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# THE FORAMINIFERA OF THE ATLANTIC OCEAN

PART 3. TEXTULARIIDAE

BY

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# INTRODUCTION.

This paper is the third part of a work the intent of which is to describe and illustrate the Foraminifera of the Atlantic Ocean, especially those species which have occurred in the waters adjacent to the shores of the United States, including the whole of the Gulf of Mexico and the Carribean Sea, that being the area in which most of the work of the vessels of the United States engaged in dredging work has been done. This part includes only the family Textulariidae. The first part issued in 1918 included the family Astrorhizidae, and the second part issued in 1920 included the family Lituolidae.

JOSEPH AUGUSTINE CUSHMAN.

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# THE FORAMINIFERA OF THE ATLANTIC OCEAN.

## TEXTULARIIDAE.

By Joseph Augustine Cushman,
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### INTRODUCTION.

This third part of the work on the Atlantic Foraminifera deals entirely with the Textulariidae, a family allied to the Astrorhizidae, which took up Part 1 of this work, and the Lituolidae, which took up Part 2, in that the test in numerous genera is made up of foreign material, sand grains, etc. The same arrangement of data is followed as in Parts 1 and 2. The classification is that adopted in Part 1 of my work on the North Pacific Foraminifera. The distribution of various species still further emphasizes the faunal areas developed in the western Atlantic and their relation to the Indo-Pacific. Many of these species recorded in this part are evidently limited in their distribution to the western Atlantic.

### SYSTEMATIC PART.

A systematic presentation of the various groups of the family follows:

### Family 4. TEXTULARIIDAE.

Test either arenaceous or calcareous, perforate, the chambers usually numerous, typically biserial or triserial, or in some genera spirally arranged.

The family Textulariidae is apparently more primitive than most of the other families of the Foraminifera and seems to naturally follow the Lituolidae in its general characters. A number of the simpler genera are wholly or in part composed of species with arenaceous tests, and this in itself is a primitive character. Many species are known in both microspheric and megalospheric forms, the former, as in other groups, repeating more of the phylogenetic characters than are seen in the megalospheric form. In many species of various genera the microspheric form shows a coiled early development, following the proloculum, and this may be taken as the primitive character for the whole group. This coiled stage may be compared

to the entire development of such a genus as *Haplophragmoides* in the Lituolidae.

In the most primitive subfamily, the Spiroplectinae, the coiled development is continued for a fairly long period, and makes up a considerable portion of the test. This coiled stage also occurs in both the microspheric and megalospheric forms, showing that this subfamily is decidedly primitive and has not as yet become so specialized as to lose the coiled stage in the megalospheric form. In *Spiroplecta*, the only genus of this subfamily, the coiled development is followed by a series of more or less numerous chambers arranged biserially. *Spiroplecta* in its stages of development recapitulates the essential features of the Textulariidae—a proloculum, followed by a closely coiled series of chambers, in turn followed by a biserially arranged group. This sequence is the basis of the development throughout the family, as will be shown, and is not an exceptional character.

In the Textulariinae, the typical genus of which, *Textularia*, may be taken as an example, the same stages are shown, but are modified by specialization and acceleration of development. The earlier stages are either much reduced or are entirely skipped. Microspheric forms of certain species of *Textularia* have been referred by many later writers to *Spiroplecta*, but in the type species of *Textularia* both of these forms occur, and if such a procedure were adhered to the genus *Textularia* would have to be made synonymous with *Spiroplecta* and the former used as the older name, the latter being dropped. As used here, however, *Spiroplecta* includes simply those species which have a very considerable coiled stage, and in which it usually occurs in both forms, microspheric and megalospheric.

In *Textularia* it is only very rarely, so far as observed, that a coiled stage occurs in the megalospheric form, and then in but a very few chambers. It is obvious, therefore, that the microspheric form of many species of *Textularia* has a coiled development in the young.

In this same subfamily have been included those other genera which have essentially a biserial arrangement of the chambers, such as *Bolivina* and *Pavonina*, and a biserial development followed by a uniserial, as in *Bigenerina*. In this last genus there is a coiled development in the microspheric form of at least one species.

In the subfamily Verneuilininae the typical arrangement of the adult chambers is triserial instead of biserial, but here again there is in the microspheric form of some species a coiled series of chambers in the young. The specimens are much more difficult to manipulate, and the coiled series may be more common than many at first appear. The expected modification—the return to the biserial condition of

the previous subfamily—takes place in *Gaudryina*, in some species only in the last-formed chambers, in other species appearing by acceleration of development early in the life history, the triserial portion much reduced. In *Clavulina* there is a complete return to the uniserial condition, but with the triserial character present in the young.

The subfamily Bulimininae, as here considered, includes the spiral forms with a loop-shaped aperture, such as *Bulimina* and *Virgulina*, the latter tending to assume a biserial arrangement. The test here is hyaline and perforate.

The subfamily Cassidulininae includes species which are like the Bulimininae in their aperture, but which have a peculiar arrangement of the chambers. These are biserial, but are secondarily coiled in a helicoid spiral. In *Cassidulina* the species are either completely involute, or in late growth are somewhat uncoiled. In *Ehrenbergina* the uncoiling takes place early and little of the involute character is seen.

The Textulariidae as a whole are much more rich in ornamentation and complex forms than are any of the preceding families. In *Bolivina* and in some species of *Bulimina*, *Ehrenbergina*, and *Virgulina*, there is a considerable range of ornamentation, punctae, limbate sutures, knobs or bosses, costae and spines being the most common forms. On the whole, however, the ornamentation is simple and uninteresting compared with that seen in the Lagenidae.

### Subfamily 1. Spiroplectinae.

Test either coarsely arenaceous or calcareous, or even hyaline, the early chambers following the proloculum closely coiled, the later chambers biserial, occasionally tending to become uniserial in the last developed chambers.

This subfamily includes the single genus *Spiroplecta*, which in its developmental stages connects the Textulariidae with the Lituolidae. Its development is primitive in that the stages are seen in both the microspheric and megalospheric forms of the species, and are of comparatively long duration.

#### Genus SPIROPLECTA Ehrenberg, 1844.

*Spiroplecta* Ehrenberg (type, *S. americana* Ehrenberg), Monatsber. preuss. Akad. Wiss. Berlin, 1844, p. 75.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 375.—Chapman, The Foraminifera, 1902, p. 170.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 4.

*Description.*—Test with the early chambers close-coiled in both the microspheric and megalospheric forms, later chambers biserial, wall typically arenaceous.

This genus is known from as far back as the lower Cretaceous. Some of the species have a very elongate biserial condition, and in others the two parts are nearly equal. In some species of *Textularia* also there is a coiled stage in the early development of the microspheric form, but it is not usually present in the megalospheric form of the same species.

*Spiroplecta* is here limited to the species which show both in the microspheric and megalospheric forms a definite coiled stage. The best developed species seem to be from the Indo-Pacific region, but *Spiroplecta biformis* seems to be very largely a species of cold waters.

**SPIROPLECTA BIFORMIS (Parker and Jones).**

*Textularia agglutinans* d'Orbigny, var. *biformis* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 370, pl. 15, figs. 23, 24.

*Textularia biformis* H. B. Brady, Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 436, pl. 20, fig. 8.

*Spiroplecta biformis* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 376, pl. 45, figs. 25–27.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 333, pl. 13, fig. 21.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 895.—Schlumberger, Mèm. Soc. Zool. France, 1894, p. 239.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 38, pl. 7, figs. 308–312.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Earland, Journ. Quekett Micr. Club., ser. 2, vol. 9, 1905, p. 204.—Awerinzew, Mem. Acad. Imp. Sci. St. Petersburg, ser. 8, vol. 29, No. 3, 1911, p. 17.—Kiaer, in Duc d'Orleans Crois. Océan, Mèr du Grönland, 1905 (1907), p. 560.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 310; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 56.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1012.—Heron-Allen and Earland, Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 231.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 22.

*Description.*—Test small, elongate, compressed, initial end broadly rounded, sides nearly parallel, rounded, apertural end bluntly pointed; early chambers close-coiled, later ones biserial, inflated; sutures distinct, depressed, wall arenaceous, with reddish-brown cement, rather smoothly finished on the exterior; aperture at the base of the inner margin of the last-formed chamber.

Length about 0.25 mm.

*Distribution.*—Parker and Jones described this species from off the Hunde Islands, Davis Strait, in 60 to 70 fathoms (110 to 128 meters). From the known records of this species it is characteristically an Arctic species of comparatively shallow water and very deep cold water elsewhere. Specimens are recorded from the coasts of Europe and the British Isles and in the Gulf of St. Lawrence. In the Arctic it is known from off Franz Josef Land, the west coast of Nova Zembla, Baffin Bay and Smith Sound, Spitzbergen, Barents Sea, Nordenskiold Sea, at depths ranging from 2 to 270 fathoms (4 to 496 meters), and in the Antarctic in 2,110 fathoms (3,859 meters), *Scotia* station 337A (Pearcey).

SPIROPLECTA FUSCA Earland.

Plate 4, fig. 4.

*Spiroplecta fusca* Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 204, pl. 12, figs. 1–3.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1909, p. 331; Trans. Linn. Soc. London, vol. 11, ser. 2, Zoology, 1912, p. 232.

This species described by Earland from the sands at Bognor has been recorded also from Selsey Bill and from the coast of Scotland. It is not known except about the British Isles.

SPIROPLECTA WRIGHTII Silvestri.

Plate 4, figs. 5–8.

*Spiroplecta sagittula* (Defrance) Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 471; Irish Nat., vol. 11, 1902, p. 211, pl. 3.

*Spiroplecta wrightii* Silvestri, Atti Accad. Rom. Nuovi Lincei, Ann. 56, 1903, pp. 1–5 (woodcuts).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 64.

The Spiroplectine forms often referred to *Textularia sagittula* have been named by Silvestri *Spiroplecta wrightii*. Such forms seem to be common off the coast of the British Isles but are not known from the western Atlantic.

## Subfamily 2. Textulariinae.

Test typically biserial, wholly or in part, the early portion in the microspheric form often with a few coiled chambers, followed by the biserial chambers; later chambers variously modified in the different genera, uniserial, broadly extended, etc.; wall either arenaceous or calcareous and hyaline, perforate; aperture single, or in a few cases, many present in a single chamber.

This subfamily includes those forms which are essentially biserial in their development, not having reached the triserial stage anywhere in their stages of development. The stages in the simpler genera are like those of *Spiroplecta*, except in duration, the biserial condition being taken on much earlier than in that genus. Variously modified forms occur as in the uniserial arrangement in *Bigenerina*, the broadly flaring later growth of *Pavonina*, and the peculiarly modified aperture in *Pleurostomella*.

### Genus TEXTULARIA Defrance, 1824.

*Textularia* Defrance (type, *T. sagittula* Defrance), Dict. des Sci. Nat., vol. 32, 1824, p. 177; vol. 53, 1828, p. 344; Atlas Conch., pl. 13, fig. 5.—Chapman, The Foraminifera, 1902, p. 165.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 5.

*Textilaria* Ehrenberg, Abh. preuss. Akad. Wiss. Berlin, 1839, p. 135.

*Grammostomum* Ehrenberg (part), Abh. preuss. Akad. Wiss. Berlin, 1839, p. 129.

*Plecanium* Reuss, Sitz. Akad. Wiss. Wien, vol. 44, 1861 (1862), p. 383.

*Description.*—Test elongate, tapering, composed of two series of alternating chambers; wall calcareous in the young, hyaline and perforate, occasionally so throughout the test, often with an external coating of siliceous or calcareous sand, or in some species nearly the whole test arenaceous; aperture typically an arched slit at the inner margin of the chamber close to its line of attachment to the preceding chamber; occasionally with the aperture surrounded by a raised lip, or in some species with the aperture circular and terminal.

There are numerous modifications in the species of the genus due mainly to differences in the amount and the direction of compression. Except for spines and accessory growths of the sutures and periphery there is little ornamentation. The young of the microspheric form is often coiled but usually not that of the megalospheric form. Typically the genus consists of forms with an arenaceous test, either smoothly finished or rough, with a series of chambers alternating on opposite sides of a central axis. The aperture typically is in a reentrant of the inner margin of the apertural end but in some species may become terminal or even a series of pores.

From this genus are developed numerous forms such as *Bigenerina*, etc., which have evidently been derived from such forms as *Textularia*. Its geological history goes very far back, at least into the Paleozoic. Its range is given by Chapman as Cambrian to Recent. In the present oceans it reaches its best development in shallow water of tropical seas but is abundant in some parts of the temperate zone, and a few species live at considerable depths.

#### TEXTULARIA SAGITTULA Defrance?

Specimens from two stations, D2311, in 79 fathoms (145 meters), and D2314, in 159 fathoms (291 meters), off the southeastern coast of the United States, may possibly belong to this species although they are not typical. They are represented by single specimens and a note of their occurrence is all that can be done with them at the present time.

Much more typical specimens of this species occur off the coasts of Europe, as is noted by many authors.

*Textularia sagittula—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17034 | U.S.N.M. | 1 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s. bk. sp. | Rare. |
| 17035 | U.S.N.M. | 1 | D2314... | 32 43 00 N.; 77 51 00 W.. | 159 | 47.4 | crs. s. bk. sp. | Rare. |

TEXTULARIA SAGITTULA Defrance, var. JUGOSA H. B. Brady.

Heron-Allen and Earland record a single specimen which they have referred to this variety from off the western coast of Scotland.[1]

TEXTULARIA MAYORI Cushman.

*Textularia mayori* CUSHMAN, Publ. 311, Carnegie Inst. Wash., 1922, p. 23, pl. 2, fig. 3.

*Description.*—Test compressed, increasing rapidly in breadth, initial end rounded, apertural end obliquely truncate; surface fairly smooth; chambers rather indistinct; sutures slightly depressed; periphery of each chamber with an elongate, conical, spinose projection, often broken at the tips, those of the early portion directed backward, the later ones extending straight outward; wall arenaceous, of angular sand-grains with much fine cement; aperture very low, elongate, at the inner border of the last-formed chamber, in a reentrant of the border, with a thin lip above; color gray.

Length up to 0.80 mm.

This species occurred at 5 stations in the Tortugas area, usually those of greater depths. I have failed to find it in other material from the West Indies or Caribbean, although it is a striking form and could hardly be overlooked. With its peripheral spines it resembles such species as *T. carinata* d'Orbigny, *T. horrida* Egger, and *T. sagittula* Defrance, var. *fistulosa* H. B. Brady, but is different from any of these.

It is named in honor of Dr. Alfred G. Mayor, Director of the Tortugas Laboratory of the Carnegie Institution of Washington.

TEXTULARIA AGGLUTINANS d'Orbigny.

Plate 1, figs. 4, 5.

*Textularia agglutinans* D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 136, pl. 1, figs. 17, 18, 32, 34.—GÖES, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 41.—FLINT (part), Rep. U. S. Nat. Mus., 1897 (1899), p. 284, pl. 29, fig. 4.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 49, pl. 11, figs. 1–3; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 106, pl. 20, fig. 8; Publ. 311, Carnegie Inst. Wash., 1922, p. 22, pl. 1, fig. 6.

*Description.*—Test elongate, tapering, compressed, the periphery rounded; chambers inflated, increasing in height toward the apertural end; sutures distinct, depressed, wall rather coarsely arenaceous, but smoothly finished; aperture an elongate slit in a well-marked depression of the inner border of the chamber; color gray.

Length 1 mm. or slightly more.

*Distribution.*—D'Orbigny described this species from the shore-sands of Cuba. In the West Indian region typical specimens of this

[1] Trans. Linn. Soc., London, ser. 2, vol. 11, 1916, p. 229.

species occur in the region southward from Cape Hatteras, the Gulf of Mexico, and the Caribbean in comparatively shallow water. These fit well the description given by d'Orbigny. I have had it also from the coast of Jamaica. It has been customary for authors to place under this name most any form of elongate tapering *Textularia*, but from an examination of material from the West Indian region, it seems here to have a definite distribution and well defined characters. Its southward distribution reaches at least to southeastern Brazil, near Pernambuco, where it is recorded by Brady and Flint, and from which region I have *Albatross* material.

*Textularia agglutinans—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16970 | U.S.N.M. | 1 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Rare. |
| 16971 | U.S.N.M. | 1 | D2312... | 32 54 00 N.; 77 53 30 W.. | 88 | 57.8 | crs. s. bk. sp. | Rare. |
| 16972 | U.S.N.M. | 2 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Rare. |
| 16973 | U.S.N.M. | 2 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co.. | Rare. |
| 16974 | U.S.N.M. | 3 | D2388... | 29 24 30 N.; 88 01 00 W.. | 35 | ..... | yl. s. bk. sp. | Rare. |
| 16975 | U.S.N.M. | 3 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16977 | U.S.N.M. | 8 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Common. |
| 16978 | U.S.N.M. | 3 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 16979 | U.S.N.M. | 6 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Few. |
| 16980 | U.S.N.M. | 1 | ..... | Fowey, Fla..... | 55 | ..... | ..... | Rare. |
| 16981 | U.S.N.M. | 1 | ..... | Key West, Fla..... | 78 | ..... | ..... | Rare. |
| 16982 | U.S.N.M. | 5 | ..... | Off Bell, Fowey, Fla..... | 22 | ..... | ..... | Few. |

**TEXTULARIA CANDEIANA d'Orbigny.**

Plate 1, figs. 1–3.

*Texularia candeiana* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 143, pl. 1, figs. 25–27.—Fornasini, Mem. Accad. Sci., Bologna, ser. 5, vol. 10, 1903, p. 137, pl. 0, fig. 8.—Chapman, Rep. For. Subantarctic Ids., New Zealand, 1909, p. 329.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 12, figs. 14–17 (in text); Publ. 291, Carnegie Inst. Washington, 1919, p. 32; Proc. U. S. Nat. Mus., vol. 59, 1921, p. 50, pl. 11, figs. 7, 8; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 109; Publ. 311, Carnegie Inst. Wash., 1922, p. 23, pl. 2, fig. 2.

*Textularia sagittula* Defrance, var. *candeiana* Millett, Journ. Roy. Micr. Soc., 1899, p. 562, pl. 7, fig. 2.

*Description.*—Test elongate, club-shaped, the early portion narrow, much compressed, the edges almost carinate, slightly tapering to the round-pointed apex, the later chambers enlarging rapidly, much inflated; chambers numerous; wall rather coarsely arenaceous; aperture in a broad but shallow sinus at the base of the inner margin of the chamber; color dark gray.

Length about 1 mm.; microspheric proloculum about 0.015 mm., megalospheric proloculum about 0.050 mm.

*Distribution.*—D'Orbigny's original material of this species was from Cuba, Martinique, and St. Thomas. I have had specimens from Montego Bay, Jamaica, in 10 fathoms (18 meters). Specimens in the *Albatross* dredgings are from off the coast of Georgia, and off Cuba. It seems to occur in tropical regions elsewhere. Heron-Allen and Earland record it from off the British Isles, but the figures given are different from the typical form as developed in the West Indies.

*Textularia candeiana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16966 | U.S.N.M. | 5 | D2311 | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s.bk. sp.. | Few. |
| 16967 | U.S.N.M. | 5 | D2312 | 32 54 00 N.; 77 53 30 W.. | 88 | 57.8 | crs. s.bk. sp.. | Few. |
| 16968 | U.S.N.M. | 1 | D2318 | 24 25 45 N.; 81 46 00 W.. | 45 | 75.0 | co..... | Rare. |
| 16969 | U.S.N.M. | 1 | D2420 | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk. s.m.g.... | Rare. |

**TEXTULARIA GOËSII Cushman.**

Plate 1, fig. 6.

*Textularia sagittula* Defrance, var. Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, pl. 5, figs. 150–158.

*Textularia trochus* H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 366, pl. 43, fig. 17 (not 15, 16, 18, 19); pl. 44, figs. 1–3 [not *T. trochus* d'Orbigny].

*Textularia goësii* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 15, fig. 24 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 113, pl. 21, fig. 3.

*Distribution.*—There are a few specimens from the Gulf of Mexico and from the Caribbean which may belong to this species. The specimens figured by Flint under the name of *T. gramen* [2], from *Albatross* station D2150 may be this same species. I have other specimens from this same station, which resemble very much Flint's figured ones.

*Textularia goësii—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17043 | U.S.N.M. | 2 | D2150 | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Rare. |

**TEXTULARIA FUSIFORMIS Defrance.**

Heron-Allen and Earland record a single specimen of this species from off the west coast of Scotland.[3]

[2] Rep. U. S. Nat. Mus., 1897 (1899), pl. 29, fig. 5.

[3] Trans. Linn. Soc., London, ser. 2, vol. 11, 1916, p. 229.

### TEXTULARIA GLOBULOSA Ehrenberg.

This species is recorded as recent off the Irish coast by Balkwill and Wright [4], by Brady [5], and by Wright.[6] Heron-Allen and Earland do not record it as recent in their various papers from the British coast.

### TEXTULARIA GRAMEN d'Orbigny.

An examination of the figured specimens referred to this species by numerous authors and a comparison of these with the original figures of *T. gramen* given by d'Orbigny in his Vienna Basin Mèmoire shows how many different forms are placed under this name and how different most of them are from d'Orbigny's original type.

There is almost nothing in the western Atlantic material that can well be referred to this species. On the coasts of Europe specimens occur which show a broad, short form which, from an examination of the records, seems at least by some authors to have been referred to this species. I have had specimens from European material which may belong to this species, and which are different from any of the specimens of the western Atlantic.

### TEXTULARIA LUCULENTA H. B. Brady.

Plate 1, figs. 7–9.

*Textularia luculenta* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 364, pl. 43, figs. 5–8.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 42.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 284, pl. 29, fig. 3.

*Description.*—Test elongate, tapering, compressed, peripheral margin in the early portion angular, the later portion rounded, biserial, but toward the end the chambers tending to become uniserial, sides in the last half nearly parallel; chambers distinct, somewhat inflated, increasing in height toward the apertural end; sutures fairly distinct, very slightly compressed, wall finely arenaceous, rather smoothly finished, thick; aperture in the early portion as in *Textularia*, and in the last-formed chambers becoming nearly terminal, rounded; color light gray.

Length up to 2.5 mm.

*Distribution.*—Brady's original localities for this species are as follows: Off Sombrero Island, 450 fathoms (823 meters); off Culebra Island, 390 fathoms (713 meters); off Bermuda, 435 fathoms (796 meters), and off the coast of Brazil, south of Pernambuco, 350 and 675 fathoms (640 and 1,234 meters). Goës had the species from *Albatross* station D2150 in the western Caribbean. Flint records it from this same station, and from two others, D2315 in 37 fathoms (68 meters), off the coast of Cuba, and D2355, off Yucatan. I have

[4] Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882; Trans. Roy. Irish Acad., vol. 28, 1885, pp. 332, 447.
[5] Journ. Roy. Micr. Soc., 1887, p. 895.
[6] Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 471.

had specimens from D2150 only. The *Albatross* specimens are very similar to those figured by Brady, and some of those from D2150 are even more so than the figures given by Flint. This is a well characterized species and evidently of fairly wide distribution in the Caribbean and related areas. The fact that it has not been recorded elsewhere seems to show that its distribution is limited to this area. It is to be regretted that Brady did not describe as new more species of this character found in the West Indian region, instead of referring them to older names to which they evidently did not belong. It would have simplified the later work.

There are specimens from four stations off the southeast coast of the United States, which although they do not show the adult characters, are apparently young specimens belonging to this species.

*Textularia luculenta—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16946 | U.S.N.M. | 10 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Common. |
| 16965 | U.S.N.M. | 3 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Few. |
| 17025 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp.. | Rare. |
| 17026 | U.S.N.M. | 1 | D2644... | 25 40 00 N.; 80 00 00 W.. | 193 | 43.4 | gy. s..... | Rare. |
| 17027 | U.S.N.M. | 3 | D2659... | 28 32 00 N.; 78 42 00 W.. | 509 | 45.2 | br. for..... | Rare. |
| 17028 | U.S.N.M. | 9 | D2668... | 30 58 30 N.; 79 38 30 W.. | 294 | 46.3 | gy. s., dd. co. | Common. |
| 17029 | U.S.N.M. | 2 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

**TEXTULARIA PARVULA, new species.**

Plate 6, figs. 1, 2.

*Description.*—Test small, very much elongate, five or six times as long as wide, gradually tapering from the bluntly pointed apical end to the broadly rounded apertural end; chambers numerous, distinct, inflated, increasing but slightly in height as added, subglobular; sutures distinct, much compressed, wall finely arenaceous, smoothly finished; aperture slightly rounded, at the central part of the inner margin of the last-formed chamber; color grayish with a slight tinge of yellowish-brown.

Length up to 0.45 mm.

*Distribution.*—Type-specimen (U.S.N.M.No. 17041) from *Albatross* station H79 in 821 fathoms (1,485 meters), in the eastern part of the Caribbean Sea. There is also a specimen from *Albatross* station D2398 in 227 fathoms (416 meters) and D2150 in 382 fathoms (697 meters). This is a very distinct but minute species. Its elongate, tapering form and the large number of very distinct subglobular chambers will distinguish it.

*Textularia parvula—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17070 | U.S.N.M. | 5 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Few. |
| 17042 | U.S.N.M. | 1 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 17041 | U.S.N.M. | 1 | H79..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s., sh. for. | Rare. |

**TEXTULARIA CATENATA Cushman.**

Plate 6, fig. 3.

*Textularia catenata* CUSHMAN, Bull 71, U. S. Nat. Mus., pt. 2, 1911, p. 23, figs. 39, 40 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 112, pl. 23, fig. 5.

*Description.*—Test elongate, rounded in end view, composed of inflated chambers separated by rather deep sutures, making the outline of the test sinuous; wall somewhat coarsely arenaceous; aperture in the early chambers slit-like at the ventral border of the inner margin, in later chambers gradually moving away from the margin and in the last-formed chamber subterminal and rounded.

Length about 1 mm.; microspheric proloculum 0.022 mm.

*Distribution.*—There are single specimens from three stations southeast of New York which are very close, if not identical, with this species which I have described from the western Pacific in fairly deep water. They are perhaps less rounded than the Pacific form, but have the characteristic aperture which stands out, with a tubular neck some distance above the base of the chamber. There is another specimen which questionably may be this, from off Fowey Rocks, Florida, in 70 fathoms (128 meters).

*Textularia catenata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17030 | U.S.N.M. | 1 | D2105... | 37 50 00 N.; 73 03 50 W.. | 1,395 | 41.0 | glob. oz..... | Rare. |
| 17031 | U.S.N.M. | 1 | D2174... | 38 15 00 N.; 72 03 00 W.. | 1,594 | ..... | gy. m..... | Rare. |
| 17032 | U.S.N.M. | 2 | D2713... | 38 20 00 N.; 70 08 30 W.. | 1,859 | ..... | br. oz..... | Rare. |
| 17033 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla., S. by E. ½ E. | 70 | ..... | ..... | Rare. |

TEXTULARIA ABBREVIATA d'Orbigny(?)

Plate 2, fig. 1.

Brady, Parker, and Jones record this species from off the Abrohlos Bank at three stations.[7] I have had no typical material which can be referred to this species; only a single specimen of a short broad form from *Albatross* station D2572 in 1,769 fathoms (3,235 meters), southeast of New England, can be referred here.

*Textularia abbreviata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17044 | U.S.N.M. | 1 | D2572... | 40 29 00 N.; 66 04 00 W... | 1769 | 37.8 | gy. oz..... | Rare. |

TEXTULARIA ASPERA H. B. Brady.

Wright records this species as rare off the southeast coast of Ireland in 1,000 fathoms (1,829 meters).[8] Pearcey records it from the warm area of the Faroe Channel[9] and from the Antarctic in deep waters.[10] This is recorded in the *Challenger* material from stations 23 and 24, in 450 and 390 fathoms (823 and 713 meters), off the Danish West Indies, and at station 120, in 675 fathoms (1,234 meters), off the eastern coast of Brazil.

TEXTULARIA FLINTII Cushman, var. CAROLINIANA, new variety.

Plate 2, fig. 4.

*Description.*—Variety differing from the typical in the much more elongate form, rounded periphery, in the lesser amount of concavity on the basal sides of the chambers, narrower throughout.

*Distribution.*—Type-specimen (U.S.N.M. No. 17038) from *Albatross* station D2614, in 168 fathoms (307 meters), off the coast of Carolina. A specimen which perhaps may belong to this variety is from 70 fathoms (128 meters) off Fowey Rocks, Florida.

*Textularia flintii, var. caroliniana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | | | |
| 17038 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W... | 168 | ..... | gy. s. bk. sp.. | Rare. |
| 17039 | U.S.N.M. | 1 | ..... | Off Fowey, Fla., S. by E. ½ E. | 70 | ..... | ..... | Rare. |

[7] Trans. Zool. Soc. London, vol. 12, 1888, p. 219, pl. 42, figs. 4, 5.
[8] Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448.
[9] Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.
[10] Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1012.

**TEXTULARIA FLINTII Cushman, var. CURTA, new variety.**

Plate 2, figs. 2, 3.

*Textularia agglutinans* Flint (part), Rep. U. S. Nat. Mus., 1897 (1899), p. 284, pl. 29, fig. 4 (part) [not *T. agglutinans* d'Orbigny].

*Textularia rugosa* Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 131 [not *T. rugosa* (Reuss)].

*Textularia flintii* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 21, figs. 36*a*, *b* (in text).

*Distribution.*—Type-specimen (U.S.N.M. No. 17003) from *Albatross* station D2144, in 896 fathoms (1,639 meters), in the Caribbean. This species was originally referred by Flint to *T. agglutinans*, but, as has been previously pointed out, the two are very different. The Atlantic material shows this species only in the Caribbean, one station westward of the Windward Islands, the other three along the coast of Yucatan to Panama. There is very little variation in the specimens of this variety, but it differs from the Pacific specimens in having a more acute periphery and a broader shorter form.

*Textularia flintii, var. curta—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17002 | U.S.N.M. | 1 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s.. | Rare. |
| 17003 | U.S.N.M. | 5 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Few. |
| 17004 | U.S.N.M. | 8 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Common. |
| 17005 | U.S.N.M. | 2 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co... | Rare. |
| 17006 | U.S.N.M. | 1 | D2392... | 28 47 30 N.; 87 27 00 W.. | 724 | 40.7 | br. gy. m.... | Rare. |

**TEXTULARIA ALBATROSSI, new species.**

Plate 2, figs. 5, 6.

*Textularia concava* Flint (part) (not Karrer), Rep. U. S. Nat. Mus., 1897 (1899), p. 283.

*Description.*—Test elongate, much tapering, apical end bluntly pointed, apertural end broadly angled, in the later portion the breadth nearly equal to the thickness, concave at each side in the middle, periphery convex; chambers distinct, the last ones much inflated, low and broad, each with a reentrant portion near the central part at each side; sutures distinct, depressed, wall coarsely arenaceous, rather smoothly finished, especially in the later portion; aperture a long, narrow slit above the base of the chamber, with a slight lip; color gray.

Length up to 1.75 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17040) from *Albatross* station D2150, in 382 fathoms (697 meters), in the western part of the Caribbean Sea. Other specimens of this species occurred at this station, but it is not found elsewhere in the western Atlantic. An

examination of Flint's mounted slides shows that this is the form noted by him under *T. concava* from this station, as given in the above reference. In some of its characters it is related to *T. concava*, and in its reentrant at each side of the test reminds one of T. *rugosa* Reuss, but in most of its characters it is very different from any of these. The sides are very concave in the middle, but in end view the breadth is nearly equal to the width. The last two or three chambers are much inflated and do not show the concavity at the sides. From the material examined from the western Atlantic this species seems to be very limited in its distribution, being found nowhere but at this one station.

*Textularia albatrossi*—*material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 17040 | U.S.N.M. | 3 | D2150... | ° ′ ″ ° ′ ″ 13 34 45 N.; 81 21 10 W.. | 382 | °F. 45.8 | wh. crs. s.... | Few. |

TEXTULARIA CONCAVA Karrer.

This species is recorded by Wright and others off the southwest of Ireland and by Heron-Allen and Earland from four stations in the Clare Island region. I have seen no Atlantic material which I should refer to the typical form of this species.

TEXTULARIA CONCAVA Karrer, var. HETEROSTOMA Fornasini.

Plate 2, figs. 7, 8.

Heron-Allen and Earland record two specimens of this variety from a station west of Scotland.[11]

TEXTULARIA SUBPLANA, new species.

Plate 2, fig. 10.

*Textularia concava* FLINT (not Karrer) (part), Ann. Rep. U. S. Nat. Mus., 1897 (1899), p. 283, pl. 28, fig. 5 (part).

*Description.*—Test about twice as long as wide, tapering from the bluntly rounded initial end, very much compressed, sides flat, periphery flattened at right angles to the sides; chambers increasing slightly in height as added, rectangular; sutures distinct but not depressed, wall arenaceous with a large proportion of cement, very smoothly finished; color gray.

Length up to 1 mm. or slightly more.

*Distribution.*—Type-specimen (U.S.N.M. No 17045) from *Albatross* station D2641, in 60 fathoms (110 meters), off Carysfort Light, Florida. It has occurred at two other stations—D2639, in 56 fathoms (102 meters), also off the coast of Florida, and D2761, in 818

[11] Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 229. pl. 40, figs. 22, 23.

fathoms (1,483 meters), off the southeast coast of Brazil. Most of the specimens in Flint's figure belong to this species. One of his records for *T. concava* is from the type station.

*Textularia subplana—Material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17036 | U.S.N.M. | 2 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 17045 | U.S.N.M. | 2 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 17037 | U.S.N.M. | 1 | D2761... | 15 39 00 S.; 38 32 54 W.. | 818 | 39.0 | pter. oz..... | Rare. |

**TEXTULARIA FOLIACEA Heron-Allen and Earland, var. OCCIDENTALIS, new variety.**

Plate 2, fig. 13.

*Textularia concava* FLINT (part) (not Karrer), Rep. U. S. Nat. Mus., 1897 (1899), p. 283.

*Description.*—Variety differing from the typical form of the species in being broader, less tapering, the apical end less acute.

*Distribution.*—Type-specimen (U.S.N.M. No. 16991) from *Albatross* station D2318, off the coast of Cuba, in 45 fathoms (82 meters). It has occurred often abundantly at stations in this general region, off the coast of Florida, and the northern part of the Gulf of Mexico, and northeastward along the coast of the United States as far as Chesapeake Bay. It has not been found at all in the collection from the Caribbean.

This is very close to the species described by Heron-Allen and Earland from the Kerimba Archipelago, off the southeastern coast of Africa. The typical form of the species also occurs in the Philippines. This broader form of the species is the same as that recorded by Flint under the name *T. concava*, from off Carysfort Light, *Albatross* station D2641, as his original slide shows.

*Textularia foliacea, var. occidentalis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16988 | U.S.N.M. | 7 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s. bk. sp. | Common. |
| 16989 | U.S.N.M. | 8 | D2312... | 32 54 00 N.; 77 53 30 W.. | 88 | 57.8 | crs. s. bk. sp. | Common. |
| 16990 | U.S.N.M. | 1 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Rare. |
| 16991 | U.S.N.M. | 1 | D2318... | 24 25 45 N.; 81 46 00 W.. | 45 | 75.0 | co..... | Rare. |
| 16992 | U.S.N.M. | 2 | D2377 .. | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Rare. |
| 16993 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16994 | U.S.N.M. | 1 | D2420... | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk. s. m. g.... | Rare. |
| 16995 | U.S.N.M. | 3 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp . | Few. |
| 16996 | U.S.N.M. | 9 | D2639 .. | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Common. |
| 16997 | U.S.N.M. | 8 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Common. |
| 16998 | U.S.N.M. | 5 | ..... | Key West, Fla..... | 78 | ..... | ..... | Few. |
| 16999 | U.S.N.M. | 1 | D2668... | 30 58 30 N.; 76 50 30 W.. | 294 | 46.3 | gy. s. dd. co. | Rare. |
| 17000 | U.S.N.M. | 1 | ..... | Off Turtle Harbor..... | 50 | ..... | ..... | Rare. |
| 17001 | U.S.N.M. | 2 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |

### TEXTULARIA MEXICANA, new species.

Plate 2, fig. 9.

*Textularia rugosa* REUSS, var., GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 43, pl. 5, figs. 4, 5.

*Textularia carinata* FLINT (not d'Orbigny), Rep. U. S. Nat. Mus., 1897 (1899), p. 284, pl. 29, fig. 1.

*Description.*—Test much compressed, about one and one-half times as long as broad, the apical end triangular, bluntly pointed, apertural end rounded or slightly angular, periphery sharp, test thickest near the middle, rhomboid in end view; chambers numerous, distinct, broadest at the apertural end, thence concave toward the inferior margin; sutures clear-cut, depressed, wall coarsely arenaceous, roughened, especially over the sutures which are raised, united in the center to form a definite high ridge, especially in the latter half of the test; aperture semicircular, at the base of the inner margin of the last-formed chamber; color grayish-white.

Length up to 1.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16948) from *Albatross* station D2377, in the northern part of the Gulf of Mexico, in 210 fathoms (384 meters). It has also occurred at three stations in this immediate vicinity, and a single specimen possibly this species occurred at D2313, off the coast of Georgia. This seems to be a very distinct species found in considerable numbers at these stations, but not occurring elsewhere in the western Atlantic material that I have seen. A study of the Goës collection shows that this is the species from D2399, recorded by him as *T. rugosa*, variety, and Flint's specimens from *Albatross* D2400, which he figures, are the same. This is very close indeed to *T. millettii* Cushman.[12] This species is known from the Hawaiian Islands and from Guam and the coast of Japan. It lacks the very high central ridge of the species from the Gulf of Mexico, and its end view is less broad in consequence. The two are however very closely related. This seems to be another of the species from the Gulf of Mexico which has its relationships in the Pacific rather than the other parts of the Atlantic region.

*Texularia mexicana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16947 | U.S.N.M. | 1 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Rare. |
| 16948 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16949 | U.S.N.M. | 7 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Common. |
| 16950 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m.... | Rare. |
| 16951 | U.S.N.M. | 4 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Few. |

[12] Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 13, figs. 18, 19 (in text).

### TEXTULARIA FLORIDANA Cushman.

Plate 2, figs. 11, 12.

*Textularia transversaria* Flint (not H. B. Brady), Rep. U. S. Nat. Mus., 1897 (1899), p. 283, pl. 28, fig. 4.

*Textularia floridana* Cushman, Publ. 311, Carnegie Inst. Wash., 1922, p. 24, pl. 1, fig. 7.

*Description.*—Test elongate, two to three times as long as wide, much compressed, periphery acute, the ends of the chambers forming tubular projections but often broken, showing a truncate or concave area which is hollow, initial end rather sharply pointed, apertural end broadly rounded; chambers numerous, thickest near the center, increasing somewhat in height toward the apertural end; sutures indistinct, slightly if at all depressed, wall finely arenaceous, smooth; aperture small, rounded, at the base of the inner margin of the last-formed chamber.

Length slightly more than 1 mm.

*Distribution.*—Type-specimen from the Tortugas, Florida (J. A. C. Coll.). Typical specimens from *Albatross* station D2641, in 60 fathoms (110 meters), off the southeast coast of Florida, near Carysfort Light. There are also numerous specimens from a number of stations as far north as the coast of South Carolina and in the Gulf of Mexico. Flint's record for *T. transversaria* is this same type station, and his specimens which I have examined agree with this closely. Another slide in the U.S.N.M. collection from this station is labeled by Flint *T. sagittula*, var. *fistulosa*. The only Atlantic *Challenger* station referred to this later name is No. 33, off Bermuda. The species then has a very definite range, similar to that of many of the species in the Gulf of Mexico and adjacent waters. It is near *T. sagittula*, var. *fistulosa* H. B. Brady, which is common in tropical and subtropical waters in the Indo-Pacific. The test is much smoother, the sutures less distinct, the apical end more pointed, and a comparison of specimens from the two regions show that the two are evidently distinct.

*Textularia floridana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16952 | U.S.N.M. | 1 | D2317 | 24 25 45 N.; 81 46 45 W.. | 45 | 75.0 | co..... | Rare. |
| 16953 | U.S.N.M. | 6 | D2318 | 24 25 45 N.; 81 46 00 W.. | 45 | 75.0 | co..... | Common. |
| 16954 | U.S.N.M. | 1 | D2394 | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16955 | U.S.N.M. | 2 | D2420 | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk. s. m. g.. | Rare. |
| 16956 | U.S.N.M. | 2 | D2614 | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Rare. |
| 16957 | U.S.N.M. | 1 | D2629 | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co. s..... | Rare. |
| 16958 | U.S.N.M. | 10 | D2639 | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Common. |
| 16959 | U.S.N.M. | 7 | D2641 | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Common. |
| 16960 | U.S.N.M. | 5 | ..... | Off Bell, Fowey, Fla..... | 22 | ..... | ..... | Few. |
| 16961 | U.S.N.M. | 1 | ..... | Off Turtle Harbor..... | 50 | ..... | ..... | Rare. |
| 16962 | U.S.N.M. | 2 | ..... | Long Reef, Fla..... | 40 | ..... | ..... | Rare. |
| 16963 | U.S.N.M. | 4 | ..... | Key West, Fla..... | 65 | ..... | ..... | Few. |
| 16954 | U.S.N.M. | 1 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |

### TEXTULARIA PSEUDOTURRIS, new species.

Plate 3, fig. 1.

*Textularia turris* H. B. Brady (not d'Orbigny), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 366, pl. 44, figs. 4, 5.

*Textularia conica* Flint (not d'Orbigny), Rep. U. S. Nat. Mus., 1897 (1899), p. 285, pl. 29, fig. 6.

*Description.*—Test elongate, tapering, circular or quadrangular in end view, apex bluntly pointed, apertural end concave; chambers numerous, slightly inflated; sutures indistinct, very slightly compressed, wall coarsely arenaceous, rough; aperture rather small, semicircular, in the center of the inner margin of the last-formed chamber; color gray.

Length up to 3 or 4 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17019) from *Albatross* station D2134. Brady referred the *Challenger* material from two stations to this species. These are off Culebra Island, 390 fathoms (713 meters), and off the coast of South America, southeast of Pernambuco, Brazil, 350 fathoms (640 meters). Specimens from *Albatross* station D2314, in 159 fathoms (291 meters), off the coast of Georgia, are very similar to those figured by Brady. Smaller specimens, evidently the young of this species, occurred at a number of stations off the coast of Georgia, from Florida, Cuba, and Yucatan, and off the eastern coast of Brazil. There is a *Challenger* record in the "Summary of Results" volume, off Bermuda. Specimens have been referred to this species from numerous localities, both fossil and recent, but in the western Atlantic it has such a definite form and character that it seems that material from outside this area should be carefully examined to see if it is really the same as this species or the Cretaceous one of d'Orbigny. Pearcey refers specimens from the warm area of Faroe Channel and Heron-Allen and Earland specimens from the west of Scotland to this species. Flint's specimens which I have examined, marked *T. conica*, from D2641, off Carysfort Light, Florida, belong here.

*Textularia pseudoturris—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17018 | U.S.N.M. | 2 | D2314 | 32 43 00 N.; 77 51 00 W.. | 159 | 47.4 | crs. s. bk. sp. | Rare. |
| 17019 | U.S.N.M. | 1 | D2352 | 22 35 00 N.; 84 23 00 W.. | 463 | 45.0 | wh. co..... | Rare. |
| 17020 | U.S.N.M. | 1 | D2355 | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 17021 | U.S.N.M. | 5 | D2639 | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Few. |
| 17022 | U.S.N.M. | 1 | D2641 | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 17023 | U.S.N.M. | 2 | D2668 | 30 58 30 N.; 79 38 30 W.. | 294 | 46.3 | gy. s. dd. co. | Rare. |
| 17024 | U.S.N.M. | 5 | D2758 | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Few. |

### TEXTULARIA BARRETTII Jones and Parker.

Plate 3, figs. 3-6.

*Textularia barrettii* Jones and Parker, Rep. British Association, Newcastle Meeting, 1863, pp. 80, 105; Ann. Soc. Mal. Belg., vol. 11, 1876, p. 99, woodcut.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 367, pl. 44, figs. 6–8.—Woodward, Journ. New York Micr. Soc., 1885, p. 149.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 285, pl. 30, fig. 2.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 31, pl. 6, figs. 5–7.

*Textularia conica* Goës (not d'Orbigny), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 43.

*Description.*—Test tapering, about twice as long as broad, very slightly compressed, broadest near the apertural end, the apical end bluntly pointed, later portion of the test often with nearly straight sides; chambers distinct, numerous, labyrinthic; sutures very clearly marked, not depressed, wall finely arenaceous with an abundance of cement, very smoothly finished; aperture a narrow slit at the base of the inner margin of the last-formed chamber, the sides of the chamber slightly projecting beyond it on each side, sometimes subdivided into one or more openings.

Length up to 4.5 mm.

*Distribution.*—Brady gives the following Atlantic records: Off Bermuda, 435 fathoms (796 meters); off Culebra Island, West Indies, 390 fathoms (713 meters); off Jamaica, 100 to 250 fathoms (183 to 457 meters), and southeast of Pernambuco, Brazil, 350 fathoms (640 meters). Flint's specimens were from off Little Bahama Bank, *Albatross* station D2655, in 338 fathoms (619 meters). I have found the species to be very abundant at numerous stations in less than 100 fathoms (183 meters) off the southern coast of Florida, and it has also occurred in the Gulf of Mexico and off the southeastern coast of the United States. This is a very striking species in its labyrinthic chambers and the neatly finished exterior with its clear-cut finely drawn sutural lines. Some of the specimens off Key West in 78 fathoms (143 meters), and off the Barbados in 100 fathoms (183 meters), are very large and broad. They represent the microspheric form of the species. Elsewhere the length is usually not over 2–3 mm.

An examination of the Goës collection shows this species under the name of *T. conica*.

*Textularia barrettii—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16925 | U.S.N.M. | 10 | D2314... | 32 43 00 N.; 77 51 00 W.. | 159 | 47.4 | crs. s. bk. sp. | Common. |
| 16926 | U.S.N.M. | 10 | D2315... | 24 26 00 N.; 81 48 15 W.. | 37 | ..... | co..... | Common. |
| 16927 | U.S.N.M. | 7 | D2377... | 24 25 45 N.; 81 46 45 W.. | 45 | 75.0 | co..... | Common. |
| 16928 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16929 | U.S.N.M. | 2 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 16930 | U.S.N.M. | 4 | D2404... | 28 44 00 N.; 85 16 00 W.. | 60 | ..... | gy. s..... | Few. |
| 16931 | U.S.N.M. | 1 | D2648... | 25 53 00 N.; 80 03 30 W.. | 84 | ..... | gn. m..... | Rare. |
| 16932 | U.S.N.M. | 3 | D2655... | 27 22 00 N.; 78 07 30 W.. | 338 | 47.5 | gy. s..... | Rare. |
| 16933 | U.S.N.M. | 10 | ..... | Fowey, Fla..... | 55 | ..... | ..... | Common. |
| 16934 | U.S.N.M. | 3 | ..... | Off Barbados..... | 100 | ..... | ..... | Few. |
| 16935 | U.S.N.M. | 10 | ..... | Off Ragged Key, Fla..... | 75 | ..... | ..... | Common. |
| 16936 | U.S.N.M. | 2 | ..... | Govt. Cut, Fla..... | 100 | ..... | ..... | Rare. |
| 16937 | U.S.N.M. | 1 | ..... | Off Turtle Harbor..... | 50 | ..... | ..... | Rare. |
| 16938 | U.S.N.M. | 10 | ..... | Long Reef, Fla..... | 40 | ..... | ..... | Common. |
| 16939 | U.S.N.M. | 10 | ..... | Key West, Fla..... | 65 | ..... | ..... | Common. |
| 16940 | U.S.N.M. | 10 | ..... | Key West, Fla..... | 78 | ..... | ..... | Common. |
| 16941 | U.S.N.M. | 3 | ..... | Key West, Fla..... | 98 | ..... | ..... | Few. |
| 16942 | U.S.N.M. | 5 | ..... | Sand Key..... | 92 | ..... | ..... | Few. |
| 16943 | U.S.N.M. | 10 | ..... | Sambo..... | 50 | ..... | ..... | Common. |
| 16944 | U.S.N.M. | 10 | *Fish Hawk* 949 | 40° 03′ 00″ N.; 70° 31′ 00″ W..... | 100 | 52.0 | yl. m..... | Common. |
| 16945 | U.S.N.M. | 10 | ..... | Ajax Reef, Fla..... | 40 | ..... | ..... | Common. |

**TEXTULARIA PSEUDOTROCHUS, new species.**

Plate 5, figs. 1–3.

*Textularia trochus* H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 366, pl. 43, figs. 15, 16, 18.

*Description.*—Test broader than long, forming a low broad cone, the apex bluntly rounded, the apertural end flattened or concave; chambers few, distinct; sutures distinct, not depressed, wall rather coarsely arenaceous but smoothly finished with an abundance of dark gray cement; aperture nearly straight, a very narrow slit in the central part of the inner margin of the last-formed chamber, with a thin, overhanging lip; color gray.

Diameter 1 mm. or slightly more.

*Distribution.*—Type-specimen (U.S.N.M. No. 17014) from *Albatross* station D2641 off the southern coast of Florida in 60 fathoms (110 meters). The common West Indian shallow-water species referred to *T. trochus* when compared with the original Cretaceous specimens of Brady seems to be an entirely different form. Brady's figures show a sharply conical test coming to an acute point with concave sides, while the West Indian species has a very blunt often broadly rounded apex and convex sides. It occurs as far north as the Delaware Capes, southward along the coast, becoming abundant off the coast of Florida in water between 50 and 100 fathoms (91 and 183 meters) in depth. There are other records from the Bahamas and in the northern part of the Gulf of Mexico, and Brady records it from off the Danish West Indies and off Bermuda. *T. trochus* as a recent species is recorded from very widely scattered regions, but figures are not usually given and it is difficult to tell whether

this species so common in the West Indies is the same as that found elsewhere. The West Indies species is certainly not the same as *T. trochus* d'Orbigny.

*Textularia pseudotrochus—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17007 | U.S.N.M. | 1 | D2263... | 37 08 00 N.; 74 33 00 W. | 430 | ..... | gn. m..... | Rare. |
| 17008 | U.S.N.M. | 3 | D2312... | 32 54 00 N.; 77 53 30 W. | 88 | 57.8 | crs. s. bk. sp. | Few. |
| 17009 | U.S.N.M. | 5 | D2313... | 32 53 00 N.; 77 53 00 W. | 99 | 57.2 | crs. s. bk. sp. | Few. |
| 17010 | U.S.N.M. | 1 | D2318... | 24 25 45 N.; 81 46 00 W. | 45 | 75.0 | co..... | Rare. |
| 17011 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W. | 1330 | ..... | lt. br. m..... | Rare. |
| 17012 | U.S.N.M. | 1 | D2629... | 23 48 40 N.; 75 10 40 W. | 1169 | 38.4 | co. s..... | Rare. |
| 17013 | U.S.N.M. | 8 | D2639... | 25 04 50 N.; 80 15 10 W. | 56 | ..... | co. s..... | Common. |
| 17014 | U.S.N.M. | 5 | D2641... | 25 11 30 N.; 80 10 00 W. | 60 | 69.2 | co. s..... | Few. |
| 17015 | U.S.N.M. | 1 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |
| 17016 | U.S.N.M. | 10 | ..... | Fowey, Fla., E by S..... | 55 | ..... | ..... | Common. |
| 17017 | U.S.N.M. | 1 | ..... | Off Turtle Harbor..... | 50 | ..... | ..... | Rare. |

**TEXTULARIA CONICA d'Orbigny.**

Plate 5, figs. 5–7.

*Textularia conica* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 143, pl. 1, figs. 19, 20.—H.B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 365, pl. 43, figs. 13, 14; pl. 113, fig. 1.—Chapman, Proc. Zool. Soc. London, 1895, p. 19.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 43.—Chapman, Journ. Linn. Soc. London, vol. 28, 1902, pp. 185, 382; Trans. New Zealand Inst., vol. 38, 1905, p. 86; Journ. Quekett Micr. Club, 1907, p. 126.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 55.—Pearcey, Trans. Roy Soc. Edinburgh, vol. 49, 1914, p. 1012.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 230.—Mestayer, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—Cushman, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 50, pl. 11, figs. 4–6; Bull. 100, U. S. Nat. Mus, vol. 4, 1921, p. 123, pl. 25, figs. 2*a–c*; Publ. 311, Carnegie Inst. Wash., 1922, p. 24, pl. 2, fig. 4.

*Description.*—Test usually wider than high, triangular in front view, broadly oval in end view, slightly compressed, apex bluntly pointed; chambers comparatively few, distinct; sutures distinct, slightly depressed, wall arenaceous, smooth, or slightly roughened; aperture a narrow slit at the base of the inner margin of the last-formed chamber; color gray.

Length 1 mm. or less.

*Distribution.*—The original specimens which d'Orbigny had were from Cuba and Jamaica in shallow water. I have had it from Montego Bay in 9 and 10 fathoms (16 and 18 meters), and it has occurred at *Albatross* stations southward from the coast of South Carolina, off the coast of Florida, and the northern part of the Gulf of Mexico, and in the Caribbean. The *Challenger* Atlantic records are off the Danish West Indies and off Bermuda. I have not seen specimens in the abundant material north of Cape Hatteras, nor in the deep water of the Caribbean. According to the records it seems

to be widely distributed in the tropical regions. According to Heron-Allen and Earland it is abundant off the British coasts.

Williamson's figure named *T. cuneiformis*, var. *conica*, resembles this species in general but is apparently not the same as the tropical form.

*Textularia conica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16983 | U.S.N.M. | 1 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co.. | Rare. |
| 16984 | U.S.N.M. | 1 | D2371... | 29 17 00 N.; 85 30 45 W.. | 26 | ..... | gy.s.brk.sh.. | Rare. |
| 16985 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy.s.bk.sp.. | Rare. |
| 16986 | U.S.N.M. | 3 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Few. |
| 16987 | U.S.N.M. | 4 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Few. |

### Genus BIGENERINA d'Orbigny, 1826.

*Bigenerina* d'Orbigny (type, *B. nodosaria* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 261.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 368.—Chapman, The Foraminifera, 1902, p. 168.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 27.

*Gemmulina* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 262.

*Description.*—Test free, generally elongate, cylindrical or compressed, the early portion textularian, composed of a series of biserially arranged chambers, later chambers arranged in a single line; wall usually thick, arenaceous, usually coarse but often smoothly finished; aperture in the young at the base of the inner margin of the last-formed chamber, as in *Textularia*, but in the adult, in the uniserial portion terminal, rounded or oval according to the form of the chamber.

Both microspheric and megalospheric forms occur in the various species. In the microspheric form as in the same form in *Textularia* the earliest chambers may be arranged in a planospiral manner. In the megalospheric form the coiled chambers are usually wanting and the test starts with the biserial arrangement. As is usual with other foraminifera the microspheric form of the species attains a larger size in the adult than does the megalospheric

From its developmental stages it is very evident that *Bigenerina* represents a series derived from *Spiroplecta* through *Textularia*, and is very closely allied to the latter. There are various stages in the acceleration of development shown by various species. In some the biserial series makes up the larger part of the test, the uniserial series being only in the last-formed portion. In others the biserial series is confined to the very early development and the larger part of the test is uniserial. In the former cases specimens are often found which have not yet reached the adult uniserial condition, and would be taken for a species of *Textularia* were it not for their association with adults with the full characters of *Bigenerina*. Such specimens occur in the West Indies, especially those of *Bigenerina capreolus* as is noted under that species.

Well characterized species of *Bigenerina* occur in the Tertiary from the Eocene onward. In the Palaeozoic, especially in the Carboniferous, specimens occur which may possibly belong generically to *Bigenerina*, but their structure should be carefully studied to be sure of this. At any rate they are closely allied in general form.

BIGENERINA NODOSARIA d'Orbigny.

*Bigenerina nodosaria* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 261, pl. 11, figs. 9–11; Modèles, 1826, No. 57.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 28, pl. 2, fig. 62.—Terrigi, Atti Acc. Pont. Nuovi Lincei, vol. 33, 1880, p. 192, pl. 2, fig. 28.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 369, pl. 44, figs. 14–18; Journ. Roy. Micr. Soc., 1887, p. 895.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 471.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 37, pl. 7, figs. 313–315 [316–323?].—Fornasini, Mem. Accad. Sci. Bologna, ser. 5, vol. 10, 1901, p. 12; 1903, p. 142, pl. O, figs. 12, 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 27, figs. 46–48 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 125, pl. 26, fig. 2; Publ. 311, Carnegie Inst. Wash., 1922, p. 25, pl. 2, figs. 5, 6.

*Description.*—Test elongate, subcylindrical, the early portion somewhat compressed, consisting of a biserial group of chambers, broader than the succeeding uniserial group, later portion cylindrical or slightly tapering; chambers distinct, those of the early portion typically more numerous than those of the uniserial portion, the latter being 3–5 in number; sutures usually distinct, slightly depressed; wall rather coarsely arenaceous with a grayish-white cement; aperture of the early portions as in *Textularia*, an elongate slit between the base of the inner margin of the chamber and the adjacent wall of the preceding chamber, in the uniserial portion rounded and terminal; color white or light gray.

