CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

96. A RESUMÉ OF NEW GENERA OF THE FORAMINIFERA ERECTED SINCE EARLY 1928

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Since the publication of the work "Foraminifera, Their Classification and Economic Use" early in 1928 there have been numerous new genera erected as well as three family names proposed. Owing to the suggestions that these be gathered together so that they would supplement the earlier work and bring it up to date while awaiting a second edition this resumé has been prepared.*

For the most part the original descriptions and figures have been copied so that the full data may be available to students of the group. In some instances a modified description is given and if the original figures are not susceptible to reproduction with good results they have not been copied. Figures of nearly all the genotypes will be found here however. The genera are placed in their systematic position in the classification and the position of the new families is indicated.

Family ASTRORHIZIDAE

Genus SCHIZAMMINA Heron-Allen and Earland, 1929

Plate 10, figure 1

Genotype, by designation, *Schizammina labyrinthica* Heron-Allen and Earland

Schizammina HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1929, p. 103.

Test free, arenaceous, a rounded unseptate tube, dichotomously branching, approximately in one plane. The wall of the tube is

* For use with the earlier work for those who do not wish to break up these Contributions this paper will be available in separate form as Special Publication No. 2 from this Laboratory.

labyrinthic in structure, consisting of fine sand grains firmly cemented together, spicules or other foreign material being rarely used. Colour yellow to brown, according to the amount of ferruginous cement used in the outer layer, which is dull and unpolished, becoming grey at the extremities of the branches, which are sometimes open and at other times closed with a cap of loosely agglutinated sand grains. The extremities, whether open or closed, serve as apertures for the protrusion of the protoplasm. The labyrinthic wall is perforated in all directions by ramifying canals which originate in large oscules, covering the surface of the inner tube. The canals sometimes expand into vacuoles or chamberlets in the thickness of the wall, but do not penetrate the external wall of the test.

Recent. South Atlantic.

Family STEGNAMMINIDAE

Under this new family name, Moreman (Journ. Pal., vol. 4, 1930, p. 48) proposes to place *Psammosphaera* F. E. Schultze, 1875, *Sorosphaera* H. B. Brady, 1879, *Storthosphaera* F. E. Schultze, 1875, and two new genera *Stegnammina* Moreman, 1930, and *Raibosammina* Moreman, 1930. There are no definite apertures visible.

Genus STEGNAMMINA Moreman, 1930

Plate 10, figure 2

Genotype, *Stegnammina cylindrica* Moreman

Stegnammina MOREMAN, Journ. Pal., vol. 4, 1930, p. 49.

Test free, a straight cylindrical or subcylindrical chamber; wall thin, composed of small to medium sized sand grains, well cemented; aperture indefinite.

Lower Palaeozoic. America.

Genus RAIBOSAMMINA Moreman, 1930

Plate 10, figure 3

Genotype, *Raibosammina mica* Moreman

Raibosammina MOREMAN, Journ. Pal., vol. 4, 1930, p. 50.

Test free or attached, subcylindrical, straight, crooked or irregularly branched, interior of chamber not of uniform diameter; wall of unequal thickness, composed of poorly sorted sand grains; aperture not apparent.

Lower Palaeozoic. America.

Family SACCAMMINIDAE

Genus COLONAMMINA Moreman, 1930

Plate 10, figure 4

Genotype, *Colonammina verruca* Moreman

Colonammina MOREMAN, Journ. Pal., vol. 4, 1930, p. 55.

Test attached, planoconvex, circular or elliptical in outline, attached surface surrounded by a more or less flattened border; wall thin, composed of fine sand well cemented; aperture single, on the convex surface.

Lower Palaeozoic. America.

Family HYPERAMMINIDAE

Genus HYPERAMMINOIDES Cushman and Waters, 1928

Plate 10, figures 8, 9

Genoholotype, *Hyperammina elegans* Cushman and Waters

Hyperamminoides CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 112.

Hyperamminella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 36.

Test elongate, consisting of a proloculum and elongate, somewhat tapering, second chamber; wall siliceous or arenaceous with siliceous cement, with numerous constrictions caused by growth intervals but the chambers not definitely divided; aperture at the end of the chamber, circular or elliptical, constricted, sometimes with a trace of a lip-like thickening.

Pennsylvanian. Texas.

Genus EARLANDIA Plummer, 1930

Genoholotype, *Earlandia perparva* Plummer

Earlandia PLUMMER, Bull. 3019, Univ. Texas, 1930, p. 12.

Test free, very elongate, composed of a globular or subglobular proloculum and an elongate, nonseptate, second chamber; shell wall of minute crystalline calcareous granules bound by a calcareous cement, imperforate, smoothly finished; aperture a broad circular opening at the end of the tube.

Pennsylvanian. Texas.

Figures not copied, as original was received while this paper was in press.

Genus PROTOBOTELLINA Heron-Allen and Earland, 1929

Plate 10, figures 5-7

Genoholotype, *Protobotellina cylindrica* Heron-Allen and Earland

Protobotellina HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1929, p. 326.

Test irregularly cylindrical, undivided, non labyrinthic, open at one end, closed at the other; wall of fine sand grains and broken sponge spicules firmly agglutinated but with little visible cement.

Recent. South Atlantic.

Family AMMODISCIDAE

Genus TREPEILOPSIS Cushman and Waters, 1928

Plate 10, figures 10 *a*, *b*

Genoholotype, *Turritellella grandis* Cushman and Waters

Trepeilopsis CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 38.

Test consisting of a proloculum and a long tubular second chamber, the early portion close coiled, and last portion bending back and making a nearly straight tube over the exterior of the early coils; wall very finely arenaceous with a very large proportion of yellowish-brown ferruginous cement; aperture at the end of the tubular chamber.

Pennsylvanian. Texas.

Family LITUOLIDAE

Genus ENDOTHYRANELLA Galloway and Harlton, 1930

Plate 10, figures 15 *a*, *b*

Genoholotype, *Ammobaculites powersi* Harlton

Endothyranella GALLOWAY and HARLTON, in Galloway and Ryniker, Oklahoma Geol. Surv., Circular 21, 1930, p. 13.

Test free, coiled in the early part, evolute and rectilinear in the later part; the coil consists of about three whorls, with five to ten slightly inflated chambers to a whorl, the plane of coiling rotating from 10° to 30° from the plane of the previous whorl, the earlier whorl or whorls partly or completely embraced by the last whorl, so that the coil appears nearly planispiral from the outside; chambers little or much inflated; peripheral margin rounded; sutures conspicuous; wall calcareous, imperforate, opaque or translucent,

not arenaceous, consisting of transverse fibers, much as in *Fusulinella* and *Fusulina*, which may become granular during fossilization or weathering, and appearing arenaceous on casual study; surface smooth, glisteny, punctate, becoming roughened by weathering or by attachment of grains from the embedding rock; aperture single, a high arch at the base of the septum in the coiled portion, gradually becoming central to the septum and finally terminal and round or oval in the evolute portion.

Pennsylvanian. Oklahoma and Texas.

Genus FRANKEINA Cushman and Alexander, 1929

Plate 10, figures 12 *a-c*

Genoholotype, *Frankeina goodlandensis* Cushman and Alexander

Frankeina CUSHMAN and ALEXANDER, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 61.

Test free, in the early stages planispiral, compressed, later uncoiling and becoming triangular in section; later chambers uniserial, the development such that one of the angles of the test is in the line of the early axis of coiling and the broad face dorsal instead of ventral as in many calcareous forms, chambers simple, not labyrinthic; sutures in the early portion generally radial, in the uniserial portion much angled toward the apertural end in the middle of the flattened faces; wall coarsely arenaceous but firmly cemented; aperture in the early planispiral portion at the base of the chamber in the median line, in the uncoiled portion simple, terminal.

Cretaceous. Europe and America.

Genus YABERINELLA Vaughan, 1928

Genoholotype, *Yaberinella jamaicensis* Vaughan

Yaberinella VAUGHAN, Journ. Pal., vol. 2, 1928, p. 8.

Test in the megalospheric form operculinoid, in the microspheric form operculinoid in the young but in the adult becoming cyclical; chambers numerous, fairly distinct from the exterior, in the early stages forming a coil about the proloculum, later becoming more elongate and finally extending back and becoming annular, in section showing a complex labyrinthic structure in a complicated criss-cross pattern; sutures somewhat indistinct, slightly depressed; wall arenaceous; apertures indefinite on the anterior surface of the growing edge.

Middle Eocene. Jamaica.

