CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

134. NEW AMERICAN CRETACEOUS FORAMINIFERA*

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The following new species and varieties are all from the Upper Cretaceous of the Gulf Coastal Plain region of the United States, and are here placed on record so that they may be available for workers on the Cretaceous of that region while awaiting the large report now nearly completed. A very considerable proportion of the species of our Gulf Coastal Plain Cretaceous have already been described by authors from the European Cretaceous, as many of the species of the two areas are identical. Most of the forms here described have a relatively short vertical range in the American Cretaceous, and will be found useful as markers for their particular parts of the section.

BATHYSIPHON ALEXANDERI Cushman, n. sp. (Pl. 5, fig. 1)

Test small, slender, elongate, cylindrical; wall comparatively thin, apparently composed of fine amorphous material; chamber opening comparatively large and undivided. Length of figured specimen 1.00 mm.; breadth 0.20 mm.

Holotype (Cushman Coll. No. 16926) from the lower Brownstown near the base, Paris-Clarksville Highway, 1.85 miles S.E. of Bagwell, Texas; collected by C. I. Alexander.

At this locality the species is fairly common and the characters are very constant. It is a much smaller, more slender species than the other Texas Cretaceous species, *Bathysiphon taurinensis* Sacco, which is much larger and stouter, known from the Upper Austin chalk and the Taylor marl.

AMMOBACULITES STEPHENSONI Cushman, n. sp. (Pl. 5, figs. 2 a, b)

Test comparatively small, much compressed, mostly planispiral and close coiled, but in some specimens with two or more

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chambers in the uncoiled portion; chambers rather indistinct, much compressed, of nearly uniform shape, increasing gradually in size as added; sutures marked by nearly pure cement; wall arenaceous, with much cement and distinct angular fragments; aperture narrowly elliptical, terminal. Length 0.70-1.00 mm.; breadth 0.50-0.70 mm.; thickness 0.10-0.15 mm.

Holotype (Cushman Coll. No. 19025) from the Taylor marl, main Chilton Road, 14 miles S. by W. of Waco, Texas; collected by L. W. Stephenson.

This is a distinctive species of rather wide distribution in the Taylor marl.

AMMOBACULITES TEXANA Cushman, n. sp. (Pl. 5, fig. 3)

Test large, compressed, mostly close coiled, planispiral, but in the adult with two or more chambers uncoiled; chambers numerous, usually seven in a coil, in the adult somewhat inflated; sutures indistinct in the early portion, later slightly depressed; wall coarsely arenaceous, with much cement and definite angular fragments; aperture in the adult terminal, broadly elliptical. Length up to 3.00 mm.; breadth 2.00 mm.; thickness 0.50-0.60 mm.

Holotype (Cushman Coll. No. 19026) from the Navarro, three feet below the base of Exogyra-Gryphaea bed, San Antonio Road, 6 miles E. of Castroville, Bexar Co., Texas; collected by L. W. Stephenson.

This is a fine large species found at the type locality, and should make a good marker for this particular horizon in the Navarro.

AMMOBACULITES ARENATA Cushman, n. sp. (Pl. 5, fig. 4)

Test elongate, very much compressed, of nearly uniform breadth, early chambers close coiled, later ones uncoiled, indistinct; sutures very indistinct; wall coarsely arenaceous, rather roughly finished, with much cement and angular sand grains; aperture terminal, narrowly elliptical. Length of holotype, 2.00 mm.; breadth 0.60 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 19030) from the Arkadelphia clay, 6 miles N. by W. of Hope, Hempstead Co., Arkansas; collected by L. W. Stephenson.

This is a very thin, scale-like form peculiar to the uppermost Cretaceous.

AMMOBACULITES ALEXANDERI Cushman, n. sp. (Pl. 5, figs. 5 a-c)

Test elongate, slightly tapering, early portion much compressed, planispiral, later portion uncoiling, inflated; chambers few, usually 4 or 5 in a coil; sutures fairly distinct, slightly depressed; wall arenaceous, rough; aperture elongate, small, nearly circular. Length 0.50-0.60 mm.; breadth 0.25 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 15775) from the lower Taylor marl, roadside ditch 8.4 miles S. of Paris, Texas; collected by C. I. Alexander.

This is a small but distinctive species with the later chambers much thicker than the earlier ones.

VERNEUILINA CRETOSA Cushman, n. sp. (Pl. 5, figs. 7 a, b)

Test elongate, tapering, greatest breadth near the apertural end, initial end acute, triangular in transverse section, periphery serrate; chambers numerous, triserial, of rather uniform shape, increasing regularly in size as added; sutures distinct, very slightly depressed; wall finely arenaceous, with much cement, smoothly finished; aperture at the base of the inner margin of the last-formed chamber, low, elongate. Length of holotype 2.10 mm.; breadth 1.10 mm.; thickness 0.90 mm.

Holotype (Cushman Coll. No. 19033) from the Austin chalk, Pecan Creek, 3.4 miles S. by E. of Troy, Bell Co., Texas; collected by L. W. Stephenson.

This is a large species apparently confined to the upper Austin and lowest Taylor so far as we have seen.

GAUDRYINA IO Cushman, n. sp. (Pl. 5, figs. 6 a-c)

Test elongate, tapering, the periphery of the biserial portion angularly lobed, early portion triserial, triangular in section, later portion biserial; chambers inflated and rounded except at the angles; sutures distinct, slightly depressed in the early portion, strongly so in the adult chambers; wall distinctly arenaceous, composed of rather uniformly sized sand grains cemented into a fairly smooth surface; aperture elongate, at the base of the last-formed chamber, or tending to become terminal. Length 2.00 mm.; breadth 0.70 mm.; thickness 0.50 mm.

Holotype (Cushman Coll. No. 19032) from the basal Wolfe City sand, McKinney Road, 3 miles W. of Farmersville, Collin Co., Texas.

This is a large species often abundant in the Wolfe City sand.

The early stages are apparently triserial throughout, making this a typical *Gaudryina*. There is a tendency for the aperture to become somewhat terminal in large specimens, showing the tendency toward *Gaudryinella*.

GAUDRYINELLA CAPITOSA Cushman, n. sp. (Pl. 5, figs. 8 a-c)

Test elongate, the early portion equally triangular in transverse section, earliest stage triserial, later biserial, the two sides showing the alternating chambers broader than the third side, later portion uncoiled, nearly circular in section; chambers with the early portion somewhat indistinct, later distinct and inflated; sutures of the biserial portion fairly distinct, not depressed, later distinct, depressed; wall coarsely arenaceous but smoothly finished; aperture in the adult small, rounded, terminal, without a neck or lip. Length up to 2.25 mm.; breadth 0.90 mm.; thickness 0.60 mm.

Holotype (Cushman Coll. No. 19034) from the lower Selma chalk, ½ mile E. of Mooreville, Lee Co., Mississippi.

This is a very widely distributed species in the Selma chalk and various parts of the Taylor marl of the general Coastal Plain region. It may be distinguished from the following variety, which is equally abundant in the upper and middle portions of the Austin chalk, by the character of the early portion which in the typical form has the chambers rather indistinct, the faces of the triangular portion rather smooth, and the sutures indistinct and little if at all depressed, while the varietal form has a distinctly lobed periphery, and the sutures distinct and depressed.

GAUDRYINELLA CAPITOSA Cushman, n. sp., var. SERRULATA Cushman, n. var. (Pl. 5, figs. 9 a-c)

Variety differing from the typical especially in the lobed character of the biserial portion, the sutures also being distinctly depressed, and the number of chambers usually smaller in the biserial portion.

Holotype of variety (Cushman Coll. No. 19035) from the upper Gober chalk, but on T. & P. RR., 2.2 miles W. of High, Lamar Co., Texas; collected by L. W. Stephenson.

This and the following species seem to fall within the limits of *Gaudryinella*. The earlier portion is distinctly triserial, followed by a later biserial portion which is sharply angled, and the final chambers are uniserial with a rounded, terminal aperture. They

are considerably different from the type species of *Gaudryinella,* but the stages of development are apparently the same.

