

Eight New Genera of Unilocular Foraminifera¹

R. TIMOTHY PATTERSON AND RANI H. RICHARDSON

Department of Earth and Space Sciences, University of California,
Los Angeles, California 90024 U.S.A.

Abstract. Although varied and diverse, unilocular foraminifera are among the least understood group of the foraminifera. Part of the problem has been the inadequate number of taxonomic divisions within this diverse group. A new taxonomic framework has been proposed to make the group more useful to taxonomists and stratigraphers. Several additional new genera are proposed herein. The new genera *Hyalinonettrion* (type species *H. sahalense* n. sp.) and *Pygmaeoseistrion* (type species *P. hispidulum*) are included in the Lageninae. Five new genera also are included in the Ellipsolageninae. These include *Cursina* n. gen. (type species *C. adornata* n. sp.), *Exsculptina* n. gen. (type species *L. sidebotomi*), *Favulina* n. gen. (type species *Entosolenia hexagona*), *Homalohedra* n. gen. (type species *Lagena guntheri*), and *Laculatina* n. gen. (type species *Lagena quadrilatera striatula*). *Bifarilaminella* n. gen. (type species *Lagena advena* Cushman) is included in the Sipholageninae. Three additional new species are described: *Favutna epibathra* n. sp., *Pytine petaloskelis* n. sp., and *Sipholagena structiloides* n. sp.

Although very diverse, unilocular foraminifera are among the least understood foraminiferal groups. However, recent major taxonomic revisions (Jones, 1984; Patterson & Richardson, 1987) will greatly aid taxonomists and stratigraphers and hopefully will lead to greater understanding and utilization of the family in biostratigraphic and paleoecological studies. Based on the taxonomic framework developed by Patterson & Richardson (1987), eight new genera and several new species are described herein.

MATERIALS AND METHODS

Several thousand specimens from 18 localities were studied with a binocular stereomicroscope at 20-50 x. Both transmitted and reflected light were used to determine morphologic variation, and the presence or absence of an entosolenian tube. Outer walls were partially removed from 40 specimens by the

¹ This research was supported by a NSERC Postgraduate Scholarship to RT.P. The Cushman Foundation for Foraminiferal Research provided support in the form of student research grants to both RT.P. and RH.R. The Department of Earth and Space Sciences, University of California, Los Angeles and Geological Society of America Research Grant 3640-86 provided funds for the purchase of Polaroid film. Samples from the Deep Sea Drilling Project were supplied through the assistance of the National Science Foundation. Other samples were from the personal collections of Alfred R. Loeblich, Jr. and Helen Tappan. NSF Grant EAR-8306170 to A.R.L. and H.T. provided support and use of the scanning electron microscope. Acknowledgment is made to the Donors of the Petroleum Research Fund, administered by the American Chemical Society, for the partial support of this research under PRF 16479-4C2. We also would like to thank A. R. Loeblich, Jr. and H. Tappan for critically reviewing the manuscript, B. Olszewska for supplying and etching many specimens, and V. Doyle-Jones and B. Widawski for illustrating several specimens.

method of Plummer (1951). Scanning electron micrographs were made using an ISI Super-111A scanning electron microscope, recording on Polaroid® NP 55 film. The previously published illustrations are reproduced for previously described species that we have designated as types for new genera. Holotypes, figured paratypes, unfigured paratypes, and hypotypes of formerly described species are deposited in the U.S. National Museum of Natural History (USNM), Washington, D.C.

Specimens were studied from the following localities: (I) *Quaternary*. DSDP Site 357 (Leg 39) on the Rio Grande Rise, southwest Atlantic Ocean, 30°00.25'S, 35°33.59'W. Core levels: 357-1-1, 82-92 cm; 357-1-2, 80-86 cm; 357-1-3, 80-86 cm; 357-1-4, 80-86 cm. *Pliocene*. 357-2-1, 80-86 cm; 357-2-4, 83-89 cm; 357-3-3, 80-86 cm; 357-5-3, 80-86 cm. *Miocene*. 357-7-5, 83-89 cm; 357-8-1, 83-89 cm; 357-8-5, 85-91 cm; 357-9-1, 75-81 cm; 357-10-3, 82-88 cm; 357-14-1, 80-86 cm; 357-14-CC. *Oligocene*. 357-16-1, 74-80 cm; 357-17-1, 80-86 cm. (2) *Quaternary*. DSDP Site 292 (Leg 31) on the Benham Rise, western Philippine Basin, western Pacific Ocean, 15°49.11'N, 124°39.05'E. Core levels: 292-1-1, 30-38 cm; 292-1-2, 47-52 cm; 292-1-3, 27-33 cm; 292-1-4, 28-34 cm; 292-1-CC; 292-2-1, 120-126 cm; 292-2-2, 52-58 cm; 292-2-3, 34-39 cm; 292-2-CC; 292-3-1, 125-130 cm. (3) *Quaternary*. DSDP Site 207 (Leg 21) on the South Lord Howe Rise, Tasman Sea, 36°57.75'S, 165°26.06'E, 207-1-2, 68-74 cm. (4) *Pleistocene*. Timms Point Formation, from railway cut behind parking lot at 1400 South Harbour Boulevard, San Pedro, California. Coli. A. R. & H. T. Loeblich. (5) *Lower Pliocene* (Plaisancian). Ponticella di Savena, on right bank of stream below bridge near San Ruffillo, Province of Bologna, Italy. Coli. B. Accordi, C. Loriga, and H. T. & A. R. Loeblich. (6) *Upper Cretaceous*. Bergstrom Formation (Taylor Group) on right (east) bank of Onion Creek, at Moore & Berry's Crossing, just downstream from iron bridge of Burieson Road, SE of Austin, Travis Co., Texas. Coli. A. R. & H. T. Loeblich, and B. Olszewska. (7) *Holocene*. Beach sand, Dogs Bay, 2 mi SW of Roundstone Village, County Mayo, Ireland. (8) *Holocene*. F. C. Goldseeker, Haul 127, Entrance to Stornoway Harbor, 37-66 m, 15 August 1907. (9) *Holocene*. F. C. Goldseeker, Haul 175, E Loch Roag, Lewis, 9-13 m, 29 August 1908. (10) *Holocene*. F. C. Goldseeker, Haul 70, In Cromarty Firth, 18 m, 8 March 1907. (II) *Holocene*. F. C. Goldseeker, Haul 228, W Atlantic to N of St. Kilda, 57859'N, 10°34'W, 28 October 1910. (12) *Holocene*. F. C. Goldseeker, Haul 102, 3.5 mi W of Cava Island, Scapa Flow, Orkney, 38 m, 15 July 1907. (13) *Holocene*. F. C. Goldseeker, Dogger Bank, 52 m, 54°55'N, 0°42'E, 16 September 1913. (14) *Holocene*. F. C. Goldseeker, Haul 11159, Station 15 B, 282 m, 61°39'N, 4°45'W, 21 June 1909. (15) *Holocene*. F. C. Goldseeker, Haul 188, Kinnaird Deep, Moray Firth, 196 m, 28 June 1909. (16) *Holocene*. Scripps Institution of Oceanography, 1961 Sahul Shelf Cruise 2 of *Stranger*, Core V-227, 11°59.2'S, 123°53.3'E, 94 m, Timor Sea. (17) *Holocene*. Scripps Institution of Oceanography, 1960 Sahul Shelf Cruise 1 of the *Malita*, Core V-27, 9°46.0'S, 128°21.5'E, 89 m, Timor Sea. (18) *Holocene*. Scripps Institution of Oceanography, 1961 Sahul Shelf Cruise 2, of the *Stranger*, Core V-224, 12°14.0'S, 124°23.0'E, 96 m Timor Sea, off NW Australia.

