Four New Foraminiferal (Protozoa) Genera from the Rio Grande Rise, Southwest Atlantic Ocean[1]

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Abstract. Based on wall microstructure as indicated in thin section and other morphologic features, some new foraminiferal genera are proposed. *Magnesoina,* a new genus of the Prolixoplectidae, differs from other genera of the family in having the final chambers uniserially arranged. The type species of the genus is *Listerella antillarum,* The family Prolixoplectidae is emended to include genera with a late uniserial stage. *Strtctocostella,* a new genus of the Stilostomellidae, differs from other genera of the family by its costate test. The type species of the genus is *Ellipsonodosaria modesta prolata. Torulumbonina,* a new genus of the Nodosariinae, with type species *Frondicularia btkintensis,* differs from other genera of the subfamily by its non-palmate chamber arrangement and knob-encircled aperture. *Pleuroskelidion,* a new genus of the Pleurostomellidae, differs from other genera of the family by its costate test. The type species is *Pleuroskelidion unda* n. sp.

During an examination of Neogene benthic foraminifera from the Rio Grande Rise in the southwest Atlantic Ocean, several new and old species have been discovered that do not fit present generic categories. The proposed genera are variously based on wall structure, as well as internal and external anatomy. The suprageneric classification of Loeblich & Tappan (1984, 1985) is followed with a minor emendation.

MATERIALS AND METHODS

Specimens from several core levels at a single locality were examined in reflected light, transmitted light, and by scanning electron microscopy (SEM) to study the test surface, apertural form and position, and the test interior in whole- as well as half-longitudinal and transverse sections. For sectioning, specimens were embedded in Lakeside 70 and carefully ground on 15-µm wet/dry emery paper until the inner structure of the test was exposed. The specimens were then immersed in alcohol overnight to dissolve the Lakeside 70, mounted on a plug, coated with gold, and illustrated by scanning electron micrographs. Micrographs were taken with an ISI Super-111A scanning electron microscope using Polaroid NP 55 film. Photographs were taken with a Leitz Orthomat

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camera attachment in conjunction with a Leitz Ortholux Microscope using Ilford Pan F 135 film. Some specimens were also etched to show early chamber arrangement and internal structures using the method described by Plummer (1951).

Figured holotypes, figured and unfigured paratypes, and figured and unfigured hypotypes were deposited in the United States National Museum of Natural History (USNM), Washington, D.C.

Materials used for this study were from 10 core levels of Deep Sea Drilling Project (DSDP) Site 357 (Leg 39) on the Rio Grande Rise, southwest Atlantic Ocean 30°00.25'S; 35°33.59'W: (1) Pleistocene, core 1, section 2, 80-86 cm; (2) Pliocene, core 1, section 5, 80-86 cm; (3) Pliocene, core 1, section 6, 80-86 cm; (4) Pliocene, core 1, core catcher; (5) Pliocene, core 2, section 2, 79-85 cm; (6) Pliocene, core 2, section 4, 83-89 cm; (7) Pliocene, core 2, section 6, 82-88 cm; (8) Pliocene, core 3, section 3, 80-86 cm; (9) Miocene, core 4, section 3, 70-76 cm; (10) Miocene, core 5, section 3, 80-86 cm.

TAXONOMIC ACCOUNT

Order Foraminiferida Eichwald, 1830
Suborder Textulariina Delage & Herouard, 1896
Superfamily Verneuilinacea Cushman, 1911
Family Prolixoplectidae Loeblich & Tappan, 1985
(The family Prolixoplectidae is herein emended to include species that become uniserial in later development.)

Genus *Magnesoina* n. gen.

Type species. Lisierella aniillarum Cushman, 1936.

Diagnosis. A genus of Prolixoplectidae with a short trochospiral stage, later becoming biserial, then uniserial.

Description. Test free, elongate, circular in transverse section, early stage trochospirally coiled, later becoming uniserial, sutures straight and depressed; wall coarsely agglutinated with an organic lining, non-canaliculate, surface roughly finished; aperture small and round, terminal on the final chamber.

Remarks. Magnesoina differs from *Martinottiella* Cushman, 1933 in having an imperforate rather than canaliculate wall, and in being more coarsely agglutinated. The present genus differs from *Cylindroclavulina* Bermudez & Key, 1952 and *Clavulina* d'Orbigny, 1826 in being trochospiral rather than triserial in the earliest stage.

