SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 91, NUMBER 21

Johnson Fund

REPORTS ON THE COLLECTIONS OBTAINED BY THE FIRST JOHNSON-SMITHSONIAN DEEP-SEA EXPEDITION TO THE PUERTO RICAN DEEP

FOURTEEN NEW SPECIES OF FORAMINIFERA

(With Three Plates)

BY
JOSEPH A. CUSHMAN
Cushman Laboratory for Foraminiferal Research, Sharon, Mass.

(Publication 3327)

CITY OF WASHINGTON
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American workers on the foraminifera have long desired to have material from that area dredged by the *Challenger* and represented by the two famous *Challenger* stations 23 and 24. In the volume, "Summary of Results", Brady lists 155 separate species and varieties from station 23, and 241 from station 24. This alone would indicate the extreme richness of this area as far as the foraminifera are concerned. These stations are also important as being the type localities for numerous species described by Brady. Although the *Albatross* did some dredging in this general area, the exact stations were not occupied. The area on the north coast of Puerto Rico, as is known to those of us who have sailed over it, is one of rough seas, and it is difficult for an ordinary ship to do deep-sea dredging. When the *Challenger* herself made these two stations, one of the men was lost during the operations.

It has been left to the Johnson-Smithsonian Deep-Sea Expedition to reexplore this area. The large size of the vessel used, the *Caroline,* practically 280 feet in length, with a draft of 17½ feet, a beam of 38 feet, and equipped with a 50-ton Sperry gyrostabilizer, which keeps her on an almost even keel in all kinds of weather, made it possible to work off this rough area to the north of Puerto Rico. The stations occupied, particularly numbers 36, 91, 93, 94, and 95, cover the region of the two *Challenger* stations, and a preliminary study of the material has shown that most, if not all, of the species described and listed by Brady from this area are present in the samples dredged by the *Caroline*.

The study of this material is therefore particularly important in giving more material for these particular stations. The author has been fortunate in having had placed at his disposal some small amounts of the original *Challenger* material from these two famous stations, but the amount has been insufficient to give the large series of specimens which are desirable. So it is a matter of congratulation that this

expedition has made available an adequate amount of material from this region.

In the preliminary studies, a considerable number of new forms have been found, and these are here described with illustrations of the holotypes, and occasionally of other specimens to make the species more adequately known.

REOPHAX TRILATERALIS, n. sp.

Plate 1, figs. 1-4

Test elongate, angled, with three distinct faces generally flattened, and the angles prominent but somewhat rounded, sides nearly parallel, triangular in transverse section; chambers few, indistinct; sutures indistinct; wall very coarsely arenaceous, composed of angular fragments rather neatly cemented, the surface only slightly roughened; aperture terminal, rounded, circular to narrowly elliptical. Length up to 1.75 mm; diameter 0.70-0.90 mm.

Holotype.—U.S.N.M. no. 26181; from station 13, latitude 18°31′05″ N., longitude 62°02′15″ W. to latitude 18°30′30″ N., longitude 66°04′05″ W., 200 to 300 fathoms.

NOURIA JOHNSONI, n. sp.

Plate 1, figs. 5, 6

Test somewhat longer than broad, very slightly compressed, periphery broadly rounded, greatest breadth somewhat below the middle, base rounded or somewhat truncate, apertural end rounded, truncate; chambers comparatively few, and more or less involute, irregularly biserial in the adult; sutures very slightly depressed, strongly oblique; wall thin, composed of elongate sponge spicules arranged longitudinally to the test, rather neatly cemented, occasionally with the ends projecting toward the base; aperture fairly large, generally rounded or elliptical. Length up to 1.50 mm; breadth 0.65-0.75 mm; thickness 0.55-0.65 mm.

Holotype.—U.S.N.M. no. 26183; from station 25, latitude 18°32′15″ N., longitude 66°22′10″ W. to latitude 18°32′05″ N., longitude 66°22′10″ W., 240 to 300 fathoms.

This species somewhat resembles others of the genus known from the Pacific, but is much more rounded.

VERNEUILINA SPICULOTESTA, n. sp.