TAXONOMIC ACCOUNT

Species referred to new genera in the remarks for each new generic description are based on examination either of hypotypes or topotypes, or on a literature search. These listings are not complete, but are provided to indicate the degree of variation within a particular genus.

Order Foraminiferida Eichwald, 1830
 Suborder Lagenina Delage & Hérouard, 1896
 Superfamily Nodosariacea Ehrenberg, 1838
 Family Lagenidae Reuss, 1862
 Subfamily Lageninae Reuss, 1862
Lagena Walker & Jacob, 1798
 (Figs. 1-4)

Lagena Walker & Jacob, in Kanmacher, 1798, p. 634.

Serpula (Lagena) Boys & Walker, 1784 (publ. rejected, ICZN Op. 558, 1959).

Vermiculum Montagu, 1803, p. 517.

Lagenula de Montfort, 1808, p. 311.

Tetragonulina Seguenza, 1862, p. 53.

Capitellina Marsson, 1878, p. 122.

Ectolagena Silvestri, 1900, p. 4.

Type species. *Serpula (Lagena) sulcata* Walker & Jacob, in Kanmacher, 1798, p. 634, pl. 14, fig. 5; subsequently designated by Parker & Jones, 1859, p. 337.

Diagnosis. A genus of Lageninae containing species which have a globular, costate test, a porous wall, a circular aperture, and no entosolenian tube.

Range. Jurassic to Holocene (based on literature search).

Remarks. A great number of different species of *Lagena* have been incorrectly referred to *Lagena sulcata*. To avoid further confusion, we have illustrated a hypotype from the Pliocene of Bologna, Italy.

Hyalinonetrion n. gen.

Amphorina d'Orbigny, 1849, p. 666 (not *Amphorina* de Quatrefages, 1844).

Type species. *Hyalinonetrion sahulense* n. sp.

Diagnosis. A genus of Lageninae comprised of species which have a smooth, fusiform test, a non-porous wall, a circular aperture, and no entosolenian tube.

Description. Test free, unilocular, fusiform, wall calcareous, hyaline, smooth, imperforate; aperture small, circular, terminal to elongate neck and bordered by a small, smooth, phialine lip.

Range. Middle Oligocene to Holocene (based on literature search).

Remarks. *Hyalinonetrion* differs from *Lagena* and *Pygmaeoseistrion* in having a fusiform test and an elongate neck with a phialine lip. *Hyalinonetrion* differs from *Procerolagena* in having a smooth rather than costate test surface. Based on examination of specimens of *Lagena laevis* (Montagu) var. *amphora* from Timms Point, California, the species is herein transferred to *Hyalinonetrion*. Examination of illustrations of *Lagena sulcata* Walker & Jacob var.

distomapolita indicate that this species may be referred to *Hyalinonetrion* as well.

Etymology. From the Greek, *hyalinus*, glassy, transparent; *netron*, spindle; *netrion*, diminutive. Gender, neuter.

Hyalinonetrion sahulense n. sp.
(Figs. 5, 6)

Diagnosis. A cigar-shaped species of *Hyalinonetrion* with sub-parallel walls that gradually taper at the extremes.

Description. Test free, unilocular, fusiform, maintaining a constant maximum diameter for the main portion of the test where the walls are parallel, and tapering gradually, beginning just before the apical and apertural extensions; wall calcareous, hyaline, smooth, imperforate; aperture small, round with a small phialine lip.

Species dimensions. Maximum length, 1,000 μm ; maximum width, 100 μm .

Material. 53 specimens.

Types and occurrence. Quarternary. Figured holotype (USNM 383329) from 1961 Sahul Shelf Cruise 2 of *Stranger*, Timor Sea, Core V-227, 11°59.2'S, 123°53.3'E. Unfigured paratype (USNM 383410) from 1961 Sahul Shelf Cruise 2 of *Stranger*, Timor Sea, Core V-74, 12°21.3'S, 129°17.4'E.

Etymology. From the Sahul Shelf, Timor Sea, north of Australia; and *-ense*, denoting place, locality,

Remarks. *Hyalinonetrion sahulense* closely resembles *H. distomapolita* (Parker & Jones), yet *H. sahulense* maintains a constant width, tapering gradually just below the neck and apical extensions; *H. distomapolita* tapers sharply away from a maximum width at the midpoint.

Pygmaeoseistrion n. gen.
(Figs. 7-10)

Type species. *Lagena hispidula* Cushman, 1913, p. 14, pl. 5, figs. 2, 3.

Diagnosis. A genus of Lageninae comprised of species that have a smooth or finely hispid imperforate wall, a sub-globular test, a circular aperture terminal to a narrow neck, and no entosolenian tube.

Description. Test free, unilocular, sub-globular; wall calcareous, hyaline, smooth or finely hispid, non-costate; aperture small, round, with a small phialine lip, terminal to a narrow neck,

Range. Cretaceous to Holocene,

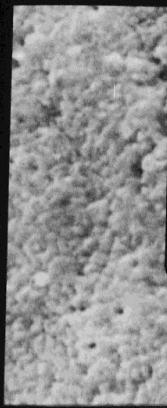
Material. The genus was defined following our examination of the figured hypotype and 50 additional specimens.

Types and occurrence. Miocene. Figured hypotype (USNM 383408) from DSDP Site 357 (Leg 39), on the Rio Grande Rise, southwest Atlantic, 30°00.25'S, 35°33.51'W, 357-8-5, 85-91 cm,

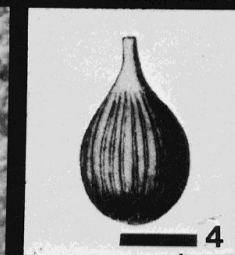
Remarks. *Pygmaeoseistrion* differs from *Lagena* by lacking costae, and from *Procerolagena* and *Hyalinonetrion* in being globular rather than fusiform. Based on a search of the literature, *L. flatulenta* Loeblich & Tappan, *L. laevis* (Montagu) var. *nebulosa* Cushman, *L. parri* Loeblich & Tappan, *L. adepta*



1



3



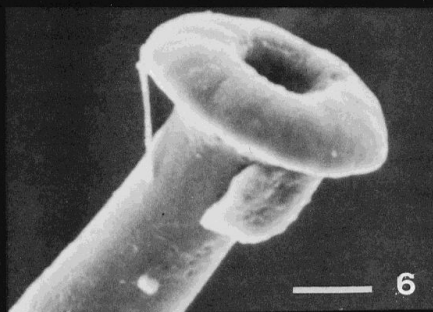
4



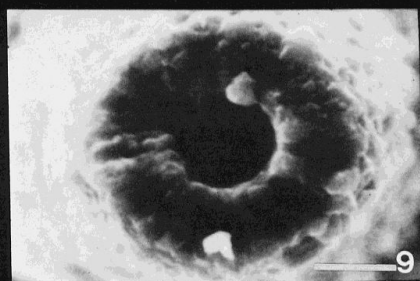
10



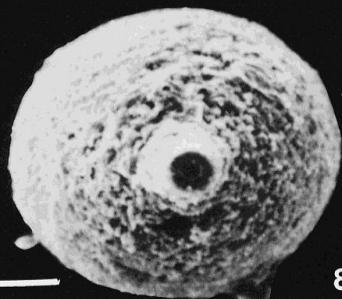
2



6



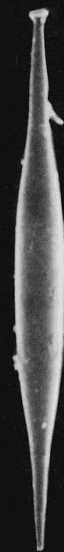
9



8



7



5

Jennings, and *L. vulgaris* Williamson, are herein transferred to *Pygmaeoseistron*.