Etymology. From the Latin, *magnes,* lodestone, magnet, + *-ina,* diminutive, with reference to the coarsely agglutinated test of the type species.

Geologic range. Oligocene-Recent.

Magnesoina antillarum (Cushman, 1936)
(Figs. 1-6)

Listerella antillarum Cushman, 1936, p. 41, pl. 6, figs. 12a, b.
Martinottiella petrosa (Cushman & Bermudez) Douglas, 1973, p. 626, pl. 3, fig. 1 (not *Listerella petrosa* Cushman & Bermudez, 1937).

Martinottiella scabra (Cushman) Boltovskoy, 1978, p. 162, pl. 4, figs. 34, 35 (not *Pseudoclavulina scabra* Cushman, 1936).

Description. Test free, elongate, broadest near the base, initial trochospiral whorl of five chambers rapidly reduced to uniserial, sutures indistinct in trochospiral section, straight and depressed in uniserial portion; wall coarsely agglutinated and rough with an inner organic lining, wall non-canaliculate; aperture small and round, terminal on the last chamber.

Dimensions. Maximum length, 1,200 µm; maximum width, 570 µm.

Types and occurrence. Figured hypotypes (USNM 383563) from core 1, core catcher; USNM 383562 from core 2, section 2, 79-85 cm; USNM 383564 from core 2, section 4, 83-89 cm; USNM 383565 from core 2, section 6, 82-86 cm; and USNM 383558 from core 3, section 3, 80-86 cm.

Remarks. The figured specimens of *Magnesoina antillarum* incorporated large detrital porous chunks of planktonic foraminifera into their tests. These pores are clearly visible in section, but the matrix of these specimens was imperforate.

Suborder Rotaliina Delage & Herouard, 1896
Superfamily Eouvigerinacea Cushman, 1927
Family Stilostomellidae Finlay, 1947

Strictocostella n. gen.

Type species. Ellipsonodosaria modesta prolata Cushman & Bermudez, 1937.

Diagnosis. A genus of the Nodosariinae characterized by a costate test, and inward projecting teeth within a phialine lip.

Description. Test free, uniserial, circular in section, chambers inflated; wall calcareous, hyaline, imperforate; surface characterized by longitudinal costae; aperture characterized by a large tooth and numerous smaller teeth projecting within a circular aperture bordered by a phialine lip, and situated at the end of a neck.

Remarks. Strictocostella differs from *Orthomorphina* Stainforth, 1952 in having a costate rather than a smooth or papillate test and in having inwardly projecting apertural teeth. 11 differs from *Nodosaria* Lamarck, 1812 in having a phialine lip, and from *Siphonodosaria* A. Silvestri, 1924 in having a costate and straight test, rather than a smooth and arcuate test.

