributed, but rare. The species is most characteristic of the Porters Creek and uppermost Clayton but is extremely rare in lower Clayton beds and is reported by Plummer from the Cretaceous.

ROBULUS WILCOXENSIS Cushman and Ponton

Plate VII, 27

Robulus wilcoxensis Cushman and Ponton, Contr. Cushman Lab. Foram. Res., Vol. 8, pt. 3, p. 52, pl. 7, figs. 3a, b, 1932. Toulmin, Jour. Pal., Vol. 15, p. 579, pl. 78, figs. 24, 25, 1941. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 18, pt. 2, p. 27, pl. 5, fig. 7, 1942.

“Test compressed, close coiled except in the oldest (latest) portion where 1 or 2 chambers may become uncoiled, periphery in the earlier portion with a narrow blunt keel, in the adult chambers with the keel becoming obsolescent and the periphery rounded in the last chambers; chambers numerous, 9 or 10 in the last-formed coil of the adult, later ones slightly inflated and uncoiling, early ones of uniform shape, gradually increasing in size as added; sutures distinct, rather strongly curved, in the early portion limbate and raised, then becoming flush with the surface and in the adult slightly depressed; wall smooth except for the earlier raised sutures; aperture terminal, radiate in the adult, in the earlier chambers at the outer peripheral angle. Length 1.00-1.15 mm.; breadth 0.75-0.80 mm.; thickness 0.25-0.30 mm.”

Cushman's holotype is described as having raised sutures on

the early portion of the test, but these are not present on the Salt Mountain limestone forms described by Toulmin and are only slightly developed on specimens reported by Cushman from the Naheola (Midway) of Choctaw County, Alabama. The Clay County forms lack the raised sutures in the early part but show other characteristics of the species. A few specimens were noted, all being from Porters Creek clay samples.—HRB

Genus LENTICULINA Lamarck, 1804

LENTICULINA DEGOLYERI (Plummer)

Plate I, 8

Cristellaria degolyeri Plummer, Univ. Texas Bull. 2644, p. 97, 98, pl. 7, figs. 7a, b, 1927.

Lenticulina degolyeri Toulmin, Jour. Pal., Vol. 15, no. 6, p. 580, 581, pl. 78, figs. 29, 30, 1941.

“Test somewhat longer than broad, moderately compressed; peripheral margin very sharp and bounded by a ragged flange; chambers 7-9, gently curved, smooth; sutures marked by strong elevations of clear shell matter tapering outward from a conspicuous umbonal boss; aperture at apex of an elongate septal face. Length up to .8 mm.; usually less.”

Specimens assigned to this species show as many as 10 chambers and usually approach the maximum size cited by Plummer.

The species ranges throughout the Midway and is reported from the Wilcox by Toulmin.

LENTICULINA ROTULATA (Lamarck)

Plate I, 4

Lenticulites rotulata Lamarck, Ann. Mus., Vol. 5, p. 188, no. 3, 1804; Vol. 8, pl. 62, fig. 11, 1806.

Cristellaria rotulata d'Orbigny, Mem. soc. geol. France, ser. 1, Vol. 4, p. 26, pl. 2, figs. 16-18, 1840. Plummer, Univ. Texas Bull. 2644, p. 91, 92, pl. 7, figs. 8a, b, 1927.

“Test round, biconvex; peripheral margin sharply angular but not flanged; chambers 8-9 in final convolution; sutures visible as distinct lines or very slight elevations that curve very little and radiate rather acutely from the central umbonal area; apertures of all chambers usually visible on periphery in clear fresh specimens. Diameter up to .5 mm.”

Rare specimens of this species have been identified from the Porters Creek clay. Plummer reports it from the upper Midway, and Cushman reports a similar form from the Naheola.

Genus MARGINULINA d' Orbigny, 1826

MARGINULINA EARLANDI (Plummer)

Plate I, 10

Cristellaria earlandi Plummer, Univ. Texas Bull. 2644, p. 103, 104, pl. 7, fig. 10, 1927.

Marginulina earlandi Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 56, pl. 9, figs. 14, 15, 1940.

"Test very elongate, much compressed; peripheral margin narrowly rounded; chambers numerous, first six or seven closely coiled about a conspicuous and only slightly protruding boss, later ones in an erect series; sutures oblique in both the coiled and uncoiled portion of test, strongly elevated in rather even development in the coiled area but more greatly thickened on each side of the linear series; aperture marginal. Length probably up to about 3 mm."

Two poorly preserved specimens from the Clayton chalk have been assigned to this species. Plummer describes the species from the entire Midway of Texas, and Cushman reports it from the upper Midway of Alabama.

Genus HEMICRISTELLARIA Stache, 1865

HEMICRISTELLARIA SUBACULEATA (Cushman) var.

TUBERCULATA (Plummer)

Plate I, 11

Cristellaria subaculeata Cushman var. *tuberculata* Plummer, Univ. Texas Bull. 2644, p. 101, pl. 7, fig. 2; pl. 14, figs. 1a-c, 1927.

"Test elongate, somewhat compressed; periphery rounded on early chambers and very bluntly angular on later chambers of mature forms; chambers numerous, smooth, first six or seven plano-spiral followed by a linear succession of short, compact chambers; sutures marked by rows of distinct beadlike tubercles best developed on the coiled portion of the test and giving place to more ridgelike elevations between later chambers or even to depressions in extreme maturity; aperture protruding, radiate, peripheral. Length up to 1.4 mm.; average 1 mm."

Specimens of this upper Midway species were identified in Porters Creek samples from three localities. The species is very rare.

Genus DENTALINA d'Orbigny, 1826

DENTALINA ACULEATA (?) (d'Orbigny)

Plate II, 1

Nodosaria (Dentalina) aculeata d'Orbigny, Mem. soc. geol. France, Vol. 4, no. 1, p. 13, pl. 1, figs. 2, 3, 1840.

Dentalina aculeata (?) Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 59, pl. 10, figs. 16, 17, 1940.

Specimens similar to those identified by Cushman from Alabama as *D. aculeata* (?) (d'Orbigny) are very abundant throughout the lower Midway. All of the specimens consist of single chambers, a fairly large number of which show apertures. There is considerable variation among tests assigned to this species. It is possible that more than one species may be represented, or that some of the tests may be terminal chambers of other species.

DENTALINA BASIPLANATA Cushman

Plate II, 2

Dentalina basiplanata Cushman, Contr. Cushman Lab. Foram. Res., Vol. 14, pt. 2, p. 38, 39, pl. 6, figs. 6-8, 1938; Vol. 16, pt. 4, p. 82, pl. 14, figs. 1-6, 1940.

"Test very elongate, slightly tapering, usually slightly curved, early portion showing oblique costae indicating coiling especially in the microspheric form and often slightly compressed; chambers distinct, earlier ones not inflated, later becoming increasingly inflated as added, earlier ones much more strongly overlapping; sutures distinct, somewhat limbate, earlier ones flush with the surface, oblique, later ones progressively more depressed and more nearly at right angles to the elongate axis; wall smooth, or the earliest portion sometimes slightly roughened; aperture terminal, radiate. Length up to 2.50 mm.; diameter 0.20-0.25 mm."

A few specimens from the Clayton chalk seem to be identical with this species described from the upper Cretaceous of Mexico. The species is very rare.

DENTALINA CRINITA Plummer

Plate II, 3

Dentalina crinita Plummer, Univ. Texas Bull. 3101, p. 154, 155, pl. 11, figs. 12, 13, 1931.

"Test very elongate, arcuate, only slightly tapering, without apical spine; chambers slowly enlarging in youth, but of about

equal breadth through maturity, short, appressed throughout most of the test but slightly longer and more inflated in late maturity, typically ornamented by faint and discontinuous striae that bear irregularly distributed minute nodes giving the chambers a hirsute appearance; sutures flush to markedly constricted between the later chambers, transverse; aperture a radiate protruding orifice, somewhat eccentric. Length up to 2.5 mm."

Specimens which check closely with the species described from the Navarro of Texas are common in samples of Clayton chalk and Porters Creek clay at a small number of localities.

DENTALINA DELICATULA Cushman

Plate II, 4

Dentalina delicatula Cushman, Contr. Cushman Lab. Foram. Res., Vol. 14, pt. 2, p. 40, 41, pl. 6, figs. 19, 20, 1938; Vol. 16, pt. 3, p. 56, pl. 10, figs. 22-24, 1940.

"Test elongate, slender, gently curved, initial end with a distinct spine, very slightly tapering; chambers distinct, earlier ones not inflated, somewhat overlapping, increasing very slightly in height as added until, in the adult, becoming more remote and strongly inflated, somewhat pyriform; sutures distinct, limbate, later ones somewhat depressed; wall ornamented with numerous, 15-20, rather high, plate-like, longitudinal costae, somewhat less raised and more delicate on the final chambers, independent of the sutures; aperture terminal, radiate, with a tapering neck. Length up to 1.60 mm.; diameter 0.20 mm."

Rare specimens of this species have been identified from the Clayton chalk at a small number of localities. The species, described from the Navarro of Texas, is reported by Cushman from the lower Midway of Alabama.

DENTALINA GARDNERAE (Plummer)

Plate II, 5

Marginulina gardnerae Plummer, Univ. Texas Bull. 2644, p. 106, pl. 5, figs. 11a-c, 1927.

Dentalina (?) *gardnerae* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 57, pl. 10, figs. 10-12, 1940.

Dentalina gardnerae Toulmin, Jour. Pal., Vol. 15, no. 6, p. 585, pl. 79, fig. 15, 1941.

"Test elongate, straight to slightly arcuate, somewhat stout, tapering bluntly toward the initial extremity; early chambers

very slightly compressed, later ones round in transverse section, compact, subcylindrical, narrow; sutures evident as dark bands or faint lines, constricted only between the last two or three chambers, early sutures oblique or displaying even a suggestion of coiling, later ones transverse; aperture accentric, protruding, radiate. Length up to 1.5 mm.; average 1 mm."

Tests of this short stout species are widely distributed, being present in about half of the Clayton samples examined, but extremely limited in number. As in Texas, the species is known only from the lower (Clayton) beds.

DENTALINA HAVANENSIS Cushman and Bermudez

Plate II, 11

Dentalina havanensis Cushman and Bermudez, Contr. Cushman Lab. Foram. Res., Vol. 13, pt. 1, p. 11, 12, pl. 1, figs. 39, 40, 1937.

"Test elongate fusiform, greatest breadth at about the middle, thence tapering nearly equally toward either end, one side convex, the other slightly concave, initial end bluntly pointed; chambers few, increasing rapidly in size as added, overlapping; sutures fairly distinct, slightly oblique, becoming less so in the later portion; wall smooth, finely perforate; aperture terminal, radiate. Length 0.75 mm.; diameter 0.18 mm."

This is an extremely rare species which has thus far been observed only in the Porters Creek clay.

DENTALINA PLUMMERAE Cushman

Plate II, 6

Dentalina plummerae Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 57, pl. 10, figs. 7-9, 19, 1940.

"Test slender, elongate, slightly curved, tapering, greatest breadth at the last-formed chamber, initial end rounded in the megalospheric form, pointed in microspheric; chambers distinct, rapidly increasing in size as added, the later ones much inflated, subspherical; sutures of the later portion very strongly depressed, limbate; wall smooth; aperture with a distinct, rather elongate, tapering neck, radiate. Length 1.30-2.00 mm.; diameter 0.20-0.32 mm."

Rare, and usually fragmentary, specimens of this species are present in the Porters Creek clay and uppermost Clayton chalk.

Cushman described the species from the upper Midway of Alabama.

DENTALINA PLUMMERAE Cushman var.

Plate VIII, 17

The figured specimen differs from the typical form in having numerous fine costae on each chamber. On some specimens the sutures are extremely depressed, and the later chambers are separated by a slender connecting neck.

Specimens were found only in the basal Porters Creek clay on the Christopher property, 2½ miles north of Pheba.—HRB

DENTALINA PSEUDO-OBLIQUESTRIATA (Plummer)

Plate II, 14

Nodosaria pseudo-obliquestriata Plummer, Univ. Texas Bull. 2644, p. 87, 88, pl. 4, fig. 18, 1927.

Dentalina pseudo-obliquestriata Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 58, pl. 10, fig. 18, 1940.

“Test long, slender, arcuate, tapering toward the aboral extremity; chambers numerous, strongly inflated, ornamented by coarse costae that follow the length of the test somewhat obliquely; sutures strongly constricted; aperture protruding, round, somewhat eccentric. Length up to 2 mm.”

This species has been reported from the basal Midway of Texas and the upper Midway of Alabama. Fragmentary tests are extremely rare in both Clayton and Porters Creek beds.

DENTALINA cf. SOLVATA Cushman

Plate VII, 23

Specimens in one sample of Porters Creek clay from the Christopher property 2½ miles north of Pheba are compared to the species described in the Selma chalk near Booneville, Mississippi. Broken specimens with larger chambers than on the illustrated form have costae confined largely to the deep sutures but extend a short distance onto each chamber.—HRB

DENTALINA (?) sp.

Plate VII, 22

The figured specimen is a delicate costate form found in the Porters Creek clay on the Christopher property 2½ miles north of Pheba. Adjacent costae coalesce at the ends of chambers and obliquely cross the connecting slender necks.—HRB

Genus *NODOSARIA* Lamarck, 1812*NODOSARIA LATEJUGATA* Gumbel

Plate II, 10

Nodosaria latejugata Gumbel, K. bayer. Akad. Wiss. Munchen, Cl. 2, Abh., Vol. 10, p. 619, pl. 1, fig. 32, 1868 (1870). Toulmin, Jour. Pal., Vol. 15, no. 6, p. 588, pl. 79, figs. 26, 27, 1941.

Nodosaria affinis Plummer (not d'Orbigny), Univ. Texas Bull. 2644, p. 89-91, pl. 14, figs. 2a-d, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 59, pl. 10, figs. 30-33, 1940.

"Test straight, elongate, apiculate; chambers cylindrical or only slightly inflated in earliest portion of test to more strongly globular in later development, ornamented by 9-11 strong, longitudinal costae; sutures transverse, generally slightly constricted in early part of test to deeply constricted above; aperture protruding, round, mammillate. Length up to 7 mm."

This species, one of the largest of the Midway forms, was identified in most of the samples examined. As in the Texas and Alabama Midway, it ranges through the entire section but is more abundant and more widely distributed in the lower (Clayton) beds.

Genus *NODOSARIA OLIGOTOMA* Reuss

Plate II, 16

Nodosaria oligotoma Reuss, Palaeontographica, Vol. 20, pt. 1, p. 135, pl. 33, fig. 16, 1872. Plummer, Univ. Texas Bull. 2644, p. 87, pl. 4, fig. 14. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 59, pl. 10, figs. 25, 26, 1940.

"Test elongate, somewhat tapering posteriorly; chambers very few, generally 4-5 at most, somewhat elongate, ornamented by about six major thin costae alternating with faint minor costae that may be very weakly developed; sutures transverse, somewhat constricted; aperture greatly protruding, small, round. Length up to .65 mm."

Reported from the upper Midway of Alabama and Texas, this species is rare in and confined to the Porters Creek clay.

Genus *NODOSARINA* Parker and Jones, 1859*NODOSARINA (NODOSARIA) ASPERA* (Reuss)

Plate II, 15

Nodosaria aspera Reuss, Verstein. boh. Kreide., pt. 1, p. 26, pl. 13, figs. 14, 15, 1845. Cushman and Jarvis, Proc. U. S. Nat. Mus., Vol. 80, art. 14, p. 35, pl. 11, fig. 5, 1932. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 4, p. 88, 89, pl. 16, fig. 2, 1940.

"Test elongate, somewhat tapering with the greatest breadth near apertural end; chambers fairly distinct, subglobular, in-

creasing rather uniformly in size as added, somewhat overlapping; sutures distinct, but only slightly depressed; wall ornamented with small, closely set spines covering the entire surface; aperture with a slender, elongate, cylindrical neck projecting well beyond the outline of the final chamber. Length up to 1.60 mm.; diameter 0.50-0.55 mm."

This species appears to be confined to the Porters Creek beds in Clay County. Tests are extremely rare.

NODOSARINA (FRONDICULARIA) GOLDFUSSI (Reuss)

Plate II, 7

Frondicularia goldfussi Reuss, Sitz. Akad. Wiss. Wien, Vol. 40, p. 192, pl. 4, fig. 7, 1860. Plummer, Univ. Texas Bull. 2644, p. 115, pl. 5, fig. 3, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 62, pl. 10, fig. 29, 1940.

"Test elongate oval, very thin, anteriorly acute; initial segment long, narrow, highly elevated along its axis, extended into a long apical spine; later chambers sagittate and narrow; sutures fine, narrow, gracefully curved ridges; apertures extended, radiate. Length up to 1 mm.; average .5 mm."

In Texas and Alabama, this species is confined to the upper part of the Midway. It is fairly abundant in Porters Creek samples from three localities in Clay County.

NODOSARINA (NODOSARIA) LONGISCATA (d'Orbigny)

Plate II, 8

Nodosaria longiscata d'Orbigny, Foram. Foss. Vienne, p. 32, pl. 1, figs. 10-12, 1846. Plummer, Univ. Texas Bull. 2644, p. 82, pl. 4, figs. 17a, b, 1927.

"Test very long and slender; chambers probably numerous (entire specimens impossible to procure), very elongate, smooth, cylindrical to very elongate ellipsoid; sutures transverse, only slightly to very distinctly depressed; aperture probably round and radiate. Length unknown."

Fragmentary tests of this species, consisting of 1 or 2 chambers, are common in the Clayton. They show a limited geographical distribution in Porters Creek beds, but are abundant where present.

Genus CHRYSALOGONIUM Schubert, 1907

CHRYSALOGONIUM GRANTI (Plummer)

Plate II, 9

Nodosaria granti Plummer, Univ. Texas Bull. 2644, p. 83, 84, pl. 5, figs. 9a-d, 1927.

Ellipsonodosaria (?) *granti* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 12, pt. 3, p. 51, 52, pl. 9, figs. 3-5, 1936.

Chrysalogonium granti Toulmin, Jour. Pale., Vol. 15, no. 6, p. 589, pl. 79, figs. 34, 35, 1941.

"Tests very long, slender, arcuate, smooth, apiculate; chambers numerous, varying from rarely compact to the more average elongate chamber that is about twice as long as broad, cylindrical to gently inflated, elliptical to ovoid; sutures transverse, unconstricted to gently constricted; wall thick, opaque, aperture round, radiate. Length probably up to several millimeters."

Tests consisting usually of from 2 to 4 chambers are common in the Clayton, less common in the Porters Creek. Considerable variation is shown, specimens ranging from extremely short stout forms to forms about two and one half times as long as broad.

Genus PSEUDOGLANDULINA Cushman, 1929

PSEUDOGLANDULINA cf. CAUDIGERA (Schwager)

Plate II, 17

Glandulina caudigera Schwager, Palaeontographica, Vol. 30, Pal. Theil, p. 107, pl. 26(3), figs. 6a, b, 1883.

Pseudoglandulina cf. *caudigera* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 60, pl. 11, figs. 2, 3, 1940.

Specimens assigned to this species appear to be identical with those so identified by Cushman from the Midway of Alabama.

Cushman reports the species as rare and confined to the lower beds. Clay County specimens were present, though rare, throughout the lower Midway, with a relatively wider distribution and greater abundance in the Porters Creek clay.

PSEUDOGLANDULINA COMATA (Batsch)

Plate II, 13

Nautilus (Orthoceras) comatus Batsch, Conch. Seesandes, pl. 1, fig. 2, 1791.

Nodosaria (Glandulina) comata Plummer, Univ. Texas Bull. 2644, p. 76, pl. 4, fig. 7, 1927.

Pseudoglandulina pygmaea Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 60, pl. 11, fig. 4, 1940.

Pseudoglandulina comata Toulmin, Jour. Paleo., Vol. 15, no. 6, p. 589, 590, pl. 79, fig. 31, 1941.

"Test short, ovate, apiculate; chambers few, greatly overlapping, striate; sutures transverse, only faintly depressed if at all; aperture large, round. Length up to .7 mm."

Specimens identified as this species show considerable variation, ranging from nearly globular to highly elongated forms. The majority exhibit little sutural construction, but other tests are markedly constricted.

This is one of the most common of the Midway forms, being present and abundant in most of the samples examined.

PSEUDOGLANDULINA MANIFESTA (Reuss)

Plate II, 12

Glandulina manifesta Reuss, Haidinger's Naturwiss. Abhandl., Vol. 4, pt. 1, p. 22, pl. 1, fig. 4, 1857.

Nodosaria radricula Plummer (not Linnaeus), Univ. Texas Bull. 2644, p. 77, 78, pl. 4, figs. 9a, b, 1927.

Pseudoglandulina manifesta Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 60, pl. 11, fig. 1, 1940.

"Test elongate, stout; chambers few and somewhat overlapping, smooth, short, compact, enlarging very little; sutures transverse, slightly depressed in early part of test but increasingly more constricted toward the oral extremity; shell wall thick, glossy; aperture small, round, protruding, radiate. Length up to 1 mm."

This species is widely distributed and fairly common in the Porters Creek clay; it is extremely rare in the Clayton chalk. Although the species is rarely present in beds of Clayton age or older, its appearance as a common form may be considered indicative of probable Porters Creek age.

Genus SARACENARIA Defrance, 1824

SARACENARIA MIDWAYENSIS Kline, n. sp.

Plate III, 3a-c

Test nearly triangular, periphery acute, apertural face elliptical; closely coiled; chambers few, 4 to 5 usually visible, increasing rapidly in size; sutures distinct, depressed slightly or not at

all, slightly curved; wall smooth, glossy; aperture peripheral, radiate. Average length 0.5 mm.

This species is rare but widely distributed in the Porters Creek clay. It appears to be confined to that formation.

Cotypes: Porters Creek clay, east of test hole M93, at surface, 1½ miles northwest of Montpelier; Type slide III, 3a-c, Mississippi Geological Survey.