Etymology. From the Greek, *pygmaios*, dwarf, pygmy; *seistron*, rattle. Gender, neuter.

Subfamily Ellipsolageninae Silvestri, 1923

Cursina n. gen.

Type species. *Cursina adornata* n. sp.

Diagnosis. A subglobular genus of Oolininae comprised of species with an encircling carina and a distinct, reticulate surface sculpture.

Description. Test free, unilocular, subcircular in outline, slightly compressed, completely carinate; wall calcareous, hyaline, coarsely reticulate, perforate, yet pores do not penetrate outer wall; elongate aperture at center of a broad slit located in the side of apical carina, entosolenian tube attached to wall opposite aperture.

Range. Pleistocene to Holocene.

Remarks. *Cursina* differs from *Pseudofissurina* in being much less compressed, reticulate, and possessing a thicker keel. *Cursina* differs from *Parafissurina* Parr in lacking an apertural hood, and from *Fissurina* Reuss in having the aperture in the side of the carina rather than at the center of a fissure-like cavity.

Etymology. From the Latin, *cursus*, coarse; *-ina*, diminutive, with reference to the coarsely sculpted test. Gender, feminine.

Cursina adornata n. sp.

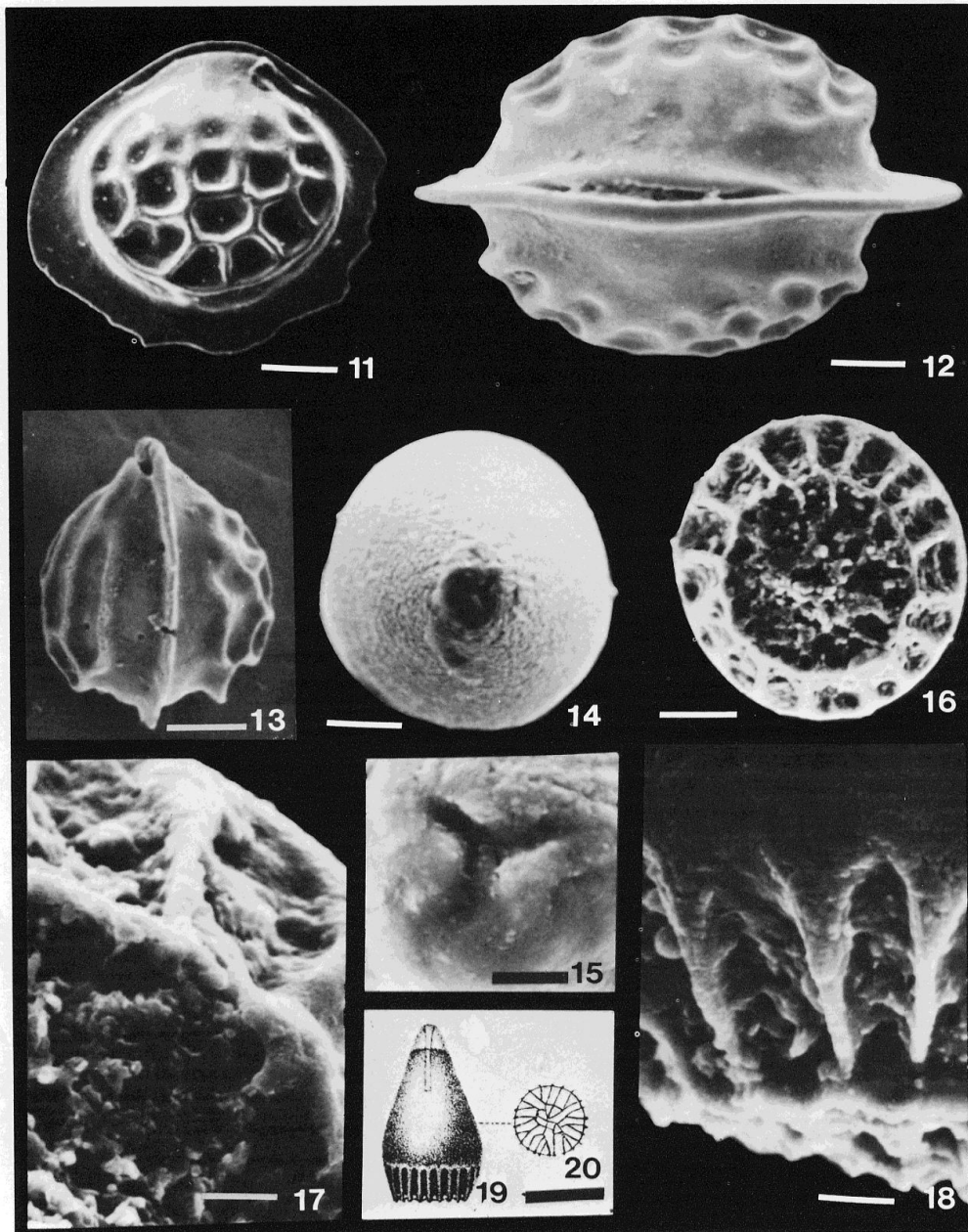
(Figs. 11-13, 46)

Diagnosis. A species of *Cursina* having a network of pits on the test surface, and an entosolenian tube attached to one wall.

Description. Test free, unilocular, circular in outline, compressed, oval in section; wall calcareous, hyaline; a wide, thin carina completely surrounds the test, with a smaller carina on either side; a network of reticulations forms large polygonal pits on test surface; aperture fissurine, in the side of central carina, entosolenian tube attached to back wall of test, terminating near the base.

←

FIGS. 1-4. *Lagena sulcata* (Walker & Jacob). Figs. 1-3. Ponticella di Savena, Bologna, Italy, Lower Pliocene. Fig. 1. Side view of hypotype (USNM 383330). Scale bar represents 35 μ m. Fig. 2. Apertural view. Scale bar represents 20 μ m. Fig. 3. Enlargement showing numerous fine pores. Scale bar represents 2 μ m. Fig. 4. Shore sands, Kent, England. Side view of specimen as figured by Walker & Jacob (1798, pl. 14, fig. 5). Scale bar represents 140 μ m. FIGS. 5, 6. *Hyalinonetron sahulense* n. sp. Core V-227, 1961 Sahul Shelf Cruise 2 of *Stranger*, Timor Sea, Quaternary. Fig. 5. Side view of hypotype (USNM 383329) showing smooth, unstriated surface. Scale bar represents 200 μ m. Fig. 6. Enlargement of aperture showing broad lip. Scale bar represents 10 μ m. FIGS. 7-10. *Pygmaeoseistron hispidula* (Cushman). DSDP Site 357, Rio Grande Rise, southwest Atlantic, Oligocene. Fig. 7. Side view of hypotype (USNM 383408). Scale bar represents 30 μ m. Fig. 8. Apertural view. Scale bar represents 20 μ m. Fig. 9. Apertural view. Scale bar represents 30 μ m. Fig. 10. Enlargement of finely-perforate wall showing hispid surface. Scale bar represents 20 μ m.



FIGS. 11-13. *Cursina adornata* n. sp. DSDP Site 357, Rio Grande Rise, southwest Atlantic, Quaternary. Fig. 11. Side view of holotype (USNM 383336) showing broad carina and polygonal surface reticulations. Scale bar represents 50 μ m. Fig. 12. Edge view of paratype (USNM383337) showing slit-like aperture and arrangement of surface reticulations in relation to carina. Scale bar represents 40 μ m. Fig. 13. Apertural view showing slit-like aperture. Scale bar represents 35 μ m. FIGS. 14-20. *Exsculptina sidebottomi* (Earland). Figs. 14-18. DSDP Site 292, Benham Rise, western

Species dimensions. Maximum length, 240 μm ; maximum width, 240 μm .