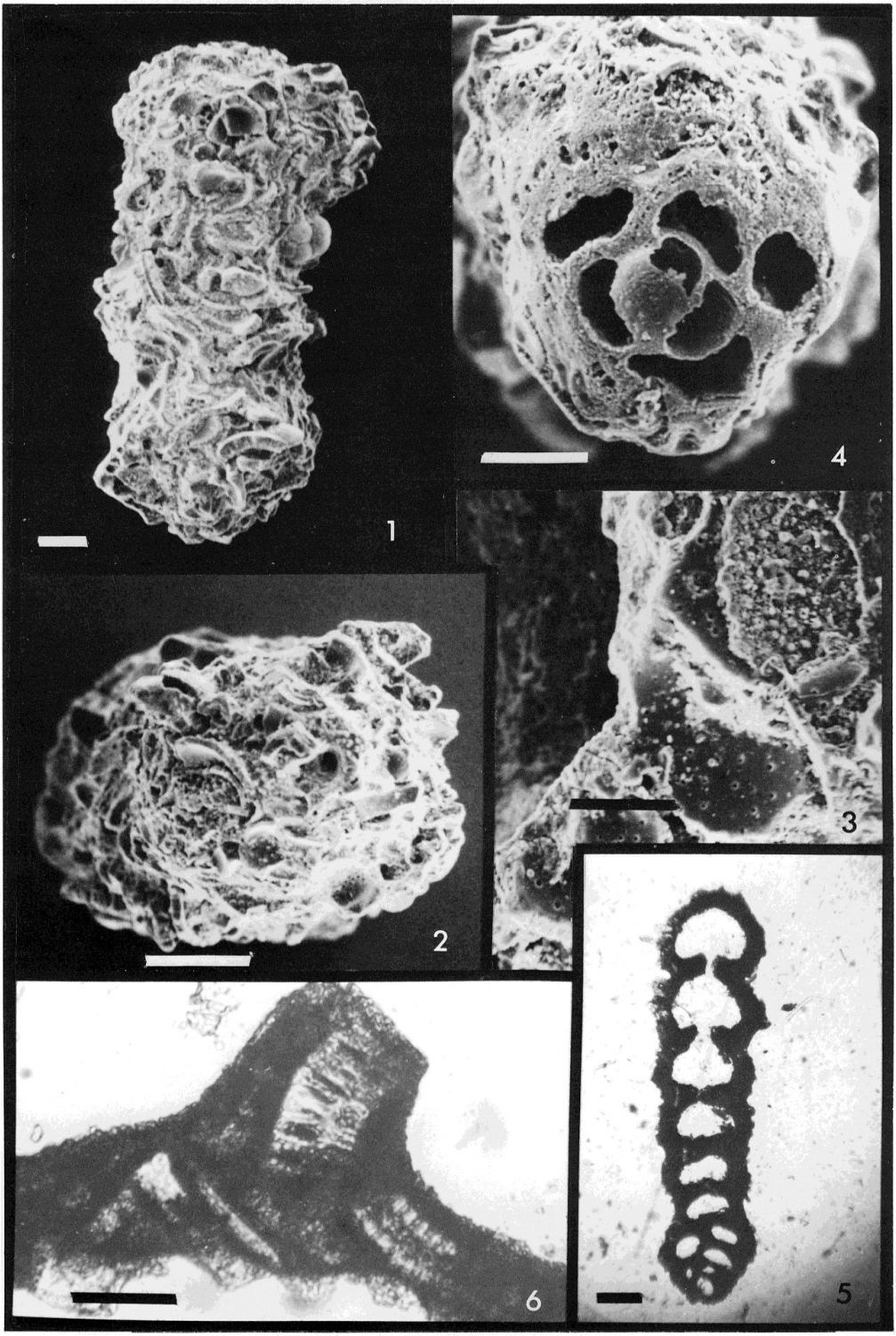
Etymology. From the Latin, *strict us*, straight, tight, + *costa*, rib, side, ridge, + *-ella*, diminutive, with reference to the elongate costate test; gender feminine.

Geologic range. Eocene-Recent (based on a literature search).

Strictocostella prolata (Cushman & Bermudez, 1937)
(Figs. 7-12)

Siphonodosaria prolata nom transl. herein ex *Ellipsonodosaria modesta* var. *prolata* Cushman & Bermudez, 1937.

Ellipsonodosaria modesta var. *prolata* Cushman & Bermudez, 1937, p. 109, pl. 16, figs. 1,7.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Siphonodosaria modesta (Bermudez) Douglas, 1973, p. 630, pl. 5, fig. 4 (not *Ellipsonodosaria modesta* Bermudez, 1937).

Orthomorphina modesta (Bermudez) Boltovskoy, 1978, p. 163, pl. 5, fig. 25 (not *Ellipsonodosaria modesta* Bermudez, 1937).

Description. Test free, uniserial and rectilinear, slightly tapering, consisting of 8-10 inflated globular chambers that gradually increase in size, sutures depressed; wall calcareous, hyaline, imperforate; 7-10 heavy longitudinal costae extend from the base to base of final chamber which is smooth, finer and shorter discontinuous costae intercalated between some of the larger costae; aperture consists of numerous small inward projecting teeth and a single large inward projecting tooth within a phialine lip at the end of a neck.

Dimensions. Maximum length, 600 μm; maximum width, 100 μm.

Types and occurrence. Figured hypotype (USNM 383556) from core 4, section 3, 70-76 cm; a second hypotype (USNM 383555) from core 1, section 5, 80-86 cm; and a third hypotype (USNM 383586) from core 5, section 3, 80-86 cm.

