

RECENT FORAMINIFERA FROM OFF JUAN FERNANDEZ ISLANDS

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During his cruise about South America, Dr. Waldo Schmitt collected foraminifera from a number of interesting localities. Among these is a collection of material taken by means of a "bull-dog" snapper from shallow water 10-20 fathoms, in Cumberland Bay, Juan Fernandez Island, Chile. This represents a region very little known as far as the foraminifera are concerned. Since d'Orbigny's classic memoir published in 1839¹ almost no records are known from the west coast of South America or adjacent islands. The *Challenger* cruised in this region and the *Albatross* made a trip about South America on which a few samples were collected, but these have not been worked up for their contained foraminifera. The *Challenger* dredged in the vicinity of Juan Fernandez but only in very deep water so that the records have little in common with this shallow-water material.

The fauna is interesting on account of its association with other regions. Some of the species are evidently East Indian or Australian in their relationship, such as *Spirillina spinigera*, *Patellina advena*, *Tretomphalus bulloides*, etc. Others seem to be more closely related to colder water faunas such as are known from the west coast of North and South America represented by such species as *Gaudryina triangularis*, *Sigmoidella (Sigmoidina) pacifica*, *Elphidium articularia*, *Bulimina patagonica*, *Angulogerina carinata*, and others. There are a few representatives of pelagic species such as *Globigerina conglomerata*, *G. inflata*, *G. triloba*, *Globorotalia menardii*, and *G. truncatulinoides*.

Some of the species are represented by too few specimens to allow a full description and identification. Some of these are, however, of sufficient interest so that figures are here given for future reference. Several of the species have proved to be new. The figures on the

¹ Voy. Amér. Mérid., 1839, Foraminifères.

plates are from carefully made camera lucida drawings and have sufficient detail so that it is hoped the characters of the specimens of the collection will be adequately given. Descriptions of the species follow.

Family TEXTULARIIDAE

Genus GAUDRYINA d'Orbigny, 1839

GAUDRYINA TRIANGULARIS Cushman

Plate 1, figures 1 *a*, *b*

Gaudryina triangularis CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 65, fig. 104 (in text); Bull. 103, U. S. Nat. Mus., 1918, p. 56, pl. 20, fig. 3; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 604; Publ. 291, Carnegie Inst. Washington, 1919, p. 35; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 148; U. S. Geol. Survey, Prof. Paper 129 F., 1922, p. 127; Prof. Paper 133, 1923, p. 21, pl. 3, fig. 5; Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 138.

Test slightly longer than broad, for the most part triangular, the angles subacute, early chambers triserially arranged, later ones biserial, few; wall coarsely arenaceous, smoothly finished; aperture a narrow slit at the inner margin of the last-formed chamber.

Length 0.35 mm.

Family MILIOLIDAE

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA VULGARIS d'Orbigny

Plate 1, figures 7 *a-c*

Quinqueloculina vulgaris D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 302. — TERQUEM, Mém. Soc. Géol. France, ser. 3, vol. 1, 1878, p. 66, pl. 6 (11), figs. 20*a-21*.

There are a few specimens in the collection similar to that figured which may be referred to this species of d'Orbigny. The wall shows a few longitudinal costae.

QUINQUELOCULINA LAEVIGATA d'Orbigny

Plate 1, figures 4 *a-c*

Quinqueloculina laevigata D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 301; in BARKER, WEBB and BERTHELOT, Hist. Nat. Îles Canaries, 1839, vol. 2, pt. 2 "Foraminifères," p. 143, pl. 3, figs. 31-33.

A few specimens with smooth surface and general shape as that given on Plate 1, figure 4, are referred to this species of d'Orbigny. From the records, this species seems to have a very wide range, but this is probably due to its smooth surface and lack of more definite characters.

Length 0.27 mm., breadth 0.13 mm.

QUINQUELOCULINA PUNCTULATA d'Orbigny (?)

Plate 1, figures 2 a-c

Quinqueloculina punctulata D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 302.

Some authors have referred to this species forms similar to those figured (Pl. 1, figs. 2 a-c). The surface is smooth or finely pitted but not conspicuously so, and the chambers are decidedly angled.

QUINQUELOCULINA DURANDI, new species

Plate 1, figures 5 a-d

Test small, short and broad, only slightly longer than broad in front view; periphery rounded or somewhat truncate; chambers distinct, slightly inflated; sutures distinct, slightly depressed, sinuate; wall thin, ornamented with longitudinal costae slightly raised and irregular in size and often irregularly sinuate; aperture large, with a large flat tooth.

Length 0.25 mm., breadth 0.20 mm., thickness 0.14 mm.

Holotype.—(Cat. No. 20775, U.S.N.M.) from Cumberland Bay, Juan Fernandez, collected by Dr. Waldo Schmitt. The species has been named for Señor René Durand, a resident of Juan Fernandez, in appreciation of the generous hospitality and unstinted assistance extended Doctor Schmitt during his sojourn on the island.

This is a peculiar small species but seems to be rather constant in its somewhat unusual characters.

Genus TRILOCULINA d'Orbigny, 1826

TRILOCULINA GRACILIS d'Orbigny

Plate 1, figures 3 a-c

Triloculina gracilis D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 181, pl. 11, figs. 10-12.—CUSHMAN, Publ. 311, Carnegie Inst. Washington, 1922, p. 74.

Test elongate, slender, triloculine; chambers rounded; sutures very slightly depressed; apertural end extended into a cylindrical neck, the outer end of which is enlarged and has a phialine lip; surface smooth or very finely striate; aperture circular, with a slight tooth.

Length 0.40 mm., breadth 0.13 mm., thickness 0.08 mm.

This species was described by d'Orbigny as rare from shore sands of Cuba and Jamaica. It is recorded from four stations in the Tortugas region. It is a very slender, thin-walled species, and most easily distinguished by the characters of the aperture. The figured specimen shows fairly well the general characters of the species.

TRILOCULINA ROTUNDA d'Orbigny

Plate 2, figures 2 a-c

Triloculina rotunda D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 299.—SCHLUMBERGER, Mém. Soc. Zool. France, vol. 6, 1893, p. 64, pl. 1, figs.

48-50; figs. 11, 12 (in text).—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 639; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 460; U. S. Geol. Survey, Prof. Paper 133, 1923, p. 57, pl. 8, figs. 6, 7; Publ. 344, Carnegie Inst. Washington, 1926, p. 82.

Miliolina rotunda MILLETT, Journ. Roy. Micr. Soc., 1898, p. 267, pl. 5, figs. 15, 16.—HERON-ALLEN and EARLAND, Trans. Micr. Soc. London, vol. 20, 1915, p. 568, pl. 42, figs. 27-30.

Test somewhat longer than wide; chambers distinct, somewhat inflated; periphery broadly rounded; sutures very slightly depressed, distinct; wall smooth, polished, occasionally with transverse wrinkles; apertural end somewhat contracted with a slightly thickened lip, the aperture itself rounded with a single bifid tooth projecting somewhat above the outline of the aperture.