Material. Five specimens.

Types and occurrence. Quaternary. Figured holotype (USNM 409087) from DSDP Site 357 (Leg 39), Rio Grande Rise, southwest Atlantic Ocean, 30°00.25'S, 35°33.51'W, 357-1-2, 80-86 cm. Figured paratype (USNM 409088) from the same locality, 357-1-3, 80-86 cm.

Etymology. From the Latin, *adorno*, decorate, embellish, adorn, ornamental, ornate; *-atus*, with reference to the highly reticulate test.

Remarks. *Cursina adornata* superficially resembles *Lagena lacunata* Burrows & Holland in the carina arrangement and in the surface excavations. The species are readily differentiated by the absence of a neck and the more reticulate surface sculpture of *C. adornata*.

Exsculptina n. gen.

(Figs. 14-21)

Type species. *Lagena sidebottomi* Earland, 1934, p. 161, pl. 7, fig. 23.

Diagnosis. A genus of Oolininae comprised of species that have incised sculpture near the basal margin.

Description. Test free, unilocular, pyriform to conical, circular in section; wall calcareous, hyaline to translucent, non-porous, smooth, with excavated sculpture confined to basal region; base may be truncate; aperture round, with or without entosolenian tube; may have a short neck.

Range. Pliocene to Holocene (based on literature search).

Material. The genus was defined based on examination of five specimens of the type species.

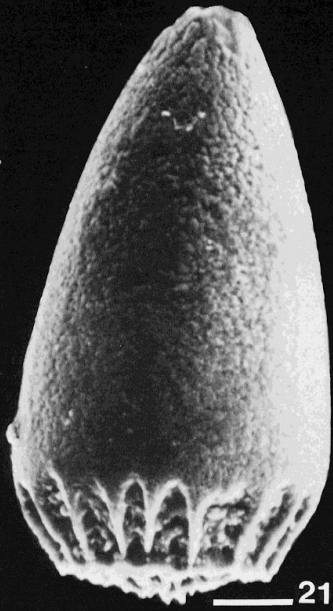
Types and occurrence. Quaternary. Figured hypotype (USNM 423537) from DSDP Site 292 (Leg 31), Benham Rise, western Philippine Basin, western Pacific Ocean, 15°49.11'N, 124°39.05'E, 292-2-CC.

Remarks. *Exsculptina* differs from other genera of the Oolininae in possessing incised rather than raised surface sculpture.

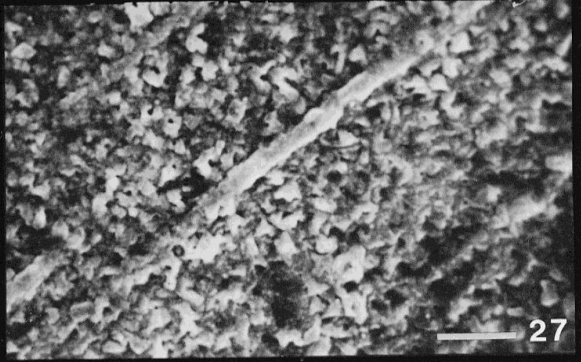
Based on a search of the literature, *L. pliocenica* Cushman & Gray, *L. pliocenica* Cushman & Gray var. *discrepans* Cushman & Gray, *L. semilineata* Wright, *L. semilineata* Wright var. *spinigera* Earland, *E. spinigera* (Earland), and *L. exsculpta* Brady, are herein transferred to *Exsculptina*.

Etymology. From the Latin *exsculptus*, cut out, chiseled out; *-ina*, diminutive, with reference to the incised test. Gender, feminine.

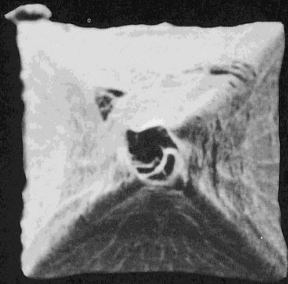
←
Philippine Basin, Quaternary. Fig. 14. Apertural view showing circular cross-section. Scale bar represents 20 μm . Fig. 15. View showing trigonal aperture. Scale bar represents 5 μm . Fig. 16. End view showing basal ring. Scale bar represents 20 μm . Fig. 17. Enlargement of base. Scale bar represents 5 μm . Fig. 18. Enlargement of side of basal area, showing coarsely perforate wall within exsculpted region. Scale bar represents 7 μm . Figs. 19, 20. Tasman Sea, Holocene. Side and basal views of specimen as figured by Sidebottom (1912, pl. 17, fig. 1), showing complicated network of reticulations. Scale bar represents 125 μm .



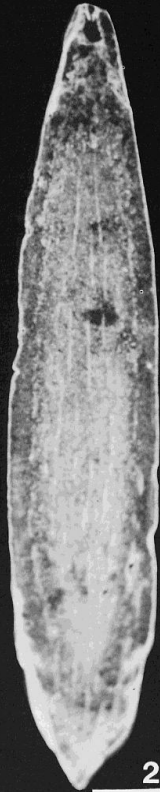
21



27



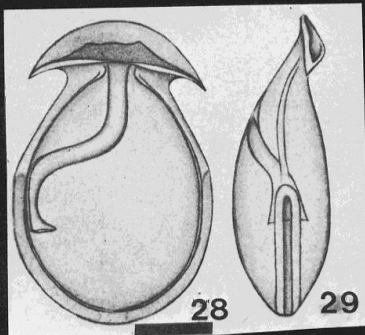
26



25

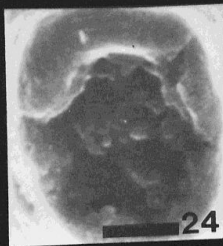


22

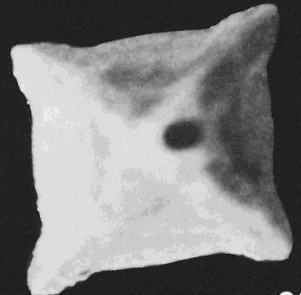


28

29



24



23

Favulina n. gen.

(Figs. 32,33, 47)

Type species. *Entosolenia squamosa* (Montagu) var. *hexagona* Williamson, 1848, p. 20, pl. 2, fig. 23.

Diagnosis. A genus of Oolininae consisting of subglobular species with raised polygonal reticulations on the test surface.

Description. Test free, unilocular, globular to ovate; wall calcareous, translucent, imperforate, surface covered with raised polygonal reticulations; aperture rounded or radiate.

Range. Upper Cretaceous to Holocene (based on literature search).

Material. The genus was defined following the examination of 200 specimens of the type species.

Types and occurrence. Quaternary. Figured hypotype (USNM 409086) from DSDP Site 292 (Leg 31), Benham Rise, western Philippine Basin, western Pacific Ocean, 15°49.11'N, 124°39.05'E, 292-1-4 28-34 cm. Another figured hypotype (USNM 383574) from DSDP 357 (Leg 39), Rio Grande Rise, southwest Atlantic Ocean, 30°00.25'S, 35°33.59'W, 357-5-3, 80-86 cm, Miocene.

Remarks. *Favulina* differs from *Oolina* in having a reticulate outer surface. Based on a search of the literature, *Lagena hexagona* (Williamson) *apertura* Balakhmatova, *L. hexagona* (Williamson) *apicostaia* ten Dam & Reinhold, *Oolina melo* d'Orbigny, *O. lineatopunctata* (Heron-Allen & Earland), and *O. squamosa* (Montagu) are herein transferred to *Favulina*.