SARACENARIA cf. SUBLATIFRONS (Plummer)

Plate III, 1

Cristellaria sublatifrons Plummer, Univ. Texas Bull. 2644, p. 100, 101, pl. 7, figs. 6a, b, 1927.

“Test elongate, smooth, tapering at both ends; peripheral margin bluntly angular; chambers few, passing from very slightly spiral to linear oblique in rapidly lengthening series, later chambers bluntly triangular but not keeled; sutures strongly oblique, smooth, distinct; aperture at apex of a long, narrow, slightly inflated septal face marked by a faint longitudinal furrow. Length up to .5 mm.”

A single poorly preserved specimen from each of four localities may belong to the above species. These tests differ from the specific description in lacking the longitudinal furrow, which, however, may be due to the poor preservation.

Plummer reports the species as known only from the upper Midway. Three of the Clay County specimens are from the Porters Creek clay, the fourth from the Clayton chalk.

SARACENARIA TRIGONATA (Plummer)

Plate III, 2

Cristellaria trigonata Plummer, Univ. Texas Bull. 2644, p. 101, pl. 7, figs. 3a, b, 1927.

“Test elongate, triangular in cross section, tapering toward the oral end; peripheral margin carinate; early chambers closely coiled; later ones sharply carinate on each side of the septal face; sutures as dark lines; aperture at the apex of a long broad septal face on mature specimens. Length up to .7 mm.”

Rare specimens of this species, reported from the upper Midway of Texas and Alabama, have been identified in samples from six localities, four in Porters Creek and two in the uppermost Clayton.

Genus VAGINULINA d'Orbigny, 1826

VAGINULINA GLABRA (d'Orbigny)

Plate III, 4

Marginulina glabra d'Orbigny, Ann. Sci. Nat., Vol. 7, p. 259, No. 6, Modele No. 55, 1826.

Marginulina glabra Plummer, Univ. Texas Bull. 2644, p. 104, 105, pl. 6, figs. 3a-d, 1927.

"Test short, stout, slightly curved, bluntly rounded at the base, circular in transverse section; chambers smooth and few, first three or four being inrolled; sutures not at all depressed in the coiled portion of the test but merging into slightly depressed sutures above; shell wall generally thick and opaque but rarely thin and transparent, very smooth; aperture radiate, protruding, marginal in youth but becoming more central with maturity. Length up to 1 mm."

Plummer reports this species from the upper and upper basal Midway of Texas. In Clay county the species is known only from the Porters Creek, where it is rare.

VAGINULINA GRACILIS Plummer

Plate III, 7

Vaginulina gracilis Plummer, Univ. Texas Bull. 2644, p. 111, pl. 6, figs. 5a, b, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 61, pl. 9, fig. 27, 1940.

"Test long, slender, slightly arcuate, gradually tapering toward the initial end, compressed; chambers numerous, short, smooth, compact, except the primordial chamber which is bulbous in megalospheric forms; sutures oblique on early portion of test to less oblique above, expressed outwardly by distinct and narrow ridges that extend around the apertural margin; wall moderately strong; aperture marginal, protruding, radiate. Length up to 2.5 mm."

Tests of this species are widely distributed throughout the Clayton chalk, being very abundant at some localities. As in Texas and Alabama, the species is confined to the Clayton.

VAGINULINA LEGUMEN (Linnaeus)

Plate VII, 13

Nautilus legumen Linnaeus, Syst. Nat., ed. 10, p. 711, no. 248, 1758; ed. 12, p. 1164, no. 288, 1767.

Vaginulina legumen, Plummer, Univ. of Texas Bull. 2644, p. 109, pl 6, fig. 2, 1927. (See this reference for other references).

"Test elongate, arcuate, slender, smooth, tapering gracefully toward the apical end; chambers compact, as many as 13 in very well-developed specimens with an average of 8-9, very oblique, slightly turgid in maturity, initial chamber provided with a prominent spine; sutures oblique, slightly constricted above; aperture eccentric, radiate, all visible through the sutures of pellucid specimens. Length up to 1.3 mm.; usually much less."

Specimens identical with those described from the Texas Midway were found in the Porters Creek clay from the Cristopher property 2½ miles north of Pheba.—HRB

VAGINULINA LEGUMEN (LINNAEUS) var. ELEGANS d'Orbigny

Plate III, 5

Vaginulina elegans d'Orbigny, Ann. Sci. Nat., Vol. 7, p. 257, No. 1, Modele No. 54, 1826.

Vaginulina legumen var. *elegans* Cushman, U. S. Nat. Mus. Bull. 100, Vol. 4, p. 258, pl. 41, fig. 4, 1919. Plummer, Univ. Texas Bull. 2644, p. 110, 111, pl. 6, fig. 1, 1927.

"Test elongate, stout, very bluntly tapering toward the initial end, compressed in its early portion to less compressed in its later development; chambers smooth, 8-10 in tests of average size to as many as 13 in especially well-developed ones; proloculum nearly round but not inflated above the general contour of the test; sutures very faintly elevated to smooth, conspicuous as dark bands on pellucid specimens, very oblique in early part of test to almost transverse above, unconstricted except between last two or three; aperture eccentric, protruding, radiate, all visible through the sutural bands of very fresh tests. Length up to 1.5 mm.; average 1 mm."

A rather stout bluntly tapering species of *Vaginulina* appears to be identical with the Texas form referred to the above species by Plummer. Although reported confined to the upper Midway of Texas, the species ranges throughout the Clay County lower Midway.

VAGINULINA PLUMOIDES Plummer

Plate III, 6

Vaginulina plumoides Plummer, Univ. Texas Bull. 2644, p. 113, pl. 6, fig. 6, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 61, pl. 9, fig. 26, 1940.

"Test very thin, wing shaped, acuminate posteriorly and anteriorly, spreading rapidly upward; chambers very oblique

and somewhat curved, ornamentated by very fine delicate striae parallel to the direction of growth; aperture protruding. Length up to .8 mm."

Clay County specimens of this species are large, averaging about 1.5 mm. in length. Tests are abundant in a small number of samples from both Porters Creek and Clayton beds.

VAGINULINA ROBUSTA Plummer

Plate III, 8

Vaginulina robusta Plummer, Univ. Texas Bull. 2644, p. 112, pl. 6, figs. 4a, b; pl. 13, fig. 3, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 61, pl. 10, figs. 1-4, 1940.

"Test elongate, moderately broad, stout, somewhat compressed, tapering bluntly in megalospheric forms but very acutely in microspheric forms; chambers smooth, few, first two or three very slightly twisted followed by the usual straight linear series; sutures oblique, conspicuously marked by sharp, high ridges that on most specimens encircle the test, though a slight amount of discontinuity is frequently evident; aperture on extreme margin. Length up to 1.4 mm."

This is one of the most characteristic of the Porters Creek species. Tests are extremely rare in most samples, but are present in all Porters Creek clay material examined. At one locality specimens were found in the uppermost Clayton chalk associated with *Vaginulina gracilis* Plummer.

Genus PALMULA Lea, 1833

PALMULA cf. BUDENSIS (Hantken)

Plate III, 9

Flabellina budensis Hantken, Mittheil. Jahrb. k. geol. Anstalt, Vol. 4, p. 44, pl. 4, fig. 17, 1875.

Fronidicularia budensis Plummer, Univ. Texas Bull. 2644, p. 116, 117, pl. 5, figs. 5a, b, 1927.

Palmula cf. *budensis* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 62, pl. 10, figs. 5, 6, 1940.

"Test transparent, thinly and evenly compressed, elongate elliptical to ovate, rarely apiculate, aboral extremity bluntly pointed; periphery very narrowly rounded; chambers numerous, narrow, smooth, partially coiled in early portion of test followed by typical sagittate chambers; sutures very faintly depressed

between later chambers; shell wall very thin and smooth; aperture central, circular, prolonged, radiate. Length up to 1 mm."

This is a widely distributed and rather common species. Although reported from the upper Midway only in Texas and Alabama, Clay County specimens appear to be distributed rather uniformly throughout the Clayton and lower Porters Creek.

PALMULA DELICATISSIMA (Plummer)

Plate III, 12

Fronicularia delicatissima Plummer, Univ. Texas Bull. 2644, p. 120, pl. 5, fig. 4, 1927.

Palmula delicatissima Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 61, pl. 9, figs. 28, 29, 1940.

"Test very thin, broadly subovate, tapering rapidly toward the apertural extremity and bluntly rounded posteriorly; peripheral edges narrowly quadrate; early chambers flabelline and irregularly coiled, later series typically sagittate; sutures delicate, thin, raised ridges from which branch a few wavy elevations especially near the apertural extremities of the sutures; shell wall coarsely punctate; aperture protruding. Length up to .95 mm., average .5 mm."

A single specimen of this species was identified from the Porters Creek clay.

PALMULA cf. PRIMITIVA Cushman

Plate III, 10

Palmula simplex Cushman, Contr. Cushman Lab. Foram. Res. Vol. 14, pt. 2, p. 36, pl. 6, fig. 1, 1938.

Palmula primitiva Cushman, Contr. Cushman Lab. Foram. Res., Vol. 15, pt. 4, p. 91, pl. 16, figs. 4, 5, 1939.

"Test elongate, much compressed, greatest thickness at the umbo, formed by the proloculum, thence thinning toward the periphery, the later portion greatly compressed, rounded at the base, sides in the adult nearly parallel, periphery acute, at the base slightly carinate, early portion close-coiled, later uncoiling, and in the adult with a few chambers chevron-shaped; chambers distinct, not inflated; sutures distinct, slightly limbate, not depressed; wall with very delicate, longitudinal striae; aperture terminal, elongate, with a slender neck. Length up to 1.60 mm.; breadth 0.30-0.35 mm."

Midway specimens differ from the typical species, described from the upper Cretaceous of Texas, in being relatively broader, the ratio of length to breadth being as about 3 to 1. In this respect they more closely resemble the specimen figured by Cushman from the Midway of Alabama.

The species is rare in Clayton samples from several localities, and abundant in a Porters Creek sample from one locality.

PALMULA RUGOSA (d'Orbigny)

Plate III, 11

Flabellina rugosa d'Orbigny, Mem. soc. geol. France, Ser. 1, Vol. 4, p. 23, pl. 2, figs. 4, 5, 7, 1840.

Frondicularia rugosa Plummer, Univ. Texas Bull. 2644, p. 118-20, pl. 5, fig. 1, 1927.

Palmula rugosa Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 62, pl. 9, fig. 30, 1940.

“Test equally compressed, thin, subrhomboid; early chambers Flabelline followed by the typical sagittate chambers, smooth or with few punctations; sutures marked by conspicuous, thin elevations; aperture protruding, radiate, central. Length up to 1 mm.; usually less.”

Tests of this species are rare, but widely distributed, being present in about half of the Clayton samples examined.

Genus FRONDICULARIA De France, 1826

FRONDICULARIA ARCHIACIANA d'Orbigny

Plate III, 13

Frondicularia archiaciana d'Orbigny, Mem. soc. geol. France, Ser. 1, Vol. 4, p. 20, pl. 1, figs. 34-36, 1840. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 12, pt. 1, p. 19, pl. 4, figs. 8-10, 1936. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 592, pl. 80, fig. 4, 1941.

“Test elongate, slender, widest at the base of the final chamber, much compressed, with a small inflated smooth proloculum, periphery truncate, flat; chambers numerous, chevron-shaped, increasing gradually in size as added; sutures distinct, strongly oblique to the periphery; wall smooth; aperture small, terminal, protruding, at the end of a slender neck. Length up to 1.4 mm.; width up to 0.42 mm.; thickness 0.09-0.17 mm.”

Rare tests of this species were identified from Clayton beds at five localities. The figured specimen, the only complete one,

is not entirely typical, in that the chambers of most specimens increase in width more gradually, giving rise to a relatively more slender test.

FRONDICULARIA cf. FRANKEI Cushman

Plate III, 14

Frondicularia archiaciana var. *strigillata* Plummer, Univ. Texas Bull. 2644 p. 114, 115, pl. 5, figs. 2a, b, 1927.

Frondicularia frankei Cushman, Contr. Cushman Lab. Foram. Res., Vol. 12, pt. 1, p. 18, pl. 4, figs. 6, 7, 1936. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 592, 593, pl. 80, fig. 5, 1941.

Frondicularia cf. *frankei* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 63, pl. 10, figs. 36, 37, 1940.

"Test elongate, lanceolate, widest at the base of the final chamber, compressed, with a rather large inflated proloculum and stout initial spine, periphery truncate, flat; chambers up to about 8 or 10 in number in large specimens, chevron-shaped, gradually increasing in size as added; sutures indistinct, obscured by the ornamentation of the test, limbate, especially near the median line of the test; wall marked by fine longitudinal, discontinuous raised costae, proloculum ornamented by one to three longitudinal raised costae; aperture terminal, protruding. Length up to 3.04 mm.; width up to 0.74 mm.; thickness up to 0.28 mm."

A large *Frondicularia* which rather closely resembles *F. frankei* Cushman is common throughout the lower Midway. It differs from the typical form in showing sutures rather distinctly and in possessing costae many of which are continuous and most of which cross several chambers. It is possible that this form should be considered a separate species. However, although specimens were rather numerous, they were too poorly preserved to be so designated.

Genus LAGENA Walker and Jacob, 1798

LAGENA HISPIDA Reuss

Plate IV, 3

Lagena hispida Reuss, Zeitschr. deutsch. geol. Gesell., Vol. 10, p. 434, 1858. Carsey, Univ. Texas Bull. 2612, p. 30, pl. 4, fig. 8, 1926. Plummer, Univ. Texas Bull. 3101, p. 159, pl. 10, fig. 12, 1931.

"Test globular and covered by short delicate spines that are evenly distributed over the test; aperture at end of long tube. Length of globular body of test .18 mm.; breadth .17 mm.; length of test including apertural tube .27 mm."

A few specimens of this species were identified from Clayton beds at two localities.

LAGENA LAEVIS (Montagu)

Plate IV, 4

"*Serpula (Lagena) laevis ovalis*" Walker and Boys, Test. Min., p. 3, pl. 1, fig. 9, 1784.

Vermiculium laeve Montagu, Test. Brit., p. 524, 1803.

Lagena laevis Cushman, U. S. Nat. Mus. Bull. 71, pt. 3, p. 5, pl. 1, fig. 3, 1913.
Toulmin, Jour. Pal., Vol. 15, no. 6, p. 593, pl. 80, fig. 7, 1941.

"Test globular to ellipsoid, circular in transverse section, with long slender neck and phialine lip; wall without ornamentation; aperture a round opening at the end of the long neck. Length (including neck) up to 0.6 mm.; diameter up to 0.35 mm."

This species has the widest distribution of the Midway *Lagenas*. Rare specimens have been obtained from the Clayton at several localities and from the Porters Creek at one locality.

LAGENA ORBIGNYANA (Seguenza)

Plate IV, 5a, b

Fissurina (Fissurine) orbignyana Seguenza, Dei terreni Terziarii del distretto di Messina, p. 66, pl. 2, figs. 25, 26, T. Capra, Messina, Italy, 1862.

Lagena orbignyana Cushman, Rept. Tenn. Div. Geol. Bull. 41, p. 39, pl. 6, figs. 1a, b, 2a, b, 1931.

Specimens assigned to this species differ slightly from the originally figured specimen, but are well within the limits of the species as identified by Cushman from the Cretaceous of Texas. Tests are moderately convex, with a strong median keel merging into the apertural lip, and well developed secondary heels lying very close to the median keel.

A number of tests were collected from samples from the Porters Creek at one locality.

LAGENA cf. PRIMIGERA H. B. Brady

Plate VII, 21

Lagena primigera H. B. Brady, Quart. Jour., Micr. Sci., Vol. 21, p. 62. Cushman, Rept. Tenn. Div. Geol. Bull. 41, p. 37, pl. 5, fig. 8, 1931.

The figured specimen is not identical with the species described by Brady, nor is it identical with specimens referred to this species from the Ripley formation of Tennessee. Brady's species has 10 to 12 longitudinal costae whereas the Mississippi specimen has only 6. These costae are fairly uniform throughout the length of the test but slightly thickened towards the neck. The

surface of the test between the costae is smooth, but a striking ornamentation is developed along the costae by the numerous tubules aligned normal to the axis of each.

The specimen was the only one of its kind that was found in the Clay County material. It came from the uppermost Clayton chalk in a test hole (M66) on the John E. Snell, Jr. property (SE. 1/4, SE.1/4, SW.1/4, Sec. 15, T. 16 S., R. 3 E.) 30 feet west of a road curve.—HRB

LAGENA SULCATA (Walker and Jacob) var. SEMIINTERUPTA Berry

Plate VII, 15, 16

Lagena sulcata (Walker and Jacob) var. *semiinterrupta* W. Berry, in Berry and Kelly, Proc. U. S. Nat. Mus., Vol. 76, art. 19, p. 5, pl. 3, fig. 19, 1929. Cushman, Rept. Tenn. Div. Geol. Bull. 41, p. 37, pl. 5, figs. 9-11, 1931. Bergquist, Miss. Geol. Surv. Bull. 49, p. 52, pl. V, 21, 22, 1942.

Specimens that have coalescing costae were found sparingly in both lower Porters Creek clay and from the Clayton chalk in Clay County. These are similar to the specimens found in the Ripley formation.—HRB

FAMILY POLYMORPHINIDAE

Genus **GUTTULINA d'Orbigny, 1839**

GUTTULINA PROBLEMA d'Orbigny

Plate IV, 2

Guttulina problema d'Orbigny, Ann. Sci. Nat., Vol. 7, p. 266, no. 14, 1826. Cushman and Ozawa, Proc. U. S. Nat. Mus., Vol. 77, art. 6, pp. 19-22, pl. 2, figs. 1-6; pl. 3, figs. 1a-c, 1930. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 594, pl. 80, fig. 8, 1941.

“Test subovate, broadly rounded at the initial end, acute at the apertural end; chambers elongate, inflated, each succeeding chamber slightly removed from the base; sutures distinct, depressed; wall smooth; aperture radiate. Length up to 1 mm.; width up to 0.68 mm.”

Specimens from the Midway show few chambers, closely resembling those figured from the Midway of Texas. Tests are small, averaging about .5 mm. in length.

The species is fairly common in the Clayton, extremely rare in the Porters Creek.

Genus *GLOBULINA* d'Orbigny, 1839*GLOBULINA GIBBA* d'Orbigny

Plate IV, 1

Globulina gibba d'Orbigny, Ann. Sci. Nat., Vol. 7, p. 266, No. 10, Modele No. 63, 1826. Cushman and Ozawa, Proc. U. S. Nat. Mus., Vol. 77, art. 6, pp. 60-64, pl. 16, figs. 1-4, 1930. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 63, pl. 11, fig. 6, 1940. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 594, pl. 80, fig. 9, 1941.

Polymorphina gibba Plummer, Univ. Texas Bull. 2644, p. 122, 123, pl. 6, figs. 8a, b, 1927.

"Test globular to subglobular, circular in transverse section; chambers few, rounded; sutures marked by dark lines, often indistinct, not depressed; wall smooth, or with a fistulose growth near the apertural end of some specimens; aperture radiate. Diameter up to 0.83 mm."

Tests of this species are abundant in the Clayton but extremely rare in the Porters Creek beds.

Genus *PYRULINA* d'Orbigny, 1839*PYRULINA CYLINDROIDES* (Roemer)

Plate VII, 5

Polymorphina cylindroides Roemer, Neues Jahrb. fur Min., p. 385, pl. 3, fig. 26, 1838. H. B. Brady, Parker and Jones, Trans. Linn. Soc., Vol. 27, p. 221, pl. 39, figs. 6 a-c, 1870.

Pyrulina cylindroides Cushman and Ozawa, Proc. U. S. Nat. Mus., Vol. 77, Art. 6, p. 56, pl. 14, figs. 1-5, 1930. Cushman, Rept. Tenn. Div. Geol. Bull. 41, p. 40, pl. 6, figs. 7, 8, 1931. Toulmin, Jour. Pal. Vol. 15, no. 6, p. 594, pl. 80, fig. 10, 1941.

"Test elongate, fusiform to cylindrical, acuminate toward both extremities, almost circular in cross section; chambers elongate, not much embracing, arranged in a nearly triserial series, tending to become biserial, each succeeding chamber farther removed from the base; sutures but little depressed; wall smooth; aperture radiate. Length 0.50-1.10 mm.; breadth 0.18-0.32 mm.; thickness 0.15-0.30 mm."

There are a few specimens that appear to belong to this widely distributed species. These show variation in tests from the fusiform type to the elongated and somewhat irregular form illustrated herein. These are sparingly found in the basal Porters Creek clay and the uppermost Clayton chalk.—HRB

Genus SIGMOMORPHINA Cushman and Ozawa, 1928

SIGMOMORPHINA sp.

Plate IV, 6

The figured specimen was collected from the Clayton formation.

Genus POLYMORPHINA d'Orbigny, 1826

POLYMORPHINA CUSHMANI Plummer

Plate IV, 8

Polymorphina cushmani Plummer, Univ. Texas Bull. 2644, p. 125, pl. 6, fig. 9; pl. 15, figs. 1a-c, 1927. Cushman and Ozawa, Proc. U. S. Nat. Mus., Vol. 77, art. 6, p. 117, pl. 30, figs. 8a, b, 1930.

"Test broadly ovoid, strongly compressed; peripheral margin narrowly rounded and somewhat lobate; sutures marked by faint depressions toward the margins but marked by irregularly disposed and broken elevations down the central axis on each side of the test; aperture extended, radiate. Length up to 1 mm."

The figured specimen, the only one of this species noted in the Clay County material, is from a bed at the top of the Clayton.

POLYMORPHINA FRONDEA (Cushman)

Plate IV, 7

Bolivina frondea Cushman, U. S. Geol. Survey Prof. Paper 129-F, p. 126, pl. 29, fig. 3, 1922; Prof. Paper 133, p. 20, 1923.