Family TEXTULARIIDAE

Genus DECKERELLA Cushman and Waters, 1928

Plate 10, figures 11 *a*, *b*

Genoholotype, *Deckerella clavata* Cushman and Waters

Deckerella CUSHMAN and WATERS, Journ. Pal., vol. 2, 1928, p. 128.

Test elongate, the early stages biserial, textularian, later chambers uniserial; wall with an inner, clear, perforate layer, and an outer, opaque, arenaceous layer; aperture in the early biserial chambers simple, textularian, at the inner edge of the chamber, later pushing into the apertural face, finally cutting off two dis-

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EXPLANATION OF PLATE 10

FIG. 1. *Schizammina labyrinthica* Heron-Allen and Earland. × 2. (After type figure.)

FIG. 2. *Stegnammina cylindrica* Moreman. × 35. (After type figure.)

FIG. 3. *Raibosammina mica* Moreman. × 35. (After type figure.)

FIG. 4. *Colonammina verruca* Moreman. × 50. (After type figure.)

FIGS. 5–7. *Protobotellina cylindrica* Heron-Allen and Earland. × 2. (After type figures.) Fig. 5, exterior; Fig. 6, longitudinal section; Fig. 7, transverse section. × 8.

FIGS. 8, 9. *Hyperamminoides elegans* (Cushman and Waters). × 25. (After type figures.) Fig. 8, megalospheric; Fig. 9, microspheric.

FIGS. 10 *a*, *b*. *Trepeilopsis grandis* (Cushman and Waters). × 25. (After type figures.) *a*, *b*, opposite sides.

FIGS. 11 *a*, *b*. *Deckerella clavata* Cushman and Waters. × 20. (After type figures.) *a*, front view; *b*, apertural view.

FIGS. 12 *a–c*. *Frankeina goodlandensis* Cushman and Alexander. × 50. (After type figures.) *a*, side view; *b*, ventral view; *c*, apertural view.

FIGS. 13 *a*, *b*. *Spandelina (Spandelinoides) nodosariformis* Cushman and Waters. × 40. (After type figures.) *a*, front view; *b*, apertural view.

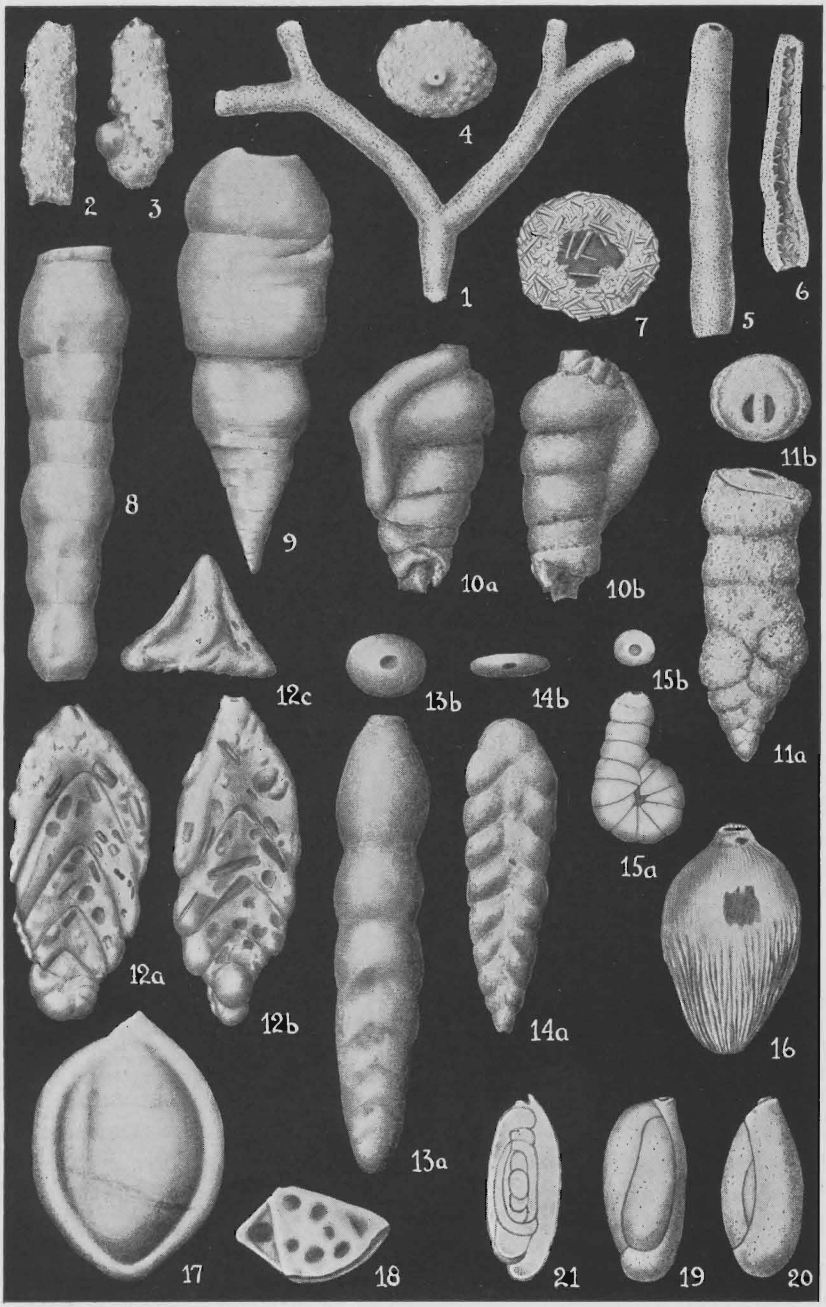
FIGS. 14 *a*, *b*. *Spandelina excavata* Cushman and Waters. × 55. (After type figures.) *a*, front view; *b*, apertural view.

FIGS. 15 *a*, *b*. *Endothyranella powersi* (Harlton). × 20. (After type figures.) *a*, side view; *b*, apertural view.

FIG. 16. *Pseudoglandulina comata* (Batsch). (After type figure.)

FIGS. 17, 18. *Silicosigmoilina californica* Cushman and Church. × 40. (After type figures.) Fig. 17, side view; Fig. 18, transverse section.

FIGS. 19–21. *Miliammina oblonga* (Montagu), var. *arenacea* (Chapman). × 35. (After Heron-Allen and Earland.) Figs. 19, 20, side views; Fig. 21, section.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tinct, elongate, elliptical apertures with a narrow partition between and this character continuing throughout the adult.

Pennsylvanian. Texas.

Genus SPANDELINA Cushman and Waters, 1928

Plate 10, figures 14 *a*, *b*

Genoholotype, *Spandelina excavata* Cushman and Waters

Spandelina CUSHMAN and WATERS, Journ. Pal., vol. 2, 1928, p. 363.

Test uniserial, the chambers in a generally rectilinear series, the earlier ones at least, compressed in typical forms especially in the microspheric form; sutures usually distinct and compressed, in the early stages, at least of the microspheric form obliquely slanting back from the central region; wall calcareous, perforate; aperture single, terminal, elliptical or rounded.

Pennsylvanian. Jurassic?

Subgenus SPANDELINOIDES Cushman and Waters, 1928

Plate 10, figures 13 *a*, *b*

Subgenoholotype, *Spandelinoides nodosariformis* Cushman and Waters

Spandelinoides CUSHMAN and WATERS, Journ. Pal., vol. 2, 1928, p. 367.

Test elongate, consisting of numerous chambers arranged in a rectilinear series, the earlier chambers at least in the microspheric form somewhat compressed, later ones becoming circular in cross section; aperture circular, terminal, sometimes with a lip.

Pennsylvanian. Jurassic?

Family SILICINIDAE

Genus SILICOSIGMOILINA Cushman and Church, 1929

Plate 10, figures 17, 18

Genoholotype, *Silicosigmoilina californica* Cushman and Church

Silicosigmoilina CUSHMAN and CHURCH, Proc. Cal. Acad. Sci., ser. 4, vol. 18, 1929, p. 502.

Test in the early stages nearly planispiral, later becoming sigmoid; wall finely arenaceous with siliceous cement; aperture at the end of the tubular chamber without apertural teeth.

Cretaceous. California.

Genus MILIAMMINA Heron-Allen and Earland, 1930

Plate 10, figures 19-21

Genotype, by designation, *Miliolina oblonga* (Montagu), var. *arenacea* Chapman

Miliammina HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1930, p. 41.

Test free, chambers arranged on a triloculine or quinqueloculine plan; wall imperforate, composed of very minute mineral fragments embedded in an excess of siliceous cement, smooth or polished, rarely rough; aperture terminal, furnished with a tooth, perhaps sometimes cribrate.