GAUDRYINELLA MOLLIS Cushman, n. sp. (Pl. 6, figs. 6 a-c)

Test compressed, tapering, broadest toward the apertural end, earliest chambers triserial, later biserial, and in the adult with the final chamber terminal; chambers fairly distinct, increasing rather rapidly in height as added; sutures distinct, very slightly depressed; wall thin, rather coarsely arenaceous but smoothly finished; aperture terminal, narrowly elliptical. Length 0.40 mm.; breadth 0.20 mm.; thickness 0.08 mm.

Holotype (Cushman Coll. No. 17635) from the upper Austin chalk, 2.3 miles N. of Dallas, on Dallas-Sherman Highway, Texas; collected by C. I. Alexander.

This thin-walled species seems to belong to the genus *Gaudryinella,* as the last chambers tend to become uniserial and the aperture terminal. It is characteristic of the upper Austin.

HETEROSTOMELLA AUSTINANA Cushman, n. sp. (Pl. 6, figs. 1-3)

Test elongate, slightly tapering, the megalospheric form with the greatest width toward the apertural end in front view, the microspheric form somewhat more fusiform, the greatest width usually attained in about the middle of the test, earliest chambers triserial, later biserial, fairly distinct, the angles of the chambers very thin, usually eroded, leaving large depressions in linear series; sutures rather indistinct; wall finely arenaceous, rather smoothly finished; aperture in the adult terminal, small, rounded, with a distinct neck. Length up to 1.00 mm.; breadth 0.30-0.40 mm.; thickness 0.25-0.30 mm.

Holotype (Cushman Coll. No. 19036) from the Gober tongue of the Austin chalk, Bonham Road, 0.6 mile W. of Windom, Fannin Co., Texas; collected by L. W. Stephenson and W. P. Popenoe.

This species is a distinctive one, and is characteristic of the upper portion of the Austin chalk. The axis of the test is straight, and in the megalospheric form the sides are nearly parallel for a considerable portion of the length in the adult. The larger linear depressions are a marked characteristic of this species, but more distinctive than those of the Taylor species.

HETEROSTOMELLA CUNEATA Sandidge, var. CURVATA Cushman, n. var.
(Pl. 6, figs. 4 a, b)

Variety differing from the typical in the more curved axis of the test, the sharper angles, and more depressed sides.

Holotype of variety (Cushman Coll. No. 19037) from near the top of the Selma chalk, Alpine Road, 2 miles S. of Graham, Union Co., Mississippi; collected by L. W. Stephenson.

This variety may be easily distinguished from the typical when the two are seen together. The peculiar curved form of the test is characteristic of all the specimens from this particular horizon.

Other American Cretaceous species of *Heterostomella* include *H. foveolata* (Marsson). This species is characteristic of the upper and middle Taylor, and ranges as high as the Saratoga chalk and the basal Navarro. The microspheric form is large and stout while the megalospheric form is smaller and much more slender. American references to *Heterostomella foveolata* (Marsson) include the following: Cushman, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 111, pl. 16, figs. 9-12; Journ. Pal., vol. 5, 1931, p. 301, pl. 34, figs. 8 *a*, *b*; l. c., vol. 6, 1932, p. 333.

Heterostomella cuneata Sandidge described from the Ripley formation of Alabama (Journ. Pal., vol. 6, 1932, p. 269, pl. 41, figs. 11, 15, 16) has a somewhat curved test with a prominent, tubular neck and sharp angles. It occurs also in the Selma chalk.

Heterostomella boynensis Wickenden described from the Boyne beds of Manitoba, Canada (Trans. Roy. Soc. Canada, 3rd ser., vol. 26, Sect. IV, 1932, p. 89, pl. 1, figs. 5 *a*, *b*) is not well figured. Paratypes in the collections of this laboratory show it to be a small species with the edges decidedly truncate and the sides somewhat concave, somewhat like *H. cuneata*, but not arcuate as in that species, and the sides generally parallel instead of flaring as in most species. In this last character it somewhat resembles *H. austinana*.

CLAVULINA ARENATA Cushman, n. sp. (Pl. 6, figs. 5 a, b)

Test elongate, cylindrical, early chambers triserial and somewhat triangular in section, later ones uniserial; chambers rather indistinct, of rather uniform size except the final one which is somewhat longer than the others; sutures mostly indistinct, very slightly depressed; wall rather coarsely arenaceous, surface

rough; aperture terminal, rounded, without a neck. Length 0.65 mm.; diameter 0.15 mm.

Holotype (Cushman Coll. No. 19038) from the Arkadelphia clay, 6 miles N. by W. of Hope, Hempstead Co., Arkansas; collected by L. W. Stephenson.

This small, cylindrical species with a rough surface is found at the top of the Upper Cretaceous, where it seems to be a rather definite marker.

The various American Cretaceous species of *Clavulina* are in a number of cases excellent markers for definite horizons. They need much further study than has yet been given them to work out the details of structure and development as well as the limits of their vertical ranges.

GOESELLA RUGULOSA Cushman, n. sp. (Pl. 6, figs. 7 a-d)

Test elongate, subcylindrical, early portion rapidly enlarging, later portion nearly cylindrical; chambers in the earliest whorl usually four, later becoming triserial, in the adult loosely biserial, or in the last-formed chambers nearly uniserial; sutures fairly distinct, slightly depressed; wall arenaceous, of the early portion smoothly finished, later uniserial portion somewhat rougher; aperture in the adult terminal, rounded, without a neck. Length 1.40 mm.; diameter 0.40 mm.

Holotype (Cushman Coll. No. 19039) from the lower Selma chalk, ½ mile E. of Mooreville, Lee Co., Mississippi.

A study of the basal portion shows that this species should be placed in *Goësella*, in which the first whorl has more than three chambers, later becoming triserial, then biserial, and finally tending to become uniserial. This record extends the range of the genus back to the Upper Cretaceous, a range predicted for it when the genus was erected. It is evidently a form derived from *Eggerella* through *Dorothia* and *Plectina*.

DOROTHIA PONTONI Cushman, n. sp. (Pl. 6, figs. 8 a-c)

Test small, early portion tapering, later broadly flaring, earliest stage with more than three chambers to a whorl, then becoming triserial and later biserial, the triserial portion in a regular conical shape, biserial chambers rapidly enlarging as added; sutures distinct, those of the later portion strongly depressed; wall finely arenaceous, smoothly finished, the later chambers becoming almost entirely calcareous; aperture an arched opening

at the base of the inner margin of the last-formed chamber. Length 0.40 mm.; breadth 0.30 mm.; thickness 0.22 mm.

Holotype (Cushman Coll. No. 17632) from the Ripley formation, 2½ miles E. of Pontotoc, Mississippi; collected by G. M. Ponton.

This is a small but distinctive species characteristic of some portions of the Ripley. It shows well the development of *Dorothia* from the early 4 or 5 chambers to a whorl to the definitely triserial stage similar to *Eggerella*, followed by a biserial stage. It also shows the development of the calcareous forms of this sort from the finely arenaceous ones.

DOROTHIA GLABRELLA Cushman, n. sp. (Pl. 6, figs. 9 a-c)

Test in front view generally triangular, in side view somewhat tapering with the greatest breadth near the apertural end, and in end view roughly quadrangular, earliest portion with four or more chambers in a whorl, later triserial, and then regularly biserial; chambers increasing in size as added, later ones slightly inflated; wall finely arenaceous throughout in the early portion, tending to become almost entirely calcareous in the last-formed ones; aperture an elongate low opening at the base of the inner margin of the last-formed chamber. Length 0.90-1.00 mm.; breadth 0.70 mm.; thickness 0.40 mm.

Holotype (Cushman Coll. No. 19040) from the upper Taylor, 1.9 miles E. of Bristol, Ellis Co., Texas.

This species somewhat resembles the preceding, but the chambers are not nearly so inflated as in *D. pontoni*, and the end view is much more angled.

