MICROSCOPICAL EXAMINATION

OF

SOUNDINGS,

MADE BY THE U. S. COAST SURVEY OFF THE ATLANTIC COAST OF THE U. S.

BY PROF. J. W. BAILEY,

OF THE MILITARY ACADEMY, WEST POINT.

NAMES OF THE COMMISSION

TO WHICH THIS PAPER HAS BEEN REFERRED

Prof. LEWIS R. GIBBES,
Prof. WILLIAM B. ROGERS.

MICROSCOPICAL EXAMINATION OF SOUNDINGS,

MADE OFF THE COAST OF THE UNITED STATES, BY THE

U. S. COAST SURVEY.

To JOSEPH HENRY, LL. D.,
Secretary of the Smithsonian Institution.

COAST SURVEY OFFICE,
Washington, Dec. 24, 1850.

SIR.

The accompanying paper, containing an examination, by Prof. Bailey, of the Military Academy, West Point, of specimens of the bottom of the sea, obtained in sounding between Montauk Point, New York, and Cape May, New Jersey, was presented to the meeting of the American Association of Geologists and Naturalists at Boston, by Prof. Agassiz, and its publication recommended. Besides the practical value to navigators of the examination of specimens of the bottom to ascertain the forms peculiar to different positions of our coast, the investigations of Professor Bailey have a scientific interest for the naturalist, and his descriptions, especially of new species, should be made known for the benefit of those engaged in similar pursuits. By authority of the Treasury Department, I, therefore, transmit the report of Prof. Bailey to you for publication in the Smithsonian Contributions to Knowledge, if on examination it is found to be of the proper character for insertion.

Very respectfully, your obedient servant,

A. D. BACHE,
Superintendent U. S. Coast Survey.

To Prof. A. D. Bache.
Superintendent of Coast Survey.

West Point, *March* 8, 1848.

Dear sir:

I propose in this communication to give you a more complete report of the results of my examination of the soundings which you kindly supplied me with, than I was able to do when I sent you a notice of my first hurried observations.

The specimens were each subjected to the following modes of examination:

1st. Inspection when dry with a pocket Stanhope lens.

2d. About a cubic inch of each specimen was placed in a watch glass with water, and agitated to bring the Polythalamia to the surface; the larger organic forms could then be easily picked up on the point of a needle and examined separately.

3d. Portions of the soundings were diffused in water on a glass slide, and when dried were coated with Canada balsam, and examined as transparent objects.

4th. By levigation the lightest particles were floated off, spread out on glass, and then coated with Canada balsam; by this means the infusorial remains were most easily detected.

By the above means the specimens yielded the results given below:

FIRST LINE OF SOUNDINGS.

Specimens from line E, about S. E. from Montauk Point.

E, No. 73, 13 fathoms; lat. 40° 59′ 35″; long. 71° 55′ 40″.

This specimen is quartzose sand with black specks. Nothing of interest was observed in it, and in consequence of its being mingled with grease the infusorial forms, if present, could not be detected.

E, No. 37, 19 fathoms; lat. 40° 59′ 55″; long. 71° 48′ 55″.

This is a coarse gravel, mingled with ash colored mud. By levigation it yielded a considerable number of silicious shells of Infusoria, among which were Gallionella sulcata, Coscinodiscus lineatus, C. excentricus, C. radiatus, Actinoptychus senarius, Actinocyclus quindenarius, Rhaphoneis rhombus, Triceratium alternans, Bailey; Grammatophora oceanica, Dictyocha speculum, Dictyopyxis cruciata; with spiculæ of Sponges or Alcyonia, small bivalve crustaceans, and a few small Polythalamia, chiefly species of Rotalina.

E, No. 7, 98 fathoms; lat. 40° 05′ 45″; long. 70° 55′ 35″.

This is a coarse clean sand, with black specks, with a few minute bits of shells. No Infusoria nor Polythalamia were detected in it.

E, No. 9, 51 fathoms; lat. 40° 21′ 54″; long. 70° 55′ 35″.

A greenish gray mud or fine sand, with a few bits of shells. It contains a considerable abundance of Polythalamia, among which were noticed Marginulina Bacheii, fig. 5, not abundant; Robulina D'Orbignii, fig. 9 and 10, and Bulimina auriculata, fig. 25 to 27.

SECOND LINE OF SOUNDINGS.

From line F, about S. E. from Fire Island Inlet.

F, No. 19, 11½ fathoms; lat. 40° 24′ 40″; long. 73° 41′ 20″.