Polymorphina frondea Cushman, Contr. Cushman Lab. Foram. Res., Vol. 5, p. 41, 1929. Cushman and Ozawa, Proc. U. S. Nat. Mus., Vol. 77, art. 6, p. 118, 119, pl. 30, figs. 11a, b, 1930.

"Test compressed, of uniform thickness, the broad sides nearly parallel, oblong, broadest above the middle, acuminate toward the initial end, margins with a raised rim; chambers compressed, elongated, alternating; sutures depressed, distinct; wall smooth, often with obscure fine costae; aperture radiate. Length 0.50-0.65 mm.; breadth 0.30-0.40 mm.; thickness 0.04-0.05 mm."

A small number of specimens appear to be identical with the above species, described from the lower Oligocene. Considerable variation is exhibited by the Midway specimens, the figured test being an intermediate form. The species is most common in the Porters Creek clay, but is also rarely present in the Clayton chalk.

POLYMORPHINA sp.

Plate IV, 9

The illustrated specimen was collected from the uppermost Clayton beds.

Genus **RAMULINA** Rupert Jones, 1875

RAMULINA GLOBULIFERA (H. B. Brady)

Plate IV, 10, 15

Ramulina globulifera H. B. Brady, Quart. Jour. Mic. Soc., Vol. 19, p. 272, pl. 8, figs. 32, 33, 1879. Plummer, Univ. Texas Bull. 3101, p. 174, pl. 11, figs. 15a, b, 1931. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 596, 597, pl. 80, fig. 21, 1941.

Ramulina cf. *aculeata* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 64, pl. 11, figs. 13, 14, 1940.

“Test free, branching, composed of segments of different sizes connected by stoloniferous tubes. Segments numerous (two to eight or more), globular or subglobular, each with several (two to six) tubulated apertures extended from different portions of the periphery, some of which terminate in fresh chambers. Stoloniferous tubes narrow, circular in section, about equal in length to the diameter of the larger chambers. Texture hyaline; surface hispid or aculeate. Length, when complete, 1/15 inch (1.7 millim.) or more.”

Single chambers, globular or ovate, and fragments of stoloniferous tubes are common in many samples from both the Porters Creek and Clayton.

Genus **BULLOPORA** Quenstedt, 1856

BULLOPORA CHAPMANI (Plummer)

Plate IV, 11

Vitriwebbina chapmani Plummer, Univ. Texas Bull. 2644, p. 128, pl. 8, figs. 2a, b, 1927.

Bullopورا chapmani Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 64, pl. 11, figs. 10, 11, 1940.

“Test adherent, composed of strongly inflated, perfectly smooth, elongate chambers joined by narrow slender tubes, and edged by a slight flange that is so thin and merges so well into the shell on which it is adherent, that it is hardly evident unless the test has been broken away from its support. Average length of single chamber .7 mm.; average width .3 mm.”

Tests assigned to this species are slightly smaller, on the average, than those from the Midway of Texas. The species is rare throughout the Clay County Midway, being somewhat more common in the Porters Creek beds. Tests are usually broken free or attached to shells of *Nodosaria latejugata* Gumbel.

BULLOPORA CHAPMANI (Plummer) var. HISPIDA Kline, n. var.

Plate IV, 12

Variety differs from the species in having a finely hispid surface. The variety resembles the species very closely in size and shape, but may readily be identified by its hispid test. No intermediate forms between species and variety have been noted.

This is the most abundant of the Midway species of *Bullopora*. It is restricted to the Porters Creek beds, whereas the species is rarely present in the Clayton.

Holotype: Porters Creek clay, test hole M49, surface to 8.7 feet below, 2 1/2 miles north of Pheba; Type slide IV, 12, Mississippi Geological Survey.

BULLOPORA LAEVIS (Sollas)

Plate IV, 13

Webbina laevis Sollas, Geol. Mag., Vol. 4, p. 103, pl. 6, figs. 1-3, 1877.

Vitriwebbina laevis Chapman, Geol. Mag., Vol. 8, p. 53, pl. 2, fig. 4, 1892.
Plummer, Univ. Texas Bull. 2644, p. 128, pl. 8, fig. 3, 1927.

Bullopora laevis Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 64, pl. 11, fig. 12, 1940.

“Test adherent, composed of a few smooth, hemispherical chambers; aperture protruding, small, round. Average length of chamber .3 mm.”

Tests of this species from the Midway are larger than those reported by Plummer from the Midway of Texas, and average about the same size as specimens of *B. chapmani* (Plummer). Present throughout the lower Midway, the species is more common in the Porters Creek clay. Tests are usually broken free; a few are attached to tests of *Nodosaria latejugata* Gumbel.

BULLOPORA LAEVIS (Sollas) var. HISPIDA Kline, n. var.

Plate IV, 16

Variety differs from the species in having a finely hispid surface.

This is a well defined variety which is identical with the species in size and shape but may readily be distinguished by the hispid character of the surface. No intermediate forms were observed.

The variety is a little more abundant than the species in the Midway beds, but is more restricted in range, being confined to the Porters Creek.

Holotype: Porters Creek clay, test hole M49, surface to 8.7 feet below, 2 1/2 miles north of Pheba; Type slide IV, 16, Mississippi Geological Survey.

FAMILY NONIONIDAE

Genus NONIONELLA Cushman, 1926

NONIONELLA WELLERI (Plummer)

Plate IV, 21a, b

Truncatulina welleri Plummer, Univ. Texas Bull. 2644, p. 143, pl. 9, figs. 6a-c, 1927.

"Test small, equally biconvex, considerably compressed; chambers 10-11 in final whorl, strongly punctate, narrow, curved, increasing gradually in size; sutures distinct, narrow, tapering, slightly elevated, and curved in a broad gentle swing, those on the ventral side being joined in a low ridge about the small umbilical depression, aperture a low arch very close to the periphery and narrowing toward the umbilicus under a narrow lip. Diameter up to .35 mm.; usually about .25 mm."

Rare specimens of this species are present in the Porters Creek clay and uppermost beds of the Clayton chalk.

FAMILY HETEROHELICIDAE

Genus GUMBELINA Egger, 1899

GUMBELINA MORSEI Kline, n. sp.

Plate VII, 12

Test small, about twice as long as broad, regularly tapering, with greatest breadth at apertural end, periphery rounded and lobulate; chambers with breadth greater than height, inflated, increasing rapidly in size, especially in breadth; sutures distinct, depressed; wall finely but distinctly spinose; aperture high, arched, with distinct lateral flanges.

This minute species resembles *Gumbelina midwayensis* Cushman, from the Midway of Alabama, but may readily be distinguished from that species by the proportionately greater breadth of the chambers.

The species is common in the Porters Creek and transitional beds, but is not known from typical Clayton beds.

Holotype: Porters Creek clay, test hole M49, surface to 8.7 feet below, 2 1/2 miles north of Pheba; Type slide VII, 12, Mississippi Geological Survey.

Genus *PLANOGLOBULINA* Cushman, 1927

PLANOGLOBULINA ACERVULINOIDES Cushman

Plate VII, 1

Gumbelina acervulinoides Egger, Abhandl. kon. bay. Akad. Wiss. Munchen, Cl. II, Vol. 21, p. 36, pl. 14, figs. 17, 18, 20-22, 1899.

Pseudotextularia acervulinoides Cushman, Jour. Wash. Acad. Sci., Vol. 15, p. 134, 1926; Contr. Cushman Lab. Foram. Res., Vol. 2, pt. 1, p. 17, 1926.

Planoglobulina acervulinoides Cushman, 1. c., Vol. 3, pl. 13, fig. 5, 1927. Jour. Pal., Vol. 1, p. 158, pl. 27, fig. 3, 1927. Special Publ. No. 1, Cushman Lab. Foram. Res., pl. 33, figs. 8, 9; pl. 34, fig. 5, 1928. White, Jour. Pal., Vol. 3, p. 33, pl. 4, fig. 6, 1929. Cushman, Special Publ. No. 4, Cushman Lab. Foram. Res., pl. 21, fig. 8, 1933. Special Publ. No. 5, pl. 26, fig. 17, 1933. Contr. Cushman Lab. Foram. Res., Vol. 14, pt. 1, p. 23, pl. 4, figs. 5-8, 1938.

“Test much compressed, early stages similar to *Pseudotextularia*, later with the subglobular chambers spread out in one plane; sutures fairly distinct, depressed; wall longitudinally costate. Length up to 0.75 mm.; breadth 0.75 mm.; thickness 0.10-0.15 mm.”

The figured specimen was the only one noted. It came from a sample of Clayton chalk from a test hole (M172) on the C. H. Hubbert property north of Highway 10, 0.1 mile west of the bridge over Double Cabin Creek. The striated chambers and general characteristics appear to be the same as on specimens described from the Ripley formation, at Old Canton Landing, Alabama River, Alabama.—HRB

Genus *EOUVIGERINA* Cushman, 1926

EOUVIGERINA EXCAVATA Cushman

Plate IV, 19

Eouvigerina excavata Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 66, pl. 11, fig. 18, 1940. Cushman and Todd, Contr. Cushman Lab. Foram. Res., Vol. 18, pt. 2, p. 35, pl. 6, figs. 20, 21, 1942.

“Test small, mostly biserial, in the adult quadrangular in end view, tapering, greatest breadth formed by the last two chambers, initial end rounded; chambers very distinct, the broader

faces deeply excavated, the angles of the chamber raised into narrow plate-like projections; sutures distinct, strongly raised; wall smooth, finely perforate; aperture terminal, rounded, with a distinct neck and lip. Length 0.18-0.25mm.; diameter 0.08-0.10 mm."

This rare species has been observed only in Porters Creek beds from one locality and the uppermost Clayton from a second locality.

Genus *PSEUDOUVIGERINA* Cushman, 1927

PSEUDOUVIGERINA NAHEOLENSIS Cushman and Todd

Plate VII, 2

Pseudouvigerina naheolensis Cushman and Todd, Contrib. Cushman Lab. Foram. Res., Vol. 18, pt. 2, p. 36, pl. 6, figs. 18, 19, 1942.

"Test small, broadly fusiform in front view, in end view triangular with the sides flattened or somewhat concave, the periphery angled and slightly carinate, or slightly truncate; chambers distinct, very slightly inflated in the last whorl; sutures distinct, slightly depressed in the later portion; wall distinctly perforate, generally smooth; aperture circular, at the end of a short but distinct cylindrical neck with a slight phialine lip. Length 0.30 mm.; breadth 0.15 mm."

Minute tests from samples of both the basal Porters Creek clay and the Clayton chalk show characteristics of the species described from the Naheola formation of Alabama.—HRB

Genus *SIPHOGENERINOIDES* Cushman, 1927

SIPHOGENERINOIDES ELEGANTA (Plummer)

Plate IV, 18

Siphogenerina eleganta Plummer, Univ. Texas Bull. 2644, p. 126, pl. 8, figs. 1a-c, 1927.

Siphogenerinoides eleganta Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 66, pl. 11, fig. 17, 1940.

"Test elongate; early chambers biserial merging into a succession of alternately oblique chambers that very rarely reach a Nodosarian development; very earliest portion of test marked by indistinct and irregularly developed longitudinal striations and spinulose projections that disappear rapidly upward; mature chambers very smooth and coarsely punctate; sutures sharply depressed; aperture terminal, elliptical, bounded by a short,

flaring rim and connected to earlier apertures by an inner tube. Length up to .9 mm.; average .5 mm."

Tests of this species are widely distributed but seldom common throughout the Clayton and lower Porters Creek.

FAMILY BULIMINIDAE

Genus BULIMINA d'Orbigny, 1826

BULIMINA ARKADELPHIANA Cushman and Parker, var. MIDWAYENSIS

Cushman and Parker

Plate VII, 9

Bulimina aculeata Plummer, Univ. Texas Bull. 2644, p. 73, pl. 4, fig. 3, 1927.

Bulimina arkadelphia Cushman and Parker var. *midwayensis* Cushman and Parker; Contrib. Cushman Lab. Foram. Res., Vol. 12, pt. 2, p. 42, pl. 7, figs. 9, 10, 1936.

"Test small, about 1 1/2 times as long as broad, tapering, usually with a well-defined basal spine; chambers distinct, undercut at base, giving a "collared" effect, about 5 whorls, last-formed chambers inflated; sutures distinct, depressed; wall of all but the last-formed whorl, covered with sharp, fine spines, usually extending from the lower edges of the chambers, last-formed whorl smooth, finely perforate; aperture loop-shaped with a well-defined lip. Length 0.26-0.38 mm.; diameter 0.16-0.25 mm."

A single specimen from a sample of the basal Porters Creek clay from a test hole (M195) in a pasture 0.1 mile south of the Columbus & Greenville Railway tracks and 0.2 mile east of Pheba, appears to have the characteristics of the species described from the Midway of Texas.—HRB

BULIMINA CACUMENATA Cushman and Parker

Plate VII, 8

Bulimina cacumenata Cushman and Parker, Contrib. Cushman Lab. Foram. Res., Vol. 12, pt. 2, p. 40, pl. 7, figs. 3 a-c, 1936; Vol. 16, pt. 3, p. 67, pl. 11, fig. 20, 1940.

"Test small, somewhat fusiform, greatest width slightly above the middle, gradually tapering to a long, subacute point; chambers numerous 6-7 whorls, those of the last whorl somewhat inflated, arranged in a slightly twisted series, those of adjacent series meeting in a zigzag line; sutures distinct in the upper part, obscure in the lower part of the test, very slightly depressed; wall, except for the last whorl and occasionally for the

next to the last, covered with irregular, low, closely set costae, last whorl smooth, coarsely perforate; aperture loop-shaped, with a slight lip. Length 0.20-0.23 mm.; diameter 0.10-0.11 mm."

Figured specimen is from basal Porters Creek clay (test hole M49) on J. Christopher property, 2 1/2 miles north of Pheba. Specimens of this small species were also found in a few samples of the uppermost Clayton chalk.—HRB

BULIMINA (DESINOBU LIMINA) QUADRATA Plummer

Plate IV, 20a, b

Bulimina (Ellipsobulimina) quadrata Plummer, Univ. Texas Bull. 2644, p. 72, pl. 4, figs. 4, 5, 1927.

Bulimina (Desinobulimina) quadrata Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 67, pl. 11, fig. 21, 1940.

"Test of megalospheric form almost cylindrical, stout, increasing in diameter only very slightly from the broad blunt initial end toward the broadly rounded oral extremity; microspheric form pointed aborally through a succession of small chambers that followed the proloculum to the later mature chambers that comprise a test identical in shape with that of the much more frequent megalospheric form; chambers smooth, very little inflated, broad, and short; sutures as sharp lines in early part of test and faintly depressed above; wall thin; aperture a large vertical slit on the inner side of the last chamber and connected with all previous apertures by an inner tube that traverses the entire length of the shell. Length up to .65 mm. in megalospheric form, average .5 mm.; up to .8 mm. in microspheric form."

This is one of the most widely distributed of the Midway species. Although reported confined to the upper Midway of Texas and Alabama, it ranges throughout the Clay County lower Midway. In the Clayton it is widespread but rare; in the Porters Creek it is usually somewhat larger and is frequently extremely abundant.

Genus **ENTOSOLENIA** Ehrenberg, 1848

ENTOSOLENIA MORSEI Kline, n. sp.

Plate IV, 17

Test ovate to globular, greatest width usually a little below center, with short apical spine; surface smooth; aperture round,

small, at end of short but distinct neck. Length of holotype 0.46 mm.; breadth 0.34 mm.

This is probably the same species as that described by Plummer as *Lagena apiculata* (Reuss) and by Cushman as *Entosolenia* sp. Many of the tests are well enough preserved to show the internal structure. The species is present throughout the Clayton chalk and Porters Creek clay.

Holotype: Porters Creek clay, test hole M49, surface to 8.7 feet below, 2 1/2 miles north of Pheba; Type slide IV, 17 Mississippi Geological Survey.

Genus *VIRGULINA* d'Orbigny, 1826

VIRGULINA WILCOXENSIS Cushman and Ponton

Plate VI, 24

Virgulina wilcoxensis Cushman and Ponton, Contr. Cushman Lab. Foram. Res., Vol. 8, pt. 3, p. 67, pl. 8, figs. 22a-c, 1932. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 67, pl. 11, fig. 19, 1940.

"Test elongate, fusiform, somewhat compressed, about 2 1/2 times as long as broad, early portion irregularly spiral, adult irregularly biserial, periphery rounded; chambers distinct, very slightly inflated; sutures distinct, very slightly depressed; wall smooth, distinctly perforate; aperture a broad, comma-shaped opening at the base of the apertural face in the median line. Length 0.50 mm.; breadth 0.15 mm.; thickness 0.10 mm."

This species, originally described from the Wilcox and later from the upper Midway of Alabama, is fairly common in most of the Porters Creek clay samples studied. A few specimens range downward into the higher Clayton chalk beds.

Genus *BOLIVINA* d'Orbigny, 1839

BOLIVINA MIDWAYENSIS Cushman

Plate IV, 14

Bolivina midwayensis Cushman, Cushman Lab. Foram. Res., Spec. Publ. 6, p. 50, pl. 7, figs. 11a, b, 1936; Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 67, pl. 11, fig. 22, 1940.

"Test elongate, very slightly tapering, much compressed, periphery rounded, biserial throughout; chambers distinct, slightly inflated, low and broad, very slightly overlapping, of rather uniform shape throughout; sutures distinct, slightly depressed, strongly oblique, forming an angle of at least 45° with the horizontal,

slightly curved; wall smooth, very finely perforate; aperture an oval opening, tending very slightly to be somewhat removed from the inner margin. Length up to 0.85 mm.; breadth 0.15-0.18 mm., thickness 0.08-0.10 mm."

Tests of this species are abundant in most of the Clayton samples. A few specimens have been identified from the Porters Creek clay at two localities.

Genus LOXOSTOMA Ehrenberg, 1854

LOXOSTOMA APPLINAE (Plummer)

Plate V, 7

Bolivina applini Plummer, Univ. Texas Bull. 2644, p. 69, pl. 4, fig. 1, 1927.

Loxostoma applinae Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 68, pl. 11, fig. 23, 1940.

"Test long and slender, somewhat compressed, tapering to a blunt point; periphery broadly rounded; shell wall strongly punctate; chambers smooth except for distinct striae extending from the initial extremity upward over several early chambers; sutures in early part of test faint dark lines that become more distinct upward and are finally somewhat depressed and show crenulations; aperture an elongate loop-shaped orifice extending from near the apex downward on the inner side of the last chamber. Length up to 1 mm."

This is one of the most widely distributed of the Midway species, being present in most of the samples studied. It ranges throughout the section. Plummer reports it as most abundant in the upper Midway of Texas and Cushman as confined to that horizon in Alabama. In Clay County the species appears to be about equally characteristic of the lower Porters Creek and Clayton.

FAMILY ELLIPSOIDINIDAE

Genus PLEUROSATOMELLA Reuss, 1860

PLEUROSATOMELLA cf. BREVIS var. ALTERNANS Schwager

Plate VI, 23

Pleurostomella alternans Schwager, Novara-Exped., Geol. Thiel, Vol. 2, p. 238, pl. 6, figs. 79, 80, 1866. Plummer, Univ. Texas Bull. 2644, p. 69, 70, pl. 4, figs. 2a, b, 1927.

Pleurostomella cf. alternans Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 68, pl. 11, figs. 25, 26, 1940.

"Test elongate, tapering very bluntly toward the aboral extremity; chambers few, 7-8 in adult specimens, smooth, alternat-

ing but rarely Textularian even in the beginning of the test, inflated; sutures sharply but not deeply depressed; aperture highly arched and almost vertical with a sharply pointed tooth extending inward from each side. Length up to .4 mm."

Tests of this small species were fairly common in Porters Creek beds at three localities only.

Genus ELLIPSONODOSARIA A. Silvestri, 1900

ELLIPSONODOSARIA ALEXANDERI Cushman

Plate V, 1, 2

Nodosaria spinulosa Plummer (not Montagu), Univ. Texas Bull. 2644, p. 84, pl. 4, figs. 19a-c, 1927.

Ellipsonodosaria alexanderi Cushman, Contr. Cushman Lab. Foram. Res., Vol. 12, p. 52, pl. 9, figs. 6-9, 1936; Vol. 16, pt. 3, p. 69, pl. 11, figs. 27-29, 1940.

"Test elongate, straight or slightly curved, microspheric form increasing rather rapidly in diameter from the small proloculum, the megalospheric form with proloculum having nearly as great a diameter as the last-formed chambers; chambers distinct, inflated, increasing rather gradually in length, the adult ones about twice as long as broad; sutures distinct, strongly depressed; wall ornamented with short backwardly pointing spines, in the early stages of the microspheric form with a single ring of spines slightly below the middle of the chamber, in the adult with numerous spines rather irregularly scattered over the surface; aperture a semi-circular opening with a single tooth, with a distinct neck and slightly raised lip. Length up to 2.00 mm.; diameter 0.20 mm."

Specimens assigned to this species show considerable variation from forms ornamented with costae terminating in a ring of spines at the base of each chamber to others covered with numerous short outwardly pointing spines.

The species ranges throughout the lower Midway, but is more common in the Clayton.

ELLIPSONODOSARIA PLUMMERAE Cushman

Plate V, 8

Nodosaria sagrinensis Plummer (not Bagg), Univ. Texas Bull. 2644, p. 85, 86, pl. 4, fig. 16, 1927.

Ellipsonodosaria plummerae Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 69, pl. 12, figs. 4, 5, 1940.

"Test elongate, very slightly tapering, chambers in a straight linear series, circular in transverse section, initial end with one

or more short spines; chambers distinct, later ones becoming pyriform with the greatest breadth toward the base, which is somewhat excavated, increasing in size very gradually as added; sutures deeply excavated in the later portion; wall ornamented by low, longitudinal costae, broken into irregular short spines, and limited largely to the upper part of the chamber, ending often in short spines at the ridge near the base of the chamber; aperture terminal, rounded, with a distinct tooth at one side, and with a definite neck and slight lip. Length 0.80-1.00 mm.; diameter 0.10-0.14 mm."