Length 0.85 mm., breadth 0.60 mm.

This species apparently has a very wide distribution as it is recorded from the Mediterranean, the West Indian region, and from the Indo-Pacific.

TRILOCULINA CRASSA (?) (d'Orbigny)

Plate 2, figures 1 a-c

To this species are referred a few specimens with smooth surface or very slightly costate of the form shown in the figure.

TRILOCULINA SUBROTUNDA (Montagu) (?)

Plate 1, figures 6 a-c

There are a few rather small specimens which although they are triloculine fit rather closely the characters given for this species. In some respects they resemble *Triloculina circularis* Bornemann but are not in the usual form of that species.

Family OPHTHALMIDIIDAE

Genus CORNUSPIRA Schultze, 1854

CORNUSPIRA INVOLVENS (Reuss)

Plate 2, figure 3

Operculina involvens REUSS, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 370, pl. 46, fig. 30.

Cornuspira involvens REUSS, Sitz. Akad. Wiss. Wien, vol. 48, Abt. 1, 1863, p. 39, pl. 1, fig. 2; vol. 50, Abt. 1, 1864, p. 450.

Test nearly circular in side view, consisting of a proloculum and a long closely coiled, planispiral second chamber of nearly equal diameter throughout, slightly involute; suture distinct, somewhat depressed; wall smooth and polished, occasionally showing slight lines of growth; aperture nearly the size of the open end of the tube.

Diameter 0.45 mm.

There are a few specimens of this simple, widely distributed species in the material examined.

Family FISCHERINIDAE

Genus FISCHERINA Terquem, 1878

FISCHERINA DUBIA (d'Orbigny)

Plate 2, figures 4 a-c

Rotalina dubia D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 91, pl. 2, figs. 29, 30.

Fischerina dubia CUSHMAN, Publ. 311, Carnegie Inst. Washington, 1922, p. 59, pl. 10, figs. 6, 7.

Test composed of a few coils, the early portion undivided, the last-formed coil divided usually into four chambers or sometimes five, all visible from the dorsal side, only those of the last-formed coil from the ventral side as the chambers on that side are completely involute, ventral side somewhat concave, dorsal side slightly convex; sutures distinct but not depressed; wall thin, translucent, of a milky-white color; aperture at the end of the last-formed chamber, circular, or the inner portion somewhat flattened.

Diameter 0.40 mm., thickness 0.15 mm.

This species was described from Cuba by d'Orbigny, and has also been recorded from the Tortugas region. It also resembles closely *Fischerina helix* Heron-Allen and Earland, but does not have the spire of that species.

Family TROCHAMMINIDAE

Genus CARTERINA H. B. Brady, 1884

CARTERINA FULVA Cushman

Plate 2, figures 6 a-c

Carterina fulva CUSHMAN, Publ. 342, Carnegie Inst. Washington, 1924, p. 10, pl. 1, fig. 3.

Test rotaliform, slightly longer than broad, compressed; chambers 5-8 in the last-formed coil; sutures distinct but not depressed on the dorsal side, slightly depressed on the ventral side, curved; wall very thin, translucent, composed largely of fusiform bodies, irregularly arranged; aperture on the ventral side toward the umbilicus; color yellowish-brown throughout.

Length 0.26 mm., breadth 0.22 mm., thickness 0.08 mm.

This species was originally described from Samoa and it is interesting to find it ranging further to the east to Juan Fernandez. It is to be suspected that the species also occurs as far westward as the east coast of Africa.

Family LAGENIDAE

Genus LENTICULINA Lamarck, 1804

LENTICULINA CONVERGENS (?) Bornemann

Plate 2, figures 5 a, b

There are a very few specimens of the form figured which are of the general appearance of specimens usually referred to this species of Bornemann.

Genus MARGINULINA d'Orbigny, 1826

MARGINULINA species ?

Plate 3, figures 1 a-c

There is a single megalospheric specimen somewhat irregular in shape which it has not seemed wise to definitely name at the present time. A figure of it is given for future reference.

Genus NODOSARIA Lamarck, 1812

NODOSARIA SUBSTRIATULA Cushman

Plate 3, figures 2, 3

Nodosaria subcanaliculata H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 512, pl. 64, figs. 23, 24 (not *Dentalina subcanaliculata* Neugeboren).

Nodosaria substriatula CUSHMAN, Proc. U. S. Nat. Mus., vol. 51, 1917, p. 655; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 204, pl. 36, figs. 8, 9; pl. 52, figs. 7-9.

Test usually consisting of four chambers, the proloculum with a globular body, an apical spine, and with definite longitudinal costae; the second chamber much more elongate, flask shaped, with a long neck, when partially covered by the third chamber becoming subcylindrical, ornamented like the proloculum; third chamber still more elongate, with a long neck, the surface ornamentation consisting of short, broken, longitudinal striae; the fourth chamber similar but remote, a large part of the neck between the two chambers visible; final chamber with the apertural neck long and slender, smooth; the apertural end with four or more flangelike costae extending up and beyond the aperture and incurving somewhat over the aperture.

Length 0.45 mm., diameter 0.15 mm.

It is interesting to find this distinct species which is known to have an Indo-Pacific distribution so far from the other records. No adult with the four chambers was found, but the specimens with three chambers figured here seem to be typical.

Genus LAGENA Walker and Jacob, 1798

LAGENA STRIATA (Montagu)

Plate 3, figures 4 a, b

The form figured here is rare in the collection, and may be referred to this species.

LAGENA LAEVIGATA (?) Reuss

Plate 3, figures 5 a, b

The form figured sometimes has very slight striae near the base, and the aperture as shown is not entirely symmetrical.

LAGENA species ?

Plate 3, figures 6 a, b

This form is a peculiar one in the ridges at the base. It is somewhat complex and has a thickened band along the periphery; the aperture is elongate, elliptical.

Family POLYMORPHINIDAE

Genus SIGMOIDELLA Cushman and Ozawa, 1928

SIGMOIDELLA (SIGMOIDINA) PACIFICA Cushman and Ozawa

Plate 3, figures 7 a, b

Sigmoidella (Sigmoidina) pacifica CUSHMAN and OZAWA, Contr. Cushman Lab. Forum. Res., vol. 4, 1928, p. 19, pl. 2, fig. 13.

Test small, involute, somewhat compressed, few chambers visible from the exterior, ovate, the greatest breadth below the middle; chambers few, distinct, the last-formed one somewhat angled at the periphery; sutures distinct, very slightly depressed; wall smooth, translucent; aperture radiate, terminal.

Length 0.43 mm., breadth 0.32 mm., thickness 0.14 mm.

The type of this species is from the China Sea, near Formosa. It is interesting to find this species so far from its original locality, although its known distribution is wide in the Pacific.