Etymology. From the Latin, *favus*, honeycomb; *-ina*, diminutive, with reference to the sculpted surface of the test. Gender, feminine.

Favulina epibathra n. sp.

(Figs. 30, 31)

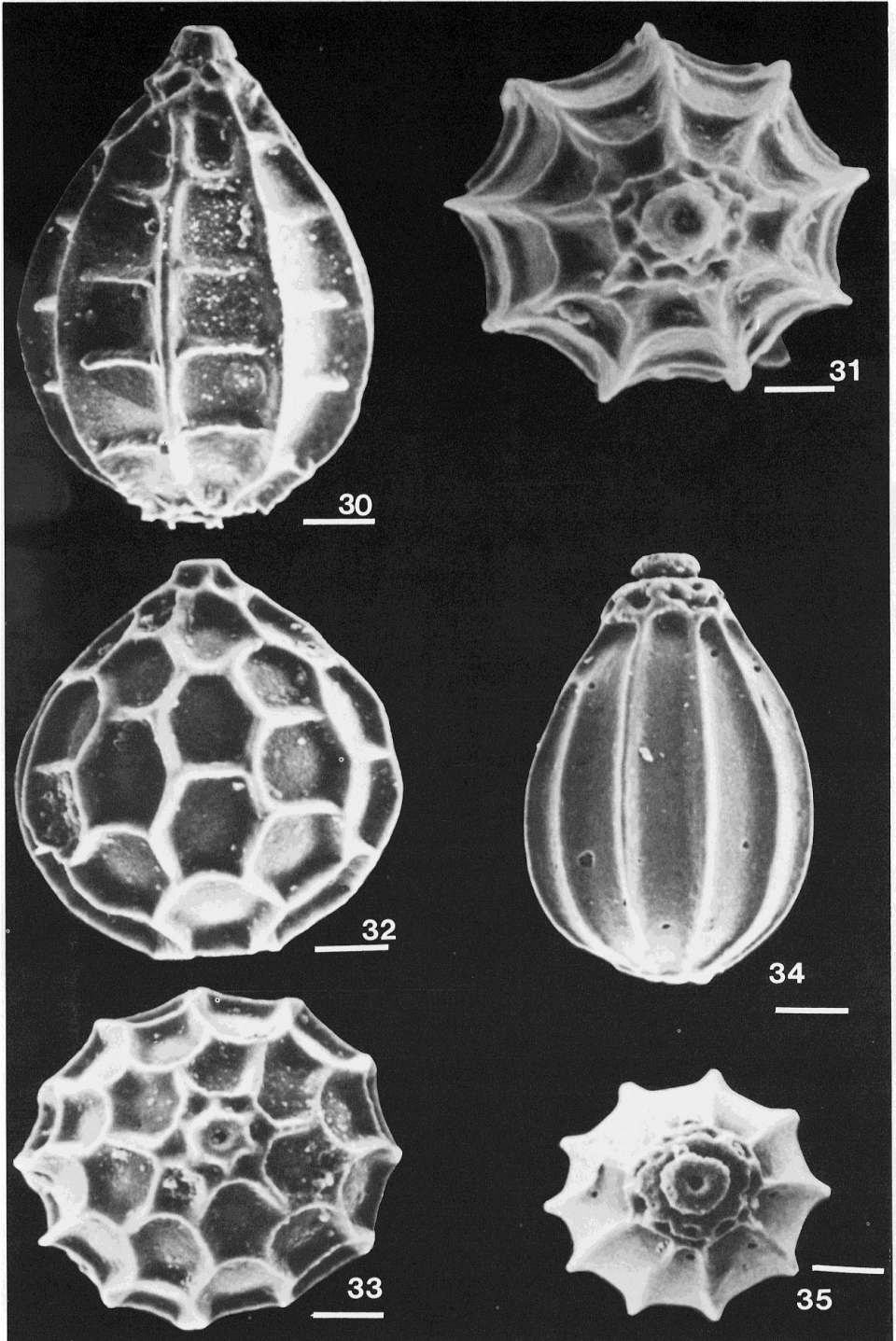
Oolina sp. 1 Jones, 1984, p. 103, pl. 1, fig. 26

Diagnosis. A subspherical species of *Favulina* with a rectangular reticulation on the test surface.

Description. Test free, unilocular, subspherical; wall calcareous, hyaline; surface ornamented with 8-10 high, stout longitudinal costae that together with the discontinuous transverse costae, about one-half the height of the longitudinal

←

FIG. 21. *Exsculptina sidebottomi* (Earland). DSDP Site 292, Benham Rise, western Philippine Basin, Quaternary. Side view of hypotype (USNM 383340) showing incised surface structures near the base. Scale bar represents 20 μ m. FIGS. 22-27. *Laculatina striatula* (Earland). Figs. 22-24. DSDP Site 357, Rio Grande Rise, southwest Atlantic, Quaternary. Fig. 22. Side view of hypotype (USNM 383569). Scale bar represents 50 μ m. Fig. 23. Apertural view showing quadrate section and slightly developed costae. Scale bar represents 20 μ m. Fig. 24. Enlargement of ovate aperture. Scale bar represents 3 μ m. Fig. 25. Side view of another hypotype (USNM 383358) showing discontinuous costae on surface. Scale bar represents 23 μ m. Fig. 26. Apertural view showing distinctive quadrate cross-section. Scale bar represents 65 μ m. Fig. 27. Enlargement of surface showing fine pores. Scale bar represents 2 μ m. Figs. 28, 29. *Irenita cornigera* (Buchner). Gulf of Naples, Holocene. As figured by Buchner (1940, pl. 22, figs. 445, 446). Scale bar represents 60 μ m.



costae, form rectangular pits on the test; longitudinal costae bifurcate near the apex of the test to form a single row of hexagonal reticulations below the phialine lip; aperture small, round, may have entosolenian tube.

Species dimensions. Maximum length, 180 μm ; maximum width, 120 μm .

Material. Two specimens.

Types and occurrence. Quaternary. Figured holotype (USNM 409089) from DSDP Site 292 (Leg 31), on the Benham Rise, western Pacific Ocean, 15°49.11'N, 124°39.05'E, 292-1-2, 47-52 cm. Unfigured paratype (USNM 383365) from the same locality, 292-1-4, 28-34 cm.

Etymology. From the Greek, *epibathra*, ladder, stairs, steps, gangway; with reference to the surface sculpture of the test.

Homalohedra n. gen.

(Figs. 34-36, 48, 49)

Type species. *Lagena guntheri* Earland, 1934, p. 151, pl. 6, figs. 53, 54.

Diagnosis. A genus of Oolininae consisting of subglobular species with longitudinal costae.

Description. Test free, unilocular, pyriform, broadest near midpoint, circular in section; wall calcareous, translucent, non-porous; a variable number of costae radiate from basal rim, or caudal process, and mayor may not extend to small, round aperture, may have entosolenian tube.

Range. Upper Cretaceous to Holocene.