This specimen is composed of a quartzose sand with black specks. It presented nothing of interest.

F, No. 27, 20 fathoms; lat. 40° 14′ 13″; long. 73° 21′ 20″.

In this were found numerous small plates of an echinoderm; also one spine of an Echinus, and a single specimen of Quinqueloculina occidentalis, Bail. See fig. 46 to 48.

F, No. 24, 49 fathoms; lat. 39° 52′ 40″; long. 72° 14′ 00″.

This is a greenish gray and rather coarse sand, mixed with some mud. By levigation it yielded a few spiculæ of sponges, a small cypriform crustacean shell, and one spine of an Echinus. Polythalamia are rather abundant in this locality, and among them were noticed Marginulina Bacheii, fig. 5, rather common; Orbulina universa, fig. 1, rare; a small Bulimina, and a few small specimens of Globigerina.

F, No. 25, 105 fathoms; lat. 39° 41′ 10″; long. 71° 43′ 00″.

This is a fine grayish green sand, very rich in small Polythalamia, particularly in the species of Globigerina represented in fig. 20 to 22; Marginulina Bacheii, fig. 5, is present, but rare; a triangular species of Textularia (T. atlantica Bail., fig. 38 to 43,) is also rather rare; the species of Rotalina (R. Ehrenbergii Bail.) represented in fig. 11 to 13, is quite common. By levigation this specimen yielded some spiculæ of sponges, fragments of Coscinodisci, one specimen of Triceratium alternans, fig. 55 and 56; many frustules of Gallionella sulcata, Ehr.; and some excessively minute spherical bodies (see fig. 49) which may possibly be the ova of Polythalamia.

THIRD LINE OF SOUNDINGS.

From line G, about east from Little Egg Harbor.

G, No. 12, 10 fathoms; lat. 39° 30′ 20″; long. 74° 10′ 40″.

In the coarse, clean, quartzose gravel, of which this specimen is chiefly composed, I noticed one small pebble of fossiliferous limestone, fig. 66, containing

well preserved plates from the column of a species of encrinite. The gravel also afforded two valves of Astarte castanea Say. By levigation it yielded a very small number of silicious Infusoria.

G, No. 27, 20 fathoms; lat. 38° 41′ 00″; long. 74° 06′ 00″.

A fine grained sand with black specks. A few fragments of bivalve and univalve shells, small spines, and numerous plates of an echinoderm, like those in F, No. 27, and some Polythalamia, were detected in this specimen. Among the Polythalamia were the Triloculina (T. brongniartiana? D'Orb.) represented in figs. 44, 45. The large species of Robulina (R. D'Orbignii, fig. 9 and 10) rather common, and several specimens of a minute species of Rotalina.

By levigation a considerable number of Infusoria were obtained, among which were Coscinodiscus lineatus, and undetermined fragments of other species. Actinocyclus in fragments also. Actinoptychus senarius, Gallionella sulcata, Stauroptera aspera, Striatella arcuata, a sigmoid Navicula, N. sigma Ehr., fig. 52, Dictyocha speculum, fig. 60, with some spicules of sponges. A few of the minute globular bodies, fig. 49, (eggs of Polythalamia?) were also seen.

G, No. 31, 50 fathoms; lat. 39° 20′ 38″; long. 72° 44′ 35″.

This sounding is composed of a fine grained grayish sand with much mud. It contains a considerable number of Polythalamia, among which were Marginulina Bacheii, rather common; Robulina D'Orbignii Bail., figs. 9, 10, Globigerina rosea? D'Orb., common, but not so much so as in F, No. 25.

The forms obtained by levigation were perfect discs of Coscinodiscus oculus-iridis, Triceratium alternans, fig. 55, Gallionella sulcata, and some spiculæ of sponges, fig. 58.

G, No. 8, 89 fathoms; lat. 39° 31′ 00″; long. 72° 11′ 20″.

Coarser than the last, not so muddy, and about the same color. It ***abounds in Textularia atlantica***, fig. 38 to fig. 43, and in Globigerina, fig. 20 to 24; Marginulina Bacheii is also present; some specimens of Orbulina universa, fig. 1, and of Robulina D'Orbignii were also noticed.

Only a very small number of Infusoria were detected by levigation. These were, one specimen of Coscinodiscus patina, and a few frustules of Gallionella sulcata. A few silicious spiculæ, and some of the supposed ova of Polythalamia, fig. 49, were noticed.

FOURTH LINE OF SOUNDINGS.