DOROTHIA GLABRATA Cushman, n. sp. (Pl. 6, figs. 10 a-c)

Test elongate, slightly tapering throughout, greatest width formed by the last two chambers, early stages with four or more chambers to a whorl, later triserial, and the larger part of the test biserial; chambers of rather uniform shape, increasing in size as added, and the last ones rather rapidly increasing in height, side view with the sides nearly parallel throughout the test, end view broadly elliptical or ovoid; sutures distinct, those of the later portion becoming more depressed; wall finely arenaceous, becoming more and more calcareous toward the apertural end, the last chambers of which may be almost entirely of calcareous cement; aperture a high semicircular opening, at the

base of the inner margin of the last-formed chamber. Length 0.75-0.90 mm.; breadth 0.30-0.40 mm.; thickness 0.20-0.25 mm.

Holotype (Cushman Coll. No. 19041) from the Navarro, chalky marl member, ¼ mile W. of Kimbro and 2 miles S. of Manda, Travis Co., Texas; collected by L. W. Stephenson.

This is a larger, more slender species than either of the two preceding, and is rather characteristic of this part of the upper Navarro.

The genus *Dorothia* as it occurs in the American Cretaceous and elsewhere needs much further study. Some work has been done on the types of the early Cretaceous species of Europe, and some of those already described under other genera belong in the genus *Dorothia*. It is hoped that work now under way will place these species in their proper genera and also give typical figures showing the early stages of development which are very necessary for a complete understanding of this and allied genera.

PLECTINA WATERSI Cushman, n. sp. (Pl. 7, figs. 1 a-d)

Test elongate, slightly tapering in front view, in side view with the early portion broader than the later biserial portion which has the sides nearly parallel, end view broadly oval; chambers with four in the earliest whorl, followed by a fairly long triserial stage, after which the remainder of the test is biserial, chambers fairly distinct, those of the adult biserial portion inflated, and as high as broad; sutures fairly distinct, those of the later portion strongly depressed; wall very finely arenaceous, smoothly finished; aperture in the adult an elongate elliptical opening in the terminal wall. Length 1.00 mm.; breadth 0.30 mm.; thickness 0.20 mm.

Holotype (Cushman Coll. No. 19045) from the Navarro, from the pit at Corsicana Brick Company, 5 miles S. of Corsicana, Navarro Co., Texas; collected by J. A. Cushman and J. A. Waters.

This is a larger, rather striking species, very abundant in the chalky marl member of the Navarro. The development from *Dorothia* is very clear, but in the adult the aperture tends to become terminal.

NONIONELLA AUSTINANA Cushman, n. sp. (Pl. 7, figs. 2 a-c)

Test small, nearly as broad as long, dorsal side flattened or slightly concave in the center, ventral side convex, periphery

broadly rounded; chambers distinct, few, six in the last-formed whorl, increasing regularly in size as added; sutures distinct, slightly curved, very slightly depressed; wall smooth, finely perforate; aperture a low elongate slit, at the base of the inner margin of the last-formed chamber on the ventral side. Length 0.25 mm.; breadth 0.18 mm.; thickness 0.12 mm.

Holotype (Cushman Coll. No. 19042) from the upper Austin, ditch 1.4 miles N. of Melissa, on Sherman-McKinney Highway, Texas; collected by C. I. Alexander.

This is a very small but distinctive species easily distinguished from *Nonionella cretacea* Cushman by the much more rounded form, very broadly rounded periphery, and the few chambers, of which there are only six in a whorl in *N. austinana*, while *N. cretacea* has as many as ten chambers in a whorl, is much more elongate, and has the periphery narrow. From *Nonionella robusta* Plummer, characteristic of the Navarro formation, it is distinguished by the more broadly rounded periphery and the fewer chambers in a whorl, *N. robusta* having typically about eight chambers, and *N. austinana* only six.

BOLIVINITA SELMENSIS Cushman, n. sp. (Pl. 7, figs. 3, 4)

Test minute, gently tapering from the subacute initial end, broad faces distinctly concave, the narrow sides strongly convex; chambers distinct, increasing gradually in size as added;

EXPLANATION OF PLATE 5

FIG. 1. *Bathysiphon alexanderi* Cushman, n. sp. × 50.

FIGS. 2 *a*, *b*. *Ammobaculites stephensoni* Cushman, n. sp. × 33. *a*, side view; *b*, peripheral view.

FIG. 3. *Ammobaculites texana* Cushman, n. sp. × 20.

FIG. 4. *Ammobaculites arenata* Cushman, n. sp. × 20.

FIGS. 5 *a–c*. *Ammobaculites alexanderi* Cushman, n. sp. × 50. *a*, side view; *b*, peripheral view; *c*, apertural view.

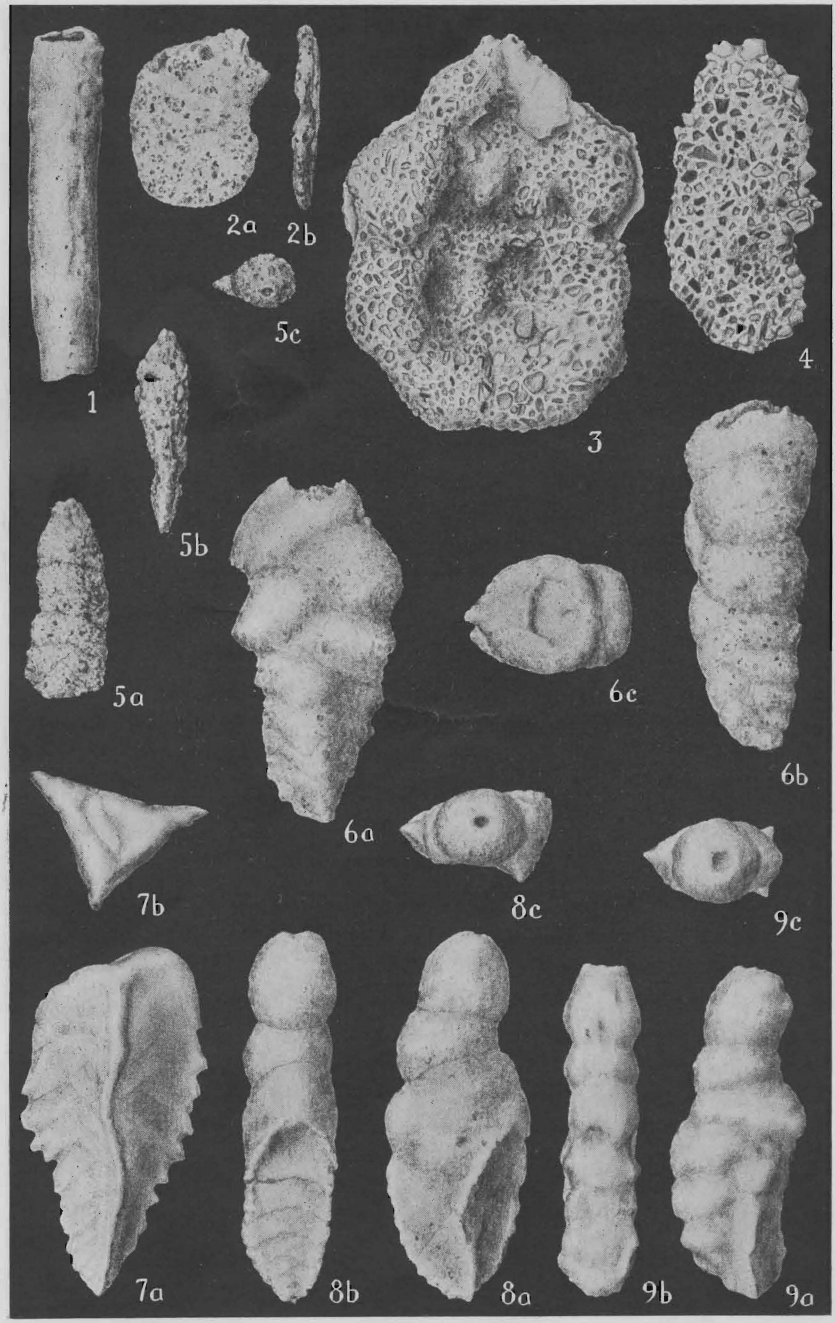
FIGS. 6 *a–c*. *Gaudryina io* Cushman, n. sp. × 20. *a*, front view; *b*, side view; *c*, apertural view.