Recent. Antarctic.

Family OPHTHALMIDIIDAE

Genus ORTHOVERTELLA Cushman and Waters, 1928

Plate 11, figures 1, 2

Genoholotype, *Orthovertella protea* Cushman and Waters

Orthovertella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 45.

Test with the early coils in constantly changing planes, but close coiled, the later portion becoming uncoiled and more or less straight, consisting of a proloculum and tubular undivided second chamber; wall calcareous, imperforate; aperture formed by the open end of the tubular second chamber.

Pennsylvanian. Texas.

Genus CALCITORNELLA Cushman and Waters, 1928

Plate 11, figure 7

Genoholotype, *Calcitornella elongata* Cushman and Waters

Calcitornella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 45.

Test attached, consisting of a proloculum and long, tubular, second chamber, the latter at first coiled, usually nearly planispiral in the early stages thence in a series of long bends back and forth upon itself, either elongate or forming an irregular coil; wall calcareous, imperforate; aperture formed by the open end of the tubular second chamber.

Pennsylvanian. Texas.

Genus CALCIVERTELLA Cushman and Waters, 1928

Plate 11, figure 3

Genoholotype, *Calcivertella adherens* Cushman and Waters

Calcivertella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 48.

Test attached, with the earlier stages irregularly coiled, later in a definite zigzag series, the tubular second chamber bending back and forth but with the sides of the resulting test very slightly tapering, the last portion largely losing the coiled portion and becoming somewhat straight; wall calcareous, imperforate; aperture rounded, formed by the open end of the tubular chamber.

Pennsylvanian. Texas.

Genus APTERRINELLA Cushman and Waters, 1928

Plate 11, figures 4-6

Genoholotype, *Tolypammina grahamensis* Harlton

Apterrinella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 64.

Test attached, consisting of a proloculum and tubular second chamber with the early portion coiled about the proloculum, then uncoiling and wandering about over the surface to which it is attached; wall calcareous, imperforate; aperture semi-circular, formed by the open end of the tubular chamber.

Pennsylvanian. Oklahoma and Texas.

EXPLANATION OF PLATE 11

FIGS. 1, 2. *Orthovertella protea* Cushman and Waters. × 70. (After type figures.)

FIG. 3. *Calcivertella adherens* Cushman and Waters. × 40. (After type figure.)

FIGS. 4–6. *Apterrinella grahamensis* (Harlton). Figs. 4, 5, megalospheric form; Fig. 4, × 60; Fig. 5, × 40; Fig. 6, microspheric form. × 40.

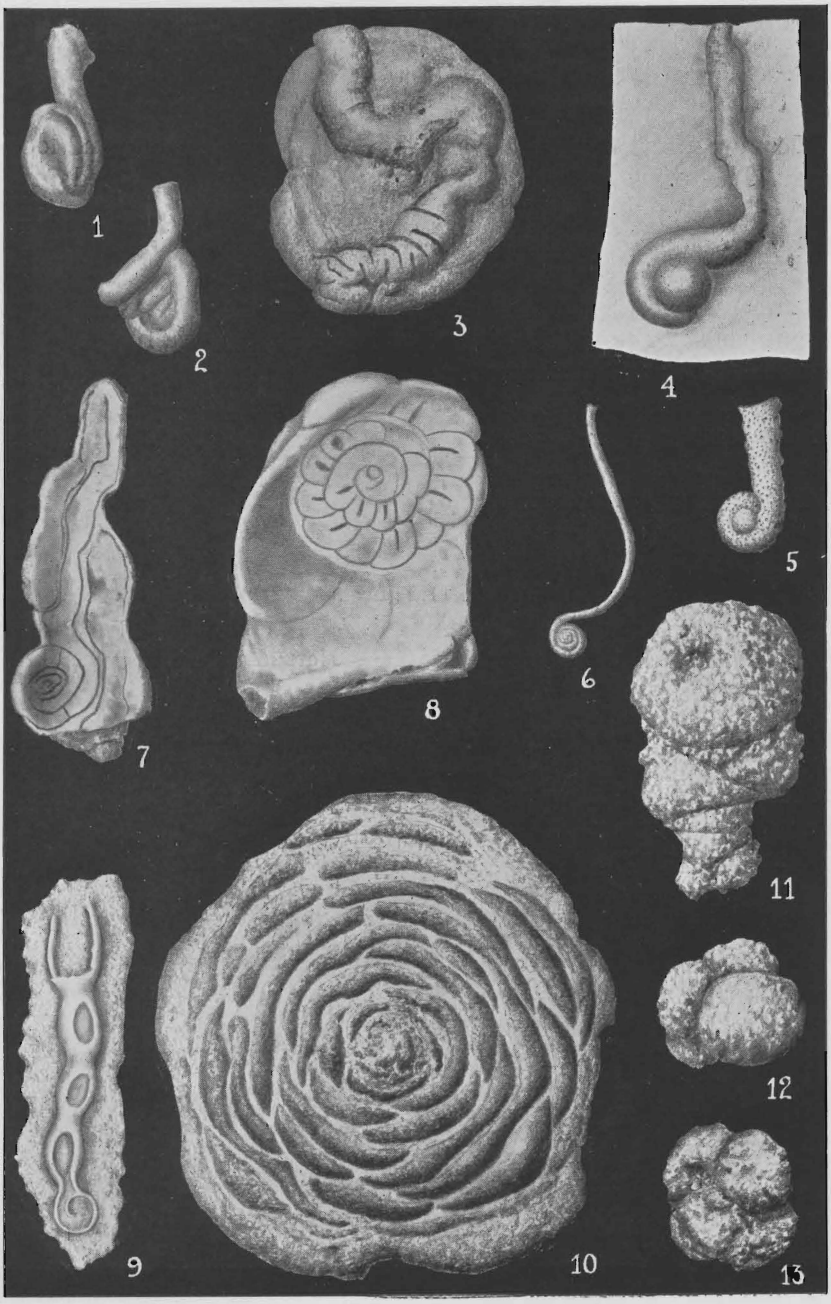
FIG. 7. *Calcitornella elongata* Cushman and Waters. × 50. (After type figure.) From attached side.

FIG. 8. *Plummerinella complexa* Cushman and Waters. × 60. (After type figure.) From attached side.

FIG. 9. *Nubeculinella bigoti* Cushman. × 80. (After type figure.)

FIG. 10. *Polytaxis laheei* Cushman and Waters. × 30. (After type figure.)

FIGS. 11–13. *Mooreinella biserialis* Cushman and Waters. × 40. (After type figures.) Fig. 11, adult; Fig. 12, ventral view of young stage; Fig. 13, dorsal view of young stage.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Genus PLUMMERINELLA Cushman and Waters, 1928

Plate 11, figure 8

Genoholotype, *Plummerinella complexa* Cushman and Waters

Plummerinella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 49.

Test attached, compressed, consisting of a proloculum and long undivided tubular second chamber, earliest portion coiled in a more or less planispiral manner, later in regular convolutions bending back and forth, but the whole closely coiling upon itself in a regular manner, in the last chambers becoming irregular; sutures clear on the attached side but the structure obscured from the upper surface which is more or less involute; wall roughened on the dorsal side, calcareous, imperforate; aperture in the earliest stages formed by the open end of the tubular chamber, in the adults somewhat obscure, probably at one side representing the opening of the final convolution of the tubular chamber.

Pennsylvanian. Texas.

Genus NUBECULINELLA Cushman, 1929

Plate 11, figure 9

Genoholotype, *Nubeculinella bigoti* Cushman

Nubeculinella CUSHMAN, Bull. Soc. Linn. Normandie, ser. 8, vol. 2, 1929, p. 133.

Test attached, the early stages with a tubular chamber coiled about the proloculum followed by a series of chambers irregularly placed, the earlier ones usually in a linear series; wall porcellanous; aperture simple.

Jurassic. Europe.

Family TROCHAMMINIDAE

Genus MOOREINELLA Cushman and Waters, 1928

Plate 11, figures 11-13

Genoholotype, *Mooreinella biserialis* Cushman and Waters

Mooreinella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 50.

Test in the early stages trochoid, later developing at one side into a biserial form, the chambers alternating along an elongate axis and the aperture becoming rounded and subterminal; wall arenaceous, rather coarsely so in the type species.

Pennsylvanian. Texas.

Family ORBITOLINIDAE

Genus POLYTAXIS Cushman and Waters, 1928

Plate 11, figure 10

Genoholotype, *Polytaxis laheei* Cushman and Waters

Polytaxis CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 51.