Length up to nearly 2 mm.

*Distribution.*—D'Orbigny described this species from the Adriatic Sea. His Modèle shows a rather smooth form. In typical European material which I have seen from off the coast of the British Isles the biserial compressed portion makes up usually one-third or more of the total length of the chamber. It seems to be common about the British Isles from the numerous records given above. In the western Atlantic however it does not appear, at least in its typical form, and is replaced by the following variety.

*Bigenerina nodosaria—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| ..... | J. A. C... | 4 | *Flying Falcon.* | ° ′ ″ ° ′ ″<br>51 02 00 N.; 11 27 00 W.. | 345 | ..... | ..... | Few. |

**BIGENERINA NODOSARIA d'Orbigny, var. TEXTULARIOIDEA Goës.**

Plate 5, figs. 8, 9.

*Textularia sagittula* Defrance, forma *Bigenerina* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, pt. 4, 1882, p. 78, pl. 5, figs. 159, 160.

*Clavulina textularioidea* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, 1894, p. 42, pl. 8, figs. 387–399; Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 37, pl. 4, figs. 26–38.

*Bigenerina nodosaria* Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 286, pl. 31, fig. 4.—Cushman, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 51.

*Description.*—Variety differing from the typical in the larger size and much greater proportion of the uniserial stage and reduction of the biserial portion, and in the relation of the two, the last-formed chambers of the test being often greater in size than the entire biserial portion.

Length 3–5 mm.

*Distribution.*—Goës described this in the Caribbean as frequent at a depth of 300 meters (164 fathoms). In looking over the material in the Goës collection I find a series of ten specimens, evidently this variety from *Albatross* station D2315 in 159 fathoms (291 meters). These are marked "*Clavulina parisiensis*, var. *bigerinoides*." This name does not appear under *Clavulina* in the 1896 paper, but on page 9, in the list of species from D2315, this name was found. Immature specimens of this species resemble the typical form, but the adults show very great differences. The Textularian portion is very small compared to the size of the adult test, and the last-formed chambers of the uniserial portion typically being large and globose are often several times the size of the entire biserial portion. It occurs also in shallow water off the northern coast of Jamaica and the Tortugas region.

*Bigenerina nodosaria, var. textularioidea—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16879 | U.S.N.M. | 10 | D2315... | 24 26 00 N.; 81 48 15 W.. | 37 | ..... | co..... | Common. |
| 16880 | U.S.N.M. | 5 | D2318... | 24 25 45 N.; 81 46 00 W.. | 45 | 75.0 | co..... | Few. |
| 16881 | U.S.N.M. | 1 | D2339... | 23 10 40 N.; 82 20 15 W.. | 191 | ..... | co..... | Rare. |
| 16882 | U.S.N.M. | 2 | D2370... | 29 18 15 N.; 85 32 00 W.. | 25 | ..... | crs.s.brk.sh. | Rare. |
| 16883 | U.S.N.M. | 1 | D2371... | 29 17 00 N.; 85 30 45 W.. | 26 | ..... | gy.s.brk.sh. | Rare. |
| 16884 | U.S.N.M. | 1 | D2406... | 28 46 00 N.; 84 49 00 W.. | 26 | ..... | crs. s. co..... | Rare. |
| 16885 | U.S.N.M. | 3 | D2629... | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co. s..... | Rare. |
| 16886 | U.S.N.M. | 3 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 16887 | U.S.N.M. | 10 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Common. |
| 16888 | U.S.N.M. | 2 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Rare. |
| 16889 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla., E. by ½ E. | 70 | ..... | ..... | Rare. |
| 16890 | U.S.N.M. | 1 | ..... | Off Barbados..... | 22 | ..... | ..... | Rare. |

### BIGENERINA CYLINDRICA, new name.

Plate 3, figs. 7, 8.

*Bigenerina digitata* H. B. Brady (not d'Orbigny), Trans. Linn. Soc. London, vol. 24, 1864, p. 468, pl. 48, fig. 8; Nat. Hist. Trans. Northumberland, vol. 1, 1865–67, p. 102, pl. 12, fig. 7.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 28, pl. 2, fig. 61.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 370, pl. 44, figs. 19–24; Journ. Roy. Micr. Soc., 1887, p. 895.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 471.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Fornasini, Mem. Acad. Sci. Bologna, ser. 5, vol. 10, 1901, p. 12.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 28, figs. 49*a*, *b*.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 231.

*Description.*—Test fusiform or cylindrical, elongate, rounded in cross section, the early portion consisting of a number of chambers arranged biserially, but circular in cross section; sutures somewhat indistinct, apex bluntly rounded, later portion consisting of a number of chambers arranged uniserially; division between the two portions not marked by a difference in size; wall rather coarsely arenaceous, but the particles neatly cemented with a reddish-brown cement to form a nearly smooth surface; aperture rounded, small, usually in the middle of the apertural face.

Length 1.0–1.6 mm.

*Distribution.*—This species which seems to be very common at least in certain places off the northwestern coast of Europe and the British Isles and elsewhere is not the same at all as d'Orbigny's Modèle. Brady and subsequently other authors following him have referred this recent species to the name given by d'Orbigny for a peculiar form from the Mediterranean. If the Modèle is at all correct, d'Orbigny's *Gemmulina digitata* is a very different thing. The figures in the *Challenger* Report referred by Brady to *Bigenerina digitata* are very characteristic of specimens which I have had through the kindness of Mr. Joseph Wright from the dredgings of the *Flying Falcon*, southwest of Ireland in 53 fathoms (97 meters). At this station specimens are very abundant and except for certain minor characters show very little variation in essentials. In all the western Atlantic material that I have examined there seem to be nothing which at all fits this European species. I have specimens in my own collection from Log 8, *Flying Falcon*, 11 miles south of Glandore Harbor, southwest of Ireland, 53 fathoms (97 meters).

*Bigenerina cylindrica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 17273 | U.S.N.M. | 2 | ..... | *Flying Falcon*..... | 53 | ..... | ..... | Rare. |
| ..... | J.A.C.... | 10 | ..... | *Flying Falcon*, southwest of Ireland. | 53 | ..... | ..... | Common. |
| ..... | J.A.C.... | 3 | ..... | Dröbach, Norway..... | ..... | ..... | ..... | Rare. |

**BIGENERINA PENNATULA (Batsch).**

Plate 5, fig. 4.

"Orthoceratia Pupa," SOLDANI, Test., vol. 1, pt. 2, 1791, p. 99, pl. 108, figs. *D, E, F.*

*Nautilus (Orthoceras) pennatula* BATSCH, Conch. Seesandes, 1791, No. 13, pl. 4, figs. 13*a–d.*

*Bigenerina pennatula* H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 373, pl. 45, figs. 5–8.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 44.—FLINT, Rep. U. S. Nat. Mus., 1897 (1899), p. 287, pl. 32, fig. 2.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 127, pl. 25, figs. 3*a, b.*

*Vulvulina elegans* D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 264, no. 3.

*Grammostomum elegans* PARKER, JONES, and H. B. BRADY, Ann. Mag. Nat. Hist., ser. 4, vol. 8, 1871, p. 170, pl. 11, figs. 121, 123.

*Description.*—Test much compressed, in the adult usually twice as long as wide, the early biserial portion making up at least one-half the test, broader than the following 1–4 chambers of the uniserial portion, periphery acute, that of the early portion often pectinate; chambers distinct, those of the uniserial portion somewhat inflated; sutures of the early portion raised, confluent along the median line, those of the uniserial part simple and depressed, wall finely arenaceous, in the biserial portion roughened, especially on the sutures and the later chambers smooth; aperture in the early part textularian, in the uniserial portion becoming much elongated, narrow, terminal, central; color in the early portion yellowish-brown, the uniserial chambers gray.

Length up to 2 mm.

*Distribution.*—This species is usually found in company with the preceding. Its geographical distribution is very similar. In the *Albatross* material it has been found at a large number of stations, including one in the northern part of the Gulf of Mexico, four off the southeast coast of the United States, and one in the Carribean, off Yucatan.

This species differs from the preceding in having the biserial portion much more bluntly rounded, and often with a yellowish color, which is lacking in *B. capreolus.* The biserial portion is also much broader in comparison with its length. Some of the specimens show the spiral arrangement of the early chambers, showing the relationship of this genus to *Textularia* and *Spiroplecta.*

*Bigenerina pennatula*—*material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16870 | U.S.N.M. | 2 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Rare. |
| 16871 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 16872 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16873 | U.S.N.M. | 3 | D2416... | 31 26 00 N.; 79 07 00 W.. | 276 | 53.8 | co. brk. sh.. | Rare. |
| 16874 | U.S.N.M. | 2 | D2668... | 30 58 30 N.; 79 38 30 W.. | 294 | 46.3 | gy. s. dd. co. | Rare. |
| 16875 | U.S.N.M. | 1 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

### BIGENERINA CAPREOLUS (d'Orbigny).

Plate 5, fig. 10.

*Vulvulina capreolus* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 264, No. 1, pl. 11, figs. 5, 6; Modèles, 1826, No. 59.

*Grammostomum capreolus* Parker and Jones, Ann. Mag. Nat. Hist., ser. 3, vol. 11, 1863, p. 93.

*Bigenerina capreolus* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 372, pl. 45, figs. 1–4.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 44.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 286, pl. 32, fig. 3.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 127, pl. 26, figs. 1*a*, *b*.

*Description.*—Test compressed, slightly longer than wide, the biserial portion occupying the larger part of the test, uniserial stage represented by only one or two chambers, somewhat less in width than the preceding part of the test, periphery acute, more or less pectinate; chambers distinct, especially those in the later portion; sutures limbate, raised, confluent along the middle line of the test, in the later portion depressed, wall arenaceous, in the early portion more or less roughened and the last uniserial chambers smoothly finished; aperture of the biserial part Textularian, the later portion terminal, central, much elongated, narrow; color gray.

Length up to 2.5 mm.

*Distribution.*—The type-specimens of this species are recorded by d'Orbigny from the Adriatic Sea. There are numerous records for this species in the Atlantic, several being given by Brady off the Azores, 450 fathoms (823 meters); off the Canaries, 600 fathoms (1,097 meters); off the Danish West Indies, 390 and 450 fathoms (713 and 823 meters), and off the coast of Brazil, near Pernambuco, 350 and 675 fathoms (640 and 1,234 meters). Brady also records it from some of the *Porcupine* dredgings as far north as 50° N. latitude. Goës records it as very rare in 399 fathoms (730 meters), in the Caribbean, at *Albatross* station D2355. Flint's specimens were from *Albatross* station D2416, off the coast of Georgia, in 276 fathoms (505 meters). I have had specimens from this station, also from station D2415 in the same region, 440 fathoms (805 meters), and at D2355, the station from which Goës records this species.

*Bigenerina capreolus—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ . | | °F. | | |
| 16876 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 16877 | U.S.N.M. | 1 | D2415... | 30 44 00 N.; 79 26 00 W.. | 440 | 45.6 | co. crs. s..... | Rare. |
| 16878 | U.S.N.M. | 1 | D2416... | 31 26 00 N.; 79 07 00 W.. | 276 | 53.8 | co. brk. sh.. | Rare. |
| ..... | J.A.C.... | 3 | *Porcupine.* 16..... | Northwest of Ireland..... | 994 | ..... | ..... | Few. |

#### BIGENERINA ROBUSTA Brady.

*Bigenerina robusta* Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 53; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 371, pl. 45, figs. 9–16.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 286, pl. 32, fig. 1.

*Description.*—"Test elongate, subcylindrical; early portion compressed, and tapering to a blunt point, composed of a number of segments arranged, as in *Textularia*, in two more or less regular alternating series: later portion cylindrical, convex or truncate at the distal end; consisting of numerous very short segments, the marginal outline of which is often ventricose and irregular. Aperture in the early stage Textularian in form and position; in adult specimens terminal and porous."

Length, $\frac{1}{6}$ inch (4.2 mm.), sometimes more.

*Distribution.*—Brady's records for this species are all in the Atlantic, *Challenger* station 24, off Culebra Island, West Indies, 390 fathoms (713 meters); station 122, southeast of Pernambuco, Brazil, 350 fathoms (640 meters), and in one dredging in shallower water off the Shetland Islands. In the *Challenger* volume, "Summary of Results," it is recorded from station 23, off Sombrero Island, West Indies, 450 fathoms (823 meters). Flint records it from *Albatross* station D2150 in 382 fathoms (697 meters), off Old Providence Island, south of Yucatan. I have not found in the *Albatross* material any specimens which seem to belong to this species. The description above is that of Brady. This species is peculiar in its aperture which consists of several small openings instead of a single one. In this respect it seems more like some of the older fossil forms than the other recent species of the genus.

### Genus BOLIVINA d'Orbigny, 1839.

*Bolivina* d'Orbigny (type, *B. plicata* d'Orbigny), Voy. Amér. Mérid., vol. 5, pt. 5, 1839, p. 61.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 416.—Chapman, The Foraminifera, 1920, p. 173.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 31.

*Description.*—Test elongate, distinctly biserial throughout; wall usually thin and hyaline in the young, but becoming thickened with age in many species, ornamented by punctae, striae, costae, knobs, and spines, with carinae developed in some species; aperture elongate, usually symmetrical.

As already noted in the Pacific work, the species of this genus for the most part seem to be very local in their distribution. As stated there this is especially true of species of tropical and subtropical seas. A comparison of material from the eastern and western Atlantic, from the Caribbean and the Gulf of Mexico, with that of colder parts of the Atlantic and with the Pacific, shows that most of the species, if carefully studied, are not widely spread. This was shown by the number of new species which Brady felt compelled to describe in the *Challenger* Report. Most of the species are small and inconspicuous

and show surprisingly little variation, at least in tropical and subtropical regions.

There is a tendency in the later development of certain species to initiate a uniserial stage. The chambers instead of going only halfway across the test extend to the opposite side and the aperture becomes terminal. Such species are referred to the subgenus *Bifarina*.

**BOLIVINA BEYRICHI Reuss.**

Plate 9, fig. 6.

*Bolivina beyrichi* Reuss, Zeitschr. Deutsch. geol. Gesellsch., vol. 3, 1851, p. 83, pl. 6, fig. 51.—Hantken, Mitth. Jahrb. Ung. geol. Anstalt, vol. 4, 1875 (1881), p. 64, pl. 7, fig. 11.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 33, 1880, p. 198, pl. 2, figs. 43–45; vol. 35, 1883, p. 191, pl. 3, fig. 33.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 422, pl. 53, fig. 1.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 296, pl. 8, figs. 24–26.—Chapman, Proc. Zool. Soc. London, 1895, p. 24.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 47.—Jones and Chapman, Monogr. Christmas Island, 1900, p. 231.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 334.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 34, fig. 56 (in text).—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 40, pl. 10, fig. 10.—Chapman, Zool. Res. *Endeavour*, 1912, p. 310; 1915, p. 19.—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 239, pl. 41, fig. 15.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 126.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 128.

*Description.*—Test elongate, rather narrow, much compressed, slightly tapering to the round-pointed apical end, apertural end evenly rounded; chambers numerous, high at the posterior outer edge, each projecting backward in a spinose projection; wall smooth, punctate; aperture elongate; color white.

Length slightly less than 1 mm.

*Distribution.*—The only Atlantic stations given by Brady in the *Challenger* Report are off the Canaries, 600 and 1,125 fathoms (1,097 and 2,057 meters). Heron-Allen and Earland record it from the west of Scotland. There are numerous other records, mostly from the Pacific.

**BOLIVINA BEYRICHI Reuss, var. ALATA (Seguenza).**

Plate 8, fig. 3.

*Vulvulina alata* Seguenza, Atti Accad. Gioenia Sci. Nat., ser. 2, vol. 18, 1862, p. 115, pl. 2, figs. 5, 5*a*.

*Bolivina alata* Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 296, pl. 8, fig. 27.

*Bolivina beyrichi* Reuss, var. *alata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 422, pl. 53, figs. 2–4.—Bagg, Maryland Geol. Survey, Miocene, 1904, p. 473, pl. 132, fig. 4.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 35, figs. 57*a*, *b* (in text).—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 40, pl. 10, figs. 7–9.—Cushman, Bull. 676, U. S. Geol. Survey, 1918, p. 49.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 126.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 129.

*Bolivina beyrichi* Reuss, var. *carinata* Hantken, Magy. kir. földt. int. évkönyve, vol. 4, 1875 (1876), pl. 7, fig. 12; Mitth. Jahrb. Ung. geol. Anstalt, vol. 4, 1875 (1881), pl. 7, fig. 12.

*Description.*—Test differing from that of the typical form of the species by the wide peripheral flange; it is also broader and much more tapering.

Length about 1 mm.

*Distribution.*—The only Atlantic record for this variety is that given by Brady in the *Challenger* Report, off Cezimbera, south of Lisbon, in 50 fathoms (91 meters). In the *Albatross* material specimens which may be referred to this variety occurred at four stations, one southeast of Nantucket, one off the coast of Carolina, one in the Gulf of Mexico, and one off the southeast coast of Brazil. The record of Goës for *B. beyrichi* from the Caribbean is probably this variety.

*Bolivina beyrichi, var. alata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17072 | U.S.N.M. | 1 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s.. | Rare. |
| 17073 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 00 W.. | 68 | ..... | gy. m..... | Rare. |
| 17074 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Rare. |
| 17075 | U.S.N.M. | 1 | D2761... | 15 39 00 S.; 38 32 54 W.. | 818 | 39.0 | pter. oz..... | Rare. |

**BOLIVINA ALBATROSSI, new species.**

Plate 6, fig. 4.

*Description.*—Test short, small, rather thick, periphery rounded, initial end broadly rounded, early portion marked by a network of fine reticulations, later portion smooth; chambers comparatively few, those of the later portion distinct; sutures distinct except in the early portion, not depressed, slightly limbate, wall translucent, finely punctate; aperture narrow, slightly elongate.

Length 0.25–0.30 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17098) from *Albatross* station D2677, in 478 fathoms (873 meters), off the Carolina coast. There is also a single specimen from *Albatross* station D2398 in the Gulf of Mexico. This species is peculiar in its rounded form, closely set chambers, and the reticulations of the early portion.

In the "Summary of Results" volume of the *Challenger* Report *B. reticulata* is recorded from off the West Indies at station 23, 400 fathoms (732 meters). This may be the present species.

*Bolivina albatrossi—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17097 | U.S.N.M. | 1 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 17098 | U.S.N.M. | 2 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

BOLIVINA CAMPANULATA Egger.

*Bolivina campanulata* Egger, Abh. kön. bay, Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 401, pl. 8, figs. 53, 54.

Among other stations from which Egger describes this minute species is *Gazelle* Station 3, in 5,301 meters (2,899 fathoms), west of Portugal.

BOLIVINA COSTATA d'Orbigny.

Some of the earlier records from the British Isles are given under this name, but it is not recorded by recent writers from this region. Without specimens it is difficult to determine just what was the form referred to.

BOLIVINA DECUSSATA H. B. Brady.

*Bolivina decussata* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 58; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 423, pl. 53, figs. 12, 13.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 475.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 47, fig. 77 (in text).—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 128.

The only Atlantic record referred to this name is that of Wright given above. He records the species as common at 1,020 fathoms (1,866 meters) off the southwest coast of Ireland. In the material sent me by Mr. Wright I have found specimens which are evidently what he has referred to this name, but they are not like the Pacific material which I have seen, and I doubt very much if they are the same.

BOLIVINA DIFFORMIS (Williamson).

Plate 4, fig. 1.

*Textularia variabilis* Williamson, var. *difformis* Williamson, Rec. Foram. Great Britain, 1858, p. 77, pl. 6, figs. 166, 167.

*Textularia agglutinans* d'Orbigny, var. *difformis* Parker and Jones, in Carpenter, Introd. Foram., 1862, App., p. 311.

*Bolivina difformis* Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 335.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 899.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 50.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 48, pt. 2, 1904, p. 15.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 4, 1913, p. 65; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 239.

*Description.*—Test much compressed, tapering from the subacute apical end to the apertural end, broadly angular, periphery spinose, especially the later portion; chambers distinct, the outer end of each extended into a short rounded spine; sutures distinct, very slightly depressed, wall smooth, finely punctate; aperture rounded, elongate. Length 0.25–0.40 mm.

*Distribution.*—This species, as the records show, is very abundant in the region of the British Isles. Except for the record of Sidebottom

from the Mediterranean, it is not recorded in any other region. I have had specimens from the "*Lord Bandon*," from off Bantry Bay, southwest of Ireland, in 37½ fathoms (70 meters), in material kindly sent me by Mr. Joseph Wright. Specimens vary little in their general character. This species was well figured by Williamson. It has not occurred in any of the material I have seen from the western Atlantic.

BOLIVINA DILATATA Reuss.

*Bolivina dilatata* Reuss, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 381, pl. 48, fig. 15.—Terrigi, Atti Accad. Pont. Nuovi Lincei, vol. 33, 1880, p. 197, pl. 2, fig. 42.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 418, pl. 52, figs. 20, 21.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 335.—Woodward, Journ. New York Micr. Soc., 1885, p. 150.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 900.—Malagoli, Boll. Soc. Geol. Ital., ser. 4, vol. 6, 1887, p. 520, pl. 13, fig. 3.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 221, pl. 43, figs. 3, 6.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 475.—Terrigi, Mem. Com. Geol. d'Ital., vol. 4, 1891, p. 75, pl. 1, fig. 29.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Woodward and Thomas, Geol. Nat. Hist. Surv. Minnesota, vol. 3, 1893, p. 33, pl. c, fig. 26.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 294, pl. 8, figs. 17–20.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 50, pl. 9, figs. 482–486, pl. 14, figs. 5–10.—Egger, Jahr. 16, naturhist. Ver. Passau, 1895, p. 10, pl. 1, fig. 6.—Millett, Journ. Roy. Micr. Soc., 1900, p. 542.—Fornasini, Mem. Acad. Sci. Bologna, ser. 5, vol. 9, 1901, p. 160.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400; California Acad. Sci., ser. 3, vol. 1, 1904, p. 244, pl. 29, fig. 6.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 208.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 334.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 33, fig. 54*a*, *b* (in text).—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 40, pl. 11, figs. 7–9.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 238.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 603; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 128, pl. 26, fig. 6.

*Description.*—Test cuneate, broadening rapidly toward the apertural end, the apical end small, blunt, much compressed, the edges thin; chambers numerous, broad, and low, little inflated; sutures very distinct but hardly depressed; wall smooth, punctate; aperture elongate, narrow, ending at the edge of the inner border of the chamber; color white.

Length 0.3–0.6 mm.

*Distribution.*—From the above references it will be seen that this name has been used by many authors for both recent and fossil specimens from about all the regions from which foraminifera have been obtained. It has been used for all the flat, broad forms of the genus. A comparison, however, of such specimens from different

regions shows that there are undoubtedly constant differences which should be more carefully noted. The material from the western Atlantic which is here described as *B. goësii* is one of this group, but no typical *B. dilatata* occurs in that region so far as I have seen. The specimens I have seen from European localities are as a rule very close to the form described by Williamson as *T. variabilis*, var. *spathulata*,[13] which is more elongate and has the chambers curved backward more than found in the type figure of Reuss. Such specimens are evidently very abundant about the British Isles, but so far as I have seen certainly do not occur on our side of the Atlantic.

BOLIVINA DURRANDII Millett.

*Bolivina durrandii* Millett, Journ. Roy. Micr. Soc., 1900, p. 544, pl. 4, fig. 7.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 314.

Outside of the Malay Archipelago, from which this species was described by Millett, where he found it in abundance, the only other record seems to be that of Heron-Allen and Earland, who record "one large, very fine specimen of unquestionably recent origin." This was from the shore sands of Sussex, England. This is a very peculiar distribution.

BOLIVINA GLUTINATA Egger.

*Bolivina glutinata* Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 297, pl. 8, figs. 57–62.

Egger describes this species from *Gazelle* Station 17, off western Africa, in 677 meters (369 fathoms). His figures, as usual, are very poor and give little guide as to the real character of this species.

BOLIVINA GOËSII, new species.

Plate 6, fig. 5.

*Bulimina* (*Bolivina*) *punctata* d'Orbigny, var., Göes, Köngl. Svensk. Vet. Akad. Handl., vol. 29, pt. 4, 1882, pl. 4, figs. 124–26.

*Bolivina dilatata* Goes (part) (not Reuss), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 47.

*Description.*—Test rhomboid, tapering toward the initial end to a blunt point, the apertural end also angular, much compressed, periphery slightly if at all lobulated; chambers fairly numerous, distinct, narrow, at the inner end usually with a ventral pointing projection, somewhat rounded; sutures distinct, very slightly depressed, irregular on account of the peculiar shape of the inner end of the chambers, wall smooth, finely punctate, aperture narrow, slightly elongate; color white.

Length 0.30–0.40 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17092) from *Albatross* station D2641, in 60 fathoms (110 meters), off the coast of

[13] Rec. Foram. Great Britain, 1858, p. 76, pl. 6, figs. 164, 165.

Florida. The other records for this species are in this same general region, the Bahamas, and off the northeast coast of Brazil. This is evidently the species referred to by Göes in the reference above, but the species differs from *B. dilatata* in the smaller size, shorter form, and the peculiar configuration of the outline of the chambers. It is evidently, from the records, a species of the general West Indian region.

*Bolivina goesii—material examined.*

| Cat. No. | Coll of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F | | |
| 17089 | U.S.N.M. | 1 | D2420... | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk.s.m.g... | Rare. |
| 17090 | U.S.N.M. | 2 | D2629... | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co.s..... | Rare. |
| 17091 | U.S.N.M. | 5 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co.s..... | Few. |
| 17092 | U.S.N.M. | 4 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co.s..... | Few. |
| 17093 | U.S.N.M. | 1 | D2756... | 3 22 00 S.; 37 49 00 W.. | 417 | 40.5 | gy. spk..... | Rare. |
| 17094 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla., S. by E. ½ E. | 70 | ..... | ..... | Rare. |
| 17095 | U.S.N.M. | 5 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Few. |
| 17096 | U.S.N.M. | 1 | ..... | Key West, Fla..... | 78 | ..... | ..... | Rare. |

**BOLIVINA GRAMEN (d'Orbigny).**

*Vulvulina gramen* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 148, pl. 1, figs. 30, 31; Foram. Foss. Bass. Tert. Vienne, 1846, p. 251, pl. 21, figs. 46, 47.—W. B. Carpenter, Parker, and Jones, Introd. Foram., 1862, p. 190, pl. 12, fig. 15.

*Bolivina gramen* Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 69, pl. 5, figs. 4, 5; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 239.

Heron-Allen and Earland record this species from the Clare Island region and from the western coast of Scotland. It was originally described by d'Orbigny from the coast of Cuba, and there are no further recent records except these. As noted by Heron-Allen and Earland, the specimens from the British Isles are not entirely typical.

**BOLIVINA INFLATA Heron-Allen and Earland.**

Plate 9, figs. 1–4.

*Bolivina inflata* Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 68, pl. 4, figs. 16–19; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 240.

*Description.*—"Test wedge-shaped, consisting of five to nine pairs of chambers rapidly increasing in breadth and thickness, so that the terminal portion of the shell is comparatively inflated. Marginal edges, rounded, sutures slightly depressed. Aperture somewhat variable, at times regularly textularian, but usually bolivine, situate at the extremity of the terminal chamber. Surface hyaline, coarsely punctate, somewhat rough. Average breadth, 0.12–0.15 mm. Average length, 0.17–0.25 mm. Average thickness of oral extremity, 0.1 mm."

*Distribution.*—This species described from the Clare Island region is also recorded by the authors from off South Cornwall and from nine stations west of Scotland, although they remark as follows on this last material: "Poorly represented, the specimens being few, and not very typical." I have seen no specimens in the western Atlantic which can be referred to this.

**BOLIVINA LAEVIGATA (Williamson).**

Plate 4, fig. 2.

*Textularia variabilis* Williamson, var. *laevigata* Williamson, Rec. Foram. Great Britain, 1858, p. 77, pl. 6, fig. 168.

*Textularia agglutinans* d'Orbigny, var. *variabilis* Parker and Jones, in Carpenter, Introd. Foram., 1862, p. 312.

*Bolivina laevigata* H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 900.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 208.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 335; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 65; Journ. Roy. Micr. Soc., 1915, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 238.

As will be seen by the above references, *B. laevigata* has been recorded from various places off the British Isles. As far as I have seen the species does not occur in the western Atlantic.

**BOLIVINA (BIFARINA) LIMBATA H. B. Brady.**

Plate 7, fig. 3.

*Bolivina limbata* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 57; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 419, pl. 52, figs. 26–28.—Howchin, Trans. Roy. Soc. South Australia, vol. 12, 1889, p. 8.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 300, pl. 8, figs. 10–12.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1900, p. 187.—Millett, Journ. Roy. Micr. Soc., 1900, p. 543.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 382.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 15.—Dakin, Rep. Ceylon Pearl-Oyster Fish., vol. 5, 1906, p. 234.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1907, p. 32, pl. 4, fig. 83.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 138.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 404.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 47, figs. 78*a–c* (in text).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 67, pl. 5, figs. 2, 3.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 33; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 135, pl. 19, fig. 5.

*Description.*—Test elongate, much compressed, gradually tapering to the rather bluntly rounded apical end, often somewhat twisted, thickest along the median line, thinning toward the lateral margins, which are slightly rounded; chambers usually about as high as wide, slightly tumid, the sutures very distinct, irregularly curved, limbate; especially along the median portion of the face; wall calcareous, smooth, punctate; aperture elongate-oval, in some specimens somewhat remote from the border and terminal; color white.

Length 0.50–0.75 mm.

*Distribution.*—The only Atlantic record given by Brady in the *Challenger* Report is off the Cape Verde Islands, in 11 fathoms (20 meters). The only other record seems to be that of Heron-Allen and Earland, a single specimen in Clew Bay, off western Ireland, 5½ to 11 fathoms (9 to 20 meters). I have had two specimens which may be referred to this species from the *Albatross* material. One of these is off the coast of Florida in 56 fathoms (102 meters), the other in 20 fathoms (37 meters) off the coast of Brazil. Most of the records for this species are in the tropical Pacific, and it may be likely that further study will show the Atlantic specimens to be distinct.

*Bolivina limbata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17076 | U.S.N.M. | 1 | D2639... | 25 40 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 17077 | U.S.N.M. | 1 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Rare. |

BOLIVINA LIMBATA H. B. Brady, var. COSTULATA Cushman.

*Bolivina limbata* H. B. Brady, var. *costulata* Cushman, Publ. 311, Carnegie Inst. Wash., p. 26, pl. 3, fig. 8.

*Description.*—Variety differing from the typical form of the species mainly in the addition of longitudinal costæ, usually few in number, and near the base of the test. The specimens are almost invariably somewhat twisted as in the typical.

Length of largest specimen 0.75 mm.

*Distribution.*—All of the Tortugas specimens seem to be of this variety. The typical form of the species does not seem to be common in the Atlantic, the only records I have had being from off the coast of South America. This species, however, is fairly common in the Tortugas region as represented by this variety, and it may be found to be common in the shallower waters of the tropical Atlantic.

BOLIVINA NOBILIS Hantken.

*Bolivina nobilis* Hantken, Magy. kir. foldt. int. évkönyve, vol. 4, 1875 (1876), p. 56, pl. 15, fig. 4; Mitth. Jahrb. Ung. geol. Anstalt, vol. 4, 1875 (1881), p. 65, pl. 15, fig. 4.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 424, pl. 53, figs. 14, 15.—Chapman, Quart. Journ. Geol. Soc., vol. 48, 1892, p. 516, pl. 15, fig. 11; Proc. Zool. Soc. London, 1895, p. 24.—Millett, Journ. Roy. Micr. Soc., 1900, p. 541, pl. 4, fig. 4.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 209.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1907, p. 32, pl. 4, fig. 81.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 138.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 335.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1910, p. 405.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 39, figs. 64*a*, *b* (in text).—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 41, pl. 10, figs. 6*a–c*.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 64.—

PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 29, 1914, p. 1013.—CHAPMAN, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 19.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 238.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 126.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 604; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 130.

*Description.*—Test much elongate, slender, somewhat compressed; sides nearly parallel but tapering rather quickly to a blunt point at the apical end, apertural end obliquely truncate; chambers numerous, high, somewhat inflated; sutures slightly depressed; wall calcareous, the apical portion with fine longitudinal costae, the apertural end smooth; aperture oval, in some specimens, where a uniserial condition is attained, remote from the border and subterminal, otherwise reaching to the preceding chamber as also in the young; color white.

Length up to 1.20 mm.

*Distribution.*—This species is recorded from about the British Isles, in the Mediterranean, the Arabian Sea, and Indo-Pacific. There are no records for it in the western Atlantic, the Gulf of Mexico, or Caribbean, and I have failed to find anything corresponding to it in all the material I have examined from this region. What few specimens I have seen from European waters seem to be, as noted by Heron-Allen and Earland (1913, p. 64), "a striate form of *B. punctata*." Most of the specimens that I have seen from the Pacific, however, are of a different character, usually having the aperture terminal, much as figured in the *Challenger* Report by Brady. In this connection it is interesting to note that the original of Brady's plate 53, figure 14, came from the Philippines. I am indebted to Capt. F. O. Potts of Cambridge for this information.

**BOLIVINA PLANA (d'Orbigny) (?)**

*Textilaria plana* D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 263, No. 14.

There are a very few specimens from off the coast of New England in cold water which are thickened in the middle, and may doubtfully be referred to this species.[14] This does not occur with typical *B. dilatata* or any other of the broad forms, and just what it may be must be left until more abundant specimens are available.

*Bolivina plana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17101 | U.S.N.M. | 2 | D2022... | 37 32 00 N.; 74 13 20 W.. | 487 | 40.0 | bu. m..... | Rare. |
| 17102 | U.S.N.M. | 1 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | crs. s. m. g.... | Rare. |
| 17103 | U.S.N.M. | 1 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn. m. bk. sp. | Rare. |
| 17104 | U.S.N.M. | 1 | D2544... | 40 01 45 N.; 70 24 00 W.. | 131 | 47.7 | gn. s. bk. sp.. | Rare. |
| 17105 | U.S.N.M. | 1 | *Fish Hawk* 1110. | 40 02 00 N.; 70 35 00 W.. | 100 | 47.0 | gn. m. fne. s.. | Rare. |

[14] Fornasini, Riv. Ital. Pal., Ann. 8, pt. 2, 1902, p. 45.

BOLIVINA PLICATA d'Orbigny.

*Bolivina plicata* d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, 1839, "Foraminifères," p. 62, pl. 8, figs. 4–7.—H. B. Brady, Ann. Mag. Nat. Hist., ser. 4, vol. 6, 1870, p. 302, pl. 12, figs. 7*a*, *b*.—Moebius, Beitr. Meeresfauna, Insel Mauritius, 1880, p. 95, pl. 9, figs. 12, 13.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447; Trans. Roy. Irish Acad., vol. 28, 1885, p. 335.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 889.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 221.—Halkyard, Trans. Ann. Rep. Manchester Micr. Soc., 1889, p. 65, pl. 1, fig. 13.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, no. 9, 1894, p. 51, pl. 9, figs. 487, 488.—Millett, Journ. Roy. Micr. Soc., 1900, p. 545.—Cushman, Amer. Geologist, vol. 33, 1904, p. 265.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 209.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 138.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 335.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 43.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 68; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 240.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 127.

This species is recorded at numerous stations off the British Isles, off the coast of Norway, off the Abrohlos Bank, Brazil, and elsewhere in other oceans. The comparison of the original figure given by d'Orbigny, whose specimens were from off the coast of Chile, with those referred to this name, such as that given by Goës in the above referred, show what very great differences there are in these forms referred to this species. Heron-Allen and Earland (1913, p. 68) give two references above referred to as figured specimens, the original of d'Orbigny, and that of Goës, and it is very difficult with such a basis to determine what form occurs in any definite region until the specimens themselves are studied and figured. Nothing has been noted in the western Atlantic material which I could refer to this species.

BOLIVINA (BIFARINA) PORRECTA H. B. Brady.

Plate 7, fig. 2.

*Bolivina porrecta* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 57; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 418, pl. 52, figs. 22*a–c*.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 292, pl. 38, fig. 2.

*Description.*—Test elongate, slightly tapering, apical end bluntly rounded, apertural end obliquely truncate, compressed; chambers numerous, broadest near the middle, somewhat inflated, the later ones extending clear across the test; sutures distinct, depressed, wall thin and translucent, very finely perforate, smooth; aperture elongate, elliptical, terminal, in a slight lip.

Length 1 mm. or slightly more.

*Distribution.*—One of the original localities for this species was a *Challenger* station off Culebra Island, West Indies, in 390 fathoms

(713 meters). Pearcey records this from the warm area of Faroe Channel as rare.[15] Flint gives a single station *Albatross* D2530, in 956 fathoms (1749 meters), southeast of Georges Bank. There are two other *Challenger* stations in the Atlantic, one off the Bermudas, the other off the Azores. The six stations from which I have had specimens are scattered, one southeast of Cape Hatteras, one off Ragged Key, Florida, three in various parts of the Caribbean, and one off the coast of Brazil. The Atlantic specimens are very long, slender, and are very finely punctate, differing from the somewhat broader, very coarsely punctate form of the Pacific.

*Bolivina porrecta*—material examined.

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17135 | U.S.N.M. | 1 | D2140... | 17 36 10 N.; 76 46 05 W.. | 966 | 39.7 | s..... | Rare. |
| 17136 | U.S.N.M. | 2 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s... | Rare. |
| 17137 | U.S.N.M. | 8 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp.. | Common. |
| 17138 | U.S.N.M. | 1 | D2751... | 16 54 00 N.; 63 12 00 W.. | 687 | 40.0 | bu. glob. oz.. | Rare. |
| 17139 | U.S.N.M. | 1 | D2756... | 3 22 00 S.; 37 49 00 W.. | 417 | 40.5 | gy. sp..... | Rare. |
| 17140 | U.S.N.M. | 1 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |

**BOLIVINA MAYORI** Cushman.

*Bolivina mayori* CUSHMAN, Publ. 311, Carnegie Inst. Wash., 1922, p. 27, pl. 3, figs. 5, 6.

*Description.*—Test elongate, somewhat compressed, of nearly uniform width, except in the extreme young; chambers numerous, distinct; sutures depressed; wall thin, translucent, coarsely punctate, especially in the young; chambers in the later portion extending clear across the test, the last-formed chamber in the adults forming the entire width of the test and usually of a less diameter than the preceding; the wall smooth, except in the early portion, which has a few longitudinal costae; aperture in the adult terminal, elongate, extending nearly across the peripheral end of the last-formed chamber with a slightly projecting lip.

Length up to 0.85 mm.

This species most nearly resembles *B. porrecta* H. B. Brady, but differs in the more attenuate form and the ornamentation of the early portion. The punctations over a large part of the surface are arranged in longitudinal lines. In old-age specimens the diameter of the test is considerably less in the last-formed chamber than at the maximum width of the preceding chambers. The aperture would place this species in the subgenus *Bifarina*. It has occured at numerous stations in the Tortugas region, but not in any considerable numbers.

[15] Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.

These specimens resemble very much Brady's figure in the *Challenger* Report (pl. 53, fig. 14), which he refers to *Bolivina nobilis* Hantken. A comparison of these with Hantken's original figures shows that the two are probably different species. Brady's specimens were all from the South Pacific, and our specimens from the Tortugas are probably identical or very closely related to those of the South Pacific.

**BOLIVINA PULCHELLA (d'Orbigny).**

Plate 7, fig. 4.

*Sagrina pulchella* D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 150, pl. 1, figs. 23, 24.

*Bolivina costata* GOËS (not d'Orbigny), Svensk. Vet. Akad. Handl., vol. 19, no. 4, 1882, p. 71, pl. 4, figs. 129–132.

*Bolivina caribaea* GOËS (not d'Orbigny), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 48.

*Bolivina pulchella* CUSHMAN, Publ. 311, Carnegie Inst. Wash., 1922, p. 25, pl. 1, figs. 8, 9.

*Description.*—Test small, about one and one-half times as long as wide; chambers comparatively few, increasing rapidly in size as added, initial end subacute, apertural end broad and rounded, chambers fairly distinct, ornamented by a series of short, longitudinal costae, the outer angles of the chambers somewhat extended, forming a somewhat toothed edge to the test; sutures indistinct, very slightly depressed, wall thin, translucent, very finely punctate, over the sutures somewhat more opaque; aperture an elongate oval opening.

Length 0.15–0.25 mm.

*Distribution.*—Typical specimens were obtained from the lagoon of the Dry Tortugas, Florida, southwest of Brilliant Shoal, in 7½ fathoms (13 meters). In addition it has occurred at several *Albatross* stations, all but one in the Caribbean, the exception being off the Carolina coast. This species is a small, but very definite one, both in shape and ornamentation. Goës evidently had this species from the Caribbean, first as *B. costata*, and later under *B. caribaea*. D'Orbigny's specimens were from the shore sands of Cuba.

*Bolivina pulchella—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17123 | U.S.N.M. | 5 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Few. |
| 17124 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp.. | Rare. |
| 17125 | U.S.N.M. | 8 | H59..... | 17 42 10 N.; 65 39 40 W.. | 789 | ..... | oz. for..... | Common. |
| 17126 | U.S.N.M. | 1 | H79..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for.. | Rare. |
| 17127 | U.S.N.M. | 1 | ..... | Tortugas, Fla..... | 6 | ..... | ..... | Rare. |

**BOLIVINA PUNCTATA d'Orbigny.**

Plate 7, fig. 1.

*Bolivina punctata* d'Orbigny, Voy. Amér. Mérid., vol. 5, pt. 5, 1839, "Foraminifères," p. 63, pl. 8, figs. 10–12.—H. B. Brady, Trans. Linn. Soc. London, vol. 24, 1864, p. 468, pl. 48, figs. 9*a*, *b;* Nat. Hist. Trans. Northumberland and Durham, vol. 1, 1865–67 (1867), p. 103, pl. 12, figs. 8*a*, *b*.—Mobius, Beitr. Meeresfauna, Insel Mauritius, 1880, p. 94, pl. 9, figs. 9, 10.—Terrigi, Atti Acc. Pont. Nuovi Lincei, vol. 33, 1880, p. 197, pl. 2, fig. 41.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 417, pl. 52, figs. 18, 19.—Balkwill and Wright, Trans. Roy. Irish. Acad., ser. 2, vol. 28, 1887, p. 335.—Woodward and Thomas, 13th Ann. Rep. Geol. Nat. Hist. Surv. Minnesota for 1884 (1885), p. 169, pl. 3, fig. 12.—Sherborn and Chapman, Journ. Roy. Micr. Soc., 1886, p. 743, pl. 14, figs. 10*a*, *b*.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 899.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 221.—Malagoli, Boll. Soc. Geol. Ital., vol. 7, 1889, p. 375, pl. 14, figs. 1–4.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—Terrigi, Mem. Com. Geol. d'Italia, vol. 4, 1891, p. 74, pl. 1, figs. 26–28.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Woodward and Thomas, Geol. Nat. Hist. Surv. Minnesota, vol. 3, 1893, p. 34, pl. *C*, figs. 27, 28.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 298, pl. 8, figs. 1–3.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 49, pl. 9, figs. 475–478, 480.—Chapman, Proc. Zool. Soc. London, 1895, p. 23.—Egger, Jahr. 16, naturhist. Ver. Passau, 1895, p. 12, pl. 1, fig. 11.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 47.—Morton, Proc. Portland Soc. Nat. Hist., 1897, p. 115, pl. 1, fig. 11.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 292, pl. 38, fig. 1.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1900, p. 186.—Wright, Geol. Mag., Dec. 4, vol. 7, 1900, p. 100, pl. 5, fig. 10.—Millett, Journ. Roy. Micr. Soc. 1900, p. 540.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 208.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 14.—Dakin, Rep. Ceylon Pearl-Oyster Fish., vol. 5, 1906, p. 234.—Chapman, Journ. Linn. Soc. Zoology, vol. 30, 1907, p. 32, pl. 4, fig. 80; Journ. Quekett Micr. Club, 1907, p. 128.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 138.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 28, pl. 5, fig. 13.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 336.—Chapman, Proc. Roy. Soc. Victoria, vol. 22, 1910, p. 274; Journ. Linn. Soc. Zool., vol. 30, 1910, p. 404.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 32, figs. 53*a*, *b* (in text).—Bagg, Bull. 513, U. S. Geol. Surv., 1912, p. 41, pl. 10, figs. 1–5.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 64.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1013.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 20.—Heron-Allen, and Earland, Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 237.—Mestayer, Trans. New Zealand Inst., vol. 28, 1916, p. 129.—Sidebottom, Journ. Roy. Micr. Soc. 1918, p. 126.—Cushman, Bull. 676, U. S. Geol. Survey, 1918, p. 49; Publ. 291, Carnegie Inst. Wash., 1919, p. 33.; Proc. U. S. Nat. Mus., vol. 59, 1921, p. 51, pl. 11, figs. 9, 10; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 136, pl. 26, fig. 5.

*Bulimina presli* Reuss, var. (*Bolivina*) *punctata*, Parker and Jones, Philos. Trans., vol. 155, 1865, p. 376, pl. 17, fig. 74.

*Description.*—Test much elongate, straight or slightly curved, the apical end bluntly pointed, tapering very gradually to the apertural end; chambers numerous, somewhat compressed, the sutures slightly depressed, the chambers increasing in height as added; wall smooth, conspicuously but finely punctate; aperture an elongated slit, widest at the inner end; color white, brownish when living.

Length 0.40–0.85 mm.

*Distribution.*—This species, if one believes the figures referred to it, is very variable and is very widely distributed. It seems to be one of those species to which almost any elongate, slightly compressed, smooth form of *Bolivina* is referred.

In the western Atlantic material forms which can be definitely referred to d'Orbigny's species are comparatively rare. They are found at a few stations on the southeast coast of the United States south of Cape Hatteras, in the Gulf of Mexico, and the Caribbean. Brady gives a number of stations well scattered from off Bermuda, off the West Indies, off the Azores, off Brazil, and in deeper water in the mid-Atlantic. There are numerous records of its occurrence in European waters.

*Bolivina punctata* —*material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17084 | U.S.N.M. | 3 | D2150... | 13 34 45 N.; 81 21 10 W... | 382 | 45.8 | wh. crs. s... | Few. |
| 17085 | U.S.N.M. | 1 | D2396... | 28 31 00 N.; 86 48 00 W... | 335 | ..... | gy. m..... | Rare. |
| 17086 | U.S.N.M. | 2 | D2614... | 34 09 00 N.; 76 02 00 W... | 168 | ..... | gy.s. bk. sp | Rare. |
| 17087 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W... | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 17088 | U.S.N.M. | 1 | H60..... | 17 39 00 N.; 65 44 00 W... | 578 | ..... | co. s. for.... | Rare. |

**BOLIVINA STRIATULA Cushman.**

*Bolivina striatula* CUSHMAN, Publ. 311, Carnegie Inst. Wash., 1922, p. 27, pl. 3, fig. 10.

*Description.*—Test elongate, gradually tapering from the somewhat rounded initial end to the broad apertural end; chambers numerous, distinct, slightly inflated; sutures very slightly depressed; early portion of the test less compressed than the adult, the peripheral margin rounded in the young, sharply angled in the adult, early portion of the test with numerous longitudinal striations occupying about half the length of the test, following the chambers with a very fine reticulate pattern, the final chambers being smooth, hardly punctate.

Length 0.35 mm.

This species is peculiar in the three different stages of ornamentation and the development of the test. The early portion is more or

less rounded, with numerous fine longitudinal costae, followed by a few more compressed chambers, the surface of which has a very fine reticulate pattern, not seeming to be raised from the surface of the test and yet distinct with a considerable magnification. The last-formed chambers are still more compressed, with a sharp edge, and are composed of clear, transparent shell material, the wall being not even punctate over a large part of the surface.

BOLIVINA RHOMBOIDALIS (Millett).

*Textularia rhomboidalis* MILLETT, Journ. Roy. Micr. Soc., 1899, p. 559, pl. 7, fig. 4.—SIDEBOTTOM, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, 1905, no. 5, p. 8, pl. 2, fig. 2.

*Bolivina rhomboidalis* CUSHMAN, Publ. 311, Carnegie Inst. Wash., 1922, p. 28.

*Description.*—Test generally triangular in front view, increasing in breadth from the rather bluntly pointed initial end to the broad apertural end, which is oblique; chambers numerous, distinct, obliquely placed, so that the test in end view, instead of having the sides at right angles to one another, has them more or less oblique, giving a rhomboid shape to the test in end view; wall translucent, coarsely punctate; aperture a low slit at the base of the inner margin of the last-formed chamber within a reentrant of the margin; color white.

Length of the Tortugas specimens 0.40 mm.

*Distribution.*—This is from station 28, in Bird Key Harbor, Tortugas, in 4.75 fathoms (9 meters). This species was described by Millett under the genus *Textularia* from the Malay Archipelago, and he gives also *Challenger* station 185, off Raine Island, and other localities in Torres Strait, and also the Aegean Sea. Sidebottom's specimens were from the Mediterranean. This single Tortugas specimen is very similar to that figured by Millett. It has not previously been recorded from the Atlantic, but should be looked for further in the West Indian region.

BOLIVINA QUADRILATERA (Schwager).

Plate 8, fig. 2.

*Textularia quadrilatera* SCHWAGER, *Novara*-Exped., Geol. Theil, vol. 2, 1866, p. 253, pl. 7, fig. 10.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 358, pl. 42, figs. 8–12.—FLINT, Rep. U. S. Nat. Mus., 1897 (1899), p. 283, pl. 28, fig. 3.—MILLETT, Journ. Roy. Micr. Soc., 1899, p. 559, pl. 7, fig. 3.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 131.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 24, figs. 42–44 (in text).

*Bolivina quadrilatera* WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 475.

*Description.*—Test elongate, slender, very slightly tapering, in end view quadrilateral, the angles usually carinate; chambers high and narrow, running back obliquely on the outer border, compressed; the initial end of the test often with a stout spine, occasionally with several small spines or smooth and broadly rounded, the early chambers sometimes with one or more longitudinal raised costae

for a short distance; wall hyaline, distinctly perforate; aperture at one side near the distal end of the chamber, sometimes obliquely elongate, but somewhat variable.

Length up to 1.2 mm., megalospheric proloculum 0.076–0.115 mm., microspheric proloculum 0.012–0.023 mm.

*Distribution.*—Most of the records for this species are from the Pacific, where it is very characteristic of considerable depths in tropical and subtropical waters. In the Atlantic it is recorded by Brady from the *Challenger* stations off the Canaries, off the Cape Verde Islands, and southeast of Pernambuco, Brazil. Flint recorded this species from *Albatross* station D2144 in 896 fathoms (1,639 meters), near Aspinwall, Isthmus of Panama. I have found this species fairly common at this same station in the material I have examined, but it has not occurred elsewhere in the western Atlantic material. These specimens are all without the basal spine which is so characteristic of most Pacific specimens that I have seen. Wright has recorded this species from off the southwest coast of Ireland, but it has not been recorded in this region by other workers. From its general character of the test and the aperture, it seems as though this species should belong to *Bolivina* rather than to *Textularia*.

*Bolivina quadrilatera*—*material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F | | |
| 17099 | U.S.N.M. | 3 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Rare. |
| 17100 | U.S.N.M. | 2 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |

BOLIVINA COMPACTA Sidebottom.

*Bolivina robusta* H. B. Brady, var. *compacta* Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 15, pl. 3, fig. 7.

*Bolivina compacta* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 36, fig. 58 (in text); Publ. 311, Carnegie Inst. Wash., 1922, p. 26, pl. 1, fig. 10.

*Description.*—Test elongate, tapering, periphery rounded, initial end bluntly pointed, apertural end obliquely rounded; chambers numerous, somewhat inflated; sutures very slightly depressed, not very distinct; wall ornamented by a series of large coarse punctae, somewhat irregularly arranged, those of the last-formed chambers finer and more numerous; aperture elongate, extending from the base of the inner margin of the last-formed chamber to the highest point of the chamber; color white.

Length of the Tortugas specimens 0.5 mm.

*Distribution.*—Specimens of this species are extremely rare, a single typical specimen occurring at station 20 in 7 fathoms and another less typical specimen from station 22 in 6 fathoms, in the Tortugas

region. Sidebottom originally described this as a variety of *Bolivina robusta* from the Mediterranean, and I have referred to it specimens from the tropical Pacific.

BOLIVINA ROBUSTA H. B. Brady, variety.

Plate 6, fig. 6.

There are specimens from two *Albatross* stations, D2150, in the western Caribbean, and D2420, off the southeast coast of the United States. These may be referred to this species. They are somewhat like the figures given by Brady (pl. 53, fig. 7), but lack the spine typical of this species. There are *Challenger* records for this species from off the West Indies in 450 fathoms (823 meters), off Bermuda, 950 fathoms (1,740 meters), off the Canaries, 1,125 fathoms (2,057 meters), and off the coast of Brazil, 675 fathoms (1,234 meters).

*Bolivina robusta, var.—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17078 | U.S.N.M. | 1 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Rare. |
| 17079 | U.S.N.M. | 4 | D2420... | 42 41 00 N.; 64 55 30 W.. | 62 | 40.6 | rky..... | Few. |

BOLIVINA SUBAENARIENSIS, new species.

Plate 7, fig. 6.

*Bolivina aenariensis* H. B. Brady (not Costa), Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 711; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 423, pl. 53, figs. 10, 11; Journ. Roy. Micr. Soc., 1887, p. 900.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 221, pl. 43, figs. 2, 4, 5.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 475.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 292, pl. 37, fig. 8.

*Description.*—Test elongate, much compressed, slightly tapering, periphery acute, often carinate, surface smooth except for two long raised costae running from the apex toward the apertural end of the test, and one or two supplementary ones, much shorter, the apical end with a single short spine; chambers distinct, curved, widest near the center; sutures distinct, slightly depressed, wall finely punctate; aperture semicircular; color white.

Length up to, or slightly exceeding, 1 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17113) from *Albatross* station D2262, in 250 fathoms (457 meters), southeast of Nantucket. It is a common species at many stations from south of Nova Scotia to Cape Hatteras. It is apparently found off the British Isles in cold water and is excellently figured by Brady, Parker, and Jones from the Abrohlos Bank, Brazil, in 40 and 260 fathoms (73 and 476 meters). Specimens referred to *B. aenariensis*

by Heron-Allen and Earland from off the coast of England may be this species, but their figured specimen at least from the Clare Island region is not at all like this. The species is replaced south of Cape Hatteras and in the Gulf of Mexico by the following variety.

*Bolivina subaenariensis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17106 | U.S.N.M. | 4 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Few. |
| 17107 | U.S.N.M. | 3 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | crs. s. m. g.. | Few. |
| 17108 | U.S.N.M. | 3 | D2078... | 41 11 30 N.; 66 12 20 W.. | 499 | 40.0 | gy. m. s..... | Few. |
| 17109 | U.S.N.M. | 1 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Rare. |
| 17110 | U.S.N.M. | 1 | D2111... | 35 09 50 N.; 74 57 40 W.. | 938 | ..... | gn. m..... | Rare. |
| 17111 | U.S.N.M. | 1 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Rare. |
| 17112 | U.S.N.M. | 1 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn.m.bk.sp. | Rare. |
| 17113 | U.S.N.M. | 10 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 17114 | U.S.N.M. | 1 | D2263... | 37 08 00 N.; 74 33 00 W.. | 430 | ..... | gn. m..... | Rare. |
| 17115 | U.S.N.M. | 1 | D2425... | 36 20 24 N.; 76 46 30 W.. | 119 | 51.5 | dk. gy. m. fne. s. | Rare. |
| 17116 | U.S.N.M. | 1 | D2539... | 39 59 45 N.; 70 53 00 W.. | 133 | 47.7 | gn. s..... | Rare. |
| 17118 | U.S.N.M. | 7 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Common. |
| 17119 | U.S.N.M. | 2 | D2544... | 40 01 45 N.; 70 24 00 W.. | 131 | 47.7 | gn. s. bk. sp. | Rare. |
| 17117 | U.S.N.M. | 5 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Few. |
| 17120 | U.S.N.M. | 10 | D2555... | 39 53 00 N.; 71 32 00 W.. | 136 | 47.7 | gn. m. s..... | Common. |
| 17121 | U.S.N.M. | 1 | D2572... | 40 29 00 N.; 66 04 00 W.. | 1,769 | 37.8 | gy. oz..... | Rare. |
| 17122 | U.S.N.M. | 1 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

**BOLIVINA SUBAENARIENSIS, new species, var. MEXICANA, new variety.**

Plate 8, fig. 1.

*Bolivina aenariensis* FLINT (part) (not Costa), Rep. U. S. Nat. Mus., 1897 (1899), p. 292.

*Description.*—Variety differing from the typical in the greater number of costae which for the most part run nearly to the apertural end of the test; by the sharper, more abruptly tapering form, especially toward the apex of the test, and by the translucent character of the wall.