Family NONIONIDAE

Genus ELPHIDIUM Montfort, 1808

ELPHIDIUM ARTICULATUM d'Orbigny, RUGULOSUM, new variety

Plate 3, figures 8 a, b

Test bilaterally symmetrical, umbilicate, somewhat compressed, periphery rounded; about nine chambers in the last-formed coil, slightly inflated; sutures slightly depressed, gently curved, somewhat filled with a rugose secondary growth which, over the umbilical region, fills that area, wall otherwise smooth, finely perforate; aperture consisting of an arched opening in the median line and a few smaller supplementary openings at either side.

Diameter 0.30 mm., thickness 0.12 mm.

Holotype of variety.—(Cat. No. 20782, U.S.N.M.) from off Juan Fernandez, collected by Dr. Waldo Schmitt.

This variety differs from the species described by d'Orbigny in the peculiar ornamentation of the sutures and the umbilical regions, and also in the aperture. The general shape and number of chambers is very similar to d'Orbigny's species.

ELPHIDIUM SCHMITTI, new species

Plate 3, figures 9 a-c

Test bilaterally symmetrical, slightly compressed; periphery broadly rounded; about seven chambers in the last-formed coil, inflated;

sutures distinct, depressed, slightly curved, marked by a few small retral processes; wall smooth, finely perforate except the umbilical regions which are covered by a coarsely granular ornamentation; apertures consisting of three or more small rounded openings at the base of the last-formed chamber close to the median line.

Diameter 0.36 mm., thickness 0.15 mm.

Holotype.—(Cat. No. 20776, U.S.N.M.) from Juan Fernandez, collected by Dr. Waldo Schmitt.

This is an interesting species especially in the ornamentation of the umbilical regions.

ELPHIDIUM species

Plate 3, figures 10 *a, b*

This species figured on Plate 3, figure 10 is not given a name as further specimens should be studied to determine its exact relationships. It is noted here for future reference.

Family BULIMINIDAE

Genus BULIMINELLA Cushman, 1911

BULIMINELLA ELEGANTISSIMA (d'Orbigny)

Plate 3, figures 12 *a, b*

Bulimina elegantissima d'ORBIGNY, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, "Foraminifères," p. 51, pl. 7, figs. 13, 14.

Buliminella elegantissima CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 89.

This species was described by d'Orbigny from the west coast of South America where he had specimens from several stations from Peru to Chile. There have been numerous forms referred to this species from various parts of the world both fossil and recent. Our specimens from Juan Fernandez are of the slender form figured by d'Orbigny from his types.

Genus BULIMINA d'Orbigny

BULIMINA PATAGONICA d'Orbigny

Plate 3, figures 11 *a, b*

Bulimina patagonica d'ORBIGNY, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, "Foraminifères," p. 50, pl. 1, figs. 8, 9.

There are a few specimens which may be referred to this species. They are elongate, fusiform, the last few chambers smooth, the earlier ones marked by short spines both on the border of the chamber and some on the chamber faces. It seems best referred to this species of d'Orbigny which he described in his South American work. It somewhat resembles *Bulimina marginata*, but seems to be distinct.

BULIMINA PATAGONICA d'Orbigny, **GLABRA**, new varietyPlate 4, figures 1 *a-c*

Test broadest near the apertural end and much like d'Orbigny's figure of *Bulimina patagonica*, except that the ornamentation at the base of the chambers is wanting.

Holotype of variety.—(Cat. No. 20777, U.S.N.M.), collected by Dr. Waldo Schmitt in material from off Juan Fernandez.

Genus VIRGULINA d'Orbigny, 1826**VIRGULINA SCHREIBERSIANA** CzjzekPlate 4, figures 2 *a, b*

There have been very many forms referred to this species which have no surface ornamentation, and the chambers rather irregularly arranged. The specimens fit Czjzek's species as closely as do many others, and it has seemed best to leave them under his name.

Genus BOLIVINA d'Orbigny, 1839**BOLIVINA DONIEZI**, new speciesPlate 4, figures 3 *a, b*

Test small, depressed, broadest near the apertural end; chambers comparatively few, consisting of 8 or 10 pairs; wall very coarsely perforate, the earlier chambers with a few coarse perforations near the basal margin, the adult chambers with the coarse perforations scattered over the general surface; chambers fairly narrow, but becoming higher toward the apertural end; sutures distinct, depressed, strongly oblique; aperture elongate, arched, in the median line at the base of the last-formed chamber.

Length 0.36 mm., breadth 0.15 mm., thickness 0.10 mm.

Holotype.—(Cat. No. 20778, U.S.N.M.) from material collected by Doctor Schmitt from off Juan Fernandez. The species has been named for Señor Doniez of the firm Recart & Doniez, concessionaires of the principal lobster fishery on the island.

This species from other records is probably widely distributed in the Indo-Pacific region.

BOLIVINA SUBEXCAVATA, new speciesPlate 4, figures 4 *a, b*

Test small, broadest near the apertural end, from which it rapidly tapers to the initial end; periphery rounded; chambers few, consisting of six or eight pairs, the earlier ones broad and low, the later ones increasing in height toward the apertural end; sutures distinct, depressed, slightly oblique; wall very coarsely perforate, with two regions, one at either side of the central area, which is excavated; aperture, an arched indentation at the base of the last-formed chamber in the median line.

Length 0.32 mm., breadth 0.18 mm., thickness 0.12 mm.

Holotype.—(Cat. No. 20779, U.S.N.M.) from off Juan Fernandez, collected by Dr. Waldo Schmitt.

This is a peculiar small form especially marked by the coarse perforations and the two distinct ridges close to the median line. It is somewhat similar to a species which occurs off the European coast and has often been known as *Bolivina plicata* d'Orbigny, although it is not that species. *Bolivina subexcavata* apparently has a wide range in the South Pacific from other records and material that we have.

BOLIVINA cf. KARRERIANA H. B. Brady, var. **CARINATA** Millett

Plate 4, figure 5

This species which is figured is much compressed, has numerous chambers which are low and broad with strongly oblique sutures, and all but the last chambers ornamented, with a few distinct longitudinal costae and the periphery subacute. It is not entirely typical of Millett's variety, but may be left under that name until more is known concerning it.

Genus LOXOSTOMUM Ehrenberg, 1854

LOXOSTOMUM cf. MAYORI (Cushman)

Plate 4, figures 6 a-c

This small, somewhat irregular specimen belongs in this genus, as the aperture is terminal and away from the edge of the last-formed chamber. The wall is finely perforate and the earlier portion has traces of fine longitudinal costae. *L. mayori* has a wide distribution, and this may be a somewhat irregular form of it.

Genus UVIGERINA d'Orbigny, 1826

UVIGERINA VIRGULINOIDES, new species

Plate 4, figures 8 a-c

Test elongate, broadest toward the apertural end, the early portion triserial, later portion irregularly biserial and twisted; chambers numerous, inflated, the last-formed ones forming a somewhat compressed test; sutures distinct, depressed; wall smooth, finely perforate, thin; aperture terminal with a short tubular neck and sometimes with a slight lip.