Test in the early stages similar to *Tetrataxis*, the earliest stage coiled, followed by elongate chambers in series of four, then in the adult, spreading, and many chambers making a series about the peripheral edge, ventral side concave, irregular; apertures several, elongate, on the ventral side.

Pennsylvanian. Texas.

Family LAGENIDAE

Genus PSEUDOGLANDULINA Cushman, 1929

Plate 10, figure 16

Genoholotype, *Nautilus comata* Batsch

Pseudoglandulina CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 87.

Nodosaria (part) of authors.

Glandulina (part) of authors (not D'ORBIGNY).

Test similar to *Nodosaria*, but the chambers embracing, the last-formed one making up a large proportion of the surface of the test; chambers uniserial throughout; aperture radiate.

Jurassic to Recent.

Genus KYPHOPYXA Cushman, 1929

Plate 12, figure 2

Genoholotype, *Frondicularia christneri* Carsey

Kyphopyxa CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 1.

Test consisting of numerous chambers, a globular proloculum followed by a very few chambers, usually only two or three as in *Flabellina*, in a flattened, partial coil at one side, immediately followed by a series of alternating chambers, extending farther and farther back as added and often overlapping below the proloculum, these in turn followed by chambers as in *Frondicularia*, extending back on each side of the earlier portion, and in this genus the ends often meeting and overlapping at the base of the test; sutures distinct and usually somewhat limbate, the earlier ones

standing up far above the walls of the chamber; wall calcareous, finely perforate; aperture terminal, radiate.

Cretaceous. North and South America.

Family POLYMORPHINIDAE

Genus EOGUTTULINA Cushman and Ozawa, 1930

Plate 12, figures 3 *a-c*

Genoholotype, *Eoguttulina anglica* Cushman and Ozawa

Eoguttulina CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, art. 6, 1930, p. 16.

Test with the chambers arranged in a spiral series added in planes less than 90° apart from one another, each succeeding chamber removed farther from the base; wall calcareous, finely perforate; aperture radiate.

Jurassic and Cretaceous. Europe.

Genus QUADRULINA Cushman and Ozawa, 1930

Plate 12, figures 4 *a, b*

Genoholotype, *Polymorphina rhabdogonoides* Chapman

Quadrulina CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, art. 6, 1930, p. 18.

Test with the chambers added in planes 90° apart from one another, that is, arranged in a tetraloculine series, at least in the later stages; wall calcareous, finely perforate; aperture radiate.

Jurassic and Cretaceous. Europe.

Genus PALEOPOLYMORPHINA Cushman and Ozawa, 1930

Plate 12, figures 5 *a, b*

Genoholotype, *Polymorphina pleurostomelloides* Franke

Paleopolymorphina CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, art. 6, 1930, p. 112.

Test with the early chambers spiral, later ones becoming biserial; wall calcareous, finely perforate; aperture radiate.

Lower Cretaceous. Europe.

Family NONIONIDAE

Genus GLYPHOSTOMELLA Cushman and Waters, 1928

Plate 12, figure 1

Genoholotype, *Ammochilostoma (?) triloculina* Cushman and Waters

Glyphostomella CUSHMAN and WATERS, Contr. Cushman Lab. Foram. Res., vol. 4, 1928, p. 53.

Test involute, only the chambers of the last-formed coil visible

from the exterior, earlier chambers not entirely bisymmetrically arranged, later ones more nearly so; chambers inflated, a few making up the whole of the exterior of the test, sub-globular, regularly increasing in size as added; wall finely arenaceous with a large proportion of cement, smoothly finished, perforate; apertures in the early stages parallel to the margin of the chamber and suture, later developing at right angles to the base of the chamber, several on each chamber in the adult and occasionally irregular ones in the apertural face, the apertures connecting with the interior by a funnel-shaped structure.

Pennsylvanian. Texas.

Family ROTALIIDAE

Genus ANNULOPATELLINA Parr and Collins, 1930

Genoholotype, *Orbitolina annularis* Parker and Jones

Annulopatellina PARR and COLLINS, Proc. Roy. Soc. Victoria, vol. 43, 1930, p. 92.

Test depressed conical, concave on the inferior side, consisting of a globular proloculum, which is wholly or partly embraced by a crescentic to subcircular second chamber; remaining chambers annular and with the exception of the first two or three, always subdivided into chamberlets, which extend inward on the under surface of the test in the form of tubular prolongations closed at the ends and sometimes anastomosing; wall calcareous, hyaline, perforate, thin; aperture apparently absent.

Recent. Australia.

Figures not copied, as original was received while this paper was in press.

Family PEGIDIDAE

This new family is used by Heron-Allen and Earland for the following new genera. The family is placed by the authors as intermediate between the Rotaliidae and the Globigerinidae but seems to be much closer to the former.

The original description (Journ. Roy. Micr. Soc., 1928, p. 288) is as follows: Test free, calcareous, perforate, thick-walled, lenticular or sub-spherical in form; chambers turgid but few in number, rarely more than three or four in the adult shell, arranged so that each successive chamber is opposed to or partly enveloping

its predecessors; initial chambers either arranged spirally or in opposition, and resorbed in course of growth; aperture tubular or a series of tubes, either free or perforating a solid mass of shell substance filling up the depression between the final chambers; no canal system.

Genus PHYSALIDIA Heron-Allen and Earland, 1928

Plate 12, figures 6 *a*, *b*

Genotype, by designation, *Physalidia simplex* Heron-Allen and Earland

Physalidia HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1928, p. 288.

Test free, calcareous, coarsely perforate, thick-walled, smooth, consisting of a few sub-globular chambers arranged in opposition. Aperture one or more rudimentary tubes at the line of opposition of chambers, sometimes accompanied by a thickening of shell deposit at this point.

Recent. Pacific.

EXPLANATION OF PLATE 12

FIG. 1. *Glyphostomella (?) triloculina* (Cushman and Waters). × 35. (After Cushman and Waters.)

FIG. 2. *Kyphopyxa christneri* (Carsey). × 30.

FIGS. 3 *a–c*. *Eoguttulina anglica* Cushman and Ozawa. × 45. (After type figures.) *a*, *b*, opposite sides; *c*, basal view.

FIGS. 4 *a*, *b*. *Quadrulina rhabdogonoides* (Chapman). × 40. (After type figures.) *a*, side view; *b*, apertural view.

FIGS. 5 *a*, *b*. *Paleopolymorphina pleurostomelloides* (Franke). × 65. (After Cushman and Ozawa.) *a*, side view; *b*, apertural view.

FIGS. 6 *a*, *b*. *Physalidia simplex* Heron-Allen and Earland. × 80. (After type figures.) *a*, side view; *b*, apertural view.

FIGS. 7 *a*, *b*. *Rugidia corticata* (Heron-Allen and Earland). × 60. (After type figures.) *a*, dorsal view; *b*, apertural view.

FIG. 8. *Sphaeridia papillata* Heron-Allen and Earland. × 40. (After type figure.)