This small distinctive species of *Ellipsonodosaria* is very abundant and widely distributed. It is equally characteristic of the Porters Creek and Clayton beds.

FAMILY ROTALIIDAE

Genus DISCORBIS Lamarck, 1804

DISCORBIS MIDWAYENSIS Cushman

Plate V, 9, 10

Discorbis midwayensis Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 70, pl. 12, figs. 6a, b, 1940.

"Test trochoid, plano-convex, dorsal side somewhat convex, ventral side flattened or even slightly concave, periphery subacute but not keeled, ventral side umbilicate; chambers normally 7 in the last-formed whorl, fairly distinct, of uniform shape, increasing gradually in size as added, slightly inflated on the dorsal side; sutures distinctly curved on both dorsal and ventral sides, slightly depressed; wall distinctly papillate on both dorsal and ventral sides, the center of the dorsal side sometimes slightly umbonate and smooth; aperture on the ventral side, in the umbilical region, low and elongate, with a distinct, overhanging lip. Diameter 0.65-0.80 mm.; thickness 0.18-0.25 mm."

In typical form this species is confined to the Clayton chalk, where it is usually present but rarely abundant.

Genus VALVULINERIA Cushman, 1926

VALVULINERIA ALLOMORPHINOIDES (Reuss)

Plate V, 11, 12

Valvulina allomorphinoides Reuss, Sitz. Akad. Wiss. Wien, Vol. 40, p. 223, pl. 11, figs. 6a-c, 1860.

Discorbis allomorphinoides Plummer, Univ. Texas Bull. 2644, p. 139, 140, pl. 9, figs. 2a, b, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 70, 71, pl. 12, figs. 9a, b, 1940.

"Test elongate oval, somewhat more strongly convex on the dorsal side; peripheral margin very broadly rounded giving the form a very rotund appearance; chambers few, four in last whorl, enlarging rapidly; sutures faintly depressed; gently curving; shell wall very smooth and glistening; aperture opening into the umbilicus under a large, triangular umbilical flap. Length up to 0.5 mm.; average 0.4 mm."

Considerable variation is shown by specimens assigned to this species, some having 5 chambers instead of the more typical 4. The species is present throughout the lower Midway, but much more abundant and widely distributed in the Porters Creek, in which formation specimens are also usually much larger.

Genus *GYROIDINA* d'Orbigny, 1826
GYROIDINA SUBANGULATA (Plummer)
 Plate V, 13-15

Rotalia soldanii (d'Orbigny) *subangulata* Plummer, Univ. Texas Bull. 2644, p. 154, 155, pl. 12, figs. 1a-c, 1927.

Gyroidina subangulata Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 71, pl. 12, figs. 7a-b, 1940.

"Test almost plano-convex, the dorsal side being flat or faintly convex, the ventral side very strongly convex, composed of about two convolutions; peripheral margin bluntly angular; chambers 8-9 in final whorl; sutures slightly depressed between the last two or three chambers on both sides and around the small umbilical excavation, otherwise plain or faintly elevated, moderately oblique dorsally and radiate ventrally; shell wall very finely punctate, very smooth, glistening; aperture a long narrow slit at the base of a broad septal face extending from a point below the periphery almost into the umbilicus. Diameter up to 0.4 mm.; usually less."

This species, as typically developed, is confined to the lower Porters Creek clay and uppermost Clayton chalk. Tests are frequently very numerous.

Genus *EPONIDES* Montfort, 1808
EPONIDES cf. *TENERA* (H. B. Brady)
 Plate V, 16, 18

Truncatulina tenera H. B. Brady, Challenger, Vol. 9 (Zool.), p. 665, pl. 95, fig. 11, 1884. Plummer, Univ. Texas Bull. 2644, p. 146, pl. 9, figs. 5a-c, 1927.

Eponides sp. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 71, pl. 12, figs. 8a, b, 1940.

"Test biconvex, the ventral face being very rotund and thick, the dorsal face not so high and somewhat more sharply elevated near the center; peripheral margin bluntly acute and in general somewhat lobate; chambers very smooth and finely punctate, usually 6 in the final convolution; sutures expressed by faint, slightly oblique, narrow bands on the superior face, distinctly depressed, almost straight lines below; aperture a gently curved slit under a narrow lip. Diameter up to .4 mm."

This is one of the most characteristic and most abundant of the Porters Creek species. It has been reported from the upper Midway only of Texas and Alabama. In Clay County it is also present rarely in the uppermost Clayton chalk.

Genus *PARRELLA* Finlay, 1939

PARRELLA EXPANSA Toulmin

Plate V, 19, 20

Truncatulina culter Plummer, Univ. Texas Bull. 2644, p. 147, pl. 10, figs. 1a-c; pl. 15, figs. 2a, b, 1927.

Pulvinulinella culter var. *mexicana* Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, p. 72, pl. 12, figs. 12a, b, 1940.

Parrella expansa Toulmin, Jour. Pal., Vol. 15, no. 6, p. 604, text figs. 3 a-c, 4 F, G, 1941.

"Test trochiform, close coiled, subcircular in outline, ventral side strongly convex, dorsal side nearly flat with earliest coils gently elevated, periphery sharply acute with a broad thin flange; all chambers visible on dorsal side, with flange of all coils forming a limbate whorl suture, only chambers in the final convolution visible ventrally, eight or nine chambers in the final whorl; dorsal sutures broad, oblique, slightly curved, flush or slightly elevated, ventral sutures limbate between early chambers of the final whorl, generally depressed between the last two or three chambers, radiating from a small umbilical filling and curving backward near the junction with the peripheral flange; wall smooth, perforate; aperture consisting of two portions, a narrow elliptical opening extending from the base of the final chamber near the periphery obliquely across the apertural face, at an angle of 45 degrees or more to the peripheral plane, and a very narrow slit at base of the septal face extending ventrally toward the umbilical area from the dorsal end of the oblique opening. Average diameter 0.5 mm."

This is one of the most characteristic Porters Creek species, tests being abundant in most of the samples examined. A single specimen was identified from each of three localities in the uppermost Clayton, but the presence of a large number of specimens may be considered indicative of the Porters Creek. It has been recorded from the upper Midway only of Texas and Alabama.

Genus SIPHONINA Reuss, 1850

SIPHONINA PRIMA Plummer

Plate V, 21, 22

Siphonina prima Plummer, Univ. Texas Bull. 2644, p. 148, pl. 12, figs. 4a-c, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 71, pl. 12, fig. 10, 1940.

"Test almost circular, about equally biconvex, considerably compressed laterally; peripheral angle sharply acute and delicately serrate, slightly lobate; chambers usually 5 in last-formed convolution, distinctly punctate, smooth, strongly curved; dorsal sutures marked by the serrate edges of the successive chambers and obliquely curved; ventral sutures excavated, radial from a small, shallow central depression; aperture a small, narrow, elliptical opening at the periphery on the ventral side. Diameter up to .25 mm."

Tests assigned to this species differ slightly from the typical in that most have only 4 chambers rather than 5 in the last whorl.

The species is present, though nowhere abundant, throughout the lower Porters Creek and Clayton.

FAMILY CASSIDULINIDAE

Genus PULVINULINELLA Cushman, 1926

PULVINULINELLA EXIGUA (H. B. Brady)

Plate V, 23, 24

Pulvinulina exigua H. B. Brady, Challenger, Vol. 9, (Zool.), p. 696, pl. 103, Figs. 13, 14, 1884. Plummer, Univ. Texas Bull. 2644, p. 150, 151, pl. 11, figs. 3a-c, 1927.

"Test small, almost equally biconvex; peripheral margin bluntly acute, very faintly lobate; chambers smooth, finely punctate, 6 in final convolution; sutures on the dorsal side very oblique, almost straight, and expressed as conspicuous, fine dark

lines; ventral sutures radiate and slightly curving from a small umbilical filling that lies flush with the convexity of the inferior face; aperture a long, narrow slit extending from near the peripheral margin almost to the umbilicus. Diameter up to .5 mm.; usually less."

This species is one of the most widely distributed of the Midway forms, and is usually rather common. Although Plummer reports it as characteristic of the upper Midway of Texas, it ranges throughout the Clay County lower Midway.

FAMILY CHILOSTOMELLIDAE

Genus ALLOMORPHINA Reuss, 1850

ALLOMORPHINA TRIGONA Reuss

Plate VI, 1, 2

Allomorphina trigona Reuss, Denk. Akad. Wiss. Wien., Vol. 1, p. 380, pl. 48, fig. 14, 1850. Plummer, Univ. Texas Bull. 2644, p. 129, 130, pl. 8, figs. 5a, b, 1927.

"Test bluntly subtrigonal; periphery broadly rounded; chambers few, 3 in each whorl, considerably embracing, inflated; sutures slightly depressed; shell wall thin, very smooth, distinctly porous; aperture a narrow slit bearing a conspicuous flap at the base of the final chamber on the ventral face. Length up to .35 mm."

Specimens assigned to this species appear to be identical with those figured by Plummer from the Midway of Texas. The species was found at only one locality, east of M93, where tests proved abundant in beds of Porters Creek age.

Genus CHILOSTOMELLA Reuss, 1850

CHILOSTOMELLA SUBTRIANGULARIS Kline, n. sp.

Plate VI, 3

Test subtriangular, about one and one-half times as long as broad, greatest width a little above middle, ends bluntly rounded; wall smooth, finely punctate; aperture narrow, nearly straight. Average length 0.75 mm.

Rare specimens of this species are known from two localities where they are present only in the highest Porters Creek beds examined. They are associated with an extremely large

number of tests of *Bulimina quadrata* Plummer and *Valvulineria allomorphinoides* (Reuss).

Holotype: Porters Creek clay, east of test hole M93, at surface, 1 1/2 miles northwest of Montpelier; Type slide VI, 3, Mississippi Geological Survey.

Genus *CHILOSTOMELLOIDES* Cushman, 1926

CHILOSTOMELLOIDES EOCENICA Cushman

Plate VI, 8

Chilostomelloides eocenica Cushman, Contr. Cushman Lab. Foram. Res., Vol. 1, pt. 4, p. 78, pl. 11, fig. 20, 1926. Plummer, Univ. Texas Bull. 2644, p. 129, pl. 8, figs. 8a, b, 1927.

“Test elongate ellipsoid, about twice as long as broad; shell wall very thin, smooth, and finely punctate; aperture semi-lunar and highly flaring, with a conspicuous lip. Length of only perfect specimen .38 mm.”

A single large specimen from the Porters Creek near test hole M49 appears to belong to this species.

Genus *PULLENIA* Parker and Jones, 1862

PULLENIA QUINQUELOBA (Reuss)

Plate VI, 4, 7

Nonionina quinqueloba Reuss, Zeitschr. deutsch. geol. Gesell., Vol. 3, p. 47, pl. 5, fig. 31, 1851.

Pullenia quinqueloba H. B. Brady, Challenger, Vol. 9, (Zool), p. 617, pl. 84, figs. 14, 15, 1884. Plummer, Univ. Texas Bull. 2644, p. 136, pl. 8, figs. 12a, b, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 72, pl. 12, figs. 13, 14, 1940.

“Test plano-spiral, closely coiled, completely embracing, bilaterally symmetrical; peripheral margin broadly rounded; chambers 5 in last-formed whorl; shell wall very smooth and glistening; sutures faintly depressed between last two chambers; aperture a long narrow slit extending over the periphery at base of septal face. Diameter up to .3 mm.”

This is one of the commonest Midway forms, being present and usually abundant in all of the samples examined. It has been reported throughout the entire Midway of Texas and Alabama.

FAMILY GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA COMPRESSA Plummer

Plate VI, 5, 6

Globigerina compressa Plummer, Univ. Texas Bull. 2644, p. 135, 136, pl. 8, figs. 11a-c, 1927. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 607, pl. 82, figs. 1, 2, 1941.

"Test small, rotaliform, closely coiled, somewhat compressed, equally biconvex; peripheral margin bluntly angular, lobate; chambers increasing gradually, 5 in last-formed whorl, moderately inflated, overlapping on dorsal face; sutures distinctly depressed and strongly curved on the dorsal side; shell wall thin, smooth, finely punctate; aperture a single moderately arched slit protected by a definite flaring flap at base of septal face and extending into the small but distinct umbilical depression. Diameter up to .4 mm.; average .3 mm."

This species, reported by Plummer to be confined to the upper Midway of Texas, has been found only in Porters Creek and uppermost Clayton beds. Tests are rare.

GLOBIGERINA PSEUDO-BULLOIDES Plummer

Plate VI, 9-11

Globigerina pseudo-bulloides Plummer, Univ. Texas Bull. 2644, p. 133, 134, pl. 8, figs. 9a-c, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 72, pl. 12, figs. 16a, b, 1940.

"Test rotaliform, very obtusely trochoid to plane dorsally, composed of about two and one-half convolutions, of which the last consists most generally of 5 (rarely 6) highly ventricose chambers increasing rapidly in size; periphery broadly rounded and lobate; shell wall thin and distinctly punctate but finely reticulate; superior face bearing a spire of small chambers only very slightly elevated, if at all, above the circumambient chambers of the final whorl; inferior face less convex and with a very distinct, though not large, umbilical depression; aperture a single, moderately large, lunate opening on the last chamber extending from the margin to the umbilicus and edged with a narrow, delicate, flaring lip. Diameter up to .4 mm."

This is one of the most abundant Midway species, ranging throughout the entire lower section in Clay County. Tests are relatively a little more common in the Porters Creek clay.

GLOBIGERINA TRILOCULINOIDES Plummer

Plate VI, 12, 13

Globigerina triloculinoides Plummer, Univ. Texas Bull. 2644, p. 134, 135, pl. 8, figs. 10 a-c, 1927. Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 72, 73, pl. 12, figs. 15a-b, 1940. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 607, 608, pl. 82, fig. 3, 1941.

“Test spiral, trochoid, composed of about 2 convolutions, the last of which is composed of 3 1/2 very rapidly increasing and highly globose chambers; periphery very broadly rounded and distinctly lobate; shell surface strongly reticulate; superior face rounded with a very low spire of neatly coiled tiny chambers of the preceding whorl; inferior face rounded with a very shallow umbilical depression; aperture a small arched slit on the last chamber and edge with a more or less prominent, delicately notched flap that extends from a point near the periphery to the umbilical depression. Greatest diameter up to .35 mm.; usually less.”

This species is commonly present in the Porters Creek. Tests are rare in beds of Clayton age.

FAMILY GLOBOROTALIIDAE

Genus GLOBOTRUNCANA Cushman, 1927

GLOBOTRUNCANA sp.

Plate VI, 14

This species was obtained from a sample from the base of the Porters Creek clay at a single locality.

FAMILY ANOMALINIDAE

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA ACUTA (Plummer)

Plate V, 3, 4

Anomalina ammonoides var. *acuta* Plummer, Univ. Texas Bull. 2644, p. 149, 150, pl. 10, figs. 2a-c, 1927.

Anomalina acuta Cushman and Renz, Contr. Cushman Lab. Foram. Res., Vol. 18, pt. 1, p. 12, pl. 3, figs. 6a-c, 1942.

“Test involute, much compressed, almost equally biconvex but slightly more flattened above; peripheral margin subacute; chambers numerous, about 13-15 to the final convolution, narrow, and slightly curving; sutures marked by more or less distinct limbatious, which on the ventral face terminate along the inner edge of the convolution in a series of fine beads that sur-

round a thick spiral of irregular filling of translucent shell material in the umbilical recess, and on the dorsal face merge at the center into a more or less prominently developed boss; shell wall distinctly but not coarsely punctate; aperture on arched opening over the peripheral margin and extending toward the umbilicus. Diameter up to 0.4 mm.; average 0.25 mm."

Clay County specimens average slightly larger in size than the species as described from the Midway of Texas, and frequently have but 12 chambers in the last whorl. The species ranges throughout the lower Midway of Clay County.

ANOMALINA cf. *AMMONOIDES* (Reuss)

Plate VII, 24-26

The figured specimens have strongly raised limbate sutures over most of the test except that on the ventral side, the last two or three are depressed. The final chamber appears to be usually greatly inflated ventrally.

A few specimens from the Midway of Alabama have been referred to this Upper Cretaceous species by Cushman; the Clay County forms appear to be most like it also.

Specimens were found in both the basal Porters Creek clay and the Clayton chalk of Clay County.—HRB

ANOMALINA *MIDWAYENSIS* (Plummer)

Plate VI, 17, 18

Truncatulina midwayensis Plummer, Univ. Texas Bull. 2644, p. 141, 142, pl. 9, figs. 7a-c, 1927.

Anomalina midwayensis Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 73, pl. 12, figs. 18a, b, 1940.

"Test almost equally biconvex, moderately compressed; peripheral margin rounded; convolutions about 2, the final one being strongly embracing; chambers usually 9 in final whorl, conspicuously punctate, gradually increasing, moderately curving; sutures broadly elevated on both sides, tapering toward the margin, and curved; aperture a slit at base of septal face under a narrow lip that extends to the umbilicus. Diameter up to .5 mm.; usually less.

This species is very abundant and widely distributed throughout the lower Midway in Clay County.

ANOMALINA MIDWAYENSIS (Plummer) var. TROCHOIDEA (Plummer)

Plate VI, 15, 16

Truncatulina midwayensis (Plummer) var. *trochoidea* Plummer, Univ. Texas Bull. 2644, p. 142, pl. 9, figs. 8a-c, 1927.

"From the type this variety is distinguished by the more strongly trochoid dorsal coiling of the convolutions. Diameter up to 0.6 mm.; usually less."

It is extremely difficult to separate this variety from the species, since most tests appear to be intermediate in form. Tests which could definitely be assigned to the variety were identified from Clayton beds at a small number of localities.

Genus CIBICIDES Montfort, 1808**CIBICIDES ALLENI (Plummer)**

Plate VI, 21, 22

Truncatulina alleni Plummer, Univ. Texas Bull. 2644, p. 144, pl. 10, figs. 4a-c, 1927.

Cibicides alleni Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 73, pl. 12, figs. 19a, b, 1940.

"Test almost equally biconvex, the ventral side of most specimens being the more rounded; periphery subacute and bordered by a band of clear shell material, faintly lobate in its latest development; chambers 10-11 in last convolution, very coarsely punctate, previous whorls concealed by strong elevations of shell matter that follow the base of the chambers on the dorsal face; sutures on dorsal side marked by conspicuous elevations of transparent shell matter that taper and curve gently toward the periphery; sutures of the ventral face very slightly elevated and curving outward from the large smooth umbilical boss; aperture a large arched opening over the periphery and extending farther downward on the ventral side. Diameter up to .7 mm.; average about .4 mm."

Clay County specimens are large, averaging close to the maximum size reported by Plummer, strongly convex, and show 8 to 9 chambers in the final whorl.

The species is abundant in the lower Porters Creek clay and ranges downward into the uppermost Clayton chalk.

CIBICIDES BROWNI Kline, n. sp.

Plate VII, 18-20

Test plano-convex, ventral side convex, dorsal side flat, frequently showing signs of attachment, periphery subacute but not keeled; chambers usually 5 in the last-formed whorl, distinct, increasing rapidly in size, inflated on ventral side; sutures distinctly curved on dorsal and ventral sides, depressed on ventral side; aperture near periphery, small.

This species is common throughout the Clay County lower Midway. Tests are often deformed as a result of attachment to irregularly shaped objects.

Cotypes: Clayton chalk, test hole M49, surface to 8.7 feet below, 2 1/2 miles north of Pheba; Type slide VIII, 18-20, Mississippi Geological Survey.

CIBICIDES PRAECURSORIUS (Schwager)

Plate V, 5, 6

Discorbina praecursoria Schwager, Palaeontographica, Vol. 30, Pal. Theil, p. 125, pl. 27 (4), figs. 12a-d, 13a-d; pl. 29 (6), figs. 16a-d, 1883.

Cibicides praecursorius Cushman and Ponton, Contr. Cushman Lab. Foram. Res., Vol. 8, p. 72, pl. 9, figs. 14a-c, 1932. Toulmin, Jour. Pal., Vol. 15, no. 6, p. 610, pl. 82, figs. 19-21, 1941. Cushman and Renz, Contr. Cushman Lab. Foram. Res., Vol. 18, pt. 1, p. 13, pl. 3, figs. 9a-c, 1942.

"Test trochiform, plano convex, dorsal side flat or nearly flat, ventral side moderately convex; periphery acute, slightly lobate; chambers distinct, seven to nine in the final whorl, slightly inflated on both sides in the later part of the whorl, increasing regularly in size as added, of uniform moderately curved shape; sutures distinct, slightly depressed on the dorsal side, more deeply depressed on the ventral side and radiating from a low small umbo, rather strongly curved on dorsal side, slightly curved on ventral side; wall smooth, rather finely perforate, polished; aperture a low slit at base of final chamber on the ventral side, arching across the periphery onto the dorsal side where it extends along the base of the last two chambers. Length 0.37 mm.; width 0.33 mm.; thickness 0.16 mm."

This species is widely distributed and common throughout the Clayton chalk, more restricted in distribution and numbers in the Porters Creek clay. Known also from the Wilcox, the species has no stratigraphic value.

CIBICIDES VULGARIS (Plummer)

Plate VI, 19, 20

Truncatulina vulgaris Plummer, Univ. Texas Bull. 2644, p. 145, 146, pl. 10, figs. 3a-c, 1927.

Cibicides vulgaris Cushman, Contr. Cushman Lab. Foram. Res., Vol. 16, pt. 3, p. 73, pl. 12, fig. 21, 1940.

“Test almost equally biconvex, the ventral face being slightly the more elevated; peripheral margin broadly rounded, frequently somewhat lobate; chambers 7-9 in last whorl, last two or three distinctly turgid; sutures marked by strong elevations of clear shell material curving gently toward the periphery from a very high ridge of irregularly disposed mass of shell matter that follows the inner edge of the whorl and produces a more or less well-developed spiral on both faces; shell wall more coarsely punctate than any other species in the fauna; aperture a long, arched slit extending from the periphery toward the umbilicus under a narrow lip. Diameter up to 0.6 mm.”