Length 0.25 mm., breadth 0.10 mm., thickness 0.07 mm.

Holotype.—(Cat. No. 20780, U.S.N.M.), collected by Doctor Schmitt in his material from Juan Fernandez.

This is a peculiar species with the last-formed portion becoming distinctly biserial. It resembles somewhat irregular forms of *Virgulina*, but it has the distinct characters of *Uvigerina*. There are a number of specimens all of this same form, showing that it is not an abnormally shaped specimen. There are a few other species of this genus which become depressed and biserial, mostly in the late Tertiary of the Mediterranean region.

Genus **ANGULOGERINA** Cushman, 1927**ANGULOGERINA CARINATA** Cushman

Plate 4, figures 7 a-d

Angulogerina carinata CUSHMAN, Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 159, pl. 4, fig. 3.

Test generally triangular in section, initial end bluntly rounded; chambers few, distinct, the three sides flattened, the angles sharply carinate, often with fine radial tubules; sutures distinctly depressed; wall thick, opaque, mostly smooth but with traces of some longitudinal costae.

This species was described from recent material from off the west coast of America. It is interesting to note that Brady in the *Challenger* Report (pl. 74, fig. 18) figures this species under another name from north of Juan Fernandez in deep water.

Family **ROTALIIDAE**Genus **SPIRILLINA** Ehrenberg, 1841**SPIRILLINA VIVIPARA** Ehrenberg, variety

Plate 4, figures 9 a, b

There are a few specimens of a form of *Spirillina* in which the later coils are coarsely perforate as in the typical form of the species, but the earlier coils are somewhat ornamented by radial lines. Such forms are recorded from the South Pacific under various names by Sidebottom, Chapman, and others.

SPIRILLINA SPINIGERA Chapman, variety

Plate 5, figures 1 a-c

The figured specimen shows the characters of this form, which may be considered a variety of Chapman's species. One side is flattened and covered by a rugose ornamentation, the other somewhat rounded, having radial lines and the inner edge along a spiral suture with a row of pits each with a distinct border. The periphery is extended into spinose projections similar to those seen in Chapman's species. Not enough specimens were obtained to make clear the full characters.

Genus **PATELLINA** Williamson, 1858**PATELLINA ADVENA** Cushman

Plate 4, figures 10 a-c

Patellina advena CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 135, pl. 31, fig. 9; Prof. Paper 133, 1923, p. 37; Publ. 342, Carnegie Inst. Washington, 1924, p. 32.

Test plano-convex, early portion composed of chambers spirally arranged, later ones elongate and becoming nearly annular; chambers partly divided by numerous longitudinal septae, visible from the exterior, forming what seems to be a radiating pattern; ventral side with numerous radiating lines near the periphery.

Diameter 0.30 mm., height 0.18 mm.

This small, scalelike species has been recorded from the region of Samoa and possibly is widely distributed in the South Pacific. The types are from the Lower Oligocene of the Coastal plain of the United States.

It is a species which has much finer divisions than the Atlantic species *P. corrugata* Williamson.

Family CYMBALOPORETTIDAE

Genus TRETOMPHALUS Moebius, 1880

TRETOMPHALUS BULLOIDES (d'Orbigny)

Plate 5, figures 2-4

Rotalina bulloides D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 104, pl. 3, figs. 2-5.

Cymbalopora bulloides CARPENTER, PARKER, and JONES, Introd. Foram, 1862, p. 216.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 638, pl. 102, figs. 7-12, text figs. 20 a-c.

Tretomphalus bulloides MOEBIUS, Beitr. Meeresfauna Insel Mauritius, 1880, p. 98, pl. 10, figs. 6-9.—CUSHMAN, Publ. 311, Carnegie Inst. Washington, 1922, p. 42, text figs 2, 3; Publ. 342, 1924, p. 36, pl. 11, figs. 1-3.

Test free, subglobular, early chambers rotaliform, numerous, rather coarsely perforate, forming a cap to which is attached a large final "balloon-chamber," subspherical, with coarse perforations on the ventral side and within, a "float-chamber" with a single opening at the base from which a tubular neck projects inward; color of the early chambers dark brown, the last chamber colorless.

Diameter 0.30 mm.; height 0.35 mm.

Figure 4 shows the adult, and figures 2 a-c the early stage somewhat similar to *Discorbis*.

Family CASSIDULINIDAE

Genus CASSIDULINA d'Orbigny, 1826

CASSIDULINA CRASSA d'Orbigny

Plate 5, figures 5 a-c

Cassidulina crassa D'ORBIGNY, Voy. Amér. Mérid., 1839, vol. 5, pt. 5, "Foraminifères," p. 56, pl. 7, figs. 18-20.

There are a few specimens of this species which d'Orbigny described in his South American monograph.

Family GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA CONGLOMERATA Schwager

Plate 5, figures 6 a-c

Globigerina conglomerata SCHWAGER, Novara Exped., Geol. Theil., pt. 2, 1866, p. 255, pl. 7, fig. 113.—CUSHMAN, Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 172.

Globigerina dutertrei H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 81, figs. 1-3 (not d'Orbigny).

Globigerina dubia H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 79, figs. 17 a-c (not Egger).

Test subglobose in the early stages, consisting of but four chambers in each coil, closely grouped; aperture small and with a distinct lip; in later stages with five or six chambers in a coil, the last coil usually below the level of the others and with a distinct umbilicus.

This is one of the commonest species in the Pacific and was first described by Schwager from the Pliocene of Kar Nicobar.

GLOBIGERINA INFLATA d'Orbigny

Plate 5, figures 8 a-c

Globigerina inflata D'ORBIGNY, in Barker, Webb, and Berthelot, Hist. Nat. Îles Canaries, 1839, vol. 2, pt. 2 "Foraminifères," p. 134, pl. 2, figs. 7-9.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 601, pl. 79, figs. 8-10.

There are a few specimens of this species in the material, but not as common as the preceding.

GLOBIGERINA TRILOBA Reuss

Plate 6, figures 1 a-c

Globigerina triloba REUSS, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 374, pl. 47, fig. 11.

There are a very few specimens such as figured here in which the final coil is made up almost entirely by three chambers, and may be referred to Reuss's species.

GLOBIGERINA species

Plate 5, figures 7 a-c

This very small form is interesting as it has a smooth young, later becoming spinose and the umbilical area covered by a thin platelike projection of the ventral side of the last-formed chamber. Rhumbler has figured similar forms in his *Plankton Expedition Report*, and they occur in the Upper Cretaceous. Not enough specimens were obtained to warrant a full description as these are evidently young specimens.

Family GLOBOROTALIIDAE

Genus GLOBOROTALIA Cushman, 1927

GLOBOROTALIA MENARDII (d'Orbigny)

Plate 6, figures 2 a-c

Rotalia menardii D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 273; Modèles No. 10.

Pulvinulina menardii OWEN, Journ. Linn. Soc. London (Zool.), vol. 9, 1867, p. 148, pl. 5, fig. 6.