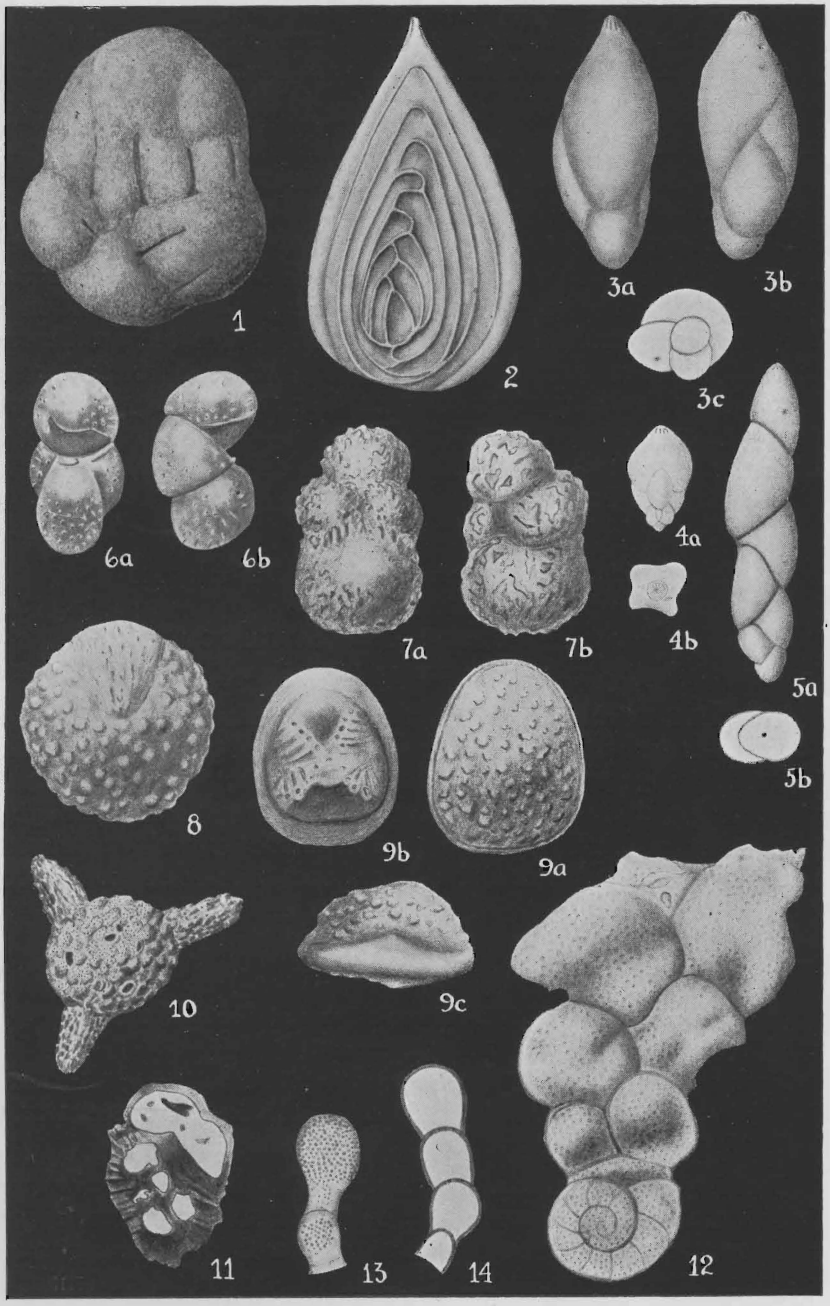
FIGS. 9 *a–c*. *Pegidia dubia* (d'Orbigny). × 30. (After Heron-Allen and Earland). *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

FIG. 10. *Baculogypsinoides spinosus* Yabe and Hanzawa. × 10.

FIG. 11. *Victoriella plecte* (Chapman). × 12. (Section, after type figure.)

FIG. 12. *Dyocibicides biserialis* Cushman and Valentine. × 50. (After type figure.)

FIG. 13, 14. *Tuberitina bulbacea* Galloway and Harlton. × 20. (After type figures.) Fig. 14, section.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Genus RUGIDIA Heron-Allen and Earland, 1928

Plate 12, figures 7 *a, b*

Genoholotype, *Sphaeridia corticata* Heron-Allen and Earland

Rugidia HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1928, p. 289.

Test free, calcareous, perforate, thick-walled, the adult shell exhibiting only four sub-globular chambers arranged in opposed pairs, all visible and forming an irregular oval, compressed on two faces. Walls thick, coarsely punctate and covered with irregular cortications giving a rough bark-like appearance to the test, especially on the more convex or superior side. Smoother on the inferior side, especially in the fissure between the points of opposition of the final and penultimate chambers. This fissure and the depression between the final and the earlier pairs of chambers is more or less filled with shell matter, through which numerous short tubes, constituting the apertures, pass. There is, however, no solid plug of shell substance filling the depression as in *Pegidia* or *Sphaeridia.*

Recent. Indo-Pacific.

Genus PEGIDIA Heron-Allen and Earland, 1928

Plate 12, figures 9 *a-c*

Genotype, by designation, *Rotalia dubia* d'Orbigny

Pegidia HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1928, p. 290.

Test free, calcareous, perforate, thick-walled; chambers three to four in number, arranged in opposition and separated by thick septa, forming an ellipsoid or nearly circular and unequally biconvex test. Aperture a series of furcating tubes passing through a solid mass of shell substance filling up the depression between adjacent chambers near one edge of the inferior or less convex side of the test.

Miocene to Recent.

Genus SPHAERIDIA Heron-Allen and Earland, 1928

Plate 12, figure 8

Genotype, by designation, *Sphaeridia papillata* Heron-Allen and Earland

Sphaeridia HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1928, p. 294.

Test free, calcareous, thick-walled, perforate, very nearly spherical; chambers few, three to four in number, rapidly increasing in size, opposed to and nearly enveloping each other; aperture a series of furcating tubes passing through a large and solid mass of

shell substance which fills in the gap between the final and penultimate chambers and thus rounds off the sphere.

Recent. Indo-Pacific.

Family CALCARINIDAE

Genus BACULOGYPSINOIDES Yabe and Hanzawa, 1930

Plate 12, figure 10

Genoholotype, *Baculogypsinoides spinosus* Yabe and Hanzawa

Baculogypsinoides YABE and HANZAWA, Sci. Dept. Tohoku Imper. Univ., ser. 2, (Geol.), vol. XIV, no. 1, 1930, p. 43.

Test in the early stages planispiral and the chambers globular, the later chambers acervuline on both sides of the test, finally covering the entire test except the four very large heavy spines, and the entire test becoming more or less tetrahedral; wall calcareous, rather coarsely perforate.

Late Tertiary and Recent. Indo-Pacific.

Family ANOMALINIDAE

Genus DYOCIBICIDES Cushman and Valentine, 1930

Plate 12, figure 12

Genoholotype, *Dyocibicides biserialis* Cushman and Valentine

Dyocibicides CUSHMAN and VALENTINE, Contr. Dept. Geol., Stanford Univ., vol. 1, no. 1, 1930, p. 30.

Test in the young, trochoid, plano-convex, ventral side convex, dorsal side flattened, close coiled, the chambers in the later development becoming biserial and rapidly enlarging; aperture in the early stages peripheral or extending slightly to the dorsal side, in the adult an elongate, open slit at the outer end of the chamber with a lip; wall calcareous, coarsely perforate, test probably attached.

Miocene to Recent.

Family VICTORIELLIDAE

Under this family Chapman and Crespin (Proc. Roy. Soc. Victoria, vol. 42, 1930, p. 111) group *Eorupertia* Yabe and Hanzawa, 1927 and a new genus *Victoriella.*

Genus VICTORIELLA Chapman and Crespin, 1930

Plate 12, figure 11

Genoholotype, *Carpenteria proteiformis*, var. *plectae* Chapman

Victoriella CHAPMAN and CRESPIN, Proc. Roy. Soc. Victoria, vol. 42, 1930, p. 111.

Test free, consisting of a more or less conoidal aggregate of inflated chambers, either alternating or spirally coiled, chambers not numerous; surface granulated, the tubercles surrounded by the coarsely tubulated shell-wall; aperture sublunate and limbate. The wall of the test is apparently simple in the later portion, but in the earliest part it consists of two layers as in *Carpenteria*, and is also thicker than in that genus. The surface tubercles are more strongly papillate than those of *Eorupertia*.

Tertiary. Australia.

Family ORBITOIDIDAE

Genus ORBITOCYCLINA Vaughan, 1929

Genoholotype, *Lepidocyclina minima* H. Douvillé

Orbitocyclina VAUGHAN, Proc. Nat. Acad. Sci., vol. 15, 1929, p. 291.

The first chamber of the embryonic apparatus of the megalospheric form is subspherical and is followed by a slightly reniform second chamber. These first two chambers are rather similar to the embryonic chambers of *Lepidorbitoides* but are somewhat smaller. The second chamber is succeeded by three or four other chambers which extend around the initial chamber and nearly or entirely envelope it. The entire apparatus suggests a partial initial spiral. The equatorial chambers have curved outer walls and truncate or pointed inner ends, depending on whether the sides of chambers in the same circle do or do not meet. Communication between the equatorial chambers is by means of stoloniferous apertures. Roofs and floors of the equatorial chambers and the roofs of the lateral chambers are cribriform perforate.

Upper Cretaceous. North America.

Genus ACTINOSIPHON Vaughan, 1929

Genoholotype, *Actinosiphon semmesi* Vaughan

Actinosiphon VAUGHAN, Journ. Pal., vol. 3, 1929, p. 163.

Test lenticular, with a single layer of equatorial chambers and well developed lateral chambers. Pillars and terminal small papillae present. Embryonic apparatus of the megalospheric form

consists of a rather large subspherical initial chamber, followed by a smaller chamber whose longer diameter is parallel to the circumference of the first chamber. The later chamber is followed by about eleven other chambers which entirely encircle the first two chambers and outside this circle there are several other chambers opposite chamber no. 3. The equatorial chambers tend to form radial rows; roofs and floors perforate. Each chamber communicates by a medianly placed stolon with the adjacent proximal and distal chamber of the same row; communication with chambers of adjacent rows by means of stolons at the sides of the chambers. There are no canals.