Typical specimens of this species are abundant and widely distributed throughout both the Clayton and the lower Porters Creek. Although reported by Plummer from the upper and upper basal Midway of Texas and by Cushman from the upper Midway only of Alabama, the species ranges downward into the lowest Midway beds present in Clay County.

DESCRIPTION OF OSTRACODA

FAMILY CYTHERELLIDAE

Genus *CYTHERELLA* Jones, 1849

CYTHERELLA SYMMETRICA Alexander

Plate VIII, 9

Cytherella symmetrica Alexander, Jour. Pal., Vol. 8, no. 2, p. 212, pl. 32, fig. 9; pl. 35, fig. 13, 1934.

“Female carapace elongate-quadrate in outline. Dorsal and ventral margins nearly straight and parallel, slightly and evenly convex. Anterior end broadly and evenly rounded. Right valve overlaps left moderately around entire periphery; overlap slightly less around anterior end and in lower half of posterior margin than elsewhere. Anterior border of left valve bears a very fine, narrow, obscure marginal rim or flange. Surface of valves smooth or finely and densely punctate. Valves moderately convex. In dorsal view carapace widest at, or slightly behind, middle; anterior end subacute, posterior end blunt, rounded.

“Measurements of holotype: length 0.79 mm., height 0.46 mm., width 0.36 mm.”

Shells belonging to this species are rare in beds of Clayton age, but moderately common in the Porters Creek clay.

FAMILY CYPRIDAE

Genus *ARGILLOECIA* Sars, 1865

ARGILLOECIA FABA Alexander

Plate VIII, 2

Argilloecia faba Alexander, Jour. Pal., Vol. 8, no. 2, p. 213, 214, pl. 32, fig. 16; pl. 35, figs. 12, 14, 1934.

“Carapace minute, in side view elongate, highest slightly behind middle. Height equal to nearly one-half of length. Dorsal margin rather strongly arched, curving downward somewhat more steeply posteriorly than anteriorly from highest point of arch. Ventral margin nearly straight, very slightly convex downward. Anterior end low, obliquely rounded. Posterior end tapering to rather blunt postero-ventral angle. Right valve overlaps left distinctly both dorsally and ventrally, with strongest overlap along anterior half of dorsal margin and at middle of ventral

margin. Carapace in side view lanceolate, widest at middle; ends similar, acute. Surface of valves smooth.

"Length of holotype, 0.42 mm., height 0.2 mm., width 0.16 mm."

Shells of this minute species are limited in number but show a wide distribution, being present in about half of the samples examined. It ranges throughout the Clayton and lower Porters Creek.

Genus **PARACYPRIS** Sars, 1865

PARACYPRIS PERAPICULATA Alexander

Plate VIII, 1

Paracypris perapiculata Alexander, Jour. Pal., Vol. 8, no. 2, p. 214, pl. 32, fig. 18; pl. 35, figs. 9, 15, 1934.

"Carapace in side view elongate, highest at antero-cardinal angle, tapering strongly posteriorly. Dorsal margin gently arched, nearly straight along hinge-line, obscurely angled at ends of hinge-line. Ventral margin almost straight, slightly sinuate at middle. Anterior end broadly and somewhat obliquely rounded. Posterior end slender, tapering, acute. In dorsal view narrow, lanceolate, widest at about anterior one-third of length; anterior end somewhat less acute than posterior. Surface smooth.

"Length of holotype, 1.07 mm., height 0.37 mm., width 0.28 mm."

A single specimen of this species was obtained from the Porters Creek clay. The species is reported as rare in upper and lower beds of the Texas Midway.

FAMILY BAIRDIDAE

Genus **BAIRDIA** McCoy, 1844

BAIRDIA MAGNA Alexander

Plate VIII, 4

Bairdia magna Alexander, Jour. Pal., Vol. 1, p. 32, pl. 6, figs. 7, 8, 1927; Univ. Texas Bull. 2907, p. 63, pl. 3, fig. 8, 1929; Jour. Pal., Vol. 8, no. 2, p. 215, 1934.

"Carapace in side view subtriangular; height equal to slightly less than three-fourths the length. Greatest height at about middle. Dorsal margin strongly and evenly arched. Ventral margin convex downward. Anterior end broadly and somewhat obliquely

rounded. Posterior end obtusely angled, not produced. Left valve larger than and overlapping right valve along dorsal and ventral margins. Valves strongly and evenly convex. Surface punctate.

"Length, 1.44 mm.; height, 0.99 mm.; width, 0.78 mm."

This species, originally described from the Navarro clay, occurs rarely in both Clayton and Porters Creek beds.

FAMILY CYTHERIDAE

Genus *BRACHYCYTHERE* Alexander, 1933

BRACHYCYTHERE FORMOSA Alexander

Plate VIII, 7

Brachycythere formosa Alexander, Jour. Pal., Vol. 8, no. 2, p. 217, pl. 33, fig. 3, 1934. Murray and Hussey, Jour. Pal., Vol. 16, no. 2, p. 175, pl. 27, figs. 1, 4; text fig. 2, figs. 17, 18, 21, 22, 1942.

"Carapace in side view, oblong ovate, highest at anterior end, tapering strongly posteriorly. Dorsal margin arched, flattened and nearly straight along hinge line. Ventral margin straight. Anterior end compressed, broadly rounded, bearing a broad, thin, marginal keel. This keel is so thin and fragile that it is partially or wholly destroyed in all individuals observed. Posterior end compressed, narrow, obtusely angled. The elongated, obliquely disposed anterior cardinal tubercle is connected at its upper end to a low, rounded ridge which continues backward along the dorsal margin, becoming lower and less distinct posteriorly. A second low, rounded ridge arises a short distance below and behind the anterior cardinal tubercle and extends obliquely backward and upward to join the dorsal marginal ridge at about the middle of the hinge margin. A broad, low, obscure subcentral node gives rise to a low ridge which extends backward for a short distance along the median longitudinal line. The ventro-lateral edge of the valve bears a high, strong, longitudinal ridge which bears a row of strong pits along its upper surface, and which terminates posteriorly in a short, sharp backward-projecting angle. Surface of valves with a few large, widely spaced, shallow pits.

"Length of holotype 0.6 mm., height 0.42 mm., width 0.33 mm."

This is the most abundant of the Midway species of ostrocods, numerous specimens being present in about three-fourths of the samples examined. Although reported restricted to the upper Midway in Texas, the species ranges throughout the lower Midway in Clay County.

BRACHYCYTHERE INTERRASILIS Alexander

Plate VIII, 5

Brachycythere interrasilis Alexander, Jour. Pal., Vol. 8, no. 2, p. 217, pl. 33, fig. 4, 1934.

"Carapace in side view ovate in outline, highest near anterior end. Dorsal margin arched, flattened along hinge line. Ventral margin gently and evenly convex downward. Anterior and posterior ends rounded, posterior narrower than anterior; anterior end minutely denticulate, posterior bearing three to four short, stout spines along inferior border. Valves strongly convex, widest ventrally, ventral surface broad and flat. Vento-lateral edge of valves bears a strong, high, curved, longitudinal ridge. The surface of a narrow area at the anterior end of the shell is marked by a fine, strong, dense punctation. The remainder of the valve surface is strongly and coarsely reticulate, the meshes becoming finer near the dorsal, anterior, and posterior margins of the shell.

"Length of holotype, 0.9 mm., height 0.53 mm., width 0.49 mm."

A single specimen of this species was collected from the Porters Creek at one locality and a second specimen from the uppermost Clayton at a second locality. The species is reported from both upper and lower Midway beds in Texas.

BRACHYCYTHERE PLENA Alexander

Plate VIII, 3

Brachycythere plena Alexander, Jour. Pal., Vol. 8, no. 2, p. 216, 217, pl. 33, fig. 6, 1934. Murray and Hussey, Jour. Pal., Vol. 16, no. 2, p. 176, pl. 27, figs. 2, 5, 6; text fig. 2, figs. 3, 7, 1942.

"Carapace in side view, oblong ovate, highest near anterior end. Dorsal margin gently arched, almost straight along hinge line. Ventral margin gently convex downward. Anterior end broadly rounded, posterior end narrow, rounded. Vento-lateral edge of valves bears fine, narrow ridge, which in some individuals is obscure and almost imperceptible. Immediately above the anterior end of this ridge, the right valve bears a curved, somewhat crescent-shaped depression. Surface of valves finely and discretely punctate.

"Length of holotype, 1.15 mm., height 0.68 mm., width 0.65 mm."

A small number of shells of this species are known from both

Clayton and Porters Creek beds. The species appears to be a little more common in the Clayton formation. It is also known from Wilcox beds in other localities.

Genus *CYTHEREIS* Jones, 1840

CYTHEREIS PRESTWICHIANA Jones and Sherborn

Plate VIII, 11

Cythereis prestwichiana Jones and Sherborn, Geol. Mag., p. 454, pl. 11, figs. 11a, b, 1887; Jones and Sherborn, Suppl. Monogr. Tertiary Entom. England, Paleont. Soc. London, p. 33, pl. 2, figs. 13, 14, 1889. Alexander, Jour. Pal., Vol. 8, no. 2, p. 220, 221, pl. 32, figs. 14, 15, 1934.

"Carapace oblong, highest in front. Dorsal and ventral margins straight, subparallel, converging slightly posteriorly. Anterior end rounded, rimmed, denticulate. Posterior end bluntly angled at about middle, bearing four or five short, stout teeth along lower margin. Continuations of the anterior marginal rim extend ridge-like, along the dorsal and ventral borders of the valves; ventral ridge more strongly elevated than dorsal. Both ridges terminate posteriorly in sharp rectangles, immediately in front of the compressed posterior end. An obscure subcentral node forms the anterior end of a short, narrow, median longitudinal ridge which, near the posterior end, turns obliquely upward to join the down-turned end of the dorsal marginal ridge. Surface of valves covered with a distinct, but delicate, lace-like reticulation.

"Length of plesiotype, 0.6 mm., height 0.33 mm., width 0.28 mm."

None of the shells was well enough preserved to show the short spurs projecting into the pits, described as characteristic of the species. In all other respects the Clay County specimens appear identical with those from Texas. The species is fairly common in both the Clayton and Porters Creek.

CYTHEREIS SPINIFERRIMA Jones and Sherborn

Plate VIII, 6

Cythereis spiniferrima Jones and Sherborn, Suppl. Monogr. Tertiary Entom. England, Paleont. Soc. London, p. 34, fig. 3, 1889. Alexander, Jour. Pal., Vol. 8, no. 2, p. 220, pl. 32, fig. 11, 1934.

"Carapace distinctly oblong, highest in front. Dorsal and ventral margins straight, converging posteriorly. Anterior end rounded, strongly rimmed, bearing a double row of short, sharp

spines. Posterior end compressed, triangular in form, acutely angled at middle, finely denticulate along upper border and bearing three or four long, stout, outward--and downward-projecting spines along the outer border. Surface of valves coarsely reticulate, with scattered spinose projections arising from the junctions of the ridges of the meshes. The spines are somewhat longer near the dorsal and ventral borders, and the reticulation distinctly coarser near the anterior end of the shell.

"Length of plesiotype 0.69 mm., height 0.45 mm., width 0.28 mm."

Specimens assigned to this ornate species are rather large, averaging nearly a millimeter in length. Although reported from the upper and lower Midway of Texas, it is almost entirely confined to the Porters Creek, only 2 specimens having been obtained from Clayton samples.

Genus *CYTHEROMORPHA* Hirschman, 1901

CYTHEROMORPHA SCROBICULATA Alexander

Plate VIII, 8

Cytheromorpha scrobiculata Alexander, Jour. Pal., Vol. 8, no. 2, p. 223, pl. 32, fig. 19, 1934.

"Carapace in side view narrow, elongate, highest at anterior end. Dorsal margin nearly straight, very slightly arched. Ventral margin slightly sinuate near middle. Anterior end obliquely rounded. Posterior end much narrower than anterior, bluntly rounded. Surface of valves except for narrow zone near anterior end, coarsely and strongly pitted, and with two low, short, longitudinal plications; one of these plications is curved slightly upward and lies near the median longitudinal line of the valves, the other is straight, and is near the ventral margin. A narrow, crescent-shaped area at the anterior end of the shell is smooth except for a few low, narrow, radiating ridges.

"Length of holotype 0.43 mm., height 0.22 mm., width 0.09 mm. (single valve)."

A single specimen of this species was collected from the Porters Creek at one locality, and a second specimen from the uppermost Clayton at a second locality. The species is reported from both upper and lower Midway beds in Texas.

Genus LOXOCONCHA Sars, 1865

LOXOCONCHA MISSISSIPPIENSIS Kline, n. sp.

Plate VIII, 10

Carapace in side view subrectangular, nearly twice as long as high. Dorsal margin straight. Ventral margin straight, curving gently upward posteriorly to the short, blunt caudal process. Anterior end obliquely rounded, with narrow, compressed border. Surface of valves strongly and finely reticulate. Most of reticular ridges low and rounded; two short ridges elevated to set off small central depressed area; third fairly distinct ridge beginning near ventral margin a little anterior to center of shell, paralleling ventral margin, then curving upward parallel to dorsal margin, terminating below center of shell. Strongly convex, with greatest thickness at center.

Loxoconcha mississippiensis is very similar in appearance to *Loxoconcha perdecora* Alexander of the Texas Midway, from which it differs in the development of more or less distinct ridges.

This species is rare throughout the lower Midway, although it is relatively more abundant in the Clayton division.

Holotype: *Ostrea pulaskensis* bed, Clayton chalk, test hole M173, 36.3 to 41.5 feet below surface, 1/2 mile west of Pheba; Type slide VIII, 10, Mississippi Geological Survey.

Genus KRITHE Brady, Crosskey and Robertson, 1874

KRITHE PERATTICA Alexander

Plate VIII, 12

Krithe perattica Alexander, Jour. Pal., Vol. 8, no. 2, p. 229, pl. 34, figs. 1, 2; pl. 35, fig. 18, 1934.

“Carapace of female rhomboidal in side view, highest at middle. Dorsal margin rather strongly arched, curving downward posteriorly in a smooth, unbroken curve to the rounded, subacute postero-ventral angle. Ventral margin gently convex downward. Anterior end evenly rounded. Carapace strongly convex, widest at middle.

“Carapace of male similar in outline to that of female, but with dorsal margin less strongly arched, ventral margin nearly straight, and with valves less strongly convex.

“Length of holotype (females) 0.7 mm., height 0.37 mm., width 0.15 mm. (single valve).”

This is a rare species, a small number of specimens having been identified in samples from 5 localities. Stratigraphically, it appears to be confined to the Porters Creek and uppermost Clayton.

LOGS AND LOCATIONS OF TEST HOLES

| | | |
|---|------|------|
| M49 Jabe Christopher property (SW.1/4, NE.1/4, NW.1/4, Sec.9, T.20 N., R.13 E.) In gullied area 10 yards north of road and about 0.1 mile east of road forks | | Feet |
| Porters Creek clay | | |
| Clay, smooth to slightly silty; lower 2 feet glauconitic and very fossiliferous, P1 | 15.3 | |
| (Surface of hole) | | |
| Clay, tough gray calcareous, chalky, slightly glauconitic, S2..... | 8.7 | |
| Clayton chalk | | |
| Clay, tough gray calcareous, somewhat glauconitic and micaceous, S3 | 8.9 | |
| Clay, sandy micaceous, glauconitic gray to somewhat chalky, S4 | 8.4 | |
| | 41.3 | |
| M65A Dr. T. D. Houston property (NW.1/4, NE.1/4, NW.1/4, Sec.10, T.16S., R.3E.) Above roadcut in basal Midway 1/4 mile west of Prairie Creek; 20 feet south of road | | Feet |
| Topsoil | | |
| Clay, sandy black | 1.3 | |
| Clayton chalk | | |
| Clay, silty micaceous to smooth waxy glauconitic gray, S2..... | 9.4 | |
| | 10.7 | |
| M66 John Edd Snell, Jr., property (SE.1/4, SE.1/4, SW.1/4, Sec.15, T.16 S., R.3 E.) 30 feet west of road curve; at corner of garden | | Feet |
| Porters Creek clay | | |
| Clay, silty slightly micaceous reddish-brown..... | 8.3 | |
| Clayton chalk | | |
| Chalk, fine sandy glauconitic grayish-tan; scattered lime nodules, S2 | 8.4 | |
| Chalk, fine sandy slightly micaceous glauconitic greenish-gray, S3 | 1.5 | |
| | 18.2 | |
| M67 Walton Hill property (SW.1/4, SE.1/4, NW.1/4, Sec.15, T.16 S., R.3 E.) 20 yards north of road on east slope | | Feet |
| Clayton chalk | | |
| Chalk, tan sandy glauconitic highly fossiliferous; scattered lime nodules, S1 | 6.1 | |
| Chalk, sandy glauconitic grayish-tan, S2 | 1.7 | |
| | 7.8 | |
| M84 Archie Murrah property (NW.1/4, SE.1/4, SW.1/4, Sec.34, T.15 S., R.3 E.) Between 2 large trees 15 feet northeast of road | | |

CLAY COUNTY FOSSILS

73

| | Feet |
|---|------|
| Colluvium (Porters Creek clay?) | |
| Clay, tough silty grayish-tan | 6.0 |
| Clay-silt, gray, S2 | 3.0 |
| Clayton chalk | |
| Clay, very silty ferruginous brown and gray; scattered glauconite, S3 | 3.3 |
| Chalk, glauconitic slightly micaceous tan; highly fossiliferous, S4 | 2.4 |
| | 14.7 |
| M93 Sim Dixon property (NE.1/4, SW.1/4, NE.1/4, Sec.33, T.15 S., R.3 E.) At base of slope and 150 yards northeast of road | |
| | Feet |
| Porters Creek clay | |
| Clay, compact stiff grayish-tan | 3.8 |
| Clayton chalk | |
| Chalk, glauconitic grayish-tan; abundant lime nodules, <i>Ostrea pulaskensis</i> shells and foraminifera, S2 | 7.2 |
| | 11.0 |
| M122 W. F. Walker property (SW.1/4, NW.1/4, NW.1/4, Sec.32, T.16 S., R.3 E.) Half way down eastward facing slope, 100 yards northeast of the Ozzie Brownlee house | |
| | Feet |
| Porters Creek clay | |
| Clay, smooth khaki-tan, S1 | 3.8 |
| Clayton chalk | |
| Chalk, increasingly sandy glauconitic fossiliferous grayish-tan; scattered lime concretions, S2 | 5.2 |
| | 9.0 |
| M148 J. A. Murrah property (SE. corner, Sec.17, T.20 N., R.13 E.) On section line, 50 feet west of road and bridge over Double Cabin Creek | |
| | Feet |
| Alluvium | |
| Silt, tan | 1.0 |
| Porters Creek colluvium | |
| Clay, very sandy brown | 11.0 |
| Porters Creek clay | |
| Clay, silty calcareous to chalky tannish-gray; slightly glauconitic; foraminifera abundant, S3 | 7.5 |
| Clayton chalk | |
| Chalk, gray slightly micaceous; glauconitic near top; foraminifera abundant, S4 | 8.5 |
| Chalk, glauconitic gray; <i>Ostrea pulaskensis</i> , S5 | 5.8 |
| | 33.8 |
| M168 Bank of West Point property (NE.1/4, SE.1/4, NE.1/4, Sec.29, T.20 N., R.13 E.) In pasture, 37 feet west of road at point 0.4 mile south of railroad in Pheba | |
| | Feet |
| Alluvium | |
| Clay, silty slightly micaceous gray and brown; ferruginous concretions | 8.1 |

| | |
|--|------|
| Clay, silty to sandy highly ferruginous concretionary brown and gray, S2 | 1.3 |
| Porters Creek clay | |
| Clay, silty calcareous to smooth tannish-gray; foraminifera abundant, S3 | 10.0 |
| Clayton chalk | |
| Chalk, silty glauconitic fossiliferous gray, S4 | 12.6 |
| Chalk, very glauconitic gray; <i>Ostrea pulaskensis</i> , S5 | 2.0 |
| | 34.0 |
| M169 Bank of West Point property (SW.1/4, SW.1/4, SW.1/4, Sec. 28, T.20 N., R.13 E.) On north bank of Sun Creek Canal, 30 feet west of county line, 30 feet east of road, and 1.2 miles south of Pheba | |
| | Feet |
| Alluvium | |
| Clay, sandy and silty brownish-gray | 8.7 |
| Porters Creek clay | |
| Clay, silty somewhat micaceous gray and brown | 10.3 |
| Clayton chalk | |
| Clay, calcareous to chalky compact gray; foraminifera abundant in lower part; increasingly glauconitic toward base, S3 | 4.5 |
| Chalk, glauconitic dark-gray; foraminifera abundant | 16.3 |
| Chalk, glauconitic dark-gray; <i>Ostrea pulaskensis</i> , S5 | 1.4 |
| | 41.2 |
| M170 J. P. Champion property (SE. corner, Sec.8, T.20 N., R.13 E.) 50 feet west of county road; in small clump of trees in open pasture, near power line | |
| | Feet |
| Porters Creek clay | |
| Clay, silty micaceous tan | 25.0 |
| Clayton chalk | |
| Clay, silty calcareous to chalky glauconitic dark-gray; foraminifera abundant, S2 | 5.0 |
| Chalk, glauconitic light-gray; foraminifera abundant, S3a, S3b | 16.5 |
| Chalk, glauconitic gray; <i>Ostrea pulaskensis</i> , S4 | 2.0 |
| | 48.5 |
| M171 (NE.1/4, SW.1/4, SW.1/4, Sec.20, T.20 N., R.13 E.) In canal bed 25 feet north of bridge 0.8 mile due west of Pheba | |
| | Feet |
| Porters Creek clay | |
| Clay, compact silty micaceous ferruginous grayish-tan and tan | 3.0 |
| Clay, very silty micaceous somewhat calcareous grayish-tan; foraminifera, S 2 | 5.0 |
| Clayton chalk | |
| Clay, very silty micaceous gray; increasingly chalky with abundant foraminifera toward base, S3a, S3b | 26.0 |
| | 34.0 |
| M172 C. H. Hubart property (SE.1/4, SW.1/4, NE.1/4, Sec.21, T.20 N., R.13 E.) On north side of Highway 10, 0.1 mile west of bridge over Double Cabin Creek | |