Globorotalia menardii CUSHMAN, Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 175.

This is a very widely distributed pelagic species, but shows some variation in the different oceans.

GLOBOROTALIA TRUNCATULINOIDES (d'Orbigny)

Plate 6, figures 3 *a-c*

Rotalina truncatulinoides D'ORBIGNY, in Barker, Webb, and Berthelot, Hist. Nat. Îles Canaries, vol. 2, pt. 2 "Foraminifères," 1839, p. 132, pl. 2, figs. 25-27.

Pulvinulina truncatulinoides PARKER and JONES, Phil. Trans., vol. 155, 1865; p. 398, pl. 16, figs. 41-43.

Globorotalia truncatulinoides CUSHMAN, Bull. Scripps Inst. Oceanography, Tech. Ser., vol. 1, 1927, p. 176.

The few specimens of this species are unusually spinose about the aperture.

Family ANOMALINIDAE

Genus ANOMALINA d'Orbigny, 1826

ANOMALINA SCHMITTI, new species

Plate 6, figures 5 *a-c*

Test with the dorsal side flattened, ventral side especially in the central portion forming a fairly high spire, last-formed coil evolute on both sides; periphery smooth, keeled, especially in the younger portion; eleven or twelve chambers in the last-formed coil in the adult, not inflated; sutures distinct, very slightly if at all depressed, limbate on the dorsal side, slightly curved; wall coarsely perforate, especially on the dorsal side; aperture low, broad at the peripheral margin.

Length 0.40 mm., breadth 0.36 mm., thickness 0.20 mm.

Holotype.—(Cat. No. 20781, U.S.N.M.) from Juan Fernandez, collected by Dr. Waldo Schmitt.

This is an interesting species, especially in the spire that is developed.

ANOMALINA CORONATA H.B. Brady (?)

Plate 6, figures 9 *a-c*

The peculiar form here figured is evidently an abnormal specimen. The chambers are not all arranged in a single plane, but in general it has the characters of this species.

ANOMALINA (?) species

Plate 6, figures 6 *a-c*

This peculiar specimen has some of the characters of *Anomalina*, yet in others, resembles *Nonion*. It is figured here for future reference.

ANOMALINA cf. GROSSERUGOSA (Gümbel)

Plate 6, figures 7 a, b

The specimen figured may belong to this species, although there were not enough of them to give the full specific characters.

Genus CIBICIDES Montfort, 1808

CIBICIDES species

Plate 6, figures 4, 8

These figures probably represent two distinct species. There is so much variation in these attached forms that it does not seem wise to give them specific names until a study may be made of a larger series to show developmental steps and variation, and especially the characters associated with microspheric and megalospheric forms.

EXPLANATION OF PLATES

PLATE 1

- FIGS. 1 a, b. *Gaudryina triangularis*. $\times 100$. a, front view; b, apertural view.
 2 a-c. *Quinqueloculina punctulata*. $\times 50$. a, b, opposite sides; c, apertural view.
 3 a-c. *Triloculina gracilis*. $\times 95$. a, b, opposite sides; c, apertural view.
 4 a-c. *Quinqueloculina laevigata*. $\times 150$. a, b, opposite sides; c, apertural view.
 5 a-d. *Quinqueloculina durandi*, new species. a, b, opposite sides; c, d, apertural views. a-c, $\times 95$; d, $\times 190$.
 6 a-c. *Triloculina subrotunda*. $\times 50$. a, b, opposite sides; c, apertural view.
 7 a-c. *Quinqueloculina vulgaris*. $\times 100$. a, b, opposite sides; c, apertural view.

PLATE 2

- FIGS. 1 a-c. *Triloculina crassa*. $\times 50$. a, b, opposite sides; c, apertural view.
 2 a-c. *Triloculina rotunda*. $\times 50$. a, b, opposite sides; c, apertural view.
 3. *Cornuspira involvens*. $\times 65$.
 4 a-c. *Fischerina dubia*. $\times 100$. a, dorsal view; b, peripheral view; c, ventral view.
 5 a, b. *Lenticulina convergens*. $\times 95$. a, side view; b, peripheral view.
 6 a-c. *Carterina fulva*. $\times 150$. a, dorsal view; b, peripheral view; c, ventral view.

PLATE 3

- FIGS. 1 a-c. *Marginulina* species. $\times 150$. a, side view; b, apertural view; c, front view.
 2, 3. *Nodosaria substriatula*. $\times 95$. a, a, front views; b, b, apertural views.
 4 a, b. *Lagena striata*. $\times 95$. a, front view; b, apertural view.
 5 a, b. *Lagena laevigata*. $\times 95$. a, front view; b, apertural view.
 6 a, b. *Lagena* species. $\times 95$. a, front view; b, apertural view.
 7 a, b. *Sigmoidella (Sigmoidina) pacifica*. $\times 95$. a, front view; b, apertural view.
 8 a, b. *Elphidium articulatum*, variety *rugulosum*. $\times 95$. a, side view; b, peripheral view.
 9 a-c. *Elphidium schmitti*, new species. $\times 100$. a, b, opposite sides; c, peripheral view.

- 10 *a, b. Elphidium* species. $\times 65$. *a*, side view; *b*, peripheral view.
 11 *a, b. Bulimina patagonica*. $\times 95$. *a, b*, opposite sides.
 12 *a, b. Buliminella elegantissima*. $\times 95$. *a, b*, opposite sides.