*Distribution.*—Type-specimen (U.S.N.M. No. 17129) from *Albatross* station D2377 in 200 fathoms (366 meters), in the northern part of the Gulf of Mexico. Specimens from a number of other stations in this area are very similar in their characters.

*Bolivina subaenariensis, var. mexicana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ″ | | °F. | | |
| 17128 | U.S.N.M. | 7 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Common. |
| 17129 | U.S.N.M. | 8 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 17130 | U.S.N.M. | 5 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Few. |
| 17131 | U.S.N.M. | 4 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Few. |
| 17132 | U.S.N.M. | 5 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Few. |
| 17133 | U.S.N.M. | 4 | ..... | Off Fowey Rocks, Fla., E. by N. | 100 | ..... | ..... | Few. |
| 14134 | U.S.N.M. | 2 | ..... | Off Key West, Fla..... | 78 | ..... | ..... | Rare. |

### BOLIVINA SUBSPINESCENS, new species.

Plate 7, fig. 5.

*Description.*—Test minute, elongate, tapering, apical end bluntly pointed, apertural end angular, periphery lobulated; chambers distinct, angular, concave, ventral, the outer portion smooth, the lower angle finely spinose; sutures distinct, depressed, wall calcareous, outer part smooth, remainder covered with short close-set spines, in the early portion granular, roughened; aperture rounded; color white.

Length 0.15–0.25 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17080) from *Albatross* station D2192, in 1,060 fathoms (1,938 meters), off the northeast coast of the United States. Similar specimens have also occurred at scattered stations in the Gulf of Mexico and in the Caribbean.

This species is somewhat similar to *B. spinescens* Cushman, but the angular form of the chambers is much more marked and the whole more definitely tapering. This may be possibly the same as the European material referred to *B. textilarioides* Reuss. It is a very small species, but its characters seem to be very definite.

*Bolivina subspinescens—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17080 | U.S.N.M. | 1 | D2192... | 39 46 30 N.; 70 14 45 W.. | 1,060 | 38.6 | gy. oz..... | Rare. |
| 17081 | U.S.N.M. | 1 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 17082 | U.S.N.M. | 1 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 17083 | U.S.N.M. | 1 | H58..... | 17 45 20 N.; 65 35 35 W.. | 1,315 | ..... | oz. for..... | Rare. |

### BOLIVINA TEXTILARIOIDES Reuss.

Under this name numerous authors record specimens from about the British Isles, off the Abrohlos Bank, off Burdwood Bank, and in the Indo-Pacific. The earlier records from the British Isles were confused with *B. laevigata*. Apparently the northern Atlantic material is not closely like that of Reuss. Brady's figure in the *Challenger* Report referred to this species is also different from that of Reuss as I have previously noted (pt. 2, 1911, p. 46). There is nothing in the western Atlantic material which can be referred to it. The nearest is the species here described as *B. subspinescens*.

BOLIVINA TORTUOSA Brady.

Plate 9, fig. 5.

*Bolivina tortuosa* H. B. Brady, Quart. Journ. Micr. Soc., vol. 21, 1881, p. 57; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 420, pl. 52, figs. 31–34.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 298, pl. 8, figs. 43, 44.—Millett, Journ. Roy. Micr. Soc., 1900, p. 543.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1900, p. 187; 1902, p. 382.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 209.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 317, pl. 10, figs. 3, 4.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 13.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 66, pl. 5, fig. 1; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 240.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 127.

*Description.*—"Test elongate, tapering, broadest near the apertural end; the margins bent obliquely towards the median line on either side, so as to give to the entire shell a twisted contour; peripheral edge thin, sharp, lobulated. Segments numerous; long and narrow; the later ones projecting and rounded at the peripheral ends. Shell conspicuously perforated."

"Length, 1/60th inch (0.42 mm) more or less."

*Distribution.*—Brady figures two forms in the *Challenger* Report, one a shorter broader form from the South Pacific, and a larger, more tapering form from the Cape Verde Islands in shallow water. Except for Sidebottom's records from the Mediterranean, most other records are from either the region of the British Isles or from the Indo-Pacific. It does not occur as far as I have seen in the western Atlantic.

BOLIVINA VARIABILIS (Williamson).

Plate 4, fig. 3.

*Textularia variabilis* (*typica*) Williamson, Rec. Foram. Great Britain, 1858, p. 76, pl. 6, figs. 162, 163.

*Bolivina variabilis* Chaster, First Report Southport Soc. Nat. Sci., 1890–91 (1892), pp. 59, 69.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 336; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 68; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 242.

Heron-Allen and Earland distinguish this species in the region of the British Isles where it seems to be abundant.

Genus PLEUROSTOMELLA Reuss, 1860.

*Nodosaria* (part) Reuss, Verst. Böhm. Kried., pt. 1, 1845, p. 28.

*Dentalina* (part) Reuss, Haidinger's Nat. Abhandl., vol. 4, 1850, p. 24.

*Pleurostomella* Reuss (type, *P. subnodosa* Reuss), Sitz. Akad. Wiss. Wien, vol. 40, 1860, p. 203.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 410.—Chapman, The Foraminifera, 1902, p. 174.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 49.

*Description.*—Test elongate, somewhat compressed, composed of numerous chambers, usually biserially arranged; wall calcareous,

perforate, smooth or ornamented; aperture distinctive, an arched opening with a vertical notch or slit in the middle of the lower edge, usually with tooth-like projections upward at either side.

This genus is almost entirely confined to the Pacific and Indian oceans. There are records of its occurrence as far back as the Cretaceous, but Tertiary records seem to be very rare.

#### PLEUROSTOMELLA SUBNODOSA (Reuss).

*Nodosaria nodosa* Reuss (part), Verst. Böhm. Kreid., pt. 1, 1845, p. 28, pl. 13, fig. 22.

*Dentalina subnodosa* Reuss (part), Haidinger's Nat. Abhandl., vol. 4, 1850, p. 24, pl. 1, fig. 9.

*Pleurostomella subnodosa* Reuss, Sitz. Akad. Wiss., Wien, vol. 40, 1860, p. 204, pl. 8, fig. 2*a*, *b*.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 412, pl. 52, figs. 12, 13.—Pearcey, Trans. Hist. Nat. Soc. Glasgow, vol. 2, 1890, p. 177.—Chapman, Proc. Zool. Soc. London, 1895, p. 25; Journ. Linn. Soc. London, vol. 30, 1910, p. 405.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 51, figs. 82*a–c* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 139.

*Description.*—Test much elongate, very slightly compressed, nearly cylindrical, hardly tapering, the apical end broadly rounded, the apertural end subacute in front view, rounded in side view; chambers several, the very early ones biserial, the later uniserial, but with oblique sutures showing the traces of the biserial condition; aperture fairly broad; sinus broad with slight projections at each side; color white.

Length 0.65–0.90 mm.

*Distribution.*—In the *Challenger* Report Brady notes the appearance of this species in the South Atlantic in deep water, 2,200 and 2,350 fathoms (4,024 and 4,298 meters). Pearcey records it from the warm area of the Faroe Channel as very rare. I have not seen the species in any of the material I have examined from the Atlantic. It seems to be open to question whether or not this recent species from deep water is the same as that described by Reuss from the Cretaceous, but I have had no specimens to determine this.

#### PLEUROSTOMELLA ACUMINATA, new species.

Plate 19, fig. 6.

*Pleurostomella alternans* H. B. Brady (part) (not Schwager), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 412, pl. 51, fig. 22 (not fig. 23).

*Description.*—Test elongate, subcylindrical or fusiform, the initial end pointed and terminating in a definite spine; apertural end in front view broadly rounded, in side view acute and tapering; chambers of the early portion crowded, later ones much less so, biserial, inflated; sutures, distinct, slightly depressed; wall smooth, finely punctate; aperture narrow, vertical, with an upwardly projecting

tooth at either side, the whole in a rounded depression of the inner face of the chamber; color white.

Length about 0.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16275) from *Albatross* station H79 in 821 fathoms (1,488 meters) in the Caribbean Sea. Atlantic records for *Pleurostomella* are very few and it is interesting to note that this species comes from a region which by other species allies itself with the Pacific rather than with the Atlantic in general. Brady's records for *P. alternans* which include this species are from the Pacific. There is, however, one record in the volume on "Summary of Results" which gives *P. alternans* from station 35*c*, in 1,950 fathoms (3,566 meters), latitude 32° 15′ N., longitude 65° 08′ W. This may be the same as the specimens which I have referred to *P. alternans*[16] from off the Galapagos Islands.

*Pleurostomella acuminata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 16275 | U.S.N.M. | 1 | H79..... | ° ′ ″ ° ′ ″ 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for. | Rare. |

## Genus PAVONINA d'Orbigny, 1826.

*Pavonina* d'Orbigny (type, *P. flabelliformis* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 260.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 374.—Chapman, The Foraminifera, 1902, p. 169.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 30.

*Description.*—Test calcareous, hyaline, perforate, many chambered, the early chambers biserial, the later ones becoming uniserial, broad, curved, in the type species finally becoming embracing, and the embracing series each composed of one or more chambers; apertures numerous on the peripheral margin.

There seem to be two distinct species of this genus, the type species, *P. flabelliformis* d'Orbigny, found in the Indo-Pacific, from Honolulu, southward to Torres Strait and westward to Madagascar, and the other found in the West Indies.

### PAVONINA ATLANTICA, new species.

Plate 19, fig. 1.

*Description.*—Test subtriangular, slightly longer than broad, initial end with a short spine, very much compressed, the sides carinate; chambers comparatively few, the earliest ones alternating, biserial,

[16] Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 50, figs. 81*a*, *b* (in text).

those of the adult uniserial, broad, extending across the width of the test, slightly curved backward at the ends; sutures somewhat limbate, wall thin and translucent, finely perforate; apertures numerous on the terminal wall of the last-formed chamber.

Length up to 0.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 17272) from off Sand Key, Florida, in 92 fathoms (169 meters). Specimens have also occurred off Ragged Key, Florida., in 75 fathoms (137 meters), off Fowey Rocks, 55 fathoms (99 meters), and in shallow water of the Tortugas lagoon. Brady records *P. flabelliformis* from *Challenger* station 24, in 390 fathoms (713 meters), off Culebra Island in the West Indies. This is probably the same as this species here described, as all the Florida material I have seen appears to be of this new species, not showing at all the embracing character of *P. flabelliformis*.

*Pavonina atlantica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17268 | U.S.N.M. | 1 | D2420... | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk. s. m. g.. | Rare. |
| 17269 | U.S.N.M. | 1 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 17270 | U.S.N.M. | 1 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |
| 17271 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla., E. by S. | 55 | ..... | ..... | Rare. |
| 17272 | U.S.N.M. | 1 | ..... | Off Sand Key, Fla..... | 92 | ..... | ..... | Rare. |

### Genus CUNEOLINA d'Orbigny, 1839.

*Cuneolina* d'Orbigny (type, *Cuneolina pavonina* d'Orbigny), in De la Sagra. Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 150; Foram. Foss. Bass. Tert. Vienne, 1846, p. 253.—Chapman, The Foraminifera, 1902, p. 166.

*Description.*—Test biserial, tapering, broadest near the apertural end, compressed so that the two alternating series of chambers form a zigzag line on the narrow sides of the test; chambers numerous, low, and very broad, wall arenaceous, composed of very thin material, smooth, chamber wall labyrinthic, composed of numerous openings, the smaller near the exterior; aperture elongate, narrow, either simple or a row of pores.

This genus was erected by d'Orbigny for certain Cretaceous species. There are certain species in the West Indies which occur in the late Tertiary which seem close to this genus in several ways. They have been referred to d'Orbigny's type species, but are evidently different, as will be noted later.

**CUNEOLINA ANGUSTA Cushman.**

Plate 10, figs. 1–3.

* *Textularia trochus* Goës (not d'Orbigny), Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 80, pl. 5, figs. 167–170; pl. 6, figs. 171, 172.

*Cuneolina pavonina* d'Orbigny, var. *angusta* Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 34, pl. 7, fig. 2.

*Description.*—Test elongate, triangular, usually twice as long as wide, thence gradually tapering to the subacute apex, compressed, in a plane parallel to that of the junction between the chambers; chambers broader than high, distinct, labyrinthic, consisting of numerous chamberlets, those of the exterior smaller and more numerous than those of the inner portion; sutures distinct, very slightly depressed, wall arenaceous, of fine sand grains with an abundance of cement forming a very smooth surface; aperture elongate, either a simple fissure, or by contractions forming a series of pores; color grayish-brown.

Length up to 7 mm.

*Distribution.*—The type-specimens were from the Bowden Marl, Jamaica (Miocene) where it was found in the following variety. It has occurred in the region of the West Indies, living off the Barbados in 100 fathoms (183 meters), off Key West, Florida, 78 fathoms (143 meters), and at *Fish Hawk* Station 949, off the eastern coast of the United States.

From a study of the original figures and description of d'Orbigny, it seems that the Cretaceous *Cuneolina pavonina* d'Orbigny is undoubtedly different from that which occurs in the Miocene or recent material. That name being available for the recent or Tertiary form necessitates the adoption of *angusta* Cushman as the name for the recent species and the narrow variety already described from Bowden, Jamaica. This leaves the broad form of Bowden which has been referred to as *C. pavonina* without a name. All the recent material I have seen seems to belong to *C. angusta*.

*Cuneolina angusta—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 16891 | U.S.N.M. | 10 | ..... | Off Barbados..... | 100 | ..... | ..... | Common. |
| 16892 | U.S.N.M. | 9 | *Fish Hawk* 949. | 40° 03′00″ N.; 70° 31′00″ W. | 100 | 52.0 | yl. m. | Common. |
| 16893 | U.S.N.M. | 4 | ..... | Off Key West, Fla..... | 78 | ..... | ..... | Few. |

CUNEOLINA ANGUSTA Cushman, var. LATA, new variety.

*Cuneolina pavonina* Jones and Parker (not d'Orbigny), Ann. Soc. Mal. Belg., vol. 11, 1876, p. 98.—Hill, Bull. Mus. Comp. Zoöl., vol. 34, 1899, p. 147.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 34, pl. 7, fig. 1.

This variety which has been noted by several authors from the Miocene Marl of Bowden, Jamaica, is, as already noted, different from *C. pavonina* d'Orbigny from the Cretaceous, and according to the rules of nomenclature must, under the circumstances, have a new name applied to it, which I have here done. This is the broad form which I have described and figured from Bowden in the above reference, and the breadth of which is nearly equal to the length.

It has not occurred as a recent form so far as I have seen.

## Subfamily 3. VERNEUILININAE.

This subfamily includes those genera which, at least in their early development, have a distinctly triserial arrangement of the chambers. In *Verneuilina* this method of arrangement is continued throughout the development of the test, but in other genera becomes modified. In *Gaudryina* the early portion of the test is triserial and the adult arrangement is biserial and comparable to *Textularia*. In *Clavulina* there is still another regressive step and the young are triserial, while the adult arrangement is uniserial with a central aperture.

### Genus VERNEUILINA d'Orbigny, 1840.

*Verneuilina* d'Orbigny (type, *V. tricarinata* d'Orbigny), Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 38.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 382.—Chapman, The Foraminifera, 1902, p. 166.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 52.

*Bulimina* (part) Reuss, Verst. Böhm. Kreid., pt. 2, 1845, p. 109, and other authors.

*Polymorphina* (part) Schultze, Organ. Polyth., 1854, p. 61.

*Textularia* (part) Parker and Jones, Philos. Trans., vol. 155, 1865, p. 371; and other authors.

*Description.*—Test free, more or less elongate, tapering, in cross section round or triangular, composed of a series of chambers spirally arranged, but in three vertical columns; walls variable, arenaceous or hyaline; aperture a slit at or near the base of the inner margin of the chamber.

In general the genus *Verneuilina* may be used to include all the definitely triserial species which have a slit-like aperture at the base of the inner margin of the chamber. This is apparently the primitive genus from which have developed such genera as *Gaudryina*, and in its relations to *Textularia*, *Verneuilina* may be taken as the simplest member of the subfamily *Verneuilininae*. It includes a number of well characterized species, some of them rather common and of wide distribution.

There are records of this genus running back to the Lower Cretaceous.

VERNEUILINA SCABRA (Williamson).

*Bulimina scabra* Williamson, Rec. Foram. Great Britain, 1858, p. 65, pl. 5, figs. 136, 137 (*B. arenacea* on explanation of plate).

*Textularia scabra* Fischer, Actes Soc. Linn. Bordeaux, vol. 27, 1870, p. 393, no. 32.

*Verneuilina polystropha* Parker and Jones, Introd. Foram., Appendix, 1862, p. 311.—H. B. Brady, Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 436, pl. 20, figs. 9*a–c*.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 3, vol. 3, 1882, p. 447.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 386, pl. 47, figs. 15–17.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 332.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 896.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Göes, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 32, pl. 7, figs. 247–255.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 206.—Cushman, Proc. Boston Soc. Nat. Hist., vol. 34, 1908, p. 27.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, No. 64, 1913, p. 55, pl. 4, figs. 1–5; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 231.

*Textularia*, var. *V. polystropha* Dawson, Ann. Mag. Nat. Hist., vol. 8, 1870, p. 178; vol. 7, ser. 4, 1871, p. 88; Amer. Journ. Sci. Arts, vol. 1, ser. 3, 1871, p. 198.

*Description.*—Test elongate, tapering, triserial, the apical end bluntly rounded; chambers comparatively few, inflated; sutures distinct, depressed, wall coarsely arenaceous, surface slightly roughened; aperture oval, at the base of the inner margin of the last-formed chamber, in a depression formed at the junction of the three last-formed chambers; color reddish-brown.

Length up to 1 mm.

*Distribution.*—This seems to be very common in shallow water off the northern coast of Europe, especially about the British Isles. There are records of its occurrence in the Gulf of St. Lawrence, and off the New England coast. It is evidently a species of cool northern waters, but very rare on the American side of the Atlantic, and not found at all on the southern Atlantic coast or in the Gulf of Mexico or in the Caribbean. This may be the same species as that described and figured by Schultze as *Polymorphina silicea*,[17] but is evidently not the same as *Bulimina polystropha* Reuss, which he described from the Cretaceous. Heron-Allen and Earland in their Clare Island Report mention that at a few stations "a minute variety occurs in very small numbers, which we have observed at many other localities where the larger type is abundant. It exactly resembles the common types, but has normally only one-eighth of their size, though often possessing a greater number of chambers than the larger specimens. The average length of these dwarf

[17] Organ. Polythal., 1854, p. 61, pl. 6, figs. 10, 11.

specimens is from .17–.30 mm., and their average breadth .07–.10 mm. It is possible that these minute individuals may represent the mircospheric form, but owing to the difficulty of observing the primordial chambers in this species, we are unable to make any pronouncement of this point." Off the New England coast in Casco Bay a small species occurs which fits rather well this description, and which may be known as variety *advena*, new variety. This may prove to be a different species as it is not usual for the microspheric form to have a smaller adult test than the megalospheric.

*Verneuilina scabra—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| ..... | J.A.C. | 7 | ..... | Log. 8, "*Flying Falcon*" 11 miles south of Glandore Harbor, southwest of Ireland. | 53 | ..... | ..... | Common. |

VERNEUILINA PROPINQUA H. B. Brady.

Plate 9, figs. 10, 11.

*Verneuilina propinqua* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 387, pl. 47, figs. 8–12 (not 13, 14).—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Picaglia, Atti. Soc. Modena, ser. 3, vol. 12, 1893, p. 155.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 33, pl. 7, figs. 264–266.—Chapman, Proc. Zool. Soc. London, 1895, p. 19.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 38.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 285, pl. 31, fig. 2.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 402.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 53, figs. 86*a*, *b* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 140.

*Description.*—Test free, pyramidal, triserial, the apical end bluntly rounded; chambers well inflated but closely set; wall coarsely arenaceous, the surface somewhat rough or nearly smooth; aperture elongate at the base of the inner margin of the chamber; color brown, or gray.

Length up to 3.6 mm.

*Distribution.*—This species described by Brady from the *Challenger* material was recorded from five stations in the North Atlantic, one station in 100 fathoms (183 meters), and the others in 1,000 to 2,435 fathoms (1,829 to 4,415 meters), and at one station in the South Atlantic in 1,900 fathoms (3,475 meters). On the European side of the Atlantic it occurs in the warm area of the Faroe Channel (Pearcey), and in the Atlantic 1,750 meters (955 fathoms) (Goës). From the western Atlantic Goës records it from the Caribbean in 196

to 1,181 fathoms (359 to 2,160 meters), and Flint from a number of stations, four off the eastern coast of the United States, two in the Gulf of Mexico, and one off the coast of Brazil, ranging in depth from 732 to 1,226 fathoms (1,339 to 2,243 meters).

I have seen material from but three stations and two of these off the northeastern coast of the United States, the other in the northern part of the Gulf of Mexico.

*Verneuilina propinqua—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16866 | U.S.N.M. | 5 | D2039... | 38 19 26 N.; 68 20 20 W.. | 2639 | ..... | glob. oz..... | Common. |
| 16867 | U.S.N.M. | 1 | D2096... | 39 22 20 N.; 70 52 20 W.. | 1451 | 37.5 | glob. oz..... | Rare. |
| 16868 | U.S.N.M. | 5 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Few. |

VERNEUILINA ADVENA Cushman.

Plate 9, figs. 7–9.

*Verneuilina polystropha* Heron-Allen and Earland (not Reuss), minute form, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 55 (in part), pl. 4, figs. 3–5 (not 1, 2).

*Verneuilina advena* Cushman, Res. Hudson Bay Exped., 1920, no. 9, 1922, p. 9.

*Description.*—Variety differing from the typical in the smaller size and more slender form.

Length 0.17–0.30 mm.; breadth 0.07–0.1 mm.

*Distribution.*—This small variety is more closely allied with *V. arenacea* (Williamson), than any other species and seems to be found on both sides of the Atlantic.

Heron-Allen in the above reference refer to it as follows:

> At a few stations a minute variety occurs in very small numbers, which we have observed at many other localities wherethe larger type [*V. polystropha*] is abundant. It exactly resembles the common types, but is normally only one-eighth of their size, though often possessing a far greater number of chambers than the larger specimens. . . . . It is possible that these minute individuals may represent the microspheric form, but, owing to the difficulty of observing the primordial chamber in this species, we are unable to make any definite pronouncement in this point.

Figures of the typical form after Williamson are given on plate 10, figures 5, 6.

*Verneuilina advena—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 17068 | U.S.N.M. | 2 | 23 | Casco Bay, Me..... | ..... | ..... | ..... | Rare. |

### VERNEUILINA AFFIXA Cushman.

Plate 3, fig. 2, plate 10, fig. 4.

*Verneuilina propinqua* H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 387, pl. 47, figs. 13, 14 (not figs. 8–12).—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 38.

*Verneuilina affixa* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 56, figs. 90, 91 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 142, pl. 27, fig. 6.

*Description.*—Test affixed, pyramidal, tapering to a rather acute point at the apical end, triserial except at the attached end, which may be biserial in the attached chambers; test usually somewhat curved; wall coarsely arenaceous, but only slightly roughened on the surface; aperture at the base of the inner margin of the chamber in an elongated depression formed by the last-formed whorl of chambers, rounded or somewhat elongate; color reddish-brown, except the attached chambers, and the area of attachment about the chambers, which are light gray.

Length up to 4 mm.

*Distribution.*—This species which was named on the basis of *Albatross* specimens from the western coast of Mexico seems to be fairly common in the western Atlantic. The records range from the latitude of Cape Cod south with a few stations in the Gulf of Mexico, off Yucatan, and off the coast of Brazil. As Brady notes, this species is very different from *V. propinqua* H. B. Brady, is more tapering, higher, and very often bent toward the tip, the aperture is larger in a rather deep reentrant at the end; and toward the end it often becomes biserial. Adult specimens are usually gray near the end, showing their base of attachment.

*Verneuilina affixa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17046 | U.S.N.M. | 2 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Rare. |
| 17047 | U.S.N.M. | 3 | D2037... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob. oz..... | Rare. |
| 17048 | U.S.N.M. | 4 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob. oz..... | Few. |
| 17049 | U.S.N.M. | 1 | D2042... | 39 33 00 N.; 68 26 45 W.. | 1,555 | 38.5 | glob. oz..... | Rare. |
| 17050 | U.S.N.M. | 4 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Few. |
| 17051 | U.S.N.M. | 1 | D2096... | 39 22 20 N.; 70 52 20 W.. | 1,451 | 37.5 | glob. oz..... | Rare. |
| 17052 | U.S.N.M. | 2 | D2105... | 37 50 00 N.; 73 03 50 W.. | 1,395 | 41.0 | glob. oz..... | Rare. |
| 17053 | U.S.N.M. | 1 | D2110... | 35 12 10 N.; 74 57 15 W.. | 516 | 40.0 | bu. m..... | Rare. |
| 17054 | U.S.N.M. | 1 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Rare. |
| 17055 | U.S.N.M. | 1 | D2219... | 39 46 22 N.; 69 29 00 W.. | 948 | 38.8 | gy. m..... | Rare. |
| 17056 | U.S.N.M. | 3 | D2221... | 39 05 30 N.; 70 44 30 W.. | 1,525 | 36.9 | gy.oz..... | Few. |
| 17057 | U.S.N.M. | 1 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 17058 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 17059 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 36 15 W.. | 1,330 | ..... | lt. br. m..... | Rare. |
| 17060 | U.S.N.M. | 10 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br. gn. m.... | Common. |
| 17061 | U.S.N.M. | 10 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Common. |
| 17062 | U.S.N.M. | 1 | D2399... | 20 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 17063 | U.S.N.M. | 1 | D2562... | 39 15 30 N.; 71 25 00 W.. | 1,434 | 37.3 | gy. oz..... | Rare. |
| 17064 | U.S.N.M. | 3 | D2572... | 40 29 00 N.; 66 04 00 W.. | 1,769 | 37.8 | gy. oz..... | Rare. |
| 17065 | U.S.N.M. | 4 | D2682... | 39 38 00 N.; 70 22 00 W.. | 990 | ..... | gn. m..... | Few. |
| 17066 | U.S.N.M. | 4 | D2706... | 41 28 30 N.; 65 35 30 W.. | 1,188 | ..... | gy. oz. for... | Few. |
| 17067 | U.S.N.M. | 1 | D2760... | 12 07 00 S.; 37 17 00 W.. | 1,019 | 39.5 | br. co..... | Rare. |

VERNEUILINA BRADYI Cushman.

Plate 11, fig. 1.

*Verneuilina pygmaea* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 385, pl. 47, figs. 4–7 (not *Bulimina pygmaea* Egger).—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Chapman, Proc. Zool. Soc. London, 1895, p. 19.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 285, pl. 31, fig. 1.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 402.—Awerinzew, Mem. Acad. Imp. Sci. St. Petersburg, ser. 8, vol. 29, no. 3, 1911, p. 17.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 55, pl. 4, fig. 10.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 21.

*Verneuilina propinqua* Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 38 (part).

*Verneuilina bradyi* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 54, figs. 87*a*, *b*.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1013.—Cushman, Bull. 100, U. S. Nat. Mus., vol 4, 1921, p. 141, pl. 27, fig. 4.

*Description.*—Test pyramidal, the triserial chambers inflated, the wall finely arenaceous; about five visible chambers in each vertical series; surface smooth, but not usually polished; aperture an elongate slit near the base of the inner margin of the chamber, occasionally with a thickened lip; color light gray.

Length 0.60–1.50 mm.

*Distribution.*—This is a species which seems to be characteristic of *Globigerina*-ooze. It is very widely distributed in the deeper water of all the oceans under such conditions. About the British Isles it is found only in deep water, Wright's records being southwest of Ireland, 750 to 1,020 fathoms (1,370 to 1,866 meters). Heron-Allen and Earland record a single specimen from the Clare Island region. Pearcy records it from the Faroe Channel. The *Challenger* records include fourteen stations in the northern Atlantic, ranging in depth from 420 to 2,750 fathoms (768 to 5,030 meters), and six in the South Atlantic, 675 to 2,475 fathoms (1,234 to 4,527 meters). In the western Atlantic Flint records the species from the Gulf of Mexico in 347 and 1,181 fathoms (635 and 2,160 meters). I have had the species from a considerable number of stations in the *Albatross* collections, most of them off the northeastern coast of the United States, but others scattered off the southeastern coast of the United States, in the Gulf of Mexico, and in the Caribbean Sea. Awerinzew records this from the Arctic, Pearcey from the Antarctic, and it is also recorded in both the North and South Pacific, mostly in deep water.

*Verneuilina bradyi* should be used for this recent species instead of *V. pygmaea* Egger, as has already been shown in a previous paper (Bull. 71, pt. 2, p. 55).

*Verneuilina bradyi—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16821 | U.S.N.M. | 1 | D2003... | 37 16 30 N.; 74 20 36 W.. | 611 | ..... | ..... | Rare. |
| 16822 | U.S.N.M. | 6 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Common. |
| 16823 | U.S.N.M. | 2 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Rare. |
| 16824 | U.S.N.M. | 1 | D2036... | 38 52 40 N.; 69 24 40 W.. | 1,735 | 38.0 | glob. oz..... | Rare. |
| 16825 | U.S.N.M. | 5 | D2037... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob. oz..... | Few. |
| 16826 | U.S.N.M. | 1 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob. oz..... | Rare. |
| 16827 | U.S.N.M. | 1 | D2042... | 39 33 00 N.; 68 26 45 W.. | 1,555 | 38.5 | glob. oz..... | Rare. |
| 16828 | U.S.N.M. | 2 | D2050... | 39 42 50 N.; 69 21 20 W.. | 1,050 | 44.5 | glob. oz..... | Rare. |
| 16829 | U.S.N.M. | 4 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Few. |
| 16830 | U.S.N.M. | 5 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39.0 | for. s. m..... | Few. |
| 16831 | U.S.N.M. | 2 | D2105... | 37 50 00 N.; 73 03 50 W.. | 1,395 | 41.0 | glob. oz..... | Rare. |
| 16832 | U.S.N.M. | 1 | D2117... | 15 21 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s.. | Rare. |
| 16833 | U.S.N.M. | 1 | D2138... | 17 44 05 N.; 75 39 00 W.. | 23 | ..... | co. brk. sh... | Rare. |
| 16834 | U.S.N.M. | 8 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Common. |
| 16835 | U.S.N.M. | 1 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Rare. |
| 16836 | U.S.N.M. | 1 | D2205... | 39 35 00 N.; 71 18 45 W.. | 1,073 | 38.1 | gy. oz..... | Rare. |
| 16837 | U.S.N.M. | 3 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Few. |
| 16838 | U.S.N.M. | 2 | D2335... | 23 10 39 N.; 82 20 21 W.. | 204 | ..... | ..... | Rare. |
| 16839 | U.S.N.M. | 3 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m..... | Few. |
| 16840 | U.S.N.M. | 1 | D2392... | 28 47 30 N.; 87 27 00 W.. | 724 | 40.7 | br. gy. m.... | Rare. |
| 16841 | U.S.N.M. | 5 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m..... | Few. |
| 16842 | U.S.N.M. | 2 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16843 | U.S.N.M. | 1 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Rare. |
| 16844 | U.S.N.M. | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 16845 | U.S.N.M. | 2 | D2564... | 39 22 00 N.; 71 23 30 W.. | 1,390 | 37.3 | gy. oz..... | Rare. |
| 16846 | U.S.N.M. | 1 | D2566... | 37 23 00 N.; 68 08 00 W.. | 2,620 | 36.4 | gy. oz..... | Rare. |
| 16847 | U.S.N.M. | 2 | D2568... | 39 15 00 N.; 68 08 00 W.. | 1,781 | 36.9 | gy. oz..... | Rare. |
| 16848 | U.S.N.M. | 1 | D2572... | 40 29 00 N.; 66 04 00 W.. | 1,769 | 37.8 | gy. oz..... | Rare. |
| 16849 | U.S.N.M. | 4 | D2573... | 40 31 18 N.; 66 09 00 W.. | 1,742 | 37.3 | gy. m. s..... | Few. |
| 16850 | U.S.N.M. | 1 | D2581... | 39 43 00 N.; 71 34 00 W.. | 391 | ..... | gn. m..... | Rare. |
| 16851 | U.S.N.M. | 1 | D2678... | 32 40 00 N.; 76 40 30 W.. | 731 | 38.7 | lt. gy. oz..... | Rare. |
| 16852 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz..... | Rare. |
| 16853 | U.S.N.M. | 2 | D2684... | 39 35 00 N.; 70 54 00 W.. | 1,106 | ..... | br. c. bk. sp.. | Rare. |
| 16854 | U.S.N.M. | 2 | D2706... | 41 28 30 N.; 65 35 30 W.. | 1,188 | ..... | gy. oz. for.... | Rare. |
| 16855 | U.S.N.M. | 3 | D2713... | 38 20 00 N.; 70 08 30 W.. | 1,859 | ..... | br. oz..... | Few. |
| 16856 | U.S.N.M. | 1 | D2716... | 38 29 30 N.; 70 57 00 W.. | 1,631 | ..... | br. oz. for.... | Rare. |
| 16857 | U.S.N.M. | 2 | D2748... | 39 31 00 N.; 71 14 30 W.. | 1,163 | 37.8 | gy. m. for.... | Rare. |
| 16858 | U.S.N.M. | 1 | D2751... | 16 54 00 N.; 63 12 00 W.. | 687 | 40.0 | bu. glob. oz.. | Rare. |

### VERNEUILINA SPINULOSA Reuss.

Plate 19, fig. 5.

*Verneuilina spinulosa* Reuss, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 374, pl. 47, fig. 12.—Egger, Neues Jahrb., 1857, p. 292, pl. 9, figs. 17, 18.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 384, pl. 47, figs. 1–3.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 333.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 896.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 219, pl. 42, fig. 15 (not fig. 14).—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Dakin, Rep. Ceylon Pearl-Oyster Fish., vol. 5, 1896, p. 233.—Chapman, Journ. Linn. Soc. London, vol. 28, 1900, p. 185.—Millett, Journ. Roy Micr. Soc., 1900, p. 11.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 10, pl. 2, fig. 5.—Rhumbler, Zool. Jahrb., Abth. Syst., vol. 24, 1906, p. 61, pl. 5, fig. 53.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 132.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 327.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 11.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 402.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 55, figs. 88*a*, *b*, 89 (in text).—Pearcey, Trans. Linn. Soc. Edinburgh, vol. 49, 1914, p. 1039.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 311; Bull. 72, Australian Geol. Survey, 1917, p. 13.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 22.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 34; Proc. U. S. Nat. Mus., vol. 59, 1921, p. 51; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 141, pl. 27, fig. 5; Publ. 311, Carnegie Inst. Wash., 1922, p. 28, pl. 3, fig. 11.

*Description.*—Test pyramidal, three-sided, triangular in transverse section, the sides flat or slightly concave, the initial end acutely pointed; initial end and angles of chambers often with sharp spines; walls of medium thickness, hyaline, or in some cases thickened and rough, perforate, smooth or granular; apertural end of test bluntly angled, the edges of the chambers thickened; aperture a curved slit at the base of the inner edge of the chamber.

Length 0.25–0.75 mm.

*Distribution.*—From the available records this seems to be a very widely distributed species in shallow water of warm regions. It is, however, known from numerous stations about the British Isles according to published records. In the western Atlantic there are several *Challenger* stations, including two off the Lesser Antilles. Neither Flint or Bagg record this from the Gulf of Mexico or the Caribbean. I have had specimens from a few *Albatross* stations southward from Chesapeake Bay to Key West, and also from Montego Bay, Jamaica, and one station off the coast of Brazil. It was not common at any of these stations, but it was common at station D2758, in 20 fathoms (37 meters), off the coast of Brazil. It seems to be widely spread in the Indo-Pacific in shallow water.

*Verneuilina spinulosa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16859 | U.S.N.M. | 1 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s. bk. sp. | Rare. |
| 16860 | U.S.N.M. | 3 | D2420... | 37 03 20 N.; 74 31 40 W.. | 104 | 47.7 | bk. s. m. g... | Few. |
| 16861 | U.S.N.M. | 3 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16862 | U.S.N.M. | 5 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Few. |
| 16833 | U.S.N.M. | 9 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Common. |
| 16864 | U.S.N.M. | 3 | ..... | Off Key West, Fla..... | 78 | ..... | ..... | Few. |
| 16865 | U.S.N.M. | 1 | ..... | Off Sand Key, Fla..... | 92 | ..... | ..... | Rare. |

**Genus VALVULINA d'Orbigny, 1826.**

*Valvulina* d'Orbigny (type, *V. triangularis* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 270.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 391.—Chapman, The Foraminifera, 1902, p. 171.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 58.

*Rotalina* (part) Williamson, Rec. Foram. Great Britain, 1858, p. 55.

*Description.*—Test spiral, conical, with three chambers in a whorl, umbilicate, usually attached; wall arenaceous, fairly smooth; aperture provided with a valvular tooth; color usually reddish-brown, area of fixation white or light gray.

Species referred to this genus are recorded as far back as the Carboniferous.

The test is typically attached, usually by a large area of fixation, but specimens are often found detached.

### VALVULINA TRIANGULARIS d'Orbigny.

*Valvulina triangularis* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 270, No. 1; Modèles, 1826, No. 25.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 331.

Heron-Allen and Earland record a single specimen of this species from shore sands of Sussex, England. This seems to be the only record for it in the Atlantic.

### VALVULINA CONICA (Parker and Jones).

Plate 11, figs. 8, 9.

*Valvulina triangularis* Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 295, pl. 11, figs. 15, 16 (not *Valvulina triangularis* d'Orbigny).

*Valvulina triangularis* Parker and Jones, var. *conica* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 406, pl. 15, fig. 27.

*Valvulina conica* M. Sars, Vid. Selsk. Forh., 1868, p. 249.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 392, pl. 49, figs. 15, 16.—Woodward, New York Micr. Soc., 1885, p. 150.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 896.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 220, pl. 41, fig. 21; pl. 42, figs. 16, 17.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 39, pl. 8, figs. 342–352.—Chapman, Proc. Zool. Soc. London, 1895, p. 21.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 286, pl. 31, fig. 3.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 58, figs. 93*a–c* (in text).—Heron-Allen and Earland, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 233.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 142, pl. 27, fig. 7.

*Description.*—Test typically attached, conical, often with the axis somewhat curved, the apical end bluntly pointed, the affixed end flat and truncate, even concave; chambers arranged spirally, but so as to form a triserial test; wall coarsely arenaceous, rough or fairly smooth on the surface; aperture slit-like, at the inner basal margin of the chamber, protected by a valvular lip; early chambers dark reddish-brown, the later becoming lighter; area of attachment light gray.

Length about 0.50 mm.

*Distribution.*—This seems to be well distributed in the Atlantic, being recorded from the coasts of Norway and Sweden, 100 to 450 fathoms (183 to 823 meters), Faroe Channel, and the west of Scotland. On the American side of the Atlantic it occurs in the Gulf of St. Lawrence, at numerous stations off the eastern coast of the United States, Bermuda, in the Gulf of Mexico, and on the Abrohlos Bank of Brazil. From an examination of the material I have had it seems that there may be more than one species, as the apical end, even in the conical forms, is quite different, especially in different areas. The species is also recorded from the Mediterranean and from the Pacific.

*Valvulina conica—material examined.*

| Cat. No. | Coll. of— | No. of specimens | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16904 | U.S.N.M. | 10 | D2003... | 37 16 30 N.; 74 20 30 W.. | 641 | ..... | ..... | Common. |
| 16905 | U.S.N.M. | 3 | D2018... | 37 12 22 N.; 74 20 04 W.. | 788 | 39.0 | bu.m..... | Few. |
| 16906 | U.S.N.M. | 2 | D2039... | 38 19 26 N.; 68 20 20 W.. | 2,369 | ..... | glob.oz..... | Rare. |
| 16907 | U.S.N.M. | 3 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu.m..... | Few. |
| 16909 | U.S.N.M. | 1 | D2072... | 41 53 00 N.; 66 35 00 W.. | 858 | 39.0 | gy.m..... | Rare. |
| 16909 | U.S.N.M. | 7 | D2110... | 35 12 10 N.; 74 57 15 W.. | 516 | 40.0 | bu.m..... | Common. |
| 16910 | U.S.N.M. | 10 | D2115... | 35 49 30 N.; 74 34 45 W.. | 843 | 39.0 | m.fne.s..... | Common. |
| 16911 | U.S.N.M. | 2 | D2171... | 37 59 30 N.; 73 48 40 W.. | 444 | 39.5 | gn.m..... | Rare. |
| 16912 | U.S.N.M. | 7 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn.m..... | Common. |
| 16913 | U.S.N.M. | 1 | D2187... | 39 49 30 N.; 71 10 00 W.. | 420 | 39.7 | gn.m.s..... | Rare. |
| 16914 | U.S.N.M. | 1 | D2234... | 39 09 00 N.; 72 03 15 W.. | 810 | 38.6 | gn.m..... | Rare. |
| 16915 | U.S.N.M. | 3 | D2262... | 39 54 45 B.; 69 29 45 W.. | 250 | 41.6 | gn.m.s..... | Rare. |
| 16916 | U.S.N.M. | 8 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy.m..... | Common. |
| 16917 | U.S.N.M. | 3 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br.gn.m.... | Rare. |
| 16918 | U.S.N.M. | 1 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy.m..... | Rare. |
| 16919 | U.S.N.M. | 1 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn.m..... | Rare. |
| 16920 | U.S.N.M. | 3 | D2573... | 40 34 18 N.; 66 09 00 W.. | 1,742 | 37.3 | gy.m.s..... | Rare. |
| 16921 | U.S.N.M. | 1 | D2581... | 39 43 00 N.; 71 34 00 W.. | 394 | ..... | gn.m..... | Rare. |
| 16922 | U.S.N.M. | 1 | D2584... | 39 05 30 N.; 72 23 20 W.. | 541 | 39.5 | gy.m..... | Rare. |
| 16923 | U.S.N.M. | 4 | D2586... | 39 02 40 N.; 72 40 00 W.. | 328 | 40.2 | dk.gy.m.... | Few. |
| 16924 | U.S.N.M. | 1 | D2729... | 36 36 00 N.; 74 32 00 W.. | 679 | ..... | dk.gn.m.... | Rare. |

VALVULINA FUSCA (Williamson).

*Rotalina fusca* Williamson, Rec. Foram. Great Britain, 1858, p. 55, pl. 5, figs. 114, 115.—Terquem, Ess. Anim. Plage Dunkerque, 1875, p. 26, pl. 2, figs. 6, *a*, *b*.

*Valvulina fusca* M. Sars, Vid. Selsk. Forh., 1868, p. 249.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 392, pl. 49, figs. 13, 14; Journ. Roy. Micr. Soc., 1887, p. 896.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 39, pl. 8, figs. 353–355.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 35.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 59, figs. 94–95.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 58; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 232.—Mestayer, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—Sidebottom, Journ. Roy. Micr. Soc. 1918, p. 24.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 604; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 143, pl. 28, figs, 1*a*, *b*.

*Description.*—Test typically attached, low conical, depressed, rounded, the affixed end concave; chambers spirally arranged, with only three chambers in each whorl; wall finely arenaceous, smooth; aperture slit-like, at the inner basal margin of the chamber, protected by a valvular lip; early chambers reddish-brown, the later yellowish-brown; area of attachment light gray.

Diameter 0.50–0.65 mm.

*Distribution.*—About the British Isles at least this species is much more common than the preceding, but in the western Atlantic the reverse is true. Three are numerous records from off the shores of Scandinavia, the British Isles, Belgium, and France, Canary Islands,

the Azores, and the West Indies (Brady). Heron-Allen and Earland record the species from two stations in the Clare Island region, off South Cornwall and at 11 stations off the west of Scotland. They note that it is most common in moderately deep water, and in their experience that it is rare in shallow dredgings off the British coast.

I have had it at but two *Albatross* stations, one off the northeastern coast of the United States, and the other south of Cuba.

*Valvulina fusca—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16894 | U.S.N.M. | 1 | D2038... | 38 30 30 N.; 69 08 25 W.. | 2,033 | ..... | glob. oz..... | Rare. |
| 16895 | U.S.N.M. | 2 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Rare. |

VALVULINA OVIEDOIANA d'Orbigny.

Plate 11, figs. 2–5.

*Valvulina oviedoiana* D'ORBIGNY, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 103, pl. 2, figs. 21, 22.—CUSHMAN, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 51, pl. 11, figs. 11–14; Publ. 311, Carnegie Inst. Wash., 1922, p. 29, pl. 2, figs. 7, 8.

*Verneuilina affixa* CUSHMAN (part), Publ. 213, Carnegie Inst. Wash., 1918, pp. 271 *et seq.*

*Description.*—Test tetrahedral, triserial, flattened on three sides, apical end bluntly rounded, apertural end broadly rounded; chambers distinct, somewhat inflated, generally triangular, the ventral border broadly rounded; sutures distinct, somewhat depressed, wall coarsely arenaceous, somewhat roughened; aperture in a depressed area on the ventral side of the last-formed chamber with a large broad overhanging tooth; color white.

Length 1.0–1.5 mm.

*Distribution.*—D'Orbigny originally described this species from shore sands of Cuba. His name was not even used by Brady as a synonym in the *Challenger* Report, and the species has been entirely neglected since its first description, except that I have shown in a recent paper that it should be used for this common West Indies species of shallow water. I have had specimens from stations on the north coast of Jamaica at Montego Bay, and at Runaway Bay. As *Verneuilina affixa* I have recorded it from numerous stations off the coast of Florida and the Bahamas. In the *Albatross* material it has occurred in the Bahamas, off Yucatan, and at one station in the northern part of the Gulf of Mexico. It is a common and very well characterized species of this region. Its nearest ally seems to be *Valvulina davidiana* Chapman described by him from Funafuti.

This probably represents a Pacific species very closely allied to our West Indian one.

*Valvulina oviedoiana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16897 | U.S.N.M. | 4 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co.. | Few. |
| 16898 | U.S.N.M. | 1 | D2388... | 29 24 30 N.; 88 01 00 W.. | 35 | ..... | yl. s. bk. sp. | Rare. |
| 16899 | U.S.N.M. | 1 | D2629... | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co. s..... | Rare. |
| 16900 | U.S.N.M. | 5 | ..... | Lisbon Creek Reef, Bahamas. | ..... | ..... | ..... | Few. |

### Genus CHRYSALIDINA d'Orbigny, 1846.

*Chrysalidina* d'Orbigny (type, *C. gradata* d'Orbigny), For. Foss. Vienne, 1846, p. 194.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 387.—Chapman, The Foraminifera, 1902, p. 167.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 60.

*Description.*—Test many chambered, triserial, at least in the early portion, tapering; apertures numerous, scattered over the terminal wall of the chamber; other walls also porous.

Three species of this genus are known, the type from the Cretaceous, another species *C. pulchella* Cushman, which I described from the Gatun Formation of the Panama Canal Zone, and the recent *C. dimorpha* H. B. Brady, which is a typically Indo-Pacific species, but which is recorded from the Atlantic. It is quite probable that the Cretaceous species is not generically the same as the last two, but further study is necessary to determine this.

#### CHRYSALIDINA DIMORPHA H. B. Brady.

Plate 19, fig. 4.

*Chrysalidina dimorpha* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 54; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 388, pl. 46, figs. 20, 21.—Woodward, Journ. New York Micr. Soc., 1885, p. 149.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. 11, vol. 18, 1893, p. 274, pl. 6, figs. 47, 51, 52.—Chapman, Proc. Zool. Soc. London, 1895, p. 20.—Millett, Journ. Roy. Micr. Soc., 1900, p. 12, pl. 1, fig. 14.—Dakin, Rep. Ceylon Pearl-Oyster Fisheries, vol. 5, 1906, p. 233.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 60, figs. 96–97 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 144.

*Description.*—Test free, elongate, tapering, triangular in cross section, the sides nearly equal, somewhat concave, the edges slightly carinate; early portion acute, consisting of chambers arranged triserially, the latter portion composed of chambers arranged in a single series; wall hyaline, perforate; apertures numerous on the broadened terminal face of the chamber.

Length about 0.50 mm., diameter about 0.25 mm.

*Distribution.*—Most of the records for this species seem to be from the Indo-Pacific, ranging from the Arabian Sea (Chapman) coral reefs of Honolulu, 40 fathoms (73 meters); Hongkong Harbor, 7 fathoms (13 meters); in dredged sand from Torres Strait, off Raine Island, 155 fathoms (283 meters); shore sands from the east coast of Madagascar; shallow water on the coast of Ceylon (Brady); coast of Mauritius, 411 and 374 meters (224 and 204 fathoms); off west Australia, 359 meters (196 fathoms) (Egger); Malay Archipelago (Millett), and Ceylon (Dakin). The only record hitherto for the Atlantic is that given by Woodward "Hamilton Harbor, Bermuda, 5 fathoms (9 meters)."

I have had two specimens of this species from *Albatross* station D2758 in 20 fathoms (37 meters) off the coast of Brazil. It seems to be very rare in the Atlantic, and it has not been found in any of the shallow-water material I have had from the coast of Florida or in the West Indies.

Brady mentions "a long, somewhat attenuated variety" which occurs in shallow water off Madagascar and Ceylon.

*Chrysalidina dimorpha—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16896 | U.S.N.M. | 2 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Rare. |

**Genus TRITAXIA Reuss, 1860.**

*Textularia* (part) Reuss, Verst. Böhm. Kreid., pt. 1, 1845, p. 39.

*Tritaxia* Reuss (type, *T. tricarinata* (Reuss)=*Textularia tricarinata* Reuss), Sitz. Akad. Wiss. Wien, vol. 40, 1860, p. 228.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 388.—Chapman, The Foraminifera, 1902, p. 167.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 61.

*Description.*—Test triserial, at least in the earlier portion, usually triangular in cross section; aperture central and terminal with or without a distinct neck and lip, rounded; wall usually arenaceous.

This genus as used by Reuss and later by Brady includes triserial forms which are "in their early development with a Textularian aperture, later becoming uniserial and the aperture circular and terminal." In this form they correspond somewhat to a triangular *Clavulina*. *Tritaxia caperata* H. B. Brady has been separated and forms the type of *Tritaxilina*.

The geological history of this genus apparently goes back to the lower Cretaceous. In the present ocean it seems to be largely confined to the Indo-Pacific region.

TRITAXIA LEPIDA H. B. Brady.

*Tritaxia lepida* H. B. Brady, Quart. Journ. Micr. Soc., vol. 21, 1881, p. 55; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 389, pl. 49, figs. 12*a*, *b*.—Millett, Journ. Roy. Micr. Soc., 1900, p. 12, pl. 1, fig. 15.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 328.

*Description.*—"Test triquetrous, elongate, broadest near the middle, tapering to a point at the aboral extremity, distal and rounded; the three sides nearly equal, the angles sharp or subcarinate; texture hyaline, aperture simple, consisting of a short tubular neck with thickened lip, at the center of the terminal segment."

"Length, 1/80th inch (0.3 mm.)."

*Distribution.*—Brady described this species from *Challenger* station 45, off the coast of North America, a little south of the latitude of New York, at a depth of 1,240 fathoms (2,268 meters). This is the only recent Atlantic record for this species. Millett records it from a single station, and a single specimen from the Malay Archipelago, and also records specimens from *Challenger* station 185 off Raine Island, Torres Strait, 155 fathoms (283 meters). A comparison of the figures given by Brady and that of Millett show considerable difference in the two and it is probable that a further examination of the specimens from the two areas will show that the one from the Pacific is distinct.

Genus GAUDRYINA d'Orbigny, 1839.

*Gaudryina* d'Orbigny (type, *G. rugosa* d'Orbigny), in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 109; Mém. Soc. Géol. France, ser. 1, vol. 4, 1840, p. 43; For. Foss. Vienne, 1846, p. 197.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 377.—Chapman, The Foraminifera, 1902, p. 170.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 62.
*Heterostomella* Reuss, Sitz. Akad. Wiss. Wien, vol. 52, pt. 1, 1865, p. 448.

*Description.*—Test free, composed of two distinct portions, the earlier consisting of a series of chambers arranged triserially, followed by a later consisting of a series arranged biserially; wall arenaceous, varying much in coarseness in the different species; aperture variable as in the various species of *Textularia*, either an opening at the base of the inner margin of the chamber, between it and the wall of the preceding chamber, or a perforation near the base of the inner margin, often with a raised border, or in some species a terminal more or less circular opening.

The genus *Gaudryina* is evidently derived through triserial ancestors such as *Verneuilina*. Its later biserial development which is very similar to that of *Textularia* in arrangement to chambers and aperture is due to a reversion in its later development. There is some difference in the apertural characters in the different species, some being entirely *Textularia*-like, others being terminal. The genus is known geologically from the lower Cretaceous to the present and there is evidently much difference in the species in the different geological periods and a uniting of the recent forms with those of the

earlier fossil forms as has been done by some authors does not seem to be the best treatment of the recent species.

A study of the *Albatross* and other material from the western Atlantic shows that our species and varieties are constant in their characters and have very definite areas of distribution which follow those of other species of the foraminifera.

### GAUDRYINA SCABRA H. B. Brady.

Plate 11, figs. 6, 7.

*Gaudryina pupoides* H. B. Brady (not *G. pupoides* d'Orbigny, 1840), Ann. Mag. Nat. Hist., ser. 4, vol. 6, 1870, p. 300, pl. 8, fig. 5.

*Gaudryina scabra* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 381, pl. 46, fig. 7.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 146, pl. 28, fig. 5.

*Description.*—Test elongate, tapering, somewhat compressed, increasing in breadth from the subacute apical end to the much broader apertural end, triserial portions short but distinct, rounded, biserial portion broadly elliptical in transverse section; chambers in the biserial portion usually consisting of about five pairs, slightly inflated, distinct; sutures distinct, slightly depressed, wall rather coarsely arenaceous with numerous broken sponge spicules and a considerable portion of cement; aperture at the base of the inner margin of the chamber, arched, simple; color deep reddish-brown.

Length up to 2 mm.

*Distribution.*—From the *Challenger* material Brady records this species from but two stations; 23, 450 fathoms (823 meters), latitude 18° 26′ N., longitude 63° 29′ W., and 24, 390 fathoms (713 meters), latitude 18° 38′ 30″ N., longitude 65° 05′ 30″ W. This species has been widely recorded by numerous authors, but an examination of their figures when given show that very few of these are at all like the typical specimens figured and described by Brady from the West Indies. An examination of the abundant western Atlantic material has been surprising in that *Gaudryina scabra* has occurred but twice, once at *Albatross* station D2751, 687 fathoms (1,256 meters), close to the two *Challenger* stations given by Brady. There are also two specimens from *Albatross* station D2150, in 382 fathoms (697 meters) in the Caribbean Sea. This therefore seems to be a species developed in the Caribbean and possibly adjacent areas in water of several hundred fathoms in depth, and so far as material shows is confined to this region.

*Gaudryina scabra—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16699 | U.S.N.M. | 2 | D2150... | 134 34 45 N.; 81 21 10 W. | 382 | 45.8 | wh. crs. s.... | Rare. |
| 16700 | U.S.N.M. | 2 | D2751... | 16 54 00 N.; 63 12 00 W. | 687 | 40.0 | bu. glob. oz.. | Rare. |

### GAUDRYINA FLINTII Cushman.

Plate 12, figs. 1, 2.

*Gaudryina subrotundata* Flint (not *G. subrotundata* Schwager, 1866), Rep. U. S. Nat. Mus., 1897 (1989), p. 287, pl. 33, fig. 1.

*Gaudryina rugosa* Göes (not *G. rugosa* d'Orbigny, 1840), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 39.

*Gaudryina flintii* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 63, figs. 102*a–c* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 146, pl. 29, fig. 1.

*Description.*—Test subcylindrical, gradually tapering to the initial end, the early triserial portion forming but a small part of the test, the later biserial portion making up fully three-fourths; chambers of the later portion well rounded, nearly circular in cross section; sutures well marked, wall arenaceous, usually rather coarse, but in some cases finer and more smoothly finished; aperture in the biserial portion a subcircular opening near, but not connecting with the inner border of the chamber; color gray.

Length 1–5 mm.

*Distribution.*—This species described in an earlier paper on the Pacific foraminifera occurs also in the Atlantic. Flint had this from off the coast of South America, off Brazil, from the region south of Yucatan, off the Windward Islands, in the Gulf of Mexico, and off the coast of Georgia. Except that I have not had it from off the coast of Brazil, I have had it from all the other regions from which Flint records it. It is interesting also to note that Brady records *G. subrotundata* from *Challenger* stations 23 and 24 off the Lesser Antilles, close to the stations from which Flint and I have had this species. The distribution of *G. flintii* in the Atlantic then follows very definitely the distribution of so many species found in the Atlantic, southward from Cape Hatteras, in the Gulf of Mexico and the Caribbean and on the eastern coast of Brazil.

*Gaudryina flintii—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16723 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 16724 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br. gn. m.... | Rare. |
| 16725 | U.S.N.M. | 10 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Common. |
| 16726 | U.S.N.M. | 2 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |
| 16727 | U.S.N.M. | 3 | D2678... | 32 40 00 N.; 76 40 30 W.. | 731 | 38.7 | lt. gy. oz.... | Few. |
| 16728 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16729 | U.S.N.M. | 2 | D2751... | 16 54 00 N.; 63 12 00 W.. | 687 | 40.0 | bu. glob., oz. | Rare. |

### GAUDRYINA ATLANTICA (Bailey).

Plate 13, figs. 1–3.