Plate 1, figs. 7, 8

Test elongate, 2 to 2½ times as long as broad, the early portion irregularly triangular in transverse section, somewhat twisted, triserial throughout, although in the last-formed whorl two chambers make up

a very large part of the apertural view, greatest breadth at the apertural end; chambers distinct, becoming somewhat inflated in the adult; sutures distinct, depressed; wall largely composed of fragments of sponge spicules firmly cemented and forming a rather neatly finished test on the exterior; aperture elongate, narrow, at the base of the inner margin of the last-formed chamber. Length 0.85-1.20 mm; diameter 0.55-0.65 mm.

Holotype.—U.S.N.M. no. 26185; from station 93, latitude 18°38′ 00″ N., longitude 65°09′30″ W. to latitude 18°37′45″ N., longitude 65°05′00″ W., 350 to 400 fathoms.

This is a unique species in the peculiar shape of the test and the unusual character of the wall. It is rather common in some of the dredgings from the Puerto Rican Deep.

GAUDRYINA d'Orbigny, 1839

Subgenus SIPHOGAUDRYINA, n. subgenus

Subgenotype.—Gaudryina (Siphogaudryina) stephensoni Cushman.

Test with the early stages triserial, usually triangular with sharp angles, one of the ridges becoming divided and forming a quadrangular test with four distinct angles, usually somewhat compressed with two narrow sides and two broad sides, one of which is somewhat wider than the other, the angles frequently expanded into fistulose processes, which become broken on the exterior, showing a row of openings along the angles of the test, end view usually quadrangular. Upper Cretaceous to Recent.

GAUDRYINA (SIPHOGAUDRYINA) COMPRESSA, n. sp.

Plate 1, figs. *9a, 9b*

Test about twice as long as broad, much compressed, the flattened sides showing the biserial arrangement very broad, the other two sides narrow, truncate, angles with tubular projections usually broken at the tip, showing a double series of openings, apertural end obliquely truncate; chambers numerous, low and broad, increasing gradually in size as added, only slightly inflated, triserial in the young stages, and biserial in the adult; sutures distinct, very slightly depressed, nearly at right angles to the elongate axis; wall finely arenaceous with a few coarse fragments, a large proportion of cement giving a fairly smooth surface; aperture narrow, elongate, in a distinct reentrant at the inner margin of the last-formed chamber. Length 0.50-0.60 mm; breadth 0.28-0.32 mm; thickness 0.15-0.20 mm.

Holotype.—U.S.N.M. no. 26187; from station 104, latitude 18°30′40″ N., longitude 66°13′20″ W. to latitude 18°30′10″ N., longitude 66°13′50″ W., 80 to 120 fathoms.

This species somewhat resembles *Gaudryina (Siphogaudryina) siphonifera* (H. B. Brady), which is characteristic of the Indo-Pacific. In the Atlantic species, however, the test is smaller, more complex, and the tubular projections more numerous but less elongate.

CRIBROGOËSELLA, n. gen.

Bigenerina H. B. Brady (not d'Orbigny), Rep. Voy. *Challenger,* Zoology, vol. 9, p. 371, 1884.

Genotype.—Bigenerina robusta H. B. Brady.

Test elongate, subcylindrical, the early portion tapering, later portion with the sides nearly parallel, rounded in transverse section, earliest whorl with four or five chambers, rapidly reducing to three, and then to a biserial stage which continues for a considerable period, followed in the adult by uniserial chambers, interior undivided; wall arenaceous; aperture in the biserial portion at the inner margin of the last-formed chamber, in the uniserial portion becoming terminal, central, and gradually increasing from one opening in the early stage to many in the adult, occupying the central portion of the terminal face. Miocene to Recent.

This genus apparently is derived from *Goësella* by the addition of the apertural characters, having a cribrate terminal face with the apertures represented by numerous, small, rounded openings in the middle portion.

Apparently this genus developed in the West Indian region directly from *Goësella* in the Miocene, as it is found in the Miocene of Trinidad, and continues in the same general region to the present oceans, the type species having been described from *Challenger* material from off the West Indies.

