

THE FORAMINIFERA OF THE RIPLEY FORMATION ON COON CREEK, TENNESSEE

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This paper presents the results of a systematic study of the Foraminifera found in the Upper Cretaceous exposed on Coon Creek in McNairy County, Tenn. The material is from the Coon Creek tongue of the Ripley formation which is stratigraphically at the base of the Ripley formation and in the *Exogyra costata* zone.

The locality from which this material was collected is known as Dave Weeks' place on Coon Creek. It is in the northeastern part of McNairy County, $3\frac{1}{2}$ miles south of Enville, $7\frac{1}{2}$ miles north of Adamsville, and one-eighth of a mile east of the main Henderson-Adamsville road.

The sediments here are in general very like those of the Upper Cretaceous exposed at Brightseat, Md. The matrix was examined petrographically and the following minerals were found after the carbonates had been removed: Light minerals about 97-98 per cent made up of about half subangular grains of quartz and about the same amount of glauconite. The heavy minerals constituted only 2-3 per cent of the material and they were in order of their frequency, pyrite, blue kyanite, rounded staurolite, muscovite, sillimanite, brown hornblende, epidote, alkali and iron varieties of tourmaline, garnet, rutile, and monazite or zircon (?). All these minerals except the pyrite show well-rounded outlines.

The Foraminifera are extremely well preserved, much better preserved in fact than any other Upper Cretaceous Foraminifera found in this country with the possible exception of those at Brightseat, Md. In general the fossils look at first glance like late Tertiary and not Upper Cretaceous material.

The Foraminifera described from this material comprise 19 genera with a total of 37 species and varieties. Of these 37 species and varieties 19 are new to science. The lack of micropaleontologic work in the area and the extremely good condition of preservation would account for this large proportion of new species and varieties.

All the genera and species here found are, with the exception of the plagic forms, all inhabitants of fairly shallow waters. This, coupled with the abundance of glauconite, would indicate shallow seas, as does the associated molluscan fauna. The fauna as a whole has strong Cretaceous affinities but so many species are new that close comparisons are not possible. When some other well preserved Cretaceous foraminiferal deposits are found we will be better able to compare this fauna with them.

A very complete account of the larger fauna and the geology of the area is to be found in the very excellent work of Bruce Wade, published as Professional Paper 137 of the United States Geological Survey, (1926), entitled "The Fauna of the Ripley Formation on Coon Creek, Tenn." In this paper Wade goes into detail concerning the geologic relations of the fauna and also the ecologic conditions.

In this present work the senior author has described all but two of the species and has discussed the entire fauna. The junior author started the work, but economic conditions took him into the field before he had time to more than get started, and the senior author took over the material and followed it to a conclusion.

The types of this material are the property of the United States National Museum.

Family LITUOLIDAE

Genus REOPHAX Montfort, 1808

REOPHAX CYLINDRICUS H. B. Brady, var. *RIPLEYENSIS* W. Berry, new variety

Plate 1, Figure 5

Test elongate, slightly tapering, straight, ratio of length to diameter about 5:1, free. Chambers distinct, round, tumid in the middle, about as long as broad, serial, closely attached. Sutures slightly depressed; wall thin, composed of many sharp sand grains and little cement. Aperture a ragged hole in the end of the last chamber.

Length, 1.28 mm.

This variety is not closely related to the parent species, as shown by the less regular structure. It is related as shown by its general appearance and characteristics. It is the largest *Reophax* found in the Ripley at this outcrop.

Holotype.—Cat. No. 73661, U.S.N.M.

REOPHAX COONENSIS W. Berry, new species

Plate 3, Figure 23

Test small, cylindrical, straight, short, ratio of length to diameter about 3:1, free. Chambers indistinct, usually 3 to 4 in number, tumid in the middle. Sutures slightly depressed, usually very indis-

tinct. Walls stout, arenaceous, with much cement. Aperture a simple hole at the end of the last chamber; there is no evidence of a neck, as in most species of this genus.

Length, 0.59 mm.

This species of *Reophax* looks very like certain species of *Hormosina*, but in thin section it is at once evident that it belongs to the genus *Reophax*. It does not seem to be closely related to any of the described species of the genus. If it should prove to be unique for this part of Ripley it should be of much economic importance.

Holotype.—Cat. No. 73662, U.S.N.M.

Family TEXTULARIIDAE

Genus TEXTULARIA Defrance, 1824

TEXTULARIA AGGLUTINANS d'Orbigny

Plate 2, Figure 1

Textularia agglutinans D'ORBIGNY, Foram. Cuba, 1839, p. 144, pl. 1, figs. 17-18 and 32-34.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 363, pl. 63, figs. 1-3.—CUSHMAN, Foram. Atlantic Ocean, U. S. Nat. Mus. Bull. 104, pt. 3, 1922, p. 7, pl. 1, figs. 4-5.

Test elongate, tapering, small, ratio of length to width about 3:1. Chambers slightly inflate giving a rough outline, biserial throughout. Chambers numerous usually about 9 in an adult specimen, have usual Textularian shape with rounder exterior margins. Sutures slightly depressed, fairly distinct; wall arenaceous, fair amount of cement. Aperture simple arched slit on the interior face near point of attachment of last chamber.

Length, 0.86 mm.

This species, which has been described from the Cretaceous of New Jersey,¹ and the Midway of Texas² is the most common *Textularia* found in the Ripley on Coon Creek. The specimens fit into the species closely.

Plesiotype.—Cat. No. 73663, U.S.N.M.

TEXTULARIA SAGITTULA Defrance, var. COONENSIS W. Berry, new variety

Plate 2, Figure 3

Test elongate, tapering, small, ratio of length to width about 2:1. Chambers extremely small, numerous, usually about 20 in an adult specimen; chambers form a sharp angle at the margin and are arranged biserially. Sutures distinct, even with the surface, slightly limbate, wall thin hayaline, perforate, colorless. Apertural end usually not preserved. Where it is present the aperture is a simple arched slit at the line of attachment of the last formed chamber.

¹ Bagg, Bull. 88, U. S. Geol. Surv.