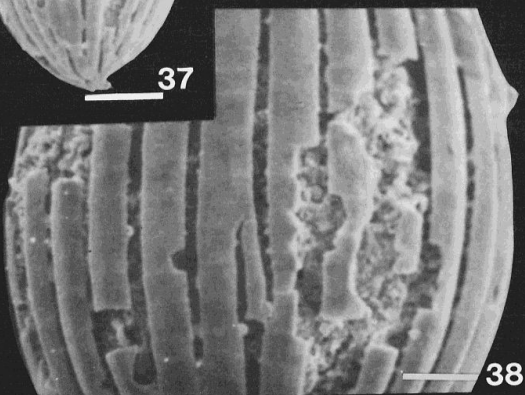
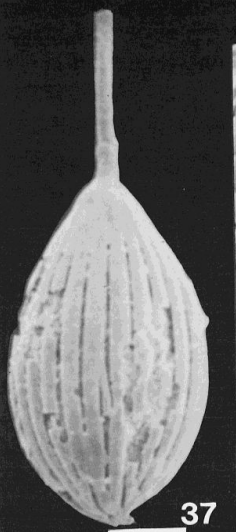
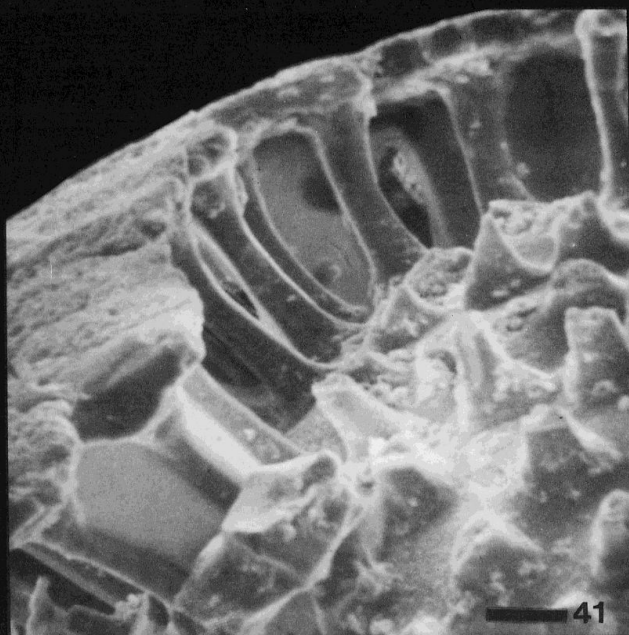
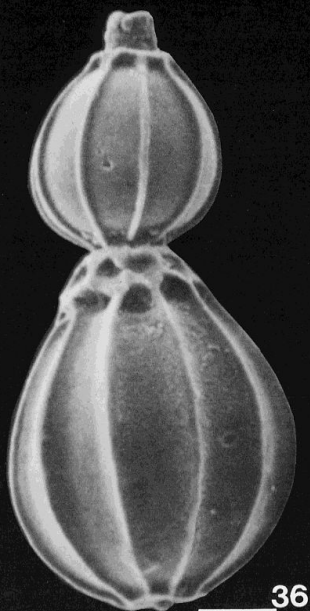
Material. The genus was defined following examination of six specimens of the type species.

Types and occurrence. Pleistocene. Timms Point Formation. Figured hypotypes (USNM 409090, 383409) from railway cut behind 1400 S. Harbour Blvd., San Pedro, California.

Remarks. *Homalohedra* differs from *Oolina* in having a costate surface, and from *Favulina* in not having hexagonal reticulations. Based on a literature search, *L. bassensis* Collins, *L. raricostiformis* McCulloch, *L. noditorquata* McCulloch, *L. liratifformis* McCulloch, *L. expressa* McCulloch, *L. disjuncta* McCulloch, *L. guntheri* Earland, *Oolina lirata* McCulloch, *O. cristobalensis* McCulloch, *O. caudata* d'Orbigny, *O. delicata* Sliter, and *O. heronalleni* Haynes are herein transferred to *Homalohedra*.

←

FIGS. 30, 31. *Favulina epibathra* n. sp. DSDP Site 292, Benham Rise, western Philippine Basin, Quaternary. Fig. 30. Side view of holotype (USNM 383334) showing straight cross-struts between costae. Scale bar represents 25 μm . Fig. 31. Apertural view. Scale bar represents 20 μm . FIGS. 32, 33. *Favulina hexagona* (Williamson). DSDP Site 292, Benham Rise, western Philippine Basin, Quaternary. Fig. 32. Side view of hypotype (USNM 383574) showing hexagonal surface structures. Scale bar represents 20 μm . Fig. 33. Apertural view. Scale bar represents 20 μm . FIGS. 34, 35. *Homalohedra guntheri* (Earland). Timms Point Formation, California, Pleistocene. Fig. 34. Side view of hypotype (USNM 383409). Scale bar represents 45 μm . Fig. 35. Apertural view. Scale bar represents 45 μm .



Etymology. From the Greek, *homalos*, level, even; *hedra*, base, plane, with reference to the characteristic base of the test. Gender, feminine.

Irenita Jones, 1984
(Figs. 28, 29)

Irenita Jones, 1984, p. 116.

Type species. *Lagena cornigera* Buchner, 1940, p. 514, pl. 22, figs. 445-450; figs. 445, 446 herein designated as lectotype.

Diagnosis. A genus of Oolininae comprised of compressed, carinate species with a produced, crescentic aperture.

Range. Pleistocene to Holocene (based on literature search).

Laculatina n. gen.
(Figs. 22-27, 50)

Type species. *Lagena quadrilatera* Earland var. *striatula* Earland, 1934, p. 160, pl. 7, fig. 9.

Diagnosis. A genus of Oolininae in which species have a quadrate axial cross-section.

Description. Test free. unilocular, elongate, quadrate in axial cross-section; wall calcareous, hyaline to translucent, finely perforate; aperture round, may be terminal to a short neck.

Range. Miocene to Holocene.

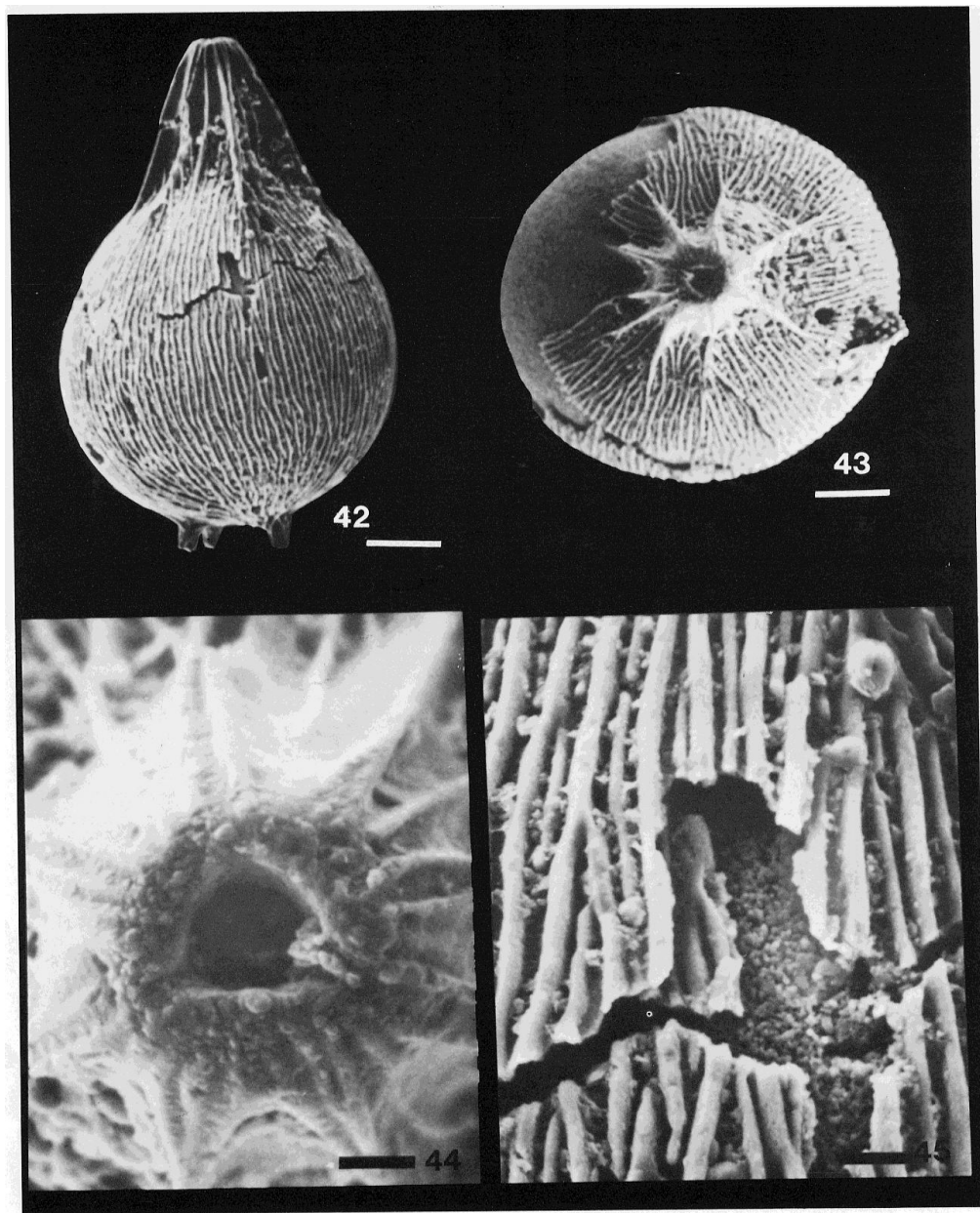
Material. The genus was defined following the examination of 40 specimens of the type species.