CRIBROGOËSELLA BRADYI, n. sp.

Plate 1, figs. 10, 11

Textularia agglutinans (part) H. B. Brady (not d'Orbigny), Rep. Voy. *Challenger,* vol. 9, pl. 43, fig. 12 (not figs. 1-3), 1884.

Test large, much elongate, gradually tapering from the subacute initial end, greatest breadth toward the apertural end, early stages with as many as five chambers, reducing to three, and soon becoming biserial, the megalospheric form becoming uniserial in the adult; cham-

bers distinct, somewhat inflated, particularly in the later portion, somewhat broader than high, increasing rather gradually in size as added; sutures distinct, becoming more depressed in the later portion, in the biserial stage usually about at right angles to the elongate axis; wall very finely arenaceous, rather smoothly finished except for a series of longitudinal depressions, particularly in the biserial portion; aperture in the biserial stage at the base of the inner margin of the last-formed chamber, later becoming divided into two or more elongate openings, and in the adult megalospheric form with numerous small rounded openings in the terminal face. Length up to 3.50 mm; diameter 0.80 mm.

Holotype.—U.S.N.M. no. 26189; from station 93, latitude 18°38′ 00″ N., longitude 65°09′30″ W. to latitude 18°37′45″ N., longitude 65°05′00″ W., 350 to 400 fathoms.

This large species was found by Brady in the *Challenger* material from this same general region and was referred by him to d'Orbigny's *Textularia agglutinans* in the above reference. In our figured specimen it is difficult to make out the terminal apertures, as they are too filled with foreign material, but in the type species of the genus they are very distinct.

TRILOCULINA NASUTA, n. sp.

Plate 2, figs. 1-3

Test very elongate, slender, the apertural end continued out into a long, slender neck, three chambers visible from the exterior in the adult, periphery broadly rounded; chambers distinct, inflated, of a peculiar shape, the apertural end greatly extended into a somewhat compressed neck, convex on the outer side, and concave on the inner, the basal portion distinct, expanded, somewhat curved, covering the elongate neck of the preceding chamber; sutures distinct, strongly depressed; wall smooth, imperforate, calcareous; aperture rounded, reniform, usually with a slight tooth on the inner margin, and a distinct lip. Length up to nearly 1.00 mm; breadth 0.18-0.20 mm; thickness 0.12 mm.

Holotype.—U.S.N.M. no. 26192; from station 26, latitude 18°30′ 20″ N., longitude 66°22′05″ W. to latitude 18°30′30″ N., longitude 66°23′05″ W., 33 to 40 fathoms.

This is a very peculiar species, with its very elongate, compressed neck and peculiarly shaped chambers. It is rather common at some of the stations.

TRILOCULINA FENIMOREI, n. sp.

Plate 2, figs. 4, 5

Test somewhat longer than broad, periphery truncate and keeled at the angles, basal and apertural ends extended, the former into a subacute point, the latter into a broader, expanded neck, typically showing strong, transverse folds; chambers very distinct, quadrangular in transverse section, the periphery truncate or slightly concave, the angles distinctly raised; sutures fairly distinct, somewhat depressed; wall fairly smooth, matte, imperforate, calcareous; aperture circular at the end of a distinct, expanded neck. Length up to 0.80 mm; breadth 0.35-0.40 mm; thickness 0.25 mm.

Holotype.—U.S.N.M. no. 26194; from station 26, latitude 18°30′20″ N., longitude 66°22′05″ W. to latitude 18°30′30″ N., longitude 66°23′05″ W., 33 to 40 fathoms.

This species is peculiar in its general shape, particularly in the large, expanded neck with transverse folds, and is fairly common in this material.

PYRGO JOHNSONI, n. sp.

Plate 2, figs. 6-8

Test short and broad, length and breadth about equal, periphery very broadly rounded, in end view broadly elliptical, the base extended back somewhat, forming a distinct lobe, apertural end also somewhat extended; chambers strongly inflated, distinct, only two visible in the adult; sutures distinct, depressed; wall smooth, imperforate, calcareous; aperture nearly circular, with a distinct, thickened lip and a simple tooth somewhat expanded at the inner end and in side view rising above the lip. Length 1.10-1.25 mm; breadth 0.85-1.00 mm; thickness 0.80 mm.

