

CONTRIBUTIONS FROM THE CUSHMAN
LABORATORY FOR FORAMINIFERAL RESEARCH

222. MIDWAY FORAMINIFERA FROM ALABAMA*

By JOSEPH A. CUSHMAN

In June, 1936, L. W. Stephenson and W. H. Monroe of the U. S. Geological Survey collected Midway material in Alabama which contained numerous foraminifera. Two samples in particular carried quite different faunas, and are of especial interest in showing the same relationships in nearly all of the species as those which have been observed in Texas. Many of these species therefore are of interest as index fossils for these two parts of the Midway.

Mrs. Helen J. Plummer's excellent work on the Midway of Texas (Univ. Texas Bull. 2644, 1927) has been used as a basis for the present paper. Through the kindness of Mrs. Plummer, autotypes of many of the new species published in 1927 have been available for comparison, as well as faunal slides mounted from her original samples.

Although the thickness of the two beds is not great, the faunas are very distinctive, and comparatively few species seem to have continued on from the Upper Cretaceous. In some of the other collections from the basal Midway in Alabama, there is very convincing evidence of the reworking of Navarro foraminifera and a mixing of faunas that at first might be perplexing if the difference in appearance of the tests were not added evidence to the known range of the various species as they occur in the Texas and Arkansas sections.

The data for the two beds which are referred to here as upper and lower beds are as follows:

Upper Bed. Chalk overlying *Ostrea pulaskensis* bed, sample

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taken 39-40 feet above water. U. S. Highway 80, S. of Sucarnoochee Creek, $\frac{1}{2}$ mile S. E. of Livingston, Sumter Co., Ala.

Lower Bed. *Ostrea pulaskensis* bed which here is at base of the Midway, sample taken 31-35 feet above water level. Old abandoned roadway S. of Sucarnoochee Creek, about $\frac{1}{10}$ mile upstream from the crossing of U. S. Highway 80, $\frac{1}{2}$ mile S. W. of Livingston, Sumter Co., Ala.

The following species were noted, a few new, and others identified only to the genus, as there was not sufficient material for specific identification.

Family LITUOLIDAE

Genus AMMOBACULITES Cushman, 1910

AMMOBACULITES MIDWAYENSIS Cushman, n. sp. (Pl. 9, figs. 1, 2)

Test in the early stages close coiled, planispiral, in the adult uncoiling and the chambers in a rectilinear series; chambers distinct, inflated, 6 to 9 in the coiled portion, only 2 or 3 in the uncoiled part, later ones circular in section; sutures distinct, depressed; wall finely arenaceous with occasional larger fragments, rather smoothly finished; aperture somewhat arcuate, narrow, elongate. Length up to 2.70 mm.; breadth 1.65 mm.; thickness 0.85 mm.

Holotype (Cushman Coll. No. 35512) from Midway group, U. S. Highway 80, S. of Sucarnoochee Creek, $\frac{1}{2}$ mile S. W. of Livingston, Sumter Co., Ala.

This species differs from *A. penonensis* Cushman and Bermudez from the Eocene of Cuba in the more elongate aperture, more inflated and distinct chambers, and distinct sutures. It occurred in both beds.

Family TEXTULARIIDAE

Genus SPIROPLECTAMMINA Cushman, 1927

SPIROPLECTAMMINA LAEVIS (Roemer), var. CRETOSA Cushman (Pl. 9, fig. 3)

A number of typical and well preserved specimens occurred in the material from the upper bed. This variety has a wide stratigraphic range in the Cretaceous, and in the Midway seems to be typical.

Genus TEXTULARIA DeFrance, 1824

TEXTULARIA PLUMMERAE Lalicker (Pl. 9, fig. 4)

Textularia plummerae LALICKER, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 50, pl. 6, figs. 10 a-c.

Textularia eocaena PLUMMER (not GÜMBEL), Univ. Texas Bull. 2644, 1927, p. 67, pl. 3, figs. 2 a, b.

The species described from the Midway of Texas by Lalicker occurs here also. Our form occurred only in the upper bed in Alabama, and is the same as that figured by Mrs. Plummer from the Texas Midway. Her specimens were also from the upper part of the section.

Family VERNEUILINIDAE

Genus GAUDRYINA d'Orbigny, 1839

GAUDRYINA sp. (Pl. 9, fig. 5)

There is a single specimen from the upper bed that closely resembles *Gaudryina cretacea* (Karrer).

Genus CLAVULINOIDES Cushman, 1936

CLAVULINOIDES MIDWAYENSIS Cushman (Pl. 9, fig. 6)

Clavulinoides midwayensis CUSHMAN, Special Publ. No. 6, Cushman Lab. Foram. Res., 1936, p. 21, pl. 3, figs. 9, 15.

Clavulina angularis PLUMMER (not D'ORBIGNY), Univ. Texas Bull. 2644, 1927, p. 70, pl. 3, figs. 4, 5.

This characteristic species occurs in considerable numbers in the upper bed both in microspheric and megalospheric forms.

Family VALVULINIDAE

Genus DOROTHIA Plummer, 1931

DOROTHIA ALABAMENSIS Cushman, n. sp. (Pl. 9, fig. 7)

Test tapering throughout, broadest at the apertural end, usually distinctly twisted, little if at all compressed, earliest whorl with 4 or 5 chambers, later triserial, and in the adult biserial; chambers distinct, somewhat inflated, increasing rather regularly in size as added, slightly overlapping; sutures distinct, depressed, more strongly so in the adult portion; wall finely arenaceous, smoothly finished but not polished; aperture a low, broad opening at the base of the last-formed chamber at the inner margin. Length up to 1.15 mm.; breadth 0.60 mm.; thickness 0.30 mm.

Holotype (Cushman Coll. No. 35518) from Midway group, U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species differs from the Cretaceous *Dorothia bulletta* (Carsey) in the more tapering test and more inflated chambers which tend to increase in size as added. It occurred in some numbers in the lower horizon.

Genus *LISTERELLA* Cushman, 1933

LISTERELLA LAEVIS Cushman, n. sp. (Pl. 9, fig. 8)

Test elongate, slender, of rather uniform diameter throughout, triserial portion rounded; chambers mostly rather indistinct, later ones becoming more inflated, 6 or 7 in the uniserial portion in the adult; sutures indistinct except in the last portion, where they are often distinctly depressed; wall finely arenaceous, smoothly finished; aperture terminal, rounded, small, often with a slight lip. Length up to 1.20 mm.; diameter 0.35 mm.

Holotype (Cushman Coll. No. 35519) from Midway group, U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species differs from *Listerella petrosa* Cushman and Bermudez in the finely arenaceous test, smoothly finished, and the rounded basal portion.

Genus *TRITAXILINA* Cushman, 1911

TRITAXILINA CUBENSIS Cushman and Bermudez (Pl. 9, fig. 9)

Tritaxilina cubensis CUSHMAN and BERMUDEZ, Contr. Cushman Lab. Foram. Res., vol. 12, 1936, pl. 10, figs. 25, 26; vol. 13, 1937, p. 8.—
CUSHMAN, Special Publ. No. 8, Cushman Lab. Foram. Res., 1937, p. 156, pl. 18, figs. 4, 5.

Our material from the upper bed seems to be the same as that described from the Eocene of Cuba.

Family *PLACOPSILINIDAE*

Genus *ADHAERENTIA* Plummer, 1938

ADHAERENTIA MIDWAYENSIS Plummer (Pl. 9, figs. 10, 11)

Adhaerentia midwayensis PLUMMER, Amer. Midl. Nat., vol. 19, 1938, p. 242, text figs. 1 a-e.

This species recently described by Mrs. Plummer occurs in both beds, those of the lower one more abundant. Fig. 10 shows a specimen attached to *Robulus*. Mrs. Plummer records it from the Midway of Alabama, Mississippi and Texas.