Remarks. Seguenza (1862) described *Tetragonulina*, with *Tetragonulina prima* Seguenza as type species, to encompass quadrate species. *Tetragonulina prima*, with its essentially circular section and four longitudinal costae cannot be considered a true quadrate species. We follow Loeblich & Tappan (1964) and place *Tetragonulina* in the synonymy of *Lagena*. *Lagena quadrilatera* Earland var. *striatula* Earland, is a true quadrate species and is herein designated as the type species of the new genus. Based on a literature search, *Lagena quadrangularis* Brady, and *Lagena quadrilatera* Earland are also placed in *Laculatina*.

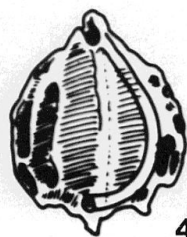
Etymology. From the Latin, *laculatus*, four cornered, checkered; *-ina*, diminutive, with reference to the quadrate section of the genus. Gender, feminine.

←

FIG. 36. *Homalohedra guntheri* (Earland). A paired hypotype (USNM 383338) Scale bar represents 45 μ m. FIGS. 37-39. *Pytine petaloskelts* n. sp. DSDP Site 292, Benham Rise, western Philippine Basin, Quaternary. Fig. 37. Side view showing elongate, non-costate neck. Scale bar represents 40 μ m. Fig. 38. Enlargement showing costae separated from inner wall by pillars. Scale bar represents 15 μ m. Fig. 39. Apertural view of holotype (USNM 409091) showing the union of costae near the base of the neck. Scale bar represents 20 μ m. FIGS. 40, 41. *Sipholagena structiloides* n. sp. DSDP Site 357, Rio Grande Rise, southwest Atlantic, Quaternary. Fig. 40. Side view of holotype (USNM 383328) showing pyriform shape. Scale bar represents 50 μ m. Fig. 41. Enlargement showing double layered wall separated by struts. Scale bar represents 15 μ m.



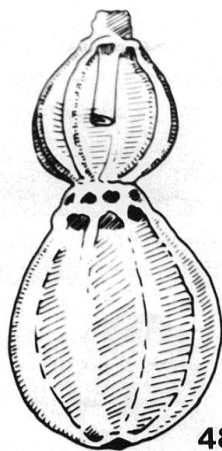
FIGS. 42-45. *Bifarilaminella advena* (Cushman), 357-18-1, 136-142 Cm, late Oligocene. Fig. 42. Side view of hypotype (USNM 383575) showing basal spines and longitudinal costae. Scale bar represents 60 μ m. Fig. 43. Apertural view showing circular section of outer wall partially removed from one side. Scale bar represents 50 μ m. Fig. 44. Enlargement of aperture showing sub-trigonal shape and slightly radiate configuration. Scale bar represents 5 μ m. Fig. 45. Enlargement of side showing anastomosing longitudinal costae of outer wall and coarse surface of inner layer. Scale bar represents 10 μ m.



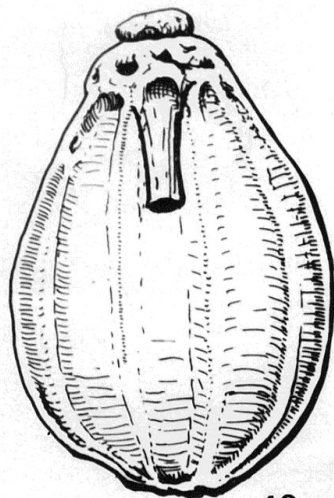
46



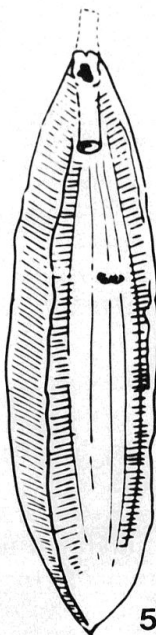
47



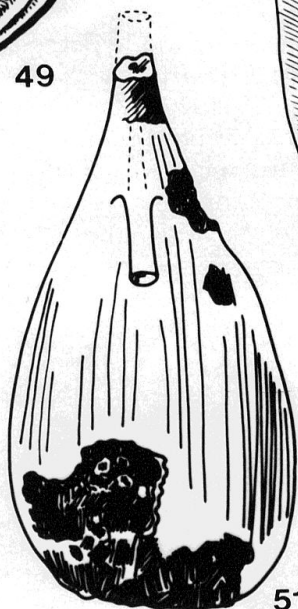
48



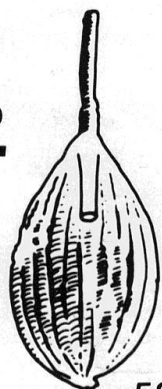
49



50



51



52

Sipholageninae n. subfam.

Bifarilaminella n. gen.

Type species. *Lagena advena* Cushman, 1923, p. 6, pl. 1, fig. 4.

Diagnosis. A genus of Sipholageninae comprised of species with two platy walls.

Description. Test free, unilocular, subspherical; wall calcareous, translucent, inner wall imperforate, outer wall perforate and costate; neck narrow, costate; aperture subtrigonal, radiate.

Range. Late Oligocene to Holocene.

Remarks. *Bifarilaminella* differs from *Sipholagena* and *Pytine* in having the two walls juxtaposed rather than separated by a network of pillars.

Etymology. From the Latin, *bifarius*, double; *lamina*, a thin plate, blade, sheet; *-ella*, diminutive, with reference to the test wall. Gender, feminine.

Bifarilaminella advena Cushman

(Figs. 42-45)

Lagena advena Cushman, 1923, p. 6, pl. 1, fig. 4.

Lagena strtata (d'Orbigny) Brady, 1884, p. 460, pl. 57, fig. 30 (not *Oolina striata*) d'Orbigny, 1839).

Lagena striata (d'Orbigny) Sidebottom, 1912, p. 386, pl. 15, fig. 9 (not *Oolina striata* d'Orbigny, 1839).