From line H, southeast from Cape Henlopen.

H, No. 2, 10 fathoms; lat. 38° 46′ 40″; long. 75° 00′ 30″.

A fine sand, slightly muddy, containing a few small spines of an echinoderm, one specimen of Triloculina, and a few minute nautiloid Polythalamia.

By levigation a great variety of silicious Infusoria was obtained. The most interesting of the species were Rhaphoneis rhombus, and several undetermined species of the same genus, fig. 61 to 65, Triceratium favus Ehr., fig. 54, Coscinodiscus radiatus, C. excentricus, C. lineatus, Actinoptychus senarius, fragments of Actinocycli, Gallionella sulcata, Navicula sigma, fig. 52, a new species of Denticella? bearing two long spines on the middle portions of the terminal surfaces, see fig. 57; Dictyocha fibula, and D. speculum, fig. 60; sponge spiculæ, fig. 58, were also found.

H, No. 17, 20 fathoms; latitude 38° 29′ 56″; longitude 74° 38′ 04″.

A clean quartzose sand, coarser than the last, white and yellow, with black specks—no Polythalamia detected. By levigation a few Infusoria were found, among which were Coscinodiscus radiatus, C. excentricus, Gallionella sulcata, Stauroptera aspera, Striatella arcuata, Pennularia didyma, P. peregrina, Triceratium favus, fig. 54, Navicula lyra, Navicula sigma, fig. 52, and Dictyocha speculum, fig. 60. Soft parts of Polythalamia, retaining the form of the cells, were also noticed.

H, No. 67, 50 fathoms; lat. 38° 09′ 25″; long. 74° 04′ 05″.

A clean grayish sand, containing a few minute shells of Globigerina and Rotalina. The infusorial forms obtained by levigation were not abundant; among them were Coscinodiscus oculus-iridis, C. excentricus, Actinoptychus senarius, Gallionella sulcata, and Triceratium alternans, figs. 55 and 56.

H, No. 1, 90 fathoms; lat. 38° 04′ 40″; long. 73° 56′ 47″.

A rather coarse gray sand, with some mud, and containing a vast number of Polythalamia, particularly of Globigerina, many thousands of which must exist in every cubic inch of the sea bottom at this locality. Marginulina Bacheii, fig. 2 to 6; Globulina universa, fig. 1; Robulina D'Orbignii, figs. 9, 10; and Rotalina Ehrenbergii, fig. 11 to 13, are also common.

By levigation a few specimens of Coscinodiscus radiatus, Gallionella sulcata, and Triceratium alternans, figs. 55, 56, were obtained, with great numbers of the minute globular bodies, which I have supposed might be the ovæ of Polythalamia; they occur not only singly but in strings and bunches, as represented in fig. 49.

In water these bodies are easily seen, but when mounted in balsam they can scarcely be perceived, their cavity becoming nearly filled with balsam, and the thin shell almost vanishing from sight.

GENERAL RESULTS OF THE ABOVE EXAMINATIONS.

1st. The most remarkable fact determined by the examination of the above mentioned soundings is, that in all the deep soundings, from that of 51 fathoms S. E. of Montauk point, to that of 90 fathoms S. E. of Cape Henlopen, there is

a truly wonderful development of minute organic forms, consisting chiefly of Polythalamia, which occur in an abundance rivalling those vast accumulations of analogous forms constituting the marls under the city of Charleston, S. C.

2d. While there is a general resemblance between the species found in all the *deep* soundings above mentioned, the same species of Polythalamia occurring with few exceptions at each locality, yet each place has its predominant species; thus in the most southerly sounding, (H, No. 1, 90 fathoms,) there occurs a much greater number of Globigerina than in any of the others; while Textilaria atlantica, although present, is by no means so abundant as in "G, No. 8, 89 fathoms."

3d. Infusoria, as well as Polythalamia, occur in the deep soundings; but the infusoria are few in number, and consist of Coscinodisci, Gallionella sulcata, and other species, which probably swim freely in the ocean; while none of the littoral parasitic species, such as Achnanthes, Isthmia, Biddulphia, Striatella, and Synedra are found.