Family *LAGENIDAE*

Genus *ROBULUS* Montfort, 1808

ROBULUS MIDWAYENSIS (Plummer) (Pl. 9, fig. 12)

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

(?) *Robulus midwayensis* COLE and GILLESPIE, Bull. Amer. Pal., vol. 15, No. 57 b, 1930, p. 6, pl. 2, fig. 12.

This characteristic Midway species occurs in typical form, and is common in the upper bed. From the figure and known range, it is very doubtful if the form recorded from the Oligocene of Mexico by Cole and Gillespie belongs here.

ROBULUS MIDWAYENSIS (Plummer), var. **CARINATUS** (Plummer) (Pl. 9, fig. 13)

Cristellaria midwayensis PLUMMER, var. *carinata* PLUMMER, Univ. Texas Bull. 2644, 1927, p. 97, text fig. 5.

The figured specimen is referred to the above variety. It has a distinct peripheral flange in most specimens, but this seems to be a rather variable character in this material. It occurs in the lower bed.

ROBULUS PSEUDO-MAMILLIGERUS (Plummer) (Pl. 9, fig. 16)

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

Very typical specimens of this species occur in the upper bed.

ROBULUS TURBINATUS (Plummer) (Pl. 9, fig. 17)

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

Typical specimens occur in the upper bed.

ROBULUS ROSETTA (Gümbel) (Pl. 9, fig. 24)

Robulina rosetta GÜMBEL, Abhandl. kön. bay. Akad. Wiss., München, Cl. II, vol. 10, 1870, p. 642, pl. 1, figs. 73 a, b.

Specimens from the lower bed seem to be identical with this species described by Gümbel from the lower Eocene of Bavaria. There is a very distinct keel, and the aperture projects slightly in the adult.

ROBULUS PSEUDO-COSTATUS (Plummer) (Pl. 9, fig. 18)

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

Specimens of this characteristic Midway species occurred in the lower bed.

ROBULUS sp. (Pl. 9, fig. 23)

A single specimen from the upper bed is figured on our plate. It tends to have a spinose projection at the peripheral angle in the last few chambers.

ROBULUS sp. (Pl. 9, fig. 25)

Rare specimens similar to that figured occur in the upper bed. They are probably the same as the form referred by Mrs. Plummer to "*Cristellaria rotulata* (Lamarck)." Not enough material was available for certain identification.

Genus MARGINULINA d'Orbigny, 1826

MARGINULINA EARLANDI (Plummer) (Pl. 9, figs. 14, 15)

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

Specimens identical with this species occurred in the upper bed. Fig. 14 shows a specimen with the early stages, probably microspheric, in which the coiled portion is prominent. Fig. 15 is a very elongate, probably megalospheric specimen in which the coiled stage is reduced and the uniserial portion greatly developed.

MARGINULINA cf. SCITULA (Berthelin) (Pl. 9, figs. 21, 22)

Our specimens are evidently the same as those which Mrs. Plummer has referred to Berthelin's species. They are much compressed, and the uncoiled chambers comparatively few. They resemble somewhat the Lower Cretaceous species, but without an opportunity to see type or topotype material, the identity must be doubtful. The specimens are from the upper bed.

MARGINULINA sp. (Pl. 9, fig. 19)

There is a single specimen here figured which resembles that referred by Sherborn and Chapman to *Marginulina attenuata* Neugeboren. Their specimen is from the Eocene, London clay, but only remotely resembles Neugeboren's original figure.

MARGINULINA sp. (Pl. 9, fig. 20)

The single specimen here figured is difficult to place. The later chambers resemble the form figured by Mrs. Plummer as "*Marginulina regularis* d'Orbigny," but the Midway form is not the same as the slender species from the Miocene of the Vienna Basin. It occurred in the upper bed.

Genus DENTALINA d'Orbigny, 1826

DENTALINA DELICATULA Cushman (Pl. 10, figs. 22-24)

Dentalina delicatula CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 14, 1938, p. 40, pl. 6, figs. 19, 20.

The fragmentary specimens figured on our plate seem identical with this species which is typical of the upper Navarro of Texas.

There is a possibility that they may be reworked from Navarro material, but they occur in our material from the lower bed only.

DENTALINA PLUMMERAE Cushman, n. sp. (Pl. 10, figs. 7-9, 197)

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.

Holotype (Cushman Coll. No. 35682) from Midway group, U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species occurs in the upper bed only. It differs from *Dentalina pauperata* d'Orbigny in the more inflated, nearly spherical chambers, more tapering form, and lack of initial spine. The specimen in figure 19 probably belongs here.

DENTALINA (?) GARDNERAE (Plummer) (Pl. 10, figs. 10-12)

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

Our specimens have been compared with a series of this species kindly sent by Mrs. Plummer. All of our specimens which occur in the upper bed seem to belong to *Dentalina*, as there is no definite coiling in the early stages. Our specimens may be the same as the form referred by Mrs. Plummer to "*Vaginulina legumen* (Linnaeus), var. *elegans* d'Orbigny."

DENTALINA sp. (Pl. 10, fig. 13)

The figured specimen is the only complete one of this species in our material. It is from the upper bed. It is evidently identical with the species figured by Sherborn and Chapman from the London clay as "*Dentalina sulcata* (Nilsson)" (Journ. Roy. Micr. Soc., 1899, p. 486, pl. 11, fig. 24), but is not Nilsson's species. It somewhat resembles *D. alternata* (Jones) from the Upper Cretaceous, but the costae are all of the same strength.

DENTALINA cf. **MUCRONATA** Neugeboren (Pl. 10, fig. 27)

This is evidently the same as the form referred to Neugeboren's species by Mrs. Plummer, but, while it does resemble Neuge-

boren's species, it is not the same. Our specimens are rare from the lower bed.

DENTALINA PSEUDO-OBLIQUESTRIATA (Plummer) (Pl. 10, fig. 18)
Nodosaria pseudo-obliquestriata PLUMMER, Univ. Texas Bull. 2644,
 1927, p. 87, pl. 4, fig. 18.

This very distinct species occurs in the upper bed in our material, and is characteristic of the lower Midway of Texas.

DENTALINA cf. PAUPERATA d'Orbigny (Pl. 10, fig. 15)