Holotype.—U.S.N.M. no. 26196; from station 26, latitude 18°30′20″ N., longitude 66°22′05″ W. to latitude 18°30′30″ N., longitude 66°23′05″ W., 33 to 40 fathoms.

This species is distinct in the peculiar form of the basal and apertural ends of the adult chamber.

PYRGO JUGOSUS, n. sp.

Plate 2, figs. 9-11

Test slightly longer than broad, in the adult having the middle of each chamber somewhat produced into a distinct ridge, and in old-age specimens usually having two supplementary ridges at either side, periphery keeled, at the base somewhat serrate; chambers distinct,

inflated; sutures distinct, slightly depressed; wall smooth except for the keel and the ridges, imperforate, calcareous; aperture narrowly elongate, largely filled by the broad tooth with the ends somewhat expanded. Length 1.00-1.40 mm; breadth 0.90-1.10 mm; thickness 0.90 mm.

Holotype.—U.S.N.M. no. 26198; from station 104, latitude 18°30′40″ N., longitude 66°13′20″ W. to latitude 18°30′10″ N., longitude 66°13′50″ W., 80 to 120 fathoms.

The series of figures given shows the development of this peculiar, ridged form, which is smooth in the early stages and then develops a single, strong ridge, and, in the adult, supplementary ones in addition.

PYRGO NASUTUS, n. sp.

Plate 3, figs. 1-4

Test in the adult in front view about as broad as long, in the early stages usually somewhat longer than broad, periphery strongly keeled and serrate in the adult, apertural end, particularly in the young stages, extended into a much compressed neck, somewhat convex on the dorsal outer side, and flattened or concave on the inner; chambers distinct, inflated; sutures distinct, slightly depressed; wall smooth, imperforate, calcareous; aperture narrow, elongate, somewhat curved without a distinct tooth. Length 0.60-0.75 mm; breadth 0.45-0.60 mm; thickness 0.30-0.35 mm.

Holotype.—U.S.N.M. no. 26200; from station 56, latitude 19°10′15″ N., longitude 69°27′20″ W. to latitude 19°10′15″ N., longitude 69°28′05″ W., 17 fathoms.

The series of figures shows the developmental stages of this unusual form, which may be distinguished particularly by the peculiarly shaped neck.

GORDIOSPIRA RUGOSA, n. sp.

Plate 3, figs. 5-7

Test in a somewhat open coil, nearly planispiral, periphery broadly rounded; the coils slightly involute; sutures distinct, depressed; wall imperforate, calcareous, with numerous transverse wrinkles; aperture large, formed by the open end of the tubular chamber. Diameter 0.60-0.75 mm; thickness 0.20-0.22 mm.

Holotype.—U.S.N.M. no. 26202; from station 104, latitude 18°30′40″ N., longitude 66°13′20″ W. to latitude 18°30′10″ N., longitude 66°13′50″ W., 80 to 120 fathoms.

This is a tropical species of this genus which has hitherto been known largely from the Polar regions. It is very strongly rugose.

GLANDULINA SPINATA, n. sp.

Plate 3, figs. 8, 9

Test oval or broadly elliptical in front view, with apertural end somewhat produced, circular in transverse section; chambers in the early portion apparently biserial, later uniserial, much involute; sutures largely obscured by the surface ornamentation; wall calcareous, perforate, rather uniformly covered with short, blunt spines; aperture elliptical, at the end of a short neck with a somewhat flaring lip. Length 0.45-0.50 mm; diameter 0.30 mm.

Holotype.—U.S.N.M. no. 26204; from station 56, latitude 19°10′15″ N., longitude 69°27′20″ W. to latitude 19°10′15″ N., longitude 69°28′05″ W., 17 fathoms.

This species apparently belongs in the genus *Glandulina,* and is to be distinguished from other species of that genus by its peculiar surface ornamentation.