4th. It is worthy of notice that in the deep soundings not a single specimen was found of Polythalamia belonging to the Plicatilia of Ehrenberg, (Agathistiques of D'Orbigny,) while a number of these forms were found in the shallow soundings, and they are well known to occur in vast quantities around the shores of Florida and the West India Islands. This group of Polythalamia appears to have been created after the deposition of the chalk formation, in which no trace of such forms occur, while they are very abundant in the tertiary deposites. Their entire absence in the deep soundings, where vast numbers of other Polythalamia occur, and their presence in littoral deposits, would seem to indicate that for their abundant development comparatively shallow seas are necessary; thus affording additional evidence of difference in the depths of the seas from which the cretaceous and tertiary beds were deposited.

5th. The deep soundings were all from localities which are more or less under the influence of the Gulf stream, and it is not improbable that the high temperature of the waters along the oceanic current may be cause of immense development of organic life, making its path, as is shown by the soundings, a perfect milky way of Polythalamia forms. The deposits under Charleston may have been produced under the similar influence of an ancient gulf stream.

6th. From the presence of such great numbers of Polythalamia in the deep soundings, there results a very large proportion of calcareous matter, thus presenting a striking difference between them and the quartzose and felspathic sands nearer shore.

7th. The littoral sands obtained in shallow soundings at first view appear to afford little promise of affording any Infusoria. But notwithstanding their coarse, and, in some cases, even gravelly nature, they all yield by levigation a considerable number of silicious Infusoria, which in variety and abundance exceed those found in the deep soundings.

8. None of the soundings present anything resembling the vast accumulations of Infusoria which occur in the Meiocene infusorial marls of Virginia and Maryland; and, indeed, I have never found, even in estuaries, any recent deposit at

all resembling the fossil ones, in abundance and variety of species, with the exception of the mud of a small creek opening into the Atlantic near Rockaway, Long Island.

9th. The occurrence of the pebble of limestone with encrinal plates in the gravel of F, No. 10, S. E. of Little Egg Harbor, is of some interest, as the nearest beds from which it could have come are the Silurian formations of Pennsylvania or northern New Jersey. It indicates a transportation of drift to a considerable distance sea-ward.

10. In addition to the quartzose grains in the soundings, fragments of felspar and hornblende (recognisable under the microscope by their cleavage planes and color) are found. The quartz, however, predominates, its grains being sharp and angular in the deep soundings, and often rounded or even polished in the shallower ones.

DESCRIPTION OF THE MOST INTERESTING MICROSCOPIC FORMS FOUND IN THE ABOVE MENTIONED SOUNDINGS.

In this description, I have adopted for the Foraminiferæ the generic characters given by Alcide D'Orbigny in his splendid work "Foraminifères fossiles du Bassin Tertiaire de Vienne." With regard to the infusorial forms I have, of course, taken Ehrenberg as my guide.

FORAMINIFERÆ, *D'Orbigny.*

(POLYTHALAMIA, *Ehrenberg.*)

Genus ORBULINA. Shell free, regular, spherical, hollow, perforated with minute holes which are only visible when greatly magnified. Aperture single, small, rounded, without projection or radiant lines.

Orbulina universa, D'Orb., (fig. 1.) Only one species of thisgenus has been distinguished, and this appears to be a cosmopolite species, occurring in the Adriatic and Mediterranean seas, at the Canary Islands, and in East and West Indies. It also occurs fossil in Italy and Austria.

It is not a rare form in the deep soundings described in this paper.

Genus NODOSARIA, D'Orb. Shell, free, regular, elongated, straight, rounded, or flattened; cells rounded, distinct, but slightly envelloping, separated by deep constrictions, the last always convex, often elongated; axis imaginary, straight; aperture rounded, small, placed at the termination of a prolongation of the last cell.

Several fragments of different species of this genus were noticed in the deep soundings, but none were sufficiently perfect to give good specific characters. Fig. 8 represents one of these fragments, which was very smooth and vitreous in its appearance.

Genus DENTALINA, D'Orb. Shell much elongated, slightly arcuate, smooth, slender, formed of long oblique cells, gradually increasing in size; aperture small, round, in the acuminated end of the last cell.

Dentalina mutabilis, Bail., (fig. 7.) Shell composed of slightly convex smooth cells, which are variable in length, a short one often succeeding a longer one; aperture surrounded by radiant ridges. Several fragments were found in the deep soundings labelled No. 1, H, 90 fathoms.

Genus MARGINULINA, D'Orb. Shell free, regular, equilateral, elongated, arcuate, often curved at the posterior extremity in form of a crosier, formed of globose partially envelloping cells, the last of which is always convex, and often prolonged; the first cells turned backwards, and often showing an approach to a spiral arrangement; imaginary axis arcuate, the convexity on the same side as the opening; aperture rounded, usually placed at the extremity of an elongation of the last cell.