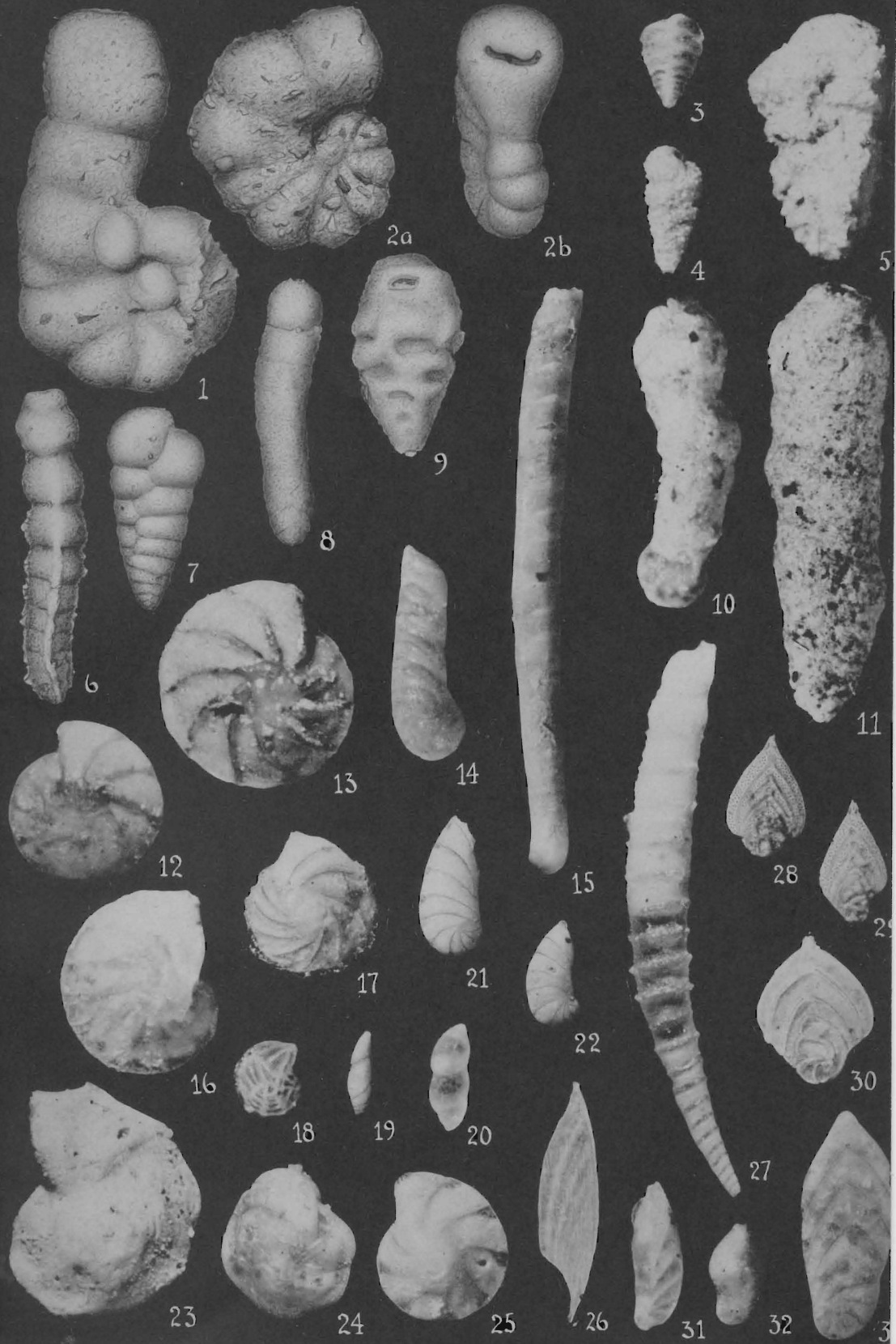
This is very similar to the specimen figured by Mrs. Plummer and referred to d'Orbigny's species from the Miocene of the Vienna Basin. Specimens are very rare in the upper bed. It is not the same as d'Orbigny's species, although similar in some characters.

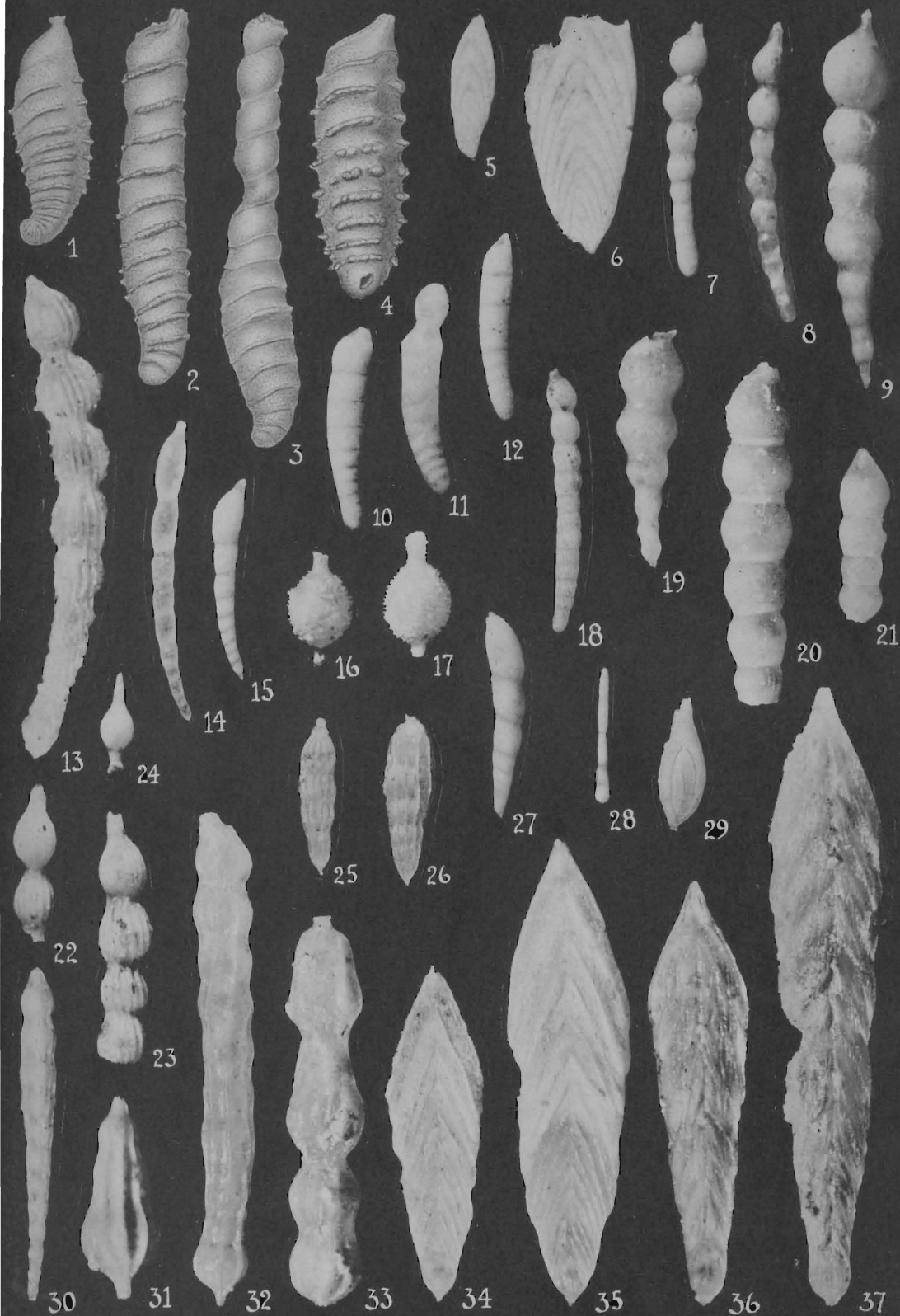
DENTALINA sp. (Pl. 10, figs. 20, 21)

There are fragmentary specimens of a large species of *Dentalina*, two of which are figured. They have deeply depressed sutures, and are somewhat limbate. It seems to be a distinctive species, but cannot be definitely identified until more specimens are available. This is probably the form referred by Mrs. Plummer to "*Nodosaria pomuligera* (Stache)," but is not the same as Stache's species, of which we have topotypes for comparison.

EXPLANATION OF PLATE 9

FIGS. 1, 2. *Ammobaculites midwayensis* Cushman, n. sp. × 22. 1, Holotype. 2, Paratype. *a*, side view; *b*, peripheral view. 3. *Spiroplectammina laevis* (Roemer), var. *cretosa* Cushman. × 33. 4. *Textularia plummerae* Lalicker. × 33. 5. *Gaudryina* sp. × 33. 6. *Clavulinoides midwayensis* Cushman. × 33. 7. *Dorothyia alabamensis* Cushman, n. sp. × 25. Holotype. 8. *Listerella laevis* Cushman, n. sp. × 25. Holotype. 9. *Tritaxilina cubensis* Cushman and Bermudez. × 45. 10, 11. *Adhaerentia midwayensis* Plummer. × 25. 10, Specimen attached to *Robulus*. 12. *Robulus midwayensis* (Plummer). × 25. 13. *Robulus midwayensis* (Plummer), var. *carinatus* (Plummer). × 25. 14, 15. *Marginulina earlandi* (Plummer). × 25. 14, Microspheric young. 15, Megalospheric adult. 16. *Robulus pseudo-mamilligerus* (Plummer). × 25. 17. *Robulus turbinatus* (Plummer). × 25. 18. *Robulus pseudo-costatus* (Plummer). × 33. 19. *Marginulina* sp. × 33. 20. *Marginulina* sp. × 33. 21, 22. *Marginulina* cf. *scitula* (Berthelin). 23. *Robulus* sp. × 25. 24. *Robulus rosetta* (Gümbel). × 25. 25. *Robulus* sp. × 25. 26. *Vaginulina plumoides* Plummer. × 33. 27. *Vaginulina gracilis* Plummer. × 25. 28, 29. *Palmula delicatissima* (Plummer). × 33. 30. *Palmula rugosa* (d'Orbigny). × 33. 31. *Saracenaria trigonata* (Plummer). × 33. 32. *Saracenaria* sp. × 33. 33. *Palmula* cf. *primitiva* Cushman. × 33.