² Plummer, Univ. Texas Bull. 2644.

This variety differs from the parent species in having a more hyaline test. It is of small size and in this material it is poorly preserved. The thin walls do not stand handling, and they are also apparently partly dissolved by the water circulating through the formation. It is a rather pretty variety and shows the arrowlike form of the parent species.

Holotype.—Cat. No. 73664, U.S.N.M.

TEXTULARIA RIPLEYENSIS W. Berry, new species

Plate 2, Figure 2

Test elongate, tapering, small, ratio of length to width about 1.3:1. Chambers, usually 10 in number in adult specimens, inflate, causing them to rise well above the area of the sutures, have a salient angle on the margin, and are arranged biserially. Sutures distinct, depressed, causing chambers to be extremely well emphasized. Wall arenaceous, with much cement. Aperture a simple arched slit extending entirely across the interior face near the line of attachment of the final chamber.

Length, 0.55 mm.

This species is related to *T. carinata* d'Orbigny, *T. milletti* Cushman, and *T. mexicana* Cushman. Sandridge has described a similar species in manuscript from the Ripley of Alabama, but, as I have not been able to see either the specimens or the figures, I can not say definitely that it is the same as this species from the Ripley of Coon Creek. *T. ripleysensis* is fairly common in this material and should be easily identified.

Holotype.—Cat. No. 73665, U.S.N.M.

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA PLAITA Carsey

Plate 1, Figure 14

Bolivina plaita CARSEY, Univ. Texas Bull. 2612, 1926, p. 26, pl. 4, fig. 2.

Proroporus plaita (Carsey) CUSHMAN, Contrib. Cush. Lab. Foram. Research, vol. 2, pt. 4, 1927, p. 89, pl. 12, figs. 7a-b.

Test elongate, subcylindrical, very slightly compressed, apical end rounded with a flat portion for the extreme end; chambers numerous, usually about 15 in an adult specimen, high, very slightly inflate, arranged in an alternating biserial series; sutures nearly flush, very slightly limbate, curving slightly in the direction of the older chambers; wall hyaline, finely punctate, otherwise smooth except for the limbate sutures; aperture loop-shaped, elongate; color transparent to translucent white.

Length, 0.94 mm.

This species is the only *Bolivina* found in the material from Coon Creek. It is rather common and characteristic. Cushman says³ it is very close to *B. reussi* Geintz. I can find little similarity. *B. plaita* is found in the Navarro of Texas and in the Ripley at Owl Creek, Miss., as well as in the Ripley of Coon Creek.

Plesiotype.—Cat. No. 73666, U.S.N.M.

Genus BULIMINA d'Orbigny, 1826

BULIMINA QUADRATA Plummer

Plate 2, Figure 7

Bulimina quadrata PLUMMER, Univ. Texas Bull. 2644, 1926, p. 72, pl. 4, figs. 4-5

Test elongate, stout, cylindrical, slightly tapering, aboral end bluntly rounded; chambers smooth, slightly inflated, arranged in a slight Textularian series, usually 8-9 chambers in the adult test; sutures sharp, only slightly depressed; aperture a large vertical slit on the inner side of the last chamber.

Length, 0.44 mm.

This specimen agrees very closely with that figured as the megalospheric form of the species by Mrs. Plummer. She records it from the upper faunule of the Midway formation of Texas.

Plesiotype.—Cat. No. 73667, U.S.N.M.

Family LAGENIDAE

Genus LAGENA Walker and Boys, 1784

LAGENA SULCATA (Walker and Jacob) var. SEMIINTERUPTA W. Berry, new variety

Plate 3, Figure 19

Test flask-shaped, body portion subglobular, ornamented with numerous fine, platelike costae; these costae are even in number and are arranged in loops starting at the base of the apertural neck, going almost to the apical end, and returning to the starting place but not connecting; the pairs alternate in their distance from the apical end; neck smooth, ending in a simple circular aperture.

Length, 0.48 mm.

This variety is in general like the parent species but differs greatly in the costae. In this variety they are formed in pairs, that is, they run from the apertural end to the apical end, but before reaching it they loop back. The pairs also alternate in their approach to the apical end. It is a very rare and delicate variety.

Holotype.—Cat. No. 73668, U.S.N.M.

³ Contr. Cush. Lab. Foram. Research, vol. 2, pt. 4, 1927, p. 89.

Genus DENTALINA d'Orbigny, 1826

DENTALINA COMMUNIS d'Orbigny

Plate 2, Figure 10

Nodosaria (Dentalina) communis D'ORBIGNY, Ann Sci. Nat., vol. 7, 1826, p. 254, No. 35.

Dentalina communis D'ORBIGNY, Mem. Soc. Geol. France, vol. 4, 1840, p. 13, pl. 1, fig. 4.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 504, pl. 62, figs. 19–22.—CUSHMAN, Foram. Philippine and Adj. Seas, U. S. Nat. Mus. Bull. 100, 1921, pp. 192–193, pl. 34, fig. 7.

Test elongate, moderately slender, tapering very slightly, compressed, rounded at the apical end; early chambers broader than long, increasing gradually in length until the final chambers are about one-third longer than broad, numerous, usually 8–9; surface smooth, polished; aperture eccentric on a slight protuberance.

Length, 0.55 mm.

This is the only *Dentalina* found in this material. It is easily recognized, and as far as I know has not been found in the Cretaceous of the United States except by Bagg⁴ in the Mommouth and Rancocas formations of New Jersey.

Plesiotype.—Cat. No. 73669, U.S.N.M.

Genus NODOSARIA Lamarck, 1812

NODOSARIA AFFINIS d'Orbigny

Plate 1, Figure 8

Nodosaria affinis D'ORBIGNY, Foram. Foss. Vienne, 1846, p. 39, pl. 1, figs. 36–39.—PLUMMER, Univ. Texas Bull. 2644, 1926, p. 89, pl. 14, figs. 2a–d.

Test elongate, tapering, composed of numerous subcylindrical, oval chambers fairly closely connected; walls ornamented with heavy longitudinal costae running the entire length of the test, sutures depressed but filled with clear material over which the costae run; apical end usually terminated with a spine, aperture on the extreme end of a short neck.