Marginulina Bacheii, Bail., figs. 2, 3, 4, 5, and 6. Shell elongated, smooth, and shining, formed of cells, the first of which are arranged in a spiral manner, and compressed laterally; the others gradually assume a more globular form, and an oblique position, giving to the whole shell a sigmoid form; aperture at the elongated extremity of the last cell, surrounded by small ridges.

This fine species is one of the largest and most conspicuous forms in these soundings. It was found in considerable numbers in all the soundings except the shallow ones, from S. E. of Montauk Point to S. E. of Cape Henlopen.

I take pleasure in dedicating this species to Prof. A. D. Bache, Superintendent of the Coast Survey. Fig. 2, side view of the young shell; fig. 3, front view of the same; fig. 4, end view of the same, showing the orifice; fig. 5, the full grown shell; fig. 6, end view, showing the orifice.

Genus ROBULINA, D'Orb. Shell free, regular, equilateral, suborbicular, much compressed, carinate, vitreous, shining, formed of elongated cells, constantly arranged in an envelloping spiral, and uniting in the region of the umbilicus. Aperture triangular, longitudinally cleft, situated at the carinal angle of the cells.

Robulina D'Orbignii, Bail., (fig. 9, 10,) shell discoidal, compressed, with a narrow but sharp carina, surface free from ridges, cells about eight in number, with traces of the successive apertures visible on the three or four last. Aperture a longitudinal cleft surrounded by small ridges. It occurs in considerable numbers at all the localities mentioned as furnishing the Marginula Bacheii. I dedicate it to Alcide D'Orbigny, who, by his labors, may be said to have created the important and interesting branch of science to which these minute shells belong.

Genus ROTALINA, D'Orb. Shell free, depressed or trochoid, minutely perforated, often carinate, formed of a depressed spire, truncate or conical, composed of depressed cells, pierced with an aperture in the form of a longitudinal cleft, on the side of the penultimate turn of the spire, occupying but a portion of the last cell.

Rotalina Ehrenbergii, Bail,. figs. 11, 12, 13. Shell orbicular, depressed, nearly

plain above, very convex and slightly umbilicate below. Spire having three or four turns composed of oblique cells, about nine of which compose the last turn. Aperture elongated, somewhat lunate, commencing near the angle of the outer cell, and extending to near the middle of the inner margin. Near to *R. Soldanii D'Orb.* It occurs rather frequently in the soundings No. 25 F, 49 fathoms, but also occurs in several of the deeper soundings. I have named it in honor of the Prince of Microscopists.

Rotalina cultrata ? D'Orb, figs. 14, 15 and 16. Shell punctate, depressed, spire composed of about five cells, each of which has a conspicuous raised border, which on the outer margins form a carinate edge to the cell. Our species appear to differ from the R. cultrata of D'Orbigny in having the carina slightly rounded, instead of presenting the acute cultrate edge represented in Pl. 5, fig. 9, Foraminiféres des Antilles.

It is quite a common form in the deep soundings.

Rotalina semipunctata, Bail., figs. 17, 18, 19. Shell somewhat irregular, having six cells visible in the upper surface, which are marked with numerous deep perforations on their upper surface, but are smooth and imperforate below. Aperture lunate, with a raised margin. Occurs in the soundings marked G. No. 28, 89 fathoms.

Genus GLOBIGERINA, D'Orb. Shell free, spiral, globose, always rugose, and perforated with minute holes. Cells few in number, spheroidal, arranged spirally. Aperture generally crescent shaped, situated at the umbilical angle near the axis of the spiral.

Globigerina rubra, D'Orb., (figs. 20, 21, 22) ? figs. 23, 24. Shell elevated, spire composed of one turn and a half, or in the adult shell of five cells only. Cells spherical, very distinct, three of which form the last turn of the spiral. Besides the usual aperture, two others are sometimes visible in the last cell, and one on the last but one.

The last cells are yellow, or yellowish red; while near the summit of the spire the red tint predominates.

Vast numbers of one or more species of Globigerina occur in some of the soundings referred to above, being particularly abundant in those marked F. No. 25, 105 fathoms, and H, No. 1, 90 fathoms. They are common also in those marked G, No. 31, 50 fathoms, and H, No. 67, 50 fathoms, while they are few and small in F, No. 24, 49 fathoms. Some of them, by their red color and other characters, are decidedly referable to G. rubra of D'Orbigny. Others like figs. 20 to 22, which are white and have a more elongated aperture, may belong to a different species. The abundance in which these species of Globigerina occur in the deep soundings, G, No. 31 and H, No. 1, gives to these green muds a most striking resemblance to the green tertiary marls perforated by the Artesian wells at Charleston, S. C. This similarity appears to indicate that the Charleston beds were a deep sea deposite, perhaps made under the influence of an ancient Gulf stream.