DENTALINA ACULEATA d'Orbigny (?) (Pl. 10, figs. 16, 17)

Broken specimens similar to the figured ones and consisting of single chambers occur in both beds. They are very similar to forms found in the Upper Cretaceous, and may actually represent end chambers of some form of *Ramulina*.

Genus NODOSARIA Lamarck, 1812

NODOSARIA AFFINIS Reuss (Pl. 10, figs. 30-33)

There are numerous specimens of this species which is abundant and widely distributed in the upper Eocene and already recorded by Mrs. Plummer from the Midway of Texas. The great differences in the microspheric and megalospheric forms are shown on our plate.

NODOSARIA OLIGOTOMA Reuss (Pl. 10, figs. 25, 26)

Nodosaria oligotoma REUSS, in Geinitz, Palaeontographica, vol. 20, pt. 1, 1872, p. 135, pl. 33, fig. 16.—SHERBORN and CHAPMAN, Journ. Roy. Micr. Soc., 1889, p. 486, pl. 11, fig. 20.—PLUMMER, Univ. Texas Bull. 2644, 1927, p. 87, pl. 4, fig. 14.

Several specimens were found in the lower bed. They agree very well with the figures given by Sherborn and Chapman from the London clay. The species was described from the Upper Cretaceous of Germany. It resembles specimens from the Upper Cretaceous of Texas referred to *N. amphioxys* Reuss, but in that species the transverse sutures are not usually as well shown.

NODOSARIA (?) LONGISCATA d'Orbigny (Pl. 10, fig. 28)

Our figured specimen shows the bulbous proloculum as well as the cylindrical later chambers. Somewhat similar specimens are

EXPLANATION OF PLATE 10

FIGS. 1-4. *Vaginulina robusta* Plummer. × 25. 5, 6. *Palmula* cf. *budensis* (Hantken). × 33. 7-9, 19. *Dentalina plummerae* Cushman, n. sp. × 33. 9, Holotype, 7, 8, 19. Paratypes. 10-12. *Dentalina* (?) *gardnerae* (Plummer). × 33. 13. *Dentalina* sp. × 33. 14. *Chrysalogonium* cf. *texanum* Cushman. × 33. 15. *Dentalina* cf. *pauperata* d'Orbigny. × 33. 16, 17. *Dentalina aculeata* d'Orbigny (?). × 33. 18. *Dentalina pseudo-obliquistriata* (Plummer). × 13. 20, 21. *Dentalina* sp. × 25. 22-24. *Dentalina delicatula* Cushman. × 33. 25, 26. *Nodosaria oligotoma* Reuss. × 33. 27. *Dentalina* cf. *mucronata* Neugeboren. × 33. 28. *Nodosaria* (?) *longiscata* d'Orbigny. × 33. 29. *Frondicularia goldfussi* Reuss. × 33. 30-33. *Nodosaria affinis* Reuss. × 25. 34, 35. *Frondicularia midwayensis* Cushman, n. sp. × 33. 35, Holotype. 34, Paratype. 36, 37. *Frondicularia* cf. *frankei* Cushman. 36, × 33. 37, × 25.

figured by Sherborn and Chapman from the London clay. Mrs. Plummer also records it from the Midway of Texas. Our specimens are from the lower bed. It seems doubtful if this is identical with d'Orbigny's species from the Miocene of the Vienna Basin from a study of topotype material. It is still more doubtful if the form really belongs under *Nodosaria*.

Genus **CHRYSALOGONIUM** Schubert, 1907
CHRYSALOGONIUM cf. **TEXANUM** Cushman (Pl. 10, fig. 14)

From a study of the apertural features of the figured specimen, it seems to belong to this genus, and somewhat resembles the species described from the Upper Cretaceous of Texas. It is from the upper bed.

Genus **PSEUDOGLANDULINA** Cushman, 1929
PSEUDOGLANDULINA MANIFESTA (Reuss) (Pl. 11, fig. 1)
Glandulina manifesta REUSS, Haidinger's Naturwiss. Abhandl., vol. 4,
 pt. 1, 1851, p. 22, pl. 1, fig. 4.

The types of this species are from the Upper Cretaceous of Lemberg. The species occurs widely distributed in the American Upper Cretaceous, and specimens occur as high in the series as the Kemp clay, so that it is not surprising to find it in the Midway. It occurs in the upper bed. Sherborn and Chapman figure a very similar form from the London clay as "*Nodosaria humilis* (Roemer)." Mrs. Plummer figures a somewhat similar form as "*Nodosaria radícula* (Linnaeus)."

PSEUDOGLANDULINA cf. **CAUDIGERA** (Schwager) (Pl. 11, figs. 2, 3)

Schwager figures a very tapering form with a pointed initial end from the lower Eocene of northern Africa. Our figured specimens are somewhat similar with a distinct spine on the initial end. Specimens occurred only in the lower bed, but were rather rare.

PSEUDOGLANDULINA PYGMAEA (Reuss) (Pl. 11, fig. 4)
Glandulina pygmaea REUSS, Haidinger's Naturwiss. Abhandl., vol. 4,
 pt. 1, 1851, p. 6, pl. 1, fig. 3.

Reuss described and figured a species from the Upper Cretaceous of Lemberg that seems to be identical with a species that occurs in the Navarro and Taylor of our Upper Cretaceous. This is probably the form referred by Mrs. Plummer to "*Nodosaria (Glandulina) comata* (Batsch)" from the Midway of Texas.

Genus SARACENARIA DeFrance, 1824

SARACENARIA TRIGONATA (Plummer) (Pl. 9, fig. 31)

Cristellaria trigonata PLUMMER, Univ. Texas Bull. 2644, 1927, p. 101, pl. 7, fig. 3.

Specimens from the upper bed seem to be identical with this species described from the Midway of Texas.

SARACENARIA sp. (Pl. 9, fig. 32)

There are very rare specimens, evidently immature, similar to the figured form in the lower bed. It is difficult to give them a specific name without the adult stages.

Genus VAGINULINA d'Orbigny, 1826

VAGINULINA GRACILIS Plummer (Pl. 9, fig. 27)

Vaginulina gracilis PLUMMER, Univ. Texas Bull. 2644, 1927, p. 111, pl. 6, figs. 5 a, b.

This species is common in the lower bed, and seems to replace the following species, *V. robusta*. This is the same relationship that was originally found in the Midway of Texas by Mrs. Plummer.

VAGINULINA ROBUSTA Plummer (Pl. 10, figs. 1-4)

Vaginulina robusta PLUMMER, Univ. Texas Bull. 2644, 1927, p. 112, pl. 6, figs. 4a, b; pl. 13, fig. 3.

This very characteristic Midway species occurs in considerable numbers in the upper bed. There is a great variation in the microspheric and megalospheric forms as shown on our plate.

VAGINULINA PLUMOIDES Plummer (Pl. 9, fig. 26)

Vaginulina plumoides PLUMMER, Univ. Texas Bull. 2644, 1927, p. 113, pl. 6, fig. 6.

A single typical specimen of this species described from the Midway of Texas occurred in the lower bed.