PLATE 4

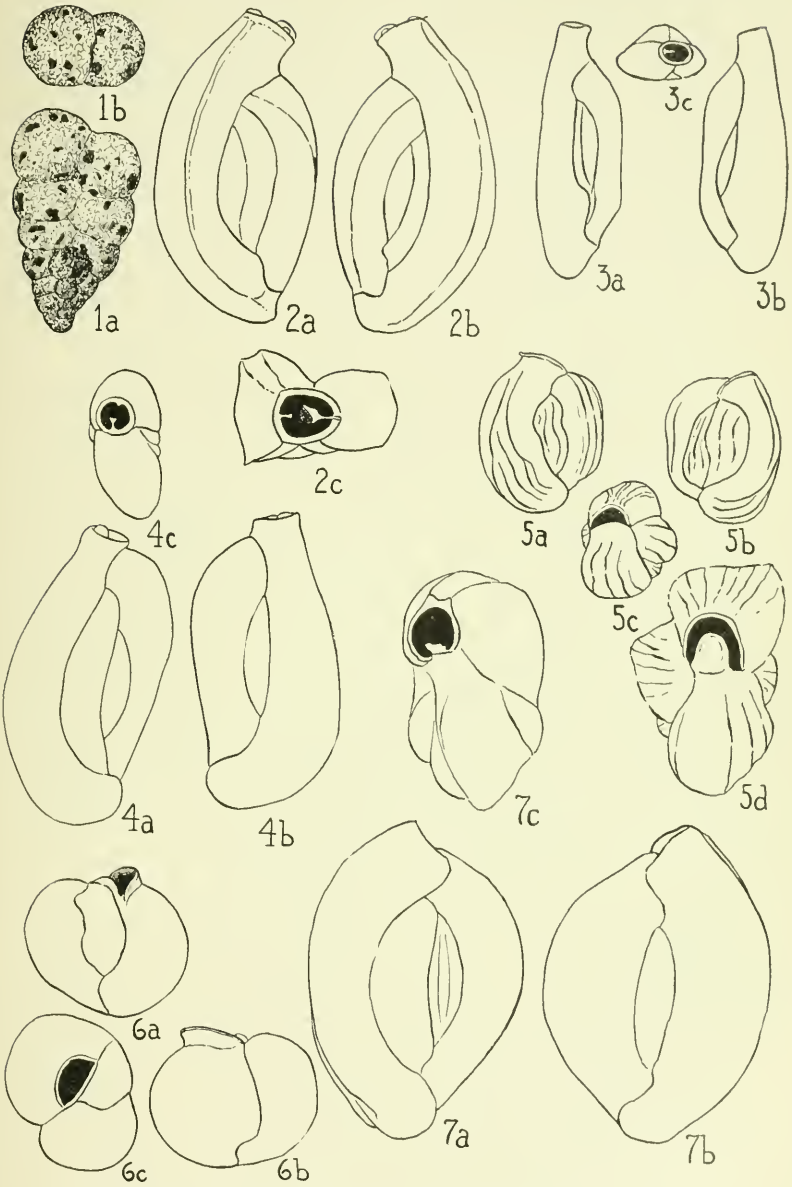
- FIGS. 1 *a-c. Bulimina patagonica*, variety *glabra*. $\times 95$. *a, b*, opposite sides; *c*, apertural view.
 2 *a, b. Virgulina schreibersiana*. $\times 95$. *a, b*, opposite sides.
 3 *a, b. Bolivina doniezi*, new species. $\times 95$. *a*, front view; *b*, apertural view.
 4 *a, b. Bolivina subexcavata*, new species. $\times 95$. *a*, front view; *b*, apertural view.
 5 *Bolivina* cf. *karreriana*, variety *carinata*. $\times 95$.
 6 *a-c. Loxostomum* cf. *mayori*. $\times 65$. *a, b*, opposite sides; *c*, apertural view.
 7 *a-d. Angulogerina carinata*. $\times 95$. *a-c*, views from different sides; *d*, apertural view.
 8 *a-c. Urigerina virgulinoidea*, new species. $\times 150$. *a, b*, opposite sides; *c*, apertural view.
 9 *a, b. Spirillina vivipara*, variety. $\times 150$. *a, b*, opposite sides.
 10 *a-c. Patellina advena*. $\times 95$. *a*, dorsal view; *b*, ventral view; *c*, side view.

PLATE 5

- FIGS. 1 *a-c. Spirillina spinigera*, variety. $\times 95$. *a, c*, opposite sides; *b*, peripheral view.
 2-4. *Tretomphalus bulloides*. $\times 95$. 2*a*, dorsal view; 2*b*, ventral view of young specimen. 3, peripheral view. 4*a*, dorsal view; 4*b*, side view of adult.
 5 *a-c. Cassidulina crassa*. $\times 95$. *a, b*, opposite sides; *c*, peripheral view.
 6 *a-c. Globigerina conglomerata*. $\times 95$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.
 7 *a-c. Globigerina* species. $\times 150$. *a*, ventral view; *b*, peripheral view; *c*, dorsal view.
 8 *a-c. Globigerina inflata*. $\times 50$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.

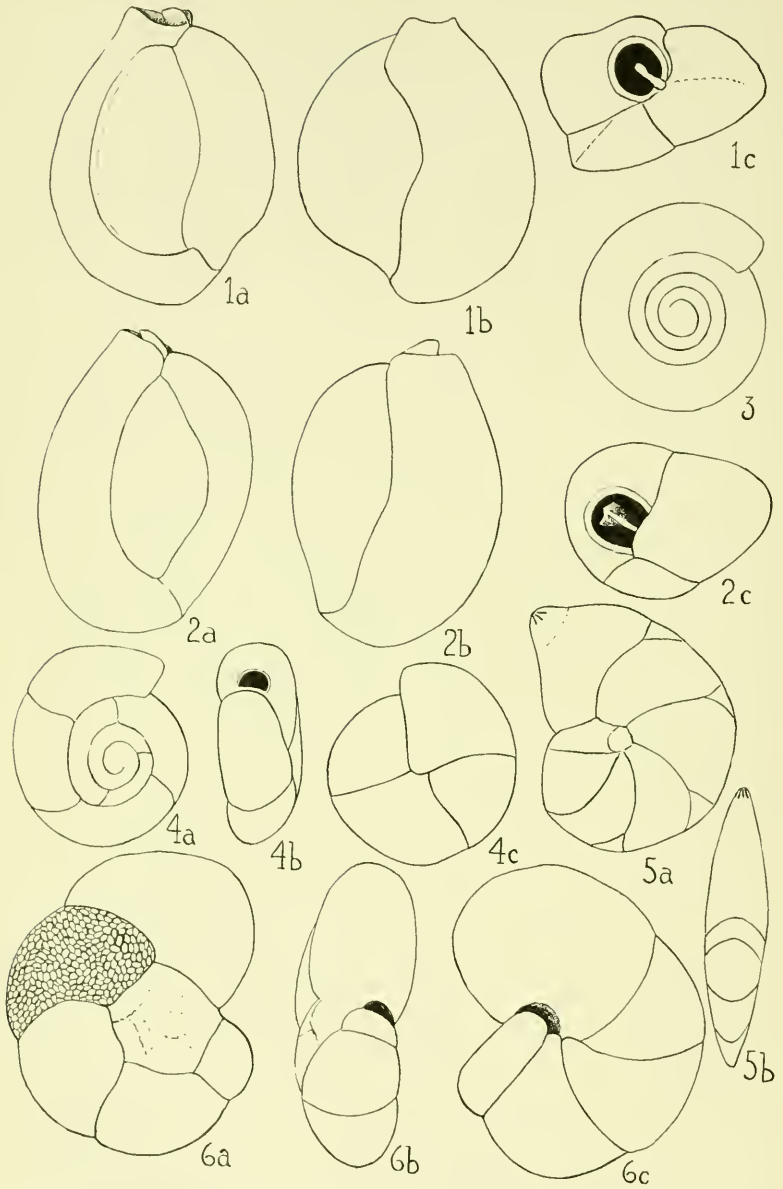
PLATE 6

- FIGS. 1 *a-c. Globigerina triloba*. $\times 50$. *a*, peripheral view; *b*, dorsal view; *c*, ventral view.
 2 *a-c. Globorotalia menardii*. $\times 50$. *a*, ventral view; *b*, peripheral view; *c*, dorsal view.
 3 *a-c. Globorotalia truncatulinoides*. $\times 65$. *a*, ventral view; *b*, peripheral view; *c*, dorsal view.
 4 *a-c. Cibicides* species. $\times 45$. *a*, peripheral view; *b*, ventral view; *c*, dorsal view.
 5 *a-c. Anomalina schmitti*, new species. $\times 95$. *a*, ventral view; *b*, dorsal view; *c*, peripheral view.
 6 *a-c. Anomalina* (?) species. $\times 95$. *a, c*, opposite sides; *b*, peripheral view.
 7 *a, b. Anomalina* cf. *grosserugosa*. $\times 50$. *a*, peripheral view; *b*, dorsal view.
 8 *a-c. Cibicides* species. $\times 45$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view.
 9 *a-c. Anomalina coronata*. $\times 95$. *a, b*, opposite sides; *c*, peripheral view.