FIGS. 7 *a*, *b*. *Verneuilina cretosa* Cushman, n. sp. × 20. *a*, side view; *b*, apertural view.

FIGS. 8 *a–c*. *Gaudryinella capitosa* Cushman, n. sp. × 20. *a*, front view; *b*, side view; *c*, apertural view.

FIGS. 9 *a–c*. *Gaudryinella capitosa* Cushman, n. sp., var. *serrulata* Cushman, n. var. × 25. *a*, front view; *b*, side view; *c*, apertural view.

Figures drawn by Margaret S. Moore.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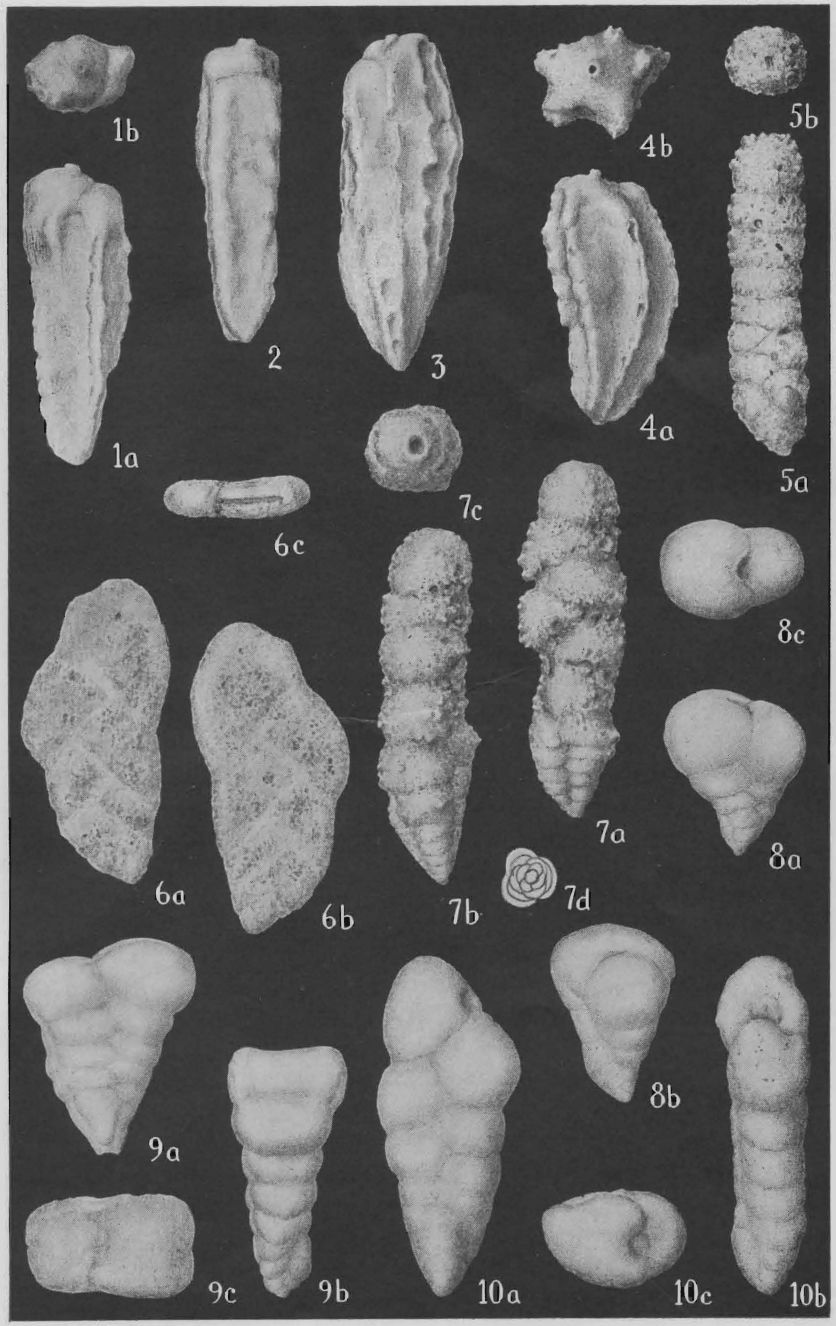
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sutures distinct, somewhat limbate; wall smooth, very finely perforate, translucent, especially in the middle of the chambers on the flattened faces; aperture narrow, at the inner margin of the last-formed chamber. Length 0.20-0.22 mm.; breadth 0.07-0.11 mm.; thickness 0.06-0.08 mm.

Holotype (Cushman Coll. No. 19043) from the Selma chalk, New Corinth Highway, 13½ miles S. of Selmer, McNairy Co., Tennessee; collected by I. G. Reimann.

This is a minute but very distinctive species with its very strongly concave faces, broadly convex sides, and the very thin wall in the middle of each chamber on the broad face.

EOUVIGERINA AUSTINANA Cushman, n. sp. (Pl. 7, figs. 5 a, b)

Test small, very gradually tapering from the subacute initial end; chambers mostly biserial, somewhat inflated toward the apertural end, gradually increasing in height as added; sutures in the early portion indistinct, later ones more distinct, slightly depressed; wall finely perforate, smooth; aperture terminal, rounded, with a thick neck and very slight lip. Length 0.20 mm.; breadth 0.08 mm.; thickness 0.05 mm.

Holotype (Cushman Coll. No. 19044) from the upper Austin, RR. cut, 3.7 miles E. of M. K. & T. RR. tracks in McKinney, on

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EXPLANATION OF PLATE 6

FIGS. 1–3. *Heterostomella austinana* Cushman, n. sp. × 50. Fig. 1, Holotype. Megalospheric form. *a*, front view; *b*, apertural view. Fig. 2, Side view. Fig. 3, Microspheric form.

FIGS. 4 *a*, *b*. *Heterostomella cuneata* Sandidge, var. *curvata* Cushman, n. var. × 50. *a*, front view; *b*, apertural view.

FIGS. 5 *a*, *b*. *Clavulina arenata* Cushman, n. sp. × 70. *a*, front view; *b*, apertural view.

FIGS. 6 *a–c*. *Gaudryinella mollis* Cushman, n. sp. × 100. *a*, *b*, opposite sides; *c*, apertural view.

FIGS. 7 *a–d*. *Goësella rugulosa* Cushman, n. sp. × 30. *a*, front view; *b*, side view; *c*, apertural view; *d*, arrangement of chambers at base.

FIGS. 8 *a–c*. *Dorothia pontoni* Cushman, n. sp. × 65. *a*, front view; *b*, side view; *c*, apertural view.

FIGS. 9 *a–c*. *Dorothia glabrella* Cushman, n. sp. × 65. *a*, front view; *b*, side view; *c*, apertural view.

FIGS. 10 *a–c*. *Dorothia glabrata* Cushman, n. sp. × 65. *a*, front view; *b*, side view; *c*, apertural view.

Figures drawn by Margaret S. Moore.

McKinney-Farmersville Road, Texas; collected by C. I. Alexander.

This is a very small rounded species, but very different from any of the others of the Upper Cretaceous. It is perhaps nearest to *E. gracilis* Cushman, but is a much shorter, smaller species with a thick wall, and the apertural characters are very different.