EHRENBERGINA SPINEA, n. sp.

Plate 3, figs. 10, 11

Test somewhat compressed, in the adult in front view somewhat rhomboid, with each side extended out into an acicular spine, dorsal view with the sides broadly rounded; chambers distinct, only slightly inflated; sutures distinct, somewhat limbate, little if at all depressed; wall smooth, calcareous, finely perforate; aperture narrow, elongate. Height 0.35 mm; breadth including spines 0.60 mm.

Holotype.—U.S.N.M. no. 26207; from station 13, latitude 18°31′05″ N., longitude 66°02′15″ W. to latitude 18°30′30″ N., longitude 66°04′05″ W., 200 to 300 fathoms.

This species most closely resembles that described by Brady from the Pliocene of the Pacific, as *Ehrenbergina bicornis.* Our Atlantic species however is smaller and much more compressed, with the spines much less developed.

PEGIDIA CORRUGATA, n. sp.

Plate 3, figs. 12, 13

Test plano-convex, the dorsal side strongly convex, ventral side flattened, periphery rounded; chambers rather indistinct, four or five making up the last-formed whorl in the adult and largely visible on the dorsal side, ventral side much obscured by the peculiar surface ornamentation; sutures largely obscured, strongly curved, sigmoid on the dorsal side; wall calcareous, distinctly but finely perforate, the dorsal side fairly smooth, ventral side strongly rugose with a peculiar laby-

rinthic pattern of raised, rounded ridges with depressed areas between, covering most of the ventral side and obscuring the structure of the aperture. Diameter 0.85 mm; height 0.50-0.55 mm.

Holotype.—U.S.N.M. no. 26210; from station 26, latitude 18°30′ 20″ N., longitude 66°22′05″ W. to latitude 18°30′30″ N., longitude 66°23′05″ W., 33 to 40 fathoms.

This species shows very considerable variation, particularly in the ornamentation of the ventral side, and seems to be distinct from all other known species of the genus.

EXPLANATION OF PLATES

Plate 1

Figs. 1-4. *Reophax trilateralis*, n. sp. × 30. 1, Holotype. *a*, front view; *b*, apertural view.

Figs. 5, 6. *Nouria johnsoni*, n. sp. × 30. 5, Paratype. 6, Holotype. *a*, *a*, front views; *b*, *b*, apertural views.

Figs. 7, 8. *Verneuilina spiculotesta*, n. sp. × 40. 7, Paratype. 8, Holotype. *a*, front view; *b*, apertural view.

Figs. 9*a*, 9*b*. *Gaudryina* (*Siphogaudryina*) *compressa*, n. sp. × 90. *a*, front view; *b*, apertural view.

Figs. 10, 11. *Cribrogoëssella bradyi*, n. sp. × 25. 10, Holotype. 11, Paratype. *a*, *a*, front views; *b*, *b*, apertural views.

Plate 2

Figs. 1-3. *Triloculina nasuta*, n. sp. × 70. 1, Holotype. *a*, *b*, opposite sides; *c*, apertural view. 2, 3, Paratypes.

Figs. 4, 5. *Triloculina fenimorei*, n. sp. × 50. 4, Holotype. *a*, *b*, opposite sides; *c*, apertural view. 5, Paratype.

Figs. 6-8. *Pyrgo johnsoni*, n. sp. × 30. 6, Holotype. *a*, side view; *b*, apertural view. 7, 8, Paratypes.

Figs. 9-11. *Pyrgo jugosus*, n. sp. × 30. 9, 10, Paratypes. 11, Holotype. *a*, front view; *b*, apertural view.