*Textularia atlantica* Bailey, Smithsonian Contrib., vol. 2, art. 3, 1851, p. 12, pl., figs. 38–43.

*Gaudryina rugosa* Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 288, pl. 33, fig. 3.

*Verneuilina triquetra* Goës (not Münster), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 38.

*Description.*—Test elongate, triangular in section, the angles acute, triserial portion short, biserial portion mostly triangular, the last-formed one or two chambers often rounded, tapering gradually from the blunt initial end to the broadly rounded apertural end; chambers distinct, not inflated; sutures distinct throughout, wall coarsely arenaceous, of angular sand grains with a large proportion of whitish cement, surface rather smoothly finished; aperture elongate, slightly arched, in a deep reentrant of the ventral inner border of the chamber; color light gray.

Length up to 4 and 5 mm., usually less.

*Distribution.*—Bailey described this species from a station in 89 fathoms (162 meters), latitude 39° 31′ N., longitude 72° 11′ 20″ W. At this station this species "is particularly abundant." Specimens of this species are abundant at a group of *Albatross* stations off the northeastern coast of the United States in the immediate vicinity of the type station given by Bailey, and at one other station off Cape Hatteras. At some of these *Albatross* stations this species was very abundant. This differs from *G. rugosa* d'Orbigny, as a reference to his figures will show.[18]

*Gaudryina atlantica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16659 | U.S.N.M. | 8 | D2244... | 40 05 15 N.; 70 23 00 W.. | 67 | 52.9 | gn. m..... | Common. |
| 16660 | U.S.N.M. | 10 | D2245... | 40 01 15 N.; 70 20 30 W.. | 122 | 48.8 | gn. m..... | Common. |
| 16661 | U.S.N.M. | 10 | D2247... | 40 03 00 N.; 69 57 00 N... | 67 | 52.4 | gn. m. bk. sp | Common. |
| 16662 | U.S.N.M. | 10 | D2314... | 32 43 00 N.; 77 51 00 W.. | 159 | 47.4 | crs. s. bk. sp. | Common. |
| 16663 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16664 | U.S.N.M. | 4 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Few. |
| 16665 | U.S.N.M. | 3 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Few. |
| 16666 | U.S.N.M. | 1 | D2544... | 40 01 45 N.; 70 24 00 W.. | 131 | 47.7 | gn. s. bk. sp. | Rare. |
| 16667 | U.S.N.M. | 10 | ..... | Key West, Fla..... | 78 | ..... | ..... | Common. |
| | | | *Fish Hawk.* | | | | | |
| 16668 | U.S.N.M. | 3 | 949..... | 40 03 00 N.; 70 31 00 W.. | 100 | 52.0 | yl. m..... | Few. |
| 16669 | U.S.N.M. | 1 | 1108..... | 40 02 00 N.; 70 37 30 W.. | 101 | 48.0 | gy. m. fn. s.. | Rare. |
| 16670 | U.S.N.M. | 1 | 1038..... | 38 58 00 N.; 70 06 00 W.. | 146 | 47.0 | s. sh..... | Rare. |

[18] Mem. Soc. Geol. France, vol. 4, 1840, pl. 4, figs. 20, 21.

GAUDRYINA cf. G. CONVEXA Cushman.

Plate 8, fig. 5.

*Gaudryina convexa* CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 66, figs. 105*a–c* (in text).

There are single specimens from two *Albatross* stations, D2639 in 56 fathoms (102 meters) and D2641 in 60 fathoms (110 meters), both off Florida, which are very close to this species, which I described from the western Pacific in Korean Strait. Except that the triangular portion occupies a larger portion of the test, the specimens from Florida are very similar to the others.

*Gaudryina cf. G. convexa—Material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17157 | U.S.N.M. | 1 | D2639... | 25 04 50 N.; 80 15 00 W.. | 56 | ..... | co. s..... | Rare. |
| 17158 | U.S.N.M. | 1 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |

GAUDRYINA CURTA, new species.

Plate 14, figs. 1–4.

*Description.*—Test short and broad, tapering, slightly compressed in the later portion, ends bluntly rounded, triserial portion composed of several chambers making up about one-third of the test, later two-thirds made up usually of four rotund chambers in a triserial arrangement; chambers few, inflated, distinct; sutures distinct, depressed, especially in the later portion, wall coarsely arenaceous, composed of angular sand grains and an abundant cement of finer material, surface smoothly finished; aperture rounded, at the edge of the ventral side at the inner margin of the chamber, the sides continued on the preceding chamber; color reddish-brown.

Length 2.0–2.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16698) from *Albatross* station D2739, 958 fathoms (1,752 meters), eastern coast of the United States. Very typical specimens of this species, often abundant, have occurred at a number of stations from the region of Cape Hatteras north to the Gulf of St. Lawrence, in the cold water off this coast. It is a very different species from *Gaudryina scabra* H. B. Brady in its much shorter, rotund form, and in its fewer chambers. It is perhaps nearest to *Gaudryina paupercula* Cushman from the Pacific, but that species has a still shorter fewer-chambered form, and especially in the triserial portion is different, being compressed where *G. curta* is very rounded.

*Gaudryina curta—Material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16684 | U.S.N.M. | 1 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu. m..... | Rare. |
| 16685 | U.S.N.M. | 1 | D2111... | 35 09 50 N.; 74 57 40 W.. | 938 | ..... | gn. m..... | Rare. |
| 16686 | U.S.N.M. | 6 | D2171... | 37 59 30 N.; 73 48 40 W.. | 444 | 39.5 | gn. m..... | Few. |
| 16687 | U.S.N.M. | 3 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn. m..... | Few. |
| 16688 | U.S.N.M. | 10 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | gn. m. s.... | Common. |
| 16689 | U.S.N.M. | 1 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Rare. |
| 16690 | U.S.N.M. | 1 | D2234... | 39 09 00 N.; 72 03 15 W.. | 810 | 38.6 | gn. m..... | Rare. |
| 16691 | U.S.N.M. | 2 | D2504... | 44 23 00 N.; 61 22 45 W.. | 82 | 40.6 | bk. m. g.... | Rare. |
| 16692 | U.S.N.M. | 10 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Common. |
| 16693 | U.S.N.M. | 4 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Few. |
| 16694 | U.S.N.M. | 10 | D2678... | 32 40 00 N.; 76 40 30 W.. | 731 | 38.7 | lt. gy. oz.... | Common. |
| 16695 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16696 | U.S.N.M. | 2 | D2682... | 39 38 00 N.; 70 22 00 W.. | 990 | ..... | gn. m..... | Rare. |
| 16697 | U.S.N.M. | 1 | D2731... | 36 45 00 N.; 74 28 00 W.. | 781 | ..... | gy. oz..... | Rare. |
| 16698 | U.S.N.M. | 10 | D2739... | 37 34 30 N.; 73 58 00 W.. | 811 | 38.2 | gy. m..... | Common. |

GAUDRYINA RUDIS J. Wright.

Plate 12, figs. 3–6.

*Gaudryina rudis* J. Wright, Irish Nat., vol. 9, 1900, p. 53, pl. 2, fig. 1.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 58, pl. 3, figs. 14–17; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 232.

*Distribution.*—Wright described this species from off the southwest of Ireland, from stations ranging in depth from tide-mark down to 110 fathoms (200 meters), frequent off Belfast Lough, 30 to 60 fathoms (55 to 110 meters), and common in the shore sands of Dog's Bay, Connemara Island. Heron-Allen and Earland record the species from 29 stations in the Clare Island region off western Ireland and add the following: "west coast of Scotland (shallow water), at several Welsh stations, and also in the Orkneys and in the Moray Firth on the east coast, but it does not appear to have been found in the English Channel or in the English North Sea." They also record it as very rare off South Cornwall and from 14 stations west of Scotland. The species is not known outside of this general region of the British Isles.

GAUDRYINA APICULARIS Cushman.

Plate 8, fig. 4.

*Gaudryina siphonella* H. B. Brady (not *G. siphonella* Reuss, 1851), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 382, pl. 46, figs. 17–19.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 288, pl. 34, fig. 2.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 23.

*Gaudryina apicularis* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 69, figs. 110*a*, *b* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 151, pl. 29, fig. 7.

*Description.*—Test elongate, triserial portion consisting of few chambers, forming usually somewhat less than half the test, later

portion biserial, the chambers inflated and distinct, the later chambers with a forward extension, at the end of which is the aperture; wall rather coarsely arenaceous and slightly rough; aperture nearly circular, at the end of the elongate chamber; color reddish-brown.

Length up to 1 mm.

*Distribution.*—From the available records this species is widely distributed in usually comparatively deep water. Brady's records in the *Challenger* report include the North and South Atlantic and the North and South Pacific. Several distinct forms have been included under the name *G. siphonella* Reuss as is shown by a reference to the published figures of Brady, Millett, Sidebottom, and others. The only record given by Flint is *Albatross* station D2568 in 1,781 fathoms (3,257 meters), off the northeastern coast of the United States. The only one of Brady's *Challenger* records which comes into our region is station 24, off the Lesser Antilles, in 390 fathoms (713 meters), and one off the coast of Brazil in 675 fathoms (1,234 meters). I have had specimens from 13 stations, ranging from latitude 40° off our northeastern coast southward to the coast of Georgia, and 4 stations in the northern part of the Gulf of Mexico, one off Yucatan, one off the Windward Islands, and one off the coast of Brazil. These specimens are all very constant in their characters and resemble very much plate 46, figure 17, as given by Brady, and the same as those figured by Flint. They are made up of rather coarse arenaceous material and are slightly roughened on the surface.

*Gaudryina apicularis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16671 | U.S.N.M. | 1 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1608 | 38.0 | glob. oz..... | Rare. |
| 16672 | U.S.N.M. | 1 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1000 | 39.0 | for. s. m..... | Rare. |
| 16673 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 16674 | U.S.N.M. | 1 | D2372... | 29 15 30 N.; 85 29 30 W.. | 27 | 67.0 | gy. m..... | Rare. |
| 16675 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1330 | ..... | lt. br. m.... | Rare. |
| 16676 | U.S.N.M. | 2 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1181 | 39.6 | br. gn. m... | Rare. |
| 16677 | U.S.N.M. | 1 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m.... | Rare. |
| 16678 | U.S.N.M. | 2 | D2568... | 39 15 00 N.; 68 08 00 W.. | 1781 | 36.9 | gy. oz..... | Rare. |
| 16679 | U.S.N.M. | 2 | D2572... | 40 29 00 N.; 66 04 00 W.. | 1769 | 37.8 | gy. oz..... | Rare. |
| 16680 | U.S.N.M. | 3 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Few. |
| 16681 | U.S.N.M. | 2 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16682 | U.S.N.M. | 3 | D2761... | 15 39 00 S.; 38 32 54 W.. | 818 | 39.0 | pter. oz..... | Few. |
| 16683 | U.S.N.M. | 1 | H86..... | 12 58 40 N.; 62 48 00 W.. | 1635 | ..... | bu. m. for... | Rare. |

### GAUDRYINA BRADYI Cushman.

Plate 12, fig. 8.

*Gaudryina pupoides* H. B. Brady (not *G. pupoides* d'Orbigny), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 378, pl. 46, figs. 1–4.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 219, pl. 43, figs. 7, 8.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 471.—Chapman, Proc. Zool. Soc. London, 1895, p. 20.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 40.—Flint, Ann. Rep. U. S. Nat. Mus., 1897 (1899), p. 287, pl. 32, fig. 4.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 403; Zool. Res. *Endeavour*, pt. 3, 1912, p. 310; vol. 3, pt. 1, 1915, p. 16.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 23.

*Gaudryina bradyi* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 67, figs. 107*a–c* (in text).—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1014.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 149, pl. 29, fig. 3.

*Description.*—Test stout, somewhat elongate, tapering slightly until near the initial end where it tapers abruptly to the somewhat blunt end; triserial portion nearly circular in cross section, of few chambers, the later biserial portion making up about three-fourths of the test, slightly compressed; chambers overlapping and appearing crowded, broadly elliptical in cross section, inflated; suture deep and distinct, end strongly convex, wall of fine arenaceous or calcareous shell material, smooth; aperture oval, slightly back from the inner margin of the chamber and with the border raised somewhat and thickened; color light gray.

Length 0.38–1.00 mm.

*Distribution.*—This recent species is very widely distributed, being one of the few Textulariidae associated with typical *Globigerina*-ooze. It is very widely distributed all over the world and shows little if any variation. It has proved to be one of the most common species of the genus in the material I have examined from the western Atlantic, being found abundantly off the entire eastern coast of the United States, in the Gulf of Mexico, and in the Caribbean Sea. *Challenger* stations show it is distributed generally over both the South and North Atlantic.

*Gaudryina bradyi—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16755 | U.S.N.M. | 1 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Rare. |
| 16756 | U.S.N.M. | 1 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Rare. |
| 16757 | U.S.N.M. | 1 | D2036... | 38 52 40 N.; 69 24 40 W.. | 1,735 | 38.0 | glob. oz..... | Rare. |
| 16758 | U.S.N.M. | 5 | D2037... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob. oz..... | Few. |
| 16759 | U.S.N.M. | 3 | D2038... | 38 30 30 N.; 69 08 25 W.. | 2,033 | ..... | glob. oz..... | Few. |
| 16760 | U.S.N.M. | 7 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob. oz..... | Common. |
| 16761 | U.S.N.M. | 4 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Few. |
| 16762 | U.S.N.M. | 1 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu. m..... | Rare. |
| 16763 | U.S.N.M. | 2 | D2050... | 39 42 50 N.; 69 21 20 W.. | 1,050 | 44.5 | glob. oz..... | Rare. |
| 16764 | U.S.N.M. | 2 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Rare. |
| 16765 | U.S.N.M. | 2 | D2076... | 41 13 00 N.; 66 00 50 W.. | 906 | ..... | bu. m..... | Rare. |
| 16766 | U.S.N.M. | 2 | D2097... | 37 56 20 N.; 70 57 30 W.. | 1,917 | ..... | glob. oz..... | Rare. |
| 16767 | U.S.N.M. | 1 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s. | Rare. |
| 16768 | U.S.N.M. | 5 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Few. |
| 16769 | U.S.N.M. | 10 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Common. |
| 16770 | U.S.N.M. | 2 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Rare. |
| 16771 | U.S.N.M. | 1 | D2196... | 39 35 00 N.; 69 44 00 W.. | 1,230 | 38.0 | gn. m..... | Rare. |
| 16772 | U.S.N.M. | 9 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Common. |
| 16773 | U.S.N.M. | 2 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | gn. m., s.... | Rare. |
| 16774 | U.S.N.M. | 1 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Rare. |
| 16775 | U.S.N.M. | 1 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Rare. |
| 16776 | U.S.N.M. | 5 | D2217... | 39 47 20 N.; 69 34 15 W.. | 924 | 38.1 | gy. m..... | Few. |
| 16777 | U.S.N.M. | 1 | D2231... | 38 29 00 N.; 73 09 00 W.. | 965 | 36.8 | gy. oz..... | Rare. |
| 16778 | U.S.N.M. | 5 | D2335... | 23 10 39 N.; 82 20 21 W.. | 204 | ..... | ..... | Few. |
| 16779 | U.S.N.M. | 1 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Rare. |
| 16780 | U.S.N.M. | 1 | D2392... | 28 47 30 N.; 87 27 00 W.. | 724 | 40.7 | br. gy. m.... | Rare. |
| 16793 | U.S.N.M. | 2 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m.... | Rare. |
| 16781 | U.S.N.M. | 2 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16782 | U.S.N.M. | 1 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Rare. |
| 16783 | U.S.N.M. | 2 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 16784 | U.S.N.M. | 8 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Common. |
| 16785 | U.S.N.M. | 3 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Few. |
| 16786 | U.S.N.M. | 1 | D2416... | 31 26 00 N.; 79 07 00 W.. | 276 | 53.8 | co. brk. sh... | Rare. |
| 16787 | U.S.N.M. | 1 | D2528... | 41 47 00 N.; 65 37 30 W.. | 677 | 38.7 | br. s..... | Rare. |
| 16788 | U.S.N.M. | 1 | D2530... | 40 53 30 N.; 66 24 00 W.. | 956 | 38.4 | gy. oz..... | Rare. |
| 16789 | U.S.N.M. | 1 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Rare. |
| 16790 | U.S.N.M. | 1 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Rare. |
| 16791 | U.S.N.M. | 2 | D2562... | 39 15 30 N.; 71 25 00 W.. | 1,434 | 37.3 | gy. oz..... | Rare. |
| 16792 | U.S.N.M. | 2 | D2564... | 39 22 00 N.; 71 23 30 W.. | 1,390 | 37.3 | gy. oz..... | Rare. |
| 16805 | U.S.N.M. | 5 | D2573... | 40 34 18 N.; 66 09 00 W.. | 1,742 | 37.3 | gy. m. s..... | Few. |
| 16794 | U.S.N.M. | 1 | D2581... | 39 43 00 N.; 71 34 00 W.. | 394 | ..... | gn. m..... | Rare |
| 16795 | U.S.N.M. | 1 | D2585... | 39 08 30 N.; 72 17 00 W.. | 542 | 39.0 | dk. gy. m.... | Rare. |
| 18796 | U.S.N.M. | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Rare. |
| 16797 | U.S.N.M. | 1 | D2629... | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co. s..... | Rare. |
| 16798 | U.S.N.M. | 1 | D2660... | 28 40 00 N.; 78 46 00 W.. | 504 | 45.7 | yl. for..... | Rare. |
| 16799 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16800 | U.S.N.M. | 2 | D2684... | 39 35 00 N.; 70 54 00 W.. | 1,106 | ..... | br. c. bk. sp. | Rare. |
| 16801 | U.S.N.M. | 2 | D2689... | 39 42 00 N.; 71 15 30 W.. | 525 | ..... | gn. m..... | Rare. |
| 16802 | U.S.N.M. | 5 | D2713... | 38 20 00 N.; 70 08 30 W.. | 1,859 | ..... | br. oz..... | Few. |
| 16803 | U.S.N.M. | 4 | D2721... | 38 56 00 N.; 72 11 30 W.. | 813 | ..... | gy. oz..... | Few. |
| 16804 | U.S.N.M. | 2 | H133.... | 11 33 20 N.; 66 19 00 W.. | 533 | ..... | gy. m. for... | Rare. |
| | | | *Flying Falcon.* | | | | | |
| | J.A.C... | 1 | Log 8... | 51 02 00 N.; 11 27 00 W.. | 345 | ..... | ..... | Rare. |

GAUDRYINA BACCATA Schwager, var. NOVANGLIAE, new variety.

Plate 13, fig. 4.

*Gaudryina baccata* Schwager, *Novara*-Exped., Geol. Theil, p. 2, 1866, p. 200, pl. 4, figs. 12*a*, *b*.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 379, pl. 46, figs. 8–11.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Chapman, Proc. Zool. Soc. London, 1895, p. 20.—Flint, Ann. Rep. U. S. Nat. Mus., 1897 (1899), p. 287, pl. 32, fig. 5.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 68, figs. 108*a*, *b* (in text).—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 23.

*Description.*—Test elongate, tapering gradually to the somewhat acute initial end; early portion composed of triserially arranged chambers with rounded angles and forming the lesser portion of the test; later portion biserial, often somewhat irregular, wall arenaceous, of fine material and smoothly finished; aperture elongate, somewhat back from the inner margin of the chamber and often with a raised border; color gray.

Length up to 3 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16710) from *Albatross* station D2105, 1,395 fathoms (2,542 meters). This species described by Schwager from Kar Nicobar was recorded by Brady from seven stations in the North Atlantic at depths of 290 to 1,750 fathoms (530 to 3,200 meters), and one in the South Atlantic in 1,900 fathoms (3,475). Additional stations were two from the South Pacific and one in the North Pacific. In my material from the North Pacific I failed to find this species and the only other Pacific record is that of Sidebottom quoted above. As it does not occur in any of Chapman's records from the Australian or general Indo-Pacific region, it certainly seems as though its distribution in the South Pacific is either very limited or the recorded specimens may not be typical of this species.

In the North Atlantic, except for the *Challenger* stations and the single record of Pearcey from the Faroe Channel it is not recorded. Heron-Allen and Earland fail to record it in their various papers on the foraminifera in the region of the British Isles. The three *Challenger* stations, for which definite references are given in the North Atlantic are in a line southeast from the region of New York. All but one of the twenty stations from which I have had this species are in this same general region as are also two of Flint's stations. Its concentration of records in this particular area seem to indicate that we have here a variety very limited in its distribution. A comparison of the figures given by Schwager and those of Brady and Flint also seem to indicate that this is not identical with the species described by Schwager. Schwager's measurements, eight-tenths of a millimeter, show that his specimens were very much smaller than those of 2 and 3 millimeters, obtained off our eastern coast.

I have placed this form as a variety of Schwager's species, and it may later prove to be distinct.

*Gaudryina baccata, var. novangliae—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16701 | U.S.N.M. | 5 | D2003... | 37 16 30 N.; 74 20 36 W... | 641 | ..... | ..... | Few. |
| 16702 | U.S.N.M. | 2 | D2037... | 38 53 00 N.; 69 23 30 W... | 1,731 | 38.0 | glob. oz..... | Rare. |
| 16703 | U.S.N.M. | 1 | D2038... | 38 30 30 N.; 69 08 25 W... | 2,033 | ..... | glob. oz..... | Rare. |
| 16704 | U.S.N.M. | 1 | D2039... | 38 19 26 N.; 68 20 20 W... | 2,369 | ..... | glob. oz..... | Rare. |
| 16705 | U.S.N.M. | 2 | D2041... | 39 22 50 N.; 68 25 00 W... | 1,608 | 38.0 | glob. oz.. .. | Rare. |
| 16706 | U.S.N.M. | 2 | D2042 .. | 39 33 00 N.; 68 26 45 W | 1,555 | 38.5 | glob. oz..... | Rare. |
| 16707 | U.S.N.M. | 2 | D2043... | 39 49 00 N.; 68 28 30 W... | 1,467 | 38.5 | glob. oz..... | Rare. |
| 16708 | U.S.N.M. | 1 | D2048... | 40 02 00 N.; 68 50 30 W... | 547 | 29.0 | crs. sm. g... | Rare. |
| 16709 | U.S.N.M. | 1 | D2052... | 39 40 05 N.; 69 21 25 W... | 1,098 | 45.0 | glob. oz..... | Rare. |
| 16710 | U.S.N.M. | 2 | D2105... | 37 50 00 N.; 73 03 50 W... | 1,395 | 41.0 | glob. oz..... | Rare. |
| 16711 | U.S.N.M. | 1 | D2189... | 39 49 30 N.; 70 26 00 W... | 600 | 39.7 | gn. m. s..... | Rare. |
| 16712 | U.S.N.M. | 1 | D2221... | 39 05 30 N.; 70 44 30 W... | 1,525 | 36.9 | gy. oz..... | Rare. |
| 16713 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 00 W... | 1,181 | 39.6 | br. gn. m.... | Rare. |
| 16714 | U.S.N.M. | 2 | D2550... | 39 44 30 N.; 70 30 45 W... | 1,081 | 38.5 | br. m..... | Rare. |
| 16715 | U.S.N.M. | 2 | D2562... | 39 15 30 N.; 71 25 00 W... | 1,434 | 37.3 | gy. oz..... | Rare. |
| 16716 | U.S.N.M. | 1 | D2563... | 39 18 30 N.; 71 23 30 W... | 1,422 | 37.4 | gy. oz..... | Rare. |
| 16717 | U.S.N.M. | 1 | D2564... | 39 22 00 N.; 71 23 30 W... | 1,390 | 37.3 | gy. oz..... | Rare. |
| 16718 | U.S.N.M. | 2 | D2581... | 39 43 00 N.; 71 34 00 W... | 394 | ..... | gn. m..... | Rare. |
| 16719 | U.S.N.M. | 2 | D2584... | 39 05 30 N.; 72 23 20 W... | 541 | 39.5 | gy. m..... | Rare. |
| 16720 | U.S.N.M. | 1 | D2682... | 39 38 00 N.; 70 22 00 W... | 990 | ..... | gn. m..... | Rare. |
| 16721 | U.S.N.M. | 1 | D2689... | 39 42 00 N.; 71 15 30 W... | 525 | ..... | gn. m..... | Rare. |
| 16722 | U.S.N.M. | 3 | D2706... | 41 28 30 N.; 65 35 30 W... | 1,188 | ..... | gy. oz. for... | Few |

GAUDRYINA CHILOSTOMA (Reuss).

Plate 12, fig. 7.

*Textilaria chilostoma* Reuss, Zeitschr. deutsch. geol. Ges., vol. 4, 1852, p. 1.

*Gaudryina chilostoma* Reuss, Denkschr. Akad. Wiss. Wien, vol. 25, 1866, p. 120, pl. 1, fig. 5.—Fornasini, Mem. Accad. Sci. Bologna, ser. 5, vol. 3, 1893, p. 197, pl. 1, figs. 6–8.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 34, pl. 7, figs. 278–280; Bull. Mus. Comp. Zoöl. 29, 1896, p. 41.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 150.

*audryina pupoides* d'Orbigny, var. *chilostoma* H. B. Brady, Rep. Voy. *Challenger*, Zoology. vol. 9, 1884, p. 379, pl. 46, figs. 5, 6.—H. B. Brady, Parker and Jones, Trans. London, vol. 12, 1888, p. 219, pl. 42, fig. 9.—Sidebottom, Journ. Zool. Soc. Roy. Micr. Soc., 1918, p. 23.

*Description.*—Test compressed, broad, gradually tapering to the broadly rounded initial end; triserial portion consisting of but few chambers; biserial portion compressed, making up most of the test; chambers rounded; wall of fine arenaceous material; the surface smoothly finished; aperture an elongate slit slightly in from the inner edge of the chamber, surrounded by a slightly thickened and raised lip; color gray.

Length about 1 mm.

*Distribution.*—The records for this species seem to be very widely scattered, few specimens occurring at any one station. I have had but two *Albatross* stations from the western Atlantic, one off the coast of Georgia and the other one in the northern part of the Gulf

of Mexico. Brady gives a number of *Challenger* stations, both in the North and South Atlantic, mostly in fairly deep water. It does not seem to be present off the British Isles nor living in the Mediterranean. Neither Goës nor Flint record it from the western Atlantic. The only station of Brady's in our area is station 24, off the lesser Antilles.

*Gaudryina chilostoma—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16321 | U.S.N.M. | 1 | D2398 | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m. | Rare. |
| 16322 | U.S.N.M. | 1 | D2416 | 31 26 00 N.; 79 07 00 W.. | 276 | 53.8 | co. brk. sh. | Rare. |

**GAUDRYINA PSEUDOFILIFORMIS (Cushman.)**

Plate 13, fig. 5.

*Gaudryina filiformis* H. B. Brady (not *G. filiformis* Berthelin), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 380, pl. 46, figs. 12*a–c*.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 333.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 896.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 219, pl. 42, fig. 6.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 287, pl. 33, fig. 2.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 205.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 57, pl. 4, figs. 7–9; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 232.

*Gaudryina pseudofiliformis* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 70, figs. 11*a*, *b* (in text).—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914. p. 1013.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 151, pl. 29, fig. 8.

*Description.*—Test much elongate, composed of numerous chambers; early portion triserial with indistinct sutures; later portion, including nearly the entire test, biserial with the sutures deep and well marked; cross section elliptical, showing some compression; walls arenaceous, but usually smooth; aperture small, in adults back a little way from the inner margin of the chamber, slightly elongate, the edges thickened and raised to form a rim about it, appearing nearly toothlike in end view; color gray.

Length 1 mm.

*Distribution.*—I separated this recent species in 1911 from the Cretaceous species of Berthelin, which name was taken by Brady in the *Challenger* Report and has since been followed by many authors. Heron-Allen and Earland have criticized me for this (1916, p. 232) but Pearcey, from his examination of the *Challenger* specimens and others considers this change which I have made as "quite correct." From the material I have examined from the western Atlantic this

species is hardly represented, but seems to be widely distributed, even in comparatively shallow water off the British Isles. Flint's specimens were from *Albatross* station D2352, 463 fathoms (847 meters), off the western coast of Cuba. The only specimens I have had are from *Albatross* station D2355, in 399 fathoms (729 meters), a station nearby that from which Flint records it. Brady had this species from the *Challenger* material from three stations in the North Atlantic and two in the South Atlantic, mostly being in deep water.

*Gaudryina pseudofiliformis*—*material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16324. | U.S.N.M. | 1 | D2352... | 22 35 00 N.; 84 23 00 W.. | 463 | 45.0 | wh. co..... | Rare. |
| 16325 | U.S.N.M. | 2 | D2355... | 20 56 48 N.; 86 27 00..... | 399 | ..... | yl. oz..... | Rare. |

### Genus TRITAXILINA Cushman, 1911.

*Clavulina* (part) H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 54.
*Tritaxia* (part) H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 390.
*Tritaxilina* Cushman (type, *T. caperata* (H. B. Brady), Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 71.

*Description.*—Test in its early development triserial, later becoming biserial and in the adult uniserial; chambers numerous, distinct, interior labyrinthic; wall arenaceous; aperture in the triserial portion elongate with a valvular lip, at the edge of the inner side of the chamber, in the adult central, terminal, usually with a series of peripheral teeth projecting in and partially closing the opening.

This genus includes the single species *T. caperata* H. B. Brady. This differs from *Tritaxia* in the form of the test, the peculiar aperture and the labyrinthic interior of the test.

#### TRITAXILINA CAPERATA (H. B. Brady), var. ATLANTICA, new variety.

Plate 15, figs. 1, 2.

*Tritaxilina caperata* H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 390, pl. 49, figs. 3*a*, *b* (not figs. 1, 2, 4, 5).

*Description.*—Variety differing from the typical in the general form of the test which in the triserial portion is less sharply triangular, the apex blunty rounded, the areas between the chambers much less excavated and distinct, uniserial portion not as well developed; color instead of grayish, a light yellowish-brown.

*Distribution.*—Type-specimen (U.S.N.M. No. 16323) from *Albatross* station D2150 in 382 fathoms (697 meters), Caribbean Sea. Brady records *T. caperata* from two Atlantic *Challenger* stations from off the Leeward Islands, station 23, 450 fathoms (823 meters),

latitude 18° 25′ N., longitude 63° 29′ W., and station 24, 390 fathoms (713 meters), latitude 18° 38′ 30″ N., longitude 65° 05′ 30″ W. One of these is given in the *Challenger* Report on the foraminifera, the other in the volume on "Summary of Results." These stations are in the immediate vicinity of that from which the type specimens of the variety were obtained. An examination of the figures in the *Challenger* Report show both the typical *T. caperata* and this variety represented. Figure 3 shows a "young specimen" according to Brady. Captain Potts who has kindly examined the Brady collection for me reports that this specimen is from *Challenger* station 23 off the West Indies. I have had very typical specimens from off the Philippines at a number of stations, some of which are almost identical with the specimens figured by Brady. His other records are off the Philippines, in 95 fathoms (174 meters), and off Kandavu, Fiji, in 250 fathoms (457 meters). I also recorded what seems to be this species from *Albatross* station D4781, in 482 fathoms (880 meters), near the Aleutian Islands.

This variety therefore takes the place of the typical form of the species in the Atlantic, but what seems to me more probable, it will be found to be a distinct species from the Pacific one when more material is available.

*Tritaxilina caperata, var. atlantica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 16323 | U.S.N.M. | 7 | D2150... | ° ′ ″ ° ′ ″<br>13 34 45 N.; 81 21 10 W.. | 382 | °F.<br>45.8 | wh. crs. s... | Common. |

**Genus CLAVULINA d'Orbigny, 1826.**

*Clavulina* D'ORBIGNY (type, *C. parisiensis* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 268.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 393.—CHAPMAN, The Foraminifera, 1902, p. 171.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 72.

*Verneuilina* (part) PARKER and JONES, Quart. Journ. Geol. Sci., vol. 16, 1860, p. 303.—VANDEN BROECK, Ann. Soc. Belgique Micr., vol. 2, 1876, p. 136.

*Valvulina* (part) PARKER, JONES, and H. B. BRADY, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 35.

*Description.*—Test free, elongate, cylindrical or angled; early portion consisting of a number of chambers arranged triserially; later portion consisting of numerous chambers arranged uniserially; walls arenaceous, usually smooth, aperture in early chambers with a valvular tooth; in the later portion aperture central or nearly so, rounded, and with or without a tooth.

This genus includes those species in which there are three definite stages, the young being triserial, followed by a biserial, and finally a uniserial development. There is a considerable difference in the amount of acceleration of development shown in the various species. Usually the triserial stage is confined to the very early chambers, the biserial very much reduced or wanting, and the uniserial stage of development making up nearly the whole of the test. In some species, however, the acceleration of development is much less and the stages are held longer. This is seen in such a species as *C. gaudryinoides* Fornasini,[19] where the biserial stage is distinct. This is much more strikingly shown in *Clavulina primaeva* Cushman.[20] In this species the biserial stage is kept for nearly half the length of the test. In this respect the species is very unaccelerated and primitive.

The development shows very clearly the relationships. *Clavulina* has evidently been derived from such forms as *Verneuilina* with its triserial development, through *Gaudryina*, where a biserial arrangement of the chambers characterizes the adult. The paleontological evidence also bears out this relationship, *Verneuilina* and *Gaudryina* both being known as far back as the Lower Cretaceous while the history of *Clavulina* so far as known only goes back to the Eocene.

There are numerous species showing definite geographical distribution. Certain species are limited to warm shallow waters and others are found in deeper cold oceanic areas.

CLAVULINA NODOSARIA d'Orbigny.

*Clavulina nodosaria* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 110, pl. 2, figs. 19, 20.—Cushman, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 53, pl. 12, fig. 3; Publ. 311, Carnegie Inst. Wash., 1922, p. 30, pl. 3, figs. 1, 2.

*Textularia gibba* d'Orbigny, forma *Bigenerina* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 79, pl. 5, figs. 162–164 [?].

*Clavulina laevigata* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1893, p. 40, pl. 8, figs. 356–367.

*Clavulina communis* Goës (not d'Orbigny) (part), Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 36, pl. 4, figs. 9–15 [?].

*Description.*—Test small, elongate, subcylindrical, early portion triserial, more or less triangular, the angles rounded, succeeding portion uniserial, hardly if at all tapering, circular in transverse section; chambers fairly numerous, those of the early portion less distinct than those of the later portion, those of the uniserial portion somewhat inflated; sutures distinct, slightly depressed, wall finely arenaceous, smoothly finished on the exterior; aperture one or more usually circular pores on the terminal face of the last-formed chamber; color light yellowish-gray.

Length usually less than 1 mm.

[19] Mem. Acad. Sci. Bologna, ser. 6, vol. 10, 1903, p. 313, pl. O, fig. 21.
[20] Proc. U. S. Nat. Mus., vol. 44, 1913, p. 635, pl. 80, figs. 4, 5.

*Distribution.*—D'Orbigny described this species from shore sands of Cuba and the name has been allowed to lapse since that until I used it for specimens from the north coast of Jamaica. It is a small species which in this region at least seems to be distinct. It may be possible that this is the same as the species given various names by Goës in his series of papers upon the Caribbean foraminifera to which I have referred above, although Goës probably had more than one species present, from the measurements given. This small species is probably rather widely distributed in shallow water in the West Indies.

**CLAVULINA NODOSARIA d'Orbigny, var. NOVANGLIAE, new variety.**

Plate 15, figs. 3–5.

*Description.*—Test elongate, slender, slightly tapering, the early triserial portion much reduced, three-sided, the angles rounded, later portion circular in transverse section, increasing in size as the chambers are added; chamber very few in the triserial portion, five to eight in the uniserial portion, more or less indistinct except the last-formed ones, slightly inflated; sutures indistinct except near the apertural end where they are depressed, wall arenaceous, slightly roughened; aperture single, circular, terminal, often with a slight neck; color light gray.

Length up to 2 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16317) from *Albatross* station D2247, in 78 fathoms (143 meters), south of Nantucket. It has occurred at several other stations in this same general region off the New England coast. I have placed it as a variety of this species, although it may be distinct, which can be determined by further collection. It reminds one somewhat of the form figured by Brady, *Challenger* Report (pl. 48, figs. 17, 18), but the triserial portion is more reduced and there is developed a slight tubular neck. From the material I have seen it seems to be limited to the New England coasts and the eastern Atlantic coast south to the Carolinas.

*Clavulina nodosaria, var. novangliae—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16315 | U.S.N.M | 1 | D2244... | 40 05 15 N.; 70 23 00 W.. | 67 | 52.9 | gn. m..... | Rare. |
| 16316 | U.S.N.M | 5 | D2245... | 40 01 15 N.; 70 20 30 W.. | 122 | 48.8 | gn. m..... | Few. |
| 16317 | U.S.N.M | 10 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn.m.,bk.sp. | Common. |
| 16318 | U.S.N.M | 3 | D2539... | 39 59 45 N.; 70 53 00 W.. | 133 | 47.7 | gn. s..... | Few. |
| 16319 | U.S.N.M | 6 | *Fish Hawk* 1108. | 40 02 00 N.; 70 37 30 W.. | 101 | 48.0 | gy.m.fne.s. | Common. |
| 16320 | U.S.N.M | 1 | | | | | | |

CLAVULINA HUMILIS H. B. Brady, var. MEXICANA, new variety.

Plate 16, figs. 1–3.

*Clavulina parisiensis* d'Orbigny, var. *humilis* Flint (not H. B. Brady), Rep. U. S. Nat. Mus., 1897 (1899), p. 289, pl. 36, fig. 1.

*Description.*—Test elongate, early portion sharply triangular, with a subacute apical end, later portion subcylindrical, slightly tapering; chambers of the early portion becoming somewhat more separate and distinct as added, those of the last-formed portion flask-shaped with a definite neck; sutures indistinct in the triserial portion, those of the later portion becoming somewhat more distinct and depressed, wall coarsely arenaceous, the surface roughened, fairly thick; aperture terminal, central, at the end of the tubular neck; color light gray.

Length up to 0.6 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16653) from *Albatross* station D2377, 210 fathoms (384 meters), in the Gulf of Mexico. It is also found at numerous other stations, mostly in the Gulf of Mexico, but one off the coast of South Carolina, and another north of Panama. Flint had this variety from the northern part of the Gulf of Mexico, and from a single station off the coast of Brazil. D'Orbigny described *C. parisiensis* from the Eocene of the Paris Basin. His Modéle No. 66 shows a specimen with the early portion strongly triangular, the faces flat, and larger than the immediately succeeding portion, which is subcylindrical and slightly tapering, the chambers well marked, gradually enlarging as they are added. Such specimens as I have at hand from the Paris Basin and the Eocene of Grignon, and elsewhere, show a very similar form to that of d'Orbigny's Modéles. They are comparatively small and have a smooth, even surface. Such specimens are recorded as common in the Eocene of the London Clay. The figures of recent material assigned to *C. parisiensis* do not meet this requirement and seem to be a different species. For some reason the rough surface seems to have been taken as a characteristic which evidently it does not have in the fossil *C. parisiensis*. Brady describes the variety *humilis* from off the Philippines from specimens which are small, less than 1 mm. in length, and have the last-formed chambers more or less globular and distinct. Flint used this name for specimens which he figures from the Gulf of Mexico under this name in the reference given above. They are very much larger than Brady's Philippine specimens and they would seem to be distinct from those. *C. parisiensis* d'Orbigny can not be used for the recent material of this sort; the first available name is that of Brady, and it is here used for the variety he described from the Philippines. The material from the Gulf of Mexico and adjacent regions is clearly related to the Philippine form and seems to be distinct at least varietally. Much of the rough material which has been

assigned to *C. parisiensis*, at least as far as the Gulf of Mexico region is concerned, can be included under this variety. Specimens assigned to *C. parisiensis* from other regions should be examined to see whether or not they are comparable to this. The fact that Brady figures at least two other distinct forms as *C. parisiensis* has made records depending on the *Challenger* figures alone of questionable position.

*Clavulina humulis, var. mexicana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16651 | U.S.N.M. | 3 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Few. |
| 16652 | U.S.N.M. | 3 | D2314... | 32 43 00 N.; 77 51 00 W.. | 159 | 47.4 | cr. s. bk. sp.. | Few. |
| 16653 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16654 | U.S.N.M. | 2 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16655 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m.... | Rare. |
| 16656 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br. gn. m.... | Rare. |
| 16657 | U.S.N.M. | 10 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Common. |
| 16658 | U.S.N.M. | 7 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Common. |

**CLAVULINA COMMUNIS d'Orbigny.**

Plate 16, figs. 4, 5.

*Clavulina communis* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 268, No. 4; Foram. Foss. Bass. Tert. Vienne, 1846, p. 196, pl. 12, figs. 1, 2.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 394, pl. 48, figs. 1–8 (not 9–13.).—Fornasini, Mem. Accad. Sci. Instit. Bologna, ser. 5, vol. 10, 1903, p. 146, (312), pl. 0, fig. 20.—Cushman (part), Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 73, fig. 117 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, pl. 31, fig. 1.

*Description.*—Test elongate, subcylindrical, broadest near the initial end, early portion triserial, later and in the adult the larger portion uniserial, both portions circular in transverse section; chambers numerous, distinct except in the triserial portion; sutures generally distinct, little depressed; wall arenaceous, smoothly finished; aperture in the early portion at the side, in the later portion small, terminal, circular, often with a short protuberant neck; color light gray.

Length up to 4 mm.

*Distribution.*—The type-specimens which d'Orbigny had were from the Adriatic. Fornasini has figured a specimen from this region which shows what is probably typical *C. communis*. It is a cylindrical form with circular transverse section throughout, the chambers distinct but nearly flush with one another. Brady has figured a very similar series of specimens in the *Challenger* Report and I have had similar ones from the North Pacific. This is evidently a widely spread species and very uniform in its characters. Other forms have been assigned to this species, but it seems best to give it definite limits.

In its typical form the species has occurred in the western Atlantic at numerous stations from the latitude of Cape Cod southward along the Atlantic coast as well as from the Gulf of Mexico and Caribbean Sea. The following variety may be distinguished at least in some of the collections.

*Clavulina communis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16290 | U.S.N.M. | 10 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Common. |
| 16291 | U.S.N.M. | 2 | D2002... | 37 20 42 N.; 74 17 36 W.. | 641 | ..... | gn. m..... | Rare. |
| 16292 | U.S.N.M. | 4 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu. m..... | Few. |
| 16293 | U.S.N.M. | 8 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Common. |
| 16294 | U.S.N.M. | 5 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh.crs.s.... | Few. |
| 16295 | U.S.N.M. | 2 | D2187... | 39 49 30 N.; 71 10 00 W.. | 420 | 39.7 | gn.m.s..... | Rare. |
| 16296 | U.S.N.M. | 1 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Rare. |
| 16297 | U.S.N.M. | 1 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn.m.s..... | Rare. |
| 16298 | U.S.N.M. | 2 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | cr.s.bk.sp.. | Rare. |
| 16299 | U.S.N.M. | 5 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Few. |
| 16300 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16301 | U.S.N.M. | 2 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt.br.m..... | Few. |
| 16302 | U.S.N.M. | 1 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16303 | U.S.N.M. | 1 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 16304 | U.S.N.M. | 1 | D2415... | 30 44 00 N.; 79 26 00 W.. | 440 | 45.6 | co.crs.s..... | Rare. |
| 16305 | U.S.N.M. | 10 | D2541... | 39 57 45 N.; 70 50 30 W.. | 134 | 47.7 | gn.s.brk.sh. | Common. |
| 16306 | U.S.N.M. | 10 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s.brk.sh.... | Common |
| 16307 | U.S.N.M. | 10 | D2544... | 40 01 45 N.; 70 24 00 W.. | 131 | 47.7 | gn.s.bk.sp.. | Common. |
| 16308 | U.S.N.M. | 1 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Rare. |
| 16309 | U.S.N.M. | 1 | D2586... | 39 02 40 N.; 72 40 00 W.. | 328 | 40.2 | dk.gy.m.... | Rare. |

**CLAVULINA COMMUNIS d'Orbigny, var. NODULOSA, new variety.**

Plate 18, figs. 1–3.

*Clavulina communis* H. B. Brady (part), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 48, figs. 9–12.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 288, pl. 34, fig. 3.—Sidebottom (part?), Journ. Roy. Micr. Soc., 1918, p. 25.

*Description.*—Variety differing from the typical form of the species in the longer form and especially in the shape of the chambers which in the variety are more or less pyriform, being broadest near the base of the chamber, giving a nodulose appearance to the uniserial portion; aperture usually without the definite protuberant neck of the typical form of the species.

Length up to 7 mm.

*Distribution.*—This variety is figured by Brady and Flint in the references given above. Sidebottom in his paper on the foraminifera from the east coast of Australia mentions one of two forms as "comparatively smooth, and the later chambers are fitted on to each other in such a manner as to cause the lower edge of the chambers to project slightly." This is evidently similar to the present variety and it may be widely spread.

The best specimens of this variety I have had from four stations off the eastern coast of the United States. The types are from *Albatross* station D2547 in 390 fathoms (713 meters).

*Clavulina communis, var. nodulosa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16310 | U.S.N.M. | 10 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Common. |
| 16311 | U.S.N.M. | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 16312 | U.S.N.M. | 10 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Common. |
| 16313 | U.S.N.M. | 2 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

**CLAVULINA FLINTIANA, new species.**

Plate 15, figs. 7–9.

*Valvulina triangularis* d'Orbigny, var. *eocaena* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 88, pl. 11, figs. 401–403.

*Clavulina eocaena* Goës (not Gümbel), Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 41, pl. 8, figs. 368–377; Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 36, pl. 4, figs. 16–25.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 289, pl. 35, fig. 1.

*Description.*—Test cylindrical, the triserial portion short, uniserial portion also short, composed of three or four, occasionally five chambers, transverse section rounded; chambers distinct, rounded, internally partially divided by a network of incomplete divisions, sutures in the uniserial portion indistinct; wall coarsely arenaceous but on the exterior rather smooth and finished; aperture a simple rounded opening in the center of the end wall of the chamber, in some cases with a slight valvular tooth; color reddish-brown.

Length up to 1.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16869) from *Albatross* station D2425 in 119 fathoms (205 meters), off Cape Hatteras. Specimens are common at some stations off the coast of Florida and in the Gulf of Mexico. Goës records this species from the Caribbean in 68 to 830 fathoms (125 to 1,510 meters). I failed to find specimens in as deep water as this. Flint's records it from D2377 in 210 fathoms (384 meters), Gulf of Mexico, from which station I also have abundant specimens. It seems to be a common species at moderate depths and to show very little variation. I have named this species in honor of the late Admiral James M. Flint.

*Clavulina flintiana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | ° | ° ′ ″ ° ′ ″ | | °F. | | |
| 16748 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16749 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16750 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m..... | Rare. |
| 16869 | U.S.N.M. | 1 | D2395... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16751 | U.S.N.M. | 10 | D2425... | 36 20 24 N.; 76 46 30 W.. | 119 | 51.5 | dk. gy. m. fne. s. | Common. |
| 16752 16901 | U.S.N.M. | 10 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Common. |
| 16753 16903 | U.S.N.M. | 10 | ..... | Key West, Fla..... | 78 | ..... | ..... | Common. |
| 16754 | U.S.N.M. | 10 | *Fish Hawk*, 949. | 40 03 00 N.; 70 31 00 W.. | 100 | 52.0 | yl. m..... | Common. |
| 16902 | U.S.N.M. | 1 | ..... | Govt. Cut, Fla..... | 100 | ..... | ..... | Rare. |

CLAVULINA OCCIDENTALIS, new species.

Plate 17, figs. 1, 2.

*Description.*—Test elongate, slender, subcylindrical, circular in transverse section, triserial portion broader than the subsequent portion of the test; chambers numerous, fairly distinct; sutures indistinct, slightly depressed; wall finely arenaceous, somewhat roughened; aperture terminal, with a slight neck; color light gray.

Length up to 3 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16739) from *Albatross* station D2383 in the Gulf of Mexico, in 1,181 fathoms (2,160 meters). It has occurred at several other stations in the Gulf of Mexico and Caribbean as well as at a number of stations on the eastern coast of the United States south of 49° N. latitude. This has, I am sure, been confused with *Reophax bacillaris* H. B. Brady. I took it to be a megalospheric form of that species and mentioned[21] that it had the appearance of a *Clavulina*. It is found alone in the Gulf of Mexico and Caribbean, showing apparently that the two are distinct.

This species is much smaller than *C. communis*, has a rougher exterior and much smaller triserial portion. The two when seen together are very distinct.

[21] Bull. 104, U. S. Nat. Mus., pt. 2, 1920, p. 20.

*Clavulina occidentalis*—material examined.

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16730 | U.S.N.M. | 2 | D2037... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob.oz..... | Rare. |
| 16731 | U.S.N.M. | 2 | D2038... | 38 30 30 N.; 69 08 25 W.. | 2,033 | ..... | glob.oz..... | Rare. |
| 16732 | U.S.N.M. | 7 | D2039... | 38 19 26 N.; 68 20 20 W.. | 2,369 | ..... | glob.oz..... | Common. |
| 16744 | U.S.N.M. | 1 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob.oz..... | Rare. |
| 16733 | U.S.N.M. | 5 | D2042... | 39 33 00 N.; 68 26 45 W.. | 1,555 | 38.5 | glob.oz..... | Few. |
| 16734 | U.S.N.M. | 3 | D2106... | 37 41 20 N.; 73 03 20 W.. | 1,497 | 42.5 | glob.oz..... | Few. |
| 16735 | U.S.N.M. | 4 | D2138... | 17 44 05 N.; 75 39 00 W.. | 23 | ..... | co.brk.sh... | Few. |
| 16736 | U.S.N.M. | 1 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn.m..... | Rare. |
| 16737 | U.S.N.M. | 8 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Common. |
| 16738 | U.S.N.M. | 1 | D2226... | 37 00 00 N.; 71 54 00 W.. | 2,045 | 36.8 | glob.oz..... | Rare. |
| 16739 | U.S.N.M. | 4 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br.gn.m..... | Few. |
| 16740 | U.S.N.M. | 1 | D2392... | 28 47 30 N.; 87 27 00 W.. | 724 | 40.7 | br.gy.m..... | Rare. |
| 16741 | U.S.N.M. | 4 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt.gy.m..... | Few. |
| 16742 | U.S.N.M. | 2 | D2563... | 39 18 30 N.; 71 23 30 W.. | 1,422 | 37.4 | gy.oz..... | Rare. |
| 16743 | U.S.N.M. | 1 | D2564... | 39 22 00 N.; 71 23 30 W.. | 1,390 | 37.3 | gy.oz..... | Rare. |
| 16314 | U.S.N.M. | 1 | ..... | Off Key West, Fla..... | ..... | ..... | ..... | Rare. |

**CLAVULINA BRADYI Cushman.**

*Clavulina cylindrica* H. B. Brady (not *Clavulina cylindrica* d'Orbigny, 1826, nor Hantken, 1875), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 396, pl. 48, figs. 32–38.—Woodward, Journ. New York Micr. Soc., 1885, p. 150.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 134.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 17.

*Clavulina bradyi* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 73, figs. 118, 119 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 155, pl. 31, fig. 4.

*Description.*—Test stout, cylindrical, the early triserial portion not well shown exteriorly, the later uniserial portion of few chambers, large, distinct, with well-defined, depressed sutures; wall arenaceous, composed of a mixture of coarse and fine material, but usually with a smooth exterior; aperture circular, often at the end of a short neck, usually with a single valvular tooth; color light gray.

Length up to 5 mm.

*Distribution.*—Brady records this species from four stations in the North Atlantic, off Gomera, Canaries, 620 fathoms (1,134 meters); off Sombrero Island, West Indies, 450 fathoms (823 meters); off Bermuda, 435 fathoms (796 meters); off the Azores, 450 fathoms (823 meters), and one station in the South Atlantic east of Buenos Aires, 1,900 fathoms (3,475 meters). I have failed to find this species in the *Albatross* material from the western Atlantic. Woodward records it from shallow water, Shelly Bay, Bermuda. I have seen no specimens referable to this in the Bermuda material I have had.

It is recorded at several stations in the Pacific.

CLAVULINA OBSCURA Chaster.

Plate 16, fig. 6.

*Verneuilina polystropha* (Reuss) "dimorphous form" J. Wright, Rep. Belfast Nat. Field Club, 1886, Appendix, p. 320, pl. 26, fig. 2.

*Clavulina obscura* Chaster, First Rep. Southport Soc. Nat. Sci., 1892, p. 58, pl. 1, fig. 4.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 206.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 311; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 59, pl. 4, fig. 6; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 233.

This small species described by Chaster from off Southport has been recorded by Heron-Allen and Earland from shore sands of Bognor, Sussex, from nine stations in the Clare Island region, from off South Cornwall, and from four stations off the west of Scotland. I have seen no specimens from the western Atlantic which are comparable to this species as figured by the English writers.

CLAVULINA TRICARINATA d'Orbigny.

Plate 17, figs. 3, 4.

*Clavulina tricarinata* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 111, pl. 2, figs. 16–18.—Cushman, Proc. U. S. Nat. Mus., vol. 59, 1921, p. 52, pl. 12, figs. 1, 2; Publ. 311, Carnegie Inst. Wash., 1922, p. 29, pl. 3, fig. 3.

*Clavulina angularis* Woodward (not d'Orbigny), Journ. New York Micr. Soc., 1885, p. 150.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 37.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 289, pl. 36, fig. 2.—Cushman, Papers Dept. Marine Biol. Carnegie Inst., vol. 9, 1918, pp. 271 *et seq.*

*Valvulina triangularis* d'Orbigny, forma *Clavulina angularis* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 4, 1882, p. 86, pl. 11, figs. 387–389.

*Description.*—Test elongate, tapering, triangular or quadrangular, in transverse section, increasing in diameter to the apertural end; chambers numerous, those of the early triserial portion obscure, those of the uniserial portion distinct, each with three or more lateral angles in line with those above and below; sutures in the uniserial portion distinct, slightly depressed; wall arenaceous but smoothly finished; aperture circular, terminal, without a definite neck but with a small valvular tooth; color white or gray.

Length up to 3 mm.

*Distribution.*—This species was originally described by d'Orbigny from shore sands of Cuba. It was placed by Brady as a synonym of *C. angularis* d'Orbigny described from the Mediterranean. As I have already shown,[22] the two certainly seem to be distinct species. The West Indian species is strongly angled throughout, while that of the Mediterranean has its later chambers rounded.

The species is evidently common in shallow water in the West Indian region and at Bermuda. I have it from the latter place,

[22] Proc. U. S. Nat. Mus., vol. 59, 1921, p. 53.

from Jamaica, and from numerous stations off the coast of Florida and the Bahamas. In the deeper water it has occurred in the *Albatross* dredgings from D2388 in 35 fathoms (66 meters) in the northern part of the Gulf of Mexico, and from D2758 in 20 fathoms (37 meters) off the coast of Brazil.

Goës records it from 300 fathoms (549 meters) in the Caribbean and Flint from *Albatross* station D2358 in 222 fathoms (407 meters) in the Straits of Yucatan.

The species is close to *C. differmis* Brady and probably is distributed widely in the Indo-Pacific in similar habitats to those in which it is found in the Atlantic.

*Clavulina tricarinata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16745 | U.S.N.M. | 1 | D2388... | 29 24 30 N.; 88 01 00 W.. | 35 | ..... | yl. s. bk. sp.. | Rare. |
| 16746 | U.S.N.M. | 1 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79.0 | brk. sh..... | Rare. |
| 16747 | U.S.N.M. | 1 | ..... | Off Bell, Fowey, Fla.... | . .. | ..... | ..... | |

## Subfamily 4. BULIMININAE.

Included in this family are those forms which are typified by *Bulimina*. In typical species the arrangement of the chambers is an elongate spiral. The aperture is elongate, loop-shaped, usually in an oblique position, and in some species there is a tooth, flange, or other structure which partially closes the opening. The test is calcareous, often hyaline in the young, but may be considerably thickened and opaque in the adult; is always perforate.

### Genus BULIMINA d'Orbigny, 1826.

*Bulimina* D'ORBIGNY (type, *Bulimina marginata* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 269.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 397.—CHAPMAN, The Foraminifera, 1902, p. 172.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 76.

*Description.*—Test usually fusiform or tapering, free, composed of numerous chambers arranged typically in a spiral, each chamber situated above the third preceding one, making a triserial arrangement, not always visible from the surface except in the last convolution; wall calcareous, perforate, usually thin and transparent, but thickening somewhat with age, smooth or ornamented with raised costae, spines, etc.; aperture typically a comma-shaped slit broadest above and tapering obliquely to a point below, usually with a raised margin and often partly closed by a tooth-like rim at one side.

In 1911 in the above reference I limited the genus *Bulimina* to that group of species which show a triserial arrangement of chambers and a more or less regular form, erecting two new genera, *Buliminella* and *Buliminoides*.