EOUVIGERINA PLUMMERAE Cushman, n. sp. (Pl. 7, figs. 6, 7)

Test small, very gently tapering, broader faces concave or nearly flattened, narrow sides slightly convex; chambers distinct, increasing rather rapidly in height as added; sutures distinct, very slightly depressed, often somewhat limbate; wall thin, finely perforate, translucent; aperture terminal, rounded, with a short neck and distinct, somewhat phialine lip. Length 0.35-0.40 mm.; breadth 0.10-0.12 mm.; thickness 0.05-0.07 mm.

Holotype (Cushman Coll. No. 19048) from the upper Austin, ditch S. of highway leading W. from McKinney, 3.1 miles W. of McKinney, Texas; collected by C. I. Alexander.

This is a small, slender, but very distinctive species apparently characteristic of the upper portion of the Austin chalk. It is very distinct from any of the other known species of the genus from the Upper Cretaceous. The flattened concave sides with the angles of the test forming sharp keels, and the strongly limbate sutures make this a very distinctive form.

EOUVIGERINA ACULEATA Cushman, n. sp. (Pl. 7, figs. 8 a, b)

Test small, tapering, greatest breadth formed by the last pair of chambers, periphery in side view angularly lobate; chambers in the later portion distinct, those of the early portion difficult to distinguish from the exterior, in the adult with a distinct ridge across the upper half of the chamber, slightly concave below; sutures of the early portion indistinct, but of the later portion distinct and somewhat depressed; wall smooth, finely perforate; aperture rounded, with a very short thick neck and a slight phialine lip. Length 0.35 mm.; breadth 0.15 mm.; thickness 0.12 mm.

Holotype (Cushman Coll. No. 19047) from the upper Austin (?), 6.5 miles E. by N. of Allen, Collin Co., Texas; collected by L. W. Stephenson and W. P. Popenoe.

This species is rather characteristic of the Austin and basal Taylor, and is widely distributed. This species is nearest to *E.*

americana Cushman, but is much less clear-cut than that species, and the chambers are not nearly so clearly sculptured.

VIRGULINA NAVARROANA Cushman, n. sp. (Pl. 7, figs. 9, 10)

Test elongate, tapering, greatest breadth toward the apertural end, periphery broadly rounded, initial end often with a short spine; chambers distinct, slightly inflated, irregularly spiral in the early portion, becoming distinctly biserial in the adult, the last-formed one somewhat more elongate than the earlier ones; sutures distinct, slightly depressed; wall smooth, coarsely perforate; aperture broadly elliptical, somewhat comma-shaped, with a slight rim. Length 0.40 mm.; breadth 0.10-0.12 mm.; thickness 0.08-0.10 mm.

Holotype (Cushman Coll. No. 19050) from the Navarro, calcareous marl member, from Corsicana clay pit, 5 miles S. of Corsicana, Navarro Co., Texas; collected by J. A. Cushman and J. A. Waters.

This is a distinctive, very widely distributed species in this part of the Navarro formation. The basal spine is not always present, but is usually distinctive.

PLEUROSTOMELLA WATERSI Cushman, n. sp. (Pl. 7, figs. 11, 12)

Test elongate, slender, gradually increasing in breadth toward the apertural end, periphery broadly rounded, sides somewhat lobulate; chambers distinct, inflated, increasing in height and size toward the apertural end, biserial, but the axis somewhat twisted; sutures distinct, strongly depressed; wall smooth, very finely perforate; aperture large, often slightly higher than broad, the base somewhat contracted into flat tooth-like projections. Length 0.50-0.60 mm.; breadth 0.13-0.15 mm.; thickness 0.10-0.12 mm.

Holotype (Cushman Coll. No. 19053) from the Austin chalk, Bonham clay member, from roadside ditch, 7.8 miles S. of Sherman, Grayson Co., Texas; collected by J. A. Cushman and J. A. Waters.

This is a distinctive species of the upper Austin with its somewhat clavate shape, especially marked in the microspheric form. The aperture is large and high, and this should make a good species marker for this part of the Austin.

PLEUROSTOMELLA AUSTINANA Cushman, n. sp. (Pl. 7, fig. 13)

Test very elongate, slender, periphery broadly rounded; chambers loosely biserial in the adult, inflated, increasing in length as added; sutures distinct, strongly depressed; wall smooth, very finely perforate; aperture ovate, the greatest breadth toward the outer end, the basal portion somewhat contracted, with small, flattened, tooth-like projections at either side near the base. Length 0.40 mm.; diameter 0.08 mm.

Holotype (Cushman Coll. No. 19055) from the Austin chalk, road cut between two RR. underpasses, N. edge of town of Howe, Grayson Co., Texas; collected by C. I. Alexander.

This is a very long, slender species tending toward *Nodosarella* in its development, the chambers except the very early ones being loosely biserial.

NODOSARELLA GRACILLIMA Cushman, n. sp. (Pl. 7, figs. 14 a, b)

Test very elongate, slender, slightly tapering, greatest breadth toward the apertural end, circular in transverse section, early chambers biserial, later ones uniserial, rectilinear; chambers distinct, inflated, increasing in size and length toward the apertural end; sutures distinct, strongly depressed; wall smooth, very finely perforate; aperture semi-elliptical, at one side of the end of the last-formed chamber. Length 0.90 mm.; diameter 0.15 mm.

Holotype (Cushman Coll. No. 19057) from the upper portion of the Austin chalk, public road (N.-S.) about 6.5 miles E. by N. of Allen, Collin Co., Texas; collected by L. W. Stephenson and W. P. Popenoe.

This is a very slender and distinctive form of *Nodosarella*, and occurs at the top of the Austin chalk and perhaps in the base of the Taylor marl.

135. POST-CRETACEOUS OCCURRENCE OF GÜMBELINA WITH A DESCRIPTION OF A NEW SPECIES

By JOSEPH A. CUSHMAN

The genus *Gümbelina* which is very abundant in the Upper Cretaceous particularly has been occasionally recorded from later formations. In the Upper Cretaceous it was apparently a pelagic form or at least occurred with *Globigerina* in great

quantities. As it has been considered a good Cretaceous marker, it is interesting to review some of the records from later formations.

In these Contributions, Mr. Ponton and I recorded a species of *Gümbelina, G. wilcoxensis* Cushman and Ponton, vol. 8, pt. 3, 1932, p. 66, pl. 8, figs. 16, 17, from the Wilcox Eocene, from a railroad cut, 1 mile N. of Ozark, Alabama. This brought the range of the genus well into the Eocene. Specimens were rather common at the locality. In some respects, particularly the large inflated chambers in the adult, these were somewhat different from the normal form of *Gümbelina* as seen in the Cretaceous, but, nevertheless, it had the undoubted characters of this genus.

Howe and Wallace in their work on the Jackson Eocene of Louisiana (Louisiana Geol. Bull. No. 2, 1932, p. 53, pl. 9, fig. 8) figured a specimen with the following note: "The figured specimen represents but one of several species of *Gümbelina* present in the finer material of both horizons at Danville. All of the species are of simple types and unornamented. While it is generally thought that the appearance of Gümbelinas in Tertiary sediments is due to the 'reworking' of Cretaceous sediments, the abundance of this genus and its perfect preservation, coupled with the fact that all specimens were in perfect condition, has led the present authors to insert this figure on the possibility that the genus did not really die out in the Cretaceous."

Nearly a year ago Mr. P. W. Jarvis of Trinidad, B. W. I., sent me a mounted slide and a considerable amount of loose material from the Hospital Hill marl from near San Fernando, Trinidad, noting in his letter that this was very abundant in this particular marl, but that the beds immediately above it had been very carefully washed and searched for this same form without any success. An examination of the material, two specimens of which are figured on Plate 7, figures 15 and 16, showed this to be a *Gümbelina* although some of the features of the aperture, which will be noted later, are peculiar. This particular material came from the *Hantkenina* material which has been definitely known to be Upper Eocene in age. This, together with the record of Howe and Wallace, shows very definitely that the genus persisted to nearly the top of the Eocene.

In September of 1930, Mr. Hollis D. Hedberg sent me a slide of a *Gümbelina*-like form from the Upper Eocene, Pauji shale, of the District of Bolivar, State of Zulia, Venezuela.