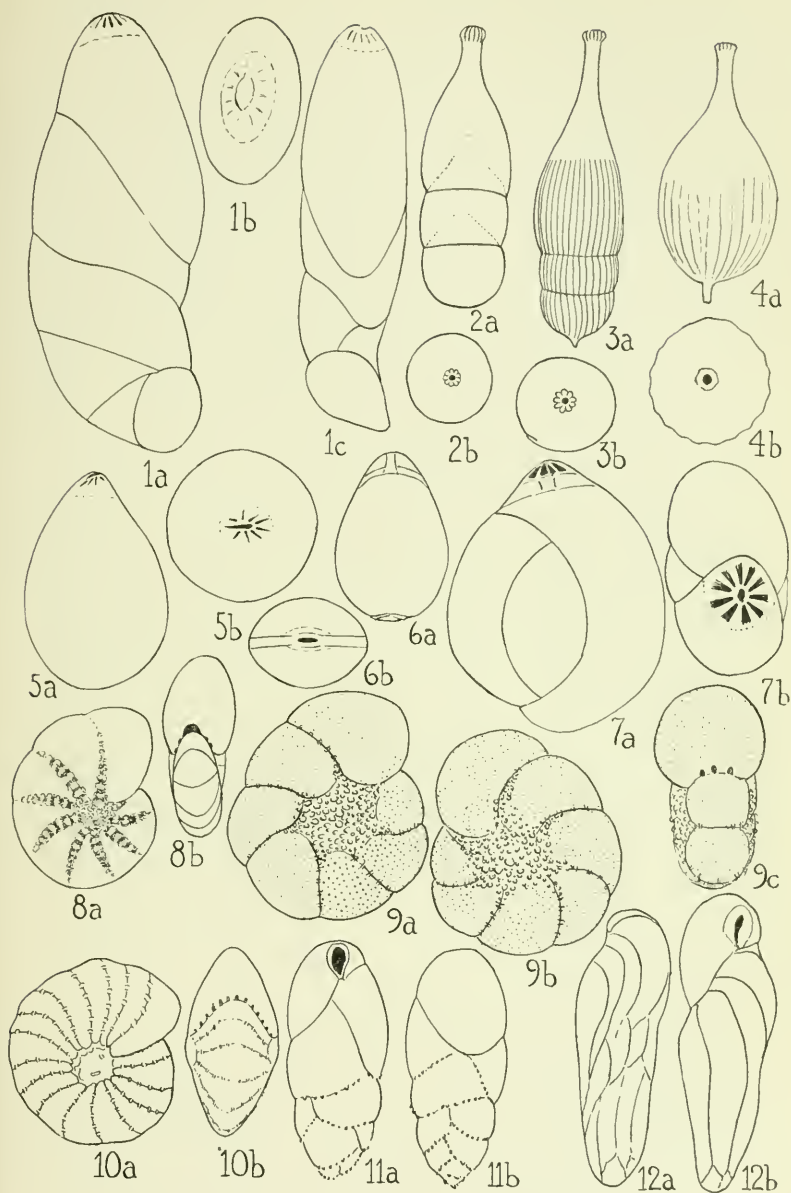
FORAMINIFERA FROM OFF JUAN FERNANDEZ ISLANDS

FOR EXPLANATION OF PLATE SEE PAGE 15



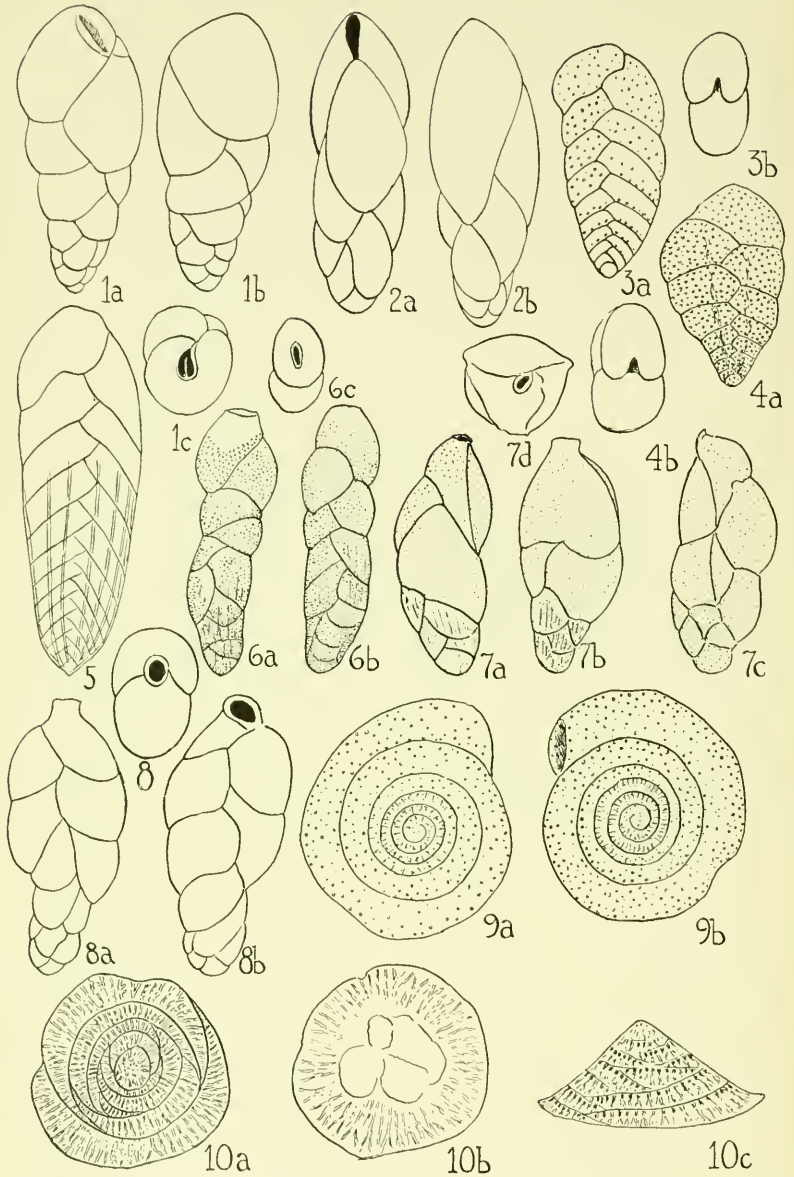
FORAMINIFERA FROM OFF JUAN FERNANDEZ ISLANDS

FOR EXPLANATION OF PLATE SEE PAGE 15



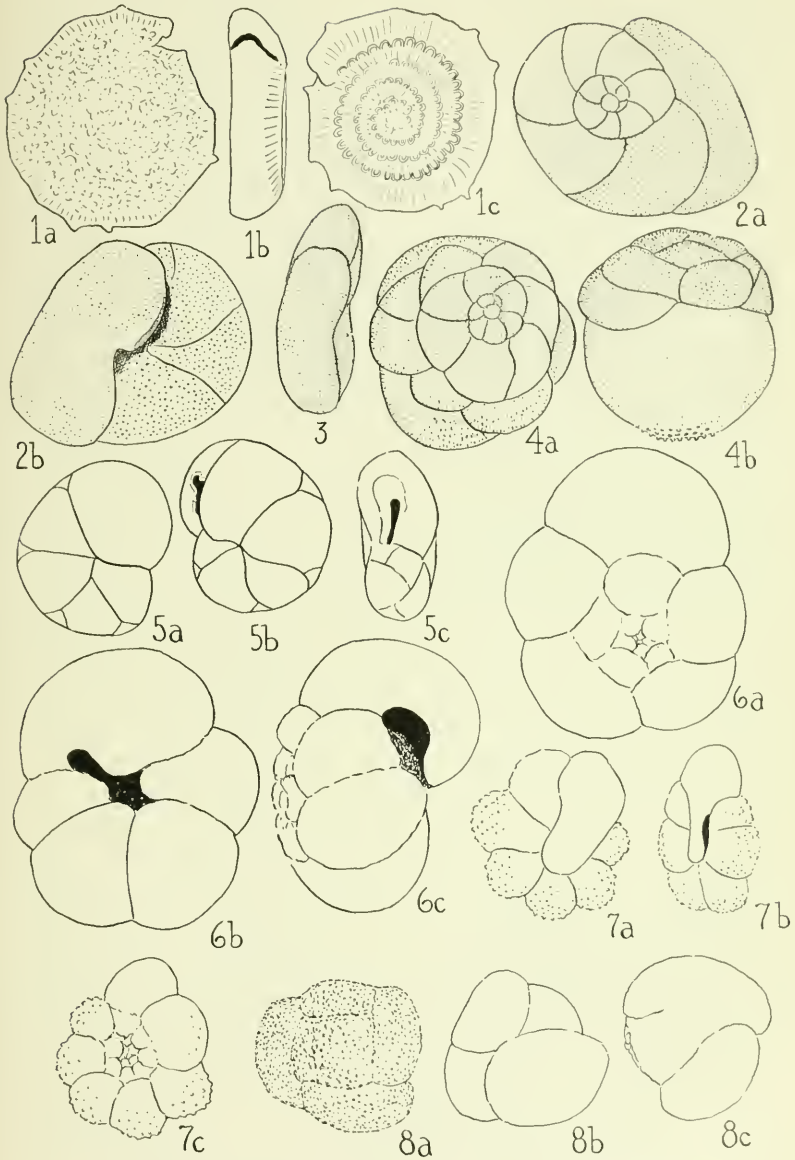