The genus *Bulimina* as thus distinguished includes numerous smooth species and others ornamented by spines or raised costae. The genus is widely distributed, some of the species having a very wide range, while others appear to be more restricted. The recent species are all forms with calcareous secreted tests, and in the fossil forms, especially in the lower Cretaceous, there are numerous species which have an arenaceous test.

BULIMINA MARGINATA d'Orbigny.

Plate 21, figs. 4, 5.

*Bulimina marginata* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 269, No. 4, pl. 12, figs. 10–12.—Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 296, pl. 11, figs. 35–40.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—H. B. Brady, Rep. Voy. *Challenger*. Zoology, vol. 9, 1884, p. 405, pl. 51, figs. 3–5.—Balkwill and Wright, Trans, Roy. Irish Acad., vol. 28, 1885, p. 333.—H. B. Brady, Journ. Micr. Soc., 1887, p. 897.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12. 1888, p. 220, pl. 43, figs. 7, 10.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 287, pl. 8, figs. 69, 70.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 46, pl. 9, figs. 439–444.—Millett, Journ. Roy. Micr. Soc., 1899, p. 277.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 207.—Chapman, Trans. New Zealand Inst., vol. 38, 1905, p. 89.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 312.—Chapman, Rep. Foram. Subantarctic Ids. New Zealand, 1909, p. 330.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 12.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 83, figs. 136*a*, *b* (in text).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 63; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 236.—Mestayer, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 123.—Cushman, Proc. U. S. Nat. Mus., vol. 56, 1919, p. 605; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 159.

*Bulimina pupoides* d'Orbigny, var. *marginata* Williamson, Rec. Foram. Great Britain, 1858, p. 62, pl. 5, figs. 126, 127.

*Bulimina presli* Reuss, var. *marginata* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 372, pl. 15, fig. 10; pl. 17, fig. 70.

*Description.*—Test ovate, somewhat tapering; chambers numerous, inflated, all visible from the exterior, ventral margin of the chambers extending out from the preceding by a definite acute angle, forming a definite rim to the chamber which has a series of short spines or crenulations, the remainder of the chamber smooth and curved; sutures distinct, depressed, wall thin and transparent, usually in

older specimens somewhat thickened, white, and nearly opaque; aperture a comma-shaped slit in a slight depression of the inner face of the chamber, often with a slightly raised border.

Length usually from 0.50–0.75 mm., occasionally reaching 0.1 mm. in length.

*Distribution.*—In the *Albatross* material examined the species is often abundant, south from the latitude of Cape Cod, and as far as the coast of South Carolina. Similar specimens occur in the northern part of the Gulf of Mexico and off Key West, Florida. In the *Challenger* collection Brady records it from off the eastern coast of the United States and off the West Indies. From the eastern part of the Atlantic it is known from numerous stations off the British Isles, from the coasts of Norway, Sweden, and Spitzbergen in 50–270 meters (27–147 fathoms) (Goës). Heron-Allen and Earland record it from 23 stations in the Clare Island region, and from 24 stations off western Scotland. Specimens are recorded from 3 stations off the Abrohlos Bank in 40–260 fathoms (73–476 meters) (H. B. Brady, Parker, and Jones).

The species is recorded from various parts of the world, but the material that I have seen elsewhere than in the Atlantic is not typical in all respects. The North Atlantic material has a definite angular character, the chambers with the edges of the adjacent chambers forming a peculiar oblique angled appearance. This is not shown in Brady's figures of the *Challenger* Report, but I have tried to illustrate it in the accompanying figures. There is also a considerable difference in the margins of the chambers, the type figures of Brady showing very long spines, a condition which is also shown in some of Goës's figures, but in the material from the western Atlantic and in that I have seen from off the British Isles the specimens seem to have very short spines.

The specimens I have recorded from off New Zealand are much shorter and more rapidly developed than are the specimens from the western Atlantic. That may be that the material from the South Pacific is of a different species. This might seem more probable in that the *Albatross* records are mostly from cold water, very few of them being in the Gulf of Mexico. A great majority are in the cold water off the New England coast.

*Bulimina marginata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16133 | U.S.N.M. | 10 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Common. |
| 17069 | U.S.N.M. | 5 | D2022... | 37 32 00 N.; 74 13 20 W.. | 487 | 40.0 | bu. m..... | Few. |
| 16134 | U.S.N.M. | 3 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | crs. s. m. g... | Few. |
| 16135 | U.S.N.M. | 2 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Few. |
| 16136 | U.S.N.M. | 1 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn. m..... | Rare. |
| 16137 | U.S.N.M | 1 | D2192... | 39 46 30 N.; 70 14 45 W.. | 1,060 | 38.6 | gy. oz..... | Rare. |
| 16138 | U.S.N.M. | 1 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Rare. |
| 16139 | U.S.N.M | 10 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Common. |
| 16140, 17071 | U.S.N.M. | 10 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn. m. bk. s. | Common. |
| 16141 | U.S.N.M. | 6 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s. | Common. |
| 16142 | U.S.N.M. | 10 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 16143 | U.S.N.M. | 1 | D2263... | 37 08 00 N.; 74 33 00 W.. | 430 | ..... | gn. m..... | Rare. |
| 16144 | U.S.N.M. | 8 | D2265... | 37 07 40 N.; 74 35 40 W.. | 70 | 57.9 | gn. m. g..... | Common. |
| 16145 | U.S.N.M. | 2 | D2309... | 35 43 30 N.; 74 52 00 W.. | 56 | ..... | gy. s. brk. sh | Few. |
| 16146 | U.S.N.M. | 2 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs.s.bk.sp. | Few. |
| 16147 | U.S.N.M. | 1 | D2378... | 29 14 30 N.; 88 09 30 W.. | 68 | ..... | gy. m..... | Rare. |
| 16148 | U.S.N.M. | 1 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 16149 | U.S.N.M. | 5 | D2539... | 39 59 45 N.; 70 53 00 W.. | 133 | 47.7 | gn. s..... | Few. |
| 16150 | U.S.N.M. | 10 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Common. |
| 16151 | U.S.N.M | 3 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Few. |
| 16152 | U.S.N.M. | 10 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m. ..... | Common. |
| 16153 | U.S.N.M. | 10 | D2555... | 39 53 00 N.; 71 32 00 W.. | 136 | 47.7 | gn. m. s..... | Common. |
| 16154 | U.S.N.M. | 2 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16155 | U.S.N.M. | 1 | D2677... *Fish Hawk.* | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |
| 16156 | U.S.N.M. | 10 | 1108..... | 40 02 00 N.; 70 37 30 W.. | 101 | 48.0 | gy. m. fne. s.. | Common. |
| 16157 | U.S.N.M. | 8 | 1110..... | 40 02 00 N.; 70 35 00 W.. | 100 | 48.7 | gn. n. fne. s.. | Common. |
| 16158 | U.S.N.M. | 1 | ..... | Key West, Fla..... | 65 | ..... | ..... | Rare. |
| 16159 | U.S.N.M. | 2 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |
| 16160 | U.S.N.M. | 1 | ..... | Key West, Fla..... | 78 | ..... | ..... | Rare. |
| ..... | J.A.C. | 8 | ..... | S.S. *Flying Falcon*, S. W. of Ireland. | 345 | ..... | ..... | Common. |
| ..... | J.A.C. | 4 | ..... | Coast of Iceland..... | ..... | ..... | ..... | Few. |

**BULIMINA INFLATA Seguenza.**

Plate 21, fig. 1.

*Bulimina inflata* SEGUENZA, Atti Accad. Gioenia Sci. Nat., ser. 2, vol. 18, 1862, p. 109, pl. 1, fig. 10.—SCHWAGER, *Novara*-Exped. geol. Theil, vol. 2, 1866, p. 246, pl. 7, fig. 91.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 406, pl. 51, figs. 10–13.—H. B. BRADY, PARKER, and JONES, Trans. Zool. Soc., vol. 12, 1888, p. 220, pl. 43, fig. 9.—WRIGHT, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448.—PEARCEY, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—WRIGHT, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—EGGER, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 288, pl. 8, fig. 85.—CHAPMAN, Proc. Zool. Soc. London, 1895, p. 22.—GOËS, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 46.—FLINT, Rep. U. S. Nat. Mus., 1897 (1899), p. 291, pl. 37, fig. 5.—MILLETT, Journ. Roy. Micr. Soc., 1899, p. 279.—CUSHMAN, Amer. Geologist, vol. 33, 1904, p. 265.—CHAPMAN, Trans. New Zealand Inst., vol. 38, 1905, p. 89.—BAGG, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 135.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 84, figs. 137*a*, *b* (in text).—CHAPMAN, Zool. Res. *Endeavour*, pt. 3, 1912, p. 310; Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 18.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 123.—CUSHMAN, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 160, pl. 31, fig. 6.

*Description.*—Test short, ovate, composed of overlapping chambers, triserial, the sutures deep; edge of chamber extending out into a free winglike expansion with a crenulated border extending outward into short spines, from which raised costae extend back into the outer surface of the chambers; upper portions of the chambers smooth and unornamented; wall transparent and thin in the young, becoming thickened and white in the adult; aperture an obliquely placed slit, elongated, widest near the upper end, usually with a raised border, and often with a lip extending in on the concave side.

Length 0.4–1.0 mm.

*Distribution.*—This is a very widely spread species, especially in comparatively deep water, occurring usually in some numbers wherever *Globigerina*-ooze occurs. Along the Atlantic coast it has been found at numerous stations and according to the records it occurs also in fairly deep water off the coast of Europe. It is recorded by Brady, Parker, and Jones from the Abrohlos Bank off Brazil, and it is also recorded from various parts of the Pacific. It is replaced in the Gulf of Mexico and in the Caribbean by the following variety.

*Bulimina inflata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16422 | U.S.N.M. | 1 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Rare. |
| 16423 | U.S.N.M. | 10 | D2018... | 37 12 22 N.; 74 20 04 W.. | 788 | 39.0 | bu. m..... | Common. |
| 16424 | U.S.N.M. | 10 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Common. |
| 16425 | U.S.N.M. | 1 | D2034... | 39 27 10 N.; 69 56 20 W.. | 1,346 | 38.0 | glob. oz..... | Rare. |
| 16426 | U.S.N.M. | 1 | D2036... | 38 52 40 N.; 69 24 40 W.. | 1,735 | 38.0 | glob. oz..... | Rare. |
| 16427 | U.S.N.M. | 3 | D2050... | 39 42 50 N.; 69 21 20 W.. | 1,050 | 44.5 | glob. oz..... | Few. |
| 16101 | U.S.N.M. | 6 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Few. |
| 16102 | U.S.N.M. | 2 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46.0 | s. ers. g..... | Rare. |
| 16103 | U.S.N.M. | 5 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39.0 | for. s..... | Few. |
| 16104 | U.S.N.M. | 2 | D2111... | 35 09 50 N.; 74 57 40 W.. | 938 | ..... | gn. m..... | Rare. |
| 16105 | U.S.N.M. | 1 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn. m..... | Rare. |
| 16106 | U.S.N.M. | 9 | D2192... | 39 46 30 N.; 70 14 45 W.. | 1,060 | 38.6 | gy. oz..... | Common. |
| 16107 | U.S.N.M. | 1 | D2196... | 39 35 00 N.; 69 44 00 W.. | 1,230 | 38.0 | gn. m..... | Rare. |
| 16108 | U.S.N.M. | 6 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Few. |
| 16109 | U.S.N.M. | 7 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | g. m. s..... | Common. |
| 16110 | U.S.N.M. | 7 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Common. |
| 16111 | U.S.N.M. | 1 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Rare. |
| 16112 | U.S.N.M. | 5 | D2217... | 39 47 20 N.; 69 34 15 W.. | 924 | 38.1 | gy. m..... | Few. |
| 16113 | U.S.N.M. | 2 | D2230... | 38 27 00 N.; 73 02 00 W.. | 1,168 | 36.8 | gy. oz..... | Few. |
| 16114 | U.S.N.M. | 1 | D2234... | 39 09 00 N.; 72 03 15 W.. | 810 | 38.6 | gn. m..... | Rare. |
| 16115 | U.S.N.M. | 7 | D2231... | 38 29 00 N.; 73 09 00 W.. | 965 | 36.8 | gy. oz..... | Common. |
| 16116 | U.S.N.M. | 3 | D2235... | 39 12 00 N.; 72 03 30 W.. | 707 | 38.8 | gn. m..... | Few. |
| 16117 | U.S.N.M. | 3 | D2528... | 41 47 00 N.; 65 37 30 W.. | 677 | 38.7 | br. s..... | Few. |
| 16118 | U.S.N.M. | 9 | D2530... | 40 53 30 N.; 66 24 00 W.. | 956 | 38.4 | gy. oz..... | Common. |
| 16119 | U.S.N.M. | 8 | D2534... | 40 01 00 N.; 67 29 15 W.. | 1,234 | 37.8 | gy. oz..... | Common. |
| 16120 | U.S.N.M. | 4 | D2535... | 40 03 30 N.; 67 27 15 W.. | 1,149 | 37.8 | gy. oz..... | Few. |
| 16121 | U.S.N.M. | 2 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 16122 | U.S.N.M. | 1 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Rare. |
| 16123 | U.S.N.M. | 6 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Few. |
| 16124 | U.S.N.M. | 2 | D2564... | 39 22 00 N.; 71 23 30 W.. | 1,390 | 37.3 | gy. oz..... | Few. |
| 16125 | U.S.N.M. | 2 | D2680... | 39 50 00 N.; 70 26 00 W.. | 555 | ..... | ..... | Few. |
| 16126 | U.S.N.M. | 3 | D2581... | 39 43 00 N.; 71 34 00 W.. | 394 | ..... | gn. m..... | Few. |
| 16127 | U.S.N.M. | 8 | D2689... | 39 42 00 N.; 71 15 30 W.. | 525 | ..... | gn. m..... | Common. |
| 16128 | U.S.N.M. | 7 | D2705... | 42 47 00 N.; 61 04 00 W.. | 1,255 | ..... | lt. br. oz.... | Common. |
| 16129 | U.S.N.M. | 3 | D2706... | 41 28 30 N.; 65 35 30 W.. | 1,188 | ..... | gy. oz. for.... | Few. |
| 16130 | U.S.N.M. | 10 | D2710... | 40 06 00 N.; 68 01 00 W.. | 984 | ..... | gn. m..... | Common. |
| 16131 | U.S.N.M. | 2 | D2684... | 39 35 00 N.; 70 54 00 W.. | 1,106 | ..... | br. c. bk. sp.. | Few. |
| 16132 | U.S.N.M. | 8 | D2748... | 39 31 00 N.; 71 14 30 W.. | 1,163 | 37.8 | gy. m. for.... | Common. |

**BULIMINA INFLATA Seguenza, var. MEXICANA, new variety.**

Plate 21, fig. 2.

*Description.*—Test differing from the typical in the larger number, higher and more definite ridges tending toward *B. buchiana*. The form, however, is that of *inflata*. The test is more translucent, and thinner than in the more northern form.

*Distribution.*—Type-specimen (U.S.N.M. No. 16402) from *Albatross* station D2377, in 210 fathoms (384 meters). It has also occurred at several other stations in this general region.

*Bulimina inflata, var. mexicana—material consumed.*

| Cat. No | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | | | |
| 16396 | U.S.N.M. | 3 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Few. |
| 16397 | U.S.N.M. | 1 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s... | Rare. |
| 16398 | U.S.N.M. | 10 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Common. |
| 16399 | U.S.N.M. | 1 | D2318... | 24 25 45 N.; 81 46 00 W.. | 45 | 75.0 | co..... | Rare. |
| 16400 | U.S.N.M. | 1 | D2339... | 23 10 40 N.; 82 20 15 W.. | 191 | ..... | co..... | Rare. |
| 16401 | U.S.N.M. | 1 | D2352... | 22 35 00 N.; 84 23 00 W.. | 463 | 45.0 | wh. co..... | Rare. |
| 16402 | U.S.N.M. | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 16403 | U.S.N.M. | 3 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m.... | Rare. |
| 16404 | U.S.N.M. | 3 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m.... | Rare. |
| 16405 | U.S.N.M. | 1 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 16406 | U.S.N.M. | 2 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 16407 | U.S.N.M. | 3 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 16408 | U.S.N.M. | 1 | D2629... | 23 48 40 N.; 75 10 40 W.. | 1,169 | 38.4 | co. s..... | Rare. |
| 16409 | U.S.N.M. | 10 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn.m..... | Common. |
| 16410 | U.S.N.M. | 3 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16411 | U.S.N.M. | 2 | D2721... | 38 56 00 N.; 72 11 30 W.. | 813 | ..... | gy. oz..... | Rare. |
| 16412 | U.S.N.M. | 1 | D2761... | 15 30 00 S.; 38 32 54 W.. | 818 | 39.0 | pter. oz..... | Rare. |
| 16413 | U.S.N.M. | 1 | HS0..... | 13 56 35 N.; 63 02 00 W.. | 684 | ..... | gy. m. for... | Rare. |

**BULIMINA BUCHIANA d'Orbigny.**

Plate 20, fig. 4.

*Bulimina buchiana* d'Orbigny, For. Foss. Vienne, 1846, p. 186, pl. 11, figs. 15–18.—Reuss, Sitz. kais. Akad. Wiss. Wien, vol. 55, 1867, p. 95, pl. 4, figs. 10*a*, *b*.—Terrigi, Atti Acc. Pont. Nuovi Lincei, vol. 33, 1880, p. 195, pl. 2, fig. 37.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 407, pl. 51, figs. 18, 19; Journ. Roy. Micr. Soc., 1887, p. 899.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 474.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 286, pl. 8, figs. 68, 77.—Chapman, Proc. Zool. Soc. London, 1895, p. 22; Cal. Acad. Sci., vol. 1, ser. 3, 1904, p. 244, pl. 29, fig. 5; Journ. Quekett Micr. Club, 1907, p. 127, pl. 9, fig. 6.—Bagg, Bull. U. S. Nat. Mus., vol. 34, 1908, p. 135.—Chapman, Journ. Linn. Soc., vol. 30, 1910, p. 403.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 85, figs. 138*a*, *b* (in text).—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1014.—Chapman, Biol. Results *Endeavour*, vol. 3, pt. 1, 1915, p. 18.—Cushman, U. S. Geol. Survey, Bull. 676, 1918, p. 50; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 160.

*Bulimina presli* Reuss, var. *buchiana* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 374, pl. 17, fig. 71.

*Bolivina karreriana* Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 138 (not *B. karreriana* H. B. Brady).

*Description.*—Test ovate, broadest above the middle, composed of numerous inflated chambers, the remainder of the test consisting of longitudinal plate-like costae, confluent from the apex to the base of the last-formed chamber; chambers distinct, inflated, smooth except for the longitudinal costae; sutures distinct, somewhat depressed, wall in young specimens thin and translucent, in the adults thickened and opaque; aperture a loop-like opening of the inner margin of the chamber with a definite margined lip; color white.

Length 0.30–0.75 mm.

*Distribution.*—This has proved to be much rarer than most of the other species of the genus in the *Albatross* material from the western Atlantic. It has occurred at two stations off the continental shelf at about 40° N., at one station off the eastern coast of Florida, at two in the northern part of the Gulf of Mexico, and at three stations in the eastern part of the Caribbean. Brady's Atlantic records are two stations north of the Lesser Antilles, two stations off the Azores, one off the Canaries, and another off the coast of Brazil. Neither Goës or Flint record the species.

There are a very few stations in the eastern Atlantic southwest of Ireland, in 48 to 750 fathoms (87 to 1,370 meters). Pearcey records it in the South Atlantic in 742 fathoms (1,357 meters) and mentions it as "common in the North Atlantic, from latitude 60° to the Equator, 150 to 1,675 fathoms (274 to 3,063 meters)." There are numerous records for the species in the South Pacific. Brady's original specimens were from the Miocene of the Vienna Basin. I have found it from the Miocene of the Coastal Plain in Virginia, and Chapman records it from the Pliocene of California. It is known from the Tertiary in various places.

*Bulimina buchiana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16414 | U.S.N.M. | 1 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | y. m. fne. s.. | Rare. |
| 16415 | U.S.N.M. | 1 | D2189... | 39 49 30 N.; 70 26 00 W.. | 600 | 39.7 | gn. m. s..... | Rare. |
| 16416 | U.S.N.M. | 1 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Rare. |
| 16417 | U.S.N.M. | 2 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 16418 | U.S.N.M. | 3 | D2573... | 40 34 18 N.; 66 09 00 W.. | 1,742 | 37.3 | gy. m. s..... | Few. |
| 16419 | U.S.N.M. | 1 | D2641... | 25 40 00 N.; 80 00 00 W.. | 193 | 43.4 | gy. s ..... | Rare. |
| 16420 | U.S.N.M. | 1 | H59..... | 17 42 10 N.; 65 39 40 W.. | 789 | ..... | oz. for..... | Rare. |
| 16421 | U.S.N.M. | 1 | H79..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co.s. sh..... | Rare. |

**BULIMINA ACULEATA d'Orbigny.**

Plate 22, figs. 1, 2.

*Polymorpha pineiformis* Soldani, Testaceographia, vol. 1, pt. 2, 1791, p. 118, pl. 127, fig. 1; pl. 130, fig. vv.

*Bulimina aculeata* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 269.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 406, pl. 51, figs. 7–9.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 334.—H. B.

Brady, Journ. Roy. Micr. Soc., 1887, p. 897.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc., vol. 12, 1888, p. 220, pl. 43, fig. 8.—Robertson, Trans. Nat. Hist. Soc., Glasgow, vol. 3, pt. 3, 1892, p. 240.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 287, pl. 8, figs. 72, 78.—Chapman, Proc. Zool. Soc., London, 1895, p. 22.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 45.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 291, pl. 37, fig. 4.—Millett, Journ. Roy. Micr. Soc., 1900, p. 278.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 48, pt. 2, 1904, p. 12.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 207.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 134.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 332.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 12.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 86, figs. 139*a*, *b* (in text).—Chapman, Zool. Res. *Endeavour*, pt. 3, 1912, p. 310.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 63.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1014.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 20.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 236.—Mestayer, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 123.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 161, pl. 31, fig. 5.

*Bulimina pupoides* d'Orbigny, var. *spinulosa* Williamson, Rec. For. Great Britain, 1858, p. 62, pl. 5, fig. 128.

*Bulimina presli* Reuss, var. *aculeata* Parker and Jones, Introd. Foram., 1862, Appendix, p. 311.

*Description.*—Test elongate, tapering, broadest near the apertural end, early portion with numerous long aculeate spines, later portion smooth; chambers fairly numerous, tumid, those of the early portion largely hidden by the numerous spines; sutures much depressed, wall calcareous, perforate, in the young specimens translucent, thin, in the older ones thickened and becoming opaque; aperture slightly curved, loop-like opening, in a slight depression of the ventral face of the chamber; color white.

Length 0.40–1.25 mm.

*Distribution.*—In the *Albatross* material from the western Atlantic this has occurred at a large number of stations, ranging from the cold water south of Nova Scotia down the coast to the region of Carolina. There is another group of stations in the northern part of the Gulf of Mexico and scattered stations in the Caribbean. Goës records it from the Caribbean also. Flint had it from off Panama, in the northern part of the Gulf of Mexico, and south of Nova Scotia. The *Challenger* records include one station off our eastern coast, off the West Indies, one off northwestern Africa, and another off the coast of Brazil. These range in depth from 150 to 2,740 fathoms (274 to 5,011 meters). Brady, Parker, and Jones record it from off the Abrohlos Bank in 40 to 260 fathoms (73 to 476 meters), and Pearcey from 2½ fathoms (4 meters) in Stanley Harbor, Falkland Islands. Whiteaves records it from the Gulf of St. Lawrence. It is known from numerous stations about the British Isles.

From the work of Heron-Allen and Earland this species does not seem to be common, although they record it at 12 stations, "but somewhat rare" off the west of Scotland in their Clare Island Report. They mention the following: "No very pronounced specimens of *Bulimina aculeata* occur in the area, but at four stations specimens were found, hispid from the whole of the initial portion of the test. . . . The spines of some of the specimens are short, but extremely fine and closely set, so that the apex of the shell is clothed with a prickly felt." In the western Atlantic there are small specimens occasionally found which have this same character, but whether they are the young of the typical form of the species or represent a different species or variety has been impossible to determine. Both forms seem to occur together. The finest large well-developed specimens have occurred in the cold water off our New England coast.

*Bulimina aculeata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperatures. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16225 | U.S.N.M. | 7 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Common. |
| 16226 | U.S.N.M. | 3 | D2022... | 37 32 00 N.; 74 13 20 W.. | 487 | 40.0 | bu. m..... | Few. |
| 16227 | U.S.N.M. | 8 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Common. |
| 16228 | U.S.N.M. | 5 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Few. |
| 16229 | U.S.N.M. | 5 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | crs. s. m. g... | Few. |
| 16230 | U.S.N.M. | 2 | D2078... | 41 11 30 N.; 66 12 20 W.. | 499 | 40.0 | gy. m. s..... | Rare. |
| 16231 | U.S.N.M. | 1 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Rare. |
| 16232 | U.S.N.M. | 1 | D2112... | 35 20 50 N.; 75 18 00 W.. | 16 | 73.5 | s. blk. sp.... | Rare. |
| 16233 | U.S.N.M. | 1 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Rare. |
| 16234 | U.S.N.M. | 4 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn. m..... | Few. |
| 16235 | U.S.N.M. | 3 | D2189... | 39 49 30 N.; 70 26 00 W.. | 600 | 39.7 | gn. m. s..... | Few. |
| 16236 | U.S.N.M. | 6 | D2192... | 39 46 30 N.; 70 14 45 W.. | 1,060 | 38.6 | gy. oz..... | Common. |
| 16237 | U.S.N.M. | 1 | D2196... | 39 35 00 N.; 69 44 00 W.. | 1,230 | 38.0 | gn. m..... | Rare. |
| 16238 | U.S.N.M. | 10 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Common. |
| 16239 | U.S.N.M. | 2 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | gn. m. s..... | Rare. |
| 16240 | U.S.N.M. | 1 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Rare. |
| 16241 | U.S.N.M. | 6 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Few. |
| 16242 | U.S.N.M. | 1 | D2221... | 39 05 30 N.; 70 44 30 W.. | 1,525 | 36.9 | gy. oz..... | Rare. |
| 16243 | U.S.N.M. | 1 | D2228... | 37 25 00 N.; 73 06 00 W.. | 1,582 | 36.8 | br. m..... | Rare. |
| 16244 | U.S.N.M. | 1 | D2231... | 38 29 00 N.; 73 09 00 W.. | 965 | 36.8 | gy. oz..... | Rare. |
| 16245 | U.S.N.M. | 6 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 16246 | U.S.N.M. | 4 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s..... | Few. |
| 16247 | U.S.N.M. | 4 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Few. |
| 16248 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 60 W.. | 1,181 | 39.6 | br. gn. m.... | Rare. |
| 16249 | U.S.N.M. | 5 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Few. |
| 16250 | U.S.N.M. | 2 | D2392... | 28 47 30 N.; 87 27 00 W.. | 721 | 40.7 | br. gy. m.... | Rare. |
| 16251 | U.S.N.M. | 4 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m.... | Few. |
| 16252 | U.S.N.M. | 9 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Common. |
| 16253 | U.S.N.M. | 3 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Few. |
| 16254 | U.S.N.M. | 1 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 16255 | U.S.N.M. | 2 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 16256 | U.S.N.M. | 2 | D2405... | 28 45 00 N.; 85 02 00 W.. | 30 | ..... | gy. s. brk. sh | Rare. |
| 16257 | U.S.N.M. | 1 | D2530... | 40 53 30 N.; 66 24 00 W.. | 956 | 38.4 | gy. oz..... | Rare. |
| 16258 | U.S.N.M. | 1 | D2534... | 40 01 00 N.; 67 29 15 W.. | 1,234 | 37.8 | gy. oz..... | Rare. |
| 16259 | U.S.N.M. | 1 | D2534... | ..... | ..... | ..... | ..... | ..... |
| 16260 | U.S.N.M. | 8 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Common. |
| 16261 | U.S.N.M. | 1 | D2550... | 39 41 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Rare. |
| 16262 | U.S.N.M. | 4 | D2581... | 39 43 00 N.; 71 31 00 W.. | 394 | ..... | gn. m..... | Few. |
| 16263 | U.S.N.M. | 3 | D2584... | 39 05 30 N.; 72 23 20 W.. | 541 | 39.5 | gy. m..... | Few. |
| 16264 | U.S.N.M. | 6 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Common. |
| 16265 | U.S.N.M. | 2 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16266 | U.S.N.M. | 10 | D2680... | 39 50 00 N.; 70 26 00 W.. | 555 | ..... | ..... | Common. |
| 16267 | U.S.N.M. | 8 | D2689... | 39 42 00 N.; 71 15 30 W.. | 525 | ..... | gn. m..... | Common. |
| 16268 | U.S.N.M. | 1 | D2710... | 40 06 00 N.; 68 01 00 W.. | 984 | ..... | gn. m..... | Rare. |
| 16269 | U.S.N.M. | 9 | D2721... | 38 56 00 N.; 72 11 30 W.. | 813 | ..... | gy. oz..... | Common. |
| 16270 | U.S.N.M. | 1 | D2740... | 37 40 00 N.; 73 50 00 W.. | 1,011 | 38.0 | br. oz..... | Rare. |
| 16271 | U.S.N.M. | 1 | H60..... | 17 39 00 N.; 65 44 00 W.. | 478 | ..... | co. s. for.... | Rare. |
| 16272 | U.S.N.M. | 1 | H179..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for. | Rare. |
| 16273 | U.S.N.M. | 1 | H180..... | 13 56 35 N.; 63 02 00 W.. | 684 | ..... | gy. m. for... | Rare. |
| 16274 | U.S.N.M. | 8 | H4133.... | 11 33 20 N.; 66 19 00 W.. | 533 | ..... | gy. m. for... | Common. |

BULIMINA ECHINATA d'Orbigny.

Plate 15, fig. 6.

*Bulimina echinata* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 269, No. 5.—Fornasini, Boll. Soc. Geol. Ital., vol. 20, 1901, p. 176, fig. 2.—Heron-Allen and Earland, Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 235, pl. 41, fig. 3.

Heron-Allen and Earland refer to this species specimens from off the western coast of Ireland which they figure in the above reference. I have found nothing of the sort in the *Albatross* material in the western Atlantic.

BULIMINA ROSTRATA H. B. Brady.

*Bulimina rostrata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 408, pl. 51, figs. 14, 15.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 287, pl. 8, figs. 96, 97.—Chapman, Proc. Zool. Soc., 1895, p. 23; Journ. Linn. Soc., vol. 30, 1910, p. 403.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 87, figs. 140*a*, *b* (in text).—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 123.

*Description.*—Test ovoid, tapering to an acute point, sometimes with a distinct apical spine; chambers arranged triserially, but indistinct in front view; surface with a series of raised costae running from the apical end to the last-formed whorl, concealing the sutures; end view showing the sutures; wall punctate, opaque, white; aperture elongate, comma-shaped.

Length 0.3–0.5 mm.

*Distribution.*—The only Atlantic record is that given by Brady in the *Challenger* Report, off Cape de Verde Islands in 1,070 fathoms (1,957 meters). It is also recorded from *Challenger* station 335, latitude 32° 24′ S., longitude 13° 05′ W., in 1,450 fathoms (2,652 meters). Other records for this species are all from the Pacific and Indian Oceans. Brady records it southeast of the Cape of Good Hope and off the Ki Islands, Egger from the western coast of Australia, and Chapman from the Arabian Sea, the eastern coast of Australia, and off Funafuti, the latter in 2,298 fathoms (4,203 meters). I have previously recorded it from several *Albatross* and *Nero* stations in the North Pacific. Apparently this species does not come into the North Atlantic along the coasts, as it certainly would have been noted either in the European material or on our own eastern coast in the abundant *Albatross* material.

BULIMINA SQUAMMIGERA d'Orbigny.

*Bulimina squammigera* d'Orbigny, in Barker, Webb, and Berthelot, Hist. Nat. Isles Canaries, vol. 2, pt. 2, 1839. "Foraminifères," p. 137, pl. 1, figs. 22–24.—Siddall, Proc. Chaster Soc. Nat. Sci., pt. 2, 1878, p. 49.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 898.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 107.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 333; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 61; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 237.

This species figured and described by d'Orbigny from off the Canaries is recorded by Siddall and by Heron-Allen and Earland from about the British Isles. They do not, however, figure any specimens of the species, and this seems to be the only region from which it has been recorded. It has not occurred in the western Atlantic.

#### BULIMINA cf. B. SUBORNATA H. B. Brady.

*Bulimina subornata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 402, pl. 51, figs. 6*a*, *b*.—Chapman, Proc. Zool. Soc. London, 1895, p. 23.—Millett, Journ. Roy. Micr. Soc., 1900, p. 276, pl. 2, fig. 3.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 88, figs. 141*a*, *b* (in text).

All of the records for this species are from the Pacific. There are, however, single specimens from two *Albatross* stations D2679, off the Carolina coast, in 782 fathoms (1,430 meters), and another off Ragged Key, Florida, in 75 fathoms (137 meters), which are smooth at the apertural end and more or less costate at the apical end, in general resembling this species.

*Bulimina cf. B. subornata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17155 | U.S.N.M. | 1 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 17156 | U.S.N.M. | 1 | ..... | Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |

#### BULIMINA OVATA d'Orbigny.

Plate 21, fig. 3.

*Bulimina ovata* d'Orbigny, For. Foss. Vienne, 1846, p. 185, pl. 11, figs. 13, 14.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 400, pl. 50, figs. 13*a*, *b*.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 77, figs. 125*a–c* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 164, fig. 4 (in text).

*Description.*—Test ovate in front view, circular or nearly so in end view, the apex broadly rounded; visible chambers several, little inflated; sutures but slightly compressed; wall smooth; aperture rather narrow with a plate-like tooth; color white.

Length 0.75–1.20 mm.

*Distribution.*—Specimens referred to this species are common, especially along the eastern coast of the United States, as well as in the Gulf of Mexico, and a few in the Caribbean. The specimens either vary considerably, or what is more likely from a study of a considerable series, there are two or more distinct forms in the area. One of these is short and broad, the other longer and more like the original figure given by d'Orbigny for this species.

*Bulimina ovata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17222 | U.S.N.M. | 5 | D2018... | 37 13 22 N.; 74 20 04 W.. | 788 | 39.0 | bu. m..... | Few. |
| 17223 | U.S.N.M. | 10 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Common. |
| 17224 | U.S.N.M. | 5 | D2034... | 39 27 10 N.; 69 56 20 W.. | 1,316 | 38.0 | glob. oz..... | Few. |
| 17225 | U.S.N.M. | 10 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Common. |
| 17226 | U.S.N.M. | 10 | D2036... | 38 52 40 N.; 69 24 40 W.. | 1,735 | 38.0 | glob. oz..... | Common. |
| 17227 | U.S.N.M. | 8 | D2037... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob. oz..... | Common. |
| 17228 | U.S.N.M. | 5 | D2038... | 38 30 30 N.; 69 08 25 W.. | 2,033 | ..... | glob. oz..... | Few. |
| 17229 | U.S.N.M. | 2 | D2039... | 38 19 26 N.; 68 20 20 W.. | 2,369 | ..... | glob. oz..... | Rare. |
| 17230 | U.S.N.M. | 10 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob. oz..... | Common. |
| 17193 | U.S.N.M. | 10 | D2012... | 39 33 00 N.; 68 26 45 W.. | 1,555 | 38.5 | glob. oz..... | Common. |
| 17231 | U.S.N.M. | 10 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Common. |
| 17232 | U.S.N.M. | 5 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu. m..... | Few. |
| 17233 | U.S.N.M. | 6 | D2050... | 39 42 50 N.; 69 21 20 W.. | 1,050 | 44.5 | glob. oz..... | Common. |
| 17234 | U.S.N.M. | 10 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Common. |
| 17235 | U.S.N.M. | 8 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46.0 | s. crs. g..... | Common. |
| 17236 | U.S.N.M. | 2 | D2076... | 41 13 00 N.; 66 00 50 W.. | 906 | ..... | bu. m..... | Rare. |
| 17237 | U.S.N.M. | 1 | D2097... | 37 56 20 N.; 70 57 30 W.. | 1,917 | ..... | glob. oz..... | Rare. |
| 17238 | U.S.N.M. | 10 | D2105... | 37 50 00 N.; 73 03 50 W.. | 1,395 | 41.1 | glob. oz..... | Common. |
| 17239 | U.S.N.M. | 10 | D2106... | 37 41 20 N.; 73 03 20 W.. | 1,497 | 42.5 | glob. oz..... | Common. |
| 17240 | U.S.N.M. | 10 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Common. |
| 17241 | U.S.N.M. | 10 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Common. |
| 17242 | U.S.N.M. | 1 | D2174... | 38 15 00 N.; 72 03 00 W.. | 1,594 | ..... | gy. m..... | Rare. |
| 17243 | U.S.N.M. | 1 | D2194... | 39 43 45 N.; 70 07 00 W.. | 1,140 | 38.4 | oz..... | Rare. |
| 17244 | U.S.N.M. | 10 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Common. |
| 17245 | U.S.N.M. | 1 | D2205... | 39 35 00 N.; 71 18 45 W.. | 1,073 | 38.1 | gy. oz..... | Rare. |
| 17246 | U.S.N.M. | 3 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Rare. |
| 17247 | U.S.N.M. | 10 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Common. |
| 17248 | U.S.N.M. | 3 | D2228... | 37 25 00 N.; 73 06 00 W.. | 1,582 | 36.8 | br. m..... | Rare. |
| 17194 | U.S.N.M. | 10 | D2230... | 38 27 00 N.; 73 02 00 W.. | 1,168 | 36.8 | gy. oz..... | Common. |
| 17195 | U.S.N.M. | 10 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Common. |
| 17196 | U.S.N.M. | 10 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s. | Common. |
| 17197 | U.S.N.M. | 1 | D2265... | 37 07 40 N.; 74 35 40 W.. | 70 | 57.9 | gn. m. g..... | Rare. |
| 17198 | U.S.N.M. | 1 | D2313... | 32 53 00 N.; 77 53 00 W.. | 99 | 57.2 | crs. s. bk. sp. | Rare. |
| 17199 | U.S.N.M. | 1 | D2381... | 28 05 00 N.; 87 56 15 W.. | 1,330 | ..... | lt. br. m..... | Rare. |
| 17200 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br. gn. m..... | Rare. |
| 17201 | U.S.N.M. | 1 | D2384... | 28 45 00 N.; 88 15 30 W.. | 910 | 39.6 | br. gy. m..... | Rare. |
| 17202 | ..... | 5 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Few. |
| 17203 | U.S.N.M. | 10 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m..... | Common. |
| 17204 | U.S.N.M. | 5 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Few. |
| 17205 | U.S.N.M. | 10 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Common. |
| 17206 | U.S.N.M. | 10 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Common. |
| 17207 | U.S.N.M. | 8 | D2520... | 42 41 00 N.; 64 55 30 W.. | 62 | 40.6 | rky..... | Common. |
| 17208 | U.S.N.M. | 5 | D2535... | 40 03 30 N.; 67 27 15 W.. | 1,149 | 37.8 | gy. oz..... | Few. |
| 17209 | U.S.N.M. | 2 | D2517... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Rare. |
| 17210 | U.S.N.M. | 10 | D2562... | 39 15 30 N.; 71 25 00 W.. | 1,434 | 37.3 | gy. oz..... | Common. |
| 17211 | U.S.N.M. | 10 | D2563... | 39 18 30 N.; 71 23 30 W.. | 1,422 | 37.4 | gy. oz..... | Common. |
| 17212 | U.S.N.M. | 5 | D2564... | 39 22 00 N.; 71 23 30 W.. | 1,390 | 37.3 | gy. oz..... | Few. |
| 17213 | U.S.N.M. | 6 | D2568... | 39 15 00 N.; 68 08 00 W.. | 1,781 | 36.9 | gy. oz..... | Few. |
| 17214 | U.S.N.M. | 1 | D2573... | 40 34 18 N.; 66 09 00 W.. | 1,742 | 37.3 | gy. m. s..... | Rare. |
| 17215 | U.S.N.M. | 2 | D2581... | 39 43 00 N.; 71 31 00 W.. | 394 | ..... | gn. m..... | Rare. |
| 17216 | U.S.N.M. | 4 | D2706... | 41 28 30 N.; 65 35 30 W.. | 1,188 | ..... | gy. oz. for... | Few. |
| 17217 | U.S.N.M. | 1 | D2713... | 38 20 00 N.; 70 08 30 W.. | 1,859 | ..... | br. oz..... | Rare. |
| 17218 | U.S.N.M. | 1 | D2716... | 38 29 30 N.; 70 57 00 W.. | 1,631 | ..... | br. oz. for... | Rare. |
| 17219 | U.S.N.M. | 1 | D2747... | 39 27 00 N.; 71 15 00 W.. | 1,276 | 37.5 | bu. m..... | Rare. |
| 17220 | U.S.N.M. | 8 | D2748... | 39 31 00 N.; 71 14 30 W.. | 1,163 | 37.8 | gy. m. for... | Common. |
| 17221 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla., S. by E. ½ E..... | 70 | ..... | ..... | Rare. |

**BULIMINA PYRULA d'Orbigny.**

Plate 20, fig. 1.

*Bulimina pyrula* d'Orbigny, For. Foss. Vienne, 1846, p. 184, pl. 11, figs. 9, 10.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 399, pl. 50, figs, 7–10.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 78, figs. 126*a–c*, 127 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 162, figs. 1*a–c* (in text).

*Description.*—Test ovate in front view, usually broadest near the base, nearly circular in end view, the apex rounded; visible chambers

few, very little inflated; sutures flush with the surface or very slightly depressed, wall smooth; aperture short and broad with a broad plate-like tooth partially closing the opening; color white.

Length 0.50–0.85 mm.

*Distribution.*—No extended list of references is given for this species, although they are very numerous. A comparison of the figures assigned to this species shows very considerable difference in the forms included under the name. I have restricted the records in the western Atlantic as far as possible to those forms which are broadest near the base and in which the later chambers reach to or almost to the apical end of the chamber. Such specimens are most common off the eastern coast of the United States, from Cape Hatteras to Nova Scotia, but scattered specimens which may be referred to this species occur farther south.

*Bulimina pyrula—material examined.*

| Cat. No | Coll. of— | No. of speci-mens. | Station. | Locality. | Depth in fath-oms. | Bot-tom tem-pera-ture. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17159 | U.S.N.M. | 1 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Rare. |
| 17160 | U.S.N.M. | 1 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Rare. |
| 17161 | U.S.N.M. | 4 | D2050... | 39 42 50 N.; 69 21 20 W.. | 1,050 | 44.5 | glob. oz..... | Few. |
| 17162 | U.S.N.M. | 4 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Few. |
| 17163 | U.S.N.M. | 2 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46.0 | s. ers. g..... | Rare. |
| 17164 | U.S.N.M. | 1 | D2073... | 41 54 15 N.; 65 39 00 W.. | 587 | 40.0 | gy. s..... | Rare. |
| 17165 | U.S.N.M. | 6 | D2076... | 41 13 00 N.; 66 00 50 W.. | 906 | ..... | bu. m..... | Few. |
| 17166 | U.S.N.M. | 7 | D2078... | 41 11 30 N.; 66 12 20 W.. | 499 | 40.0 | gy. m. s..... | Common. |
| 17167 | U.S.N.M. | 2 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Rare. |
| 17168 | U.S.N.M. | 4 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39.0 | for. s. m..... | Few. |
| 17169 | U.S.N.M. | 2 | D2106... | 37 41 20 N.; 73 03 20 W.. | 1,497 | 42.5 | glob. oz..... | Rare. |
| 17170 | U.S.N.M. | 10 | D2111... | 35 09 50 N.; 74 57 40 W.. | 938 | ..... | gn. m..... | Common. |
| 17171 | U.S.N.M. | 7 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Common. |
| 17172 | U.S.N.M. | 1 | D2160... | 23 10 31 N.; 82 2- 37 W.. | 167 | ..... | eo..... | Rare. |
| 17173 | U.S.N.M. | 1 | D2187... | 39 49 30 N.; 71 10 00 W.. | 420 | 39.7 | gn. m. s..... | Rare. |
| 17174 | U.S.N.M. | 1 | D2196... | 39 35 00 N.; 69 44 00 W.. | 1,230 | 38.0 | gn. m..... | Rare. |
| 17175 | U.S.N.M. | 4 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | gn. m. s..... | Few. |
| 17176 | U.S.N.M. | 10 | D2205... | 39 35 00 N.; 71 18 45 W.. | 1,073 | 38.1 | gy. oz..... | Common. |
| 17177 | U.S.N.M. | 2 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Rare. |
| 17178 | U.S.N.M. | 3 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Few. |
| 17179 | U.S.N.M. | 1 | D2217... | 39 47 20 N.; 69 34 15 W.. | 924 | 38.1 | gy. m..... | Rare. |
| 17180 | U.S.N.M. | 1 | D2221... | 39 05 30 N.; 70 44 30 W.. | 1,525 | 36.9 | gy. oz..... | Rare. |
| 17181 | U.S.N.M. | 4 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Few. |
| 17182 | U.S.N.M. | 5 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn. m. bk. sp. | Few. |
| 17183 | U.S.N.M. | 8 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s. | Common. |
| 17184 | U.S.N.M. | 10 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 17185 | U.S.N.M. | 9 | D2352... | 22 35 00 N.; 84 23 00 W.. | 463 | 45.0 | wh. co..... | Common. |
| 17186 | U.S.N.M. | 4 | D2531... | 40 42 00 N.; 66 33 00 W.. | 852 | 38.4 | gy. m..... | Few. |
| 17187 | U.S.N.M. | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 17188 | U.S.N.M. | 10 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Common. |
| 17189 | U.S.N.M. | 2 | D2562... | 39 15 30 N.; 71 25 00 W.. | 1,434 | 37.3 | gy. oz..... | Rare. |
| 17190 | U.S.N.M. | 1 | D2566... | 37 23 00 N.; 68 08 00 W.. | 2,620 | 36.4 | gy. oz..... | Rare. |
| 17191 | U.S.N.M. | 1 | D2584... | 39 05 30 N.; 72 23 20 W.. | 541 | 39.5 | gy. m..... | Rare. |
| 17192 | U.S.N.M. | 1 | D2721... | 38 56 00 N.; 72 11 30 W.. | 813 | ..... | gy. oz..... | Rare. |

**BULIMINA PYRULA d'Orbigny, var. SPINESCENS H. B. Brady.**

Plate 20, fig. 2.

*Bulimina pyrula* d'Orbigny, var. *spinescens* H. B. Brady, Rep. Voy. *Challenger*, vol. 9, 1884, p. 400, pl. 50, figs. 11, 12.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 290, pl. 37, fig. 1.—Chapman, Trans. New Zealand Inst., vol. 38, 1905, p. 89.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 78, figs 128*a–c*, 129 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 164, fig. 3 (in text).

*Description.*—Similar to the typical form of the species but with the broad apical end of the test beset with short spines.

*Distribution.*—Brady's original specimens of this variety were from the East Indies. Our specimens are like those figured by Flint, in which there are a few straight spines at the very base of the test. Such specimens are abundant in the cold water, especially off the New England coast. They are much like the spinose specimens figured by Parker and Jones.[23]

*Bulimina pyrula, var. spinescens—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17249 | U.S.N.M | 10 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Common. |
| 17250 | U.S.N.M | 3 | D2022... | 37 32 00 N.; 74 13 20 W.. | 487 | 40.0 | bu. m..... | Few. |
| 17251 | U.S.N.M | 3 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Few. |
| 17252 | U.S.N.M | 1 | D2046... | 40 02 49 N.; 68 49 00 W.. | 407 | 40.0 | bu. m..... | Rare. |
| 17253 | U.S.N.M | 2 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Rare. |
| 17254 | U.S.N.M | 10 | D2112... | 35 20 50 N.; 75 18 00 W.. | 16 | 73.5 | s. blk. sp.... | Common. |
| 17255 | U.S.N.M | 10 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Common. |
| 17256 | U.S.N.M | 10 | D2249... | 40 11 00 N.; 69 52 00 W.. | 553 | 51.4 | gn. m. fne. s.. | Common. |
| 17257 | U.S.N.M | 1 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Rare. |
| 17258 | U.S.N.M | 10 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Common. |
| 17259 | U.S.N.M | 1 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 17260 | U.S.N.M | 2 | D2547... | 39 54 30 N.; 70 20 00 W.. | 390 | 39.6 | gn. m..... | Rare. |
| 17261 | U.S.N.M | 1 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp.. | Rare. |
| 17262 | U.S.N.M | 10 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn. m. bk. sp. | Common. |
| 17263 | U.S.N.M | 4 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Few. |
| 17264 | U.S.N.M | 2 | D2263... | 37 08 00 N.; 74 33 00 W.. | 430 | ..... | gn. m..... | Rare. |
| 17265 | U.S.N.M | 1 | D2244... | 40 05 15 N.; 70 23 00 W.. | 67 | 52.9 | gn. m..... | Rare. |
| 17266 | U.S.N.M | 7 | *Fish Hawk* 1108..... | 40 02 00 N.; 70 37 30 W.. | 101 | 48.0 | gy. m. fne. s. | Common. |

**BULIMINA AFFINIS d'Orbigny.**

Plate 20, fig. 6.

*Bulimina affinis* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 105, pl. 2, figs. 25, 26.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 400, pl. 50, figs. 14*a*, *b*.—Sherborn and Chapman, Journ. Roy. Micr. Soc., 1886, p. 743, pl. 16, fig. 1.—Burrows, Sherborn, and Bailey, Journ. Roy. Micr. Soc., 1890, p. 554, pl. 8, fig. 23.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 473.—Chapman, Journ. Roy. Micr. Soc., 1892, p. 756, pl. 12, fig. 10.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 285, pl. 8, fig. 71.—Chapman, Proc. Zool. Soc. London, 1895, p. 22.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 290, pl. 37, fig. 2.—Millett, Journ. Roy. Micr. Soc., 1900, p. 274.—Chapman, Proc. California Acad. Sci., vol. 1, 1901, p. 244, pl. 29, fig. 4.—Fornasini, Mem. Acad. Sci. Bologna, ser. 5, vol. 10, 1901, p. 16.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 134.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 332.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 79, fig. 130 (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 165, figs. 5*a*, *b*, 6 (in text).

*Description.*—Test conical, tapering from the broadly rounded apertural end to the acutely pointed apical end; chambers numerous,

[23] Philos. Trans., vol. 155, 1865, pl. 15, figs. 8, 9.

inflated; sutures somewhat depressed, wall calcareous, smooth; aperture loop-shaped, rather short; color white.

Length about 0.75 mm.

This species originally described by d'Orbigny from the shore sands of Cuba is apparently found in the Gulf of Mexico and farther northward along our eastern coast. This and the following smooth species of *Bulimina* are not in a satisfactory state, and it should be determined by a study of abundant specimens as to whether they are very variable or whether there are numerous species which with close study can be distinguished.

*Bulimina affinis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17267 | U.S.N.M. | 1 | D2043... | 39 49 00 N.; 68 28 30 W.. | 1,467 | 38.5 | glob. oz..... | Rare. |
| 17141 | U.S.N.M. | 2 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Rare. |
| 17142 | U.S.N.M. | 1 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Rare. |
| 17143 | U.S.N.M. | 1 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s. | Rare. |
| 17144 | U.S.N.M. | 1 | D2383... | 28 32 00 N.; 88 06 00 W.. | 1,181 | 39.6 | br. gn. m... | Rare. |
| 17145 | U.S.N.M. | 1 | D2393... | 28 43 00 N.; 87 14 30 W.. | 525 | 41.1 | lt. gy. m.... | Rare. |
| 17146 | U.S.N.M. | 1 | D2394... | 28 38 30 N.; 87 02 00 W.. | 420 | 41.8 | gn. m..... | Rare. |
| 17147 | U.S.N.M. | 1 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 17148 | U.S.N.M. | 1 | D2534... | 40 01 00 N.; 67 29 15 W.. | 1,234 | 37.8 | gy. oz..... | Rare. |
| 17149 | U.S.N.M. | 1 | D2563... | 39 18 30 N.; 71 23 30 W.. | 1,422 | 37.4 | gy. oz..... | Rare. |
| 17150 | U.S.N.M. | 2 | ..... | Off Ragged Key, Fla..... | 75 | ..... | ..... | Rare. |

**BULIMINA FUSIFORMIS (Williamson).**

*Bulimina pupoides* d'Orbigny, var. *fusiformis* Williamson, Rec. Foram. Great Britain, 1858, p. 63, pl. 5, figs. 129, 130.

*Bulimina fusiformis* H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 897.—Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 473; Geol. Mag., dec. 4, vol. 7, 1900, p. 100, pl. 5, fig. 5.—Millett, Journ. Roy. Micr. Soc., 1900, p. 275, pl. 2, fig. 2.—Fornasini, Mem. Accad. Sci. Bologna, ser. 5, vol. 9, 1901, p. 157, pl. 0, figs. 6, 9, 16, 18, 23, 36, 40, 41.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 312; Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 61; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 235.

*Description.*—Test elongate, tapering, somewhat fusiform; chambers increasing in size and height as added, somewhat irregular, chambers comparatively few, distinct, irregularly spiral; sutures distinct, depressed, wall smooth, finely punctate; aperture ovate, small; color white.

*Distribution.*—Most of the Atlantic records for this species are about the British Isles. There are no specimens in the *Albatross* material which seem to be referable to this species.

### BULIMINA PUPOIDES d'Orbigny.

Plate 20, fig. 3.

*Bulimina pupoides* d'Orbigny, For. Foss. Vienne, 1846, p. 185, pl. 11, figs. 13, 14.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 400, pl. 50, figs. 15*a*, *b*.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 80, figs. 132*a–c* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 161, pl. 31, fig. 8.

*Description.*—Test ovate, broadest near the apertural end; apical end bluntly pointed, tapering; end view nearly circular; visible chambers numerous, much inflated; sutures rather deeply depressed, wall smooth; aperture long and narrow, with a narrow plate-like tooth; color white.

Length about 1 mm.

*Distribution.*—There are a few elongate specimens at scattered stations southward from Nantucket and two in the Gulf of Mexico. Some of these specimens might perhaps better be put under *B. elongata*, but the material has been very scanty. It has been recorded from the various parts of the Atlantic, as well as in other regions.

*Bulimina pupoides—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 17151 | U.S.N.M. | 2 | D2160... | 23 10 31 N.; 82 20 37 W.. | 167 | ..... | co..... | Rare. |
| 17152 | U.S.N.M. | 1 | D2205... | 39 35 00 N.; 71 18 45 W.. | 1,073 | 38.1 | gy. oz..... | Rare. |
| 17153 | U.S.N.M. | 1 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Rare. |
| 17154 | U.S.N.M. | 1 | D2385... | 28 51 00 N.; 88 18 00 W.. | 730 | 40.1 | gy. m..... | Rare. |

### BULIMINA ELEGANS d'Orbigny.

*Bulimina elegans* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 270, No. 10; Modèles, 1826, No. 9.—Parker, Jones, and H. B. Brady, Ann. Mag. Nat. Hist., ser. 3, vol. 16, 1865, p. 20, pl. 2, fig. 64.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 398, pl. 50, figs. 1–4; Journ. Roy. Micr. Soc., 1887, p. 898.—Wright, Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 472.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 284, pl. 8, figs. 66, 67.—Chapman, Proc. Zool. Soc., 1895, p. 22.—Morton, Foram. Marine Clays of Maine, 1897, p. 115.—Millett, Journ. Roy. Micr. Soc., 1900, p. 274, pl. 2, fig. 1.—Chapman, Proc. Cal. Acad. Sci., vol. 1, 1901, p. 244, pl. 29, fig. 3.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 206.—Chapman, Journ. Quekett Micr. Club, 1907, p. 127.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 333.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, p. 12.—Cushman, Bull. 71, U.S. Nat. Mus., pt. 2, 1911, p. 82, figs. 134*a–c* (in text).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 60; Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 233.

*Description.*—Test elongate, tapering to the acutely pointed, sometimes mucronate, apical end; chambers numerous, inflated; sutures

deeply depressed; wall calcareous, smooth; aperture short, broad, and rounded; color white.

Length 0.50–0.85 mm.

*Distribution.*—As far as the *Albatross* material from the western Atlantic goes, *B. elegans* is practically unknown, and is represented by the following variety. About the British Isles, however, there are numerous records for this species, but of these typical specimens, according to Heron-Allen and Earland, "are of somewhat infrequent occurrence." The only record from the western Atlantic is that given by Flint from off Block Island, *Albatross* station D2584, in 541 fathoms (989 meters). A reference to Flint's figure, however, will show that his specimens were variety *exilis* H. B. Brady.

**BULIMINA ELEGANS d'Orbigny, var. EXILIS H. B. Brady.**

Plate 17, figs. 7–12; plate 19, figs. 2, 3.