Remarks. Douglas (1973) and Boltovskoy (1978) referred the species to the Eocene *Ellipsonodosaria modesta* Bermudez, 1937. However, *Strictocostella prolata* differs from *Ellipsonodosaria modesta* in possessing fewer costae and in having more inflated chambers. Specimens are most frequently found with the final chamber broken off, because the radiate aperture is usually resorbed in previous chambers; these specimens are often mistakenly referred to *Orthomorphina.* Intact specimens rarely possess the large inward projecting tooth, although the smaller teeth are generally present.

Superfamily Pleurostomellacea Reuss, 1860
Family Pleurostomellidae Reuss, 1860
Subfamily Pleurostomellinae Reuss, 1860
Pleuroskelidion n. gen.

Type species. Pleuroskelidion unda n. sp.

Diagnosis. A genus of Pleurostomellinae with a longitudinally costate test.

Description. Test free, elongate, compressed, chambers biserial in early stage, later alternating in position, sutures oblique to test axis; wall calcareous, hyaline, finely perforate; surface with longitudinal costae; aperture terminal, eccentric

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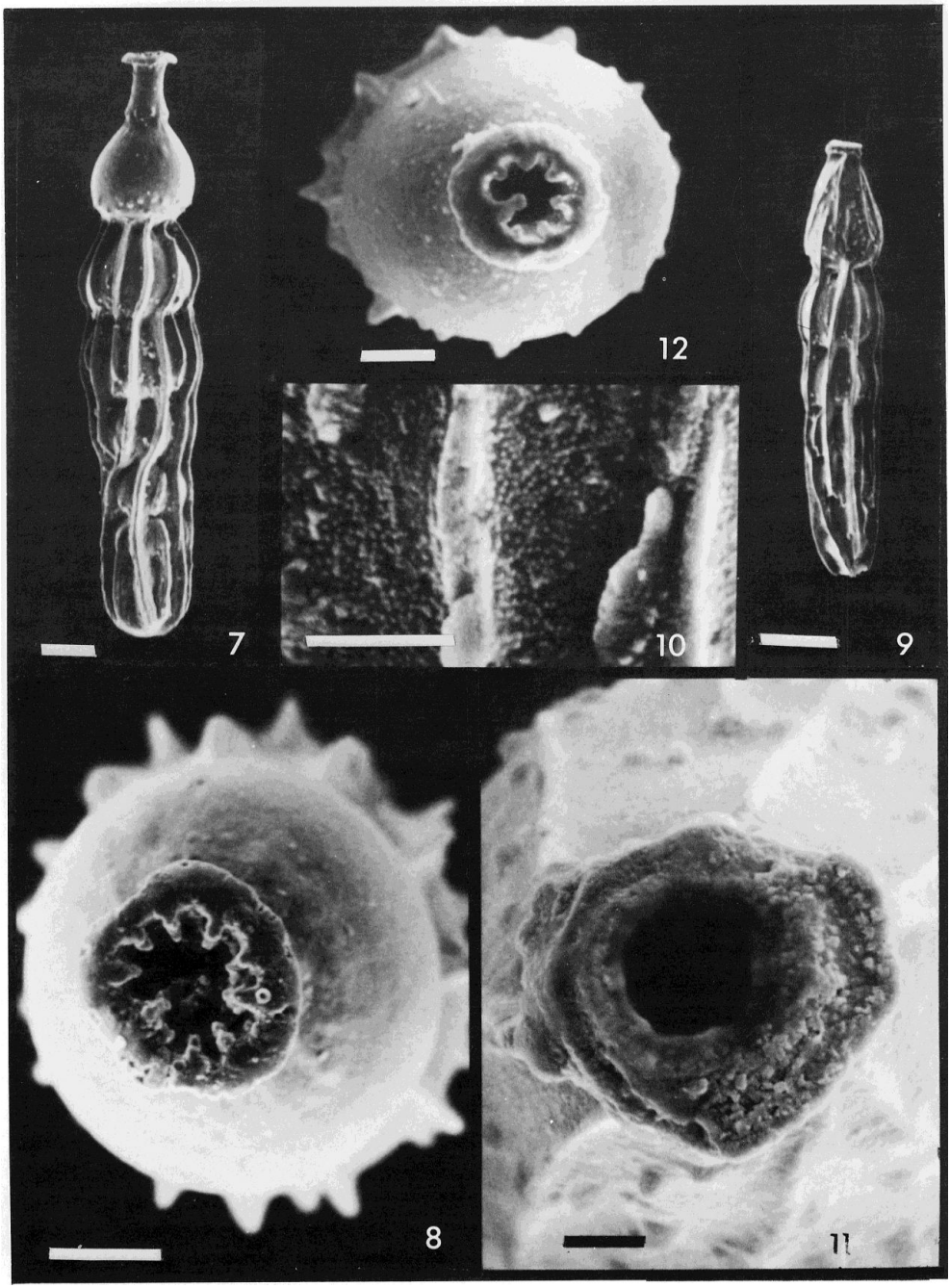
FIGS. 1-6. ***Magnesotna anttllarum*** **(Cushman) n. gen., Pliocene, Rio Grande Rise, southwest Atlantic Ocean. Fig. 1. Hypotype (USNM 383567) showing coarsely agglutinated test. Scale bar represents 100 μm. Fig. 2. Apertural view showing small round aperture. Scale bar represents 150 μm. Fig. 3. Hypotype (USNM 383563); enlargement of broken test showing perforate planktonic foraminiferal tests incorporated as agglutinated material. Scale bar represents 50 μm. Fig. 4. Hypotype (USNM 383565); detail of etched base showing early trochospiral chamber arrangement. Scale bar represents 100 μm. Fig. 5. Hypotype (USNM 383564); oriented section in transmitted light showing chamber arrangement. Scale bar represents 125 μm. Fig. 6. Hypotype (USNM 383558); enlargement of chamber walls in transmitted light showing perforate planktonic fragments within imperforate matrix. Scale bar represents 50 μm.**