Length, greater than 1.80 mm.

Nodosaria affinis is rather common in the Ripley of Coon Creek. It is easy to see, due to its large size and its usual white color. It has been described from the Midway of Texas, and under other names similar forms have been described from the Lias to the recent. In this material it shows constant characters which would tend to show that there is every reason to call it a fixed species at least in this area.

Plesiotype.—Cat. No. 73670, U.S.N.M.

⁴ Bull. 88, U. S. Geol. Survey, p. 37.

NODOSARIA PROXIMA Silvestri

Plate 1, Figure 13

Nodosaria proxima SILVESTRI, Atti Accad. Gioenia, Catania, ser. 3, vol. 7, 1872, p. 63, pl. 6, figs. 138-147.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 511, pl. 64, fig. 15.—CUSHMAN, Foram. N. Pacific Ocean, U. S. Nat. Mus. Bull. 71, pt. 3, 1913, p. 52.

Test elongate, slender, composed of several spherical chambers connected by short necks or tubes; surface ornamented with longitudinal costae extending the entire length of the test; aperture on the end of the last formed neck.

Length, 0.68 mm.

This small species was first described by Silvestri from the Subpennine Clay of San Quirico near Sienna. These clays are generally thought to be of Pliocene age, but it is now known that there are clays in the Appennines of Cretaceous age. These Cretaceous clays contain plants of Senonian age and also carry cycad stumps. It is entirely possible that the clays from which Silvestri described *N. proxima* were of Cretaceous age.

This species is rare in the Ripley at Coon Creek, but as it is the only 2-chambered species it is easily identified from any of the other species.

Plesiotype.—Cat. No. 73671, U.S.N.M.

NODOSARIA, species

Plate 1, Figure 9

Test composed of slightly inflated chambers with smooth walls. These chambers are so broken as to give no clue to the conditions of the rest of the test.

This small fragment of *Nodosaria* is of no value in determining what its affinities might be. It is of interest to note it with the hope that future work will bring to light more complete specimens and so lead us to the determination of its true species.

Genus CRISTELLARIA Lamarck, 1812

CRISTELLARIA MIDWAYENSIS Plummer

Plate 1, Figure 3

Cristellaria midwayensis PLUMMER, Univ. Texas Bull. 2644, 1926, p. 95, pl. 13, fig. 5a-c, 1926.

Test large, closely coiled, biconvex; peripheral margin carinate; composed of numerous chambers usually 11-12 in the last formed whorl of adult specimens, 9-10 in younger specimens; sutures distinct, slightly limbate and raised near the umbo; aperture radial.

Diameter, greater than 1 mm.

This is the largest and most common species of *Cristellaria* in the material from Coon Creek. Mrs. Plummer reports it as a common form in the Midway of Texas.

Plesiotype.—Cat. No. 73673, U.S.N.M.

CRISTELLARIA ORBICULARIS (d'Orbigny), var. **MINUTA** W. Berry, new variety

Plate 1, Figure 2

Test closely coiled, biconvex, composed of numerous chambers, usually 7-8 in the last formed coil; peripheral margin acute to subcarinate; sutures slightly limbate and slightly raised; there is a slightly raised umbo; walls smooth, shiny; aperture radial and visible in several chambers before the final one.

Diameter, 0.74 mm.

This variety, which bears a close resemblance to the species *C. orbicularis*, is smaller and does not have such a distinct keel. It is fairly common in the material from Coon Creek.

Holotype.—Cat. No. 73674, U.S.N.M.

CRISTELLARIA WADEI W. Berry, new species

Plate 1, Figure 1

Test small, closely coiled, biconvex; chambers numerous, usually about 8 in the last formed coil; peripheral margin very acute, carinate with a thin keel about one-eighth of the length of the rest of the test; sutures very slightly depressed; surface smooth; aperture radial.

Length, 0.64 mm.

C. wadei is somewhat like *C. submamillegera* Cushman in general appearance of the keel, but does not have the raised ridge extending to the umbo, and is smaller. *C. wadei* can be compared with *C. expansa* Cushman but, again it is smaller and lacks the alar projection. Complete specimens of this species are rare in the material; in most cases the thin keel is broken off either entirely or in parts, both of which conditions are apt to lead one to incorrect conclusions.

Holotype.—Cat. No. 73675, U.S.N.M.

Genus VAGINULINA d'Orbigny, 1826

VAGINULINA WADEI Kelley, new species

Plate 1, Figure 7

Test elongate, slender, compressed except proloculum, broadening slightly with the addition of chambers; peripheral edge straight, proximal edge nearly so; apertural face at an angle of about 45° with peripheral edge; chambers 8 in number, proloculum spherical, subsequent chambers elongate oblique, slanting down from the peripheral edge to the proximal edge at an angle of about 45°, ornamented with 14 longitudinal costae on the proloculum, 16 on the third and

fourth chambers and becoming fainter on the younger parts of the test, the most pronounced being three each on the periferal and proximal edges which continue unabated in relief throughout the test; sutures slightly depressed, nearly straight; wall hyaline, highly transparent condition of the test shows the intercameral walls to be broad, thick; aperture radiate, round, terminal on a slight projection at the junction of the apertural face and periferal edge.

Length, 1.38 mm.

This species is somewhat like one found by Sandige, (MS.), in the Ripley of Alabama, but has a greater number of chambers and is more transparent. It is very rare in the Coon Creek material, but when present is very noticeable and easily identified.

Holotype.—Cat. No. 73676, U.S.N.M.

Genus FRONDICULARIA DeFrance, 1824

FRONDICULARIA ANGUSTISSIMA Reuss

Plate 1, Figure 10

Frondicularia angustissima REUSS, MARSSON, Die Foraminifera der Schreibkeide de Insel Rügen 1877.—EGGER, Abh. d. II, Cl. d. k. Akad. d. Wiss., XXI, vol. 1, Abth. 1902.