Plate 3

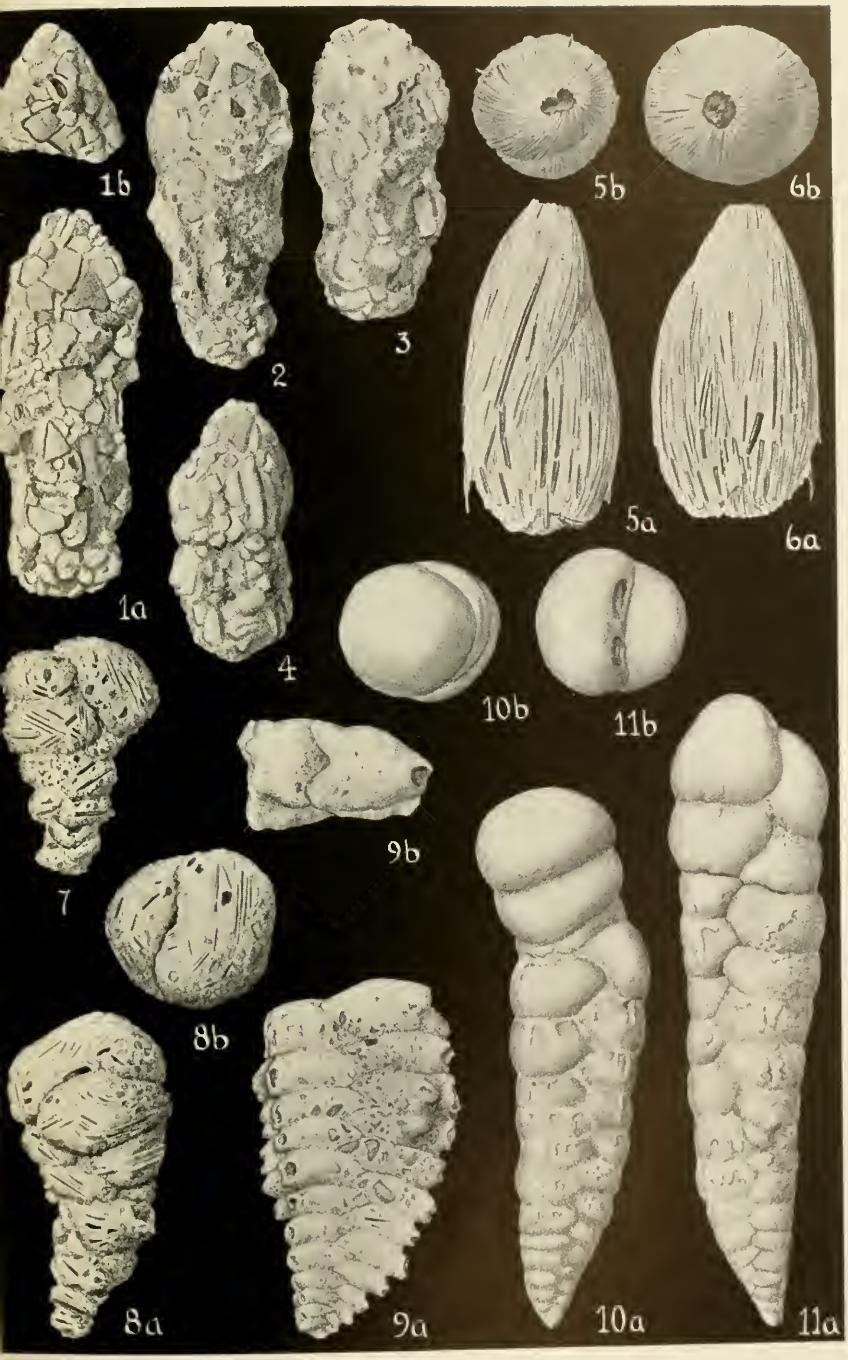
Figs. 1-4. *Pyrgo nasutus*, n. sp. × 50. 1, Holotype. *a*, front view; *b*, apertural view. 2-4, Paratypes.

Figs. 5-7. *Gordiospira rugosa*, n. sp. × 50. 5, Holotype. *a*, side view; *b*, peripheral view. 6, 7, Paratypes.

Figs. 8, 9. *Glandulina spinata*, n. sp. × 70. 8, Holotype. *a*, front view; *b*, apertural view. 9, Paratype.