Genus PALMULA Lea, 1833

PALMULA DELICATISSIMA (Plummer) (Pl. 9, figs. 28, 29)

Frondicularia delicatissima PLUMMER, Univ. Texas Bull. 2644, 1927, p. 120, pl. 5, fig. 4.

This is a characteristic Midway species, and occurs in our material from the upper bed. Mrs. Plummer records it from the upper part of the Midway of Texas.

PALMULA RUGOSA (d'Orbigny) (Pl. 9, fig. 30)
Flabellina rugosa D'ORBIGNY, Mém. Soc. Géol. France, sér. 1, vol. 4,
 1840, p. 23, pl. 2, figs. 4, 5, 7.

It is possible that the specimens of this species found in material from the lower bed may possibly be reworked. Mrs. Plummer also records specimens from the lower part of the Midway of Texas. It is common in the Upper Cretaceous of Texas ranging as high as the Corsicana marl in the Navarro group, and so it is not impossible that it continued on into the early Midway.

PALMULA cf. PRIMITIVA Cushman (Pl. 9, fig. 33)

A number of specimens from the lower bed may belong to this species described from the Upper Cretaceous of Texas. The form is rather shorter and broader than the Cretaceous form however, and the test seems to have a much thicker wall. Specimens were not very well preserved however.

PALMULA cf. BUDENSIS (Hantken) (Pl. 10, figs. 5, 6)

Our figured specimens show the characters of a smooth species of *Palmula* that occurs in the upper bed. What is evidently the same species was recorded by Mrs. Plummer from the upper part of the Midway of Texas. The figures look very much like those of Hantken from the upper Eocene of Hungary, but a study of topotypes shows that they are not the same. Further material to show all stages in development should be available for comparison with Hantken's topotypes before the Midway species is finally described.

Genus FRONDICULARIA DeFrance, 1826
FRONDICULARIA GOLDFUSSI Reuss (Pl. 10, fig. 29)

Frondicularia goldfussi REUSS, Sitz. Akad. Wiss. Wien, vol. 40, 1860,
 p. 192, pl. 4, fig. 3.

The figured specimen although young shows the characteristic elongate proloculum and other characters of this species. It is a distinctive species of our Upper Cretaceous, occurring in the Taylor and Austin. It is surprising therefore to find it in the upper bed in our material. Mrs. Plummer records it from the upper part of the Midway of Texas as rare. When numerous specimens are available to show full characters, these should be compared with typical *F. goldfussi* to see if they are really the same.

FRONDICULARIA cf. FRANKEI Cushman (Pl. 10, figs. 26, 27)

The references to this species have already been given in these Contributions, vol. 12, 1936, p. 18. The species is a variable one, and occurs in our American Upper Cretaceous, in the Taylor and Navarro particularly. Bagg recorded it from the Cretaceous of New Jersey. It is interesting to find specimens in our material from the upper bed that may be included within the limits of variation of this species. Mrs. Plummer records similar forms under Bagg's name from the upper part of the Midway of Texas.

FRONDICULARIA MIDWAYENSIS Cushman, n. sp. (Pl. 10, figs. 34, 35)

Test large, much compressed, irregularly rhomboid in front view, with the greatest breadth toward its apertural end, initial end with a slight spine; chambers numerous, distinct, of uniform shape, increasing very gradually in height as added, proloculum globular; sutures distinct, slightly raised above the general surface; wall of the proloculum with a few longitudinal costae, the surface in the adult finely but distinctly papillate; aperture terminal, radiate, slightly projecting. Length 1.75-2.50 mm.; breadth 0.50-0.65 mm.

Holotype (Cushman Coll. No. 35703) from U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species differs from *Frondicularia clarki* Bagg in the more rhomboid form, the raised sutures, and the finely papillate surface. It occurred only in the upper bed.

Genus LAGENA Walker and Jacob, 1798

LAGENA cf. ACUTICOSTA Reuss (Pl. 11, fig. 5)

Specimens very similar to Reuss' species occurred rarely in the upper bed.

Family POLYMORPHINIDAE

Genus GUTTULINA d'Orbigny, 1839

GUTTULINA sp. (Pl. 11, fig. 7)

The specimen figured is evidently a young stage, and cannot be specifically identified. It is from the lower bed.

Genus GLOBULINA d'Orbigny, 1839

GLOBULINA GIBBA d'Orbigny (Pl. 11, fig. 6)

(For references, see CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 60.)

This is a very widely distributed species, and was found in the lower bed.

Genus PSEUDOPOLYMORPHINA Cushman and Ozawa, 1928
PSEUDOPOLYMORPHINA sp. (Pl. 11, fig. 9)

This is a fine large form difficult to identify with any known species, but represented in our material from the lower bed by a single specimen.

Genus POLYMORPHINA d'Orbigny, 1826
POLYMORPHINA sp. (Pl. 11, fig. 8)

This much compressed form somewhat resembles *P. advena* (Cushman) of the Oligocene, but is distinct. It is represented by a single specimen in our material from the upper bed.

Genus RAMULINA Rupert Jones, 1875
RAMULINA cf. ACULEATA (d'Orbigny) (Pl. 11, figs. 13, 14)

The figured specimens are both from the upper bed. They possibly represent two different species, but without more definite material they are difficult to place. Similar forms occur in the Upper Cretaceous.

Genus BULLOPORA Quenstedt, 1856
BULLOPORA CHAPMANI (Plummer) (Pl. 11, figs. 10, 11)
Vitriwebbina chapmani PLUMMER, Univ. Texas Bull. 2644, 1927, p. 128,
pl. 8, figs. 2 a, b.

Our figured specimens show the characters of this species described from the Midway of Texas. As in Texas, our specimens occur in both beds. They are attached to tests of *Nodosaria* and echinoderm spines.

BULLOPORA LAEVIS (Sollas) (Pl. 11, fig. 12)
Webbina laevis SOLLAS, Geol. Mag., vol. 4, 1897, p. 103, pl. 6, figs. 1-3.

This species occurs in our Upper Cretaceous in the upper part of the Taylor marl, and its range extends upward to the Corsicana marl of the Navarro group. Mrs. Plummer records it from both faunal zones of the Midway of Texas. The Cretaceous specimens are usually not so regular in shape as that figured here.

Family HETEROHELICIDAE

Genus GÜMBELINA Egger, 1899

GUMBELINA MIDWAYENSIS Cushman, n. sp. (Pl. 11, fig. 15)

Test small, compressed, usually twice as long as broad, rapidly tapering, with the greatest breadth formed by the last pair of chambers, periphery rounded throughout, lobulate; chambers with breadth and height about equal, slightly overlapping, inflated, increasing rapidly in height as added; sutures distinct, depressed, very slightly curved; wall finely spinose; aperture high, arched, with distinct lateral flanges. Length 0.18-0.22 mm.; breadth 0.10-0.12 mm.; thickness 0.05 mm.

Holotype (Cushman Coll. No. 35715) from U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species occurs in considerable numbers in the upper bed. It is nearest to *Gümbelina planata* Cushman, which occurs in the Upper Cretaceous, middle portion of the Taylor marl, but differs in the lack of depressed, triangular areas between the later chambers, and in the finely spinose surface.

Genus RECTOGÜMBELINA Cushman, 1932

RECTOGÜMBELINA ALABAMENSIS Cushman, n. sp. (Pl. 11, fig. 16)

Test minute, elongate, early portion definitely biserial, *Gümbelina*-like, later portion uniserial; chambers of the early portion not much inflated, later ones distinctly so; sutures not depressed in the early portion, later much depressed; wall very finely hispid throughout; aperture small, nearly terminal, with a very slightly raised edge above the upper margin. Length 0.17-0.22 mm.; diameter 0.06-0.08 mm.

Holotype (Cushman Coll. No. 35716) from U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species strongly resembles *Rectogümbelina hispidula* Cushman from the Upper Cretaceous, Austin chalk, but differs in the greater number of biserial chambers which are less distinct, and in the absence of a definite neck. It is also smaller. Specimens are fairly common in the upper bed. Superficially it resembles *Siphogenerinoides elongata* (Plummer), but the latter is triserial in the early stages, is much larger, and has finer uniserial chambers.