FIGS. 7-12. *Strictocostella prolata* (Cushman & Bermudez) n. gen. Pliocene, Rio Grande Rise, southwest Atlantic Ocean. Fig. 7.Hypotype (USNM 383556). Scale bar represents 100 µm. Fig.8. Apertural view showing radiate aperture within phialine lip. Scale bar represents 50 µm. Fig.9. Hypotype (USNM 383555) with broken final chamber as is most commonly encountered. Scale bar

on last chamber with projecting lip on lower margin; an internal tube joins successive foramina.

Etymology. From the Greek, *pleuron,* rib, side, + *skelidion,* rib, side, diminutive, with reference to the longitudinally costate test; gender feminine.

Remarks. Pleuroskelidion differs from *Pleurostomella* Reuss, 1860 by the presence of longitudinal ribs.

Geologic range. Pliocene.

Pleuroskelidion unda n. sp.
(Figs. 13-16)

Diagnosis. An elongate species of *Pleuroskelidion* with numerous longitudinal costae on the test.

Description. Test free, elongate, compressed in transverse section, tapering to the base and aperture, base terminating with a short apical spine; chambers slightly inflated, initially biserial, later ones alternating in position with depressed oblique sutures; wall calcareous, hyaline, surface smooth, finely perforate; rounded, longitudinal, discontinuous surface costae are continuous and more pronounced across the sutures, terminating before base and aperture.

Types and occurrence. Holotype (USNM 383560) from core 1, section 5, 80-86 cm; figured paratypes (USNM 383561) from core 1, section 5, 80-86 cm.

Dimensions. Maximum length, 670 I'm; maximum width, 125 I'm.

Etymology. From the Latin, *unda,* wave, with reference to the undulating nature of the costa.

Remarks. In chamber configuration and arrangement of the internal tube, *Pleuroskelidion unda* resembles such pleurostomellid species as *Pleurostomella alternans* Schwager, 1866 and *Pleurostomella schuberti dominicana* Bermudez, 1949, but differs in the distinctive longitudinal costae.

Suborder Lagenina Delage & Herouard, 1896
Superfamily Nodosariacea Ehrenberg, 1838
Family Nodosariidae Ehrenberg, 1838
Subfamily Nodosariinae Ehrenberg, 1838
Torulumbonina n. gen.

Type species. Frondicularia(?) bikiniensis McCulloch, 1977.