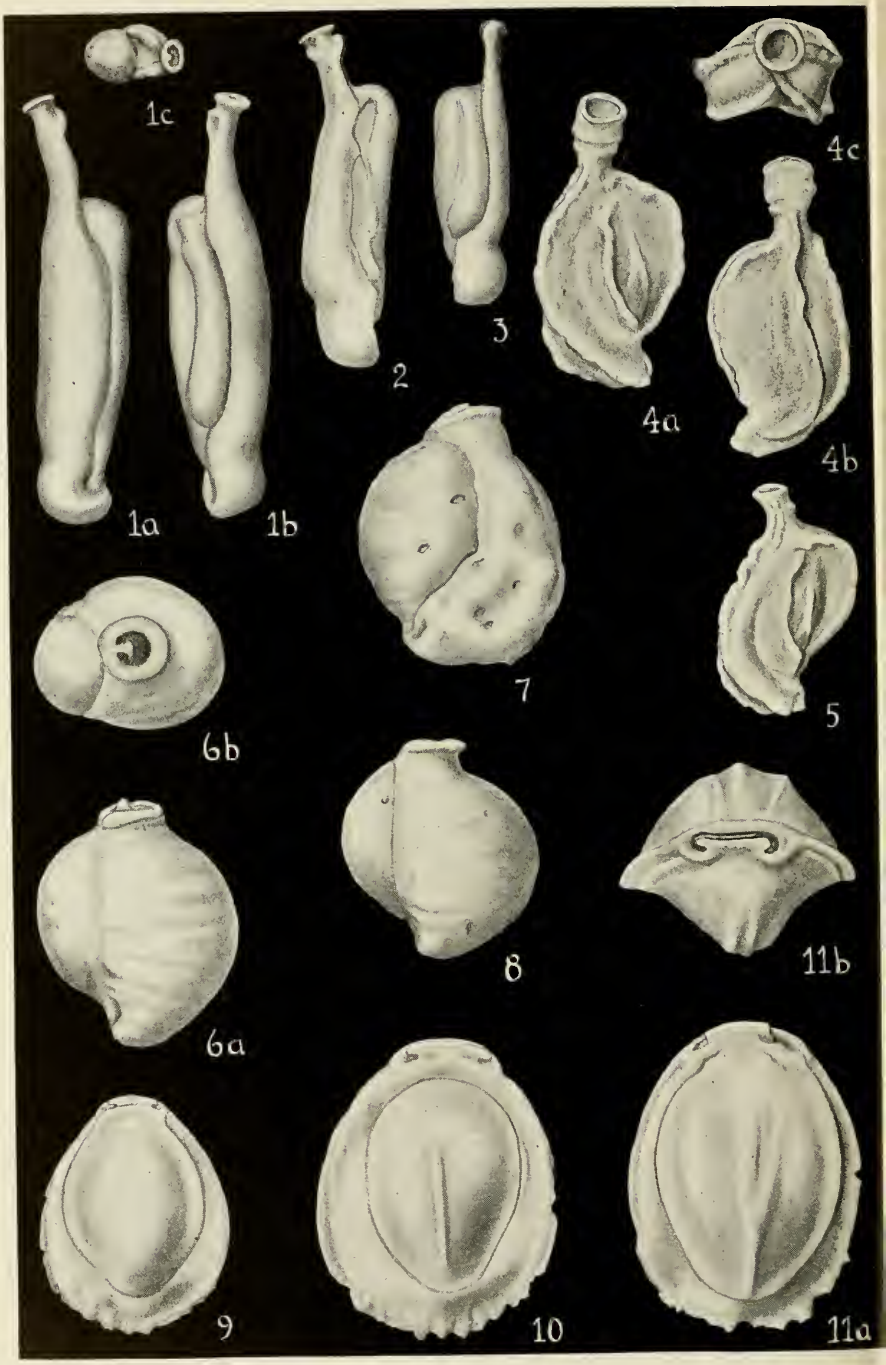
Figs. 10, 11. *Ehrenbergina spinea*, n. sp. × 50. 10, Paratype. 11, Holotype. *a*, front view; *b*, apertural view; *c*, basal view.

Figs. 12, 13. *Pegidia corrugata*, n. sp. × 35. 12, Holotype. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. 13, Ventral view of paratype.