Lower Eocene. Mexico.

Subgenus MYOGYPSINOIDES Yabe and Hanzawa, 1928

Subgenoholotype, *Myogypsina dehaartii* Vlerk

Myogypsinoides YABE and HANZAWA, Proc. Imper. Acad., vol. IV, 1928, p. 535.

"Distinguished . . . . . in having thick lateral walls, of lamellar structure in the site of several layers of lateral chambers."

Miocene. Indo-Pacific.

Subgenus ASTERODISCOCYCLINA W. Berry, 1928

Subgenoholotype, *Asterodiscocyclina stewarti* W. Berry

Asterodiscocyclina W. BERRY, Eclogae to geol. Helvetiae, vol. 21, 1928, p. 406.

A subgenus of *Discocyclina.*

Eocene. Peru.

Family ?

Genus TUBERITINA Galloway and Harlton, 1928

Plate 12, figures 13, 14

Genoholotype, *Tuberitina bulbacea* Galloway and Harlton

Tuberitina GALLOWAY and HARLTON, Journ. Pal., vol. 2, 1928, p. 346.

Test attached in life, probably to plants, by a basal disc from which rises a bulbous chamber; monothalmous or polythalmous; succeeding chambers are attached to the preceding chamber by a disc which is smoothly moulded on the preceding chamber, so that the chambers appear to be connected by thick necks; the chambers may be attached to the top of the preceding ones, making a rectilinear or curvilinear series, or to the sides of the preceding ones,

making irregular tests; the chambers increase in size as added, and are filled with clear or granular calcite; there are no foramina connecting the chambers; walls calcareous, thick, completely soluble in acid, very finely but obscurely perforate; surface with conspicuous punctae, each of which corresponds to a smaller perforation, or smooth when calcified; aperture absent.

Pennsylvanian. Oklahoma and Texas.

This may be found not to belong to the Foraminifera.

97. PLEISTOCENE FORAMINIFERA FROM MARYLAND

By JOSEPH A. CUSHMAN and W. STORRS COLE

Our knowledge of the Pleistocene foraminifera of Maryland has been limited to those records given by Dr. R. M. Bagg in two papers, one published in the Bulletin of American Paleontology, vol. 2, no. 10, 1898, the essential data of which with figures are given in the Maryland Geological Survey volume on the Pliocene and Pleistocene, Baltimore, 1906, pp. 214-216, pl. LXVI, figs. 7-15.

But four forms are included in these earlier papers as follows: "*Lagena globosa* (Montagu)", "*Cristellaria rotulata* (Lamarck)", "*Rotalia beccarii* (Lamarck)", and "*Polystomella striato-punctata* (Fichtel and Moll)". These records are from the Talbot formation, of Wailes Bluff, near Cornfield Harbor, St. Mary's County, Maryland.

To gain further knowledge of this fauna the junior author has collected both at Wailes Bluff and also at Langleys Bluff, on the Bay shore about 5½ miles south of Cedar Point, St. Mary's County, Maryland. Foraminifera are rather common at these two localities and it is quite possible from the study of the material that different conditions of temperature prevailed during the deposition. Some of the species are now found in comparatively warm waters while others are now characteristic of very cold waters. A similar condition is shown in the Pleistocene beds of Sankoty Head, Nantucket.

All the forms are also found living, even the variety described as new occurring in considerable abundance on the New England coast today. The specimens from the Maryland collections often show their original color and are mostly in a perfect state of preservation.

There are a few other very rare forms represented by single or incomplete specimens which are not noted here, indicating that further collecting will add to the known fauna of this region.

Family MILIOLIDAE

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA SEMINULA (Linnaeus)

Plate 13, figures 1 *a-c*

This species is extremely rare at Wailes Bluff.

QUINQUELOCULINA FLEXUOSA d'Orbigny

Plate 13, figures 2 *a-c*

Quinqueloculina flexuosa D'ORBIGNY, Voy. Amér. Mérid., 1839, "Foraminifères", p. 73, pl. 4, figs. 4-6.—CUSHMAN and VALENTINE, Contr. Dept. Geol. Stanford Univ., vol. 1, 1930, p. 11, pl. 2, figs. 3 *a-c*.

Test broadly fusiform, periphery broadly rounded; chambers extended at each end, distinct, inflated; sutures distinct, strongly depressed; wall ornamented by deeply incised grooves generally longitudinal but rather freely anastomosing, the areas between the incisions rounded; apertural end somewhat extended and slightly contracted to form a semblance of a neck with a slightly thickened margin, aperture itself nearly circular, with a narrow tooth, bifid at the inner end.

Specimens are extremely rare at Wailes Bluff, but the identity with d'Orbigny's species seems very marked.

Genus TRILOCULINA d'Orbigny, 1826

TRILOCULINA ROTUNDA d'Orbigny

Plate 13, figures 3 *a-c*

The figured specimen shows the characters of a species which is rare at Wailes Bluff. It is close to the figures given by Fornasini of d'Orbigny's original outlines of this species.

Family NONIONIDAE

Genus NONION Montfort, 1808

NONION POMPILIOIDES (Fichtel and Moll)

Plate 13, figures 4 *a*, *b*

Specimens similar to that figured are rare in the collections from Wailes Bluff.

NONION SLOANII (d'Orbigny) (?)

Plate 13, figures 5 *a*, *b*

The specimen figured is the only one of this particular form. It is from Langleys Bluff. It may be referred with much question to d'Orbigny's figures until further material is available.

Genus ELPHIDIUM Montfort, 1808

ELPHIDIUM INCERTUM (Williamson)

Plate 13, figures 6, 7

Polystomella umbilicatula, var. *incerta* WILLIAMSON, Rec. Foram. Gt. Britain, 1858, p. 44, pl. 3, figs. 82, 82 *a*.

Polystomella striato-punctata, var. *incerta* KIAER, Rept. Norwegian Fish. Mar. Invest., vol. 1, no. 7, 1900, p. 51.—CUSHMAN, Rept. Canadian Arctic Exped., pt. M, 1913, p. 10.

Elphidium incertum CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 7, 1930, p. 18, pl. 7, figs. 4-9.

Polystomella decipiens HERON-ALLEN and EARLAND (not COSTA), Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 282, pl. 43, figs. 20-22.

Test of small size for the genus, compressed, periphery broadly rounded, margin entire or with the last two or three chambers lobulated, umbilical regions slightly depressed, often with a slight knob or irregularly arranged slits at the base of the sutures; chambers few, usually less than ten in the last-formed whorl, slightly if at all inflated, distinct; sutures distinct, mainly marked by the openings which are in a single row, retral processes very few, usually not more than five or seven, distinct, the inner ends of the sutures slit-like; wall thick, usually opaque; aperture composed of several small, rounded openings at the base of the apertural face. Diameter usually less than 0.50 mm.; thickness 0.20-0.25 mm.

This is a common Recent species in shallow water off the New England coast, and occurs farther South in deeper, cool waters. It is much less abundant than the following variety, but occurs both at Wailes Bluff and at Langleys Bluff.

ELPHIDIUM INCERTUM (Williamson), var. CLAVATUM Cushman

Plate 13, figures 8, 9

Elphidium incertum (WILLIAMSON), var. *clavatum* CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 7, 1930, p. 20, pl. 7, figs. 10 *a*, *b*.

Variety differing from the typical in the ornamentation of the test, the umbilical portions being occupied by several large irregular bosses, very distinct but not forming a definite umbonate mass; test usually yellowish-brown in color.

This variety is common both at Wailes Bluff and at Langleys Bluff. It is somewhat larger than the typical form. In the living state, it is common off the coast of New England. Many of the Pleistocene specimens have the same characteristic coloring as is seen in living ones.

ELPHIDIUM DISCOIDALE (d'Orbigny)

Plate 13, figures 10 *a*, *b*

Polystomella discoidalis D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères", p. 56, pl. 6, figs. 23, 24.—CUSHMAN, Publ. 311, Carnegie Instit., Washington, 1922, p. 56, pl. 10, figs. 3, 4; Publ. 344, 1926, p. 80.

Elphidium discoidale CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 7, 1930, p. 22, pl. 8, figs. 8, 9.