CLAY COUNTY FOSSILS

75

| | Feet |
|---|------|
| Alluvial sand and silt | 1.5 |
| Clayton chalk | |
| Clay, silty calcareous to chalky glauconitic tannish-gray; foraminifera and phosphatic grains abundant, S2 | 8.7 |
| Chalk, slightly micaceous glauconitic tan to gray; foraminifera abundant | 8.1 |
| Chalk, slightly micaceous glauconitic gray; <i>Ostrea pulaskensis</i> , S4 | 2.0 |
| | 20.3 |
| M173 John Duke property (NE.1/4, SE.1/4, SW.1/4, Sec.20, T.20 N., R.13 E.) 0.5 mile west of Pheba at intersection of West Pheba Street and Harpole road | |
| | Feet |
| Porters Creek clay | |
| Clay, silty micaceous tannish-gray | 3.5 |
| Clay, silty calcareous gray; micaceous in upper half; slightly chalky and glauconitic at base | 21.8 |
| Clayton chalk | |
| Chalk, glauconitic gray; foraminifera abundant, S3 | 11.0 |
| Chalk, sandy glauconitic slightly micaceous; <i>Ostrea pulaskensis</i> in lower 2 feet, S4 | 5.2 |
| | 41.5 |
| M174 Cliett Estate property (NE.1/4, SE.1/4, NE.1/4, Sec.16, T.20 N., R.13 E.) Beside wagon trail at edge of woods on west side of county road; 1.1 miles north of Highway 10 | |
| | Feet |
| Porters Creek clay | |
| Clay, slightly silty grayish-tan | 3.0 |
| Clay, slightly silty micaceous grayish-tan; small ferruginous concretions abundant | 2.0 |
| Clayton chalk | |
| Clay, silty micaceous grayish-tan | 6.7 |
| Chalk, silty glauconitic grayish-tan; <i>Ostrea pulaskensis</i> from 15.5 feet to bottom, S4 | 6.5 |
| | 18.2 |
| M178 James Terry, Jr., property (NW.1/4, NW.1/4, SW.1/4, Sec.21, T.20 N., R.13 E.) Beneath large oak 15 feet east of road and 300 feet north of Pheba crossroads | |
| | Feet |
| Porters Creek colluvium | 2.5 |
| Porters Creek clay | |
| Clay, silty to smooth tannish-gray | 15.0 |
| Bentonite, silty ochreous yellow | 0.4 |
| Clay, smooth compact blocky grayish-tan | 3.1 |
| Clay, silty slightly micaceous gray | 1.3 |
| Clayton chalk | |
| Clay, chalky glauconitic gray; foraminifera abundant | 6.2 |
| Chalk, glauconitic slightly micaceous gray; <i>Ostrea pulaskensis</i> and abundant foraminifera, S7 | 3.8 |
| | 32.3 |

M183 Henry Miller Estate property (NW.1/4, NE.1/4, SW.1/4, Sec.21, T.20 N., R.13 E.) 50 feet north of Highway 10 at a point near woods and fence corner, 0.3 mile east of Henry Miller residence

| | Feet |
|---|------|
| Porters Creek colluvium | 10.0 |
| Porters Creek clay and upper Clayton chalk | |
| Clay, calcareous to chalky grayish-tan and gray; foraminifera in lower part | 19.0 |
| Clayton chalk | |
| Chalk, silty very glauconitic clay; foraminifera abundant, S3 .. | 2.0 |
| Chalk, glauconitic slightly micaceous gray; <i>Ostrea pulaskensis</i> , S4 .. | 2.2 |
| | 33.2 |

M184 Negro church property (C., E.1/2, SW.1/4, Sec.21, T.20 N., R.13 E.) 200 feet west of Pheba negro church and schoolhouse

| | Feet |
|---|------|
| Porters Creek colluvium | 9.1 |
| Porters Creek clay | |
| Clay, silty, slightly micaceous grayish-tan; lower part sandy, containing abundant foraminifera, S2 | 17.4 |
| Clayton chalk | |
| Chalk and chalky clay, silty glauconitic slightly micaceous gray; foraminifera abundant, S3 | 12.5 |
| Chalk, sandy slightly micaceous glauconitic gray; foraminifera abundant; <i>Ostrea pulaskensis</i> , S4 | 1.8 |
| | 40.8 |

M185 (SW.1/4, SW.1/4, SW.1/4, SE.1/4, Sec. 29, T.20 N., R.13 E.) On canal bank just north of county line at a point 0.5 mile west of Pheba-Starkville road

| | Feet |
|--|------|
| Alluvial clay | 8.0 |
| Porters Creek colluvium | 5.0 |
| Porters Creek clay | |
| Clay, silty micaceous tannish-gray | 8.0 |
| Clay, dark-gray silty micaceous; foraminifera abundant in basal part | 23.0 |
| Clayton chalk | |
| Chalk, somewhat glauconitic gray; foraminifera | 12.0 |
| Chalk, glauconitic gray; <i>Ostrea pulaskensis</i> , S6 | 1.9 |
| | 57.9 |

M187 Emmett Griffith property (NW.1/4, SE.1/4, NW.1/4, Sec.21, T.20 N., R.13 E.) At a point 0.3 mile northwest of Pheba cemetery on north facing slope south of Double Cabin Creek

| | Feet |
|--|------|
| Porters Creek colluvium | 7.0 |
| Porters Creek clay | |
| Clay, silty manganiferous or sideritic to bentonitic | 1.8 |

| | |
|--|------|
| Clayton chalk | |
| Chalk and chalky clay, glauconitic slightly micaceous grayish-tan; foraminifera and scattered phosphatic pebbles, S3 | 2.7 |
| Chalk, glauconitic slightly micaceous gray; <i>Ostrea pulaskensis</i> in lowest foot, S4 | 5.7 |
| | 17.2 |
| M188 C. & G. Railway property (SE.1/4, SE.1/4, Sec.20, T.20 N., R.13 E.) Near center of Pheba; 100 feet west of Starkville road crossing and 100 feet south of C. & G. Railway tracks | |
| | Feet |
| Porters Creek colluvium | 8.0 |
| Porters Creek clay | |
| Clay, silty micaceous tannish-gray | 16.4 |
| Clay, smooth calcareous gray somewhat glauconitic, S4 (in part) | 4.5 |
| Clayton chalk | |
| Chalk, silty slightly micaceous glauconitic gray; foraminifera abundant, S4 (in part) | 7.6 |
| Chalk, glauconitic fossiliferous gray; foraminifera abundant; <i>Ostrea pulaskensis</i> at base, S5 (?) | 8.0 |
| | 44.5 |
| M189 Guy Terry property (SW.1/4, SW.1/4, NE.1/4, Sec.28, T.20 N., R.13 E.) In pasture at a point about 0.5 mile east of Pheba-Starkville road and 0.5 mile south of C. & G. Railway tracks | |
| | Feet |
| Alluvium | 2.0 |
| Porters Creek colluvium | 6.0 |
| Clayton chalk | |
| Clay, silty calcareous to very chalky highly glauconitic; foraminifera abundant in lowest 2 feet, S3 | 10.5 |
| Chalk, massive gray glauconitic and fossiliferous; foraminifera abundant; <i>Ostrea pulaskensis</i> in basal foot, S4 | 8.0 |
| | 26.5 |
| M190 Federal Land Bank property (SW.1/4, NE.1/4, NW.1/4, Sec.33, T.20 N., R.13 E.) Margin of field and woods at a point 900 feet north of sawmill site and 1100 feet east of Pheba-Starkville road | |
| | Feet |
| Alluvium | 9.0 |
| Porters Creek clay | |
| Clay, smooth dark-gray to black | 8.0 |
| Clayton chalk | |
| Chalk, glauconitic fossiliferous gray; foraminifera abundant; <i>Ostrea pulaskensis</i> in basal 2 feet, S3 | 8.4 |
| | 25.4 |
| M192 James Milton property (N.1/2, SE.1/4, SE.1/4, Sec.28, T.20 N., R.13 E.) In bottom land of Sun Creek; by huge water oak about 0.2 mile east of section line and 0.1 mile north of creek | |

| | Feet |
|---|------------|
| Alluvium | 8.0 |
| Clayton chalk | |
| Sand and chalky clay, glauconitic; <i>Ostrea pulaskensis</i> at 12.0 feet, S2 | 9.9 |
| | <hr/> 17.9 |
| M195 Joe Washington property (SE.1/4, SW.1/4, SW.1/4, Sec.21, T.20 N., R.13 E.) In a pasture 0.1 mile south of C. & G. Railway tracks and 0.2 mile east of Pheba | |
| | Feet |
| Porters Creek colluvium | 8.0 |
| Porters Creek clay | |
| Clay, silty tannish-gray | 11.5 |
| Clay, silty to smooth somewhat calcareous dark-gray | 10.0 |
| Chalk, silty to sandy massive glauconitic gray; foraminifera very abundant in lower part, S4 | 6.0 |
| | <hr/> 35.5 |
| M196 Amzi Bennett property (C., SE.1/4, Sec.20, T.20 N., R.13 E.) On north side of road, 30 feet north of C. & G. Railway tracks and 0.3 mile west of Pheba | |
| | Feet |
| Porters Creek clay and colluvium | |
| Clay, silty to sandy tannish-gray; bentonite at 15 or 18 feet; foraminifera in lower part, S1a, S1b | 26.5 |
| Clayton chalk | |
| Clay, smooth to silty calcareous dark-gray; lower part glauconitic, with abundant foraminifera, S2a, S2b | 11.0 |
| | <hr/> 37.5 |
| M197 James Milton property (NE.1/4, SE.1/4, NW.1/4, Sec.28, T.20 N., R.13 E.) Near tree at edge of pasture 0.5 mile east of Pheba-Starkville road | |
| Not logged. Drilled to 11.5 feet in Clayton chalk, S1 (?) | |
| M198 May Smith property (SE.1/4, NE.1/4, NE.1/4, Sec.20, T.20 N., R.13 E.) Beside large oak tree between 2 houses; 30 feet west of Pheba-Colony road and 0.4 mile north of crossing at Highway 10 | |
| | Feet |
| Porters Creek colluvium | 9.0 |
| Porters Creek clay | |
| Clay, silty micaceous tannish-gray; tan bentonitic clay | 17.0 |
| Clay, smooth compact dark-gray | 15.5 |
| Chalk, glauconitic somewhat sandy gray; foraminifera abundant in lower part, S4 | 4.0 |
| | <hr/> 45.5 |
| M200 James Milton property (NE.1/4, SW.1/4, NW.1/4, Sec.28, T.20 N., R.13 E.) Beside oak tree near negro cabin in open pasture; 0.2 mile east of Pheba-Starkville road | |
| Not logged. Drilled to 27.5 feet in Clayton chalk, S1 (?) | |

PLATES AND EXPLANATIONS

DRAWINGS

BY

MARY LOUISE PEGUES

PLATE I

| | Page |
|---|------|
| 1. <i>Spiroplectammina laevis</i> (Roemer) var. <i>cretosa</i> Cushman, x33. Test hole M168, S4 | 13 |
| 2. <i>Clavulinoides midwayensis</i> Cushman, x33. Test hole M198, S4 | 13 |
| 3. <i>Robulus midwayensis</i> (Plummer), x33. Test hole M65A, S2... | 17 |
| 4. <i>Lenticulina rotulata</i> (Lamarck), x33. Outcrop east of M93.... | 21 |
| 5. <i>Robulus pseudo-costatus</i> (Plummer), x33. Test hole M192, S2.. | 18 |
| 6. <i>Robulus pseudo-costatus</i> (Plummer) var. <i>inornatus</i> Kline, n. var., x33. Test hole M93, S2..... | 18 |
| 7. <i>Robulus turbinatus</i> (Plummer), x33. Test hole M192, S2..... | 20 |
| 8. <i>Lenticulina degolyeri</i> (Plummer), x33. Outcrop above test hole M49 | 21 |
| 9. <i>Robulus rosetta</i> (Gumbel), x33. Test hole M49, S3..... | 19 |
| 10. <i>Marginulina earlandi</i> (Plummer), x33. Test hole M93, S2..... | 22 |
| 11. <i>Hemicristellaria subaculeata</i> (Cushman) var. <i>tuberculata</i> (Plum- mer), x33. Test hole M49..... | 22 |
| 12. <i>Robulus</i> cf. <i>pseudo-mammilligerus</i> (Plummer), x33. Outcrop above test hole M49..... | 19 |

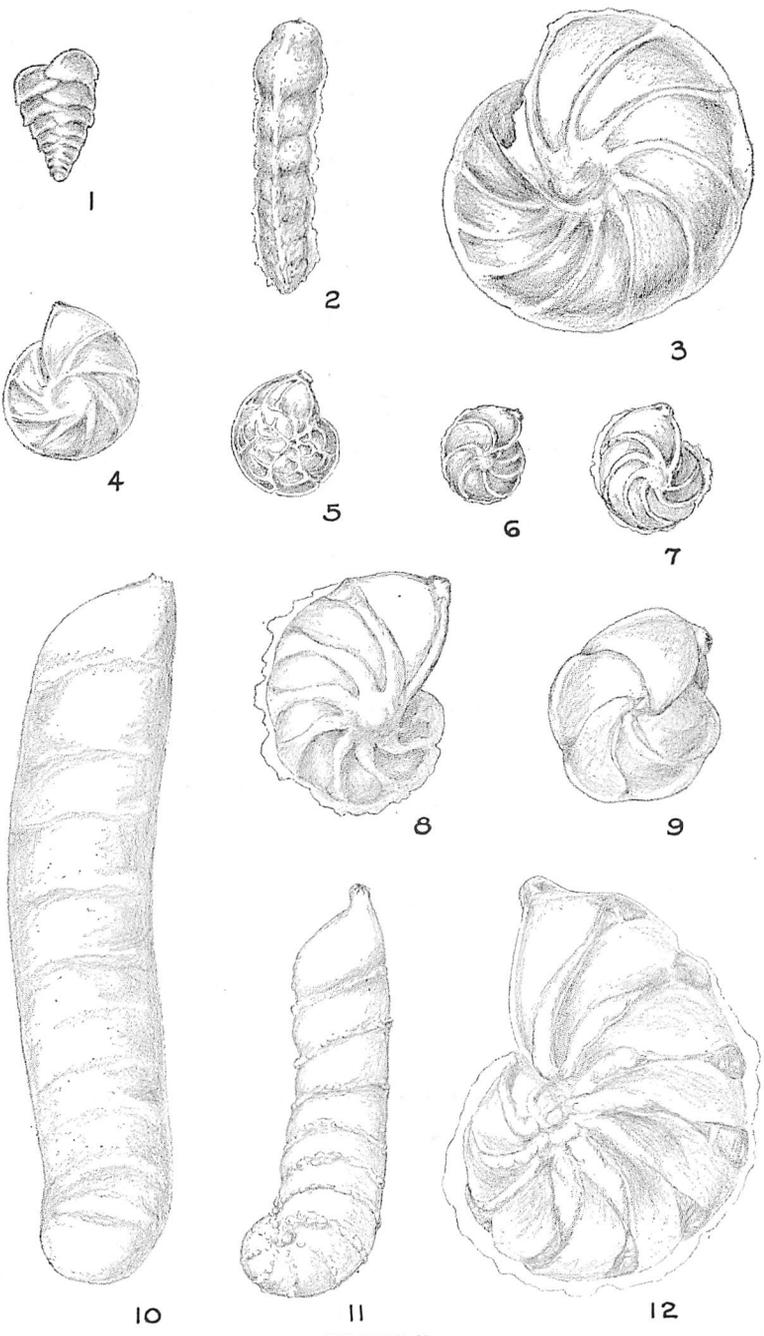


PLATE I

PLATE II

| | Page |
|---|------|
| 1. <i>Dentalina aculeata</i> (?) (d'Orbigny), x33. Test hole M93, S2 | 23 |
| 2. <i>Dentalina basiplanata</i> Cushman, x33. Test hole M49, S3 | 23 |
| 3. <i>Dentalina crinita</i> Plummer, x33. Test hole M170, S4 | 23 |
| 4. <i>Dentalina delicatula</i> Cushman, x33. Test hole M67, S1 | 24 |
| 5. <i>Dentalina gardnerae</i> (Plummer), x33. Test hole M49, S2 | 24 |
| 6. <i>Dentalina plummerae</i> Cushman, x33. Test hole M65A, S2 | 25 |
| 7. <i>Nodosarina</i> (<i>Fronicularia</i>) <i>goldfussi</i> (Reuss), x33. Test hole M49 | 28 |
| 8. <i>Nodosarina</i> (<i>Nodosaria</i>) <i>longiscata</i> (d'Orbigny), x33. Test hole M49 | 28 |
| 9. <i>Chrysalogonium granti</i> (Plummer), x33. Test hole M170, S4 | 29 |
| 10. <i>Nodosaria latejugata</i> Gumbel, x33. Test hole M200, S1 | 27 |
| 11. <i>Dentalina havanensis</i> Cushman and Bermudez, x33. Outcrop above test hole M49 | 25 |
| 12. <i>Pseudoglandulina manifesta</i> (Reuss), x33. Outcrop east of test hole M93 | 30 |
| 13. <i>Pseudoglandulina comata</i> (Batsch), x33. Test hole M49 | 29 |
| 14. <i>Dentalina pseudo-obliquestriata</i> (Plummer), x33. Test hole M185, S5b | 26 |
| 15. <i>Nodosarina</i> (<i>Nodosaria</i>) <i>aspera</i> (Reuss), x33. Test hole M49 | 27 |
| 16. <i>Nodosaria oligotoma</i> Reuss, x33. Outcrop east of test hole M93 | 27 |
| 17. <i>Pseudoglandulina</i> cf. <i>caudigera</i> (Schwager), x33. Outcrop above test hole M49 | 29 |

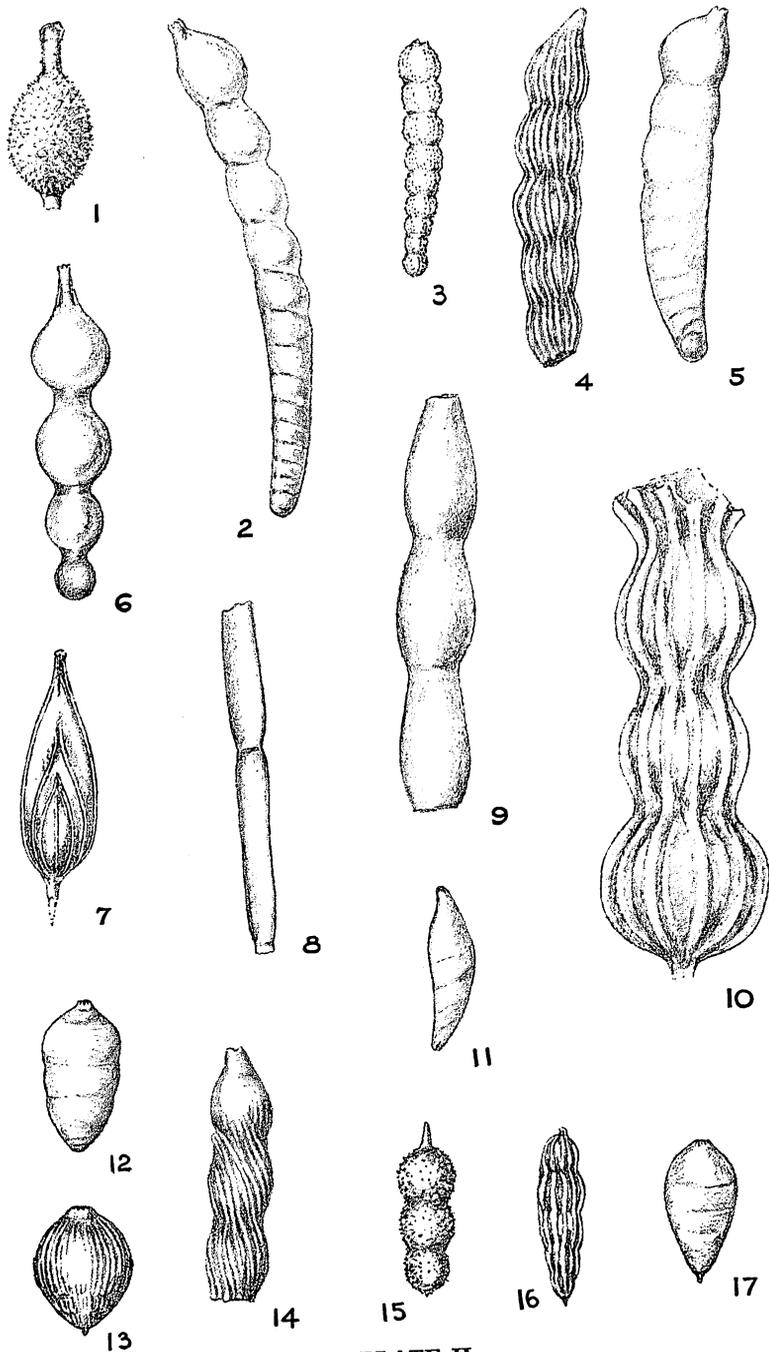


PLATE II

PLATE III

| | Page |
|---|------|
| 1. <i>Saracenaria cf. sublatifrons</i> (Plummer), x33. Outcrop east of test hole M93 | 31 |
| 2. <i>Saracenaria trigonata</i> (Plummer), x33. Outcrop east of test hole M93 | 31 |
| 3. <i>Saracenaria midwayensis</i> Kline, n. sp., x33. a, b, Peripheral views. c, Side view. Cotypes. Outcrop east of test hole M93..... | 30 |
| 4. <i>Vaginulina glabra</i> (d'Orbigny), x33. Outcrop east of test hole M93 | 32 |
| 5. <i>Vaginulina legumen</i> var. <i>elegans</i> d'Orbigny, x33. Test hole M170, S4 | 33 |
| 6. <i>Vaginulina plumoides</i> Plummer, x33. Test hole M169, S5..... | 33 |
| 7. <i>Vaginulina gracilis</i> Plummer, x33. Test hole M187, S4..... | 32 |
| 8. <i>Vaginulina robusta</i> Plummer, x33. Test hole M49..... | 34 |
| 9. <i>Palmula cf. budensis</i> (Hantken), x33. Outcrop east of test hole M93 | 34 |
| 10. <i>Palmula cf. primitiva</i> Cushman, x33. Outcrop east of test hole M93 | 35 |
| 11. <i>Palmula rugosa</i> (d'Orbigny), x33. Test hole M174, S4..... | 36 |
| 12. <i>Palmula delicatissima</i> (Plummer), x33. Test hole M198, S4.. | 35 |
| 13. <i>Frondicularia archiaciana</i> d'Orbigny, x33. Test hole M93, S2.... | 36 |
| 14. <i>Frondicularia cf. franki</i> Cushman, x33. Test hole M66, S2..... | 37 |