NEW FORAMINIFERA

(For explanation, see page 9.)



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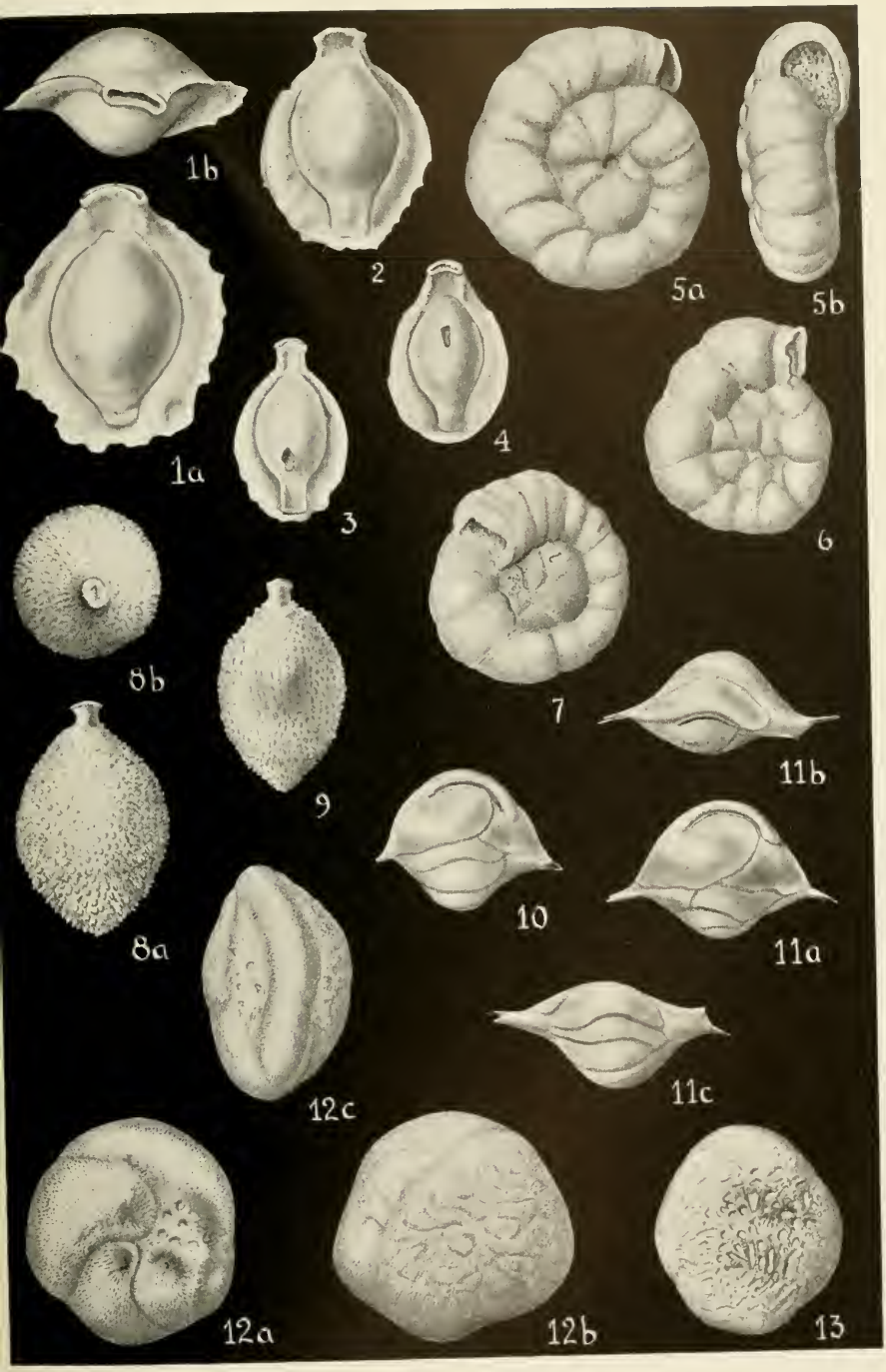

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