An additional note from Mr. Hedberg records the finding of definite Gümbelinas from the Bamboo clay from the Sea Wall section South of San Fernando, Trinidad. These were collected by Messrs. Henry and Flagler. Later Mr. Hedberg in company with Mr. Jarvis collected additional specimens in the Bamboo clay. The age of the Bamboo clay is a matter of some dispute, some geologists referring it to a position well up in the Oligocene, although others consider it Upper Eocene in age. At any rate, this brings the occurrence of definite Gümbelinas still higher in the Tertiary.

There are somewhat inflated, *Bolivina*-like forms recorded from the later Tertiary and from Recent material. Some of the species of *Bolivina* do have very much inflated chambers making them very much resemble Gümbelinas, but all of the material that I have personally examined from both Recent and late Tertiary samples seems to be definitely placed in *Bolivina*, and none can be considered true Gümbelinas. It would, therefore,

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EXPLANATION OF PLATE 7

FIGS. 1 *a–d.* *Plectina watersi* Cushman, n. sp. × 40. *a*, front view; *b*, side view; *c*, apertural view; *d*, arrangement of early chambers from base.

FIGS. 2 *a–c.* *Nonionella austinana* Cushman, n. sp. × 80. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

FIGS. 3, 4. *Bolivinita selmensis* Cushman, n. sp. × 130. Fig. 3, Holotype. *a*, front view; *b*, side view. Fig. 4, Paratype.

FIGS. 5 *a, b.* *Eouvigerina austinana* Cushman, n. sp. × 130. *a*, front view; *b*, apertural view.

FIGS. 6, 7. *Eouvigerina plummerae* Cushman, n. sp. × 130. Fig. 6, Holotype. Fig. 7, Paratype.

FIGS. 8 *a, b.* *Eouvigerina aculeata* Cushman, n. sp. × 130. *a*, front view; *b*, side view.

FIGS. 9, 10. *Virgulina navarroana* Cushman, n. sp. × 100. Fig. 9, Holotype. *a*, front view; *b*, apertural view. Fig. 10, Paratype. *a*, front view; *b*, side view.

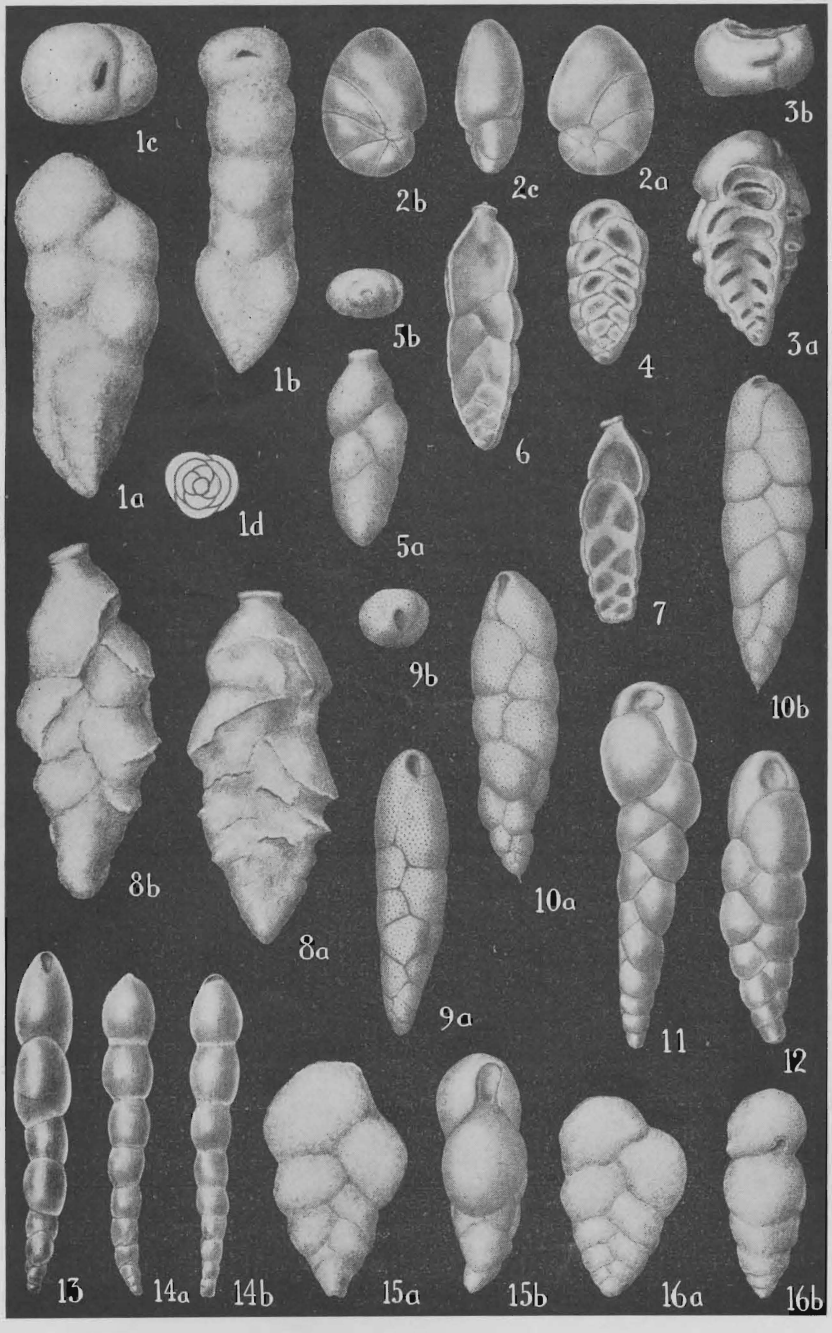
FIGS. 11, 12. *Pleurostomella watersi* Cushman, n. sp. × 80. Fig. 11, Holotype.

FIG. 13. *Pleurostomella austinana* Cushman, n. sp. × 80.

FIGS. 14 *a, b.* *Nodosarella gracillima* Cushman, n. sp. × 50. *a*, front view; *b*, side view.

FIGS. 15, 16. *Gümbelina goodwini* Cushman and Jarvis, n. sp. × 100. Fig. 15, Holotype. Fig. 16, Paratype. *a, a*, front views; *b, b*, side views.

Figures drawn by Margaret S. Moore.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16a
16b

seem that so far as the present records show, the genus *Gümbelina* became extinct at the end of the Eocene, unless these Bamboo clay samples from Trinidad carry it into the Oligocene if this material is finally found to be definitely of Oligocene age.

GUMBELINA GOODWINI Cushman and Jarvis, n. sp. (Pl. 7, figs. 15, 16)

Test small, biserial, periphery rounded, increasing in breadth so that the greatest breadth of the test is formed by the last pair of chambers in the adult; chambers distinct, inflated, of rather uniform shape but increasing gradually in size as added; sutures distinct, slightly depressed; wall calcareous, finely perforate, slightly roughened; aperture a high arched opening running up well into the apertural face on the inner side of the last-formed chamber. Length 0.30 mm.; breadth 0.20 mm.; thickness 0.10 mm.

Holotype (Cushman Coll. No. 19066) from the Upper Eocene, *Hantkenina* bed, Hospital Hill, near San Fernando, Trinidad, B. W. I.; collected by P. W. Jarvis.

This species is named in honor of Capt. J. A. Goodwin, former manager of the British Controlled Oil Fields of Trinidad.

This is the species already mentioned in a previous paragraph. It seems to be definitely a *Gümbelina* as are the others already noted.

It is interesting in this connection to note that the persistence of the simple type of *Gümbelina* carries the particular group into a later position geologically than that indicated for the more specialized genera closely related to it, such as, *Rectogümbelina, Pseudotextularia, Ventilabrella, Planoglobulina, Tubitextularia,* and others, all of which so far as known, in America at least, did not persist beyond the Upper Cretaceous. There is some question in Europe as to the occurrence of *Pseudotextularia* in the lower Eocene where it has been recorded by Rzehak. As this bed, however, carries a very definitely Upper Cretaceous fauna including *Rzehakina,* etc., it seems probable that their actual age will finally be determined to be Upper Cretaceous rather than lower Eocene.