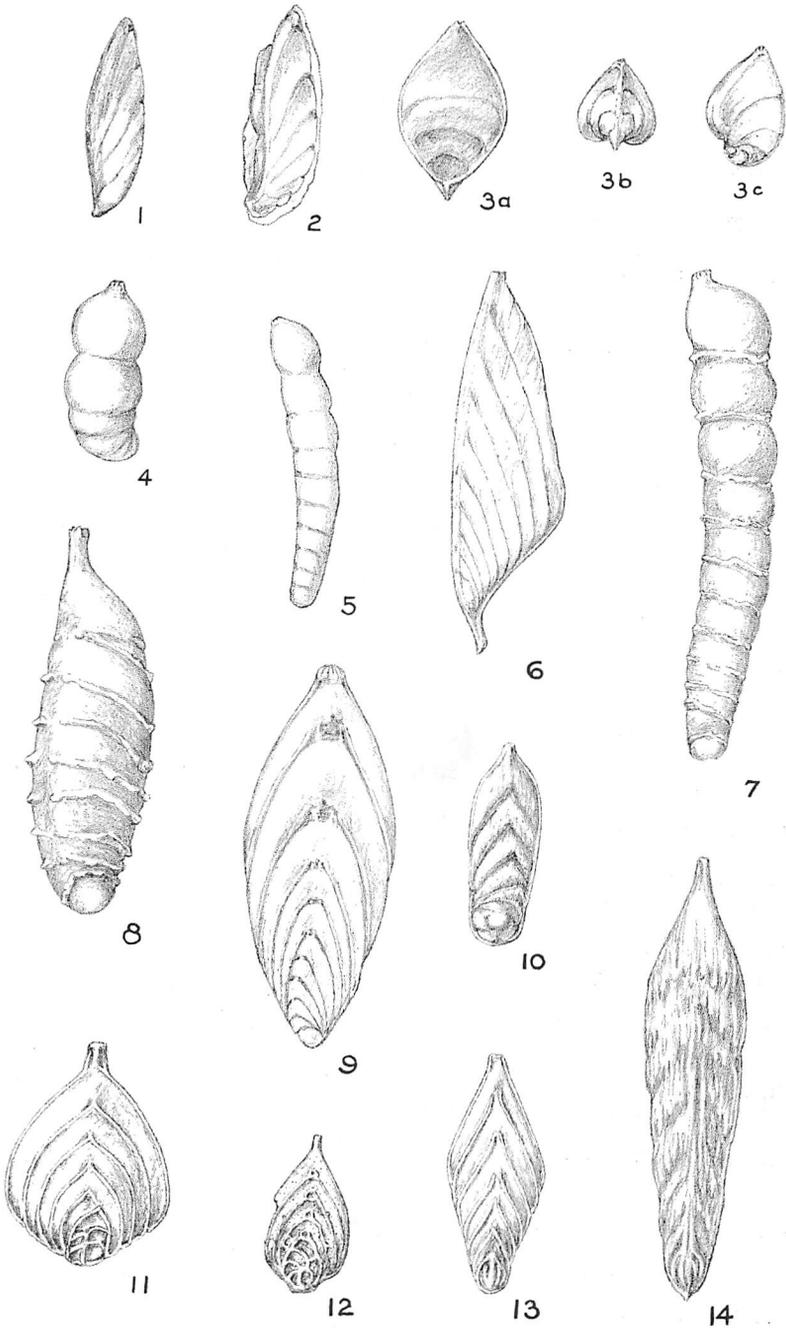


PLATE III

PLATE IV

| | Page |
|---|------|
| 1. <i>Globulina gibba</i> d'Orbigny, x33. Test hole M93, S2..... | 40 |
| 2. <i>Guttulina problema</i> d'Orbigny, x33. Test hole M93, S2..... | 39 |
| 3. <i>Lagena hispida</i> Reuss, x33. Test hole M65A, S2 | 37 |
| 4. <i>Lagena laevis</i> (Montagu), x33. Test hole M65A, S2..... | 38 |
| 5. <i>Lagena orbignyana</i> (Seguenza), x50. a, Side view. b, Peripheral view. Test hole M49..... | 38 |
| 6. <i>Sigmomorphina</i> sp., x33. Test hole M170, S3b..... | 41 |
| 7. <i>Polymorphina frondea</i> (Cushman), x33. Test hole M178, S7.... | 41 |
| 8. <i>Polymorphina cushmani</i> Plummer, x33. Test hole M184, S3.... | 41 |
| 9. <i>Polymorphina</i> sp., x33. Test hole M190, S3..... | 41 |
| 10. <i>Ramulina globulifera</i> (H. B. Brady), x33. Outcrop east of test hole M93 | 42 |
| 11. <i>Bullopورا chapmani</i> (Plummer), x33. Test hole M171, S3b.... | 42 |
| 12. <i>Bullopورا chapmani</i> (Plummer) var. <i>hispida</i> Kline, n. var., x33. Holotype. Test hole M49, S2 | 43 |
| 13. <i>Bullopورا laevis</i> (Sollas), x33. Test hole M178, S7..... | 43 |
| 14. <i>Bolivina midwayensis</i> Cushman, x33. Test hole M200, S1..... | 49 |
| 15. <i>Ramulina globulifera</i> (H. B. Brady), x33. Outcrop east of test hole M93 | 42 |
| 16. <i>Bullopورا laevis</i> (Sollas) var. <i>hispida</i> Kline, n. var., x33. Holotype. Test hole M49, S2..... | 43 |
| 17. <i>Entosolenia morsei</i> Kline, n. sp., x33. Holotype. Test hole M49, S2 | 48 |
| 18. <i>Siphogenerinoides eleganta</i> (Plummer), x33. Test hole M187, S4 | 46 |
| 19. <i>Euovigerina excavata</i> Cushman, x60. Outcrop above test hole M49 | 45 |
| 20. <i>Bulimina</i> (<i>Desinobulimina</i>) <i>quadrata</i> Plummer, x33, a, Megalospheric form. b, Microspheric form. Test hole M187, S4 and outcrop above M49 | 48 |
| 21. <i>Nonionella welleri</i> (Plummer) x33. a, Ventral view, b. Dorsal view. Test hole M188, S4 | 44 |

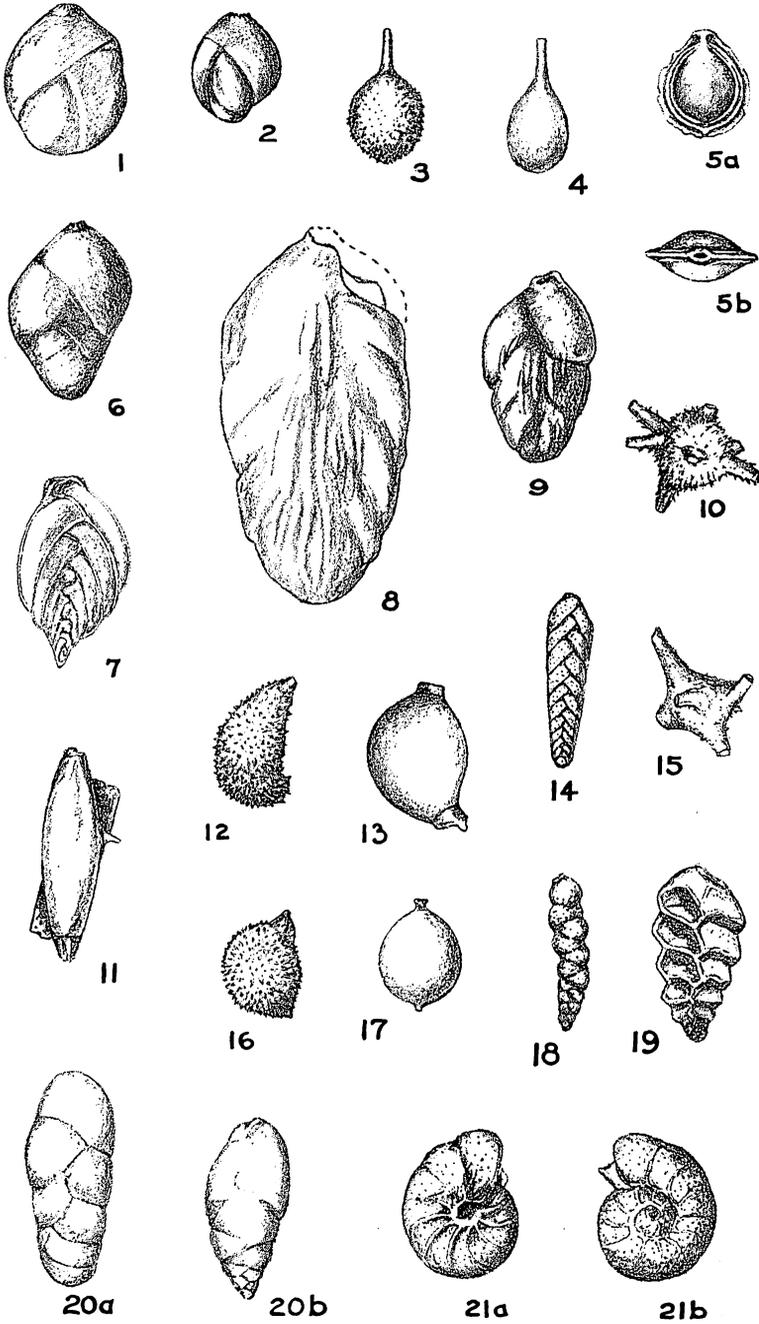


PLATE IV

PLATE V

| | Page |
|---|------|
| 1. <i>Ellipsonodosaria alexanderi</i> Cushman, x33. Test hole M49, S2.. | 51 |
| 2. <i>Ellipsonodosaria alexanderi</i> Cushman, x65. Test hole M49, S2.. | 51 |
| 3. <i>Anomalina acuta</i> (Plummer), x33. Ventral view. Test hole M148, S3 | 59 |
| 4. <i>Anomalina acuta</i> (Plummer), x33. Dorsal view. Test hole M148, S3 | 59 |
| 5. <i>Cibicides praecursorius</i> (Schwager), x33. Dorsal view. Test hole M170, S4 | 62 |
| 6. <i>Cibicides praecursorius</i> (Schwager), x33. Ventral view. Test hole M65A, S2 | 62 |
| 7. <i>Loxostoma applinae</i> (Plummer), x33. Test hole M200, S1..... | 50 |
| 8. <i>Ellipsonodosaria plummerae</i> Cushman, x33. Outcrop east of test hole M93 | 51 |
| 9. <i>Discorbis midwayensis</i> Cushman, x33. Dorsal view. Test hole M84, S4 | 52 |
| 10. <i>Discorbis midwayensis</i> Cushman, x33. Ventral view. Test hole M84, S4 | 52 |
| 11. <i>Valvulineria allomorphinoides</i> (Reuss), x33. Ventral view. Test hole M198, S4 | 52 |
| 12. <i>Valvulineria allomorphinoides</i> (Reuss), x33. Dorsal view. Test hole M198, S4 | 52 |
| 13. <i>Gyroidina subangulata</i> (Plummer), x33. Dorsal view. Test hole M198, S4 | 53 |
| 14. <i>Gyroidina subangulata</i> (Plummer), x33. Side view. Test hole M198, S4 | 53 |
| 15. <i>Gyroidina subangulata</i> (Plummer), x33. Ventral view. Test hole M198, S4 | 53 |
| 16. <i>Eponides cf. tenera</i> (H. B. Brady), x33. Dorsal view. Outcrop east of test hole M93 | 53 |
| 17. <i>Eponides cf. tenera</i> (H. B. Brady), x33. Ventral view. Outcrop east of test hole M93..... | 53 |
| 18. <i>Eponides cf. tenera</i> (H. B. Brady), x33. Side view. Outcrop east of test hole M93..... | 53 |
| 19. <i>Parrella expansa</i> Toulmin, x33. Dorsal view. Test hole M49... | 54 |
| 20. <i>Parrella expansa</i> Toulmin, x33. Ventral view. Test hole M49.... | 54 |
| 21. <i>Siphonina prima</i> Plummer, x33. Ventral view. Test hole M49, S3 | 55 |
| 22. <i>Siphonina prima</i> Plummer, x33. Dorsal view. Test hole M49, S3 | 55 |
| 23. <i>Pulvinulina exigua</i> H. B. Brady, x33. Ventral view. Test hole M200, S1 | 55 |
| 24. <i>Pulvinulina exigua</i> H. B. Brady, x33. Dorsal view. Test hole M200, S1 | 55 |

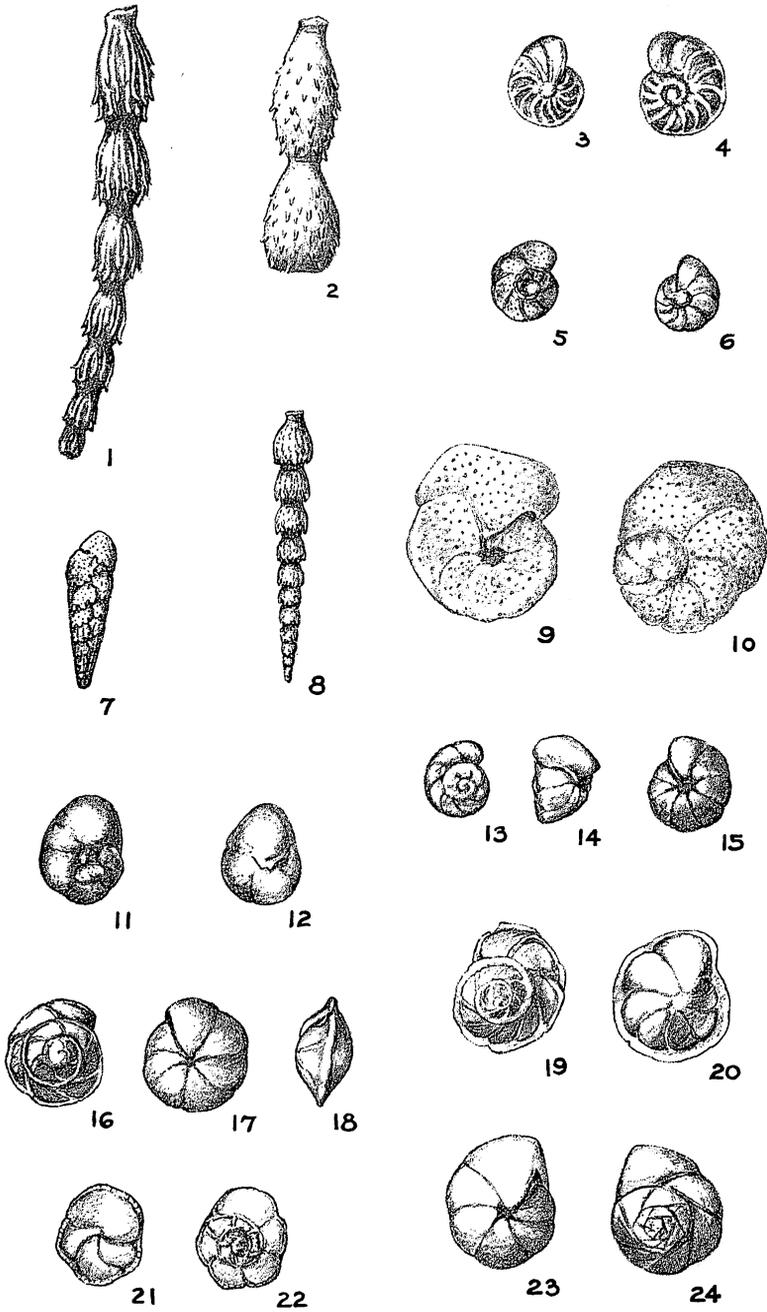


PLATE V

PLATE VI

| | Page |
|--|------|
| 1. <i>Allomorpha trigona</i> Reuss, x33. Dorsal view. Outcrop east of test hole M93..... | 56 |
| 2. <i>Allomorpha trigona</i> Reuss, x33. Ventral view. Outcrop east of test hole M93..... | 56 |
| 3. <i>Chilostomella subtriangularis</i> Kline, n. sp., x33. Holotype. Outcrop east of M93..... | 56 |
| 4. <i>Pullenia quinqueloba</i> (Reuss), x33. Test hole M187, S4..... | 57 |
| 5. <i>Globigerina compressa</i> Plummer, x33. Side view. Outcrop east of M93..... | 58 |
| 6. <i>Globigerina compressa</i> Plummer, x33. Ventral view. Test hole M171, S3b..... | 58 |
| 7. <i>Pullenia quinqueloba</i> (Reuss), x33. Test hole M187, S4..... | 57 |
| 8. <i>Chilostomelloides eocenica</i> Cushman, x33. Test hole M49..... | 57 |
| 9. <i>Globigerina pseudo-bulloides</i> Plummer, x33. Ventral view. Test hole M49..... | 58 |
| 10. <i>Globigerina pseudo-bulloides</i> Plummer, x33. Dorsal view. Test hole M168, S3..... | 58 |
| 11. <i>Globigerina pseudo-bulloides</i> Plummer, x33. Side view. Outcrop east of M93..... | 58 |
| 12. <i>Globigerina triloculinoides</i> Plummer, x33. Ventral view. Test hole M178, S7..... | 59 |
| 13. <i>Globigerina triloculinoides</i> Plummer, x33. Dorsal view. Test hole M168, S3..... | 59 |
| 14. <i>Globotruncana</i> sp., x33. Test hole M168, S3..... | 59 |
| 15. <i>Anomalina midwayensis</i> (Plummer) var. <i>trochoidea</i> (Plummer), x33. Ventral view. Test hole M84, S4..... | 61 |
| 16. <i>Anomalina midwayensis</i> (Plummer) var. <i>trochoidea</i> (Plummer), x33. Dorsal view. Test hole M84, S4..... | 61 |
| 17. <i>Anomalina midwayensis</i> (Plummer), x33. Ventral view. Test hole M148, S3..... | 60 |
| 18. <i>Anomalina midwayensis</i> (Plummer), x33. Dorsal view. Test hole M49, S2..... | 60 |
| 19. <i>Cibicides vulgaris</i> (Plummer), x33. Ventral view. Test hole M174, S4..... | 63 |
| 20. <i>Cibicides vulgaris</i> (Plummer), x33. Dorsal view. Test hole M174, S4..... | 63 |
| 21. <i>Cibicides alleni</i> (Plummer), x33. Dorsal view. Test hole M168, S3..... | 63 |
| 22. <i>Cibicides alleni</i> (Plummer), x33. Ventral view. Test hole M148, S2..... | 63 |
| 23. <i>Pleurostomella</i> cf. <i>brevis</i> . var. <i>alternans</i> Schwager, x33. Test hole M49, S2..... | 50 |
| 24. <i>Virgulina wilcoxensis</i> Cushman and Ponton, x33. Test hole M49, S2..... | 49 |