Test elongate, evenly compressed, slightly wider near the apertural end, rectangular in traverse section; chambers few 6-7 in number, bearing a blunt apical spine and 4 or 5 distinct longitudinal costae, later chambers chevron-shaped, last one drawn out to a neck bearing a ball-shaped aperture; sutures distinct, raised, forming inverted V's; wall smooth, transparent, glossy; aperture terminal at the end of the neck on the small sphere, produced, round, radiate.

Length, 1.05 mm.

This species, which is extremely rare in the Coon Creek material, is only reported from the Cretaceous. It should prove a good horizon marker if it is present in large enough numbers to be readily found. It is the only occurrence of the species in the Cretaceous of the United States, so far as I know.

Plesiotype.—Cat. No. 73677, U.S.N.M.

Genus POLYMORPHINA d'Orbigny, 1826

POLYMORPHINA LACTEA (Walker and Jacob)

Plate 1, Figure 12

Serpula lactea WALKER and JACOB (according to Kanmacher), 1794, Adam's Essays, ed. 2, p. 634, pl. 14, fig. 4.

Polymorphina lactea MACGILLIVRAY 1843. Moll. Aberdeen, p. 320.—H. B. BRADY, Rept. Voy. *Challenger*, Zoology, vol. 9, p. 559, pl. 71, figs. 11, 14.

Test small, rounded to ovate, front view circular; chambers elongate, few, usually 3-4; sutures distinct even, slightly limbate; wall smooth; aperture terminal, radial, slightly elevated.

Length, 0.56 mm.

This small almost spherical species is cosmopolital and ranges from the Jurassic ⁵ to the recent seas. It has not been met with before in the Ripley.

Plesiotype.—Cat. No. 73678, U.S.N.M.

POLYMORPHINA GUTTA d'Orbigny

Plate 1, Figure 11

Pyrulina gutta d'ORBIGNY, 1826, Ann. Sci., vol. 7, p. 267, No. 28, pl. 12, figs. 5-6.

Polymorphia, (*Pyrulina*). *gutta*, PARKER and JONES, 1863, Ann. Mag. Nat.

Hist., ser. 3, vol. 12, p. 440, No. 21.—FRANKE, 1925, Foram. pommerschen Kreide, Abh. geol.-paleon. Inst. U. Griefswald, vol. 6, p. 77, pl. 6, figs. 16a—b.

Test elongate, more or less rounded, cylindrical initial end rounded, apertural end obtusely pointed, chambers fairly numerous, 4-5 in adult specimens, smooth, elongate, sutures distinct level, last formed chamber bearing a well-developed entirely radiate aperture, wall smooth, translucent.

Length, 0.80 mm.

This form, which is rather common in this material, is a very beautiful one. It has not been found before in the Cretaceous of the United States, so far as I know.

Plesiotype.—Cat. No. 73679, U.S.N.M.

POLYMORPHINA AMPLA Karrer

Plate 1, Figure 4

Polymorphina ampla KARRER, 1870, Über ein neues Vorkommen von oberer Kreide in Leitzerdorf bei Stockerau und der Foraminifera-Fauna.—EGGER, 1902, Abh. d. II. Cl. d. k. Akad. d. Wiss. XXI, vol 1. Abth., p. 126. pl. 17, fig. 32.

Test fairly large, rounded elongate, decidedly compressed; chambers few usually about 5-7; obliquely placed; sutured distinct, level, slightly limbate; wall thin, perforate, smooth; aperture terminal, radiate.

Length, 1.56 mm.

This is the largest *Polymorphina* found in this material. Its large size and flattened condition readily set it off from any others occurring in the formation. It has not before been recorded from the American Cretaceous.

Plesiotype.—Cat. No. 73680, U.S.N.M.

⁵ Moore, Quart. Jour. Geol. Soc., vol. 27, pp. 236, 239.

Family GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA CRETACEA d'Orbigny

Plate 3, Figures 7, 8, 9

Globigerina cretacea D'ORBIGNY, Mem. Soc. Geol. France, ser. 1, vol. 4, 1840, p. 34, pl. 3, figs. 12-14.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 596, pl. 82, figs. 10a-c (?).—CUSHMAN, J. A., Foram. of the Philippine and Adjacent Seas, U. S. Nat. Mus. Bull. 100, 1921, p. 287.

Test composed of numerous inflated chambers arranged in a slightly trochoid nautiloid spiral, chambers all visible from above, very umbilicate below with only the chambers of the last formed whorl visible, chambers usually 5-6 in number in the last whorl; wall thin, reticulate with slight traces of spine bases; apertures of chambers open into the umbilical cavity.

Diameter, 0.46 mm.

This species is a most cosmopolitan one. It is found world wide from the Cretaceous up to and in the recent seas. It is widely distributed in the American Cretaceous. I have identified this as *G. cretacea* rather than *G. dubia* because of its small size and general appearance.

Plesiotype.—Cat. No. 73681, U.S.N.M.

Family ROTALIIDAE

Genus DISCORBIS Lamarck, 1804

DISCORBIS RIPLEYENSIS W. Berry, new species

Plate 3, Figures 16, 17, 18

Test biconvex, smooth, few chambers usually 6-7 in the last formed coil, all visible on the dorsal side, only those of the last formed whorl on the ventral side; periphery margin subcarinate; sutures distinct, those on the dorsal side limbate, even, ventral ones indistinct and slightly limbate near the slight umbo developed on the ventral side; aperture a narrow slit extending backward from the margin toward the umbilical region.

Diameter, 0.50 mm.

This species, which is well characterized, seems closest in its relationship to *D. bertheloti* var. *baconica* Hantken, but differs very much in the sutures and in the degree of convexity. *D. ripleysis* is easily distinguished by its heavy limbate sutures and margin.

Holotype.—Cat. No. 73682, U.S.N.M.

Genus TRUNCATULINA d'Orbigny, 1826

TRUNCATULINA COONENSIS W. Berry, new species

Plate 3, Figures 1, 2, 3

Test free, biconvex, dorsal side less convex than ventral, peripheral margin slightly rounded and slightly subcarinate, chambers numerous, 9 to 10 in the last coil, involute on ventral side, sutures depressed, slightly distinct, wall punctate; aperture an arched opening at the base of the last formed chamber with a slit extending under the dorsal margin of the chambers.