136. SOME NOTES ON D'ORBIGNY'S MODELS

By JOSEPH A. CUSHMAN

In his excellent work entitled, Alcide d'Orbigny, his Life and his Work (Journ. Roy. Micr. Soc., 1917, pp. 1-105), Heron-Allen has given a full account of the models as he has of the other portions of d'Orbigny's work. From statements in various works on foraminifera, it is evident that not all of the writers have either seen or carefully studied the data which accompanied these models. Fortunately there are in the United States available to workers several of the original sets of d'Orbigny's models which may be consulted. The original sets were sent out with labels, and with them a pamphlet which was a reprint in large measure of the 1826 work of d'Orbigny. This includes the "Explication des Modèles." The list of the earlier edition is given by Parker and Jones (Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, pp. 15-41, pls. 1-3). They give a list of the original names as used by d'Orbigny. Another interesting work on the models is that of Basset (Soc. Sci. Nat. Charente Inf., ann. 1884 [1885], pp. 153-173, photographic plate). This plate gives perhaps more interesting figures than the line drawings of Parker and Jones.

It is of interest in this connection also to note that d'Orbigny in 1843 had the models recast and re-issued as a second edition. The pamphlet accompanying this is rare, and I am greatly indebted to my friend, Edward Heron-Allen, who presented me some years ago with an original copy of this rare edition. The later pages, exact copies of which are given in the following pages, contain not only the names accepted by d'Orbigny, but also the locality of the specimen from which the model was made. These are often not indicated definitely in d'Orbigny's 1826 work so far as the text shows, and there have been for this reason misquotations of the original localities which may make a considerable difference in the interpretation of them. For this reason, it has seemed valuable to give this list in toto as it appears in this 1843 work.

MODÈLES
de
FORAMINIFÈRES
VIVANS ET FOSSILES,
par
ALCIDE D'ORBIGNY
Président de la Société Géologique de France, etc.
DEUXIÈME ÉDITION
PARIS,
IMPRIMERIE DE COSSON,
Rue Saint-Germain-Des-Prés, 9
1843
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EXPLICATION
DES MODÈLES

Nos.		
1	Nodosaria radicula, Lamarck.	*Viv.* Adriatique.
2	Orthocerina clavulus, d'Orb.	Foss. Tertiaire du calcaire grossier de Paris.
3	Flabellina rhomboidalis, d'Orb.	*Viv.* Adriatique.
4	Vaginulina tricarinata, d'Orb.	*Viv.* Adriatique.
5	Dentalina obliqua, d'Orb.	*Viv.* Adriatique.
6	Marginulina raphanus, d'Orb.	*Viv.* Adriatique.
7	Textularia pygmaea, d'Orb.	*Viv.* Adriatique.
8	Quinqueloculina lyra, d'Orb.	*Viv.* Adriatique.
9	Bulimina elegans, d'Orb.	*Viv.* Adriatique.
10	Rotalina Menardii, d'Orb.	*Viv.* Adriatique.
11	Nonionina limbata, d'Orb.	*Viv.* Adriatique.
12	Rotalina punctata, d'Orb.	*Viv.* Adriatique.
13	— — — orbicularis, d'Orb.	*Viv.* Adriatique.
14	Robulina virgata, d'Orb.	*Viv.* Adriatique.
15	Calcarina bisaculeata, d'Orb.	*Viv.* Meditérranée.
16	Peneroplis planulatus, var.	*Viv.* Meditérranée.
17	Globigerina bulloides, d'Orb.	*Viv.* Adriatique.
18	Adelosina striata, d'Orb.	*Viv.* Adriatique.
19	Cristellaria italica, d'Orb. (jeune).	Foss. Terrains subapennins.
20	Orbiculina numismalis, Lamarck.	*Viv.* Antilles.
21	Dendritina arbuscula, d'Orb.	Foss. Faluns de Dax.
22	Articulina nitida, d'Orb.	Foss. Calcaire grossier de Paris.
23	Polymorphina Thouini, d'Orb.	Foss. Calcaire grossier de Paris.
24	Spirolina cylindracea, Lamarck.	Foss. Calcaire grossier de Paris.
25	Vulvulina triangularis, d'Orb.	Foss. Calcaire grossier de Paris.
26	Lingulina secans [carinata], d'Orb.	Foss. Terrains subapennins.
27	Cristellaria cymba, d'Orb.	*Viv.* Adriatique.

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Nos.		
28	Textularia gibbosa, d'Orb.	Foss. Tertiaire des environs de Sienne.
29	Polymorphina burdigalensis, d'Orb.	Foss. Faluns de Bordeaux.
30	Pyrulina gutta, d'Orb.	Foss. Tertiaire de Sienne.
31	Biloculina aculeata, d'Orb.	Foss. Calcaire grossier de Bordeaux.
32	Quinqueloculina Ferussaci, d'Orb.	Foss. Calcaire grossier de Paris.
33	— — — saxorum, d'Orb.	Foss. Calcaire grossier de Paris.
34	Calcarina calcar, d'Orb.	*Viv.* Madagascar.
35	Rotalina rosea, d'Orb.	*Viv.* Antilles.
36	— — Soldanii, d'Orb.	*Viv.* Adriatique.
37	Truncatulina tuberculata, d'Orb.	*Viv.* Golfe de Gascogne.
38	Rosalina parisiensis, d'Orb.	Foss. Calcaire grossier de Paris.
39	Asterigerina rosacea, d'Orb.	Foss. Faluns de Bordeaux.
40	Amphistegina vulgaris, d'Orb.	Foss. Tertiaire meditérranéen.
41	Cassidulina laevigata, d'Orb.	*Viv.* Meditérranée.
42	Anomalina elegans, d'Orb.	Foss. Faluns de Bordeaux.
43	Nonionina sphaeroides, d'Orb.	*Viv.* Meditérranée.
44	Cristellaria cassis, d'Orb. (jeune).	Foss. Terrains subapennins.
45	Polystomella crispa, Lamarck.	*Viv.* Océan atlantique et Meditérranée.
46	Nonionina laevis, d'Orb.	Foss. Calcaire grossier de Paris.
47	Cristellaria laevigata, d'Orb.	Foss. Forest-Marble de Normandie.
48	Peneroplis planulatus, var.	*Viv.* Meditérranée.
49	Rosalina ariminensis, d'Orb.	*Viv.* Adriatique.
50	Alveolina Boscii, d'Orb.	Foss. Calcaire grossier de Paris.
51	Glandulina glans, d'Orb.	*Viv.* Adriatique.
52	Nodosaria hasta, d'Orb.	*Viv.* Adriatique.
53	Rimulina glabra, d'Orb.	*Viv.* Adriatique.
54	Vaginulina elegans, d'Orb.	*Viv.* Adriatique.
55	Marginulina glabra, d'Orb.	Foss. Terrains subapennins.
56	Pavonina flabelliformis, d'Orb.	*Viv.* Madagascar.
57	Bigenerina nodosaria, d'Orb.	*Viv.* Adriatique.
58	Gemmulina digitata, d'Orb.	*Viv.* Meditérranée.
59	Vulvulina capreolus, d'Orb.	*Viv.* Adriatique.

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Nos.		
60	Dimorphina tuberosa, d'Orb.	*Viv.* Adriatique.
61	Guttulina problema, d'Orb.	Foss. Tertiaire des environs de Sienne.
62	— — — communis, d'Orb.	Foss. Tertiaire des environs de Sienne.
63	Globulina gibba, d'Orb.	*Viv.* Adriatique.
64	Virgulina squamata, d'Orb.	Foss. Tertiaire des environs de Sienne.
65	Sphaeroidina bulloides, d'Orb.	Foss. Tertiaire des environs de Sienne.
66	Clavulina parisiensis, d'Orb.	Foss. Calcaire grossier de Paris.
67	Uvigerina pygmaea, d'Orb.	Foss. Tertiaire des environs de Sienne.
68	Bulimina caudigera, d'Orb.	*Viv.* Adriatique.
69	Rosalina globularis, d'Orb.	*Viv.* Golfe de Gascogne.
70	Calcarina armata, d'Orb.	*Viv.* Antilles.
71	Rotalina pulchella, d'Orb.	*Viv.*
72	— — — Gervillii, d'Orb.	Foss. Tertiaire de Valognes.