Genus BULIMINA, D'Orb. Shell free, spiral, turriculated, formed of an elongated spire composed of cells which are arranged in a regular spiral axis, project but little, are more or less envelloping, and the last of which is not prolonged into a tube. Aperture longitudinal, comma shaped, or rounded, lateral on the internal edge, or near the superior angle of the last cell.

Bulimina auriculata, Bail., figs. 25, 26, and 27. Shell ellipsoidal, smooth or very minutely punctate, sutures not very distinct. Aperture with an ear-shaped appendage.

Several of these were found in the soundings marked No. 9, 51 fathoms.

Figs. 25 and 26 show the general form of the shell, and fig. 27 represents the lower part of the shell with the auricular appendage more highly magnified.

Bulimina turgida, Bail., figs. 28 to 31. Shell ovoidal, smooth, and having several small dentate projections at the apex; cells much inflated, separated by deep sutures, aperture nearly symmetrical, with a raised border.

Found in the soundings marked No. 9, 51 fathoms, and F, No. 24, 49 fathoms.

Figs 28, 29, and 30 show different portions of the same individual. Fig. 31 shows the lower part of fig. 28 more highly magnified.

Bulimina serrata, Bail., figs. 32, 33 and 34. Shell minute, pyramidal, the sutures, particularly in the upper part of the spire, strongly marked and serrated. I noticed several of these very minute shells in the soundings No. 9, 51 fathoms, and G, No. 31, 51 fathoms.

Fig. 32 and 33 show two positions of the same shell; fig. 34 shows the lower part of fig. 32 more highly magnified.

Bulimina compressa, Bail., figs. 35, 36 and 37. Shell elongated, somewhat pyramidal, slightly compressed laterally, aperture a long cleft without any very distinct margin. Occurs in "F, No. 24, 49 fathoms," in "F, No. 25, 105 fathoms," and in "G, No. 31, 50 fathoms."

Figs. 35 and 36 show two positions of this shell, and fig. 37 represents the lower part of fig. 36 more highly magnified.

Genus TEXTULARIA, Defrance (*Textilaria* Ehr.) Shell free, regular, equilateral, conical, oblong or wedge shaped, rugose or agglutinating; formed of globular or wedge shaped cells, which regularly alternate at all ages on each side of a longitudinal axis, and which are either partially envelloping, or are only superposed on two alternate regular lines. Aperture semi-lunar, transverse, lateral on the interior side of the last cell.

Textularia atlantica, Bail., figs. 38 to 43. Shell large, pyramidal, three sided, with one side flattened and the other two rounded and convex, having three edges or carina, strongly marked near the apex of the shell, but one of which (separating the two convex sides) nearly disappears on the lower part. Surface quite rugose, color greyish. Aperture lunate, with a depressed margin.

This large and well characterized species so much resembles to the naked eye a fragment of gravel or sand, that it may be easily overlooked in soundings where it is quite abundant, but when once seen it is easily recognised, even

without the aid of a magnifier. It appears to exist only in the deep soundings, and is *particularly abundant* in those marked G, No. 8, 89 fathoms.

None of the species of Textularia, which are so abundant in our tertiary marls, have been found by me during the examination of these soundings.

Genus TRILOCULINA, D'Orb. Shell free, inequilateral, globular or compressed, having the same form at all ages, formed of enveloping cells developed on three opposite faces, so that three cells only are visible; their cavity is simple. Aperture single, round or oval, placed alternately at one or the other end of the longitudinal axis, and furnished with a more or less complicated tooth.

Triloculina brongniartiana, (figs. 44, 45)? Shell oblong, convex, a little gibbose with fine longitudinal striæ, obtuse posteriorly, acuminate and rostrate anteriorly, outline convex, not at all angular. Cells arcuate, gibbose, rounded behind, gradually diminishing in diameter in front up to the anterior portion, when they suddenly contract to form the slender prolongation for the aperture. Aperture small, round, with a small simple obtuse tooth.

This description of a species common in the West Indies, appears to suit in most respects the species represented in figs. 44 and 45, which was found in No. 27, 20 fathoms.