Diameter, 0.35 mm.

T. coonensis is like *T. vulgaris* Plummer except that it lacks the limbate sutures of that species. It is also somewhat like a form described by Sandidge in manuscript but again it differs in the sutures and in the amount of convexity of the test. *T. coonensis* is fairly common in the Ripley at this point.

Holotype.—Cat. No. 73683, U.S.N.M.

TRUNCATULINA RIPLEYENSIS W. Berry, new species

Plate 3, Figures 4, 5, 6

Test apparently free, small, very unequally biconvex, ventral side being nearly flat, peripheral margin fairly acute but not carinate, chambers numerous, all visible from the dorsal side, the ventral side involute, usually 8-9 in the last coil; sutures level, indistinct except in the last part of the test; surface finely punctate; aperture a simple arched opening at the base of the last chamber.

Diameter, 0.28 mm.

This species, which I have described as new, is probably closely related to *T. tenuimargo* H. B. Brady, but differs in lacking the carinate edge and in other minor respects. *T. ripleysensis* is the smallest *Truncatulina* found in the Ripley at this point and differs, as far as I know, from any others found at other points in the same formation.

Holotype.—Cat. No. 73684, U.S.N.M.

TRUNCATULINA WADEI W. Berry, new species

Plate 3, Figures 13, 14, 15

Test free, biconvex, slightly unequally so, peripheral margin broadly rounded, slightly lobate in young specimens; chambers numerous, 9-10 in the last coil, involute on the ventral, partly so on the dorsal; sutures distinct, depressed on ventral side, slightly limbate on the dorsal face, dorsal surface coarsely punctate, ventral more finely punctate; aperture a simple arched opening at the base of the final chamber.

Diameter, 0.39 mm.

T. wadei is very like *T. akneriana* (d'Orbigny), except that in *T. wadei* the sutures are not as much limbate as in the other species. *T. wadei* is not so coarsely punctate as the other. It is the largest *Truncatulina* found in this material and is easily distinguished from the other species found there.

Holotype.—Cat. No. 73685, U.S.N.M.

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA AMMONOIDES Reuss

Plate 2, Figures 16, 17, 18

Test small, much compressed laterally, composed of numerous chambers, all visible from the dorsal side, only those of the last formed coil visible from the ventral side; ventral side slightly umbilicate, usually about 8 chambers in the last coil, about two and a half to three coils; chambers comma shaped; sutures indistinct becoming more distinct and depressed in the later part of the test; wall fairly heavy, finely perforate; aperture narrow curved slit at the base of the final chamber.

Diameter, 0.40 mm.

This wide spread species is reported by Sandige (MS.) from the Ripley of Alabama and is common in the Ripley material. It has a fairly wide geologic and geographic range and so is of little importance in age correlations.

Plesiotype.—Cat. No. 73686, U.S.N.M.

ANOMALINA TENNESSEENSIS W. Berry, new species

Plate 2, Figures 13, 14, 15

Test small, nautiloid, slightly compressed laterally, composed of numerous chambers all clearly visible from the dorsal side, only those of the last formed coil visible on the ventral side; ventral side umbilicate; about 7–8 chambers in last coil, usually about two coils; sutures slightly depressed, more or less distinct; wall thin, coarsely perforate; aperture a narrow curved slit at base of final chamber.

Diameter, 0.32 mm.

This small species is fairly common in the Ripley. It can be compared to *A. clementina* d'Orbigny in general appearance, but while *A. clementina* has slightly raised ridges on the sutures *A. tennesseensis* has none. In size the two species are nearly alike, *A. clementina* being only slightly larger.

Holotype.—Cat. No. 73687, U.S.N.M.

ANOMALINA NELSONI W. Berry, new species

Plate 2, Figures 19, 20, 21

Test nautiloid, dorsal side nearly flat to slightly concave, ventral side convex; periphery broadly rounded, lobate; chambers numerous, 7-8 in the last formed coil, inflated, gradually increasing in size; sutures distinct, depressed; wall punctate; umbilical cavity usually filled with shell material; aperture an arched slit with a slight lip above it at the base of the last chamber.

Diameter, 0.52 mm.

This species is not common in the material, but is so well characterized that one should not have any trouble in determining it.

Holotype.—Cat. No. 73688, U.S.N.M.

ANOMALINA COONENSIS W. Berry, new species

Plate 2, Figures 22, 23, 24

Test involute, somewhat compressed, nearly equally biconvex, peripheral margin subcarinate; chambers numerous, usually 12 in the last formed coil, very slightly curving; sutures limbate, slightly raised, comma-shaped, slightly elevated at the edge of the umbilical area; wall punctate; aperture an arched slit at the base of the last chamber, extending toward the umbilicus.

Diameter, 0.55 mm.

A. coonensis is by far the most common species of *Anomalina* in this material. It can be compared with *A. ammonoides* Reuss, but is bigger, more equally convex, and has a sharper margin. It is probably fairly closely related to it.

Holotype.—Cat. No. 73689, U.S.N.M.

ANOMALINA WADEI W. Berry, new species

Plate 3, Figures 20, 21, 22

Test nautiloid, dorsal side nearly flat, ventral side strongly convex, periphery subcarinate, slightly lobate; chambers numerous, usually 10 in the last formed coil; sutures in the early portions of the test limbate, later ones depressed, distinct; wall punctate; umbilical cavity usually filled with shell material, small umbo present on ventral side; aperture an arched slit at the base of the last formed chamber, extending toward the umbilical area.

Diameter, 0.52 mm.

This very rare species is somewhat like *A. pseudopapillosa* Carsey, but is larger and the umbilical is filled. *A. pseudopapillosa* is a common form in the Texas and Navarro, but in this material it is absent.

Holotype.—Cat. No. 73690, U.S.N.M.

Genus *ROTALINA* Lamarck, 1804*ROTALIA BECCARII* Linnaeus, var. *RIPLEYENSIS* W. Berry, new variety

Plate 3, Figures 10, 11, 12

Test round, biconvex, dorsal side lower than ventral, periphery broadly rounded; chambers numerous 11–12 in the last-formed coil, later ones slightly inflate; sutures on the dorsal side slightly curved, later ones strongly depressed, early ones indistinct, on ventral surface indistinct, level; umbilicus open, small; wall smooth, finely punctate; aperture a narrow, elongate slit at the ventral margin of the last chamber and extending to the umbilicus.