Genus EOUVIGERINA Cushman, 1926

EOUVIGERINA EXCAVATA Cushman, n. sp. (Pl. 11, fig. 18)

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 0.18-0.25 mm.; diameter 0.08-0.10 mm.

Holotype (Cushman Coll. No. 35717) from U. S. Highway 80, S. of Sucarnoochee Creek, ½ mile S. W. of Livingston, Sumter Co., Ala.

This species differs from *Eouvigerina americana* Cushman in the smaller size and the very deeply excavated chambers throughout.

Genus SIPHOGENERINOIDES Cushman, 1927

SIPHOGENERINOIDES ELEGANTA (Plummer) (Pl. 11, fig. 17)

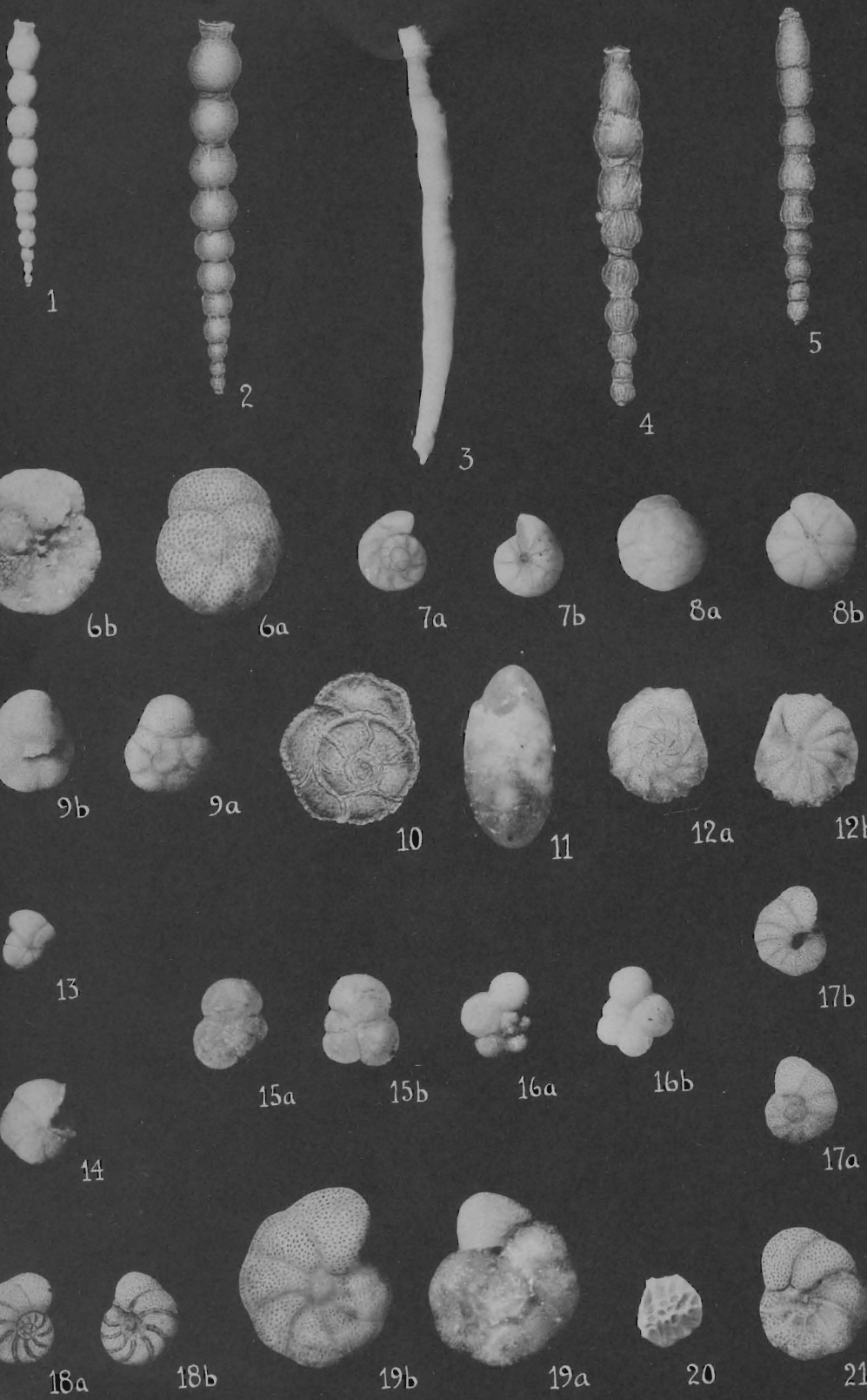
Siphogenerina eleganta PLUMMER, Univ. Texas Bull. 2644, 1927, p. 126, pl. 8, figs. 1 a-c.

Very typical specimens of this species occur in the lower bed in our material. It was described from the Midway of Texas. The chambers of the earliest portion are triserial in our specimens, and it seems to belong in the genus *Siphogenerinoides*.

EXPLANATION OF PLATE 11

FIG. 1. *Pseudoglandulina manifesta* (Reuss). × 33. 2, 3. *Pseudoglandulina* cf. *caudigera* (Schwager). × 33. 4. *Pseudoglandulina pygmaea* (Reuss). × 33. 5. *Lagena* cf. *acuticosta* Reuss. × 33. 6. *Globulina gibba* d'Orbigny. × 33. 7. *Guttulina* sp. × 33. 8. *Polymorphina* sp. × 33. 9. *Pseudopolymorphina* sp. × 33. 10, 11. *Bullopore chapmani* (Plummer). × 33. 12. *Bullopore laevis* (Sollas). × 25. 13, 14. *Ramulina* cf. *aculeata* (d'Orbigny). × 33. 15. *Gümbelina midwayensis* Cushman, n. sp. × 135. Holotype. 16. *Rectogümbelina alabamensis* Cushman, n. sp. × 105. Holotype. 17. *Siphogenerinoides eleganta* (Plummer). × 80. 18. *Eouvigerina excavata* Cushman, n. sp. × 105. Holotype. 19. *Virgulina wilcoxensis* Cushman and Ponton. × 80. 20. *Bulimina cacumenata* Cushman and Parker. × 105. 21. *Bulimina* (*Desinobulimina*) *quadrata* Plummer. × 33. 22. *Bolivina midwayensis* Cushman. × 60. 23. *Loxostoma applinae* (Plummer). × 33. 24. *Entosolenia* sp. × 33. 25, 26. *Pleurostomella* cf. *alternans* Schwager. × 33. 27-29. *Ellipsonodosaria alexanderi* Cushman. × 33. 30. *Nodosarella attenuata* (Plummer). × 80.





Family BULIMINIDAE

Genus BULIMINA d'Orbigny, 1826

BULIMINA CACUMENATA Cushman and Parker (Pl. 11, fig. 20)

Bulimina cacumenata CUSHMAN and PARKER, Contr. Cushman Lab. Foram. Res., vol. 12, 1936, p. 40, pl. 7, figs. 3 a-c.

This species was described from the Midway of Texas. Identical specimens occurred in the lower bed in our material.

BULIMINA (DESINOBULIMINA) QUADRATA Plummer (Pl. 11, fig. 21)

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

As in Texas, this species occurs in the upper bed in our material. The aperture is subterminal, and is connected with the previous ones by a peculiarly twisted plate which characterizes the subgenus *Desinobulimina*.

Genus VIRGULINA d'Orbigny, 1826

VIRGULINA WILCOXENSIS Cushman and Ponton (Pl. 11, fig. 19)

Virgulina wilcoxensis CUSHMAN and PONTON, Contr. Cushman Lab. Foram. Res., vol. 8, 1932, p. 67, pl. 8, figs. 22 a-c.—CUSHMAN, Special Publ. No. 9, Cushman Lab. Foram. Res., 1937, p. 6, pl. 1, fig. 17.—CUSHMAN and GARRETT, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 82, pl. 14, figs. 19-21.