Diagnosis. A compressed and elongate genus of Nodosariinae with slightly arched chambers.

Description. Test free, elongate, uniserial, compressed, with slightly overlapping chambers, sutures slightly arched; wall perforate, smooth, hyaline; aperture round with elevated knobs bordering the opening.

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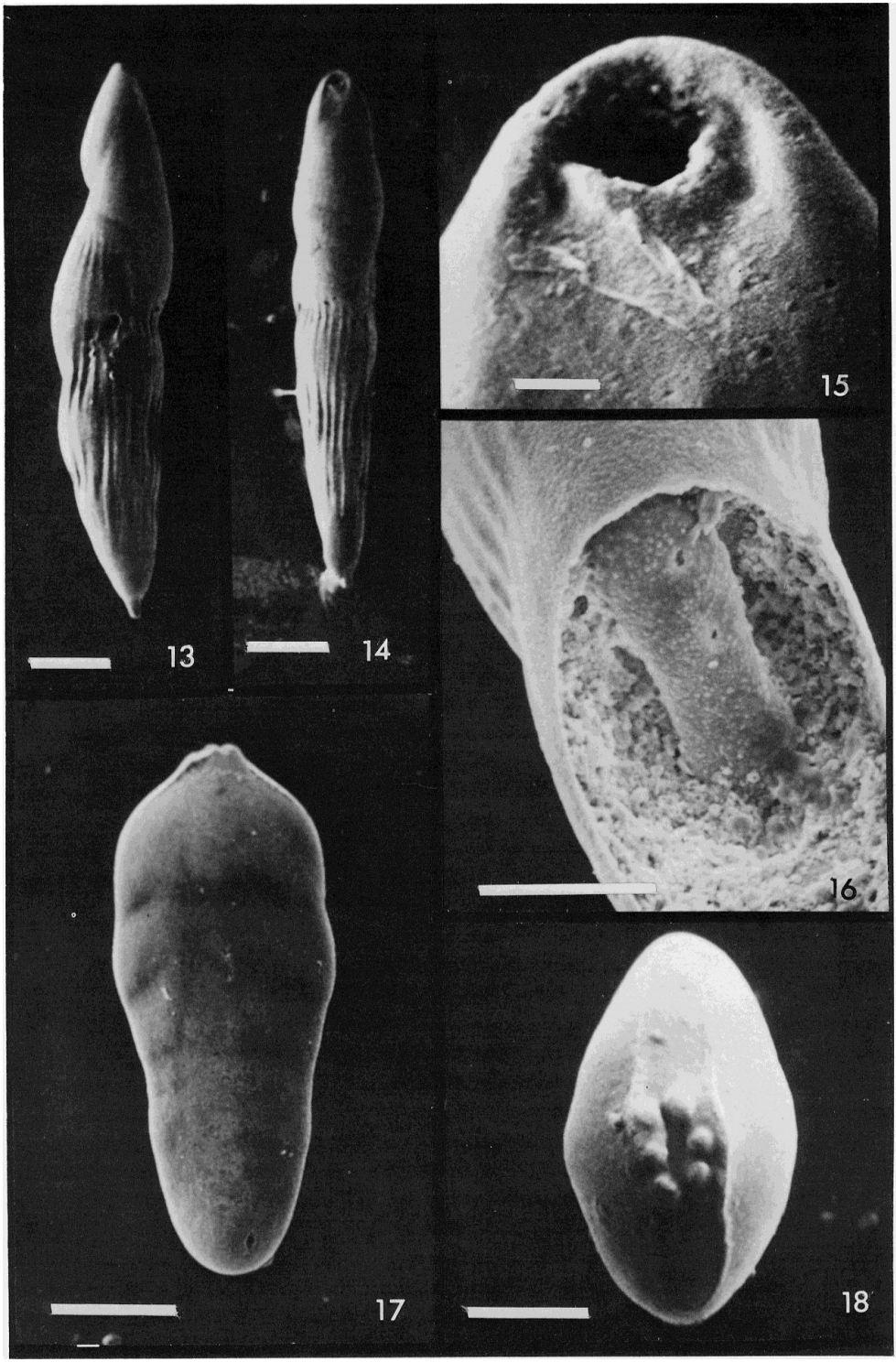
represents 100 μm. Fig. 10. Enlargement of imperforate surface to show finely hispid surface. Scale bar represents 10 μm. Fig. 11. Apertural view showing resorbed radiate aperture. Scale bar represents 10 *ILm.* Fig. 12. Apertural view of hypotype (USNM 383586) showing rarely intact large apertural tooth. Scale bar represents 100 μm.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Remarks. McCulloch (1977) referred the type species to *Frondicularia* Defrance in d'Orbigny (1826), but *Torulumbonina* is readily differentiated from that genus in having only slightly arched sutures and a non-palmate chamber arrangement. *Torulumbonina* differs from *Lingulina* in having rounded knobs bordering the round aperture as opposed to a slit-like aperture,