Diameter, 0.45 mm.

This variety differs from the parent species in the amount of convexity, it being less convex. It also differs in having a deeper umbilicus. The parent species is common in the Tertiary and is of wide geographic distribution. This variety is fairly common in the Ripley and is very characteristic.

Holotype.—Cat. No. 73691, U.S.N.M.*ROTALIA*, species

Test round, biconvex, dorsal side low, ventral face highly convex, periphery rounded, slightly lobate in the later stages, chambers numerous, 8–9 in the last whorl; sutures slightly depressed, early ones filled with clear shell-like material, umbilicus small; wall smooth, finely punctate; aperture destroyed.

This fragment seems to be closest to *R. soldanii* d'Orbigny, but there is so little left that correct determination is impossible.

Family MILIOLIDAE

Genus *CORNUSPIRA* Schultze, 1854*CORNUSPIRA INVOLVENS* Reuss

Plate 1, Figure 6

Operculina involvens REUSS, Denkschr. Akad. Wiss. Wien, vol. 1, 1849, p. 370, pl. 45, fig. 20.

Cornuspira involvens REUSS, Sitz. Akad. Wiss. Wien, vol. 48, 1863 (1864), p. 39, pl. 1, fig. 2.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 200, pl. 11, figs. 1–3.—J. A. CUSHMAN, Form. North Pacific Ocean, U. S. Nat. Mus. Bull. 71, pt. 6, 1917, p. 25, pl. 1, fig. 2; pl. 2, fig. 2.

Test biconvex, consisting of a long coiled tubular chamber gradually increasing in diameter; wall smooth; the lines between the various coils usually more or less obliterated by shell material. Aperture simply the end of the tube.

Diameter, about 1.24 mm.

This is a well known Tertiary species and, as far as I know, has not been described from the American Cretaceous. It is not common in this material but is well preserved when found. Its large size and white porcellaneous tube cause it to stand out in the matrix.

Plesiotype.—Cat. No. 73693, U.S.N.M.

Genus SPIROLOCULINA d'Orbigny, 1826

SPIROLOCULINA CRETACEA Reuss

Plate 2, Figure 6.

Spiroloculina cretacea REUSS, Ostalpen 72, vol. 26, p. 9.—EGGER, Abh. d. II. Cl. d. k. Akad. d. Wiss. XXI, vol. 1, Abth. 1902, p. 21, pl. 1, figs. 22–24.—FRANKE, Abh. geol.-paleon. Inst. Univ. Greifswald, vol. 6, 1925, p. 9, pl. 1, fig. 9.

Test in side view elliptical, in end view the sides are nearly parallel, the periphery flattened; chambers numerous; the periphery and inner margins of the chambers slightly raised, apertural end of the chamber forms a slight neck; lip slightly developed; aperture nearly circular, tooth either undeveloped or else broken off in all specimens, wall smooth, dull.

Length, 0.59 mm., width, 0.39 mm.

This form, which is represented here by one specimen, has only been reported from the Cretaceous. It is extremely rare and although there are a few apparent fragments of it in the material they are all so delicate that they could not be saved. It has not been previously reported from the Cretaceous of the United States, only from Europe.

Plesiotype.—Cat. No. 73694, U.S.N.M.

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA SEMINULUM (Linnaeus)

Plate 2, Figures 11, 12

Serpula seminulum LINNAEUS, Syst. Nat., ed. 12, 1767, p. 1264, No. 791.
Miliolina seminulum H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 157, pl. 5, figs. 6 a–c.
Quinqueloculina seminulum CUSHMAN, Foram. N. Pacific Ocean, U. S. Nat. Mus. Bull. 71, pt. 6, 1917, p. 44, pl. 11, fig. 2; text fig. 29.

Test free, elongate, about twice as long as broad, smooth, peripheral margin acute, almost carinate, sutures distinct, apertural end raised in a straight neck, aperture broadly oval; there is no tooth apparent.

Length, 0.57 mm.

This species has a very mixed synonymy and is usually used to include all the smooth forms of the genera. I have used it in the same

sense as Brady and Cushman. In my specimens the tooth is not present, having apparently been broken out.

Plesiotype.—Cat. No. 73695, U.S.N.M.

QUINQUELOCULINA WADEI W. Berry, new species

Plate 2, Figures 4, 5

Test free, small, nearly as broad as long, smooth, highly polished, peripheral margins broadly rounded, sutures distinct, apertural end forming a very slight neck, aperture fairly large, tunnel shaped with a simple tooth rounded at the free end.

Length, 0.28 mm.

This small species is rare but wonderfully preserved, the high polish making it look like a recent form. It seems to be related to *Q. circularis* Bornemann, but has a simple tooth, whereas *Q. circularis* has a broad, rectangular tooth.

Holotype.—Cat. No. 73696, U.S.N.M.

QUINQUELOCULINA COONENSIS W. Berry, new species

Plate 2, Figures 8, 9

Test free, about twice as long as broad, smooth, peripheral margin rounded but bearing a prominent ridge of costae, sutures distinct; apertural end slightly elongated; aperture fairly large, slightly egg-shaped, oval, with no tooth developed.

Length, 0.55 mm.

This fairly common species seems to be related to *Q. bicornis*, (Walker and Jacob), but is smaller and does not have the double costae or such a long neck.