This species has hitherto only been recorded from the Wilcox Eocene, but specimens that seem identical with it occur in some numbers in the upper bed of our material.

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA MIDWAYENSIS Cushman (Pl. 11, fig. 22)

Bolivina midwayensis CUSHMAN, Special Publ. No. 6, Cushman Lab. Foram. Res., 1936, p. 50, pl. 7, figs. 11 a, b; Special Publ. No. 9, l. c., 1937, p. 45, pl. 6, figs. 11-13.

EXPLANATION OF PLATE 12

a, dorsal view; b, ventral view.

FIGS. 1, 2. *Ellipsonodosaria* sp. 1, $\times 33$. 2, $\times 45$. 3. *Ellipsonodosaria granti* (Plummer). $\times 33$. 4, 5. *Ellipsonodosaria plummerae* Cushman, n. sp. $\times 45$. 4, Holotype. 5, Paratype. 6. *Discorbis midwayensis* Cushman, n. sp. $\times 33$. Holotype. 7. *Gyroidina subangulata* (Plummer). $\times 33$. 8. *Eponides* sp. $\times 33$. 9. *Valvulineria allomorphinoides* (Reuss). $\times 33$. 10. *Siphonina prima* Plummer. $\times 130$. 11. *Chilostomelloides eocena* Cushman. $\times 33$. 12. *Pulvinulinella culter* (Parker and Jones), var. *mexicana* Cole. $\times 33$. 13, 14. *Pullenia quinqueloba* Reuss. $\times 33$. 15. *Globigerina triloculinoides* Plummer. $\times 33$. 16. *Globigerina pseudo-bulloides* Plummer. $\times 33$. 17. *Anomalina* cf. *ammonoides* Reuss. $\times 33$. 18. *Anomalina midwayensis* (Plummer). $\times 33$. 19. *Cibicides alleni* (Plummer). $\times 33$. 20. *Coleites reticulosus* (Plummer). $\times 33$. Central portion of test only. 21. *Cibicides vulgaris* (Plummer). $\times 33$.

This species was described from the Midway of Texas. It occurred rarely in the lower bed in our material, but specimens are typical.

Genus LOXOSTOMA Ehrenberg, 1854

LOXOSTOMA APPLINAE (Plummer) (Pl. 11, fig. 23)

Bolivina applinae PLUMMER, Univ. Texas Bull. 2644, 1927, p. 69, pl. 4, fig. 1.

Loxostoma applinae CUSHMAN, Special Publ. No. 9, Cushman Lab. Foram. Res., 1937, p. 173, pl. 20, fig. 20.

This species was originally described from the upper part of the Midway of Texas, and it occurs in the upper bed in our material. The specimens referred to this species from the Aragon formation of Mexico by Nuttall represent another species.

Genus ENTOSOLENIA Ehrenberg, 1848

ENTOSOLENIA sp. (Pl. 11, fig. 24)

A single specimen of *Entosolenia* showing the internal tube and having a slight spine at the base occurred in the upper bed. Mrs. Plummer figures a similar form as "*Lagena apiculata* (Reuss)," and notes that it is very rare in the Texas material. It is difficult to determine the generic position of the species described by Reuss.

Family ELLIPSOIDINIDAE

Genus PLEUROSTOMELLA Reuss, 1860

PLEUROSTOMELLA cf. ALTERNANS Schwager (Pl. 11, figs. 25, 26)

Specimens of *Pleurostomella* occur very rarely in the upper bed of our material. Mrs. Plummer records it from the upper part of the Midway of Texas. This is not the same as the Upper Cretaceous species, and does not seem identical with topotypes from Kar Nicobar. It also closely resembles the species described from the Eocene of Hungary by Hantken as "*P. tenuis*." Not enough specimens are available for fully comparing the Alabama form with these other similar ones.

Genus NODOSARELLA Rzehak, 1895

NODOSARELLA ATTENUATA (Plummer) (Pl. 11, fig. 30)

Ellipsopleurostomella attenuata PLUMMER, Univ. Texas Bull. 2644, 1927, p. 131, pl. 8, figs. 6 a-d.

Very rare specimens occur in the upper beds of our material. It was originally described from the Midway of Texas.

Genus ELLIPSONODOSARIA A. Silvestri, 1900

ELLIPSONODOSARIA ALEXANDERI Cushman (Pl. 11, figs. 27-29)

Ellipsonodosaria alexanderi CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 12, 1936, p. 52, pl. 9, figs. 6-9.

Fragmentary specimens apparently identical with this species occur in the lower bed. Mrs. Plummer records it under the name "*Nodosaria spinulosa* (Montagu)" from the lower Midway as very common. The species occurs in the Taylor marl rather commonly, and less frequently in the lower part of the Navarro.

ELLIPSONODOSARIA GRANTI (Plummer) (Pl. 12, fig. 3)

Nodosaria granti PLUMMER, Univ. Texas Bull. 2644, 1927, p. 83, pl. 5, figs. 9 a-d.*Ellipsonodosaria* (?) *granti* CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 12, 1936, p. 51, pl. 9, figs. 3-5.

This species originally described from the Midway of Texas occurs in typical form in our material. It also occurs in considerable numbers in the upper part of the Navarro and its equivalents in Texas, Arkansas and Mississippi, as well as in the upper part of the Taylor marl.

ELLIPSONODOSARIA PLUMMERAE Cushman, n. sp. (Pl. 12, figs. 4, 5)

Nodosaria sagrinensis PLUMMER (not BAGG), Univ. Texas Bull. 2644, 1927, p. 85, pl. 4, fig. 16.

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.

Holotype (Cushman Coll. No. 35729) from U. S. Highway 80, S. of Sucarnoochee Creek, 1/2 mile S. W. of Livingston, Sumter Co., Ala.

This species differs from *Ellipsonodosaria pseudoscripta* Cushman in the more definite ridge near the base of the chamber, and less elongate chambers.

ELLIPSONODOSARIA sp. (Pl. 12, figs. 1, 2)

This very straight and uniformly chambered species does not seem to be identical with any yet described. Specimens are very rare, and more are necessary before an adequate description can be given. It is from the upper bed.

Family ROTALIIDAE

Genus DISCORBIS Lamarek, 1804

DISCORBIS MIDWAYENSIS Cushman, n. sp. (Pl. 12, fig. 6)

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.

Holotype (Cushman Coll. No. 35733) from old abandoned roadway, S. of Sucarnoochee Creek, about $\frac{1}{10}$ mile upstream from crossing of U. S. Highway 80, $\frac{1}{2}$ mile S. W. of Livingston, Sumter Co., Ala.

This species is fairly common in the lower bed. It differs from *Discorbis newmanae* Plummer in the more definitely plano-convex test, the broader chambers, larger apertural lip, and the distinctly papillate surface.

Genus VALVULINERIA Cushman, 1926

VALVULINERIA ALLOMORPHINOIDES (Reuss) (Pl. 12, fig. 9)

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

Discorbina allomorphinoides FRANKE, Abhandl. geol. pal. Inst. Univ. Greifswald, vol. 6, 1928, p. 91, pl. 8, figs. 11 a, b; Abhandl. Preuss. Geol. Landes., vol. 111, 1928, p. 189, pl. 18, figs. 7 a, b.

Discorbis allomorphinoides CUSHMAN, Bull. Amer. Assoc. Petr. Geol., vol. 10, 1926, p. 606, pl. 20, figs. 18, 19; pl. 21, fig. 5.—PLUMMER, Univ. Texas Bull. 2644, 1927, p. 139, pl. 9, figs. 2 a, b.