Etymology, From the Latin, *torus, torulus,* round elevation, protuberance, diminutive, + *umbo, -onis,* boss, rounded protuberance, knob, + *-ina,* diminutive, with reference to the aperture of the type species,

Torulumbonina bikiniensis (McCulloch)
(Figs. 17, 18)

Frondicularia bikiniensis McCulloch, 1977, p, 6, pi. 96, figs. 25a-c.

Description. Test free, uniserial, elongate, compressed in section, chambers generally increasing in size, partially overlapping earlier chambers, but with a much smaller last chamber; wall calcareous, hyaline, smooth, finely perforate; sutures slightly arched and depressed; aperture small and round bordered by six elevated protuberances.

Dimensions, Maximum length, 425 µm; maximum width, 170 µm,

Types and occurrences. Hypotype (USNM 383557) from core 1, section 2, 80-86 cm; pleistocene.

Remarks, The slightly damaged specimen here figured is virtually identical to that figured by McCulloch, except that her specimen has a slightly developed lateral carina.

LITERATURE CITED

BOLTOVSKOY, E. 1978.Late Cenozoic benthonic foraminifera of the Ninety east Ridge (Indian Ocean). *Marine Geol.,* 26: 139-175.

CUSHMAN, J. A. 1936. New genera and species of the families Verneuilinidae and Valvulinidae and of the subfamily Virgulininae. *Cushman Lab. Foraminiferal Res., Spec. Publ.,* 6: 1-7L

D'ORBIGNY, A.D. 1826. Tableau methodique de las classe des Cephalopodes. *Ann. Sci. Nat., Paris, ser.* 1, 7: 245-314.

DOUGLAS, R.G. 1973. Benthonic foraminiferal biostratigraphy in the central north Pacific, Leg 17, deep sea drilling project. *In* Winterer, E. L., et aI., eds., *Initial Repts. Deep Sea Drilling Proj.,* U.S. Government Printing Office, Washington, D.C., 17: 607-671.

LOEBLICH,A. R., JR. & TAPPAN,H. 1984. Suprageneric classification of the Foraminiferida (Protozoa). *Micropaleontology,* 30: 1-70.

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FIGS. 13-16. *Pleuroskelidion unda,* n. sp., n. gen., Pliocene, Rio Grande Rise, southwest Atlantic Ocean. Fig. 13. Holotype (USNM 383560) showing longitudinal costae. Scale bar represents 100 µm. Fig. 14. Edge view showing subterminal aperture. Scale bar represents 100 µm. Fig. 15. Enlargement of aperture showing prominent lip. Scale bar represents 10 µm. Fig. 16. Paratype (USNM 383561); etched chamber showing internal tube. Scale bar represents 50 µm. FIGS. 17, 18. *Torulumbonina bikiniensis* (McCulloch) n. gen., Pleistocene, Rio Grande Rise, southwest Atlantic Ocean. Fig. 17. Hypotype (USNM 383557). Scale bar represents 100 µm. Fig. 18. Apertural view showing elevated knobs surrounding circular aperture. Scale bar represents 50 µm.

1985. Some new and redefined genera and families of agglutinated foraminifera 2. J. *Foraminiferal Res.*, 15: 175-217.

MCCULLOCH, I. 1977. *Qualitative Observations on Recent Foraminiferal Tests With Emphasis on the Eastern Pacific, Parts I-III.* Univ. Southern Calif., Los Angeles. 1,079 pp.

PLUMMER, H. J. 1951. Foram surgery. *The Micropaleontologist,* 5: 26-28.