Genus QUINQUELOCULINA, D'Orb. Shell free, inequilateral, globular or compressed, rounded or angular, having the same form at all ages, formed of enveloping cells developed on five opposite faces, so that five only are visible. Cavities simple. Aperture single, with a simple or compound tooth.

Quinqueloculina occidentalis, Bail., figs. 46, 47, and 48. Shell elliptical compressed, not angular, of a smooth and porcellaneous texture. Aperture moderately large, with a simple robust tooth.

Found in the soundings marked F, No. 27, 20 fathoms, and not uncommonly in the sands along the Western shores of the Atlantic.

OVA OF POLYTHALAMIA?

The minute globular bodies, represented highly magnified in fig. 49, are particularly abundant in the soundings No. 1, 90 fathoms, S. E. of Cape Henlopen. They also occur, though less abundantly, in the other deep soundings; they are found most easily when a portion of the mud is diffused in water, for when mounted in Canada balsam, their refractive power is so nearly that of the balsam, that they become almost invisible. Their real nature is wholly unknown to me, but from their occurrence with the Polythalamia, and their resemblance in form and size to the globular bodies sometimes found in the fossil Polythalamia which have been supposed to be the fossil ova of these minute animals,* it is not improbable that these may be the eggs in a recent state.

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*See the interesting memoir on the fossil remains of the soft parts of Foraminifera, by Dr. Mantell, Phil. Trans., Part IV for 1846, and Silliman's Journ., vol. 5, p. 70, new series.

INFUSORIA.

I shall not enter into a detailed description of the Infusoria found in these soundings, as the species detected were mostly such as are well known, and which have a wide geographical range. In the deep soundings they consisted chiefly of species of the genera Coscinodiscus, Actinocyclus, and Actinoptychus, for figures of which reference may be made to figs. 10 to 15 of the second plate of my memoir on American Bacillaria.

Some of the other interesting forms are represented in the plate accompanying this memoir. The following brief account of them, it is believed, will be sufficient:

Fig. 50. This appears to be the *Dictyopyxis cruciata* of Ehrenberg. It resembles two thimbles joined together, with the whole surface covered with minute cells, or projections so arranged as to give the appearance of two sets of lines crossing each other obliquely.

It occurs in No. 37, 19 fathoms, and is also a common fossil in Virginia.

Fig. 51. This is a species of *Pinnularia*, probably new.

Fig. 52. *Navicula sigma*, Ehr.?

Fig. 53. *Periptera* sp.? Found in No. 37, 19 fathoms. Closely allied forms are common among the fossil Infusoria of Virginia.

Fig. 54. *Triceratium favus*, Ehr. An elegant cosmopolite species, easily recognised by its large triangular form and hexagonal cells. I have found it along our coast from Rockaway, Long Island, to Charleston, South Carolina.

It also occurs in the mud of the Hudson river at West Point, and has also been found in Europe and Asia. It has not yet been detected in the fossil state.

Fig. 55. *Triceratium alternans*, Bailey. I attach this provisional name to the species represented in figs. 55 and 56. It is much smaller than the preceding species and chiefly characterized by the three curved lines seen on its triangular face, as represented in fig. 56. It occurs in both shallow and deep soundings, and also as a fossil.

Fig. 57. An interesting and probably novel form referable, I think, to Ehrenberg's genus *Denticella*. The figure shows its form with sufficient accuracy, but in consequence of its surface being obscured, I could not well make out the character of the minute markings of the shell. For the present I shall call it *Denticella dubia*.

It was found in H, No. 2, 10 fathoms, S. E. of Cape Henlopen.

Fig. 58. Spicules of sponges, common in all soundings.

Fig. 59. Frustule of *Grammatophora oceanica*? common in shallow soundings.

Fig. 60. *Dictyocha speculum*, Ehr. Common in shallow soundings; occurs occasionally in deep soundings, and is also a common fossil species.

Fig. 61 to 65. Different species (?) of Ehrenberg's genus *Rhaphoneis*. These were all found in the sounding H, No. 2, 10 fathoms, and are chiefly of interest from their resemblance to species occurring abundantly in the fossil state in the Meiocene infusorial strata of Maryland and Virginia.

Fig. 66. Pebble of fossiliferous limestone, containing encrinal plates found in the soundings marked No. 12, 10 fathoms.

Fig. 67. Scale A, represents $\frac{5}{100}$ths of an English inch equally magnified with the drawings from fig. 1 to fig. 48, (excluding figs. 27, 31, 34, and 37.)