*Bulimina elegans* d'Orbigny, var. *exilis* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 399, pl. 50, figs. 5, 6.—Wright, Ann. Mag. Nat. Hist., vol. 4, ser. 6, 1889, p. 448.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Millett, Journ. Roy. Micr. Soc., 1900, p. 275.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, list, p. 400.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, No. 16, 1910, p. 12, pl. 1, fig. 11.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 82, figs. 135*a–c* (in text).—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 42; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 234, pl. 41, figs. 4–9.

*Bulimina elegans* Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 290, pl. 36, fig. 3.

*Description.*—Test elongate, slender, gradually tapering from the acute apical end to its greatest width near the apertural end; chambers numerous, triserial, apical end usually with a definite spine, chambers inflated, smooth; sutures depressed, distinct; aperture comma-shaped, small, in a slight depression of the surface.

Length 0.75 mm.

*Distribution.*—In his original description of this variety, Brady mentions that "such forms are by no means rare in deep water (1,000 to 1,500 fathoms, 1,829 to 2,743 meters) in the North Atlantic, and having also been met with in both the North and South Pacific (350 to 800 fathoms, 640 to 1,463 meters)." It is also recorded off the southwestern coast of Ireland, 1,000 fathoms (1,829 meters), rare (Wright); from both the warm and cool areas of the Faroe Channel (Pearcey), and off South Cornwall and west of Scotland (Heron-Allen and Earland). In the dredgings from the western Atlantic this species has been very common from numerous stations between the latitude of the Gulf of Maine south to Cape Hatteras, with one station off the Carolina coast. This is a definite localized area from which so many species have been found in the *Albatross* material in abundance but not farther south. One of the *Challenger* stations comes

into this same area, as well as the station from which Flint records *Bulimina elegans*, but which is known to be the variety *exilis*.

There is very little variation in the specimens of this variety in this area.

*Bulimina elegans. var. exilis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | ° F. | | |
| 16191 | U.S.N.M. | 6 | D2003... | 37 16 30 N.; 74 20 36 W.. | 641 | ..... | ..... | Few. |
| 16192 | U.S.N.M. | 2 | D2022... | 37 32 00 N.; 74 13 20 W.. | 487 | 40.0 | bu. m..... | Rare. |
| 16193 | U.S.N.M. | 1 | D2036... | 38 52 40 N.; 69 24 40 W.. | 1,735 | 38.0 | glob. oz..... | Rare. |
| 16194 | U.S.N.M. | 3 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | ers. s. m. g.... | Few. |
| 16195 | U.S.N.M. | 1 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Rare. |
| 16196 | U.S.N.M. | 10 | D2078... | 41 11 30 N.; 66 12 20 W.. | 499 | 40.0 | gy. m. s..... | Common. |
| 16197 | U.S.N.M. | 4 | D2084... | 40 16 50 N.; 67 05 15 W.. | 1,290 | 40.0 | bu. m. s..... | Few. |
| 16198 | U.S.N.M. | 2 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Rare. |
| 16199 | U.S.N.M. | 4 | D2172... | 38 01 15 N.; 73 44 00 W.. | 568 | 39.0 | gn. m..... | Few. |
| 16200 | U.S.N.M. | 1 | D2189... | 39 49 30 N.; 70 26 00 W.. | 600 | 39.7 | gn. m. s..... | Rare. |
| 16201 | U.S.N.M. | 7 | D2192... | 39 46 30 N.; 70 14 45 W.. | 10,60 | 38.6 | gy. oz..... | Common. |
| 16202 | U.S.N.M. | 10 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Common. |
| 16203 | U.S.N.M. | 7 | D2203... | 39 34 15 N.; 71 41 15 W.. | 705 | 38.9 | gn. m. s..... | Common. |
| 16204 | U.S.N.M. | 4 | D2204... | 39 30 30 N.; 71 44 30 W.. | 728 | 39.1 | br. m..... | Few. |
| 16205 | U.S.N.M. | 1 | D2205... | 39 35 00 N.; 71 18 45 W.. | 1,073 | 38.1 | gy. oz..... | Rare. |
| 16206 | U.S.N.M. | 1 | D2208... | 39 33 00 N.; 71 16 15 W.. | 1,178 | 38.4 | gn. m..... | Rare. |
| 16207 | U.S.N.M. | 5 | D2212... | 39 59 30 N.; 70 30 45 W.. | 428 | 40.0 | gn. m..... | Few. |
| 16208 | U.S.N.M. | 1 | D2217... | 39 47 20 N.; 69 34 15 W.. | 924 | 38.1 | gy. m..... | Rare. |
| 16209 | U.S.N.M. | 2 | D2231... | 38 29 00 N.; 73 09 00 W.. | 965 | 36.8 | gy. oz..... | Few. |
| 16210 | U.S.N.M. | 10 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 16211 | U.S.N.M. | 2 | D2528... | 41 47 00 N.; 65 37 30 W.. | 677 | 38.7 | br. s..... | Rare. |
| 16212 | U.S.N.M. | 5 | D2530... | 40 53 30 N.; 66 24 00 W.. | 956 | 38.4 | gy. oz..... | Few. |
| 16213 | U.S.N.M. | 7 | D2534... | 40 01 00 N.; 67 29 15 W.. | 1,234 | 37.8 | gy. oz..... | Common. |
| 16214 | U.S.N.M. | 2 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Rare. |
| 16215 | U.S.N.M. | 1 | D2568... | 39 15 00 N.; 68 08 00 W.. | 1,781 | 36.9 | gy. oz..... | Rare. |
| 16216 | U.S.N.M. | 10 | D2581... | 39 43 00 N.; 71 34 00 W.. | 394 | ..... | gn. m..... | Common. |
| 16217 | U.S.N.M. | 10 | D2584... | 39 05 30 N.; 72 23 20 W.. | 541 | 39.5 | gy. m..... | Common. |
| 16218 | U.S.N.M. | 1 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |
| 16219 | U.S.N.M. | 2 | D2680... | 39 50 00 N.; 70 26 00 W.. | 555 | ..... | ..... | Rare. |
| 16220 | U.S.N.M. | 2 | D2689... | 39 42 00 N.; 71 15 30 W.. | 525 | ..... | gn. m..... | Rare. |
| 16221 | U.S.N.M. | 1 | D2705... | 42 47 00 N.; 61 04 00 W.. | 1,255 | ..... | lt. br. oz..... | Rare. |
| 16222 | U.S.N.M. | 2 | D2706... | 41 28 30 N.; 65 35 30 W.. | 1,188 | ..... | gy. oz. for.... | Rare. |
| 16223 | U.S.N.M. | 2 | D2710... | 40 06 00 N.; 68 01 00 W.. | 984 | ..... | gn. m..... | Rare. |
| 16224 | U.S.N.M. | 1 | D2740... | 37 40 00 N.; 73 50 00 W.. | 1,011 | 38.0 | br. oz..... | Rare. |

**BULIMINA ELONGATA d'Orbigny.**

*Bulimina elongata* d'Orbigny, For. Foss. Vienne, 1846, p. 187, pl. 11, figs. 19, 20.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 401, pl. 51, figs. 1, and 2(?).—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 79, figs. 131*a-d* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 165.

*Description.*—Test elongate, subcylindrical, nearly circular in cross section; chambers numerous, inflated, short; sutures much depressed, apical end rounded, occasionally with minute spines, wall calcareous, smooth; aperture broad and rounded, with a broad platelike tooth, partially filling the opening; color white.

Length 0.50–1.00 mm.

*Distribution.*—There are a number of records for this species, mostly those given by Heron-Allen and Earland from about the British Isles. I have seen no material in the western Atlantic which I have been willing to refer to it.

#### BULIMINA MINUTISSIMA J. Wright.

Plate 17, figs. 5, 6.

*Bulimina minutissima* J. Wright, Proc. Liverpool Geol. Soc., vol. 9, 1892, p. 190, pl. 13, figs. 9–12.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 62, pl. 4, figs. 11, 12; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. Zool., ser. 2, vol. 11, 1916, p. 237.

This small species described by Wright from Boulder clays of England has been recorded by Heron-Allen and Earland from the Clare Island region, off South Cornwall, and west of Scotland. I have seen no material on the American side.

### Genus BULIMINELLA Cushman, 1911.

*Bulimina* (part) d'Orbigny, Foram. Amér. Mérid., 1839, p. 51.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 397.—Chapman, The Foraminifera, 1902, p. 172.

*Buliminella* Cushman (type, *Buliminella elegantissima* (d'Orbigny)), Bull. 71 U. S. Nat. Mus., pt. 2, 1911, p. 88.

*Description.*—Test composed of chambers triserially arranged, but in later development becoming involute and spirally coiled, the aperture being in the umbilicus thus formed; wall calcareous, perforate; aperture in the species but little twisted spirally, long and narrow, nearly vertical, in the closely spiral species becoming rounded in the middle of the concave umbilical area.

This genus was erected to include those species in which the spiral form of the test is very marked, all modifications of it with the peculiar aperture situated in the umbilical area, as in *B. subteres* (H. B. Brady), *B. declivis* (Reuss), and *B. contraria* (Reuss).

#### BULIMINELLA ELEGANTISSIMA (d'Orbigny), var. SEMINUDA (Terquem).

Plate 23, fig. 5.

*Bulimina seminuda* Terquem, Mém. Soc. géol. France, ser. 3, vol. 2, Mém. III, 1882, p. 117, pl. 12, fig. 21.

*Bulimina elegantissima* d'Orbigny, var. *seminuda* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 403, pl. 50, figs. 23, 24.—Dakin, Rep. Ceylon Pearl-Oyster Fisheries, vol. 5, 1906, p. 234.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 312.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 18.

*Description.*—"This variety presents similar general features to *Bulimina elegantissima*, and exhibits the same regularly spiral mode of growth; but it differs from the typical form in its stouter build and in the greater obliquity of the segments. The shell-wall is usually thick, and the exterior is often partially striate or costate near the initial end."

*Distribution.*—Terquem described a species from the Eocene of the Paris Basin which Brady has placed as a variety, as noted above. Heron-Allen and Earland note it from the Eocene shore sands of

Essex, England. The best recent specimens seem to be from the South Pacific and Indian Ocean. Brady's Indo-Pacific specimens were off East Moncoeur Island, Bass Strait, 38 fathoms (70 meters); off Calpentyn, Ceylon, 2 fathoms (4 meters), and shore sands from Madagascar. From the Atlantic he had it from south of the Canaries, in 1,525 fathoms (2,789 meters), and less typical specimens from off St. Vincent, Cape de Verde Islands, 11 fathoms (20 meters), and two stations off the east coast of South America in 675 and 350 fathoms (1,234 and 640 meters).

I have a single specimen which may be referred to this form. It is from *Albatross* station D2358, in 222 fathoms (407 meters), in the Caribbean.

Other recent records are by Chapman from off Australia, 40 miles south of Cape Wiles, in 100 fathoms (183 meters), and from Ceylon (Dakin).

The recent specimens, especially the Atlantic ones, do not closely resemble Terquem's Eocene species as noted by Brady, and it is to be strongly suspected that our recent form may be separated from the Eocene one. I have not seen enough material to fully confirm this view.

*Buliminella elegantissima, var. seminuda—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16289 | U.S.N.M. | 1 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co.. | Rare. |

**BULIMINELLA CONVOLUTA (Williamson).**

Plate 18, figs. 4, 5.

*Bulimina pupoides* d'Orbigny, var. *convoluta* Williamson, Rec. Foram. Great Britain, p. 63, pl. 5, figs. 132, 133.

*Bulimina convoluta* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 408, pl. 113, figs. 6*a*, *b;* Journ. Roy. Micr. Soc., 1887, p. 498.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 47.—Millett, Journ. Roy. Micr. Soc., 1900, p. 279, pl. 2, fig. 9.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400.—Bagg, Bull. 513, U. S. Geol. Surv., 1912, p. 37, pl. 9, figs. 3*a*, *b*.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 63; Journ. Roy. Micr. Soc., 1916, p. 43.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 124.

The recent records for this species described by Williamson from the British Isles are from that same region or from the Indo-Pacific. The British records include Shetland and Skye (Williamson), off Stoksund, 126 fathoms (231 meters), off Sartoröe, near Bergen, Norway, 40 fathoms (73 meters) (Norman), and in the Clare Island

region and south of Cornwall (Heron-Allen and Earland). Other recent records are Raine Island, Torres Strait (Brady), Malay Archipelago (Millett), Funafuti (Chapman), and the eastern coast of Australia (Sidebottom). It is to be suspected that there are two species involved here on account of what is known of other species having this very widely separated distribution. It evidently does not occur in the western Atlantic.

#### BULIMINELLA SUBTERES (H. B. Brady).

Plate 22, figs. 3–5.

*Bulimina presli* Reuss, var. *elegantissima* Parker and Jones, Philos. Trans., vol. 155, 1865, p. 374, pl. 15, figs. 12–17.

*Bulimina elegantissima* (var.) H. B. Brady, Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 436, pl. 21, fig. 12.

*Bulimina subteres* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 55.—J. Wright, Proc. Belfast Nat. Field Club, 1880–81, App., p. 180, pl. 8, figs. 2, 2*a*.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 403, pl. 50, figs. 17, 18.—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 334.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 898.—J. Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 176.—Robertson, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 289, pl. 8, figs. 73, 74.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 46, pl. 9, figs. 445–453.—Millett, Journ. Roy. Micr. Soc., 1900, p. 277.—Chapman, Journ. Linn. Soc. Zool., vol. 28, 1902, p. 400.—Sidebottom, Mem. Proc. Manchester Lit. and Philos. Soc., vol. 49, No. 5, 1905, p. 10.—Kiaer, in Duc d'Orleans, Crois. Grönland, 1905 (1907), p. 560.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1908, p. 314.—Chapman, Rep. Foram. Subantarctic Ids., 1909, p. 330, pl. 14, fig. 10.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 12.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 403.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 89, figs. 142*a*, *b* (in text).—Bagg, Bull. 513, U. S. Geol. Survey, 1912, p. 39, pl. 9, figs. 7*a–d*; pl. 11, figs. 1–5.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 62, pl. 4, figs. 13, 14; Journ. Roy. Micr. Soc., 1916, p. 43; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 236.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 122.—Cushman, Bull. 100, U. S. Nat. Mus. vol. 4, 1921, p. 167.

*Description.*—Test elongate, ovate, fusiform, the initial end more pointed than the apertural end; chambers oblique, forming two or three irregularly spiral coils, inflated, increasing in size as added; sutures distinct, somewhat depressed; wall usually translucent, smooth, finely punctate; aperture a long, narrow, slightly curved slit at the edge of the ventral face of the chamber, often in a depressed umbilical area.

Length 0.4–0.6 mm.

*Distribution.*—Brady described this species from seven *Challenger* stations in the Atlantic well scattered over the area, and mentions

in addition that it is known from northern regions as follows: From Davis Strait, off Nova Zembla, as well as from the Faroe Channel, the west coast of Scotland, and the north and west coasts of Ireland. Goës records it from off Spitzbergen, Greenland, and Norway, in 60 to 350 meters (33 to 191 fathoms), and Kiaer from off Greenland, in 300 meters (164 fathoms). From about the British Isles Heron-Allen and Earland record it from eight stations in the Clare Island region of western Ireland, rare off South Cornwall, and at nine stations west of Scotland.

In the *Albatross* dredgings it has occurred at several stations, mostly in the southern part of the area, south of Cape Hatteras, in the Gulf of Mexico and Caribbean Sea. In addition there are two stations south of Cape Cod on the Atlantic coast of the United States.

From this distribution and a comparison of the figures given by various authors and referred to this species it seems safe to say that the series should be carefully studied to see if only one species is present.

Our specimens from the *Albatross* dredgings are like those figured in the *Challenger* Report. There seems to be little if any deviation from this form. Apparently the species as Brady had it is present in the warmer waters of the western Atlantic, but not in the colder portion. Such forms as some of those figured by other authors, like the early figures of Parker and Jones, were not found in the western Atlantic material.

The species figured by Goës as "*Bulimina Normani* Goës" [24] from off Norway seems to be a short form related to *B. subteres*.

*Buliminella subteres—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16171 | U.S.N.M. | 1 | D2637... | 38 53 00 N.; 69 23 30 W.. | 1,731 | 38.0 | glob. oz..... | Rare. |
| 16172 | U.S.N.M. | 1 | D2041... | 39 22 50 N.; 68 25 00 W.. | 1,608 | 38.0 | glob. oz..... | Rare. |
| 16173 | U.S.N.M. | 1 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s.. | Rare. |
| 16174 | U.S.N.M. | 1 | D2110... | 17 36 10 N.; 76 46 05 W.. | 966 | 39.7 | s..... | Rare. |
| 16175 | U.S.N.M. | 2 | D2144... | 9 49 00 N.; 79 31 30 W.. | 896 | ..... | gn. m..... | Rare. |
| 16176 | U.S.N.M. | 3 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Few. |
| 16177 | U.S.N.M. | 1 | D2400... | 28 41 00 N.; 86 07 00 W.. | 169 | ..... | gy. m..... | Rare. |
| 16178 | U.S.N.M. | 1 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 16179 | U.S.N.M. | 1 | D2668... | 30 58 30 N.; 79 38 30 W.. | 291 | 46.3 | gy. s. dd. co. | Rare. |
| 16180 | U.S.N.M. | 2 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |
| 16181 | U.S.N.M. | 1 | D2678... | 32 40 00 N.; 76 40 30 W.. | 731 | 38.7 | lt. gy. oz.... | Rare. |
| 16182 | U.S.N.M. | 2 | D2679... | 32 40 00 N.; 76 40 30 W.. | 782 | 38.6 | lt. gy. oz.... | Rare. |
| 16183 | U.S.N.M. | 2 | D2751... | 16 54 00 N.; 63 12 00 W.. | 687 | 40.0 | bu. glob. oz.. | Rare. |
| 16184 | U.S.N.M. | 3 | D2754... | 11 40 00 N.; 58 33 00 W.. | 880 | 38.0 | glob. oz..... | Few. |
| 16185 | U.S.N.M. | 5 | H57..... | 17 49 06 N.; 65 29 00 W.. | 2,188 | ..... | oz. for..... | Few. |
| 16186 | U.S.N.M. | 1 | H159..... | 17 42 10 N.; 65 39 40 W.. | 789 | ..... | oz. for..... | Rare. |
| 16187 | U.S.N.M. | 1 | H160..... | 17 39 00 N.; 65 44 00 W.. | 578 | ..... | co. s. for..... | Rare. |
| 16188 | U.S.N.M. | 1 | H179..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for.. | Rare. |
| 16189 | U.S.N.M. | 2 | H180..... | 13 56 35 N.; 63 02 00 W.. | 681 | ..... | gy. m. for... | Rare. |
| 16190 | U.S.N.M. | 2 | H189..... | 17 42 30 N.; 74 40 00 W.. | 803 | ..... | br. m. for... | Rare. |

[24] Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 47, pl. 9, figs. 437, 438.

### BULIMINELLA SUBTERES (H. B. Brady), variety.

Plate 22, fig. 6.

At a single station, *Albatross* D2761, off the east coast of South America, in 818 fathoms (1,483 meters), a specimen of this species was obtained which was thin and translucent and had the wall ornamented by numerous more opaque areas, giving a very ornate appearance to the test. Whether this is a constant feature or not the lack of specimens makes it impossible to determine.

*Buliminella subteres, variety—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| 16288 | U.S.N.M. | 1 | D2761... | ° ′ ″ ° ′ ″<br>15 39 00 S.; 38 32 54 W.. | 818 | °F.<br>39.0 | pter. oz..... | Rare. |

### BULIMINELLA SUBCYLINDRICA (H. B. Brady).

Plate 20, fig. 5.

*Bulimina subcylindrica* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 56; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 404, pl. 50, figs. 16*a*, *b*.—Egger, Abh. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 289, pl. 8, fig. 100.—Chapman, Proc. Zool. Soc. London, 1895, p. 22.—Millett, Journ. Roy. Micr. Soc., 1900, p. 277, pl. 2, fig. 6.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 122, pl. 3, fig. 7.

*Description.*—Test elongate, subcylindrical, the ends broadly rounded; chambers few, irregularly spiral, slightly inflated, last-formed one elongate; sutures distinct, but very slightly depressed; wall thin and translucent, finely perforate; aperture an elongate, nearly straight slit, vertical, on the inner face of the terminal chamber extending in from the margin.

Length 0.4–0.6 mm.

*Distribution.*—Brady originally had this species from three Atlantic stations, off Gomera, Canaries, 620 fathoms (1,140 meters), off the Cape de Verde Islands, 1,070 fathoms (1,957 meters), and off Pernambuco, Brazil, in 675 fathoms (1,234 meters).

Elsewhere the species is recorded from West Africa in 677 meters (369 fathoms) by Egger, although his figure is so poor that it can not be made out whether it should really be referred to this species or not. It is also recorded from the Arabian Sea (Chapman), Malay Archipelago (Millett), and off the east coast of Australia (Sidebottom).

It is allied to *B. subteres* Brady, but is very distinct in its general form and apertural characters.

*Buliminella subcylindrica—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | | | |
| 16281 | U.S.N.M. | 1 | H79..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for.. | Rare. |
| 16282 | U.S.N.M. | 1 | H80..... | 13 56 35 N.; 63 02 00 W.. | 684 | ..... | gy. m. for... | Rare. |

**BULIMINELLA SPINIGERA, new species.**

Plate 23, figs. 1–4.

*Description.*—Test fusiform, the initial end terminating in a single stout spine, apertural end rounded, composed of numerous chambers arranged in a twisted, elongate spiral, little if at all compressed, broadest near the apertural end; chambers numerous, elongate, indistinct; sutures indistinct, not depressed; wall very smooth and shining, slightly translucent; aperture large, irregularly oval, slightly pointed near the edge of the chamber; color white.

Length 0.40–0.85 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16276) from *Albatross* station D2677, in 478 fathoms (873 meters), off the coast of North Carolina. Other specimens of the same species are from this same station, but it was not seen elsewhere in all the western Atlantic material examined.

By its peculiar shape, heavy spine at the initial end, glossy smooth surface, and large aperture, it is very different from the other species noted here. It is related to *B. elegantissima* d'Orbigny.

*Buliminella spinigera—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16276 | U.S.N.M. | 3 | D2677... | 32 39 00 N.; 76 50 30 W.. | 478 | 39.3 | gn. m..... | Rare. |

## Genus BULIMINOIDES Cushman, 1911.

**BULIMINOIDES WILLIAMSONIANA (H. B. Brady).**

*Bulimina williamsoniana* H. B. Brady, Quart. Journ. Micr. Soc., vol. 21, 1881, p. 56; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 408, pl. 51, figs. 16, 17.—Millett, Journ. Roy. Micr. Soc., 1900, p. 279, pl. 2, fig. 8.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 136.—Heron-Allen and Earland, Trans. Zool. Soc. London, vol. 20, 1915, p. 641.

*Buliminoides williamsoniana* Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 90, fig. 144 (in text); Publ. 311, Carnegie Inst. Wash., 1922, p. 31, pl. 3, fig. 7.

*Description.*—Test elongate, subcylindrical, composed of numerous chambers which are not distinct from the surface, the main ornamentation of the surface consisting of longitudinal costae, usually somewhat spirally twisted, running from the initial end to the aperture; the aperture itself rounded, in the center of the oblique, apertural face; the costae of the surface running in to the center, making a radiate pattern about the aperture itself; color white.

Length of the Tortugas specimen 0.4 mm.

*Distribution.*—This species is one of the "finds" of the Tortugas collection. It has not previously been recorded from the Atlantic. Its distribution has been from shallow water of the Indo-Pacific region. Brady, in the *Challenger* Report, gave seven localities for this, as follows: "Port Stephens and Port Jackson, New South Wales, 2–10 fathoms; off Levuka, Fiji, 12 fathoms; off the New Hebrides, 125 fathoms; Torres Strait, 155 fathoms; Humboldt Bay, Papua, 37 fathoms; Nares Harbour, Admiralty Islands, 17 fathoms." Millett's specimens came from two stations in the Malay region. Bagg recorded this species from a single *Albatross* station, H4694, in 865 fathoms, off the Hawaiian Islands, and in 1911 I added another station, H2922, in 268 fathoms, off the same Islands. The other record is from the Kerimba Archipelago, off the eastern coast of Africa, where Heron-Allen and Earland recorded it. Its natural habitat is evidently in comparatively shallow water in tropical seas. It is a small species and one that is apt to be overlooked, and it may be fairly common in the Caribbean and the Gulf of Mexico, although it was certainly rare in the Tortugas region.

### Genus VIRGULINA d'Orbigny, 1826.

*Virgulina* d'Orbigny (type, *V. squammosa* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 267.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 413.—Chapman, The Foraminifera, 1902, p. 172.—Cushman, Bull. 71, U. S. Nat. Mus., vol. 71, pt. 2, 1911, p. 91.

*Bulimina* (part) Bailey, Smithsonian Contr., vol. 2, 1851, p. 12.—Parker and Jones, Ann. Mag. Nat. Hist., ser. 2, vol. 19, 1857, p. 296; Philos. Trans., vol. 155, 1865, p. 375.—Williamson, Rec. Foram. Great Britain, 1858, p. 63.

*Description.*—Test elongate, tapering, typically biserial, often becoming irregularly twisted in a spiral manner; chambers distinct; sutures usually depressed; wall calcareous, thin and translucent, in adults sometimes becoming thicker and opaque, perforate; aperture typically a comma-shaped opening with the narrow end coming to the base of the chamber; color white.

D'Orbigny's model of *Virgulina squammosa* shows a biserial test, more regular than some of the species now assigned to this genus, but forming a very good basis for the generic characters. It is closely related to *Bulimina*, especially in the apertural characters.

In the present oceans the genus has a wide distribution in both deep and shallow water. As a fossil it seems to be largely confined to the later Tertiary, from the Oligocene onward.

VIRGULINA SQUAMMOSA d'Orbigny.

*Virgulina squammosa* d'Orbigny, Ann. Sci. Nat., vol. 7, 1826, p. 267, No. 1: Modèles, No. 64.

VIRGULINA SUBSQUAMMOSA Egger.

*Virgulina subsquammosa* Egger, Neues Jahrb. für Min., 1857, p. 295, pl. 12, figs. 19–21.

There are a great number of records for these two species from widely separated regions. The figures in the *Challenger* Report assigned to the latter of these includes several things, and it is difficult with records based on such an assemblage to place them without access to the originals. Both species were originally described from Tertiary deposits of Europe. I have not had specimens from the western Atlantic that I could satisfactorily assign to either of them.

VIRGULINA BRADYI, new species.

Plate 24, fig. 1.

*Virgulina subsquammosa* H. B. Brady (part) (not Egger), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 415, pl. 52, figs. 9*a–c* [7, 8?].

*Description.*—Test elongate, very slightly compressed, fusiform or somewhat tapering, initial end bluntly rounded, apertural end rounded; chambers biserially arranged, but somewhat twisted on the axis, comparatively few in number, inflated; sutures distinct, depressed; wall smooth; aperture elongate oval, the inner end broadest with a slight rim; color white.

Length 0.7–0.8 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16287) from *Albatross* station D2568, in 1,781 fathoms (3,257 meters), southeast of Nantucket. There are four other stations for this species in this same general region, but it was not found to the southward. It is hard to determine where Brady's figured specimens were from, so the species must rest for the present on the records given here. A comparison of this with the original figures of *V. subsquammosa* given by Egger will show how different this species is in its subcylindrical shape, fewer chambers, and, in fact, in all its characters it is a very different species.

*Virgulina bradyi*—material examined.

| Cat. No. | Coll. of– | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16283 | U.S.N.M. | 1 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46.0 | s. crs. g..... | Rare. |
| 16284 | U.S.N.M. | 1 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39.0 | for. s. m..... | Rare. |
| 16285 | U.S.N.M. | 1 | D2097... | 37 56 20 N.; 70 57 30 W.. | 1,917 | ..... | glob. oz..... | Rare. |
| 16286 | U.S.N.M. | 1 | D2534... | 40 01 00 N.; 67 29 15 W.. | 1,234 | 37.8 | gy. oz..... | Rare. |
| 16287 | U.S.N.M. | 2 | D2568... | 39 15 00 N.; 68 08 00 W.. | 1,781 | 36.9 | gy. o:..... | Rare. |

### VIRGULINA COMPRESSA (Bailey).

Plate 24, figs. 2, 3.

*Bulimina compressa* Bailey, Smithsonian Contrib., vol. 2, art. 3, 1851, p. 12, pl. 12, figs. 35–37.

*Bulimina presli* Reuss, var. (*Virgulina*) *schreibersii* (part) Parker and Jones, Philos. Trans., vol. 155, 1865, p. 375, pl. 17, fig. 72.

*Virgulina schreibersiana* Flint (not *V. schreibersiana* Czjzek), Rep. U. S. Nat. Mus., 1897 (1899), p. 291, pl. 37, fig. 6.

*Description.*—Test elongate, gradually tapering, slightly compressed, widest somewhat above the middle in the adult, apical end bluntly rounded; chambers comparatively few, inflated, oblique, distinct, arranged biserially, usually four or five on each side, the early chambers in the microspheric form arranged triserially; sutures distinct, depressed; wall smooth, fairly thick, finely punctate; aperture elongate oval, the narrow end near the border of the chamber; color white.

Length 0.6–1.0 mm.

*Distribution.*—Bailey's stations for this species are as follows: "F. No. 24, 49 fathoms (90 meters); latitude 39° 52′ 40″ N., longitude 72° 14′ 00″ W.; F. No. 25, 105 fathoms (193 meters); latitude 39° 41′ 10″ N., longitude 71° 43′ 00″ W.; G. No. 31, 50 fathoms (91 meters); latitude 39° 20′ 38″ N., longitude 72° 44′ 35″ W." These are southeast of Long Island. Flint's record for *V. schreibersiana*, which is clearly this species, is from *Albatross* D2263, off Chesapeake Bay, in 430 fathoms (787 meters). It has occurred in considerable numbers at several *Albatross* and *Fish Hawk* stations, all in this same general region. The only exception is a single station in the northern part of the Gulf of Mexico, and the specimens seem to be thinner and to have more chambers, so may be different.

Bailey's figure of this species is very clear and definite and represents well a specimen which is not quite adult. His description "shell elongated, somewhat pyramidal, slightly compressed laterally, aperture a long cleft without any very distinct margin," together with the very good figure, will serve to identify this species, especially as there is now available a large series from this general region. The specimens show little variation. The differences in the microspheric and megalospheric forms are marked by the triserial condition in the early chambers of the former, the biserial condition being assumed at once in the latter. The very white, shining, polished surface is very much like that of some Miliolidae. Altogether this is a very well-defined species when seen with abundant specimens.

*Virgulina compressa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16806 | U.S.N.M. | 1 | D2111... | 35 09 50 N.; 74 37 40 W.. | 938 | ..... | gn. m..... | Rare. |
| 16807 | U.S.N.M. | 1 | D2174... | 38 15 00 N.; 72 03 00 W.. | 1,594 | ..... | gy. m..... | Rare. |
| 16808 | U.S.N.M. | 6 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Common. |
| 16809 | U.S.N.M. | 7 | D2247... | 40 03 00 N.; 69 57 00 W.. | 67 | 52.4 | gn. m. bk. s. | Common. |
| 16810 | U.S.N.M. | 8 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s.. | Common. |
| 16811 | U.S.N.M. | 3 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Few. |
| 16812 | U.S.N.M. | 1 | D2265... | 37 07 40 N.; 74 35 40 W.. | 70 | 57.9 | gn. m. g..... | Rare. |
| 16813 | U.S.N.M. | 4 | D2377... | 29 07 30 N.; 88 08 00 W.. | 210 | 67.0 | gy. m..... | Few. |
| 16814 | U.S.N.M. | 7 | D2539... | 39 59 45 N.; 70 53 00 W.. | 133 | 47.7 | gn. s..... | Common. |
| 16815 | U.S.N.M. | 1 | D2541... | 39 57 45 N.; 70 50 30 W.. | 134 | 47.7 | gn. s. brk. sh. | Rare. |
| 16816 | U.S.N.M. | 5 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Common. |
| 16817 | U.S.N.M. | 10 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Common. |
| 16818 | U.S.N.M. | 10 | D2555... | 39 53 00 N.; 71 32 00 W.. | 136 | 47.7 | gn. m. s..... | Common. |
| | | | *Fish Hawk.* | | | | | |
| 16819 | U.S.N.M. | 5 | 1108. | 40 02 00 N.; 70 37 30 W.. | 101 | 48.0 | gy. m. fne. s. | Few. |
| 16820 | U.S.N.M. | 1 | 1110. | 40 02 00 N.; 70 35 00 W.. | 100 | 47.0 | gn. m. fne. s. | Rare. |

VIRGULINA PUNCTATA d'Orbigny.

*Virgulina punctata* d'Orbigny, in De la Sagra, Hist. Fis. Pol. Nat. Cuba, 1839, "Foraminifères," p. 139, pl. 1, figs. 35, 36.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 35; Proc. U. S. Nat. Mus., vol. 59, 1920, p. 52, pl. 11, fig. 15; Publ. 311, Carnegie Inst. Wash., 1922, p. 31, pl. 3, fig. 9.

This species described by d'Orbigny from shore sands of Cuba is recorded from the West Indies and is apparently widespread in shallow warm waters of this region. The specimen I previously recorded is from the north coast of Jamaica at Montego Bay. Fossil specimens are from the Miocene marl from the gorge of the Yumuri River, Matanzas, Cuba.

VIRGULINA SCHREIBERSIANA Czjzek.

Plate 26, fig. 6.

*Virgulina schreibersiana* Czjzek, Haidinger's Nat. Abhandl., vol. 2, 1848, p. 147, pl. 13, figs. 18–21.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 414, pl. 52, figs. 1–3.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 48, pl. 9, figs. 459, 461–472.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 94, figs. 148*a*, *b* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 169.

*Bulimina presli* Reuss, var. (*Virgulina*) *schreibersii* (part) Parker and Jones, Philos. Trans., vol. 155, 1865, p. 375, pl. 7, fig. 73 [pl. 15, fig. 18?].

*Description.*—Test elongate, slender, tapering, the initial end usually with a spine; chambers fairly numerous, inflated, distinct, rapidly increasing in size toward the apertural end; sutures distinct and depressed; wall thin and translucent, smooth, finely perforate; aperture elongate oval, fairly large for the size of the chamber.

Length usually about 0.5 mm.

*Distribution.*—In the *Albatross* dredgings specimens here referred to this species have occurred at several stations in the cold water off Nova Scotia, the New England coast, and south of Block Island. Two of the *Challenger* stations are in this same general region. There is a single specimen from another *Albatross* station in the Caribbean, south of Cuba, in over 700 fathoms (1,280 meters). The *Albatross* specimens are uniform in character and are like those figured in the above references.

An examination of the large number of figures referred to this species will show that either it is a very variable species or that numerous things are included under one name. This is especially true of the figures referred to *V. schreibersiana* from areas other than the North Atlantic. Whether the species here figured should be referred to Czjzek's species or not is another question. At any rate there is in the North Atlantic a very definite species of the form here figured. The figures given by Goës are very characteristic of this same form, as well as the one of Parker and Jones, referred to above. This was drawn from a North Atlantic specimen also. The rarity of the species in the *Albatross* dredgings from the Gulf of Mexico and Caribbean seems to indicate that it is typically a cold-water species, or at least this form of the species which is here figured.

There are numerous records for the waters about the British Isles which are probably this same form as it is figured by Goës from the Scandinavian region.

*Virgulina schriebersiana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16161 | U.S.N.M. | 1 | D2035... | 39 26 16 N.; 70 02 37 W.. | 1,362 | ..... | glob. oz..... | Rare. |
| 16162 | U.S.N.M. | 2 | D2052... | 39 40 05 N.; 69 21 25 W.. | 1,098 | 45.0 | glob. oz..... | Rare. |
| 16163 | U.S.N.M. | 3 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46.0 | s. crs. g..... | Few. |
| 16164 | U.S.N.M. | 2 | D2073... | 41 54 15 N.; 65 39 00 W.. | 587 | 40.0 | gy. s..... | Rare. |
| 16165 | U.S.N.M. | 2 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39.0 | for. s. m..... | Rare. |
| 16166 | U.S.N.M. | 1 | D2335... | 23 10 39 N.; 82 20 21 W.. | 204 | ..... | ..... | Rare. |
| 16167 | U.S.N.M. | 4 | D2684... | 39 35 00 N.; 70 54 00 W.. | 1,106 | ..... | br. e. bk. sp. | Few. |
| 16168 | U.S.N.M. | 2 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16169 | U.S.N.M. | 1 | D2720... | 38 36 30 N.; 72 12 00 W.. | 1,509 | ..... | gy. oz..... | Rare. |
| 16170 | U.S.N.M. | 1 | D2748... | 39 31 00 N.; 71 14 00 W.. | 1,163 | 37.8 | gy. m. for... | Rare. |

VIRGULINA SUBDEPRESSA H. B. Brady.

*Virgulina subdepressa* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 416, pl. 52, figs. 14–17.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 291, pl. 8, fig. 103.—Chapman, Proc. Zool. Soc. London, 1895, p. 23.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1892, p. 47.—Chapman, Journ. Linn. Soc. Zool., vol. 30, 1907, p. 31, pl. 4, fig. 78; 1910, p. 403.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 93, figs. 147*a*, *b* (in text); Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 170.

*Description.*—"Test elongate, subcylindrical, more or less compressed; oral end obtuse, rounded or subangular; aboral extremity broad and rounded; margin crenulate. Segments numerous, triangular in lateral aspect, slightly inflated; arranged in two inequilateral alternating series. Aperture an oblique or nearly erect loop-like slit, on the inner face of the final chamber.

Length, 1/25th inch (1 mm.)."

*Distribution.*—There are three Atlantic *Challenger* stations for this species, 35*c*, in 1,950 fathoms (3,566 meters), latitude 32° 15′ N., 65° 08′ W.; 332, in 2,200 fathoms (4,000 meters), latitude 37° 29′ S., longitude 27° 31′ W.; 346, in 2,350 fathoms (4,298 meters), latitude 2° 42′ S., longitude 14° 41′ W. Egger gives several records from different parts of the world. Chapman's records are from the Arabian Sea and off Funafuti. Goës records it from the eastern tropical Pacific. I recorded it from several Pacific stations, but have not had it from the western Atlantic, nor does it appear to be recorded from the region of the British Isles.

VIRGULINA TEXTURATA H. B. Brady.

*Virgulina texturata* H. B. Brady, Rep. Voy *Challenger*, Zoology, vol 9, 1884, p. 415, pl. 52, figs. 6*a*, *b*.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 292, pl. 8, fig. 99.—Chapman, Journ. Linn. Soc., vol. 30, 1910, p. 403.

*Description.*—"Test elongate, somewhat compressed, broadest near the oral end and tapering to a point at the aboral extremity; oral end obtuse or rounded; margin lobulated. Segments numerous, ventricose, arranged in two, inequilateral, regularly alternating series. Aperture a nearly erect loop-like slit on the inner face of the final segment.

Length, 1/20th inch (1.3 mm.)."

*Distribution.*—In the *Challenger* Report Brady described this species from three localities in the South Pacific, off Juan Fernandez in 1,375 and 1,825 fathoms (2,515 and 3,346 meters) and off the Ki Islands in 129 fathoms (236 meters). Egger records it from a *Gazelle* station off New Zealand in 2,769 meters (1,514 fathoms). Chapman's record is off Funafuti, in 2,298 fathoms (4, 203 meters). There are Atlantic records in the *Challenger* volumes on "Summary of Results" from the following stations: 70, in 1,675 fathoms (3,063

meters), latitude 38° 25′ N., longitude 35° 50′ W., and 346, in 2,350 fathoms (4,298 meters), latitude 2° 42′ S., longitude 14° 41′ W.

It is not recorded from the shallower waters of the eastern North Atlantic, nor have I found it in the *Albatross* or other collections from the western Atlantic.

#### VIRGULINA MEXICANA, new species.

Plate 23, fig. 8.

*Description.*—Test elongate, compressed, broadly fusiform, broadly rounded at the initial end, apertural end bluntly pointed; chambers few, rounded, not well distinguished from one another; sutures indistinct, not depressed; wall smooth and polished, translucent; aperture elongate, oval, broadest at its inner end, thence narrowing toward the edge of the chamber; color white.

Length 0.4–0.5 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16277) from *Albatross* station D2395, in the Gulf of Mexico, in 347 fathoms (635 meters). It has also occurred at the adjacent station D2396 in 335 fathoms (613 meters).

This is a broad, somewhat compressed form, with rounded sides, very smooth surface, the chambers and sutures indistinct, and is unlike any of the others found in the collections from the western Atlantic.

*Virgulina mexicana*—material examined.

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16277 | U.S.N.M. | 1 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Rare. |
| 16278 | U.S.N.M. | 1 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |

#### VIRGULINA (?) ADVENA, new species.

Plate 25, figs. 1–3.

*Description.*—Test elongate, tapering, compressed, initial end bluntly rounded, apertural end very broadly rounded, semicircular, test broadest near the initial end, thence gradually tapering to the initial end, sides nearly straight; chambers few, irregularly biserial, rather indistinct; sutures somewhat indistinct, little if at all depressed; wall thin, translucent, smooth, finely punctate; aperture long and narrow, at the end of the final chamber; color white.

Length about 0.6 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16280) from *Albatross* station D2713 in 1,859 fathoms (3,399 meters). The species also occurred at D2542 in 129 fathoms (236 meters).

This differs from other species of the genus in the peculiar form and especially the peculiar terminal aperture somewhat like that in *Bifarina*.

*Virgulina advena—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16279 | U.S.N.M. | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 16280 | U.S.N.M. | 3 | D2713... | 38 20 00 N.; 70 08 30 W.. | 1,859 | ..... | br. oz..... | Few. |

VIRGULINA PAUCILOCULATA H. B. Brady.

*Virgulina pauciloculata* H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 414, pl. 52, figs. 4, 5.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1015.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 168.

*Description.*—"Test elongate, oval or subcylindrical, somewhat compressed, tapering slightly; ends rounded, aboral extremity mucronate. Segments few in number, long, erect, but little inflated, irregularly arranged. Aperture a curved loop, situated on the inner face of the final chamber.

Length, 1/60th inch (0.42 mm.)."

*Distribution.*—All the *Challenger* records for this species were from off New Guinea or near-by, as follows: Humboldt Bay, north coast of New Guinea, 37 and 28 fathoms (68 and 51 meters); Torres Strait, 3 to 11 fathoms (5 to 20 meters), and off the Ki Islands, 129 fathoms (236 meters). With this as the known distribution it is surprising to find the record given by Pearcey from the South Atlantic, *Scotia* station 459, in 1,998 fathoms (3,654 meters), latitude 41° 30′ S., longitude 9° 55′ W. This is, however, the distribution that some of the other Pacific species show, coming into the South Atlantic only.

Egger [25] records this species from several *Gazelle* stations, between Madeira and the Cape Verde Islands, the west coast of Africa, and off West Australia. The figures given by Egger are, however, not at all convincing as to the identity of his specimens with Brady's species, as they show two or three distinct things, and these rather obscurely.

VIRGULINA OBSCURA Goës.

*Virgulina obscura* Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 48, pl. 9, figs. 457, 458.

This species of Goës from the coast of Norway and the North Sea can not be clearly identified. Goës's figures are very small. He includes in his synonymy *Virgulina texturata* H. B. Brady, which, as Brady's description is 10 years earlier, can hardly be pushed aside for this later name. The two do not seem at all alike. For present purposes it seems that *V. obscura* Goës should be pushed aside unless

[25] Abh. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 292, pl. 8, figs. 86–88, 94.

some species that can be identified with it in the region from which it was described can later be definitely placed,

## Subfamily 5. CASSIDULININAE.

This subfamily includes forms which are peculiarly constructed in that there is a combination of two distinct modes of growth. One of these, so usual in this family, is the biserial, which is here combined with a spiral or volute method. The combination of the two makes a complex test.

Two genera are common in the Atlantic, *Cassidulina* and *Ehrenbergina*, both of which are represented by several species.

### Genus CASSIDULINA d'Orbigny, 1826.

*Cassidulina* D'ORBIGNY (type, *C. laevigata* d'Orbigny), Ann. Sci. Nat., vol. 7, 1826, p. 282.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 427.—CHAPMAN, The Foraminifera, 1902, p. 175.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 95.

*Burseolina* SEGUENZA, Atti Accad. Lincei, ser. 3, vol. 6, 1880, p. 138.

*Description.*—Text complex, at least the early portion coiled, the chambers arranged biserially, alternating on the sides of the axis of coiling, chambers usually extending to the unbilicus on the sides, in some species the later portion of the test uncoiling; wall calcareous, perforate, usually smooth and without ornamentation; chambers numerous, the sutures usually distinct; aperture looplike, modified in breadth and length in the different species.

D'Orbigny's original description of the genus, while not complete, is, with the figure and model of *C. laevigata*, the type species, very clear.

Its relation to *Spiroplecta* is really close, the biserial chambers being placed alternately on the sides of the axis of coiling instead of forming a linear biserial series.

In the present-day oceans the genus is widely distributed and is one of those which extends into the very cold waters of the polar regions.

From the records it is mostly known as a fossil from the Tertiary but according to Chapman extends back to the Lower Cretaceous.

#### CASSIDULINA LAEVIGATA d'Orbigny.

Plate 24, fig. 4.

*Cassidulina laevigata* D'ORBIGNY, Ann. Sci. Nat., vol. 7, 1826, p. 282, pl. 15, figs. 4, 5; Modèles, 1826, No. 41.—WILLIAMSON, Rec. Foram. Great Britain, 1858, p. 68, pl. 6, figs. 141, 142.—PARKER and JONES, Philos. Trans., vol. 155, 1865, p. 377, pl. 15, figs. 1–4; pl. 17, fig. 64*a*, *b*, *c*.—DAWSON, Ann. Mag. Nat. Hist., vol. 5, 1870, p. 178; vol. 1, ser. 3, 1871, p. 198; vol. 7, ser. 4, 1871, list, p. 88.—BALKWILL and WRIGHT, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 428, pl. 54, figs. 1–3.—BALKWILL and WRIGHT, Trans. Roy. Irish Acad., vol. 28, 1885, p. 335.—H. B. BRADY, Journ. Roy. Micr. Soc., 1887, p. 900.—H. B. BRADY, PARKER,

and JONES, Trans. Zool. Soc. London, vol. 12, 1888, p. 221, pl. 43, fig. 11.—WRIGHT, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 475.—PEARCEY, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1891, p. 177.—ROBERTSON, Trans. Nat. Hist. Soc. Glasgow, vol. 3, pt. 3, 1892, p. 240.—EGGER, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 302, pl. 7, figs. 47, 48, 54–56.—GOËS, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 43, pl. 8, figs. 320–418.—SCHLUMBERGER, Mem. Soc. Zool., 1894, p. 239.—CHAPMAN, Proc. Zool. Soc., 1895, p. 26.—SILVESTRI, Mem. Pont. Accad. Nuovi Lincei, vol. 12, 1896, p. 103, pl. 2, fig. 10.—MILLETT, Journ. Roy. Micr. Soc., 1901, p. 1.—WHITEAVES, Geol. Survey Canada, 1901, p. 10.—CHAPMAN, Trans. New Zealand Inst., vol. 38, 1905, p. 90.—KIAER, In Duc d'Orleans, Croisière Océan, Mér. du Grönland, 1905 (1907), p. 560.—SIDEBOTTOM, Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 16.—RHUMBLER, Zool. Jahrb., Abth. Syst., vol. 24, 1906, p. 62.—CHAPMAN, Rep. Foram. Subantarctic Ids., New Zealand, 1909, p. 332, pl. 15, fig. 1.—SIDEBOTTOM, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, pt. 3, 1910, p. 14.—CHAPMAN, Journ. Linn. Soc., vol. 30, 1910, p. 405.—AWERINZEW, Mem. Acad. Imp. Sci., St. Petersburg, ser. 8, vol. 29, No. 3, 1911, p. 18.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 96, fig. 150*a*, *b* (in text).—BAGG, U. S. Geol. Survey, Bull. 513, 1912, p. 43, pl. 12, figs. 3*a*, *b*, 5*a–c*.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad. vol. 31, pt. 64, 1913, p. 69.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1015.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1916, p. 44; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 240.—MESTAYER, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 128.—CUSHMAN, U. S. Geol. Survey, Bull. 676, 1918, p. 9, pl. 1, fig. 5; Bull. U. S. Nat. Mus., vol. 4, 1921, p. 171, pl. 31, fig. 7.

*Description.*—Test nearly circular in outline, lenticular, or biconvex, usually much compressed, with a thin, acute peripheral border; chambers numerous, long, narrow, curved, surface smooth or nearly so; sutures distinct but not depressed; periphery often somewhat lobulated; wall calcareous, perforate, smooth; aperture a long, narrow slit, just below, and nearly parallel to the periphery of the test; color white.

Length 0.9 mm.

*Distribution.*—This and the following species are both very widely distributed, being known from both the Arctic and Antarctic and all the great ocean basins. In the Atlantic it is recorded from numerous stations off the British Isles, off Norway and Sweden, Spitzbergen, and Greenland. In the western Atlantic it occurs at several stations along the Atlantic coast of the United States, and is recorded from Gaspe Bay, Gulf of St. Lawrence, and off Labrador. Brady, Parker, and Jones record it from the Abrohlos Bank off Brazil, and Pearcey records it from Stanley Harbor, Falkland Islands, in 2¼ fathoms (4 meters), as well as in deep water in the same general region. It seems to be represented in rather shallow water in the Gulf of Mexico by a distinct variety, which is here described.

D'Orbigny's original figure and Modèle show a test without a definite carina, which is a form commonly found, especially in cold and deep waters.

*Cassidulina laevigata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16362 | U.S.N.M. | 2 | D2029... | 39 42 00 N.; 70 47 00 W.. | 1,168 | 38.5 | gy. m..... | Rare. |
| 16363 | U.S.N.M. | 2 | D2048... | 40 02 00 N.; 68 50 30 W.. | 547 | 29.0 | crs. s. m. g.. | Rare. |
| 16364 | U.S.N.M. | 2 | D2105... | 37 50 00 N.; 73 03 50 W.. | 1,395 | 41.0 | glob. oz..... | Rare. |
| 16365 | U.S.N.M. | 1 | D2202... | 39 38 00 N.; 71 39 45 W.. | 515 | 39.1 | gn. m..... | Rare. |
| 16366 | U.S.N.M. | 1 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s. bk. sp. | Rare. |
| 16367 | U.S.N.M. | 1 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Rare. |
| 16368 | U.S.N.M. | 1 | D2416... | 31 26 00 N.; 79 07 00 W.. | 276 | 53.8 | co. brk. sh.. | Rare. |
| 16369 | U.S.N.M. | 1 | D2721... | 38 56 00 N.; 72 11 30 W.. | 813 | ..... | gy. oz..... | Rare. |
| ..... | J.A.C.... | 1 | ..... | Coast of Ireland..... | ..... | ..... | ..... | Rare. |

**CASSIDULINA LAEVIGATA d'Orbigny, var. CARINATA, new variety.**

Plate 25, figs. 6, 7.

*Description.*—Test differing from the typical in the thinner, more compressed test, with a very distinct thin carina, forming the periphery of the test.

*Distribution.*—Type-specimen (U.S.N.M. No. 16375*a*) from Ragged Key, Florida, in 75 fathoms (137 meters). This variety has occurred at several *Albatross* stations in the Gulf of Mexico, in the Caribbean Sea, and also off the coast of Florida in less than 100 fathoms (183 meters). In this region it seems to replace the typical form of the species.

*Cassidulina laevigata, var. carinata—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16370 | U.S.N.M. | 2 | D2396... | 28 34 00 N.; 86 48 00 W.. | 335 | ..... | gy. m..... | Rare. |
| 16371 | U.S.N.M. | 1 | D2399... | 28 44 00 N.; 86 18 00 W.. | 196 | 51.6 | gy. m..... | Rare. |
| 16372 | U.S.N.M. | 5 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16373 | U.S.N.M. | 2 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 16374 | U.S.N.M. | 5 | ..... | Off Key West, Fla..... | ..... | ..... | ..... | Few. |
| 16375 | U.S.N.M. | 6 | ..... | Ragged Key, Fla..... | ..... | ..... | ..... | Few. |
| 16376 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla... | ..... | ..... | ..... | Rare. |

**CASSIDULINA CRASSA d'Orbigny.**

Plate 26, fig. 7.

*Cassidulina crassa* d'Orbigny, Foram. Amér. Mérid., 1839, p. 56, pl. 7, figs. 18–20; For. Foss. Vienne, 1846, p. 213, pl. 21, figs. 42, 43.—Dawson, Ann. Mag. Nat. Hist., vol. 5, 1870, p. 178; ser. 3, vol. 1, 1871, p. 198; ser. 4, vol. 7, 1871, list p. 88.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 429, pl. 54, fig. 5 (not fig. 4).—Balkwill and Wright, Trans. Roy. Irish Acad., vol. 28, 1885, p. 335.—H. B. Brady, Journ. Roy. Micr. Soc., 1887, p. 901.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—Wright, Proc. Roy. Irish Acad., vol. 1, ser. 3, 1891, p. 476.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 303, pl. 7, figs. 35, 36.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 43, pl. 8, figs. 421, 422.—Egger, Nat. Ver. Passau, Jahr. 16, 1895, p. 19, pl. 9, fig. 19.—Silvestri,

Mem. Pont. Accad. Nuovi Lincei, vol. 12, 1896, p. 104, pl. 2, figs. 11, 12.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 292, pl. 38, fig. 3.—Morton, Proc. Portland Soc. Nat. Hist., vol. 2, 1897, p. 116, pl. 1, fig. 12.—Millett, Journ. Roy. Micr. Soc., 1901, p. 2.—Whiteaves, Geol. Survey Canada, 1901, p. 10.—Kiaer, In Duc d'Orleans, Croisière Océan, Mèr du Grönland, 1905 (1907), p. 560.—Earland, Journ. Quekett Micr. Club, ser. 2, vol. 9, 1905, p. 209.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 139.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc., vol. 54, 1910, p. 14.—Chapman, Journ. Linn. Soc. London, vol. 30, 1910, p. 405.—Awerinzew, Mem. Acad. Imp. Sci., St. Petersburg, ser. 8, vol. 29, No. 3, 1911, p. 18.—Cushman Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 97, fig. 151*a*, *b*, *c* (in text).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 70.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1015.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 44; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 128.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, pl. 172.

*Cassidulina laevigata* d'Orbigny, var. *crassa* Parker and Jones, Philos. Trans. vol. 155, 1865, p. 377, pl. 15, figs. 5–7; pl. 17, fig. 64*d*.

*Cassidulina obtusa* Williamson, Rec. Foram. Great Britain, 1858, p. 69, pl. 6, figs. 143, 144.

*Description.*—Test subcircular, but oval in outline, biconvex, the peripheral border broadly rounded; chambers comparatively few, short, and inflated; wall calcareous, perforate, smooth; sutures distinct, somewhat depressed; aperture a long narrow slit just below and nearly parallel to the periphery of the test, often with a long tooth, partially filling the aperture; color white or light brown.

Length 0.60–1.0 mm.

*Distribution.*—Like the preceding species this is very widely distributed, but appears to be found more often in shallow water than *C. laevigata*. It is recorded from numerous stations off the British Isles, in the North Sea, off Greenland, and in the Gulf of the St. Lawrence. There are numerous stations in the *Albatross* material from the Atlantic coast of the United States and in the Gulf of Mexico. In shallow water, and especially in Casco Bay, Maine, a small thick form of the species occurs. This has a rougher surface than the typical form of deep water. In the examination of the Atlantic specimens I have had it is impossible to distinguish *C. crassa* from *C. oblonga*.

*Cassidulina crassa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16377 | U.S.N.M. | 1 | D2093... | 39 42 50 N.; 71 01 20 W.. | 1,000 | 39 | for. s. m..... | Rare. |
| 16378 | U.S.N.M. | 3 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s. | Few. |
| 16379 | U.S.N.M. | 2 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s.... | Few. |
| 16380 | U.S.N.M. | 1 | D2242... | 40 15 30 N.; 70 27 00 W.. | 58 | 51.4 | gn. m..... | Rare. |
| 16381 | U.S.N.M. | 1 | D2265... | 37 07 40 N.; 74 35 40 W.. | 70 | 57.9 | gn. m. g..... | Rare. |
| 16382 | U.S.N.M. | 1 | D2398... | 28 45 00 N.; 86 26 00 W.. | 227 | 48.6 | gy. m..... | Rare. |
| 16383 | U.S.N.M. | 6 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Common. |
| 16384 | U.S.N.M. | 2 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 16385 | U.S.N.M. | 1 | D2641... | 25 11 30 N.; 80 10 00 W.. | 60 | 69.2 | co. s..... | Rare. |
| 16386 | U.S.N.M. | 1 | D2668... | 30 58 30 N.; 79 38 30 W.. | 294 | 46.3 | gy. s. dd. co. | Rare. |

CASSIDULINA OBLONGA Reuss.