Test of medium size for the genus, somewhat compressed, periphery subacute, margin slightly lobulate, sides convex in peripheral view, umbilical regions each with a large rounded boss, in peripheral view protruding strongly beyond the outline of the test; chambers only slightly inflated, distinct, averaging about ten in number in the last-formed coil; sutures slightly depressed, somewhat broadening toward the inner end, marked also by the retral processes which are short, and ten to twelve in number; wall smooth, very distinctly perforate, umbos of clear shell material, nearly transparent, with numerous coarse tubules; aperture composed of several, small, rounded openings at the base of the apertural face.

This is typically a warm water species. Specimens of the form figured occur in some numbers at Wailes Bluff.

ELPHIDIUM ADVENUM (Cushman), var. MARGARITACEUM Cushman

There is a single specimen from Wailes Bluff which can be best referred to this variety (Bull. 104, U. S. Nat. Mus., pt. 7, 1930, p. 25, pl. 10, fig. 3). It occurs off the southern coast of New England, and is apparently a more northern variety of the tropical *E. advenum*.

Dr. Bagg records specimens from Wailes Bluff as "*Polystomella striato-punctata*" (Maryland Geol. Survey, Pliocene and Pleistocene, 1906, p. 216, pl. 66, figs. 14, 15). These are probably *Elphidium incertum*.

Family BULIMINIDAE

Genus ENTOSOLENIA Ehrenberg, 1848

ENTOSOLENIA LUCIDA (Williamson)

Plate 13, figures 11, 12

The two figured specimens are from Wailes, and the other from Langley Bluff may be referred to this somewhat variable species.

Bagg records *"Lagena globosa"* from Wailes Bluff, but no specimens referable to this were found in our material.

Family ROTALIIDAE

Genus EPONIDES Montfort, 1808

EPONIDES FRIGIDA (Cushman), var. CALIDA Cushman and Cole, n. var.

Plate 13, figures 13 *a-c*

Variety differing from the typical in the fewer chambers,

EXPLANATION OF PLATE 13

FIGS. 1 *a–c.* *Quinqueloculina seminula* (Linnaeus). × 35. *a*, *b*, opposite sides; *c*, apertural view.

FIGS. 2 *a–c.* *Quinqueloculina flexuosa* d'Orbigny. × 35. *a*, *b*, opposite sides; *c*, apertural view.

FIGS. 3 *a–c.* *Triloculina rotunda* d'Orbigny. × 35. *a*, *b*, opposite sides; *c*, apertural view.

FIGS. 4 *a*, *b*. *Nonion pompilioides* (Fichtel and Moll). × 60. *a*, side view; *b*, apertural view.

FIGS. 5 *a*, *b*. *Nonion* cf. *sloani* (d'Orbigny) (?). × 35. *a*, side view; *b*, apertural view.

FIGS. 6, 7. *Elphidium incertum* (Williamson). × 60. *a*, *a*, side views; *b*, *b*, apertural views.

FIGS. 8, 9. *Elphidium incertum* (Williamson), var. *clavatum* Cushman. × 60. *a*, side view; *b*, apertural view.

FIGS. 10 *a*, *b*. *Elphidium discoidale* (d'Orbigny). × 60. *a*, side view; *b*, apertural view.

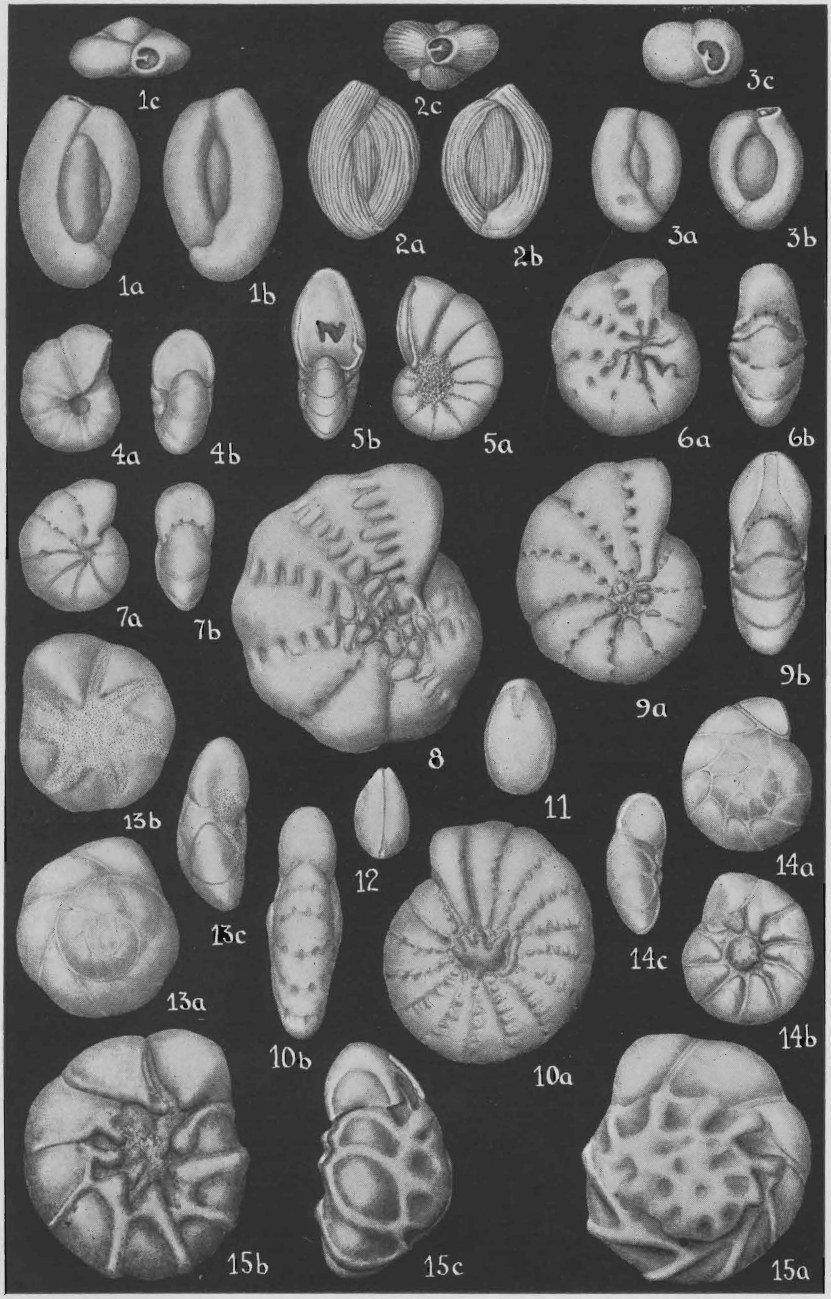
FIGS. 11, 12. *Entosolenia lucida* (Williamson). × 60. Fig. 11, front view; fig. 12, side view.

FIGS. 13 *a–c.* *Eponides frigida* (Cushman), var. *calida* Cushman and Cole, n. var. × 60. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

FIGS. 14 *a–c.* *Rotalia beccarii* (Linnaeus), var. *parkinsoniana* (d'Orbigny). × 60. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

FIGS. 15 *a–c.* *Rotalia beccarii* (Linnaeus), var. *ornata* Cushman. × 60. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

Figures drawn by Margaret S. Moore.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10b
10a
15b
15c
15a

smaller size, more compact test, and broadly rounded periphery.

Holotype of variety (Cushman Coll. No. 14,213) from Pleistocene, Talbot formation, Wailes Bluff, near Cornfield Harbor, St. Marys County, Maryland.

This variety is fairly common at both Wailes Bluff and at Langleys Bluff. It is identical with specimens now living on the New England coast, and represents a warmer water variety of the Arctic *Eponides frigida.*

Genus ROTALIA Lamarck, 1804

ROTALIA BECCARII (Linnaeus), var. PARKINSONIANA (d'Orbigny)

Plate 13, figures 14 *a-c*

Rosalina parkinsoniana D'ORBIGNY, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères", p. 99, pl. 4, figs. 25-27.

Variety with 9 or 10 chambers in the adult whorl, sutures very distinct and slightly limbate on the dorsal side, curved and depressed on the ventral side, ventral umbilical plug large and distinct, spire low.

This variety described by d'Orbigny in the Cuban report is living in comparatively shallow water in the West Indian region. It is a very clear cut form with a distinctive appearance.

This variety is common at both Wailes Bluff and Langleys Bluff.

ROTALIA BECCARII (Linnaeus), var. ORNATA Cushman

Plate 13, figures 15 *a-c*

Rotalia beccarii (LINNAEUS), var. *ornata* CUSHMAN, Bull. 676, U. S. Geol. Survey, 1918, p. 18, pl. 8, fig. 7.