FORAMINIFERA FROM OFF JUAN FERNANDEZ ISLANDS

FOR EXPLANATION OF PLATE SEE PAGES 15 AND 16



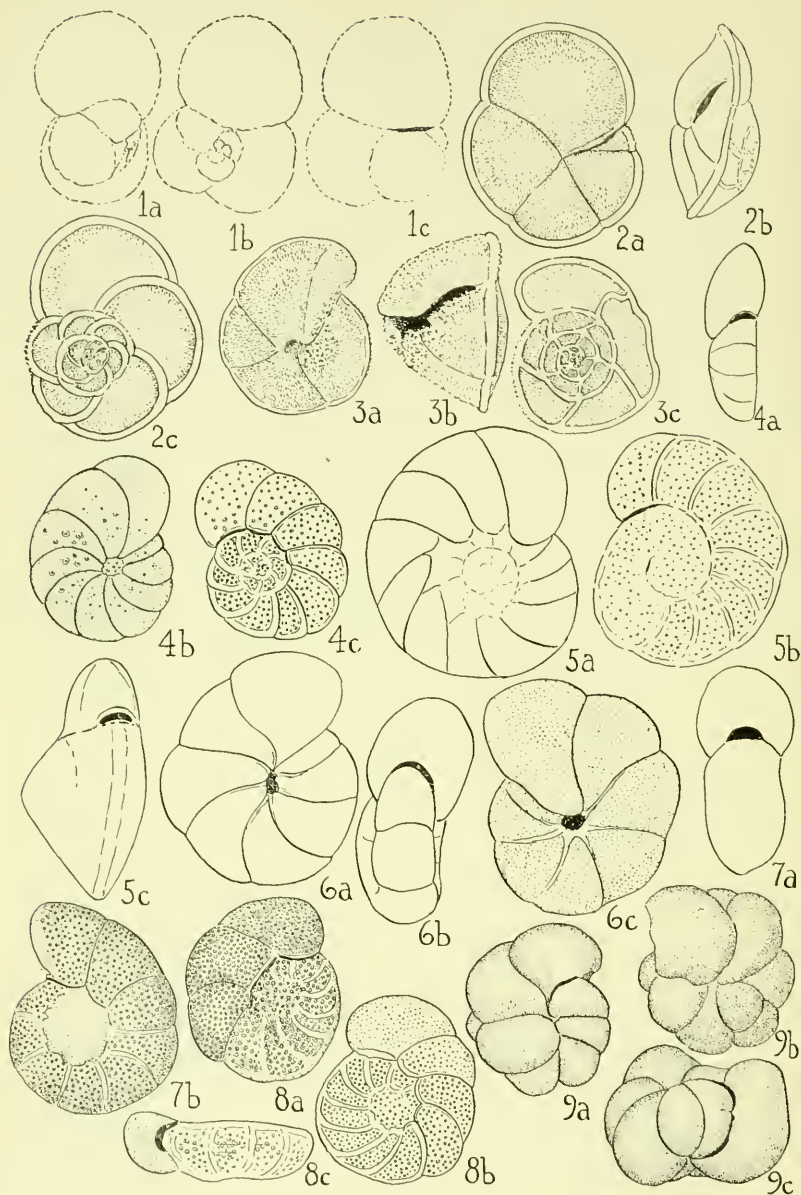
FORAMINIFERA FROM OFF JUAN FERNANDEZ ISLANDS

FOR EXPLANATION OF PLATE SEE PAGE 16



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FOR EXPLANATION OF PLATE SEE PAGE 16