*Cassidulina oblonga* Reuss, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 376, pl. 48, figs. 5, 6.—Egger, Neues Jahrb., 1857, p. 295, pl. 11, figs. 1–3.—Balkwill and Wright, Proc. Roy. Irish Acad., ser. 2, vol. 3, 1882, p. 447.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 303, pl. 7, figs. 33, 34.—Chapman, Geol. Brit. Antarctic Exped., vol. 2, 1907–9, pp. 30, 43, 65, pl. 2, figs. 12*a*, *b*; Rep. Foram. Subantarctic Ids., 1909, p. 332; Journ. Linn. Soc. London, vol. 30, 1910, p. 405.

*Description.*—This species is evidently to be distinguished from *C. crassa* by the oblong outline, both in front and side views, and by the differences in the surface, which is much smoother and more finely punctate than *C. oblonga*. Brady combined these two species in *C. crassa*, and most of the subsequent records follow his determinations.

*Distribution.*—In the Atlantic *Cassidulina oblonga* is recorded by Balkwill and Wright as very rare off Dublin and Wicklow, Ireland. I have been unable to distinguish it in the Atlantic material that I have examined.

CASSIDULINA NITIDULA (Chaster).

*Pulvinulina nitidula* Chaster, First Rep. Southport Soc. Nat. Sci., 1891 (1892), p. 66, pl. 1, fig. 17.—Sidebottom, Mem. Proc. Manchester Lit. Philos. Soc. vol. 53, 1909, p. 9, pl. 4, fig. 2.

*Cassidulina nitidula* Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 70, pl. 5, figs. 6–9; Journ. Roy. Micr. Soc., 1916, p. 44; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 241.

*Description.*—"Test small, much depressed, highly polished; convolutions about two in number, there being seven or eight segments in the last; superior surface slightly convex; sutures not depressed; inferior surface concave; aperture large and oblique; periphery acute. Diameter 1.25 mm. The test is so thin that the sutures on the inferior surface are seen through the shell and give it a pseudo-cassiduline appearance."

"The curious 'engine-turned' appearance of the test, which is well exhibited in this figure (pl. 5, fig. 6), and also in Mr. Sidebottom's figure (pl. 4, fig. 2), is not due to the 'sutures of the inferior surface' being seen through the shell, as suggested by Doctor Chaster, or to the 'sutures on the superior and inferior surfaces being curved in opposite directions,[26] but to the existence of the inferior series of chambers. For greater clearness the chambers of the superior surface have been tinted in figures 6 and 7, the inferior chambers being plain."

*Distribution.*—I have not found this species in the *Albatross* material from the western Atlantic. According to the records it is known from Southport, England, from the Clare Island region of western Ireland, off south Cornwall, and west of Scotland. Sidebottom records it from the Mediterranean and from off Iceland, and

[26] Millett, Trans. R. Geol. Soc. Cornwall, 1894.

Millett from the Pliocene of St. Erth in Cornwall. It has also been obtained at numerous stations in the North Sea by Earland, and is reported as common off Torbay in 30–50 fathoms (55–91 meters) by Heron-Allen and Earland.

The above description is the original of Doctor Chaster, and the notes that follow are from Heron-Allen and Earland as given in the synonomy.

CASSIDULINA SUBGLOBOSA H. B. Brady.

Plate 24, fig. 6.

*Cassidulina subglobosa* H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 60; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 430, pl. 54, figs. 17*a–c*.—H. B. Brady, Parker, and Jones, Trans. Zool. Soc. London, vol. 12, 1888, p. 221, pl. 43, figs. 12–14.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—Egger, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 304, pl. 7, figs. 41, 32, 52, 53.—Chapman, Proc. Zool. Soc., 1895, p. 25.—Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.—Flint, Rep. U. S. Nat. Mus., 1897 (1899), p. 293, pl. 38, fig. 4.—Chapman, Trans. New Zealand Inst., vol. 38, 1905, p. 90; Journ. Linn. Soc., vol. 30, 1907, p. 33, pl. 4, fig. 84; Geol. Brit. Antarctic Exped., vol. 2, 1907–9, pp. 31, 44, 65; pl. 2, fig. 14.—Bagg, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 140.—Chapman, Rep. Foram. Subantarctic Ids., New Zealand, 1909, p. 332; Journ. Linn. Soc., vol. 30, 1910, p. 405, pl. 54, fig. 3.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 98, figs. 152*a-c* (in text).—Bagg, U. S. Geol. Survey Bull. 513, 1912, p. 44, pl. 12, figs. 2*a*, *b*, 4.—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 70.—Pearcey, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1015.—Chapman, Biol. Res. *Endeavour*, vol. 3, pt. 1, 1915, p. 21.—Heron-Allen and Earland, Journ. Roy. Micr. Soc., 1916, p. 44; Trans. Linn. Soc. London, vol. 11, ser. 2, 1916, p. 241.—Mestayer, Trans. New Zealand Inst., vol. 48, 1916, p. 129.—Sidebottom, Journ. Roy. Micr. Soc., 1918, p. 128.—Cushman, Publ. 291, Carnegie Inst. Wash., 1919, p. 35; Proc. U. S. Nat. Mus., vol. 56, 1919, p. 606; Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 171, pl. 32, fig. 2.

*Description.*—Test subglobular, inequilateral, with an oval outline, somewhat compressed on the two faces, peripheral border broadly rounded, slightly, if at all, lobulated; chambers comparatively few, inflated, wall calcareous, perforate, smooth; sutures slightly depressed, often indistinct; aperture fairly broad, short, loop-like or oval; color white or gray.

Diameter 0.50–1.00 mm.

*Distribution.*—This is a common species in comparatively deep water, and of very wide distribution. In the Atlantic it is recorded off the British Isles at numerous stations. Brady, Parker, and Jones record it from the Abrohlos Bank, and Pearcey records it from Stanley Harbor, Falkland Islands, in 2¼ fathoms (4 meters), and at other southern stations in deep water. In the *Albatross* material it has occurred off the eastern coast of the United States, in the Gulf of Mexico, and in the Caribbean Sea. Off the coast of Florida specimens very similar in form, and probably belonging to this species, are found,

but are of small size and the sutures more distinct than the typical adult specimens. These may be a small variety characteristic of shallow, warm water. It is more abundant at such stations than is the typical form in deep water.

*Cassidulina subglobosa—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16339 | U.S.N.M. | 1 | D2063... | 42 23 00 N.; 66 23 00 W.. | 141 | 46 | s. crs. g..... | Rare. |
| 16340 | U.S.N.M. | 1 | D2117... | 15 24 20 N.; 63 31 30 W.. | 683 | 39.8 | yl. m. fne. s.. | Rare. |
| 16341 | U.S.N.M. | 1 | D2150... | 13 34 45 N.; 81 21 10 W.. | 382 | 45.8 | wh. crs. s..... | Rare. |
| 16342 | U.S.N.M. | 1 | D2265... | 37 07 40 N.; 74 35 40 W.. | 70 | 57.9 | gn. m. g..... | Rare. |
| 16343 | U.S.N.M. | 9 | D2311... | 32 55 00 N.; 77 54 00 W.. | 79 | 59.1 | crs. s. bk. sp. | Common. |
| 16344 | U.S.N.M. | 1 | D2312... | 32 54 00 N.; 77 53 30 W.. | 88 | 57.8 | crs. s. bk. sp. | Rare. |
| 16345 | U.S.N.M. | 6 | D2352... | 22 35 00 N.; 81 23 00 W.. | 463 | 45 | wh. co..... | Common. |
| 16346 | U.S.N.M. | 8 | D2355... | 20 56 48 N.; 86 27 00 W.. | 399 | ..... | yl. oz..... | Common. |
| 16347 | U.S.N.M. | 2 | D2358... | 20 19 00 N.; 87 03 30 W.. | 222 | ..... | fne. wh. co... | Few. |
| 16348 | U.S.N.M. | 4 | D2395... | 28 36 15 N.; 86 50 00 W.. | 347 | 44.1 | gy. m..... | Few. |
| 16349 | U.S.N.M. | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Rare. |
| 16350 | U.S.N.M. | 3 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Few. |
| 16351 | U.S.N.M. | 1 | D2643 .. | 25 25 00 N.; 79 55 15 W.. | 217 | 42.6 | gy. s..... | Rare. |
| 16352 | U.S.N.M. | 2 | D2668... | 30 58 30 N.; 79 38 30 W.. | 294 | 46.3 | gy. s. dd. co.. | Rare. |
| 16353 | U.S.N.M. | 3 | D2751... | 16 54 00 N.; 63 12 00 W.. | 687 | 40 | bu. glov. oz.. | Few. |
| 16354 | U.S.N.M. | 1 | D2752... | 13 34 00 N.; 61 04 00 W.. | 281 | 48 | bk. s..... | Rare. |
| 16355 | U.S.N.M. | 2 | D2754... | 11 40 00 N.; 58 33 00 W.. | 880 | 38 | glob. oz..... | Rare. |
| 16356 | U.S.N.M. | 2 | D2756... | 3 22 00 S.; 37 49 00 W.. | 417 | 40.5 | gy. sp. spk... | Rare. |
| 16357 | U.S.N.M. | 2 | D2758... | 6 59 00 S.; 34 47 00 W.. | 20 | 79 | brk. sh..... | Rare. |
| 16358 | U.S.N.M. | 4 | H79..... | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for. | Few. |
| 16359 | U.S.N.M. | 3 | H189.... | 17 42 30 N.; 74 40 00 W.. | 803 | ..... | br. m. for.... | Few. |
| 16360 | U.S.N.M. | 1 | ..... | Off Fowey Rocks, Fla... | ..... | ..... | ..... | Rare. |
| 16361 | U.S.N.M. | 1 | ..... | Off Key West, Fla..... | ..... | ..... | ..... | Rare. |

**CASSIDULINA BRADYI Norman.**

Plate 23, figs. 6, 7.

*Cassidulina bradyi* (Norman, MS.) J. Wright, Proc. Belfast Nat. Field Club, App., 1880, p. 152.—H. B. Brady, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 59; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 431, pl. 54, figs. 6–9 (not fig. 10); Journ. Roy. Micr. Soc., 1887, p. 901.—J. Wright, Ann. Mag. Nat. Hist., ser. 6, vol. 4, 1889, p. 448; Proc. Roy. Irish Acad., ser. 3, vol. 1, 1891, p. 476.—Pearcey, Trans. Nat. Hist. Soc. Glasgow, vol. 2, 1890, p. 177.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, No. 9, 1894, p. 44, pl. 8, figs. 423–426.—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 99, fig. 153 (in text).—Heron-Allen and Earland, Proc. Roy. Irish Acad., vol. 31. pt. 64, 1913, p. 70; Journ. Roy. Micr. Soc., 1916, p. 44; Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 241.

*Bulimina squammosa* d'Orbigny, var. *subsquammosa* Goës (part), Köngl. Svensk. Vet. Akad. Handl., vol. 19, pt. 4, 1882, p. 69, pl. 4, figs. 111–113[?].

*Description.*—Test elongate, somewhat compressed, the early portion spirally coiled, later chambers forming an uncoiled biserial series; lateral faces convex; peripheral border thin, usually somewhat rounded; chambers fairly distinct, but the sutures not depressed; wall very finely perforate, smooth and polished, very white· aperture broad and short, loop-like or oval on the inner face of the chamber.

Length usually less than 0.5 mm.

*Distribution.*—From an examination of the collections from the Atlantic *Albatross* dredgings this species in its typical form occurs in the colder waters along our New England and Middle Atlantic coasts north of Cape Hatteras and somewhat southward. In this part of the Atlantic it has occurred at several stations ranging in depths from 53–2,512 fathoms (97–4,594 meters).

On the opposite side of the Atlantic the species is recorded from numerous stations, by Brady in the *Challenger* Report from *Porcupine* dredgings to the west and south of Ireland at depths of 90 to 1,630 fathoms (165 to 2,981 meters). It is also recorded off Ireland from 54 to 1,000 fathoms (99 to 1,829 meters) (J. Wright); from the "warm area" of the Faroe Channel (Pearcey); North Sea and coast of Norway 180 to 360 meters (98 to 197 fathoms) (Goës); a few specimens at two stations in the Clare Island region of western Ireland in 12 to 15 fathoms (21 and 27 meters), off South Cornwall, and west of Scotland (Heron-Allen and Earland).

From my own observations it seems that the uncoiled Cassidulinae of the tropical American waters represent an entirely different species.

A reexamination of the New Zealand specimens I recently recorded under this species [27] shows that they belong to another species, as was suggested at that time. This South Pacific or perhaps Indo-Pacific species may be known as *Cassidulina orientalis* Cushman, new species. It differs from *C. bradyi* Norman in the more compressed, broader form, less elongate test, and in the wall which in the Pacific species is rather distinctly punctate, the test not polished and shining white as in the North Atlantic species. Brady records this species from five stations in the South Pacific and also off Japan and the Philippines, areas which have a generally similar fauna. It is to be suspected that of the *Challenger* figures, plate 54, figure 10, may be from a specimen of Pacific origin, as it compares favorably with those I have had from off New Zealand. It is also to be suspected that the material of the following references may be *C. orientalis* Chapman [28] and Sidebottom.[29]

Sidebottom figures a specimen referred to *C. bradyi* from the coast of the Island of Delos,[30] which in its general appearance seems more nearly allied to *C. orientalis* than to *C. bradyi*. He also records it from the Bay of Palermo.[31]

The material which I have had from deep water in the North Pacific seems to be very close to typical *C. bradyi*, and it would be

[27] Proc. U. S. Nat. Mus., vol. 56, 1919, p. 606.

[28] Proc. Zool. Soc. London, 1895, p. 25 (Arabian Sea), and Trans. New Zealand Inst., vol. 48, 1916, p. 429 (north coast of New Zealand, 98 fathoms (179 meters)).

[29] Journ. Roy. Micr. Soc., 1918, p. 128 (east coast of Australia).

[30] Mem. Proc. Manchester Lit. Philos. Soc., vol. 49, No. 5, 1905, p. 17, pl. 3, fig. 10.

[31] Idem., vol. 54, pt. 3, 1910, p. 14.

interesting to know the exact character of Chapman's specimens from very deep water off Funafuti in 2,107 and 2,715 fathoms (3,854 and 4,966 meters.[32]

Goës records the species from the Caribbean,[33] but his specimens are not available and it is doubtful just what he had from his figures. Egger's figures [34] certainly do not represent this species.

Whatever may be the case elsewhere, certainly in the North Atlantic, off both the eastern and western coasts, typical *Cassidulina bradyi* is well-developed and very constant and well defined in its characters.

*Cassidulina bradyi—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16326 | U.S.N.M | 2 | D2003... | 37 20 42 N.; 74 17 36 W.. | 641 | ..... | ..... | Few. |
| 16327 | U.S.N.M | 1 | D2111... | 35 09 50 N.; 74 57 40 W.. | 938 | ..... | gn. m..... | Rare. |
| 16328 | U.S.N.M | 1 | D2225... | 36 05 30 N.; 69 51 45 W.. | 2,512 | 36.7 | yl. oz..... | Rare. |
| 16329 | U.S.N.M | 9 | D2262... | 39 54 45 N.; 69 29 45 W.. | 250 | 41.6 | gn. m. s..... | Common. |
| 16330 | U.S.N.M | 1 | D2249... | 40 11 00 N.; 69 52 00 W.. | 53 | 51.4 | gn. m. fne. s . | Rare. |
| 16331 | U.S.N.M | 1 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | S. brk. sh.... | Rare. |
| 16332 | U.S.N.M | 3 | D2550... | 39 44 30 N.; 70 30 45 W.. | 1,081 | 38.5 | br. m..... | Few. |
| 16333 | U.S.N.M | 1 | D2639... | 25 04 50 N.; 80 15 10 W.. | 56 | ..... | co. s..... | Rare. |
| 16334 | U.S.N.M | 1 | D2684... | 39 35 00 N.; 70 54 00 W.. | 1,106 | ..... | br. c. bk. sp.. | Rare. |
| 16335 | U.S.N.M | 10 | D2555... | 39 53 00 N.; 71 32 00 W.. | 136 | 47.7 | gn. m. s..... | Common. |
| 16336 | U.S.N.M | 1 | D2539... | 39 59 45 N.; 70 53 00 W.. | 133 | 47.7 | gn. s..... | Rare. |
| 16337 | U.S.N.M | 3 | D2542... | 40 00 15 N.; 70 42 20 W.. | 129 | 47.2 | s. brk. sh.... | Few. |
| 16338 | U.S.N.M | 2 | D2544... | 40 01 45 N.; 70 24 00 W.. | 131 | 47.7 | gn. s. bk. sp.. | Few. |

**CASSIDULINA BRAZILIENSIS, new species.**

Plate 25, figs. 4, 5.

*Description.*—Test elongate, compressed, curved, early portion close-coiled, later portion loosely coiled, periphery much curved throughout; chambers comparatively few, slightly inflated, very distinct; wall thin and translucent, very finely perforate, smooth; sutures very clear and distinct, slightly depressed; aperture slightly elongate, comma-shaped, color whitish.

Length, 0.35–0.40 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16387) from *Albatross* station D2756, off the coast of Brazil, 417 fathoms (763 meters). At this station several specimens were found, all of one general character. It has a peculiar curved test, differing from *C. bradyi* in form, as the later chambers are not entirely uncoiled, are more distinct, and the walls are thin and translucent. This has not been found elsewhere in the Atlantic material I have examined and may be peculiar to this region.

[32] Journ. Linn. Soc., vol. 30, 1910, p. 406.

[33] Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.

[34] Abh. kön. bay. Akad. Wiss. München, Cl. II, 1893, pl. 7, figs. 38–40.

*Cassidulina braziliensis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16387 | U.S.N.M. | 4 | D2756 | 3 22 00 S.; 37 49 00 W... | 417 | 40.5 | gy. sp. spk. | Few. |

**CASSIDULINA MEXICANA, new species.**

Plate 24, fig. 5.

*Description.*—Test elongate, slightly if at all compressed, early portion close-coiled, later portion cylindrical; chambers comparatively few, inflated, distinct; wall thin and translucent, very finely perforate, smooth; sutures distinct, depressed; aperture elongate, broadly comma-shaped, in a large depressed area; color whitish.

Length, 0.50–0.65 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16389) off Bell, Fowey Rocks, Florida, in 22 fathoms (40 meters). A specimen was also found from station H79, Caribbean Sea, 821 fathoms (1,488 meters).

This is somewhat nearer *C. bradyi* than the preceding species, as its later portion is decidedly uncoiled, but it is not compressed as in *C. bradyi*. The aperture, too, is in a more sunken area. The figures referred by Goës[35] to *Bulimina squammosa* d'Orbigny, var. *subsquammosa* Egger seem to be very like this species. His material was from the Carribbean.

His figures are referred to later by Goës himself in 1896[36] to *C. bradyi*. This evidently is a species replacing *C. bradyi* in the warm waters of the Gulf of Mexico and in the Caribbean area.

*Cassidulina mexicana—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16388 | U.S.N.M. | 1 | H179 | 14 20 30 N.; 63 10 00 W.. | 821 | ..... | co. s. sh. for. | Rare. |
| 16389 | U.S.N.M. | 1 | ..... | Off Bell, Fowey Rocks, Fla. | 22 | ..... | ..... | Rare. |

[35] Köngl. Svensk. Vet. Akad. Handl., vol. 19, No. 40, 1832, pl. 4, figs. 111–113.
[36] Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.

CASSIDULINA CALABRA (Seguenza).

*Burseolina calabra* SEGUENZA, Atti Accad. Lincei, ser. 3, vol. 6, 1880, p. 138, pl. 13, figs. 7*a*, *b*.

*Cassidulina calabra* H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 431, pl. 113, figs. 8*a–c*.—CHAPMAN, Proc. Zool. Soc., 1895, p. 25; Journ. Linn. Soc., vol. 30, 1910, p. 406.—BAGG, U. S. Geol. Survey Bull. 513, 1912, p. 42, pl. 12, figs. 1*a–c*.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1016.—SIDEBOTTOM, Journ. Roy. Micr. Soc., 1918, p. 128, pl. 3, fig. 22.

*Description.*—Test generally rounded, close-coiled, chambers distinct but the sutures not depressed; apertural face concave, wall smooth, finely punctate; aperture a short, obliquely rounded slit; color whitish.

Diameter 0.4 mm.

*Distribution.*—The only record for the Atlantic for this species is that of Pearcey who records it from *Scotia* station 346 in 56 fathoms (102 meters), Burdwood Bank, south of the Falklands. It thus comes into the southern Atlantic area.

The species was recorded by Brady from Raine Island, Torres Straits, 155 fathoms (283 meters), and off Kandavu, Fiji Islands, 610 fathoms (1,114 meters), by Chapman off Funafuti in 2,400 fathoms (4,400 meters), and by Sidebottom from the east coast of Australia. Bagg records it from the Pliocene at San Pedro, Calif. Seguenza's material from the Miocene of Italy is, according to Brady, the same as this southern recent species.

CASSIDULINA PARKERIANA H. B. Brady.

*Cassidulina parkeriana* H. B. BRADY, Quart. Journ. Micr. Sci., vol. 21, 1881, p. 59; Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 432, pl. 54, figs. 11–16.—EGGER, Abh. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 304, pl. 7, fig. 37.—CHAPMAN, Proc. Zool. Soc., 1895, p. 26; Journ. Quekett Micr. Club, 1907, p. 128, pl. 9, fig. 7; Geol. Brit. Antartic Exped., vol. 2, 1907–9, pp. 30, 43, 54, pl. 2, fig. 13.—CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 100, figs. 154*a–c* (in text).—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1016.

*Description.*—Test elongate, cylindrical, the very early portion spirally coiled, the later chambers forming an uncoiled biserial series, making up the larger part of the test, circular in cross section; chambers broad and high, considerably inflated, wall calcareous, smooth; sutures much depressed; aperture very broad and short, occasionally subcircular, often with a broad toothlike plate nearly filling the opening; color, white.

Length 0.50–0.65 mm.

*Distribution.*—From the published records this seems to be a species of the Indo-Pacific. Brady's original specimens were from the west coast of Chile, and apparently the species extends north-

ward, at least to the Galapagos, and thence to the Bering Sea. It has been recorded by Chapman from the Arabian Sea and off Australia and the Antarctic. The only Atlantic record is that of Pearcey, who records two specimens from *Scotia* station 346 in 56 fathoms (102 meters), Burdwood Bank, south of the Falkland Islands. Apparently it does not come into the North Atlantic in so far as the records or dredgings show.

### Genus EHRENBERGINA Reuss, 1850.

*Ehrenbergina* Reuss (type, *E. serrata* Reuss), Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 377.—H. B. Brady, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433.—Chapman, The Foraminifera, 1902, p. 179.—Cushman, Bull. 71, U. S. Nat Mus., pt. 2, 1911, p. 101.

*Cassidulina* (part) d'Orbigny, Foram. Amér. Mérid., 1839, p. 57.

*Description.*—Test free, early portion coiled, later portion uncoiled, composed of numerous chambers arranged biserially about an elongate axis, evenly united on the dorsal side but forming a deep groove on the ventral border, generally triangular in cross section; wall calcareous, perforate, smooth, or ornamented with spines or ridges; aperture elongate, curved, nearly at right angles to the edge of the chamber, with a slight lip.

The type species of the genus was described by Reuss from the Miocene of Baden, near Vienna. According to Chapman the records of the genus go back to the Lower Cretaceous. In the recent oceans the genus is represented by the following species with apparently definite distribution.

It seems very questionable whether any of the recent species can be referred to Reuss's fossil species, although this was done by Brady in the *Challenger* Report, and he has since been followed by later authors.

From the published records the distribution of this genus is largely in the Pacific and in the South Atlantic. The examination of the *Albatross* material shows this very strongly, no specimens of *Ehrenbergina* having been found north of Cape Hatteras in all the abundant material examined from that area. This distribution is confined to the region from south of Hatteras to the Caribbean and the coast of South America. It is also known from the Azores.

A comparison of the original figures of *E. serrata* of Reuss with the recent ones of Brady and others will show that our recent forms are very different from the fossil ones.

#### EHRENBERGINA SERRATA Reuss.

*Ehrenbergina serrata* Reuss, Denkschr. Akad. Wiss. Wien, vol. 1, 1850, p. 377, pl. 48, fig. 7.—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 25, no. 9, 1894, p. 44, pl. 8, figs. 428–430.—Cushman, Bull. 100, U. S. Nat. Mus., vol. 4, 1921, p. 172.

*Description.*—Test subcircular in front view, early portion close-coiled, uncoiling in later growth; chambers numerous, on the dorsal side close fitting, elongate and narrow, on the ventral side with a slight depression on the middle, wall smooth, punctate, the chambers slightly carinate and at the lateral margin extended into a short spinose angle; aperture elongate, curved, nearly at right angles to the edge of the chamber.

Length 0.50–0.55 mm.

*Distribution.*—This species which Reuss described from the Miocene of Baden in Vienna is apparently the same as that figured by Goës which he found in 400 meters (218 fathoms) off the Azores. I have not seen specimens of this kind either in the Pacific or Atlantic material that I have examined. Although most recent material is referred to this species of Reuss, it has seemed best to indicate at least three distinct species which have occurred in the material that I have been able to examine.

#### EHRENBERGINA BRADYI, new species.

Plate 26, fig. 5.

*Ehrenbergina serrata* H. B. Brady (part) (not Reuss), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, pl. 55, figs. 6, 7 (not 2–5).—Cushman, Bull. 71, U. S. Nat. Mus., pt. 2, 1911, p. 101, figs. 155*a–b* [?].

*Description.*—Test triangular, tetrahedral, dorsal side curved, smooth; sutures flush, ventral side with a ventral groove along the middle, the angle of the chamber at the periphery extended into rounded, long horizontal spines, the ventral borders of the chambers with distinct carinal ridges, wall finely perforate, smooth; aperture elongated, curved, nearly at right angles to the border of the chamber; color whitish.

Length about 0.50 mm.

*Distribution.*—Type-specimen (U.S.N.M. No. 16394) from *Tuscarora* station 15° 22′ 41″ N., 171° 33′ W., in 1,874 fathoms (3,434 meters). This is the species which Brady figures in the *Challenger* Report as referred above. Although this seems to be common in the Pacific in deep water, it has not occurred in the *Albatross* Atlantic material unless a single specimen from station H59 in 789 fathoms (1,442 meters) can be referred to it. This is much more definitely triangular and carinate than the other specimens that I have seen from the Atlantic. This is the most ornate species of the genus except for *E. hystrix* H. B. Brady, which is also known from the Pacific region.

*Ehrenbergina bradyi*—material examined.

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16393 | U.S.N.M. | 1 | 1159..... | 17 42 10 N.; 65 39 40 W. | 789 | ..... | oz. for..... | Rare. |
| 16394 | U.S.N.M. | 1 | *Tuscarora.* | 15 22 41 N.; 171 33 00 W. | 1,874 | ..... | ..... | Rare. |

EHRENBERGINA MESTAYERI, new species.

*Ehrenbergina serrata* CUSHMAN (not Reuss), Proc. U. S. Nat. Mus., vol. 56, 1919, p. 607.

*Description.*—Test roughly triangular, apertural end broadly curved; chambers numerous, on the dorsal side smoothly fitting, on the ventral side coming together to form a raised smooth area, broadening toward the apertural end but extending to the initial end, apertural angles of the chamber with short, usually blunt, spines; sutures depressed on the ventral side, not at all depressed on the dorsal side; aperture an elongate curved slit, nearly at right angles to the inner margin of the chamber, somewhat more rounded and wider at the outer end; color white.

Length up to 0.50 mm.

*Distribution.*—Type-specimen collected by Mr. R. L. Mestayer off the Poor Knights Islands, east coast of New Zealand, latitude 35° 30′ S., longitude 174° 43′ E., dredged by H. M. S. *Hinemoa*. In the collection sent by Miss May and Mr. R. L. Mestayer to the United States National Museum there are a number of specimens from this locality, all of which show that these characters are very constant. They are especially marked by the truncated raised portion of the ventral side which is very distinct from any other species of recent *Ehrenbergina* that I have seen. There are numerous records for *E. serrata* in the general Australian region, but usually without figures, and it would be interesting to see how many of them are of this peculiar form. It has not occurred in the Atlantic material.

EHRENBERGINA TRIGONA Goës.

Plate 26, fig. 4.

*Ehrenbergina serrata* H. B. BRADY (part) (not Reuss), Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 434, pl. 55, figs. 2–5 (not 6, 7).—Goës, Köngl. Svensk. Vet. Akad. Handl., vol. 19, no. 4, 1882, p. 83, pl. 6, figs. 183, 184.

*Ehrenbergina serrata* REUSS, var. *trigona* Goës, Bull. Mus. Comp. Zoöl., vol. 29, 1896, p. 49.

*Description.*—Test roughly triangular in front view, dorsal side slightly curved, or plane, ventral side usually with a row of angular projections of a double row, peripheral angles projected into a series

of spines, one or more at each angle; chambers numerous, inflated somewhat on the ventral side; sutures distinct, very slightly if at all depressed on the dorsal side, more distinctly depressed on the ventral side, wall thin, translucent, finely perforate, smooth except for the spines; aperture elongate, curved, often with a slight lip extending in, nearly at right angles from the inner margin of the chamber; color whitish.

Length up to 0.75 mm.

*Distribution.*—Goës records this variety from 300 fathoms (549 meters) in the Caribbean as scarce, evidently based on his earlier 1882 work. He also records it from the Pacific in 1,201–1,322 fathoms (2,197–2,400 meters) as scarce. In the *Albatross* material I have examined from the Caribbean, Gulf of Mexico, and eastern coast of America specimens of this general form have occurred at three stations, D2117, 683 fathoms (1,249 meters), in the Caribbean; D2614, 18 fathoms (33 meters), south of Cape Hatteras, and D2644, 193 fathoms (353 meters), off the coast of Cuba. Specimens were rare in each case. These correspond fairly well with the figures given by Brady, quoted above, but the ventral side usually has a single instead of a double line of spinose angles.

*Ehrenbergina trigona—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16390 | U.S.N.M. | 2 | D2117... | 15 24 20 N.; 53 31 30 W.. | 683 | 39.8 | yl. m. fne, s.. | Few. |
| 16391 | U.S.N.M. | 2 | D2614... | 34 09 00 N.; 76 02 00 W.. | 168 | ..... | gy. s. bk. sp. | Few. |
| 16392 | U.S.N.M. | 2 | D2644... | 25 40 00 N.; 80 00 00 W.. | 193 | 43.4 | gy. s..... | Few. |

**EHRENBERGINA TRIGONA Goës, var. BRAZILIENSIS, new variety.**

Plate 26, figs. 1–3.

*Description.*—Test differing from the typical with a much more compressed form of the test, the whole being very thin and broad, the angles at the sides are well developed and spinose, usually with numerous short spines below the main one at the angle, the early portion of the test often covered with numerous short spinose projections, wall rather coarsely perforate, test translucent.

*Distribution.*—Type-specimen (U.S.N.M. No. 16395) from *Albatross* station D2756, 417 fathoms (763 meters), off the coast of Brazil. At this station the variety is rather common, all the specimens being very constant in their character and of this form. This evidently is a local variety developed in this particular region.

*Ehrenbergina trigona, var. braziliensis—material examined.*

| Cat. No. | Coll. of— | No. of specimens. | Station. | Locality. | Depth in fathoms. | Bottom temperature. | Character of bottom. | Abundance. |
|---|---|---|---|---|---|---|---|---|
| | | | | ° ′ ″ ° ′ ″ | | °F. | | |
| 16395 | U.S.N.M. | 9 | D2756... | 3 22 00 S.; 37 49 00 W.. | 417 | 40.5 | gy. sp. spk.. | Common. |

**EHRENBERGINA PUPA (d'Orbigny).**

*Cassidulina pupa* D'ORBIGNY, Foram. Amér. Mérid., 1839, p. 57, pl. 7, figs. 21–23.
*Ehrenbergina pupa* H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 433, pl. 55, figs. 1*a*, *b*; pl. 113, figs. 10*a–c*.

*Description.*—Test subtriangular, broader at the apertural end, bluntly pointed at the initial end, composed of comparatively few chambers, on the dorsal side smooth and rounded, the ventral side with a slight longitudinal depression; chambers inflated, distinct, wall fairly thin, finely punctate, smooth; sutures distinct, depressed, especially on the ventral side, not forming either spines or ridges; aperture elongate, curved, nearly at right angles to the edge of the chamber; color white.

Length 0.35 mm.

*Distribution.*—D'Orbigny originally described this species from the Falkland Islands; Brady in the *Challenger* Report records it from off the Azores, 450 fathoms (823 meters); off the mouth of the Rio de la Plata, 13 fathoms (23 meters), and off the Falkland Islands in 1,035 fathoms (1,895 meters). Pearcey records the species from *Scotia* station 342 in 1,946 fathoms (3,559 meters), 56° 54′ S., 56° 24′ W. Additional records elsewhere are off the coast of Chilé, 120 and 175 fathoms (220 and 320 meters), dredged by the *Challenger*, and two records given by Chapman, one from the muds of the shores of the Ross Sea, the other off Funafuti, in 1,050 fathoms (1,920 meters). This then is evidently a species of southern waters, coming north into the central Atlantic at the Azores, if this more or less isolated record is correct.

I have failed to find the species at all in the *Albatross* material or other material from the Caribbean, Gulf of Mexico, or the eastern coast of the United States.

## EXPLANATION OF PLATES.

### Plate 1.

Fig. 1. *Textularia candeiana*. ×30. D5318. Front view.
2. *Textularia candeiana*. ×64. Front view. (After Heron-Allen and Earland.)
3. *Textularia candeiana*. ×64. Edge view. (After Heron-Allen and Earland.)
4. *Textularia agglutinans*. ×30. D2358. Front view.
5. *Textularia agglutinans*. ×30. D2358. Front view.
6. *Textularia goësii*. ×25. D2150. Front view.
7. *Textularia luculenta*. ×30. D2150. Front view of adult.
8. *Textularia luculenta*. ×30. D2150. Side view.
9. *Textularia luculenta*. ×30. D2150. Front view of young.

### Plate 2.

Fig. 1. *Textularia abbreviata*? ×30. D2572. Front view.
2. *Textularia flintii*, var. *curta*. ×30. D2144. Front view.
3. *Textularia flintii*, var. *curta*. ×30. D2144. Front view.
4. *Textularia flintii*, var. *caroliniana*. ×30.
5. *Textularia albatrossi*. ×25. D2150. Front view.
6. *Textularia albatrossi*. ×25. D2150. Side view.
7. *Textularia concava*, var. *heterostoma*. ×64. Front view. (After Heron-Allen and Earland.)
8. *Textularia concava*, var. *heterostoma*. ×64. Edge view. (After Heron-Allen and Earland.)
9. *Textularia mexicana*. ×30. D2377. Front view.
10. *Textularia subplana*. ×30. D2641. Front view.
11. *Textularia floridana*. ×30. D2641. Front view.
12. *Textularia floridana*. ×30. D2641. Side view.
13. *Textularia foliacea*, var. *occidentalis*. ×30. D2318. Front view.

### Plate 3.

Fig. 1. *Textularia pseudoturris*. ×25. D2314. Front view.
2. *Verneuilina affixa*. ×30. D2383. Front view.
3. *Textularia barrettii*. ×25. Key West, Fla. Side view.
4. *Textularia barrettii*. ×25. Key West, Fla. Apertural view.
5. *Textularia barrettii*. ×25. Key West, Fla. Transverse section.
6. *Textularia barrettii*. ×15. Off Barbados. Front view.
7. *Bigenerina cylindrica*. ×30. Southwest of Ireland. Front view.
8. *Bigenerina cylindrica*. ×30. Southwest of Ireland. Front view.

### Plate 4.

Fig. 1. *Bolivina difformis*. *a*, front view; *b*, side view. (After Williamson).
2. *Bolivina laevigata*. Front view. (After Williamson.)
3. *Bolivina variabilis*. *a*, front view; *b*, side view. (After Williamson.)
4. *Spiroplecta fusca*. *a*, front view; *b*, side view; *c*, apertural view. (After Earland.)
5–8. *Spiroplecta wrightii*. Figs. 5–7, front view; Fig. 8, side view. ×65. (After Heron-Allen and Earland.)

PLATE 5.

FIG. 1. *Textularia pseudotrochus.* ×30. D2641. Front view.
2. *Textularia pseudotrochus.* ×30. D2641. Dorsal view.
3. *Textularia pseudotrochus.* ×30. D2641. Ventral view.
4. *Bigenerina pennatula.* ×25. D2150. Front view.
5. *Textularia conica.* ×30. D2639. Front view.
6. *Textularia conica.* ×30. D2639. Dorsal view.
7. *Textularia conica.* ×30. D2639. Apertural view.
8. *Bigenerina nodosaria*, var. *textularioidea.* ×25. D2315. Front view.
9. *Bigenerina nodosaria*, var. *textularioidea.* ×25. D2315. Front view.
10. *Bigenerina capreolus.* ×25. D2355. Front view.

PLATE 6.

FIG. 1. *Textularia parvula.* ×100. 1179. Front view of microspheric specimen.
2. *Textularia parvula.* ×100. D2398. Front view of megalospheric specimen.
3. *Textularia catenata.* ×75. D2713.
4. *Bolivina albatrossi.* ×75. D2677. Front view.
5. *Bolivina goësii.* ×75. D2641. Front view.
6. *Bolivina robusta*, var. ×100. D2150. Front view.

PLATE 7.

FIG. 1. *Bolivina punctata.* ×75. D2150. Front view.
2. *Bolivina porrecta.* ×100. D2150. Front view.
3. *Bolivina limbata.* ×75. D2758. Front view.
4. *Bolivina pulchella.* ×100. Tortugas, Fla., 6 fathoms. Front view.
5. *Bolivina subspinescens.* ×75. D2192. Front view.
6. *Bolivina subaenariensis.* ×75. D2262. Front view.

PLATE 8.

FIG. 1. *Bolivina subaenariensis*, var. *mexicana.* ×75. D2377. Front view.
2. *Bolivina quadrilatera.* ×75. D2144. Front view.
3. *Bolivina beyrichi*, var. *alata.* ×75. D2249. Front view.
4. *Gaudryina apicularis.* ×75. D2093. Front view.
5. *Gaudryina*, cf. *G. convexa.* ×75. D2641. Front view.

PLATE 9.

FIG. 1. *Bolivina inflata.* ×200. Front view. (After Heron-Allen and Earland.)
2. *Bolivina inflata.* ×200. Front view. (After Heron-Allen and Earland.)
3. *Bolivina inflata.* ×200. Front view. (After Heron-Allen and Earland.)
4. *Bolivina inflata.* ×200. Edge view. (After Heron-Allen and Earland.)
5. *Bolivina tortuosa.* ×75. Front view. (After Heron-Allen and Earland.)
6. *Bolivina beyrichi.* ×150. Front view. (After Heron-Allen and Earland.)
7–9. *Verneuilina advena.* ×120. Front view. (After Heron-Allen and Earland.)
10. *Verneuilina propinqua.* ×25. D2394. Side view.
11. *Verneuilina propinqua.* ×25. D2394. Front view.

PLATE 10.

FIG. 1. *Cuncolina angusta.* ×15. Off Barbados. Front view.
2. *Cuncolina angusta.* ×15. Off Barbados. Front view.
3. *Cuncolina angusta.* ×15. Off Barbados. Apertural view.
4. *Verneuilina affixa.* ×30. D2383. Front view.
5. *Verneuilina arenacea.* Front view. (After Williamson.)
6. *Verneuilina arenacea.* Rear view. (After Williamson.)

## Plate 11.

Fig. 1. *Verneuilina bradyi.* ×30. D2395. Front view.
2. *Valvulina oviedoiana.* ×30. Lisbon Creek Reef, Bahamas. Front view.
3. *Valvulina oviedoiana.* ×30. Lisbon Creek Reef, Bahamas. Front view.
4. *Valvulina oviedoiana.* ×30. Lisbon Creek Reef, Bahamas. Apertural view.
5. *Valvulina oviedoiana.* ×30. Lisbon Creek Reef, Bahamas. Front view.
6. *Gaudryina scabra.* ×25. D2751. Front view.
7. *Gaudryina scabra.* ×25. D2751. Front view.
8. *Valvulina conica.* ×30. D2547. Dorsal view.
9. *Valvulina conica.* ×30. D2547. Side view.

## Plate 12.

Fig. 1. *Gaudryina flintii.* ×25. D2678. Front view.
2. *Gaudryina flintii.* ×25. D2678. Front view.
3. *Gaudryina rudis.* ×35. Front view. (After Heron-Allen and Earland.)
4. *Gaudryina rudis.* ×35. Front view. (After Heron-Allen and Earland.)
5. *Gaudryina rudis.* ×35. Front view. (After Heron-Allen and Earland.)
6. *Gaudryina rudis.* ×35. Apical view, showing three initial chambers laid open. (After Heron-Allen and Earland.)
7. *Gaudryina chilostoma.* ×30. D2416. Front view.
8. *Gaudryina bradyi.* ×30. D2046. Front view.

## Plate 13.

Fig. 1. *Gaudryina atlantica.* ×20. D2399. Front view.
2. *Gaudryina atlantica.* ×20. D2399. Front view.
3. *Gaudryina atlantica.* ×20. D2399. Apertural view.
4. *Gaudryina baccata*, var. *novangliae.* ×30. D2105. Front view.
5. *Gaudryina pseudofiliformis.* ×30. D2352. Front view.

## Plate 14.

Fig. 1. *Gaudryina curta.* ×25. D2739. Front view.
2. *Gaudryina curta.* ×25. D2739. Front view.
3. *Gaudryina curta.* ×25. D2739. Front view.
4. *Gaudryina curta.* ×25. D2739. Front view.

## Plate 15.

Fig. 1. *Tritaxilina caperata*, var. *atlantica.* ×25. D2150. Front view.
2. *Tritaxilina caperata*, var. *atlantica.* ×25. D2150. Front view.
3–5. *Clavulina nodosaria*, var. *novangliae.* ×30. D2247. Front view.
6. *Bulimina echinata.* ×113. Front view. (After Heron-Allen and Earland.)
7. *Clavulina flintiana.* ×30. D2425. Front view.
8. *Clavulina flintiana.* ×30. D2425. Front view.
9. *Clavulina flintiana.* ×30. D2425. Apertural view.

## Plate 16.

Fig. 1. *Clavulina humilis*, var. *mexicana.* ×25. D2399. Front view.
2. *Clavulina humilis*, var. *mexicana.* ×25. D2399. Front view.
3. *Clavulina humilis*, var. *mexicana.* ×25. D2399. Front view.
4. *Clavulina communis.* ×25. D2377. Front view.
5. *Clavulina communis.* ×25. D2377. Front view.
6. *Clavulina obscura.* ×75. Front view. (After Heron-Allen and Earland.)

PLATE 17.

FIG. 1. *Clavulina occidentalis*. ×30. D2383. Front view.
2. *Clavulina occidentalis*. ×30. D2383. Front view.
3. *Clavulina tricarinata*. ×30. D2388. Front view.
4. *Clavulina tricarinata*. ×30. Off Bell, Fowey, Fla. Front view.
5. *Bulimina minutissima*. ×120. Ventral view. (After Heron-Allen and Earland.)
6. *Bulimina minutissima*. ×120. Dorsal view. (After Heron-Allen and Earland.)
7. *Bulimina elegans*, var. *exilis*. ×113. (After Heron-Allen and Earland.)
8. *Bulimina elegans*, var. *exilis*. ×113. (After Heron-Allen and Earland.)
9. *Bulimina elegans*, var. *exilis*. ×113. (After Heron-Allen and Earland.)
10–12. *Bulimina elegans*, var. *exilis*. ×113. (After Heron-Allen and Earland.)

PLATE 18.

FIG. 1. *Clavulina communis*, var. *nodulosa*. ×25. D2547. Front view.
2. *Clavulina communis*, var. *nodulosa*. ×25. D2547. Front view.
3. *Clavulina communis*, var. *nodulosa*. ×25. D2547. Front view.
4. *Buliminella convoluta*. Rear view. (After Williamson.)
5. *Buliminella convoluta*. Front view. (After Williamson.)

PLATE 19.

FIG. 1. *Pavonina atlantica*. ×75. Sand Key, Fla.
2. *Bulimina elegans*, var. *exilis*. ×100. D2584. Side view.
3. *Bulimina elegans*, var. *exilis*. ×100. D2584. Apertural view.
4. *Chrysalidina dimorpha*. ×75. D2758.
5. *Verneuilina spinulosa*. Smooth form. ×75. Sand Key, Fla.
6. *Pleurostomella acuminata*. ×75. H79.

PLATE 20.

FIG. 1. *Bulimina pyrula*. ×100. D2111. Side view.
2. *Bulimina pyrula*, var. *spinescens*. ×100. D2212. Front view.
3. *Bulimina pupoides*. ×100. D2160.
4. *Bulimina buchiana*. ×100. D2396. Side view.
5. *Buliminella subcylindrica*. ×100. H80. Front view.
6. *Bulimina affinis*. ×100. D2563.

PLATE 21.

FIG. 1. *Bulimina inflata*. ×100. D2018. Side view.
2. *Bulimina inflata*, var. *mexicana*. ×100. D2377. Front view.
3. *Bulimina ovata*. ×100. D2564. Side view.
4. *Bulimina marginata*. ×100. D2247. Front view.
5. *Bulimina marginata*. ×100. D2247. Side view.

PLATE 22.

FIG. 1. *Bulimina aculeata*. ×100. D2035. Side view of form without spines on the chambers, but with a large, stout, apical spine.
2. *Bulimina aculeata*. ×100. D2035. Side view of a peculiar formed specimen with very broad apertural end.
3. *Buliminella subteres*. ×100. D2144. Apertural view.
4. *Buliminella subteres*. ×100. D2144. Apertural view.
5. *Buliminella subteres*. ×100. D2117. Side view.
6. *Buliminella subteres*, var. ×100. D2761. Apertural view.

PLATE 23.

FIG. 1. *Buliminella spinigera.* ×100. D2677. Apertural view.
2. *Buliminella spinigera.* ×100. D2677. Apertural view.
3. *Buliminella spinigera.* ×100. D2677. Side view.
4. *Buliminella spinigera.* ×100. D2677. Young.
5. *Buliminella elegantissima,* var. *seminuda.* ×150.
6. *Cassidulina bradyi.* ×100. D2555. Side view.
7. *Cassidulina bradyi.* ×100. D2555. Side view, showing aperture.
8. *Virgulina mexicana.* ×75. D2395.

PLATE 24.

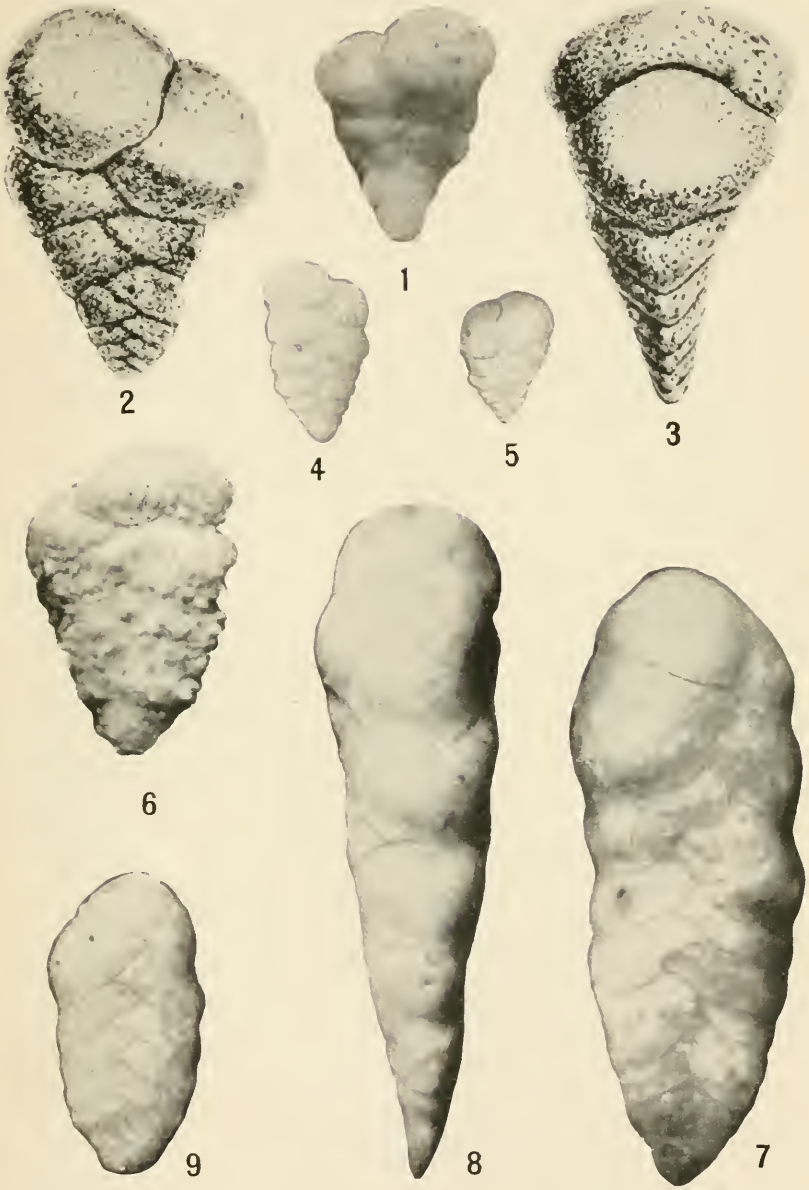
FIG. 1. *Virgulina bradyi.* ×75. D2568. Front view.
2. *Virgulina compressa.* ×75. D2249. Front view.
3. *Virgulina compressa.* ×75. D2249. Rear view.
4. *Cassidulina laevigata.* ×100. D2355. Side view.
5. *Cassidulina mexicana.* ×100. Fowey Rocks, Fla. Side view.
6. *Cassidulina subglobosa.* ×75. D2352. Front view.

PLATE 25.

FIG. 1. *Virgulina(?) advena.* ×75. D2713. Front view.
2. *Virgulina(?) advena.* ×75. D2713. Front view.
3. *Virgulina(?) advena.* ×100. D2713. Broken specimen, showing lip of interior last chamber.
4. *Cassidulina braziliensis.* ×100. D2756. Front view.
5. *Cassidulina braziliensis.* ×100. D2756. Rear view.
6. *Cassidulina laevigata,* var. *carinata.* ×100. Ragged Key, Fla. Side view.
7. *Cassidulina laevigata,* var. *carinata.* ×100. Ragged Key, Fla. Edge view.

PLATE 26.

FIG. 1. *Ehrenbergina trigona,* var. *braziliensis.* ×100. D2756. Dorsal view.
2. *Ehrenbergina trigona,* var. *braziliensis.* ×100. D2756. Ventral view.
3. *Ehrenbergina trigona,* var. *braziliensis.* ×100. D2756. Ventral view, young.
4. *Ehrenbergina trigona.* ×100. D2644. Young.
5. *Ehrenbergina bradyi.* ×100. *Tuscorora* 15.
6. *Virgulina schreibersiana.* ×75. D2614.
7. *Cassidulina crassa.* ×100. D2150. Rear view.