Variety with a high spire, the periphery broadly rounded; sutures thickened and raised on both the ventral and dorsal surfaces, on the dorsal side often making a deep net work, on the ventral side greatly thickened often knob-like on the inner end, sometimes fused with adjacent ones about the umbilicus.

This variety was originally described from the Pliocene of the Caloosahatchee River, Florida. The variety is common both at Wailes Bluff and Langleys Bluff. It is difficult to tell from Bagg's figure in the Maryland report as "*Rotalia beccarii*" (p. 215, pl. 66, figs. 11-13) which of the two above varieties he figures.

98. THE RANGE OF SIGMOIDELLA PLUMMERAE CUSHMAN AND OZAWA. A CORRECTION

By JOSEPH A. CUSHMAN

In our paper, "A Monograph of the Foraminiferal Family Polymorphinidae, Recent and Fossil" (Proc. U. S. Nat. Mus., vol. 77, art. 6, 1930) *Sigmoidella plummerae* was described (p. 142, pl. 39, figs. 3 *a*, *b*). The range for this was indicated as from the Midway to the Cooper Marl. Mrs. Plummer has called into question the Midway record and on looking up the original material there is evidently a mistake in referring it to the Midway. This particular collection credited to the Midway is in reality from the Claiborne of Texas so that the range of *Sigmoidella plummerae* is much shortened and it occurs only in the Cooper Marl and in the Claiborne. Most of these specialized forms of the Polymorphinidae have short vertical ranges and this one in particular should be a good marker for this part of our Eocene section.

RECENT LITERATURE ON THE FORAMINIFERA

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

Hofker, J.

Der Generationswechsel von Rotalia beccarii, var. flevensis, nov. var.

(Zeitschr. Zellforsch. mikr. Anat., vol. 10, 1930, pp. 756-768, 1 text fig.) *Berlin.*

Describes this variety and its development in minute detail.

Chapman, Frederick.

On a Foraminiferal Limestone of Upper Eocene Age from the Alexandria Formation, South Africa.

(Ann. So. African Mus., vol. XXVIII, 1930, pp. 291-296, pl. XXXVII.)

Figures *Discocyclina pratti*, and notes numerous other species.

Hofker, J.

Zoology of the Faroes. IIa. Foraminifera.

(Copenhagen, 1930, 21 pages, 31 text figs.) *Copenhagen.*

Nine species are noted, and a number figured in detail.

Vaughan, Thomas Wayland.

Recent Progress in the Study of Fossil Larger Foraminifera in America.

(Proc. Fourth Pacific Science Congress, Java, 1929, 2 pp.) *Bandoeng.*

Chapman, Frederick.

The Value of Foraminifera as Guide Fossils: With Special reference to the Australian cainozoic sediments.

(l. c., 1929, 6 pp.) *Bandoeng.*

Cushman, Joseph A., and Yoshiaki Ozawa.

A Monograph of the Foraminiferal Family Polymorphinidae, Recent and Fossil.

(Proc. U. S. Nat. Mus., vol. 77, art. 6, 1930, pp. 1-185, pls. 1-40, text figs. 1, 2.) *Washington.*

Three new genera, *Eoguttulina*, *Quadrulina*, and *Paleopolymorphina*, are described. There are 190 species and varieties, of which 57 are described as new. The 40 plates illustrate all the species and varieties.

Woodring, W. P.

Upper Eocene Orbitoid Foraminifera from the Western Santa Ynez Range, California, and their Stratigraphic Significance.

(Trans. San Diego Soc. Nat. Hist., vol. 4, no. 4, July 12, 1930, pp. 145-170, pls. 13-17.) *San Diego.*

Describes and figures two new species.

Howe, Henry V.

The Genus Bolivinella in the Oligocene of Mississippi.

(Journ. Pal., vol. 4, 1930, pp. 263-267, pl. 21.) *Tulsa.*

Describes and figures 5 species and varieties, of which 4 are new.

Gravell, Donald W.

The Genus Orbitoides in America, with Description of a New Species from Cuba.

(Journ. Pal., vol. 4, 1930, pp. 268-270, pl. 22.) *Tulsa.*

Exteriors and sections of the new species are figured.

Nuttall, W. L. F.

Eocene Foraminifera from Mexico.

(Journ. Pal., vol. 4, 1930, pp. 271-293, pls. 23-25.) *Tulsa.*

The guide foraminifera are given with descriptions and figures of 9 new species and 4 new varieties.

Yabe, Hisakatsu, and Shoshiro Hanzawa.
Tertiary Foraminiferous Rocks of Taiwan (Formosa).
(Sci. Rept. Tohoku Imperial Univ., ser. 2 (Geol.), vol. XIV, no. 1, 1930, pp. 1-46, pls. 1-16, 1 text fig., 2 tables.) *Sendai.*
This beautifully illustrated paper deals mostly with the orbitoids, but lists species of many other families, and describes numerous new species. A new generic name, *Baculogypsinoides*, is given, and a new subgenus, *Miogypsinoides*.

Estorff, Fritz E. von.
Kreyenhagen Shale at Type Locality, Fresno County, California.
(Bull. Amer. Assoc. Petr. Geol., vol. 14, no. 10, Oct. 1930, pp. 1, 321-1, 336.) *Tulsa.*
Numerous foraminifera are recorded, mostly by genera only, and compared with other regions.

Cushman, Joseph A.
The Interrelation of Foraminifera and Algae.
(Journ. Washington Acad. Sci., vol. 20, no. 16, Oct. 4, 1930, pp. 395, 396.) *Washington.*
Notes the relationship of these two groups in shallow tropical waters.

Silvestri, A.
Di alcune Orbitoline della Grecia.
(Mem. Pont. Accad. Sci. Nuovi Lincei, vol. XIV, 1930, pp. 223-266, pl. 1.) *Rome.*
Three species are described and figured, as well as a review given of several related genera.

Berry, W.
Contributions to the Paleontology of Peru, IV: "Orthophragmina" (Discocyclina) meroensis W. Berry, n. sp.
(Journ. Washington Acad. Sci., vol. 20, no. 17, Oct. 19, 1930, pp. 432-434, fig. 1 in text.) *Washington.*
Describes the above species from the Eocene of Peru.

Feifel, K.
Über Foraminiferen der Schwammkalke des schwäbischen weissen Jura.
(Pal. Zeitschr., vol. 12, 1930, pp. 42-47.) *Berlin.*
A brief review of the fauna without description of species.

Hok, Tan Sin.

Enkele opmerkingen over de stratigraphische verspreiding van Trybliolepidina v. d. Vlerk. (With English Summary.)

(De Mijningenieur, Jaargang 11, no. 7, July, 1930, pp. 144-146.) *Bandoeng.*

Hok, Tan Sin.

Over Spiroclypeus, met opmerkingen over zijn stratigrafische verspreiding. (Preliminary Communication, with English Summary.)

(l. c., no. 9, Sept., 1930, pp. 180-184, text figs. *a-d.*) *Bandoeng.*

These two short papers deal with the stratigraphic distribution of these genera in the Indo-Pacific.

Franke, A.

Die Trennung der Mikrofossilien aus sandigen Schlämmrückständen mit Tetrachlorkohlenstoff.

(Zeitschrift für Geschiebeforschung, Bd. VI, Heft. 4, 1930, pp. 162-164.)

Gives the general method of flotation of Foraminifera by the use of Carbon tetrachloride originated by the late Dr. Ozawa.

Parr, Walter J., and Arthur C. Collins.

Notes on Australian and New Zealand Foraminifera. No. 1—The Species of Patellina and Patellinella, with a Description of a New Genus, Annulopatellina.

(Proc. Roy. Soc. Victoria, vol. XLIII, pt. I (new series), Sept. 29, 1930, pp. 89-95, pl. IV.) *Melbourne.*

Describes a new *Patellinella* and a new Genus *Annulopatellina.*

Plummer, Helen Jeanne.

Calcareous Foraminifera in the Brownwood Shale near Bridgeport, Texas.

(Univ. Texas, Bulletin 3019, 1930, pp. 5-21, pl. 1.) *Austin.*

Describes and figures several species of Pennsylvanian forms with a new Genus *Earlandia,* and six new species.

Cushman, Joseph A., and James A. Waters.

Foraminifera of the Cisco Group of Texas.

(l. c., pp. 22-81, pls. 2-12.) *Austin.*

Pennsylvanian forms are described and figured, five new.

J. A. C.