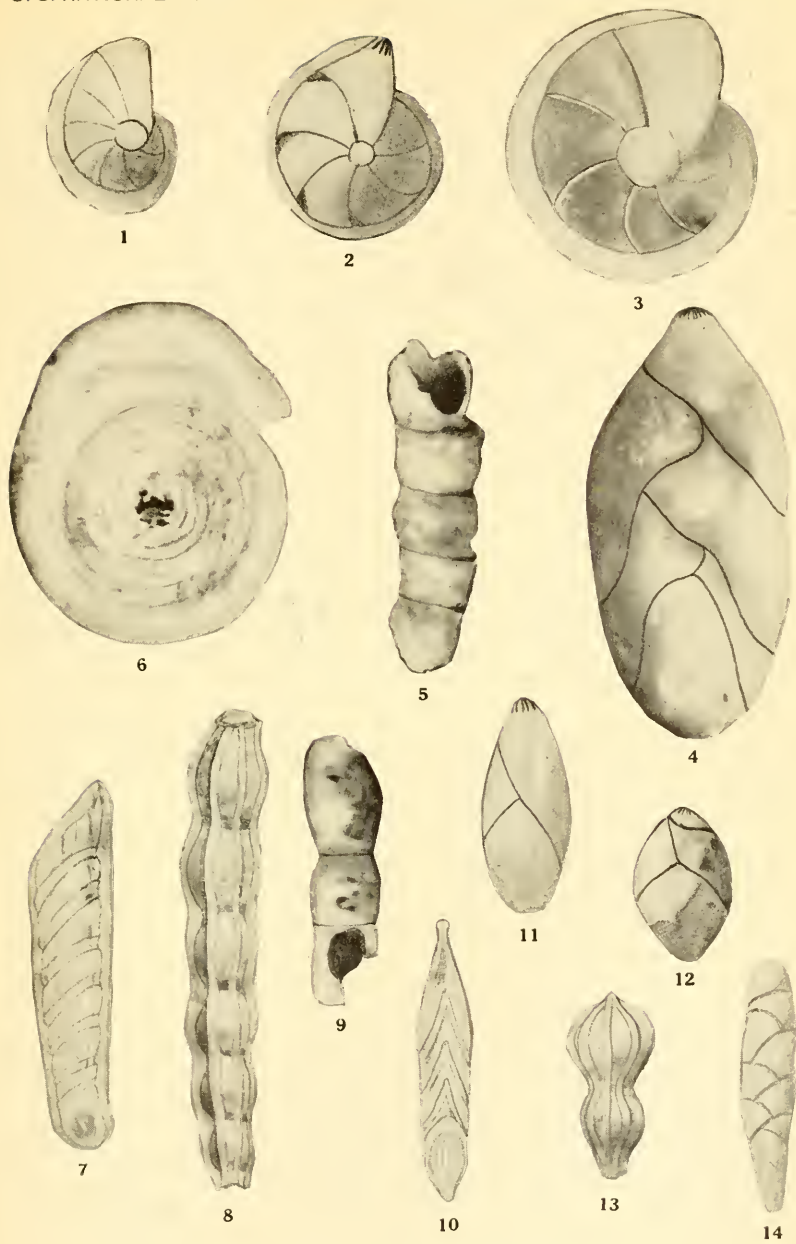
Holotype.—Cat. No. 73679, U. S. N. M.