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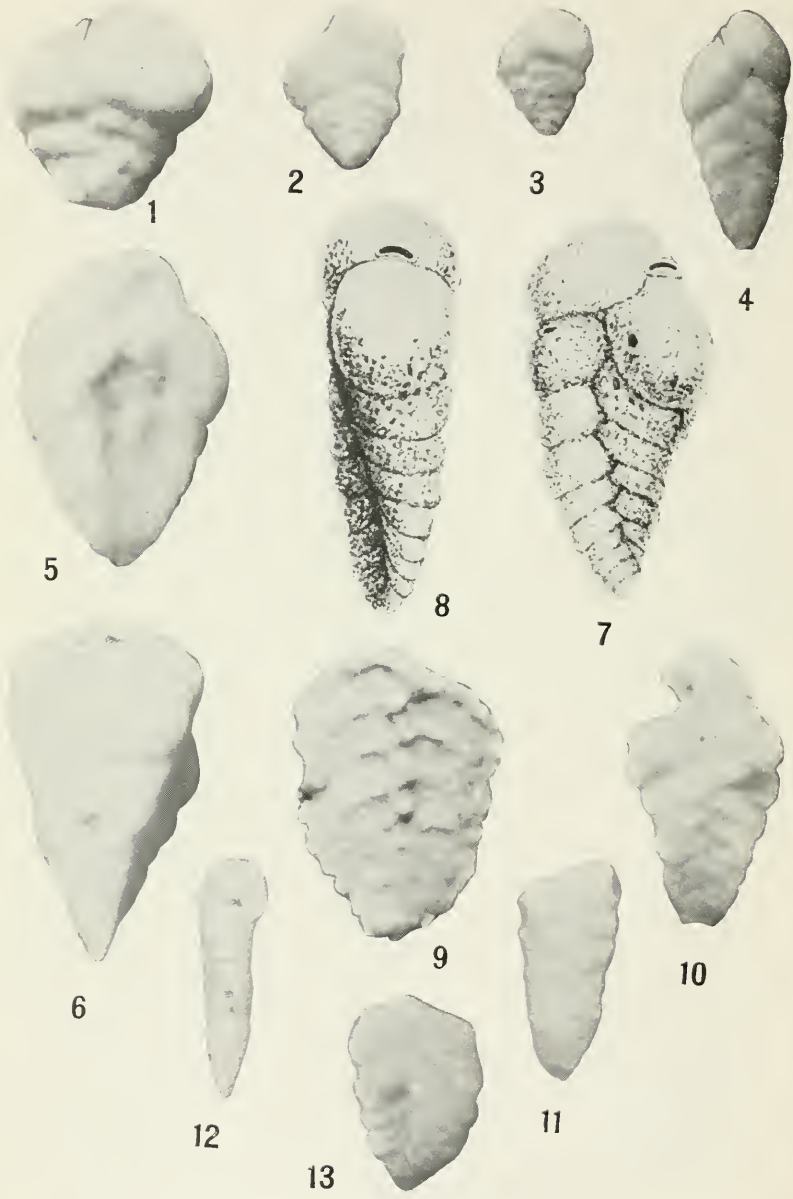


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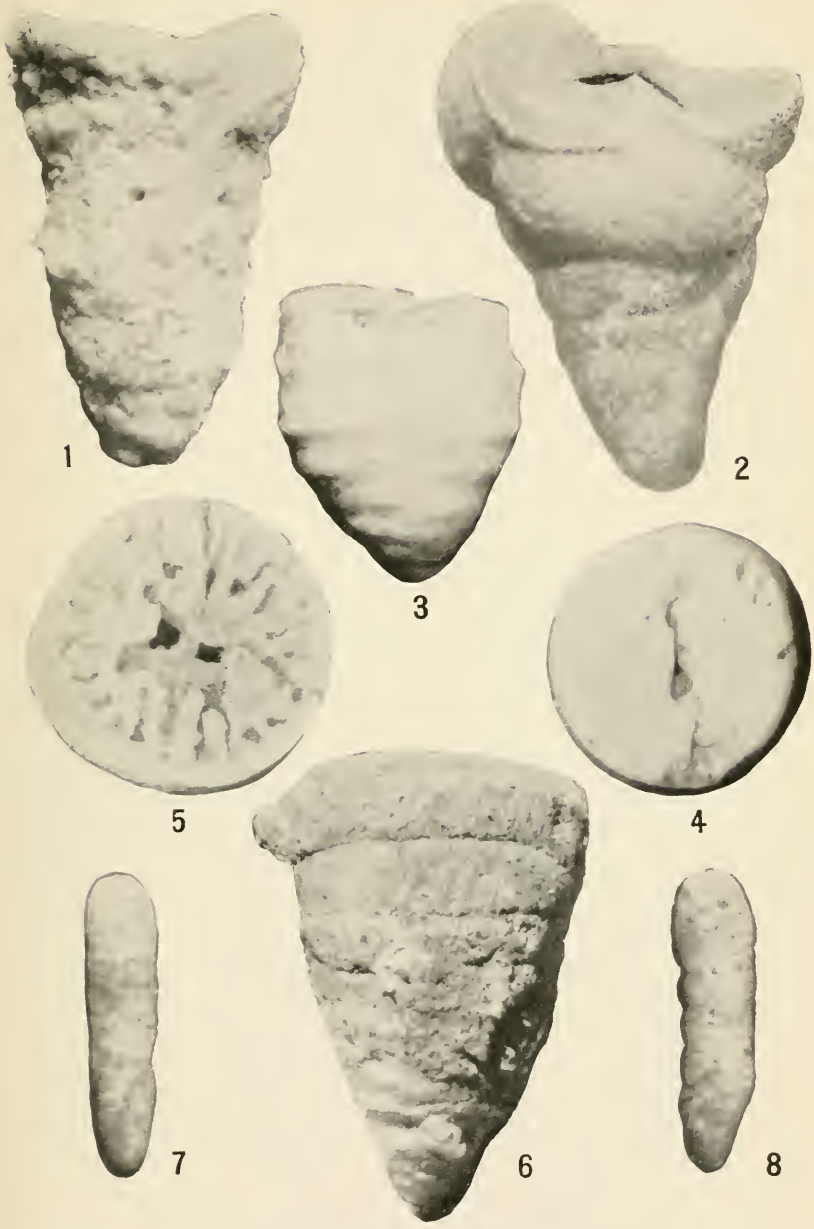


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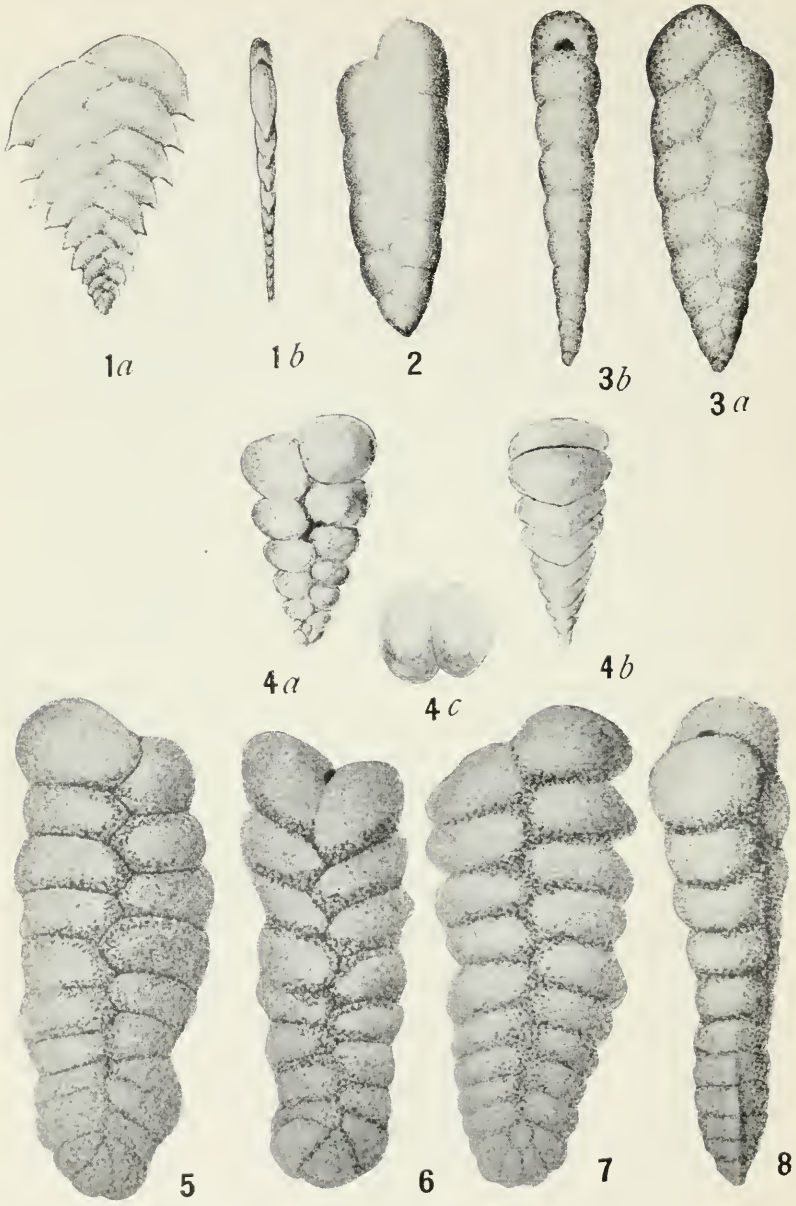


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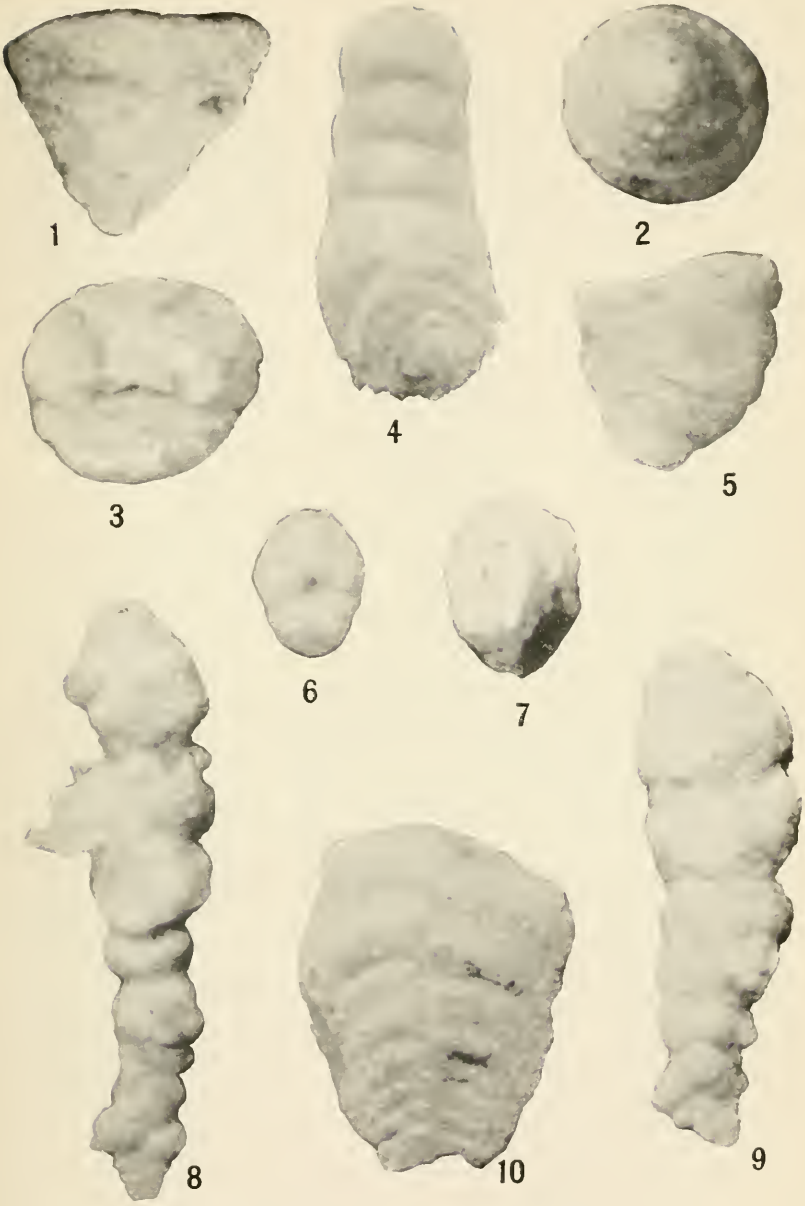


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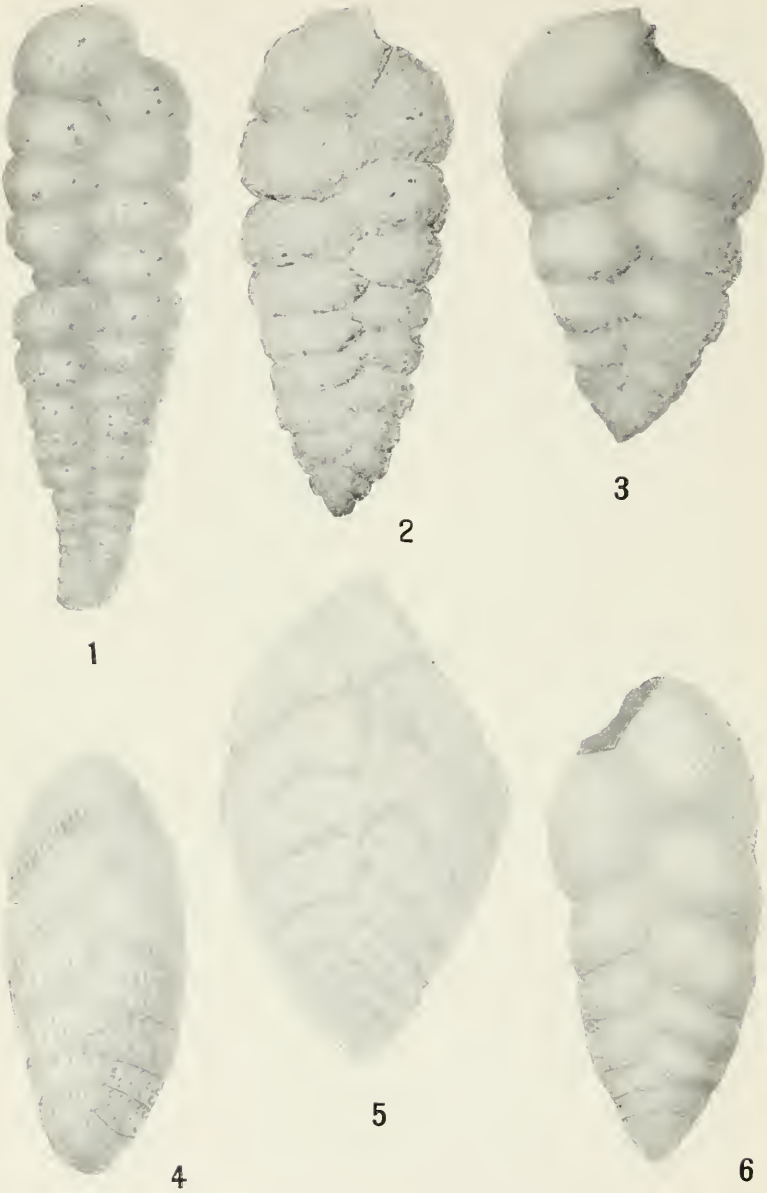


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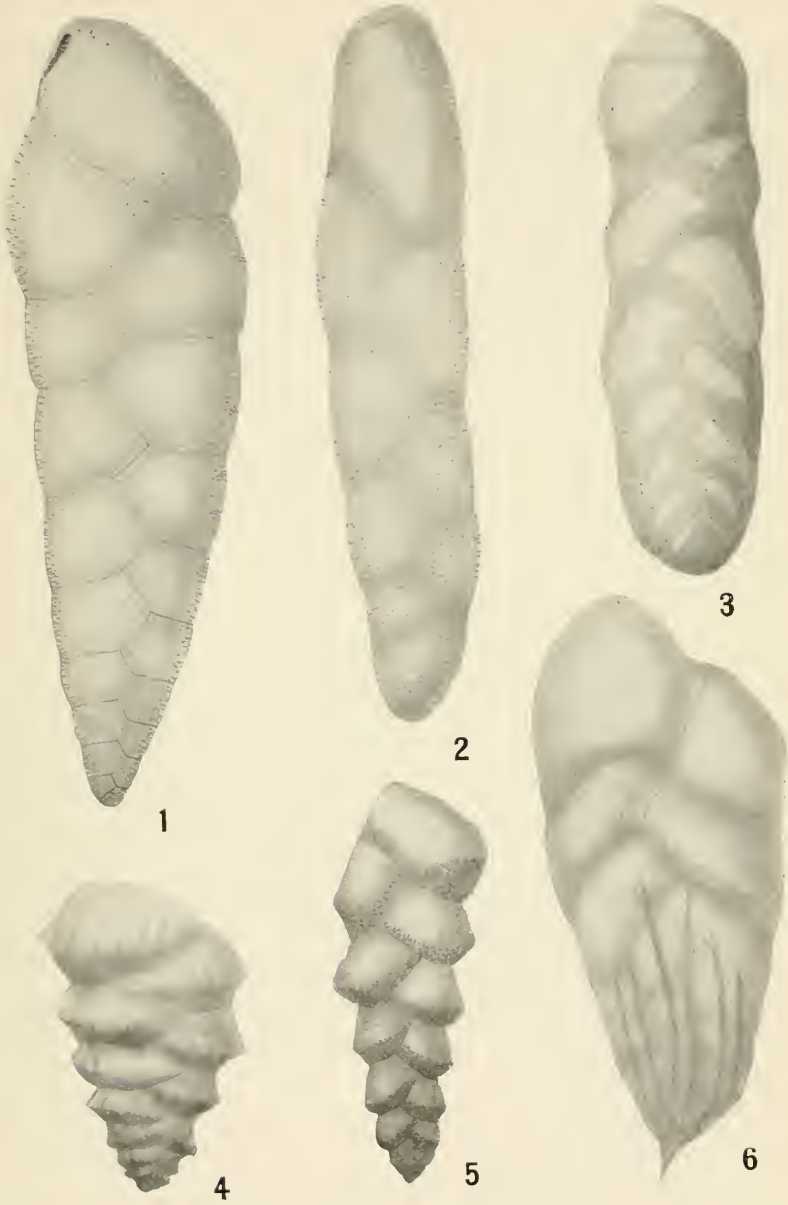


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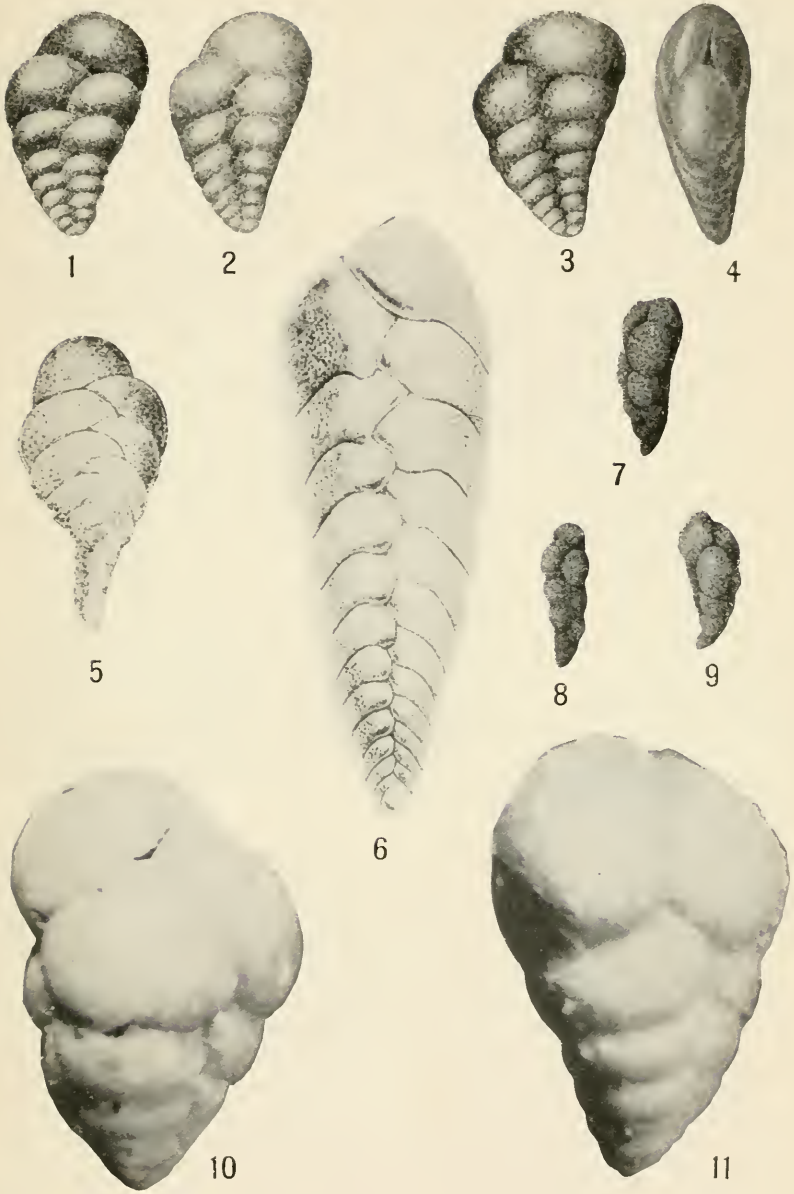


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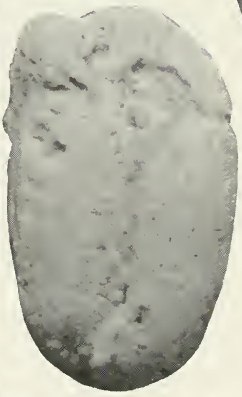

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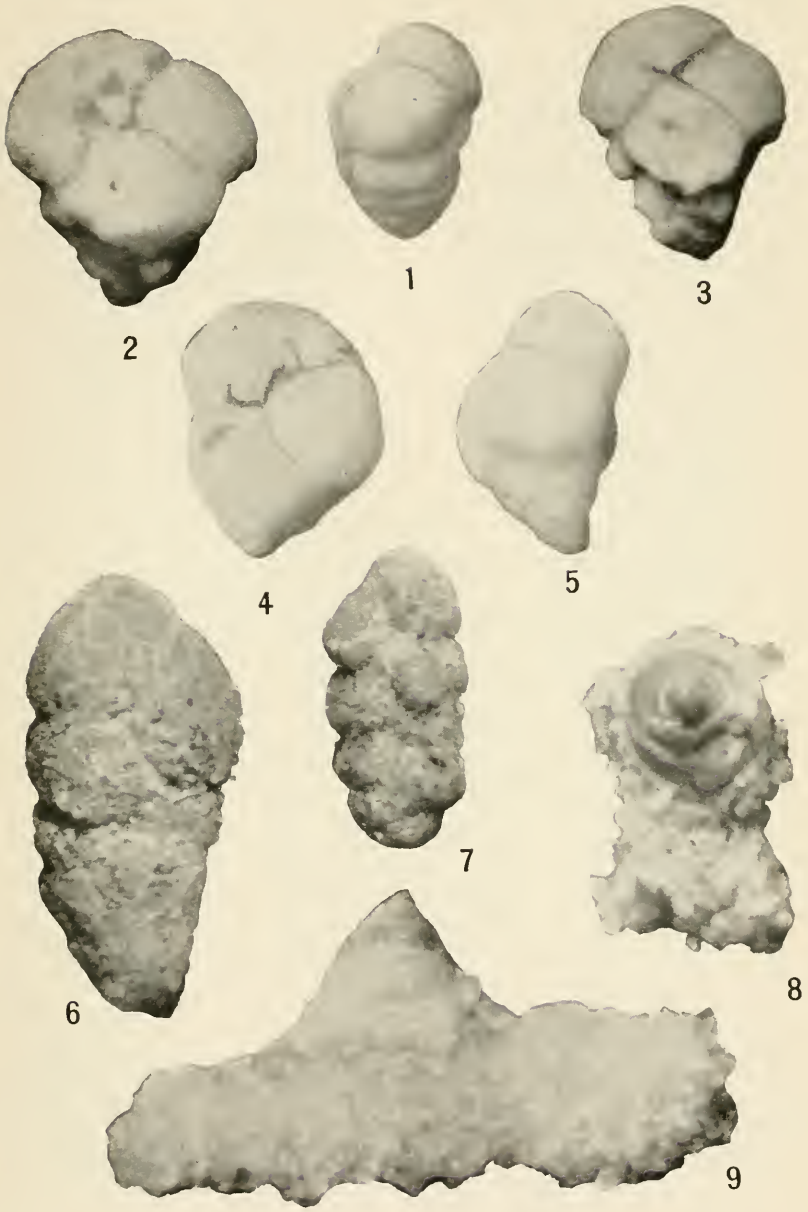


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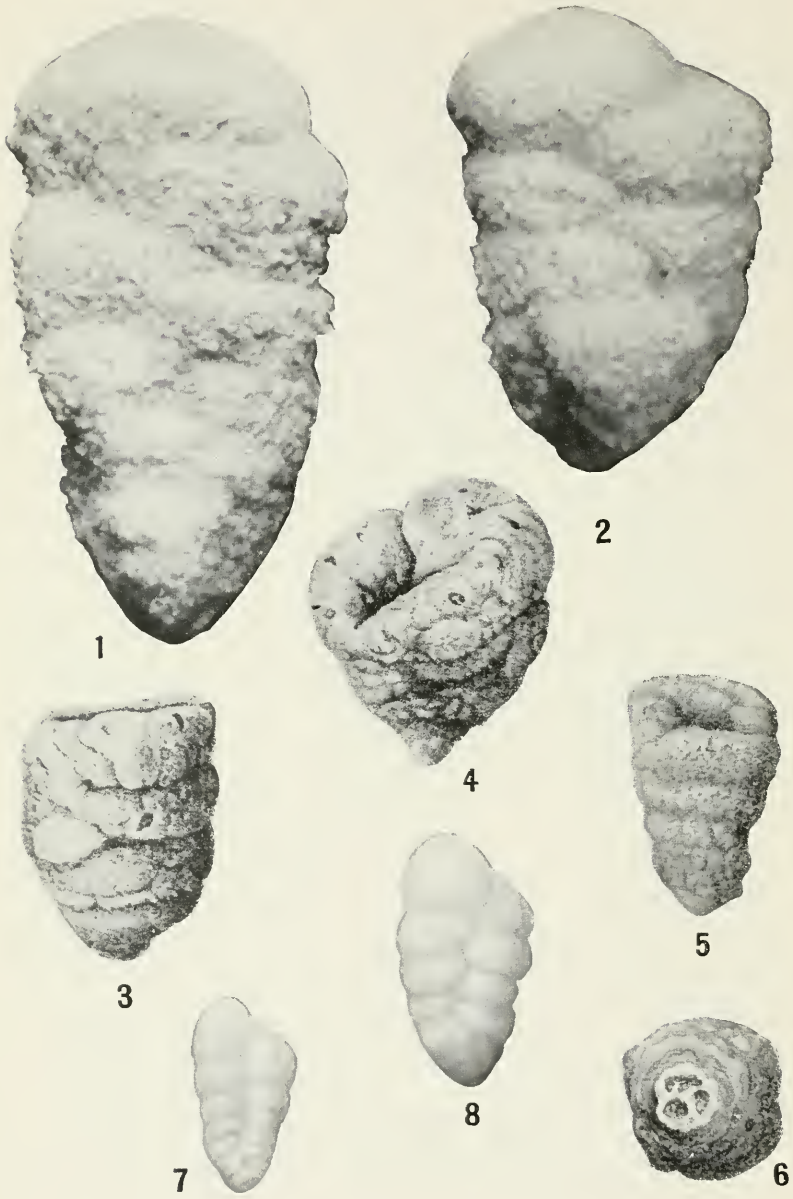


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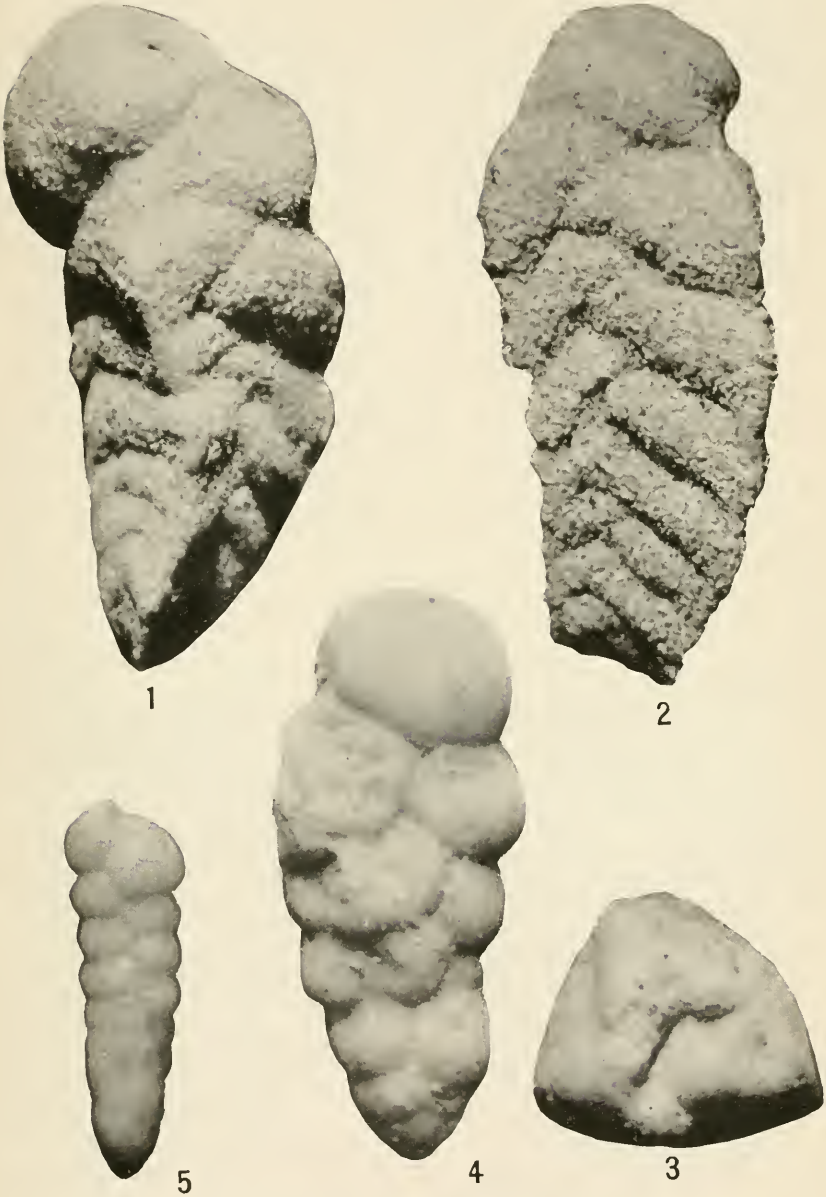


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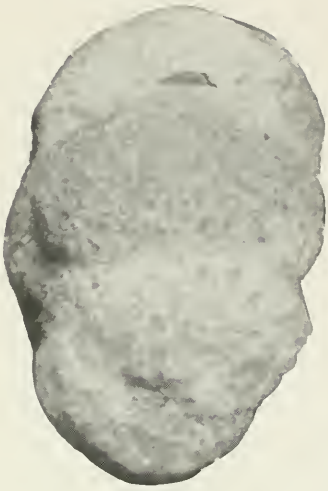

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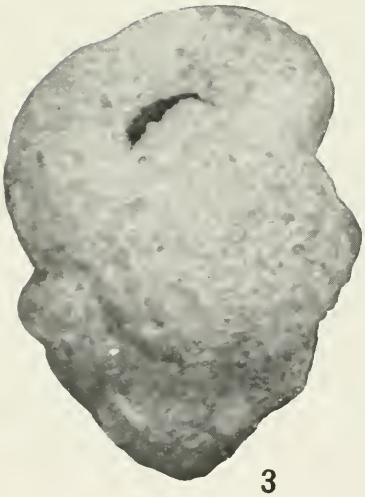

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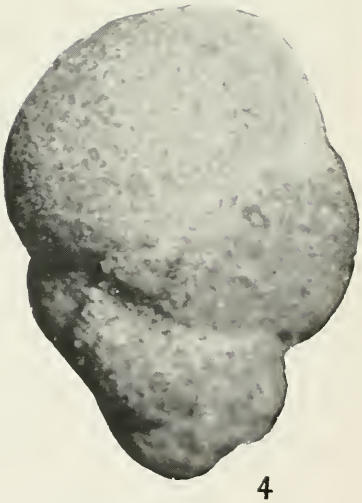

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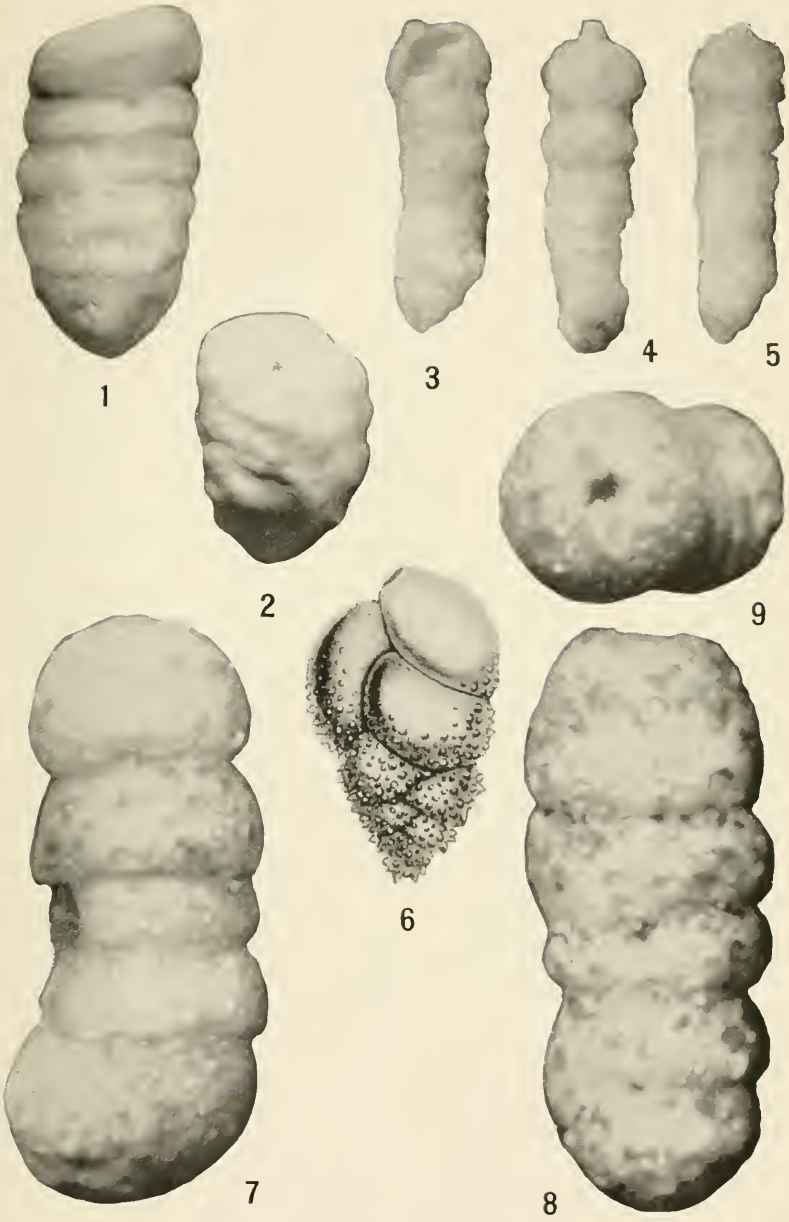


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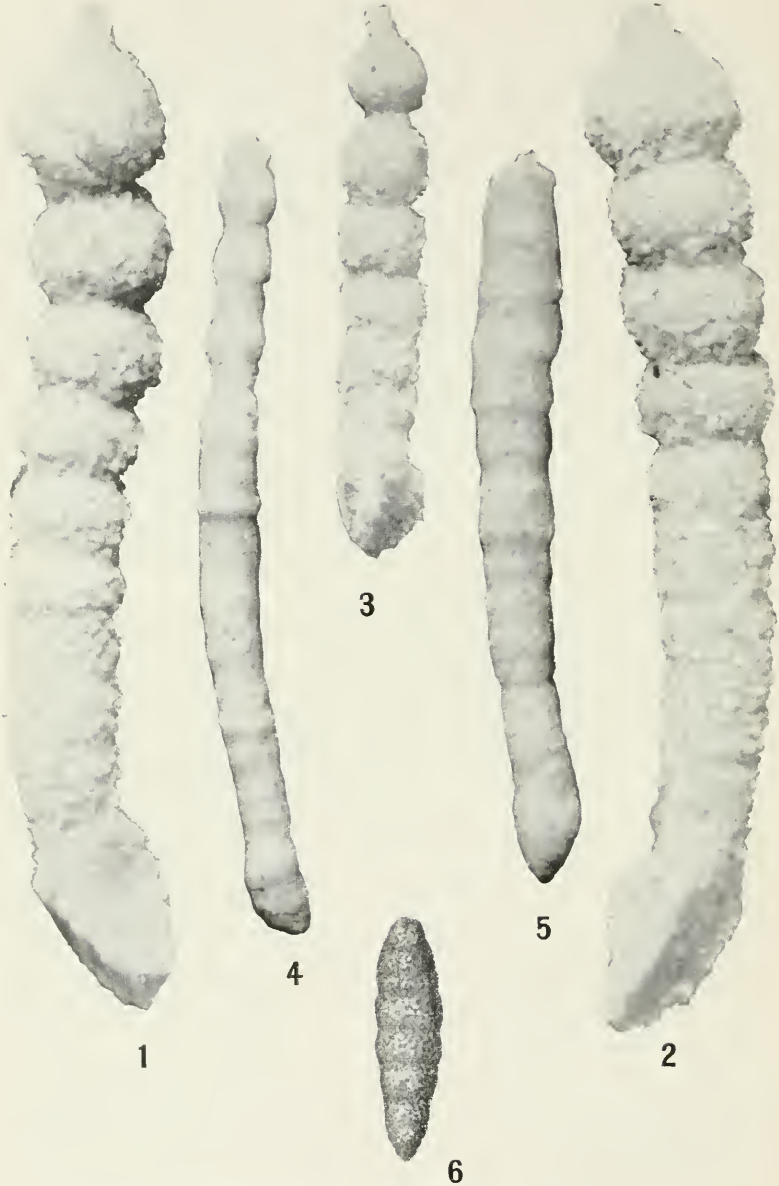


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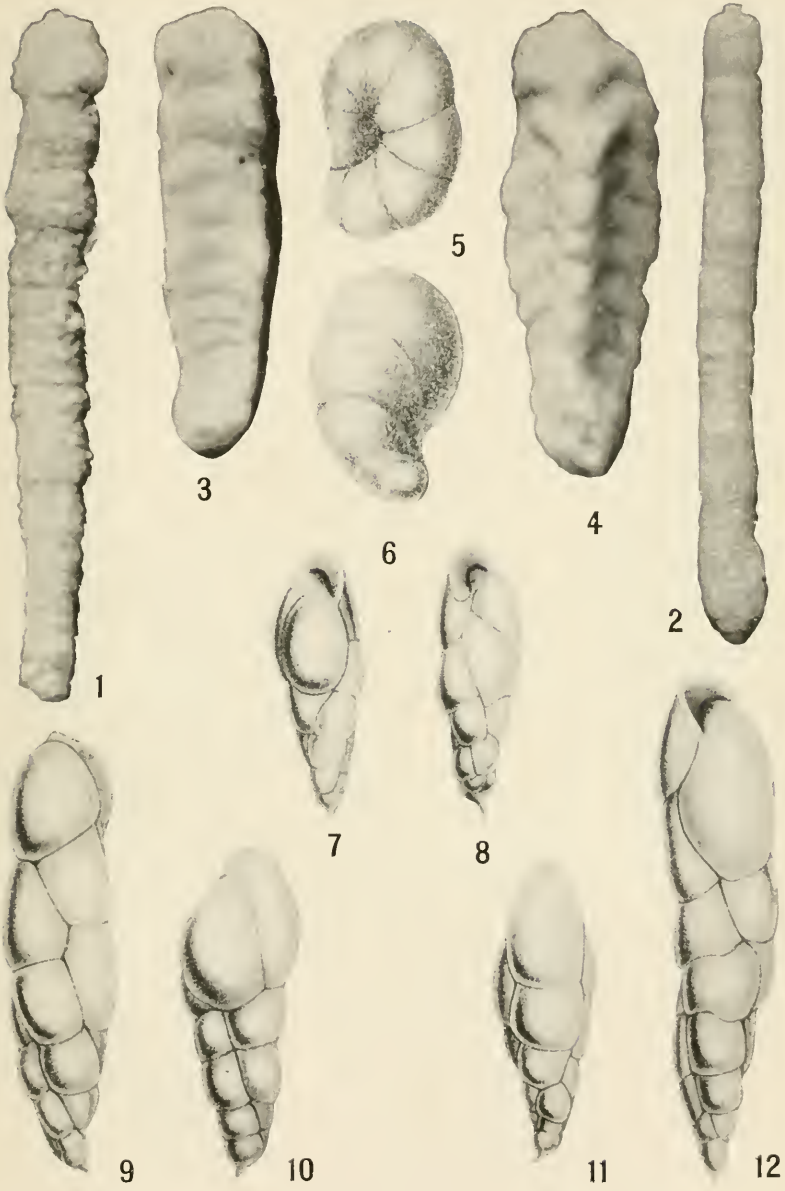


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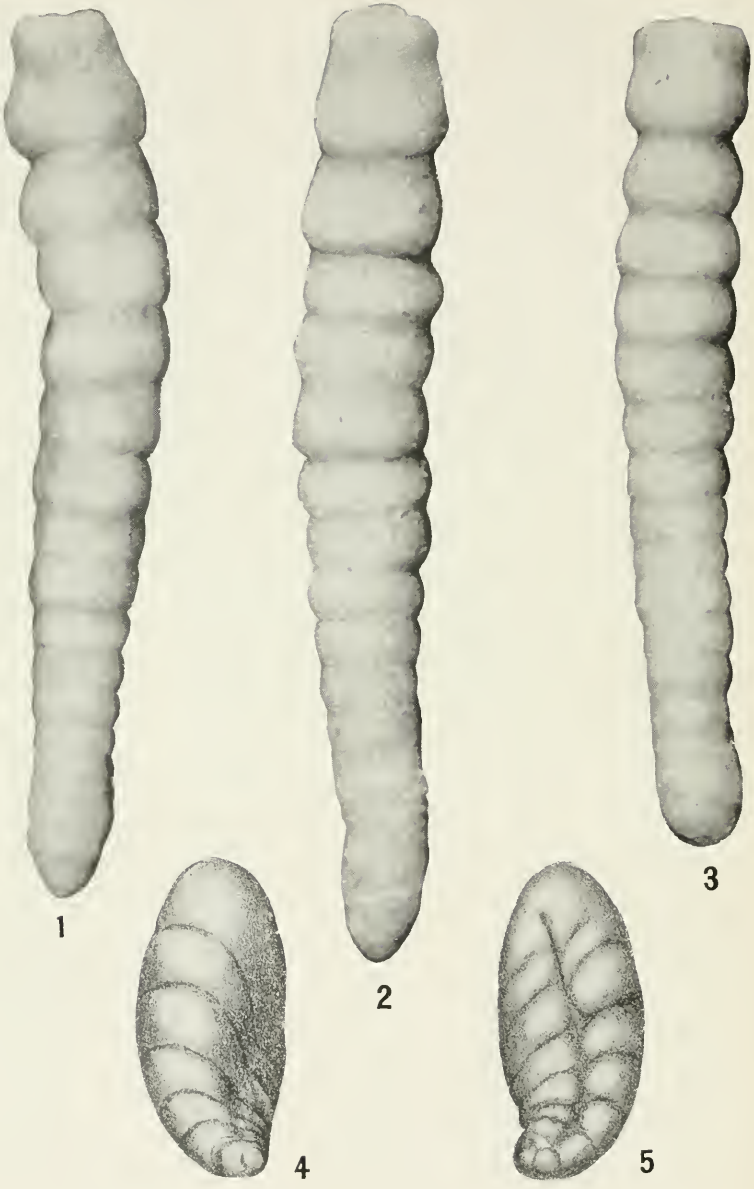


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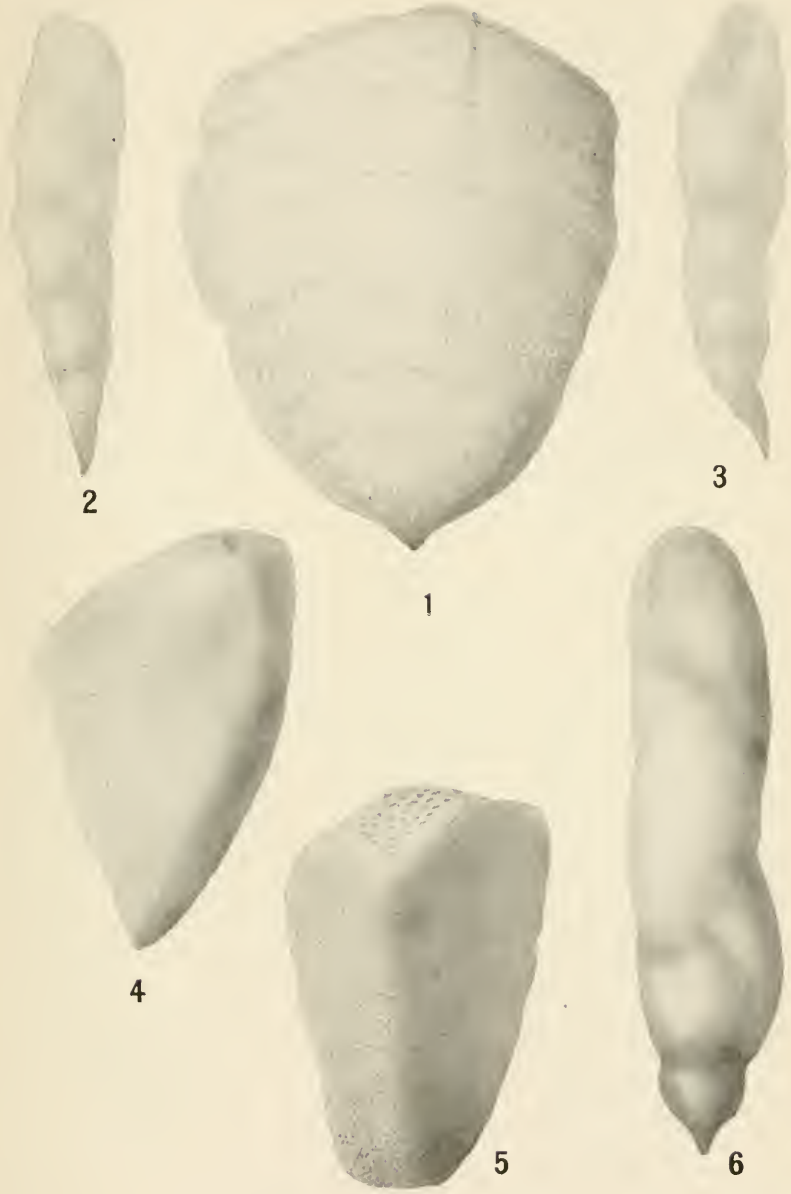


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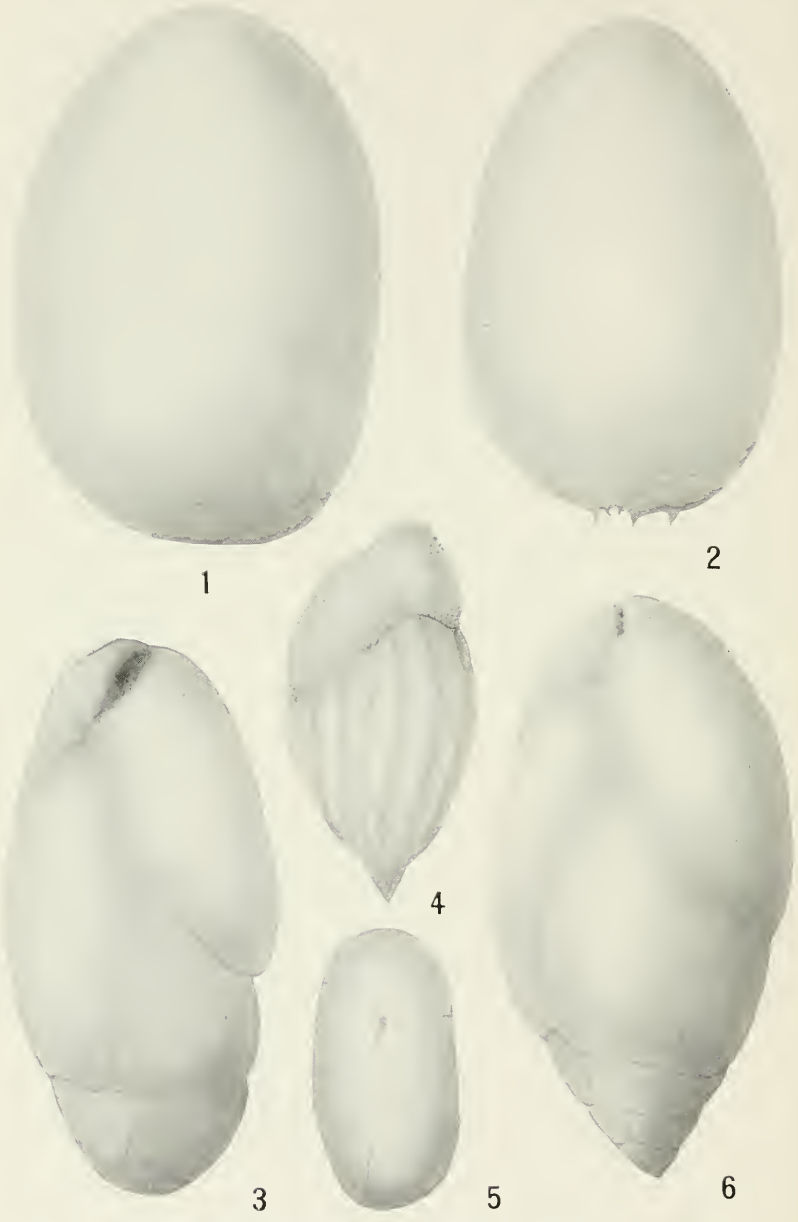


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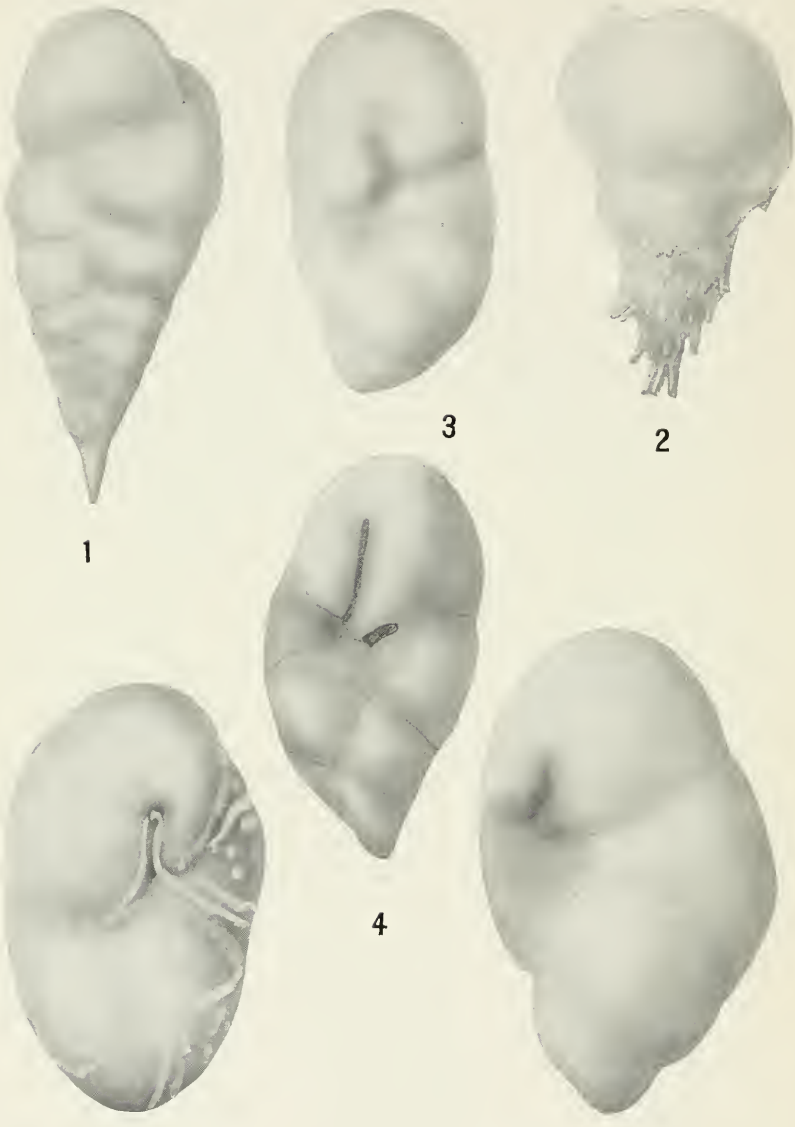


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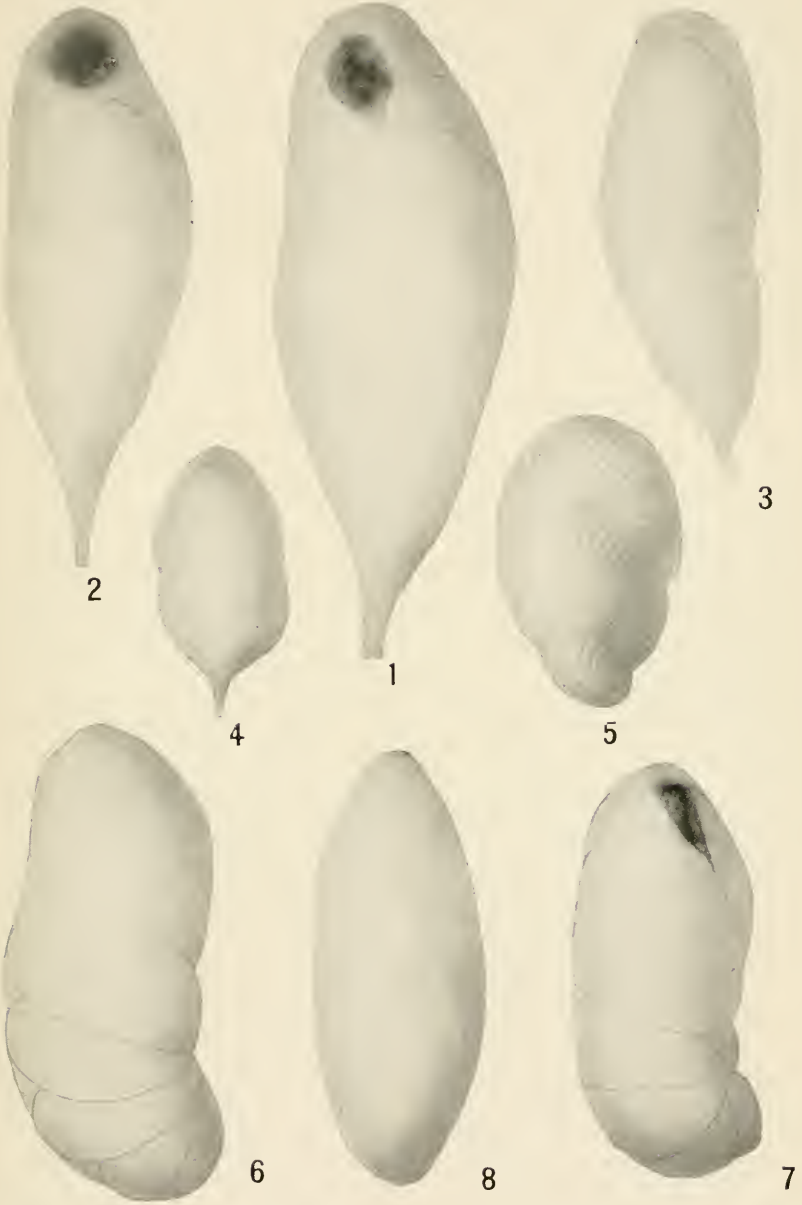


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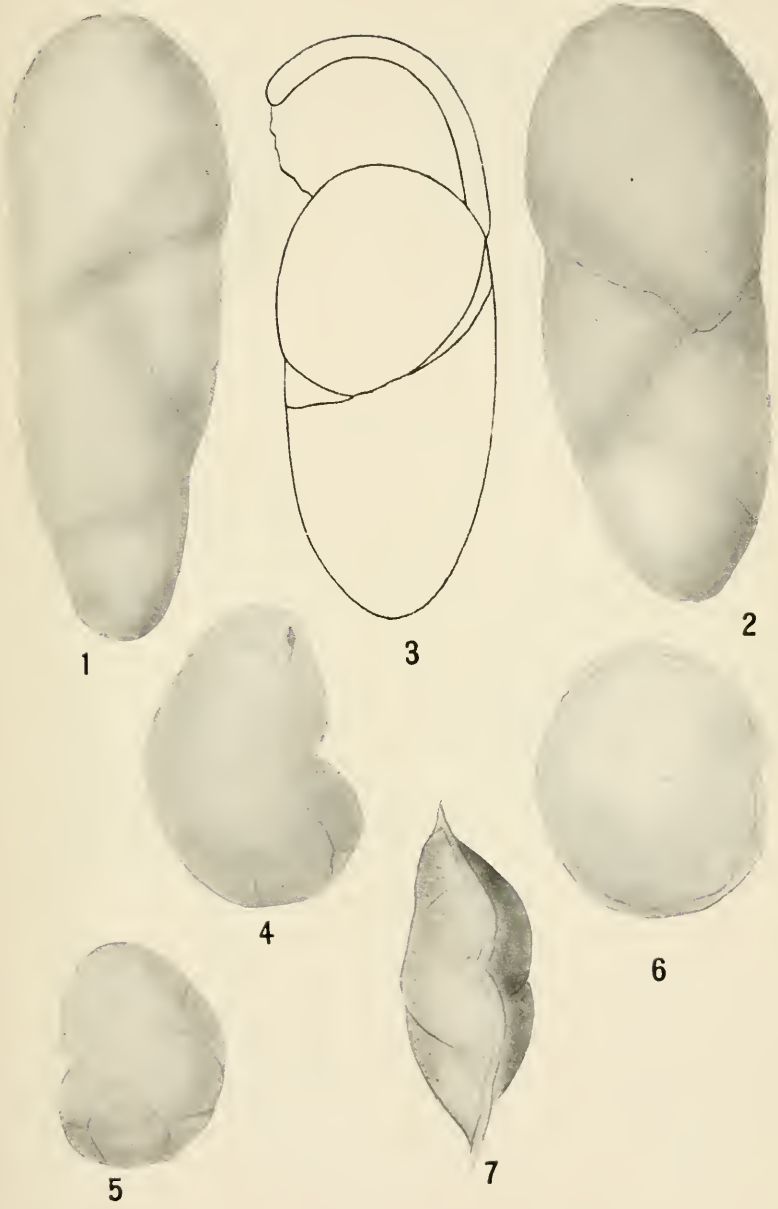


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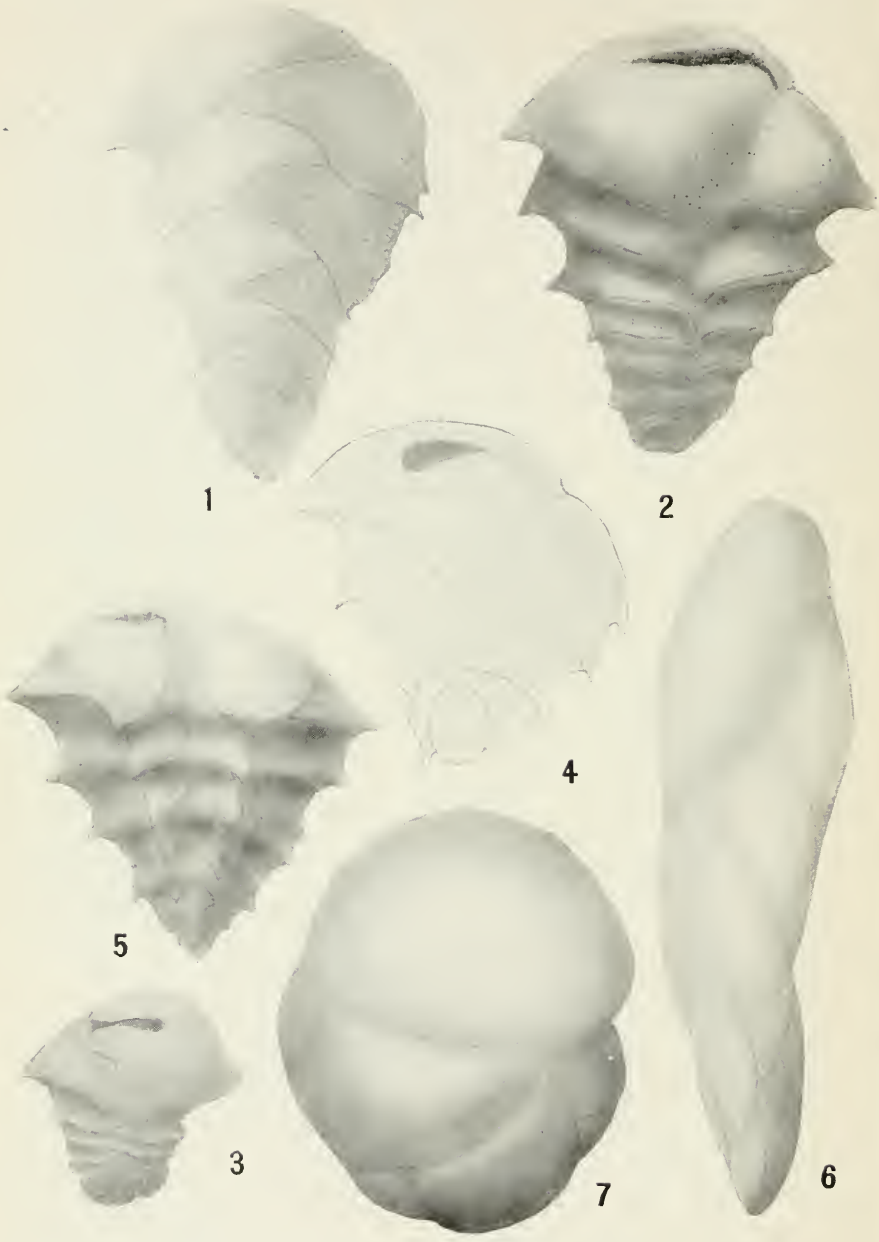


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