Fig. 68. Scale B, represents $\frac{5}{1000}$ths of an inch equally magnified with the figures from fig. 49 to fig. 65 inclusive.

It is not without much hesitation that I have ventured to attach specific names to some of the forms above described, but for the purposes of this paper it was thought that these provisional names would be more convenient than mere references to the figures. I trust that the figures themselves, which were all drawn by the aid of a camera lucida, will be found sufficiently accurate to enable naturalists interested in this subject to identify the species.

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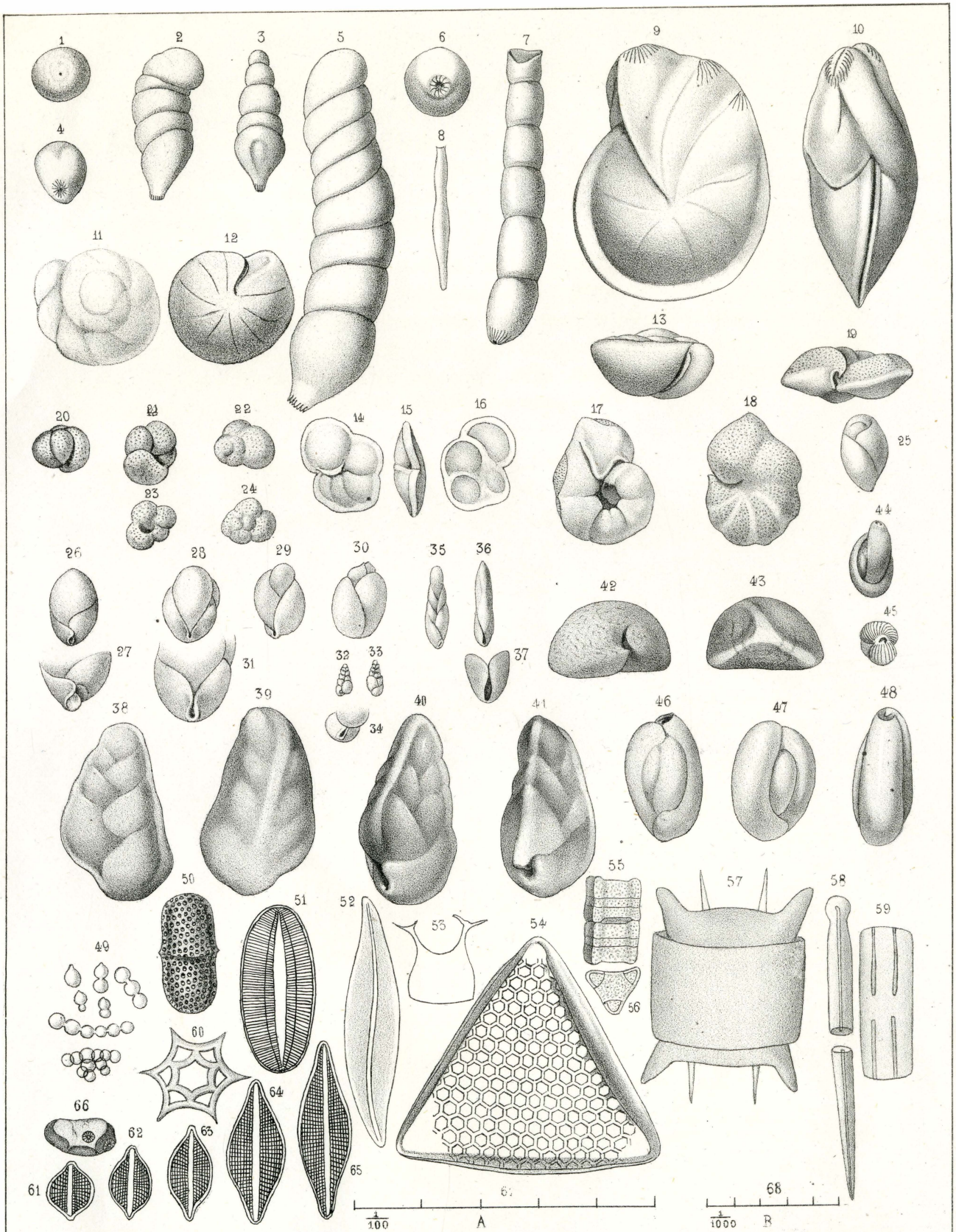

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MICROSCOPIC FORMS IN SOUNDINGS MADE BY THE U.S. COAST SURVEY.