Lagena striata (d'Orbigny) var. *haidingeri* (Czjzek) Cushman, 1913, p. 19, pl. 7, fig. 6 (not *Oolina haidingeri* Czjzek, 1848).

Diagnosis. A species of *Bifarilaminella* with a network of anastomosing costae on the outerwall.

Types and occurrence. Oligocene. Figured hypotype (USNM 383575) from DSDP Site 357 (Leg 39), Rio Grande Rise, southwestern Atlantic Ocean, 30°00.25'S, 35°33.59'W, 357-18-1, 136-142 cm.

Remarks. *Bifarilaminella advena* has been found worldwide in recent samples. Sidebottom (1912) reported the species from near Fiji, Cushman (1913) reported the species from off the Galapagos Islands, and Cushman (1923) reported the species off the coast of Nicaragua in the Caribbean.

←

FIG. 46. *Cursina adornata* n. sp., showing entosolenian tube attached to wall and terminating at base (from Fig. 12). Scale bar represents 55 μ m. FIG. 47. *Favulina hexagona* (Williamson), showing short, straight entosolenian tube. USNM 383335, DSDP Site 292-1-4, Benham Rise, western Philippine Basin. Scale bar represents 30 μ m. FIGS. 48, 49. *Homalohedra guntheri* (Earland). Fig. 48. Shows short, straight entosolenian tube in upper chamber (from Fig. 36). Scale bar represents 45 μ m. Fig. 49 (from Fig. 34). Scale bar represents 30 μ m. FIG. 50. *Laculatina striatula* (Earland), showing short, straight entosolenian tube (from Fig. 25). Scale bar represents 35 μ m. FIG. 51. *Sipholagena structiloides* n. sp., showing short, straight entosolenian tube (from Fig. 40). Scale bar represents 65 μ m. FIG. 52. *Pytine petaloskelis* n. sp., showing short, straight entosolenian tube (from Fig. 37). Scale bar represents 60 μ m.

Pytine Moncharmont-Zei & Sgarrella, 1978

Pytine petaloskelis n. sp.

(Figs. 37-39, 52)

Diagnosis. A species of *Pytine* with an outer wall of broad, flat calcite strips and a long, narrow neck.

Description. Test free, unilocular, circular in section, ovate; wall calcareous, translucent, outer wall consists of broad, flattened calcite strips connected at base of neck; aperture small, round, terminal, on a long narrow neck that comprises one-third the length of the test.

Species dimensions. Maximum length, 280 μm ; maximum width, 100 μm .

Material. Five specimens.

Types and occurrence. Quaternary. Holotype (USNM 383332) from DSDP Site 292 (Leg 31), Benham Rise, western Philippine Basin, 15°49.11'N, 124°39.05'E, 292-1-3, 80-86 em.

Remarks. This species differs from *P. parthenopeia* in having a simple, narrow non-reticulate neck.

Etymology. From the Greek, *petalos*, broad, flat, outspread; *skelis*, rib, side, with reference to the characteristic outer wall of the genus.

Sipholagena Moncharmont-Zei & Sgarrella, 1980

Sipholagena structiloides n. sp.

(Figs. 40, 41, 51)

Lagena pacifica? (Sidebottom) Boltovskoy & Watanabe, 1977 (part), p. 55, pl. 3, figs. 19, 20 (not Sidebottom, 1912).

Diagnosis. A species of *Sipholagena* with a longitudinally furrowed, imperforate outer wall.

Description. Test free, unilocular, elongate, broadest near base, circular in section; wall calcareous, hyaline, striate; bilamellar, non-porous walls separated by a network of short struts; aperture small, round, may have entosolenian tube.

Species dimensions. Maximum length, 525 μm ; maximum width, 250 μm .

Material. 65 specimens.

Types and occurrence. Quaternary. Figured holotype (USNM 383328) from DSDP Site 357 (Leg 39), Rio Grande Rise, southwest Atlantic Ocean, 35°00.25'S, 33°33.51'W, 357-1-3, 80-86 cm.

Etymology. From the Latin, *structilis*, of building; *-oides*, likeness, with reference to the girder-like struts of the bilamellar test.

Remarks. This species is identical to specimens referred to *Lagena pacifica* Sidebottom by Boltovskoy & Watanabe (1977). However, the type figure of *Lagena pacifica* Sidebottom (1912) is not striated and has large perforations covering the test.

LITERATURE CITED

- BOLTOVSKOY, E. & WATANABE, S. 1977. Foraminiferos calcareos uniloculares de profundidades grandes del Atlantic sur y del Indico (Neogeno-Reciente). Rev. Mus. Argent. Cienc. Nat. "Bernardino Rivadavia" Inst. Nac. Invest. Cienc. Nat., Hidrohiol., 5: 41-64.

- BRADY, H. B. 1884. Report on the Foraminifera dredged by H.M.S. *Challenger* during the years 1873-1876. *Reports of the Scientific Results of the Voyage of the H.M.S. Challenger (Zoology)*, 9, 1-814.
- BUCHNER, P. 1940. Die Lagenendes Golfes von Neapel und der marinen Ablagerungen auf Ischia (Beiträge zur Naturgeschichte der Insel Ischia). *K. Leop.-Carol. Deutsch. Akad. Naturj., Abh. (Nova Acta)*, Halle, 9(62), 364-560.
- CUSHMAN, J. A. 1913. A monograph of the Foraminifera of the North Pacific Ocean; Part 3, Lagenidae. *U.S. Nat. Mus. Bull.*, 71: 1-125.
1923. The Foraminifera of the Atlantic Ocean; Part 4, Lagenidae. *U.S. Nat. Mus. Bull.*, 104: 1-228.
- EARLAND, A. 1934. Foraminifera; Part 3- The Falklands sector of the Antarctic (excluding South Georgia). *Discovery Rep.*, 10: 1-208.
- JONES, R.W. 1984. A revised classification of the unilocular Nodosariida and Bulimida (Foraminifera). *Rev. Esp. Micropaleontol.*, 6: 91-160.
- KANMACHER, F. 1798. *Adam's Essays on the Microscope*, 2nd ed. Dillon and Keaton, London. 712 pp.
- LOEBLICH, A. R. & TAPPAN, H. 1964. Sarcodina, chiefly "Thecamoebians" and Foraminiferida. In Moore, R. G., ed. *Treatise on Invertebrate Paleontology*, New York and Lawrence, Geological Society of America and Univ. Kansas Press, Protista 2, Part C, 1-900.
- ORBIGNY, A. D. D'. 1839. *Voyage dans l'Amerique Meridionale -Foraminiferes. Pitois; Levrault et Cie.*, Paris, Strasbourg, P. Bertrand, 5: 1-86.
- PATTERSON, R. T. & RICHARDSON, R. H. 1987. A taxonomic revision of the unilocular foraminifera. *J. Foraminiferal Res.*, 17: 212-226.
- PLUMMER, H. J. 1951. Foram surgery. *The Micropaleontologist*, 5: 26-28.
- SEGUENZA, G. 1862. *Dei terreni Terziarii del distretto di Messina. Parte 2-Descrizione dei foraminiferi monotalamici delle marne mioceniche del distretto di Messina*. T. Capra, Messina, Italia. 84 pp.
- SIDEBOTTOM, H. 1912. Lagenae of the southwest Pacific Ocean. *J. Quekett Micropaleontol. Club*, London, Series 2, 11(1910-1912): 375-434.
- WILLIAMSON, W. G. 1848. On the British species of the genus *Lagena*. *Ann. Mag. Nat. History*, Series 2, 1: 1-20.