73	— — — turbo, d'Orb.	Foss. Calcaire grossier de Paris.
74	Rosalina Beccarii, d'Orb.	*Viv.* Golfe de Gascogne.
75	— — — corallinarum, d'Orb.	*Viv.* Golfe de Gascogne.
76	Globigerina bulloides, d'Orb. (adulte).	*Viv.* Adriatique.
77	Truncatulina refulgens, d'Orb.	*Viv.* Adriatique.
78	Planorbulina nitida, d'Orb.	*Viv.* Golfe de Gascogne.
79	— — — mediterranensis, d'Orb.	*Viv.* Meditérranée.
80	Operculina complanata, d'Orb.	Foss. Faluns de Bordeaux.
81	Vertebralina striata, d'Orb.	*Viv.* Meditérranée.
82	Robulina cultrata, d'Orb.	Foss. Terrains subapennins.
83	Cristellaria cassis, d'Orb. (adulte).	Foss. Terrains subapennins.
84	— — — costata, d'Orb.	*Viv.* Adriatique.
85	— — — italica, d'Orb.	Foss. Terrains subapennins.
86	Nonionina umbilicata, d'Orb.	Foss. Terrains subapennins.
87	Nummulina planulata, d'Orb.	Foss. Grès tertiaires inférieurs de Soissons.
88	Assilina discoidalis, d'Orb.	*Viv.* Iles océaniennes.

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Nos.		
89	Siderolina laevigata, d'Orb.	Foss. Craie blanche de Maëstrich.
90	Biloculina bulloides, d'Orb.	Foss. Calcaire grossier de Paris.
91	— — — depressa, d'Orb.	Foss. Tertiaire de Sienne.
92	Spiroloculina depressa, d'Orb.	Foss. Tertiaire de Sienne.
93	Triloculina trigonula, d'Orb.	Foss. Calcaire grossier de Paris.
94	— — — tricarinata, d'Orb.	*Viv.* Mer Rouge.
95	— — — oblonga, d'Orb.	Foss. Calcaire grossier de Paris.
96	Quinqueloculina secans, d'Orb.	*Viv.* Meditérranée.
97	Adelosina striata, d'Orb.	*Viv.* Adriatique.
98	Amphistegina Lessonii, d'Orb.	*Viv.* Ile de France.
99	Heterostegina depressa, d'Orb.	*Viv.* Ile Sainte-Hélène.
100	Fabularia discolithes, Defr.	Foss. Calcaire grossier de Paris.

FIN.

RECENT LITERATURE ON THE FORAMINIFERA

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

Sandidge, John R. Foraminifera from the Jurassic in Montana.—Amer. Midland Nat., vol. 14, No. 2, March, 1933, pp. 174-185, 1 pl., text figs. J.

Lacroix, E. Le pseudomorphisme chez les Textularidae.—Bull. Instit. Océanographique, No. 622, May 20, 1933, pl. 1-12, 10 text figs. R.—Gives interesting data on triserial young stages.

Nuttall, W. L. F. The Application of Micro-Palaeontology to Petroleum Geology.—World Petroleum Congress, London, 1933. Preprint No. 28, 6 pp., 1 fig., tables.—Charts show vertical distribution of 231 foraminiferal species and varieties in the Tampico Embayment area.

Nuttall, W. L. F. Two Species of *Miogypsina* from the Oligocene of Mexico. —Journ. Pal., vol. 7, No. 2, June, 1933, pp. 175-177, pl. 24 (part). T.—1 n. sp.

Barbat, W. F., and von Estorff, F. E. Lower Miocene Foraminifera from the Southern San Joaquin Valley, California.—l. c., pp. 164-174, pl. 23. T.—3 n. sp., 2 n. var.

Earland, Arthur. Foraminifera. Part II. South Georgia.—*Discovery* Reports, vol. VII, 1933, pp. 27-138, pls. I-VII. R.—345 species and varieties, 22 new.

Blake, Charles H. Foraminifera [of the Mount Desert Region].—Biol. Surv. Mt. Desert Region, Pt. 5, 1933, pp. 69-78, text figs. 26, 27. R.

Cushman, J. A. Two New Genera, *Pernerina* and *Hagenowella*, and Their Relationships to Other Genera of the Valvulinidae.—Amer. Journ. Sci., vol. XXVI, 1933, pp. 19-26. pls. I, II.

Cushman, J. A. and E. D. Cahill. Miocene Foraminifera of the Coastal Plain of the Eastern United States.—Prof. Paper 175-A, U. S. Geol. Survey, 1933, pp. 1-50, pls. 1-13, table.

Stetson, Henry C. Scientific Results of the "Nautilus" Expedition, 1931. Pt. V. The Bottom Deposits.—June, 1933, pp. 25, 26. R.—Notes on occurrence of foraminifera.

Vaughan, T. Wayland. Report on species of fossils collected in Cuba by O. E. Meinzer in November and December, 1915.—In Meinzer, Geologic reconnaissance of a region adjacent to Guantanamo Bay, Cuba. Journ. Washington Acad. Sci., vol. 23, No. 5, May 15, 1933, pp. 261-263. T.

Hanzawa, S. On a *Neoschwagerina*-Limestone from Okinawa-jima, the Riukiu (Loochoo) Islands.—Jap. Journ. Geol. Geogr., vol. X, 1933, pp. 107-110, pl. VII, map .P.

Macfadyen, W. A. A Note on the Foraminiferal Genus *Bolivinopsis* Yakovlev.—Journ. Roy. Micr. Soc., vol. 53, 1933, pp. 139-141, 1 text fig. C.—The generic name *Bolivinopsis* Yakovlev, 1891, seems to be an older name for *Spiroplectoides* Cushman, 1927.

The Foraminifera of the Fenland Clays at St. Germains, near King's Lynn. —Geol. Mag., vol. LXX, No. 826, April, 1933, pp. 182-191. T.—Lists with localities.

In Grahame Clark. Report on an Early Bronze Age Site in the South-Eastern Fens.—The Antiquaries Journal, April, 1933 (vol. XIII, No. 2) [Foraminifera pp. 289-292].—Recent species listed with some Cretaceous and one Jurassic species.

Davies, L. M. The Genera *Dictyoconoides* Nuttall, *Lockhartia* nov., and *Rotalia* Lamarck: Their Type Species, Generic Differences, and Fundamental Distinction from the *Dictyoconus* Group of Forms.—Trans. Roy. Soc. Edinburgh, vol. LVII, Pt. II (No. 13), 1932-1933 (1932), pp. 397-428, pls. I-IV, text figs. 1-10. T.—A new genus, *Lockhartia*, and a new variety of *Rotalia* described.

Cushman, J. A. The Foraminifera of the Tropical Pacific Collections of the "Albatross," 1899-1900, Part 2. Lagenidae to Alveolinellidae.—Bull. 161, U. S. Nat. Mus., pt. 2, 1933, pp. i-vi, 1-79, pls. 1-19. R.—Nine new species and varieties.

Foraminifera, Their Classification and Economic Use. Second Edition. —Special Publ. No. 4, Cushman Lab. Foram. Res., 1933, pp. i-viii, 1-349, pls. 1-31, charts, maps, and text figures.—One new genus, *Paalzowella* and one new species.

An Illustrated Key to the Genera of the Foraminifera.—Special Publ. No. 5, Cushman Lab. Foram. Res., 1933, 115 pages including 40 half tone plates full 6 x 9 inches.