Valvulineria allomorphinoides CUSHMAN, Contr. Cushman Lab. Foramin. Res., vol. 7, 1931, p. 43, pl. 6, figs. 2 a-c; Tenn. Div. Geol. Bull. 41, 1931, p. 53, pl. 9, figs. 6 a-c.—CUSHMAN and JARVIS, Proc. U. S. Nat. Mus., vol. 80, Art. 14, 1932, p. 46, pl. 13, figs. 17 a-c.—BROTZEN, Sver. geol. Under., ser. C, No. 396, 1936, p. 153, pl. 11, figs. 1 a-c; text fig. 56.

This species has a wide distribution in the Upper Cretaceous of Europe and America as the above references will show. Mrs. Plummer has already recorded it from the Midway of Texas. It is rare in our material, and occurs in the upper bed.

Genus GYROIDINA d'Orbigny, 1826

GYROIDINA SUBANGULATA (Plummer) (Pl. 12, fig. 7)

Rotalia soldanii (D'ORBIGNY), var. *subangulata* PLUMMER, Univ. Texas Bull. 2644, 1927, p. 154, pl. 12, figs. 1 a-c.

This form as in the Texas Midway is found in the upper bed. It seems to be a distinct species.

Genus EPONIDES Montfort, 1808

EPONIDES sp. (Pl. 12, fig. 8)

This is evidently the same as the form figured by Mrs. Plummer as "*Truncatulina tenera* H. B. Brady," but it does not seem to be identical with that species, although it resembles it in some respects. It occurs in the upper part of the Midway of Texas and in the upper bed in our material.

Genus COLEITES Plummer, 1934

COLEITES RETICULOSUS (Plummer) (Pl. 12, fig. 20)

Pulvinulina reticulosa PLUMMER, Univ. Texas Bull. 2644, 1927, p. 152, pl. 12, figs. 5 a, b.

Coleites reticulosus PLUMMER, Amer. Midl. Nat., vol. 15, 1934, p. 606, pl. 24, figs. 5-9.—CUSHMAN and GARRETT, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 87, pl. 15, figs. 14-20.

This species was originally described from the upper part of the Midway of Texas. It occurred in our Alabama material as small fragments, but showing the characteristic ornamentation. It is from the lower bed. The species also occurs in the Wilcox Eocene of Woods Bluff, Ala.

Genus SIPHONINA Reuss, 1850

SIPHONINA PRIMA Plummer (Pl. 12, fig. 10)

Siphonina prima PLUMMER, Univ. Texas Bull. 2644, 1927, p. 148, pl. 12, figs. 4 a-c.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 72, Art. 20, 1927, p. 2, pl. 2, figs. 4 a-c.

This species was originally described from the Midway of Texas. It occurs in our material in the upper bed. It occurs in the Upper Cretaceous in the upper part of the Navarro and its equivalents in Texas, Arkansas, Alabama, Mississippi, and Tennessee.

Family CASSIDULINIDAE

Genus PULVINULINELLA Cushman, 1926

- PULVINULINELLA CULTER (Parker and Jones), var. MEXICANA Cole (Pl. 12, fig. 12)
Pulvinulinella culter (PARKER and JONES), var. *mexicana* COLE, Bull.
 Amer. Pal., vol. 14, No. 51, 1927, p. 31, pl. 1, figs. 15, 16.

There are specimens from the upper bed in our material that are very much like topotypes of Cole's variety in our collections. They differ from the Recent form of the species in the more convex dorsal side and other details. The variety has been recorded from various parts of the Eocene. Mrs. Plummer records the species from the upper part of the Midway of Texas.

Family CHILOSTOMELLIDAE

Genus CHILOSTOMELLOIDES Cushman, 1926

- CHILOSTOMELLOIDES EOCENICA Cushman (Pl. 12, fig. 11)
Chilostomelloides eocenica CUSHMAN, Contr. Cushman Lab. Foram.
 Res., vol. 1, pt. 4, 1926, p. 78, pl. 11, figs. 20 a-c.—PLUMMER, Univ.
 Texas Bull. 2644, 1927, p. 129, pl. 8, figs. 8 a, b.

This species was described from the Midway of Texas. It was recorded by Mrs. Plummer from the upper part of the Midway, and occurs in our material from the upper bed.

Genus PULLENIA Parker and Jones, 1862

PULLENIA QUINQUELOBA Reuss (Pl. 12, figs. 13, 14)

- Pullenia quinqueloba* REUSS, Zeitschr. deutsch. geol. Gesell., vol. 3, 1851,
 p. 47, pl. 5, fig. 31.

Specimens which may be referred to this species occurred in both beds. It is a widely distributed and long ranging species if all the records for it really represent a single species.

Family GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA PSEUDO-BULLOIDES Plummer (Pl. 12, fig. 16)

- Globigerina pseudo-bulloides* PLUMMER, Univ. Texas Bull. 2644, 1927,
 p. 133, pl. 8, figs. 9 a-c.

This species originally described from the Midway of Texas occurs in typical form in our Alabama collections, particularly in the upper bed.

GLOBIGERINA TRILOCULINOIDES Plummer (Pl. 12, fig. 15)

- Globigerina triloculinoides* PLUMMER, Univ. Texas Bull. 2644, 1927, p.
 134, pl. 8, figs. 10 a-c.

Very typical specimens occur in the upper bed in our material.

It was described from the Midway of Texas, and there was also found most commonly in the upper part of the section.

Family ANOMALINIDAE

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA MIDWAYENSIS (Plummer) (Pl. 12, fig. 18)

Truncatulina midwayensis PLUMMER, Univ. Texas Bull. 2644, 1927, p. 141, pl. 9, figs. 7 a-c; pl. 15, figs. 3 a, b.

This rather ornate species described from the Midway of Texas occurs in typical form in our material from the upper bed.

ANOMALINA cf. AMMONOIDES Reuss (Pl. 12, fig. 17)

There are a few specimens, one of which is here figured, which may possibly belong to this species characteristic of the upper part of the Cretaceous. It may possibly be a new species, but there is not sufficient material to make certain of this.

Genus CIBICIDES Montfort, 1808

CIBICIDES ALLENI (Plummer) (Pl. 12, fig. 19)

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

Originally described from the upper part of the Midway of Texas, this species occurs in typical form in the upper bed of our Alabama material. It resembles *Cibicides harperi* (Sandidge) from the Navarro, but is distinct.

CIBICIDES VULGARIS (Plummer) (Pl. 12, fig. 21)

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

Our specimens which are from the upper bed of the Alabama section are not all entirely typical. In Texas, it also occurs in the upper portion of the Midway.

RECENT LITERATURE ON THE FORAMINIFERA

- Moore, Raymond C. Carboniferous-Permian Boundary.—Bull. Amer. Assoc. Petr. Geol., vol. 24, No. 2, February, 1940, pp. 282-336, 5 text figs.—Mentions numerous genera of fusulinid foraminifera.
- Ellisor, Alva C. Subsurface Miocene of Southern Louisiana.—L. c., No. 3, March, 1940, pp. 435-475, 11 text figs., 6 pls.—Discusses the occurrence, and lists numerous species of foraminifera. The species are figured on six plates.
- Colom, G. Estudio de Algunos Foraminiferos Recogidos por el Prof. B. Darder.—Bol. Soc. Esp. Hist. Nat., vol. XXXVI, 1936, pp. 391-402, pls. XLVIII-LII.
- Le Roy, L. W. Some Small Foraminifera, Ostracoda and Otoliths from the Neogene ("Miocene") of the Rokan-Tapanoeli Area, Central Sumatra.—Nat. Tijdschr. Ned.-Ind., vol. XCIX, pt. 6, 1939, pp. 215-296, pls. 1-14.—There are 96 species and varieties included, 44 described as new.
- Lalicker, C. G. and Irene McCulloch. Some *Textulariidae* of the Pacific Ocean.—Allan Hancock Pacific Expeditions, vol. 6, No. 2, 1940, pp. 115-143, pls. 13-16.—27 species and varieties described and figured, 10 new.
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