EXPLANATION OF PLATES

PLATE 1

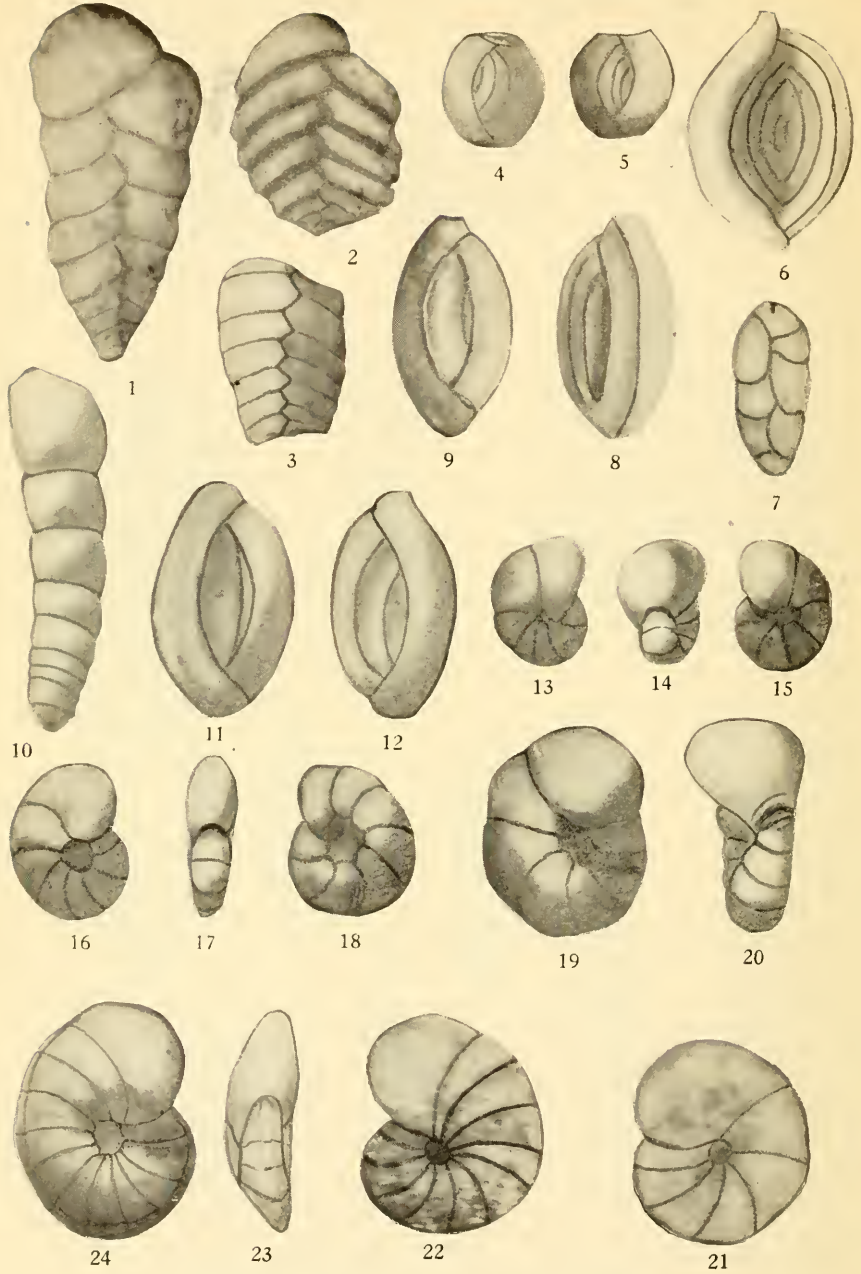
Figures enlarged 37 times

- FIGURE 1. *Cristellaria wadei* W. Berry.
2. *Cristellaria orbicularis*, var. *minuta* W. Berry.
3. *Cristellaria midwayensis* Plummer.
4. *Polymorphina ampla* Karrer.
5. *Reophax cylindricus*, var. *ripleyensis* W. Berry.
6. *Cornuspira involvens* Reuss.
7. *Vuginulina wadei* Kelley.
8. *Nodosaria affinis* d'Orbigny.
9. *Nodosaria*, species.
10. *Frondicularia angustissima* Reuss.
11. *Polymorphina gutta* d'Orbigny.
12. *Polymorphina lactea*. (Walker and Jacobs).
13. *Nodosaria proxima* Silvestri.
14. *Bolivina plaita* Carsey.



FORAMINIFERA OF THE RIPLEY FORMATION

FOR EXPLANATION OF PLATE SEE PAGE 18



FORAMINIFERA OF THE RIPLEY FORMATION

FOR EXPLANATION OF PLATE SEE PAGE 19

PLATE 2

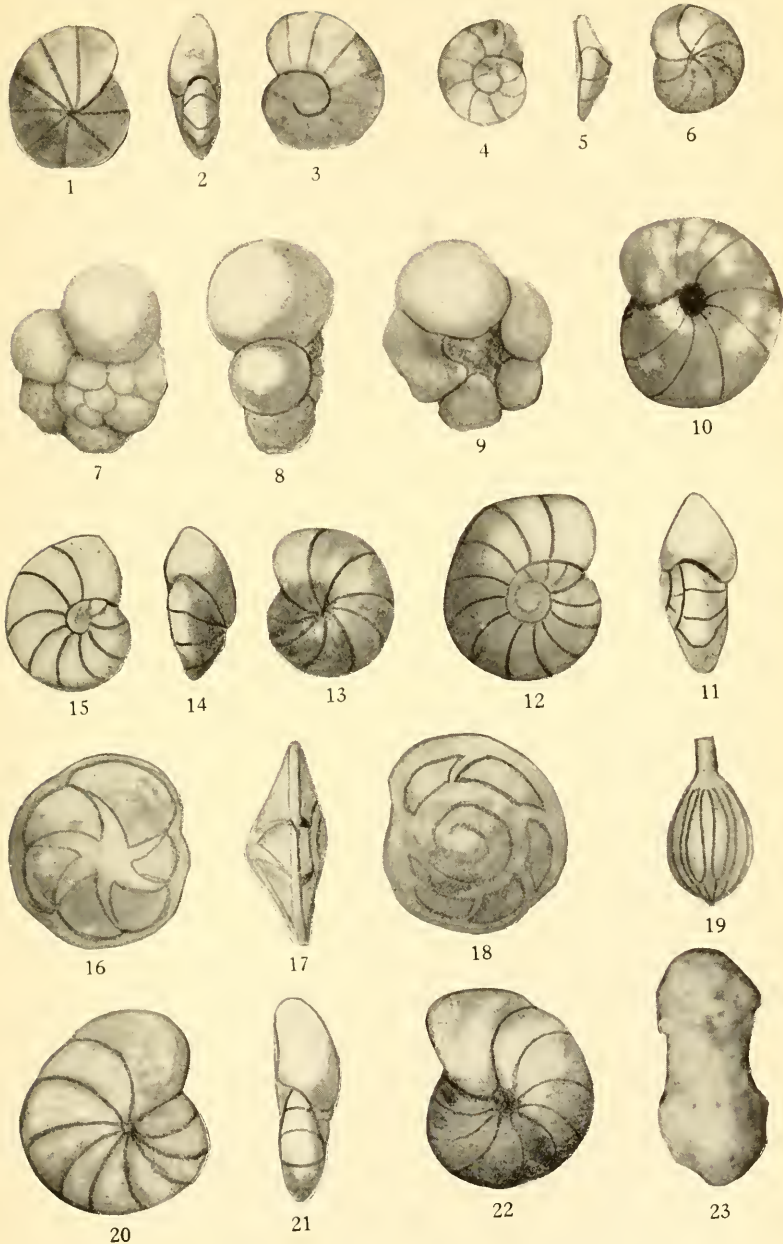
Figures enlarged 55½ times

- FIGURE 1. *Textularia agglutians* d'Orbigny.
2. *Textularia ripleyensis* W. Berry.
3. *Textularia sagittula*, var. *coonensis* W. Berry.
4-5. *Quinqueloculina wadei* W. Berry.
6. *Spiroloculina cretacea* Reuss.
7. *Bulimina quadrata* Plummer.
8-9. *Quinqueloculina coonensis* W. Berry.
10. *Dentalina communis* d'Orbigny.
11-12. *Quinqueloculina seminulum* (Linnaeus).
13-15. *Anomalina tennesseensis* W. Berry.
16-18. *Anomalina ammonoides* Reuss.
19-21. *Anomalina nelsoni* W. Berry.
22-24. *Anomalina coonensis* W. Berry.

PLATE 3

Figures enlarged 55½ times

- FIGURES 1-3. *Truncatulina coonensis* W. Berry.
4-6. *Truncatulina ripleyensis* W. Berry.
7-9. *Globigerina cretacea* d'Orbigny.
10-12. *Rotalia beccarii*, var. *ripleyensis* W. Berry.
13-15. *Truncatulina wadci* W. Berry.
16-18. *Discorbis ripleyensis* W. Berry.
19. *Lagena sulcata*, var. *semiinterrupta* W. Berry.
20-22. *Anomalina wadci* W. Berry.
23. *Reophax coonensis* W. Berry.



FORAMINIFERA OF THE RIPLEY FORMATION

FOR EXPLANATION OF PLATE SEE PAGE 20