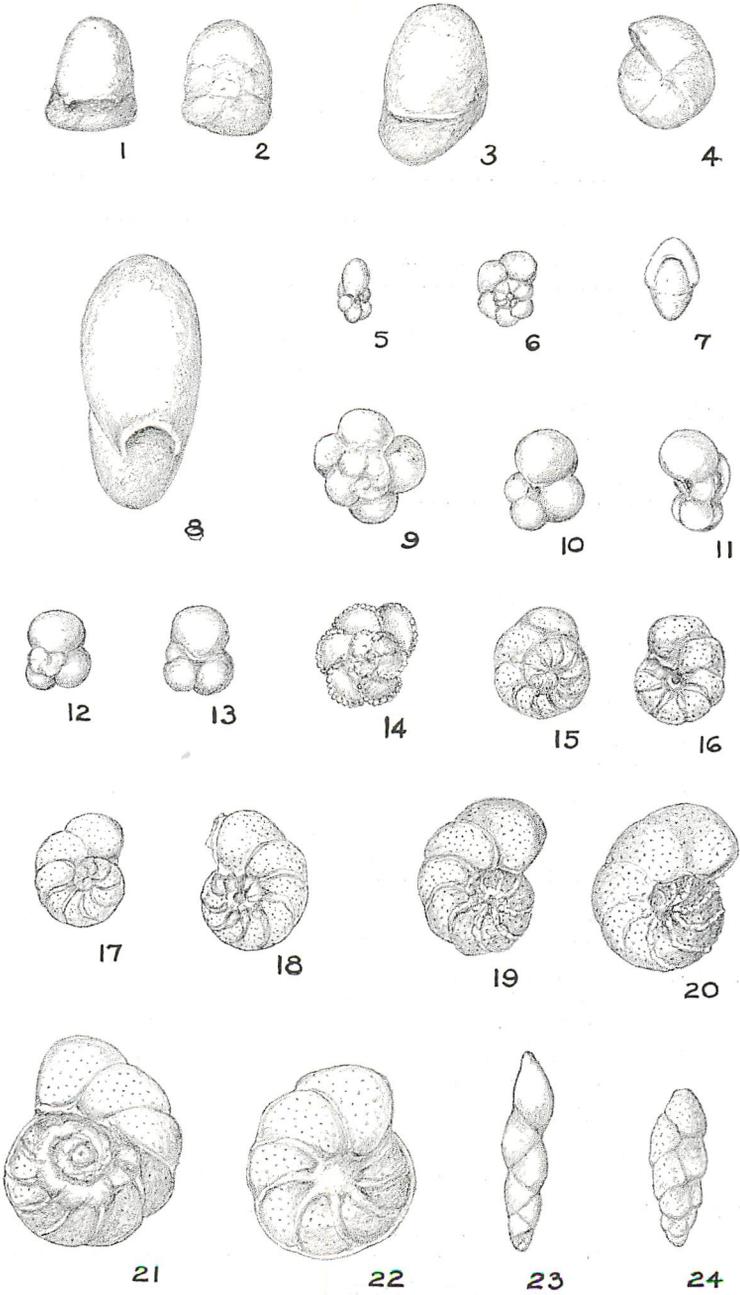


PLATE VI

PLATE VII

| | Page |
|---|------|
| 1. <i>Planoglobulina acervulinoides</i> Cushman, x65. Test hole M172, S2 | 45 |
| 2. <i>Pseudouigerina naeolensis</i> Cushman and Todd, x65. Test hole M49, S2 | 46 |
| 3. <i>Heterostomella</i> sp., x65. East of test hole M49..... | 16 |
| 4. <i>Heterostomella cuneata</i> Sandidge, x33. Test hole M168, S2 | 15 |
| 5. <i>Pyrulina cylindroides</i> (Roemer), x33. Test hole M168, S2 | 40 |
| 6. <i>Dorothia</i> sp. x33. Gully above test hole M49..... | 17 |
| 7a, 7b. <i>Dorothia</i> sp., x33. Sections transverse to axis. Test hole M49, S3 | 17 |
| 8. <i>Bulimina cacumenata</i> Cushman and Parker, x65. Test hole M49, S2 | 47 |
| 9. <i>Bulimina arkadelphiana</i> Cushman and Parker var. <i>midwayensis</i> Cushman and Parker, x33. Test hole M195, S4.. | 47 |
| 10. <i>Marssonella oxyconca</i> (Reuss), x33. Test hole M65A, S2.. | 16 |
| 11. <i>Gaudryina rugosa</i> d'Orbigny, x33. Test hole M168, S3.. | 14 |
| 12. <i>Gumbelina morsei</i> Kline, n. sp. x65. Holotype test hole M49, S2 | 44 |
| 13. <i>Vaginulina legumen</i> (Linnaeus) x33. Gully above test hole M49 | 32 |
| 14. <i>Gaudryina</i> sp., x33. Test hole M170, S4..... | 15 |
| 15, 16. <i>Lagena sulcata</i> (Walker and Jacob) var. <i>semiinterrupta</i> Berry, x65. 15 from test hole M200, S1; 16 from test hole M171, S3b | 39 |
| 17. <i>Dentalina plummerae</i> Cushman var. Gully above test hole M49 | 25 |
| 18, 19, 20. <i>Cibicides browni</i> Kline, n. sp., x33. 18, dorsal view; 19, ventral view; 20, peripheral view. Cotypes from test hole M49, S2 | 62 |
| 21. <i>Lagena</i> cf. <i>primigera</i> H. B. Brady, x65. Test hole M66, S2 .. | 38 |
| 22. <i>Dentalina</i> (?) sp., x33. Gully above test hole M49..... | 26 |
| 23. <i>Dentalina</i> cf. <i>solvata</i> Cushman, x33. Gully above test hole M49 | 26 |
| 24, 25, 26. <i>Anomalina</i> cf. <i>ammonoides</i> (Reuss). 24, dorsal view; 25, peripheral view; 26, dorsal view. Specimens from test hole M93, S2 | 60 |
| 27. <i>Robulus</i> cf. <i>wilcoxensis</i> Cushman and Ponton, x33. Gully above test hole M49..... | 20 |

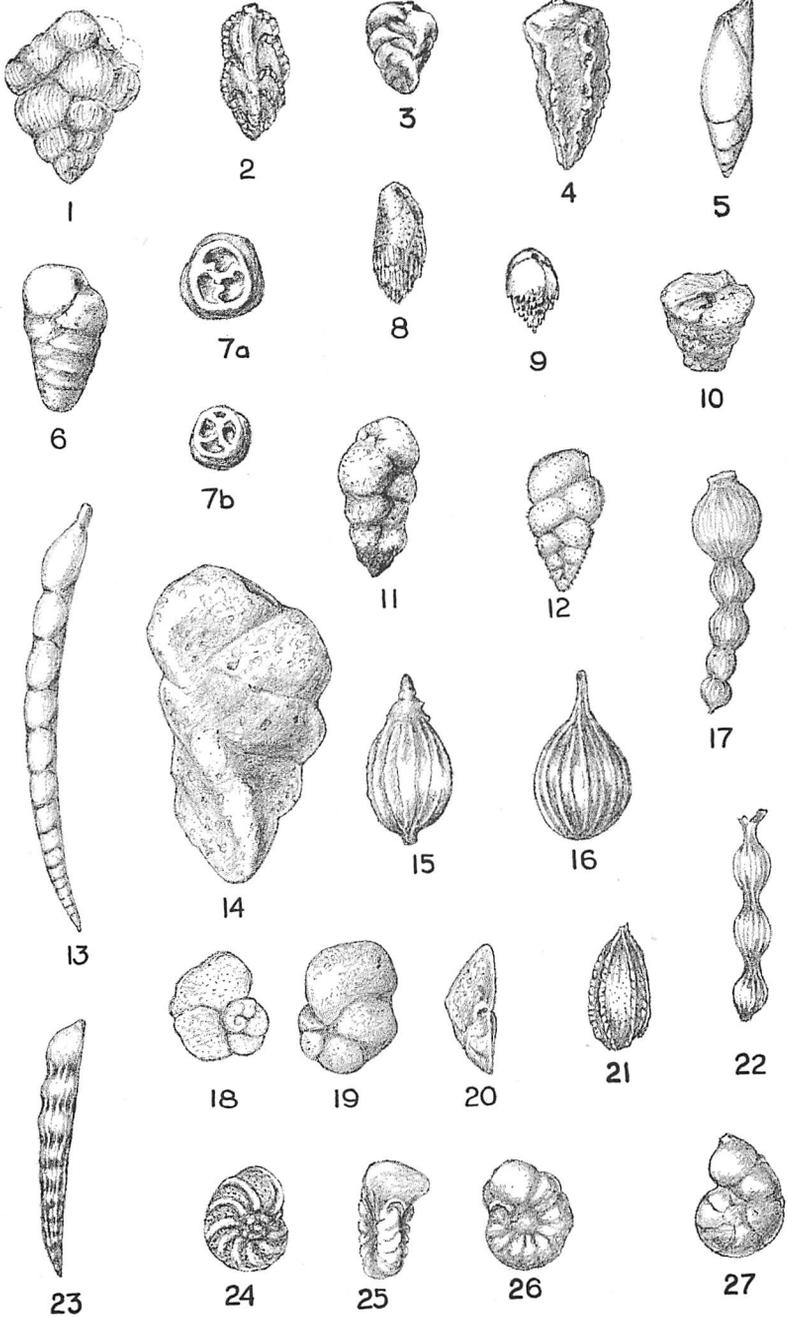


PLATE VII

PLATE VIII

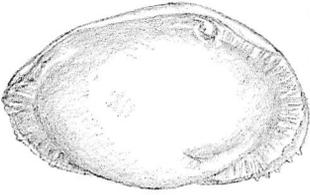
| | Page |
|--|------|
| 1. <i>Paracypris perapiculata</i> Alexander, x33. Test hole M49. | 65 |
| 2. <i>Argilloecia faba</i> Alexander, x65. Test hole M178, S7. | 64 |
| 3. <i>Brachycythere plena</i> Alexander, x33. Test hole M196, S2b. | 67 |
| 4. <i>Bairdia magna</i> Alexander, x33. Test hole M192, S2. | 65 |
| 5. <i>Brachycythere interrassilis</i> Alexander, x33. Test hole M49, S3. | 67 |
| 6. <i>Cythereis spiniferrima</i> Jones and Sherborn, x33. Test hole M49. | 68 |
| 7. <i>Brachycythere formosa</i> Alexander, x33. Test hole M49, S3. | 66 |
| 8. <i>Cytheromorpha scrobiculata</i> Alexander, x65. Test hole M171, S3a | 69 |
| 9. <i>Cytherella symmetrica</i> Alexander, x33. Test hole M49, S3. | 64 |
| 10. <i>Loxoconcha mississippiensis</i> Kline, n. sp., x65. Holotype. Test hole M173, S4 | 70 |
| 11. <i>Cythereis prestwichiana</i> Jones and Sherborn, x33. Test hole M65A, S2 | 68 |
| 12. <i>Krithe perattica</i> Alexander, x33. Test hole M170, S3a | 70 |



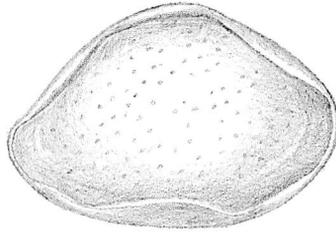
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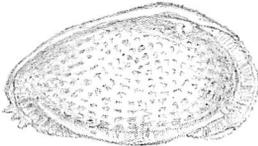
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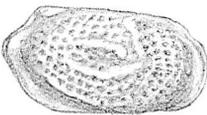
7



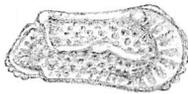
8



9



10



11



12

PLATE VIII

INDEX

| | Page | Page |
|---|------|--|
| Alabama 6, 14, 17, 19, 22, 23, 24, 26-29, 31, 32, 35, 36, 45, 46, 48, 49, 50, 54, 55, 57, 60, 63 | | Dixon, Sim, property of -----16, 73 |
| Allomorpha trigona -----11, 56, 90, 91 | | Dorothia alabamensis -----17 |
| Anomalina acuta -----9, 11, 59, 88, 89 | | sp. -----10, 17, 92, 93 |
| cf. ammonoides -----9, 11, 60, 92, 93 | | Double Cabin Creek -----45, 73, 76 |
| midwayensis -----9, 11, 60, 90, 91 | | Duke, John, property of -----75 |
| midwayensis trochoidea -----9, 61, 90, 91 | | Ellipsonodosaria alexanderi 8, 11, 51, 88, 89 |
| Argilloecia faba -----9, 11, 64, 94, 95 | | plummerae -- -----8, 11, 51, 88, 89 |
| Bairdea magna -----9, 12, 65, 94, 95 | | Entsolenia morsei -----8, 11, 48, 86, 87 |
| Bank of West Point property -----73, 74 | | Eouvigerina excavata -----8, 11, 45, 86, 87 |
| Bennett, Amzi, property of -----78 | | Eponides cf. tenera -----8, 11, 53, 88, 89 |
| Bergquist, Harlan R. -----5, 15, 16, 17, 21, 26, 33, 39, 40, 45, 46, 47, 48, 60 | | Federal Land Bank property -----77 |
| Bolivina midwayensis -----8, 11, 49, 86, 87 | | Froncularia archiaciana -----8, 36, 84, 85 |
| Booneville -----26 | | cf. frankei -----8, 10, 37, 84, 85 |
| Brachycythere formosa -----9, 12, 66, 94, 95 | | Gaudryina rugosa -----10, 14, 92, 93 |
| interrasilis -- -----9, 12, 67, 94, 95 | | sp. -----7, 15, 92, 93 |
| plena -----9, 12, 67, 94, 95 | | Globigerina compressa -----8, 11, 58, 90, 91 |
| Bulimina arkadelphia | | pseudo-bulloides -- -----8, 11, 58, 90, 91 |
| midwayensis -----11, 47, 92, 93 | | trilocolinoides -- -----8, 11, 59, 90, 91 |
| cacumenata -----11, 47, 92, 93 | | Globotruncana sp. -----11, 59, 90, 91 |
| (Desinobulimina) quadrata --8, 11, 48, 57, 86, 87 | | Globulina gibba -----8, 11, 40, 86, 87 |
| Bullopore chapmani -----8, 11, 42, 43, 86, 87 | | Griffith, Emmett, property of -----76 |
| chapmani hispida -----11, 43, 86, 87 | | Gumbelina midwayensis -----44 |
| laevis -----8, 11, 43, 86, 87 | | morsei -- -----8, 44, 92, 93 |
| laevis hispida -----11, 43, 86, 87 | | Guttulina problema -----8, 11, 39, 86, 87 |
| C. & G. Railway property -----77 | | Gyroidina subangulata --6, 8, 11, 53, 88, 89 |
| Champion, J. P., property of -----74 | | Hemicristerella subaculeata |
| Chilostomella subtriangularis -----56, 90, 91 | | tuberculata -- -----7, 10, 22, 80, 81 |
| Chilostomelloides eocenica -----11, 56, 90, 91 | | Heterostomella cuneata -----10, 15, 92, 93 |
| Choctaw County -----21 | | sp. -----10, 16, 92, 93 |
| Christopher, J., property of --17, 26, 33, 72 | | Hill, Walton, property of -----72 |
| Chrysalogonium granti -----7, 10, 29, 82, 83 | | Houston, Dr. T. D., property of -----16, 72 |
| Cibicides alleni -----6, 9, 11, 61, 90, 91 | | Hubbert, C. H., property of -----45, 74 |
| browni -----9, 11, 62, 92, 93 | | Jackson formation -----5 |
| praecursorius -----9, 11, 62, 88, 89 | | Kincaid formation -----6 |
| vulgaris -----9, 11, 63, 90, 91 | | Krithe perattica -----9, 12, 70, 94, 95 |
| Clavulinoides midwayensis --7, 10, 13, 80, 81 | | Lagena apiculata -----49 |
| Cliett Estate property -----75 | | hispida -----8, 37, 86, 87 |
| Cretaceous -----13, 14, 20, 23, 36, 60 | | laevis -----8, 10, 38, 86, 87 |
| Cushman, Joseph A. --19, 20, 21, 22, 24, 26, 29, 36, 38, 49, 50, 60, 63 | | orbignyana -----10, 38, 86, 87 |
| Cythereis prestwichiana -----9, 12, 68, 94, 95 | | cf. primigera -----8, 38, 92, 93 |
| spiniferrima -----9, 12, 68, 94, 95 | | sulcata semiinterrupta --8, 11, 39, 92, 93 |
| Cythereella symmetrica -----9, 11, 64, 94, 95 | | Lenticulina degolyeri -----7, 10, 21, 80, 81 |
| Cytheromorpha scrobiculata 9, 12, 69, 94, 95 | | rotulata -- -----10, 21, 80, 81 |
| Dentalina aculeata (?) -----7, 10, 23, 82, 83 | | Loxoconcha perdecora -----70 |
| basiplanata -----7, 23, 82, 83 | | mississippiensis -- -----9, 12, 70, 94, 95 |
| crinita -- -----7, 10, 23, 82, 83 | | Loxostoma applinae -----8, 11, 50, 88, 89 |
| delicatula -----7, 24, 82, 83 | | Marginulina earlandi -----7, 22, 80, 81 |
| gardnerae -----7, 24, 82, 83 | | Marssonella oxycona -----7, 10, 16, 92, 93 |
| havanensis -----10, 25, 82, 83 | | Mexico -----23 |
| plummerae -----7, 10, 25, 82, 83 | | Miller, Henry, property of -----76 |
| plummerae var. -----10, 26, 92, 93 | | Milton, James, property of -----77, 78 |
| pseudo-obliques triata -----7, 10, 82, 83 | | Montpelier -----16, 19, 31, 57 |
| cf. solvata -----10, 26, 92, 93 | | Murrah, Archie, property of -----72 |
| (?) sp. -----10, 26, 92, 93 | | Murrah, J. A., property of -----73 |
| Discorbis midwayensis -----8, 52, 88, 89 | | Naheola -----21, 22, 46 |
| | | Navarro -----24, 66 |
| | | Nodosaria latejugata 7, 10, 27, 42, 43, 82, 83 |
| | | oligotoma -- -----10, 27, 82, 83 |

| | Page | | Page |
|----------------------------------|--|---------------------------------|--|
| Nodosarina (Fronicularia) | | Spiroplectammina laevis cretosa | 7, 10, 13, 80, 81 |
| goldfussi | 10, 28, 82, 83 | Sun Creek | 74, 77 |
| (Nodosaria) aspera | 10, 27, 82, 83 | Tennessee | 38 |
| (Nodosaria) longiscata | 7, 10, 28, 82, 83 | Terry, Guy, property of | 77 |
| Nonionella welleri | 8, 11, 43, 86, 87 | Terry, James, Jr., property of | 75 |
| Old Canton Landing, Ala. | 45 | Test hole M49 | 17, 43, 44, 45, 48, 49, 57, 62, 72, 80, 82, 86, 88, 90, 92, 94 |
| Oligocene | 41 | M65A | 72, 80, 82, 86, 88, 92, 94 |
| Ostrea pulaskensis | 6, 7, 19, 70, 73, 74, 75, 76, 77, 78 | M66 | 39, 72, 84, 92 |
| Palmula cf. budensis | 8, 10, 34, 84, 85 | M67 | 72, 82 |
| delicatissima | 10, 35, 84, 85 | M84 | 72, 88, 90 |
| cf. primitiva | 8, 10, 35, 84, 85 | M93 | 19, 31, 56, 57, 73, 80, 82, 84, 86, 88, 90, 92 |
| rugosa | 8, 36, 84, 85 | M122 | 73 |
| Paracypris perapiculata | 11, 65, 94, 95 | M148 | 73, 88, 90 |
| Parrella expansa | 8, 11, 54, 88, 89 | M168 | 14, 15, 73, 80, 90, 92 |
| Pegues, Mary Louise | 5 | M169 | 74, 84 |
| Pheba | 14, 17, 26, 43, 44, 45, 47, 48, 49, 62, 73, 74, 76, 77, 78 | M170 | 74, 82, 84, 86, 88, 90, 94 |
| Planoglobulina acervulinoides | 8, 45, 92, 93 | M171 | 74, 86, 90, 92, 94 |
| Pleurostomella cf. brevis | | M172 | 45, 74, 92 |
| alternans | 11, 50, 90, 91 | M173 | 75, 94 |
| Plummer, Helen J. | 6, 18, 19, 20, 21, 22, 31, 32, 33, 43, 49, 50, 56, 58, 61, 63 | M174 | 75, 84, 90 |
| Polymorphina cushmani | 6, 8, 41, 86, 87 | M178 | 75, 86, 90, 94 |
| frondea | 8, 11, 41, 86, 87 | M183 | 76 |
| sp. | 8, 41, 86, 87 | M184 | 76, 86 |
| Prairie Bluff chalk | 5 | M185 | 76, 82 |
| Prairie Creek | 17, 22 | M187 | 76, 84, 86, 88, 90 |
| Pseudoglandulina cf. caudigera | 7, 10, 29, 82, 83 | M188 | 77, 86 |
| comata | 7, 10, 29, 82, 83 | M189 | 77 |
| manifesta | 7, 10, 30, 82, 83 | M190 | 77, 86 |
| Pseudoungerina naheolensis | 8, 46, 92, 93 | M192 | 77, 94 |
| Pullenia quinqueloba | 8, 11, 57, 90, 91 | M195 | 78, 92 |
| Pulvinulina exigua | 8, 11, 55, 88, 89 | M196 | 78, 94 |
| Pyrulina cylindroides | 8, 11, 40, 92, 93 | M197 | 78 |
| Ramulina globulifera | 8, 11, 42, 86, 87 | M198 | 78, 80, 84, 88 |
| Ripley formation | 15, 38, 39, 45 | M200 | 78, 82, 86, 88 |
| Robulus midwayensis | 7, 10, 17, 80, 81 | Texas | 5, 14, 24, 25, 26, 27, 28, 31, 32, 33, 35, 36, 38, 39, 42, 43, 47, 48, 50, 54, 55, 56, 57, 58, 60, 63, 65, 66, 67, 68, 69, 70 |
| pseudo-costatus | 7, 10, 18, 19, 80, 81 | Textularia cretosa | 16 |
| pseudo-costatus inornatus | 7, 10, 18, 80, 81 | Toulmin, L. D. | 21 |
| cf. pseudo-mammilligerus | 10, 19, 80, 81 | Turritella mortoni | 7 |
| rosetta | 7, 10, 19, 80, 81 | Vaginulina glabra | 10, 32, 84, 85 |
| turbinatus | 7, 10, 20, 80, 81 | gracilis | 6, 8, 32, 34, 84, 85 |
| wilcoxensis | 10, 20, 92, 93 | legumen | 10, 32, 92, 93 |
| Salt Mountain | 21 | legumen elegans | 8, 10, 33, 84, 85 |
| Saracenaria midwayensis | 10, 30, 84, 85 | plumoides | 8, 10, 33, 84, 85 |
| cf. sublatifrons | 8, 10, 31, 84, 85 | robusta | 6, 8, 10, 34, 84, 85 |
| trigonata | 8, 10, 31, 84, 85 | Valvulineria allomorphinoides | 8, 11, 52, 57, 88, 89 |
| Scott County | 5 | Virgulina wilcoxensis | 8, 11, 49, 90, 91 |
| Selma chalk | 15, 26 | Walker, W. F., property of | 72 |
| Sigmomorphina sp. | 8, 41, 86, 87 | Washington, Joe, property of | 73 |
| Siphogenerinoides eleganta | 8, 11, 46, 86, 87 | Webster County | 6 |
| Siphonina prima | 8, 11, 55, 88, 89 | Wilcox formation | 21, 49, 62, 68 |
| Smith, May, property of | 78 | | |
| Snell, John E., Jr., property of | 39, 72 | | |

